ELF MUSHROOMS and
ELF FARM SUPPLIES PTY LTD

MUSHROOM INDUSTRY EXPANSION

in

WESTERN SYDNEY

Environmental Assessment

Volume 1



Perram & Partners

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ELF FARM SUPPLIES PTY LTD

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WESTERN SYDNEY

Environmental Assessment
Volume 1 of 2

Report 121R3

December 2010

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CERTIFICATION OF ENVIRONMENTAL ASSESSMENT

PREPARED PURSUANT TO PART 3A OF THE *ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979*

ENVIRONMENTAL ASSESSMENT PREPARED BY

Name:	T W Perram
Qualifications:	BSc(Eng), MEngSc, DipEnvStud
Address:	Perram & Partners 12 Clanwilliam Street, EASTWOOD NSW 2122

in respect of:

PROJECT TO WHICH PART 3A APPLIES

Proponent Name:	Elf Mushrooms and Elf Farm Supplies Pty Ltd
Proponent Address:	PO Box 615, WINDSOR 2756
Land to be developed: Address	521 The Northern Road, Londonderry and 108 Mulgrave Road, Mulgrave
Lot No. DP/MPS, Vol/Fol etc.	Lot 138 DP 752037, part Lot 13 DP 1138749, Lot 14 DP 1138749
Proposed Development	Mushroom industry expansion in Western Sydney including a new mushroom farm at Londonderry and expansion of an existing substrate plant at Mulgrave.

ENVIRONMENTAL ASSESSMENT

An environmental assessment is attached

CERTIFICATION

I certify that I have prepared this environmental assessment and to the best of my knowledge:

- it has been prepared in accordance with Sections 75M and 75E of the *Environmental Planning and Assessment Act 1979,*
- the information contained in the Environmental Assessment is neither false nor misleading.

Signature: 

Name: T W Perram

Date: December 2010

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GLOSSARY

AHD	-	Australian height datum
AMGA	-	Australian Mushroom Growers Association
ANZECC	-	Australian and New Zealand Environment Conservation Council
ARI	-	Average recurrence interval
AS	-	Australian Standard
BCA	-	Building Code of Australia
DCP	-	Development control plan
DECCW	-	Department of Environment, Climate Change and Water and its successors
DGRs	-	Director General's requirements
DLEP	-	Draft local environmental plan
DoP	-	Department of Planning and its successors
DP	-	Deposited plan
DPI	-	Department of Primary Industries and its successors
EA	-	Environmental Assessment (this document)
EMP	-	Environmental Management Plan
ENM	-	Excavated natural material
EP&A Act	-	*Environmental Planning and Assessment Act, 1979*
EPBC Act	-	*Environment Protection and Biodiversity Conservation Act, 1999* (Cwealth)
LEP	-	Local environmental plan
OU	-	Odour unit
Phase 1 Substrate	-	Substrate that has completed the composting process
Phase 2 Substrate	-	Phase 1 substrate that has been pasteurised at high temperature
Phase 3 Substrate	-	Phase 2 substrate that contains mushroom spawn, ready for growing
POEO Act	-	*Protection of the Environment Operations Act, 1997*
REP	-	Regional environmental plan
RTA	-	Roads and Traffic Authority
SEPP	-	State environmental planning policy
STP	-	Sewage treatment plant

EXECUTIVE SUMMARY

1. Introduction

Approval is being sought to expand the mushroom-growing industry in western Sydney by constructing a new mushroom farm at Londonderry and increasing the production capacity of an existing substrate plant at Mulgrave. The developments are linked because the mushroom farm will be dependent upon a guaranteed supply of substrate. The Mulgrave facility needs to be expanded to provide substrate for the new farm and meet the growing demand for substrate from other mushroom growers.

The application is submitted to the Department of Planning under Part 3A of the *Environmental Planning and Assessment Act, 1979* seeking approval for a concept plan for the project and approval to carry out the project in stages.

Elf Mushrooms is the proponent for the mushroom farm and Elf Farm Supplies is the proponent for the substrate plant expansion. These companies are part of the Tolson group that has been producing mushrooms in western Sydney for more than 40 years. Elf Mushrooms operates an existing mushroom farm at Vineyard while Elf Farm Supplies is the operator of the existing substrate plant at Mulgrave.

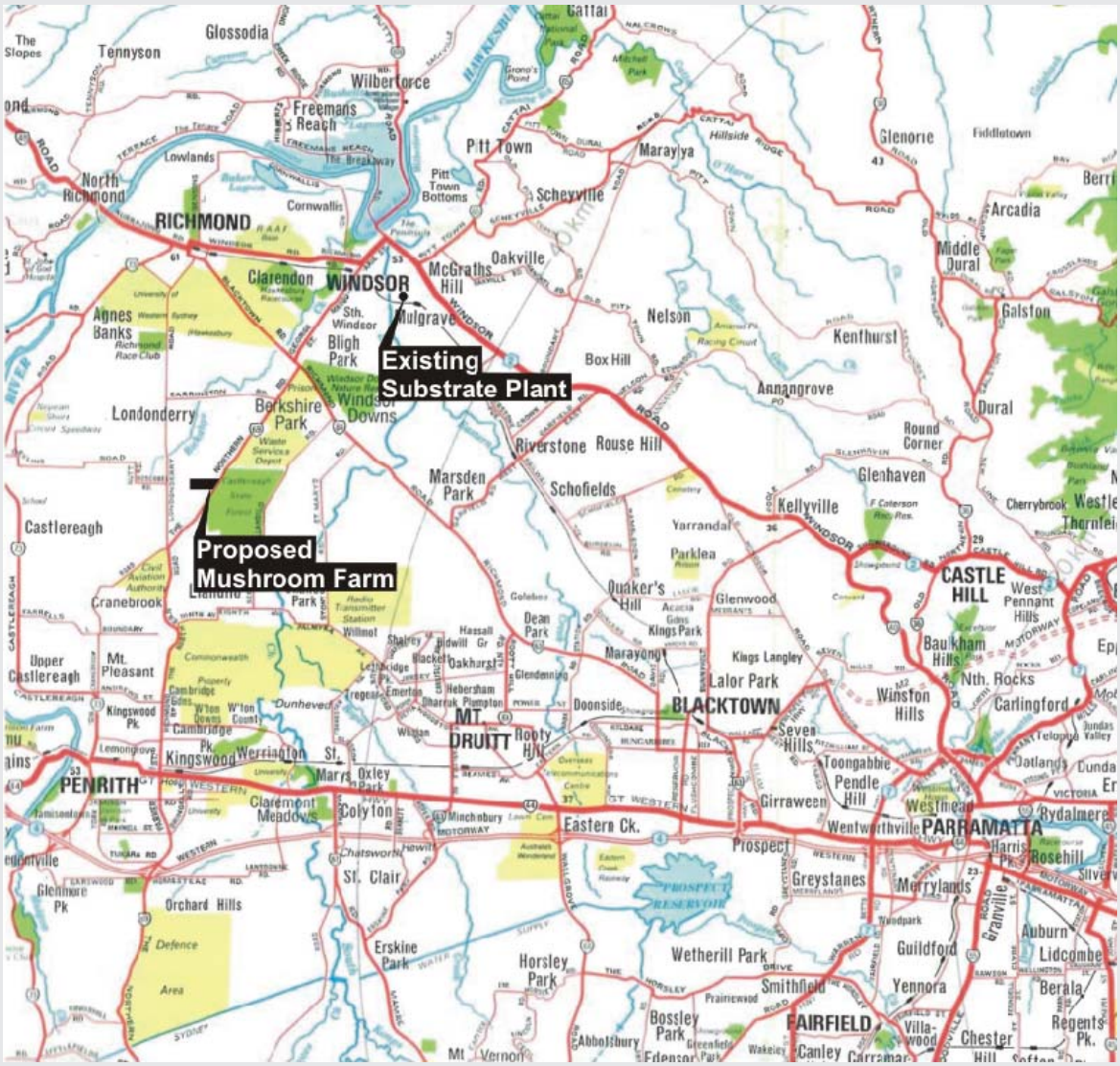
2. The Sites

The mushroom farm is proposed for a rural property at 521 The Northern Road, Londonderry. The project site comprises about 75 per cent of the 22 hectare property, leaving untouched an area of remnant native vegetation at the rear. The site is currently used for grazing but has been a piggery in earlier years.

The mushroom farm site is surrounded by rural land and the Castlereagh Nature Reserve. Some surrounding land is developed for rural-residential uses, while there are large areas of bushland and miscellaneous uses including a car wrecking yard.

The existing substrate plant is No 108 Mulgrave Road, Mulgrave. This site has an area of about 12 hectares and is accessed from Mulgrave Road. The developed area has been filled to the building level specified by Hawkesbury Council and the balance of the site is in the process of being raised to the same level. The substrate plant is part of a larger rural property that extends to South Creek.

Mulgrave is primarily a rural area with a small number of houses clustered near the railway station. The property is within the South Creek flood plain located between two linear developments that cross South Creek, Hawkesbury Valley Way and the Blacktown to Richmond Railway. An industrial area is located on the northern side of the railway on the opposite side of Mulgrave Road from the substrate plant.



3. *Relevant Planning Provisions*

Under Part 3A of the EP&A Act the Minister has the authority to determine the application for concept plan and project approval. While existing environmental planning instruments have no application in the approval process, State environmental planning policies apply to the carrying out of a project approved under Part 3A.

The relevant provisions of the various environmental planning instruments that would otherwise control development on the site have been considered in this report.

4. *Issue Identification*

Key issues for assessment have been identified through a process of environmental risk assessment, taking into account various factors including the requirements of the Director-General of Planning, review of planning instruments, consultation with agencies and guideline documents.

5. *Project Description – Mushroom Farm*

Design

The proposed mushroom farm is essentially a large metal building enclosing an array of climate-controlled growing rooms supported by ancillary infrastructure and services. It is planned to develop the mushroom farm in five stages. Each stage will add further growing rooms until a total of 50 rooms have been constructed. Most of the ancillary services will be constructed in the first stage, but some will be expanded in later stages. A child care centre for employees is included within the concept plan but will be the subject of a separate application.

In addition to the main building, a separate building will provide a peat store at one end and a workshop at the other. A third structure with canopy roof but no walls will be a spent substrate store.

Other lesser structures and facilities include a covered loading dock, office and reception building, child care centre, water storage dam, water recycling system, sewage treatment plant, roadways, building apron, car parking area, fencing and landscaping.

Construction

Construction works will be undertaken with appropriate safeguards to control dust, noise and to minimise erosion and sedimentation. To provide a level surface for the building footprints the land beneath the structures will be filled as necessary. As a first step, a 2.5 metre high earthen mound will be constructed and landscaped along The Northern Road frontage and the northern boundary of the site. This mound will help to control noise during construction and will reduce noise and visibility of the facility during operation.

It is anticipated that subsequent stages will commence approximately five years after completion of Stage 1 and progress thereafter according to market demand for mushrooms. These subsequent stages will be accompanied by the closure of Elf Mushrooms' ageing Vineyard mushroom farm.

Operation

Raw materials include mushroom substrate, peat and water. Substrate that has been pasteurised and contains mushroom spawn (Phase 3 substrate) will be delivered from the substrate plant in bulk up to four days a week. The substrate is unloaded directly onto shelves in growing rooms and a top layer of peat is applied. Growing rooms are sealed and temperature controlled with occasional watering as mushrooms emerge.

Over a six week growing period, three crops of mushrooms are manually picked. Picked mushrooms are packed into cases and dispatched from the farm. At full production, four semi trailers will be required to transport the product over each 24-hour period.

After the final crop of mushrooms has been picked, the spent substrate is steamed to destroy remaining live material and removed from the room. The growing room is washed out ready to start again. Some of the spent substrate will be directly removed from the farm for use as potting mix or soil conditioner as normally occurs. The remainder will be moved to the spent substrate store where over a period of weeks it will be refined into a drier, fine-grained material suitable for top dressing lawns, playing fields or golf courses in addition to a wider range of agricultural uses.

Production Capacity and Employment

When Stage 1 of the mushroom farm commences the production capacity will be approximately 85 tonnes of mushrooms per week with approximately 115 employees. After completion of Stage 5, full production capacity will be approximately 220 tonnes per week with a workforce of approximately 165 personnel. It is intended to introduce mechanised shelving in later stages to increase the efficiency of mushroom picking.

Hours of Operation

Activities can be occurring at the mushroom farm 24 hours per day. Cooling/heating equipment will operate continuously, but with reduced load at night. The majority of staff are engaged in mushroom picking and will work during daylight hours. The staff roster system provides for two thirds of the pickers to be present on any day. Some truck movements will occur during the night period.

Water Management

The mushroom farm will collect and utilise roof water and water falling on the main building apron. Mains water will be used for specific purposes such as watering mushrooms, and will be available as a back up for collected water during dry periods. Wash down water will be collected and processed on site to remove solids and nutrients. Processed water will be used for designated purposes including cooling towers and toilet flushing.

Wastewater from staff amenities, workshop and the child care centre will be treated in a package sewage treatment plant. The effluent will be disposed of by sub-surface irrigation within the perimeter landscape mounds.

The water management system is designed so that there will be no discharge of operational water to natural drainage.

Environmental Management

An environmental management plan will be prepared for site operations incorporating details of the conditions of approval, controls for potential environmental impacts and protocols for dealing with complaints, should any be received.

6. Environmental Assessment – Mushroom Farm

Soil

The Londonderry property was assessed for soil contamination owing to its previous use as a piggery. The first assessment considered the mushroom farm site with emphasis on the section of the land formerly used as a pig run. Some low levels of heavy metals were discovered in this area with concentrations below acceptable natural levels. It is assumed the findings are either naturally occurring or resulting from corrosion of the existing steel structure which is to be removed. There is considered to be no risk to human health or the environment as the measured metal concentrations did not exceed the health based investigation levels for commercial/industrial development. They were also below allowable levels for standard residential development.

A second assessment was undertaken on the smaller area to be developed for a child care centre. Low levels of heavy metals were detected that were consistent with background levels elsewhere on the site and below the residential health based investigation levels. The conclusion of the assessment is that the land is suitable for the proposed development and no remedial action is required.

Water Quality

The Londonderry property drains through minor drainage channels that lead to Rickabys Creek and is not flood prone. Runoff water quality will be maintained during construction through implementing erosion and sediment controls as detailed in the accompanying erosion and sediment control plan.

A stormwater management plan has been prepared to consider stormwater management, operational water harvesting and recycling and water quality. During operation, water quality in waterways and drainage paths will be maintained by designing the water management system on the basis that there will be no discharge of operational water to natural drainage.

Noise

Modelling of construction noise has indicated that in the absence of additional noise controls, construction noise goals may be exceeded at times during the development

stages. Measures recommended to ameliorate noise will be implemented including building the earthen mound as early as practicable in the construction program.

Operational noise modelling considered a series of typical operating scenarios incorporating activities that will occur at the mushroom farm over a 24-hour period. The majority of noise-generating activities occur during the daylight hours when mushroom pickers are present, most truck movements occur and temperature control plant is under its highest loading.

The modelling results show that during both calm and adverse meteorological conditions the predicted operational noise will generally satisfy noise assessment goals at all referenced residential receptors during all time periods. A minor exceedence was indicated at one receptor during the night period associated with trucks entering the site. Controls will be implemented to minimise operational noise.

The effect of adding traffic from the development to existing traffic on The Northern Road was found to satisfy the applicable noise assessment goal.

Traffic

Vehicle movements at the proposed mushroom farm have been estimated based on actual movements recorded at the existing Elf Mushrooms' farm at Vineyard. At full production there will be up to approximately 64 small vehicle visits (128 movements) and 17 truck visits (34 movements) per day.

The traffic assessment considered the traffic to be contributed by the development to The Northern Road. It was concluded that the increase in hourly traffic contributed by the mushroom farm will not alter the existing level of service during peak periods on The Northern Road, although that level of service will decline over the life of the development due to the growth in background traffic.

The intersection of the site access road and The Northern Road will be constructed as a Type AU intersection in accordance with the RTA's *Road Design Guide* prior to commencement of operations.

Air Quality

Standard dust controls will be implemented during construction particularly when earthworks are in progress. During operation, working areas will be fully sealed and cleaned regularly leaving little potential for dust generation.

Mushroom-growing activities at the Tolson Group mushroom farms have not in the past been associated with odour issues. An assessment has been carried out of potential odour emission from sources on the site, particularly the spent substrate store which is a new feature to be introduced at the Londonderry mushroom farm. Based on

measured odour emission rates from spent substrate and dispersion modelling, it is predicted that ground level concentrations of odour are unlikely to exceed the most stringent criterion (2 odour units) anywhere beyond the property boundary.

Visual Characteristics

The mushroom farm will be visible from The Northern Road and neighbouring properties to the north and south. Visibility will be reduced by the landscaped earthen mounds along the road frontage and northern boundary and by existing scattered vegetation on the property and in the area in general.

Measures to reduce visual impact include selecting building finishes to reduce glare and obtrusiveness and planting additional trees in critical locations on the property.

Flora and Fauna

The Londonderry site is predominantly cleared land covered with pasture grasses with occasional patches of remnant Castlereagh Woodland. The remnant woodland is in poor condition, being primarily young regenerating regrowth with grazed understorey. The site offers little fauna habitat. There are occasional large trees with potential breeding hollows, but little shrub layer or debris on the ground to provide protection.

No threatened plant or animal species were recorded on the site. There are some vegetation species in a small area indicative of an endangered ecological community, the Castlereagh Swamp Woodland. The impact of the development on this community is not considered significant. Mitigation measures are proposed to minimise flora and fauna impact.

Waste Management

Waste materials generated at the mushroom farm will be largely limited to miscellaneous items such as packaging, office waste, workshop waste, food waste from the staff lunchroom, child care centre waste and contractors' waste. Waste will be separately stored for recycling where possible and collected by a contractor.

Spent substrate is not considered a waste material as it will be removed from the site for beneficial use

Environmental Hazards

Mushroom-growing is not a hazardous or potentially hazardous activity. Chemicals used on the site include cleaning agents, insecticides, fungicides and the like. The area presents a bushfire risk to the mushroom farm that will be addressed in design and management requirements included in the bushfire compliance report.

Heritage

An archaeological and cultural heritage assessment has been undertaken revealing no known or discovered artefacts of indigenous heritage. There are no items of non-indigenous heritage listed for the site.

Greenhouse Gas

Greenhouse gas emissions attributable to the operation of the mushroom farm at full output have been calculated. At full production, the farm is estimated to increase the total of Australia's 2008 emissions by 0.001 per cent.

7. Project Description – Substrate Plant

Design

The proposed expansion of the existing substrate plant will take place in three stages. The first stage requires very little construction work, essentially limited to a new straw bale shed. The principal effect of Stage 1 is to increase the approved throughput of the plant to 1,600 tonnes of Phase 1 substrate[1] per week. Currently the plant is limited to produce 1,000 tonnes per week, but has sufficient capacity for a larger tonnage. Efficiencies in the production method developed by Elf Farm Supplies over a number of years have shortened the period to produce substrate, creating surplus capacity within the plant.

Subsequent stages involve more substantial building works including an extension to the pre-wet shed, a second bale wetting area, another bale storage shed, additional processing tunnels, a second building for phase 2/3 processing, a second bioscrubber with chimney and other miscellaneous alterations. After installation of Stage 2 works it is proposed the production limit be raised to 2,400 tonnes per week and to 3,200 tonnes per week after Stage 3.

Construction

As with the mushroom farm, construction works will be undertaken with appropriate safeguards to control dust, noise and to minimise erosion and sedimentation. A small area of filling is proposed at the western side of the site to enable the existing pre-wet shed to be extended. It is proposed that this should occur during stage 1 so that the batter slope can be stabilised and screening vegetation planted prior to commencement of Stage 2.

[1] Phase 1 substrate is explained on page 1.4

It is anticipated that the three stages will be implemented over about 10 years, keeping pace with the increasing demand for substrate according to market demand for mushrooms.

Operation

Raw materials for producing substrate include straw, water, poultry manure, other recycled agricultural products, gypsum and dry stable bedding. These materials are delivered in bulk and stockpiled under cover.

As a first step in the process, baled straw is wet for several days to remove the waxy layer and increase water content. Straw bales and mixed ingredients are then blended in the pre-wet shed and laid out in rows. Over a period of one week the mix frequently turned and water added while air is continuously injected through the floor.

The mix is moved to tunnels for the high temperature composting phase which takes another week. Circulating air is again injected through the floor. The resultant product is Phase 1 substrate. It is then moved to the Phase 2/3 building for two to three weeks to be pasteurised and sustain initial growth of mushroom spawn from introduced mycelium. These operations take place under controlled atmospheric conditions to avoid external spores or pathogens contaminating the pasteurised substrate.

Exhaust air is collected from the pre-wet building and the composting tunnels to pass through the bioscrubber. Within the bioscrubber the air passes over an array of frames containing media with odour-absorbing micro organisms, kept moist with water sprays. Exhaust air from the bioscrubber is discharged through a chimney to aid dispersion.

Employment

Expansion of the plant is estimated to require an additional two staff for Stage 1, a further four staff for Stage 2 and a further two staff for Stage 3.

Hours of Operation

The substrate plant operates 24 hours per day, seven days per week. Refrigeration plant and ventilation/aeration equipment operates continuously to maintain essential conditions for the process. Most outdoor operations are scheduled for daylight hours. Deliveries and dispatches currently occur throughout the day and night period. The extended plant will continue to operate in this manner.

Water Management

The plant obtains water from rainfall runoff from operational areas, a licensed pump in South Creek, a licensed bore on the property and mains water from Sydney Water. The process is water-hungry so there is no surplus water to be disposed of, other than sewage effluent from staff amenities, which flows to Sydney Water's sewer.

All operational water is recycled, ultimately to be added to the substrate where any nutrient content is of benefit. Provision has been made to collect runoff from operational areas in recycling pits, backed up by a dedicated farm dam which can receive any overflow should a major storm occur. There is no discharge of operational water to South Creek under any circumstances.

The project includes minor improvements to retention basins and farm dams to ensure rainfall runoff from buildings and roadways does not exceed pre-development flow rates and nutrient concentration.

Environmental Management

The substrate plant operates under an existing environmental management plan. This document will be updated at each stage of the proposed expansion to take account of changed operating circumstances and to incorporate the requirements of conditions of approval and any amendments to the existing Environment Protection Licence.

8. Environmental Assessment – Substrate Plant

Air Quality

Operations at the substrate plant generate little dust because operational surfaces are sealed, the substrate is moisture-laden, dry ingredients are kept under cover and working areas are cleaned every day. During construction work, standard dust controls will be implemented, with particular attention when earthworks are underway.

Additional odour controls will be installed as part of the Stage 2 works including a second bioscrubber and chimney, to treat air collected from the pre-wet process, a connection to maintain the poultry manure stockpile at negative pressure and a conveyor to transfer pre-wet material between buildings, rather than utilise front end loaders.

The odour assessment considered emissions from the chimney stack(s) and fugitive emissions from the poultry manure stockpile, pre-wet material and the existing water recycling pit. In addition the efficiency of the existing bioscrubber was verified by measuring odour at the inlet and outlet. Odour measurements have confirmed that the existing operation performs well within its licence limit.

The assessment modelled odour dispersion and predicted ground level concentrations for each of the three stages of development. The findings predicted a marginal increase in odour concentrations at nearby sensitive receptors during Stage 1 that will reduce when Stage 2 comes on line. The relevant DECCW odour criteria would not be exceeded during Stages 1 or 2 of the development.

Elf Farm Supplies has undertaken to maintain emissions within the existing licence limit at all times. It is predicted that this will be achieved for Stages 1 and 2 of the expansion. The company will not seek to progress production tonnage to Stage 3 levels however, until the improved odour controls of Stage 2 are in place and their effectiveness proven. On that basis further, more accurate predictions of Stage 3 emissions and impacts can be made and submitted for approval.

Soil and Water

Substrate production is not at risk of contaminating soil; because the materials used are natural agricultural products and used substrate is consistently added to soil as a conditioner. At the Mulgrave plant substrate does not come in contact with soil because operations are conducted on sealed surfaces that are regularly cleaned.

The substrate plant is in the catchment of South Creek but poses little risk to water quality because the plant is designed to retain and re-use all process water, with no discharge. During major storm events, the existing water recycling pit has capacity to collect at least the first 10 millimetres of runoff, with an inlet diverter sending any excess to a farm dam, receiving runoff from this source only. The quality of roof and roadway runoff will be improved by upgrading the retention basins and farm dams.

Flooding

A detailed hydraulic assessment of the South Creek flood plain was carried out for the RTA prior to construction approval for the elevated Hawkesbury Valley Way. The model used for that study has been refined to remove the area of the substrate plant that would no longer be available for flood storage as a result of current and proposed filling on the site. The results of re-modelling show no discernable impact created by the filling.

Traffic

The Mulgrave facility is an operating plant so the traffic study considered the effect of additional vehicles associated with the proposed expansion. The maximum hourly traffic associated with the site is predicted to increase from 16 to 23 vehicles. This small increase will have no material effect on level of service of either Mulgrave Road or Hawkesbury Valley Way. The intersection of the site access road with Mulgrave Road is predicted to continue to operate satisfactorily.

Noise

Modelling of construction noise has indicated that construction noise goals would generally be satisfied, with likely exceedences during the site filling works and when concrete pumping is in progress. Recommended noise abatement measures will be implemented including constructing a proposed concrete wall on the southern boundary as early as practicable in the construction program.

Operational noise modelling considered typical operating scenarios for the day, evening and night period. The results show that under all conditions considered, the noise levels during day, evening and night periods would satisfy assessment goals at all of the referenced residential receptors. Controls will be implemented to minimise operational noise.

The effect of adding additional traffic from the proposed expansion to existing traffic on Hawkesbury Valley Way was found to satisfy the applicable noise assessment goal.

Waste Management

Waste materials generated at the substrate plant in the workshop; office, staff amenities and by maintenance contractors are placed in bins and emptied weekly. Metallic items are recycled. All raw materials are fully consumed in the process and any collected sludge and spilt material is added to the substrate mix.

Visual Characteristics

The substrate plant is visible to varying degrees from surrounding lands, roads and the railway, partially screened by Hawkesbury Valley Way and existing landscaping on the property. Some of the proposed development will be internal to the plant and some near the edges. Edge development will be progressively screened as landscaping matures.

The second chimney will be observable as a companion to the existing chimney.

Flora and Fauna

The existing Mulgrave site is filled land. A small additional area of approximately 1.6 hectares will be filled as part of the development. This area has been surveyed revealing that it has been re-contoured in the past with surface vegetation primarily exotic grasses and herbs for grazing with some weed species. There is no useful animal habitat in the land to be filled and no threatened species were recorded.

Greenhouse Gas Assessment

Greenhouse gas emissions attributable to the operation of the substrate plant have been calculated. At full production, the expanded plant is estimated to increase the total of Australia's 2008 emissions by 0.0005 per cent.

Environmental Hazards

Mushroom-substrate production is not an industry therefore SEPP 33 does not apply. The plant is not hazardous or potentially hazardous. Chlorine is the only chemical substance on the site, used as a cleaning agent.

Heritage

An archaeological and cultural heritage assessment has been undertaken revealing no known or discovered artefacts of indigenous heritage on the site. The entire development site has been previously disturbed. There are no items of non-indigenous heritage listed for the site, although there are some heritage items on surrounding land.

Justification and Conclusions

The proposed development will help to maintain the Hawkesbury region as the principal mushroom-growing area of Australia and enable New South Wales to move towards regaining its self-sufficiency in mushroom production.

At full production, the proposed mushroom farm will directly employ approximately 165 people. The substrate plant expansion will employ a further eight personnel and will provide the opportunity for additional investment and innovation in environmental control of substrate production.

This environmental assessment has shown that developing the mushroom farm at Londonderry and expanding the substrate plant at Mulgrave will not create a significant adverse impact on other land. A statement of commitments has been provided.

PREFACE
MUSHROOM CONSUMPTION

Recent statistics show that every second Australian household eats mushrooms weekly and nearly nine out of 10 eats the common button mushroom every year.

Mushrooms have all the attributes of a 'super food':

- Nutrient and flavour rich
- Low in kilojoules
- High in antioxidants
- Reducing the risk of certain cancers
- Fat and cholesterol free

The Australian Mushroom Growers Association reports that over the past 30 years, there has been a five-fold increase in mushroom consumption, with mushrooms now the second highest selling fresh produce item at supermarkets. Nationwide, mushroom growers have risen to the challenge, increasing mushroom production to satisfy the national demand. As a result, mushrooms have been the fastest expanding food crop in Australia.

The Mushroom industry is a proud double recycler – recycling leftover agricultural products to produce the growing medium (substrate) and after harvesting the mushrooms, recycling the spent substrate into the landscaping industry.

Advances in technology and methods of production are continually occurring in the mushroom industry. It is confidently expected that in coming years the mushroom industry environmental and yield performance will move forward to surpass current standards and requirements referenced in this document.

1

INTRODUCTION

1.1 PURPOSE OF THE REPORT

This environmental assessment has been prepared to support an application made under sections 75M and 75E of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) seeking approval for a concept plan for a project and approval to carry out the project in stages. The project is an expansion of the mushroom industry in western Sydney including a new mushroom farm at Londonderry and expansion of an existing mushroom substrate plant at Mulgrave. *Figure 1.1* shows the location of the development sites, which are approximately 12.5 kilometres apart by road.

On 29 September 2008 the Department of Planning advised the proponents, Elf Farm Supplies Pty Ltd and Elf Mushrooms, that the Minister for Planning had formed the opinion that the proposed development is a major project to be assessed under Part 3A of the EP&A Act and had authorised submission of a concept plan for the project under s75M of the Act. The Department issued Director-General's requirements to the proponent on 7 January 2009 under sections 75F and 75N of the EP&A Act. A copy of the Department's letter is included as *Appendix A*.

This document responds to the matters included in the Director-General's requirements. It describes the project, the key environmental issues and mitigation measures incorporated in the project to reduce potential impacts on the environment. The predicted environmental impacts are assessed and management and monitoring procedures are described.

1.2 DEVELOPMENT FOR WHICH APPROVAL IS SOUGHT

1.2.1 Mushroom Farm

With respect to the proposed mushroom farm at Londonderry, approval is sought:

- for a concept plan covering all stages the development, as described in this environmental assessment;
- to carry out staged development of the mushroom farm, with the exception of Stage 2A, being the provision of a child care centre. A separate application

121R1 2-11-10 Source: 2009 Google



FIGURE 1.1 Location Plan

seeking approval for the child care centre will be submitted following completion of Stage 1 of the development.

1.2.2 Substrate Plant

With respect to the proposed expansion of the existing substrate plant at Mulgrave, approval is sought:

- for a concept plan covering all stages of the development, as described in this environmental assessment;
- to carry out staged development of the substrate plant expansion, with the proviso that the increased production incorporated in Stage 3 would require further approval based on demonstrated performance of the upgraded environmental controls to be installed in Stage 2.

1.3 THE PROPONENTS

The proponents for the development, Elf Mushrooms and Elf Farm Supplies Pty Ltd, are part of the Tolson Group of companies. The Group is based in western Sydney and currently operates three mushroom farms, a packing and distribution factory and a mushroom substrate plant at Mulgrave, the only substrate plant in the Sydney region.

The Tolson family established Elf Mushrooms within the Hawkesbury local government area in 1967. This company operates a mushroom farm at Vineyard, producing an average of 55 tonnes of mushrooms per week and employing a workforce of approximately 130.

Mushroom substrate is the nutrient-rich growing medium used by mushroom farms for growing mushrooms. The Tolson Group established a substrate plant at Mulgrave in 1981. Elf Farm Supplies currently produces up to 1000 tonnes of (Phase 1[1])substrate per week to supply the Tolson Group's mushroom farms and many other mushroom farms in the Sydney basin. A workforce of 20 is employed at the Mulgrave plant.

The Tolson Group employs a total of approximately 350 personnel at its various sites. Another 150 personnel are employed by other mushroom farms reliant on substrate supplied from Elf Farm Supplies. The Group also provides business for up to 200 specialist contracting personnel from various trades including electrical, refrigeration, mechanical and technology.

[1] Refer to the box on the next page for explanation of mushroom substrate.

Mushroom Substrate

Mushroom substrate is the nutrient-rich growing medium used by mushroom farms for growing mushrooms. It is produced from natural materials, primarily straw and water, with added ingredients of poultry manure, dry stable bedding, gypsum and agricultural meals and by-products. In earlier years, prior to development of bulk substrate processing, mushroom farms produced their own substrate at the farm. This activity was conducted outdoors with limited ability to control the process or the quality of substrate produced.

Elf Farm Supplies' facility at Mulgrave was one of the first sites in NSW producing substrate in bulk for supply to mushroom farms. Bulk processing brought efficiency in production techniques, consistency of product and improved control of environmental parameters. Initially just the composting phase was undertaken at Mulgrave (Phase 1), leaving mushroom farms to pasteurise the material (Phase 2) and introduce mushroom spawn to the mix (Phase 3) as part of the horticultural process. More recently, Elf Farm Supplies developed complete substrate processing and preparation on one site. A sizable portion of the substrate delivered from the Mulgrave plant to mushroom farms is now in the "finished" (Phase 3) state, ready for growing.

In 1988 Elf Farm Supplies pioneered the "air under" system of air injection into composting material to assist in maintaining aerobic conditions, essential for odour control. This technology was subsequently supplied world-wide by the Tolson Group.

In 2003 Elf Farm Supplies significantly upgraded the Mulgrave plant, totally enclosing the substrate production process and introducing a bioscrubber to remove organic compounds from air emissions. Mulgrave was the first plant in the southern hemisphere to adopt these measures.

In 2005 Phase 2 (pasteurisation) and Phase 3 (spawn running) processing was commenced at the Mulgrave plant, with capacity to process approximately 80 per cent of the Phase 1 substrate produced at the plant. Having proven to mushroom farms the benefit of receiving Phase 3 substrate, the company extended the Phase 2 /Phase 3 processing building in 2009 to create capacity for the entire product to be processed to the Phase 3 "finished" state.

The Tolson Group supplies Phase 3 substrate to its own farms and to an increasing number of other mushroom farms in New South Wales. Elf Farm Supplies remains the only bulk supplier of Phase 3 substrate in NSW. Following completion of building extensions, the company intends to progressively discontinue supplying Phase 1 substrate to mushroom farms still taking this material in favour of supplying all substrate in the Phase 3 "finished" condition.

1.4 PROJECT OBJECTIVES

The Tolson Group proposes to establish a new mushroom farm at Londonderry and expand the capacity of the existing substrate plant at Mulgrave to supply both the new farm and increasing demand from other mushroom growers.

At Londonderry, the project objectives include:

- establish in stages a new mushroom farm on the site of a former piggery in The Northern Road, Londonderry;
- produce up to 220 tonnes of mushrooms per week;
- employ approximately 165 persons when fully operational;
- process spent mushroom substrate on site into a fine-grained organic material suitable for top dressing for turfed sporting fields; and
- provide a child care facility for the benefit of the workforce.

At Mulgrave, the project objectives include:

- expand the existing substrate production facility;
- continue to produce mushroom substrate at the plant with a production limit increasing in stages up to 3,200 tonnes of Phase 1 substrate per week; and
- introduce further improvements to the plant and operations to improve the efficiency of production and environmental performance.

It is an objective at both locations to manage the operation to achieve environmental performance objectives derived from the conditions of approval and consolidated for each site in an environmental management plan.

1.5 DEVELOPMENT HISTORY AT MULGRAVE

The Mulgrave substrate plant has undergone a number of modifications since operations commenced in 1981. *Table 1.1* lists the development consents that have been issued from Hawkesbury Council in relation to the substrate plant.

The substrate plant operates under an Environment Protection Licence (No 2992) issued by the Department of Environment, Climate Change and Water.

Table 1.1 SCHEDULE OF DEVELOPMENT CONSENTS, MULGRAVE

Date	Consent No	Approved Development
13/7/79	58/1979	"Erect a mushroom composting shed for manufacture of compost and storage of ingredients with rail siding and weighbridge".
14/10/80	106/1980 (DA 08/80)	"Erect a mushroom composting shed for manufacture of compost and storage of ingredients with rail siding and weighbridge".
9/9/81	482/1981 (DA 544/81)	"Erect storage sheds, subject to the conditions attaching to the previous development consent over the property relating to construction and sealing of access roads and parking areas having been met".
13/7/82	modify 106/1980	"An extension of hours be granted from, 6 am to 6 pm Monday to Saturday and 6 am to 12 noon on Sunday, and Mr Tolson be requested wherever possible to load the truck inside the shed."
19/12/88	759/1988 (DA 662/88)	"Additions to the pre-wetting area"
11/9/90	218/90	"Extensions to existing mushroom composting operation in two stages. Extensions consist of 21 tunnels, materials storage shed, extension to mushroom composting shed, dam and the filling of land for building platforms".
20/12/93	184/93	"Landfill operation and erection of produce store and hayshed"
20/2/01	M1538/00	"Alterations and additions to existing mushroom compost facility" – includes two chimneys on existing tunnels, land filling and demolish house.
19/6/01	Modify 218/90	Amendment to condition 8 of 1990 consent to alter tunnel dimensions
19/2/02	MA0923/ 01	"Alterations and additions to existing mushroom compost facility" – enclosed buildings at each end of the tunnels, extend roof over ingredients shed, construct office, bioscrubber, conveyors, chimney, extend hours of operation to 24 hour operation.
26/8/02	DA0623/ 02	"Alterations and additions to existing mushroom substrate production facility" – fresh approval for all works described in MA0923/01 plus additions: enclosed pre-wet building and connecting corridor, tractor shed, extend office, extend plant room, increase chimney height, boundary wall at railway.
22/11/06	DA0571/06	"Land filling - storage and manoeuvring area for mushroom substrate plant"

Date	Consent No	Approved Development
22/11/07	DA0921/06	"Tunnel building extension (phase 2 and 3) and maintenance equipment shed" – nine additional tunnels
20/2/08	DA0701/07	"Bagging and Blocking shed having an area of 1060 m²"
14/1/10	DA0120/09	"Storage Shed" (Tractor shed)

The Department of Planning has requested that all previous planning approvals be surrendered if the project is approved. A summary of the relevance of previous approvals and conditions of consent to ongoing operations is included in *Appendix D*.

1.6 NEED FOR THE DEVELOPMENT

1.6.1 New Mushroom Farm

Elf Mushrooms operates a mushroom farm at Vineyard. The quantity of mushrooms produced at the farm has maintained full production for several years, averaging some 55 tonnes per week. The company would like to increase its production volume as there are opportunities for increased mushroom sales in the domestic market.

The Vineyard site is not suitable for expansion because the company does not have sufficient land at that location to build a new facility while maintaining production in the existing farm. Furthermore, the company does not see a future for further investment in mushroom growing on that site because the land has been nominated for future residential development in the North West Structure Plan for the NSW Government's Metropolitan Strategy.

The company desires to construct a new mushroom farm with about four times the capacity of the existing facility. A new mushroom farm of modern design as planned by the company requires a site of approximately 10 hectares. A new location is required to accommodate these expansion plans.

1.6.2 Expand Substrate Plant

The current development consent for the Mulgrave substrate plant limits production to 1,000 tonnes per week of Phase 1 substrate, regardless of whether the substrate is delivered as Phase 1 product or used as an input for further processing at the plant. The quantity of substrate supplied by the plant has progressively increased, particularly following the introduction of Phase 2 and Phase 3 processing, which has been enthusiastically embraced by mushroom growers. The consequent demand for

substrate has resulted in production levels at the Mulgrave plant reaching the approved maximum limit for the last three years.

Increased production from the Mulgrave plant is essential if Elf Mushrooms is to develop the proposed new mushroom farm at Londonderry. Should Elf Farm Supplies be unable to increase production at Mulgrave, there would be no purpose in Elf Mushrooms developing the new farm. There is no suitable alternative source of substrate. The historical practice of preparing substrate outdoors at the farm is no longer economically competitive, nor is it environmentally acceptable and would not be considered for the Londonderry operation.

An increase in production to 1,600 tonnes per week of Phase 1 substrate is the minimum required to cover the needs of Elf Mushrooms' proposed Londonderry mushroom farm, while continuing to meet all existing commitments for substrate supply. However, the projected growth in the industry generally, including subsequent mushroom farm development planned by the Tolson Group, requires Elf Farm Supplies to secure the opportunity to progressively move to higher production levels. For this reason Elf Farm Supplies is seeking approval for a staged increase up to 3,200 tonnes per week of Phase 1 substrate.

1.7 ALTERNATIVES CONSIDERED

1.7.1 Elf Mushrooms

Elf Mushrooms needed a suitable parcel of land in western Sydney to construct a new mushroom farm. The labour-intensive nature of the mushroom-growing industry means that the company must locate near an area that can supply the necessary workforce. Stage 1 of the mushroom farm will employ over 120 people. It is desired to be sufficiently close to the existing facility to enable the current experienced workforce to progressively transfer to the new site.

The operation also needs to be as close as possible to the Sydney market which is the principal destination of mushrooms produced at the farm. Being located in western Sydney, compared to a location west of the Blue Mountains for example, enables mushroom deliveries to more easily accommodate the receival times preferred by customers. It is also more economical to minimise the transport distance of mushrooms because they are a high-moisture-content product. Longer transport distances are tolerable for dry raw materials such as straw.

Before settling on the Londonderry site Elf Mushrooms considered properties on the southern side of the railway at Vineyard in an area of land designated for future employment uses and another location beside Windsor Road. These sites either proved unsuitable or were not available.

1.7.2 Elf Farm Supplies

Mushroom substrate is a high-moisture-content product. To minimise the cost of mushroom production, substrate should be transported the shortest practicable distance. Consequently, for the industry to remain competitive in western Sydney there is a fundamental need to produce substrate in reasonable proximity to the majority of substrate users.

Elf Farm Supplies has on previous occasions attempted to obtain development approval for two substrate production plants, one of which could have readily serviced the mushroom-growing area of western Sydney. Environmental impact statements were prepared and applications submitted for development proposals at Blaxlands Ridge, near Colo and in the Marulan area. On each occasion there was significant objection from residents in the locality and the proposal did not proceed.

Following the abandonment of the previous two applications the company determined to upgrade its existing facility at Mulgrave to world's best practice. The principal upgrading works were complete in 2003, with further improvements occurring more recently.

Having twice been through the process of trying to establish a substrate plant on another site, Elf Farm Supplies believes that rather than again attempt to pursue development approval for a new substrate plant in the Sydney region, the best course of action for the company is to expand its operations at Mulgrave. This will present opportunities to further develop and improve environmental performance of the operation. In these circumstances alternative sites have not been considered for substrate production.

1.8 MUSHROOM INDUSTRY BACKGROUND

The Australian Mushroom Growers Association (AMGA) produces market statistics for mushroom consumption. *Figure 1.2* below shows the growth in Australian mushroom consumption published by the Association, including domestic production and imports over the last 30 years.

Mushrooms are now the second most valuable fresh vegetable product in Australia, after potatoes (AMGA).The mushroom industry has been identified as one of the three fastest growing crop industries established in Australia since the 1950s. Domestic production expanded at an average annual rate of 10 per cent per annum from the mid 70s to the mid 90s and still continues to grow. In 2004/05 the rate of expansion was 3 per cent, while growth rates are estimated to be 3 to 5 per cent over the next five years.2

2 Australian Mushroom Growers Association – 2007 Statistics.

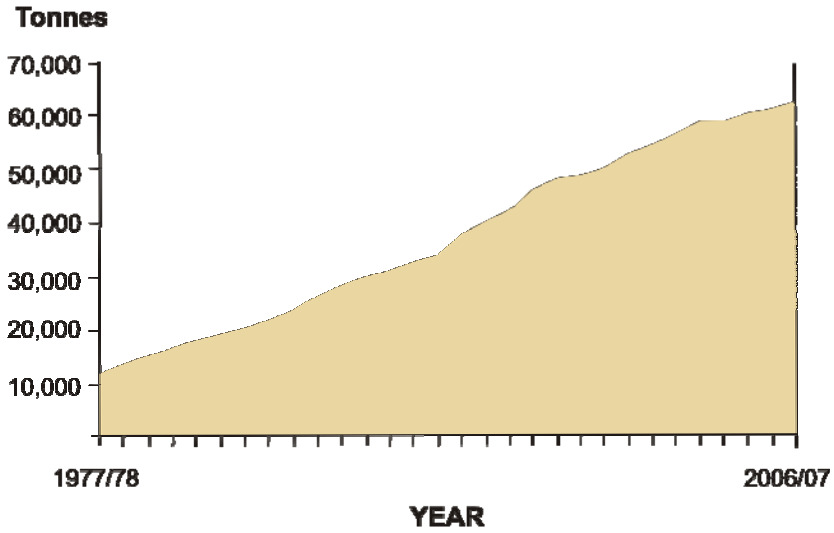


FIGURE 1.2 Australian Mushroom Market

The Hawkesbury region has the greatest concentration of mushroom growers in Australia and is the birthplace of the modern mushroom industry. It has 15 of the State's 23 growers, producing 11,335 tonnes of mushrooms per year. This amounts to 78 per cent of NSW mushroom production and nearly quarter of the national figure.

The Hawkesbury mushroom industry is worth $45 million at the farm gate; $90 million at retail; with an economic value to the community of around $450 million each year[3]. It is a major employer in the region with a predominance of non English-speaking background employees. With 600 people employed directly in the industry, the mushroom industry is one of three major employers in the Hawkesbury district along with the Richmond RAAF Base and University of Western Sydney Richmond campus.

The Region provides a ready source of labour. Although previously considered unskilled, mushroom workers now undertake a Level 2 Certificate in Horticulture which is operated by Richmond TAFE in conjunction with the Tolson Group mushroom farms. Generally, employees tend to be first home buyers with no formal skills.

Owing to the age of mushroom growing infrastructure in New South Wales however and progressive closure of older mushroom farms, particularly in western Sydney, New South Wales mushroom growers have not been able to expand production quickly enough to keep pace with the pattern of increased consumption. Growers in New South Wales no longer produce sufficient mushrooms to satisfy the State's demand.

[3] Australian Mushroom Growers Association

2

THE SITES

2.1 MUSHROOM FARM

2.1.1 Property Description

The Londonderry site is part of Lot 138 DP 752037, located on The Northern Road in Penrith local government area. Its street address is 521 The Northern Road, Londonderry. The property, shown in *Figure 2.1*, is almost rectangular with an area of 22.66 hectares and is owned by DW Tolson Management Pty Ltd.

The project site comprises approximately 75 per cent of the allotment, leaving out the area of remnant native vegetation at the rear of the property.

The current owner has used the property for casual grazing. Previous owners have operated a piggery on part of the site and grazed the remainder. Towards the rear of the property there is evidence that stony surface material has been removed from between remaining trees. In earlier years, material referred to as the Londonderry Gravel is known to have been collected in the area and utilised for civil engineering projects, such as roadworks.

The site is mainly cleared grassland, with some remaining trees along the southern boundary and in small clusters at the centre and near the frontage to The Northern Road. There is little or no understorey associated with the remaining trees.

There are several dams on the site and two minor natural drainage lines leading to the south west. The property has very little slope and was observed to be sodden under foot immediately following wet weather.

A single dwelling is located about 50 metres from The Northern Road, serviced by an unsealed access road.

121R2 27-10-10

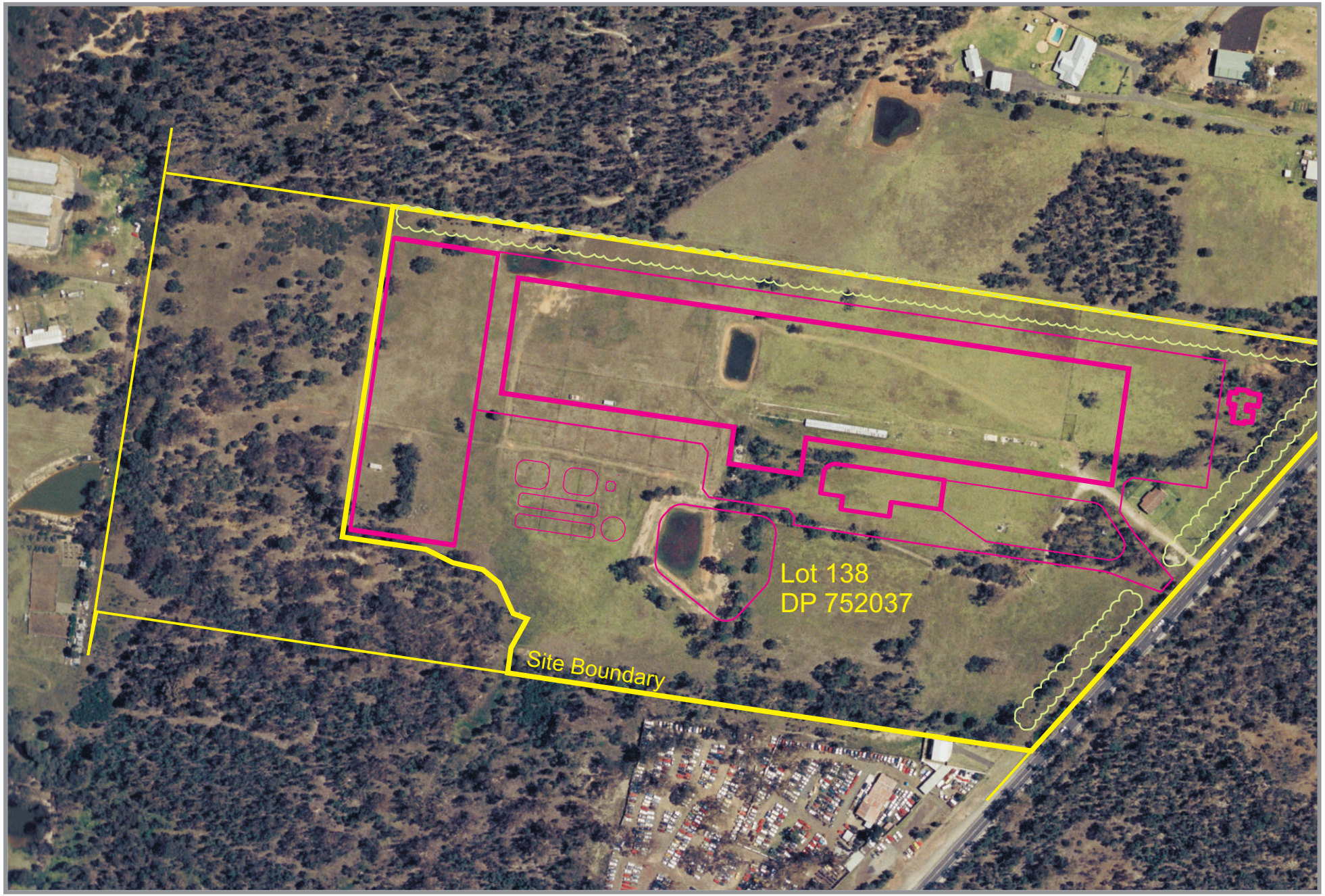


FIGURE 2.1 Mushroom Farm Site

2.1.2 Surrounding Land Use

Land surrounding the mushroom farm site at Londonderry is shown on the aerial image, *Figure 2.2*.

The southern boundary of the mushroom farm site is a battle-axe shaped allotment, No 1 Thomas Road. This property has a narrow frontage to The Northern Road and a large area at the rear extending southwards to the unmade section of Thomas Road. The property is almost entirely bushland except for a dwelling, located at The Northern Road frontage. This is the closest dwelling to the project site being adjacent to its southern boundary.

Immediately south of the dwelling, the land is used for a motor vehicle wrecking yard, with a long frontage to The Northern Road extending to the unmade section of Thomas Road. Further south from the wrecking yard, the land is used as a training area for the Rural Fire Service.

Access to the land west of the site is from Londonderry Road via Thomas Road and Timothy Road. Smaller holdings, partly cleared, predominate to the west, fronting Timothy Road. Large rural sheds including poultry sheds are evident on some of these properties. The closest residence on these properties to the west is approximately 200 metres from the site.

Rural land with scattered dwellings and frontage to The Northern Road adjoins part of the northern site boundary. These larger rural-residential properties are mainly cleared with remnant vegetation apparent in scattered clumps and with trees, possibly planted, along some boundary lines. The nearest residences to the north are more than 100 metres from the subject site.

The rear one third of the northern site boundary adjoins an extensive area of bushland that continues through to Whitegates Road and beyond.

On the opposite side of The Northern Road to the site of the proposed mushroom farm is another extensive area of bushland. This property is the Castlereagh Nature Reserve. At the northern end of the nature reserve is the former Castlereagh liquid waste disposal depot.

121R2 18-06-10 Source: 2009 Google

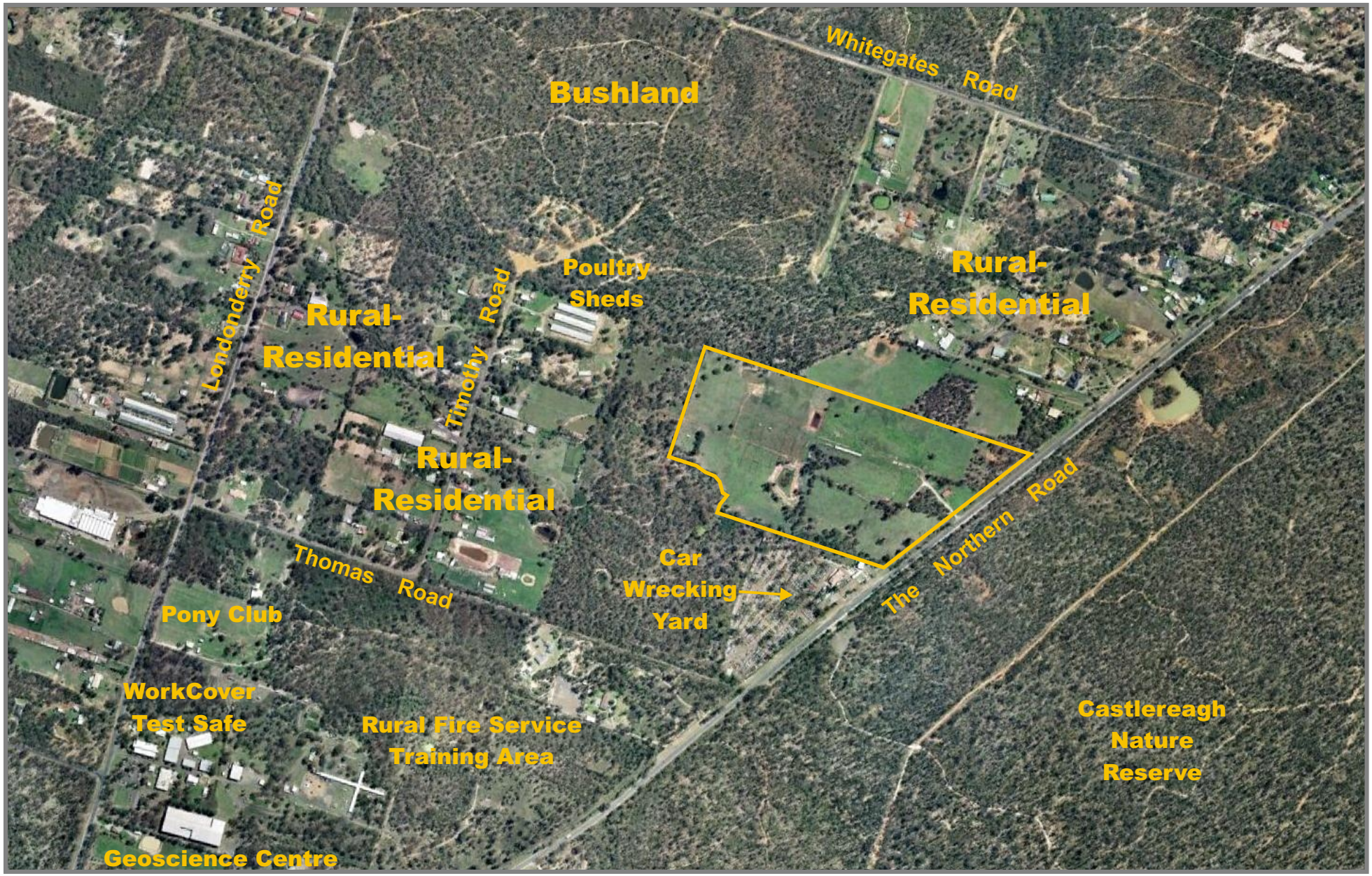


FIGURE 2.2 Londonderry Area Land Use

2.2 SUBSTRATE PLANT

2.2.1 Property Description

The Mulgrave site is roughly triangular in shape, comprising all of Lot 14 DP 1138749 and part of Lot 13 DP 1138749 as shown on *Figure 2.3*. The land is owned by RN & NR Tolson and is in Hawkesbury local government area. The street address is 108 Mulgrave Road, Mulgrave.

The substrate plant has a small frontage to Mulgrave Road, the remainder of the original frontage having been severed in recent years by construction of Hawkesbury Valley Way. This elevated road proceeds diagonally across the property from Mulgrave Road to the north west and defines part of the substrate site boundary.

On the southern side the substrate plant mostly adjoins the Blacktown-Richmond Railway. Near Mulgrave Road, the southern boundary steps in to pass around a separate narrow allotment for the station master's cottage.

Most of the northern site boundary abuts the embankment of Hawkesbury Valley Way. The remainder of the northern boundary adjoins another rural property.

Lot 13 DP 1138749 extends westward to South Creek, although the substrate plant boundary is set back at the edge of the filled land about 150 to 200 metres from the creek. The balance of Lot 13 remains as cleared farming land with a gentle slope to South Creek.

The substrate plant site has a land area of about 12.4 hectares and is accessed directly from Mulgrave Road. The existing substrate plant developed area has been filled to a level of 16 metres AHD. Most of the balance of the site is in the process of being raised to the same level, consistent with a development consent issued by Hawkesbury City Council in November 2006.

2.2.2 Surrounding Land Use

Mulgrave is primarily a rural area with a small number of houses clustered near the railway station. The small village area is adjoined by rural land in three quadrants. Land in the north east quadrant, bounded by Mulgrave Road and the railway line, is progressively being developed for mixed industrial uses.

121R2 14-06-10

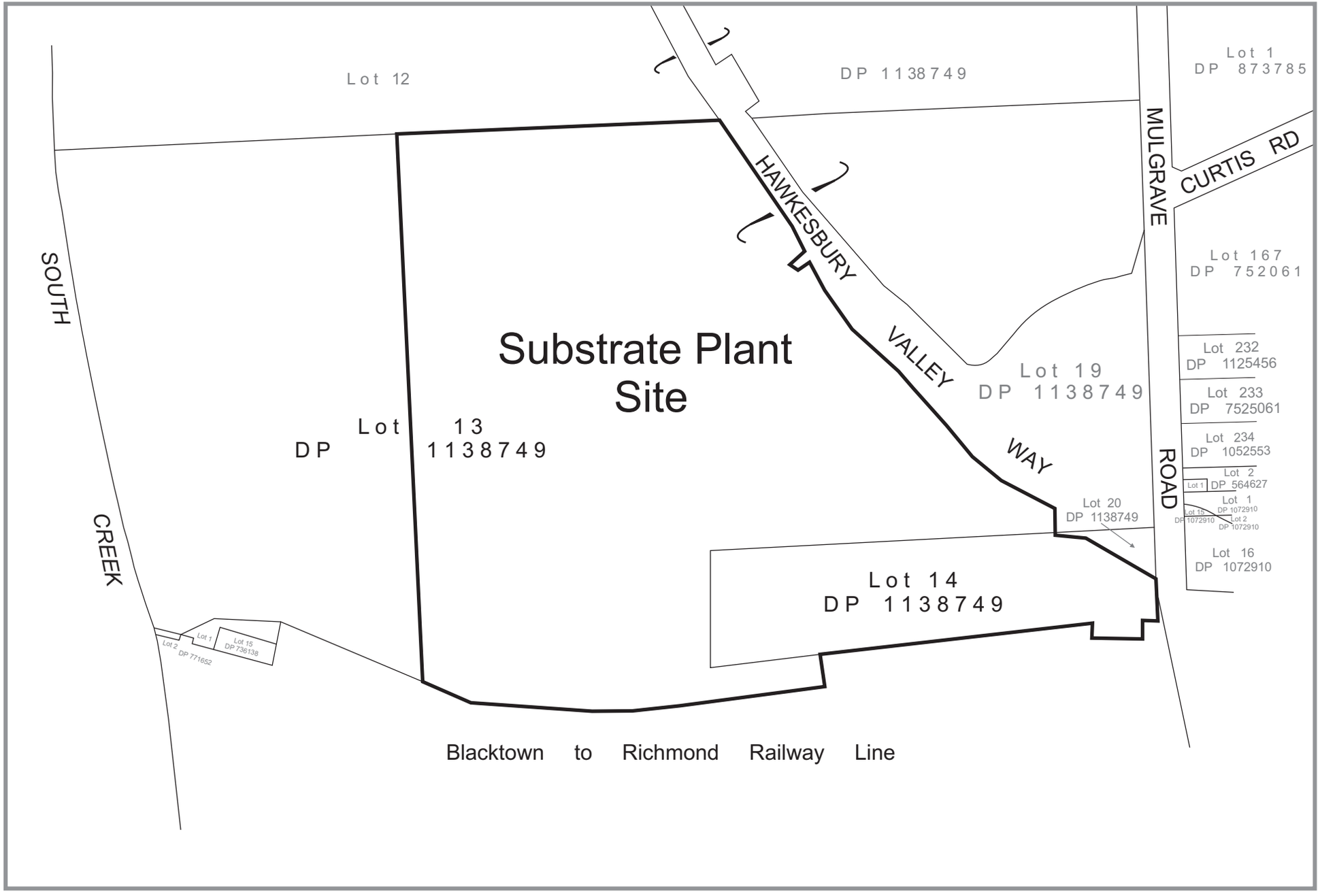


FIGURE 2.3 Substrate Plant Site

The subject property is part of a wide band of rural land comprising the flood plain of South Creek. Land uses in this area include market gardens, turf farms, dairy farms, feedlots, grazing and sewage treatment. At Mulgrave this rural area is about 1.5 kilometres wide. The Blacktown to Richmond Railway, immediately south of the site, crosses the flood plain at this location. Mulgrave Station is about 100 metres from the front gate of the property. A sewage treatment plant is located about 700 metres to the north beside Mulgrave Road, with Windsor High School opposite.

On the western side of South Creek a strip of higher land beside the railway line has been developed as a residential area. The closest residences in this estate are in Chisholm Place, about 500 metres from the substrate plant.

Hawkesbury Valley Way, the high-level flood evacuation road for Windsor, crosses the flood plain on the northern side of the site. Hence the substrate plant is situated in a section of the flood plain between two linear features that cross the creek, the railway, and main road.

On the southern side of the railway, opposite the substrate plant, the land is used as a market garden with residence at the Mulgrave Road frontage. *Figure 2.4* is an oblique aerial photograph of the existing Mulgrave substrate plant, showing surrounding lands.



FIGURE 2.4 Mulgrave Area Land Use

3

RELEVANT PLANNING PROVISIONS

3.1 OVERVIEW

The mechanism for processing the current application to expand the mushroom industry in western Sydney is prescribed under Part 3A of the *Environmental Planning and Assessment Act, 1979*.

Environmental planning instruments applying to the land affected by the development include:

- Penrith Local Environmental Plan, 2010;
- Hawkesbury Local Environmental Plan, 1989;
- Sydney Regional Environmental Plan No 20—Hawkesbury-Nepean River (No 2—1997);
- State Environmental Planning Policy No. 30 – Intensive Agriculture;
- State Environmental Planning Policy (Major Development) 2005;
- State Environmental Planning Policy No 55 – Remediation of Land;
- State Environmental Planning Policy (Infrastructure) 2007

In addition there are a number of draft plans and development control plans that apply to the land.

This section discusses the extent to which the relevant legislation, planning instruments draft plans and guidelines apply to the proposed development.

3.2 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT

Part 3A of the EP&A Act, 1979 sets down the procedure to be followed for obtaining planning approval for a development that is declared to be a project under that part. The proponents have been advised that the Minister for Planning has formed the opinion that the proposed expansion of the mushroom industry is a major project to be assessed under Part 3A of the EP&A Act and has authorised submission of a concept plan for the project under s75M of the Act. Subsection (3A) of s75M states

> *A single application may be made for approval of a concept plan for a project and for approval to carry out any part or aspect of the project. In that case, environmental assessment requirements, public consultation and reports under this Division and Division 2 with respect to the project may be combined.*

The current application seeks approval for a concept plan for a project and approval to carry out the project[1]. Section 75P of the Act provides that the Minister may approve the concept plan and the carrying out of any particular stage of the development.

The provisions of Part 1A of the Environmental Planning and Assessment Regulation, 2000 apply to the assessment of a proposed development declared by the Minister to be a project.

3.3 LOCAL ENVIRONMENTAL PLANNING INSTRUMENTS

Section 75R(3) of the EP&A Act provides that environmental planning instruments, other than State environmental planning policies, do not apply to the carrying out of a project approved under Part 3A. However, section 75I of the Act requires that the Director-General include, in a report to the Minister, reference to the provisions of any environmental planning instrument that would otherwise have governed the carrying out of the project and that has been taken into consideration in the environmental assessment of the project.

Consequently, for the purposes of assessment, it is appropriate to consider the provisions of the local environmental plans, regional environmental plan and State environmental planning policies applying to the two sites at Londonderry and Mulgrave.

3.3.1 Penrith Local Environmental Plan 2010

Penrith LEP 2010 came into force on 22 September 2010 and is the local environmental planning instrument applicable to the site of the proposed mushroom farm at Londonderry. The LEP is consistent with the standard instrument developed by the Department of Planning.

Under the LEP the mushroom farm property at Londonderry is zoned partly RU4 – Rural Small Holdings and partly SP2 – Infrastructure (Classified Road). Agriculture is permissible with consent in the RU4 zone. The SP2 zoning applies to a narrow strip

[1] Subject to approval of the concept plan, a separate application will later be submitted with detail for the child care centre associated with the proposed mushroom farm. The child care centre is planned as part of Stage 2 of the mushroom farm development (Stage 2A).

along The Northern Road frontage where uses are restricted to roads and other infrastructure.

The LEP maps provide the following information regarding the site of the proposed mushroom farm:

- a two hectare minimum lot size is applicable;
- no listed heritage items exist on the site or in the vicinity;
- the site is not included within land shown to be flood prone;
- the site does not fall within areas designated "natural resources sensitive land" and does not adjoin any land so designated;
- the site is within a substantial corridor bordering The Northern Road designated "land with scenic and landscape values"; and
- there is no height of buildings map applicable to this land to restrict the height of structures erected on the site.

Consideration of the aims of Penrith LEP 2010, the RU4 zone objectives and matters for consideration by a consent authority is presented in *Appendix C*.

3.3.2 Hawkesbury Local Environmental Plan 1989

The site of the substrate plant at Mulgrave is zoned "Rural Living" under Hawkesbury LEP 1989. Mushroom substrate production is defined as a rural industry pursuant to State Environmental Planning Policy No. 30 – Intensive Agriculture.

Rural industries are a prohibited land use within the Rural Living zone. The substrate plant operates in accordance with a number of development consents issued by Hawkesbury City Council between 1979 and 2010 and is an "identified land use" in the LEP.

Consideration of the aims of the Hawkesbury LEP, 1989 and objectives of the Rural Living zone and any matters for consideration by a consent authority is presented in *Appendix C*.

Hawkesbury Council has acknowledged that the Rural Living zone is not ideal for the site, given its use for a rural industry. Draft amendment 48, originally prepared in 1994, proposed to rezone the site of the substrate plant to Light Industrial (4b). After some hiatus, Council resolved in 2004 to proceed with the rezoning which has yet to take effect (see section 3.3.3 below).

There are three heritage items listed for Mulgrave in Hawkesbury LEP 1989, all of which are in the vicinity of the substrate plant:

- Mulgrave railway station;
- the railway stationmaster's cottage, located adjacent to the substrate plant site near Mulgrave Road, between the site and the railway; and
- "Tall Trees", a rural market garden property adjacent to the southern side of the railway, 124 Mulgrave Road.

3.3.3 Draft Hawkesbury Local Environmental Plan 2009

When Draft Hawkesbury LEP 2009 is gazetted it will replace the existing Hawkesbury LEP 1989 with a new document consistent with the standard instrument developed by the Department of Planning. At the time of writing the draft LEP had been publicly exhibited and a report of the outcome was being prepared for consideration by Council.

The draft LEP incorporates changes previously proposed in draft amendment 48 to Hawkesbury LEP 1989, which refers to the site of the substrate plant. The draft instrument proposes to rezone the existing substrate plant site IN2 – Light Industrial. Rural industries would be permissible in this zone with the consent of Council.

The boundaries of the land proposed to be zoned IN2 relate to the existing substrate plant and do not coincide with the extent of the current proposal to expand the substrate plant. Consequently, should the draft LEP come into force in its current configuration, the proposed development would be partly in zone IN2 and partly in zone RU4 – Small Rural Holdings. The draft LEP does not propose to make rural industries permissible within the RU4 zone, so unless the boundaries of the proposed IN2 zone are adjusted prior to gazettal to align with the proposal, part of the expanded substrate plant would remain prohibited development. This would be an unfortunate outcome.

The draft LEP maps provide the following information regarding the site of the substrate plant:

- the land is shown as class 5 on the acid sulphate soils map for which the LEP has no specific requirements relevant to the proposed development;
- the site is not shown to have significant vegetation or relevance for connectivity between areas of significant vegetation;
- the height of buildings map shows no restrictions to the height of buildings on the part of the site proposed to be zoned IN2, but restricts height to 10 metres on the part of the site to be zoned RU4;
- the minimum lot size map shows no restrictions on the part of the site proposed to be zoned IN2, but restricts minimum lot size to 2 hectares on the part of the site to be zoned RU4;
- there is no "environmental constraint area" map applicable to the site;

- the draft LEP lists the same three heritage items at Mulgrave referred to in section 3.3.2.

Consideration of the aims of draft Hawkesbury LEP 2009, the objectives of zones IN2 and RU4 and any matters for consideration by a consent authority is presented in *Appendix C*.

3.4 REGIONAL ENVIRONMENTAL PLANNING INSTRUMENTS

3.4.1 SREP No 20 – Hawkesbury Nepean River (No 2-1997)

Sydney Regional Environmental Plan No 20 was gazetted in 1989 and amended in 1997. From 1 July 2009 this plan is taken to be a State Environmental Planning Policy (see clause 120 of Schedule 6 to the EP&A Act). SREP 20 provides a strategy for long term planning in the river valley. The aim of the SREP 20 is:

> *to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context.*

The plan describes a number of general and specific planning considerations and policies, to be taken into account when assessing a proposed development. General considerations include the aim of SREP 20, strategies listed in an accompanying document, the *Action Plan of the Hawkesbury-Nepean Environmental Planning Strategy*, feasible alternatives to the development and its environmental impact. Numerous specific planning policies and recommended strategies are listed under the following headings:

- total catchment management;
- environmentally sensitive areas;
- water quality;
- water quantity;
- cultural heritage;
- flora and fauna;
- riverine scenic quality;
- agriculture/aquiculture and fishing;
- rural residential development;
- urban development;
- recreation and tourism; and
- metropolitan strategy

Many of the specific strategies in SREP 20 are not relevant to the current proposal for expanding the mushroom industry. Relevant strategies are summarised and considered in *Appendix C*.

The plan establishes specific development controls for various types of development. The following development controls are relevant to the proposal:

- (2) Composting facilities or works – consent is required. Controls require the consent authority to consult with the Hawkesbury-Nepean Catchment Management Trust and to consider the following two matters:
  (a) any potential for groundwater contamination;
  (b) the adequacy of the proposed leachate management system and surface water controls;
- (7) Filling – consent is required;
- (10) Intensive horticultural establishments – consent is required;
- (17) Sewerage systems or works - consent is required. Controls require the consent authority to consult with the Hawkesbury-Nepean Catchment Management Trust and to consider the following matters:
  (a) Whether the proposed development will be capable of connection to a Sydney Water Corporation Limited or council sewerage system either now or in the future.
  (b) The suitability of the site for on-site disposal of effluent or sludge and the ability of the sewerage systems or works to operate over the long-term without causing significant adverse effects on adjoining property.
  (c) The likely effect of any on-site disposal area required by the proposed development on:
    - *any water bodies in the vicinity (including dams, streams and rivers), or*
    - *any mapped wetlands, or*
    - *any groundwater, or*
    - *the floodplain.*
  (d) The scope for recycling and reusing effluent or sludge on the site.
  (e) The adequacy of wet weather storage and the wet weather treatment capacity (if relevant) of the proposed sewerage system or works.
  (f) Downstream effects of direct discharge of effluent to watercourses.
  (g) The need for ongoing monitoring of the system or work.

Matters included in SREP 20 for consideration by a consent authority, relevant to composting facilities or works and sewerage systems or works, are addressed in *Appendix C*.

3.5 STATE ENVIRONMENTAL PLANNING POLICIES

3.5.1 SEPP No 30 – Intensive Agriculture

There are two clauses of SEPP 30 relevant to the application:

- Clause 8 – this clause clarifies for planning purposes that facilities for producing mushroom substrate and any other composting facilities are rural industries; and
- Clause 9 – this clause clarifies for planning purposes that a rural industry does not fall within the definition of an industry.

3.5.2 SEPP (Major Development) 2005

The Major Development SEPP provides the framework by which a project may be declared to be a major project to which Part 3A of the Act applies.

Clause 3 of Schedule 1 of the SEPP includes "Agricultural produce industries and food and beverage processing" development that employs 100 or more people or has a capital investment value of more than $30 million as a class development declared to be a major project.

Having regard to the Major Development SEPP the Minister for Planning has formed the opinion that the proposed mushroom industry expansion is a major project to which Part 3A of the Act applies and has authorised submission of a concept plan for the project under s75M of the Act.

3.5.3 SEPP No 55 – Remediation of Land

The purpose of State Environmental Planning Policy No 55 is to promote remediation of contaminated land to reduce the risk of harm to human health or the environment.

Clause 7 of the SEPP requires a consent authority, when determining a development application, to consider whether the subject land is contaminated. If the land is contaminated, before granting consent the consent authority should be satisfied:

- that the land is suitable for the development in its contaminated state, or will be suitable after remediation; and
- if the land requires remediation to be made suitable for the development, that the land will be remediated before it is used for the development.

A contamination assessment has been prepared for the mushroom farm site at Londonderry that has previously been used as a piggery, with the conclusion that

contaminants are not present in concentrations that would present a risk to human health or the environment. No further investigation r remediation is required.

The substrate plant site is constructed on fill that has been tested and certified free of contamination at the time of importation to the site.

3.5.4 SEPP (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 is relevant because the proposed mushroom farm at Londonderry has a frontage to a classified road, The Northern Road. The SEPP requires that before granting consent to a development with a frontage to a classified road, a consent authority should be satisfied that:

(a) where practicable, vehicular access to the land is provided by a road other than the classified road, and

(b) the safety, efficiency and ongoing operation of the classified road will not be adversely affected by the development as a result of:

(i) the design of the vehicular access to the land, or

(ii) the emission of smoke or dust from the development, or

(iii) the nature, volume or frequency of vehicles using the classified road to gain access to the land, and

(c) the development is of a type that is not sensitive to traffic noise or vehicle emissions, or is appropriately located and designed, or includes measures, to ameliorate potential traffic noise or vehicle emissions within the site of the development arising from the adjacent classified road.

The proposed development satisfies the above matters for consideration. There is no practicable alternative to obtaining vehicular access to the mushroom farm from The Northern Road.

The proposal does not fall within the definition of traffic-generating development because the proposal is not a type of development listed within Schedule 3 of the SEPP.

Traffic and parking implications for the development are considered in Section 6.5, section 8.5 and *Appendix M*.

3.5.5 SEPP 33 – Hazardous and Offensive Development

SEPP 33 defines a hazardous industry, offensive industry, potentially hazardous industry and potentially offensive industry. In each case the definition refers to development for the purposes of an industry. Neither the proposed mushroom farm nor the proposed expansion to the substrate plant is development for the purposes of an industry. Other aspects of SEPP 33 referring to storage establishments also do not apply to the proposal.

Consequently SEPP 33 does not apply to the proposed development. However, for completeness, the matters for consideration by a consent authority for a potentially offensive industry are considered in relation to the proposed substrate plant expansion in section 8.11.

3.6 DEVELOPMENT CONTROL PLANS

Development control plans (DCPs) are not environmental planning instruments, but guidelines, adopted by councils to regulate development approved under Part 4 of the *Environmental Planning and Assessment Act, 1979*. DCPs do not regulate development approved under Part 3A of the Act. There is a DCP applying to each of the development sites and a draft DCP for the Londonderry site, listed here for completeness.

(i) Penrith Development Control Plan 2006

This document currently applies to the Londonderry site. Various sections of the DCP would be relevant to a mushroom farm and child care centre.

(ii) Draft Penrith Development Control Plan 2008:

When finalised and adopted by Penrith Council, Draft DCP 2008 will apply to the Londonderry site, replacing Penrith DCP 2006.

(iii) Hawkesbury Development Control Plan 2002:

Various sections of the Hawkesbury DCP would apply to the substrate plant site at Mulgrave.

An assessment of consistency of the project with the current Penrith and Hawkesbury DCPs is included in *Appendix C*.

4

ISSUE IDENTIFICATION

4.1 INTRODUCTION

The Director-General's requirements (DGRs) issued by the Department of Planning for preparing this Environmental Assessment (see *Appendix A*) require that the document contain a detailed assessment of the key issues. A preliminary list of key issues is included in the DGRs together with a requirement that a risk assessment of the potential environmental impacts of the project be undertaken to identify any further key issues for assessment.

Environmental risk assessments for the proposed development at Londonderry and Mulgrave were included in the Preliminary Environmental Assessment (Perram & Partners 2008). The risk assessments have since been revised after considering:

- the outcome of consultation (see section 4.2 below);
- a review of environmental planning instruments (refer to section 3);
- guideline documents referenced in the DGRs (see *Appendix A*); and
- ongoing development of the project.

The revised environmental risk assessments are included in *Appendix E* of this document.

4.2 CONSULTATION

4.2.1 Agency Consultation

In preparing the Director-General's requirements, the Department of Planning contacted a number of agencies requesting their input to the process. The Department received responses from DECCW, Hawkesbury City Council and DPI and made them available to the proponents as an attachment to the Director-General's requirements. Copies of correspondence received through that process are included in *Appendix A*.

The DGRs recommended the proponents conduct further consultation and in particular, required consultation with DECCW, DPI, NSW Fire Brigades, Hawkesbury City Council and Penrith City Council. During the course of preparing this Environmental Assessment, correspondence was sent to a number of agencies,

including those nominated in the DGRs, advising them of the proposal and requesting advice of any matters the agencies would like to see addressed. Responses received from this second round of consultation are also included in *Appendix B*.

The authorities contacted are listed in *Table 4.1* below, together with a summary of any matters raised and a comment or indication where the matter is addressed in this document.

Specialists engaged in preparing reports for the Environmental Assessment have undertaken further informal consultation with relevant authorities when required.

4.2.2 Community Consultation

The proponents will be pleased to discuss the proposals with neighbours when the formal application is submitted for assessment. In this manner, matters raised in discussions can be addressed as part of the assessment process.

Table 4.1 SUMMARY OF CONSULTATION RESPONSES

Authority	Matters Raised	Comment
• AGL Energy Ltd	The Department of Primary Industries requested that Sydney Gas Operations Ltd, the holder of Petroleum Exploration Licence 2, affecting land immediately west of the site of the proposed mushroom farm, be approached to discuss any land use issues associated with the project. An approach was made to AGL Energy Ltd, being the successor to Sydney Gas Operations Ltd as holder of the licence.	
	– AGL advised that it had no objection to the proposed development on either of the two subject properties.	Noted
• Department of Defence	The Department of Defence was contacted in relation to the proposed construction of a second chimney stack of identical height and diameter to the first, at the Mulgrave Substrate plant. The plant is located in the approach path to Richmond RAAF base.	
	– The Department initially requested that a plume rise assessment be conducted in accordance with Civil Aviation Safety Authority (CASA) guidelines.	An assessment was undertaken by PAE Holmes and forwarded to the Department.
	In subsequent correspondence the Department advised:	
	– The proposed stack height of 56 m AHD is within the prescribed height limit;	Noted
	– Based on the submitted plume rise assessment the velocity of the chimney exhaust plume would satisfy Defence's requirements;	Noted
	– "as constructed" details of the chimney should be supplied to the RAAF Aeronautical Information Service for recording on a central	Details will be supplied as requested.

Authority	Matters Raised	Comment
	database of tall structures;	
	– If cranes are to be used during construction of the chimney, height details should be supplied to Defence to allow assessment of the impact on aircraft operations, prior to deployment on site.	Details will be supplied as requested.
• Department of Environment, Climate Change and Water	– A licence may be required for the spent substrate facility at the proposed mushroom farm. This will be determined later;	Noted
	– DECCW made recommendations to DoP as to the content of the environmental assessment including a comprehensive generic outline to be addressed where applicable.	Generic recommendations refer to the entire document and have been addressed throughout, as relevant
	– Specific matters to be addressed for Londonderry include:	
	• Types and quantities of material that will be received at the proposed mushroom farm from offsite (per year) that will be used in the process of developing the final topdressing material product	Operation of the spent substrate facility is described in section 5.3.4. The input material is spent substrate. The quantity transferred to the facility will range up to 100% of spent substrate from the farm, depending on market demand.
	• Details of the mechanical and/or chemical processes used to convert the spent substrate to topdressing material;	
	• Quantities in tonnes of the final product to topdressing material to be produced by the facility each year	
	– Specific matters to be addressed for Mulgrave include:	
	• Detailed description of all stages of expansion, including timeframes for completion;	Refer to section 7
	• Provide an updated copy of the EMP with the environmental assessment;	The EMP for the existing plant is available for examination. Approval conditions are

Authority	Matters Raised	Comment
		required for updating.
	• Details of the conveyor transferring Phase 1 substrate to Phase 2/3 building No 2	Subject to detailed design, but similar to existing conveyor transferring Phase 1 substrate to Phase 2/3 building No 1
	• Detailed specifications of bioscrubber and chimney No 2;	Subject to detailed design, but refer to section 7.2.1 and *Appendix U*.
	• Detailed odour assessment assessing effectiveness of second bioscrubber under various operating scenarios;	Refer to section 8.2 and *Appendix P*
	• Identify and assess odour impacts accumulating from a number of sources in the plant;	Refer to section 8.2 and *Appendix P*
	• Detailed noise assessment considering truck movements, plant and equipment movements and stationary plant;	Refer to section 8.6 and *Appendix R*
	• Water management, particularly handling excess runoff to prevent contaminants from entering the dam or South Creek	Refer to section 7.5
	• Capacity of existing and proposed recycle water pits	The existing pit has a capacity of greater than 120 kL. The proposed pit capacity is subject to detailed design.
	• Development consent permitting current filling	The consent is available for perusal.
	• Quantity and classification of fill material to be used for raising the property	Refer to section 7.3.3.

Authority	Matters Raised	Comment
• Department of Primary Industries	**Agriculture**	
	– Assess potential impacts on any nearby commercial poultry farms of abrupt noise, dust, vehicle lights and potential to create biosecurity risk;	There are no poultry farms near the development sites that could sustain such impacts.
	– Assess weed management during and after construction;	Weed management is addressed in sections 5 and 7.
	Fisheries	
	– Outline the measures to ensure that water quality in any nearby creeks is not reduced.	Water management at the two sites is discussed in sections 5.5 and 7.5.
	Mineral Resources	
	– Operating mines and quarries should be protected from sterilisation or hindrance by encroachment of incompatible adjacent development;	There are no operating mines or quarries in the vicinity
	– Known resources and areas of high mineral potential should not be unnecessarily sterilised by inappropriate zoning or development;	The proposal will not sterilise any known resources or area of high mineral potential.
	– Access to land for mineral exploration and possible development should be maintained.	Access will not be possible in operational areas, but will be unimpeded over the balance of the rural properties.
	– The proponent is required to contact the holder of Petroleum Exploration Licence 2, as the site of the mushroom farm is adjacent to an area that has moderate to high potential for coal seam methane.	Refer to consultation with AGL Energy Ltd, above

Authority	Matters Raised	Comment
• Hawkesbury City Council (referring to the proposed substrate plant expansion at Mulgrave)	– A management plan should be developed that deals with fugitive odours, odour control management, monitoring, complaint management and regular reporting of monitoring results;	The existing environmental management plan (EMP) will be updated as each stage of the expansion is implemented.
	– Provide details of the proposed filling on the site and its impacts	Refer to section 7.3.3 and section 8
	– Provide detailed landscape plans for the site	Landscaping is discussed in section 7.3.5.
	– Flood site management and flood evacuation plans	Response to flooding is included in the existing EMP for the site
• NSW Fire Brigades	– New buildings and substantial alterations should comply with the BCA and relevant Australian Standards.	Noted.
• Penrith City Council (referring to the proposed mushroom farm development at Londonderry)	– The mushroom farm proposal is likely to be categorised "Intensive Horticultural Establishment" under *SREP 20 – Hawkesbury Nepean River*. Consideration should be given to the provisions of this policy;	Relevant planning provisions are considered in section 3.
	– A number of planning instruments, draft plans and DCPs apply to the Londonderry site and should be considered in the application;	Relevant planning provisions are considered in section 3.
	– Former use as a piggery may have left contamination. A soil investigation in accordance with SEPP 55 is required;	Refer to Section 5.2 and *Appendix I*.
	– A traffic report is recommended to address parking and access from The Northern Road. Deceleration lanes may be required;	Refer to section 5.5 and *Appendix M*.
	– Operations are to be conducted to minimise noise, particularly during the night period;	Refer to section 6.4 and *Appendix J*.
	– Details of construction staging and management should be provided;	Refer to section 5.1.2

Authority	Matters Raised	Comment
	– Details of the water management system should be provided, particularly in relation to nutrient removal;	Refer to section 5.5
	– Details of fencing and the earth mound are requested;	Refer to section 5.1.1
	– The Northern Road is considered a gateway to the City. Liaison with Council is suggested in developing the landscape plan;	Noted. This will be done as part of detailed design.
	– The EA will need to address sewage management and effluent disposal;	See section 5.4
	– Details of the proposed child care centre are requested and its compatibility with environmental issues associated with the mushroom farm;	The child care centre is proposed during a later stage of development and will be the subject of a separate application.
	– Dam 2 is shown in the preliminary assessment to be located adjacent to the main building. Will Dam 2 be filled?	The project has been further developed since the preliminary assessment. Dam 2 now falls within the footprint of the main building apron and will be filled.
	– Consultation with the local community is recommended	The proponents would be pleased to discuss the project with the local community when the proposal is submitted for exhibition.
• Sydney Water	Sydney Water was approached to determine whether the proposed Londonderry and Agnes Banks sewerage scheme would be capable of receiving wastewater from the proposed mushroom farm at Londonderry.	
	– A verbal response was received to the effect that the sewerage scheme was designed for residential loadings and would	Noted

Authority	Matters Raised	Comment
	terminate several kilometres from the location of the mushroom farm. No advice could be given regarding any surplus capacity until the system had been installed and the extent of take-up by residents had been assessed.	

4.3 KEY ISSUES FOR ASSESSMENT

The key issues specified by the Director-General are as follows:

- air quality – odours, particulate emissions and other emissions;
- soils and water – including water balance, erosion and sediment controls, stormwater management, soil contamination, flooding and spill containment;
- traffic – types and volumes, safety and capacity impacts, transport routes, internal roadways and parking;
- noise – construction, operation and traffic noise
- waste management – quantity and type of waste and how managed;
- flora and fauna – native vegetation, critical habitat, threatened species;
- greenhouse gas and energy efficiency – quantities, types and impacts of greenhouse emissions, energy efficiency measures;
- hazards – including SEPP 33 assessment;
- visual – buildings, landscaping, lighting and signage; and
- heritage – indigenous and non-indigenous.

No other key issues were identified arising from the environmental risk assessment, consideration of planning instruments or through consultation with authorities.

5

PROJECT DESCRIPTION, MUSHROOM FARM

5.1 SITE DEVELOPMENT

5.1.1 Layout and Design

The proposed mushroom farm is essentially a large building enclosing an array of climate-controlled growing rooms supported by ancillary infrastructure and services. The layout of the proposed mushroom farm at Londonderry is shown on *Figure 5.1*. In summary, the mushroom farm comprises the following components:

- main building containing 50 growing rooms and ancillary services;
- peat store – workshop building;
- covered loading dock;
- spent substrate store;
- office/reception building;
- child care centre;
- water storage dam;
- wash down water recycling system;
- sewage treatment plant;
- parking area;
- roadways and building apron; and
- site landscaping.

The various buildings and structures are described below. Concept design plans for the new buildings are included in *Appendix T*. Building form, finish and colours may be observed in Photographs 5 to 9 (in section 7) which show similar large structures at the Mulgrave substrate plant.

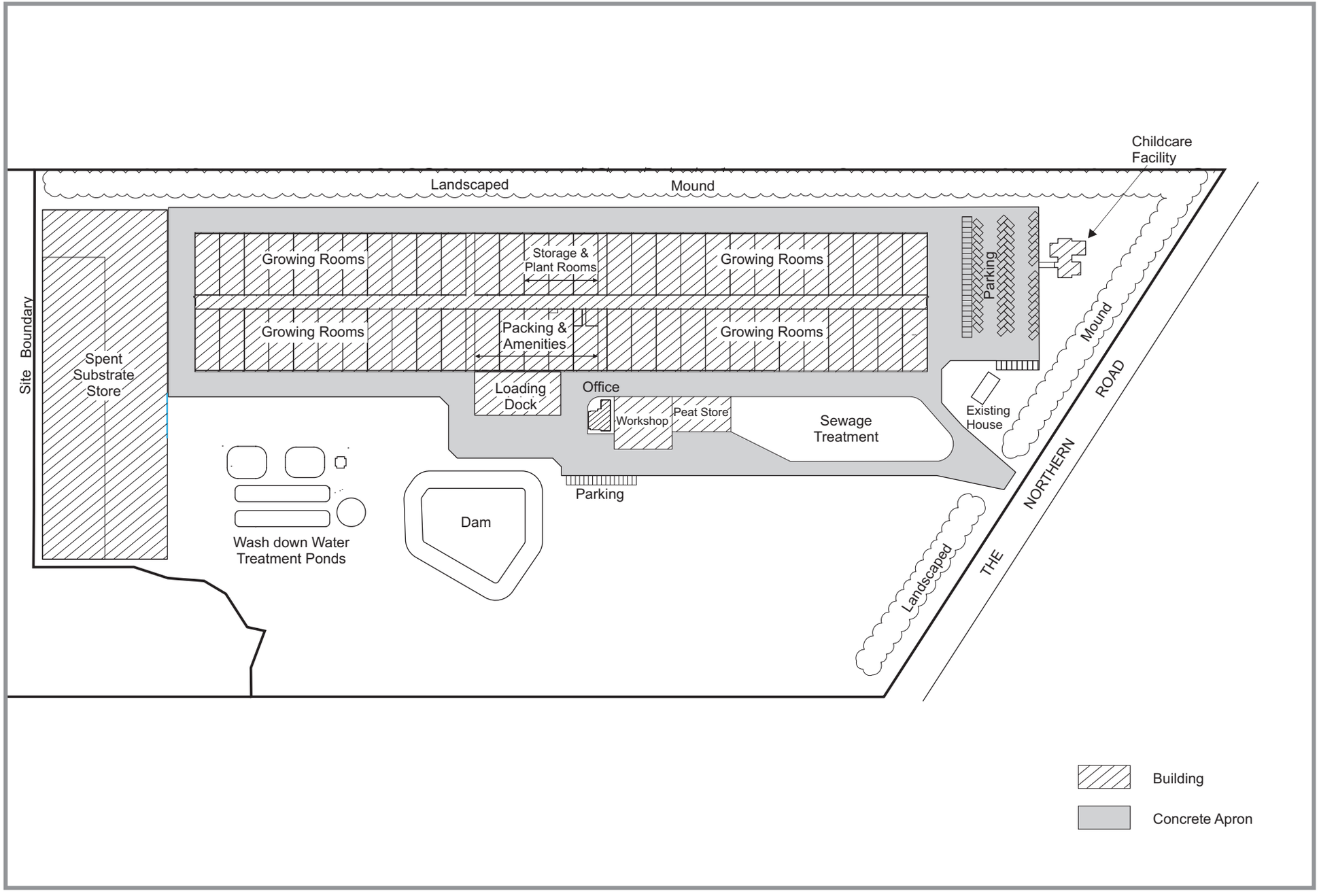


FIGURE 5.1 Mushroom Farm Layout

Main Building

The main building has the form of a large shed approximately 420 metres long by 79 metres wide with a wall height of 9.8 metres. The walls will be constructed mostly with insulated panels up to a ceiling height of eight metres with colorbond above. A 43 metre section of wall on the northern side in the centre of the building where there are ancillary service rooms will have external walls formed by concrete tilt panels or concrete blockwork.

The pitched roof will be of zincalume, extending to a ridge height of 11.9 metres. A series of hooded box ducts will be erected along the ridge, extending approximately one metre above the roof.

The building will contain 50 mushroom growing rooms with an additional eight rooms for packing, cool storage, carton storage, plant, office and staff amenities. Rooms will be arranged to the north and south of a central corridor extending the full length of the building. Sliding doors will be fitted to each of the growing rooms to provide machine access. A smaller door for personnel access will be included in each sliding door. Ancillary rooms will have roller doors, sliding doors or personnel doors to suit the purpose. Windows will be fitted to the staff lunchroom.

Roller shutter doors and a personnel door will be fitted at the centre of each end of the building, giving access to the central corridor.

The building will be erected on a concrete slab floor prepared at a finished level of 38.5 metres AHD. Under the Building Code of Australia the building will be a Class 8 large isolated building.

Peat Store- Workshop Building

The peat store and workshop are located in joined buildings 15 metres south of the main building.

The peat store will be a large shed with approximate plan dimensions 34 metres by 20 metres with a maximum wall height of 6.5 metres. The peat store building will have a sloping roof of zincalume with skylight panels. The walls will be clad with colorbond sheeting. Six roller shutter doors will be arranged along the northern side of the building facing the apron of the main building. Two personnel access doors will be provided on the southern and eastern sides.

The workshop, abutting the western end of the peat store, will be roughly square with plan dimensions approximately 30 metres by 33 metres. The workshop will have a wall height of seven metres with a pitched roof extending to approximately 7.8 metres.

The roof will be zincalume with skylight panels and the walls will be clad with colorbond sheeting.

Three roller shutter doors will be aligned along the northern side and five on the southern side. An additional roller shutter door in the eastern and western wall will create a drive through service facility. Two personnel doors are arranged on the northern side and one on the western side. The building will contain an office and lockup compound with staff amenities above on a mezzanine level.

Loading Dock

The loading dock will be attached to the central part of the southern side of the main building. The awning over the dock will extend 25 metres from the building and have a length of 49 metres. The awning will slope towards the main building attaching to the wall.

At the vehicle entrance to the dock the concrete apron will slope downward to a floor level 1.3 metres below the floor level of the main building.

Spent Substrate Store

The spent substrate store will be located to the west of the main building. The store will comprise a concrete pad with a canopy supported on columns, to keep the storage area dry. The pad area is to be approximately 183 metres by 72 metres. The double pitched zincalume canopy will range in height from 9.4 metres at the sides to 10.4 metres at the ridge tops, to allow clearance for internal truck tipping.

Office and Reception

The office and reception building will be a vinyl-clad relocatable structure with colorbond roofing in natural colours.

Child Care Centre

The work place child care centre will be designed to meet Penrith Council's DCP requirements and standards required by the Department of Community Services. The number of childcare places will be determined when Stage 1 of the mushroom farm is operating and likely employee needs can be assessed. At that time a further application will be submitted with details of the child care centre.

Existing Cottage

The existing cottage on the property near The Northern Road will remain and be utilised as a caretaker's residence in conjunction with the mushroom farm.

Water Storage Dam

It is proposed to enlarge an existing dam in the southern part of the site to serve the dual function of providing storm detention capacity and water storage for operational purposes. The water management system is described in section 5.4.

Wash Down Water Recycling System

The recycling system for wash down water comprises a series of ponds and wetlands to remove organic compounds and nutrients making it suitable for use in the cooling tower and steam generator and for toilet flushing. The ponds will be located in the open space between the water storage dam and spent substrate store. Operation of the recycling system is summarised in section 5.4.

Sewage Treatment

A proprietary sewage treatment plant creating secondary treated effluent will be installed in the open area to the east of the Peat Store. Effluent from the plant will be disposed of by subsurface irrigation within the landscape/noise mounds along the northern and eastern site boundaries. The system is further described in section 3.3.

Parking Area

Parking will be provided at the front of the site for about 90 employee vehicles. The main parking area will be used for the bulk of the workforce and the childcare centre. A smaller parking area for about 16 vehicles will be located beside the roadway to the south of the office/reception building.

Roadways and Building Apron

The main building will be surrounded by a 15 metre wide concrete apron, allowing large vehicles to pass around the structure and access each of the growing rooms. The sealed area will extend to the spent compost store and employee car park at the ends of the main building. Access from The Northern Road will be via a new roadway at approximately the centre of the property frontage.

Slip lanes are proposed to be constructed on The Northern Road to facilitate safe vehicle entry and exit. This matter is further discussed in the traffic assessment (see *Appendix M* and section 6.5).

Landscape Design

A landscaping and noise attenuation mound will extend along The Northern Road frontage with a break to allow the access road to pass into the site. The mound continues along the northern property boundary for the full length of the main building and spent substrate store. The mound will have a height of 2.5 metres above existing ground level along the site frontage and 2.5 metres above the building apron level along the northern boundary. The purpose of the mound is to assist in noise attenuation and screening. The mound will be planted with native vegetation endemic to the site to further assist in reducing views into the property. A species list for planting is included in the flora and fauna assessment (see *Appendix N*)

A landscaping plan will be prepared as part of detailed design to specify landscaping of the mound and where appropriate, in the vicinity of buildings and structures, including the car park and child care centre. The plan will provide for retention of existing shade trees wherever possible.

It is not intended to landscape undeveloped parts of the site other than to restore grass cover if disturbed during construction. It is proposed to continue grazing undeveloped parts of the property following erection of appropriate internal fencing.

Fencing

The site frontage will be fenced at The Northern Road boundary with a rural-style post and rail fence with mesh inlay. A cyclone wire security fence will be erected inside the earthen mound where it will be largely obscured from view from The Northern Road.

Lighting

The roadways and external work areas of the mushroom farm will be illuminated at night to the extent necessary for operations using energy efficient lighting. Lighting will be designed to minimise light spill onto adjoining properties.

Detailed Design

Detailed design of buildings and structures will be consistent with the Building Code of Australia and the Bushfire Compliance Report included as *Appendix L*.

5.1.2 Staging

Stage 1

Figure 5.2 shows the various stages planned for development of the mushroom farm at Londonderry.

The first stage includes more than half of the total development, comprising 18 growing rooms and common ancillary areas such as packing, loading, carton storage, plant room, administration, workshop, staff amenities, process water recycling, sewage treatment and part of the spent compost store. The Stage 1 development will have capacity to produce approximately 85 tonnes of mushrooms per week.

When Stage 1 of the new farm is fully operating, it will employ approximately 115 people, in addition to the 130 employed at the company's current mushroom farm at Vineyard. Initially it is proposed to transport some of the product from Londonderry to the Vineyard farm for packaging and distribution by White Prince, the marketing division of the Tolson Group. Part of the spent substrate processing facility will be established during the Stage 1 development.

During Stage 1 the land will be filled to establish building levels for the entire development. Fill material will be obtained opportunistically until filling is complete.

The child care centre is planned for construction to cater for employees following commissioning of Stage 1, when sufficient demand exists. The child care centre has been designated Stage 2A because it will be approved separately and may be constructed independently of other development stages.

Subsequent Stages

A further four stages are planned for progressive development of 32 additional growing rooms and ancillary development as illustrated on *Figure 5.2*. Further development will commence approximately five years after completion of Stage 1 and progress thereafter according to market demand for mushrooms.

These subsequent stages will be accompanied by the closure of Elf Mushrooms' ageing Vineyard mushroom farm. As additional growing rooms enter service, remaining employees at the Vineyard site will be progressively offered employment at Londonderry. White Prince will move to the Londonderry site from Vineyard as part of Stage 3. Expansion of the spent substrate recycling store to its final configuration will occur during Stage 4.

A summary of operational characteristics for each stage is included in section 5.3.

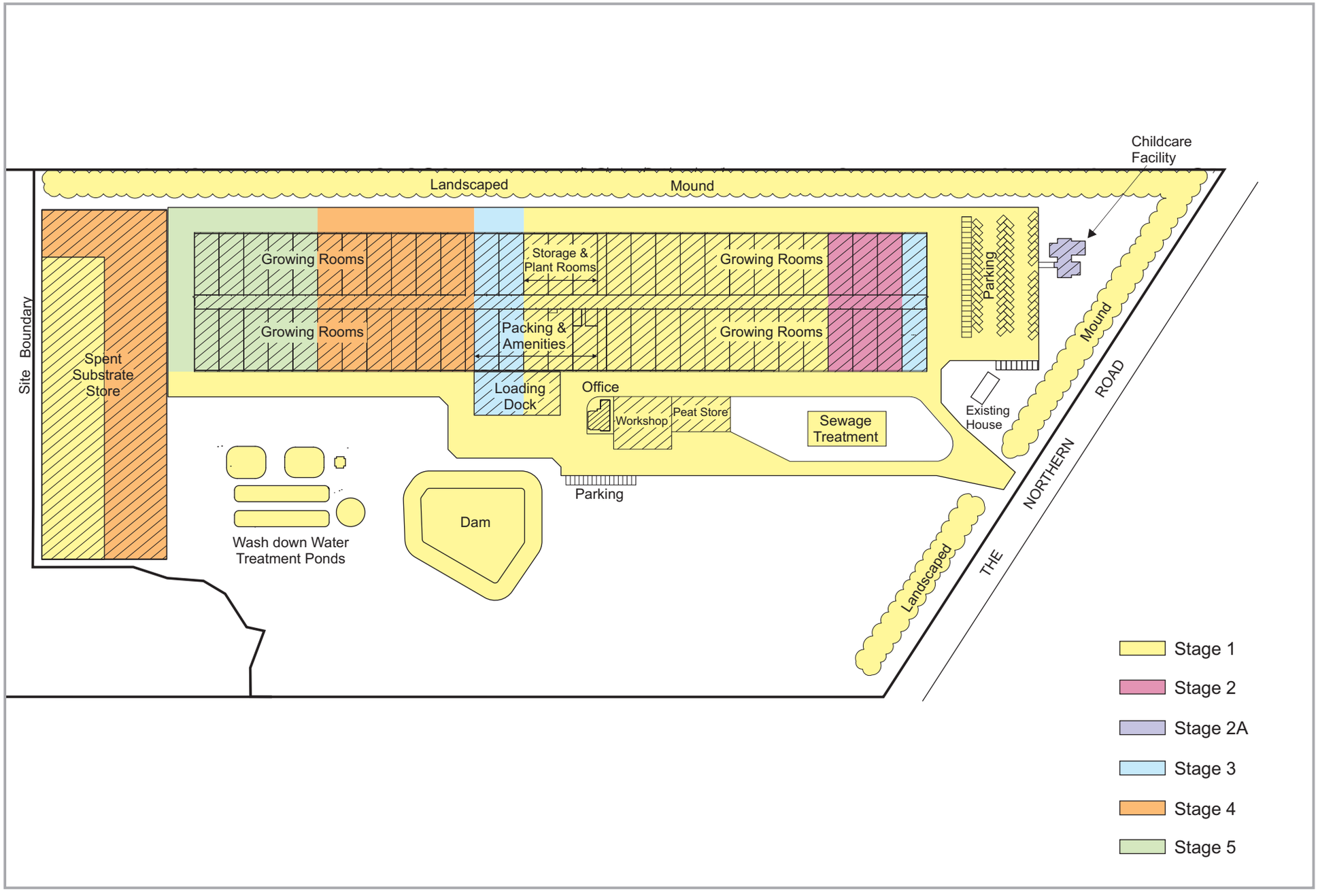


FIGURE 5.2 Mushroom Farm Staging Plan

5.2 CONSTRUCTION

5.2.1 Stage 1

Erosion and Sediment Controls

Prior to commencement of site works, erosion and sediment controls will be installed to restrict movement of soil and water from disturbed areas onto other land which is not intended to be developed. An erosion and sediment control plan has been prepared and is included in the stormwater management plan (*Appendix F*).

Clearing and Demolition

There are few trees within the development area. Where required for the project to proceed, trees will be felled and their stumps removed. Debris resulting from clearing will be mulched and used on screening mounds, or in the case of stumps, removed to a suitable waste depot. Additional vegetation near buildings will be removed or trimmed consistent with the Bushfire Compliance Report included as *Appendix L*.

The few minor structures and fences on the site remaining from previous uses will be demolished and removed to a waste depot for disposal or recycling, as appropriate.

Earthworks

Bulk earthworks are required to enlarge the existing dam, create a level platform beneath the buildings and apron and to construct the landscape mound and wash down water recycling ponds. The finished floor level of all buildings and the concrete apron will be RL 38.5 m. The depth of fill required within the development area is shown on *Figure 5.3*.

The landscape mound will be constructed using upper layers of soil stripped from within the development area together with material excavated from the dam and water recycling ponds. The landscape mound will be constructed and landscaped as an initial step to provide early noise attenuation and screening for neighbouring properties.

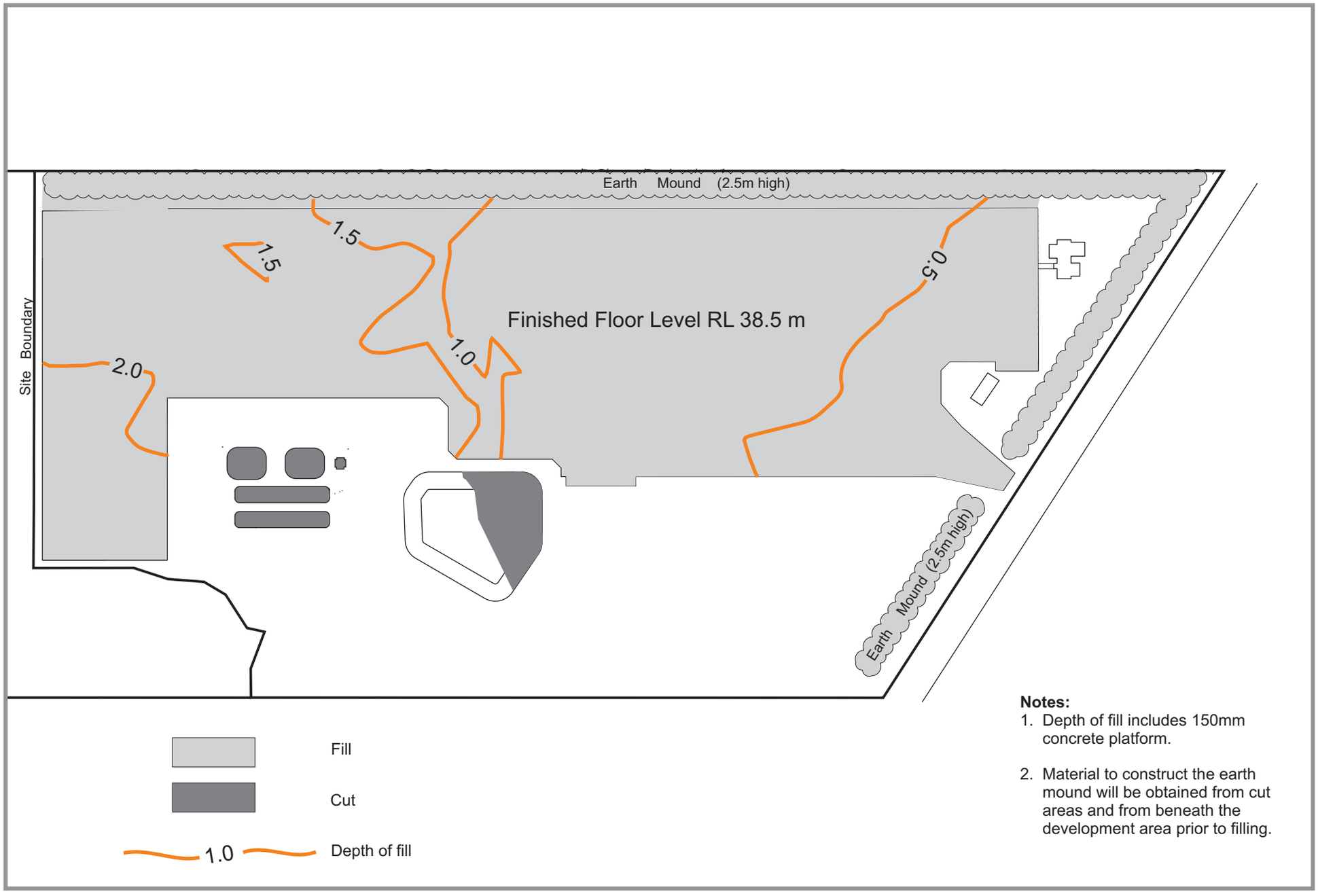


FIGURE 5.3 Mushroom Farm Cut and Fill

Finished levels for the earthworks will be achieved by importing approximately 100,000 cubic metres of fill. The imported fill will be excavated natural material certified to be free of contamination. Fill material will be sourced from construction projects in the Sydney region that have surplus excavated material at the time the mushroom farm is being developed.

As indicated in section 5.1.2, bulk earthworks will be continuous until the site has been prepared for all stages. Should bulk earthworks continue beyond the commencement of operations in Stage 1 of the development, a separate unsealed construction access will be retained adjacent to the main site access.

Building Construction

Following installation of below-ground services, the concrete footings for the buildings will be poured and the steel structures erected. The buildings will be fitted out and fixed plant and equipment installed in readiness for commissioning.

Landscaping and Restoration

When the earthen mound is complete, including installation of effluent irrigation pipes, its surface will be stabilised and planted as soon and possible to minimise the risk of erosion and to assist in early screening of the development. Landscaping on the mound will receive regular maintenance attention to ensure an adequate weed-free vegetation screen is established.

The balance of restoration and landscaping will be undertaken as construction work is completed. Restoration will include replacing grass cover lost as a result of construction activities so that undeveloped parts of the site may be returned to rural uses. Weed control will be ongoing during the construction period and will continue beyond the restoration and landscaping stage.

Hours of Working

Construction hours of working will be from 7:00 am to 6:00 pm Monday to Friday and from 8:00 am to 1:00 pm on Saturday. There will be no construction work on Sundays or public holidays. Minor construction activities may take place outside of these hours provided the noise generated at potential receptors satisfies the *operational* noise limit of existing background plus 5 dB(A).

Construction Plant and Equipment

Construction work will involve use of plant and equipment typically used for earthworks and large building construction. The largest items of equipment will be

used during earthworks and may include dump trucks, bulldozer, scraper, excavator and compactor. Building erection will require delivery trucks, cranes, elevating work platforms and concrete pumps. Portable generators and motorised pumps will be used on the site until a permanent power supply is available.

Program

Stage 1 construction work is expected to extend over a period of 78 weeks. Earthworks for filling the balance of the building platforms beyond the Stage 1 development area may continue in campaigns as suitable material becomes available.

5.2.2 Subsequent Stages

Construction for subsequent stages will involve further building construction within the established site. Bulk earthworks will have been completed as part of the Stage 1 development, so there will no further need to import significant quantities of fill material.

Construction work for each subsequent stage is anticipated to take about four months from commencement of the stage.

5.3 OPERATION

Mushrooms are grown indoors in climate-controlled growing rooms. Cleanliness is essential to minimise the intrusion of spores and pathogens that could contaminate the nutrient-rich growing mix.

5.3.1 Raw Materials Delivery

Raw materials for mushroom growing include prepared substrate, peat and water. The principal raw material is substrate that arrives fresh from the substrate plant in bulk, already pasteurised and containing mushroom spawn. The substrate will arrive in semi-trailer trucks commencing, from about 5:00 am, up to four days per week, typically Monday, Wednesday, Thursday and Friday. When all stages of the mushroom farm are in operation, six shipments will be received on each of those days. As a general rule, three truckloads of substrate will fill one growing room.

Substrate trucks will proceed around the main building and stop adjacent to a growing room to be filled. Trucks have a walking floor to mechanically move substrate to a conveyor which transports the material into the growing room.

The substrate is teased and mechanically loaded to growing shelves using a purpose-built filling machine. A casing layer of peat mix is placed over the top during the filling process.

The apron area external to the growing room is washed down after loading.

5.3.2 Growing and Picking

When shelves are fully loaded with substrate and peat, the growing room is sealed and maintained at a temperature between 13 and 22 degrees Celsius using chilled water, hot water and steam from the plant room. The growing mix is periodically inspected and watered.

After two weeks, when the emerging mushrooms are sufficiently advanced, the first crop is picked by hand. There is no practicable alternative to manual harvesting, which is why the industry is labour-intensive. Each batch of substrate is capable of yielding three crops of mushrooms over a six week cycle.

Mushroom picking occurs during daylight hours, seven days per week. It is anticipated that with the introduction of mechanical shelf rotation within the growing rooms, the efficiency of mushroom picking will progressively improve over the time, increasing the daily tonnage picked per employee. This is reflected in the predicted staff numbers for the various stages of the development (see section 5.3.7).

5.3.3 Packing and Delivery

Picked mushrooms are moved internally to a packing room where they are packed into cardboard cartons and stacked ready for collection. At full production, four semi-trailers will be loaded and dispatched to retailers or markets in each 24 hour period. Generally two departures would occur between 6:00 pm and 4:00 am to suit the needs of the customer, with the other two occurring during daylight hours.

5.3.4 Spent Substrate

When the final crop of mushrooms has been picked from a growing room, a "cookout" operation takes place where steam is introduced to raise the room temperature to 70 degrees Celsius for 24 hours. The purpose of the cookout is to destroy any remaining mushroom mycelium and any other spores, pathogens or larvae that may be present to prevent cross-contamination of other growing rooms. After cooling, the spent substrate is winched out onto an inclined conveyor and loaded to a truck. The room and apron are then washed down ready for the next growing cycle.

In the past, all spent substrate has been sold for use in potting mix or as a soil conditioner in agriculture. This practice will continue for some of the spent substrate at the Londonderry farm. Elf Mushrooms proposes to further refine the remainder of the spent substrate into a drier, fine-grained material of higher value suitable for top dressing lawns, playing fields or golf courses in addition to a wider range of agricultural uses.

This refining process will take place in the spent substrate store. Each day spent substrate will be transported the short distance from a growing room to the spent substrate store where it will be added to other material previously laid out in windrows. A turning/blending machine will periodically proceed along the windrows progressively aerating the material and reducing it to smaller sized particles.

Spent substrate will remain on the site for approximately six weeks, being turned about twice per week. Preparation of the material primarily involves moisture evaporation and mechanical breakdown into smaller particle sizes. The loss of moisture results in the material contracting in volume and weight, making transport more economical.

Refining spent substrate is not a composting process. No organic material will be added to the mix which has previously been rendered sterile at the substrate plant during the Phase 2 pasteurisation process, complemented by the cookout at the mushroom farm. It is not planned to add water as the spent substrate contains approximately 70 per cent moisture at the start of the process.

Processed material will be loaded to trucks using a telescopic handler/loader and delivered to users. It is anticipated that at full production, from eight to twelve semi-trailer loads of spent substrate will be removed from the site per week, depending on market demand for refined product.

5.3.5 Plant and Equipment

Fixed plant to be installed at the mushroom farm includes refrigeration equipment (compressors, chillers, cooling tower and air handling unit), steam boiler, hot water boiler and steam generator. This plant is located in the central part of the main building. Within the growing rooms it is intended to install mechanical equipment to vertically rotate the shelves so that all picking may take place from a central platform, rather than the current practice of having pickers work from a number of platforms to reach the shelves of various heights.

Mobile plant includes a filling machine for growing rooms, forklifts for loading products and moving peat, a front end loader, mobile blending machine and loader/conveyor for the spent substrate processing area.

5.3.6 *Hours of Operation*

Mushroom Farm

Activities can be occurring at the mushroom farm 24 hours per day. Cooling/heating equipment is required to operate continuously to maintain the necessary growing conditions but its load is very dependent upon outside weather conditions. The reduced load in the evening decreases demand upon chillers and cooling towers in particular, with consequent reduction in equipment operation.

The majority of staff are engaged in mushroom picking and will work during daylight hours. Other activities such as substrate delivery and product despatch will occur during the early morning or night time hours.

The majority of staff work on a roster of four days on, two days off. There are three shifts of mushroom pickers, so on any day two thirds of the employed pickers would be in attendance.

Childcare Centre

The childcare centre will cater for the children of employees at the mushroom farm and will operate to suit the needs of the workforce.

5.3.7 *Production Capacity and Employment*

Table 5.1 summarises the operational parameters of the mushroom farm at the various stages of development.

Table 5.1 PRODUCTION CAPACITY AND EMPLOYMENT

Stage	Growing Rooms	Production Capacity (tpw)	Employees
1	18	85	115
2	24	110	130
3	28	140	155
4	40	165	165
5	50	220	165

Note: 1. production capacity and employee numbers are approximate
2. tpw = tonnes of mushrooms per week

The anticipated improved efficiency of mushroom picking with mechanically rotated shelves is reflected in the employee numbers stabilising in the later stages.

5.4 WATER MANAGEMENT

5.4.1 Stormwater

Stormwater runoff will be collected from driveways, building aprons and roof downpipes and transferred via a series of pits and pipes to the storage dam within the site. The existing farm dam will be enlarged to have a storage volume of 14.7 megalitres with additional detention storage for extreme rainfall events. Stored water will be used primarily for washing down surfaces external to the growing rooms and supplying the cooling towers. When needed and available, dam water will also be used to maintain flow in the water recycling system and for pasture irrigation.

The stormwater system has been designed to incorporate on-site detention so that the rate of stormwater discharge from the site after the development is complete does not exceed pre-development discharge. A Stormwater Management Plan prepared by Barker Ryan Stewart is included as *Appendix F*. The report indicates that that apart from water storage for use on the farm, the dam requires approximately 1.3 metres of additional depth for storm detention. An orifice plate at the outlet will enable stormwater accumulated in the detention region of the dam following storms to slowly escape to natural drainage.

The storage dam will be designed with a spillway to permit safe overflow during major storms. Modelling carried out for the Stormwater Management Plan shows depth of flow over the spillway resulting from a 100 year ARI storm under normal operating conditions would be 0.04 metres. If the orifice plate were fully blocked the spillway depth would be 0.08 metres.

In the absence of further rain following a storm, the dam level is expected to fall rapidly because the water will be in constant use for external wash down purposes and cooling towers. When available, dam water will also be used for irrigating the landscaped and grazing areas of the property.

5.4.2 Wash Down Water

Growing rooms are washed down with heated water and steam after each mushroom growing cycle, using mains water to maintain hygiene standards. Corridors are washed down daily. The building apron external to the growing rooms is washed down after each filling operation and when spent substrate is removed from a growing room. Dam water is used for external wash down.

Wash down water from growing rooms and the apron will flow to the stormwater pits located in the apron area. The pits will contain a manually operated gate valve arrangement so that when wash down is in progress, the filtered effluent can pass through a separate dedicated pipe system leading to the wash-down water recycling

system. At other times gate valves will be configured to drain stormwater collecting in the pits to the stormwater system.

5.4.3 Wash Down Water Recycling System

The recycling system for wash down water is described in a report by Sainty & Associates Pty Ltd, included as *Appendix G.* The system will be capable of treating up to 30,000 litres per day when the farm is fully operational. Incoming wash down water will pass through a series of ponds and wetlands with a retention time of up to 10 days. Treated water will be pumped to a storage tank and re-used for cooling towers, steam generation, toilet flushing and irrigating the grounds.

The recycling system is designed for nutrient removal by wetland vegetation. *Appendix G* refers to design measures to deter colonisation by birds.

The ponds will be designed to retain water from incident rainfall and be protected by a diversion drain so that surface runoff cannot enter the system. There will be no discharge from the recycling system.

Water balance modelling undertaken in the Stormwater Management Plan, *Appendix F*, indicates that after accounting for losses, the average outflow from the wetland recycling system will be about 27,000 litres per day. This system will be supplemented as required from stored water in the dam or mains water which can be added either at the inlet to the wetland or to the storage tank.

Appendix G also contains a letter report from ALS Water Sciences reporting the results of sampling and testing wash down water from Elf Mushrooms' existing farm at Vineyard. The report finds that targeted fungicides, pesticides and chlorine used in the growing rooms are not present in significant quantities in the wash down water, with the exception of Carbendazim. This fungicide appeared at a noticeably higher level in one sample than in two others. The variation is considered to reflect normal practice where wash down water comes from different sources: growing rooms, corridors and external wash down. Water from all wash down sources will combine in the proposed wetland recycling system.

It is desirable to maintain suitable conditions for aquatic organisms that may colonise the recycling ponds to ensure proper functioning of the wetland for water recycling. The ALS report observes that Carbendazim is expected to be removed by natural processes in the early stages of the wetland. However, to be certain that the wetland will function as intended, the report recommends the water quality within the wetland be monitored after the mushroom farm is operational. This monitoring will be carried out and if necessary, further steps such as addition of dam water at the input will be undertaken to ensure successful operation of the wetlands for nutrient removal.

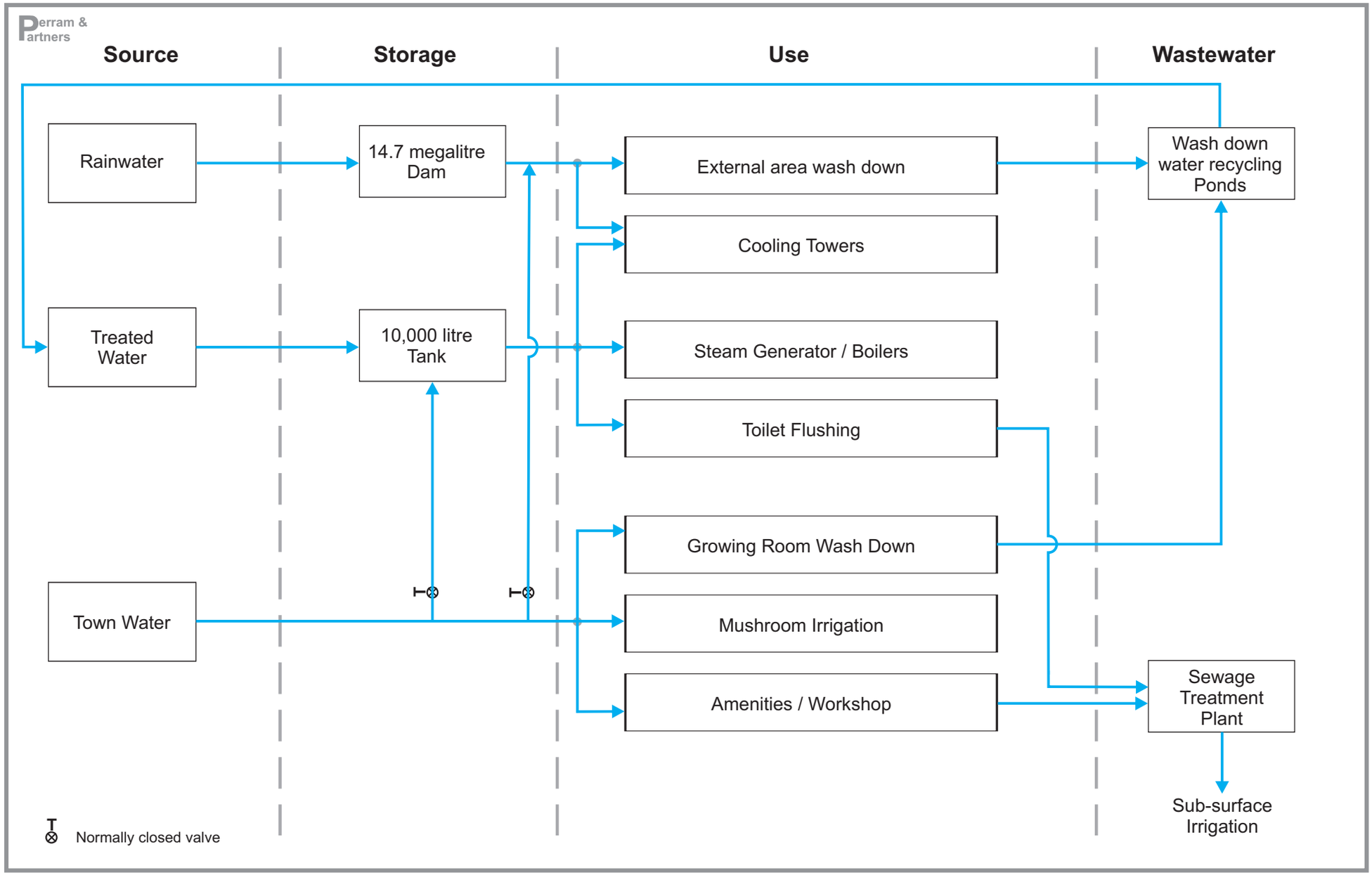


FIGURE 5.4 Mushroom Farm Operational Water Flow Chart

5.4.4 Sewage Treatment

Wastewater from the staff amenities, workshop, childcare centre and existing dwelling on the site will be treated in the sewage treatment plant located near the peat store as indicated in section 5.1. Secondary treated effluent from the plant will be disposed of on site by subsurface irrigation within the landscaped mounds.

Appendix H is a report by Blue Mountains Geological and Environmental Services assessing the requirements for effluent disposal and providing concept design for the system. The report indicates that the mounds, constructed from soil on the site, will provide more than sufficient capacity to dispose of the volume of effluent generated at the mushroom farm.

5.4.5 Summary of Water Requirements

Figure 5.4 shows diagrammatically the operational water management system for the mushroom farm. *Table 5.2* provides a summary of estimated water usage when the mushroom farm is fully operational. Town water will be available as a backup at any time should stored water or treated water be unavailable or unsuitable for use. Under normal conditions, town water will be limited to watering the mushroom crop, internal wash down within the growing rooms and staff amenities/workshop uses.

Table 5.2 SUMMARY OF WATER USE

Water Use	Source	Quantity
Mushroom Irrigation	Town water	60,000 litres/day
Growing Room wash down	Town water	10,000 litres/day
Potable uses	Town water	2,500 litres/day
External area wash down	Storage dam water	15,000 litres/day
Cooling towers	Treated water and storage dam water	30,000 litres/day
Steam generation	Treated water	15,000 litres/day
Toilet flushing	Treated water	7,000 litres/day
Site Irrigation	Treated water and storage dam water	Surplus when available

Water for use in fire fighting will be sourced from the mains supply. A static fire services supply (tank) will also be provided as recommended in the Bushfire Management Report.

5.5 ENVIRONMENTAL MANAGEMENT

5.5.1 Environmental Management Plan

An environmental management plan will be prepared for the Londonderry mushroom farm to guide management of the operation. The EMP will include all operational requirements deriving from this environmental assessment and the development approval applying to the site.

The following sections describe aspects of plant design relevant to managing odour, noise, waste and chemical storage.

5.5.2 Odour Control

Odour generation is not normally a significant issue associated with mushroom growing, where substrate is prepared off site. The proposed Londonderry farm will include the following measures that will assist in odour control:

- spent substrate retained on the site for refining will be kept under cover to prevent further wetting during rainfall;
- spent substrate will be turned and blended from time to time which will assist aeration;
- collected solids will be removed from pit filters each week using a telescopic loader; and
- the wash down water recycling system will be managed and maintained to prevent odour generation.

5.5.3 Noise Control

The mushroom farm will be developed and operated with the following features to control noise:

- a landscaped noise mound will be constructed along the northern and eastern boundaries with finished level at least 2.5 metres above ground or where adjacent to the main building, at least 2.5 metres above floor level;
- detailed design of buildings and structures will be undertaken to meet noise attenuation requirements indicated in *Appendix J*;
- mechanical plant and equipment will be selected to meet acoustic performance specified in *Appendix J*;
- moving-floor substrate trucks will be modified to include acoustic enclosures for trailer motors and to fit residential grade mufflers to achieve acoustic performance requirements indicated in *Appendix J*;

- the night time noise from truck airbrake release will be controlled by suitable silencers fitted to the trucks;
- reversing alarms fitted to mobile plant operating in the night period will be reduced-noise type; and
- vehicle speed limits will apply within the site.

A noise assessment of the proposed mushroom farm is considered in section 6.4.

5.5.4 Waste Management

Very little waste will be generated at the mushroom farm. The bulk materials regularly brought to the farm, being fresh Phase 3 substrate, peat and packing cases will be fully incorporated in the fresh mushrooms and spent substrate transported from the site. The spent substrate store will provide the opportunity to modify some of the spent substrate so its range of beneficial uses is increased.

Waste items generated on the site that will require disposal include:

- items of packaging and binding;
- office waste;
- food waste from the staff lunchroom;
- workshop waste;
- miscellaneous contractors' waste;
- waste from the child care centre;
- sewage effluent; and
- sludge from occasional cleaning of the wash down water recycling system ponds.

Solids collected by filtering from wash down water during the wash down process will be added to spent substrate in the spent substrate store.

As described in section 5.4, it is proposed to dispose of sewage effluent on site. Waste materials that can be recycled, such as metals, paper waste and drink containers will be stored separately and collected for recycling. All other waste items and sludges that are unsuitable for recycling will be removed by a waste contractor for disposal at a licensed waste depot.

Based on waste volumes at the existing Vineyard mushroom farm, it is estimated at the Londonderry farm a three cubic metre waste bin would need to be emptied twice per week with general waste from the operation. In addition four Council waste bins would be required each week for staff waste and two recycle bins for office paper and drink containers.

5.5.5 Chemical Management

A number of chemical products are stored and used on site, as listed in *Table 5.3*. Approximately four weeks' supply of the listed chemicals will be retained at the mushroom farm. Chemicals will be stored in a separately bunded storage area of the main building, near the plant room. This area will be caged to allow air flow. To maintain security of the chemical store, only management personnel will have keys to the caged area.

Persons applying chemicals will be trained in safe handling procedures.

Table 5.3 CHEMICAL REGISTER

Purpose	Product	Rate of Usage
Insecticide	Regent	1.8 litres per room per filling
	Ficam	30 grams per week
	Diazinon	5 litres per annum
Fungicide	Spinflo	1.8 litres per room per filling
(Alternative products)	Octave	2.16 kg per room per filling
Sanitiser	Bacrasan	2 litres per month
	Sanimush	100 litres per month
	Chlorine	10 litres per room per wash down
	Aquaammonia 25%	10 litres per room in cookout
Broad Spectrum Fungicide/ Biocide	Formaldehyde	200 litres per month
	Paraformaldehyde	1 kg per room per filling
Crop Water Sanitiser	Calcium Hypochlorite (dry cartridge)	4 cartridges per room per week
	Phosphoric Acid 85% (pH buffer)	3 litres per week
Rodent Control	Bromakil	15 kg per annum
	Stormsecure	8 kg per annum

5.5.6 Landscape Management

Landscaped areas of the site, including the mounds along the road frontage and northern boundary, will be maintained by suppressing weeds, nurturing screen plantings and replacing any failed plantings. Where landscaping is intended to screen

the development, the effectiveness of the screen will be monitored from time to time and additional plantings introduced when warranted. Surplus water collected in the main dam will be available to irrigate plantings when required.

5.5.7 Summary of Vehicle Movements

Truck movements will increase as additional stages of the mushroom farm are brought into service. Semi-trailer vehicles will be favoured for greater efficiency, although rigid trucks will be used for some movements and occasionally B-doubles. Routine heavy vehicle deliveries for the completed (Stage 5) development are summarised in *Table 5.4*.

Table 5.4 SUMMARY OF VEHICLE NUMBERS AT FULL PRODUCTION

Purpose	Day and Time	Vehicle Numbers
Fresh substrate delivery	Each Monday, Wednesday, Thursday and Friday commencing pre-dawn	Up to 6 deliveries per day
Outgoing spent substrate	Predominantly Tuesdays and Thursdays 6 am to 6 pm	8 – 12 shipments per week
Outgoing product	Every day, 2 at night, 2 during daytime	4 shipments per day
Cardboard cartons	Monday to Friday 6 am to 6 pm	2 deliveries per week
Peat	Monday to Friday 6 am to 6 pm	5 - 6 deliveries per week
Staff, contactors, visitors	Every day, predominantly daylight hours	Say 64 small vehicles*

* at full production approximately 115 personnel are likely to be present each day. At Elf Mushrooms' existing Vineyard mushroom farm, car usage is approximately one car per two employees

6

ENVIRONMENTAL ASSESSMENT – MUSHROOM FARM

6.1 KEY ISSUES FOR ASSESSMENT

Key issues for assessment for the Londonderry site identified in section 4 include:

- Soil
- Water
- Noise
- Traffic
- Air Quality
- Visual Characteristics
- Flora and Fauna
- Waste Management
- Environmental Hazards
- Heritage
- Greenhouse Gas

These issues are each discussed in the following sections.

6.2 SOIL

6.2.1 Soil Characteristics

As reported in section 2.1, the Londonderry site has a relatively level surface with a minor fall to the south west. There are several farm dams on the property.

The Londonderry area is shown on the Penrith 1:100,000 Soil Landscape map where the soils on the site are shown to be part of the "Berkshire Park" group. Bannerman and Hazleton (1989) describe these soils as having *weakly pedal orange heavy clays and clayey sands, often mottled* with *ironstone nodules common* and *large (up to 20 cm) silcrete boulders in sand/clay matrix*. The soils have a *very high wind erosion hazard if cleared* and a

risk of *gully, sheet and rill erosion on dissected areas.* Other limitations include *waterlogging, impermeable subsoils and low fertility*. The soils are considered capable of urban development in flood-free areas and have a low to moderate erosion hazard for non-concentrated flows.

The soils of the development area were examined by Blue Mountains Geological and Environmental Services as part of the assessment for on-site effluent management (refer to *Appendix H*). A series of test holes were created with an auger beneath the proposed noise/landscape mounds and within the main building footprint. The subsurface profile consistently demonstrated a duplex structure, with sand-based soils overlying clay-based subsoil. Sandy to loamy soils were found to occur to a depth ranging from 0.6 to 1.2 metres. The subsoil appeared as a medium clay.

The reported characteristics of the Berkshire Park soils indicate a risk of wind and water erosion during the construction phase. As indicated in section 5.2 the erosion and sediment control plan will be implemented throughout construction period until the soil surface has been stabilised and further controls are not needed.

6.2.2 Contamination Assessment

Compaction and Soil Testing Services undertook two contamination assessments of the site to determine its suitability for the proposed development. One assessment considered the land to be occupied by the mushroom farm while the other assessment focussed on the land to be occupied by the proposed child care centre, where more stringent residential standards apply. Both reports are included as *Appendix I*.

Mushroom Farm Development

Operational activities at the mushroom farm will take place on a sealed surface, either indoors or outdoors, with limited or no access to soil.

A preliminary investigation was undertaken with four composite soil samples being collected from within the development area and tested in a NATA accredited laboratory. Low levels of heavy metals were found to be present in all samples, suggesting they do not originate from any isolated source. The levels were within the acceptable background levels for soils in the Sydney basin and do not pose a significant risk to human health or the environment. No other potential contaminants were identified in the samples. Consequently the site as a whole was determined to be suitable for the proposed development during the construction and operational phases.

A more detailed investigation was then conducted of the part of the site formerly used for pig farming, owing to the intensive nature of this former use. Eleven test pits were excavated revealing no visible evidence of contamination. Four discrete soil samples were collected from this area and analysed at a NATA accredited laboratory. Some heavy metals were confirmed in these samples at levels higher than those of the

preliminary investigation. Copper and lead were found to be marginally above the previously identified levels but within acceptable background levels. Manganese and zinc were also found at higher levels, assumed to result from corrosion of the existing steel structure. As the steel structure will be removed and the levels did not exceed the Health Based Investigation Levels for commercial/industrial development and residential development, the concentrations identified would present no risk to human health or the environment.

No other potential contaminants were detected by the laboratory. The report concludes that no further investigation or remedial action is required for the proposed development to proceed.

Child Care Centre

The second assessment focussed on the smaller area of land to be developed as a child care centre. Visual inspection indicated no evidence of contamination. Two boreholes were excavated in the area and composite soil samples obtained from various depths within the holes. Analysis at a NATA accredited laboratory for a range of potential contaminants detected low levels of heavy metals that were consistent with background levels elsewhere on the site and below the residential Health Based Investigation Levels. No other potential contaminants were detected.

It has been concluded that from the perspective of soil contamination, the site is suitable for the proposed child care centre and no further investigation or remedial action is required.

6.3 WATER QUALITY

6.3.1 Site Characteristics

The site drains to the south west through two shallow drainage channels discernable on the southern and western sides of the property. The natural drainage system leads to Rickabys Creek, which flows in a northerly direction to join the Hawkesbury River just west of Windsor.

The land has a maximum elevation of about 38.4 metres at the road frontage. The land to be built upon is generally above 36.2 metres. The lowest part of the development site is in the shallow channel on the southern boundary where the level falls to approximately 34 metres.

Penrith Council's planning certificate reports that the land has not been identified as being below the adopted flood planning level. The adopted flood planning level is the one per cent annual exceedence probability flood level plus 0.5 metres.

6.3.2 *Construction Water Quality*

As indicated in section 5.2 the erosion and sediment control plan will be implemented prior to commencement of soil disturbing works on the site. Erosion and sediment controls will be designed to limit the potential for soil to be mobilised during construction work and to collect and settle any material that is suspended in runoff water.

Erosion and sediment controls that are designed, installed, operated and maintained to contemporary standards will ensure that construction work can proceed with minimal risk to water quality in natural drainage systems.

6.3.3 *Operational Water Quality*

The water management system for the mushroom farm is described in detail in section 5.4. Particular features include:

- all stormwater runoff from buildings and sealed surfaces will be collected and transferred to a storage dam on the site for use in cooling towers and external surface wash down. Aside from normal storage the dam has been designed to hold runoff from a 100 year ARI storm of six hours duration;
- wash down water used within growing rooms and on external surfaces will be collected and directed to the wash down water recycling system. This system comprises a series of ponds and wetlands on the site with a retention period of 10 days. Treated water will be pumped to storage tanks and re-used for a variety of purposes. The ponds and wetlands will be designed to retain incident rainfall resulting from a 100 year ARI storm of six hours duration and have elevated perimeters so that surface runoff cannot enter the system;
- a sewage treatment plant will process wastewater from the staff amenities, childcare centre and existing dwelling. Secondary treated effluent will be disposed of by subsurface irrigation within the landscape mounds on the eastern and northern boundaries where there is ample capacity to absorb the likely volume of effluent requiring disposal.

The water management system has been designed on the basis that there will be no discharge of operational water to natural drainage. Areas of the site that are not subject to building works will have 100 per cent ground cover for continued rural use. Rainfall runoff from these areas will continue to flow to natural drainage. The perimeter mounds will be designed to permit rainfall runoff to flow to natural drainage without pooling.
Barker Ryan Stewart considered runoff water quality in the Stormwater Management Plan (see *Appendix F*). Modelling was undertaken to assess the effect of collecting stormwater in the dam for re-use plus frequent wash down of the building apron with wash down water diverted to the wetlands. The results showed that the annual

average pollutant load and the mean concentration would both be reduced in conformity with DECCW draft guidelines *Managing Urban Stormwater: Environmental Targets* (2007).

In view of the design features of the water management system, operation of the proposed mushroom farm, is predicted to have no significant effect on water quality in natural drainage systems within the site and beyond.

6.4 NOISE

An assessment of construction and operational noise associated with the proposed Londonderry mushroom farm has been prepared by Atkins Acoustics and is included in *Appendix J*. Existing ambient noise levels were recorded at three locations on the site. Ambient noise was observed to be controlled by traffic on The Northern Road during the daytime, particularly in the eastern part of the site. Domestic activities and natural occurrences influence noise levels in the western part. The background noise level (L_{A90}) across the site ranged from 44 dB(A) during the day to 33 dB(A) at night.

6.4.1 Noise Goals

Project specific noise goals were developed with reference to published guidelines:

- *Interim Construction Noise Guideline* (DECCW 2009)
- *Industrial Noise Policy* (DECCW 2000)
- *Noise Guide for Local Government* (DECCW 2007)
- *Environmental Criteria for Road Traffic Noise* (DECCW 1999)

Noise goals for construction and operation consistent with DECCW recommendations were determined for the four nearest residential receptors to the north, south and west of the facility. The construction noise assessment goal ($L_{Aeq,15min}$) ranges from 45 to 54 dB(A) for the four residences. Operational noise goals (L_{Aeq}) have been set for each residence for day, evening, night and the 5 am to 7 am period, ranging from 38 dB(A) at night up to 48 dB(A) during the day.

Additional night time noise goals have been set for intermittent activities within the site, such as truck departures. Noise generation can also occur from development-related traffic using The Northern Road. The DECCW traffic noise goals attempt to limit traffic noise on arterial roads where feasible and reasonable to ($L_{Aeq,15hr}$) 60 dB(A) during the day and ($L_{Aeq,95hr}$) 55 dB(A) at night measured at residential facades. Where existing traffic noise exceeds the recommended level, noise from the development should not increase the existing traffic noise by more than 2 dB(A).

For the purpose of noise assessment, meteorological data derived (by PAE Holmes), from the weather station at the Mulgrave substrate plant, was considered to be representative of conditions at Londonderry. The prevalence of temperature inversions and winds was determined based on the Mulgrave data.

6.4.2 Construction Noise and Vibration

The proposed hours of construction are the standard hours recommended by DECCW in the *Interim Construction Noise Guideline* and detailed in section 5.2 of this report. The nature of construction plant and equipment and the likely construction program are also described in section 5.2.

The noise assessment modelled six work scenarios, representing activities during the development stages of the mushroom farm. The modelling considered continuous operation of items of construction plant and on this basis determined that, in the absence of additional noise controls, construction noise goals may be exceeded at various stages of the development. It is noted that the construction activities on site are essentially typical site preparation and building construction works.

The noise assessment observed that early development of the landscape mound along the northern boundary would reduce construction noise at northern residences by 5 to 8 dB(A). Furthermore if allowance is made for construction plant to be operating for only 50 per cent of the time, a more realistic scenario, predicted construction noise would be reduced by 3 dB(A).

Construction noise will be ameliorated by adopting construction noise controls recommended in the noise assessment:

- Construct the northern acoustic mound as early as practicable in the construction program;
- adopt construction practices recommended by DECCW for best management and best available technology economically achievable;
- select construction plant and equipment having regard to controlling noise emissions, including reversing alarm noise;
- reduce operating speeds of equipment where practical and switch off idle plant when not in active use;
- arrange vehicular access to work areas to allow for forward vehicle travel, minimising reversing or manoeuvring wherever possible;
- provide site induction and personnel/contractor training in correct use of plant and equipment to minimise noise;
- develop and implement a program to inspect and maintain mobile plant to ensure noise performance criteria are met;

- comply with the standard construction hours of working;
- establish a noise complaints procedure with contact phone number and logging and response protocols; and
- review the use of mobile plant reversing alarms including altering work practices and/or replacing with less intrusive devices where practicable.

Ground vibration during construction was not considered an issue, noting that the distance to residential buildings is greater than 100 metres.

6.4.3 Operational Noise

A mushroom farm operates 24 hours per day. At Londonderry, the majority of noise-generating activities will occur during daylight hours. Cooling and heating plant will operate continuously, although with reduced load at night. During the night period some product will be loaded and dispatched and substrate will begin to be received in the pre-dawn period.

Noise levels were modelled for the worst case when the mushroom farm is fully developed with 50 growing rooms. Typical operating scenarios were considered during the day, evening and night periods and the 5 to 7 am period when substrate would commence to be delivered and loaded into a growing room. For each scenario it was assumed that all items of fixed mechanical plant were operating at full output, in addition to any mobile plant or trucks that may be operating. This situation would not occur all of the time and is considered to represent the likely worst case. Loading operations were considered at various locations on the northern and southern sides of the main building. In addition, modelling was carried out for calm conditions and with various wind conditions as determined from the meteorological data. The worst case intermittent night time noise was considered to be truck airbrake release. This was modelled for a truck at six locations along the northern and southern building façade and in the loading dock.

The modelling results show that during both calm and adverse meteorological conditions the predicted operational noise will generally satisfy noise assessment goals at all referenced residential receptors during all time periods (day, evening, night and 5 to 7 am fringe morning), except as follows:

- under some operating and meteorological conditions, while goals are satisfied compliance is predicted to be marginal and typically influenced by the operation of filling growing rooms with substrate. Measures to reduce filling noise are included in the recommendations.
- in the night time period, predicted noise levels satisfy the assessment goals apart from a minor 1 dB(A) exceedence (L_{A1}) at the residence to the south. This is an intermittent noise associated with trucks entering the site. The noise level associated with this exceedence is less than the measured L_{A1} noise currently

experienced at this residence during the night from isolated vehicles on The Northern Road. The external L_{A1} noise level of 49 dB(A) is considered unlikely to result in significant impact within the building.

Controls for operational noise to be adopted at the plant include:

- undertake detailed design of buildings and structures to meet specified noise attenuation criteria as indicated in *Appendix J*;
- select mechanical plant and equipment to meet specified sound power levels and/or acoustic performance;
- construct a noise mound along the northern and eastern boundaries as proposed with finished level at least 2.5 metres above the floor level of the main building;
- modify moving floor substrate trucks to incorporate acoustic enclosures for trailer motors and residential grade mufflers to achieve a minimum 3 dB(A) noise reduction and result in a sound power level consistent with that referenced in *Appendix J*;
- maintain truck airbrake release discharge noise levels below the level specified in *Appendix J*;
- require trucks to operate on the access roads at speeds not exceeding 20 kph;
- fit "quacker" reversing alarms to mobile plant where practicable; and
- incorporate noise management protocols within the environmental management plan for the site.

6.4.4 Road Traffic Noise

Existing traffic on The Northern Road creates road noise which already exceeds the DECCW baseline goals at a distance of 10 metres from the road. Both the day and night goals are exceeded by approximately 10 dB(A).

Considering the projected traffic volume on the Northern Road when vehicles from the proposed mushroom farm are added, the additional noise levels at the reference distance of 10 metres from the road are predicted to increase by 0.8 dB(A) during the day and 1.9 dB(A) at night. These increases are less than 2 dB(A), satisfying the DECCW noise assessment goal.

In conclusion, the noise assessment has predicted that noise impacts from the proposed mushroom farm can generally be controlled to levels recommended by DECCW and are unlikely to significantly impact on nearby residences.

6.5 TRAFFIC

A traffic assessment for the two project sites was carried out by traffic consultants Halcrow MWT and is included in *Appendix M.* The Londonderry site is accessed from The Northern Road, a two-lane State road controlled by the RTA with a posted speed limit of 80 kilometres per hour. *Figure 6.1* shows the access point on The Northern Road.

6.5.1 Existing Traffic Conditions

For the purpose of the study, historical traffic data were obtained from the RTA and classified traffic counts were conducted in May 2009 on The Northern Road, near the site of the proposed mushroom farm. Traffic data from the RTA show that annual average daily traffic has been growing at about 11 per cent per annum since 1971 but declined between 2002 and 2005. The latest RTA data (2005) show an average of 10,650 vehicles per day on The Northern Road. The annual average daily two-way traffic flow measured on behalf of Halcow MWT in 2009 was found to be about 9,600 vehicles with 12 per cent heavy vehicles, suggesting that annual average vehicle numbers may have further declined.

The classified survey on The Northern Road undertaken in May 2009 showed that the peak hour two-way traffic flow was approximately 800 vehicles with a peak hour heavy vehicle component of 13 per cent.

6.5.2 Proposed Development

Vehicle movements at the proposed Londonderry mushroom farm have been estimated based on actual movements recorded at the existing Elf Mushrooms' farm at Vineyard. The majority of staff work a normal eight-hour shift. Most deliveries to the site would occur during daylight hours, although some substrate would be delivered in the early morning hours. Mushroom product would be dispatched during both day and night. At full production during Stage 5 there will be up to approximately 64 small vehicle visits (128 movements) and 17 truck visits (34 movements) per day.

The majority of bulk haulage movements will use semi trailer vehicles or rigid trucks. B-doubles will be used from time to time where circumstances permit.

Access to the Londonderry site will be via a sealed road with a formalised intersection with The Northern Road. Requirements for the intersection are discussed below. The internal dock layout will be designed to comply with the relevant Australian standard.

121R2 30-10-10 Source: 2009 Google

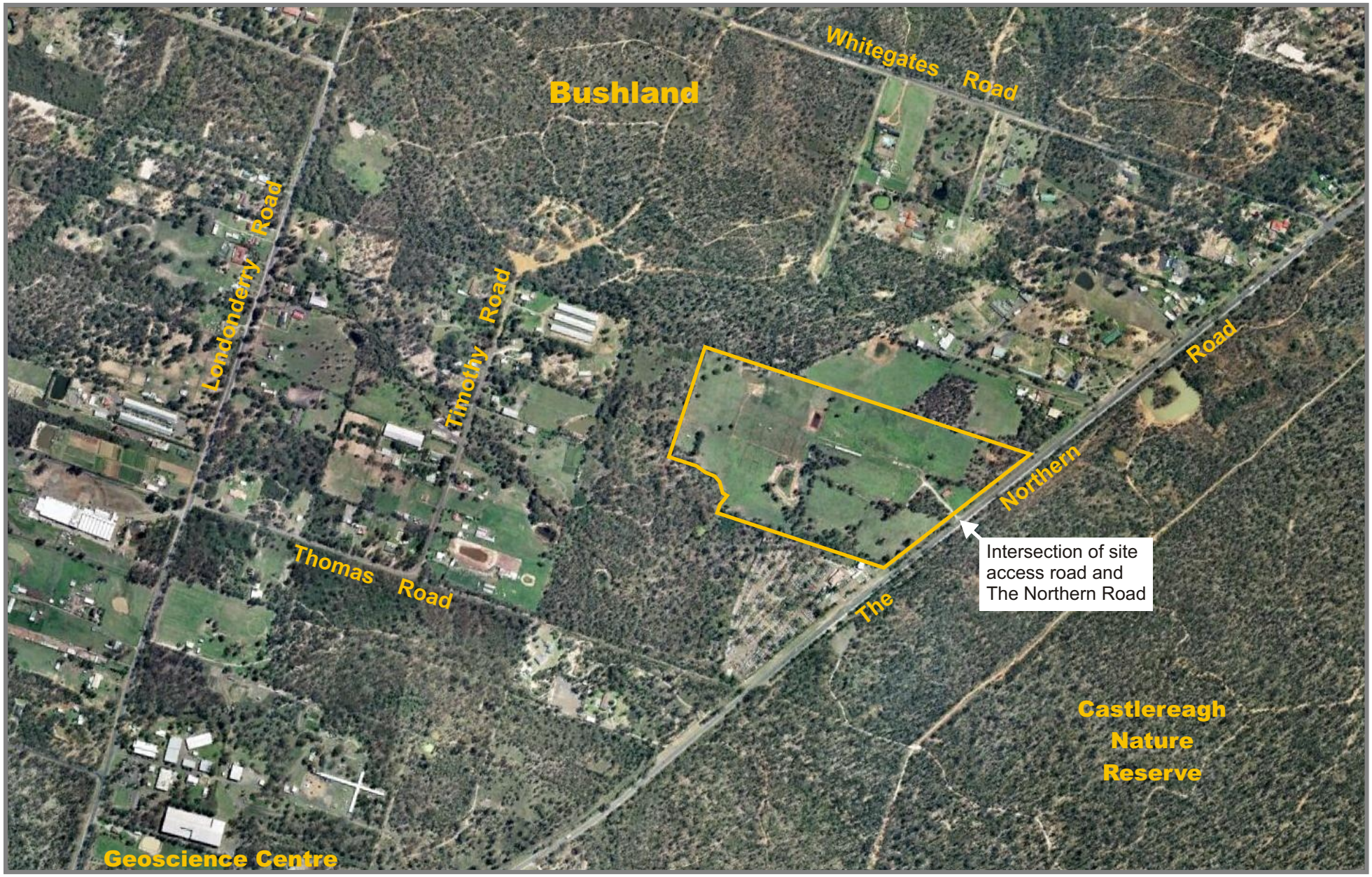


FIGURE 6.1 Londonderry Area Road Network

6.5.3 Operational Traffic Assessment

Based on recorded traffic generation at the existing mushroom farm at Vineyard, it is predicted that during the busiest part of the day the Londonderry operation will generate approximately 38 vehicle movements per hour in Stage 1, increasing to approximately 54 vehicles per hour when the development is complete. It is assumed that vehicles accessing the site will be distributed 50 per cent to the north and 50 per cent to the south.

Halcrow MWT expects that this increase in hourly traffic contributed by the mushroom farm will not alter the existing level of service during peak periods on The Northern Road, although that level of service will decline over the life of the development due to the growth in background traffic.

The intersection of the site access road and The Northern Road will be designed in accordance with the RTA's *Road Design Guide*. Based on site-generated traffic flows, a Type AU intersection will be required including provision of a right turn bay and a left turn deceleration lane from The Northern Road. This configuration will be installed prior to commencement of operations. An extract from the *Road Design Guide* is included in *Appendix M*, illustrating the Type AU intersection design.

The performance of the intersection of the site access road with The Northern Road has been analysed for the subsequent stages of the development taking into account assumed concurrent traffic growth on The Northern Road. The analysis has shown that the intersection will continue to operate with satisfactory level of service during all stages of the development.

With the proposed intersection modifications, to be undertaken at the outset and upgraded when required, the development is assessed be satisfactory from a traffic perspective.

6.5.4 Parking

The Penrith Development Control Plan (DCP) does not specify parking requirements for a mushroom farm or similar intensive agriculture. Parking requirements are therefore based on anticipated demand. The DCP parking requirement for a factory is one parking space per two employees. This parking rate is considered appropriate for the nature of the development and requires that approximately 55 parking spaces be provided on the site.

There is ample room to provide the requisite number of parking spaces allocated for employees, office staff, visitors and the child care centre. The parking spaces will be

designed to comply with the DCP and the relevant Australian Standard (AS2890.1-2004).

6.5.5 Construction Traffic

Estimates of construction traffic for the Londonderry mushroom farm are based on experience at the Mulgrave substrate plant where similar construction projects have been carried out on a number of occasions over the last 10 years. Elf Farm Supplies estimates that when building works have been underway at Mulgrave, an average of 20 vehicles would visit the site per day, including construction personnel and materials deliveries.

In addition to building work, the Londonderry project requires import of approximately 100,000 cubic metres of fill. The number of trucks entering the site to deliver clean fill each day depends upon the location of the source material and the number of trucks allocated to the circuit. Discussion with a filling contractor indicates that truck numbers for a project of this size can vary from very few per day up to about one every 15 minutes. If all of the fill material were to be imported in a 12 month period, considered a worst case, then approximately 35 loads would be delivered each working day or about 3.5 loads per hour. It is unlikely the first fill truck in any day would arrive much before 8 am because of the logistics of gaining access to the source and then travelling to Londonderry

The conclusions of the traffic assessment are considered to be unaffected by construction traffic for the following reasons:

- construction work carried out prior to the farm commencing operations will generate less traffic than will occur when the farm opens;
- building work for subsequent stages carried out in parallel with operations will create only a minor addition to total vehicle numbers visiting the site and will be spread over the day;
- it is anticipated filling will be complete prior to Stage 1 commencing operation and if this is not the case the reason will be that fill material is arriving at a slow rate in which case vehicle numbers will be lighter.

A traffic management plan for construction, including signs warning traffic on The Northern Road of the heavy vehicle entry, will be prepared in consultation with the RTA prior to commencement of construction work.

6.6 AIR QUALITY

6.6.1 Dust

Nuisance dust generation will be controlled during construction of the Londonderry mushroom farm. Dust control measures will be implemented throughout the stages of construction work with particular attention during Stage 1 when bulk earthworks are being carried out. The initial work of constructing the perimeter mounds will require the entire development area to be stripped of soil and managed to minimise dust.

When construction work is in progress, dust generation will be controlled by:

- restricting vehicles to a defined route within the site;
- limiting vehicle speeds on unsealed surfaces;
- maintaining haul routes for fill trucks in a damp state;
- applying temporary stabilisation to any exposed surface that is unlikely to be further disturbed for a period of one month or longer; and
- rehabilitating finished surfaces as soon as possible to limit wind-generated dust.

During subsequent operation of the mushroom farm there will be little opportunity for dust generation because:

- vehicles and mobile implements will operate on sealed surfaces;
- the building apron external to growing rooms will be washed down after substrate loading and emptying;
- mushroom substrate is moisture laden; and
- internal roadways will be cleaned as frequently as required to avoid build-up of particulate matter that could generate dust.

6.6.2 Odour

PAE Holmes has undertaken an air quality assessment for the proposed Londonderry mushroom farm, included as *Appendix K*. The assessment is focussed principally upon odour and in particular, the potential for odour to be emitted from spent substrate. Some of the spent substrate from mushroom growing will be stockpiled under cover at the site while it is conditioned and transformed into a higher grade mix for adding to turf and agricultural land.

Mushroom-growing operations have not been assessed because the indoor activities at Tolson Group mushroom farms have not in the past been associated with odour generation issues.

Having regard to the layout of the Londonderry farm and management practices proposed to be employed, PAE Holmes has undertaken modelling to predict the ground level concentration of odour expected to occur in the locality, particularly at residences in the area.

Odour Emissions

As a basis for modelling, Stephenson Environmental Management has measured odour emissions from spent substrate at Elf Mushrooms' existing farm at Vineyard. Stephenson sampled and tested odour, using the technique of olfactometry[1], from spent substrate freshly removed from growing rooms as well as material that had been standing for one day and six weeks.

Using Stephenson's results, PAE Holmes has estimated emission rates for the proposed spent compost store at Londonderry. A conservative basis was used by assuming all of the stockpile area emits odour at the maximum rate measured by Stephenson: 0.655 odour units metres per second (ou.m/s).

Other potential sources of odour considered in the assessment are the wash down water recycle ponds and the sewage treatment plant. Odour emissions rates were adopted from previous measurement of sources considered to be similar in nature. These emission rates are minor or negligible in comparison to emissions from the spent compost.

Assessment Criteria

Odour levels generated by any variable process will fluctuate with time according to variations in emission rates and climatic conditions. Further variability arises because the sensitivity of people to odour varies widely from one person to another. The DECCW has produced recommended odour performance criteria for odour assessment purposes nominating odour levels that should not be exceeded for more than one percent of the time. That means that in any 12 month period the applicable criterion should not be exceeded for more than 87.6 hours. The criteria depend on local population density for the reason that where the density is highest, it is more likely individuals will be present who have a particular sensitivity to odour. The DECCW criteria are reproduced in *Table 6.1* below.

[1] Olfactometry is explained in *Appendix K*.

Table 6.1 DECCW RECOMMENDED ODOUR PERFORMANCE CRITERIA

Population of Affected Community	Ground Level Concentration of Odour (ou*)
≤~2	7
~10	6
~30	5
~125	4
~500	3
Urban (2000) and/or schools and hospitals	2

* ou = odour units (see *Appendix K*)

For the scattered rural population in the vicinity of the Londonderry site, *Table 7.1* indicates a criterion of four to five odour units is applicable.

Meteorological Data

Continuous meteorological data are available from the weather station at the Mulgrave substrate plant which has been in operation since 1996. Additional data was obtained from Sydney airport and Richmond RAAF. PAE Holmes utilised three computer models (TAPM, CALMET and CALPUFF) to firstly prepare the meteorological data into a fine resolution three dimensional array for each hour of the run period and then calculate the dispersion of odour plumes within that array.

Meteorological data for the site show the predominant annual wind directions are north-northeast and northeast. During summer, southerly and south-south-westerly winds also figure significantly.

Modelling Results

The results of odour dispersion modelling predict that when the farm is storing the maximum amount of spent substrate, the 99th percentile one-hour odour concentration would remain at or below 0.9 odour units for all nearby sensitive receptors. Furthermore, the most stringent DECCW criterion for urban areas of two odour units would not be exceeded at any location beyond the site boundary.

In view of the conservative assumptions adopted in the study and the results of modelling, it is concluded that the proposed Londonderry mushroom farm is unlikely to result in ground level odour concentrations in excess of the applicable assessment criterion.

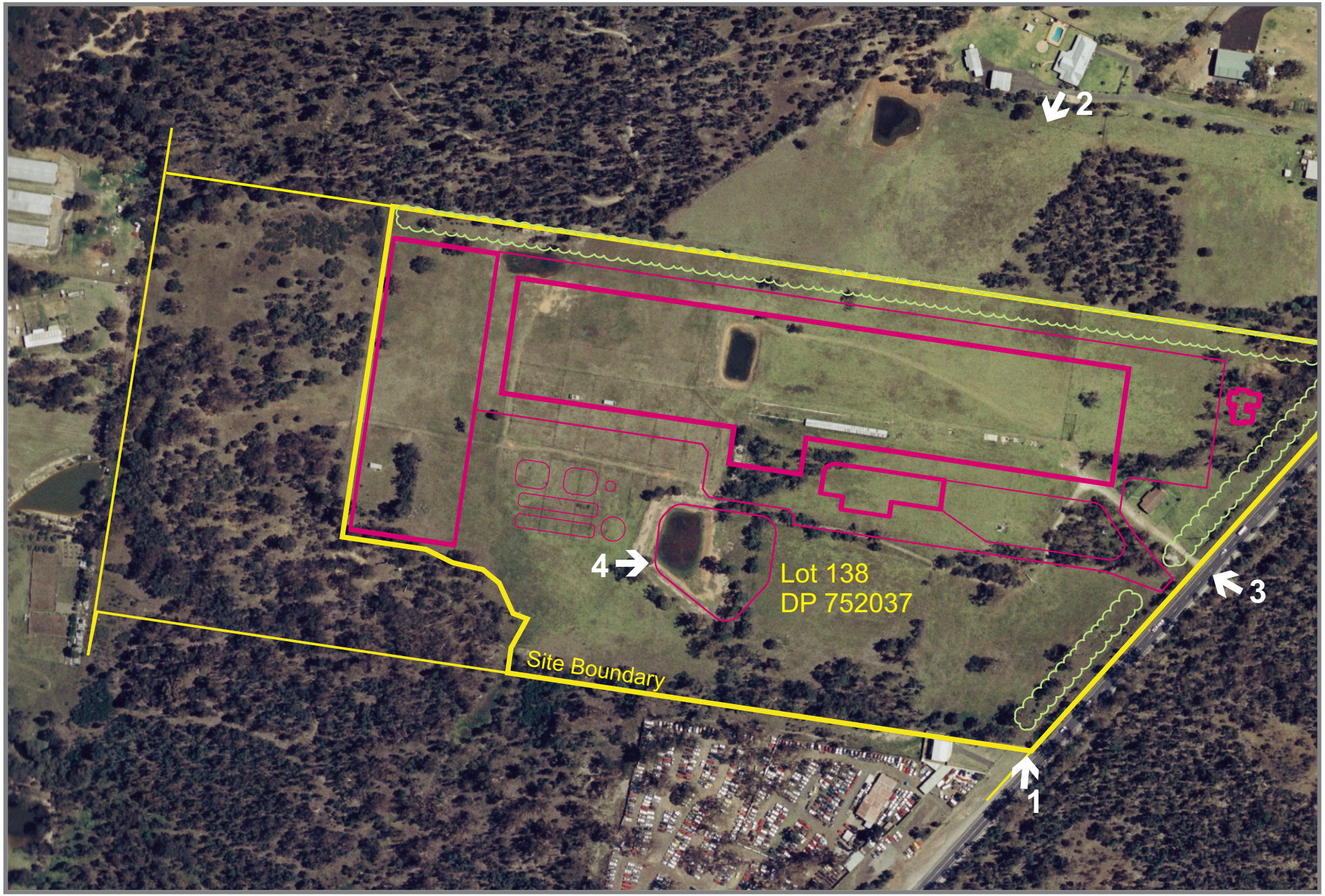


FIGURE 6.2 Location of Photographs, Londonderry

Discussion

The analysis has indicated that conditioning spent substrate at the mushroom farm will not be a source of significant odour, primarily because the spent substrate itself is not particularly odorous. Elf Mushrooms will nonetheless commence the operation at a small scale and under careful control while the process is developed and optimised. Spent substrate will be observed daily to assess if any identifiable odour is present, particularly when the material is being turned. Having the spent substrate covered as proposed to protect it from rainfall is fundamental to preventing odour generation.

The purpose of conditioning spent substrate is to open additional market opportunities for a finer grained and drier product. In the unlikely event that any batch of material was of concern, it could be immediately removed from the site and used for soil conditioning in the same manner as currently occurs with spent substrate from other existing mushroom farms. In that regard, the spent substrate facility will be fail-safe.

The environmental management plan for the mushroom farm will include a procedure for recording and responding to any complaints that may be received pertaining to operation of the facility. Procedures will be similar to those described for the substrate plant in section 8.2.

6.7 VISUAL CHARACTERISTICS

6.7.1 Existing Landscape

The proposed site of the mushroom farm is visible from The Northern Road and to a varying extent from surrounding properties. Views into the property from The Northern Road are partially obscured by vegetation along the frontage, particularly towards the northern end. Less obstructed views are obtainable in the central and southern part of the frontage, although a band of trees near the existing residence restricts views in that area.

The location of photographs 1 to 4, referenced in this section, is shown on *Figure 6.2*.

The property to the immediate north of the site contains areas of grazing land and bushland. The residence is located at the front of that property in the north-eastern corner in a wooded area. Vegetation restricts views towards the mushroom farm site from the vicinity of this residence. Towards the rear of the neighbouring property the land surface is grassed up to the boundary with the subject site. *Photograph 1* shows the existing view from the rear of this property.





PHOTOGRAPH 1 and PHOTOMONTAGE (Londonderry) Looking northwest from The Northern Road

Residences on properties further to the north are located at various setbacks from The Northern Road but views into the subject site are restricted by distance and intervening vegetation.

The nearest residence to the south adjoins the southern boundary near The Northern Road frontage. Views into the site would be possible from this residence, although restricted by existing trees. *Photograph 2* shows the existing view into the property from The Northern Road at this southern corner. Adjoining land further to the south is occupied by a car wrecking yard surrounded by a high fence, obscuring views into the site from this property.

Adjoining properties to the west are at lower altitude with a frontage to Timothy Road. residences are located close to the road frontage. It is unlikely that views of the development area would be obtainable from western properties owing to the altitude difference and the wide band of vegetation along the western boundary of the subject property. *Photograph 3* shows a view of the entrance from The Northern Road and *Photograph 4* shows an internal view of the property.

Where the development site can be viewed it appears as relatively level rural land partly cleared with scatters of remnant vegetation at the front and a continuous band of vegetation at the rear. The visible landscape of the surrounding area is dominated by bushland on both sides of The Northern Road, broken to the north of the site by several partially cleared rural-residential properties. The Castlereagh Nature Reserve and a former waste depot on the eastern side of The Northern Road make a significant contribution to this landscape which is unlikely to change in the future.

6.7.2 Appearance of the Proposed Development

Aspects of the proposed mushroom farm which are relevant for visual impact assessment include:

- the landscaped mound to be constructed along The Northern Road frontage and along the northern boundary of the site;
- the main building containing mushroom growing rooms and ancillary services;
- the workshop and peat store buildings;
- the spent substrate store;
- the child care centre; and
- the access road intersection with The Northern Road.

The location of these features is shown on *Figure 5.1*. Other components of the plant such as car parking, water management infrastructure and internal roadways would essentially occur at ground level with little likelihood of significance for visual impact.





PHOTOGRAPH 2 and PHOTOMONTAGE (Londonderry) Looking south from the adjoining property

6.7.3 Visibility of the Mushroom Farm

Key viewing locations for consideration of visual impact include The Northern Road, dwellings on rural properties to the north and the residence adjacent to the southern boundary.

Views of the development from the Northern Road will be partially obscured by the 2.5-metre high landscaped mound along the site frontage and northern boundary. The earthen mound will be more than a metre higher than the eye level of drivers in light vehicles. The additional barrier created by landscaping together with retained natural vegetation near the frontage would permit only limited views of the upper section of structures within the site. It would be possible to observe more of the development by viewing along the site access road, which passes through a break in the mound or from a short section of the southern approach, looking diagonally into the property (see *Photograph 2* and photomontage). These viewing opportunities would be extremely brief for a moving vehicle.

When viewed from cleared rural land to the north, the upper section of the main building would be visible above the landscaped mound (see *Photograph 1* and associated photomontage). The building is parallel to the mound and set back approximately 25 metres behind the crest. The rear section of the main building and spent substrate store are adjacent to bushland, where visibility from the north would be limited. Intervening vegetation would provide some screening of the main building from existing residences on the northern properties. Over time appropriate landscaping on the mound would mature to further limit the visibility of the main building.

The mushroom farm development would be visible from the residence adjacent to the southern boundary. Again, existing vegetation to be retained on the development site would partially obstruct views from this location.

6.7.4 Viewer Sensitivity

The sensitivity of viewers to a change in the appearance of the landscape depends upon a number of factors including the context of the view, the circumstances of the viewer and the purpose of the alteration to the landscape. Residents would normally be considered more sensitive to changes than workers or travellers.

Motorists on The Northern Road would not be considered sensitive viewers. The road is part of a busy north-south route passing many localities where development has occurred on rural land. The context for road travellers would be influenced by the bushland in the area, rural residential development to the north and the wrecking yard just south of the property.

The context of the view from adjoining properties is a partly cleared partly timbered rural landscape. While large sheds are not uncommon in the rural lands of western Sydney, being associated with poultry farming, mushroom farming and other rural activities, there are no large sheds in the immediate view catchment of the subject site. Consequently the development would introduce a new landscape element to the immediate locality.

Likely viewers of the development on rural properties to the north would be considered sensitive to changes to the rural outlook. A higher degree of sensitivity would be expected should the development make a significant alteration to the view from an existing residence, rather than from locations elsewhere on the property.

Viewers in the residence adjoining the southern boundary would also be considered sensitive to alterations to the landscape. In this case sensitivity would be considered in relation to the context of being immediately adjacent to the car wrecking yard.

6.7.5 Visual Effect

The visual effect of the proposed mushroom farm is the manner in which it alters the view, taking into account the mitigation measures to be undertaken in conjunction with the development. A development would be considered to have a high visual effect where it creates a significant change. For example, when a view of green open space becomes substantially altered with development the visual effect would be high. If the view already includes disturbed areas or the change is minor, screened or far away, then the visual effect is lower.

For motorists on The Northern Road, the visual effect would be low to moderate. While much of the development would be screened from the roadway, the landscape mounds themselves would have a visual effect by further restricting views to the west.

The visual effect from the nearest properties to the north of the site is considered high. Where the mushroom farm can be viewed from locations on properties to the north, it will appear as a long metallic rural shed, extending above a landscaped mound. The combination of the mound and the main building would curtail opportunities to look into the rural land of the subject property, where this is currently possible through the existing tree cover.

Similarly, the visual effect from the residence to the south would be considered high. While there would be limited change to foreground views over the subject property, the mid-ground would be dominated by the various structures on the site. Any present opportunities afforded by the scattered tree cover to obtain rural views into properties further north would be curtailed by the proposed development.



PHOTOGRAPH 3 (Londonderry) Existing property entrance from The Northern Road



PHOTOGRAPH 4 (Londonderry) Existing farm dam to be enlarged

6.7.6 Visual Impact

The visual impact of a development is assessed in consideration of visibility, viewer sensitivity and visual effect. The factors are summarised in *Table 6.2*.

Table 6.2 VISUAL IMPACT ASSESSMENT

Viewing Location	Visibility of the Mushroom Farm	Viewer Sensitivity	Visual Effect of the Mushroom Farm	Assessed Visual Impact
Car travellers on The Northern Road	Upper section of structures may be visible above the landscape mound	Low, as travellers on the busy route expect rural structures	Low to moderate, as the mound will prevent rural views to the west	Low
Nearest rural properties to the north	Upper section of structures will be visible above the landscape mound where vegetation permits views	Moderate to High, depending on whether the view is from the property or residence	High, as the development will curtail existing views to the south, where these exist	High
Existing residence to the south	Views of the development obstructed by vegetation	Moderate, considering the adjoining wrecking yard	High, as the detail of the development would be visible with no mound	Moderate to High

The visual impact assessment has identified that the proposed development will have a low visual impact when viewed from The Northern Road, but a high visual impact when viewed from certain locations on properties to the north and from the residence to the south. When a high visual impact is anticipated it is appropriate to consider further ameliorative measures to lessen the impact. Proposed mitigating measures are outlined in section 6.7.7.

6.7.7 Summary of Mitigating Measures

To further reduce visual impact of the development from all viewing locations the following measures have been incorporated into the project:

- select external building finishes and colours to reduce glare and minimise visual obtrusiveness.
- construct and landscape the mound along The Northern Road frontage and the northern site boundary as soon as possible after site activities commence;
- plant a mixture of semi-advanced trees, shrubs and groundcover on the mound to achieve early coverage and height enhancement;
- maintain and nurture the landscaping on the mound with appropriate mulching, frequent watering at first and frequent inspections to correct any wind or animal damage and to replace failed plantings;
- plant additional trees in the south eastern corner of the site to further restrict diagonal views from northbound vehicles on The Northern Road;
- plant additional trees in the southern section of the site to further restrict views from the adjoining residence to the south towards the development area;
- during each stage of the development, when the frame of the main building or building extension has been erected, undertake a visual assessment from The Northern Road and with the agreement of owners, from adjoining properties. Where it is practicable to reduce visual impact:
  - plant additional screening vegetation in strategic locations on the property, such as in the southern area, to further reduce visibility from The Northern Road and the residence to the south;
  - offer to residents on properties to the north to plant screening vegetation on their properties at locations agreed with them and if the offer is accepted, undertake the plantings for the residents to maintain;
- during construction, minimise the area of physical disturbance to the land at any one time and revegetate any disturbed areas visible from beyond the site that are not required as hardstand.

6.8 FLORA AND FAUNA

Kevin Mills and Associates undertook a flora and fauna assessment of the project sites which is included in *Appendix N*.

6.8.1 Flora

The flora survey classified the vegetation on the Londonderry site, recorded as many as possible of the plant species present and searched for threatened plant species having regard to the potential for threatened species to be present.

The Londonderry site is predominantly cleared land covered with pasture grasses with occasional patches of remnant woodland. The remnant woodland is in poor condition, being primarily young regenerating regrowth with grazed understorey.

The woodland vegetation is part of the Castlereagh Woodlands described by Benson and Howell (1990) that occurs on the flat alluvial soils of clay, silt, sand and gravel in the Castlereagh and Londonderry areas. A larger stand of this woodland appears at the rear of the property outside of the development area and on adjoining properties. Remnant Castlereagh Woodland also occurs across the road from the site in the Castlereagh Nature Reserve, where it is managed for conservation.

Most dams on the property are poorly vegetated with few wetland plant species. The dam in the north eastern corner is an exception, containing wetland plants with some trees and shrubs around the edge.

The survey did not record any threatened plant species on the site. Six plant species that were present, while common and widespread throughout New South Wales, are considered to be regionally significant.

6.8.2 Fauna

The site offers little fauna habitat. There are occasional large trees with potential breeding hollows, but little shrub layer or debris on the ground to provide protection. Apart from introduced grazing animals and rabbits, the survey identified 26 bird species, one reptile and one species of fish in the dams.

Owing to the patchy shrub layer, few small birds were observed during the survey.

6.8.3 Threatened Species

Kevin Mills & Associates compiled a list of threatened species previously recorded in the Londonderry area and assessed the potential for each threatened species to be present on the site, having regard to its habitat characteristics. While no threatened species were considered likely to inhabit the site, it was considered possible that the Cumberland Land Snail may occur in low numbers and that the Grey Headed Flying Fox and Swift Parrot may visit the site from time to time.

No threatened plant or animal species were recorded on the Londonderry site during the survey, despite a thorough search for Cumberland Land Snails.

A small stand of woodland on poorly drained soils in the north east corner of the site at The Northern Road frontage contains some species indicative of an endangered ecological community, the Castlereagh Swamp Woodland. Other characteristic species

of this community are uncommon or absent, likely as a result of the long history of grazing disturbance.

While some migratory birds were recorded on the site, there is no important habitat on the property for these species and no significant population present.

6.8.4 Assessment of Impact

The proposed mushroom farm development will principally take place on cleared land with removal of occasional remnant trees. The larger area of woodland remnant to the rear of the property is not included in the project site. At the front of the property the proposed child care centre and earth mound will make a minor incursion into the small remnant of Castlereagh Swamp Woodland community.

As part of the assessment Kevin Mills & Associates applied the factors for assessment prescribed in the *Threatened Species Conservation Act, 1995* and the *Fisheries Management Act, 1994* to determine whether there proposed mushroom farm is likely to have a significant effect on threatened species, populations or ecological communities or their habitats. It was concluded that no significant impact is likely and hence a species impact statement is not required.

A further assessment was carried out concluding that the proposal is not likely to have a significant impact on matters of national environmental significance, as specified in the (Commonwealth) *Environment Protection and Biodiversity Act, 1999*. Hence referral to the Commonwealth Minister for the Environment is not necessary.

State Environmental Planning Policy No 44 – *Koala Habitat Protection* does not apply in Penrith local government area.

6.8.5 Mitigating Measures

Kevin Mills & Associates has recommended the following mitigating measures which have been incorporated into the project:

- avoid removing remnant trees wherever possible;
- install temporary fencing to protect woodland remnants when undertaking construction work in the immediate vicinity that does not require disturbance of the woodland;
- collect stormwater from the development in dams rather than directing it into woodland areas;
- plant local native species from the Castlereagh Woodlands along The Northern Road frontage and elsewhere for landscaping to enhance the remnant of this community. A suitable species list has been provided.

The operator will manage the rural property during construction and subsequent operation of the mushroom farm to maintain pasture and suppress weeds.

6.9 WASTE MANAGEMENT

As explained in section 5.5, waste materials generated at the mushroom farm will be largely limited to miscellaneous items such as packaging, office waste, workshop waste, food waste from the staff lunchroom, child care centre waste and contractors' waste. Items that are recyclable will be separately stored and collected for recycling. Other waste will be removed for disposal at a licensed waste depot.

Any spilt solids, collected after filling or emptying growing rooms, will be added to material in the spent substrate store. Occasionally the wash down water recycling ponds and sewage treatment plant will need desludging. Sludge obtained from the ponds and STP will be removed by a contactor for disposal. Spent substrate is not considered a waste material as it will be removed from the site for beneficial use.

Waste management at the mushroom farm will not be a source of any significant environmental impact.

6.10 ENVIRONMENTAL HAZARDS

Mushroom growing is not an industry and in particular, it is not a hazardous or potentially hazardous industry as defined in *State Environmental Planning Policy No 33 - Hazardous and Offensive Development* (the SEPP). The Londonderry farm will not pose a significant risk to human health, life or property or to the biophysical environment. Chemicals stored and used on the site include cleaning agents, insecticides, fungicides and the like. Section 5.5 describes storage and management of chemicals.

Similarly the mushroom farm will not be an offensive or potentially offensive industry as defined in the SEPP. The farm will not emit a polluting discharge in a matter which would have a significant adverse impact in the locality or on the existing or likely future development on other land. The conclusion of the noise and odour assessments is that there will be no significant adverse impact.

Appendix L is a bushfire compliance report for the proposed mushroom farm prepared by Bushfire Safety Solutions. The report considers the nature and design of the development and the bushfire hazard potential of its surroundings. The conclusion is reached that the development is capable of complying with the general performance provisions relevant standards.

The recommendations of the report are summarised as follows:

- establish and maintain a defendable space of 10 metres to the west, north and south of each building. The defendable space is to be a clear area with unimpeded access for fire fighting;
- on sides of the spent substrate store where there is no concrete apron, include a three-metre hardstand area as part of the defendable space;
- provide a static water supply (water tank, not dependent upon electricity for pumping) to supplement the reticulated supply;
- use non-combustible external cladding to the main building;
- provide ember protection to the spent substrate store in the form of drencher sprays to keep the contents damp during a bushfire event;
- design the structures to have concrete floors, steel roof cladding, non-combustible flashing at roof intersections with no gaps and non-combustible gutters and downpipes;
- fit steel mesh screens to all windows and personnel doors on the northern and western elevations;
- maintain an asset protection zone for 24 metres to the north, east and western aspects of the buildings with shrub layer managed so as not to exceed five tonnes per hectare. Existing trees do not require removal, but branches should not come within five metres;
- provide a reticulated water supply compliant with relevant standards capable of providing emergency supply for fire fighting;
- provide a rubber fire hose of minimum diameter 18 millimetres capable of reaching all elevations of all buildings;
- maintain vehicle access to the site in compliance with the standard and fire brigade access to the northern and western asset protection zones;
- develop and adopt an emergency bushfire plan.

The recommendations of the bushfire compliance report will be included in the detailed design and environmental management plan for the mushroom farm.

6.11 HERITAGE

6.11.1 Indigenous Heritage

Biosis Research undertook an archaeological and cultural heritage assessment of the mushroom farm site at Londonderry and the land affected by expansion of the

substrate plant at Mulgrave. A copy of the assessment report, dated April 2009, is included in *Appendix O*.

In conducting the study, Biosis undertook the following steps:

- consulted heritage registers and statutory documents to identify any previously recorded Aboriginal cultural heritage sites in the area;
- reviewed relevant literature relating to previous studies of the area;
- surveyed the site on foot in the presence of representatives of the Aboriginal community;
- recommended actions to minimise impacts on Aboriginal cultural heritage.

Registers managed under Commonwealth and state legislation were consulted. Nine Aboriginal sites have previously been recorded in the vicinity of the mushroom farm site, but none have been discovered within the property itself. All of these sites were recorded on the Aboriginal Heritage Information Management System (AHIMS) register, managed by DECC and are listed in *Appendix O*.

Based on review of the literature and consideration of the local environment, Biosis developed a predictive model for the types of Aboriginal sites likely to be present in the area, including:

- stone artefacts occurring as isolated specimens or low-medium density scatters;
- areas of potential archaeological deposit, generally close to water; and
- mature trees exhibiting cultural scarring.

The ground survey was undertaken in the presence of representatives of the Deerubbin Local Aboriginal Land Council. No Aboriginal sites were identified. Biosis considers that previous rural land uses have reduced the likelihood of finding intact archaeological cultural deposits.

Two recommendations arose from the cultural heritage assessment:

- should any Aboriginal object be identified during construction, work should cease and notification given to DECC and other parties as indicated in *Appendix O*;
- should skeletal remains be discovered, the protocol outlined in *Appendix O* should be followed.

The recommendations of the report will be implemented as part of the project.

6.11.2 Non-Indigenous Heritage

In undertaking the cultural heritage assessment described in section 6.11.1 above, Biosis Research examined local, State and Commonwealth heritage registers. Biosis reported in *Appendix O* that no items of non-indigenous heritage were listed for the site of the proposed mushroom farm or in the immediate vicinity.

6.12 GREENHOUSE GAS

PAE Holmes has undertaken a greenhouse gas assessment for the proposed mushroom farm, included in the air quality assessment, *Appendix K*. Australia has ratified the Kyoto protocol establishing a national obligation to meet a target for greenhouse gas emissions over the five year period from 2008 to 2012. Australia's annual target during this period is 108 per cent of the nation's 1990 emissions.

In assessing the greenhouse gas emissions from the proposed mushroom farm, PAE Holmes considered:

- direct emissions from within the property (Scope 1);
- off-site emissions created in producing energy purchased from others for use in the property (Scope 2); and
- all other indirect emissions consequential to the operation but not controlled by the operator (Scope 3).

Fuel consumed on the premises includes diesel, electricity and natural gas. Indirect emissions occur off site from vehicle movements associated with the operation and from losses in the electricity supply system.

Table 6.3 is taken from *Appendix K* and summarises the quantity of greenhouse gas emissions, in tonnes of CO_2 equivalent, estimated to be generated when the mushroom farm is operating at full capacity.

The total quantity of greenhouse gas generated by the proposed mushroom farm when operating at full capacity is estimated to increase the total of Australia's 2008 emissions by 0.001 per cent. An offsetting allowance would need to be made for the closure of Elf Mushrooms' Vineyard farm.

Table 6.3 ESTIMATED EMISSIONS (tonnes of CO_2 equivalent per year)

Source	Scope 1	Scope 2	Scope 3	Total
Diesel (stationary)	80	-	6	**86**
Diesel (transport)	92	-	237	**329**
Electricity	-	4005	810	**4815**
Natural Gas	544	-	353	**897**
Total	**716**	**4005**	**1406**	**6127**

An energy efficiency program will be implemented as part of the environmental management plan for the purpose of minimising the greenhouse gas impact of the development. This will have the added benefit from a business perspective of minimising production costs. The program will have two key elements:

- improving energy use and efficiency wherever practicable; and
- raising awareness among suppliers, customers, employees and contractors of the need to maximise energy efficiency.

6.13 CUMULATIVE IMPACT

There are two principal aspects to consideration of cumulative impact:

- the accumulation of incremental environmental changes from multiple sources over time. Examples would be land clearing, resource depletion or greenhouse gas emission;
- a combination of environmental effects upon a locality from a single activity. For example noise and dust generated by vehicles on an unsealed road

The proposed mushroom farm adds to previous and ongoing changes in the Londonderry locality in the following manner:

- additional land clearing on the property, but only to the extent necessary for the proposal to proceed and offset by screen plantings as described in section 6.7;
- alteration of the ground profile by importing fill to level the development site;
- a minor increase of traffic on roads used for access to the site and associated traffic noise;
- minor change to noise levels in the locality;
- no significant change to water quality.

None of the above cumulative impacts are considered to be significant.

7

PROJECT DESCRIPTION, SUBSTRATE PLANT

7.1 EXISTING OPERATION

Elf Farm Supplies' mushroom substrate plant at Mulgrave has progressively expanded since operations commenced in 1981. Significant features of the plant include:

- pre-wet building;
- Phase 1 tunnel structure with eight tunnels and enclosed loading area;
- storage shed for raw materials;
- Phase 2/3 tunnel building with 22 processing tunnels and a storage tunnel;
- blocking facility; and
- bioscrubber with chimney exhaust.

In addition there are a number of minor structures including storage sheds, workshops, office and amenities, weighbridge and water storage tanks. There is a dwelling on the property near the front gate.

Development currently in progress or recently completed includes:

- filling land to the north and east of the current development area; and
- installing a new weighbridge and restoring the original site access route passing north of the dwelling, following completion of RTA roadworks.

Figure 7.1 shows the layout of the substrate plant as currently configured together with the additional development in progress.

7.2 SITE DEVELOPMENT

7.2.1 Layout and Design

At the Mulgrave site, the project is to expand the existing substrate plant to increase the production of substrate. Proposed construction works include:

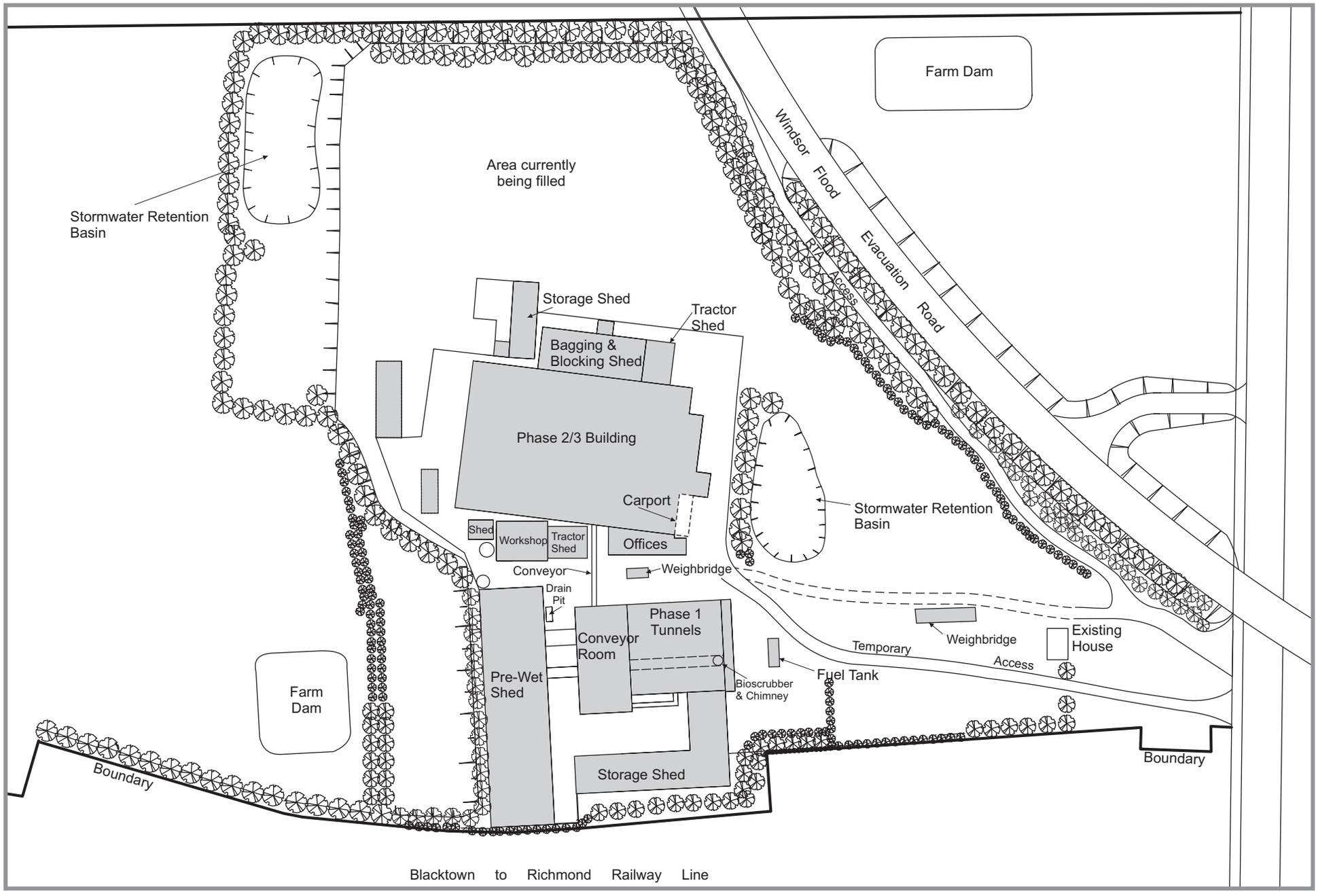


FIGURE 7.1 Substrate Plant Existing Development

- extension to the pre-wet building;
- two additional Phase 1 tunnels;
- two storage sheds for baled straw;
- a second bale wetting area;
- a second Phase 2/3 tunnel building containing 22 tunnels and a storage tunnel;
- a second bio-scrubber with chimney;
- other alterations, including conveyors, access, parking and drainage systems.

The future layout of the site including the proposed additional development is shown on *Figure 7.2*. The various buildings and structures are described below. Concept design plans for the new buildings are included in *Appendix U*. Photographs 5 to 9 show various views of the existing plant, illustrating building form, finish and colours.

Pre-wet Building Extension

A second pre-wet building will be erected adjacent and parallel to the existing building sharing a common wall. The extension will be larger than the existing structure, being approximately 133 metres long and 45 metres wide.

The extension will have a wall height of approximately eight metres with a pitched roof extending to approximately 12.6 metres above ground. On three sides the walls will be concrete for the first two metres above the floor and then sheeted with a combination of metal and clear panel above. On the eastern side, where the structure adjoins the existing pre-wet shed, the existing wall will have the sheeting removed and some of the two-metre concrete wall panels removed for internal doorways. The roof will be clad with metal sheeting.

The floor of the extension will be of reinforced concrete within which will be cast a manifold of air pipes with spigots protruding through the floor. The pipes form the "air under" system which distributes fresh air, to aerate the ricks of pre-wet material being processed.

A hopper at the southern end of the extension will feed a conveyor located beneath the roof of the existing pre-wet building and then outside to the east and north, connecting with the Phase 1 tunnel building. The hopper has been positioned next to a passageway linking the two pre-wet halls so it can receive pre-wet material from either side.

The site of the pre-wet building extension will be filled as part of the project to raise the level to 16 metres AHD, the same finished level as currently exists throughout the existing substrate plant.

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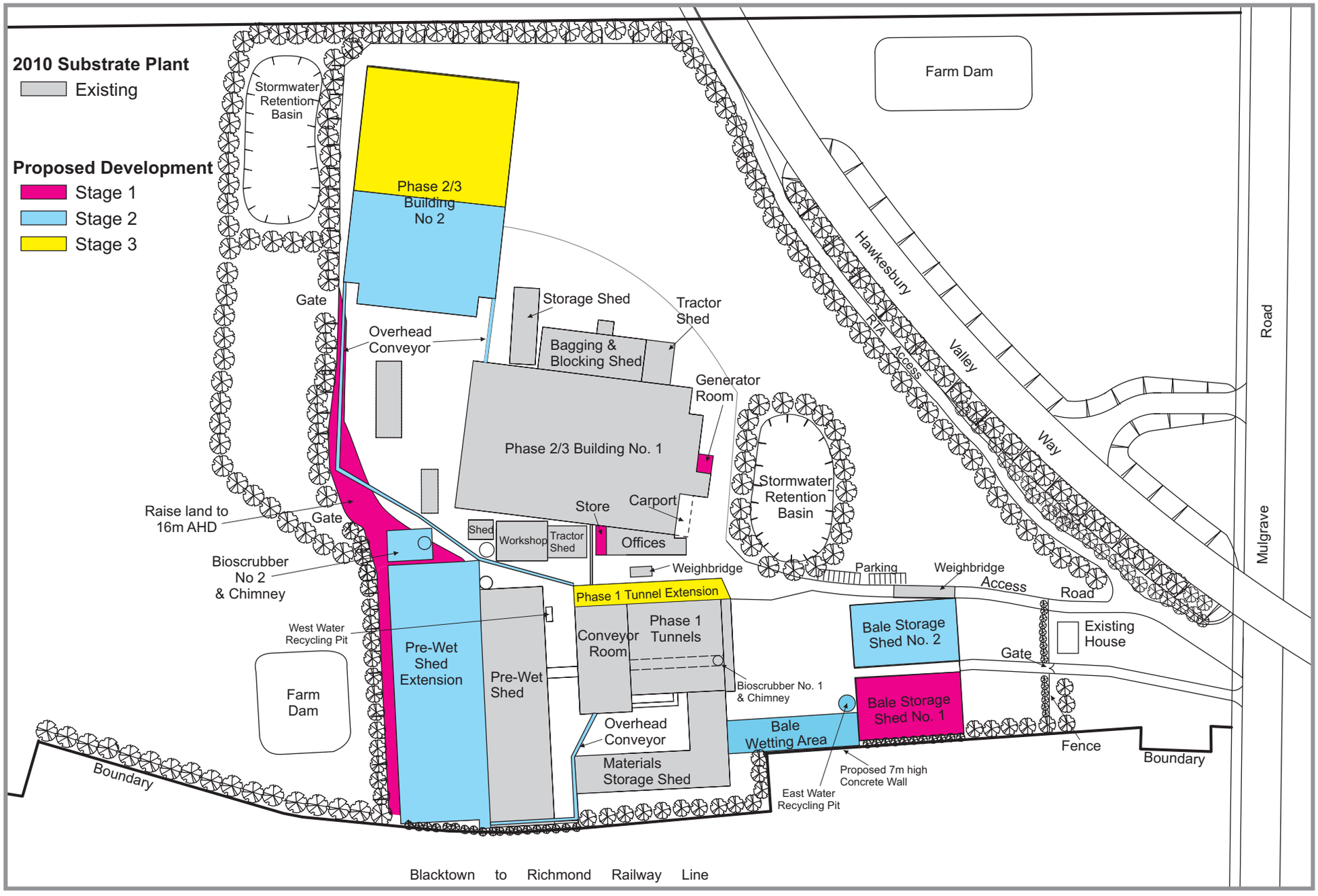


FIGURE 7.2 Substrate Plant Staging Plan

Additional Phase 1 Tunnels

The existing Phase 1 tunnel building will be extended in a northerly direction by approximately 10 metres to provide two additional tunnels and associated loading area and equipment space. The structure will have the same variable height as the existing tunnel building, ranging from about 6.8 metres at the flat tunnel roof to 12.8 metres at the highest point of the pitched roof over the loading area. The tunnels are constructed of reinforced concrete with a concrete roof. The loading area walls and roof are metal clad. The equipment space at the eastern end of the structure has an external wall of concrete blockwork for noise control.

Bale Storage Sheds

Two storage sheds for straw bales will be constructed to the east of the existing storage building and Phase 1 tunnels. The buildings will be located five metres apart and will each be 50 metres by 26 metres in plan with a maximum height of approximately 10 metres. The 7.3 metre walls and pitched roof will be clad with metal sheeting except for the lower two metres of the walls, where reinforced concrete will be used to withstand accidental impact from machinery operating in the shed. A roller door will be provided in the western end of each building for front end loader access. Each bale storage shed will have an automatic sprinkler system for fire protection.

Bale Wetting Area

The second (east) bale wetting area will be located between the southern bale storage shed and the existing raw materials storage shed. The bale wetting area is a concrete slab profiled to drain to an in-ground water recycle pit. The slab is about 49 by 18 metres with a seven metre high concrete wall along its southern side. The slab will be surrounded with walls on three sides: the existing raw materials shed to the west, a new concrete wall to the south and a new bale storage shed to the east.

The east water recycle pit will have a capacity of 100 kilolitres and be fitted with an inlet filter and two pumps. Straw bales stacked in the bale wetting area will be sprayed from movable boom sprays using recycled water that is filtered and aerated through the pit.

Additional Phase 2/3 Tunnels

The second Phase 2/3 tunnel building will be of similar size and design to the existing structure. The building will be approximately 114 metres long by 73 metres wide with a wall height of 7.9 metres and a ridge height of 10.9 metres. The southern end of the

building extends approximately 10 metres at a lower height to contain refrigeration plant, staff amenities, storage and other plant ancillaries.

The building walls will be constructed of colorbond insulated panels for noise suppression. Galvanised metal sheeting will be installed on the pitched roof. A separate sloping galvanised steel roof will cover the ancillary areas at the southern end.

Internally, the building will enclose 22 processing tunnels and one storage tunnel with filling and emptying halls along each of the long sides. The tunnels are erected on a raised concrete grid floor to facilitate air circulation through the substrate. Hebel panels are used for the tunnel walls and ceiling. Each processing tunnel is ducted through the roof at each end via vents that extend marginally above the height of the ridge.

Two roller doors in each end of the building provide vehicular access to both the filling and emptying halls. A series of personnel doors are provided in all walls for emergency exit. At the southern end there are several roller doors and personnel doors providing access to the various equipment and ancillary rooms.

No 2 Bioscrubber and Chimney

The second bioscrubber will be erected at the northern end of the pre-wet building extension. The bioscrubber will be a stand-alone structure measuring approximately 22 by 15 metres in plan. External walls of the bioscrubber will be of concrete panels. The flat reinforced concrete roof will be approximately nine metres above ground. The base of the structure will be four metres below ground to form a water storage tank.

A chimney with an external diameter of about 1.8 metres will extend from the roof of the structure to 40 metres above ground, the same height as the existing No 1 bioscrubber chimney. Air flow will be generated by dual fans located adjacent to the bioscrubber in a concrete blockwork building.

Ductwork installed in both halls of the extended pre-wet building will collect air and draw it into No 2 bioscrubber. Internal concrete walls will create a long air path fitted with baffles and sprays.

Conveyors

There are three new conveyors to be installed with the plant extension. The first conveyor connects the pre-wet building extension with the Phase 1 tunnel building and is described above with the pre-wet building extension.

Two conveyors will enter the new Phase 2/3 tunnel building. One conveyor will bring Phase 1 substrate from the Phase 1 tunnels to the Phase 2/3 tunnel building. The second shorter conveyor will transfer processed substrate from the new Phase 2/3

building to the existing Phase 2/3 building where it will be loaded to dispatch vehicles. By use of this latter conveyor it will be possible to avoid the need for dispatch vehicles to enter the new Phase 2/3 tunnel building, reducing the risk of product contamination from pests and spores.

The new conveyors will be suspended off the ground on columns at sufficient height to enable plant machinery to pass underneath. The conveyors will be of similar design to existing conveyors at the substrate plant, with a steel frame and bolted Perspex covers over the belt. An existing conveyor at the plant is shown on *Photograph 6*.

Minor Modifications

Minor alterations are also proposed to the plant consequent to the major works described above. Such modifications include extending the emergency backup generator room, constructing a small store room and providing sealed parking areas.

The site drainage system will be reconfigured to a minor extent as part of the development, including modifications for stormwater detention and water quality improvement. Water management is described in section 7.5.

An air duct will be installed during Stage 2 connecting the roof space of the existing raw materials storage to a nearby building connected to a bioscrubber. This duct will extract air from above the poultry manure storage area for treating in the bioscrubber.

7.2.2 Staging

It is proposed to expand the existing plant in three stages over approximately 10 years, keeping pace with the increasing demand for Phase 3 substrate as mushroom farms expand production to satisfy the market for locally produced fresh mushrooms.

Stage 1

The active development consent regulating operation of the existing Mulgrave substrate plant was issued by Hawkesbury City Council in 2002. The consent restricts the plant's production to 1000 tonnes per week of Phase 1 substrate[1]. Over the six years that the plant has been operating with the current configuration, Elf Farm Supplies has continued to develop its processing techniques and has shortened the period to produce a batch of Phase 1 substrate from three weeks to two weeks. This has created surplus capacity within the plant. With no physical change to the operational structures or equipment, the plant now has potential production capacity for 1,600 tonnes of Phase 1 substrate per week.

[1] 1000 tonnes of Phase 1 substrate reduces during processing to 600 tonnes of Phase 3 substrate.

The first stage of development will utilise surplus capacity in the plant by increasing weekly tonnage up to 1,600 tonnes. A new storage shed for straw bales, the principal raw material, is proposed to be erected as part of Stage 1. Minor modifications including extending the backup generator room, constructing a small store room, providing sealed parking areas and improvements to stormwater management will also be undertaken. In addition, during Stage 1 it is proposed to undertake the filling required in readiness for the pre-wet shed extension, to be constructed in Stage 2.

Subsequent Stages

In the subsequent two stages the capacity of the plant will be increased to 2,400 and then 3,200 tonnes of Phase 1 substrate per week.

A summary of the changes associated with the three stages of development of the substrate plant is presented in *Table 7.1*. The location of new buildings is illustrated on *Figure 7.2*.

Table 7.1 PROPOSED STAGES OF EXPANSION AT MULGRAVE

Stage	**Development Works**	**Plant Capacity** (tonnes per week*)	**Extra staff**
1	• Construct one additional straw bale storage shed; • Fill a 1.6 hectare area on the western side of the pre-wet shed to 16 metres AHD; • Minor modifications to existing structures described above.	1,600	2
2	• Construct a second pre-wet shed with conveyor; • a second bio scrubber with chimney; • a second bale storage shed; • a second bale wetting area; • a new building with 13 Phase 2/3 tunnels; and • an overhead supply conveyor; and • remove the old weighbridge.	2,400	4
3	• Construct an extra two Phase 1 tunnels; and • expand the new Phase 2/3 tunnel building constructed in Stage 2 to include an extra 9 Phase 2/3 tunnels and a storage tunnel.	3200	2

* tonnes per week of Phase 1 Substrate (1000 t of Phase 1 substrate reduces to 600 t of Phase 3 substrate).



PHOTOGRAPH 5 (Mulgrave) Typical colours and finishes on plant buildings



PHOTOGRAPH 6 (Mulgrave) Conveyor carrying Phase 1 substrate to the Phase 2/3 processing building

7.3 CONSTRUCTION

7.3.1 Erosion and Sediment Controls

All stages of construction involve some soil disturbance either from filling the land, installing foundations, burying services such as water, drainage or electricity and driving over unsealed surfaces. To limit soil displacement during the works, erosion and sediment controls will be installed to arrest movement of soil from the disturbed areas onto other land. An erosion and sediment control plan is included in *Appendix S*.

7.3.2 Demolition

There is no significant demolition associated with the project. Minor demolition works include removing the western wall of the existing pre-wet shed, removing part of the northern façade of the Phase 1 tunnel building and removing an existing weighbridge.

7.3.3 Earthworks

The area of land to be filled to the west of the existing pre-wet shed has an area of 1.6 hectares and will require approximately 58,000 cubic metres of material to be imported to the site. The maximum depth of fill, adjacent to the existing dam is 9.2 metres. The finished level will be 16 metres AHD, equal to the level of other filled land within the substrate plant site. *Figure 7.2* shows the location of the land to be filled.

Fill material will be sourced from construction projects in the Sydney region that have surplus excavated material at the time filling is underway at the substrate plant. The imported fill will be excavated natural material certified to be free of contamination. Demolition rubble or other forms of waste will not be accepted on the site. Topsoil scraped from the land to be filled will assist in preparing the fill batter for landscaping. The surface of the filled area will be finished as hardstand, suitable for building construction.

7.3.4 Building Construction

Building construction work will proceed in stages as programmed with necessary changes to plant operations to allow construction work to proceed. During the construction period environmental controls will be maintained with temporary measures as required and by timing critical works, such as removing walls from operational buildings to match periods of low activity.



PHOTOGRAPH 7 (Mulgrave) Western side of the site showing the pre-wet shed in the background



PHOTOGRAPH 8 (Mulgrave) Concrete tunnel structure for Phase 1 processing with loading room at the end

7.3.5 Landscaping

Landscaping at the substrate plant has been modified on a number of occasions in the past when progressive development of the site has been undertaken. As part of the approved filling now underway, further areas of dense planting are being created around the enlarged perimeter of the operational area.

Additional screen landscaping will be undertaken when the filling proposed in Stage 1 of the project is nearing completion. The western embankment of the filled area will be planted using native species consistent with existing plantings at the site. At the completion of construction works, any undeveloped part of the filled land that is not required for hardstand will be returned to pasture for grazing.

A landscape plan detailing the species and planting methods for extending the screen will be prepared as part of the detailed design.

7.3.6 Hours of Construction

Earthworks and building construction will take place between:

- 7:00 am to 6:00 pm Monday to Friday; and
- 8:00 am to 1:00 pm Saturday.

Building fitout, commissioning and other minor construction activities could be undertaken outside the above hours provided the work is not audible at residential premises.

7.3.7 Construction Plant and Equipment

Construction work at the substrate plant will use similar equipment to that described for the Londonderry mushroom farm. Dump trucks, bulldozer, excavator and compactor will be used during earthworks and delivery trucks, concrete pumps, cranes and elevating work platforms during building erection. Portable generators may be used at some locations if more convenient than a construction power supply from the substrate plant electricity system.

7.3.8 Program

Building construction in Stage 1 is expected to take up to five months. Earthworks may proceed over a longer period in campaigns as suitable material becomes available.

Stage 2 and Stage 3 works involve constructing several new structures and altering operating parts of the plant. Each of these stages is expected to take up to 18 months to complete.

As indicated above, it is anticipated the three stages of development will be completed over approximately 10 years.

7.4 OPERATION

7.4.1 Raw Material Delivery and Storage

Raw materials used in substrate manufacture include wheaten straw, water, poultry manure, other recycled agricultural products, gypsum and dry stable bedding. Materials are delivered by road as required. Vehicles travelling long distances or with limited collection opportunities (used stable bedding) arrive during the night hours. No change is proposed to current delivery operations.

Solid raw materials, other than straw, are stored in a three-sided shed, leaving an open side for material to be delivered by tip truck. These ingredients are kept in a dry state under cover. Straw is stored in the bale storage shed.

7.4.2 Substrate Production

The manufacturing process for mushroom substrate is shown schematically on *Figure 7.3*. The various steps in the process are described below.

Bale Wetting

Straw is softened by watering prior to use in the composting process. Straw bales are spray watered in the bale wetting area for several days to remove the waxy layer and increase water content. Water draining from the bales is collected, filtered, aerated and recirculated via the sprays. Make-up water is continually added to the process as the straw bales soak up to four times their dry weight.

Pre-Wet

Using front end loaders, wetted straw bales are laid out in rows in the pre-wet building. Dry ingredients are transported to the building by a Kuhn mixing trailer and blended with the straw and water using a mobile blending machine. The building is totally enclosed and kept under negative air pressure with air recirculated through the floor beneath the rows. Under the current configuration of the plant, exhaust air

passes from the pre-wet building through ducts into the Phase 1 tunnel building and thence to the No 1 bioscrubber. Stage 2 of the project provides for a second pre-wet shed and a second bioscrubber. When this arrangement is commissioned, the No 2 bioscrubber will be dedicated to treating air exhausted from the pre-wet building.

The pre-wet process takes up to one week, with the blending machine adding water, mixing and turning each row at least every second day. As the plant is presently configured, the finished pre-wet material is transported from the building using front end loaders. Stage 2 of the project includes a conveyor to make this transfer more efficient.

Phase 1 Composting

Incoming pre-wet material is delivered to a hopper feeding an external conveyor system that transports the mix to a nominated tunnel and drops it through the ceiling. An internal conveyor operating just below the ceiling drops the substrate evenly along the tunnel floor.

The high-temperature composting phase takes place in tunnels for up to one week. Approximately 450 tonnes of material can be processed in a tunnel. The mix must remain above 75^{o} Celsius for at least 90 hours to enable the process to reach completion. Part way through the process, the tunnel is emptied by front end loader and the contents placed in the hopper where water is added uniformly and the mix returned by conveyor to an empty tunnel.

The finished Phase 1 product is placed in the hopper so that the conveyor system can either load it to trucks for delivery as Phase 1 substrate or transfer it to the Phase 2/3 tunnel building for further processing.

The Phase 1 tunnel building, including the work space at its western end, is enclosed and maintained under negative pressure. Air is recirculated through the floor of each tunnel to aerate the composting material. Exhaust air from the tunnels passes through the bioscrubber and then is discharged via the chimney.

Phase 2 and Phase 3 Processing

Phase 2 is a pasteurisation process undertaken at high temperature on finished compost to kill unwanted spores and organisms. Phase 3 is the initial growth of mushroom spawn from introduced mycelium, undertaken in controlled atmospheric conditions. These operations take about two to three weeks of processing, depending upon dispatch days.

Utmost cleanliness in the buildings is required to avoid foreign spores or pathogens contaminating the pasteurised substrate. All air used in the process is filtered down to

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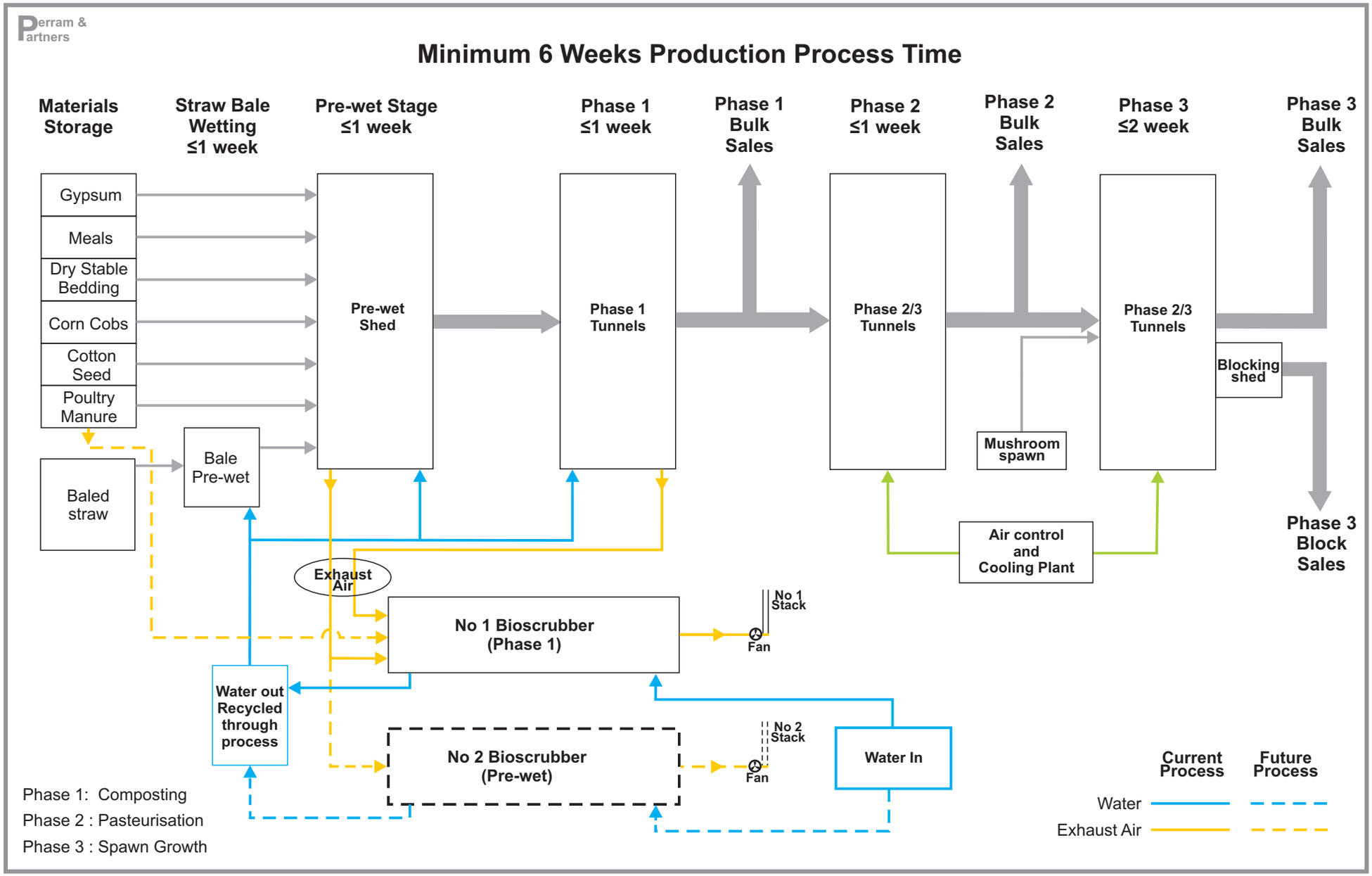


FIGURE 7.3 Substrate Plant Process Flow Diagram

five microns absolute. Finished product loading is carried out indoors with trucks being cleaned down prior to entering the loading area, if necessary.

Bioscrubber

The existing No 1 bioscrubber processes air collected from the Phase 1 tunnels and some of the air from the pre-wet shed. The bioscrubber occupies a space between Phase 1 tunnels, having dimensions, 45 metres long, three metres wide and seven metres high. A plenum floor is suspended 4.5 metres above the base to divide the bioscrubber into upper and lower chambers. The walls, floor, roof and plenum floor are made of reinforced concrete. On the lower floor, two concrete transverse weirs extend from the floor to a height of approximately one metre dividing the base into three equal segments.

Process air flows through the bottom chamber, rises to the upper chamber and returns to the eastern end, discharging via the chimney. A series of frames stand on the floor of the upper chamber, causing the airflow to frequently change direction. Attached to the frames are media designed for growth of the odour-absorbing micro-organisms.

Water is recirculated within both chambers of the bioscrubber via a series of spray nozzles attached to the underside of the roof, keeping the baffles wet and the air humid. Circulating water accumulates in the bottom chamber behind each weir and progressively overflows towards the lower eastern end where water is extracted for use as process water.

Odour tests of air entering and leaving the bioscrubber have demonstrated a minimum 70 per cent reduction in odour as the air is processed. The No 2 bioscrubber, to be installed as part of the expansion project, will separately process air from the extended pre-wet shed, leaving the existing bioscrubber to process air from the Phase 1 tunnels and enclosed loading area.

The No 2 bioscrubber will have similar internal characteristics to the existing unit, but has been designed as a more compact stand-alone structure with plan dimensions 22 by 15 metres. Air will follow a zigzag path, travelling the length of the structure three times on each level before reaching the chimney. Recirculating water will collect in a below-ground storage at the base.

7.4.3 Product Delivery

Substrate can be delivered from the plant following Phase 1, Phase 2 or Phase 3 processing, depending on the preference of mushroom farms. However since 2005 when Phase 2 and Phase 3 processing was introduced at the Mulgrave plant, mushroom farms have increasingly preferred to receive the Phase 3 "finished"

substrate. Consequently Elf Farm Supplies intends to move towards discontinuing supply of substrate that has not been fully processed to Phase 3.

Phase 3 substrate is loaded indoors and transported in bulk using semi-trailer vehicles. Vehicles are normally loaded and dispatched during the night and early morning to meet the requirements of the receiving mushroom farms.

Elf Farm Supplies is also moving into supplying products tailored to specific needs of the commercial and home markets. Some older mushroom farms will experience greater efficiency if the spawned substrate is prepared in the form of plastic-wrapped blocks, suitable for placing directly on growing shelves or trays. There is also a market for do-it-yourself growers who require spawned substrate pre-wrapped and ready to place in a suitable growing environment at home.

A blocking shed has been constructed to enable packaged substrate to be prepared and loaded into vehicles external to the processing tunnel building.

7.4.4 Hours of Operation

The substrate plant operates 24 hours per day, seven days per week. Refrigeration plant and ventilation/aeration equipment operates continuously to maintain essential conditions for the process. Most outdoor operations are scheduled for daylight hours. Deliveries and dispatches currently occur throughout the day and night period. The extended plant will continue to operate in this manner.

7.4.5 Operational Plant and Equipment

Mobile plant used at the facility includes front end loaders, trucks, tractors, forklifts, access equipment and blending machines. Fixed mechanical plant includes conveyors, fans, pumps, generators, refrigeration plant, compressors and the like.

7.5 WATER MANAGEMENT

7.5.1 Operational Water

Figure 7.4 is an operational water flow chart for the plant.

Water Sources

Mushroom substrate production is a water-intensive process. Operational water is obtained from four sources:

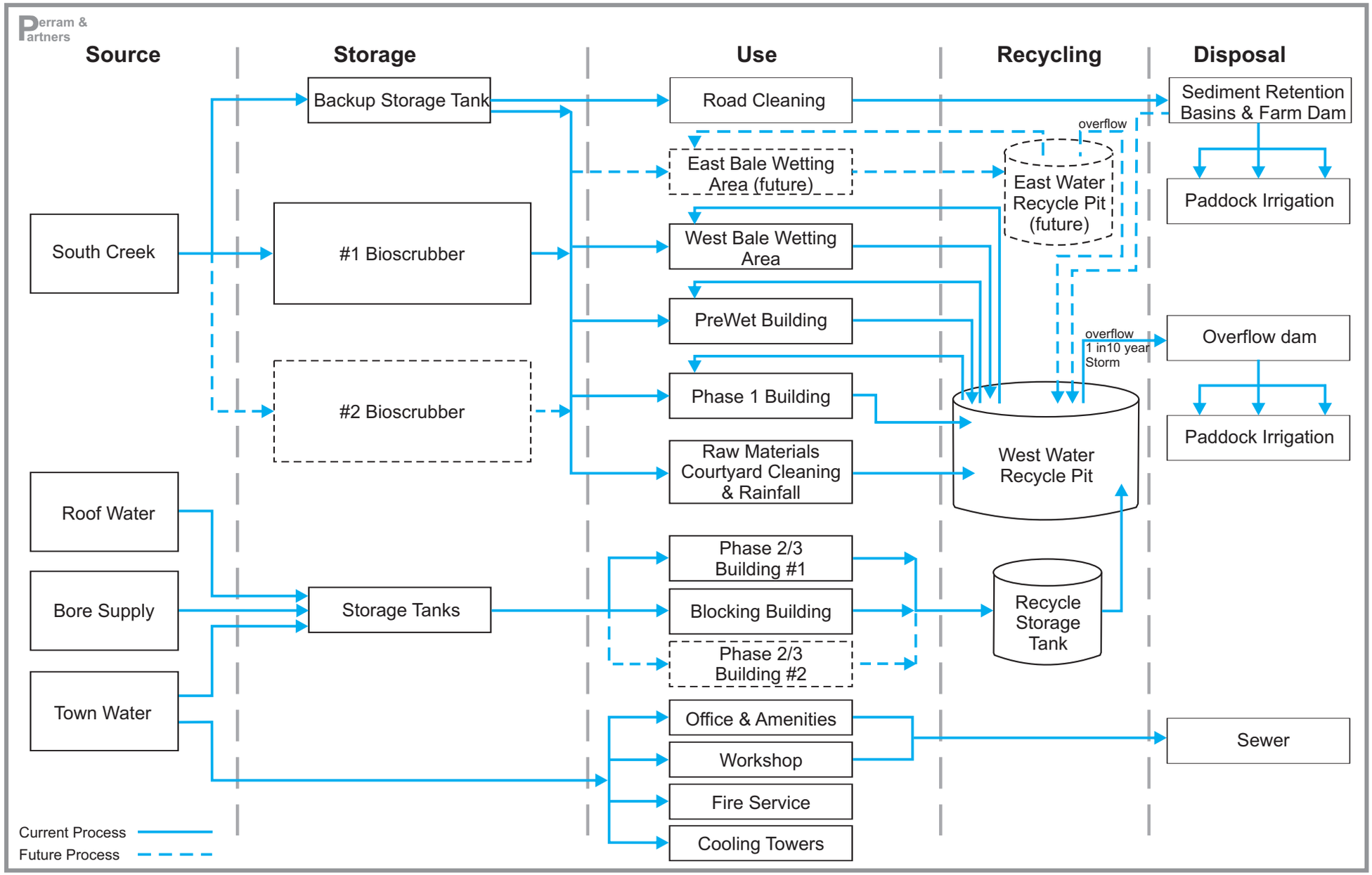


FIGURE 7.4 Substrate Plant Operational Water Flow Chart

- Water for use in the Phase 1 process is obtained from South Creek via a submersible pump in accordance with a licence administered by the Department of Environment Climate Change and Water. Creek water is pumped either directly to the bioscrubber or to a 120,000 litre water tank located beside the maintenance workshop.
- Water used for the Phase 2/3 processing area is drawn from a licensed borehole near the north west corner of the plant and stored in a 22,000 litre tank located beside the borehole. The Phase 2 and 3 processing area requires cleaner water to minimise the risk of spores entering the pasteurised substrate.
- Potable water for the office, staff amenities, maintenance workshop and cooling towers is obtained from a metered supply from Sydney Water. Fire hydrants are also connected to this supply. The Sydney Water service is also connected as a backup to provide operational water should either the South Creek or borehole sources be unavailable for service.
- Rainfall runoff from the sealed work area between the raw materials storage shed, Phase 1 tunnel building and the pre-wet shed drains to the west water recycle pit, adding to the supply of operational water.
- The farm dam in the north east of the property collects building roof water which is used in the operation, when required.

Pre-Wet and Phase 1 Process Water

Water for use in the pre-wet and Phase 1 process is preferentially drawn from the bioscrubber to maintain a flow of fresh water through this apparatus. The pool of water in the base of the No 1 bioscrubber has an operating depth range between 300 and 600 mm with automatic top up. If the level reaches the minimum setting, process water is drawn from the creek supply until the bioscrubber level is restored.

Water is used in the Phase 1 processing area for bale wetting, addition to the pre-wet mixture, addition to composting material in the Phase 1 tunnel building and for daily wash down in the Phase 1 buildings and work area. Wash down water collects in the recycle pit for reuse in the process. There is no waste water generated from the Phase 1 process.

Bale Wetting

The straw bale wetting operation is a circulatory system with water being pumped from the water recycle pit and sprayed over the stacked straw bales. Surplus water drains from the bales and flows back to the collection pit for recirculation. The water draws tannins from the straw which imparts a colouration to the circulating water. A gross solids trap is installed in the drain leading to the pit to reduce the volume of solid material entering the pit and allow easy cleaning. Duplicate pumps are installed in the

pit to reduce the risk of interruption to service. The pumps and spray nozzles are designed to allow loose strands of straw to pass through, minimising the likelihood of blockage. An aeration pump is installed in the pit to oxygenate the water and maintain aerobic conditions.

The water recycle pit is de-sludged fortnightly, producing about a wheelbarrow load of material that is added to the processing substrate.

Phase 2/3 Process Water

The Phase 2/3 processing building requires water for wash down, the refrigeration system, steam boiler and for adding to the substrate if required. There is no waste water from this building as all drainage water from the Phase 2/3 operation is pumped to the west water recycle pit for use in Phase 1.

7.5.2 Domestic Wastewater

Wastewater from the maintenance shed and staff amenities is the only water discharged to sewer from the site.

7.5.3 Summary of Water Requirements

Table 7.2 provides an estimate of water usage at the substrate plant currently and when all stages of development are fully operational.

Table 7.2 SUMMARY OF WATER USE

Water Use	Source	Estimated Quantity Consumed	
		Currently (1,000 t/w)*	Stage 3 (3,200 t/w) *
Phase 1 processing area	South Creek, Phase 2/3 recycled water, dam, rainwater and town water backup	40 megalitres /year	80 to 100 megalitres/year
Phase 2/3 building wash down	Borehole with town water backup	15 megalitres/year	35 megalitres/year
Potable uses	Town water	200 kilolitres/year	250 kilolitres/year
Fire fighting	Town water	nil	nil

* tonnes per week of Phase 1 substrate

7.5.4 Stormwater Management

A Stormwater Management Plan for the proposed expansion has been prepared by Barker Ryan Stewart and is included in *Appendix S*.

Existing stormwater drainage at the site includes the following features:

- roof water from most major structures at the site is directed to a farm dam in the north east corner of the property;
- roof water from buildings near the southern boundary flows beneath the Blacktown – Richmond Railway to the neighbouring market garden which has a large storage dam;
- surface water from non-operational areas and roadways on the site is directed to two stormwater retention basins, one discharging to the farm dam in the north east corner of the property and the other discharging to the South Creek flood plain; and
- surface water from the operational area of the site drains to the west water recycle pit, from which it is re-used in the process.

The west water recycle pit has been designed with sufficient capacity to retain the first flush of rainfall runoff from operational surfaces of the site above a sump where bale-wetting water accumulates for recirculation through the bale sprays. The pit can retain 10 millimetres of runoff from the operational surface area of the plant. Should the pit become full, an inlet diverter directs any surplus runoff to the farm dam immediately west of the plant. This dam is configured not to receive runoff water from any other source. Water collecting in this dam is used for farm irrigation, to keep the level of water in the dam at a minimum.

Whenever rainfall results in surplus water being present in the west water recycle pit it is preferentially used for operational purposes, quickly restoring capacity of the pit to collect water from subsequent rainfall.

Expansion of the plant will alter the existing stormwater arrangement as follows:

- an east water recycle pit will be installed to serve the new bale wetting area and will receive stormwater runoff from this area;
- the increased area of roof and paving will result in increased stormwater flows; and
- the additional paved and hardstand areas may contribute increased sediment and nutrients to the runoff.

The following works are included in the project to manage the changed stormwater conditions resulting from the development:

- the east water recycle pit will be sized to contain the first flush of rainfall runoff from its catchment as for the existing pit. Any surplus runoff will be diverted at the inlet to the west water recycle pit and thence to the western farm dam;
- the two existing sediment basins will be modified to detain stormwater as outlined in *Appendix S*. Works include fitting orifice plates to the outlets of both basins and minor earthworks at the north-western basin; and
- water quality works include installing a reed bed at the inlet to the north eastern farm dam and a bio basin to receive water discharging to the west onto the flood plain, as outlined in *Appendix S*.

The sediment basin modifications are designed to ensure there will be no increase in stormwater flow from the developed area. The reed bed and bio basin will ensure that stormwater quality does not deteriorate as a result of the development.

The surface area draining stormwater to the various dams and discharges on the property will not significantly alter as a result of the development.

7.6 ENVIRONMENTAL MANAGEMENT

7.6.1 Environmental Management Plan

The Mulgrave substrate plant operates in conformance with an environmental management plan (EMP) that is periodically reviewed and when necessary, updated. The EMP is consistent with the requirements of development approvals applying to the site and the licence for the operation issued by the Department of Environment Climate Change and Water (licence No 6229).

The following sections describe aspects of plant design relevant to managing odour, noise and waste.

7.6.2 Odour Control

Since its commencement in 1981, the Mulgrave substrate plant has been progressively modified, incorporating design innovations and proven management practices to control and minimise odour emissions. Odour control features incorporated in the design of the existing plant include:

- under-cover storage for raw materials to keep them dry;
- enclosed processing areas for all potentially odour-generating activities;
- air-under system in the pre-wet building and in all Phase 1 tunnels to improve aeration of composting material;

- automatic control system for fans to maintain optimum air supply and extraction;
- an enclosed vehicle passageway to enable indoor transfer of partly processed material from the pre-wet building to Phase 1 tunnels;
- enclosed conveyor transport for tunnel loading, dispatch loading and transfer to Phase 2/3 tunnels;
- a bioscrubber to remove odorous compounds from exhaust air prior to release to the atmosphere;
- a chimney to discharge exhaust air 40 metres above ground to aid dispersion; and
- a monitoring system to detect any faults or operational anomalies and immediately send an alarm to the Duty Manager at any time of day.

The above design features, completed during the last significant upgrade of the plant in 2003, in combination with rigorous management procedures have resulted in the plant consistently performing well within the odour limits specified in the environment protection licence.

Existing odour control measures will be maintained during the proposed expansion with the following improvements:

- a second bioscrubber dedicated for the pre-wet processing area. This will reduce the load on the existing bioscrubber and allow better control of negative pressure in the pre-wet building, reducing the likelihood of fugitive emissions;
- an enclosed conveyor from the pre-wet building to the Phase 1 tunnel building replacing the vehicle passageway. This will speed up the material transfer process and reduce the potential for fugitive emissions from this operation;
- application of negative pressure to the raw materials storage shed, reducing the potential for fugitive emissions from poultry manure and other materials.

Air quality impacts of the proposed substrate plant expansion are considered in section 8.2.

7.6.3 Noise Control

The existing plant and the proposed extension have been designed with the following features to control noise emissions:

- all stationary noise making plant and equipment such as fans, pumps and conveyors are enclosed within buildings or structures;
- the ventilation plant room beside the Phase 1 tunnels has been designed to have a 290 mm thick concrete-filled block construction extending the full height up to the roofline, with insulated roof;

- front end loaders operate either indoors or in the bale wetting area surrounded by buildings to screen the noise;
- the truck filling area for Phase 1 substrate has been positioned in an area where trucks are effectively surrounded by buildings or structures;
- the Phase 2/3 tunnels including their loading and unloading areas are fully enclosed within a large building;
- refrigeration and other plant serving the existing Phase 2/3 tunnels is housed within an acoustic enclosure utilising 290 mm thick concrete-filled block construction extending the full height up to the roofline, with insulated roof;
- the new Phase 2/3 plant rooms will achieve noise reduction requirements using 100 millimetre thick insulted panel construction; and
- acoustic input will be obtained in selection of plant and detailed design of relevant structures, fittings and plant mountings.

The existing plant has operated within noise limits specified in the development consent.

Noise impacts of the proposed substrate plant expansion are considered in section 8.6

7.6.4 Waste Management

The substrate plant produces very little waste. Raw materials are fully consumed in the process, other than the bale twine binding the straw bales. Waste generated in the maintenance shed, office, staff amenities and as a result of contractors working on the plant is retained in bins that are emptied weekly. There are three 4.5 cubic metre bins that are emptied each week. Any steel and non-ferrous metal waste items are recycled via the scrap metals industry. The recycled metal bin is emptied monthly. The office paper recycling bin is emptied fortnightly.

From time to time a small surplus of substrate may be produced at the plant. With the commissioning of the blocking shed, this material will now be processed and blocked for sale. Occasionally a small quantity of unused substrate may be retained at the site as a soil conditioner for the rural property. Substrate has been used in the past to prepare the screen planting areas around the periphery of the development site. Small quantities of floor sweepings from the Phase 3 substrate building, amounting to one or two cubic metres per week, are gratefully accepted by employees for use on home gardens.

The proposed expansion will not require any modification to the waste management system at the plant.

7.6.5 Fuel

Distillate is stored on site in below-ground tanks located near the pre-wet shed and near the emergency generator room. An above ground tank is positioned east of the new weighbridge. Mobile plant is refuelled at bowsers installed adjacent to the underground tanks. The refuelling areas are bunded to collect any spillage. A canopy over the above ground tank prevents the bunded area becoming filled with rainwater.

Clean-up equipment and materials are retained in the maintenance workshop to assist in cleaning up any spillage from within the bunded area.

7.6.6 Chemicals

Chemicals are not used in substrate production. Chlorine, stored in 20-litre drums, is used for cleaning buildings and tunnels.

7.6.7 Site Management

Landscaped areas of the site will be maintained to ensure that screening vegetation continues to thrive and serves to reduce visibility of the development. Maintenance will include weed suppression, nurturing plantings to maturity, replacing failed plantings and irrigating landscaped areas when necessary.

Unsealed areas of the site used for storage and manoeuvring will be maintained as hardstand areas to minimise erosion. Sediment basins receiving runoff from these areas will be maintained to remove sediment as required from time to time. Where possible, some of the filled area will be returned to pasture for cattle grazing.

7.6.8 Summary of Vehicle Movements

At the current level of output (1000 tonnes of phase 1 equivalent substrate per week) there are on average 16 truck deliveries or dispatches and 17 car visits per day. Car movements primarily occur during daylight hours while truck movements are spread over a 24 hour period.

Table 7.3 summarises the typical daily vehicle numbers at present and an estimate of likely numbers to occur for each stage of the proposed expansion.

Table 7.3 TYPICAL DAILY VEHICLE NUMBERS

	Current Production (1000 t/w)*	**Stage 1 (1600 t/w)***	**Stage 2 (2400 t/w)***	**Stage 3 (3200 t/w)***
Straw deliveries	2	3	5	6
Stable bedding delivery	1	2	3	4
Poultry manure delivery	1	2	3	4
Other ingredients delivery	1	2	3	4
Miscellaneous trucks	2	3	4	5
Contractors (light trucks)	3	4	5	5
Substrate dispatch	6	10	16	22
Staff and visitors	17	20	23	25
Total	16 trucks & 17 cars	26 trucks & 20 cars	39 trucks & 23 cars	50 trucks & 25 cars

* tonnes per week of Phase 1 substrate

Each delivery, dispatch or visit creates two vehicle movements, arrival and departure. Traffic impacts of the proposed substrate plant expansion are considered in section 8.5

8

ENVIRONMENTAL ASSESSMENT, SUBSTRATE PLANT

8.1 KEY ISSUES FOR ASSESSMENT

Key issues for assessment for the Mulgrave site identified in section 4 include:

- Air Quality
- Soil and Water
- Flooding
- Traffic and Parking
- Noise
- Waste Management
- Visual Characteristics
- Flora and Fauna
- Greenhouse Gas
- Environmental Hazards
- Heritage

These issues are each discussed in the flowing sections.

8.2 AIR QUALITY

8.2.1 Dust

During operation the existing Mulgrave facility generates very little dust for the following reasons:

- vehicles and mobile implements operate primarily on sealed surfaces;
- mushroom substrate in preparation is moisture laden;

- dry raw materials are stored and handled to minimise dust - bulk ingredients are tipped and kept under cover and straw is stacked in bales until thoroughly wet; and
- internal roadways and working areas are cleaned every day.

The proposed expansion will not alter the manner of operation, maintaining the low-dust generation on the site.

There is potential for dust generation during construction work, particularly when importing fill material during Stage 1 of the works. While construction work is in progress dust generation will be controlled by the following measures:

- limiting vehicle speeds on unsealed surfaces;
- maintaining unsealed haul routes for fill trucks in a damp state; and
- rehabilitating finished surfaces as soon as possible either with landscaping or hardstand, according to intended use.

8.2.2 Odour

PAE Holmes has undertaken an air quality assessment of the proposed expansion of substrate production at Mulgrave focussed principally upon odour. The air quality assessment report is included as *Appendix P*.

Odour generated from the composting process is minimised and managed by design features and operating procedures at the plant. Sources of odour at the existing plant include:

- stack emissions from the chimney servicing the Phase 1 tunnels, loading area and pre-wet building; and
- fugitive sources, including the poultry manure stockpile, doorways into the pre-wet building, west water recycle pit and bale wetting area.

The Phase 2/3 tunnel building is used for pasteurisation and spawn growth. These processes do not emit significant odour.

Existing Licence

Existing odour controls employed at Mulgrave are described in section 7.6. Design features and management practices to control odour have been progressively developed over a number of years. Implementation of the controls has ensured odour emissions remain within the limit set in the Environment Protection Licence for the site. The licence specifies that odour concentration in air passing up the bioscrubber chimney must not exceed 55,400 odour units per second over a duration of one hour, averaged annually. Odour monitoring in the chimney stack has been occurring since

the chimney was commissioned in 2003. The licence limit has never been exceeded. In recognition of this consistent performance, more recent renewals of the licence have relaxed the monitoring period from quarterly to every six months.

Since commissioning the existing bioscrubber in 2003 Elf Farm Supplies has been conducting trials and improving its operation. This optimising process is ongoing. Over the last two years monitoring at the inlet and outlet of the bioscrubber has shown an average of 77 per cent of odour being removed from the air passing through the bioscrubber with best results when input odour levels are higher.

Odour emissions have also reduced in response to refinements in the manner in which substrate is made. The parameters of the process are continually being developed and modified with objectives to achieve:

- better mushroom crop yield;
- shorter processing times; and
- reduced odour emissions.

Optimisation of the bioscrubber performance and improvements to substrate processing will continue in the future.

Proposed Expansion

The proposed expansion will improve odour controls by introducing a second bioscrubber and chimney to treat and manage air collected from the pre-wet process. The second bioscrubber will have an improved design with greater contact area between organic media and passing air and is expected to exceed the efficiency of the existing unit.

Other modifications to provide improved odour performance include creating negative pressure over the poultry manure stockpile and transferring pre-wet material to the Phase 1 tunnel building by enclosed conveyor rather than front end loader. In addition, the pre-wet shed extension will provide sufficient space to allow further development of processing techniques.

Odour Emissions

Odour emissions from various sources at the substrate plant have been measured by Stephenson Environmental Management. Stephenson sampled and tested odour using the technique of olfactometry[1], from the following sources:

[1] Olfactometry is explained in *Appendix P*.

- existing chimney;
- poultry manure stockpile;
- pre-wet material;
- west water recycling pit; and
- bale wetting.

In addition Stephenson has measured odour concentration at the inlet and outlet of the existing bioscrubber at various times to allow the efficiency of that apparatus to be determined.

Based upon the testing results obtained by Stephenson, PAE Holmes has estimated emissions for the proposed expansion of the plant. The estimates are conservative owing to assumptions made and the expected improved efficiency of Bioscrubber No 2. *Table 8.1* shows a summary of current emissions and emissions predicted to occur when each stage of the development reaches full production.

Table 8.1 EXISTING AND PREDICTED ODOUR EMISSIONS

Source	Units	Existing (1,000tpw)	Stage 1 (1,600 tpw)	Stage 2 (2,400 tpw)	Stage 3 (3,200 tpw)
No 1 Chimney emissions	ou.m^3/s	19,200	30,720	46,080	61,440
No 2 Chimney emissions[1]	ou.m^3/s	-	-	2,449	3,265
Pre-wet shed[2]	ou.m^3/s	4,000	6,400	-	-
Poultry manure stockpile[3]	ou.m^3/s	20.52	32.83	-	-
West water recycling pit	ou.m^2/s	0.193	0.193	0.193	0.193
East water recycling pit[4]	ou.m^2/s	-	-	0.193	0.193
Existing bale wet area	ou.m^3/s	52.26	83.6	62.7	83.6
Second bale wet area[4]	ou.m^3/s	-	-	62.7	83.6

Notes:

1. The No 2 chimney will be constructed as part of Stage 2
2. Air from the extended pre-wet shed will exhaust through No 2 chimney from Stage 2 onwards
3. Air from the poultry manure stockpile will exhaust through a chimney from Stage 2 onwards
4. The east water recycle pit and second bale wet area will be present from Stage 2 onwards

The predictions in *Table 8.1* indicate during Stage 1, emissions will be well below the emissions limit of 55,400 odour units per second contained in the licence. From Stage 2 onwards all significant emissions will be exhausted via the chimneys. During Stage 2 emissions will remain marginally below the licence limit, but this limit is likely to be exceeded when Stage 3 reaches full production.

Elf Farm Supplies has undertaken to ensure that the proposed expansion will not result in odour emissions from the plant in excess of the current licence limit. The company will achieve this outcome by the following means:

- continuing to develop and improve operations at the plant to reduce odour emissions;
- increasing the quantity of substrate produced in manageable steps with confirmation through monitoring that emissions are remaining within the licence limit; and
- proposing in this application that approval to exceed the maximum weekly production limit for Stage 2, 2,400 tonnes per week, be subject to Elf Farm Supplies demonstrating that production at Stage 3 levels can take place without exceeding the licence limit.

For Stage 1 of the development, odour emissions will continue to be measured in the existing chimney. When Stage 2 works are commissioned, odour emissions will be measured in both chimneys and the combined emissions will be maintained below the licence limit.

Dispersion Modelling

Having regard to the odour controls already applied at the plant and additional measures proposed for the expansion including the second chimney source, PAE Holmes has undertaken modelling to predict the ground level concentration of odour expected to occur in the locality, particularly at residences and other sensitive receptors, for each stage of the development.

Assessment Criteria

Odour levels generated by any variable process will fluctuate with time according to variations in emission rates and climatic conditions. Further variability arises because the sensitivity of people to odour varies widely from one person to another. The DECCW has produced recommended odour performance criteria for odour assessment purposes that indicate odour levels that should not be exceeded for more than one percent of the time. That means that in any 12 month period the applicable criterion should not be exceeded for more than 87.6 hours. The criteria depend on local population density for the reason that where the density is highest, it is more likely individuals will be present who have a particular sensitivity to odour. The DECCW criteria are reproduced in *Table 8.2* below.

Table 8.2 DECCW RECOMMENDED ODOUR PERFORMANCE CRITERIA

Population of Affected Community	Ground Level Concentration of Odour (ou*)
≤~2	7
~10	6
~30	5
~125	4
~500	3
Urban (2000) and/or schools and hospitals	2

* ou = odour units (see *Appendix P*)

When applying the above table, the town of Windsor would be considered an urban area where the criterion would be 2 odour units. The scattered houses in the village of Mulgrave would suggest a criterion of 4 to 7 odour units in that locality.

Meteorological Data

Continuous meteorological data for the site are available from the weather station on the property which has been in operation since 1996. Data was also obtained from Sydney airport and Richmond RAAF. PAE Holmes utilised three computer models (TAPM, CALMET and CALPUFF) to firstly prepare the meteorological data into a fine resolution three dimensional array for each hour of the run period and then calculate the dispersion of odour plumes within that array.

Meteorological data for the site show the predominant annual wind directions are north-northeast and northeast. During summer, southerly and south-south-westerly winds also figure significantly.

Modelling Results

Odour dispersion modelling was carried out for the current throughput of the plant and for each stage of the proposed expansion. The modelling predicted that the 99th percentile one-hour average odour concentration would remain in the range of 1 to 3 odour units for all sensitive receptors, except the five closest receptors in the village of Mulgrave. For receptors east of the site, predicted odour levels remain within the 2 odour unit criterion applicable in that area during all stages of the development. For receptors to the west of the substrate plant, predicted odour levels remain within the 4 to 7 odour unit criterion applicable there during stages 1 and 2 of the development.

Discussion

It is proposed that stages 1 and 2 should proceed on the following basis:

- modelling predicts that the applicable DECCW criteria will not be exceeded at any sensitive receptor during stages 1 and 2;
- an increase in average odour concentrations predicted during Stage 1 is shown to reduce when Stage 2 comes on line;
- PAE Holmes considers the modelling results to be conservative, meaning that they are more likely to overstate the impact;
- during stages 1 and 2, odour emissions are predicted to remain below the existing licence limit;
- if necessary during Stage 2, emissions can be controlled to remain below the licence limit by limiting the quantity of substrate produced; and
- Stage 2 includes major additions to environmental controls at the plant that will substantially improve odour management.

As indicated earlier, it is proposed not to exceed the maximum Stage 2 production rate until separate approval is granted to do so. This will be based on a review of emissions from both bioscrubber stacks after the Stage 2 development has been operating with consistent performance, confirmed by measurement. On the basis of measured results, odour emissions for Stage 3 production levels will be more accurately predicted. Progression to the Stage 3 production range would occur when it has been reliably predicted that emissions will remain below the odour licence limit of 55,400 ou.m^3/s.

Throughout the development phase and future operation, odour monitoring will be maintained to verify that the licence limit is not exceeded. Elf Farm Supplies will continue to monitor worldwide developments in controlling odour from substrate production and adapt improvements to better manage odour emissions at Mulgrave.

Complaints Management

The environmental management plan for the substrate plant includes a process for receiving and responding to any complaints regarding the plant. The procedure contains the following elements:

- advertised telephone number for complaints;
- system for logging and investigating complaints;
- process for recording the outcome of investigations and action taken; and
- feedback to complainants following investigation.

Investigation of any complaint relating to odour firstly involves obtaining wind strength and direction information from the weather station on site to determine

whether the location of the complaint is downwind of the plant. This step is necessary because of the multiple sources of odour in the rural area. Where wind data indicates the plant could be the source, contingency measures implemented include:

- record details of activity at the plant in the period leading up to the complaint;
- complete as quickly as possible any handling of material that may be underway;
- attend to any failure of equipment such as fans or pumps.

With all processing carried out indoors, equipment failure would be the likely cause of any odour episode and would need to be present for some time to result in anaerobic discharge. To minimise the risk and duration of plant failure, operating procedures include cleaning and maintaining equipment on a weekly basis. In addition, alarms are being installed on equipment critical for environmental performance to notify the duty manager who will take remedial action, whenever required.

8.3 SOIL AND WATER

8.3.1 Soil

The raw materials used and products produced at the Mulgrave substrate plant do not present any risk of soil contamination for the flowing reasons:

- indoor and outdoor operational areas of the plant have a concrete floor or base creating separation from the underlying fill material;
- any spillage of materials on the working surfaces is removed daily; and
- mushroom substrate and its constituent raw materials are natural agricultural products that are routinely added to soil to improve its organic content.

Contrary to any suggestion of contamination, surplus mushroom substrate is widely added to soil as a soil conditioner and from time to time is used for this purpose on the Mulgrave property.

Fill material imported to the site during construction to raise the level of a 1.6 hectare area for building construction will be excavated natural material, certified to be free of contamination. Prior to placement of fill, top soil will be recovered from the surface for use in rehabilitation associated with the works.

Fuel tanks located underground and above ground are monitored to confirm there is no leakage. Levels are recorded weekly and checked against fuel receipts and usage.

The project is not likely to result in any significant impact to soil quality on the rural property.

8.3.2 Water Quality

The substrate plant is located in the catchment of South Creek, flowing northwards to join the Hawkesbury River approximately five kilometres from of the site. South Creek has an extensive catchment south of the property and receives processed effluent from an upstream sewage treatment plant. South Creek flooding is considered in section 8.4.

Water management at the Mulgrave site is described in detail in section 7.5. Salient points relevant to water quality include:

- all process water including wash down water is fully consumed in substrate production;
- the only waste water generated at the site is from the workshop and staff amenities, which is discharged to sewer;
- in wet weather rainfall runoff from operational areas drains to the west water recycle pit, where it is used in the substrate production process;
- the west water recycle pit has capacity to collect the first 10 millimetres of runoff. During storm events an inlet diverter sends any excess runoff to a farm dam which receives runoff from this source only;
- whenever the farm dam contains sufficient water it is used for pasture irrigation; and
- the proposal includes measures to improve water quality in stormwater runoff from non-operational parts of the site, such as roadways and hardstand areas.

Of particular relevance to water quality in South Creek, there is no discharge of any process water from the site. Rainfall runoff diversion to the western farm dam during storms occurs only after the first flush has been collected and retained in the west water recycle pit. The nutrient loading of water collecting in the farm dam is thereby reduced. Any nutrients that may be present in the farm dam derive from natural agricultural products and are beneficial to the pasture when dispersed by irrigation.

Roof water from the site buildings is diverted to farm dams in the area. Surface runoff from non-operational areas of the plant is collected in retention basins and stored in farm dams or released onto the flood plain. A reed bed and bio-basin will be installed to improve water quality as recommended in *Appendix S*. Rainfall runoff collecting in farm dams is used either in the process or for pasture irrigation.

With the implementation of stormwater works recommended in *Appendix S*, stormwater quality after the staged expansion of the plant will be improved in comparison to the current situation. It may therefore be concluded that the proposed expansion of the substrate plant will not cause any significant impact to water quality in surrounding waters.

8.4 FLOODING

The Mulgrave site is located on the South Creek flood plain. The site of the existing substrate plant has been filled to raise the level to 16 metres AHD, complying with Hawkesbury Council requirements for building construction in this locality. The development now proposed will extend the raised platform by approximately 1.6 hectares. To assess the effect of this additional area of filling on the flood characteristics of the South Creek flood plain, a flood assessment was undertaken by WMAwater and is included as *Appendix Q*.

South Creek can flood at Mulgrave from two mechanisms, local flooding from runoff in the South Creek catchment and backwater flooding from the Hawkesbury River. In the lower reaches of South Creek at Mulgrave, backwater flooding is the dominant mechanism.

The most recent flood study of South Creek at Mulgrave was the hydraulic assessment carried out on behalf of the RTA for the construction of the Windsor Flood Evacuation Route (Hawkesbury Valley Way). WMAwater refined the model used for that study by removing the area of the project site that would no longer be available for flood flow and storage. The area removed included all land that has been filled at the substrate plant since the previous flood study for the RTA plus the 1.6 hectare area now proposed for filling.

The results of re-modelling show no discernable impact created by the proposed filling. The flood levels and flow rates will be unchanged as a result of the proposed development. WMAwater has explained that this result is expected as the proposal will remove only a very small fraction of flood storage from the flood plain at Windsor.

8.5 TRAFFIC

8.5.1 Existing Traffic Conditions

A traffic assessment was carried out by traffic consultants Halcrow MWT and is included in *Appendix M*. The Mulgrave site is accessed from Mulgrave Road, a two-lane local road maintained by Hawkesbury City Council. About 100 metres north of the site entrance a link road joins Mulgrave Road to the elevated Hawkesbury Valley Way, a State road controlled by the RTA. Depending on source and destination, heavy vehicles accessing the site travel via Mulgrave Road and either Hawkesbury Valley Way, Windsor Road (via Curtis Street) or Railway Road South (via the level crossing at Mulgrave).

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FIGURE 8.1 Mulgrave Area Road Network

For the purpose of the study traffic counts were conducted in May 2009 near the site on Mulgrave Road and Hawkesbury Valley Way classifying traffic into light and heavy vehicles. The average daily two-way traffic flow on Mulgrave Road was found to be about 2,500 vehicles with 12 per cent heavy vehicles. The average daily two-way traffic on Hawkesbury Valley way was about 19,000 vehicles with 11 per cent heavy vehicles.

Each working day most operational staff arrive at the Mulgrave plant from about 5 am and leave by about 2 pm. Truck movements are presently concentrated between the hours of 2 am and 9 pm but can occur 24 hours per day. The focal periods for vehicle movements are not expected to significantly change with the proposed expansion. At full development there will be approximately 36 small vehicle visits (72 movements) and 50 truck visits (100 movements) per day.

Bulk haulage movements will use semi trailers or B-double vehicles as convenient for the operation.

8.5.2 Traffic Assessment

It is projected that maximum hourly traffic generation associated with the Mulgrave site will increase from the current 16 to 23 vehicles per hour by the final stage of the development. Halcrow MWT expects that this small addition to maximum hourly traffic from the Mulgrave development will have no material effect on the existing level of service for Mulgrave Road or Hawkesbury Valley Way.

Intersection analysis has been based on the assumption that site traffic is distributed 50 per cent to the east and 50 per cent to the west. The results show that the intersection of the site access road and Mulgrave Road will continue to operate satisfactorily through all stages of the development. No significant increase is predicted to the average delay in either the morning or evening peak period.

On the basis of the findings of the traffic assessment the proposed expansion at Mulgrave will have no significant impact on traffic conditions in the area.

8.5.3 Parking and Access

It is estimated that 14 parking spaces will be required at Mulgrave which can be easily accommodated on the site.

The level of traffic associated with the proposed expansion at Mulgrave does not warrant any upgrade or re-configuration of the basic intersection between the access road and Mulgrave Road. The site entrance and access road have recently been reinstated following relocation during the RTA works, as shown on the site plan, *Figure 7.2*.

8.5.4 Construction Traffic

Construction projects have been underway at the Mulgrave substrate plant on a number of occasions over the last 10 years. Works have included filling the land to level the site and various building projects. Approved filling is currently underway at the time of writing.

Elf Farm Supplies estimates that when building works have been underway, an average of 20 vehicles would visit the site per day, including construction personnel and materials deliveries.

The number of trucks entering the site to deliver clean fill each day depends upon the location of the source material and the number of trucks allocated to the circuit. Discussion with the filling contractor engaged for the current work indicates that truck numbers can vary from very few per day up to about one every 15 minutes. At the present time activity is slow owing to there being few projects underway with a surplus of spoil. Filling work at the site will be complete prior to commencement of Stage 2 when significant building works commence.

In view of the relatively small vehicle numbers associated with construction, the conclusions of the traffic assessment are considered to be unaffected by construction traffic. The site has an established entry location for heavy vehicles that will continue to be used by operational and construction traffic

8.6 NOISE

Atkins Acoustics carried out a noise assessment for the proposed Mulgrave expansion, included in this document as *Appendix R*. The consultant logged existing ambient noise levels at three locations, two addresses in Mulgrave Road, to the north and south of the site and one address in Chisholm Place, to the west of the site. Ambient noise was observed to be affected by traffic, primarily using Hawkesbury Valley Way, domestic activities and industry within the South Windsor industrial precinct.

Project specific noise goals were developed with reference to published guidelines:

- *Interim Construction Noise Guideline* (DECCW 2009)
- *Industrial Noise Policy* (DECCW 2000)
- *Noise Guide for Local Government* (DECCW 2007)
- *Environmental Criteria for Road Traffic Noise* (DECCW 1999)

Noise goals were determined for the four nearest residential locations to the north, south-east and west of the facility and at the Mulgrave industrial area to the east.

Meteorological data derived (by PAE Holmes) from the existing weather station at the substrate plant was used to determine the prevalence of temperature inversions and winds. The assessment considered construction noise, operational noise and road traffic noise from the facility.

8.6.1 Construction Noise and Vibration

Section 7.3 of this report indicates the proposed hours of construction work, the nature of construction plant and equipment and the likely construction program.

Atkins Acoustics developed construction noise assessment goals ($L_{Aeq,15min}$) for five assessment locations, being 51-52 dB(A) for the residences and 65 dB(A) for the industrial area. Nine work scenarios were modelled representing various activities during the three stages of development at the facility. Atkins concluded that construction noise goals would generally be satisfied, with notable exceedences during:

- the filling operation in Stage 1 for the pre-wet shed extension, particularly if a bulldozer and compactor are operated simultaneously; and
- concrete pumping, primarily during construction of the bale storage shed and bale wetting area at the southern edge of the site.

The above exceedences will be ameliorated by adopting construction noise controls recommended in the noise assessment:

- avoid operating the bulldozer and compactor simultaneously during filling operations;
- when concrete pours are taking place, locate concrete trucks and pumps in a manner that will maximise screening to residential properties to the south and west;
- construct the southern boundary wall adjacent to the eastern bale wetting area as early as practicable in the construction program;
- adopt construction practices recommended by DECCW for best management and best available technology economically achievable;
- select construction plant and equipment having regard to controlling noise emissions, including reversing alarm noise;
- where practicable schedule the noisiest activities to occur during parts of the day when ambient noise levels are higher;
- undertake audits at receiver locations to monitor noise from site construction;
- establish a noise complaints procedure with contact phone number and logging and response protocols;
- undertake construction activities in accordance with AS 2436:1981, *Guide to Noise Control on Construction, Maintenance and Demolition Sites*, with all

equipment demonstrating compliance with the noise levels recommended in the standard.

Ground vibration during construction was not considered an issue, noting that the distance to residential buildings is greater than 170 metres.

8.6.2 Operational Noise

As indicated in section 7.4 the existing substrate plant operates 24 hours per day, seven days per week and this operating scenario will be maintained in the expanded plant.

Atkins Acoustics modelled operational noise for the completed expansion with the plant producing its full complement of 3,200 tonnes of Phase 1 substrate per week. Several operating scenarios were considered for the day, evening and night periods, assuming all plant and equipment operating simultaneously. Modelling took into account both calm conditions and likely winds at various times of the day derived from meteorological data. Night time intermittent activities were also considered to assess potential sleep disturbance. The modelled scenarios are considered to represent the likely worst case and would not occur all of the time.

The modelling results show that under all conditions considered, the noise levels during day, evening and night periods would satisfy assessment goals at all of the referenced residential receptors. Additional calculations showed that although not proposed, the mobile blender could also operate in the pre-wet shed during the night without noise goals being exceeded at any of the residential receptors.

Modelling demonstrated that intermittent night time noise, particularly airbrake release, would not exceed the relevant sleep disturbance goals at the residential receptors.

Operational noise controls to be adopted at the plant include:

- undertake detailed design of buildings and structures to meet specified noise attenuation criteria;
- select mechanical plant and equipment to meet specified sound power levels and/or acoustic performance;
- require trucks to operate on the access roads at speeds not exceeding 20 kph;
- fit "quacker" reversing alarms to mobile plant where practicable; and
- incorporate noise management protocols within the environmental management plan for the site.

8.6.3 Road Traffic Noise

After deducting traffic from the substrate plant, existing traffic on Hawkesbury Valley Way creates road noise which already exceeds the DECCW baseline goals at a distance of 10 metres from the road. Both the day and night goals are exceeded by up to 10 dB(A). In these circumstances the recommended goal for new development is that traffic noise attributable to the development should not increase the existing noise level by more than 2 dB(A).

Considering the projected traffic volumes for the expanded substrate plant when operating at full capacity of 3,200 tonnes of Phase 1 substrate per week, the additional noise levels at the reference location 10 metres from the road are predicted to increase by 0.2 dB(A) during the day and 0.3dB(A) at night, well within the criterion.

8.7 WASTE MANAGEMENT

Management of waste materials at the substrate plant is described in section 7.6. In summary:

- raw materials are fully consumed during substrate production with the only waste being twine used to bind straw bales;
- any surplus substrate, previously removed and used as a soil conditioner will now be formed into blocks at the plant for sale to the retail and home market;
- sludge from the water recycle pit is added to substrate;
- waste generated in the workshop; office, staff amenities and by maintenance contractors is placed in bins and emptied weekly; and
- metallic waste items are recycled.

There is no significant environmental impact from waste management processes employed at the plant.

8.8 VISUAL CHARACTERISTICS

8.8.1 Existing Landscape

The largest visual feature of the existing landscape in the vicinity of the substrate plant is the floodplain of South Creek. This land is characterised by farming paddocks extending along the valley north and south, although dissected at Mulgrave by elevated rail and road crossings.

On the western (Windsor) side of the floodplain a narrow tongue of higher land extends from the Windsor urban area almost to South Creek, supporting a small housing estate and the Blacktown to Richmond railway.

To the east of the floodplain, across Mulgrave Road, the land rises and is developed for industrial purposes. The Windsor showgrounds are to the south of this area and the village of Mulgrave is to the north. The village is on the northern side of the railway and comprises scattered rural-residential development.

The substrate plant has been erected on a filled section of the floodplain, located between the rail and road embankments. The plant appears as a series of large rural sheds and structures of similar height apart from a single chimney that rises amidst the development. The structures are partly screened by planted native vegetation, which has yet to reach full height and maturity. The landscaping is being enhanced as part of the filling project currently underway.

While the substrate plant with its collection of structures contrasts with the paddocks of the South Creek flood plain, its location between elevated road and rail corridors with an industrial area to the immediate east creates a more developed context.

8.8.2 Characteristics of the Plant Expansion

Aspects of the development that are of interest for visual assessment are the new buildings and structures likely to be visible from beyond the site. As shown on *Figure 7.2* the proposed expansion involves new building works primarily on the eastern and western sides of the existing plant. Other changes more central to the plant will be largely obscured or indiscernible from surrounding areas.

Buildings to be constructed on the western side include the Phase 2/3 tunnel building No 2, pre-wet shed extension and bioscrubber No 2. On the eastern side two bale storage sheds will be erected. New buildings and building extensions will be of similar height to existing buildings at the plant and be constructed with similar materials and colours. The second bioscrubber chimney will be of identical height and diameter to the existing chimney.

Some of the alterations abut the southern (railway) boundary, including the pre-wet shed extension, a bale storage shed and a section of seven-metre-high concrete wall.

The proposed expansion will include additional native vegetation planting, designed to assist in screening the development as far as possible and soften the appearance of sections of the plant that remain visible.

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FIGURE 8.2 Location of Photographs, Mulgrave

8.8.3 Visibility of the Plant

Opportunities to view the substrate plant have altered in recent years with the construction of Hawkesbury Valley Way. While the elevated roadway has reduced visibility from some areas, particularly north and east of the site, it has provided transitory viewing opportunities from the roadway itself. A further change has occurred from the growth of screening vegetation that has progressively reduced visibility of the site.

The existing substrate plant is visible to a varying extent in static views from:

- adjoining rural lands;
- the residential area to the west of South Creek;
- parts of the industrial area to the east of Mulgrave Road; and
- the western part of Mulgrave village including the platform of Mulgrave Station.

Parts of the plant are also visible to travellers from sections of Mulgrave Road, the elevated Hawkesbury Valley Way and the Blacktown to Richmond railway.

The neighbourhood surrounding the existing substrate plant has been visited to identify potential viewing locations. Photographs 9 to 12 have been taken from publicly accessible vantage points in the area, including roads and the railway.

Figure 8.2 indicates the locations from which photographs were taken.

8.8.4 Viewer Sensitivity

The sensitivity of viewers to a change in the appearance of the landscape depends upon a number of factors including the context of the view, the circumstances of the viewer and the purpose of the alteration to the landscape. Residents would normally be considered more sensitive to changes than workers or travellers.

Residents in the housing estate to the west of South Creek would view the proposed expansion in the context of the existing substrate plant, the elevated road and rail corridors and industrial area. These viewers would not be considered highly sensitive to minor alterations to the view that are consistent with the existing character and do not significantly alter or reduce the visible landscape.



PHOTOGRAPH 9 (Mulgrave) Site entrance from Hawkesbury Valley Way. Roadside and on-site screen planting will reduce this view over time.



PHOTOGRAPH 10 (Mulgrave) Looking southeast from Hawkesbury Valley Way. Landscape plantings have grown to obscure all but the nearest building roof and chimney.

Non-residential viewers in the area whose presence is transitory or work-based would also not be considered sensitive to the view.

8.8.5 Visual Effect

The visual effect of the proposed expansion is the manner in which it alters the view, taking into account the mitigation measures to be undertaken in conjunction with the development. A development would be considered to have a high visual effect where it creates a significant change. For example, when a view of green open space becomes substantially altered with development the visual effect would be high. If the view already includes disturbed areas or the change is minor, screened or far away, then the visual effect is lower.

Expansion of the substrate plant will result in several additional buildings erected on the site of the similar size, form, colour and texture to buildings already present. While the buildings to the east and west will be visible, landscaping around the site perimeter will be extended to surround the new structures providing screening over time. . The expansion would create an incremental change to a development already present in the view

Viewed from the west, some of the buildings will be erected in front of others with little visual effect. The phase 2/3 tunnel building No 2 will extend the development to the north increasing its apparent size and creating a moderate visual effect. The western view emphasises the full height of the development against the original flood plain level.

From the east the additional structures will either be directly in front of existing buildings or appear to the rear of the site with low visual effect.

From Hawkesbury Valley Way the most noticeable feature will be the Phase 2/3 tunnel building No 2. This building will be of similar size as the existing Phase 2/3 tunnel building and will have similar setback from the roadway. The visual effect is considered low.

Similarly the additional building facades on the southern side would be considered to have a low visual effect for the short duration when the site is visible to passengers on trains.



PHOTOGRAPH 11 (Mulgrave) The chimney is visible from Mulgrave village, but the plant buildings are almost entirely screened by vegetation.



PHOTOGRAPH 12 (Mulgrave) From Mulgrave Station platform the substrate plant chimney is visible, but other structures are largely obscured.

8.8.6 Visual Impact

The visual impact of a development is assessed in consideration of visibility, viewer sensitivity and visual effect. The factors are summarised in *Table 8.3*.

Table 8.3 VISUAL IMPACT ASSESSMENT

Viewing Location	Visibility of the Plant Expansion	Viewer Sensitivity	Visual Effect of Plant Expansion	Assessed Visual Impact
Residential area to the west (Chisholm Place)	The substrate plant is visible across South Creek, partly screened	Low to Moderate, given the context of the existing view	Moderate, as the site will appear expanded to the north and in full height	Moderate
Mulgrave Village, industrial area and station	Views available from some areas near Mulgrave Road, partly screened	Low, given the context of the existing view and mostly non-residential viewers	Low	Low
Car travellers on Hawkesbury Valley Way	Transitory views into the site, partly screened	Low	Low to moderate, as the road provides a vantage point	Low
Rail travellers	Transitory views into the site, partly screened	Low	Low	Low

It is the conclusion of the visual impact assessment that while the proposed substrate plant expansion will be visible in a number of views, it will generally have a low to moderate visual impact. With the additional planting incorporated into the project as proposed, the alteration to the plant will not substantially alter the landscape characteristics of the district.

8.8.7 Summary of Mitigating Measures

To minimise visual impact of the development the following measures have been incorporated into the project:

- commence screen planting around the periphery of the extended platform area as early as possible during the project;
- during construction, minimise the area of physical disturbance to the land at any one time and revegetate any disturbed areas visible from beyond the site that are not required as hardstand;
- fill batters are to be mulched as soon as possible after completion and maintained to achieve total vegetation cover;
- continue to maintain previous landscaping and screen planting on the site to maximise screening of the plant;
- incorporate building materials of the same colour and texture as used in the existing plant, which minimise glare and visual obtrusiveness.

8.9 FLORA AND FAUNA

Kevin Mills and Associates undertook a flora and fauna assessment of the project sites which is included in *Appendix N*. At the Mulgrave site the area to be filled was examined, being approximately 1.6 ha to the east of the currently filled platform.

The survey reported that the land to be filled at the Mulgrave site has been re-contoured in the past and now contains no naturally occurring native vegetation. The surface vegetation is primarily exotic grasses and herbs for grazing with some weed species present. The site contains almost no habitat attributes that would attract native fauna. The adjoining dam provides habitat for turtles and birds but lacks fringing vegetation and is therefore not an important wetland habitat.

No threatened species were recorded at the site and none are expected to occur. Owing to the characteristics of this site, further assessment of flora and fauna on the Mulgrave site under State and Commonwealth legislation is not warranted.

The proposed development at Mulgrave will have no significant impact on flora and fauna. The operator will continue to manage the balance of the rural property to maintain pasture and suppress weeds.

8.10 GREENHOUSE GAS ASSESSMENT

PAE Holmes has undertaken a greenhouse gas assessment for the substrate plant, included in the air quality assessment, *Appendix P*. Australia has ratified the Kyoto protocol establishing an obligation to meet a national obligation to meet a target for greenhouse gas emissions over the five year period from 2008 to 2012. Australia's annual target is 108 per cent of the 1990 emissions.

In assessing the greenhouse gas emissions from the proposed substrate plant expansion, PAE Holmes considered:

- direct emissions from within the property (Scope 1);
- off-site emissions created in producing energy purchased from others for use in the property (Scope 2); and
- all other indirect emissions consequential to the operation but not controlled by the operator (Scope 3).

Fuel consumed on the premises includes diesel, electricity and natural gas. Other fuel emissions occur off site from vehicle movements associated with the operation and from losses in the electricity supply system.

Composting produces methane, which is a potent greenhouse gas. However, the raw materials for the composting process are agricultural products and by-products. If these materials were not used in the composting process, they would undergo decomposition, either from natural composting in the environment or use for another purpose such as stock feed. Consequently the composting process at the plant does not contribute greenhouse gas emissions that would not otherwise occur.

Table 8.4 is derived from *Appendix P* and summarises is the quantity of greenhouse gas emissions, in tonnes of CO_2 equivalent, estimated to be generated at present and when each of the three stages of expansion is operating at full capacity.

Table 8.4 GREENHOUSE GAS EMISSIONS (tonnes of CO_2 equivalent per year)

Source	Existing	Stage 1	Stage 2	Stage 3
Diesel (stationary)	390	623	796	970
Diesel (transport)	173	289	463	636
Electricity	4	5	7	10
Natural Gas	33	54	81	109
Total	**600**	**971**	**1,347**	**1,725**

The total quantity of greenhouse gas generated by the expanded substrate plant, when operating at full capacity, is estimated to increase the total of Australia's 2008 emissions by 0.0005 per cent.

An energy efficiency program will be implemented as part of the environmental management plan for the purpose of minimising the greenhouse gas impact of the development. This will have the added benefit from a business perspective of minimising production costs. The program will have two key elements:

- improving energy use and efficiency wherever practicable; and
- raising awareness among suppliers, customers, employees and contractors of the need to maximise energy efficiency.

8.11 ENVIRONMENTAL HAZARDS

Mushroom substrate production is not a hazardous or potentially hazardous industry as defined in *State Environmental Planning Policy No 33 - Hazardous and Offensive Development* (the SEPP). As explained in section 3.5.5, substrate production is not an industry hence SEPP 33 does not apply to the development.

The Mulgrave facility involves indoor processing of agricultural products. It does not pose a significant risk to human health, life or property or to the biophysical environment. There are no hazardous substances used or produced in the process.

Although SEPP 33 does not apply to the development, for completeness the matters for consideration listed in clause 13 of the SEPP for a potentially offensive industry are reproduced in *Table 8.5* together with a consideration of the proposal against each provision.

Table 8.5 SEPP 33 MATTERS FOR CONSIDERATION

Matters for Consideration		Comment
a)	*current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development; and*	There are no current circulars relating to potentially offensive industry as defined in the SEPP.
b)	*whether any public authority should be consulted concerning any environmental and land use safety requirements with which the development should comply; and*	This is a matter for the approving body.

c)	*in the case of development for the purpose of a potentially hazardous industry - a preliminary hazard analysis prepared by or on behalf of the applicant; and*	Not relevant as the proposal is not development for the purpose of a potentially hazardous industry.
d)	*any feasible alternatives to the carrying out of the development and the reasons for choosing the development the subject of the application (including any feasible alternatives for the location of the development and the reasons for choosing the location of the subject of the application); and*	Alternatives are considered in Section 1.7
e)	*any likely future use of the land surrounding the development.*	The land surrounding the development site is described in section 2.4. It is conceivable that the residential development in Mulgrave village may increase in density, with zoning change. Other nearby land uses such as agricultural land (flood plain) and industrial development are unlikely to alter over time.

8.12 HERITAGE

8.12.1 Indigenous Heritage

As described in section 6.11, Biosis Research undertook an archaeological and cultural heritage assessment of the mushroom farm site at Londonderry and the land affected by expansion of the substrate plant at Mulgrave. A copy of the assessment report, dated April 2009, is included in *Appendix O*.

Examination of heritage registers revealed that twenty three Aboriginal sites and seven areas of potential archaeological deposit (PAD) have previously been recorded in the vicinity of the substrate plant site, but none have been discovered within the property itself. All of these sites and PADs were recorded on the Aboriginal Heritage Information Management System (AHIMS) register, managed by DECCW and are listed in *Appendix O*.

A ground survey was undertaken in the presence of representatives of the Deerubbin Local Aboriginal Land Council. No Aboriginal sites were identified. Biosis considers that previous rural land uses and subsequent ground disturbance have reduced the likelihood of finding intact archaeological cultural deposits on the site.

The recommendations of the cultural heritage assessment, reported in section 6.11, are equally applicable to the substrate plant site:

- should any Aboriginal object be identified during construction, work should cease and notification given to DECCW and other parties as indicated in *Appendix O*;
- should skeletal remains be discovered, the protocol outlined in *Appendix O* should be followed.

The recommendations of the report will be implemented as part of the project.

8.12.2 Non-Indigenous Heritage

In undertaking the cultural heritage assessment described in section 8.12.1 above, Biosis Research examined local, State and Commonwealth heritage registers. Biosis reported in *Appendix O* that no items of non-indigenous heritage were listed for the site of the proposed substrate plant expansion.

As indicated in section 3.3.2, there are three heritage items listed for Mulgrave in Hawkesbury LEP 1989, all of which are in the vicinity of the substrate plant:

- Mulgrave railway station;
- the railway stationmaster's cottage, located adjacent to the substrate plant site near Mulgrave Road, between the site and the railway; and
- "Tall Trees", a rural market garden property adjacent to the southern side of the railway, 124 Mulgrave Road.

These heritage items can be seen in the aerial photo, *Figure 2.4*. The proposed expansion of the substrate plant will have no significant effect on the heritage significance of these listed items.

8.13 CUMULATIVE IMPACT

There are two principal aspects to consideration of cumulative impact:

- the accumulation of incremental environmental changes from multiple sources over time. Examples would be land clearing, resource depletion or greenhouse gas emission; and
- a combination of environmental effects upon a locality from a single activity. For example noise and dust generated by vehicles on an unsealed road.

The proposed substrate plant expansion adds to previous and ongoing changes in the Mulgrave locality in the following manner:

- an insignificant alteration to flooding characteristics in the area. Existing flood characteristics are the result natural forces in combination with all historic changes at various locations on the South Creek flood plain;
- addition of building development and tree planting, further contributing to conversion of Mulgrave from a primarily rural district to a locality of mixed development;
- a minor increase of traffic on roads used for access to the site and associated traffic noise;
- minor changes to multiple sources of odour and noise in the locality;
- no significant change to water quality.

None of the above cumulative impacts are considered to be significant.

9

JUSTIFICATION AND CONCLUSIONS

9.1 JUSTIFICATION

The Hawkesbury region has the greatest concentration of mushroom growers in Australia. The industry provides an economic value to the community of around $450 million each year[1] and with 600 people employed directly in the industry, is one of three major employers in the region (others are Richmond RAAF Base and University of Western Sydney Richmond campus).

Owing to the age of mushroom growing infrastructure in New South Wales however, and progressive closure of older mushroom farms, particularly in western Sydney, New South Wales mushroom growers have not been able to expand production quickly enough to keep pace with the pattern of increased consumption. Growers in New South Wales no longer produce sufficient mushrooms to satisfy the State's demand.

The Tolson Group has been growing mushrooms in western Sydney since 1967. The Group now employs approximately 350 personnel at three mushroom farms, a packing and distribution factory and a mushroom substrate plant at Mulgrave. The substrate plant supplies not only Tolson Group mushroom farms but a number of other mushroom farms in the region and beyond that are reliant on substrate produced at Mulgrave.

The current proposal to establish a new mushroom farm at Londonderry and expand the capacity of the existing Mulgrave substrate plant will help to maintain the Hawkesbury region as the principal mushroom-growing area of Australia and enable New South Wales to move towards regaining its self-sufficiency in mushroom production. The proposed development will help the local industry respond to increasing mushroom consumption, through production at the new Londonderry farm and by supplying additional substrate to other growers enabling them to increase output.

At full production, the proposed mushroom farm will directly employ approximately 165 people. The substrate plant expansion will employ a further eight personnel and will provide the opportunity for additional investment and innovation in environmental control of substrate production.

[1] Australian Mushroom Growers Association

The proponents are experienced operators in the industry, familiar with environmental management procedures applicable to mushroom growing and substrate production and fully competent to undertake the development.

9.2 CONCLUSIONS

This environmental assessment has shown that developing the mushroom farm at Londonderry and expanding the substrate plant at Mulgrave will not create a significant adverse impact on other land. Environmental safeguards, including advanced design and operating techniques will be incorporated into the development of both sites to control potential environmental impacts.

At Londonderry, the presence of the intensive agricultural enterprise on the property will alter the appearance of the land, although visibility of the development will be limited by proposed landscaping, including an earthen mound on two boundaries. Noise from night time activities associated with the mushroom farm will generally be within criteria recommended by DECCW and should not cause significant alteration to amenity at residences in the area. Odour is assessed not to be an issue at the mushroom farm and the farm does not present a risk to water quality. The site is suitable for the development, having been assessed for flora/fauna, cultural heritage soil contamination and suitability for effluent disposal.

The Mulgrave operation is well established on the property. Potential odour impacts have been modelled and shown to fall within established criteria during stages 1 and 2 of the development. Stage 2 of the proposal includes substantial additions to odour control apparatus at the plant. The operators have undertaken that odour emissions will continue to remain within the existing licence limit. The Stage 2 production tonnage will not be exceeded until the effectiveness of improved odour controls introduced during that stage have been verified allowing accurate predictions to be made for Stage 3 and on that basis, further planning approval obtained.

Noise from the Mulgrave expansion has been assessed and found to be within DECCW criteria during day, evening and night periods. The operation does not discharge water and is not a threat to water quality. The appearance of additional structures, will be screened as far practicable by extensive landscaping, much of which is already in evidence on the property. There are no issues with flora/fauna, cultural heritage or contamination.

Both facilities will operate with environmental management plans. The existing EMP for the Mulgrave substrate plant will be upgraded prior to commencement of the development to incorporate matters arising from the approval. A new EMP will be prepared for the Londonderry mushroom farm incorporating requirements of the approval and this environmental assessment.

9.3 DRAFT STATEMENT OF COMMITMENTS

This draft Statement of Commitments identifies environmental management and mitigation measures that Elf Mushrooms and Elf Farm Supplies commit to implement in expanding their operations in western Sydney. It consolidates environmental management and mitigation measures contained in this Environmental Assessment and already being implemented at the existing facilities in accordance with the existing approvals and environmental management plan.

Commitments are listed separately for the mushroom farm and the substrate plant. Elf Mushrooms is responsible for implementing the commitments in respect of the mushroom farm and Elf Farm Supplies is responsible for the commitments pertaining to the substrate plant.

9.3.1 Mushroom Farm - Construction

Outcome		Commitment	Timing
Environmental management	1.1	Prepare and subsequently implement an environmental management plan for construction, consistent with this environmental assessment and conditions of approval.	Prior to issue of construction certificate
	1.2	Identify and clearly mark vegetation to be retained.	Prior to construction
	1.3	Instruct all construction personnel of the requirements for environmental management on the site.	Prior to and during construction
Minimise soil erosion and sediment deposition	1.4	Implement erosion and sediment controls consistent with the erosion and sediment control plan and keep in place with adequate maintenance until work is complete or they are no longer required.	Prior to commencement of earthworks and thereafter as long as necessary
	1.5	Progressively rehabilitate areas disturbed during construction with grass or landscaping as designed	During construction
Control nuisance dust	1.6	Implement dust mitigation measures described in section 6.6 of this environmental assessment.	During construction
Minimise construction noise	1.7	Implement construction noise mitigation measures described in section 6.4 of this EA.	During construction
Manage construction traffic	1.8	Implement traffic safety measures described in section 6.5 of this environmental assessment.	During construction
	1.9	Construct the intersection of the site access road and The Northern Road to Type AU in accordance with the RTA *Road Design Guide*	Prior to issue of occupation certificate

Outcome		Commitment	Timing
Minimise visual impact	1.10	Implement the measures to reduce visual impact of the development described in section 6.7 of this EA.	During construction and prior to issue of occupation certificate
Protect cultural heritage	1.11	Should the occasion arise, implement the protocols contained in the two recommendations of the heritage assessment described in section 6.11.	During construction
Protect flora and fauna	1.12	Implement the measures to minimise impacts on flora and fauna described in section 6.8.	Prior to and during construction

9.3.2 Mushroom Farm - Operation

Outcome		Commitment	Timing
Environmental management	2.1	Prepare and subsequently implement an environmental management plan for operation consistent with this EA and conditions of approval.	Prior to issue of occupation certificate for each stage
Minimise operational noise	2.2	Operate the farm in a manner to maintain noise levels at nearby sensitive receptors within DECCW criteria.	During operation
	2.3	Implement operational noise mitigation measures described in section 6.4 of this EA.	During operation
Avoid offensive odour	2.4	Implement the odour controls referred to in section 5.5 and section 6.6 of this EA.	During operation
Effectively manage operational water	2.5	Manage the operation to prevent discharge of process water from the site and to maximise use of collected and recycled water.	During operation
	2.6	Adequately maintain the sewage treatment plant to ensure satisfactory operation.	During operation
	2.7	Adequately maintain the wash down water recycling system to ensure satisfactory operation.	During operation
Protect flora and fauna	2.8	Continue to suppress weeds on the development site and protect remaining trees.	During operation
Bushfire Protection	2.9	Maintain defendable areas and asset protection zones as described in section 6.10 of this EA	During operation
Monitor performance	3.0	Continue to monitor operations as specified in the environment management plan	During operation

9.3.3 Substrate Plant - Construction

Outcome		Commitment	Timing
Environmental management	3.1	Prepare and subsequently implement an environmental management plan for construction, or modify the existing EMP, consistent with this EA and conditions of approval.	Prior to issue of construction certificate
	3.2	Instruct all construction personnel of the requirements for environmental management on the site.	Prior to and during construction
Minimise soil erosion and sediment deposition	3.3	Implement erosion and sediment controls consistent with the erosion and sediment control plan and keep in place with adequate maintenance until work is complete or they are no longer required.	Prior to commencement of earthworks and thereafter as long as necessary
	3.4	Progressively rehabilitate areas disturbed during construction with landscaping or hardstand as designed	During construction
Control nuisance dust	3.5	Implement dust mitigation measures described in section 8.2 of this environmental assessment.	During construction
Minimise construction noise	3.6	Implement construction noise mitigation measures described in section 8.6 of this EA.	During construction
Manage construction traffic	3.7	Implement traffic safety measures described in section 8.5 of this environmental assessment.	During construction
Minimise visual impact	3.8	Implement the measures to reduce visual impact of the development described in section 8.8 of this EA.	During construction
Protect cultural heritage	3.9	Should the occasion arise, implement the protocols contained in the two recommendations of the heritage assessment described in section 8.12.	During construction
Protect flora and fauna	3.10	Suppress weeds on the construction site and protect existing landscape planting that is to be retained.	During construction

9.3.4 Substrate Plant - Operation

Outcome		Commitment	Timing
Environmental management	4.1	Prepare and subsequently implement an environmental management plan for operation, or modify the existing EMP, consistent with this EA and conditions of approval.	Prior to issue of occupation certificate for each stage
Production limit	4.2	Maintain average weekly production of Phase 1 substrate within upper limits as follows: • Stage 1 1600 tonnes • Stage 2 2400 tonnes • Stage 3 3,200 tonnes	During operation
Minimise operational noise	4.3	Operate the plant in a manner to maintain noise levels at nearby sensitive receptors within DECCW criteria.	During operation
	4.4	Implement operational noise mitigation measures described in section 8.6 of this EA.	During operation
Avoid offensive odour	4.5	Operate the plant in a manner to maintain odour emissions within the limit specified in the DECCW licence.	During operation
	4.6	Implement the odour controls referred to in section 8.2 and section 7.6	During operation
Effectively manage operational water	4.7	Manage the operation to prevent discharge of process water from the site and to maximise use of collected and recycled water.	During operation
Minimise visual impact	4.8	Continue to manage the landscaped areas to ensure the vegetation screen remains effective.	During operation
Protect flora and fauna	4.9	Continue to suppress weeds on the development site and protect remaining trees.	During construction
Monitor and report performance	4.10	Continue to monitor operations and report results as specified in the environment management plan	During operation

APPENDICES

Appendix A

DIRECTOR – GENERAL'S REQUIREMENTS

NSW GOVERNMENT
Department of Planning

Major Project Assessment
Industry & Mining
Contact: Georgia Ivancevic
Phone: (02) 9228 6457
Fax: (02) 9228 6466
Email: Georgia.Ivancevic@planning.nsw.gov.au

Our Ref: S08/00149

Mr Terry Perram
Principal
T W Perram & Partners Pty Ltd
12 Clanwilliam Street
EASTWOOD NSW 2122

RECEIVED
21 JAN 2009

Dear Mr Perram

Tolson's Mushroom Farm and Substrate Plant Project (MP 08_0255)
Director General's Requirements

The Department has received your application for the Tolson's Mushroom Farm and Substrate Plant Project.

I have attached a copy of the Director-General's requirements for the project. These requirements have been prepared in consultation with the relevant Government agencies, and are based on the information you have provided to date. I have also attached a copy of the agencies' comments for your information.

Please note that the Director-General may alter these requirements at any time.

The Department prefers operations like the Mushroom Farm and Substrate Plant to operate under one, modern planning approval. Consequently, you are advised that the Department expects the company to surrender all existing planning approvals if the project is approved, and recommends that the project be developed with this in mind. Further details of this requirement are included in the attached table.

If your proposal is likely to have a significant impact on matters of National Environmental Significance, it will require an approval under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). This approval is in addition to any approvals required under NSW legislation. It is your responsibility to contact the Department of Environment, Water, Heritage and the Arts in Canberra (6274 1111 or http://www.environment.gov.au) to determine if the proposal requires an approval under the EPBC Act. The Commonwealth Government has accredited the NSW environmental assessment process, so if it is determined that an approval is required under the EPBC Act, please contact the Department immediately as supplementary Director-General's requirements may need to be issued.

I would appreciate it if you would contact the Department at least two weeks before you propose to submit your Environmental Assessment for the project. This will enable the Department to determine the:

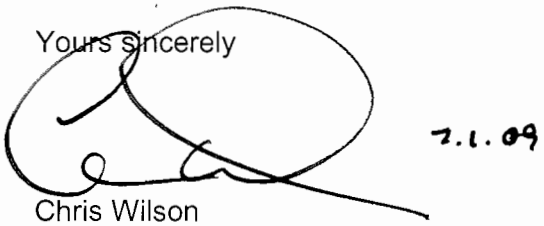
- applicable fee (see Division 1A, Part 15 of the Environmental Planning and Assessment Regulation 2000); and
- number of copies (hard-copy or CD-ROM) of the Environmental Assessment that will be required for exhibition purposes.

Once it receives the Environmental Assessment, the Department will review it in consultation with the relevant agencies to determine if it adequately addresses the Director-General's requirements, and may require you to revise it prior to public exhibition.

The Department is required to make all the relevant information associated with the project publicly available on its website. Consequently, I would appreciate it if you would ensure that all the documents you subsequently submit to the Department are in a suitable format for the web, and arrange for an electronic version of the Environmental Assessment to be hosted on a suitable website during the exhibition period.

If you have any enquiries about these requirements, please contact Georgia Ivancevic on 9228 6457 or Georgia. Ivancevic@planning.nsw.gov.au.

Yours sincerely



7.1.09

Chris Wilson
Executive Director
Major Project Assessment
As delegate for the Director-General

Director-General's Requirements

Section 75F and 75M of the *Environmental Planning and Assessment Act 1979*

Application Number	MP 08_0255
Project	The Tolson's Mushroom Farm and Substrate Plant Project, which includes the establishment of a new mushroom farm at Londonderry and an extension of a mushroom substrate plant at Mulgrave.
Location	Lot 138, DP 752037, 521 The Northern Road, Londonderry and Lot 4 DP 610341 and part Lot 3 DP 771652, 108 Mulgrave Road, Mulgrave
Proponent	Elf Farm Supplies Pty Ltd and Elf Mushrooms
Date of Issue	January 2009
General Requirements	The Environmental Assessment must include: • an executive summary; • a detailed description of the existing site, current operations and landuse; • a detailed description of the project, including the: – need for the project; – alternatives considered; – likely staging of the project; and – plans of any proposed building works; • a risk assessment of the potential environmental impacts of the project, identifying the key issues for further assessment; • a detailed assessment of the key issues specified below, and any other significant issues identified in the risk assessment (see above), which includes: – a description of the existing environment, using sufficient baseline data; – an assessment of the potential impacts of all stages of the project, including any cumulative impacts, taking into consideration any relevant guidelines, policies, plans and statutory provisions (see below); – a description of the measures that would be implemented to avoid, minimise, mitigate, rehabilitate/remediate, monitor and/or offset the potential impacts of the project, including detailed contingency plans for managing any potentially significant risks to the environment; • a statement of commitments, outlining all the proposed environmental management and monitoring measures; • a summary of all previous consents issued for the facility including: – a summary of the conditions of consent that are relevant to on-going operation and management; – a summary of the conditions that are no longer relevant and justification for modifying or removing such conditions for the expanded facility; and – details of any components that have consent, but have not been constructed. • a conclusion justifying the project on economic, social and environmental grounds, taking into consideration whether the project is consistent with the objects of the *Environmental Planning & Assessment Act 1979*; • a signed statement from the author of the Environmental Assessment, certifying that the information contained within the document is neither false nor misleading.
Key Issues	• **Air quality** - including odours, particulate and other emissions due to the proposal;

	• **Soils and Water** - including: – a detailed assessment of potential soil, surface and groundwater impacts; – a water balance for the site detailing water sources, water consumption, water recycling, the quantity and quality of waste water streams and the impact of any water and wastewater release from the site on surface and groundwater; – proposed erosion and sediment controls (during construction) and the proposed stormwater management scheme (during operations); – soil contamination; – flooding; and – spill containment and bunding; • **Traffic** – including: – details of traffic types and volumes likely to be generated during construction and operation; – an assessment of the predicted impacts of this traffic on the safety and capacity of the surrounding road network; and – details of key transport routes, site access, internal roadways, infrastructure works and parking; • **Noise** – including construction, operation and traffic noise; • **Waste Management** - identify the quantity and type of all liquid and solid waste generated on the site and how this waste would be handled, processed and, if necessary, disposed of; • **Flora and Fauna** – including impacts on critical habitats (including riparian habitat and groundwater dependent ecosystems), threatened species, populations, ecological communities and native vegetation; • **Greenhouse Gas & Energy Efficiency** – including: - a quantitative assessment of the potential scope 1 and 2 greenhouse gas emissions of the project, and qualitative assessment of the potential impacts of these emissions on the environment; and - a detailed description of the measures that would be implemented on site to ensure that the project is energy efficient; • **Hazards** – including consideration of the proposal against the relevant provisions of *State Environmental Planning Policy No.33 – Hazardous and Offensive Development*; • **Visual** – assess the visual impact of design and siting of the buildings, landscaping, lighting and any signage; and • **Heritage –** both Aboriginal and non-Aboriginal.
References	The environmental assessment of the key issues listed above must take into account relevant guidelines, policies, and plans. While not exhaustive, the following attachment contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this project.
Consultation	During the preparation of the Environmental Assessment, you should consult with the relevant local, State or Commonwealth government authorities, service providers, community groups or affected landowners. In particular, you must consult with the: • Department of Environment and Climate Change; • Department of Primary Industries (Agriculture); • NSW Fire Brigades; • Hawkesbury City Council; • Penrith City Council. The consultation process and the issues raised must be described in the Environmental Assessment.
Deemed Refusal Period	60 days

Guidelines, Policies and Plans

Aspect	Policy /Methodology
Risk	
	Multi-Level Risk Assessment (DUAP, 1997)
Air Quality	
	Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC, 2005)
	Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DECC, 2007)
	Technical Framework: Assessment and Management of Odour from Stationary Sources in NSW (DEC, 2006)
	Technical Notes: Assessment and Management of Odour from Stationary Sources in NSW (DEC, 2006)
	Protection of the Environment Operations (Clean Air) Regulation 2002
Soil and Water	
Soil	Design Manual for Soil Conservation Works - Technical Handbook No. 5 (DoL, 1987)
	State Environmental Planning Policy No. 55 – Remediation of Land
	Managing Land Contamination – Planning Guidelines SEPP 55 – Remediation of Land (DOP)
Surface Water	National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2001)
	National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ, 2000)
	Using the ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006)
	Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC, 2004)
	Managing Urban Stormwater: Soils and Construction (Landcom, 2004)
	Managing Urban Stormwater: Treatment Techniques (EPA, 1997)
	Managing Urban Stormwater: Strategic Framework. Draft (EPA, 1996)
	Managing Urban Stormwater: Source Control. Draft (EPA, 1998)
Groundwater	The NSW State Groundwater Policy Framework Document (DLWC, 1997)
	The NSW State Groundwater Quality Protection Policy (DLWC, 1998)
	The NSW State Groundwater Dependent Ecosystems Policy (DLWC, 2002)
	National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC, 1995)
Transport	
	Guide to Traffic Generating Development (RTA)
	Road Design Guide (RTA)
Noise	
	NSW Industrial Noise Policy (DECC)
	Environmental Criteria for Road Traffic Noise (NSW EPA)
	Environmental Noise Control Manual (DECC)
Waste	
	Waste Classification Guidelines (DECC)
	DECC's Environmental Guidelines: Composting and Related Organics Processing Facilities (DECC, 2004)
Flora and Fauna	
	Draft Guidelines for Threatened Species Assessment under Part 3A of the

	Environmental Planning and Assessment Act 1979 (DEC, 2005);
	Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC, 2004);
	NSW Groundwater Dependent Ecosystem Policy (DNR, 2002)
	Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 - Guide to implementation in NSW (DoP, 2007)
Greenhouse Gas and Energy Efficiency	
	National Greenhouse Accounts (NGA) Factors (DECC)
	Guidelines for Energy Savings Action Plans (DEUS, 2005)
Hazards	
	The storage and handling of flammable and combustible liquids (Standards Australia, 2004, AS 1940-2004)
	Storing and Handling Liquids: Environmental Protection Manual (DECC)
	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
	Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines (DUAP, 1997)
Visual	
	Control of Obtrusive Effects of Outdoor Lighting (Standards Australia, AS 4282)
Heritage	
Aboriginal	Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC)
Non-Indigenous	NSW Heritage Manual (NSW Heritage Office & DUAP)
	The Burra Charter (The Australia ICOMOS charter for places of cultural significance)
Strategic	
	Sydney Regional Environmental Plan No 20 – Hawkesbury-Nepean River
	State Environmental Planning Policy No 30 – Intensive Agriculture
	Hawkesbury Development Control Plan 2002 (Hawkesbury City Council)
	Penrith Development Control Plan 2006 (Penrith City Council)

Your Ref: S08/00149

Our Ref: DW2966698

18 December 2008

Department of Planning
Major Development Assessment
DX 10181
SYDNEY

Attention: Georgia Ivancevic

Dear Ms Ivancevic

Proposed Mushroom Farm and Substrate Plant Project, Londonderry and Mulgrave

I refer to your letter of 2 December requesting Council's key requirements for the preparation of the Environmental Assessment for the abovementioned project proposal. Council's comments relate to the substrate plant extension project at Mulgrave.

A review of the preliminary Environmental Assessment prepared by the applicant indicates that the majority of the relevant issues seem to be proposed to be addressed in the Environmental Assessment (EA) to be prepared.

Council agrees that the nominated proposed key issues of air and water quality, noise, transport and visual amenity must be addressed in the EA as a minimum. Council requests that the Director-General's requirements include the following additional key issues;

1. Odour monitoring and management
   A Management Plan should be developed that deals with the additional issues of control of fugitive odours, management and monitoring of odour controls (particularly related to certain weather conditions that trap odours in the locality), complaint management and regular reporting of odour monitoring results.

2. Details of the minor additional filling proposed and the impacts that work may have on surrounding properties and the floodplain,

3. Detailed landscape plans for the site,

4. Flood site management and flood evacuation plans

Council appreciates the opportunity to provide input into the Director-General's requirements. It is requested that a copy of the requirements, when completed, be forwarded to Council for reference.

If there are any queries regarding this matter please contact the undersigned.

Yours faithfully

Matthew Owens
Director City Planning

Direct Line: (02) 4560 4540

Our reference : DOC08/60407
Contact : Deanne Pitts (02) 9995 5595

Ms Georgia Ivancevic
Environmental Planning Officer
Major Development Assessment
Department of Planning
GPO Box 39
SYDNEY NSW 2001

STANDARD POST & FACSIMILE

Dear Ms Ivancevic

Proposed Mushroom Farm and Expansion of Substrate Plant – S08/00149
Elf Farm Supplies Pty Ltd

I refer to your letter dated 2 December 2008 and received by the Department of Environment and Climate Change NSW ("DECC") on 3 December 2008 requesting Director General's requirements for the preparation of an Environmental Impact Statement ("EIS") for a proposed mushroom farm and expansion of the substrate plant for Elf Farm Supplies Pty Ltd.

DECC has considered the details of the proposal as provided by the proponent and the Department of Planning and has identified the following information it requires for the EIS in Attachment 'A' to this letter. All sections must be addressed with respect to both proposals (new mushroom farm and expansion of substrate plant). Sections I and J contain site specific information requirements for the mushroom farm and substrate plant respectively.

In summary, DECC's key information requirements for the proposal are:

1) Compost management;
2) Waste management;
3) Stormwater and wastewater management (including management of leachate);
4) Air quality issues (including odour management and dust management);
5) Noise impacts; and
6) Site design.

Based upon the information provided to DECC, the applicant may require an environment protection licence for the "spent composting processing facility" at the proposed mushroom farm at Londonderry in accordance with Schedule 1 of the *Protection of the Environment Operations Act 1997.* The following categories may apply:

PO Box A290 Sydney South NSW 1232
59-61 Goulburn St Sydney NSW 2000
Tel: (02) 9995 5000 Fax: (02) 9995 5999
TTY (02) 9211 4723
ABN 30 841 387 271
www.environment.nsw.gov.au

- (12) Composting
- (41) Waste processing (non-thermal treatment)
- (42) Waste storage

The applicant will need to make a separate application to DECC to obtain this licence if it is required, after development consent has been granted.

If you have any further queries regarding this matter, please contact Deanne Pitts on (02) 9995 5595.

Yours sincerely

18/12/08

LESLEY CORKILL
A/Unit Head Waste Operations
Environment Protection and Regulation

Encl: Attachment A - Director General Requirements

ATTACHMENT A:

ENVIRONMENTAL ASSESSMENT REQUIREMENTS FOR

THE PROPOSED MUSHROOM FARM, THE NORTHERN RD, LONDONDERRY

AND

EXPANSION OF THE SUBSTRATE PLANT, MULGRAVE

December 2008

DECC Director General Requirements

The DECC Director General Requirements have been structured in the following way:

A. Executive summary

B. The proposal

C. The location

D. Identification and prioritisation of issues

E. The environmental issues

F. List of approvals and licences

G. Compilation of mitigation measures

H. Justification of the proposal

I. Site specific requirements for the proposed mushroom farm, Londonderry

J. Site specific requirements for the proposed expansion of the substrate plant, Mulgrave

A. Executive Summary

The executive summary should include a brief discussion of the extent to which the proposal achieves identified environmental outcomes.

B. The proposal

1. Objectives of the proposal

The objectives of the proposal should be clearly stated and refer to:

a) the size and type of the operation, the nature of the processes and the products, by-products and wastes produced
b) a life cycle approach to the production, use or disposal of products
c) the anticipated level of performance in meeting required environmental standards and cleaner production principles
d) the staging and timing of the proposal and any plans for future expansion
e) the proposal's relationship to any other industry or facility.

2. Description of the proposal

General

- Outline the production process including:
  a) the environmental "mass balance" for the process – quantify in-flow and out-flow of materials, any points of discharge to the environment and their respective destinations (sewer, stormwater, atmosphere, recycling, landfill etc)
  b) any life-cycle strategies for the products.

- Outline cleaner production actions, including:
  a) measures to minimise waste (typically through addressing source reduction)
  b) proposals for use or recycling of by-products
  c) proposed disposal methods for solid and liquid waste
  d) air management systems including all potential sources of air emissions, proposals to re-use or treat emissions, emission levels relative to relevant standards in regulations, discharge points
  e) water management system including all potential sources of water pollution, proposals for re-use, treatment etc, emission levels of any wastewater discharged, discharge points, summary of options explored to avoid a discharge, reduce its frequency or reduce its impacts, and rationale for selection of option to discharge
  f) soil contamination treatment and prevention systems.

- Outline construction works including:
  a) actions to address any existing soil contamination
  b) any earthworks or site clearing; re-use and disposal of cleared material (including use of spoil on-site)
  c) construction timetable and staging; hours of construction; proposed construction methods
  d) environment protection measures, including noise mitigation measures, dust control measures and erosion and sediment control measures.

Air

- Identify all sources of air emissions from the development.

  Note: emissions can be classed as either point (eg emissions from stack or vent) or fugitive (from wind erosion, leakages or spillages associated with loading or unloading, conveyors, storage facilities, plant and yard operation, vehicle movements and associated dust from roads, exhausts, loss from load, land clearing and construction works)

- Provide details of the project that are essential for predicting and assessing air impacts including:
  a) the quantities and physio-chemical parameters (eg concentration, moisture content, bulk density, particle sizes etc) of materials to be used, transported, produced or stored
  b) an outline of procedures for handling, transport, production and storage
  c) the management of solid, liquid and gaseous waste streams with potential for significant air impacts.

Noise and vibration

- Identify all noise sources from the development (including both construction and operation phases). Detail all potentially noisy activities including ancillary activities such as transport of goods and raw materials.
- Specify the times of operation for all phases of the development and for all noise producing activities.
- For projects with a significant potential traffic noise impact provide details of road alignment (include gradients, road surface, topography, bridges, culverts etc), and land use along the proposed road and measurement locations – diagrams should be to a scale sufficient to delineate individual residential blocks.

Water

- Provide details of the project that are essential for predicting and assessing impacts to waters:
  a) including the quantity and physio-chemical properties of all potential water pollutants and the risks they pose to the environment and human health, including

the risks they pose to Water Quality Objectives in the ambient waters (as defined on www.environment.nsw.gov.au/ieo, using technical criteria derived from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality, ANZECC 2000)

b) the management of discharges with potential for water impacts

c) drainage works and associated infrastructure; land-forming and excavations; working capacity of structures; and water resource requirements of the proposal.

- Outline site layout, demonstrating efforts to avoid proximity to water resources (especially for activities with significant potential impacts i.e. effluent ponds) and showing potential areas of modification of contours, drainage etc.
- Outline how total water cycle considerations are to be addressed showing total water balances for the development (with the objective of minimising demands and impacts on water resources). Include water requirements (quantity, quality and source(s)) and proposed storm and wastewater disposal, including type, volumes, proposed treatment and management methods and re-use options.

Waste and chemicals

- Provide details of the quantity and type of any waste that is generated, received, handled, processed or disposed of at the premises. Waste must be classified according to DECC's *Waste Classification Guidelines* (2008).
- Provide details of the quantity, type and specifications for all output products proposed to be produced from the facility. The description should include the physical, chemical and biological characteristics (including contaminant concentrations) of those output products as well as relevant accredited standards against which the products would comply.
- Provide details of intended (or potential) end uses for output products from the facility and the relevant product standards which would be used to assess those products against.
- Provide details of the layout of the facility, the production process and the environmental controls proposed to be installed at the facility. This should include details of any **staged** development, with proposed timeframes for completion. In providing these details, reference should be made to the environmental design requirements and performance benchmarks set out in DECC's *Environmental Guidelines: Composting and Related Organics Processing Facilities* (2004).
- Provide details of all waste management at the facility, including:

  a) the transportation, assessment and handling of waste arriving at or generated at the site

  b) any stockpiling of wastes or recovered materials at the site

  c) any waste processing related to the facility, including reuse, recycling, reprocessing or treatment both on- and off-site

  d) the method for disposing of all wastes or recovered materials at the facility

  e) the emissions arising from the handling, storage, processing and reprocessing of waste at the facility

  f) the proposed controls for managing the environmental impacts of these activities.

- Provide details of spoil disposal with particular attention to:
  a) the quantity of spoil material likely to be generated
  b) proposed strategies for the handling, stockpiling, reuse/recycling and disposal of spoil
  c) the need to maximise reuse of spoil material in the construction industry
  d) identification of the history of spoil material and whether there is any likelihood of contaminated material, and if so, measures for the management of any contaminated material
  e) designation of transportation routes for transport of spoil.
- Provide details of procedures for the assessment, handling, storage, transport and disposal of all hazardous and dangerous materials used, stored, processed or disposed of at the site, in addition to the requirements for liquid and non-liquid wastes.
- Provide details of the type and quantity of any chemical substances to be used or stored and describe arrangements for their safe use and storage.
- In documenting or describing the composition of output products and/or wastes generated from the proposed facility reference should be made to DECC's *Waste Classification Guidelines* (2008).
- The EIS should also provide details of any proposed leachate collection and management systems for contaminated run-off water from stored organic waste and product.

Ecologically Sustainable Development (ESD)

- Demonstrate that the planning process and any subsequent development incorporates objectives and mechanisms for achieving ESD, including:
  a) an assessment of a range of options available for use of the resource, including the benefits of each option to future generations
  b) proper valuation and pricing of environmental resources
  c) identification of who will bear the environmental costs of the proposal.

3. Rehabilitation

- Outline considerations of site maintenance, and proposed plans for the final condition of the site (ensuring its suitability for future uses).

4. Consideration of alternatives and justification for the proposal

- Consider the environmental consequences of adopting alternatives, including alternative:
  a) sites and site layouts
  b) access modes and routes
  c) materials handling and production processes
  d) waste and water management

e) impact mitigation measures
f) energy sources

- Selection of the preferred option should be justified in terms of:
  a) ability to satisfy the objectives of the proposal
  b) relative environmental and other costs of each alternative
  c) acceptability of environmental impacts and contribution to identified environmental objectives
  d) acceptability of any environmental risks or uncertainties
  e) reliability of proposed environmental impact mitigation measures
  f) efficient use (including maximising re-use) of land, raw materials, energy and other resources.

C. The location

1. General

- Provide an overview of the affected environment to place the proposal in its local and regional environmental context including:
  a) meteorological data (eg rainfall, temperature and evaporation, wind speed and direction)
  b) topography (landform element, slope type, gradient and length)
  c) surrounding land uses (potential synergies and conflicts)
  d) geomorphology (rates of landform change and current erosion and deposition processes)
  e) soil types and properties (including erodibility; engineering and structural properties; dispersibility; permeability; presence of acid sulfate soils and potential acid sulfate soils)
  f) ecological information (water system habitat, vegetation, fauna)
  g) availability of services and the accessibility of the site for passenger and freight transport.

2. Air

- Describe the topography and surrounding land uses. Provide details of the exact locations of dwellings, schools and hospitals. Where appropriate provide a perspective view of the study area such as the terrain file used in dispersion models.
- Describe surrounding buildings that may effect plume dispersion.
- Provide and analyse site representative data on following meteorological parameters:
  a) temperature and humidity
  b) rainfall, evaporation and cloud cover
  c) wind speed and direction

d) atmospheric stability class
e) mixing height (the height that emissions will be ultimately mixed in the atmosphere)
f) katabatic air drainage
g) air re-circulation.

3. Noise and vibration

- Identify any noise sensitive locations likely to be affected by activities at the site, such as residential properties, schools, churches, and hospitals. Typically, the location of any noise sensitive locations in relation to the site should be included on a map of the locality.
- Identify the land use zoning of the site and the immediate vicinity and the potentially affected areas.

4. Water

- Describe the catchment including proximity of the development to any waterways and provide an assessment of their sensitivity/significance from a public health, ecological and/or economic perspective. The Water Quality and River Flow Objectives on the website: www.environment.nsw.gov.au/ieo should be used to identify the agreed environmental values and human uses for any affected waterways. This will help with the description of the local and regional area.

5. Soil Contamination Issues

- Provide details of site history – if earthworks are proposed, this needs to be considered with regard to possible soil contamination, for example if the site was previously a landfill site or if irrigation of effluent has occurred.

6. Threatened Species, population, ecological communities and their habitat

- Identify any threatened species or endangered ecological communities likely to be affected by the development in accordance with DECC's *Threatened Species Assessment Guidelines – Assessment of Significance* (2007).

D. Identification and prioritisation of issues/scoping of impact assessment

- Provide an overview of the methodology used to identify and prioritise issues. The methodology should take into account:
  a) DECC's *Environmental Guidelines: Composting and Related Organics Processing Facilities* (2004)
  b) Other relevant NSW government guidelines
  c) Industry guidelines
  d) Environmental Assessments/ Environmental Impact Statements for similar projects
  e) Relevant research and reference material
  f) Relevant preliminary studies or reports for the proposal
  g) Consultation with stakeholders.
- Provide a summary of the outcomes of the process including:
  a) all issues identified including local, regional and global impacts (i.e. increased/ decreased greenhouse emissions)
  b) key issues which will require a full analysis (including comprehensive baseline assessment)
  c) issues not needing full analysis though they may be addressed in the mitigation strategy
  d) justification for the level of analysis proposed (the capacity of the proposal to give rise to high concentrations of pollution compared with the ambient environment or environmental outcomes is an important factor in setting the level of assessment).

E. The environmental issues

1. General

- The potential impacts identified in the scoping study need to be assessed to determine their significance, particularly in terms of achieving environmental outcomes, and minimising environmental pollution.
- Identify gaps in information and data relevant to significant impacts of the proposal and any actions proposed to fill those information gaps so as to enable development of appropriate management and mitigation measures. This is in accordance with ESD requirements.

Note: The level of detail should match the level of importance of the issue in decision making which is dependent on the environmental risk.

Describe baseline conditions

- Provide a description of existing environmental conditions for any potential impacts.

Assess impacts

- For any potential impacts relevant for the assessment of the proposal, provide a detailed analysis of the impacts of the proposal on the environment including the cumulative impact of the proposal on the receiving environment especially where there are sensitive receivers.
- Describe the methodology used and assumptions made in undertaking this analysis (including any modelling or monitoring undertaken) and indicate the level of confidence in the predicted outcomes and the resilience of the environment to cope with the predicted impacts.
- The analysis should also make linkages between different areas of assessment where necessary to enable a full assessment of environmental impacts eg assessment of impacts on air quality will often need to draw on the analysis of traffic, health, social, soil and/or ecological systems impacts; etc.
- The assessment needs to consider impacts at all phases of the project cycle including: exploration (if relevant or significant), construction, routine operation, start-up operations, upset operations and decommissioning if relevant.
- The level of assessment should be commensurate with the risk to the environment.

Describe management and mitigation measures

- Describe any mitigation measures and management options proposed to prevent, control, abate or mitigate identified environmental impacts associated with the proposal and to reduce risks to human health and prevent the degradation of the environment. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.
- Proponents are expected to implement a 'reasonable level of performance' to minimise environmental impacts. The proponent must indicate how the proposal meets reasonable levels of performance. For example, reference technology based criteria if available, or identify good practice for this type of activity or development. A 'reasonable level of performance' involves adopting and implementing technology and management practices to achieve certain pollutant emissions levels in economically viable operations. Technology-based criteria evolve gradually over time as technologies and practices change.
- Use environmental impacts as key criteria in selecting between alternative sites, designs and technologies, and to avoid options having the highest environmental impacts.
- Outline any proposed approach (such as an **Environmental Management Plan**) that will demonstrate how commitments made in the Environmental Assessment will be implemented. Areas that should be described include:
  a) operational procedures to manage environmental impacts
  b) monitoring procedures
  c) training programs
  d) community consultation
  e) complaint mechanisms including site contacts
  f) strategies to use monitoring information to improve performance

g) strategies to achieve acceptable environmental impacts and to respond in event of exceedences.

2. Air

Describe baseline conditions

- Provide a description of existing air quality and meteorology, using existing information and site representative ambient monitoring data.

Assess impacts

- Identify all pollutants of concern and estimate emissions by quantity (and size for particles), source and discharge point.
- Estimate the resulting ground level concentrations of all pollutants. Where necessary (e.g. potentially significant impacts and complex terrain effects), use an appropriate dispersion model to estimate ambient pollutant concentrations. Discuss choice of model and parameters with DECC if needed.
- Describe the effects and significance of pollutant concentration on the environment, human health, amenity and regional ambient air quality standards or goals.
- Describe the contribution that the development will make to regional and global pollution, particularly in sensitive locations.
- For potentially odorous emissions, provide the emission rates in terms of odour units (determined by techniques compatible with DECC procedures). Use sampling and analysis techniques for individual or complex odours and for point or diffuse sources, as appropriate. This analysis must consider the **cumulative** impacts of all odour emissions from the premises and other potentially odorous activities in the surrounding area.

  Note: With dust and odour, it may be possible to use data from existing similar activities to generate emission rates.

- Reference should be made to relevant guidelines e.g. *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2001); *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (EPA, 2001); *Assessment and Management of Odour from Stationary Sources in NSW* (EPA, 2001); *Technical Notes: Draft Policy: Assessment and Management of Odour from Stationary Sources in NSW (EPA, 2001).*

Describe management and mitigation measures

- Outline specifications of pollution control equipment to be used at the site (including manufacturer's performance guarantees where available).
- Describe management protocols and procedures for both point and fugitive emissions. Where possible, this should include cleaner production processes.

- Describe management protocols and procedures for preventing and/or minimising odour emissions from both point and fugitive **odour** sources at the site with special consideration given to:
    - All dams or other leachate collection areas on the site
    - Storage areas for product and/or waste materials.

3. Noise and vibration

Describe baseline conditions

- Determine the existing background (L_{A90}) and ambient (L_{Aeq}) noise levels in accordance with EPA's *NSW Industrial Noise Policy* (2000).
- Determine the existing road traffic noise levels in accordance with EPA's *NSW Environmental Criteria for Road Traffic Noise* (1999) where road traffic noise impacts may occur.
- The noise impact assessment report should provide details of all monitoring of existing ambient noise levels including:
    a) details of equipment used for the measurements
    b) a brief description of where the equipment was positioned
    c) a statement justifying the choice of monitoring site, including the procedure used to choose the site, having regards to the definition of 'noise sensitive locations(s)' and 'most affected locations(s)' described in Section 3.1.2 of EPA's *NSW Industrial Noise Policy* (2000)
    d) details of the exact location of the monitoring site and a description of land uses in surrounding areas
    e) a description of the dominant and background noise sources at the site
    f) day, evening and night assessment background levels for each day of the monitoring period
    g) the final Rating Background Level (RBL) value
    h) graphs of the measured noise levels for each day should be provided
    i) a record of periods of affected data (due to adverse weather and extraneous noise), methods used to exclude invalid data and a statement indicating the need for any re-monitoring under Step 1 in Section B1.3 of EPA's *NSW Industrial Noise Policy* (2000)
    j) determination of L_{Aeq} noise levels from existing industry.

Assess impacts

- Determine the project specific noise levels for the site. For each identified potentially affected receiver, this should include:
    a) determination of the intrusive criterion for each identified potentially affected receiver
    b) selection and justification of the appropriate amenity category for each identified potentially affected receiver
    c) determination of the amenity criterion for each receiver
    d) determination of the appropriate sleep disturbance limit.
- Maximum noise levels during night-time period (10pm-7am) should be assessed to analyse possible affects on sleep. Where $L_{A1(1min)}$ noise levels from the site are less

than 15 dB above the background L_{A90} noise level, sleep disturbance impacts are unlikely. Where this is not the case, further analysis is required. Additional guidance is provided in Appendix B of EPA's *NSW Environmental Criteria for Road Traffic Noise* (1999).

- Determine expected noise level and noise character (eg tonality, impulsiveness, vibration, etc) likely to be generated from noise sources during:
  a) site establishment
  b) construction
  c) operational phases
  d) transport including traffic noise generated by the proposal
  e) other services.

  Note: The noise impact assessment report should include noise source data for each source in 1/1 or 1/3 octave band frequencies including methods for references used to determine noise source levels. Noise source levels and characteristics can be sourced from direct measurement of similar activities or from literature (if full references are provided).

- Determine the noise levels likely to be received at the most sensitive locations (these may vary for different activities at each phase of the development). Potential impacts should be determined for any identified significant adverse meteorological conditions. Predicted noise levels under calm conditions may also aid in quantifying the extent of impact where this is not the most adverse condition.
- The noise impact assessment report should include:
  a) a plan showing the assumed location of each noise source for each prediction scenario
  b) a list of the number and type of noise sources used in each prediction scenario to simulate all potential significant operating conditions on the site
  c) any assumptions made in the predictions in terms of source heights, directivity effects, shielding from topography, buildings or barriers, etc
  d) methods used to predict noise impacts including identification of any noise models used. Where modelling approaches other than the use of the ENM or SoundPlan computer models are adopted, the approach should be appropriately justified and validated
  e) an assessment of appropriate weather conditions for the noise predictions including reference to any weather data used to justify the assumed conditions
  f) the predicted noise impacts from each noise source as well as the combined noise level for each prediction scenario under any identified significant adverse weather conditions as well as calm conditions where appropriate
  g) for developments where a significant level of noise impact is likely to occur, noise contours for the key prediction scenarios should be derived
  h) an assessment of the need to include modification factors as detailed in Section 4 of EPA's *NSW Industrial Noise Policy* (2000)
  i) Discuss the findings from the predictive modelling and, where relevant noise criteria have not been met, recommend additional mitigation measures.

- The noise impact assessment report should include details of any mitigation proposed including the attenuation that will be achieved and the revised noise impact predictions following mitigation.
- Where relevant noise/vibration criteria cannot be met after application of all feasible and cost effective mitigation measures the residual level of noise impact needs to be quantified by identifying:

  a) locations where the noise level exceeds the criteria and extent of exceedence
  b) numbers of people (or areas) affected
  c) times when criteria will be exceeded
  d) likely impact on activities (speech, sleep, relaxation, listening, etc)
  e) change on ambient conditions
  f) the result of any community consultation or negotiated agreement.
- For the assessment of existing and future traffic noise, details of data for the road should be included such as assumed traffic volume; percentage heavy vehicles by time of day; and details of the calculation process. These details should be consistent with any traffic study carried out in the Environmental Assessment.

<u>Describe management and mitigation measures</u>

- Outline the hours of operation for the proposed facility and provide justification for same.
- Determine the most appropriate noise mitigation measures and expected noise reduction including both noise controls and management of impacts for both construction and operational noise. This will include selecting quiet equipment and construction methods, noise barriers or acoustic screens, location of stockpiles, temporary offices, compounds and vehicle routes, scheduling of activities, etc.
- For traffic noise impacts, provide a description of the ameliorative measures considered (if required), reasons for inclusion or exclusion, and procedures for calculation of noise levels including ameliorative measures. Also include, where necessary, a discussion of any potential problems associated with the proposed ameliorative measures, such as overshadowing effects from barriers. Appropriate ameliorative measures may include:
  a) use of alternative transportation modes, alternative routes, or other methods of avoiding the new road usage
  b) control of traffic (eg: limiting times of access or speed limitations)
  c) resurfacing of the road using a quiet surface
  d) use of (additional) noise barriers or bunds
  e) treatment of the façade to reduce internal noise levels buildings where the night-time criteria is a major concern
  f) more stringent limits for noise emission from vehicles (i.e. using specially designed 'quite' trucks and/or trucks to use air bag suspension
  g) driver education
  h) appropriate truck routes
  i) limit usage of exhaust breaks

j) use of premium muffles on trucks
k) reducing speed limits for trucks
l) ongoing community liaison and monitoring of complaints
m) phasing in the increased road use.

4. Water

Describe baseline conditions

- Describe existing surface and groundwater quality – an assessment needs to be undertaken for any water resource likely to be affected by the proposal and for all conditions (e.g. a wet weather sampling program is needed if runoff events may cause impacts).

  Note: Methods of sampling and analysis need to conform to an accepted standard (e.g. Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC 2004) or be approved and analyses undertaken by accredited laboratories).

- Provide site drainage details and surface runoff yield.
- State the ambient Water Quality and River Flow Objectives for the receiving waters. These refer to the community's agreed environmental values and human uses endorsed by the Government as goals for the ambient waters. These environmental values are published on the website: www.environment.nsw.gov.au/ieo. The Environmental Assessment should state the environmental values listed for the catchment and waterway type relevant to your proposal. NB: A consolidated and approved list of environmental values are not available for groundwater resources. Where groundwater may be affected the Environmental Assessment should identify appropriate groundwater environmental values and justify the choice.
- State the indicators and associated trigger values or criteria for the identified environmental values. This information should be sourced from the ANZECC 2000 *Guidelines for Fresh and Marine Water Quality* (http://www.deh.gov.au/water/quality/nwqms) (Note that, as at 2004, the NSW Water Quality Objectives booklets and website contain technical criteria derived from the 1992 version of the ANZECC Guidelines. The Water Quality Objectives remain as Government policy, reflecting the community's environmental values and long-term goals, but the technical criteria are replaced by the more recent ANZECC 2000 Guidelines). NB: While specific guidelines for groundwater are not available, the ANCECC 2000 Guidelines endorse the application of the trigger values and decision trees as a tool to assess risk to environmental values in groundwater.
- State any locally specific objectives, criteria or targets, which have been endorsed by the government e.g. the Healthy Rivers Commission Inquiries (http://www.nrc.nsw.gov.au) or the NSW Salinity Strategy (DLWC, 2000) (http://www.naturalresources.nsw.gov.au/salinity/government/govt-docs.htm).
- Where site specific studies are proposed to revise the trigger values supporting the ambient Water Quality and River Flow Objectives, and the results are to be used for regulatory purposes (e.g. to assess whether a licensed discharge impacts on water

quality objectives), then prior agreement from DECC on the approach and study design must be obtained.

- Describe the state of the receiving waters and relate this to the relevant Water Quality and River Flow Objectives (i.e. are Water Quality and River Flow Objectives being achieved?). Proponents are generally only expected to source available data and information. However, proponents of large or high risk developments may be required to collect some ambient water quality / river flow / groundwater data to enable a suitable level of impact assessment. Issues to include in the description of the receiving waters could include:
  a) lake or estuary flushing characteristics
  b) specific human uses (e.g. exact location of drinking water offtake)
  c) sensitive ecosystems or species conservation values
  d) a description of the condition of the local catchment e.g. erosion levels, soils, vegetation cover, etc
  e) an outline of baseline groundwater information, including, but not restricted to, depth to watertable, flow direction and gradient, groundwater quality, reliance on groundwater by surrounding users and by the environment
  f) historic river flow data where available for the catchment.

Assess impacts

- No proposal should breach clause 120 of the *Protection of the Environment Operations Act* 1997 (i.e. pollution of waters is prohibited unless undertaken in accordance with relevant regulations).
- Identify and estimate the quantity of all pollutants that may be introduced into the water cycle by source and discharge point including residual discharges after mitigation measures are implemented.
- Include a rationale, along with relevant calculations, supporting the prediction of the discharges.
- Describe the effects and significance of any pollutant loads on the receiving environment. This should include impacts of residual discharges through modelling, monitoring or both, depending on the scale of the proposal. Determine changes to hydrology (including drainage patterns, surface runoff yield, flow regimes, wetland hydrologic regimes and groundwater).
- Describe water quality impacts resulting from changes to hydrologic flow regimes (such as nutrient enrichment or turbidity resulting from changes in frequency and magnitude of stream flow).
- Identify any potential impacts on quality or quantity of groundwater describing their source.
- Identify potential impacts associated with geomorphological activities with potential to increase surface water and sediment runoff or to reduce surface runoff and sediment transport. Also consider possible impacts such as bed lowering, bank lowering, instream siltation, floodplain erosion and floodplain siltation.
- Identify impacts associated with the disturbance of acid sulfate soils and potential acid sulfate soils.
- Containment of spills and leaks shall be in accordance with the technical guidelines section 'Bunding and Spill Management' of the *Authorised Officers Manual* (EPA,

1995) (http://www.environment.nsw.gov.au/mao/bundingspill.htm) and the most recent versions of the Australian Standards referred to in the Guidelines. Containment should be designed for no-discharge.

- The significance of the impacts listed above should be predicted. When doing this it is important to predict the ambient water quality and river flow outcomes associated with the proposal and to demonstrate whether these are acceptable in terms of achieving protection of the Water Quality and River Flow Objectives. In particular the following questions should be answered:
  a) will the proposal protect Water Quality and River Flow Objectives where they are currently achieved in the ambient waters; and
  b) will the proposal contribute towards the achievement of Water Quality and River Flow Objectives over time, where they are not currently achieved in the ambient waters.
- Consult with DECC as soon as possible if a mixing zone is proposed (a mixing zone could exist where effluent is discharged into a receiving water body, where the quality of the water being discharged does not immediately meet water quality objectives. The mixing zone could result in dilution, assimilation and decay of the effluent to allow water quality objectives to be met further downstream, at the edge of the mixing zone). DECC will advise the proponent under what conditions a mixing zone will and will not be acceptable, as well as the information and modelling requirements for assessment.

Note: The assessment of water quality impacts needs to be undertaken in a total catchment management context to provide a wide perspective on development impacts, in particular cumulative impacts.

- Where a licensed discharge is proposed, provide the rationale as to why it cannot be avoided through application of a reasonable level of performance, using available technology, management practice and industry guidelines.
- Where a licensed discharge is proposed, provide the rationale as to why it represents the best environmental outcome and what measures can be taken to reduce its environmental impact.
- Reference should be made to relevant guidelines e.g. *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004), *Guidelines for Fresh and Marine Water Quality* ANZECC 2000), *Environmental Guidelines: Use of effluent by Irrigation* (DEC, 2004).

Describe management and mitigation measures

- Outline stormwater management to control pollutants at the source and contain them within the site. Also describe measures for maintaining and monitoring any stormwater controls.
- Outline erosion and sediment control measures directed at minimising disturbance of land, minimising water flow through the site and filtering, trapping or detaining sediment. Also include measures to maintain and monitor controls as well as rehabilitation strategies.
- Describe waste water treatment measures that are appropriate to the type and volume of waste water and are based on a hierarchy of avoiding generation of waste water; capturing all contaminated water (including stormwater) on the site; reusing/recycling

waste water; and treating any unavoidable discharge from the site to meet specified water quality requirements.

- Outline pollution control measures relating to storage of materials, possibility of accidental spills (eg preparation of contingency plans), appropriate disposal methods, and generation of leachate.
- Describe hydrological impact mitigation measures including:
  a) site selection (avoiding sites prone to flooding and waterlogging, actively eroding or affected by deposition)
  b) minimising runoff
  c) minimising reductions or modifications to flow regimes
  d) avoiding modifications to groundwater.
- Describe groundwater impact mitigation measures including:
  a) site selection
  b) retention of native vegetation and revegetation
  c) artificial recharge
  d) providing surface storages with impervious linings
  e) monitoring program.
- Describe geomorphological impact mitigation measures including:
  a) site selection
  b) erosion and sediment controls
  c) minimising instream works
  d) treating existing accelerated erosion and deposition
  e) monitoring program.
- Any proposed monitoring should be undertaken in accordance with the *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DEC 2004).

5. Soils and contamination

Describe baseline conditions

- Provide any details (in addition to those provided in the location description - Section C) that are needed to describe the existing situation in terms of soil types and properties and soil contamination.

Assess impacts

- Identify any likely impacts resulting from the construction or operation of the proposal, including the likelihood of:
  a) disturbing any existing contaminated soil
  b) contamination of soil by operation of the activity
  c) subsidence or instability
  d) soil erosion
  e) disturbing acid sulfate or potential acid sulfate soils.

- Reference should be made to relevant guidelines e.g. *Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites* (EPA, 1997); *Contaminated Sites – Guidelines on Significant Risk of Harm and Duty to Report* (EPA, 1999).

Describe management and mitigation measures

- Describe and assess the effectiveness or adequacy of any soil management and mitigation measures during construction and operation of the proposal including:
  a) erosion and sediment control measures
  b) proposals for site remediation – see *Managing Land Contamination, Planning Guidelines SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning and Environment Protection Authority, 1998)

6. Waste and chemicals

Describe baseline conditions

- Describe any existing waste or chemicals operations related to the proposal.
- Describe current recycling activities at the site including the types and volumes of waste received, the types and volumes recycled, and the types and volumes transported off-site for recycling.

Assess impacts

- Assess the adequacy of proposed measures to minimise natural resource consumption and minimise environmental impacts (eg. odours, noise, water pollution) from the handling, transporting, storage, recycling, processing and reprocessing of waste and/or chemicals.
- Reference should be made to relevant guidelines e.g. DECC's *Waste Classification Guidelines* (2008) and DECC's *Environmental Guidelines: Composting and Related Organics Processing Facilities* (2004).

Describe management and mitigation measures

- Outline measures to minimise the consumption of natural resources.
- Outline measures to minimise environmental impacts from the recycling activities, including any increase/decrease on the current types and volumes of waste recycled at the site.
- Outline measures to avoid the generation of waste and promote the re-use and recycling and reprocessing of any waste.
- Outline measures to support any approved regional or industry waste plans.

7. Cumulative impacts

- Identify the extent that the receiving environment is already stressed by existing development and background levels of emissions (including **odour emissions**) to which this proposal will contribute.
- Assess the impact of the proposal against the long term air, noise and water quality objectives for the area or region.
- Identify infrastructure requirements flowing from the proposal (eg water and sewerage services, transport infrastructure upgrades).
- Assess likely impacts from such additional infrastructure and measures reasonably available to the proponent to contain such requirements or mitigate their impacts (eg travel demand management strategies).

8. Impacts on threatened species, population, ecological communities and their habitat

- Identify any threatened species or endangered ecological communities likely to be affected by the development. A field survey should be conducted and documented in accordance with the DECC's *Threatened Species Assessment Guidelines – Assessment of Significance* (2007).
- All potential impacts on threatened species, populations, ecological communities and their habitat need to be assessed, evaluated and reported on in accordance with DECC's *Threatened Species Assessment Guidelines – Assessment of Significance* (2007).
- Describe the actions that will be taken to avoid or mitigate impacts on these communities as a result of the development (such as dust and runoff) or compensate for unavoidable impacts of the project on threatened species and their habitat. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.

9. Impacts on Aboriginal cultural heritage values

- The EIS should address and document the information requirements set out in the draft *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* involving surveys and consultation with the Aboriginal community.
- Identify the nature and extent of impacts on Aboriginal cultural heritage values across the project area.
- Describe the actions that will be taken to avoid or mitigate impacts or compensate to prevent unavoidable impacts of the project on Aboriginal cultural heritage values. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.
- The EIS needs to clearly demonstrate that effective community consultation with Aboriginal communities has been undertaken in determining and assessing impacts, developing options and making final recommendations.

F. List of approvals and licences

- Identify all approvals and licences required under environment protection legislation including details of all scheduled activities, types of ancillary activities and types of discharges (to air, land, water).

G. Compilation of mitigation measures

- Outline how the proposal and its environmental protection measures would be implemented and managed in an integrated manner so as to demonstrate that the proposal is capable of complying with statutory obligations under DECC licences or approvals (eg outline of a detailed environmental management plan).
- The mitigation strategy should include the environmental management and cleaner production principles which would be followed when planning, designing, establishing and operating the proposal. It should include two sections, one setting out the program for managing the proposal and the other outlining the monitoring program with a feedback loop to the management program.

H. Justification of the proposal

- Reasons should be included which justify undertaking the proposal in the manner proposed, having regard to the potential environmental impacts.

I. Specific requirements for proposed Mushroom Farm - Londonderry

- Address all requirements listed in Sections A-H above (where applicable).
- Provide details of the processes at the "spent composting processing facility", including:
    - Types and quantities of material that will be received at the proposed mushroom farm from offsite (per year) that will be used in the process of developing the final product of "topdressing material".
    - Details of the mechanical and/or chemical processes used to "process and convert" the "spent compost" to "topdressing material".
    - Quantities (in tonnes) of the final product of "topdressing material" to be produced by the facility per year.

J. Specific requirements for proposed expansion of substrate plant - Mulgrave

- Address all requirements listed in Sections A-H above (where applicable) in respect of the proposed expansion of the substrate plant.

General

- Detailed description of all stages of expansion including timeframes for completion.
- An updated copy of the Environmental Management Plan must be provided with the EIS
- Details of the new overhead conveyor moving compost material to the proposed additional Phase2/3 building (e.g. will the conveyor be enclosed?). Procedures for dust and odour management if there are potential impacts.

Air quality

- Provide detailed specifications of the additional bioscrubber and chimney to be installed, including location, stack height and dimensions.
- In addition to this, a detailed odour assessment must be conducted by a suitably qualified independent consultant to model and assess the effectiveness of the proposed bioscrubber and stack in preventing or minimising odour and complying with DECC's requirements. The assessment should consider the effectiveness of the bioscrubber under alternative conditions (e.g. when the building is operating under negative pressure; when the doors are open; when the building is not operating under negative pressure).
- As outlined in Section E, potential odour impacts are to be identified and impacts assessed, particularly in terms of the *cumulative* effect of an increased number of odour sources. Odour sources that must be considered in this assessment include (but are not limited to):
    - The sediment pit (considering the additional quantity of leachate that it will process as a result of the expansion)
    - Potential odour impacts from the proposed second sediment pit
    - Storage areas for products and increased quantities of products that will be stored (e.g. chicken manure)
    - Turning of the compost material in the existing pre-wet shed
    - Turning of the compost material in the proposed additional pre-wet shed. This must include cumulative odour impacts from *both* pre-wet sheds processing compost material simultaneously.
    - The Phase 1 tunnels including the proposed additional tunnels
    - The onsite dam, especially in light of the increased activity at the facility.

Noise

- As outlined in Section E, a detailed noise assessment must be conducted by a suitably qualified independent consultant to model and assess potential noise impacts from the increased activity at the site, including (but not limited to):

- Increased truck movements
- Increased plant and equipment movements
- Additional conveyor, pre-wet shed and Phase 2/3 tunnels.

Water management

- In addition to requirements set out in Section E, the EIS must include details of water management on the site, including management of excess runoff during storm events. This should include (but is not limited to):
  - Preventing leachate from entering the onsite dam
  - Preventing runoff from the site discharging to South Creek
- Details of the capacity of the current and proposed sediment pits and their capability to contain all leachate on the site in light of the increased activity.

Construction

- A copy of the development consent from Hawkesbury City Council permitting filling and raising of the property.
- Quantity and classification of the fill material used to fill and raise the property. Note: the application of waste-derived material to land is an activity that may require a licence under the POEO Act. However, a licence is not required by the occupier of land if the only material applied to land is virgin excavated natural material or waste-derived material that is subject of a resource recovery exemption under clause 51A of the POEO (Waste) Regulation 2005.

NSW DEPARTMENT OF
PRIMARY INDUSTRIES

Environmental Planning Officer
Major Development Assessment
NSW Department of Planning
GPO Box 39
SYDNEY NSW 2001

Your Ref: S08/00149
Our Ref: 08/1618, OUT08/15730

Attention: Georgia Ivancevic

15 December 2008

Dear Ms Ivancevic

Proposed Mushroom Farm and Substrate Plant Project
Londonderry and Mulgrave

Thank you for your letter of 2 December 2008 concerning construction of a mushroom farm and expansion of existing mushroom substrate plant - the NSW Department of Primary Industries (DPI) has reviewed the proposal and provides the following advice.

Agriculture

Potential impacts on nearby commercial poultry farms of;

- Abrupt noise
- Dust
- Vehicle lights
- Potential to create a biosecurity risks

Weed management during and after construction.

Fisheries

Outline the measures to ensure that water quality of any near-by creeks is not reduced. NSW DPI (Fisheries) has no other requirements for the preparation of this Environmental Assessment.

NSW DPI – Mineral Resources - Land Use Planning Issues

Identification and assessment of impacts on other land users is required as a critical component of the Environmental Assessment (EA) process. Specifically, the EA must consider the potential for the project to impact upon any mineral resources, including metallic minerals, industrial and extractive minerals, petroleum, gas and coal resources.

DPI – Mineral Resource Division (DPI – MR) requires the proponent to adopt the following strategies regarding mineral resources in its planning and EA:

- ***Operating mines and quarries should be protected from sterilisation or hindrance by encroachment of incompatible adjacent development.***

Private Forestry and Resources

Locked Bag 4, Richmond NSW 2753
Building M14, Castle Road, University of Western Sydney (Hawkesbury)

ABN 51 734 124 190
www.dpi.nsw.gov.au
Tel: 02 4588 2100
Fax: 02 4588 2159

- ***Known resources and areas of high mineral potential should not be unnecessarily sterilised by inappropriate zoning or development.***

- ***Access to land for mineral exploration and possible development should be maintained.***

A significant aspect of mineral resource evaluation and development from a land use planning viewpoint is that the locations of mineable deposits cannot be predicted. This makes it imperative that known resources are protected from sterilisation by inappropriate zoning or development, and that access to land for mineral exploration should be maintained over as much of the project area as possible.

The subject areas are located within Petroleum Exploration Licence (PEL) 2 held by Sydney Gas Operations Ltd. The site of the proposed farm is immediately to the east of an area (refer to map below) which has been identified as having moderate to high potential for coal seam methane (CSM). NSW DPI – MR requires the proponent to contact the title holder to discuss the proposed mushroom farm and substrate plant project at Londonderry and Mulgrave in relation to the associated land use impacts. Details of these consultations and the major outcomes must be presented in the EA.

Should you wish to discuss any of the mineral resources matters mentioned above please contact Cressida Gilmore of the Minerals Division via email (cressida.gilmore@dpi.nsw.gov.au) or on (02) 4931 6537.

NSW DPI Mineral Resources Division - Geoscience Information Services

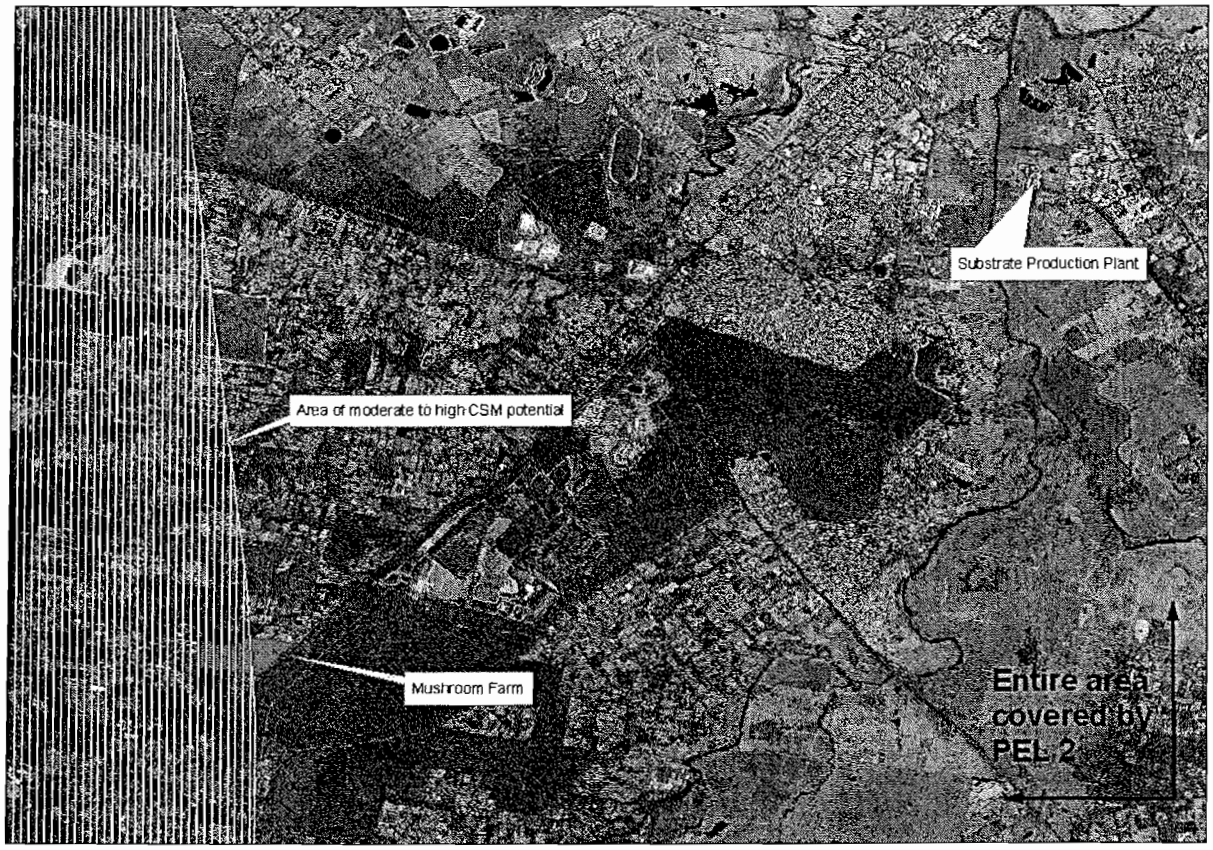
The Division has a range of data available on line through our primary website address at:
http://www.dpi.nsw.gov.au/minerals

This site hosts a range of data to enable research into exploration, land use and general geoscience topics.

The location of exploration and mining titles in NSW may be accessed by the general public using the following online utilities:

1. **TAS Map** permits the search, display and download of up to date NSW mineral, coal and petroleum titles maps and related information. This online service is available at:
   http://www.dpi.nsw.gov.au/minerals/titles/online-services/tasmap

2. **MinView** allows users to interactively display and query current and historical exploration titles information, state wide geology, mineral deposits and occurrences. This online service is available at:
   http://www.minerals.nsw.gov.au/online_services/min_view



This is a coordinated NSW Department of Primary Industries response should you have any further general queries on this matter please do not hesitate to contact Andrew Docking, Resource Management Officer, 45882128.

Thank you for providing the opportunity to comment on the proposal.

Yours sincerely

Andrew Docking
Resource Management Officer
Division of Agriculture and Fisheries

Appendix B

RESPONSES FROM AUTHORITIES

NSW DEPARTMENT OF
PRIMARY INDUSTRIES

Principal
Perram & Partners
12 Clanwilliam Street
EASTWOOD NSW 2122

RECEIVED
04 JUN 2009

Your Ref: 121L03
Our Ref: 08/1618, OUT09/7156

Attention: Terry Perram

2 June 2009

Dear Mr Perram

Proposed Mushroom Industry Expansion in Western Sydney

Thank you for your letter of 21 May 2009 concerning the proposed new mushroom farm at Londonderry and expansion of the mushroom substrate facility at Mulgrave - the NSW Department of Primary Industries (DPI) has reviewed the proposal and provides the following advice.

There are no further issues from those that were raised through the Director-General of NSW Department of Planning (Attached).

NSW DPI Minerals – suggest that you contact Sydney Gas Operations Ltd to discuss any access required for removing Coal Methane Gas resources in the locality of the developments.

Should you have any further queries on this matter please do not hesitate to contact Andrew Docking, Resource Management Officer, 45882128.

Thank you for providing the opportunity to comment on the proposal.

Yours sincerely

Andrew Docking
Resource Management Officer
Division of Agriculture and Fisheries

Private Forestry and Resources

Locked Bag 4, Richmond NSW 2753
Building M14, Castle Road, University of Western Sydney (Hawkesbury)

ABN 51 734 124 190
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NSW DEPARTMENT OF
PRIMARY INDUSTRIES

Environmental Planning Officer COPY
Major Development Assessment
NSW Department of Planning
GPO Box 39
SYDNEY NSW 2001

Your Ref: S08/00149
Our Ref: 08/1618, OUT08/15730

Attention: Georgia Ivancevic

15 December 2008

Dear Ms Ivancevic

Proposed Mushroom Farm and Substrate Plant Project
Londonderry and Mulgrave

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Potential impacts on nearby commercial poultry farms of;

- Abrupt noise
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- Vehicle lights
- Potential to create a biosecurity risks

Weed management during and after construction.

Fisheries

Outline the measures to ensure that water quality of any near-by creeks is not reduced. NSW DPI (Fisheries) has no other requirements for the preparation of this Environmental Assessment.

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Identification and assessment of impacts on other land users is required as a critical component of the Environmental Assessment (EA) process. Specifically, the EA must consider the potential for the project to impact upon any mineral resources, including metallic minerals, industrial and extractive minerals, petroleum, gas and coal resources.

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- ***Operating mines and quarries should be protected from sterilisation or hindrance by encroachment of incompatible adjacent development.***

- ***Known resources and areas of high mineral potential should not be unnecessarily sterilised by inappropriate zoning or development.***

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The subject areas are located within Petroleum Exploration Licence (PEL) 2 held by Sydney Gas Operations Ltd. The site of the proposed farm is immediately to the east of an area (refer to map below) which has been identified as having moderate to high potential for coal seam methane (CSM). NSW DPI – MR requires the proponent to contact the title holder to discuss the proposed mushroom farm and substrate plant project at Londonderry and Mulgrave in relation to the associated land use impacts. Details of these consultations and the major outcomes must be presented in the EA.

Should you wish to discuss any of the mineral resources matters mentioned above please contact Cressida Gilmore of the Minerals Division via email (cressida.gilmore@dpi.nsw.gov.au) or on (02) 4931 6537.

NSW DPI Mineral Resources Division - Geoscience Information Services

The Division has a range of data available on line through our primary website address at:
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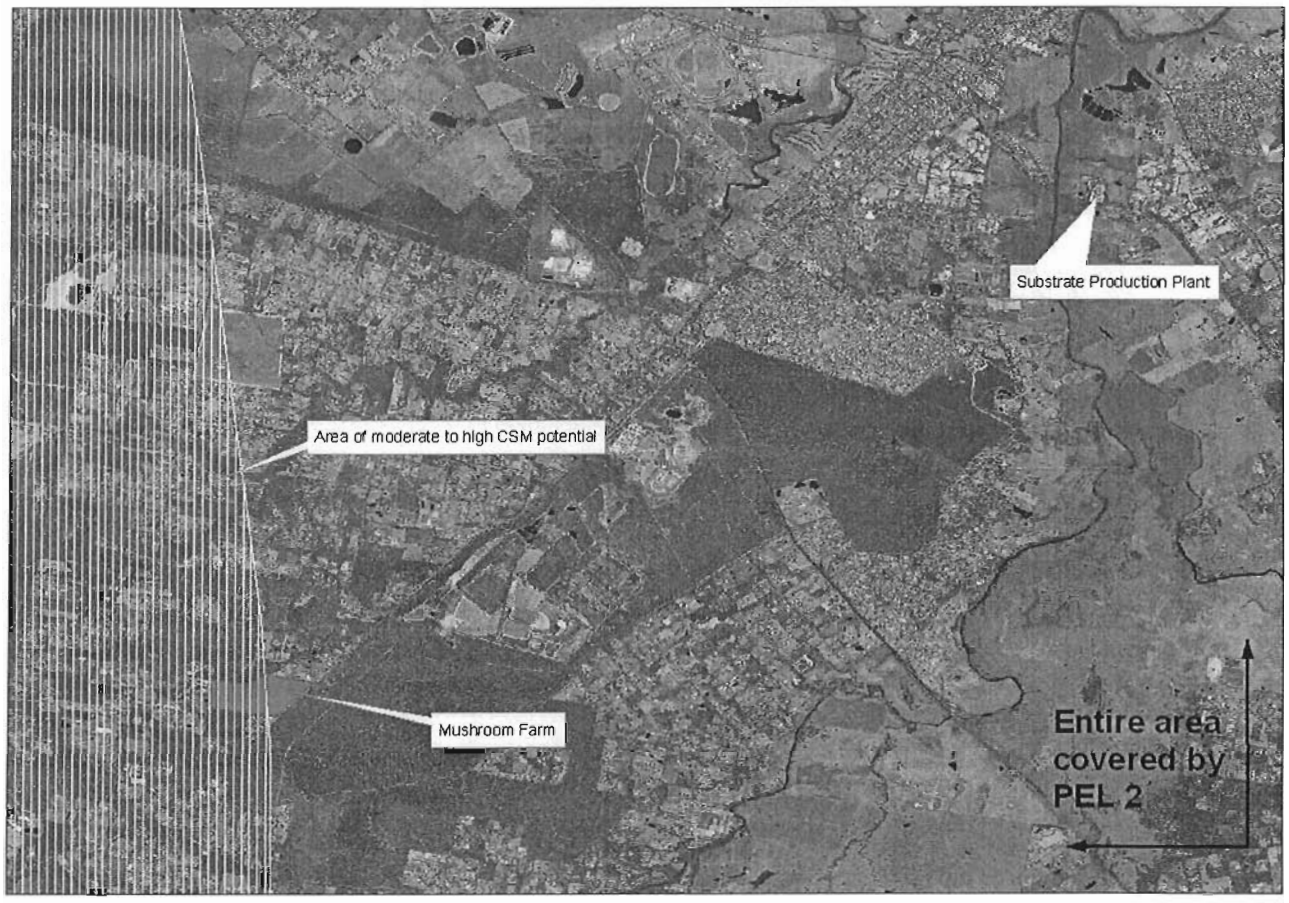
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http://www.minerals.nsw.gov.au/online_services/min_view



This is a coordinated NSW Department of Primary Industries response should you have any further general queries on this matter please do not hesitate to contact Andrew Docking, Resource Management Officer, 45882128.

Thank you for providing the opportunity to comment on the proposal.

Yours sincerely

Andrew Docking
Resource Management Officer
Division of Agriculture and Fisheries

Your reference: 121L03
Our reference: DOC09/25019
Contact: Deanne Pitts, (02) 9995 5595

RECEIVED
26 JUN 2009

Mr Terry Perram
Principal
Perram & Partners
12 Clanwilliam St
EASTWOOD NSW 2122

STANDARD POST

Dear Mr Perram

Proposed mushroom industry expansion in Western Sydney – Elf Farm Supplies Pty Ltd

I refer to your letter dated 21 May 2009 and received by the Department of Environment and Climate Change NSW ("DECC") on 25 May 2009 regarding the proposed expansion of the Elf Farm Supplies facility located at Mulgrave Rd, Mulgrave ("the Premises") and the establishment of a new mushroom farm at Londonderry. Activities at the Premises are currently regulated by environment protection licence no. 6229.

Please note that, although the Environment Protection Authority ("EPA") is now a part of DECC, certain statutory functions and powers continue to be exercised in the name of the EPA.

In your letter, you invite DECC to advise of any matters that should be addressed in the environmental assessment that will be assessed by the Department of Planning. Please be advised that DECC has already provided comments regarding the proposed developments in correspondence to the Department of Planning dated 18 December 2008. DECC has also discussed specific requirements for the environmental assessment with Elf Farm Supplies and Kerry Holmes directly.

At this stage, DECC has no further comments in relation to issues to be addressed in the environmental assessment. DECC may provide further comments on the environmental assessment when it is placed on public exhibition.

If you have any further queries regarding this matter, please contact Deanne Pitts on (02) 9995 5595.

Yours sincerely

LESLEY CORKILL 23/6/09
Unit Head Waste Operations
Environment Protection and Regulation

PO Box A290 Sydney South NSW 1232
59-61 Goulburn St Sydney NSW 2000
Tel: (02) 9995 5000 Fax: (02) 9995 5999
TTY (02) 9211 4723
ABN 30 841 387 271
www.environment.nsw.gov.au

PENRITH CITY COUNCIL
Serving Our Community

Our Reference: IMS 1975408
Your reference: 121L03
Contact: Allison Cattell
Phone: 02 4732 7909

30 June 2009

Mr Terry Perram
Perram & Partners Trust
12 Clanwilliam Street
Eastwood NSW 2122

RECEIVED
2 JUL 2009

Dear Mr Perram,

Preliminary Environmental Assessment
Proposed Mushroom Industry Expansion in Western Sydney
Lot 138, DP 752037, 521 Northern Road Londonderry NSW

I refer to your Preliminary Environmental Assessment (PEA) dated 21 May 2009 received by Council dated 22 May 2009 and the phone conversation on the 11 of June 2009 where it was confirmed that comments would be forwarded by Council prior to the end of June 2009.

It is noted that Penrith Council's comments are limited to the aspects of the proposal located within the Penrith Local Government Area (LGA) boundary only. Particular attention has been given to the proposed Mushroom Farm at Londonderry.

In this regard, Council's Development Services Department offers the following comments with particular reference to Chapter 4.1 – Mushroom Farm (Relevant Planning Provisions) to be addressed in the Environmental Assessment (EA):

- ***Local Planning Instruments***

Local Environmental Plan
The Penrith Local Environmental Plan 201 (Rural Lands) applies to the site. The mushroom growing components of the proposal could be defined as 'agriculture' under this instrument which is permitted without consent however *Sydney Regional Environmental Plan No.20 - Hawkesbury Nepean (SREP 20)* prevails. The proposed mushroom growing components are likely to be categorised under this instrument as an 'Intensive Horticultural Establishment' in accordance with Clause 11(10) which is defined as:

"Use of a place to grow a commercial crop of plants or fungi, whether under cover or in the open, using intensive agricultural systems such as hydroponics or a sprinkler system (but no use of a place to grow produce for personal household consumption

or enjoyment) which in the opinion of the consent authority has the potential to impact significantly on the total water cycle".

This policy contains aims and objectives for the zone and the plan, provisions pertaining to access from designated roads, tree removal, provision of services and setbacks from major roads that require consideration.

Draft Local Environmental Plan
Council has exhibited Penrith Draft Local Environmental Plan 2008 and are currently considering any submissions made during the exhibition period. At this stage, the plan is of draft status. Depending on the timing of your submission, this plan may supersede Penrith LEP 201 (Rural Lands).

Lot 138 in DP 752037 is proposed to be partially zoned RU4 (Smallholdings) and SP2 (Infrastructure) under this draft instrument. The portion of the site proposed to be affected by the SP2 (Infrastructure) zoning is the entire boundary with frontage to The Northern Road frontage for a width of approximately 6 metres. Any proposed setback of buildings from The Northern Road is to be a minimum of 30 metres in addition to that part zoned for infrastructure development.

Development Control Plans
Penrith Development Control Plan 2006 applies to the site. Part 1 (Introduction), Part 2 (City Wide General Controls), and Part 4 (Land Use Based Controls) particularly Chapter 4.9 (Rural Development) are to be considered in the proposal for a Mushroom Farm.

Draft Penrith Development Control Plan 2008 was prepared concurrently to the Draft Local Environmental Plan 2008. Upon gazettal of the Draft LEP 2008, this accompanying Draft DCP 2008 will also apply to the site.

- ***Regional Planning Instruments***
  Sydney Regional Environmental Plan No.20 – Hawkesbury Nepean River applies to the site. Environmental considerations throughout the instrument will apply. The composting component of the proposal is likely to be defined as 'composting' under this instrument. The associated sewerage treatment system may also be separately defined within this instrument. These uses may trigger further assessment within this instrument.

- ***State Planning Legislation & Instruments***
  Environmental Planning and Assessment Act 1979, Environmental Planning and Assessment Regulation 2000, State Environmental Planning Policy No.55 - Remediation of Land and Protection of the Environment Operations Act 1997, Roads Act 1993, Rural Fires Act 1997 and National Parks and Wildlife Act 1974 apply to the site and may apply to the proposal.

There appears to be compositing activity proposed for this site. As such, it is likely the proposed development represents Designated Development for the purposes of

Compositing Facilities or Works in accordance with Clause 13, Schedule 3 of the Environmental Planning and Assessment Regulation 2000 (the Regulations). Any proposed Sewerage System may also be captured by Clause 29 of Schedule 3 of the Regulations. To this end, clarification as to the Section of the EP&A Act 1979 under which the application can be made as a Part 3A – Major Project is sought given the application is likely to represent Designated development.
Given the past use of the site as a Piggery, the site may be contaminated and remediation may be required. An analysis of the soil is to be undertaken in accordance with SEPP 55.

Given the scale of the proposed development and the proposed child care centre, a Bush Fire Safety Authority (BFSA) may be required from the NSW Rural Fire Service (RFS). Consultation with this Authority is required.

Should access off a Designated Road be acceptable to the NSW Roads and Traffic Authority, deceleration lanes from the north and south directions allowing for passing lanes for motorists not entering the site is to be considered.

- ***Other planning issues***

Car parking – A Traffic Report is recommended to address potential impacts including sufficient car parking provision on site;

Hours of operation – There are residential uses adjoining the proposed Mushroom Farm. Whilst the site may operate 24 hours a day, operations are to be detailed such that noise from truck visits and cooling units are minimised, particularly during night time periods as outlined in the Industrial Noise Policy (INP);

Access from designated roads – Access to the site from both directions is to be accommodated such that normal traffic flow is not interrupted. This may require dedicated deceleration lanes;

Staged construction – A Construction Management Plan that details the staged service provision and timeframes for completion is recommended to be provided. This is particularly pertinent to provide for orderly development and storage of waste given the site is a gateway site into the city, there are surrounding residential uses and there may be continual development for a number of years;

Treatment system proposed to clean wash-down and surface liquid for re-use – A standard silt trap will not remove the fertilisers contained in wash-down water. Consideration is to be given to separating the roof water from wash-down water and treating the latter by removing the nutrients. Details of the proposed system are to accompany the development application;

Design – Fencing plans are to be detailed. Given it is likely that security fencing along the perimeter of the site will be proposed, treatment of the massing of fencing is to be demonstrated. Consideration is to be given to setting fencing back from the boundary allowing adequate screening vegetation in front. Details of the height of the proposed earth-mound are required;

Landscaping – The Northern Road is considered a gateway site into the City of Penrith. As such, it is suggested to liaise with Council's Landscape and Design Unit with regard to proposed landscaping, particularly along The Northern Road frontage.

You are advised that at the Council meeting of 23 June 2008, Council determined by way of approval a Mushroom Growing Facility at 334-362 Londonderry Road Londonderry (Development Application No.07/1066).

A link to this report is attached for your reference and comparison: http://bizsearch.penrithcity.nsw.gov.au/pccbps/Open/2008/CNL_23062008_AGN_AT.PDF

The PEA was referred to Council's Environmental Health Department where it was acknowledged that the environmental investigations are in their infancy. As such the following comments are offered:

- Council would like the opportunity to provide comment on the EA and the following reports or assessments prepared for the development:

  1. Noise;
  2. Air Quality;
  3. Water Quality (Cycle); and
  4. Flora and Fauna

  There may be additional matters arising from review of the comprehensive EA and associated reports;

- The information provided did not make mention of any on-site sewage management system or requirements. As such a report will need to be prepared for this aspect of the development;

- There is a childcare centre proposed at the front of the development. Detail is required regarding the intended placements for which this centre is proposed to cater and whether it is intended for use exclusively for children of staff.

  A thorough assessment of the potential impacts the mushroom farm and The Northern Road may have on the childcare centre needs to be undertaken and noise, odour and potential health impacts resulting from operations including, but not limited to, airborne dust, particles and chemical storage be assessed;

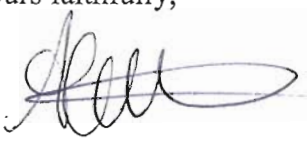
- Dam 2 (as identified on page 20 of the information) is located directly adjacent to Stage 4 growing rooms. Additional information is required as to whether it is intended to fill this dam;

- There is a history of community concern in this area regarding intensive rural activities, such as cattle fed lots, mushroom farms and poultry farms causing

odours and extensive community consultation should occur before progressing the proposal as unreasonable impacts on the existing community will not be accepted.

Should you have any further queries, please contact me on 02 4732 7909.

Yours faithfully,



Allison Cattell
Senior Environmental Planner
Development Services Department

NEW SOUTH WALES FIRE BRIGADES
COMMUNITY SAFETY DIVISION
STRUCTURAL FIRE SAFETY
Amarina Avenue Greenacre NSW 2190
Locked Bag 12 Greenacre NSW 2190
Telephone: (02) 9742 7400 Facsimile: (02) 9742 7486
www.fire.nsw.gov.au info@fire.nsw.gov.au ABN: 12 593 473 110

Your Reference:
File No: NFB/05011
Contact Officer: A Bruce

Telephone: (02) 9742 7400
Facsimile: (02) 9742 7483
Email: firesafety.nswfb@fire.nsw.gov.au

RECEIVED - 7 SEP 2009

2 SEP 2009

Perram and Partners
12 Clanwilliam St
EASTWOOD NSW 2122

Attention: Terry Perram.

Dear Sir

Proposed Mushroom Industry Expansion in Western Sydney
WESTERN SYDNEY

I refer to your correspondence dated 21st May 2009, regarding the above premises.

An Officer of the NSW Fire Brigades (NSWFB) has reviewed the submitted Preliminary Environmental Assessment and based on the information therein provides the following comments:

The NSWFB Structural Fire Safety Unit is an advisory authority to both the regulatory authorities and the people of New South Wales regarding fire and life safety issues. The unit works under the ambit of the Environmental Planning and Assessment Act 1979, the Environmental Planning and Assessment Regulation 2000, the Fire Brigades Act, the Local Government Act, the Building Code of Australia (BCA) and applicable Australian Standards to ensure that Fire Safety requirements for existing and proposed developments are met.

The NSWFB would expect any new building proposals and substantial alterations to existing buildings to comply with the current BCA and relevant Australian Standards. In particular, the proposed child care centre, processing plants and storage facilities.

The NSWFB has no other specific concerns with the proposed development and looks forward to reviewing any forthcoming associated documentation.

Should you have any further enquiries regarding any of the above matters, please do not hesitate to contact the Fire Safety Division.

Yours faithfully

For Commissioner

Australian Government
Department of Defence
Defence Support Group

2005/1001921/7
LPSI/OUT/83/2010

Mr Terry Perram
Perram & Partners Pty Ltd
12 Clanwilliam Street
EASTWOOD NSW 2122

Dear Mr Perram

MUSHROOM INDUSTRY EXPANSION - PROPOSED CHIMNEY STACK 108 MULGRAVE ROAD MULGRAVE NSW

I refer to your letter dated 25 May 2009 addressed to RAAF Base Richmond and subsequent correspondence with this office advising of a proposed exhaust stack to vent compost odour to be erected at the Elf Farm Supplies mushroom substrate plant, 108 Mulgrave Road, Mulgrave NSW. You subsequently supplied Plume Rise Assessment reports dated 29 October 2009 and 25 February 2010 which advise that the proposed exhaust stack will have an above ground level (AGL) height of 40m and the top of the exhaust stack will have an above mean sea level elevation of 56m AHD.

The site for the proposed exhaust stack is located approximately 3.5km east-south-east of the eastern end of the runway at RAAF Base Richmond and is consequently subject to height restrictions to ensure the safety of aircraft using the runway for takeoff and landing. At the subject site, the maximum height for any structure is 59m AHD. Defence notes the proposed stack height of 56m AHD is within this prescribed height limit.

In addition, the exhaust plume rising from the stack can also be a potential hazard to low flying aircraft. The Civil Aviation Safety Authority (CASA) published an Advisory Circular (AC) 139-05(0) - *Guidelines For Conducting Plume Rise Assessments* dated June 2004 and the AC has been used as guidance for assessment purposes. CASA has identified that a plume rise in excess of 4.3m/s may cause airframe damage and/or affect the handling characteristics of an aircraft in flight. Therefore in order for Defence to discount the exhaust plume as a potential hazard, the velocity of the plume must reduce to below 4.3m/s before reaching the abovementioned height limit of 59m AHD.

There is an existing 40m AGL odour dispersal exhaust stack at the Elf Farm Supplies plant which Defence assessed prior to construction in November 2001 and the exhaust stack was constructed in approximately 2002. This chimney stack was constructed before CASA AC 139-05 (0) was published and so Defence has not previously assessed the plume rise for the existing chimney stack.

The Air Pollution Model (TAPM) has been used to model the two exhaust stacks representing the existing and proposed stack and the latest plume rise assessment report has been prepared by PAE Holmes and dated 25 February 2010. The report states that as TAPM does not provide a fine resolution of the exhaust plume characteristics close to the stack tip, linear interpolation of the TAPM results has been used to calculate the height at which the average vertical velocity of the plume is reduced to 4.3m/s. The report states, "The average vertical

velocity after one second of travel is 3.3m/s at a height of 59m AHD. The height at which the vertical velocity of the plume reduces to 4.3m/s is 58.71m AHD".

The value that is used for aeronautical assessment of the OLS and IFR procedures is the 0.1% frequency of exceedence of the critical vertical velocity (ie. 4.3m/s). PAE Holmes advised that the 0.1% exceedence elevation is 56m AHD which equates to the elevation of the top of the exhaust stack. PAE Holmes again draws reference to TAPM limitations to produce a fine resolution of the exhaust plume characteristics close to the exhaust stack tip.

Defence has assessed this proposal using the TAPM plume rise assessment report produced by PAE Holmes and assumes that TAPM has been correctly executed and applied. Using the heights annotated in the report, it appears that the height at which the velocity of the resultant exhaust plumes reduces to 4.3m/s would be within the prescribed height limit of 59m AHD and this would satisfy Defence's requirements.

There is an additional ongoing need to obtain and maintain accurate information about tall structures. The risk posed by a tall structure to aircraft safety can be minimised if information on the tall structure is conveyed to pilots so that they can fly at a safe margin above the structure. The RAAF Aeronautical Information Service (RAAF AIS) in Melbourne is responsible for recording the location and height of tall structures. The information is held in a central database managed by RAAF AIS and relates to the erection, extension or dismantling of tall structures the top of which is:

a. 30 metres or more above ground level - within 30 kilometres of an aerodrome, or

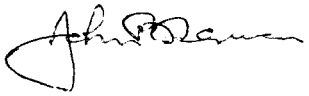
b. 45 metres or more above ground level elsewhere.

The proposed chimney stack will meet the above definition of tall structure. Defence therefore requests that the Elf Farm Supplies provide RAAF AIS with "as constructed" details. RAAF AIS has a web site with a Vertical Obstruction Report Form at www.raafais.gov.au/obstr_form.htm which can be used to enter the location and height details of tall structures.

If cranes will be used on site during the construction phase of the proposed exhaust stack, Defence requests that prior to rigging of cranes commences that crane height details are supplied to allow assessment of the impact on aircraft operations.

In summary, Defence has no objection to the proposed chimney stack subject to compliance with the structure height and plume rise restrictions outlined above. My point of contact for this matter is Mr Gary Lee on telephone (02) 6266 8187.

Yours sincerely



John Kerwan
Director Land Planning & Spatial Information
BP3-1-A052
Department of Defence
CANBERRA ACT 2600
13 July 2010

For Information:
Regional Director DS Northern NSW
RAAF Base Richmond SADFO
RAAF Base Richmond ABXO
RAAF Base Richmond BSM

Terry Perram

From: "JONES, KIM" <KIM.JONES@casa.gov.au>
To: <tperram@bigpond.net.au>
Cc: "CHALK, MARTIN" <Martin.Chalk@casa.gov.au>
Sent: Thursday, 15 July 2010 4:09 PM
Subject: PROPOSED CHIMNEY STACK AND PLUME - 108 MULGRAVE ROAD, MULGRAVE, NSW [SEC=UNCLASSIFIED]

Dear Mr Perram,
I understand that the Department of Defence has responded to you regarding the proposed construction of 40m high chimney at 108 Mulgrave Road, Mulgrave, NSW. I further understand that they did not object to the proposal based on an assessment of the military instrument procedures into nearby RAAF Richmond.

While some of the military procedures are also used by civilian pilots, there is one procedure that is unique to civilian operations and this was not covered in the letter provided by Defence. CASA has assessed this procedure and confirms that it will not be affected by the proposed chimney or its associated hot gas plume.

Yours faithfully,

Kim Jones
Manager, Airways and Aerodromes Branch
Civil Aviation Safety Authority

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5 August 2010

Terry Perram

Principal
Perram & Partners
12 Clanwilliam Street
Eastwood NSW 2122

Dear Mr Perram,

RE: Proposed Mushroom Industry Expansion in Western Sydney

I refer to your recent correspondance regarding establishing a new mushroom farm at Londonderry, and expansion of the existing mushroom farm substrate plant in Mulgrave.

As owners of Petroleum Exploration Licence 2 (PEL 2) over the above mentioned properties, AGL has no objection to the two proposals.

If you require any further information, please contact Adam Lollback – Land & Approvals Manager on M: 0404 027 940.

Yours sincerely,

Adam Lollback

Land & Approvals Manager

AGL is taking action toward creating a sustainable energy future for our investors, communities and customers. Key actions are:
› Being Australias largest private owner and operator of renewable energy assets
› Gaining accreditation under the National GreenPower Accreditation Program for AGL Green Energy®, AGL Green Living® and AGL Green Spirit

Appendix C

CONSIDERATION OF PLANNING INSTRUMENTS

CONSIDERATION OF PLANNING INSTRUMENTS

This appendix should be read in conjunction with section 3. It considers in more detail the local and regional environmental planning instruments applying to the two sites, summarising any relevant matters for consideration by a consent authority and providing a brief response to each matter. The proposal is also considered for consistency with development control plans applying to the two sites.

1 PENRITH LOCAL ENVIRONMENTAL PLAN 2010

The aims of Penrith LEP 2010 are listed in *Table 1* together with a statement of the consistency of the proposal with each aim.

Table 1 AIMS OF PENRITH LEP 2010

Penrith LEP 2010 Aims	Consistency of Proposal
(a) to promote development that is consistent with the Council's vision for Penrith, namely, one of a sustainable and prosperous region with harmony of urban and rural qualities with a strong commitment to environmental protection and enhancement,	The proposal is consistent. It is a significant agricultural undertaking on rural land, employing environmentally sustainable practices.
(b) to ensure development incorporates the principles of sustainable development through the delivery of balanced social, economic and environmental outcomes,	The proposal will contribute to sustainable outcomes in terms of employment, environmental protection and prosperity for the region.
(c) to encourage development to be designed in a way that assists in reducing and adapting to the likely impacts of climate change,	Mushroom-growing is climate-controlled so the mushroom farm is unlikely to be affected by climate change.
(d) to protect the environmental values and heritage of Penrith, including places of historic, aesthetic, architectural, natural, cultural, visual and Aboriginal significance,	The rural surroundings of The Northern Road are indicated in the LEP to be of visual significance. The project includes measures to minimise visual impact. None of the other factors are relevant.
(e) to provide for an urban environment that is active, attractive and safe for residents and visitors,	Not relevant. The site is not in an urban area.
(f) to foster viable employment, transport, education and future investment opportunities that are suitable to the needs and skills of the residents and the workforce,	The proposal will provide employment opportunities for the Penrith region.

Penrith LEP 2010 Aims	Consistency of Proposal
(g) to protect views and vistas from main roads and other public vantage points,	The rural surroundings of The Northern Road are indicated in the LEP to be of visual significance. The project includes measures to minimise visual impact.
(h) to reinforce Penrith's urban growth limits by allowing rural living opportunities where they will promote the intrinsic rural values and functions of Penrith's rural lands and the social well being of its rural communities.	The proposal retains the rural residence on the property and will provide rural employment for the social well being of the community.

The objectives of the RU4 Rural Small Holdings zone in Penrith LEP 2010 are listed in *Table 2* together with a statement of the consistency of the proposal with each objective.

Table 2 OBJECTIVES OF THE RU4 - RURAL SMALL HOLDINGS ZONE

RU4 Zone Objectives	Consistency of Proposal
• *To enable sustainable primary industry and other compatible land uses.*	Mushroom growing is sustainable primary industry
• *To maintain the rural and scenic character of the land.*	The character of the area is bushland and partially cleared farming or rural-residential land. The proposal maintains agricultural use of the property with improved screening from surroundings.
• *To ensure that development does not unreasonably increase the demand for public services or public facilities.*	The proposal is consistent.
• *To minimise conflict between land uses within the zone and land uses within adjoining zones.*	The proposal is consistent with land uses in the rural zoning and is not in conflict with the classified road and the nature reserve opposite.
• *To ensure land uses are of a scale and nature that is compatible with the environmental capabilities of the land.*	Mushroom growing is carried out indoors having little effect on the environmental capability of the land.
• *To preserve and improve natural resources through appropriate land management practices.*	The proposed mushroom farm has been designed to operate as efficiently as possible, minimising consumption of natural resources.

Clause 6.1 of the LEP requires a consent authority to consider a number of matters before granting development consent for earthworks. As the proposed mushroom farm includes an earthworks component, the matters listed in Clause 6.1 are reproduced in *Table 3* with a consideration in each case.

Table 3 MATTERS FOR CONSIDERATION – CLAUSE 6.1 (PLEP 2010)

Matter for Consideration	Consideration
(a) the likely disruption of, or any detrimental effect on, existing drainage patterns and soil stability in the locality,	The earthworks include construction of earth mounds and filling the building site to obtain a level platform. The drainage design includes provision for maintaining adequate drainage for all affected land. There is no stability issue on the site.
(b) the effect of the proposed development on the likely future use or redevelopment of the land,	The proposed mushroom farm is a significant investment and is unlikely to vacate the premises in any foreseeable time frame. Hence there is no future use or redevelopment that could be considered likely.
(c) the quality of the fill or the soil to be excavated, or both,	Soil to be excavated for the mounds has been tested and passed as suitable. Imported fill will be suitable for the purpose and certified free from contamination.
(d) the effect of the proposed development on the existing and likely amenity of adjoining properties,	While the earthworks will be visible from the adjoining properties to the north and south, there is little amenity impact from this part of the proposal other than temporary construction impacts. On the northern side the earthworks will create a landscaped mound which would not have a significant enduring effect on amenity.
(e) the source of any fill material and the destination of any excavated material,	Fill material will be obtained from sources available at the time the earthworks are underway. In this regard managers of other construction projects with a surplus of spoil will be approached. Material will be accepted if it is suitable and practicable arrangements can be made.
(f) the likelihood of disturbing relics,	Archaeologists have investigated the site no relics being found leading to the conclusion that previous land uses have reduced the likelihood of finding intact archaeological cultural deposits.

(g) the proximity to and potential for adverse impacts on any watercourse, drinking water catchment or environmentally sensitive area.	The earthworks will have no significant effect on any watercourse or the nature reserve opposite. The site is not in a drinking water catchment.

Clause 6.2 of Penrith LEP 2010 requires a consent authority to consider the following matters with regard to salinity before granting consent to any development:

(a) whether or not the proposed development is likely to have an impact on salinity processes, and
(b) whether or not salinity is likely to have an impact on the proposed development, and
(c) appropriate measures that can be taken to avoid or reduce any undesirable effects that may result from the impacts referred to in paragraphs (a) and (b).

The proposed development will not significantly affect groundwater processes or the level of the water table. On-site disposal of treated effluent will occur over a length of approximately 900 metres of the landscaped mounds to avoid any local waterlogging. Apart from expanding the existing dam there will be no significant excavation on the site. Consequently the proposal is not considered likely to have a significant impact on salinity processes or be affected by salinity.

Clause 6.5 of the LEP applies to the mushroom farm site as the land is within a large area identified in the LEP as having scenic and landscape values. Before granting consent a consent authority is required to be satisfied *that measures will be taken, including in relation to the location and design of the proposed development, to minimise the visual impact of the development from major roads, identified heritage items and other public places.*

While the property can be viewed from The Northern Road, there are no identified heritage items or other public places within the view catchment of the site. The visual impact of the proposal from The Northern Road has been assessed in the environmental assessment. Measures to minimise visual impact from The Northern Road include construction of the 2.5 metre high landscaped mound along the road frontage and selection of building colours and finishes to minimise visual intrusion.

Clause 6.6 of Penrith LEP 2010 requires a consent authority, before granting development consent for development on any land to which the LEP applies, to be satisfied that:

(a) the development will be connected to a reticulated water supply, if required by the consent authority, and
(b) the development will have adequate facilities for the removal and disposal of sewage, and
(c) if the development is for seniors housing, the development can be connected to a reticulated sewerage system, and
(d) the need for public amenities or public services has been or will be met.

The proposed mushroom farm development is consistent with the above matters that are relevant to the proposal.

2 HAWKESBURY LOCAL ENVIRONMENTAL PLAN, 1989

Hawkesbury planning instruments apply to the existing substrate plant in Mulgrave Road, Mulgrave. The aims of the Hawkesbury LEP, 1989 are listed in *Table 4* together with a statement of the consistency of the proposal with each aim.

Table 4 AIMS OF HAWKESBURY LEP 1989

Hawkesbury LEP 1989 Aims	Consistency of Proposal
(a) to provide the mechanism for the management, orderly and economic development and conservation of land within the City of Hawkesbury,	The LEP has served this purpose in relation to the existing substrate plant.
(b) to provide appropriate land in area, location and quality for living, working and recreational activities and agricultural production,	The site of the substrate plant is appropriate for the development, notwithstanding a subsequent LEP amendment zoning this section of the flood plain for Rural Living and prohibiting rural industry.
(c) to protect attractive landscapes and preserve places of natural beauty, including wetlands and waterways,	The proposal is consistent.
(d) to conserve and enhance buildings, structures and sites of recognised significance which are part of the heritage of the City of Hawkesbury for future generations, and	Not relevant
(e) to provide opportunities for the provision of secure, appropriate and affordable housing in a variety of types and tenures for all income groups within the City.	Not relevant

The objectives of the Rural Living zone in the LEP are listed in *Table 5* together with a statement of the consistency of the proposal with each objective. Development for the purposes of rural industries, which includes the existing substrate plant, is prohibited in the Rural Living zone.

Table 5 OBJECTIVES OF THE RURAL LIVING ZONE (HLEP 1989)

Rural Living Zone Objectives	Consistency of Proposal
(a) to provide primarily for a rural residential lifestyle,	Not consistent. Rural residential development is not appropriate on the site of the existing substrate plant.
(b) to enable identified agricultural land uses to continue in operation,	Not relevant. The substrate plant is a rural industry.
(c) to minimise conflict with rural living land uses,	The existing substrate plant is not in conflict.
(d) to ensure that agricultural activity is sustainable,	Not relevant. The substrate plant is a rural industry.
(e) to provide for rural residential development on former agricultural land if the land has been remediated,	Not relevant. These circumstances do not apply at the substrate plant site.
(f) to preserve the rural landscape character of the area by controlling the choice and colour of building materials and the position of buildings, access roads and landscaping,	The proposal is consistent.
(g) to allow for agricultural land uses that are ancillary to an approved rural residential land use that will not have significant adverse environmental effects or conflict with other land uses in the locality,	Not relevant. These circumstances do not apply at the substrate plant site.
(h) to ensure that development occurs in a manner: *(i) that does not have a significant adverse effect on water catchments, including surface and groundwater quality and flows, land surface conditions and important ecosystems such as streams and wetlands, and* *(ii) that satisfies best practice guidelines and best management practices,*	The proposal is consistent.
(i) to prevent the establishment of traffic generating development along main and arterial roads,	Not relevant. The substrate plant is not on a main or arterial road.
(j) to ensure that development does not create unreasonable economic demands for the provision or extension of public amenities or services.	The proposal is consistent.

Clause 18 of the LEP requires that consent for any development not be granted unless *arrangements satisfactory to the Council have been made for provision to the land of water, sewerage, drainage and electricity*.

Satisfactory arrangements already exist in relation utility services at the substrate plant. Any augmentation of services will be negotiated with relevant authorities.

Clause 28 of the LEP provides that T*he Council shall not grant consent to an application to carry out development in the vicinity of a heritage item unless it has made an assessment of the effect the carrying out of that development will have on the heritage significance of the item and its setting.*

The existing substrate plant is located in the vicinity of three heritage items listed in the LEP (see section 5.3.3). The proposed expansion of the substrate plant will have no effect on the heritage significance of the listed items.

3 DRAFT HAWKESBURY LOCAL ENVIRONMENTAL PLAN, 2009

The aims of Draft Hawkesbury LEP, 2009 are listed in *Table 6* together with a statement of the consistency of the proposal with each objective.

Table 6 AIMS OF DRAFT HAWKESBURY LEP 2009

Hawkesbury LEP 1989 Aims	Consistency of Proposal
(a) to provide the mechanism for the management, orderly and economic development and conservation of land within Hawkesbury,	The draft LEP serves this purpose in relation to the existing substrate plant.
(b) to provide appropriate land in area, location and quality for living, working and recreational activities and agricultural production,	The draft LEP has not served this purpose in relation to the proposed substrate plant expansion. The IN2 zone should cover the entire site.
(c) to protect attractive landscapes and preserve places of natural beauty, including wetlands and waterways,	Not relevant to the Mulgrave site.
(d) to protect and enhance the natural environment in Hawkesbury and to encourage ecologically sustainable development,	The draft LEP serves this purpose in relation to the existing substrate plant.
(e) to conserve and enhance buildings, structures and sites of recognised significance which are part of the heritage of Hawkesbury for future generations, and	Not relevant to the Mulgrave site.
(f) to provide opportunities for the provision of secure, appropriate and affordable housing in a variety of types and tenures for all income groups within Hawkesbury.	Not relevant.

The objectives of the IN2 – Light Industrial zone in the draft LEP are listed in *Table 7* together with a statement of the consistency of the proposal with each objective.

Table 7 OBJECTIVES OF THE IN2 - LIGHT INDUSTRIAL ZONE (DHLEP)

IN2 Zone Objectives	Consistency of Proposal
• *To provide a wide range of light industrial, warehouse and related land uses.*	Substrate production is a rural industry, permissible in this zone.
• *To encourage employment opportunities and to support the viability of centres.*	The proposal is consistent.
• *To minimise any adverse effect of industry on other land uses.*	The proposal is consistent.
• *To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area.*	Not relevant.
• *To set aside certain land for the purposes of light industry within convenient distances of the urban centres of Hawkesbury;*	The proposal is consistent.
• *To allow commercial and retail development for:* *(i) uses ancillary to the main use of land within the zone; and* *(ii) the day-to-day needs of the occupants and employees of the surrounding industrial area.*	Not relevant.
• *To ensure that industrial development creates areas which are pleasant to work in and safe and efficient in terms of transportation, land utilisation and services distribution*	Not relevant. The substrate plant is not industrial development.

Part of the substrate plant site is proposed to be zoned RU4 - Rural Small Holdings in Draft Hawkesbury LEP 2009. This arises from an anomaly in the boundary alignment of the proposed IN2 zone and the existing (and expanded) substrate plant. It is anticipated this anomaly will be corrected prior to gazettal of Draft LEP 2009. Development for the purposes of rural industries, which includes the existing substrate plant, is prohibited in the RU4 zone. For completeness, the objectives of the RU4 Rural Small Holdings zone are listed in *Table 8* together with a statement of the consistency of the proposal with each objective.

Table 8 OBJECTIVES OF THE RU4 - RURAL SMALL HOLDINGS ZONE

RU4 Zone Objectives	Consistency of Proposal
• *To enable sustainable primary industry and other compatible land uses.*	Substrate production is a rural industry that is not permitted within the RU4 zone. Not consistent.
• *To maintain the rural and scenic character of the land.*	Not relevant to the exiting substrate plant site.
• *To ensure that development does not unreasonably increase the demand for public services or public facilities.*	The proposal is consistent.
• *To minimise conflict between land uses within the zone and land uses within adjoining zones.*	The proposal is consistent with surrounding land uses.
• *To enable identified agricultural land uses to continue in operation.*	Not relevant. Substrate production is a rural industry.
• *To ensure that agricultural activity is sustainable.*	The proposal is consistent.
• *To ensure that agricultural activities occur in a manner that do not have a significant adverse effect on water catchments, including surface and groundwater quality and flows; land surface conditions and important ecosystems such as streams and wetlands.*	The proposal is consistent.
• *To prevent the establishment of traffic generating development along classified roads.*	The proposal is consistent.
• *To encourage tourism related development that will not have significant adverse environmental effects or conflict with other land uses in the locality.*	Not relevant

Clause 5.10 of the draft LEP requires a consent authority to consider the effect of a proposed development on any heritage item in the vicinity. There are three heritage items in the vicinity of the existing substrate plant (refer to section 5.3.4). The proposed expansion of the substrate plant will have no effect on the heritage significance of the listed items.

Clause 6.7 of the draft LEP *applies to land subject to the discharge of a 1:100 ARI (average recurrent interval) flood event*. This clause would be relevant to the small part of the site that is proposed to be filled to raise its level equal to that of the existing substrate plant. Before granting consent, clause 6.7 requires a consent authority to be satisfied that the development:

(a) will not adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties; and
(b) will not significantly alter flow distributions and velocities to the detriment of other properties or the environment; and
(c) will enable safe occupation and evacuation of the land; and
(d) will not significantly detrimentally affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of the river bank/watercourse; and
(e) will not be likely to result in unsustainable social and economic costs to the flood affected community or general community as a consequence of flooding; and
(f) if located in a floodway,
(i) is compatible with the flow conveyance function of the floodway; and
(ii) is compatible with the flood hazard within the floodway.

The proposed substrate plant expansion does not conflict with any of the above requirements. The effect of the development on flooding is discussed in section 8.

4 SREP 20 –HAWKESBURY-NEPEAN RIVER (NO 2-1997)

4.1 Matters for Consideration

Sydney Regional Environmental Plan No 20 – Hawkesbury-Nepean River (No2-1997) prescribes matters for consideration by a consent authority for certain types of development. The Mulgrave substrate plant would be considered "composting facilities or works" pursuant to SREP 20. The proposed mushroom farm at Londonderry contains a sewage treatment plant and effluent disposal system. This part of the development would be considered "sewerage systems or works" pursuant to SREP 20. Matters for consideration for these types of development are addressed as follows:

5.1.1 Composting Facilities or Works

(a) any potential for groundwater contamination

There is virtually no potential for groundwater contamination, as the operational area is fully sealed and all water draining from this area will flow to recycled water pits for re-use in the process. Water management at the substrate plant is assessed in section 8.

(b) the adequacy of the proposed leachate management system and surface water controls;

There is very little leachate from the composting operations carried out under cover as the composting material is protected from rainfall and is naturally "water hungry". Any seepage from the composting material that does not evaporate from the concrete floor would drain to the water recycling pit.

5.1.2 Sewerage Systems or Works

(a) Whether the proposed development will be capable of connection to a Sydney Water Corporation Limited or council sewerage system either now or in the future.

It is unlikely that a reticulated sewerage system will be available at the mushroom farm site at any time in the foreseeable future.

(b) The suitability of the site for on-site disposal of effluent or sludge and the ability of the sewerage systems or works to operate over the long-term without causing significant adverse effects on adjoining property.

An investigation into effluent disposal has been undertaken as referenced in section 3.4.4, confirming that the site is suitable.

(c) The likely effect of any on-site disposal area required by the proposed development on:
- *any water bodies in the vicinity (including dams, streams and rivers), or*
- *any mapped wetlands, or*
- *any groundwater, or*
- *the floodplain.*

This matter has been considered in the effluent disposal report reference din section 3.4.4. The proposal is considered not likely to have a significant effect on the listed items.

(d) The scope for recycling and reusing effluent or sludge on the site.

Mushroom-growing is a food production process. For health reasons and the image of the product, it is not appropriate to recycle effluent.

(e) The adequacy of wet weather storage and the wet weather treatment capacity (if relevant) of the proposed sewerage system or works.

Subsurface disposal is proposed as described in the report referenced in section 3.4.4. This will not be influenced by wet weather.

(f) Downstream effects of direct discharge of effluent to watercourses.

Not relevant.

(g) The need for ongoing monitoring of the system or work.

Monitoring of the system is proposed as part of normal operations.

4.2 Consistency with Planning Considerations, Policies and Strategies

Clause 4 of SREP 20 requires that a consent authority to take into account general planning considerations, specific planning policies and recommended strategies in

determining an application for consent to carry out development. The various considerations, policies and strategies are listed in summary form in *Table 9* and *Table 10* below together with responses regarding the compliance of the proposed development.

Table 9 SREP 20 PLANNING CONSIDERATIONS

SREP 20 Planning Considerations	Compliance of proposal
(a) The aim of SREP 20	The proposal does not conflict with the intention to protect the environment of the river system by considering future land uses in a regional context
(b) Strategies listed in the Action Plan of the Hawkesbury-Nepean Environmental Planning Strategy	A consent authority would consider the consistency of the proposal against the various strategies and actions listed in the Action Plan.
(c) Feasible alternatives to the development	Alternatives are discussed in Section 1.6..
(d) The impact of the proposal on the environment and proposed safeguards	The impact of the proposal on the environment and safeguards are discussed in sections 7 and 8

Table 10 SREP 20 PLANNING POLICIES AND RECOMMENDED STRATEGIES

Planning Policy and Strategy	Compliance of proposal
Planning Policy 1: Total catchment Management	
(a) Refer the application to other Councils likely to be affected	Other Council areas will not be affected by the proposal
(b) Consider the impact on the catchment	There will be minimal impact on the catchment
(c) Consider the cumulative environmental impact on the catchment	The impact of the proposal on the catchment is not of such significance as to have a cumulative effect with other proposals
Planning Policy 2: Environmentally Sensitive Areas	Environmentally sensitive areas are not affected.
(a) Rehabilitate sand, gravel or soil extraction areas.	Not relevant to the proposal
(b) Minimise adverse impacts on water quality, aquatic habitats, riverine vegetation and bank stability.	The proposal includes water management to prevent release of polluted water including sediment latent water from the sites.

Planning Policy and Strategy	Compliance of proposal
(c) *Minimise impacts on land reserved or dedicated under the NPW Act, 1974 or the Forestry Act, 1916 and conservation area sub-catchments, to protect water quality and biodiversity.*	Not relevant as these lands are not affected.
(d) *Protect wetlands from future development and from the impacts of land use within their catchments.*	Not relevant as wetlands are not affected.
(e) *Consider the need to include buffer zones (such as adequate fire radiation zones) for proposals on land adjacent to land reserved or dedicated under the NPW Act, 1974 or the Forestry Act, 1916.*	Castlereagh Nature Reserve is on the opposite side of The Northern Road from the proposed mushroom farm. The road provides an adequate buffer zone.
(f) *Consider the views of the Director-General of National parks and Wildlife about proposals for land adjacent to land reserved or dedicated under the NPW Act, 1974*	A consent authority would consider the views from the Director-General should this be relevant in relation to Castlereagh Nature Reserve.
(g) *Consider the impact on the water table and the formation of acid sulphate soils*	The sealed surface of operational areas will prevent the development contributing pollutants to the water table.
(h) *New development in conservation area sub-catchments should be located in areas that are already cleared.*	Not relevant. The sites are not within conservation sub-catchments
Planning Policy 3: Water Quality	
(a) *Quantify and assess impacts of pollutant loads on receiving waters*	There will be no significant pollutant loads emanating from the sites
(b) *Ensure that water quality goals are achieved and monitored*	The proposal includes safeguards to ensure there will be no significant impacts on water quality
(c) *Allow river water to be used for human contact only where the quality is suitable*	Not relevant
(d) *Approve on-site sewage effluent disposal only where water and groundwater quality will not be affected*	The proposed treatment plan will ensure that effluent disposal will not harm surface water or groundwater
(e) *Develop in accordance with the land capability of the site and do not cause degradation*	The proposal complies
(f) *Consider the need for an erosion and sediment control plan*	Erosion and sediment control plans will be prepared following development approval.

Planning Policy and Strategy	Compliance of proposal
(g) Minimise or eliminate point source and diffuse source pollution by use of best management practices	The proposal complies
(h) Undertake measures to ensure bank stability along the river and tributaries	Not relevant. No streams are affected.
(i) Consider the impact of removal of river water or groundwater	The substrate plant already uses water from South Creek and from a borehole.
(j) Protect the habitat of native aquatic plants	The proposal will not contribute any significant pollution to either surface water or groundwater as may affect aquatic plants
Planning Policy 4: Water Quantity	
(a) Future development must be consistent with river flow objectives	Not relevant. The substrate plant extracts water in accordance with an existing licence.
(b) Encourage on-site stormwater detention, infiltration and re-use	The development complies.
(c) Consider the effect of development on the total water budget of the river	Extraction of water for the substrate plant will remain within existing licence limits.
(d) Consider the effect on the level and quality of the water table	The quality of the water table will not be affected. The substrate plant will continue to use groundwater from an existing licensed borehole.
Planning Policy 5: Cultural Heritage	
(a) Encourage development which facilitates conservation of heritage items.	Not relevant.
(b) Protect Aboriginal sites and places of interest	Not relevant. Surveys found no sites.
(c) Consider an Aboriginal site survey	An archaeological survey has been carried out.
(d) Consider the extent to which heritage items relate to the river.	Not relevant
Planning Policy 6: Flora and Fauna	
(a) Conserve and where appropriate, enhance flora and fauna communities	The mushroom farm protects vegetation to the rear of the site and involves additional plantings.
(b) Locate structures in areas which are already cleared	The proposal complies.

Planning Policy and Strategy	Compliance of proposal
(c) Minimise impacts, protect and restore habitat values	The proposal will not significantly disturb the naturally vegetated areas.
(d) Consider the impact on ecological processes, such as waste assimilation and nutrient cycling	Ecological processes will be virtually undisturbed in the naturally vegetated part of the site
(e) Consider the presence and survival of flora and fauna, threatened species and migratory species	The proposed development has been assessed as having little impact. Refer to section 7
(f) Consider the need for buffers, fire zones and building setbacks from significant flora and fauna habitat areas	The proposal will not include any process or activity requiring a buffer between it and flora and fauna habitat areas.
(g) Consider the need to control access to flora and fauna habitat areas	The mushroom farm will be fenced. Other access restrictions will not be necessary.
(h) Consider the need to maintain corridors for fish passage …	Not relevant
(i) to (q) apply to wetlands	Not relevant
Planning Policy 7: Riverine scenic quality	
Strategies (a) to(f)	Not relevant as the proposed development is not located in the riverine corridor
Planning Policy 8: Agriculture/ Aquaculture, fishing	
(a) *Give priority to agricultural production in rural zones*	Not relevant. This is a direction to councils
(b) Ensure zone objectives and minimum lot sizes support continued agricultural use …	Not relevant. This is a direction to councils
(c) Incorporate effective separation between intensive agriculture and adjoining uses to mitigate noise, odour and visual impacts	The proposed mushroom farm is adequately separated from residences and incorporates earth mounds to further reduce impacts
(d) Protect agricultural sustainability from the adverse impacts of other forms of proposed development	Not relevant. This is a direction to councils
(e) Consider the ability of the site to sustain over the long term the development concerned	Both the mushroom farm and substrate plant sites can be sustained over the long term.
(f) Consider the likely effect of the development on fish breeding grounds, nursery areas …	Not relevant

Planning Policy and Strategy	Compliance of proposal
Planning Policy 9 : Rural Residential Development	
Strategies (a) to (g)	Not relevant. This strategy refers to constraints on proposals for rural residential development.
Planning Policy 10: Urban development	
Strategies (a) and (b)	Not relevant
Planning Policy 11: Recreation and Tourism	
Strategies (a) to (f)	Not relevant
Planning Policy 12: Metropolitan Strategy	
Strategies (a) to (e)	Not relevant

5 PENRITH DEVELOPMENT CONTROL PLAN 2006

Consistency of the proposal with relevant sections of Penrith DCP 2006 is considered in *Table 11* below:

TABLE 11 CONSISTENCY WITH PENRITH DCP 2006

Relevant Section of Penrith DCP 2006	Consistency of Proposal
Part 2 City Wide General Controls	
2.4 Erosion and Sediment Control	An erosion and sediment control plan for the mushroom farm development has been prepared and is included in the application.

Relevant Section of Penrith DCP 2006	Consistency of Proposal
2.6 Landscape	The proposed mushroom farm is an agricultural development on a rural property. Landscaping will be undertaken on the earthen mound to be constructed along The Northern Road frontage and the northern property boundary for the purposes of reducing visibility of the developed area. It is not intended to landscape the balance of the rural property as it is to remain in rural use. Plantings on the earthen mounds will be local indigenous species specified by the ecological consultant. Detailed design of the car parking area, child care centre and office building may provide for small gardens or shade trees. It is proposed to develop a detailed planting schedule and maintenance regime as part of detailed design of the development. The detailed plan would be submitted for approval at that time according to requirements of the project approval.
2.9 Waste Planning	The waste planning section of the DCP states that it applies to residential, commercial and industrial development in the City of Penrith. The proposed mushroom farm is not strictly within that definition, but the proposal is consistent with the objectives of the section: • To encourage waste avoidance and resource recovery through planning, re-use and recycling. • To facilitate source separation. • To ensure quality design of facilities for the storage and collection of wastes and recyclables. Waste management at the mushroom farm is considered in this environmental assessment.

Relevant Section of Penrith DCP 2006	Consistency of Proposal
2.11 Car Parking	The car parking section of the DCP applies to all developments in Penrith Local Government area. There are no specific parking requirements in the DCP for a mushroom farm or similar agricultural activity. The traffic assessment included in this environmental assessment has considered parking and adopted the parking rate in Penrith DCP 2006 for a factory, being one space per two employees.
2.12 On-site Sewage Management	The DCP requires a site and soil assessment to accompany an application for a new sewage management system. An assessment of the proposed on-site effluent management system is included in the environmental assessment.
Part 3 City Wide Specific Land Uses	
3.3 Child Care Centres	The DCP provides standards for child care centres in Penrith, but indicates that standards for work place child care may vary from those expressed in the DCP. A separate application will be submitted for the child care centre, proposed in stage 2A of the development, having regard to the requirements of the DCP.
Part 4 Land Use Based Controls	
4.9 Rural Development	Detailed development controls for rural development are contained in section 4.9 of Penrith DCP 2006. Relevant controls are as follows:
Part B – Development Issues	
1. Setbacks	
Minimum setback of 30 metres from The Northern Road	The proposal complies.
2. Services	
Applicants are required to make satisfactory arrangements with service providers for water, electricity, telephone and gas. An effluent disposal system is required in rural areas.	The proposal complies. Suitable arrangements will be made.
3. Flooding	
If the site is subject to risk of flooding detailed requirements will apply	The site is not identified as being at risk of flooding

Relevant Section of Penrith DCP 2006	Consistency of Proposal
4. Access	
Roads and intersections are to be upgraded to handle traffic generated by the development	The proposal complies.
5. Tree Preservation	
Consent is required to remove any trees	A project approval will provide the necessary consent.
6. Aboriginal Archaeological Surveys	
An archaeological survey may be required	The proposal complies.
7. Advertising	
Minimise the impact of advertising structures and prevent distraction to motorists	Advertising is not proposed apart from site identification.
8. Car Parking	
Refer to section 2.12 (sic) of the DCP to determine the extent of parking required.	The proposal complies
Car parking should be hard stand with delineated parking bays and circulation aisles	The proposal complies
Access design should allow vehicles to enter and leave safely	The proposal complies
The method for treating and minimising runoff should be addressed	The proposal complies
Landscaping should visually separate car parks from the access roads buildings they serve	Not considered practical for the mushroom farm
Large car parks should not be visible from a road	The proposal complies
9. Noise Generation and Control	
An acoustic report is required to accompany an application for noise generating development	The proposal complies
Consent will not be granted to a development that cannot comply with DECCW recommended standards	The proposal complies
10. Drainage	
Development proposals should take into account the effect of the development on access, drainage on	The proposal complies
adjoining properties, flooding on adjoining properties	The proposal complies
Consideration should be given to the existing soil type	

Relevant Section of Penrith DCP 2006	Consistency of Proposal
11. Landscaping	
Concept plan should accompany an application with more detail submitted later for construction cert.	The proposal complies
Local species should be favoured that are suitable for the application	The proposal complies
Existing trees should be included, with proposed removals identified	The proposal complies
Re-vegetation of disturbed areas should be included on the plan	The proposal complies
12 REPs	
Relevant REPs should be consulted	See above in section 4
13. Soil Erosion and Sedimentation	
Demonstrate the measures to be employed to control erosion and sedimentation	The proposal complies
Part D – Agricultural Developments	
1. Agriculture	
Clearing and filling for agriculture requires consent *Natural vegetation is to be retained where possible* *Drainage should be designed to ensure no detriment to downstream properties and watercourses*	The proposal complies
8. Filling	
Introduced fill shall not include putrescible waste or building material	The proposal complies
The filled area shall not impact on drainage characteristics of other properties	The proposal complies
The material shall be suitably compacted and treated to prevent siltation of watercourses	The proposal complies
The filled area shall be finished and landscaped	The proposal complies
Plans should demonstrate levels before and after	The proposal complies
9. Dams	
Detailed information is required with applications to construct a dam	Detailed design drawings will be supplied at construction certificate stage
Part E – Non Agricultural Developments	
2. Traffic Generating Developments	
A list of specific maters relating to safety, pedestrian/ vehicle conflict, parking, access, traffic and main road considerations	The proposal complies

5 HAWKESBURY DEVELOPMENT CONTROL PLAN 2002

Consistency of the proposal with relevant sections of Hawkesbury DCP 2002 is considered in *Table 12* below:

TABLE 12 CONSISTENCY WITH HAWKESBURY DCP 2002

Relevant Section of Hawkesbury DCP 2002	Consistency of Proposal
Part C –General Guidelines	
1 Landscaping *A landscape concept plan is required for most developments*	The substrate plant site is already extensively planted with screening vegetation along all fill batters and elsewhere on the site. Similar landscape planting will be undertaken on the batters of the additional area to be filled. As this will be a minor extension, complementing what is already present, a detailed landscape plan is not considered warranted.
2 Car Parking and Access *Provision is to be made for off street car parking to cater for employees, visitors and service vehicles. There are guidelines regarding design of parking areas, access requirements and number of spaces to be provided for various types of development. There are no specific parking requirements applicable to a substrate plant*	Car parking and access requirements have been considered in the traffic report forming part of the application. The report determined that the Mulgrave site should provide 14 car parking spaces. The proposal complies with access guidelines in the DCP, where they are relevant.
3 Signs *The DCP discourages signs in residential, rural and scenic protection zone. A sign up to 0.75 m^2 is permitted to indicate the purpose for which land is used*	The proposal does not include any change to signage.
4 Soil Erosion and Sediment Control *An erosion and sediment control plan may be required with a DA. The DCP provides guidelines for various types of projects.*	An erosion and sediment control plan for the substrate plant upgrade has been prepared and is included in the application.
5 Bushfire Prone Land	Not relevant as the Mulgrave site is not bushfire prone land
6 Energy Efficiency	Not relevant as the guideline is specific to residential development.
7 Effluent Disposal	Not relevant as the guideline refers to on-site sewage management. The substrate plant is connected to the sewer.

Relevant Section of Hawkesbury DCP 2002	Consistency of Proposal
8 Construction and Demolition Waste *Waste management plans are required for various types of development, but the requirement does not include rural industry. The DCP provides principles and guidelines for waste management plans and their implementation.*	The proposed expansion of the substrate plant is not a development of the types referred to in the DCP as requiring a waste management plan. Management of construction waste at the Mulgrave site has been addressed in the environmental assessment.
Part D –Specific Development *7 Landfill* *An applicant for consent for a project that includes filing land should demonstrate that*	
• *soil erosion will be controlled;*	The application includes an erosion and sediment control plan.
• *filling will have no adverse effect on the surrounding drainage systems (including overland flow);*	a flood impact assessment is included with the application, indicating no significant effect.
• *height, shape and bulk of the fill will be in character with the surrounding topography;*	The fill will be a minor extension to an already filled area, raising land to the same height.
• *that fill material will be capable of sustaining plant growth and the proposed plant material is in character with the surrounding landscape.*	Fill material will be obtained from sources available at the time. Topsoil will be selected to support an extension of existing landscape plantings.

Appendix D

EXISTING CONSENT CONDITIONS, SUBSTRATE PLANT

EXISTING CONSENT CONDITIONS, MULGRAVE

The Department of Planning has indicated that if the project is approved, it expects Elf Farm Supplies to surrender all existing planning approvals for the Mulgrave substrate plant in favour of a single modern planning approval (see *Appendix A*). The Director-General's requirements requests a summary of previous consents issued for the Mulgrave substrate plant, including a summary of conditions that are relevant for ongoing operations and those that are no longer relevant. Details are also requested of any components of the plant that have been approved but not constructed.

1. Existing Development Consents

A summary of existing development consents applicable to the Mulgrave substrate plant appears in *Table 1.1* in section 1.4 of this environmental assessment. That table is reproduced below as *Table 1*.

Table 1 SCHEDULE OF DEVELOPMENT CONSENTS, MULGRAVE

Date	Consent No	Approved Development
13/7/79	58/1979	"Erect a mushroom composting shed for manufacture of compost and storage of ingredients with rail siding and weighbridge".
14/10/80	106/1980 (DA 08/80)	"Erect a mushroom composting shed for manufacture of compost and storage of ingredients with rail siding and weighbridge".
9/9/81	482/1981 (DA 544/81)	"Erect storage sheds, subject to the conditions attaching to the previous development consent over the property relating to construction and sealing of access roads and parking areas having been met".
13/7/82	modify 106/1980	"An extension of hours be granted from, 6 am to 6 pm Monday to Saturday and 6 am to 12 noon on Sunday, and Mr Tolson be requested wherever possible to load the truck inside the shed."
19/12/88	759/1988 (DA 662/88)	"Additions to the pre-wetting area"
11/9/90	218/90	"Extensions to existing mushroom composting operation in two stages. Extensions consist of 21 tunnels, materials storage shed, extension to mushroom composting shed, dam and the filling of land for building platforms".
20/12/93	184/93	"Landfill operation and erection of produce store and hayshed"
20/2/01	M1538/00	"Alterations and additions to existing mushroom compost facility" – includes two chimneys on existing phase 1 tunnels, land filling and demolish house.

Date	Consent No	Approved Development
19/6/01	Modify 218/90	Amendment to condition 8 of 1990 consent to alter dimensions of phase 1 tunnels not yet constructed.
19/2/02	MA0923/01	"Alterations and additions to existing mushroom compost facility" – enclosed buildings at each end of the tunnels, extend roof over ingredients shed, construct office, bioscrubber, conveyors, chimney, extend hours of operation to 24 hour operation.
26/8/02	DA0623/02	"Alterations and additions to existing mushroom substrate production facility" – fresh approval for all works described in MA0923/01 plus additions: enclosed pre-wet building and connecting corridor, tractor shed, extend office, extend plant room, increase chimney height, boundary wall at railway.
22/11/06	DA0571/06	"Land filling - storage and manoeuvring area for mushroom substrate plant"
22/11/07	DA0921/06	"Tunnel building extension (phase 2 and 3) and maintenance equipment shed" – nine additional phase 2 and 3 tunnels
20/2/08	DA0701/07	"Bagging and Blocking shed having an area of 1060 m^2"
14/1/10	DA0120/09	"Storage Shed" (Tractor shed)

2. Conditions Relevant for Ongoing Operations

Development consent DA0623/02 issued in August 2002 approved a series of significant alterations to the plant to largely create its current configuration. Operating requirements included in DA0623/02 incorporated or superseded operating requirements of previous development consents.

The four development consents issued subsequent to DA0623/02 also contain relevant operating conditions, some of which are repeated in more than one development consent. *Table 2* lists the operating conditions appearing in DA0623/02 and the four subsequent consents and indicates relevance to ongoing operations.

Table 2 EXISTING DEVELOPMENT CONSENT CONDITIONS RELEVANT TO ONGOING OPERATIONS AT MULGRAVE

Condition	DA0623/02 Plant expansion	DA0571/06 Manoeuvring area	DA0921/06 Extra phase 2/3 tunnels	DA0701/07 Bagging shed	DA0120/09 Tractor shed	Relevance
Substrate dispatched from the site shall not exceed 600 tonnes of "Phase 3 equivalent substrate". For the purpose of this condition "Phase 3 equivalent substrate" means Phase 1 substrate tonnage divided by 1,667 plus Phase 3 substrate tonnage.	Condition 32		Condition 36 also submit compliance to Council annually	Condition 41 also submit compliance to Council annually		This is the current limitation on production at the facility. The current application proposes that this limitation be increased in stages.
All sound producing plant, equipment, machinery, fittings, and the like shall be sound insulated and/or isolated so as to control noise emissions from the premises to within the limits prescribed by the Noise Control guidelines.	Condition 33					This condition was satisfied in the construction phase of the 2002 plant expansion. It continues to be relevant to ongoing operations.
The facility is to [be] operated in such a manner as to comply with EPA criteria for the emission of noise and odour.	Condition 34		Condition 40 refers to odour only	Condition 38 refers to odour only		Relevant
The facility to is be operated in such a manner as to not interfere with the amenity of the neighbourhood, in respect of noise, vibration, smell, dust, waste or waste products, or otherwise.	Condition 35					Relevant

Condition	DA0623/02 Plant expansion	DA0571/06 Manoeuvring area	DA0921/06 Extra phase 2/3 tunnels	DA0701/07 Bagging shed	DA0120/09 Tractor shed	Relevance
The 24 hour operation as described in the Schedule of Operations submitted with the application is for a trial period of 12 (twelve) months from the start of the said operations provided that truck and loading movements are restricted to existing operating hours until the enclosure works have been completed and inspected by Council officers. Written advice is to be given to Council within 7 (seven) days of the start of the 24 hour operations. At the end of the 12 (twelve) month period Council will examine the performance of the facility with respect to compliance with EPA noise criteria and the predictions made in the noise planning assessment submitted with the application. The operator of the site is advised that additional noise monitoring/modelling may be required to be submitted in order to demonstrate such compliance.	Condition 36					The twelve month trial was completed and a noise assessment, prepared by an acoustic consultant, was submitted to Council indicating compliance. As the trial was successfully completed the condition has been satisfied and is no longer relevant to ongoing operations.
The development shall be limited to the area shown on the submitted plans		Condition 57				This refers to the area approved for filling and for subsequent use as a manoeuvring and storage area. Relevant.

Condition	DA0623/02 Plant expansion	DA0571/06 Manoeuvring area	DA0921/06 Extra phase 2/3 tunnels	DA0701/07 Bagging shed	DA0120/09 Tractor shed	Relevance
All vehicle manoeuvring/ parking and hardstand storage areas are to be regularly cleaned to minimise nutrient/ sediment runoff from the site.		Condition 58				Relevant
All work and the storage of goods or materials shall be confined within the buildings or approved areas at all times.		Condition 59				Relevant
All landscaping works shall be monitored and maintained by a suitably qualified landscape specialist. Any required remediative measures to maintain landscaping works to a high standard are to be implemented.		Condition 60				Relevant
Erosion and sediment control devices are to be maintained to ensure there is no increase in downstream levels of sedimentation, nutrients or other water borne pollutants in accordance with Council's Development Control plan – Soil Erosion and Sedimentation.		Condition 61				Relevant
Measures shall be implemented to prevent vehicles tracking sediment, debris, soil and other pollutants onto any road.		Condition 62				Relevant

Condition	DA0623/02 Plant expansion	DA0571/06 Manoeuvring area	DA0921/06 Extra phase 2/3 tunnels	DA0701/07 Bagging shed	DA0120/09 Tractor shed	Relevance
The sedimentation ponds are to be cleaned when necessary to maintain suitable storage capacity. Any vegetation disturbed in this process is to be replanted/reinstated.		Condition 63				Relevant
The development is not to contribute to water pollution or pollution of waters as defined under the Protection of the Environment Operations Act, 1997		Condition 64				Relevant
No internal or external alterations shall be carried out without prior approval of Council.			Condition 37	Condition 35	Condition 29	Relevant
All fire safety equipment and fixtures shall be regularly serviced and maintained. The owner or their agent shall certify annually that each of the fire safety measures specified in this statement has: (a) been assessed by a properly qualified person, and found, when it was assessed, to be capable of performing to at least the standard required by the current Fire Safety Schedule for the building for which the certificate is issued.			Condition 38	Condition 36	Condition 30	Relevant

Condition	DA0623/02 Plant expansion	DA0571/06 Manoeuvring area	DA0921/06 Extra phase 2/3 tunnels	DA0701/07 Bagging shed	DA0120/09 Tractor shed	Relevance
Noise from the combined operation of all mechanical plant and equipment shall not generate noise levels that exceed 5dB(A) above the ambient background noise level measured at the nearest residential property boundary when measured in accordance with the Environment Protection Authority's Industrial Noise Policy.			Condition 39	Condition 37	Condition 31	Relevant
The blocking and bagging process shall be undertaken in a "fully enclosed" environment at all times to minimise noise and odour emissions for [sic] the premises.				Condition 39		Relevant
Hours of operation of the blocking and bagging process is [sic] to be restricted to 6am - 6pm Monday to Saturday and 6am - 12pm on Sundays.				Condition 40		This restriction is considered unwarranted given that rest of the plant is approved for 24 hour operation. It was not pressed at the time with Council pending the current project application

3. Conditions No Longer Relevant

Development consents issued prior to DA0623/02 are considered to have no further relevance to the operation of the substrate plant. Conditions of DA0623/02 and subsequent consents referring to completed construction work are also considered to no longer be relevant.

4. Approved Works Not Yet Constructed

Development consent DA0571/06 authorises filling part of the site to create a manoeuvring/storage area. This is an ongoing construction activity, progressing towards completion. Consequently DA0571/06 continues to have relevance in authorising and conditioning this work.

All other approved works have been constructed.

Appendix E

ENVIRONMENTAL RISK ASSESSMENTS

ENVIRONMENTAL RISK ASSESSMENT, MUSHROOM FARM

According to the Australian Mushroom Growers Association (AMGA) western Sydney has the highest concentration of mushroom growers in Australia, accounting for some three quarters of New South Wales production and one quarter of Australia's national mushroom product. In 2006 the AMGA reported that there were some 15 mushroom growers in western Sydney.

Mushroom farming is an intensive agricultural activity that does not require a licence from DECC. Because the mushroom industry is well established in the region there has been ample opportunity to observe the environmental performance of mushroom farms. An appropriately located, designed and managed mushroom farm has a relatively benign impact on the surroundings. The need for 24 hour operation however, including night time truck movements, indicates a potential for environmental impacts if the mushroom farm is not well located, designed and managed.

Table 1 below identifies potential incidents or circumstances associated with Londonderry mushroom farm that may give rise to environmental impacts, the possible consequences should those incidents or circumstances occur, preventive measures that form part of the mushroom farm project to protect against environmental impacts and the likelihood of the impact occurring. The likelihood of occurrence has been assessed on a scale with the values: "almost certain"; "likely"; "possible"; "unlikely"; or "almost never".

The likelihood of occurrence is assessed as "unlikely" for the majority of potential impacts and "possible" for the key environmental issues of noise, dust, water quality and transport.

Noise and transport issues are given a "possible" rating because the site will be served by trucks not controlled by the operator. There will be measures in place to inform drivers of requirements that their vehicles remain noise compliant and requesting that they drive in an appropriate manner, but this does not eliminate the possibility of non-compliance.

Dust nuisance is possible during the construction phase associated with preparing the building platform and creating an earthen mound for noise and visual purposes along the frontage and northern side of the site. Standard dust control practices would normally prevent a significant impact, however dry weather and strong winds at the time can exacerbate dust generation.

Water management systems are designed to handle defined climatic events. Should a storm exceeding the defined event occur during the lifetime of the mushroom farm, the water management system may overflow.

Table 1 EVENT - CONSEQUENCE CHART, MUSHROOM FARM

Environmental Issue	Initiating Event	Potential Consequences	Preventive Measures	Likelihood of Occurrence*
Noise	• Noisy plant, outside specification; • Plant room doors left open or shielding panels removed; • Vehicle noise outside specification; • Driver using compression brakes at night	• Excessive noise at receptors resulting in decreased amenity.	• Plant designed to meet noise specifications; • An earthen mound included along the frontage and northern side of the site for noise attenuation • Noise management procedures included in the EMP and rigorously implemented; • Compliance testing at start up; • Complaint management procedure.	• Possible
Air quality	• Dust generation during earthworks in the construction phase; • Spent substrate becomes saturated and odour-generating.	• Dust nuisance created affecting nearby residents • Odour detected at receptors under certain climatic conditions.	• Dust controls during construction; • Plant designed to prevent contaminants entering dam and to keep spent substrate under cover; • Odour management procedures included in the EMP and rigorously implemented; • Complaint management procedure	• Possible (dust) • Unlikely (odour)
Water Quality	• Nutrients from spent substrate enter runoff water; • Wash water escapes to natural drainage; • Pollution incident from vehicle	• Decrease in water quality in downstream watercourses; • Pollutants enter groundwater; • Damage to vegetation or wildlife.	• Plant designed to convey roof and surface runoff to the site dams; • Dams adequately sized to prevent release of water except in major rainfall events;	• Possible

Environmental Issue	Initiating Event	Potential Consequences	Preventive Measures	Likelihood of Occurrence*
	accident or fuel spill; • Polluted water leaving the site during or following a fire or flood; • Suspended sediments in runoff during construction.		• Process water including wash down water separately collected and treated for reuse; • Erosion and sediment controls implemented during construction	
Transport	• Traffic congestion when employees arrive/depart the premises; • Traffic accidents at the site entrance; • Accident involving heavy vehicle en route to/from the site.	• Delays for other roads users; • Reduction in road safety.	• Intersection of site access road and The Northern Road designed to RTA requirements; • Driver behaviour management part of EMP.	• Possible
Flora/fauna	• Construction activity or vehicles disturb land beyond the project boundary; • Pollution incident from vehicle accident or fuel spill	• Loss of native vegetation and fauna habitat;	• Identify vegetation to be retained on the site before commencement; • Erect barriers around the vegetation to be protected before commencement.	• Unlikely
Visual amenity	• Bushfire destroys screen planting and landscaping; • Drought results in dieback of screen planting or landscaping.	• Farm buildings become more visible until screening restored.	• Maintain fire fighting equipment on site; • Water screen plantings from collected runoff when needed.	• Unlikely
Cultural heritage	• Aboriginal artefacts disturbed during construction.	• Loss of Aboriginal artefacts	• implement measures recommended in Aboriginal archaeological survey.	• Unlikely

* Likelihood of occurrence: “almost certain”; “likely”; “possible”; “unlikely”; or “almost never”

ENVIRONMENTAL RISK ASSESSMENT, SUBSTRATE PLANT

The mushroom substrate plant at Mulgrave has operated for some 27 years. Over that period the plant has been modified and adapted to improve the efficiency and quality of substrate and minimise environmental impacts. The plant has operated in its current configuration for several years at maximum production levels allowing its environmental performance to be observed and monitored. Ongoing odour monitoring has confirmed that the plant remains within limits set in the licence issued by DECCW.

The expansion now proposed is based upon designs and techniques for impact minimisation already proven at the plant. In addition the expansion includes new measures to be introduced that will further reduce the potential for environmental impact of the current operation from fugitive emissions.

Table 2 below identifies potential incidents or circumstances associated with the Mulgrave substrate plant that may give rise to environmental impacts, the possible consequences should those incidents or circumstances occur, preventive measures that will form part of the substrate plant expansion to protect against environmental impacts and the likelihood of the impact occurring. The likelihood of occurrence has been assessed on a scale with the values: "almost certain"; "likely"; "possible"; "unlikely"; or "almost never".

The likelihood of occurrence is assessed as "possible" for the key environmental issues of air quality, noise and transport and "unlikely" for water quality and "almost never" for visual impact.

Air quality impacts are considered possible in respect of dust and odour. Dust generation is possible during the construction phase, associated with filling a small part of the site and other construction activities on unsealed surfaces. Odour emissions are possible because the process is by nature odour-generating. The design of the current operation and the proposed expansion is substantially governed by the need to collect and treat air emissions. The current operation has a bioscrubber to treat emissions which are released through a chimney to aid dispersion. The expansion will include a second bioscrubber and chimney, separating emissions from the pre-wet building from those of the Phase 1 tunnel building and providing better control of fugitive emissions. For this reason odour impacts are considered "possible", but not "likely".

The water management system at the plant is designed to direct surface runoff into the recycled water tank, sized to hold runoff from a defined storm event. Water is recycled from the tank for bale wetting. A second similar system is proposed to be added as part of the expansion. Should these systems overflow in a major storm, the discharge flows to a farm dam on the property. The dam is lined to prevent infiltration and configured so that it does not receive runoff from any other catchment. It is possible

that the dam could be inundated in the event of a major flood. However in these circumstances it is unlikely that any significant deterioration in then existing water quality would occur.

Noise and transport issues are given a "possible" rating because the site will be served by trucks not controlled by the operator. There will be measures in place to inform drivers of requirements that their vehicles are noise compliant and requesting that they drive in an appropriate manner, but this does not eliminate the possibility of non-compliance.

It is considered that once the landscaping is completed with its screening vegetation, the chance of this being lost through neglect, bushfire or dieback is "almost never". This assessment takes into account that the site will be continually monitored by the operators who will become aware if the screening vegetation begins to fail.

Table 2 EVENT - CONSEQUENCE CHART, SUBSTRATE PLANT

Environmental Issue	Initiating Event	Potential Consequences	Preventive Measures	Likelihood of Occurrence*
Air quality	• Dust generation during earthworks in the construction phase; • Failure of odour control plant; • Fugitive emissions; • Dam becomes anaerobic.	• Dust nuisance created, affecting nearby residents • Odour detected at receptors under certain climatic conditions.	• Dust controls during construction; • Plant designed for odour control with second bioscrubber duplicate fans and improvements to prevent fugitive emissions; • Dam to be monitored to prevent anaerobic conditions; • Odour management and monitoring procedures included in the EMP and rigorously implemented; • Complaint management procedure	• Possible (dust) • Possible (odour)
Water Quality	• Dam water escapes to South Creek; • Infiltration of nutrients from the dam; • Pollution incident from vehicle accident or fuel spill; • Polluted water leaving the site during or following a fire or flood; • Suspended sediments in runoff during construction;	• Decrease in water quality in South Creek; • nutrients enter groundwater; • Material deposited on farm pasture; • Potential effect on wildlife	• Process water, including wash down water is separately collected and recirculated in the process; • Surplus capacity is built in to recycle water pits to receive storm water; • Dam is lined and adequately sized to prevent release of water; • Erosion and sediment controls implemented during construction	• Unlikely

Environmental Issue	Initiating Event	Potential Consequences	Preventive Measures	Likelihood of Occurrence*
Noise	• Noisy plant, outside specification; • Plant room doors left open or shielding panels removed; • Vehicle noise outside specification; • Driver using compression brakes at night	• Excessive noise at receptors resulting in decreased amenity.	• Plant designed to meet noise specifications; • Noise management procedures included in the EMP and rigorously implemented; • Compliance testing at start up; • Complaint management procedure.	• Possible
Transport	• Traffic accidents at the site entrance; • Accident involving heavy vehicle en route to/from the site.	• Reduction in road safety.	• Intersection of site access road and Mulgrave Road designed to RTA requirements; • Driver behaviour management part of EMP.	• Possible
Visual amenity	• Bushfire destroys screen planting and landscaping; • Drought results in dieback of screen planting and landscaping.	• Plant buildings become more visible until screening restored.	• Maintain fire fighting equipment on site; • Water screen plantings as needed.	• Almost never

* Likelihood of occurrence: "almost certain"; "likely"; "possible"; "unlikely"; or "almost never"

Appendix F

MUSHROOM FARM STORMWATER MANAGEMENT PLAN

Barker Ryan Stewart

Planning • Sustainability • Infrastructure • Development • Certification

Proposed Mushroom Farm

521 The Northern Road

Londonderry

Stormwater Management Plan

Revision E
Date: 24/11/2010
File Ref.: 20070166R01E

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1 Introduction

This report has been prepared to consider the stormwater management options for the proposed mushroom farm to be established at 521 The Northern Road, Londonderry. Barker Ryan Stewart has been engaged to investigate the management of stormwater on the site and determine options for its detention and re-use.

In determining stormwater management options for the site, this report will consider the following:

1. The pre-development site conditions;

2. The extent and nature of the site catchment area;

3. The storage requirements for detention and re-use purposes; and

4. The configuration of the site stormwater drainage system.

2 Existing Site

2.1 Site Location

The site of the proposed mushroom farm is described as 521 The Northern Road, Londonderry (Lot 138, DP 752037) and is located within the Penrith City Council local government area. The site adjoins the auto wreckers on its southern boundary. The northern and western boundaries adjoin existing rural residential properties. The site area is approximately 22.12 hectares and the locality is shown in Figure 2-1 below.



Figure 2-1 Site Location of 521 The Northern Road, Londonderry

2.2 Existing Site Conditions

The existing site is a rural residential development. The majority of the site is undeveloped, although generally cleared, with a pocket of vegetation located in the south-western corner of the site. Isolated small pockets of vegetation are also scattered around the site. A residential cottage is located adjacent to The Northern Road, on the eastern boundary of the site.

The site is generally flat, although the southern half of the site has a slight fall to the south. A small portion in the north-western corner of the site also falls towards the north-west.

The property contains six existing rural dams, with most being small farm dams. The dam in the middle of the southern half of the site is a larger dam and receives runoff from a large portion of the site. This dam will be retained in the proposed development to act as a reservoir for water storage.

An aerial photo of the site is contained within Appendix A.

2.3 Existing Flow Paths and Catchment

Figure 2-2 shows the ridge line and corresponding overland flow paths for the existing undeveloped site. Natural contours of the site show that a ridge line exists through the centre of the site (see in red). Due to the topography of the adjoining northern property there is no external contributing catchment area to the proposed site, water from the proposed development site flows north from the ridge.

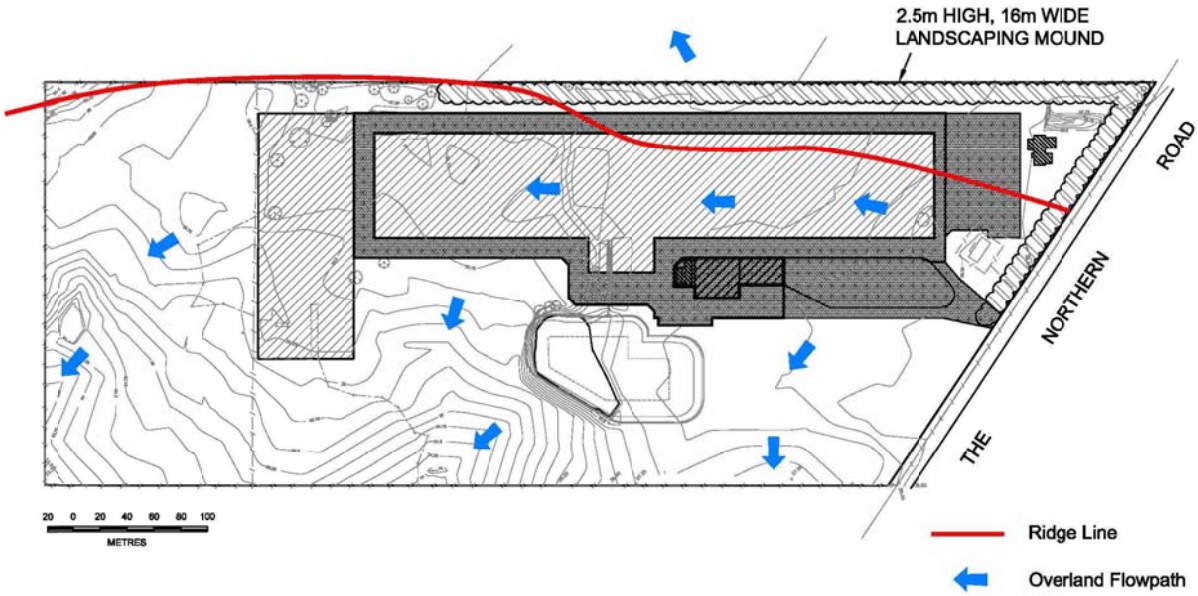


Figure 2-2 Overland Flow path to Landscaping mounds.

The site is quite flat around the ridge line with the land gently falling generally in a southerly or westerly direction with little to no fall to the sites north.

3 Proposed Development

3.1 General

The proposed development consists of the establishment of a mushroom farm and associated facilities on the site. The farm will include growing rooms, peat and compost storage facilities, workshops and sheds, car parking and driveway areas and a child care centre for staff. The configuration of the proposed development is shown on the plan detailed in Appendix B.

3.2 Stormwater Management

3.2.1 General

It is proposed to implement an extensive stormwater management system on the site to manage both, the stormwater runoff from rainfall events and runoff from wash-down, cleaning and maintenance activities. This system will enable the storage of both types of runoff and the re-use of water within the farm, thereby resulting in water quality benefits for site runoff as well as significant cost savings in the operation of the farm and an environmental benefit from the reduction in water consumption. The stormwater runoff will be collected and stored in a proposed 14.7megalitre dam, whilst the wash-down water from maintenance and cleaning activities will be treated in a 339, 000L wetland system and stored for re-use in a 100,000L tank. Section 4 of the report describes the water balance proposed for the site while section 5 indicates how the peak stormwater discharges shall be addressed during periods of heavy rainfall and section 6 shows how the site will manage to control the discharge of pollutants originating from the development of the site.

3.2.2 Stormwater Management System

The stormwater management system will consist of two distinct pipe systems, separating polluted flows from wash down activities and runoff from rainfall events.

Stormwater runoff will be collected from roof, driveway and apron areas through a conventional pit and pipe system. This water is directed to the existing dam located in the southern half of the site utilised as a reservoir for water storage where it will be stored for re-use for wash down purposes and the cooling towers. Details of water balance calculations can be found in Section 4. The modified dam would also act as detention storage in extreme rainfall events, reducing peak runoff discharges from the impervious areas of the farm back to pre-developed flow rates. Details of estimated peak discharges for pre-developed and developed discharges can be found in Section 5.

The second pipe drainage system will be operational during the washout of the growing rooms and adjacent areas. Runoff from these areas will be captured by the same pit system in the driveway and apron areas used to collect rainfall runoff. However, these pits will contain a manually operated gate valve arrangement, which will prevent wash down water from entering the rainfall runoff pipe system. The wash down water will be conveyed by a separate pipe system to the water recycling ponds wetland treatment system located on the southern side of the farm building. Floor drains in the spent compost store room will also be connected to the wetland treatment system. The wetland system will treat these waters and the resulting water will then be stored in a 100,000L storage tank, which will be used on the premises for toilet flushing, steam generation, boilers and supplementing demand for cooling towers and irrigation.

With the existing site being generally flat with only slight fall to the south west a minimum pipe grade of 0.5% would be adopted for the pipe network, with a minimum 20mm drop through the pits. This was done in a bid to minimise filling on the site while ensuring the site could drain to the proposed discharge point.

To ensure that there is no overflow from the water treatment facility of polluted waters into the downstream watercourse, it is proposed to incorporate a small bund wall at the low side of the treatment area, that will have the capacity to contain the maximum operating treatment volume as well as the 24 hour, 1 in 100 year ARI rainfall event. The volume associated with this storage is 10.1mm per hour over 24 hours across an area of 1000 square metres equating to a volume of 250 cubic metres. The proposed stormwater management system is shown on the plans detailed in Appendix C.

3.2.3 Catchments

The proposal is situated on a low ridge and will have 5 significant discharge points, two to the west and 3 to the south. Refer to Figure 3-1 for discharge point locations. The proposed development will comprise of roofed areas, paved area, Water Recycling Ponds treatment area and landscaped areas that will discharge to a storage dam for reuse. Overflows from this dam will discharge to the south via the main discharge point of the site. Approximately 10.8ha of the site will drain with uninterrupted flow from the site. Table 3-1 below shows the areas contributing to the dam.

Table 3-1 Site Catchment Areas

Total Site Area =	221266 m^2
Roofed Area =	49388 m^2
Paved Area =	25990 m^2
Landscaping Area / Sound Mound Draining to the Dam including dam surface area =	33424 m^2
Area with no modification to existing flow =	107990 m^2
Reuse Water Recycling Ponds Treatment Area =	4480 m^2
Areas used for loss calculations	
Process Area Pavement =	18722 m^2
Dam Surface Area =	6633 m^2

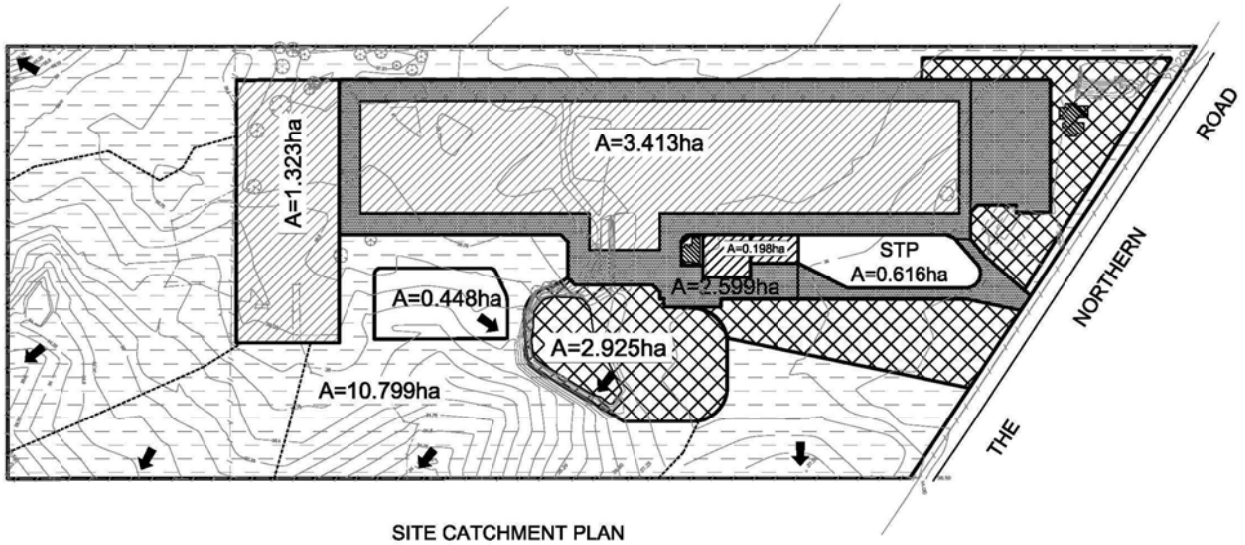


Figure 3-1 Site Catchments

The proposal directs site runoff from the developed areas into the proposed dam located on the southern side of the buildings. No surface water is blocked from entering the site and any surface runoff from the landscaped section of the sites north and eastern sides will also be directed via catch drains into the dam. The remaining natural drainage paths will remain as they are.

4 Water Balance Calculations

Water balance calculations have been undertaken for the proposed stormwater management system to estimate recycled and mains water usage for the development and determine site discharge volumes under normal operation conditions.

The calculations use daily rainfall figures from some 130 years of records to estimate the average performance of the proposed system, evaporation, water drawn and used by the facility, stormwater capture and stormwater overflow (lost from the system) during periods of heavy rainfall. Figure 4.1 shows a flow chart of the waters incorporated into the assessment.

4.1.4 Flow Routing Method

Figure 4-1 shows the Water cycle for the proposed development. A flow routing model was generated to estimate inflow and outflow volumes by using the water balance for each time step of data. (See Equation **4-1**).

$$\frac{\Delta S}{\Delta t} = I - O$$ **Equation 4-1**

Where, S is the storage over time (t), I is the net inflow generated from the rain and reuse, and O is the outflow from the site. The computations were completed using Excel and were conducted on daily rainfall information using daily time steps.

4.1.5 Rain Gauge Data

Daily rainfall records showing the amount of rain each day in millimetres, was obtained from the Bureau of Meteorology, Site Number 67021, RICHMOND - UWS HAWKESBURY, Elevation: 20 m. Suitable daily rainfall data from this station was extracted using records from between 1881 to 2010. A period of data was selected based on quality control flags on the data and a continuous record set with limited data gaps. The period selected is summarised in Table 4-1.

Table 4-1 Summary of extracted Rainfall Data Records

Summary of Data		
Start Date	1/01/1881	
End Date	1/3/2010	
Total Days Recorded	45682	days
Period	47126	days
Number of Gaps in Records	169	
Number of Gap Days in Records	1648	
Average Daily Rainfall	2.218	mm
Maximum Rainfall event	309.4	mm
Number of Days >1.5mm Rainfall	8332	days
Average Number of Days between events >1.5mm Rainfall	5.48	days

4.1.6 Evaporation

Monthly statistics on mean daily evaporation records showing the mean amount of evaporation each day in millimetres was obtained from the Bureau of Meteorology, Site Number 67021, RICHMOND - UWS HAWKESBURY, Elevation: 20 m. A correction factor of 0.75 was used to adjust evaporation rates from the Class A Evaporation pan to dam surface. Mean monthly evaporation statistics are shown in Table 4-2 below.

Table 4-2 Mean Daily Evaporation (mm)

Month	Mean Daily Evaporation (mm)	Adjusted Daily Evaporation (mm)
January	6	4.50
February	5	3.75
March	4.1	3.08
April	3.2	2.40
May	2.2	1.65
June	1.8	1.35
July	1.9	1.43
August	2.7	2.03
September	3.8	2.85
October	4.8	3.60
November	5.1	3.83
December	5.9	4.43

4.1.7 Water Demands

The following data was used as demand inputs in the calculations:

Table 4-3: Water Demand Rates

Water Demand	Rate	Source
Mushroom irrigation	60kl/day	Town water
Growing room wash down	10kl/day	Town water
External wash down	15kl/day	Storage dam, then town water
Cooling towers	30kl/day	Wetland water (Water Recycling Ponds), then storage dam, then town water
Steam generator & boilers	15kl/day	Wetland water (Water Recycling Ponds), then storage dam, then town water
Toilet flushing	7kl/day	Wetland water (Water Recycling Ponds), then storage dam, then town water
Workshop & amenities	2.5kl/day	Town water

This demand data was provided by the client, who obtained it from their experience from within their other operating facilities, which currently operate in the same manner as planned for this site. These are maximum expected demands taken from a fully developed and operating plant running at full production. Water demands will be less during the earlier stages of the development.

The following assumptions were made in the calculations:

- The 50 functioning growing rooms demand 60m^3/day for irrigation and 10m^3/day for wash down.
- Growing room irrigation and wash down will be provided by town water, whilst external wash down will be provided by stored dam water.
- Losses from rainfall runoff were estimated at 1mm/m^2 for roof areas, 1mm/m^2 for pavement areas and 5mm/m^2 for Landscape areas.
- Losses from external wash down were calculated at 1mm per square metre based 25% of the process area being washed down each day. Given the average recurrence of significant rainfall fall events is around once every 6 days, which equates to no washing down of the said areas one day in every six.
- Losses during external wash down are estimated at 5%.
- Overflow from Water Recycling Ponds Treatment area tanks will be directed to the dam.
- All irrigation water will be lost to production and transported off site in soil or mushroom produce.
- No infiltration losses to the groundwater from the dam.
- No outdoor wash down losses during wet days.
- The runoff from the roof, pavement and Landscaping areas to the east of the site would be diverted to the 14.7ML dam.

Shown on the next page in Figure 4.1 is a flow diagram of the water usage within the facility, incorporating the stormwater, potable water and discharge waters generated by the facility.

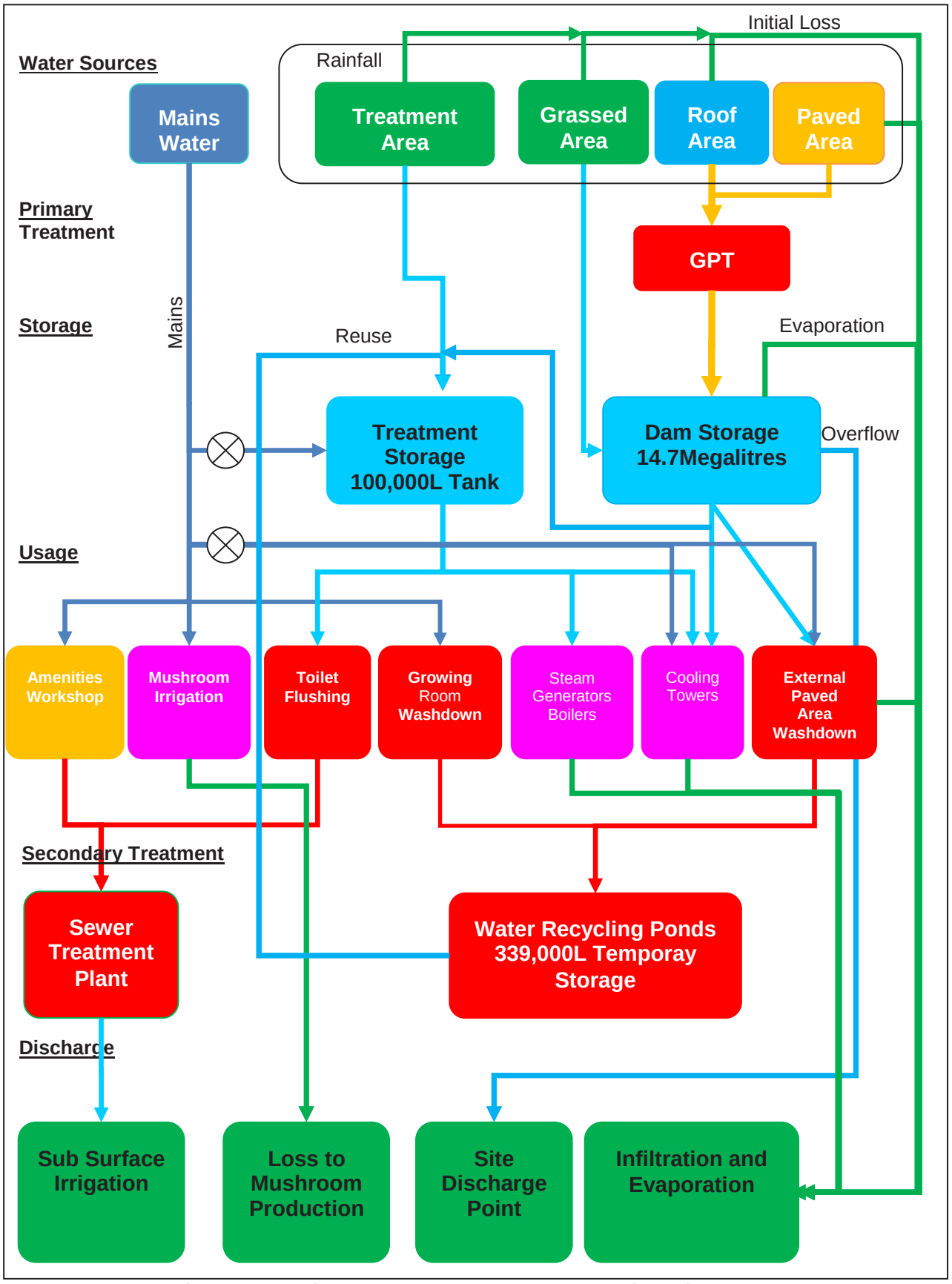


Figure 4-1 Mushroom Farm Water Management Flow Chart

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4.2 Results

4.2.1 General

A nominal site storage capacity within the dam of 14, 700 m^3 has been adopted. This volume will catch 90.7% of daily runoff flows according to the established spread sheet. This storage volume will come from the modification of the existing dam and is shown in Appendix C, which contains the draft design plans of the proposed dam.

In addition to the dam storage, the water treatment system will have a maximum operating storage volume of 439m^3 as detailed in Table 4.4 below, with an additional capacity to contain the 24 hour, 1% AEP storm event above this water level. This extra storage will be provided by local mounding around the treatment area and so contain the any water falling on to the pond, wetland and storage facility.

Table 4-4 Water Recycling Ponds Storage

Process Area				Tank	Total Storage Volume
Collection Trenches 2x12,000L	Facultative Ponds 75,000L	Aerated Ponds 90,000L	Surface flow Wetlands 2x75,000L	Tank 100,000L	
24m^3	75 m^3	90 m^3	150 m^3	100 m^3	439 m^3

The storage volume in the dam, Water Recycling Ponds and Treatment storage tank when running full will provide sufficient capacity to supply the facility with its average daily requirement of 70.3m^3 for wash down and cooling tower water for approximately 210 days without additional inflow from rainfall or mains supply.

Using the routing method, the total annual runoff from the site entering into the dam and Water Recycling treatment areas is estimated to average 72,955m^3/year with an average overflow from the dam (and so storm water lost from the site) estimated at 48,378m^3/year. The dam water will be used for top up water in the cooling towers (should the supply from the treatment pond run dry) and for washing down external hardstand areas. Both the internal and external wash down areas would drain into the Water Recycling Pond and wetland system and be treated. The water that will be drawn from the dam is estimated at 15,779m^3/year. Mains water will always be used as wash down water for the growing rooms for health reasons. A summary of the results, using the daily routing methods of analysis are detailed in Table 4-5.

Table 4-5 Average Annual Water Balance Figures

Rain water inflow system from site (m^3/year)	Overflow from dam to creek system (m^3/year)	Evaporation from dam and site (m^3/year)	Annual demand by facility (m^3/year)	Dam water used each year (m^3/year)	Reclaimed Water from treatment system (m^3/year)	Mains Demand needed (m^3/year)
72,955	48,378	7,021	56,394	15,779	14,500	26,460

The external mains demand of 26,460m^3/year (72.5 m^3/day) comprises the base average daily demand for Irrigation, Growing Room wash down and amenities and contributes an annual volume to the treatment storage tank of 14,150m^3/year (38.77m^3/day). The reduction in mains water demand due to the dam and treatment systems is 30,279m^3/year (or 83m^3/day).

A histogram showing the distribution of daily overflow volumes and frequency of overflow events from the flow routing model is shown in Appendix D. The use of the dam water reduces the likelihood of discharge from the site by 90.8% with a mean daily (50%) volume of discharge of around 640m^3, meaning 95% of flows would be less than this amount.

4.2.2 Dam Water Usage

During this period it is estimated that the dam will overflow on average 33.7 days/year and will never empty completely. In the period the routing model was run, the minimum volume of water in the dam was observed at 5600 m^3. A summary of the results are detailed in Table 4-6. It shows that the dam would be able to supply all of the water used in the external wash down and supplement water used by the cooling towers above that drawn from the Treatment Storage tanks. The average reduction of mains potable water per year would be 15,431 cubic metres.

Table 4-6 Summary Dam Usage

Dam Storage 14.7ML	
Average Runoff into Dam (m3/day)	72,955
Days Dam is Empty	0
Days Dam is Full over period of run (average days/year) (Percentage)	4221 33.7 9.24%
Average Mains Reduction (m3/year)	15,431

4.2.3 Water Recycling Ponds Water Usage

The Water Recycling Ponds and tank will need to be supplemented for a total of 40881 days over the period the model was run (on average 327 days/year) and will exceed its designed storage capacity on average less than one day per year. Should the system exceed the designed operating level it will be stored in the system with an increased water depth across the wetlands. This overflow system has the capacity to store the 24 hour, 1% AEP rainfall event above this designed storage volume. A summary of the results are detailed in Table 4-7 below. It is estimated that there will be an average flow through the water recycling ponds treatment area of 27.06m^3/day (9876m^3/year) arising from the internal and external wash-down procedure and from the rainfall falling directly on the water recycling ponds.

Table 4-7 Summary Water Recycling Facility Usage

Water Recycling Ponds Treatment Storage 439m3	
Average Demand for Cooling tower, toilets & boilers (m3/day) (m3/year)	 60.0 21,900
Days tank will Need Top Up (days/year) (Percentage)	40881 326.6 89.49%
Days Treatment storage is Full (days/year) (Percentage)	107 0.9 0.23%
Average Mains Reduction (m3/year)	 14,500

As the treatment system will not have the capacity to cater for the demand of the boilers, toilets and steam generators, It is estimated that there would be an average drawn from the dam to supplement it of around 20.3m^3/day or 7,400m^3/year. This water can be mixed with the wash down water from the growing rooms before entering the water treatment system. This will also reduce the potential issue of allowing high concentrations of the fungicide Carbendazim as noted in the ALS Water Science Groups correspondence dated 6th December, 2010 to enter the system, as it will have the effect of diluting the concentration of the chemical in the wetland waters. On-going testing should be established at the time of establishment in order to ensure the dilution is achieved to acceptable limits.

4.3 Climate Change Effects

Climate change has the potential to affect rainfall and hence available water for reuse. Trends in rainfall due to climate change are for increase rainfall and distribution of rainfall. Rainfall gauge data Site Number 67021, RICHMOND - UWS HAWKESBURY, Elevation: 20m was analysed to project potential impacts due to climate change. Figure 4-2 below shows a trend towards increased annual rainfall. This will increase the available annual rainfall will increase re-use water available decreasing mains demand.

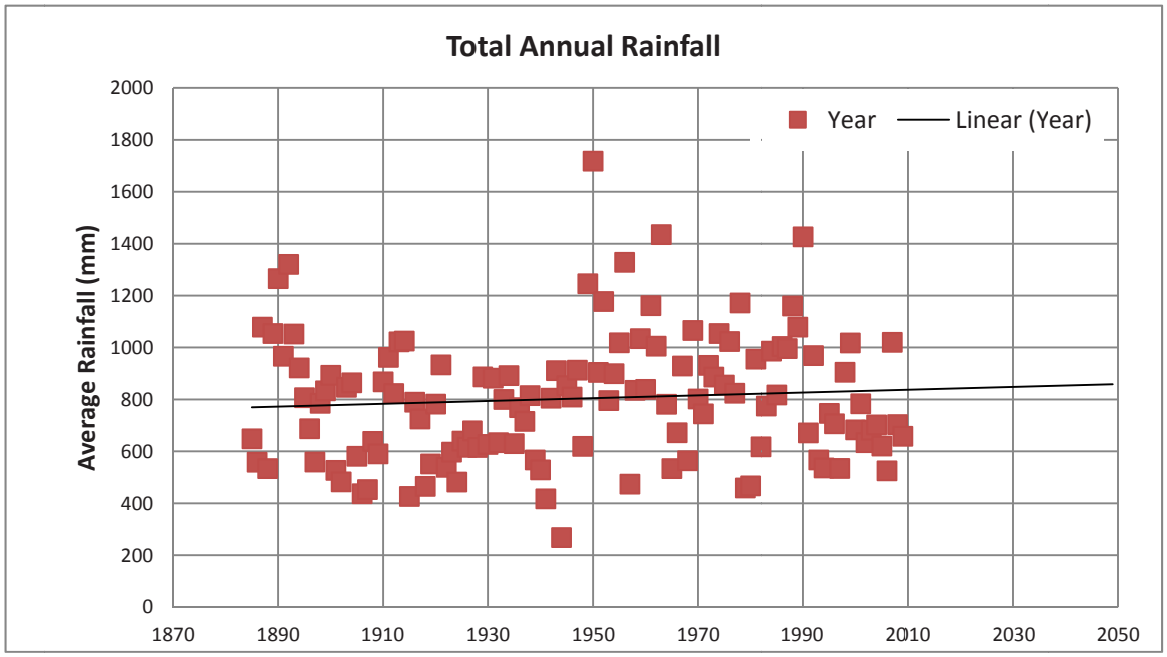


Figure 4-2 Forecast Annual Rainfall

Increased variability in rainfall could affect the availability of water due to longer dryer periods and likely more intense storm events. Figure 4-3 below shows the annual average number of days between rainfall events that would produce runoff into the storage areas.

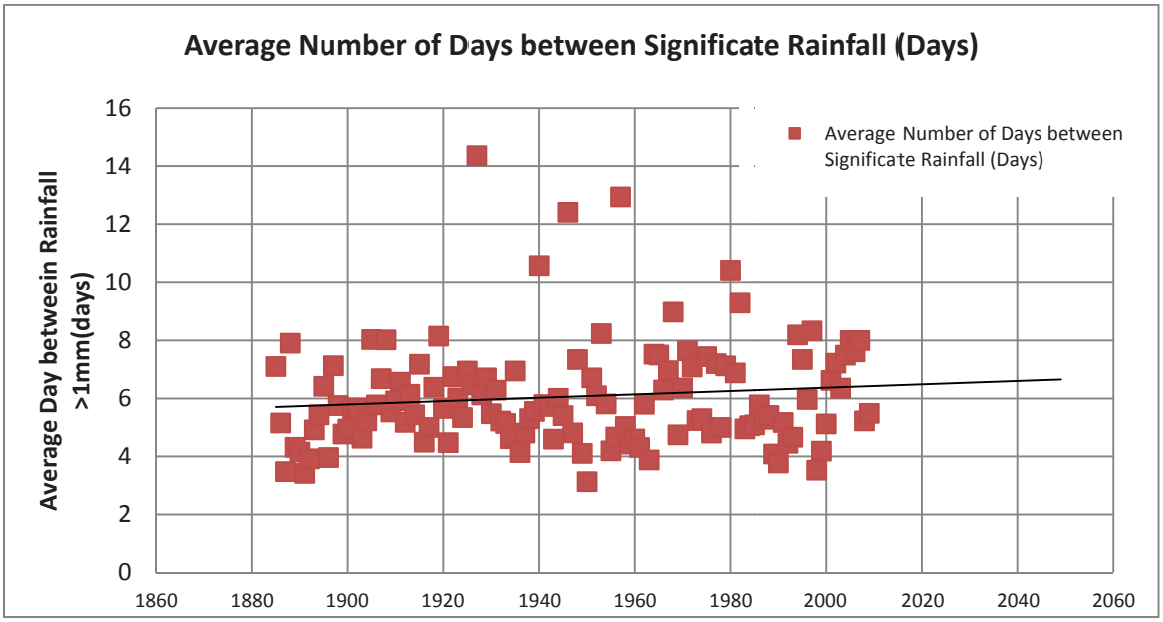


Figure 4-3 Average number of days between significant Rainfall Events

Given that through global warming there is expected to be only a small increase in periods between significant rainfall events as well as an increase in rainfall associated with these events, more rainfall will be expected to be available within the system. This will impact favourably within the dam system due to its long draw down period but will work in a negative manner for the Water Recycling Ponds wetland system which has a much shorter draw down period. Given the increased rainfall and availability of rainfall for reuse during prolonged dry periods, water from the dam could be pumped into the water recycling ponds treatment area during periods of rainfall, increasing the available reuse potential.

5 Stormwater Design

This section addresses the stormwater management design for the proposed development. A hydraulic analysis to determine peak runoff during all storms up to and including the 1 in 100 year Average Recurrence Interval (ARI) event was conducted to ensure water flows on the site are managed. This section of the report firstly highlights the site parameters used to model the site, relating the different catchment characteristics and initial parameters adopted. The general system layout is then discussed outlining the stormwater management strategy for the site and design methodology for estimates of peak flow rates used in sizing stormwater structures.

5.1 Design Methodology

Roof areas would direct rainfall via conventional gutter and downpipe system to pits located in the driveway area. Roof water drainage grades would be a minimum 1% and a minimum size of 150mm diameter. All pits would be grated surface inlet pits allowing surface runoff to be captured. Overland flow paths convey water to either the driveway drainage system or directly into the dam for events greater than the 1 in 20 year ARI. For the 100 year ARI event, freeboard would be no less than 200mm for workshop floor level and no less than 300mm to office floor levels.

All storm water and roof drainage has been designed in accordance with AS 3500.3.2 1998 and council engineering guidelines. Pipe materials would be uPVC for pipe sizes up to 300mm diameter and class 3 reinforced concrete pipes for larger sizes.

5.1.1 Pipe Capacity and Sizing

The pipe network has been sized to cater for peak flow estimates for the 1:20 year ARI event without surcharge of pits within the network in accordance with AS3500. The peak flow estimates and projection of hydraulic grade lines through the pipe system was obtained, by using the software DRAINS. Stormwater originating from storm events greater than the 20 year ARI event will be conveyed by overland flow paths in the same general direction as the piped drainage system.

5.1.2 Detention Storage

Detention storage requirements have been catered for in the dam to attenuate flows up to the 100 year ARI storm event, with a combination of controls restricting the discharge. The outlet structure is a combination of a weir and an orifice plate controlling the discharge to that of pre-developed peak flow rates. The onsite detention storage is located above the permanent storage volume within the dam with the invert of the low flow outlet positioned at the maximum permanent storage level. All designed detention discharge structures have been designed with capacity to carry the peak flow estimates as outlined in AR&R87.

In accordance with Penrith City Council guidelines, the proposed development has provided on-site detention to restrict peak post-development site discharges to peak pre-development levels. The basin has been designed to temporarily detain the runoff produced from the post development site and discharged at a controlled rate through the outlet structures. A spillway was designed to adequately convey the estimated 100 year ARI flow rate without overtopping of the basin embankment. The initial volume of the dam within the DRAINS model was set to full storage level assuming that the dam was full at the start of the rainfall

event, even though there is significant water demand from the dam, meaning that it is unlikely to be full at the start of an extreme event.

5.2 Drains Modelling

5.2.1 Site Parameters

The area contributing to the catchment of the stormwater management system is essentially the area of the proposed buildings and surrounding apron and driveway areas. The catchment area draining to the basin totals 11.279ha, with only two grassed/landscaped sub catchment areas. Estimates of pre-developed runoff from the site were calculated with the kinematic wave equation in the DRAINS model. The following Table 5-1 shows the initial site parameters used within the stormwater software modelling program DRAINS.

Table 5-1 Site Parameters

Pre-developed Catchment (Kinematic Wave)	
Area (ha)	11.279
Impervious (%)	0
Pervious (%)	100
Slope (%)	0.6
Flow Path Length (m)	400
Flow Path Roughness	0.2
Hydraulic Parameters	
Hydraulic Model	ILSAX
Paved Area Depression Storage (mm)	1
Supplementary Area Depression Storage (mm)	1
Grassed Area Depression Storage (mm)	5
Soil Type	3

5.2.3 Rainfall and Peak Runoff estimates

The average rainfall intensity for different duration and ARI storms was generated within DRAINS by specifying statistical data sourced from the Bureau of Meteorology. This data is gathered from rain gauge data as outlined in AR&R 1987 Volume 2. An IFD data used to generate the intensities is shown in Appendix E. The temporal zone rainfall hydrographs were generated for all durations from 5 min up to 72hrs for the 100, 20, 5 and 1 year ARI events.

The total catchment area was divided into three main sub catchment categories; roof area, driveway/hardstand area and grassed/landscaped area. Table 5.2 shows the sub catchment parameters used for these categories.

Table 5-2 Sub catchment Parameters

Type	**Impervious (%)**	**Pervious (%)**	**tc (min)**
Roof	100	0	5
Driveway/hardstand area	100	0	5
Basin	0	100	5
Grassed/landscaped	0	100	Kinematic Wave

Fall on the driveway/hardstand areas ranges between 1% and 2%, so times of concentration will generally be less than 5 minutes. Australian practice assumes that intensities for durations below 5 minutes are equal to the 5 minute intensity; hence 5 minute time of concentration minimum is adopted.

5.2.4 Pipe and Pit Capacities

Using an ILSAX model peak flows for the pipe network were estimated. The pipes were sized to convey the 1 in 20 year ARI storm event, without surcharge within the system. Pit inlet capacities have been calculated in accordance with Council requirements.

5.2.5 Loss Coefficients

Pit loss coefficients for full pipe flow were revised for the system based on Queensland Urban Drainage manual 1992 (QUDM) Volume 2 charts. Pipe friction loss coefficients used in the estimation of hydraulic grade lines for the pipe network are detained in Table 5-3 below.

Table 5-3 Pipe friction coefficients

Pipe Material	Colebrook- White k(mm)	Manning's n
Concrete - Spun precast, with "O" rings	0.3	0.013
uPVC – Chemically cemented joints	0.03	0.01

5.3 Results

As described in Section 5.1.2, the detention basin has been designed to temporarily detain the runoff produced from post development flow and discharge it at a controlled rate through an outlet structure. The aim of the spillway is to convey major flows and prevent overtopping of the basin, which may compromise the integrity of the earth embankments. The following Table 5-4 summarises the detention basin design parameters.

Table 5-4 Detention Basin Design Parameters

Detention Basin Parameters	
Design Elements	
Top of Bank	RL 37.75m (AHD)
Spillway Base	RL 35.60m (AHD)
Base of Storage	RL 34.80m (AHD)
Low flow pipe invert level	RL 34.80m (AHD)
Depth during 1% AEP event	1.29 m
Crest Width at top of Bank	3 m
Internal Batter slopes	1 : 4 -1 : 6
External Batter Slopes	1 : 6

Table 5-5 below summarises the peak flow and discharge rates attained from the stormwater design of this site.

Table 5-5 Peak Runoff and Discharge Results

ARI event	Pre developed Q (m3/s)	Post Developed Q (m3/s)	Basin Water Level (m)
1	0.068	0.066	35.39
5	0.358	0.246	35.82
20	0.654	0.631	36.01
100	1.100	0.908	36.09

Table 5-5 shows that the peak discharge through the low flow outlet is effectively mitigated by an orifice plate to a flow rate equal to less than the predevelopment 1 year ARI peak discharge. Similarly Table 5-5 shows that flow rates are restricted to predevelopment levels for the 100, 20 and 5 year ARI events. The corresponding Top Water Level (TWL) in the basin during the maximum discharge storm event is at RL 36.09m. This level allows for over 500mm of freeboard to the top of bank level specified in Table 5-5 Detention Basin Design Parameters.

The total available storage volume at the top of basin embankment level is 41,331m^3. Of this volume 14,700m^3 is for permanent storage of runoff stormwater, 11,200m^3 is used for temporary storage associated with the on-site detention during the 100 year ARI storm event and the remainder is the volume associated with the freeboard contained up to the top of the basin embankment level.

The depth of flow over the spillway during the 100 year ARI event under normal operational conditions will be 0.04m, based on the estimated 100 year ARI flow rate of 43 L/s and the basin having a full storage volume of 14,700m^3 prior to the rainfall event occurring. In the event of a low flow blockage the depth of flow over the spillway will be 0.08m which is based on the estimated 100 year ARI discharge rate of 104L/s. In the event of low flow blockage and the basin being full prior to the estimated 100 year flow event of 908L/s the flow depth over the spillway will be 0.81m. This still allows for over 500mm freeboard to the TOB level of RL 37.75m.

6 Stormwater Quality

6.1 General

This section of the report describes the control measures and management of water quality that will be implemented on site. It identifies sources of pollution and how they will be treated to minimise the risk of pollution discharging from the site.

Mushroom Farms are designed with hardstand areas and utilise rich organic material used in the growing process. This has the potential to impact on the downstream waterways. For this reason the stormwater runoff flows and wash down waters within the site are to be separated and treated separately. The wash down water is to be directed to the Water Recycling Pond system as described by Sainty and Associates while the stormwater runoff will be directed to the dam system for storage or detention purposes.

It is expected that the majority of pollution not only from the growing rooms but also from the hardstand areas immediately around the growing rooms will be captured by wash down waters and directed to the Water Recycling Ponds wetland system and used in the plant. Accordingly it is to be expected that any build-up of nutrients, sediment and other polluting substances such as oils and greases that would be found to accumulate on any hardstand (driveway) surface will be washed into the Water Recycling Ponds wetland system. The model set up to simulate the generation of hardstand pollutants however has not considered this regular wash down, but has however considered the hardstand as a pollution generating surface. It is for this reason that the approach to the simulation is considered to be conservative.

Given that around 90% of daily rainfall events would be captured by the dam and Water Recycling Pond treatment areas and therefore ultimately used by the facility, it is anticipated that the majority of pollution generated from hardstand areas and the building roofs will be taken out of the system by settlement within the dam due to its storage component. The modelling of the site was undertaken using the software MUSIC and set up in accordance with the above description with the reuse function within the pond module of the program.

Water Quality modelling requires the use of continuous rainfall data at a 6 minute to 6 hourly interval. For the concept design of the water sensitive urban design elements MUSIC modelling was utilised. The recorded rainfall from pluviograph number 067105, located at the RAAF base in Richmond, as supplied by the Bureau of Meteorology was imported into MUSIC. This data was simulated for a 6 minute rainfall period interval from 1985 until 1995 to ensure a long-term assessment was conducted on the expected water quality.

Modelling was undertaken for the constructed plant with no dam and compared to the same model with the pond treatment system module with reuse function to simulate the dam. All the subcatchments were modelled according to the Western Sydney Draft MUSIC guidelines, inputting the respective variables for the appropriate land use. A catchment plan is shown in Appendix C.

The following values have been adopted as the Rainfall Runoff parameters for the impervious and pervious scenarios;

Table 6-1 Rainfall Runoff Parameters

	Built Up Area	Agriculture
Impervious Area Parameters		
Rainfall Threshold (mm/day)	1.4	1.4
Pervious Area Parameters		
Soil Storage Capacity	170	210
Initial Storage	30	30
Field Capacity	70	80
Infiltration Capacity – Coeff a	210	175
Infiltration Capacity – Coeff b	4.7	3.1
Groundwater Properties		
Initial Depth	10	10
Daily Recharge Rate	50	35
Daily Baseflow Rate	4	20
Daily Deep Seepage rate	0	0

The catchment was divided into five distinct runoff areas which all drain to a dam system which was modelled as a pond in MUSIC. The areas and their respective classifications are shown in Table 6.2.

.

Table 6-2 Pre Development MUSIC Model Inputs North Eastern catchment

Catchment	Area (ha)	Classifications	Impervious
Growing Rooms	3.413	Roof	100%
Spent Compost	1.323	Roof	100%
Associated Buildings	0.616	Sealed Road	100%
Hardstand	2.599	Sealed Road	100%
Landscaped	2.445	Landscaped	0%

6.2 Developed Site Results with No Controls

The model was run with 6 minute rainfall intervals to determine the post development pollutant loads for the site where no water quality and reuse facilities are incorporated into the facility. The mean annual water quality results from the model are shown below in Table 6.3 while the results from the flow weighted daily mean criteria are shown in Table 6-4.

Table 6-3 Water Quality Loading Results – No Controls

		Loading – no Controls
Flow	**(ML/yr)**	64.3
Total Suspended Solids	**(kg/yr)**	7930
Total Phosphorus	**(kg/yr)**	18.4
Total Nitrogen	**(kg/yr)**	143
Gross Pollutants	**(kg/yr)**	1550

Table 6-4 Flow Weighted daily Mean Water Concentration – No Controls

		Mean	Maximum
Flow	**(m^3/s)**	$2.04x10^{-3}$	0.182
Total Suspended Solids	**(mg/L)**	31.4	463
Total Phosphorus	**(mg/L)**	$87.6x10^{-3}$	0.568
Total Nitrogen	**(mg/L)**	0.835	3.21
Gross Pollutants	**(kg/Day)**	4.25	65.1

6.3 Upgrading Works

In order to reduce the post development pollutant loadings to levels as prescribed in Penrith Councils Draft 2010 DCP and DECCW's draft guidelines, Managing Urban Stormwater: Environmental targets (2007) the proposed pond/dam was modelled and found to provide a water quality benefit for the system in addition to providing a reduction to the potable water usage for the mushroom facility. In the modelling the discharge from the spent compost shed was not incorporated as this was to be dealt with by the proposed Water Recycling Ponds sediment trenches and wetland facility as described by Sainty and Associates.

The size of the dam as determined by the water balance calculations has the following properties that were incorporated into the music model;

- A surface area of 6270 square metres,
- A permanent pond volume of 14700 cubic metres,
- An extended detention depth of 0.3 metres, and
- A reuse component of 41.92KL/day or 15.3ML/year.

Engineering plans showing the location, size and minimum requirements of the pond are shown in Appendix C.

The hardstand and roof areas that drain to the south west of the plant will need to have a gross pollutant trap fitted to the outlet of the system. This is also shown in Appendix C.

6.4 Development Site Results With Controls

The post development scenario was simulated for 6 minute rainfall intervals, the results of which are summarised in Tables 6.5 and 6.6.

Table 6-5 Water Quality Loading Results- With Controls

		Loading – with Controls
Flow	**(ML/yr)**	43.0
Total Suspended Solids	**(kg/yr)**	1070
Total Phosphorus	**(kg/yr)**	5.07
Total Nitrogen	**(kg/yr)**	62.9
Gross Pollutants	**(kg/yr)**	0

Table 6-6 Water Quality Results for Post Development Scenario

		Mean	Maximum
Flow	**(m^3/s)**	$1.36x10^{-3}$	0.093
Total Suspended Solids	**(mg/L)**	3.09	54.1
Total Phosphorus	**(mg/L)**	0.018	0.183
Total Nitrogen	**(mg/L)**	0.236	1.9
Gross Pollutants	**(kg/Day)**	0	0

The model was set up without the inclusion of the gross pollutant control device, being the nominated Ecosol unit. With the inclusion of this device the results for the site with controls will only increase in effectiveness. The Ecosol unit will control the litter entering the dam system as well as controlling the oil and grease runoff from the driveway areas of the site.

A comparison of the site without controls to that of the site with controls is shown below in Tables 6.7 and 6.8.

Table 6-7 Water Quality Loading Results & Comparison

		No Controls	With Controls	% Reduction
Flow	**(ML/yr)**	64.3	43.0	33
Total Suspended Solids	**(kg/yr)**	7930	1070	86.5
Total Phosphorus	**(kg/yr)**	18.4	5.07	72.4
Total Nitrogen	**(kg/yr)**	143	62.9	56.0
Gross Pollutants	**(kg/yr)**	1550	0	100

Table 6-8 Flow Weighted daily Mean Water Concentration Results and Comparison

Pollutant Type		**Mean**		**Maximum**	
		No Control	**With Control**	**No Control**	**With Control**
Flow	**(m^3/s)**	$2.04x10^{-3}$	$1.36x10^{-3}$	0.182	0.093
Total Suspended Solids	**(mg/L)**	31.4	3.09	463	54.1
Total Phosphorus	**(mg/L)**	0.087	0.018	0.568	0.183
Total Nitrogen	**(mg/L)**	0.835	0.236	3.21	1.9
Gross Pollutants	**(kg/Day)**	4.25	0	65.1	0

The above tables show that the annual average loads and the mean concentrations have all been reduced in accordance with the requirements of both Penrith council and the DECC draft guidelines, Managing Urban Stormwater: Environmental targets (2007).

7 Conclusions

This report has considered the stormwater management options for the proposed mushroom farm to be established at 521 The Northern Road, Londonderry. The options adopted for the management of stormwater on the site include the following components:

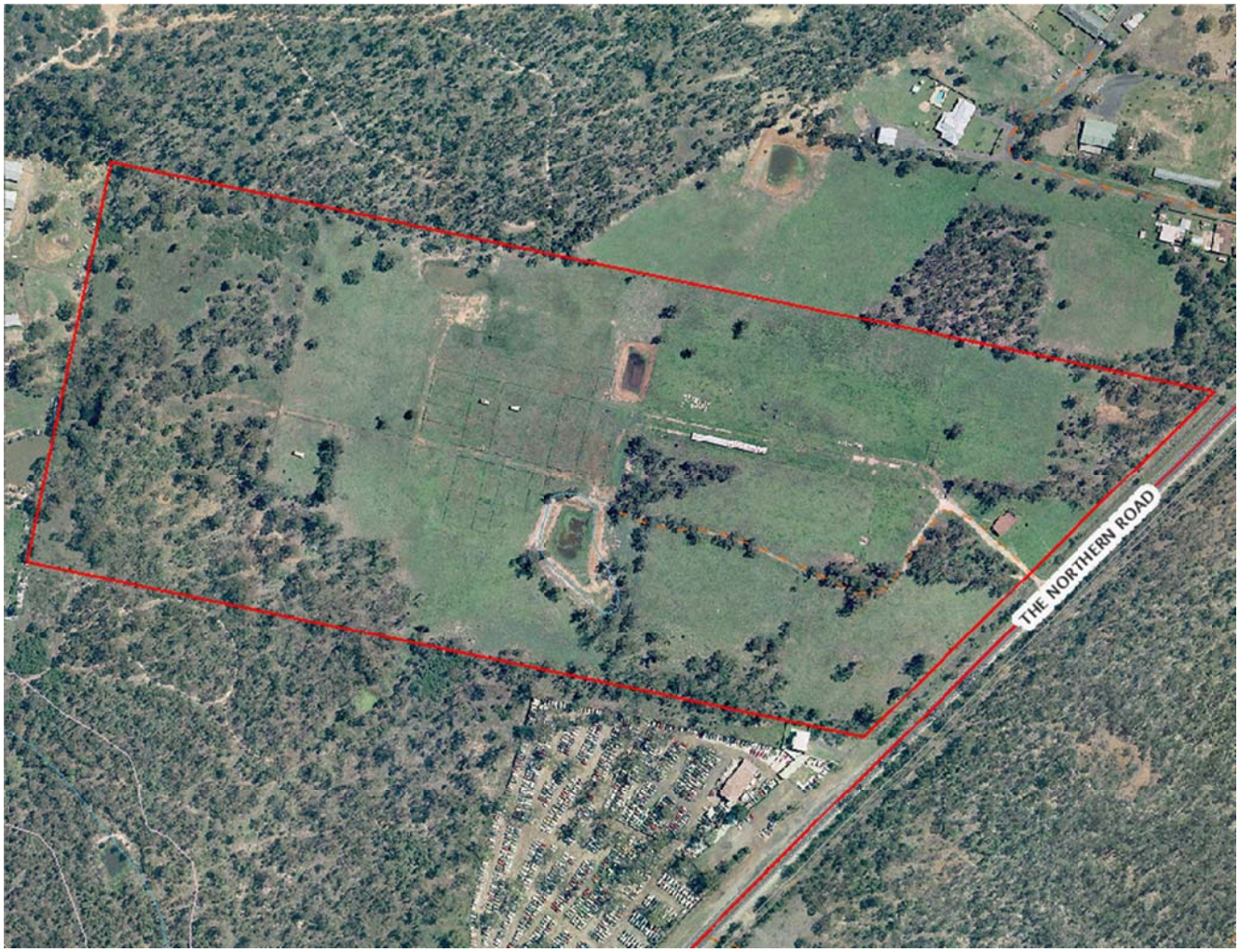
- A dual-pipe drainage system to collect both wash down water and stormwater runoff;
- Diversion pits in the apron areas to enable operators to switch between the two pipe systems;
- A modified existing dam to provide the dual use of capturing and storing stormwater runoff in addition to providing detention storage;
- GPT system to be installed prior to surface discharge into the dam: and
- A Water Recycling Ponds and wetland system to treat wash down water and store it for re-use in toilet flushing, steam generation and cooling towers.

The calculations and investigations undertaken in the preparation of this report, have found that the above components will operate satisfactorily with the following capacities:

- The modified dam will have a maximum storage capacity of approximately 14.7 megalitres;
- The dam capacity will be sufficient to provide the required 70,000 litres of wash down and cooling tower water per day to the plant for approximately 210 days without additional rainfall;
- The detention storage requirement to reduce developed flows back to pre-developed can be catered for within the modified dam as buffer storage above the full storage level;
- Provide adequate water quality controls for the site to ensure that stormwater leaving the site will conform to at least the minimum water quality requirements as stipulated by the relevant government organisations.

It is expected that if the above system is implemented as part of the development and satisfactorily operated and maintained, then the stormwater management of the site will meet water quality and quantity requirements.

Appendix A. Aerial Photo of Site



Appendix B. Proposed Development

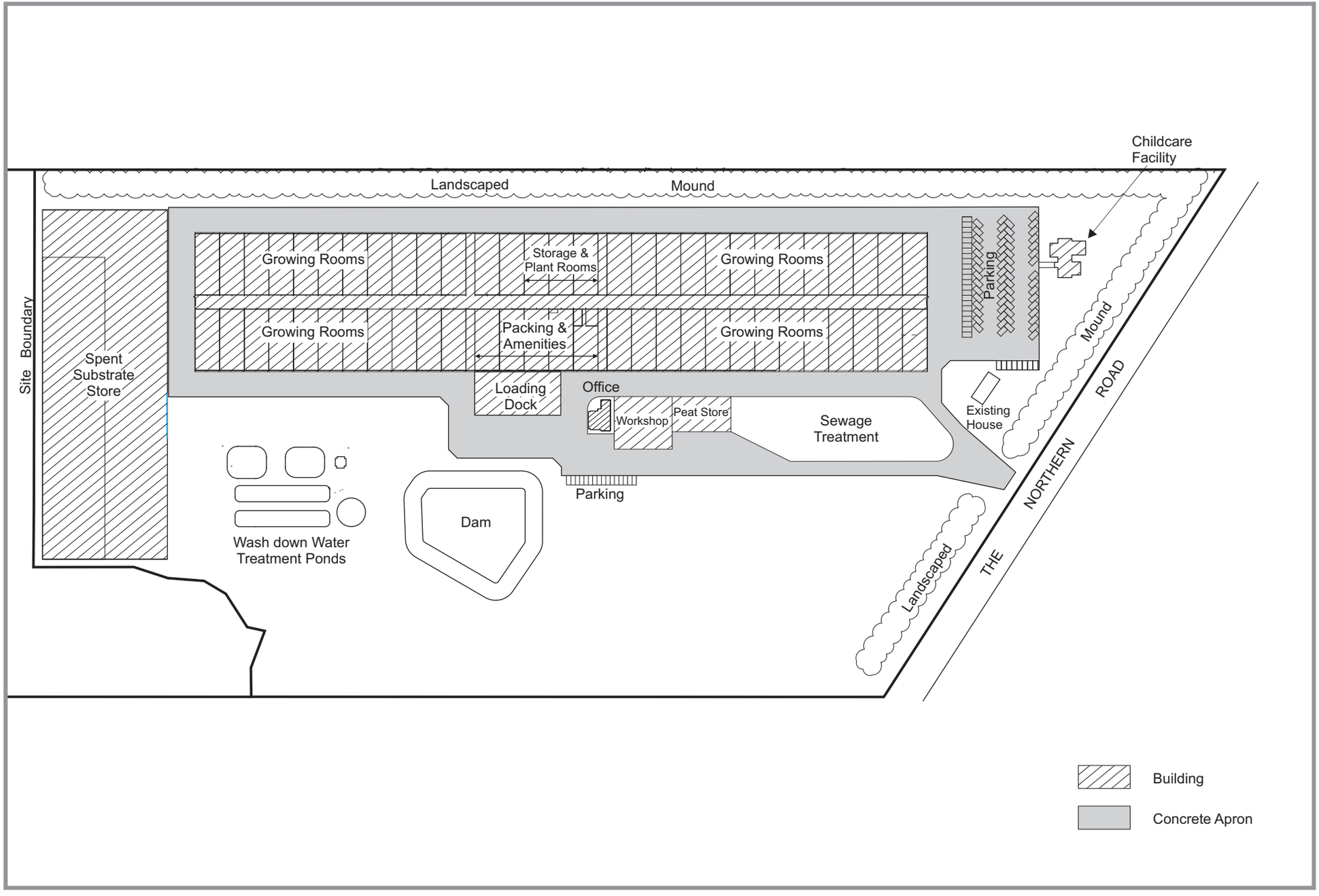


FIGURE 5.1 Mushroom Farm Layout

Appendix C. Stormwater Management System

PENRITH CITY COUNCIL

PROPOSED DRIVEWAY & DRAINAGE CONSTRUCTION
521 THE NORTHERN ROAD, LONDONDERRY
DRIVEWAY & DRAINAGE PLANS

Prepared for: Elf Mushrooms Pty Ltd

GENERAL NOTES

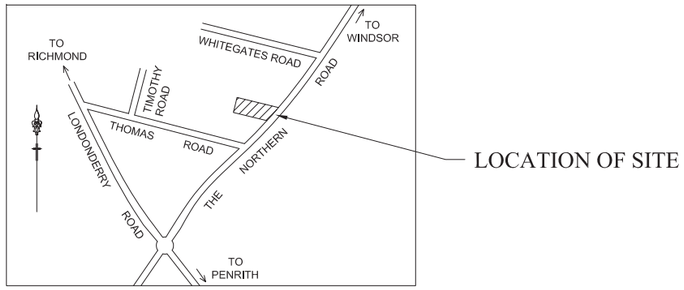
1. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH HAWKESBURY CITY COUNCIL'S CIVIL WORKS SPECIFICATION, PART 2 CONSTRUCTION.
2. THE CONTRACTOR IS TO IDENTIFY, LOCATE AND LEVEL ALL EXISTING SERVICES PRIOR TO THE COMMENCEMENT OF CONSTRUCTION WORKS AND MAKE ARRANGEMENTS WITH THE RELEVANT AUTHORITY TO 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. THE CONTRACTOR IS NOT TO ENTER UPON NOR DO ANY WORK WITHIN ADJACENT LANDS WITHOUT THE PRIOR APPROVAL OF THE SUPERINTENDENT AND THE WRITTEN PERMISSION OF THE OWNERS.
5. ALL SITE FILLING SHALL BE COMPACTED IN ACCORDANCE WITH COUNCIL'S SPECIFICATIONS AND TESTED AT THE REQUIRED INTERVALS BY A NATA REGISTERED GEOTECHNICAL LABORATORY.
6. SURPLUS EXCAVATED MATERIAL SHALL BE PLACED OR DISPOSED OF IN ACCORDANCE WITH THE CONTRACT, OR AS DIRECTED BY THE SUPERINTENDENT.
7. ALL NEW WORK IS TO MAKE A SMOOTH JUNCTION WITH EXISTING WORKS.
8. DIMENSIONS SHALL NOT BE SCALED FROM THE PLANS. CLARIFICATION OF DIMENSIONS SHALL BE SOUGHT FROM THE SUPERINTENDENT OR REFERRED TO THE DESIGNER.
9. ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH OCCUPATIONAL HEALTH AND SAFETY ACT 2000 AND ALL RELEVANT OCCUPATIONAL HEALTH AND SAFETY POLICIES AND REGULATIONS.

DRAINAGE NOTES

1. ALL DRAINAGE LINES SHALL BE LAID AT A MINIMUM GRADE OF 1.0%. PIPES Ø375mm AND ABOVE SHALL BE FRC OR RCP. PIPES SHALL BE BACKFILLED WITH CLEAN SAND TO A MINIMUM OF 150mm ABOVE THE TOP OF THE PIPE.
2. ALL PIPES LAID AT A GRADE STEEPER THAN TABLE BELOW HAVE BULKHEADS PLACED IN THE TRENCH IN ACCORDANCE WITH COUNCIL'S SPECIFICATION:

Ø450mm	STEEPER THAN 11%
Ø525mm	STEEPER THAN 9.0%
Ø600mm	STEEPER THAN 7.5%

3. ALL PITS SHALL BE CONSTRUCTED CAST IN-SITU IN ACCORDANCE WITH COUNCIL'S SPECIFICATION TO THE SIZES DETAILED IN THE SCHEDULE OF DRAINAGE STRUCTURES.
4. A 3m LONG SECTION OF AGRICULTURAL PIPE WRAPPED IN A FILTER SOCK SHALL BE PLACED ON THE UPSTREAM SIDE OF ALL PITS AND CONNECTED TO THE PIT. WHERE THE UPSTREAM PIPE SIZE EXCEEDS 750mm, A 3m LENGTH OF AGRICULTURAL PIPE SHALL BE PLACED ON BOTH SIDES OF THE PIPE.



LOCALITY SKETCH
NOT TO SCALE

LEGEND

- PROPOSED DRAINAGE LINE
- EXISTING DRAINAGE LINE
- KERB RETURN NUMBER (KR 1)
- NATURAL SURFACE CONTOUR (24)
- DESIGN SURFACE CONTOUR (25)
- TABLE DRAIN
- EXISTING HEADWALL
- PROPOSED HEADWALL
- LIMIT OF WORKS (LIMIT OF CONSTRUCTION)
- PIT NUMBER (1/2)

SHEET INDEX

SHEET No.	DESCRIPTION
0	COVER SHEET - GENERAL NOTES, SHEET INDEX AND LEGEND
1	OVERALL LAYOUT PLAN
2	DETAIL PLAN SHEET 1
3	DETAIL PLAN SHEET 2
4	OSD BASIN PLAN AND SECTIONS
5	EROSION AND SEDIMENT CONTROL PLAN
6	EROSION AND SEDIMENT CONTROL DETAILS

Prepared by:

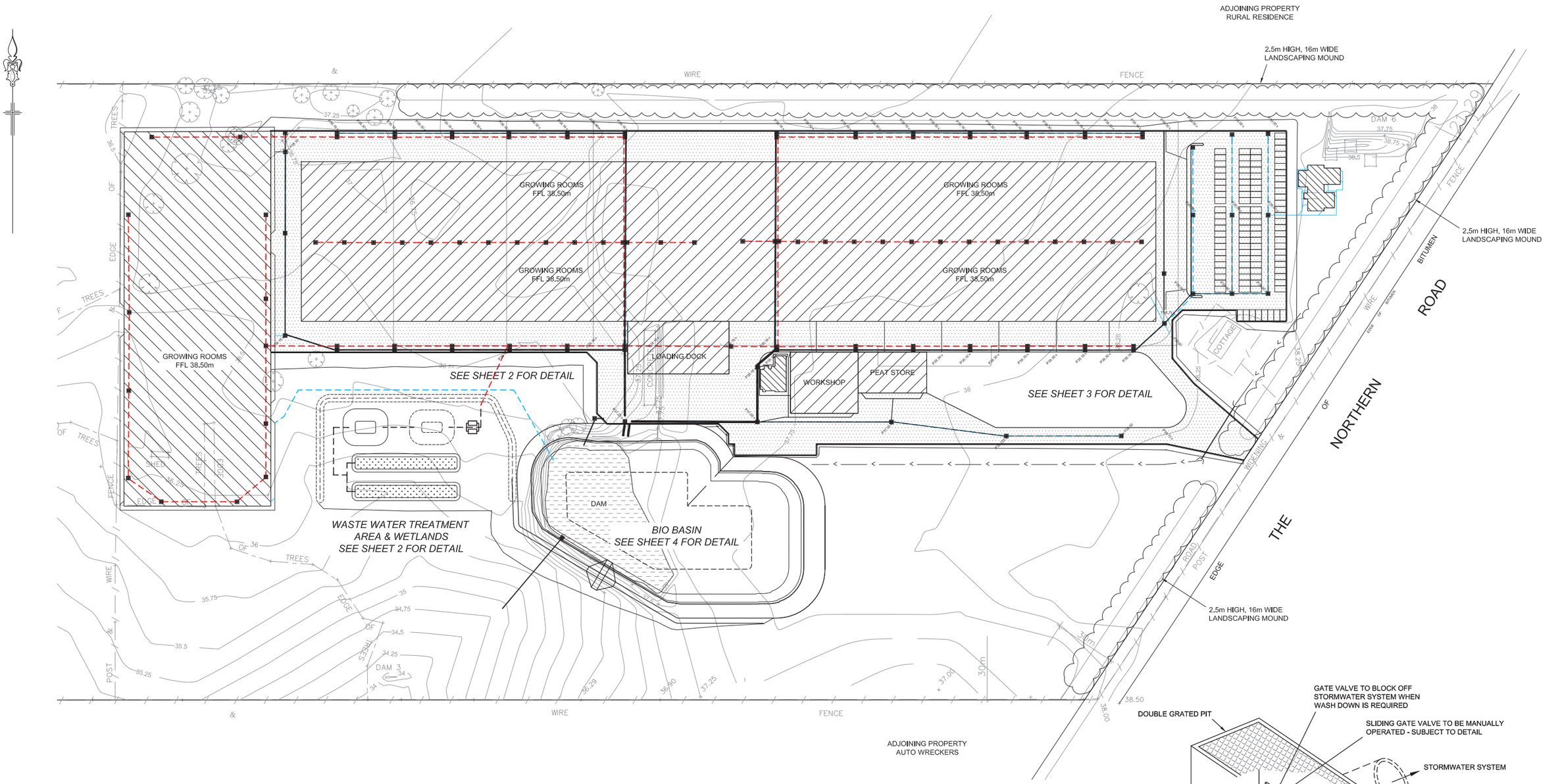
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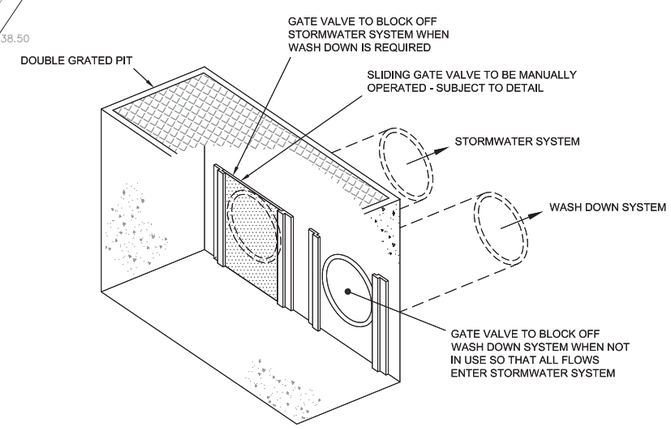
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Central Coast P: 02 4304 1144
Hunter P: 02 4929 3639
Brisbane P: 07 3118 5158

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A1





PIT DETAIL - WITH GATE VALVE

NOT TO SCALE

No.	DATE	AMENDMENT
E	30/11/10	GENERAL AMENDMENTS
D	6/8/10	WETLAND AREA ADDED
C	18/6/10	SITE LAYOUT REVISED
B	3/11/08	REVISED ISSUE TO CLIENT
A	25/9/08	FIRST ISSUE

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Central Coast P: 02 4304 1144
Hunter P: 02 4929 3639
Brisbane P: 07 3118 5158
Road Member of CONSULT AUSTRALIA

Designed: EM
Drawn: JB
Checked: GJ
Approved: ...../...../.....

Scales: Plan 1:1000
Horiz.
Vert.
X-Sect.
Datum: A.H.D.

Client: ELF MUSHROOMS PTY LTD
LGA: PENRITH
Council Ref:

521 THE NORTHERN ROAD
LONDONDERRY
PROPOSED MUSHROOM FARM
OVERALL LAYOUT PLAN

Plan No. 07166E1
REV. E
File Ref. 07166E1f.dwg
SHEET 1 OF 7 SHEETS

A1

PIT 2.1
900x900mm GSIP
GRATE RL.38.367
INVERT RL.37.231

PIT 3.1
900x900mm GSIP
GRATE RL.38.179
INVERT RL.37.449

PIT 3.2
900x900mm GSIP
GRATE RL.38.179
INVERT RL.37.289

PIT 3.3
900x900mm GSIP
GRATE RL.38.179
INVERT RL.37.132

PIT 3.4
900x900mm GSIP
GRATE RL.38.179
INVERT RL.36.974

PIT 3.5
900x900mm GSIP
GRATE RL.38.179
INVERT RL.36.804

PIT 3.6
900x900mm GSIP
GRATE RL.38.179
INVERT RL.36.645

PIT 2.2 900x900mm GSIP
GRATE RL.38.160
INVERT RL.37.165

PIT 2.3 900x900mm GSIP
GRATE RL.38.160
INVERT RL.36.945

PIT 2.4
900x900 mm GSIP
GRATE RL.38.160
INVERT RL.36.677

PIT 2.5 900x900mm GSIP
GRATE RL.38.160
INVERT RL.36.529

PIT 2.6 900x900mm GSIP
GRATE RL.38.298
INVERT RL.36.363

PIT 2.7 900x900mm GSIP
GRATE RL.38.211
INVERT RL.36.202

PIT 2.8 900x900mm GSIP
GRATE RL.38.229
INVERT RL.36.041

PIT 2.9 900x900 GSIP
GRATE RL.38.247
INVERT RL.35.880

PIT 2.10 900x900mm GSIP
GRATE RL.38.240
INVERT RL.35.738

PIT 1.12 900x900mm GSIP
GRATE RL.38.178
INVERT RL.35.805

PIT 1.14 900x900mm GSIP
GRATE RL.37.787
INVERT RL.34.850
LOW FLOW OUTLET INVERT RL.34.800

PIT 1.15
HEADWALL
INVERT RL.35.264

PIT 1.16
GRATE RL.35.600
INVERT RL.34.97
SEE DISCHARGE STRUCTURE DETAIL

PIT 1.17

PIT 4.6
900x900mm GSIP
GRATE RL.38.179
INVERT RL.36.434

PIT 4.5
900x900mm GSIP
GRATE RL.38.179
INVERT RL.36.647

PIT 1.11 900x900mm GSIP
GRATE RL.38.160
INVERT RL.35.882

PIT 1.10
900x900mm GSIP
GRATE RL.38.160
INVERT RL.36.315

PIT 1.13
900x900mm GSIP
GRATE RL.37.817
INVERT RL.35.645

CONCRETE APRON

GROWING ROOMS
FFL 38.50m

GROWING ROOMS
FFL 38.50m

AERATED POND
10x6x1.5m DEEP
CAPACITY 90,000 LITRES

FACULTATIVE POND
(IF REQUIRED)
10x5x1.5m DEEP
CAPACITY 75,000 LITRES

SOLIDS COLLECTION
TRENCHES
2x4x1.2m DEEP
CAPACITY 12,000
LITRES PER TRENCH

DIRECT LOW FLOWS
TO ECOSOL RSF 41200
GROSS POLLUTANT
TRAP VIA LOW FLOW
DIVERSION PIT.

4m WIDE MAINTENANCE ROAD

PROVIDE DIVERSION BANK
AROUND TREATMENT AREA
- SEE DETAIL THIS SHEET

VEGETATED WETLANDS
50x6x0.25m DEEP
CAPACITY 75,000 LITRES
PER WETLAND

100,000 LITRE STORAGE
TANK TO RECEIVE
TREATED WATER

DAM

OSD BASIN
SEE SHEET 4 FOR DETAILS

OFFICE

SHED

EDGE OF TREES

EDGE OF TRAVEL

JOINS SHEET 3

10 5 0 5 10 15 20 25 30 35 40 45 50
METRES
1:500

TYPICAL DIVERSION BANK
NOT TO SCALE

1.8 min.
0.5 min.
COMPACTED SOIL

No.	DATE	AMENDMENT
F	30/11/10	GENERAL AMENDMENTS
E	13/10/10	TREATMENT AREA DETAILS ADDED
D	6/8/10	WETLAND AREA ADDED
C	18/6/10	SITE LAYOUT REVISED
B	2/2/09	DA ISSUE
A	6/5/08	FIRST ISSUE

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Designed: EM
Drawn: JB
Checked: GJ
Approved: ...../...../.....

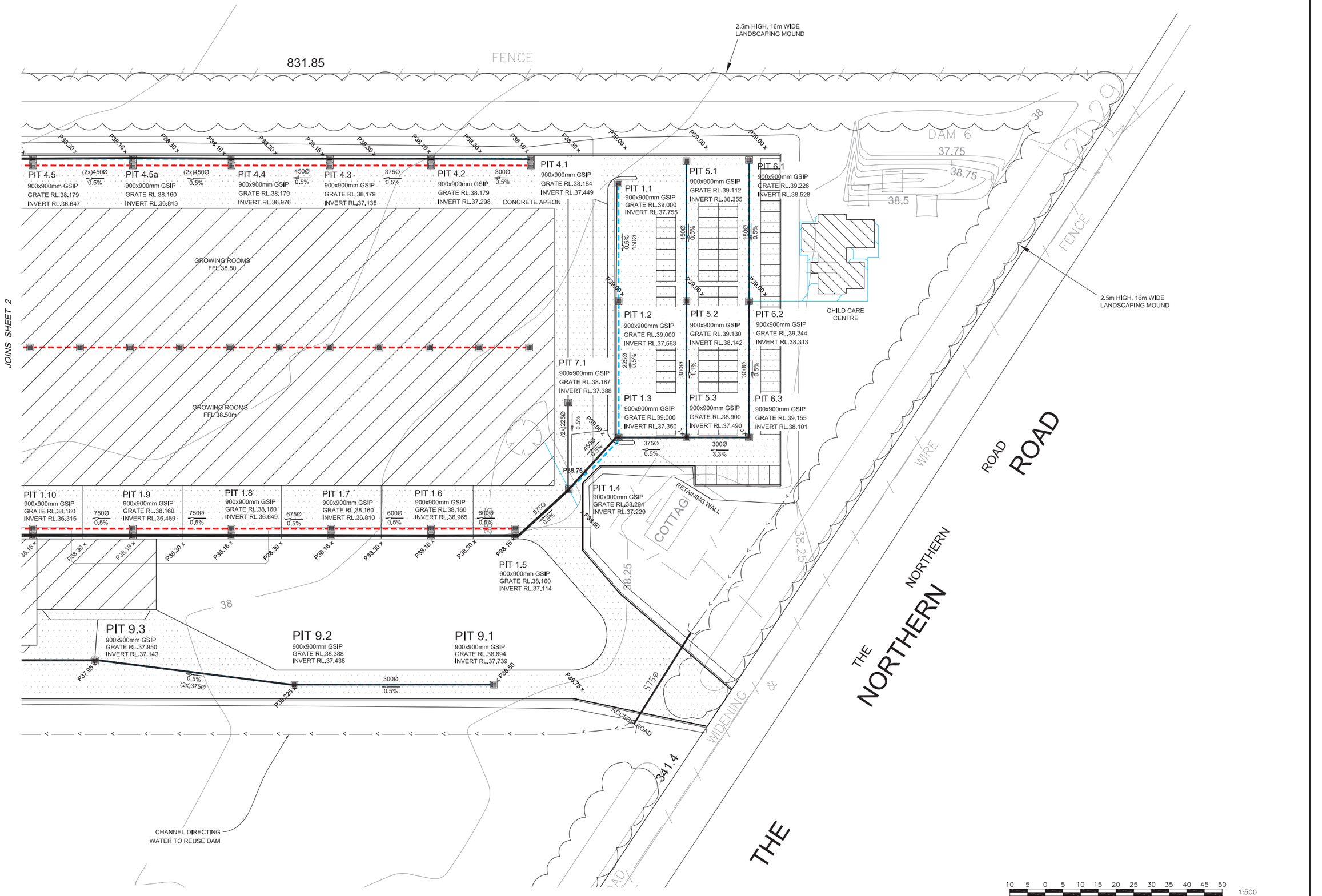
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Datum: A.H.D.

Client: ELF MUSHROOMS PTY LTD
LGA: PENRITH
Council Ref:

521 THE NORTHERN ROAD
LONDONDERRY
PROPOSED MUSHROOM FARM
DETAIL PLAN SHEET 1

Plan No. 07166E2 REV. F
File Ref. 07166E1f.dwg
SHEET 2 OF 7 SHEETS

A1



No.	DATE	AMENDMENT
E	30/11/10	GENERAL AMENDMENTS
D	6/8/10	WETLAND AREA ADDED
C	18/6/10	SITE LAYOUT REVISED
B	2/2/09	DA ISSUE
A	6/5/08	FIRST ISSUE

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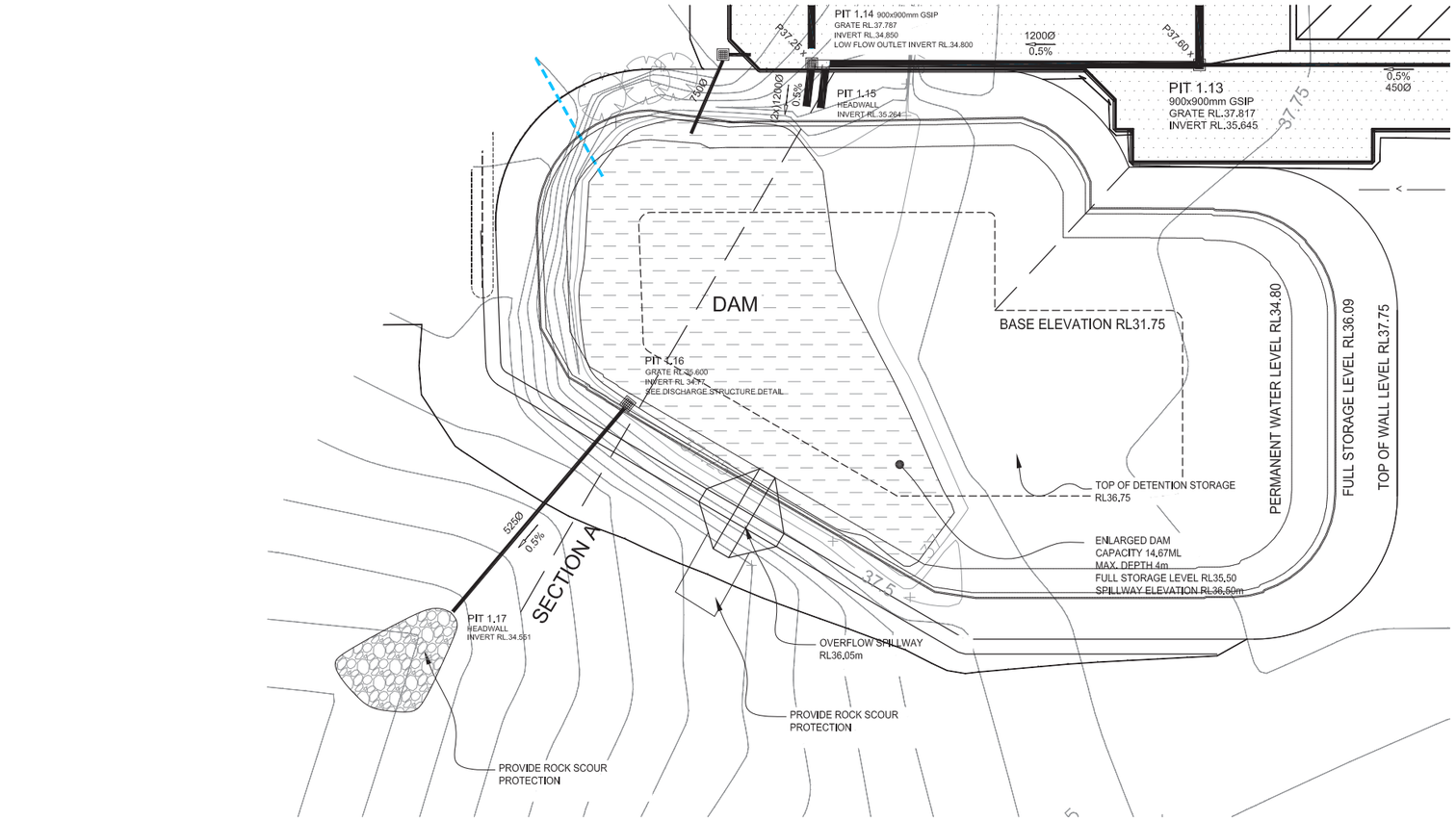
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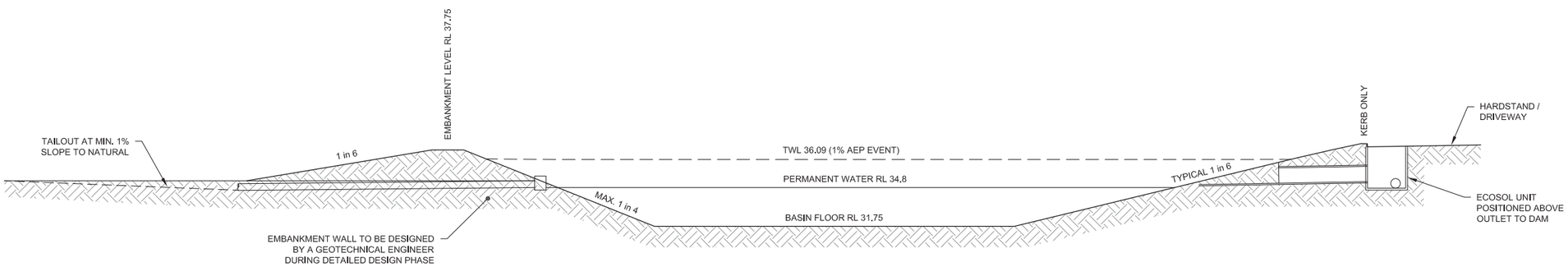
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521 THE NORTHERN ROAD LONDONDERRY
PROPOSED MUSHROOM FARM
DETAIL PLAN SHEET 2

Plan No. 07166E3
REV. E
File Ref. 07166E1f.dwg
SHEET 3 OF 7 SHEETS

A1





SECTION A

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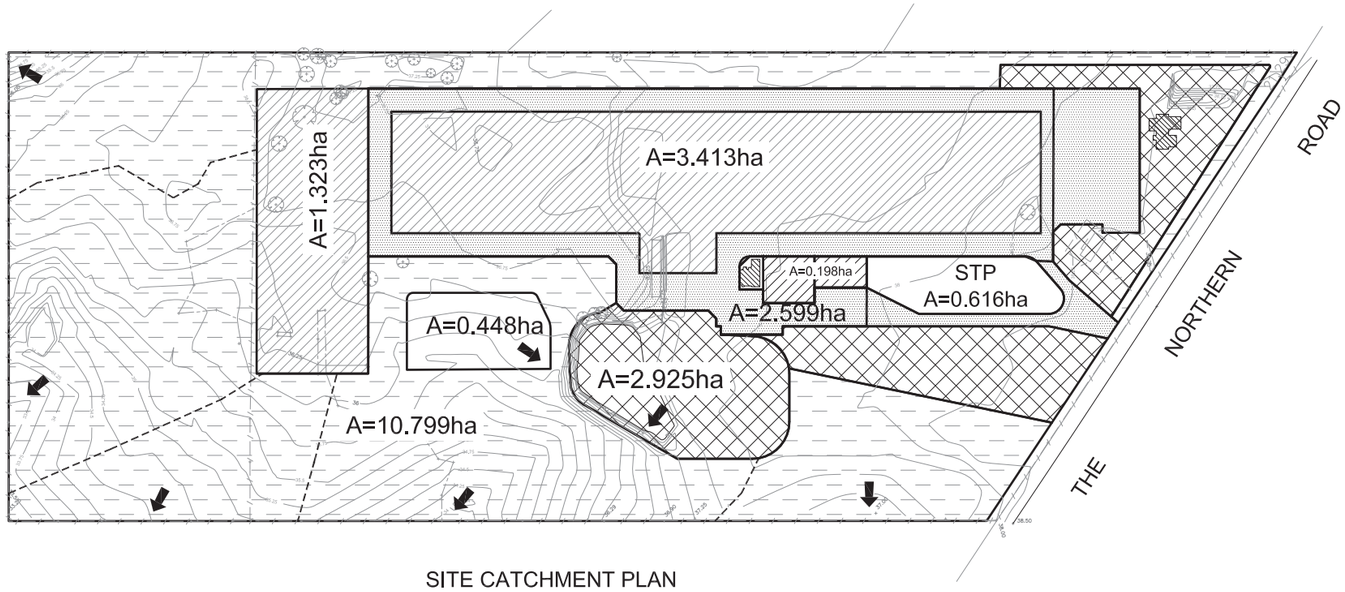
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LGA: PENRITH
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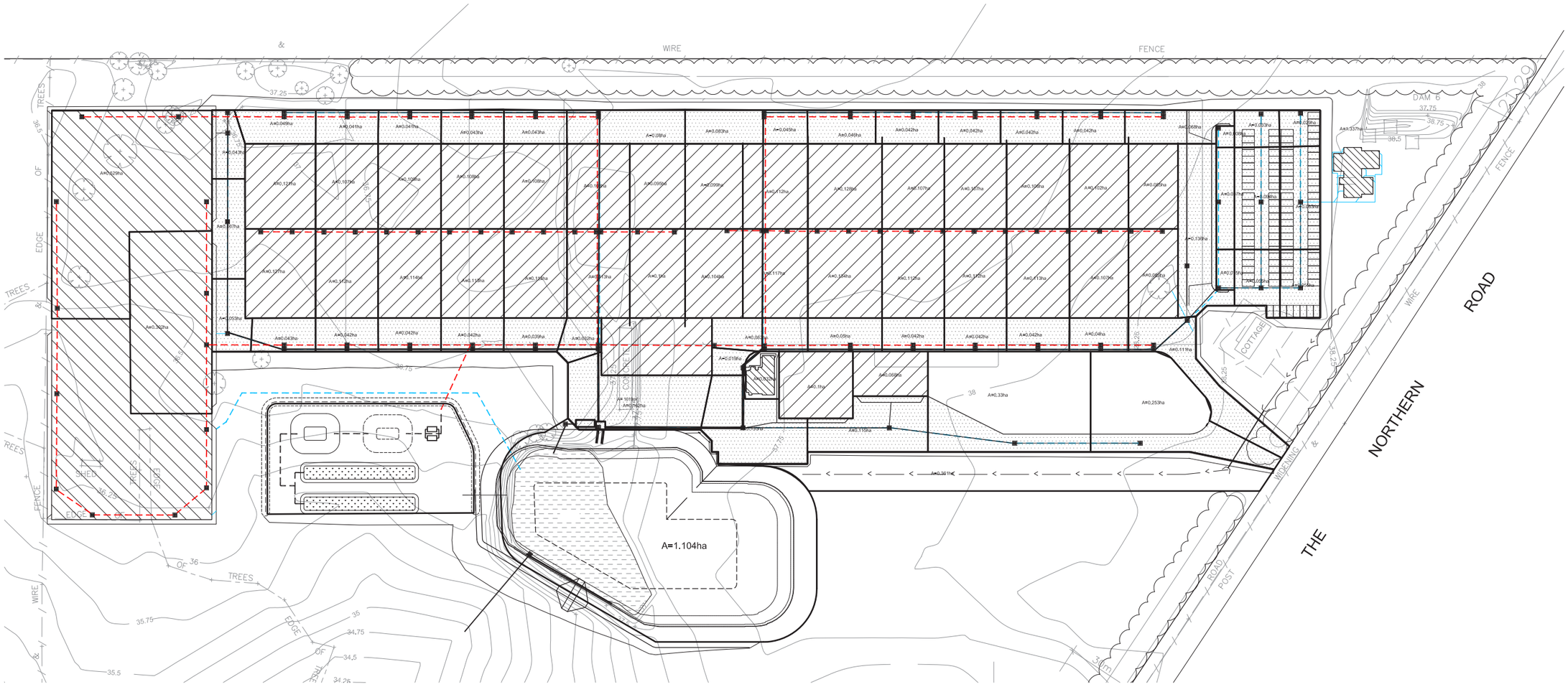
521 THE NORTHERN ROAD
LONDONDERRY
PROPOSED MUSHROOM FARM
OSD BASIN PLAN AND SECTION

Plan No. 07166E4 REV. A
File Ref. 07166E1f.dwg
SHEET 4 OF 7 SHEETS

A1



SITE CATCHMENT PLAN
1:2000



No.	DATE	AMENDMENT
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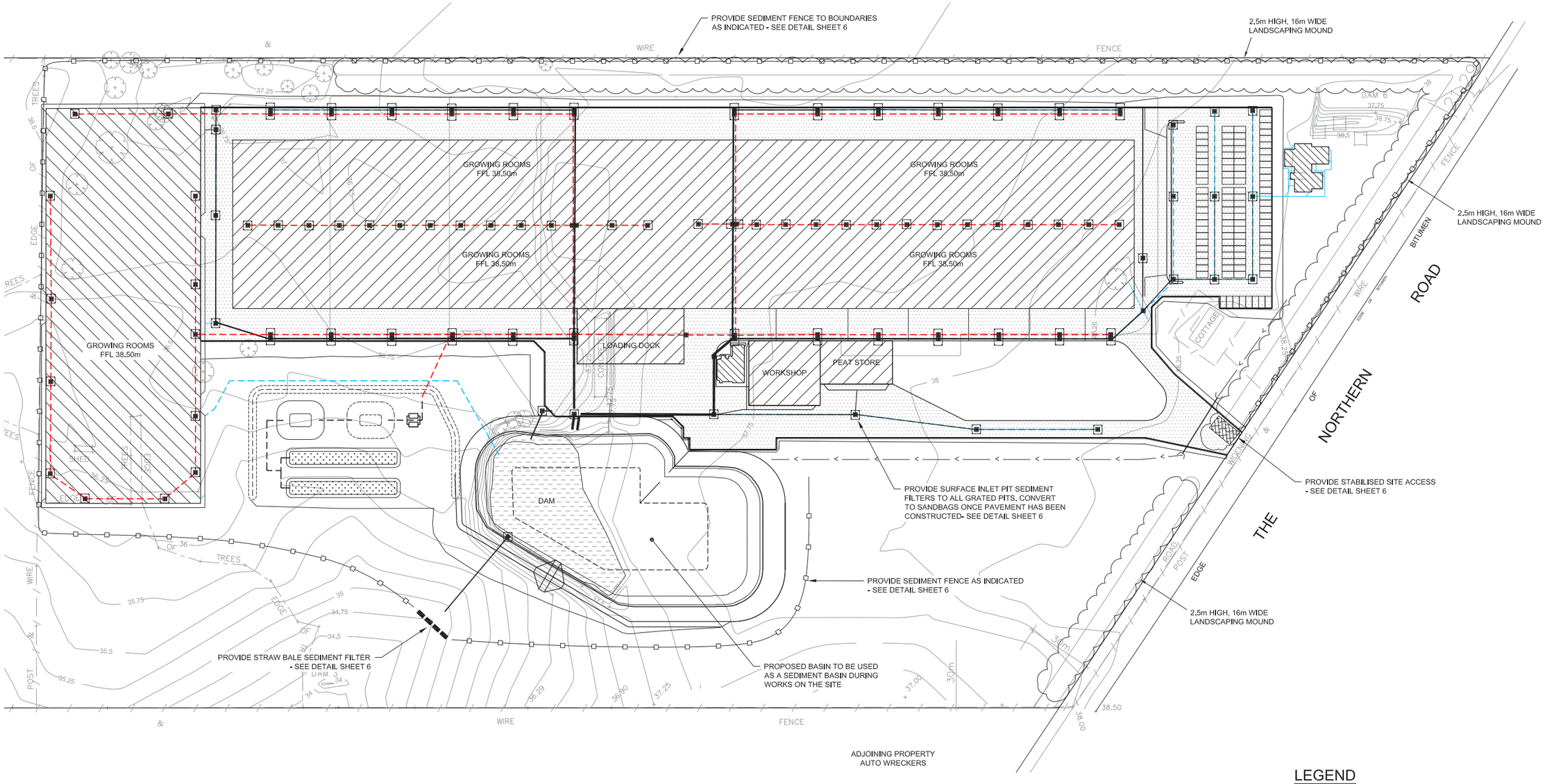
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521 THE NORTHERN ROAD
LONDONDERRY
PROPOSED MUSHROOM FARM
CATCHMENT PLAN

Plan No. 07166E5
REV. A
File Ref. 07166E1f.dwg
SHEET 5 OF 7 SHEETS

A1



EROSION AND SEDIMENTATION CONTROL NOTES

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6. SILT BARRIERS LOCATED AROUND KERB INLET AND ROAD PITS SHALL BE REINSTATED FOLLOWING ROAD PAVING WORKS IF IT IS LIKELY THAT UNDISTURBED AREAS WILL STILL DRAIN TO THE PIT.
7. SANDBAGS SHALL BE PLACED ACROSS THE END OF ROAD CONSTRUCTION AT THE COMPLETION OF EACH DAYS WORK TO PREVENT EROSION OF THE CONSTRUCTED MATERIAL.
8. THE CONTRACTOR SHALL CONDUCT WEEKLY INSPECTIONS OF THE SITE TO ENSURE THAT ALL DEVICES AND REHABILITATION AREAS HAVE BEEN ADEQUATELY MAINTAINED. THE CONTRACTOR SHALL ALSO KEEP A LOG BOOK DETAILING SUCH INSPECTIONS, AND RECORDING RAINFALL EVENTS AND OTHER RELEVANT EVENTS.
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20 10 0 10 20 30 40 50 60 70 80 90 100 1:1000
METRES

LEGEND

- PROPOSED HEADWALL
- DIVERSION BANK
- SILT FENCE
- STRAW BALE BARRIER
- GRAVEL SHAKER PAD AT ENTRANCE TO WORKS
- S.P. — TOPSOIL STOCKPILE SITE
- SURFACE INLET PIT SEDIMENT FENCE
- SANDBAG/FILTER SAUSAGE SEDIMENT BARRIER

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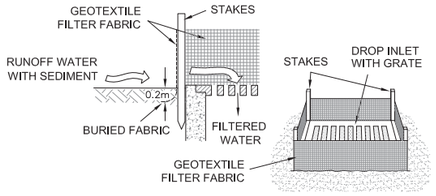
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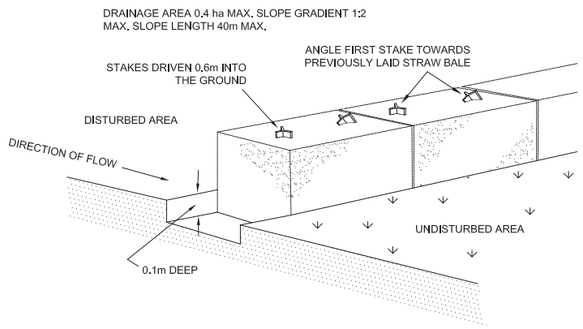
521 THE NORTHERN ROAD
LONDONDERRY
PROPOSED MUSHROOM FARM
EROSION AND SEDIMENT CONTROL PLAN

Plan No. 07166E6 REV. B
File Ref. 07166E1f.dwg
SHEET 6 OF 7 SHEETS

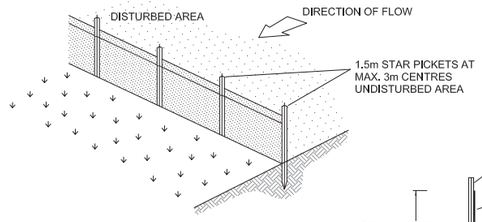
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SURFACE INLET PIT SEDIMENT TRAP



STRAW BALE SEDIMENT FILTER



CONSTRUCTION NOTES

1. CONSTRUCT SEDIMENT FENCE AS CLOSE AS POSSIBLE TO PARRALLEL TO THE CONTOURS OF THE SITE.

2. DRIVE 1.5m LONG STAR PICKETS INTO GROUND 2.5 METRES APART (MAX.)

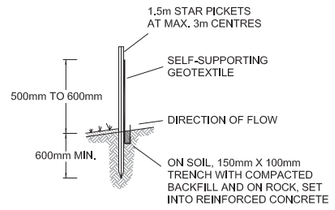
3. DIG A 150mm DEEP TRENCH ALONG THE UPSLOPE LINE OF THE FENCE FOR THE BOTTOM OF THE FABRIC TO BE ENTRENCHED.

4. FIX SELF-SUPPORTING GEOTEXTILE TO UPSLOPE SIDE OF POSTS WITH WIRE TIES OR AS RECOMMENDED BY GEOTEXTILE MANUFACTURER.

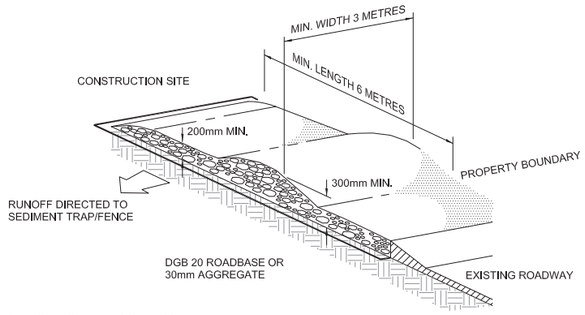
5. JOIN SECTIONS OF FABRIC AT A SUPPORT POST WITH A 150mm OVERLAP.

6. BACKFILL THE TRENCH OVER THE BASE OF THE FABRIC AND COMPACT IT THOROUGHLY OVER THE GEOTEXTILE.

SEDIMENT FENCE



SECTION DETAIL



CONSTRUCTION NOTES

1. STRIP TOPSOIL AND LEVEL SITE.

2. COMPACT SUBGRADE.

3. COVER AREA WITH NEEDLE-PUNCHED GEOTEXTILE.

4. CONSTRUCT 200mm THICK PAD OVER GEOTEXTILE USING ROADBASE OR 30mm AGGREGATE. MINIMUM LENGTH 15 METRES OR TO BUILDING ALIGNMENT. MINIMUM WIDTH 3 METRES.

5. CONSTRUCT HUMP IMMEDIATELY WITHIN BOUNDARY TO DIVERT WATER TO A SEDIMENT FENCE OR OTHER SEDIMENT TRAP.

GEOTEXTILE FABRIC DESIGNED TO PREVENT INTERMIXING OF SUBGRADE AND BASE MATERIALS AND TO MAINTAIN GOOD PROPERTIES OF THE SUB-BASE LAYERS.

GEOFABRIC MAY BE A WOVEN OR NEEDLE PUNCHED PRODUCT WITH A MINIMUM CBR BURST STRENGTH (AS3706.4-90) OF 2500 N

STABILISED SITE ACCESS

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6/5/08	FIRST ISSUE

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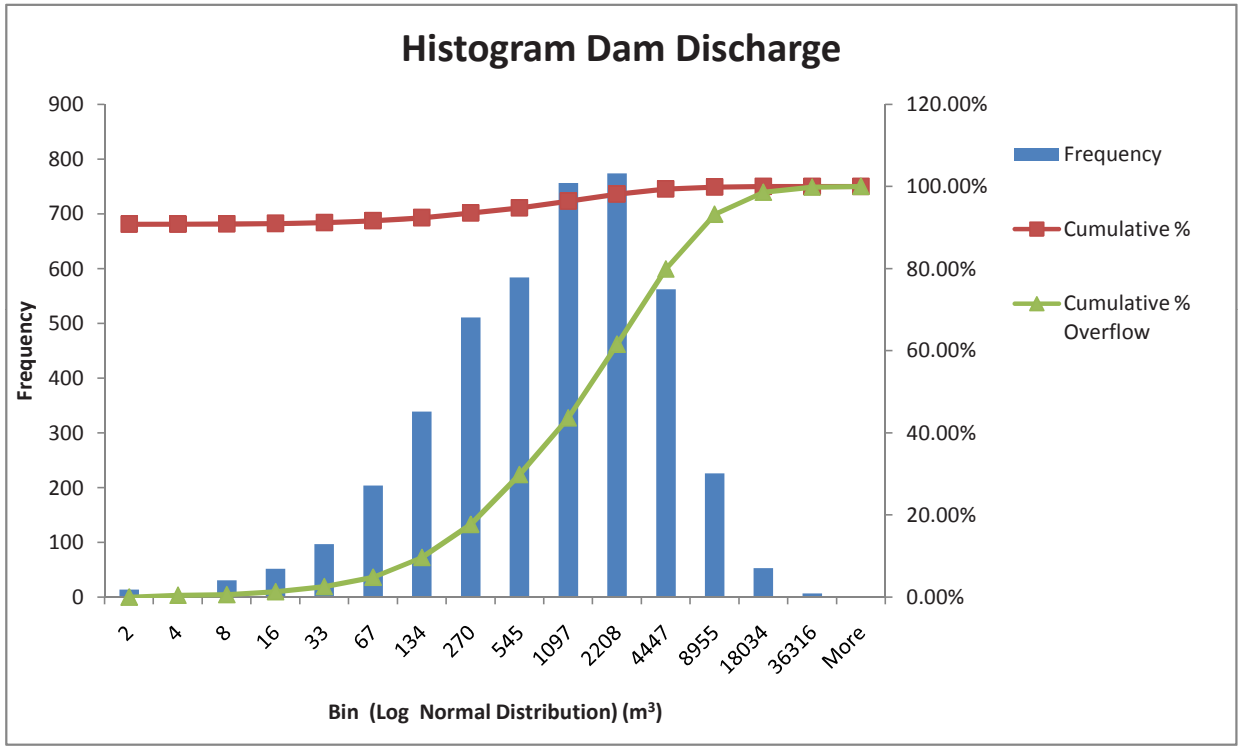
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Council Ref:

521 THE NORTHERN ROAD
LONDONDERRY
PROPOSED MUSHROOM FARM
EROSION & SEDIMENT CONTROL DETAILS

Plan No. 07166E7
REV. B
File Ref. 07166E1f.dwg
SHEET 7 OF 7 SHEETS

Appendix D. Overflow Histogram from Dam.

Bin	Frequency	Cumulative %	*Cumulative % Overflow*
0	41462	90.76%	0
2	14	90.80%	0.45%
4	6	90.81%	0.59%
8	31	90.88%	1.33%
16	52	91.00%	2.56%
33	97	91.21%	4.86%
67	204	91.66%	9.69%
134	339	92.40%	17.72%
270	511	93.52%	29.83%
545	584	94.79%	43.66%
1097	756	96.45%	61.57%
2208	774	98.14%	79.91%
4447	562	99.37%	93.22%
8955	226	99.87%	98.58%
18034	53	99.98%	99.83%
36316	7	100.00%	100.00%
More	0	100.00%	100.00%
Sum Overflow events =	4221		
	Mean Flow=	643 m^3	



Appendix E. IFD Table

IFD TABLE

Location:	Lattitude	-33.67572						
	Longitute	150.74270						
Duration		Average Recurrence Interval (Years)						
		1	2	5	10	20	50	100
5	minutes	74.5	96.6	126	143	166	197	220
6	minutes	69.7	90.3	118	134	156	185	206
10	minutes	57	73.8	96.4	110	127	150	168
20	minutes	41.5	53.7	69.9	79.5	92.1	109	121
30	minutes	33.6	43.5	56.6	64.4	74.6	88.1	98.5
1	Hour	22.8	29.5	38.4	43.7	50.6	59.8	66.9
2	Hours	15.1	19.6	25.5	29	33.5	39.6	44.2
3	Hours	11.9	15.4	19.9	22.6	26.2	30.9	34.4
6	Hours	7.85	10.1	13.1	14.8	17.1	20.2	22.5
12	Hours	5.11	6.61	8.59	9.76	11.3	13.3	14.9
24	Hours	3.22	4.2	5.58	6.42	7.5	8.95	10.1
48	Hours	1.93	2.56	3.52	4.12	4.89	5.95	6.77
72	Hours	1.4	1.87	2.62	3.1	3.71	4.55	5.21

Appendix G

MUSHROOM FARM WATER RECYCLING SYSTEM

Sainty & Associates Pty Ltd

Mr D. Tolson
Principal
Elf Mushrooms

28/ 05/2010

Dear David
Herewith the report you requested that outlines a system to treat the mushroom wash at the relocated Elf mushroom farm.

A surface flow system has been designed with the capacity to treat the projected 30 000 L/day flow for reuse in the cooling towers. Water will remain within the property and will be treated to a quality that makes it suitable for industrial reuse. The system operates by gravity, except for recirculation and pumping of the treated water. The system has been designed with a minimum of concrete and pipes and is low in cost. It is designed with ample capacity and features treatment stages that can be bypassed to facilitate maintenance. It is designed to eliminate problems with odour and mosquitoes, provided the Maintenance Manual is followed.

The system is based on experience in numerous wetlands in Australia, but is primarily based on a design developed by the Dairy Industry in New Zealand that effectively treats dairy washings. The best of these systems incorporates aeration in the sequence and this ensures that stratification is avoided and BOD is adequately managed, and oxygen depletion does not occur. The system does not present OH and S problems, but fencing of the pools and dense plantings of the benches is recommended.

A Maintenance Manual will be needed to make sure the components are functioning effectively and even though maintenance costs will be low it is essential that the system be inspected 2 or 3 times a week, whilst in operation, to ensure it is operating efficiently. To this end the system needs to be surrounded by a road to facilitate inspection.

Yours faithfully

Geoff Sainty
Principal
Sainty and Associates Pty Ltd

PO Box 1219 Potts Point NSW Australia 1335
Ph +61 2 9332 2661 Fax +61 2 9331 5372
Email : geoff@sainty.com.au
Website: www.sainty.com.au
ABN: 27 320 366 545

Wetland Specialists

Wetlands to manage the Elf Mushroom grey water treatment stream

Introduction

The filtering functions in natural wetlands and their ability to remove sediments and pollutants passing through them are well known. Constructed wetlands are designed to harness processes that occur in natural wetlands. (Reed, Crites and Middlebrooks 1995; Tanner and Kloosterman 1997; Reed et al 1999)

The projected washing output from the new mushroom production facility at full production is 30,000 L/day throughout the year all of this water will be completely reused in the cooling towers, steam generator & for toilet flushing. All the treated water will be reused within the property and not allowed to enter downstream ecosystems. There will be no pause in greywater production so the system has to have the capacity to provide continual treatment and at the same time allow for maintenance to be carried out. In addition, the system has to be designed to operate with lesser volumes of grey water during the early stages of the mushroom farm development when there are fewer growing rooms.

Wetlands can be sized and designed in a variety of ways to fulfil site specific requirements. A number of options were considered. Given the nature and volume of the effluent and the intended total use in cooling towers, steam generator and for toilet flushing we have selected a system that includes solids collection, aeration and reed bed. It is designed with more than adequate hydraulic retention times (4 to 8 days) and bypass and recirculation capacity. The bypass system will enable maintenance to take place while treatment continues. This system has sufficient size to enable an increase in flow without jeopardising performance. It uses gravity throughout apart from recirculation from the downstream collecting Pond back to the linear wetlands and in this regard is low on energy use, although energy will be required for periodic—probably limited to daylight hours—use of the aeration system.

Effluent/washings content

The effluent produced from mushroom production is high in organic matter and moderately high in BOD, ammonia, and nutrients.

Table.1. Recent washings water quality data—Elf Mushrooms

Analyte	**27 Aug 09**	**28 Aug 09**	**29 Aug 09**	**Average**
Ammonia	7.6	13	26	15.5
BOD	38	50	68	52
Phosphorous	8.1	18	14	13.4
TKN	21	30	96	49

Preliminary and final treatment

Pre-treatment using a facultative (a pond containing both aerobic and anaerobic zones) and an oxidation pond will reduce BOD, total nitrogen and total ammonia to levels that will reduce the work to be done by the shallow linear reedbeds. (Knight et al 1993, Tanner and Kloosterman 1997, Reed et al 1999). Pond systems without shallow linear wetlands generally achieve limited nutrient removal, although subsurface systems can do this at greater cost for both construction and maintenance. Full nutrient removal will take place in the proposed two parallel linear wetlands. These are 50x6 m in length and will operate at a depth of around 25 cm. The hydraulic retention time in each of the linear wetlands will be about 2.5 days. The proposed system will have a hydraulic retention time (HRT) of around 8 days when all stages are operating and 5 days when Stage 2 and 3 are bypassed and both of the linear wetlands are operating.

Recirculation

It is recommended that the capacity to recirculate the treated effluent from the downstream collection pool to the head ditch of the linear wetlands be included in the system. Additional treatment may be needed depending on seasonal biological variables in the system or there is need to carry out maintenance on the facultative and aerobic pond. The pump and pipe that delivers water to the storage tank will also be connected to the head ditch of the linear wetlands.

Staged system

The proposed system is in four stages with potential to bypass for maintenance purposes and discourage waterbirds taking up permanent residence. Stage 2 is optional but land needs to be allocated so that in the event that the continual output of 30,000 L/day of mushroom wash down is causing the treatment system to be overloaded it can be constructed.

Construction will be of earth apart from the concrete collector trenches at Stage 1, and prefabricated concrete inlets and outlets, and recirculation and delivery pipes. Initially it is proposed that open channels be used to avoid piping and the potential for blockages. All channels and ponds will be designed not to receive surface runoff and with sufficient freeboard to retain incidental rainfall.

(i) **Stage 1.** Dual concrete sediment collecting trenches that can be mechanically cleaned while one trench continues washings collection. An adjustable outlet pipe (100 mm PVC sewage pipe) will enable the liquid to be drawn off at different levels and to some extent separate solids from liquid. Most of the coarse solids will be removed at this stage. Combined volume approx. 12,000 L.

(ii) **Stage 2.** A facultative pond 5x10 m 1.5 m deep with a working volume of 75,000 L. In the event of need for maintenance and need to prevent waterbirds from using it as a permanent residence, a bypass channel is included to Stage 3. Nutrient levels are moderately high in water washed from the production area and there will be a need to target total ammonia and

nitrogen. Given the projected wash output of 30,000 L/day a hydraulic retention time of 2.5 days is projected for Stage 2. Dense planting of *Juncus polyanthemos* and *Juncus usitatus* is recommended for planting around the edge of the bench. These species are non rhizomatous and are not favoured habitat for breeding birds or provide food. The Pond to be surrounded by a road for maintenance. **NOTE** THIS POND MAY NOT BE NECESSARY, GIVEN THE CURRENT WATER QUALITY OF THE EFFULENT. IT IS PROPOSED THAT THIS FACULTATIVE POND BE NOT BUILT BUT AN AREA BE ALLOCATED IN THE TREATMENT TRAIN FOR IT TO BE BUILT AT A LATER DATE.

(iii) **Stage 3.** An aerated oxidation pond 6x10 m and 1.5 m deep with a working volume of approx. 100,000 L and a HRT of approx.3 days at 30,000 L/day. Aeration using compressed air will be needed in this pond. In the event of need for maintenance and need to prevent waterbirds from using it as a permanent residence a bypass channel is included. Dense planting of *Juncus polyanthemos* and *Juncus usitatus* is recommended for planting around the edge of the bench. These species are non rhizomatous and are not favoured habitat for breeding birds or provide food. The pond to be surrounded by a road for maintenance.

(iv) **Stage 4.** Comprises 2 linear wetlands each 50x6 m (300m^2) with an average depth of 25 cm and a volume of 75,000L on a slope of 0.25% (12.5 cm in 50 m). (**NB**: The construction of evenly sloping linear wetlands is difficult to achieve). The more accurately it is built the better the treatment). The combined volume of the two linear wetlands is 150,000 L giving a hydraulic retention time (HRT) of 5 days if both wetlands are operating. The wetland to be separated by a 4 m wide road to allow for rapid maintenance from both sides of the linear wetlands. The wetlands to be planted with *Phragmites australis* which should be allowed to colonise the whole of the wetlands. *Phragmites* will form a dense cover and not provide good bird habitat. Water draining from the linear wetland to be delivered by a small drain to the pool on the southern boundary of the site, and from there pumped to the storage tank for re-use or to the start of the linear wetlands for recirculation.

Table. 2. Summary—volume, depth and area

Stage	**Area**	**Depth**	**Volume Litres**
Stage 1 **Solids collection trenches**	2 m X 4 m	1.2 m	12 000 L
Stage 2 Facultative pool	5 m X 10 m not including bench	1.5 m	75 000 L
Stage 3 Aerated pool	6 m X 10 m including bench	1.5 m	90 000 L
Stage 4 **Two linear vegetated wetlands**	Two wetlands 50 m X 6 m	av. 25 cm	150 000 L

Contour and Substratum

The linear wetlands are 50 metres long and should be constructed to follow the natural contour to minimise the need for excavation. The 'A' horizon (living surface soil) skimmed from the wetland footprint should be stockpiled and used to provide the growing medium for Phragmites in the linear wetland.

Odour

Odour is reduced by water movement. The effluent flow will result in continual turnover of the water and when coupled with the aeration pond will ensure that odour is not a problem.

Planting

The linear wetlands to be planted with Phragmites *Phragmites australis*. This plant should be allowed to fully colonise both linear wetlands.

Phragmites can be grown from seed. Seed is produced in May to July. A series of collections should be made as not all populations produce viable seed. Six months is approximately the time needed to bring the seedlings to a growth stage that will enable planting to take place. Juvenile seedlings are easily drowned or die from lack of water and daily sprinkler irrigation is recommended.

Dense planting of *Juncus polyanthemos* and *Juncus usitatus* are recommended for planting around the edge of the bench. These species are non rhizomatous and are not favoured habitat for breeding birds or provide food.

Occupational Health and Safety

The wetlands, except for the linear stage, will result in the construction of a drowning hazard. Stage 1, 2 and 3 will require security fencing that removes the potential for drowning. The concrete collection trenches 1.2 m deep present a major risk.

The linear wetlands are shallow (25 cm) and fully vegetated and the risk of drowning is low. The facultative and aerobic pools, with depths of 1.5 m, are a hazard for children and non-swimming adults. The edges of these pools should be built with a gently sloping bench, 20 cm deep at top water level at the edge, sloping to 30 cm deep at a bench width of 1.5 metres. The safety bench to extend around the pools before the steep 1:3 m slope is commenced.

Pathogens

Given the 'clean' mushroom effluent and the absence of pathogens in this waste, the water in the 'treatment train' will not be a health hazard, provided the Maintenance Manual is followed.

Gesberg, R.M. (1989) et al in a study *Pathogen Removal in Constructed Wetlands,* showed that correctly designed vegetated surface flow wetlands with hydraulic retention times greater than 3 days significantly reduced *E. coli* levels

Mosquitoes

Production of mosquito habitat is a major ongoing problem with wetlands. Mosquito larvae mature in less than ten days in spring, summer and autumn in static water that contains no larvae predators. Insects are the main predators of larvae, and small fish are also significant predators. Ruffled water surface also limits the capacity of larvae to breathe and survive. Stages 1 and 2 have disturbed water with a high turnover and will not provide a habitat for mosquitoes to complete their life cycle. Stage 3 is aerated and unlikely to become a mosquito breeding pool as it will develop an invertebrate and *Gambusia* population. The linear wetlands will eventually develop an insect population that predates on mosquito larvae; also the water will also be moving with turnover every few days. To ensure that there is a rapid build up of insects it is recommended that once the flow has stabilized and the system is operating 20 litres of sludge from the edge of a number of points in a nearby wetland that is more than 10 years old be taken to the linear wetlands and introduced at the inflow point. (Russell, 2003)

Maintenance

A separate **maintenance manual** that specifies water quality data to be collected and daily, weekly, monthly and yearly observations and OH and S checks to be made and recommended action will be prepared. Maintenance costs will be low but the system requires checking two or three times a week. A check list to be prepared that requires a signature from the person who made the inspection.

The effective and economical key to this system is its design that enables Stages to be bypassed and water quality standards to be maintained. Road access to enable quick checking of the system will be built.

A series of annual draw-downs/drainings are essential to limit any build up of waterfowl through the system. Note that waterbirds are encouraged to breed and stay where water continually surrounds emergent vegetation.

Commencement

The construction of the wetland system and planting should be completed one full growing season (September to April) before effluent flow commences.

Table 3. Terms used in wetland treatment systems

Pollutant	Description	Significance in discharge
Biochemical oxygen demand	Measure of oxygen consumption of a wastewater under standard conditions. Oxygen is consumed by bacteria decomposing organic matter present in the waste. BOD is therefore an indirect measure of the degradable organic matter remaining in the wastewater	Minimum dissolved oxygen concentrations of around 5 mg/L are required for the survival of fish and other stream or wetland organisms.
Suspended solids (SS)	Suspended particles present in the water. Measured by passing water through a fine 0.45 micron filter and weighing the solids retained on the filter after drying. A measure of particulate matter present in water.	High levels of SS can reduce light levels available for plant growth and smother bottom sediments, stressing bottom dwelling organisms
Aerobic and anaerobic ponds	Nitrification takes place in aerobic conditions and denitrification takes place in anaerobic conditions where carbon is available. The deeper water may be subject to thermal stratification with a warmer surface layer in high daytime temperatures and a colder lower layer. The lower layer generally becomes anaerobic.	These processes reduce nitrogen throughout the system
Facultative Pond	A pond containing both aerobic and anaerobic zones. Algae and surface re-aeration supply oxygen to the upper waters, while anaerobic conditions prevail in the deeper zones.	Often wrongly referred to as aerobic ponds.
Nitrate	Oxidised form of nitrogen.	Generally readily converted to nitrogen gases by wetland microbes
Nitrification	Conversion of ammonium nitrogen to nitrate by microbes in aerated conditions.	

Geoff Sainty

Principal

Sainty and Associates Pty Ltd

21/5/10

References and further reading

Gersberg, R.M., et al (1989) Pathogen Removal in Constructed Wetlands in: *Constructed Wetlands for Wastewater Treatment*, D. Hammer, ed., pp 432-445, Lewis Publishers, Chelsea Ml.

Kadlec, R. H. and Knight, R. L. (1996). *Treatment Wetlands.* CRC Press, Boca Raton Florida.

Reed, S., New, J.F., Blackwell, J.H., Russell, R., Sainty, G.R. and Constandopoulos, J. (1999). *Proceedings from Natural Systems to Manage Grey Water, Sewage, Leachate and Sludge*. Sydney and Brisbane.

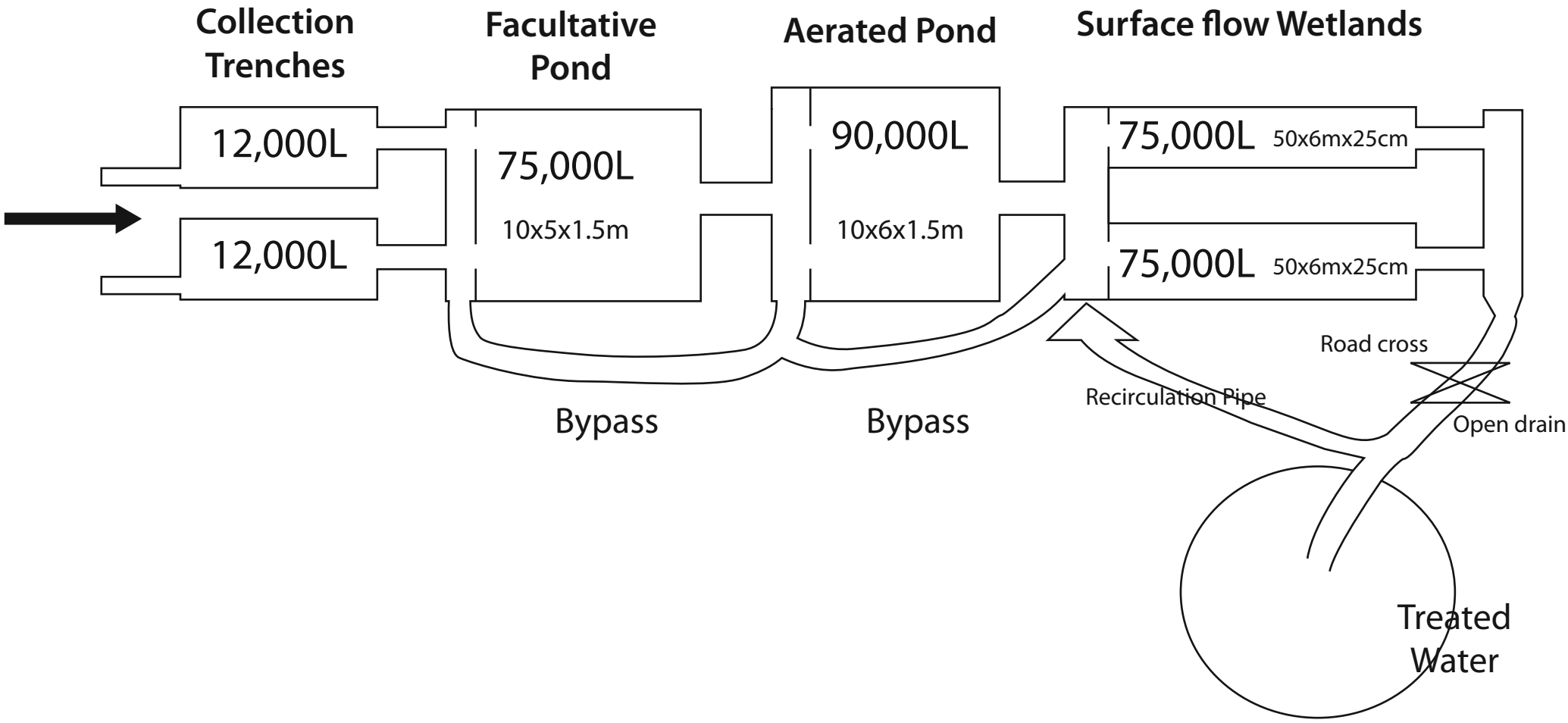
Reed, S. C., Crites, R. W., Middlebrooks E. J., (1995), *Natural Systems for Waste Management*, second edition McGraw Hill Co, New York, NY.

Russell, R. Sainty, G.R. and Hunter, G. (1999) *Wetlands for Stormwater Management: Water, vegetation and mosquitoes a—recipe for concern.* From Proceedings of South Pacific Conference on Stormwater and Aquatic Ecosystem Management, Auckland, New Zealand.

Tanner C.C and Kloosterman, V.C. (1997) *Guidelines for Constructed Wetland Treatment of Farm Dairy Wastewater in New Zealand.* pp. 67.

Elf Mushrooms

Schematic of treatment system
April 2010



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5/4/2010

Date **6th December 2010** Our Ref: CN212315-2010-03

Client: David Tolson
Managing Director, Elf Mushrooms
61 Wallace Rd,
Vineyard, NSW 2765

Dear David,

Re: Examination of wastewater pesticide concentrations

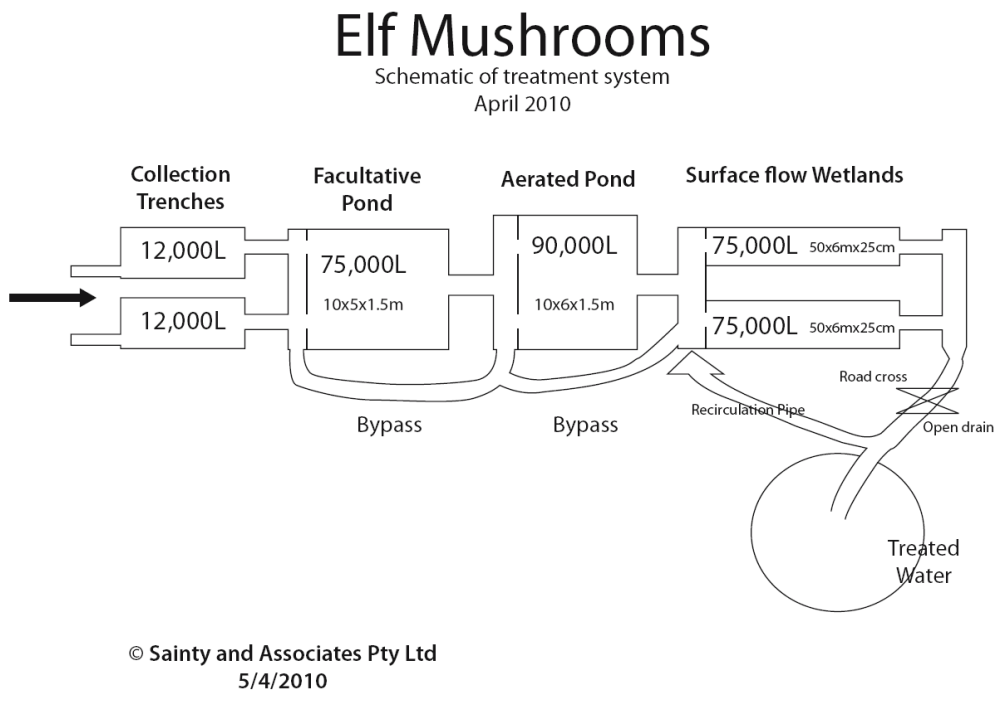
Please find below the interpretative report for the Elf Mushrooms wastewater investigation.

BACKGROUND

Elf Mushrooms currently operates a mushroom farm at Vineyard, and has filed a development application for another farm at a site in Londonderry. This proposed development is to include a wastewater treatment system, able to process farm wastewater to a level suitable for non-potable uses.

The treatment system incorporates wetlands, which are described in "Wetlands to manage the Elf Mushroom grey water treatment system" report by Sainty (2010). A brief description from Sainty (2010), including a schematic diagram, are reproduced below.

"The projected washing output from the new mushroom production facility at full production is 30,000 L/day throughout the year all of this water will be completely reused in the cooling towers, steam generator & for toilet flushing. All the treated water will be reused within the property and not allowed to enter downstream ecosystems. There will be no pause in greywater production so the system has to have the capacity to provide continual treatment and at the same time allow for maintenance to be carried out. In addition, the system has to be designed to operate with lesser volumes of grey water during the early stages of the mushroom farm development when there are fewer growing rooms."



As part of the Development Application by Elf Mushrooms, the Department of Planning has required an assessment of the potential effect of chemical residues in wash down water on the wetland recycling system proposed for the new mushroom farm at Londonderry.

The farming processes include some pesticides; including Regent 200SC Insecticide, Spin Flo Systemic Fungicide, and Octave WP Fungicide; which respectively contain the active constituents - Fipronil, Carbendazim and Prochloraz, respectively.

Usage rates for these chemicals have been previously supplied by Elf Mushrooms for the environmental assessment as the following:

- Regent® - Fiprinol; 1.8 L per room per filling
- Spin Flo® - Carbendazim; 1.8 L per room per filling
- Octave® - Prochloraz; 2.16 kg per room per filling

In addition, chlorine is used in the washdown process, at a rate of 10 L per room per washdown. Examination of chlorine concentration has also been included as a requirement.

SCOPE AND OBJECTIVES

The objectives of this examination were to:

- Take three samples from the Vineyard process wastewater stream, to be analysed for Fipronil, Carbendazim, Prochloraz, and free chlorine; so as to provide indicative levels of these chemicals in wastewaters resulting from the farming processes. One sample will be taken at a time indicated by Elf Mushrooms to be when the chemicals would be anticipated as at their highest concentrations, representing a worst-case scenario. Two samples are to be taken at times representative of usual flow conditions at the farm.
- Provide a brief interpretive report, incorporating the laboratory analyses and relevant farm process information, and discussing the potential effects of the farm wastewater on the proposed wetland.

METHODOLOGY

The “worst-case” sample of the Vineyard farm wastewater was taken by ALS on Friday 29th October, 2010 at 1:40PM. The “usual flow” wastewater samples were taken by ALS on Wednesday 17th November, 2010 at 8:45AM; and on Friday 19th November, 2010 at 8:40AM. Samples were examined on the spot for free chlorine (Hach DR/890 Colorimeter, and DPD reagents for 10mL test). The remainder of the samples were delivered on the same day to the ALS Smithfield laboratory and refrigerated, and then couriered to the National Measurement Institute.

The first sample arrived at NMI on Monday 1st November, for examination by a LC-MS/MS screen. Chemical extraction was performed on 3rd November, analysis performed on 5th November, and reporting to ALS performed on 9th November.

The second sample arrived at NMI on Tuesday 23rd November, and the third on the 22nd November. Extraction for both samples was performed 25th November, with analysis performed 26th November, and reporting on 3rd December.

RESULTS

No free chlorine residuals were detected in the samples.

The laboratory reports of the chemical examinations has been reproduced as Appendix A.

Reported concentrations were for Carbendazim (280 µg/L), Fipronil (<2 µg/L), and Prochloraz (1.6 µg/L) in the “worst-case” sample. The “usual flow” samples contained reported concentrations of Carbendazim (40 µg/L), Fipronil (<2 µg/L), and Prochloraz (0.6 µg/L) for the 17th November sample; and Carbendazim (5.7 µg/L), Fipronil (<2 µg/L), and Prochloraz (0.31 µg/L) for the 19th November sample.

DISCUSSION

As the scope of this examination was limited to determining the concentration of the targeted chemicals in the outflows and the potential effects of the chemicals on the proposed wetland treatment system, the following comments have been restricted to these aspects.

The absence of a chlorine residual in the wastewater is as expected. The wastewater contains a substantial load of organic material from the farming processes, which would exert a considerable chlorine demand. It is regarded as unlikely that a chlorine residual able to affect the downstream wetland would result from the described operating practices.

Ecotoxicology information on the three pesticides targeted in this assessment is available in their Material Safety Data Sheets (provided by NuFarm for Spin Flo and Regent, and by Bayer Crop Science for Octave). This information is summarised in the figure below.

MSDS summary of pesticides

Composition:

Octave:	contains 462 g/kg Prochloraz
Spin Flo:	contains 500 g/L Carbendazim
Regent:	contains 200 g/L Fipronil

Ecotoxicity – Prochloraz:

Fish toxicity:	LC50 (96 h) rainbow trout (*Onchorhynchus mykiss*) 1.5 mg/L
	LC50 (96 h) bluegill sunfish 2.2 mg/L
Daphnia toxicity:	EC50 (48 h) water flea (*Daphnia magna*) 4.3 mg/L
Algal toxicity:	EC50 (72 h) algae (*Selenastrum capricornutum*) 0.094 mg/L
Bird toxicity:	Acute oral LD50 mallard duck >1954 mg/kg
	Acute oral LD50 bobwhite quail 662 mg/kg

Ecotoxicity – Octave Fungicide (ie: Prochloraz):

Fish toxicity:	LC50 (96 h) rainbow trout (*Onchorhynchus mykiss*) 2.4 mg/L
Daphnia toxicity:	EC50 (48 h) water flea (*Daphnia magna*) 4.3 mg/L

Ecotoxicity – Carbendazim:

Fish toxicity:	LC50 (96 h) rainbow trout (*Onchorhynchus mykiss*) 0.87 mg/L
Daphnia toxicity:	EC50 (48 h) water flea (*Daphnia magna*) 0.22 mg/L
Bird toxicity:	Not toxic to birds. LD50 for quail 5862-15595 mg/kg
Insect toxicity:	Not toxic to bees. LD50 >50 µg/bee

Ecotoxicity – Fipronil:

Fish toxicity:	LC50 (96 h) bluegill sunfish 0.085 mg/L
	LC50 (96 h) rainbow trout (*Onchorhynchus mykiss*) 0.248 mg/L
	LC50 (96 h) European carp 0.430 mg/L
Daphnia toxicity:	EC50 (48 h) water flea (*Daphnia*) 0.19 mg/L
Algal toxicity:	EC50 (72 h) algae (*Scenedesmus subspicatus*) 0.068 mg/L
Bird toxicity:	Acute oral LD50 mallard duck 5000 mg/kg
	Acute oral LD50 bobwhite quail 48 mg/kg
Insect toxicity:	Highly toxic to bees by direct contact or ingestion

Of the indicative results from the chemical analysis, Carbendazim, which was present at a concentration of 0.28 mg/L in the “worst case” sample, has the potential to affect the ecology of the wetlands, based on the environmental assessments reported on its MSDS (see below for further discussion). Carbendazim concentrations in the “usual flow” samples (0.04 mg/L and 0.0057 mg/L) show reduced potential for environmental effects.

Concentrations of the other two fungicides - Fipronil and Prochloraz - were very low; these would be unlikely to have ecological effects, based on the environmental assessments that have been reported on their respective MSDSs.

From our preliminary assessment, it appears that there could be two significant potential effects from an elevated Carbendazim concentration in the effluent; upon the wetland fauna, and upon the wetland fungi population.

Although direct information is not available, based on the information presented in the MSDS, Carbendazim at the concentration observed in the "worst case" sample could directly affect invertebrates (including mosquitoes) and fish like Gambusia, which prey upon the mosquito larvae. As noted by Sainty (2010),

> *"Stages 1 and 2 have disturbed water with a high turnover and will not provide a habitat for mosquitoes to complete their life cycle. Stage 3 is aerated and unlikely to become a mosquito breeding pool, as it will develop an invertebrate and Gambusia population. The linear wetlands will eventually develop an insect population that predates on mosquito larvae; also the water will also be moving with turnover every few days."*

The environmental effects of Carbendazim have been previously examined by the WHO report on the chemical in Environmental Health Criteria, no. 149. This report notes that:

> *"Carbendazim has little effect on soil microbial activity at recommended application rates. Some adverse effects have been reported for groups of fungi.*
>
> *The 72-h EC50, based on total growth, for the green alga Selenastrum capricornutum was calculated to be 1.3 mg/litre; the NOEC was 0.5 mg/litre. The toxicity of carbendazim to aquatic invertebrates and fish varies widely, with 96-h LC50 values ranging from 0.007 mg/litre for the channel catfish to 5.5 mg/litre for the bluegill sunfish. In a 21-day test on Daphnia magna the onset of reproduction was significantly delayed at 0.025 mg/litre; the NOEC was 0.013 mg/litre.*
>
> *Carbendazim is toxic to earthworms in laboratory experiments at realistic exposure concentrations and from recommended use in the field. It is "relatively non-toxic" to honey-bees and of low toxicity to birds.*
>
> *Carbendazim persists on leaf surfaces and in leaf litter. In soil the half-life is between 3 and 12 months, and the compound may be detected for up to 3 years. However, in many cases, major residues will be lost within a single season. Residues of carbendazim and its metabolites are strongly bound or incorporated into soil organic matter. The strong adsorption (K_{oc} = approximately 2000) of carbendazim to soil and sediment particles reduces its bioavailability to terrestrial and aquatic organisms. Similarly, the mobility of carbendazim in soil is limited, and it is not expected to leach to ground water."*

It is likely that Carbendazim, at 0.28 mg/L, will exert some effect on the fish and invertebrate population in the wetlands, with invertebrates such as *Daphnia* (Water Fleas) particularly affected. However, the exact effect is not quantifiable at this stage. The "usual flow" samples, with Carbendazim concentrations of 0.04 mg/L and 0.0057 mg/L, would certainly dilute wastewater containing more elevated chemical concentrations, although the exact amount of dilution is also not quantifiable at this stage.

From discussion with Elf Mushrooms, the washdown regime at the proposed farm growing rooms would involve internal, external, and corridor washdowns. Of these, the fungicide containing Carbendazim would be used only in the internal growing room washdowns at the end of growing cycles (taking approximately 2 hours, three times per week). The wastewater from the other washdowns, which are to be conducted on a daily basis, would dilute the fungicide concentration in the combined flow to the wetland. Measures to further dilute Carbendazim may also be available, so as to ameliorate environmental effects prior to discharge into the proposed wetlands. Microorganisms are likely to break down any pesticide present at lower concentrations much more rapidly than at higher concentrations. Dilution may also ameliorate any potential direct impacts on other fauna.

Given the strong adsorption to soil and sediment particles, the upper end of the treatment process could be expected to remove much of the fungicide from the flow, developing a microbial population able to utilize Carbendazim; and resulting in the latter stages of the wetlands having a substantially reduced concentration of the chemical. The Stage 1 treatment of the proposed development includes the removal of most coarse solids; which could be expected to include adsorbed chemicals.

Nevertheless, it should be noted that being a fungicide, Carbendazim could be expected to have an effect

on some fungi in the soil and sediment, which are part of the ecosystems within the wetlands. The heterotrophic, degradation pathways ("Detrital Food Chain", dominated by fungi and bacteria) are particularly significant in nutrient transformation (including Carbon cycling) in aquatic habitat and wetlands. Elevated concentrations of pesticides are often toxic and undesirable for microorganisms, which are involved in the breakdown of various chemicals. In this case, the wetland is a component of a water treatment system and is removed from other environmental processes; it is necessary to ensure that the wetlands are able to fulfill their water recycling function. This should be verified once the wetlands begin operation.

It is also noted that the insecticide Fipronil was not detected, being reported as at a concentration of <2 µg/L. However, this pesticide may exert a desirable, adverse effect on mosquito larvae, which are highly susceptible to this chemical. Ali *et al.* (1998) describes Fipronil effect on mosquito larvae as follows:

> *"…48-h median lethal concentration (LC50) values ranging from 0.43 µg/L (Ae. taeniorhynchus and An. quadrimaculatus) to 23 µg/L (Ae. albopictus). Chironomus crassicaudatus and G. paripes also were extremely susceptible (48-h LC50 of both species: 0.42 µg/L) to fipronil."*

RECOMMENDATIONS

It is recommended that the concentration of Carbendazim is examined in the different stages of the proposed treatment system, once it becomes established and operational. This will provide information as to whether further dilution is required for successful operation of the wetlands.

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- Ali, A., J.K. Nayar, and W. Gu (1998). Toxicity of phenyl pyrazole insecticide, fipronil, to mosquito and chironomid midge larvae in the laboratory. J. Am. Mosq. Control. Assoc.14(2): 216-218.
- Sainty and Associates (2010). Wetlands to manage the Elf Mushroom grey water treatment stream.
- World Health Organisation (1993). International Programme on Chemical Safety, Environmental Health Criteria 149 – Carbendazim. Downloaded from www.inchem.org/documents/ehc/ehc/ehc149.htm on 9/11/10

CLOSURE

Please do not hesitate to contact the undersigned on 02 4721 3477 to discuss further.

Yours sincerely



Malcolm Warnecke

Senior Consultant, ALS Water Sciences Group (Environment Division), Penrith Office

Task	Position	Name	Signature	Date
Prepared by	Senior Consultant	Malcolm Warnecke		9 November 2010
	Principal Consultant	Dr. Nimal Chandrasena		9 November 2010
Reviewed by	Senior Consultant	Malcolm Warnecke		6 December 2010
	Principal Consultant	Dr. Nimal Chandrasena		10 November 2010
Disclaimer	This document has been prepared for the Client named above and is to be used only for the purposes for which it was commissioned. No warranty is given as to its suitability for any other purpose.			

REPORT OF ANALYSIS

Client	: AUST LABORATORY SRVS PTY LTD	Job No.	: AUSL01/101101
	277-284 WOODPARK ROAD	Quote No.	: QT-01016
	SMITHFIELD NSW 2164	Order No.	: 402381
		Date Sampled	: 29-OCT-2010
		Date Received	: 1-NOV-2010
Attention	: NANTHINI COILPARAMPIL	Sampled By	:
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N10/029502	.	ELF MUSHROOM WASTEWATER

Lab Reg No.	Units	N10/029502				Method
Sample Reference		.				
LC-MS/MS Screen						
Carbendazim	ug/L	280				NR51
Fipronil	ug/L	< 2				NR51
Fungicides						
Prochloraz	ug/L	1.6				NR47
Dates						
Date extracted		3-NOV-2010				
Date analysed		5-NOV-2010				

N10/029502
Sample N10/029502 was also found to contain the following compounds:

Propiconazole
Piperonyl Butoxide
Metalaxyl
Chlorfenvinphos
Diazinon

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

8-NOV-2010

REPORT OF ANALYSIS

NATA
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This Report supersedes reports: RN824269

Australian Government

National Measurement Institute

REPORT OF ANALYSIS

Report No. RN829286

Client	: AUST LABORATORY SRVS PTY LTD	Job No.	: AUSL01/101123
	277-284 WOODPARK ROAD	Quote No.	: QT-01016
	SMITHFIELD NSW 2164	Order No.	: 402474
		Date Sampled	: 17-NOV-2010
		Date Received	: 23-NOV-2010
Attention	: NANTHINI COILPARAMPIL	Sampled By	:
Project Name	:		
Your Client Services Manager	: BRIAN WOODWARD	Phone	: (02) 94490151

Lab Reg No.	Sample Ref	Sample Description
N10/031834	.	WATER ELF MUSHROOM WASTEWATER 2 17/11/10

Lab Reg No.	Units	N10/031834				Method
Sample Reference		.				
LC-MS/MS Screen						
Carbendazim	ug/L	40				NR51
Fipronil	ug/L	< 2				NR51
Fungicides						
Prochloraz	ug/L	0.60				NR47
Dates						
Date extracted		25-NOV-2010				
Date analysed		26-NOV-2010				

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

2-DEC-2010

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National Measurement Institute

REPORT OF ANALYSIS

Report No. RN829282

Client	: AUST LABORATORY SRVS PTY LTD	Job No.	: AUSL01/101122/1
	277-284 WOODPARK ROAD	Quote No.	: QT-01016
	SMITHFIELD NSW 2164	Order No.	: 402469
		Date Sampled	:
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Attention	: NANTHINI COILPARAMPIL	Sampled By	:
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Lab Reg No.	Sample Ref	Sample Description
N10/031610	.	WATER ELF MUSHROOM WASTEWATER 3 19/11/2010

Lab Reg No.		N10/031610				
Sample Reference	Units	.				Method
LC-MS/MS Screen						
Carbendazim	ug/L	5.7				NR51
Fipronil	ug/L	< 2				NR51
Fungicides						
Prochloraz	ug/L	0.31				NR47
Dates						
Date extracted		25-NOV-2010				
Date analysed		26-NOV-2010				

Luke Baker, Analyst
Organics - NSW
Accreditation No. 198

2-DEC-2010

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Appendix H

MUSHROOM FARM EFFLUENT DISPOSAL

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REPORT ON
ASSESSMENT FOR ON-SITE EFFLUENT MANAGEMENT – PROPOSED MUSHROOM FARM AT LOT 138 DP 752037, No. 521 - 555 THE NORTHERN ROAD, LONDONDERRY

PREPARED FOR: MR. D. TOLSON – ELF MUSHROOMS

SUBMITTED TO: DEPARTMENT OF PLANNING

REF. No. 100305

JUNE 2010

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1. INTRODUCTION

This report outlines the results of an assessment for on-site effluent management in relation to the proposed mushroom farm at Lot 138 DP 752037, No. 521 - 555 The Northern Road, Londonderry. The investigation was performed at the request of Mr. D. Tolson, Managing Director of Elf Mushrooms, and the report will be submitted to the Department of Planning. This report is prepared with due consideration to the relevant parts of Penrith City Council 'On-Site Sewage Management and Greywater Reuse Policy' (June 2007). This policy mainly concentrates on domestic scale sewage management systems and is further referred to as 'Penrith City Council (2007)'.

The property comprises an almost rectangular-shaped parcel of land that is situated off the western side of The Northern Road at a distance of about 2.2km northeast of the intersection with Cranebrook Road and immediately north of an established car wrecking yard (i.e. Northern Auto Wreckers). Figure 1 is an aerial photograph showing the layout of the property and extent of the main building footprint within the development site boundary.

As shown in Figure 2, the proposed development comprises the following components:

1. The east-west trending main mushroom farm building comprising growing rooms, offices, lunch rooms and amenities, as well the associated spent compost store area, loading dock, peat store, workshop, driveways and car park. The maximum potential number of personnel associated with the mushroom farm on site on any day will build to 160 persons (staff, contractors and visitors).
2. The existing three bedroom dwelling to be retained – this will function as a mangers residence once the mushroom farm is in operation and has a maximum potential occupancy level of five persons.
3. The staff childcare facility. Whilst the number of pre-school age children that will use the facility is not accurately known, an estimate of up to 25 children and six staff is made. However, the facility would have scope to cater for a greater number of children and staff, if ever required in the future.

2. OPTIONS FOR WASTEWATER TREATMENT

In conjunction with Mr. Tolson, various options for wastewater treatment have been considered for the features of the proposed development. A single treatment system will be utilised for the mushroom farm, dwelling to be retained and staff childcare facility to be established. Due to the scale of development, the proposed on-site sewage management system is deemed as 'commercial-scale' as defined in Penrith City Council (2007) for between 10 and 2500 equivalent persons. The location of the wastewater treatment system to the south of the eastern end of the main mushroom farm building and east of the peat store is shown in Figure 2.

The initial premise is to have a system providing at least secondary treated wastewater – i.e. secondary treatment system **(STS)**. A STS should be large enough to cater for the maximum design effluent volume generated in a single day with an appropriate factor of safety incorporated. A STS should be installed and maintained by a suitably qualified and experienced person.

As confirmed concurrently with Mr. Tolson, two options for effluent treatment systems are put forward in this report. Irrespective of the final choice of system, the requirements and proposal for land application will be the same.

The two options for effluent treatment considered for the subject site are:

1. The AdvanTex Recirculating Textile Filter **(ARTF)** Wastewater Treatment System – this is a specific type of effluent treatment system that is distinct to others available in the market place.
2. The Aerated Wastewater Treatment System **(AWTS)** – various brands available in the market place.

Further details regarding the systems are provided below.

2.1 The AdvanTex Recirculating Textile Filter

Whilst relatively new in Australia, it is understood that the ARTF was established in the USA approximately ten years ago and is now approved for use by the NSW Health Department. The system proper covers an approximate area of 5m in length x 2m in width = $10m^2$.

The ARTF is a multiple-pass, packed bed aerobic wastewater treatment system specifically designed and engineered for long-term processing of residential strength effluent. The treatment media is an engineered textile which has an extremely high void capacity, moisture holding capacity and surface area per unit volume. The ARTF comprises the following main components:

1. A primary treatment compartment.
2. A secondary treatment compartment.
3. The AdvanTex filter to result in additional treatment to a level deemed as better than secondary standards – i.e. 'advanced secondary treatment'.

When utilised, disinfection is carried out with use of an ultraviolet light.

As conveyed by the supplier, results from the testing of treated effluent from the ARTF system shows that the following typical treatment levels detailed in Table 1 are achieved.

TABLE 1: TYPICAL TREATMENT LEVELS ACHIEVED WITH THE ADVANTEX RECIRCULATING TEXTILE FILTER WASTEWATER SYSTEM

PARAMETER	**CONCENTRATION**
BIOCHEMICAL OXYGEN DEMAND	<4mg/L
SUSPENDED SOLIDS	<6mg/L
TOTAL NITROGEN	<15mg/L
TOTAL PHOSPHORUS	<8mg/L
FAECAL COLIFORMS – disinfected effluent	<10cfu/100mL
FAECAL COLIFORMS – non-disinfected effluent	$<1.35 \times 10^4$ cfu/100mL

Note that with the lack of cooked meals in the mushroom farm and minimal laundering and showering, there will be considerably lower overall pollutant levels in the influent derived relative to a domestic dwelling. Therefore, it is likely that better treatment will be achieved compared with that detailed in Table 1.

It is understood that the annual power cost with the ARTF for the effluent loadings experienced at the site would be less than $100/year and the system is well-suited to periods of no use and intermittent loadings.

2.2 The Aerated Wastewater Treatment System

The AWTS comprises single, dual or triple pre-cast processing tanks which produces secondary treated effluent that can be disinfected with either chlorine or UV light. It is essential to achieve the prescribed treatment levels with the AWTS to control the levels of nitrates, phosphates and faecal coliforms generated.

Reference to the Guidelines in Department of Local Government et. al. (1998) shows the expected quality of wastewater after treatment in an AWTS, which is given in Table 2. An AWTS must be well maintained and operated to achieve this quality on a continuous basis. It is possible that an AWTS would provide improved nitrogen and phosphorus treatment levels compared with those detailed below.

Aerated systems rely on biological activity for proper system operation. Changes to the effluent loadings, in the form of either a significant increase or decrease, may affect system performance. This would not be anticipated to be an issue with this development due to its continual nature of its processes. It is suggested that an AWTS must be operated continuously and the power must not be turned off, as intermittent use may require servicing of the system at each start up.

Note that with the lack of cooked meals in the mushroom farm and minimal laundering and showering, there will also be considerably lower overall pollutant levels in the influent derived relative to a domestic dwelling. Therefore, it is likely that better treatment will be achieved compared with that detailed in Table 2.

TABLE 2: EXPECTED QUALITY OF WASTEWATER AFTER TREATMENT IN AN AERATED SYSTEM

PARAMETER	CONCENTRATION	FAILURE INDICATOR
BIOCHEMICAL OXYGEN DEMAND	<20mg/L	>50mg/L
SUSPENDED SOLIDS	<30mg/L	>50mg/L
TOTAL NITROGEN	25 - 50mg/L	not applicable
TOTAL PHOSPHORUS	10 - 15mg/L	not applicable
FAECAL COLIFORMS NON-DISINFECTED EFFLUENT	up to 10^4 cfu/100mL	not applicable
FAECAL COLIFORMS DISINFECTED EFFLUENT	<30cfu/100mL	>100cfu/100mL
DISSOLVED OXYGEN	>2mg/L	<2mg/L

3. LAND APPLICATION OF SECONDARY TREATED EFFLUENT

The nature of the site and development proposal, soil profile encountered and lack of significant physical constraints are conducive for the land application of treated effluent, whereby ample land is available for this purpose to cater for the maximum design effluent volume from the features of development at the subject site. This is a positive scenario that allows for consideration of a range of land application options for secondary treated wastewater such as absorption trenching, surface spray or drip irrigation, subsurface dispersal and the Wisconsin mound.

In any circumstance, treated effluent should be viewed and preferably utilised as a resource for water supply to vegetation rather that just being ‘disposed of’ in an absorption trench for example which covers a much smaller area than that required for surface irrigation or subsurface dispersal.

As shown in Figure 2, landscaped soil mounds with a total length of approximately 900m are proposed in associated with establishment of the mushroom farm and associated features along sections of the northern and eastern boundaries. As conveyed by Mr. Neil Groat of Compaction & Soil Testing Services, the mounds will be constructed with sand-based topsoil stripped from the area containing the mushroom farm building and associated structures at a minimum height of 2.5m and width of 17m that is positioned at a minimum distance of 3m from property boundaries and any paved areas/driveways (i.e. 3m natural margin from the base at each side). The mounds will be laid with a liberal layer of mulch and landscaped with a variety of native plants that will need a regular water supply. The landscaped mounds are considered to be conducive to the land application of treated effluent due to the ample additional soil volume and enhanced levels of evapotranspiration afforded, in conjunction with the need to provide a consistent water supply.

Further to the details above, absorption trenching and surface/subsurface irrigation in a conventional sense have been discounted and a somewhat novel approach will be applied to the land application of treated effluent. This involves placing a subsurface dispersal line or lines along the substantial length of the landscaped soil mounds to be established in conjunction with the development as a whole. This is a positive scenario when viewed against the volumes of clean water that would be required to sustain the vegetation on such large landscaped mounds.

The proposed landscaped mounds maintain appropriate clearance from the existing and proposed features of development and have a total available length of approximately 900m for the application of treated effluent.

Not only will the landscaped soil mounds disperse the wastewater and enhance the levels of evapotranspiration, but they will have the added benefit of providing further treatment beyond the secondary level applied to it (i.e. ‘sand filtration’). Whilst the soil to be used in the mounds is not exactly the same as that imported for soil mounds, it will be a similar sand-based material that has an ability to treat and filter the effluent. As detailed in AS/NZS 1547 (2000), the sand filters the effluent and provides the within-mound treatment, whilst the basal area of the mound covers the natural soil which then absorbs the filtered effluent. When the secondary treated effluent infiltrates into and percolates through the soil mound and underlying natural soils the

pathogens are removed, organic matter (i.e. BOD) and suspended solids are assimilated, and nitrogen and phosphorus concentrations are reduced to minimal levels that are not considered to pose environmental risk. In addition, it is considered that the levels of evapotranspiration and additional treatment will be greater for the large landscaped soil mounds proposed compared the conventional sizing of Wisconsin mounds that have a relatively lesser overall volume of soil.

Whilst not being designed and constructed in exactly the same manner, the landscaped mounds are akin to Wisconsin mounds whereby distribution of treated effluent can be achieved with use of a subsurface dispersal line or lines placed in the mound created by a commercially supplied sand-based soil above the ground surface (that is normally imported). It is understood that soil mounds have an evapotranspiration rate that is about two-thirds greater than that from in-situ soils at the natural ground surface. Furthermore, the mounds will also settle slowly over time, resulting in a decrease in their height and grade of batters.

A subsurface dispersal line or lines can be used to disperse treated effluent instead of a distribution lateral placed in a bed of coarse aggregate within Wisconsin mounds (even though subsurface dispersal lines should also be placed in gravel bed). As previously detailed, topsoil derived from the site will be utilised for the creation of mounds which is fortunately a sand-based material similar to that used in formalised Wisconsin mounds. The basal area of the mound will cover the natural soil which then absorbs the filtered effluent.

Pending final confirmation by a system installer experienced with subsurface dispersal (and particularly placement within soil mounds), it is suggested to apply treated wastewater with use of a subsurface dispersal line or lines laid along the length of the mound at a minimum depth of 300mm below the highest part. This will allow the treated effluent to filter into the body of the mound to become available for uptake by the plants (i.e. transpiration) and sun/wind (i.e. evaporation).

Whilst various options are available, it is suggested that the subsurface dispersal system to be utilised have lines that are wrapped in a geotextile fabric which promotes capillary attraction and the spread of treated wastewater evenly and efficiently into the surrounding soils and root zones of vegetation – known to be patented as ‘KISS’ (i.e. kapillary irrigation subsoil system)

which is understood to be supplied by Irrigation and Water Technologies Pty Ltd at Rouse Hill. The subsurface dispersal line or lines should also have a root inhibitor to ensure they do not become blocked. Whilst the kisss system is suggested, it does not preclude the use of a different type of subsurface dispersal line, and the final choice can be made at the detailed design stage with the installer in conjunction with Mr. Tolson.

The type of subsurface dispersal line or lines to be used should be confirmed by an irrigation specialist, who should ensure that even coverage of wastewater is applied to the full volume of the mound.

To provide a significant factor of safety, the landscaped mounds will be viewed as subsurface dispersal areas and not Wisconsin mounds proper – i.e. based on the basal width of the mound. If designed as a Wisconsin mound proper, much higher wastewater loading rates could be applied when viewed in comparison to a square meter subsurface dispersal area as proposed. Nevertheless, whilst viewed as a square metre irrigation area for subsurface dispersal, it is obvious that the majority of treated effluent will be taken-up by evapotranspiration from the soil mounds proper with only minimal absorption to the existing soils at and below the base. This provides an important factor of safety in that the wastewater application rates to the landscaped mounds will be far less than their ultimate 'design capacity' and there will be considerable surplus capacity in the mounds.

The subsurface dispersal area will be based on the length of the mounds to be irrigated with treated effluent x the nominated basal mound width of 17m. With a total length of approximately 900m available in the landscaped mounds, there is a total basal area of approximately 15,000m^2 available for the land application of treated effluent. Below the mound base, the natural soils also accept and absorb the filtered effluent.

Further to the details above in relation to wastewater application rates, the intention is to provide a water source along the full length of the mound at approximately 900m. It is this intention that will effectively set the wastewater application rate to the landscaped mounds when viewed on the maximum design effluent volume from the features of development – i.e. on a basal square metre area basis that can be converted to a litreage/lineal metre along the mounds. This will

provide a further factor of safety in that there will be a lower wastewater application rate when viewed on a square meter area basis compared with even the 'most-limiting' soil type encountered in the natural soil profile underlying the mounds.

4. SOURCES OF EFFLUENT AND ESTIMATION OF DESIGN WASTEWATER VOLUME

Effluent will be generated from the following sources:

1. Proposed Mushroom Farm – toilet and hand-basin usage will be the predominant source of effluent. Lesser effluent will be generated from two kitchenette sinks in the lunch rooms, as well as from a washing machine and infrequent shower usage (i.e. two male and three female showers). The kitchenette sinks in the lunch rooms will not be utilised for the cooking of meals, but for tea/coffee making and washing up as 'pie warmers' are to be provided for the heating of any pre-prepared lunches.
2. Dwelling to be Retained – standard features in dwellings including dual-flush toilet (x1), shower (x1), hand-basin (x1), aerator taps and a water-conserving top-loading washing machine. This equates with a 'standard set' of water-reduction fixtures as detailed in Note 2, Appendix 4.2D of AS/NZS 1547 (2000).
3. Proposed Staff Childcare Facility – toilet and hand-basin usage will be the predominant source of effluent. Lesser effluent will be generated from kitchen and possible infrequent use of a washing machine (e.g. for tea-towels or towels). It is understood that cooked meals will also not be prepared in the kitchen.

More than ¾'s of the effluent generated will be derived from the mushroom farm facilities, with considerably less from the staff childcare centre and even less from the existing dwelling to be retained. Based on this break up, the majority of effluent will be water used to flush toilets and for hand-washing, thereby containing a somewhat enhanced nitrogen input level when compared with the range of pollutants derived from domestic dwellings – but expect relatively lower phosphorus, BOD, suspended solids and faecal coliform input levels.

Estimations in relation to the design effluent volume are based on relevant data in Appendix 4.2D of AS/NZS 1547 (2000) for the maximum number of persons associated with the

mushroom farm, dwelling and staff childcare facility. To overcome design estimations and monitor the volumes of effluent actually generated, it is suggested to install a 'flow meter'. Such a device would display the volumes of treated wastewater discharged on a daily basis from the STS before application to the landscaped soil mounds.

A flow meter reads the volume of treated effluent discharged, which equates with the volume of influent entering a treatment device. A flow meter normally provides a cumulative total of daily wastewater loadings and should be read on a daily basis at the same time each day, for example at the end of business operation. Volumes should be recorded and maintained for future reference and to facilitate data as to the actual volumes of effluent generated from the features of development. A daily log should also be kept as to the number of staff at the mushroom farm, staff and children in the childcare centre and persons residing in the managers residence in order to obtain an overall record of effluent generation on a litreage/person/day (albeit not specifically for the different features of development).

Further to discussions with Mr. Tolson, the following details are provided in relation to effluent generation:

- The property is serviced with a reticulated town water supply.
- The mushroom farm will operate seven days/week with staff present predominantly between the hours of 7am - 3pm. Furthermore, it is presumed that the staff childcare facility will operate between just before 7am to just after 3pm.
- The maximum number of staff on site on any day associated with the mushroom farm facility is anticipated to build up to a maximum of 160 persons. Based on experience from existing mushroom farms, the staff showers are used very infrequently and an estimate of 1 person in 40/day is applied for showering. Furthermore, a single load/day is assigned to the washing machine to account for the laundering of up to about six pairs of overalls (for growing staff).
- The existing dwelling comprises three bedrooms that has a maximum population of five persons in accordance with Table 4.3A1 of AS/NZS 1547 (2000). As previously detailed, the dwelling has a standard set of water-reduction fixtures.

- Whilst the number of pre-school age children that will use the staff childcare facility is not accurately known, an estimate of up to 25 children and six staff is made = 31 persons in total (expected to build from a lesser number).
- The mushroom farm and childcare facility will have specific water limiting devices in order to reduce water usage and effluent generation (to be treated and applied). These include low litreage dual-flush toilets, aerator taps with water limiting handle systems, a low litreage male urinal, automatic water conserving top or front loading washing machines and low-flow showerheads.

Details in relation to the design effluent volumes from the features of development are provided below. Design estimates are based on the assumption that all plumbing features will be maintained properly so that there are no leakages or faults that would result in additional wasted water being transferred to the effluent treatment system and landscaped mounds (e.g. leaking toilets, urinal or taps).

Proposed Mushroom Farm

For the staff in the mushroom farm, it is considered that data for 'Rural Factories' in Appendix 4.2D of AS/NZS 1547 (2000) best equates with effluent generation. For a reticulated town water supply, a volume of 50 litres/person/day is applied to rural factories and the proposed mushroom farm. This volume is considered to strictly relate only to toilet, hand-basin and a minimal overall litreage/person for kitchenette sink usage, whilst not making allowance for a reduction based on use of water limiting devices such as those described above (particularly male urinal). Whilst it is possible that the figure of 50 litres/person/day accounts for a limited number of showers, both the minimal shower and washing machine usage will be viewed as additions to this volume. This will provide a factor of safety with regards to effluent volume calculations, particularly when viewed with the use of water limiting devices and possible actual generation of less than 50 litres/person/day for toilet, hand-basin and kitchenette sink usage.

For a maximum of 160 personnel associated with the mushroom farm, the design effluent volume is:

* 160 personnel x 50L/person/day = 8000L/day.

For showers at an estimate of 1 in 40 persons/day, the assumption of four showers/day is made on the basis of 160 personnel. With a low-flow showerhead, an allowance for 30 litres/shower is applied. For four showers/day, this results in a volume of 120 litres/day.

For laundering, an estimate of 100 litres of water/day is assigned to the washing machine for a single load/day.

In conclusion, the estimate of the total maximum design effluent volume from the mushroom farm is 8000L/day + 120L/day + 100L/day = **8220L/day**.

Existing Dwelling to be Retained

For the dwelling with a reticulated water supply and standard set of water-reduction fixtures, reference to Appendix 4.2D of AS/NZS 1547 (2000) shows that the corresponding design effluent volume is 145 litres/person/day. As previously detailed, the maximum potential occupancy level of the dwelling is five persons. Therefore, the maximum design effluent volume from the dwelling to be retained is:

* 5 persons x 145L/person/day = **725L/day**.

Proposed Staff Childcare Facility

For the children and staff in the childcare centre, it is considered that data for 'Schools' in Appendix 4.2D of AS/NZS 1547 (2000) best equates with effluent generation. For a reticulated water supply, a volume of 40 litres/person/day is applied to pupils and staff at schools and the proposed childcare facility. As previously detailed, an estimate of an anticipated maximum of 25 children and six staff is made. This equates with a design effluent volume of:

* 31 persons x 40L/person/day = 1240L/day.

The volume of 1240 litres/day above will be rounded-up to **2000L/day** in order to provide a factor of safety and effectively cater for a greater number of children and staff – i.e. +760 litres/day, or an extra 19 persons/day based on design volume of 40 litres/person/day.

In summary, the maximum design effluent volume from the features of development are:

1. Proposed Mushroom Farm = 8220 litres/day
2. Existing Dwelling = 725 litres/day
3. Proposed Staff Childcare Facility = 2000 litres/day

The sum of points 1- 3 above is 10,945 litres/day. To provide a final factor of safety, this volume is rounded-up to 12,000 litres/day. This would account for about 26 extra persons in the childcare facility and/or some additional showering for example. Therefore,

* **MAXIMUM DESIGN EFFLUENT VOLUME FROM ALL FEATURES OF DEVELOPMENT = 12,000 LITRES/DAY**

As previously detailed, the volume of 12,000 litres/day above should be confirmed with use of a flow meter when the site is in operation.

5. SITE DESCRIPTION

The property comprises an approximately rectangular-shaped parcel of land that has a frontage of about 350m onto The Northern Road and extends downslope in a westerly direction for distances ranging from about 630 - 820m. The site is occupied by an existing dwelling to be retained as a managers residence in the eastern part of the property adjacent to the frontage with The Northern Road. The relative location of the existing dwelling and proposed features of development are shown in Figure 2. It is seen that the main mushroom farm building (or 'main building footprint' in Figure 1) is situated to the northwest of the dwelling, whilst the proposed car park and staff childcare facility are positioned off the eastern side of the main building.

The proposed landscaped soil mounds at 17m in width to be utilised for the land application of treated effluent have a total length of 900m. Reference to Figure 2 shows that the landscaped moundings as a whole have the following components:

1. The longest east-west trending section along the northern boundary positioned to the north of the main mushroom farm building, car park, staff childcare facility and spent compost store – whole length to be irrigated with treated effluent.

2. The northeast-southwest trending section adjacent to the eastern boundary fronting The Northern Road that is north of the driveway at the property entry point – 6m length at southern end of this mound adjacent to the northern side of the driveway will not be irrigated with treated effluent.
3. The northeast-southwest trending section adjacent to the eastern boundary that is south of the driveway at the property entry point – 6m length at northern end of this mound adjacent to the southern side of the driveway will note be irrigated with treated effluent.

As shown in Figure 2, the landscaped mounds to be utilised for the application of treated effluent maintain appropriate buffer distances from property boundaries and the existing and proposed features of development (including paved areas and driveways).

The majority of the vegetation on the property has previously been cleared to facilitate past rural activities and mainly comprises a pasture grass cover. Reference to Figure 1 shows that the area containing the proposed soil mound and main building footprint (and other features) predominantly comprise a pasture grass cover with the occurrence of some scattered eucalypt trees. In the western part of the property, there is a greater occurrence of eucalypts and other trees in the land away from the proposed features of development.

There are small farm dams to be infilled near the central part of the main building footprint, adjacent to the northwestern corner of the main building footprint and in the northeastern corner of the property. Part of dam 6 in the northeastern corner of the property covers the area containing the landscaped soil mound. Furthermore, dam 2 adjacent to the northwestern corner of the main mushroom farm building is almost wholly sited in the area containing the mound (i.e. at western end of northern mound).

Whilst in close proximity, the latter two dams are just clear of the mounds. The largest dam to the south of the main building footprint will be retained and incorporated with the operation of the mushroom farm, whilst the small dam (No. 3) to the southeast of this dam will also be retained (Figures 1 and 2).

The property as a whole has a gentle grade typically in a westerly direction. The typical grade in the area containing the proposed landscaped mounds is about 1 in 80 - 300, with some more sloping land at the southern end of the mound to the south of the entry driveway. The proposed landscape mounds along the northern and eastern boundaries provide appropriate clearance from the main mushroom farm building, dwelling, childcare centre, paved areas and driveways (Figure 2). With the relative positioning of features, the landscaped mounds will afford exposure to the open northerly aspect and prevailing winds.

It is understood that the property is not affected by any prescribed flood levels, with the most elevated eastern part of the site having a maximum elevation of about 38.5m. As shown in Figure 2, the nearest 'water features' within the drainage path of the land containing the soil mounds is the dam and associated poorly-defined drainage depression to the south of the main mushroom farm building. As shown in Figure 2, these features maintain the following approximate minimum set-back distances from what is the southern mound to the south of the entry driveway:

- 230m in the land fall direction from the dam.
- 230m in the land fall direction from the drainage depression leading to the dam from its northeastern side.
- 190m in a direct line from the dam.

The dam to the south of the main mushroom farm building is represented on the Springwood 1:25,000 scale topographic map, but the associated drainage depression is not. Beyond the western side of the dam, the drainage depression trends in a southwest to westerly direction for about 450m before reaching a defined intermittent watercourse represented on the Springwood topographic map. From this point, the intermittent watercourse trends in a northerly to northeasterly direction for a distance for approximately 9km before attaining a perennial flow in Rickabys Creek.

Climatic conditions at the site are generally temperate throughout the year, however hot to very hot summer weather and cold winter conditions are sometimes experienced. Reference to the Penrith topographic map shows that the average annual rainfall in the area is in the order of

850mm and the average daily maximum temperature ranges from 17 - 18^{0}C in winter to 26 - 27^{0}C in summer. Rainfall and evaporation data is provided in Table 5, Section 9.

6. FIELDWORK METHODS

The initial phase of the fieldwork comprised a site inspection and ground survey aimed at assessing the general nature of the land and delineating the physical constraints to the land application of treated effluent. Particular consideration is given to the proposed use of the landscaped soil mounds to be prepared that will be utilised for the application of secondary treated wastewater.

Further to the ground survey, seven 200mm diameter auger holes were bored to a depth of 1.5m at spacings of about 100 - 150m along the length of the area containing the proposed landscaped soil mounds (Figure 2). The auger holes were used to determine the physical characteristics of the subsurface strata and were bored with a vehicle mounted rig. Furthermore, two additional augers were bored to depths of 0.7m and 1.0m across the site of the main east-west trending mushroom farm building to assess the typical nature of the topsoil material that will be stripped and utilised in the landscaped soil mound. It is understood that a geotechnical report has been prepared for the mushroom farm by Compaction & Soil Testing Services which has investigated the building site area and chosen the sand-based topsoil material to be stripped and then utilised on the landscaped mounds.

To assess soil permeability, results from the auger holes are related to the textural/structural classification in Table 4.1.1 of AS/NZS 1547 (2000) which enables determination of the soil category and corresponding indicative permeability value. An indicative permeability value can be converted to a design irrigation rate **(DIR)** from Table 4.2A4 of AS/NZS 1547 (2000).

7. GROUND SURVEY

The area containing the landscaped soil mounds to be utilised for the application of secondary treated wastewater, as well as the extent of the additional usable land available for the application of secondary treated wastewater beyond this, has been has been carefully delineated

on the site with Mr. Tolson. Results from the ground survey indicate that the main physical constraints to on-site effluent management comprise the following:

- The largest dam to be retained and associated poorly-defined drainage depression to the south of the main mushroom farm building (note, other dams to be infilled at and near features of development).
- The tree-line (or 'edge of trees' in Figure 2) comprising more dense native vegetation in the western part of the property.

In light of the constraints above, the vegetated area in the western part of the property is deemed as unsuitable for the land application of treated wastewater, whilst a 40m buffer distance is required for effluent management from the dam and drainage depression. The buffers shown in Figure 2 and detailed in Section 5 for the soil mound are well in excess of the minimum recommendation of 40m for the land application of treated effluent from the dam and drainage depression. Whilst the drainage depression is more poorly-defined, a 40m buffer strictly relates to more well-defined intermittent watercourses that are typically represented as such on topographic maps. Furthermore, buffers from defined intermittent watercourses (40m) and perennial watercourses (100m) are also more than satisfied.

Beyond the land utilised for the siting of the landscaped mounds, there is additional usable land available for the application of treated wastewater in the southeastern corner of the property at a distance of greater than 40m from the dam and drainage depression to the south of the main mushroom farm building. With clearance from the southern soil mound, there is a usable area of about 1.9 hectares available in the southeastern corner for the land application of treated effluent beyond that afforded in the proposed soil mounds as a whole. Whilst this land in the southeastern corner of the property is properly located, it is not proposed to utilise it for the application of treated effluent, unless ever required in the future – i.e. more than constitutes the requirements for a 'reserve' land application area.

The soil mounds afford exposure to the open northerly aspect and prevailing winds, which in conjunction with the vegetation coverage to be established, will enhance the benefits of evapotranspiration and concurrently reduce the absorption loads of secondary treated wastewater on the underlying natural soil.

8. AUGER HOLES AND SUBSURFACE PROFILE

The location of auger holes in the natural soil 1 - 7 along the length of the area to be utilised for the siting of the landscaped mounds proposed for the land application of secondary treated wastewater by subsurface dispersal are shown in Figure 2. Detailed engineering geological logs for the auger holes are provided in Appendix 1, together with notes defining classification methods and descriptive terms.

Reference to the Penrith 100,000 scale Soil Landscape map indicates that the property as a whole is underlain by the fluvial 'Berkshire Park' group which occurs on dissected, gently undulating low rises on the Tertiary terraces of the Hawkesbury/Nepean River system.

The Berkshire Park group comprises weakly pedal orange clays and clayey sands, often mottled; common ironstone nodules; large (up to 20cm) silcrete boulders in sand/clay matrix; and Solods, Yellow Podzolic Soils, Red Podzolic Soils, Chocolate Soils, Structured Plastic Clays and Structured Clays (Bannerman and Hazelton, 1990). Findings from the auger holes are considered to best equate with Yellow Podzolic soils.

General limitations of the Berkshire Park group include very high wind erosion hazard if cleared, gully, sheet and rill erosion on dissected areas, waterlogging, impermeable soils, low fertility, stoniness, strong to very strong acidity and very high potential aluminium toxicity (Bannerman and Hazelton, 1990).

The subsurface profile observed in the auger holes has a 'duplex structure' structure, as there is a well-defined textural and permeability contrast between the overlying sand-based soils and underlying clay-based subsoil. With reference to Table 4.1D4 of AS/NZS 1547 (2000), it is considered that the A1 and A2 soil horizons have a single grained structure whilst the B horizon soils have a weak structure.

In general, a somewhat consistent subsurface profile was observed in the auger holes. The soils lacked any signs of anomalous moisture and were typically in a dry to slightly moist condition (even in light of prior heavy rains).

Further to the individual logs in Appendix 1, the findings from auger holes 1 - 7 are summarised below in Table 3. In Appendix 1, the soils are described in accordance with the classification schemes in Australian Soil and Land Survey: Field Handbook (1990) and AS/NZS 1547, 2000 (Appendix 1). Structure and coarse fragments are defined from AS/NZS 1547 (2000) and a list of abbreviations are provided below Table 3.

TABLE 3: SUMMARY OF RESULTS FROM AUGER HOLES 1 - 7

Auger Hole No.	Bedrock Type	Layer Top (m)	Layer Base (m)	Horizon	Texture	Structure	Overall Structure & Type	Coarse Fragments %
1	Shale (not inter-sected)	0 0.1 0.4 1.0	0.1 0.4 1.0 1.5	A1 A2 B B	CS LS SCL MC	SG SG Weak Weak	Duplex & Podzolic	2 - 10 10 - 20 2 - 10 2 - 10
2	Shale (not inter-sected)	0 0.1 0.3 0.6	0.1 0.3 0.6 1.5	A1 A2 B B	CS LS SCL MC	SG SG Weak Weak	Duplex & Podzolic	2 - 10 10 - 20 2 - 10 2 - 10
3	Shale (not inter-sected)	0 0.1 0.4 0.9	0.1 0.4 0.9 1.5	A1 A2 B B	CS LS SCL MC	SG SG Weak Weak	Duplex & Podzolic	2 - 10 10 - 20 2 - 10 2 - 10
4	Shale (not inter-sected)	0 0.1 0.4 0.6	0.1 0.4 0.6 1.5	A1 A2 B B	CS LS SCL MC	SG SG Weak Weak	Duplex & Podzolic	2 - 10 10 - 20 2 - 10 2 - 10
5	Shale (not inter-sected)	0 0.1 0.5 1.2	0.1 0.5 1.2 1.5	A1 A2 B B	CS LS SCL MC	SG SG Weak Weak	Duplex & Podzolic	2 - 10 10 - 20 20 - 50 2 - 10
6	Shale (not inter-sected)	0 0.15 0.4 0.6	0.15 0.4 0.6 1.5	A1 A2 B B	CS LS SCL MC	SG SG Weak Weak	Duplex & Podzolic	2 - 10 10 - 20 2 - 10 2 - 10

TABLE 3 CONTINUED:

7	Shale	0	0.15	A1	CS	SG	Duplex &	2 - 10
	(not inter-	0.15	0.3	A2	SL	SG	Podzolic	2 - 10
	sected)	0.3	0.75	B	SCL	Weak		2 - 10
		0.75	1.5	B	MC	Weak		2 - 10

List of Abbreviations to Accompany Table 3:

CS = clayey sand

LS = loamy sand

SL = sandy loam

SCL = sandy clay loam.

MC = medium clay.

SG = single grained structure.

The findings from the auger holes in Appendix 1 and summarised in Table 3 are considered to be conducive for the land application of treated effluent. Sandy to loamy soils occur to depth ranging from 0.6 - 1.2m and have favourable permeability characteristics to accept treated effluent. Whilst the underlying medium clay at a somewhat considerable depth has a lower permeability, it will have a relatively high phosphorus capacity and ability to cater for nutrients.

Results from the auger holes in Appendix 1 and Table 3 can be related to the corresponding soil category, indicative permeability, indicative drainage class and design irrigation rate **(DIR)** for each soil horizon from Tables 4.1.1 and 4.2A4 of AS/NZS 1547 (2000). These results are provided in Table 4. A list of abbreviations are also provided below Table 4.

TABLE 4: RELATIONSHIP OF FINDINGS FROM AUGER HOLES 1 - 7 TO THE SOIL CATEGORY, INDICATIVE PERMEABILITY, INDICATIVE DRAINAGE CLASS AND DESIGN IRRIGATION RATE

Auger Hole No.	Bedrock Type	Layer Top (m)	Layer Base (m)	Texture	Soil Category	Indicative Permeab-ility (m/day)	Indicative Drainage Class	Design Irrigation Rate (mm/week)
1	Shale	0	0.1	CS	1	>3.0	RD	35
	(not inter-	0.1	0.4	LS	1	>3.0	RD	35
	sected)	0.4	1.0	SCL	3	0.5 - 1.5	MWD	28
		1.0	1.5	MC	6	<0.06	VPD	15
2	Shale	0	0.1	CS	1	>3.0	RD	35
	(not inter-	0.1	0.3	LS	1	>3.0	RD	35
	sected)	0.3	0.6	SCL	3	0.5 - 1.5	MWD	28
		0.6	1.5	MC	6	<0.06	VPD	15
3	Shale	0	0.1	CS	1	>3.0	RD	35
	(not inter-	0.1	0.4	LS	1	>3.0	RD	35
	sected)	0.4	0.9	SCL	3	0.5 - 1.5	MWD	28
		0.9	1.5	MC	6	<0.06	VPD	15
4	Shale	0	0.1	CS	1	>3.0	RD	35
	(not inter-	0.1	0.4	LS	1	>3.0	RD	35
	sected)	0.4	0.6	SCL	3	0.5 - 1.5	MWD	28
		0.6	1.5	MC	6	<0.06	VPD	15
5	Shale	0	0.1	CS	1	>3.0	RD	35
	(not inter-	0.1	0.5	LS	1	>3.0	RD	35
	sected)	0.5	1.2	SCL	3	0.5 - 1.5	MWD	28
		1.2	1.5	MC	6	<0.06	VPD	15
6	Shale	0	0.15	CS	1	>3.0	RD	35
	(not inter-	0.15	0.4	LS	1	>3.0	RD	35
	sected)	0.4	0.6	SCL	3	0.5 - 1.5	MWD	28
		0.6	1.5	MC	6	<0.06	VPD	15
7	Shale	0	0.15	CS	1	>3.0	RD	35
	(not inter-	0.15	0.3	SL	2	>3.0	RD	35
	sected)	0.3	0.75	SCL	3	0.5 - 1.5	MWD	28
		0.75	1.5	MC	6	<0.06	VPD	15

List of Abbreviations to Accompany Table 4:

CS = clayey sand

LS = loamy sand

SL = sandy loam

SCL = sandy clay loam

MC = medium clay

RD = rapidly drained

MWD = moderately well drained.

VPD = very poorly drained

No free groundwater was observed in any of the auger holes to a maximum depth of 1.5m. Whilst the exact depth to groundwater below the site is not known, it is estimated that the expected depth to a consistent groundwater table would be in the vicinity of at least about 10 - 20m or greater.

9. DESIGN APPLICATION RATE OF TREATED WASTEWATER TO THE SOIL MOUNDS

As detailed in Section 3, it is proposed to apply secondary treated effluent to the landscaped soil mounds that have been designed in conjunction with the proposed development. Design details regarding the nature of the landscaped mounds and identification of the soil to be used have been conveyed by Mr. Groat of Compaction & Soil Testing Services.

Whilst akin to a Wisconsin mound that can accept relatively high wastewater loadings, land application to the mounds is viewed as a subsurface dispersal area based on the basal mound width at 17m x its length. This approach will provide a considerable factor of safety with respect to wastewater application rates, which with Wisconsin mounds are based on the soil properties at the toe of mounds and are much greater than that based on a square meter subsurface dispersal area only. With a total length of approximately 900m available in the landscaped mounds, there is a total basal area of approximately 15,000m^2 available for the land application of treated effluent.

A conservative and uncomplicated approach is assigned to the assessment of wastewater application rates. This approach is based on the need to supply a consistent water source to the landscaped mounds and will be achieved by applying the treated effluent from the features of development along the length of them. Therefore, application rates will be based on the volumes of treated effluent applied over the length and basal surface area of the mound. For use in this assessment, the estimated maximum design effluent volume of 12,000 litres/day detailed in Section 4 will be applied. This volume has been rounded-up from a lesser number to provide a factor of safety and cater for additional children and staff that may utilise the childcare facility.

Based on the maximum design effluent volume of 12,000 litres/day, the resultant application rates to the landscaped soil mounds based on a square metre basal area and lineal metreage are:

1. 12,000L/day over approximately 15,000m^2 basal mound area = 0.801L/m^2/day.
2. 12,000L/day over approx. 900m mound length = approx. 13.3L/lineal metre/day.

It is seen that the maximum wastewater application rate to the mound will be approximately 13.3 litres/lineal metre/day at the point of discharge near the top of the mound at its centre – i.e. 1 lineal metre along mound = 17m^2 basal area. This is based on an application rate of 0.801 litres/m^2/day at the base of the mound and allowance for what would be nil uptake by evapotranspiration as the effluent filters through the mound. However, with what will be the considerable levels of evapotranspiration from the mound, the actual wastewater loadings rates reaching the base and underlying soils will be considerably less than a maximum of 0.801 litres/m^2/day.

With Wisconsin mounds, it is understood that wastewater application rates range from a minimum of 50 litres/lineal metre/day based on a limiting medium to heavy clay soil in category 6 at the toe to a maximum of 125 litres/lineal metre/day based on well-drained sand-based soils in category 1 at the toe. Therefore, the proposed maximum wastewater application rate to the large landscaped soil mounds of approximately 13.3 litres/lineal metre/day is considered to be a minimal rate when viewed with the sand-based soils at the toe as well as the underlying medium clay at a depth ranging from 0.6 - 1.2m below the natural ground surface. This rate is also considered to be suitable when viewed with the much larger size of the landscaped mounds

compared with Wisconsin mounds proper – i.e. landscaped mounds have considerable estimated soil volume of about 20,000m^3.

It is seen that the landscaped mound and natural soils underlying it will more than adequately cater for the maximum design effluent volume of 12,000 litres/day. Furthermore, based on a maximum nominated application rate of approximately 13.3 litres/lineal metre/day, it is considered that the mounds and surrounding soils can cater for what would be a volume of up to just over nine times greater than that based on an application rate of 125 litres/lineal metre/day for Wisconsin mounds for the sandy soils encountered at the mound toe – i.e. 9 x 12,000 litres/day = 108,000 litres/day. Even based on the most-limiting medium clay within the natural soil profile below the base of the mound, it is considered that the landscaped mound could cater for an application rate of 50 litres/lineal metre/day for Wisconsin mounds – i.e. about 3.6 times greater than that based on approximately 13.3 litres/m^2/day, which equates with a volume of 3.6 x 12,000 = 43,200 litres/day. The enhanced uptake by evapotranspiration will effectively further increase the volumes of treated wastewater that could be applied to the mound as the design calculations based on a conservative assumption of nil evapotranspiration and all effluent applied at the top of mounds will infiltrate to base over the surface area. Nevertheless, geotechnical and stability issues would need to be considered if the mound was ever subjected to high wastewater application rates (not expected for any reason).

Further to the details above, a conservative application rate of wastewater at approximately 13.3 litres/lineal metre/day will be applied to the mounds over their usable length of approximately 900m (based on 17m^2 basal area/lineal metre). As a function of the considerable soil volume in the landscaped mounds and enhanced uptake by evapotranspiration, it is considered that the mounds and underlying natural soils can actually cater for a much greater volume of secondary treated effluent that would far exceed any contingency for increased numbers in the staff childcare centre or mushroom farm proper – note maximum personnel number of 160 associated with mushroom farm on site on any day is set, whilst the maximum estimation of 25 children and six staff in the childcare facility may be exceeded.

As previously detailed, the assumption that all the effluent applied to the top of the mound will actually infiltrate to its basal area without evapotranspiration is not what will actually occur and

therefore incorporates a considerable factor of safety with respect to wastewater application rates – i.e. wastewater application rate to the basal mound area will be less than the estimated 0.801 litres/m^2/day based on approximately 13.3 litres/lineal metre/day application rate at the top.

Whilst the suitability of the landscaped mound for wastewater application is confirmed, the suitability of the basal area of approximately 15,000m^2 for the application of secondary treated effluent at 12,000 litres/day, albeit conservatively estimated, will be checked by application of the water balance methodology which incorporates the influence of climatic conditions.

Table 5 is the water balance for the site at Londonderry based on nil runoff and a minimal 20mm/month percolation allowance. Rainfall and pan evaporation data is derived from the University of Western Sydney, Richmond Campus that is located only approximately 5km north of the subject site. Furthermore, crop factors are variable and based on seasonal differences.

The lack of negative values in the final effluent applied column in Table 5 indicates that treated effluent can be applied in all months of the year without the need for prescribed wet-weather storage. Furthermore, wet-weather storage is strictly not required for 'below-ground' land application such as that from absorption trenches, subsurface dispersal or soil mounds.

In Section 6.6.1 of the EPA (1995) document there is an equation that is used to determine the 'field area' required for irrigation systems based on the liquid loading rate:

$$A = \frac{36.5 \times Q}{H}$$, where

A = field area in hectares.

Q = wastewater flow in kL/day – i.e. maximum of 12kL/day.

H = annual liquid loading in millimetres per year – i.e. 787.9mm from Table 1.

Note that an equivalent equation is also detailed in the guidelines from Department of Local Government et. al. (1998).

TABLE 5: WATER BALANCE TABLE FOR THE SITE AT LONDONDERRY BASED ON NIL RUNOFF AND 20mm PER MONTH PERCOLATION

Month	**Median Rainfall (mm)**	**Average Pan Evaporation (mm)**	**Crop Factor**	**Average Evapotrans-piration (mm)**	**Percolation Allowance (mm)**	**Effluent Applied (mm)**
JAN	72.8	192.2	0.9	172.9	20	120.1
FEB	70.5	145.6	0.9	131.0	20	80.5
MAR	64.6	133.3	0.8	106.6	20	62.0
APR	50.7	102.0	0.75	76.5	20	45.8
MAY	30.0	71.3	0.7	49.9	20	39.9
JUN	36.8	57.0	0.6	34.2	20	17.4
JUL	30.7	68.2	0.6	40.9	20	30.2
AUG	24.4	86.8	0.6	52.0	20	47.6
SEP	35.8	123.0	0.7	86.1	20	70.3
OCT	43.2	150.5	0.75	112.8	20	89.6
NOV	66.2	147.0	0.8	117.6	20	71.4
DEC	54.7	164.3	0.9	147.8	20	113.1
TOTAL	580.4	1441.2		1128.3		H=787.9

The field area equation is applied to the features of development:

$$A = \frac{36.5 \times 12.0\text{kL/day}}{787.9\text{mm}}$$

$$= 0.556 \text{ hectares}$$

$$= 5560\text{m}^2.$$

The equation indicates that a surface area of 5560m^2 is required for the land application of secondary treated wastewater by subsurface dispersal (or surface irrigation) based on the water

balance methodology. The basal area of the mound at approximately 15,000m^2, exceeds this area by 9434m^2. This indicates that the area of approximately 15,000m^2, which is about 2.6 times greater than 5560m^2 from the water balance, is more than appropriate for the land application of secondary treated wastewater and also incorporates a considerable factor of safety with regards to effluent generation.

To provide another comparison to confirm suitability of the land application proposal, the area required for land application based on the hydraulic properties of the most-limiting underlying medium clay in the B horizon below the mound will be applied to the design effluent volume of 12,000 litres/day. A medium clay corresponds with medium to heavy clays in soil category 6 of AS/NZS 1547, 2000. Reference to Table 4.2A4 in AS/NZS 1547 (2000) shows that for soil category 6, the corresponding design irrigation rate **(DIR)** value is 15mm/week. This represents a DIR value of 2.14m/day, or an equivalent effluent application rate of 2.14 litres/m^2/day. Based on the maximum design effluent volume of 12,000 litres/day, the corresponding land application area requirement would be:

- 12,000 litres/day divided by 2.14 litres/m^2/day = 5608m^2.

The basal area of the mound at approximately 15,000m^2, exceeds the area above by 9386m^2. This indicates that the area of approximately 15,000m^2, which is also about 2.6 times greater than 5608m^2 on the basis of the hydraulic properties of the most-limiting medium clay subsoil, is more than appropriate for the land application of secondary treated effluent and also incorporates a considerable factor of safety.

Results in this Section have indicated that, even with allowance for nil evapotranspiration from the mound, the proposal for land application more than caters for the water balance methodology and hydraulic properties of the most-limiting medium clay subsoil. This provides a considerable factor of safety with respect to hydraulic and nutrient loading rates.

In addition to the details in this Section, it is considered that the landscaped mound will adequately cater for the nutrient loadings (i.e. nitrogen and phosphorus compounds) in the treated effluent, whose concentration will be significantly reduced due to additional treatment in the mound and uptake by the vegetation before reaching the basal area and underlying natural

soils. The mound will have a high transpiration effect which will reduce nutrient concentrations, whilst both the mound soil and underlying natural soils (particularly the medium clay subsoil) will reduce nitrogen and phosphorus concentrations – i.e. high critical loading rate for nitrogen based on vegetation and high phosphorus retention index expected for the medium clay. Such a low design basal area application rate of 0.801 litres/m^2/day applied to the assessment, which will be considerably less in reality due to uptake from the mound, is well below that required and deemed appropriate for nutrient uptake from sand-based and clay-based soils in Penrith City Council (2007) – i.e. 1.72 litres/m^2/day and 2.14 litres/m^2/day respectively. Furthermore, formalised nutrient balance calculations are not applied to land application systems such as mounds and absorption trenches – i.e. land application arrangement designed on basis of a subsurface dispersal area for factor of safety, but strictly land application arrangement is a soil mound.

10. MONITORING AND MAINTENANCE OF THE SECONDARY TREATMENT SYSTEM

All commercial effluent treatment systems require both installation and operational approvals from Council (Penrith City Council, 2007). It is understood that the conditions of approval will detail the requirements for monitoring of the STS once it is operational.

Part of the management and monitoring regime includes installation of a flow meter to monitor the actual volume of treated effluent applied to the land, which can be compared to the design estimations in Section 4. A flow meter should be read on a daily basis at the same time of day (e.g. end of work day) and will provide valuable information regarding wastewater loadings. Proper records should be kept of daily flow meter readings which can be readily sourced and utilised in the future. Flow meter data should also be recorded in conjunction with a log of the total number of persons associated with the mushroom farm, staff childcare facility and dwelling – i.e. to facilitate an overall estimate of litreage/person/day.

Not only will a STS need to be maintained and serviced on a regular basis, but periodic testing of the treated effluent will be required to ensure it is operating properly and achieving

appropriate levels of treatment. The parameters that should be tested include, but are not limited to, the ones below:

- Total P.
- Total N.
- BOD.
- Suspended solids
- Faecal coliforms.
- pH.

Pending exact final confirmation, it is suggested to carry out testing of the treated effluent approximately three months after commissioning of a STS to give it time to 'bed-in'. The second set of tests could then be carried out approximately three months after the first. If testing shows that secondary (or advanced secondary) treated effluent is not being produced, continued quarterly testing should be carried out with view to determine the nature of any fine-tuning required to improve treatment levels. Once it is established that the STS is treating effluent to an appropriate standard, it is suggested that the frequency of testing could be reduced to once every year or two.

Complete records should be kept of all testing and monitoring of the wastewater treatment system. Such records could be forwarded to Council, if required, and retained for future reference by site management.

11. CONCLUSION

(i) An investigation and assessment has been undertaken for on-site effluent management in relation to the proposed mushroom farm at Lot 138 DP 752037, No. 521 - 555 The Northern Road, Londonderry.

(ii) The proposed development comprises the following components:

1. The main mushroom farm building comprising growing rooms, offices, lunch rooms and amenities, as well the associated spent compost store area, loading dock, peat store,

workshop, driveways and car park. The maximum potential number of personnel associated with the mushroom farm on site on any day will build to 160 persons.

2. The existing three bedroom dwelling to be retained – this will function as a mangers residence once the mushroom farm is in operation and has a maximum potential occupancy level of five persons.
3. The staff childcare facility. Whilst the number of pre-school age children that will use the facility is not accurately known, an estimate of up to 25 children and six staff is made. However, the facility would have scope to cater for a greater number of children and staff, if ever required in the future.

(iii) The two options for effluent treatment considered for the subject site are the AdvanTex Recirculating Textile Filter Wastewater Treatment System providing advanced secondary treatment and the Aerated Wastewater Treatment System (various brands available in the market place). Irrespective of the final choice of system, the requirements and proposal for land application will be the same.

(iv) It is proposed to utilised the landscaped mounds to be established along the northern and eastern boundaries for the land application of treated effluent – i.e. akin to Wisconsin soil mounds. The mounds will be constructed with sand-based topsoil stripped from the area containing the mushroom farm building and associated structures at a minimum height of 2.5m and width of 17m that is positioned at a minimum distance of 3m from property boundaries and any paved areas (i.e. 3m natural margin from the base at each side).

(v) Beyond the land utilised for the siting of the landscaped mounds, there is additional usable land available for the application of treated wastewater in the southeastern corner of the property comprising approximately 1.9 hectares.

(vi) The landscaped mounds will have a total length of approximately 900m. Not only will the landscaped soil mounds disperse the wastewater and enhance the levels of evapotranspiration, but they will have the added benefit of providing further treatment beyond the secondary level applied to it

(vii) Pending final confirmation by an irrigation specialist, it is suggested to apply treated effluent to the mound with use of a subsurface dispersal line or lines placed at a minimum depth of 300mm below the surface of the highest part of the mound. The subsurface dispersal line or lines should be laid in a bed of coarse aggregate that is wrapped in a geotextile fabric.

(viii) To provide a significant factor of safety, the landscaped mounds will be viewed as subsurface dispersal areas and not Wisconsin mounds proper – i.e. based on the basal width of the mound. If designed as a Wisconsin mound proper, much higher wastewater loading rates could be applied when viewed in comparison to a square meter subsurface dispersal area as proposed.

(ix) The subsurface dispersal area will be based on the length of the mounds x the nominated basal mound width of 17m. With a total length of approximately 900m available in the landscaped mounds, there is a total basal area of approximately 15,000m^2 available for the land application of treated effluent. Below the mound base, the natural soils also accept and absorb the filtered effluent.

(x) The intention is to provide a water source along the full length of the mound at approximately 900m. It is this intention that has effectively set the wastewater application rate to the landscaped mounds when viewed on the maximum design effluent volume from the features of development – i.e. on a basal square metre area basis that can be converted to a litreage/lineal metre along the mounds.

(xi) The estimated maximum design effluent volume from the features of development has been rounded-up to 12,000 litres/day. Based on this volume, the resultant application rates to the landscaped soil mounds based on a square metre basal area and lineal metreage are 0.801L/m^2/day and approximately 13.3L/lineal metre/day respectively. Furthermore, it is considered that the mounds and underlying natural soils can actually cater for a much greater volume of secondary treated effluent that would far exceed any contingency for increased numbers in the staff childcare centre or mushroom farm proper

(xii) Details in relation to the preparation, maintenance and monitoring of the STS and land application area comprising the soil mounds should be followed.

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Engineering Geologist
MAIG, Affil. I.E. Aust.

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APPENDIX 1

DETAILED ENGINEERING GEOLOGICAL LOGS FOR AUGER HOLES 1 - 7, TOGETHER WITH NOTES DEFINING CLASSIFICATION METHODS AND DESCRIPTIVE TERMS

GEOLOGICAL PROFILE LOG

CLIENT: ELF MUSHROOMS **DATE**: 8/3/2010

SITE: 521 - 525 THE NORTHERN ROAD, LONDONDERRY **LOG No**: AUGER 1

JOB No: 100305 **SURFACE RL**: -

COMMENTS: ON-SITE EFFLUENT MANAGEMENT.

D = DISTURBED SAMPLE. PROPOSED MUSHROOM FARM AND STAFF CHILDCARE FACILITY, PLUS EXISTING DWELLING TO BE RETAINED.

DEPTH METRES		**AUGER HOLE LOCATION**: SEE FIGURE 2	**SAMPLING DATA**	
FROM	**TO**	**MATERIAL DESCRIPTION**	**DEPTH**	**TYPE**
S.L.	0.1	**CLAYEY SAND** – A1 Horizon: dark-brown to grey-brown, fine grained clayey sand with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments from Table 4.1D2 of AS/NZS 1547, 2000).		
0.1	0.4	**LOAMY SAND** – A2 Horizon: light-brown and light-grey, fine grained loamy sand with common sub-rounded to rounded ironstone and quartz gravels (i.e. 10 - 20% coarse fragments).		
0.4	1.0	**SANDY CLAY LOAM** – B Horizon: light-brown to brown, fine grained sandy clay loam with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).		
1.0	1.5	**MEDIUM CLAY –** B Horizon: stiff to very stiff, brown to orange-brown and light-grey medium clay with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).	1.1m	D
		NO FREE GROUNDWATER OBSERVED		
		AUGER HOLE DISCONTINUED AT 1.5m		

LOGGED BY: G. AUSTIN PAGE: 1 OF

GEOLOGICAL PROFILE LOG

CLIENT: ELF MUSHROOMS **DATE**: 8/3/2010

SITE: 521 - 525 THE NORTHERN ROAD, LONDONDERRY **LOG No**: AUGER 2

JOB No: 100305 **SURFACE RL**: -

COMMENTS: ON-SITE EFFLUENT MANAGEMENT.

D = DISTURBED SAMPLE. PROPOSED MUSHROOM FARM AND STAFF CHILDCARE FACILITY, PLUS EXISTING DWELLING TO BE RETAINED.

DEPTH METRES		**AUGER HOLE LOCATION**: SEE FIGURE 2	**SAMPLING DATA**	
FROM	**TO**	**MATERIAL DESCRIPTION**	**DEPTH**	**TYPE**
S.L.	0.1	**CLAYEY SAND** – A1 Horizon: dark-brown to grey-brown, fine grained clayey sand with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments from Table 4.1D2 of AS/NZS 1547, 2000).		
0.1	0.3	**LOAMY SAND** – A2 Horizon: light-brown, fine grained loamy sand with common sub-rounded to rounded ironstone and quartz gravels (i.e. 10 - 20% coarse fragments).		
0.3	0.6	**SANDY CLAY LOAM** – B Horizon: light-brown to brown, fine grained sandy clay loam with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).		
0.6	1.5	**MEDIUM CLAY –** B Horizon: stiff to very stiff, brown to orange-brown and light-grey medium clay with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).	0.7m	D
		NO FREE GROUNDWATER OBSERVED		
		AUGER HOLE DISCONTINUED AT 1.5m		

LOGGED BY: G. AUSTIN PAGE: 1 OF

GEOLOGICAL PROFILE LOG

CLIENT: ELF MUSHROOMS **DATE**: 8/3/2010

SITE: 521 - 525 THE NORTHERN ROAD, LONDONDERRY **LOG No**: AUGER 3

JOB No: 100305 **SURFACE RL**: -

COMMENTS: ON-SITE EFFLUENT MANAGEMENT.

D = DISTURBED SAMPLE. PROPOSED MUSHROOM FARM AND STAFF CHILDCARE FACILITY, PLUS EXISTING DWELLING TO BE RETAINED.

DEPTH METRES		**AUGER HOLE LOCATION**: SEE FIGURE 2	**SAMPLING DATA**	
FROM	**TO**	**MATERIAL DESCRIPTION**	**DEPTH**	**TYPE**
S.L.	0.1	**CLAYEY SAND** – A1 Horizon: dark-brown to grey-brown, fine grained clayey sand with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments from Table 4.1D2 of AS/NZS 1547, 2000).		
0.1	0.4	**LOAMY SAND** – A2 Horizon: light-brown and light-grey, fine grained loamy sand with common sub-rounded to rounded ironstone and quartz gravels (i.e. 10 - 20% coarse fragments).		
0.4	0.9	**SANDY CLAY LOAM** – B Horizon: light-brown to brown, fine grained sandy clay loam with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).		
0.9	1.5	**MEDIUM CLAY –** B Horizon: stiff to very stiff, brown to orange-brown and light-grey medium clay with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).	1.0m	D
		NO FREE GROUNDWATER OBSERVED		
		AUGER HOLE DISCONTINUED AT 1.5m		

LOGGED BY: G. AUSTIN PAGE: 1 OF

GEOLOGICAL PROFILE LOG

CLIENT: ELF MUSHROOMS **DATE**: 8/3/2010

SITE: 521 - 525 THE NORTHERN ROAD, LONDONDERRY **LOG No**: AUGER 4

JOB No: 100305 **SURFACE RL**: -

COMMENTS: ON-SITE EFFLUENT MANAGEMENT.

D = DISTURBED SAMPLE. PROPOSED MUSHROOM FARM AND STAFF CHILDCARE FACILITY, PLUS EXISTING DWELLING TO BE RETAINED.

DEPTH METRES		**AUGER HOLE LOCATION**: SEE FIGURE 2	**SAMPLING DATA**	
FROM	**TO**	**MATERIAL DESCRIPTION**	**DEPTH**	**TYPE**
S.L.	0.1	**CLAYEY SAND** – A1 Horizon: dark-brown to grey-brown, fine grained clayey sand with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments from Table 4.1D2 of AS/NZS 1547, 2000).		
0.1	0.4	**LOAMY SAND** – A2 Horizon: light-brown and light-grey, fine grained loamy sand with common sub-rounded to rounded ironstone and quartz gravels (i.e. 10 - 20% coarse fragments).		
0.4	0.6	**SANDY CLAY LOAM** – B Horizon: light-brown to brown, fine grained sandy clay loam with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).		
0.6	1.5	**MEDIUM CLAY –** B Horizon: stiff to very stiff, brown to orange-brown and light-grey medium clay with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).	0.7m	D
		NO FREE GROUNDWATER OBSERVED		
		AUGER HOLE DISCONTINUED AT 1.5m		

LOGGED BY: G. AUSTIN PAGE: 1 OF

GEOLOGICAL PROFILE LOG

CLIENT: ELF MUSHROOMS **DATE**: 8/3/2010

SITE: 521 - 525 THE NORTHERN ROAD, LONDONDERRY **LOG No**: AUGER 5

JOB No: 100305 **SURFACE RL**: -

COMMENTS: ON-SITE EFFLUENT MANAGEMENT.

D = DISTURBED SAMPLE. PROPOSED MUSHROOM FARM AND STAFF CHILDCARE FACILITY, PLUS EXISTING DWELLING TO BE RETAINED.

DEPTH METRES		**AUGER HOLE LOCATION**: SEE FIGURE 2	**SAMPLING DATA**	
FROM	**TO**	**MATERIAL DESCRIPTION**	**DEPTH**	**TYPE**
S.L.	0.1	**CLAYEY SAND** – A1 Horizon: dark-brown to grey-brown, fine grained clayey sand with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments from Table 4.1D2 of AS/NZS 1547, 2000).		
0.1	0.5	**LOAMY SAND** – A2 Horizon: light-brown and light-grey, fine grained loamy sand with common sub-rounded to rounded ironstone and quartz gravels (i.e. 10 - 20% coarse fragments).	0.3m	D
0.5	1.2	**SANDY CLAY LOAM** – B Horizon: light-brown to brown, fine grained sandy clay loam with many sub-rounded to rounded ironstone and quartz gravels (i.e. 20 - 50% coarse fragments).		
1.2	1.5	**MEDIUM CLAY –** B Horizon: stiff to very stiff, brown to orange-brown and light-grey medium clay with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).		
		NO FREE GROUNDWATER OBSERVED		
		AUGER HOLE DISCONTINUED AT 1.5m		

LOGGED BY: G. AUSTIN PAGE: 1 OF

GEOLOGICAL PROFILE LOG

CLIENT: ELF MUSHROOMS **DATE**: 8/3/2010

SITE: 521 - 525 THE NORTHERN ROAD, LONDONDERRY **LOG No**: AUGER 6

JOB No: 100305 **SURFACE RL**: -

COMMENTS: ON-SITE EFFLUENT MANAGEMENT.

D = DISTURBED SAMPLE. PROPOSED MUSHROOM FARM AND STAFF CHILDCARE FACILITY, PLUS EXISTING DWELLING TO BE RETAINED.

DEPTH METRES		**AUGER HOLE LOCATION**: SEE FIGURE 2	**SAMPLING DATA**	
FROM	**TO**	**MATERIAL DESCRIPTION**	**DEPTH**	**TYPE**
S.L.	0.15	**CLAYEY SAND** – A1 Horizon: dark-brown to grey-brown, fine grained clayey sand with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments from Table 4.1D2 of AS/NZS 1547, 2000).		
0.15	0.4	**LOAMY SAND** – A2 Horizon: light-brown and light-grey, fine grained loamy sand with common sub-rounded to rounded ironstone and quartz gravels (i.e. 10 - 20% coarse fragments).		
0.4	0.6	**SANDY CLAY LOAM** – B Horizon: light-brown to brown, fine grained sandy clay loam with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).		
0.6	1.5	**MEDIUM CLAY –** B Horizon: stiff to very stiff, brown to orange-brown and light-grey medium clay with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).	0.7m	D
		NO FREE GROUNDWATER OBSERVED		
		AUGER HOLE DISCONTINUED AT 1.5m		

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GEOLOGICAL PROFILE LOG

CLIENT: ELF MUSHROOMS **DATE**: 8/3/2010

SITE: 521 - 525 THE NORTHERN ROAD, LONDONDERRY **LOG No**: AUGER 7

JOB No: 100305 **SURFACE RL**: -

COMMENTS: ON-SITE EFFLUENT MANAGEMENT.

D = DISTURBED SAMPLE. PROPOSED MUSHROOM FARM AND STAFF CHILDCARE FACILITY, PLUS EXISTING DWELLING TO BE RETAINED.

DEPTH METRES		**AUGER HOLE LOCATION**: SEE FIGURE 2	**SAMPLING DATA**	
FROM	**TO**	**MATERIAL DESCRIPTION**	**DEPTH**	**TYPE**
S.L.	0.15	**CLAYEY SAND** – A1 Horizon: dark-brown to grey-brown, fine grained clayey sand with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments from Table 4.1D2 of AS/NZS 1547, 2000).		
0.15	0.3	**SANDY LOAM** – A2 Horizon: brown to orange-brown, fine grained sandy loam with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).		
0.3	0.75	**SANDY CLAY LOAM** – B Horizon: brown to orange-brown, fine grained sandy clay loam with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).		
0.75	1.5	**MEDIUM CLAY –** B Horizon: stiff to very stiff, brown to orange-brown and light-grey medium clay with few sub-rounded to rounded ironstone and quartz gravels (i.e. 2 - 10% coarse fragments).	0.8m	D
		NO FREE GROUNDWATER OBSERVED		
		AUGER HOLE DISCONTINUED AT 1.5m		

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DEFINITIONS OF ROCK, SOIL, AND DEGREES OF CHEMICAL WEATHERING

(A) GENERAL DEFINITIONS — ROCK AND SOIL

ROCK In engineering usage, rock is a natural aggregate of minerals connected by strong and permanent cohesive forces.

Note: Since "strong" and "permanent" are subject to different interpretations, the boundary between rock and soil is necessarily an arbitrary one.

SOIL In engineering usage, soil is a natural aggregate of mineral grains which can be separated by such gentle mechanical means as agitation in water, can be remoulded and can be classified according to the Unified Soil Classification System. Three principal classes of soil recognised are:

(a) Residual soils: soils which have been formed insitu by the chemical weathering of parent rock. Residual soil may retain evidence of the original rock texture or fabric or, when mature, the original rock texture may be destroyed.

(b) Transported soils: soils which have been moved from their places of origin and deposited elsewhere. The principal agents of erosion, transport and deposition are water, wind and gravity. Two important types of transported soil in engineering geology and materials investigations are:

(i) Colluvium - a soil, often including angular rock fragments and boulders, which has been transported downslope predominantly under the action of gravity assisted by water. The principal forming process is that of soil creep in which the soil moves after it has been weakened by saturation. It may be water borne for short distances

(ii) Alluvium - a soil which has been transported and deposited by running water. The larger particles (sand and gravel size) are water worn.

(c) Lateritic soils: soils which have formed insitu under the effects of tropical weathering and include all reddish residual and non residual soils which genetically form a chain of material ranging from decomposed rock through clays to sesquioxide rich crusts. The term does not necessarily imply any compositional, textural or morphological definition; all distinctions useful for engineering purposes are based on the differences in geotechnical characteristics.

(B) ROCK WEATHERING DEFINITIONS

Extremely Weathered (EW)
Rock substance affected by weathering to the extent that the rock exhibits soil properties, i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.

Highly Weathered (HW)
Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.

Moderately Weathered (MW)
Rock substance affected by weathering to the extent that staining extends throughout the whole of the rock substance and the original colour of the fresh rock is no longer recognisable.

Slightly Weathered (SW)
Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance, usually by limonite, has taken place. The colour and texture of the fresh rock is recognisable.

Fresh (Fr)
Rock substance unaffected by weathering.

The degrees of rock weathering may be gradational. Intermediate stages are described by dual symbols with the prominent degree of weathering first (e.g. EW-HW).

The various degrees of weathering do not necessarily define strength parameters as some rocks are weak, even when fresh, to the extent that they can be broken by hand across the fabric, and some rocks may increase in strength during the weathering process.

Fresh drill cores of some rock types, such as basalt and shale may disintegrate after exposure to the atmosphere due to slaking, desiccation, expansion or contraction, stress relief or a combination of any of these factors.

ASSESSMENT OF SOIL TEXTURE

From AS/NZS 1547:2000 – On site domestic wastewater management - Table 4.1D1

Classification	Properties	Typical clay content % (see note)
Sand	Very little to no coherence; cannot be moulded; single grains stick to fingers.	less than 5
Loamy sand	Slight coherence; forms a fragile cast that just bears handling; gives a very short (5mm) ribbon that breaks easily; discolours the fingers.	5-10
Sandy loam	Forms a cast but will not roll into a coherent ball; individual sand grains can be seen and felt; gives a ribbon of 5-25mm long.	10-20
Fine Sandy loam	As for sandy loams, except that the individual sand grains are not visible, although they can be heard and felt; gives a ribbon 15-25mm long.	10-20
Loam	As for sandy loams but cast feels spongy, with no obvious sandiness, or silkiness; may feel greasy if much organic matter is present; forms a thick ribbon about 25mm long.	10-25
Silty Loam	As for loams but not spongy; very smooth and silky; will form a very thin ribbon 25mm long and dries out rapidly.	10-25
Sandy clay loam	Can be rolled into a ball in which sand grains can be felt; forms a ribbon 25-40mm long.	20-30
Fine sandy clay loam	As for sandy loam, except that individual sand grains are not visible although they can be heard and felt; forms a ribbon 25-40mm long	20-30
Clay loam	Can be rolled into a ball with a rather spongy feel; slightly plastic; smooth to manipulate; will form a ribbon 40-50mm long.	25-35
Silty clay loam	As for clay loams but not spongy; very smooth and silky; will form ribbon about 40-50mm long; dries out rapidly.	25-35
Sandy clay	Forms a plastic ball in which sand grains can be seen, felt or heard; forms a ribbon 50-75mm.	35-45
Light clay	Smooth plastic ball that can be rolled into a rod; slight resistance to shearing between thumb and forefinger; forms a ribbon of 50-75mm long.	35-40
Silty clay	As for light clay but very smooth and silky; will form a ribbon about 50-75mm long but very fragmentary; dries out rapidly.	40-50
Medium clay	Smooth plastic ball; handles like plasticine and can be moulded into rods without fracture; some resistance to ribboning, forms a ribbon of 75mm or more long.	40-55
Heavy clay	Smooth plastic ball that handles like stiff plasticine; can be moulded into rods without fracture; firm resistance to ribboning; forms a ribbon of 75mm or more in length.	50 or more
NOTE: The typical clay content figures are included for information only.		

SOIL CLASSIFICATION

From: Australian Soil and Land Survey: Field Handbook 1990

Field Texture Grade		*Behaviour of moist bolus*	*Approximate clay content (%)*
S	*Sand*	coherence nil to very slight; cannot be moulded; sand grains of medium size; single sand grains adhere to fingers.	commonly less than 5%
LS	*Loamy sand*	slight coherence; sand grains of medium size; can be sheared between thumbs and forefinger to give minimal ribbon of about 5mm.	about 5%
CS	*Clayey sand*	slight coherence; sand grains of medium size; sticky when wet; many sand grains stick to fingers; will form minimal ribbon of 5-15mm; discolours fingers with clay stain.	5%-10%
SL	*Sandy loam*	bolus coherent but very sandy to touch; will form ribbon of 15-25mm; dominant sand grains are of medium size and are readily visible.	10%-20%
L	*Loam*	bolus coherent and rather spongy; smooth feel when manipulated but with no obvious sandiness or 'silkiness'; may be somewhat greasy to the touch if much organic matter is present; will form ribbon of about 25mm.	about 25%
ZL	*Silty Loam*	coherent bolus; very smooth to often silky when manipulated; will form ribbon of about 25mm.	about 25% and with silt 25% or more
SCL	*Sandy clay loam*	strongly coherent bolus; sandy to touch; medium size sand grains visible in finer matrix; will form ribbon of 25-40mm.	20%-30%
CL	*Clay loam*	coherent plastic bolus; smooth to manipulate; will form ribbon of 40-50mm.	30%-35%
CLS	*Clay loam, sandy*	coherent plastic bolus; medium size sand grains visible in finer matrix; will form ribbon of 40-50mm.	30%-35%
ZCL	*Silty clay loam*	coherent plastic bolus; plastic and often silky to the touch; will form ribbon of 40-50mm.	30%-35% and with silt 25% or more
LC	*Light clay*	plastic bolus; smooth to touch; slight resistance to shearing between thumb and forefinger; will form ribbon of 50-75mm.	35-40%
LMC	*Light medium clay*	plastic bolus; smooth to touch; slight to moderate resistance to ribboning shear; will form ribbon of about 75mm.	40%-45%
MC	*Medium clay*	smooth plastic bolus; handles like plasticine and can be modelled into rods without fracture; has moderate resistance to ribboning shear; will form ribbon of 75mm or more.	45%-55%
MHC	*Medium heavy clay*	smooth plastic bolus; handles like plasticine; can be modelled into rods without fracture; has moderate to firm resistance to ribboning shear; will form ribbon of 75mm or more.	50% or more
HC	*Heavy clay*	smooth plastic bolus; handles like stiff plasticine; can be modelled into rods without fracture; has firm resistance to ribboning shear; will form ribbon of 75mm or more.	50% or more

DESCRIPTION AND CLASSIFICATION OF SOILS

The methods of description and classification of soils used in this report are based on Australian Standard 1726 - 1981, the SAA Site Investigation Code. In general, descriptions cover the following properties - soil type, colour, secondary grain size, structure, inclusions, strength or density and geological description.

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (e.g. sandy clay) on the following basis:

Classification	Particle Size
Clay	less than 0.002mm
Silt	0.002 to 0.06mm
Sand	0.06 to 2.00mm
Gravel	2.00 to 60.00mm

Soils are also classified according to the Unified Soil Classifications System which is included in this Appendix.

Rock types are classified by their geological names.

Cohesive soils are classified on the basis of strength either by laboratory testing or engineering examination. The terms are defined as follows:

Classification	Shear Strength kPa
Very soft	less than 12
Soft	12 - 25
Firm	25 - 50
Stiff	50 - 100
Very stiff	100 - 200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of insitu standard penetration tests as below:

Relative Density	"N" Value blows/300mm
Very loose	less than 5
Loose	5 - 10
Medium dense	10 - 30
Dense	30 - 50
Very dense	greater than 50

SAMPLING

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are generally taken by one of two methods:

(i) driving or pushing a thinwalled sample tube into the soil and withdrawing with a sample of the soil in a relatively undisturbed state.

(ii) Core drilling using a retractable inner tube (R.I.T.) core barrel.

Such samples yield information on structure and strength in addition to that obtained from disturbed samples and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling are given in the report.

PENETRATION TESTING

The relative density of non-cohesive soils is generally assessed by insitu penetration tests, the most common of which is the standard penetration test. The test procedure is described in Australian Standard 1289 "Testing Soils for Engineering Purposes" - Test No. F3.1.

The standard penetration test is carried out by driving a 50mm diameter split tube penetrometer of standard dimensions under the impact of a 63 kg hammer having a free fall of 750mm.

The "N" value is determined as the number of blows to achieve 300mm of penetration (generally after disregarding the first 150mm penetration through possibly disturbed material). The results of these tests can be related empirically to the engineering properties of the soil.

The test is also used to provide useful information in cohesive soils under certain conditions, a good quality disturbed sample being recovered with each test.

Other forms of insitu testing are used under certain conditions and where this occurs, details are given in the report.

APPENDIX 2

SUGGESTIONS IN RELATION TO THE PREPARATION AND MANAGEMENT OF THE LANDSCAPED SOIL MOUNDS

Design details in relation to the construction of the landscaped mounds have been conveyed by Mr. Neil Groat of Compaction & Soil Testing Services – i.e. soils to be used, cross-sectional shape, dimensions and location. As previously detailed, the landscaped mounds will be constructed with the sand-based topsoil stripped from the area containing the mushroom farm building and associated structures at a minimum height of 2.5m and width of 17m that is positioned at a minimum distance of 3m from property boundaries and any paved areas and driveways. The 3m buffer distance from the toe of the mound provides a natural margin at each side. As a function of slow settling over time, the height of the mound and grade of batters will reduce.

As previously detailed, additional auger holes 8 and 9 bored at the site of the mushroom farm confirm the findings of auger holes 1 - 7 and the nature of the soil material chosen for use in the landscaped mounds. It is the clayey sand and loamy sand soils described in the A1 and A2 horizons in the logs in Tables 3 and 4 and Appendix 1 that will be used for the landscaped mound (silty loam of Compaction & Soil testing Services report).

The soils to be stripped from the building are considered to be of appropriate texture for use in the landscaped mounds in that they are sand-based and similar to that used in formalised Wisconsin mounds. This results in a sustainable situation in that the soils do not have to be taken off the site and happen to have an appropriate texture for the land application of treated effluent (i.e. avoids needs for large volumes of imported soil to create mounds). Note that AS/NZS 1547 (2000) indicates that the mound soil should be free of clay and organic matter (and limestone). If lightly placed and not formally compacted during mound construction, the soils should retain appropriate levels of drainage to accept the treated effluent. This is an important consideration because excessive compaction can lead to the loss of soil drainage properties, irrespective of the texture.

The following details from AS/NZS 1547 (2000) are provided in relation to the construction of the landscaped soil mounds. It is essential that both the natural ground surface and mounds are properly prepared. The area containing the mounds shall be protected from vehicular traffic (to avoid compaction) and shall be isolated or marked out so that other nearby construction activity does not damage the area. Trees and shrubs must be cleared, with trees cut at the ground surface

and stumps removed and backfilled to natural surrounding conditions. The mound perimeter and bed shall be marked out and the basal area within the mound perimeter and immediately adjacent parts should be aerated by ploughing. A twin or larger mouldboard plough should be used, ploughing 18 - 20cm deep. Single ploughs should not be used because it leads to compaction, whilst a chisel plough may be used in place of a mouldboard plough. Roughening the surface with the teeth of a backhoe bucket may be satisfactory. Furthermore, rototilling is not recommended because it damages soil structure. Mound soil should be carefully placed onto the ploughed area and moved into place either manually or by using a small truck-type earthmoving machine with a blade (i.e. rubber tyred or tracked). It is essential to keep vehicles off the ploughed area and to have a minimum of 150mm of soil material beneath the tyres or tracks of an earthmoving machine to minimise compaction of the natural soil.

Pending final confirmation by an irrigation specialist, it is suggested to apply treated effluent to the mound with use of an appropriate number of subsurface dispersal lines placed at a minimum depth of 300mm below the surface of the highest part of the mound (Figure 2). If more than one line is used, the spacing could range from 1 - 1.5m, pending exact final confirmation.

For ease of installation, the subsurface dispersal line or lines can be placed on the open cap of the landscaped mounds during construction and before the final top level is established – i.e. build up mound height until it reaches the level of the subsurface dispersal line or lines. This avoids digging into an established mound to facilitate line/bed placement and also allows for the laying of the subsurface dispersal line or lines in a suggested bed of coarse aggregate. The subsurface dispersal line or lines and aggregate bed can also be wrapped in a geotextile fabric to eliminate the migration of fine soil particles into the mound discharge area. It is suggested that the gravel bed for distribution should be laid to a thickness of at least 150 - 200mm and reference to AS/NZS 1547 (2000) shows that graded river run aggregate can be used at a size of 20 - 60mm which is non-crushed, rounded and levelled at a minimum depth of 150mm.

The nitrogen and phosphorus compounds in the treated effluent will act as a fertiliser and assist with the growth of the plants on the expected low fertility soils comprising the landscaped mounds. Whilst placement of organic matter in the body of the mound should be avoided as it may impede drainage, consideration can be given to the use of a layer of mulch at the surface to

a suggested thickness of about 100mm. Mulch should be placed on the mounds as soon as possible in order to contain the soil and address the potential for soil erosion during rainfall events. Consideration can also be given to limited organic matter (e.g. mushroom compost) in the top 100 - 200mm of soil and/or use of an imported blended topsoil material that is well drained and has a higher fertility.

With respect to the vegetation to be planted on the mound, turf grass is not proposed due to the significant maintenance issue (i.e. mowing). Various types of small native trees, shrubs, groundcovers and grasses can therefore be planted on the mound – understood to fit with landscaping proposal. Whilst having enough plants on the mound to provide high levels of evapotranspiration, it is suggested to ensure that over-planting does not occur as this will limit the levels of sunlight directly reaching the surface of the landscaped mounds. Furthermore, excessive leaf-litter build-up should also be periodically removed.

With regards to the choice of plant species on the landscaped mounds, 'effluent tolerant' native species suitable for wet areas and most-suited to the local climate and low fertility sand-based soil used to construct the mound. Reference to Appendix 3 is a list of what are understood to be native vegetation species that are suitable for land applications areas. This list is reproduced from Appendix 7 of Department of Local Government et. al. (1998), which is also provided in Appendix 2 of Penrith City Council (2007). The list in Appendix 3 therefore provides a comprehensive list of vegetation species that can be considered for planting on the soils mounds. As previously detailed, the subsurface dispersal line or lines should also have a root inhibitor to ensure they do not become blocked.

Appropriate drainage measures should be implemented to ensure that any water runoff does not collect near the base of the landscaped mounds – i.e. avoid damming effect. This will ensure that the mounds only have to cater for treated effluent and any direct rainfall, thereby enhancing the levels of evapotranspiration and general performance of the mounds.

As detailed in Section 5, part of dam 6 in the northeastern corner of the property covers the area containing the landscaped soil mound. Furthermore, dam 2 adjacent to the northwestern corner of the main mushroom farm building is almost wholly sited in the area containing the mound.

With respect to dams 2 and 6, the following suggestions are made so that the land containing them to be infilled has appropriate soil drainage:

- Drain the water from the dams.
- Allow the dams to sit and dry out after draining when weather conditions allow (plan the timing of work).
- Fill dams in with sand-based topsoils and not loamy to clayey soils.
- Do not formally compact or unintentionally over-compact the soils when infilling the dams – i.e. lightly place soil to ensure has appropriate permeability.

There should be regular initial inspections of the landscaped soil mound to visually determine if wastewater is being accepted properly without showing signs of waterlogging at the toe or surface runoff. This could be done on a daily to weekly basis by a representative on the site – i.e. should be the same person or 2 - 3 persons at most. Furthermore, it is suggested that inspections should also be periodically carried out by the undersigned, the frequency of which could reduce over time. Observations should be carried out at different times/seasons of the year, and most importantly during or immediately after periods of adverse weather conditions.

APPENDIX 3

LIST OF VEGETATION SUITABLE FOR LAND APPLICATION AREAS

Extracted from Appendix 7 of Department of Local Government et. al. (1998). Same list is also provided in Appendix 2 of Penrith City Council 2007.

APPENDIX 7

VEGETATION SUITABLE FOR LAND APPLICATION AREAS

Botanical Name	Approximate Height	Common Name or Variety
Grasses		
Carex spp.		
Lomandra longifolia		
Microlaena stipoides		
Oplismenus imbecillis		
Pennisetum alopecuroides	40 - 80 cm	Available as lawn turf
Poa lab		
Stipa spp.		
Ground cover/climbers		
Hibbertia scandens		Snake vine
Hibbertia stellaris		
Isotoma fluviatalis	Prostrate	
Kennedia rubicunda	Climber	Dusky coral pea
Scaevola albida		
Scaevola ramosissima		
Veronica plebeia		
Viola hederacea		Native violet
Sedges/grasses/small plants		
Anigozanthus flavidus	2m	Kangaroo Paw
Baumea acuta		
Baumea articulata	Sedge	
Baumea juncea	Sedge	
Baumea nuda	Sedge	
Baumea rubiginosa	Sedge	
Baumea teretifolia	Sedge	
Blandfordia grandiflora	30-90cm	Christmas Bell
Blandfordia nobilis	30-90cm	Christmas Bell
Brachyscome diversifolia	Clump	Native Daisy
Carex appressa	Sedge	
Cotula coronopifolia	10-20cm	Waterbutton
Crinum pedunculatum	<2m	Swamp Lily
Cyperus polystachyos	Sedge	
Dianella caerulea	Low plant	Blue Flax Lily
Epacris microphylla	50cm -1m	
Ferns		
Gahnia spp.	Tall Grass	
Juncus spp.	0.5 m Rush	
Lobelia trigonocaulis	5-10cm	
Lomandra spp.	Grass	
Patersonia fragilis		Native Iris
Patersonia glabrata		Native Iris
Patersonia occidentalis		Native Iris
Ranunculus graniticola	5cm	
Restio australis	Reed	
Restio tetraphyllus	1m	
Sowerbaea juncea	Sedge	Rush Lily
Tetratheca juncea	<30cm	
Xyris operculata	<1m	Tall Yellow Eye

Botanical Name	Approximate Height	Common Name or Variety
Shrubs		
Agonis flexuosa nana		
Baekea linifolia	1 - 2.5 m	
Baekea utilis	1-2.5 m	
Baekea virgata	< 4 m	
Banksia aemula	1 - 7 m	
Banksia robur	0.5 - 2 m	
Bauera ruboides	0.5 - 1.5 m	
Callistemon	2 - 3 m	Burgundy
Callistemon	2 - 4 m	Eureka
Callistemon	3 - 4 m	Harkness
Callistemon	3 - 4.5 m	Kings Park Special
Callistemon	2 - 3 m	Mauve Mist
Callistemon	1 - 2.5 m	Red Clusters
Callistemon	2 - 3 m	Reeves Pink
Callistemon citrinus	50 - 80 cm	Austraflora Firebrand
Callistemon citrinus	2 - 4 m	Splendens
Callistemon citrinus	60cm – 1m	White Ice
Callistemon linearis	1 - 3 m	
Callistemon macropunctatus	2 - 4 m	
Callistemon pachyphyllus	2 - 3 m	
Callistemon pallidus	1.5 - 4 m	
Callistemon paludosus	3 - 7 m	
Callistemon pinifolius	1 - 3 m	
Callistemon rigidus	1.5 - 2.5 m	
Callistemon salignus	3 – 10m	
Callistemon shiresii	4 - 8 m	
Callistemon sieberi	1.5 - 2 m	
Callistemon sieberi	50 - 80 cm	Austraflora Little Cobber
Callistemon subulatus	1 - 2 m	
Callistemon viminalis	1 - 2 m	Captain Cook
Callistemon viminalis	5 - 10 m	Dawson River
Callistemon viminalis	3 - 5 m	Hannah Ray
Callistemon viminalis	50 cm - 1 m	Little John
Callistemon viminalis	1.5 - 2 m	Rose Opal
Callistemon viminalis	2 - 3 m	Western Glory
Goodenia ovata	1 - 1.5 m	
Hibiscus diversifolius	1 - 2 m	Swamp hibiscus
Kunzea capitata	1 - 2 m	
Leptospermum flavescens	< 2 m	Tea-tree
Leptospermum juniperinum	1 m	Tea-tree
Leptospermum lanigerum	1 - 2 m	Woolly tea-tree
Leptospermum squarrosum	< 2 m	Tea-tree
Melaleuca alternifolia	4 - 7 m	
Melaleuca decussata	1 - 2 m	Cross-leaved honey myrtle
Melaleuca lanceolata	4 - 6 m	
Melaleuca squamea	1 - 2 m	
Melaleuca thymifolia		

Botanical Name	Approx Height	Common Name or Variety
Trees		
Acacia elongata	> 2 m	
Acacia floribunda	2 - 4 m	Gossamer wattle
Agonis flexuosa	5 - 6 m	Willow myrtle
Allocasuarina diminuta	1.5 m	
Allocasuarina paludosa	0.5 - 2 m	
Angophora floribunda	Large tree	
Angophora subvelutina	Large tree	
Callicoma serratifolia	< 4m	
Casuarina cunninghamiana	10 - 30 m	River she-oak
Casuarina glauca	6 - 12 m	Swamp oak
Elaeocarpus reticulatis	Large tree	Blueberry ash
Eucalyptus amplifolia	Large tree	
Eucalyptus botryoides (coastal areas)	10 - 30 m	
Eucalyptus camaldulensis (west of ranges)	15 - 20 m	River red gum
Eucalyptus deanei	Large tree	Blue Mountains blue gum
Eucalyptus elata	Large tree	River Peppermint
Eucalyptus grandis	10 - 20 m	Flooded gum
Eucalyptus longifolia	20 m	Woollybutt
Eucalyptus pilularis	30 - 40 m	Blackbutt
Eucalyptus punctata	< 35 m	Greygum
Eucalyptus robusta	20 - 30 m	Swamp mahogany
Eucalyptus saligna (coastal)	30 - 50 m	Sydney blue gum
Eucalyptus tereticornis	30 - 40 m	Forest red gum
Eucalyptus viminalis (ranges)	20 - 40 m	Ribbon gum
Acmena smithii	10 - 20 m	Lilli pilli
Flindersia australis	< 40 m	Native teak
Hymenosporum flavuum	3 - 6 m	Native frangipani
Melaleuca armillaris	3 - 4 m	Bracelet honey myrtle
Melaleuca decora	4 - 7 m	
Melaleuca ericifolia	6 m	
Melaleuca halmaturorum	4 - 6 m	
Melaleuca hypericifolia	2 - 3 m	
Melaleuca linariifolia	4 - 8 m	Snow in summer
Melaleuca quinquenervia	5 - 7 m	Broad paperbark
Melaleuca squarrosa	6 m	
Melaleuca stypheloides	6 - 15 m	
Melia azedarach	15 - 20 m	
Pittosporum spp.		
Syzgium paniculatum	8 - 10 m	Bush cherry
Tristania laurina	5 - 15 m	Kanuka
Viminaria juncea	2 - 3 m	Golden spray

Source: Australian Plants Society

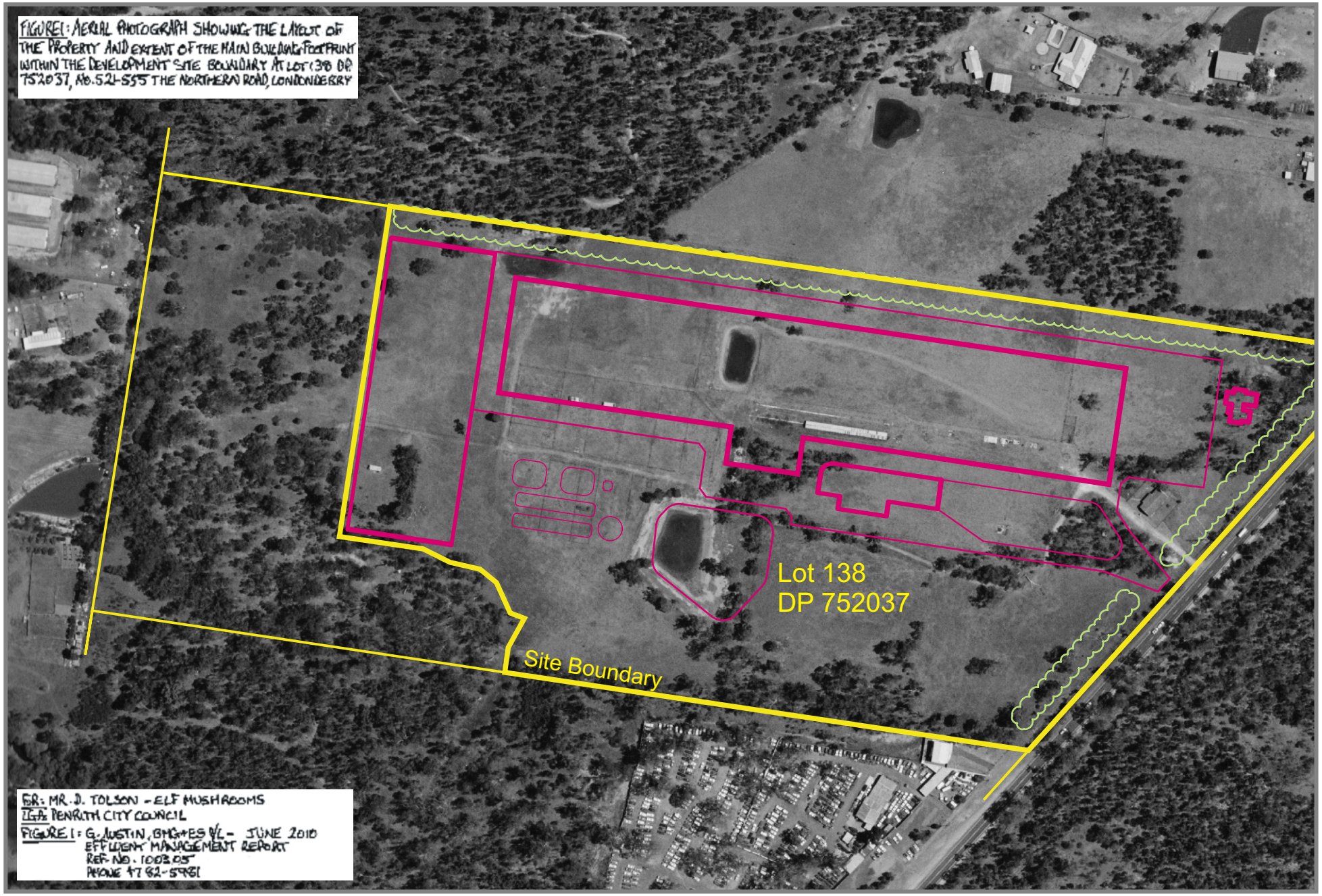
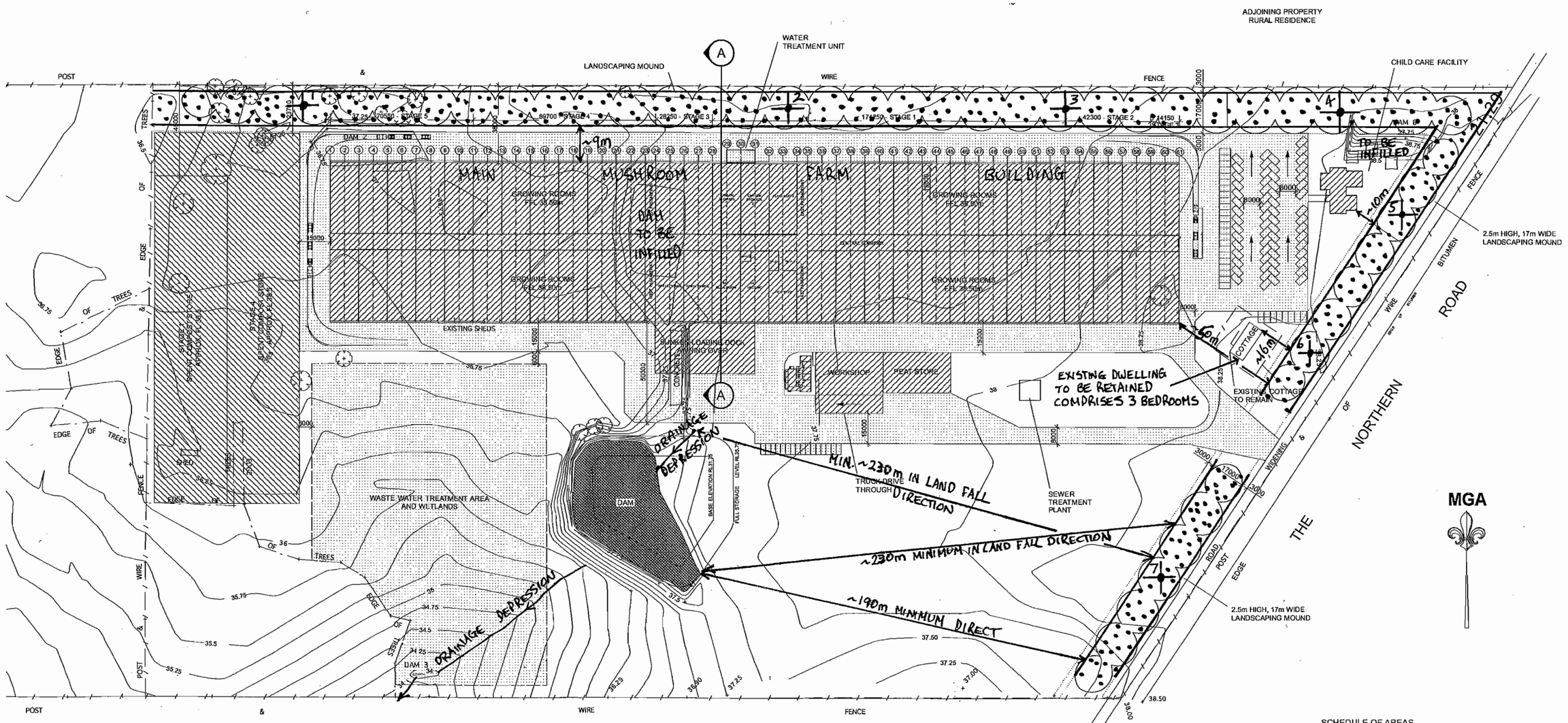

FIGURE 1: AERIAL PHOTOGRAPH SHOWING THE LAYOUT OF THE PROPERTY AND EXTENT OF THE MAIN BUILDING FOOTPRINT WITHIN THE DEVELOPMENT SITE BOUNDARY AT LOT 138 DP 752037, No. 521-555 THE NORTHERN ROAD, LONDONDERRY
Lot 138
DP 752037
Site Boundary
FOR: MR. D. TOLSON - ELF MUSHROOMS
TO: PENRITH CITY COUNCIL
FIGURE 1: G. AUSTIN, BMGT+ES P/L - JUNE 2010
EFFLUENT MANAGEMENT REPORT
REF. NO. 10023.05
PHONE 47 62-5981

FIGURE 2: PLAN SHOWING THE LOCATION OF THE FEATURES OF DEVELOPMENT, AUGER HOLES 1-7 AND THE LANDSCAPED SOIL MOUND TO BE UTILISED FOR THE LAND APPLICATION OF TREATED WASTEWATER AT LOT 138 DP 752037, No. 521-555 THE NORTHERN ROAD, LONDONDERRY



FOR: MR. D. TOLSON – ELF MUSHROOMS
LGA: PENRITH CITY COUNCIL
FIGURE 2: G. AUSTIN, BMGIES P/L
EFFLUENT MANAGEMENT REPORT
REF. NO. 100305
JUNE 2010
PHONE 4782-5981

SCHEDULE OF AREAS

MAIN BUILDING -	32, 865 sq mts
COMPOST STORE STAGE 1 -	5, 821 sq mts
COMPOST STORE STAGE 4 -	7, 355 sq mts
WORKSHOP -	996 sq mts
PEAT STORE -	672 sq mts

LEGEND

AUGER HOLES 1-7

PROPOSED LAND APPLICATION AREA WITHIN LANDSCAPED SOIL MOUNDS AVAILABLE FOR SUBSURFACE DISPERSAL – 17m IN WIDTH, MIN. HEIGHT OF 2.5m + APPROX. LENGTH OF 900m

SCALE ~1:2000 AT 13

0 10 20 30 40 50 100

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DATE	BY	REVISION	ISSUE
7/5/09	CD	DA ISSUE	A
25/11/09	CD	DESIGN AMENDMENTS	B
3/12/09	CD	DESIGN AMENDMENTS	C
1/2/10	CD	STAGE 2 SHOWN CORRECTLY	D
1/4/10	CD	GENERAL AMENDMENTS	E
17/5/10	CD	COMPOST STORE STAGING	F

APEX BUILDING SYSTEMS PTY LTD
ABN 14 003 540 252
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Telephone: 02 4587 7166
Fax: 02 4587 7139
E-Mail: design@apexbuildingsystems.com

SITE DESCRIPTION:
521 THE NORTHERN ROAD
LONDONDERRY NSW

LOCAL GOVERNMENT AREA : PENRITH CITY COUNCIL

DRAWN: CHRIS DAWSON 16 APRIL 2009
CHECKED:

PROPOSED SITE PLAN

CLIENT : ELF - LONDONDERRY

SCALE: 1 : 1000 @ A1

DRAWING No. 1840 / 1F

Appendix I

MUSHROOM FARM SOIL CONTAMINATION REPORT

Mushroom Industry Expansion in Western Sydney



ELF Mushrooms

Proposed New Mushroom Farm
521 The Northern Road, Londonderry

Preliminary and Detailed Site Contamination Assessment

Compaction and Soil Testing Services Pty Ltd

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
NATA Accreditation No: 15121

Job No.: ELF 677
Our Ref.: ELF 677-AA

15 October 2009

Elf Mushrooms
Wallace Road,
Vineyard, NSW,

Attention: Mr David Tolson

Dear Sir,

RE: Proposed Mushroom Farm – ELF Mushrooms
521 The Northern Road, Londonderry

Compaction and Soil Testing Services Pty Ltd has been engaged by Mr Terry Perram (of Perram and Partners) on behalf of ELF Mushrooms (apart of the Tolson Group) to complete an assessment on a site of a proposed mushroom farm. It is our understanding the proposed development will be determined by the NSW Minister for Planning as a Part 3A Major Project under the Environmental Planning and Assessment (EP&A) Act 1979.

As a part of this proposal, Compaction and Soil Testing Services Pty Ltd has completed a combined preliminary and detailed contamination assessment on the site in order to determine if the site has been significantly contaminated by any previous activities on the site.

The site is to be developed as a mushroom farm which would generally be considered as an agricultural development, however this development will involve the construction of a large warehouse/growing rooms with concrete sealed surfaces throughout the structure. As such there would be limited to no access to soil and the traditional risk factors with agricultural developments would not be present.

This would make the development effectively an industrial style development and as such the site has been assessed as an industrial development in accordance with the *National Environmental Protection Measure 1999* (NEPM).

Yours Sincerely

Aaron Ridley
B. App Sc – Env. Mgt
Environmental Consultant
Compaction and Soil Testing Services Pty Ltd

Compaction & Soil Testing Services Pty Limited

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The Project

Project Overview

This project is being undertaken by Elf Farm Supplies Pty Ltd and Elf Mushrooms, which are apart of the Tolson Group of companies. This group, based in Outer-Western Sydney currently operate a number of mushroom farms, a packing/distribution factory and a substrate plant located at Mulgrave.

The Group is proposing to establish a new mushroom farm at a site on The Northern Road, Londonderry and to expand the capacity of the existing Mulgrave substrate plant. The new mushroom farm is to be developed in a series of stages over a period of years to progressively increase the capacity of the farm. The substrate plant is also to be developed over a series of stages to increase the capacity and efficiency of the substrate farm.

The Northern Road (propose mushroom farm) site is currently a small farm with several paddocks for grazing cattle/horses. Given the agricultural land use of the site there is the potential for the site to have been contaminated by previously activities. As such Compaction and Soil Testing Services Pty Ltd has completed an assessment on the site to determine if there is significant contamination within the soil on the site. The substrate plant is an expansion of the existing facility and as such does not require a contamination assessment prior to approval of the development.

Compaction and Soil Testing Services Pty Ltd has completed an assessment on the contamination status of the Londonderry site to determine if the site is suitable for the proposed development. The purpose of this report is to identify if the site is suitable for the proposed mushroom farm development and to recommend any remedial action if deemed necessary through the investigation.

It is our understanding this report will be used by the Tolson Group to seek approval from the NSW Minister of Planning in accordance with Part 3A Major Project under the Environmental Planning and Assessment (EP&A) Act 1979.

Executive Summary

Compaction and Soil Testing Services Pty Ltd has completed an assessment of the proposed mushroom farm site to determine if the site is suitable for the proposed development in accordance with the *National Environmental Protection (Assessment of Site Contamination) Measure 1999*. This measure contains a series of Health Based Investigation Levels (HBILs), developed by the **National Environmental Protection Council** (NEPC), that are used by site auditors to identify if a site has been contaminated by previous activity and to determine the site's suitability for the proposed development. As such Compaction and Soil Testing Services Pty Ltd has used this guideline to assess the proposed mushroom farm development for ELF Mushrooms.

The site is to be developed as a mushroom farm which would generally be considered as an agricultural development, however this development will involve the construction of a large warehouse/growing rooms with concrete sealed surfaces throughout the structure. As such there would be limited to no access to soil and the traditional risk factors with agricultural developments would not be present.

This would make the development effectively an industrial style development and as such the site has been assessed as an industrial development in accordance with the *National Environmental Protection Measure 1999* (NEPM).

The site was broken up into four (4) areas with a composite sample recovered from each area (Refer to Drawing ELF 667-1) in order to complete the assessment of the site. Compaction and Soil Testing Services Pty Ltd recovered four (4) composite soil samples from the site to determine if the soils on the site were contaminated.

Each composite soil sample consisted of four (4) sub-samples. The sub-samples were recovered from random locations within each area (Refer to Drawing ELF 677-1) in accordance with Australian Standards AS 4482.1- 2005: *Guide to the investigation and sampling of sites with potentially contaminated soil*.

Each sub-sample has been recovered from approximately 300mm below the surface level using a decontaminated mechanical auger to excavate a borehole approximately 100mm in diameter. Decontaminated hand tools were used to recover the sub-samples from the borehole and to transfer them into laboratory supplied sample jars (with teflon seal lids).

Laboratory analysis was completed by Envirolab Services Pty Ltd on a regular turnaround. The analysis found low levels of Heavy Metals present in all the recovered samples.

These levels were consistent across the entire site, indicating they do not originate from any isolated source. These levels were found to be below the HBILs for *Standard Residential Development* (a category with lower HBILs than the industrial classification required for the development) in accordance with the NEPM.

Further comparison of the concentrations of heavy metals found they were within the acceptable background levels for soils in the Sydney Basin as determined in the NEPM. As such the heavy metals in the soil can be considered as naturally occurring and would not pose any significant risk to human health or the environment.

No other potential contaminants (including hydrocarbons and pesticides) were detected in any of the recovered samples (Refer to Envirolab Certificate of Analysis 32970) indicating the site has not been significantly contaminated by activities on the site.

Based on this assessment Compaction and Soil Testing Services Pty Ltd has determined the site is suitable for the proposed development of an industrial style mushroom farm. The soil on site, though containing low levels of Heavy Metals will not pose any significant risk to human health or the surrounding environment in either the construction or occupation phase of the development. As such no further action is required on the site to allow the development to proceed.

Although the site as a whole has been classified as suitable for the proposed development, the area formerly used as a piggery could potentially contain an isolated pocket of contamination due to the more intensive nature of pig farming. As such Compaction and Soil Testing Services Pty Ltd has completed a detailed assessment of this area.

Compaction and Soil Testing Services Pty Ltd excavated eleven (11) test pits across the area to identify the sub-surface conditions (Refer to attached bore logs). This investigation found the underlying soil consisted of predominately silty clay, some of the material was natural soil while other material was identified as fill imported (around the dam). There was no dark staining or strong odours being emitted from the soil that would indicate the soil had been contaminated. As such it was considered the soil posed little risk of being significantly contaminated due to a lack of visible indicators.

In order to confirm the soil was free of contaminants, four (4) discrete soil samples were recovered from the area for analysis by a NATA accredited laboratory. The samples were recovered from random locations within each area (Refer to Drawing ELF 677-1) in accordance with Australian Standards AS 4482.1- 2005: *Guide to the investigation and sampling of sites with potentially contaminated soil.*

These samples were recovered from approximately 200mm below the surface level using a decontaminated mechanical auger to excavate a borehole approximately 100mm in diameter. Decontaminated hand tools were used to recover the sub-samples from the borehole and to transfer them into laboratory supplied sample jars (with teflon seal lids).

Laboratory analysis of these samples identified some levels of heavy metals higher than those encountered in the preliminary investigation. Of these levels detected (Refer to details in report), in was concluded the copper and lead were small isolated “hotspots” of naturally occurring metals, as these levels were only marginally above the levels previously encountered, and were within the acceptable background levels as prescribed in the NEPM.

Manganese and Zinc were also detected at higher levels than detected in the preliminary investigation, indicating there was a source of these metals in the affected area. It was concluded these metals originate from the corrosion of the existing steel structure located in the area. Given this structure will be demolished during the development, the source of the manganese and zinc with will removed and as such the concentration will not rise.

The levels of heavy metals detected did not exceed the HBILs for commercial/industrial developments and as such would not affect this development proceeding. Further comparisons showed the concentrations of heavy metals present were below the HBILs for *Standard Residential Development* and as such would pose no risk to human health or the surrounding environment.

No other potential contaminants (including hydrocarbon and pesticides) were detected by the laboratory suggesting these substances were not present in the soil on site. As such the soil in this area will not pose any risk to human health or the surrounding environment.

Based on this investigation, Compaction and Soil Testing Services Pty Ltd has determined the former pig run area does not pose a risk to human health or the surrounding environment, and as such would not affect the construction and occupation phases of the proposed development. Given these findings, no further assessment or remedial action is required for the project to proceed.

Based on the preliminary and detailed contamination assessments, Compaction and Soil Testing Services Pty Ltd has determined that the site has not been contaminated by previous activities on the site or surrounding sites. As such the site can be considered as suitable for the proposed development of and industrial style mushroom growing farm as proposed by ELF Mushrooms.

No further investigation or remedial action is required for this development to proceed on the proposed site.

Should you have any queries about the methodology or findings of this investigation please do not hesitate to contact our office on (02) 9675 7522.

Yours Sincerely

Aaron Ridley
B. App Sc – Env. Mgt
Environmental Consultant
Compaction and Soil Testing Services Pty Ltd

Preliminary Assessment

Compaction and Soil Testing Services Pty Ltd has completed a preliminary assessment on the site to determine if the site is suitable for the proposed development as an industrial style mushroom farm. This preliminary assessment has been completed in accordance with Australian Standard AS 4482.1 – 2005 *Guide to the investigation and sampling of sites with potentially contaminated soil*.

The purpose of the investigation was to determine if the site is likely to pose any significant risk to human health or the environment prior to the commencement of the development. Additionally Compaction and Soil Testing Services Pty Ltd aimed to identify any areas within the site with a higher potential for contamination. These areas would require further investigation to determine the extent of any contamination.

In order to complete this assessment the follow works were completed by technicians from Compaction and Soil Testing Services Pty Ltd:

- Visual assessment of the entire site, recording site conditions and identifying potential areas of concern (Refer to **Site Conditions**),
- Identify surrounding land uses and their potential to contaminate the site (Refer to **Surrounding Land Use**),
- Completion of a historical search of the site through the local council and NSW Lands Department (Refer to **Site History),**
- Excavation of sixteen (16) boreholes across the site (Refer to drawing ELF 677-1),
- Recovery of sixteen (16) sub-samples to be homogenised into four (4) composite soil samples,
- Laboratory analysis of the composite soil samples by a NATA accredited laboratory,
- Review of potential risk factors and laboratory analysis of soil samples,
- Report results of analysis with conclusions and recommendations

Field works were completed by technicians from Compaction and Soil Testing Services Pty Ltd 07 September 2009 with the recovered soil samples received by the chemical analysis laboratory on 08 September 2009 under stringent chain of custody conditions.

Chemical analysis was completed by Envirolab Services Pty Ltd, a laboratory accredited (Accreditation No.: 2901) with the National Association of Testing Authorities (NATA). Envirolab Services Pty Ltd was chosen to complete the laboratory analysis due to their previous experience with form of analysis and the detailed quality control and quality assurance procedures they implement during the analysis (Refer to **Laboratory Quality Assurances and Quality Controls**). As such the laboratory results can be considered as an accurate representation of the recovered material.

Site Identification

The site under investigation is known as No. 521 The Northern Road, and is located in the North Western Sydney Parish of Londonderry. The area is located within the Penrith City Council LGA with the site registered as Lot 138 DP No.752037 within local council and Lands Department records.

The site is located on the western side of The Northern Road (Refer to Figure A) in a predominately rural area (Refer to **Surrounding Land Uses**). Access to the site is gained through a single driveway originating from The Northern Road (Visible on Aerial Photographs – Figure B), while the site is secured by a locked gate and rural barbed wire fencing around the entire site.

Figure A: Site Location



Sourced from http://classic.whereis.com

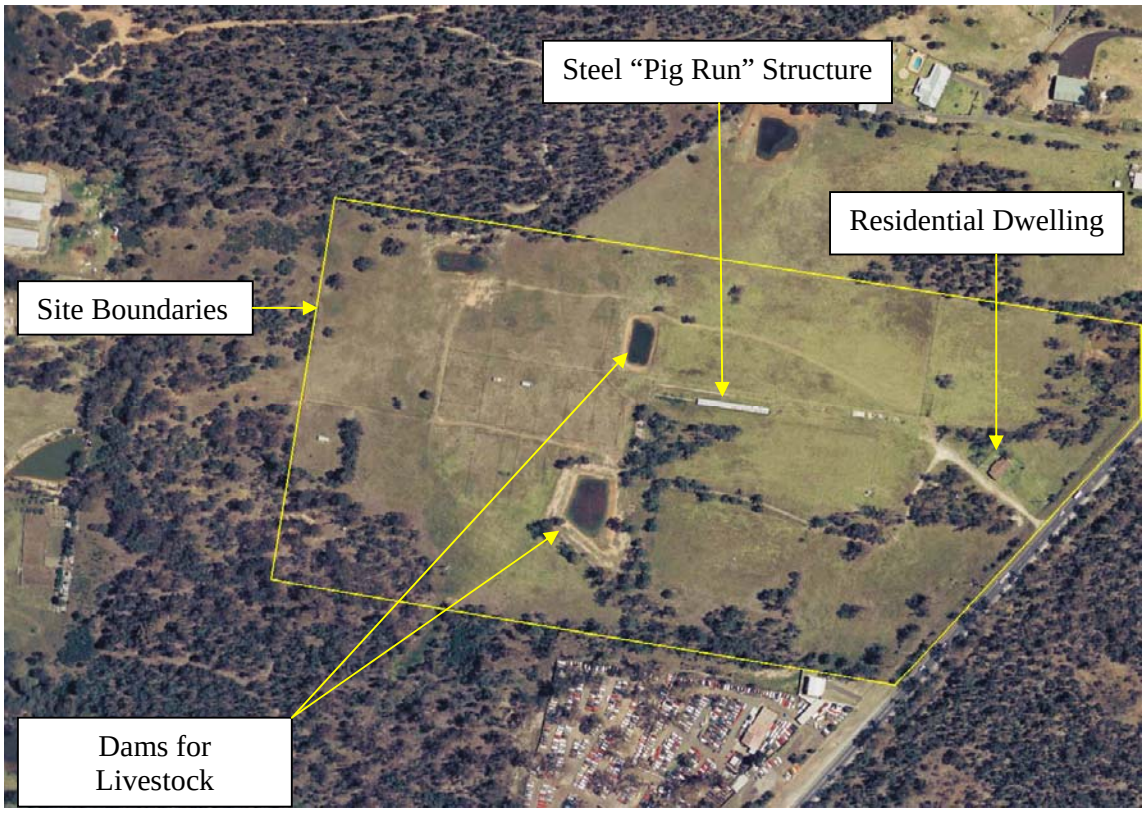
Site Description

The site is rectangular in shape and covers an area of approximately 22.66 hectares, of which more than three quarters has been cleared for casual grazing (Refer to Figure B). There were isolated clumps of trees/shrubs still present on the site, favouring the rear and southern areas of the site and are visible from aerial photographs (Refer to Figure B).

Small piles of concrete debris are located in the northern paddock, which also contains a corrugated steel structure that has previously been used as a pig-run structure. Though the steel structure was in good condition, and on its own would not pose any significant risk, previous use of the structure and surrounding area in the raising of pigs could pose a risk of contaminants having entered the soil.

A single storey residential dwelling is located on the site, approximately 50 metres from The Northern Road, and is serviced by an unsealed driveway originating from the road and leading past the house to the rear paddocks. The dwelling was a brick structure with a tiled roof, and poses very little risk of contaminating the site.

Figure B: Current Aerial Photograph of the Site



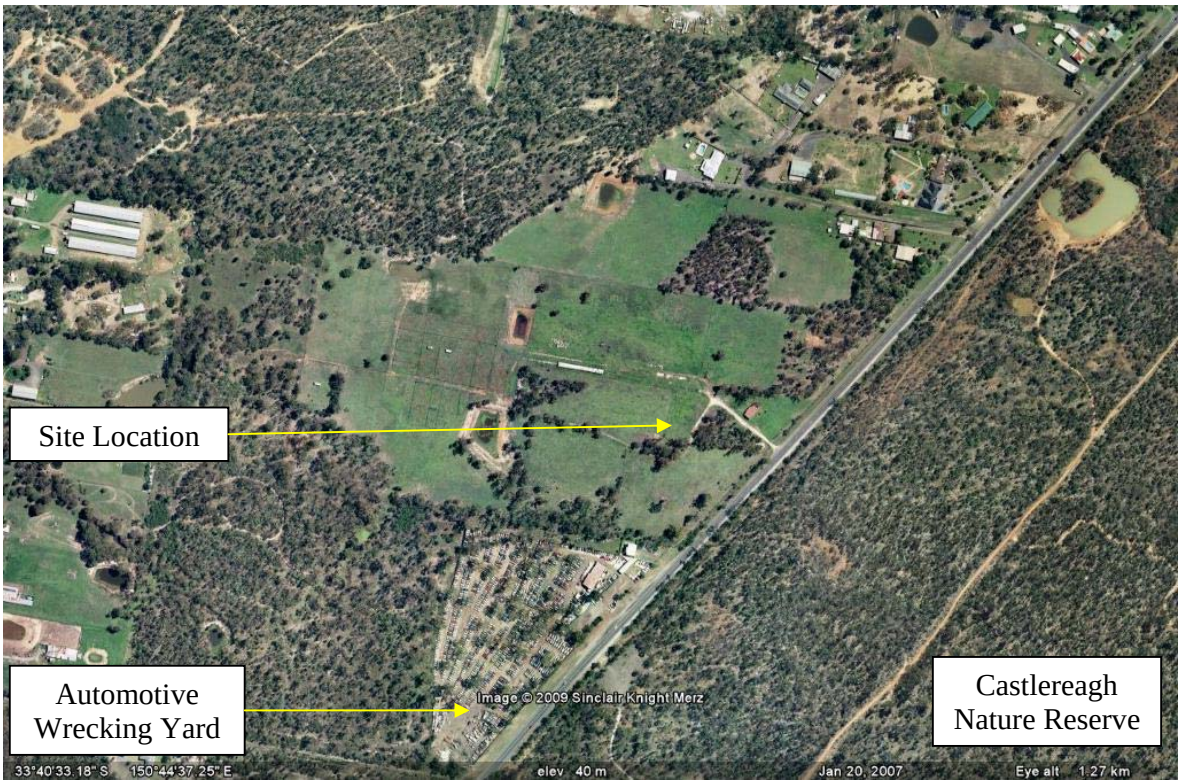
Part of the site had previously been used as a piggery, with evidence of a pig run still visible in the centre of the site (Refer to Figure B). The run consisted of steel uprights covered by a corrugated steel roof and appeared to be in relatively good condition with no evidence of significant degradation.

There are two (2) small dams located in the rear paddocks (Refer to Figure B), with some minor drainage lines leading to the south west. It is our belief these were used as a water source for the livestock on the site and would not pose any significant risk of contaminating the site.

Surrounding Land Use

The site is located within a predominately rural residential area, with limited development in the local area. The adjoining property directly south of the site is a motor vehicle wrecking yard (Northern Auto Wreckers), while the remaining immediate adjoining properties are all rural residential sites with no physical structures near the site boundaries (Refer to Figure C). These surrounding properties pose very little risk of contaminating the site through runoff, with the motor vehicle wrecker being located down slope of the site, thus preventing potentially contaminated runoff for entering the site.

Figure C: Aerial Photograph of Site – 20 January 2007



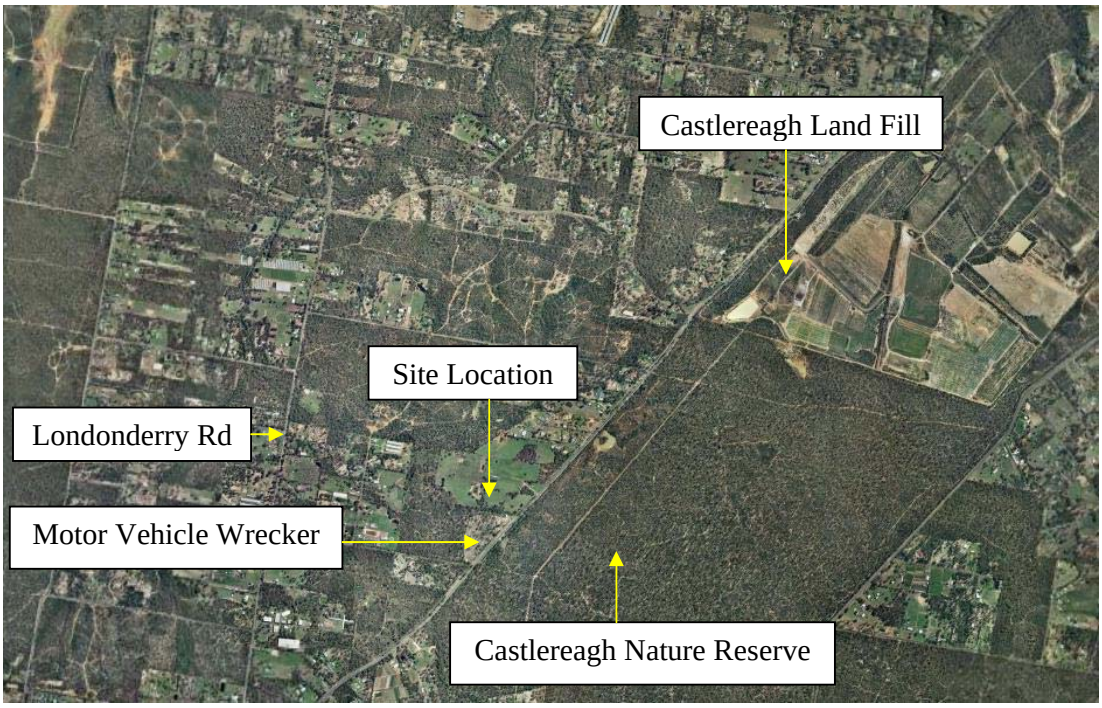
Photograph taken from an altitude of approximately 1270m

The site is also adjacent the **Castlereagh Nature Reserve**, a large nature reserve, which would not pose any risk of contaminating the site.

Within the local area there are three other major developments; Test Safe Australia, Mineral Resources Core Library and the Castlereagh Landfill. Test Safe Australia and the Mineral Resources Core Library (located on Londonderry Rd) are scientific facilities with numerous safety measures in place to prevent spills and as such do not pose any risk to the surrounding lands. Additionally these facilities are located down slope of the site, thus preventing contaminated runoff from entering the site.

The Castlereagh Landfill site, located on The Northern Road, is less than four (4) kilometres from the site. This landfill has had a history of leaching contaminants into the surrounding area, though generally to the north of the site towards the Windsor/Richmond area. This landfill has since ceased to accept the types of waste while lead to this leaching. As such the landfill would no longer pose any significant risk of contaminating the site.

Figure D: Aerial Photograph of Surrounding Area



Site History

Compaction and Soil Testing Services Pty Ltd attempted to complete a historical search of the site using information available from Penrith City Council and the NSW Lands Department along with anecdotal evidence present on the site.

Penrith City Council had no information on the site based the current DP numbers. Given the area is a predominately rural area, staff at Penrith Council indicated there would be limited development, mainly new fences, sheds or other property improvements which were recorded in the rates books. These references are available on request at Penrith Council. There were no historical aerial photographs from this area available at Penrith Council.

A historical search through the New South Wales Lands Department indicated the site under its current identification (Lot 138 DP 752037) has not changed hands (with the exception of being sold to D.W Tolson Management Pty Ltd) since prior to 1988 when the title system was automated.

A more detailed search within the Lands Department archives shows the site had changed hands a few times in the past 200 years, and was formerly a part of a larger land title. There is no record of industrial activity in the area. As such it can be concluded the area has been used for agricultural purposes over the past 200 years.

Anecdotal evidence from the site confirmed the site has been used for agricultural purposes for an extended period of time, with cattle and horses still present on the site. Visually it appeared the site has been cleared for grazing for an extended period of time with little evidence of understorey or small vegetation (Refer to **Site Description**).

A small structure constructed of steel uprights and corrugated steel roofing was located within one of the paddocks. It is our understanding that this structure had been used as a "pig run" for a small number of pigs previously present on the property. Though the structure was in good physical condition it was clearly visible the structure had been onsite for some period of time.

Two dams were also visible on the site, with some evidence of fill visible around the northern dam. Boreholes taken across this site indicate the fill material consisted of natural silty clays (of various colour and texture) with no visible evidence of foreign material. As such this material was considered to pose no significant risk to the site.

Assessment Criteria

The National Environmental Protection Council (NEPC) has calculated the maximum allowable levels of contaminants in soils (based on proposed land use) along with the acceptable natural levels for soil within the Sydney basin. These levels are readily available in the *National Environmental Protection (Assessment of Site Contamination) Measure 1999*-Table 5A. This guideline is one of the current guidelines used by site auditors to identify if a site has been contaminated by previous activity and to determine the site's suitability for the proposed development. As such Compaction and Soil Testing Services Pty Ltd has used this guideline to assess the proposed mushroom farm development for ELF Mushrooms.

Figure E: NEPC Health Based Investigation Levels

Metal/Metalloids	**Health Investigation Level**		**Background Ranges**
	Residential	***Industrial***	
Arsenic (Total)	100 mg/Kg	500mg/Kg	1-50mg/Kg
Cadmium	20 mg/Kg	100mg/Kg	1mg/kg
Chromium(VI)	100mg/Kg	500mg/Kg	5-1000mg/kg (Total)
Copper	1000mg/Kg	5000mg/Kg	2-100mg/Kg
Lead	300mg/Kg	1500mg/Kg	2-200mg/Kg
Mercury (inorganic)	15mg/Kg	75mg/Kg	0.03mg/Kg
Nickel	600mg/Kg	3000mg/Kg	5-500mg/Kg
Zinc	7000mg/Kg	35000mg/Kg	10-300mg/Kg

*Adapted from Table 5A from **National Environmental Protection Council's** National Environmental Protection (Assessment of Site Contamination) Measure 1999.

Given the site is to be developed as a commercial/industrial premise (refer to Page 2), the soil samples recovered from the site will be assessed against the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (NEPM) Health Based Investigation Levels (HBILs) and acceptable background levels for Sydney (Refer to Figure E). Provided the recovered soil samples do not contain concentrations above these levels, no further action will be required for the proposed development to continue.

Soil Sampling Process

Given the site has a grazing/rural history there is only a limited potential for contamination to have occurred. In order to determine if the site had been adversely affected by these agricultural activities, a limited sample site assessment has been completed by Compaction and Soil Testing Services Pty Ltd in accordance with Australian Standard AS 4482.1-2005 *Guide to the investigation and sampling of sites with potentially contaminated soil*.

The site has been broken up into four (4) approximately equally sized areas (Refer to Drawing ELF 677-1) to allow a general investigation of the contamination status of the site. From each of these areas a composite soil sample was recovered for laboratory analysis.

A total of four (4) composite soil samples were recovered from site, with each composite sample comprising of four (4) sub-samples each. The sub-samples were recovered from random locations within each area (Refer to Drawing ELF 677-1) in accordance with Australian Standards AS 4482.1- 2005: *Guide to the investigation and sampling of sites with potentially contaminated soil*.

Each sub-sample has been recovered from approximately 300mm below the surface level using a decontaminated mechanical auger to excavate a borehole approximately 100mm in diameter. The sub-samples were recovered from the bottom of the borehole using a decontaminated stainless steel trowel to transfer the material from the borehole into a decontaminated stainless steel bowl.

The decontamination process of objects included:

- Removal of soils adhering to the object by scrubbing with a brush.
- Washing the object thoroughly in a solution of phosphate free detergent (Decon 90).
- Rinsing the object thoroughly with potable water.
- Drying the object with a clean cloth.

Once four (4) sub-samples were recovered, the samples were homogenised into a single composite sample. The composite sample was then transferred into a laboratory supplied 250mL glass jar and sealed with a teflon lid. The sealed jar was labeled and transferred into a chilled container for transporting to our laboratory.

This process was repeated for each of the four areas. Once all the samples were recovered the chilled container was transported to our primary laboratory (1/78 Owen Street, Glendenning) under stringent chain of custody procedures

Upon arrival at our laboratory the glass jars were transferred to a refrigerator to maintain a temperature below 4°C.

The following day, the sealed glass jars were placed in the chilled container and sealed with security tape before being forwarded to the primary laboratory (Envirolab Services Pty Ltd) a NATA registered laboratory, under Chain of Custody (COC) conditions.

Upon receipt of the samples, the laboratory returned the Sample Receipt Confirmation, verifying the integrity of all the samples received.

Within the following holding times, detailed in Schedule B (3) of The *National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM)* by the National Environment Protection Council (NEPC), the discrete and composite samples were analysed:

ANALYTE	HOLDING TIME
Heavy Metals *	6 months
Mercury	28 days
Organochlorine Pesticides (OCP)	14 days

* Heavy Metals include As, Cd, Cr, Cu, Pb, Ni and Zn

NA: Not Applicable

Heavy Metals include arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni) and zinc (Zn)

OCP = Organochlorine Pesticides

Laboratory Quality Assurances and Quality Control

Envirolab Services Pty Ltd is registered by NATA for Chemical Testing (Reg.No:**2901**) and Quality System compliance to ISO/IEC 17025. For this reason they were deemed as suitably qualified to conduct the assessment of these soil samples.

Quality Assurance Procedures

As Envirolab Services Pty Ltd is a NATA accredited laboratory they must conform to a variety of quality assurance procedures. Quality control samples included in any analytical run are listed below.

Reagent Blank

Sample free reagents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every sample batch analysis. For larger projects, a reagent blank is prepared and analysed with every 20 samples.

Matrix Spike Duplicates

Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction/digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water (or Milli-Q water) may be used. A duplicate spiked sample is prepared at least every 20 samples.

Surrogate Spike

Added to all samples requiring analysis for organics (where relevant) prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples.

Internal Standard

Added to all samples requiring analysis for organics (where relevant) after the extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run-to-run with the instruments.

Duplicate

A separate portion of a sample being analysed which is treated the same as the other samples in the batch. A duplicate is prepared at least every 20 samples.

Control Standards

Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity.

Additional QC Samples

A calibration standard and blank are run after every 20 samples of an instrumental analysis run to assess analytical drift.

Statistical Analysis of QC Data

Quality control data is plotted on control charts using the APHA procedure with warning and control limits at 2 and 3 standard deviations respectively.

Certified Reference Materials

Certified Reference Materials and Standards are regularly placed in the system as blind samples. These materials/standards have certified reference values for various parameters.

Proficiency Testing

Regular proficiency test samples are analysed by our laboratories. Envirolab Services Pty Ltd participates in a number of programs. Results and proficiency status are compiled and sent to participating laboratory post data interpretation. Failure to comply with acceptable values result in further investigations.

Interlaboratory/Intralaboratory Testing

Envirolab Services Pty Ltd has schedules in the Quality Systems to participate in Inter/Intra laboratory testing conducted internally and by other parties.

Failure to meet the internal acceptance criteria will result in sample/sample batch repeat.

Compaction and Soil Testing Services Pty Ltd has checked the QA/QC procedures adopted by the laboratory against the appropriate guidelines. The quality control sample numbers adopted by Envirolab Services Pty Ltd are considered to be adequate for the analyses undertaken and conform to the recommendations provided in the National Environment Protection Measure (NEPM) 1999 "*Guideline on Laboratory Analysis of Potentially Contaminated Soils*" and Australian and New Zealand Environment and Conservation Council (ANZECC)-1996 "*Guidelines for the Laboratory Analysis of Contaminated Soils*".

Overall, the quality control elements indicate that the analytical data fall within acceptable levels of accuracy and precision for the analysis of soils and water. The analytical data provided are therefore considered reliable and useable for this assessment.

Results of Soil Sample Analysis

Initial laboratory analysis of the composite samples found low levels of Heavy Metal present in the recovered composite samples (Refer to Figure F). These levels were relatively consistent across the site and as such did not appear to originate from an isolated source. The levels of heavy metals detected were then compared against the health based investigation levels (HBILs) and acceptable background levels as detailed in the *National Environmental Protection Measure 1999* (NEPM) (Refer to Figure E).

When compared with the HBILs for industrial developments the detected levels of heavy metals were found to be well below the maximum allowable levels for industrial developments, indicating the soils on site would be suitable for this development.

More so the levels of heavy metals were below the maximum allowable levels for *Standard Residential Developments*. This category (Standard Residential) allows for developments with access to the soil including child care facilities. As such the heavy metals in the soil would not pose any significant risk to human health or the environment should the development proceed.

Comparing the detected levels of heavy metal with the acceptable background levels for Sydney soils as prescribed in the NEPM (Refer to Figure E) found the heavy metals to be within the acceptable levels. As the concentrations were relatively consistent across the entire site, these levels of heavy metals were considered to be naturally occurring and would not pose any significant risk to human health or the surrounding environment.

Figure F: Concentrations of Heavy Metal

Metal	C1	C2	C3	C4	Acceptable Background Level
Arsenic	<4	6	9	6	1 - 50
Beryllium	1	<1	<1	<1	NA
Boron	<3	<3	<3	<3	NA
Cadmium	<0.5	<0.5	<0.5	<0.5	1
Chromium	56	83	52	34	5 - 1000
Cobalt	2	2	2	2	1 - 40
Copper	5	2	2	6	2 - 100
Lead	17	14	15	14	2 - 200
Manganese	4	4	9	12	850
Mercury	<0.1	<0.1	<0.1	<0.1	0.03
Nickel	4	3	3	3	5 - 500
Zinc	2	2	4	11	10 - 300

Adapted from Envirolab Certificate of Analysis 32970
All levels recorded in mg/Kg

In addition to analysis for heavy metals, the recovered samples were analysed for the presence of a range of other potential contaminants including pesticides and hydrocarbons (Refer to Figure G). None of these contaminants were detected by the laboratory and as such can be considered as not being present in the soil. Given the low levels of heavy metals and non-presence of other contaminants it can be concluded the general soil on the site would not pose any significant risk to human health or the environment.

Figure G: Concentration of Other Potential Contaminants

Contaminant	C1	C2	C3	C4
Benzene	<DL	<DL	<DL	<DL
Toluene	<DL	<DL	<DL	<DL
Ethylbenzene	<DL	<DL	<DL	<DL
m+p – Xylene	<DL	<DL	<DL	<DL
o – Xylene	<DL	<DL	<DL	<DL
Total Volatile Petroleum Hydrocarbons (vTPH)	<DL	<DL	<DL	<DL
Total Semi Volatile Petroleum Hydrocarbons (sTPH)	<DL	<DL	<DL	<DL
Total Polycyclic Aromatic Hydrocarbons (PAH)	<DL	<DL	<DL	<DL
Total Organochlorine Pesticides (OCP)	<DL	<DL	<DL	<DL
Total Organophosphorus Pesticides (OPP)	<DL	<DL	<DL	<DL
Total Polychlorinated Biphenyls (PCB)	<DL	<DL	<DL	<DL
Total Phenolics	<DL	<DL	<DL	<DL

Adapted from Envirolab Certificate of Analysis 32970
<DL = below minimum level for detection by laboratory equipment

Conclusion and Recommendations

Initial assessment indicated the site has been previously used for agricultural purposes, predominately grazing for livestock such as cattle. This indicated the site had a low potential for significant contamination from activities on the site. Surrounding lands are also used for predominately agricultural or rural residential developments, with the exception of an automotive wrecking yard which is down gradient of the site and as such does not pose a risk of contaminants leaching into the soils on site.

Analysis of the composite soil samples recovered from the site indicated low levels of heavy metals were present in the soil. These levels were consistent across the entire site, indicating they do not originate from any isolated source. These levels were found to be below the HBILs for *Standard Residential Development* (a category with lower HBILs than the industrial classification required for the development) in accordance with the NEPM.

Further comparison of the concentrations of heavy metals found they were within the acceptable background levels for soils in the Sydney Basin as determined in the NEPM. As such the heavy metals in the soil can be considered as naturally occurring and would not pose any significant risk to human health or the environment.

No other potential contaminants (including hydrocarbons and pesticides) were detected in any of the recovered samples (Refer to Envirolab Certificate of Analysis 32970) indicating the site has not been significantly contaminated by activities on the site.

Based on this assessment Compaction and Soil Testing Services Pty Ltd has determined the site is suitable for the proposed development of an industrial style mushroom farm. The soil on site, though containing low levels of Heavy Metals will not pose any significant risk to human health or the surrounding environment in either the construction or occupation phase of the development. As such no further action is required on the site to allow the development to proceed.

It is our understanding that a significant amount of fill is to be placed on the site during construction of the development. Given all imported fill must be “clean” this material would not pose any risk to human health or the surrounding environment.

Although the site as a whole has been classified as suitable for the proposed development, the area formerly used as a piggery could potentially contain an isolated pocket of contamination due to the more intensive nature of pig farming.

As such Compaction and Soil Testing Services Pty Ltd has completed a detailed assessment of this area (Refer to Detailed Assessment of Pig Run Area). In the event there was significant contamination in this area, localised remedial works would be completed prior to proceeding with the development.

Detailed Assessment of Pig Run Area

As identified in the preliminary investigation (Refer to Site Conditions), one paddock in the property contains a steel structure that had formerly been used for the rearing of pigs. Given this previous land use, this portion of the site has a higher risk of contamination than the rest of the site due to the more intensive manner in which pigs are reared.

As such Compaction and Soil Testing Services Pty Ltd has completed a detailed assessment on this isolated area within the site to determine if this area has been significantly contaminated by previous activities.

In order to complete the assessment the following works were completed by a technician from Compaction and Soil Testing Services Pty Ltd:

- Review of Pig Run Area,
- Identify the potential contaminants for this area of the site,
- Excavation of four (4) bore holes around the pig run area,
- Recovery of four (4) discrete soil samples for analysis,
- Laboratory analysis of the recovered samples by a NATA accredited laboratory,
- Review of laboratory analysis, to determine if there were any contaminants present,
- Report conclusions and recommendations

The field works were completed 07 September 2009 by technicians from Compaction and Soil Testing Services Pty Ltd with the recovered soil samples received by the chemical analysis laboratory on 08 September 2009 under stringent chain of custody conditions.

Chemical analysis was completed by Envirolab Services Pty Ltd, a laboratory accredited (Accreditation No.: 2901) with the National Association of Testing Authorities (NATA). Envirolab Services Pty Ltd was chosen to complete the laboratory analysis due to their previous experience with form of analysis and the detailed quality control and quality assurance procedures they implement during the analysis (Refer to details in report). As such the laboratory results can be considered as an accurate representation of the recovered material.

Area of Concern

The area of concern identified in the preliminary investigation is located in a paddock just to the rear of the residential dwelling (Refer to Figure H). This area contained the former pig run structure and the surrounding grazing area. This is the area where the pigs had previously been reared, though at the time of the investigation there was no visible evidence (such as faecal matter or foot prints) of the pigs in the area. This indicated it had been some time since pigs had been reared in the area.

Figure H: Area of Concern



Compaction and Soil Testing Services Pty Ltd excavated eleven (11) boreholes in the area to determine the sub-surface conditions and to identify if there was any visible contamination in the sub-surface material. Upon visual inspection there was very little evidence that would suggest the soil was contaminated.

In general the sub-surface material consisted of Silty Clays (Refer to attached Bore Logs). Some of this material was natural soil while other material was identified as fill imported (around the dam). There was no dark staining on the surface of the soil and upon excavation there were no odours that could indicate the soil was significantly contaminated.

The structure visible in Figure H was in very good condition with only limited evidence of corrosion. Even so there is the potential for some heavy metals (predominately Zinc) to have leached into the soil as the structure slowly corrodes. As such the structure poses a risk of contaminating the soil.

Potential Contaminants of Concern

Using the *Contaminated Site Management Series; Potentially Contaminating Activities, Industries and Landuses 2004* (Department of Environment – Government of Western Australia) Compaction and Soil Testing Services Pty Ltd has identified the most probable contaminants that could be present within the soils on the site. This is based on the land having previously been used for the grazing of livestock including pigs and cattle.

The potential contaminants of concern for this site have been identified as:

- Heavy Metals
- Carbamates
- Organochlorine Pesticides (OCP)
- Organophosphate Pesticides (OPP)
- Herbicides
- Synthetic Pyrethroids

As identified in the preliminary investigation, low levels of heavy metals are naturally occurring within the soils on this site. As such it was expected that some low levels of heavy metals were likely to be present in the soil, however should elevated levels be present, they could pose a significant risk to human health and the surrounding environment. As such the recovered soil samples were assessed bearing in mind the previously encountered heavy metals on site.

The other potential contaminants identified are not naturally occurring and can pose a significant risk to human health or the surrounding environment if encountered in elevated concentrations. Many of these potential contaminants were previously used by farmers to control pests on both the land and livestock. Some the identified contaminants (such as OCP and OPP) degrade very slowly and can often been found many years after they ceased to be used.

Provided there were no significant concentrations of contaminants detected in the soil, the development could proceed without further action as noted in the **Preliminary Investigation**. However, in the event that significant levels of contaminants are detected, further assessment and remedial action would be necessary.

Assessment Criteria

As with the preliminary investigation, Compaction and Soil Testing Services Pty Ltd has used the Health Based Investigation Levels (HBILs) identified by the National Environmental Protection Council (NEPC) in the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* – Table 5A.

As with the preliminary assessment, the soil samples recovered from the site will be assessed against the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (NEPM) HBILs for commercial/industrial developments and acceptable background levels for Sydney (Refer to Figure I). Provided the recovered soil samples do not contain concentrations above these levels, no further action will be required for the proposed development to continue.

Figure I: NEPC Health Based Investigation Levels

Metal/Metalloids	**Health Investigation Level**		**Background Ranges**
	Residential	***Industrial***	
Arsenic (Total)	100 mg/Kg	500mg/Kg	1-50mg/Kg
Cadmium	20 mg/Kg	100mg/Kg	1mg/kg
Chromium(VI)	100mg/Kg	500mg/Kg	5-1000mg/kg (Total)
Copper	1000mg/Kg	5000mg/Kg	2-100mg/Kg
Lead	300mg/Kg	1500mg/Kg	2-200mg/Kg
Mercury (inorganic)	15mg/Kg	75mg/Kg	0.03mg/Kg
Nickel	600mg/Kg	3000mg/Kg	5-500mg/Kg
Zinc	7000mg/Kg	35000mg/Kg	10-300mg/Kg

*Adapted from Table 5A from **National Environmental Protection Council's** National Environmental Protection (Assessment of Site Contamination) Measure 1999.

Soil Sampling Process

In order to assess the pig run area, further soil sampling has been completed in the area in order to determine if the pig run or activities associated with it have had a detrimental effect on the soils within the site. A total of four (4) discrete soil samples were recovered from around the pig run (Refer to Drawing ELF 677-2).

These samples were recovered from approximately 200mm below the surface level using a decontaminated mechanical auger to excavate a borehole approximately 100mm in diameter. The sample was recovered from the bottom of the borehole using a decontaminated stainless steel trowel to transfer the material from the borehole into a laboratory supplied 250mL glass jar. Once the sample was recovered the sample jars were sealed with a teflon lid and labeled prior to being placed into a chilled container for transport to our primary laboratory.

The decontamination process of objects included:

- Removal of soils adhering to the object by scrubbing with a brush.
- Washing the object thoroughly in a solution of phosphate free detergent (Decon 90).
- Rinsing the object thoroughly with potable water.
- Drying the object with a clean cloth.

Upon arrival at our laboratory the glass jars were transferred to a refrigerator to maintain a temperature below 4°C.

The following day, the sealed glass jars were placed in the chilled container and forwarded to the primary laboratory (Envirolab Services Pty Ltd) a NATA registered laboratory, under Chain of Custody (COC) conditions.

Upon receipt of the samples, the laboratory returned the Sample Receipt Confirmation, verifying the integrity of all the samples received.

Within the following holding times, detailed in Schedule B (3) of The *National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM)* by the National Environment Protection Council (NEPC), the discrete and composite samples were analysed:

ANALYTE	HOLDING TIME
Heavy Metals *	6 months
Mercury	28 days
Organochlorine Pesticides (OCP)	14 days

* Heavy Metals include As, Cd, Cr, Cu, Pb, Ni and Zn

NA: Not Applicable

Heavy Metals include arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni) and zinc (Zn)

OCP = Organochlorine Pesticides

Laboratory Quality Assurances and Quality Control

Envirolab Services Pty Ltd is registered by NATA for Chemical Testing (Reg.No:**2901**) and Quality System compliance to ISO/IEC 17025. For this reason they were deemed as suitably qualified to conduct the assessment of these soil samples.

Quality Assurance Procedures

As Envirolab Services Pty Ltd is a NATA accredited laboratory they must conform to a variety of quality assurance procedures. Quality control samples included in any analytical run are listed below.

Reagent Blank

Sample free reagents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every sample batch analysis. For larger projects, a reagent blank is prepared and analysed with every 20 samples.

Matrix Spike Duplicates

Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction/digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water (or Milli-Q water) may be used. A duplicate spiked sample is prepared at least every 20 samples.

Surrogate Spike

Added to all samples requiring analysis for organics (where relevant) prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples.

Internal Standard

Added to all samples requiring analysis for organics (where relevant) after the extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run-to-run with the instruments.

Duplicate

A separate portion of a sample being analysed which is treated the same as the other samples in the batch. A duplicate is prepared at least every 20 samples.

Control Standards

Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity.

Additional QC Samples

A calibration standard and blank are run after every 20 samples of an instrumental analysis run to assess analytical drift.

Statistical Analysis of QC Data

Quality control data is plotted on control charts using the APHA procedure with warning and control limits at 2 and 3 standard deviations respectively.

Certified Reference Materials

Certified Reference Materials and Standards are regularly placed in the system as blind samples. These materials/standards have certified reference values for various parameters.

Proficiency Testing

Regular proficiency test samples are analysed by our laboratories. Envirolab Services Pty Ltd participates in a number of programs. Results and proficiency status are compiled and sent to participating laboratory post data interpretation. Failure to comply with acceptable values result in further investigations.

Interlaboratory/Intralaboratory Testing

Envirolab Services Pty Ltd has schedules in the Quality Systems to participate in Inter/Intra laboratory testing conducted internally and by other parties.

Failure to meet the internal acceptance criteria will result in sample/sample batch repeat.

Compaction and Soil Testing Services Pty Ltd has checked the QA/QC procedures adopted by the laboratory against the appropriate guidelines. The quality control sample numbers adopted by Envirolab Services Pty Ltd are considered to be adequate for the analyses undertaken and conform to the recommendations provided in the National Environment Protection Measure (NEPM) 1999 "*Guideline on Laboratory Analysis of Potentially Contaminated Soils*" and Australian and New Zealand Environment and Conservation Council (ANZECC)-1996 "*Guidelines for the Laboratory Analysis of Contaminated Soils*".

Overall, the quality control elements indicate that the analytical data fall within acceptable levels of accuracy and precision for the analysis of soils and water. The analytical data provided are therefore considered reliable and useable for this assessment.

Results of Soil Sample Analysis

Laboratory analysis of the recovered samples detected low levels of heavy metals present within the pig run area (Refer to Figure J). The detected levels of heavy metals were relatively consistent with those levels found in the preliminary assessment and were within the acceptable background levels (Refer to Figure J).

Figure J: Concentrations of Heavy Metal

Metal	S1	S2	S3	S4	Acceptable Background Level
Arsenic	9	8	7	10	1 - 50
Beryllium	1	1	<1	1	NA
Boron	<3	<3	<3	<3	NA
Cadmium	<0.5	<0.5	<0.5	<0.5	1
Chromium	47	57	53	74	5 - 1000
Cobalt	3	2	2	5	1 - 40
Copper	11	3	4	21	2 - 100
Lead	30	18	16	27	2 - 200
Manganese	87	8	20	110	850
Mercury	<0.1	<0.1	<0.1	<0.1	0.03
Nickel	6	4	4	4	5 - 500
Zinc	150	20	37	9	10 - 300

Adapted from Envirolab Certificate of Analysis 32969
All levels recorded in mg/Kg

However there were four exceptions, where the concentrations of heavy metals detected were higher than those found in the preliminary assessment. These were as follows:

- Slightly higher concentrations of Copper in S1 and S4,
- Slightly higher concentrations of Lead in S1 and S4,
- Higher concentrations of Manganese in all samples,
- Higher concentrations of Zinc in all samples

These levels, though still below the acceptable natural levels, were considered higher than the rest of the site. The levels of Copper and Lead were most likely originating from very small isolated “hotspots” as there were no identifiable sources for these metals seen onsite. As these levels were only slightly above those found in the preliminary assessment and within the acceptable background levels they can be considered as naturally occurring and would not pose any significant risk to human health or the surrounding environment.

The levels of Manganese and Zinc present in the soil were consistently higher across the affected area than was found in the preliminary assessment. These substances are present in steel and corrugated iron/steel roofing, and as such it is possible these heavy metals originate from the corrosion of the existing structure.

When the concentrations of all the heavy metals were compared with the HBILs for industrial developments they were found to be below the maximum allowable levels for industrial developments, indicating the soils in this area would be suitable for this development.

Additional comparisons found the levels of heavy metals detected were below the maximum allowable levels for *Standard Residential Developments*. This category (Standard Residential) allows for developments with access to the soil including child care facilities. As such the heavy metals in the soil would not pose any significant risk to human health or the environment should the development proceed.

The recovered samples were also analysed for the presence of a range of other potential contaminants previously identified in this assessment (Refer to **Potential Contaminants of Concern**). The laboratory could not detect any levels of any of these contaminants (Refer to Figure K) present in the samples, indicating they were not present in the identified area. Based on these results it could be concluded this area of the site has not been adversely affected by previous activities.

Figure K: Concentrations of Other Potential Contaminants

Contaminant	Units	S1	S2	S3	S4
Total Organochlorine Pesticides (OCP)	mg/Kg	<DL	<DL	<DL	<DL
Total Organophosphorus Pesticides (OPP)	mg/Kg	<DL	<DL	<DL	<DL
Total Polychlorinated Biphenyls (PCB)	mg/Kg	<DL	<DL	<DL	<DL
Total Carbamates	mg/Kg	<DL	<DL	<DL	<DL
Total Herbicides (Phenoxy)	mg/Kg	<DL	<DL	<DL	<DL
Total Synthetic Pyrethroids	mg/Kg	<DL	<DL	<DL	<DL

Adapted from Envirolab Certificate of Analysis 32969
<DL = below minimum level for detection by laboratory equipment

Conclusion and Recommendations

The preliminary investigation of the site identified this area of the site as being of higher risk of contamination due its previous use to raise pigs. Additionally this area contained an older steel structure with some visible evidence of corrosion, which posed a risk of introducing significant levels of heavy metals into the soil.

At the time of the investigation there was no visual evidence of pigs in the area, suggesting it had been a significant period of time since pigs were present on the site. The steel structure, though showing evidence of corrosion, was in general in very good condition, and did not appear to have been painted in high gloss paint (a potential source of lead).

The sub-surface soil exposed during the excavation of the boreholes did not emit any odours that could indicate contamination, and there was no dark staining on either the soil surface or in any of the sub-surface material.

Laboratory analysis of the recovered soil samples identified some levels of heavy metals higher than those encountered in the preliminary investigation (Refer to **Results of Soil Sample Analysis**). Of these levels detected, in was concluded the copper and lead were small isolated "hotspots" of naturally occurring metals, as these levels were only marginally above the levels previously encountered, and were within the acceptable background levels as prescribed in the NEPM.

Manganese and Zinc were also detected at higher levels than detected in the preliminary investigation, indicating there was a source of these metals in the affected area. It was concluded these metals originate from the corrosion of the existing steel structure. Given this structure will be demolished during the development, the source of the manganese and zinc with will removed and as such the concentration will not rise.

The levels of heavy metals detected did not exceed the HBILs for commercial/industrial developments and as such would not affect this development proceeding. Further comparisons showed the concentrations of heavy metals present were below the HBILs for *Standard Residential Development* and as such would pose no risk to human health or the surrounding environment.

None of the other identified potential contaminants (including hydrocarbon and pesticides) were detected by the laboratory (Refer to attached Envirolab Certificate of Analysis 32969) suggesting these substances were not present in the soil on site. As such the soil in this area will not pose any risk to human health or the surrounding environment.

Based on this investigation, Compaction and Soil Testing Services Pty Ltd has determined the former pig run area does not pose a risk to human health or the surrounding environment, and as such would not affect the construction and occupation phases of the proposed development. Given these findings, no further assessment or remedial action is required for the project to proceed.

Final Conclusions and Recommendations

Though the soils on the site contain low levels concentrations of heavy metals, these levels were below the health based investigation levels for residential developments (as determined by the National Environmental Protection Council – *National Environmental Protection {Assessment of Site Contamination} Measure 1999*). As such the heavy metals do not pose any significant risk to human health or the environment. No other contaminants were detected by the laboratory and as such it has been determined the soil has not been contaminated by any of the previous activities on the site.

Based on the preliminary and detailed contamination assessments, Compaction and Soil Testing Services Pty Ltd has determined that the site has not been contaminated by previous activities on the site or surrounding sites.

The soil onsite was found to comply the health based investigation levels (HBILs) for *Standard Residential Development* as noted in the ***National Environmental Protection (Assessment of Site Contamination) Measure 1999***. As such the site can be considered as suitable for the proposed development of and industrial style mushroom growing farm as proposed by ELF Mushrooms.

Based on the investigation Compaction and Soil Testing Services Pty Ltd has concluded the site is suitable for the proposed development as an industrial style mushroom farm. No further investigation or remedial action is required on the site to allow the project to proceed.

It is our understanding the project will require the importing and placing of a significant amount of material. This fill must be free of contaminants and classified as suitable for use as fill material by a suitable qualified environmental technician. It is our understanding this material is to be placed over the existing soils to bring the site up to a suitable level for the development. Compaction and Soil Testing Services Pty Ltd would recommend the existing material be compacted to a suitable level as determined by a qualified geotechnical engineer prior to any new fill being placed to ensure the stability of the soil.

Limitations

This report covers the site for at the time of sampling (07 September 2009). As such the conclusions drawn in this assessment as based on the site conditions of that date and would not take into account any incidents on site since that date. Should there be any variations in site conditions since the above mentioned date, such as importation of fill, chemical spillage, illegal dumping, etc, Compaction and Soil Testing Services Pty Ltd would be required to complete further assessment to determine if the conclusions were still valid.

Neither Compaction and Soil Testing Services Pty Ltd nor any other reputable firm can give unqualified warranties on the conditions of the site and subsurface conditions.

While Compaction and Soil Testing Services Pty Ltd takes all reasonable due care and diligence, we offer no absolute warranty for the material between the locations sampled and investigated.

In addition Compaction and Soil Testing Services Pty Ltd does not assume any liability for site conditions not observed or accessible at the time of the investigation.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. If there is any change in the proposed development described in the report then all recommendation should reviewed. No other warranty expressed or implied is made or intended. Copyright on this report remains the property of Compaction and Soil Testing Services Pty Ltd.

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Should you have any queries about the methodology, findings, conclusions or recommendations of these assessments please do not hesitate to contact our office on (02) 9675 7522.

Yours Sincerely



Aaron Ridley
B. App Sc – Environmental Management
Environmental Consultant

Reviewed by



Prakash Chandra
OMIE Aust. Assoc Dip Civil Eng
Senior Geotechnician/Director

Ancillary Documents and Drawings

C.S.T.S.

Compaction & Soil Testing Services Pty Limited

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Email: office@comsoiltest.com.au Web: www.comsoiltest.com.au

NATA
Accreditation
No: 15121

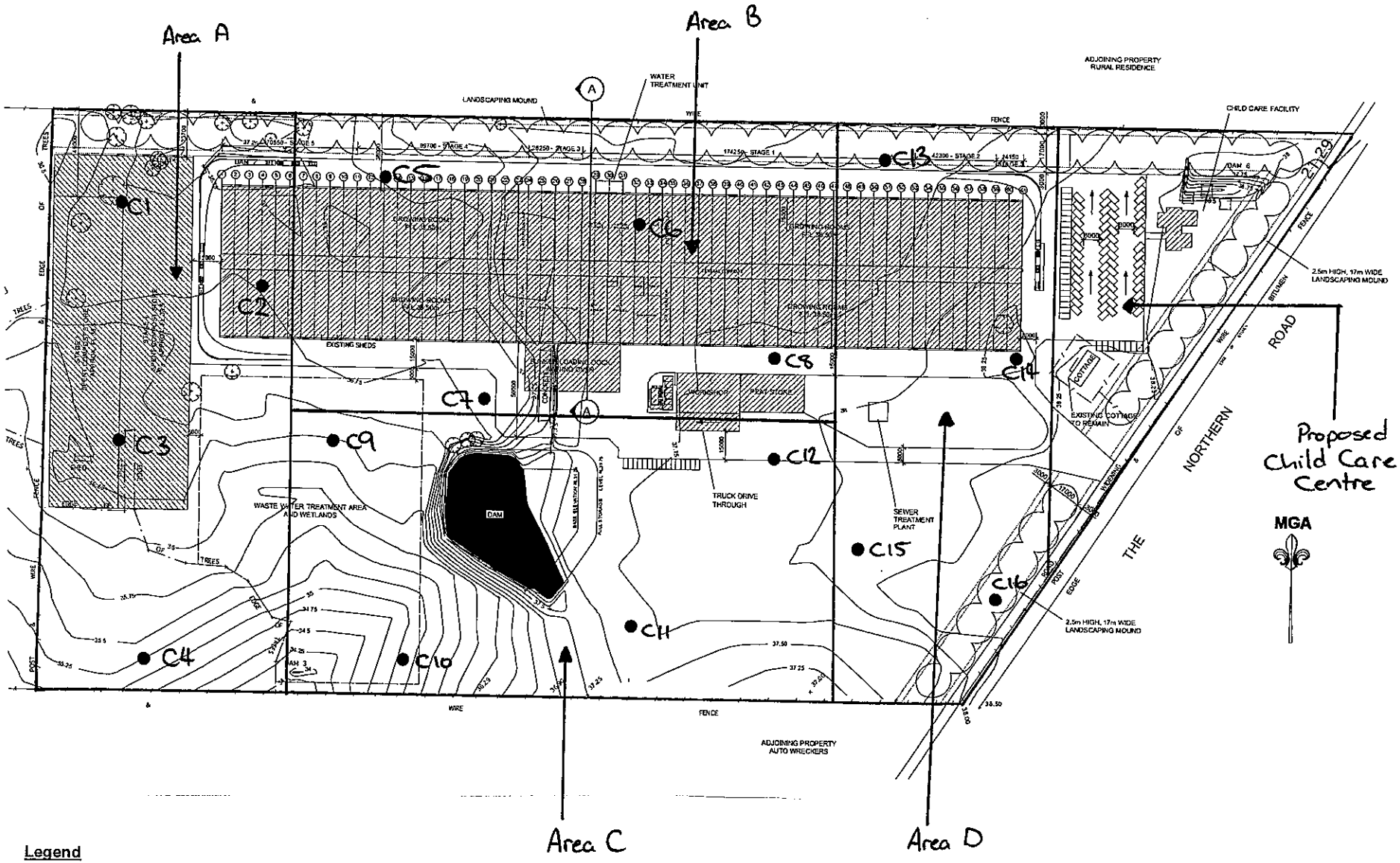
Attachment 1

Site Drawings/Soil Sample Location maps

ELF 677-1 – Composite Soil Sample Locations
(Preliminary Investigation)

ELF 677-2 – Discrete Soil Sample Locations
(Detailed Investigation)

ELF 677-3 – Borehole Locations
(Detailed Investigation)



Legend

- Composite Sub-Sample Locations

Compaction and Soil Testing Services Pty Ltd

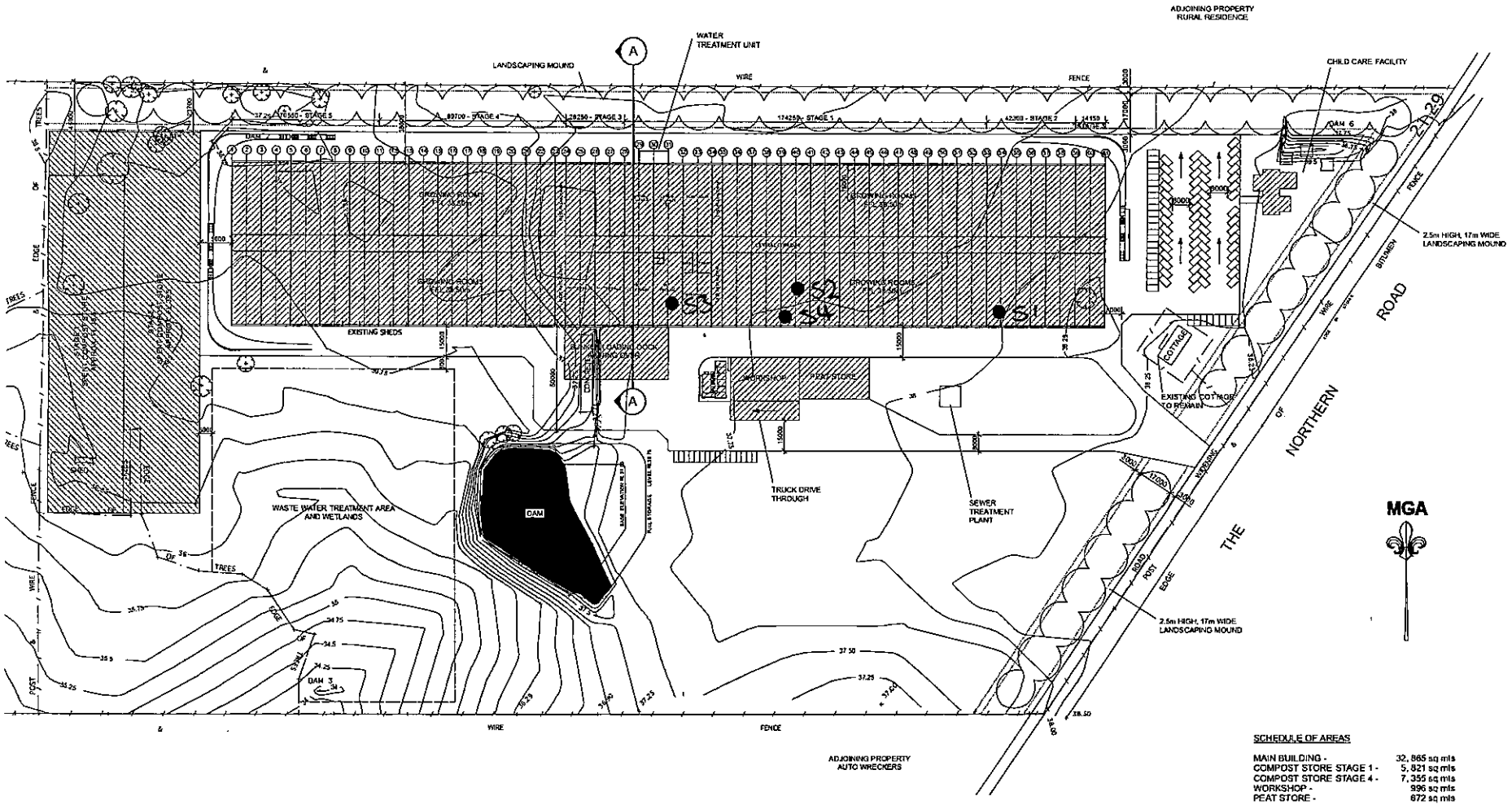
CSTS

Notes: *This drawing has been produced using a base plan provided by others to which additional information e.g.: density test, DCP and Test Pit locations or notes have been added. Some or all the information shown on the plan may not be relevant at the time of producing this drawing.*

Drawn:	AR
Approved:	NG
Date:	07/09/2009
Scale:	Not to Scale

ELF Mushrooms
Proposed Mushroom Farm
The Northern Road, Londonderry
Composite Sub-Sample Locations

Drawing No:	ELF 677-1
Job No:	ELF 677



SCHEDULE OF AREAS

MAIN BUILDING -	32, 865 sq mts
COMPOST STORE STAGE 1 -	5, 821 sq mts
COMPOST STORE STAGE 4 -	7, 355 sq mts
WORKSHOP -	996 sq mts
PEAT STORE -	672 sq mts

Legend

- Discrete Soil Sample Locations

Compaction and Soil Testing Services Pty Ltd

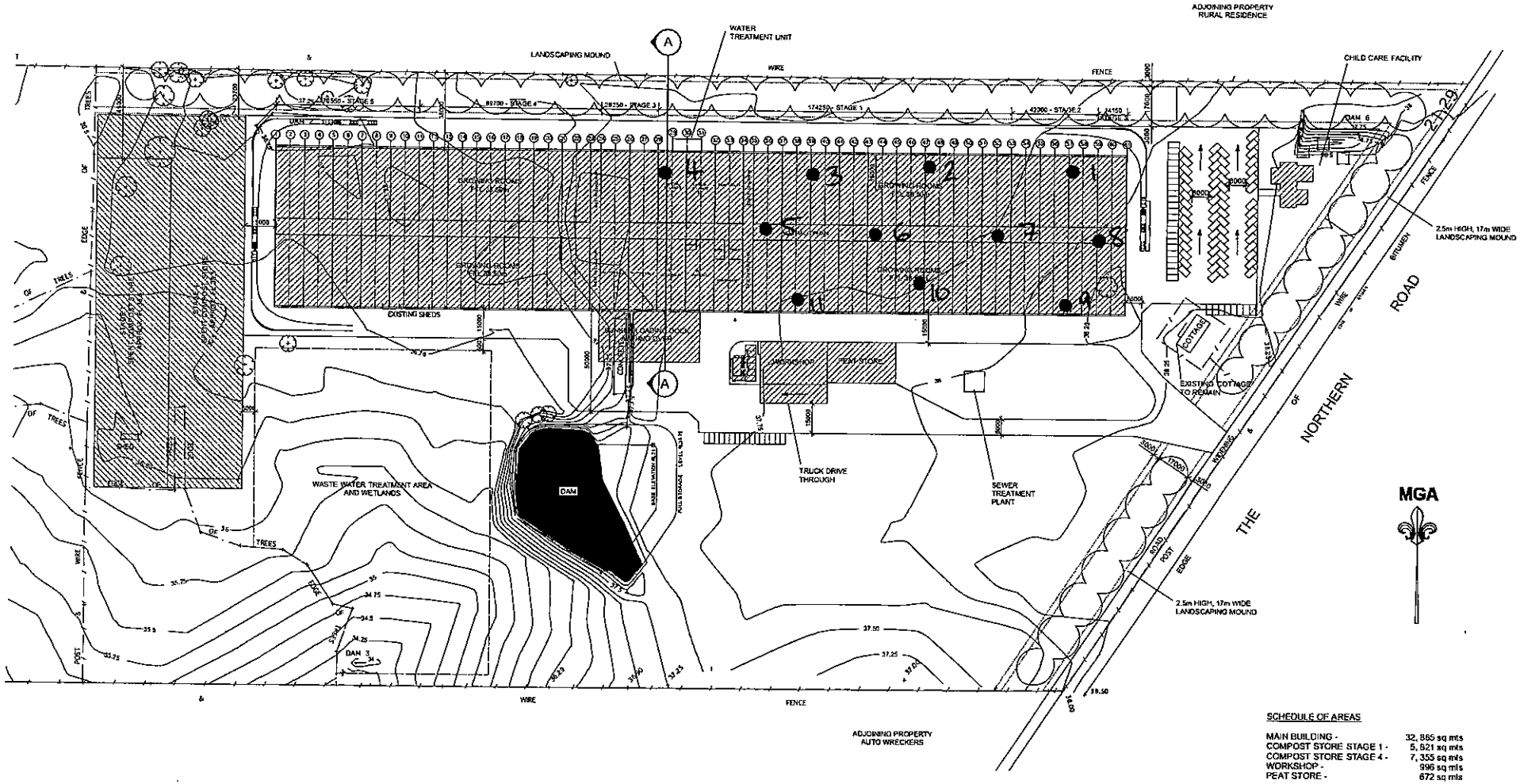
CSTS

Notes: *This drawing has been produced using a base plan provided by others to which additional information e.g.: density test, DCP and Test Pit locations or notes have been added. Some or all the information shown on the plan may not be relevant at the time of producing this drawing.*

Drawn:	AR
Approved:	NG
Date:	07/09/2009
Scale:	Not to Scale

ELF Mushrooms
Proposed Mushroom Farm
The Northern Road, Londonderry
Discrete Soil Sample Locations

Drawing No:	ELF 677-2
Job No:	ELF 677



SCHEDULE OF AREAS

MAIN BUILDING -	32, 865 sq mts
COMPOST STORE STAGE 1 -	5, 521 sq mts
COMPOST STORE STAGE 4 -	7, 355 sq mts
WORKSHOP -	996 sq mts
PEAT STORE -	672 sq mts

Legend

● Bore Hole Locations

Compaction and Soil Testing Services Pty Ltd

CSTS

Notes: *This drawing has been produced using a base plan provided by others to which additional information e.g.: density test, DCP and Test Pit locations or notes have been added. Some or all the information shown on the plan may not be relevant at the time of producing this drawing.*

Drawn:	AR
Approved:	NG
Date:	07/09/2009
Scale:	Not to Scale

ELF Mushrooms
Proposed Mushroom Farm
The Northern Road, Londonderry
Bore Hole Locations

Drawing No:	ELF 677-3
Job No:	ELF 677

C.S.T.S.

Compaction & Soil Testing Services Pty Limited

1/78 Owen Street, GLENDENNING NSW 2761 • ABN 44 106 976 738
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NATA
Accreditation No: 15121

Attachment 2

New South Wales Government – Department of Lands Records

Title Search – Lot 138 DP No.: 752037

Historical Search – Lot 138 DP No.: 752037

Land and Property Management Authority

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 138/752037

SEARCH DATE	TIME	EDITION NO	DATE
10/9/2009	2:36 PM	3	22/4/2009

LAND

LOT 138 IN DEPOSITED PLAN 752037
LOCAL GOVERNMENT AREA PENRITH
PARISH OF LONDONDERRY COUNTY OF CUMBERLAND
(FORMERLY KNOWN AS PORTION 138)
TITLE DIAGRAM CROWN PLAN 2098.2030

FIRST SCHEDULE

D.W. TOLSON MANAGEMENT PTY LIMITED (T AB754644)

SECOND SCHEDULE (3 NOTIFICATIONS)

1 LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)
2 EXCEPTING LAND BELOW A DEPTH FROM THE SURFACE OF 15.24 METRES
3 M704279 RESTRICTION ON USER (S.27E(6) MAIN ROADS ACT, 1924) BEING LOT 11 IN DP240590

NOTATIONS

UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Land and Property Management Authority

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE
10/9/2009 2:24PM

FOLIO: 138/752037

First Title(s): SEE PRIOR TITLE(S)
Prior Title(s): VOL 11048 FOL 36

Recorded	Number	Type of Instrument	C.T. Issue
3/12/1988		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
11/1/1989		CONVERTED TO COMPUTER FOLIO	FOLIO CREATED CT NOT ISSUED
25/11/1998	5421054	DEPARTMENTAL DEALING	
19/9/2003	9991035	TRANSMISSION APPLICATION	EDITION 1
8/9/2005	AB754644	TRANSFER	
8/9/2005	AB754645	MORTGAGE	EDITION 2
22/4/2009	AE624602	DISCHARGE OF MORTGAGE	EDITION 3

*** END OF SEARCH ***

C.S.T.S.

Compaction & Soil Testing Services Pty Limited

1/78 Owen Street, GLENDENNING NSW 2761 • ABN 44 106 976 738
Phone: (02) 9675 7522 Fax: (02) 9675 7544
Email: office@comsoiltest.com.au Web: www.comsoiltest.com.au

NATA
Accreditation
No: 15121

Attachment 3

Envirolab Services Pty Ltd Documents – Preliminary Investigation

Sample Receipt – Envirolab Reference No.: 32970

Chain of Custody Document

Certificate of Analysis – Envirolab Reference No.: 32970

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Compaction and Soil Testing
Unit 1, 78 Owen St
Glendenning NSW 2761

ph: 9675 7522
Fax: 9675 7544

Attention: Aaron Ridley

Sample log in details:

Your reference:	**ELF677**
Envirolab Reference:	**32970**
Date received:	08/09/09
Date results expected to be reported:	**15/09/09**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	4 Soils
Turnaround time requested:	Standard
Temperature on receipt	Cool
Cooling Method:	Ice Pack

Comments:

Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

Compaction and Soil Testing Services Pty Ltd

Laboratory Test Request

Job No ELF 677

Sheet 1 of 1

Project: ELF Mushrooms
Location: Londonderry

CSTS Contact Person: Aaron Ridley
☐ **Tested material to be disposed off site (EPA Validation)**

Date Requested: 8/9/09
Requested by: AR
Date Required by: Normal T.A

Laboratory Reference No.	Sample Identification	Sample type	Test Method Requested - Test Required (/) Test completed (X)																				Additional Test Details	Notes:
	e.g. BH / TP No. Depth , & sample No. client reference No. sample location.	i.e. U50, or D for disturbed samples. S: Soil W: Water R: Rock	13 metals	oc/op/PCB	PAH	TPH+BTEX	Phenols																i.e. degree of compaction for CBR, confining pressures for triaxial, etc.	
1	C1	S	/	/	/	/	/																	
2	C2	S	/	/	/	/	/																	
3	C3	S	/	/	/	/	/																	
4	C4	S	/	/	/	/	/																	

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: 9910 6200

Job No: 32970
Date received: 8/9/09
Time received: 1:37
Received by: EG
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Date Reliquished: 8/9/09	**Samples Received:** Arleen 625	**Send results to:**	
Reliquished By: AR	Please sign and date to acknowledge receipt of and return by fax.	Compaction & Soil Testing Services Pty Ltd	Phone: (02) 96757522
Total number of samples in container: 4	**Date:** 8/9/09 1:37	Unit 1/78 Owen Street	Fax: (02) 96757544
Results required by: Normal T.A	**Signature:** AH	Glendenning NSW 2761	

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 32970

Client:
Compaction and Soil Testing
Unit 1, 78 Owen St
Glendenning
NSW 2761

Attention: Aaron Ridley

Sample log in details:

Your Reference:	**ELF677**
No. of samples:	4 Soils
Date samples received:	08/09/09
Date completed instructions received:	08/09/09

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	15/09/09
Date of Preliminary Report:	Not Issued
Issue Date:	11/09/09

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This document is issued in accordance with NATA's accreditation requirements.
Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

Jacinta Hurst
Operations Manager

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

vTPH & BTEX in Soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32970-1 C1 Soil	32970-2 C2 Soil	32970-3 C3 Soil	32970-4 C4 Soil
Date extracted	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
vTPH C_6 - C_9	mg/kg	<25	<25	<25	<25
Benzene	mg/kg	<0.5	<0.5	<0.5	<0.5
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1.0	<1.0	<1.0	<1.0
m+p-xylene	mg/kg	<2.0	<2.0	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0	<1.0	<1.0
Surrogate aaa-Trifluorotoluene	%	99	89	95	110

NATA
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TECHNICAL
COMPETENCE

sTPH in Soil (C10-C36) Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32970-1 C1 Soil	32970-2 C2 Soil	32970-3 C3 Soil	32970-4 C4 Soil
Date extracted	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
TPH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50
TPH C_{15} - C_{28}	mg/kg	<100	<100	150	<100
TPH C_{29} - C_{36}	mg/kg	<100	<100	830	<100
Surrogate o-Terphenyl	%	111	112	120	114

NATA
ACCREDITED FOR
TECHNICAL
COMPETENCE

PAHs in Soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32970-1 C1 Soil	32970-2 C2 Soil	32970-3 C3 Soil	32970-4 C4 Soil
Date extracted	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-d_{14}	%	103	110	87	120

NATA
ACCREDITED FOR
TECHNICAL
COMPETENCE

Organochlorine Pesticides in soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32970-1 C1 Soil	32970-2 C2 Soil	32970-3 C3 Soil	32970-4 C4 Soil
Date extracted	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	72	100	63	71

Organophosphorus Pesticides Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32970-1 C1 Soil	32970-2 C2 Soil	32970-3 C3 Soil	32970-4 C4 Soil
Date extracted	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	72	100	63	71

PCBs in Soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32970-1 C1 Soil	32970-2 C2 Soil	32970-3 C3 Soil	32970-4 C4 Soil
Date extracted	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	72	100	63	71

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Total Phenolics in Soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32970-1 C1 Soil	32970-2 C2 Soil	32970-3 C3 Soil	32970-4 C4 Soil
Date extracted	-	10/09/2009	10/09/2009	10/09/2009	10/09/2009
Date analysed	-	11/09/2009	11/09/2009	11/09/2009	11/09/2009
Total Phenolics (as Phenol)	mg/kg	<5.0	<5.0	<5.0	<5.0

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Acid Extractable metals in soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32970-1 C1 Soil	32970-2 C2 Soil	32970-3 C3 Soil	32970-4 C4 Soil
Date digested	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Arsenic	mg/kg	<4	6	9	6
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	56	83	52	34
Copper	mg/kg	5	2	2	6
Lead	mg/kg	17	14	15	14
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	4	3	3	3
Zinc	mg/kg	2	2	4	11
Boron	mg/kg	<3	<3	<3	<3
Beryllium	mg/kg	1	<1	<1	<1
Cobalt	mg/kg	2	2	2	2
Manganese	mg/kg	4	4	9	12

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Moisture Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32970-1 C1 Soil	32970-2 C2 Soil	32970-3 C3 Soil	32970-4 C4 Soil
Date prepared	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Moisture	%	22	11	9.3	12

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Method ID	Methodology Summary
GC.16	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS.
GC.3	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.
GC.12 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
GC-5	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
GC.8	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
GC-6	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
LAB.30	Total Phenolics - determined colorimetrically following disitillation.
Metals.20 ICP-AES	Determination of various metals by ICP-AES.
Metals.21 CV-AAS	Determination of Mercury by Cold Vapour AAS.
LAB.8	Moisture content determined by heating at 105 deg C for a minimum of 4 hours.

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QUALITY CONTROL vTPH & BTEX in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
Date analysed	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
vTPH C_6 - C_9	mg/kg	25	GC.16	<25	[NT]	[NT]	LCS-1	86%
Benzene	mg/kg	0.5	GC.16	<0.5	[NT]	[NT]	LCS-1	103%
Toluene	mg/kg	0.5	GC.16	<0.5	[NT]	[NT]	LCS-1	66%
Ethylbenzene	mg/kg	1	GC.16	<1.0	[NT]	[NT]	LCS-1	81%
m+p-xylene	mg/kg	2	GC.16	<2.0	[NT]	[NT]	LCS-1	90%
o-Xylene	mg/kg	1	GC.16	<1.0	[NT]	[NT]	LCS-1	86%
Surrogate aaa-Trifluorotoluene	%		GC.16	114	[NT]	[NT]	LCS-1	77%

QUALITY CONTROL sTPH in Soil (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
Date analysed	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
TPH C_{10} - C_{14}	mg/kg	50	GC.3	<50	[NT]	[NT]	LCS-1	101%
TPH C_{15} - C_{28}	mg/kg	100	GC.3	<100	[NT]	[NT]	LCS-1	112%
TPH C_{29} - C_{36}	mg/kg	100	GC.3	<100	[NT]	[NT]	LCS-1	108%
Surrogate o-Terphenyl	%		GC.3	114	[NT]	[NT]	LCS-1	105%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
Date analysed	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
Naphthalene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	LCS-1	89%
Acenaphthylene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	LCS-1	89%
Phenanthrene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	LCS-1	99%
Anthracene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	LCS-1	95%
Pyrene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	LCS-1	100%

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QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Benzo(a)anthracene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	LCS-1	95%
Benzo(b+k)fluoranthene	mg/kg	0.2	GC.12 subset	<0.2	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	GC.12 subset	<0.05	[NT]	[NT]	LCS-1	85%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	GC.12 subset	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		GC.12 subset	103	[NT]	[NT]	LCS-1	93%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
Date analysed	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
HCB	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	88%
gamma-BHC	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	110%
Heptachlor	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	87%
delta-BHC	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	84%
Heptachlor Epoxide	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	94%
gamma-Chlordane	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	113%
Dieldrin	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	94%
Endrin	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	96%
pp-DDD	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	120%
Endosulfan II	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	91%
Methoxychlor	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		GC-5	82	[NT]	[NT]	LCS-1	85%

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QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
Date analysed	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
Diazinon	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	[NR]	[NR]
Dimethoate	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos-methyl	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	[NR]	[NR]
Ronnel	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	LCS-1	112%
Fenitrothion	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	LCS-1	116%
Bromophos-ethyl	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	[NR]	[NR]
Ethion	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	LCS-1	130%
Surrogate TCLMX	%		GC.8	82	[NT]	[NT]	LCS-1	78%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
Date analysed	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
Arochlor 1016	mg/kg	0.1	GC-6	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	GC-6	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	GC-6	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	GC-6	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	GC-6	<0.1	[NT]	[NT]	LCS-1	83%
Arochlor 1260	mg/kg	0.1	GC-6	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		GC-6	82	[NT]	[NT]	LCS-1	96%

QUALITY CONTROL Total Phenolics in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			10/09/09	[NT]	[NT]	LCS-1	10/09/09
Date analysed	-			11/09/2009	[NT]	[NT]	LCS-1	11/09/2009
Total Phenolics (as Phenol)	mg/kg	5	LAB.30	<5.0	[NT]	[NT]	LCS-1	90%

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QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date digested	-			9/9/09	[NT]	[NT]	LCS-1	9/9/09
Date analysed	-			9/9/09	[NT]	[NT]	LCS-1	9/9/09
Arsenic	mg/kg	4	Metals.20 ICP-AES	<4	[NT]	[NT]	LCS-1	92%
Cadmium	mg/kg	0.5	Metals.20 ICP-AES	<0.5	[NT]	[NT]	LCS-1	96%
Chromium	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	92%
Copper	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	95%
Lead	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	92%
Mercury	mg/kg	0.1	Metals.21 CV-AAS	<0.1	[NT]	[NT]	LCS-1	96%
Nickel	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	93%
Zinc	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	94%
Boron	mg/kg	3	Metals.20 ICP-AES	<3	[NT]	[NT]	LCS-1	81%
Beryllium	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	90%
Cobalt	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	92%
Manganese	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	93%

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Date prepared	-			9/09/09
Date analysed	-			9/09/09
Moisture	%	0.1	LAB.8	<0.10

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Report Comments:

Asbestos was analysed by Approved Identifier: Not applicable for this job
INS: Insufficient sample for this test NT: Not tested PQL: Practical Quantitation Limit <: Less than >: Greater than
RPD: Relative Percent Difference NA: Test not required LCS: Laboratory Control Sample NR: Not requested

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria:

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable. Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and speciated phenols.

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C.S.T.S.

Compaction & Soil Testing Services Pty Limited

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No: 15121

Attachment 4

Field Bore Logs - Compaction and Soil Testing Services Pty Ltd

Bore Hole 1 – BH1

Borehole 2 – BH2

Bore Hole 3 – BH3

Bore Hole 4 – BH4

Bore Hole 5 – BH5

Bore Hole 6 – BH6

Bore Hole 7 – BH7

Bore Hole 8 – BH8

Bore Hole 9 – BH9

Bore Hole 10 – BH10

Bore Hole 11 – BH11

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Field Log

Job No. ELF 677

Client: ELF Mushrooms Pty Ltd	**Date:** 07/09/2009
Project: 521 The Northern Road	**Logged by:** AR/NG
Location: Londonderry	**Bore Hole** BH1

Depth (m)	Method: Spiral Auger(Vertical) Material Description	Field Test	Graphic Log	Moisture Content	Consistency Strength	Ground Water
0mm	Grassed Surface with <10mm Topsoil					
350mm	Brown Silty Clay (350mm)	NA		NA	NA	No
700mm	Orange/Brown Silty Clay (350mm)	NA		NA	NA	No
	End of BH 700mm Below Surface Level					

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Field Log

Job No. ELF 677

Client: ELF Mushrooms Pty Ltd	**Date:** 07/09/2009
Project: 521 The Northern Road	**Logged by:** AR/NG
Location: Londonderry	**Bore Hole** BH2

Depth (m)	Method: Spiral Auger(Vertical) Material Description	Field Test	Graphic Log	Moisture Content	Consistency Strength	Ground Water
0mm	Grassed Surface with <10mm Topsoil					
400mm	Brown Silty/Sandy Clay (400mm)	NA		NA	NA	No
650mm	Orange/Brown Silty Clay (250mm)	NA		NA	NA	No
	End of BH 650mm Below Surface Level					

C.S.T.S.

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Accreditation No: 15121

Field Log

Job No. ELF 677

Client: ELF Mushrooms Pty Ltd	**Date:** 07/09/2009
Project: 521 The Northern Road	**Logged by:** AR/NG
Location: Londonderry	**Bore Hole** BH3

Depth (m)	Method: Spiral Auger(Vertical) Material Description	Field Test	Graphic Log	Moisture Content	Consistency Strength	Ground Water
0mm	Grassed Surface with <10mm Topsoil					
150mm	Brown/Grey - Silty/Sandy Clay (150mm)	NA		NA	NA	No
500mm	Orange/Brown - Silty/Sandy Clay (350mm)	NA		NA	NA	No
	End of BH 500mm Below Surface Level					

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Field Log

Job No. ELF 677

Client: ELF Mushrooms Pty Ltd	**Date:** 07/09/2009
Project: 521 The Northern Road	**Logged by:** AR/NG
Location: Londonderry	**Bore Hole** BH4

Depth (m)	Method: Spiral Auger(Vertical) Material Description	Field Test	Graphic Log	Moisture Content	Consistency Strength	Ground Water
0mm	Grassed Surface with <10mm Topsoil					
	Red/Orange/Brown - Silty Clay (900mm) (Fill Material Near Dam)	NA		NA	NA	No
900mm	End of BH 900mm Below Surface Level					

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Field Log

Job No. ELF 677

Client: ELF Mushrooms Pty Ltd	**Date:** 07/09/2009
Project: 521 The Northern Road	**Logged by:** AR/NG
Location: Londonderry	**Bore Hole** BH5

Depth (m)	Method: Spiral Auger(Vertical) Material Description	Field Test	Graphic Log	Moisture Content	Consistency Strength	Ground Water
0mm	Grassed Surface with <10mm Topsoil					
350mm	Brown Sandy/Silty Clay (350mm)	NA		NA	NA	No
500mm	Brown/Orange - Silty Clay with some Gravel (<10mm diameter) (150mm)	NA		NA	NA	No
	End of BH 500mm Below Surface Level					

C.S.T.S.

Compaction & Soil Testing Services Pty Limited

1/78 Owen Street, GLENDENNING NSW 2761 • ABN 44 106 976 738
Phone: (02) 9675 7522 Fax: (02) 9675 7544
Email: office@comsoiltest.com.au Web: www.comsoiltest.com.au

NATA
Accreditation No: 15121

Field Log

Job No. ELF 677

Client: ELF Mushrooms Pty Ltd	**Date:** 07/09/2009
Project: 521 The Northern Road	**Logged by:** AR/NG
Location: Londonderry	**Bore Hole** BH6

Depth (m)	Method: Spiral Auger(Vertical) Material Description	Field Test	Graphic Log	Moisture Content	Consistency Strength	Ground Water
0mm	Grassed Surface with <10mm Topsoil					
450mm	Brown Sandy/Silty Clay (450mm)	NA		NA	NA	No
700mm	Orange/Brown - Silty Clay (250mm)	NA		NA	NA	No
	End of BH 700mm Below Surface Level					

C.S.T.S.

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NATA
Accreditation No: 15121

Field Log

Job No. ELF 677

Client: ELF Mushrooms Pty Ltd	**Date:** 07/09/2009
Project: 521 The Northern Road	**Logged by:** AR/NG
Location: Londonderry	**Bore Hole** BH7

Depth (m)	Method: Spiral Auger(Vertical) Material Description	Field Test	Graphic Log	Moisture Content	Consistency Strength	Ground Water
0mm	Grassed Surface with <10mm Topsoil					
400mm	Brown Sandy/Silty Clay (400mm)	NA		NA	NA	No
800mm	Orange - Silty Clay (400mm)	NA		NA	NA	No
	End of BH 800mm Below Surface Level					

C.S.T.S.

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NATA
Accreditation No: 15121

Field Log

Job No. ELF 677

Client: ELF Mushrooms Pty Ltd	**Date:** 07/09/2009
Project: 521 The Northern Road	**Logged by:** AR/NG
Location: Londonderry	**Bore Hole** BH8

Depth (m)	Method: Spiral Auger(Vertical) Material Description	Field Test	Graphic Log	Moisture Content	Consistency Strength	Ground Water
0mm	Grassed Surface with <10mm Topsoil					
350mm	Brown Sandy/Silty Clay (350mm)	NA		NA	NA	No
600mm	Brown/Orange - Silty Clay (250mm)	NA		NA	NA	No
	End of BH 600mm Below Surface Level					

C.S.T.S.

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Phone: (02) 9675 7522 Fax: (02) 9675 7544
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NATA
Accreditation No: 15121

Field Log

Job No. ELF 677

Client: ELF Mushrooms Pty Ltd	**Date:** 07/09/2009
Project: 521 The Northern Road	**Logged by:** AR/NG
Location: Londonderry	**Bore Hole** BH9

Depth (m)	Method: Spiral Auger(Vertical) Material Description	Field Test	Graphic Log	Moisture Content	Consistency Strength	Ground Water
0mm	Grassed Surface with <10mm Topsoil					
250mm	Brown Sandy/Silty Clay (250mm)	NA		NA	NA	No
500mm	Orange/Brown - Silty Clay (250mm)	NA		NA	NA	No
	End of BH 500mm Below Surface Level					

C.S.T.S.

Compaction & Soil Testing Services Pty Limited

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Phone: (02) 9675 7522 Fax: (02) 9675 7544
Email: office@comsoiltest.com.au Web: www.comsoiltest.com.au

NATA
Accreditation No: 15121

Field Log

Job No. ELF 677

Client: ELF Mushrooms Pty Ltd	**Date:** 07/09/2009
Project: 521 The Northern Road	**Logged by:** AR/NG
Location: Londonderry	**Bore Hole** BH10

Depth (m)	Method: Spiral Auger(Vertical) Material Description	Field Test	Graphic Log	Moisture Content	Consistency Strength	Ground Water
0mm	Grassed Surface with <10mm Topsoil					
300mm	Orange/Brown - Sandy/Silty Clay (300mm)	NA		NA	NA	No
500mm	Orange/Brown - Silty Clay (200mm)	NA		NA	NA	No
	End of BH 500mm Below Surface Level					

C.S.T.S.

Compaction & Soil Testing Services Pty Limited

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Field Log

Job No. ELF 677

Client: ELF Mushrooms Pty Ltd	**Date:** 07/09/2009
Project: 521 The Northern Road	**Logged by:** AR/NG
Location: Londonderry	**Bore Hole** BH11

Depth (m)	Method: Spiral Auger(Vertical) Material Description	Field Test	Graphic Log	Moisture Content	Consistency Strength	Ground Water
0mm	Grassed Surface with <10mm Topsoil					
300mm	Brown/Grey - Sandy/Silty Clay (300mm)	NA		NA	NA	No
500mm	Orange/Brown - Silty Clay (200mm)	NA		NA	NA	No
	End of BH 500mm Below Surface Level					

C.S.T.S.

Compaction & Soil Testing Services Pty Limited

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Attachment 5

Envirolab Services Pty Ltd Documents – Detailed Investigation

Sample Receipt – Envirolab Reference No.: 32969

Chain of Custody Document

Certificate of Analysis – Envirolab Reference No.: 32969

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Compaction and Soil Testing
Unit 1, 78 Owen St
Glendenning NSW 2761

ph: 9675 7522
Fax: 9675 7544

Attention: Aaron Ridley

Sample log in details:

Your reference:	**ELF677**
Envirolab Reference:	**32969**
Date received:	08/09/09
Date results expected to be reported:	**18/09/09**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	4 Soils
Turnaround time requested:	Standard
Temperature on receipt	Cool
Cooling Method:	Ice Pack

Comments:

Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

Compaction and Soil Testing Services Pty Ltd

Laboratory Test Request

Job No ELF 677

Sheet 1 of 1

Project: ELF Mushrooms
Location: Londonderry.

CSTS Contact Person: Aaron Ridley

☐ **Tested material to be disposed off site (EPA Validation)**

Date Requested: 8/9/09
Requested by: AR
Date Required by: Normal T.A

Laboratory Reference No.	Sample Identification	Sample type	Test Method Requested - Test Required (/) Test completed (X)																					Additional Test Details	Notes:
	e.g. BH / TP No. Depth , & sample No. client reference No. sample location.	i.e. **U50**, or **D** for disturbed samples. **S**: Soil **W**: Water **R**: Rock	13 Metals	Carbamates	Ocp/Opp/PCB	Herbicides (Phenoxy)	Synthetic Pyrethroids																	i.e. degree of compaction for CBR, confining pressures for triaxial, etc.	
1	S1	S	/	/	/	/	/																		
2	S2	S	/	/	/	/	/																		
3	S3	S	/	/	/	/	/																		
4	S4	S	/	/	/	/	/																		

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: 9910 6200

Job No: 32869
Date received: 8/9/09
Time received: 1:37
Received by:
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Date Reliquished: 8/9/09	**Samples Received:** Aileen ELS.	**Send results to:**	
Reliquished By: AR	Please sign and date to acknowledge receipt of and return by fax.	Compaction & Soil Testing Services Pty Ltd	Phone: (02) 96757522
Total number of samples in container: 4	**Date:** 8/9/09 1:37	Unit 1/78 Owen Street	Fax: (02) 96757544
Results required by: Normal T.A	**Signature:**	Glendenning NSW 2761	

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 32969

Client:
Compaction and Soil Testing
Unit 1, 78 Owen St
Glendenning
NSW 2761

Attention: Aaron Ridley

Sample log in details:

Your Reference:	**ELF677**
No. of samples:	4 Soils
Date samples received:	08/09/09
Date completed instructions received:	08/09/09

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	18/09/09
Date of Preliminary Report:	Not Issued
Issue Date:	22/09/09

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Accredited for compliance with ISO/IEC 17025.
Tests not covered by NATA are denoted with *.

Results Approved By:

Jacinta Hurst
Operations Manager

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Organochlorine Pesticides in soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32969-1 1 Soil	32969-2 2 Soil	32969-3 3 Soil	32969-4 4 Soil
Date extracted	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	10/09/2009	10/09/2009	10/09/2009	10/09/2009
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	79	81	91	92

Organophosphorus Pesticides Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32969-1 1 Soil	32969-2 2 Soil	32969-3 3 Soil	32969-4 4 Soil
Date extracted	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	10/09/2009	10/09/2009	10/09/2009	10/09/2009
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	79	81	91	92

PCBs in Soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32969-1 1 Soil	32969-2 2 Soil	32969-3 3 Soil	32969-4 4 Soil
Date extracted	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	10/09/2009	10/09/2009	10/09/2009	10/09/2009
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	79	81	91	92

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Acid Extractable metals in soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32969-1 1 Soil	32969-2 2 Soil	32969-3 3 Soil	32969-4 4 Soil
Date digested	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Arsenic	mg/kg	9	8	7	10
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	47	57	53	74
Copper	mg/kg	11	3	4	21
Lead	mg/kg	30	18	16	27
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	6	4	4	4
Zinc	mg/kg	150	20	37	9
Boron	mg/kg	<3	<3	<3	<3
Beryllium	mg/kg	1	1	<1	1
Cobalt	mg/kg	3	2	2	5
Manganese	mg/kg	87	8	20	110

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Moisture Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32969-1 1 Soil	32969-2 2 Soil	32969-3 3 Soil	32969-4 4 Soil
Date prepared	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Moisture	%	11	12	13	7.7

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Carbamates in soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32969-1 1 Soil	32969-2 2 Soil	32969-3 3 Soil	32969-4 4 Soil
Date extracted	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	14/09/2009	14/09/2009	14/09/2009	14/09/2009
Carbaryl	mg/kg	<0.1	<0.1	<0.1	<0.1
Fenoxycarb	mg/kg	<0.1	<0.1	<0.1	<0.1
Primicarb	mg/kg	<0.1	<0.1	<0.1	<0.1

Herbicides in Soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32969-1 1 Soil	32969-2 2 Soil	32969-3 3 Soil	32969-4 4 Soil
Date extracted	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	14/09/2009	14/09/2009	14/09/2009	14/09/2009
Dicamba	mg/kg	<0.1	<0.1	<0.1	<0.1
MCPA	mg/kg	<0.1	<0.1	<0.1	<0.1
Dichlorprop	mg/kg	<0.1	<0.1	<0.1	<0.1
2,4-D	mg/kg	<0.1	<0.1	<0.1	<0.1
2,4,5-T	mg/kg	<0.1	<0.1	<0.1	<0.1
2,4,5-TP	mg/kg	<0.1	<0.1	<0.1	<0.1
2,4-DB	mg/kg	<0.1	<0.1	<0.1	<0.1
MCPP	mg/kg	<0.1	<0.1	<0.1	<0.1
Triclopyr	mg/kg	<0.1	<0.1	<0.1	<0.1

Synthetic Pyrethroids in soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32969-1 1 Soil	32969-2 2 Soil	32969-3 3 Soil	32969-4 4 Soil
Date extracted	-	9/09/2009	9/09/2009	9/09/2009	9/09/2009
Date analysed	-	14/09/2009	14/09/2009	14/09/2009	14/09/2009
Bifenthrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Cyhalothrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Cypermethrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Deltamethrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Fenvalerate	mg/kg	<0.1	<0.1	<0.1	<0.1
Permethrin	mg/kg	<0.1	<0.1	<0.1	<0.1

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Method ID	Methodology Summary
GC-5	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
GC.8	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
GC-6	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Metals.20 ICP-AES	Determination of various metals by ICP-AES.
Metals.21 CV-AAS	Determination of Mercury by Cold Vapour AAS.
LAB.8	Moisture content determined by heating at 105 deg C for a minimum of 4 hours.
Ext-020	Analysis subcontracted to Australian Government - National Measurement Institute. NATA Accreditation No: 198

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QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
Date analysed	-			10/09/09	[NT]	[NT]	LCS-1	10/09/09
HCB	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	88%
gamma-BHC	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	110%
Heptachlor	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	87%
delta-BHC	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	84%
Heptachlor Epoxide	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	94%
gamma-Chlordane	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	113%
Dieldrin	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	94%
Endrin	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	96%
pp-DDD	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	120%
Endosulfan II	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	LCS-1	91%
Methoxychlor	mg/kg	0.1	GC-5	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		GC-5	82	[NT]	[NT]	LCS-1	85%

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QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
Date analysed	-			10/09/09	[NT]	[NT]	LCS-1	10/09/09
Diazinon	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	[NR]	[NR]
Dimethoate	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos-methyl	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	[NR]	[NR]
Ronnel	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	LCS-1	112%
Fenitrothion	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	LCS-1	116%
Bromophos-ethyl	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	[NR]	[NR]
Ethion	mg/kg	0.1	GC.8	<0.1	[NT]	[NT]	LCS-1	130%
Surrogate TCLMX	%		GC.8	82	[NT]	[NT]	LCS-1	78%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	[NT]	[NT]	LCS-1	9/09/2009
Date analysed	-			10/09/09	[NT]	[NT]	LCS-1	10/09/09
Arochlor 1016	mg/kg	0.1	GC-6	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	GC-6	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	GC-6	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	GC-6	<0.1	[NT]	[NT]	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	GC-6	<0.1	[NT]	[NT]	LCS-1	83%
Arochlor 1260	mg/kg	0.1	GC-6	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		GC-6	82	[NT]	[NT]	LCS-1	96%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date digested	-			9/9/09	[NT]	[NT]	LCS-1	9/9/09
Date analysed	-			9/9/09	[NT]	[NT]	LCS-1	9/9/09
Arsenic	mg/kg	4	Metals.20 ICP-AES	<4	[NT]	[NT]	LCS-1	93%
Cadmium	mg/kg	0.5	Metals.20 ICP-AES	<0.5	[NT]	[NT]	LCS-1	97%
Chromium	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	95%
Copper	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	97%
Lead	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	93%
Mercury	mg/kg	0.1	Metals.21 CV-AAS	<0.1	[NT]	[NT]	LCS-1	93%

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QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Nickel	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	95%
Zinc	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	94%
Boron	mg/kg	3	Metals.20 ICP-AES	<3	[NT]	[NT]	LCS-1	81%
Beryllium	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	98%
Cobalt	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	93%
Manganese	mg/kg	1	Metals.20 ICP-AES	<1	[NT]	[NT]	LCS-1	94%

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Date prepared	-			9/09/09
Date analysed	-			9/09/09
Moisture	%	0.1	LAB.8	<0.10

QUALITY CONTROL Carbamates in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/09	[NT]	[NT]	LCS-1	9/09/09
Date analysed	-			14/09/09	[NT]	[NT]	LCS-1	14/09/09
Carbaryl	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	[NR]	[NR]
Fenoxycarb	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	[NR]	[NR]
Primicarb	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	LCS-1	84%

QUALITY CONTROL Herbicides in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/09	[NT]	[NT]	LCS-1	9/09/09
Date analysed	-			14/09/09	[NT]	[NT]	LCS-1	14/09/09
Dicamba	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	LCS-1	101%
MCPA	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	LCS-1	103%
Dichlorprop	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	LCS-1	105%
2,4-D	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	LCS-1	105%
2,4,5-T	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	LCS-1	107%
2,4,5-TP	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	LCS-1	108%
2,4-DB	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	LCS-1	109%
MCPP	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	LCS-1	105%
Triclopyr	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	LCS-1	106%

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QUALITY CONTROL Synthetic Pyrethroids in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9//09/09	[NT]	[NT]	LCS-1	9/09/09
Date analysed	-			14/09/09	[NT]	[NT]	LCS-1	14/09/09
Bifenthrin	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	LCS-1	56%
Cyhalothrin	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	[NR]	[NR]
Cypermethrin	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	[NR]	[NR]
Deltamethrin	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	[NR]	[NR]
Fenvalerate	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	[NR]	[NR]
Permethrin	mg/kg	0.1	Ext-020	<0.1	[NT]	[NT]	[NR]	[NR]

Report Comments:

Herbicides analysed by NMI Report No: RN756355

Asbestos was analysed by Approved Identifier: Not applicable for this job

INS: Insufficient sample for this test NT: Not tested PQL: Practical Quantitation Limit <: Less than >: Greater than

RPD: Relative Percent Difference NA: Test not required LCS: Laboratory Control Sample NR: Not requested

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria:

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable. Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and speciated phenols.

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C.S.T.S.

Compaction & Soil Testing Services Pty Limited

1/78 Owen Street, GLENDENNING NSW 2761 • ABN 44 106 976 738
Phone: (02) 9675 7522 Fax: (02) 9675 7544
Email: office@comsoiltest.com.au Web: www.comsoiltest.com.au

NATA
Accreditation No: 15121

Job No.: ELF 677
Our Ref.: ELF 677-AB

08 October 2009

Elf Mushrooms
Wallace Road,
Vineyard, NSW,

Attention: Mr David Tolson

RE: Proposed Childcare Centre within the Proposed Mushroom Farm Development 521 The Northern Road, Londonderry – Lot 138 DP No.752037

As requested, Compaction and Soil Testing Services Pty Ltd has completed as assessment on an area within the newly proposed mushroom farm where a childcare centre is to be constructed for the employees. Compaction and Soil Testing Services Pty Ltd was engaged by Mr Terry Perram (of Perram and Partners) on behalf of Elf Mushrooms (a part of the Tolson Group).

The site as a whole has already been classified as suitable for the proposed mushroom farm development (Refer to Compaction and Soil Testing Services Pty Ltd Report ELF 677-AA). However the proposed childcare centre falls under a different land use (in accordance with the *National Environmental Protection (Assessment of Site Contamination) Measure 1999*(**NEPM**)) and as such had to be assessed separately to the remainder of the development.

In order to complete the assessment the following works were completed by Compaction and Soil Testing Services Pty Ltd:

- Visual assessment of the area of the proposed child care centre, identifying the boundaries of the childcare centre,
- Excavation of two (2) boreholes within the proposed childcare centre area,
- Recovery of two (2) composite soil samples for laboratory analysis,
- Chemical analysis of the recovered samples by a NATA accredited laboratory,
- Review of laboratory analysis by Compaction and Soil Testing Services Pty Ltd,
- Determine the site suitability in accordance with the NEPM,
- Reporting of conclusion and recommendations

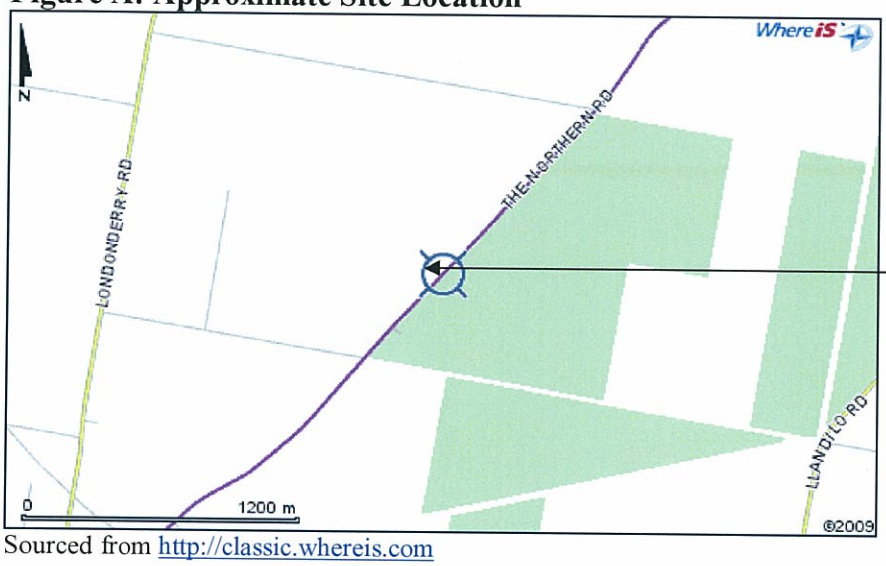
All works were completed by technicians from Compaction and Soil Testing Services Pty Ltd on 07 September 2009, with the recovered soil samples received by the chemical analysis laboratory on 08 September 2009 under stringent chain of custody conditions.

Chemical analysis was completed by Envirolab Services Pty Ltd, a laboratory accredited (Accreditation No.: 2901) with the National Association of Testing Authorities (NATA). Envirolab Services Pty Ltd was chosen to complete the laboratory analysis due to their previous experience with form of analysis and the detail quality control and quality assurance procedures they implement during the analysis (Refer to details in report). As such the laboratory results can be considered as an accurate representation of the recovered material.

Site Identification

The childcare centre is the be built as apart of a proposed commercial/industrial style mushroom farm development on the D.W Tolson land known as 521 The Northern Road, Londonderry (Lot 38, DP No.: 752037). The site is located on the western side of The Northern Road (Refer to Figure A) in a predominately rural area.

Figure A: Approximate Site Location



Sourced from http://classic.whereis.com

According to the supplied plans the proposed childcare centre is to be built in the north eastern corner of the site (Refer to Drawing ELF 677-3). Aerial photographs of where the childcare centre is to be constructed show the area is currently a mix of grazing land and natural vegetation (Refer to Figure B). There was no visible evidence of contamination within this area, and the technician did not identify any potential sources of significant contamination. As such the area would be considered as low risk, though chemical analysis of the soil was still required to confirm the soil was not contaminated.

Figure B: Aerial Photograph of Proposed Childcare Centre



Assessment Criteria

The National Environmental Protection Council (NEPC) has calculated the maximum allowable levels of contaminants in soils (based on proposed land use) along with the acceptable natural levels for soil within the Sydney basin. These levels are readily available in the *National Environmental Protection (Assessment of Site Contamination) Measure 1999*-Table 5A. This guideline is one of the current guidelines used by site auditors to identify if a site has been contaminated by previous activity and to determine the site's suitability for the proposed development. As such Compaction and Soil Testing Services Pty Ltd has used this guideline to assess if the area within the site is suitable for the proposed childcare centre.

Table A: NEPM Health Based Investigation Levels (HBILs)

Metal/Metalloids	Health Investigation Level		Accepted Background Ranges
	Residential	*Industrial*	
Arsenic (Total)	100 mg/Kg	500mg/Kg	1-50mg/Kg
Cadmium	20 mg/Kg	100mg/Kg	1mg/kg
Chromium(VI)	100mg/Kg	500mg/Kg	5-1000mg/kg (Total)
Copper	1000mg/Kg	5000mg/Kg	2-100mg/Kg
Lead	300mg/Kg	1500mg/Kg	2-200mg/Kg
Mercury (inorganic)	15mg/Kg	75mg/Kg	0.03mg/Kg
Nickel	600mg/Kg	3000mg/Kg	5-500mg/Kg
Zinc	7000mg/Kg	35000mg/Kg	10-300mg/Kg

*Adapted from Table 5A from **National Environmental Protection Council's** National Environmental Protection (Assessment of Site Contamination) Measure 1999.

Given the area within the site is to be developed as a childcare centre (Residential), the soil samples recovered from the site will be assessed against the *National Environmental Protection (Assessment of Site Contamination) Measure 1999* (NEPM) Health Based Investigation Levels (HBILs) and acceptable background levels for Sydney (Refer to Table A). Provided the recovered soil samples do not contain concentrations above these levels, no further action will be required for the proposed development to continue.

Compaction and Soil Testing Services Pty Ltd recovered soil samples for chemical analysis in accordance with the NEPM; however additional chemical tests were conducted due to the previous land use on this site. The total range of contaminants assessed by Compaction and Soil Testing Services Pty Ltd included:

- Benzene, Toluene, Ethylbenzene and Xylene (BTEX),
- Volatile Total Petroleum Hydrocarbons (vTPH),
- Semi Volatile Total Petroleum Hydrocarbons (sTPH),
- Polycyclic Aromatic Hydrocarbons (PAH),
- Organochlorine Pesticides (OCP),
- Organophosphorus Pesticides (OPP),
- Polychlorinated Biphenyls (PCB),
- Total Phenolics (Phenols),
- Heavy Metals (Arsenic, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Mercury, Nickel and Zinc)

Soil Sampling Process

A total of two (2) composite soil samples were recovered from the proposed childcare centre area (Refer to Drawing ELF 677-3), with each composite sample comprising of four (4) sub-samples each. The sub-samples were recovered from each 100mm stage of the bore hole to the terminal depth of 400mm below the surface level.

The sub-samples were been recovered using a decontaminated hand tools to excavate a borehole approximately 100mm in diameter to a depth of 400mm below the surface level. The sub-samples were recovered from the boreholes using a decontaminated stainless steel trowel to transfer the material from the borehole into a decontaminated stainless steel bowl.

The decontamination process of objects included:

- Removal of soils adhering to the object by scrubbing with a brush.
- Washing the object thoroughly in a solution of phosphate free detergent (Decon 90).
- Rinsing the object thoroughly with potable water.
- Drying the object with a clean cloth.

Once four (4) sub-samples were recovered from a bore hole, the samples were homogenised into a single composite sample. The composite sample was then transferred into a laboratory supplied 250mL glass jar and sealed with a teflon lid. The sealed jar was labeled and transferred into a chilled container for transporting to our primary laboratory.

This process was repeated for each of the four areas. Once all the samples were recovered the chilled container was transported to our primary laboratory (1/78 Owen Street, Glendenning) under stringent chain of custody procedures

Upon arrival at our laboratory the glass jars were transferred to a refrigerator to maintain a temperature below 4 °C.

The following day, the sealed glass jars were placed in the chilled container and sealed with security tape before being forwarded to the primary laboratory (Envirolab Services Pty Ltd) a NATA registered laboratory, under Chain of Custody (COC) conditions.

Upon receipt of the samples, the laboratory returned the Sample Receipt Confirmation, verifying the integrity of all the samples received.

Within the following holding times, detailed in Schedule B (3) of The *National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM)* by the National Environment Protection Council (NEPC), the discrete and composite samples were analysed:

ANALYTE	HOLDING TIME
Heavy Metals *	6 months
Mercury	28 days
Organochlorine Pesticides (OCP)	14 days

* Heavy Metals include As, Cd, Cr, Cu, Pb, Ni and Zn

NA: Not Applicable

Heavy Metals include arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni) and zinc (Zn)

OCP = Organochlorine Pesticides

Laboratory Quality Assurances and Quality Controls

Envirolab Services Pty Ltd is registered by NATA for Chemical Testing (Reg.No:**2901**) and Quality System compliance to ISO/IEC 17025. For this reason they were deemed as suitably qualified to conduct the assessment of these soil samples.

Quality Assurance Procedures

As Envirolab Services Pty Ltd is a NATA accredited laboratory they must conform to a variety of quality assurance procedures. Quality control samples included in any analytical run are listed below.

Reagent Blank

Sample free reagents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every sample batch analysis. For larger projects, a reagent blank is prepared and analysed with every 20 samples.

Matrix Spike Duplicates

Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction/digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water (or Milli-Q water) may be used. A duplicate spiked sample is prepared at least every 20 samples.

Surrogate Spike

Added to all samples requiring analysis for organics (where relevant) prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples.

Internal Standard
Added to all samples requiring analysis for organics (where relevant) after the extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run-to-run with the instruments.

Duplicate
A separate portion of a sample being analysed which is treated the same as the other samples in the batch. A duplicate is prepared at least every 20 samples.

Control Standards
Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity.

Additional QC Samples
A calibration standard and blank are run after every 20 samples of an instrumental analysis run to assess analytical drift.

Statistical Analysis of QC Data
Quality control data is plotted on control charts using the APHA procedure with warning and control limits at 2 and 3 standard deviations respectively.

Certified Reference Materials
Certified Reference Materials and Standards are regularly placed in the system as blind samples. These materials/standards have certified reference values for various parameters.

Proficiency Testing
Regular proficiency test samples are analysed by our laboratories. Envirolab Services Pty Ltd participates in a number of programs. Results and proficiency status are compiled and sent to participating laboratory post data interpretation. Failure to comply with acceptable values result in further investigations.

Interlaboratory/Intralaboratory Testing
Envirolab Services Pty Ltd has schedules in the Quality Systems to participate in Inter/Intra laboratory testing conducted internally and by other parties.

Failure to meet the internal acceptance criteria will result in sample/sample batch repeat.

Compaction and Soil Testing Services Pty Ltd has checked the QA/QC procedures adopted by the laboratory against the appropriate guidelines. The quality control sample numbers adopted by Envirolab Services Pty Ltd are considered to be adequate for the analyses undertaken and conform to the recommendations provided in the National Environment Protection Measure (NEPM) 1999 "*Guideline on Laboratory Analysis of Potentially Contaminated Soils*" and Australian and New Zealand Environment and Conservation Council (ANZECC)-1996 "*Guidelines for the Laboratory Analysis of Contaminated Soils*".

Overall, the quality control elements indicate that the analytical data fall within acceptable levels of accuracy and precision for the analysis of soils and water. The analytical data provided are therefore considered reliable and useable for this assessment.

Results of Laboratory Assessment

Laboratory analysis of the recovered samples found low levels of heavy metals present in both of the composite soil samples. The levels detected were consisted between the two (2) samples, and were found to be below the Maximum Contaminant Concentration (Residential HBILs) as specified in the NEPM (Refer to Table B). Based on the detected levels, the heavy metals in the soil would not pose any significant risk to human health or the surrounding environment, and would not affected the overall use of the land.

Table B: Concentration of Heavy Metals (mg/Kg)

Metal	CC1	CC2	Maximum Contaminant Concentration (Residential HBILs)
Arsenic	12	13	100
Beryllium	1	<1	20
Boron	<3	<3	3,000
Cadmium	<0.5	<0.5	20
Chromium	80	45	100
Cobalt	2	2	100
Copper	2	3	1,000
Lead	21	29	300
Manganese	9	20	1,500
Mercury	<0.1	<0.1	15
Nickel	3	3	600
Zinc	3	21	7,000

Adapted from Envirolab Certificate of Analysis 32971

No other contaminants were detected in the soil, indicating the site has not been contaminated by previous land use or surrounding activities. As such the soil on the site is considered as clean and would not affect the overall use of the land.

Conclusion and Recommendations

Based on the visual assessment of the site, there were **no** identified sources of contamination within the childcare centre area or the surrounding lands. Chemical analysis of recovered soil samples was completed to determine if there were any non-visible contaminants present in the soil.

Analysis of the recovered soil samples identified low levels of heavy metal present in both soil samples. These levels were relatively consisted and were found to be below the health based investigation levels for residential developments. As such these levels would not affect the overall use of the land. No other contaminants were detected indicating the soil was free of contaminants.

Given the results of the analysis, Compaction and Soil Testing Services Pty Ltd has classified this area of the site as suitable for the proposed childcare centre development. No further investigation or remediation is warranted as the area does not pose a risk to human health or the surrounding environment during either the construction or occupation phase of the development.

Limitations

This report covers the site for at the time of sampling (07 September 2009). As such the conclusions drawn in this assessment as based on the site conditions of that date and would not take into account any incidents on site since that date. Should there be any variations in site conditions since the above mentioned date, such as importation of fill, chemical spillage, illegal dumping, etc, Compaction and Soil Testing Services Pty Ltd would be required to complete further assessment to determine if the conclusions were still valid.

Neither Compaction and Soil Testing Services Pty Ltd nor any other reputable firm can give unqualified warranties on the conditions of the site and subsurface conditions.

While Compaction and Soil Testing Services Pty Ltd takes all reasonable due care and diligence, we offer no absolute warranty for the material between the locations sampled and investigated.

In addition Compaction and Soil Testing Services Pty Ltd does not assume any liability for site conditions not observed or accessible at the time of the investigation.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. If there is any change in the proposed development described in the report then all recommendation should reviewed. No other warranty expressed or implied is made or intended. Copyright on this report remains the property of Compaction and Soil Testing Services Pty Ltd.

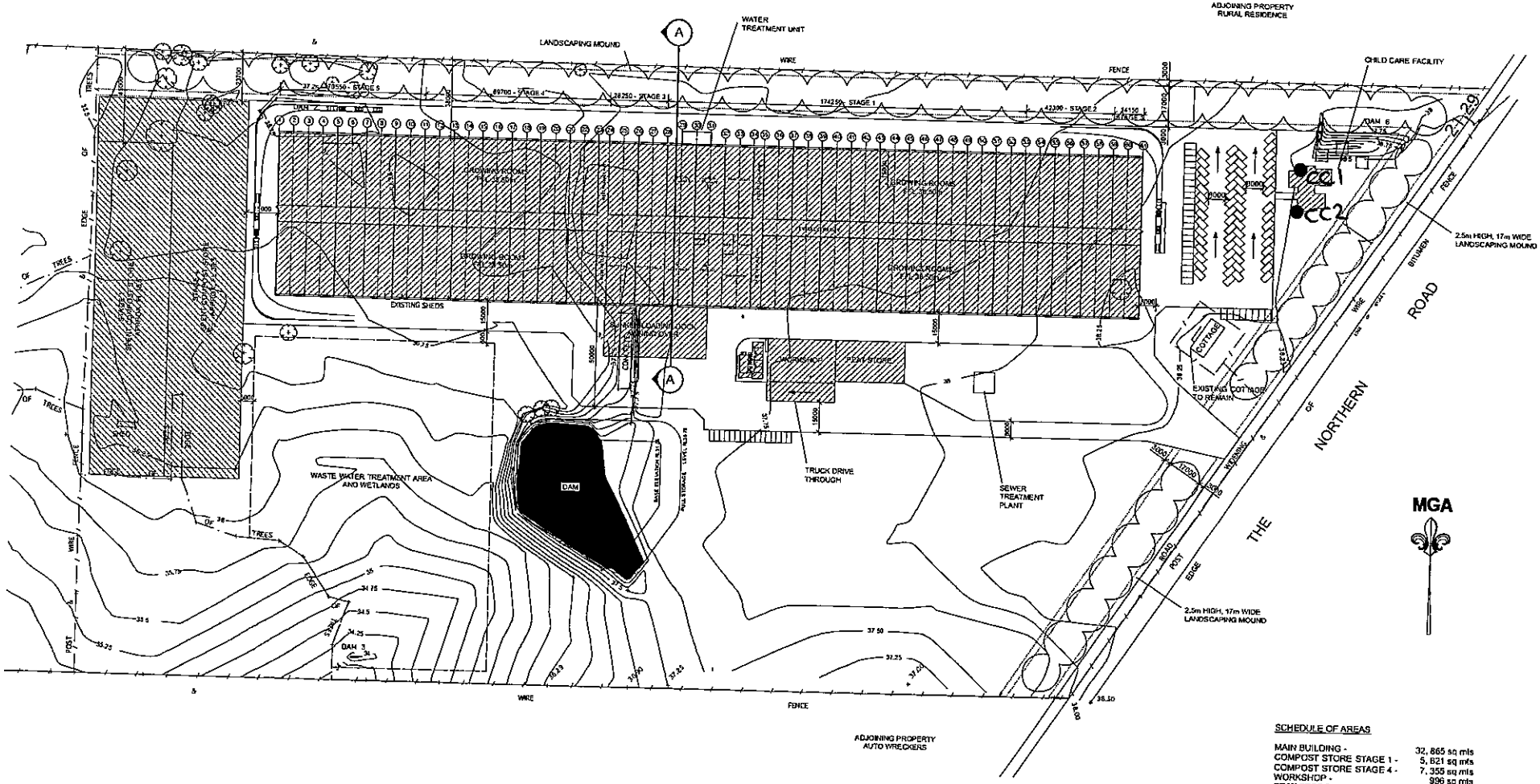
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Should you have any queries about the methodology, findings, conclusions or recommendations of these assessments please do not hesitate to contact our office on (02) 9675 7522.

Yours Sincerely



Aaron Ridley
B. App Sc – Environmental Management
Environmental Consultant



SCHEDULE OF AREAS

MAIN BUILDING -	32, 865 sq mts
COMPOST STORE STAGE 1 -	5, 821 sq mts
COMPOST STORE STAGE 4 -	7, 355 sq mts
WORKSHOP -	996 sq mts
PEAT STORE -	672 sq mts

Legend

● Bore Hole Locations

Compaction and Soil Testing Services Pty Ltd

CSTS

Notes: *This drawing has been produced using a base plan provided by others to which additional information e.g.: density test, DCP and Test Pit locations or notes have been added. Some or all the information shown on the plan may not be relevant at the time of producing this drawing.*

Drawn:	AR
Approved:	NG
Date:	07/09/2009
Scale:	Not to Scale

ELF Mushrooms
Proposed Mushroom Farm
The Northern Road, Londonderry
Childcare Centre Bore Hole Locations

Drawing No:	ELF 677-3
Job No:	ELF 677

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Compaction and Soil Testing
Unit 1, 78 Owen St
Glendenning NSW 2761

ph: 9675 7522
Fax: 9675 7544

Attention: Aaron Ridley

Sample log in details:

Your reference:	**ELF677**
Envirolab Reference:	**32971**
Date received:	08/09/09
Date results expected to be reported:	**15/09/09**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	2 Soils
Turnaround time requested:	Standard
Temperature on receipt	Cool
Cooling Method:	Ice Pack

Comments:

Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

Compaction and Soil Testing Services Pty Ltd

Laboratory Test Request

Job No ELF 677

Sheet 1 of 1

Project: ELF Mushrooms
Location: Londonderry

CSTS Contact Person: Aaron Ridley

☐ Tested material to be disposed off site (EPA Validation)

Date Requested: 8/9/09
Requested by: AR
Date Required by: Normal T.A

Laboratory Reference No.	Sample Identification	Sample type	Test Method Requested - Test Required (/) Test completed (X)																						Additional Test Details	Notes:
	e.g. BH / TP No. Depth , & sample No. client reference No. sample location.	i.e. U50, or D for disturbed samples. S: Soil W: Water R: Rock	13 metal	OCP/OPP/PCB	PAH	TPH + BTEX	Phenols																		i.e. degree of compaction for CBR, confining pressures for triaxial, etc.	
1	CC 1	S	/	/	/	/	/																			
2	CC 2	S	/	/	/	/	/																			

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: 9910 6200

Job No: 32871
Date received: 8/9/9
Time received: 1:37
Received by: ELS
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Date Reliquished: 8/9/09	Samples Received: Aileen ELS	Send results to:	
Reliquished By: AR	Please sign and date to acknowledge receipt of and return by fax.	Compaction & Soil Testing Services Pty Ltd	Phone: (02) 96757522
Total number of samples in container: 2	Date: 8/9/09 1:37	Unit 1/78 Owen Street	Fax: (02) 96757544
Results required by: Normal T.A	Signature: AR	Glendenning NSW 2761	

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 32971

Client:
Compaction and Soil Testing
Unit 1, 78 Owen St
Glendenning
NSW 2761

Attention: Aaron Ridley

Sample log in details:

Your Reference:	ELF677
No. of samples:	2 Soils
Date samples received:	08/09/09
Date completed instructions received:	08/09/09

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by:	15/09/09
Date of Preliminary Report:	Not Issued
Issue Date:	11/09/09

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Results Approved By:

Jacinta Hurst
Operations Manager

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vTPH & BTEX in Soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32971-1 CC1 Soil	32971-2 CC2 Soil
Date extracted	-	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009
vTPH C_6 - C_9	mg/kg	<25	<25
Benzene	mg/kg	<0.5	<0.5
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1.0	<1.0
m+p-xylene	mg/kg	<2.0	<2.0
o-Xylene	mg/kg	<1.0	<1.0
Surrogate aaa-Trifluorotoluene	%	69	98

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Client Reference: ELF677

sTPH in Soil (C10-C36) Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32971-1 CC1 Soil	32971-2 CC2 Soil
Date extracted	-	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009
TPH C_{10} - C_{14}	mg/kg	<50	<50
TPH C_{15} - C_{28}	mg/kg	<100	<100
TPH C_{29} - C_{36}	mg/kg	<100	<100
Surrogate o-Terphenyl	%	110	101

PAHs in Soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32971-1 CC1 Soil	32971-2 CC2 Soil
Date extracted	-	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1
Surrogate p-Terphenyl-d_{14}	%	99	103

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Organochlorine Pesticides in soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32971-1 CC1 Soil	32971-2 CC2 Soil
Date extracted	-	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009
HCB	mg/kg	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	69	64

Organophosphorus Pesticides Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32971-1 CC1 Soil	32971-2 CC2 Soil
Date extracted	-	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009
Diazinon	mg/kg	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	69	64

Client Reference: ELF677

PCBs in Soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32971-1 CC1 Soil	32971-2 CC2 Soil
Date extracted	-	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009
Arochlor 1016	mg/kg	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	69	64

Client Reference: ELF677

Total Phenolics in Soil Our Reference: Your Reference Type of sample	UNITS ----------	32971-1 CC1 Soil	32971-2 CC2 Soil
Date extracted	-	10/09/2009	10/09/2009
Date analysed	-	11/09/2009	11/09/2009
Total Phenolics (as Phenol)	mg/kg	<5.0	<5.0

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Client Reference: ELF677

Acid Extractable metals in soil Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32971-1 CC1 Soil	32971-2 CC2 Soil
Date digested	-	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009
Arsenic	mg/kg	12	13
Cadmium	mg/kg	<0.5	<0.5
Chromium	mg/kg	80	45
Copper	mg/kg	2	3
Lead	mg/kg	21	29
Mercury	mg/kg	<0.1	<0.1
Nickel	mg/kg	3	3
Zinc	mg/kg	3	21
Boron	mg/kg	<3	<3
Beryllium	mg/kg	1	<1
Cobalt	mg/kg	2	2
Manganese	mg/kg	9	20

Client Reference: ELF677

Moisture Our Reference: Your Reference Type of sample	UNITS ---------- ----------	32971-1 CC1 Soil	32971-2 CC2 Soil
Date prepared	-	9/09/2009	9/09/2009
Date analysed	-	9/09/2009	9/09/2009
Moisture	%	11	10

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Method ID	Methodology Summary
GC.16	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS.
GC.3	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID.
GC.12 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
GC-5	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
GC.8	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
GC-6	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
LAB.30	Total Phenolics - determined colorimetrically following disitillation.
Metals.20 ICP-AES	Determination of various metals by ICP-AES.
Metals.21 CV-AAS	Determination of Mercury by Cold Vapour AAS.
LAB.8	Moisture content determined by heating at 105 deg C for a minimum of 4 hours.

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QUALITY CONTROL vTPH & BTEX in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/09/2009
Date analysed	-			9/09/2009	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/09/2009
vTPH C_6 - C_9	mg/kg	25	GC.16	<25	32971-1	<25 || <25	LCS-1	86%
Benzene	mg/kg	0.5	GC.16	<0.5	32971-1	<0.5 || <0.5	LCS-1	103%
Toluene	mg/kg	0.5	GC.16	<0.5	32971-1	<0.5 || <0.5	LCS-1	66%
Ethylbenzene	mg/kg	1	GC.16	<1.0	32971-1	<1.0 || <1.0	LCS-1	81%
m+p-xylene	mg/kg	2	GC.16	<2.0	32971-1	<2.0 || <2.0	LCS-1	90%
o-Xylene	mg/kg	1	GC.16	<1.0	32971-1	<1.0 || <1.0	LCS-1	86%
Surrogate aaa-Trifluorotoluene	%		GC.16	114	32971-1	69 || 90 || RPD: 26	LCS-1	77%

QUALITY CONTROL sTPH in Soil (C10-C36)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/09/2009
Date analysed	-			9/09/2009	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/09/2009
TPH C_{10} - C_{14}	mg/kg	50	GC.3	<50	32971-1	<50 || <50	LCS-1	101%
TPH C_{15} - C_{28}	mg/kg	100	GC.3	<100	32971-1	<100 || <100	LCS-1	112%
TPH C_{29} - C_{36}	mg/kg	100	GC.3	<100	32971-1	<100 || <100	LCS-1	108%
Surrogate o-Terphenyl	%		GC.3	114	32971-1	110 || 110 || RPD: 0	LCS-1	105%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/09/2009
Date analysed	-			9/09/2009	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/09/2009
Naphthalene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	LCS-1	89%
Acenaphthylene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	LCS-1	89%
Phenanthrene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	LCS-1	99%
Anthracene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	LCS-1	95%
Pyrene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	LCS-1	100%

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QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Benzo(a)anthracene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	LCS-1	95%
Benzo(b+k)fluoranthene	mg/kg	0.2	GC.12 subset	<0.2	32971-1	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	GC.12 subset	<0.05	32971-1	<0.05 || <0.05	LCS-1	85%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	GC.12 subset	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		GC.12 subset	103	32971-1	99 || 103 || RPD: 4	LCS-1	93%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/09/2009
Date analysed	-			9/09/2009	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/09/2009
HCB	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	LCS-1	88%
gamma-BHC	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	LCS-1	110%
Heptachlor	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	LCS-1	87%
delta-BHC	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	LCS-1	84%
Heptachlor Epoxide	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	LCS-1	94%
gamma-Chlordane	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	LCS-1	113%
Dieldrin	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	LCS-1	94%
Endrin	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	LCS-1	96%
pp-DDD	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	LCS-1	120%
Endosulfan II	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	LCS-1	91%
Methoxychlor	mg/kg	0.1	GC-5	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		GC-5	82	32971-1	69 || 60 || RPD: 14	LCS-1	85%

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QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/09/2009
Date analysed	-			9/09/2009	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/09/2009
Diazinon	mg/kg	0.1	GC.8	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Dimethoate	mg/kg	0.1	GC.8	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos-methyl	mg/kg	0.1	GC.8	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Ronnel	mg/kg	0.1	GC.8	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	GC.8	<0.1	32971-1	<0.1 || <0.1	LCS-1	112%
Fenitrothion	mg/kg	0.1	GC.8	<0.1	32971-1	<0.1 || <0.1	LCS-1	116%
Bromophos-ethyl	mg/kg	0.1	GC.8	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	GC.8	<0.1	32971-1	<0.1 || <0.1	LCS-1	130%
Surrogate TCLMX	%		GC.8	82	32971-1	69 || 60 || RPD: 14	LCS-1	78%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			9/09/2009	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/09/2009
Date analysed	-			9/09/2009	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/09/2009
Arochlor 1016	mg/kg	0.1	GC-6	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	GC-6	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	GC-6	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	GC-6	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	GC-6	<0.1	32971-1	<0.1 || <0.1	LCS-1	83%
Arochlor 1260	mg/kg	0.1	GC-6	<0.1	32971-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		GC-6	82	32971-1	69 || 60 || RPD: 14	LCS-1	96%

QUALITY CONTROL Total Phenolics in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			10/09/09	32971-1	10/09/2009 || 10/09/2009	LCS-1	10/09/09
Date analysed	-			11/09/2009	32971-1	11/09/2009 || 11/09/2009	LCS-1	11/09/2009
Total Phenolics (as Phenol)	mg/kg	5	LAB.30	<5.0	32971-1	<5.0 || <5.0	LCS-1	90%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date digested	-			9/9/09	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/9/09
Date analysed	-			9/9/09	32971-1	9/09/2009 || 9/09/2009	LCS-1	9/9/09
Arsenic	mg/kg	4	Metals.20 ICP-AES	<4	32971-1	12 || 14 || RPD: 15	LCS-1	92%
Cadmium	mg/kg	0.5	Metals.20 ICP-AES	<0.5	32971-1	<0.5 || <0.5	LCS-1	96%
Chromium	mg/kg	1	Metals.20 ICP-AES	<1	32971-1	80 || 84 || RPD: 5	LCS-1	92%
Copper	mg/kg	1	Metals.20 ICP-AES	<1	32971-1	2 || 3 || RPD: 40	LCS-1	95%
Lead	mg/kg	1	Metals.20 ICP-AES	<1	32971-1	21 || 20 || RPD: 5	LCS-1	92%
Mercury	mg/kg	0.1	Metals.21 CV-AAS	<0.1	32971-1	<0.1 || <0.1	LCS-1	96%
Nickel	mg/kg	1	Metals.20 ICP-AES	<1	32971-1	3 || 3 || RPD: 0	LCS-1	93%
Zinc	mg/kg	1	Metals.20 ICP-AES	<1	32971-1	3 || 4 || RPD: 29	LCS-1	94%
Boron	mg/kg	3	Metals.20 ICP-AES	<3	32971-1	<3 || <3	LCS-1	81%
Beryllium	mg/kg	1	Metals.20 ICP-AES	<1	32971-1	1 || 1 || RPD: 0	LCS-1	90%
Cobalt	mg/kg	1	Metals.20 ICP-AES	<1	32971-1	2 || 2 || RPD: 0	LCS-1	92%
Manganese	mg/kg	1	Metals.20 ICP-AES	<1	32971-1	9 || 10 || RPD: 11	LCS-1	93%

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Date prepared	-			9/09/09
Date analysed	-			9/09/09
Moisture	%	0.1	LAB.8	<0.10

QUALITY CONTROL vTPH & BTEX in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	32971-2	9/09/2009
Date analysed	-	[NT]	[NT]	32971-2	9/09/2009
vTPH C_6 - C_9	mg/kg	[NT]	[NT]	32971-2	81%
Benzene	mg/kg	[NT]	[NT]	32971-2	77%
Toluene	mg/kg	[NT]	[NT]	32971-2	81%
Ethylbenzene	mg/kg	[NT]	[NT]	32971-2	78%
m+p-xylene	mg/kg	[NT]	[NT]	32971-2	85%
o-Xylene	mg/kg	[NT]	[NT]	32971-2	82%
Surrogate aaa-Trifluorotoluene	%	[NT]	[NT]	32971-2	108%

QUALITY CONTROL sTPH in Soil (C10-C36)	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	32971-2	9/09/2009
Date analysed	-	[NT]	[NT]	32971-2	09/09/09
TPH C_{10} - C_{14}	mg/kg	[NT]	[NT]	32971-2	97%
TPH C_{15} - C_{28}	mg/kg	[NT]	[NT]	32971-2	119%
TPH C_{29} - C_{36}	mg/kg	[NT]	[NT]	32971-2	121%
Surrogate o-Terphenyl	%	[NT]	[NT]	32971-2	110%

QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	32971-2	9/09/2009
Date analysed	-	[NT]	[NT]	32971-2	09/09/09
Naphthalene	mg/kg	[NT]	[NT]	32971-2	90%
Acenaphthylene	mg/kg	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	[NT]	[NT]	32971-2	92%
Phenanthrene	mg/kg	[NT]	[NT]	32971-2	102%
Anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	[NT]	[NT]	32971-2	100%
Pyrene	mg/kg	[NT]	[NT]	32971-2	105%
Benzo(a)anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	[NT]	[NT]	32971-2	97%
Benzo(b+k)fluoranthene	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	[NT]	[NT]	32971-2	85%
Indeno(1,2,3-c,d)pyrene	mg/kg	[NT]	[NT]	[NR]	[NR]

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QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Dibenzo(a,h)anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%	[NT]	[NT]	32971-2	101%
QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	32971-2	9/09/2009
Date analysed	-	[NT]	[NT]	32971-2	9/09/2009
HCB	mg/kg	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	[NT]	[NT]	32971-2	82%
gamma-BHC	mg/kg	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	[NT]	[NT]	32971-2	102%
Heptachlor	mg/kg	[NT]	[NT]	32971-2	84%
delta-BHC	mg/kg	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	[NT]	[NT]	32971-2	79%
Heptachlor Epoxide	mg/kg	[NT]	[NT]	32971-2	87%
gamma-Chlordane	mg/kg	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	[NT]	[NT]	32971-2	105%
Dieldrin	mg/kg	[NT]	[NT]	32971-2	88%
Endrin	mg/kg	[NT]	[NT]	32971-2	72%
pp-DDD	mg/kg	[NT]	[NT]	32971-2	110%
Endosulfan II	mg/kg	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	[NT]	[NT]	32971-2	86%
Methoxychlor	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%	[NT]	[NT]	32971-2	72%

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QUALITY CONTROL Organophosphorus Pesticides	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	32971-2	9/09/2009
Date analysed	-	[NT]	[NT]	32971-2	9/09/2009
Diazinon	mg/kg	[NT]	[NT]	[NR]	[NR]
Dimethoate	mg/kg	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos-methyl	mg/kg	[NT]	[NT]	[NR]	[NR]
Ronnel	mg/kg	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos	mg/kg	[NT]	[NT]	32971-2	99%
Fenitrothion	mg/kg	[NT]	[NT]	32971-2	129%
Bromophos-ethyl	mg/kg	[NT]	[NT]	[NR]	[NR]
Ethion	mg/kg	[NT]	[NT]	32971-2	116%
Surrogate TCLMX	%	[NT]	[NT]	32971-2	64%
QUALITY CONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	32971-2	9/09/2009
Date analysed	-	[NT]	[NT]	32971-2	9/09/2009
Arochlor 1016	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1232	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1242	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1248	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1254	mg/kg	[NT]	[NT]	32971-2	114%
Arochlor 1260	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%	[NT]	[NT]	32971-2	76%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date digested	-	[NT]	[NT]	32971-2	9/9/09
Date analysed	-	[NT]	[NT]	32971-2	9/9/09
Arsenic	mg/kg	[NT]	[NT]	32971-2	79%
Cadmium	mg/kg	[NT]	[NT]	32971-2	92%
Chromium	mg/kg	[NT]	[NT]	32971-2	81%
Copper	mg/kg	[NT]	[NT]	32971-2	93%
Lead	mg/kg	[NT]	[NT]	32971-2	74%
Mercury	mg/kg	[NT]	[NT]	32971-2	90%
Nickel	mg/kg	[NT]	[NT]	32971-2	82%
Zinc	mg/kg	[NT]	[NT]	32971-2	84%
Boron	mg/kg	[NT]	[NT]	32971-2	70%
Beryllium	mg/kg	[NT]	[NT]	32971-2	86%
Cobalt	mg/kg	[NT]	[NT]	32971-2	84%
Manganese	mg/kg	[NT]	[NT]	32971-2	88%

Report Comments:

Asbestos was analysed by Approved Identifier: Not applicable for this job
INS: Insufficient sample for this test NT: Not tested PQL: Practical Quantitation Limit <: Less than >: Greater than
RPD: Relative Percent Difference NA: Test not required LCS: Laboratory Control Sample NR: Not requested

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike: A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample): This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria:

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the sample batch were within laboratory acceptance criteria.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes and LCS: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable. Surrogates: 60-140% is acceptable for general organics and 10-140% for SVOC and speciated phenols.

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