

5.0 Bio-physical Environment Assessment of Impacts

The following sections describe the existing environment, assess the potential impacts of the proposed project on the bio-physical environment and describe management measures which may be implemented at the site.

5.1 Geology, Soils and Groundwater

5.1.1 Existing Environment

Geology and Soils

The Elizabeth Drive Site has been previously used as a quarry and part is currently used as a solid waste landfill. As a consequence, the ground surface has been altered substantially. In general, the site slopes gently from the south-east to the north-west and becomes predominantly flat over the north-west portion.

Most of the site lies above Reduced Level (RL) 44m AHD. On the western site boundary, near Badgerys Creek, the ground surface drops 2 to 3m to approximately RL 40m AHD. The lowest point is RL 26m AHD at the base of a waste cell to the south-west (**Figure 5.1**).

Except for the area adjacent to Badgerys Creek, most of the Elizabeth Drive Site has been cleared of vegetation in the past. The site has been subject to extensive quarrying, particularly for surface clays. Some light-firing clays remain at the eastern section.

The geology of the Elizabeth Drive Site comprises metasediments belonging to the Bringelly Shale which is the uppermost formation of the Wianamatta Group. Sediments that occur on the site include (in DECCreasing abundance) claystone, siltstone, laminate, sandstone, coal and highly carbonaceous claystone and tuff. The Minchinbury Sandstone, a persistent quartz-lithic sandstone band, underlies the Bringelly Shale. This, in turn, is underlain by the Ashfield Shale formation.

Jointing is commonly near vertical and would be expected to be oriented north to south, parallel to the north trending Lapstone Monocline–Nepean Fault system with a conjugate east-west trending set. Other significant lineaments occur within the area, with dominant north-easterly and north-westerly orientations. These appear to control the overall drainage distribution of the Elizabeth Drive Site area.

Soils that occupied most of the central and western portion of the Elizabeth Drive Site have been stripped, due to excavation and construction activities, revealing the underlying geological foundation. However the original soils in and around the Elizabeth Drive Site were of the Blacktown Soil Landscape comprising residual textured red, brown and yellow podsollic soils derived by *insitu* weathering of the Bringelly Shale.

The soil found on the higher levels and side slopes on the eastern and south-eastern margin of the Elizabeth Drive Site is an old river terrace soil, red and brown in colour and containing ironstone concretions. The soils consist of a loam, fine sandy topsoil over a conspicuously bleached fine sandy clay loam A2 horizon over a light medium clay subsoil.

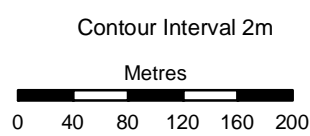
The soil on the floodplain of Badgerys Creek is structured loams, consisting of clay loam topsoil underlain by two alluvial soils: a layer of clay loam over a layer of medium clay. The topsoils are often hard setting, with high fine sand and silt content and high to moderate organic content. The undisturbed soils within the Elizabeth Drive Site are generally in a stable condition. However, due to the type of A2 horizon in the soil profile (fine sandy clay loam with low organic matter content), the

potential for erosion to occur is significant if this material is left exposed at the surface, particularly where it is dispersible and associated with high salinity.

The proposed SAWT-BIOWISE facility will be located on generally undisturbed soil on the north-west of the site. Because of its elevation, the Elizabeth Drive Site has extremely low potential for Acid Sulphate Soils (ASS). No potential ASS or evidence of activities that may be associated with contamination, have been identified during excavations connected with the existing Landfill. Consequently, the presence of ASS or contamination is considered unlikely on the proposed SAWT-BIOWISE footprint.



Date: 16 May, 2007 11:05:05 AM \nausyd1ap004\Graphics\Client_Data\20014604_00_SITA_Elizabeth_Drive\Fig5_1_Contours_SSCH.mxd
© Maunsell Limited, 2005.



Advanced Waste Treatment Facility
Elizabeth Drive
FIGURE 5.1: Elizabeth Drive Site Elevation

Groundwater

The claystones, siltstones and sandstones encountered under the Elizabeth Drive Site are rocks of negligible primary porosity and permeability. As a result, they are highly resistant to the movement of groundwater. Groundwater recharge is also minimal because of surface clays, which form a capping layer over the site and this restricts rainfall infiltration in those areas. For this reason, a large proportion of rain falling on the site becomes surface runoff that flows directly to Badgerys Creek or is held in local depressions as ponded water. Although limited in quantity, the flow direction of groundwater reflects the surface topography with groundwater flow directed towards Badgerys Creek.

Previous NSW reports have documented that groundwater under the Elizabeth Drive Site has moderate to high salinity. **Figure 5.2** shows salinity potential in the vicinity of the Elizabeth Drive Site based on data previously supplied by DIPNR and indicates high potential for salinity in the extreme south-west corner of the site. This is a natural occurrence caused by the presence of saline Wianamatta Shales.

The SAWT-BIOWISE facility will be located within the existing approved Elizabeth Drive Site boundaries. As part of the Landfill Licence, groundwater is monitored on a quarterly basis and the level and quality of the groundwater is reported in an Environmental Monitoring Annual Report to both PCC and the DECC-EPA (Maunsell, 2006). Location of the existing groundwater monitoring wells are shown on **Figure 5.3**.

Both groundwater levels and quality have been monitored during the entire period of operation of the existing solid waste landfill. Results to date show there is no impact of the landfill on the groundwater down-gradient of the Elizabeth Drive Site when compared to up-gradient monitoring. The groundwater levels (shown as contours) at the most recently reported annual monitoring event (Maunsell, 2006) are also shown in **Figure 5.3**. In general, groundwater levels measured during this event are consistent with previously measured level variations.



Advanced Waste Treatment Facility
Elizabeth Drive
FIGURE 5.2: Salinity Hazard

It is estimated that 240,000m³ of cut and 110,000m³ of fill will be required for construction of benches and other infrastructure. Material that will be 'cut' from the Elizabeth Drive Site will generally not include material excavated from natural soils but will consist of excavation into temporary on-site stockpiles. Material in excess of the SAWT-BIOWISE fill requirements will be used on the adjacent Landfill Site as cover.

Disturbing any of this material may have the potential to provide a pathway for runoff to Badgerys Creek, or to excavate contaminated material. In addition, stockpiling of any material may affect the drainage of the area, and this should be considered during detailed design.

Operational Impacts

The SAWT-BIOWISE facility will not handle or process materials other than municipal solid waste, green waste, biosolids and the processed compost product. Potential for pollution to enter groundwater is limited to substances present in these materials that can be mobilised and transported by rainfall runoff or process water. Potential pollution that could derive from these materials includes excess nutrients, soluble trace quantities of heavy metals and nuisance/odorous organic compounds. Natural soil conditions at the Elizabeth Drive Site provide resistance to infiltration by surface water due to the high clay content of the soils and their low permeability. Along with this natural barrier, specifically designed features are also proposed to mitigate potential groundwater impacts. No impact on the naturally occurring saline groundwater at the southwest of the site is predicted.

5.1.3 Management of Impacts

Construction

An Erosion and Sediment Control Plan (ESCP) and/or Stormwater Management Plan (SWMP) will be prepared, as part of the CEMP to ensure that impacts associated with construction are appropriately managed. The specific mitigation measures that will be applied to control erosion and soil related impacts are:

- An ESCP and/or SWMP will be prepared and implemented in line with Edition 4 of the Department of Housing's *Managing Urban Stormwater Guidelines* (2004) 'Blue Book' prior to the commencement of works;
- Regular inspection of the work site will be undertaken during construction activities to ensure that the SWMP is properly implemented and maintained;
- Geofabric sediment fences will be temporarily installed down slope of disturbed areas where there is the potential for runoff to enter Badgerys Creek;
- Temporary stockpiles will not be located adjacent to drainage lines;
- Vegetation clearance and soil disturbance will be limited to areas required for construction;
- Revegetation of disturbed areas will occur (where practicable) immediately after completion of works in that area; and
- In the event that unexpected contaminated material is disturbed during earthworks, controls will be implemented to divert surface runoff and the material will be removed from the Site and disposed of at an approved DECCC site.

Operation

The following mitigation measures have been incorporated into the design of the SAWT-BIOWISE facility to reduce the risk of groundwater pollution:

- Solid waste, which could potentially pollute stormwater runoff, will be handled in an enclosed building with concrete floors to limit the generation of leachate;

- Sorting and composting will occur within an enclosed building. Condensate from composting tunnels and biocells will be recycled in the composting process, which will prevent leachate discharge to other parts of the SAWT-BIOWISE facility. As the composting process is a net user of water, leachate discharge from the process is highly unlikely;
- Maturation pads and green waste storage will be carried out on specifically designed hardstand areas that have suitably low permeability to prevent infiltration of leachate into the groundwater. Any leachate from the maturation pads and green waste storage will be drained to the leachate pond;
- All drainage paths will be designed to prevent ponding and infiltration into the groundwater as a result of standing water; and
- Leachate storage and treatment ponds and stormwater storage ponds will be lined with a low permeability liner to control infiltration into groundwater.

These engineering controls will mitigate the risk of groundwater pollution from stormwater and leachate infiltration.

Monitoring

The proposed SAWT-BIOWISE facility will be located entirely within the Elizabeth Drive Site which has extensive leachate monitoring already in place.

Quarterly and annual monitoring is currently undertaken in accordance with the existing Landfill's Environmental Protection Licence. The existing monitoring plan has been designed to characterise groundwater quality and levels at both the up- and down-gradient of the Elizabeth Drive Site. By continuing with the current monitoring regime, any changes in groundwater quality or levels, either due to the existing Landfill or the operation of the SAWT-BIOWISE facility, will be detected.

5.2 Surface Water Quality

5.2.1 Existing Environment

Badgerys Creek, a tributary of South Creek and the Hawkesbury-Nepean River, forms the western property boundary of the Elizabeth Drive Site and therefore runs to the west and north of the SAWT-BIOWISE facility. It is the receiving environment for runoff and discharge from the existing Landfill. These flows are dominated by overland flow on the existing undisturbed ground. A sedimentation basin is located to the west of the proposed SAWT-BIOWISE facility. This basin is used to manage stormwater runoff from the Landfill and, under intense rainfall conditions, the basin discharges via an overland flow regime to Badgerys Creek. Other smaller sedimentation ponds are situated around the perimeter of the Elizabeth Drive Site and control runoff from areas where there is high sediment load. A small catchment in the north-western corner of the Elizabeth Drive Site discharges directly to Badgerys Creek via thick vegetation over an undisturbed portion of the site.

Currently, a vegetation buffer of at least 50m is maintained along much of the creek's length. The Elizabeth Drive Site's fence line is set back a minimum of 50m from Badgerys Creek. This buffer provides substantial amelioration of any pollution entrained in stormwater runoff as well as habitat, water flow features and stream shading. Existing Landfill operations have been carried out to avoid impacts on the creek by constructing all infrastructure away from the creek banks.

Water quality monitoring has been regularly conducted in designated locations along Badgerys Creek as part of the environmental monitoring program specified in the existing Landfill Licence and surface water criteria have been adopted for the site. Monitoring indicates that the waterway typically maintains acceptable water quality for suspended solids, turbidity and Biological Oxygen Demand (BOD). However, samples analysed during routine monitoring show nutrient levels for both total nitrogen and total phosphorus to be above the adopted Elizabeth Drive Site criteria for surface waters.

These nutrients are at elevated levels both up and down stream of the existing Elizabeth Drive Site in Badgerys Creek.

The elevated levels upstream of the Landfill indicate that the Landfill is not the source of the pollution. Water quality data reported in studies for the Second Sydney Airport NSW (Tuft, 1997), indicated that Badgerys Creek was a disturbed ecosystem with generally high levels of nitrogen and chlorophyll A and low levels of oxygen.

Non-ionised ammonia was above the toxic threshold. The creek also supported plants characteristic of eutrophic ecosystem and a wide variety of invertebrates with a high proportion of pollution tolerant species. Introduced pest fish species, such as *Gambusia* and European Carp were reported as common.

5.2.2 Impacts of the SAWT-BIOWISE facility

Sediment

During construction of the SAWT-BIOWISE facility, there is potential for erosion of any disturbed areas. This includes any working areas as well as in areas being re-vegetated. This would result in an increased sediment load in any runoff generated from the site. If this excess sediment were to reach Badgerys Creek it would have a detrimental impact on the existing waterway.

Stormwater and Leachate

The proposed SAWT-BIOWISE facility is located adjacent to the creek. Processing of waste materials and production of compost will result in the generation of leachate, which has come into contact with compost or related organic materials. DECC (2004) highlights the potential for pollution of waterways due to the excessive sediment, acidity, nutrient and micro-organism loading, and BOD characteristic of compost-related leachate. As defined in **Section 4.6.3**, three types of leachate will be generated at the proposed SAWT-BIOWISE facility: condensate leachate, leachate from cleaning, and stormwater leachate. Leachate from each of these sources is likely to contain concentrations of pollutants that make the liquid unsuitable for discharge to waterways.

Pathogens

There is a potential for pathogens to exist in the received waste. These pathogens have the potential to spread via runoff, wind or through application of composted material.

5.2.3 Management of Impacts

Sediment

During construction, temporary erosion controls will be provided where necessary. Permanent stabilisation of embankments, channels and other slopes will be achieved using vegetation and will be carried out promptly. Construction will be staged and progressive rehabilitation undertaken to minimise the area available to erosion at any one time.

Stormwater and Leachate

Potential impacts associated with discharge of leachate and stormwater will be mitigated through the structural design and process controls described in **Section 4.6**.

Collection, treatment, re-use and controlled discharge of leachate and stormwater runoff from the proposed SAWT-BIOWISE facility are important for the overall water management on the SAWT-BIOWISE Site (e.g. maximising re-use) and to ensure that potential impacts on the surrounding

environment are minimised. The control of well-classified types of runoff allows potential impacts on receiving waters to be mitigated, managed and made acceptable.

Stormwater affected by the proposed SAWT-BIOWISE facility has been divided into two categories, diverted stormwater and 'clean' site runoff, as defined in **Section 4.6.2**. The SAWT-BIOWISE Site will be graded to ensure that stormwater is diverted appropriately and undergoes the level of treatment as required by regulation. Roads will be graded to prevent uncontrolled runoff. All stormwater will be captured and retained on site up to and including the 1 in 10 year, 24 hour duration event.

Storage of stormwater runoff will be suitably managed to provide for as much re-use, and thereby reduction in potable water demand, as is practicable. This type of water will be used for application in the SAWT-BIOWISE process, or it will be directly used for operational purposes (irrigation, dust suppression and fire fighting).

All three types of leachate will be retained and re-used on site. Condensate leachate and leachate from cleaning will be temporarily stored in closed containers before being preferentially re-used in the composting process. Stormwater leachate will be treated through bioretention before being temporarily stored in Sedimentation Pond A and re-used as discussed in **Section 4.6**. As with stormwater re-use, this will have the added benefit of reducing the demand for potable water. The pond will either be compacted to a suitable permeability or a synthetic lining will be used to prevent leachate infiltration.

In addition to the compliance aspect, this proposal is a good opportunity for preferential re-use of leachate and stormwater runoff instead of potable water. This will avoid potentially adverse impacts of discharge and reduce consumption of potable water during operation of the SAWT-BIOWISE facility.

Providing passive, physical-biological treatment prior to storage can readily mitigate potential adverse environmental impacts from storage of untreated stormwater runoff and leachate. Re-use of process and product-related leachate and additional use of stormwater runoff to the extent that is practicable, will prevent the discharge of untreated water from the SAWT-BIOWISE facility.

Once these controls are put in place and stormwater runoff is retained on the Elizabeth Drive Site, the quantity of stormwater discharged to Badgerys Creek will not be increased as a result of the SAWT-BIOWISE proposal. The engineering concept design provides sufficient mitigation to address the issues associated with potential increase in stormwater pollution, runoff volume or velocity.

Pathogens

The waste will be received under cover in the Receiving and Mechanical Separation Buildings to avoid contact with stormwater and hence stop potential pathogen transfer via wind and/or water. Control of the conditions in the composting tunnels and biocells will ensure that the pathogens are destroyed during compost production process. Therefore, the compost will be free of pathogens and hence any leachate generated should be free of pathogens. As described in **Section 4.6.4**, the leachate will be tested to ensure that it meets all pathogen level requirements for use in irrigation. This will also provide an indication should pathogens be present in the compost.

5.3 Flooding

The proposed SAWT-BIOWISE facility is located in the north-western corner of the Elizabeth Drive Site. Badgerys Creek runs generally parallel to the western boundary of the Elizabeth Drive Site but turns in a north east direction and passes closest to the site at this corner. Potential impacts of the proposed SAWT-BIOWISE project with respect to the hydrology of Badgerys Creek were assessed during concept design and are presented in the following sections.

5.3.1 Existing Environment

Badgerys Creek has a highly variable flow regime with long periods of no flow interspersed with brief periods of high flow (Tuft, 1997). Penrith City Council, have advised that the 1 in 100 year Annual Exceedance Probability (AEP) flood level is approximately equal to the Relative Level (RL) 42m contour on the SAWT-BIOWISE Site. This coincides with the western boundary of the Elizabeth Drive site (**Figure 5.4** and **Figure 5.5**) and encroaches onto the site of the proposed SAWT-BIOWISE facility.

However, based upon realistic conditions that occur during a flooding event, such a flood level is unlikely to remain at a single RL contour, as water will rise and fall according to the land contours. It is therefore more likely that the relevant RL of this flood level will vary across the site. Table 5.5 of the NSW for the Elizabeth Drive Landfill (PPK Consultants, 1993) includes information from the former NSW Department of Water Resources, now NSW Department of Natural Resources. The Department had noted in a 1990 report that the 1 in 100 AEP flood level at the northern boundary of the Elizabeth Drive site is 39.86m AHD. This information means that the land for the proposed SAWT-BIOWISE facility, the RL of which is generally between 40m and 42m, is outside this flood level.

5.3.2 Potential Impacts

Flooding

Figure 5.4 and **Figure 5.5** display the concept SAWT-BIOWISE facility layout and the Relative Levels (RL) of all major items. As shown, the SAWT-BIOWISE Site will be on the north-western corner. The majority of the existing SAWT-BIOWISE Site area is located above the 1 in 100 year AEP flood level as calculated by the Department of Water Resources. The entire SAWT-BIOWISE facility layout is located above the 1 in 100 year AEP flood line. Hence the SAWT-BIOWISE facility, including ponds, will be above the flood level and will not be subject to inundation during a 1 in 100 year AEP flood.

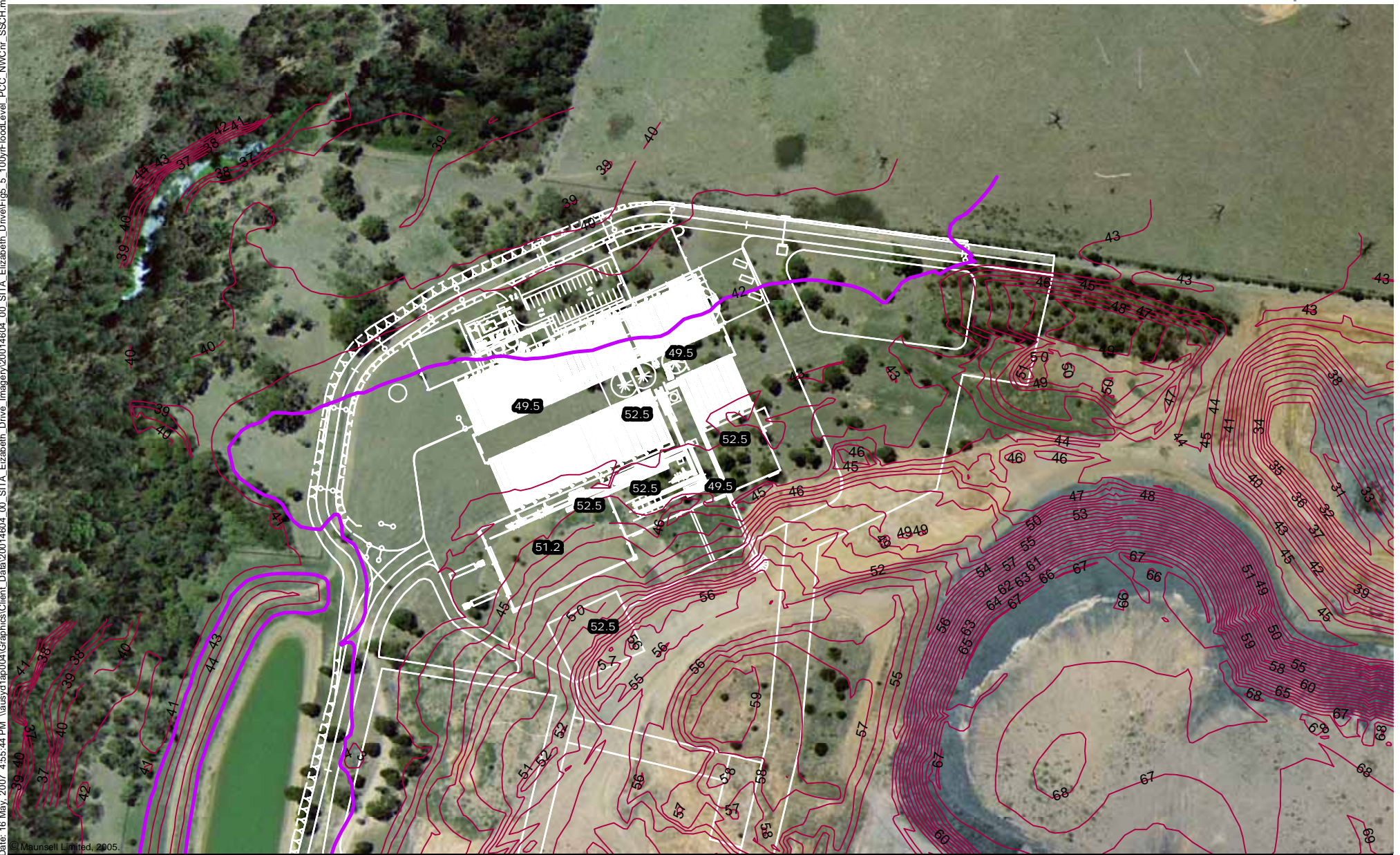
During detailed design the final levels will be set for the haulage road to minimise flood inundation where practicable. Sections will be adequately protected to prevent damage and erosion during 1 in 100 year AEP storm events.

Runoff

Potential impacts due to new developments within a drainage catchment are caused by a change in the runoff characteristics of the catchment such as imperviousness and slope. Impervious surfaces such as roof areas, hardstands or pavements substantially increase runoff flows when compared with undeveloped catchments. Change in ground slope can increase the time it takes the runoff to reach the creek. Generally, runoff could enter Badgerys Creek in a shorter period of time and contribute to peak flows in Badgerys Creek. Modification of the flow regime in Badgerys Creek could subsequently influence bed and bank stability, downstream flood levels and biological components of the waterway.

As the SAWT-BIOWISE proposal is to retain all runoff for events up to and including the 1 in 10 year, 24 hour AEP event, it will not increase the volume of stormwater that will be discharged to Badgerys Creek for these events. However, for larger events, there is potential for the runoff from the Elizabeth Drive Landfill site to be affected by the SAWT-BIOWISE facility.

Date: 16 May, 2007 4:55:44 PM \\vausyd1rap004\Graphics\Client_Data\20014604_00_SITA_Elizabeth_Drive_Imagery\20014604_00_SITA_Elizabeth_Drive\Figs_5_100yrFloodLevel_PCC_NWCnr_SSCH.mxd
 © Maunsell Limited, 2005.



- 42m - Approx 100y flood level
 - 1m Contours
 - ! SAWT Design Roof Heights (m AHD)
- Contour Interval 1m



Advanced Waste Treatment Facility
 Elizabeth Drive

FIGURE 5.5: 1 in 100 Year AEP Flood Level and Elevations - Detailed View

Source: Maunsell, 2006; SITA, 2006

As the majority of the existing SAWT-BIOWISE Site area is located above the 1 in 100 year AEP flood level, there will be minimal disruption to the normal patterns of minor flood flows in Badgerys Creek. However, the earthworks proposed to raise the western boundary above the 1 in 100 year AEP flood level will restrict the cross-sectional width in larger flood events. Depending on the flood characteristics of Badgerys Creek, this constriction could have an impact on the flood pathway and/or the flood storage of the creek. In turn, these effects could result in increased velocities, flow peaks and scour.

During detail design, a comprehensive flood study will be conducted to assess the extent of impacts of the SAWT-BIOWISE facility on Badgerys Creek flood flows.

5.3.3 Management of Impacts

Detailed design will ensure that all facilities and roads are elevated above the 1 in 100 year AEP flood event. This will provide protection to areas subject to erosion during a 1 in 100 year AEP storm event.

Runoff for all events up to and including the 1 in 10 year, 24 hour AEP event will be retained on site as described in **Section 4**.

These two management measures will assist with the protection of Badgerys Creek. By retaining the water on site for a period of time, runoff into the Creek will be of an appropriate quality and released at a velocity that avoids scouring and erosion.

5.4 Flora and Fauna

5.4.1 Existing Environment

A flora and fauna assessment of the site of the proposed SAWT-BIOWISE facility was undertaken in May 2004 by Environmental Appraisal and Planning P/L (**Appendix B**). The assessment included:

- A desktop review of relevant databases;
- Consideration of relevant legislation;
- A field survey targeting species of conservation significance; and
- Section 5A assessments (under the EP& A Act 1979), applied to the threatened species or communities present or considered likely to occur on site.

Given the time lapse (greater than two years) since the original assessment Maunsell ecologists reviewed the flora and fauna assessment of the site in July and November 2006 and February 2007 with consideration to the following:

- Updated database searches (including NPWS Atlas of NSW Wildlife, BioNET, EPBC Protected Matters Search Tool) to identify any additional threatened species or newly listed species under the *Threatened Species Conservation Act 1995* or the *Environmental Biodiversity Conservation Act 1999* potentially occurring within the subject site;
- Review of relevant legislation and planning;
- Site visits on 11 July 2006 and 21 February 2007 to verify vegetation condition; and
- Re-visit Section 5A assessments under the EP&A Act 1979 in light of the *Threatened Species Conservation Amendment Act 2002* (revised 8-part test).

The results of the relevant findings of these investigations are summarised below.

General

The most extensive vegetation studies of the general area are by Benson (1992) and Benson and Howell (1994). Flora and fauna assessments of the immediate area have been conducted by Kevin Mills and Associates (1993) and Kinhill Stearns (1985).

Site Condition

The SAWT-BIOWISE Site has been extensively disturbed and modified as part of the existing landfill operations. There only remains small pockets of highly degraded Eucalyptus species and virtually no natural understorey remains today although isolated individual blackthorn *Bursaria spinosa* and paperbark *Melaleuca nodosa* were observed (a full species list is presented in **Appendix B**). Introduced pasture grasses have regenerated on the cleared land, and a large topsoil stockpile (for landfill coverage) to the north-eastern side of site is covered with regenerating black wattle *Acacia parramattaensis*. A large rough-barked angophora *Angophora floribunda* occurs near this stockpile, however this will be retained. An access road around the perimeter of the site is another source of human disturbance.

The north-western area adjacent to the SAWT-BIOWISE Site leads to Badgery's Creek and the riparian vegetation community supported along the creek consists of 'River Flat Eucalypt Forest' which is listed as an endangered ecological community (EEC). This community was found to be in good condition near the SAWT-BIOWISE Site, although evidence of tree mortality was observed further south. None of this vegetation type will be cleared as part of this proposal, and existing revegetation works in conjunction with the local eofabri group occurring outside the SAWT-BIOWISE Site will continue.

Plate 1: SAWT-BIOWISE Site



Plate 2: SAWT-BIOWISE Site with Badgerys Creek Riparian Vegetation in Background



Plate 3: Access Track 1



Plate 4: Access Track 2



Flora and Vegetation

General

A total of 26 species of vascular flora from 20 genera and 12 families were recorded within the SAWT-BIOWISE Site (**Appendix B**).

The tree species recorded were generally species that are associated with the Shale Plains Woodland (NPWS 'Cumberland Plain Vegetation Mapping' Database 2004) although the degree of historical disturbance and regeneration by introduced pasture species means that none of this habitat type will be cleared by the proposed works.

These are: Forest Red Gum *Eucalyptus tereticornis*, Cabbage Gum *Eucalyptus amplifolia*, Grey Box *Eucalyptus moluccana*, Thin-leaved Stringybark *Eucalyptus eugenioides*, Rough-barked Angophora *Angophora floribunda*, Prickly Paperbark *Melaleuca styphelioides*, Honey-ball Myrtle *Melaleuca nodosa*, *Melaleuca sieberi*, *Melaleuca decora*, *Acacia parramattensis* and the Swamp Oak *Casuarina glauca*.

However, due to prior disturbance and clearing, few understorey species were recorded. Species present included the Blackthorn *Bursaria spinosa*, Sickie Wattle *Acacia eofabr*, Needlebush *Hakea sericea* and *Dillwynia sieberi*. This remnant vegetation is isolated from other woodlands in the locality and occurs along the site boundary fence such that it will not be affected by the proposed works.

Other species recorded on site included False Sarsaparilla *Hardenbergia violacea*, Kangaroo Grass *Themeda australis*, Couch *Cynodon dactylon*, the Bullrush *Typha orientalis* and numerous exotic weeds and grasses.

Species and Communities of Conservation Significance

A search of the Atlas of NSW Wildlife database and the Schedules of the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) revealed that 11 species of conservation significance occur within five kilometres of the SAWT-BIOWISE Site (**Table 5.1, Figure 5.7**).

Table 5.1: Results of Threatened Species Database Searches

Family Name	Scientific Name	Legislation and Code (Description)	
		Threatened Species Conservation Act 1995	EPBC Act 1999
Apocynaceae	<i>Marsdenia viridiflora</i> subsp. <i>Viridiflora</i>	E2 (Endangered population)	
Mimosaceae	<i>Acacia pubescens</i>	V (Vulnerable)	Vulnerable
Fabaceae	<i>Dillwynia tenuifolia</i>	E2 (Endangered population)	Vulnerable
Fabaceae	<i>Pultenaea parviflora</i>	E1 (Endangered)	Vulnerable
Proteaceae	<i>Grevillea parviflora</i>	V (Vulnerable)	
Proteaceae	<i>Grevillea parviflora</i> subsp. <i>Parviflora</i>	V (Vulnerable)	Vulnerable
Proteaceae	<i>Grevillea juniperina</i> subsp. <i>Juniperina</i>	V (Vulnerable)	
Proteaceae	<i>Persoonia nutans</i>	E1 (Endangered)	Endangered
Lobeliaceae	<i>Hypsela sessiliflora</i>	E1 (Endangered)	
Asclepiadaceae	<i>Cynanchum elegans</i>	E1 (Endangered)	Endangered
Thymelaeaceae	<i>Pimelea spicata</i>	E1 (Endangered)	Endangered
Rhamnaceae	<i>Pomaderris brunnea</i>		Vulnerable

Reference *Threatened Species Conservation Act 1995* (Schedule 2) and (Schedule 1, Part 1) *EPBC Act 1999*

It is considered highly unlikely that flora of significance listed in **Table 5.1** occur within the site of the proposed SAWT-BIOWISE facility as targeted searches for species of significance did not locate any of the threatened species.

Given the highly disturbed nature of the site, threatened flora are not expected to occur within the area of direct impact. Areas of vegetation around the perimeter of the site could potentially support threatened flora although these will not be disturbed by this proposal.

The results of the field survey suggest that the original vegetation within the SAWT-BIOWISE Site was Cumberland Plain Woodland EEC, although this has been largely eradicated from the site. The Cumberland Plain Woodland is listed as an endangered ecological community in Part 3 of Schedule 1 of the NSW *Threatened Species Conservation Act 1995*. Threats to the Cumberland Plain Woodland vegetation community include 'clearing, grazing, hobby farms, poultry farms, housing and other developments, invasion by exotic plants and increase in nutrient loads due to fertiliser runoff from gardens and farmland, dumped refuse or sewer discharge' (NPWS, Final Determination).

An Assessment of Significance has been applied to the Cumberland Plain Woodland (**Appendix C**). The Assessment of Significance concluded that "while 0.81 ha of highly modified and disturbed Cumberland Plain Woodland will be cleared (only small isolated degraded pockets remaining), the proposal will not have a significant impact on the diversity, species composition or structure of this community, or its long term survival on local, state or regional levels".

Invasive Species

A number of environmental and noxious weeds were recorded on site, these include Inkweed (*Phytolacca octandra*), Deadly Nightshade (*Solanum nigrum*) Fleabane (*Conyza albida*), Blackberry (*Rubus* spp), mothvine (*Araujia hortorum*) Fireweed (*Senecio madagascarensis*) and Paspalum (*Paspalum dilatatum*).

Fauna

Fauna Habitat and Wildlife Corridors

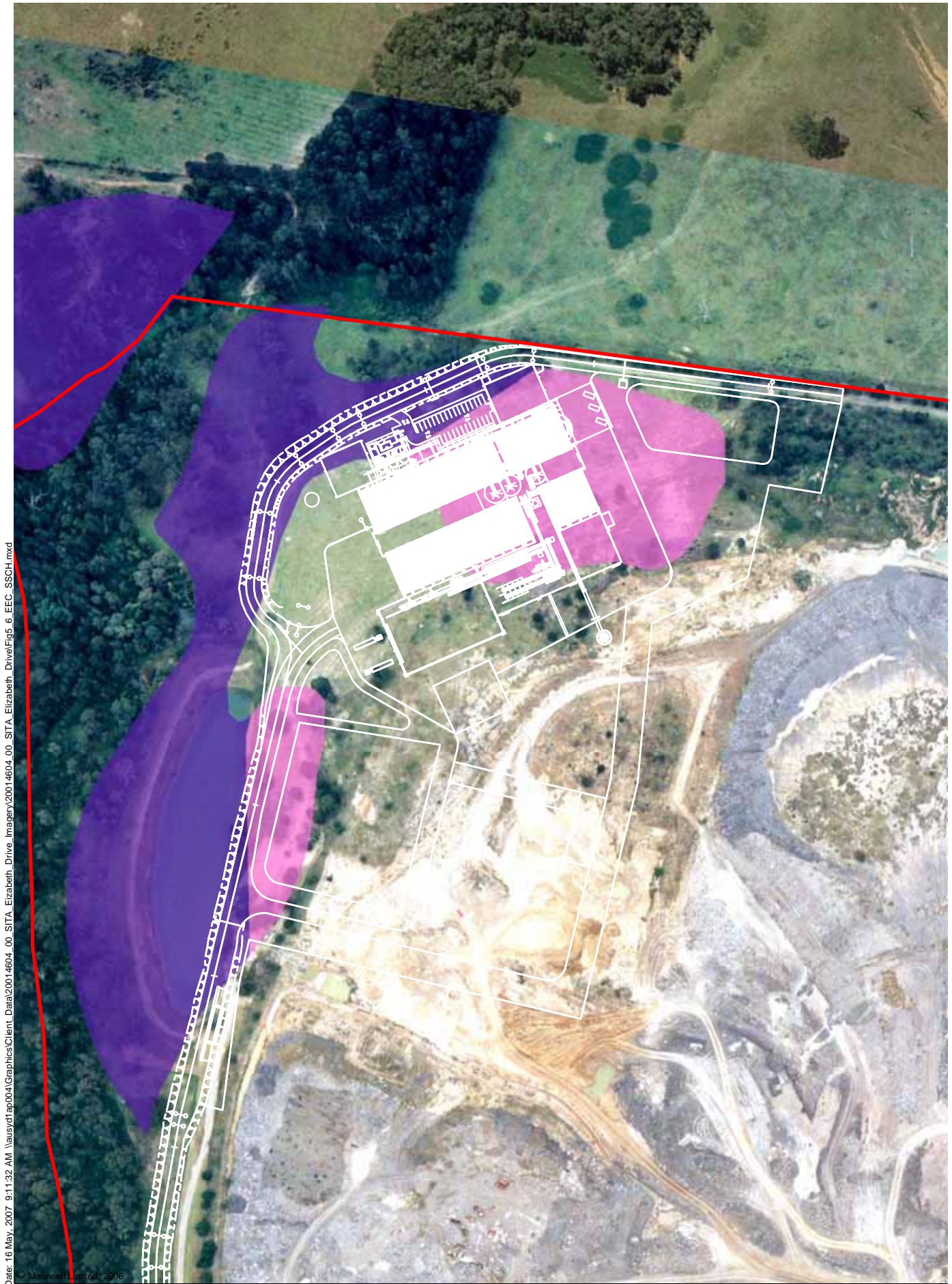
Due to the lack of native vegetation, the SAWT-BIOWISE Site is of low value as fauna habitat. A few Melaleuca shrubs and one mature *Angophora* tree may provide food for fauna, however the large tree will not be affected by the proposed works and no critical breeding resources, such as tree hollows, were observed on site.

The remnant vegetation around the periphery of the site is mapped as 'Support to Core Habitat' due to its proximity to the adjacent Badgerys Creek Riparian Community (**Figure 5.8**). NPWS classify remnant bushlands into Conservation Significance Categories to assist with planning and decision making for the Cumberland Plain Recovery Plan. These areas are 'Core Habitat', 'Support for Core Habitat', 'Urban Remnant Trees' and 'Other remnant Vegetation'. 'Core Habitat' areas are predominately EECs as listed under the TSC Act and are there to provide a conservation network through the landscape. 'Support for Core Habitat' provide corridor connections between areas of remnant native vegetation for movement of fauna, buffering edge effects and increasing areas of remnant vegetation, ultimately enhancing the biodiversity values of the region.

Species of Conservation Significance

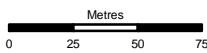
A search of the Atlas of NSW Wildlife database and EPBC Act database revealed that 33 species of conservation significance potentially occur within the broader district and bioregion. These species are listed in **Table 5.2**.

A comprehensive fauna survey was not undertaken, however, potential fauna composition in relation to threatened species and their habitat requirements has been assessed and is reported in **Table 5.2**. Threatened fauna known to occur within a 5 km radius are presented in **Figure 5.9**.



Date: 16 May, 2007, 9:11:32 AM, \\ausydrfap004\Graphics\Client_Data\20014604_00_SITA_Elizabeth_Drive_imagery\20014604_00_SITA_Elizabeth_Drive\Figs_6_EEC_SSCH.mxd
© Maunsel Limited, 2006

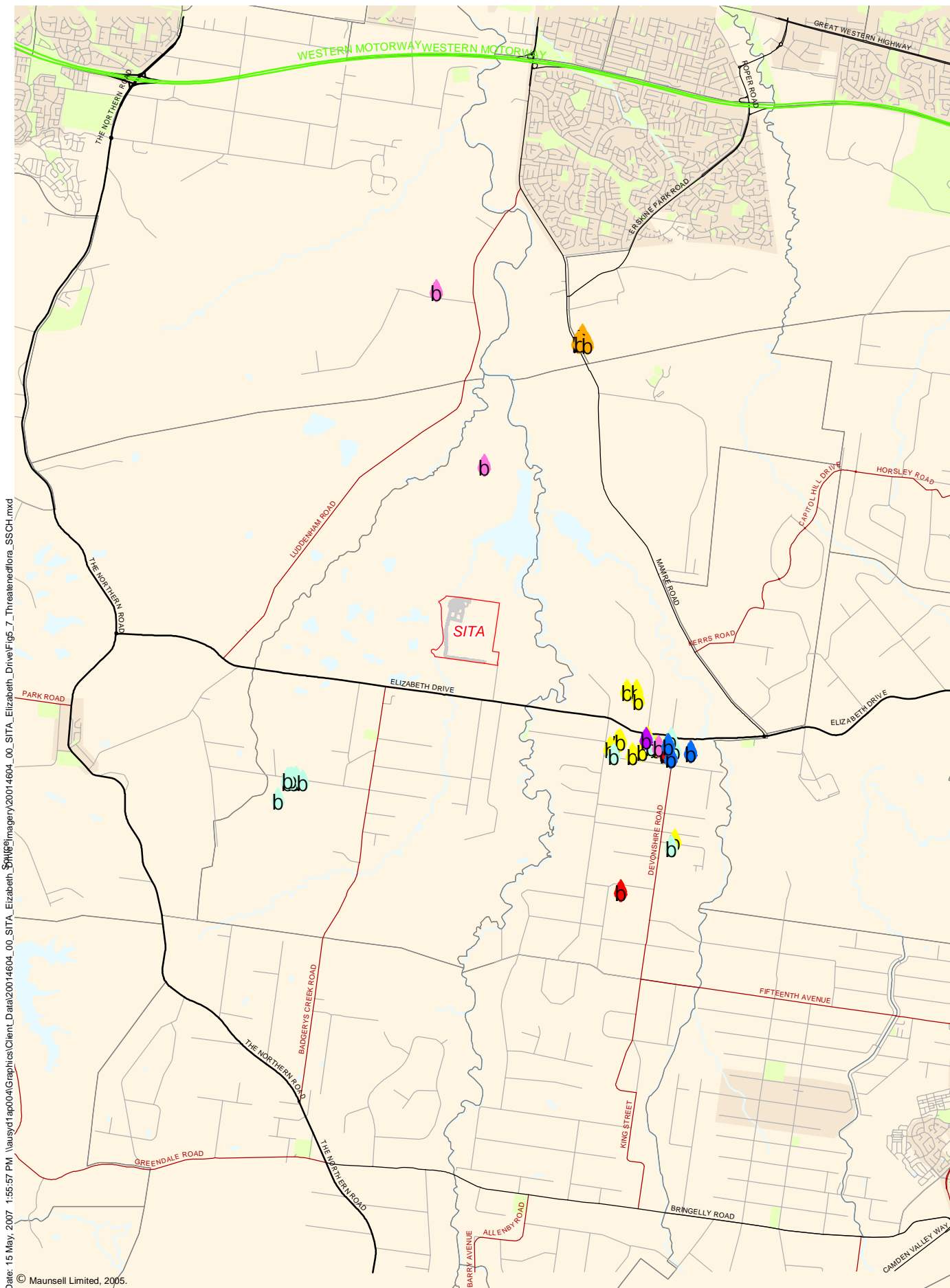
- Cumberland Plain Woodland
- River Flat Eucalypt Forest



Advanced Waste Treatment Facility Elizabeth Drive

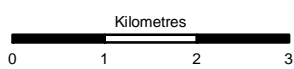
FIGURE 5.6: Endangered Ecological Communities

*Note: Vegetation visible as CPW has been cleared since this photograph was taken under previous approvals.
Source: Maunsel, 2006; NPWS, 2002a*



Date: 15 May, 2007 1:55:57 PM \\vausyd1ap004\Graphics\Client_Data\20014604_00_SITA_Elizabeth_Drive\imagery\20014604_00_SITA_Elizabeth_Drive\Figs_7_Threatenedflora_SSCH.mxd
© Maunsell Limited, 2005.

- | | | | |
|--|--|--|--|
| | Acacia pubescens | | Grevillea parviflora subsp. parviflora |
| | Dillwynia tenuifolia | | Hypsela sessiliflora |
| | Grevillea juniperina subsp. juniperina | | Persoonia nutans |
| | Grevillea parviflora | | Pultenaea parviflora |



Advanced Waste Treatment Facility
Elizabeth Drive

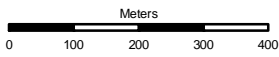
FIGURE 5.7: Threatened Flora

Source: GA, 2006; Maunsell, 2006; NPWS, 2006

Date: 17 May, 2007 11:26:15 AM \\nausyd\p004\Graphics\Client_Data\20014604_00_SITA_Elizabeth_Drive_Imagery\20014604_00_SITA_Elizabeth_Drive\Figs_8_Conserv\Sig_SSCH.mxd



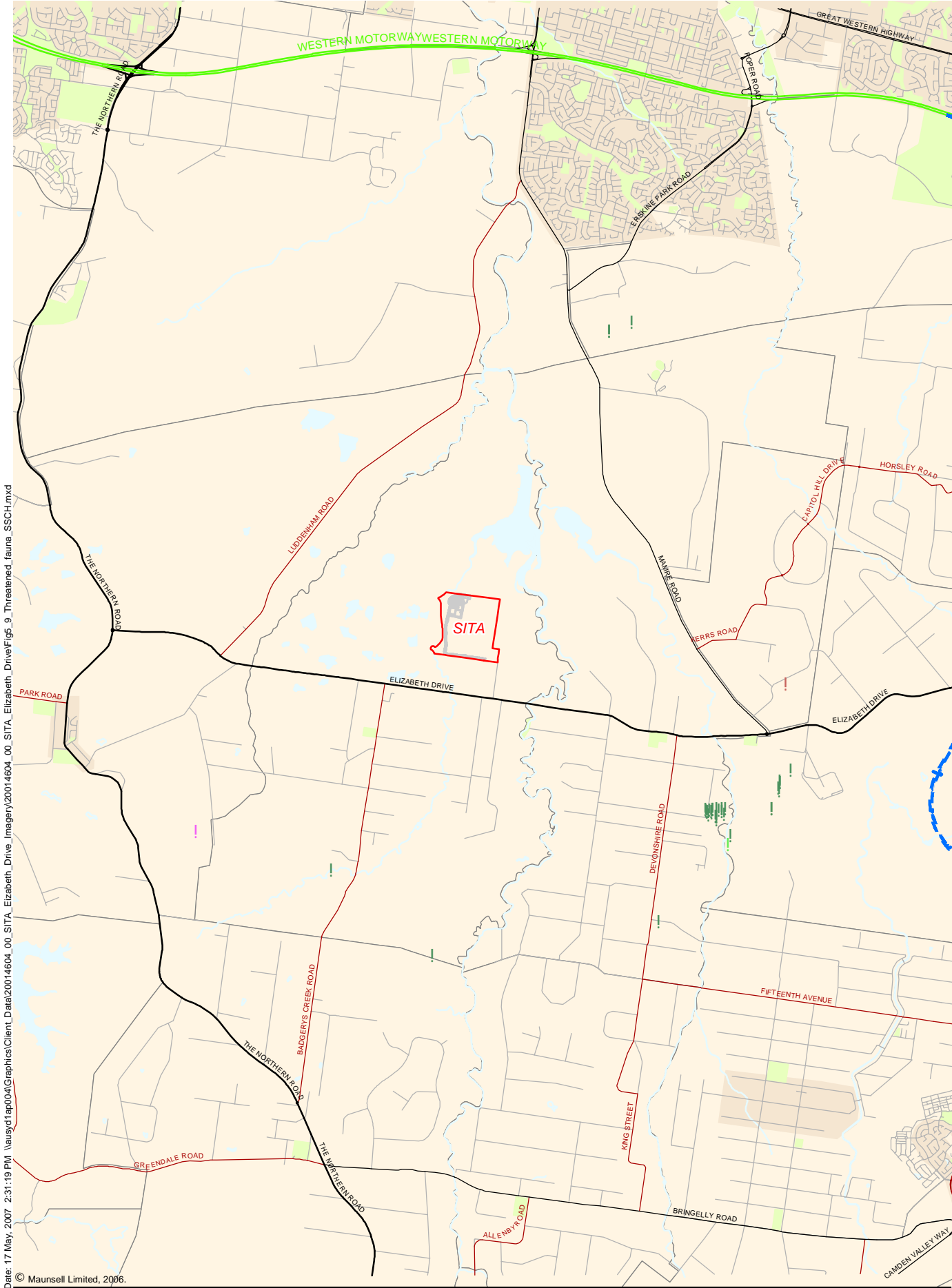
- Core Habitat
- Support to Core Habitat
- Other Remnant Vegetation
- Highly Disturbed



Advanced Waste Treatment Facility
Elizabeth Drive

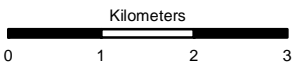
FIGURE 5.8: Fauna Habitat and Movement Corridors

Source: Maunsell, 2006; NPWS, 2002b



Date: 17 May, 2007 2:31:19 PM \\ausyd1ap004\Graphics\Client_Data\20014604_00_SITA_Elizabeth_Drive_Imagery\20014604_00_SITA_Elizabeth_Drive\Figs_9_Threatened_fauna_SSCH.mxd
 © Maunsell Limited, 2006.

- ! Cumberland Plain Land Snail
- ! Eastern Bentwing-bat
- ! Eastern Freetail-bat
- ! Grey-headed Flying-fox
- ! Large-footed Myotis
- ! Speckled Warbler



Advanced Waste Treatment Facility
 Elizabeth Drive

FIGURE 5.9: Threatened Fauna

Source: Maunsell, 2006; NPWS, 2006

Table 5.2: Results of Threatened Species Database Searches

Species	Legislation and Code		Evaluation of Potential Habitat within SAWT-BIOWISE Site
	<i>Threatened Species Conservation Act 1995 (Schedule 2)</i>	<i>EPBC Act 1999</i>	
Mammals			
* Eastern (Common) Bent-winged Bat <i>Miniopterus schreibersii</i>	Vulnerable	-	Potential foraging habitat only. There are no caves, tree hollows or similar artificial roosting habitats present on-site.
* Eastern Free-tailed Bat <i>Mormopterus norfolcensis</i>	Vulnerable	-	
Large eared Pied Bat, <i>Chalinolobus dwyeri</i>	Vulnerable	Vulnerable	
Little Bent-winged Bat <i>Miniopterus australis</i>	Vulnerable	-	
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>	Vulnerable	-	
Yellow-bellied Sheath-tailed Bat <i>Saccolaimus flaviventris</i>	Vulnerable	-	
Brush-tailed Rock Wallaby <i>Petrogale penicillata</i>	Endangered	Vulnerable	No suitable habitat present.
Long-nosed Potoroo <i>Potorous tridactylus tridactylus</i>	Vulnerable	Vulnerable	No suitable habitat present.
Koala <i>Phascolarctos cinereus</i>	Vulnerable	-	Food tree <i>Eucalyptus tereticornis</i> present. However, species is extinct within the locality.
Spotted-tailed (Tiger) Quoll <i>Dasyurus maculatus</i>	Vulnerable	-	Potential marginal foraging habitat present within the adjacent riparian community habitat, however Tiger Quolls are long extinct in the Sydney Basin.

*Known to occur within a 5km radius

Species	Legislation and Code		Evaluation of Potential Habitat within SAWT-BIOWISE Site
	Threatened Species Conservation Act 1995 (Schedule 2)	EPBC Act 1999	
Squirrel Glider <i>Petaurus norfolcensis</i>	Vulnerable	-	Potential foraging habitat present within nearby riparian community, however Squirrel Gliders are long extinct in the Sydney Metropolitan area.
Large-footed Myotis <i>Myotis adversus</i>	Vulnerable	-	Potential marginal foraging habitat present only.
Birds			
Bush Stone Curlew <i>Burhinus grallarius</i>	Endangered	-	Very broad habitat present, but Bush Stone Curlew no longer occurs in the Sydney Metropolitan area.
Glossy Black Cockatoo <i>Calyptorhynchus lathami</i>	Vulnerable	-	No key foraging or breeding habitat present. Species may traverse through study site.
Swift Parrot <i>Lathamus discolor</i>	Endangered	Endangered	Small area of potential feeding habitat only.
Turquoise Parrot <i>Neophema pulchella</i>	Vulnerable	-	Unlikely habitat.
Powerful Owl <i>Ninox strenua</i>	Vulnerable	-	Broad foraging & roosting habitat present within adjacent riparian community, but not on site.
Barking Owl <i>Ninox connivens</i>	Vulnerable	Vulnerable	Broad foraging and roosting habitat present within adjacent riparian community, but not on site.
Masked Owl <i>Tyto novaehollandiae</i>	Vulnerable	Vulnerable	Potential broad foraging habitat present throughout.
Regent Honeyeater <i>Xanthomyza phrygia</i>	Endangered	Endangered	Marginal foraging habitat.
Australian Painted Snipe <i>Rostratula australis</i>	-	Vulnerable	No habitat present.
Grey Goshawk <i>Accipiter novaehollandiae</i>	Protected	-	Known to utilise adjacent riparian vegetation as breeding habitat. May occasionally traverse the study area.

Species	Legislation and Code		Evaluation of Potential Habitat within SAWT-BIOWISE Site
	Threatened Species Conservation Act 1995 (Schedule 2)	EPBC Act 1999	
White Bellied Sea Eagle <i>Haliaeetus leucogaster</i>	Protected	Migratory	The White Bellied Sea Eagle is present within the adjacent riparian community and is nesting within this habitat. However, no habitat for these species occurs within the subject site.
White-throated Needletail <i>Hirundapus caudacutus</i>	Protected	Migratory	These species may occasionally traverse the study area, however more likely to occur within the adjacent riparian habitat and will not be affected by the proposal.
Black-faced Monarch <i>Monarcha melanopsis</i>	Protected	Migratory	
Satin Flycatcher <i>Myiagra cyanoleuca</i>	Protected	Migratory	
Speckled Warbler <i>Pyrholaemus sagittatus</i>	Vulnerable	-	-
Amphibians			
Giant Burrowing Frog <i>Heleioporus australiacus</i>	Vulnerable	Vulnerable	Species prefers low-lying riparian habitat and moist areas. No suitable breeding or sheltering areas within the project area. These species may utilise adjacent riparian habitat.
Giant Barred Frog <i>Mixophyes iteratus</i>	Endangered	Endangered	
Red-crowned toadlet <i>Pseudophryne australis</i>	Vulnerable	-	
Green & Golden Bell Frog <i>Litoria aurea</i>	Vulnerable	Endangered	Marginal habitat present in nearby Badgerys Creek, however, breeding habitat is likely to be sterilised due to infestation by Mosquito Fish.
Reptiles			
Broad-headed snake <i>Hoplocephalus bungaroides</i>	Endangered	Vulnerable	Key habitat resources (sandstone outcrops and tree hollows) absent. Unlikely to occur on site.

Species	Legislation and Code		Evaluation of Potential Habitat within SAWT-BIOWISE Site
	<i>Threatened Species Conservation Act 1995 (Schedule 2)</i>	<i>EPBC Act 1999</i>	
Invertebrates			
*Cumberland Plain Land Snail <i>Meridolum corneovirens</i>	Endangered		Marginal potential habitat present, however habitat within subject site is mostly destroyed. Targeted searches revealed no Cumberland Plain Land Snail within the SAWT-BIOWISE site, however, the species was recorded within the adjacent riparian land.

*Known to occur within a 5km radius

The SAWT-BIOWISE Site is not considered to be a critical habitat for any of the species listed in **Table 5.2** as:

- The area has been largely cleared of vegetation and virtually no native regeneration has occurred other than the wattle on the stockpile;
- Previous fauna surveys did not locate these species within the SAWT-BIOWISE Site;
- The SAWT-BIOWISE Site does not provide sufficient resources for breeding (such as tree hollows); and
- Only marginal feeding habitat is present and more suitable foraging habitat is present in the adjacent Badgerys Creek Riparian community.

Fauna that do use this site will do so because of its existing disturbed nature. For example, Australian magpies would be attracted to the open grassland to forage, and microbats would be attracted to moths and other nocturnal invertebrates that are attracted to any lights that are powered at night on the site.

Conservation Reserves/Planning Policies

There are no nature conservation reserves adjacent, or in close proximity, to the subject site. On a broader scale, district conservation areas include the Kemps Creek Nature Reserve, Western Sydney Regional Park, Leacock Regional Park, Parramatta Regional Park, William Howe Regional Park, Bents Basin State Recreation Area and the Castlereagh Nature Reserve.

There are no designated State Environmental Planning Policy 14 (Coastal Wetlands) or SEPP 19 Public Bushland Reserves (Urban Bushland Protection) present within, or adjacent to, the SAWT-BIOWISE Site.

Potential Impacts

Endangered Ecological Communities

No significant impacts to locally or regionally significant native vegetation and flora are expected to occur as a result of the proposed project. While NPWS mapping shows that part of the SAWT-BIOWISE Site supports Cumberland Plain Woodland, the field surveys showed that only tiny, isolated and highly disturbed remnants were present.

A total of 0.81 ha of Cumberland Plain Woodland will be removed as a result of the proposal. This is primarily comprised of degraded *E.tereticornis* and *E. eugenioides* over *Melaleuca woodland* adjacent to the Access Track to site (refer to **Plate 2** and **Plate 3**). In addition some clearing of scattered *E.tereticornis*, *E. amplifolia* and *E. moluccana* may occur along the perimeter of the site (Refer to **Plate 1** and **Plate 2**).

An 8-part test undertaken in 2002 (Refer to **Appendix B**) determined that there would be no net impact to Cumberland Plain Woodland. In light of the 2002 Amendment to the *Threatened Species Conservation Act* 1995, an Assessment of Significance was reapplied to this community with the same conclusion (**Appendix C**).

Moderate-to-good condition River Flat Eucalypt Forest occurs immediately adjacent to the SAWT-BIOWISE Site (listed as Endangered under the TSC Act). This area of riparian vegetation (to the north/northwest of the existing access track) is currently fenced off from existing operations and no impacts are expected to occur to this community if mitigation measures outlined in **Section 5.3.2** are implemented.

Threatened Flora

No threatened flora species were present on site. There is potential for introduction of invasive weed species, from the site, to adjacent Badgerys Creek Riparian Community and this has been addressed in the mitigation measures (**Section 6.3.3**).

Threatened Fauna and Fauna Habitats

The construction of the SAWT-BIOWISE facility is not expected to impact any critical habitat or threatened fauna given:

- No sightings or evidence of species of conservation significance were recorded within the SAWT-BIOWISE Site;
- The degraded and modified state of the area is not considered favourable as permanent fauna habitat; and
- The construction of the SAWT-BIOWISE facility will not result in the severance of wildlife movement corridors or fragmentation of fauna habitat.

An 8-part test undertaken in 2002 (Refer to **Appendix B**) determined that there would be no net impact to the following species: Swift Parrot, Regent Honeyeater, Grey-headed Flying Fox and the Cumberland Land Snail. Given that these species were not observed on site and that the proposal will not impact any critical habitat of these species, Section 5A Assessments (*Threatened Species Conservation Amendment Act 2002*) were not reapplied to these species.

Fauna Movement Corridors

The proposal does not include removal of vegetation within the riparian habitat precinct. All of the species expected to occur within the locality will still be able to traverse through the riparian community *en route* to other vegetative links.

Pest Species

An issue usually associated with food waste disposal is the attraction of feral animals, such as rats, mice, feral cats, foxes and dogs, and opportunistic native animals, such as seagulls. These animals feed on the waste and can potentially spread disease as well as causing nuisance. Access to food waste has led to a massive population explosion of seagulls in the Sydney Region, causing problems for other native species, infrastructure and amenity. Because the waste receipt and waste separation areas of the SAWT-BIOWISE facility are in an enclosed building, and separated food waste will be composted in enclosed biocells, pests will be largely eliminated. In addition, the site will be securely fenced to prevent access by dogs and foxes.

Phylloxera (*Daktalospaira vitifoliae*) is a tiny insect that attacks the roots of grapevines and is capable of jeopardising the viability of vineyards. It has been detected in the Orchard Hills and Camden areas of NSW. As a result, Phylloxera "exclusion" zones have been deemed for the major wine regions of NSW to protect against an outbreak. The Sydney Region, from where waste will be sourced for feedstock, is located within the County of Cumberland which is a DECClared *Phylloxera*-infected area under the *Plant Diseases Act 1924*. Authorisation is required from NSW Agriculture to move any soil, parts of the plant genus *Vitis*, or any material that is likely to spread *Phylloxera* from the County.

The active composting and curing processes proposed for the SAWT-BIOWISE facility are sufficient to destroy grape vine roots infected with Phylloxera. NSW Agriculture (2002) advise that adherence to AS 4454 will minimise the risk of this species surviving in compost. This standard will be applied to all compost produced by the SAWT-BIOWISE facility (**Section 4.4.2**) and there is not expected to be a problem with this species. However, appropriate authorisation from NSW Agriculture will be obtained

if there is potential for grape vine material to enter the waste stream, with regard to transfer of waste to/from *Phylloxera* exclusion zones from/to the SAWT-BIOWISE Site.

Management of Potential Impacts

In order to mitigate potential impacts to flora and fauna, SITA propose the following management measures:

- To offset the removal of some severely degraded and isolated small pockets of Cumberland Woodland, a revegetation program will be initiated (in discussion with LANDCARE & DECCC) along the north west boundary. It is envisaged that the revegetation program will include species affiliated with Cumberland Woodland vegetation association; and
- Along with the revegetation program an active vegetation management program will be initiated and will include the following measures to ensure this vegetation buffer zone is maintained in a healthy state:
 - The area of Badgerys Creek Riparian Community, adjacent to the SAWT-BIOWISE Site, will remain restricted to staff of SITA and persons will enter this area only for the purposes of vegetation management and environmental monitoring. This is of key importance to the ongoing preservation of Riparian vegetation and the protection of fauna habitat (in particular the White Bellied Sea Eagle and Grey Goshawk);
 - Clearing limits will be clearly marked and fenced prior to construction to prevent accidental impacts to adjacent vegetation;
 - Weed management;
 - No heavy machinery will be permitted access outside of clearing limits;
 - No building materials (including spoil mounds) will be stored or placed outside of clearing limits;
 - Two remnant mature trees on site (Grey Box and Rough barked Apple) will be fenced prior to clearing to avoid disturbance;
 - Non-residual herbicides will be used, on an as-needed basis, to control weeds; and
 - A monitoring program will be implemented to ensure the revegetated areas become fully established.

A referral should be sent to the DEH in regards to the clearing of Cumberland Plain Woodland, a listed EEC under the EPBC Act.

In addition to the above measures, SITA have implemented a programme of revegetation along the northern boundary of the Elizabeth Drive Site with species consistent with Cumberland Woodland vegetation association. This revegetation commenced in 2004 in co-operation with LANDCARE, such that 1000 trees have already been planted in this area. Key objectives of replanting would be to replace any remnants of Cumberland Plain Woodland that have already been removed from the Elizabeth Drive Site during historical (pre-SITA) quarrying/land clearing practices. This planting will also serve as a vegetative screening barrier along this boundary.

The above programs will provide the appropriate offset to any proposed clearing of small isolated pockets of severely degraded Cumberland Woodland vegetation. The reintroduction of Cumberland Woodland habitat along the north west and north boundary will ensure there is a "support for core habitat" and provide the necessary buffering of the facility to the existing core habitat River Flat Eucalypt Forest EEC, which occurs along Badgerys Creek.