Prepared by SUEZ Recycling & Recovery Australia

Lucas Heights Resource Recovery Park Project
Response to Submissions and Preferred Project Report

SUEZ Recycling & Recovery

PART 2 - Appendix A & Appendix B & Appendix C

June 2016

Appendix A
Communication materials

we plan to invest in essential waste management and recycling infrastructure at Lucas Heights resource recovery park

key features of the proposal

- Increase landfill capacity by 8.3 million cubic metres
- Improve and relocate the garden organics facility
- Better environmental outcomes through best practice prevention, mitigation and rectification measures
- No significant impact to the environment or the community
- Invest in and extend operations until 2037
- Invest in a $90 million resource recovery facility to divert up to 70% of waste from landfill
- Establish community parklands after closure
- Provide $100 million for community facilities in the Sutherland Shire

The Environmental Impact Statement is now on exhibition by the NSW Department of Planning and Environment.

Have your say on the project or register your support by visiting **majorprojects.planning.nsw.gov.au**

Visit us between 9th - 28th November to find out more.

Menai Marketplace

Tuesday	9am-11am
Thursday	3pm-7pm
Saturday	10.30am-12.30pm & 2pm-4pm
Sunday	10am-12pm

The Ridge Golf Club House

Saturday	8am-10am

For more information about the project or a guided tour of the Lucas Heights Resource Recovery Park, visit or contact us at:

suez-env.com.au/lucasheights

lucas.heights@suez-env.com.au

1800 810 680 Project Hotline

SITA Australia is now SUEZ

The Australian Business Awards WINNER ENVIRONMENTAL SUSTAINABILITY 2013

The Australian Business Awards ABA100 WINNER SUSTAINABILITY 2014

suez

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Lucas Heights resource recovery park

Our plan to invest in essential waste management and recycling infrastructure

*SUEZ Recycling and Recovery (referred to as SUEZ) (ABN 70 002 902 650) is the new business name of SITA Australia Pty Ltd.
SITA Australia Pty Ltd is part of the SUEZ global group of companies. SUEZ Recycling and Recovery is a joint venture with Sembcorp.

about SUEZ

SUEZ* makes the best use of **water and waste** by providing **smart and reliable** resource management solutions.

- Our first preference is always to recycle the waste we receive and in NSW we divert more than 370,000 tonnes of waste from going into landfill each year.
- We enable communities to transform their waste into valuable energy and materials. Our smart and reliable collection, recovery and recycling solutions help protect our environment and make our communities more sustainable.
- With operations across the entire resource recovery chain, we help local councils, businesses and residents work towards solving two of our largest environmental problems – managing waste and conserving resources.

Above: Highly engineered landfill at Lucas Heights Resource Recovery Park

key facts

SUEZ has operated the Lucas Heights Resource Recovery Park since 2011, we provide essential waste management and recycling infrastructure.

At the recovery park, we process garden organics into composts, mulches and other soil conditioning products.

Where waste is not recycled, we treat and dispose of it in our highly engineered landfill and then capture landfill gas to produce renewable energy.

We give back to the Sutherland Shire by supporting a range of local community initiatives and sporting teams.

we're investing in essential waste management and recycling infrastructure

We plan to increase capacity at the **New Illawarra Road Landfill** by 8.3 million cubic metres and extend operations at the site for 12 years until 2037.

- We will also upgrade the landfill gas capture system to reduce a source of odour, reduce greenhouse gas emissions and generate more renewable energy.
- We plan to relocate and expand our existing garden organics facility that recycles garden waste into a range of nutrient-rich compost products and diverts these valuable resources from landfill.
- We will invest in additional infrastructure for our garden organics operations, including covering active phases of the composting process for better odour management. The capacity will be increased from 55,000 to 80,000 tonnes per year and activities moved to the western side of the site near Heathcote Road, further away from residential areas.
- We are seeking approval to build a fully enclosed $90 million state-of-the-art Advanced Resource Recovery Technology facility in the future. This facility would process up to 200,000 tonnes of general solid waste per year and recover valuable resources that can be used to create compost or alternative fuels. The facility would divert up to 70% of waste from landfill.

- The Lucas Heights Resource Recovery Park will ultimately be returned to the community as parklands for everyone to enjoy. As part of the proposal, the parklands would be approximately 25 hectares larger in area than the currently approved parkland, providing more area for recreation and community use.
- SUEZ will also contribute $100 million in funding over 15 years to Sutherland Shire Council which will be used by Council to fund a range of new projects and facility upgrades in Sutherland Shire.

key features

- Increase landfill capacity by 8.3 million cubic metres
- Invest in and extend operations until 2037
- Improve and relocate the garden organics facility
- Invest in a $90 million resource recovery facility to divert up to 70% of waste from landfill
- Better environmental outcomes through best practice prevention, mitigation and rectification measures
- No significant impact to the environment or the community
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- Provide $100 million for community facilities in the Sutherland Shire

Far left: SUEZ will upgrade the landfill gas infrastructure at the New Illawarra Road Landfill

Left: Compost

advanced resource recovery technology

Recovering and recycling valuable resources back into the economy

Our Advanced Resource Recovery Technology (ARRT) facilities **transform household waste** into compost that can be used in rehabilitation projects to **replenish degraded soils**.

- These facilities also turn mixed plastics, timbers, textiles and other dry combustible materials into fuels which can replace gas and coal in cement kilns.
- SUEZ owns and operates more than half of all alternative waste treatment facilities in Australia and in 2014 recovered over 399,000 tonnes of materials that would have otherwise gone to landfill.
- As part of the Lucas Heights proposal, the onsite ARRT will be a fully enclosed facility and be able to divert up to 140,000 tonnes of waste from landfill.

Above: An ARRT facility which recycles waste that would have otherwise gone to landfill

Top: Nutrient-rich compost used to replenish degraded soils

community engagement is an essential part of our operations

Community and stakeholder engagement is an **integral part of our operations** in the Sutherland Shire.

- We are committed to actively engaging and listening to the community and our stakeholders throughout the planning process, including by offering guided tours of the Lucas Heights Resource Recovery Park.
- We will continue to seek input from the community through our Lucas Heights Community Reference Group, which is made up of local residents and business neighbours. The CRG meets regularly to discuss our operations.
- We will also continue to help educate the local community about resource recovery, recycling and waste management practices.

For futher information we encourage the community to have their say on this proposal during the Environmental Impact Statement (EIS) exhibition period.

Visit **majorprojects.planning.nsw.gov.au**

Above and right: Councils, residents, community groups, schools and businesses are encouraged to visit our facilities to learn how we recover valuable resources from everyday 'waste'

timeline

01

SUEZ submits State Significant Development Supporting Documentation with the Department of Planning and Environment

02

Secretary of NSW Department of Planning and Environment provides environmental assessment requirements and community consultation begins

03

Development Application including EIS submitted to the Department of Planning and Environment for review

04 **WE ARE HERE**

EIS placed on public exhibition by the Department of Planning and Environment which provides a further opportunity for community input

05

Department of Planning and Environment assesses the application

garden organics

Returning nutrients to the earth with high quality compost products

SUEZ's garden organics facilities **recycle garden waste** into a range of high-quality, nutrient-rich **compost products**, diverting these valuable resources from landfill in the process.

- Our facilities transform lawn clippings, leaves, branches and other green waste into high quality compost products.
- Once the garden organics material is received from council and commercial collections, all contaminants such as plastic bags, bottles and metals are removed. The organics are then ground into a smaller, more suitable size for composting.
- This material decomposes naturally with the help of the same micro-organisms found in any home compost bin.
- The composting process is aerobic, meaning the material breaks down in the presence of oxygen.
- Over the composting period the organic product is closely monitored for moisture, temperature and bulk density. When decomposition is complete, the material is screened into a variety of high quality compost, mulch and soil blends.
- SUEZ is investing in compost organics onsite, relocating and expanding our existing garden organics facility to the western side of the site.
- Capacity will be increased from 55,000 to 80,000 tonnes per year.
- We will also invest in additional infrastructure including covering active phases of the composting process for better odour management.

Left and below: SUEZ's garden organics operations return nutrients to the earth with high quality compost products

By returning organic matter and essential nutrients to the soil, SUEZ contributes to a sustainable future for Australia's fragile soil systems.

engineered landfill

Renewable energy generation from biogas capture

Our first preference is always to **recycle or reuse** the waste we receive.

- Where waste is not recycled or reused, it is disposed of safely and securely at our engineered landfills.
- At SUEZ, our highly engineered landfills are divided into areas called cells. Before a cell can be filled with commercial and residential waste, many protective layers are installed. These consist of 900mm of compacted clay, a 2.5mm plastic liner, and perforated pipes which are laid down within a layer of drainage aggregate to capture the wastewater generated within the landfill known as leachate.
- Leachate is pumped out of the cell and into a Leachate Treatment Plant. It is then treated onsite using bacteria and forced aeration before being responsibly discharged into the sewer system in compliance with Sydney Water's requirements.
- Biogas generated from the waste as it breaks down is captured using a network of wells and pipes and converted into green electricity, which is fed into the power grid. In 2013, gas captured at our New Illawarra Road Landfill produced enough renewable energy to power 20,000 households.
- Long-term care, through ongoing monitoring of capped and closed landfills, is an important part of our commitment to environmental protection and rehabilitation programs.
- After the cell is capped it is then revegetated using local native plants and grasses. Rejuvenated landfills are often turned into public parks and gardens, golf courses or bike tracks for use by the community.

Above: A lined landfill cell at Lucas Heights Resource Recovery Park

As part of the proposal, we will invest in additional gas extraction operations which will assist in managing potential odour and **boost renewable energy production**, generating power equivalent to the needs of approximately **5,700 homes**.

we believe in giving back to the communities in which we operate

SUEZ is an **active supporter** of the **Sutherland Shire** community.

- Parts of Lucas Heights Resource Recovery Park are currently being used by local community groups such as the PCYC Mini Bike Club and the Sydney International Clay Target Association.
- Once operations cease in 2037, the site will be rehabilitated into parklands within two years for everyone to enjoy.
- SUEZ will continue to support a range of community initiatives and local sporting teams in the Sutherland Shire, including Menai Roosters Junior Rugby League, Menai Warriors Junior Rugby Union, Bangor Football Club, Bangor Cricket Club, Barden Ridgebacks Football Club and Barden Ridgebacks Netball Club.
- We are a major sponsor of the Australian Kookaburra Kids Foundation based in the Sutherland Shire and have contributed $150,000 to programs supporting children living in families affected by mental illness.

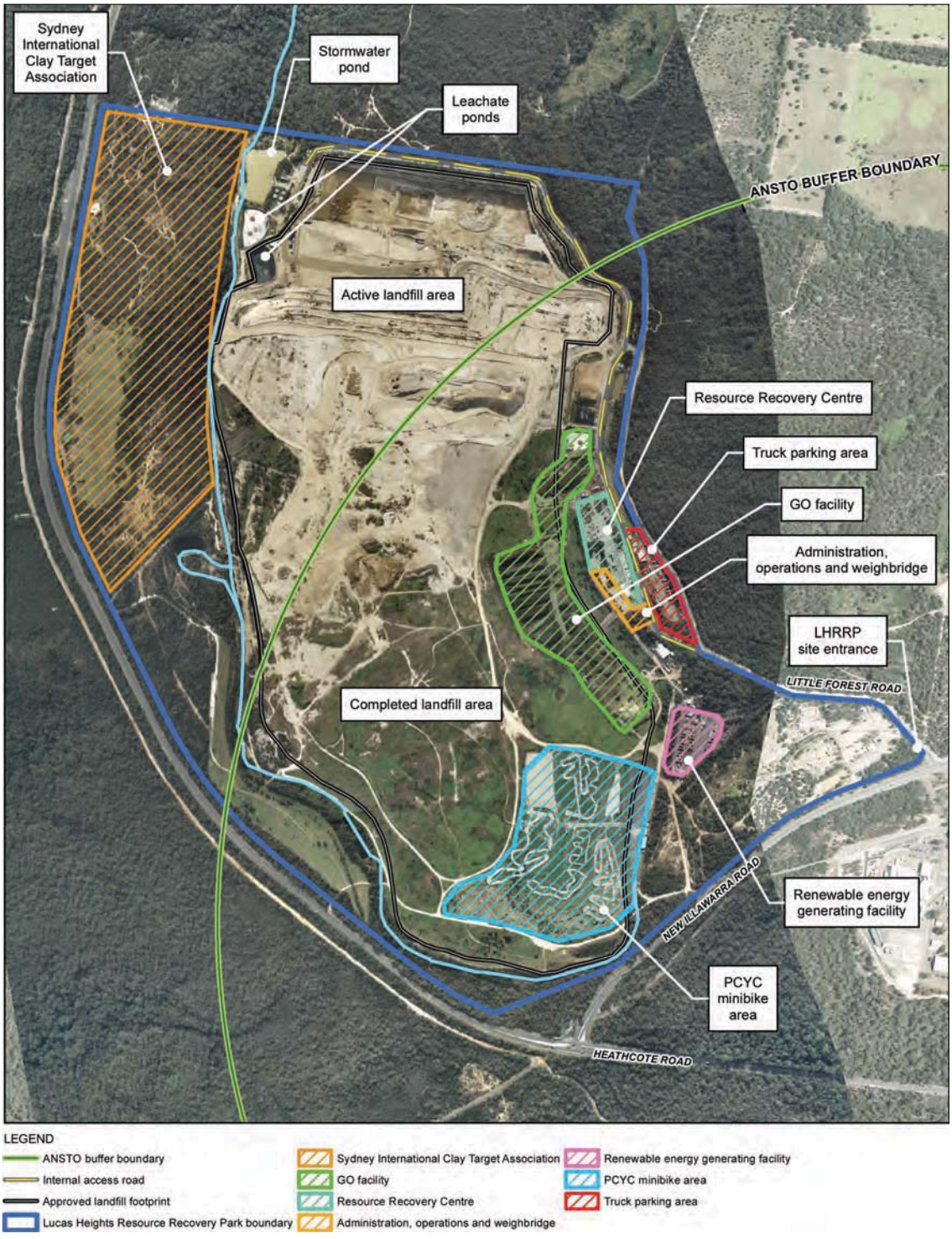
Through the SUEZ Community Grants Program, we provide funding for **social** and **environmental projects** which create a more **sustainable future**.

- Over the last two years, the program has distributed over $250,000 in funding to over 50 community groups across Australia, including $25,000 in grants funding to Sutherland Shire community groups.

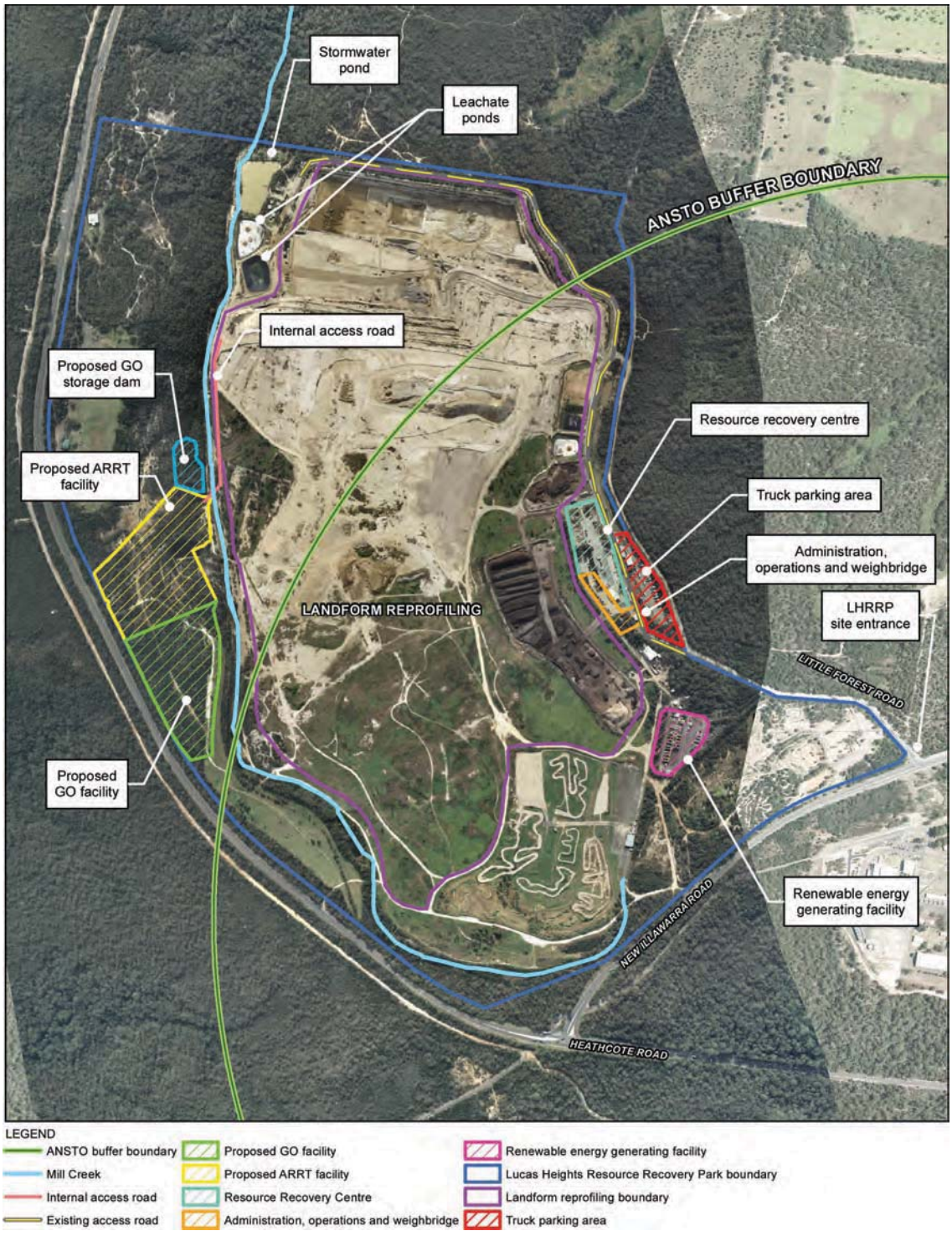
As part of the proposal, SUEZ will contribute **$100 million in funding over 15 years** to a range of Sutherland Shire Council projects that benefit the local community.

Above and left: SUEZ has a long history of supporting the Sutherland Shire community

existing site plan



proposed site plan



community parklands

Once operations cease in 2037, the site will be rehabilitated and **converted into community parklands** within two years for everyone to enjoy.

The parkland will have a total area of 149 ha. This is approximately 25 hectares larger in area than the currently approved parkland, providing more area for recreation and community use.

The parkland will include a range of features such as open grassed picnic areas, viewing areas, bridges, ponds, pedestrian and cyclist paths and a vehicle access route through the site.

There are also substantial undulating open spaces with areas suitable for a variety of activities.

For example:

- Running, jogging or walking
- Picnics
- Bicycling
- Dog training or off-leash dog areas
- Equestrian activities

The final uses of the each space would be determined in 2035 by Sutherland Shire Council with ANSTO approval based on community needs at the time.

Q&A

The Environmental Impact Statement addresses the full range of potential impacts from the proposal.

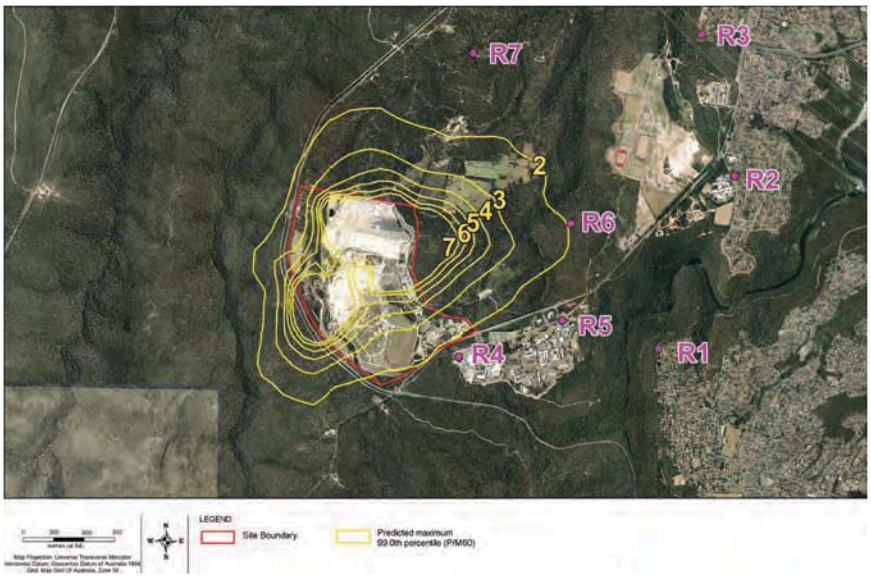
Q Will there be an impact on air quality?

A SUEZ has measures in place to prevent and mitigate odour from the facility and this will continue. As part of the proposal, SUEZ will also upgrade the landfill's gas capture system to further reduce a source of odour.

The garden organics operations will be moved to the western side of the site further away from residential areas, and the active phases of the composting process will be covered for better odour management.

Through the proposal, odour from our operations across the precinct will be **reduced by more than 40%** compared to current levels. These improvements will be achieved as early as 2016.

SUEZ has also committed to strict air quality targets beyond its statutory requirements.



Left: Odour modelling shows the facility will achieve the 'two odour units' performance criteria at the nearest residential receptor. Typically, odour less than two odour units is not perceived as a nuisance

other topics

Visual impact

Whilst the site is operational, the perimeter will be screened by planting. There will be **no significant visual impacts** to the community.

Noise

The noise assessment concluded that the proposal would have **no significant impacts** on the community or environment.

Q&A

The Environmental Impact Statement addresses the full range of potential impacts from the proposal.

Q Will there be an impact on traffic?

A The Lucas Heights Resource Recovery Precinct accounts for **only 1.3% of all vehicles** on New Illawarra Road at the present time. As part of the proposal, there will be marginal increases to traffic volumes along New Illawarra Road and Heathcote Road.

The year 2027 is expected to be the peak year in terms of traffic generation at the facility. If all facilities are operating at maximum capacity, the forecast increase in vehicles using New Illawarra Road during peak hour periods is approximately 1.6%, or a **maximum of 63 additional vehicles** at this time. Modelling indicates that 96% of vehicles using New Illawarra Road are not associated with this proposal.

For waste delivered from the SUEZ network of facilities, we have invested in High Mass Load trailers which can carry approximately **20% more waste** than older trailers. These trailers allow efficient waste transport and reduce the number of truck movements to the park.

other topics

Leachate

Leachate is water that has come into contact with waste.

The new landform design will **increase rainfall run off** from the surface of the site, reduce water infiltration and prevent unplanned ponding from occurring. Less leachate reduces the potential impact on the local environment.

Litter

Existing controls to manage and mitigate litter such as portable litter nets and regular patrols will continue.

Waste delivered to the Advanced Resource Recovery Technology facility would occur within enclosed buildings therefore the potential litter impact is low.

SUEZ will contribute to a **$300,000 fund over five years** aimed at preventing and combatting illegal dumping in the Sutherland Shire.

Left: SUEZ have invested in High Mass Load trailers which can carry approximately 20% more waste than older trailers

Appendix B
Consolidated submissions from DPE

NSW GOVERNMENT | Planning & Environment

Mr Phil Carbins
Sydney Landfill Business Manager
SUEZ Recycling & Recovery Australia
70 Anzac Street
CHULLORA NSW 2190

Contact: Deana Burn
Phone: 02 9228 6453
Email: deana.burn@planning.nsw.gov.au
Our ref: SSD-6835

Dear Mr Carbins

Lucas Heights Resource Recovery Park Project (SSD 6835) – Environmental Impact Statement

The Environmental Impact Statement (EIS) for the above development was publicly exhibited from 6 November 2015 to 18 December 2015 and the Department received a total of seven (7) submissions on the development. These included two submissions from the general public and five from government agencies. A copy of the submissions is included in Attachment A. After careful review of the EIS, the Department has also identified a number of issues to be clarified and addressed, and these are set out in Attachment B. This information is considered necessary for a proper assessment of the development application, as per clause 54(1) of the *Environmental Planning and Assessment Act 1979*.

The Department requests that you provide a response to all of the issues raised in submissions as provided in Attachments A and B. Where specific technical issues have been raised by government agencies, the Department recommends that you discuss these issues directly with the relevant agency and keep the Department informed of the outcomes of these discussions. The Department requests that your response to submissions is provided no later than 11 March 2016.

If you have any questions, please don't hesitate to contact Deana Burn on the above details.

Yours sincerely

Chris Ritchie 19/11/16.
Director, Industry Assessments

cc: Mr Ian Drinnan, Manager Environmental Science, Sutherland Shire Council

ATTACHMENT A: GOVERNMENT AGENCY AND PUBLIC SUBMISSIONS

Environmental Health and Regulation Committee

Sutherland Shire COUNCIL

Report Title: **SITA/SUEZ Lucas Heights Resource Recovery Park - Public Exhibition**

Report Number: **EHR037-16** **Meeting Date:** **30/11/2015**

The Development Application and accompanying Environmental Impact Statement (EIS) for the expansion of the Lucas Heights Resource Recovery Park are both currently on public exhibition until Friday 18 December 2015.

Council has been invited by the Department of Planning and Environment to make a submission to the exhibition.

Council has had considerable involvement in the development of the EIS. It is recommended that Council respond to the Department of Planning and Environment noting that all Council matters have been addressed during the preparation of the EIS and that Council is supportive of the application.

Council will have an opportunity to provide further comment following consideration of the submissions received during the consultation period, by way the Preferred Project Report/Response to Submissions.

1. That Council write to the Department of Planning and Environment advising that all issues raised by Council have been addressed during the preparation of the EIS and that Council is supportive of the application.
2. That the Council submission recommend the VPA be amended from 7 (seven) kilometres to 9 (nine) kilometres.

PURPOSE

The Environmental Impact Statement (EIS) and accompanying Development Application (DA) for the expansion of the Lucas Heights Resource Recovery Park are currently on public exhibition. As such the Department of Planning and Environment is inviting written submissions from the community and other stakeholders, such as Council, until Friday 18 December 2015. This report outlines the possible contents of such a submission.

BACKGROUND

Due to a previous legal agreement, Council is a joint applicant for the expansion of the Lucas Heights Resource Recovery Park. As such, Council has been in a unique position to influence not only the content of any development application, but also the form of the development itself. Throughout the 3 year development of the project, Council staff have worked with SITA to refine the project to one that is broadly acceptable to the Council. This has involved both changes to the development, such as the covering of the active composting phase for the garden organics facility, the provision of a scrubber until should the biofilter on the ARRT not achieve the odour goals, and improved leachate and gas management of the landfill, and development of a Voluntary Planning Agreement (VPA) to deliver monetary and environmental benefits to the community.

Throughout the development of the project, staff and SITA personnel have provided a number of briefings to Councillors, to both keep them informed of the progress of the development, and also to seek feedback and direction at critical periods. Throughout this process, Council have been able to anticipate potential concerns the community may have with the development and ensure that they are adequately addressed in both the project design and are also adequately communicated to the community in the EIS and DA documents. During the most recent round of consideration of the development by Council, Council resolved that the project and associated documentation was at an appropriate level to be lodged with the Department of Planning and Environment in order for it to progress to the public exhibition phase.

At the completion of the public exhibition phase, all submissions received will be provided to the applicants (both SITA/SUEZ and Council) to prepare a response to those submissions describing how any concerns or issues raised in the submission have already been addressed in the DA/EIS, or where the DA/EIS has been amended to address these issues and concerns. Thus Council will again be in the unique position of being able to influence the nature and form of the development following the exhibition phase.

It is therefore recommended that during this public exhibition phase that Council make a submission to the Department of Planning and Environment noting Council's involvement in the development of the project and the EIS, and that subject to positive feedback from the community consultation period, that Council are in support of the development. Our submission should further note that Council would seek to provide further comment following consideration of the submissions received during the consultation period by way the Preferred Project Report/Response to Submissions.

DISCUSSION

Previously supported and discussed at Council.

CONSULTATION

Prior to the lodgement of the DA/EIS there was considerable consultation between SITA/SUEZ and Council, but only limited consultation with the community, mainly via the LHRRP Community Reference Group (CRG). The public exhibition period provides the first opportunity for extensive community consultation. In addition to the usual consultation coordinated by the Department of Planning and Environment, additional consultation will be undertaken by SITA/SUEZ, including displays at The Ridge, Menai Marketplace and Engadine Community Centre. Following the completion of the exhibition period, Council will have the opportunity to review and respond to the community feedback.

BUDGET AND RESOURCES

The VPA associated with the development proposal provides for significant monetary contributions to Council and a range of other benefits, such as preferential treatment of Council waste at the three facilities on the LHRRP site.

POLICY

The support of the DA/EIS is consistent with previous decisions of Council (BDS041-16 Notes Link).

CONCLUSION

As Council have had considerable involvement in the development of the EIS it is recommended that Council respond to the Department of Planning and Environment noting that all Council matters have been addressed during the preparation of the EIS and that subject to positive community feedback during the consultation process, Council is supportive of the application.

RESPONSIBLE OFFICER

The officer responsible for the preparation of this Report is the Manager Environmental Science Ian Drinnan, who can be contacted on 9710 0547.

That Council write to the Department of Planning and Environment advising that all issues raised by Council have been addressed during the preparation of the EIS and that Council is supportive of the application.

(Councillor Simpson / Councillor Schreiber)

THAT:

1. Council write to the Department of Planning and Environment advising that all issues raised by Council have been addressed during the preparation of the EIS and that Council is supportive of the application.

2. The Manager Environmental Science and members of Menai Community Group be thanked for their efforts in regards to this matter.

(Councillor Riad / Councillor Awada)

NSW GOVERNMENT | Department of Primary Industries

OUT15/36055

Ms Deana Burn
Industry Assessments
NSW Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

Deana.Burn@planning.nsw.gov.au

Dear Ms Burn,

Lucas Heights Resource Recovery Park Project (SSD_6835)
Response to exhibition of Environmental Impact Statement

I refer to your email dated 3 November 2015 requesting advice from the Department of Primary Industries (DPI) in respect to the above matter.

Comment has been sought from DPI Water, Fisheries, Agriculture and Lands. Any further referrals to DPI can be sent by email to landuse.enquiries@dpi.nsw.gov.au. DPI Agriculture, Lands and Fisheries have no issues. DPI Water comments are provided below.

The matters raised here by DPI should be considered in the final project design and ongoing management plans, however should not be considered an impediment to determination of this project.

Comment by DPI Water
DPI Water has reviewed the Environmental Impact Statement (EIS) and provides detailed comments in Attachment A, and the following comments:

In relation to Mill Creek and riparian corridor, DPI Water recommends:

- The project clarifies the riparian widths that are proposed to be established along either side of Mill Creek on the site both during the operation of the project and following site closure.

- A Mill Creek Stream Rehabilitation and Stabilisation and Vegetation Management Plan should be be prepared for the rehabilitation of new section of the realigned creek and for the rehabilitation of Mill Creek and the riparian corridor following site closure.

- Consideration is given to locating the proposed Garden Organics (GO) storage dam to the south of the GO facility on land that is already cleared of native vegetation rather than locating it adjacent to Mill Creek on land that is currently vegetated with native vegetation.

- The proposed sediment pond/detention pond which is proposed to be located north of the ARRT facility is located elsewhere on the site to avoid potential impacts on the Coastal Upland Swamp.

- A scaled plan is provided which shows the location of the Asset protection zone (APZ) requirements, the riparian corridor footprint and the proposal. Where possible, it is recommended the layout is designed so that the APZ is located outside the riparian corridor.

- The water quality monitoring parameters target the potential impacts of the landfill leachate. This would assist validate whether the proposed reprofiling has reduced the potential risk of leachate being discharged off site.

- Additional water quality sampling is undertaken prior to the project commencing.

- Additional baseline aquatic monitoring is undertaken prior to the project commencing over a range of seasons and weather conditions in order to assess change.

- Additional reference/control sites are added to the macroinvertebrate sampling program.

- The water quality, macroinvertebrate and aquatic/riparian habitat monitoring continues once the project commences and the monitoring program is undertaken for the duration of the operation of the project to assess any potential impacts on the aquatic ecology downstream of the site.

- Works on waterfront land should be undertaken in accordance with the *Guidelines for Controlled Activities on Waterfront Land* (DPI, 2012)

In relation to groundwater, DPI Water requests additional information to clarify the current situation and to inform the proposed future management actions:
In particular, DPI Water seeks improvement in the following key considerations. These can generally be addressed in the final project design, or management plans developed in consultation with DPI Water.

- Monitoring bore coverage should be improved across the Waste Management Centre domain for the purpose of identifying the potential leachate pathways within the shallow sandstone aquifer.

- There is an assessment of post-closure potential lead in soil contamination in the NW corner of the site due to the clay-shooting range. Heavy metals associated with the lead shot residue have the potential to be mobilised in the acid soil and groundwater regime. These matters need to be addressed at or before closure.

- Additional monitoring of heavy metal contamination from purpose-built bores installed down gradient of the clay shooting range.

- Refinement of the management plans to include additional monitoring and revised trigger levels (e.g. lead concentrations down gradient of the clay shooting range) both during operation and post-closure.

- Maintenance of the leachate management system, as described in the management plans, to include regular periodic cleaning (i.e. flushing and repair) of the leachate system piping.

- Clarification of the current number, location and construction of the existing monitoring bores so that additional targeted installations can be designed to improve the likelihood of leachate detection in groundwater if leaks occur (i.e. sentinel monitoring in appropriate locations).

DPI Water would be available to discuss with the DP&E and Proponent any of the above issues should it be required.

Yours sincerely

Mitchell Isaacs
Director, Planning Policy & Assessment Advice
18/12/2015

Attachment A

Lucas Heights Resource Recovery Park Project (SSD_6835)
Response to exhibition of EIS
Detailed comments - DPI Water

DPI Water provides the following detailed comment on the EIS for the Lucas Heights Resource Recovery Park (LHRRP) expansion project:

Aquatic Assessment /Macroinvertebrate sampling

Water quality monitoring can be improved to ensure adequate monitoring of leachate and stormwater runoff - the water quality parameters don't appear to focus on the potential impacts of the leachate. The monitoring program needs to provide details on:

- how the leachate/stormwater runoff may affect biota (ie what's in the leachate/stormwater that could affect stream biota).

- what the landfill leachate might contain so as to guide the water quality monitoring and clarify whether the water quality monitoring parameters target this.

The inclusion of parameters that target the potential impacts of the landfill leachate will assist to validate whether reprofiling has reduced the potential risk of leachate being discharged off-site and potential impacts to surface water.

The report refers to the 2013-2014, River Health Monitoring program which has undertaken 5 years of monitoring in the Georges River catchment of water quality, vegetation and macroinvertebrates (page 30) but this monitoring may or may not continue and it is not considered appropriate to rely on another program to monitor this State Significant Development. It may provide additional information, but it was not designed to test the effects of the landfill.

It is unclear if the project proposes to undertake any additional water quality sampling prior to the project commencing, as only a single round of sampling was undertaken. Additional sampling prior to development should be required.

It is recommended the monitoring is more frequent (for example monthly), and it measures relevant parameters at appropriate times - focusing on leachate/high nutrients etc. during times when groundwater will be the major source of stream flow. There also should be some sort of event sampling focusing on stormwater effects, particularly as the report acknowledges that a significant rainfall event which occurred in the 24 hours prior to undertaking the fieldwork may have influenced the results (page 20).

Appendix T (Garden Organic Operation Environmental Management Plan) notes that any surface water discharged to Mill Creek from a storage dam or pond is to be monitored and tested to confirm that it meets EPL requirements before being discharged (Section 9.1.1, page 9.1). It is noted the parameters listed to monitor the leachate dam differ to the water quality parameters that were measured at the monitoring locations as outlined in Appendix C of Appendix H (see Section 9.1.3 of Appendix T and Section 4.2.2 of Appendix C of Appendix H). It is suggested Sections 9.1.1 and 9.1.3 of Appendix T clarify if the testing will also incorporate the water quality parameters listed in Section 4.2.2 of Appendix C of Appendix H.

It is also unclear if the project proposes to undertake any additional baseline macroinvertebrate sampling prior to the project commencing. For example, the report notes further sampling in spring and/or an ongoing macroinvertebrate monitoring program would allow for a more comprehensive analysis of macroinvertebrate community composition (Section 6.5.1, page 30)

but it recommends further investigation is undertaken of the habitat condition / macroinvertebrate populations every three years commencing soon after reprofiling works commence (Section 8). It is recommended the proponent undertakes additional baseline aquatic monitoring prior to the project commencing over a range of seasons and weather conditions in order to assess change.

The report hasn't used control sites but it refers to recent studies in the Georges River catchment which found that urban streams throughout the catchment contain macroinvertebrate communities dominated by pollution tolerant species with little or no pollution sensitive species present. As noted above, it is not considered appropriate to rely on another program to monitor this SSD as the program was not designed to test the effects of the landfill. Ideally some extra reference/control sites should be added to the macroinvertebrate sampling program. A single reference is inadequate (MCUP). In addition, MCUP is probably an intermittent stream and maybe already affected by stormwater runoff from the site (Fig. 3.1, Appendix A – Staging Drainage Plans). If extra sites are not possible, the monitoring should focus on AUSRIVAS results, which predict the invertebrate assemblage that should occur in the absence of any impact from reference sites.

If the project is approved, DPI Water recommends monitoring continues once the project commences and the monitoring program is undertaken for the duration of the operation of the project to assess any potential impacts on the aquatic ecology downstream of the site. It is recommended the proponent repeats the sampling more frequently than every three years and this sampling is undertaken over a range of seasons and weather conditions. It is recommended the macroinvertebrate sampling is undertaken annually or twice per year.

Groundwater

(i) Groundwater levels and presence of leachate

The issue of groundwater levels in and around the site, and their relationship to the hydrogeological setting has been discussed in Sections 3.5 and 3.6 (Appendix I). This is an important matter as the ultimate fate of migrating leachate is into the Hawkesbury Sandstone formation leading to the Mill Creek Valley and beyond to the north-west (Deadman's Creek Valley) with likely flow into the George's River around 4km to the north. The key aspects of the prevailing hydrogeological system have been described as follows and indicate groundwater flow (and hence any included leachate) is likely to be associated with fractures at two different depths.

- High angle jointing systems are likely to provide the main pathway for vertical groundwater migration.
- Major pathways for lateral movement are likely to be sub-horizontal fissures associated with bedding plans.
- Groundwater flow is primarily expected to be within a laterally continuous fracture zone located at the depths of 20 to 50m bgl and between elevations of 74 to 85m AHD, which is expected to extend further down Mill Creek valley.
- There is 20 to 25m of low permeability rock located between the base of the landfill/Mill Creek Valley and the moderately permeable fracture zone interpreted to exist between elevations of 74 to 85 m AHD.

Consequently, groundwater monitoring has, and needs, to be established so that any leachate-affected groundwater is suitably recognised in the Hawkesbury Sandstone aquifer system.

There are two areas of particular interest for the project as it develops:

A. GO and ARRT sites: Groundwater monitoring for the relocated and expanded composting facility (GO) and the waste sorting and recovery facility (ARRT) has been proposed to be addressed by the installation of additional monitoring piezometers and development of event trigger plans – Section 24 and especially Table 24.1 which details new monitoring bores.

This is considered to be a satisfactory response.

B. Enlarged landfill overall (LHRRP): -Longer term monitoring for the whole, expanded landfill site (LHRRP).

   At present 11 clustered monitoring bores are prescribed for sampling and consideration in regard to monitoring the existing groundwater situation and detecting potential leachate effects on the groundwater system. This system should be improved for the proper detection of leachate in groundwater systems to the north of the LHRRP.

The measurement of SWLs in groundwater monitoring bores needs to be more extensive north (and down-gradient) of the project site. Additional, regular monitoring and reporting from at least bores BH31, MB021, MB022, BH24 should be introduced, and further consideration be given to including additional, existent bores located on Lot 2 DP 1032102. The additionally sampled bores MB044 and MB045, described in the project's "Groundwater Assessment" (Appendix I), should also be included for regular monitoring.

(ii) Leachate generation

The Proponent has undertaken an extensive analysis of leachate generation (Appendix J) in respect of the proposed increased filling, and placed this properly into the context of present leachate generation and the on-going situation as if the proposed development had not taken place.

The analysis has taken account of existing leachate volumes, considerations of the leachate collection system design and function, typical climate conditions at the site and future proposed designs for the landfill capping. Numerical modelling has then followed and forms the basis of most recommendations regarding the future developments and capacity of the system. The analysis and considerations are satisfactorily developed.

The Proponent argues that the finished project will result in a lower level of leachate development than is presently seen. This contention is based on the reprofiling of landfill side slopes which facilitate surface runoff, the removal of ponding areas, and the construction of a greatly improved final capping compared to the present. An important matter is whether the Proponent's central conclusions - that the overall amount of leachate will be reduced is correct; since if it is incorrect, there are potentially increased impacts on the underlying groundwater systems.

The Proponent has addressed the matter of ensuring that the existing leachate management system keeps functioning correctly in Section 5.3 (Appendix J) – "Operational mitigation issues". These proposals could be strengthened by ensuring that, where possible, the leachate collection system be cleaned and flushed from time to time to ensure its continued efficient operation; this is an accepted technique for important sub-soil drainage systems - here the leachate system is equivalent to this.

Conclusions

With respect to groundwater for this development application and the response for Lucas Heights Resource Recovery Park - Expansion Project (SSD-6835), DPI Water considers this proposal to be adequate and most likely an improvement on the existing site condition. For example, the re-profiling of the landfill cap will significantly (25%) reduce rainfall infiltration rates and therefore also reduce the volumes entering the leachate management system.

The EIS illustrates the predictions that as landfilling increases the included watertable rises within the landfill, and down-gradient of the landfill regional water table levels fluctuate in response to the amount of groundwater in the system. Given this historic situation and the site geology there is no significant concern as to any major alterations in groundwater impacts, flow direction changes or unforeseen impacts resulting from the project's variation of footprints, and the re-positioning of the GO and ARRT facilities. The Proponent is required to monitor groundwater quality at 11 locations around the greater site as specified in their Environmental Protection Licence (EPL No 5065) (from Appendix I – groundwater assessment).

Recommendations

DPI Water requires additional information to clarify the current situation and to inform the proposed future management actions. In particular, DPI Water seeks improvement in the following key considerations:

- More comprehensive monitoring bore coverage across the Waste Management Centre domain for the purpose of identifying the potential leachate pathways within the shallow sandstone aquifer.
- There is an assessment of post-closure potential lead in soil contamination in the NW corner of the site due to the clay-shooting range. Heavy metals associated with the lead shot residue have the potential to be mobilised in the acid soil and groundwater regime. These matters need to be addressed at or before closure.
- Additional monitoring of heavy metal contamination from purpose-built bores installed down gradient of the clay shooting range.
- Refinement of the management plans to include additional monitoring and revised trigger levels (e.g. lead concentrations down gradient of the clay shooting range) both during operation and post-closure.
- Maintenance of the leachate management system, as described in the management plans, to include regular periodic cleaning (i.e. flushing and repair) of the leachate system piping.
- Clarification of the current number, location and construction of the existing monitoring bores so that additional targeted installations can be designed to improve the likelihood of leachate detection in groundwater if leaks occur (i.e. sentinel monitoring in appropriate locations).

End Attachment A

NSW GOVERNMENT | Office of Environment & Heritage

DOC15/443958-12
SSD 6835

Mr Chris Ritchie
Director
Industry Assessments
Department of Planning and Environment
GPO Box 39
Sydney NSW 2001

Dear Mr Ritchie

Lucas Heights Resource Recovery Park Project Environmental Impact Statement (SSD 6835)

I refer to your letter dated 3 November 2015 inviting the Office of Environment and Heritage (OEH) to comment on the exhibited environmental impact statement (EIS) for the Lucas Heights Resource Recovery Park Project Environmental Impact Statement (SSD 6835)

OEH provides comments on the project EIS in relation to biodiversity in Attachment 1.

If you have any queries regarding this matter please contact Marnie Stewart, Senior Operations Officer, on 9995 6868.

Yours sincerely

S. Harrison 18/12/15

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Attachment 1: Office of Environment and Heritage comments on the Lucas Heights Resource Recovery Park Project Environmental Impact Statement (SSD 6835)

Biodiversity

OEH has reviewed the *Lucas Heights Resource Recovery Park Project Biodiversity Assessment Report* by GHD (September 2015) against the *Framework for Biodiversity Assessment* (FBA) and the biodiversity SEARs (signed 3 February 2015).

OEH's input into the SEARs included that impacts on the following threatened populations and ecological community would require further consideration and provision of the information specified in s9.2 of the FBA:

Threatened Ecological Communities
Shale Sandstone Transition Forest
Endangered Populations
Allocasuarina diminuta subsp. mimica L.A.S.Johnson population in the Sutherland and Liverpool local government areas
Prostanthera saxicola population in Sutherland and Liverpool local government areas

OEH considers that the Biodiversity Assessment Report (BAR) adequately demonstrates that direct and indirect impacts Shale Sandstone Transition Forest are unlikely.

The BAR reports the presence of the *Allocasuarina diminuta* subsp. *mimica* endangered population within the study area as a number of 'ramets' (the stems of *Allocasuarina diminuta* subsp. *mimica* are described as ramets because it is possible that many of the stems have reproduced apomyctically after damage to the roots and stems of the original plants). However, the BAR inconsistently reports the number of ramets to be directly impacted as 58 and 82. The BAR, and in particular s7.4.3 (impacts requiring further consideration in accordance with s9.2 of the FBA), needs to be updated to accurately report the number of ramets (or individuals if this can be identified) to be impacted. OEH would then need to review this information again against s 9.2.5.2 of the FBA.

Further, as the *Allocasuarina diminuta* subsp. *mimica* endangered population is not currently available within the credit calculator, the BAR does not provide the number of species credits that would be required to offset the impact. Until the calculator is updated, OEH recommends that the BAR include an estimate of the likely number of credits to be required using Equation 6 of the FBA and the Tg value of 0.125.

The BAR states that the *Prostanthera saxicola* population in Sutherland and Liverpool local government areas is "unlikely" to occur within the proposal footprint as no suitable sandstone rock habitat is present and that it was not recorded during the November 2012/January 2015/March 2015 searches. OEH requires further justification as the BAR considers there to be suitable habitat on sandstone outcrops within the wider study area (Appendix B); all but one of the flora species this population is known to associate with (OEH threatened species profile) were recorded within the study area; two rock outcrops are proposed for removal; and, surveys were conducted outside of the optimal detection period for this endangered population (July-October). Specifically, OEH recommends that targeted searches be undertaken during July-October (and/or when a nearby reference sub-population is known to be flowering); or an Expert Report be prepared in accordance with s6.6.2 of the FBA to demonstrate that the endangered population is unlikely to occur and be impacted by the proposed works; or assume that the endangered population is present and assess further in accordance with the FBA.

OEH makes the following additional comments on the BAR:

- The BAR identifies one Plant Community Type (PCT) within the development footprint: 'Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux'. Plot/transect data was compared with Tozer (2010) diagnostic plant species lists to help confirm the identity of the PCT.

However, the BAR does not include evidence of this as required by FBA 5.2.1.8. Raw data has since been provided directly to OEH by the proponent and it is understood that the final BAR will include a summary of the data from this comparison to provide further evidence of how PCTs were derived for the development site in accordance with section 5.2.1.8 of the FBA.

- OEH understands an error has been made on Figure 7.1 of the BAR where 'Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux – regenerating and planted' has not been mapped as native vegetation within the assessment circles and some areas of Exotic Grassland have been mapped as native vegetation. Please update Figure 7.1 to correctly show the areas of native vegetation cover and update the '% native vegetation cover' values within Table 7.1 of the BAR and the credit calculator if required.

- The draft Biodiversity Offset Strategy (BOS) within the BAR is inadequate as it does not address the FBA requirements outlined in Table 22 of Appendix 7. OEH understands that the proponent is considering using the land currently leased by SICTA to establish a biobank site to help offset the proposed works. Initial investigations have determined that the matching vegetation for ecosystem credit requirements is present and that ramets of the *Allocasuarina diminuta* subsp. *mimica* endangered population occur. The following information needs to be considered and included in the draft BOS as a minimum:

    - How many matching ecosystem credits would be generated should a biobanking application be successful? If additional ecosystem credits are required to be purchased, where will these be bought and retired from?

    - How many species credits for the *Allocasuarina diminuta* subsp. *mimica* endangered population would be generated should a Biobanking application be successful? If additional species credits are required, are these available within the endangered population's distribution?

    - BBAM 6.5.1.9 states that species that require species credits cannot be assumed to be present on a biobank site. Therefore, the suggestion within the draft BOS to assume the presence of Eastern Pygmy-possum, Giant Burrowing Frog and Rosenberg's Goanna on the proposed Biobank site is not supported.

    - How many, if any, species credits for *Acacia bynoeana* would be generated should a Biobanking application be successful? If additional species credits are required to be purchased, where will these be bought and retired from?

    - If a biobanking application for the SICTA land is unsuccessful or not pursued, where will all the required credits be bought and retired from?

    - How will the potential impacts of the already accumulated lead shot on flora and fauna be assessed and managed when considering the suitability of the site for biobanking?

    - Will the SICTA lease be terminated to pursue a biobanking application?

    - If multiple parties have an interest in the SICTA lands, have they all expressed an interest in establishing a biobank site?

    - Are there any existing agreements over the SICTA site for managing vegetation for conservation?

    - Section 10.5 of the FBA and s2 of Appendix A of the *NSW Biodiversity Offsets Policy for Major Projects* outline the steps required to be undertaken should a variation to the offset rules and/or supplementary measures be applied for. This includes being able to demonstrate that all reasonable steps have been taken to secure the number and types of credits impacted on at the development site, including: consideration of any feasible sites known to the proponent; checking the biobanking public register and having an

expression of interest for credits on it for at least six months; liaising with an OEH office and relevant local councils to obtain a list of potential sites that meet the requirements for offsetting; considering properties for sale in the required area; and, providing evidence of the unwillingness of a landowner to sell or establish a Biobank site. OEH advises that the proponent may want to consider starting this process to minimise any future delay to applying for an offset rule variation and/or supplementary measure (if required), given that implementing all of the steps would take at least six months.

- The FBA requires that it be determined whether candidate species are likely or unlikely to occur, or use habitat, on a development site (s6.5). Only when it has been determined that a species is unlikely to occur, or unlikely to use habitat, may it be removed from further assessment (s 6.5.1.11). The BAR (Appendix B) states that the Koala (a species credit species) is likely to occur within the study area and that it "may forage in the proposal footprint on occasion when moving between other areas of better quality habitat". The BAR does not include credit calculations for the Koala. OEH understands the habitat within the development footprint is of low value to the Koala, based on the information provided in the BAR. OEH requests however, that either the BAR be updated to exclude the Koala from further consideration in accordance with s6.5.1.11 of the FBA, or that the Koala be considered further and species credits be calculated.

- The BAR also states (in Appendix B) that the Squirrel Glider (a species credit species) may possibly forage within the proposal footprint on occasion, and that limited suitable den habitat is present. Despite this, no credits have been generated for this species and no justification for exclusion has been provided in the BAR. OEH requests that either the BAR be updated to exclude the Squirrel Glider from further consideration in accordance with s6.5.1.11 of the FBA, or that the Squirrel Glider be considered further and species credits be calculated.

- No species polygons, as required by s 6.5.1.17 and Appendix 7 of the FBA, have been included in the BAR.

- Plot/transect data for Plot 2 within the BAR indicates "0" for 'Number of trees with hollows' yet a value of "1" has been entered in the credit calculator. Please confirm which is correct.

- The BAR reports that 459 ecosystem credits are required yet the credit summary report (Appendix A) states that 460 are required.

- The BAR reports the distance between the Coastal Upland Swamp (Needlebush - banksia wet heath) and the proposed GO (garden organics) storage dam sometimes as 40 m and sometimes as 6 m. The BAR should be updated to report the correct distance and consider whether the discussion on indirect impacts to the Coastal Upland Swamp requires updating as a result.

- Lot 2 DP 605077 has not been identified in the 'land title details' section of the credit calculator.

OEH makes the following additional comments on the Operational Environmental Management Plans OEMPs):

- OEH recommends that "Monitoring of revegetation of realigned Mill Creek to ensure planted individuals are thriving" (Table 6.2 of the BAR) is included in the relevant OEMP(s).

- The post-closure mitigation measures in Table 6.3 of the BAR should be included in the post-closure OEMP.

- The 'flora and fauna' sections of the OEMPs should be updated to reflect the recent recording of threatened biota as well as the current TSC Act listings for those species, populations and ecological communities.

(END OF SUBMISSION)

DOC15/444781-09

Mr Chris Ritchie
Director, Industry Assessments
NSW Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

STANDARD POST AND EMAIL
22 December 2015

Dear Mr Ritchie

SITA Australia Pty Ltd - State Significant Development Application - SSD 14_6835
Lucas Heights Landfill and Resource Recovery Expansion
New Illawarra Road, Lucas Heights

I refer to the public exhibition of Sita Australia Pty Ltd's proposed landfill and resource recovery expansion at New Illawarra Road, Lucas Heights. Sita Australia Pty Ltd has submitted documents including the draft Operational Environmental Management Plans and the Environmental Impact Statement dated October 2015 ("the EIS") in support of the proposal.

The EPA has reviewed the EIS and found that in a number of instances the information provided is insufficient to allow an adequate assessment to be made of the potential environmental impacts of the proposal. As such, the EPA cannot support this proposal as submitted and therefore, has not provided recommended conditions of consent. The EPA requests that the proponent update the publicly exhibited EIS to address the following matters detailed below.

The Proposal

Sita Australia Pty Ltd ("the Proponent") proposes to change the existing landfill and construct additional processing facilities at Lucas Heights Resource Recovery Park located on New Illawarra Road, Lucas Heights, NSW (Lot 3 DP 1032102, Lot 101 DP 1009354, Lot 2 DP 605077) in the Sutherland Local Government Area. The proposal involves:

- **Re-profiling the existing landfill** to provide an additional 8.3 million cubic metres of landfill capacity and extend the life of the landfill from 2025 to 2037 (12 extra years);
- **Increase the approved quantity of waste landfilled** from 575,000 to 850,000 tonnes per year;
- **Relocate the existing garden organics facility** and increase capacity from 55,000 to 80,000 tonnes of garden waste per year;
- **Construct and operate a fully enclosed advanced resource recovery technology (ARRT)** facility to recover resources from up to 200,000 tonnes of general solid waste per year; and

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- **Rehabilitate the landfill post-closure** to create 124 hectares of parkland for future community uses.

Noise assessment

The EPA has reviewed the Noise Assessment dated August 2015 submitted as Appendix E of the EIS (the "Noise Assessment"). The EPA has no significant concerns in relation to noise associated with the construction or onsite operation of the proposal.

Attachment 1 sets out what additional information is required in more detail.

Air quality assessment

The EPA has reviewed the Air Quality Assessment dated August 2015 submitted as Appendix G of the EIS (the "Air Assessment"). The assessment does not adequately characterise the risk of odour impacts from the proposed development and requests that the Air Assessment be revised.

Furthermore, the EPA understands that the "*establishment of the ARRT facility would be dependent upon SITA securing a guaranteed, long term waste supply to ensure that the substantial upfront investment is able to be recouped*" (Section 6.1 of the EIS). As such the details of the ARRT, including biofilter specifications, have not been determined. Because of this the EPA is unable to adequately assess the likely odour impacts from the ARRT facility.

The EPA is available to discuss the comments provided should the proponent wish to do so.

Attachment 2 sets out monitoring comments (**Attachment 2A**), the additional information required (**Attachment 2B**) and the specific technical issues that would need to be addressed in the revised Air Assessment (**Attachment 2C**).

Surface water assessment

The EPA has reviewed the findings of the Surface Water Assessment dated August 2015 provided in Chapter 13 of the EIS. Additional information and clarification is required by the EPA to adequately assess surface water impacts and consider recommended conditions of consent.

Attachment 3 sets out the additional information and clarification required.

Leachate assessment

The EPA has reviewed the findings of the Leachate Assessment dated September 2015 provided in Chapter 15 of the EIS. Additional information and clarification is required by the EPA to adequately assess leachate impacts and consider recommended conditions of consent.

Attachment 4 sets out the additional information and clarification required.

The Proponent should be aware that any commitments made in the EIS may be formalised as approval conditions and may also be placed as formal licence conditions. Consequently, pollution control measures should not be proposed if they are impractical, unrealistic or beyond the financial viability of the development. It is important that all conclusions are supported by adequate data.

Based upon the information provided to the EPA, should approval be granted, the Proponent may need to make a separate licence application to the EPA. The Proponent should be made aware that, consistent with provisions under Part 9.4 of the *Protection of the Environment Operations Act* 1997

("the POEO Act"), the EPA may require the provision of a financial assurance for the site. The amount and form of the assurance would be determined by the EPA and required as a condition of the licence.

In addition, as a requirement of the licence, the EPA will require the Proponent to prepare, test and implement a Pollution Incident Response Management Plan in accordance with Section 153A of the POEO Act.

If you have any further queries regarding this matter, please contact Trevor Wilson on (02) 9995 5646.

Yours sincerely

Trevor Wilson
Unit Head - Waste Compliance
Environment Protection Authority

Attachment 1 *EPA request for additional information on the Noise Assessment*
Attachment 2 *EPA request for additional information on the Air Assessment*
Attachment 3 *EPA request for additional information on the Surface Water Assessment*
Attachment 4 *EPA request for additional information on the Leachate Assessment*

Attachment 1: Noise Assessment - EPA request for additional information on the Lucas Heights Landfill and Resource Recovery Expansion

Comment No. 1
Sleep disturbance criteria for the proposal have been derived in Table 3.5 of the Noise Assessment, however no assessment of potential sleep disturbance impacts has been carried out. The EPA propose to set night-time LA1,1minute noise limits conservatively at 45 dBA for all receivers, based on the predicted LAeq noise levels. Alternatively, the proponent should provide an assessment of the potential sleep disturbance impacts of the proposal in the Noise Assessment.

Request for additional information No. 1
Table 5.3 of the Noise Assessment assigns a sound power level of 110 dBA for a single 20 tonne Caterpillar excavator, and 107 dBA (3dB lower) for a larger Caterpillar 30 tonne excavator, of which there are two used in the modelling. The proponent must confirm that the sound power levels are assigned correctly in the Noise Assessment.

Attachment 2: Air Assessment - EPA request for additional information on the Lucas Heights Landfill and Resource Recovery Expansion

Attachment 2A – General Comments

Approach to Assessment

The Air Quality Assessment Report ("AQAR") outlines the following objectives in relation to assessing odour:

- No significant impacts on the community or environment; and
- Achieving the 2 OU odour performance criteria cumulatively at the nearest residential receptor;

The AQAR included an extensive odour sampling regime to quantify spatial emissions across the landfill and identified three large odour sources, which have been focused on for rectification. The predicted odour impacts, and meeting the assessment objectives rely heavily on these odour sources being rectified. The EIS outlines that "*through the proposal, estimated odour emissions would be reduced by more than 40% compared to current estimated levels through improved odour management*". "*These improvements would likely be achieved as early as 2015 with the predicted odour levels dropping considerably at nearby sensitive receptors*". **It is also noted that the AQAR recommends "*retesting of rectified localised emission points, the v section, the area south of the excavation stockpile and batter in 2015/16*".**

Based on this information there is additional information or data that could be supplied to demonstrate that existing odour emission sources have been rectified.

Attachment 2B – Request for Additional Information

Request for additional information No. 1
Odour modelling scenarios 2, 3 and 4 are based on a "stripped back area" of 2,500m^2. However significantly larger stripped backed areas are proposed in Chapter 12 the EIS. In Chapter 12 it states:

> *"The areas of the existing landfill (south of existing active landfill area) would be stripped back in segments, with approximately 1 ha stripped in advance of the active tipping area for currently covered areas and approximately 2 ha stripped in currently capped areas. Of this area approximately 2,500 m2 would be less than one day old to minimise the emission of odour from the stripped surface."* And in Chapter 15 of the EIS it states *"The area of cover material removed will be limited to 20,000m^2 or at least 2 weeks in advance of the active tip face."*

a) The EPA requests further detail on why 2,500 m^2 was used to predict odour impacts from the "stripped back areas" in odour modelling scenarios 2, 3 and 4 but up to 2 hectares of stripped back area proposed in the EIS?

b) The EPA requests an additional odour modelling scenario be done using the stripped back areas proposed in this EIS.

The EPA notes that the Landfill Operational Environmental Management Plan ("OEMP") details a number of contingency actions designed to address odours from these activities should odours occur.

Ref: Table 12.7, Table 12.8, page 12-19 of the EIS and Table 15.2 of the EIS.

Request for additional information No. 2
The information provided in the EIS and Landfill OEMP states that intermediate capping will be scraped back to exposed waste prior to landfilling. The EPA notes that the EIS states that intermediate cover is constructed from 0.3m (min) compacted crushed sandstone, the depth required by the licence (Table 15.2 of the EIS) and the Landfill OEMP (page 7) states the intermediate cap will be stripped back 0.45m, exposing landfill waste.

a) The EPA requests that the proponent clarify what depth of intermediate capping will be left after being scraped back.

Request for additional information No. 3
The proponent notes that landfill gas capture will be used as an odour mitigation strategy during the reprofiling of the landfill. In the EPA's experience landfill gas wells in areas of shallow cover may need to be shut off to prevent sucking air through the cover.

a) The EPA requests further information regarding how fugitive landfill gas from "stripped back" areas will be managed without compromising the effectiveness of the entire landfill gas capture system?

Ref: Page 129 Part A&B

Request for additional information No. 4
The EPA was unable to locate a map in the EIS that shows the location of the large emission point 1 "v section" and large emission point 2 "rectangular area south of the excavation stockpile".

a) The EPA requests that a map identifying these areas be provided.

Request for additional information No. 5
The EIS states that the Voluntary Planning Agreement ("VPA") process is the governing mechanism to determine the strip back configuration and details.

a) The EPA requests clarification as to how the VPA governs strip back configuration and details.

Ref: Page 12-19 of the EIS

Request for additional information No. 6
The Proponent is currently permitted "Other activities" at any time at the landfill and wants this to continue.

a) The EPA requests further details on what activities are proposed to occur between 5pm and 10pm and between 10pm and 6am?

Ref: Table 6.2 (page 6-5) of the Environmental Impact Statement (EIS).

Request for additional information No. 7
SITA is currently permitted to operate the Garden Organics ("GO") Facility at any time and wants this to continue.

a) The EPA requests further details on what activities are proposed to occur between 5pm and 10pm and between 10pm and 6am?

Please note the EPA can limit identified odour producing activities including windrow turning and shredding through the environment protection licence.

Request for additional information No. 8
The EPA notes that EIS states compost at the GO facility is to be stored in 30 metre long bunkers for 4 weeks and turned after the first 2 weeks.

a) The EPA requests further information on how the compost stored in the bunkers will be turned?

Ref: Point 6.3.7 of the EIS

Request for additional information No. 9
The EPA requested that the EIS contain a map of all organic material stored outside, processed or unprocessed including *"the type, their respective volumes and locations on site map."* This has not been provided.

a) The EPA requests that this information be submitted.

Ref: EPA letter to the Department of Planning dated 18 Dec 2015

Request for additional information No. 10
The EIS provides details on the length and height of the proposed windrows located in the maturation area and compost storage area of the GO Facility.

a) The EPA requests the proposed width of the windrows located in the maturation area and compost storage area of the GO Facility.

Request for additional information No. 11
a) The EPA requests details of proposed contingencies should the volume of incoming waste exceed the storage/processing capacity of the Receival Area in the GO Facility?

Request for additional information No. 12
The EPA notes that there is a conveyor belt that travels between the ARRT Waste Receival and Processing Building to the ARRT Composting Hall.

a) The EPA requests clarification on whether the will be enclosed?

Ref: page 6-36 of the EIS

Request for additional information No. 13
The EPA notes that the EIS does not provide details of any pre-treatment of odorous air from the AART facility prior to being discharged to the biofilter. It is the EPA's experience that odours generated from the composting of municipal waste will generate strong odours that require pre-treatment, such as a wet scrubber, prior to being discharged to a biofilter. This pre-treatment of the odorous air is essential to maintaining the biofilters ability to treat odours.

a) The EPA requests information reading the pre-treatment of air discharged to the bio scrubber, and if there is none proposed, a detailed explanation as to why not.

Attachment 2C – Technical Comments

Odour Impact Assessment Criteria

Section 8.2 of the AQAR provides a discussion around nearest sensitive receptors, including identified future receptors, for the purposes of establishing the odour performance criteria for the assessment. Table 8-3 outlines varying odour criteria (from 2 to 4 OU) for identified receptor groups, however adopts a 2 OU criteria for assessment purposes. The EPA advises that for assessment of sites located in the greater Sydney metro area, a 2 OU criteria is typically adopted.

Odour Emission Rate Justification

Appendix C of the AQAR presents justification for the odour emission rates utilised for the odour assessment. However there are inconsistencies with data published in Appendix C as compared with the data adopted within the quantitative assessment. The inconsistencies add a degree of uncertainty to the predicted impacts. The EPA provide comments on the inconsistencies identified below, however only in relation to the odour emission data for the Future Scenario(s).

Landfill - Daily Covers

Appendix C outlines a Surface Odour Emission Rate (SOER) of 0.03 OU/m^2/s adopted for daily landfill covers. However the odour analytical report outlines two samples with an SOER of 0.03 and 0.05 OU/m^2/s. It is also noted that the AQAR states:

> "*Automatic tarp machines (ATM) (tarps as daily cover on the active tipping batter areas) have been extensively trialled over 2014. An application is before the EPA demonstrating their performance. It is expected that they would be approved by the EPA as an alternative to VENM daily cover and provided this approval is granted by the EPA the development application is seeking their continued use*"

Request for additional information No. 1

It is not clear if the adopted SOERs for the daily landfill covers represent potential emissions from the proposed alternative daily cover.

a) The EPA requests clarification on whether SOER are based on odour emission rates from waste covered with alternate daily cover, being Automatic Tarp Machines, or VENM.

Landfill - Intermediate covers and landfill batters

The odour sampling regime conducted across the site shows variation in SOERs for the intermediate cover. It is noted that 'hot spots' were identified and SOERS up to ~57 OU/m^2/s were measured. The AQAR adopts a median value for areas across the site, excluding the 'hot spot' areas, for consideration of future impacts. The assessment adopts this approach on the basis areas would be rectified, including the provision of additional gas extraction infrastructure. Appendix C states, for the series of elevated analytical results that "*these were not included in the other scenarios as SITA has rectified these emissions points*". No data or information has been included to support any odour reductions achieved at these areas.

Comment

The EPA notes that the proponent has undertaken remediation works to address odour from current "hot spots". Retesting of the remediated "hot spots" identified in the AQAR will be required in 2016, through the environment protection licence, to determine if remediation work has been effective in reducing odours.

Garden Organics ("GO") Facility

(a) Turkey manure

Section 7.5.2 of the AQAR outlines the use of pre-composted turkey manure, and Appendix C outlines an SOER of 867 for chicken manure, which has been adopted in the absence of data for turkey manure. However the modelling inventory doesn't appear to include any SOERs at this level. It is unclear if turkey manure has been adequately considered within the modelling assessment.

(b) Active composting

The assessment adopts SOERS based on measured data from another facility (the SITA Brooklyn Site). Appendix C outlines that the referenced SOERS were scaled, coupled with a reduction factor associated with the use of the Gore covers. It has not been outlined (including justification) what scaling has been conducted. Additionally no data supporting the 90 % control efficiency for the use of Gore covers has been included.

(c) Maturation

Table 7-11 of the Air Assessment outlines an SOER for product maturation of 0.7 OU/m^2/s. However Appendix C outlines a range of SOERs up to 6.1 OU/m^2/s. It is not clear the justification for adopting the lower SOER for maturation of compost.

(d) Finished Compost

Table 7-11 of the Air Assessment adopts an SOER for finished compost of 0.34 OU/m^2/s. However Appendix C outlines an SOER of 2.6 for matured product. It is not clear the justification for the lower SOER for finished product.

(e) Turning

Table 7-11 of the Air Assessment outlines an SOER of 1.18 for "turning". Presumably this is for turning events of compost, where spikes in odours can occur. However Appendix C outlines a range of SOERs for turning based on data presented in other assessments, and references SOERs up to 20.5 are referenced.

Request for additional information No. 2
The EPA advise that based on points (a) to (e) above there is uncertainty with the adopted emission rates, and the SOERs are unlikely to be conservative.

a) The EPA request a more detailed justification be submitted for the adopted SOER. Where there is uncertainty with the application of a specific SOER, a conservative approach including a sensitivity analysis of the range of referenced values on the predicted impacts should be presented.

Meteorological Data for Assessment

The methodology for assessing predicted impacts adopts a level 2 impact assessment which includes the use of site-specific input data. Meteorological data has been sourced from the on-site weather station. Data has been selected for a nominal period from October 2011 to September 2012. It is not clear why this period was selected for input into predicting odour impacts, or if the selected period represents longer term conditions and is representative of conditions at the site.

The assessment includes annual, and seasonal wind rose diagrams to describe the meteorological patterns at the site for the data selected. The windrose diagrams outline 0% calm conditions in all instances. Such a low portion of calm conditions is unusual. Calm conditions are known to relate to potential odour impacts. This is likely due to low wind speeds categorised within the windrose, however clarification on the quantity of low wind speed conditions should be sort.

Request for additional information No. 3

a) The EPA recommend that the meteorological data used for assessment purposes:

- Be demonstrated to adequately represent the longer-term meteorological conditions at the site; and
- Adequately represent an appropriate portion of conditions that effect poor dispersion (i.e. calm or low wind speed conditions).

Selection of Dispersion Model

The assessment adopts the AUSPLUME dispersion model to predict ground level odour concentrations. AUSPLUME is a steady state Gaussian dispersion model package. AUSPLUME is an approved dispersion model for use in most applications in NSW, however it is not approved in some applications where other more advanced dispersion models, such as CALPUFF, may be more appropriate. The *Approved Methods for Modelling* outlines two key factors that should be considered in evaluating whether to use a conventional plume model (i.e. AUSPLUME), those being:

1. Is the steady-state assumption in the plume model valid?
2. Do the technical parametrisations in the plume model adequately treat the situation to be modelled?

AUSPLUME has limited application with consideration to low wind speed or 'calm' conditions. These conditions can drive odour impacts.

Request for additional information No. 3

a) The EPA requests a detailed justification for the selection of AUSPLUME in the context of site specific sources, terrain and meteorology. Alternatively, if suitable justification cannot be presented, an impact assessment based on modelling that can be suitably justified for the proposal must be presented.

Inclusion of Terrain Effects

The assessment outlines that "*given that the planned odour sources are all at or near-ground, the effect of local terrain is not accounted for in AUSPLUME, and terrain was therefore not included*". The EPA note that terrain is a key input parameter that can affect dispersion and must be considered. Not including terrain effects because the modelling package that has been selected is unable to account for it is not considered suitable justification. The EPA advises there are modelling packages which can suitably handle dispersion in complex terrain.

Request for additional information No. 4

a) The EPA requires an odour assessment be undertaken that adequately considers terrain effects.

Mitigation Options and Control Efficiencies

The proposal includes the adoption of mitigation measures for additional proposed odour generating activities, those being the GO Facility and the Advanced Resource Recovery Treatment (ARRT) Facility. The proposed GO Facility activities include the use of concrete bunkers and breathable membrane covers (proposed for use during the first four weeks of the composting cycle).

A control efficiency of 90 % was adopted for assessing odour emissions from the first four weeks of the compositing cycle. It is noted that no detailed supporting information has been included to justify the adoption of a 90 % reduction for the proposed mitigation measures. Additionally the report states, "*GHD do not have access to New South Wales odour sampling data for composting windrows with Gore or similar covers but we are aware that such data exists and demonstrates that covers are very effective in reducing the emission of odour from compost.*"

Request for additional information No. 5

a) The EPA requests documentation that supports the 90% reduction referred to in the EIS so an adequate assessment of its effectiveness can be made.

Averaging Period for Assessment Purposes

5.1.2

Section 8.2.2 of the outlines the parameters used for the dispersion modelling stage of the assessment and includes the adoption of a three minute averaging period for predicting odour impacts. The EPA advice that the assessment criteria for Odour is for a 1 hour average (peak-to-mean nose response).

Request for additional information No. 6

a) The EPA requires that the proponent clarify or revise the modelling to include assessment against 1 hour (peak-to-mean nose response) impacts.

Dust Impact Assessment

Chapter 9 of the AQAR includes an assessment of predicted particulate matter impacts at sensitive receptors. The assessment includes the preparation of an emissions inventory, dispersion modelling of PM_{10} emissions (24 hour average), and consideration of potential cumulative impacts with reference to annual average background data from the Liverpool monitoring station.

Request for additional information No. 7

a) The EPA requires that the dust impact assessment be revised and must:

- Include an assessment of all relevant particulate fractions and averaging periods;
- Adopt background concentrations representing the averaging period being assessed. The adopted annual average background concentration for assessing 24 hour average impacts is not considered suitable;
- Present predicted impacts, as incremental and cumulative (increment plus background) reported as the 100th percentile. As per the *Approved Methods for Modelling and Assessment of Air Pollutants in NSW* (the Approved Methods) cumulative impacts maybe maximum impact plus maximum background, or a contemporaneous assessment.

Attachment 3: Surface Water Assessment - EPA request for additional information on the Lucas Heights Landfill and Resource Recovery Expansion

Request for additional information No. 1

a) The EPA requests how much freeboard (depth in cms) is required to hold a 5 day 90th percentile rainfall event in Sediment Dam 5?

Request for additional information No. 2

a) The EPA requests details of what sized rainfall event could the sediment dam hold if the freeboard level is maintained at the base of the 10ML settling zone in Sediment Dam 5?

Ref: Page 13-8 of the EIS

Request for additional information No. 3
The EPA seeks clarification on how the Proponent proposes to manage surface water in the GO Facility. The information provided in the EIS is not clear.

- Section 6.3.4 of the EIS states "*All clean water collected from the roof and breathable membrane covers via a separate collection system. Separation of clean water from garden organics leachate would prevent excessive volumes of contaminated water from being produced. The clean water would be conveyed direct to the natural environment (Mill Creek), or stored for later use on site.*"

- The Water Balance results for the ARRT/GO facilities indicates that the only surface water being discharged to Mill Creek is from the ARRT Roof and Hardstand.
  Ref: Section 6.3.4 and Figure 13.11 of the EIS

a) The EPA requests clarification of which of the above proposed surface water management approaches is accurate and which approach was used to calculate storage requirements for the two leachate dams?

Please note, without further surface water quality information from the GO Facility bunker area the EPA would require that the rainwater falling onto the breathable membrane covers to be collected and treated as leachate.

Attachment 4: Leachate Assessment - EPA request for additional information on the Lucas Heights Landfill and Resource Recovery Expansion

Request for additional information No. 1
The EIS estimates that in a 50% AEP rainfall year the existing final cap (1800mm min. of compacted crushed sandstone) allows significantly more rainwater to infiltrate the cap than intermediate cover (300mm min compacted crushed sandstone) (17% compared to 7% on a platform, 12% compared to 5% on slopes).

a) The EPA asks the proponent to explain why thicker cover resulted in more rainfall infiltration.

Ref: Table 15.2 and Table 15.3 of the EIS.

Request for additional information No. 2
The EIS estimates that in a 50% AEP rainfall year the infiltration difference between intermediate cover (300mm min compacted crushed sandstone) and the proposed final cap (100mm topsoil, 250mm revegetation layer, 500mm subsoil layer, 600mm compacted clay barrier and 300mm seal bearing layer) is marginal.

That is, the proposed final cap was projected to reduce rainwater infiltration only 1% more than intermediate capping on platforms and 1% less than intermediate capping on slopes.

a) The EPA asks the proponent to explain why there was little difference between the infiltration rates of the intermediate cap and the proposed final cap.

Ref: Table 15.2 and Table 15.3 of the EIS.

Request for additional information No. 3
In 50% and 10% AEP rainfall years, the estimated leachate generation for existing operations compared to stage 1 is very similar. Leachate is then expected to reduce as areas are capped. So in effect, SITA is proposing to increase current leachate treatment capacity and trade waste limits to meet both current and projected leachate generation levels.

Ref: Table 15.5 of the EIS

The EPA notes that the proposal is planned to commence in June 2015.

a) The EPA requests details of proposed contingencies if increases to leachate processing or changes to the trade waste agreement are delayed?

Request for additional information No. 4
The EPA notes that the proposal is to place waste without a leachate barrier/liner on top of existing waste cells on the southern end of the Lucas Heights facility.

a) The EPA requests the Proponent justify the proposed leachate collection system on the reprofiled landfill areas. The justification must be detailed and consider alternative leachate barrier options (including a collection layer) on all surfaces on which waste will be placed under this proposal.

Request for additional information No. 5
Calculations by GHD on stages 5.2 and 5.3 (i.e. the north area) indicates that the leachate collection pipework for these cells can withstand a weight/cover height of 75m. The leachate collection pipework and its integrity is essential for the proper management of leachate in a landfill. It is not clear if the unit weight of waste used to calculate the weight/height cover of 75m and the depth of waste in cells 5.2 and Cell 5.3 has been provided in the EIS.

a) The EPA requests the Proponent provide the proposed height of Cell 5.2 and Cell 5.3 from the base of the cell to the proposed final landform?

b) What unit weight for waste was used by GHD to calculate the height of 75m?

c) The EPA requires the proponent assess the structural integrity and hydraulic performance of existing leachate collection infrastructure under the additional leachate and waste loads to be imposed by the proposed overtopping of waste and storage of leachate in Cell 5.2 and Cell 5.3.

Ref: Point 4.3 (page 18) of Appendix C

Department of Industry
Resources & Energy

11th November 2015

Patrick Copas
Student Planner – Industry Assessments
Department of Planning & Environment
GPO Box 39
Sydney NSW 2001

Emailed: patrick.copas@planning.nsw.gov.au

Your Reference: SSD 6835
Our Reference (TRIM): OUT15/31413

Dear Mr Copas

Re: Lucas Heights Resource Recovery Park Project (SSD 6835), Southerland LGA

Thank you for the opportunity to provide advice on the above matter. This is a response from NSW Department of Industry – Geological Survey of New South Wales (GSNSW).

GSNSW previously provided a response for the request for input into SEARs for the above project on the 12th December 2014 (our reference OUT14/40607). The GSNSW position remains unchanged with no resource issues to raise regarding the above proposal.

General Information

Please note Coal Authorisation (AUTH) 6 held by (Secretary NSW Department of Industry on behalf of the Crown) exists over a broad regional area that includes the subject site. Identification of the title is to make the consent authority aware that there are other stakeholders with interests in the region.

Geoscience Information Services

The GSNSW has a range of online data available on line through the following website address:
http://www.resources.nsw.gov.au/geological/online-services

This site hosts a range of data to enable research into exploration, land use and general geoscience topics. Additionally, the location of exploration and mining titles in NSW may be accessed by the general public using the following online utilities:

1. **MinView** allows on-line interactive display and query of exploration tenement information and geoscience data. It allows spatial selection, display and download of geological coverages, mineral deposits and mine locations, geophysical survey

boundaries, drillhole locations, historical and current exploration title boundaries and other spatial datasets of New South Wales. This online service is available at: http://www.resources.nsw.gov.au/geological/online-services/minview

2. **NSW Titles** enables the public to access and view frequently updated titles mapping information across NSW. This online service is available at: http://nswtitles.minerals.nsw.gov.au/nswtitles/

Queries regarding the above information, and future requests for advice in relation to this matter, should be directed to the GSNSW Land Use team at landuse.minerals@industry.nsw.gov.au.

Yours sincerely

Cressida Gilmore
Team Leader - Land Use

From:	system@affinitylive.com on behalf of Grant Beamish
To:	Deana Burn
Subject:	Submission Details for Grant Beamish (object)
Date:	Tuesday, 8 December 2015 10:37:05 PM

Confidentiality Requested: no

Submitted by a Planner: no

Disclosable Political Donation: no

Name: Grant Beamish
Email: grant.beamish@internode.on.net

Address:
10/22 Gatenby Pl

Barden Ridge, NSW
2234

Content:
As a long time resident of Barden Ridge, and employee at Ansto I wish to express my personal views of the proposal based on past exposure to the current Lucas heights waste site.

Under the proposal I agree with the recycling and resource recovery centre to improve operations and reduce waste volumes into the landfill. I also agree with energy production from the methane gas coming from the existing land fill. These aspects all make sense.

However I do not agree with increasing the landfill capacity and continuing to add to the existing problems with the site.
If the site was more remote from local residents, businesses and sporting facilities, then I would have no objections with the proposal. But given the close proximity to communities (less than 5 km from current housing, less than 2-3km from planned housing in Gandangarra stage 3, 1km from Ansto), then I must object to the expansion of the landfill. It simply doesn't make sense to add so much additional waste so close to residents.

The current site landfill already creates these problems:
- bad odour problems, especially in winter time mornings
- increased pests around the neighbourhood (ibis birds, crows, foxes, rats)
- runoff pollution after rain into the local creek running through a mountain bike park on local council land
- visually unattractive with "Mount Menai" dirt mounds
- impact on residential property values with many people not wanting to live that close to a major tip
Residents would consider these major impacts, even if Suez does not.

Local council has invested heavily in local infrastructure to improve the Barden ridge/Lucas heights/Menai neighbourhood (the ridge sporting complex, new mountain bike facilities adjacent to the current landfill), plus the state government has approved the Gandangarra stage 3 residential expansion close to the tip, but this landfill expansion detracts from that. All local residents property values will be affected by the increased landfill proposal, but this is not justified and unfair on residents.
The increased landfill component should be shifted to another site in Sydney further removed from local residents and ALL future Sydney housing developments - re future long term town planning like any good city. Be smart and take the hard but smart decision, not the lazy dumb decision.

The money allocated to the increased landfill should instead be spent on better recycling facilities and recycling education to reduce landfill requirements.

IP Address: ppp121-44-30-70.lns20.syd4.internode.on.net - 121.44.30.70
Submission: Online Submission from Grant Beamish (object)
https://majorprojects.affinitylive.com/?action=view_activity&id=133841

Submission for Job: #6835 Landfill and Resource Recovery expansion - General Solid Waste (putrescible)
https://majorprojects.affinitylive.com/?action=view_job&id=6835

Site: #3028 Lucas Heights (Suez)
https://majorprojects.affinitylive.com/?action=view_site&id=3028

Grant Beamish

E : grant.beamish@internode.on.net

From:	system@affinitylive.com on behalf of Donald Page
To:	Deana Burn
Subject:	Submission Details for Donald Page (object)
Date:	Thursday, 3 December 2015 11:35:59 AM

Confidentiality Requested: no

Submitted by a Planner: no

Disclosable Political Donation: no

Name: Donald Page
Email: d.page@optusnet.com.au

Address:
124 Pricces Circuit

Woronora, NSW
2232

Content:
I object to the endless expansion of the Lucas Heights Mega Tip:
1- The continuing environmental cost to the local bushland.
2- No finite end to the waste dumped in the Sutherland Shire, despite broken promises that the dumping would stop at the end of each expansion.
3- The need to include as part of any consent a guarantee of reduced disposal costs for Sutherland Shire in future, in compensation for having tolerated this Mega Tip for so long for the convenience of the greater metropolitan area.
4- When the capacity fills up at Lucas Heights, the Shire will then be charged the same as every other LGA to truck waste much further, when it could still be using Lucas Heights indefinitely if it had been restricted to Shire waste only.
5- False and misleading assurances in previous EISs on each of the above.
Regards,
Don Page
3 Dec 2015

IP Address: c110-20-220-228.mirnd4.nsw.optusnet.com.au - 110.20.220.228
Submission: Online Submission from Donald Page (object)
https://majorprojects.affinitylive.com/?action=view_activity&id=133215

Submission for Job: #6835 Landfill and Resource Recovery expansion - General Solid Waste (putrescible)
https://majorprojects.affinitylive.com/?action=view_job&id=6835

Site: #3028 Lucas Heights (Suez)
https://majorprojects.affinitylive.com/?action=view_site&id=3028

Donald Page

E : d.page@optusnet.com.au

ATTACHMENT B: DEPARTMENT OF PLANNING COMMENTS

- Does the application include surrender of the 2010 AWT consent?
- Where are the comments from Department of Defence (birdstrike and exhaust plumes posing hazards to aircraft operations) addressed? Can't find reference in Chapter 12 as stated in section 3.5.1
- Clarify operational hours on weekends, table 6-2 and pg 6-13 conflicting – waste receival hours 8am – 4pm or 8am – 5pm?
- Provide larger phasing figures (6.5 – 6.10) with clearer labels
- Resource recovery – is the conveyor to transfer waste material to the composting system covered?
- More consideration/information required in relation to the need for ANSTO agreement to lease the site for future parkland following closure – this affects over 50% of the land.
- Is the large sandstone mound currently on the site used for daily cover? When would it be removed/graded into the profile, at which phase?
- Provide more detail on the Council resolution referenced regarding a flying area for model aeroplanes in the final parkland design.

Additional Submissions

Transport
Roads & Maritime
Services

16 February 2016

Our Reference: SYD14/01464/04 (A11671494)
Department Ref: SSD 6835

Director
Industry Assessments
Department of Planning & Environment
GPO Box 39 SYDNEY NSW 2001

Attention: Chris Ritchie

Dear Sir/Madam,

LUCAS HEIGHTS RESOURCE RECOVERY PROJECT
NEW ILLAWARRA ROAD, LUCAS HEIGHTS

Reference is made to the department's letter dated 3 November 2015 and the additional information provided 3 February 2016, regarding the abovementioned Application which was referred to Roads and Maritime Services (Roads and Maritime) for comment in accordance with the *State Environmental Planning Policy (Infrastructure) 2007.*

Roads and Maritime has reviewed the submitted documentation and notes that the proposed development would generate 105 vehicles per hour which is less than the approved 118 vehicles per hour as initially approved in 1999, In this regard, Roads and Maritime raises no objection to the proposal.

Should you have any further inquiries in relation to this matter, please do not hesitate to contact Hans Pilly Mootanah on telephone 8849 2076 or by email at development.sydney@rms.nsw.gov.au

Yours sincerely,

Pahee Rathan
Senior Land Use Planner
Network and Safety Section

-----Original Message-----
From: no-reply@planning.nsw.gov.au [mailto:no-reply@planning.nsw.gov.au]
Sent: Wednesday, 2 March 2016 7:34 PM
To: _DPE-PSVC Online Lodgements
Subject: Request for Security Key

Applicant Details

Name: Mr Greg Hoy
Phone: 95253693
Mobile: 0417284615
Email: Greghoy@bigpond.com

Company Details
Name: Cronulla Model Aero Club
ABN:

Job: SSD #6835 Landfill and Resource Recovery expansion - General Solid Waste (putrescible)
https://majorprojects.affinitylive.com/?action=frameset&frameset_action=view_job&id=6835
Site: Lucas Heights (Suez)
https://majorprojects.affinitylive.com/?action=frameset&frameset_action=view_site&id=3028

Security Key: 83597247
Application url: http://majorprojects.planning.nsw.gov.au/application/Login/?job_id=6835

IP Address: - 101.175.5.98

Reason for requesting key:
I had previously made a submission via email to the department. This was followed up with a conversation with the Department. The issue of available land for local community groups namely the Cronulla Model Aero Club being, deferred until 2040 has not been properly addressed. This is despite other crown land being available in the same area. Such groups now have to wait an additional 25 years with no guaranttee the the proposed areas will be suitable. The mega tip will result in a mound that is not suitable groups previously identified.
Why has Sita/suez not addressed this shortfall in making land available to previously promised groups. It is a snub to these NFP community organisations and the Department should make the applicant address this issue.

Appendix C

Response to EPA comments - attachments

Memorandum

18 May 2016

To	Carol Ng		
Copy to			
From	Anthony Dixon and Evan Smith	Tel	02 9239 7025
Subject	SSD 14_6835 - Lucas Heights Resource Recovery Park Project - Review of Odour Impact Assessment Odour Emission Rates for the GO	Job no.	21/23482

1 Introduction

GHD understands that the EPA is seeking information on the reliability and sensitivity of the odour impact assessment that was completed for the Lucas Heights Resource Recovery Park (LHRRP) Project, particularly for the proposed Garden Organics (GO) Facility.

This memorandum provides further assessment to demonstrate that the odour emission rates applied for the GO (and the overall odour impact assessment for the Project) is a conservative representation of the potential odour emissions from the site. This memorandum includes further analysis and commentary on the following:

- The odour reduction potential for using GORE® covers or similar breathable membrane over the early stage of the composting process; and
- The stage of the composting process selected for turning the material and associated odour emission rate applied when turns are made.

2 Reliance

The following documents have been relied on by GHD in preparation of this memorandum:

- SITA Australia (2015) Lucas Heights Resource Recovery Park Project: Environmental Impact Statement, Appendix G – Air Quality Assessment
- EPA's review of the Lucas Heights Resource Recovery Expansion Project, issued to the NSW Department of Planning and Environment and dated 22 December 2015.

3 Environmental Impact Statement: Air Quality Assessment (SITA Australia, 2015)

The information included in Attachment 1 is taken from Section 7.7.3 of the Air Quality Assessment (AQA) and lists the odour contribution from all of the significant odour sources at the site. The information is provided for all three operations when they planned to be occurring concurrently in 2021 (landfill, GO and ARRT) and comprises an odour inventory of all sources and commentary on them.

This is reproduced to highlight the fact that the odour predictions are based on a cumulative assessment of odour contributions from the site and have been considered holistically. This is a conservative approach and is discussed in more detail in Section 4.7.

Furthermore, specific conservatism in the odour contributions for the Project have been included in the

GHD
Level 15, 133 Castlereagh Street Sydney NSW 2000 Australia
T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com W www.ghd.com

odour impact predictions and these are summarised below.

- A potential worst-case year was selected for the odour impact assessment when all three operations are occurring at maximum capacity. The year 2021 was selected based on the landfill reprofiling works being closest to future residential receptors and involves areas to be reprofiled which have a higher odour emitting potential.
- A detailed and extensive field campaign of odour measurements was undertaken at the landfill to quantify site specific odour emissions from the site. One significant element of conservatism with the applied odour emission rates is in regard to the odour emission rate applied for intermediate cover (with gas extraction). This is stated in Appendix C of the AQA and an odour emission rate was conservatively applied for this surface (intermediate cover with gas extraction with an area in Phase 6 of approx. 30Ha) when the character of the odour suggested that this large area could be discounted as an odour source.
- Shredding of garden waste was considered to occur continuously from 7am – 5pm every day at the proposed GO facility. This is a conservative assumption as the shredding times will not be continuous nor undertaken every day.
- A conservative stage for the turning of the compost (by identifying and utilising the turning stage which would have the highest potential odour emissions taking into account the specific odour emission rate and area for the emission) was applied which provides the largest odour emission rate for this aspect of the composting process.
- The available literature from GORE® states[1] that: '*facilities using the GORE® Cover technology experience a greater than 90% reduction in process odours and VOC emissions'*. GHD adopted the conservative odour reduction of 90% when in fact higher odour reduction rates are achievable.
- GHD undertook a further sensitivity analysis by assuming an odour reduction of 60% for the period of time when the active composting process is covered. The results confirm that odour would not exceed 2OUs at any of the existing or proposed residential receptors.

Further discussion is provided on these points below.

4 Conservative Elements of Odour Modelling Predictions

4.1 Worse-Case Scenario

2021 is considered to be a worst-case scenario with the landfill, GO and ARRT facilities operating at full capacity. Also landfill odour emissions are expected to remain relatively similar from 2017 to 2037. The year 2021 was selected based on the landfilling activities proximity (north east side of the site – Phase 6) to the proposed residences and in areas where stripping of old intermediate covered surfaces would occur. The odour sampling undertaken as part of the EIS studies indicated that stripping in areas of old intermediate surfaces has a potential to release some odour, whereas stripping over the capped and revegetated areas does not.

In subsequent years after 2021, as more of the landfill is capped and revegetated, potential odour emissions would be reduced from the site. In the preceding years from 2017 to 2021, the potential odour

[1] GORE® and Associates, 2008. The Gore Cover System A Leading Composting Technology for Organic Waste Treatment. http://www.astoriaorganics.com.au/download/Gore-Cover-Intro-2013.pdf

impacts are expected to be less as the reprofiling works are located further away from the proposed residences and are on areas that were previously capped and revegetated.

4.2 Conservatism of odour emission rates from the landfill

As described above in Section 3, a detailed and extensive field campaign of odour measurements was undertaken at the landfill to quantify site specific odour emissions from the site. One significant element of conservatism with the applied odour emission rates is in regard to the odour emission rate applied for intermediate cover (with gas extraction). This is stated in line item 2 of Table 5-1 of Appendix C of the AQA.

Five odour samples were collected to derive the odour emission rate (SOER) for the intermediate covered surface (with gas extraction). Of these samples four of them were recorded as having the same odour character as areas not over waste and for the one sample (No. 25) which was attributed to have a waste character, the sample was taken within the rectangular section south of the existing stockpile. This location (sample No. 25) has since had a series of additional landfill gas extraction wells installed and are operational to prevent odour emissions from this area.

This means that the odour predictions could have reasonably applied a nil odour contribution to the intermediate covered surface (with gas extraction).

As the intermediate covered area is large (over approx. 30 Ha for Phase 6) by applying a nil odour contribution to this area results in a significant reduction in the predicted odour emissions (approx. 6,900 OUv/s) for the landfill. As this was not done this incorporates a level of conservatism in the odour predictions.

4.3 Shredding duration at GO Facility

As stated above in Section 3, shredding of garden waste was considered to occur continuously from 7am – 5pm every day at the GO. This is a conservative assumption as the shredding times will not be continuously nor undertaken every day.

4.4 Turning emission rate

The odour emission rate (see tables 7-10 and 7-11 of the AQA for the 'turning' item) applied in the assessment takes into account the 12 week composting process and applies worst-case odour emitting turning conditions. GHD has used data that represents weeks 5 – 8 in the maturation process, which has a lower emission rate per m^2 of turned material compared to the active composting phase turn emissions, however when the larger area is considered the emission contribution is greater. This explanation is provided below:

- OER for turning of an active composting bunker (150 m^2) in weeks 2 to 4 (note not turned until week 2) is 405 OU
- OER for turning of maturation windrows (713 m^2) in weeks 5 to 8 is 1340 OU (modelled option)
- OER for turning of maturation windrows (713 m^2) in weeks 9 to 12 is 930 OU

This demonstrates that the odour assessed from turning is worst-case and adds to the conservatism used in the odour assessment.

Note that an odour emission rate applied for the modelled option takes into account the range of ages of the 5 – 8 week maturation period as the maturation stockpiles will be distributed in age. Therefore the

odour emission rate is a function of the age of the compost. The range of specific odour emission rates for turning the various ages of the compost are represented in the applied odour emission rate and hence why the maximum specific odour emission rate in the 5 – 8 week period is not applicable.

4.5 Cover odour reduction efficiency at the GO Facility

As stated in Section 3, the available literature from GORE® states that: '*facilities using the GORE® Cover technology experience a greater than 90% reduction in process odours and VOC emissions'*. GHD adopted the conservative odour reduction of 90% when in fact higher odour reduction rates are achievable.

It is also worth noting that the contribution of odour from the active composting process was modelled with and without the application of covers. The odour modelling (Figures 8-3 and 8-4 in the AQA and the information in Attachment 1) demonstrates that applying the covers does not result in a significant reduction in the extent of predicted odour impacts. This is due to the total odour contribution from the active composting phase contributing approx. 6% of the total predicted site night time odour emission and the percentage is significantly less during day time operations when the odour emission from the active tipping face is included.

4.6 Odour sensitivity analysis

GHD has undertaken additional analysis to determine the predicted odour levels at the nearest sensitive receptor (R6) with a GORE® cover that has a lower odour reduction efficiency of 60%. The predicted level is 2.0 OU (which is the same predicted odour level as a GORE® or similar cover with 90% efficiency). This further demonstrates that the covering the active phase of the composting process achieves a marginal benefit in reducing potential odour emissions from the site.

Note, however, that covering of the active composting phase also has the advantage of reducing the quantity of leachate they would be generated by the GO.

4.7 Odour contribution

Odour modelling has been undertaken as a cumulative assessment. There are three main sources of odour at the LHRRP, These are:

- biofilter /earthy odour character
- mixed solid waste, garbage odour character
- green waste/herbaceous odour character

While odours of different character are not usually assessed cumulatively, often in landfill assessments odours from MSW, landfill gas and green waste are grouped together. Odours from a biofilter, which generally have an earthy odour character are not considered as offensive as other odours onsite and have only been included in the cumulative assessment for additional conservatism.

5 Summary

Table A summaries the odour emission contribution from the proposed landfill, GO and ARRT Facilities. This demonstrates the following:

- During daytime operations the most significant source of odour is from the landfill (in the afternoon) with the main odour contribution predicted from the active tip face. This value is considered a reliable

representation of this source of odour and is significantly higher than applied odour emissions for other landfill projects. The potential reason is due to the site specific measurement technique of upwind and downwind measurements which capture the disturbance of waste (eg unloading) unlike the standard method of using IFCs.

- The highest odour emissions are expected from the Project during the afternoon period (for the reason discussed above), however during daytime periods the atmospheric conditions enable more efficient dispersion of odour and reduces the potential for any off-site odour impacts (i.e. greater wind speeds occur during the daytime which better disperses odour).
- During night time the most significant source of odour is the ARRT and the odour emission from its biofilter portal (with the commitment described below in terms of design provisions for additional odour treatment). The landfill odour emissions are significantly reduced at night (when there is generally less dispersive atmospheric conditions) as all waste is covered at the end of each day's operations (as required by the site's Environment Protection Licence).

Table A Predicted odour emissions from each facility

Facility	Morning Odour Contribution (OER OU/s)*	Afternoon Odour Contribution (OER - OU/s)*	Night Odour Contribution (OER - OU/s)*
Landfill	80,000	115,000	15,000
GO (Covered)	24,000	24,000	16,000
ARRT	86,000	86,000	86,000
Total	**190,000**	**225,000**	**117,000**

*rounded to the nearest 1,000 OU/s.

6 Conclusion

The SOERs applied for the GO are based on representative information measured at other equivalent composting facilities. When odour emissions are considered holistically for the Project, the layers of conservatism provide a high level of confidence that the odour predictions will meet the assessment criteria of 2OUs at the existing and proposed residences.

In addition, as per the technical report provided by Dr Robert Kelly, SUEZ would commit to including as part of the design provisions for additional odour treatment performance enhancements such as the implementation of advance biofiltration technology or inclusion of an Activated Carbon filter or other proven technology as a polishing treatment stage to be operated only on an "as needed" basis in response to the prevailing environmental conditions.

Attachment 1

Introduction

The following tables provide the relative contribution of odour predicted from each of the sources during the potential worse-case scenario 2021. This is the percentage of that odour source compared with the total odour contribution of the activity. Commentary is also provided on each of the applied odour emission rates in the following tables.

Landfill

The most significant source of odour at the landfill is the active tip face during operating hours, followed by intermediate cover and then stripped back areas. The leachate pond during aeration is also potentially a significant source however this activity is generally only undertaken for two to four hours per day. The intermediate cover area has been modelled conservatively as discussed in the table.

Table 1 Odour emissions for 2021 landfill

Source	Surface area (m^2)	SOER OUv/ m^2/s	OER OUv/s	Source % Morning	Source % Afternoon	Source % Night	Comment
Active tip face morning	2500	26	65,000	81.5	-	-	This applied value is significantly higher than applied odour emissions for other projects. The potential reason is due to the site specific measurement technique of upwind and downwind measurements which capture the disturbance of waste (eg unloading) unlike the standard method of using IFCs.
Active tip face afternoon	2,500	40	100,000	-	87.1	-	This applied value is significantly higher than applied odour emissions for other projects. The potential reason is due to the site specific measurement technique of upwind and downwind measurements which capture the disturbance of

Source	Surface area (m^2)	SOER OUv/ m^2/s	OER OUv/s	Source % Morning	Source % Afternoon	Source % Night	Comment
							waste (eg unloading) unlike the standard method of using IFCs.
Daily cover	2500	0.03	100	0.1	0.1	0.7	Site specific measurement and not a significant odour source.
Daily cover area	10,000	0.03	300	0.4	0.3	2.0	Site specific measurement and not a significant odour source.
Leachate pond (quiescent)	3,550	0.26	923	1.2	0.8	6.2	Site specific measurement and not a large odour source.
Leachate pond (aerated) for 2 hours of the day	3,550	1.8	6390	-	-	-	Site specific upwind and downwind measurement and reflects the day time operation of the leachate dam
Final cap	485,490	0	0	0	-	-	Nil source confirmed by site specific measurements.
Intermediate cover	434,750	Intermediate cover without gas extraction – 0.05 Intermediate cover with gas extraction – 0.023	11,038	13.8	9.6	74.3	See the discussion in Section 4.2 above.
Stripped back area	2,500	1	2,500	3.1	2.2	16.8	Based on site specific measurements.

Source	Surface area (m^2)	SOER OUv/ m^2/s	OER OUv/s	Source % Morning	Source % Afternoon	Source % Night	Comment
Total morning	-	-	79,761	-	-	-	
Total afternoon	-	-	114,761	-	-	-	
Total night	-		14,861	-	-	-	Odour emission for the landfill are significantly lower at night when the active landfill tip face is covered. This odour contribution would be lower in the night time (when weather conditions can lead to a higher risk of odour impacts) should the intermediate cover level of conservative be applied.

Proposed GO Facility with GORE® or similar cover

Odour emissions from the GO facility are shown in Table 2. The three largest sources of odour are the receivals area, shredding and maturation stockpiles. The active composting area with GORE® covers makes up only 3% of emissions in total, over the 4 week composting period, which is insignificant when compared to other sources at the facility.

Table 2 Odour emissions for proposed GO facility with breathable membrane covers

Table 3

Source	Surface area (m^2)	SOER OUv/m^2/s	OER OUv/s	Source % Day	Source % Night	Comment
Receivals area	1,949	4	7,796	31.9	48	This is a potential significant source of odour and is based on an equivalent garden waste receival composting operation.
Shredding	-	-	5,740	23.5	35	This has conservatively been assumed to operate

Source	Surface area (m^2)	SOER OUv/m^2/s	OER OUv/s	Source % Day	Source % Night	Comment
						the entire day, and is the second highest source of odour from the GO facility. In reality the shredding operations are not undertaken all day and are an intermittent operation.
Loading	5	8	40	0.2	0.2	Minor odour source
Active composting week 1	1,500	0.20	293	1.2	2	A significant reduction in odour based on a conservative reduction of 90% with the pre-covered odour emission rate based on the SITA Brooklyn garden waste data set and scaled to by a factor of 7.6 to account for the removal of grease trap waste.
Active composting week 2	1,500	0.11	168	0.7	1	A significant reduction in odour based on a conservative reduction of 90% with the pre-covered odour emission rate based on the SITA Brooklyn garden waste data set and scaled to by a factor of 7.6 to account for the removal of grease trap waste.
Active composting week 3	1,500	0.10	146	0.6	1	A significant reduction in odour based on a conservative reduction of 90% with the pre-covered odour emission rate based on the SITA Brooklyn garden waste data set and scaled to by a factor of 7.6 to account for the removal of grease trap waste.
Active composting week 4	1,500	0.09	134	0.5	1	A significant reduction in odour based on a conservative reduction of 90% with the pre-covered odour emission rate based on the SITA Brooklyn garden waste data set and scaled to by a factor of 7.6 to account for the removal of grease trap waste.

Source	Surface area (m^2)	SOER OUv/m^2/s	OER OUv/s	Source % Day	Source % Night	Comment
Maturation	5,638	0.7	3,947	16.1	24	Potential large odour source and odour emission rate based on the SITA Brooklyn garden waste data set and scaled to by a factor of 7.6 to account for the removal of grease trap waste. Note that an odour emission rate takes into account the range of ages of the 5-8 week maturation process as the stockpile ages will be evenly distributed in age over this time.
Finished compost	8,145	0.34	2,769	11.3	17	Potential large odour source and odour emission rate based on the SITA Brooklyn garden waste data set and scaled to by a factor of 7.6 to account for the removal of grease trap waste.
Screening	-	-	1,600	6.5	10	This has conservatively been assumed to operate the entire day, and is a medium potential source of odour from the GO facility.
Turning	713	1.18	841	3.4	5	Turning has been assessed as a worst case scenario as discussed in Section 4.2 of this memorandum.
Leachate pond	6,818	0.145	989	4.0	6	Not a large source of odour.
Leachate pond (aerated) for 2 hours of the day	6,818	1.0	6,818	28	-	Potentially a large odour source with aeration to occur in day time conditions when weather conditions are more favourable for dispersion.
TOTAL day	-	-	24,463* (unaerated)	-	-	
TOTAL night	-	-	16,242	--	-	Lower potential odour emissions due to no shedding, screening,

Source	Surface area (m^2)	SOER OUv/m^2/s	OER OUv/s	Source % Day	Source % Night	Comment
						loading or turning of materials.

ARRT Facility

As described in Section X (Carol to reference) additional analysis by SUEZ (Dr Robert Kelly) confirms that the performance of a biofilter can achieve 250 OU/m3. To ensure that this value is achieved SUEZ will further address the performance of the biofilter during the detailed design process for the ARRT.

This commitment is detailed in the technical report provided by Dr Robert Kelly, and SUEZ would including as part of the design provisions for additional odour treatment performance enhancements such as the implementation of advance biofiltration technology or inclusion of an Activated Carbon filter or other proven technology as a polishing treatment stage to be operated only on an “as needed” basis in response to the prevailing environmental conditions.

Table 4 Odour emissions for proposed ARRT facility

Source	Flow rate (m^3/s)	Biofilter emission rate OU/m^3	OER (OU/s)
Biofilter	345	250	86,250

Attachments to response 7.2.14

Topic: ARRT facility operations and design

LUCAS HEIGHTS RESOURCE RECOVERY PARK
Proposed ARRT Facility – Odour Treatment Design

Author:
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Date: April 14, 2016

Reference: NOSE B1603-0666
Revision:

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SUEZ Recycling & Recovery Australia has submitted a development application with the Department of Planning & Environment (DPE) for proposed development of the Lucas Heights Resource Recovery Park (LHRRP), to include landfill expansion of 8.3 million cubic metres, relocation and expansion of the garden organics facility and construction of a 200,000 tpa Advanced Resource Recovery Treatment (ARRT) facility.

The proposed ARRT facility will process mixed solid waste for conversion into quality, fit-for-purpose compost, soil conditioner and mulch products for use in agriculture and horticulture, diverting up to 140,000 tonnes of waste per year from landfill. The technology used at each ARRT facility is specifically tailored to meet local requirements, however such systems generally fall within the category of in-vessel, forced aeration composting.

The proposed ARRT facility represents a new odour source for the LHRRP, however all process operations (including storage of the final compost products) will take place within a fully-enclosed building maintained under negative pressure. All air emissions from the ARRT facility will be treated via a dedicated odour control system, per industry best practices, prior to release to the atmosphere.

The Environmental Impact Statement (EIS) for the project has defined a 250 OU/m^3 criteria for the ARRT odour control outlet stack based upon implementation of a biofiltration treatment strategy. The NSW Environment Protection Agency has requested further details on how the facility would be able to achieve this level of performance. SUEZ therefore prepared the following critical scientific review on the effectiveness of biofilters at odour removal from composting facilities, in support of the formal assessment of the project.

This memo was prepared as an official response, to present industry best-practices for odour control at ARRT facilities and associated reference plants to facilitate assessment of the anticipated odour control performance.

SUEZ operates numerous large-scale composting facilities throughout the world, including seven ARRT facilities in Australia, representing more than half of all such plants in operation in Australia today. The basis for the data presented in this memo includes SUEZ internal database, contact with SUEZ ARRT Operations staff in Europe, and review of the available literature publications for external references.

ARRT Odour Control Practices

Management of nuisance odours remains one of the primary concerns of large-scale composting facilities, especially those located near residential areas. While good process management and careful housekeeping can greatly reduce associated odours, in most cases some method of odour treatment is required.

In-vessel composting of household waste is known to generate and emit a range of odorous compounds. Typically, the most problematic odorous compounds at composting facilities include ammonia, hydrogen sulphide, mercaptans, alkyl sulphides such as dimethyl sulphide and dimethyl disulphide and terpenes. However, the specific composition of the gaseous emissions depend upon a number of inter-related factors (Arcadis *et al*., 2010):

1. The nature of the input wastes, in particular the nature of the organic carbon in the various waste components, and the nature of any organic compounds in the input wastes which may be released as the mass of material heats up;
2. The nature of the process, and the retention time in that process, as well as the maturation period;
3. The nature and effectiveness of the turning / airflow systems, and the frequency of turning;
4. The biomass moisture management regime, especially in turned windrow systems;
5. The C:N ratio of the bio-waste; and
6. **The nature and effectiveness of any measures to control air pollution, for example biofiltration systems as typically employed by enclosed facilities.**

In many cases, biofiltration is the most effective and economical treatment option for the odorous compounds found within composting exhaust gas streams, which has led to its widespread use in the composting industry.

Biofilters are porous packed bed reactors that support a mixed culture of pollutant-degrading organisms within a biofilm on the support media. The overall effectiveness of a biofilter is largely determined by the properties and characteristics of the support medium, which include porosity, degree of compaction, water retention capacity, and the ability to host microbial populations. The choice of filter medium is therefore one of the most significant decisions facing an operator, as filter types can vary significantly in cost, performance and longevity. Typical biofilter support media include peat, wood chips or bark, as well as cockle shells, soil, lava rock and synthetic types.

It is well-documented in the published literature that highly soluble and low molecular weight VOCs and inorganic compounds such as ammonia are effectively treated via biofiltration, with performance efficiencies for ammonia routinely exceeding 95% removal.

In general, while ammonia removal in biofilters is usually very high, there are relatively few studies which reference removal performance for VOCs. It is noted that even highly effective

biofilters will likely only decompose and remove a proportion of the total VOC content of emissions, with low weight aliphatic hydrocarbons such as methane, pentane and some chlorinated compounds often proving difficult to biodegrade. According to Arcadis *et al.* (2010), the use of biofilters with in-vessel composting facilities yields a reduction in VOC emissions on the order of 80%.

In terms of Odour Concentration removal performance, literature review illustrates that typical biofilter performance efficiency ranges from 85 to as high as 99%, providing that standard operating procedures are in place and followed for their monitoring and maintenance.

The ability of biofilters to eliminate typical odorous compounds from waste gas streams are summarised in Table 1 below (European Commission, 2006).

Table 1. Biofilter efficiency in treating mechanical biological treatment waste gas streams.

Substance (group)	Biofilter efficiency (% removal)
Aldehydes, alkanes	75
Alcohols	90
Adsorbable organic halogens, aromatic hydrocarbons (benzene)	40
Aromatic hydrocarbons (toluene, xylene)	80
Non-methane volatile organic compounds	83
Polychlorinated dibenzo-p-dioxins and dibenzofurans	40
Odour	**95 – 99**

SUEZ ARRT Facilities – Odour Treatment Performance

A review of biofilter performance data from SUEZ operated composting facilities illustrated that biofilter technology is capable of maintaining a relatively stable odour emission concentration, independent of the variation in the process load as indicated by the inlet odour concentration. The data indicates that the outlet odour concentration from well operated biofilters, can achieve ≤ 250 OU/m^3. All biofilters were also found to have a beneficial effect on the character of the odour released and it's perceived offensiveness in comparison to the process odours.

By way of reference, Table 2 below presents the certified performance data resulting from a 1-year study (monthly measurement campaigns) conducted in 2012 at a solid waste methanization and composting facility operated by SUEZ in Montpellier, FRANCE.

All facility process air emissions are combined (with the exception of the waste receiving pit) and treated by two biofilters (N^{os} 1 & 2) operated in parallel. The maximum allowable odour concentration at the biofilter outlet is 300 OU/m^3, as established by the local regulatory agency.

Table 2. AMETYST – Biofilter Performance Data (2012)

	Odour Concentration Range (OU/m^3)	Average Odour Concentration (OU/m^3)
Biofilter Inlet	300 – 9,000	1,800
Biofilter Outlet	60 to 700	238

It should be noted however that while some feedstocks, such as green waste, have a fairly low potential for odour generation if handled and stored correctly, feedstocks such as mixed household waste, have a much higher potential for odour generation.

Accordingly, for very high exhaust gas odour levels (for example, > 12,500 OU/m^3), even very good odour removal rates (98%) may be insufficient to fully reduce emitted odour to below the targeted 250 OU/m^3 threshold.

Therefore, it is reasonable to conclude that meeting the targeted odour threshold level on a continuous and consistent basis will be very challenging, particularly if exhaust gas odour concentrations are very high and dominated by compounds derived from anoxic conditions.

Based upon this conclusion, consideration of the following strategies to enhance odour removal performance, thereby providing an added measure of nuisance prevention security, is strongly recommended:

- Implementation of Advanced Biofiltration Technology
- Inclusion of a polishing treatment stage employing Activated Carbon filtration

Advanced Biofiltration Technology

Innovative biofiltration technology that makes use of a proprietary support material (consisting of both an inorganic and an organic phase) designed to support high-level odour control performance objectives. The inorganic component provides greatly improved mechanical resistance, and the organic phase is an ideal medium for the proliferation and fixation of the microorganisms while also acting as an adsorbent, which helps to reduce the effects of inlet air composition and concentration variability.

According to the manufacturer's experience typical Odour concentration removal performance for composting applications is very high, ranging from 95-99% with low intrinsic odour, supporting the ability to **guarantee** biofilter outlet odour concentrations of ≤ 500 OU/m^3.

A composting facility (Organic Fraction MSW) in Spain has conducted an annual performance assessment of the site's Advanced Biofilter installation (design airflow rate of 390,000 m^3/h) for the past 7 years which results in an average inlet odour concentration of 18,500 OU/m^3 and average outlet odour concentration of 220 OU/m^3 yielding 99% removal efficiency and 7 years of run time without any need for media replacement.

Activated Carbon Filter

Implementation of a polishing treatment stage, based upon Activated Carbon filtration, is a relatively common practice within the composting industry, particularly for facilities that are faced with increasingly stringent odour control regulations or faced with increasing urbanization and residential encroachment.

Activated carbon filtration is a proven technology for adsorption of odorous compounds that are not readily biodegradable and therefore may pass through the biofiltration stage.

Factors impacting the performance of Activated Carbon filters include:

- Type of compound(s) to be removed;
- Concentration of compound(s) to be removed - increased concentration yields higher carbon consumption;
- Temperature – improved adsorption capacity at lower temperatures;
- Humidity – improved adsorption capacity at lower humidity levels

Recent design advances make it possible for this polishing treatment stage to be brought on/off line based on odour control performance and prevailing environmental conditions so as to optimize the associated operating costs while ensuring odour removal performance objectives are consistently achieved.

CONCLUSIONS

SUEZ is committed to providing solutions that improve the environmental and economic sustainability of our waste management operations.

The proposed ARRT facility for the Lucas Heights Resource Recovery Park has applied for an odour control outlet concentration of 250 OU/m^3 based upon a review of similar approved alternative waste treatment projects in NSW and in accordance with the Victorian EPA practices based on the performance of well-maintained and operated biofilters.

The present report provides a critical review of available evidence regarding biofilter performance for treatment of odour emissions from composting facilities in order to provide assurance that such technology can perform adequately.

The review confirms that biofilters have been shown to be effective at treating the odours associated with in-vessel composting, including ammonia, and a wide range of volatile organic compounds (including sulfur compounds and amines).

A review of representative odour concentration emissions data from similar sites operated by SUEZ and of published literature references demonstrates that a well operated biofilter can achieve outlet odour concentration levels of less than 250 OU/m^3. Biofilter performance

efficiency, as regards odour concentration removal, was consistently in the 95% range or above for well operated systems.

The potential variability of the in-vessel composting process exhaust air is also recognized, and it is a reasonable assumption that meeting the targeted odour threshold level on a continuous and consistent basis will be very challenging.

It is therefore recommended that the odour control design for the proposed LHRRP ARRT facility include provisions for the consideration of additional odour treatment performance enhancements such as the implementation of advanced biofiltration technology or inclusion of an Activated Carbon filter or other proven technology as a polishing treatment stage to be operated on an “as needed” basis in response to the prevailing environmental conditions.

Finally, it must be noted that achieving and maintaining low odour exhaust emissions and effective biofilter odour reduction will require composting systems and biofilters to be operated optimally with a prescribed maintenance program. This should include routine monitoring of in-vessel exhaust gas characteristics (odour concentration and odour compound profile) as well as regular monitoring of biofilter moisture content, back pressure and outlet emissions.

Attachments to response 8.4.5

Topic: Design

12 May 2016

Phil Carbins
Sydney Landfill Business Manager
SUEZ
70 Anzac Street
Chullora NSW 2190

Our ref: 21/23482
Your ref: 215720

Dear Phil

Lucas Heights RRP project
Response to submissions - leachate pipework

1 Introduction

This letter provides a response to EPA's 22 December 2016 submission in regards to the leachate collection pipework (Request No. 5 of Attachment 4).

The EPA provided the following comments:

Calculations by GHD on stages 5.2 and 5.3 (i.e. the north area) indicates that the leachate collection pipework for these cells can withstand a weight/cover height of 75m. The leachate collection pipework and its integrity is essential for the proper management of leachate in a landfill. It is not clear if the unit weight of waste used to calculate the weight/height cover of 75m and the depth of waste in cells 5.2 and Cell 5.3 has been provided in the EIS.

The specific questions from the EPA and GHD's responses follow.

2 Responses

a) The EPA requests the Proponent provide the proposed height of Cell 5.2 and Cell 5.3 from the base of the cell to the proposed final landform?

A contour map of the expected depth of waste over Cell 5.2 and Cell 5.3 is attached (Drawing 21-20508-SK039, Appendix A). These contours represent the depth between the designed base of the liner (Drawing 21-20508-C003, Appendix B) to the top of the baseline final landform (as shown in Figure 6.2 of the EIS). The maximum proposed height from the base of the liner to the proposed final landform is 66.7 m. It is noted that the maximum height of waste over any leachate pipe is expected to be 62 m.

Note: The EIS references 75 m as the maximum height/weight the pipes can withstand. The original design report for Cells 5.2 and 5.3 noted that the pipes could withstand the load from 64 m of waste (a copy of these calculations are included in Appendix C), as this was the proposed maximum height of waste at the time. Subsequent review of the calculations, undertaken as per AS/NZ 2566.1 Buried flexible pipelines Part 1: Structural design, confirmed that the maximum height of 75 m (at 12 kN/m^3) can be sustained (refer Appendix D). Further calculations were undertaken based on 13 kN/m^3 as a

sensitivity review which confirmed that the pipes can withstand the predicted load (refer response part (b) below and Appendix E).

b) What unit weight for waste was used by GHD to calculate the height of 75m?

The assumed unit weight of waste used in the calculation of the structural integrity of the leachate collection pipes in the base of Cell 5.2 and Cell 5.3 was 12 kN/m$^{3.}$ *Geotechnical Aspects of Landfill Construction and Design* (Qian et al) illustrates that the expected unit weight for waste up to 65 m below the landfill surface has been observed in MSW to be 12.5 kN/m^3 (Appendix F). As the waste near the landfill surface will be less dense than this, 12 kN/m^3 was taken as a conservative value of the average waste unit weight through the entire column of waste above the pipework. The attached calculation (Appendix C) was taken from the design basis memo provided to the EPA as part of the approval of the cell design. This was submitted alongside the design documents which are referenced in Condition E4 of the site licence (EPL 5065).

GHD subsequently undertook additional calculations with unit weight of 13 kN/m^3 (where observed values asymptote) for the entire column of waste and confirm that the pipe integrity is maintained at this extreme conservative value (Appendix E).

c) The EPA requires the proponent assess the structural integrity and hydraulic performance of existing leachate collection infrastructure under the additional leachate and waste loads to be imposed by the proposed overtopping of waste and storage of leachate in Cell 5.2 and Cell 5.3.

The calculations which assess the structural integrity of the pipes within Cell 5.2 and Cell 5.3 assuming 64 m of waste with unit weight of 12 kN/m^3 and 13 kN/m^3 are attached (Appendix C and Appendix E). The pipe spacing calculation attached confirms that at 50 m spacing the leachate head can be maintained at less than 300 mm (Appendix G).

The pipe perforation spacing calculation attached confirms that the spacing of perforations is sufficient to maintain leachate head of less than 300 mm (Appendix H).

The hydraulic capacity of the pipes per AS2200-2006 *Design charts for water supply and sewerage* has been confirmed to be adequate for the expected leachate flows (Appendix I).

If you have any further questions on the above matter, please contact me on the number listed below.

Regards
GHD Pty Ltd

Anthony Dixon
Service Group Manager - Waste Management
02 9239 7025

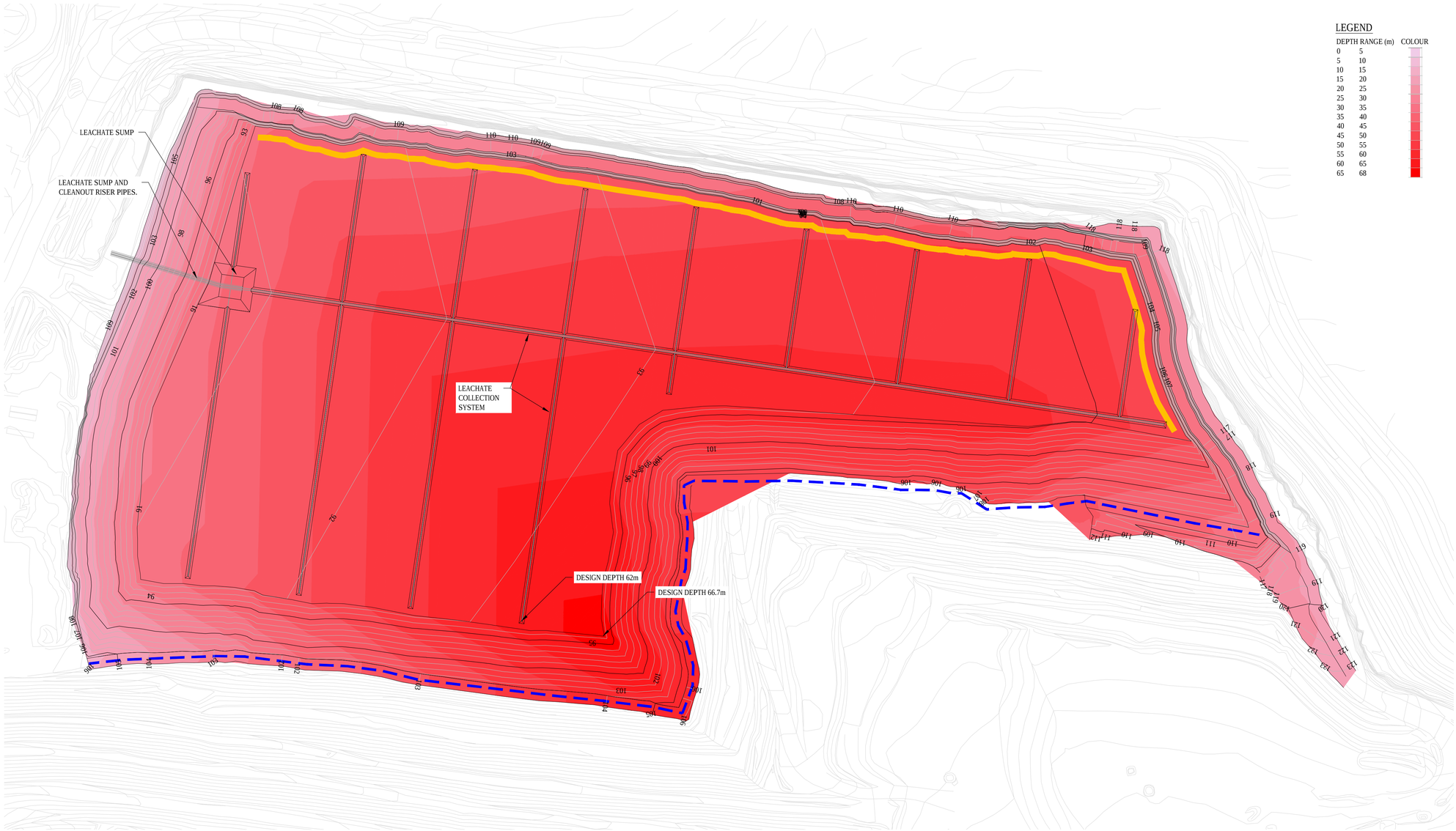
Appendix A

Expected depth of waste

N

LEGEND

DEPTH RANGE (m)		COLOUR
0	5	
5	10	
10	15	
15	20	
20	25	
25	30	
30	35	
35	40	
40	45	
45	50	
50	55	
55	60	
60	65	
65	68	



PLAN

SCALE 1:1000

0 10 20 30 40 50m

SCALE 1:1000 AT ORIGINAL SIZE

PRELIMINARY

rev	description	app'd	date
A	INITIAL ISSUE	AD	25.01.16

SUEZ

LUCAS HEIGHTS LANDFILL

DEPTH - DESIGN SUBGRADE TO BASELINE FINAL LANDFORM

Level 15, 133 Castlereagh Street, Sydney NSW 2000 Australia
T 61 2 9239 7100 **F** 61 2 9239 7199
E sydmail@ghd.com **W** www.ghd.com

scale	1:1000 for A1	job no.	21-20508
date	JAN 2016	rev no.	A

approved (PD) SK039

Plot Date: 25 January 2016 - 1:53 PM Plotted by: Alison Horlyck Cad File No: G:\21\20508\CADD\Drawings\21-20508-SK39.dwg

Appendix B

Design subgrade levels

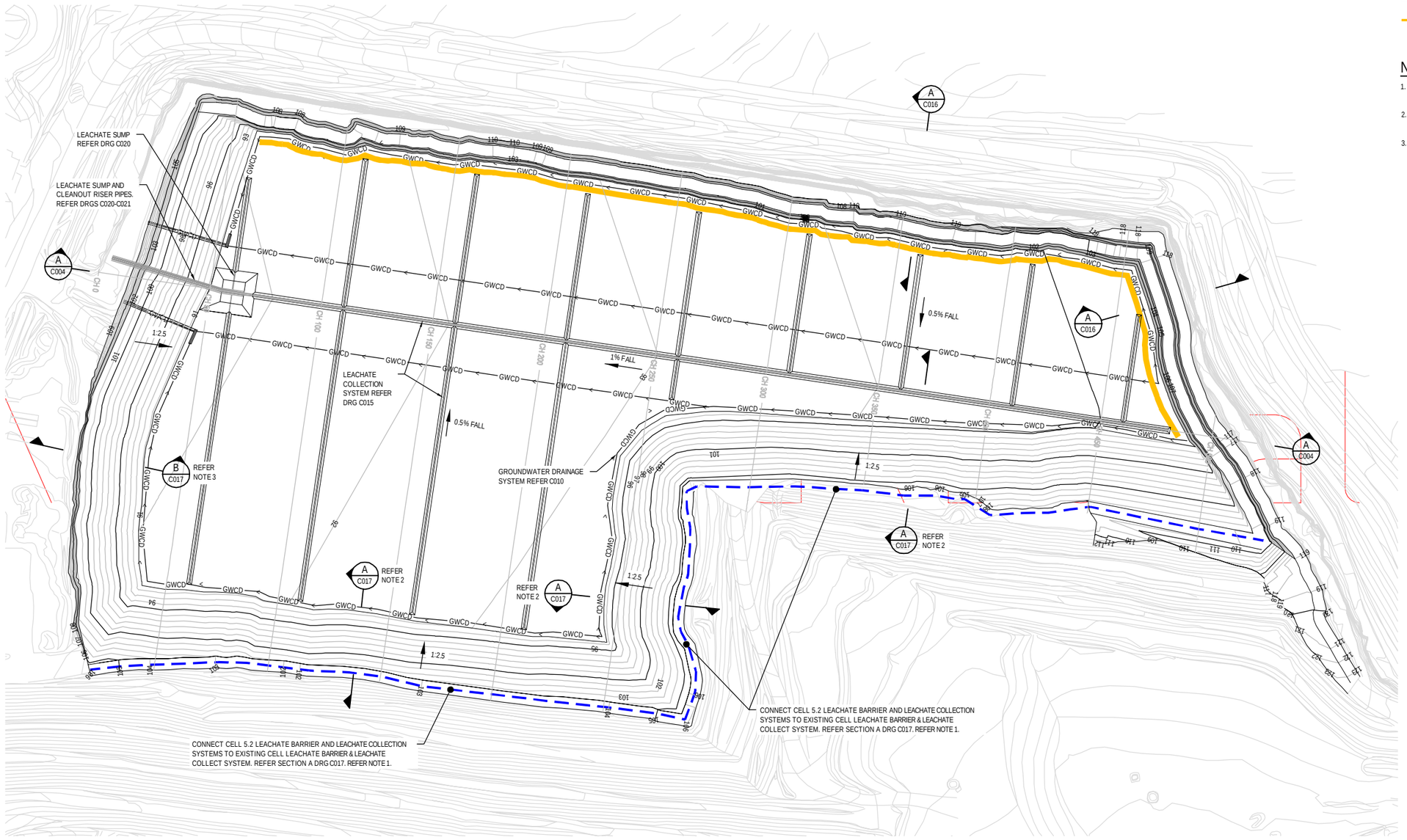
N

LEGEND:

- EXISTING SITE CONTOURS
- PROPOSED SUBGRADE
- LEACHATE COLLECTION TRENCH
- GWCD — GROUNDWATER DRAINAGE SYSTEM
- CONNECTION TO EXISTING SYSTEMS
- PERIMETER BUND

NOTE:

1. MANAGEMENT OF EXPOSED WASTE, LEACHATE & GROUNDWATER TO BE DETERMINED ON SITE IN CONSULTATION WITH PRINCIPAL.
2. SOUTH BATTER ANCHOR TRENCH EXCAVATION NOT INCLUDED IN DESIGN SUBGRADE. REFER SECTION A DRG C017
3. WEST BATTER DESIGN SUBGRADE FINAL ALIGNMENT INDICATIVE ONLY. TO BE CONFIRMED ON SITE WITH PRINCIPAL.



PLAN

SCALE 1:1000

SURVEY PRODUCED BY GEOSPECTRUM PTY.LTD JUNE 2012

FOR TENDER

No	Revision	Drawn	Job Manager	Project Director	Date
B	ISSUED FOR TENDER	AH	AH	AD	14.11.12
A	ISSUED FOR CLIENT REVIEW	AM	AH	AD	29.08.12

Note: * indicates signatures on original issue of drawing or last revision of drawing

0 10 20 30 40 50m

SCALE 1:1000 AT ORIGINAL SIZE

GHD

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DO NOT SCALE

Drawn	A. MILLER	Designer	A. HORLYCK
Drafting Check		Design Check	
Approved (Project Director)			
Date			
Scale	1:2000		

Client **SITA AUSTRALIA**
Project **LUCAS HEIGHTS LANDFILL CELLS 5.2 & 5.3**
Title **GENERAL ARRANGEMENT**

Original Size **A1**
Drawing No: 21-20508-C003 **Rev: B**

Plot Date: 16 November 2012 - 12:33 PM Plotted by: Alison Horlyck Cad File No: G:\21\20508\CADD\Drawings\21-20508-C003.dwg

Appendix C

Pipe structural design calculation – part 1

Project: Lucas Heights 2 - Cells 5.2 & 5.3 **Job:** 21-20508

Designer: A Horlyck **Date:** 12 October 2012

This spreadsheet calculates the structural design of a flexible pipe using AS2566

Item	Description	Symbol	Case 1	Case 2	Case 3	Case 4	Unit	References to AS/NZS 2566.1
PIPE SPECIFICATION AND PROPERTIES OF PIPE WALL			**PE100 (Landfill 60 m)**	**PE100 During Construction**	**PE100 (Landfill 30 m)**	**PE100 During Construction**		
1	DN		200	200	450	450	mm	
2	Profile Number		20	20	20	20		
3	Internal Diameter	D_i	0.1536	0.1536	0.346	0.346	m	
4	External Diameter	D_e	0.1984	0.1984	0.4466	0.4466	m	
5	Overall Thickness	t	**0.0224**	**0.0224**	**0.0503**	**0.0503**	m	
6	Moment of Inertia for Ring Bending	I_{xx}	**9.37E-07**	**9.37E-07**	**1.06E-05**	**1.06E-05**	m^4/m	
7	Distance from Neutral axis to internal surface	c_2					m	Figure 1.2
8	Initial (3-minute) ring bending modulus of elasticity	E_b	**826.5**	**950**	**826.5**	**950**	Mpa	Table 2.1 adjusted for 30 degrees celcius
9	Long-term ring-bending modulus of elasticity	E_{bL}	**226.2**	**260**	**226.2**	**260**	MPa	Table 2.1 adjusted for 30 degrees celcius
10	Diameter of Neutral Axis	D	0.18	0.18	0.40	0.40	m	
11	Ring-bending stiffness	$S_{D\,I}$	141993	163211	140829	161873	N/m/m	Equation 2.2.1.1(1)
		S_{DL}	38861	44668	38543	44302	N/m/m	Equation 2.2.1.1(2)
			OK	OK	OK	OK		Clause 1.4.6.2 S_{DI}<7500E'
12	Ratio of long-term (2 years) to initial (3 minute) ring-bending stiffness	$S_{DL2}/S_{D\,I}$	0.36	0.36	0.36	0.36		Equation 2.2.3
13	Longterm (2 years) ringbending stiffness)	S_{DL2}	50443	57980	50029	57505	N/m/m	Product of Item 11 & 12
14	Allowable longterm internal pressure	P_{all}	2.04	2.04	2.03	2.03		
	Maximum Allowable Long Term Hoop Stress	$\sigma_{h\,all}$	8	8	8	8	MPa	Table 2.1
15	Poissons Ratio	v	0.4	0.4	0.4	0.4		Table 2.1
LIMITING PARAMETERS FOR THE PIPE								
16	Allowable longterm vertical deflection	$\Delta_{y\,all}/D$	7.5%	7.5%	7.5%	7.5%	%	Table 2.1
17	Allowable longterm ring-bending strain	ε_{ball}	4%	4%	4%	4%	%	Table 2.1
18	Design Factor for Buckling	F_s	2.5	2.5	2.5	2.5		Clause 5.4
19	Factor of safety for:-							
	- Longterm internal pressure	η_p	1.25	1.25	1.25	1.25		
	- Longterm ring bending strain	η_b	2	2	2	2		
	- Longterm combined loading	η	1.25	1.25	1.25	1.25		
SITE CONDITIONS								
20	Cover	H	0.3	0.3	0.3	0.3	m	
21	Native Soil:-							
	- Classification		Compacted Clay	Compacted Clay	Compacted Clay	Compacted Clay		Table 3.2
	- Standard Penetration Test						Blows	Table 3.2
	- Soil Modulus	E'_n	**5**	**5**	**5**	**5**	MPa	Table 3.2
22	Embedmnt:-							
	- Classification		Gravel SS	Gravel SS	Gravel SS	Gravel SS		Table 3.2
	- Density Index (Estimated Field Compaction	I	80	80	80	80	%	Table 3.2
	- Soil Modulus	E'_e	**14.0**	**14.0**	**14.0**	**14.0**	MPa	Table 3.2
23	Width of trench at the springline	B	1.700	1.700	10.000	10.000	m	
24	Height of Water surface above the top of the pipe	H_w	3.3	0.3	4.3	1.3	m	
25	Internal Working Pressure	P_w	0	0	0	0		
26	Internal Vacuum	q_w	0	0	0	0		
27	Unit weight of trench fill	γ	**17.1**	**17.1**	**17.1**	**17.1**	kN/m^3	Clause 4.3 Paragraph C4.2.2
28	Specific Gravity of Soil Particle	ρ_s	2.65	2.65	2.65	2.65		Equation 5.4(2) for γ_{sub}
DESIGN DEAD LOAD AND LIVE LOADS DETERMINATION								
		$K_o\tan\delta$	0.16	0.16	0.16	0.16		AS2566.1 Supp1:1998
		H/B'	0.18	0.18	0.03	0.03		Clause C4.3
		K	0.97	0.97	1.00	1.00		Clause C4.3
29	Design load due to trench fill	w_g	5	5	5	5	kPa	Equation C4.3(1)
30	Design Load due to external live loads							
	- Wheel Load	P	0	70	0	70	kN	Table C4.1
	- Sum of Wheel Loads	$\sum P$	0	280	0	280	kN	
	- Wheel Load contact area	$a\,b$	0	0.2x0.5	0	0.2x0.5	m^2	Figure 4.1
	- Distance between centre lines of wheel loads	G	0	1.2	0	1.2	m	Figure 4.1
	- Length of base of load prism measured in relation to the direction of travel of the vehicle:-							
	Perpendicular	L_1	0.00	1.10	0.00	1.10	m	Figure C4.7, Fig 4.2
	Parallel	L_2	0.00	0.60	0.00	0.60	m	Fig 4.2
	- Live load impact factor	α	0	1.355	0	1.355	-	Equation 4.7.2(2)
	- Average intensity of design live loads	w_q	0.00	574.85	0.00	574.85	kPa	Equation 4.7.2(1) or Fig 4.1
	Design Load due to waste and stockpiles							
	- Landfill Depth (including Cover)		64.00	1.00	30.00	1.00	m	
	- Density of Landfilled Waste and Cover		12.00	8.50	12.00	8.50	kN/m^3	
	- Height of Stockpiles		0.00	0.00	0.00	0.00	m	
	- Density of Stockpiles		0.00	0.00	0.00	0.00	kN/m^3	

Project: Lucas Heights 2 - Cells 5.2 & 5.3 **Job:** 21-20508

Designer: A Horlyck **Date:** 12 October 2012

This spreadsheet calculates the structural design of a flexible pipe using AS2566

Item	Description	Symbol	Case				Unit	References to AS/NZS 2566.1
	Vertical design load (pressure to top of pipe) due to surface applied dead load	w_{gs}	768	8.5	360	8.5	kPa	Clause 4.6(a), Equations 5.2(2), 5.4(1), 5.4.(3)
	Internal Vacuum	q_v	0	0	0	0	kPa	Clause 5.4(b)
DETERMINE EFFECTIVE SOIL MODULUS								
31	E'_e/E'_n		2.80	2.80	2.80	2.80	-	
32	B/D_e		8.57	8.57	22.39	22.39	-	
		Δ_f	1.44	1.44	1.44	1.44	-	
33	Leonhardt Correction Factor	ζ	1.00	1.00	1.00	1.00	-	Figure 3.2 of Equation 3.4.3(2)
34	Effective Soil Modulus	E'	14.00	14.00	14.00	14.00	MPa	Equation 3.4.3(1)
DETERMINE DEFLECTION								
	Bedding constant	K	0.1	0.1	0.1	0.1	-	Clause 5.2
35	Predicted Longterm Vertical Deflection	Δ_y/D	0.061	0.045	0.029	0.045		Equation 5.2(2)
			6.1%	4.5%	2.9%	4.5%		
			OK	OK	OK	OK		
DETERMINE STRAIN								
36	Shape Factor	D_f	3.22	3.19	3.22	3.19		Figure 5.1 or Equation 5.3.1(3)
37	Effective Wall Thickness of Pipe	t_{es}	0.0224	0.0224	0.0503	0.0503		Clause 1.5 2*MAX(c1,c2)
38	Predicted Longterm ring bending strain	ε_b	0.025	0.018	0.012	0.018		Equation 5.3.1(2)
			2.5%	1.8%	1.2%	1.8%		
			OK	OK	OK	OK		
DETERMINE EFFECTS OF EXTERNAL HYDROSTATIC PRESSURE AND INTERNAL VACUUM								
39	Buckling Pressure on Pipe for:-							
		γ_{sub}	10.65	10.65	10.65	10.65		
	- H < 0.5m		ok	ok	ok	ok		
	- H >= H_w to be <= max($q_{all\ 1\&2}$)		NA	591.6	NA	NA	kPa	Equation 5.4(1)
	- H < H_w		806.2	NA	410.8	604.2	kPa	Equation 5.4(3)
40	Allowable buckling pressure (See Item 18):-							
	- H < 0.5m	$q_{all\ 1}$	621.8	714.7	616.7	708.8	kPa	Equation 5.4(4)
	- H >= 0.5m	$q_{all\ 1}$ or $q_{all\ 2}$	NA	NA	NA	NA	kPa	Equation 5.4(4) or 5.4(5)
			OK	OK	OK	OK		
COMBINED LOADING								
		r_c	1.00	1.00	1.00	1.00		Equation 5.3.3
	Response to combined external load and internal pressure		0.315	0.315	0.315	0.315		Equation 5.3.3
		1/η	0.8	0.8	0.8	0.8		Equation 5.3.3
			OK	OK	OK	OK		

Appendix D

Pipe structural design calculation – part 2

Project: Lucas Heights 2 - Cells 5.2 & 5.3 **Job:** 21-20508

Designer: A Horlyck **Date:** 29 January 2016

This spreadsheet calculates the structural design of a flexible pipe using AS2566

Item	Description	Symbol	Case 1	2	3	4	Unit	References to AS/NZS 2566.1
PIPE SPECIFICATION AND PROPERTIES OF PIPE WALL			**PE100 (75m max.)**					
1	DN		200				mm	
2	Profile Number		20					
3	Internal Diameter	D_i	0.1536				m	
4	External Diameter	D_e	0.1984				m	
5	Overall Thickness	t	**0.0224**				m	
6	Moment of Inertia for Ring Bending	I_{xx}	**9.37E-07**				m^4/m	
7	Distance from Neutral axis to internal surface	c_2					m	Figure 1.2
8	Initial (3-minute) ring bending modulus of elasticity	E_b	**826.5**				Mpa	Table 2.1 adjusted for 30 degrees celcius
9	Long-term ring-bending modulus of elasticity	E_{bL}	**226.2**				MPa	Table 2.1 adjusted for 30 degrees celcius
10	Diameter of Neutral Axis	D	0.18				m	
11	Ring-bending stiffness	$S_{D\,I}$	141993				N/m/m	Equation 2.2.1.1(1)
		S_{DL}	38861				N/m/m	Equation 2.2.1.1(2)
			OK					Clause 1.4.6.2 S_{DI}<7500E'
12	Ratio of long-term (2 years) to initial (3 minute) ring-bending stiffness	$S_{DL2}/S_{D\,I}$	0.36					Equation 2.2.3
13	Longterm (2 years) ringbending stiffness)	S_{DL2}	50443				N/m/m	Product of Item 11 & 12
14	Allowable longterm internal pressure	P_{all}	2.04					
	Maximum Allowable Long Term Hoop Stress	$\sigma_{h\,all}$	8				MPa	Table 2.1
15	Poissons Ratio	v	0.4					Table 2.1
LIMITING PARAMETERS FOR THE PIPE								
16	Allowable longterm vertical deflection	$\Delta_{y\,all}/D$	7.5%				%	Table 2.1
17	Allowable longterm ring-bending strain	ε_{ball}	4%				%	Table 2.1
18	Design Factor for Buckling	F_s	2.5					Clause 5.4
19	Factor of safety for:-							
	- Longterm internal pressure	η_p	1.25					
	- Longterm ring bending strain	η_b	2					
	- Longterm combined loading	η	1.25					
SITE CONDITIONS								
20	Cover	H	0.3				m	
21	Native Soil:-							
	- Classification		Compacted Clay					Table 3.2
	- Standard Penetration Test						Blows	Table 3.2
	- Soil Modulus	E'_n	**5**				MPa	Table 3.2
22	Embedment:-							
	- Classification		Gravel SS					Table 3.2
	- Density Index (Estimated Field Compaction	I	80				%	Table 3.2
	- Soil Modulus	E'_e	**14.0**				MPa	Table 3.2
23	Width of trench at the springline	B	1.700				m	
24	Height of Water surface above the top of the pipe	H_w	3.3				m	
25	Internal Working Pressure	P_w	0					
26	Internal Vacuum	q_w	0					
27	Unit weight of trench fill	γ	**17.1**				kN/m^3	Clause 4.3 Paragraph C4.2.2
28	Specific Gravity of Soil Particle	ρ_s	2.65					Equation 5.4(2) for γ_{sub}
DESIGN DEAD LOAD AND LIVE LOADS DETERMINATION								
		$K_a\tan\delta$	0.16					AS2566.1 Supp1:1998
		H/B'	0.18					Clause C4.3
		K	0.97					Clause C4.3
29	Design load due to trench fill	w_g	5				kPa	Equation C4.3(1)
30	Design Load due to external live loads							
	- Wheel Load	P	0				kN	Table C4.1
	- Sum of Wheel Loads	$\sum P$	0				kN	
	- Wheel Load contact area	$a\,b$	0				m^2	Figure 4.1
	- Distance between centre lines of wheel loads	G	0				m	Figure 4.1
	- Length of base of load prism measured in relation to the direction of travel of the vehicle:-							
	Perpendicular	L_1	0.00				m	Figure C4.7, Fig 4.2
	Parallel	L_2	0.00				m	Fig 4.2
	- Live load impact factor	α	0				-	Equation 4.7.2(2)
	- Average intensity of design live loads	w_q	0.00				kPa	Equation 4.7.2(1) or Fig 4.1
	Design Load due to waste and stockpiles							
	- Landfill Depth (including Cover)		75.00				m	
	- Density of Landfilled Waste and Cover		12.00				kN/m^3	
	- Height of Stockpiles		0.00				m	
	- Density of Stockpiles		0.00				kN/m^3	

Project: Lucas Heights 2 - Cells 5.2 & 5.3 **Job:** 21-20508

Designer: A Horlyck **Date:** 29 January 2016

This spreadsheet calculates the structural design of a flexible pipe using AS2566

Item	Description	Symbol	Case	Unit	References to AS/NZS 2566.1
	Vertical design load (pressure to top of pipe) due to surface applied dead load	w_{gs}	900	kPa	Clause 4.6(a), Equations 5.2(2), 5.4(1), 5.4(3)
	Internal Vacuum	q_v	0	kPa	Clause 5.4(b)
DETERMINE EFFECTIVE SOIL MODULUS					
31	E'_e/E'_n		2.80	-	
32	B/D_e		8.57	-	
		Δ_f	1.44	-	
33	Leonhardt Correction Factor	ζ	1.00	-	Figure 3.2 of Equation 3.4.3(2)
34	Effective Soil Modulus	E'	14.00	MPa	Equation 3.4.3(1)
DETERMINE DEFLECTION					
	Bedding constant	K	0.1	-	Clause 5.2
35	Predicted Longterm Vertical Deflection	Δ_y/D	0.072		Equation 5.2(2)
			7.2%		
			OK		
DETERMINE STRAIN					
36	Shape Factor	D_f	3.22		Figure 5.1 or Equation 5.3.1(3)
37	Effective Wall Thickness of Pipe	t_{es}	0.0224		Clause 1.5 2*MAX(c1,c2)
38	Predicted Longterm ring bending strain	ε_b	0.029		Equation 5.3.1(2)
			2.9%		
			OK		
DETERMINE EFFECTS OF EXTERNAL HYDROSTATIC PRESSURE AND INTERNAL VACUUM					
39	Buckling Pressure on Pipe for:-				
		γ_{sub}	10.65		
	- H < 0.5m		ok		
	- H >= H_w to be <= max($q_{all\ 1\&2}$)		NA	kPa	Equation 5.4(1)
	- H < H_w		938.2	kPa	Equation 5.4(3)
40	Allowable buckling pressure (See Item 18):-				
	- H < 0.5m	$q_{all\ 1}$	621.8	kPa	Equation 5.4(4)
	- H >= 0.5m	$q_{all\ 1}$ or $q_{all\ 2}$	NA	kPa	Equation 5.4(4) or 5.4(5)
			OK		
COMBINED LOADING					
		r_c	1.00		Equation 5.3.3
	Response to combined external load and internal pressure		0.369		Equation 5.3.3
		1/η	0.8		Equation 5.3.3
			OK		

Appendix E

Pipe structural design calculation – part 3

Project: Lucas Heights 2 - Cells 5.2 & 5.3 **Job:** 21-20508

Designer: A Horlyck **Date:** 29 January 2016

This spreadsheet calculates the structural design of a flexible pipe using AS2566

Item	Description	Symbol	Case 1	2	3	4	Unit	References to AS/NZS 2566.1
PIPE SPECIFICATION AND PROPERTIES OF PIPE WALL								
			PE100 (Landfill 60 m)					
1	DN		200				mm	
2	Profile Number		20					
3	Internal Diameter	D_i	0.1536				m	
4	External Diameter	D_e	0.1984				m	
5	Overall Thickness	t	**0.0224**				m	
6	Moment of Inertia for Ring Bending	I_{xx}	**9.37E-07**				m^4/m	
7	Distance from Neutral axis to internal surface	c_2					m	Figure 1.2
8	Initial (3-minute) ring bending modulus of elasticity	E_b	**826.5**				Mpa	Table 2.1 adjusted for 30 degrees celcius
9	Long-term ring-bending modulus of elasticity	E_{bL}	**226.2**				MPa	Table 2.1 adjusted for 30 degrees celcius
10	Diameter of Neutral Axis	D	0.18				m	
11	Ring-bending stiffness	$S_{D\,I}$	141993				N/m/m	Equation 2.2.1.1(1)
		S_{DL}	38861				N/m/m	Equation 2.2.1.1(2)
			OK					Clause 1.4.6.2 S_{DI}<7500E'
12	Ratio of long-term (2 years) to initial (3 minute) ring-bending stiffness	$S_{DL2}/S_{D\,I}$	0.36					Equation 2.2.3
13	Longterm (2 years) ringbending stiffness)	S_{DL2}	50443				N/m/m	Product of Item 11 & 12
14	Allowable longterm internal pressure	P_{all}	2.04					
	Maximum Allowable Long Term Hoop Stress	$\sigma_{h\,all}$	8				MPa	Table 2.1
15	Poissons Ratio	v	0.4					Table 2.1
LIMITING PARAMETERS FOR THE PIPE								
16	Allowable longterm vertical deflection	$\Delta_{y\,all}/D$	7.5%				%	Table 2.1
17	Allowable longterm ring-bending strain	ε_{ball}	4%				%	Table 2.1
18	Design Factor for Buckling	F_s	2.5					Clause 5.4
19	Factor of safety for:-							
	- Longterm internal pressure	η_p	1.25					
	- Longterm ring bending strain	η_b	2					
	- Longterm combined loading	η	1.25					
SITE CONDITIONS								
20	Cover	H	0.3				m	
21	Native Soil:-							
	- Classification		Compacted Clay					Table 3.2
	- Standard Penetration Test						Blows	Table 3.2
	- Soil Modulus	E'_n	**5**				MPa	Table 3.2
22	Embedmnt:-							
	- Classification		Gravel SS					Table 3.2
	- Density Index (Estimated Field Compaction	I	80				%	Table 3.2
	- Soil Modulus	E'_e	**14.0**				MPa	Table 3.2
23	Width of trench at the springline	B	1.700				m	
24	Height of Water surface above the top of the pipe	H_w	3.3				m	
25	Internal Working Pressure	P_w	0					
26	Internal Vacuum	q_w	0					
27	Unit weight of trench fill	γ	**17.1**				kN/m^3	Clause 4.3 Paragraph C4.2.2
28	Specific Gravity of Soil Particle	ρ_s	2.65					Equation 5.4(2) for γ_{sub}
DESIGN DEAD LOAD AND LIVE LOADS DETERMINATION								
		$K_a\tan\delta$	0.16					AS2566.1 Supp1:1998
		H/B'	0.18					Clause C4.3
		K	0.97					Clause C4.3
29	Design load due to trench fill	w_g	5				kPa	Equation C4.3(1)
30	Design Load due to external live loads							
	- Wheel Load	P	0				kN	Table C4.1
	- Sum of Wheel Loads	$\sum P$	0				kN	
	- Wheel Load contact area	$a\,b$	0				m^2	Figure 4.1
	- Distance between centre lines of wheel loads	G	0				m	Figure 4.1
	- Length of base of load prism measured in relation to the direction of travel of the vehicle:-							
	Perpendicular	L_1	0.00				m	Figure C4.7, Fig 4.2
	Parallel	L_2	0.00				m	Fig 4.2
	- Live load impact factor	α	0				-	Equation 4.7.2(2)
	- Average intensity of design live loads	w_q	0.00				kPa	Equation 4.7.2(1) or Fig 4.1
	Design Load due to waste and stockpiles							
	- Landfill Depth (including Cover)		64.00				m	
	- Density of Landfilled Waste and Cover		13.00				kN/m^3	
	- Height of Stockpiles		0.00				m	
	- Density of Stockpiles		0.00				kN/m^3	

Project: Lucas Heights 2 - Cells 5.2 & 5.3 **Job:** 21-20508

Designer: A Horlyck **Date:** 29 January 2016

This spreadsheet calculates the structural design of a flexible pipe using AS2566

Item	Description	Symbol	Case	Unit	References to AS/NZS 2566.1
	Vertical design load (pressure to top of pipe) due to surface applied dead load	w_{gs}	832	kPa	Clause 4.6(a), Equations 5.2(2), 5.4(1), 5.4(3)
	Internal Vacuum	q_v	0	kPa	Clause 5.4(b)
DETERMINE EFFECTIVE SOIL MODULUS					
31	E'_e/E'_n		2.80	-	
32	B/D_e		8.57	-	
		Δ_f	1.44	-	
33	Leonhardt Correction Factor	ζ	1.00	-	Figure 3.2 of Equation 3.4.3(2)
34	Effective Soil Modulus	E'	14.00	MPa	Equation 3.4.3(1)
DETERMINE DEFLECTION					
	Bedding constant	K	0.1	-	Clause 5.2
35	Predicted Longterm Vertical Deflection	Δ_y/D	0.067		Equation 5.2(2)
			6.7%		
			OK		
DETERMINE STRAIN					
36	Shape Factor	D_f	3.22		Figure 5.1 or Equation 5.3.1(3)
37	Effective Wall Thickness of Pipe	t_{es}	0.0224		Clause 1.5 2*MAX(c1,c2)
38	Predicted Longterm ring bending strain	ε_b	0.027		Equation 5.3.1(2)
			2.7%		
			OK		
DETERMINE EFFECTS OF EXTERNAL HYDROSTATIC PRESSURE AND INTERNAL VACUUM					
39	Buckling Pressure on Pipe for:-				
		γ_{sub}	10.65		
	- H < 0.5m		ok		
	- H >= H_w to be <= max($q_{all\ 1\&2}$)		NA	kPa	Equation 5.4(1)
	- H < H_w		870.2	kPa	Equation 5.4(3)
40	Allowable buckling pressure (See Item 18):-				
	- H < 0.5m	$q_{all\ 1}$	621.8	kPa	Equation 5.4(4)
	- H >= 0.5m	$q_{all\ 1}$ or $q_{all\ 2}$	NA	kPa	Equation 5.4(4) or 5.4(5)
			OK		
COMBINED LOADING					
		r_c	1.00		Equation 5.3.3
	Response to combined external load and internal pressure		0.341		Equation 5.3.3
		1/η	0.8		Equation 5.3.3
			OK		

Appendix F

Extract from Qian et al.

From *Geotechnical Aspects of Landfill Design and Construction* (2002)
Qian, Koerner and Gray

Methods based on direct field or laboratory measurements tend to be more reliable and, in general, test methods which involve controlled conditions and large samples, such as test pits or test cells, are the most reliable. According to Fassett et al. (1994) the least reliable values are those computed by indirect methods (e.g. values based on incoming weights and in-place volume estimates).

A summary of average unit weights of municipal solid waste is shown in Table 6.3. The unit weight values presented in Table 6.3 range from 20 to 84 lb/ft^3 (3.1 to 13.2 kN/m^3). The wide range is likely caused by the diversity of material in the waste stream, the variable amount of daily cover, and varying moisture content and compaction efforts. More information about the unit weight of solid waste can be found in Table 6.5.

The initial in-place unit weight will increase immediately when compressed by the application of overburden pressure from subsequent waste placement. The in-place unit weight may also increase with further compression that occurs over time. Earth Technology (1988) reported the results of field and laboratory studies of unit weight performed at the Puente Hills landfill near Los Angeles. They developed an interpreted profile of unit weight versus depth for that landfill. The interpreted profile was derived from measurements of unit weight of drive samples recovered for laboratory testing and down-hole geophysical gamma-gamma logging. The interpreted unit weight profile shown in Figure 6.1, varied from 21 lb/ft^3 (3.3 kN/m^3) at the surface to 81.4 lb/ft^3 (12.8 kN/m^3) at depths greater than 200 ft (60 m). Based on reported initial in-place waste densities for modern landfills and the waste compressibility values reported by Fassett et al. (1994), Kavazanjian et al. (1995) developed a profile to show the relationship between the unit weight of the waste and landfill depth. In the absence of site specific information, this profile can be used to estimate the unit weight of the municipal solid waste in engineering analysis for modern municipal solid waste landfills (Kavazanjian et al., 1995).

TABLE 6.3 Average Unit Weight of Municipal Solid Waste (Sharma et al., 1990)

Source	Waste Placement Conditions	Unit Weight lb/ft^3	Unit Weight kN/m^3
Sowers (1968)	Sanitary Refuse: Depending on compaction effort	30 to 60	4.7 to 9.4
NAVFAC (1983)	Sanitary Landfill		
	(a) Not Shredded		
	• Poor compaction	20	3.1
	• Good compaction	40	6.3
	• Best compaction	60	9.4
	(b) Shredded	55	8.6
NSWMA (1985)	Municipal Refuse		
	• In a landfill	44 to 49	6.9 to 7.7
	• After degradation and settlement	63 to 70	9.9 to 11
Landva and Clark (1986)	Refuse Landfill (Refuse to soil cover ratio varied from about 2:1 to 10:1)	57 to 84	9 to 13.2
EMCON Associates (1989)	For 6:1 refuse to daily cover soil	46	7.2

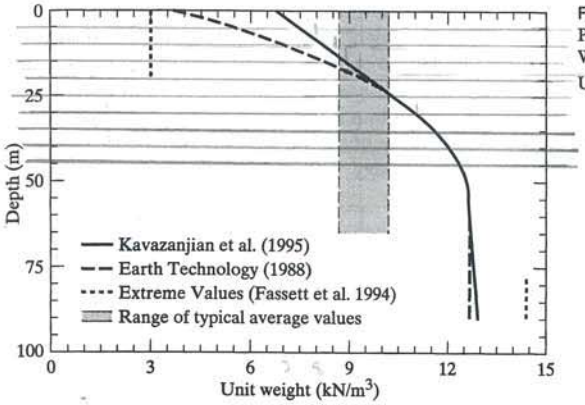


FIGURE 6.1 Unit Weight Profile for Municipal Solid Waste (Kavazanjian et al., 1995) Used with permission of ASCE.

Zornberg et al. (1999) conducted direct field measurements and spectral surface wave analysis (SASW) surveys to characterize the unit weight profile for the waste at a MSW landfill located in southern California. The waste unit weight obtained from direct field measurements ranged approximately from 64 lb/ft^3 to 95 lb/ft^3 (10 kN/m^3 to 15 kN/m^3) at a depth of between 26 ft and 164 ft (8 m and 50 m) below the landfill surface.

Based on the compaction equipment used in most landfills at present, the compaction ratio of loose waste to compacted waste usually ranges from 2:1 to 3:1. The average unit weight of compacted solid waste is usually 55 to 70 lb/ft^3 (9 to 11 kN/m^3) for modern solid waste landfills.

6.3 MOISTURE CONTENT OF MUNICIPAL SOLID WASTE

Two types of moisture content are used in landfill design. The first type of moisture content is defined as the percent by weight of water in the waste based on the dry weight of the waste. This dry gravimetric moisture content definition, commonly used in geotechnical engineering analyses, is written as

$$w_d = (W_w/W_s) \times 100 \tag{6.1}$$

where w_d = dry gravimetric moisture content, %;
W_w = weight of water; and
W_s = dry weight of solid waste.

In some references, moisture content is defined on the basis of wet weight of the wastes (i.e., w_w), written as

$$w_w = [W_w/(W_s + W_w)] \times 100 \tag{6.2}$$

where w_w = wet gravimetric moisture content, %;
W_w = weight of water; and
W_s = dry weight of solid waste.

Appendix G

Pipe spacing calculation

Pipe spacing based on Giroud's equation

Maximum leachate head over liner	0.3	m	Generally = 0.3m, no greater than 0.5
Drainage layer selected	Gravel		Coarse sand, Sand, Fine sand or Gravel
90%le annual rainfall	1,315.10	mm	From BOM station 66078
Infiltration %	50%		Daily cover = 50%
Geotextile incIded above drainage layer	yes		yes or no
Liner gradient	2.3%		No less than 1%

Permeability of drainage layer	3.00E-03	m/s
Permeability of drainage layer after clogging	3.00E-04	m/s
Leachate seepage rate into drainage layer	2.09E-08	m/s

Min. spacing between drainage pipes	123.3	m	
Design spacing between drainage pipes	50	m	As per landfill guidelines

Material	**Permeability (m/s)**
Coarse sand	1.00E-04
Fine sand	3.10E-05
Gravel	3.00E-03
Sand	5.80E-05

Appendix H

Pipe perforation calculation

Client:	SUEZ	**Job Number:**	21-20508		
Project:	Lucas Heights Landfill	**Calcs by:**	A Horlyck	**Date:**	25/01/2016
Subject:	Pipe perforation spacing	**Checked by:**		**Date:**	

Statement of design procedure	
This spreadsheet provides design calculations for the perforation of leachate collection pipework based on Bernoulli's Equation	
References	
Geotechnical Aspects of Landfil Design and Construction, Qian , Koerner, Gray, 2001	
Design cases / assumptions	
1	Minor leachate collection pipes
2	Major leachate collection pipe - north
3	Major leachate collection pipe - south
4	Not used

Item	Description	Symbol	Case				Unit	Notes
			1	2	3	4		
1	Assumed maximum leachate flow	Q_{max}	1.00E-06	1.00E-06	1.00E-06		m3/s/m2	Saturated hydraulic conductivity of waste
2	Drainage area length	x	50	420	200		m	
3	Drainage area width	y	130	65	130		m	
4	Length of pipe	L	130	420	200		m	
5	Cell area per unit length of pipe	A_{unit}	50	65	130		m2 / m	
6	Leachate generated	Qb	5.00E-05	6.50E-05	1.30E-04		m3/s	
7	Discharge coefficient	C	0.62	0.62	0.62			
8	Liquid head	Δh	0.3	0.3	0.3		m	From design
9	Limiting leachate entrance velocity	V_{ent}	2.43	2.43	2.43		m/s	Equation 9.1
10	Required total area of perforations	A_b	3.32E-05	4.32E-05	8.64E-05		m2	
11	Diameter of perforations	dp	10	10	10		mm	From design
12	Area of single perforation	Ap	7.85E-05	7.85E-05	7.85E-05		m2	
13	Blockage	b	50%	50%	50%		%	
14	Required number of perforations	Np	1	1	2			
15	Number of perforations per set	n	4	4	4		-	
16	**Minimum distance between sets**	d	**4726**	**3635**	**1818**		mm	
17	**Design distance between sets**		**100**	**100**	**100**		mm	As shown on drawings
18	**Max. pipe flow**		**0.05**	**0.07**	**0.13**		L/sec	

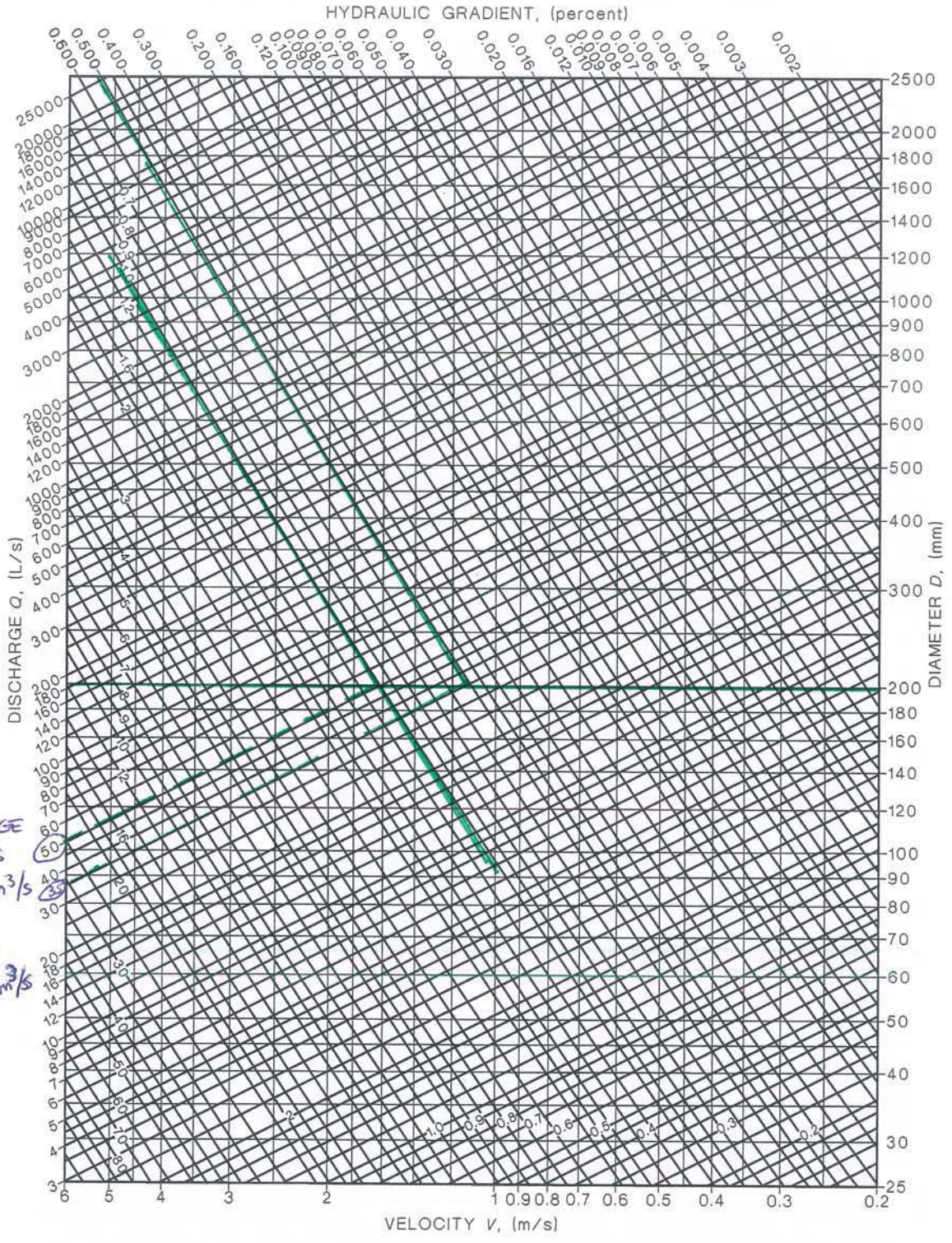
Appendix I

Pipe flow calculation

LUCAS HEIGHTS CELL 5.2 + 5.3.
A HORLYCK 25/01/16

PER DESIGN
LEACHATE MAIN MIN 1%
LEACHATE MINOR MIN 0.5%

A1



DISCHARGE
= 50 L/s
= 0.05 m³/s
OR
= 35 L/s
= 0.035 m³/s

PER DESIGN DN200 PIPE

CHART 3 COLEBROOK-WHITE FORMULA WITH k = 0.015 mm

PER AS2200 TABLE 2
k = 0.003 - 0.015 mm
FOR PLASTIC PIPE.