	Total Passenger Kilometres - Direct and Indirect Total Service Kilometres; Total Vehicle Kilometres

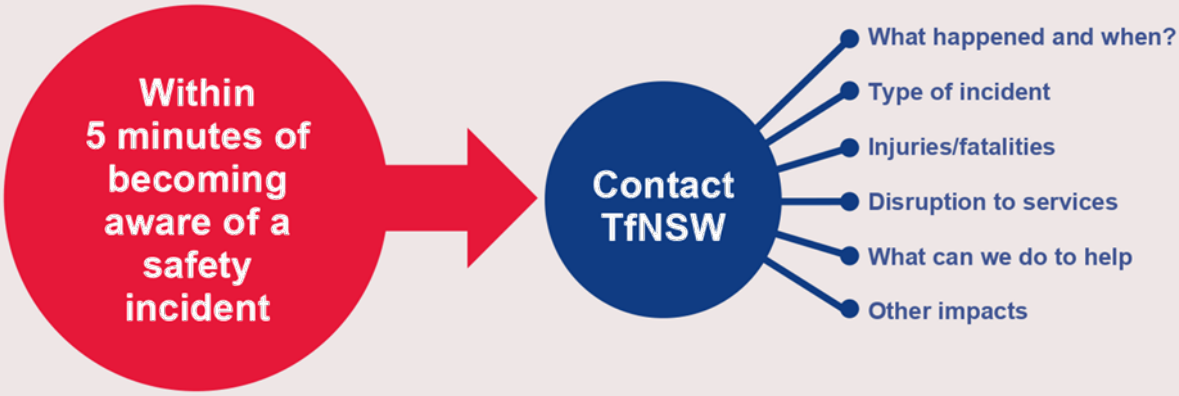
5. REPORTING REQUIREMENTS FOR THE CHSP

Each year during the Term, the Provider must provide the reports set out in the table below regarding the expenditure of the Funding provided under the CHSP and the Services delivered with that Funding.

REPORT	PERIOD COVERED BY THE REPORT	DUE DATE	DESCRIPTION AND REQUIREMENTS
Performance/ Service Delivery Report	1 July to 31 December 1 January to 30 June	30 January 30 July	Report on service delivery activities and outcomes to be provided in accordance with the DEX Protocols through the DEX.

TfNSW: Serious Incident Guide

Community Transport Safety Incident Reporting Protocol



Serious Incident Guide:

Safety and Welfare

- Fatality or person(s) seriously injured, i.e requiring transportation to hospital
- Passenger(s) unable to disembark due to technical asset failure for more than 5 minutes

Service

- Incidents resulting in a significant detrimental impact on other modes of transport e.g collision, departure from roadway, roll away vehicle, projectiles

Asset or Technical Failure

- Major failure of an asset that results in significant customer delays of >30 minutes, e.g vehicle fire, loss of a wheel

Security

- Police Operation (e.g. threat, suspicious package, security incident, civil unrest)
- Antisocial behaviour on service or resulting in (potential) delays >30 minutes

Depot/Control Centre

- Evacuation or unplanned closure, caused by: flood, fire, smoke, hazardous substances spill or suspicious substance
- Access and operation compromised (e.g no exit/ egress) for >20 minutes

1. **Call/text TfNSW Regional and Outer Metropolitan**

Jacob Loadsman

M 0429 380 453

TfNSW Regional and Outer Metropolitan manage strategic issues and risks including reputational risk/ impact, media response and strategy. They also escalate to the Secretary and Minister as required.

2. **Report serious incidents in writing to community.transport@transport.nsw.gov.au (cc your Contract Development Officer) as soon as reasonably practical**

Sue Kirk, Safety Manager
Services
Greater Sydney

NSW GOVERNMENT

VERSION 2.4 - JULY 2019

SCHEDULE 8 - GOVERNANCE

1. GOVERNANCE OVERVIEW

1.1 General Requirements

The Provider must:

(a) provide effective governance for the Provider's team to ensure the Services are delivered in accordance with the Service Contract;

(b) ensure that the governance model used is aligned with and, where appropriate, integrated with the TfNSW business model; and

(c) raise issues relating to the delivery of the Services at the Bi-annual Governance Meeting described in section 2.

2. SERVICE DELIVERY AND BI-ANNUAL GOVERNANCE MEETING

(a) The 'Bi-annual Governance Meeting' will be convened by TfNSW on an as required basis, no more than two times per year. The Bi-annual Governance Meeting will focus on the ongoing delivery of the services under the Service Contract.

(b) The Bi-annual Governance Meeting will be attended by:

(i) the Provider's managing director / chief executive officer / general manager or senior manager; and

(ii) the TfNSW Area Manager (as required) and the TfNSW Contract Manager, who will chair the forum.

(c) TfNSW may determine that meetings will be held by telephone or another method as advised instead of in person.

(d) The attendees at the Service Delivery and Commercial Forum Bi-annual Governance Meeting will address the following, as required by TfNSW:

(i) Provider's performance in the delivery of the Services and any other services under the Service Contract;

(ii) Provider's performance against the KPIs, in particular:

A. reporting, including emerging trends and any KPI Action Plans;

B. management of any Serious Incidents; and

C. post incident (including but not limited to Serious Incidents, Safety Incidents) reports and rectification plans;

(iii) Provider's handling and management of any customer complaints;

(iv) any issues relating to performance of the Services or any other services under the Service Contract raised by TfNSW;

(v) identify and approve any improvements to operational processes;

(vi) any breaches by the Provider, corrective actions to resolve such breaches and progress of corrective actions;

(vii) interactions between the Provider and other provider's (if appropriate) and ways to improve those interactions;

(viii) lifecycle management of assets by the Provider, and tracking against end of life service plans;

(ix) implementation and management of Systems and Equipment and new Systems and Equipment by TfNSW and the Provider;

(x) raise and attempt to resolve any contractual disputes, prior to issuing a dispute Notice under the Service Contract, this includes:

A. review of any Service Contract issues raised by TfNSW; and

B. tabling KPI breaches;

(xi) table and discuss proposed Service variations and other proposed amendments to the Service Contract;

(xii) address any payment issues and results of benchmarking;

(xiii) review and manage audit activities and outcomes;

(xiv) the Provider's assessment and control of work health and safety risks present at the workplace; and

(xv) the Provider's plans, policies, procedures and processes for dealing with the following:

A. customer relations;

B. incident (including but not limited to Serious Incidents, Safety Incidents) and accident management; and

C. safety, alcohol and drug monitoring.

SCHEDULE 9 – KEY PERFORMANCE INDICATOR (KPI)

1. KPI OVERVIEW

1.1 Definitions

'KPI Action Plan' means an action plan prepared to address the cause of any KPI Default or KPI Negative Trend in any KPI Calculation Period as required under this Schedule.

'KPI Default' means a failure to comply with a KPI in any KPI Calculation Period.

'KPI Negative Trend' means a trend in the measured results of a KPI between each KPI Calculation Period which demonstrates a reduction in performance.

'KPI Table' means the KPI Tables set out in section 6 of this Schedule 9.

'KPI Termination Event' means as defined in section 5.

'**Major Defect**' means a defect identified in regular and random inspections by TfNSW as a major defect not immediately resulting from a road accident, which must be rectified immediately and prior to driving or using the Owned Asset.

'**Preventable Accidents**' means an accident occurring in the delivering of the Services that is caused by either:

- poor maintenance (such as wheels falling off, fire, fluid leaks); or
- driver failure to follow proper procedures (such as failure to engage the handbrake resulting in a runaway Service Asset); or
- failure to perform adequate maintenance; or
- driver at fault.

1.2 Interpretation of KPI Tables

The following table sets out how to interpret the KPI Tables in this Schedule

The KPI Number and the name of the KPI is included in the header of the KPI Table (here)	
'Description'	This section of the KPI Table outlines a description of the KPI and how it is measured and calculated.
'KPI Specifications'	This section of the KPI Table outlines the KPI specifications, for example, the minimum performance levels the Provider is required to achieve.
'KPI Reporting Period ''	This section of the KPI Table outlines the time period to be covered by the respective KPI report.
'Calculation'	This section of the KPI Table sets out how the Provider's performance against the KPI is calculated.

'KPI Calculation Period'	This section of the KPI Table sets out the frequency which the Provider's performance against the KPI must be calculated in each KPI Report.
'Data source'	This section of the KPI Table sets out where data for calculating the Provider's performance against the KPI may be obtained.
'Measurement responsibility'	This section of the KPI Table sets out whether it is the Provider's responsibility, TfNSW's responsibility or a third party's responsibility to collect the necessary data required and to measure the Provider's performance against the KPI.
'KPI Report Due Date'	This section of the KPI Table outlines the date the Provider must provide each KPI report.
'Services'	This section of the KPI Table identifies what Services (CHSP, CTP) that the KPI applies to.

1.3 KPI Data Requirements

All data used to measure the Provider's KPI performance must comply with the definitions and requirements contained in this Schedule 9, Standard Terms and Conditions and any reporting templates TfNSW issue to the Provider.

2. KPI OBLIGATIONS

The Provider must comply with the following KPI obligations:

(a) all KPIs outlined in this Schedule 9 must be reported on and monitored as outlined;
(b) calculate and measure the Provider's performance against KPIs 1, 2 and 9 every month, note, the Provider will not be required to report their performance monthly;
(c) calculate KPIs 3-8 (inclusive) every 6 months;
(d) The Provider is only required to comply with and report on the KPIs as set out in the KPI Tables;
(e) Subject to section 2(f), the Provider acknowledges that TfNSW may remove, change or add to the KPIs, by giving reasonable notice to the Provider. For KPIs added by TfNSW after the Commencement Date, non-compliance will not be a KPI Termination Event.
(f) The Provider agrees that if Commonwealth policy regarding the amount of Fees to be recovered by service providers changes, TfNSW may change KPI 8 to reflect that change in policy upon 20 Business Days' notice in writing to the Provider.

3. KPI REPORTING AND ACTION PLANS

(a) The Provider must provide TfNSW with a report regarding the Provider's performance against each of the KPIs set out in the KPI Tables in the KPI Reporting Period containing:

(i) a table setting out both the numerical data required to calculate the Provider's performance against each KPI and the Provider's actual performance against the KPI in the relevant KPI Calculation Period(s) and, where applicable, the preceding 6 months;

(ii) commentary explaining any performance variations and performance trends;

(iii) where the KPI report shows a current KPI Default or KPI Negative Trend:

(A) an explanation of the KPI Default or KPI Negative Trend;

(B) a proposed KPI Action Plan; and

(C) where there has been a previous KPI Action Plan, a statement of what action has been taken under the KPI Action Plan and an explanation of any relationship between the KPI Action Plan and current performance.

(b) The Provider must comply with all the steps and actions set out in a KPI Action Plan including any changes required pursuant to section 3(g) of this Schedule 9.

(c) TfNSW may also write to the Provider and issue the Provider with TfNSW calculations of the Provider's performance against each KPI using the data available to TfNSW and require the Provider to issue the reports identified in 3(a)(ii) and 3(a)(iii) in respect of the KPIs identified by TfNSW, within 14 days.

(d) The Provider must:

(i) calculate the Provider's performance against each KPI in the manner specified in each KPI Table including by:

(A) collecting the necessary data throughout the KPI Reporting Period set out in the KPI Table;

(B) calculating the Provider's performance in the manner specified in the KPI Table;

(C) provide each KPI Report to TfNSW by the KPI Report Due Date (as set out in the KPI Table); and

(D) provide separate KPI reports regarding the Provider's delivery of the Services under the CHSP and CTP as specified in the relevant KPI table ('Services' section indicate the Services that KPI applies to).

(e) The Provider must comply with any written directions TfNSW gives the Provider regarding the format or content of the Provider's KPI Reports.

(f) The Provider must include such other information in the Provider's KPI reports as required by TfNSW from time to time.

(g) TfNSW may require the Provider to make reasonable changes to any KPI Action Plan the Provider proposes.

(h) Nothing in a KPI Action Plan derogates from the Provider's responsibility to perform the Services as required by this Service Contract.

4. KPI BENCHMARKING

(a) The Provider acknowledges and agrees that TfNSW may and is able to use the results of the Provider's KPI Reports and other reports and data obtained from CTABS or alternative system Services data acquired to benchmark the Provider's performance against other providers of transport services under the Programs and make the aggregated and anonymised results available to those other providers.

(b) TfNSW may, in our absolute discretion, excuse the Provider's from the need to comply with any KPI that TfNSW specify by notice in writing to the Provider, if TfNSW are satisfied of the Provider's current performance in the relevant area when benchmarked against other providers of transport services under the relevant Program.

5. TERMINATION RIGHT FOR KPI BREACH

(a) A '**KPI Termination Event**' means the Provider has failed to meet a KPI 1 and/or 2 requirement outlined in the KPI Tables on three or more occasions within a 6 month period or on four or more occasions in a 12 month period, unless TfNSW are satisfied, acting reasonably, that any of those KPI failures have not been material or have arisen as a result of circumstances beyond the Provider's reasonable control.

(b) A failure to provide TfNSW with a KPI Report or a KPI Action Plan or failure to comply with a KPI Action Plan for any KPI including any changes required pursuant to section 3(g) above, will constitute a 'Non-Compliance Event'.

(c) Both a KPI Termination Event and Non-Compliance Event gives rise to a termination right under the Service Contract, as outlined in clause 25.1 of the Standard Terms and Conditions.

6. KPI TABLES

6.1 Safety

KPI 1 OWNED ASSET – MAJOR DEFECTS	
Description	This KPI aims to ensure that all Owned Assets are properly maintained and do not have Major Defects which potentially impact reliability and safety.
KPI Specifications	Nil Major Defect notices for the KPI Calculation Period. A Major Defect notice that is appealed will apply to the KPI Calculation Period in which the appeal is finally determined (if the Major Defect Notice is upheld).
KPI Reporting Period	1 January 2021 to 30 June 2021 1 July 2021 to 31 December 2021 1 January 2022 to 30 June 2022

Calculation	Number of Owned Assets deemed un-roadworthy by TfNSW
KPI Calculation Period	Each calendar month
Data source	Maintenance records; TfNSW
Measurement responsibility	The Provider, with selected audits to be undertaken by TfNSW
KPI Report Due Date	The last day of the second month following each reporting period (e.g. 31 January for the 1 July to 31 December reporting period)
Services	CHSP, CTP Services

KPI 2 **PREVENTABLE ACCIDENTS**	
Description	This KPI aims to ensure that all Service Assets are properly maintained and operated.
KPI Specifications	Nil Preventable Accidents
KPI Reporting Period	1 January 2021 to 30 June 2021 1 July 2021 to 31 December 2021 1 January 2022 to 30 June 2022
Calculation	Number of Preventable Accidents during the KPI Calculation Period
KPI Calculation Period	Each calendar month
Data source	Accident reports, maintenance records, defect reports, reports provided to TfNSW, the Office of Transport Safety Investigations
Measurement responsibility	The Provider, with selected audits to be undertaken by TfNSW
KPI Report Due Date	The last day of the second month following each reporting period (e.g. 31 January for the 1 July to 31 December reporting period)
Services	CHSP CTP Services

6.2 Service Delivery

KPI 3 PERCENTAGE OF PASSENGER TRIPS DELIVERED TO ABORIGINAL AND TORRES STRAIT ISLANDER PEOPLE	
Description	This KPI measures the proportion of Trips provided to Aboriginal and / or Torres Strait Islander people.
KPI Specifications	Increase in the proportion of Trips provided to Aboriginal and / or Torres Strait Islander people and their carers in each consecutive KPI Calculation Period.
KPI Reporting Period	1 January 2021 to 30 June 2021 1 July 2021 to 31 December 2021 1 January 2022 to 30 June 2022
Calculation	100 x [Trips provided to Eligible Customers and their carers/ Total number of trips delivered in the KPI Calculation Period] Note: The Provider is required to include in the Provider's KPI Report separate figures for each Funding stream.
KPI Calculation Period	Every 6 months
Data source	From CTSP trip records
Measurement responsibility	The Provider, with selected audit to be undertaken by TfNSW
KPI Report Due Date	The last day of the second month following each reporting period (e.g. 31 January for the 1 July to 31 December reporting period)
Services	CHSP and CTP only

KPI 4 Provider Trip Performance	
Description	This KPI measures the proportion of Funded Trips delivered by the Provider.
KPI Specifications	Increase in the proportion of Funded Trips delivered in each consecutive KPI Calculation Period.
KPI Reporting Period	1 January 2021 to 30 June 2021 1 July 2021 to 31 December 2021 1 January 2022 to 30 June 2022
Calculation	100 x [Trips provided to Eligible Customers and their carers/ Total number of Funded Trips delivered in the KPI Calculation Period]

	Note: The Provider is required to include in the Provider's KPI Report separate figures for each Funding stream.
KPI Calculation Period	Each Calendar Month
Data source	From CTSP trip records
Measurement responsibility	The Provider, with selected audit to be undertaken by TfNSW
KPI Report Due Date	The last day of the second month following each reporting period (e.g. 31 January for the 1 July to 31 December reporting period)
Services	CHSP and CTP only

6.3 Customer Service

KPI 5 **CUSTOMER COMPLAINT RESOLUTION**	
Description	Measures the satisfactory closure of customer complaints within agreed time frames, from the time of receipt of the complaint by the Provider to the resolution and closure of the complaint
KPI Specifications	95% of complaints are resolved within 30 Business Days
KPI Reporting Period	1 January 2021 to 30 June 2021 1 July 2021 to 31 December 2021 1 January 2022 to 30 June 2022
Calculation	100 x ((Complaints resolved within 30 Business Days during the KPI Calculation Period + anonymous complaints) / Total complaints received for the KPI Calculation Period))
KPI Calculation Period	Every 6 months
Data source	Complaints received by the Provider and complaints recorded in transport info line, if applicable
Measurement responsibility	The Provider, with selected audits to be undertaken by TfNSW
KPI Report Due Date	The last day of the second month following each reporting period (e.g. 31 January for the 1 July to 31 December reporting period)
Services	CHSP and CTP

6.4 Operational Efficiency

KPI 6 COST PER PASSENGER KILOMETRE - DIRECT	
Description	This measures the cost of each Passenger Kilometre – Direct delivered to Eligible Customers (including carers)
KPI Specifications	Decrease in each consecutive KPI Calculation Period
KPI Reporting Period	1 January 2021 to 30 June 2021 1 July 2021 to 31 December 2021 1 January 2022 to 30 June 2022
Calculation	(Direct Costs and Indirect Costs of delivering Passenger Kilometres – Direct) /Passenger Kilometres - Direct
KPI Calculation Period	Every 6 months
Data source	Provider operational data, the Provider's financial records and the Provider's audited financial accounts
Measurement responsibility	The Provider, with selected audit by to be conducted by TfNSW
KPI Report Due Date	The last day of the second month following each reporting period (e.g. 31 January for the 1 July to 31 December reporting period)
Services	CHSP and CTP only

KPI 7 DIRECT v INDIRECT COSTS	
Description	This measures the proportion of the Funding and Fees the Provider spend on costs other than those associated with direct service delivery
KPI Specifications	Decrease in each consecutive KPI Calculation Period, unless the Provider's Indirect Costs are 15% or less of the Provider's Direct and Indirect Costs.
KPI Reporting Period	1 January 2021 to 30 June 2021 1 July 2021 to 31 December 2021 1 January 2022 to 30 June 2022
Calculation	100 x [Indirect Costs in the KPI Calculation Period / (Indirect Costs + Direct Costs in the KPI Calculation Period)]
KPI Calculation Period	Every 6 months
Data source	The Provider's financial accounts

Measurement responsibility	The Provider, with selected audit by to be conducted by TfNSW.
KPI Report Due Date	The last day of the second month following each reporting period (e.g. 31 January for the 1 July to 31 December reporting period)
Services	CHSP and CTP only

KPI 8 **PERCENTAGE OF FUNDING COLLECTED IN FEES**	
Description	This KPI measures the Fees recovered from Eligible Customers (in relation to Services provided under the CHSP and CTP Programs) compared to the proportion of CHSP and CTP Funding
KPI Specifications	The Fees recovered by the Provider from Eligible Customers for delivery of CHSP and CTP Services must increase each relevant KPI Calculation Period.
KPI Reporting Period	1 January 2021 to 30 June 2021 1 July 2021 to 31 December 2021 1 January 2022 to 30 June 2022
Calculation	Fees collected from Eligible Customers in respect of the CHSP or CTP Services in the applicable KPI Calculation Period/ Total Funding paid to the Provider to deliver Services under the CHSP or CTP in the applicable KPI Calculation Period
KPI Calculation Period	Each 6 months
Data source	The Provider's financial records
Measurement responsibility	The Provider, with selected audits to be undertaken by TfNSW
KPI Report Due Date	The last day of the second month following each reporting period (e.g. 31 January for the 1 July to 31 December reporting period)
Services	CHSP and CTP only

6.5 Contract Compliance

KPI 9 REPORTING	
Description	This KPI aims to ensure that all reports required to be provided under this Service Contract are available to TfNSW within the agreed time frame. Any report which has material errors will be deemed not to have been received until a correct version is available.
KPI Specifications	100% within reporting requirements
KPI Reporting Period	1 January 2021 to 30 June 2021 1 July 2021 to 31 December 2021 1 January 2022 to 30 June 2022
Calculation	100 x (Total number of reports presented within the required time frame in the KPI Calculation Period / total number of reports due to be presented in the KPI Calculation Period)
KPI Calculation Period	Each calendar month
Data source	Reporting tools and records, including those held by TfNSW, Family and Community Services and Department of Social Services / Department of Health
Measurement responsibility	TfNSW
KPI Report Due Date	The last day of the second month following each reporting period (e.g. 31 January for the 1 July to 31 December reporting period)
Services	CHSP and CTP

Narrandera Shire Council

Narrandera Waste Facility
Long Term Plan of Management

Robert Bailey Consulting
Unit 408 12-24 William Street
Port Macquarie, NSW 2444
Phone 0448737383

November2020

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1.0 Overview

Narrandera Shire Council controls and operates the Narrandera Waste Facility which is located at 16 Redhill Rd, Narrandera (Lot 340 / DP 821540 and Lot 311 / DP 751719), approximately 2.5 km north east of the Narrandera township. Residents of the serviced areas of Narrandera, Barellan, Pinehill, Nallabooma and Grong Grong are provided with a weekly general waste collection service as undertaken by Tomra Cleanaway where all of the collected waste is transported to the Narrandera Waste Facility for disposal. . The Facility also accepts self haul domestic general waste and commercial and industrial wastes and has been in operation as a landfill for approximately 40 years. The day to day activities are performed by Council staff where free disposal is offered for domestic general waste and for sorted waste. The Facility is open to the public for defined hours on Saturdays, Sundays, Tuesdays, Wednesdays and Fridays.

There is no weighbridge to calculate the quantity of waste materials delivered to the site, however based on the size of the local population of around 3,700, it is likely that about 4,000 tonnes per annum is received. The facility is not required to be licensed by the Environment Protection Authority (EPA) but nonetheless is operated under a number of legislative controls, including the EPA Environmental Guidelines: Solid Waste Landfills (2nd 2016) and the Protection of the Environment Operations Act (1997) and Regulations made there under.

Household waste is currently being deposited in a dedicated disposal area with other separate active tipping areas provided for inert waste, street sweepings, deceased animals, asbestos, some hydrated sludges and sewage screenings. The aggregation of these diverse tipping areas would improve operating efficiencies.

Stockpile areas are provided for green waste, wood waste, used tyres, leaf litter, drumMuster, scrap metal and mattresses. A ''return and earn" reverse vending machine has recently been installed at the entrance to the facility and a Community Recycling Centre (CRC) constructed within the facility for the receival of household problem wastes. The separation of e-waste for off-site recycling has recently been discontinued.

Overtopping of part of the landfill footprint is being undertaken at the existing general waste disposal area and inert waste disposal is being conducted in a separate area across virgin ground. A new excavation has been completed for the future landfilling of general waste with capacity for up to 10 years. However, the overall waste disposal processes are not particularly efficient and improvements can be made.

Preserving existing stockpiles of soil (large soil bunds) and identifying sources of additional soil for cover material will be important considerations with overtopping operations in the future. Council should be mindful that overtopping is construction work that requires skilled plant operators, correct plant, an understanding of grades, reduced levels, waste placement, covering and compaction. Greater emphasis would need to be directed to litter management with overtopping.

Although overtopping is already proceeding, there is no final landform design or filling (staging) plans nor excavation plans to guide the development of the final shape. This long term plan of management (LTPoM) addresses these matters.

The facility is operated by Council's staff and the principal item of plant is an early series Cat 936E front end loader that has been adapted for landfill work by adding compactor wheels and a trash rack. The landfill compactor (modified FEL) should achieve compaction rates of around 800 kilograms per cubic metre if waste material is placed in layers and a compaction pattern applied. Good compaction will maximise the effective life of the active tipping area and minimise void space consumption.

The landfill compactor (modified FEL) is suitable for pushing waste and for compacting but not ideal for constructing shallow diversion berms, nor trimming, nor shaping, nor loading trucks. The landfill compactor can be destructive when working on a tipping platform or access roads and tracks. Council staff will need to adapt the available plant to undertake all of the tasks associated with the operation of a waste facility and accept that compromises may be necessary as overtopping proceeds. A review of the plant requirements forms part of this LTPoM..

Windblown litter is an issue both within and outside of the waste facility. Litter is generally not being well controlled. Litter should be collected routinely and become part of the facility's standard operating procedures.

Incoming loads of household waste are being pushed up/compacted and partially covered with shredded green waste. The shape currently being achieved is not in keeping with what the final landform will look like and the shredded green waste that has been applied will need to be removed, the shape corrected, additional waste added, capping applied and then the shredded green waste placed on top to act as the re-vegetation medium as part of the final cap.

2.0 Background

Narrandera Shire Council has determined to undertake a review of the operations of the Narrandera Waste Facility in order to identify how the residual life of the landfill can be extended, how improvements to current practices could be introduced, where efficiencies may be gained and risks mitigated.

Council has prepared a scope of works and engaged Robert Bailey Consulting and Robert Amaral Geotechnical (Landfill) Engineer to prepare a long term plan of management for the Narrandera Waste Facility that will provide a final landform design, filling/staging plans, site master plan and procedures to improve operational performance and to mitigate risks.

3.0 Purpose

The purpose of this Long Term Plan of Management is to provide a process with the highest probability of achieving the defined project aims. The LTPoM would address long term planning and the future design of the Narrandera Waste Facility in considering the final landform, activity area interrelationships, existing and future infrastructure, plant replacement, the application of fees and charges, complying with the EPA Environment Guidelines: Solid Waste Landfills (2nd edition 2016), valuing responsible environmental performance, improving existing landfill management practices and recognising resource recovery opportunities.

The primary aims of the project are:

- To put measures in place that will maximise the residual life of the landfill
- To identify improvements to existing practices that will translate into cost efficiencies and provide for the realisation of these opportunities.
- To develop plans for the coordinated development of the facility over the longer term.
- To engage practices that will ensure responsible environmental performance is achieved
- To comply with the requirements of the EPA Environment Guidelines: Solid Waste Landfills (2nd edition 2016) together with other relevant legislation, regulations and codes where applicable
- To address risk
- To develop a financial model that will predict future incomes and expenditures and will provide for the managed development of the facility over the longer term.

4.0 Operations

A site master plan has been prepared that shows the location of a proposed domestic waste drop off area, buy back centre, small vehicle waste transfer station, other activity areas together with existing infrastructure. The master plan is included as Appendix 6.

General Principles

Weighbridge and gatehouse - the location of a future weighbridge has been added although this is unlikely to be constructed in the near term. When positioning a weighbridge and gatehouse it will be important to understand some general principles that should be observed for a weighbridge/gatehouse location and these are -

- Approaches to the weighbridge should be direct, have flat gradients, have good line of sight and provide sufficient space for vehicles to wait without interfering with passing traffic
- There should be a clear line of sight to observe approaching vehicles from the gatehouse
- Have an un-tarping area at the ingress approach to the weighbridge so that loads can be inspected at the weighbridge
- The gatehouse should be located to allow the operator clear line of sight for approaching vehicles, to enable loads to be inspected (elevated CCTV and manually), to allow the operator to communicate effectively with customers and to enable the exchange of payments/receipts

- Be located where the gatehouse attendant can generally observe activity areas within the waste facility
- Accept that compromises may need to be made

Buyback Centre – Buyback centres can play an important role in Council's overall waste management strategy by providing the local community with the opportunity of donating or purchasing re-purposed goods and materials. Buyback centres can provide employment and on the job training avenues and help support other community enterprises. It is not necessarily just about waste diversion. The following are some features to consider when establishing a buyback centre –

- Should be located outside of the waste facility, but near to the entrance. Those wishing to access the buyback centre do not need to enter the waste facility
- Should be generally under cover and suitably sized to enable goods to be displayed and for customers to have easy access to goods and materials (need to consider landfill gas in enclosed spaces)
- Have professional signage that identifies and promotes the buyback centre and signage that clearly defines what goods and materials may be accepted and those that will not be accepted
- How the buyback centre will be operated, that is, by social enterprise, not-for-profit group, contractor or Council staff
- How suitable goods can be recovered from incoming waste loads
- Site security (chain link fence, CCTV, back to base monitoring)

The successful operation of a buyback centre relies on sound marketing principles including the following –

- The operator has organisational aims and objectives that demonstrate their purpose in operating the buyback centre. This may include being a social enterprise
- The operator has a staff training policy which includes customer service, personal development, and monitors staff performance
- Staff are noticeably polite, have a positive attitude and are keen to make the business successful
- The operator has a stock turnover policy.
- The operator has a policy on acceptable and unacceptable items.
- The operator has a system to move stock so as to prevent excessive shelf life.
- The operator has a method of presenting stock which is appealing and avoids clutter.
- The operator has guidelines on the set out of shelves and passageways.
- The operator has an effective marketing plan

Small Vehicle Waste Transfer Station – the purpose of a small vehicle waste transfer station (transfer station) is to restrict domestic self haul vehicles from accessing the active tipping area, where plant can be operating and large commercial vehicle manoeuvring and unloading. When determining the location, design and construction of a transfer station, the following matters should be considered –

- Geo technical survey (to ensure sound foundations)
- Transfer station design and engineering drawings
- Approvals process (DA/CC) - is a SEE required
- Community engagement
- The gradient and cross fall of where the transfer station may be located
- Surface water catchment and surface water management
- All weather access
- Risk assessment
- Likely throughput
- Level tipping platform
- Budget
- Security (CCTV linked to the gatehouse)
- The type of transfer receptacle(s) to be used and how it will be serviced
- Access and manoeuvring
- Traffic control
- Signage
- Fall protection
- Management of spilt or windblown materials (including use of chain link fences)
- Weather protection
- Vehicle protection (wheel stops, location of stanchions, line marking, concrete kerb or upstand)
- Emergency response
- Located at the end of a loop where recoverable materials can be dropped before accessing the transfer station (including household recyclables, mattresses)
- Staff training and staff resources
- The number of vehicles to be accommodated at any one time
- Update any existing WH&S Management systems and SOPs
- Suitable signage warning of potential hazards

4.1 **Current operations for the general waste active tipping area** – general waste, including self haul and kerbside collected waste, is deposited at the active tipping area and is pushed up daily using the Cat 936E front end loader (FEL) that has been adapted for landfill work. The tipping platform is located at the base of the waste mass and is suitably sized. The deposited waste material is progressively loaded into the FEL bucket and transported to the top of the waste mass where it is placed and compacted. This is not a particularly efficient method of waste management.

4.2 **Proposed improvements to the operation of the general waste tipping area** – Geotechnical engineer Robert Amaral (Amaral) has prepared concept designs for the future operation of the current general waste disposal area and expansion into the newly excavated cell and for future stages. A top to bottom approach should be adopted for waste placement where an access road will be developed at the current filling area so that trucks can haul their

wastes to the top of the current landform and off load on a tipping platform. Waste will be progressively pushed onto the tipping face and compacted (see Appendix 8) and figure 13 Appendix 2. Waste will continue to be deposited in this manner until the designed landform shape has been achieved for the current tipping area before moving to the newly excavated stage (see Appendix 2. Domestic self haul vehicles will continue to drop off wastes at the base of the current tipping area waste mass until a waste transfer station is constructed. Once the transfer station is in use, all waste material, including commercial and industrial wastes will be deposited at the one active tipping area and the current inert and bulky waste active tipping area will be closed and the site rehabilitated.

4.3 **Current operations at the active tipping area for inert waste**.- inert commercial/industrial wastes and bulky wastes are deposited in a dedicated area separate from the general waste disposal area. Some of these waste types are bulky, irregular in shape and can be difficult to manage at the tipping area. This operation simply places the waste material over virgin ground and is an inefficient use of landfill space and has sterilised potential sources of cover material. Operating multiple waste disposal areas is not considered good practice as it adds to the cost of disposal and consumes resources unnecessarily.

4.4 **Proposed improvements to the operation of the active tipping area for inert and bulky waste –** Amaral concept designs (Appendix 2) show the proposed re-location of the inert and bulky waste activity to the general waste disposal area as stage 1 or stage 2, depending on Council's adopted timeframe Top to bottom approach is proposed Figure 13 (Appendix 2) provides guidance as to how the waste materials would be placed as the landform progresses.. Waste types considered difficult to handle and to compact should have fees applied reflective of the cost of disposal. Existing areas of inert and bulky wastes external to the proposed four stages of filling should be shaped, covered and re-habilitated using suitable plant. A risk assessment should be completed before any further work in undertaken on these exposed bulky waste areas

4.5 **Existing landfill plant -** a Cat 936E front end loader (FEL) that has been adapted for landfill work by adding compactor wheels and a trash rack above the bucket is the only item of plant dedicated for use at the landfill. The modified FEL/compactor can perform a range of tasks including the placement of daily cover, spreading shredded green waste as a revegetation medium, pushing waste onto the active tipping face and compacting the waste material. Its use is generally restricted to the active tipping area. If used on other parts of the waste facility, the compactor wheels can be destructive on hardstands, internal roadways and rehabilitated surfaces. It would not be ideal on external batters where final capping is to be placed and compacted on gradients of 1 vertical to 3 horizontal.

4.6 **Proposed improvement to landfill plant** – for landfills where relatively small quantities of waste are received, that is less than 5000 tonnes per annum, a universal item of plant suitable to manage these wastes would be a traxcavator (crawler loader), such as a Cat 953 K

A traxcavator with a four in one bucket could be used to place and spread the waste at the active tipping area in shallow layers and to "track" compact the waste until a uniform surface is created. Compaction rates of 700 kilograms per cubic metre could be achieved and a more uniform finish maintained that would require a minimum of daily cover material. Well compacted waste would be less likely to generate windblown litter and would have reduced post closure settlement

The traxcavator could be used to construct stormwater diversion berms, pre-strip the landfill floor, shape and grade the intermediate cover, push up the green waste/metals stockpiles, load trucks/trailers, construct drying beds for sludges and a range of other activities in addition to placing and compacting waste

It is important for the waste to be placed and compacted in keeping with accepted best practice in landfill management regardless as to what type of plant is being used. Waste should be placed in layers up to one metre on a face having a gradient of around 1vertical to 4 horizontal. Lifts should be 2 to 2.5 metres high and compacted until a uniform even surface is achieved.

Council should undertake its own investigations into what item of plant would be best suited to the proposed operations at the Narrandera landfill, taking into account the types of work envisaged, the residual life of the existing machine, purchase of either new or second hand (any plant with more than 10,000 hours should be considered carefully – 5000 hours preferred) capacity (willingness) to pay, potential internal plant hire rate, local servicing, international exchange rates, warranty. Short term hire of various items of plant (wet hire and dry hire) and consulting with other facility operators on their choice of plant may be options in order to gain confidence before making a decision to purchase an expensive item of plant.

4.7 **Current site control and supervision** – site supervision and landfill activities are undertaken by a single member of Narrandera Shire Council. The position requires the operative to manage the gatehouse where loads are inspected, fees applied to commercial loads and instructions given. After closing time, the operative attends to various site activity areas, predominately pushing up and compacting the deposited waste materials.

4.8 **Proposed improvement to site control and supervision** – it is proposed that an additional 0.5 full time equivalent person be employed to be stationed at the gatehouse and to undertake duties and tasks associated with that position (see position statement Appendix 4) including the assessment all incoming loads, applying fees, providing instructions and to supervise the areas located near to the gatehouse. The existing operative will focus on the landfill activities, including stockpile management, placement and compacting wastes, application of daily (weekly) cover, placement of final capping, winning/transporting of cover material, berm construction, hydrated sludge management, servicing the transfer station, supervising the CRC.

4.9 **Current Green Waste Management** – there are two separate areas where self haul green waste/wood waste are stockpiled, pushed up regularly and shredded routinely as part of a service contract. The first is near to the

general waste disposal area and is the larger of the two stockpiles. Contamination is significant where plastics and metals are evident. The stockpile also includes materials such as MDF(medium density fibreboard), treated pine, particle board, laminated timber, furniture and palm trunks. These make for a very poor shredded product of little value, especially where the shredding gauge appears to be 90 mm plus. The second stockpile is located towards the inert waste disposal area and appears to be made up principally of tree leaves and some tree branches/trunks that have been finely shredded. This is a better quality product. The shredded materials from both stockpiles are retained on site and have potential beneficial re-use applications.

4.10 **Proposed improvements to green waste management** – although no change is proposed to the manner in which green waste is stockpiled, the location will be changed and included into the self haul drop off area near to the proposed transfer station. Incoming loads will be inspected at the gatehouse to improve contamination management and materials such as MDF, particleboard, laminated timber, furniture, pallets, that is, anything other than green waste is directed to landfill. The existing poorer quality shredded green/wood waste could be used as the base layer for the re-vegetation medium as part of the final capping and then topped with better quality material which is more likely to break down and support a vegetative cover. It can also be used for internal berms. As the overall quality of the shredded material is improved, it can be used as placement over existing disturbed or covered surfaces to reduce dust and erosion, for sedimentation control and as the re-vegetation medium above intermediate cover and final capping

4.11 **Current scrap metal management** – self haul scrap metal is stockpiled and on sold to a service contractor whereby the material is taken off site on a routine basis. The scrap metal stockpile is pushed up regularly using the Council compactor (modified FEL)

4.12 **Proposed scrap metal management** –the scrap metal stockpile area will be re-located to the drop off area near to the proposed transfer station. All incoming loads of waste material will be inspected at the gatehouse and facility users required to take suitable scrap metal to the scrap metal pile.

4.13 **Current and proposed waste concrete management** – waste concrete is currently being landfilled within the inert and bulky waste disposal area and covered with ENM (excavated natural material) Once the proposed transfer station is constructed, waste concrete will be landfill within the general waste disposal area. Suitable waste concrete can be utilised to form internal berms at the general waste disposal area where such use is appropriate

4.14 **Deceased animals and asbestos disposal-** asbestos is currently disposed of within a dedicated disposal trench. This practice is acceptable however the final depth of soil above the asbestos should be 1 metre as prescribed in the Waste Regulations (2014) (see Appendix 5) and applied at the end of each day to a depth of 0.5 metres. A key feature of the long term plan of management is to rationalise the number of waste disposal activity areas and to concentrate the operations rather than have them spread throughout the facility. Both deceased animals and asbestos are currently deposited into

separate trenches but can be placed at the toe of the advancing face of the general waste disposal area and covered with excavated natural material (ENM) then overtopped with general waste. The depth of soil cover for deceased animals is not prescribed in the Waste Regulations (2014) and therefore can be at a depth determined by the on-site plant operator or supervisor. Once the proposed transfer station is constructed and domestic self haul vehicles prohibited from the general waste disposal area, asbestos and deceased animals could be deposited in the general waste disposal area.

4.15 **Hydrated sludges-** sludges from the off-site truck wash containing animal faeces and other sludges containing fats are currently poured over open ground near to the inert waste disposal area. Although the quantities are not significant, nonetheless there are better ways of disposing of these materials. Shallow drying beds formed from shredded green waste with perimeter berms of ENM would be preferable. Once dried, the beds could be added to the stockpiles of shredded green waste and used as the re-vegetation medium as part of the final capping.

4.16 **Street sweepings** - street sweepings are currently deposited in a separate area near to the inert waste disposal area. The street sweepings are made up largely of gravel, dirt and some organic matter and would be suitable to be used as daily cover or for internal service roads. Operating an additional waste disposal area for street sweepings is not ideal

4.17 **Sewage screenings** – small quantities of sewage screenings consisting mainly of rags are deposited in a separate trench near to the general waste disposal area. . Operating this additional waste disposal area is not efficient and once domestic self haul vehicles are excluded from the general waste area, the sewage screenings should be deposited in that location

4.18 **Housekeeping** – it is not uncommon with larger sites that activity areas and storage of materials is spread widely throughout a site. The Narrandera Waste Facility sits within this description. The LTPoM proposes a **rationalisation of activity areas** where inert waste, street sweepings, sewage waste, asbestos and wood waste that are currently in separate locations are all included into the general waste disposal area. The proposed domestic self haul drop off area will concentrate green waste, scrap metal, mattresses, household recyclables, e-waste and drumMuster around the transfer station. This will improve supervision and deliver efficiencies in site management.

There are many **small stockpiles of gravel**, dirt, ENM and asphalt scattered throughout the site that should be aggregated and used as future cover material and all weather access tracks over waste. Once the domestic self haul drop off area/transfer station has been established and is operating, all cover material should be stockpiled in the current green/wood waste area, including these existing small stockpiles of gravel, dirt, ENM and asphalt.

The practice of shredding **mattresses** has seen a proliferation of mattress flock about the site near to the current mattress stockpile. This material should be collected and deposited at the general waste disposal area. It can act as a litter control measure. The proposed domestic self haul drop off area

will include cages for the acceptance of mattresses which will be transported of site for recycling.

In the past, **e-waste** has been placed into stillages and transported off site for recycling. This activity has recently been discontinued and some damaged stillages remain on site. These damaged stillages should be taken to the general waste disposal area and landfilled.

There is an accumulation of **waste oil** drums located near to the general waste disposal area, many of which contain waste oil. Waste oil should be stored within a bunded area or on bunded pallets and placed under cover. The existing CRC (community recycling centre).is the correct location for waste oil and the current accumulation of drums should be re-located to the CRC and stored on bunded pallets. Bunds should have a 110% capacity of the volume of the liquid materials stored thereon.

The area identified as **Amaral stage 3** is undulating and several sink holes are evident in the dispersive soil through which water in percolating and likely developing into leachate in the sub soil. This area should be graded towards the south east to shed surface water off site and a berm created on the northern face to divert run-off water from the up gradient catchment.

The operation of the facility is deficient in that it does not have an up to date **fire management plan** nor a **traffic management plan** and site **signage is inadequate.** These plans and improved signage should be developed and introduced as part of the delivery of the LTPoM.

5.0 Landform Concept Design

Final landform design and filling/staging plans have been prepared for the future development of the Narrandera landfill and these appear as –

- Notes to Accompany Design Drawings in Appendix 1,
- Guide to Site Capacity in Appendix 1,
- Concept Designs in Appendix 2 and
- Design Principles in Appendix 2.

This suite of documents provides information on the development of the landfill for future decades and offers guidance for the orderly progression of the landfilling operations. Each sub stage is essentially a building block that in total combination will deliver the final landform. It will be most important that the design is followed in order to deliver the desired outcomes. This may require periodical examination by an external party (surveyor, geotechnical engineer) to confirm the landfilling works are progressing in keeping with the adopted designs.

Council should also be aware that overtopping is construction work that requires skilled plant operators, correct plant, an understanding of grades, reduced levels, waste placement, surface water management, covering and compaction. Site personnel and supervisors should be trained accordingly and be familiar with the designs and the principles supporting those designs

6.0 Acts and Policies Associated with the Project

- Protection of the Environment Operations Act 1997
- Protection of the Environment Operations (Waste) Regulation 2014
- EPA Environmental Guidelines: Solid Waste Landfills (2nd edition 2016)
- Environmental Planning and Assessment Act 1979
- Environmental Planning and Assessment Regulation 2000
- Infrastructure SEPP 2007

7.0 Delivery

Desired Outcomes -

- The Narrandera Waste facility will be developed in a planned and co-ordinated manner.
- The project will deliver the stated aims
- Risk will be managed
- Stakeholder consultation results in broad support for the project.
- Regulatory agencies gain confidence in Council's management processes
- Succession planning is achieved
- Landfill void space will be maximised
- Residual life of the landfill will be optimised
- Long term planning prevents re-work resulting in corresponding savings
- Budgets can be developed for the capital works and programmed for delivery in a measured way and for optimum benefit

Key Actions to deliver the desired outcomes

Sequencing – broadly speaking, continue with current practices until the general waste disposal area (Amaral stage1) is completed and final capping applied. Concurrently, develop the domestic self haul drop off area and transfer station and have this completed before Amaral stage 1 landfilling achieves the final landform design. Make a determination on suitable plant. Establish service contracts for scrap metal removal, shredding of green waste, mattress removal and e-waste. Begin operating the domestic self haul drop off area and transfer station prior to commence landfilling of Amaral stage 2. Direct all general waste to Amaral stage 2, including commercial waste, asbestos waste, deceased animals, concrete waste and wood waste. Program "housekeeping" works. Buyback centre and weighbridge to be developed in time frames as determined.

1. Milestone 1 – Complete landfilling of the current general waste disposal area (Amaral stage 1) to achieve the final landform design and undertake the final capping

Key Tasks

- Construct vehicular access to the top of the existing waste mass
- Establish height pegs/markers that align with the Amaral stage 1 final landform RLs. Consider depth of final capping when determining RL for finished waste height
- Shape final batters on the western and southern sides to the stage 1 design (includes the filling of the catch drain on the western boundary)
- Work from west to east with the waste placement
- Identify sources of suitable final capping material
- Apply compacted final capping progressively as the design RLs are achieved

2. Milestone 2 - Make a determination on the most suitable item of plant. Undertake procurement if necessary

Key Tasks

- Consider the range of tasks required of plant in order to deliver the transition to the LTPoM
- Enquire with other operators of waste facilities of a similar size to Narrandera as to the type of plant used at their facilities and assess the performance
- Consider the residual life of the current FEL and how it might manage the identified tasks. Can it be retained and work in with a traxcavator?
- A new Cat 953 K traxcavator is likely to cost in the order of $485,000. Second hand with less than 5,000 hours is likely to cost $240,000. New Chinese manufactured landfill compactors could be as cheap as $200,000
- A determination should be made on plant before final capping is to be applied. Consider wet hire for job lots as an alternative approach.

3. Milestone 3 – Develop the domestic self haul drop off area and construct the transfer station

Key Tasks

- Determine the area to be used for domestic self haul drop off and waste transfer
- Confirm the master plan suitability
- Undertake civil works to prepare the identified site for the proposed uses
- Undertake geotechnical surveys where structures are intended to be built
- Prepare structural engineering designs and architectural designs for all proposed buildings and structures
- Determine if DA, CC and SEE are required. Make applications as necessary
- Call RFT or RFQ or engage Council staff for construction works and civil works
- Engage contractor or Council staff and undertake civil works

- Appoint contractor(s) or engage Council staff and undertake construction works
- Confirm suitability of the location of the drumMuster compound
- Procure waste transfer vehicle and recycling receptacles (mattress cages, 240 litre MGBs, e-waste stillages)
- Commission works
- Appoint depot attendant (permanent part time)

4. Milestone 4 – Design, construct and operate the Buyback Centre

Key Tasks

- Prepare documentation and call expressions of interest (EOI) to operate a buyback centre
- Consider submissions and appoint an operator
- Engage with the operator in the design of the buyback centre
- Undertake a geotechnical survey of the proposed location for the buyback centre
- Engage a structural engineer and architect to prepare plans and specifications for the buyback centre building.
- Consider potential landfill gas implications for building design and construction
- Prepare and submit DA/CC
- Call RFT or RFQ to construct the buyback centre building
- Consider submissions and appoint a contractor
- Undertake construction works
- Fit out and commission
- Commence operations

5. Milestone 5 – Commence landfilling - Amaral stage 2

Key Tasks

- Recover ENM by square cutting internal side batters (as advised by the geotechnical engineer) and stockpile for future use as cover material
- Recover ENM from the external side batters as landfilling progresses (as advised by the geotechnical engineer) and stockpile for future use as cover material
- Cut vehicular access and prepare a tipping platform and tipping face for the first filling pass

6. Milestone 6 – Rationalise waste disposal areas once the transfer station becomes operational and the public denied access to the general waste disposal area (Amaral stage 2)

Key Tasks

- Fill in the existing asbestos disposal trench and place all future asbestos inputs in the general waste disposal area in accordance with Protection of the Environment Operations Waste Regulations 2014 – Part 80 (see Appendix 5)
- Fill in the existing deceased animal disposal trench and place all future deceased animals in the general waste disposal area at the toe of the advancing tipping face
- Prepare shallow drying beds formed from shredded green waste with perimeter berms of ENM for the acceptance of truck wash sludges and fatty sludges. Once dried, blend the sludge encrusted green waste with the shredded green waste stockpile for use as the final capping re-vegetation medium
- Close the existing inert waste disposal area and re-direct all commercial and inert waste to the general waste disposal area (Amaral stage 2). Program site rehabilitation
- Fill in the existing sewage screenings waste disposal trench and re-direct all commercial and inert waste to the general waste disposal area (Amaral stage 2)
- Recover the existing small piles of street sweepings and together with all future street sweepings, place at the cover material stockpile area

7. Milestone 7 – Complete housekeeping

Key Tasks

- Prepare a Fire Management Plan
- Prepare a Traffic Management Plan
- Review, rationalise, formalise and update/replace all site signage
- Landfill all damaged e-waste stillages
- Establish waste oil storage at the CRC
- Shred and landfill the existing mattress stockpile together with existing mattress flock. Arrange a mattress collection contract and have mattress cages located at the domestic self haul drop off area
- Arrange scrap metal collection and green waste shredding contracts where by servicing can be undertaken on a regular to ensure stockpile sizes are kept to a manageable size
- Grade and shape Amaral stage 3 area towards the south east to shed surface water off site and form a berm on the northern face to divert run-off water from the up gradient catchment (see Figure 11 noted as part 3A in Appendix 2)
- Rehabilitate the inert waste disposal area

Assumptions

Generally, the information provided by Council in the development of the baseline financial model is accurate, relevant, complete and up to date.

Figures provided are cost estimates only and may well vary depending on a range of circumstances. The purpose of the model is to provide guidance on the likely cost implications of undertaking the proposed scope of works

Milestone 1

Capital

Construct vehicular access to the top of the waste mass

7 hrs FEL/compactor plant hire @ $ 85 /hr = **$595**

7 hrs tipper hire @ $130 /hr = **$910**

150 m3 gravel @ $ 30/m3 = **$4,500**

TOTAL $6,005

Apply final capping (2 x 300 mm ENM and 1 x 400 mm shredded green waste)

3,000 square metres @ $7/m2 = **$21,000**

Fill in catch drain 40 linear metres @ $15/lm = **$600**

TOTAL $27,705 ($9,235 pa over 3 years)

Milestone 2

Capital

A new Cat 953 K traxcavator **$485,000**.plus hourly plant hire rate **$110** working 15 hours per week ($110 x 15hrs x 52.2 wks =$86,130)

Second hand Cat 953 K with less than 5,000 hours **$240,000** plus hourly plant hire rate **$85** working 15 hours per week

New 40 tonne Cat landfill compactor **$680,000** plus hourly plant hire rate **$127** working 15 hours per week

Milestone 3

Operational

Additional Staff Costs
Mon – Fri wages 21 hours @normal time ($29/hr plus 40% on costs =$40.60/hr)
= $852.60 per week

$852.60 per week x 52.2 weeks = **$44,504 pa**

If required, Sat – Sun wages (Sat time and a half for the first two hours and double time thereafter – Sun double time – no "on cost" with overtime)

Service transfer station – included in plant operator duties

Mattress collection – PS **$15.000** pa

Scrap metal - cost benefit (included in "waste management sundry revenues")

Household recycling drop off collection – **$5,000**

Capital

civil works to prepare the identified site – **PS $30,000** (compactor, tipper, grader drum roller)

geotechnical surveys **PS $5,000**

structural engineering designs and architectural designs **PS $15,000**

DA, CC - **$3,000**

construct buildings and structures (transfer station, retaining wall, fall protection) **PS $200,000**

establish hardstand areas, purchase tip truck (waste transfer) **PS $45,000**

TOTAL CAPITAL $298,000

Milestone 4

Capital

geotechnical survey **$5,000**

structural engineer and architect plans and specifications **PS $30,000**

DA/CC **$3,000**

Construct building, pathways, parking, provide services, fencing amenities **PS $250,000**

TOTAL $288,000

Milestone 5

Capital

Cut vehicular access and prepare a tipping platform **PS $8,000**

TOTAL $8,000

Milestone 6

Operational

Prepare shallow drying beds and treat sludges **$5,000 pa**

Capital

Fill in redundant trenches (asbestos, deceased animals, sewer waste) **PS $3,000**

Milestone 7

Capital

Prepare a Fire Management Plan **-$5,000**

Prepare a Traffic Management Plan **$5,000**

Review, rationalise, formalise and update/replace all site signage (provisional sum) PS **$10,000**

Establish waste oil storage at the CRC – 2 x bunded pallets @ **$2,000**

Rehabilitate the inert waste disposal area (provisional sum) PS **$15,000**

TOTAL $37,000

Plant hire (new landfill compactor) The existing FEL cost is already included in the current budget. New landfill compactor $127 per hour x 15 hours per week x 52.2 weeks = **$99,441 per annum.** Alternative, new traxcavator **$86130 pa**

Additional depot attendant 21 hours per week - Mon to Fri @ $40.60 x 15 x 52.2 = **$44,505 pa**

Financial Model 1 (adjusted) – residual life of stage 1 is about 3 years (14,000 cubic metres void space remaining and being consumed at 5,000 cubic metres per annum)

Milestone 1- Capital program - construct access track to head of existing landform in year 1. Apply final capping progressively over 3 years

Milestone 2 – Capital program - purchase new traxcavator year1

Operational program - apply plant hire rate annually from year 1

Milestone 3 – Capital program over years 2 and 3 -

Operational program - additional staff from year 1, mattress collection from year 2 and ongoing, service transfer station from year 3, scrap metal recycling collection annually, household recyclables serviced fortnightly from year 2

Milestone 4 – Capital program year 4

Milestone 5 – Capital program year 4

Milestone 6 – Capital program year 2, Operational program year 2

Milestone 7 – Capital program years 1 and 2

Narrandera Council - Waste Management Adjusted Model 1

GL		New Items Amount	New Items Year	2019/20 Actual	2020/21 Budget	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
	Income Increase				**0**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**
	Expenditure % Increase				**0**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**
Operational Income																
0512-1038	Waste Management User Fees			10,483	9,200	9,384	9,572	9,763	9,958	10,158	10,361	10,568	10,779	10,995	11,215	11,439
0512.1067	Domestic Waste Collection Revenues			750,147	770,126	785,529	801,239	817,264	833,609	850,281	867,287	884,633	902,325	920,372	938,779	957,555
0512.1068	Non DW Collection Revenues			116,267	118,390	120,758	123,173	125,636	128,149	130,712	133,326	135,993	138,713	141,487	144,317	147,203
0512.1077	Interest on Investments - Non Current			70,855	43,200	44,064	44,945	45,844	46,761	47,696	48,650	49,623	50,616	51,628	52,661	53,714
0512.1078	Interest on Internal Loans			0	24,817	25,313	25,820	26,336	26,863	27,400	27,948	28,507	29,077	29,659	30,252	30,857
0512.1089	Waste Management Sundry Revenues			33,315	25,000	25,500	26,010	26,530	27,061	27,602	28,154	28,717	29,291	29,877	30,475	31,084
					0	0	0	0	0	0	0	0	0	0	0	0
					0	0	0	0	0	0	0	0	0	0	0	0
					0	0	0	0	0	0	0	0	0	0	0	0
					0	0	0	0	0	0	0	0	0	0	0	0
					0	0	0	0	0	0	0	0	0	0	0	0
					0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL OPERATIONAL INCOME			**981,068**	**990,733**	**1,010,548**	**1,030,759**	**1,051,374**	**1,072,401**	**1,093,849**	**1,115,726**	**1,138,041**	**1,160,802**	**1,184,018**	**1,207,698**	**1,231,852**
Operational Expenditure																
0512.2001	Conference Expenses			753	0	0	0	0	0	0	0	0	0	0	0	0
0512.2002	Waste Collection Expenses			334,859	398,329	406,296	414,421	422,710	431,164	439,787	448,583	457,555	466,706	476,040	485,561	495,272
0512.2013	Travelling Expenses			48	500	510	520	531	541	552	563	574	586	598	609	622
0512.2100	Narrandera Landfill Expenses			244,728	196,819	200,755	204,770	208,866	213,043	217,304	221,650	226,083	230,605	235,217	239,921	244,720
0512.2101	Barellan Landfill Expenses			15,072	21,571	22,002	22,442	22,891	23,349	23,816	24,292	24,778	25,274	25,779	26,295	26,821
0512.2102	Compactor Running Costs			37,394	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902	24,380	24,867
0512.2103	Leaf Collection			38,630	26,000	26,520	27,050	27,591	28,143	28,706	29,280	29,866	30,463	31,072	31,694	32,328
0512.2112	Waste Legal Expenses			1,086	0	0	0	0	0	0	0	0	0	0	0	0
0512.2115	Waste Insurance Expenses			116	200	204	208	212	216	221	225	230	234	239	244	249
0512.2119	Telephone Expenses			1,405	1,450	1,479	1,509	1,539	1,570	1,601	1,633	1,666	1,699	1,733	1,768	1,803
0512.2600	Landfill Rates			3,818	5,000	5,100	5,202	5,306	5,412	5,520	5,631	5,743	5,858	5,975	6,095	6,217
					0	0	0	0	0	0	0	0	0	0	0	0
	Milestone 2 - Traxcavator plant hire				0	86,130	87,853	89,610	91,402	93,230	95,094	96,996	98,936	100,915	102,933	104,992
	Milestone 3 0.5 FTE Staff				0	44,504	45,394	46,302	47,228	48,173	49,136	50,119	51,121	52,144	53,186	54,250
	Milestone 3 - recoverables recycling				0	20,000	20,400	20,808	21,224	21,649	22,082	22,523	22,974	23,433	23,902	24,380
	Milestone 6 - drying beds				0	5,000	5,100	5,202	5,306	5,412	5,520	5,631	5,743	5,858	5,975	6,095
					0	0	0	0	0	0	0	0	0	0	0	0
					0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL OPERATIONAL EXPENDTIURE			**677,908**	**669,869**	**838,900**	**855,678**	**872,792**	**890,248**	**908,053**	**926,214**	**944,738**	**963,633**	**982,905**	**1,002,564**	**1,022,615**
0512.2700	Waste Management Internal Charges			132,098	138,844	141,621	144,453	147,342	150,289	153,295	156,361	159,488	162,678	165,931	169,250	172,635
0512.2800	Depreciation - Plant & Equipment			12,392	13,500	13,770	14,045	14,326	14,613	14,905	15,203	15,507	15,817	16,134	16,456	16,786
0512.2806	Depreciation - Other Structures			0	800	816	832	849	866	883	901	919	937	956	975	995
0512.2808	Depreciation - Specialised Buildings			0	830	847	864	881	898	916	935	953	972	992	1,012	1,032
	Total Miscellaneous Expenses			144,490	153,974	157,053	160,195	163,398	166,666	170,000	173,400	176,868	180,405	184,013	187,693	191,447
	TOTAL EXPENDTIURE			**822,398**	**823,843**	**995,954**	**1,015,873**	**1,036,190**	**1,056,914**	**1,078,052**	**1,099,614**	**1,121,606**	**1,144,038**	**1,166,919**	**1,190,257**	**1,214,062**
	OPERATIONAL RESULT			**158,670**	**166,890**	**14,594**	**14,886**	**15,183**	**15,487**	**15,797**	**16,113**	**16,435**	**16,764**	**17,099**	**17,441**	**17,790**

Narrandera Council - Waste Management Adjusted Model 1

	New Items Amount	New Items Year	2019/20 Actual	2020/21 Budget	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32
Capital Income															
				0	0	0	0	0	0	0	0	0	0	0	0
				0	0	0	0	0	0	0	0	0	0	0	0
				0	0	0	0	0	0	0	0	0	0	0	0
				0	0	0	0	0	0	0	0	0	0	0	0
				0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL INCOME			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Capital Expenses															
Milestone 1 - access track				0	6,005	0	0	0	0	0	0	0	0	0	0
Milestone 1 apply final capping				0	9,235	9,235	9,235	0	0	0	0	0	0	0	0
Milestone 2 - purchase traxcavator				0	485,000	0	0	0	0	0	0	0	0	0	0
Milestone 3 - self haul drop off/transfer station				0	0	98,000	200,000	0	0	0	0	0	0	0	0
Milestone 4 - buy back centre				0	0	0		288,000	0	0	0	0	0	0	0
Milestone 5 - stage 2 filling access				0	0	0	8000		0	0	0	0	0	0	0
Milestone 6 - rehabilitate redundant trenches				0	0	3,000	0	0	0	0	0	0	0	0	0
Milestone 7 - management plans/signage/oil				0	22,000	0	0	0	0	0	0	0	0	0	0
Milestone 7 - rehabilitate closed inert disposal				0		0	0	0	15,000	0	0	0	0	0	0
				0	0	0	0	0		0	0	0	0	0	0
				0	0	0	0	0	0	0	0	0	0	0	0
				0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL EXPENDITURE			**0**	**0**	**522,240**	**110,235**	**217,235**	**288,000**	**15,000**	**0**	**0**	**0**	**0**	**0**	**0**
CAPITAL RESULT			**0**	**0**	**-522,240**	**-110,235**	**-217,235**	**-288,000**	**-15,000**	**0**	**0**	**0**	**0**	**0**	**0**
Cash Balance of Reserve 1 July			511,000	682,062	864,082	371,868	292,260	106,264	-149,871	-132,370	-99,218	-65,404	-30,913	4,268	40,152
Transfer to Reserve - Operating Result			158,670	166,890	14,594	14,886	15,183	15,487	15,797	16,113	16,435	16,764	17,099	17,441	17,790
Add Back: Non Cash Depreciation			12,392	15,130	15,433	15,741	16,056	16,377	16,705	17,039	17,380	17,727	18,082	18,443	18,812
Transfer from Reserve - Capital Expenditure			0	0	-522,240	-110,235	-217,235	-288,000	-15,000	0	0	0	0	0	0
Movements in the year			171,062	182,020	-492,214	-79,608	-185,996	-256,136	17,502	33,152	33,815	34,491	35,181	35,884	36,602
Balance of Reserve 30 June			682,062	864,082	371,868	292,260	106,264	-149,871	-132,370	-99,218	-65,404	-30,913	4,268	40,152	76,754

What Financial Model 1 reveals –

1. Reserves exhausted by year 4 and do not recover and accumulate until year 10 with current income streams
2. The purchase of a second hand traxcavator instead of a new machine would provide a small budget surplus and transfer to reserves. The same outcome is likely if job lots for traxcavator type work is contracted out
3. Unless income streams were increased there would be minimal transfer to reserves
4. Other Council ambitions (organics collection/processing) will have a financial impact

8.0 Procurement Management

Item to be Procured	Procurement Method
Services of consultants, landfill engineers, surveyors	By negotiation and RFQ – scope of works to be priced by service providers
Civil works	By RFQ or by Council staff based on design specification
Buyback centre and transfer station design	RFQ and based on scope of works
Buyback centre and transfer station construction	RFT/RFQ and based plans and specifications
Landfill plant	By tender and based on performance specification
Weighbridge and gatehouse	By RFT
Plant hire	By RFQ or existing service agreements
DA/CC	By Council staff or private certifier
SEE	RFQ - by consultant

9.0 Appendices

Appendix 1- Notes to Accompany Design Drawings

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NOTES TO ACCOMPANY FIGURES 1 – 13

20206 NARRANDERA WASTE FACILITY 05.11.2020

Figure 1
Figure 1 , Site Plan , was derived from Narrandera Shire Council Drawing Number 125 entitled " Landfill Masterplan , Focus View " dated 06.10.2020 and represents the proposed landfill development area as it existed in October , 2020.

The selected landfill footprint is based on on site discussions with NSC Officers , includes a 5m wide access track around the base of the proposed landfill landform and sufficient room on the northern side of the footprint to allow access to the proposed transfer facility at its current location.

Figure 2
This figure illustrates a " Final Landform " which extends to RL 22 , has 3H:1V external perimeter batters and a capping area with a gradient of 7% to allow for inevitable long term settlement and a resultant post – settlement gradient of at least 5%.

Although noted as being a " Final " landform , it is the case that , if necessary , it could be raised / overtopped to a higher level and achieve additional capacity. Similarly , it could be reduced in height to achieve a lower capacity. A decision to raise or otherwise need not be made at this stage and may be left to the future as there is substantial existing capacity using this design and there is no impediment to deciding on increasing or decreasing its capacity at a later date.

As a guide the total capacity of this landform by raising it to RL 22 with no further excavations is approximately 158,000m3. Assuming a cover usage rate of 20% , the volume of soil cover required will be approximately 32,000m3 , leaving a net void space capacity of approximately 126,000m3.

It is highly unlikely that the required volume of soil needed to complete this landform is available unless it can be obtained from using the existing very large bunding placed around the deep excavation adjoining the current landfilling area.

The option of using this bunding and / or extending the excavation of the proposed Stage 2 filling area is explored below.

Figure 3
The proposed Stage 1 filling plan is provided in this figure.

It illustrates the Stage1 filling area raised to final height , commencing at the existing RL 15 contour level.

2

The external , final perimeter batters are shown at 3H:1V gradients. A method of achieving this final gradient is illustrated on **Figure 12** and has the advantage of developing the final soil cover of at least 600mm during this construction process.

An alternative construction process such as placing the waste on a 3H:1V gradient as the advancing fill face reaches the perimeter of the filling area can be used but lacks the advantage of always filling behind pre-placed soil bunds , thus helping to contain any excess rainfall runoff from waste.

The internal , temporary batters are are shown at 1:1 gradients. The method of achieving this temporary internal gradient is also illustrated on **Figure 12.**

At a later date when adjoining waste placement occurs during later stages of landfilling these internal soil batters should , as far as is practicable , be removed to provide waste to waste contact.

Similarly , as progressive layers of waste are applied the previously placed soil cover should also be removed to some degree to allow vertical contact of waste to waste.

The approximate capacity of this raising is about 18,000m3 , requiring a soil cover volume of some 3,600m3 , leaving a net air space of about 14,400m3.

Figure 4
This figure illustrates the Stage 2 landform at completion , with 3H:1V final external batters and a 1:1 temporary internal batter.

The approximate capacity of Stage 2 filling area (leaving the existing soil batters in place is 50,000m3 , requiring a soil cover volume of 10,000m3 , leaving a net air space of 40,000m3.

At this point in time the entire western one half or so of the landfill landform will have been completed with its final cover already in place.

By this stage of course the preparation for the Stage 3 filling area would have already commenced.

Figures 5 and 6
The Stage 3 and Stage 4 filling areas at completion are illustrated on these figures.

The combined capacity of these 2 stages (assuming no excavation beneath either stage) is approximately 90,000m3 , requiring about 18,000m3 of soil cover , leaving a net air space for waste of about 72,000m3.

At this point of time the approximate total air space available , the total soil cover requirement and the net air space available for waste will be as shown on Table 1 below:

TABLE 1

Stage	Total air space (m3)	Total required soil cover (m3)	Net air space (m3)
1	18,000	3,600	14,400
2	50,000	10,000	40,000
3&4	90,000	18,000	72,000
Total	158,000	31,600	126,400

Assuming an annual incoming waste stream of 5,000m3 (4,000 tonnes / 0.8 tonnes per m3), this would equate to a life span of about 25 years.

It is highly unlikely that the volume of soil cover required to develop this landfill landform is available on site without further excavations beneath the landfill footprint.

Figure 7
This figure illustrates 2 potential alternatives to securing additional soil cover from within the proposed Stage 2 filling area.

The Stage 2A excavation would involve the removal of the existing very large soil bunds around the western and northern sides of the existing excavation and extending the base of the existing excavation as shown.

The Stage 2B excavation would also involve the removal of the existing very large soil bunds around the western and northern sides of the existing excavation and extending the base of the existing excavation to larger extent than the Stage 2A proposal.

The Stage 2A excavation will provide an additional approximate 3,500m3 of potential soil cover.

The Stage 2B excavation will provide an additional approximate 9,600m3 of potential soil cover.

The removal of the western and northern very large soil bunds down to original ground surface (RL 13) will provide an additional approximate 7,200m3 of soil cover.

The total potential soil cover which can be recovered from both excavation Stages 2A and 2B and the existing soil bunds is approximately 20,000m3 which would go a long way towards meeting the necessary 31,600m3 to complete the landform.

These excavations will also provide additional net air space of about 16,000m3 and a further 3 years of life for the landfill.

The soil excavated from these areas should be temporarily stockpiled across the proposed Stage 4 filling area for later use.

Figure 8
This figure depicts sub-stage 2A filling up to RL14 and subsequent sub-stages 2B , 2C and 2D to a similar level.

The temporary internal soil batters are shown at 1:1 and should be raised in 1m increments as shown on **Figure 12.** Following completion of sub-stage 2A to RL 14 , the central soil bund should be extended to the western excavation batter in 1m lifts.

In the event of heavy rainfall occurring during the filling of these sub-stages , any water that collects in open sub-stages can be pumped to the environment.

Once sub-stages 2A , 2B ,2C and 2D have been completed , similar sized sub-stages should proceed above ground surface within appropriate internal and perimeter soil bunds to final height.

Figure 9
Figure 9 illustrates the " squaring up " of the Stage 1 filling area to a uniform level at RL 17.

As discussed on site the access to this level should be by means of a ramp developed from waste and surfaced with sufficient gravel , broken asphalt , bricks , tiles or similar material to provide suitable truck access.

Figure 10
This figure illustrates an ideal excavation beneath the proposed Stage 3 filling area , with a base grading downwards uniformly from RL 11 in the west to RL 10 in the east which would yield approximately 12,000m3 of soil cover.

From discussions on site however it is likely the case that much of this area is underlain by old waste.

In lieu of the " ideal " excavation , this area should be divided into 2x50m wide segments running north - south and each surface area excavated until waste is encountered or to an RL ranging from 11 to 10 depending on the segment's location whichever is higher.

The soil for bunding these segments should be obtained from the segment excavation itself with excess soil being temporarily stockpiled across the Stage 4 filling area.

Figure 11
Figure 11 depicts the completion of the sub-stage 3A filling carried out in the same way as the Stage 2A filling process , followed by the adjacent Sub-stage 3B until the Stage 3 filling area has been raised to RL 13.

Overtopping of this area should then proceed within soil bunded areas / segments to final grade using soil cover from the stockpile across the Stage 4 filling area.

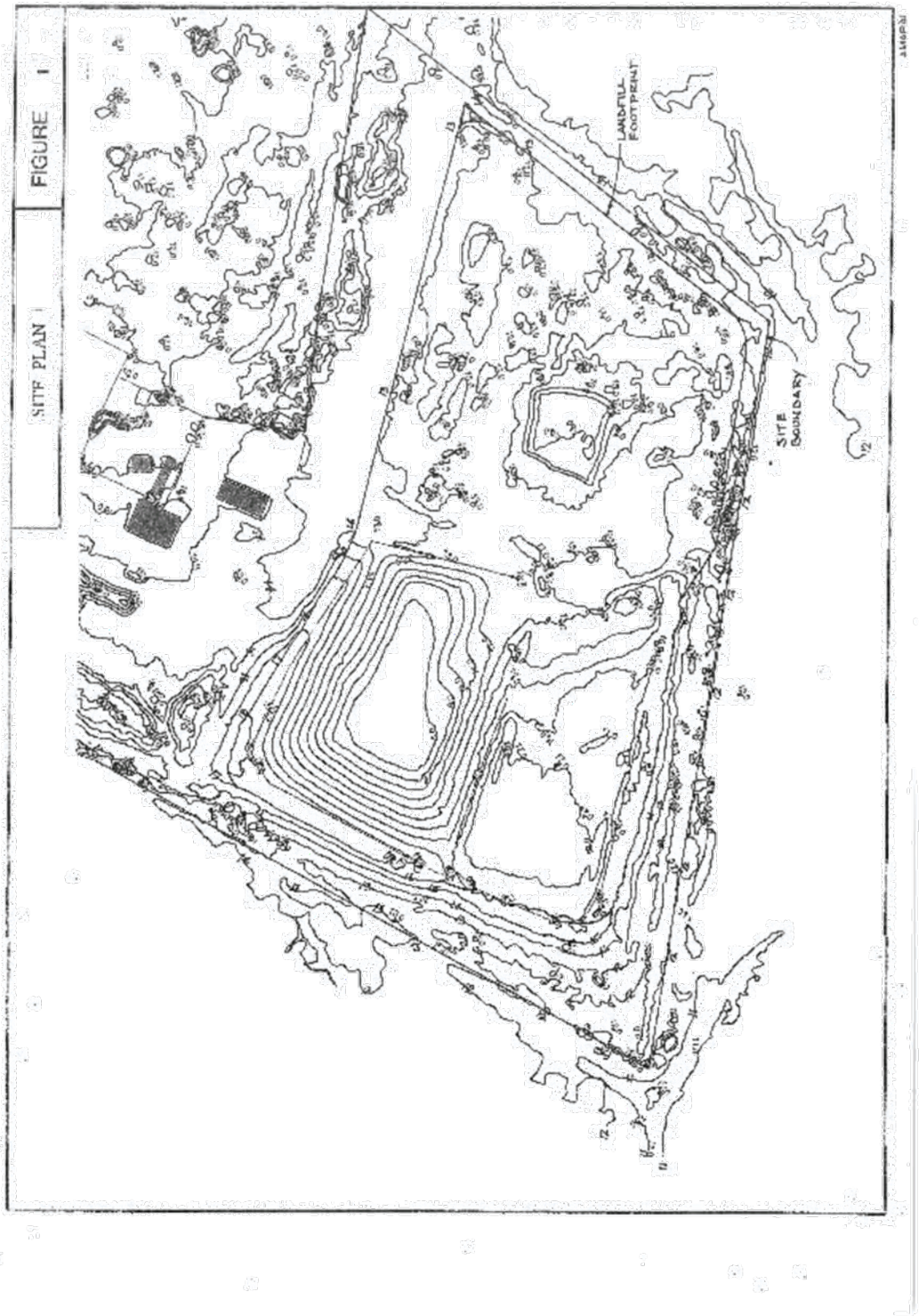
This exercise would be repeated for the Stage 4 filling area until the final design height is reached.

Figure 12
Soil batter construction techniques for both final external batters and temporary internal batters are illustrated on this figure.

Figure 13
As much as practicable of the daily soil cover should be removed in advance of overtopping with subsequent waste lifts to allow vertical migration of any leachate that may develop as shown on this figure.

Follow-up site visit / review with staff
A wide range of activities and landfill construction methodologies have been covered during our recent site visit and in these Figures which would be best addressed with relevant NSC staff members at a follow-up meeting.

Appendix 2 – Design Concept Figures 1 to 13



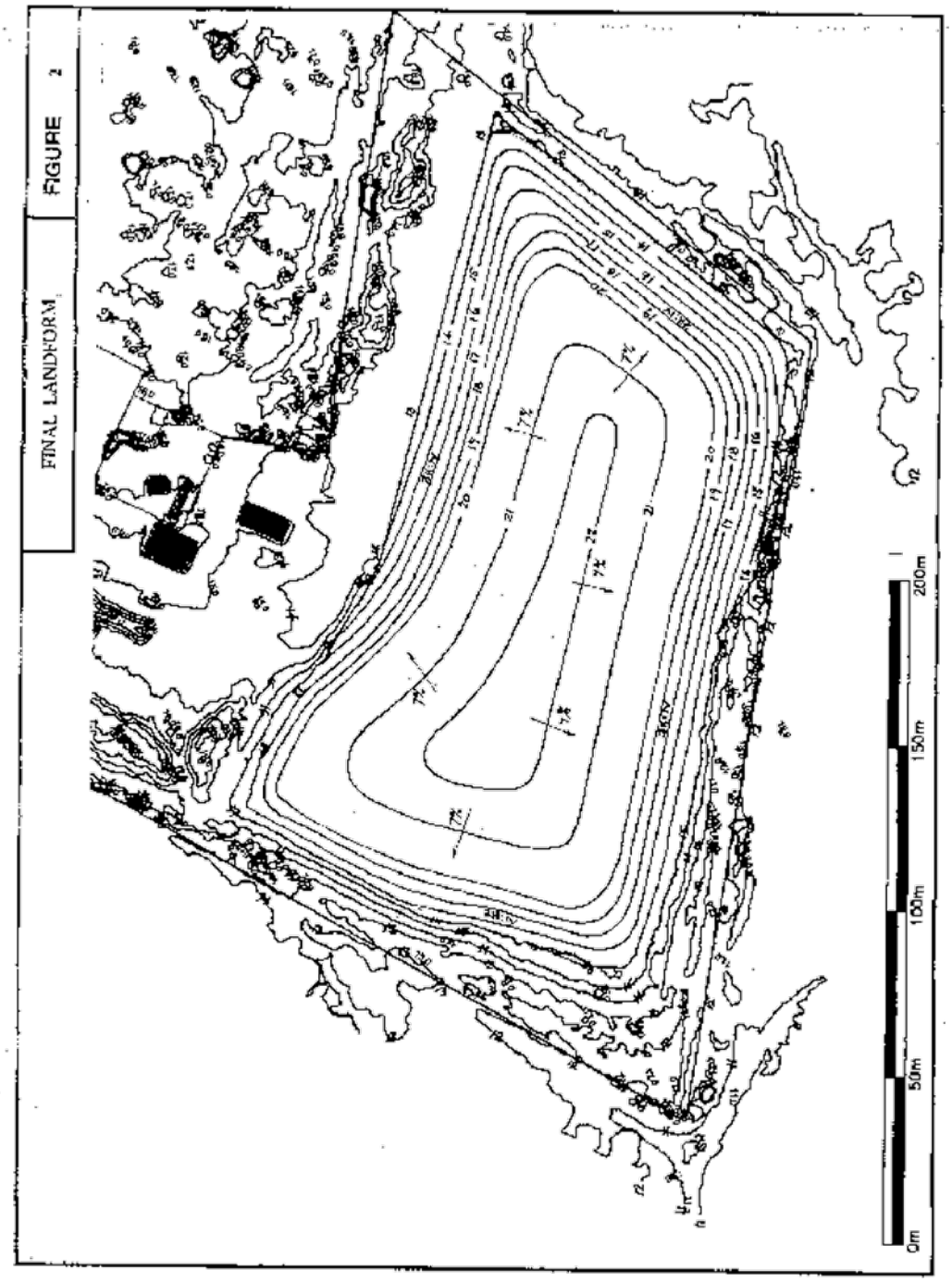


FIGURE 2
FINAL LANDFORM
0m
50m
100m
150m
200m

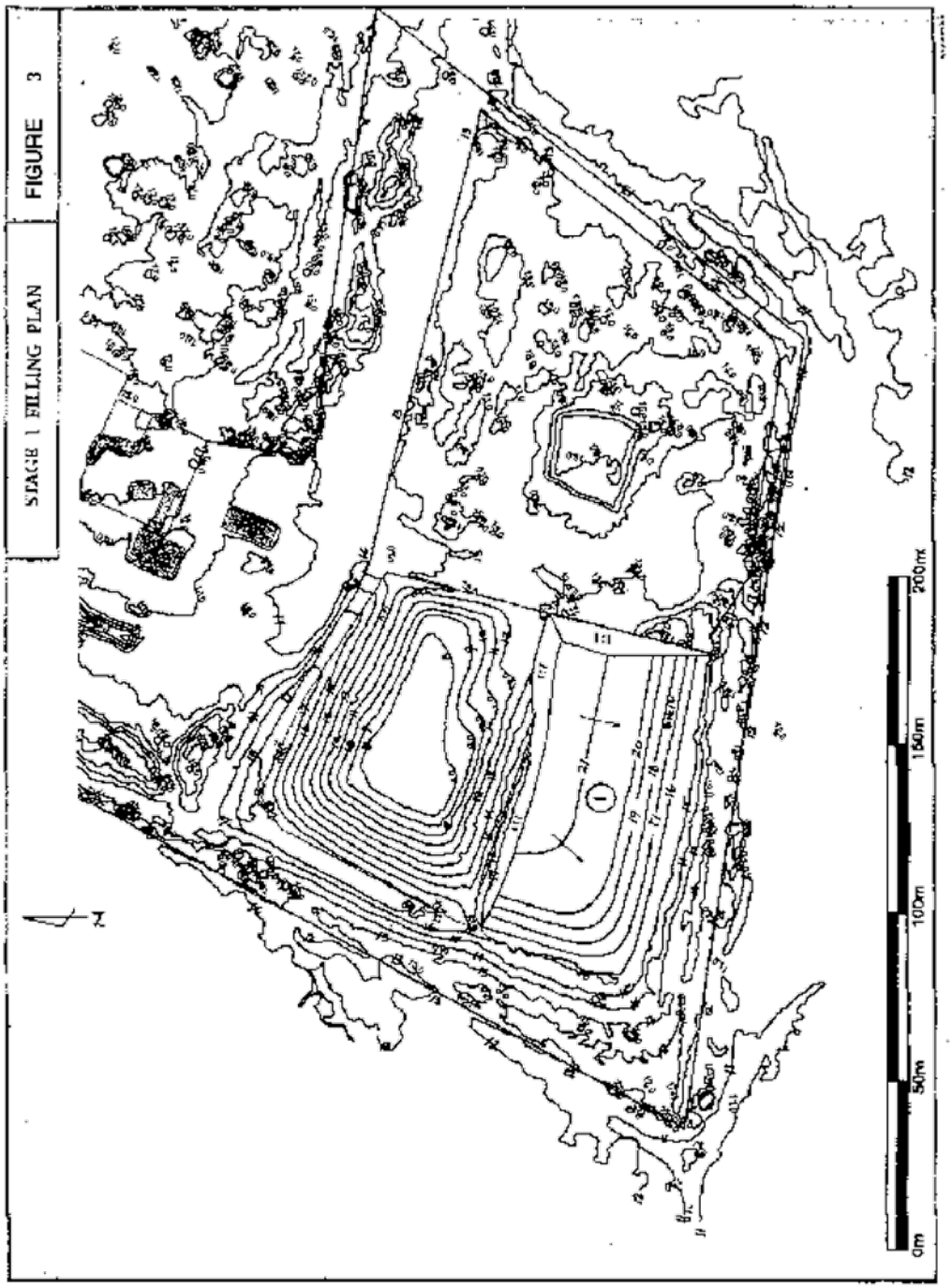


FIGURE 3
STAGE 1 FILLING PLAN
0m
50m
100m
150m
200m

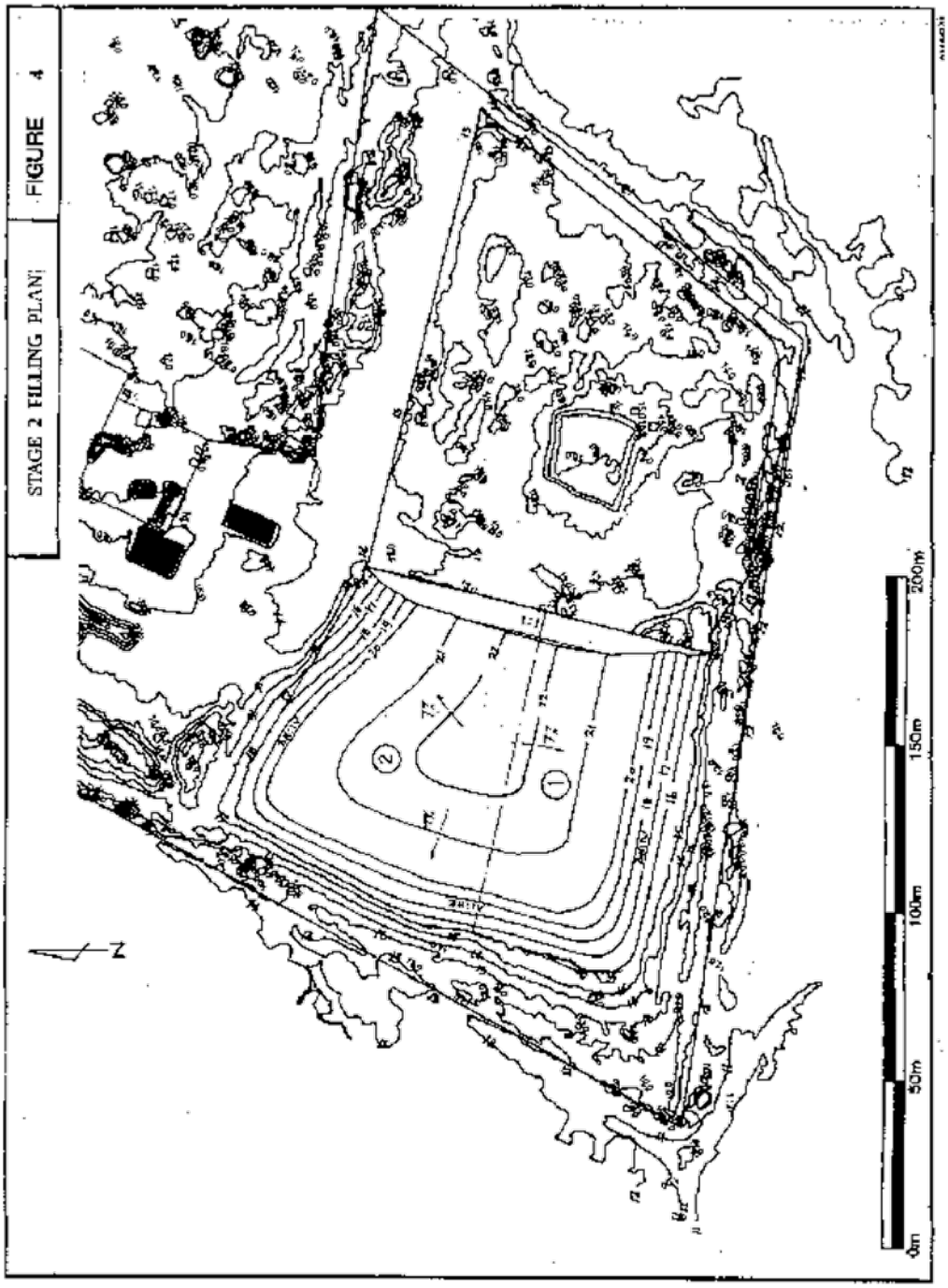


FIGURE 4
STAGE 2 FILLING PLAN
N
0m
50m
100m
150m
200m

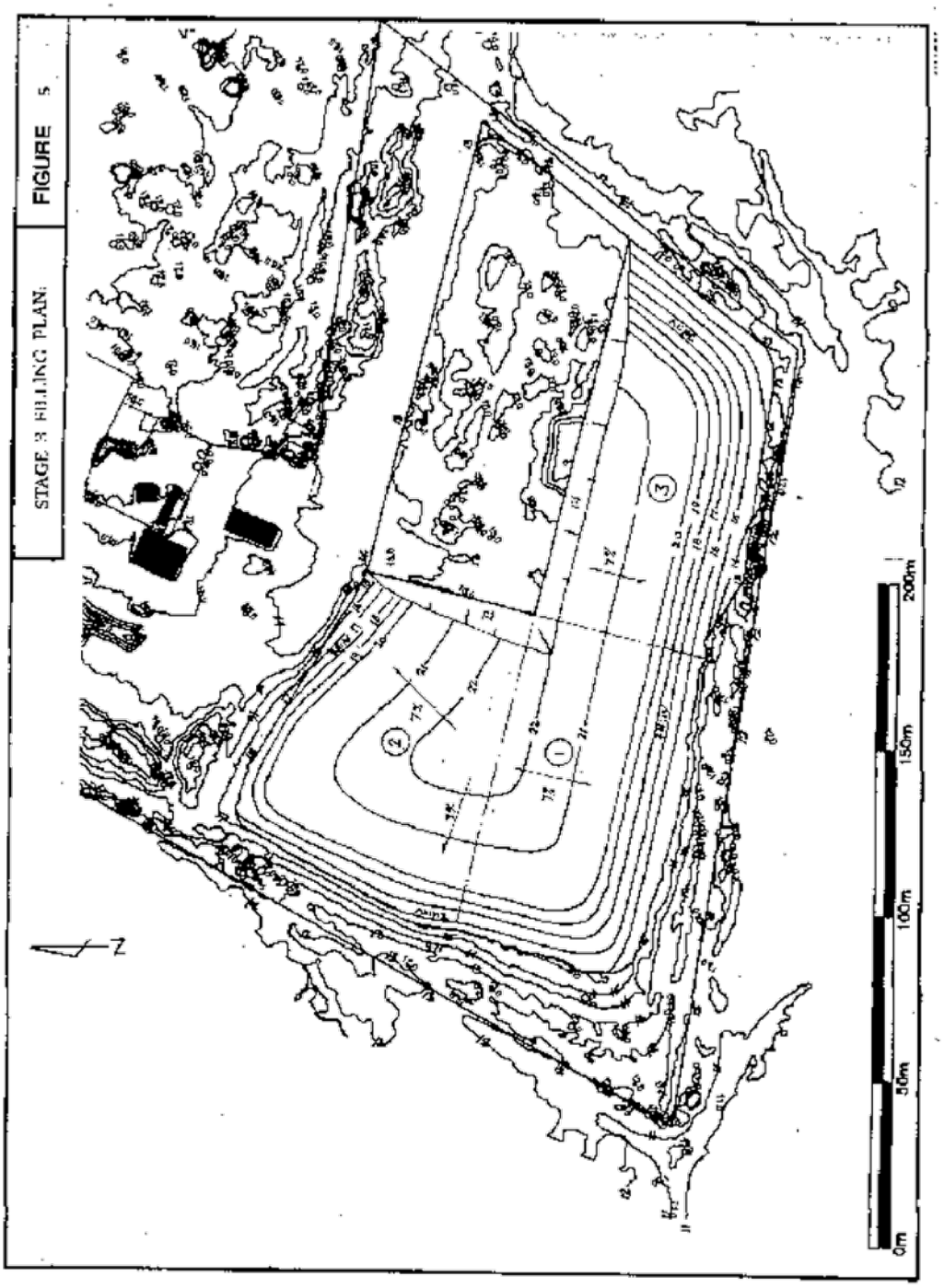
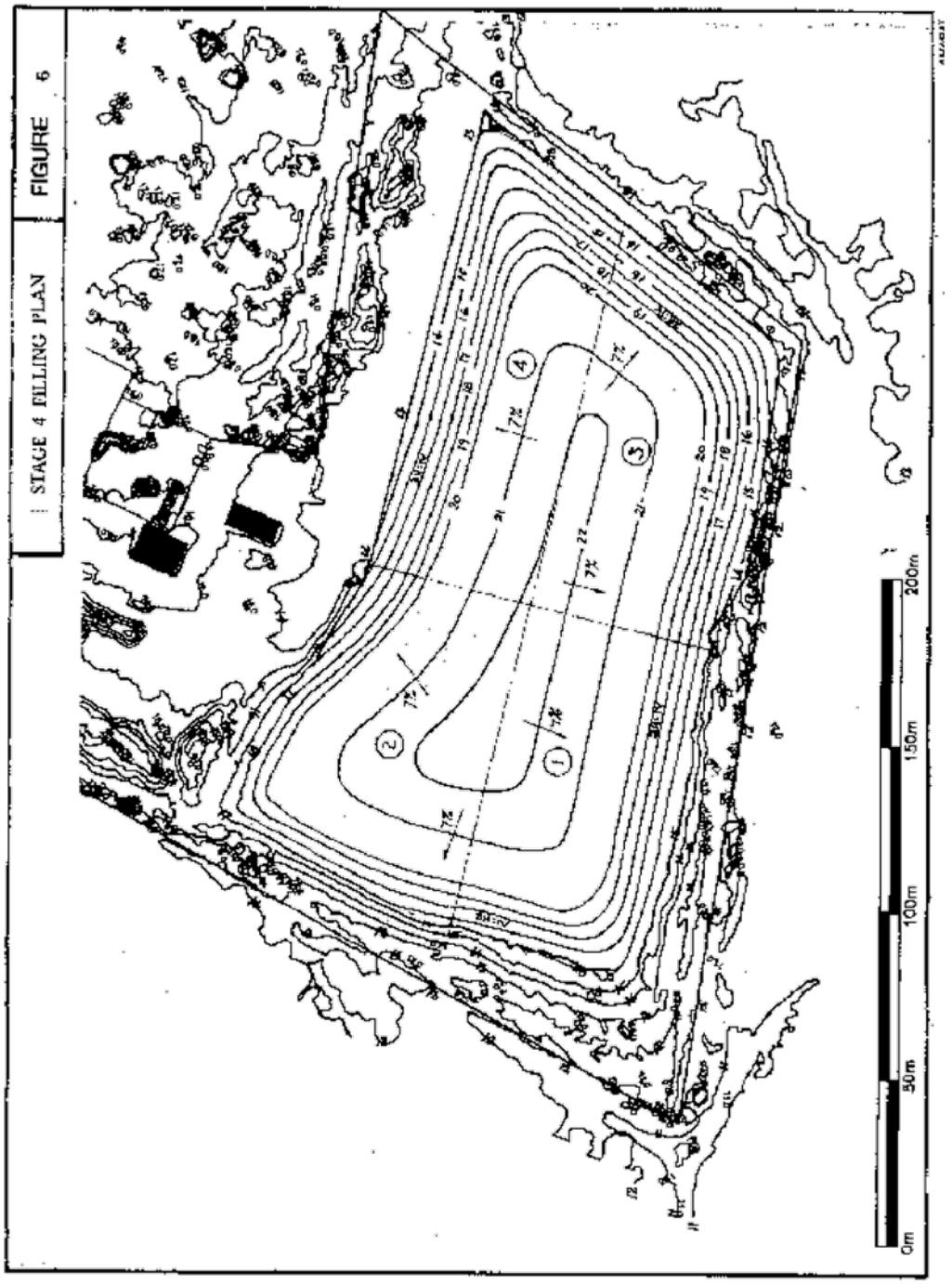


FIGURE 5
STAGE 3 FILLING PLAN
N
0m
50m
100m
150m
200m


STAGE 4 FILLING PLAN
FIGURE 6
0m
50m
100m
150m
200m

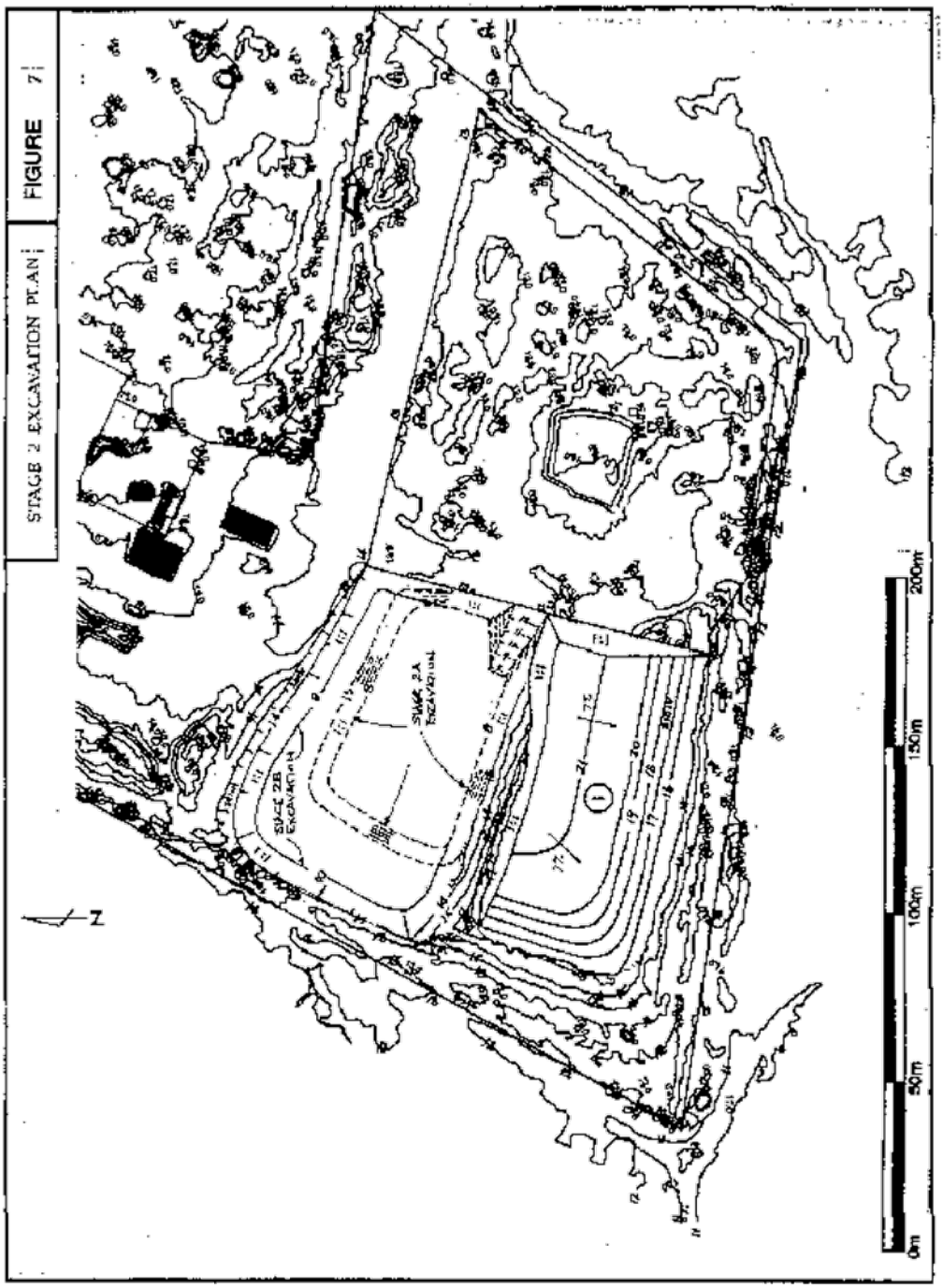


FIGURE 7
STAGE 2 EXCAVATION PLAN
STAGE 2A EXCAVATION
STAGE 2B EXCAVATION
Z
0m
50m
100m
150m
200m

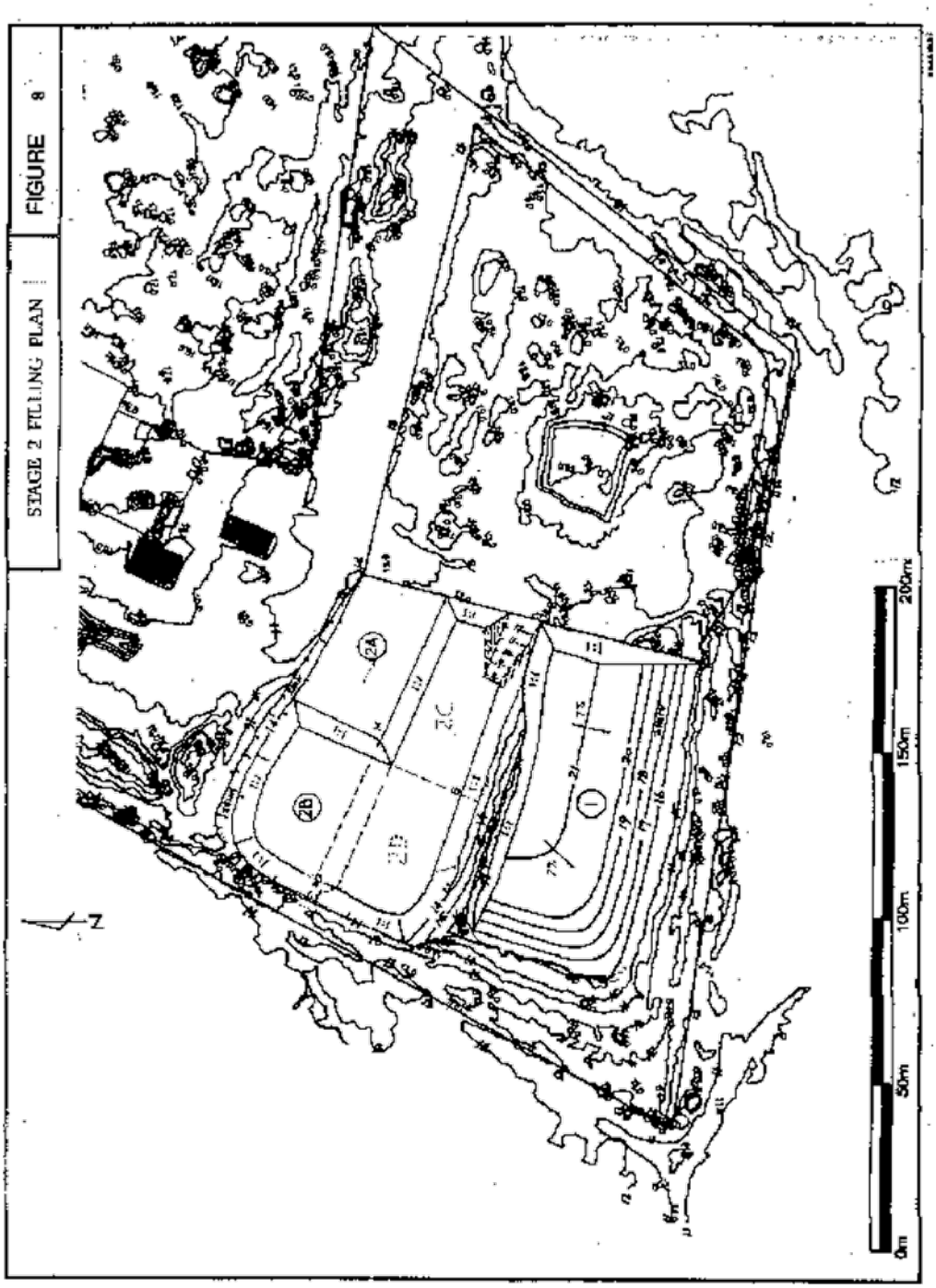


FIGURE 8
STAGE 2 FILLING PLAN
2A
2C
2B
1
1:1
Z
0m
50m
100m
150m
200m

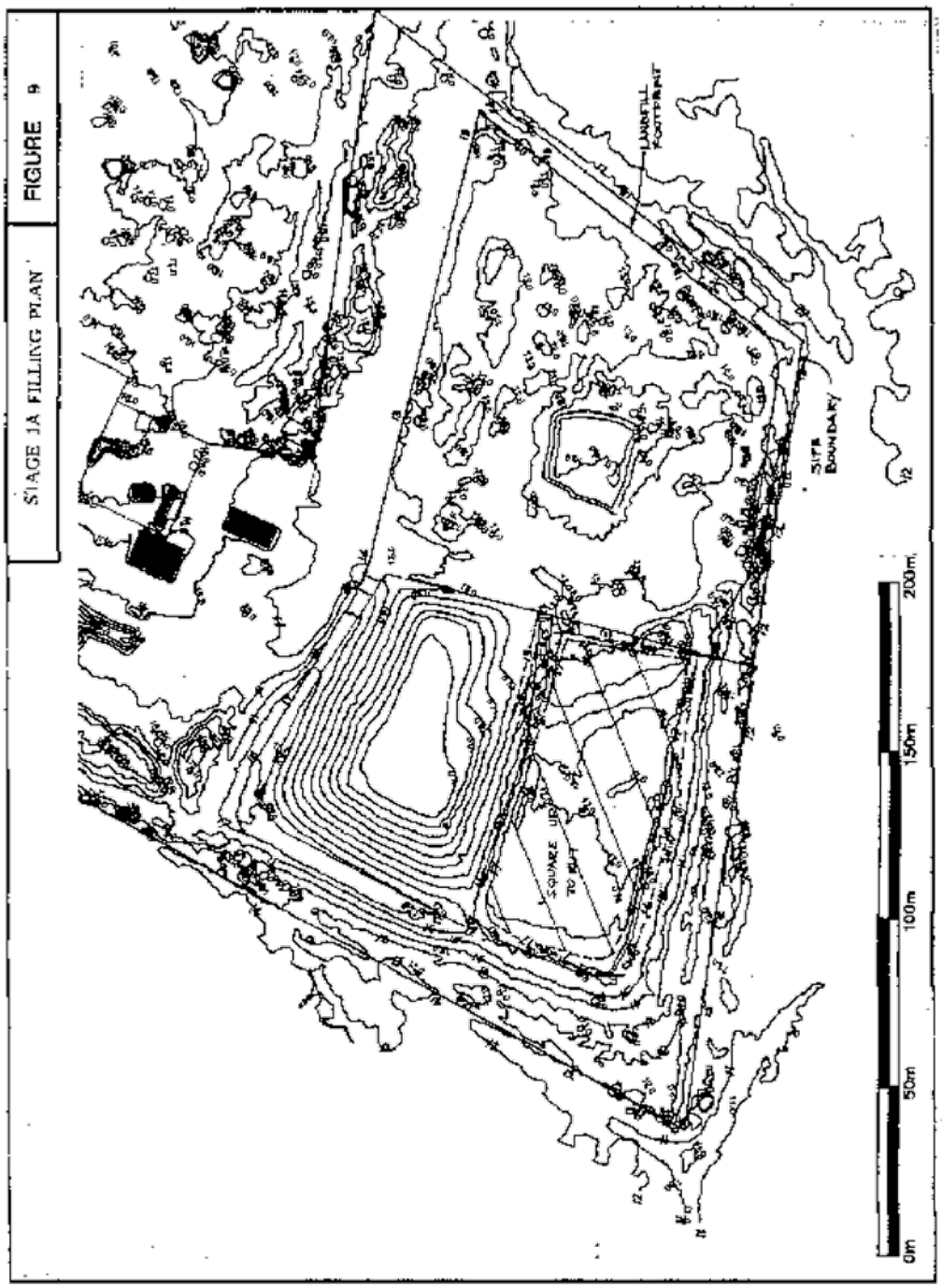


FIGURE 9
STAGE 1A FILLING PLAN
LANDFILL FOOTPRINT
SITE BOUNDARY
0m
50m
100m
150m
200m

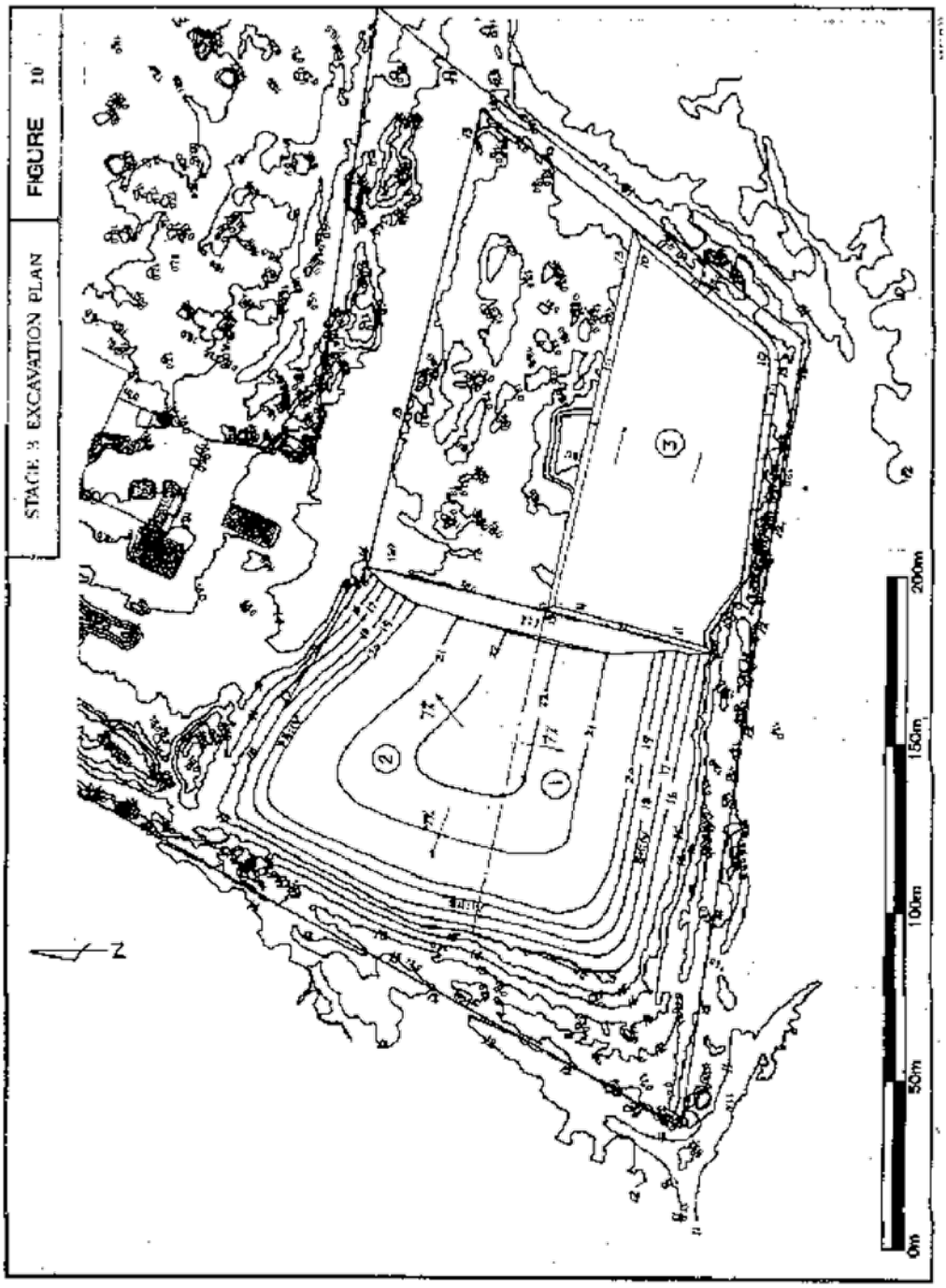


FIGURE 10
STAGE 3 EXCAVATION PLAN
N
0m
50m
100m
150m
200m

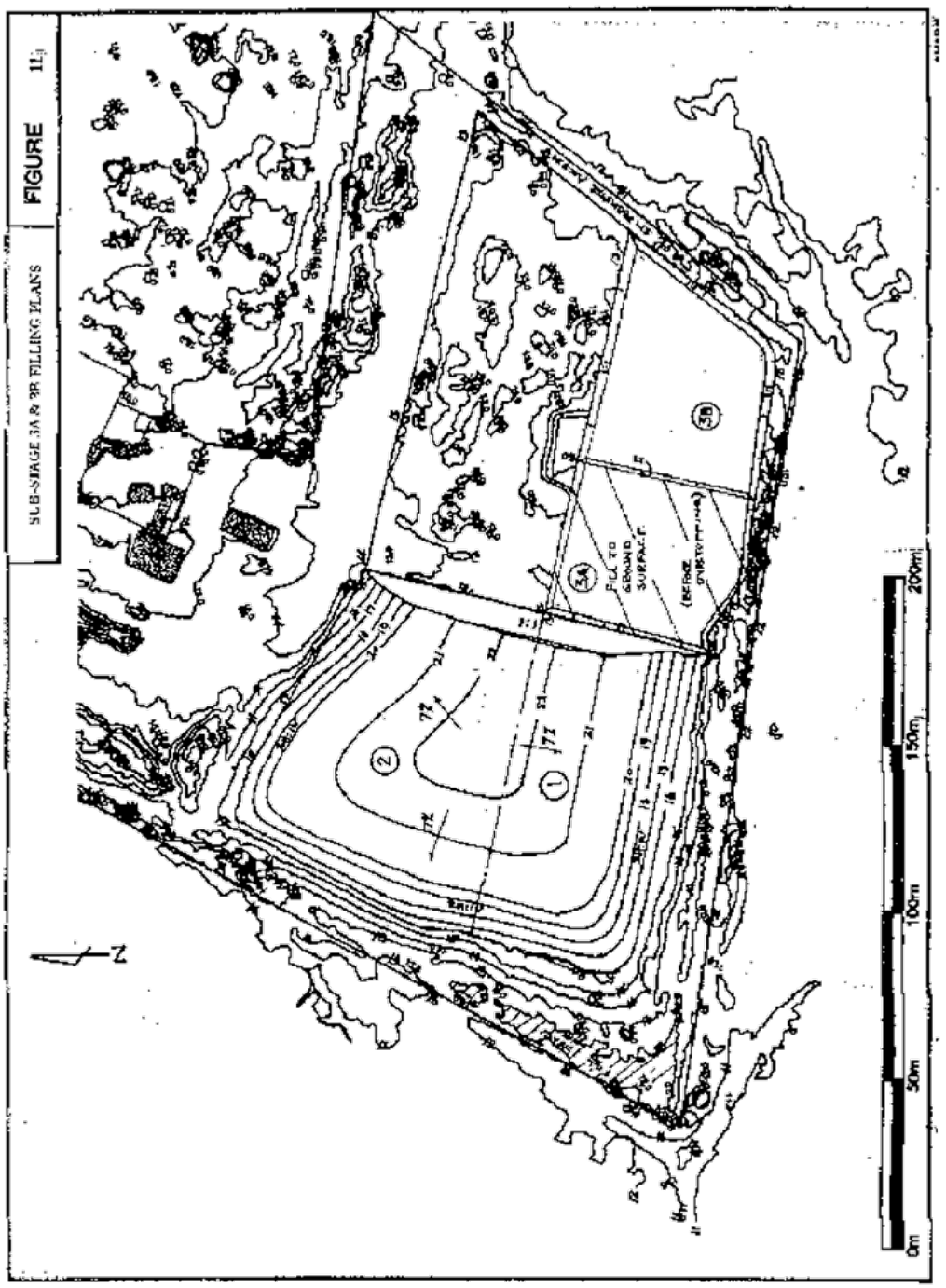
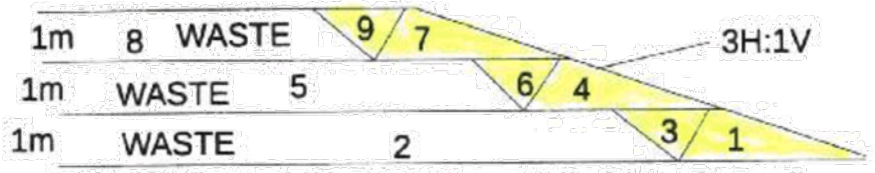


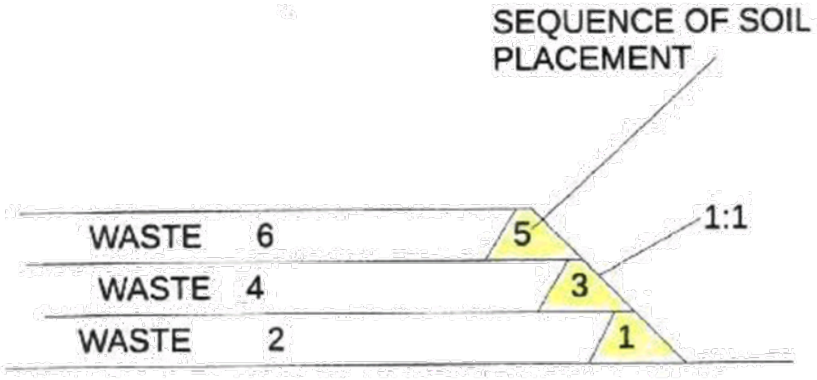
FIGURE 11
SUB-STAGE 3A & 3B FILLING PLANS
3A
3B
1
2
0m
50m
100m
150m
200m

SOIL BATTER CONSTRUCTION | FIGURE 12

1, 3 , 4 , 6 , 7 AND 9 IN BATTER IS SEQUENCE OF SOIL PLACEMENT



FINAL PERIMETER SOIL BUNDS

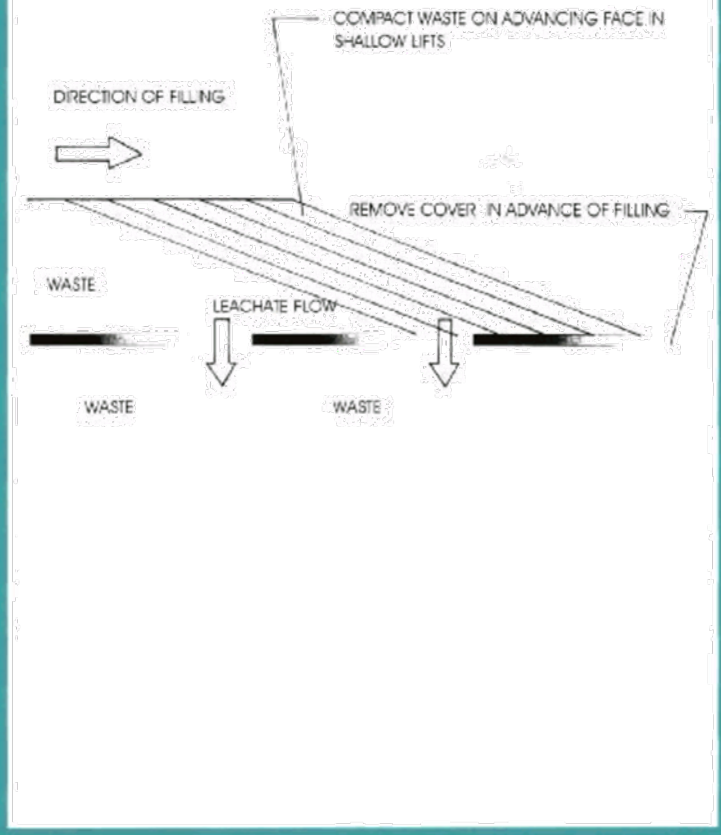


INTERNAL TEMPORARY SOIL BUNDS

AMARAL

FIGURE 13

DAILY COVER (PROGRESSIVE REMOVAL)



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Appendix 3 - Aerial Site Plan

Appendix 4 – Position Statement

Narrandera Shire Council

Position Statement

CLASSIFICATION : **Depot Attendant**

DEPARTMENT : **Infrastructure Services**

REPORTS TO : **Manager Development and Environment**

SUPERVISES : **NA**

OCCUPANT : **Vacant**

EMPLOYEE NUNBER : **to be determined**

SALARY GRADE : **Grade 4**

POSITION OVERVIEW

The position is for a **part time** depot attendant to be stationed at the gatehouse at the Narrandera Waste Facility to inspect all incoming vehicles, to make a determination on how materials contained within those vehicles will be best managed and to supervise the use of the domestic self haul drop off area, CRC and transfer station

Council Themes

Our Community

To live in a healthy community and one that demonstrates a positive attitude

To advocate for quality educational and cultural opportunities

To live in an inclusive and tolerant community

To feel connected and safe

Our Environment

To value, care for and protect our natural environment

To effectively manage and beautify our public spaces

To live in a community where there are sustainable practices

Our Economy

To encourage new business and industry that can be sustained

To support local business and industry to grow and prosper

To strongly promote our Shire and to improve its attractiveness

To grow our population

Our Infrastructure

To have an improved and adequately maintained road network

To improve, maintain and value-add to our public and recreational infrastructure

To improve and enhance our water and sewer networks

To have a say when planning for new facilities or refurbishing existing facilities

Our Civic Leadership

To have a Council that demonstrates effective management consistently

To have a progressive Council that communicates and engages well with all of the community and is a role model for inclusivity

To have a community and a Council that works collaboratively with harmony, respect and understanding

BEHAVIOURS

- Courteous interaction with all customers and fellow staff members.
- Timely response to requests.
- Accuracy of information delivery.
- Meeting customer's needs.
- Actively contribute to the delivery of Council's themes.
- Actively participate in team building.
- Support personal training offered by Council in skills and knowledge development

KEY RESPONSIBILITIES

Site Security

- Unlock and open the entrance gate when the Facility is to be made available to the public
- Ensure CCTV cameras and monitors are functioning correctly
- Ensure all visitors to the Facility and contractors sign the attendance register and receive site induction. Visitors and contractors to sign out
- Close and lock the entrance gate when the Facility is to be closed to the public

Examine all loads of incoming waste materials

- Ensure prohibited waste are not accepted
- Enquire if the load contains any problem wastes or hazardous wastes
- Identify and communicate how and where waste types can be segregated for placement at defined locations
- Inspect for contamination in segregated loads, especially green waste
- Provide clear and accurate instructions to facility users

Assess loads where fees are to be applied

- Refer to Council's load assessment guidelines and determine the fee to be applied
- Record all relevant information (customer name, address, vehicle registration, fee applied, waste type, assessed quantity, date/time)
- Refer information to Council's Finance section for invoice preparation

Comply with Council's Work Health and Safety Management System

- Develop a familiarity with the Narrandera Waste Facility WH&S Management System
- Correctly use and maintain PPE
- Undertake all work activities in a safe manner
- Identify risks and hazards and take or recommend corrective actions
- Report and assist in the investigation of all workplace incidents
- Attend safety/tool box meetings and undertake safety training as provided by Council
- Comply with emergency and evacuation procedures
- Ensure the gatehouse is kept clean and tidy

Standard Operating Procedures (SOPs) and Supervision

- Develop a familiarity with the Narrandera Waste Facility SOPs
- Attend workplace training provided by Council as part of its employee training plan
- Record incidents/complaints in the site register
- Generally supervise the use of the domestic self haul drop off area, CRC and transfer station
- Liaise and communicate with the on-site plant operator

SELECTION CRITERIA

- Minimum 2 years relevant working experience.
- Demonstrated customer service skills.
- Sound oral communication and interpersonal skills.
- Demonstrated ability to work effectively independently and in a team environment.
- Basic computer skills.

…… ……

Incumbent **Manager Development and Environment**

Date:……. / :……. / :…….

Appendix 5 - Protection of the Environment Operations (Waste) Regulation 2014

80 Disposal of asbestos waste
(cf clause 42(4) of 2005 Reg)

(1) (Repealed)

(2) When a person delivers asbestos waste to a landfill site, the person must inform the occupier of the landfill site that the waste contains asbestos.

(3) The following persons must ensure that when a person unloads or disposes of asbestos waste at a landfill site (regardless of whether the site is subject to an environment protection licence) no dust is generated from the waste—

(a) the person unloading or disposing of the asbestos waste,

(b) the occupier of the landfill site.

(4) Subject to any alternative cover conditions provided in an environment protection licence held by the occupier or approved in writing by the EPA, the occupier of a landfill site must ensure that asbestos waste disposed of at the site is covered with virgin excavated natural material—

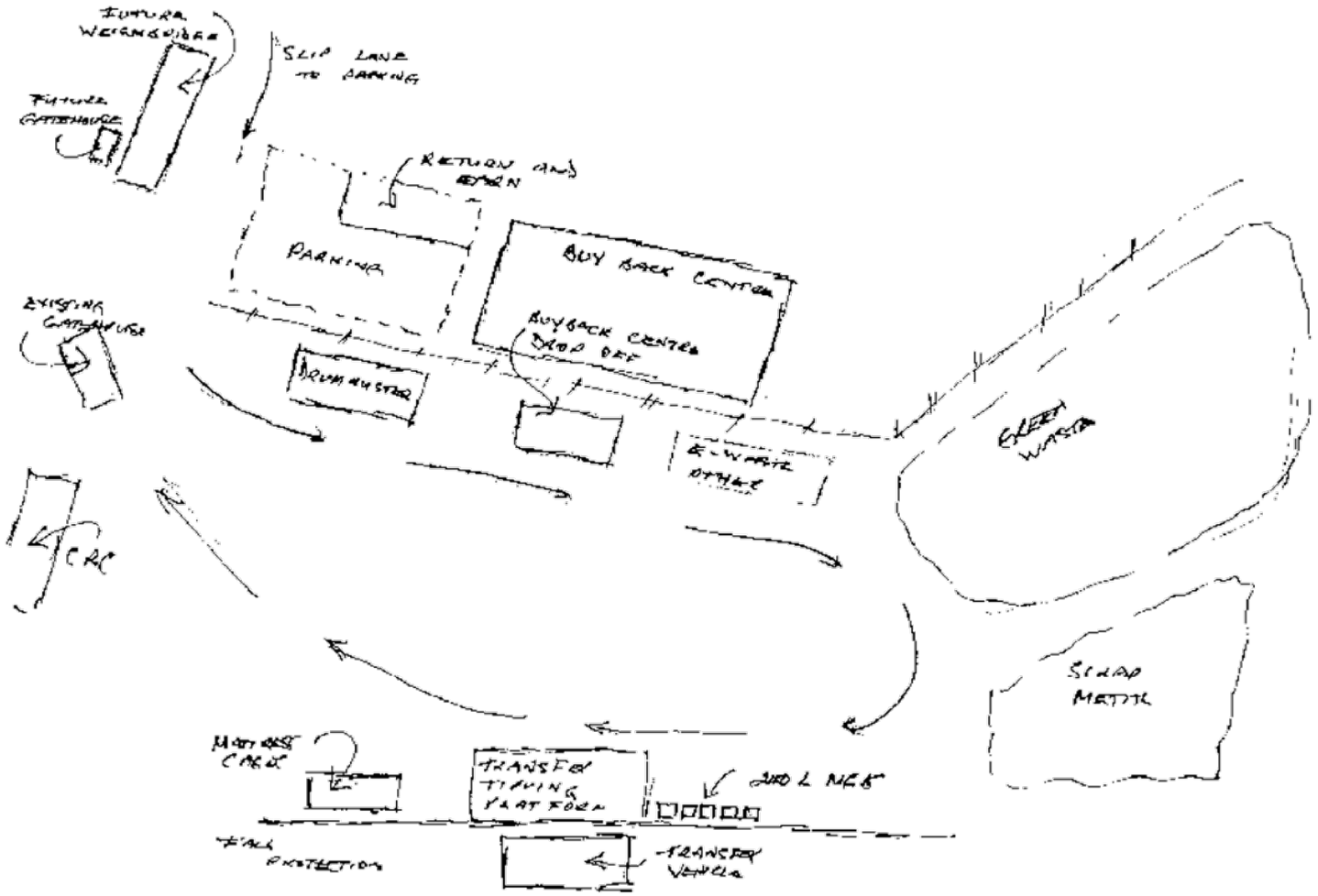
(a) initially (at the time of disposal), to a depth of at least 0.15 metre, and

(b) at the end of each day's operation, to a depth of at least 0.5 metre, and

(c) finally, to a depth of at least 1 metre (in the case of bonded asbestos material or asbestos-contaminated soils) or 3 metres (in the case of friable asbestos material) beneath the final land surface of the landfill site.

(5) In this clause, ***landfill site*** means a landfill site that can lawfully receive asbestos waste.

Appendix 6 –Site Master Plan


FUTURE WEIGHBRIDGE
FUTURE GATEHOUSE
SLIP LANE TO PARKING
RETURN AND EXIT
PARKING
BUY BACK CENTRE
BUYBACK CENTRE DROP OFF
DRUM MUSTER
EXISTING GATEHOUSE
E-WASTE
GREEN WASTE
CRC
SCRAP METAL
TRANSFER TIPPING PLATFORM
2ND L NECK
TRANSFER VEHICLE

Appendix 7 - Plant Hire Calculations

Cat 826 K (40 t) Landfill Compactor - Narrandera Shire Council

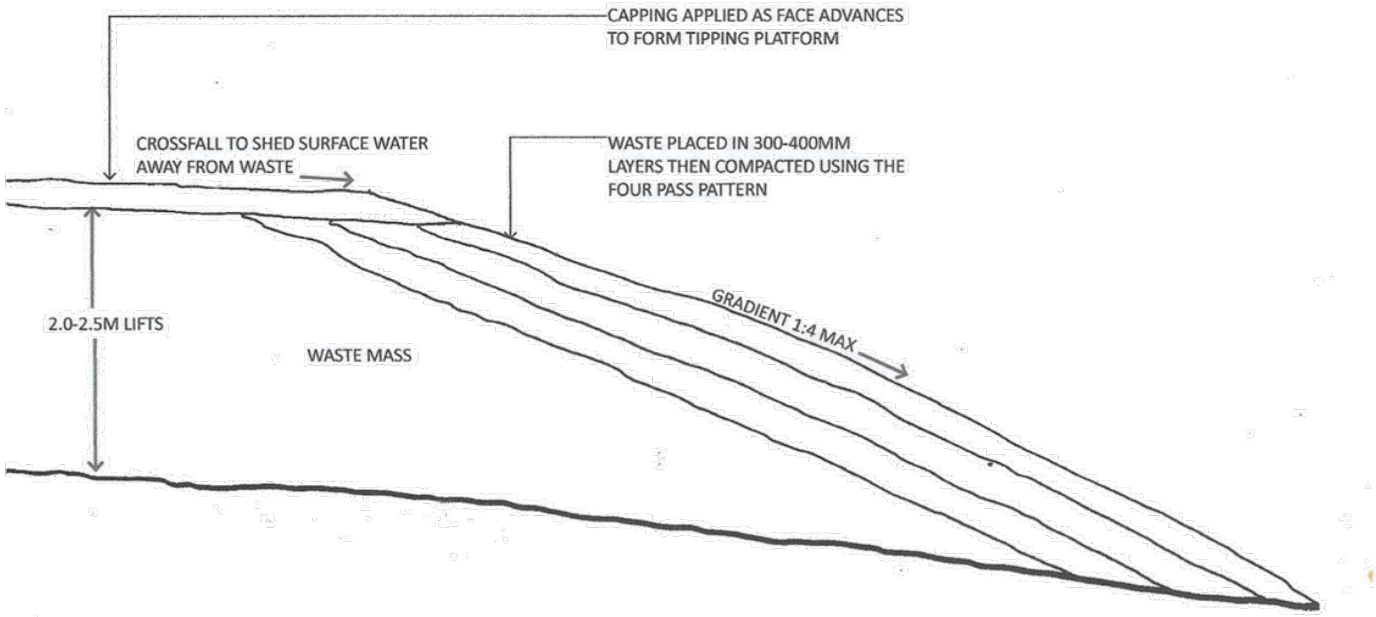
	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30
Purchase Price	680,000	693,600	707,472	721,621	736,054	750,775	765,790	781,106	796,728	812,663
Residual Value	100,000	102,000	104,040	106,121	108,243	110,408	112,616	114,869	117,166	119,509
Depreciable Value	580,000	591,600	603,432	615,501	627,811	640,367	653,174	666,238	679,562	693,154
Hours operated per week	15									
Hours operated per year	780									
Servicing & Repairs per hour	7.00									
Diesel per hour	23	Litres								
Fuel Cost	1.20	Per litre								
CPI	1.02									

	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	Total
Depreciation (straight line)	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	58,000	580,000
Fuel	21,528	21,959	22,398	22,846	23,303	23,769	24,244	24,729	25,223	25,728	235,726
Servicing & Maintenance	5,460	5,569	5,681	5,794	5,910	6,028	6,149	6,272	6,397	6,525	59,785
Total Costs	84,988	85,528	86,078	86,640	87,213	87,797	88,393	89,001	89,621	90,253	875,511
Cost of New Machine in addition to depreciation	11,315	11,315	11,315	11,315	11,315	11,315	11,315	11,315	11,315	11,315	113,154
Total Costs	96,303	96,843	97,394	97,955	98,528	99,112	99,708	100,316	100,936	101,569	988,665
Hire rate per hour	126.75	126.75	126.75	126.75	126.75	126.75	126.75	126.75	126.75	126.75	
Total Income collected	98,866	98,866	98,866	98,866	98,866	98,866	98,866	98,866	98,866	98,866	988,665

Check

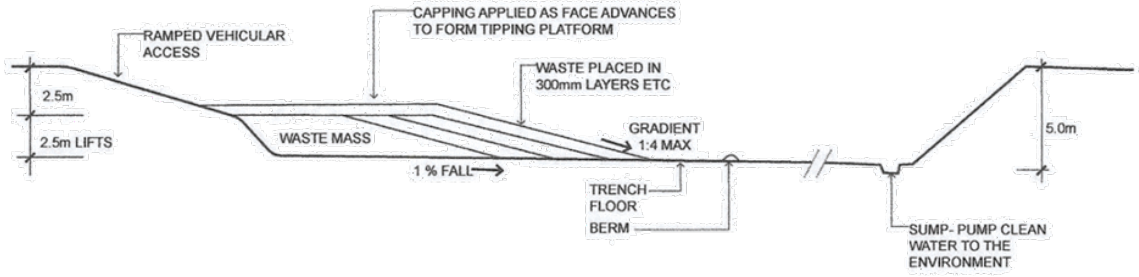
Total Income	988,665
Less Total Costs	875,511
New Machine less Depreciation	113,154
	0

Appendix 8 – General Principle of Waste Placement

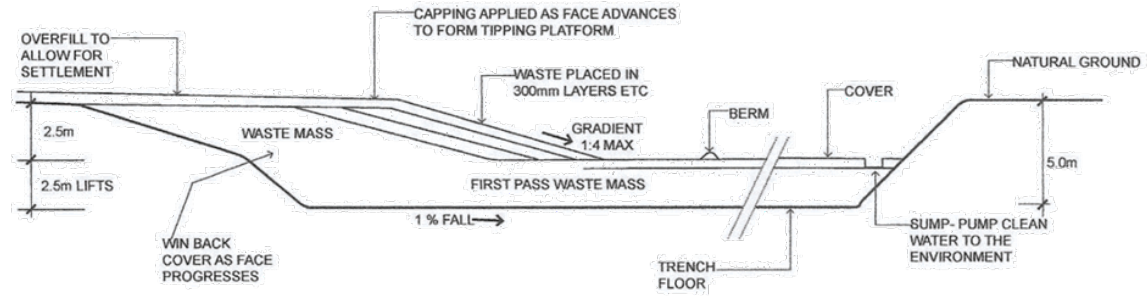


Appendix 9 – Waste Placement , Two Pass Filling

TRENCH WASTE PLACEMENT- FIRST PASS



TRENCH WASTE PLACEMENT- SECOND PASS



Appendix 10 – Document Control Form

Document Control Form		
As a result of the review of the Long Term Plan of Management, the following amendments to the plan have been made. .		
DISTRIBUTION • Master copy • Site copy		**ISSUE DATE**
PAGE NO	**SECTION**	**DESCRIPTION OF CHANGE**
MANAGEMENT AUTHORIZATION…… DATED……..		
I ACKNOWLEDGE RECEIPT OF THE AMENDMENTS TO THIS PLAN AND HAVE INCORPORATED INTO THE DOCUMENT FOR WHICH I AM RESPONSIBLE. ***SIGNED…….. DATED……***		

SUPPLEMENTARY REPORT
SITE CONSTRAINTS

SOUTH-WEST NARRANDERA
SEWER SCOPING STUDY

September 2020

Building and Environmental Services Today
26 Goulburn Street
JUNEE NSW 2663

www.bestoday.com
ABN 11 489 259 978

CONTENTS

Hard copy reference	Soft copy reference	Attachment Title
1	A	Key Features & Site Constraints Map

Version Control Table:

Version	Date	Comments	Prepared	Reviewed	Authorised
1	30/08/2020	Draft for preliminary comment	Neil Smith	Noel Crichton	Neil Smith
2	01/09/2020	Final draft ground water bore inclusion	Neil Smith	Noel Crichton	Neil Smith

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ABN 11 489 259 978

1. Executive Summary

Building & Environmental Services Today (BEST) was engaged by Narrandera Shire Council to explore the desirability and feasibility of extending sewerage to South West Narrandera.

Phase One of the project "Survey & Information Collection" was completed in late May 2020. The reader is referred to this report for background information and results.

This report summarises outcomes from Phase Two of the project titled "Options Study Report".

In broad terms this report examines the site constraints that limit the ability of certain parts of the study area from accepting on site sewage disposal. In other words, land that septic tanks etc should not permitted.

Interestingly, the further examinations carried out in this phase under pin the recommendations made in the Phase One report, consequently the recommendations below are almost identical.

This report recommends that:

1. Reticulated sewer be provided to service the study area, excluding the Dixonville locality and flood prone areas.
2. Dixonville locality:
    a. Remain unsewered;
    b. Be zoned for large lot residential development;
    c. Minimum lot size of approximately 4,000 square metres.
3. Groundwater bore locations be determined and depending on circumstances, water quality be examined.
4. Policy be developed to clarify requirements for OSSMS in the Narrandera local government area (LGA).

2. Acknowledgements

The assistance of Noel Crichton, Project Engineer, is gratefully acknowledged.

As with Phase One, Noel was happy to meet on a number of occasions, after hours, at his home to discuss aspects of the work.

3. Limitations

This report is based on observations and information collected as outlined in the Phase One report. It is also based on mapping of various environmental constraints as shown in Narrandera Local Environmental Plan 2013 (the LEP).

It should be pointed out that the scale and accuracy of the LEP on line resources is reasonably poor and therefore the exact position of any lines on the mapping provided as part of this report should be read as approximate.

4. Relevant Experience & Technical Skills

This report was produced by Neil Smith. The reader is referred to the Phase One report for further information on relevant experience and technical skills.

Background and Methodology

Discussions with Project Engineer

Discussions with Noel Crichton occurred over the course of developing this report. These discussions were via telephone, email and face to face.

Mapping

A pdf map of the study area was provided by Council. This map included lot, section and deposited plan numbers for each allotment.

From the above and as part of the Phase One report a “Key Features Map” (Phase One - Attachment 2 and Attachment A) was produced.

To this map were added highlighted sections showing the following constraints:

- Groundwater vulnerability
- IN2 - Light Industrial Zone
- Future stormwater retention basin locality
- Expanded brick pit area
- High density, small lot

The map provides an “at a glance” view of the study area clearly giving the reader an overall view of the land which would be unlikely to be suitable for future development without sewerage thus, conversely, indicating the land remaining which should be sewered.

5. Results & Discussion

Narrandera Local Environmental Plan 2013

An examination of Council's LEP with respect to the following potential constraints was carried out:

- Land Zoning
- Lot Size
- Land Reservation Acquisition
- Heritage
- Terrestrial Biodiversity & Salinity
- Wetlands, Groundwater Vulnerability & Watercourses
- Flood Planning
- Defence Communications Facility Buffer

The outcomes of these examinations are elaborated on in the sections below.

Land Zoning

Land located in the north east sector of the study area bounded by River Street, the disused rail line and approximately by Twynam Street is zoned as Light Industrial. The "Permitted with consent" uses, copied from Council's LEP, are as follows:

"Depots; Funeral homes; Garden centres; Hardware and building supplies; Heliports; Industrial training facilities; Kiosks; Landscaping material supplies; Light industries; Neighbourhood shops; Oyster aquaculture; Places of public worship; Rural supplies; Take away food and drink premises; Tank-based aquaculture; Timber yards; Vehicle sales or hire premises; Warehouse or distribution centres; Any other development not specified in item 2 or 4."

The potential for greases, oils, fats, hydrocarbons and other undesirable contaminants to be discharged via OSSMS to groundwater from such uses presents a risk that is considered undesirable. As such it is strongly recommended that the Light Industrial area be provided with reticulated sewerage.

Lot Size

There is no minimum lot size specified in the LEP for any of the land in the study area. This was highlighted in the Phase One report. There is the potential for land to be subdivided with little regard to available space for on site sewage disposal. Should such subdivision occur, the volume of effluent being discharged to ground would increase, the proximity of residents to effluent discharge areas would reduce resulting in an increase in risk to the environment and public health.

Land Reservation Acquisition

Nil effect.

Heritage

Nil effect.

Terrestrial Biodiversity & Salinity

There are no saline areas identified in the LEP mapping. With regard to biodiversity, the LEP mapping indicates that biodiverse land aligns with the flood prone land adjoining the Murrumbidgee River. It is the writer's opinion that there would be little effect on biodiversity and that OSSMS and dwellings would generally be excluded from flood prone land in any case.

Wetlands, Groundwater Vulnerability & Watercourses

The groundwater vulnerability areas align closely with land south of the canal and effectively rule out permitting OSSMS in the Sandhills and South West Narrandera areas.

Relevant excerpts from the LEP are pasted below:

"***Groundwater vulnerability***

(1) The objectives of this clause are as follows—

(a) to maintain the hydrological functions of key groundwater systems,

(b) to protect vulnerable groundwater resources from depletion and contamination as a result of development.

(2) This clause applies to land identified as "Groundwater Vulnerable" on the Groundwater Vulnerability Map.

(3) Before determining a development application for development on land to which this clause applies, the consent authority must consider the following—

(a) the likelihood of groundwater contamination from the development (including from any on-site storage or disposal of solid or liquid waste and chemicals),

(b) any adverse impacts the development may have on groundwater dependent ecosystems,

(c) the cumulative impact the development may have on groundwater (including impacts on nearby groundwater extraction for a potable water supply or stock water supply),

(d) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.

(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that—

(a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or

(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or

(c) if that impact cannot be minimised—the development will be managed to mitigate that impact"

Flood Planning

The flood planning areas align with the 1 in 100 flood level and effectively exclude fringe areas around the edges of Sandhills and South West Narrandera from further development. It is not expected that it would be necessary to provide sewerage to these fringe locations since development would generally be discouraged in any case.

Defence Communications Facility Buffer

Nil effect.

Additional Constraint Considerations

Development Density

Of particular concern are the higher density areas where small allotments of approximately 1,000 square metres exist.

The southern portion of the North West Narrandera locality around Audley Street and Twynam Street is especially concerning due to the small lot sizes and consequently close proximity of human activity/neighbours to effluent disposal areas.

These small lot size areas should be provided with sewerage to reduce risk to public health and the environment.

Domestic Ground Water Bores

There are registered ground water bores located on land at Dixonville, Sandhills and South West Narrandera. The location of these is as listed below. See also map of locations on the following page and also at Attachment A.

Dixonville

- Lot 4, DP 6829
- Lot1, DP 204062
- Lot 7, DP 6829
- Lot 2, DP 1232220

Sandhills

- Lot12, DP 129171

South West Narrandera

- Lot 1, Section 28, DP 758757
- Lot 6, Section 29, DP 758757

There may be other unregistered bores in the study area too. There is a significant risk to public health where bore water is used in the home (whether for drinking or bathing) and where these bores are located close to sewage disposal areas, especially in sandy soils such as have been shown to exist throughout the study area.

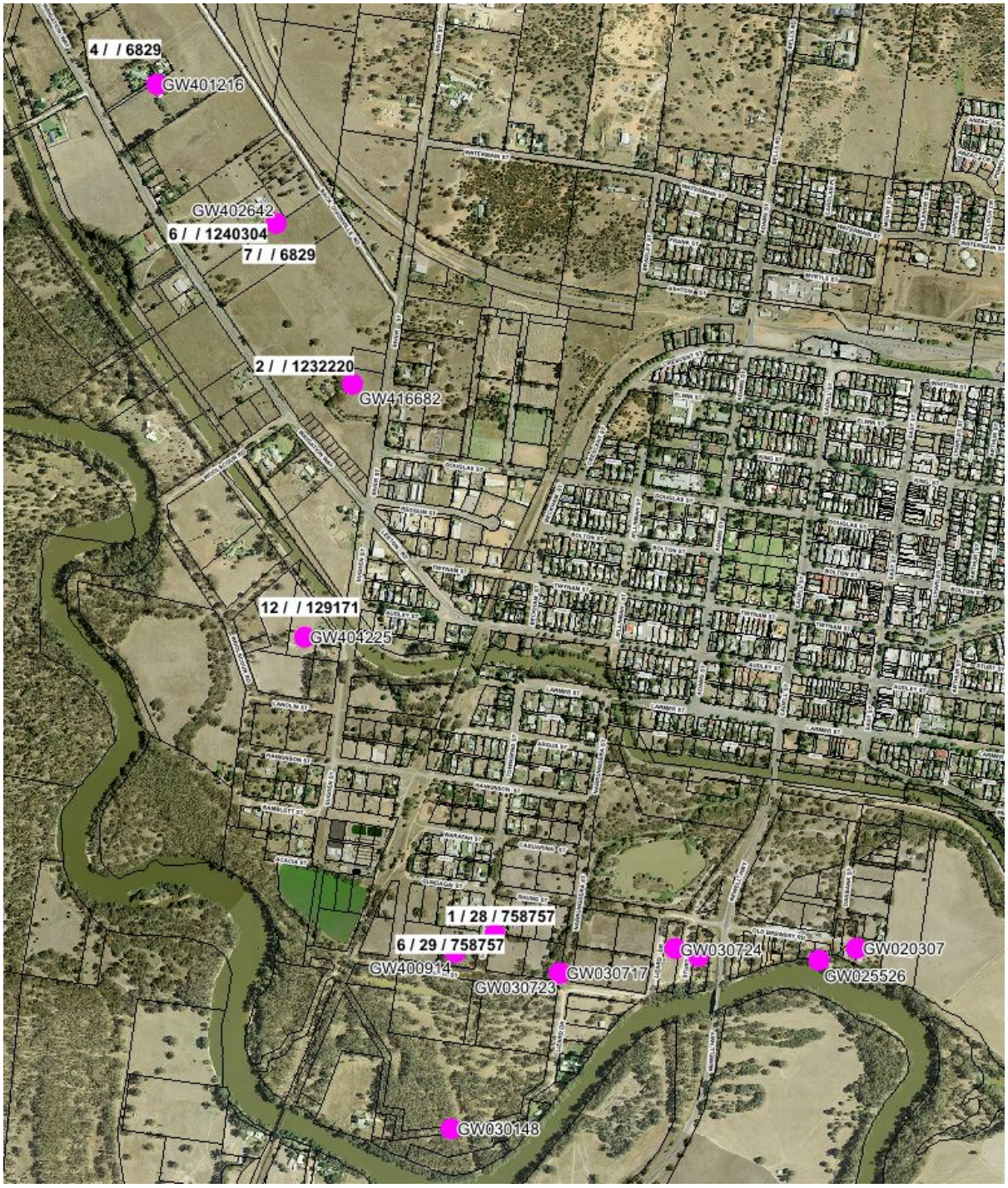
The Phase One report has this to say regarding ground water bores.

"The reason that ground water bore information is important is because sewage disposal areas must not be located near them. Australian Standard 1547:2012 – On-site domestic wastewater management specifies buffers distances between effluent disposal areas and ground water bores of between 15m and 50m depending on the soil type. In sandy situations such as those that exist in the study area, the larger buffer zones are desirable."

It is strongly recommended that specific individual examination occur with respect to:

1. The location of known groundwater bores in the study area;

2. Whether or not the ground water from the above bores is being used in the home;
3. If used in the home, the proximity of the above bores to on site sewage disposal areas; and
4. If within 50 metres of an effluent disposal area, bacteriological water testing be carried out to determine whether contamination of the groundwater entering the home may be occurring.



6. Summary

This summary and the following recommendations closely mirror those set out in the Phase One report.

Provide Reticulated Sewage to North West, South West and Sandhills

In conclusion, and in consideration of both the public health risks, environmental impacts and constraints underpinned by Council's LEP, it is felt that reticulated sewerage services be extended to the North West, South West and Sandhills localities.

Dixonville Earmarked for On Site Disposal with Extra Controls

If Dixonville is to remain unsewered, there should be some controls put in place to regulate further development of the locality.

Presently Council's LEP does not specify any minimum lot size and the land is zoned RU5 Village. As a consequence, every application for development must be considered on merit running the risk that undersized allotments and inappropriate uses may result.

Appropriate zonings and policies give clear guidelines and boundaries for not only developers but also for staff.

It has been mentioned previously that the estimates in this report for lot yield where on site effluent disposal is permitted have been based on 4,000 square metres. This figure was provided by council staff and is supported by the writer. Such a limit on lot size in the Dixonville locality in combination with a zoning more reflective of the larger lot character of the area is strongly recommended.

In addition, clearer policy should be developed regarding council's requirements for the installation of OSSMS. Such policy should be consistent across the local government area and not simply focus on Dixonville. The policy would specify, amongst other things, the minimum requirements for soil testing and effluent disposal area design. The minimum size for septic tanks and AWTSs etc. Such a policy would not need to be highly prescriptive but at least set the boundaries around minimum standards of testing and documentation required with new applications.

7. Recommendations

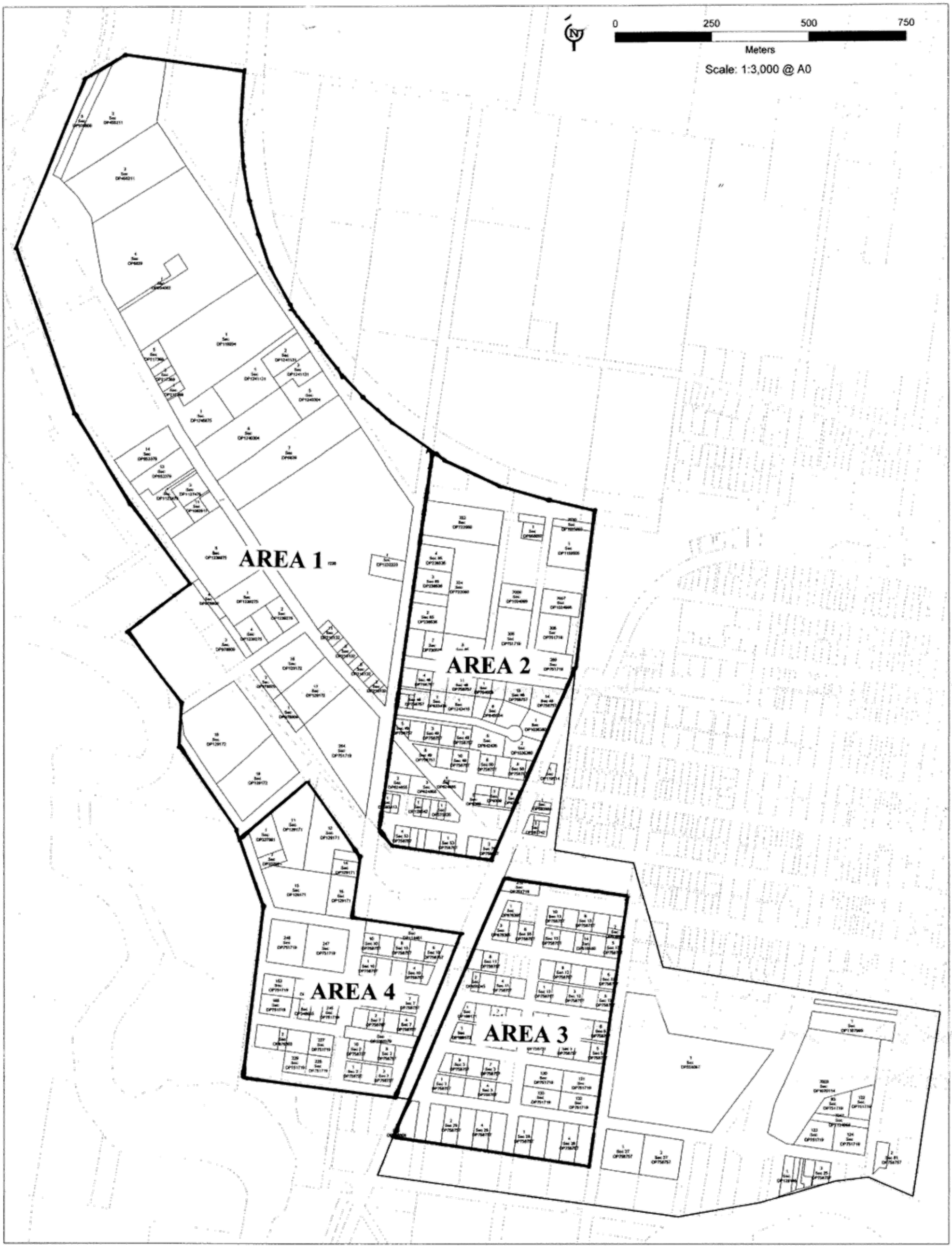
1. That reticulated sewerage services be extended to the North West, South West and Sandhills localities.
2. That the Dixonville locality be identified for large lot development and on-site sewage disposal.
3. That appropriate actions be taken to control development of Dixonville. including:
    a. Re-zoning;
    b. Setting a minimum lot size of approximately 4,000 square metres; and
    c. Developing a policy which sets standards for on site sewage management systems in Narrandera local government area including minimum buffer distances from groundwater bores.
4. That, with respect to existing ground water bores, the following examinations occur:
    a. As far as practicable, the location of groundwater bores in the study area be established;
    b. Determine whether or not the ground water from the above bores is being used in the home;
    c. If used in the home, the proximity of the above bores to effluent disposal areas; and
    d. If within 50 metres of an effluent disposal area, bacteriological water testing be carried out to determine whether contamination of the groundwater entering the home may be occurring.

Neil Smith,
Principal,
Building & Environmental Services Today
Bachelor Applied. Science (Environmental Health)
NSW BPB A1 Accreditation # 1642
Fellow Environmental Health Australia
Member Australian Institute Building Surveyors
Justice of the Peace.

Attachment 1 – Key Features and Site Constraints Map

Electronic (soft copy) Attachments **(see attached USB stick)**

A. – Key Features & Site Constraints Map



SOUTH WEST NARRANDERA SEWER SCOPING STUDY

SUB-AREAS

This map is a representation of the information currently held by Narrandera Shire Council. While every effort has been made to ensure the accuracy of the product, Council accepts no responsibility for any errors or omissions.

Narrandera

NARRANDERA SHIRE COUNCIL
141 East Street
Narrandera NSW 2700
Ph: 02 6959 5510

Date: 17/03/2020

Compiled by:
GIS Narrandera

Coordinate System:
MGA 94 Zone 55

Ref: 2020-019

ASSESSMENT REPORT

SOUTH-WEST NARRANDERA SEWER SCOPING STUDY

May 2020

Building and Environmental Services Today
26 Goulburn Street
JUNEE NSW 2663

www.bestoday.com
ABN 11 489 259 978

CONTENTS

Hard copy reference	Soft copy reference	Attachment Title
1	D	McMahon Earth Science Land Capability Assessment Report
2	A	Key Features Map
3		Existing OSSMS Inspections Checklists and Risk Matrix Sheets
	B	Property Summary Spreadsheet
4	C	Photographic Examples of Problems Observed
	E	All Photographs Taken During Inspections

Version Control Table:

Version	Date	Comments	Prepared	Reviewed	Authorised
1	21/5/2020	Draft for preliminary comment	Neil Smith	Noel Crichton	Neil Smith
2	23/5/2020	Final draft	Neil Smith	Noel Crichton	Neil Smith

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ABN 11 489 259 978

1. Executive Summary

Building & Environmental Services Today (BEST) was engaged by Narrandera Shire Council to explore the desirability and feasibility of extending sewerage to South West Narrandera.

Site soil tests found that the soils within the unsewered study area, are suitable for on-site sewage disposal.

A detailed assessment of the performance of approximately 10% of the existing on-site sewage management systems (OSSMS) revealed a generally poor degree of operation in terms of risk to public health &/or the environment.

A comparison of the approximate number of new allotments possible in the study area was carried out to determine the land yield whether sewered or not. Not surprisingly, a much larger number of potential allotments was found to be possible when the land is sewered.

Some parts of the study area, most notably that portion adjoining Irrigation Way and Dixonville Road, lend themselves to larger allotments. Unsewered larger lots, compared to unsewered smaller lots, present a lower risk to public health & the environment whilst providing the additional advantage of a wider degree of land size choices to potential purchasers.

This report recommends that:

1. Subject to positive outcomes from detailed investigations outlined in Phase 2 of the project, reticulated sewer be provided to service the study area, excluding flood prone locations and the Dixonville locality.
2. Dixonville locality:
    a. Remain unsewered;
    b. Be zoned for large lot residential development;
    c. Minimum lot size 4,000 square metres.
    d. Policy be developed to clarify requirements for OSSMS in the Narrandera local government area (LGA).

2. Acknowledgements

The assistance of Noel Crichton, Project Engineer and Helen Ryan, GIS Officer, is gratefully acknowledged. Their help with information and local knowledge has been invaluable in bringing this report to fruition.

It is pertinent to note that assistance was provided during the COVID 19 pandemic - a particularly difficult period when social distancing and working from home was the "norm".

In addition to working under the above interruptive conditions, Noel was happy to meet on a number of occasions, after hours, at his home (social distancing observed) to discuss aspects of the work. At the same time Helen's prompt and willing help could not have been more cheerfully delivered.

3. Limitations

This report is based on observations made at the time inspections were carried out, information provided by Council, soil testing and calculations by McMahon Earth Science and the writer's experience on the subject of on site sewage management.

Information provided to BEST by Council included:

- A field inspection of the study area with long time shire engineer, Noel Crichton. Noel's extensive local knowledge regarding physical features and installations is considered invaluable.
- Council's flood mapping data, flood risk study and plan.
- Property information for the study area in the form of an Excel spreadsheet.
- Mapping of the study area showing lot, section and DP details of allotments.
- Aerial mapping of the study area.
- Minimum lot size recommendations for unsewered land.
- Assistance with identifying location of ground water bores.

Information commissioned by and provided to BEST by McMahon Earth Science included:

- A land capability assessment and report (Attachment 1 and Attachment D) including soil sample data, groundwater bore location and depth information and calculations regarding the land area required to sustainably support on site disposal using Aerated Waste Treatment Systems (AWTSs).
- Separate calculations regarding the land area required to sustainably support on site disposal using traditional septic tank and absorption trench systems.

The site area and in particular the "subdividability" of allotments was assessed using aerial mapping from the NSW government SIXMaps web site. This information source should considered approximate because the aerial photographs showing the position of buildings on land were approximately 4 years old. In addition, the cadastre may not be exactly aligned. To off-set the out of date nature of the aerial photography to some extent, a record of allotments containing

dwellings was made by physically driving every street and lane and marking them on a map, thereby ground truthing the SIXMaps data and updating it where necessary – for example where new homes had been constructed. Nevertheless, the subdividability estimations are approximate only.

Every effort has been made to ensure accuracy and completeness of this report however the client should also ensure that all matters relating to the subject are considered and, where necessary, investigated.

4. Relevant Experience & Technical Skills

This report was produced by Neil Smith. Inspections were carried out by Neil Smith with assistance from Bob Callow.

Neil Smith is an environmental health and building surveyor with over 40 years experience working in local government. His primary qualification is a Bachelor Applied Science (Environmental Health).

A list of the main on-site sewage management related projects that Neil has been responsible for is given below:

a. Coolamon Shire Council -Ardlethan township OSSMS assessment & report on need for sewerage extension 2006.
b. Oberon Shire Council – East Oberon rural residential area OSSMS assessment & report on need for sewerage extension 2018.
c. Federation Council – Public Education Programme and Inspection of OSSMS throughout unsewered villages, unsewered parts of Corowa, Howlong, Urana, Mulwala and properties adjoining the Murray River 2019/2020.
d. On Site Sewage Management Strategies produced for:
    - Parkes Shire Council
    - Deniliquin Council
    - Conargo Shire Council
    - Windouran Shire Council
    - Jerilderie Shire Council
    - Murrumbidgee Council
e. Environmental Health Officer Training, “OSSMS Field Inspection Techniques”:
    - Blayney 2007
    - Narromine 2007
    - Cootamundra 2009
    - Glenn Innes 2010
    - Tumut 2012
    - Penrith 2013
    - Orange 2013
    - Jerilderie 2018
    - Corowa 2019

f. Various papers and presentations on the subject of OSSMS field inspections including:
    - Environmental Health Australia (EHA) 2006 National Conference, Sydney – "Effluent of the Affluent".
    - Riverina Group Conference regional presentation.

5. Background and Methodology

A Request for Simple Quotation (RSQ), was provided to BEST. The RSQ document comprised 3 phases and specified a number of key outcomes within each phase. At the end of each phase were hold points designated to discuss with Council's Project Manager, information gleaned, current thoughts and any steps to be taken prior to moving to the next phase.

BEST submitted a quotation to undertake phases 1 and 2 and was subsequently engaged to carry out these first 2 phases of the project. The second phase to be worked jointly in consultation with Council's Project Engineer.

Methodology

The RSQ set out the main data collection requirements. This data was then to be used as the basis for decision making with respect to options for all or some of the study area to be sewered. The RSQ requirements for the study area are summarised below:

Phase 1 (completed on 29/4/20)

a) Map existing property holdings.
b) Identify and map holdings connected to sewer and not connected to sewer.
c) Map properties affected by physical constraints which may affect OSSMS performance. Constraints such as flood prone land etc.
d) Conduct soil tests to determine suitability or otherwise of land to support OSSMS and map areas not suitable.
e) Inspect 10% of existing OSSMS to determine operational efficiency and risk.

Phase 2

a) Investigate options for connecting holdings with existing OSSMS and vacant holdings to Council's sewerage system including possible additional holdings that may be created by subdivision or boundary adjustment.
b) Identify and map holdings not suitable for OSSMS or which need specific treatment conditions because of physical or other constraints.
c) Investigate options for communal treatment of wastewater.
d) Prepare preliminary construction and operational costs for all options for comparison.

Inspections & Site Visits

Three key inspection dates are worth mentioning:

- Thursday 20th February 2020 – Prior to submitting a quotation, the writer in the company of Bob Callow from BEST and Council's Project Engineer, Noel Crichton, inspected the study area. The local knowledge of Mr

Crichton is underscored here and is recognised as invaluable in assisting to understand the project and local conditions. Key features identified during the inspection included:

- Council water supply bores & depths
- Old brick pit locations
- Low lying "problem" land
- Locality names eg Dixonville, Sandhills, Brewery Flat etc.

- Monday 23rd March 2020 – The writer in the company of Alex Rudd from McMahon Earth Science and Council's Project Engineer, Noel Crichton, carried out an inspection of the study area for the purpose of identifying representative and appropriate locations for soil samples to be taken. In addition, Mr Crichton introduced Mr Rudd to the locations of Council's town water supply bores for closer evaluation.

- Monday 23rd to Wednesday 25th March 2020 – The writer with assistance from Bob Callow, BEST Office Manager, carried out inspection of randomly selected, existing on-site sewage management systems.
  It was determined that a statistically accurate picture of existing conditions would be gained by inspecting approximately 10% of the existing septic and AWTSs. The original estimate of the total number of systems in the study area was 120, meaning 12 systems would have been selected at random. Following closer inspection and physically driving the area, noting the location of every dwelling and commercial premises, it was found that there were 139 premises with on site disposal systems. As a consequence, 14 systems were inspected and assessed with regard to risk.

- Friday 27th March 2020 – McMahon Earth Science staff attended the study area and carried out soil testing as detailed in Attachment 1 and Attachment D. Sixteen sites were sampled to a depth of 500mm. Three sites adjoining council's water supply bores were sampled to a depth of 3 metres.

Discussions with Project Engineer

Discussions with Noel Crichton occurred over the course of developing this report. These discussions were via telephone, email and face to face over the period of information collection and collation.

Spreadsheet Data

Base property data for the study area was provided by council. This data, amongst other things, included property lot numbers, deposited plan numbers, street address and owner information.

To this base data, the following additional information was inserted in separate columns, the aim being to facilitate separation of data and calculation of potential land yield:

- Street name separated from street number
- Locality ie Dixonville, Sandhills, South West or North West.

- "Excluded" or "Included" from potential for sewer connection. To elaborate, the excluded land can generally be described as meeting one or more of the following criteria:
    - Land is prone to flooding; &/or
    - Land is public land not for development (eg electricity sub station, cemetery etc); &/or
    - Already connected to reticulated sewerage.
- "Vacant", "House" or "Commercial"
- Approximate existing land area
- Subdivision potential "Yes" or "No". This based on whether existing buildings are located such that they preclude potential subdivision and also whether the land is too small already to permit future subdivision.
- Estimated number of new lots if subdivided to minimum 4,000 square metres (minimum size to support on-site sewage management systems).
- Estimated number of new lots if subdivided to minimum 1,000 square metres if sewered.
- Subdivision restriction. This notes whether or not there are any other perceived restrictions to development such as brick pits etc.
- Notes elaborating on any conditions and assumptions made with regard to each property.

The additional data, once inserted in the spreadsheet was then able to be used to estimate potential maximum yield of land should the land be sewered or not. In addition, the separate localities of Dixonville, Sandhills, South West Narrandera and North West Narrandera could be separated for the purpose of determining the approximate land yields in each area.

With the above comparative land yield information, potential maximum rate return could be estimated for sewered properties, giving Council some basis for income potential versus cost of sewerage installation.

Mapping

A pdf map of the study area was provided by Council. This map included lot, section and deposited plan numbers for each allotment.

The above map was used as the basis for a "Key Features Map" (Attachment 2 and Attachment A). The following information was added to the base map provided:

- Street names, bridge locations, rail lines, river and canal locations
- Public land unlikely to be developed eg cemetery, sewage treatment plant, electricity sub-station, old brick pits.
- Flood prone land (1 in 100)
- House locations
- Commercial premises locations
- Sewered properties
- Locations where on site sewage systems were inspected
- Soil sample sites
- Deep bore hole testing sites
- Known ground water bore locations

The map provides an “at a glance” view of the study area clearly giving the reader an overall view of the land which would be unlikely to be suitable for future development and also indicating the land remaining which might be sewered. The map also shows the density of current development, residential and commercial.

6. Results & Discussion

Performance of Existing OSSMS

There were found to be approximately 140 OSSMS within the study area. Approximately 10% of existing OSSMS within the study area were randomly selected and inspected to determine the level of performance, risk to the environment & public health. A risk assessment ranking of high, medium and low was allocated with the following results:

➢ **Risk Rating**	➢ **Number of Systems**
➢ **High**	➢ 4
➢ **Medium**	➢ 6
➢ **Low**	➢ 4

A standardised checklist in combination with a Risk Matrix & scoring system was used for the purpose of assessing the performance of the existing OSSMS. The detailed checklists and risk assessments for each property assessed are provided at Attachment 3. In addition, photographs showing examples of problems discovered during the inspections are included at Attachment 4. A comprehensive collection of all photographs taken are included in Attachment C.

From the above data it can be seen that there is a high percentage of systems that are of concern. This is despite the fact that the soils in the study area are highly permeable and therefore accept effluent readily.

Problems encountered with the systems inspected included such things as:

- X Poorly maintained systems such as effluent being irrigated above ground but no disinfection tablets present in the Aerated Waste Treatment System.
- X Effluent being siphoned from septic tank onto the ground, bypassing any approved, below ground, absorption trench.
- X Septic tank lids broken or otherwise providing access for vectors of disease such as flies, mosquitoes and/or vermin.
- X Undersized land area available for sub soil disposal, especially in relation to dwelling size and/or potential dwelling population.
- X Inaccessible septic tanks for the purpose of maintenance.
- X Children’s play equipment located in close proximity to effluent ponding on the ground.

It is the writer’s experience that rarely do owners and residents understand the health risks associated with OSSMS. In a majority of cases, OSSMS fail in terms of risk to public health and the environment.

Of particular concern are the higher density areas where small allotments of approximately 1,000 square metres exist. The southern portion of North West Narrandera locality around Audley Street and Twynam Street for example

As a side note, regardless of the final decision regarding "to sewer or not to sewer", Council should take steps to assess all the existing OSSMS to ensure that they are operating in a safe manner without risk to public health.

Soil Testing

McMahon Earth Science carried out extensive soil testing across the study area. Sixteen (16) soil samples were taken and, amongst other things, permeability tests conducted. In addition to these shallow (500mm deep) test sites, three deeper holes were drilled in close proximity to Council's town water supply bores.

The above testing found that with the exception of flood prone areas and one site off the Irrigation Way, the soils within the study area were suitable for on site disposal of sewage. The report confirms that of the 16 soil samples taken, 13 were sandy loam, 2 were loam and1 was clay loam.

The 2 loam sites are located at:

- Brewery Flat (WP13) ;and
- The extreme southern end of Woolscour Road (WP5).

The clay loam site is located at the extreme north western end of the study area adjoining Irrigation Way (WP12). It should be noted that based on this specific soil classification, particular attention must be made to the design and installation of any future OSSMS in this locality

All other locations were found to be sandy loam and highly suitable for on site sewage disposal.

Groundwater Bores

The McMahon Earth Science report also mentions the existence of a number of groundwater bores however specific information on the exact location of these proved difficult to find. Page 29 of the report shows 3 bores in the Dixonville locality and two bores at the southern end of Townsend Street in the South West Narrandera locality however the map accuracy was poor. As a consequence, the writer contacted council's Helen Ryan who conducted further enquiries and local investigations to provide a more accurate level of information regarding ground water bore locations. These have been included on the Key Features Map at Attachment 2 & Attachment A.

The reason that ground water bore information is important is because sewage disposal areas must not be located near them. Australian Standard 1547:2012 – On-site domestic wastewater management specifies buffers distances between effluent disposal areas and ground water bores of between 15m and 50m depending on the soil type. In sandy situations such as those that exist in the study area, the larger buffer zones are desirable.

In relation to ground water bores, suffice to say that any future approvals for subdivision of land and the installation of on site sewage management systems must consider the proximity of any existing ground water bores and diligent enquiries made regarding their exact location.

Disposal Area Sizes

The McMahon Earth Science report carried out modelling on the soil samples to determine the land area required for the above ground disposal of irrigated effluent from an AWTS and an assuming a range of house sizes from average to large. Disposal areas ranged from a minimum of 164 square metres to a maximum of 299 square metres. The McMahon Earth Science report also makes it clear that separate soil testing should be undertaken in each individual case and that the above figures should only be used as an approximation.

For the purpose of the calculations made in this report, the writer has taken a conservative approach and assumed the larger disposal area would be required in every case. In summary, a figure 300 square metres for an effluent disposal area has been used for the purpose of calculations when an AWTS is to be installed.

The McMahon Earth Science report did not elaborate on absorption trench options. The writer emailed Alex Rudd at McMahon Earth Science and obtained subsequent advice regarding the range of absorption trench lengths that would be appropriate for the soils in the study area. The range provided by Mr. Rudd in his response to was for loams rather than sandy loams and ranged from 47 metres to 65 metres in length. From this information, it can be safely assumed that for large homes in the study area, using traditional septic tank systems, a trench length of 65 metres would be adequate.

It should be stated here however that the McMahon Earth Science report makes it clear that site specific, individual testing and assessment should be carried out for any new systems to ensure that the effluent disposal area is accurately and comprehensively assessed and determined.

Septic Tank Versus Aerated Waste Treatment System

Ultimately it is up to the owner or applicant to decide what system they wish to install. As long as it is a system that is accredited by the NSW Health Department and approved by council.

Despite the choice being, to some extent, the owner's, it is also normal for the council's environmental health officer or building surveyor to provide advice to the applicant regarding options regarding OSSMS. The comments below may have no significant bearing on the outcomes of this report however they are included for information should council wish to continue with on site disposal in part or all of the study area. Notwithstanding that there are other locations throughout the shire that will continue to need on site disposal advice.

A personal opinion: The writer has personally inspected and assessed the operation of over 1,000 existing OSSMS. The majority of these have been traditional septic tanks with absorption trenches and AWTSs, these being the most popular options, at least in country NSW. The writer quite openly prefers traditional septic tanks for the following reasons:

- ✓ Septic tanks require much less maintenance whereas in the majority of cases, AWTSs must be serviced by an accredited technician every 3 months.

- ✓ The cost of servicing and electricity to run pumps and air blowers for an ATWS can be prohibitive, and many owners do not realise the critical nature of the servicing. Consequently, in many cases servicing is not done.
- ✓ If not maintained, unbeknown to the owner:
    - o Air blowers cease to work meaning limited or no aerobic treatment of the effluent.
    - o Chlorine tablets are not replaced meaning effluent is not disinfected yet it is still being irrigated above ground presenting a significant health risk through either direct contact or through indirect contact with vectors of disease.
    - o Sprinkler heads block up and cease to work resulting in ponding of effluent.
- ✓ Irrigation lines associated with AWTSs are easily tampered with by owners. This can result in the following:
    - o Lines are relocated to areas of human activity eg children's play areas, lawn areas near outdoor entertaining spaces and so on.
    - o Lines are (less often) moved to irrigate vegetable growing areas.
    - o Approved large droplet sprinkler heads are replaced with fine misting systems that result in effluent blowing over people on breezy days.
    - o Sprinklers are dispensed with altogether and the effluent is simply pumped out of sight "down the back" and quite often next to the neighbour's fence.

By contrast, a properly sized and constructed septic tank and absorption trench system is relatively maintenance free. Sludge removal from the septic tank is the only regular maintenance that generally should be needed, and this – depending on the population in the home – should only need occur every 5 to 10 years. There are no running costs such as electricity because most septic systems work using gravity.

Potential Land Yield On Site Disposal Versus Sewer Connected

As mentioned previously, a Properties Summary Spreadsheet (Attachment B) provided by council was updated with additional data including an approximation of the maximum number of new allotments that might be possible should owners choose to subdivide or carry out a boundary adjustment in the future.

It is worth mentioning that surprisingly, the study area has no specified minimum lot size under Council's Local Environmental Plan. As a result there are a considerable range of existing lot sizes from small blocks around 750 square metres facing Irrigation Way, to large tracts of land of many hectares. Whilst the smaller allotments mentioned may have been established many years ago, they represent a risk, or to put it another way, a potential "time bomb" should staff not be alert to the need for sufficient land area for proper and safe effluent disposal.

Two land areas were used to calculate the potential land yields in this report:

> Unsewered lots - The minimum land area was based on information provided by Council's Manager – Development & Environment, Garry Stoll. Mr. Stoll advises that historically council has required land to be a minimum 4,000 square metres to accept on site disposal of effluent.

Sewered lots - The minimum land area has been arrived at in consultation with Noel Crichton and in consideration of the traditional house block size and has been assumed as 1,000 square metres.

The results below are split based on locality so that Council can better see the potential should it be decided to sewer some but not all of the study area or to stage the sewer extension process over a number of years.

➢ **Locality**	➢ **Approx. number of additional 1,000 square metre allotments if sewered**	➢ **Approx. number of additional 4,000 square metre allotments if not sewered**
➢ Dixonville	➢ 542	➢ 125
➢ North West Narrandera	➢ 63	➢ 6
➢ Sandhills	➢ 16	➢ 1
➢ South West Narrandera	➢ 30	➢ 0

Public Health & Environment Based Priorities

Priorities below were generally established based on a hierarchy where risk to life safety, public health and environment were assigned the highest priority. In simple terms, the smaller the allotments and the closer that dwellings are to each other and to the individual effluent disposal areas, the higher the risk. It follows therefore that higher density areas, where there are more houses per square unit of measure, the higher the risk.

Vectors of disease, particularly flying insects such as flies and mosquitoes for example, having ready access to breeding sites such as poorly sealed septic tanks and/or ponding effluent are a major cause for concern.

The reader should bear in mind that in some respects, the priorities below are like "splitting hairs" since flies and mosquitoes are known to travel quite some distance, particularly depending on wind conditions, so the risks to public health are not dramatically reduced in what is essentially an urban situation.

The priorities, based on density of development, are in order with number one being the highest:

1. North West Narrandera –This locality, particularly around Audley and Twynam Street area, has the highest density of development and the smallest allotments.
2. South West Narrandera – The second highest density of development exists in this locality, east of the disused rail line. Some properties have so many buildings on them that there is little remaining for an adequately sized effluent disposal area.
3. Sandhills – This locality is not so densely populated with buildings and generally houses are further apart.

4. Dixonville – This locality remains relatively undeveloped in comparison to those previously listed. As such it still has the opportunity to be ear marked for installation of properly controlled and regulated on-site sewage management systems.

Logistical Considerations

The reader must bear in mind that the comments below are based on a general overview of the "lay of the land" only at this stage of reporting. No specific levels have been taken nor detailed design carried out in making the observations here.

Whilst the above priorities might be seen as the sensible order in which works should be carried out, the logical order is sometimes different. When considering the physical installation of sewer pipework and the path that pipework must follow to achieve maximum advantage from gravity flow, we arrive at a different and more sensible order of works.

It is observed that generally the land in the northern part of the study area is at a level higher than the existing main pumping station approximately located at the southern end of Adams Street.

The logical course of action would be to first extend sewer mains from the North West locality to connect with the Adams Street pump station if it has capacity to accept the additional effluent. Whether or not additional pump stations are required to achieve this is yet to be determined.

Regarding the Sandhills and South West Narrandera localities, it would seem counter productive to only connect the higher priority South West sector in exclusion of Sandhills given their close proximity and the fact that any new pipe system would have to pass through Sandhills to reach the Sewage Treatment Plant.

7. Summary

Provide Reticulated Sewage to North West, South West and Sandhills

In conclusion, and in consideration of both the public health risks and the logistical factors, it is felt that further detailed investigations occur regarding providing reticulated sewage services to the North West, South West and Sandhills localities.

Dixonville Earmarked for On Site Disposal with Extra Controls

If Dixonville is to remain unsewered, there should be some controls put in place to regulate further development of the locality.

Presently Council's Local Environmental Plan 2013 does not specify any minimum lot size and the land is zoned RU5 Village. As a consequence, every application for development must be considered on merit running the risk that undersized allotments and inappropriate uses may "slip through".

Appropriate zonings and policies give clear guidelines and boundaries for not only developers but also for staff.

It has been mentioned previously that the estimates in this report for lot yield where on site effluent disposal is permitted have been based on 4,000 square metres. This figure was provided by council staff and is supported by the writer. Such a limit on lot size in the Dixonville locality in combination with a zoning more reflective of the larger lot character of the area is strongly recommended.

In addition, clearer policy should be developed regarding council's requirements for the installation of OSSMS. Such policy should be consistent across the local government area and not simply focus on Dixonville. The policy would specify, amongst other things, the minimum requirements for soil testing and effluent disposal area design. The minimum size for septic tanks and AWTSs etc. Such a policy would not need to be highly prescriptive but at least set the boundaries around minimum standards of testing and documentation required with new applications.

8. Recommendations

1. That further detailed investigations occur regarding providing reticulated sewage services to the North West, South West and Sandhills localities.
2. That the Dixonville locality be identified for large lot development and on site sewage disposal.
3. That appropriate actions be taken to control development of Dixonville. Without limiting the generality of the aforementioned sentence, appropriate actions may include:
    a. Re-zoning;
    b. Setting a minimum lot size of approximately 4,000 square metres; and
    c. Developing a policy which sets standards for on site sewage management systems in Narrandera local government area.

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Justice of the Peace.

ATTACHMENTS

Attachment 1 – McMahon Earth Science Land Capability Assessment Report.

Attachment 2 – Key Features Map

Attachment 3 – Existing OSSMS Inspection Checklists and Risk Matrix Sheets

Attachment 4 – Photographic Examples of Problems Observed

Electronic (soft copy) Attachments **(see attached USB stick)**

A. – Key Features Map
B. – Properties Summary Spreadsheet
C. – Photographic Examples of Problems Observed
D. – McMahon Earth Science Land Capability Assessment Report
E. - All Photographs Taken During Inspections

100% renewables

NSW Planning, Industry & Environment

Narrandera Shire Council

Narrandera Shire Council

Climate Action Strategy (*Council Operations*)

24 November 2020

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Glossary of climate change & project abbreviations

Acronym	Definition
AC, DC	Alternating & direct current
ACCU	Australian Carbon Credit Unit
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AFOLU	Agriculture, Forestry and Other Land Use
APVI	Australian Photovoltaic Institute
ATA	Alternative Technology Association
B20, B50	Diesel blends with 20% and 50% biodiesel
BASIX	Building Sustainability Index
BAU	Business-as-usual
BCA	Building Code of Australia
BEEC	Building Energy Efficiency Certificate
BESS	Battery Energy Storage System
BMS	Building Management System
BEV	Battery electric vehicle
CDM	Clean Development Mechanism
C40	Network of the world's megacities committed to addressing climate change
CCF	Climate Change Fund
CER	Certified Emissions Reductions (offsets)
CFL	Compact fluorescent
CFD	Contract for Difference
COP	Coefficient of performance (refrigeration)
COP21	Conference of the Parties in Paris at which the Paris Agreement was reached
CO_2-e	Carbon Dioxide Equivalent
CPP	Cities Power Partnership
CPRS	Australia's Carbon Pollution Reduction Scheme
CSP	Community Strategic Plan
C4CE	Coalition for Community Energy
DOL	Direct On Line
DPIE	NSW Department of Planning, Industry and Environment
E3	Equipment Energy Efficiency program
EER	Energy efficiency ratio
EPA	Environmental Protection Authority
EPC	Energy Performance Contracting
EPC(M)	Engineer, Procure, Construct (Maintain)
ERF	Emissions Reduction Fund
ESB	Energy Security Board
ESC	Energy Saving Certificates
ESS	NSW Energy Savings Scheme
EUA	Environmental Upgrade Agreement
EV	Electric Vehicle
FiT	Feed-in-tariff

GFC	Global Financial Crisis
GHG	Greenhouse Gas
HVAC	Heating, ventilation, and air conditioning
ICE	Internal combustion engine
ICLEI	Local Governments for Sustainability
IPCC	Intergovernmental Panel on Climate Change
kWh, MWh, GWh	Units of energy – usually used for electricity
LED	Light Emitting Diode (lighting technology)
LGC	Large-scale Generation Certificate
MJ, GJ	Units of energy – usually used for gas
LGA	Local Government Areas
LPG	Liquefied Petroleum Gas
NABERS	National Australian Built Environment Rating System
NCC	National Construction Code
NDC	Nationally Determined Contributions by countries to meet Paris commitments
NEM	National Electricity Market
NCOS	National Carbon Offset Standard
NGA	National Greenhouse Accounts
NRMA	National Roads and Motorists' Association
NSW	New South Wales
OEH	Office of Environment and Heritage
O&M	Operation and maintenance
P2P	Peer to Peer trading of renewable energy
PHEV	Plug-in hybrid electric vehicle
PPA	Power Purchase Agreement
PV	Solar photovoltaic technology
REF	Revolving Energy Fund
RET	Australia's Renewable Energy Target
RMU	Removal Units (offsets)
ROI	Return on Investment
S1	Scope 1 greenhouse gas emissions, from combustion of fuel at your facilities
S2	Scope 2 greenhouse gas emissions, caused by consuming electricity
S3	Scope 3 greenhouse gas emissions, indirect emissions upstream and downstream of your business
SDGs	Sustainable Development Goals
SRES	Small-scale Renewable Energy Scheme
SPS	Sewer Pumping Station
STC	Small-Scale Technology Certificates
STP	Sewerage Treatment Plant
VCS	Verified Carbon Standard
VFD, VSD	Variable Frequency Drive / Speed Drive
VGA	Virtual Generation Agreement
VPPs	Virtual Power Plants
W, kW, MW	Units of power – usually used for electricity
WTP	Water Treatment Plant

1 Executive Summary

100% Renewables was engaged by the NSW Department of Planning, Industry & Environment: Sustainable Councils and Communities Program to develop a Climate Action Strategy with Narrandera Shire Council that will help it to cost-effectively increase the amount of renewable energy at its facilities, lower energy demand, and reduce costs.

This Strategy is focused on energy-related emissions associated with Council's operations facilities, which can demonstrate to the community that emissions reduction is feasible and cost-effective, and position Council as a leader in the community's climate action. Council's broader climate response can extend beyond this to encompass landfill and other waste emissions resulting from community activities (that Council manages), as well as emissions in the community from stationary energy use, transport, agriculture and other land use.

1.1 Suggested climate action goals for Narrandera Shire Council

Based on an assessment of Council's energy utilisation and of opportunities for energy saving and emissions reduction, the following targets or goals could be pursued by Narrandera Shire Council.

1.1.1 Energy efficiency and renewable energy goals

The scope for grid energy savings from energy efficiency and behind-the-meter solar PV (with battery energy storage) at Council's facilities is up to 797 MWh per annum or 31% of current electricity consumption. Deterioration of solar performance over time, and projects that progressively upgrade Council's sites and services can see some of this potential be reduced.

A suitable target for grid energy reduction for Narrandera Shire Council could therefore be 25% of 2019 consumption, achievable within the next ten years, and with much of this achievable through cost effective actions within the next five years. Good examples of the opportunities available to Council include upgrading all streetlights to LED technology, shifting energy demand at large water pumping and treatment sites, and solar PV at the Narrandera sewerage treatment plant (STP).

Additional savings in energy consumption may be feasible through purchasing of low emissions vehicles, however these will be small in the next ten years.

In addition to grid electricity reduction, Council can elect to source its electricity supply from renewable energy sources, and many Councils in NSW have already done this. While typically this covers all large-market sites only, it may be feasible to source clean energy for all Council sites within the next ten years.

Potential targets for Narrandera Shire Council to consider are:

- 25% savings in grid electricity by 2030 through energy efficiency and onsite solar PV
- Up to 100% renewable energy for Council's electricity supply by 2030, with all large-market sites to be supplied with renewables as soon as practicable and where no added risk or costs are borne by Council

1.1.2 Greenhouse gas emissions reduction goal

The achievement of the above targets would translate into greenhouse gas emissions savings of 70-75% by 2030, with the balance of emissions relating to transport, and in particular to diesel used by large vehicles and plant.

It will likely be feasible to switch to electric vehicles for passenger cars and some LCVs by 2030, however there is greater uncertainty about timing of electric options for other vehicles at this time.

Given this, a suggested emissions target for Narrandera Shire Council is:

- Up to 75% savings in greenhouse gas emissions from Council's facilities by 2030

1.2 Budget implications

A number of potential energy efficiency and behind-the-meter solar PV opportunities have been costed at a high level for this strategy. This estimates costs of $1.2 million for short, medium and long term actions, with annual cost savings based on current rates of around $250,000. Overall this represents a payback of under five years.

There will be additional costs (and benefits) through sustainable transport and other procurements over time. It is envisaged that Council would enter into a renewable energy power purchase agreement where there is no added cost or risk to Council compared with their normal electricity procurement process. This would be assessed at each procurement cycle, typically every two to three years, and it may be done via a group of Councils through RAMJO for example.

1.3 Council's energy and carbon footprint

In 2019 Council's carbon footprint for its operations was dominated by electricity consumption followed by diesel fuel consumption, as tabulated and graphed below.

TABLE 1: NARRANDERA SHIRE COUNCIL – CARBON FOOTPRINT 2019, ENERGY ONLY

	Emission source	Activity data	Units	Scope 1 t CO2-e	Scope 2 t CO2-e	Scope 3 t CO2-e	Total	%
	Diesel for fleet	280	kL	762		39	801	25.3%
	Petrol for fleet	24	kL	56		3	59	1.9%
	Ethanol for fleet	0.005	kL	0		0	0	0.0%
	Electricity used in council assets	2,214,878	kWh		1,794	199	1,993	63.0%
	Electricity used by streetlighting	346,183	kWh			312	312	9.8%
	Electricity use from solar PV	57,629	kWh				0	0.0%
	TOTAL:			**819**	**1,794**	**553**	**3,165**	**100.0%**

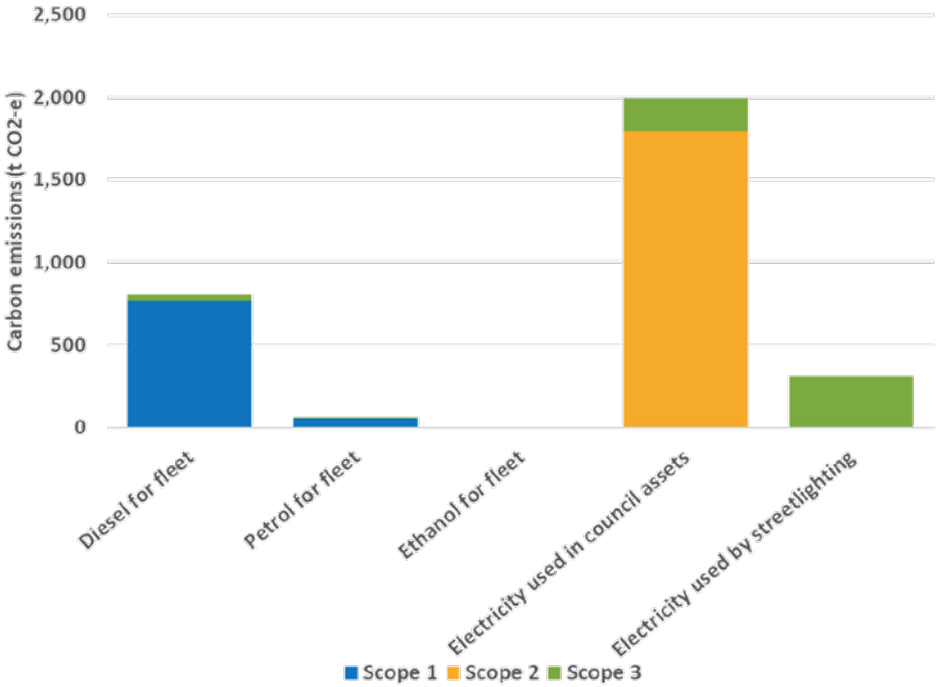

FIGURE 1: NARRANDERA SHIRE COUNCIL CARBON FOOTPRINT BY EMISSIONS SOURCE, ENERGY ONLY

Electricity use is dominated by a small number of large sites (including the main streetlighting account) and many individually small electricity using sites. The 'top 10' sites' use 79% of all Council's electricity.

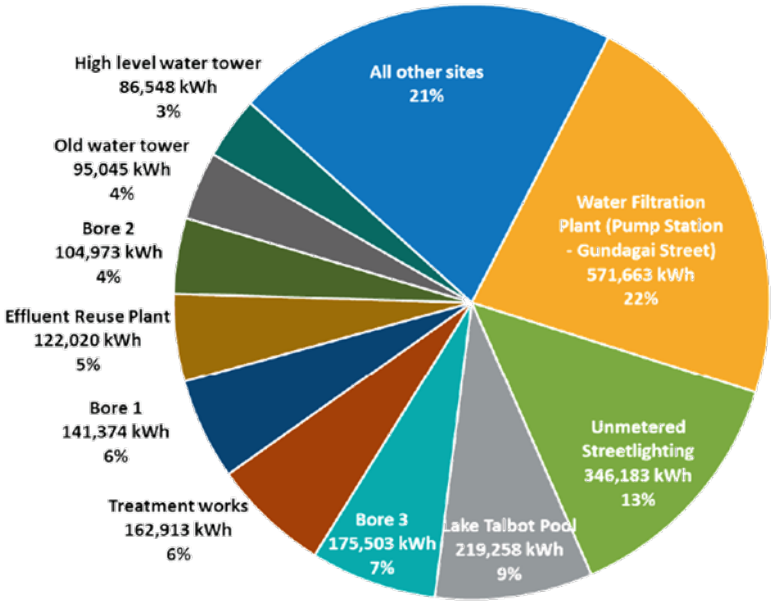

FIGURE 2: NARRANDERA SHIRE COUNCIL'S LARGE ELECTRICITY USING SITES

1.4 Efficiency, renewable energy & emissions reduction plans

A review of Narrandera Shire Council's current energy demand and carbon footprint, site visits and discussions with Narrandera Shire Council staff, suggest that there are six main areas of action by Narrandera Shire Council that, implemented together in a planned way, can significantly reduce energy demand, increase onsite renewables, and reduce emissions. These six areas are:

1. Grid decarbonisation
2. Buying clean energy (e.g. via a renewable energy power purchase agreement or PPA)
3. Behind-the-meter solar (i.e. onsite solar)
4. Energy efficiency
5. Sustainable transport
6. Sustainable procurement

Recommended action plans to achieve savings in Council's operations are tabulated below.

1.4.1 Short and medium-term action plan

TABLE 2: NARRANDERA SHIRE COUNCIL SHORT TO MEDIUM TERM PLAN FOR COUNCIL OPERATED SITES

Category	Sub-category	Site	Energy-saving option	Indicative cost
Energy efficiency	Metering and Accounts	Narrandera STP	Determine if the STP and Effluent Reuse Plant can be combined into a single NMI account to lower peak demand and supply charges.	Council confirming costs
Energy efficiency	VSD Control		Install a DO monitoring system to optimise the usage of existing VSD controls during aeration cycles.	$20,000
Behind the meter solar	Solar PV - Ground - STC		Install a 45.8 kW ground-mounted system in the field adjacent to the STP.	$59,540
Behind the meter solar	Solar PV - Ground - STC		ALTERNATIVE: Install an 80.6 kW ground-mounted system in the field adjacent to the STP if the STP and ERU meters can be combined	$104,780
Behind the meter solar	Solar PV - Ground - STC	Sewer Pump Station No. 1 Larmer Street	Install a 10.3 kW ground-mounted system in the field in front of the pump station.	$13,390
Energy efficiency	New Plant	Water Filtration Plant	Incorporate good practice energy efficient design into new works.	Not assessed
Energy efficiency	Power Factor Correction		Install a 135 kVAr PFC unit to reduce the demand charges.	$13,500
Energy efficiency	Scheduling		Implement load shifting of operations from peak to off-peak to reduce demand and energy charges.	Staff time
Energy efficiency	VSD Control		Investigate the costs and savings to install VSD control on the 2x 250 kW water pumps.	$200,000
Energy efficiency	Metering and Accounts	Old Water & High Water Towers	Determine if the Old Water and High Water can be combined into a single NMI account to lower peak demand and supply charges.	Council confirming costs
Behind the meter solar	Solar PV - Ground - STC	Red Hill Pressure	Install a 4.74 kW ground-mounted system in front of the pump station.	$6,162

		Booster Station		
Energy efficiency	LED Lighting	Unmetered streetlighting	Install LED streetlights for local roads.	$359,000
Behind the meter solar	Solar PV - Roof - STC	Truck Washbay	Install a 10.1 kW roof mounted system.	$10,100
Behind the meter solar	Solar PV + BESS - Roof - STC	Sports Stadium	Install a 14.7 kW roof-mounted system with 15 kWh battery.	$28,200
Energy efficiency	Metering and Accounts	Council Chambers	Determine if the 3 NMIs supplying the Chambers main building, HR & Finance and the bell tower can be combined into a single NMI account.	Council confirming costs
Behind the meter solar	Solar PV - Roof - STC		Install an additional 9.7 kW roof-mounted system on the roof of the Chambers building (with micro-inverters).	$9,700
Behind the meter solar	Solar PV - Micro-inverter - Roof - STC		Install an additional 10.1kW roof-mounted system on the roof of the HR building, provided the meter for this and the Chambers building can be combined.	$12,120
Behind the meter solar	Solar PV - Roof - STC	Meals on Wheels (One stop shop)	Install a 14.7 kW roof-mounted system on the roof of the centre.	$14,700
Energy efficiency	Power Factor Correction	Bore Pumps	Install a 135 kVAr PFC unit to reduce the demand charges.	$13,500
Energy efficiency	Metering and Accounts	All sites	Install smart meters on all significant sites to capture usage to facilitate consumption analysis and potential for solar and batteries.	TBC if this is a capex or on-bill cost
Behind the meter solar	Solar PV + BESS - Roof - STC	Depot	Install additional 25.5 kW roof-mounted system with 25 kWh battery to increase solar energy usage onsite.	$48,000
Sustainable transportation	EV Charging		Install EV charging station to charge PHEV or BHEV vehicles.	$12,000

Behind the meter solar	Solar PV - Carport - STC	Lake Talbot Pool	Install a 49.8 kW carport solar system.	$139,440
Behind the meter solar	Solar PV - Carport - STC		Install a 74.7 kW carport solar system.	$209,160

1.4.2 Long term action plan

A suggested long-term action plan for Narrandera Shire Council is outlined below.

TABLE 3: NARRANDERA SHIRE COUNCIL LONG TERM PLAN FOR COUNCIL OPERATED SITES

Category	Sub-category	Site	Energy-saving option	Indicative cost
Energy efficiency	Voltage Optimisation	Narrandera STP	Install a voltage optimisation system to control incoming voltage.	$7,000
Behind the meter solar	Solar PV - Micro-inverter - Roof - STC	Old Water & High Water Towers	Install a 15.1 kW roof-mounted system on the roof of Old Water reservoir (after the current reservoir is replaced)	$18,120
Behind the meter solar	Solar PV - Micro-inverter - Roof - STC	Old Water & High Water Towers	Install a 29.8 kW roof-mounted system on the roof of Old Water reservoir (after the current reservoir is replaced AND if the meters for the two water towers can be combined.	$35,760
Behind the meter solar	Solar PV + BESS - Roof - STC	Truck Washbay	Install a 25.1 kW roof-mounted system with 25 kWh battery on the roof of washbay.	$47,600
Behind the meter solar	BESS	Library	Install an additional 30 kWh battery to the existing solar PV system to increase solar energy consumption.	$27,000
Behind the meter solar	Solar PV + BESS - Roof - STC	Parkside Cottage Museum	Install a 3.02 kW roof-mounted system with 3 kWh battery on the roof of the museum.	$5,720
Behind the meter solar	Solar PV + BESS - Roof - STC	Community Cultural Hall	Install a 3.02 kW roof-mounted system with 3 kWh battery on the roof of the east gallery.	$5,720

Behind the meter solar	Solar PV + BESS - Roof - STC	Sports Stadium	Install a 14.7 kW roof-mounted system with 15 kWh battery.	$28,200
Energy efficiency	VSD Control	Pine Hill Pump Station	Install VSD control on the pumps supplying the Pine Hill reservoirs.	$10,000
Energy efficiency	UV Treatment		Install LED for UV systems at the STP	Not estimated

1.4.3 Continuous improvement

Based on the assessment of onsite measures, the current electricity market and sustainable transport opportunities, a suggested continuous improvement plan for Narrandera Shire Council is outlined below

TABLE 4: NARRANDERA SHIRE COUNCIL CONTINUOUS IMPROVEMENT PLAN FOR COUNCIL OPERATED SITES

Category	Sub-category	Site	Energy-saving option	Cost or resources required
Sustainable Procurement	Sustainable Procurement	All sites	Review Council's procurement policy and practices and consider adopting the updated Local Government Sustainable Procurement Guidelines to inform policy, training and specifications for buying products and services, such as sporting field LED lighting and split system air conditioning unit replacement for example.	Not estimated
Sustainable transport	Sustainable transport		Review options available to Council to progressively improve the emissions of its fleet, and opportunities to transition towards electric vehicles – including hybrid vehicle costs for passenger cars and LCVs, development of EV infrastructure, a trial of an electric vehicle, Council's fleet strategy and review process including obtaining data from telematics, staying abreast of technology, policy and incentives, and low-NOx and Euro 6 opportunities for large fleet and plant.	Not estimated
Buying clean energy	Renewable Energy Power Purchasing		Incorporate renewables as a procurement option in Council's next supply agreement.	Not estimated

Energy efficiency	Energy efficiency awareness		Promote a higher awareness of good energy saving practise and reward staff accordingly.	Not estimated
Energy efficiency	Scheduling	Bore Pumps	Implement load shifting of 5-8 pm load to off-peak hours for Bore 1, and review periodically to optimise performance and respond to any network tariff changes	Not estimated
Energy efficiency	Scheduling		Implement load shifting of 5-8 pm load to off-peak hours for Bore 2, and review periodically to optimise performance and respond to any network tariff changes	Not estimated
Energy efficiency	Scheduling		Implement load shifting of 5-8 pm load to off-peak hours for Bore 3, and review periodically to optimise performance and respond to any network tariff changes	Not estimated

Scope

Summary of the scope of work and approach

2 Approach and scope of work

100% Renewables was engaged by the NSW Department of Planning, Industry & Environment: Sustainable Councils and Communities Program to develop a Climate Action Strategy for Narrandera Shire Council that will help it to cost-effectively increase the amount of renewable energy at its facilities, and lower energy demand through efficiency measures. The scope of this project is outlined below, and is focused on Council's operations energy use and carbon emissions.

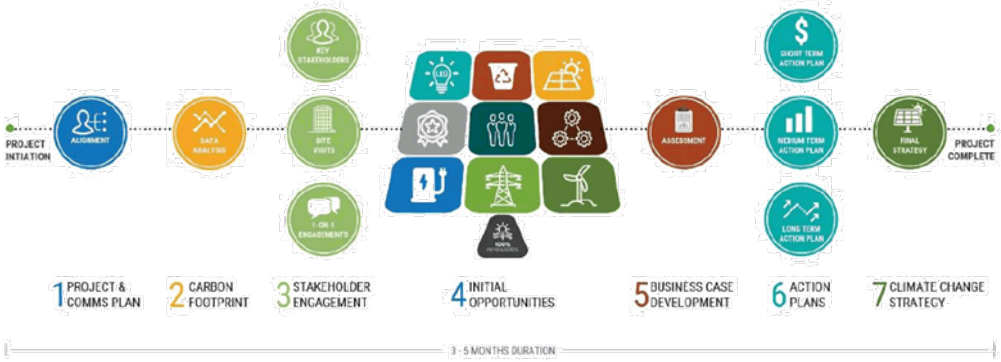

FIGURE 3: SEVEN-STEP PROCESS TO DEVELOP NARRANDERA SHIRE COUNCIL'S CLIMATE ACTION STRATEGY

- **Stage 1 – Inception**
  - Meet Council's key stakeholders and discuss the project plan
- **Stage 2 – Energy & carbon footprint**
  - Collect energy data from Council's energy management platform or billing
  - Analyse interval data where available
  - Develop energy & carbon footprint for Council operations
- **Stage 3 – Engagement**
  - Set up meetings / presentations with key stakeholders across Council
  - Set up and conduct site visits across key sites at Council
- **Stage 4 – Draft opportunities**
  - Develop draft opportunities in Excel for discussion with stakeholders
  - Circulate these opportunities to Council staff for input, discussion and prioritisation
- **Stage 5 – Business case development**
  - Model solar PV business cases, assess efficiency opportunities
  - Overview of sustainable transport and renewable energy power purchasing
- **Stage 6 – Action plans**
  - Develop short, medium and long term action plans for Council
- **Stage 7 – Climate Action Strategy Plan**
  - Draft Climate Action Strategy report
  - Conduct presentation of the plan to Council
  - Finalise Climate Action Strategy report

Background and Context

Factors underpinning climate action at global and sectoral levels

3 Global context for climate action and targets

3.1 The need to reach 'net-zero' greenhouse gas emissions

Due to all historical and current carbon emissions global temperatures have increased by ~1°C from pre-industrial levels. The main driver of long-term warming is the total cumulative emissions of greenhouse gases over time. As shown by the *Climate Action Tracker*[1] below, without additional efforts, human-caused carbon dioxide (equivalent) emissions may increase to over 100 billion tonnes annually by 2100, which is double current global emissions. The resulting increase in global temperatures would be up to 4.8°C (as per the IPCC Climate Change 2014 Synthesis Report[2]).

With current policies around the world, global temperatures are projected to rise by about 3.2°C. To prevent dangerous climate change by limiting global warming, close to 200 of the world's governments signed the landmark Paris Agreement. This Agreement underpins science-based targets to limit global temperature increase to well below 2°C by 2050. With current pledges, and if all countries achieved their Paris Agreement targets, it would limit warming to 2.8°C. To limit warming to 1.5°C, carbon emissions must decline sharply in the short-term and reach net-zero by mid-century.

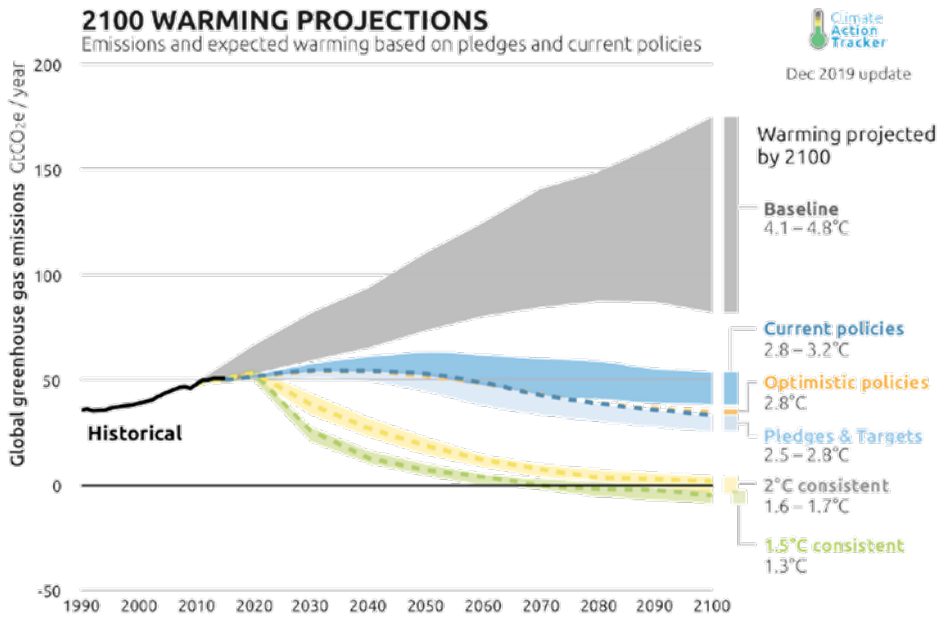

FIGURE 4: THE CLIMATE ACTION TRACKER'S WARMING PROJECTIONS FOR 2100, VARIOUS POLICY SCENARIOS

A net-zero target means that by the target date, there must be no greenhouse gas emissions on a net basis. For a local government's operations for example, this could mean:

1. Net-zero GHG emissions from stationary fuel combustion such as LP gas use, and
2. Net-zero GHG emissions from transport fuel combustion, and
3. Net-zero GHG emissions from electricity consumption, and
4. Net-zero GHG emissions from the treatment of waste generated by Council

[1] https://climateactiontracker.org/global/temperatures/
[2] IPCC Climate Change 2014 Synthesis Report

3.2 International drivers for climate action

Internationally, there are three primary drivers for urgent action on climate, additional to the second commitment period of the Kyoto Protocol from 2013 to 2020. These are:

1. **Sustainable Development Goals (SDGs)**

   In 2015, countries adopted the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals. Governments, businesses and civil society together with the United Nations are mobilising efforts to achieve the Sustainable Development Agenda by 2030[3]. The SDGs came into force on 1 January 2016 and call on action from all countries to end all poverty and promote prosperity while protecting the planet.

2. **Paris Agreement**

   To address climate change, countries adopted the Paris Agreement at the COP21 in Paris on 12 December 2015, referred to above. The Agreement entered into force less than a year later. In the agreement, signatory countries agreed to work to limit global temperature rise to well below 2°C, and given the grave risks, to strive for 1.5°C Celsius[4].

3. **Special IPCC report on 1.5°C warming (SR15)**

   In October 2018 in Korea, governments approved the wording of a special report on limiting global warming to 1.5°C. The report indicates that achieving this would require rapid, far-reaching and unprecedented changes in all aspects of society. With clear benefits to people and natural ecosystems, limiting global warming to 1.5°C compared to 2°C could go hand in hand with ensuring a more sustainable and equitable society[5].

FIGURE 5: GLOBAL CONTEXT FOR ACTION ON CLIMATE

In addition, the World Economic Forum's Global Risks Report 2020[6] highlights adverse climate change-related outcomes as among the most likely to occur with the highest impacts to the global economy.

[3] Sourced from https://www.un.org/sustainabledevelopment/development-agenda/
[4] Sourced from https://www.un.org/sustainabledevelopment/climatechange/
[5] Sourced from https://www.ipcc.ch/news_and_events/pr_181008_P48_spm.shtml
[6] http://reports.weforum.org/global-risks-report-2020/

The chart below from the WEF's report shows several key climate risks clustered in the top right corner; that is, these risks are assessed to be among the most likely to eventuate, with the greatest economic impact among all the global risks that were assessed.

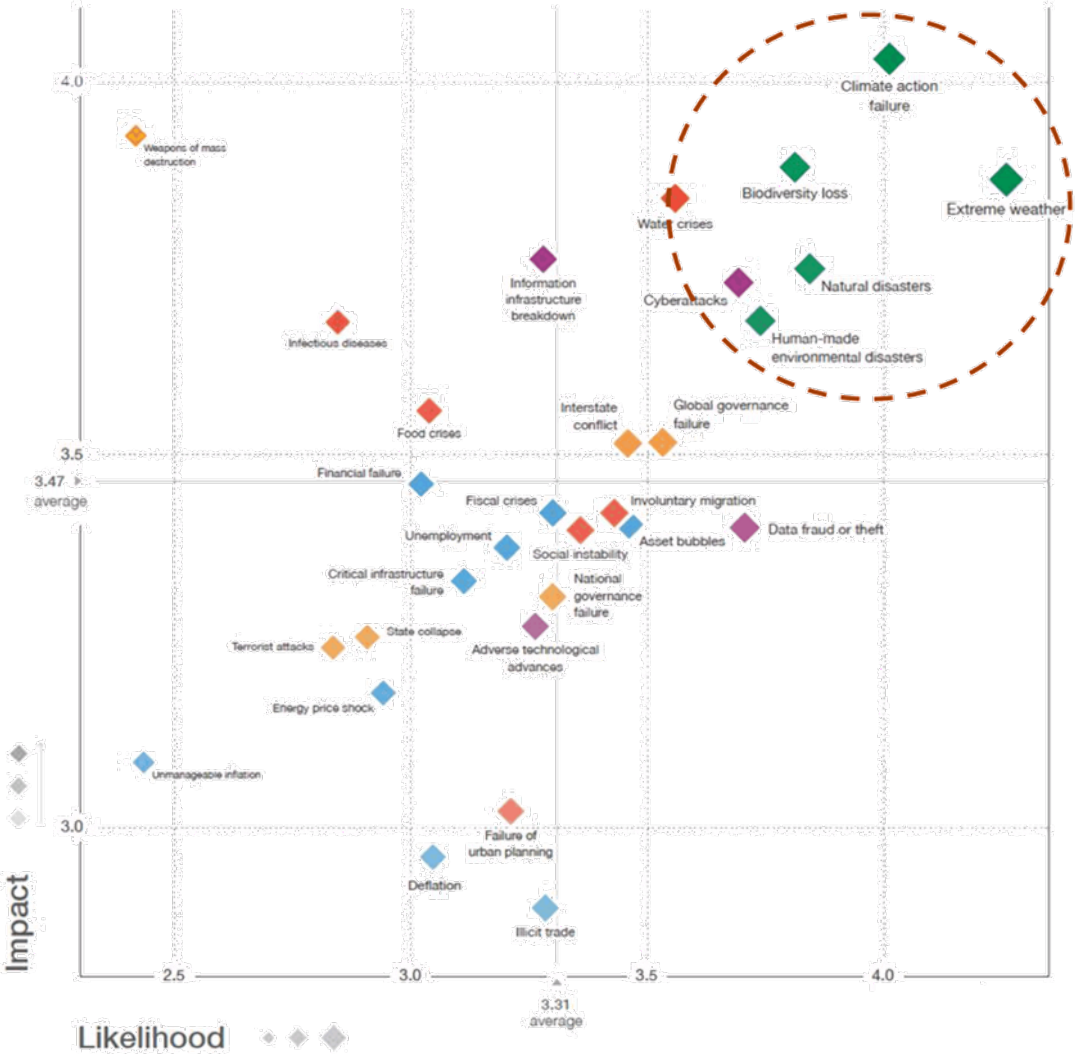

FIGURE 6: GLOBAL RISKS REPORT – LIKELIHOOD & IMPACT OF CLIMATE, OTHER RISKS TO GLOBAL ECONOMY

4 National and State Government action

4.1 National targets

At a national level, Australia's response to the Paris Agreement has been to set a goal for greenhouse gas (GHG) emissions of 5% below 2000 levels by 2020 and GHG emissions of 26% to 28% below 2005 levels by 2030. A major policy that currently underpins this is the Renewable Energy Target (RET). This commits Australia to source 20% of its electricity from renewable energy sources by 2020.

FIGURE 7: AUSTRALIA'S RENEWABLE ENERGY AND CARBON GOALS – NATIONAL LEVEL

According to the Clean Energy Regulator[7], the Renewable Energy target has been met and renewable energy generation will exceed the target by some 7,000 GWh.

The RET is the main successful policy underpinning Australia's climate mitigation efforts. Other key initiatives include the Climate Solutions Fund, formerly the Emissions Reduction Fund, which sources abatement from eligible activities in the economy via periodic auction processes. Despite these initiatives, Australia's GHG emissions have been rising steadily in recent years following a period of emissions reduction at the time of the Global Financial Crisis (GFC) and during the period of Australia's Carbon Pollution Reduction Scheme (CPRS).

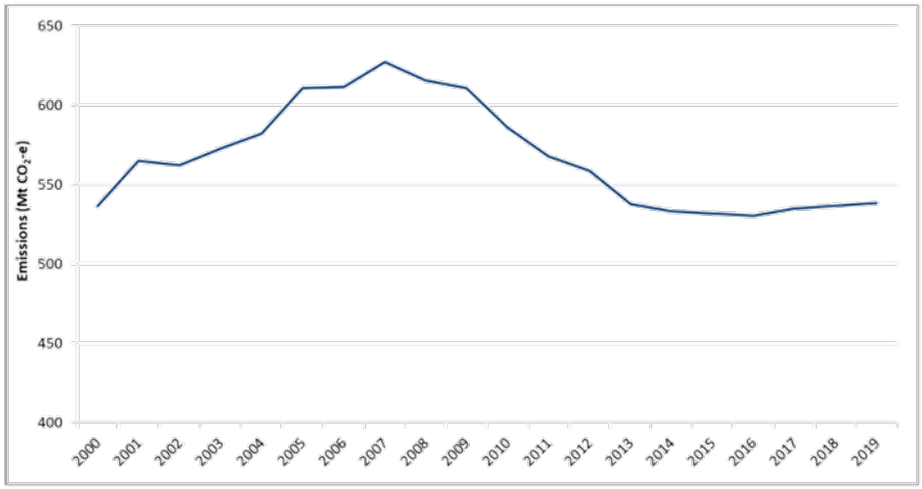

FIGURE 8: AUSTRALIA'S GHG EMISSIONS FROM ALL SOURCES

[7] March 2018, Australian Government – Clean Energy Regulator. 2018 Annual Statement to the Parliament on the progress towards the 2020 Large-scale Renewable Energy Target.

4.2 NSW State targets

At a sub-national level, most states and territories have established emissions targets as well as some legislated targets for renewable energy, as seen below.

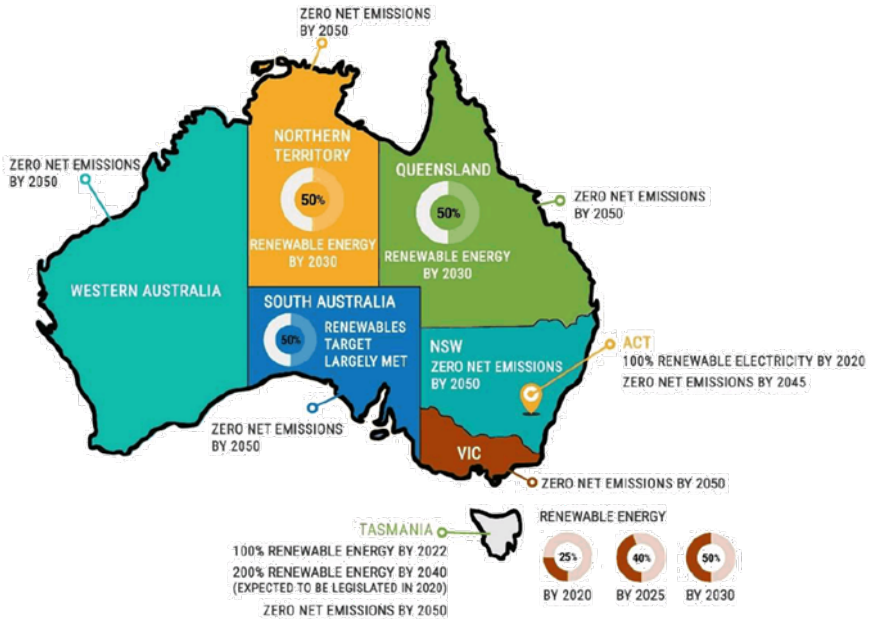

FIGURE 9: AUSTRALIA'S RENEWABLE ENERGY AND CARBON GOALS – STATE & TERRITORY LEVEL

Supporting the NSW Government's commitment to reach net zero emissions by 2050, NSW Government recently released its **Net Zero Plan Stage 1: 2020–2030**[8]. This is a big milestone that sees the first of three 10-year plans released that will set a pathway to net zero emissions by 2050.

In addition the NSW Government has developed an **NSW Electricity Strategy**[9] which will help the State to deliver on its goal to attract renewable energy investment. In the first instance a 3,000 MW renewable energy zone (REZ) in Central West Orana will be developed, attracting significant private sector investment to developing new generation assets in this region.

A larger 8,000 MW renewable energy zone is to be developed in the New England region, which is closer to Clarence Valley, with up to seven additional REZs' to be developed in future.

The figures below show the approximate locations of the Central West Orana and New England REZs'.

[8] © State of New South Wales 2020. Published March 2020
[9] https://energy.nsw.gov.au/renewables/renewable-energy-zones

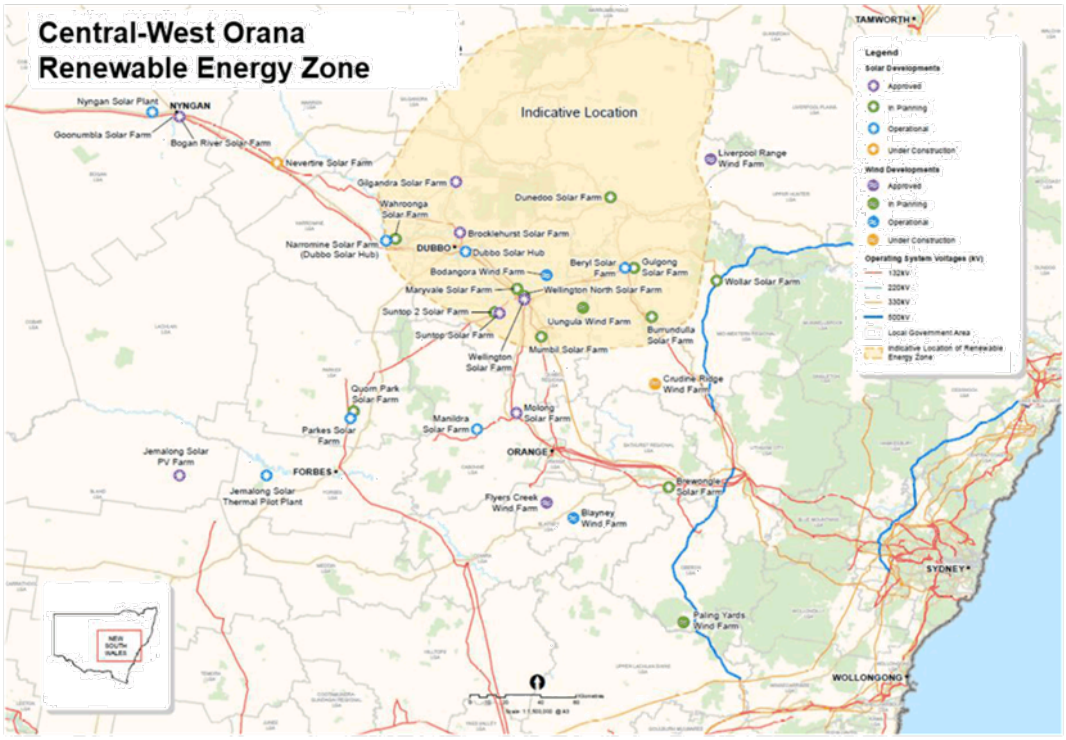

FIGURE 10: INDICATIVE CENTRAL-WEST ORANA NSW RENEWABLE ENERGY ZONE

FIGURE 11: INDICATIVE NEW ENGLAND NSW RENEWABLE ENERGY ZONE

Some of the key highlights of the 2020-2030 Net Zero Plan include:

- A central focus of the Plan is about jobs that will be created and about the lowering of energy costs for consumers. Many renewable energy jobs will be created in regional NSW.
- The Plan commits to breaking down barriers that remain to people and business investing in commercially-available technologies, such as energy efficient appliances and buildings, rooftop solar, firmed grid-scale renewables, and electric vehicles.
- The Plan commits NSW to reducing State emissions by 35% by 2030 and to net zero by 2050 and articulates this is a shared responsibility among business, individuals and governments.
- There will be a broadening of the focus of abatement to encompass low-carbon products and services and providing consumers with more information to influence buying decisions.
- Clarity on some of the funding, targets and programs that will help drive this change, such as:
    - $450 million Emissions Intensity Reduction Program
    - $450 million commitment to New South Wales from the Climate Solutions Fund
    - $1.07 billion in added funding via NSW and Commonwealth across several measures
    - Development of three Renewable Energy Zones in the Central-West, New England and South-West of NSW to drive up to $23 billion in investment and create new jobs
    - Energy Security Safeguard to extend and expand the Energy Savings Scheme
    - Expanded Energy Efficiency Program
    - Expanded Electric and Hybrid Vehicle Plan with the Electric Vehicle Infrastructure and Model Availability Program to fast-track the EV market in NSW
    - Primary Industries Productivity and Abatement Program to support primary producers and landowners to commercialise low emissions technologies
    - Target of net-zero emissions from organic waste by 2030
    - Development of a Green Investment Strategy, with Sydney as a world-leading carbon services hub by 2030
    - Enhancement of the EnergySwitch service by allowing consumers to compare the emissions performance of energy retailers
    - Advocate to expand NABERS to more building types, and improve both the National Construction Code and BASIX
    - Establishment of a Clean Technology Program to develop and commercialise emissions-reducing technologies that have the potential to commercially out-compete existing emissions-intense goods, services and processes
    - Establishment of a Hydrogen Program that will help the scale-up of hydrogen as an energy source and feedstock, and target 10% hydrogen in the gas network by 2030
    - Aligning action by government under GREP with the broader state targets through clear targets for rooftop solar, EVs, electric buses, diesel-electric trains, NABERS for Government buildings, power purchasing and expansion of national parks

Several of these initiatives will be of interest and benefit to Narrandera Shire Council and its community.

4.3 NSW local governments response to climate change

Much of the leadership on renewable energy and climate in Australia comes from local government. Prominent examples of how local governments are demonstrating leadership are highlighted below.

1. Cities Power Partnership or CPP is an initiative of the Climate Council and it represents Australia's largest local government climate action network with >120 councils. While this doesn't involve setting specific targets per se, the commitment to key actions can either serve as a set of de facto targets or can provide a basis from which to set targets in future. Key aspects of the CPP include:
    a. Making five action pledges to tackle climate change.
    b. Connection and sharing between participants.
    c. Access to a comprehensive online Knowledge Hub and Power Analytics tool to help track emissions, energy and cost savings.
    d. Councils can also access support from local and international experts.
2. Adoption and publication of ambitious targets for renewable energy and/or carbon emissions for Council operations and setting targets for renewables or emissions reduction in the community. The chart below shows the status of target-setting by local councils in NSW (at July 2020).

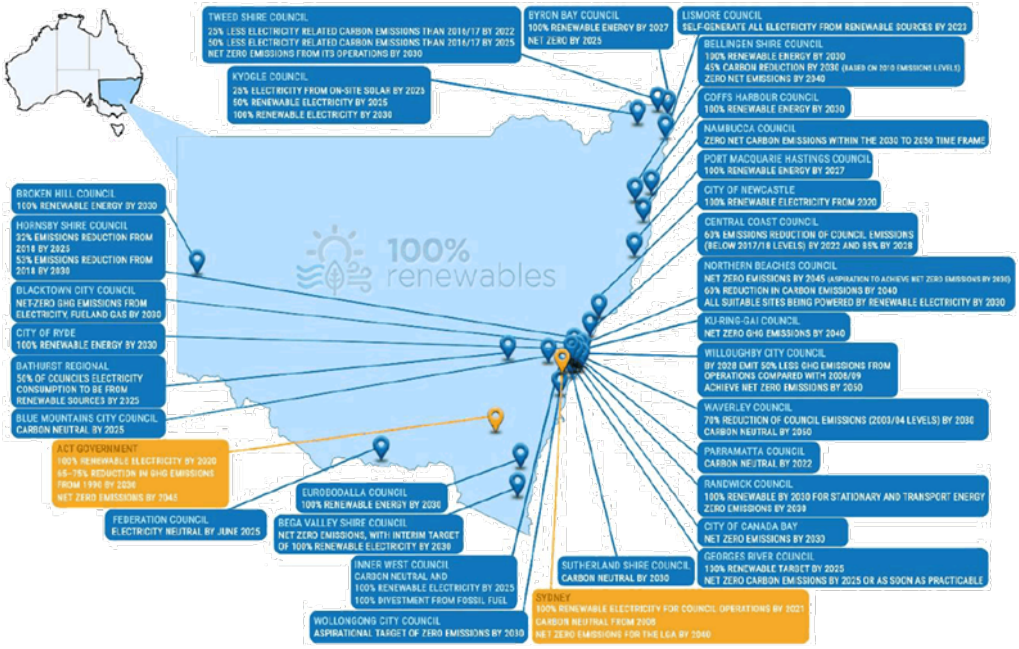

FIGURE 12: RENEWABLE ENERGY & CARBON TARGETS BY NSW COUNCILS & ACT

3. Many local councils across NSW have taken up opportunities as LED streetlighting has become available and approved for use, to upgrade their local and main road lights. Councils across NSW and across the three distribution networks have seen energy use and costs, as well as maintenance costs, fall dramatically as a result of these upgrades. Narrandera Shire Council is among those who will be upgrading their streetlights to LED in the near future.

5 Local trends – what is occurring in Narrandera Shire?

Narrandera Shire Local Government Area is in the upper middle of LGAs in terms of the uptake of solar hot water and solar PV systems. According to data sourced from the Australian Photovoltaic Institute (APVI), Narrandera Shire Council LGA has:

- 758 PV installations, a 25.6% penetration rate, at July 2020, with almost 5.5 MW of installed capacity. Refer to the APVI map with Narrandera Shire Council LGA details highlighted below.
- 67 installations over 10 kW and less than 100 kW, 690 installations of less than 10 kW, and 1 installation of over 100 kW.

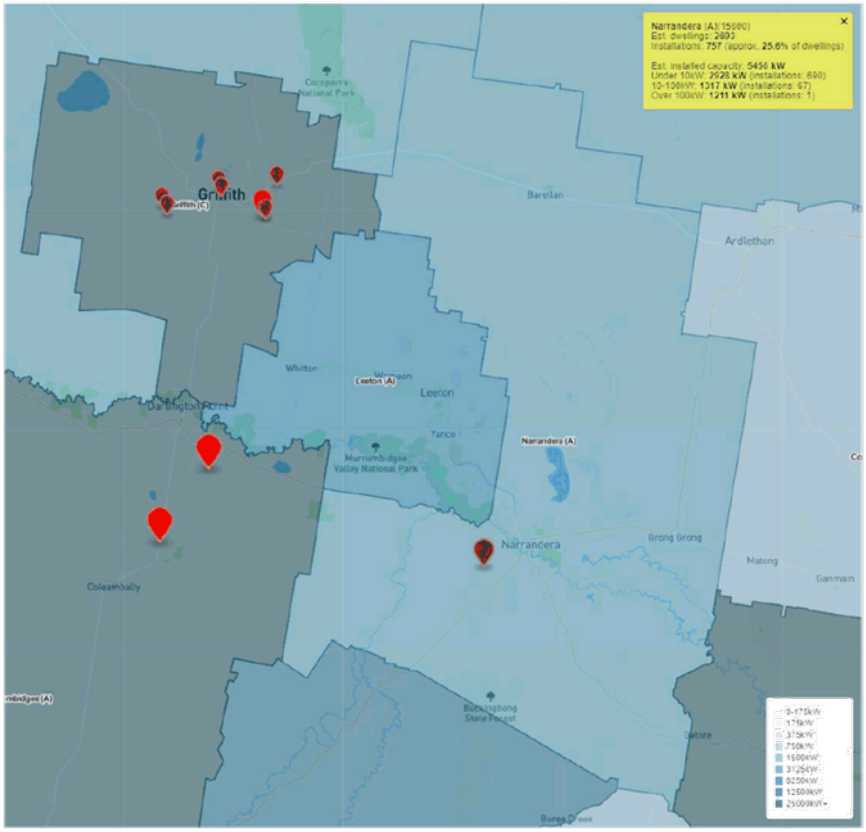

FIGURE 13: NARRANDERA SHIRE LGA SOLAR PV INSTALLATIONS, JULY 2020

Narrandera Shire Council has implemented a number of initiatives to reduce energy demand and cost. It is often the case that this is done as 'business-as-usual'. Examples, supplied by Council and observed from site visits, include:

- 20 kW solar PV installation at Narrandera Library
- 15 kW solar PV installation at Narrandera Shire Works Depot
- 15 kW solar PV installation at Narrandera Council Chambers
- VSD control of major motor drives in some of Council's sewer and water pumping systems
- LED lighting has been installed at most of Council's facilities such as offices, library, depot
- White Way and Festoon lighting in town has all been upgraded to LED technology
- Council has committed funding to upgrade all of its residential and main road lighting to LED technology

Baseline

Narrandera Shire Council's energy and carbon footprint

6 Council's 2019 energy use and carbon footprint

Council's energy use and carbon footprint were assessed based on energy consumption and emissions from landfill waste and wastewater, based on data supplied by Council covering the financial year 2018/19 and calendar year 2019. This reflects data availability for various emissions sources, and the inventory year is simply referred to as 2019.

In 2019 Council's carbon footprint for its operations was dominated by electricity consumption followed by diesel fuel consumption, as tabulated below. Waste from landfill, which Council operates but which reflects community greenhouse gas emissions, is also significant. Fugitive emissions estimates from wastewater pumping and treatment were not available.

TABLE 5: NARRANDERA SHIRE COUNCIL – CARBON FOOTPRINT 2019, ENERGY + LANDFILL WASTE

	Emission source	Activity data	Units	Scope 1 t CO2-e	Scope 2 t CO2-e	Scope 3 t CO2-e	Total	%
	Diesel for fleet	280	kL	762		39	801	16.8%
	Petrol for fleet	24	kL	56		3	59	1.2%
	Ethanol for fleet	0.005	kL	0		0	0	0.0%
	Electricity used in council assets	2,214,878	kWh		1,794	199	1,993	41.9%
	Electricity used by streetlighting	346,183	kWh			312	312	6.5%
	Electricity use from solar PV	57,629	kWh				0	0.0%
	Landfill waste	1,137	t	1,592			1,592	33.5%
	TOTAL:			**2,410**	**1,794**	**553**	**4,757**	**100.0%**

Outside of waste, Council's emissions are dominated by electricity as tabulated below.

TABLE 6: NARRANDERA SHIRE COUNCIL – CARBON FOOTPRINT 2019, ENERGY ONLY

	Emission source	Activity data	Units	Scope 1 t CO2-e	Scope 2 t CO2-e	Scope 3 t CO2-e	Total	%
	Diesel for fleet	280	kL	762		39	801	25.3%
	Petrol for fleet	24	kL	56		3	59	1.9%
	Ethanol for fleet	0.005	kL	0		0	0	0.0%
	Electricity used in council assets	2,214,878	kWh		1,794	199	1,993	63.0%
	Electricity used by streetlighting	346,183	kWh			312	312	9.8%
	Electricity use from solar PV	57,629	kWh				0	0.0%
	TOTAL:			**819**	**1,794**	**553**	**3,165**	**100.0%**

The above inventory summaries are repeated graphically below.

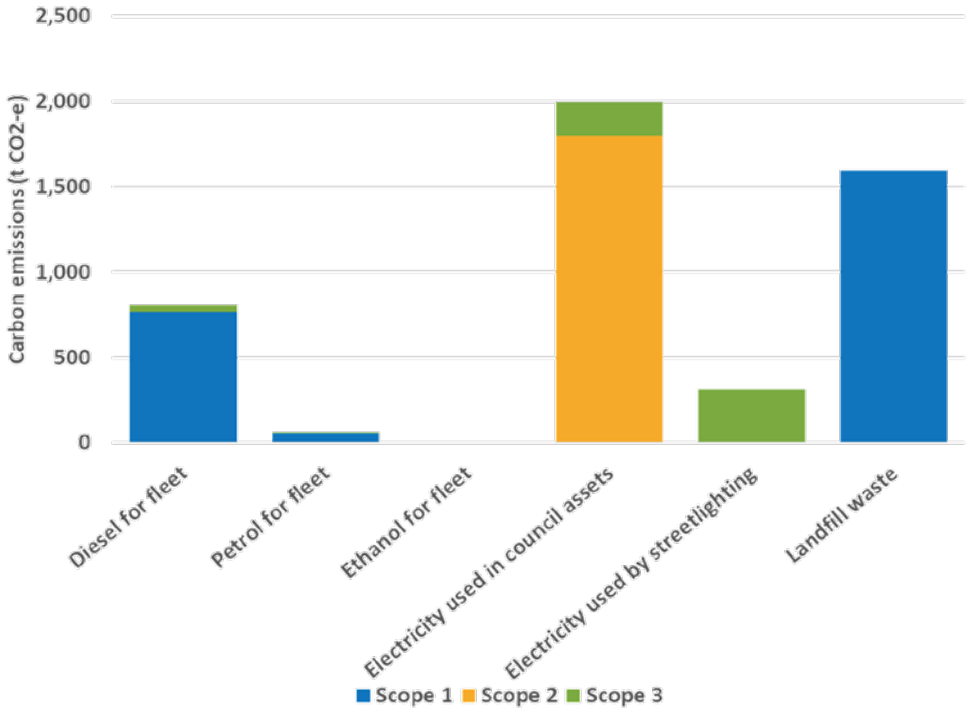

FIGURE 14: NARRANDERA SHIRE COUNCIL CARBON FOOTPRINT BY EMISSIONS SOURCE, ENERGY + WASTE

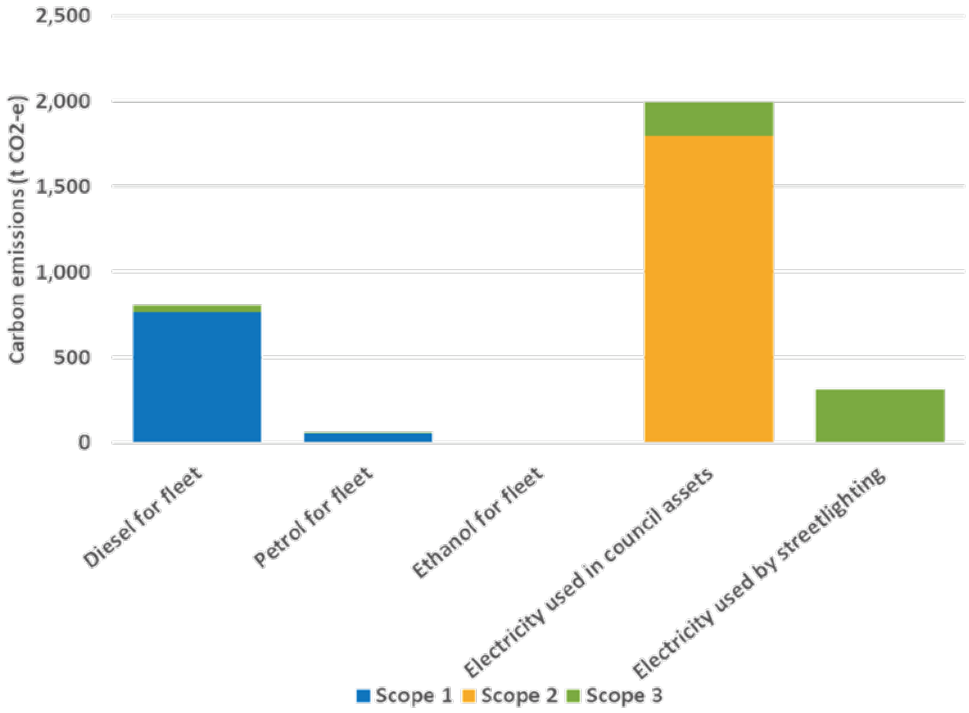

FIGURE 15: NARRANDERA SHIRE COUNCIL CARBON FOOTPRINT BY EMISSIONS SOURCE, ENERGY ONLY

6.1 Electricity consumption summary

As the main source of operational greenhouse gas emissions, electricity use was assessed further. The following three charts provide a summary of where and how electricity is used, including:

- Top 10 electricity using sites seen against the balance of consumption
- Electricity use by site type, and
- Estimated electricity end use by equipment type

Electricity use is dominated by a small number of large sites (including the main streetlighting account) and many individually small electricity using sites. The 'top 10' sites' use 79% of all Council's electricity.

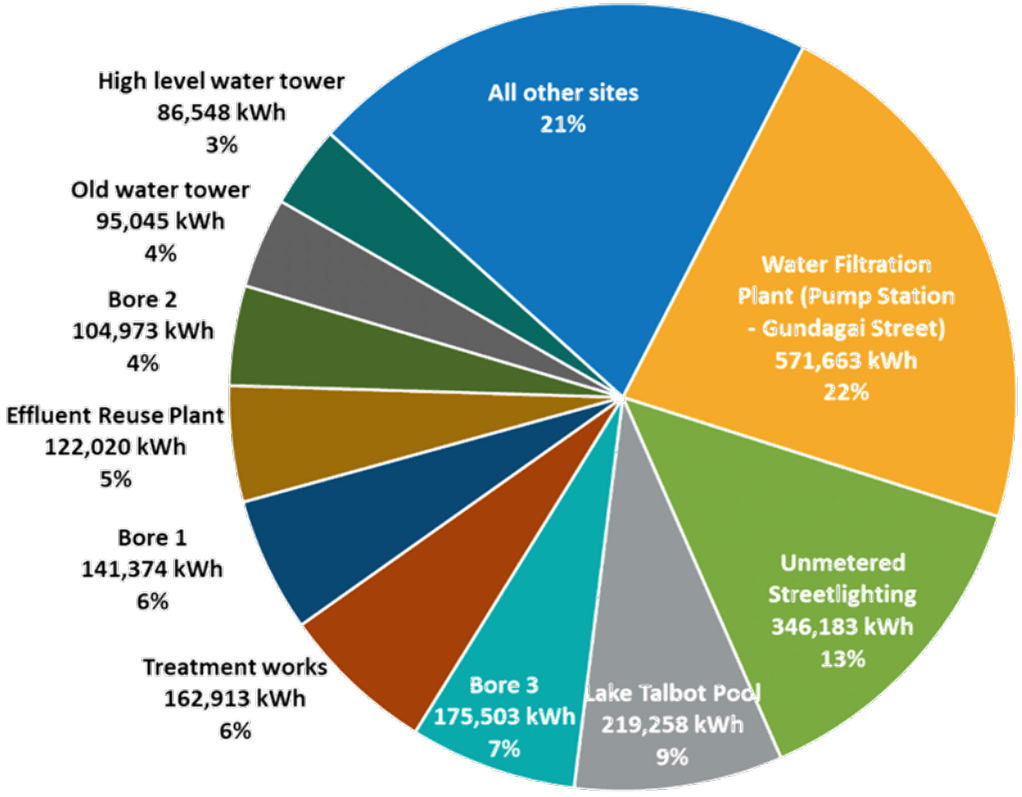

FIGURE 16: NARRANDERA SHIRE COUNCIL'S LARGE ELECTRICITY USING SITES

Viewed by site type it can be seen that water and sewer pumping assets consume 27% of Council's power, while water treatment plants use 22%, unmetered streetlighting uses 14% and sewage treatment plants use 11%. Council's swimming pools and buildings together consume 17% of power, and other sites are small users, aggregated into sports, parks, public lighting & amenities, depot, emergency services and other Council asset categories.

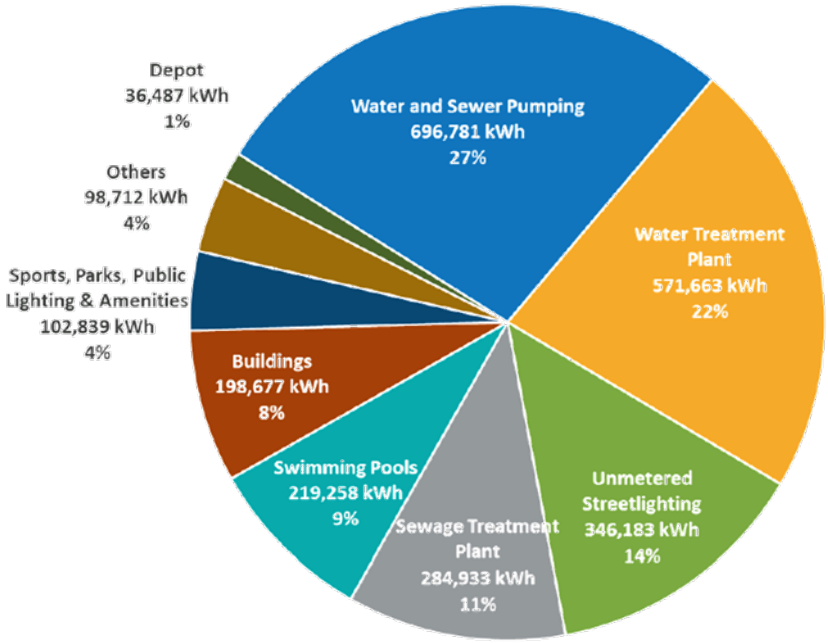

FIGURE 17: NARRANDERA SHIRE COUNCIL'S MAIN ELECTRICITY USING ASSET CATEGORIES

It is also possible to estimate the contribution by major equipment types to electricity use, based on experience with similar operations. The major equipment types include motor systems, lighting, air conditioning (HVAC) and power & appliances. The estimated contribution to Council's electricity consumption is illustrated below, highlighting motor systems and lighting as the major users, and likely the major focus areas for energy efficiency.

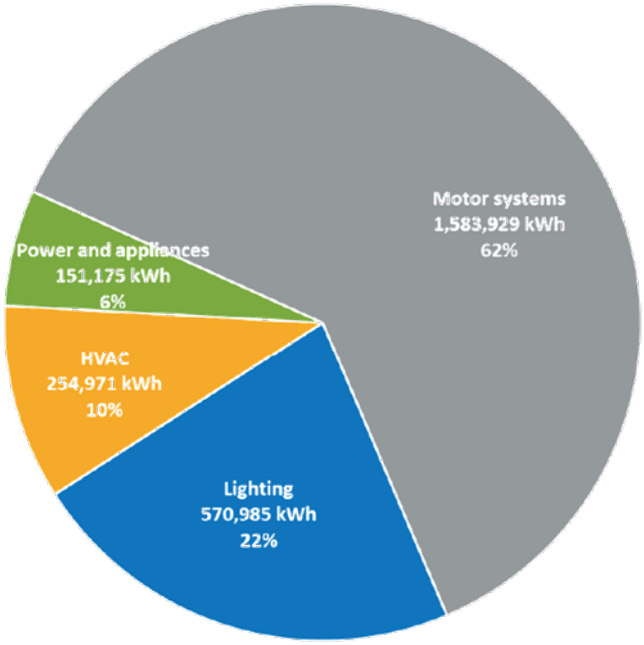

FIGURE 18: NARRANDERA SHIRE COUNCIL'S ELECTRICITY USE BY END USE EQUIPMENT

6.2 Landfill gas and wastewater emissions summary

6.2.1 Landfill gas emissions

Emissions from landfill are not the focus of this strategy. However, for completeness emissions are included in this work to provide a reference for Council as it considers its targets for carbon emissions in future, and action to reduce emissions by the Narrandera Shire community.

The 2019 landfill data was unavailable, hence, landfill data from 2017/18 was used. In 2017/18 emissions from landfill in Narrandera Shire were 1,591.8 t CO_2-e, from 1,137 tonnes of waste (see table below).

A total of 1,168 tonnes of waste was recycled in 2019.

TABLE 7: NARRANDERA SHIRE COUNCIL – CARBON FOOTPRINT 2019, LANDFILL GAS

	Emission source	Activity data	Units	Scope 1 t CO2-e	Scope 2 t CO2-e	Scope 3 t CO2-e	Total
	Landfill waste	1,137	t	1,592			1,592

6.2.2 Direct wastewater emissions

Council was not able to provide data for wastewater emissions in 2019. Emissions from wastewater should be included in future reporting of emissions by Council.

Climate Action Strategy

Narrandera Shire Council's emissions reduction opportunities

7 Narrandera Shire Council's emissions reduction options

7.1 Measures available to reduce Narrandera Shire Council's footprint

A review of Narrandera Shire Council's current operational energy demand and carbon footprint, site visits and discussions with Narrandera Shire Council staff, suggest that there are six main areas of action by Narrandera Shire Council that, implemented together in a planned way, can reduce energy demand, increase onsite renewables, and reduce emissions. These six areas are:

1. Grid decarbonisation
2. Buying clean energy (e.g. via a renewable energy power purchase agreement or PPA)
3. Behind-the-meter solar (i.e. onsite solar)
4. Energy efficiency
5. Sustainable transport
6. Sustainable procurement

These six measures are illustrated in the graphic below. Waste management was not included below as this was not the focus on this strategy. Following this, a summary of the scope, scale, cost-effectiveness and risks associated with each of these measures is presented that can enable the success of Council's abatement efforts. This is then followed by the presentation of action plans that will enable Narrandera Shire Council to achieve its goals.

Action plans are based on analysis of information and data, visits to numerous Narrandera Shire Council facilities with experienced staff, and discussions with key stakeholders.

FIGURE 19: SIX CATEGORIES OF EMISSIONS REDUCTION FOR NARRANDERA SHIRE COUNCIL

7.2 Grid decarbonisation

Description

In NSW there are five coal-fired power stations with combined 10,240 MW capacity that supply most of the State's electricity and make up the majority of NSW electricity sector emissions (Liddell, Vales Point B, Eraring, Bayswater, Mt Piper).

The state is largely self-reliant for power, with this supplemented by interstate links as and when required. Since 2010 three coal-fired power stations with 1,744 MW of capacity have closed in NSW (Wallerawang C, Redbank and Munmorah).

In recent years nearly 800 MW of large-scale solar and over 5,500 MW of wind energy generation has been built in NSW, together with nearly 2,350 MW of rooftop solar PV capacity, and in recent years rooftop solar installations have accelerated.

A total of 11,000 MW of capacity in two Renewable Energy Zones was recently announced for the State's Central West Orana and New England regions.

As more coal-fired power stations approach the end of their life – announced closures are in 2022, 2028, 2034, 2035 and 2043 respectively for the five active coal-fired power stations noted above – they are most likely to be replaced with renewable energy. This is most likely to be from large-scale wind and solar PV, together with Distributed Energy Resources (DER) and demand-side measures.

Assuming this, the future carbon intensity of the NSW grid could – simplistically – look something like the chart below (note that grid emissions factors are on a 3-year rolling average, leading to an apparent lag in emissions reduction compared with the above closure dates).

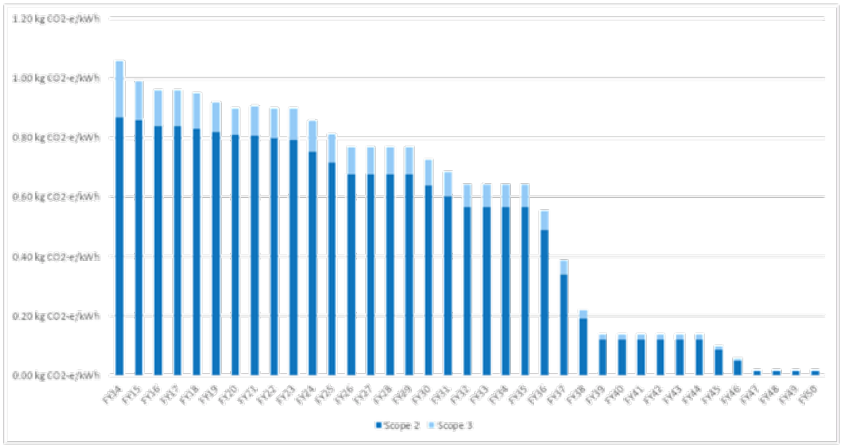

FIGURE 20: SIMPLISTIC FORECAST MODEL OF NSW GRID EMISSIONS INTENSITY

The actual grid emissions intensity will be influenced by a range of factors, and AEMO's Integrated System Plan 2020 [10] (ISP2020) models five scenarios with differing assumptions for key influencing factors including demand drivers, DER uptake, emissions, large-scale renewable build cost trajectories, investment and retirement considerations, gas market settings and coal price settings, together with assumptions regarding policy settings and transmission infrastructure development.

[10] AEMO: https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2020-integrated-system-plan-isp