

NT RESOURCE RECOVERY

A Division of Transpacific Industries Pty Ltd - A.C.N. 010 745 383

PUBLIC ENVIRONMENTAL REPORT

**Liquid Waste Treatment Facility
Mendis Rd, Hudson Ck, Darwin, NT**

October, 2000

NT RESOURCE RECOVERY
LIQUID WASTE TREATMENT FACILITY

PUBLIC ENVIRONMENTAL REPORT

PREPARED BY:

TRANSPACIFIC INDUSTRIES PTY LTD
P O BOX 1049
TOOWONG Q 4066

TELEPHONE: (07) 3870 7511
FACSIMILE: (07) 3870 7460

PREFACE

The development for the Liquid Waste Treatment Facility at Hudson Creek, Darwin was commenced in 1999 when the land at Mendis Road was purchased by the proponent, N T Resource Recovery. A Development Application was submitted November 15, 1999 to the Minister for Lands, Planning and Environment ("DLPE") for determination.

The DLPE determined that the proposal required assessment under the Environmental Assessment Act. The assessment was determined to be at the level of a Public Environmental Report. Terms of Reference have been issued by the Minister following governmental and public comment on the proposal. This document addresses the terms of reference and, following further comments provided by the DLPE following preliminary review of the draft PER, represents the final version for public and governmental comment.

Details of the proposed development are outlined below:-

Proponent:	N T Resource Recovery
Premises referred to:	Lot 4 (Section 5109) Mendis Road Hudson Creek, DARWIN, NT
Date of Development Application Lodgement:	November 15, 1999

OBJECTIVES

The proponent, N T Resource Recovery (NTRR), has identified the need for a liquid waste treatment facility capable of treating, storing, recycling, transporting a variety of industrial wastes in the Northern Territory.

Many current waste disposal practices are poorly managed or controlled, wasteful or, most importantly, conducted in a manner which transfers significant risks from industries to the environment. Unfortunately, these types of environmental impacts such as air pollution and soil contamination generally have long term effects without a reduction in the hazard potential and require considerable expense to remedy.

These practices are often representative of best available treatment which in turn is influenced by a lack of available resources and readily accessible technology.

The NTRR Liquid Waste Treatment Facility will be a purpose built waste management facility capable of storing, treating and disposing of most industrial wastes. Briefly, biodegradable wastes will be used as a nutrient additive in composting and land remediation, used oils will be recovered and recycled, industrial wastes will be treated to a level that poses negligible risk to the receiving environment, and waters from industrial wastes will be biologically treated to a quality suitable for re-use on-site or discharge to the PAWA lagoons.

The treatment facility will be supported by a laboratory, workshop, administration and a fleet of road tankers.

The facility is to be located on 1.8 hectares of Crown Leasehold land within the East Arm Control area and the Trade Development Zone, some 5 kilometres east of the Port of Darwin. The location of the proposed LWTF in the East Arm Control area is designed to utilise the geographical and commercial advantages of the Port region and the proximity to the City of Darwin.

The purpose of the facility and its operations is for NTRR to offer an environmentally responsible service in all aspects of waste management to industries in the Darwin region.

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Philip Bell	<i>Philip Bell & Partners, Consulting Engineers</i>

The supply of meteorological data from Queensland University of Technology Library and the Australian Meteorological Bureau is appreciated.

ABBREVIATIONS

ADG	Australian Dangerous Goods Code
AHD	Australian Height Datum
AIP	Australian Institute of Petroleum
ANZECC	Australian and New Zealand Environment and Conservation Council
ARI	Average Recurrence Interval (of an event, typically a rain storm)
AS	Australian Standard
BOD _{5-day}	Biochemical Oxygen Demand
CFS	Chemical Fixation, Stabilisation & Solidification
CPS	Coalescing Plate Separator
DAF	Dissolved Air Flotation
DLPE	Department of Lands, Planning and Environment
DUAP	Department of Urban Affairs and Planning (New South Wales)
EIS	Environmental Impact Study (or Statement)
EPA	Environmental Protection Agency (or Authority)
DEP	Department of Environmental Protection (West Australia)
HAZOP	Hazard and Operability Study
HIPAP	Hazardous Industry Planning Advisory Paper
IBC	Intermediate Bulk Container
LWTF	Liquid Waste Treatment Facility
MSDS	Material Safety Data Sheets
PAWA	Power & Water Authority
PAH	Polynuclear Aromatic Hydrocarbons
PER	Public Environmental Report
TCLP	Toxicity Characteristic Leaching Procedure
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Carbon Compounds

STRUCTURE OF THE PUBLIC ENVIRONMENTAL REPORT

The following protocol was followed to identify and prioritise issues in the preparation of the PER.

- (1) Terms of Reference that the Minister for Lands, Planning and Environment required to be specifically addressed in the PER (February 20, 2000).
- (2) Environmental Assessment Act 1982.
- (3) West Australian Environmental Protection Authority: *Environmental Reviews - Guidelines for Proponents*, 1993.
- (4) Department of Lands, Planning and Environment comments in response to the Draft PER (May 16, 2000).
- (5) Guidance in respect to the form and content of the New South Wales Department of Urban Affairs and Planning: *Chemical Facilities - EIS Guideline*, 1996.

The form and content of this Public Environmental Report (“PER”) closely follows the requirements for a PER as given in correspondence from the Department of Lands, Planning and Environment, that outlined in *Environmental Reviews - Guidelines for Proponents*, published by the Environmental Protection Authority (WA), and that given in the *EIS Guideline : Chemical Facilities*, published by the Department of Urban Affairs and Planning (NSW) in September, 1996.

The basic structure is outlined below. Appendices to the PER contain specific, detailed information relating to the development proposal.

	Preface
	Acknowledgments
	Abbreviations
Section 1	Executive Summary
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Section 3	Existing Environment
Section 4	Environmental Impacts
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1.0 EXECUTIVE SUMMARY

1.1 Title of the Proposal

This document is the Public Environmental Report for the Liquid Waste Treatment Facility proposed by N T Resource Recovery at Mendis Road, Hudson Creek, Darwin, N T.

1.2 Name and Address of the Proponent

***NT Resource Recovery
P O Box 1049
Toowong Qld 4066***

Attention: Mr Geoff Sparks

Ph: (07) 3870 7511 Fax: (07) 3870 7460

NT Resource Recovery is a division of Transpacific Industries Pty Ltd (A.C.N. 010 745 383), the Queensland-registered parent company of a large group of companies involved in waste management in Australia.

1.3 Introduction

NT Resource Recovery, a division of Transpacific Industries Pty Ltd, proposes to build and operate a liquid waste treatment facility at Mendis Road, Hudson Creek with a nominal capacity of 20 ML per year.

The facility will provide waste management support to the port and maritime industries located within the East Arm Control area and the Trade Development Zone and receive, store, treat and despatch non-sewerable liquid wastes from industries within the Darwin region. Such a facility will provide an outlet for industrial wastes and used lubricating oils that have the potential to be serious environmental contaminants.

The by-products of the treatment processes can be reused as in the case of lubricating oils, can be used as a nutrient additive in the case of the biodegradable wastes or co-disposed with general refuse at an approved landfill as a non-hazardous solid waste.

The proposal to build a Liquid Waste Treatment Facility was referred to the Department of Lands, Planning and Environment in November, 1999. The Minister for Lands, Planning and Environment determined that the Project would be assessed as a Public Environmental Review (PER) under the *Environmental Assessment Act*. This PER is submitted to satisfy the Terms of Reference developed by the Department in response to public and internal government reviews.

The PER has found that such a facility will have a minimal environmental impact as an operational facility but will have a significantly beneficial impact on waste management in the region and so limit the potential for environmental damage from inappropriate disposal.

The facility, its operation and products are entirely compatible with the principles of Ecologically Sustainable Development and incorporate the concept of extended producer responsibility.

All potential environmental factors associated with the proposal were identified, for which the environmental objectives, management strategies and outcomes for each factor were tabulated (Table 1.2). Those key environmental factors requiring further investigation and/or discussion in the PER were identified in consultation with the Department of Lands, Planning and Environment.

The focus of this document is to address those key environmental factors which have the potential to cause biophysical or social effects, or which are known to be of public interest as identified in the Terms of Reference for the PER.

1.4 Benefits of the Project

Capital expenditure for the entire project will be in the order of \$2million, of which the major cost items will be process equipment, construction costs and supplies. It is anticipated that the majority of all equipment contracts and supplies will be provided by Northern Territory businesses. The Liquid Waste Treatment Facility will result in the employment of a construction workforce averaging ten (10) people and an initial operational workforce of six to ten employees.

The most significant benefit of the facility will be associated with the regulated processing of some non-sewerable liquid wastes generated in the course of business in a cost effective and efficient manner based on a “*user pays*” philosophy, i.e., at no cost to the rate or tax payers with the generators incurring the cost of waste treatment and disposal.

With the enforcement of environmental legislation there is a necessity for wastes generated in the course of industry to be properly and effectively treated prior to disposal using best available technologies. Responsible environmental management, particularly in terms of waste management, has become essential company practice due to legislative impacts and the expectations of the corporate sector and general community as a whole. Industries are required to meet their obligations for due diligence in their activities and maintain a duty of care for the environment.

NT Resource Recovery believes that industry in the region would benefit from the availability of a state-of-the-art treatment facility which would act as a catalyst for future industrial growth in the area. The proposed facility will perform a vital role in liquid waste management in the Port of Darwin and the surrounding area.

NT Resource Recovery believes that the protection of the environment is the responsibility of the whole community and that private enterprise can work closely with the public sector to achieve the goal of Ecologically Sustainable Development (ESD).

The concept of Ecologically Sustainable Development (ESD) can be defined as the ability of each generation to support its own material needs without denying future generations the same opportunity. The principles include equity between generations, the precautionary principle, the conservation of resources, accountability for one’s actions and the protection, restoration and enhancement of the quality of the environment.

The proposed LWTF not only complies with all such concepts but also enables many other industrial activities to achieve ESD in their own particular business operations.

1.5 Project Background and Justification

In 1999, the Northern Territory Government enacted the Waste Management and Pollution Control Act which requires businesses to comply with a General Environmental Duty in the conduct of their activities.

This duty requires any person or company undertaking an activity which causes or may cause environmental impacts to take all reasonable steps to minimise the environmental harm and to reduce the generation of wastes. With the enforcement of the Act there is a necessity for a waste service to provide effective and appropriate methods of waste management such as collection, transport, treatment, storage and disposal in the Darwin region. The Liquid Waste Treatment Facility will be designed to meet the needs of the Northern Territory and will be a purpose-built facility capable of providing an essential mechanism to industries in meeting their General Environmental Duty.

The site is located near the new East Arm Port and NT Resource Recovery believes that the facility will perform an important role in liquid waste management to the maritime industry and the Northern Territory region.

It is expected that the provision of an advanced treatment facility capable of offering best available technology should significantly reduce uncontrolled environmental impacts from liquid wastes. Additional benefits will include “cradle to grave” management of wastes, reductions in contaminated sites and a reduction in the long term risks to the Government and the general community.

The proximity of the facility to the Port of Darwin will enable NTRR to provide waste management services to the shipping and maritime support industries such as cleaning of shipping containers, hull washings, and the collection and disposal of ships’ sewage, bilge wastes and bunker oils.

1.6 Description of the Project

1.6.1 General

The Mendis Road site has been prepared within an industrial subdivision by Paradise Developments and includes the necessary subdivision, earthworks and off-site stormwater drainage, and connection of services. NTRR will provide project supervision of the design, construction and, ultimately, operational control of the Liquid Waste Treatment Facility (“LWTF”). For the purposes of this PER, the starting point for the project is the commencement of construction of the LWTF.

1.6.2 Summary of the Proposal

The proponent, N T Resource Recovery (“NTRR”) has identified a need for a facility capable of treating liquid industrial wastes in the Northern Territory.

NTRR proposes to build and operate a liquid waste treatment facility for a wide range of industrial, commercial and domestic wastes including biodegradable aqueous wastes, oily water wastes, wash waters, shipping wastes and non-sewerable industrial wastes to support the growing port and maritime industries within the East Arm Control Area and Trade Development Zone.

The objectives of the facility are:-

- Recovery of usable or recyclable products, i.e., oil, solvents, biodegradable greases and fats.
- Maximum removal of water from wastes.
- Chemical neutralisation, stabilisation and solidification of industrial wastes to a level acceptable for disposal in which the risk to the environment is minimal.
- Biological treatment of the water phases to a level suitable for discharge to the environment or the receiving environment, i.e., PAWA lagoons.
- Waste collection and transport services.

NTRR is proposing to offer waste management services to support the port and port-related activities and the industries of the Northern Territory including the following:

- ♦ Collection, transport and treatment of shipping wastes including bunker oils, bilge wastes, sewage and biodegradable wastes;
- ♦ Waste management services to industries in the Northern Territory and offshore oil and gas drilling rigs;
- ♦ Complete waste management services to the local and international Defence Forces;
- ♦ Industrial cleaning operations including high pressure water blasting, drain cleaning, tank cleaning and washout of ships' holds, shipping containers and ISO-tankers;
- ♦ Washing and cleaning of shipping containers for importers and exporters to comply with quarantine requirements;
- ♦ Collection and treatment of non-sewerable industrial wastes from maritime support industries;
- ♦ Emergency response advice and services.

Port and maritime industries will use 50% of the LWTF's treatment capacity and 75% of its servicing capabilities.

In the future, NTRR also intends to provide more diversified maritime services, including heavy vacuum road tankers, oil salvage tankers and high pressure water blasting units.

The LWTF will incorporate the following units:

- ♦ Biological aqueous waste receipt, storage and treatment plant;
- ♦ Oily water and waste oil receipt, storage and treatment plant;
- ♦ A chemical fixation, stabilisation and solidification (CFS) plant for non-sewerable industrial wastes;
- ♦ A container storage and washdown area;
- ♦ A wastewater oxidation unit;
- ♦ Shipping container and ISO-tainer washdown unit;
- ♦ Evaporation ponds;
- ♦ Workshop

- ♦ Administration building incorporating offices and a laboratory;
- ♦ Truck depot.

The LWTF will be constructed in modules to allow for future expansion and to meet the demands of industrial and maritime growth in the Darwin region.

A total of four tank farms will be constructed initially. The layout will allow for expansion to meet potential market demands. The tank farms and bunds will be constructed in accordance with the relevant Australian Standards and Building Codes.

The LWTF has been designed to treat a total annual volume of approximately 5.75 ML. The breakdown of waste classes and respective volumes is presented in Table 1.1.

Table 1.1 Estimated Volumes of Liquid Waste to be Treated at the LWTF

LIQUID WASTE CLASS	ANNUAL VOLUME (ML per annum)
Biodegradable aqueous wastes	1.5
Waste oil	1.5
Oily water	1
Contaminated waters	0.75
Non-sewerable industrial wastes	1
TOTAL	5.75

The volumes have been estimated based on industry and government information and on data from regions within Australia with comparable densities of industry and population.

1.6.3 Treatment Processes

All wastes directed to the LWTF will be assessed to determine the most appropriate treatment and disposal process. NTRR will encourage generators to segregate waste at the source wherever possible to ensure waste treatment costs are kept to a minimum. NTRR will also provide scientific and environmental advice to industries to optimise processes, minimise wastes and assist generators to meet cleaner production targets.

The LWTF will comprise of four (4) treatment processes:

- biodegradable aqueous waste treatment;
- oily water treatment;
- waste oil recycling;
- treatment of non-sewerable industrial wastes by chemical fixation and solidification (CFS).

All four treatment processes will occur on the same site and will be supported by a modern on-site laboratory. The site will also operate as a transfer station for wastes which require treatment at other approved facilities, e.g., solvents for recycling.

The four processes are briefly described below. More detailed information of each process is outlined in Section 2.4.

A. Biodegradable Aqueous Waste Treatment Plant

Biodegradable aqueous wastes such as grease trap wastes will be pumped into a settling tank in which the various phases will be able to separate into the component phases of solids, liquid and a floating scum comprising cooking oils, fats and grease.

The aqueous phase will be transferred to the dissolved air flotation (DAF) unit before discharge to a series of evaporation ponds for final treatment.

The grease, fat and sludge from the settling tank and DAF unit will be transferred to composters or disposed to landfill.

In summary:

- Biodegradable aqueous wastes will be discharged under vacuum into an upright holding tank.
- The waste will be pumped via a solids/liquid separator to a settling tank. Inorganic solids will be removed and disposed at a composter or an approved landfill.
- Settled solids from the settling tank will be used for compost or solidified and disposed at an approved landfill.
- The remaining effluent will be pumped to a biological aeration system prior to discharge to on-site evaporation ponds or the PAWA lagoons.

NTRR has been granted permission to discharge effluent to the PAWA-controlled lagoons. The PAWA has set quality criteria such as mass loading and concentration limits on the effluent.

B. Oily Water Treatment Plant

Oily waters from service stations and automotive workshops will be transferred into a settling tank to allow separation of the oil from the water phase. It may be necessary to introduce chemical additives to break stable emulsions and assist the separation process.

The separated oil will be transferred to the waste oil storage tanks whilst the water phase will be transferred to a coalescing plate separator (CPS) unit in which any residual oil and solids will be removed. The effluent from the CPS unit will then be transferred to the DAF unit for final treatment.

In summary:

- Oily water wastes will be discharged into a receival vessel.
- The oily water will be pumped through a solids/liquid separator and an oil/water separator.
- Recovered oil will be removed and transferred to the used oil storage for recycling. Solid wastes will be disposed and treated in the chemical fixation and solidification (CFS) plant.
- The water phase will be transferred to the Dissolved Air Flotation unit to recover any residual oil and sludge.

- The treated water will be transferred to bulk storage tanks from where it will be transferred by pump to the on-site evaporative ponds or the PAWA lagoons.
- Settled sludge will be dewatered through a filter press and transferred to the chemical fixation and solidification (CFS) plant for further treatment.

C. Waste Oils

Waste oils will be delivered to the site for storage, treatment and resale of the processed oil as a fuel. Treatment methods for the waste oil includes combinations of the following processes:

Dewatering:

A low temperature evaporative, oil conditioning process that removes water and some low boiling point hydrocarbons that may be present in very small quantities. The water is subsequently treated in the DAF unit. Any low boiling point hydrocarbons removed at this stage are separated and used as an energy source on-site.

Demineralisation:

A patented process developed by Transpacific Industries in conjunction with ICI involving a low temperature process in which proprietary chemicals are added to aid in the removal of metal contaminants, impurities and water. Once separated, the oil is filtered to remove any particulate matter prior to sale as fuel oil.

Product Blending:

This ambient temperature process blends the treated oil with distillate and proprietary additives to produce fuel oils for sale. The process involves simple mixing vessels and proportional control of all ingredients.

In summary:

- Waste oil will be discharged into above-ground storage tanks via a filter box to remove any gross solids. Any free water will be drained from the bottom of the storage tanks and transferred to the oily water treatment plant.
- Any settled sludge in the tanks will be removed and transferred to the CFS Plant for further treatment.
- Further treatment may be conducted on the oil depending on the specifications of customers including demineralisation, dewatering, dehydration and filtration.
- Recovered oil will be recycled as a fuel oil for use in boilers and kilns.

D. Chemical Fixation and Solidification Plant

The CFS process is used for non-sewerable liquid waste and sludges to reduce the hazard potential of wastes by converting potentially hazardous contaminants to the least soluble, least mobile or least toxic form.

The chemical fixation step chemically reduces contaminants to the least hazardous form and the solidification step physically and mechanically binds the contaminants into a solid matrix resistant to leaching or breakdown.

Stage 1 : Prescreening

Each waste will be assessed prior to approval to dispose at the facility. Methods of assessment will include analysis, review of Material Safety Data Sheets or analytical data provided by the generator of the waste.

Stage 2 : Receival

On arrival at the facility, the wastes will be sampled and checked to confirm the integrity of the waste. Transport documentation will also be checked and a receipt issued on completion. A small amount of each sample will be retained for a period of time to allow further testing to be conducted if required.

Stage 3 : Fixation

Fixation involves the addition of chemical such as lime or caustic soda to the waste to precipitate soluble metals as insoluble metal hydroxides. Flocculants are added to improve the settling rate of the metal hydroxide particles. The fixation process usually produces a relatively clean, supernatant liquid and a sludge residue. The supernatant, containing only trace levels of metals, will be transferred to the DAF unit and the sludge containing the metal hydroxides will be pumped to a filter press for dewatering prior to solidification.

Stage 4 : Solidification

Solidification mechanically binds the insoluble metal solids using chemical additives such as fly ash, cement or cement kiln dust. Mixing can be achieved using an auger system with hoppers feeding the dry chemical additives to the dewatered cake from the filter press.

The chemically bound solids are then allowed to hydrate/cure for a period of 5 - 7 days.

The site will be secured by a security fence and lockable gates. Out of hours the site will be locked. If necessary, alarms, security lighting and security patrols may be used. Site lighting will be provided in accordance with the relevant Australian Standards and health and safety requirements.

1.7 Potential Environmental Impacts

The potential environmental impacts and proposed management strategies associated with each stage of the development are summarised in Table 1.2.

The primary objectives of the proposed environmental management and monitoring programme are to control environmental impacts to levels within acceptable standards and to minimise possible impacts on the workforce and the general community of foreseeable risks during the planning, design, construction and subsequent operational phases of the LWTF.

The proposed construction phase of the development is expected to be completed within six (6) months from the date of commencement. Possible short term impacts from the construction phase include noise and dust from the building activities and the possibility of increased erosion from surface water runoff.

Potential impacts on the environment from the LWTF, once operational, include risks from the handling, storage and treatment of non-sewerable liquid wastes, atmospheric emissions, management of potentially contaminated stormwater and contamination of the environment from spill or leaks. However, the proposed facility has been designed to mitigate the potential for occurrence of incidents which could lead to impact on the environment. This will be reinforced by strict adherence to operational procedures.

Notwithstanding the possible impacts from the construction and operation of the LWTF, the facility will provide a number of environmental benefits including responsible management of liquid wastes from “cradle to grave”, recycling of wastes into useable products, e.g., waste oils into fuels, treatment of industrial wastes to a level considered non-hazardous to the environment and suitable for disposal to approved landfills, and, in conjunction with government agencies, emergency response expertise for industrial and traffic accidents.

The construction of the LWTF will provide industry and the community with a viable, safe and economic alternative for waste disposal in line with government legislation. Overall, the community and environment will benefit from the reduction in exposure to the risks posed by the illegal or improper disposal of industrial wastes.

Table 1.2 Summary of Potential Impacts Associated with the LWTF

CONSTRUCTION PHASE

ISSUE	POTENTIAL IMPACT	ENVIRONMENTAL MANAGEMENT & SAFEGUARDS	MONITORING
Air Quality	Dust from earthworks and vehicle movements.	If dust emissions are problematic then dust suppression methods such as water trucks will be implemented.	Visually monitored by Project Manager.
Noise	Noise may be generated by construction activities or traffic.	Site is within a designated industrial area. The nearest residence is 4 km away. If noise complaints are received, hours of operation may be adjusted.	Noise monitoring will be conducted in response to noise complaints.
Construction Wastes	Management of construction wastes will be required.	<ul style="list-style-type: none"> Solid wastes will be disposed at approved landfills or reused as on-site fill and landscaping. Liquid wastes will be 	The Project Manager will conduct daily inspections of the site to ensure construction wastes are disposed of correctly.

ISSUE	POTENTIAL IMPACT	ENVIRONMENTAL MANAGEMENT & SAFEGUARDS	MONITORING
Construction Wastes – cont.		collected and treated or recycled by NTRR. <ul style="list-style-type: none"> Sewage and sullage will be collected and disposed at approved waste disposal sites. 	The Project Manager will inspect the boundaries of the site daily to ensure adequate waste controls exist on-site and that pollution does not occur.
Surface Water Run-off and Erosion	Increased turbidity and sedimentation of the marine environment and siltation from surface water run-off and soil erosion.	Implementation of good construction practices aimed at minimising the impacts of erosion e.g. surface drainage systems to divert run-off from construction areas and provision of silt traps to minimise off-site sediment discharges.	Regular inspection of silt traps and stormwater drains.
Traffic	Increased traffic, noise and safety-related issues.	As an industrial estate, traffic will not travel through residential areas. Construction vehicles will haul via designated arterial routes.	The Project Supervisor will monitor and regulate traffic activity to the site to minimise impacts such as noise, dust & increased local traffic.
Biting Insects	Increase in mosquito and biting insect populations due to pooling of water and possible creation of breeding sites. Potential for transmission of diseases. Public nuisance.	Design and maintenance of earthworks and drainage systems during construction to prevent the creation of potential mosquito breeding areas. Where necessary, larvicides will be used to prevent mosquito breeding.	Regular inspection for potential breeding areas.

OPERATIONAL PHASE

ISSUE	POTENTIAL IMPACT	ENVIRONMENTAL MANAGEMENT & SAFEGUARDS	MONITORING
Risk	The LWTF has the potential to pose hazards to employees, the public and the company.	Preliminary risk assessments have been conducted. Risk control measures implemented into design & construction phase.	Regular performance audits will be conducted of environmental control systems. These will be reviewed by the Site OHS&E Committee. Risk assessments will be conducted on all new plant, equipment, projects, chemicals and operations to identify and control OHS&E - hazards or impacts.

ISSUE	POTENTIAL IMPACT	ENVIRONMENTAL MANAGEMENT & SAFEGUARDS	MONITORING
Risk – cont.			Risk assessments will be conducted on all new activities to ensure hazards are controlled and safe work procedures are followed. SWP will be reviewed annually.
Stormwater Management	Stormwater can transport contaminants from the site into the marine environment & groundwater.	<p>Implementation of good housekeeping practices & spill management.</p> <p>Segregate clean & contaminated stormwaters.</p> <p>Treat contaminated stormwater by provision of CPS unit to remove oil and suspended solids.</p>	<p>Monitoring of stormwater effluent from the site. Parameters to include visible and chemical contaminants.</p> <p>Daily housekeeping procedures to maintain clean areas including roads and bunds.</p> <p>Daily inspections of stormwater drains, sumps, traps and roadways during and after rain events. Removal of debris, solids and any hydrocarbons from catchment traps.</p>
Spill Management	Spills or leaks can contaminate stormwater, the soil or leach into the ground water.	<p>Spill kits provided.</p> <p>Construct impervious bunds & roadways to Australian Standards.</p> <p>Emergency response plan.</p>	<p>Daily visual inspections of the site for spills.</p> <p>Weekly site OHS&E audits.</p> <p>Non-conformance reports for spills which are reviewed monthly by Site OHS&E Committee.</p> <p>Regular audits (12 monthly) of operating procedures.</p>
Waste Management	Increased loading on landfills.	<p>Segregate recyclable wastes.</p> <p>Minimise waste generation.</p> <p>Dispose of treatment wastes to approved facilities</p>	<p>Waste audits.</p> <p>Regular inspection of the site to ensure wastes are disposed of segregated correctly.</p> <p>Inspections to ensure wastes are stored and contained adequately.</p> <p>Annual waste audits to review waste minimisation and management.</p> <p>Documentation for all wastes despatched from the site is correctly recorded and filed.</p>

ISSUE	POTENTIAL IMPACT	ENVIRONMENTAL MANAGEMENT & SAFEGUARDS	MONITORING
Air Quality	<p>Odour emissions from handling and treatment of wastes.</p> <p>Volatile organic carbon emissions from the storage & handling of fuel oils, waste oils & oily waters.</p>	<p>Minimise aspiration of wastes.</p> <p>Accurate classification of wastes.</p> <p>Reduce treatment volumes.</p> <p>Send wastes to off-site facilities for treatment.</p>	<p>Odour monitoring in response to complaints.</p> <p>Wind direction.</p> <p>Monitoring for odours or dust in response to complaints. Monitor boundaries and point sources.</p> <p>Regular site inspections for dust sources such as roadways.</p> <p>Weather monitoring for parameters such as wind direction.</p> <p>Testing and assessment of all wastes prior to and upon receipt to prevent unwanted odours, emissions or reactions.</p>
Noise	<p>Increased noise from operational activities.</p>	<p>Site is within a designated industrial area. The nearest residence is 4 km away. If noise complaints are received, hours of operation may be adjusted.</p>	<p>Noise monitoring will be conducted in response to noise complaints.</p> <p>Equipment will be assessed for noise levels prior to purchase</p> <p>Sound levels will be monitored on the site boundary and near operating equipment to determine background, normal and peak noise levels.</p> <p>Traffic flows will be controlled as much as possible to normal business hours.</p>
Mosquitoes & Biting Insects	<p>Potential health problems from the transmission of diseases.</p> <p>Public nuisance.</p>	<p>Maintenance of drainage systems to prevent creation of potential mosquito breeding areas.</p> <p>Where necessary, chemical controls will be used to prevent mosquito breeding.</p>	<p>Regular inspection for potential breeding areas.</p> <p>Daily visual inspection during and following rainfall events of drains, traps, sumps and bunds on and around the site for breeding sites.</p> <p>Removal of water from drains, sumps, traps and bunds during or as soon as possible after rain.</p> <p>Inspection and removal of all containers and devices which can offer a temporary breeding site, e.g. empty drums.</p>

ISSUE	POTENTIAL IMPACT	ENVIRONMENTAL MANAGEMENT & SAFEGUARDS	MONITORING
Mosquitoes & Biting Insects – cont.			Particular attention prior to wet season to clean up the site. Use of chemical sprays where necessary. Sprays include PTI or Metheprine which are both mosquito-specific insecticides.
Traffic	Increased traffic, noise and safety-related issues.	As an industrial estate, traffic will not travel through residential areas.	

1.8 Management Commitments

NTRR seeks to establish a liquid waste treatment facility that will utilise proven, appropriate technology to minimise environmental impacts from the treatment, transport, storage and disposal of various industrial wastes.

The Industrial Waste Treatment Facility has been designed to minimise any impacts on the surrounding environment. The operational procedures have been developed to ensure that the Facility is managed and operated in accordance with company and legislative requirements. The parameters and procedures have been selected from best practices adopted by the Transpacific Industries group of companies elsewhere throughout Australia.

The auditing programme documented in the Environmental Management Plan will ensure that the highest safety and environmental standards will be maintained throughout the operational life of the facility.

A review of the potential environmental impacts identified within the proposal indicate that the proposed facility will have negligible impact on the environment. The provision of an integrated waste treatment facility will have a positive effect on the management of industrial wastes from the port and the region's industries by offering safe and responsible disposal options.

Table 1.2 provides a summary of key environmental impacts identified for the facility and NT Resource Recovery's management of each issue.

A summary of the management commitments to ensure the development of an environmentally responsible facility is presented in Table 1.

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Table 1.3 Summary of Management Commitments

ISSUE	OBJECTIVE	COMMITMENT	TIMING	WHOSE ADVICE	MONITORING CRITERIA
Dust (Section 5.3.1)	To ensure that dust emissions do not cause adverse impacts.	Implement appropriate dust control measures, e.g., use of water trucks.	During construction.	DLPE	Site inspections. Visual inspection to ensure wind-borne dust or dust caused by truck movement does not cause a nuisance beyond the site's boundaries.
Noise (Sections 5.3.1 & 5.3.2)	To minimise noise impacts beyond the site boundaries	Sound levels will be consistent with good industry practices & government regulations.	During construction & operation.	DLPE	Noise monitoring as required. Noise levels monitored at point sources and health and safety risks evaluated against appropriate noise exposure standards. Noise levels monitored at the boundary and any noise sensitive location to ensure compliance with noise level criteria. Generally, Background noise level plus 5dB(A) at a noise sensitive place. Background noise level plus 10dB(A) at a commercial place.
Emergency response (Section 5.3.2)	Ensure minimal risk of impact to the environment, personnel or community by implementation of an	An Emergency Response Plan will be developed that addresses various emergency scenarios. Employees will be trained	Prior to commissioning.	DLPE, NT Fire Authority	Presentation and implementation of Emergency Response Plan.

ISSUE	OBJECTIVE	COMMITMENT	TIMING	WHOSE ADVICE	MONITORING CRITERIA
Emergency response – cont. (Section 5.3.2)	Emergency Response Plan.	in emergency response protocols.			<ul style="list-style-type: none"> • Audits of Emergency Response Plan. • Assessment and review of responses to actual or planned emergencies Assessment to involve Emergency Services. • Audit Emergency Response Plan against requirements for hazard facilities eg Worksafe Major Hazard Facilities, Australian Standards, or AIP requirements.
Spills & leaks (Section 5.3.2)	To ensure no adverse impacts occur due to spills and leaks.	<p>Procedures developed to ensure maintenance & operations conducted to minimise spills and leaks, e.g., spill management.</p> <p>Routine maintenance checks on plant & equipment.</p>	During operation	DLPE	<p>Presentation of Site Safety and Environmental Awareness training. Presentation and implementation of Emergency Response Plan.</p> <p>Audit of site procedures and observation of activities. Inspection of work areas, bunds and roadways daily to ensure housekeeping and cleanliness protocols are being met.</p> <p>Visual inspection of stormwater run-off and</p>
Spills & leaks – cont.					

ISSUE	OBJECTIVE	COMMITMENT	TIMING	WHOSE ADVICE	MONITORING CRITERIA
(Section 5.3.2)					rainfall contained within bunded areas for visible signs of contamination.
Hazardous substances (Section 5.3.2)	Ensure that the risks of handling, storing & transporting hazardous substances are properly managed.	Appropriate management procedures will be implemented & employees trained.	Prior to commissioning.	DLPE, WHA	<p>Implementation and training of hazardous substance management procedures.</p> <p>Audits of testing procedures, records, training and operation of procedures to ensure compliance with procedures.</p> <p>Assessment of non conformance eg failure of processes to meet specifications.</p> <p>Analysis of treated wastes to meet specification.</p> <p>Weekly stock take and volume reconciliations.</p> <p>Daily records of all transfers and tank volumes.</p>
Waste management (Section 5.3.2)	To ensure that wastes generated by the activities of the facility are properly managed	Appropriate management procedures developed & implemented to ensure wastes are recycled or disposed correctly.	Prior to commissioning.	DLPE	<p>Implementation of waste management procedures & training of personnel.</p> <p>Audits of waste management practices.</p> <p>Assessment of waste</p>
Waste management –					

ISSUE	OBJECTIVE	COMMITMENT	TIMING	WHOSE ADVICE	MONITORING CRITERIA
cont. (Section 5.3.2)					production figures against reuse, recycling or reduction targets. Conduct annual mass balances of all processes and revise waste management targets.
Environmental Management System (Section 5.1)	Ensure minimal risk of impact to the environment, personnel or community by implementation of Environmental Management System. Control of environmental impacts within acceptable limits.	An Environmental Management System will be developed & implemented.	During commissioning & operation.	DLPE	Issue of EMS and training of personnel. Review of system and procedural non conformance and corrective actions. Measure against performance targets. Assessment of records and documentation.
Environmental Management Plan (Section 5.2)	To ensure that environmental management strategies address potential impacts	An Environmental Management Plan will be implemented once approval for the LWTF has been granted.	Prior to operation	DLPE	Implementation of EMP and training of personnel. Review of environmental non conformance, incidents or exceedances. Assess corrective measures. Measure performance against target indicators Audit working procedures and operational activities against documented
Environmental					

ISSUE	OBJECTIVE	COMMITMENT	TIMING	WHOSE ADVICE	MONITORING CRITERIA
Management Plan – cont. (Section 5.2)					procedures. Measure impacts for compliance with state criteria.

1.9 Structure and Scope of the PER

The PER has been prepared to meet the requirements of the NT Environmental Assessment Act. The purpose of the PER is to provide concise and comprehensive information concerning the design, construction and operation of the LWTF and the potential environmental impacts associated with it. The public review process enables balanced review and assessment of the proposal and the environmental impacts and provides a means of assessing the risks associated with the LWTF to be assessed and contingencies developed beforehand.

The PER focuses only on the direct environmental impacts presented by the construction and operation of the LWTF and the immediate surrounds.

This document has been prepared in accordance with the guidelines issued by the Minister for Lands, Planning and Environment (DLPE) in February, 2000.

The PER includes the following main sections:

SECTION	TITLE	CONTENTS
1	Executive Summary	Background and justification of the project.
2	Project Description	<ul style="list-style-type: none">• Location of the proposed development.• Elements of the project including design, construction & operation.
3	Existing Environment	Description of the existing environment.
4	Environmental Impacts & Issues	<ul style="list-style-type: none">• Potential environmental impacts from the construction & operational phases.• Management strategies to minimise or control impacts.
5	Environmental Management	<ul style="list-style-type: none">• Environmental Management System for the facility.• Environmental Management Plan for the construction & operational phases.• Monitoring programmes.
6	Summary of Environmental Commitments	Summary of commitments to the management & monitoring strategies.
7	Glossary	Definitions of terms.
8	References	References used during research.
Appendices		Supporting documentation, calculations, plans, flowcharts, etc.

1.10 Studies Undertaken as Preparation of the PER

The proposed LWTF requires land zoned as General Industry with sufficient area to accommodate the proposed development and allow for future expansion if required. The subject land complies with these zoning and size requirements.

The site in Mendis Road affords geographical and commercial advantages for the proponent, local industries, the Port and Port-related activities and the local community.

Access to the site is satisfactory for six wheel, eight wheel and semi-trailer and B-double vehicles. The site is in close proximity to nearby highways.

Market surveys undertaken by Transpacific Industries Pty Ltd in 1999 indicated a possible 10 - 20 ML of industrial liquid waste was being generated in the Darwin region with a break-up as follows:-

Table 1.4 Liquid Industrial Wastes in the Northern Territory (1999)

LIQUID WASTE CLASS	ANNUAL VOLUME (ML per annum)
Biodegradable aqueous wastes	2 – 5
Oily waters	2 – 5
Oils (suitable for recycling)	5 – 7
Non-sewerable industrial wastes	1 - 3
TOTAL	10 – 20 ML/YR

The information was obtained through discussions with waste generators such as the Department of Defence, Port of Darwin, large hotels, car yards and industrial waste generators, in addition to information obtained from the Australian Institute of Petroleum, several local transporters and Local and Territory government agencies.

It was assumed that the volumes of liquid waste will increase with the advent of stricter environmental laws, tighter regulation on trade waste discharges to the sewer, industrial development and expansion of greenfield sites which will be subject to more stringent planning and assessment requirements, and increased public environmental awareness and accountability of companies.

The availability of a LWTF capable of providing industries with a safe and responsible means of waste management using cost-effective, environmentally sound treatment processes will form an important element in the life cycle stewardship of industrial wastes.

This PER utilises experience from similar projects designed, constructed and operated by other companies within the Transpacific Industries Group including Townsville, Brisbane, Perth and Kalgoorlie.

Surveys and correspondence in relation to the proposal were received from the following sources:

- Department of Lands, Planning and Environment;

- PAWA - Infrastructure Branch & Environmental Services;
- Department of Business and Industries;
- Trade Development Zone Authority;
- Darwin City Council;
- Darwin Port Corporation;
- Mobil Oil Australia & Shell Australia Ltd;
- Various waste transport company operators;
- Thiess Environmental Services.

1.11 Aboriginal Sacred Sites

The Aboriginal Areas Protection Authority has advised that it has no Registered or Recorded sacred sites within the area of the proposed facility.

An Authority Certificate (C97/110) was issued in August 1997 by the Aboriginal Areas Protection Authority for the area of which the sub-division is a part. The Certificate is currently held by the Department of Lands, Planning and Environment.

2.0 DESCRIPTION OF THE PROPOSAL

2.1 Location and Design Requirements

2.1.1 Location

The site for the proposed LWTF is located at Lot 4 (Section 5109) Mendis Road, Hudson Creek within the East Arm Control area and 5 km east of the current Port of Darwin (Appendix F).

The Mendis Road site is zoned for Industrial Use and is situated within the East Arm Industrial Area. The property is bordered by Mendis Road to the west and Berrimah Road to the north. The nearest residential area is the suburb of Berrimah which lies about 4 km to the north-east. Access will be via Mendis Road only.

Although other sites were considered, the benefits of the selected site, taking into consideration the proposed activities to be conducted, were:

- ✓ Proximity to the Port, local industries and the city;
- ✓ Appropriate zoning;
- ✓ Greenfields industrial estate;
- ✓ Surrounding environment;
- ✓ Proximity to major roads;
- ✓ Distance from residential zones;
- ✓ Topography of the site;
- ✓ Compatibility with future developments proposed for the area.

2.1.2 Land Tenure and Planning Issues

NTRR has purchased an 1.8 ha lot under Crown leasehold from Paradise Development Pty Ltd.

Under Section 133 of the Planning Act 1993, the Darwin Regional Land Use Structure Plan 1990 contains statements of land use objectives. The Darwin Regional Land Use Structure Plan shows the land as intended for industrial purposes.

As part of its ongoing planning and development of the East Arm area, the DLPE developed a land use concept for the area and the port which shows the site set aside for industrial purposes. In June 1998 the Minister for Lands, Planning and Environment declared the East Arm Control Plan 1998. Under the Plan, the land is zoned EA (East Arm). The purpose of the EA zone is “to accommodate the industrial and commercial activities associated with the port in the control plan area”. The Plan enabled industrial and commercial activities to proceed with the Minister’s consent in the area zoned EA (East Arm).

A Development Application for the LWTF is currently before the DLPE which will assess the PER before development consent under the Planning Act is granted.

In considering whether to give consent to a proposed use or development of land and the conditions, the Consent Authority is to have regard to:

- The purpose of the zone in which the land is situated; and,
- The merits of the proposal.

The following Government Departments have confirmed approval for the proposal to proceed:

- Power and Water Authority
- Fire and Rescue Service - Fire Protection Division
- Department of Industries and Business - Dangerous Goods Inspectorate
- Department of Transport and Works

2.2 Liquid Waste Treatment Facility Layout

The proposal is to develop a liquid waste treatment facility which will receive, store, treat and despatch non-sewerable liquid wastes. A road tanker fleet for liquid waste collection and transport will also use the LWTF as a depot. The proposed LWTF will comprise the following units:

- Biological aqueous waste receipt, storage and treatment plant;
- Oily water and waste oil receipt, storage and treatment plant;
- A chemical fixation, stabilisation and solidification (CFS) plant for non-sewerable industrial wastes;
- Bunded tank farms;
- A container storage and washdown area;
- A wastewater oxidation unit;
- Shipping container and ISO-tainer washdown unit;
- Evaporation ponds;
- Workshop
- Administration building incorporating site offices and amenities;
- Laboratory;
- Truck depot.

The proposed layout of the LWTF is shown in Appendix G.

The layout of the facility has been designed to be capable of adding further treatment units to meet increases in waste treatment demand.

Operational features of the LWTF for which planning approval is being sought include:

- Only approved wastes will be accepted for treatment at the facility;
- All wastes received will be checked by the laboratory on arrival to confirm the integrity of the waste;
- The site will be locked whenever the LWTF is unattended;
- Routine maintenance of all pumps, paperwork and control devices;
- Documentary records of all wastes received or despatched from the facility will be kept;
- A truck wash facility;

- Truck parking;
- A maintenance and automotive workshop;
- Waste tracking documentation will be used in accordance with regulatory requirements;
- Disposal of treated wastes will be via licensed transporters to approved landfills.

Design considerations and allowances have been made for the following long term proposals:

- Treatment of ballast waters;
- Drum reconditioning unit;
- Commercial environmental and analytical services.

There will be approximately six people employed on-site comprising a manager, two truck drivers, an administrator, a chemist/operations manager and a plant operator.

Car parking will be provided for the employees and an additional six visitors' vehicles making a total of twelve car parking spaces on site. One car park will be provided for a disabled user adjacent to the administration building.

Several road tankers (rigid body and articulated trucks) will operate from the site to collect liquid wastes. A flat bed truck with a lifting arm or hydraulic platform is also expected in the future to collect and transport drums and bins (oil filters). These vehicles will be parked on-site overnight.

Roadways, parking and turning areas will be designed to accommodate articulated vehicles.

2.2.1 Design Principles

The LWTF will be designed to relevant Australian Standards incorporating the most recent information and recommended practices.

As the Northern Territory is subject to adverse weather conditions, particularly during the wet season, the following design considerations have been included.

2.2.1-1 Wind Loadings

The wind loads for the design of the LWTF will be based upon the Australian Standard AS 1170.2 - 1989: *Minimum design loads on structures - Wind loads* and the Building Code of Australia ("BCA") NT Specification B1.2.

The following criteria will be adopted as a minimum:

Wind Region	C
Serviceability Wind Speed (V_s)	45 m/s
Permissible Wind Speed (V_p)	57 m/s
Ultimate Wind Speed (V_u)	70 m/s
Terrain category	2

2.2.1-2 Cyclonic Tidal Surges

The design of the LWTF will take into account cyclonic tidal surges.

The LWTF design will be based upon a 1-in-100 year storm surge. The consequences of the 1-in-1,000 year storm surge will be documented, and the associated risks will be assessed, documented and analysed.

Department of Lands Planning & Environment advise that the storm surge levels at East Arm Port close to the site are:

1-in-100 year	4.9 m AHD
1-in-1,000 year	6.0 m AHD

The existing ground level at the site generally rises above 6.0 m AHD.

2.2.1-3 Earthquake Loads

The LWTF will be designed to incorporate the recommendations and specifications provided by Australian Standard AS 1170.4 – 1993: Minimum design loads on structures - Earthquake loads as follows:

Based on a Structure Classification Type III, an Acceleration Coefficient (a) of 0.08, and likely Site Factor (S) of 1.0, an Earthquake Design Category C, in accordance with Section 2, Clause 2.7.4 and associated paragraphs, is proposed for structural design of the LWTF.

Non-structural components will be categorised as either architectural, or mechanical and electrical components, and under Earthquake Design Category C will be designed and constructed to resist earthquake forces. For ducts and piping distribution systems, particular attention is drawn to Clause 5.3.2 which states:

“Ducts and piping distribution systems – Earthquake restraints for ducts and piping distribution systems of earthquake Design Categories A and B are not required.

Earthquake restraints for ducts and piping distribution systems of earthquake Design Categories C, D and E shall be provided except in the following circumstances:

- (a) Gas piping less than 25 mm inside diameter.*
- (b) Piping in boiler and mechanical rooms less than 32 mm inside diameter.*
- (c) All other piping less than 64 mm inside diameter.*
- (d) All electrical conduit less than 64 mm inside diameter.*
- (e) All rectangular air-handling ducts less than 0.4 sq m in cross-sectional area.*
- (f) All round air-handling ducts less than 700 mm in diameter.*
- (g) All ducts and piping suspended by individual hangers 300 mm or less in length from the top of the pipe to the bottom of the support for the hanger.”*

from AS 1170.4 – 1993: Minimum design loads on structures - Earthquake loads

Because the East Arm area has been designated an industrial area and is removed from Darwin’s residential centres (main population centre), no further design limitations have been imposed as a result of neighbouring land uses.

2.3 Construction Phase

2.3.1 Construction Programme

The block is located in a subdivision prepared by Paradise Developments. The property has been cleared of vegetation by Paradise Developments. Services such as roads, electricity and water reticulation are provided. Sewer reticulation is not available in the area. Site access will be from Mendis Road only.

Construction is set to commence by early in 2001 for completion by the middle of 2001. Although commissioning of the facility will occur, the LWTF will become operational on completion of construction.

2.3.2 Construction Requirements

Civil works for the site will include earthworks, construction of hardstand areas and internal roadways, pavements, kerbing, parking areas, buildings and structures, tank farms and bunds, evaporation ponds, foundations for buildings, structures and equipment, stormwater drainage, site services, landscaping and security fencing.

Detailed excavation will be required for the evaporation ponds. Other excavation will be limited to providing trenches for sewerage, water, power, stormwater and communications. Tank bunds will be constructed from impervious material such as cement blocks.

Storage tanks will be assembled off-site and transported to the site. Fabrication will be mild steel plate, reinforced fibreglass and HDPE polymer depending on the use and tank contents. Pipework will be fabricated and connected on-site. Other storage tanks will be purchased second-hand, transported to the site and modified to specifications.

Civil works will include concrete hardstands, sealed roadways and truck parking areas, reinforced concrete and sheet metal-roofed administration building, and a number of bunds.

Temporary buildings will be used during the construction phase including site offices, amenities, ablution blocks and secure stores. The site will be fenced to comply with construction regulations and for security.

Sources and transport of construction materials, fill, cement, aggregate and wood will be determined by local suppliers and the project contractor.

It is expected that the deliveries of construction materials will not significantly impact on local traffic. Deliveries of concrete will be expected intermittently up to three times daily over an estimated 6 week period.

Construction of bunds, tanks and buildings will be in accordance with Building Codes and Australian Standards as determined by structural engineers and government requirements. The construction and commissioning of the facility will be managed full-time by a site-based Project Supervisor employed directly by NTRR.

2.3.3 Construction Standards

The construction standards will be governed by the Northern Territory Work Health Act and its Regulations.

The purchase, manufacture, assembly and provision of labour and services will be subject to Quality Assurance requirements where applicable.

2.3.4 Construction Workforce

The labour force required for the site works is expected to be about 10 persons at any one time and is likely to be provided by the local workforce. A project manager will be on-site throughout the construction phase to supervise the works and is responsible for security.

2.4 Operational Phase

2.4.1 Description of Wastes to be Treated

NTRR proposes to treat the following waste classes at the LWTF:

- ☒ Biodegradable aqueous wastes, e.g., grease interceptor wastes, food processing wastes.
- ☒ Oily waters and oil interceptor wastes, e.g., interceptor wastes from service stations, car washing facilities and automotive workshops.
- ☒ Waste oils.
- ☒ Non-sewerable industrial wastes, e.g., oily sludges, spent chemical wastes, rinse waters, sludges from industrial processes.
- ☒ Contaminated waters from water blasting operations, washouts from ships' holds, etc.
- ☒ Container washings.

Brief outlines of each of the treatment options proposed by NTRR are detailed in Section 2.4.6.

No incineration or burning of waste will occur at the LWTF site.

2.4.2 Hours of Operation

The facility will be required to be available 24 hours per day, 7 days per week to service the industrial sector and the maritime industry, in particular shipping. Vehicular access to the site will be restricted to approved transporters. The site will be supervised by NTRR at all times that it is open.

Normal daily operations will commence at about 4 am and cease about 9 pm, 7 days per week. When the site is unmanned, the security gates will be locked.

2.4.3 Waste Collection

Industrial and shipping wastes collected by transporters licensed to collect and transport industrial wastes from the Port district and the Darwin region will generally be delivered

directly to the NT Resource Recovery (NTRR) facility. Where necessary liquid wastes may be collected and discharged at a transfer station before collection and transportation by road tanker or semi-trailer to the treatment facility. All wastes will be collected using an approved waste documentation system.

Wastes will generally be delivered by bulk road tanker although a proportion will be delivered in various containers such as drums and intermediate bulk containers (IBCs). Bulk waste loads will be delivered in road tankers with carrying capacities up to 20,000 litres (rigid tankers) or 30,000 litres (semi-trailer tanker) or 60,000 litres (triple road trains). It is anticipated that 5 to 7 tankers will unload at the LWTF each day. Products will be discharged from tankers via a flexible reinforced hose through coarse static screens into holding tanks. Sludge pumps will be used to transfer the waste between tanks within the treatment process.

In addition to other licensed transporters delivering wastes to the LWTF, NTRR will operate its own truck fleet for liquid waste collection and transport. It is expected that initially two rigid tankers will be based at the Mendis Road facility. A dog trailer will also be based at the site. These vehicles will be licensed to transport industrial wastes in accordance with legislative requirements including the Australian Dangerous Goods Code. Future additions to the fleet would include a flat-bed truck with a lifting arm capable of transporting drums and a tipper for transporting the solid CFS wastes to approved landfills. NTRR's truck fleet will use the LWTF as a depot and generally will be parked on-site overnight and on week-ends.

2.4.4 Waste Receiving

The facility will be capable of accepting biodegradable aqueous wastes, oily water emulsions, waste oils, other non-sewerable industrial wastes and liquid wastes generated by shipping, e.g., bunker oils and bilge waters.

All wastes will require initial approval and assessment (where possible) before acceptance at the facility. The wastes will be classified according to the most appropriate treatment. Where necessary, routine tests may be conducted by NTRR or requested of the generator to identify contaminants.

On receipt of the approved waste, samples of the waste will be assessed to ensure that the waste meets the acceptance criteria and to confirm preliminary information about the particular waste.

In the case of non-sewerable industrial wastes, prior to acceptance on site, an analysis certificate from a recognised laboratory may be required or a pre-delivery representative sample may need to be submitted to the Plant Manager to enable classification of the waste, the treatment process and the cost of disposal. The Plant Manager will ensure compatibility with the envisaged treatment process. Details to be recorded will include the volume of waste to be disposed, the generation rate, the frequency of disposal and whether or not the particular waste stream will be representative of future production or will be an 'one-off' disposal.

It will be the obligation of the generator to provide all known information on the waste for disposal including any Material Safety Data Sheets (MSDS), chemical data sheets and certified chemical analysis when requested and to assist in provision of waste samples when requested. The generator will be required to meet any costs incurred in order for the waste to be classified and the most appropriate method of treatment by NTRR.

All applications for disposal including analytical results and data sheets will be assessed by the Plant Manager at NTRR and assigned to a waste class (based on the treatment process). The system of classification of industrial wastes will be based upon the characterisation guidelines developed at other treatment facilities operated by Transpacific Industries.

Where necessary, specific chemical pretreatment, handling or packaging requirements to be undertaken by the waste generator will be advised for particular wastes.

A register will be maintained of all waste generators contacting the facility, together with an authorised contact person, the generator's address and a contact telephone number together with the nature, quantity, cost and classification of the waste generated. Such information will be confidentially maintained but will be available to the authorities in accordance with statutory requirements and will include the following information:

- (a) generator's name and address from which the waste will be received;
- (b) authorised contact person and telephone number;
- (c) locality code, i.e., shire code;
- (d) chemical analysis and MSDS information;
- (e) waste classification;
- (f) expected or observed contaminants;
- (g) volume of waste;
- (h) frequency of disposal;
- (i) transport and delivery requirements (plastic-lined skips, drums with lids, etc.);
- (j) on-site handling requirements including safety precautions;
- (k) cost per unit for disposal;
- (l) handling or extra fees (laboratory analysis, drum fees, etc.).

This information will be further categorised into those generators with registered approval numbers and generators with 'one-off' wastes.

Bulk waste deliveries will discharge through coarse static screens into pump wells. Sludge pumps will transfer the waste to the appropriate treatment process storage tanks. Tankers will wash out into the pump well using recycled water from the evaporation ponds.

Any wastes stored in containers or drums delivered to NTRR will also be checked prior to storage of the wastes in a suitably bunded and roofed area whilst awaiting treatment or dispatch to another approved treatment facility. All containers will be labeled to allow identification under the waste tracking system. Containers of poor integrity will not be accepted at the site unless contained within suitable receptacles such as overdrums. Overdrums will be available for emergencies or for drums in poor condition.

2.4.5 Transport Documentation

All wastes delivered to the site must be accompanied by relevant statutory transport documentation (in compliance with any waste tracking system established by legislation) to enable tracking of wastes from the generators to the treatment facility. No waste will be accepted onto the site unless all the above criteria have been complied with and no adverse environmental, safety or health impacts will result from its treatment. Similar documentation will be used to trace the movement of treated solidified waste from the treatment plant to the

licensed disposal facility. The documentation will enable relevant authorities to trace waste material from its source, through the phases of transport, treatment and ultimate disposal: a 'cradle to grave' approach.

On receipt and acceptance of the waste at the LWTF, the waste details and volumes will be recorded and a service docket issued to the transporter.

2.4.6 Treatment Processes

Essentially, the facility will comprise of four (4) treatment processes:

- (a) biodegradable aqueous waste treatment;
- (b) oily water treatment;
- (c) waste oil recycling;
- (d) treatment of non-sewerable industrial wastes by chemical fixation and solidification (CFS).

All four treatment processes will occur on the same site and will be supported by a modern on-site laboratory. The site will also operate as a transfer station for wastes which require treatment at other approved facilities, e.g., solvents for recycling. Schematic flow charts of each process are shown in Appendix E.

The treatment processes essentially follow similar regimes: the wastes will pass through coarse filter screens into primary settling tanks to allow gravity separation of sludges and floating scum from the liquid. The water phase from each process will pass through mechanical separation devices such as a Dissolved Air Flotation (DAF) unit and coalescing plate separators before discharge to the evaporation ponds. The biodegradable sludges and scum fractions will be sent to landfill, the CFS Plant or to composters as a nutrient additive. Non-biodegradable sludges will be treated in the CFS process.

2.4.6-1 Biodegradable Aqueous Waste

The types of biodegradable waste suitable for activated sludge treatment include:

- grease interceptor trap wastes
- abattoir wastes
- food processing wastes
- laundry wastes
- car wash wastes
- leachate from landfills
- stormwater and groundwater with low level contamination

A sample of the waste will be assessed by the operator to ensure that the waste meets the acceptance criteria. Tankers will unload their wastes and washout under gravity via a screen into a receival pit. While the gross solids will be collected for disposal to composters, landfill or the CFS Plant, the screened liquid will be pumped to a vertical settling tank with sufficient retention time to allow separation of the waste into the component phases of solids, liquid and a floating scum comprising cooking oils, fats and grease. The settling tank will have a conical base to improve solids' settlement and removal. The aqueous phase from the settling tank will be drawn off through a series of valves set at different levels and transferred to a

dissolved air flotation (DAF) unit via a balancing tank. The DAF unit utilises small air bubbles to float solids and particulate matter in the aqueous phase to form a scum on the surface. The scum layer is regularly removed by scraping or by being floated off.

The grease, fat and sludge removed from the settling tank and the solids from the receival tank will be combined with the floating scum (greases and fats) from the DAF for disposal to landfill or further treatment by anaerobic digestion or composting. Particulate grease and solids will be removed as a scum by the DAF, usually with the assistance of a flocculant aid such as a polyelectrolyte. Alkaline dosing may also be required to maintain pH control.

The effluent from the DAF unit will discharge to a series of evaporation ponds containing facultative and aerobic bacteria for final treatment. Greater than 99% of the organic (biodegradable) material will be removed from the waste stream by the process. Effluent from the evaporation ponds will be recycled for use as on-site wash water, e.g., tanker wash outs.

The waste details and volumes of each load will be recorded and the transporter's documentation will be retained by NTRR as a record of receipt.

2.4.6-2 Oily Water Wastes

A sample of the oily water will be assessed by the operator to ensure that the waste meets the acceptance criteria and that undesirable contaminants such as flammable liquids (petrol), solvents or excessive quantities of sludge are not present.

If accepted, tankers will unload their wastes and washout into a receival pit via a screen to remove nuts, bolts, sand and plastic. The waste details and volumes will be recorded and a copy of the transporter's documentation will be retained by NTRR as a record of receipt.

After passing through the screen, the liquid will be transferred to a vertical holding tank with sufficient retention time to allow separation of the oil, aqueous and solid phases. The gross solids captured by the screen will be collected for treatment in the chemical fixation and solidification (CFS) plant. The receival tank will have a conical base to improve settling rates and removal of solids from the tank. It may be necessary to introduce chemical additives to break stable emulsions to assist agglomeration of the dispersed phase and the formation of the water and oil phases. Once the emulsion is broken, the oil and water phases can be separated by conventional methods.

The separated oil phase will be transferred from the holding tank to the waste oil storage tanks and the solids to the CFS plant for treatment. The aqueous phase will be transferred to a coalescing plate separator (CPS) unit in which any residual oil and solids will be removed. The effluent from the CPS unit will then be directed to the DAF unit for final treatment. Any oil recovered by the CPS unit will be transferred to the oil storage tanks and solids will be removed for CFS treatment.

2.4.6-3 Waste Oils

NTRR will operate a waste oil storage and treatment depot at the LWTF. Waste oils collected from ships, industrial and mine sites, service stations and automotive workshops will be

delivered to the NTRR facility for storage and treatment. Treatment methods for the waste oil will include combinations of dewatering, dehydration, demineralisation and filtration.

NTRR will encourage generators to segregate waste oils suitable for recycling and reduce contamination from other wastes. All waste oils collected, received and despatched will be documented.

As an additional service to generators, NTRR will also collect oil filters and recover the residual oil by crushing. The oil will be collected for recycling and the oil filter cartridges will be disposed to scrap metal merchants or landfill.

The types of waste oils suitable for recycling include hydraulic oils and lubricating oils. Oils from the oily water process will also be recovered for storage and recycling.

A sample of the waste oil will be assessed by the operator to ensure that the oil meets the acceptance criteria and that undesirable contaminants such as flammable liquids (petrol), solvents, excessive water or sludge are not present.

If accepted, tankers will transfer their load into a storage tank. The waste details and volumes will be recorded and a service docket issued to the transporter.

Any free water will be drained from the storage tanks and transferred to the oily water process for treatment. Any settled sludge which accumulates in the oil storage tanks will be transferred to the CFS plant for treatment.

2.4.6-4 Chemical Fixation and Solidification of Non-sewerable Industrial Wastes

Chemical fixation and solidification (CFS) is an accepted environmental technology for the treatment of non-sewerable liquid wastes. Fixation refers to precipitation, flocculation and sedimentation as a single process by which the metal contaminants are converted into their least soluble, least mobile or least toxic form. The fixation process can be described as follows:

- **Precipitation**: a physical/chemical process in which some or all of the substances in the solution are transformed into a solid material thereby facilitating their removal;
- **Flocculation**: a physical process in which very small particles suspended in a liquid are made to agglomerate into larger, more settleable particles;
- **Sedimentation**: a physical process whereby suspended particles in a liquid settle by means of gravity.

Batch treatment of the waste streams will be undertaken, generally with compatible wastes from several generators forming a single batch.

Lime and caustic soda are the most widely used chemicals to precipitate soluble metals as insoluble metal hydroxides. Flocculants such as synthetic polyelectrolytes are usually added during the metal hydroxide flocculation stage to aid the agglomeration of suspended colloidal and precipitated material into larger, more rapid settling flocs. The fixation process usually produces a relatively clear supernatant liquid and a sludge residue. The supernatant liquid

will be transferred to the DAF unit and the sludge pumped to a filter press for dewatering before solidification.

Solidification refers to techniques that encapsulate the waste in a monolithic solid having structural integrity. Solidification mechanically binds the waste. Contaminant migration is restricted by vastly decreasing the surface area exposed to leaching and/or by isolating the waste within an impervious capsule. The most common binding materials are fly ash, cement and cement kiln dust (CKD), a by-product from the manufacture of cement. An additional benefit of cement is the high alkaline content which buffers the material from leaching processes in landfills.

Once the contaminants are ‘chemically fixed’ and stabilised as a solid, the mixture can be allowed to settle and the supernatant decanted to the DAF unit and the sludge dewatered. The filter cake containing the insoluble metal hydroxides will be mixed with an absorbent (usually fly ash or bentonite clays) and cementaceous material (cement kiln dust or cement itself) to form a solidified mass. The resultant ‘fixed’ material will be allowed to hydrate/cure for a period of 5 - 7 days. Chemically fixed and solidified wastes will be subjected to stringent testing, e.g., the USEPA Toxicity Characteristic Leaching Procedure (TCLP) test, to ensure the solidified waste complies with the acceptance criteria for disposal to approved landfills. Supernatant from neutralisation and precipitation reactions and the filtrate from the filter press will be transferred to the biological treatment process.

The solidification materials such as cement and fly ash will be stored in silos adjacent to the CFS building. Transfer to the fixation process will be via a weighing hopper and air slides. If make-up water is required effluent from the biological treatment process will be used whenever possible.

NTRR’s preferred disposal route will be the treatment which utilises the best available technology, has a zero or negligible impact on the environment and human health, is reasonable and economical and, for any off-site disposal facilities used by NTRR, operates under a licence from the appropriate authorities. All wastes received, treated, handled and dispatched by NTRR will be documented for review and audit by the authorities.

The CFS plant and tanker discharge area will be covered by a roof with sufficient overhang to prevent rain from entering the treatment area. The roadway at the entrance to the building will be designed to prevent stormwater from entering the treatment area. Rain falling onto the roofed area will be directed to the stormwater drainage system.

2.4.7 High Pressure Water Blasting

NTRR proposes to establish a fleet of mobile water blast units capable of providing specialised services to industry such as drain cleaning, surface preparation, industrial cleaning, cleaning of boiler tubes and heat exchangers, reactor vessels, mixing tanks and underground tanks.

Services proposed for maritime industries by the water blast units include washing out of cargo holds, hull cleaning and rust removal. The advantages of water blasting are reduced environmental and health risks. In comparison to other industrial cleaning procedures such as sand blasting, water blasting generates greatly reduced levels of emissions and dusts, e.g., silica dust, and the waste streams are relatively easy to contain and treat.

Waste water generated by the blasting activities will be contained using temporary bunds to allow collection and appropriate treatment. Treatment options include disinfection (for exotic flora and fauna), heavy metal fixation and solidification, settling and filtration. Water blasting activities conducted at the LWTF will be conducted within bunded areas. Waste waters will be transferred to storage tanks for treatment and reuse. Heavily contaminated waste waters will be treated via the CFS process.

2.4.8 Operations Control

An on-site laboratory will provide analytical services and technical support to the LWTF operations. The laboratory will be run by an industrial chemist (or equivalent) who will be responsible for waste classification, checks on approved wastes at the time of delivery, waste treatment, storage and transfers at the facility, despatch of wastes from the site, documentation and customer records and quality control of the various processes, waste products, stormwater and fuel oils.

The Plant Chemist will be responsible for obtaining and storing MSDS's, conducting risk assessments on all hazardous substances and ensuring the operational staff exposed to the chemicals are fully aware of the hazards and the appropriate control measures to be used.

All incoming wastes will be tested or analysed prior to approval being issued for receipt.

All wastes approved for receipt will be inspected / tested on arrival to validate the original assessment and the integrity of the waste.

All drums and containers will be labeled and stored in accordance with Dangerous Goods requirements.

All treated wastes despatched from the site will be analysed to ensure disposal criteria are met.

The Process Chemist will be responsible for investigating process improvements, developing and maintaining analytical procedures and accurately maintaining records.

All operators and drivers will receive suitable training in health, safety and environment issues including hazardous substances handling, risk management, emergency response, and transport and handling of Dangerous Goods.

2.4.9 Storage Tanks

Storage tank locations and the facility layout are given in Figure 2.1. The site facilities have been designed for easy truck and road tanker movement, segregated tank farms and process areas with sufficient separation distances incorporated to minimise fire risks.

With the exception of the Evaporation Ponds all storage tanks, treatment units and transfer lines will be constructed above ground. No underground tanks will be used in the development.

The facility will consist of four treatment units each containing a cluster of tanks (tank farms) with provision for additional tank storage to meet potential market demands. Details of the tank farms are listed below:

- Biodegradable aqueous waste
- Oily water treatment
- Waste oil storage
- CFS storage

Table 2.1 Biodegradable Waste Treatment Plant - Tanks

TANK NO	DESCRIPTION OF CONTENTS/USE	CAPACITY (kL)	MATERIAL
GT1	Cone tank	55	Mild steel
GT2	Sludge cone tank	10	Fibreglass
GT3	Settling tank	50	Mild steel
GT4	DAF Transfer tank	15	Fibreglass
GT5	Caustic soda storage tank	5	Fibreglass
GT6	Hydrochloric acid storage tank	5	Fibreglass
DAF Unit	Dissolved air flotation unit	10	Stainless steel
GT PP1	Process pump 1	-	-
GT PP2	Process pump 2	-	-
GT TP3	Transfer pump	-	-

Table 2.2 Oily Water Waste Treatment Plant - Tanks

TANK NO	DESCRIPTION OF CONTENTS/USE	CAPACITY (kL)	MATERIAL
OW1	Cone tank	55	Mild steel
OW2	Settling tank	55	Mild steel
OW3	Settling tank	55	Mild steel
OW4	Sludge cone tank	15	Mild steel
OW5	OW storage tank	55	Mild steel
OW6	OW storage tank	55	Mild steel
OW7	CPS Transfer tank	55	Mild steel
OW8	Hydrochloric acid storage tank	5	Fibreglass
OW9	Caustic Soda storage tank	5	Fibreglass
CPS Unit	Coalescing plate separator unit	10	Stainless steel
OW PP1	Process pump 1	-	-
OW PP2	Process pump 2	-	-
OW TP3	Transfer pump	-	-

Table 2.3 CFS Treatment Plant - Tanks

TANK NO	DESCRIPTION OF CONTENTS/USE	CAPACITY (kL)	MATERIAL
CFS1	Storage tank	70	Mild steel
CFS2	Storage tank	70	Mild steel
CFS3	Storage tank	70	Mild steel
CFS4	Storage tank	70	Mild steel
CFS5	Storage tank	70	Mild steel
CFS6	Storage tank	70	Mild steel
CFS7	Reactor tank	55	Fibreglass
CFS8	Caustic soda storage tank	5	Fibreglass
CFS9	Caustic soda storage tank	5	Fibreglass
CFS10	Sulphuric acid storage tank	20	Fibreglass
CFS11	Hydrochloric acid storage tank	20	Fibreglass
CFS TPI1	Transfer pump	-	-
CFS TPI2	Transfer pump	-	-
CFS TPI3	Transfer pump	-	-

Table 2.4 Waste Oil Storage Tanks

TANK NO	DESCRIPTION OF CONTENTS/USE	CAPACITY (kL)	MATERIAL
OW1	Oil storage tank	300	Mild steel
OW2	Oil storage tank	150	Mild steel
OW3	Oil storage tank	90	Mild steel
OW4	Oil storage tank	90	Mild steel
OW5	Oil storage tank	55	Mild steel
OW6	Oil storage tank	55	Mild steel
OW7	Oil storage tank	55	Mild steel
OW8	Oil storage tank	55	Mild steel
OW9	Oil storage tank	55	Mild steel
OW10	Oil storage tank	55	Fibreglass

The tank lists shown are indicative only based on expected throughputs. Actual sizes will be dependent on the cost and availability of used and new tanks.

Whereas the nature of the waste streams to be stored in the tanks in the biodegradable aqueous waste, oily water and waste oil storages will remain reasonably constant with regard to the physical and chemical properties of each type of waste, the CFS wastes will vary considerably in terms of the chemical and physical properties. Consequently, the tanks will be designed and constructed to resist chemical corrosion.

The tank storage is based on industry and government information and on data from regions within Australia with comparable densities of industry and population. However, allowances have been made in the design and layout for future expansion to meet market demands.

Where possible, bulk waste deliveries will be stored in holding tanks to allow primary settling of sludges and separation of floating scums. Waste oils will be transferred directly from road tankers into storage tanks via an in-line coarse screen filter

It is anticipated that the largest treatment tanks will have a heights up to 11 metres and diameters of 5 metres, respectively. It is expected that the largest treatment tanks will have capacities of about 300 kL. Separation distances between tanks will be in accordance with the Australian Standard having regard to risk management and fire safety. Distances from tanks to protected works will be incorporated in the design of the LWTF.

Storage and reactor tanks will be provided with venting, isolation valves and level gauges.

Each tank farm will be bunded to contain 100% of the maximum capacity of the largest tank and 10% of the second largest tank in accordance with the Australian Standard AS 1940 - 1993: Storage and handling of flammable and combustible liquids. The bund floors will be graded to slope towards blind sumps and pits. The bunds will be constructed of impervious materials and in accordance with Australian Standards and design requirements.

In addition to the storage tanks, a number of process tanks and mixing tanks will be installed within the bunded areas as part of the treatment process, e.g., dissolved air flotation (DAF) unit, coalescing plate separator, chemical dosing tanks, chemical mixing tanks and clarifiers.

All pipework, pumps and ancillary equipment between tanks and transfer points will be constructed above-ground and within bunded areas wherever possible. Valves and transfer points will be recessed inside bunded areas.

2.4.10 Silos for Fixation Additives

Fixation additives such as cement and cement kiln dust for the CFS treatment plant will be stored in silos. Handling of the material will be by an air-operated system of valves and slides to direct flow of the material to the mixing unit. A load cell and hopper will be used to weigh the material required for each treatment batch.

The capacities for the silos will be subject to availability of secondhand silos or pre-fabricated units ordered to specification but will be a minimum of 80 tonnes of cement and 60 tonnes of fly ash.

2.4.11 Storage of CFS Treated Material

The CFS treated material (known as ‘fixed’ or ‘fixated’ waste), once solidified, will be transferred and stored in a roofed, bunded area to allow the material time to cure (about 4 - 7 days). The material will remain in storage until analysis is completed. If the waste passes landfill criteria, it will be sent to an approved disposal facility after permission has been given to transfer the final product. The ‘fixed’ solid waste will be transported with appropriate documentation. If the ‘fixed’ waste fails to meet landfill criteria it will be returned to the CFS plant for reprocessing.

2.4.12 Drum Store

A drum store will be constructed in accordance with the provisions of the Australian Standards AS 1940-1993: Storage and Handling of Flammable and Combustible Liquids, the Australian Standard AS 3780-1994: The Storage and Handling of Corrosive Substances and any regulations defined by the administering authorities such as dangerous goods legislation. The storage area will be designed to have a maximum capacity equivalent of 200 drums (205 litre drum size). The drum store will be bunded and covered as required by the relevant standards. Bunding will be constructed in accordance with the Australian Standard to contain at least 25% of the maximum capacity of the storage area.

All drums received at the facility will require assessment and will be required to be in sound condition (except where permission has been granted otherwise, e.g. a protective overdrum), transported in accordance with directions, clearly labeled and be provided with lids or suitable covers to prevent spillage or rainwater contamination. Drums which have been emptied will undergo rinsing in accordance with the Operating Procedures and will be crushed for recycling to scrap metal merchants or disposal to landfill. The rinsate will be directed to the CFS plant for treatment.

For wastes unsuitable for treatment at the LWTF, NTRR will act as a waste management agent to obtain the most cost effective and appropriate disposal options for customers. Where necessary, the facility will act as a temporary storage site until the wastes can be transferred to a licensed treatment facility. These wastes will include greases and pesticides. The materials will be stored in an isolated Drum Store designed and constructed in accordance with building regulations, Australian Standards and Dangerous Goods' legislation.

2.4.13 Flammable Goods Store

Solvent wastes, solvent-based paints and laboratory solvents will be stored in a bunded, covered depot in accordance with regulatory requirements or, as a minimum, the relevant Australian Standards, i.e., AS1940-1993: Storage and Handling of Flammable and Combustible Liquids and AS3780-1994: The Storage and Handling of Corrosive Substances.

A flammable liquid storage tank will constructed in accordance with the provisions of the Australian Standards AS 1940-1993: Storage and Handling of Flammable and Combustible Liquids and any regulations defined by the administering authorities such as dangerous goods legislation. The storage tank will have a maximum capacity of 77 kL and will be bunded as required by the relevant standards. Bunding will be constructed in accordance with the Australian Standard to contain at least 110% of the maximum capacity of the storage tank. The tank will be used to store contaminated flammable liquids such as kerosene or Avtur, from shipping and Defence Forces. The flammable waste will be blended to produce various grades of fuel oil.

2.4.14 Site Access and Traffic

Access to the site will be from Mendis Road. Access to the public road will meet the requirements of the Department of Transport and Works.

Heavily trafficked areas will be constructed with concrete pavement to reduce damage from turning vehicles. Bitumen or compacted road base will be used elsewhere on the site such as truck parking areas.

Access will be designed and constructed to allow articulated vehicles into the facility from Mendis Road. The access will be designed so that the trucks can move off Mendis Road whilst awaiting authorisation.

The site will be laid out in such a manner as to provide controlled traffic movement. Drivers will be required to report to the office for security, documentation clearance and sample analysis before being accompanied to the specific unloading area. After the unloading of wastes or the loading of cured products, drum wastes, oil or treated wastes, traffic will leave the site via an exit gate.

Forklifts will be used at the facility to transport bins, drums and pallets. Pedestrian walkways, speed limits and parking areas will be suitably displayed and marked. Transfer bays will be suitably bunded as a spill management contingency and forklift entry to storage areas will be via rollover bunds.

2.4.15 Evaporation Ponds

Effluent from the activated sludge treatment system will be directed to the evaporation ponds which will act as a tertiary biological treatment system. The ponds will operate as aerobic ponds and, in addition to the effluent from each treatment process, will be designed to contain any treated stormwater from the bunded areas of the site.

Four Evaporation Ponds have been designed for final effluent treatment and storage with a total capacity of 1 ML. Flow through the ponds is sequential with the effluent from the final pond being used for on-site wash water. Two storage tanks will be provided for storage of pond effluent for use on-site as recycled water, e.g., for tank washouts and wash downs of floors, bunds and trucks. The tanks will be bunded to retain 110 % of the maximum capacity of a single tank.

The effluent from the biological lagoons will be used for tanker washout, floor washdown in the CFS plant or in the CFS process, as required.

The evaporation ponds will be constructed with impervious linings (HDPE) to prevent seepage and will be shallow enough to promote the growth of facultative and aerobic bacteria. Facultative and aerobic bacteria will assist in further reducing the organic load in the ponds. Monitoring of the ponds will be conducted regularly.

The Evaporation Ponds will be pumped dry, cleaned out and covered during the wet season to prevent the possibility of the ponds overflowing from excess stormwater inflow.

The wildlife able to access the evaporation ponds will be largely limited to birds, reptiles and small animals. Larger animals will be unable to access the ponds due to the security fence. As the ponds will consist of aerobic bacteria, it is unlikely that fauna will be at risk. The effluent discharged from the treatment units will comprise of mainly soluble biodegradable organic matter readily digested by aerobic bacteria and phytoplankton. The ponds will require

complete evacuation and cleaning every 12 months to prevent overflows during the wet season. This will be incorporated into the operating procedures.

Effluent discharged to the ponds and the ponds' contents will be regularly tested by NTRR to monitor performance of the various processes and measure the quality of the treated water.

2.4.16 Discharges and Wastes Produced by the CFS Plant

The CFS Plant will produce a non-hazardous, solid waste of treated product which will be transferred to banded curing bays. After curing the chemically treated waste will vary in physical characteristics from a friable soil to a rock-like material. The cured waste will be analysed to ensure that it meets the required limits for disposal in an approved landfill. Solidified wastes approved for disposal will be transported from the site in covered containers to licensed disposal sites approved by the regulatory authorities.

Any effluents produced from plant washdown or other activities will be collected and treated in the CFS Plant.

Dust from the CFS process will be contained by installation of an extraction system which will direct all dusts back into an air filtering system attached to the silos.

The amounts of wastes produced from the chemical fixation plant will be wholly dependent on the waste products supplied by the waste generators. At all times waste minimisation techniques will be utilised to minimise the final amounts of wastes produced by the plant.

2.4.17 Despatch and Product Loading

The CFS wastes approved for disposal will be loaded onto tippers or similar vehicles and transported to approved landfills. Tippers will be loaded by a front end loader or backhoe. Drums and IBCs despatched to other licensed disposal or treatment facilities will be transported by approved freight vehicles.

Bulk transport of liquid wastes, recycled oils and oil products, and pond effluent from the facility will be conducted by NTRR's licensed vehicles or licensed contractors.

2.4.18 Transfer Systems and Pipelines

Wherever possible, liquid wastes will be transferred from tanks using pumps and pipes in a closed-loop system to control emissions, reduce the opportunity of spills and reduce exposure of the wastes to employees. Pumps and pipework from tanks and pits will be arranged to utilise the same pumps connected to a pipe manifold to reduce the number of pumps required.

On-site transfers from tanks which are not connected by pipework will be conducted by mobile pumps or vacuum tankers. Similarly, mobile pumps or vacuum tankers may be used to remove and transfer liquid residues from tanks, containers, drums and pits.

The waste oil storage tanks will have dry break valves to reduce the possibility of spillage or loss of containment. Where direct connection to fixed pipework is not possible, reinforced flexible hose will be used. Valve connections to tanks will be inside banded areas to reduce

the risk from loss of containment. Lockable valves will be installed on tanks for security. Transfer bays for road tankers will be bunded in accordance with spill management requirements.

All on-site services including pipelines for the transfer of wastes will be located above ground wherever possible for ease of maintenance and repair. Where pipelines cross roadways trench pits will be used.

Guard rails and bollards will be used to protect pipelines from the risk of collision from on-site vehicles where pipelines come close to trafficable areas.

2.4.19 Equipment Details

The major items of plant required will be purchased complete in most cases. However, some tanks, ladders and pipework will be constructed on-site. Major items of equipment are listed in Table 2.5.

Table 2.5 Equipment Details

Biodegradable Plant	Oily Water Plant	Oil Storage	CFS Plant
DAF Unit	CPS Unit	Heating Tank	Filter Press
	Centrifuge		Silos
			Hoppers
			Screw Mixer
Tanks for settling, storage, blending, reacting and mixing processes. Pumps & compressors Pipework Forklift			

2.4.20 Safety and Security Controls

Safety and security controls include the following:-

- The site will be enclosed by a 1.8 metre high chainlink fence.
- Access and ingress points to the site will be fitted with 1.8 metre high lockable gates.
- Site gates will be locked whenever the plant is unattended.
- Security lighting.
- Lockable valves on tanks.

2.4.21 Odour Control

Control measures will be implemented to reduce any odours which may be produced from site activities that could impact on neighbouring properties. Control measures will include prevention of emissions, alteration of procedures, careful assessment of wastes prior to receipt and mixing of compatible wastes.

Odours from transfers: reduce aspiration of wastes by using flexible hose into pit, discharge under liquid surface, vent stacks.

Odours from evaporation ponds: pH control, recirculation and aeration, regular cleanout of lagoons, maintain levels of water.

Odours from reactions: careful choice of reactants, smaller volumes or dilution of waste quantity, pH correction or control, adjust addition of waste into fixation process, choose favourable weather conditions, aeration of tanks.

Odours from tanks: pH control, aeration, recirculation.

Odours from wastes such as sludges, scums: regular removal of wastes, addition of lime or cement, mixing with sawdust, sealed bins or tanks until ready for removal.

Storage of liquids with the potential to cause explosive or hazardous atmospheres such as kerosene will be stored in accordance with statutory requirements and the relevant Australian Standard. Vapour controls will include ventilation points and liquid seals. However, bulk storage of Flammable Liquids - Packaging Group I (flash point less than 23°C) will not be accepted at the site.

It is expected that vapours emitted by storage vessels and reaction processes will be negligible as waste oils are Class C2 combustible liquids, i.e., liquids having a flash point greater than 150°C. As only waste oils are accepted, flammable vapours and VOCs from oil storage tanks will be negligible. The small proportion of flammable liquids present in waste oils generally evaporates before collection and transport.

Ventilation will be provided where necessary to prevent any build up of explosive vapours. Static lines will be installed where necessary and electrical fittings will meet Australian Standards.

Any flammable liquids (bulk and packaged) will be stored in isolation in bunded areas which will be designed and constructed in accordance with Australian Standard AS 1940 - 1993: Storage and handling of flammable and combustible liquids. Packaged flammable goods will be stored under cover with lids and closures fitted.

To prevent possible odour generation from the biodegradable and oily water treatment processes at the facility, pumps for aeration or recirculation of tanks will be installed to prevent anaerobic bacteria from proliferating.

2.4.22 Additional Facilities

Additional features to be provided within the LWTF include a truck wash bay, administration office and amenities, laboratory, workshop, a segregated stormwater drainage and treatment system, truck fuelling facilities and general facilities.

A tanker refuelling facility will be constructed consisting of two underground/above ground storage tanks, spill containment and drainage and dispensing pumps.

The administration building will be a single storey block and contain offices, laboratory, reception area, amenities, toilets, showers and lockers, first aid room, and a lunchroom.

2.4.23 Services and Utilities

As part of the sub-division and site preparation works, the developer and the Northern Territory Government have provided mains power and water reticulation to the site. Sewer reticulation is not available and effluent disposal will be via a septic system constructed in accordance with Government approvals.

Site landscaping will be designed to improve the aesthetics of the site, reduce wind effects and conform to the local climate. A strip of landscaped vegetation sufficient to adequately screen any parking area at the front of the property will be included.

Security fencing and lockable gates will be constructed. Lighting will be provided for security and to meet health and safety requirements.

2.4.24 Mosquito Control

Appropriate design controls will be constructed into the LWTF to reduce the possibility of mosquito breeding sites developing. Landscaping will be contoured during construction to ensure the site is well drained and to reduce the possibility of surface waters pooling for extended periods. Drains from the site will be designed to reduce the establishment of vegetation that promotes mosquito breeding.

Potential breeding sites for mosquitoes include stormwater drains and traps, uncovered bunded areas and the evaporation ponds. Mosquitoes can lay eggs on water surfaces, damp ground or vegetation at the edge of a pond or pool of water or on the edges of a damp man-made container. Mosquito eggs laid on damp surfaces are usually drought resistant, so there is a resting stage where the eggs remain viable until the pool, container or cavity is flooded by rainfall, irrigation or tidal water.

Temporary pools generally provide more opportunities for mosquito breeding since permanent waters often have substantial numbers of established predators such as fish, dragon flies and other insects. In temporary pools which form after rain inundation, mosquitoes establish and complete their development rapidly before the numbers of predators rise to a level where they can provide any significant control.

Operators at the site will be required to inspect each area and the fence line daily to ensure potential breeding sites do not develop. Where potential breeding sites do develop, water may be removed using tankers or portable pumps. Alternatively, chemicals designed to prevent or break the mosquito breeding cycle may be used. Careful consideration will be given in the design of the facility to aeration of tanks and ponds, water recirculation and physical barriers and maintenance of the facility.

Insect repellants, protective clothing and awareness training will be provided to employees and visitors to mitigate mosquitoes and other biting insects. Where chemical controls of breeding areas are required, insecticides such as “Bti”, a protein produced in a fermentation process by the bacteria *Bacillus thuringiensis israelensis*, and an insect growth regulator called “Methoprene” will be used. Both these chemicals are friendly to the environment because they specifically target mosquitoes. The chemicals are applied by dispersion of Methoprene-coated sand or by spraying Bti dissolved in water.

2.4.25 Maintenance

Site maintenance will be provided by both employees and contractors, depending on the scale of work. A workshop will be constructed to provide plant and equipment suitable for the repair and service of most of the facility's operating equipment including pumps, valves, pipes, vehicles, forklift and trucks.

The facility has been designed with sufficient excess storage capacity to cope with emergencies and periods of high volume throughput such as during the Christmas-New Year break. During periods of plant maintenance where storage capabilities are reduced, plant throughputs will be controlled by the Plant Manager. Contingency planning for extended shutdowns would include scheduling of waste receivals, ensuring available storage on-site and communication with transporters and generators in advance, if possible.

2.4.26 Stormwater Management

The stormwater management system for the NTRR site will be designed to minimise the potential for contamination of the stormwater discharge and the receiving environment including receiving waters and ground waters.

There will be three distinct catchment areas on the site:

- *Catchment A* - Bunded areas;
- *Catchment B* - Roadways, parking and hardstand areas; and,
- *Catchment C* - Building roofs, lawns and gardens.

Wherever wastes or chemicals are stored, treated or transferred from road tankers to tanks, or there is the possibility of spillage, bunding will be installed, e.g., tank farms, drum stores and tanker transfer bays.

Whereas Catchment Area A has the potential for contamination, Catchment Areas B and C are not considered to be a sources of contamination. The stormwater drainage system will be constructed so that potentially contaminated stormwaters are segregated from clean stormwater. Clean stormwater from Catchment Areas B and C will be discharged directly to off-site stormwater drains.

The stormwater catchment and treatment system will be designed to take the equivalent flow of a Q5 event, i.e., a 1-in-5 year Average Rainfall Interval ("ARI"), and a Q100 ARI event, i.e., a 1-in-100 year ARI. Using design criteria to handle the first 10 minutes of runoff from a storm event, for a Q5 event this equates to a water depth of 30 mm and for a Q100 event a water depth of 40 mm. Therefore, the stormwater management systems will be required to be able to efficiently treat flow rates from exposed hardstand areas of 30 litres/sq m and 40 litres/sq m, respectively, for the two events. It will be necessary to select treatment systems capable of efficiently treating the anticipated flow rates.

The rainfall intensity details were calculated from the procedures presented in *Australian Rainfall and Runoff* by Canterford (1987) and are presented in Appendix D.

Stormwater from Catchment Area A will be inspected by the Plant Manager or Plant Chemist and, if relatively clean, will be discharged directly to the stormwater system via the

stormwater treatment system. If the stormwater in the bunds is contaminated, i.e., visible solids or hydrocarbon contamination, it will be treated through the CPS unit and the effluent directed to the Evaporation Ponds. The CPS unit will be cleaned regularly and closed to prevent mosquitoes breeding. Only minimal amounts of sludge and hydrocarbons are expected to be recovered since spill management and general housekeeping procedures will minimise contaminants within the bunds. Any hydrocarbons retained by the CPS unit will be transferred to the oil storage tanks and the sludge will be transferred to the CFS Plant for treatment.

The bunds will be constructed so that the grade of the bund floors fall towards blind sumps or pits. Stormwater captured in the bunded areas will be transferred from the blind sumps using a portable pump or a vacuum tanker.

Where possible bunded areas will be covered to prevent rainfall coming into contact with contaminants. All vehicle access points into bunds will be via a rollover bund.

Spill management kits and procedures for their use will be implemented and clean housekeeping measures enforced.

2.4.27 Waste Management

Wastes generated at the facility are expected to include:

- General wastes such as kitchen scraps, paper, bottles, plastic, etc. - removed from the site by licensed contractors and disposed at licensed landfill. NTRR will promote recycling programmes and plastic, paper and cardboard, wood and scrap metal will be segregated and collected by recyclers;
- Metal drums and lids, crushed oil filters from trucks and cars - scrap metals will be placed in segregated industrial bins. If the scrap metal meets recyclers' acceptance criteria, the metal will be removed by recyclers. If unacceptable, the metal will be disposed to a landfill;
- Oil filters for refining processed oils to specifications - disposed and treated in the CFS Plant;
- Plastic containers and drums - after rinsing disposed into the industrial refuse bin for disposal to landfill;
- Solid wastes from coarse screens in the waste receival pits - transferred to the CFS Plant for treatment and disposal;
- Truck wash wastes and sludge - transferred by vacuum tankers to the CFS Plant for treatment and disposal.

In addition to those defined above, a number of waste streams will be generated by the treatment processes conducted at the LWTF. The types of waste produced and disposal options are as follows:

Biodegradable Aqueous Waste Treatment:

- Solids, greases and sludges to landfill, landfarming operations or composters.
- Treated effluent discharged to the evaporation ponds for reuse on-site as wash water.

Oily Water Treatment:

- Recovered oils stored on-site for recycling.
- Treated water phase discharged to the evaporation ponds for reuse on-site as wash water.

Oils Storage:

- Oils stored on-site for recycling.

CFS Treatment:

- Supernatant from neutralisation reactions transferred to the biodegradable aqueous waste treatment system.
- Cured CFS solids disposed to landfill after meeting landfill acceptance criteria.

Drums:

- After washing, drums will be forwarded to metal recyclers or drum merchants, if acceptable, or disposed to landfill.

Laboratory Wastes:

- Laboratory wastes will be reused or transferred to the CFS Plant for treatment and disposal. Samples of wastes will be transferred to the CFS Plant for disposal.

The quantities of waste produced by the facility will be entirely dependent on the waste collected from the Port's maritime industries, shipping and generators in the Darwin region. Waste estimates may vary considerably from that anticipated. The volumes of wastes generated for disposal are expected to decrease significantly over the next decade due to factors such as the cost of disposal as the 'user pays' principle is implemented and the introduction of waste minimisation programmes, cleaner production techniques, recycling by generators, and environmental legislation.

At all times waste minimisation techniques will be utilised by NTRR to minimise the final amounts of wastes produced by the LWTF.

2.4.28 Fire Fighting Systems

On-site fire systems and equipment will be designed and fitted in accordance with Australian Standards and fire protection codes. A fire risk assessment will be conducted during design of the facility which will examine the risk of fire from the transport, transfer and storage of wastes and products.

Firebreaks 4 metres wide will be installed along the perimeter of the site in accordance with the requirements of the Northern Territory Fire and Rescue Service.

The Site Safety Management System will incorporate a Permit to Work procedure in relation to hot work and working in the vicinity of flammable and combustible liquids.

All personnel will be trained in fire fighting techniques, evacuation procedures emergency response. Training sessions including ‘mock’ emergencies will be conducted at least every six months. Emergency services will also be requested to provide advice, audit emergency equipment and procedures and participate in the ‘mock’ emergencies.

2.4.29 Vehicle Fleet

NTRR proposes to operate a fleet of vehicles from the site including road tankers (vacuum tankers, “Supavac” tankers and oil tankers), water blast trucks, a flat bed truck, forklifts and ancillary equipment.

The vacuum tankers use positive and negative pressures to transfer liquids into and out of the tank vessel. Uses of the vacuum tankers include transport of liquid wastes to the LWTF, on-site transfers of chemicals for customers, septic and sullage removal from residences, ship to shore transfers and emergency spill clean ups.

“Supavac” tankers are specialised vacuum tankers which use a higher vacuum than normal which in turn requires a reinforced tank barrel. “Supavac” tankers are capable of transferring solids, dry waste, sludges as well as liquids, particularly from deep pits, over long distances, from ships’ holds and clearing blockages in sewer and stormwater mains.

High pressure blast trucks have a truck-mounted water blast unit comprising a compressor pump, hoses, water blast guns and lances. Most water blast activities will be conducted on customers’ sites. Water blast trucks do not transport liquid wastes.

A flat bed truck will be required to transport containers and drums. The flat bed truck will have a rear-lift platform or a crane for lifting containers onto and off the vehicle.

All vehicles will be licensed to transport dangerous goods and drivers will receive appropriate training.

All vehicles will carry spill management equipment, driver’s handbook, emergency procedure guide, fire and first aid equipment.

The vehicles will be parked overnight at the facility. Loaded tankers will be parked in bunded loading bays. All transfers will be supervised and an operator will be in attendance at all times. Transfers will be conducted in bunded areas including drum transfers.

The vehicle fleet will comprise of 6 and 8 wheel rigid vehicles, semi-trailers, B-doubles and a number of utilities for local transportation.

3.0 EXISTING ENVIRONMENT

3.1 Ambient Conditions

The proposed site is within the East Arm Industrial Area which has been specifically planned, zoned and developed to be an area for general industry with an emphasis on Port-related activities. The East Arm area is partially developed.

The existing air quality of the site and the immediate region is consistent with that of semi-tropical forest. The proposed site has been cleared of trees and shrubs but has a complete vegetative cover of grass. The estate consists of similar small areas of cleared land and surfaced roadways surrounded by native forest. Within these environs there are no large, open, uncovered, non-vegetated areas which could be a source of wind-blown dust.

Roads in the area are paved and are not a source of vehicle-generated dust. No odour impacts on air quality exist in the surrounding area.

Run-off water is that expected of semi-tropical vegetation.

Background noise is consistent with a greenfield development shielded by semi-tropical vegetation. However, as industrial development of the area progresses, background noise levels consistent with industrial zoned land will predominate.

3.2 Climate

The site is located near the coastline of the East Arm area of the Port of Darwin (approximately 450 metres from mangroves flats), and has an elevation of about 6 metres AHD.

Darwin's climate is typically characterised by high humidity during a hot, wet season from November to March and a hot, dry season from May to September. The seasons are separated by short intermediate periods during April and October. Climatic data for the Bureau of Meteorology Weather Station No. 14015 at Darwin Airport is detailed in Appendix D. The station has 59 years of meteorological data.

The mean annual rainfall of 1,666 mm is highly seasonal ranging from a mean of 1 mm in July to 420 mm in January. Heavy rainfall events are common during storms in the wet season.

Rainfall intensity-frequency-duration data has been calculated for the site and is included in Appendix C. Rainfall intensities will be used to determine the design criteria for stormwater treatment and management (discussed in Section 2.4.26).

Temperatures fluctuate within a fairly narrow range throughout the year with a mean daily minima varying from 19.3°C in July to 25.3°C in November and December. The mean daily maxima for the same months varies between 30.4°C (July) and 33.1°C in November.

During the winter months (dry period) south-easterly winds predominate whilst light west to north-westerly winds predominate during the wet season. Sea breezes are experienced on most afternoons throughout the year.

On average, Darwin experiences one tropical cyclone per year. Structural design of buildings will be in accordance with the Australian Standard AS1170 Part 2 – 1989: *Minimum Design Loads on Structures – Wind Loads*.

3.3 Topography

The site is approximately level. The natural physiographic feature of the area surrounding the site is dissected Southern Coastal Plain. This unit typically has gently undulating to undulating slopes with relief ranging to 16 metres.

A mangrove fringe (adjacent to Hudson Creek) is located approximately 420 metres to the south of the site.

3.4 Seismic Stability

Seismic design should be based on the level of ground motion associated with a design earthquake event appropriate to the region. Darwin is in a relatively low risk seismic zone, and the possibility of reactivation of geological ancient faults is considered remote. The potential for liquefaction in the residual/lateritic cohesive site soils is considered to be negligible. Liquefaction could only occur in predominantly sandy and silty marine sediments. A basic Acceleration Coefficient (a) of 0.08 is proposed for evaluation of ground and earth slope stability associated with the development of the site

3.5 Hydrology

3.5.1 Surface Water

The natural direction of flow for surface water in the area of the site is expected to be from north/north-west to south/south-east. Hudson Creek, located to the south of the site, is part of a catchment area comprising an extensive network of broad drainage channels and a perennial lagoon, Marlows Lagoon. During the Wet season and for some time afterwards the catchment area remains largely saturated due to continued seepage and poorly draining soils. While under normal circumstances this may not directly affect the site, it may affect aspects of the groundwater hydrology in the area.

3.5.2 Groundwater

Groundwater underlying the subject site is brackish to saline and is considered unsuitable for most uses. Based on a review of DLPE Water Resources Division records, the closest registered bore to the site is Bore 377 located approximately 1 km to the north-west in the vicinity of the old Leprosarium. Minimal data is available concerning this bore except that it was abandoned due to unacceptable water quality.

Three other registered groundwater bores are located in the area. Registered Bores 371 and 5161 are located approximately 1.2 km to the west and south-west, respectively. Bore 24735 is located approximately 2 km to the south-east on the opposite side of Hudson Creek.

Data relating to groundwater quality for registered Bores 5161 and 24735 is provided in Table 3.1 and available borehole logs and laboratory analysis results are provided in Appendix I.

Table 3.1 Groundwater Quality Data

PARAMETERS ANALYSED	UNITS	BORE 5161 (Drilled 1980)	BORE 24735 (Drilled 1986)
pH	-	6.3	6.3
Conductivity	mS/cm	38	35
Total Dissolved Solids	mg/L	24	35
Sodium	mg/L	3	2
Potassium	mg/L	<1	2
Calcium	mg/L	2	2
Magnesium	mg/L	<1	1
Total Hardness (as CaCO ₃)	mg/L	5	9
Total Alkalinity (as CaCO ₃)	mg/L	7	10
Iron	mg/L	0.1	1.2
Silica	mg/L	10	14
Chloride	mg/L	2	6
Sulphate	mg/L	2	<1
Nitrate	mg/L	6	1
Bicarbonate	mg/L	9	12
Fluoride	mg/L	<0.1	0.1
Sodium Chloride (from Chloride)	mg/L	3	8

Investigations completed by Dames & Moore (March 2000) in close proximity to the site indicate that groundwater is likely to be encountered at a depth of approximately 1 - 2 metres. Due to rainfall patterns in the Darwin region, groundwater levels fluctuate greatly between Wet and Dry seasons. Groundwater levels generally rise in the mid-to-late Wet season and subside at an average rate of 0.5 metres per month until the end of the Dry season.

The extent of the aquifer underlying the subject site is unknown and transmissivity, discharge and recharge characteristics and storage/flow-through coefficients are unavailable.

3.6 Soil Characteristics

The Darwin 1:100,000 Geological Map Sheet issued by the Northern Territory Department of Mines and Energy (1983) indicates that the sub-surface profile in the area of the site includes:

- Unconsolidated sand, clayey sand, ferruginous clayey sand, soil, commonly containing limonite pisolites.
- Nodular, concretionary, pisolitic and vermicular mottled laterite; ferricrete; *in situ* and reworked remnants of standard laterite profile.

In addition, there is a possibility of encountering siltstone; shale; sandstone (quartz arenite, sublitharenite); quartz-pebble conglomerate; metamorphosed to lower greenschist facies.

3.7 Terrestrial & Other Vegetation

The 1.8 hectare site has been cleared of all vegetation by the developer, Paradise Developments Pty Ltd, prior to transfer to Transpacific Industries Pty Ltd. Following construction, landscaping and local vegetation will be planted to beautify and enhance the visual aspect of the facility, replace native vegetation and act as a wind break

3.8 Fauna

The clearance of vegetation has resulted in the removal of all faunal habitat from the site.

4.0 ENVIRONMENTAL IMPACTS AND ISSUES

4.1 Construction Phase

The construction of the LWTF will be on a site previously prepared and subdivided by Paradise Developments Pty Ltd. Construction of the LWTF will be supervised by NTRR and it is anticipated that the construction phase will last 6 - 9 months from the date of commencement depending on weather conditions.

Short term environmental effects from earthmoving machinery and construction activities include the generation of dust, noise and increased erosion from stormwater runoff.

The Principal Contractor and sub-contractors will be required to abide by NTRR's Corporate Policies including the Occupational Health, Safety and Environmental Policies.

4.1.1 Air Quality and Dust

During the construction phase it is expected that some dust emissions will occur due to movement of vehicles and earthmoving equipment. Some wind erosion of the areas cleared of vegetation may also occur. However, dust emissions will be dependent on the moisture of the ground and the amount of rainfall during construction.

As the impacts of dust emissions are expected to be negligible and localised to the site, off-site environmental impacts and nuisance to the surrounding area is expected to be minimal. However, dust suppression using sprinklers or water trucks will be conducted if visual inspection indicates high levels of dust or complaints are received.

4.1.2 Noise

Noise during construction is expected from earthmoving equipment, construction activities and vehicles. In general, construction activities will be conducted during day light hours. Noise impacts are not expected to be a nuisance beyond the boundaries of the site.

In the event of noise complaints, investigations and remedial actions will be undertaken.

4.1.3 Surface Runoff and Erosion

Construction activities have the potential to cause impacts in surface, marine and ground water environments through contaminated stormwater runoff. Contamination of stormwater is possible from construction and earthmoving machinery, fuel spills, and particulate solids from soil erosion. Groundwater can be contaminated by leaks and spills from machinery causing infiltration of contaminants into the soil.

High seasonal rainfall events may lead to significant removals of soil from the exposed site leading to sedimentation of receiving waters and increases in turbidity levels.

NTRR will require the Principal Contractor to adopt measures that will minimise environmental impacts from surface water runoff during construction by providing surface drainage which diverts stormwater runoff away from the site and by installing silt traps on any site drainage leaving the site.

4.1.4 Construction Wastes

Wastes expected to be generated during the construction phase include:

- Excess fill from earthmoving operations and building rubble;
- General wastes such as plastics, wood, cardboard, paper and scrap metal;
- Liquid wastes such as oil;
- Sewage and domestic wastes.

Clean excess fill will be used on-site wherever possible or transported to other sites capable of using the material. If there are no sites available nearby, the fill will be taken to an approved hardfill dump.

Solid wastes produced during construction such as rubble will be disposed at an approved landfill.

Liquid wastes such as oil will be collected in drums or tanks and retained by NTRR for recycling or treatment once the LWTF is completed. If storage is not possible, then the waste will be sent to an approved waste disposal facility.

Sewage and sullage from portable toilets and temporary ablution blocks will be removed by NTRR or licensed contractors for disposal at an approved facility.

4.1.5 Mosquitoes and Biting Insects

Mosquitoes and biting insects can be highly irritating biting pests of man and animals and are capable of carrying viruses which can cause debilitating diseases to those infected.

Mosquitoes and other biting insects have the potential to breed where water is allowed to pool or stagnate. Temporary pools generally provide more opportunities for mosquito breeding. Therefore, it will be important that construction activities do not allow the establishment of breeding sites.

The Principal Contractor will be required to provide site drainage to remove or divert stormwater runoff from the site. The drainage will be designed so that ponding of water does not occur. Regular inspections for mosquito breeding sites will be conducted by the Contractor and remedial actions taken where necessary.

Where necessary, chemicals to prevent mosquitoes or other biting insects breeding will be used particularly in silt traps and bunds.

4.1.6 Traffic

Traffic flow in Mendis Road is expected to increase during the construction phase. However, the only other traffic in the estate will be similar construction traffic. Therefore, the temporary increase in traffic is not expected to be an issue to traffic using Mendis Road.

Construction traffic will use designated routes and will not travel through residential areas.

4.2 Operational Phase

4.2.1 Risk Assessment

A preliminary Risk Assessment has been undertaken for the operation of the LWTF using assessment tools developed by Standards Australia, Caltex Australia and NSW Department of Planning (Appendix A). The Risk Score Calculator developed by the Shell Company of Australia was used to rank the levels of environmental risk for each hazard identified (Figure 4.1).

Figure 4.1 Risk Score Calculator (Courtesy Shell Company of Australia)

CONSEQUENCE				INCREASING LIKELIHOOD				
SEVERITY	People	Assets	Environment	A	B	C	D	E
				Never heard of in industry	Heard of in industry	Incident has occurred in our company	Happens several times/yr in our company	Happens several times/yr in a location
0	No health effect/injury	No damage	No effect					
1	Slight health effect/injury	Slight damage	Slight effect			Increasing Risk		
2	Minor health effect/injury	Minor damage	Minor effect					
3	Major health effect/injury	Localised damage	Localised effect	LOW RISK				
4	PTD or 1 – 3 fatalities	Major damage	Major effect		MEDIUM RISK			
5	Multiple fatalities	Extensive damage	Massive effect			HIGH RISK		

The Risk Assessment process is an integrated approach to safety and environmental planning that examines the wider concept of industrial risks.

To ensure that all occupational health, safety and environmental issues are properly considered, assessments will be conducted on all significant hazards associated with the design, construction and operation of the LWTF. The assessments will be used to ensure that the risks to personnel, the environment and the facility are considered and minimised.

An Emergency Response Plan will be developed for the facility and the transport fleet to address issues such as spills, fires and vapour releases.

Management systems, policies and procedures for health, safety, environment and quality will be developed. Employees will receive appropriate training in health, safety, environment, quality, handling and storing hazardous substances, process operations, driving and emergency response through induction training and ongoing awareness education.

4.2.2 Natural Events

4.2.2-1.1 Wind

The effects of wind on the LWTF will be negligible as the tanks and structures will be designed in accordance with Australian Standard AS 1170.2 – 1993: Minimum design loads

on structures - Wind loads and the Building Code of Australia *NT Specification B1.2*. There are no structures on the site which will be critically affected by climatic wind effects.

4.2.2-2 Electrical Storms

Lightning and electrical storms are not expected to have a significant effect on the facility. Lightning strikes may cause a temporary power loss but this would not cause environmental harm. Where necessary, lightning rods or similar conductors will be strategically placed on taller structures at the site to minimise the potential for damage from lightning strikes.

4.2.2-3 Tidal Surges

Tidal surges are not expected to have an impact at the site. As the storm surge levels at the East Arm Port are 6.0 metres AHD for an 1-in-1,000 year event, and the ground level at the site generally rises above 6.0 metres AHD, the facility is not expected to be affected by cyclonic tidal surges. In addition all tanks, transfer points and storage areas will be bunded which will effectively further reduce the potential for a tidal surge to affect the plant.

4.2.2-4 Earthquake

The site is in a low risk seismic zone and the possibility of reactivation of geological faults is considered remote. The potential risks to the environment from an earthquake are contamination of the land, groundwater and marine and stormwater environments from the release of tank contents due to ruptures of structures and bunds.

The facility will be designed with structural integrity sufficient to withstand regional earthquake loads in accordance with the Australian Standard, AS 1170.4 – 1993: *Minimum design loads on structures - Earthquake loads*, the Building Code of Australia and Town Planning requirements. In addition, tanks, storage areas and transfer points will be bunded and most of the site will be covered with a concrete surface. The bunds will be constructed to retain 100% of the largest tank and 10% of the second largest tank for tank farms and 25% of the maximum storage capacity for drum stores.

4.2.2-5 Cyclones

Darwin experiences about one cyclone each wet season. Cyclones can be expected to have a significant impact on the facility and its ability to function. Procedures will be implemented at the LWTF to ensure that plant, equipment and personnel are properly prepared to ensure minimal damage or loss of equipment due to high winds, floodwaters and lightning strikes. The buildings and structures will be designed and constructed to meet Australian Standards, the Building Code of Australia and local planning requirements. Employees at the site will undergo regular training and participate in emergency training as preparation for cyclonic storm conditions.

The major impacts that can be caused by a cyclone include overfilling of bunds leading to stormwater and groundwater contamination, flooding and structural damage causing indirect environmental harm.

4.2.2-6 Floods

The facility will be built above the 1-in-100 year cyclonic tidal surge. As the storm surge levels at the East Arm Port are 6.0 metres AHD for an 1-in-1,000 year event, and the ground level at the site generally rises above 6.0 metres AHD, the facility is not expected to be affected by flood conditions caused by rising waters or cyclonic tidal surges. In addition all tanks, transfer points and storage areas will be bunded which will effectively further reduce the potential for flood levels to affect the plant.

Flood waters captured within bunded areas can overflow causing contamination of the stormwater and groundwater systems. Housekeeping procedures and pumping of contained waters will minimise the risks from a loss of containment event. The evaporation ponds will be kept empty during the wet season and are not expected to be a source of contamination.

Bunds will be examined for visible signs of contamination such as debris and floating oil and grease and, if clean, transferred to the stormwater system. If contaminated, the water will be pumped to storage for appropriate treatment.

4.2.3 Fire

Fire is considered a possibility in the facility due to the storage of flammable, combustible and other reactive chemicals. Fire will generally be localised to a tank farm and could cause rupture, explosion or loss of containment. The facility will have adequate fire fighting equipment installed, specific site rules in relation to ignition sources and Permit to Work procedures. Contamination can occur from a fire to the atmosphere, land, stormwater and groundwater from liquids used to control the fire.

Incompatible chemicals will not be permitted to be transported or stored together and is the responsibility of the Plant Chemist to ensure that testing on all samples occurs.

The site will be landscaped with vegetation mainly along fence lines and roadways. Firebreaks (4 metres wide) will be maintained along the perimeter of the site to minimise the risk of any brush fire damaging or reaching the facility's infrastructure. Firebreaks will also be maintained along the outside of the fence line where possible and debris and undergrowth will be cleared seasonally to reduce the risk of fire.

Fire fighting equipment and fire hydrants will be installed in accordance with the Building Code of Australia, Australian Standards and government fire requirements. The structures, stores and bunds will be designed in accordance with fire regulations where necessary. Placement of fire fighting equipment will be determined in accordance with design requirements and, where necessary, Australian Standards such as AS 1940: 1993 - The storage and handling of flammable and combustible liquids.

4.2.4 Groundwater Contamination

Although groundwater contamination is a possibility through spills and loss of containment, it is unlikely since all vehicles will unload and load within bunded areas. All transfers will be supervised and all valves will be recessed inside bund walls.

All areas used for traffic movement, parking, transfers, cleaning, drum and container handling, treatment and storage will be surfaced with impervious materials such as concrete and bitumen in accordance with the Building Code of Australia, Australian Standards and government requirements. There will be little likelihood of groundwater contamination as the storage and treatment tanks will be constructed above-ground within impervious bunds. All tanks, storage facilities and transfer bays will be bunded. All bunds will be designed to drain to blind sumps to allow any captured liquid to be pumped out of the bund or transferred to storage.

Hardstand areas and bunds will be inspected daily for contaminants and all spills will be cleaned up immediately in accordance with operational procedures. Drip trays and housekeeping will be utilised for connection points and pump and pipe maintenance.

Tanks will be inspected before and after all transfers to prevent overflows and all transfers will be recorded. Tanks will be clearly labeled. Dry break and non-return valves will be used wherever possible to prevent unnecessary spills and the possibility of a tank's contents from siphoning back. Pumps and valves will be clearly marked wherever possible.

Groundwater underlying the subject site is brackish to saline and is considered unsuitable for most uses. Since all activities at the facility will be undertaken on impervious surfaces within bunded areas, the risk of exposure of humans to contaminated waters is considered infinitesimally low.

The evaporation ponds will be lined with impermeable High Density Polyethylene (HDPE) welded along the seams to prevent seepage. Notwithstanding the low contaminant potential of the pond waters, the risk of contamination of the groundwater or land from seepage is not expected. The evaporation ponds will be pumped dry, cleaned and inspected for repairs before the start of each wet season and remain unused for the duration of the wet season. Plant effluent will be directed to the water storage tanks and transported to the PAWA lagoons during this period.

4.2.5 Stormwater Contamination

The possible sources of stormwater contamination include the roadways and trafficable areas, bunded areas and transfer points caused mainly by minor spills and leaks. Operational procedures will require spills and leaks to be immediately cleaned up.

The facility will be designed and constructed so that runoff from other sites is diverted away from the LWTF by channels and drains.

All transfers and pumping operations will be closely supervised to prevent overflows or any loss of containment.

Tanker transfers will occur in bunded bays capable of retaining the equivalent volume of the largest compartment of the largest road tanker.

The evaporation ponds have the potential to overflow during the wet season causing contamination of the surrounding ecosystem. As a result, the ponds will be emptied prior to the start of the wet season and cleaned to prevent contamination.

Clean stormwater runoff from site gardens, lawns and building roofs will be segregated from other, potentially contaminated stormwater and discharged separately to the stormwater system. Potentially contaminated stormwater from roadways and trafficable areas will be diverted to interceptor traps capable of removing fine colloidal matter, oils, greases, floating debris and gross solids. The effluent will be discharged to the stormwater system. The throughput of the interceptor traps will be calculated for each catchment area from rainfall data for 1-in-5 and 1-in-100 year rainfall events in the Darwin region.

Stormwater collected within bunds will be inspected for gross solids, floating oil and grease and debris. If clean, the water will be transferred to the stormwater system. If contaminated, the stormwater will be transferred to a storage tank and treated appropriately to remove the contaminants. Bunded areas will not have valves running through the bund walls.

4.2.6 Land Contamination

All operations including treatment, transfers and storage of materials will be conducted in impervious bunded areas. Activities which have the potential to contaminate the soil will be undertaken in bunded areas. Land contamination can occur from spills, leaks, loss of containment or overflows.

Drum loading and unloading operations will occur in within bunded areas. Drums of unsound condition will be placed into overdrums to prevent leakage. Where possible drums containing chemicals or wastes will be stored with their closures in place and kept under cover.

Vehicles will be washed in the truck wash bay whilst tanker washouts will occur during the transfer of wastes into the respective plant.

High pressure water blasting undertaken on-site will be conducted within bunded areas and all water captured. The bund floors will be constructed to drain to blind sumps to enable the contaminated water to be pumped to storage tanks for treatment.

If soil contamination occurs due to an accidental spill or loss of containment, emergency response procedures will be used to control and clean up the contaminated area.

The size and capacity of the evaporation ponds will be determined by the estimated waste volumes collected, the land available at the site, the rate of water evaporation from the ponds and the amount of rainfall expected. The design of the plant and evaporation ponds will be such that sufficient capacity will be available to meet surcharges from industry and high rainfall events. In addition, the ponds will be designed to contain excess stormwater based on rainfall estimates for 1-in-5 and 1-in-100 year rainfall events. Bulk storage tanks may also be incorporated as holding tanks for pond effluent to enable recycled water to be used for plant washdowns, truck washes, tanker washouts and irrigation.

In the event that the ponds were near or at capacity and threatening to overflow, contingency plans would include transferring to holding tanks on-site or transferring to the PAWA lagoons. It should be pointed out that the pond effluent will not be highly contaminated or polluted and will pose minimal risk to the environment.

The pipe lines between tanks will occur within the bunded tank farms. Valves and connecting points for transfers of wastes and products will be placed inside bunded areas. Caps will be kept on all transfer valves when not in use.

4.2.7 Site Rehabilitation

The land is zoned as General Industry and is located within the East Arm Control area and the Trade Development Zone. The final use of the land, if the facility was to close, would be consistent with the zoning of the land.

For the land to be redeveloped or re-used, the buildings, plant, infrastructure and tanks would need to be removed fully or in part. Contamination of the site is unlikely given the nature of the proposal and the pollution safeguards proposed.

There are a number of factors identified which will have an impact on waste generating industries which, in turn, may affect the lifespan of the facility, such as:

- The advent of cleaner production and waste minimisation techniques;
- Introduction of more stringent environmental laws and policies;
- Greater reuse and recycling of wastes by generators;
- Greater awareness of recycling, reusing or reducing wastes by generators;
- Due diligence of companies in relation to environmental responsibility and accountability of wastes;
- Life cycle stewardship of products;
- Expansion of the populace and industry in the region;
- Increased controls on the discharge of foreign ballast waters in the Port of Darwin;
- Increased costs of treatment and disposal.

Although it is recognised that the activities conducted at the facility have the potential to contaminate the environment, the focus is on control, elimination or reduction of those hazards to acceptable or manageable levels. The LWTF provides an environmentally safe, responsible and regulated means of treating and disposing of industrial wastes.

As the operation of the LWTF is expected to be long term, rehabilitation of the site has not been considered for the site. The LWTF will be designed, constructed and operated to present minimal impacts to the surrounding environment particularly with respect to land contamination. The material usage of the site is not expected to change over time.

It should be noted that all activities at the site will be conducted within bunded areas and on impervious hardstand surfaces. Therefore, in conjunction with operational procedures and good housekeeping, the possibility of any short or long term contamination of the soil or groundwater environments is expected to be negligible.

4.2.8 Stormwater Management

A large part of the site will be covered with roadways, hardstand areas and parking areas for cars and trucks which is expected to result in an increase in stormwater runoff from the site. There is the potential for stormwater runoff to come into contact with and remove contaminants from the site into the environment during rainfall events.

Stormwater from areas of possible contamination will be inspected and, if relatively clean, will be discharged to the stormwater system via an interceptor such as a coalescing plate separator (CPS) unit designed to remove contaminants such as hydrocarbons and particulates. If the stormwater in the bunds is contaminated, i.e., visible solids or hydrocarbon contamination, it will be treated through the CPS unit and the effluent directed to the Evaporation Ponds. The CPS unit will be cleaned regularly and closed to prevent mosquitoes breeding. Only minimal amounts of sludge and hydrocarbons are expected to be recovered since spill management and general housekeeping procedures will minimise contaminants within the bunds. Any hydrocarbons retained by the CPS unit will be transferred to the oil storage tanks and the sludge will be transferred to the CFS Plant for treatment.

The stormwater drainage system will be constructed so that clean stormwater from building roofs, gardens, parking areas, roadways and lawns will be segregated from potentially contaminated stormwaters and discharges directly to off-site stormwater drains.

Monitoring of stormwater discharges from the site can be conducted by the laboratory to ensure discharge criteria are being met.

4.2.9 Spill Management

Spills may occur as a result of leaks, spills, mechanical failure such as a pump failure, expansion, overfilling a tank, corrosion, collision, breakage or a failure in control measures or procedures. Spills have a safety as well as an environmental risk. Contamination of the soil and water environments are possible if a spill breaches containment measures and enters the environment or when contaminants from a spill are transported into the environment. However, all wastes received at the LWTF will be stored in above-ground tanks within bunded areas. Therefore, the risk of contamination of the soil environment from seepage or leaks is considered negligible.

The LWTF will incorporate the following safety measures to contain spills and leaks;

- Construction of bunds to Australian Standards;
- Valves recessed inside bund walls;
- Provision of drip trays under valves;
- Spill management kits throughout the facility and on road tankers;
- Level indicators on storage tanks;
- Implementation of procedures and training to minimise risks such as an operator always being present during transfers, all tanks visibly checked before and after transfers and the transfer data recorded;
- Provision of an oil and solids recovery unit in the stormwater treatment system;
- Installation of above ground tanks.

An emergency response plan addressing minor and major spills, including road accidents involving NTRR road tankers, will be developed. All personnel at the facility will be trained in emergency response procedures and be made aware of the emergency devices in the plant.

4.2.10 Waste Management

There will be small amounts of solid wastes such as scrap metal, paper, cardboard, plastics and general refuse generated at the site by routine activities. Where recycling is feasible,

these wastes will be stored in segregated bins and removed as required. General refuse will be stored in industrial bins and removed by contractors on a regular basis.

The types of wastes from the various site treatment processes have been dealt with earlier. Wherever possible, waste products from each treatment process will be stored under cover or in sealed containers to prevent rainfall intrusion. The waste products will be stored within bunded areas and will be despatched upon approval from licensed disposal facilities.

4.2.11 Air Quality

Localised odours from biodegradable aqueous wastes, oily wastes and CFS wastes will occur to the atmosphere from the discharge, storage, handling activities conducted at the facility. Vapour and gaseous emissions are also expected from the CFS process. These odours are not expected to impact beyond the boundaries of the site through the use of vacuum transfer systems, closed-circuit pipework for transfers and operational procedures such as recirculation of tank contents to prevent anaerobic conditions from developing.

Odours will be reduced by minimising the amount of aspiration of the wastes during transfers, the use of closed storage tanks and the provision of vent stacks, where necessary.

Odours produced by CFS reactions will be reduced by careful selection of the amounts of reactants added and diligent monitoring of generators' wastes prior to receipt by the Process Chemist. Incompatible wastes will not be permitted to be mixed by transporters. All wastes will be classified according to the most appropriate treatment regime. Treatment processes will be conducted in the laboratory beforehand for certain waste streams to accurately determine the most appropriate treatment method.

For wastes which generate excessive odours or vapours, the facility will attempt to treat smaller volumes of the waste. If this is not considered viable, treatment may take place at times which do not impact on neighbouring properties. In the case of highly noxious wastes, NTRR will not treat the waste and off-site treatment options will be sought.

Volatile organic carbon (VOC) emissions will occur from the storage and handling of waste oils, fuels and oily waters. However, the evaporative losses are considered to be negligible and are not expected to cause an environmental impact based on the volumes proposed to be handled by the facility.

Minimal releases of oxides of carbon, nitrogen and sulphur to atmosphere will occur as a result of the facility's operations. No incineration will occur at the site.

4.2.12 Noise

Minimal noise levels will be generated by the site and impacts on neighbouring properties will be negligible. No noise impact is expected on the nearest residential community by the activities of the facility.

4.2.13 Mosquitoes and Biting Insects

Potential breeding sites for mosquitoes include stormwater drains and traps, uncovered bunded areas and the evaporation ponds. Mosquitoes can lay eggs on water surfaces, damp

ground or vegetation at the edge of a pond or pool of water or on the edges of a damp man-made container. Mosquito eggs laid on damp surfaces are usually drought resistant, so there is a resting stage where the eggs remain viable until the pool, container or cavity is flooded by rainfall, irrigation or tidal water.

Breeding sites for mosquitoes and other biting insects will be avoided by design and engineering features implemented during construction. The gradient of the site will be sufficient to ensure that stormwater drains from the property without ponding.

Uncovered bunds will be graded towards blind sumps to allow removal of collected stormwaters. Stormwater pits, sumps and separators will be designed to prevent the entry of mosquitoes thereby preventing the establishment of breeding sites.

Stormwater outlet points from the site will be regularly checked and maintained to prevent ponding of water or the establishment of vegetation.

Personal repellants and protective clothing will be provided for biting insects, as required and education programmes will be delivered to alert visitors and employees.

4.2.14 Traffic

Wastes will generally be delivered by bulk road tanker and flat bed trucks. Bulk waste loads will be delivered in road tankers with carrying capacities up to 20,000 litres (rigid tankers) or 30,000 litres (semi-trailer tanker) or 60,000 litres (triple road trains). It is anticipated that 5 to 10 tankers will unload at the LWTF each day and between 7 to 15 trucks will enter and exit the facility per day. The actual number will depend upon a number of factors including legislation, waste minimisation and cleaner production, disposal options and cost of transport and disposal.

Motor vehicular movements from the site workforce, visitors and contractors would have a minimal impact on traffic volumes.

Impacts to local traffic will be minimal since the facility will be located within an industrial estate. Entry and exit from the site will be via Mendis Road.

Trucks and tankers will use designated roads around the port and the city of Darwin. Biodegradable wastes are collected during early morning hours to minimise impacts on businesses and to avoid residential traffic. Tankers collecting other industrial wastes such as waste oils do so during the day but operate principally in industrial areas and around the port. Therefore, heavy vehicular traffic from the facility will have negligible impact on residential areas.

5.0 ENVIRONMENTAL MANAGEMENT

5.1 Environmental Management System

NTRR will develop and implement an Environmental Management System to:

- identify and evaluate existing and potential environmental impacts caused by company activities and operations;
- achieve the levels of environmental performance required;
- control environmental impacts within acceptable standards; and,
- minimise possible impacts upon the wider community and the workforce during the construction and operation of the facility.

The purpose of the Environmental Management System will be to:

- a) identify and evaluate existing and potential environmental impacts caused by company activities and operations;
- b) develop and implement systems of work practices, procedures and management controls to control, minimise or eliminate these impacts;
- c) ensure compliance with company policies;
- d) provide a framework for continuous improvement in the management of environmental impacts.

The fundamental requirements for implementing an EMS within an operation will be to firstly ensure compliance with legislation and, secondly, identify the major impacts and assess and treat their associated risks to achieve environmental performance outcomes.

The key principles of the EMS will be:

- (a) Environmental Commitment and Policy;
- (b) Planning;
- (c) Implementation and Operation;
- (d) Measurement and Evaluation; and,
- (e) Review and Continuous Improvement.

The EMS will be based on the Australian Standard *AS/NZS ISO 14001:1996 - Environmental Management Systems*.

5.2 Environmental Management Plan

NTRR will develop an Environmental Management Plan which will outline the management strategies required to address potential impacts identified in the PER.

The purpose of the EMP is to specify all potential environmental impacts, performance criteria and mitigation strategies together with relevant monitoring, reporting and, if an undesirable impact or unforeseen level of impact occurs, the appropriate corrective action. The EMP will outline specific environmental objectives, commitments, methods of implementation and the measures proposed to be taken to achieve and maintain those levels.

The EMP will outline management strategies for each potential impact through:

- Prevention
- Detection
- Review
- Reporting

Each potential impact identified by the PER will be addressed in the EMP as follows:

- ◆ establishment of performance criteria and objectives;
- ◆ detailed description of the potential impact and its consequences;
- ◆ detailed prevention, minimisation and mitigation strategies;
- ◆ details of proposed monitoring;
- ◆ reporting and auditing responsibilities; and,
- ◆ corrective actions and contingency plans to rectify deviations from the normal.

Employees at NTRR will be trained in environmental awareness and corrective actions. NTRR will ensure that all employees are competent to recognise, monitor and manage environmental impacts caused by its activities.

The EMP for NTRR's Mendis Road facility is detailed in Appendix B.

5.3 Monitoring Programme

Environmental monitoring to be undertaken at the Mendis Road site is detailed below.

It is NTRR's objective that environmental emissions do not impact significantly beyond the site's boundaries. NTRR will operate the facility to comply with the stated levels as determined by the regulatory authorities or licence conditions. Where no levels were stated, NTRR would operate the facility so that the environmental emissions do not impact significantly beyond the site's boundaries.

Parameters or criteria for impacts to the environment will generally be set by the steward of the receiving environment, e.g., waste to landfill will be determined by the landfill operator, noise levels by the DLPE and water to the PAWA lagoons by the PAWA.

5.3.1 Construction Phase

Dust

Dust levels will be visually monitored by the Principal Contractor during the construction phase. Where complaints are received, dust suppression techniques will be implemented.

Noise

Noise monitoring will be undertaken if any complaints are received. Operational hours will be reviewed and altered if necessary.

Stormwater Discharge

Regular inspections of the drainage system will be undertaken. If necessary, temporary drainage will be installed to remove site surface water. Similarly, pooled water and silt traps will be pumped empty to remove potential mosquito breeding sites.

Mosquitoes and Biting Insects

Regular inspections will be conducted for potential mosquito breeding sites. Silt traps and pooled water locations will be pumped empty and removed. Chemical control measures may be introduced.

5.3.2 Operational Phase

Stormwater Discharge

Stormwater captured in bunded areas will be inspected for contamination. Contaminated stormwater from the bunded areas will be monitored following treatment through the CPS unit.

Noise

Noise levels from the facility are not considered to present a significant impact beyond the site boundaries. However, if noise complaints are received, noise monitoring will be conducted.

Spills and Leaks

Emergency procedures in case of spills will be developed, e.g., spill kits. Procedures will be implemented which require operators to check and record the contents of tanks before and after transfer. Operators will be in attendance during transfers or discharges.

Spills will be cleaned up immediately to prevent possible contamination of stormwater.

Mosquitoes and Biting Insects

Regular inspection of the site, evaporation ponds, stormwater outlets, tanks and bunds for potential mosquito breeding sites will be undertaken. Drains, pooled water locations and bunds will be pumped out. Chemicals will be used to control or prevent mosquito breeding sites from developing where necessary.

5.3.3 Complaints and Exceedances

Where investigative monitoring is required, e.g., in response to a complaint, assessment will generally be conducted by plant staff. However, under certain circumstances or when monitoring is required to satisfy government agencies, experts from within the company or from external consultancy firms will be used to conduct investigations.

NTRR's management will be responsible for co-ordinating and investigating complaints and exceedances. Government agencies will be notified in accordance with regulatory requirements.

5.3.4 Records

Records of all monitoring, assessments and audits will be retained. Environmental non-conformances and exceedances will be recorded and become the responsibility of management. Non-conformances or exceedances will be identified by testing, audits, breakdowns or complaints. Site testing will be conducted on potential impacts such as waste receivals, treated effluents and products using parameters such as pH, suspended solids and biochemical oxygen demand (BOD_{5-day}) and the records retained. Complaints and exceedances will be recorded by the relevant plant staff following an incident including corrective and preventive actions undertaken.

6.0 SUMMARY OF ENVIRONMENTAL COMMITMENTS

NTRR is proposing to design, construct and operate a Liquid Waste Treatment Facility that will use proven technology to minimise environmental impacts from its activities to acceptable levels.

The potential environmental impacts and risks have been identified and appropriate management procedures have been developed to eliminate, reduce or control the risks to the environment.

The following commitments have been developed for the various phases of the project including the construction and operation of the LWTF. The commitments have been summarised earlier in Section 1.8.

Design Phase:

A hazard identification study will be undertaken to determine the risks associated with the construction and operation of the facility. Management controls will be developed and implemented.

An Environmental Management Plan has been developed which outlines the management strategies required to address potential impacts identified in the PER.

A Fire Hazard Study will be conducted prior to construction and include fire services, fire fighting equipment, emergency response and evacuation routes.

Construction Phase:

Site inspections will be undertaken to determine dust levels. Dust suppression methods will be implemented if necessary.

Stormwater drainage will be constructed to minimise surface water intrusion onto the site during construction. Drainage and silt traps will be constructed to reduce the potential for soil erosion contaminants being transported from the site by runoff.

Waste management practices will be implemented during the construction phase to ensure proper management of wastes is conducted by the Principal Contractor and the sub-contractors.

Operation Phase:

Potentially contaminated stormwaters will be segregated from clean stormwaters and discharged through a treatment unit to remove contaminants.

Noise monitoring will be conducted in response to complaints. Noise levels will be considered when selecting equipment or modifying operations in response to noise complaints.

Spill management procedures will be implemented to reduce the possibility of surface water runoff becoming contaminated.

An Emergency Response Plan will be developed and implemented for site-related activities and transport operations. Employees will be trained in emergency response protocols.

Waste management procedures will be prepared to ensure that wastes are segregated, recycling opportunities are maximised and waste minimisation techniques are adopted.

An Environmental Management System will be prepared and implemented.

7.0 GLOSSARY

Aerobic organisms - require molecular oxygen for their metabolic processes.

Anaerobic organisms - function in the absence of oxygen and obtain their energy from organic compounds.

Aquifer – a deposit of rock which yields a supply of water as a result of its porosity or permeability.

Ballast water – water contained within a ship to secure stability.

Bilge oil – seawater and oil from a ship's engine room and machinery.

Blind sump – a recessed sump or small pit with no outlet point.

BOD_{5-day} (Biochemical Oxygen Demand) – the amount of oxygen taken up by microorganisms that decompose organic matter in water. BOD defines the biodegradable organic content of a waste and is used as a measure of the amount of certain organic pollutants in water.

Bunds and bunding – an embankment of earth or a wall of brick, stone, concrete or other approved material which may form part of or all of the perimeter of a compound.

Bunker oil – oil from ship's engine room.

CFS (Chemical Fixation, Stabilisation and Solidification) – a chemical process in which soluble metals are converted to their insoluble form (*fixation*) through *precipitation* and then solidified in a concrete matrix.

COD (Chemical Oxygen Demand) - measures the total organic content, both biodegradable and refractory.

Coagulation - addition of a chemical which results in the destabilisation of the forces which keep colloids apart thereby allowing the formation of larger flocculant suspensions.

Combustible liquid – any liquid other than a flammable liquid that has a flashpoint and that has a firepoint less than its boiling point.

Combustible liquids are divided into two classes as follows:

Class C1 – a combustible liquid that has a flashpoint of 150°C or less.

Class C2 – a combustible liquid that has a flashpoint exceeding 150°C.

Corrosive – a chemical characteristic describing a chemical's ability to cause severe damage when in contact with living tissue or other materials. Includes hazardous substances such as acids and alkalis.

CPS (Coalescing Plate Separator) - a treatment system used to separate oil from water in which a series of corrugated plates provide collecting surfaces for oil globules. As wastewater flows between the plates the lighter oil droplets float upward towards the corrugation, coalesce into larger drops while rising to the top portion of the plate pack and finally to the top of the tank.

DAF (Dissolved air flotation) - small air bubbles released from air-saturated water attach themselves to small particles and flocs. The air-solid mixture rises to the surface where it concentrates and is removed.

Dangerous Goods – chemicals which present a hazard when handled, stored or transported. Dangerous goods are sub-divided into a number of classes according to their hazard and are defined by an international register.

°C - Degrees Centigrade - a measure of temperature.

Demineralisation – the removal of metals and other impurities from a solution (in this case, waste oil).

Dry break valves – valves which have a spring-loaded shut-off flap which prevents the runout of product from the valve.

Effluent – the treated liquid output from a process or treatment unit.

EMP (Environmental Management Plan) – an outline of the means of achieving environmental objectives and targets.

EMS (Environmental Management System) – that part of the overall management system which includes organisational structure, planning, activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy.

Emulsion – a liquid-liquid colloid in which small particles of one liquid are dispersed in another liquid, e.g., oil in dispersed in water. Usually stabilised by an emulsifier such as detergent.

Encapsulate – encasing a contaminant in a solid, impenetrable matrix such as concrete.

Facultative bacteria – bacteria which function in the presence of oxygen or absence of oxygen.

Filtrate – the clear liquid obtained by filtration.

Filtration – the process of separating solid particles from a liquid using a filter membrane.

Fixation – chemical process by which soluble metals are precipitated as their insoluble metal hydroxide generally by the addition of alkaline chemicals such as lime or sodium hydroxide.

Fixed waste – the resultant insoluble metal sludge formed by the fixation process.

Flammable liquid – a liquid which gives off a flammable vapour at temperatures no greater than 60.5°C (closed-cup test).

Flash point – the temperature at which the vapour above a volatile liquid forms a combustible mixture with air.

Flocculation – process in which particles in a colloid aggregate into larger clumps.

Groundwater – body of water yielded by the earth due to its porosity or permeability.

ha (hectare) – metric measure of area equivalent to 10,000 sq metres.

HAZOP Study - a Hazard and Operability Study (HAZOP) is a formally structured method of systematically investigating each element of a system for all of the ways in which important parameters can deviate from the intended design conditions to create hazards and operability problems. The hazard and operability problems are typically determined by a study of the piping and instrument diagrams (or plant model) by a team of personnel who critically analyse effects of potential problems arising in each vessel of the operation. Pertinent parameters are selected, e.g., flow, temperature, pressure and time. Then the effect of deviations from design conditions of each parameter is examined. A list of key words, e.g., “more of”, “less of”, “part of”, are selected for use in describing each potential deviation. The system is evaluated as designed and with deviations noted. All causes of failure are identified. An assessment is made weighing the consequences, causes and protection requirements involved.

HDPE - High Density Polyethylene polymer used as structural material for devices such as tanks and pipes.

High pressure water blasting – the use of high pressure water, with or without the addition of other chemicals or abrasives to remove matter from various surfaces. The water delivery system consists of an energy source (e.g. electric motor or internal combustion engine), pump, control mechanism, hoses and pipes, nozzles and various other attachments necessary to pumped at high pressure using a piston pump to project a jet through a nozzle or nozzles. The pressure of the water varies from 3,000 to 30,000 pounds per sq inch and is used as an industrial cleaning agent for applications such as surface preparation, cutting, scale or rust removal and drain cleaning.

IBC (Intermediate Bulk Container) – a rigid or flexible portable container of capacity not exceeding 3 cu.m. (m³) for the transport of dangerous goods.

Inorganic compounds – compounds that contain elements other than carbon.

ISO-tainers (tank container) – a tank fitted with frames to international freight container dimensions

kL - (kilolitres) - a measure of volume equivalent to 1,000 litres.

km - (kilometres) - a measure of distance equivalent to 1,000 metres.

LWTF (Liquid Waste Treatment Facility) – an integrated facility capable of managing liquid wastes produced by governments, industries and the general public by utilising processes which reduce or remove the environmental risk presented by waste streams through the principles of reduction, reuse and recycling.

MSDS (Material Safety Data Sheets) – a document that provides information on the identification, chemical and physical properties, health hazards, precautions for use and safe handling of a specific chemical product and uses of a substance.

m - (metres) - a measure of distance equivalent to a distance of 100 cm.

m/s - (metres per second) - a measure of velocity.

Metal hydroxide – a metallic compound containing the hydroxyl group (-OH) bound to a metal atom such as zinc.

mg/L (Milligrams per litre) - a measure of concentration as weight per volume.

ML (Megalitres) – a measure of volume equivalent to 1,000,000 litres.

mS/cm (Milli-siemens) - a measure of electrical conductance across 1 cm.

NTRR - NT Resource Recovery) - the proponent of the project.

Organic compounds – compounds that contain the element carbon.

Packing Group – dangerous goods are assigned to Packing Groups according to the degree of risk the goods present during transport:

<i>Packing Group I:</i>	Great danger
<i>Packing Group II:</i>	Medium danger
<i>Packing Group III:</i>	Minor danger

PAWA – Power and Water Authority.

PER (Public Environmental Report) – a project analysis technique with provision for public involvement to ensure projects undertake systematic examination of the expected consequences of development and operation and to ensure that the project proceeds within defined limits to minimise environmental impacts.

pH – a measure of acidity or alkalinity.

Polyelectrolyte – a synthetic organic polymer used as a flocculant aid in water and wastewater treatment to accelerate the settling rates of colloids or particles.

Q-5, etc. - a predicted rainfall event based on calculations using historical data, e.g., an 1-in-5 year, 1-in-100 year rainfall events.

Risk Score Calculator – calculator used to assess risk levels of hazards. The results can be used to assess the size and acceptability of the risk and recommend safety controls to minimise the risks. Certain Risk Calculators also calculate whether the cost of different methods of addressing the safety issue are justified when weighed against the risk.

The Risk Calculator is a qualitative method of risk assessment which allows the risks to people, the environment and assets from identified hazards to be calculated in terms of consequence and severity. The results form the basis of management strategies to minimise risks to a level “as low as reasonably practicable” (ALARP). “Practicable” can be defined as

what is reasonably practicable for the nature of the project, the state of knowledge of the risk and technology, the availability of the technology and the cost involved.

Sludge – a liquid/solid mixture generally settled from a liquid.

Solidification – encapsulation of fixed waste in an impermeable chemical matrix such as cement. Water is taken up by the chemical bonding process.

sq m (square metres) - a measure of area equivalent to 10,000 sq cm.

Stormwater – rainwater on the ground.

Suspended solids - small particles present in colloidal form.

Supernatant – the clear liquid remaining after a precipitate has settled.

TOC (Total Organic Carbon) - measure of the total organic content of a liquid.

TCLP (Toxicity Characteristic Leaching Procedure) – a standard testing procedure developed by the US Environmental Protection Agency to simulate the long term conditions experienced within a landfill. A sample is agitated in an acidic solution for a number of hours (generally 16 – 18 hours), the solution filtered and the contaminants such as metals in the filtrate determined. The concentrations are used to determine landfill acceptance criteria and the total mass loading of contaminants able to be absorbed by the landfill.

USEPA - United States Environmental Protection Agency.

User pays – is the principle that all costs associated with the use of a resource should, if practicable, be included in the prices of the goods and services (including government services) that result from the use.

VOCs (Volatile Organic Carbon compounds) – organic carbon compounds which have a low boiling point and hence rapidly form a vapour above the liquid surface.

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APPENDIX A - PRELIMINARY RISK ASSESSMENT

APPENDIX A - PRELIMINARY RISK ASSESSMENT

Potential Hazard	Potential Consequences	Risk Calculator Score			Risk Minimisation Controls
		Environs	People	Assets	
CATASTROPHIC					
Earthquake	<ul style="list-style-type: none">▪ Damage to structures & equipment.▪ Loss of containment.▪ Contamination of soil, groundwater & stormwater.▪ Possibility of ignition of products	A2 Low	A0 Low	A3 Low	Facility designed in accordance with Building Codes, Australian Standards for earthquake loads & bund capacity (AS 1940).
Sabotage	<ul style="list-style-type: none">▪ Damage to structures & equipment.▪ Contamination of soil, groundwater & stormwater.▪ Possibility of ignition of products	A2 Low	A0 Low	A3 Low	Site secured out of hours. Security lighting & security fencing. Tank valves locked where necessary. Controlled access during operating hours.
Cyclone	<ul style="list-style-type: none">▪ Damage to structures & equipment.▪ Loss of containment.▪ Contamination of soil, groundwater & stormwater.	B2 Low	B0 Low	B3 Low	Facility designed & constructed to Building Codes, Australian Standards for cyclonic wind loads & bund capacity (AS 1940).
Aircraft Strike	<ul style="list-style-type: none">▪ Damage to structures & equipment.▪ Loss of containment.	A2 Low	A0 Low	A3 Low	LWTF not in immediate vicinity of airport. Bunding constructed in accordance with AS 1940.

Potential Hazard	Potential Consequences	Risk Calculator Score			Risk Minimisation Controls
		Environs	People	Assets	
Aircraft Strike – cont.	<ul style="list-style-type: none"> Contamination of soil, groundwater & stormwater. 				No transfer operations during cyclone.
Explosion	<ul style="list-style-type: none"> Damage to structures & equipment. Loss of containment. Contamination of soil, groundwater & stormwater. Possibility of fire & secondary ignition of products. 	B3 Low	B3 Low	B2 Low	<p>Safe work procedures.</p> <p>No ignition sources on site except under Work Permit.</p> <p>Bunding in accordance with AS 1940.</p> <p>Fire fighting equipment & Emergency Response procedures.</p>

Vapour Release	Potential Consequences	Risk Calculator Score			Risk Minimisation Controls
		Environs	People	Assets	
SITE					
Vapour Release	▪ Impact on atmospheric environment, e.g., reduction in air quality.	B4 Med	B3 Low	B0 Low	Maintenance procedures. Pressure relief valves & vents on tanks. Assessment of all wastes before approval. Wastes checked on receipt.
Odours	▪ Impact on atmospheric environment, e.g., reduction in air quality.	C3 Low	C0 Low	C0 Low	Operational procedures developed to minimise odours. Maintenance checks & routine audits.
Flammable Gas Release	▪ Risk of fire or explosion from ignition source.	B3 Low	B2 Low	B1 Low	Operational procedures to reduce risks. Vents & recirculation on tanks. No ignition sources on-site without Permit to Work.
Explosion	▪ Damage to structures & equipment. ▪ Loss of containment. ▪ Contamination of soil, groundwater & stormwater.	B3 Low B3 Low B3 Low	B3 Low B2 Low B1 Low	B4 low B3 Low B3 Low	Operational procedures to reduce risks. Implementation of Hot Work Permits. No ignition sources on-site without Permit to Work.
Bund Overflow	♦ Loss of containment. ♦ Contamination of soil, groundwater & stormwater.	B4 Med	B2 Low	B2 Low	Bunding in accordance with AS 1940.
Tanker Spill	▪ Loss of containment. ▪ Contamination of soil,	C2 Low B3 Low	C0 Low B0 Low	C0 Low B2 Low	Driver procedures. Operational procedures.

Vapour Release	Potential Consequences	Risk Calculator Score			Risk Minimisation Controls
		Environs	People	Assets	
	groundwater , stormwater & marine environment.				Bunding in accordance with AS 1940.
Motor Vehicle Accident	<ul style="list-style-type: none"> ▪ Loss of containment. ▪ Contamination of soil, groundwater, stormwater & marine environment. 	C0 Low	C0 Low	C3 Med	Driver training. Spill management kits. Emergency Response procedures. Tanker design to include rollover protection, recessed valves, etc.
Fire	<ul style="list-style-type: none"> ▪ Risk of explosion. ▪ Contamination of soil, groundwater & stormwater from fire fighting residues. ▪ 	B3 Low	B2 Low	B4 Med	Fire hazard audit. Fire protection systems & fire fighting equipment installed. Bunding to AS 1940. Operational procedures to reduce risk. No ignition sources on site without Permit to Work.
Pond Overflow	<ul style="list-style-type: none"> ▪ Contamination of soil, groundwater, stormwater & marine environment. 	A3 Low	A0 Low	A1 Low	Bunds constructed to retain excess rainfall events. Procedure to transfer excess pond waters to PAWA lagoons.
Lightning Strike	<ul style="list-style-type: none"> ▪ Risk of ignition causing fire or explosion. 	A2 Low	A3 Low	A3 Low	Operating procedures - no transfers during electrical storm.

Potential Hazard	Potential Consequences	Risk Calculator Score			Risk Minimisation Controls
		Environs	People	Assets	
UNIT OPERATIONS					
Spill	<ul style="list-style-type: none">Contamination of soil, groundwater, stormwater & marine environment.	D1 Low	D0 Low	D0 Low	Bunding in accordance with AS 1940. Operating procedures. Spill management kits. Emergency response procedures.
Fire	<ul style="list-style-type: none">Risk of explosion.Contamination of soil, groundwater & stormwater from fire fighting residues.	B3 Low	B0 Low	B3 Low	Hot work permits. No ignition sources on-site without Permit to Work. Fire fighting equipment. Emergency response procedures. Fire Hazard Audit to be conducted.
Explosion	<ul style="list-style-type: none">Damage to structures & equipment.Loss of containment.Contamination of soil, groundwater & stormwater from fire fighting residues.	B2 Low B3 Low B3 Low	B3 Low B0 Low B0 Low	B4 Med B1 Low B3 Low	Permit to Work procedures. No ignition sources on-site without Permit to Work. Fire fighting equipment. Bunding in accordance with AS 1940. Pressure relief valves & vents on tanks. Emergency stop buttons for pumps.
Vapour Release	<ul style="list-style-type: none">Impact on atmospheric environment, e.g., reduction in air quality.	C3 Med	C2 Low	C0 Low	Maintenance procedures. Fire fighting equipment. Pressure relief valves & vents on tanks. Procedures to check all wastes before & upon receival.
Overpressure of Tanks	<ul style="list-style-type: none">Loss of containment.	B1 Low	B0 Low	B2 Low	Pressure relief valves & vents on tanks.

Potential Hazard	Potential Consequences	Risk Calculator Score			Risk Minimisation Controls
		Environs	People	Assets	
Overpressure of Tanks – cont.	<ul style="list-style-type: none"> Contamination of soil, groundwater & stormwater. 	B3 Low	B0 Low	B3 Low	Bunding in accordance with AS 1940. Emergency response procedures. Spill management procedures.
Corrosion	<ul style="list-style-type: none"> Loss of containment. Contamination of soil, groundwater & stormwater. 	B2 Low B3 Low	B0 Low B0 Low	B2 Low B3 Low	Regular maintenance & checking procedures. Stock control & reconciliation of tank volumes. Use of anti-corrosion materials & coatings.
Hot Work	<ul style="list-style-type: none"> Explosion. Loss of containment. Contamination of soil, groundwater & stormwater. 	C2 Low C2 Low C3 Low	C2 Low C0 Low C0 Low	C3 Low C2 Low C2 Low	Permit to work procedures. No ignition sources on-site without Permit to Work. Emergency response procedures. Fire fighting equipment available.
Hazardous Chemicals	<ul style="list-style-type: none"> Impact on atmospheric environment, e.g., reduction in air quality. Consequences of inappropriate treatment or disposal. 	C3 Low B3 Low	C1 Low B2 Low	C0 Low B1 Low	Procedures to check all wastes before & upon receipt. Approved wastes only to be received at the site. Wastes to be stored & treated according to compatibility. Operating procedures & training in handling hazardous substances.
Static Electricity	<ul style="list-style-type: none"> Ignition of flammable vapours causing fire or explosion. 	A4 Low	A3 Low	A4 Low	Earth straps. Venting of tanks. Fire fighting equipment available. Anti-static equipment.

Potential Hazard	Potential Consequences	Risk Calculator Score			Risk Minimisation Controls
		Environs	People	Assets	
Power Failure	<ul style="list-style-type: none"> Loss of containment due to pump failure. 	A0 Low	A0 Low	A0 Low	Bunding in accordance with AS 1940. Operational procedures - shut off all valves.
Electrical Equipment	<ul style="list-style-type: none"> Spark from electrics. Ignition of flammable liquids or vapours. 	B3 Low	B3 Low	B3 Low	Hazardous area rated electrical equipment. Regular maintenance & inspection of electrics. Portable electrical equipment to comply with regulations. Permit to work procedures.

APPENDIX B - ENVIRONMENTAL MANAGEMENT PLAN

N T RESOURCE RECOVERY

(A Division of Transpacific Industries - A.C.N. 010 745 383)

ENVIRONMENTAL MANAGEMENT PLAN

Mendis Road, Hudson Creek, NT

DOCUMENT NO:

REVISION:

DATE:

NTRR-EMP-001

0

February 1, 2000

T de Jong
Group Compliance Manager
Transpacific Industries Pty Ltd
Level 10, 9 Sherwood Road, Toowong, Q, 4066
TEL: (07) 3870 7511 FAX: (07) 3870 7460

N T RESOURCE RECOVERY

Environmental Management Plan

ISSUE: Site Management

PHASE: Audits

OBJECTIVES:

- To review the level of environmental performance.
- To review the effectiveness of environmental management procedures.
- To assess compliance with legislation and regulatory standards.
- To assess environmental risks and hazards.

STRATEGY:

Regular environmental audits will be conducted to determine the compliance status of the business, identify the environmental problems and analyse the practices of operation of the facility.

Environmental audits provide an analysis of the potential issues associated with:-

- * regulatory compliance
- * identification of existing environmental hazards
- * identification of potential risks and liabilities
- * reduction of risk and liability
- * operational efficiency in relation to environmental practice
- * remedial action and mitigation of risk

CORRECTIVE

ACTION: Management will be advised of the issue, and remedial action undertaken to eliminate or correct any non-compliance.

N T RESOURCE RECOVERY

Environmental Management Plan

ISSUE: Site Management

PHASE: Security

OBJECTIVES:

- To provide adequate supervision during operating hours.
- To ensure adequate security measures exist.

STRATEGY:

The operation and maintenance of all plant and equipment will be carried out by or under the supervision of a competent person. All staff will undergo induction and training to a satisfactory level of competency appropriate to the task and in accordance with the safety and environmental requirements of the site. All visitors and contractors will be required to report to the office before entering the facility. The site will be surrounded by a security fence. Out of hours the gates will be locked.

CORRECTIVE

ACTION: Regular OHS&E meetings will be conducted to discuss, monitor and review safety and environmental standards.

All non-conformances of safety and environmental issues will be recorded for review and action by management.

N T RESOURCE RECOVERY

Environmental Management Plan

ISSUE: Site Management

PHASE: Integrated Environmental Management System (IEMS)

OBJECTIVES: To develop and implement an IEMS which provides for the effective and appropriate management of the facility's environmental impacts and which meets the general principles of ISO 14000.

STRATEGY:

The IEMS will provide the following functions:-

- monitoring of releases of contaminants into the environment.
- assessment of the environmental impacts.
- training and induction of all staff and contractors.
- control procedures to prevent or minimise environmental harm.
- contingency plans and emergency procedures including corrective responses to prevent or mitigate environmental harm.
- organisational structure and responsibilities.
- effective communication between management, staff, regulatory bodies and the public, where necessary.
- an environmental policy stating management's commitment to the principles of environmental responsibility and ecologically sustainable development.
- the conduct and review of environmental audits.
- development and implementation of appropriate management plans for waste, stormwater and emergency response.

CORRECTIVE

ACTION: The IEMS will be reviewed regularly to ensure the effectiveness and relevance of the procedures.

The level of environmental performance will be monitored, reviewed and improved through regular assessment of audits, non-conformance reports, environmental impacts and benchmark values.

N T RESOURCE RECOVERY
Environmental Management Plan

ISSUE: Air Quality

PHASE: Odours

OBJECTIVES:
To prevent odours causing a nuisance.

STRATEGY:
Wastes will be handled, treated and stored so as to minimise odour emissions.

Incompatible wastes which combine to cause odours will be segregated or treated so as to minimise odour emissions.

Physical or chemical methods may be employed to reduce or minimise odour emissions.

CORRECTIVE ACTION: Incompatible wastes will be identified and segregated. Handling, treatment and storage methods will be reviewed and improvements introduced, where possible. Preventative measures such as containment or chemical treatment will be assessed and used, where necessary.

N T RESOURCE RECOVERY

Environmental Management Plan

ISSUE: Noise

PHASE: Plant and Equipment

OBJECTIVES:

- To ensure that noise emissions from the plant and equipment used on-site do not cause a nuisance beyond the boundaries of the facility.
- To minimise noise emissions from traffic and vehicular activity.

STRATEGY:

Reduced noise emissions will be used as a selection criteria for the plant and equipment.

Use of plant and equipment and the movement of vehicles will be restricted to the hours of operation and emergencies.

A speed limit will be enforced on-site for all vehicles.

CORRECTIVE

ACTIONS:

- * Undertake a noise survey of the site.
- * Review and implement noise attenuation designs.
- * Review operating hours.

N T RESOURCE RECOVERY
Environmental Management Plan

ISSUE: Land

PHASE: Land application

OBJECTIVES:
To prevent the contamination of the site or ground water.

STRATEGY:
All waste water will be contained and removed for appropriate treatment and disposal.

Wastes will be stored within impervious bunds so as to prevent contamination of the site.

All spills will be contained.

CORRECTIVE ACTION: The management of wastes will be reviewed and alternative measures implemented.

N T RESOURCE RECOVERY

Environmental Management Plan

ISSUE: Stormwater

PHASE: Stormwater contamination

OBJECTIVE: To prevent, as far as is practicable, any contamination of stormwater or any release of contaminated stormwater.

STRATEGY: All work areas will be banded in accordance with regulatory requirements or, as a minimum, the site requirements.

Spill management procedures will be implemented and clean housekeeping measures enforced.

Non-contaminated stormwaters will be diverted from contaminated areas wherever possible.

CORRECTIVE

ACTION: Stormwater controls will be reviewed and appropriate measures introduced.

Procedures for spill management, housekeeping, site operations, and plant maintenance and monitoring will be reviewed and revised, as required.

N T RESOURCE RECOVERY

Environmental Management Plan

ISSUE: Stormwater

PHASE: Stormwater management

OBJECTIVES: To develop and implement a Stormwater Management Plan detailing the appropriate methods of dealing with stormwater.

STRATEGY: A Stormwater Management Plan will be developed to incorporate the preferred practices and future options of dealing with stormwater on the site.

Issues in relation to stormwater management which will be considered include:-

- prevention of stormwater contamination.
- diversion of stormwater from contaminated areas.
- minimisation of contaminated areas.
- procedures for dealing with stormwater contained within bunds.
- installation of stormwater treatment systems.
- a stormwater monitoring programme.

CORRECTIVE

ACTION: Regularly review and revise the Stormwater Management Plan.

In the event of a non-conforming event, amend the Plan and procedures to ensure future compliance conditions are met.

N T RESOURCE RECOVERY

Environmental Management Plan

ISSUE: Waste Management

PHASE: Waste Management Plan

OBJECTIVE: To develop and implement a Waste Management Plan detailing the appropriate methods of dealing with waste.

STRATEGY: A Waste Management Plan will be developed to incorporate the preferred practices and future options of dealing with wastes produced by the activities conducted.

Issues in relation to waste management which will be considered include:-

- avoiding waste generation.
- waste minimisation.
- recycling of wastes produced.
- treatment of wastes to render it less or non-hazardous.
- disposal of the wastes.

CORRECTIVE

ACTION: Regular waste audits will be conducted, the results reviewed and improvements made to the Waste Management Plan, if necessary.

Where practical and economically feasible, amendments will be made to the Waste Management Plan to reflect advances in waste treatment methods and best available technology.

N T RESOURCE RECOVERY

Environmental Management Plan

ISSUE: Waste Management

PHASE: Documentation

OBJECTIVES: To maintain all waste management records and documentation in accordance with regulatory requirements.

STRATEGY: Records will be kept of all wastes treated, stored and disposed during operations, including:-

- * transport documentation
- * analytical results, if required
- * treatment details

Wastes will only be taken to disposal facilities licensed under the relevant State legislation. Transport of wastes will comply with the Australian Dangerous Goods Code, where applicable. Appropriate transport documentation will be used in accordance with statutory and client requirements..

Records in relation to other site activities such as materials' handling and monitoring will also be kept.

CORRECTIVE

ACTION: Waste management criteria will be reviewed and amendments implemented, if required.

N T RESOURCE RECOVERY

Environmental Management Plan

ISSUE: Waste Management

PHASE: Transport

OBJECTIVES:

- * To ensure wastes are transported in accordance with statutory requirements.
- * To ensure only compatible wastes are transported.
- * To prevent prohibited, contaminated or unacceptable wastes from being transported.
- * To prevent spills during loading or unloading operations.

STRATEGY:

Approval from licensed disposal facilities must be obtained before waste is transported to the facility.

Waste will only be transported by licensed transporters using appropriate documentation. All details in relation to the transporter, generator and the type of waste will be recorded by N T Resource Recovery and a copy of the documentation provided to the client.

All transport operations will be supervised whilst on-site during any loading, unloading or transfer operations.

CORRECTIVE

ACTION: The waste loading and transport procedures will be reviewed.

N T RESOURCE RECOVERY
Environmental Management Plan

ISSUE: Monitoring and Reporting

PHASE: Complaints

OBJECTIVES: To ensure that all complaints are recorded, assessed and appropriate corrective actions are undertaken.

STRATEGY: All details in relation to the complaint, the investigation process and corrective actions will be recorded.

All complaints will be reviewed by management.

Where necessary the regulatory authorities will be notified.

CORRECTIVE ACTION: Where necessary audits and monitoring programmes will be conducted for qualitative assessment of the complaint.

Following review by management, a timetable of corrective actions will be outlined.

N T RESOURCE RECOVERY

Environmental Management Plan

ISSUE: Monitoring and Reporting

PHASE: Incidents

OBJECTIVES: To ensure that all incidents causing, or with the potential to cause, environmental harm are recorded and corrective actions are undertaken.

STRATEGY: All details in relation to the incident, the investigation process and the corrective actions will be recorded.

All incidents will be reviewed by management.

Where necessary, the regulatory authorities will be notified.

Proposed actions to prevent a recurrence of the incident will be recorded and provided to management.

Environmental monitoring will be conducted to assess the level of environmental harm, and the results and conclusions presented to management for review.

CORRECTIVE ACTION: Following review by management, a timetable of corrective actions will be outlined.

N T RESOURCE RECOVERY

Environmental Management Plan

ISSUE: Monitoring and Reporting

PHASE: Emergency Response

OBJECTIVES:

- To be able to respond rapidly and effectively to an emergency which threatens or causes environmental harm.
- To prevent or control environmental harm during an emergency.

STRATEGY: Develop and implement an Emergency Response Plan for the Company's activities and any related activities including:

- responsibilities
- communication
- evacuation procedures
- control measures and procedures
- training and induction
- assessment of environmental impacts
- Emergency Services
- reporting
- debriefing

All details in relation to the emergency will be recorded including the investigation process, debriefing and corrective actions. The report will be submitted to management for review.

Site management and the authorities will be notified immediately of an emergency.

Environmental monitoring will be conducted to assess the level of environmental harm, and the results and conclusions presented to management.

Proposed actions to prevent a recurrence of the incident will be recorded and provided to management. All details in relation to the incident, the investigation process and the corrective actions will be recorded.

All incidents will be reviewed by management.

CORRECTIVE

ACTION: Following review by management, a timetable of corrective actions and any necessary recommendations will be outlined.

The Emergency Response Plan will be reviewed and amended regularly.

APPENDIX C -

RAINFALL INTENSITY – FREQUENCY – DURATION

CALCULATIONS

RIFD - 6 TO 60 MINUTES DURATION

$$K (\text{mins}) = 0.309 + \frac{49.586}{m + 11.767} \quad - \text{Eqn 1}$$

where m = rainfall duration in minutes

m in mins	6	10	20	30	60
K (mins)	3.100	2.587	1.870	1.496	1.000

RIFD TABLE FOR NTRR DARWIN, NT

Rainfall Intensity (mm/hr) for Darwin, NT for different storm durations and different average recurrence intervals (ARI) in accordance with the procedures presented in Chapter 2 of Australian Rainfall & Runoff (1987).

Location: Darwin Airport - Bureau of Meteorology No. 14015
 Latitude: 12 deg 26 min S
 Longitude: 130 deg 52 min E

$$r (m) = K(\text{mins}) * r (60 \text{ mins}) \quad - \text{Eqn 2}$$

where $r (m)$ = rainfall intensity for m minutes in mm/hr
 $r (60 \text{ mins})$ = rainfall intensity for 60 minutes in mm/hr
 $K (\text{mins})$ = variable dependent on duration of rainfall

DURATION	Average Storm Recurrence Interval (Years)				
	1 YEAR (mm/hr)	2 YEARS (mm/hr)	5 YEARS (mm/hr)	50 YEARS (mm/hr)	100 YEARS (mm/hr)
6 mins	156.48	191.23	214.95	270.68	287.83
10 mins	130.59	159.59	179.39	225.90	240.21
20 mins	94.39	115.36	129.66	163.28	173.62
30 mins	75.53	92.30	103.75	130.65	138.92
60 mins	50.48	61.69	69.34	87.32	92.85
2 hours	29.46	36.34	41.5	53.41	57.07
12 hours	7.31	9.02	10.35	13.44	14.4
24 hours	4.5	5.67	6.97	9.89	10.83
72 hours	2.23	2.82	3.73	5.75	6.46

APPENDIX D -

CLIMATIC DATA FOR DARWIN –

BUREAU OF METEOROLOGY STATION NO. 14015

Climatic Data for Bureau of Meteorology Weather Station No 14015 at Darwin Airport

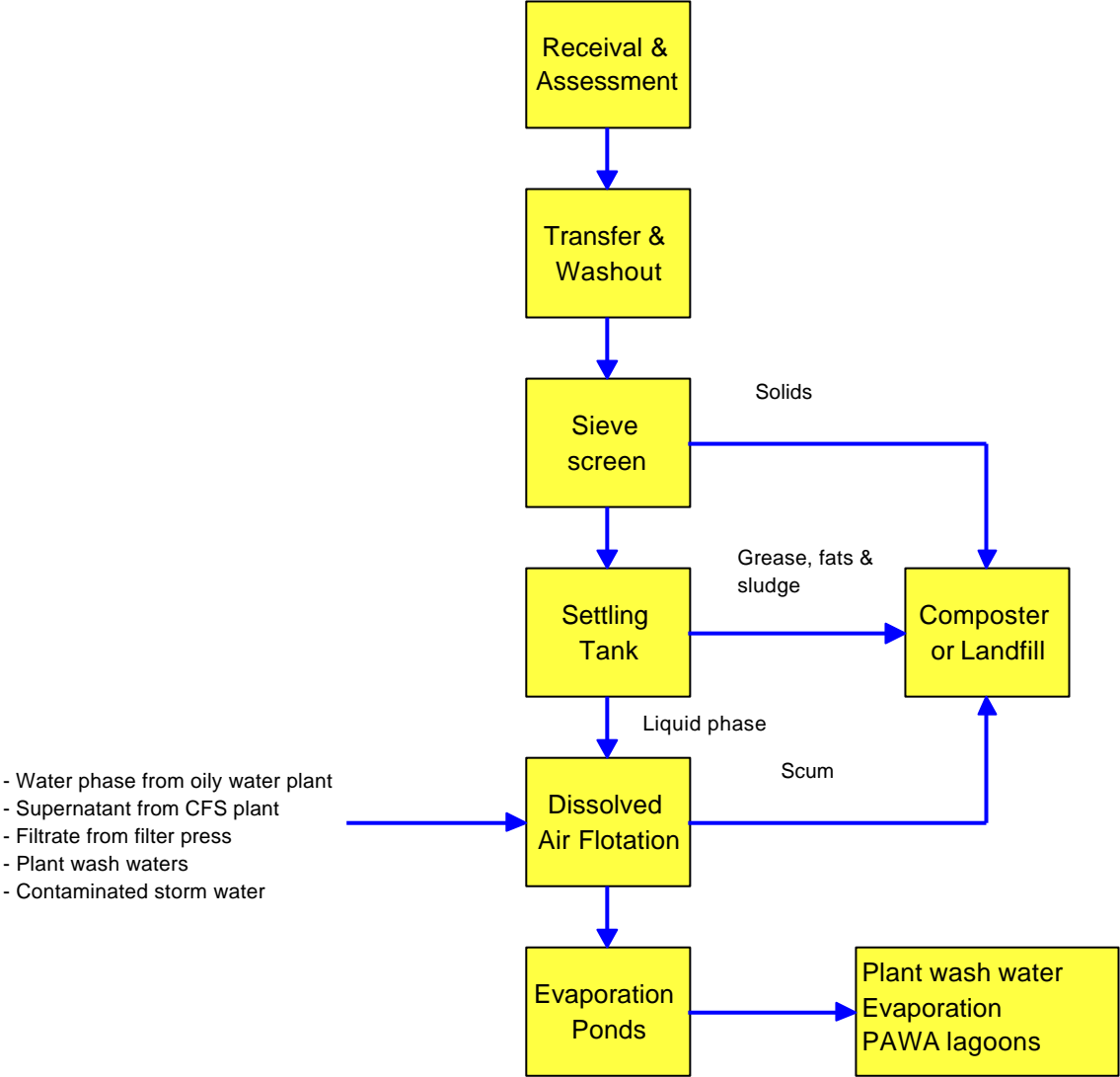
Latitude: 12 Degrees 26 Mins South

Longitude: 130 Degrees 52 Minutes East

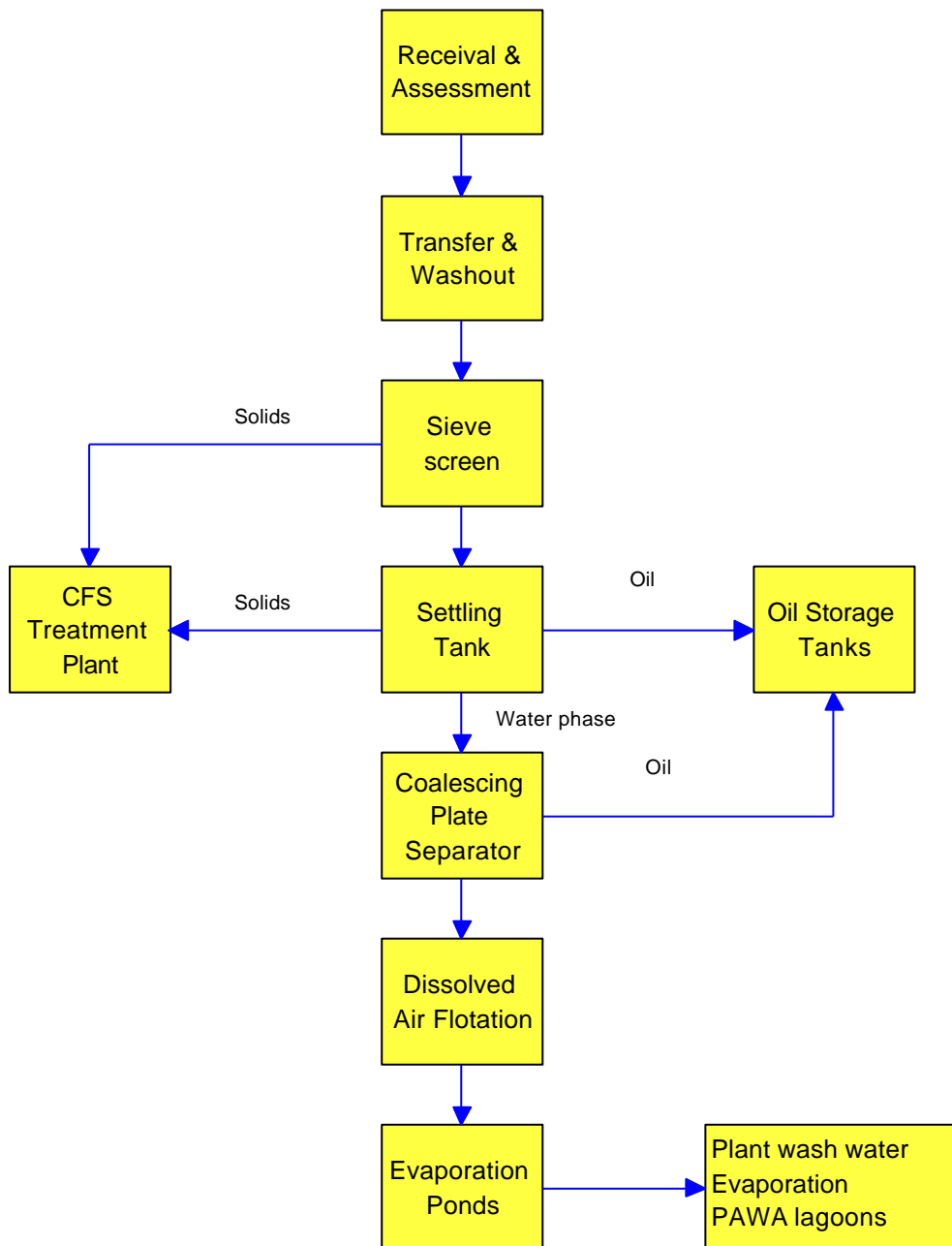
Month	Mean Daily Minimum Temperatures (° C)	Mean Daily Maximum Temperatures (° C)	Mean Rainfall (mm)	Median Rainfall (mm)	Raindays
January	24.8	31.8	418.8	388.7	20.8
February	24.7	31.4	342.3	325.0	19.9
March	24.5	31.9	312.4	282.8	19.1
April	23.9	32.6	99.5	79.7	9.0
May	22.1	32.0	20.3	4.0	2.0
June	20.0	30.5	1.3	0.0	.05
July	19.3	30.4	1.1	0.0	0.4
August	20.6	31.2	6.2	0.0	0.7
September	23.1	32.4	16.7	6.6	2.3
October	25.0	33.1	70.6	53.7	6.4
November	25.3	33.1	141.7	138.7	11.9
December	25.3	32.6	235.3	203.9	16.2
YEAR	23.2	31.9	1666.2	1672.2	109.4

APPENDIX E - FLOWCHARTS OF PLANT PROCESSES

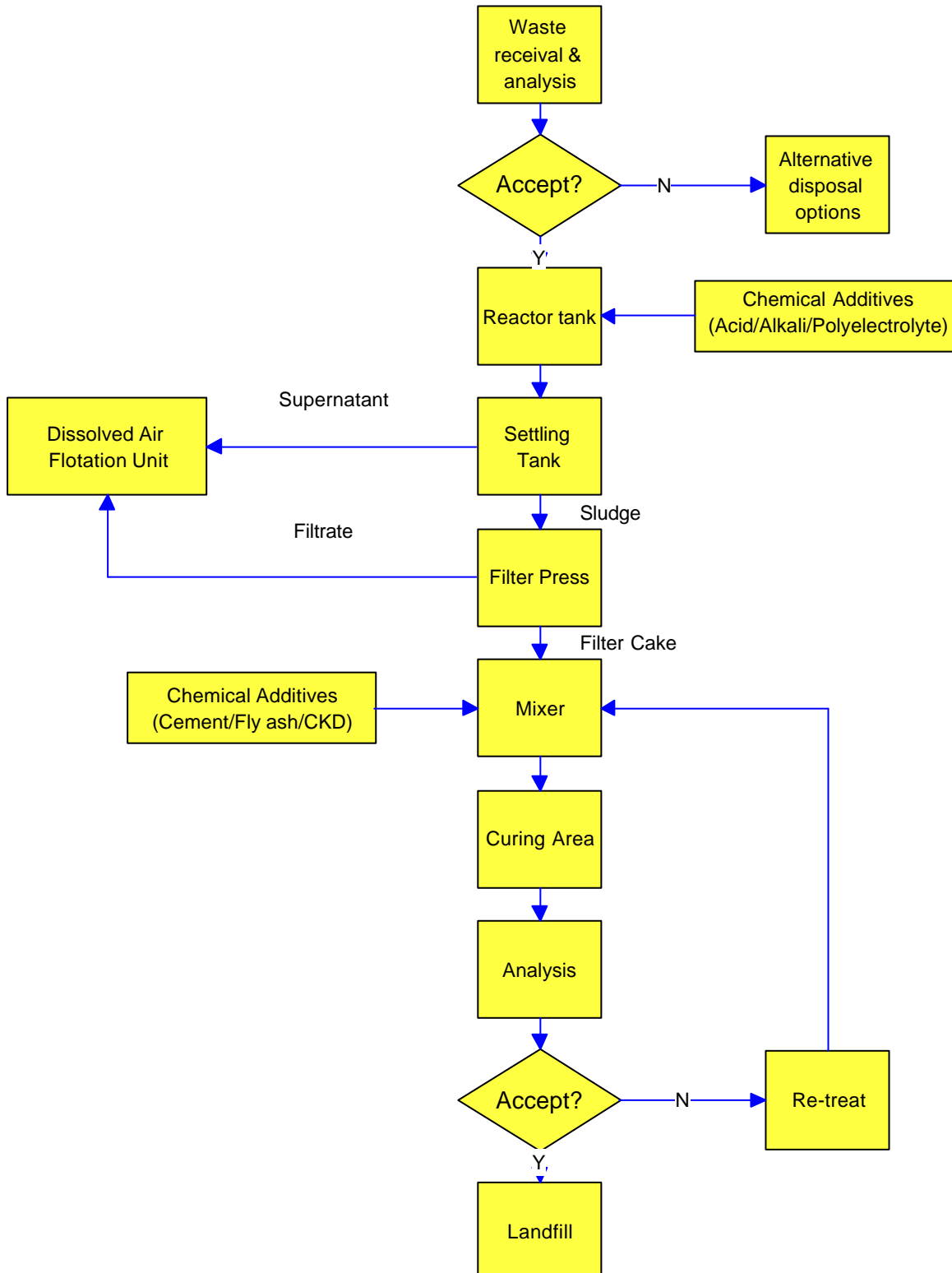
**NT Resource Recovery
Biodegradable Waste Treatment**



NT Resource Recovery Oily Water Waste Treatment



NT Resource Recovery Chemical Fixation & Solidification Treatment



APPENDIX F - LOCALITY MAP

APPENDIX G - SITE PLAN

