Appendix G

Chevron Management of Waste Procedure (CDMS 179)

Chevron South Africa (Pty) Limited
Cape Town Refinery

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1. PURPOSE

The purpose of this process is to facilitate the disposal of hazardous and non-hazardous waste in an environmentally responsible manner. The management of waste includes:
(a) Collection, temporary storage, transport, and disposal of waste,
(b) Tracking, monitoring and regulation of the production, collection, transport, and disposal of waste, and
(c) Prevention of waste production through in-process modifications, re-use and recycling.

2. SCOPE

This procedure applies to the sampling, testing, recycling, and disposal of hazardous and non-hazardous waste. This includes the management and disposal of wastes contained in drums and bulk containers from the refinery.

3. OVERVIEW

3.1 HAZARDOUS WASTE

The Environmental Specialist keep necessary records associated with each disposal and documents the disposal of all hazardous and non-hazardous waste generated at the Refinery. The Reliability and Maintenance (R&M) Site Services section coordinates the removal of waste by an accredited removal specialist.

These wastes include:

- Asbestos insulation
- Asphalt/bitumen
- Contaminated soil
- Separator sludge
- Tanks bottom sludge(leaded and leaded)
- Redundant chemicals
- Laboratory chemicals
- Laboratory contaminated glass sample bottles
- Spent caustic
- Spent amine
- Spent catalysts
- Vanadium contaminated waste such as Furnace deposits, refractory, boiler sludge etc
- Plant 72 clay filter
- Charcoal
- Contaminated blast grit
- Contaminated salt from salt filters
- Contaminated stone from salt filters

The generator of waste should eliminate unnecessary waste generation. Effort must be directed at reducing waste at source (in terms of volume and toxicity) and recycling. The hierarchy of the waste management system is: reduce; reuse/recycle; treatment and final disposal. Currently the Refinery's waste is either

- re-used/recycled in the refining process or off-site
- disposed of, under various controlled conditions for dilution with effluent (e.g. waste water at the effluent treatment plant), or
- disposed of by an accredited waste management contractor

Handling of hazardous waste shall only take place under a suitable authorization permit system.

The Waste Generator will arrange for sampling and laboratory testing of the material in the laboratory according to the schedule in Appendix 1.

Effort must first be directed at reducing, re-using or recycling the waste on-site, then off-site. Disposal to a landfill site should be considered as a last option. The current initiative is integrated waste management where Chevron and Enviroserv look at ways of re-using/re-cycling larger waste streams from the refinery so that the amount of hazardous waste going to landfill is reduced and eventually eliminated. By going for the integrated waste management option, Chevron is ensuring that it minimize future liabilities.

Waste in drums
As indicated above, the Waste Generator should have the waste sampled and sent to the lab for analyses. In order to reduce safety hazards on the Plant, the Waste Generator shall request R&M Site Services section to transfer waste in drums to the designated waste storage site (HW Transfer Station) on the Refinery. All drums containing hazardous waste on this site must be labeled by the generator, using Chevron's Standard Essential Suite Tool, to print the required drum label.

Waste storage holding site – HW Transfer Station
An area shall be designated for the temporary storage of waste material and drums containing waste products. The waste shall be stored in such a manner that no leakage can occur at any time. The area shall be fenced off and signposted with "hazardous waste" signs. Unauthorized entry is prohibited in the area. Hazardous waste generated at the Refinery should be disposed of within 90 days.

Empty drum storage site – Salvage Yard
30 to 40 empty drums are stored in the salvage yard in case of plant emergencies. No empty drums will be discarded as scrap metal, but will instead be sent to a Ekapa drum refurbishers and reconditioners of drums.

For waste disposal by a contractor, the lab results will be forwarded to the Waste contractor before removal is arranged from the Refinery. Hazardous waste disposal is only allowed on a permitted Hazardous waste landfill site. Hazardous waste must be disposed of in accordance with the Environmental Conservation Act No. 73 of 1989.

The waste contractor shall be escorted to the designated area or Plant area by Operations personnel after hours. The waste removal is supervised by R&M Site Services section, and monitored by the Plant Operator - **under permit control**.

Waste contractors are obliged to certify in writing via a Waste Manifest Document that the waste was disposed of in an environmentally responsible manner. Since Chevron is the generator of the waste, the waste manifest document must also be signed by a Chevron person.

Complete records shall be kept of each container or batch of waste to ensure all wastes can be traced from cradle-to-grave.

Recycling alternatives

Diesel Hydrotreated catalyst is recycled (Metal reclamation) at Hong Jing in Taiwan and forms part of a global Chevron contract. This facility has appears on the Global Chevron fit to use(FTU) list i.e. it has already been audited using the Third-Party Waste Stewardship process.

3.2 NON-HAZARDOUS WASTE

Non-hazardous waste is categorized as general waste.

Refinery staff and contractors deposit this waste in wheelie bins or labeled 210L open-top metal drums placed at designated sites around the Refinery. These containers are collected by a Refinery waste collection team on a daily basis and the waste material is placed in skips at the salvage yard, from where these and the Otto bins on site are sorted for recycling purposes and then removed by a waste contractor at least once a week.

Refer to **RELIAB\GUIDE\000218** for the guideline on refuse collection.

4. DEFINITIONS

Hazardous Waste
Waste which has the potential, even in low concentrations, to have a significant adverse effect on public health and/or the environment. This would be on account of its inherent chemical and physical characteristics, such as toxic, ignitable, corrosive, explosive, reactive, carcinogenic or other properties.

Non-hazardous Waste
Waste that does not pose an immediate threat to man or the environment. This includes builder's rubble, garden rubble, domestic (cafeteria), waste paper and general dry waste. Non-hazardous waste is categorized as general waste.

Medical Waste
Any waste generated in the Refinery Clinic (e.g. syringes, cotton swabs, plasters, etc).

Generator
The originating party whose activities result in the production of waste.

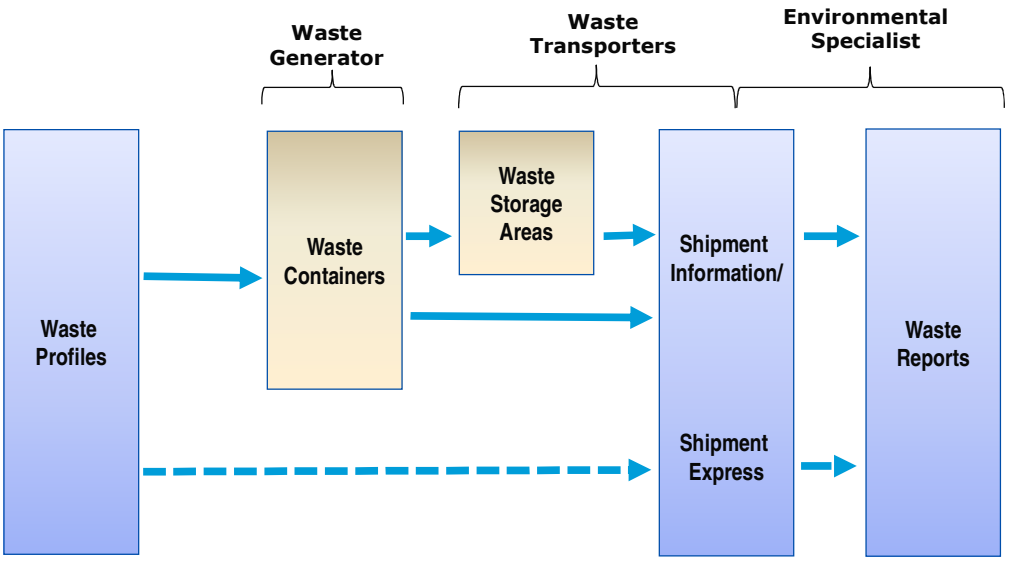
SABS Code 0228
SABS Code 0228 "Identification and Classification of Dangerous Substances and Goods" describes an inclusive hazardous waste list. The presence of a substance on the list automatically brings any material containing that substance into regulatory control.

"Minimum requirements for the handling and disposal of hazardous waste - Vol. 1"
A document issued by the Department of Water Affairs and Forestry, indicating the policy and principles underpinning the safe handling, classifying and disposal of hazardous waste in South Africa.

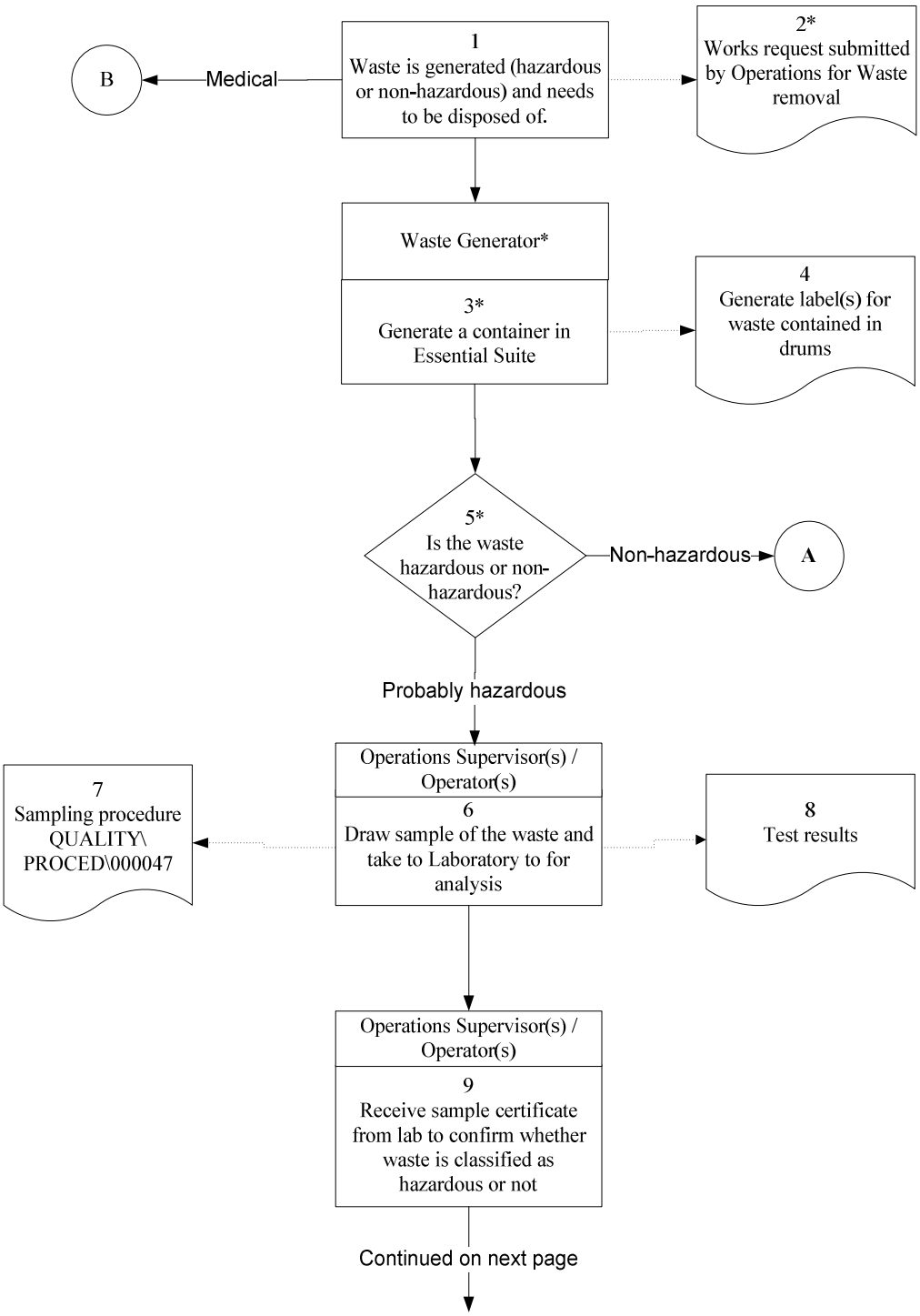
5. REQUIREMENTS AND RESPONSIBILITIES

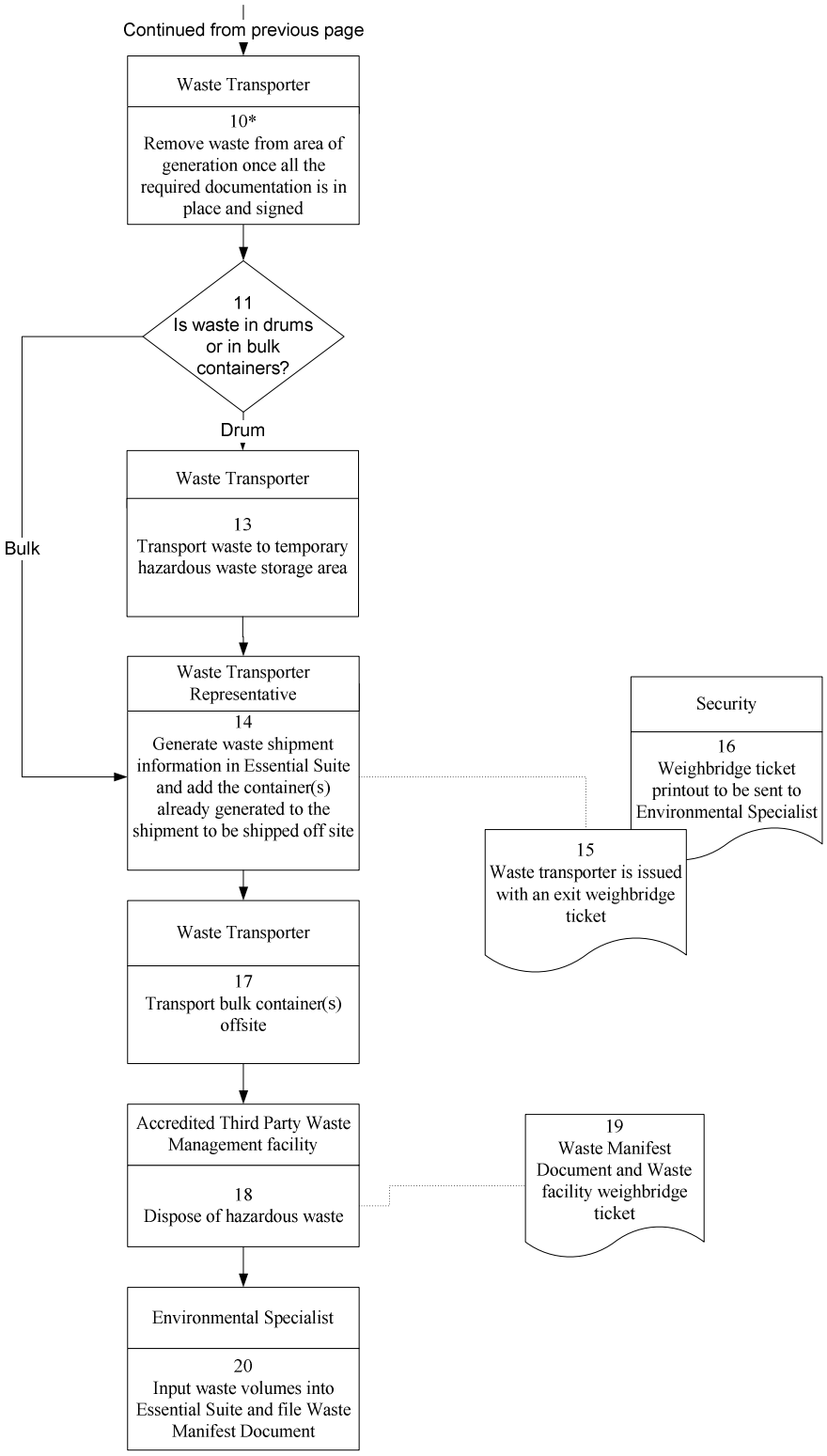
The flowcharts which follow provide a detailed breakdown of the activities required. Additional details are provided at the end of the flowchart for elements marked *.

Below is an overview of the Essential Suite workflow which supports this procedure.

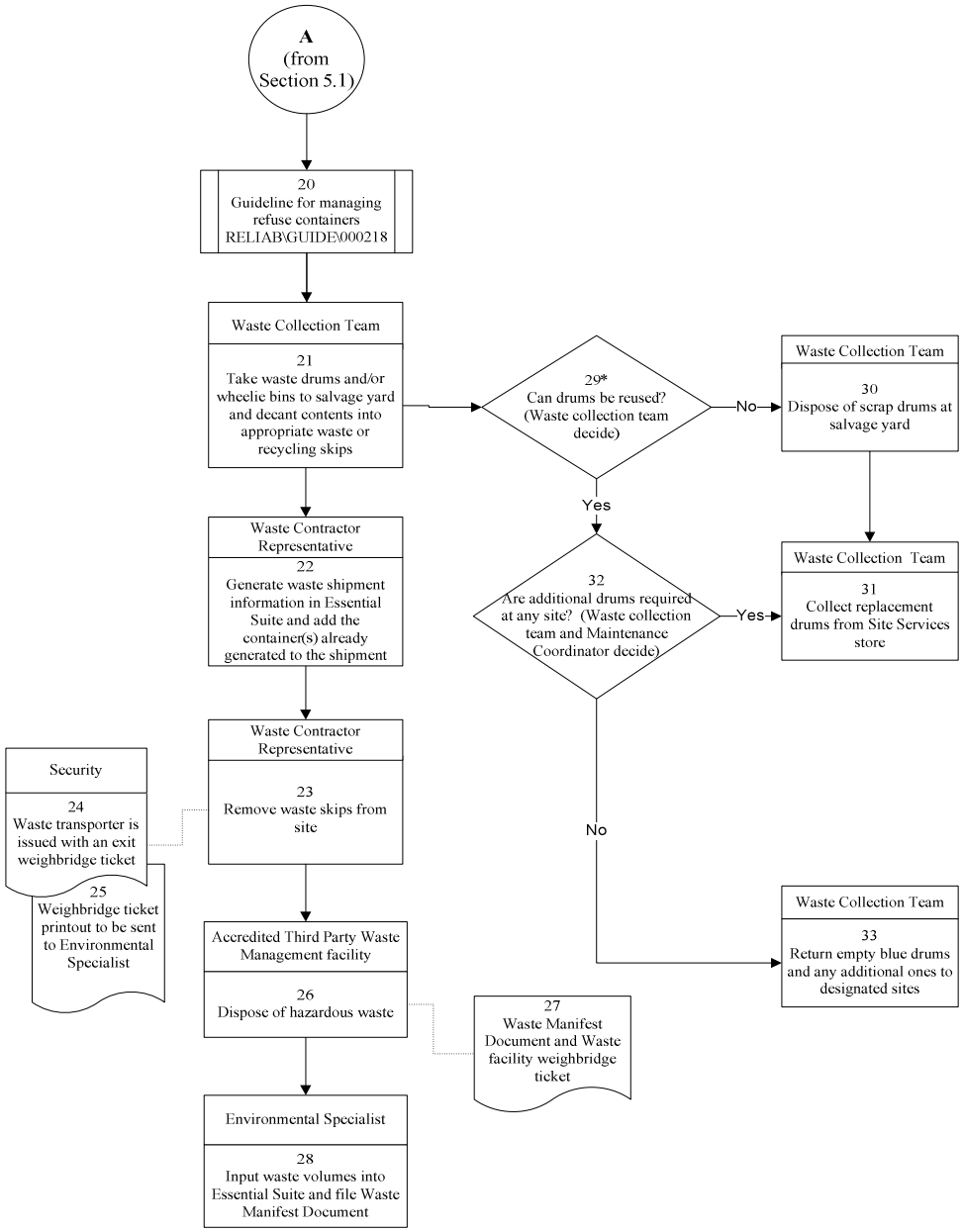


5.1 Hazardous waste

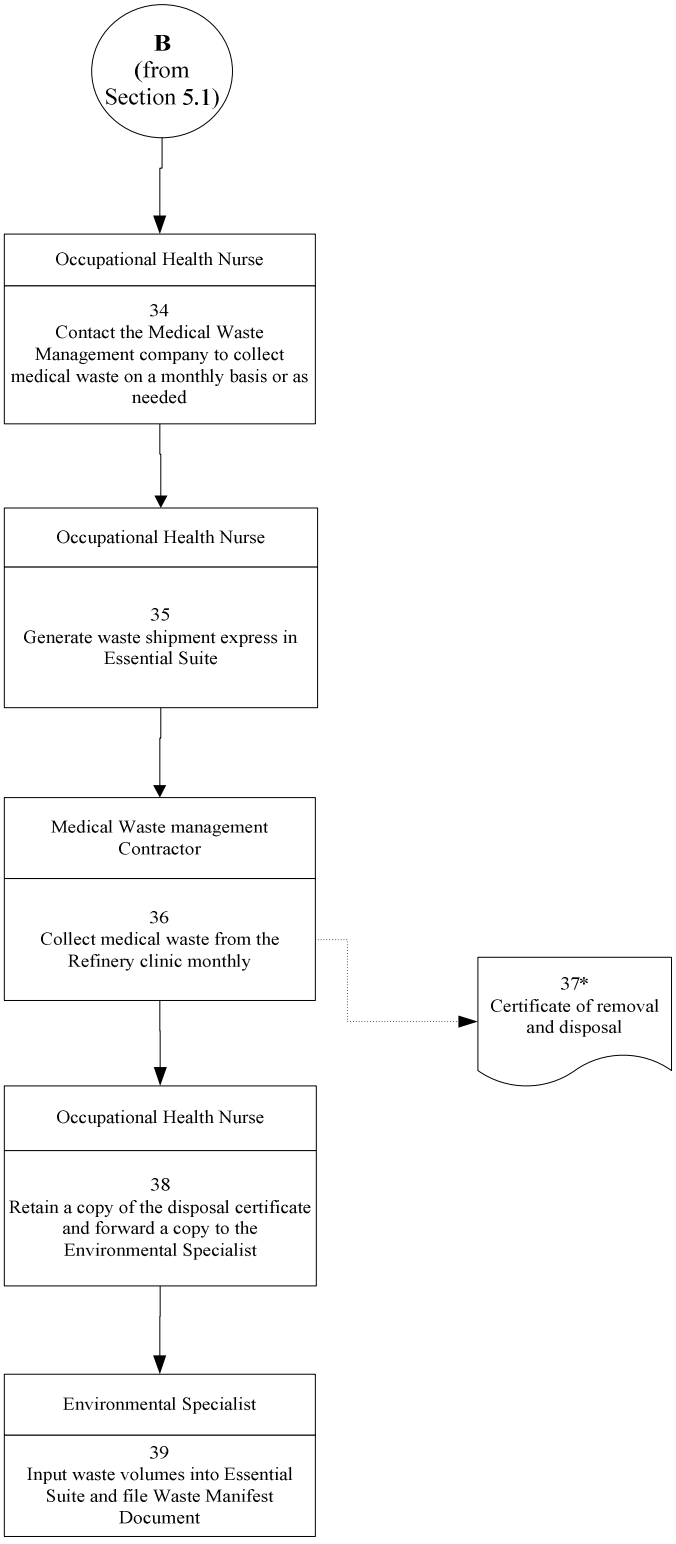




5.2 Non-hazardous waste



5.3 Medical waste



Additional information in support of the flowchart:

Reference No. in the flowchart	Additional information
1, 5	Should there be any doubt by the Supervisor as to whether the waste is hazardous or not, the Supervisor should always err on the safe side and treat the waste as ***probably hazardous*** – HES Subject Matter Experts can be approached for guidance**.** As a guideline, refer to **Appendix 1**.
2	No waste will be removed from site without the submission of a works request. Works request is allocated to site services, who schedule the work accordingly.
3	The waste generator defines the area where the waste is generated, i.e. operations (primarily hazardous waste) or clinic (medical waste)
10	Waste is only removed if the waste manifest document has been signed by the waste generator (i.e. operations representative), the lab certificate has been received and the drums (if applicable) are correctly labeled. In addition, the container number which is generated in Essential Suite must be noted under the 'special instructions' field on the waste manifest document. OPS Supervisor is to ensure that the contractor complies with requirements of any work permits that exist for the waste disposal work.
18, 27	Waste manifest to be kept for 50 years.
29	Before undertaking the rehabilitation of drums, it is important to consider any contamination from the drum's previous contents that might adversely affect the health of those doing the rehabilitation.
37	Certificate provided to confirm that medical waste was removed from site and disposed of via high temperature incineration and then the residual ash disposed of at a Hazardous Waste Landfill Site in accordance with the regulations as per the Department of Water Affairs.

In deciding on a waste handling method, the following factors should be considered:
- the opportunity for reduction or recycling at source
- cost of transportation and disposal/ recycling
- potential for injury to persons
- potential to contaminate soil or groundwater
- long-term risks and potential future costs.

Specify the designated area for the handling of the waste, to limit/control the exposure to personnel to acceptable levels.

The waste disposal procedures to be used may be found in CDMS or in the Health Environmental and Safety (HES) files. Examples are:

- Lead monitoring and control - **HEALTH\PROCED\000422**
- Handling asbestos insulation - **HEALTH\GUIDE\000202**
- Shutdown environmental guidelines - **ENV\GUIDE\001219** covering waste such as spent caustic, boiler firebox washings, vanadium waste, etc.

5.4 External Waste Facility audits

The Environmental Specialist, and/or appointed qualified person will conduct a 4 yearly external audit at the waste disposal site(s) to ensure compliance to permits and regulations. The standardized Chevron Third-Party Waste Stewardship (TWS) evaluation is used to determine whether an external waste facility is fit to use (FTU).

Refer to **ENV\FORM\002777** as the standardised guideline for the site evaluation.

5.5. Hazard Rating

The objectives of Hazard Rating are to indicate:

- the risk posed by a Hazardous Waste and hence the degree of care required for its disposal;
- the class of Hazardous Waste landfill at which the waste may be disposed;
- the amount of a hazardous substance or compound that can be disposed of at a particular Hazardous Waste landfill site before it begins to pose a risk.

The Hazard Rating is used to classify Hazardous Waste into four Hazard Ratings.

Hazard Rating 1: **Extreme Hazard**
Hazard Rating 2: **High Hazard**
Hazard Rating 3: **Moderate Hazard**
Hazard Rating 4: **Low Hazard**

The four Hazard Ratings are ranked according to a logarithmic progression, whereby Extreme Hazard is 10 times more toxic than High Hazard and 1000 times more toxic than Low Hazard.

Hazard Rating 1 (Extreme Hazard): is waste of first priority concern, containing significant concentrations of extremely toxic substances, including certain carcinogens, teratogens and infectious wastes.

Hazard Rating 2 (High Hazard): is waste of second priority concern with highly toxic characteristics or extremely toxic substances, which are not persistent, including certain carcinogens.

Hazard Rating 3 (Moderate Hazard): is waste of third priority concern, which is moderately toxic or which contains substances that are potentially highly harmful to human health or to the environment but are not persistent.

Hazard Rating 4 (Low Hazard): is waste that often occurs in large quantities and which contains potentially harmful substances in concentrations that in most instances would represent only a limited threat to human health or the environment.

The Hazard Rating determines the class of landfill at which a waste is disposed:

Hazard Rating 1 } H: H landfill
Hazard Rating 2

Hazard Rating 3 } H: H or H: h landfill
Hazard Rating 4

The requirements for the siting, investigation, design, operation and monitoring of Hazardous Waste landfill are more stringent than those for a General Waste landfill. In turn, the requirements for an H: H landfill are more stringent than those for an H: h landfill.

APPENDIX 1: Types of hazardous waste and associated laboratory tests

TYPE OF WASTE	HAZARDOUS SUBSTANCES	LAB TESTS FOR DISPOSAL PURPOSES (Not Specified In Code)	CODE 0228 HAZARD CLASS (see Appendix 2)	SUBSIDIARY RISK
AMINE • Spent amine / Amine water washings • Amine sludge	• Amine, (corrosive, flammable) • Hydrogen sulphide	• pH • Amine strength • Sulphide	8 2(2.3)	Flammable liquid Flammable gas
ASBESTOS	• Blue / Brown asbestos • White asbestos	N/A	9 9	-
BATTERIES, e.g. • Lead acetate	• Lead acetate	N/A	9	
BOILER WASHINGS	• Boiler ash • heavy metals: vanadium, • refractory pieces, • sulphur, carbon /soot deposits	• pH • Vanadium		
CATALYSTS • Spent FCCU catalyst • Cat-poly catalyst • Sulphur catalyst	Dry metal catalyst, with vanadium, sodium • Phosphoric acid • coke • possible hydrocarbons • Aluminium based • solidified sulphur • coke	• pH • % Vanadium, • pH • Vanadium MSDS required for all catalysts	4.2 6.1 4.1	
CAUSTIC • spent caustic • caustic washings • Tank sludge from caustic storage	• Caustic (corrosive) • Phenol • Mercaptan/ sulphide	• Caustic Strength • Phenol • Mercaptan / Sulphide • pH	8 6.1 3	Toxic
CERAMIC FIBRE	Treated as Asbestos	N/A		
CHARCOAL / ACTIVATED CARBON	• Activated carbon	N/A	4.2	

TYPE OF WASTE	HAZARDOUS SUBSTANCES	LAB TESTS FOR DISPOSAL PURPOSES (Not Specified In Code)	CODE 0228 HAZARD CLASS (see Appendix 2)	SUBSIDIARY RISK
LABORATORY • Standards of heavy metals • Testing residues • Redundant lab chemicals	Consult the SABS Code using the chemical names			
LEADED COMPOUNDS • sandblasting grit/sand from sandblasting outside of lead storage containers	• Inorganic lead	• Inorganic lead	6.1 (111)	
LEAD COMPOUNDS • organic sludges in gasoline tanks • contaminated material such as rags / gloves	• Lead	• Organic lead • Inorganic Lead • Total Lead	6.1 (1)	
OFF-SPEC PRODUCT, such as Bitumen	Tars, including asphalt and bitumen (Flammable) Heavy metals	• Flashpoint • Vanadium • Sodium	3 6.1 4.3	
REFRACTORY	• Vanadium	Vanadium	6.1	
SAND • Oil contaminated sand from oil spills • Sandblasted sand • Contaminated sand from tanks	• Hydrocarbons • Heavy metals (if heavier product streams such as fuel oil) • Lead (if leaded gasoline) • (Dependent on tank or vessel type)	• Flashpoint • Vanadium, sodium (for fuel oil, vac. resid.) • Lead (if leaded gasoline)	3	
SCALE / RUST • from tanks / vessels	• Iron oxides *(non-hazardous unless pyrophoric)* • heavy metals*		4.2 (only if pyrophoric)	
SLUDGES • Cooling water sludge	• Silica, algae/ (insects),iron *(non-hazardous)*	-	-	

TYPE OF WASTE	HAZARDOUS SUBSTANCES	LAB TESTS FOR DISPOSAL PURPOSES (Not Specified In Code)	CODE 0228 HAZARD CLASS (see Appendix 2)	SUBSIDIARY RISK
• Sludge ex vessels e.g. Desalter	(Dependent on vessel) • Heavy metals* • Phenol • Sulphide	• Heavy metals* • Phenol • Sulphide		
• Oily separator sludges (Retention pond, impounding basin)	• Lead, phenol, heavy metals*, oil • Flammable hydrocarbon	• Total lead, heavy metals, phenol • Flashpoint of hydrocarbon		
• Tank bottom sludges (Fuel oil, Vacuum residue)	• Heavy metals* • Flammable hydrocarbons	• Vanadium, sodium • Flashpoint	6.1 3	
• Bitumen sludges	• Heavy metals* • Flammable liquid	• Nickel, vanadium, sodium • Flashpoint	6.1 3	
• Gasoline leaded tank sludges	• Lead	• Total lead (organic/inorganic lead)		
• Ash hopper sludges	Same as for boiler washings			
SPILLAGE OF PRODUCT / CLEANING OF PROCESS AREA	• Hydrocarbons • Heavy metals if heavy products	• Flashpoint • Lead (if leaded gasoline) • Vanadium (if other hydrocarbons)	3	
SULPHURIC ACID • spent liquid • tank sludge	• Sulphuric acid liquid • Acid sludge	• pH • Acid strength	8 8	
VANADIUM CONTAMINATED SAND / DUST • Furnaces boiler ducts	• Vanadium dust	• % Vanadium	6.1	
• Fuel Oil Blend	• Flammable • Heavy Metals	• Flash Point • Catalyst Content • Vanadium	3	

*** Heavy metals**

Heavy metals come in with the crude and tend to concentrate in the fuel oil and the heavier process streams

Heavy metals in fuel oil and heavy process streams:-

Vanadium - classified as hazardous in SABS Code (highest concentration)
Sodium - classified as hazardous in SABS Code
Nickel - only hazardous when bonded to another chemical in a compound (check SABS Code 0228)
Aluminium - only hazardous when bonded to another chemical in a compound (check SABS Code 0228)
Copper - only hazardous when bonded to another chemical in a compound (check SABS Code 0228)

Substances that are also listed in the SABS Code 0228, of interest to the Refinery, include the following:

HAZARDOUS SUBSTANCES	CODE 0228 HAZARD CLASS (see Appendix 2)	SUBSIDIARY RISK
Aluminium		
Ammonia		
Benzene	3	
Calcium/alloys	4.3	
Carbon monoxide	2(2.3)	Flammable Gas
Cobalt catalyst • dry • wetted with liquid	4.2	
Crude oil	3	
Cyanide, solution or inorganic solid	6.1	
Diesel fuel, oil;	3	
Dimethyl disulphide (DMDS)	3	
Fuel oil (kerosene)	3	
Gasoline	3	
Hydrocarbon gas, liquified, compressed	2(2.1)	
Hydrocarbons	3	Flammable
Hydrogen and carbon monoxide, mixture	2(2.3)	
Hydrogen peroxide	5.1	Corrosive
Hydrogen sulphide	2(2.3)	Flammable Gas
Liquified petroleum gases	2(2.1)	
Mercaptan mixture, liquid	6.1	Flammable liquid
Metal Catalyst, dry	4.2	
Motor fuel anti-knock mixture	6.1	Flammable liquid flashpoint <=60.5°C
Petroleum distillates or petroleum products	3	
Phenol, solution	6.1	
Sodium	4.3	
Sulphides, pyrophoric	4.2	
Sulphur/Sulphur, molten	4.1	
Sulphur dioxide, liquified	2(2.3)	Corrosive
Sulphur dioxide solution	8	
Tars, liquid including asphalt and bitumen	3	

APPENDIX 2: SABS Code 0228 classes

Class	Description
Class 1	Explosives
Class 2 2.1 2.2 2.3	Gases: compressed, liquified or dissolved under pressure Flammable gases Non-flammable gases Poisonous gases
Class 3 3.1 3.2 3.3	Flammable liquids Low flashpoint group of liquids; flashpoint below - 18 deg. C c.c.* Intermediate flashpoint group of liquids; flashpoint of - 18 deg. C up to, but not exceeding 23 deg. C c.c.* High flashpoint group of liquids; flashpoint up to, and including 61 deg. C c.c.*
Class 4 4.1 4.2 4.3	Flammable solids or substances Flammable solids Flammable solids liable to spontaneous combustion Flammable solids which emit flammable gases when in contact with water
Class 5 5.1 5.2	Oxidizing substances Oxidizing agents Organic peroxides
Class 6 6.1 6.2	Poisonous (toxic) and infectious substances Toxic substances Infectious substances
Class 7	Radioactive substances
Class 8	Corrosives
Class 9	Other miscellaneous substances, that is, any other substance which experience has shown, or may show, to be of such dangerous character that the provisions of the Section should apply to it.

* c.c. = closed cup test.