1. Description and Operation of Plant & Associated Processes

1.1 Hot Mix Plant

Allied's asphalt plant is a parallel-flow drum mix plant, a common type of asphalt plant in New Zealand. This type of plant operates on a continuous basis with the drum used to both dry and heat aggregate and to mix liquid bitumen with hot aggregate to produce hot mix asphalt.

The plant has a maximum production capacity of 80 tonnes per hour (Tph) of product. Figure 4.1 presents a generic diagram of a drum mix asphalt plant to illustrate the operation of this process. The particulate emission control system is a venturi water scrubber. The hot mix asphalt storage is in elevated bins rather than being loaded out directly into the truck as shown. The plant consists of the following sections:

- Aggregate storage facilities, lime storage in a 46 tonne silo and fibre filler;
- Five cold feed bins and associated conveyor to the dryer drum;
- Three thermally insulated electric heated bitumen storage tanks fitted with atmospheric breathers for pressure equalisation, with a total capacity of around 50m^3.
- Diesel storage (about 1000 litres);
- Drum mix asphalt plant (consisting of the rotary drying drum; a duel fuel burner and integral combustion air fan; bitumen drum injection system; and an expansion box);
- A venturi water scrubbing section in the duct from the expansion box to the centrifugal water/dust separator;
- An exhaust fan;
- A cyclonic separator and a discharge chimney 18 m high;
- Scrubber settling pond;
- Three hot mix storage bins supplied from an enclosed slat conveyor from the mixer; and
- A control room.

A burner for an 80 Tph parallel flow plant at maximum rate of heat release has a required thermal capacity of about 7 MW gross. The calculated fuel consumption for this rate of heat release is up to 630 m^3 of natural gas/hour (calorific value of 40 MJ/m^3) or about 575 kg for used lubricating oil (calorific value of around 44 MJ/kg).

The emission control facilities consist of a venturi water scrubber. This is designed to substantially remove particulate matter. The scrubber water is collected in the scrubber pond, settled, and then reused in the scrubber.

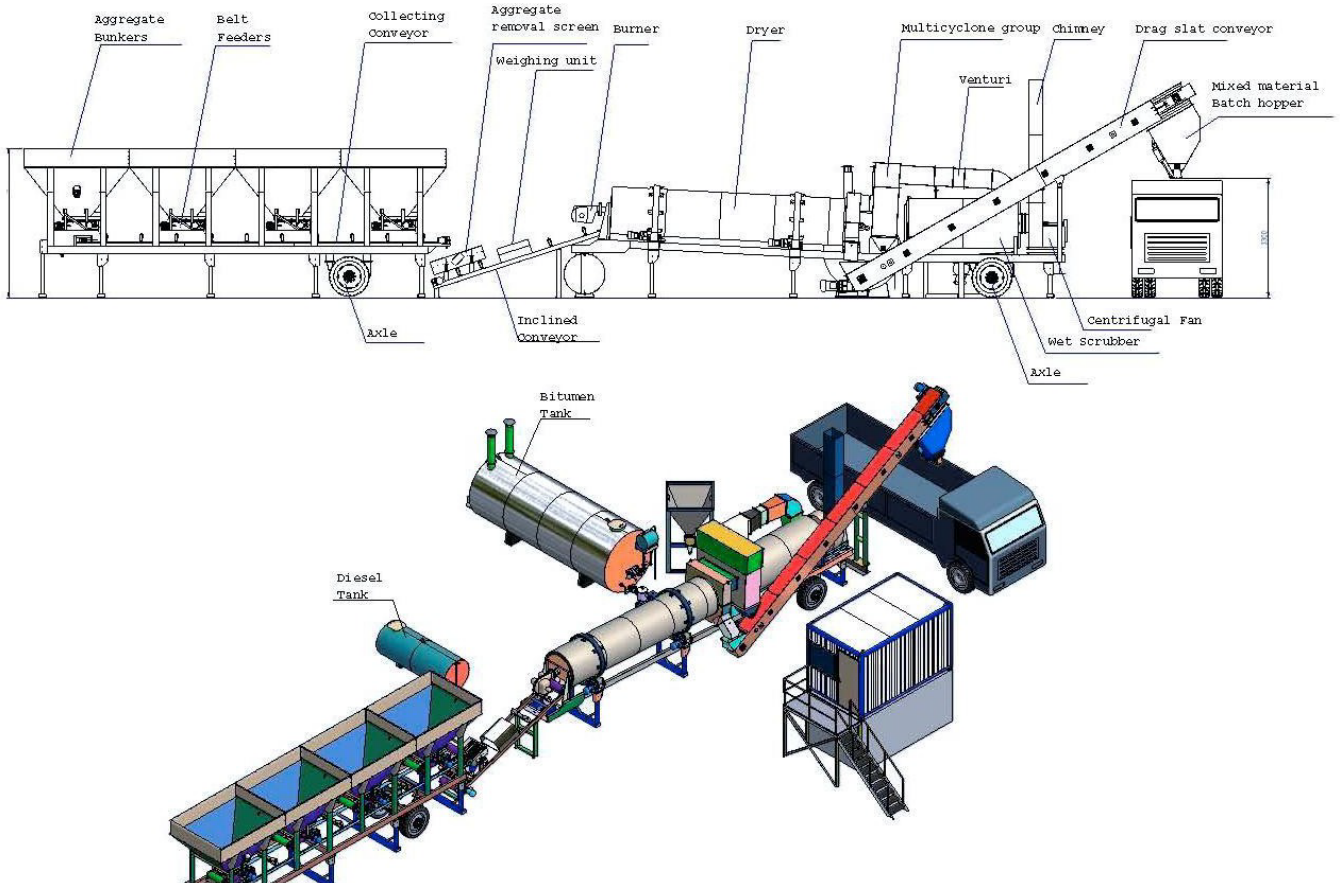


Figure 4.1: Parallel Drum Mix Flow Asphalt Plant

1.2 Raw Materials

Raw materials consist of gravel chip, sand, and crusher dust (collectively aggregates). About 6% bitumen by weight is incorporated into the aggregate during processing. Fuel is ULO, but the burner is dual fuel enabling the use of natural gas subject to commercial considerations. At this stage, the burner is ignited using gas and is then switched to used lubricating oil.

1.2.1 Aggregates

Aggregates for asphalt manufacture are a blend of fine aggregate and course aggregates. Different asphalt mix types have different percentages of course and fine aggregates. Allied Asphalt uses predominantly aggregates from greywacke quarries. Fine aggregates stockpiles are stored in covered sheds to prevent windblown dust, and water sprinklers minimise any emissions during delivery truck unloading, and frontend loader operations during asphalt manufacturing. Course aggregates are large particles of crushed rock that have too much mass to be mobilised by wind, and may be covered or uncovered in stockpile.

1.2.2 Bitumen

Bitumen is a solid to semi-solid residue resulting from the distillation of heavy crude oils. Bitumen consists of a complex mixture of high boiling point paraffinic, aromatic hydrocarbons, and heterocyclic compounds containing sulphur, nitrogen, and oxygen. Although bitumen contains a variety of aromatic compounds, it is substantially different to coal tar and pitches, which are derived by high temperature carbonisation (destructive distillation) of bituminous coal. According to the World Health Organisation[6] coal tars are composed of highly condensed-ring aromatic and heterocyclic hydrocarbons, while bitumen contains a much lower proportion of these compounds.

Bitumen is stored hot (135°C to 165°C) using electric heating via thermal oil heat exchangers to keep contents sufficiently fluid to pump to the hot mix drum and inject into the aggregate mix. Bitumen tank temperature is controlled by thermostat set in fail-safe mode. The storage tank is fitted with a short breather vent to permit pressure equalisation.

1.2.3 Patching Mixes

Asphalt may occasionally be manufactured for patching mixes.

1.2.4 Release Agent

Truck and trailer trays are swabbed with a proprietary release agent solution to prevent asphalt sticking to the tray using an ecologically friendly detergent. This is normal practice in the asphalt industry.

1.2.5 Fuel

Fuel for current plant is either natural gas or ULO. ULO has a maximum sulphur content of 1.0% by weight. The generic specification of ULO supplied by ExOil is presented in Table 4.1. The full Safety Data Sheet for ULO is provided in Appendix B.

[6] World Health Organization. Selected Petroleum Products. Environmental Health Criteria 20; WHO, Geneva, 1982.

Table 4 1: Properties of ULO

Element	Target	Typical
Ash (% w/w)	<1.0	<1.0
Water (% w/w)	<1.0	<1.0
Arsenic (ppmw)	<5.0	<1.0
Cadmium (ppmw)	<2.0	<1.0
Total Chromium (ppmw)	<5.0	1-3
Copper (ppmw)	<50	<30
Lead (ppmw)	<50	<30
Sulphur (% w/w)	<1.0	0.5-0.7
Polychlorinated biphenyls (ppmv)	Nil	Not detectable
Halogen (chlorine) (ppmv)	<1000	<500

1.3 Operation of Plant

1.3.1 Drying and Mixing

Parallel-flow drum mix plants operate on a continuous basis with the drum used to both dry and heat aggregate and to mix hot aggregate with bitumen. Aggregate is conveyed into the drum at the burner end and then travels down the slightly inclined rotating drum (which is fitted with flights) where products of combustion from the burner and excess air dries and heats the aggregate. The lifting motion of the flights achieves good contact between aggregate and drying gases. Hot liquid bitumen is injected into the drum about half way down and the mixing action of the rotating drum ensures a good and even coating of bitumen on aggregate particles. A steam barrier generated by the drying aggregate, and burner design, prevents the burner flame impinging on the bitumen. Hot mix temperatures range from about 135 to 170°C depending on the blend (about 150°C for the standard blends) and contains about 5% moisture. Product is discharged from the drum at the opposite end to the burner onto a slat conveyor for transfer to thermally insulated hot storage bins and then load-out.

Combustion gases, dust, bitumen volatile matter and pyrolysis products are drawn by an induced draught (ID) fan through the particulate water scrubber before gases are discharged into air through the stack.

Spraying the bitumen into the aggregate and the steam generated by drying aggregate removes a substantial portion of the entrained dust (i.e. acts as a primary dust collector) which lowers the loading on the down-stream emission control equipment.

Parallel flow plants are energy efficient. Although the drying drum acts as the mixer, the potential for dryer drum fires with modern plant is low. As well as the plant being equipped with normal process sensors and control systems to maximise product quality, the cold bin to drum conveyor is fitted with a fail-safe load sensor, which shuts down the burner if aggregate flow ceases for about 15 seconds or more.

1.3.2 Plant Emissions Control

The drying of aggregate generates dust and steam within the drier drum. Negative pressure is maintained within the drum by the main fan situated down-stream of the injection section of the water scrubber. Dust not captured in the drying/mixing drum is drawn into the expansion box at the end of the drying drum where large particles settle out and drop into the aggregate/bitumen mix.

Air and remaining entrained dust is scrubbed in an adjustable throat high efficiency venturi wet scrubber. Dust- containing water droplets entrained in the gas flow downstream of the venturi scrubber are centrifugally removedin the scrubber drum to discharge into the scrubber settling pond. This type of venturi scrubber, when appropriately set-up and operated, can consistently achieve dust emission concentrations of less than
250 mg/Nm^3 dry gas basis. The actual concentration of particulate depends on the rate of drying, the percentageof fines in the aggregate, the pressure drop across the venturi scrubber and its water flow, and the degree of settling achieved in the scrubber pond prior to recycle of water to the scrubber.

Not all of the particulate discharged from the scrubber is PM_{10}. USEPA emission factors do not speciate particulate emitted from venturi scrubbers but the ratio of PM_{10} to TSP will be lower than the ratio specified bythe USEPA for fabric filters (70% of the TSP from fabric filters is PM_{10}).

Given that water injection nozzles are maintained in good condition increasing the venturi water flow increases particulate removal efficiency, but excessive water injection may overload downstream droplet removal causingexcessive droplet carryover into the stack and problems with emission testing (and sometimes the ejection of droplets from the stack). Such droplets are often ‘muddy’ due to carryover of dirty scrubber water and washingof particulate from inside ducting and stack surfaces.

The height of the plant chimney is 18 m with an exit diameter of 0.75 m. Temperature of chimney gases is usually between 50 - 80°C with 70-75°C being a typical value at high rates of production. During normal operation, the discharge from the stack an opaque white steam plume is obvious. Design volumetric flow of an 80 tph plant is about 4.65 Nm^3/s wet gas basis at 25% moisture or about 3.7 Nm^3/s dry gas basis, which equates to an actual rate of discharge of around 5.8 Am^3/s at 65°C. Actual volumetric flow (and its temperature)from the stack varies depending on how the drier is set up, the rate of drying, and on scrubber operating factors.

Appendix 4

Recent discharge testing of the Company’s plant performed by CRL in March 2019 indicates that at high rates ofproduction volumetric flows of ~4.7 Nm^3/s dry basis, which equates to a rate of discharge of ~6.2 Nm^3/s wet basis or 7.8 Am^3/s saturated at 70°C. A copy of the discharge testing report is provided in Appendix C. The discharge testing measured an average particulate concentration as total suspended particulate over three sample runs of 113 mg/m^3 0°C, dry gas basis.

Environmental Management Plan – Operational Summary – Mount Maunganui Asphalt Plant

allied asphalt limited
MANUFACTURERS OF ALL GRADES OF HOT BITUMINOUS MIXES

Prepared By: Blain Brown- Plant Manager	Reviewed By: BP/BB	Approved By: Brian Palmer	Date: 1/11/22		

Scope
This EMP – Operational Summary applies to all activities, operations and staff at the Mount Maunganui Plant – Aerodrome Road.

Responsibilities
Particular responsibilities of note for the Plant include:
- Overall responsibility for Environment Management rests with: Blain Brown – Plant Manager
- Responsibility for the direction of onsite operations, including planning and management of the safety and environmental protection measures, rests with: Blain Brown and Brian Palmer.
- Day to day management of the safety and environmental protection measures, inspections, monitoring and maintenance rests with: Plant Manager and Plant Operators

Advice on environment and sustainability matters and overview of consent compliance and reporting by: Brian Palmer (with Dale Eastham- FH Environmental Manager advising)

Requirements
All work undertaken by Asphalt Plant personnel shall be undertaken in a manner which is compliant with:
- Company and Site requirements
- AAL Mount Maunganui EMS where appropriate
- Legislative requirements including permitted activities and the following resource consents:
- Discharge to Air Consent
- Hazard controls, Work Instructions
- Health and Safety at Work (Hazardous Substances) Regulations 2017 compliance for storage and handling of hazardous substances

Working in accordance with this EMP - Operational Summary will help you comply with these requirements.

Critical Resource Consent Compliance Monitoring, Recording and Reporting
Staff working at the Plant shall be aware of the conditions of Resource Consent ------- – Discharge to Air (copy in Control Room).

Plant processes at all times shall be operated, maintained, supervised, monitored and controlled so that emissions authorised by this consent are minimised.

Monitoring, Recording and Reporting at the Plant shall be undertaken in accordance with:
- Mount Maunganui Asphalt Plant Air Quality Management Procedure requirements
- Plant Maintenance and Inspection schedule and checklists
- Any identified non-compliances/deficiencies in controls must be fixed before any environmental impact can occur

The following specific environmental compliance monitoring and reporting is required to meet legal requirements
- Dust nuisance does not occur beyond the boundary of the site.
- Particulate matter shall not exceed 250 mg/cubic metre
- Control of odour nuisance beyond the boundaries of the site
- Ensue that the fuel used shall not exceed 2% w/w sulphur content.
- Scrubber water must be maintained at pH greater than 7.

Any identified non-compliances / deficiencies in controls must be fixed before any environmental impact can occur and recorded through the OFI system.

Critical Manufacturing and Operations, Inspections and Maintenance
Prior to & during manufacture of any asphalt the Plant Daily Check Sheet must be completed
- All plant and associated odour/smoke/dust controls must be implemented and monitored on a constant basis for their functions and operation
- Manufacturing temperature must be maintained within specified manufacturing temperatures for each asphalt mix
- Ensure extraction fans for smoke/fumes running whenever the manufacturing temperature is 150ºC or above and load out is taking place
- Burner combustion efficiency is to be maintained and monitored during plant operations
- Ensuer sprinklers around stockpiles, feed bins and conveyors to be in operation during dry periods or as necessary to suppress dust
- All items of the Asphalt plant identified as requiring maintenance are to be serviced as scheduled

Related Documents
The following documents are associated with this EMP:
- Asphalt Plant SOP's – Mount Maunganui
- Plant Maintenance Check Sheets
- Operational Hazard Register and Pre-start tailgates
- AALs Mount Maunganui EMP

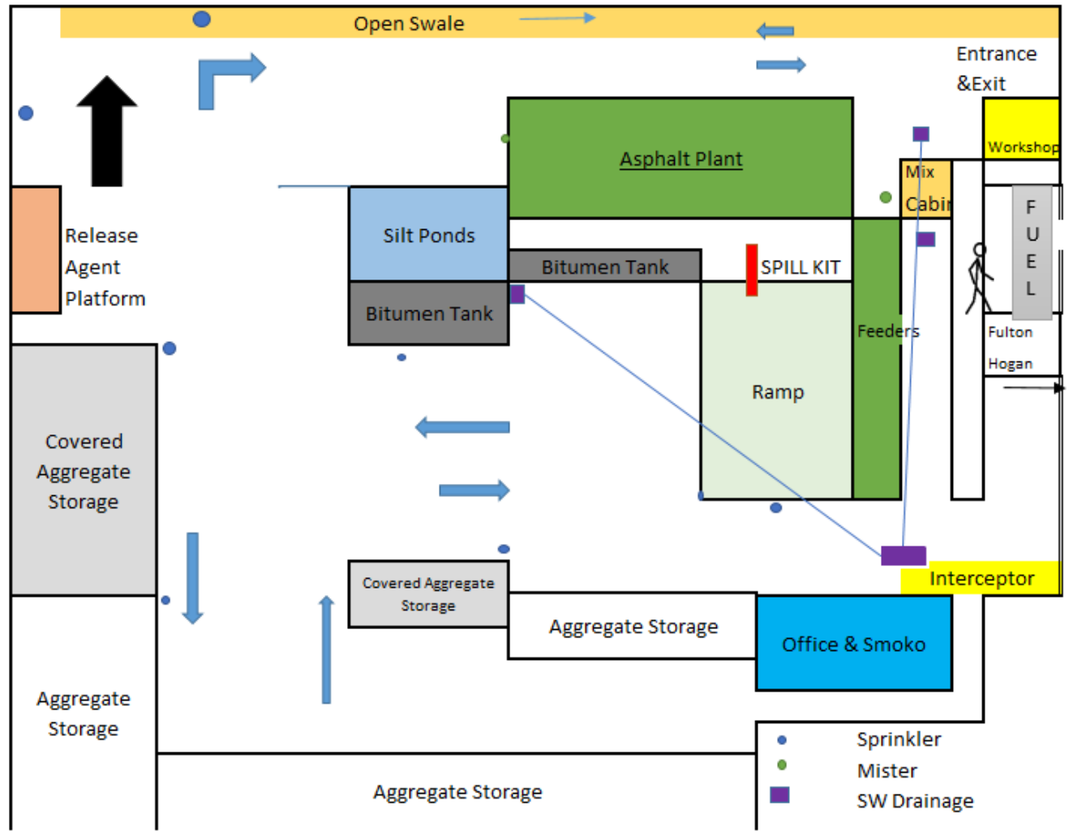
Communication of Requirements
This EMP needs to be communicated to all staff and subcontractors to inform them of the safety and environmental requirements of working on the above site, by the following means:
- Display of this Plan in the Control Room and Plant Managers Office
- Tailgate Meetings including Pre-start Tailgates
- Staff and Subcontractor Inductions
- Audit Reports
- Leadership Actions
- Opportunity for Improvement (OFI) forms

Incident and Emergency Response - fire, gas pipe rupture, major chemical spill or air discharge
All incidents shall be managed in accordance with the Health & Safety System.
- All incidents and complaints are to be reported to the Plant Manager, Blain Brown and recorded on an OFI Form which are to be provided to staff and kept in the main office.
- Emergencies shall be managed in accordance with the Emergency Evacuation Plan and Plant Emergency Response Procedures documented and kept in the Control Room.
- The emergency muster point for Asphalt Plant staff is carpark at the site entrance off
- Bay of Plenty Regional Council shall be notified as soon as practicable where any significant discharge to air results, or has the potential to result, in a breach of consent conditions
- Spills shall be managed as detailed below in Chemical Storage and Spill Management

Community and Complaint Management
The nearest residential neighbour is over 600m to the west of the site on Maunganui Road. Particular issues of concern to neighbours are odour, dust and noise.

Keeping our neighbours happy is crucial to the continuing viability of our business particularly with respect to Consent compliance and renewal.
- All internal or external complaints from neighbours, clients or regulators shall be recorded as per SOP and added to Complaints Register (kept by the Plant and Operations Manager).
- Details of any complaints received shall be provided to BOPRC within one working day of receipt of the complaint.

Allied Asphalt Mount Maunganui



Environmental Hazards and Controls

Noise
Working Hours:
- Works at the Asphalt Plant can occur 24 hours of the day. Night noise is a key risk

Noise Minimisation Methods:
- General vehicles to avoid reversing, excessive engine revving and banging of tailgates particularly at night
- Loader to restrict dropping heights and scraping of the ground where practical
- Broadband directional reversing alarms to be used on loader instead of
- Maintenance of plant and equipment to be undertaken as per management schedule or as soon as possible on identification of any noise issue

Discharges to stormwater
Sediment from aggregates and fuel, oil, chemical leaks and spills are the main risk to water quality
- Sediment is minimised via dust management methods (see Air Quality) and regular plant and yard sweeping
- Vehicle washing on site to be in designated truck washes

Stormwater Drainage and Treatment Systems:
- Stormwater from roofs and yard flows overland or via catchpits and pipes to a drainage system (refer site plan) and treated by sediment traps.
- The Asphalt Plant catchpits have pumps to remove stormwater to the wider yard
- Catchpits shall be checked regularly and cleaned out as required to prevent pump damage / malfunction
- Sediment from catchpits to be disposed of with RAP.

Energy:
- All energy use data (gas, electricity, fuel oil, fuel) is logged via accounting system.
- Plant maintenance (burner, compressor), stockpile moisture management and manufacturing temperature minimisation (where possible) are critical to minimising energy use
- Improvements that can reduce energy use shall be raised at tailgate meetings and submitted on an OFI as a New idea
- Loaders NOT TO IDLE, BUT TO BE SHUT DOWN WHEN NOT IN USE.

Waste Minimisation and Energy Use
Waste Minimisation Methods:

The waste hierarchy AVOID- REDUCE- REUSE- RECYCLE will be used by the Plant. As a minimum the following shall apply:
- A co-mingle recycling bin located adjacent to the lunchroom
- All steel is to be recycled via the scrap metal bin
- Cardboard and plastic film wrap is recycled to the site cardboard / plastic cages at the Yard waste station
- Empty drums / IBC's are either returned to the supplier for disposed or via a reputable disposal supplier
- All used spill material is to be placed in the prescribed contaminated waste bin.
- Other hazardous waste is disposed of in closed containers via the contaminated waste bin or through approved providers
- No polystyrene cups are to be used

Waste Storage and Disposal :
- Start-up / shutdown waste and waste asphalt from the silos is disposed of to the surge pile before being removed from site.

Sustainable Purchasing:
- Purchasing shall be from approved suppliers only
- Products, materials and services should be manufactured and/or supplied by businesses that are committed to sustainability principles and their sustainability record should be sound

Air Quality
Plant Emissions.

Bitumen odour from manufacturing, load-out, storage and deliveries along with unburnt fuel oil odours are the most significant Plant environmental risks:
- Emissions minimised by manufacturing temperatures being kept at correct manufacturing temperatures. Spec sheets specify production temperature limits

Dust Minimisation

The aggregate stockpiles, deliveries, handling and transfer are potential sources of dust:
- Bag house filters checked and maintained / replaced as required (lime).
- Loader to minimise drop heights of aggregates where practical
- Weekly yard sweeping / cleaning to be undertaken
- Speed limit of 15 kph on site to be maintained and managed.

Dust Suppression:
- Sprinklers around stockpiles and feed bins operated by loader driver

Chemical Storage and Spill Management
Chemical Storage:
- All fuels, oils and chemicals (including empty containers) shall be stored in correctly labelled containers in bunded areas / shipping containers with lids on
- Small storage containers (liquids, aerosols) shall be separated and stored in workshop container
- Safety Data Sheets shall be kept in the office and control room, electrical copies on all computers.

Spill Management:
- All spills (no matter what size) shall be managed in accordance with site Spill Procedures - be contained and cleaned up as soon as possible, disposed of into the contaminated waste bin and spill kits re-stocked
- Spill kits are located in workshop and next to bitumen tanks.
- Any spills must be recorded as an incident.
- All staff shall be trained in Spill Response

Bitumen and Fuel Oil Delivery and Storage:
- Bitumen delivery is by tanker and AAL trained personnel (bitumen) and guided by SOPs (1.6c) for offloading tankers (PPE, safety zones etc).
- Fuel oil delivery is by tanker – follow SOP.
- Staff to be in attendance during all loading/offloading operations
- Storage and overnight heating – monitor all potential outlet sources for odour as necessary
- Monitor all valves/pipe work, tanks for leaks daily
- Plant maintenance to be undertaken as per PAM schedule and Preventative Maintenance

Lime deliveries
- Ensure Lime Silo and Pulse Cleaning Air are operating and all spills are swept up afterwards

Relevant Procedures
-