

Environmental Management Plan

PPC Secondary Materials Co-Processing Programme to be introduced at Kilns 1 & 2 at the Dwaalboom Manufacturing Plant

Reference: LEDET 16/1/12 - 30

PPC Secondary Materials Co-Processing Programme to be introduced at Kilns 1 & 2 at the Dwaalboom Manufacturing Plant

Prepared by: **Marsh Environmental Services**
Marsh Vikela (Pty) Limited
The Marsh Centre
88 Grayston Drive, Sandton, 2196, Johannesburg

Contact Person: James Brice
Phone: 011 506-5317 / Mobile: 082 492 0625
Fax: 086 673 3177
Mailto: james.brice@marsh.com

Applicant: **PPC Cement**
Pretoria Portland Cement (PPC)
Head Office and Cement Division
PPC Building, 180 Katherine Street, Barlow Park ext. Sandton
PO Box 787416, Sandton, 2146

Contact Person: Egmont Ottermann
Telephone: 00 27 (0)11 386 9114
Fax: 00 27 (0) 86 515 6320
Website: <http://www.ppc.co.za> and
<http://www.ppcement.co.za/>
E-mail: egmont.ottermann@ppc.co.za

Date: October 2007

SECTION 1: TABLE OF IMPACTS AND PROPOSED MITIGATION

1.1 BACKGROUND

Marsh Environmental Services (MES) has been appointed by Pretoria Portland Cement (PPC) to conduct the Environmental Impact Assessment relating to the proposed use of secondary materials to supplement the coal supply for the firing of the cement kilns. The proposed project is identified as an activity, which may have detrimental effects on the environment, thus requiring environmental assessment (Section 21: Listed Activity 1(c), 8 and 9 of the Environment Conservation Act, 1989). The content of the Scoping Report and the public participation process is dictated by the Regulations (Regulation 1183) promulgated in terms of the ECA.

PPC Cement is currently utilising coal as their main source of energy required for the manufacturing of cement. Cement manufacture is an energy-intensive process, and therefore large amounts of coal (a non-renewable resource) are utilised. PPC has been seeking means of minimising their use of coal by investigating the use of secondary materials in the cement manufacturing process.

Secondary Materials under considerations are:

- Scrap tyres and rubber waste;
- De-watered, treated sewage pellets;
- Hydrocarbon waste (such as used oil, oil-contaminated general waste, oil-contaminated soil and coal fines);
- Plastic waste; and
- Biomass (such as paper waste, sawdust, wood chips and waste from bio-fuel production).

MES has been appointed by PPC to prepare and Environmental Management Plan (EMP) for the Construction and Operational Phases relating to the proposed Secondary Materials Co-Processing Programme.

1.2 PURPOSE OF THIS DOCUMENT

The purpose of the EMP is to mitigate the negative impacts and maximize positive impacts during the construction and operational phases of the proposed activity as identified by the Scoping Report, prepared in accordance with Regulation 1183 promulgated in terms of the Environmental Conservation Act (Act 73 of 1989).

The EMP is not a static document and mitigation measures for impacts that might only become apparent during the construction and operational phase must be added.

1.3 ENVIRONMENTAL OFFICER (EO)

During the construction Phase of the proposed development the appointed principal contractor shall appoint an environmental officer (preferably a senior member of his staff) that will be responsible to oversee compliance with the EMP.

1.4 DUTIES

1.4.1 Environmental Officer (EO)

- Oversee day to day compliance with the EMP by the contractor's staff and sub-contractors and their staff,
- Issue instructions to remediate non-compliance,
- Conduct regular inspection meeting with the Project Manager to report on compliance, and
- Report non-compliance to the Project Manager.

SECTION 2: ENVIRONMENTAL MANAGEMENT PLAN - CONSTRUCTION PHASE

This construction phase shall apply to the construction of the permanent waste storage area post-trial burn and the installation and connection and commissioning of the feeding equipment.

2.1 COMMISSIONING

- 2.2.1. All contractors, sub-contractors and service providers will be made aware of the contents of this Environmental Management Plan (EMP) and any penalties arising from non-compliance.
- 2.2.2. The applicant will appoint a Project Manager who will be responsible for overseeing all construction activities relating to this proposed activity. The appointed Project Manager must be suitably qualified and must have sufficient knowledge of the cement manufacturing plant, process and secondary materials co-processing programme to ensure informed decision-making.
- 2.2.3. The applicant will task a senior member of its staff to oversee compliance with the EMP. Specialist assistance to the EO must be ensured for specific environmental issues as required.
- 2.2.4. The EO must undertake a weekly audit of all construction activities for compliance with the EMP.
- 2.2.5. Compliance reporting must be done at site and project meetings.

2.2 SITE PLANNING / LAYOUT

2.2.1 General

The EO will induct all contractors and personnel working on the project on the contents of this Environmental Management Plan and any penalties arising from non-compliance.

2.3 SITE ESTABLISHMENT

- 2.3.1 The Contractor shall inform the General Manager of the PPC Dwaalboom Cement Manufacturing Plant of the intended actions and programme for site establishment.
- 2.3.2 The site layout shall include access points for deliveries and services, and future works. Minimising disturbance to neighbours (including security issues) shall be considered.
- 2.3.3 The position of the site camp and offices shall be approved by the Project Manager and shall be in accordance with the approved Site Development

Plan. The position shall be selected in terms of minimising both the impact on the biophysical environment and to the local community.

2.3.4 The Contractor shall restrict all his activities, materials, equipment and personnel to within the area/s specified.

The Contractor shall erect and maintain permanent and/or temporary fences, type and location as directed by the Site Manager, prior to start of other activities.

2.4 ACCESS TO SITE

2.4.1 The Contractor shall ensure that access to the site, including associated infrastructure and equipment, is off-limits to the public at all times during construction.

2.4.2 Additional areas restricted to the public and suggested detours shall be clearly marked on information boards to the satisfaction of the Site Manager.

2.4.3 If required, certain areas shall be designated as "no go" areas. The Contractor shall ensure that, no unauthorised person, machinery, equipment or material enters "no go" areas at any time.

2.4.4 Traffic safety measures (e.g. traffic warning signs), to the satisfaction of the Site Manager, shall be considered in controlling entry / exit onto public roads.

2.4.5 Attention shall be paid to minimising disruption of the flow of traffic and reducing the danger to other road users and pedestrians.

2.4.6 Physically demarcate the working area ahead of construction to ensure that construction remains within the area to be disturbed.

2.4.7 Excavation of any material on site shall be done in accordance with the relevant SABS codes.

2.5 'HOUSEKEEPING' ACTIVITIES

2.5.1 Workshop, equipment maintenance and storage.

2.5.2 The Contractor shall ensure that if plant maintenance occurs on site, that there is no contamination of the soil or vegetation (e.g. use of drip trays).

2.5.3 Drip trays shall be provided for stationary plant and for "parked" plant.

2.5.4 All vehicles and equipment shall be kept in good working order and serviced regularly. Leaking equipment shall be repaired immediately or removed from the site.

2.5.5 Ensure that facilities for the collection of hydraulic and other vehicle oils are provided within the hard park area.

2.6 STAFF FACILITIES

- 2.6.1 Toilet facilities supplied by the Contractor for the workers shall occur at the following ratio: between 1:30 and 1:15 (toilets per worker).
- 2.6.2 The location thereof shall be approved by the Project Manager prior to establishment.
- 2.6.3 All such toilets shall be secured to prevent them toppling over.
- 2.6.4 The entrances to the toilets shall be adequately screened from public view.
- 2.6.5 These facilities shall be maintained in a hygienic state and serviced regularly. Toilet paper shall be provided.
- 2.6.6 The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are removed from site by a licensed service provider.
- 2.6.7 Disposal of such waste is only acceptable at a licensed waste disposal facility.
- 2.6.8 Eating areas shall be designated and demarcated.
- 2.6.9 Sufficient bins shall be present in this area for all waste material.
- 2.6.10 No fires will be permitted at the site camp.

2.7 MATERIALS HANDLING, USE AND STORAGE

- 2.7.1 The Contractor shall ensure that delivery drivers are informed of all procedures and restrictions required to comply with this document. Such drivers shall be supervised during off-loading, by a person knowledgeable of the requirements.
- 2.7.2 Materials shall be appropriately secured to ensure safe passage between destinations. Loose loads (e.g. sand, stone chip, fine vegetation, refuse, paper and cement) shall be covered. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.
- 2.7.3 All material lay-down areas and stockpiles shall be subject to the Site Manager's approval.
- 2.7.4 Imported fill / soil / sand materials shall be free of weeds, litter and contaminants.
- 2.7.5 Storage areas shall be roofed in an impervious material, with a suitable overhang or side-cladding. Rainwater run-off shall be channeled away from the storage area as required.

2.8 HAZARDOUS SUBSTANCES (DANGEROUS GOODS)

- 2.8.1 A designated re-fuelling area shall be provided. The re-fuelling area shall be protected from potential hydrocarbon spillage by mechanisms to the satisfaction of the Site Manager. As a minimum the re-fuelling and workshop

areas shall have an impermeable floor with bund and storm water collector mechanisms.

- 2.8.2 The Contractor shall ensure that there is a supply of absorbent material readily available to absorb, breakdown and where possible encapsulate minor hydrocarbon spillage. The amount and type of absorbent material shall be appropriate to the volumes of hydrocarbons kept on site.
- 2.8.3 Potential pollutants shall be kept, stored, and used in such a manner that any escaped pollutants can be contained and the water table not endangered.
- 2.8.4 Spread absorbent soil on all areas where oil spills are expected for the duration of the construction phase. This soil to be removed post-construction and disposed of in a responsible manner.
- 2.8.5 Hazardous materials should be disposed of at registered sites.
- 2.8.6 The Contractor shall notify the Site Manager immediately of any pollution incidents.

2.9 WASTE MANAGEMENT

- 2.9.1 No on-site burying / dumping of waste materials, vegetation, litter or refuse shall occur. All solid waste shall be disposed of at suitable licensed disposal sites.
- 2.9.2 Vermin / weatherproof bins shall be provided in sufficient number and capacity to store all solid waste produced on a daily basis. These bins must be kept closed and emptied regularly (minimum daily) such that they are not overfilled.
- 2.9.3 A general side-wide litter clean-up shall occur at least once a week.
- 2.9.4 Waste shall be collected from site by a licensed contractor and removed to an appropriate waste disposal facility.
- 2.9.5 Wherever possible, materials shall be recycled via a "Greens waste site". To this end, containers for glass, paper, metals, plastics, organic waste and hazardous wastes (e.g. oil rags, paint containers, thinners) shall be provided in sufficient quantity on the site.

2.10 POLLUTION GENERATION POTENTIAL

- 2.10.1 All lighting installed on site must not interfere with road traffic or lead to unacceptable light pollution to the surrounding community (e.g. use of down-lighters).
- 2.10.2 Construction activities generating output levels of 85 dB (A) or more shall be confined to the hours 08h00 to 17h00 Mondays to Fridays.
- 2.10.3 The Contractor shall take preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to minimise complaints regarding noise and vibration nuisances from sources such as power tools.

- 2.10.4 Contractors shall be solely responsible for the control of dust arising from their operations and for any costs against the Employer for damages resulting from the dust.
- 2.10.5 Excavation, handling and transport of erodible materials shall be avoided under high wind conditions or when a visible dust plume is present. If dust-damping measures are deemed inadequate, working will cease until wind speeds drop to an acceptable level.
- 2.10.6 Soil stockpiles shall be located in sheltered areas to limit the erosive effects of the wind.
- 2.10.7 The Contractor shall take preventative measures (e.g. screening, dust control, timing, pre-notification of affected parties) to minimise complaints regarding dust nuisances from sources such as power tools.

2.11 CEMENT AND CONCRETE BATCHING

- 2.11.1 Concrete shall not be mixed directly on the ground or any other permeable surface. Concrete batching activity, should it occur, shall be located in an area of low environmental sensitivity to be designated on the Site Development Plan. The batching / mixing area shall be kept neat and clean at all times and the generation of dust prevented.
- 2.11.2 Cleaning of equipment and flushing of mixers shall not result in pollution, with all contaminated wash water entering the waste water collection system. To prevent spillage onto roads, ready mix trucks shall rinse off the delivery shoot into a suitable sump prior to leaving the site.
- 2.11.3 Suitable screening and containment shall be in place to prevent wind blown contamination from cement storage, mixing, loading and batching operations.
- 2.11.4 All contaminated water and fines from exposed aggregate finishes shall be collected and stored in sumps for disposal at an approved waste disposal site.
- 2.11.5 All visible remains of excess concrete shall be physically removed on completion of the plastering or concrete pouring and disposed off in an acceptable manner.

2.12 GEOLOGY AND SOILS

- 2.12.1 Foundation construction methodology as specified in the engineering specifications must be followed.
- 2.12.2 The contractor must determine the correct position of the topsoil stockpile/s such that the greater site is disturbed as little as possible, and such that the topsoil may be reused in landscaping of the final site.
- 2.12.3 The position of construction related materials must be approved by the Project Manager and must ensure minimal impact to the area outside of the construction footprint.

2.13 EMERGENCY PROCEDURES

- 2.13.1 The Contractor shall take all reasonable and active steps to avoid increasing the risk of fire through their activities on site. No fires should be lit on the site.
- 2.13.2 Precautions (e.g. suitable fire extinguisher, welding curtains) when working with welding or grinding equipment near potential sources of combustion shall be taken. All staff on site shall be made aware of general fire prevention and control methods, and the name of the responsible person to alert to the presence of a fire.
- 2.13.3 The Contractor shall advise the relevant authority of a fire outside of a demarcated area as soon as it starts and shall not wait until he can no longer control it.
- 2.13.4 The Contractor shall ensure that his employees are aware of procedures to be followed for dealing with spills and leaks, which shall include notifying the relevant authorities. The Contractor shall ensure that the necessary materials and equipment for dealing with spills and leaks are available on site at all times. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the Site Manager.

2.14 SAFETY AND HEALTH

- 2.14.1 There is an inspection schedule and log for use by security or contracts staff.
- 2.14.2 All trenches and manholes shall be secured.
- 2.14.3 Fencing and barriers shall be in place in accordance with the Occupational Health and Safety Act (Act No. 85 of 1993).
- 2.14.4 Applicable notice boards and hazard warning notices shall be put in place and secured. Night hazards shall be indicated suitably (e.g. reflectors, lighting, traffic signage).
- 2.14.5 Emergency and Management contact details shall be prominently displayed.
- 2.14.6 Security personnel shall be briefed and have facilities to contact relevant management and emergency personnel.
- 2.14.7 No unauthorised firearms or weapons on any kind shall be permitted on the site.
- 2.14.8 Fire hazards shall be identified and the relevant local authority division notified of any such potential threats (e.g. large brush stockpiles, fuels sources)
- 2.14.9 Pipe stockpiles shall be wedged / secured at all times.
- 2.14.10 Scaffolds shall be secure.
- 2.14.11 Structures vulnerable to high winds shall be secure.
- 2.14.12 Fire extinguishers shall be serviced and accessible.

2.15 COMMUNITY RELATIONS / ONGOING PUBLIC PARTICIPATION PROCESS

- 2.15.1 A "Complaints Register" shall be kept on site, containing contact details of the complainant, as well as details pertaining to the complaint itself.
- 2.15.2 Operations that are likely to be noisy, dusty or in some other manner disruptive shall only be commenced after due notice and consultation with the community I&APs. This shall include direct notification of the adjacent landowners, possibly through contacting the local Residents Associations or posting a notice at the entrance to the existing residential area, of unusually intrusive construction activities.
- 2.15.3 The EMP shall be made available to I&APs upon request for perusal.

SECTION 3: ENVIRONMENTAL MANAGEMENT PLAN - TRIAL BURN

3.1 GENERAL

- 3.1.1 Trial burns may only commence once permission from the relevant authority has been received and the Opsis monitoring for Kiln 8 installed and calibrated.
- 3.1.2 A trial burn must be conducted prior to the full-scale implementation of the project.
- 3.1.3 The trial burns will be performed at a pre-announced date and relevant government officials will be invited to attend the burn at least 30 days prior to the commencement of the burn.
- 3.1.4 In addition, the trial burn will be subject to an independent audit and emissions monitoring by an independent contractor. A report will be compiled and submitted to the regulatory authorities.
- 3.1.5 Feed equipment will be prepared in advance and tie-in's to the kiln connected and tested during shutdown periods.

3.2 BLENDING OF WASTES FOR TRIAL BURN

- 3.2.1 Following receipt of a Record of Decision for a kiln, and installation of the Opsis monitoring system for that kiln, a trial burn will be performed for a waste stream (Waste 1). All the monitoring, measurements and audits will be complied to, as recommended in this report and prescribed in terms of the Record of Decision.
- 3.2.2 The results of the trial burn shall be communicated in a formal report to the authorities.. Following approval from the authorities to proceed with full-scale implementation, PPC will only commence with the waste stream category for which the trial burn was performed (i.e. Waste 1).
- 3.2.3 Only once stable operation is attained for cement production with Waste 1, will PPC consider application of a second waste stream category (which will be one of the other 5 waste streams included in this application), i.e. Waste 2. This will commence with a trial burn, following the same monitoring, measurement and auditing procedures as detailed in this chapter, for Waste 2.
- 3.2.4 Step 2 above shall therefore be repeated for the addition of Waste 2 (with the continuing burning of Waste 1).
- 3.2.5 Only once authorisation is granted for Waste 2, will full-scale implementation of Waste 2 commence. This will involve PPC bringing the kiln to stable operation with Waste 1 and Waste 2, plus their normal fuels and raw materials (which will be slightly reduced due to the addition of the waste streams).

3.2.6 Before considering any additional waste streams, the entire process shall be repeated.

3.2.7 Under no circumstances will a new waste stream be introduced without stable kiln operation (whether or not waste streams are currently being burnt), a proper trial burn and reporting to the authorities and independent audit.

3.3 STORAGE AND FEED TO KILN

3.3.1 For the purposes of the trial burn, PPC may perform preparation of the waste streams in order to facilitate the safe feeding and metering of such to the kiln. Such preparation will be limited to physical preparation in such a manner as to avoid the generation of noxious or offensive gases and any chemical alteration of the waste streams.

3.3.2 Given the minor quantity of wastes to be burnt in the trial burn, a dedicated storage area shall be constructed according to guidelines set out by DEAT.

3.3.3 The waste streams shall be present on-site for no longer than 90 days, and residual waste not consumed in the trial burn shall be removed from site and disposed of to a suitably permitted facility within 7 days of completion of the trial burn.

3.3.4 The feeding of the waste streams to the kiln during the trial burn shall occur by means of formal feeding equipment to the kiln only. Temporary or informal conveying systems to the feeding equipment shall be employed only for the trial burn.

3.3.5 During trial burn planning (i.e. before the trial burn commences), the maximum safe feed rate for the waste material will be calculated by PPC using:

- International experience of the use of the material, and
- Kiln-specific mass balance considering the specific waste stream (using the detailed waste identification analysis data gathered as per section 4.1).

3.3.6 The maximum safe feed rate (MSF) is therefore defined as the maximum flow rate of the proposed waste stream, or combination of waste streams, which will not disturb the kiln stability and which will produce emissions compliant to that accepted by PPC in terms of this proposal.

3.3.7 During the trial burn, the MSF will therefore be confirmed for each trial burn according to the following:

- The process impacts of the secondary materials;
- The impacts on emissions;
- Health and safety effects and risks, and
- Product quality.

3.3.8 During the trial burn, therefore, the calculated MSF will be verified with practical tests using the actual waste stream on Kiln 8. If it is found that the calculated MSF results in kiln instability, degradation of product or excessive emissions, then the feed rate will be reduced, while monitoring continues, to determine an acceptable feed rate. If it is established during the trial burn that

more waste will be accepted without negative effects on kiln stability, emissions, health and safety of the staff or product quality, the feed of the waste will be increased until an acceptable maximum rate is reached. Thus the optimal or maximum safe feed rate of the respective waste stream will be determined during the trial burn.

- 3.3.9 During normal operation the MSF will not be exceeded without another trial burn being conducted. The intention to do so will be communicated by PPC in writing to DEAT and CAPCO beforehand.

3.4 PROCESS MONITORING

- 3.4.1 The process monitoring during the trial is carefully laid out in the trial plan and an independent auditor will agree on the monitoring plan prior to its commencement

3.5 INDEPENDENT AUDIT

- 3.5.1 PPC shall appoint an independent environmental auditor to witness the entire trial burn, including the baseline measuring, for compliance against legal requirements, competence of staff during handling and feeding of waste streams, and the trial burn itself.

3.6 EMISSIONS MONITORING AND REPORTING

- 3.6.1 A full baseline assessment shall be conducted prior to the introduction of the waste streams, using normal fuels (i.e. coal) and feed material. This shall involve isokinetic sampling and analysis at accredited laboratories according to ISO, EPA or ASTM methods for the following parameters:

- CO, CO₂;
- NO_x, SO₂;
- HCl, HF;
- All metals;
- Total Chromatographable Organics or TCO (which includes all VOC's and SVOC (semi-volatile organics));
- Dioxins and furans, PCB's, PAH (polycyclic aromatic hydrocarbons)¹; and

¹ Dioxin, TCO, PCB and PAH measurements, given their cost, will be performed only when required based on the nature of the secondary materials and their entry into the kiln system. Based on the previous sections, therefore, dioxin measurements will only be performed if the secondary materials contain chlorides or carbon in any quantities (as detected by the sampling program described in section 4.1 of the Draft Scoping Report), and are being introduced into the back-end (i.e. the raw material feed side) of the kiln.

- Total Particulate Matter (TPM, or cement kiln dust).
- 3.6.2 It is important that the coal and feed material quality remains constant during the entire trial burn so as to avoid introducing any variables into the process. PPC will therefore ensure the consistency of such feed in advance (such as moisture content of feed, etc) by monitoring weather and preparation conditions.
- 3.6.3 During the burning exercise, the waste shall be fed at a constant rate, most closely resembling that of anticipated operating conditions. The emissions monitoring exercise conducted for the baseline assessment shall be repeated in exactly the same fashion as for the baseline monitoring.
- 3.6.4 The analysis results shall be provided directly from the emissions sampling contractor to the independent auditor, along with original laboratory results. The auditor shall then compile a report on the trial burn, and provide this to the authorities within 30 days of the date of the trial burn.
- 3.6.5 No further burning of waste streams may occur until:
- 3.6.6 Written confirmation has been received from the authorities to proceed with full-scale operations; and
- 3.6.7 Formal storage and feed systems have been constructed and tested on site.

SECTION 4: ENVIRONMENTAL MANAGEMENT PLAN - OPERATIONAL PHASE

4.1 Sampling and Acceptance of Secondary Materials prior to Processing

A detailed sampling, analysis and accept-refuse program shall be implemented and adhered to as described in section 4.1 of the Draft Scoping Report.

4.2 Collection from Generator and Transport to site

4.2.1 It will be an requirement of any Supply Contracts entered into between PPC and the Generator of a waste stream that the waste stream is prepared to a condition which is acceptable by PPC by the Generator.

4.2.2 PPC will not establish a blending platform on site. PPC may, however, perform preparation of the waste streams in order to facilitate the safe feeding and metering of such to the kiln. Such preparation will be limited to physical preparation in such a manner as to avoid the generation of noxious or offensive gases and any chemical alteration of the waste streams.

4.2.3 The appointment of the waste transport contractor shall be subject to the contractor complying with the following:

- Compliance with all requirements of the National Road Traffic Act and associated SANS codes for Transportation of Dangerous Goods.
- All Emergency Response equipment as stipulated in the Transport Emergency Card (as prescribed by SANS 10232-4) shall be carried on the vehicle.
- All drivers carry a Professional Driver's Permit and are trained in HAZMAT response.
- All documents relevant to the load are accurate and complete.
- The contractor has contracted adequate emergency response facilities along the route from the Generator to the PPC plant.
- All placarding and emergency information relevant to the load is displayed by the transport contractor.

4.2.4 Waste shall be delivered to site in the condition and containment as detailed in Table 1:

Table 1: Delivery arrangements for Secondary Materials

Waste Stream	State of waste stream	Transport Containment
Waste tyres		
	Whole tyres or chipped to a size required by the kiln system (20 - 50 mm chips) (including steel radials).	Open trucks.
Sewage Sludge Pellets		
	Dried sewage pellets averaging < 20 mm in diameter. Moisture content < 15 %.	Covered skips or bulk bags. Material must be kept dry to ensure the area is not odorous and no CH ₄ is generated.
Pulp and Paper Waste:		
- Dry	Shredded paper waste.	To avoid dust generation and moisture ingress during transport, covered skips or covered truck loads (not flat bed trucks).
- Wet	Sludge or pulp slurries, with solid particle size < 25 mm. Note: these solutions may be corrosive due to their high pH.	Contained tankers, max. 30,000 l per load
Plastic waste:		
- Dry	Shredded plastic waste (if sampling indicates no PVC contents)	To avoid dust generation during transport, covered skips or covered truck loads (not flat bed trucks).
- Wet	Washed shredded plastic waste to remove all PVC through flotation separation	Covered skips or covered truck loads.
Hydrocarbon sludges and liquids:		
- Received in drums (max. volume per drum = 210 l)	Liquid solutions with suspended solid fractions < 25 mm, and viscosity < 10,000 cP. Temperature = ambient.	Flatbed trucks are permissible as long as the drums are suitable strapped down.
- Received in tankers		Contained tankers, max. 30,000 l per load

4.3 On-site storage

The general principles of storage and handling are as follows:

- 4.3.1 Establish suitable and safe transfer systems from transportation to the storage area to avoid SHEQ risks from spillage such as fugitive emissions or vapour displacement. Suitable vapour filtration and capture equipment should be in place to minimize impact to the reception point and surrounding areas from unloading activities.
- 4.3.2 Assure that storage facilities fit their purpose. Appropriate storage for liquids should meet relevant safety and design codes for storage pressures and temperatures.
- 4.3.3 Solid materials handling systems should have adequate dust control systems.
- 4.3.4 Storage design should be appropriate to maintain the quality of the materials: for solids, prevent build-up of old materials; for liquids, mix or agitate to prevent settlement, etc.
- 4.3.5 Design transfer and storage areas to manage and contain accidental spills into rainwater or firewater, which may be contaminated by the materials. This requires appropriate design for isolation, containment and treatment.
- 4.3.6 Appropriate storage for liquids should have adequate secondary containment.
- 4.3.7 There should be written procedures and instructions in place for the unloading, handling, and storage of the solid and liquid fuels and raw materials used on site.
- 4.3.8 Relevant employees should be trained in the company's operating procedures, and compliance with such procedures should be audited regularly.
- 4.3.9 Storage facilities should be operated in such a way as to control emissions to air, water, and soil.
- 4.3.10 Designated routes for vehicles carrying specified fuels and raw materials should be clearly identified within the site.
- 4.3.11 Appropriate signs indicating the nature of materials should be in place at storage, stockpiling, and tank locations. Storage halls should be fitted with water sprinkler systems and be vented to control accumulation of solvent vapours (which could be sent to the kiln).
- 4.3.12 Tanks should be fitted with an explosion safety device. Additional devices may be considered such as atmosphere control (e.g. N₂ inertization) and temperature control (e.g. shell cooling), etc.
- 4.3.13 Storage areas should be kept clear of uncontrolled combustible materials. Clear safety warnings, no smoking, fire, evacuation route, and any procedures signs should be posted.
- 4.3.14 An emergency shower and eye washing station should be clearly marked and located near the storage of liquid alternative fuels.
- 4.3.15 A fire protection system must be available at all times and should meet all standards and specifications from local authorities (e.g. local fire department).
- 4.3.16 Adequate alarms should be provided to alert all personnel about emergency situations. Communications equipment (e.g. telephone) should be maintained at the site so that the site control room and the local fire department can be contacted immediately in case of a fire.

4.3.17 Equipment should be grounded and appropriate anti-static devices and adequate electrical devices selected (e.g. motors, instruments, etc.).

4.3.18 Adequate systems and procedures should be in place to minimize the risk of unauthorized access to hazardous materials used on-site.

Table 2 below details the storage facilities to be provided for each of the waste streams:

Table 2: On-site Storage Facilities for each waste stream

Waste Stream	Storage Facility	Environmental Risk
Waste tyres		
	<u>Whole Tyres</u> Stock pile on a walled concrete slab with storm water control <u>Tyre chips</u> Stockpile in walled open bunkers on a concrete slab. Ensure proper storm water runoff	Fire risk, and for whole tyres, rodents and mosquitoes.
Sewage Sludge Pellets		
	Store in a dry ventilated place under roof on concrete floor. Ensure fugitive dust control. Keep away from water	Fire risk, soil and surface water contamination Self igniting when in contact with water
Pulp and Paper Waste:		
- Dry	Store in a dry ventilated place under roof on concrete floor. Ensure fugitive dust control. Keep away from water.	Dust (occupational), Litter, Surface Water
- Wet	Will not use due to high moisture content.	Surface Water and Soil contamination
Plastic waste:		
- Dry	Stockpile in open bunkers on a concrete bed. Ensure proper storm water runoff.	Dust (occupational), Litter, Surface Water
- Wet	Will not use due to high moisture content.	Surface Water and Soil contamination
Hydrocarbon sludges and liquids:		
- Received in drums	Store in a dry ventilated place under roof on concrete floor.	Fire, explosions, air emissions (VOC's), contaminated soil and surface water
- Received in tankers	Well designed tank installation with bunds, fire protection and water management system.	

4.4 Feed to the kiln

4.4.1 PPC shall employ the following approaches to feeding the various waste streams into the kiln:

Table 3: Feed systems for Secondary Materials

Waste Stream	Method of Feed to Kiln
Waste tyres	
	Back end of preheater of calciner kiln. Mid kiln injection of tyres to long dry kin.
Sewage Sludge Pellets	
	Feed through main burner. In calciner of preheater kilns, the sewage sludge can be fed to secondary firing point.
Pulp and Paper Waste:	
- Dry	Feed to the calciner or back end.
Plastic waste:	
- Dry	Small granules fired through the main burner. Larger pellets to the back end or the calciner.
Hydrocarbon sludges and liquids:	
- Received in drums	Drums are decanted into a feed system that can feed the material to the back end, calciner or the main burner depending on the characteristics of the liquid or sludge.
- Received in tankers	Unloaded into a liquid feeding system for use at the main burner or back end of the kiln.

In addition, PPC shall:

- 4.4.2 Assess operations for health and safety risks or concerns to ensure that equipment is safe and to minimize risks of endangering people or installations, or damaging the environment.
- 4.4.3 Use appropriate procedures to assess risks or hazards for each stage of the design process. Only competent and qualified personnel should undertake or oversee such hazard and operability studies.
- 4.4.4 Carefully consider plant layout to ensure access for day-to-day operations, emergency escape routes, and maintainability of the plant and equipment.
- 4.4.5 Apply recognized standards to the design of installations and equipment. Any modification to installations and equipment should meet requirements set in the standards. Thoroughly evaluate existing equipment refitted for a different

service from a safety and performance standpoint before resuming commercial production.

- 4.4.6 Document modifications to installations and equipment.
- 4.4.7 Handling systems and feed systems should be appropriate to the fuel and raw material used. The feed systems should allow stable and controlled input of materials to the kiln.
- 4.4.8 The operator should assess risks from fugitive emissions; equipment failure modes and appropriate safeguards should be incorporated into the design to prevent environmental pollution, health, and safety problems.

The following shall be implemented by PPC in terms of feed equipment:

- 4.4.9 Tyres: For long dry kilns the best technology to use is mid-kiln injection of whole tyres into the kiln. through a valve arrangement. For preheater and calciner kilns, depending on the distance of the cement kiln from the source of used tyres, the tyres can be fed to preheater/calciner kilns either as whole tyres or chipped tyres. Chipped tyres are fed to the riser duct of a preheater kiln or to the calciner. The feeding and transport equipment is designed to minimize human intervention and handles the material right from the discharge of the truck onto a large walking floor hopper arrangement. From the walking floor hopper, the tyres, chipped or whole, are transported to the preheater or precalciner with a conveying device. The tyres are weighed shortly before injection into the kiln system and locations of injection into the kiln are selected carefully to optimise combustion efficiency.
- 4.4.10 Sewage Sludge Pellets: Sewage Sludge pellets arrive at the cement operation in bulk bags and have to be stored on a covered, but ventilated, storage area to ensure that the material remains dry. The bulk bags are emptied using an automatic bulk bag emptying system and transported to an intermediate storage bin from where the material is weighed and fed to the main burner, together with coal into the main burner. Again it is important to, during handling of the material, ensure that human intervention in the materials handling process is minimized and the process automated as much as possible. Dust masks and gloves will be worn by all personnel involved with this operation.
- 4.4.11 Pulp and Paper waste: Pulp and paper waste has to be shredded to prepare for use in a cement kiln. This material is then taken to the cement operation and stored under cover in a well ventilated area. Pulp and Paper waste is fed to the riser or calciner of a preheater/calciner kiln. The material can also be fired to the main burner of the kiln, but due to the low CV value and effect on the main flame, the substitution in the main flame would be lower than in the calciner or riser duct. This means that the achievable substitution for a long dry kiln using paper waste is lower than for preheater/calciner kilns.
- 4.4.12 Plastic Waste: Plastic waste is chipped to a particle size of less than 10 mm for injection into the main burner. The injection process is similar to that of sewage sludge. For injection into the calciner or riser duct, the feed technology used is similar to that of tyre chips.
- 4.4.13 Hydrocarbon sludges and liquids: Low viscosity liquids would be injected into the main burner, using a separate firing lance and air-liquid atomization system to ensure proper combustion. From delivery with a tanker, the liquids

would be pumped to a set of banded blending and storage tanks. The blending system would be designed to prepare batches of blended liquid material for firing into the kiln. The system should be designed according to MHI regulations and proper plant zoning principles should be followed. For high viscosity liquids (sludges), these will be injected into the kiln system at the preheater or calciner. Injection is facilitated through a piston pump arrangement, fed from a well contained sludge basin.

4.5 Process Monitoring during Operation

- 4.5.1 The use of alternative fuels and raw materials should not detract from smooth and continuous kiln operation, product quality, or the site's environmental performance. Therefore a constant quality and feed rate of the alternative fuels and raw materials must be ensured.
- 4.5.2 The general principle of good operational control of the kiln system using conventional fuels and raw materials should be applied. In particular, all relevant process parameters should be measured, recorded and evaluated continuously; this should cover free lime, excess oxygen, and carbon monoxide levels.
- 4.5.3 The impact of alternative fuels and raw materials on the total input of circulating volatile elements such as chlorine, sulphur, or alkalis must be assessed carefully prior to acceptance as they may cause operational troubles in the kiln system. Input limits and operational set points for these components should be set individually by the site based on the process type and on the specific site conditions.
- 4.5.4 For start-up, shut-down, or upset conditions of the kiln, written instructions should be issued, describing conditions of use of alternative fuels and raw materials. Kiln operators should know and understand these instructions. In most cases, waste fuels should not be used during start-up and shut-down of kilns, except where kiln temperatures are achieved to produce clinker that meets quality standards.
- 4.5.5 Waste fuels should not be used during failure of the air pollution control devices (i.e. ESP at the stack of the kiln). This does not apply to CO purging.
- 4.5.6 There should be written procedures and operating instructions in place for the use of conventional and alternative fuels and raw materials; such operating instructions should cover start-up and shut-down of the kiln and actions to comply with set quality requirements of the product and emissions.
- 4.5.7 Operators should be trained in the company's operating procedures, and compliance with such procedures should be audited regularly. Adequate personal protective equipment should be made available to employees and contractors, and to individuals visiting the installation.

4.6 Emissions Monitoring during Operation

- 4.6.1 No burning of secondary materials will occur post trial-burn until the Opsis monitor is installed and calibrated.
- 4.6.2 The Opsis monitor will measure the following parameters: NO, NO₂, SO₂, HCl, HF, CO and benzene.
- 4.6.3 The Codel monitors currently installed at each stack will continue to monitor the particulates concentrations on-line.
- 4.6.4 Any measurement of emissions will have to be reported at a specified oxygen level (typically 10%) and dry (i.e. no water vapour). PPC will need to ensure that this is communicated to any external specialists performing such measurement, and that their Opsis on-line emission monitors will be able to accommodate such.
- 4.6.5 Dioxin measurements, given their cost, will be performed only when required based on the nature of the secondary materials and their entry into the kiln system. Based on the previous sections, therefore, dioxin measurements will only be performed if the secondary materials contain chlorides or carbon in any quantities and are being introduced into the back-end (i.e. the raw material feed side) of the kiln.
- 4.6.6 Dioxins will be measured at the following times:
 - Before (i.e. baseline) and during the trial burn, as well as
 - After one month of running full scale secondary materials consumption, and
 - Annually thereafter.

4.7 Auditing and Reporting during Operation

- 4.7.1 Once the full-scale operation has received written approval from the authorities, and the storage and feeding systems implemented and tested, PPC shall employ an independent environmental auditor to audit the operations against the conditions of the Record of Decision and legal requirements, on the following frequency:
 - During the trial burn (please refer to Section 4.11);
 - Commencement of full-scale production;
 - 6 months after commencement of full-scale production;
 - One year after commencement of full-scale production, and
 - Annually thereafter.
- 4.7.2 It is noted that this is the same schedule as the emissions monitoring program, and is designed to co-incide with such.
- 4.7.3 The scope of the audit shall cover all operations and supporting paperwork of the sourcing, sampling and analysis, acceptance, transportation, storage and

preparation on site, operation, monitoring, reporting, staff training, emergency preparedness and response procedures and processes.

4.7.4 A report shall be compiled by the auditor within 2 weeks of completing the audit, documenting his/her findings and recommendations. This report shall be made available to the following parties:

- National government (Department of Environmental Affairs and Tourism);
- Provincial Department of Environmental Affairs.

4.8 Emergency Preparedness and Response

An emergency response plan should be in place which:

- 4.8.1 Identifies potential spill or contamination areas;
- 4.8.2 Defines clean-up procedures;
- 4.8.3 Identifies areas of high risk on site or in the local community;
- 4.8.4 Provides written instructions in the event of an emergency;
- 4.8.5 Documents equipment required in the event of an emergency;
- 4.8.6 Assigns responsibilities to employees and local officials;
- 4.8.7 Details emergency response training requirements, and
- 4.8.8 Describes reporting and communication requirements both within the company and with interested external stakeholders.

The emergency response plan may be reviewed with relevant external emergency services. Emergency drills may be arranged with the local community emergency response services to ensure a coordinated response under emergency conditions.

4.9 Health and Safety

The following requirements pertain to protecting the health and safety of workers associated with secondary materials and will form part of PPC's Health and Safety Management System:

- 4.9.1 Safety and emergency instructions, such as Safety Data Sheets, should be provided to employees and contractors in due time, and should be easily understandable. Hazards relating to new materials should be reviewed with operating staff prior to using such materials in the facility. Conducting a job safety analysis is one approach to identifying hazards and potential exposures, along with appropriate control practices and techniques.
- 4.9.2 Adequate personal protective equipment should be made available to employees and contractors, and to individuals visiting the installation. Its use should be required. This includes but is not limited to: helmet, glasses, gloves,

hearing protection, safety shoes, respiratory protection, and other protective equipment specified in the Safety Data Sheets.

- 4.9.3 Automated handling equipment should be used wherever possible.
- 4.9.4 Wherever a contact risk such as infection or skin irritation exists, the company should provide appropriate facilities for operators to take required hygiene precautions.
- 4.9.5 Maintenance work should be authorized by plant management, and carried out once a supervisor has checked the area and necessary precautions have been taken.
- 4.9.6 Special procedures, instructions, and training should be in place for such routine operations as:
 - Working at height, including proper tie-off practices and use of safety harnesses;
 - Confined space entry where air quality, explosive mixtures, dust, or other hazards may be present;
 - Electrical lock-out, to prevent accidental reactivation of electrical equipment undergoing maintenance; and
 - “Hot works” (i.e. welding, cutting, etc.) in areas that may contain flammable materials.

4.10 Employee Training

- 4.10.1 The company should develop and implement appropriate documented training programs for employees to be trained in SHEQ issues relevant to their jobs.
- 4.10.2 New employees should be trained during an induction process. Such training programs should be given to contractors and, in some instances, suppliers.
- 4.10.3 Personnel reporting to work on site for the first time should be trained through a site induction program.
- 4.10.4 Training records should be kept on file.
- 4.10.5 The training program should include the following:
 - General and job specific safety rules;
 - Safe operation of equipment;
 - Details of the site emergency plan;
 - Procedures for handling alternative fuels and
 - Raw materials, and
 - Use of personal protective equipment.