SECTION 9 ISSUES IDENTIFICATION

This section of the report describes the approach and methodology employed in determining the environmental risks arising from the proposed activity, identifying the potential environmental effects (impact) through the change the raw materials and fuels inputs into the process through the introduction of secondary materials. The objective is to determine what changes occur to the current outputs as a result of changing the current inputs by using secondary materials and to identify the potential environmental impacts, both positive and negative, associated with the proposed development. This was based on a review of the following:

- Literature review: Technical papers, books, reports, etc. published by the cement industry, independent research organisations, non-governmental organisations, etc. ;
- The experience of PPC's engineers as derived from previous test and trial burns, and experience gained internationally, as derived through personal interviews;
- Empirical engineering principles;
- Specialist studies, which were conducted separately to inform this report;
- The experience and observations of the authors; and
- Comments and issues raised by the Interested and Affected Parties, both during Focus Group Meetings and Open Days.

9.1 GEOLOGY

The proposed activity of adding secondary materials to partly replace fuel and raw materials will not result in the transformation of any undisturbed land. Storage areas of the SM will however be required that may result in the potential contamination of soil and groundwater.

9.2 TRAFFIC AND TRANSPORTATION

9.2.1 Traffic Impact

It is anticipated that the delivery of Secondary Materials at PPC De Hoek will require an additional 6 to 10 heavy vehicles travelling to and from the plant each day. In terms of the Manual for Traffic Impact Studies, as published by the Department of Transport in October of 1995, a threshold of 50 additional peak hour trips is considered a significant impact on traffic flows, as shown in the following table.

Table 9-1: Trip Generation Threshold Value for a Traffic Impact Study

Recommended Threshold
i) More than 150 peak hour trips [(a)] – prepare a Traffic Impact Study (TIS).
ii) Less than 150 and more than 50 peak hour trips – prepare a Traffic Impact Statement (TISm).
iii) Less than 50 peak hour trips – no study required except if the surrounding road network is operating at or above capacity.
iv) Discretion of the responsible road authority. [(b)]

(a) Refers to "trip-ends" which includes primary and by-pass trips.

(b) *Based on the discretion of the responsible authority, a Traffic Impact Study or Statement can be required, eg. If the development is located in a sensitive area, even though less than 50 peak hour trips are generated. Alternatively, only a Traffic Impact Statement can be required although the development generates more than 150 trips, but is for example located in a sensitive area.*

Furthermore, Civil Concepts (Pty) Ltd (Traffic Engineers) confirmed that an additional 6 to 10 heavy vehicles travelling to and from De Hoek will not have a significant impact on the traffic.

9.2.2 Transportation, Handling and Storage of Hazardous Waste

The collection and transportation of waste from the Generator of the waste to the PPC plant needs to be considered. Spills and accidents may occur wherein large quantities (up to 30,000 l per load) may be released to the soil and surface water bodies. Although the nature of these risks are the same as the risks of transportation of these waste streams to a hazardous landfill site, the risk may be amplified due to the longer transportation distances required to bring these wastes to the kiln.

The nature of the 5 waste streams considered by PPC in this application do, to a degree, limit the impacts from such an incident. Paper, sludge pellets, plastic and tyre waste are considerably inert and may only present a litter/physical and visual impact on any sensitive receiving environment. Pulp and paper sludges (high pH and corrosive in nature) and hydrocarbons (with toxic components (i.e. metals and possible PCB's), high chemical oxygen demand and flammability) present a different risk and therefore require specific emergency response plans. These will be compiled in accordance with the relevant SANS codes under the National Road Traffic Act (i.e. SANS 10232-1 to 3). Any contaminated soil arising from any clean-up exercises could be disposed of to the same kiln for which the waste load was originally intended (subject, of course, to the necessary approvals).

Internal transport, storage, and handling of wastes and secondary materials must therefore be done in a manner to minimise the possibility of spills and groundwater/soil contamination, to minimize the risk of fire or explosion, to control fugitive dust from dry materials, and to contain volatile components, odours, and noise.

Although the storage of the waste materials on-site will be minimised as the waste should be processed as it is received, the risk of spills, leaks, accidents and discharges of liquid and gaseous pollutants need to be planned for.

9.3 FAUNA, FLORA AND HERITAGE

The PPC De Hoek manufacturing plant is established. The land portion is regarded as completely transformed though historic and current industrial activities. Though the surrounding areas are regarded as untransformed and in some instances represent a pristine veld type, the proposed activity will not require an expansion of the land currently occupied by PPC.

9.4 CLIMATE CHANGE

With the substitution of fossil fuels by (renewable) secondary fuels, the overall output of thermal CO_2 is reduced ("CO_2 neutrality"). A thermal substitution rate of 40% in a cement plant with an annual production of 1 million tons of clinker reduces the net CO_2 generation by about 100,000 tons. This comparison assumes that the renewable fuel or waste is alternatively incinerated in a dedicated incinerator. The same basic principle would be valid when the waste should decompose in a landfill site or for instance digested in a biological treatment plant. The “greenhouse” gases would also include methane, for instance.

Even more important is the substitution of clinker by mineral additions as both thermal CO_2 from fossil fuels and CO_2 from the decarbonation of raw materials are reduced. Therefore, the use of secondary fuels, raw materials and mineral additions can contribute significantly to national schemes for the reduction of greenhouse gases.

9.5 GENERATION OF WASTE AND EFFLUENT

The following issues are not regarded to result in significant impact:

1. Generation of Liquid Effluent, as the cement process produces no liquid effluent.
2. Generation of Solid Waste, as all “waste” from the burning of secondary materials is incorporated into the product.
3. Leaching of metals into water from cement made from Secondary Materials. This is considered insignificant as compared to the risk of “ordinary cement” if the levels of Cr VI remain equivalent to their current levels (i.e. without the use of secondary materials).

9.6 SOIL AND SURFACE WATER CONTAMINATION

Dust is released from cement production processes either as point source dust (from process exhaust stacks: kiln and raw mill, cooler, coal mill and cement mill) or as fugitive dust (dispersed from stockpiles, material transfer points, and road transportation). Most of the dust consists of pulverized raw material together with some clinker and cement dust.

There should be no change in the dust emission from a kiln equipped with a bag filter or electrostatic precipitator due to the addition of secondary materials. Fugitive dust can arise from material spills from inadequately dedusted and/or worn out material transfer points/material feeding points, material storage areas, dusty transport roads etc. with subsequent wind erosion/dispersion. Mitigation techniques should include preventive and quick reactive maintenance, wetting of stockpiles, roof covering of stock piles, vacuum cleaning systems, etc.

It is anticipated that the composition of dust may change due to the addition of secondary materials, particularly the metal content of the particles which may lead to stormwater contamination. This cannot be verified without a suitable sample taken during trial burns.

9.7 EMISSIONS

Emissions to atmosphere: Particulate and gaseous emissions to the atmosphere i.e. dust, SO_2, NO_x, VOC in raw material, and CO_2, comprise the major environmental impacts in the manufacture of clinker and cement. Gaseous emissions – except for NO_x – are mainly caused by the chemical characteristics of the raw materials, and not of the fuels. Other gaseous emissions such as hydrochloric acid or hydrofluoric acid are nearly completely captured by the inherent and efficient alkaline scrubbing effect of the cement kiln system, and are usually far below the regulatory limits.

Mercury, Thallium and, to a lesser degree, Cadmium, as the only highly volatile metals in the kiln system, are only partly captured with the kiln dust in the de-dusting device and represent an emission risk.

Process conditions in cement kilns – i.e. high combustion temperatures and long retention times – will effectively destroy organic compounds in the fuels. Thus, dioxins and furans originating from the introduction of hydrocarbons and chlorine with any fuel could not easily survive. [58 & 59] Usually, the level of dioxins and furans emitted is far below the limit value of 0.1 ng/Nm^3 for dry process kilns (as in the case of De Hoek). In rare cases[60], this limit has been slightly exceeded with some long wet kilns. The mechanism of Dioxins/Furans formation in these cases is not fully clear but is definitely linked to the presence of organic precursors in the raw materials.

A summary of these emissions issues is presented in Table 9-2:

Table 9-2: Constituents and Properties of the Secondary Materials and their environmental risks

Constituent or Property	Production Risk	Environmental Risk
Chlorides	Build-up in kiln system resulting in process blockages	HCl or dioxin emissions if introduced in raw material in excessive quantities, and in the presence of VOC's
Fluorides	Kiln instability due to lowering temperature required to achieve sintering	HF emissions
Sulphur in fuels	Build-up in kiln system resulting in process blockages	SO_2 emissions
Non-volatile and semi-volatile metals	Quality of clinker	None (absorbed in clinker)
Volatile Metals	Quality of clinker	Metals emissions by-passing the ESP and being released to atmosphere
Calorific Value of fuel	Too low – reduction of flame intensity Too high – overheating of kiln resulting in gas change at back-end	CO emissions (but fully oxidised in riser) None
Moisture	Weak flame and gas flow changes	None (CO fully oxidised in riser)
Fuel particle size	Slow rate of combustion & incomplete combustion	CO emissions

[58] *2nd North American Symposium on Assessing the Environmental Effects of Trade May 30, 2003*
[59] *Behaviour of Toxic Elements in Cement Kilns", A. Iskraut, Report N° VA 87/5423/E,Technical Meeting Bern, 1987*
[60] *http://europa.eu.int/comm/environment/dioxin/stage1/cement.pdf*

9.8 INCIDENTS AND ACCIDENTS

Emergencies such as fire, explosions or spillage/leakage are extremely rare in the cement industry. Potential consequences for the environment are minimised by adequate prevention and protection measures such as fire and explosion proof design of machinery and emergency response schemes. Spills and accidents on-site or during transport may result in soil, surface water and/or groundwater contamination.

9.9 REDUCTION OF WASTE SENT TO LANDFILL

Another positive impact arising from this proposed project is the reduction in waste sent to landfill. This has many secondary benefits including the reduction of the risk of groundwater contamination resulting from landfill operation, but also the environmental impacts of the construction of further hazardous waste landfills as the airspace of the current landfills is occupied. Thus this secondary materials project could be seen as contributing to the delay of constructing further hazardous landfills in the Western Cape area.

9.10 OCCUPATIONAL EXPOSURE TO CEMENT AND CONCRETE

The USEPA report (see section 3.2.16) states that the risk of dioxin formation is present in the preheater section due to Cl and organics introduced with the raw materials. Any dioxins so formed will not be incorporated into the final product, which is produced at a later stage in the production process. Metals, especially non-volatile metals, will however be incorporated into the final product. It is worth noting that coal and other current raw materials contain significant quantities of metals, which are incorporated into the “normal” cement currently available on the market. As a result of these measures, the health risk posed to end-users of the product require the use of PPE (i.e. dust masks) as using cement made from secondary materials.