SECTION 10 TABLE OF IMPACTS AND PROPOSED MITIGATION

Based on the environmental analysis and the comments received during the Public Participation Period, perceived environmental impacts are identified and rated in terms of its potential extent, duration probability and significance. The purpose of this impact identification is to determine whether there are any "fatal flaws" associated with the proposed development portion and to provide a base for the identification of potential significant impacts that will require further investigation. The methodology of impact assessment is adopted from the DEAT 2002, Information Series[68]. The impacts register identifies the anticipated impacts expected during the construction and operation phases of the proposed development.

Table 10-1: Thresholds of Significance Tables

Extent	
High	Widespread, Far beyond site boundary, Regional / national / international scale.
Medium	Beyond site boundary, Local area.
Low	Within site boundary.
Duration	
High (long term)	Permanent, Beyond decommissioning, Long term (more than 15 years).
Medium (medium term)	Reversible over time, Lifespan of the project, Medium term (5-15 years).
Low (short term)	Quickly reversible, Less than the project lifespan, Short term (0-5 years).
Probability Rating	
(A) High likelihood	Greater than 50:50 chance of occurrence (P>0.5)
(B) Low likelihood	Less than or equal to a 50:50 chance, but at least a 1:20 chance or occurrence (P<=0.5, but >1:20)
(C) Negligible	Less than 1:20 chance of occurrence (P<0.05)
Impact Magnitude and Significance Rating	
High	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt. In the case of beneficial impacts, the impact is of a substantial order within the bounds of impacts that could occur.
Medium	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly possible. Social cultural and economic activities of communities are changed but can be continued (albeit in a different form). Modification of the project design or alternative action may be required. In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost and effort.

[68] *DEAT (2002) Impact Significance, Integrated Environmental Management, Information Series 5, Department of Environmental Affairs and Tourism (DEAT), Pretoria.*

Low	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural, and economic activities of communities can continue unchanged. In the case of beneficial impacts, alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming.
No Impact	Zero Impact.

The table below identified the expected impacts of the proposed activity during the construction phase and operational phase. The Impacts are identified as negative (-), positive (+) or to have no significant impact (n). Other the terms used in this table will have the following meanings:

Aspect: Refers to the physical, biophysical or socio-economic aspect as investigated in the Scoping Report.

General Impact: Refers to the broad-spectrum or category of the expected impact being pollution, degradation, loss; etc.

Specific Impact: Refers to the actual activity that will cause the expected impact.

10.1 INTRODUCTION TO TABLES

The following tables identify the expected impacts of the proposed development activities during the operation phase, both before and after the proposed mitigations measures. Please note that the mitigation measures are, in general, included in the project description as provided in section 4, since the project has been designed with best practices in mind and, as described in section 8, conservative estimates with regards to the emissions profile have been assumed.

Table 10-2: Table of Impacts – Construction Phase

Issue	General Impact	Specific Impact	Cause / Aspect	-	+	N	Impact significance prior to mitigation				Mitigation Measures	Impact significance after to mitigation			
							Extent	Duration	Probability	Significance		Extent	Duration	Probability	Significance
Hydrology	Pollution	Potential storm water pollution.	Hydrocarbons, cement, or other fuels.	**X**			M	L	H	M	Temporary fuel and waste storage areas must have impermeable hard standing and must be bunded.	M	L	L	L
Soils	Pollution	Potential pollution of soils by hydrocarbon spills	Temporary fuel storage facilities on site.	**X**			L	L	H	M		L	L	L	L
Light pollution	Pollution / Disturbance	Light pollution by construction activities if carried out at night	Floodlights	**X**			L	L	L	L	None	L	L	L	L
Groundwater	Pollution	Potential pollution of groundwater through uncontrolled spills and other construction activities	Temporary fuel storage facilities on site.	**X**			H	H	L	H	Temporary fuel and waste storage areas must have impermeable hard standing and must be bunded.	H	H	L	L
Waste	Pollution	Potential pollution through litter		**X**			M	L	M	M	All wastes must be sorted and disposed of at an appropriate registered landfill site.	M	L	L	L
		Potential pollution of soil, groundwater through the incorrect disposal of hazardous waste	Disposal of paints, hydrocarbons, etc.	**X**			M	M	M	H		M	M	M	L
Traffic	Disruption	Disruption of traffic flow during the construction phase due to heavy vehicles and deliveries	Delivery vehicles and construction plant.	**X**			M	L	H	H	Delivery of materials must be restricted to non-peak hours (9:00 to 16h00)	M	L	M	L
Noise	Pollution	Potential increased noise levels due to construction activities	Blasting, drilling.	**X**			M	L	M	L	Noisy activities must not be undertaken after 16h00, and when undertaking such activities all	M	L	M	L

Issue	General Impact	Specific Impact	Cause / Aspect	-	+	N	Impact significance prior to mitigation				Mitigation Measures	Impact significance after to mitigation			
							Extent	Duration	Probability	Significance		Extent	Duration	Probability	Significance
											adjacent landowners must be notified.				
Socio-economic	Job creation	Potential increased employment opportunities during the construction phase			**X**		M	L	H	M	None	M	L	H	M

Table 10-3: Table of Impacts – Operational Phase

Issue	General Impact	Specific Impact	Cause / Aspect	-	+	N	Impact significance prior to mitigation				Mitigation Measures	Impact significance after to mitigation			
							Extent	Duration	Probability	Significance		Extent	Duration	Probability	Significance
Emissions	Community Health	Cancer and non-cancer health effects on sensitive receptors in the community (i.e. children, sick and elderly) who are exposed to emissions at ground-level concentrations	Input of high Cl and VOC materials into preheater stages of kiln	**X**			H	H	L	M	Limitation of Cl and VOC content in SM feed to preheater through waste sampling and analysing procedures. Materials with significant Cl and VOC content will only be fed to kiln on fuel-side.	H	H	L	L
			Input of SM containing volatile metals at either end of kiln	**X**			H	H	L	M	Full ICP scan to be performed on all waste streams prior to acceptance. Wastes containing Hg, Cd and Tl to be avoided.	H	H	L	L
	Community Health, Air Quality	Particulate Matter falling out from dust emissions (Cement Kiln Dust) resulting respiratory ailments and visual pollution (from stack plume)	Operation of cement kiln	**X**			H	H	L	L	None	H	H	L	L
	Climate Change	Overall reduction in CO_2 emissions	Substitution of coal fuel feed with Secondary Materials		**X**		H	H	H	M	Replacement of up to 30% of coal with secondary materials	H	H	H	M

Issue	General Impact	Specific Impact	Cause / Aspect	-	+	N	Impact significance prior to mitigation				Mitigation Measures	Impact significance after to mitigation			
							Extent	Duration	Probability	Significance		Extent	Duration	Probability	Significance
	Air Pollution	Acid Deposition resulting in acidification of soil and surface water	HCl, HF, NO_x, CO_2, and SO_2 emissions	X			H	H	H	L	Limiting N and S content in Secondary Materials, although this will be limited in extent	H	H	H	L
	Community Health	CO emissions resulting toxic effects on blood	Calorific value of fuel too low, resulting in poor combustion. Incomplete combustion will result in elevated CO emissions	X			H	H	L	L	Sampling and measuring of CV of waste prior to acceptance	H	H	L	L
							General note for Emissions Mitigation Measures: the overall goal of all of the above is the adherence to EC Limits through trial burns, regular monitoring, independent audits and reporting. PPC's commitment is that non-adherence to the EC Limits will result in termination of the SM programme, until such emissions can be guaranteed.								
	Community Health, Air Pollution, Soil and Surface water pollution	Dust and gas releases	In case of fire, explosion, failure of kiln, spills and leaks from kiln	X			M	L	L	H	Full HAZOP study and implementation of mitigation measures, along with emergency response, maintenance and safety plan and training	M	L	L	L
Groundwater & soil	Pollution	Sterilisation of soil (loss of biodiversity) and health effects on downstream water users of groundwater	Leaks and spills from waste storage areas seeping into soil and groundwater	X			M	L	M	M	Construction of storage tanks in bunded hardstanding with spillage collection systems.	L	L	L	L

Issue	General Impact	Specific Impact	Cause / Aspect	-	+	N	Impact significance prior to mitigation				Mitigation Measures	Impact significance after to mitigation			
							Extent	Duration	Probability	Significance		Extent	Duration	Probability	Significance
Odour & air emissions	Air Pollution	Fugitive emissions of VOCs and odours	Storage of hazardous waste either in vented tanks (hydrocarbons) or open bunkers (sewage pellets)	**X**			L	L	H	L	Vapour recovery systems or other control systems on liquid tanks, protection of sewage pellets from rain and use only of dried pellets	L	L	L	L
Leaching of metals from concrete	Water Pollution (potable, surface and/or groundwater)	Public health and environmental health effects may result from the toxicity of the metals incorporated into clinker	Leaching of heavy metals from concrete products when in contact with water	**X**			H	H	L	M	Limit Chrome VI content in final cement product	H	H	L	L
Dust from concrete or cement	Air Pollution	Occupational health effects from use of cement and concrete made from Secondary Materials (extent affected by sales and distribution of PPC cement)	Dust exposure from use of cement in construction activities, or concrete from demolition activities.	**X**			H	L	M	M	Occupation Health and Safety measures advise the use of dust masks during the handling of cement and mixing of concrete	H	L	M	L
Waste Disposal	Groundwater Pollution	The secondary impacts of disposal of general and hazardous waste to landfill	Disposal of general and hazardous waste to cement kiln		**X**		M	H	M	M	Sourcing of high volume and problematic waste streams for which alternatives to landfill disposal (such as recycling and reuse) are not commercially available	M	H	L	M
	Loss of land use	Construction of further general and hazardous waste landfills	Disposal of general and hazardous waste to cement kiln		**X**		L	H	M	M		L	H	L	M

Issue	General Impact	Specific Impact	Cause / Aspect	-	+	N	Impact significance prior to mitigation				Mitigation Measures	Impact significance after to mitigation			
							Extent	Duration	Probability	Significance		Extent	Duration	Probability	Significance
Traffic	Disruption, Dust and Noise along route	Impacts to communities resident along routes to Dwaalboom	Increased traffic flow	**X**			H	L	L	L	Appointment of suitable qualified transport contractors with emergency response systems in place	H	L	L	L
	Soil and water Pollution	Contamination of surface water and soil with high pH, high COD waste streams	Spills and accidents during transport	**X**			L	L	L	M	Restriction of use of 5 designated waste streams. Appointment of suitable qualified transport contractors with emergency response systems in place	L	L	L	L

10.2 IMPACT STATEMENT

Construction Phase

Relative to the operational phase, the impacts of the construction phase will be minor. Issues are largely limited to the construction of the waste storage area (bunkers for solid waste and bunded tanks for liquids and sludges). The final location of the waste storage area is not yet determined but the risk assessment assumed that it will be on exposed soil. It will, however be within the plant boundary and will therefore present minimal risk to surrounding land owners and the environment outside of the plant. The only negative impacts worth mentioning, post mitigation, are the potential for increased traffic and noise due to construction vehicles and machinery, and the positive impact of job creation in the area.

Operational phase (including trial phase)

The impacts associated with the operations of a secondary materials programme may be defined as follows:

1. The impact of highest significance relates to the expected emissions from the Secondary Materials Co-Processing Programme.

   When the cement kiln is operated without secondary materials, the most significant emissions are:

   - Cement kiln dust (visual and community health effects),
   - NO_x (which contributes to acid deposition),
   - Carbon Monoxide (community health effects),
   - VOC's (volatile organic compounds, which result in photochemical smog and other forms of community health risks and air pollution) and
   - CO_2 (which contributes to climate change).

   It is our professional opinion that these impacts are not affected by the addition of secondary materials as the quantity of these emissions will not be increased. If anything, a small decrease should result in the emissions of NO_x and a substantial decrease in the emissions of CO_2 depending on how much replacement of coal by waste occurs.

   These negative impacts will be largely due to the change in emissions which may result from the burning of hazardous waste, which may result in impacts on community health and the surrounding (ambient) air quality. These emissions include sulphur dioxide (SO_2), dioxins and furans, acids (such as hydrochloric and hydrofluoric acid) and metals (especially the volatile and semi-volatile metals such as Mercury, Thallium and Cadmium).

   The mitigation measures accepted by PPC aim to limit the inputs of certain chemicals which may generate these emissions and to perform trial burns before moving to full-scale burning of waste streams to confirm that these emissions are within acceptable limits. PPC's commitment is to adhere to stringent and self-imposed emissions limits which comply with existing air pollution certificates and European Union limits. If these emissions limits are adhered to, then the resulting impact on the health of the community, according to various specialist studies, is negligible and legal compliance against SANS standards is achieved.

   In addition to accepting emissions limits, PPC has agreed to a programme of external monitoring, auditing and reporting in addition to their normal legal compliance and ISO 14001 audits.

Sufficient previous studies performed by PPC, international studies and research as well as a technical understanding of the underlying mechanisms of the generation of emissions result in PPC being confident of being able to achieve EU emissions limits for all parameters of concern (with the exception of dust and NO_x, where current emissions levels will be maintained).

2. Another significant risk is that of process accidents or incidents, including fires, explosions or spills and leaks from the kiln when the kiln contains uncombusted hazardous wastes. Although the occurrence of such is very rare in the cement industry, a Hazop study will be undertaken by PPC to consider all of the possible risks. For the purposes of this study, the trial burn will determine the Maximum Safe Feed Rate of waste at which kiln stability is maintained and the emissions limits are achieved. Thus the gradual addition of waste to the kiln will be performed during the trial burn to ensure no unstable kiln operation results.

3. The storage of large volumes of waste (especially the liquid hydrocarbons) will present risks to soil, surface water and groundwater during storage, unloading, transport and transfer to the kiln. Comprehensive mitigation measures have been proposed to ensure containment or emergency response to accidents and risks of leaks and spills. It is believed that these are industry norms and will be adequate to bring these impacts to an acceptable level. The same applies to fugitive emissions of dust, vapours and gases from the transfer and storage of these waste streams on-site. Again, mitigation measures which are standard to the industry will prevent unacceptable impacts from arising, such as vapour recovery systems or similar, and protection of the stored dry waste from wind and rain.

4. Several concerns have been raised by I&AP's and our internal risk assessment process regarding the end-use of the final product. This includes the leaching of toxic components from the final cement (i.e. concrete) or when users of the cement (i.e. the public or workers in construction companies) are exposed to cement dust which has been made from secondary materials. The reason for this concern is that the final product which is made from secondary materials may have higher concentrations of metals than the 'normal' cement made currently. While it is expected that higher metals concentrations will be present in secondary material cement, the impact of metals leaching into water cement water pipes and reservoirs (the 'worst case scenario') has been dismissed by international literature as negligible, as long as the concentration of Chrome VI (hexavalent chromium) is limited. PPC will therefore limit the amount of chromium added to the kiln through waste streams to ensure that the chrome VI content in secondary materials cement is the same as for 'normal' cement. With regards to dust emissions during the use of secondary materials cement, it is always recommended, as with normal cement, that personal protective equipment (i.e. dust masks be worn) as normal cement also contains metals. The unprotected exposure to cement dust is always a health risk, whether or not the cement is made from secondary materials or not (although the health risk of secondary materials cement, due to its higher metals content, is believed to be higher).

5. The positive impacts arising from this proposal is the potential diversion of significant quantities of waste streams from Gauteng's landfills to PPC, whereby the mineral and energy value of the waste stream is recovered. If these waste streams continue to be disposed of to landfill, then the construction of future landfills is expedited (accompanied by the risks of groundwater contamination from landfills) and the value of the waste remains buried underground. Furthermore, the replacement of coal (a non-renewable fossil fuel, which has to be transported even greater distances than the waste) results, implying an improvement in the energy efficiency of the cement industry.

All of the impacts are sufficiently mitigated by the proposed control actions as required in terms of the National Environmental Management Act, thereby reducing the significance of each impact.