5 COST-BENEFIT ANALYSIS

5.1 Methodology and Selection Criteria

5.1.1 Methodology

A workshop was held with Rand Carbide management on 6 June 2012 to discuss the management measures to be selected. Mr Nellis Bester (General Manager), Ms Kerry Beamish (SHERQ unit manager) and Mr Harry Landman (Carbonaceous Unit Manager) were present.

5.1.2 Section criteria

- **Budget:** The first item that was discussed was available budget per annum over the next five (5) years.
- **Focus areas:** Areas requiring management due to current impacts noted were then identified. The following focus areas were selected:
    - Storm water management to reduce impacts on surface water resources
    - Waste management (reclamation) to reduce impacts on groundwater resources
    - Monitoring to monitor effectiveness of management measures
- **80:20 principle:** Management measures that would make the largest impact with the least amount of investment.
- **Long-term considerations:** Storm water management around the historic waste dump was not considered a priority due to the dump being reprocessed and disappearing into the future. The area (footprint) will be rehabilitated and considered a clean area into the future. The volume of storm water generated from the area was therefore not considered in the volume of water to be captured and contained in the storm water dam (pollution control dam). This reduced the size of the storm water containment dam (pollution control dam) required and reduced the cost of building and lining such dam.

5.2 Selected Management of Identified Risks

5.2.1 Short-term solutions (5 year plan)

Refer to Table 5-1.

Water conservation - reduce municipal water intake:
Due to the high cost associated with municipal water (approximately R652 464 per annum which equates to approximately R7.30 per cubic metre of water) and in terms of water conservation principles, Rand Carbide is in the process of developing strategies to decrease the municipal (raw) water intake through a reuse and reclamation plan. Municipal water will only be used for purposes where a potable water quality is required. These purposes include:

- Human consumption/use (offices, change rooms etc.)
- Where water quality can affect product quality (for example paste plant where water is used for cooling of product)
- Where water quality can negatively affect operation (cooling systems where a build-up of salts can interfere with the effectiveness of the operations)

The alternative water supply sources that have been identified include:

- *Captured storm water:* Runoff and rain water potentially contaminated by the Rand Carbide facilities, materials or operations, could to be captured and contained on the site to prevent pollution spreading to the surrounding environment. Ideally the water will be reused to minimise raw water intake.
- *Springs:* Three (3) springs are evident on the site and are located underneath Furnaces E & F and at B conveyor sump. Since this water is contaminated by Rand Carbide due to its location within the plant area, it will be used for dust suppression on plant roads.

Groundwater management:
- Redrill / open borehole RGC-B2 (currently blocked) and continue groundwater monitoring programme six-monthly.
- Remove groundwater contamination sources – rework/reprocess historic waste dump

Waste management:
- *Good housekeeping:* Separate waste and no on-site waste disposal.
- *General waste:* Minimise waste, collect different types of waste in different skips/bins (separation of waste), recycle (plastic, glass, paper), and/or dispose of off-site (Kriel waste disposal facility).
- Hazardous waste: Minimise waste, collect different types of waste in different skips/bins (separation of waste), recycle (hydrocarbons – oil, greaser), and/or dispose of off-site (Holfontein waste disposal facility).
- Rework/reprocess historic waste dump to remove all waste off-site and rehabilitate historic waste disposal area.

Surface water management:
- Use spring water for dust suppression to prevent contaminated water from moving off-site and reduce municipal water intake.
- Separate clean and dirty water.
- *Divert clean water and discharge:* Construct earth berms and diversion trenches to divert clean storm water around and away from Rand Carbide activities & facilities and discharge to municipal storm water infrastructure to replenish surface water resources as per regulation 704.
- *Capture, contain and reuse contaminated storm water:* Capture (drains/pipes) and contain (storm water or pollution control dam) potentially contaminated storm water that has been in contact with Rand Carbide activities & facilities and reuse water (for dust suppression) to reduce municipal water intake.
- Construct new & upgrade existing drains / trenches.
- Construct storm water containment dam and associated silt traps

Monitoring: Refer to section 7. Include springs (3 on site and 1 off site in monitoring programme).

5.2.2 Long-term solutions (5 – 10 year plan)

Update of groundwater model: The groundwater model will be updated with data collected through the monitoring programme.

5.3 Financial Provisioning

Rand Carbide has invested more than R 1.6 million over the last financial year in reducing their impacts on the surrounding environment and will budget for a further R 36 million to put a storm water management plan in place.

Table 5-1: Management plan

Objective / goal:	Strategy (actions):	Timeline:	Budget:
Groundwater management	Redrill / open RCG-B2 (currently blocked)	2012	R50 000.00
	Remove groundwater contamination sources: Rework / remove historic waste dump (raw material storage poses no risk)	2007 – 2020 (on-going)	Operational cost.
	Monitor boreholes (six-monthly)	2012 (on-going)	R32 000.00 (annual)
	Include off-site spring in monitoring programme	2012 (on-going)	R2 000.00 (annual)
	Include on-site springs in monitoring programme (3 springs)	2012 (on-going)	R6 000.00 (annual)
	Contain and reuse contaminated water to prevent off-site movement and pollution of surrounding environment: Reuse spring water due to contamination	2012 (on-going)	No cost Duty of care
Waste management	Collect (bins/skips), separate (different coloured bins/skips), recycle (plastic, glass, paper) and/or dispose of all general waste (Kriel waste disposal facility)	2012 (on-going)	R505 000.00 (annual)
	Collect (bins/skips), recycle (oil) and/or dispose of all hazardous waste (Holfontein waste disposal facility)	2012 (on-going)	
	No on-site disposal: Dispose of all new arising industrial waste off-site (Holfontein waste disposal facility)	2012 (on-going)	
	Rework / remove historic waste dump	2007 - 2020	Self-sufficient
Surface water management	Reuse spring water for dust suppression to prevent contaminated water from moving off-site and reduce municipal water intake	2012 (on-going)	No cost.
	Separate clean and dirty water	2013 - 2017	(included below)
	Divert clean water and discharge: Construct earth berms and diversion trenches to divert clean storm water around and away from Rand Carbide activities & facilities and discharge to municipal storm water infrastructure to replenish surface water resources as per regulation 704.		
	Contain and reuse contaminated storm water: Capture (drains/pipes) and contain (storm water or pollution control dam) potentially contaminated storm water that has been in contact with Rand Carbide activities & facilities and reuse water (for dust suppression) to reduce municipal water intake.		
	Construct new & upgrade existing drains / trenches	2013 (R1-R5)	R 1 500 000.00
		2014 (R6-R9)	R 3 500 000.00
	Construct storm water containment dam & associated silt traps	2015 - 2016	R 2 600 000.00

Objective / goal:	Strategy (actions):	Timeline:	Budget:
	Storm water management around historic waste dump	2017	R 1 000 000.00
	Monitor surface water (monthly)	2012 (on-going)	R60 000.00 (annual)