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KMT plans to re-treat the tailings deposited on the Kingamyambo tailings dam and in the Musonoi River by previous mining operations. These tailings still contain copper and cobalt at an average grade of 1.49 % copper and 0.32 % cobalt. The original Definitive Feasibility Study (DFS) was undertaken for KMT by a joint venture between Murray and Roberts and GRD Minproc, under the management of Added Value Engineering Consultants (AVEC). Subsequently, First Quantum Minerals (FQM) has re-engineered some aspects of the project and these changes are reflected in the project description below.

The engineering design for the project has been informed by the environmental and social baseline data collected by SRK. This information has provided input to the original siting and design of facilities, and mitigation measures have been developed in conjunction with the engineering ream. A number of alternatives have been investigated and those relevant to the current project are discussed in Chapter 4. The environmental design criteria (e.g. the limits for air, water and noise pollution) set out by the DRC government and the World Bank Group have also been provided to the engineering team so that these requirements have, as far as possible, been incorporated into the design of the project rather than being added on afterwards.

Many of the measures designed to mitigate potential management of environmental and social impacts have been incorporated into operational controls to ensure that they become routine activities. Other measures have been developed into a series of Management Plans included as appendices to the Environmental and Social Management Plan (ESMP), found in Volume 3 of this report.

3.1 Site Location

The KMT concession area (Tailings Exploitation Area, TEP), where re-processing operations will be conducted, is located north of Kolwezi town and north-east of and adjacent to the existing mine workings. The TEP was awarded for an initial period until May 2022 and is automatically renewable. The licence area covers 6,100 hectares and extends 13.75 km from north to south and up to 9 km from east to west. The concession/development area occupies gently undulating ground that slopes gently to the Musonoi river course. A range of low hills borders the area to the north. The geographical co-ordinates of the area are included in Table 3.1 below.

Table 3.1 : Geographical co-ordinates of the Tailings Exploitation Area

Points	Longitude			Latitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
A	25	24	30	10	35	00
B	25	26	30	10	35	00
C	25	26	30	10	36	00

H	25	27	00	10	41	30
I	25	27	30	10	42	30
J	25	25	30	10	42	30
K	25	25	00	10	41	30
L	25	26	00	10	41	30
M	25	26	00	10	41	00
N	25	27	00	10	41	00
O	25	27	00	10	39	00
P	25	24	30	10	39	00
Q	25	24	30	10	38	00
R	25	23	00	10	38	00
S	25	23	00	10	36	00
T	25	24	30	10	36	00

3.2 The Tailings Reserve

The location of the Kingamyambo and Musonoi tailings deposits and proposed infrastructure are shown in Figure 3.1 on a 1:50 000 scale.

The Kingamyambo tailings dam is a conventional tailings facility which contains 42.3 million tonnes of tailings and covers an area of 3 km^2 with an average height of 20 m. The Musonoi River tailings deposit contains over 70.5 million tonnes of tailings over an area 11 km long and up to 2.5 km wide. Both the Kingamyambo and Musonoi tailings deposits will be mined simultaneously to achieve the required grade and grain size distribution.

The current project plans to mine initially an average of 2.4 million tonnes of tailings per year and produce 35,000 tpa of copper and up to 7,000 tpa of cobalt as cobalt hydroxide. In the first year this will increase to 70,000 tpa of copper and 14,000 tpa of cobalt hydroxide, and after a further year a cobalt purification and electrowinning plant will be added to produce 14,000 tpa of cobalt metal. A further expansion would increase production to 105,000 tpa copper, 15,000 tpa of cobalt metal and 5,000 tpa of cobalt hydroxide. At these production rates the mine life will be around 16 years. The mining method and processing of the tailings from Kingamyambo and Musonoi are described in Sections 3.3.1 and 3.3.2 respectively.

Since the KMT project is concerned with the retreatment of existing tailings deposits, the orebody for this project consists of the existing tailings to be reprocessed. An analysis of the tailings material has been carried out as part of the process plant test work. Principal minerals identified in the tailings are listed in table 3.2, together with chemical formulae and representative concentration estimates, although there is some variation between the Musonoi and Kingamyambo and between different areas of these deposits due to variations in the original source rocks. A description of the malachite), traces of Cu-Co-carbonate (probably Kolwezite, $(Cu, Co)_2 (CO3) (OH)_2$), Co-hydroxide (heterogenite), Cu-phosphate (probably pseudo malachite), and Mn-Ba-Co-Cu-hydroxide (probably romanechite (Ba, H_2O) (Mn^{4+}, Mn^{3+}) $_{5O10}$. Heterogenite can contain Cu, Zn, Fe and Mn. The concentration of Cu-carbonate is higher than that of Cu-phosphate. The Cu- and Co- minerals occur either as coarse granular particles (up to 200 µm) or as a network-like texture intergrown with quartz. In addition, Cu-sulfides (<30 µm), predominantly covellite and chalcocite/digenite, occur either liberated or enclosed in Cu-carbonate. Fe-oxide/hydroxide is a minor mineral and can contain Cu and, to a lesser degree, Co. Sphalerite is the main sulfide and occurs liberated. It is believed to be a "contamination phase", possibly originating from other mine dumps or treatment facilities (i.e. the now decommissioned UZK Zinc plant adjacent to the Musonoi River).

Table 3.2: Minerals observed in 'orebody' (tailings) including formula and relative abundance

Minerals	Formula	Residue	Grain size (µm)	Mineral Association	Comments
Apatite	Ca5 $(PO4)_3$ (F,Cl,OH)	Trace	<30	With mica	
Barite	$BaSO_4$	Trace	<20	With quartz	
Chlorite	$(Mg,Al,Fe)_{12}(Si,Al)_8O_{20}(OH)_8$	Trace to minor	Up to 100		
Co-(Cu-Fe-) oxide/hydroxide (heterogenite)	CoOOH	Trace	<10 to 150	Liberated or locked in quartz	Can contain: Cu, Zn, Al, Si, P, Mn, Fe
Cu-carbonate (malachite?)	$Cu_2CO_3(OH)_2$	Trace	<100	Liberated or associated with quartz	
Cu-Co carbonate (kolwezite?)	$(Cu,Co)_2 (CO_3) (OH)_2$	Trace	<50	With heterogenite	
Cu-phosphate (pseudomalachite)	$Cu_5(PO_4)_2 (OH)_4$	Trace	<100	Liberated or associated with quartz	
Cu-sulfide (chalcocite/digenite)	Cu_2S	Trace	<30	Liberated or locked in quartz or Cu-carbonate	
Cu-sulfide (covellite)	CuS	Trace	<30	Liberated or locked in quartz or Cu-carbonate	
Fe-oxide/hydroxide	Fe_2O_3/FeOOH	Minor	<10 to 200	Liberated + integrown with quartz	Contains Cu and lesser Co, Mg, Si, P +/- S
Feldspar	$(Na,K)AlSi_3O_8$	Trace	<150		
Mica	$K_2Al_4Si_6Al_2(OH)_4O_{20}$	Trace to minor	<150		

Mn-Ba-Fe-Co-Cu-oxide/hydroxide	$(Ba, H_2O)(Mn^{4+}, Mn^{3+})_5O_{10}$	Trace	<80	Usually associated with quartz	
Quartz	SiO_2	Major	<5 to 200	Predominantly liberated	
Rutile	TiO_2	Trace	<50	Liberated locked in quartz	
Sphalerite	ZnS	Trace	<80	Liberated	
Zircon	$ZrSiO_4$	Trace	<75	Liberated and locked in gangue	

(FEED 1-7 2001). Major:>20wt-%, minor: 1 to 20 wt-%, trace:< 1 wt-%

Source: AARL Applied Mineralogy Draft Report , 2001.

The reserve details for the Kingamyambo and Musonoi Tailings are indicated below in **Error! Reference source not found.**. The volumes, tonnages and percentage copper and cobalt within the tailings are provided.

Table 3.3: Reserve details for the Kingamyambo and Musonoi Tailings

Resource	Category	Volume (m3)	Tonnes	Density	Tonnes Cu	% Cu	Tonnes Co	% Co
Kingamyambo	Measured	31,516,909	42,316,297	1.34	563,094	1.33	130,898	0.31
Musonoi	Measured	50,681,440	67,424,650	1.33	1,070,337	1.59	220,572	0.33
	Indicated	2,333,871	3,061,698	1.31	42,968	1.40	11,780	0.38
	Total	53,015,311	70,486,348	1.33	1,113,305	1.58	232,352	0.33
	Totals	84,532,220	112,802,645	1.33	1,676,399	1.49	363,249	0.32

Source: Dr Isobel Clarke, Kolwezi Resource Report, August 2003

3.3 Mining Process

The Project will be implemented in a series of phases. These are:

- Operational Phase 1: Hydraulic mining of the Kingamyambo and dredge mining of the Musonoi.
- Operational Phase 2: draining and hydraulic mining of the Musonoi as indicated in the Mining Schedule on Figure 3.2.

The average production rates anticipated for the initial phase of the project are as follows:

Plant throughput: 2.4 million tpa

Copper output: 35,000 tpa

BASE CASE	Cu Metal	Co Metal	Co Hydrox	Acid Plant
Jan 2010	**35ktpa**	**-**	**7ktpa**	**1 x 600tpd**
Optimized				
Dec 2010	70ktpa	-	14ktpa	unchanged
Case 1				
Dec 2011	70ktpa	14ktpa	-	unchanged
Case 2				
Mid 2012	105ktpa	15ktpa	5ktpa	additional 600tpd

Hydraulic mining of the tailings deposited on both the Kingamyambo tailings facility and in the Musonoi River will be carried out using high pressure water monitors (although in the first four years mining of the Musonoi will be by dredging). The amount of tailings from each source might vary between the wet and dry seasons, although it is intended to mine both deposits simultaneously to provide the correct grain size distribution for the process and minimise impurity excursions from, principally, Musonoi.

Water from boreholes will pumped on the mining site, into a reservoir. Water is extracted from the reservoir by a series of pumps. These high pressure pumps deliver into a pipe that reticulates the water around and onto the tailings areas to be mined. This pipe feeds the monitors.

Recovery of the tailings will take place 24 hours a day 365 days per year, utilising three 8 hour shifts and a relief shift. Four monitors will be operated simultaneously and will be manually controlled, although the production tonnage could be obtained from just one. However operating a single monitor would limit any blending potential. The tailings will be blended to achieve the desired grade and particle size distribution. .

3.3.1 Mining of Kingamyambo Tailings Deposit

Kingamyambo tailings dam is a conventional surface constructed tailings dam rising to in excess of 25 m above the surrounding topography on the east and south sides. The dam is built onto gently sloping topography such that over the width of the dam its height diminishes to a few metres. This combination of high main wall and sloping underlying topography allows a conventional hydraulic reclamation method to be utilised.

The dam will be reclaimed in two main levels utilising high pressure monitors operating from the top of the dam. This method provides for a safer working environment and improved control of reclaimed slimes density. The reclamation method will initially be started by the construction of a slot in the dam running from approximately the NW to SE corners. This will be extended as required and will provide a discharge channel for tailings reclaimed from either side of the slot. This allows for the operation of up to six faces simultaneously for improved blending and operational flexibility.

Monitored tailings slurry will gravitate to a pump station for transfer to the treatment plant.

The slurry, consisting of tailings and water, will flow over a finger screen to remove coarse debris and vegetation, and is then pumped over a vibrating screen to remove fine debris and any oversize material discharging into a surge tank. From the surge tank at the tailings dam the slurry is pumped approximately 8 km to the treatment plant. As mining operations will be continuous, the working areas will be floodlit at night using portable lighting equipment.

Following the removal of the Kingamyambo tailings deposit, the potential for further open pit operations will be determined. An exploration programme will be initiated across the concession in 2008 and 2009.

3.3.2 Mining of Musonoi Tailings deposit

Musonoi tailings dam is a valley type dam, situated in a shallow valley which was fed from the south end with tailings and constrained to the north the Kasobantu Dam wall. The tailings gravitated down the valley with the solids settling out in the process, leaving a clear supernatant solution which forms the pool behind the wall. The dam profile is such that at the feed end the depth of tailings is shallow, generally deepening towards the north end wall. The dam decants via a constructed diversion channel into the Nzilo Lake, leaving only storm flows to occasionally spill down the river course below the dam wall.

On the west bank of the Musonoi dam lies the decommissioned UZK zinc plant. This plant has discharged effluents and sediments into the Musonoi which have caused a contaminant plume in the dam, principally of zinc. The contamination levels are significant and thus the affected part of the dam will be reclaimed in later years and blended in such a manner as to minimise the impact on the operating plant.

Reclamation of the Musonoi tailings will be by two principal techniques. Initially the tailings will be recovered by dredging, with hydraulic monitors replacing the dredges once the dredgeable portion has been exhausted after the first 4 years.

Dredging will be utilised where the tailings are thicker, principally in the northern half of the dam where depths to 12 m are available for recovery. Two dredges (only if the 105 kt production level is reached before the dredge volume is exhausted) will be floated on the pool with the tailings reclaimed using submerged pumps and pumped to a shore station for screening and for transfer to the metallurgical plant. A 3 m layer of tailings will be left above the floor level to ensure that the dredges stay clear of most vegetation and termite mounds.

In the Musonoi tailings, the mining areas are at a similar level to that of the water in the Kasobantu dam, therefore the water levels in this area must be reduced before hydraulic mining commences. There are currently two spillways; one via an artificial canal to Nzilo Lake and one over the Kasobantu dam to the Musonoi river valley. The spillway to the Nzilo is lower than that to the Musonoi, which only overflows during peak flows in the rainy season. The water level in the dam

Once the dredgeable portion has been exhausted after approximately 4 years, the reclamation method will be changed to hydraulic monitoring once the central part of the deposit has dried out following diversion of the Musonoi flow around the operating areas. This will require the utilization of two transfer stations along the west side of the dam, with monitored slurry gravitating from the dam to the station. To enable complete recovery of the tailings, the Kasobantu dam will be partially drained and run off waters running into the Musonoi from the Kakifuluwe, Kanamwamwa and other tributaries diverted around the operating areas.

These tributaries, along with the main Musonoi river flow, will be diverted in a river diversion channel along the side of the Musonoi valley. No detailed design calculations have yet been made but the channel will have to be sufficiently large to accommodate the high flows experienced in the Musonoi River during the rainy season. Initial hydrological calculations suggest a channel of about 50m wide (at ground level) and 4 m deep and able to withstand the erosive forces of the high water flows. These studies have been deferred to take place during the Musonoi dredging operations.

On completion of mining, the Kasobantu Dam will revert to a water reservoir. This will be larger than the current Kasobantu Dam as most of the tailings will have been removed from the valley.

3.4 Processing

The tailings are treated by a hydrometallurgical process. As they have already been treated (historically) in a conventional flotation plant to extract copper and cobalt, they are already milled to a variety of particle sizes, ranging from < 5µm to 200 µm. Extraction of the residual metals will therefore be by a leaching process followed by solvent extraction (SX) and electro-winning (EW) to produce cathode copper of 99.9%, and cobalt hydroxide. In time, cobalt metal of 99.8%, purity will be produced. The details of this process are outlined below. The overall process is illustrated in Figure 3.4.

3.4.1 Tailings Reclamation and Dewatering

Tailings from the Kingamyambo and Musonoi tailings will be reclaimed simultaneously to achieve the required grade and grain size distribution. Kingamyambo will be mined by monitoring with high pressure water, Musonoi will initially be mined using dredge barges and thereafter, once the water level in the Kasobantu Lake has been reduced, by hydraulic monitoring. From the surge tanks at the tailings dams the monitored slurry is pumped varying distances, averaging approximately 8.5 km, to the treatment plant.

At the treatment plant the slurry is collected in the tailings dewatering thickener, which acts as a buffer tank for smoothing out variations in the slurry density. The tailings dewatering thickener underflow is collected in a filter surge tank, and then pumped to four tailings dewatering belt filters.

top of the dam.

3.4.2 Copper and Cobalt leaching

The dewatering belt filters produce a filter cake with a moisture content of around 16% that is fed to the leach circuit. Solution from the belt filters is collected in the three individual filtrate receivers, each having dedicated filtrate pumps. The filtrate pumps return solution back to the dewatering thickener.

Flocculant is prepared in a central make-up tank from where it is fed to the dewatering thickeners and belt filters.

Any spillage emanating from the dewatering area will be collected in a sump and returned to the dewatering thickener.

The filter cake is re-pulped with copper raffinate solution from the raffinate pond in a re-pulper tank, to a solids concentration of around 30 %. The primary -copper- leach is carried out in four mechanically agitated tanks, each having one hour residence time. The acidity in the primary leach is controlled at 2 g/l by addition of concentrated sulfuric acid.

The slurry is decanted in the primary copper leach thickener. Primary leach thickener overflow solution is transferred to a Pinned Bed clarifier to ensure clarity of the Pregnant Leach Solution (PLS). The PLS is the feed to the copper solvent extraction (SX) plant. PLS is stored in the PLS storage pond that has a 24 hour storage capacity sized as a 2000 m^3 HDPE double lined earthen pond.

The primary leach thickener underflow is fed to the secondary leach train where the slurry density is adjusted, with barren copper solution, to a solids concentration of around 20%. The secondary cobalt leach is carried out in 10 mechanically agitated tanks in two parallel banks of five in series, each with one and a half hour residence, with SO_2 spargers. The acidity in the secondary leach is controlled at 2 g/l sulfuric acid.

The secondary leach circuit provides the necessary residence time, acidity and redox potential to complete the leaching of the copper and cobalt containing minerals.

Both the primary and secondary leach take place at ambient temperature and pressure in open topped vessels.

3.4.3 Secondary Leach Residue Solid Liquid Separation

The solid-liquid separation process is carried out in two stages. The first stage takes place in the secondary cobalt leach thickener. The underflow from the secondary leach thickener is passed through a 5 stage Counter Current Decantation (CCD) train for recovery of soluble values. Barren liquor is used as the wash solution.

Spillage from the CCD area is collected in a sump and returned to the copper leach thickener or closest CCD thickeners.

The final CCD underflow is pumped to residue neutralisation where it is neutralised with lime to pH 8.5 and discharged to the tailings impoundment.

3.4.4 Primary Copper Solvent Extraction

The copper pregnant leach solution pumps feed solution from the pregnant leach solution (PLS) storage pond to the primary copper solvent extraction (SX) plant that comprises two extraction stages, one organic wash stage and one stripping stage. In the extraction stages the PLS is contacted (in counter current mode) with an organic phase containing approximately 18% (v/v) of copper SX extractant Acorga M-5640 in a low aromatic diluent (Escaid 110 or similar). Copper is selectively extracted by the organic phase, releasing the equivalent amount of acid to the aqueous phase (raffinate). Raffinate is treated for removal of entrained and dissolved organics and then gravitated to the raffinate pond, from whence it is returned to the leaching circuit.

The loaded organic from the extraction stages, together with loaded organic from the secondary copper extraction plant, is first washed with spent electrolyte that has been used to backwash the strong electrolyte filters, and then fed to the loaded organic coalescing and surge tank. Organic losses will be made up in this tank by the addition of fresh extractant and diluent. Any entrained aqueous solution recovered from the coalescer is pumped to the first extraction stage and the loaded organic pumps feed the copper stripping stages. Aqueous solution from the wash stage is recycled to the extraction stages.

In the stripping stages the loaded organic is contacted with spent electrolyte produced in the copper electro winning circuit. The copper in the organic phase is transferred to the aqueous phase and the enriched advance electrolyte is collected in the strong electrolyte tank. The strong electrolyte pumps return the advance electrolyte to the electro winning circuit via an organic removal filter. The stripped organic is returned to the primary copper SX extraction stages and a bleed stream of stripped organic is fed to the secondary copper SX extraction stages to recover copper contained in the feed to the cobalt circuit.

Crud formed in the mixer-settlers is treated for recovery of its organic content and there will be an allowance for an organic clay treatment tank and a centrifuge to treat a stream of organic with active clays. The clay removes any degraded material and solids from the organic phase. Any spillage in the copper SX area is collected in a dedicated sump and pumped to the raffinate pond.

3.4.5 Copper Electro Winning (EW)

Rich electrolyte from the solvent extraction stripping circuit is filtered through a dual medium anthracite and garnet filter to recover any organic entrainment. The organic recovered is pumped

The electrolytic cells are equipped with Pb-Ca-Sn anodes and stainless steel cathodes. Copper is deposited onto the cathodes over a 6-7 day period.

Copper is stripped from the stainless steel blanks and the copper sheets are bundled and stored for shipment.

The spent electrolyte from the EW cells is returned to the main circulation tank. From here the bulk of the liquor is recirculated to the cells and a portion is forwarded to the primary copper SX as spent electrolyte for organic stripping.

3.4.6 Iron Removal

Iron is removed from the solution by oxidation with air (or oxygen) followed by precipitation with limestone at a pH of 4.5 an. Iron is oxidised in the first precipitation tank and the pH raised by the addition of limestone slurry to precipitate these elements.

The precipitated solids are concentrated in a thickener and then filtered and washed in a tower filter. The washed solids are combined with the washed repulped tailings in the tailings neutralisation circuit. Thickener overflow is transferred to secondary copper SX.

3.4.7 Cobalt Circuit: Secondary Copper Solvent Extraction

In the secondary copper SX, the iron free solution is contacted with a bleed of the stripped organic from the primary copper SX circuit to remove minor quantities of copper and thus minimize contamination of the cobalt recovery circuit.

Secondary copper SX raffinate passes through a raffinate after-settler to recover entrained organic and is then collected in a storage pond ahead of the iron and manganese removal circuit.

3.4.8 Cobalt Precipitation

Iron and copper free solution from secondary copper SX is passed to a train of 6 tanks for the precipitation of the contained cobalt as cobalt hydroxide. Magnesia is added to the train to a pH of 8.4 to precipitate the cobalt. The last stage discharges to a thickener, with the underflow passing to a storage tank and tower filter for recovery of the contained hydroxide product. Thickener overflow and filtrate are passed to a barren neutralisation circuit to precipitate out manganese and a proportion of the magnesium prior to discharge to the tailings impoundment.

FQM has declared its intention to produce cobalt metal from 2011, but the metallurgical flowsheet for this has not yet been fully defined.

SRK has some concern that the effluent for this process may be difficult to manage.

Management System documentation produced for the site once Construction commences.

Table 3.4: Annual consumption of chemical products[1]

	Quantity Tpa or m^3/a	Inventory (tonnes) Approximate quantity
Flocculant	545	45
Sulfur	31,713	8,000
Burnt Lime	2,105	175
Copper Extractant: Acorga	84	320
Bentonite clay	25	10
Guar	8	2
Diluent: CuSX	378	1,250
Limestone	24,801	4,000
Zn/Co extractant: Cyanex 272	42	110
Diluent: Zn/Co SX	420	820
Sodium Hydroxide Flake	21,630	1,800
Butyl Hydroxytoluene	4.9	5
Nitric acid	103	20
Gelatine	13	6
Anthracite	55	10
Garnet	104	20
Activated Carbon		
IX Resin Purolite S950		
Diatomaceous earth	37	10
Vehicle Fuel	105,000 litres/annum	10,000 litres

Source: D vd Westhuizen

The storage of various substances will be in line with good international practice and in accordance with MSDS recommendations. Allowance will be made in each circumstance for the containment and management of spills, with bunded areas specific to each section of plant being designed to sound engineering principles to contain ad hoc inadvertent spills and catastrophic tank rupture of the largest tank in that given bunded area.

presented in Figure 3.5 shows designated areas for limestone, sulfur, reagents, organics and a main store, as well as copper and cobalt product storage areas. Liquids will be stored in areas with suitable bunds and drainage channels for capture of accidental spills. Detailed procedures will be developed according to the MSDS and Occupational Health and Safety criteria detailed in Annex B (Health and Safety Plan) This will also contain details of the emergency procedures for dealing with a variety of different types of incident.

3.5 Sulfuric Acid Plant

The acid plant consists of a sulfur burner producing 12% sulfur dioxide (SO_2) using a four pass 3:1 double contact double adsorption configuration plant that will absorb 99.8% of the SO_2 and produce 98.5% pure sulfuric acid (H_2SO_4). In addition, the acid plant is equipped with a 100 tpd liquid sulfur dioxide production facility for utilisation in the cobalt leach circuit. The acid plant exhaust gas will exit via an 80 m stack to reduce ground level concentrations of gaseous SO2 to within specified limits.

3.6 Infrastructure

Figure 3.5 shows the proposed layout of the plant site. The following infrastructure will be developed as part of the proposed project:

- A new tailings dam for the tailings that have been retreated
- A process plant including:
  - An electrode boiler,
  - A sulfur burning acid plant,
  - Copper extraction plant,
  - Cobalt extraction plant,
  - Limestone milling plant
  - Offices and workshops,
  - Finished product storage,
  - Spares storage,
  - Parking,
  - Hardstanding, and
  - Waste disposal for a variety of different waste streams.

- Pipeline to take slurry from the Musonoi tailings site to the plant
- Pipeline to take slurry from the Musonoi tailings site to the plant
- Pipeline to take the neutralised retreated tailings to the new tailings dam;
- Pipeline to take the neutralised aqueous effluent to the Luilu river;
- Pipeline to take the tailings decant pond water to the plant;
- Pipeline to take the tailings decant water via the tailings decant pond to the tailings reclamation area at Kingamyambo;
- Pipeline from the well field to the tailings reclamation and plant sites;
- Power line from the substation to the plant site;
- Sealed gravel roads around the site;
- Dirt track from the plant to the tailings dam;
- 180 km access road from Zambia to Kolwezi, plus border post

The following power lines have been identified:

- The main incomer from the “Repeter Oest” Substation to the main switchyard located at the plant site;
- And a feeder to the borehole well field from the transformer at “Repeter Ouest”.

Smaller transmission lines identified are:

- to the tailings dam from the plant site / switchyard at the plant;
- to the aggregate quarry to the plant site / switchyard at the plant ;
- to the tailings reclamation at Musonoi from the plant site / switchyard at the plant;
- To the tailings reclamation at Kingamyambo from the plant site / switchyard at the plant.

Other infrastructure associated with the project includes the following:

- A tie-in to the Kolwezi “Repeter Ouest” substation;
- Switchgear at the plant site and other electrical installations;
- Water supply boreholes;
- Sewage treatment system, of a masonry septic tank and filter field type;
- Mobile equipment;
- Fuel and reagent storage;
- Telecommunications masts etc;

- Temporary accommodation for construction workers;
- Senior management village.

The infrastructure will remain on site for approximately 23 years (subject to any plant expansion which would reduce this term), after which any necessary decommissioning will take place.

The concession area is 6100 ha and stretches 13.75 km from north to south varying from a minimum of 0.5 km to 9 km wide from east to west. The servitude widths for access to the plant vary from 21.5m (pipeline, powerlines and main road) to 40 m (railway, road, pipelines and powerlines). The proposed facilities will have the following approximate footprint areas (given in hectares and kilometres):

- Tailings Dam: 420 ha (initially ± 50 ha) 2 x 2.5km
- Plant Site: 60 ha 800 x 1000m plus 300 x 600m for lime facilities
- Length of proposed gravel roads to and from site: 7 km
- Length of access road to site: 8.95 km
- Length of gravel roads around site: 4.36 km
- Length of gravel road to the existing quarry: 5.51 km

(The need for additional effluent related infrastructure once cobalt metal is produced needs to be clarified by FQM when it has resolved the metallurgical flowsheet for that operation, started to schedule in 2011.)

During mining operations the tailings deposits at Kingamyambo and Musonoi will be removed, potentially leaving these areas available for other uses following reclamation. Pressures on land use in the Kolwezi area are acute and while a final land use has not been defined at this stage, this will be reviewed through the project life and discussed in conjunction with local communities and the municipal authorities. The Musonoi River will ultimately form an open water dam, the size of which will depend on the height of the final spillway. The new tailings dam (420 ha) will remain in perpetuity. It is planned to remove the plant; but if an alternative use can be made of the site, such as an industrial development, the road, rail, power and water links will remain in place for the benefit of future users.

The areas to be developed will be cleared of the secondary scrub vegetation that predominates in the area, and where possible this will be composted for future use in reclamation. The sites selected for the plant site and tailings dam are relatively level, and little cut and fill is envisaged.

Quarries

Two alternative quarry sites were investigated, the first being the Kibarian quartzite and the second

Quantum Minerals, and will be used exclusively during the construction phase to provide hard core for foundations, gravel for a number of applications and sand for acid-resistant concrete at the plant site. A temporary quarry licence has been applied for, this is for a period of one year and can be extended for one year. This will cover the requirements of the construction phase. Tests on the suitability of this material for construction purposes indicated that dust production during construction could be high.

Borrow pits

The precise requirement for borrow pits for the project has not yet been identified either in terms of location, size, type of material or duration of operation. The following are the potential project uses of borrow pit and/ or quarried material:

- Fill for the plant site;
- Aggregate for construction of the plant site and other permanent structures;
- Starter dam wall for the tailings dam;
- Dam wall for Storm Water Dam at the plant site.

Of these the largest requirement is for the starter wall for the tailings dam. This material will be taken from under the footprint of the tailings dam as far as possible, or from other locations close by. Test work is being carried out on laterite and waste rock in the area to determine their suitability for all or some of these uses.

Limestone

The SX EW process needs considerable amounts of lime and limestone. This will be bought commercially for the initial phase of operations. During this time the possibility of using the limestone deposit at Lusumbi, for which RPM owns an exploration licence for limestone, at some distance from Kolwezi, will be investigated, along with other supply sources such as existing sources in Zambia close to FQM's other operations. The location for this potential limestone quarry is shown in Figure 3.7. Geological investigations are underway to determine the suitability and quantity of material which may be available. One drill hole has been put into the deposit. Should the limestone prove suitable, the necessary environmental and social impact assessment will be carried out in accordance with the legislative requirements of the DRC and also the requirements of the World Bank Group, in line with First Quantum Minerals policies. Initially a limestone mill will be installed at the plant site, but for the production of cobalt metal, quantities of slaked lime will also be required so a lime burning plant will be added.

3.7 Waste Neutralisation

In addition, a small waste stream (2,500 ^{3}/d) will be produced from the "reflux" step in the process flow sheet, which will be incorporated into the tailings slurry liquor.

3.7.1 Solid Tailings Disposal

Form of tailings

The tailings will consist of re-treated copper/cobalt tailings. The dominant gangue material is quartz with mica, chlorite and feldspar occurring as trace to minor minerals. There is a significant degree of variability in particle size distribution particularly in the Musonoi reserve. Particle size distributions vary from fine fractions at greater than 90% passing 38 µm to fine fractions at less than 15% passing 38 µm.

The tailings solids will be slurried with a combination of plant waste streams (including the reflux solution) and tailings decant water returned from the TSF. Analysis of the slurry liquor and the solids separated from a test sample of tailings gives the results presented below, compared with the limits for low and high risk tailings as defined in the DRC Mining Code. (NS in the table denotes Not Specified). The results tabulated below in table 3.5 show that the tailings will qualify for classification as Low Risk tailings in terms of the dissolved metals content as defined in Article 2, Table 1 of Annexure XI of the DRC Mining Code and with IFC Mining sector guidelines

There is however, no specific guideline in the DRC Mining Code or the IFC Environmental Health and Safety Guidelines for Mining for the dissolved salts content of discharges to watercourse or seepage to the underlying aquifer. The impacts from this are assessed on an individual risk basis taking account of the assimilative capacity of the receiving water and the quality of other discharges to that water as well as the uses to which the receiving water is put. In this case the TDS in the spillage from the TSF is likely to range from 3,000 mg/l in wet weather to 10,000 mg/l in dry weather. Seepage from the TSF is likely to average about 8,000 mg/l as TDS, as shown in the table below. The spillage is likely to be diluted at least 10-fold in the Musonoi River, while the seepage will be diluted progressively in the shallow groundwater by about 3-fold.

Three tailings test samples was leached and analysed using the required Toxicity Characteristics Leach Procedure (TCLP) method. The results are tabulated below in table 3.5 show compliance with the limits set out in Article 3 of the Annexure XI of the DRC Mining Code. The tailings are therefore classified as non-leachable tailings.

Table 3.5: Level of metal concentrations used to categorize mine tailings as low or high risk

Parameters	Limit for Low Risk tailings (mg/l)	Limit for High Risk tailings (mg/l)	IFC EH&S Guidelines for Mining (2007)	Concentration in test tailings slurry liquor (mg/l)	Concentration in test tailings solids (TCLP) (mg/l)

			(2007) (mg/l)	(mg/l)	(mg/l)
Calcium	NS	NS	NS	575	
Magnesium	NS	NS	NS	1,270	
Sodium	NS	NS	NS	0	
Sulfate	NS	NS	NS	6,400	
Chloride	NS	NS	NS	57	
Total dissolved salts	NS	NS	NS	8,300	
Arsenic	1.00	5.0	0.1	<0.02	<0.02
Barium	NS	100.0	NS	0.02	0.13
Boron	NS	500.0	NS	<0.006	0.03
Cadmium	0.01	0.5	0.05	<0.001	<0.001
Chromium, total	NS	5.0	NS	0.8	<0.004
Chrome VI			0.1		
Copper	0.30	NS	0.3	0.02	0.91
Nickel	0.50	NS	0.5	0.03	0.04
Nitrates + nitrites	NS	1000.0	NS	1.8	0.7
Mercury	0.002	0.1	0.002	<0.001	<0.001
Fluoride, total	NS	150.0	NS	1.9	0.2
Lead	0.60	5.0	0.2	<0.01	<0.01
Iron, total	2.00	NS	2	<0.001	0.11
Selenium	NS	1.0	NS	<0.03	<0.03
Uranium	NS	2.0	NS	0.8	<0.004
Zinc	1.00	NS	0.5	<0.005	0.22

			(2007) (mg/l)	(mg)	(mg)
Total Cyanide	1.00	1.0	1.0	<0.50	<0.50
WAD Cyanide			0.5		

Analysis of test work tailings indicates that the metal concentrations, with the exception of copper, in both the tailings solids and the solution are below the limits specified in the DRC Mining Code and therefore classify as Low Risk. The copper in the TCLP extract from the tailings solids exceeds the 0.3 mg/l limits indicated in Low Risk tailings and the IFC Mining Sector discharge guidelines. The DRC, however, sets relaxed limits for copper in areas where copper is mined specifically, in view of the naturally high background levels of copper in these areas.

Comprehensive analyses for volatile organic content of the tailings were carried out with the result that all values were below detection limit.

Results of geochemical test work on existing sediments

Representative composite samples of waste rock and tailings from existing mining deposits within the KMT Project area were taken and submitted to an accredited laboratory in Johannesburg for geochemical test work.

The initial objective of this test work was to determine whether any of these existing mining deposits contained sufficient sulfide to generate acid on oxidation. If so, in the absence of sufficient neutralising material such as calcite or dolomite, the acid formed may have the potential to dissolve heavy metals from mineralised sediments leading to contamination of the surface or ground water bodies affected.

The samples were therefore subjected to acid-base accounting (ABA) using the modified Sobek methodology. Results are presented below in table 3.6.

Sediment Samples taken from the KMT Project Area	Total Sulphur (%)	Acid Potential (AP) (kg CaCO3/t)	Neutralising Potential (NP) (kg CaCO3/t)	AP:NP Ratio	Net Neutralising Potential (NNP) (kg CaCO3/t)	Rock Type (Acid generating potential)
Composite waste rock	0.04	1.2	4.6	<0.3	3.4	III
Kingamyambo Tailings	0.02	0.6	8.5	0.1	7.9	III
Musonoi Tailings	0.06	1.9	9.3	0.2	7.4	III

Table 3.7: Classification of rock type by acid generating potential

Acid Generating Potential	Total Sulfide[1] (%)	AP/NP[2]	NNP[3] (kg/t $CaCO_3$)	Rock Type
Probably Acid forming	>0.25	>1	<20	I
Indeterminate	>0.25	0.3 to 1	-20 to +20	II
Probably Non-acid forming	<0.25	<0.3	>20	III

Note 1: Calculations on Total Sulfur instead of Total Sulfide are often too conservative

Note 2: Acid Potential divided by Neutralising Potential

Note 3: Net Neutralising Potential is Neutralising Potential minus Acid Potential

The ABA results tabulated above show:

- none of the sediment samples from the KMT Project area contain sufficient sulfide to generate significant acid on oxidation;
- all of the samples from the KMT Project area show relatively high neutralizing potential;
- none of the samples from the KMT Project would be classified as acid generating;

Classification of the tailings as Low Risk

A number of samples of tailings produced during metallurgical test work on bulk samples taken from the Kingamyambo Tailings at Kolwezi have been subjected to classification tests, including laboratory leaching for metals and volatile organics and acid-base accounting, as reported in the sections above. In all cases the results confirm the classification of the tailings material as Low Risk, as defined in Annexure XI of the DRC Mining Code.

Tailings storage facility (TSF) design

storage facility would require a capacity of approximately 87 million m^3 at an in-situ dry density of 1.28 tonnes / m^3. The dam will be developed to a maximum elevation of 57 m above the datum level of 1390 metres above mean sea level (mamsl). At current production levels the new tailings will be deposited at about 2.4 million tpa solids. Based on preliminary test work the tailings material is expected to have an average permeability of approximately $1 * 10^{-5}$ to $1 * 10^{-6}$ cm/s and will restrict the rate of seepage accordingly.

A geotechnical investigation has been done and used in the design of the tailings dam. This works, as well as borehole drilling logs in this area show that much of the underlying material is strongly weathered.

Recent trends in the USA would be to consider the lining of the tailings dam to prevent seepage draining into the underlying soils and shallow aquifers. In this case the decision has been taken not to line the 420 ha tailings dam on the basis of the following considerations:

- The DRC Mining Code stipulates that tailings dams that classify as Low Risk do not require a barrier between the dam and the underlying soils and ground water.

- The US Bureau of Mines and the US EPA have adopted the Bevill Amendment which classifies the solid wastes from primary copper processing (amongst other mining activities) as high volume-low toxicity wastes exempt from hazardous waste classification. These wastes conform with the US EPA criteria requiring absence of:

  - corrosivity
  - reactivity
  - ignitability
  - Extraction toxicity.

- The US states of Arizona, Utah, Texas and New Mexico specifically exclude the solid wastes from primary copper processing facilities from their hazardous waste regulation.

- The question of lining specific tailings dams has not yet been resolved in the European Union, and is currently under investigation.

- Preliminary testwork on the KMT tailings indicates that the sediments are likely to drain slowly and retain approximately 34% of the slurry water as interstitial water, limiting their capacity to consolidate. The imposition of a basal liner is considered to impede drainage and consolidation further and possibly reduce the stability of the tailings dam.

Tailings storage facility (TSF) layout

The conceptual layout of the Tailings storage facility is shown in Figure 3.8 and incorporates the following:

- As the material will be hydraulically deposited the material will be saturated. Therefore, in order to control the stability of the dam, an underdrainage system will be provided. The underdrainage system will consist of both a toe drain and an elevated blanket drain. The drains are intended to promote the drying and consolidation of tailings deposited over them and also to prevent the build-up of elevated phreatic surfaces within the TSF. The drains will be constructed of graded drainage stone and sand, perforated drainage pipes and geofabric. Drain outlets will be constructed at regular intervals and will discharge into the solution trench that will be constructed around the perimeter of the facility. The solution trench will in turn be pumped into the tailings decant pond.

- The tailings delivery system will comprise a delivery line feeding a spigot pipeline with spigots at. appropriate centres

- The decant solution will be reclaimed directly from the "pool" in the early phase. This will be via a trench and pump system located on the side of the hill noting that the TSF will not in the early phase have a constructed western wall, as this is provided by the hill upon whose side it is constructed. As the dam level rises and a western wall is required the decant will be revised to a pontoon system. The decant solution is pumped to the plant for re-use with excess discharged to the Luilu River. The dam wall on the northern side will be equipped with a spillway to prevent any overtopping.

- A runoff diversion trench (to the west of the tailings dam) which will collect and divert clean runoff from up-gradient of the facility until the TSF development exceeds this requirement.

TSF construction

The tailings impoundment starter wall will be constructed over the full, final, footprint of the dam. Ongoing wall raising during operations will be by cycloning and/or raising with fill as required.

The water retention works, including the tailings dam it self and the storm water control dam is designed to cater for the 1:100 year return period flood leaving a 2 m freeboard. It is anticipated at this stage that the facility will be sited more than 200 m from the nearest natural high water line. It will therefore be well away from any potential area of flooding.

The TSF consists of the following works:

slopes of the wall around the tailings dam are 1V:1.5H and [illegible]:2.[illegible] [illegible]ectively. The outer side slopes of the wall around the perimeter of the dam are to be covered with topsoil and vegetated.

- Toe drains and blanket drains

  Toe drains with a width varying between 3.0 m and 5.0 m will be installed on the inside perimeter of the starter walls.

  The inner blanket drain is 8m wide and has been constructed on elevated platforms, 2.0 m above the natural ground level.

- Catchment paddocks

  Catchment paddocks are to be constructed on the perimeter of the TSF. These will have an average height of 1 m.

- Solution trench

  A solution trench is to be constructed along the perimeter of the TSF. The solution trench has a base width of 1m and side slopes of 1V:1.5H. The solution trench will convey water collected by the subsoil drains and the water will be pumped to the top of the TSF.

  In order to minimise seepage losses to the foundation as well as to protect the solution trench from erosion, the trench will be concrete lined. The depth of the solution trench varies according to the topography from a minimum of 1m to a maximum of ±3m.

3.7.2 Aqueous Effluent

This issue is described in detail in Chapter 4.

Form of effluent

The aqueous effluent stream from the KMT process plant is derived from the “reflux” circuit and will be neutralised with lime to a pH of about 10.5. It will contain the constituents listed below. In the flowsheet selected, the stream is produced at 105 m^3/h (about 2,500 m^3/d) containing total dissolved solids (TDS) of about 11,000 mg/l, made up as follows:

Sodium	Nil
Calcium	600 mg/l
Magnesium	1,700 mg/l
Sulfate	8,400 mg/l

Aqueous effluent disposal

Neither the DRC Mining Code, nor the IFC effluent discharge guidelines, imposes a limit on dissolved salts discharging to watercourse.

FQM has confirmed that this effluent stream will form part of the tailings slurry liquor, who's overall TDS will be about 8,000 mg/l dominated by calcium and magnesium sulfates with traces of insoluble copper and cobalt. This option has been selected above the alternative of discharging this effluent stream into the Luilu River as previously proposed. The river discharge had been justified by the arguments that the Luilu River has been shown to be severely degraded as a result of decades of mining waste discharges, which, however, are diluted to insignificant levels when the Luilu flow merges downstream with the high flow rates in the Lualaba River.

However, during the annual wet periods there will be far more water in the tailings pool than can be returned to the plant. This water cannot be stored on the dam for capacity and stability reasons, and must therefore be discharged, at rates peaking at an estimated 1300 m3/h at TDS values between 3000 and 8000 mg/l. The proposal is to discharge this surplus to the Luilu River during wet periods, when it is assumed that it would be diluted by high flows in the river, with no further impact on the already degraded watercourse. Blending estimates indicate that the effect of the Luilu River flowing into the Lualaba River below Nzilo Lake would have a negligible impact on the Lualaba TDS.

3.7.3 Treated sewage

Domestic sewage produced on site will be routed to a series of septic tanks with a filter field/French drain for the dispersal of the clarified effluent. These will be located close to and downhill from the various residential areas and ablution blocks/canteens. Septic tanks of this nature typically reduce BOD_5 (5-day biochemical oxygen demand) to below 100 mg/l. The septic tanks will require emptying of solids periodically; this will be pumped out and disposed of to a site to be determined

3.7.4 Solid waste management

Solid waste management will be undertaken in accordance with the Waste Management Plan, attached as Annex G. This details the waste streams anticipated to arise from the operation, initiatives to reduce, reuse or recycle waste, waste segregation and options for final disposal of different sorts of wastes. The plan acknowledges the lack of suitable landfill sites in the Kolwezi area. As a minimum the operation will have a lined hazardous waste cell and a general landfill site.

The plant site sewage treatment facility has been positioned on the northern boundary of the plant.

A key component of the layout selection is to select safe storage areas for the hazardous and potential hazardous materials and to include facilities for the cleanup of any spills and water run off. This includes storage areas of large quantities of materials such as limestone, sulfur, other products waste. The waste will be compacted and covered with suitable material at the end of each working day to prevent windblown litter and to control vectors.

The lined waste site or hazardous cell in landfill will be used for solid and organic hazardous waste like drums used to transport hazardous materials, wastes containing acid, oils, greases, medical waste etc.

3.7.5 Other waste management

Ventilation exhaust stacks will be positioned in the plant and service areas where required, at the acid plant, at the boiler and at the electro-winning plants.

The heat generated in the sulfuric acid plant will be recovered in waste heat boilers and will provide a portion of the steam required in the processing plant.

3.8 Water Management

3.8.1 Existing Water flows

The two major river systems that have been affected historically by urban and mining activities in the Kolwezi area are the Luilu River to the west, and the Musonoi River to the east. The Musonoi is the major tributary of the Luilu, which in turn is a tributary of the Lualaba River, fed mainly from the outflow from Nzilo Lake.

The Musonoi River flows through the KMT concession area and hosts the Musonoi tailings deposit which forms the major portion of the resource to be reclaimed by the KMT Project.

Upstream contributions of flows to the river system include urban run-off and sewage discharges, the Kolwezi Concentrator and a discharge from the KOV pit, which is being dewatered, in addition to the natural base flow. The water balance has been calibrated based on the gauge flow data collected by KMT on a weekly basis from a number of gauging positions within the Musonoi system. Of particular interest is the data from the continuous monitor installed at SW09 (Nzilo spillway at Kasobantu dam), which measured 3 300 000 m^3 of flow for the period 15 July 2004 to 15 August 2004 and 3 000 000 m^3 for the period 16 August 2004 to 16 September 2004. These values are substantially higher than the originally reported numbers as additional information is now available, and more confidence can be attributed to the present numbers. The hourly hydrograph is presented in Figure 3.10 and the following should be noted from the data:

- Baseflow which leaves the Kasobantu dam is simulated at approximately 1 500 000 m^3 /month;

- A rainfall event of 20 mm causes a sudden peak within an hour and the hydrograph tail takes

- The tail of the second hydrograph indicated on the 27 August 2004 is an anomaly as the hydrograph falls within 1 hour, which is highly unlikely. It is possible the float (element of the continuous monitor) got stuck in the pipe and dropped from its original height on the 1st September. A more likely scenario is that the tail of the hydrograph was similar to that of the first (28 July 2004) hydrograph. If this is the case, it can be seen that the hydrograph takes 5 days to get back to its original baseflow;

- on the 18 August 2004 the KOV pit was not pumping water into the Musonoi River and the drop in the water discharge was approximately 3600 m^3 /h;

- This period of monitoring occurs during the dry season, but during the wet season rainfall is high and frequent and it is likely that the tail of the hydrograph following one rainfall event will not have recovered before the next rainfall event.

The water balance for the medium, dry and wet months are presented in Figures 3.11 to 3.13, respectively, and the following conclusions can be drawn from the present day site water balance:

- The water balance for a medium month indicates the discharge of water that is expected from the Kasobantu Dam through the Nzilo spillway (SW09). The inflow into the Musonoi tailings dam indicates substantially higher flows than those exiting the Kasobantu Dam.

- Extensive losses of water are encountered along the river where the Musonoi tailings are situated.

- The discharge of water from the Kasobantu Dam to the Nzilo canal is highly variable from 1.4million m^3/mth to in excess of 16 million m^3/mth.

- Approximately 90,000 m^3/mth of water enters the Kakifuluwe wetland from the Musonoi River.

- Baseflow is extensive in this area.

e 3.8: Expected flow in the Musonoi River as it enters the Kolwezi tailings as m^3/month

Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
2 258 752	4 962 722	7 847 169	11 803 614	12 842 494	11 742 995	10 922 705	10 224 597	6 703 568	3 194 972	2 2
1 808 096	2 760 645	5 826 614	8 193 515	9 573 306	9 390 160	8 504 291	8 804 887	5 015 534	2 548 693	1 6
1 634 596	2 200 075	3 821 305	7 095 442	7 709 310	7 618 526	7 705 329	7 773 995	4 145 987	1 749 132	1 6
1 634 596	1 814 765	3 475 617	6 084 649	6 787 700	6 963 737	6 474 846	6 933 132	3 464 666	1 634 596	1 6
1 687 847	2 096 181	3 678 773	6 198 521	7 151 555	7 090 663	6 485 676	7 028 017	3 572 716	1 833 267	1 6
1 634 596	1 695 644	3 046 604	5 475 008	6 131 910	6 064 154	5 230 848	6 163 204	2 750 806	1 634 596	1 6
1 634 596	1 634 596	2 176 060	4 012 979	5 369 742	5 129 528	4 349 286	5 167 004	2 267 724	1 634 596	1 6
1 634 596	1 634 596	1 808 008	3 152 747	4 251 306	4 279 103	3 492 253	4 315 739	1 714 900	1 634 596	1 6
1 634 596	1 634 596	1 634 596	1 634 596	1 634 596	4 101 289	3 336 065	3 492 988	1 634 596	1 634 596	1 6

e 3.9: Discharge of water through the Nzilo spillway (from Kasobantu dam) as m^3/month

Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
2 533 392	6 345 137	10 738 621	16 452 451	17 976 515	16 334 323	15 360 539	14 347 382	8 950 622	3 794 729	2 4
1 687 023	3 248 869	7 656 595	11 112 846	13 141 143	12 854 306	11 563 654	12 044 891	6 453 895	2 838 835	1 4
1 443 974	2 367 252	4 698 937	9 488 715	10 384 155	10 233 927	10 381 929	10 520 125	5 167 769	1 603 269	1 4
1 443 974	1 760 621	4 226 031	8 031 845	9 021 024	9 265 446	8 561 954	9 276 427	4 160 045	1 403 355	1 4
1 535 189	2 184 211	4 544 044	8 168 280	9 560 387	9 453 770	8 583 820	9 423 454	4 319 146	1 720 118	1 4
1 443 974	1 552 705	3 582 374	7 101 437	8 051 062	7 934 895	6 721 988	8 137 646	3 104 193	1 403 355	1 4
1 443 974	1 446 150	2 349 115	4 929 522	6 923 759	6 552 513	5 418 092	6 664 192	2 389 679	1 403 355	1 4
1 443 974	1 446 150	1 725 376	3 657 960	5 270 703	5 294 672	4 150 477	5 405 107	1 564 796	1 403 355	1 4
1 443 974	1 446 150	1 422 698	1 450 937	1 458 867	5 031 672	3 919 463	4 188 197	1 424 632	1 403 355	1 4

3.8.2 Water supply

Water will be used in the reclamation of the tailings and in the process plant with a maximum make-up requirement of approximately 620 m^3/h. This requirement will reduce by the volume of water that can be returned from the Tailings storage facility, estimated conservatively at about 60 m^3/h, although during the wet season many times that volume will be available for use.

A ground water investigation was undertaken to assess the existing ground water resources in the KMT Concession Area and to identify a suitable well-field for water abstraction. Water from the well-field will be pumped to the tailings reclamation area and as make-up to the plant site. Potential water sources are:

- The Manga ore body has the best potential for water supply and its potential to supply water is described below. This is currently being further investigated by FQM along with other locations; however, this site appears to be the most promising.

- The unexpectedly high yields determined for boreholes BH5 and BH6 at Plant Site A near the dambo indicate that this area could be an alternative source for the water supply to the Kolwezi Tailings Project, and this option has also been investigated.

- The Kingamyambo ore body could also potentially provide a water supply within the KMT concession area, although it is probably within the KOV cone of drawdown.

Manga Ore body

A single borehole, BH 1, was drilled within the Manga ore body to investigate the potential for groundwater supply to KMT. The borehole was targeted in the CMN formation (determined from the geological map) within the concession area. The borehole was drilled to a final depth of 91vm and to a final diameter of 165 mm. The final estimated blow yield of 101 m^3/h was too strong for the two compressors to lift the water out of the hole and deeper drilling was therefore not possible.

Test pumping of BH1 in the Manga ore body was not possible as the maximum abstraction rate for the pump on site was 40 m^3/h. Nevertheless, aquifer parameters collated for the Calcaire a Mineraux Noir (CMN) of the Roan Series have been used in the assessment and preliminary design of a well-field using the available data.

Chemical analysis of the ground water abstracted on a monthly basis from BH1 and analysed for process use shows water that is typically near-neutral in pH, with low dissolved salts (less than 50 mg/l) and negligibly low concentrations of heavy metals, apart from manganese (1-2 mg/l) and iron (50-70 mg/l).

It has been concluded that this area is the most feasible for development of a water supply well-field for the following reasons:

- High yielding borehole BH1 shown that at least 100-200m^3/h could be abstracted from the CMN formation in this area providing the borehole dimensions are sufficiently large (17 inches in diameter). The sustainability of this abstraction rate has not been fully proven, as it was not possible to test-pump this borehole due to the capacity of the pump on site.

- There are no other users exploiting this aquifer and no villages close to the site.
- The water quality is good (based on the 12-month dataset) with the exception of the high concentrations of ferrous iron and manganese present. Contamination from other sources is unlikely.
- The proposed well-field is within the KMT concession area, well placed for monitoring at Kingamyambo Tailings as well as the upper reaches of the Musonoi tailings deposit.

The assumed data from the KOV CMN aquifer, shown in table 3.10, indicate the following drawdown is expected depending on the variables:

Table 3.10: Comparison of water drawdown at the Manga ore body under different transmissivity rates

Transmissivity	Storativity	Abstraction rate	At radius of	Drawdown (m)		
m^2/day		m^3/hour	m	1 year	10 years	30 years
30	0.0001	100	500	44 m	58 m	65
Dolomitic CMN	0.001	200	500	58	87	101
400	0.0001	100	500	4.5	5.6	6
Altered CMN	0.001	200	500	6.8	9	10

Since the blow yield intercepted in BH1 was more than 100 m^3/h from a small diameter hole (8”), it is likely that the CMN is altered (rather than dolomitic) in which case a transmissivity of about 400 m^2/day is feasible. Depending on the storativity, the expected cone of drawdown at a distance of 200-500m is expected to be only 6 to 10m after 30 years of pumping at this rate.

The project requirements are estimated at approximately 620 m^3/h ranging from 240 to 620 m^3/h, which could be supplied by ground water from an estimated total of 6 boreholes, spaced 500 m apart and operating on a rotational basis.

It should be noted that the conclusions itemized above are based on data from a single borehole and the water supply potential has been extrapolated from the current understanding of the hydro geological model. It is intended to investigate the Manga ore body more extensively by drilling a number of suitably sized boreholes and test-pumping these to establish the assured yield with more certainty. At the same time, boreholes that may be used by communities will be monitored to determine whether abstraction from the Manga well-field could impact negatively on other ground water supplies. The occurrence of elevated iron and manganese levels in the ground water will need to be confirmed, and if so, a treatment system to remove these metals will be specified.

A number of alternative water supplies are available that could augment the supply from the aquifer:

- High quality return water from the new Tailings storage facility will be available as discussed briefly above.
- Table 3.11 defining the flows leaving the Kasobantu Dam through the outlet to the Nzilo Lake shows that during most months of the year the bulk (or all) of the KMT water requirements could be obtained from the Musonoi River. Monthly samples analysed over the past year

show the TDS to be consistently in the range 250 to 350 mg/l, and metals to be essentially absent.

It should also be noted that other developers, currently assessing the feasibility of re-opening existing mines in the Kolwezi area, are likely to undertake extensive dewatering of open pits and underground workings for the foreseeable future. It is possible that some of this abstracted water could be used by KMT for process purposes, in lieu of the Manga well-field supply.

These opportunities will be investigated further. Development of any of these options will mean that the drawdown from the aquifer will be significantly lower and KMT will vigorously pursue these options to ensure a high security of water supply under all seasonal conditions and to limit the use of the aquifer.

Water Recycling

Water that can be recycled includes

- Rainfall on top of the tailings dam;
- Water recycled within the plant operations.

The measures that are in place to recycle the water are described below:

Storm water management

The channel on the KOV pit side of the Kingamyambo tailings dam will be diverted away from the Kingamyambo tailings, again to minimise the pollution of clean runoff. Similarly the Musonoi River will be diverted away from the reclamation workings to minimise clean and dirty water mixing. Storm water run-off at the tailings dams (Kingamyambo and Musonoi) will flow towards the sump created for the capture of slurried tailings to be pumped to the plant. At the new tailings dam, clean storm water will be diverted away from the tailings area and discharged to the environment.

A storm water control dam at the plant will capture and control run-off from non-contaminated areas. The expected size of the dam will be approximately 200 m x 100 m with a depth varying between 1 and 4m.

The following measures have been adopted to reduce non-contaminated run-off:

- A storm water control dam will be constructed at the plant to collect dirty run-off water emanating from the open plant areas. Oils, grease and non-miscible solvents will be trapped and drummed for disposal in a lined impoundment. Particulate matter in the dirty stormwater will be allowed to settle, and the supernatant will be sampled to determine what further treatment is required before controlled discharge over an extended period in admixture with the plant effluent.
- Upstream storm water diversion controls will be constructed at the plant and tailings dam to divert clean water away from the dirty water infrastructure.
- An additional seepage drain will be constructed along the southern boundary of the new tailings dam to minimise pollution of the Kanamwamwa River.

3.8.3 Water Disposal

Apart from the process plant solids and aqueous effluents the operations will discharge the following water flows.

Overflow from the plant storm water dam during very wet periods. This flow will be discharged into the Kasobantu dam and will be typical surface water runoff quality;

- The plant has the capacity to use between 3000 and 4000 (typically 3300 m3 per day) of return water from the TSF. The data shown graphically below indicates that overflow from the TSP is expected only during the wet season, up to a peak of 1300 m^3/h. This water is discharged directly to the Luilu River through a pumped system but may contain elevated levels of suspended solids, which should be settled out before discharge. Daily variations in decant volumes, dictated by rainfall patterns, will mean that in practice the process make-up water will be drawn in varying amounts both from the tailings decant pond, as well as the ground water aquifer, as required.

3.8.4 Water Balance during operation

Figure 3.10 indicates the overall flows in and around the project operations for average conditions, a wet month and a dry month. Included is a graph indicating the simulated spillage from the return water dam.

3.8.5 River diversion

The Musonoi River will need to be diverted along the edge of the existing tailings deposit. In order to take the 1:50 year event (310 m^3/s) a canal of 30 m wide, (at least 50 m wide at ground level) 3 4 m deep (this is the minimum depth and depending on the topography this could increase for portions of the canal) with side slopes of 1:2. No detailed survey along the canal route has been undertaken so an estimate of 1:300 has been used. The velocities in the canal should be restricted to about 3 m/s. This diversion of the river will divert the water entering the Kasobantu dam and the water level in the dam will drop significantly. The river diversion will in effect create a by-pass to the settling and pollution 'sink' role played by the Kasobantu Dam. Since the dam will be lowered and the river diverted directly into Nzilo canal, poor quality water from upstream of the Project will pass directly into Nzilo canal and into Nzilo Lake.

The canal will need to be designed to ensure that seepage from the canal does not enter the mine workings and if the canal is made smaller then the risk of flooding the workers will need to be carefully considered. FQM has indicated that the feasibility of the Musonoi diversion will be evaluated during the period of dredging operations in the Musonoi.

3.9 Transport

A number of transport routes were investigated for the transport of construction materials and reagents to site and the transport of product from site, from a technical and economic perspective. It is not possible to determine at this stage where each raw material or construction material will be sourced and how it will reach site. However, the preferred route during construction will be the existing route through Kasumbalesa via Likasi to Kolwezi during 2008 and during 2009 from

Zambia along the 180km road which will be constructed up to a new border crossing between Zambia and DRC some 20 kilometres south of Kolwezi. Other options are outlined below, in 3.9.2.

The existing rail and road infrastructure between Kolwezi and Lubumbashi is described below and shown in figure 3.14.

3.9.1 Rail and road infrastructure

Rail Infrastructure

The current rail line from Lubumbashi to Kolwezi is operational but accommodates only 2 trains per week (14 wagons/train using diesel locomotives and 17 wagons/train using electric locomotives) with a transit time of 20 hours each way (320 km). The rolling stock inventory held by SNCC is insufficient to satisfy the rail demand this project would place on the route. The current locomotive condition and availability do not satisfy either the numbers or the minimum mechanical conditions to satisfy the demand the project will place on this infrastructure. In-country emergency equipment to respond to derailments on this route does not exist, and will result in line closure of up to 5 days in the event of such an occurrence.

For these reasons, rail transport was not considered a viable option for the tailings project

Road infrastructure

A Contract has been awarded to Enterprises Malta Forrest by the DRC Government, using World Bank funds, to rehabilitate the road between Lubumbashi and Likasi to full paved surface standard, and the road from Likasi to Nguba to full gravel road status. This contract, which is planned to be completed in 22 months, was due to commence in March 2005. To date the contract has not commenced.

There are no known plans for new regional roads in the area.

Whilst the local Kolwezi municipality has plans to rehabilitate the existing local road network, there are no funds available for this and there are unlikely to be funds available in the foreseeable future.

As indicated in Chapter 5 below, the sections of the Likasi to Kolwezi Road from Fungurume to the Kolwezi Mining complex are currently maintained by TFM Mining, DEM Mining, Bazano and DCP as the biggest users of these sections of road.

The route Lubumbashi / Likasi / Kakanda / Tenke Fungurume (205.6 km) is functional, but narrow bridges at km 173.9 and 190.2 may require reinforcement and widening, depending on loads, and the road requires widening in certain areas.

The road surface from Tenke Fungurume to Lake Lualaba (km 208 to km 281) is not passable in its current condition by articulated vehicles.

The route is currently serviced by rigid chassis 6x4 tipper trucks capable of conveying 30t per trip. These vehicles are privately owned and contract to mines in this region. Fleet size is unknown but thought not to exceed 10 trucks.

Road bridges established at Lufira River (98.4 km from Lubumbashi) and Lake Lualaba (281 km from Lubumbashi), with no alternative diversions, place the following cargo restrictions on the project:

- Max width: 3.2m
- Max height: 5.0m
- Max GVM: 65t

The World Bank and the Office Des Routes are actively seeking the involvement of potential road users in the rehabilitation and maintenance of this route.

The distinct advantages offered by road vs. rail during the construction phase are:

- Reliability
- Flexibility
- Time and Speed
- Crisis Management
- Emergency Freight

3.9.2 Materials and supplies to site

Road is the most economic transport option from Johannesburg to Kolwezi for container supply. It is recommended that the road from Likasi via Nguba to Kolwezi be repaired / upgraded to meet the requirements of the construction phase (as discussed in 3.9.1 above). All construction equipment and materials are to be transported by road as this option is reliable, quick and flexible (as compared with the rail option).

3.9.3 Transport around site

The project will not be using any mobile equipment for the mining process. A front end loader will be used as will a backhoe for clean up around the dam and construction of drainage channels. During the period of construction there will be large vehicles delivering plant and materials to the site. Detailed schedules of deliveries have been developed, these are summarised below:

During mining operations transport movements will comprise delivery of supplies to the plant site by road and transport of employees between the plant and staff accommodation. Product will be transported off the site by road. Personnel access around the site will be by means of light vehicles on existing (upgraded) and new roads.

This access road known as Road 2 is the main access road off Road 1 (Kolwezi – Luilu Road) that serves the existing construction operations within the concession (including the construction village) and is planned to serve the future plant site including the senior management village.

Internal Access and Distribution Roads

Apart from the main access road (Road 2), there are a further 10 roads or tracks that make up the re-treatment operations internal road network as follows:

Road 5 - Access to residue storage facility

Road 6 - Lime quarry access road

Road 7 - Aggregate quarry haul road

Road 8A Access to pipeline maintenance road: Upper Musonoi reclaim area

Road 8B Access to pipeline maintenance road: Middle Musonoi reclaim area

Road 8C Access to pipeline maintenance road: Lower Musonoi reclaim area

Road 9 - Powerline maintenance track

Road 10 Borefield maintenance track

Road 12 Access and pipeline maintenance road to Luilu River

3.9.4 Movement of product from site

Copper exports will probably be sent to RSA via road using on open flat bed trucks. Cobalt exports will probably be sent to RSA via road in 6m containers. These are the most cost effective and secure transport methods.

3.10 Energy use

Initial estimates of energy use for the KMT operations have been made and these estimate the power draw for all activities as 62 MVA, rising to 106 MVA for the 105kt copper output. Power supply to the process plant is derived from the Repartituer Ouest (RO) substation located approximately 7 km north of the plant. This substation belongs to the DRC national electricity supply company La Societé National d'Electricite (SNEL). A dedicated 120 kV power line transmits power from RO substation to the plant main substation. The plant substation is provided with 2 x 120/33 kV, 100/120 MVA transformers for stepping down the 120 kV supply to 33 kV for plant power distribution. The required loads can be met by either of the main transformers, giving full redundancy.

The power supply to the various plant load centres is distributed from the main 33 kV distribution board via 33 kV cables and overhead lines. Power supply to remote facilities is provided via 33 kV overhead lines and power distribution within the plant area is maintained via 33 kV cables installed above ground on cable ladders.

The Process plant is provided with 5 plant substations to step down the 33 kV supply to 525v to supply plant Motor Control Centres (MCCs). Most of the plant area step-down transformers are rated at 2,500 KVA, 33/0.550 kV, for standardisation. The remote facilities, Kingamyambo, Musonoi pumping stations, bore pumps, tailings area, effluent storage area and accommodation camp, etc., are provided with their own step down substation. Substation buildings are constructed of block work and are provided with air-conditioning units and fire alarm monitors.

All the power in this area is hydro-electric sourced and therefore, it would be safe to say that 99% of the electrical power utilisation is “clean”. Even the steam boilers are electrode boilers using power from the DRC national grid. The acid plant generates steam when in production ensuring efficient power use throughout the plant and minimising the draw from the grid. Furthermore, the plant has been designed to use process stream heat interchange where possible (i.e. heat exchange between the various process streams), ensuring efficient energy utilisation.

A total of 13 diesel generators will be used at the plant site, with storage for 48,000 l diesel. This will initially be used during a period of 9 months during the construction phase, but will remain into the operational phase. The generators are the enclosed ‘silent’ type and will generate between 60 and 300 KVA. Three 1MW sets will be installed for the main plant to provide emergency back up in the event of power outages In addition there will be some very small diesel lighting generators used to illuminate (and ensure safety at) the tailings reclamation works at Kingamyambo..

The main use of diesel will be for the truck fleet which will bring in the required materials and reagents and export the copper cathode and cobalt hydroxide/metal (according to the stage of the project). The vehicle fleet will be owned and operated by FQM (Const/Ops division).

Almost all electricity in Katanga is generated by Hydro power dams as outlined below:

- Congo River : Inga, Nzilo, Nseke.
- Lufira River: Mwadingusha, Koni
- Kalemie: Hydro plant
- Kananga: fuel plant
- Tshopo River in Kisangani: Hydro plant but does not belong to SNEL.

3.11 Security and communications

Attempts at extortion, bribery, poor and inefficient bureaucracy, poor infrastructure and insufficient lines of communication combine to create a challenging environment for business operations. KMT has resolutely resisted the bypassing of correct business practices which in some cases has led to negotiations being protracted and transactions being delayed. However, KMT’s policy on Corrupt Practices and First Quantum’s involvement with EITI (the Extractive Industries Transparency Initiative) clearly indicate the business ethics of the organisation. In addition to doing business in such a fashion, it is also imperative to have a robust and sustainable security policy.

Protocols

Despite the variety of challenges facing KMT, it is still possible to conduct business in a transparent manner and KMT has taken this approach and follows transparent business practices. Inherent in this is an overall business plan, which will include security, which reflects an understanding of and compliance with the appropriate parts of the following protocols:

- Universal Declaration of Human rights (1948).
- Geneva Convention (1949).
- Protocols additional to the Geneva Conventions (1977).
- Chemical Weapons convention (1993).
- Voluntary principles on security and human rights (2000).

And with specific emphasis on the following:

- IFC Performance Standards
- The Equator Principles
- The Voluntary Principles on Security and Human Rights with regard to the extractive and energy sector.
- The Conflict Sensitive Business practise Guidance for extractive industries, produced in March 2005 by International Alert.

Security

Security at the plant site has been provided for by means of the following measures:

Perimeter Gate

- The plant perimeter and staff housing area will be closed off with 2.4 m high security fencing.
- Installation of 2 x 6m boom gates on the entry and exit roads for trucks as well as 2 x 4m boom gates for entry and exit of light vehicles. The entrance and exit roads will be widened to allow traffic to split up into trucks and light vehicles.
- Installation of 2 x double entry and 2 x double exit turnstiles.
- Construction of a security office at the outer perimeter comprising of access control ‘badging’, security and other offices.

All mine personnel not living on site will enter the mine through this gate. All personnel who arrive on site by bus (and any passengers in light vehicles) will debus and walk through the turnstiles. Once the vehicle has been checked by security it can pass through the boom gates and collect its passengers again. Visitors to the mine will be issued with a temporary electronic Visitors ID badge. This badge will be issued from the badging office at the main gate and will be set for a limited date & possibly time period (e.g. a visitor will only be allowed on site access for today for a 3 hour period to ensure the visitor does not spend the whole day wandering around the mine site). The access level issued at the main gate will only allow the visitor up to, but not inside, the plant gate.

The plant site itself will also be enclosed with 2.4 m high security fencing.

Plant Gate

- Installation of 2 x 6m boom gates on the entry and exit roads. As there will be limited traffic through these gates there is no need for a separate truck and light vehicle entrance and exit gate.
- Installation of 2 x double entry and 2 x double exit turnstiles. These will be used for time & attendance clocking points.
- Completion of covered walkway for pedestrian traffic as well as construction of a plant gate building.

When the buses with employees arrive at the plant gate, they will park in the car park. The employees will debus and walk through the turnstiles, continuing on to their various places of work. The plant gate will be used as the main time & attendance clocking point (except for employees who work outside the Plant, these can be clocked at the perimeter gate). Visitors who have been issued an ID badge at the perimeter gate will report in to the main badging office outside the plant gate if they require plant access. Their appointment will be confirmed by telephone. If they are expected on site they will be issued further access (for a limited period) inside the plant. The purpose of the plant gate is to further restrict access onto the site and in the plant area. Vehicle access will be very restricted to those fit to drive within the plant area. Any visitors required to have plant access will be given the necessary induction and PPE issue.

Certain areas within the plant will be secured with single type fencing and, in the case of the cobalt electro winning and loading bay with double type fencing.

Entire plant site area, external pump stations, construction camp and staff housing facility to be less than 24hr manned contracted guarding.

Principles of the Security Function

- KMT has employed a senior security manager for the DRC to oversee all security policies and implementation. On site on a day-by-day basis the implementation of the security policy will be implemented by the Health and Safety superintendent.
- KMT is in the process of employing Group 4 Securicor, a world renowned service provider, with a proven track record in management and a full understanding of working in the DRC environment for the provision of manned guarding, associated risk management services and technology-based applications (access control, CCTV and electronic Occurrence Book and reporting). This also includes the ability to select, vet, train, equip and motivate a well disciplined guard force
- A clearly defined organisational structure and reporting chain.

- Integrate with existing, ongoing local relationships including liaison with local community leaders, police and military.
- Validation of existing security measures.
- Detailed security survey to be carried out at all locations.
- Recommendations for different project phases, commencing with pre-construction and Construction, and implementation of those recommendations.
- Liaison with the Health, Safety, Environment and Community (HSEC) Manager to ensure sensible coordination of activities and communication to stakeholders
- Adherence to IFC Performance Standard 4
- Adherence to the Equator Principles and the Voluntary Principles for Security and Human Rights
- Crisis Management, including emergency procedures, in conjunction with the Emergency Preparedness Plan (Annexure C).
- The ability to react effectively to different circumstances such as fire, injury, accidents.
- Basic security of individuals and company assets. These would include some electronic security measures.
- Management of reputation related issues.
- A clear chain of command in the event of a threat.
- Integration with social and environmental programmes.
- Liaison with appropriate NGOs as part of an overall networking plan.
- Participation in the Katanga Security Managers forum with the other mines active in the region
- An understanding of the judicial system and legal issues which might impact on the operation such as union and labour law and laws relating to medical care.
- Journey management.

Personal

- Security briefings, particularly on arrival.
- Production of a basic security handbook.
- Training of household staff as necessary.

- Rehearsals of emergency procedures (particularly fire) on a regular basis.

Communications

- The establishment of a security operations room with 24 hr radio monitoring and reaction.
- Frequencies and radio allocation.
- Vehicle radios.
- Standby independent satellite communications.

Crisis Management and Emergency Response

Detailed plans have been drawn up to cover the following potential incidents (see Annex C: security Arrangements), and security personnel will be trained in the response to each of these, as well as having the necessary equipment available and operational:

- Civil and military disturbance.
- Breakdown in law and order.
- Natural disaster.
- Evacuation planning / site / accommodation.
- Medical evacuation.
- Kidnap and ransom.
- Armed robbery from offices.
- Armed robbery from residential accommodation.
- Labour disputes / site invasion / takeover.
- Malfunction at site involving environmental impact.
- Arson / sabotage
- Vehicle accident / breakdown / overdue / carjacking
- Provision of a kit and equipment.
- Protection of family units.
- Accidental / criminal fatalities.
- Requisition of equipment by government forces or other armed factions.

Security Management

- A security strategy is to be agreed in line with corporate policy in order that detailed procedures are recorded in line with best practices. These are to be published and made available. All staff will be trained in their application.
- The transfer of information is to be determined by clear reporting lines in conjunction with corporate policy.
- Reporting procedures and templates are to be drawn up to ensure correct, accurate, timely and detailed information is available. This is particularly important in the event of a crisis.
- A code of ethics and conduct will be established for all security staff. This will include training in human rights.
- Clear guidelines on the use of force will be formalised and integrated in the training to be undertaken of G4S staff, and shared with any Government security personnel / commanders who may be called in to assist in times of conflict.
- A continuation training package will be implemented in order that the highest standards are maintained with integrity.
- Preparation for all phases of emergency response plan to include training and rehearsals at all levels.

Conclusion

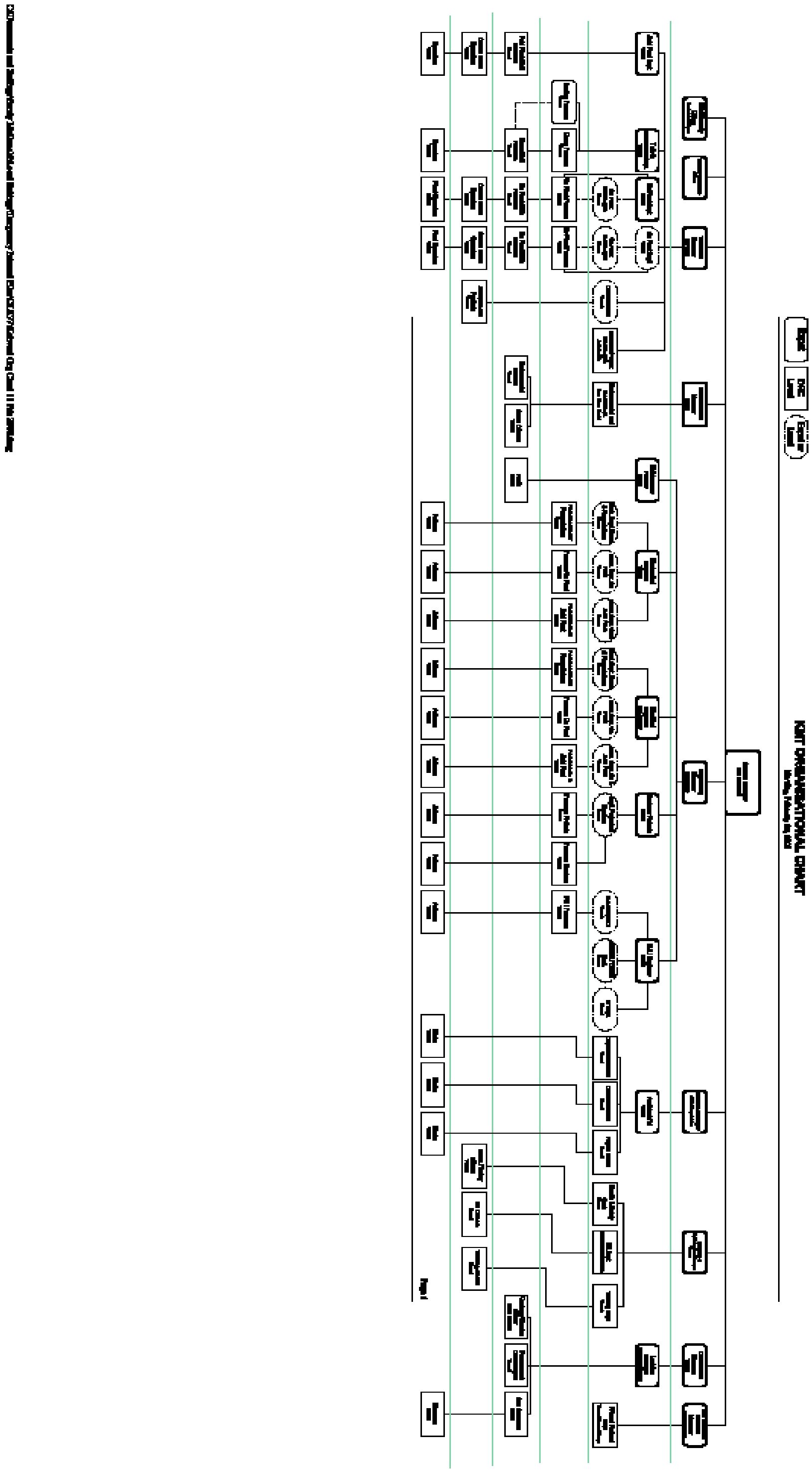
While the exact formation and numbers of guards are, at this stage, difficult to determine, detailed site surveys and liaison with the project managers will be carried out during the pre-construction phase, to ensure that the necessary measures are in place and the staff trained, as soon as construction begins

3.12 Employment

The project is anticipated to employ about 660 people during operations, of which 20 are anticipated to be expatriate, with 640 local positions. It is anticipated that most of the operational staff will be drawn from the population of Kolwezi.

During construction, there will be up to 1300 employees, of whom 400 expats from Indonesia and the Philippines, who will each be ‘twinned’ with a local worker in order to develop their skills.

KMT Organogram Planned staffing requirements during operations



3.12.1 Employment Policies

(See Annex A, on Labour and Human Resources and heath and Safety Policies for more detail)

KMT's policies pertaining to its employees are briefly described below

Categories of Human resources

- In all divisions/departments, the first priority will be given to hiring qualified local Congolese employees.
- If, for some categories of employees, KMT is unable to find sufficient numbers of qualified national Congolese staff, or for positions requiring highly specialized expertise, an international expatriate will be hired.

Legal compliance

- KMT strives to be compliant with the statutes applicable to its employees, namely the Loi No 015/2002 dated October 16, 2002; code du travail, and its application measures.
- Every year, before January 31, KMT will submit to the Labour Inspector and to the National Labour Office a summary of the numbers of both national and expatriate employees.
- All non-Congolese working with KMT require a work permit. The taxation that applies to expatriates' work permits is defined in the Arrêté Ministériel No 013/95 dated January 31, 1995.

Employment contracts

- Daily contracts apply to employees recruited for daily, small casual-labour requirements.
- Fixed-term contracts apply to a specified term or ascertainable period, for which the starting and finishing dates are specified. The maximum length of a fixed-term contract is two years.
- Congolese staff hired on a permanent basis in Kolwezi are offered open-ended contract for an undetermined period of time.
- Independent contracts are contract agreements which will specify the task to be accomplished and the payment due on successful completion of the task.

Staff regulations and internal regulations

These form part and parcel of the fixed-term and open-ended employment contracts of Congolese employees. Staff regulations are to be signed alongside the Employment Contract on recruitment of all staff.

Work environment

- For the purpose of ensuring that staff members are informed about matters concerning their employment, KMT will place notice boards for the display of any notices of or relating to employment.

- Employees on contract will be issued with a KMT Identity Card for identification and security purposes.

- Work tools are specific to the functions of the position; e.g.: desk, computer, stationery, toolkits, uniforms and protective gear. Uniforms and working tools are the property of KMT, and are to be returned upon termination of employment or when replaced.

Working hours

- Normal working hours will not exceed nine hours per day and/or 45 hours per week (not including transportation time from and to the work place).

- All employees shall be required to submit their time worked on approved KMT timecards, which the supervisors shall sign.

Paid leave

- All staff is entitled to annual leave.

- Sick leaves are granted upon presentation of a medical certificate signed by an approved doctor.

- A woman employee, who has become pregnant and has been employed for a continuous period of no less than six months prior to the expected date of birth, is entitled to maternity leave. The woman shall be entitled to 14 consecutive weeks with a maximum of eight taken after childbirth.

- After completion of three months' continuous service, any employee holding a fixed-period contract of more than six months and/or open-ended period contract is entitled to compassionate leave.

Transport policy

- In addition to the transport allowance given as part of the remuneration package, KMT provides bus transportation on specified routes to all employees bearing identification cards.

- Employees are not authorized to use their private motor vehicle for KMT work-related purposes and will consequently not be reimbursed for any claims.

Travel policy

Travel policy applies when an employee is hired outside the work location or during out-station posting.

- An employee recruited and hired in Kolwezi is considered a resident of Kolwezi despite his/her place of origin or the residence location of the family. Only employees hired by KMT outside Kolwezi are entitled to the travel allowance.

- KMT pays for the cost of travel for the employee and his/her immediate family relocation from the residing place to the work place. The same shall apply if and when the contract is terminated.

- Return travel is granted to the employee and his/her immediate family every second year of full service.

- Employees are entitled to an out-of-station allowance whenever they are required to travel outside Kolwezi on official duty.

Housing policy

- This is discussed below in Section 3.12.4.

Medical and Health Care policy

KMT shall guarantee its employees and their immediate families access to proper medical and health care as recommended by KMT's doctor , and in compliance with appropriate DRC legislation, such as:

- Medical care and emergency treatment on site for employees.

- Out patient and in patient treatment through medical schemes for employees and their immediate families.

- Drug reimbursement.

- Dental care

- Evacuation in death-threatening situations

- Accident and occupational illnesses

- Coverage of HIV/AIDS treatment is discussed below.

Accidents

All work-related accidents shall be immediately reported to the appropriate supervisor, regardless of the severity or cause.

3.12.2 Emergency medical evacuation

- The decision to make a medical evacuation shall be taken by KMT's medical doctor or KMT's designated doctor. The decision will be based on the severity of the case, the emergency of the situation and the non-availability of proper care in Kolwezi.

- The logistic person responsible for the situation must organize/coordinate the evacuation and liaise with the person responsible for logistics in Lubumbashi.

- Upon receiving all the information, confirmation from Kolwezi that evacuation is underway, the Lubumbashi office will coordinate the effort for receiving the patient.

- Re-routing of a patient to Kinshasa or outside DRC will be considered only if Lubumbashi Hospital lacks the diagnostic or therapeutic means to treat the patient evacuated from Kolwezi.

3.12.3 Occupational Illness/Disability

- Employees who are developing work related health-problems/occupational illnesses must report them to the supervisor and be referred to the KMT doctor.
- Employees will be given a temporary medical disability leave of absence.
- When a contract is suspended due to an occupational illness or work-related accident, the employee is entitled to two-thirds of the wage and to the full amount of the child-care allowance for a period not exceeding six months.

3.12.4 Employment during construction

An organisation chart has been developed encompassing all phases of project execution including: engineering, design and procurement; construction; and commissioning.

Organisation Chart is separated into Offshore (external to DRC) and Onshore (DRC) components.

The chart shows the key positions and/or functions and the relative reporting lines between each position. The Lycopodium Project Manager will have responsibility for Lycopodium's scope of services. The Lycopodium Project Manager will report directly to FQM’s Project Manager.

As can be seen from the organisation chart, FQML will bring its significant project execution and construction experience to the KMT project. Essentially all key construction positions will be filled by FQML, and the successful construction models from Kansanshi and Frontier will be applied in full.

When the plant is physically complete, it will be handed over to the Commissioning Manager who will undertake plant commissioning and operator training. The Commissioning Manager will be supported by the Project Manager and the construction management and field engineering team until the plant is successfully commissioned and handed over.

The construction phase will be characterized by the large number of people involved in the project. Construction workers and sub-contractor’s employees will progressively be hired and ‘or brought on site to peak to a level of 1,300 people by mid-2008. After about 7 months, the number of required construction workers will start to decrease and will progressively be replaced by the operations workforce. See Figure. For the location of construction camps etc.

3.13 Employment during operations

It has been estimated that around 660 employees will be required to fill the 127 positions necessary to run the operations at the plant site in Kolwezi.

When construction starts, a recruitment process for the Congolese and expatriate personnel needed to run the plant during the operations phase will follow. Expatriate employees will be hired to fill positions for which no local experienced and skilled people are readily available.

The Human Resources team will put together a set of job descriptions for the 127 positions of the organizational chart. This will provide a framework to make an inventory of required skills and to construct a skill availability survey. During the recruitment process, training programs will be established to train prospective employees in the required skills.

Worker housing and other facilities

The temporary modular construction camp is being erected south of the plant site, and within walking distance of it. These comprise construction labour accommodation within walking distance of the plant, capable of housing around 600 staff in rooms of up to 5 personnel, and a management camp consisting of 6 one bed-one bath units, 6 three bed-two bath units and 6 three bed-three bath units. Unskilled labour will be sourced from Kolwezi and its surrounds. These facilities will be removed upon completion of the project, and all areas will be rehabilitated in compliance with the Environmental and Social Management Plan.

Additional accommodation and a visitor's centre may be constructed in the township of Kolwezi at a later date, east of the present built-up area. The site is situated in the new Mutoshi urban area and borders the road "Avenue Ungu Ngandu" to the east. The total site consists of 14 contiguous plots of 30 m x 50 m each making up a total area of 21,000 m^2.

All Congolese employees will receive a housing allowance paid together with the monthly salary as required by the Congolese labour law. The housing allowance will be equivalent to 30% of the gross salary. Accommodation will be provided in KMT's furnished housing (either shared compound accommodation for single employees, or a separate house for family posting) for employees hired outside the work location.

Accommodation for Lubumbashi-based employees visiting Kolwezi or in transit or temporarily posted in Kolwezi will be booked at a KMT guest house or KMT's preferred accommodation facilities.

3.13.1 HIV/AIDS in the workplace

It is FQM policy (and a DRC requirement) that health care is extended to the immediate families of national and expatriate employees. However, by simply improving and sustaining the health of national employees, the Project has an impact on households and communities. It does so by ensuring that productive, income earning members remain so as along as possible. In an environment of scarce resources and few formal jobs, this security is extremely important.

Focussed community health initiatives will prioritise malaria and HIV/AIDS, but will not necessarily be limited to these.

With reference to HIV/AIDS and STIs, KMT will undertake a similar collaborative and coordinating role. The community programme might be implemented through a knowledgeable NGO (such as Population Services International). Among other things a structured information dissemination programme will be implemented, using focus groups, training sessions and peer training.

FQM has an HIV/AIDS programme at it other operations and a similar programme will be set up in Kolwezi, starting in may 2007. It will have an annual endowment of US$100.000, plus a yet unknown additional grant from USAID, with whom FQM is actively collaborating on HIV/AIDS prevention in the Zambian Copperbelt.

The HIV/Aids implementation plan for Kolwezi will contain the following:

- KMT will undertake orientation sessions in HIV/AIDS which will primarily target the entire workforce and their spouses. These are 2 hourly sessions and they are will be done over a number of days to give chance to almost all the employees to attend. The sessions cover an over view of HIV/AIDS information.
- The next stage will be the training of peer educators who will be identified during the orientation sessions and become the main stay of HIV/AIDS sensitization both at the work place and the community. The community members are integrated in the Peer education training and all the other trainings thereafter.
- The training in psychosocial and antiretroviral treatment will then follow. The VCT will be started from the inception of the programme.
- The company will provide free treatment of opportunistic infections and Anti Retroviral treatment for the employee and their spouses.
- Positive living training and support will be offered for the HIV-positive employees who are not in need of ART, to delay as much as possible the onset of AIDS.

Employees or potential candidates with HIV/AIDS may work or pursue employment at KMT, as no employee or a candidate to a position will be forced to undergo compulsory HIV testing. Employees living with HIV/AIDS will be treated in exactly the same manner as the other employees and will not be subjected to discriminatory practices because of their HIV/AIDS status. The right of the employee and his/her family members on confidentiality regarding HIV serologic testing, diagnosis and treatment will be respected.

Voluntary Counselling Testing (VCT) will be actively promoted to all KMT employees. A reference structure for counselling and testing will be identified in Kolwezi for those employees or immediate family members who request VCT. Information materials will be made available within KMT's on-site medical facilities, and KMT medical staff will be in a position to provide information, guidance and referral to any employee requesting support.

If an employee's contract is terminated for any reason, KMT commits itself to continue to pay 50% of the cost of treatment for six months. However, in case of new (define) employment, the employee will inform KMT's doctor and KMT will disengage itself from its commitment.

In case of death of the employee, immediate family members who are already under treatment shall receive their entitlement to 50% of the cost of treatment for a maximum of a further twelve months after the death.

3.13.2 Malaria Prevention

In the context of malaria, a key role for the Project will be to help to coordinate local players active in malaria prevention and treatment. These include local NGOs, community-based hospitals and the mine clinic. Malaria risk and early diagnosis information will be distributed, and preventive initiatives, such as bed net distribution, will be considered. Throughout, a collaborative community-based approach will be pursued. The KMT clinic will monitor trends in drug resistance, and will ensure a supply of the appropriate drugs. General awareness of the dangers of stagnant water will be built in the HSEC department, and among communities. Research indicates that up to 30% of all lost time in the workplace in locations like Kolwezi is related to malaria infection. Therefore, FQM takes an active role in malaria control during the construction phase as well as during operations.

During operations, KMT will take an active roll in malaria control at its operations in the local communities in partnership with government and local authorities in their malaria roll-back program. A representative of Regent Laboratories of South Africa has visited KMT site and concession in March 2008 and has submitted a one year proposal for a comprehensive malaria control program for the construction site, construction camp, housing estate, and communities living inside and adjacent to the concession. The program focus on source reduction larviciding, residual in-door spraying, insecticide treated bed nets, personal protection, spraying equipment, fogging and training. Subject to approval of the proposal, KMT will begin implantation in May/April following consultation with communities and authorities.

3.14 Construction Activities

A number of construction activities are already underway at site, particularly around the plant site. Most of this activity is early engineering works in preparation for the main construction phase which is scheduled to start at the beginning of the next dry season, i.e. in March/April 2008.

Current activities

The following activities are currently ongoing at and close to the plant site:

Construction of a camp for the construction workers. This will house 572 individuals, largely in 5 man rooms, 4 rooms to a building. Separate ablution blocks are equipped with brick lined soakaways and filter fields. There is a central kitchen, mess and laundry. Water will be supplied from a borehole close by.

The concrete bases for the buildings are being prepared by either CCC or Benco, local contractors based in Lubumbashi. The buildings themselves are being supplied and erected by Qwikspace from South Africa, who are also building three houses in the town and the barracks for the security personnel. The Qwikspace contract should be completed by the end of April 2008. A total of 100,000 m3 of concrete will be poured for the project construction phase.

CCC will provide the concrete for the construction camp and the management camp, plus slabs for the reagent shed. Benco will provide the slabs for the administration building, the construction site offices, some of the Nova (management) housing and the security building.

Earthworks These will be primarily for the plant site, TSF, aggregate quarry (drilling/blasting/quarrying) and site roads including the road to the Zambian border. This contract is let to the mining division of FQM, known as FQMO (Operations). The plant site is expected to take 9 months and will commence once the equipment has arrived from Lonshi and Kansanshi. The TSF work is expected to take from June 2008 until August 2009. The road to Solwezi should be complete by June/July 2008 although the portion from the DRC/Zambian border to Solwezi make take longer than this.

For the aggregate, FQMO will provide aggregate to the Projects Division, which is responsible for co-ordinating and managing the contraction phase (in the place of an EPC contractor), and who will in turn quality check the material and supply the aggregate to the various sub-contractors who require it. At present the aggregate used is being supplied by Gécamines from an existing quarry. Sand will be provided from crusher dust at the aggregate crushing plant and also from an existing source in Kolwezi. Cement will be brought from Ndola in bulk road tankers.

In addition to the work being carried out by FQMO, some work will also be done by DEM mining, who has built the plant site access road from the Luilu road northwards along the line previously earmarked for the railway line to the plant site. They will also be building other site roads which will be complete by the end of the dry season 2008 (October/November).

Drilling: Comisa and Boart Longyear are carrying out drilling activities for water wells – a total of 12 holes will be drilled and tested to establish the quantities of groundwater available in each location.

Management camp: CCC and Benco are putting in the bases and Nova will be erecting and finishing the 18 houses, 6 one bed one bath units, 6 three bed two bath units and 6 three bed three bath units. Nova is due to begin construction on in February and have a 15 week contract. They have a team of 6 expatriates and local staff.

Security fencing: This is already 95% complete and is being carried out by the FQM Projects division.

Removal of tailings pipeline: This old approx 12 inch diameter pipeline runs along the western side of the Musonoi valley and was previously used for spigoting tailings into the Musonoi. The pipes are being removed and reused as drainage sleeves around the FQM construction site.

Vehicle fleet during construction

This will consist of the following:

- 20 pickups
- 4 5 ton or 6 ton trucks
- 8 tractors, bobcats, loaders etc.
- 13 cranes

Staffing of the construction works

The construction workforce is estimated to be about 1300 maximum, with about 700 local unskilled and semi-skilled labour drawn from Kolwezi and environs, and a maximum of 600 expatriates, with a base load of around 480. These will be Filipinos, who will carry out the civil works, and Indonesians, who will be working on the structural steel, plate work and piping. Around 60% of these workers have already worked on FQM projects in Mauritania (Guelb Mughraine), and Zambia/DRC (Frontier and Kansanshi). These skilled workers will be matched with a local worker to provide a buddy system and on-the-job training. This system has been used successfully at other FQM operations.

CCC and Benco both have 57 local employees and CCC have one expatriate manager.

Local workers will be managed through Bernard Mwape, the HR manager for RPM. Three sets of labour brokers will be used to source workers; one of these has worked with FQM at Frontier. The labour brokers should feed the workers and provide them with PPE (personal protective equipment) but this will be supplemented by FQM where required. As part of its due diligence, FQM will screen these labour brokers in relation to their modus operandi, to ensure that their actions are in keeping with DRC laws and IFC Performance Standard 2 (Labour & Working Conditions).

Particular skills are difficult to find locally (such as crane operators) so these will be sourced from Zambia using operators who have previously worked at Frontier. Others from DRC will be trained.

Buses will be provided to move local workers from Kolwezi to the plant site where construction activities are centred. This will take the form of 2 x 60-seater buses. Access control and clocking-in will be carried out at the gate to the construction area (which is already access controlled).

Health and Safety

The responsibility for health and safety during construction is, as far as possible, devolved to the sub contractors but reported back to the FQM Projects Division. Ultimate responsibility for OHS management and incidents on the KMT site resides with FQM. A local safety officer who has previously worked for Phelps Dodge/Freeport MacMoran at Tenke Fungurume is currently employed by FQM. A monthly report will be prepared reporting LTI's and man-hours, reported through the contractors to the manager of FQM Projects or the HSE manager within his organisational structure.

FQM typically report (have reported to date?) no fatalities at any of their construction sites and few lost time injuries (LTIs).

One of the units at the construction camp will be equipped as a clinic – the equipment is already on site waiting to be installed. A further clinic will be opened at the plant site and one in town for employees and dependents. A component of the workers' salaries is paid to the clinic in town to allow access for their dependents.

Construction programme

Agri-auto will be constructing the steel sheds which consist of the warehouse at the plant, the reagent store, the cobalt store, workshops for plant and light vehicles. This company construct their own concrete bases and fixings, although FQM supply the aggregate and some reinforcing. Their workforce will consist of 3 expat (Zambian) specialists and a supervisor, and 12 local workers. They will be on site until Dec 2008.

Wade Walker is carrying out the electrical works (including the external reticulation for the construction camp) and is due to be on site from mid March 2008 for 2 months. They will use 1 expatriate, 5 skilled Zimbabwean workers and 25 local staff.

Conco will build the power line from the Inga-Shaba line to the plant site, including a temporary line to supply the power needed for construction, to be completed by end Mar 08, and the permanent power to be completed by Jun/Jul 2009. They will use an international team of 9 staff plus 8 locals.

Lycopodium from Australia is the design and engineering contractor responsible for the main plant site construction, which is due to start in March/April 2008. It will take two months for full mobilisation and 12 months to complete the concrete, a planned 28,000 m3. The building work will be carried out by FQM Projects division. The plant should be commissioned by the end of 2009.

Figure 3.1: Location of the Kingamyambo and Musonoi tailings deposits and proposed infrastructure

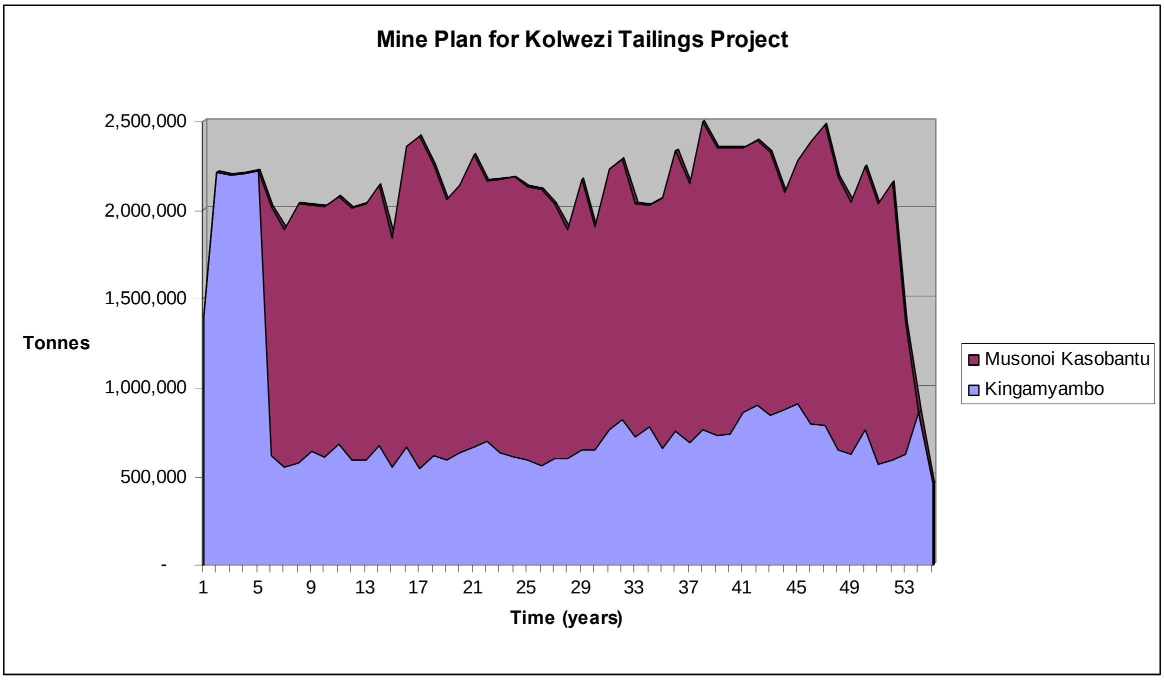


Figure 3.2: Mining Schedule for Kolwezi Tailings Project indicating the source of tailings to be processed.

Source: (LQS Ltd, March 2005)

Figure 3.3: Schematic diagram of mining of the Kingamyambo Tailings Deposit

Figure 3.4: Process Flow Diagram

Figure 3.5: Plant Layout

Figure 3.6: The location of the alternative quarry sites investigated

Figure 3.7: Location of potential limestone quarry

Figure 3.8: General arrangement of the tailings dam in the KMT Concession area

Figure 3.9: Discharge points from the tailings decant pond and stormwater control dam

Figure 3.10: Observed hourly discharges from Kasobantu Dam

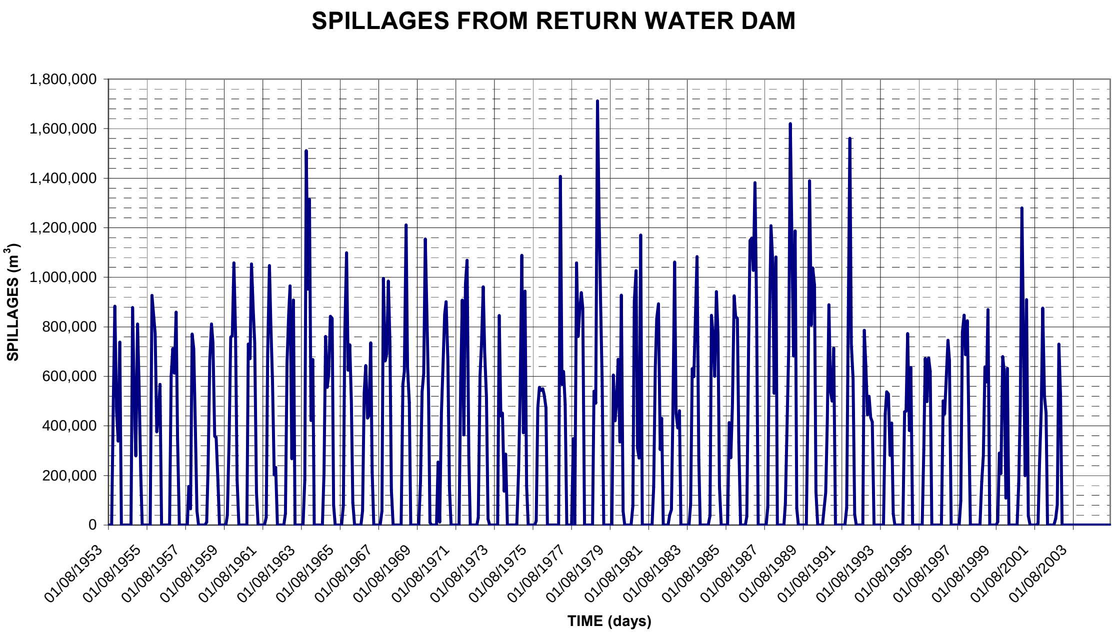


Figure 3.11: Spillages from return water dam

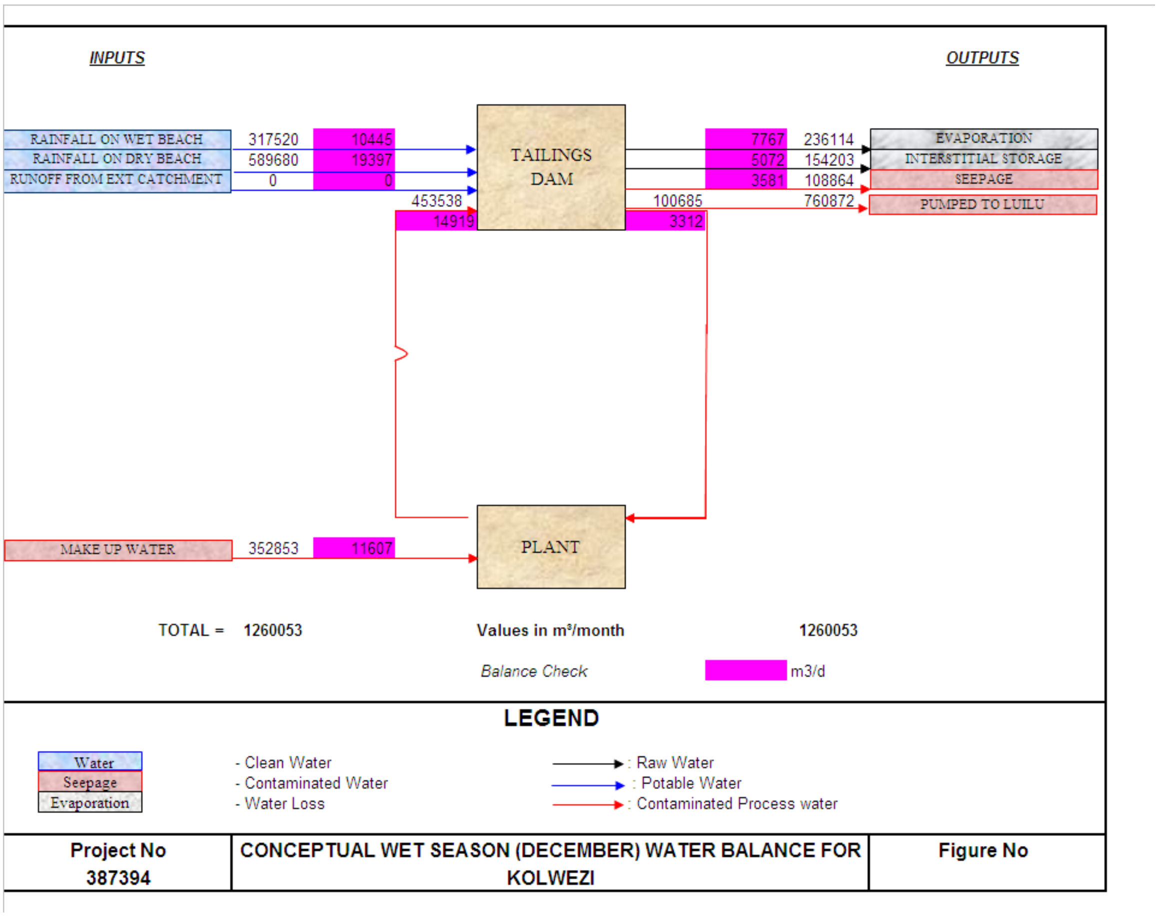


Figure 3.12: Conceptual wet season water balance for Kolwezi

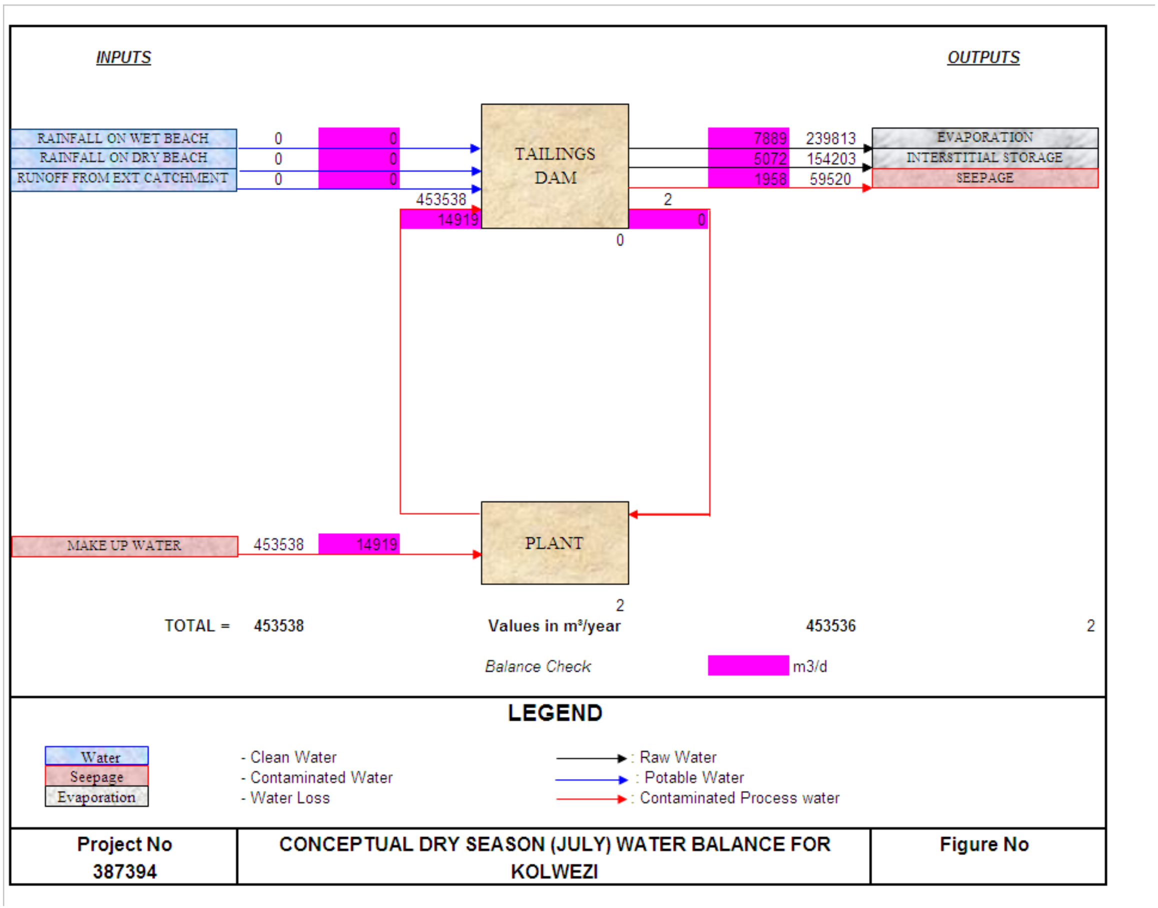


Figure 3.13: Conceptual Dry Season Water Balance for Kolwezi

Figure 3.14: Road and rail links, Lubumbashi to Kolwezi

Figure 3.15: Possible transport routes to and from Kolwezi

Figure 3.16: Fencing, location Construction Camp and Management Camp