17.0 RECOVERY METHODS

17.1 PROCESS PLANT

The proposed Karma process plant design will be based on gold heap leach technology, which will consist of two crushing circuits (for soft and hard ore respectively), agglomeration and stacking, heap leaching with cyanide solution followed by adsorption of the pregnant solution, elution and gold smelting. Services to the process plant will include reagent make-up, storage and distribution, water and air supply.

The heap leach plant is required to process 4 Mtpa of oxide and transition ore for the recovery and extraction of gold, delivered from five separate open pit mines, namely: GGI, GGII, Kao, Rambo and Nami. Only a minimal amount of sulphides, extracted from Rambo and Nami pits, will be processed through the heap leach plant. Sulphide material from GGI, GGII and Kao cannot be treated through heap leaching due to its refractory nature.

Gold will be recovered through heap leaching where the stacked ore is permeated with a dilute solution of cyanide. The gold in the ore dissolves into the cyanide solution and is collected and pumped to a carbon adsorption column. Once sufficient gold has been adsorbed on to the carbon, the loaded carbon will be acid washed prior to elution, followed by reactivation of the eluted carbon. The solution from the elution circuit will be subjected to electrowinning, where gold will be deposited onto cathodes as sludge. Periodically the sludge will be washed off the cathodes and dried. The dried gold sludge will then be smelted to produce gold bullion which will be shipped to a refinery.

The overall flow sheets of the Karma heap leach plant are shown in Figure 17.1 and Figure 17.2 below.

Figure 17.1 Karma Comminution Overall Flowsheet

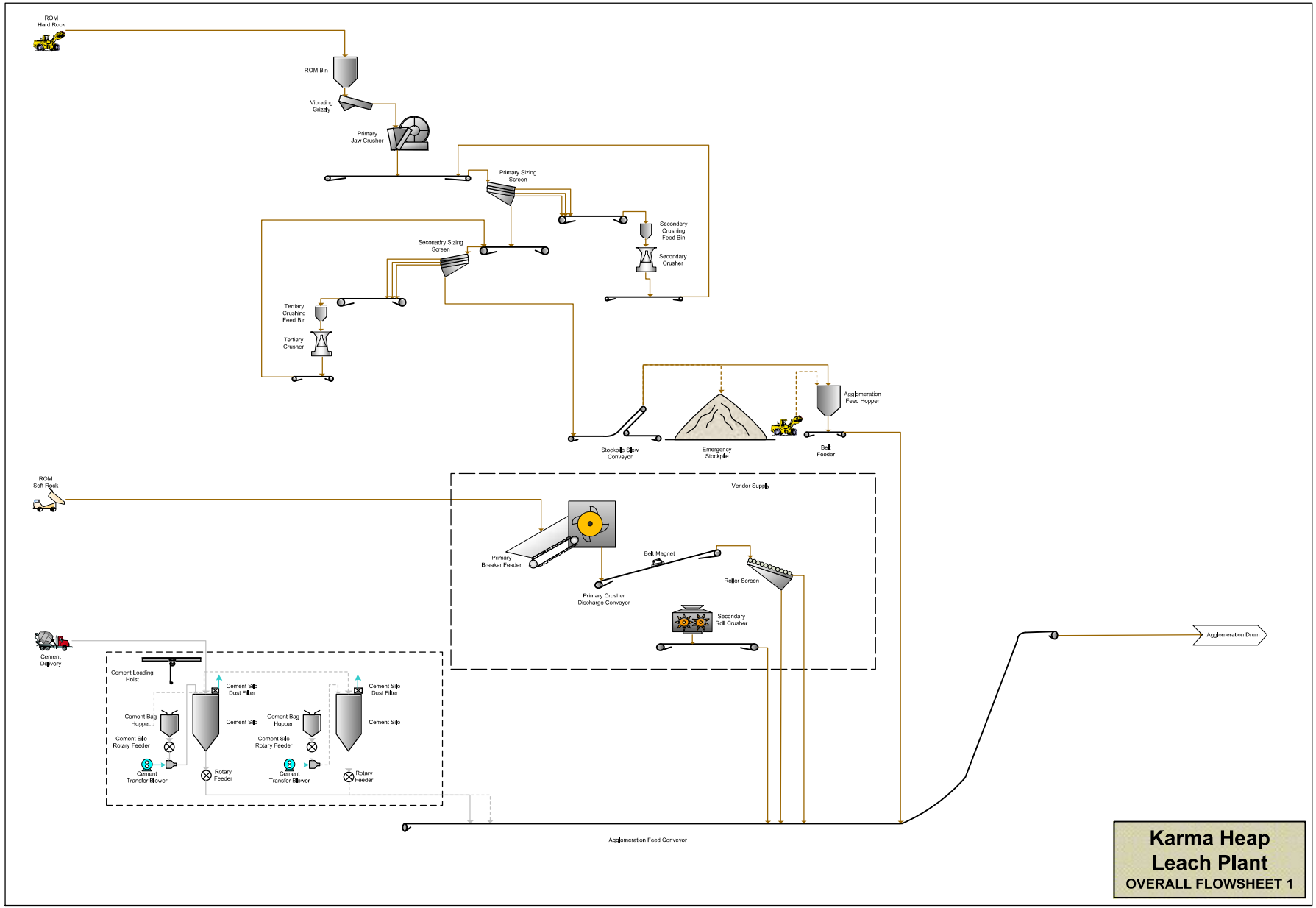
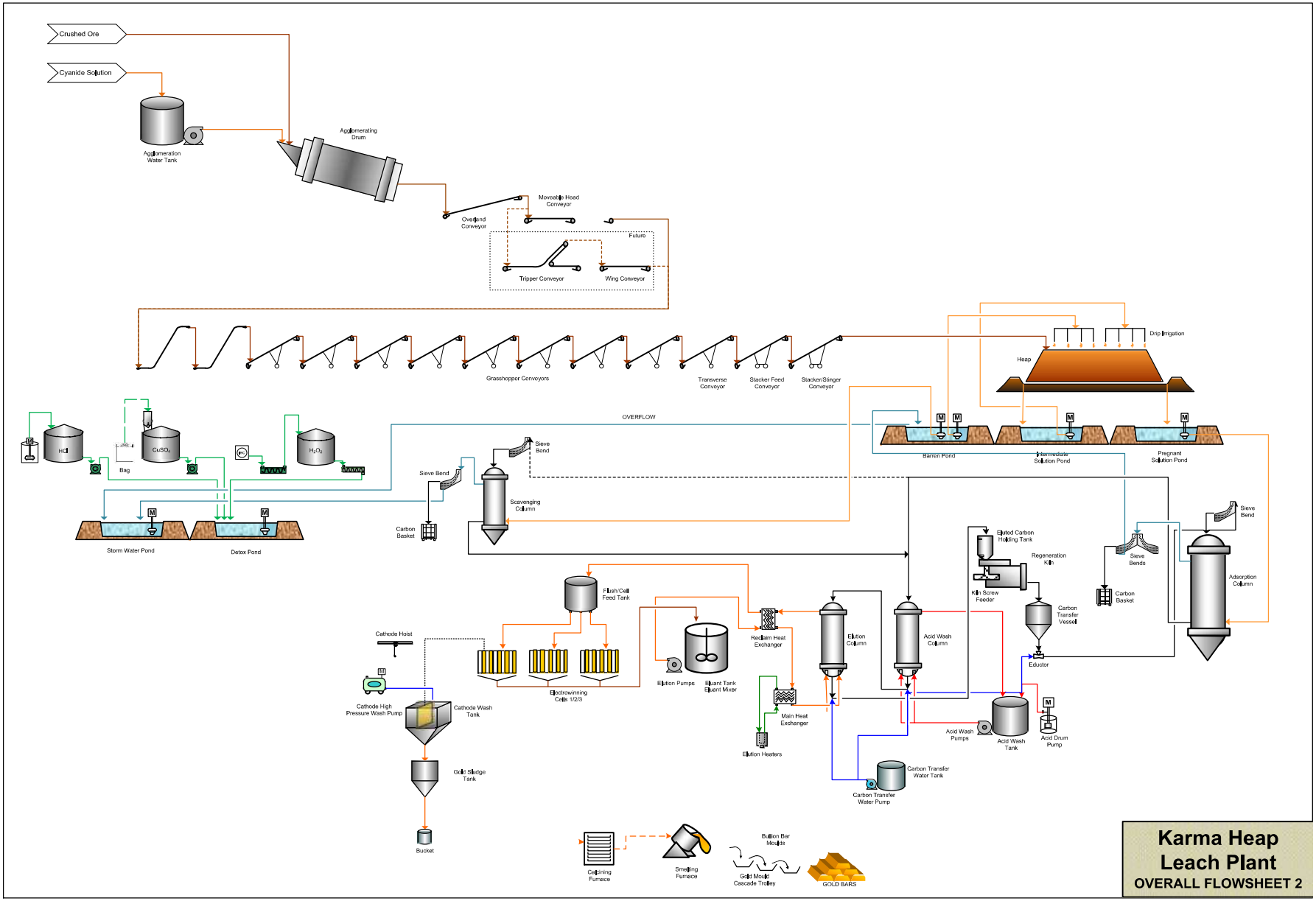


Figure 17.2 Karma Heap Leach & ADR Overall Flowsheet



17.1.1 Mineral Reserve Characteristics

Results from the following tests were used to characterise the ore.

- Selected comminution test results
- Comminution circuit simulations
- Head analyses
- Moisture content

The resulting ore characteristics are tabulated in Table 17.1 through Table 17.3.

TABLE 17.1
OXIDE MINERAL RESERVE CHARACTERISTICS

	Units	Oxides					Source
		GGI	GGII	Kao	Rambo	Nami	
Mineral Reserve Source		Open Pit	Open Pit	Open Pit	Open Pit	Open Pit	Client
Nominal Max Size	mm	600	600	600	600	600	Client
Max Lump Size	mm	849	849	849	849	849	Calculated
Mineral Reserve Head Grade (Au)	g/t	0.95	0.63	1.30	3.87	0.73	PEA
Moisture Content	%	15%	15%	15%	15%	15%	SENET
Specific Gravity		1.94	1.96	1.64	1.78	1.75	Client
Bulk Density of Crushed Ore	t/m^3	1.20	1.20	1.20	1.20	1.20	PEA
Uniaxial Compressive Strength	Mpa	3.09	2.77	0.68	0.31	-	Testwork
Bond Crushability Index	kWh/t	5.9	6.4	3.0	2.1	1.6	Testwork
Ball Mill Work Index	kWh/t	-	8.15	-	-	-	Testwork
Abrasion Index		0.021	0.007	0.003	0.005	0.005	Testwork

TABLE 17.2
TRANSITION MINERAL RESERVE CHARACTERISTICS

	Units	Transition					Source
		GGI	GGII	Kao	Rambo	Nami	
Mineral Reserve Source		Open Pit	Open Pit	Open Pit	Open Pit	Open Pit	Client
Nominal Max Size	mm	600	600	600	600	600	Client
Max Lump Size	mm	849	849	849	849	849	Calculated
Mineral Reserve Head Grade (Au)	g/t	0.60	0.88	0.69	2.98	0.64	PEA
Moisture Content	%	10%	10%	10%	10%	10%	SENET
Specific Gravity		2.30	2.25	2.12	2.37	2.21	Client
Bulk Density of Crushed Ore	t/m^3	1.66	1.66	1.66	1.66	1.66	PEA
Uniaxial Compressive Strength	Mpa	-	-	-	-	-	Testwork
Bond Crushability Index	kWh/t	-	-	-	-	-	Testwork
Rod Mill Work Index	kWh/t	-	-	-	-	-	Testwork
Ball Mill Work Index	kWh/t	-	9.99	10.41	-	11.8	Testwork
Abrasion Index		0.025	0.014	-	-	-	Testwork

TABLE 17.3 SULPHIDE MINERAL RESERVE CHARACTERISTICS				
	Units	Sulphides		Source
		Rambo	Nami	
Mineral Reserve Source		Open Pit	Open Pit	Client
Nominal Max Size	mm	600	600	Client
Max Lump Size	mm	849	849	Calculated
Mineral Reserve Head Grade (Au)	g/t	2.94	0.83	PEA
Moisture Content	%	5%	5%	SENET
Specific Gravity		2.58	2.69	Client
Bulk Density of Crushed Ore	t/m^3	1.66	1.66	PEA
Uniaxial Compressive Strength	Mpa	-	-	Testwork
Bond Crushability Index	kWh/t	-	-	Testwork
Rod Mill Work Index	kWh/t	-	-	Testwork
Ball Mill Work Index	kWh/t	-	16.16	Testwork
Abrasion Index:		-	-	Testwork

17.1.2 Operating Schedule

The majority of the run-of-mine ("ROM") feed will be oxide and transition ore with minimal amounts of sulphide ore. The soft rock crushing circuit equipment availability was aligned to the availability of the agglomeration and stacking systems and included the downtime for planned maintenance and crusher re-lines. The operating schedule is described in Table 17.4.

TABLE 17.4 OPERATING SCHEDULE			
	Units	Design	Source
Soft Rock Crushing			
Days per Year	days	365	Client
Hours per day	hrs	24	Client
Possible hours per annum	hrs/a	8,760	Calculated
Scheduled Maintenance per week	hrs	42.12	Calculated
Scheduled Maintenance per annum	hrs	2,190	Calculated
Availability	%	75	PEA
Available hours per annum	hrs	6,570	Calculated
Productivity	%	71	Calculated
Operating hours per annum	hrs	6,242	Calculated
Crushed Tonnes per annum	t	4,000,000	Client
Crushing tonnes per hour	tph	641	Calculated
Selected Crushing Throughput	tph	650	Calculated
Hard Rock Crushing			
Days per Year	days	365	Client
Hours per Day	hrs	24	Client
Possible Hours per Annum	hrs	8,760	Calculated
Scheduled Maintenance per week	hrs	42	Calculated

TABLE 17.4 OPERATING SCHEDULE			
	Units	**Design**	**Source**
Scheduled Maintenance per annum	hrs	2,190	Calculated
Availability	%	75%	PEA
Available Hours per Annum	hrs	6,570	Calculated
Utilisation	%	95%	SENET
Operating Hours per Annum	hrs	6,242	Calculated
Crushed Tonnes per Annum	t	1,200,000	Client
Crushing Tonnes per Hour	tph	192	Calculated
Selected Crushing Throughput	tph	200	Calculated
Agglomeration and Stacking			
Days per year	days	365	Client
Hours per Day	hrs	24	Client
Possible Hours per Annum	hrs	8,760	Calculated
Scheduled Maintenance per week	hrs	42	Calculated
Scheduled Maintenance per annum	hrs	2,190	Calculated
Availability	%	75%	PEA
Available Hours per Annum	hrs	6,570	Calculated
Utilisation	%	95%	SENET
Operating Hours per Annum	hrs	6,242	Calculated
Agglomerated Tonnes per Annum	t	4,000,000	Client
Agglomerated Tonnes per Hour	tph	641	Calculated
Selected Agglomeration Throughput	tph	650	Calculated
Heap Leach & ADR			
Days per year	days	365	Client
Hours per Day	hrs	24	Client
Possible Hours per Annum	hrs	8,760	Calculated
Scheduled Maintenance per week	hrs	42	Calculated
Scheduled Maintenance per annum	hrs	2 190	Calculated
Availability	%	75%	PEA
Available Hours per Annum	hrs	6,570	Calculated
Utilisation	%	95%	SENET
Productivity	%	71%	Calculated
Operating Hours per Annum	hrs	6,242	Calculated
Leached Tonnes per Annum	t	4,000,000	Client
Leached Tonnes per Hour	tph	641	Calculated
Selected Leached Throughput	tph	650	Calculated

17.1.3 Production

The projected mine processing plant production schedule over the LOM is shown in Table 17.5 to Table 17.7.

TABLE 17.5 PROPOSED OXIDE PRODUCTION SCHEDULE							
Gold Production	**Units**	**Oxides**					**Source**
		GGI	**GGII**	**Kao**	**Rambo**	**Nami**	
Head Grade	g/t	0.95	0.63	1.30	3.87	0.73	PEA
Lab Leach Dissolution	% of HL Feed Grade	92%	90%	96%	95%	95%	Testwork
Plant Leach Dissolution	% of HL Feed Grade	90%	88%	94%	93%	93%	Calculated
Heap Leach Residue	g/t	0.06	0.13	0.05	0.10	0.06	Calculated
Annual Gold	kg	2,142	3,675	2,982	5,480	3,319	Calculated
Annual Gold	oz	68,864	118,152	95,870	176,188	106,704	Calculated

TABLE 17.6 PROPOSED TRANSITION PRODUCTION SCHEDULE							
Gold Production	**Units**	**Transition**					**Source**
		GGI	**GGII**	**Kao**	**Rambo**	**Nami**	
Head Grade	g/t	0.60	0.88	0.69	2.98	0.64	PEA
Lab Leach Dissolution	% of HL Feed Grade	75%	75%	85%	85%	88%	Testwork
Plant Leach Dissolution	% of HL Feed Grade	73%	73%	83%	83%	86%	Calculated
Heap Leach Residue	g/t	0.17	0.39	0.16	0.34	0.12	Calculated
Annual Gold	kg	1,809	4,206	3,123	6,659	3,036	Calculated
Annual Gold	oz	58,156	135,236	100,402	214,102	97,616	Calculated

TABLE 17.7 PROPOSED SULPHIDE PRODUCTION SCHEDULE				
Gold Production	**Units**	**Sulphides**		**Source**
		Rambo	**Nami**	
Head Grade	g/t	2.94	0.83	PEA
Lab Leach Dissolution	% of HL Feed Grade	70%	85%	Testwork
Lab Leach Dissolution Discount	%	2%	2%	Testwork
Plant Leach Dissolution	% of HL Feed Grade	68%	83%	Calculated
Heap Leach Residue	g/t	1.30	0.46	Calculated
Annual Gold	kg	11,041	8,940	Calculated
Annual Gold	oz	354,981	287,424	Calculated

17.1.4 Crushing

There will be two separate crushing stations to treat the soft and hard ore. The soft rock circuit will be partially skid-mounted and moveable and will be supplied as a complete package from a vendor. The hard rock crushing plant will only be required intermittently when the more competent ore is delivered from the pit. The quantity of more competent ore will be minimal compared to the softer material that will be fed to the plant and as a result, the hard rock crushing plant will be moveable.

The soft rock circuit will produce a final product with a top size of 50 mm. This product will be achieved in a two stage crushing circuit employing a feeder-breaker and a double roll crusher. The feeder-breaker will size the ROM material, which will then be discharged onto the primary

product discharge conveyor. The crushed material will be conveyed to the roller screen which will separate the oversize from the undersize. The oversize material from the screen will be discharge into a double roll crusher using a conveyor. The screen undersize and roll crusher product will both discharge directly onto the agglomeration feed conveyor.

The mobile hard rock crushing circuit will produce a final product of 80% passing 1.70 mm. This product will be achieved in a three stage crushing circuit which will be supplied as a complete package from a vendor. A jaw crusher will primarily crush the ROM material, followed by a secondary cone crusher and tertiary hammer mill both in closed circuit with dedicated triple deck screens. The hard rock crushing circuit product will be transferred to the agglomeration feed conveyor via a feed hopper and belt feeder.

17.1.5 Agglomeration and Stacking

An agglomeration drum will be used to eliminate fines in the ore prior to stacking on the heap leach pad. Cement will be used to bind the fine particles in the ore to produce competent agglomerates. Solution will be added into the rotating drum to maintain the critical ore moisture required for optimum agglomeration.

Agglomerated ore will be discharged onto the overland conveyor. The overland conveyor will transfer the ore onto a conveyor system which will deliver the ore onto the heap leach pad. Provision for a stack height of 20 m has been made in the heap leach pad design. The cells have been designed with a lift height of 10 m.

17.1.6 Heap Leach

A leach period of 120 days has been allowed for normal solution flow. Barren solution will be sprayed across the stacked cell via the irrigation system and will dissolve the gold in the agglomerated ore as it percolates through the heap to the pad floor. The gold enriched solution will be collected and gravitate to either the intermediate leach solution ("ILS") pond or pregnant leach solution ("PLS") pond. Excess solution will overflow to the storm water pond.

While the first cell is being irrigated, the second cell will be stacked. The gold enriched solution from the intermediate leach solution pond will be pumped to the second cell to irrigate the agglomerated ore. The solution will be further enriched in order to achieve the desired gold content in the final pregnant solution. The pregnant solution will be pumped from the pregnant pond to the adsorption column.

17.1.7 Adsorption

Pregnant solution will be pumped into the bottom of the adsorption column where it will come into contact with activated carbon in each of the six stages in the column. The solution will then discharge at the top of the column as barren solution and will gravitate through sieve bends to remove any carbon before gravitating to the barren pond to be reused for irrigation on the heaps.

A batch of carbon, loaded with gold, will be extracted from the first stage of the column and will be hydraulically transferred via an eductor to the elution circuit. Carbon will be transferred between the column stages using eductors. The carbon from stage 2 will be transferred to stage 1

(bottom of column) after which carbon from stage 3 will be transferred to stage 2. This will be repeated until stage 6 carbon has been transferred to stage 5.

Fresh or reactivated carbon from regeneration will be added to stage 6 of the column via the dewatering sieve bend installed above the adsorption column to remove the carbon transfer water. The transfer water will gravitate back to the carbon transfer water tank for reuse.

17.1.8 Cyanide Detoxification and Storm Water Control

In cases of high rainfall, run-off from the pads and overflow from the ponds will gravitate to the storm water pond. Any excess solution from the storm water pond will overflow into the detox pond. Detox reagents will be pumped to the detox pond to destroy any residual cyanide. Cyanide destruction will be effected via hydrogen peroxide and copper. Hydrochloric acid ("HCl") will be used to neutralize the alkaline solution prior to pumping into the environment.

During times of high rainfall, excess barren solution will be pumped to the scavenging column prior to being discharged into the storm water pond. The solution discharging from the top of the scavenging column will be directed to the storm water pond, via a sieve bend screen which will catch any fugitive carbon, and collect in a basket. Overflow solution from the storm water will gravitate into the detox pond from where it can either be pumped to the environment or back to the storm water pond for reuse.

17.1.9 Scavenging Column

Barren solution will be pumped into the bottom of the scavenging column where it will come into contact with activated carbon in each of the two stages in the column. The solution will then discharge at the top of the column and will gravitate through a sieve bend to remove any carbon before gravitating to the barren pond. The carbon from the sieve bend oversize will be collected in a carbon basket.

The batch of gold loaded carbon will be removed from the first stage of the column and will be hydraulically transferred via the eductor to the acid wash circuit. Carbon will be transferred between the column stages using eductors whereby the carbon from stage 2 will be transferred to stage 1 (bottom of column). Fresh or reactivated carbon from regeneration will then be added to stage 2 via the dewatering sieve bend installed above the scavenging column to remove the carbon transfer water. The transfer water will gravitate back to the carbon transfer water tank to be reused.

17.1.10 Acid Wash

A cold acid wash circuit capable of taking the full 6 t batch will be included to remove any carbonates that might otherwise foul carbon. The circuit will be designed to acid wash every batch of loaded carbon, before it is eluted, by circulating 3% HCl through the carbon in the acid wash column.

Loaded carbon will be discharged from the adsorption column eductor at the bottom of the column straight into the acid wash column. The carbon batch will be back-washed with raw water to remove any light trash such as slimes, plastic and organic trash captured in the bed. The trash will removed through strainers, and the solution will flow to the barren pond via a gravity

pipeline. The carbon will then be acid washed with dilute hydrochloric acid. The acid wash solution will be emptied to the acid wash tank at the end of the operation.

Once the process of acid wash has been completed and the carbon bed has been neutralized, the pre-treated carbon batch will be hydraulically transferred into the elution column.

17.1.11 Elution

Pressurized Zadra will be used as the elution method. A cyanide-caustic solution will be pumped through the elution column whilst being heated up via the heat exchangers. The pregnant solution will be directed to the electrowinning cells once the temperature exiting the column outlet reaches 130°C. The spent electrolyte from electrowinning will flow back to the elution area. This cycle will continue until the level of contamination becomes unacceptable.

At the end of the elution cycle the stripped carbon will be hydraulically transferred to the regeneration section and the system will be made available to treat the next batch of loaded carbon.

17.1.12 Electrowinning

The eluate from the elution column will be directed to the electrowinning flash/cell feed tank where it will be distributed to the electrowinning cells. Gold will be plated onto stainless steel cathodes as sludge and the barren solution will be circulated back to the elution area.

The loaded cathodes are removed periodically and the sludge will be washed off and collected in the gold sludge tank where it will be manually tapped off into a bucket and taken to the drying oven in the gold room for drying.

17.1.13 Regeneration

Eluted carbon will be transferred hydraulically to the eluted carbon holding tank. Carbon will be withdrawn from the eluted carbon holding tank by a screw feeder, which will discharge the carbon to a diesel-fired rotary kiln for thermal regeneration. Regenerated carbon will be quenched in the quench pan and will pass over a screen to remove fine carbon before gravitating to the eductor tank.

17.1.14 Gold Room

The gold sludge that has been tapped into the bucket will be loaded onto stainless steel trays. The tray will be placed into the drying oven, equipped with a mercury retort for removing mercury from the sludge. The dried sludge, once cooled, will be mixed with fluxes and smelted. The molten charge will be poured into bullion moulds and allowed to cool. The slag phase will be broken away leaving a relatively pure gold bar.

17.1.15 Reagents

Facilities to mix, store and distribute reagents and other consumables will be allowed for in the design. These reagents and consumables will include cyanide, caustic, cement, copper sulphate, hydrogen peroxide, diesel (for plant use only), hydrochloric acid and smelting fluxes. The

reagent consumptions obtained during bench scale laboratory tests were used to estimate the size of the equipment associated with mixing, storage and distribution of the reagents. As reagents are generally classified as a safety risk, safety showers will be incorporated into the design and where there is cyanide usage in high concentrations, hydrogen cyanide detectors will be put in place to give an early warning in the event of formation of detectable HCN gas.

Cyanide

A cyanide make-up and dosing facility will be designed by taking into account total cyanide usage (heap leach and elution), and will allow for two make-ups a day. The storage capacities of cyanide were based on the oxide and transition ores. The sulphide tonnage is minimal over the LOM, compared to the oxide and transition ore.

Caustic

The make-up tank will perform dual purpose as both a mixing and dosing tank. Total caustic usage in the plant (elution and acid neutralisation) was used to determine the size of the tank assuming that a batch is made up every 3 days.

Cement

Due to high consumption required for some of the ore deposits, the cement will preferentially be delivered in bulk and pumped directly from delivery trucks into the storage silos. Provision has been made for a bag hopper feed installation. The cement loading and distribution system will be supplied as a complete package from a vendor. Cement will be added directly onto the agglomeration feed conveyor.

Hydrochloric Acid

The design assumes that hydrochloric acid will be delivered in drums at a concentration of 33% HCl. This will used to acid wash the loaded carbon and in the neutralisation process during detoxification.

Copper Sulphate

The design of copper sulphate make-up and storage facilities for the cyanide detoxification of the plant solution will be based on reducing the residual cyanide level to 1 ppm WAD. The facility will be located close to the detox pond. It will be used in the emergency detox facility should the storm water pond overflow.

Hydrogen Peroxide

Hydrogen peroxide will be delivered to site in iso-bulk containers (IBC) at a concentration of 60%. The facility will also be located close to the detox pond. It will be used for emergency detoxification should the storm water pond overflow.

Activated Carbon

Coconut shell (8 X 16 mesh) activated carbon with high gold adsorption activity and high abrasion resistance properties will be used for the adsorption of gold during leach. The carbon will be delivered in 500 kg bags. A consumption rate of 25 g/t has been assumed. An attritioning tank will be used to treat fresh activated carbon.

Smelting Fluxes

Smelting fluxes; borax, sodium carbonate, and sodium nitrate and silica consumptions will be allowed for in the design.

Diesel

A facility to store diesel in the plant will be designed by taking into account diesel consumed by thermic oil heaters, regeneration kiln and the smelting furnace.

Diesel will be delivered into a diesel storage tank on the plant which will supply the elution and regeneration areas. Diesel will also be supplied to two diesel tanks which will feed the laboratory and the gold room respectively.

17.1.16 Compressed Air Services

Two compressors will be employed in a duty/standby arrangement to provide the required general plant and the instrument air. The air will pass through a filter before being discharged as per demand into the compressed air receiver or into the instrument air dryer. From the compressed air receiver, the general plant air will be distributed where required in the plant. The instrument air will pass through further filtering after drying before it is stored in the air receiver that will distribute to the plant.

17.1.17 Water Services

Raw Water

Raw water will be supplied from the barrage, currently under construction on the Nkambe River and will be pumped via a diesel-driven pump to the storm water pond or the raw water pond. The reagent make-up and top-up water requirement will be transferred into the process water distribution tank. Water for dust suppression and the water treatment plant will be drawn directly from the raw water pond via dedicated pumps. The fire water system will also consist of dedicated pumps and will be drawn directly from the raw water pond.

Potable Water Circuit

Raw water will be treated in the potable water treatment plant where it will be pumped to the potable water storage tank. Potable water will be distributed using a pump and hydrosphere to maintain the required pressure in the potable water header. The safety shower hydrosphere will ensure that the required safety shower water will be available during a power failure.

17.2 HEAP LEACH DESIGN

17.2.1 Introduction

All ore mined from the open pit will be delivered to the ROM pad from where it will be crushed, agglomerated and conveyed to a single, centrally located heap leach pad situated 250 m south of the GGII pit. The pad is located on flat terrain with a low ridge running from east to west across the north western corner of the pad. The pad has been designed to have a slope of 1.0% draining from north to south and 0.5% draining from west to east.

17.2.2 Heap Leach Pad

The final Heap Leach Pad will measure 1,620 m long by 810 m wide and will consist of 42 cells each measuring 75 m wide by 405 m long at the base of the first lift, with the exception of the two easternmost cells which are 110 m wide by 405 m long. The pad will be stacked to a height of 20 m in two lifts of 10 m each. It is anticipated that the Heap Leach Operation will have a life of 8.5 years. The pad will be constructed in three phases as follows:

- The first phase will comprise 9 cells in the south east corner of the pad, and the PLS, ILS, barren, storm and raw water ponds. The first (easternmost) cell will measure 405 m x 110 m at the base, and the rest will be 405 m x 75 m.
- The second phase will be construction of the 9 north-eastern cells (Cells 10 to 18). The cells will have similar dimensions to those adjacent to them in Phase 1.
- The third phase will be construction of the remaining 24 cells (Cells 19 to 42). These cells will all measure 405 m x 75 m.

Layerworks under the pad will consist of a sub-base of locally sourced or in-situ material compacted to 95% Mod AASHTO with a 600 mm layer of selected low permeability material forming the base. The geotechnical investigation has shown that the in-situ ferricrete has a sufficiently low permeability to provide the base if compacted to 95% Mod AASHTO. The overall surface elevation of the pad has been raised above ground level to minimise excavation in the cut/fill operation needed to create the base of the pad. Fill material for the pad layerworks will be sourced from pond excavation and from open pit overburden.

A 1.5 mm thick HDPE liner will be laid directly onto the base to form a composite liner, with a protective layer of needle-punched geofabric placed over it. A 550 mm thick drainage layer of crushed aggregate with a network of slotted pipes will be placed over the liner to provide a stable base for the stacked ore. The drainage system will discharge leachate from each cell into double lined leachate collection channels delivering to either the PLS, ILS or Barren ponds.

17.2.3 Ponds

The PLS, ILS, barren, storm water, raw water and detox ponds are located south-eastern corner of the pad. All except the raw water pond are excavated into natural ground, to enable the pad to drain into them. The raw water pond will contain water pumped from the barrage currently under construction on the Nkambe River and is located above ground.

The ponds have been designed to enable solution to spill from the PLS pond to the ILS pond to the Barren Pond and eventually into the storm water pond.

The required capacity of the PLS, ILS and Barren ponds is 29,600 m^3 each. The ponds will be double lined with 1.5 mm HDPE. A synthetic seepage interception layer will be placed between the two liners

The storm water pond has been designed to contain the runoff from the entire pad plus 8 months process water consumption during the dry season. Allowance has also been made for evaporation losses from the pond. The capacity of the storm water pond is 1.25 million m^3.

The raw water pond has a capacity of 340,000 m^3 and will be constructed above natural ground level. This will provide storage of uncontaminated river water pumped from the barrage on the Nkambe River during the wet season. Allowance has been made for evaporation losses from the pond.

The detox pond is designed to contain spillage or rundown from the plant and has a capacity of 15,000 m^3.

The storm water, raw water and detox ponds will be lined with single 1.5 mm thick HDPE liners.

18.0 PROJECT INFRASTRUCTURE

The location of the Karma Project is currently a 'green fields' site without any existing infrastructure. A gravel road currently passes to the south of the Project through the Kononga village.

The proposed infrastructure for the mining and ore processing operations includes several open pits, waste rock stockpiles, a heap leach pad and related facilities; and maintenance buildings for mobile open pit equipment. Facilities will include office space, change house facilities, an explosives storage area, power supply and distribution networks, fuel storage tanks, a warehouse and laydown area,. The infrastructure on site will be designed to accommodate and support an efficient mining and ore processing operation. A plan of the Project site is provided in Figure 18.1.

The ore processing area of the Project will be located just south of the GGII open pit. Nearby will be the mine maintenance facilities, fresh water storage pond and Project administration facilities. The GGI, Rambo, Nami, and Kao open pits areas will be operated as separate, effectively remote pits.

There will be no camp facilities on site due to the proximity of the town Ouahigouya. Most national employees will live at home in Ouahigouya or the other surrounding villages. During construction, a contractor workforce will be temporarily accommodated in Ouahigouya. During operations, expatriate and senior management staff will also be based in approximately 20 – 30 rented houses in Ouahigouya.

Provision has been made in the mining facilities for the following:

- Approximately 27 kilometres of haul roads;
- Prefabricated mine administration buildings, change house and ablution buildings;
- Mine equipment maintenance facility with six maintenance bays, suitable for the selected mobile mining equipment fleet;
- Fuel storage and refuelling facility, which will be provided by the fuel vender;
- Remotely located explosives storage magazine, designed and constructed in accordance with local regulations.

The heap leach facility and related process plant infrastructure required for the development of the Project includes the following:

- Approximately 1,200 m of plant site roads with a gravel wearing course finish;
- Plant and administration buildings, including control facilities, maintenance facilities, assay laboratories, medical facilities, change house and security.

Other infrastructure required for the development of the Project will include the following:

- A 1.7 km long, 8 m wide site access road;
- Power generation and distribution facilities, which would include a 3.6 MVA connected load diesel generating plant, power distribution transformer substations and above ground cables;

- Storm water drainage, including appropriately placed ditches and culverts. Storm drainage from the leach pad site will be captured and directed to the contaminated water pond;
- A sewage treatment plant, sized to accommodate effluent discharge for a 175 person facility;
- Water supply and distribution network, including a water supply pond, which would take water from the existing barrage, a potable water treatment plant and a fire water distribution system;
- Communications;
- Security;
- Fuel storage

The open pits will be connected to the process area by a series of dedicated haul roads, wide enough to accommodate the width of two nominal 90 t dump trucks. Mining administration, change house and ablution buildings will consist of pre-fabricated buildings to accommodate mining and engineering labour and provide change house and ablution facilities. The mining equipment workshop will consist of a steel-framed and sheet-clad building. Diesel fuel storage for the site will be accommodated within a tank storage facility with a capacity of 560,000 L. Explosives and detonators will be stored separately in secured explosive magazines located adjacent to the mining facilities and at a safe distance from buildings, structures and pits.

The administration building will be a single-storey prefabricated panel construction. The building will include areas for engineering, administration personnel and offices for the general manager, plant superintendent, administration superintendent, plant maintenance superintendent environmental officers and finance staff.

The process plant building will be a single-storey prefabricated building. It will include facilities for the process plant personnel.

The plant maintenance facility will be located beside the process facilities and will include a workshop and offices for maintenance personnel.

A prefabricated change house building will provide male and female change rooms fitted with lockers, showers and ablution facilities.

General plant warehousing will be established adjacent to the administration offices. The plant warehouse building and the reagents and cement warehouse will be steel-framed buildings. The cyanide storage area will comprise a concrete floor, and will be fenced and gated in a locked security area. The cyanide will be stored in the shipping containers supplied with cyanide delivery.

Water for the project will be provided from a barrage (dam) constructed on a tributary to the Nkambe River, 4 km south of the proposed plant site. The barrage on the river will be built in two phases with the first phase providing 50,000 m^3 of water for the community and construction activities. The second phase will have a capacity of 1.2 M m^3, to support operations.

Water will be drawn from the existing barrage during the rainy season and pumped to the process plant raw and storm water ponds. One diesel-powered, skid-mounted pump will be located next to the barrage and will be utilized to recover water during and shortly after the rainy season. This

pump was sized to cater for the three-month wet season, and will be used to fill the raw and storm water ponds to capacity for use throughout the dry season.

A water balance was developed and was used as the basis for sizing the storm and raw water storage ponds. The storm (contaminated) and raw (uncontaminated) water ponds were designed to cater for the entire plant and mining requirements throughout the wet and dry seasons. Water stored in the storm water pond will be pumped to the process plant for heap leach irrigation and plant processing water as required. Water stored in the raw water pond will be used and circulated for dust suppression and for potable water make up as required.

The site layout in Figure 18.1 shows an overall view of the Project site, while Figure 18.2 shows detail of the leach pad, process plant and water storage ponds.

Figure 18.1 Site General Layout

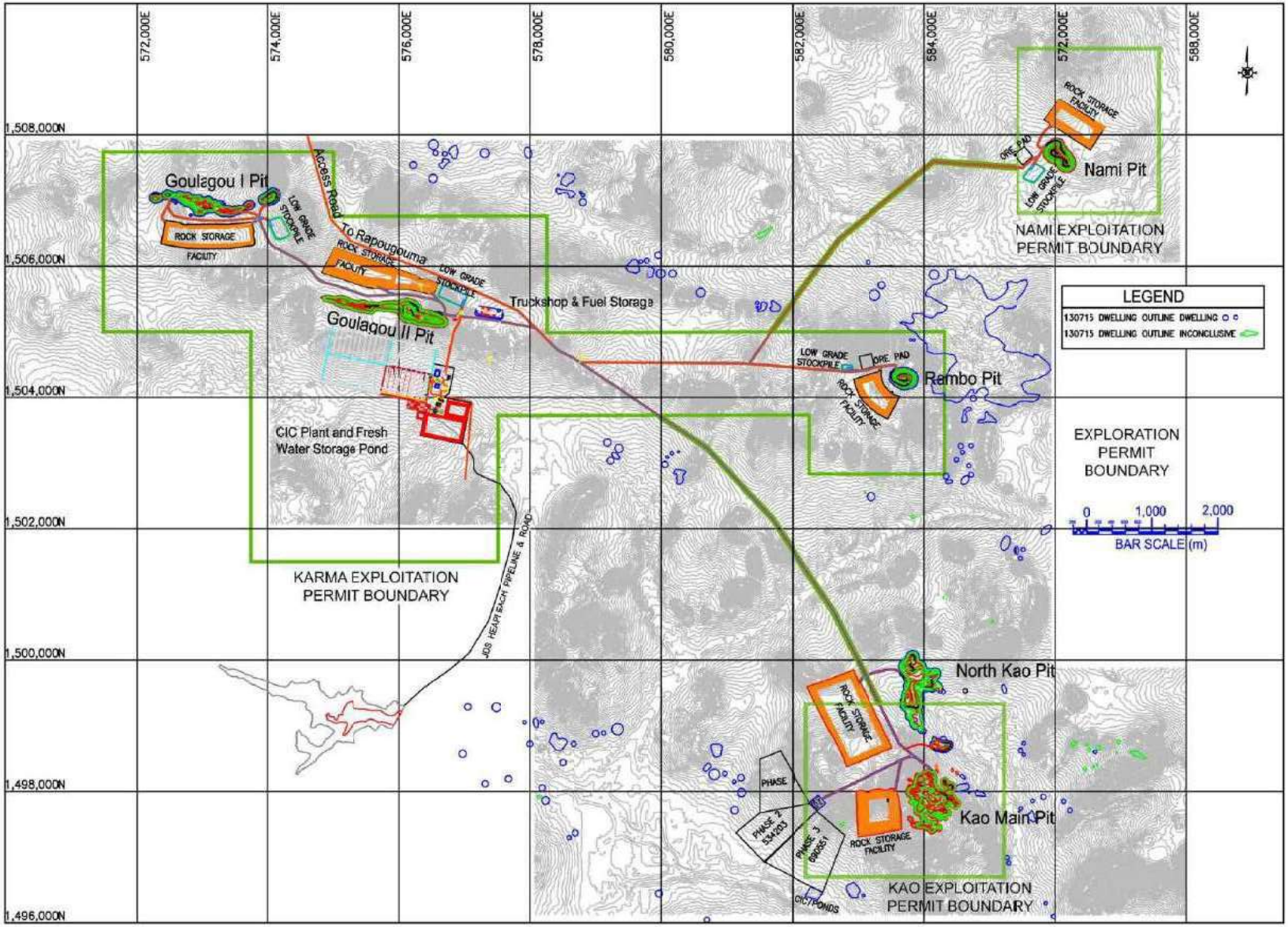
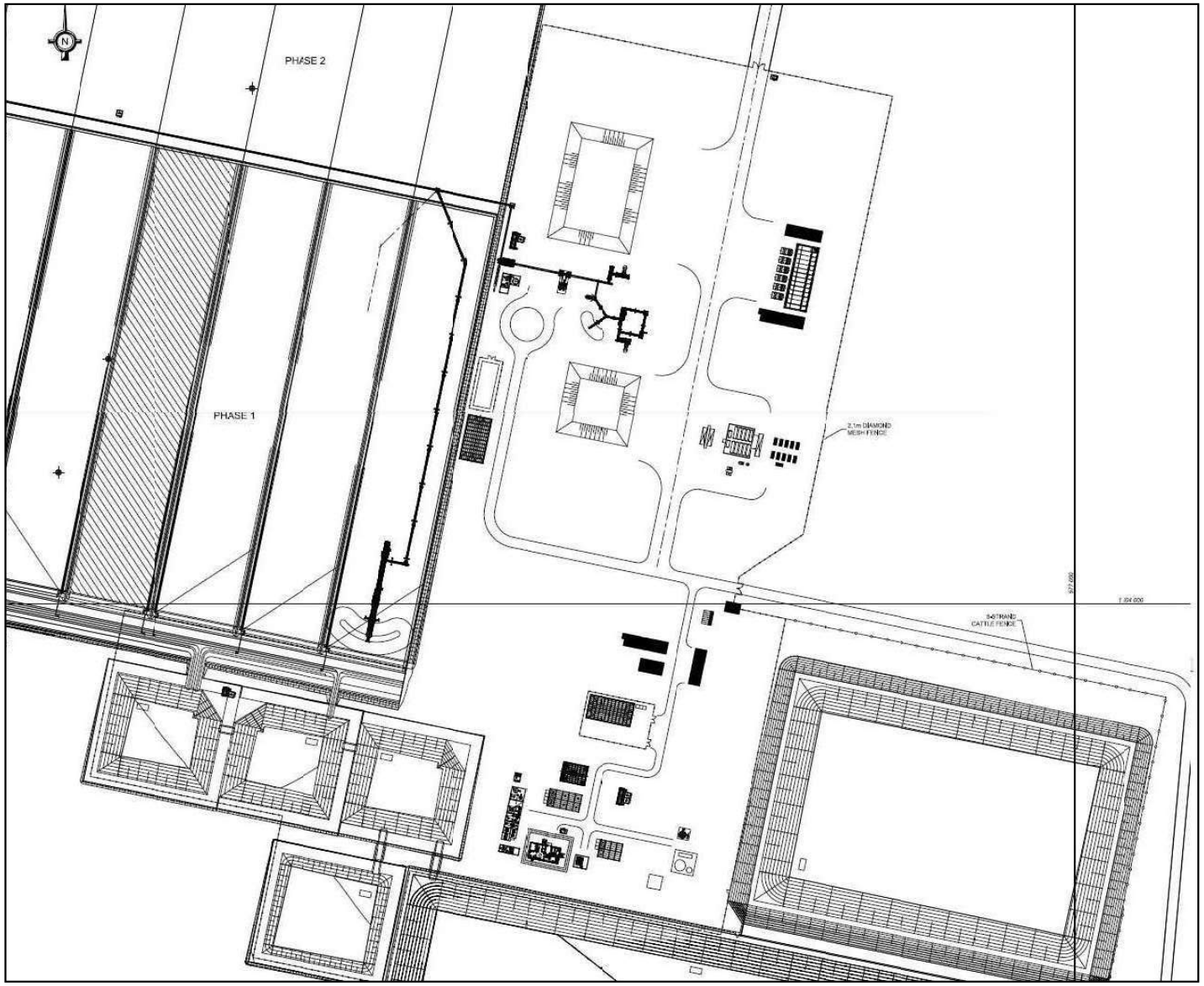


Figure 18.2 Detail Showing Leach Pad, Process Plant and Water Plants



19.0 MARKET STUDIES AND CONTRACTS

19.1 INTRODUCTION

There were no market studies completed or contracts in place in support of this Technical Report. With gold, like other precious metals, all production can generally be sold to any of a number of refineries located around the world. As such, market studies are not required.

Metallurgical process studies confirm that the Project will produce doré gold of a specification comparable with that produced at currently operating mines.

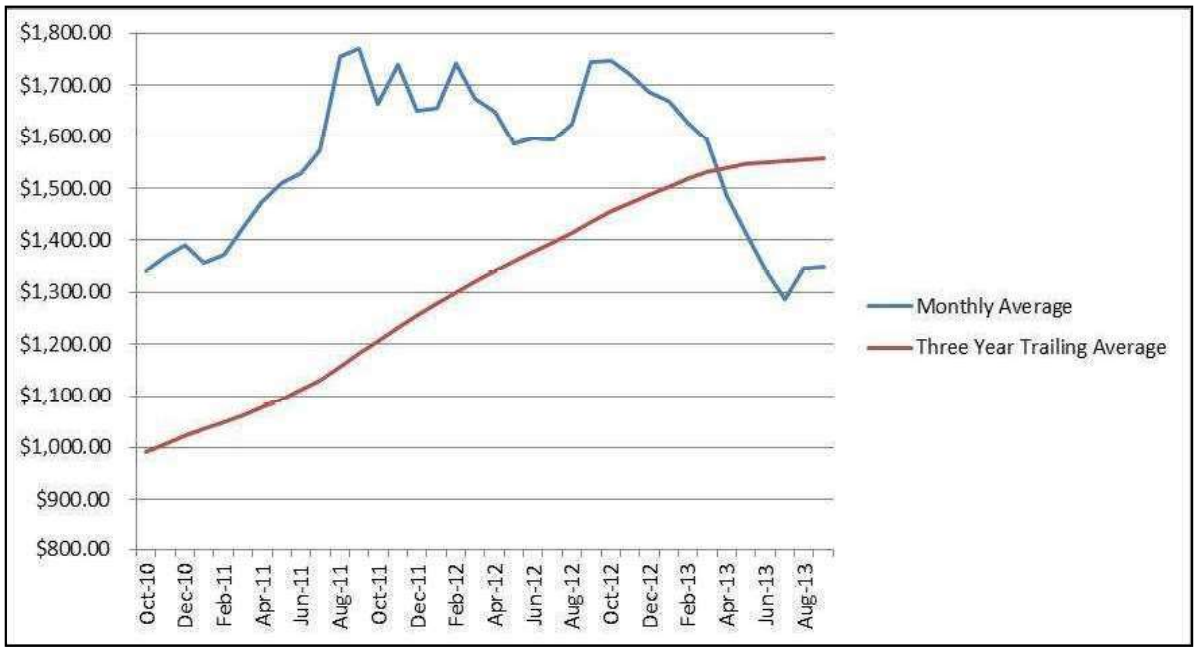
Doré gold produced at the Karma project would be sold to a refinery and the settlement price would be based on the then-current spot price for gold on public markets. There would be no direct marketing of the metal. For the purpose of this study, trailing averages and consensus pricing models were investigated as possible price indicators.

The base case financial model for the Karma Project utilizes a gold price of US$1,250/oz, which is conservative, considering that the 36-month trailing average price for gold that existed on the effective date of this Technical Report was somewhat higher.

19.2 36-MONTH TRAILING AVERAGE GOLD PRICE

Figure 19.1 shows the 36 month historical trailing average prices of gold, leading up to the effective date of this Technical Report. The data is taken from the published London afternoon spot fix. The graph also shows the 36-month trailing average of these values.

Figure 19.1 Last 36 months of Gold Price Data



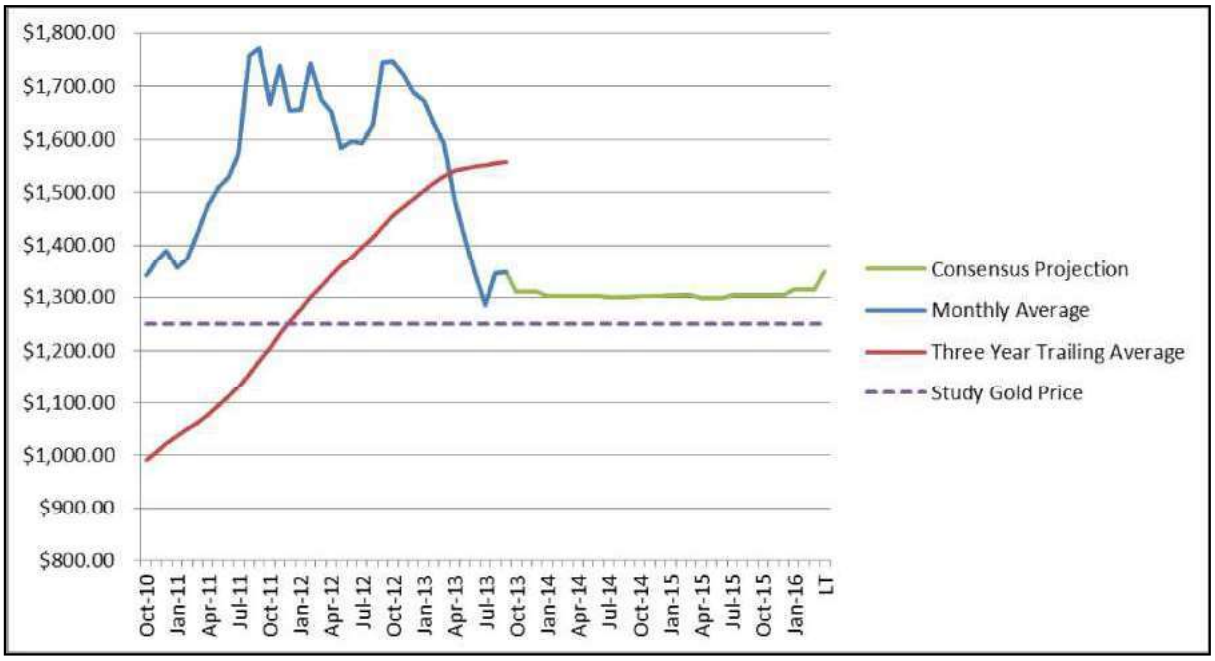
These data points represent the monthly averages of the LBMA afternoon spot fix.

The monthly average ranged from a low of US$1,286.72/oz in July 2013 to a high of US$1,771.88/oz in September 2011. The 36-month trailing average has steadily increased from US$991.18/oz to US$1,557.40/oz over that 36-month period. The 36-month trailing average is peaking and will decline in the coming months.

19.3 CONSENSUS PRICE

Consensus Economics forecasts were obtained and used for the purpose of obtaining consensus pricing. Consensus Economics is one of the world's leading international economic survey organizations and polls more than 700 economists each month to obtain their forecasts and views. The Energy & Metals Consensus Forecasts, (for gold) a quarterly publication used for this study, is the result of a survey of twenty five international banks and financial organizations. Eight of the twenty five institutions have provided long term forecasts. The October 2013 edition was used for this study. The spot price on the day of the survey was US$1,316/oz. Figure 19.2 shows a plot of the 36-months of historical data with 36-month trailing averages as well as a plot of consensus prices from the October 2013. The project gold price is also shown.

Figure 19.2 36-Months of Historical Data, 36- Month Trailing Average and Study Gold Price



19.4 GOLD SALES

Based on the evaluation of 36-month trailing averages and of consensus forecasts, the price which the True Gold Management team has selected for the base line economics of the project is US$1,250/oz. This price is considered to be conservative in nature. For the purposes of this study it has been assumed that the gold produced from the project would be shipped to the Rand Refinery in South Africa. Quotations have been obtained for transporting the bullion (with fully insured contractors) from the Karma site to Ouagadougou. The gold would subsequently be shipped on a commercial airliner to Johannesburg, where it will be transferred to the Rand Refinery.

20.0 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

20.1 ENVIRONMENTAL BASELINE

20.1.1 Environmental Studies

A number of environmental and socio-economic studies have been performed on the project area and several more are in preparation. The environmental and socio-economic baseline for the project is documented in the Environmental and Social Impact Assessment (ESIA) performed by BEGE Consulting in 2011 and 2012. This document was submitted to the Ministry of Environment in April 2012 and approved. The BEGE ESIA was subsequently updated by Roche Consulting Ltd (environment) and MacCormick IMC (social) to reflect the revised project design described in the current DFS.

The approved ESIA for the Karma Project covers an area which encompassed the Goulagou I, Goulagou II, and Rambo deposits. A separate ESIA exists for the Kao deposit for which an Environmental Permit was received January 7, 2014. A third ESIA for the Nami deposit was submitted to the Ministry of Environment on January 15, 2014 and the Nami environmental permit was received on May 28, 2014 (includes approval of the ESIA and relocation program).

In 2013, ANTEA Burkina Faso prepared a Notice of Environmental Impact (NIE) for the then proposed barrage development on the tributary to the Nkambe River which flows along the south border of the project area. The NIE was approved by the Ministry of Environment in March 2013. This approval and ascent from the Ministry of Mines to build a barrage and water holding pond has led to the construction of the first phase of a barrage which will be the source of water for future mine operations.

20.1.2 Terrestrial Environment

20.1.2.1 Regional Setting

Regionally, the Karma property lies within the Birimian Greenstone Belt, a group of altered sedimentary and intrusive rocks recognized to host numerous gold deposits in Mali, Ghana, Burkina Faso, and Niger.

20.1.2.2 Local Setting

The landscape in the project area is characterized by alternating areas covered with hard laterite and transported wind and water-borne sediments. The host rocks are subject to varying degrees of weathering. To a depth of 60-80 m from surface, the host rock is completely weathered to a low-clay saprolite. From 80-110 m weathering decreases until the fresh rock contact is reached below 100 m. The transition from saprolite is generally quite abrupt often taking place over 10 m or less.

20.1.2.3 Deposit Geology

The resource occurs in six separate deposits. Two deposits are hosted in altered volcano-sedimentary rocks, two in altered intrusive rocks, and the last in a mixture of both rock types. In

the Goulagou and Rambo deposits, gold is deposited in a series of shear-hosted, sub-vertical quartz veins surrounded by a halo of lower grade, disseminated mineralization. In the Kao and Nami deposits, the mineralized zones generally occur as a number of stacked, flat-lying sheets. The North Kao deposit is not included in the Feasibility Study.

20.1.2.4 Mineralization

Gold is typically fine in nature with individual particles ranging in size from 10-200 um. Most of the gold above the fresh rock contact is free. In the Goulagou and Kao deposits the gold mineralization in the fresh rock is not readily leachable. In the Rambo and Nami deposits, the gold in the non-weathered rock remains free.

20.1.2.5 Resource

The potentially economic resource defined in the Preliminary Economic Assessment of September 2012 identified mineralized material of 29.3 Mt grading 0.88 g/t containing 828,000 oz (25.8 t) of gold. This material was associated with 72.7 Mt of non-mineralized material resulting in a possible strip ratio of 2.5:1.

This potentially mineable resource has been replaced by mineral reserves as defined in this document and the DFS at 33.2 Mt ore grading 0.89 g/t containing 949,000 oz (29.5 t) of gold. This material is associated with 80.6 Mt of waste resulting in a strip ratio of 2.4:1 and total material of 113.8 Mt.

20.1.3 Geomorphology

20.1.3.1 Topography

The project area lies at an elevation of 300-350 m ASL. The terrain is generally flat with total relief across the property of about 15-20 m. The highest feature on the property is about 50 m in height and lies between Goulagou I and II. The land surface undulates gently, broken intermittently by small laterite hills and shallow drainages. The general slope of the land is to the south at 2-3% where a broad, dry river valley defines the southern margin of the project area.

20.1.3.2 Soil

Much of the property is covered by shallow soils from which soluble salts and minerals have been leached. When found to overlie hard or cemented gravel and rocks these soils are known as lithosols and leptosols. Other soils present are products of erosion and/or intense tropical weathering. These soils exhibit significant subsurface accumulations of clay and are classified as Cambisols and Lixisols. Most of the soils in the area are iron-rich due to the widespread presence of “cuirasse” or hard laterite on the property. In river valleys and drainages saturated, clay-rich soils known as Gleysols can be found but account for only a small proportion of all soils present.

Surveys indicate that much of the project area is unsuited to agriculture. About 25% of the land has no agricultural value while another 35% has limited value for farming. The remaining 40% of the land has is marginally to moderately suited to the cultivation of rain-fed cereals and legumes. Less than 1% of the land in the project area is suited to growing high-value crops such

as rice and vegetables. The factors limiting the value of the land for agricultural purposes are shallow soil depth, soil erosion, water availability, and low organic content.

In general, soils in the project area which have not been exposed to artisanal mining activities show no pollution in the form of mercury, cyanide, or heavy metals while soils located where artisanal mining has been conducted are often found to possess contaminant levels higher than established guidelines.

20.1.4 Hydrology

20.1.4.1 Surface Water

The main surface water flow in the project area is a tributary to the Nkambe (White Volta) River which runs roughly west to east about 4 km south of the plant site during the rainy season, June to September. Due to the low topographic relief of the area the river is extremely shallow, typically no more than 1-2 m in depth, but may reach a width of 200-300 m during the height of flow each year.

At the location of the barrage site, the average annual flow is 22 M m^3. This can vary from 7 M m^3 during the 1/10 year low flow year to as much as 40 M m^3 in the 1/10 year high flow year. In a typical year, the river valley is dry by the end of December while man-made and natural pools or reservoirs generally persist until March. Based on the operating requirements of the mine, 1.2 M m^3 annually, there is sufficient flow to support operations without unduly impacting downstream water users.

Chemical analyses of water samples taken from major drainages running south and east of the project area during the rainy season indicate that surface waters have been contaminated due to artisanal mining activities. Contamination occurs in the form of mercury, iron, manganese, and ammonium. Pollution is a result of (1) illegal, crude, small-scale gold processing operations, (2) mobilization of naturally occurring contaminants due to unmanaged excavation, and (3) uncontrolled use of fertilizers.

Concentrations of iron and manganese generally run 5-20x the allowable limit set for international drinking water standards. Mercury and ammonium concentrations can typically be found at levels 3-5x and 2-3x the allowable limits, respectively.

20.1.4.2 Groundwater

Groundwater conditions were investigated by drilling ten test wells, two in each open pit. Despite being sited to intersect prospective water-bearing structures only two of the ten bores encountered water and neither of those produced sufficient quantity to conduct pump tests. Most water appears to be concentrated near the fresh rock contact.

Water does exist in the saprolite at depths of 10 m or more below surface but the transmissivity of the material is so low (1 x 10-8 m/s) that subsurface flow is nominal and outflows are extremely limited. Evaporation is expected to match or exceed the amount of water released from the surrounding rock as the result of mining eliminating groundwater-related risk to the design of pit slopes and eliminating the need for continuous dewatering of excavations.

In the river valley bottom to the south of the plant site geotechnical test pits encountered water a depth of 5 m at the height of the dry season. Once exposed, however, this entrapped water evaporated quickly with no recharge. Test bores in the valley bottom returned flows of 0.5-4.0 m^3/hr, 1 km up and downstream from the proposed barrage site.

Baseline monitoring of groundwater in the project area is conducted monthly from a series of ten monitoring wells located near the future location of the open pits and process facilities. The wells were drilled 60-100 m in depth through the fresh rock contact. Only six of the ten wells have measurable water levels. Generally, yields resulting from pump tests range from 0.5-2 m^3/hr. Measurement of borehole water levels and chemical analyses are performed on a regular basis.

Chemically, groundwater in the project area generally meets local drinking water standards. Exceptions include naturally occurring contamination from manganese, lead, and arsenic. In the southeastern part of property, naturally occurring arsenic at concentrations of 2-10x the threshold set by international standards for drinking water has rendered water from some wells undrinkable. The health effects on the local population who have no alternate sources of drinking water are evident.

20.1.5 Atmospheric

20.1.5.1 Climate

The climate in the project area is classified as Sahelian. It is characterized by a short wet season, June to September, and a long dry season, October to May. Precipitation ranges from 300-750 mm annually with a recent average of about 600 mm.

Temperatures range from minimum of about 10°C to maximums over 50°C. The hottest months are March to May when average temperatures are between 30°C and 40°C. The coolest months are from December to February when temperatures can average 15°C-25°C.

The Harmattan wind blows south from the Sahara across Burkina Faso from December to June. From December to February the “Cool Harmattan” blows followed by the “Hot Harmattan” in March until June.

The average annual wind speed is 2.3 m/s. November is the least windy month with an average wind speed of 1.6 m/s. June is the windiest month with an average wind speed of 3.2 m/s, however, as the rainy season approaches severe storms with winds up to 120 km/hr can occur.

The project area receives, on average, nine hours of sunshine daily. Evaporation is significant, roughly 3000 mm or 5x annual precipitation. Relative humidity is highest in July and August during the rainy season and lowest from February to March during the “Hot Harmattan”.

20.1.6 Biological

20.1.6.1 Vegetation

There are a number of vegetation zones in the project area. Their presence is strongly related to proximity to water and human activities. Barren land, shrub-steppe, grassland, forest, and

riparian zones all occur naturally and generally correspond to the increasing presence of water. Irrigation of cultivated land may enrich naturally occurring vegetation located nearby.

The most common vegetation in the project area is desert scrub. These plants a number of species from the family Combretacae including Saba and Acacia as well numerous other hardy shrubs and grasses. Human activities in the form of agriculture, pastoralism, artisanal mining, and destruction of wooded areas to generate firewood have had a distinct impact on the vegetation in the project area.

Naturally occurring wooded and shrub-steppe areas feature Combretacae-type shrubs as well as Acacia, Shea, Zanga, and Baobab trees. Reforestation programs have introduced Rasinier and Nere trees to augment indigenous species. Plantations located near cultivated land and drainages where water is more plentiful contain Eucalyptus, Mango, and Neem trees.

Users of forest products in the project area include herders, tree-cutters, healers, and artisans. It is notable that women and children depend on trees and plants in order to perform many of these roles. Degradation of plants due to climate change and human activities has caused some species to disappear. Efforts have been made to reverse this trend by the introduction of drought-resistant varieties but the trend is a general decline in the health of natural vegetation.

True grasslands exist for only a short time each year after the rains. Pastoralism is practiced widely with cattle, sheep, and goats foraging in the woods and steppe as they are able, however, the quality of feed is poor. The potential for damage to an already fragile ecosystem from overgrazing is high.

20.1.6.2 Wildlife

There are few large animals in the project area due to habitat destruction resulting from increasing human population and activity. Warthogs, porcupines, monkeys, and hares are all disappearing. Avian fauna is more diverse given the presence of scattered woodlands and forest. Guinea fowl, francolin, parrots, hornbills, weavers, doves, crows, hawks, and vultures can all be found on the property. The dry, desert-like environment supports numerous varieties of snakes, lizards, arthropods, and insects.

The aquatic environment, although seasonal in nature, supports a diverse collection of species. Tilapia and catfish can be found in the tributaries to the Nkambe River during the rainy season. Stocks in the Bagyalgo barrage are sufficient to support subsistence fishing. The small barrage at Barelgo is home to 10-20 crocodiles between June and November. Aquatic birds in the area include herons, ducks, teal, kingfisher, and egrets.

20.2 SOCIOECONOMIC

20.2.1 Introduction

The Karma Gold Project lies almost entirely within the Department of Namissiguima. A very small part of the land affected by the development of the barrage falls inside the boundaries of the Department of Oula. Both of these areas are characterized by large undeveloped tracts of land, poor infrastructure, and a largely rural population.

In the Department of Namissiguima there are two towns and five villages in the immediate project area. The towns are Ramatoulaye and Namissiguima located at the east end of the project area. The villages are Kononga and Barelgo located near Goulagou I and II, Nogo and Koswende located south of the Goulagous, and Boulonga situated on the northern edge of Kao. In the Department of Oula, the principal village affected by the development is Lougouri-Weogo located in the river valley about 3 km south of Nogo.

20.2.2 Population

In 2013 the total population of the Department of Namissiguima was approximately 40,000. The population in the project area itself numbers about 12,000. About 7,000 people reside in the combined towns of Ramatoulaye and Namissiguima with the remainder distributed throughout the rural villages. The largest of the villages is Kononga with a population of about 1,500. Lougouri-Weogo in the Department of Oula has a population of approximately 85.

It is notable that among the residents of the project area, 75% are under the age of 35 and more than 50% have an age less than 20. There are slightly more men than women. This demographic is amplified in the dry season when lack of water makes it impossible to farm and young men of working age travel to the cities in search of employment.

20.2.3 Ethnicity

Most of the residents in the project area belong to the Mossi tribe. The ancestry of many area residents stretches back to other parts of Burkina Faso and Mali over the last few hundred years. As people settled in the region they inter-married with the indigenous Mossi and adopted their customs and language. The local language spoken in the project area is Moore. This process of assimilation and integration continues today with the Fulani, migrants who settled in the region recently and have become part of the existing villages.

20.2.4 Religion

Nation-wide, Burkina Faso is about 50/50 Muslim and Christian. In the project area, the proportion is about 80/20 Muslim and Christian. Despite the disparity, followers of the two faiths coexist in the region in harmony. Most of the people in the rural areas maintain some connection to their animist roots. Regardless of the modern religions they have adopted, traditional beliefs present a unifying force that binds the local society together.

The Mosque at Ramatoulaye is considered to be one of the most sacred sites in West Africa for Muslims. It is the destination for pilgrims in the region who do not have the resources to go to Mecca. The Chiek who presides over the mosque has a following of over four million in Burkina Faso.

20.2.5 Health

The most prevalent disease in the project area is malaria. Over 50% of all sickness treated in the region is malaria which is followed in prevalence by acute respiratory illness, diarrhea, and HIV/AIDS. Life expectancy in Namissiguima Department has increased over the last ten years from 46 to 56 years of age but this figure is still far less than that expected in more developed countries.

Malnutrition is a serious concern but fluctuates depending on climate and the annual harvest. In 2010, in Namissiguima Department, a poor harvest resulted in moderate to acute malnutrition in 35,000 of 80,000 children up to the age of five.

Namissiguima has a clinic staffed by six nurses which serves residents of the project area. It is poorly equipped and supplied. The local authorities struggle to find doctors willing to live and work in rural areas. A new hospital exists in Ouahugouya. It is well equipped but the staff needs training to ensure that community gets the full benefit of the facility.

20.2.6 Education

There are 24 public schools in the Department of Namissiguima which serve 4,700 students. There are also 12 Islamic schools. There is only one high school in the region. In 2010, 3,500 students applied for enrollment but only 1,200 could be accepted due to lack of capacity. Class sizes are large ranging from 50-100 students each which diminishes the quality of education.

A large portion of the population in the project area is functionally illiterate. The biggest issues facing education are insufficient housing for teachers, poor classroom conditions, lack of water and latrines in some schools, and poverty among the population at large which makes it difficult for people to recognize the value of education.

20.2.7 Government

The Department of Namissiguima lies in Yatenga province. The province is administered by the governor. Under the governor are the High Commissioner and the Secretary General. The High Commissioner exercises government policy and law in the departments through the department Prefet. The Secretary General provides administration and services to the various departments through the Mayor.

A parallel tribal system exists which organizes and manages affairs in the province in a traditional manner. The king of Yatenga Province, the Naba Kiba, rules over all the village chiefs in the province. The chiefs administer affairs in their own villages with the assistance of their advisors. Among these is the CVD, whose role is to manage the land and land-related activities controlled by each chief. It is through the CVD that the traditional and state-sponsored administrations connect.

The populace of Yatenga province is strong supporter of the ruling political party in the country, the CDP. In the last state elections, the CDP garnered 71% of the vote in Yatenga province. The next federal election is scheduled for January 2015.

20.2.8 Land Tenure

Land ownership is of two types: traditional and legal. Traditional land ownership is a function of ancestry or conferred by the village chiefs who, in the traditional system, own all the land and portion it out to members of the tribe. Some residents also have legal title to their land. Legal title is granted by the state and administered by the provincial and municipal authorities.

20.2.9 Housing

Three types of housing exist in the project area. In rural villages, construction is dominated by traditional mud huts with straw roofs. More affluent residents may have metal-roofed mud homes. In the towns building are more frequently constructed of concrete but mud-built structures are still common.

20.2.10 Water

The only river in the project area is a tributary to the Nkambe (White Volta) which runs seasonally about 4 km south of the proposed plant site. There are three main barrages in Namissiguima Department at Tougon, Namissiguima, and Bagyalgo. Throughout the department most villages are supplied by boreholes fitted with pumps or wells which number seventy-three and twelve respectively. The standard ratio in Burkina Faso of boreholes to people is 1/300 but in the project area it is 1/477.

20.2.11 Infrastructure

The project area is served by two unimproved dirt roads which run along the north and south margins of the property from Ouahigouya to Namissiguima. One trucking company with two trucks and buses provide transport for goods and people. Private vehicles are generally confined to bicycles, motos, and a few private cars.

A low voltage power line runs along the northern road from Ouahigouya to Ramatoulaye. There are few fixed telephone lines. Residents rely on cellular telephone coverage for communication which is good. Two national radio stations broadcast in the area. A number of newspapers are available but "news" is published on a payment basis and so is not objective or reliable.

20.2.12 Employment

20.2.12.1 Farming

Agriculture is by far the most prevalent form of employment in the project area. More than 95% of the residents are engaged in subsistence farming. Crops most commonly grown are sorghum, millet, and maize. Where sufficient water is available rice and vegetables are also grown both for personal consumption and as cash crops. Issues affecting the success of farming in the project area include lack of water, poor soil, and lack of equipment. Lack of knowledge results in poor agricultural practices such as overgrazing and lack of crop rotation.

20.2.12.2 Livestock Breeding

Raising, herding, and breeding livestock is a common activity in the project area. Namissiguima Department accounts for 9% of the livestock in Yatenga province. Cattle, goats, sheep, pigs, and chickens are the most common domestic animals raised in the area. Overgrazing is a common occurrence. Theft, a lack of pasture and veterinarians, and poor knowledge of sound livestock management practices all present challenges to animal breeders.

20.2.12.3 Commerce

Trade and commerce are an important activity. Town and village markets are held weekly in established centres. The manufacture and sale of handicrafts has potential to help stimulate the local economy but poor access to markets has the industry in decline in the project area. In general trade and commerce are severely hampered by poor roads, limited transport, illiteracy, and a lack of investment.

20.2.12.4 Gold Mining

Artisanal mining or orpaillage is an important and growing source of income in the project area. Miners are of two types: residents and migrants. Residents are local people, mostly women and children, who work local deposits by hand during the dry season when agriculture is limited or not possible. Migrants may be individuals who drift through the area hoping to find a likely spot to work or more often, bands of workers, organized, equipped, and financed by gold buyers.

Artisanal mining is difficult, usually dangerous, work that can involve the use of child labour, mercury, and cyanide. Organized migrant mining is often associated with organized crime and brings with it various social and legal issues that make it undesirable. It is the objective of modern industrial developments to provide the local residents with alternatives to this sort of labour.

20.3 ENVIRONMENTAL MANAGEMENT

20.3.1 Air Quality Management

20.3.1.1 Introduction

The three primary sources of airborne impact on the project area environment are dust, emissions, and noise. Air quality in the project area is generally good as there is presently little industrial activity to generate impacts. The greatest current source of made-made dust in the project area is from vehicles. The limited amount of traffic at present results in this having little impact.

20.3.1.2 Dust

Dust can affect the health of plants and trees, that of workers, the neighbouring population, and general aesthetics of the project area. Dust occurs naturally or through various project activities. Wind-blown dust is most prevalent from December to May when the Harmattan wind blows from the north off the Sahara. Monitoring carried out since the end of October 2013 has shown that background dust concentration regularly exceeds IFC/World Bank guidelines for PM2.5 and PM10.

During the pre-production and construction phases of the project, earthmoving and heavy and light vehicle traffic will generate dust. During production, mining, blasting, crushing and conveying operations will also be potential dust producers.

The effects of dust will be mitigated through prevention and implementation of controls. Prevention seeks to keep dust from being generated. Examples of dust prevention to be used are

organic-based binders like molasses and pine-tar that can spread on the surface of roads. These agents are effective for a period of months before reapplication is required and, unlike magnesium and calcium chloride, are environmentally benign.

Dust controls include water sprays in the ROM bin and at transfer points on conveyors between the crushing/sizing circuits and the leach pad. Transfer points will be enclosed where ever possible and equipment will be designed and laid-out to facilitate clean-up minimizing the build-up of fine, dust-generating material. Employees in the plant area will wash equipment down with water to ensure that clean-up itself does not expose personnel to inhaled dust hazards. Dust masks and respirators will be mandatory when working in areas where dust hazards exist.

Mining operations will employ two 30,000 L capacity water trucks to suppress dust generated by mobile mining equipment, particularly haul trucks. It is estimated that the mine will consume about 35,000 m^3 of water per month for dust suppression. Adherence to the prescribed traffic plan, following designated routes, and observing maximum speed limits of 50 kph will enhance dust suppression efforts while limiting dust generation.

Wind-blown dust from waste rock stockpiles will be addressed through progressive reclamation. As each 20 m lift of a stockpile is completed it will be re-sloped and re-vegetated to fix the soil in place. The soft nature of the rock will allow blasting to be minimized which will contribute to less dust and fewer emissions.

20.3.1.3 Emissions

The primary source of emissions from project activities will be vehicle and engine exhaust. The mining fleet and the diesel-powered generators which will generate electricity for the site are the two major contributors to CO_2 and NO_x emissions. Reducing the project's carbon footprint assists in limiting global warming and its effects on climate change. A "No-Idle" policy and regular preventative maintenance of vehicles and equipment will minimize harmful emissions.

Other minor sources of emissions include gases generated during blasting, emissions from the gold furnace and carbon regeneration kiln, and emissions from the burning of solid waste. None of these will have a significant impact on project area air quality due to the small quantities of gas generated. Generally, contaminants from these activities will be rapidly diluted to non-measurable levels as they enter the atmosphere.

Greenhouse gas emissions for the fleet, the generators and the explosives have been estimated to less than 20,000 tons of CO_2 equivalent per year.

20.3.1.4 Noise

Noise from construction and production activities can cause health effects and annoyance for both workers and the community. The two largest sources of noise will be the crushing/sizing circuit and the mining fleet. To attenuate noise from operations to reasonable background levels (55 dB during daytime and 45 dB during night-time as per IFC/World Bank guidelines), the project has been designed so that no community or home is closer than 250 m to mine infrastructure.

The Rambo Pit, in particular, is close (1000 m) to the towns of Ramatoulaye and Namissiguima. The Rambo Pit, however, is the smallest of all five open pits. For this reason, the pit can be mined less intensely with less equipment generating less noise than if the entire fleet was working there. Blasting when required will only be conducted once the pit gets deeper thus the sound will be blocked to a large degree by the walls of the pit. If necessary, measures may be implemented to muffle blasts using rubber mats similar to those employed by quarries located in the midst of towns and villages in Europe and North America.

The other area most subject to the noise of operations will be Barelgo which is located near the plant site. The soft nature of the material will reduce the noise generated during crushing and sizing. As the bulk of the village is over 300 m distant from the work site noise generated by equipment will not exceed permissible limits. Modelling has been carried out for the estimation of noise levels at Barelgo during the operation phase. The 45 dB night-time IFC/World Bank guideline will be respected following the establishment of a 10 m berm along the access road to the ore treatment area.

A notable feature of the development is that mining will move sequentially from one pit to next. For this reason, no single area except that near the plant site will be subjected to noise from operations for more than 2-3 years over the entire mine life.

20.3.1.5 Monitoring

Noise levels and air quality parameters in the project area have been measured as part of baseline monitoring so that a comparison can be made to those experienced during construction and operations. Monitoring will be done monthly and the results of monitoring reported to the Community Liaison Committee (CLC) and discussed at regular meetings.

20.3.2 Water Quality Management

20.3.2.1 Water Supply

Water to sustain operations will be captured during the rainy season in a barrage constructed on the river which flows seasonally, 4 km south of the proposed plant site. A 2.5 m high, armored, compacted-earth dam will be built across the river in two phases with the second phase completed before the rainy season preceding the start of operations. The dam will be submersible in nature eliminating the need for a spillway and minimizing the potential for flooding during high flow years.

During the rainy season, water will be pumped from the barrage to a Raw Water Storage Pond at the plant site with a capacity of approximately 300,000 m^3. The Raw Water Storage Pond will overflow to a Storm Water Holding Pond with a capacity of 1.2 M m^3. At the end of each rainy season, both the Raw Water and Storm Water ponds will be full to capacity as a result of pumping from the barrage, direct precipitation, and collection of runoff from the site. This water will be used to support operations until the next rainy season.

Similarly, at the end of the rainy season, the barrage will be full. This water will be available for the free use of the local community. Given the low relief at the dam site, water in the barrage is expected to last until March when it will go dry until it is refilled by the rains starting again in

June. Options are under consideration to keep the barrage full year-round and include raising the dam height or excavating the barrage basin.

20.3.2.2 Water Balance

Total annual water usage by operations is approximately 1.65 M m^3 including 1.2 M m^3 for heap leach operations, 400,000 m^3 for dust suppression, and 50,000 m^3 of potable water for drinking, ablutions, and safety showers. A further 300,000 m^3 is expected to evaporate over the course of year from storage ponds. Offsetting this is about 750,000 m^3 of water added to the system through direct precipitation and collection of runoff from the open pits and excess water from the leach pad. As a result, the total amount of raw water required to meet operational needs each year is 1.2 M m^3.

20.3.2.3 Solution Containment

Water used in processing will contain dissolved sodium cyanide which is toxic to most biological life-forms. Effective containment of the heap leach solution will be achieved through the use of a multiple-liner containment system.

The pad is founded on a widespread area of naturally occurring ferricrete, iron-rich lateritic soil hardened to the consistency of concrete by the effects of heat and oxygen. This material exists in a layer 5-15 m thick and has extremely low transmissivity on the order of 1 x 10-10 m/s. The ferricrete overlies the host saprolite, a clay-like decomposed rock with a transmissivity almost as low as the ferricrete at 1 x 10-8 m/s.

Above the ferricrete is a filter sand leak detection layer and on top of that is an impermeable 1.5 mil HDPE plastic liner. Numerical groundwater modeling shows that if the plastic liner were accidentally punctured, then the impervious material beneath would allow a contaminant plume to spread only 50 m from the site of the puncture over a period of 50 years.

20.3.2.4 Excess Water Management and Detoxification

The Storm Water Storage Pond is designed with enough capacity to contain the inflow from the 1/100 year storm event in addition to its normal operating volume. There may still, however, be circumstances where it is necessary to release excess water to the environment. In this event, water will be transferred to a 30,000 m^3 Detoxification Pond where it will be treated with hydrogen peroxide and copper sulphate to destroy any dissolved cyanide before release. The separate treatment pond ensures that water quality can be confirmed through testing prior to release.

On a more routine basis, the heap leach design includes an Intermediate solution pond which will allow excess water from precipitation during the rainy season to be circulated through leached out portions of the heap. This practice ”stores” the excess water in the system until volumes return to normal while providing the opportunity to recover a minor amount of residual gold still contained in the heap.

Kinetic leaching tests (humidity cell) indicate that the concentration of arsenic, naturally occurring in the host rock, could build up in the leach solution over time. For this reason, water in the heap leach system will periodically be removed and allowed to evaporate. The resulting

residue will be collected and mixed with cement to form bricks that will physically and chemically immobilize the contaminants. The bricks will then be buried in a designated location to complete disposal.

20.3.2.5 Monitoring

Monitoring of surface and ground water will include monthly measurements of flow rate, water levels, and chemical analyses by specialists working in the company's Environment Department. Departures from background will be subjected to more frequent monitoring. Regular audits and checks will be employed to ensure the validity of results. The results of monitoring will be shared on a regular basis with the Community Liaison Committee and the local water authority.

20.3.3 Waste Management

20.3.3.1 Process Waste

Process waste from heap leaching is presents in the form of the leached-out material stacked on the leach pad. Throughout the mine life and in perpetuity thereafter, this material remains stacked on the lined leach pad preventing leach solution or precipitation seeping from the heap into the ground.

Acid-Base Accounting (ABA) test work indicates that the process waste remaining on the heap has little potential for acid generation. Most of the material is naturally basic in nature and cannot generate acid. For the small portion of the material which has the potential to generate acid due to the minor presence of sulphide mineralization, the surrounding host rock and the cement in the heap provide enough buffering capacity to maintain a neutral pH.

When the mine is closed the heap will be rinsed with fresh water to remove all residual cyanide. This process may take up to one year. Meteoric Water Metals Transport (MWMT) testing indicates that once the heap is rinsed, precipitation falling on the surface of the heap will not mobilize naturally occurring metals present in the leached-out material.

At closure, the heap will be re-sloped to 3:1 (h:v) and re-vegetated. The heap and underlying pad will be designed so that once the final heap configuration is achieved all material will still be on top of the liner.

20.3.3.2 Mine Waste

Waste rock will be stored near each pit in Waste Rock Stockpiles. Stockpiles will be constructed in 10 m lifts. At the completion of each lift the slope will be dozed from 2:1 to 3:1 (h:v) to facilitate reclamation. A distance of 20 m will be left between the crest and toe of consecutive lifts to serve as a barrier to prevent erosion. Soil will be spread on the face of the re-sloped stockpile to promote growth.

Acid-Base Accounting (ABA) test work indicates that the stockpiled waste rock has little potential for acid generation. Most of the material is naturally basic in nature (absence or low sulphide content) and cannot generate acid. For the small portion of the material which has the potential to generate acid the surrounding host rock provides enough buffering capacity to

maintain a neutral pH. Kinetic leaching tests indicate that precipitation falling on the surface of the stockpiles will not mobilize naturally occurring metals present in the material.

20.3.3.3 Overburden and Soil

Some soil and overburden may have been contaminated by artisanal mining activity. In these instances, contaminated soil will be identified by testing, excavated, and hauled to a designated Contaminated Soil Stockpile (CSSP). Each CSSP will have a compacted clay based to prevent the further spread of contaminants and at closure will be capped with clay to ensure that encapsulation is effective.

More typically, soils will not be contaminated. Where the depth of the soil permits, material will be stripped prior to mining and stockpiled to be used to provide a growth medium for progressive and final reclamation.

20.3.3.4 Domestic and Industrial Waste

A designated waste disposal site will be established to accept and store domestic waste generated at the mine site. The facility will be fenced, constructed, and operated in compliance with all applicable regulations.

Burnable waste will be burned in an incinerator at the waste disposal site. Wood from packing crates and reagent packaging would be the most common types of burnable waste generated by the mine. Waste oil will be hauled away by the fuel and lubricant supplier as part of the supply contract.

20.3.4 Progressive Reclamation

The mine will practice progressive reclamation. As mining moves from one operating area to another throughout the mine life completed, pits and waste dumps will be decommissioned and reclaimed. In particular, waste rock stockpiles will be constructed in 10 m lifts. As each lift is completed, that portion of the stockpile will be re-sloped to 3:1 (h:v), coated with a suitable growth medium, and re-vegetated. Test plots will be conducted during the initial years of operation to determine the species most suited to thrive under project area conditions.

20.3.5 Closure

At closure all buildings will be removed. Concrete foundations will be destroyed and the land returned to its pre-development state. Any power lines will be decommissioned and removed. Haul roads between the pits, leach pads, and facilities will be left in place for public use.

Open pits not backfilled will be fenced to prevent animals and people from inadvertently entering while the pits are filling with water which is expected to be non-toxic. Waste rock stockpiles located at each open pit will be re-sloped and re-vegetated.

The material stacked on the leach pad will be rinsed with fresh water for a period of one year or until such time as residual contaminant levels in the runoff meet allowable limits. The heap will then be re-sloped to 3:1 (h:v) and re-vegetated.

The lined solution ponds will be used to dispose of soil contaminated with reagents or hydrocarbons from the plant and maintenance workshop areas. Contaminated soil will be buried in saprolitic clay, covered with a sand filter layer, and then encapsulated in another layer of saprolite.

The Barrage, pumps, Raw Water Pipeline, Raw Water and Storm Water Ponds will remain in place and functional. A solar-powered pumping system will be installed when operations cease to eliminate the need for diesel-fuel to keep the system running. Former employees, resident in the project area, will operate and maintain the system for the community.

In a typical year, it is expected that 200-300,000 m^3 of water would be collected for use by the communities of Barelgo, Kononga, and Nogo each rainy season. Meanwhile, the barrage will continue to provide Lougouri-Weogo and Sambtinga with a 1.2 M m^3 water resource annually.

Monitoring of the site will continue for a period of five years after the end of production. Water, air, and soil quality will be measured to confirm that any contaminants present return to pre-development levels. Reclamation and re-vegetation will be monitored to ensure that new growth becomes self-sustaining.

20.4 SOCIO-ECONOMIC MANAGEMENT

20.4.1 Stakeholder Engagement Plan

Stakeholders are all parties who have a direct or indirect interest in the project. The Stakeholder Engagement and Communication Plan describes how True Gold will interact with stakeholders to facilitate operations and ensure that the interests of all parties are respected. The legal frameworks governing stakeholder engagement are Burkina Faso legislation, World Bank guidelines, and IFC Performance Standards, in particular PS1.

A registry of all project stakeholders has been compiled. Of the fifty primary stakeholders, a risk analysis indicates that those with the greatest influence and interest in the project are the Naba Kiba, Chiek of Ramatoulaye, Mayor of Namissiguima, and the village chiefs in the project area. It is essential that an emphasis is placed on keeping these persons informed about project activities so that they can continue to support the development.

Consultation and dialogue are the primary means True Gold will employ to engage with the community. During project development community engagement will be led by the True Gold Community Relations team composed of a manager, specialist, clerk, and four community relations officers. This group is supported by the Country Manager and Environment, Health and Safety Department. When operations commence the role of the Country Manager will be replaced by the Karma General Manager.

To facilitate dialogue with the company, the community formed a committee out of project area stakeholders called the “Comite de Suivi et de Liaison” (Committee of Monitoring and Liaison) abbreviated in English as Community Liaison Committee (CLC). The committee is chaired by the Mayor of Namissiguima and is composed of approximately 80 members who represent the civic authorities and various segments of the population in the project area.

Two other groups also monitor project development. These are the "Cadre de Concertation Technique Provincial" (CCTP) chaired by the local High Commissioner and the "Comite de Concertation Regional" (CCR) chaired by the Governor of Yatenga province. Dialogue with these organizations keeps provincial and regional authorities apprised of project issues.

True Gold meets every 1-2 months with the CLC to discuss issues relating to company activities and project development. The issues of greatest importance to the community in general are health care, water, education, and the local economy. With regard to the project itself, the community's interest focuses on jobs, the barrage, community development, and the environment. It is notable that True Gold has incorporated input from the CLC in the development of its social management action plans.

A number of tools are employed by True Gold to manage relations with stakeholders. These include a meeting schedule, a stakeholder registry which updated periodically, and a stakeholder engagement record which documents each meeting with text and photographs.

A key element of True Gold's stakeholder engagement plan is the Grievance Management Mechanism. This mechanism provides a process that enables the company to formally address issues of concern regarding the company's activities that cannot be resolved by direct engagement between the True Gold Community Relations team and project area stakeholders. It directs all qualifying issues through the CLC to True Gold so that all parties are made aware of issues of importance and the company does not have to deal with potentially thousands of individuals directly.

20.4.2 Relocation

The original ESIA submitted in 2012 suggested that as many as 5,000 people would need to be resettled due to the mine development. This was, in part, due to the establishment of a tailings impoundment where the villages of Kononga, Nogo, and Koswende are located.

With the adoption of heap leaching in the PEA plan the need for a tailings facility was eliminated and the figure dropped to less than 3,000. This number was further reduced as engineering studies determined that mining could be conducted largely without blasting. This allowed the buffer zone between operating areas and local residents to be safely reduced from 500 m to 250 m and dropped the number of people needed to move to less than 2,000.

Finally, a revised water supply plan that employed a small barrage (1.2 M m^3) compared to that originally envisioned (8.0 M m^3) brought the number of people needed to resettle over the course of the mine life to less than 1,000. This evolution in the project design highlights one of the project's guiding principles, which is to develop the mine in a manner that minimizes the impact on the local community.

The Feasibility Study development plan calls for the relocation of approximately 836 people. Of these, 36 people of the settlement Tang-Zougou, a part of the village of Konanga, must be relocated from their present location which falls within the limits of the leach pad. This relocation must occur before the start of operations in 2015. These people will be moved back to the main area of Kononga, west of the leach pad.

The other 800 people who need to resettle are in the village of Boulonga. Boulonga is located on the northern edge of the Kao pit. The Kao pit is not mined until the fourth year of operations, 2019. For this reason the residents of Boulonga will be relocated in 2018. The new site for the village has yet to be determined but will be done so in consultation with the residents of Boulonga.

True Gold and the Community Liaison Committee (CLC) have agreed on the terms of reference for all resettlement required over the life of the project. This agreement is based on the contents of the Relocation Action Plan (RAP) which was agreed to by both parties in January 2013. In the document, the principles, process, and basis for compensation are defined. The details regarding the relocation of each village or household are agreed with each family individually based on the guidelines established in the RAP.

The RAP also considers compensation paid for "economic" relocation. In these instances, although a resident is not physically moved he is impacted such that he can no longer pursue his previous livelihood. In the project area, a typical example of economic relocation is compensation paid for fields disrupted by the development.

Compensation is paid for agricultural land in the project area at a rate of CFA 200,000/ha based on typical crops grown, crop yield, and market prices. Compensation is adjusted for the presence of trees which enhance the value of the land. Compensation is paid annually for a period of three years or until replacement land can be provided and made productive. The CLC acknowledges its responsibility to provide replacement land as soon as possible. True Gold has committed to assist in making replacement productive through the drilling of wells.

A land compensation agreement has been concluded with the residents of Lougouri-Weogo for the 20 ha of land affected by the first phase of the barrage. A land compensation agreement has also been concluded with various owners of a total 220 ha of land impacted by the development of the Goulagou and Rambo open pits. Most of the owners of the affected land in the pit areas are from Kononga and Barelgo.

20.4.3 Cultural Heritage

In the original ESIA there were 117 sites of cultural significance in the project area that would be impacted by development. These sites included graves, cemeteries, mosques, and historical or natural places of importance to the local community. Since that time, the project was redesigned with the plan to avoid, protect, or relocate cultural sites before a site was destroyed and compensation paid.

As a result of this approach, there are only 33 cultural sites in the project area now. Of these, only three fall inside the 250 m buffer zone established around the site infrastructure. Two of these need only to be protected to ensure that they remain undisturbed by operations. The third is the small Goulagou-Barelgo barrage, the home of crocodiles which the local people consider sacred.

The barrage itself which is not sacred will be removed when Goulagou II Pit is mined as it lies within the pit limits. The crocodiles, which number 20-30 according to the BEGE survey in 2010, will be relocated to the new barrage constructed on the river to supply water to the mine.

This relocation will occur prior to disturbing the existing barrage and will be planned and supervised by internationally recognized and local experts.

20.4.4 Health and Safety

A program to manage community health and safety will be established using Burkina law, World Bank, and IFC standards as a framework. The objectives are to (1) mitigate health and safety impacts from mine development on the community, (2) ensure a healthy workforce is available to support development activities, and (3) improve the general well-being of the community.

Health challenges in the project area a function of endemic disease, social conditions, and diseases arising from those conditions. Malaria accounts for more than half of all medical conditions treated in Namissiguima Department. Acute respiratory disease, diarrhea, and sexually transmitted diseases (STDs) are the other most common health conditions facing the local population.

Living conditions and climate also contribute to health issues among the project area communities. Poor sanitation can contribute to the contamination of drinking water while naturally occurring arsenic in groundwater can cause health-related issues. Low rainfall can result in poor harvest and threaten food security. In 2010, a poor harvest resulted in acute malnutrition among almost half of the young children in Namissiguima Department.

The mine development itself will also bring with it the potential for health impacts. Noise, dust, and vibration can have adverse effects if not effectively managed. Open excavations, industrial chemicals, the activity of heavy equipment, blasting, and increased motor vehicle traffic all present health and safety issues for people who live in the project area.

The area is served by a new hospital, old hospital, and private clinic in Ouahigouya, a dispensary in Kononga, and a clinic in Namissiguima. The facilities in the rural areas are poorly supplied and staffed. The hospitals in the city are well equipped but staff needs training. Getting qualified medical personnel to live in rural areas is an ongoing challenge.

The mine will have its own clinic and ambulance to provide first aid and evacuation capability for mine workers. These resources may be leveraged to assist the local community as long their ability to serve the mine workforce is not diminished. The improvement of local health infrastructure and services is a goal of the True Gold Community Development Plan and will be undertaken in cooperation with local authorities.

True Gold will establish a number of disease control programs in the project area with a focus on malaria, STDs, water-borne diseases, and HIV/AIDS. The programs will involve both education as well as direct control measures and will be delivered through employee health and safety programs and the Community Liaison Committee (CLC).

True Gold will monitor water quality, dust, and noise levels during construction and operations to ensure that impacts are minimized. Fencing of active operating areas will prevent inadvertent entry into active mining areas and prevent exposure of the community to industrial hazards. Security's role at the mine site will be to protect both True Gold assets and the local community.

An Emergency Response Plan (ERP) will be developed to define actions to be taken in the event of an accident, fire, or controlled release of a harmful substance. Information sessions for the community will be organized through the CLC to make local residents aware of mining-related hazards and the measures in place to manage them and keep the public safe.

The success of programs to address community health issues and ensure the safety of area residents will be monitored by the True Gold Community Relations and Health and Safety staff. Key performance indicators will be established to measure program effectiveness. These will include direct measures of water and air quality and noise levels and indirect measures such as accident and incident frequency. Programs will emphasize hazard recognition, avoidance, and prevention to eliminate or minimize impacts before they occur.

20.4.5 Employment and Training

Prior to the start of construction, screening will be conducted to establish the skills available and employability of people in the project area. Pre-employment training will be offered to qualified applicants to increase the number of locally employable people. Pre-employment training will focus on basic literacy, math skills, and industrial safety.

No one under the age of sixteen will hired on a fulltime basis and preference will be given to persons who have completed secondary or tertiary education. Unskilled positions will be reserved for people from the project area recognizing the lower levels of literacy there and the need to hire locally. Both men and women will be eligible for work at the mine site. Hiring will be on the basis of qualifications, experience, and aptitude. While True Gold hiring practices will respect social and cultural norms in the community, the company will consider the employment of women in non-traditional roles to enable them to contribute equally to the success of the project.

The phased development of the project will offer the opportunity to screen potential future employees before offering fulltime work. A casual labour pool will be established where project area residents will be able to register for part-time work. Causal workers who prove themselves to be good employees may be offered fulltime employment when openings become available. The phased development of the barrage and water holding ponds will create casual employment opportunities before the start of general site construction.

During construction, employment will be approximately 500 as shown in the Table 20.1. Fulltime employment is estimated at 375. Employees will work a 4 x 4, 12-hour continuous shift schedule where workers will work two dayshifts and two night shifts before having four days off. The schedule results in average annual work hours of about 2,160 hours. Employees will be paid a premium for time they work in excess of the standard 2,000 hours per year.

TABLE 20.1
ESTIMATED PROJECT EMPLOYMENT

Phase	Mining	Processing	Administration	Construction	Total
Construction	200	0	100	200	500
Production	200	75	100	0	375

Expatriate staff and management will be employed to oversee operations and train and mentor national employees. Expatriate employees will be drawn from western countries as well as

neighbouring West African nations. Employees from neighbouring countries are termed "Third-country Nationals" (3CN). It is important to note that the use of 3CN employees will not replace the need to train Burkinabe nationals.

A national succession plan will be implemented from the start of the production period. It is expected that expats will compose up to 10% of the workforce in the first year of operations. This percentage will be reduced 2.5% each year over the subsequent four years to achieve a steady state for the remainder of the project life. It is essential to the long-term viability of the project that Burkinabe be hired and trained to operate and manage the mine.

Local contractors will be identified to execute construction and provide specialist services to support operations during the production period. An emphasis will be placed, however, on transfer of knowledge so that national True Gold personnel can perform as many of the required job functions on site as is reasonably practical. The operating philosophy is that it is better to spend more money in the short-term to train True Gold employees to do a job than to pay a contractor a premium in perpetuity to do the work on a contract basis. The knowledge transfer process will take time, however, and it is recognized that there may always be some tasks that are better performed by a contract rather than owner workforce.

Hiring will recognize that the mine development will not replace agriculture as a mainstay of the local economy and the primary source of subsistence for project area residents. Work schedules will be adopted that enable employees to report to work as scheduled while addressing the needs to tend crops and animals. Options for job-sharing will be explored that could result in lower wages than at other existing mines in Burkina Faso but which may offer the benefits of employment to a larger number of people, particularly those from the local area.

20.4.6 Community Development

True Gold has developed a framework to serve as a foundation for a program of ongoing community development throughout the mine life. The legislative and institutional bases for community development initiatives are (1) Burkina law, (2) Burkina Millennium Development goals, and (3) World Bank and IFC performance standards.

A review of baseline conditions indicates agriculture is the primary occupation for 95% of the project area population. Subsistence farming of sorghum and millet as well as animal husbandry are the principal activities. Capacity and productivity are both limited due to a lack of investment and knowledge. Artisanal mining plays a less significant but important role, particularly during the dry season.

Malaria and HIV present chronic health issues which the community struggles to face given limited funding for health services, poor infrastructure, and a lack of health professionals. Illiteracy and a lack of skills training make the local population less employable while limited investment reduces the opportunities for jobs. Social problems related to organized orpaillage also present a number of community challenges.

Current community development programs focus on the provision of water, schools, improvement to existing agricultural and animal breeding practices, and reforestation. These programs are pursued through local community-based organizations and NGOs. The Community

Liaison Committee (CLC) will be the primary vehicle for implementation of community development programs sponsored by True Gold.

The goals of community development for True Gold are to mitigate the impact of the project development on the community and leverage that development to bring benefit to the persons affected and the general population. Inherent in the mine development plan are benefits to the community from jobs, improvements to infrastructure (barrage and roads), and relocation (improved housing and services).

Specific community development activities will focus on (1) agriculture, (2) education, (3) health care, and (4) local economy. Agricultural programs will be about increasing crop yields, improving local knowledge of good farming practice, and provision of water for irrigation. Educational programs will look at raising the general level of literacy in the project area, bolstering the resources which exist for primary and secondary education, and skills training and apprenticeship programs related to activities at the mine.

Health care programs will address disease control for malaria and HIV/AIDS, training for project area health professionals, and improvements to community health infrastructure as is possible through cooperation with local health authorities. Programs related to the local economy will include to improvements to roads and water infrastructure and micro-finance to support the growth of local businesses.

The implementation of these programs will occur following a thorough needs assessment and consultation with the CLC to identify the most appropriate and effective ways to proceed. Following implementation, community development programs will be monitored to determine their effectiveness and opportunities for improvement.

The principles underlying the implementation of community development programs are that they be realistic, customized to communities they serve, respectful of local culture and traditions, needs-based, and sustainable.

20.5 PERMITTING

In April 2012, an application was made for an exploitation permit for the Karma Gold Project. The permit area encompassed three of the now five deposits that have been identified on the property. These three deposits are Goulagou I, Goulagou II, and Rambo. The exploitation permit was composed of portions of two existing exploration permits, Goulagou and Rambo.

An Environmental and Social Impact Assessment (ESIA) and a national-standard Feasibility Study were submitted to support the application. The operating plan was based on an inferred 11 Mt resource containing 12.4 t of gold using Carbon-in-Leach (CIL) processing. The ESIA was accepted by the Ministry of Environment but the issue of an exploitation permit was withheld pending completion of a Relocation Action Plan (RAP).

During the period while the application was under review, June to September 2012, a PEA was completed for the project. The PEA delivered a vastly improved plan with enhanced economics based on a 29 Mt resource containing 25.8 t of gold using heap leach technology. Also of particular note was that the PEA plan resulted in far less environmental and social impact than the previous scheme.

Given the positive results of the PEA, True Gold decided to resubmit the exploitation permit application based on a new project description, an updated ESIA, and a RAP that reflected significantly less resettlement. The revised ESIA and RAP were submitted in July 2013 and the presidential decree officially acknowledging the grant of an exploitation permit to True Gold for the Karma permit was signed in January 2014.

Meanwhile, in March 2013, an ESIA was undertaken on the Kao property, 10 km to the southeast of Goulagou II. That document along with a national-standard Feasibility Study and a relocation action plan has been submitted to the Ministry of Environment in July 2013. The environmental permit for the Kao deposit was granted to True Gold January 7, 2014. The Kao exploitation permit was approved by the Council of Ministers on September 17, 2014.

The last deposit to be permitted will be Nami. The ESIA was completed in December 2013 and submitted for review by the Ministry of Environment in January 2014. The Nami Environmental Permit was received on May 28, 2014. The Nami Exploration Permit was approved by the Council of Ministers on September 17, 2014. Once exploitation permits are received for the various mining areas then True Gold will proceed with the negotiation of a Mining Convention with the government. The Mining Convention is a stability agreement that establishes the terms under which the project will operate (legislation, royalties and taxes) over the initially defined project life.

The other aspect of the project requiring permitting is the barrage. An application for a 2.5 m high dam with a capacity of 1.2 M m^3 of water was submitted to the Ministry of Environment in January 2013. Due to the height of the dam, no ESIA was required, only a Notice of Environmental Impact (NIE). In March 2013, True Gold received approval of the NIE from the Ministry of Environment and permission from the Ministry of Mines to construct mine infrastructure in the form of a dam and a water holding pond.

Construction of the first (1 m) phase of the dam was started in April 2013 and was completed in September. The second phase of the dam was completed in H2 2014. Preparations for the dam raise were started in December 2013 and site works commenced in the last week of January 2014 and the phase 2 dam was completed in May 2014. No additional permissions are required for this second phase of work.