## 2.1 Overall Project Description

This section describes the proposed project from site preparation, mining and processing, through to rehabilitation. A summary of the overall project is presented in Table 2-1.

**Table 2-1 Proposed Mining Process**

| Phase | Process Details |
|---|---|
| **Site Preparation** | Where practicable any suitable vegetation that needs to be removed will be stockpiled to be used for rehabilitation purposes. As the area is already disturbed and the proposed additional clearance is relatively small (18.1 ha), vegetation clearance will be minimal. |
| **Infrastructure Development** | The project will include box cut development, decline development, road construction, mine water dam, irrigation infrastructure, site offices, power line and workshops. |
| **Mining** | Extraction of ore and waste will be carried out using long hole, sub-level retreat and open stoping techniques. Blasting will be required to fracture the ore and waste rock, which will be hauled to the surface in 50 t haul trucks. |
| **Waste Rock Management** | The waste rock material excavated during the construction of the box cut and decline will be stored on the surface temporarily, on the existing Run-of-Mine (ROM) pad, and then pushed into the base of the pit. |
| **Water Management** | The mine will need to be dewatered, first removing the water from the existing open pit and second removing groundwater, as mining will occur below the water table. A bund wall will separate runoff in the operational mine area from the natural stream system. All of the water produced from the operating mine area (surface water and groundwater) will be pumped to a mine water dam and used for dust suppression or disposed of by irrigated land application. |
| **Ore Transport** | Ore will be stockpiled temporarily on an existing ROM pad before being loaded onto road trains and transported to URGM for processing. It is anticipated that approximately 42,000 t of ore will be transported to URGM per month. |
| **Ore Processing and Tailings Management** | All ore from the Maud Creek mine site will be transported to URGM for processing. The ore from the Maud Creek mine is primarily refractory in nature, and will be processed through a GEOCOAT® bio-oxidation facility at URGM.<br><br>Tailings will be managed within the URGM site in the existing Crosscourse Pit in-pit tailings disposal facility, which has a further 25 years of life at current rates of discharge. |
| **Rehabilitation** | Following mining operations, areas disturbed by the proposed operations will be rehabilitated and returned to their previous land use (pastoral land) (refer Section 3). |

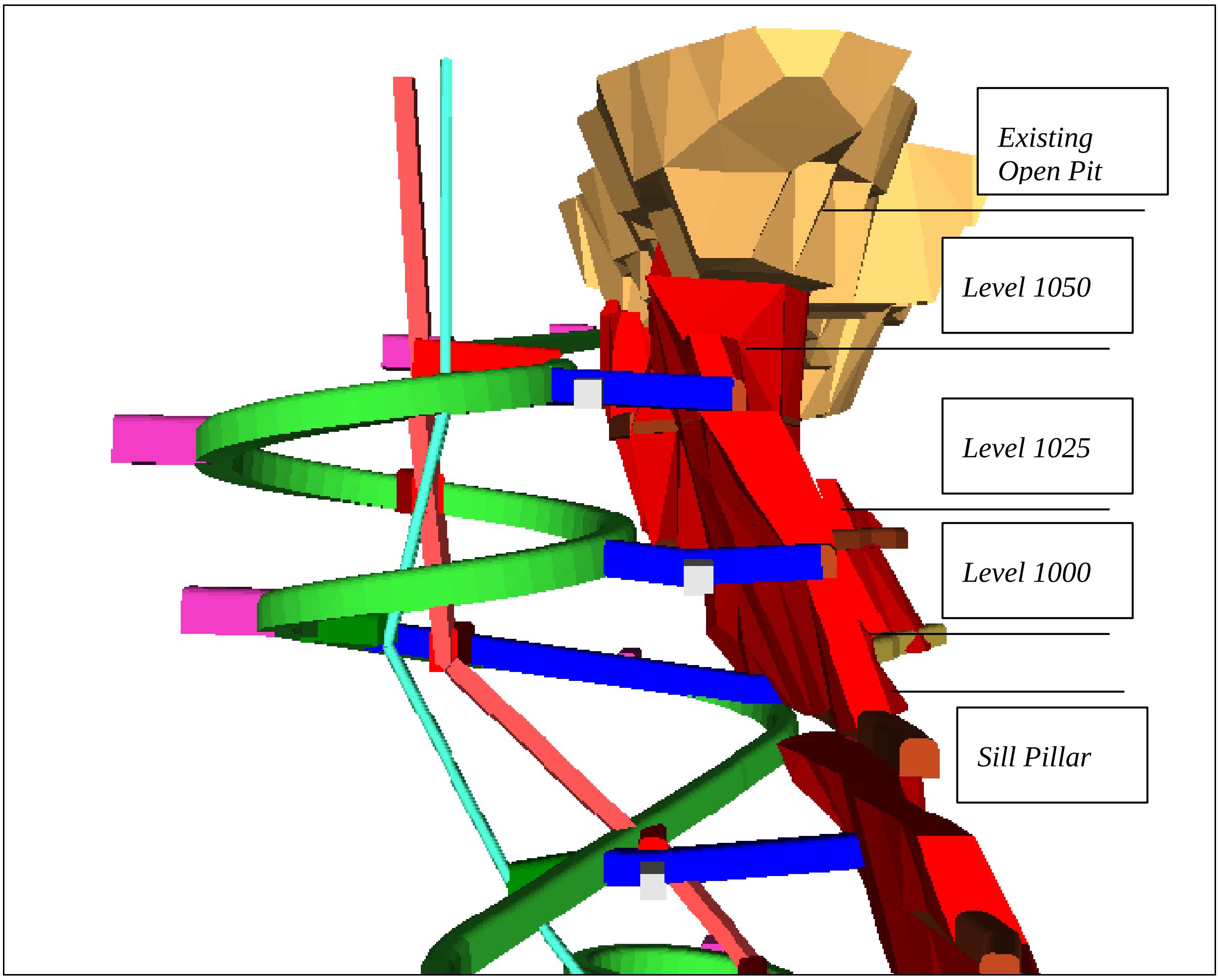
# Section 2 Description of the Proposal

Terra Gold proposes to commence an underground gold mining operation at the Maud Creek mine site in 2009. Access to the ore bodies will be via a portal and underground decline. The blasted ore material will be transported to the surface where it will be stored in stockpiles before being loaded onto road trains and transported to URGM, which is located approximately 145 km north west of the project area (Figure 1-1).

Figure 2-1 is an isometric view (looking from north north east to south south west), showing the pit and box cut (light brown), the stopes (orange) to access the ore body (red), 5 x 5.5 m decline (green) with vehicle coveys (pass points) (purple), development drives into the ore body (dark blue), tramming drives for extraction of ore (yellow), 3 x 3 m ventilation rise (light red) and 1.8 m diameter emergency escape way (light blue) with escape refuge bays (dark green).

The mine will be developed sequentially, as each level is accessed and mined. The overall depth to the base of the ore body is approximately 290 m below ground level. The decline slope is approximately 1:7.

**Figure 2-1 Isometric view of the vertical development at Maud Creek mine**



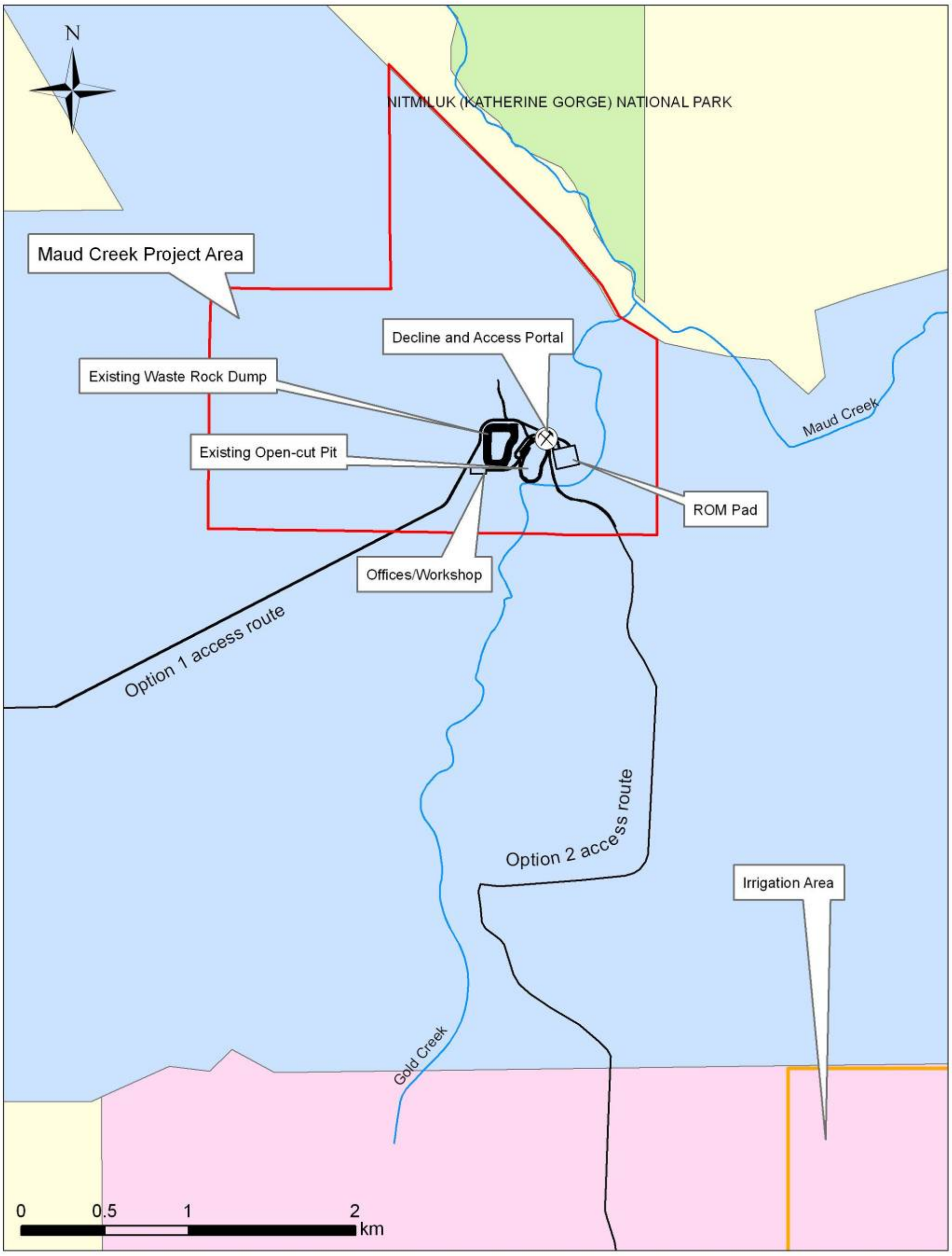

From Abel and Gerritsen (October 2007a)

## 2.2 Site Preparation and Construction

Existing office infrastructure and roads will be maintained. GBS plans to commence construction of the additional infrastructure indicated in Figure 2-2 early in the dry season of 2009. The planned construction work includes:

- upgrade of the administrative offices, crib/lunch rooms and change rooms/ablutions block;
- contractors laydown area and workshop facilities;
- power lines;
- dewatering bores;
- a lined mine water dam (to be constructed on the existing waste rock dump);
- pump and pump house for irrigation;
- centre pivots and irrigation piping; and
- haulage and access road.

**Figure 2-2 Maud Creek conceptual mine site layout**




| Client | Project | Title | |
|---|---|---|---|
| Terra Gold Mining Ltd | MAUD CREEK GOLD PROJECT | Maud Creek Conceptual Mine Site Layout | |
| URS | Drawn: IH / Approved: VF / Date: 5 Nov 2007 | Figure: 2-2 | Rev. A |
| | Job No.: 42213775 / File No.: 42213775-021.mxd | | A4 |

### 2.2.1 Area of disturbance

Previous mining activity and agricultural development on Maud Creek Station has disturbed 95.8 ha. However the majority of this previous disturbance (84 ha) is associated with agricultural development in the proposed irrigation area. The total footprint area of the project is approximately 113.9 ha, including 84 ha for two irrigation pivots, 17.9 ha for the proposed access and haul road, and 12.0 ha for the operational mine area.

The total road length for the preferred access (Option 1 in Figure 2-2) is 8,400 m with 2,400 m along existing fence lines. The clearing required for Option 1 is 17.9 ha (6,000 m x 25 m + 2,400m x 12 m). The total road length for the alternative, upgrading the existing road (Option 2 in Figure 2-2), is 10,400 m in a 15 m wide corridor. Widening to 25 m equates to an additional 10.4 ha of clearing required.

The additional area that will be disturbed during mine construction amounts to approximately 18.1 ha primarily associated with access road development (15 ha). The footprint areas, existing disturbed areas and additional land disturbance for different mining infrastructure are itemised in Table 2-2. The need to clear natural woodland has been minimised by utilising existing facilities as far as possible, including the irrigation area, run-of-mine (ROM) ore pad, and use of the existing waste rock stockpile for the mine water dam.

**Table 2-2 Estimated Areas of Disturbance**

| Infrastructure | Footprint area (ha) | Area already disturbed (ha) | Additional land disturbance (ha) |
|---|---|---|---|
| Existing Open Pit Void | 2.7 | 2.7 | 0.0 |
| Box-cut access for the underground mine decline portal | 0.7 | 0 | 0.7 |
| ROM ore pad - will also be used as waste rock stockpile, during initial mine development (decline etc) | 1.6 | 1.6 | 0.0 |
| Existing Waste Rock Stockpile – to support Mine Water Dam | 4.6 | 4.6 | 0.0 |
| Miscellaneous Infrastructure (Bunding, Internal Roads, Office and Change Rooms, Contractors Laydown Area, Workshops, Fuel Bays and Explosive Areas, Sediment Ponds) | 2.4 | 0.0 | 2.4 |
| **Sub-total: Operational mine area** | **12.0** | **8.9** | **3.1** |
| Irrigation Area, Infrastructure, Pumps, Pump House, Centre Pivots and Irrigation Piping | 84 | 84 [2] | 0 |
| Access Route: | | | |
| Option 1. Preferred access route and power lines | 17.9 | 2.9 | 15.0 |
| Option 2. Alternative upgrade of existing access route [1] | (26.0) | (15.6) | (10.4) |
| **Sub-total: Outside operational mine area** | **101.9** | **86.9** | **15.0** |
| **Totals** [1] | **113.9** | **95.8** | **18.1** |

[1] The total does not include alternative option impacts.
[2] The existing available cleared pastoral area for irrigation is 160 ha, and exceeds the 84 ha area required.

### 2.2.2 Borrow material requirements and sources

The material required for road construction will be obtained from the existing waste rock stockpile on site (Figure 2-2). Material from the waste rock stockpile has been tested and found to be non-acid forming, thus there is no risk of acid mine drainage (AMD) in using this material (Appendix L).

The material required as underbed for the mine water dam liner will be sourced by subcontractors from active borrow pits (Figure 1-3).

## 2.3 Mining

### 2.3.1 Ore characteristics and processing

Maud Creek will produce transition and primary ores containing refractory gold associated with sulphide mineralisation as arsenopyrite and pyrite. The global indicated resource is estimated to be 9.3 million tonnes of ore at a grade of 3.1 g/t for 0.9 million ounces of gold. The estimated ore production rate is 500,000 t per annum at an average grade of 6.1 g/t.

Geochemical tests of the orebody were undertaken for the weathered zone (near the surface) and the unweathered zone (at depth) at Maud Creek (see Appendix L). The pH of the weathered zone ore ranged from 6.0 to 9.1, while the unweathered ore was more alkaline, ranging in pH from 8.4 to 9.1. Overall the ore is characterised as non-acid forming (NAF), similar in composition to un-mineralised soils and rocks, although it is enriched in arsenic (As) and antimony (Sb).

All ore processing will be undertaken off site at the existing URGM processing facility. This option has been selected to minimise potential environmental impacts, and was selected after community consultation (Section 20). GBS Gold is in the process of expanding the facilities at URGM to include a flotation and biological oxidation circuit complete with neutralisation and carbon in leach (CIL) sections to treat the refractory ores from Maud Creek and other sources.

Ore processing at URGM involves concentrating the sulphide minerals through a flotation plant before oxidising the sulphide mineral species, to enable their refractory gold components to be recovered by a subsequent CIL plant. Alternative oxidation options for sulphide flotation concentrates include roasting and pressure oxidation, which are far more energy intensive.

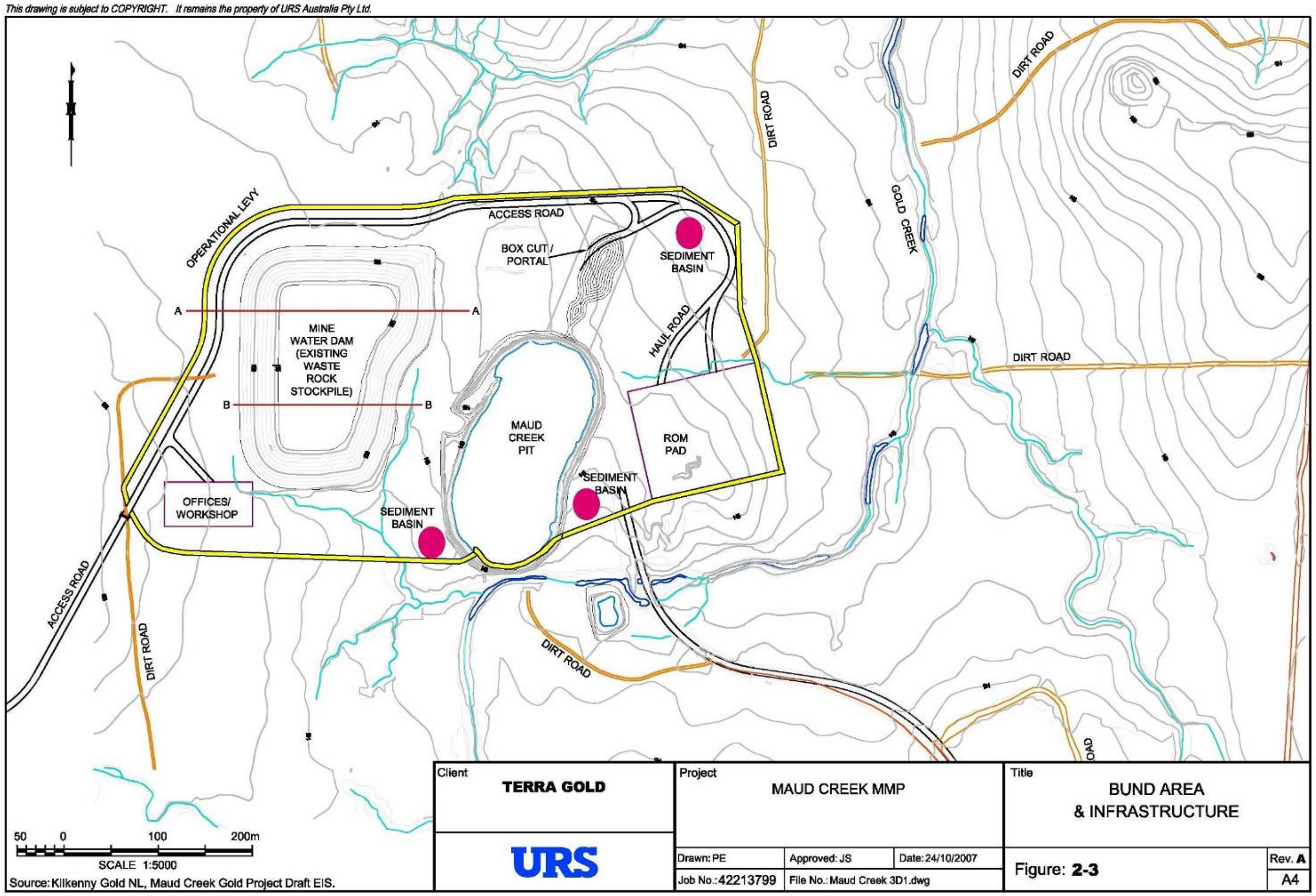
### 2.3.2 Mine design and site layout

Underground mining and off-site processing at URGM minimises the operational footprint at Maud Creek. The planned infrastructure development including the portal and decline, run-of-mine (ROM) pad, mine water dam, irrigation areas, offices / workshop and access road are shown in Figure 2-2, and in more detail in Figure 2-3.

The complete mine operational area will be contained within a perimeter bund, designed for a 1 in 500 year storm event (Figure 2-3). The bunded operational area will have a footprint area of 12.0 ha, of which 8.9 ha is already disturbed (Sections 6.3 and 6.4). The mine design has focused on minimising additional land disturbance.

Historic exploration and mining activities have disturbed the majority of the mine site (Table 2-2).

**Figure 2-3 Bund area and infrastructure**



### 2.3.3 Life of mine plan

The expected total life of mine (LOM) is around 10 years, based on preliminary mine planning. A detailed mine plan has been completed for the first two and a half years of operation (Abel and Gerritsen October 2007a). Detailed mine planning beyond the initial two and a half years will be an ongoing exercise as more detailed information is obtained through exploration drilling underground, and will be provided in annual updates of the Mining Management Plan (MMP).

The detailed two and a half year mine plan was scheduled using Earthworks Production Scheduler Software. The rates for development and mining activities are shown in Table 2-3, and these have been used in creating the LOM estimates presented in Table 2-4. The estimated 74,624 $m^3$ of waste rock on the surface at the end of the first two years of mine life is in addition to the ~300,000 $m^3$ of waste rock in the existing waste rock stockpile. The additional waste will be placed into the backfilled pit.

**Table 2-3 Estimated development and mining rates**

| Object | Rate |
|---|---|
| Decline | 90 m / month |
| Other Drives | 60 m / month |
| Production Drilling | 8,000 m / month |
| Filling | 15,000 fill tonnes / month (per fill location) |
| Vertical Development | 60 m / month |
| Stope Production | 25,000 t /month per active stope |

From Abel and Gerritsen (October 2007a)

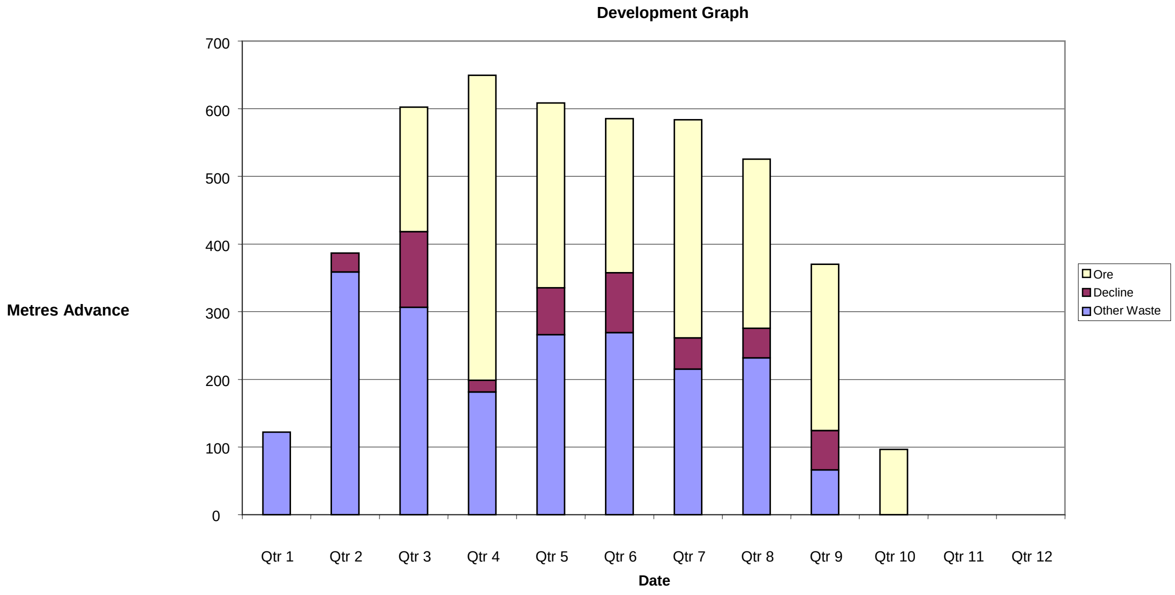
**Table 2-4 Two and a half year mine plan waste rock volume estimates**

| | Quarter 1 & 2 | Quarter 3 & 4 | Quarter 5 & 6 | Quarter 7 & 8 | Quarter 9 & 10 |
|---|---|---|---|---|---|
| Waste Produced ($m^3$) | 32,510 | 24,871 | 29,578 | 18,915 | 272 |
| Waste Used ($m^3$) | 0 | 15,378 | 46,645 | 43,851 | 272 |
| Waste (addition or consumption) ($m^3$) | 32,510 | 9,492 | -17,067 | -24935 | 0 |
| **Waste stockpile size on surface ($m^3$)** | **108,067*** | **245,292** | **191,188** | **74,624** | **74,624** |

* 75,557 $m^3$ from the development of the box cut (from Abel and Gerritsen, October 2007a)

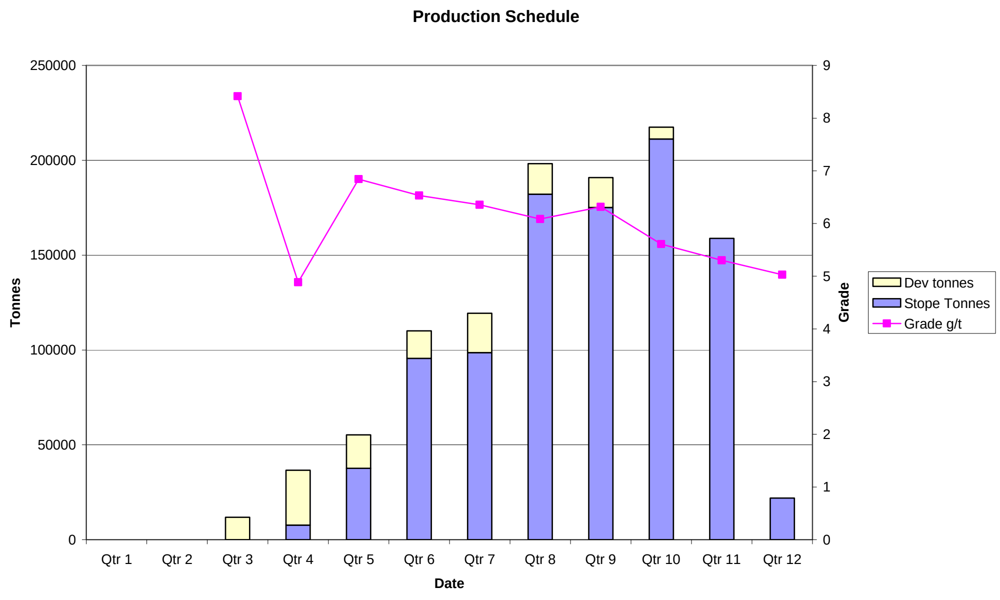
The development schedule over the initial period of mine development, shown in Figure 2-4, peaks in the 4th quarter, and tails off in the 8th quarter. Scheduling has been broken down to quarterly time increments. The short to medium term ore production schedule is shown in Figure 2-5, which shows production peaking from the 8th quarter to the 11th quarter. These schedules will continue to be updated over the life of the mine, using a two-year horizon.

## Figure 2-4 Quarterly development schedule




From Abel and Gerritsen (October 2007a)

## Figure 2-5 Quarterly ore production schedule




From Abel and Gerritsen (October 2007a)

### 2.3.4 Mining methods

The mine design and mining methods (Abel and Gerritsen, October 2007a) have been developed to be feasible, practical and safe. The ore and waste rock will be extracted using long hole, sub-level retreat and open stoping techniques. Blasting will be required to fracture the ore and waste rock, which will be hauled to the surface in 50 t haul trucks via a 1:7 gradient decline and access portal, to the surface. The ore will be stockpiled on the existing run-of-mine (ROM) pad and the initial development waste will be stockpiled on a temporary waste rock stockpile before being returned either as backfill or to the base of the pit. Ore will be loaded into road trains for transport to URGM.

#### *Box Cut*

A ramp and a small box cut will be excavated to allow the portal to be developed in competent rock below the weathered surface soil and rock. Waste rock removed from the box cut will be placed on a temporary waste stockpile on the crest of the old pit. This stockpile will be used for backfill later in the project. Also, the stockpile comprises innocuous material that can be used to construct the bund wall securing the perimeter of the box cut. Surface drains will be installed around the box cut to divert surface water away from the box cut and to reduce water entering the portal and to maintain the integrity of the box cut walls. The box cut walls above the portal location will be supported with cable bolts, mesh and shotcrete.

#### *Portal Development*

Drilling and blasting will be used to develop the mine portal into the box cut wall. Blasted portal material will be added to the temporary waste stockpile. The portal excavation will be supported with mesh, cables, bolts and shotcrete until the decline is of sufficient length to install permanent means of support.

#### *Decline Development*

The decline will be developed down to the 1050, 1025 and 1000 Levels (mRL). Galvanised mesh and bolts will be used as part of the hanging wall support strategy to support the full length of the decline. Cable bolts will be used at access and stockpile intersections for added support unless ground conditions dictate the need to use shotcrete. Decline waste will be trucked to the temporary surface waste stockpile until the 1000 Level stope is available for backfilling.

As the decline progresses it will be necessary to extend power, compressed air and water reticulation services to the working faces and develop a dewatering system to extract excess water created by dust suppression systems and groundwater inflow. Initially a fan will be installed at the portal to supply fresh air which is ducted to the working faces.

#### *Stope Development*

The main factors which affect the ability to mine the ore directly below the pit safely are:

- the possibility of the pit walls being undermined, leading to failure which extends to the underground development; and
- the possibility of water inundation of the underground workings in the case of a high rainfall event such as a cyclone.

The orebody is considerably higher grade and greater thickness at the base of the existing pit. The value of the resource would be heavily reduced if the ore in this zone were to be left as a crown pillar hence the mining activities will remove all this material and break through to surface at the base of the pit. The mine development and scheduling have been designed to reduce the risk of ground failure and water inundation.

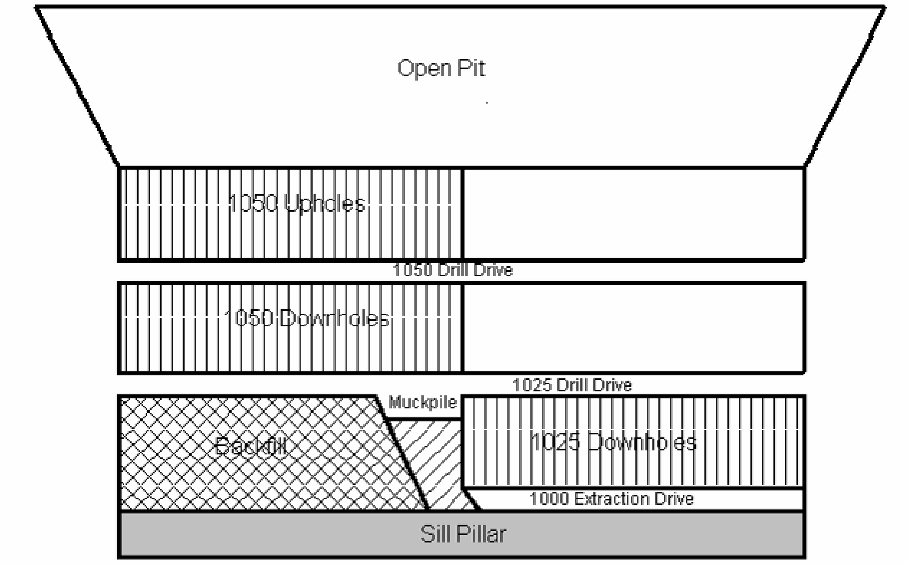
A crown pillar has been designed between the 1000 and 975 Levels to protect the mine workings below, and the stopes on Levels 1050 and 1025 have been designed to be backfilled to support the pit walls. The 1000 Level stope is designed to be backfilled and to provide enough inundation surge capacity to protect the lower levels when the mine is opened to the pit. The crown pillar appears as a 10 m break in the orebody (Figure 2-1).

### 2.3.5 Stope and Fill Mining

Stope and fill mining is sequenced from the bottom up, which delays the production of stope ore until the lowest development drive is completed. In the case of the Maud Creek Mine, this is necessary to provide inundation surge capacity on the 1000 Level, before the stopes above break into the open pit.

The 1025 and 1050 Level stopes will be extracted from the top of the backfilled 1000 Level stopes, as shown in the Figure 2-1. These stopes will be fired and extracted until the length of the open stope approaches a state of instability. Then the stopes will be backfilled from within the pit to support the walls and a further series of stope extraction and filling until the level is complete.

**Figure 2-6 Down hole stope and fill mining method**




From Abel and Gerritsen (October 2007a)

#### *Level 1050, 1025 & 1000 Development*

All horizontal development is to be supported with meshing and bolting.

Figure 2-1 shows the access through waste rock (blue) to ore development drives (brown and yellow) on the first three levels. Access to Level 1000 is taken off the decline at a higher elevation to maintain the inundation water surge capacity of the rock filled 1000 Level stope, while reducing risk of water flow to the decline and lower development. Particular aspects of the underground development are:

- stockpiles (pink and white) and return airway access are established on each level;

- sub-vertical return airways (dark pink) between Level 1050 and the surface and between each subsequent level; and
- an escape way access is established on each level and sub vertical escape ways (light blue) between Level 1050 and the surface and between at each subsequent level.

#### *Level 1000 Stope Development*

The first production ore is available after initial firing and extraction on Level 1000. Production holes for Level 1025 stoping will be drilled up from Level 1025. Once all the stope ore is hauled to the surface, backfilling of the stope with waste rock previously stockpiled on surface will commence. It will then be necessary to re-establish loader access to Level 1025 on the top of the backfilled stope. Figure 2-6 shows the 1000 Level stopes backfilled with rock to provide an inundation surge barrier.

#### *Level 1050 & 1025 Stope Development Stage 2*

The stoping sequence represented in Figure 2-6 also applies for the 1025 and 1050 Levels above the 1000 Level backfilled stope. The stopes are backfilled with development waste via the opening created in the pit when the 1050 Level stopes are fired. The backfill material provides support for the open stope walls and the existing pit walls. Backfilling follows closely behind stope firing and ore extraction to minimise the spans of unsupported walls, and hence the risk of wall failure.

#### *Sill Pillar – Level 975 Development*

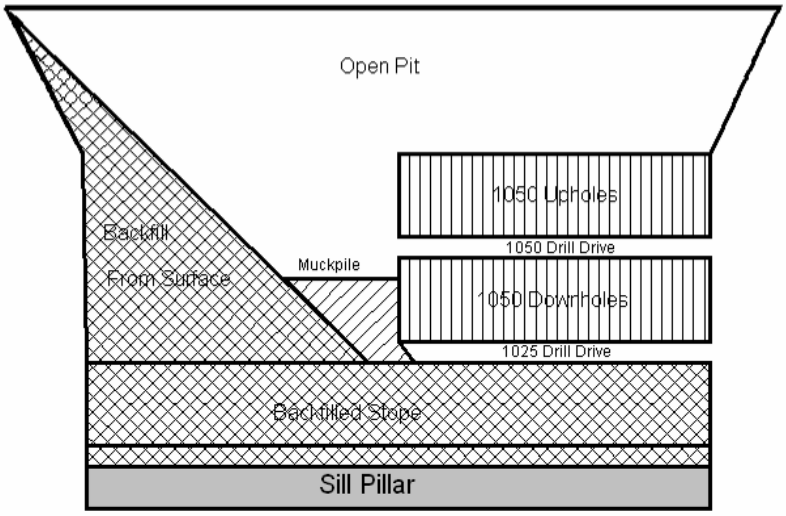
A 10 m sill pillar of low grade ore will remain intact between Levels 1000 and 975. The sill pillar marks the transition from backfilled stoping methods to uphole bench stoping. The pillar will be formed by drilling a 10 m high uphole stope from the 975 Level, instead of the full height 20 m stope.

### 2.3.6 Uphole Bench Stoping

Uphole bench stoping is a top down mining method designed to produce stope ore as each level of ore development is completed, leaving permanent island pillars in lower grade zones within the stopes. The sequencing for uphole bench stoping is illustrated by Figure 2-7.

Uphole bench stoping is used for isolated stopes and for early ore production as ore is made available at the completion of each development level. The location of island pillars is flexible, allowing their location in lower grade and/or less stable zones.

**Figure 2-7 Uphole Bench Stoping**




Adapted from Abel and Gerritsen (October 2007a)

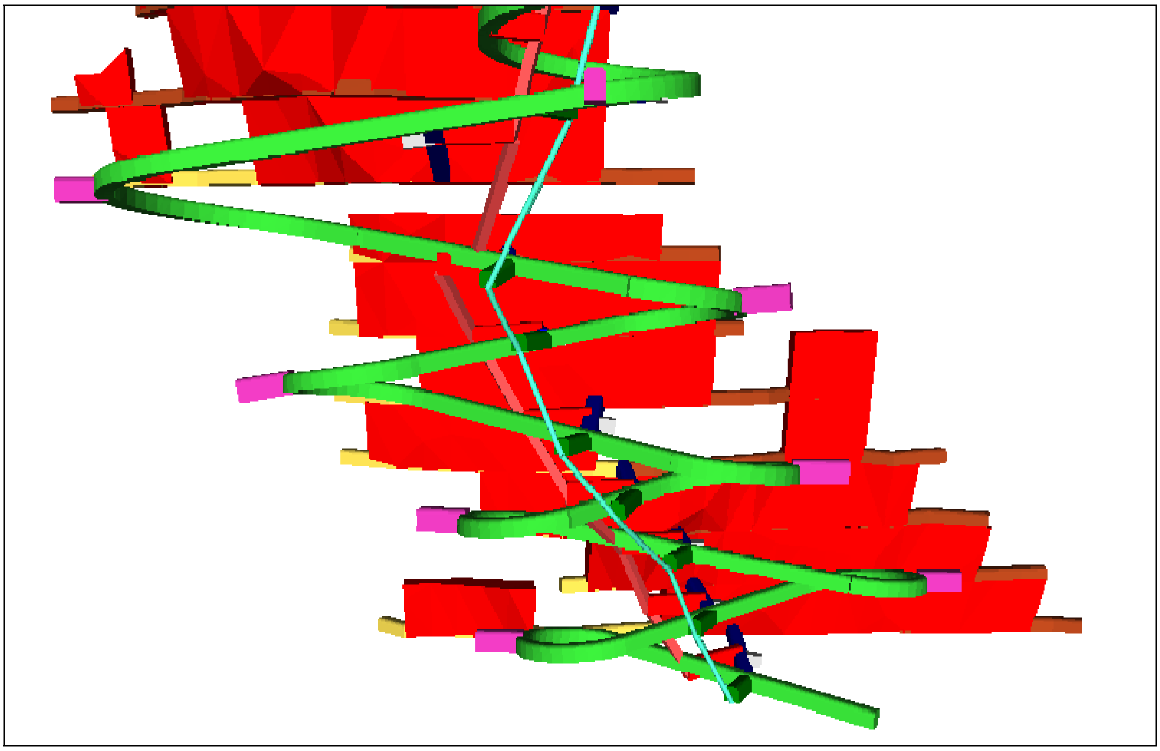
### *Level Development*

Figure 2-9 shows the uphole bench stoping areas below the 10 m crown pillar. The development layout is similar to the stope and fill mining above, with access through waste (blue) to ore development drives (brown and yellow). Stockpiles (pink and white) and return airway accesses are established on each level. Sub vertical return airways (light red) are developed between each level. Escape way accesses and sub vertical escape ways (blue) are developed on and between each level. All horizontal development is to be supported with meshing and bolting.

### *Stope Development*

The stope height for the 975 Level stopes is reduced to 10 m to maintain the 10 m crown pillar below the 1000 Level, all other stopes are 20 m in height – opening to the levels above. Production holes for each stoping level are drilled up from that level. Production ore is available after initial firing and extraction once stoping is completed on the level directly above. Stope wall stability is maintained by leaving island pillars within the stopes. This negates the requirement to import fill material when waste development is minimal in the later stages of the mine life.

**Figure 2-8 Long Section of Lower Development, Stopes and Vertical Rises**



From Abel and Gerritsen (October 2007a)

### 2.3.7 Drilling and blasting

It is anticipated that underground mining will be operated across two 12 hour shifts, 7 days a week on a continuous roster. Drilling and firing activity will be unrestricted during initial development stages and before multi-level mining activities begin.

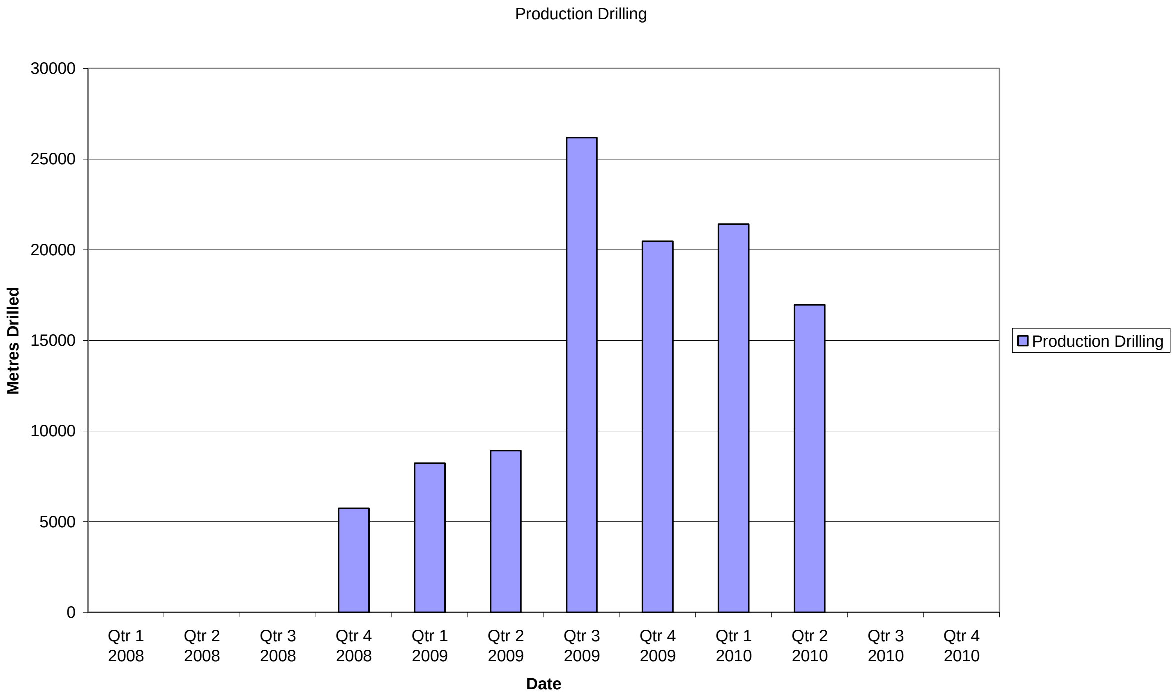
Once multi-level operations commence, firing will occur once to four times a day. All drilling and blasting will be undertaken in accordance with Terra Gold's risk management policy and accepted procedures for blasting.

The quarterly drilling schedule over the initial two years is shown in Figure 2-9 This schedule will be updated every two years over the life of the mine. The schedule will be reported each year in the Maud Creek MMP.

### 2.3.8 Ore stockpile

Ore from the mine will be stockpiled for a short period of time on the existing designated ROM pad adjacent to the current open-cut pit, prior to transporting and later processing at URGM. Geochemical testing reported in Appendix L characterised ore materials as non-acid forming (NAF), but with elevated concentrations of arsenic (As) and antimony (Sb). However, testing of water extractable metals indicate that the risk of significant contamination in surface water run-off from this material is low.

**Figure 2-9 Quarterly production drilling (initial two years)**




From Abel and Gerritsen (October 2007a)

## 2.3.9 Possible future extensions

Terra Gold has an active exploration program within the company and aims to increase the indicated resource thereby extending the life of the Maud Creek mining operation (refer to Section 16).

## 2.3.10 Waste Rock Management

Waste rock will be generated from the construction of the decline and subsequent underground mining operations. Initially, waste rock will be trucked to the surface and stockpiled adjacent to the pit on the existing ROM ore pad. Once the first three bench stopes have been removed, the waste rock will be used to backfill the 1000mRL stope then the remainder will be used to fill the 1025mRL stope through the base of the pit. This is expected to take place within three years of commencing operations.

Currently, approximately 300,000 bank cubic metres (BCM) of oxide waste is located in the existing waste rock stockpile. Geochemical tests have determined this material is non-acid forming (NAF), owing to low sulphide concentration and a moderate to high capacity to consume acid. This waste stockpile has been capped and rehabilitated, though it is noted that it has been colonised by weeds.

Terra Gold propose to use the material from the existing waste rock stockpile to construct the box cut perimeter bund and access roads, after which the remaining stockpile would be shaped to accommodate the Mine Water Dam (Figure 2-3). Section 6 provides further information on the design of the Mine Water Dam. Waste rock management is further discussed in Section 16.5.

## 2.4 Water Management

### 2.4.1 Water requirements and sources

There will be no mineral processing at Maud Creek, as a result there will be no requirement for processing water. Pond water will be generated from the existing pit water inventory, mine dewatering, and also runoff. As described above, the entire operational area will be bunded (including the infrastructure and workshop area, ROM pad and temporary waste rock stockpiles), to ensure that there is zero discharge from the working mine areas. The water management system is described briefly here and in greater detail in Section 6.

### 2.4.2 Mine Water Dam

As noted above, it is proposed to build the mine water dam on the existing waste rock stockpile (from previous mining operations). The area of the waste rock stockpile is 4.6 ha; the use of the waste rock stockpile will avoid the need for disturbance of any new area for the mine water dam.

During construction, the mine water dam will be formed to shape, and the base covered with a suitable fine material sourced from an existing licensed quarry, and a HDPE liner installed over this base.

Following the completion of mining operations, the mine water dam walls will be removed, and the area will be contoured, ripped and seeded.

### 2.4.3 Pit dewatering

The existing pit contains approximately 0.3 GL of pond water. Water will be removed from the pit prior to mining operations, as planned in the development schedule (Figure 2-4). The pit will be kept free of water during mining operations through ongoing dewatering activities.

A bund will be constructed around the rim of the existing pit to minimise the pit catchment, and to protect against water incursion into the pit. Dewatering bores will be installed to lower the groundwater table below the base of the pit. Water generated from pit dewatering activities will be pumped to the mine water dam, and will be then disposed of by land application in the irrigation area.

### 2.4.4 Irrigation

The mine water management system will dispose of all waters arising from the mine area via irrigated land application and dust suppression. The irrigated land application facility will be designed to dispose of mine dewatering volumes during the dry season and stormwater runoff and mine dewatering volumes through the wet season, while minimising the risks of discharge to the creek as well as reducing the impact on soils and groundwater.

The preferred option is to irrigate 84 ha of an existing 160 ha cleared pasture area, located south-east of the mine. A second less environmentally acceptable option would involve clearing an irrigation area north-west of the mining lease (MLN 1978).

Terra Gold envisages that two 42 ha centre pivot irrigation systems would be adequate to dispose of the estimated water inventory, according to guidelines for management of irrigated agricultural land (ANZECC 2000), and to prevent direct discharge to the local creek system.

### 2.4.5 Runoff and erosion control

Runoff from the general mine site area is contained within a perimeter bund (Figure 2-3) and directed to three stormwater sumps. The sumps will be designed to contain peak flows from storm events and will be constructed according to engineering guidelines for soil erosion and sediment control (Institution of Engineers Australia and the Institute of Agricultural Scientists 1996).

Water collected in the stormwater sumps will be pumped to the mine water dam, and then to the irrigation area. The bunded operational area will be designed for a 1 in 500 year storm event (Sections 6.3 and 6.4).

## 2.5 Ore Transport

Road trains will transport the ore to the URGM processing plant, a total distance of approximately 145 km. The road trains will leave the mine site via one of the proposed access roads (shown in Figure 1-3) and pass through GBS Gold freehold property to the Stuart Highway.

At the intersection of the haulage road and the Stuart Highway, the road trains will turn right onto the Stuart Highway. The trucks will then travel north up the Stuart Highway to Ping Que Road, where they will turn right to URGM.

It is anticipated that there will be 15 road train trips per day from the mine site to URGM, carrying approximately 100 t per road train, and 15 road train trips per day returning empty to Maud Creek.

Proposed road works to facilitate safe transport of ore from Maud Creek to URGM include:

- constructing a new access road (preferred Option 1) from the mine site to the Stuart Highway;
- widening of the intersection with the new access road and construction of a slip lane to allow right-turning loaded road trains to accelerate onto the Stuart Highway from the new access road, while other traffic can pass by without stopping; and
- widening the intersection with the new access road to allow left-turning unloaded quad road trains to decelerate on the Stuart Highway, while other traffic can pass by without stopping.

A (non-preferred) Option 2 is to utilise the existing access via Ross Road. With this option the access track would be upgraded and widened, and a crossing would need to be installed over Gold Creek, to enable haulage to continue during periods of high water flows in the creek.

This route is also longer, and is used by other landholders along Ross Road and by a school bus service. Further information on transport and haulage is included in Section 15.

## 2.6 Processing at URGM

The URGM processing plant is currently configured to treat free-milling oxide ores only. GBS Gold is in the process of expanding the processing facilities to treat refractory ores, such as those found at the Maud Creek mine site. This expansion is expected to increase the gold production of the plant from 150,000 ounces per annum to 250,000 ounces per annum.

Gold ore is typically defined as refractory when the gold recovery is less than 80 % through conventional gold leach processes such as standard cyanidation and carbon adsorption processes (CIL). These refractory ores require pre-treatment in order for cyanidation to be effective in recovery of the gold. A refractory ore generally contains sulfide minerals, organic carbon, or both.

Sulfide minerals often trap or occlude gold particles, making it difficult for the leach solution to dissolve the gold for recovery in the carbon adsorption circuit. Refractory ores require pre-treatment in order for the gold to be recovered. This typically entails producing a high grade, low tonnage concentrate in a flotation plant.

Pre-treatment options for refractory ores include:

- bio-oxidation;
- pressure oxidation;
- roasting; and
- ultrafine grinding.

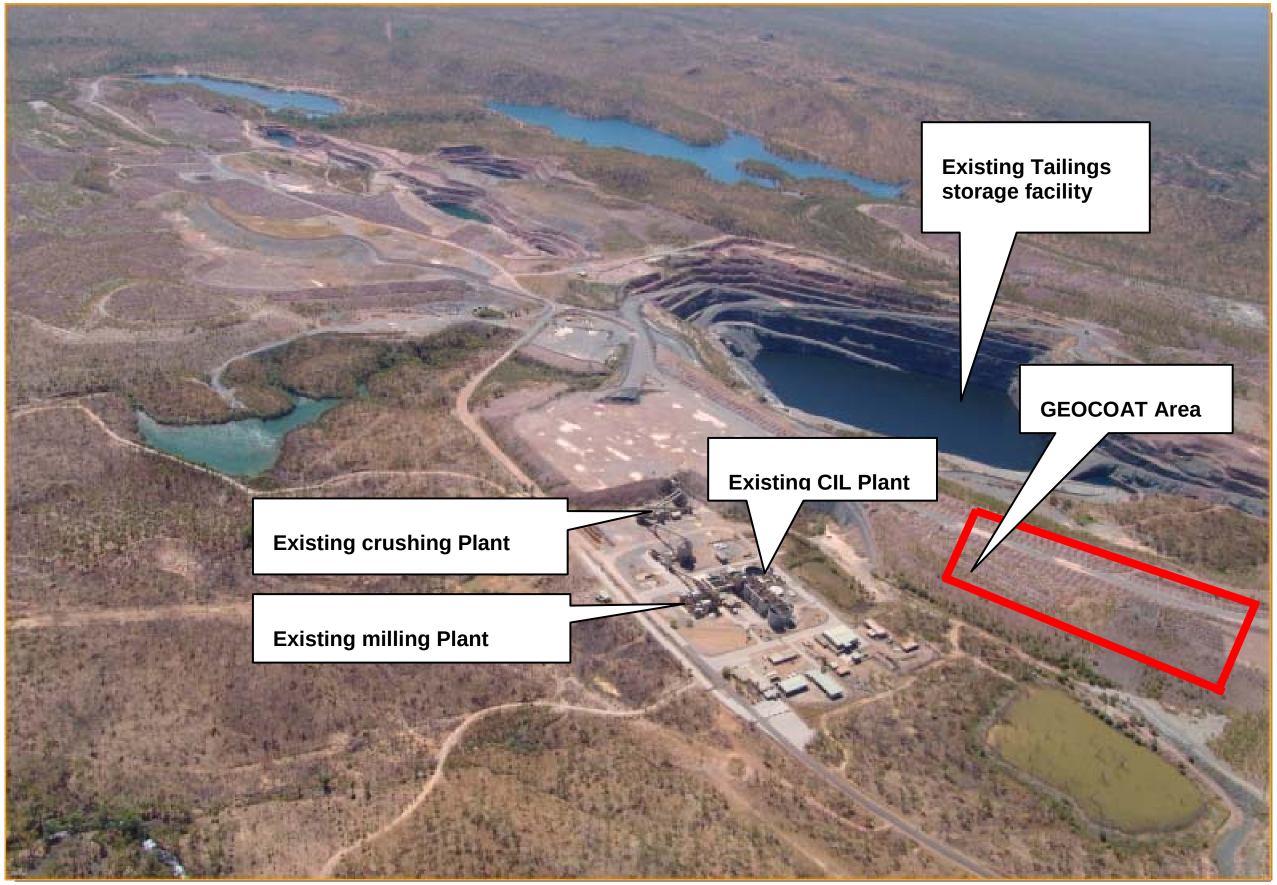
The refractory ore treatment processes are typically preceded by concentration (usually sulfide flotation). Oxidation of the sulphide minerals in the flotation concentrates is then required. Bio-oxidation involves the use of bacteria that promote oxidation reactions in an aqueous environment.

All new URGM facilities associated with this upgrade will be constructed within the existing plant area and on an existing disturbed waste rock stockpile, as illustrated in Figures 2-11 and 2-12. No new areas will need to be disturbed. Tailings from processing the refractory ore will be disposed of in the existing tailings disposal facility, along with tailings from the existing oxide circuit.

The additional facilities required for construction at URGM are a flotation plant, a heap bio-oxidation plant (GEOCOAT®) with neutralisation section, and an additional CIL plant. The existing facilities such as the free gold circuit within the free milling circuit, the elution section and the gold room will be shared between the free milling and the refractory ore circuits. A revised MMP to reflect these changes was submitted to DPIFM in April 2007, and was approved in July 2007.

**Figure 2-10 Proposed Positioning of Plant Expansions**

**Figure 2-11 Proposed Positioning of Heap Bio-oxidation Plant (GEOCOAT®)[1]**




[1] There is distortion in the image due to the wide angle lens used in this photo such that the extent of the GEOCOTE plant is approximate and not to scale.

### 2.6.1 Process description for free milling and refractory ore

#### *Free milling ore*

The flow diagram in Figure 2-13 illustrates the current gold recovery technique that is employed for processing of free milling ore at the URGM plant.

Free-milling ores are defined as ores where around 95% of the gold can be recovered through a standard cyanidation and carbon absorption (Carbon In Leach [CIL]) circuit once is has been through a crushing and milling circuit to reduce the size of the material to around 80% passing 75 micron (0.075 mm). Free milling ores are typically close to the surface and have been weathered, or oxidised and may overlay refractory ore, which is too deep to have been subject to natural weathering or oxidation (see below).

At URGM the mined ore is crushed and then milled with water to produce a gold bearing slurry. A gravity circuit then recovers any gold particles that are completely exposed. The slurry is then pumped into a CIL circuit where cyanide is added. The cyanide leaches (dissolves) the gold particles so that less than 5% of the gold is left in the solids.

Activated carbon is added to the slurry and this absorbs the gold that is in the solution much like a sponge absorbs water. The carbon is removed from the slurry and processed through an elution circuit where the gold is removed from the carbon and concentrated up for final gold bar production in the gold room. The carbon is recycled back to the CIL circuit and the barren slurry is disposed of in a tailings disposal facility

#### *Refractory ore*

Refractory ore types are typically ores where the gold particles are too small to be exposed through conventional crushing and milling, or where the particles are fused with surrounding rock. Figure 2-14 shows the flow diagram of refractory ore processing at URGM. Refractory gold is typically associated with sulphide minerals such as pyrite and arsenopyrite.

In refractory ores, much of the gold may be harder to leach out using conventional cyanidation and carbon absorption alone, because the particles are either too small to be exposed through conventional milling or are intimately bonded with the host rock.

Refractory ores typically require additional processing through a flotation and oxidation process before the gold can be recovered through conventional cyanidation and carbon absorption processes.

At URGM the refractory ore is crushed and then milled with water to produce a gold bearing slurry. A gravity circuit then recovers any gold particles that are completely exposed. The material is then pumped to a flotation circuit where a high grade low tonnage gold bearing concentrate is produced. The flotation process is a physical process that utilises the natural characteristic of the sulphide minerals to repel water and therefore to remain ‘dry’ in a milled slurry.

Copper sulphate and Sodium Isobutyl Xanthate is added to the slurry prior to the flotation process to enhance the physical characteristics of the gold bearing sulphide minerals to repel water. The slurry is then pumped into flotation cells where air is introduced into the slurry. A long chain alcohol frother is added to strengthen the froth (bubbles) produced. The sulphide minerals attach to the froth and float to the surface of the cells where it is removed. The unwanted material flows through the cells and is disposed of in the tailings disposal facility.

The gold bearing concentrates are then thickened to a paste and pumped to the GEOCOAT® biological oxidation circuit to expose the gold particles. The paste is coated onto fingernail-sized pebbles and then stacked in a heap on a well prepared base. An acidic irrigation solution is pumped onto the heap and air is introduced through the base of the heap.

**Figure 2-12 Union Reefs Free Milling Ore Process Flow Diagram**

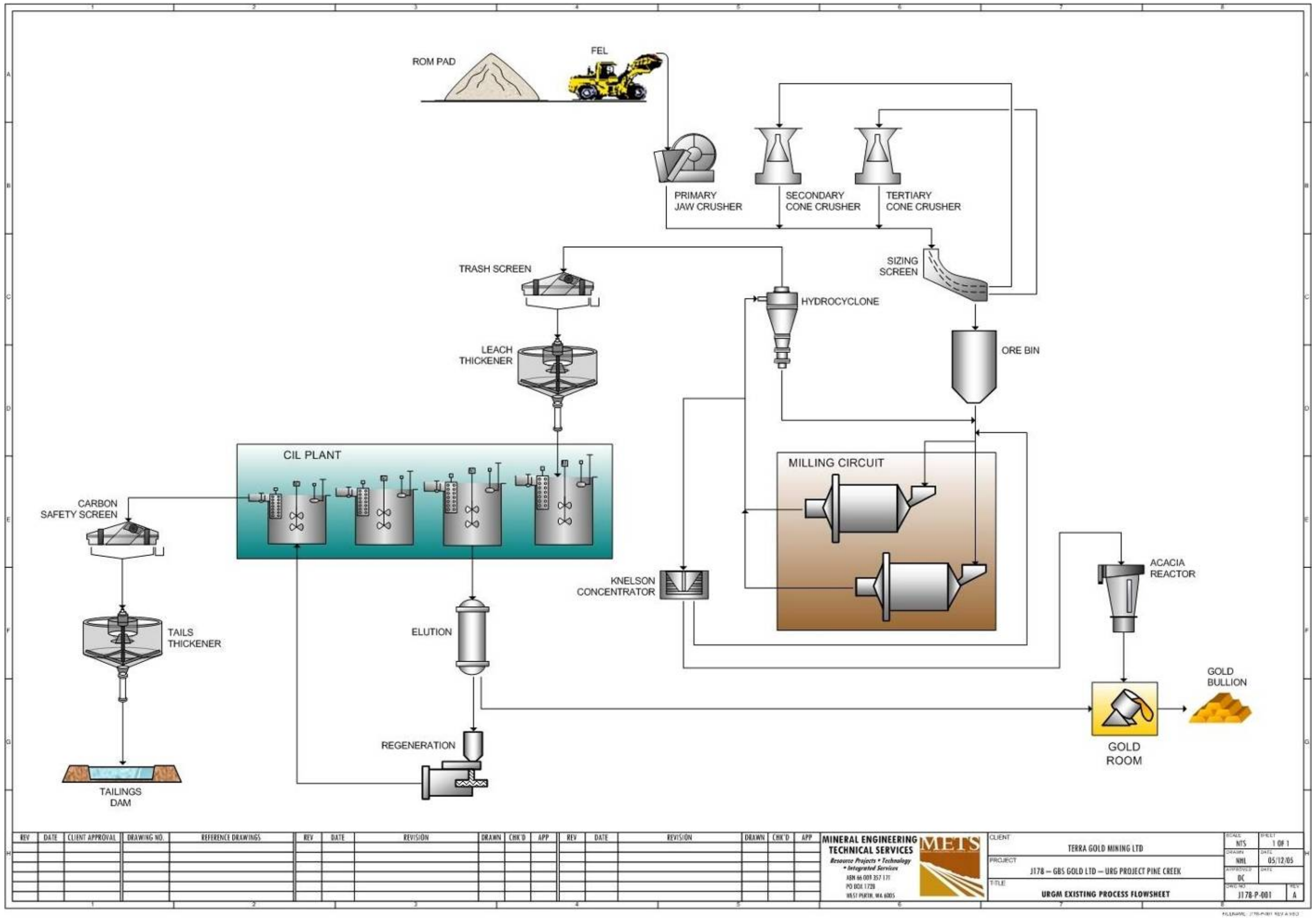
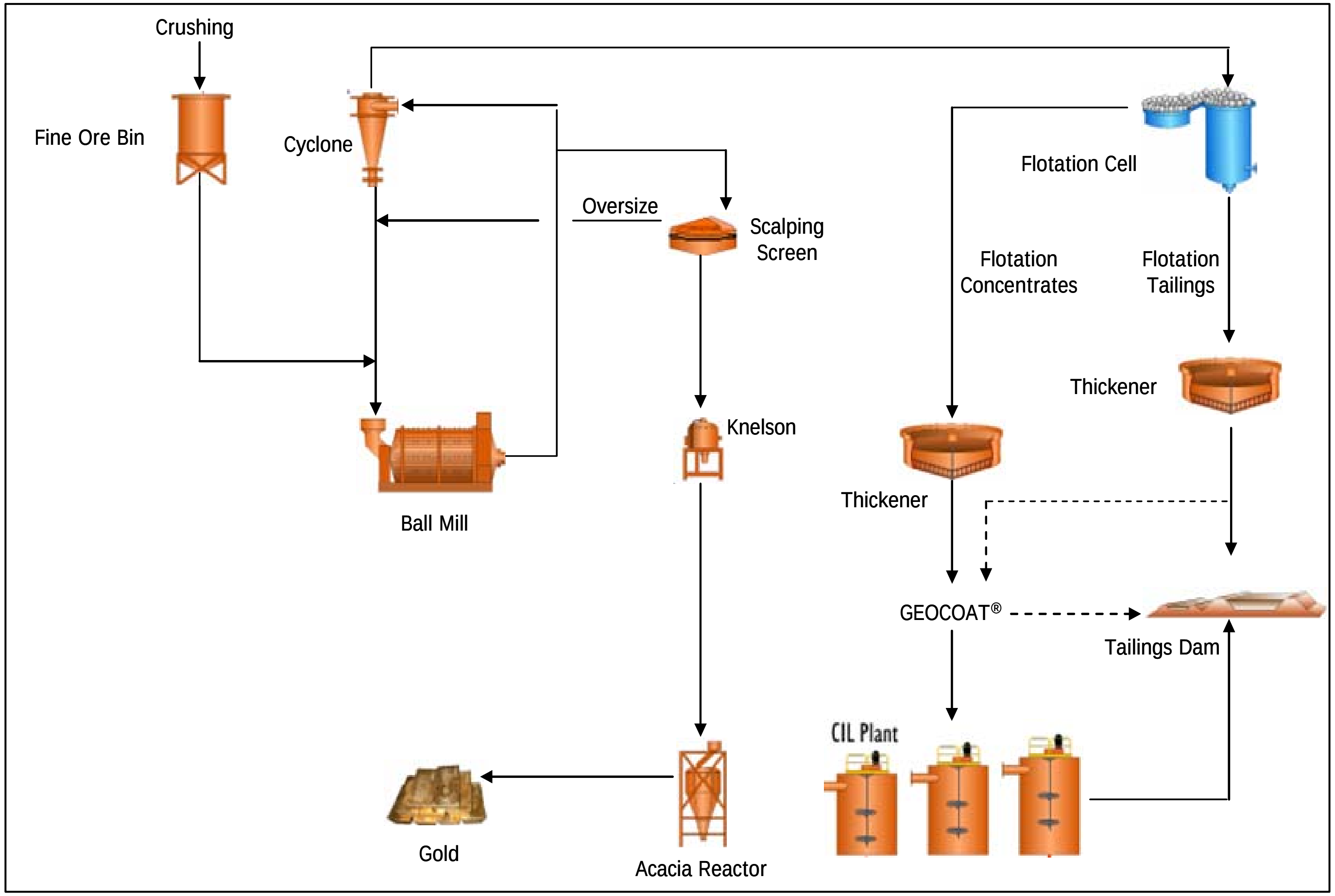


**Figure 2-13 Union Reefs Refractory Ore Process Flow Diagram**



The GEOCOAT® process uses industry standard bacteria to fast-track the oxidization process that would normally occur through exposure to the elements. These bacteria are naturally occurring, and are harmless to plants, animals and humans.

The coated pebbles are left on a formed heap for 75 to 90 days to allow the bacteria to oxidise the sulphide minerals and expose the gold. After this time, the coated pebbles are removed from the heap, and the now-oxidised concentrate containing the gold is washed off the rock for further processing. The pebbles are then recycled back to the heap.

The gold-bearing material then passes through a conventional cyanidation and carbon absorption gold recovery process, followed by final gold production in the gold room.

All the gold produced in the gold room is transported to the Perth Mint for final refining and sale.

### 2.6.2 Tailings management

All tailings generated from processing Maud Creek ore will report to the Crosscourse in-pit tailings disposal facility at URGM. The Crosscourse in-pit tailings disposal facility was commissioned for tailings deposition in August 2002.

The environmental monitoring programme will document the volume and placement of tailings, remaining capacity, groundwater impact and supernatant water quality. Reporting will be timed so as to manage the low level risks associated with in-pit tailings disposal at this site (URS 2002).

The total tailings disposed to the Crosscourse in-pit tailings disposal facility to July 2006 is estimated at 2.1 Mt (1.6 $Mm^3$). The capacity of Crosscourse Pit in-pit tailings disposal facility is estimated to be 32.8 $Mm^3$.

Since URGM was recommissioned in August 2006, a total of 0.6 Mt (0.4 $Mm^3$) of additional material has been pumped into the tailings facility. The estimated life of this facility at the current rate of tailings generation is approximately 25 years.