Appendix F

Hydrology

63 Wessel Road Rivonia 2128 PO Box 2597 Rivonia 2128 South Africa

Telephone: +27 (0)11 803 5726 Facsimile: +27 (0)11 803 5745
Web: www.gcs-sa.biz

Leeuwpan Hydrology - Scoping Report

Version – Draft

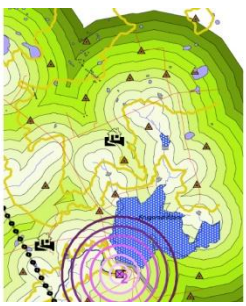
23 April 2012

Exxaro Leeuwpan Coal

GCS Project Number: 11-447

Client Reference: Leeuwpan Hydrology

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Author	P. Lourens		
Document Reviewer	A. Marais		
Director	A. Marais		

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1 INTRODUCTION

The Leeuwpan project is situated just outside the town of Delmas in the Mpumalanga Province of South Africa. The study area is located in Water Management Area 4: Olifants and in quaternary catchment area B20A. The Bronkhorstspruit River flows in a south-north direction through the site to eventually end in the Bronkhorstspruit Dam downstream of the site area. Natural water features on site include tributaries of the Bronkhorstspruit River and pans. Artificial water features on site include farm dams, old void areas, Pollution Control Dams (PCD's), rain water in open cast pits and river diversion channels.

Mining activities are widely spread over the entire Olifants catchment area making the project sensitive to already existing water quality issues. Downstream and sensitive users need to be carefully considered in the hydrological study in order to assure responsible management.

2 PROPOSED SCOPE OF WORK

The Leeuwpan project consists of existing mining activities and infrastructure as well as newly proposed mining activities and associated infrastructure. The official Scope of Work (SoW) as detailed in the proposal documents can be summarised as follows:

- To conduct detailed hydrology over the entire project boundary area including the following;
  - Baseline quality evaluation;
  - Average flow contributions;
  - Flood lines;
  - To establish a "status quo" condition on site with regards to Storm Water Management (SWM);
- To compile a conceptual SWM Plan (SWMP) for the entire project boundary area (existing mining activities and infrastructure as well as newly proposed mining activities and associated infrastructure);
- To do PCD analyses;
- To provide preliminary conceptual designs of all proposed infrastructure;
- To update the existing Water Balance (WB) Process Flow Diagram (PFD);

- To update the existing Water and Salt Balance (W&SB);
- To investigate treatment options (desktop level);
- To create a detailed monitoring program;
- To give ratings on potential environmental impacts; and
- To propose mitigation measures.

The hydrological investigation will form part of the amendments to the EIA, EMP and WULA authorisation processes.

3 INNITIAL SITE VISIT

An initial site visit was conducted on Wednesday 18 April 2012 where an overview of the site was established and baseline quality samples were taken at strategic points. The following main aspects were observed on site:

- 3 river diversions
- Rehabilitated areas;
- 2 large void areas with water;
- The main plant;
- 3 main active pits;
- 3 non active pits;
- Neighbouring mines;
- Lined Storm Water drains around plant area;
- Berms to separate potential dirty water from clean water;
- Silt trap upstream of PCD next to plant; and
- PCD's.

The watercourse on the newly proposed area that is indicated on the 1:50 000 topographical map was not flowing and did not seem to have a defined flowpath.

4 PLAN OF STUDY

It is envisaged that the following aspects need to be evaluated in detail:

- Hydrology:
  - Current compliance status of SWM measures on site;
  - Compilation of a conceptual SWMP;
  - Preliminary conceptual designs of proposed new infrastructure;
  - Evaluation of water quality of voids;
  - Comparison of baseline quality results against existing quality parameters;
  - Possible evaluation of groundwater quality at specific points in order to evaluate the potential effects of decanting of ground water into surface water features;
  - To create a monitoring network;
  - To evaluate different treatment options (desktop) of surface water used within the system for the potential discharge and/or r-use of water;
  - To evaluate the effectiveness of the existing river diversions in terms of design criteria and conveyance of peak flows;
  - Effectiveness of rehabilitation;
    - To establish if the possible effect of decanting can be mitigated;
- Water and Salt Balance
  - Verification of existing Process Flow Diagram
  - Confirmation of flows and demands
  - Confirmation of operational philosophies
  - Verification of existing water balance model
    - Including wet and dry seasons
    - Including a statistical analysis of rainfall data to take into account extreme events.
- To assess the potential impacts of current and future mining activities and infrastructure on the natural surface water features in the environment; and
- To propose mitigation measures.

The Figure below gives a short summary of the main aspects as described in this section and can be summarised as follows:

RD = River Diversion

Void = Old rehabilitated pit area that is non active and contains water;

PCD = Pollution Control Dam;

PCD & ST = Pollution Control Dam & Silt Trap;

Rehab area = Old rehabilitated pit areas;

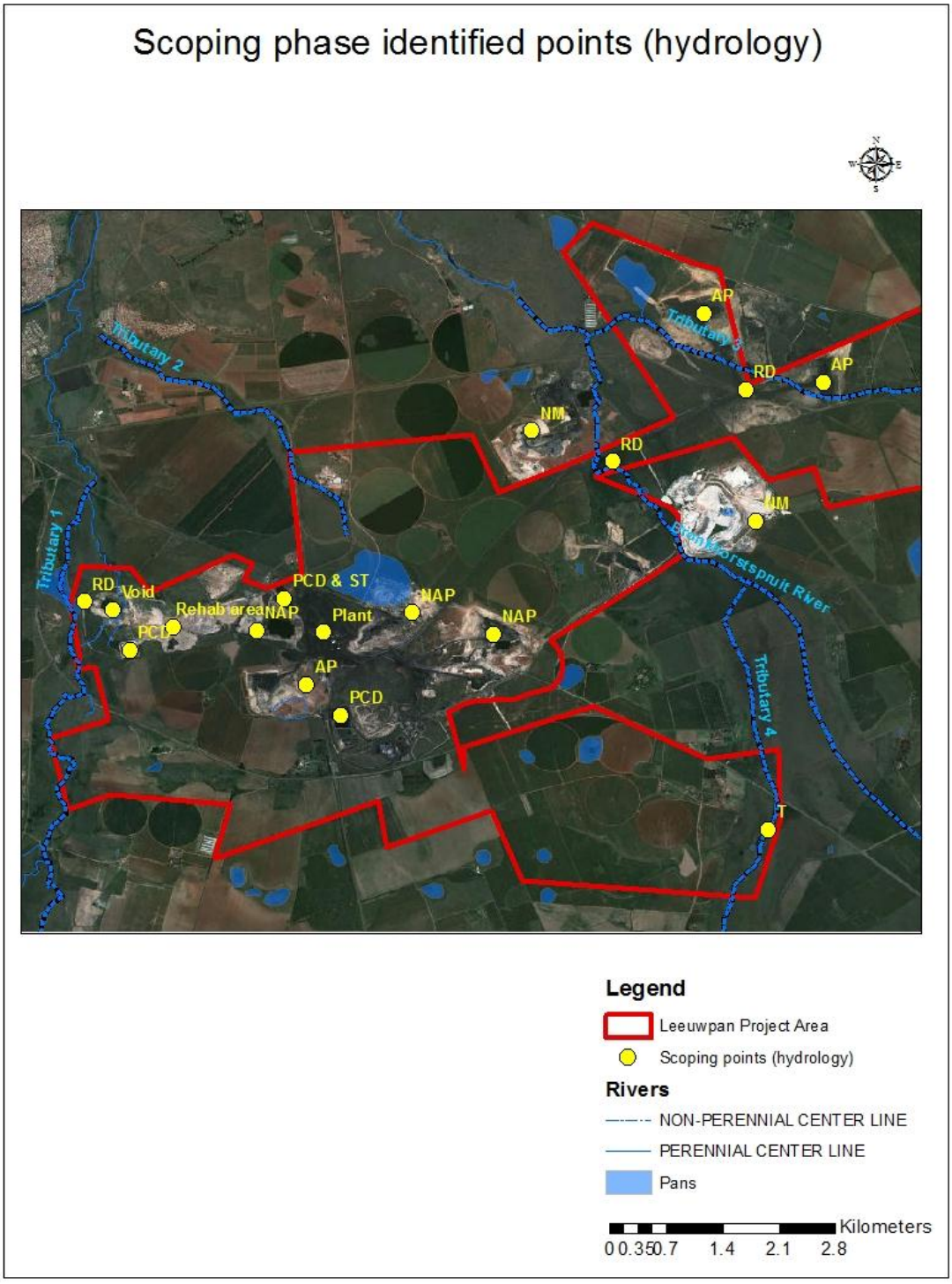
Plant = Main plant and crushing area;

AP = Active Pit;

NAP = Non Active Pit;

T = Tributary of the Bronkhorstspruit River (no water or defined channel);

NM = Neighbouring Mines.


Scoping phase identified points (hydrology)
Tributary 1
Tributary 2
Tributary 3
Tributary 4
Grootspruit River
RD
Void
Rehab area
PCD & ST
NAP
Plant
NAP
NAP
PCD
AP
PCD
AP
RD
AP
NM
RD
NM
T
Legend
Leeuwpan Project Area
Scoping points (hydrology)
Rivers
NON-PERENNIAL CENTER LINE
PERENNIAL CENTER LINE
Pans
Kilometers
0 0.35 0.7 1.4 2.1 2.8