MEMO: VANDYKSDRIFT CENTRAL (VDDC) PROJECT: MINE RESIDUE FACILITIES: WASTE CLASSIFICATION AND BARRIER DESIGN

From: **Marietjie Eksteen**

To: **Morné van der Westhuyzen (Worley Parsons SA)**

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1. WASTE CLASSIFICATION

1.1 Overburden Dumps

A new overburden dump will be developed in the south-east of the VDDC project area and the existing overburden dump at the Steenkoolspruit (SKS) pit will also be used – refer to attached Figure (courtesy J&W, 2019).

Golder Associates conducted a geochemical characterisation study for the Wolvekrans Colliery in 2018. The Waste Classification and Management Regulations and the Norms and Standards for the Assessment of Waste for Landfill Disposal (GN R.634 to R636, 23 August 2013), promulgated under the National Environmental Management: Waste Act 59 of 2008 (NEMWA) were interpreted and used to determine the mine waste materials classification type.

Spoils associated with the existing SKS pit were analysed to determine the waste classification type. No samples were taken from the VDDC opencast areas; however, geologically this material should be very similar to the adjacent SKS pit and the results from the SKS spoils is therefore considered sufficient for the purpose of classifying the VDDC overburden (spoils) material.

The Golder report (2018) concluded that the spoils from SKS main pit are not Type 4 waste as at least one parameter exceed TCT0, but it does not meet the definition of Type 3 waste either due to low risk from leachate (all parameters LC≤LCT0).

Thus, although the spoils from SKS main pit might be considered as Type 3 for the purpose of barrier design if stored, stockpiled or dumped outside the pits (in terms of GN R. 635 Regulation 7(6)), the environmental risk associated with drainage from the spoils is similar to that of a Type 4 waste due to low concentrations of leachable constituents.

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1.2 Mixed ROM coal and slurry stockpile areas

Historically fine coal slurry was disposed of in the No. 2 seam mine workings. During the VDDC opencast mining process the slurry will be mined with the Run of Mine (ROM) coal and the blended coal and slurry will be transferred to mixed ROM coal and slurry stockpile areas located to the south of the Vleishaft Dam. The fine coal will be in a wet state, due to the historical flooding of the underground workings, hence, the mixed material will be allowed to dewater for approximately 30 days, before it is taken to the South Export Processing Plant. Water will be collected and conveyed via a silt trap to the Vleishaft Dam.

Jones & Wagener (Pty) Ltd (J&W) conducted a waste assessment to determine the default barrier system for the mixed ROM coal and slurry stockpile areas as required in terms of the National Norms and Standards for the Assessment of Waste for Landfill Disposal published in GNR 635 of August 2013.

J&W concluded that the slurry is a Type 3 waste requiring stockpiling and disposal on facilities of which the performance of the barrier system complies with a Class C landfill as per the National Norms and Standards for Disposal of Waste to Landfill.

However, based on an amendment to the Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits from a Prospecting, Mining, Exploration or Production Operation of July 2015, the requirement to conduct a waste assessment for mine residue facilities has been removed from these regulations and replaced with the risk-based approach whereby resource-pathway-receptor modelling can be conducted to determine the barrier requirements for residue stockpiles and deposits.

J&W therefore recommended that, although the coal slurry was assessed as a Type 3 waste requiring stockpiling and disposal on facilities of which the performance of the barrier system complies with that of a Class C landfill, source-pathway-receptor modelling should be considered to identify the most appropriate barrier system for the mixed ROM coal and slurry stockpile areas at VDDC.

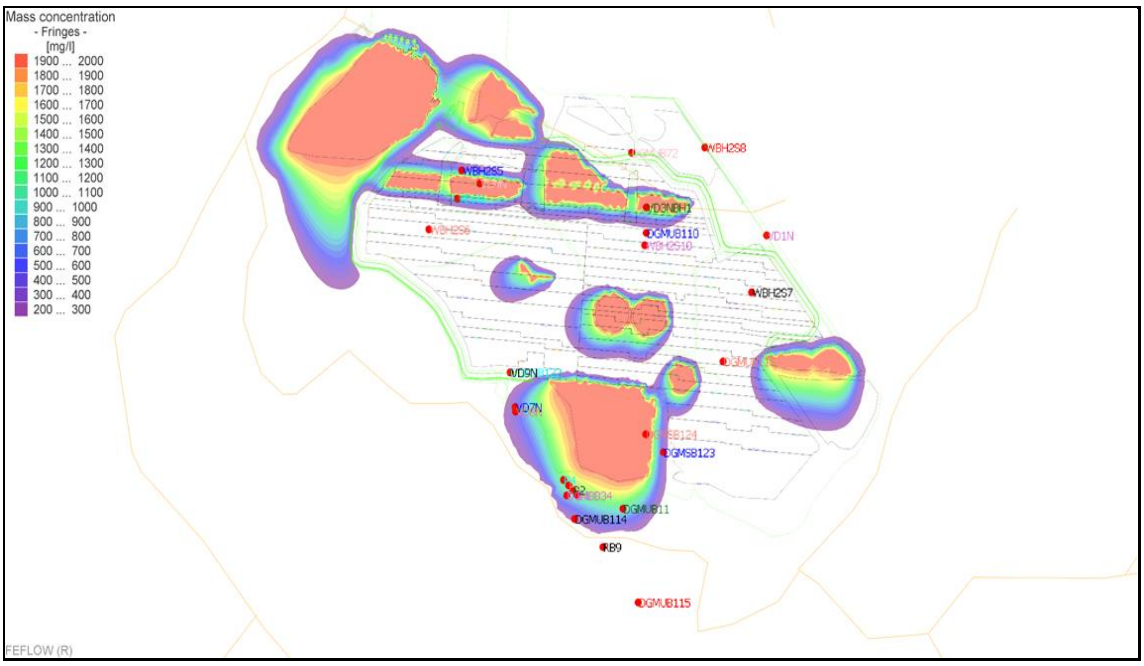
2. SOURCE-PATHWAY-RECEPTOR CHARACTERISATION

The current VDDC groundwater model (J&W, 2019) includes a high-level Source-Pathway-Receptor (SPR) assessment, and was recently updated in line with the final block plan for the VDDC Project (*Drawing C00820_05AA_GE_DAL_0001_001_Rev1*):

- The overburden dumps and mixed ROM coal and slurry stockpile areas have been included as potential impact sources.
- Source terms used for the material on these facilities were based on previous geochemistry assessments (Golder, 2018 and others), and augmented by the additional work done recently on the underground slurry (J&W, 2019).

- The worst-case scenario has been modelled, i.e. these facilities are unlined and a recharge of 20% over the footprint area has been assumed.
- The extent of impact has been modelled and the receptors that will be impacted, have been identified.

The figure below indicates the potential contamination plume during the operational phase from the various potential pollution sources identified within the VDDC project area (J&W, 2019). The figure below indicates a very low risk of contamination of the Olifants River and its tributary to the east of the new overburden dump in the south-east.



Further aspects to consider:

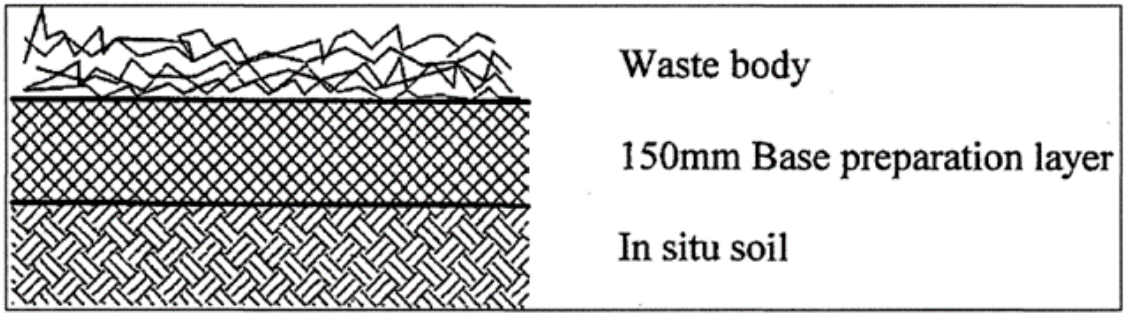
- The mixed ROM coal and slurry stockpile areas are located within the mining footprint and will be mined out at some stage. Any dirty surface water from these facilities will be collected and conveyed via a silt trap to the Vleishaft Dam and managed as part of the dirty water management system. Any leachate to the groundwater will flow to the open pit and/or underground workings due to the cone of depression caused by opencast mining, and again managed as part of the dirty water management system.
- The SKS overburden dump is an existing facility located within the SKS pit footprint and dirty water will be collected within the SKS pit and managed as part of the dirty water management system.

- The overburden dump to the south-east will not be mined out, but the material will be utilised as backfill during the rehabilitation of the final VDDC void. Surface water runoff from the dump will be captured and managed as part of the dirty water management system.

3. RECOMMENDED BARRIER DESIGN

Based on the waste classification and SPR assessment, and associated risk for contamination, the following recommendations are made in respect of the barrier systems for the mine residue facilities at VDDC:

- Mixed ROM coal and slurry stockpile areas: Class D barrier design
- SKS overburden dump: None (existing)
- New overburden dump in the south-east: Class D barrier design



Example of Class D barrier design

References:

Golder Associates, 2018: Geochemical Characterisation for Wolvekrans Colliery: Report Number: 1660807-317000-1 – DRAFT: May 2018.

Jones & Wagener, 2019: Wolvekrans Colliery: Vandyksdrift Central Mining Infrastructure Development Coal Slurry Waste Classification and Assessment Report: Report No.: Jw103/19/G535 - Rev 1: May 2019.

Jones & Wagener, 2019: Wolvekrans Colliery: Vandyksdrift Central Mining Infrastructure Development Groundwater Impact Assessment (Draft).

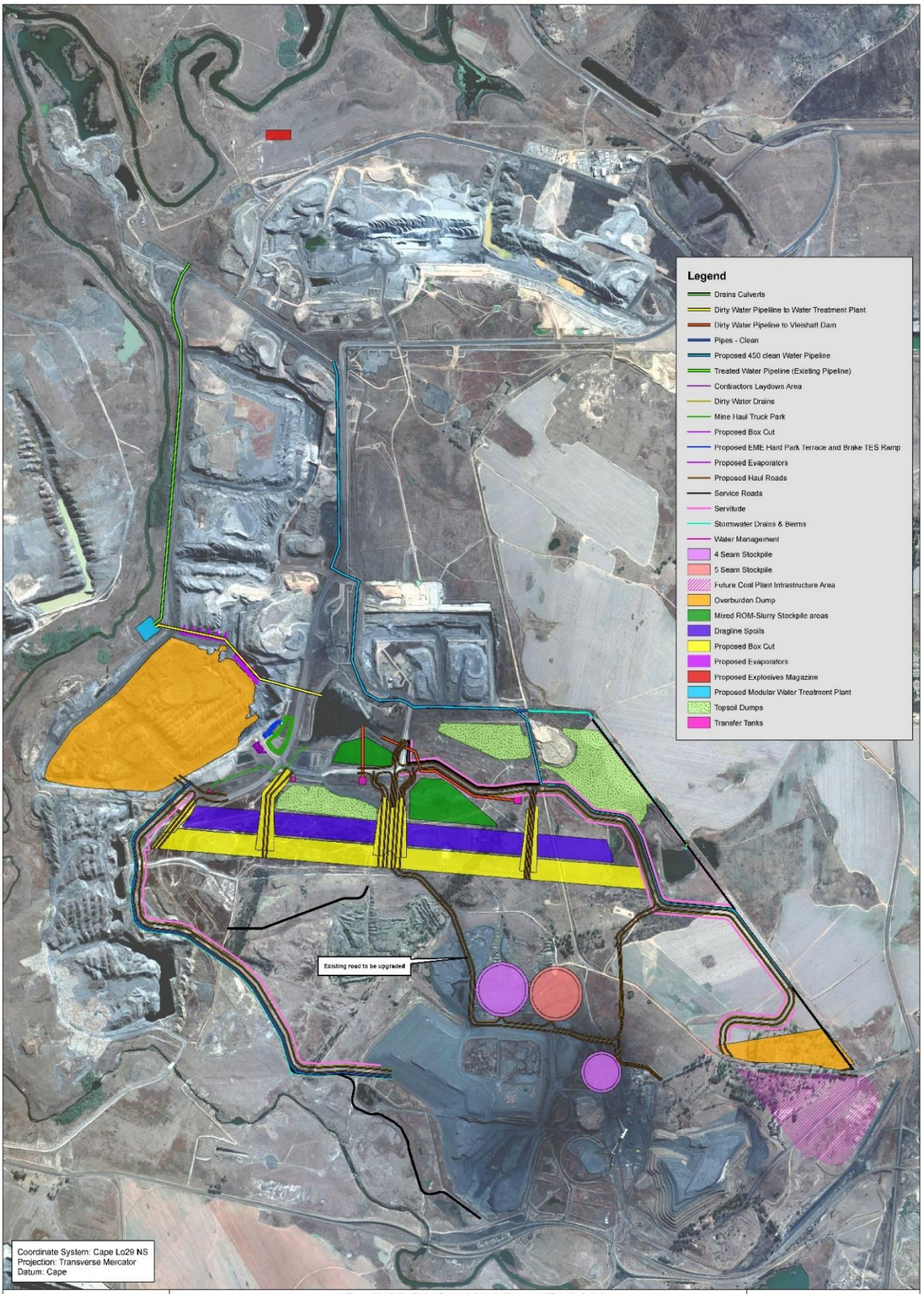


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Figure 2