AGNEW GOLD MINE
WORKS APPROVAL APPLICATION

ATTACHMENT 6A
EMISSION AND DISCHARGES

PREPARED FOR:

AGNEW GOLD MINING COMPANY PTY LTD

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REDEEMER WWTP WORKS APPROVAL APPLICATION
ATTACHMENT 6A - EMISSIONS AND DISCHARGES

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1. CATEGORY 54 - WASTEWATER TREATMENT PLANT

Construction and assembly of the WWTP and irrigation field (the proposed works) have the potential to create a number of emissions and discharges to the environment that may impact the health of site personnel and that of the adjacent environment. Emissions to air and from noise, and discharges to land and surface water, and groundwater are discussed in the following sections.

1.1 EMISSIONS TO AIR

1.1.1 Sources

Installation of the WWTP may have the potential to impact air quality through the generation of dust via:

- Installation of footing for the SBR WWTP 12 m container.
- Vehicle movements on unsealed roads.

Operation of the WWTP has the potential to impact air quality through the generation of odour via:

- Storage, handling, use and spillage of treatment chemicals.
- Raw sewage lines and storage.
- WWTP operation, treated effluent storage, sludge storage and irrigation field discharge.

1.1.2 Potential Impacts

Potential impacts from diffuse source particulate, gaseous emissions and odours as a result of the installation and operation of the modular SBR WWTP include:

- Impact on human and fauna health through inhalation.
- A decrease in vegetation health and condition in adjacent areas due to dust covering vegetation, blocking stomata and reducing the plant's ability to photosynthesise.
- Reduced air quality from discharge of greenhouse gas emissions and particulates.
- Reduction in local air quality from mobile equipment emissions from engine exhausts including particulates, carbon monoxide, carbon dioxide, sulfur dioxide and nitrous oxides.

1.1.3 Receptors

There are no environmentally sensitive receptors near the WWTP area that may be impacted.

The closest air quality receptors to the replacement WWTP are:

- Fauna and flora in close association with the site.
- On-site personnel working in the vicinity of the plant and irrigation field.

1.1.4 Control Measures

1.1.4.1 Dust Emissions

The following management measures will be implemented during operations:

- Dust minimisation measures will be implemented during installation activities.

- Vehicles and earth moving equipment will keep to defined roads.
- Dust will be managed by watering unsealed areas with a water cart as required.
- Occupational hygiene requirements for dust will be complied with in operational areas.

1.1.4.2 Odour Emissions

All WWTPs have the potential for the generation of odour emissions. This may happen when aerobic bacteria consume oxygen and other nutrients at a faster rate than expected (e.g., with increasing wastewater temperature). This results in low dissolved oxygen, which, coupled with rising water temperatures can lead to an increase in anoxic zones within the wastewater system. Anaerobic digestion releases sulfur compounds, including hydrogen sulphide (H2S), along with a variety of other gases that are the causes of wastewater odour.

Mitigation of odour occurs primarily through changes in the control of the WWTP process, including:

- Increasing the dissolved oxygen in the WWTP to prevent anaerobic digestion
- Increased circulation to ensure dissolved oxygen is evenly distributed
- Adding sodium hypochlorite to increase the sewage pH, thus limiting the generation of H2S.

Additional management measures will be implemented during operations:

- The WWTP will be maintained in accordance with the manufacturer's specifications.
- Sludge will be removed to the on-site landfill or bio-remediation pads in accordance with the conditions of Environmental Licence L4611/1987/11on an annual basis
- The irrigation field will be fenced, sign-posted and be maintained in accordance with the manufacturer's specifications.
- A 50 m buffer between irrigation field and mine activities (including roads) will be implemented to ample ensure separation.

1.1.5 Predicted Environmental Risk

Project design and location has considered exposure to odour emissions in order to minimise adverse impacts. Stringent control measures will be implemented during operations to ensure compliance with occupational health and environmental emission standards.

Given the remote location of the Project, the containerised nature of WWTP infrastructure and buffer from the irrigation field, risk of impact to air quality is considered to be low.

1.2 NOISE EMISSIONS

1.2.1 Sources

Minor noise emissions that have the potential to occur during construction and from the operation of the WWTP and irrigation field include:

- Unloading, moving and assembling infrastructure.
- Pumps.
- Generators.
- Irrigation field discharge.
- Warning alarms.

1.2.2 Potential Impacts

The potential environmental impacts from noise emissions as a result of project implementation may include:

- A decrease in amenity due to increased localised noise volumes.

1.2.3 Receptors

Potential adverse impacts from project related noise will be limited due to the reasonably remote location of the project. There are no human receptors in the vicinity of the Prescribed Premises relevant to the proposed works. The nearest township is located 26 km northeast of the Prescribed Premises boundary being the Leinster townsite. The receptors of potential noise issues will be limited to employees and contractors working at and residing in the accommodation camp.

1.2.4 Control Measures

The following management measures will be implemented during construction and operations:

- Construction conducted during daytime operations.
- The WWTP unit is fully enclosed in noise attenuating sea-containers.
- The WWTP units and irrigation field components will be maintained to ensure they are operating efficiently and within manufacturer's requirements.

1.2.5 Predicted Environmental Risk

Given the remote location of the project, low levels of noise, and proposed mitigation and management measures for noise, the residual risk is expected to be low.

1.3 DISCHARGE TO LAND AND SURFACE WATER

1.3.1 Sources

Planned discharges to land as part of the operations include:

- Discharge of treated sewage effluent to the designated irrigation field.

Unplanned discharges to land and surface water during construction and operations may include:

- Unplanned discharge of reagents stored in the WWTP.
- Unplanned discharge of raw sewage, treated effluent, and sludge.
- Treated sewage effluent not meeting design quality criteria.

1.3.2 Potential Impacts

The WWTP and irrigation field construction and operations have the potential to:

- Cause deposition of sediment in the surrounding environment from uncontrolled runoff during construction activities.
- Cause ponding of water in infrastructure areas (e.g. irrigation field).
- Contaminate surface water and land due to spillages or leaks of chemicals, sewage or hydrocarbons.
- Mobilise treated effluent from the irrigation field to natural drainage lines, particularly during periods of high rainfall.

1.3.3 Receptors

The discharge area of the WWTP and irrigation field is situated 300 meters upstream from the historical surface water lines. However, the topography of the area has been modified due to infrastructure development. To prevent inundation of the irrigation field, surface water flows will be redirected around it. Efforts will be made to guide the water towards natural flow paths and minimise flows to dry creek beds.

1.3.4 Control Measures

Project design has considered the local topography and locations of adjacent drainage lines and surface water flows to minimise the potential impacts of expected and unexpected discharges during construction and operations. Management measures implemented to control and mitigate the potential impacts of discharges to land and surface water of the treated effluent intended for irrigation include:

- Validation and verification monitoring of the WWTP irrigation tank at low exposure risk level (ERL - DOW WPQN22) as outlined in the DoH National Guidelines for Water Recycling: Managing Health and Environmental Risks (DoH 2006).
- Appropriately sized irrigation field to irrigate volumes of treated effluent generated for discharge according to DoW's Water Quality Protection Note (WQPN) 22 (DoW 2008).
- Irrigation has been designed so run-off, spray drift or other discharge does not occur beyond the boundary of the designated irrigation area.
- Wastewater will be evenly distributed over the irrigation area to prevent pooling and soil erosion.
- A flow meter will record the volume of treated wastewater discharged to the irrigation area.
- Appropriate fencing and signage will be installed at the irrigation area as per DoH requirements.

The following management measures will be implemented to manage potential discharges to land and surface water during operations:

- All storage components will be impermeable, and tanks installed on a compacted and stabilised earthen pads.
- Sludge volumes monitored on a monthly basis with sludge to be removed and disposed of to the on-site landfill facility or bioremediation pads as required. .
- WWTP tanks will be hydro-tested with fresh water during commissioning.
- The WWTP units will be regularly inspected, and discharge suspended if it is discovered operating below the established standards.
- WWTP systems will be installed, operated and maintained in accordance with the Operation and Maintenance Manual, DWER Works Approval, subsequent Environmental Licence and the DoH Regulations and permitting requirements as issued by the Shire of Leonora.
- The WWTP units will be fitted with alarms to warn of high levels tanks or if pump failure occurs. Units can be isolated and shut down if required. The system is not critical infrastructure, and should an extended shutdown occur staff will be diverted to other facilities until repairs are affected.
- Monitoring of WWTP water quality parameters will be undertaken in accordance with Licence conditions to ensure discharge compliance.
- Safety Data Sheets will be available and accessible in areas where hazardous materials are stored and used.
- Spillages of raw sewage or treated effluent occurring as a result of incident or equipment failures will be addressed and reported through AGM's incident reporting procedure.

1.3.5 Predicted Environmental Risk

The scope, controls and management measures proposed are expected to adequately maintain baseline environmental conditions and are sufficient to ensure a low risk of significant impact to local land and surface water.

1.4 DISCHARGE TO GROUNDWATER

1.4.1 Sources

Discharges to land expected as part of the WWTP and irrigation field construction and operations include:

- Infiltration of treated sewage effluent to the designated irrigation field.

Sources of discharge to land and groundwater during WWTP operations may potentially originate from:

- Seepage of spilt or leaked reagents stored for the WWTPs.
- Seepage of spilt or leaked raw sewage or treated effluent.
- Seepage of spilt or leaked treated effluent outside of irrigation field discharge areas.

1.4.2 Potential Impacts

Proposal activities have the potential to:

- Result in localised groundwater mounding adjacent at the irrigation field.
- Contaminate groundwater in areas within and adjacent to the proposed activities.

1.4.3 Receptors

No groundwater bore users aside from Agnew Gold Mining and other nearby mining operations are registered within 500 m of prescribed premises boundary. The nearest potable water source is the Fairyland borefield (GWL 151398) located 10 km Northeast of the Redeemer Precinct and proposed WWTP and irrigation field. Monitoring bores indicate average depth to groundwater is approximately 12-18 m below ground level. Groundwater quality ranges from fresh to brackish.

1.4.4 Control Measures

Management measures described for discharges to land will ensure discharge quality meets requirements, including:

- Limits for discharge rates to meet licence criteria.
- Irrigation field located …
- Depth to groundwater indicates there is very low risk of groundwater mounding.

1.4.5 Predicted Environmental Risk

Groundwater is located at least 12 m below ground level. Accordingly, the proposed mitigation and management measures are expected to be sufficient to achieve a low risk of impact to local groundwater quality through seepage.

2. REFERENCES

Department of Water (DoW). 2006. National Guidelines for Water Recycling: Managing Health and Environmental Risks. 2006

Department of Water (DoW). 2008. Water Quality Protection Note. WQPN 22 (WPQN 22). Irrigation with nutrient-rich wastewater. July 2008.