



Thunderbird Mineral Sands Project

The Project

The Sheffield Resources' Thunderbird Mineral Sands Project is located 75 kilometres west of Derby in Western Australia's Kimberley region. The Thunderbird deposit is one of the largest mineral sands discoveries of the last 30 years and the first major mineral sands deposit discovered in the Canning Basin.

The project will produce zircon and titanium mineral products, extracted from the mineral sands deposit. Zircon is used in ceramics and titanium minerals (ilmenite, leucoxene and rutile) are used in everyday products such as paints, plastics, food products, toothpaste and sunblock.

The project is expected to have a mine life of over 40 years and make a significant social and economic contribution to the Kimberley region. The company is planning to begin construction in 2017 and commence production in 2019. The project is expected to create 140 permanent local jobs and opportunities for partnerships with local business.

The environmental impact of the project is considered to be low as the mine will be progressively rehabilitated as the mineral sands are extracted from the ground.

Project regulatory requirements

The project will be subject to the requirements of all relevant State and Commonwealth government legislation including mine safety, environmental protection, water licencing, Native Title, Aboriginal heritage and transport safety requirements.

What are the environmental impacts of this project?

The Thunderbird project is subject to the environmental protection requirements of the *WA Environmental Protection Act 1986* and the *Commonwealth Environment Protection Biodiversity Conservation Act 1999*.

Sheffield has prepared a Public Environmental Review (PER) that details the potential environmental impacts and how the company would mitigate and manage those risks. The PER was released for a four week public review period from 16 January 2017 to 13 February 2017. The EPA Report is expected to be released by mid-2017.

Prior to project commencement, Sheffield will require an approved Mining Proposal, Mine Closure Plan and Project Management Plan from the Department of Mines and Petroleum, a licence to take water from the Department of Water, a works approval from the Department of Environment Regulation and a range of other State and local government approvals.

How will the mine be rehabilitated?

The mine will be progressively rehabilitated as the mineral sands are extracted in accordance with a DMP approved Mining Proposal and Mine Closure Plan. Around 3 to 5 per cent of sand excavated is exported as product and the remaining 95 to 97 per cent backfilled and rehabilitated progressively over the life of the mine. Rehabilitation will be conducted in accordance with agreed completion criteria that ensure the rehabilitated areas are consistent with the surrounding landforms, vegetation and post mining land use. Rehabilitation progress will be reported to government and be subject to periodic audit by DMP environmental inspectors.

Flora and fauna surveys have been conducted and the Greater Bilby is known to be present within the project and surrounding areas. A Bilby Management Plan designed to minimise impacts on Bilby habitat and individual animals has been prepared. An offset program has been proposed to address potential impacts on the species.

Sheffield Resources is subject to the *Mine Rehabilitation Fund Act 2012* and is required to contribute to the WA Mine Rehabilitation Fund on an annual basis.

How much water will the project use and will this impact other water users?

Groundwater will be taken from the Broome Sandstone Aquifer. According to hydrological modelling by specialised groundwater consultants, the quantity of water needed for the Thunderbird project is expected to remain relatively constant for the life of the project (about 10.7 GL/year), however once mining moves below the water table (after year 15), additional water will need to be removed to allow safe dry mining activities. The volume of water required to be abstracted after year 32 will exceed project demands. Excess water not required for the project will be reinjected back into the same aquifer downstream of mining activities. Between 65 to 80 percent of abstracted water will be returned to the aquifer via either seepage processes from pit backfilling or direct reinjection of excess water.

The hydrology assessment indicates that the Thunderbird project is unlikely to adversely impact other water users outside of the mine lease area. This includes the Water Corporation Broome Borefield (around 80 km south of the project area), agricultural activities on Mt Jowlaenga and adjacent pastoral stations, the Yeeda Abattoir, the Bidan community 30 km south of the project area or wetlands on the Dampier peninsula and around Roebuck Bay.

Monitoring bores will be used to record changes in water level and quality.

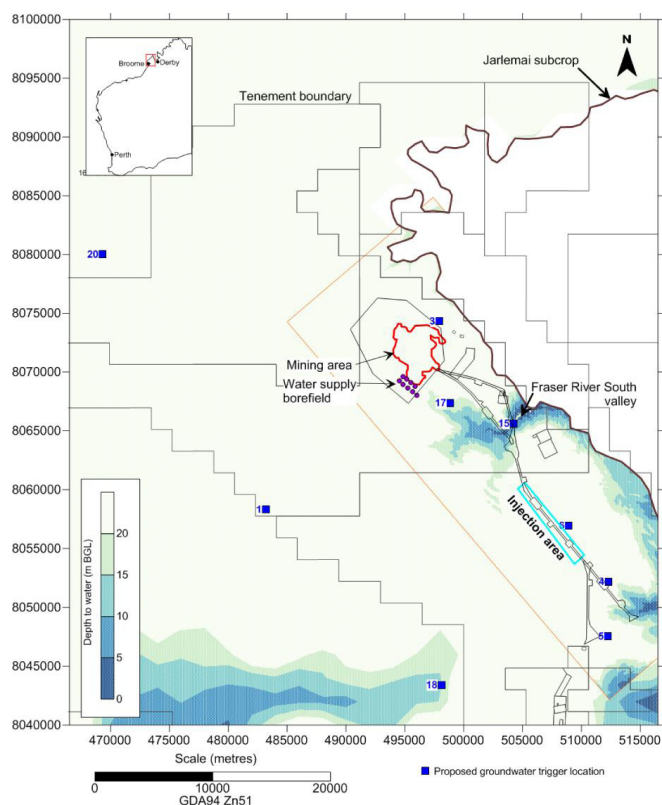


Figure 1: Location of proposal and monitoring sites/areas

Source: Thunderbird PER Appendix 24: Groundwater Management Plan Page 14. Rockwater Hydrological and Environmental consultants. Nov 2016.

How often will trucks be taking product to the Derby and Broome ports?

It is proposed that modern road trains will transport product to Derby port around 10 - 12 times daily and to Broome port around 7 – 10 times daily. A Traffic Management Plan will be implemented to address speed, timing, route, safety, noise, dust, emissions and community information.

Are mineral sands products radioactive?

Thunderbird mineral sand ore has radiation activity levels less than 1 Becquerel per gram. It is not considered to be radioactive.

The Becquerel (Bq) is a unit used to measure the amount of radiation or activity in a substance. Radiation activity is usually expressed in terms of Becquerel per gram (Bq/g) or Becquerel per kilogram (Bq/Kg) of a substance. The definition of a radioactive substance is something that has an activity greater than 1 Bq per gram.

The heavy mineral concentrate (ilmenite and zircon) extracted from the ore is expected to have activity levels between 1.1 – 2.2 Bq/g – slightly more than the 1 Bq/g definition of a radioactive substance. The tailings to be returned to the mine void are predicted to be around 0.2 – 0.5 Bq/g and fall the below definition of a radioactive substance.

The ilmenite to be exported through Derby port has a very low radioactivity level (between 0.5 and 0.6 Bq/g) and is below the level considered to be a radioactive substance (1 Bq/g). The radiation level of zircon to be exported as a packaged product through Broome Port are higher (between 1.5 and 9.1 Bq/g).

These concentrations are less than the minimum level requiring placarding as a radioactive substance for transport (10 Bq/g) under the Australian Code of Practice for Safe Transport of Radioactive Materials. Being above 1 Bq/g, the material will be subject to management under the *Radiation Safety Act 1975* and the *Mines Safety and Inspection Act 1994*.

Sheffield will require an approved Radiation Management Plan that details risk management measures before mining and transport of product commences. DMP regulates radiation safety on WA mine sites through the *Mines Safety Inspection Act 1994* and regulations. A Radiation Management Plan (RMP) and Radiation Waste Management Plan (RWMP) are required under section 16 of the Mines Safety and Inspection Regulations 1995. In addition to DMP requirements, the Radiological Council administers the *Radiation Safety Act 1975* and the Radiation Safety (Transport of Radioactive Substances) Regulations 2002 which includes the monitoring, storage and transport of radioactive substances.

The predicted dose to mine workers and process plant workers was conservatively estimated to be between 2 and 3 mSv/year. This is well below the dose rate limit for radiation workers of 20 mSv/year. The predicted dose to a member of the public was considered to be negligible and well below the public limit of 1 mSv/year.