Purpose

In accordance with legislative requirements, Iluka Resources conducts its Murray Basin Operations under an approved Radiation Management Plan and Radioactive Waste Management Plan. This document provides a summary of those plans.

Iluka Resources Limited

Iluka Resources is involved in mineral sands exploration, project development, operations and marketing. The company is the major producer of zircon globally and largest producer of the high grade titanium dioxide products of rutile and synthetic rutile, with operations in Australia and Virginia, USA.

The company is listed on the Australian Securities Exchange (ASX code: ILU) and employs approximately 850 people, the majority in Australia.

What are Mineral Sands?

Mineral sands is the term given to a group of minerals commonly found and mined together from alluvial deposits. The products are generally characterised by whether the major element is titanium or zirconium. The titanium minerals include ilmenite, leucoxene and rutile while the zirconium mineral is zircon. Other mineral sands products include monazite containing cerium and xenotime containing yttrium. Minerals sands are not pure and contain other components that can affect the way that they separate in the plant or affect their characteristics including increasing the radioactivity.

Further information on mineral sands and naturally occurring radioactive materials (NORM) can be found in the Iluka Fact Sheet: Mineral Sands and Naturally Occurring Radiation on the Iluka website www.iluka.com

Murray Basin Operations

Iluka commenced mining minerals sands at the Douglas mine, located near Horsham Victoria, in November 2005, and concluded mining and ore processing in early 2012. Between early 2010 and February 2012, ore from the Echo satellite mine was also processed at Douglas.
Mining started at the Kulwin deposit located near Ouyen, Victoria, in late 2009 and was completed in February 2012. The Douglas and Kulwin sites are under active rehabilitation, with Echo in a monitoring phase following completion of scheduled rehabilitation.

Current mining activities at the Woornack, Rownack and Pirro deposits, southeast of Ouyen, are scheduled to conclude in the first half of 2015, with ore processing continuing until mid-2016.

Following initial processing activities on site, the heavy mineral concentrate (the concentrated form of mineral sands ore) produced at the mine sites is transported by truck to a purpose-built rail loading facility at Hopetoun and then sent by rail to the Hamilton mineral separation plant. Heavy mineral concentrate from the South Australian mine, Jacinth-Ambrosia, is also shipped into the Port of Portland and then transported to Hamilton for processing.

Processing at the mineral separation plant involves the use of water, magnets, screening equipment and electrostatic tools to separate material mined from the ground to recover the saleable minerals of zircon, rutile and ilmenite. These products are transported to the Port of Portland for shipping to customers.

The process leaves sands, clay and gypsum and these by-products are disposed of at part of the former Douglas site. While some common chemicals, such as sulphuric acid, are used peripherally in processing, the mineral sands and by-products are not chemically altered. This disposal practice is approved and regulated by various Victorian Government agencies.

Radiation in the mineral sands industry

Radiation in mineral sands is associated with low level, naturally occurring uranium and thorium contained within the grains of the mineral monazite, xenotime, zircon and some ilmenites. Both uranium and thorium are continuously decaying, producing other natural elements, which also emit radiation.

The concentration of thorium and uranium in heavy mineral concentrate is significantly dependent on the percentage of mineral monazite. Monazite is a naturally occurring, rare earth phosphate, typically found in mineral sand deposits at 0.1 per cent (variable between ore bodies) and increases to approximately 1 per cent in heavy mineral concentrate. This mineral is the main source of radiation exposure within mineral sands operations, including Iluka’s Murray Basin operations.

The by-product or waste stream generated in mineral sands mining and processing operations, typically contains variable concentrations of naturally occurring radiation. These by-product or waste streams can derive from mineral processing tailings, waste rock (or oversize material), scales, sludges and scrap metal.

Another source of radiation at Iluka’s Murray Basin operations is through the use of radiation gauges, which are used predominantly at concentrators for the purpose of density measurements.

Regulatory requirements

Iluka’s Murray Basin operations in Victoria are conducted in compliance with various regulatory approvals and licence conditions. The key regulatory approval for all mining activities is an approved Mine Work Plan in accordance with the Mineral Resources (Sustainable Development) Act 1990, with other licences and approvals relating to land use.
planning, flora and fauna, environmental protection, cultural heritage, surface and groundwater, and land use planning as stipulated within the Work Plan, as required.

An approved planning permit is generally the key regulatory instrument authorising activities at non-mining, Iluka-controlled sites, such as the Hamilton mineral separation plant.

The single regulatory approval common to all of Iluka’s Murray Basin operations is the Radiation Management Licence issued by the Victorian Department of Health. The Department of Health administers the Radiation Act 2005 (Vic) (the Act) which establishes a system of licensing users of radiation apparatus and managers of radiation practices (consisting of the Radiation Act 2005, Radiation Regulations 2007 and application of various National Codes and Standards). The purpose of the legislation is “to protect the health and safety of all persons and the environment from the harmful effects of radiation”.

The Victorian Radiation Regulations 2007 (the Regulations) are made under Section 139 of the Act, and prescribe the definition of radioactive material, radiation dose limits, the requirement for certificates of compliance, and various other matters required to give effect under the Act.

The Radiation Regulations (2007) define radioactive material to be material that exceeds the activity concentration limit (1 Bq/g) and total activity limit (1 KBq). Heavy mineral concentrate produced at the mine sites, some mineral separation plant saleable finished products, and the majority of the non-saleable mineral separation plant by-products have an activity concentration exceeding 1 Bq/g, and are therefore regarded as radioactive material for the purposes of the Victorian radiation regulatory framework. This, combined with the usage of radiation gauges within the concentration and separation plants, triggers the requirement for a Radiation Management Licence authorising the mining, processing, storage and disposal activities associated with these gauges and materials.

**Radiation Management Licence**

Iluka holds a current Company Radiation Management Licence (No. 300042022) as issued by the Department of Health. Conditions attached to the licence require Iluka to:

- comply with various Codes of Practice as published by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), including the Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005);
- prepare and submit to the Department of Health on a six-monthly basis a report detailing radiation doses received from occupationally exposed workers; and
- comply with reporting requirements as detailed in various documents published by Department of Health.

The licence can be amended to reflect the changing scope and nature of operations. The licence has duration of two years and is renewable.

**Radiation Management Plan**

The requirement for a Radiation Management Plan for Iluka’s Murray Basin operations is stated as a condition of licence in Schedule 5 of Iluka’s Radiation Management Licence No. 300042022.

The Radiation Management Plan outlines the obligations of the licensee, Iluka Resources, and applies to all persons who may be exposed to ionising radiation arising from the mining and processing of mineral sands at Iluka Murray Basin operations. All practices involving mining, processing, handling, disposal, storage and transport of radioactive minerals must be conducted in accordance with the approved Radiation Management Plan.

In addition to outlining the legislative and regulatory requirements the Radiation Management Plan, provides details pertaining to:

- operations at each Murray Basin mining, processing or storage site, including the radiological characteristics of the materials produced, stored or disposed at each site;
- workforce and critical group information;
- sources and pathways of radiation exposure within the Murray Basin operations;
- equipment and facilities for the control of radiation sources;
- institutional controls for radiation protection;
- employee training;
- radiation monitoring, record keeping and reporting;
- radiation dose assessment; and

Radioactive Waste Management Plan

The requirement for a Radioactive Waste Management Plan for Murray Basin operations is contained within Radiation Protection Series 9, and is included as a condition of licence in Schedule 5 of Iluka’s Radiation Management Licence No. 300042022.

The Regulations define radioactive waste as material, whatever its physical form, remaining from a practice and for which no further use is foreseen, and that contains or is contaminated with radioactive substances and has an activity or activity concentration higher than the level for clearance from regulatory requirements. Ref. Radiation Protection Series No 9.

The Murray Basin Radioactive Waste Management Plan has been prepared by Iluka for its mining activities conducted in the Murray Basin in Victoria, and outlines the obligations of Iluka, and its intermediaries involved in the carrying out of practices involving control and management (e.g. handling and storage, transport and disposal) of the by-products generated as part of mining and processing mineral sands.

The objective of the Radioactive Waste Management Plan is to ensure that radioactive by-products are disposed in a manner that ensures that there is no unacceptable health risk to humans, and no long-term unacceptable detriment to the environment arising from Iluka operations in the Murray Basin and following their closure. The plan outlines the type of by-product generated, and the storage and disposal procedures to be undertaken.
The Radioactive Waste Management Plan also describes the baseline radiological characteristics of the by-product and assesses the potential radiation doses to workers and the public arising from the management of this material. The monitoring programs outlined in the plan are implemented to ensure that the radiological exposures from the management of mining and milling by-products, both during operations and post-closure are As Low As Reasonably Achievable (ALARA).

The Regulations stipulate radioactive waste must be managed in order to isolate it from the general community and the environment ("safety"). Radioactive waste must also be managed in a way that prevents it from being accessed by unauthorised personnel ("security").

The two ways in which such material is managed are under the principles of “concentrate and contain” or “dilute and disperse”. Accordingly, the Regulations define radioactive waste management as involving the treatment, conditioning, transportation, storage and disposal of all categories of radioactive waste, including administrative, operational and safety-related activities.

In addition to the outlining the legislative and regulatory requirements the Radioactive Waste Management Plan provides details pertaining to:

- by-product disposal activities and operations at each Murray Basin mining, processing or storage site, including the radiological characteristics and classification of the by-products produced, stored or disposed at each site;
- transport and disposal of mineral separation plant by-products, including disposal methodology and locations at the Douglas mine site;
- radiation dose limits;
- sources and pathways of radiation exposure associated with by-products disposal within the Murray Basin operations;
- assessment of dose and long-term impact to the general public;
- radiation exposure control measures; and
- radiation monitoring, record keeping and reporting requirements.