2 The Alligator Rivers Region

2.1 Description of the Region

The Alligator Rivers Region is of outstanding heritage value for its unusual combination of largely uninhabited areas with attractive wild scenery. It is highly biodiverse and has a very large concentration of Aboriginal rock art of world significance. Its national and international importance is recognised by the inclusion of Kakadu National Park (totally enclosed within the region) on the Register of the National Estate and its inscription on the World Heritage List. The floodplain areas within Kakadu are recognised as one of Australia's Wetlands of International Importance listed under the Convention on Wetlands of International Importance (the 'Ramsar' Convention).

The ARR is defined in Section 3(1) of the *Environment Protection (Alligator Rivers Region) Act* 1978. This current definition is based on the definition in the Ranger Uranium Environmental Inquiry Second Report but also includes the former Gimbat and Goodparla pastoral leases in the south following the declaration of Stage 3 of Kakadu National Park and the inclusion of the above leases within the boundary of the Park. The region (Figure 1) is about 220 km east of Darwin and comprises an area of about 28 000km^2. It includes the catchments of the West Alligator, South Alligator and East Alligator Rivers, extending east into Arnhem Land. The region also contains sections of the Katherine River catchment to the south and the Mary River and Wildman River catchments to the west.

The Region is rich in natural resources, having a variety of terrestrial and aquatic ecosystems including sandstone heathlands, open woodland, monsoon rainforest, flood plains, large rivers, seasonal water courses and permanent billabongs, as well as large mineral reserves including uranium, gold and platinum group metals.

The Region lies within the wet-dry tropics and has a distinct monsoon-like climate. Virtually the entire rainfall occurs in the Wet season, which varies in length but is generally confined to the November–March period; October and April tend to be transitional months; with the Dry season lasting from about May to September. Annual rainfall at Jabiru (12°40'S, 132°54'E) has averaged approximately 1450 mm over the past 20 years and evaporation exceeds rainfall in most years. Prevailing winds are easterly to south-easterly in the Dry season and northerly to north-westerly in the Wet season, and, like other parts of northern Australia, the Region is subject to cyclones.

The two major river systems of the Region, the East and South Alligator rivers, both drain to Van Diemen Gulf and are tidal in their lower reaches. The headwaters of these rivers and their major tributaries rise in the sandstone plateau region to the east and south and generally flow in a north-westerly direction in shallow valleys across the lowlands to discharge through extensive flood plains. The upper sections of tributary streams usually have sandy or rocky bottoms, and in places are bordered by dense vegetation. The stream courses in the lowlands vary in form, but most commonly they are channel complexes which link billabongs. In the Wet season they overflow into adjacent swamps.

The three Alligator rivers and the Wildman River maintain a flow in their lowest sections in the Dry season. All other streams - including the main tributaries, Cooper, Magela, Nourlangie, Jim Jim and Barramundie creeks - cease to flow for the major part of their length in the last few months of most Dry seasons. Permanent water is restricted to springs, waterholes and billabongs.

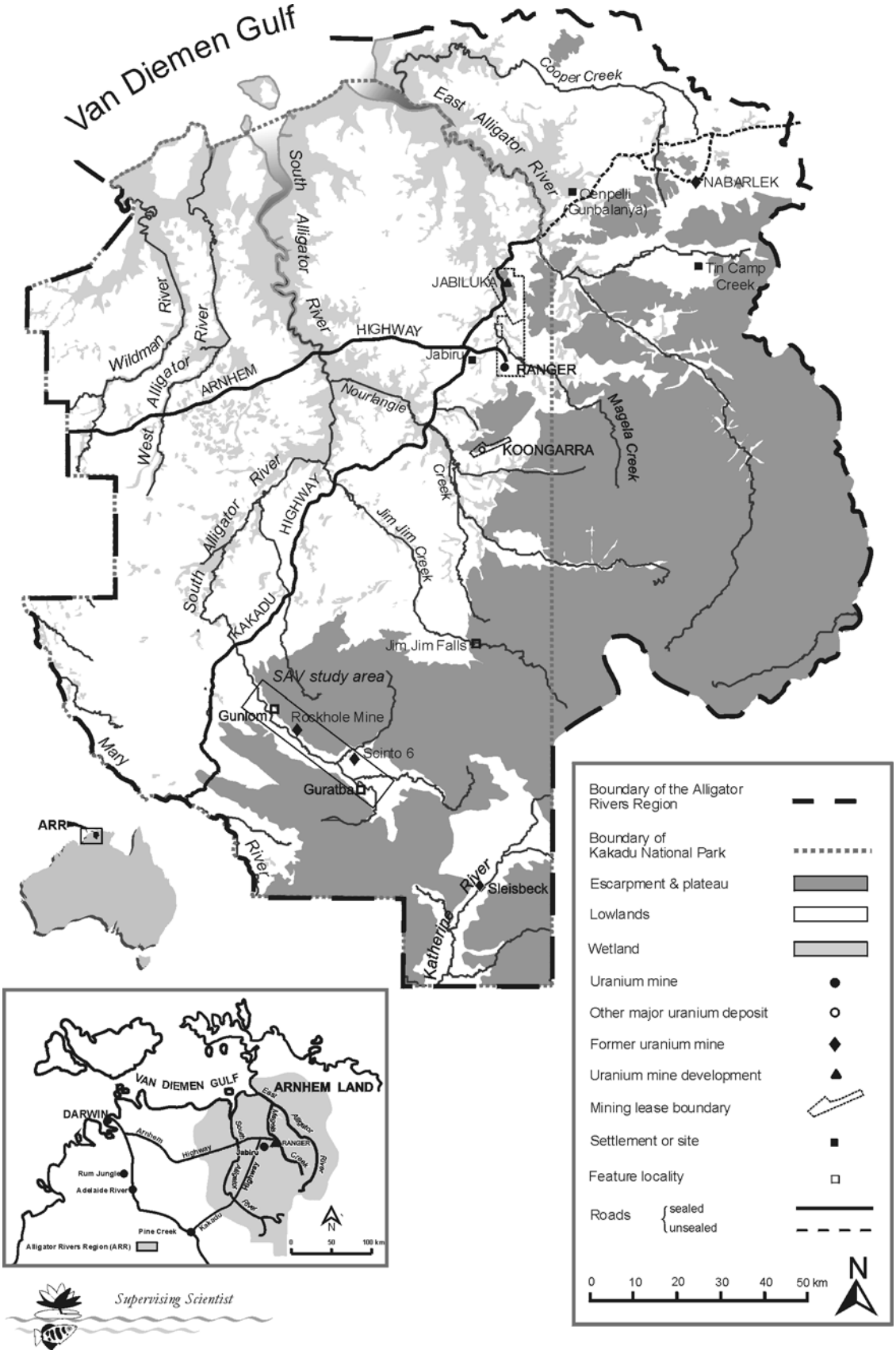

Figure 1 The Alligator Rivers Region in Australia's Northern Territory. The boundary of Kakadu National Park, within the region, is indicated.

The major rivers maintain their channels and levee banks across the flat floodplain areas. Some of their major tributaries (eg Magela Creek) are cut off from the river by a levee bank and require an accumulation of Wet season water before commencing to flow into the river. Thus a flood plain, or more accurately a backwater plain, is formed. These broad areas of flooding remain for periods varying from three to nine months according to location and rainfall. Once this water has receded there remain only permanent billabongs on a dry plain; these are extremely important for the maintenance of the ecosystems.

The hydrological regime is dictated by the seasonal rainfall distribution and both the total annual stream discharge and its pattern within a season can vary considerably. Wet season stream flows typically comprise a series of peak flows superimposed on a base flow which usually begins in about mid-December and ceases by the end of June. In a wet year, however, flow might commence in November and finish in August. The flow pattern over this period varies considerably from year-to-year; eg the total annual flow past GS8210009 in Magela Creek near Jabiru East was recorded as approximately 840 million cubic metres in 1975–76 and 190 million cubic metres in 1982–83, and between 1972 and 1986 the number of days of flow in any one season ranged from 82 to 170.

The distinctive subregions and the large seasonal changes give rise to a wide diversity of plant and animal habitats. The Region is rich in numbers of species of both flora and fauna. Zoologically and botanically it is representative of a large part of the far north of tropical Australia but because of the diversity of the native species that occur in the Region, it is regarded as one of the richest in Australia in biological terms. For example, almost 1500 species of plants have been recorded and they occur in a wide range of vegetation types, including mangrove, grassland, monsoon forest, woodland and scrub communities. More than one-third of the bird species in Australia have been sighted in the Region, and the large populations of waterbirds on the wetlands are one of its outstanding features. Of the aquatic fauna, the fifty species of fish occurring in the Region represent about a quarter of all recorded Australian native freshwater fish.

2.2 Early mining in the Region

The region is within an ancient geological basin called the Pine Creek Geosyncline which has a long history of mineral production. Uranium exploration in the Geosyncline was stimulated by the discovery in 1949 of secondary uranium mineralisation near Rum Jungle, south of Darwin. This was followed by a decade of intense exploration activity resulting in the discoveries of economic uranium orebodies at Rum Jungle and in the upper reaches of the South Alligator River valley.

Exploration and mining activity in the South Alligator River valley in the 1950s and 1960s resulted in the discovery of minor gold, silver, lead, zinc and iron in addition to significant uranium deposits (some of which contained recoverable gold). The South Alligator River valley uranium field was small, containing thirteen now worked-out mines (total production 874 tonnes U_3O_8) and over fifteen prospects, mostly within a north-west trending belt 24 km long and 3 km wide, located about 220 km south-east of Darwin (Fig 1).

In 1953, following the Rum Jungle discoveries, a program of examining base metal prospects for signs of radioactivity led to the discovery of the Coronation Hill uranium ore body. This mine commenced operations in 1956 and ceased in 1964; 75 tonnes U_3O_8 were produced in that period.

In the same year as the Coronation Hill discovery, radioactivity and mineralisation were discovered at Sleisbeck near the Katherine River, some 50 km to the south-east. This ore was mined by open-cut and gloryhole in 1956. Production was below expectations totalling only 3 tonnes U_3O_8.

In 1954 further discoveries were made at the Scinto mining claims, the rich El Sherana outcrop, and the Palette and the Saddle Ridge ore bodies. The El Sherana mines proved to be the most productive in the South Alligator field (411 tonnes U_3O_8). Production from these mines was by shallow open-cut and cut-and-fill stoping from small shafts.

By 1957 the reserves developed by testing the Rockhole, El Sherana, Saddle Ridge and Scinto lodes were sufficient to justify small treatment plants. One company, South Alligator Uranium NL, erected a small plant at the foot of the ranges near the Rockhole lode. United Uranium NL took over the gold treatment plant at Northern Hercules (later renamed Moline) 55 km west of the ore bodies and converted it to a solvent-extraction uranium plant. Both plants were operating by 1959.

The widely scattered deposits in the valley with variations in grade, size and continuity, as well as the location on steep slopes contributed to an operation that was complex and relatively short lived. After production ceased in 1964 the mines and associated workings were abandoned. With the exception of the Sleisbeck Mine all lie within a region previously defined as being a Conservation Zone of Kakadu National Park Stage III. Exploration in the 1980s near two of these abandoned uranium mines (Coronation Hill and El Sherana) resulted in the discovery of significant concentrations of gold, platinum and palladium metals.

The Coronation Hill Joint Venture (CHJV) comprising BHP Gold Mines Ltd, Noranda Pacific Ltd and Norgold Ltd commenced exploration and drilling activities in 1986 at the site of the Coronation Hill uranium mine. In 1991, the Commonwealth Government decided that mining at Coronation Hill should not proceed and the Conservation Zone was subsequently re-incorporated into Kakadu National Park.

2.3 Recent mining in the Region

All the known major uranium deposits of the East Alligator River uranium field have been discovered since 1969. Energy Resources of Australia Ltd (ERA) operates the Ranger Mine, 8 km east of the township of Jabiru. The mine lies within the 78 sq km Ranger Project Area (RPA) and is near the Magela Creek, a tributary of the East Alligator River. Following successive declaration in stages, the RPA is now surrounded by, but does not presently form part of, Kakadu National Park. Mining and commercial production of uranium concentrate have been underway since 1981. Mining of orebody No 1 was completed in 1994 while mining of orebody No 3 commenced in May 1997. (The smaller No 2 orebody is close to Mount Brockman, an Aboriginal sacred site, and will *not* be mined.)

Other orebodies discovered in the East Alligator uranium field were located at Nabarlek, about 30 kms east of Oenpelli in Arnhem Land, Jabiluka about 20 kms north of Ranger and Koongarra about 25 kms south-west of Ranger.

The ore at Nabarlek was mined and stockpiled in 1979 and milling took place between 1980 and 1988. The site has been rehabilitated but the operating company, now Hanson Australia Pty Ltd, has not yet been issued with a Revegetation Certificate by the Northern Territory Government that would release it from further responsibility for the site. A number of issues remain to be resolved to the satisfaction of the NT Government, the Northern Land Council and the Supervising Scientist.

In October 1996, Energy Resources of Australia submitted a Draft Environmental Impact Statement (EIS) (ERA, ERA Environmental Services & Kinhill Engineers 1996) for the mining of uranium at the Jabiluka site, 25 km north of Ranger. This proposal was assessed by the Commonwealth Government under the *Environment Protection (Impact of Proposals) Act* 1974 (EPIP Act). The principal proposal, known as the Ranger Mill Alternative (RMA), involved the mining of the Jabiluka orebody by underground methods and the milling of the ore at the existing mill at Ranger. This proposal received approval from the Commonwealth Government in October 1997 subject to a broad range of requirements on environmental protection. However, the RMA proposal requires the trucking of ore from Jabiluka to Ranger and this requires the specific agreement of the Aboriginal traditional land owners. The traditional land owners have so far refused to give their permission for the milling of Jabiluka ore at Ranger.

The draft EIS also contained an alternative proposal, known as the Jabiluka Mill Alternative (JMA), that involved the construction of a new mill at Jabiluka. The conclusion of the Commonwealth Government on the JMA in October 1997 was that insufficient information had been presented for a rigorous assessment of environmental impact and that, should ERA wish to proceed with that proposal, a further assessment under the EPIP Act would be required. The Government agreed, however, that any development at Jabiluka that was consistent with both the RMA and the JMA proposals could proceed subject to the normal approval process. ERA subsequently developed the decline at Jabiluka and constructed an Interim Water Management Pond (IWMP) as part of a water management system to ensure ongoing protection of the downstream environment.

In June 1998, ERA submitted a Public Environment Report (PER) (ERA, ERA Environmental Services & Kinhill Engineers 1998) containing its detailed proposal for the milling of ore at Jabiluka. Following assessment of the proposal under the EPIP Act, the Government approved the project in August 1998 subject to a number of environmental requirements. Principal among these was the requirement that all mill tailings would be returned underground to the mine void and to specially constructed stopes or silos instead of tailings pits as proposed by ERA in the PER.

The Koongarra uranium deposit is located 20 km to the south of Ranger. Uranium ore occurs in two distinct but clearly related mineralised bodies separated by a barren gap about 100 metres in length. The ore resource at Koongarra is relatively small (containing some estimated 15 300 tonnes of U_3O_8) and because of its location in the Nourlangie catchment which drains to the South Alligator River, the Ranger Uranium Environmental Inquiry recommended against its exploitation. There are no immediate plans for mining of the Koongarra orebody.