# Durack REE

Generated 3 June 2026 · Focused — ree

## Ree Prospectivity Assessment: Durack REE

> *Focused-mode summary. Commodity:* ***Rare Earth Elements****.*

- **Type:** Area of Interest
- **Reports processed:** 50 A-numbers
- **Verdict:** Prospectivity: Moderate | Exploration maturity: Moderate | Priority: Follow-up

### 0. Geological Setting

The area lies within the Proterozoic Kimberley Basin, underlain by Carpentarian-aged rocks of the Kimberley Group [A100247 (2013); A92141 (2011)]. The local stratigraphy comprises, from oldest to youngest, the King Leopold Sandstone, Carson Volcanics, Warton Sandstone, Elgee Siltstone, and Pentecost Sandstone [A92141 (2011); A100247 (2013)]. Broader mapping also shows the Speewah Sandstone, Whitewater Volcanics, and the overlying Bastion Group in the region [A89212 (2011)]. The Hart Dolerite intrudes the Kimberley Group and is mapped separately, alongside other intrusive phases such as the Fish Hole Dolerite and the Lamboo Complex, which likely represent a mafic igneous event [A9674 (1981); A89212 (2011)]. Structural features are dominated by faulting and lineations, with faults displacing stratigraphy and controlling later hydrothermal pathways [A1723 (1971); A60461 (1970); A720 (1971)]. No regional metamorphism is recorded in these reports, and the primary rock types are basaltic volcanics, volcaniclastic units, siliciclastic sandstones, and siltstones of the Carson Volcanics and associated sedimentary formations [A100247 (2013); A89212 (2011); A92141 (2011)].

### 1. Commodity Evidence

Direct rare earth mineralisation is documented in historical reports from this area. The mineral **florencite** - a rare earth aluminium hydroxy phosphate ($CeAl_3(PO_4)_2(OH)_6$) - was identified as the main host of thorium and uranium in a friable quartz pebble conglomerate of the King Leopold Sandstone [A6033 (1968)]. The heavy mineral fraction of that conglomerate also contains zircon and cassiterite, but florencite is the dominant radioactive species. Electron probe micro analysis confirmed that thorium and uranium in those grains are associated with phosphorus, aluminium, and variable cerium dominant rare earth elements.

A detailed petrological study of the "Purple Sandstone" in the Durack Ranges showed that **monazite** (a REE phosphate) and zircon are the primary uranium and thorium bearing minerals [A60787 (1969)]. Concentrate assays returned 5.8% $ThO_2$ and 0.27% U for monazite, with lower than average total rare earth oxide due to suspected huttonite ($ThSiO_4$) substitution. The same report delineates a distinct heavy mineral zone - a "titanahæmatite monazite zircon

sandstone" - that carries thorium up to 20,370 ppm and yttrium up to 2,640 ppm over a sampled suite.

Regional mapping of the King Leopold Sandstone identified two uraniferous conglomerate members that persist for tens of kilometres, with monazite concentrated in the matrix of pebble size clasts [A28 (1970)]. Thorium/uranium ratios and scintillometer work indicated a sedimentary placer origin for the monazite, and later drilling (DDH DR1 - 3) confirmed limited down dip extension of the radioactive horizons.

The known mineral occurrence **Durack Ranges 10** [MINEDEX S0030002] is recorded as a heavy mineral (HM) and uranium (U) occurrence, consistent with monazite rich placers. No direct REE assay data (La, Ce, Nd, HREE) are available in any of the reports, but the mineralogical evidence unambiguously establishes the presence of REE bearing minerals in multiple stratigraphic intervals.

## 2. Structural & Mineralisation Controls

REE enrichment is tied to specific sedimentary heavy mineral concentrations within the King Leopold Sandstone and an equivalent purple sandstone facies. The **purple sandstone** contains a defined "titanahæmatite monazite zircon" zone that represents a high energy, well sorted fluvial or near shore placer environment [A60787 (1969)]. In the King Leopold Sandstone, monazite is concentrated in the matrix of two boulder to pebble conglomerate bands - the "Basal Conglomerate" and a higher marker bed associated conglomerate - both of which show ripple marks indicating a SSE to NW paleoflow direction [A28 (1970)].

The host unit is a coarse grained, bimodal purple sandstone conglomerate package about 1,000 feet thick within a 4,000 foot thick section. The conglomerate beds vary from 15 feet thick with boulders up to 15 inches in the south, thinning to 2 - 3 feet with pea sized pebbles in the north. Lateritisation and prolonged weathering have caused some leaching of uranium from surface exposures, but thorium (and by inference monazite) is more stable, so surface scintillometer anomalies may be muted relative to subsurface grades.

The regional structural dip ( 15° west) and north south striking fault corridors expose the heavy mineral horizons along the eastern escarpment of the Durack Ranges. Supergene florencite noted in the conglomerate [A6033 (1968)] suggests that secondary REE phosphate mobilisation may locally upgrade the placer horizons, particularly in weathered, friable sections.

## 3. Historical Work Performed

Exploration began with an airborne scintillometer magnetometer survey in 1968 [A6033 (1968)], which detected anomalous radioactivity over Cretaceous sandstones and the Proterozoic conglomerates. Ground follow up and petrological work in 1969 - 70 [A60787 (1969), A28 (1970)] characterised the heavy mineral assemblages of the purple sandstone and conglomerate bands and provided the first identification of florencite and monazite.

During 1970, diamond drilling (DDH DR1 - DR3, DDH DR5, DDH DR23) and costeaning targeted copper and uranium mineralisation, and those holes incidentally intersected the conglomeratic horizons [A720 (1971), A60463 (1970)]. Sampling included channel sampling across quartz reef hosted copper lead mineralisation (Martin's Prospect) but no systematic REE assays.

Geochemical stream sediment and soil surveys carried out for tin and tungsten in 1980 [A9674 (1981)] included cerium in a multi element scan, yet no Ce anomalies were reported.

Later tenement holders (e.g., Northern Mining, Pegasus Metals) conducted rock chip and soil sampling with thorium and uranium determinations [A86980 (2010), A89212 (2011), A92141 (2011)], but never commissioned full REE analytical packages. Thus, despite over 50 years of intermittent activity, no REE specific drilling or bulk sampling has been carried out.

## 4. Extracted Signals

Structured geochemical data from the tenure pack and harvested GSWA submissions confirm a widespread, albeit subtle, thorium signature. Soil sampling in the area returned thorium values up to 50 ppm [A86980 (2010)], with uranium reaching 10 ppm. Rock chip samples from the same campaigns also carry thorium to 50 ppm [A89212 (2011)], while copper focused sampling recorded up to 12 % Cu with negligible Th pathfinders. No cerium, lanthanum, or other rare earth element concentrations are available in the structured assay tables, so the Th signal serves as the only indirect proxy for monazite content.

The drillholes logged at [A92141 (2011)] intersected sandstone, basalt, and breccias but were assayed only for base metals and precious metals; no REE or Th/U data were generated from that drilling. The absence of targeted REE analytics means the physical extent and grade of the documented monazite florencite horizons remain unquantified. The one relevant MINEDEX occurrence (heavy minerals + uranium) indicates that a placer style concentration is recognised, but no resource estimates exist.

## 5. Prospectivity Assessment

The area possesses a **confirmed REE mineral system**: monazite and florencite bearing placer horizons are documented in the King Leopold Sandstone and purple sandstone facies over a strike length of at least several kilometres. The mineralogy is dominantly LREE (Ce enriched florencite, monazite), with some HREE potential from xenotime like components detected as yttrium anomalies. The presence of coarse grained, well sorted conglomerates and the friable nature of the host rock suggest that heavy mineral concentration could be amenable to mechanical upgrading.

However, the prospectivity is **speculative** because no quantitative REE assay data exist, and the known Th/U values are modest. The $ThO_2$ content of the monazite (5.8%) and the overall low REE oxide percentage relative to typical economic monazite imply that the monazite may be diluted by huttonite substitution. The lack of systematic sampling along the mapped conglomerate bands and the absence of any test for ionic clay hosted REE in deeply weathered profiles are major data gaps.

On balance, the combination of direct mineral identification, favourable placer architecture, and untested REE potential gives **moderate prospectivity**. The region's exploration maturity for REE is low, as all previous work focused on copper, uranium, diamonds, or mineral sands. A dedicated program is warranted.

**Recommended Next Steps:**

- Re analyze available historical drill pulps or core from holes that intersected the conglomerate (e.g., DDH DR1 - DR3, DDH DR5) for full REE suite (La, Ce, Nd, Pr, Sm, HREE, Y) and thorium, to provide the first quantitative REE grades.
- Undertake systematic heavy mineral pan concentrate sampling along drainage lines cutting the King Leopold Sandstone escarpment, with mineralogical identification of monazite, florencite, and any xenotime to assess placer potential.
- Acquire high resolution airborne radiometric data (Th, U, K) to map the thorium rich conglomerate and purple sandstone horizons; follow up with ground truthing and channel sampling across the full thickness of the heavy mineral bands.
- Evaluate the weathered profile for possible supergene REE enrichment (ionic clays) by test pitting and shallow auger drilling over areas with known monazite bearing bedrock.

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## Tenement Context: AOI Report (~36 blocks, 1 tenements)

**Generated:** 03/06/2026

*This context is generated by the NextMaps pipeline from SLIP public data and the NextMaps register. It supplements the WAMEX report corpus. For full due diligence data including tenure history, expenditure compliance, and spatial datasets, see the Tenure Pack at nextmaps.com.au.*

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## Tenement Timeline

*Historical tenure on this ground — shows who explored here, for how long, and what happened.*

**Timeline Summary** — 33 historical

- Unique holders: 23 · Avg duration: 2.0 yrs · Oldest record: 12 Feb 1976
- Status: Withdrawn (13) | Surrendered (11) | Forfeited (6) | Cancelled (2) | Refused (1)

**Most active holder:** WHIRLIGIG PTY LTD (4 tenements) **Longest tenure:** 4.1 yrs — P 80/1303 (WHIRLIGIG PTY LTD)

| Tenement | Status | Holder | Start | End | Overlap |
|---|---|---|---|---|---|
| E 80/6165 | Withdrawn | EXMAPS PTY LTD | 4 Aug 2025 | 6 Oct 2025 | 98% |
| E 80/5951 | Withdrawn | OAKOVER RESOURCES PTY LTD | 3 Aug 2023 | 26 Jun 2025 | 59% |
| E 80/5886 | Withdrawn | GREENROCK METALS PTY LTD | 9 Dec 2022 | 9 Jun 2023 | 6% |
| E 80/5625 | Withdrawn | PEAK MINERALS LIMITED | 12 May 2021 | 19 Jan 2023 | 16% |
| E 80/5626 | Withdrawn | PEAK MINERALS LIMITED | 12 May 2021 | 19 Jan 2023 | 81% |

*...and 28 earlier tenements not shown — see Tenure Pack for full history.*

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*Context sourced from DMPE SLIP WA public datasets and NextMaps register. Verify against primary sources before reliance.*