



Annual Report 2024

SEL 21/2022 (First Annual Report)

14th September 2023 to the 13th September 2024

Authors:

Fiona Holgate Levings (Geologist)

Direct Lithium Pty Ltd
ABN 77 662 833 221
Suite 405, 410 Elizabeth Street, Surry Hills
NSW 2010

Direct Lithium is a Solution Energy Company

Summary

Direct Lithium Pty Ltd (DLPL) is the owner and operator of Special Exploration Licence 21/2022 a combined Category 1 (metallic minerals) and Category 6 (geothermal substances) licence of 2179 km² located in the Midlands of Tasmania. The principal goal of DLPL's work on this tenement is the location of resources suitable for geothermal power generation. Secondary goals include cascading and direct-use applications for geothermal energy as well as the extraction of economically significant metal salts from geothermal brine.

Significant results of previous work in this area include the identification by KUTh Energy Ltd in 2009 of the Lemont geothermal resource which was inferred to contain ~260,000 PJ_{th} of heat within a 1019 km³ reservoir located between 3 km and 5 km depth. Geophysical data derived from different sources align to draw a consistent picture of this resource as being a naturally fractured, potentially permeable play that is both spatially and thermally associated with deeply buried granite intrusions. An area of high priority has already been identified within the tenement and work is now required for target optimisation ahead of initial drilling.

This annual report covers work completed in the year 14/9/2023 – 13/9/2024 and is the first report lodged for this licence. Work commenced and/or completed on the tenement in this period included:

- *Collation and review of existing geological and geophysical data*
- *Review of legacy magnetotelluric (MT) data and generation of a new 1D, 2D and 3D models for the Lemont resource area*

Future work planned for SEL 21/2022 includes:

- *Assembly of new 3D geological and thermal model (whole tenement)*
- *Review of aeromagnetic data and interpretation (whole tenement)*
- *3D modelling of legacy gravity datasets (whole tenement)*
- *Further 3D modelling and assessment of legacy MT data (Lemont area)*
- *Reprocessing of passive seismic data (Lemont area)*
- *Design and acquisition of active seismic data (Lemont area)*
- *Targeting and design of slim hole test drilling (Lemont area)*

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1 Introduction

Direct Lithium Pty Ltd, a Tasmanian-registered company, is owner and operator of the Lemont special exploration licence. Effective from 2 August 2024, DLPL is a wholly-owned subsidiary of Solution Energy Pty Ltd. The principal target of DLPL's work is the location of heat resources suitable for geothermal power generation. The company also maintains an interest in cascading and direct-use applications for geothermal energy as well as the extraction of economically significant metal salts from solution in geothermal brine.

This annual report covers work completed in the period 14/9/2023 – 13/9/2024 on tenement SEL 21/2022. It is the first annual report lodged for this tenement.

1.1 Mapping Datum and References

Unless otherwise stated all maps, plans and geographical references included in this report have been produced using GDA94 (MGA55). SEL 13/2021 extends across the South Esk (8314), St Pauls (8414), Lake Sorell (8313) and Little Swanport (8413) maps of the 1:100,000 TASMAP topographic series.

1.2 Tenement Status

Direct Lithium Pty Ltd is the sole holder and operator of SEL 21/2022 (Figure 1) granted for a period of five years to search for geothermal substances (Category Type 6) and metallic minerals and atomic substances (Category Type 1). Tenure details of SEL 21/2022 are provided in Table 1.

Tenement Type	SEL
Number	21/2022
Commodity	Geothermal (6), Metallic Minerals (1)
Licensee	Direct Lithium Pty Ltd
Operator	Direct Lithium Pty Ltd
Area	2179 km ²
Date Granted	14/09/2023
Renewal	13/09/2028

Table 1: Tenure details for SEL 21/2022

1.3 Location and access

SEL 21/2022 encompasses a broad section of the Tasmanian midlands, extending northwards from Oatlands in the south to the South Esk River in the north (Figure 1). The majority of the tenement lies to the east of the sealed Midlands Highway which is the primary access route. Secondary road access is excellent throughout the tenement with options including the Lake Leake Road and the Esk Main Road to the north as well as numerous other minor roads, farm and forestry tracks. A rural area, townships located within the tenement include Campbell Town (pop. 823) and Avoca (pop. 192) in the north, Ross (pop. 410) and Oatlands (pop. 728) in the south.

Unavailable areas (exclusions) from SEL 21/2022 include several small mining leases (quarries), private reserves, nature reserves, historical sites and a gas pipeline easement (Figure 1). Also excluded from the northwest of the tenement area is a pre-existing category 1 exploration licence EL 7/2010.

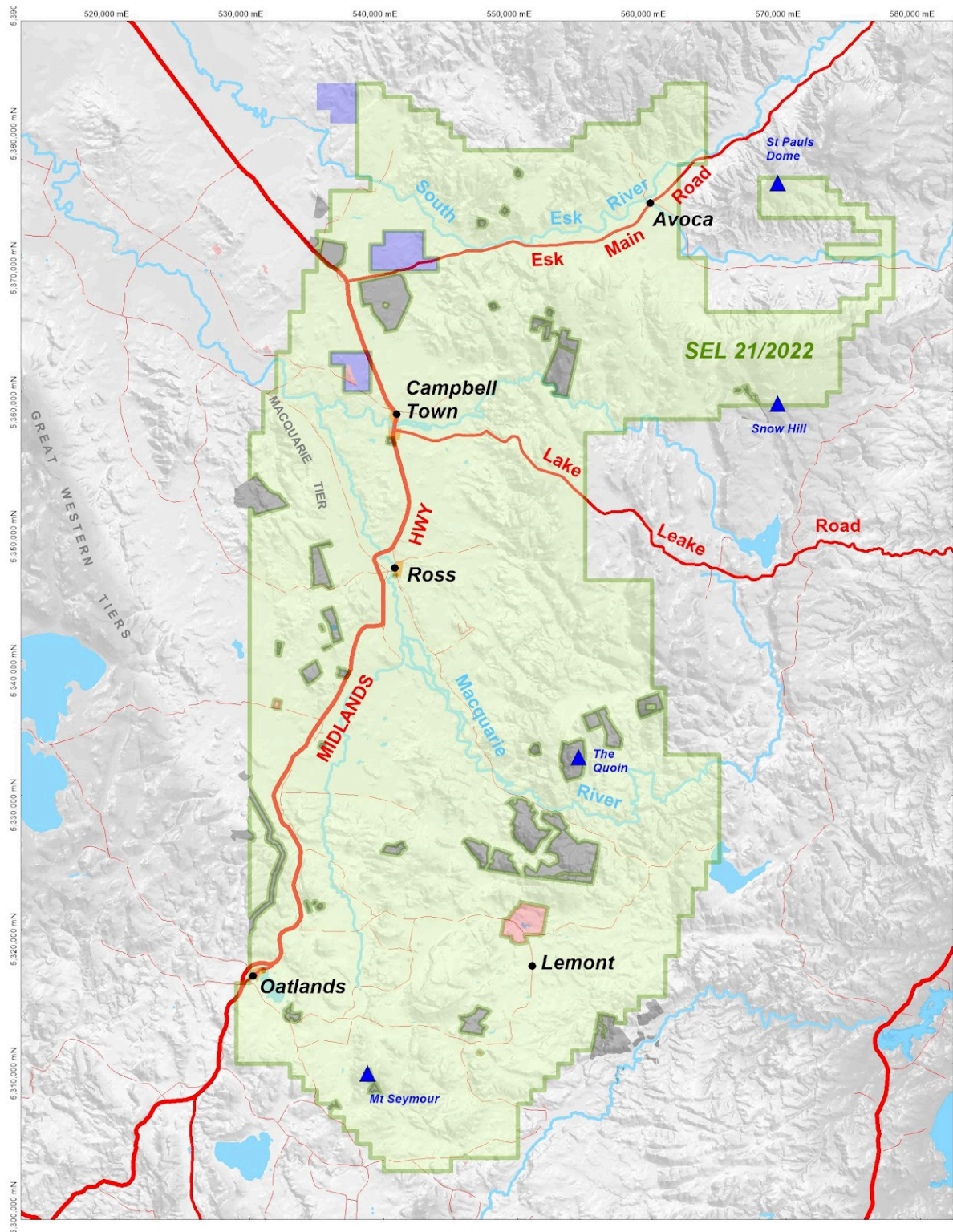


Figure 1: Location map of Direct Lithium Pty Ltd Geothermal Exploration Licence SEL 21/2022 (green). Mining leases area shaded red; blue shaded area is EL 7/2010. All other unavailable areas are shaded grey.

1.4 Topography, Vegetation and Land Use

The Midlands of Tasmania lie within a northwest-southeast trending graben bound to the south, west and east by dolerite ranges that include areas of significant relief in the Great Western Tiers, the eastern coastal ranges and the western Fingal Valley. By contrast, areas within the graben are characterised by a relatively low relief (undulating) terrain that are now largely developed for agricultural use. Elevations within SEL 21/2022 vary between 160 to 1010 mASL; prominent peaks within the tenement include Mt Seymour (739 m) and The Quoin (568 m) in the south and Snow Hill (974 m) and St Pauls Dome (1010 m) in the north.

The majority of SEL 21/2022 lies within the Macquarie River catchment, the Macquarie and Elizabeth Rivers draining northwest off the coastal ranges towards the Tamar Valley in the north of the State. The north of the tenement area also includes a portion of the South Esk River which drains westwards from the Fingal Valley in the far northeast.

Land tenure within SEL 21/2022 is almost entirely private freehold, the majority of which is active farmland. Agriculture is dominated by dryland grazing (sheep) on improved and derived pasture although irrigated crops and (to a lesser extent) irrigated pasture are increasingly common. Areas in the east of the tenement include minor amounts of plantation timber and native forest production. Patches of remnant native vegetation, predominantly lowland grassland and dry eucalypt forest/woodlands, are observed across the tenement becoming more common in the east. Small areas of acacia woodland and rare patches of coastal heath are also present throughout along with minor amounts of wet eucalypt forest in the eastern ranges.

1.5 Geology and Geophysics

1.5.1 Surface Geology

The surface geology of SEL 21/2022 is mapped in the 1:250,000 digital geological atlas and is summarised in Figure 2. With the exception of a small area in the northeast of the tenement, rocks visible at surface across this area are cover sequences and are no older than late-Permian in age. This cover conceals a major geological boundary that divides Tasmania into two distinct basement terranes located in the west and east of the State. Distinguished by age, lithology and deformation these two regions are ‘believed to have been juxtaposed at a NNW trending dislocation’ inferred to coincide with the Tamar Valley region in central Tasmania (Burrett & Martin, 1989; Figure 2, inset). The Western Tasmania Terrane (WTT) is visible in exposures west of SEL 21/2022 and comprises variably deformed and metamorphosed Pre-Cambrian basement, deformed Cambrian volcanics and sediments of the Dundas Trough and Mt Read Volcanic Belt and the Ordovician-Silurian shelf sediments of the Wurrawina Supergroup. In contrast, basement rock exposures in the northeast of SEL 21/2022 comprise low-grade deep-water meta-sediments of the Panama Group, part of the broader Ordovician – Devonian Mathinna Supergroup of the Eastern Tasmanian Terrane (ETT). A sequence of turbiditic, sand and siltstone deposits, these rocks have been subject to several stages of deformation, including the widespread mid-Devonian Tabberabberan Orogeny (Cayley et al., 2002). Similarities between the deformation and depositional style of the Mathinna Supergroup and units within the Lachlan Fold Belt (LFB) of mainland Australia have led to ongoing attempts to correlate the two (Powell & Baillie, 1992; Reed, 2001; Cayley 2011). Most commonly assumed to be a faulted contact or crustal suture, and often referred to in literature as the Tamar Fracture System (TFS), the nature of the deep geological boundary between east and west terranes has not yet been uniquely constrained by drilling (Burrett & Martin, 1989).

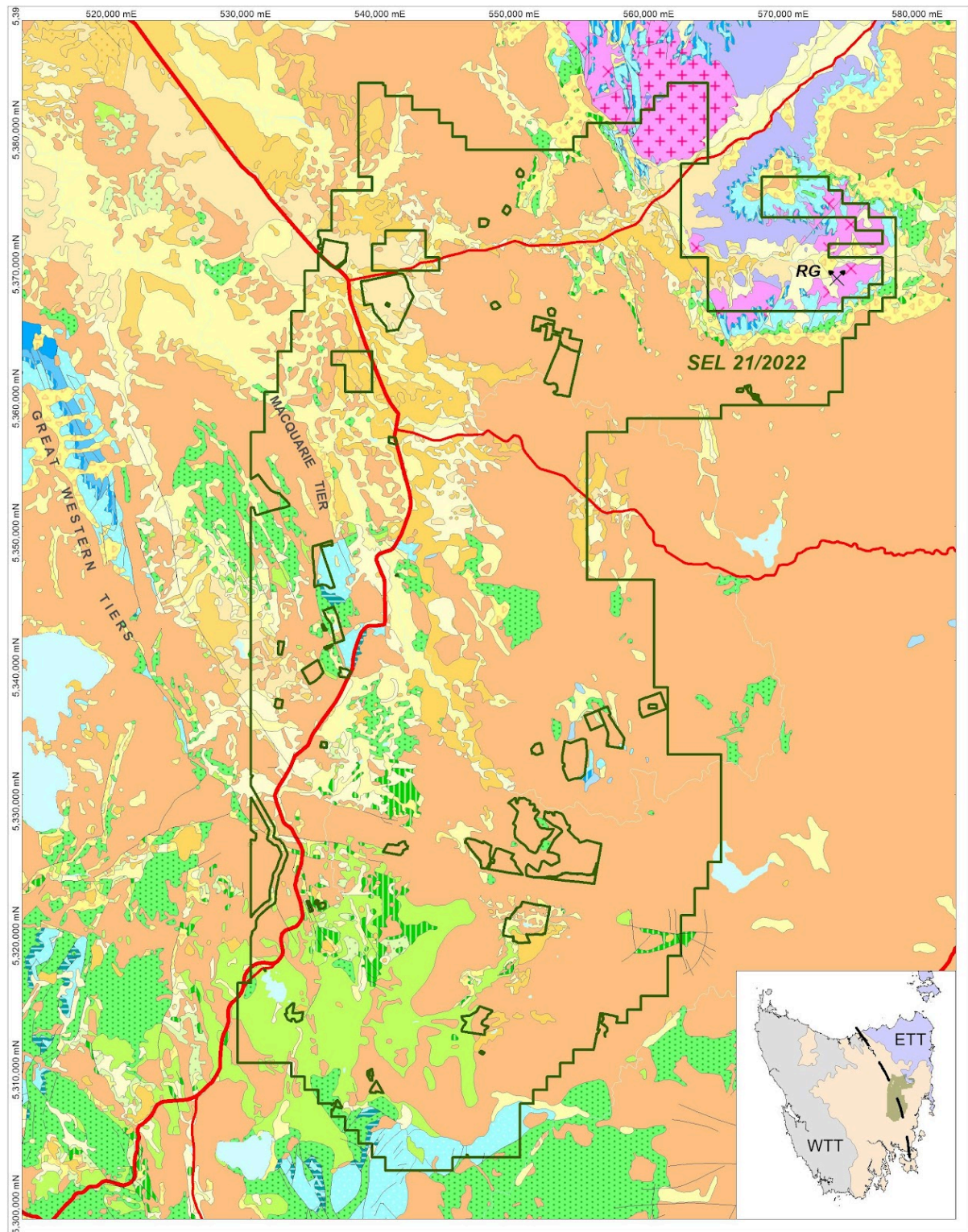


Figure 2: Surface Geology of SEL 21/2022 based on the 1:250,000 digital geology. Purple colours are Mathinna Supergroup; Pink, Granitoids; Blue/Green, Lower/Upper Parmeener Supergroup; Orange Tasmanian Dolerite; yellow-orange Tertiary basalt and tan/yellow Tertiary-Quaternary sediments and alluvium. RG indicates the location of the former tin mine at Royal George. Inset bottom right: map of the state showing areas of western Tasmanian Terrane (WTT; grey) and eastern Tasmanian Terrane (ETT; purple) outcrop and the inferred terrane boundary (dashed line) beneath cover sequences (orange).

Throughout Tasmania basement rocks are intruded by extensive Devonian/Carboniferous-aged granitoids. Intrusive rocks exposed at surface in northeast SEL 21/2022 comprise a series of fractionated I- and S-type alkali-feldspar granites collectively referred to as the Ben Lomond Batholith. Individual intrusions recognized within this group include the Gipps Creek, Henbury and Royal George granites. Emplaced at relatively shallow depths these rocks are known to be high-heat-producing granites (HHP) and are associated with greisen and greisen-vein tin/tungsten deposits that have been exploited at several locations, including at the former Royal George mine south of Avoca (Corbett et al., 2014; Collins *et al.*, 1981; Everard & Duffett, 2016). Where exposed at surface, granites of the Ben Lomond Batholith are observed to extend south and west beneath younger cover and may continue at depth beneath the tenement area.

Cover sequences that conceal basement rocks throughout SEL 21/2022 include flat-lying sediments of the Parmeener Supergroup. Deposited unconformably atop basement as part of the broader Permo-Triassic Tasmanian Basin these rocks consist of a ‘Lower’ sequence of glacio-marine sediments that grade upwards into ‘Upper’ fluvio-lacustrine sediments. Both Lower and Upper Parmeener sequences include coal seams with prospects identified at Bonneys Pains in the north, Woodbury and York Plains in the south, the latter having been mined historically. Information available from stratigraphic boreholes drilled within and around the tenement indicates total thicknesses of Parmeener units range up to around 1 km (Beardsmore, 2009).

Within SEL 21/2022 Parmeener Supergroup rocks are now largely preserved beneath extensive exposures of erosion-resistant dolerite sills. Intruded into the older sediments during the Jurassic-era break-up of the Gondwana supercontinent, drill data indicate dolerite is typically a horizontal layer between 200 and 300 m thick. Localised complexities, such as multiple intrusive layers and increased thicknesses around feeder zones, are also observed within this area (Beardsmore, 2009).

Overlying Tasmania Basin sediments and their intrusive rocks are younger late Cretaceous – Oligocene non-marine sediments of the Tamar Graben/Longford Sub-Basin. An onshore propagation of the Bass Basin and part of a broader extensional event related to the final break-up of Gondwanaland, this NNW-trending basin likely resulted from the reactivation of existing fault structures (Stacey, 2007). The location and orientation of the graben structure coincides strongly with the inferred location of the concealed basement terrane boundary (TFS; Burrett & Martin, 1989).

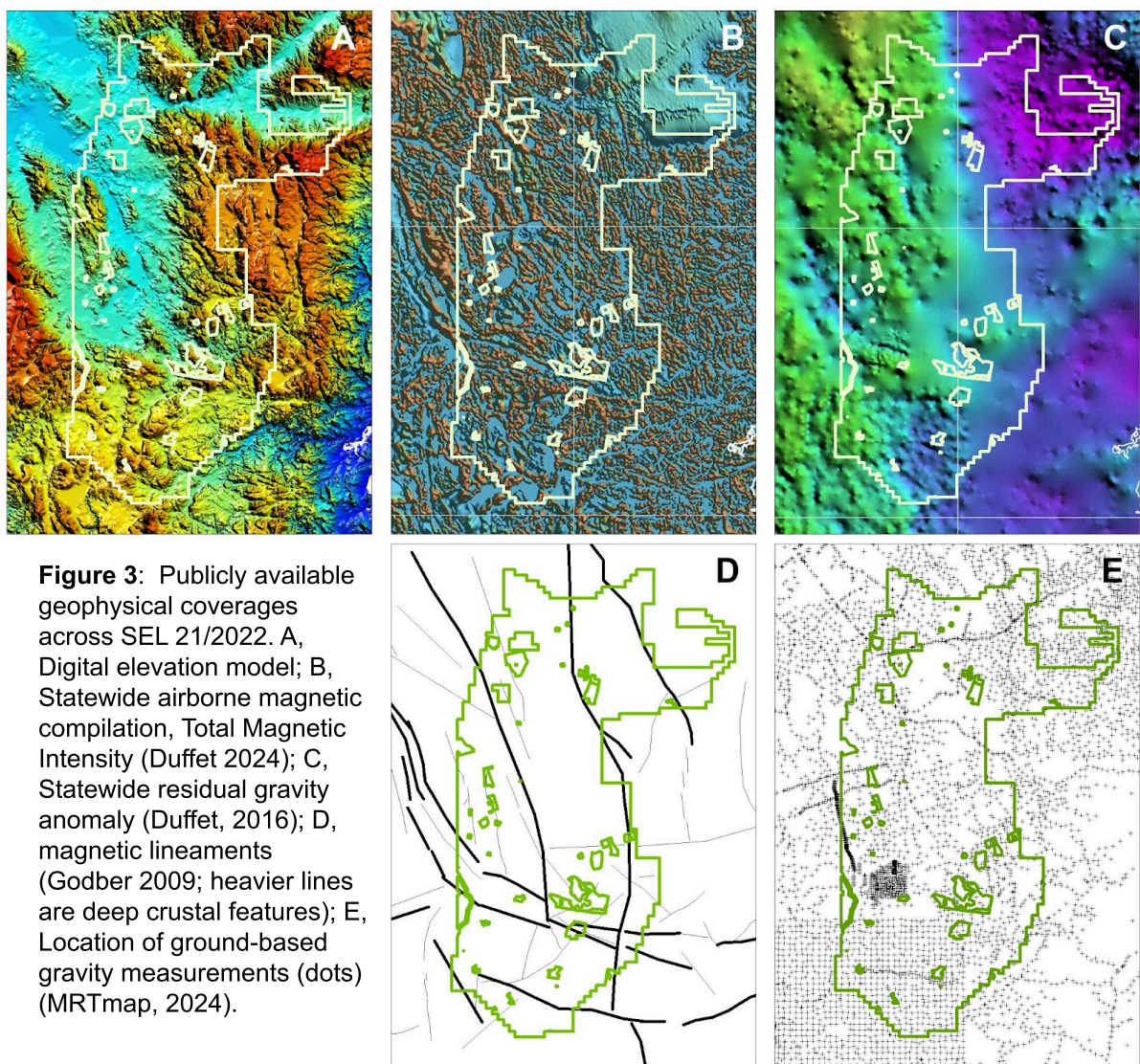
Also present within cover sequences on SEL 21/2022 are Oligocene intraplate basalts flows and eruptive centres, the latter often forming distinctive ‘sugarloaf’ hills. Younger deposits, including relatively minor amounts of Quaternary sediments and alluvial deposits complete the stratigraphy of this area.

1.5.2 Geophysics

The presence of extensive cover sequences across the Tasmanian Midlands makes the availability of quality geophysical data of particular relevance for interpreting the nature and relationships of basement rocks. Publicly available geophysical coverages across SEL 21/2022 include elevation models, ground-based gravity surveys and airborne magnetic data (Figure 3). Active seismic survey lines have been recorded west of the tenement area with a single east-west line crossing into SEL 21/2022 (Cooper et al., 2009; Figure 5). The

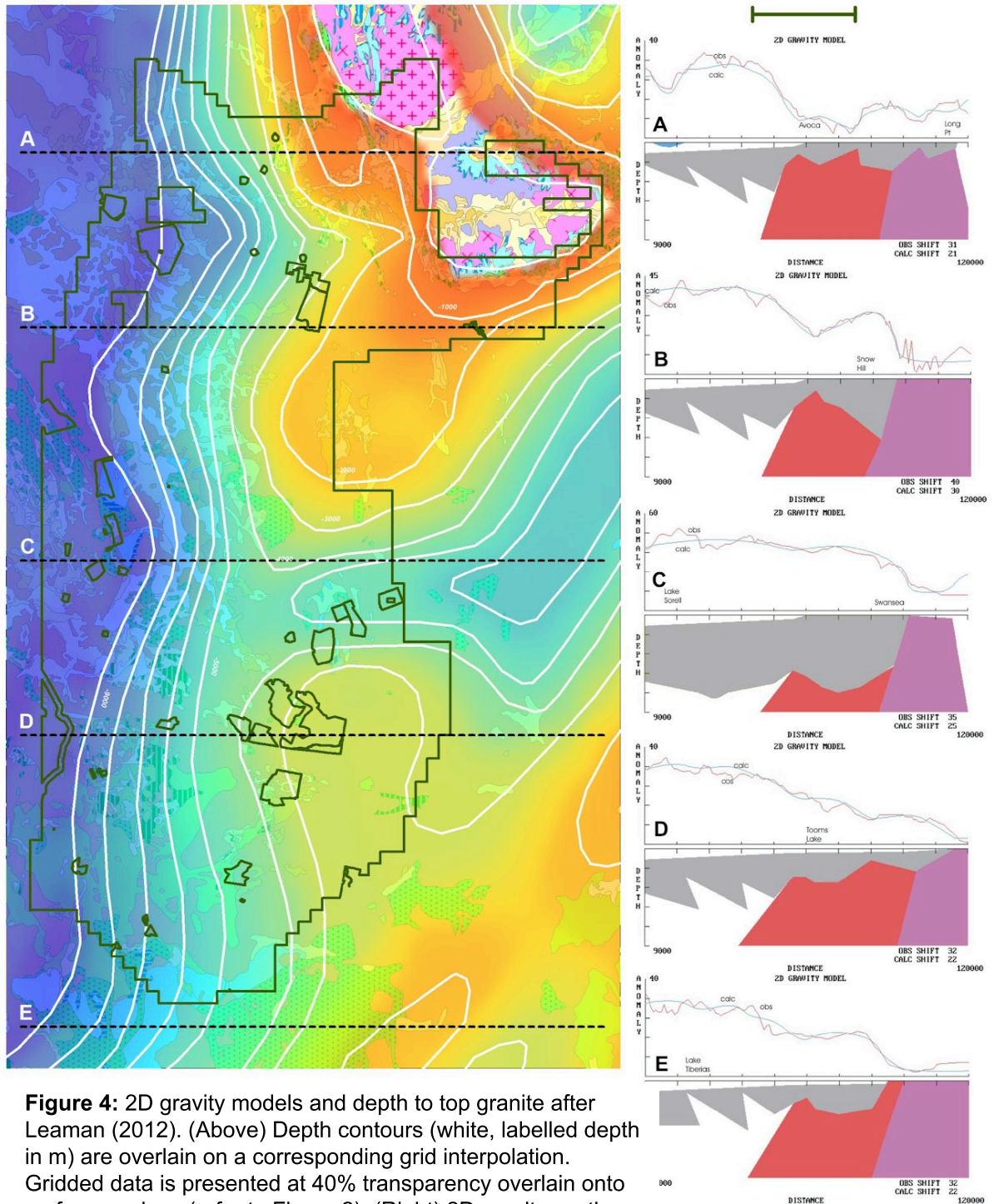
tenement area lies within both regional passive seismic survey coverage undertaken as part of the WOMBAT project (Rawlinson *et al.*, 2010; Young *et al.*, 2011) and the regional AusLAMP magnetotelluric survey (Ostersen, 2021).

Geophysical data quality and coverage across the tenement area are excellent and compilation images derived from both ground-based gravity and airborne magnetic data are available (Figure 3). Comparisons of these images reveal clear and consistent trends in topography, magnetic lineaments and gravity data. Tertiary-aged structures associated with extension and rifting are apparent within the topography and are also visible as magnetic lineaments. NNW structural trends associated with graben formation in the north of the tenement are seen to truncate against EW structures in the south, a pattern interpreted as a horsetail termination of normal faults (Berry, 2019). The termination of the NNW trending graben is interpreted as a result of differences in basement structure and composition (Stacey, 2007).



Gravity data coverage across SEL 21/2022 is excellent (Figure 3E) and statewide compilation of available gravity data (Figure 3C) has enabled 2D modelling to estimate the extent of granitic bodies beneath much of the region (Leaman, 2012). A distinct gravity low

in the northeast of the tenement area underlies outcropping granites of the Ben Lomond Batholith. 2D section lines across and to the south of SEL 21/2022 predict that these plutons are deeply rooted (>9 km total depth) and likely extend south beyond the extent of the tenement area (Figure 4). By contrast, to the west, granite terminates along a sharp north-south trending boundary, the so-called eastern Tasmanian ‘granite wall’ (Leaman, 2012).



Active seismic line data that crosses into the west of SEL 21/2022 is of poor-moderate quality only and does not provide any confirmation of the gravity model (Figure 5). Nonetheless, interpretation of these data provide insight into deeper crustal structure, suggesting a regional thin-skinned pattern of what are likely to be long-lived NE-dipping listric basement faults, many of which show signs of reactivation during subsequent periods (Cooper *et al.*, 2009). Fault structures are interpreted to coalesce into a regional detachment surface dipping shallowly NE between 6.5 and 7.5 km depth. Mathinna Supergroup units are predicted at depth where they are observed to be poorly reflective in character. A deeper offshore seismic line (Drummond *et al.*, 1991) which extends north-south along the east coast also indicates a relatively non-reflective upper crust that extends to depths of between 10 and 12 km. These rocks are underlain by en-echelon blocks of more reflective basement material. Differences in basement character between northern and southern ends of the offshore line are attributed to the potential presence of oceanic crust in the north versus Proterozoic continental crust in the south, an observation that is consistent with the termination of the extensional fault graben of the Longford sub-basin in SEL 21/2022.

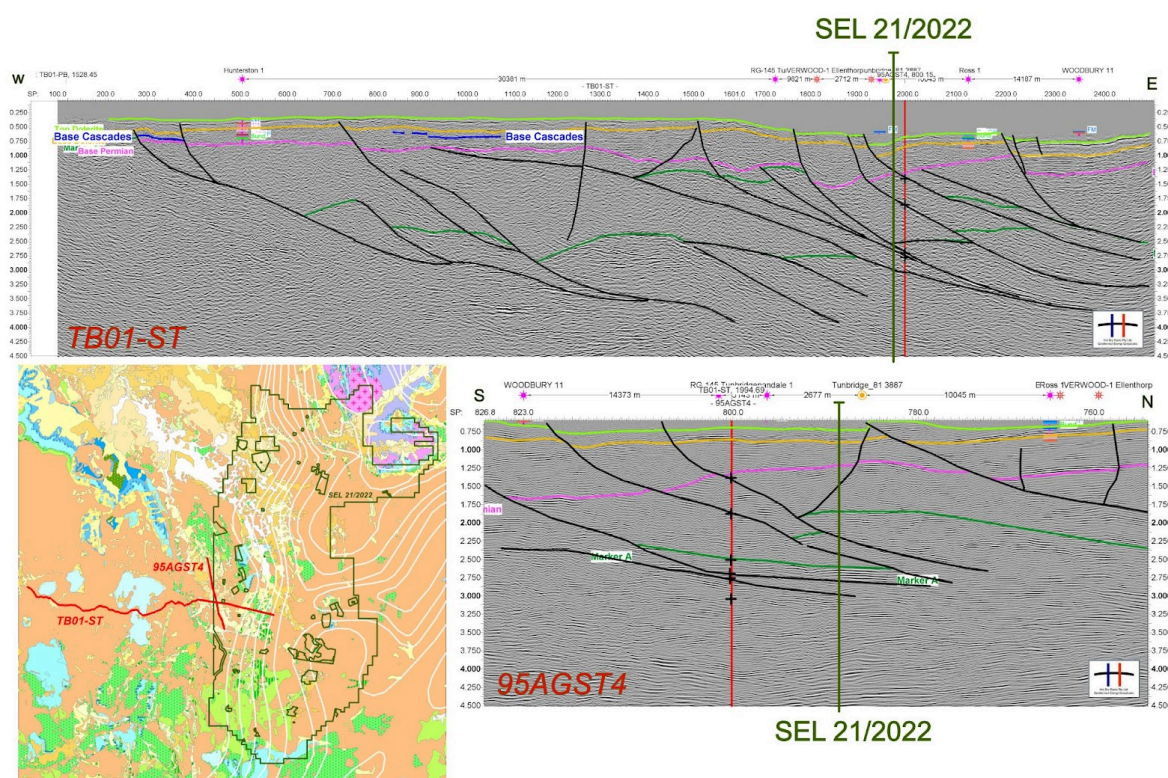


Figure 5: Interpretation of legacy seismic lines (amplitudes) TB01-ST (Great South Lands Minerals, 2001) and 95AGST4 (AGSO, 1995). Orthogonal to each other, line intersection is shown by a red vertical and intersection with SEL 21/2022 is a green vertical. Section vertical axis is two-way time. Interpreted fault surfaces are black lines, the pink horizontal lines are the interpreted depth of base Permian (Parameener). No conclusive evidence of granite intrusion is visible despite gravity prediction of deep rooted plutons beneath the east of line TB01-ST (see contours, inset left).

Regional passive seismic surveys undertaken across northern Tasmania as part of the WOMBAT project were designed to investigate large-scale crustal architecture, including the

inferred TFS. Initial three-dimensional (3D) tomographic models of teleseismic data revealed a distinct NNW-trending zone of low seismic velocity extending southwards from the Tamar Graben to the east coast and coinciding with the location of the inferred TFS (Rawlinson, *et al.*, 2010). To the east of this feature is a region of higher wave speed and reduced Moho depth (thinner crust) that correlates with the location of the ETT. A subsequent study using ambient noise tomography has mapped the low velocity zone in more detail at depths <15 km describing a consistently broad (~50 km wide) feature that follows a path southeast from the Tamar Graben, curving to the south in the vicinity of SEL 21/2022 (Young *et al.*, 2011). Lithospheric models based on these data support the conclusion of Drummond *et al.* 1991 whereby the WTT is underlain by Proterozoic continental crust and the east by mafic oceanic crust. Possibly part of a broader Paleozoic-era passive margin, the ETT has been shortened and accreted against the west by successive orogenic events culminating in the mid-Devonian Tabberabberan Orogeny. The nature of contact between terranes is inferred to be thin-skinned, the TFS being a 'mid-upper crustal expression of a broad and heavily deformed transitional zone (Young *et al.*, 2011). Ongoing seismic data collection and modelling of data from Bass Strait and southern Victoria support theories that the TFS may be an extension of the Governor Fault system of southeast Australia, the ETT being correlated with the Tabberabberan Zone of the LFB (Pilia *et al.*, 2015).

The Tamar Graben/Longford Sub-basin has a long history of investigation using electrical resistivity techniques. Studies of magnetotelluric (MT) field data identifying a possible conductive anomaly in Tamar Valley date back to the mid-1970's and are summarised in Ostensen (2021). A broad zone of anomalously high electrical conductivity (low-resistivity) was identified and observed to strike southwards, parallel to the NNW trending axis of the TFS. Referred to as the Tamar Conductivity Zone or TCZ, this feature was observed at depth beneath Mesozoic cover but no direct information was available regarding the nature or detailed structure of the geology associated with it. It was concluded that 'the most likely cause of the high conductivity anomaly was a combination of the presence of high conducting fluids and graphite in pores, cracks, and or fractured rocks' implying that there was potential for fracture permeability associated with this feature (Hermanto, 1992).

In 2016 a state-wide survey of long-period MT data was undertaken in Tasmania as part of the national Australian Lithospheric Architecture Magnetotelluric Project (AusLAMP). Interpretation of these data included the creation of a 3D regional resistivity model spanning the upper crust through to lithospheric mantle (~10 to 100 km depth) across the entire state (Ostensen, 2021). Clearly visible at shallow depths within these data is a zone of low resistivity in the vicinity of the Tamar Valley. First detected around 3 km below surface in the north, this feature is seen to deepen to the south and by ~10 km depth is an arcuate corridor of low resistivity ~45 km wide extending the length of the state from the Tamar River south to the Coal River. Consistent with the previously identified TCZ, the new long-period data continue to indicate low-resistivity associated with this structure dipping west to depths of around 60 km, well into the lithospheric mantle.

In assessing the nature of the TCZ Ostensen notes a strong correlation in the location and geometry of the low-resistivity anomaly and that of the TFS as identified by Young *et al.* (2011). Concluding that this feature marks the terrane boundary between WTT and ETT it was again determined that at depths of less than 10 km (above the brittle-ductile boundary) it most likely arises due to the presence of conductive phases and pore fluids in shear zones.

2 Previous Exploration

Early heat flow studies undertaken across Tasmania produced a small number of measurements across the state (Figure 6; Jaeger & Sass, 1963; Cull, 1991). Several values spatially associated with Devonian granite were found to be anomalously high ($>90 \text{ mWm}^{-2}$) including at Storeys Creek immediately to the north of SEL 21/2022 and at Coles Bay, to the east. The value of 159 mWm^{-2} determined for Storeys Creek is particularly high and has not been independently verified, however, the likelihood of elevated heat flow associated with the Ben Lomond Batholith is supported by local heat production data which indicates average values between $5 - 11 \mu\text{W/m}^3$ with extremes of up to $60 \mu\text{W/m}^3$ recorded (Collins *et al.*, 1981; Everard & Duffett, 2016).

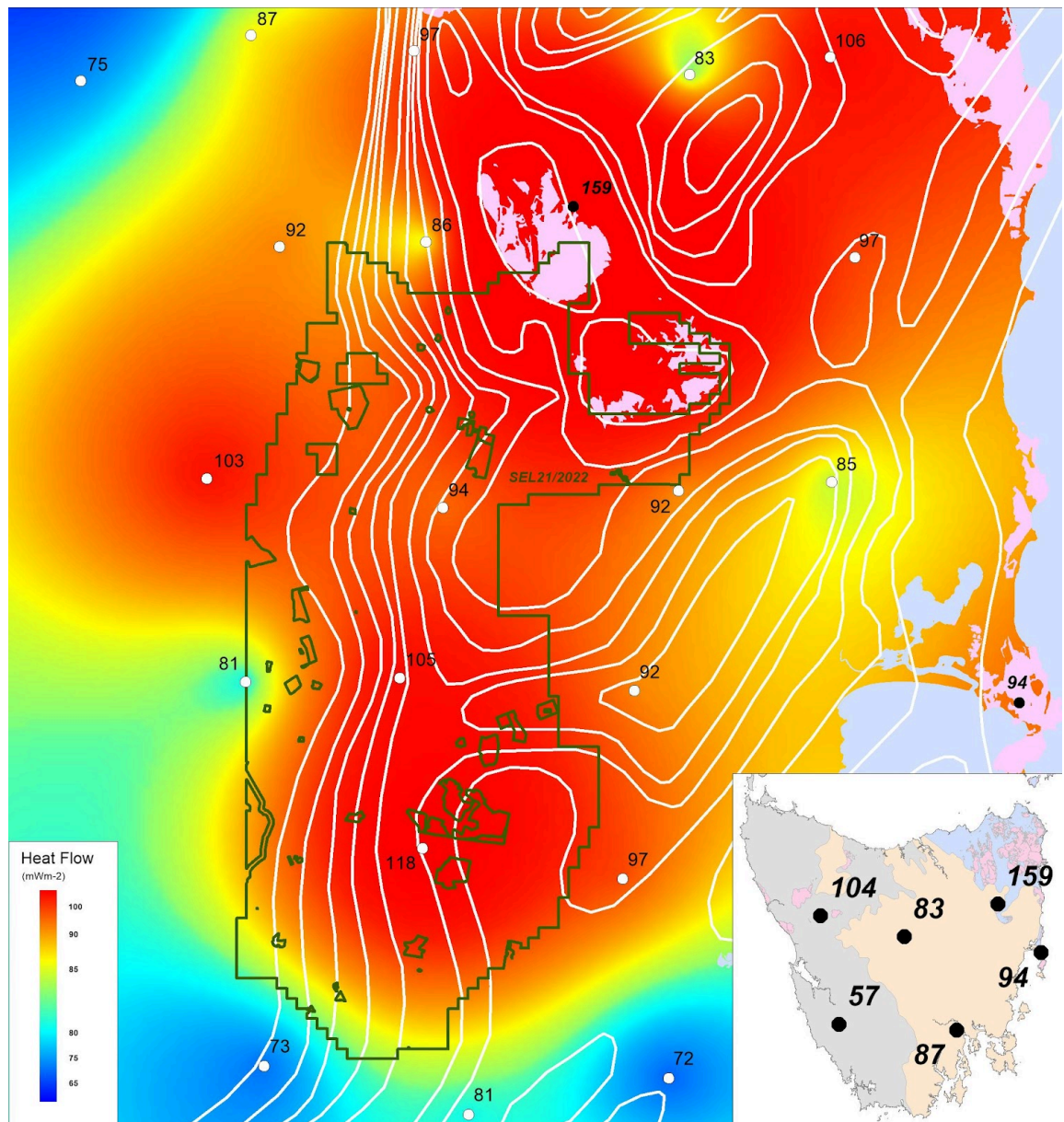


Figure 6: Legacy heat flow data points from central-eastern Tasmania superimposed upon the interpolated thermal field and predicted depth to top-granite (Leaman, 2012; ref. Figure 4). Black dots are pre-2000 data; white are KUTH drillholes. Granite contour interval is -1000 m ; areas of granite outcrop are shown in pink. Inset: pre-KUTH heat flow values across Tasmania superimposed upon major terrane elements (ref. Figure 2).

The rise of interest in non-conventional geothermal energy in the early 2000's focussed attention on exploration for these resources in Australia. In Tasmania KUTh Energy Ltd (KUTh), noting the spatial correlation of the TCZ, TFS and HHP Devonian granite in the east of the state, undertook what would become a decade-long campaign to identify exploitable geothermal plays at depth in this area. Between 2005 and 2014 the company completed a program of geological and geophysical data acquisition across a broad area of the state that included drilling and rock property determination, downhole temperature measurement and heat flow modelling, gravity, aeromagnetic and MT surveys, seismic studies and, ultimately, inferred resource estimation (Ward *et al.*, 2008; Goh & Holgate, 2009; Holgate and Goh, 2010).

Surface heat flow estimation was undertaken between 2007 and 2009 via a systematic program of shallow wells drilled on a 20 x 20 km grid across central and eastern Tasmania. Holes were purpose-drilled up to 250 m using RC pre-collars (100 – 150 m) and DDH tails with at least two successive temperature logs recorded in each hole between 1 and 3 months post-drilling. A database of rock property measurements, including thermal conductivity and heat production data were acquired from both new and legacy core and rock samples and these were combined with drill temperature logs to construct 1D heat flow models for each site. Results from this work defined an area of anomalously high heat flow located in central Tasmania that was clearly spatially associated with Devonian granite, much of which now lies within the vicinity of SEL 21/2022 (Figure 6). Of particular interest were results $>100 \text{ mWm}^{-2}$ from boreholes located south along strike from the HHP Ben Lomond Batholith at Charlton (105 mWm^{-2}) and Lemont (118 mWm^{-2}).

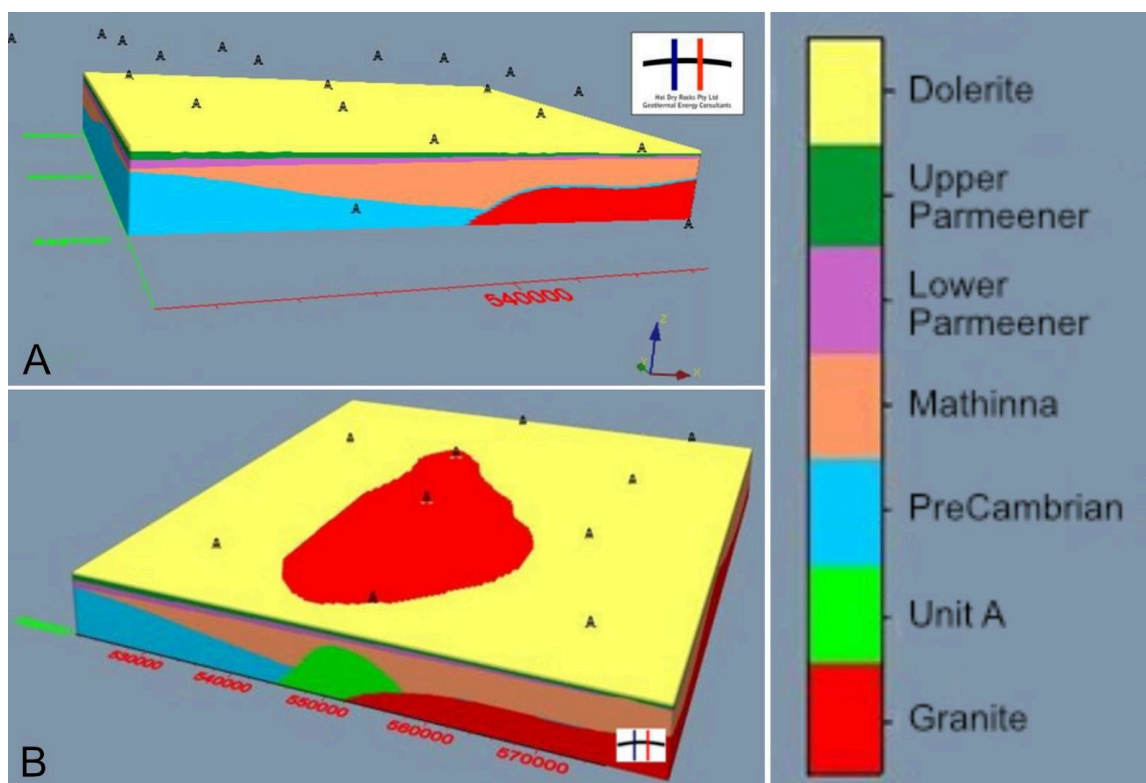


Figure 7: 3D earth models of the Charlton-Lemont area (Beardmore, 2009) showing the location of shallow heat flow constraints (boreholes); (a) initial resource model that was unable to account for anomalous heat flow; (b) subsequent resource model showing the addition of Unit A and the footprint of the resulting inferred resource area based on the 150°C isotherm at 4km depth (solid red). Refer to Figure 8 for location of the resource footprint within SEL 21/2022.

In 2009 KUTh commissioned Hot Dry Rocks Pty Ltd to create a 3D conductive thermal model of the Charlton - Lemont area using a combination of legacy and company acquired geological and geophysical data (Beardsmore, 2009). An earth model was constructed covering an area of 4140 km² to a depth of 7 km. The model initially utilised a simplified six-layered stratigraphy of (t-b) Jurassic Dolerite, Upper and Lower Parmeener, Mathinna (ETT), Devonian Granite and undifferentiated Pre-Cambrian Basement (WTT) (Figure 7a). A 3D conductive heat flow inversion, constrained by surface heat flow (note: the Royal George value of Jaeger & Sass, 1963 was excluded) and temperature data was used to predict temperature increase at depth. Surprisingly, initial results indicated that the geology model was unable to account for the extreme heat flow recorded in the Charlton and Lemont holes. Explaining these values in the conductive model required the addition of a previously unrecognised geological unit aligned north-south along the western margin of the interpreted Devonian Granite (Figure 7b). Referred to as 'Unit A' this feature has no known surface projection and was postulated to be a thermally conductive body, either a granodiorite or basement sedimentary unit with a thermal anisotropy caused by vertical cleavage.

Following refinement of the geological model, stored-heat estimation was carried out and a contained heat resource of around 260,000 PJ was inferred within a 1019 km³ reservoir of granite and basement sediment located between 3 to 5 km depth beneath the Charlton and Lemont holes (Table 2). Temperatures of up to 200 °C were predicted at 5 km depth within the hottest part of the resource area. The geothermal play was considered to be an Enhanced Geothermal System (EGS) target; the footprint of this resource is now fully contained within licence SEL 21/2022 (Figure 8).

Reservoir	Stored Heat (PJ_{th})*	Volume (km3)**	Inferred Geothermal Resource (PJ_{th})
Mathinna SG	54,260	230	54,000
Granite	26,300	108	26,000
Unit A	101,840	402	102,000
Precambrian	73,490	279	73,000
TOTALS	255,890	1019	260,000

Table 2: Inferred geothermal resource in the Charlton-Lemont geothermal play (Beardsmore, 2009). Resource estimate is rounded to the nearest 1000 PJ_{th}. *Stored-heat or thermal-energy-in-place represents the amount of heat contained within a volume of rock. For the purposes of resource estimation, only that portion of the stored-heat energy which has reasonable prospects for eventual economic extraction was considered. A stored-heat estimation was made for the reservoir by assigning values of heat capacity and density to the relevant lithologies in the thermal model. The stored-heat estimate considered only that portion of energy present above a 'base' or 'rejection' temperature of 70°C. This value represents the temperature at which a low-temperature organic rankine-cycle binary power plant rejects fluid and is therefore the limit on the amount of energy that can be drawn from the geothermal resource. **Reservoir volume was defined based upon a cut-off temperature of 150°C and a maximum depth of 5km. Cut-off temperature is the minimum economic reservoir fluid temperature for commercial energy extraction and in this instance was based upon the requirements of a low-temperature organic rankine-cycle binary power plant. Geothermal wells now exceed 7 km in places and a correspondingly larger resource could be inferred.

In 2011 KUTh released an updated resource estimation in accordance with changes that had been introduced with the second edition of the *Australian Code for Reporting of Exploration Results, Geothermal Resources and Geothermal Reserves*, released in 2010 (Beardsmore, 2011; Table 3). Changes made to the Code required that resources now be determined using

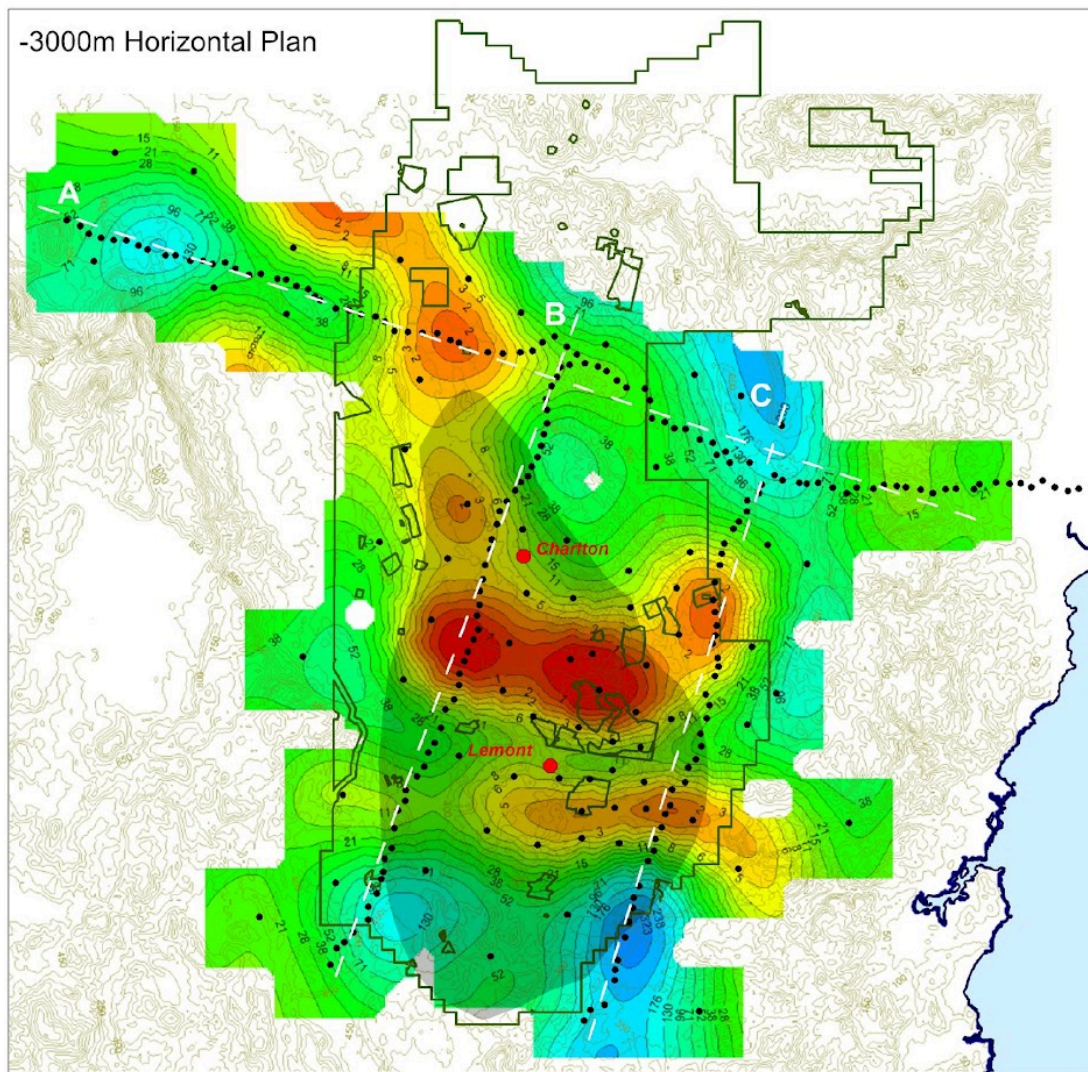
a base or rejection temperature of 80°C + mean ambient air temperature (12°C at Lemont for a total of base temperature of 92°C); that a recovery factor of 14% be applied to the stored-heat estimation and that the resource should be reported per depth intervals within the reservoir. In addition the new code allowed for reporting of estimated electrical power generation potential for each depth level within the reservoir (Table 3).

Depth Interval (m)	Inferred Resource PJ_{th} recoverable energy per the second ed. Code (2010)	Estimated Power Potential (MWe for 30 years)
< 4,000	3,400	411
4,000 – 4,500	11,000	1,391
4,500 – 5,000	13,000	1,824

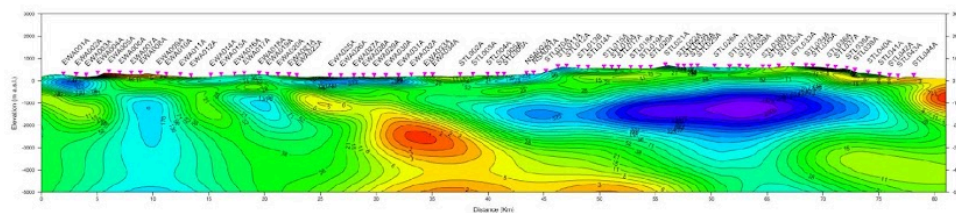
Table 3: Updated inferred geothermal resource estimate for the Lemont resource (Beardsmore, 2011)

Between 2008 and 2010 KUTh undertook a series of broadband MT data acquisitions across the TCZ to test the potential of the TFS as a fractured geothermal play. Two initial E-W reconnaissance lines bisected the Tamar Valley in the north and the central Midlands in the south. Both lines detected large electrically-conductive basement anomalies that were consistent with the known characteristics of the TCZ. In the southern region an east-dipping anomaly was spatially associated along strike from the recently detected area of high heat flow. An expanded broadband MT/TerraTEM survey was subsequently undertaken across the southern Midlands to increase survey coverage and enable 3D MT modelling. Resistivity models were constructed by WesternGeco on an 800m x 800m (lateral) x 100 m (vertical) grid using proprietary software that included topography and which inverted for static shift. The results of this work clearly indicated the presence of the TCZ within the vicinity of what is now SEL 21/2022, the east-dipping electrically conductive zone diverging in strike from NNW in the north to ~EW in the south in close agreement with the known pattern of Tertiary faults and magnetic lineaments (Figure 8; Soyer & Battaglini, 2010). Two planar EW striking structures were modelled beneath the Charlton-Lemont resource area, a shallowly north-dipping anomaly in the north and a moderately south-dipping anomaly in the south. Vertical sections through these features indicated the apogee of the inverted v-shaped created by these electrically-conductive structures was projected to lie beneath the Lemont bore hole (surface heat flow 118 mWm²).

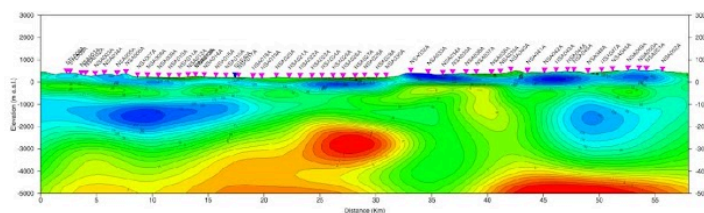
The striking spatial coincidence of what appears to be deep fractured zones (interpreted from surface fault mapping, passive seismic, gravity and aeromagnetic data), electrically-conductive MT anomalies (as little as 1 Ohm.m) and anomalously high heat flow within the Lemont region led to the development of a new conceptual play model for this area. Originally conceived as a relatively high temperature, low permeability Hot Dry Rock prospect, Lemont now appeared to host what may be a naturally fractured hot rock play with potential for warm/hot fluids at depth along zones of fracture permeability (Holgate, 2011). Following up on this theory, KUTh commissioned stress state modelling of fracture systems predicted to occur within the Lemont area. Detailed in Mortimer (2010) and based upon an E-W compressional stress state derived from a single local earthquake, the results of this work, while speculative, nonetheless clearly indicate the potential for fracture permeability in this area. Shallow to moderately-dipping structures were found to be critically stressed, and therefore potentially permeable. In particular, intersections between ~NS and NW/SE



Line A - Vertical Section



Line B - Vertical Section



Line C - Vertical Section

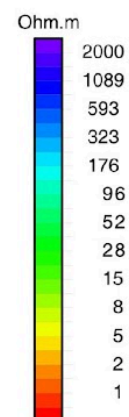
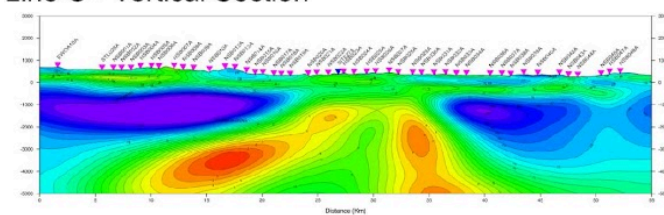


Figure 8 (prev. page): 3D MT model results from KUTH southern midlands broadband MT data (Soyer & Battaglini, 2010). Model results shown include the -3000m slice (top) with outline of SEL 21/2022 (green), MT data locations (black dots), Charlton and Lemont drill holes (red dots) and inferred resource outline (shaded area). The location of vertical section lines (bottom) are shown on the plan as dashed white lines labelled A, B and C. Vertical exaggeration of section lines is 2:1.

structures adjacent to the predicted western boundary of the granite were modelled as zones of enhanced permeability and were considered to be potential drill targets.

The 2014 takeover of KUTH Energy Ltd by Geodynamics Ltd led to target reprioritisation and the relinquishment of Tasmanian geothermal tenements. Following the detection of the TCZ within the state-wide AusLAMP MT survey in 2016, Ostensen (2021) undertook to re-model the existing KUTH broadband MT database to incorporate the newly acquired long-period data. 3D MT models were constructed across the area previously modelled by Soyer & Battaglini (2010) using the legacy data and six adjacent AusLAMP sites (Figure 9). The new models differed from existing work in several ways including a slightly smaller mesh size (700 m horizontal), no inversion of static shift and no topography. Models were created using both a homogenous and an *a priori* starting conditions, the latter based on the results of the regional AusLAMP model.

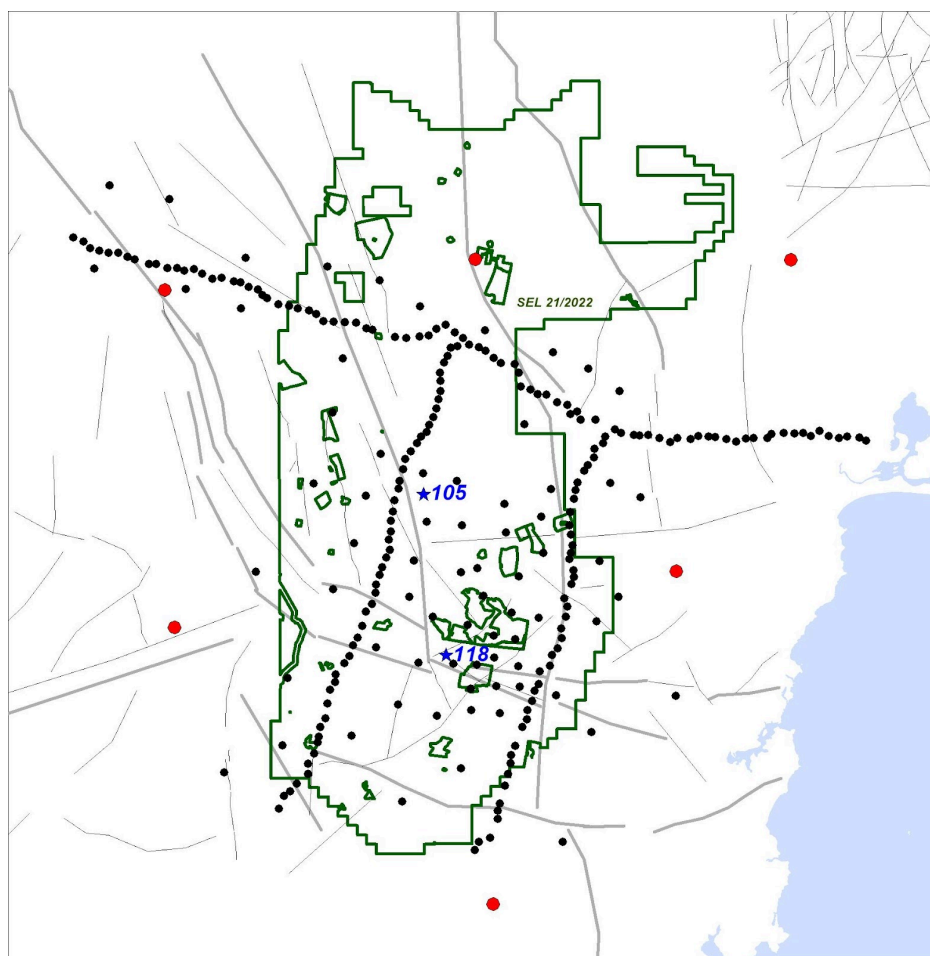


Figure 9: Location of AusLAMP (red dots) and KUTH MT (black dots) stations beneath SEL 21/2022. Also shown are the location and heat flow values modelled for the Charlton and Lemont boreholes (blue) and deep structures interpreted from magnetic lineaments (grey lines). The 3D MT modelling results of Ostensen (2021) suggest electrically conductive zones share a close spatial correlation with these structures.

Results of the new 3D modelling work were found to be broadly compatible with previous models, predicting a series of electrically conductive anomalies, first appearing as discrete zones below 1 km in depth. These features intensify and broaden with increasing depth, linking together below 3.7 km to form an arcuate corridor of low resistivity that curves south-east from the northwest margin of the survey area. However, differences in detail are apparent; the new models display more detailed resistivity structure with a stronger vertical exaggeration and more extreme resistivity values. Further, lateral shifts in the location of the most conductive zones in Ostensen's preferred model (using the *a priori* AusLAMP model) appears to provide a closer match to fault structure predicted at depth from magnetic lineaments (Figure 9). Of particular interest is a specific correlation between a highly conductive zone and a predicted fault intersection along the western edge of the predicted granite. It is concluded that the new models give 'high credibility to the existing (naturally fractured) conceptual model for the Lemont geothermal resource' but that further work on modelling, including the incorporation of topography and possibly new data acquisition should be considered.

The potential of the Lemont area as a fracture permeable source of warm/hot geothermal fluids circulating within and adjacent to fractionated granite of the Ben Lomond Batholith raises the possibility of economically significant fluid chemistry, especially lithium salts. The global average upper crustal concentration of lithium is estimated to be around 35 ppm and lithium concentrations derived from rock samples within the Ben Lomond granites are clearly elevated above this (Figure 10). Several historic lithium prospects are recorded associated with zinnwaldite in greisen tin/tungsten mineralisation in the Gipps Creek/Storeys Creek area (Figure 10); recent analysis of rock samples from these sites has detected significant lithium mineralisation including one value over 9000 ppm (2% Li₂O) (TinOne, 20 July 2023, <https://tinone.ca/>). Mobilisation of lithium ions from granites into circulating groundwater systems has been widely observed and high lithium concentrations (*ca.* 200 mg/L) are known from a number of active geothermal sites worldwide (*e.g.* United Downs, Cornwall, UK; Upper Rhine Graben, Germany; Salton Sea, California, USA). A range of direct extraction technologies are available to concentrate lithium salts from water and these can be applied to geothermal brines.

It is clear that if warm/hot fluids are circulating in fracture permeability adjacent to the modelled granite margin at the Lemont prospect then there is a coincident potential for economic concentrations of lithium salts within those waters. Further, this potential is unlikely to be limited to the Lemont area and may occur elsewhere along zones of fracture permeability adjacent to or within the granite margin. Temperatures required for lithium enrichment are not as high as those required for geothermal power generation implying targets may be encountered at relatively shallow depths including at locations closer to granite outcrop in the north of the tenement area.

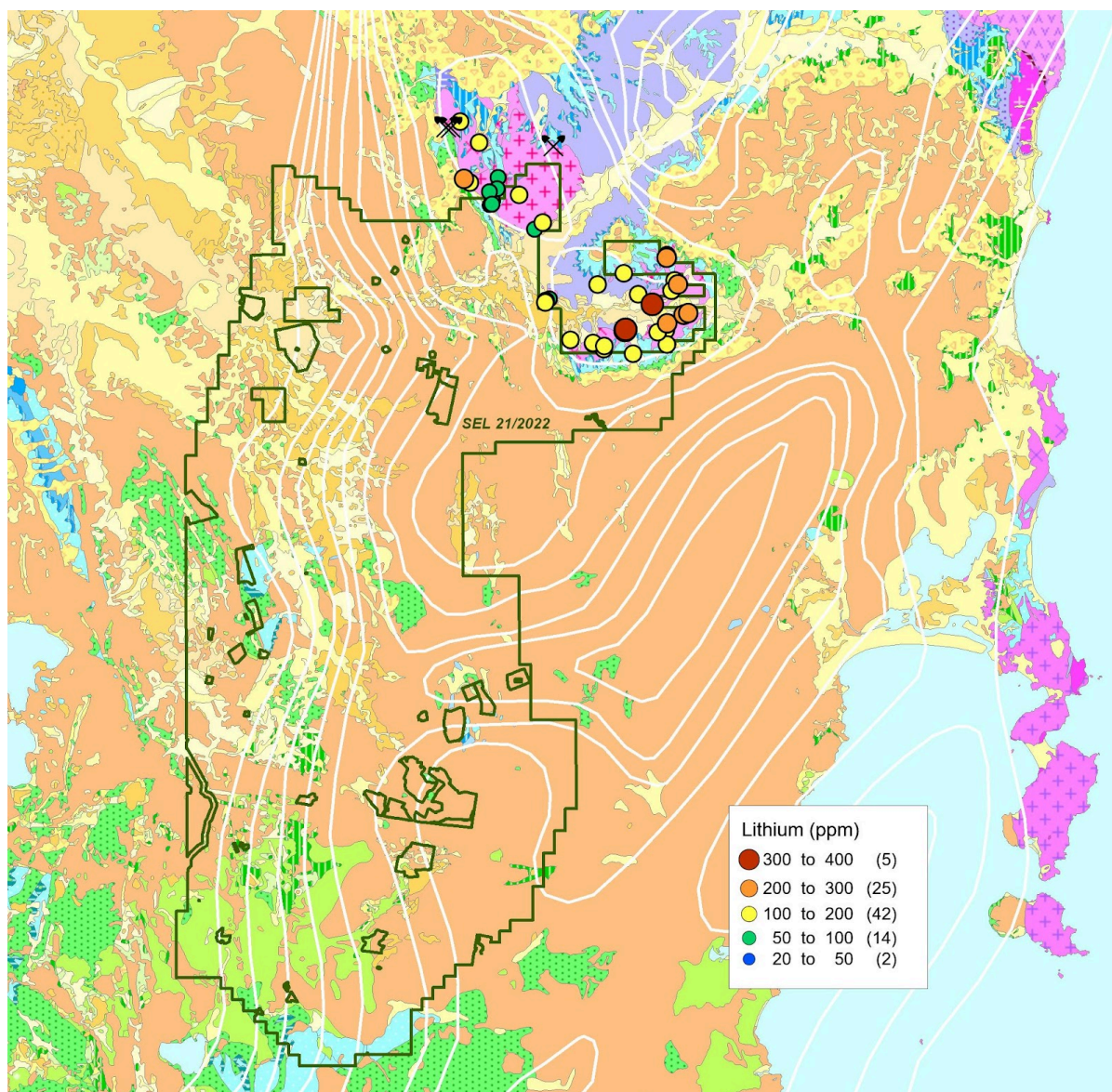


Figure 10: Rock geochemistry data from the Ben Lomond Batholith available from the MRT Samples and Geochemistry Database (MRT, 2024). Lithium values in ppm, as shown. Mine symbols indicate the location of historically known lithium mineralisation. Depth-to-granite contours modelled from gravity are shown in white (Leaman, 2012).

3 Work Completed

Work completed on the Lemont geothermal resource area has identified a play that is compatible with a fracture-permeable geothermal system. The depth of the system (>2 km) necessitated a reliance upon remote geophysical techniques to describe and define the play. Further resource definition will require deep drilling and specific target optimisation is now the priority of the exploration effort on SEL 21/2022.

3.1 3D MT Model Optimisation

3D modelling of magnetotelluric data undertaken by Ostensen (2021) revealed broad agreement with legacy models of Soyer & Battaglini (2010) as well as a number of differences in detail that may be of potential significance for drill targeting. To better understand the implication of model variance, and the potential uncertainties inherent within these visualisations, DLPL commissioned Vox Geophysics to review past work and re-model the existing MT data. The full results of this work are included in Appendix 1.

Initial modelling of the Lemont resource site by Soyer & Battaglini (2010) was assessed to have stood the test of time using methods that continue to represent good practice. Models of Ostensen (2021) were found to display unexplained differences between those using homogenous starting conditions and those relying on the AusLAMP *a priori* model. Unusual amounts of sharp structure observed in the former, along with several anomalies not reproduced in other models, may be the result of over-iteration and/or static shift effects whilst the latter retained unsmoothed remnants of the starting model alongside unusual streaking and banding effects.

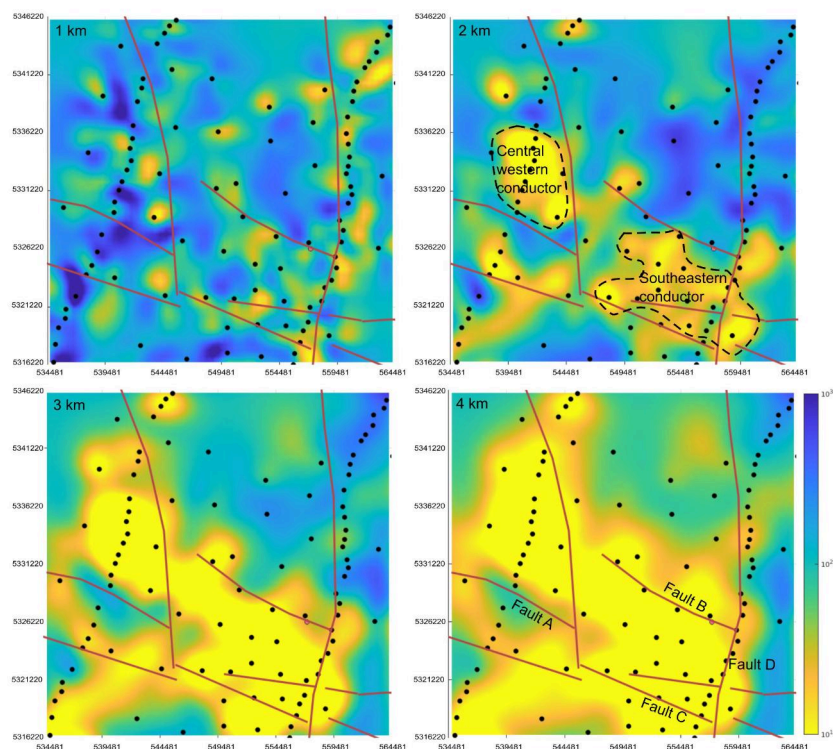


Figure 11: Depth slices through the preferred revised Lemont 3D MT model (Selway, 2024 - Appendix 1). Black dots are MT station locations, lines are magnetic lineaments from Godber (2009), resistivity scale as shown.

A new 3D model was created for a subset of data within the area of interest around the Lemont resource. Restricting the modelled area enabled a smaller 500 m lateral cell size and subsampling of a greater number of frequencies whilst still balancing the computational effort required to create the model. Topography was not included in the inversion and static shift was accounted for via the inclusion of 11 thin (30 m) shallow layers to allow for generation of near-surface conductors. Results for three models are reported: two generated from a homogenous (100 ohm.m) starting condition using (a) default smoothing and (b) low smoothing and a third (c) using the AusLAMP Tasmania model as an *a priori* starting condition with default smoothing. Depth slices from the preferred model (a) are provided in Figure 11.

Once again patterns of resistivity are observed that are broadly consistent with previous models whilst differing somewhat in detail. The northeast of the model space is noticeably more resistive than the south and west in which low-resistivity/high-conductivity anomalies appear around 2 km depth. Two major conductive anomalies are observed and are termed central-west and south-east according to their locations. Initially isolated, these features broaden with increasing depth to form a now-familiar arcuate shape curving south and east from the northwest of the model space. Some evidence of structural control over the location of modelled anomalies is provided by an apparent spatial correlation between these forms and aeromagnetic lineaments interpreted as deep crustal features by Godber (2009). This is further corroborated by comparison with 3D passive seismic (ambient noise tomography, ANT) models where conductive anomalies appear to coincide with areas of low seismic velocity (pers. comm. Gerrit Olivier, IMS).

The differences observed between 3D MT model versions reflect the implicit uncertainty that exists in interpretations of these data. To better understand the limitations of model fit, phase tensor analysis as well as 1D and 2D models were undertaken. These data interrogation methods provide useful insight into the reliability of modelled features, an important consideration for drill target optimisation. The results of this work indicated a range of reliability in model fit per data point and often also in fit with depth beneath a single station. Overall, the two major conductive bodies located in the central-west and south-east model area were found to be robust features, with evidence from 2D modelling going some way to resolving the lateral variations observed between models.

4 Discussion

A significant amount of legacy data is available for the Lemont geothermal resource in SEL 21/2022. Independent geophysical data derived from different sources align to draw a consistent picture of a naturally fractured, potentially permeable play that is both spatially and thermally associated with deeply buried granite intrusions. An area of high priority has already been identified within the tenement and work is now required for target optimisation ahead of initial drilling.

The depth of the resource at Lemont has made drill targeting reliant upon the intersection of geological and geophysical datasets to remotely identify areas of optimal prospectivity. To be successful this process must:

- a) use as many independent sources of data as practicable,
- b) use the most optimal data to reduce uncertainty,

- c) ensure that uncertainty inherent to data/models is understood, and
- d) combine data into a common format for synthesis and interpretation

Table 3 provides a summary of the datasets that are currently available at Lemont and what work each may need, at prospect scale, to provide optimal input into drill targeting. Lemont is currently characterised by a number of excellent geophysical data sets, however, a number of improvements and additions can be made to enhance both understanding and applicability of these data.

	Is there data at Lemont	Does the data require infill?	Does the data exist in a 3D model space?	Is 3D model revision required?	Work recommended
Geology	Yes	No	Yes	Yes	Review data to create a new 3D geological model space for SEL 21/2022
Geothermics	Yes	No	Yes	No	Incorporate available rock property data (thermal conductivity, heat production) and heat flow data into 3D geological model
Aeromagnetics	Yes	No	No	Yes	Review original aeromagnetic interpretation; incorporate lineaments into 3D geological model space
Gravity	Yes	No	No	Yes	Undertake 3D inversion of gravity data across the Lemont prospect
Magnetotellurics	Yes	<i>tba</i>	Yes	Yes	Produce optimal 3D MT model
Passive Seismic	Yes	<i>tba</i>	Yes	Yes	Review and produce an optimal 3D ANT model
Active Seismic	No	-	-	-	Design and acquire active seismic data at Lemont

Table 4: Current status of existing Lemont geological and geophysical datasets

The production of a 3D model space for SEL 21/2022 will form the basis for ongoing investigation of both deep geothermal power prospects and shallower geolithium targets. It is recommended that this work be based upon existing 3D geological interpretations which should be validated against available surface mapping, drill intersections and structural interpretations. Particular attention should be paid to capturing structural data across the tenement to best support future identification of shallower lithium targets. The model should be constructed in a space where it is possible to assign physical rock properties such as thermal conductivity and heat production to each geological unit.

Sufficient aeromagnetic and gravity data are available across the Lemont prospect. It is recommended that these data be reviewed and incorporated into the 3D model space. In the case of gravity data it is recommended that a 3D inversion be attempted at prospect scale to best predict the geometry and location of granite intrusions. In both cases particular care should be taken to understand the size and character of uncertainty inherent in interpretation.

3D magnetotelluric and passive seismic (ambient noise tomography) models exist for the Lemont prospect. A review process of the MT data has already begun (see Section 3: Work Completed) and is expected to continue into the next year with the construction of a final 3D model that will incorporate topography into the inversion. The impact of static shift and possible options for reducing this effect will be considered as part of this process, as will the need for any data infill. Review and revision of the existing Lemont ANT model (IMS) is also underway; when completed these data should both be incorporated into the 3D model space.

Active seismic data coverage is relatively sparse across Tasmania, the presence of the dolerite and its effects on seismic signals having served to suppress the use of this technique in the state. However, interpretable data have been acquired from locations to the west of SEL 21/2022 implying that with careful design a successful survey could be implemented across the Lemont resource area. As knowledge of fracture location and orientation is critical to this project it is recommended that an active seismic data acquisition be pursued across this area. The nature of this data acquisition should be determined in close consultation with experts in this field to maximise the chances of survey success.

Alongside work for drill target optimisation, it is recommended that expert advice be sought regarding the design of proposed test drill holes and any subsequent well-testing programs.

5 Conclusion and Recommendations

Previous exploration work in the Lemont area has identified the presence of a significant geothermal resource within the area now covered by SEL 21/2022. Independent geophysical data derived from different sources align to draw a consistent picture of a naturally fractured, potentially permeable play that is both spatially and thermally associated with deeply buried granite intrusions. An area of high priority has already been identified within the tenement and work is now required for target optimisation ahead of initial drilling. Recommendations for future work on SEL 21/2022 are:

- *Assembly of 3D geological model (whole tenement) - \$20,000*
- *Review of aeromagnetic interpretation (whole tenement) - \$10,000*
- *3D modelling of legacy gravity datasets (Lemont area) - \$20,000*
- *Further 3D modelling and assessment of legacy MT data (Lemont area) - \$10,000*
- *Reprocessing of passive seismic data (Lemont area) - \$10,000*
- *Design and acquisition of active seismic data (Lemont area) - \$180,000*
- *Targeting and design of slim-hole drilling and well testing (Lemont area) - \$10,000*

6 Environment

No ground disturbing activities were undertaken on SEL 21/2022 during the reporting period.

7 Expenditure

Details of expenditure on SEL 21/2022 across the 12-month period 14/9/2023 – 13/9/2024 are captured in Table 4 below.

	SEL 13/2021
Geoscience Costs	\$
Geology	-
Geochemistry	-
Geophysics	\$17,050
Remote Sensing	-
Drilling & Gridding	
Gridding	-
Drilling	-
Land Access Costs	-
Rehabilitation Costs	-
Feasibility Study Costs	-
Other Costs	\$17,393
Administrative Costs	\$3,444
TOTAL 23/24	\$37,887
Total Expenditure	\$37,887

Table 5: Expenditure on SEL 21/2022 in the 12-month period 14/9/2023 – 13/9/2024.

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9 Keywords

Geothermal exploration

Geothermal resource

Lithium

East Tasmania

High Heat Producing (HHP) granite

Heat Flow

Lemont