Overview of landslides in northern Tasmania from the mid-October 2022 rainstorm

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OCTOBER 12-14 RAINSTORM

October rainfall across northern Tasmania from 12-14 October 2022 was more than double the long-term monthly average. Numerous locations – including Sheffield and Deloraine – received their highest recorded total October rainfall. Precipitation was concentrated on October 12th and 13th as a slow-moving rain band crossed the region before exiting into Tasman Sea on October 14th. Daily precipitation surpassed 50 mm in many places and locally exceeded 100 mm, with daily October records set at dozens of meteorological stations including Mount Barrow (188.8 mm), Targa (150.6 mm), Loongana (144.4 mm), and Quamby Bluff (133.6 mm). During the rainstorm more than 300 mm fell at Mount Blackwood (P. Hills, pers. comm.).

The rainstorm caused numerous landslides and widespread flooding that required months of clean-up and repair works. Already moist soils and high groundwater tables from three consecutive La Niña years probably increased the severity and extent of slope failures and inundation.

MRT INVESTIGATIONS

Mineral Resources Tasmania (MRT) is investigating landslides produced by this rainstorm through multiple approaches: targeted site visits; systematic mapping using high-resolution satellites tasked in late 2022 and early 2023; analysis of rainfall distributions; and on-going monitoring of select creeping slopes. Many of the landslides were reported by Local and State Government agencies, Hydro Tasmania, and TasNetworks. However, many slope failures that did not affect infrastructure were not immediately recognised. To date, MRT has mapped more than 230 landslides that were either caused or likely caused by the October rainstorm; others probably occurred or were reactivated.

IMPACTS

The Great Western Tiers, centred near Poatina, experienced the highest number of slope failures (Figures 1 and 2) due to steep, landslide-prone slopes and the concentration of rainfall as the weather system was forced up the face of the nearly 1-km-high escarpment. This area featured heavily in media reporting, largely because of several debris flows that ran out 1.5-2.5 km from their sources. Poatina Road was closed for over a month while deposits of numerous debris slides and debris flows were removed and, where feasible, stabilised. The debris flow down First Creek undermined a TasNetworks high-voltage transmission tower, requiring its demolition with explosives. A small landslide occurred next to the penstock at Poatina Power Station, exposing in situ bedrock. The most debris-laden part of the Poatina Creek debris flow terminated just short of Poatina Power Station, with only more distal muddy water inundating and passing the site. Damage to Hydro Tasmania infrastructure could easily have been much worse.

Smaller groups of landslides occurred across a ~180-km swath of northern Tasmania between Oonah in the west and Derby in the east (Figure 3). They caused diverse damage that was largely overlooked in media reports. Several failures blocked or displaced roads, in some places requiring closures and traffic detours for weeks to months. Slope movement at Upper Natone displaced part of a property including a shed by ~30 cm, compromised two farm dams, and continues to threaten Upper Natone Road. The extent and orientation of its scarps suggest a large, incipient landslide. Various landslides in the vicinity of Gunns Plains partially blocked roads or undermined their shoulders. A deep debris slide at Targa transformed into a mobile flow. It fortuitously parted around a house, but farther downslope destroyed two sheds and ran into a farm-dam reservoir. Two landslides triggered by rainfall at Derby damaged mountain biking trails with an initially estimated repair cost of $500,000.

Several landslides, including at Gunns Plains and near Mole Creek, occurred along river bends where erosion by flood waters undercut river banks. At some of these locations, the landslides affected roads directly upslope. Observations at sites of long-term MRT projects in Tamar Valley and Fingal Tier suggest reactivations or temporary accelerations of deep-seated landslides well beyond the area of greatest rainstorm impacts.

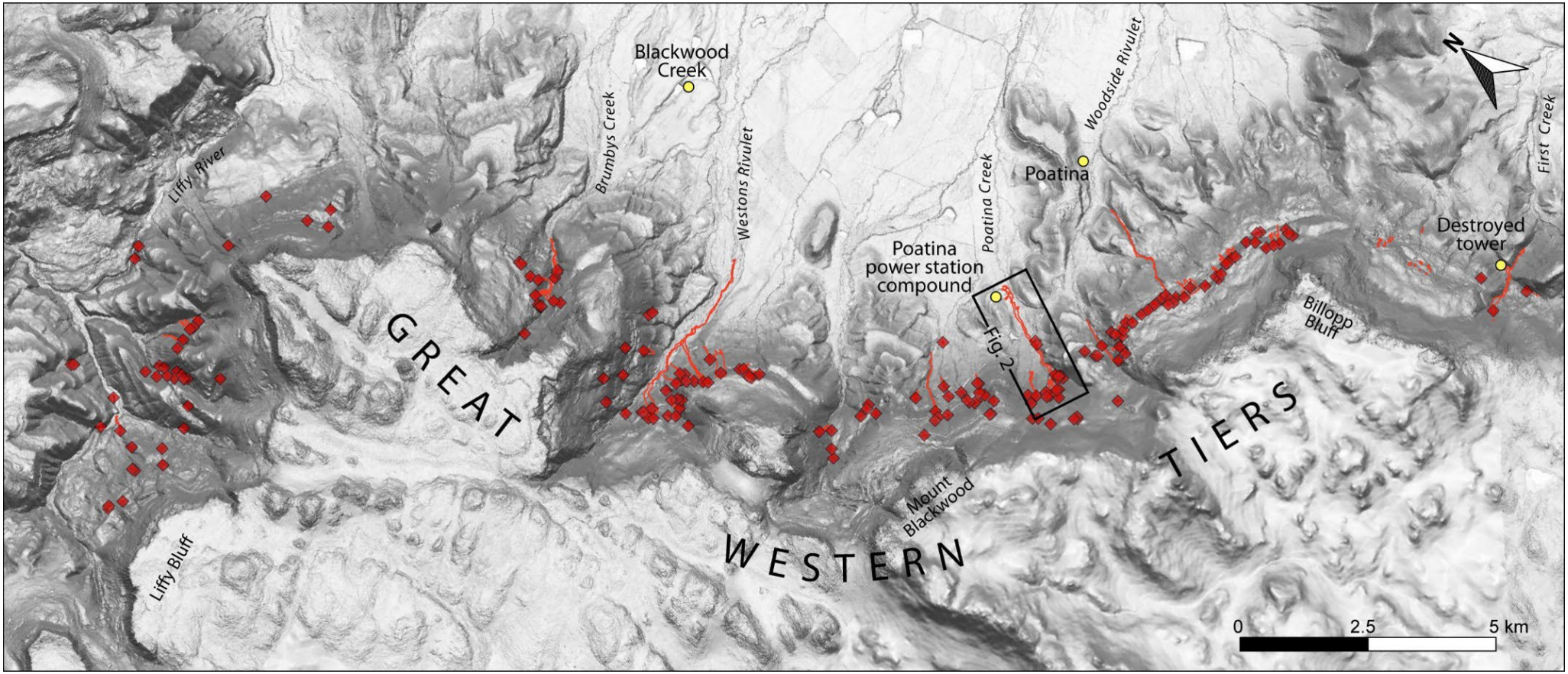

Figure 1. Overview of 2022 rainstorm-triggered landslides (red diamonds and polygons) in the Great Western Tiers. The base map is a hillshade from LIST Map produced using LiDAR collections that were recently completed for this escarpment.

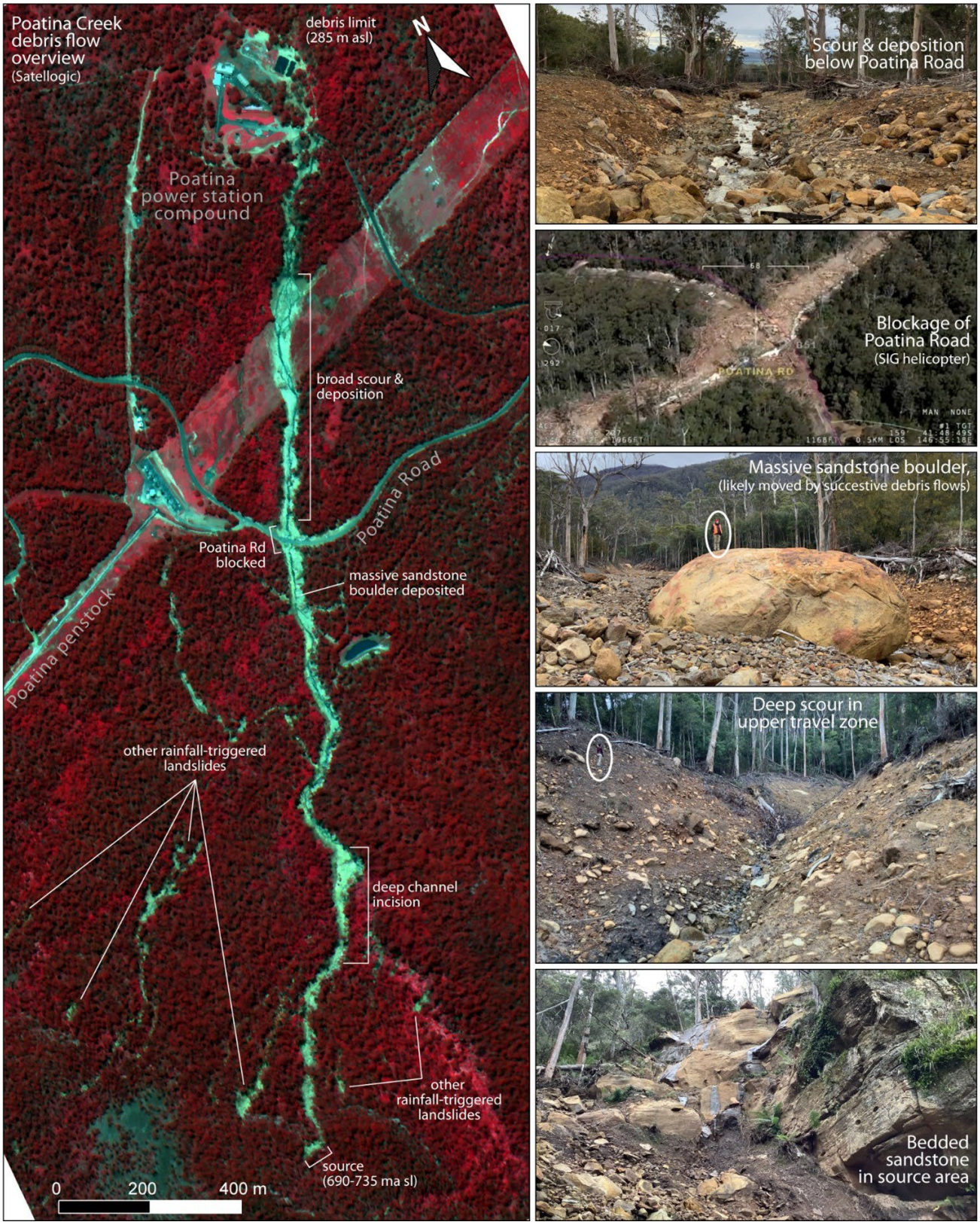

Figure 2. Features of the 2022 rainstorm-triggered debris flow down Poatina Creek. The landslide is representative of the large, repeated, rainfall-triggered debris flows in the Great Western Tiers. Satellite imagery was collected by Satellogic specifically for MRT's reconnaissance mapping. Photos are from MRT field visits, unless otherwise attributed. Note circled person for scale.

Figure 3. Various 2022 rainstorm-related landslides beyond the Great Western Tiers. These failures variously involved sliding, flow, and fall of debris (a mixture of soil, rock, and sometimes organic material) mantling slopes. Their velocities differ depending largely on landslide type, ranging from creeping to many kilometres per hour. Photos are from MRT field visits, unless otherwise attributed.

PAST AND FUTURE EVENTS

The October 2022 event was only the latest of many rainstorms to trigger extensive landslides in northern Tasmania (Figure 4). Rainstorms in 2011 and 2016 similarly caused numerous landslides across the region – particularly along the Great Western Tiers escarpment – although their distributions differed depending on the path and intensity of each storm. The June 2016 rainstorm, for instance, triggered hundreds of landslides concentrated at the western end of the tiers, near Mersey River, and reactivated landslides as far away as Tamar Valley. Archived newspapers reports describe rainstorms triggering multiple landslides in the Great Western Tiers near Poatina as early as 1906. Analogous events would have occurred throughout the geologic history of the area, significantly contributing to landscape evolution.

Northern Tasmania will continue to experience periodic flooding accompanied by numerous landslides because its topography and geology influence the landscape response to the regular passage of large rainstorms. The frequency and magnitude of these disasters are expected to increase over the remainder of the twenty-first century due to changing climates that are forecasted to produce more intense rainfall events.

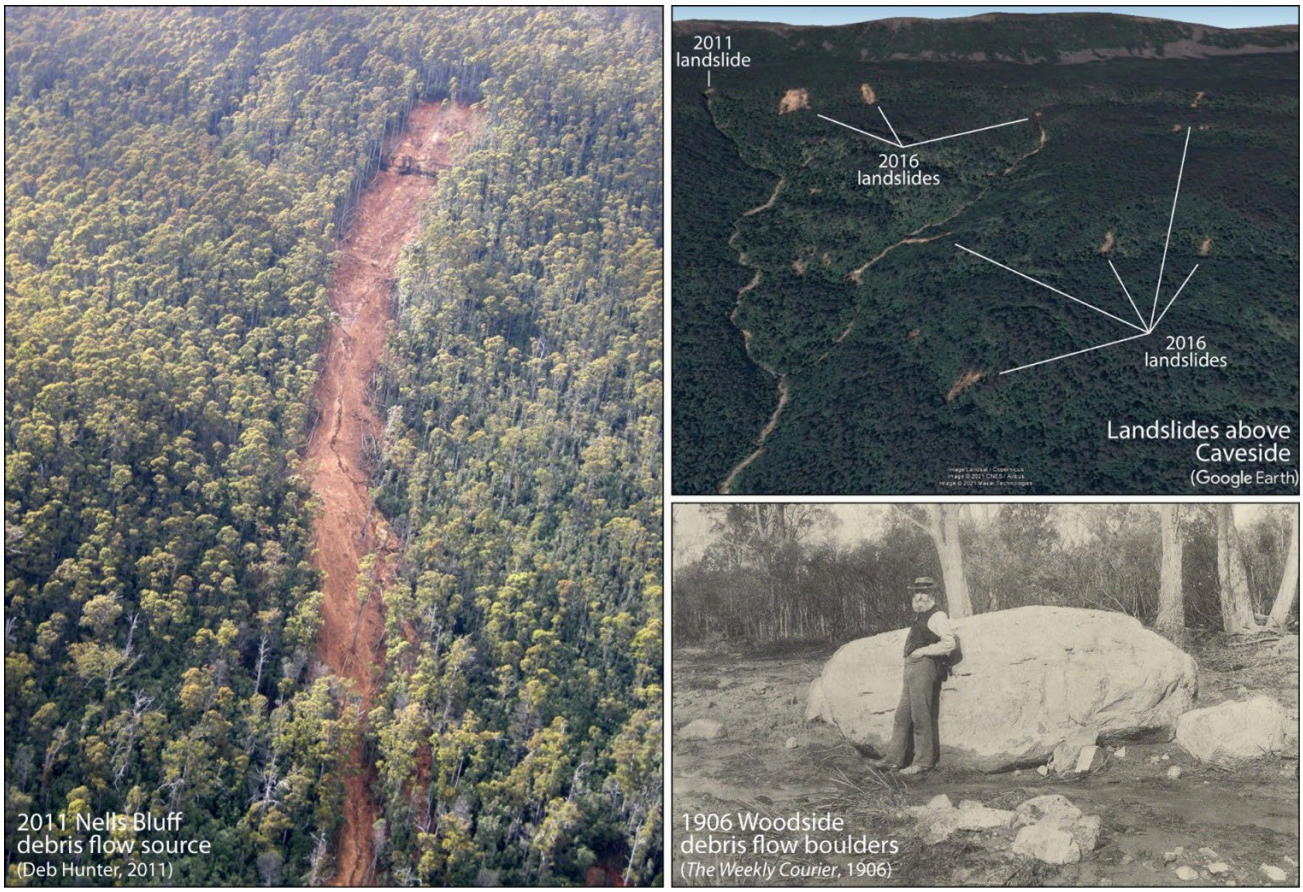

Figure 4. Features of landslides triggered by rainstorms in the Great Western Tiers in 2016, 2011, and 1906.