Student SURVEY Expeditions

Malcolm Cadastral/GNSS Survey Project

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History

Malcolm is an abandoned town site which was once a thriving Goldfields town. It is located roughly 850km north east of Perth City and 20km east of Leonora. The area was first explored by John Forrest in 1869 who was travelling with a settler by the name of Malcolm Hamersley. The town site obtained its name later in 1896 after the mountain in the area, Mount Malcolm which was coined by Forrest during his explorations. Gold was discovered throughout the area between the years 1895-1896. In the month of November 1896, the area underwent a government survey to declare it as an official town site. In 1897, when it was gazetted, the town had 6 stores, 3 hotels and 2 bakeries. By 1904 the town had a population of 400 people, 6 hotels, 200 buildings and a brewery. The total area of the town was 1 square mile or 259 hectares.

In the year of 1905, the final copy of the local Chronical paper was printed and in 1908 the government moved its regional administration offices to Leonora. By 1925, only twenty nine people populated the town with no miners working in the district. Eventually, the town faded away into obscurity and abandonment, resulting in the current day ghost town of Malcolm.

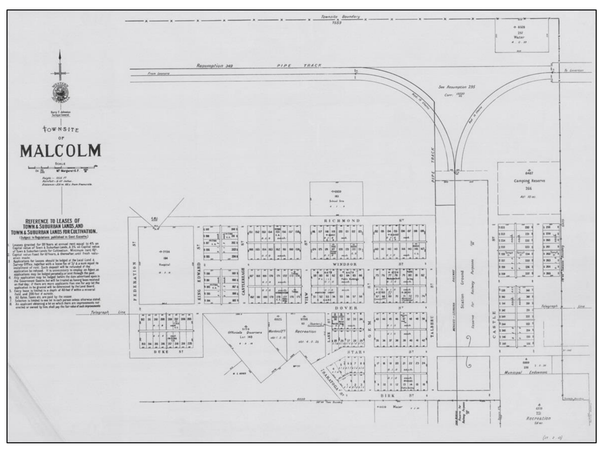
The post office and telegram station (Lots 67 and 68) of Malcolm Town Site

Aim

The Malcolm Cadastral/GNSS Survey Project had two objectives. The primary objective was to redefine the lot boundaries of Lots 67 and 68, the post and telegram station. The secondary objective was to analyse the accuracy of the Spatial Cadastral Database (SCDB) by observing Global Navigation Satellite System (GNSS) baselines and making comparisons between the observations and the Least-squares adjusted distances given by the SCDB.

Primary Objective: The cadastral re-peg of the two lots was the main objective of the project and had precedence over the GNSS survey. The street alignments bordering the lots under survey had to be redefined using traditional methods of surveying. Any changes in dimensions (excess/deficiency) had to be recorded and distributed in order to place the boundary pegs in their correct positions.

Secondary Objective: The GNSS survey required static baselines between receivers occupying original face posts found on the outer extents of Malcolm Town Site. The observed distances had to be compared to the distances given by the SCDB (see image on the right) which uses a least squares adjustment of the original lot dimensions.

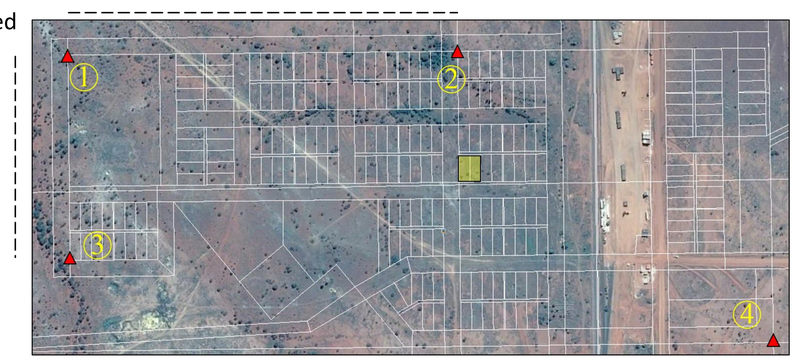


Results

Primary Objective Results: The cadastral re-pegging was successfully carried out and the lot boundary pegs were placed with respect to the existing survey evidence found in the area. After a relatively recent survey was completed in 1976, several corners were spiked, allowing for a more simplified re-alignment. The two streets that required a re-alignment were Dover Street and Gem Street. After the survey was complete, the observed distances were compared to the original distances, resulting in a total of 29mm excess in Dover Street and 49mm in Gem Street. The excess was proportioned out along the two alignments and the pegs were placed with respect to the new proportioned distances and the observed internal angle between the two street alignments.

Secondary Objective Results: As seen in the image on the right, the red triangles represent the original face posts found in Malcolm Town Site. The figure on the left is what was found on site, an original, 120 year old face post. The GNSS receivers occupied each of the posts found and the baselines were compared to the SCDB distances. The calculations below relate to the posts found and shown in the image to the right.

Western Alignment (1 – 3)	**Northern Alignment (1 – 2)**
Orig Dist 377.190m	Orig Dist 721.291m
Meas Dist 377.375m	Meas Dist 721.607m
Difference of **0.185**m	Difference of **0.316**m



Conclusion

The survey work undertaken on the Malcolm Cadastral/GNSS Survey Project was successful and the results obtained were better than expected. Prior to leaving in the 2016 Curtin university Survey Expedition, there were doubts on the condition/existence of any survey marks in the area. After finding four original face posts and additional survey marks placed in later surveys, the Malcolm Town Site Project ran smoothly with the guidance of experienced mentors.

The difference in the GNSS distances compared to the SCDB distances was expected because there is a known issue with the error propagation in the least-squares adjustment. The expected accuracy of the SCDB in a region such as the Malcolm Town Site is anywhere up to 10.0m. Therefore, with differences of 0.185m and 0.316m the results were better than expected. This concludes that the SCDB can be reliable up to 1.0m in outer regions such as Malcolm. However, the SCDB should not be relied upon without any checks such as survey observations.

Acknowledgements

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