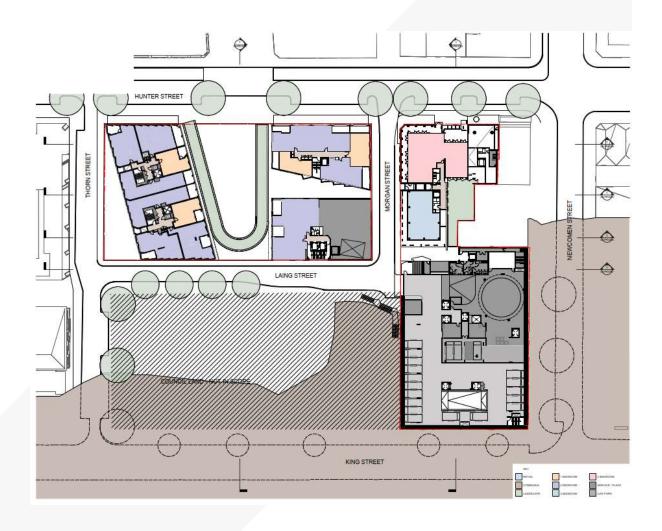


UPSTREAM CATCHMENT REPORT

FOR

East End Stage 3&4

King, Hunter, Thorn Newcomen, Laing and Morgan Streets, Newcastle NSW



Project Number 220901 Date 31/03/2023

Prepared for: Iris Capital

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2 INTRODUCTION

This Upstream Catchment Report has been prepared for Iris Capital by Xavier Knight to accompany a Development Application (DA) to Newcastle City Council (NCC) for East End Stage 3&4 (The Development). This report analyses the existing stormwater drainage major system at the frontages of the development for its ability to safely convey stormwater runoff generated by local catchment upstream of The Development.

This reports does not examine the performance of the existing underground minor storm drainage system and such system has not been incorporated into the hydrologic model developed for the purposes of this report, therefore, the results from this analysis are conservative.

This report has identified underperforming areas in the major system at the frontages of The Development and provides recommendations for upgrades to prevent nuisance storm runoff from affecting pedestrian activity and setting finished floor levels.

For a discussion of the proposed stormwater system and the existing stormwater system in the street surrounding the site, refer to the "Stormwater Management Report" and "Infrastructure Services Report" by Xavier Knight.

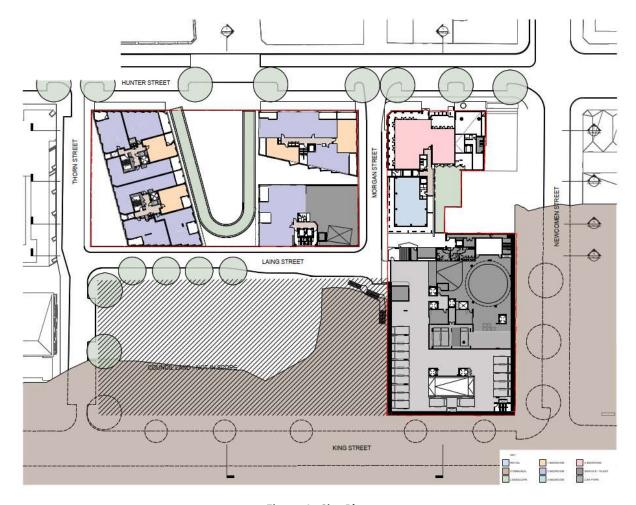


Figure 1 - Site Plan

2.1 EXISTING CONDITIONS

A detailed survey, street imagery from Google Street View and LiDAR data were used to identify the extent and response of the catchment to stormwater events.

The detailed survey was conducted by "Monteath & Powys" in December 20077 (See Appendix C) For the purpose of this analysis, it was assumed that the existing adjoining developments discharge roof stormwater streets.

LIDAR data was obtained from NSW Spatial Services and contours were generated to determine the existing elevations for the site as shown in Figure 2. The contours indicate The Development may be affected by significant upstream catchment runoff based on the area falling towards The Development.



Figure 2 - LiDAR Contours

3 STORMWATER DRAINAGE

The 'Newcastle City-Wide Floodplain Risk Management Study and Plan' [1] was authored by BMT WBM in June 2012. The study analysed the flood regime across Newcastle and set out a strategy of short term and long term actions and initiatives to be pursued by agencies and the community in order to address flooding risks.

The study identified that flooding within Newcastle can occur as a result of flash flooding of local catchments, river flooding from the Hunter River or Ocean flooding.

Flood maps have been extracted from the study and it has been found that East End Stage 3&4 is not affected by flooding per the flood maps in Appendix D.

3.1 CATCHMENT DELINEATION

Contours were generated in finer detail to determine what portion of the runoff reaches the frontages of The Development on King, Hunter, Thorn, Newcomen, Laing and Morgan Streets. Based on the site characteristics, the catchment areas for the frontage roads were delineated in GIS and areas were calculated as shown in Figure 3.

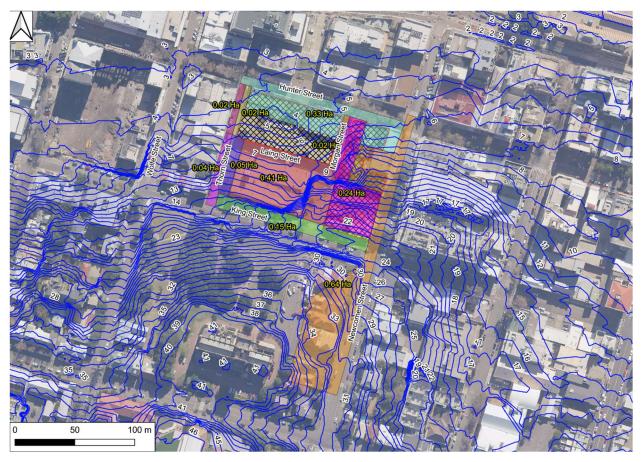


Figure 3 - Catchment Areas

Runoff is blocked from flowing into King Street from Newcomen Street due to the presence of a pedestrian crossing. Similarly, Runoff is blocked from flowing into Hunter Street from Newcomen Street due to the presence of a paved footpath.

On the western side, all runoff conveyed through Wolfe Street will not reach the frontage roads as the contours fall away from The Development.



Figure 4 - Intersection of Newcomen and King Streets



Figure 5 - Intersection of Newcomen and Hunter Streets

3.2 MODEL SETUP

The upstream catchment was analysed in DRAINS using the ILSAX Hydrology and the ARR 2019 procedures. A time of concentration of 5 minutes was used for all sub catchments due to their small sizes except for the Newcomen road sub-catchment where the Kinetic Wave formula was used.

Representative cross sections were modelled for each of the frontage streets and input into DRAINS. The average longitudinal slopes of the road were calculated from site contours and input into the model.

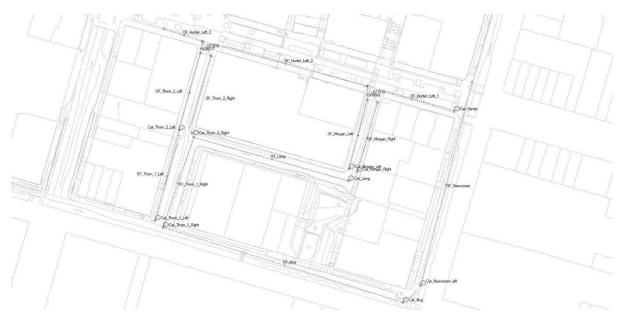


Figure 6 - DRAINS Model

4 RESULTS AND RECOMMENDATIONS

4.1 RESULTS

A summary of the results is shown on Appendix A. The DRAINS model and cross sections for the 1% AEP run are shown in Appendix B.

The results are summarised below:

- Flows are safe on King, Hunter and Laing Streets and the runoff does not overtop the kerbs at max depth.
- The Western side of Newcomen Street has a kerb height of approximately 100mm. This has caused the 1% AEP runoff to overtop the kerb. D*V = 0.41. This is considered to be negligible since the results are conservative since the street pits have not been modelled.
- The flow on Eastern side of Morgan Street is unsafe (D*V = 0.65). This is caused by the steepness of the road and to the large contributing catchment area.
- The Western side of Thorn Street has a very shallow kerb height, assumed to be 50mm. This has caused the 1% AEP runoff to overtop the kerb. Flows are otherwise safe (D*V = 0.11).

4.2 RECOMMENDATIONS

The following works are recommended as part of the East End redevelopment.

- The kerb on the western half of Newcomen street to be upgraded to a 150mm High Kerb. Our review of 20% Concept design for the "Stages 3, 4, 6, 7 AND 8" by Northrop has shown that the kerb is proposed to be upgraded as part of that package.
- The kerb on the western half of Thorn street to be upgraded to a 150mm High Kerb. Our review of the stamped S138 drawings for East End Stage 2 has shown that the kerb is proposed to be upgraded as part of that package.
- It is recommended that roof rainwater discharge from the Stage 4 building be connected directly to the underground pit and pipe system instead of discharging into Morgan street.
 This will reduce the D*V product of the Runoff and improve safety.

5 CONCLUSION

Existing flood studies have been reviewed and it has been determined that East End Stages 3&4 are not affected by flooding and are thus not subject to flooding controls.

The catchment upstream of The Development frontages has been analysed for the 1% AEP event to assess the capacity and safety of the major drainage system.

It has been determined that upgrade of the streets kerbs are required on Newcomen and Thorn streets. It has been found that such upgrades have already been proposed as part of other Civil packages relating to the East End development.

It has also been found that flows running through Morgan road are unsafe. It is recommended that any roof runoff from the proposed East End Stage 4 building to connect directly to the underground drainage system.

6 DISCLAIMER

Xavier Knight Consulting Engineers gives notice that the particulars set out in this report are for the exclusive use of Client and that no responsibility or liability is accepted as a result of the use of this report by any other party. This report shall not be construed as a certificate or warranty.

For and on behalf of the Xavier Knight team.

Kind regards,

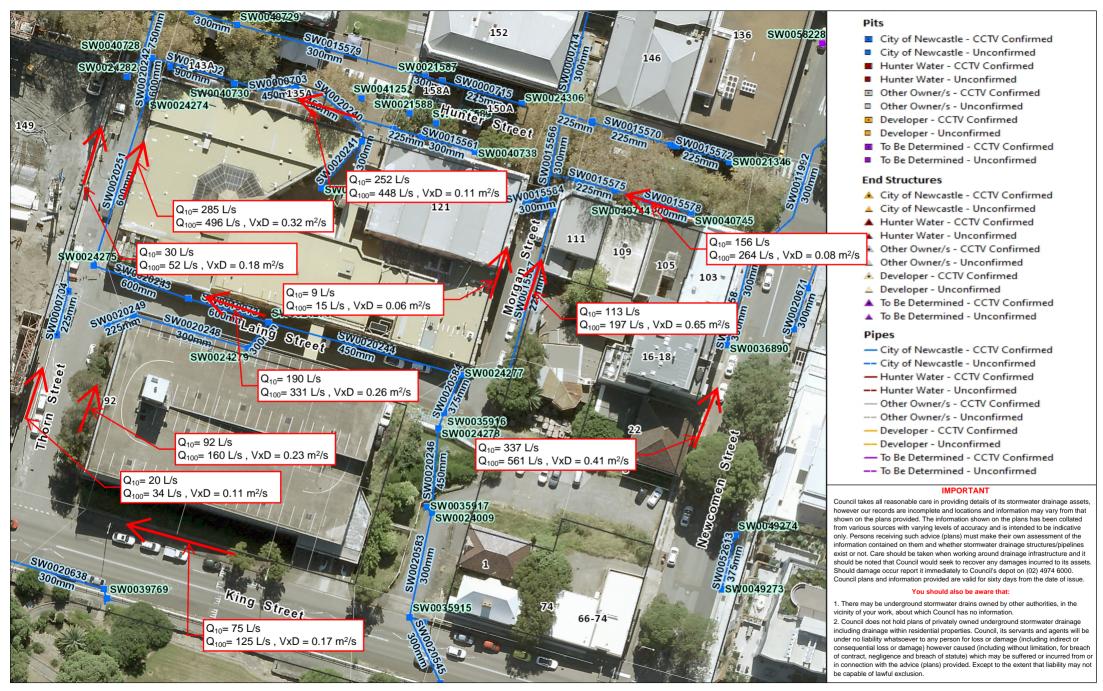
Scott Sharma
PROJECT DIRECTOR

APPENDIX A - RESULTS SUMMARY



Drainage Map - 105 Hunter Street



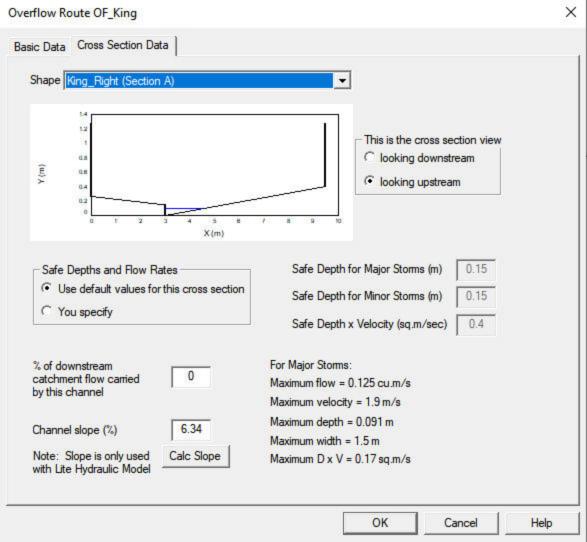


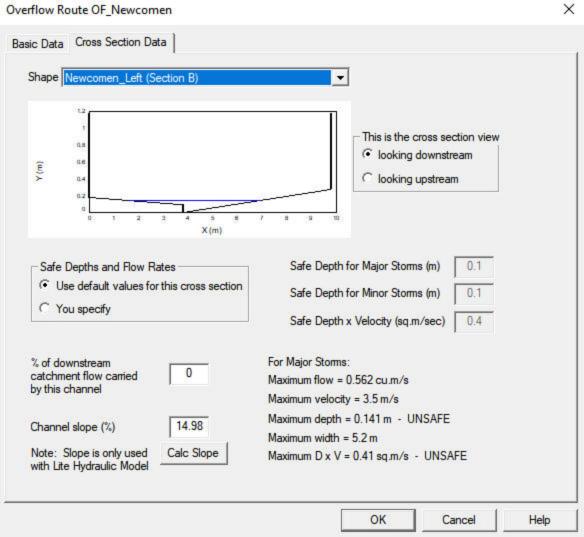
APPENDIX B - DRAINS OUTPUT

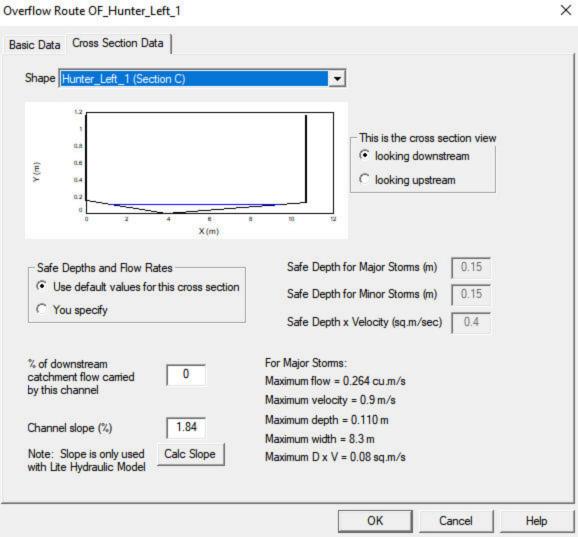


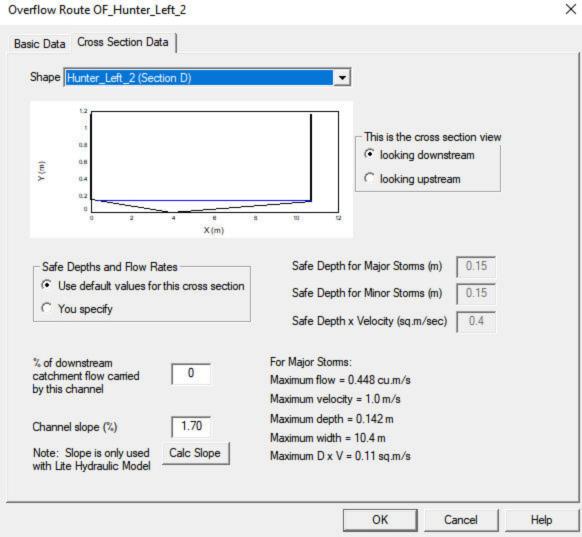


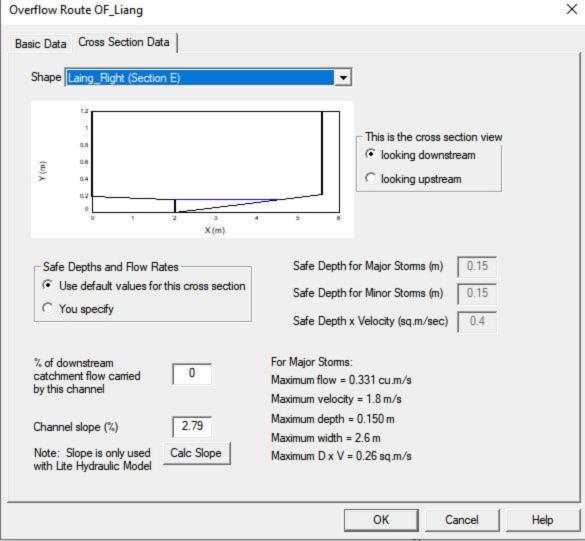


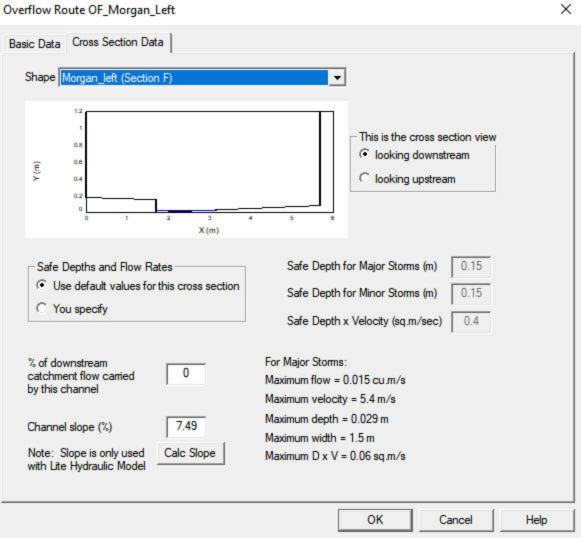


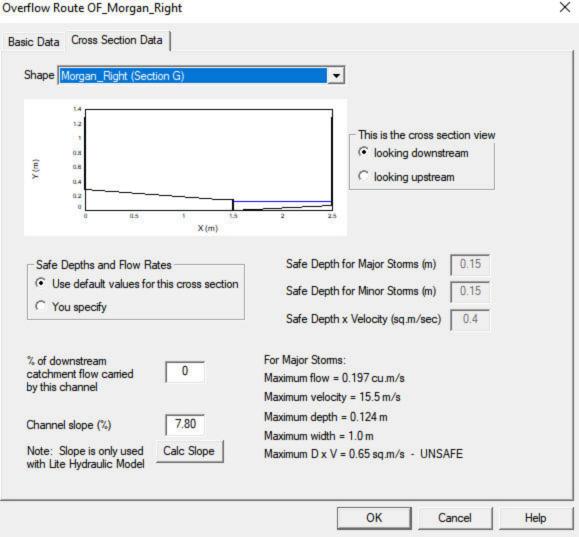


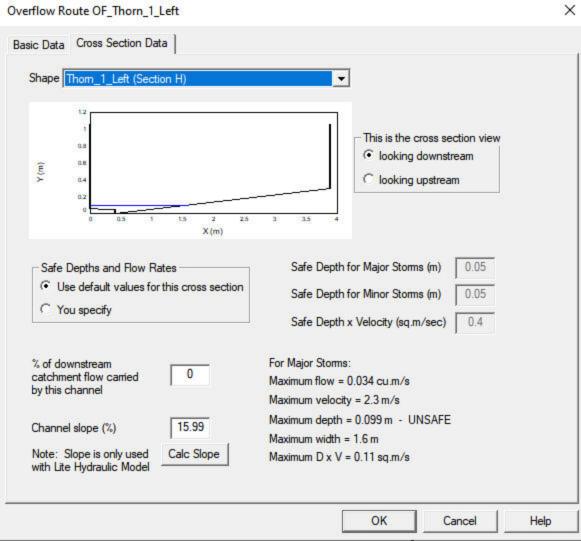


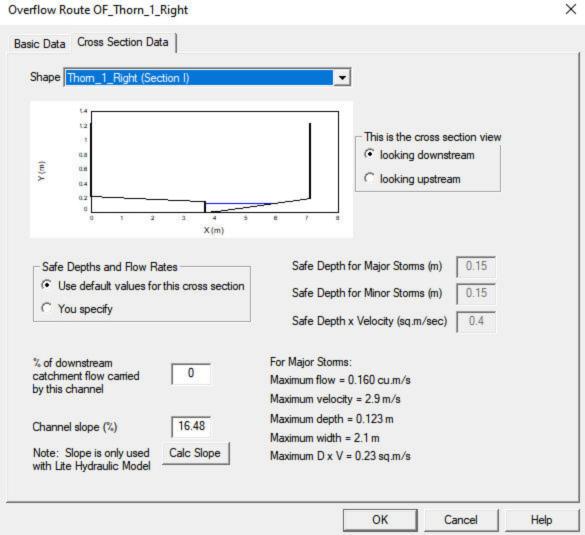


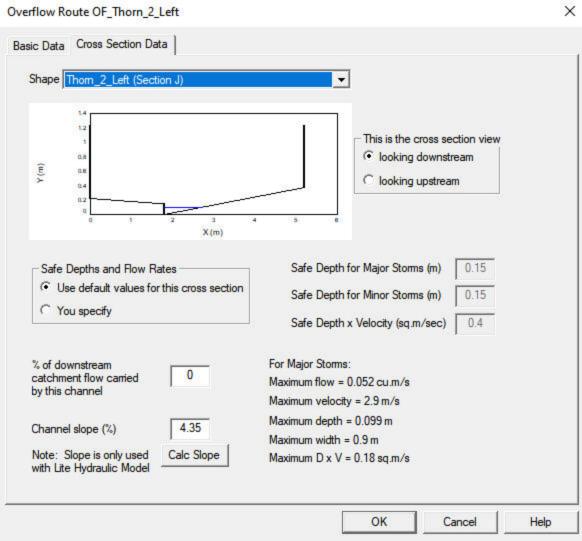


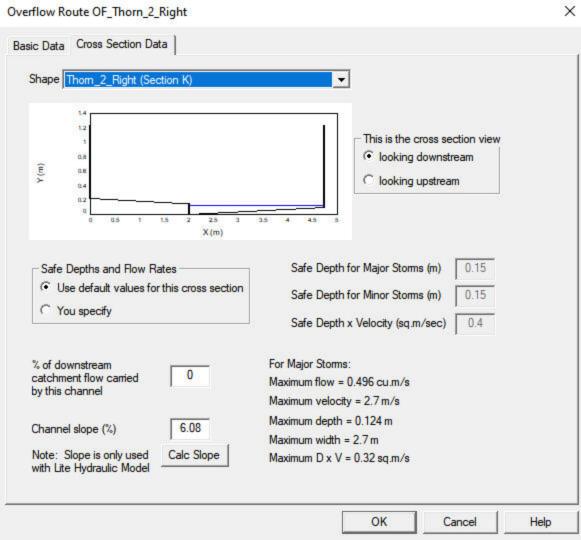






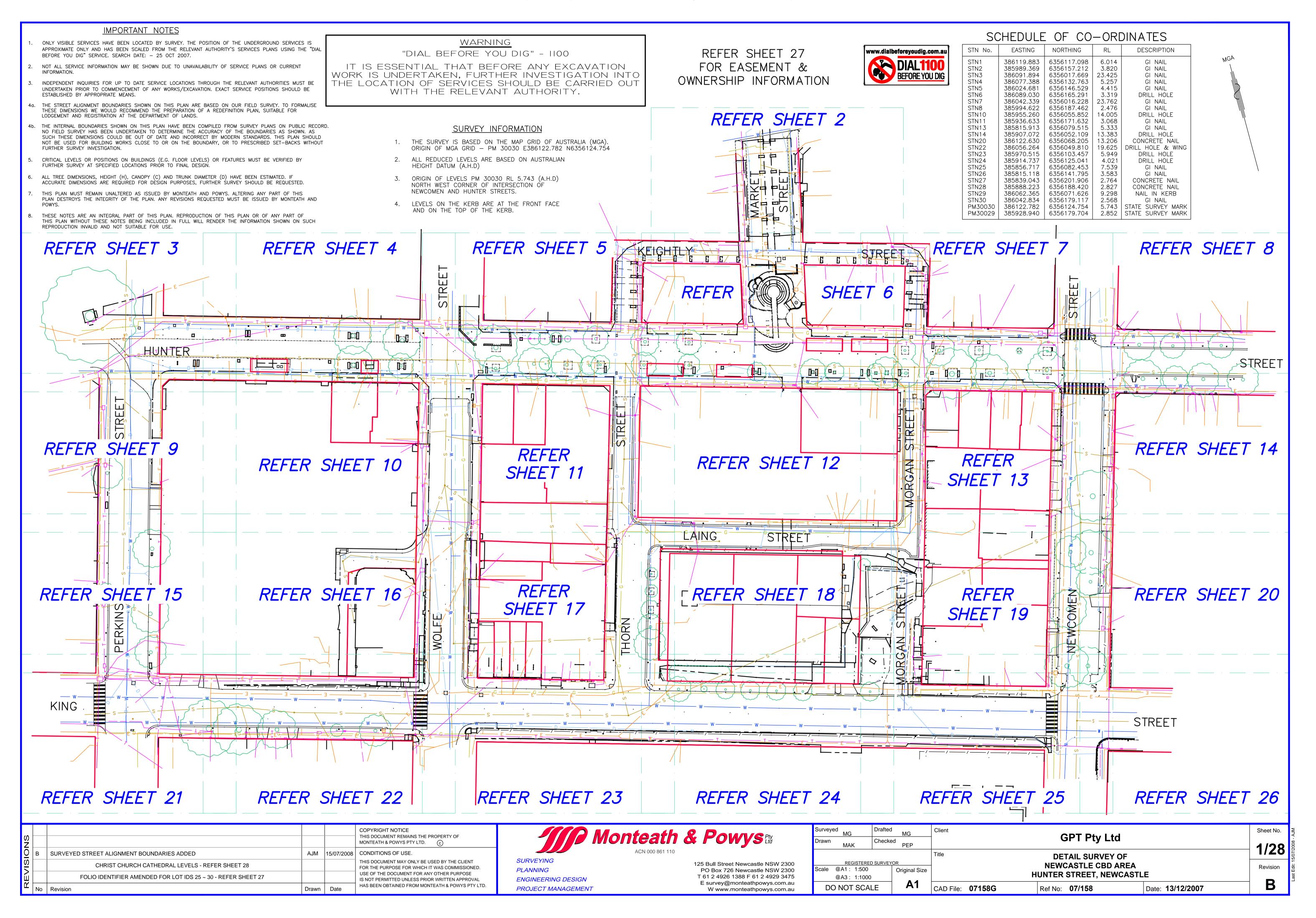


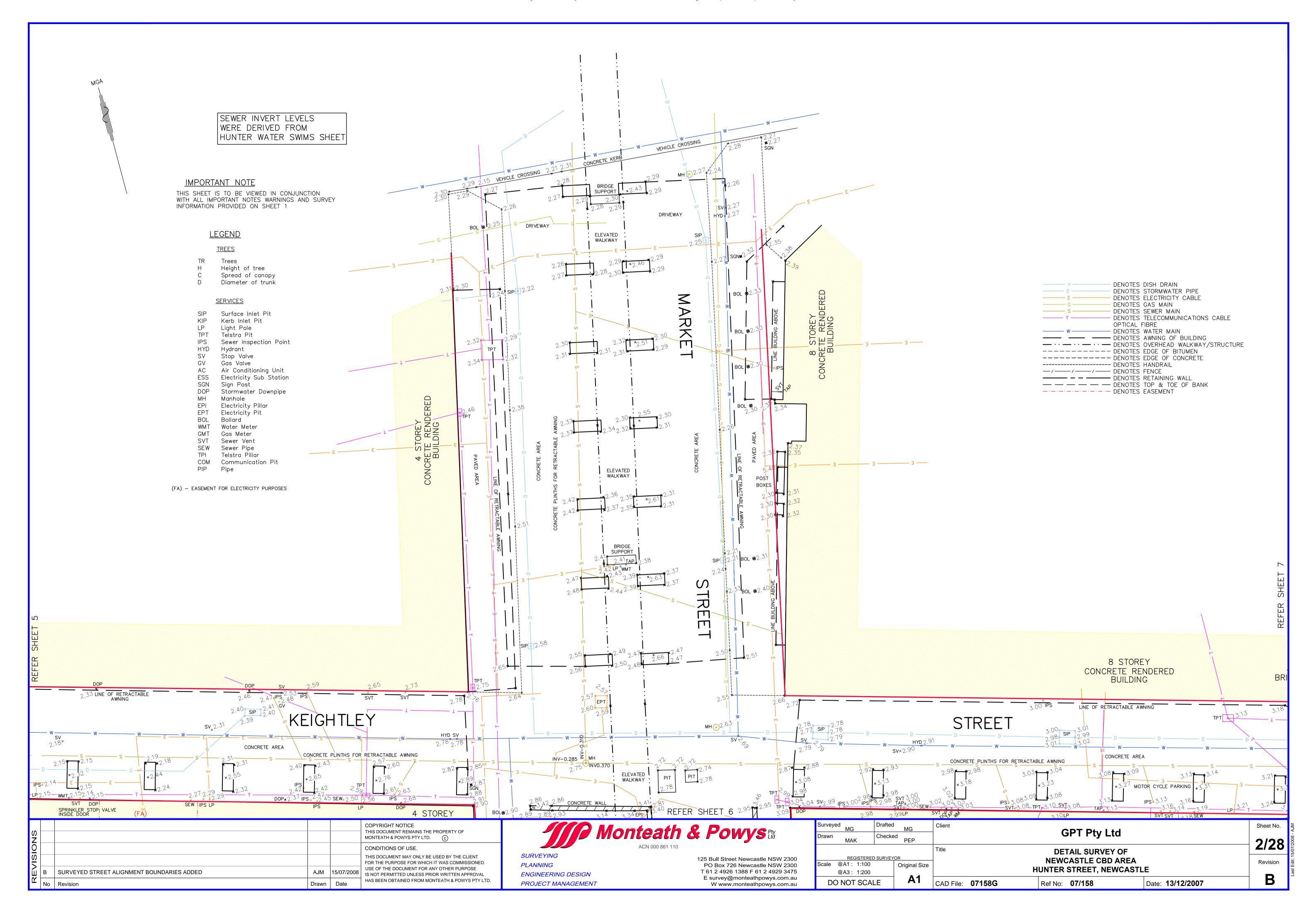


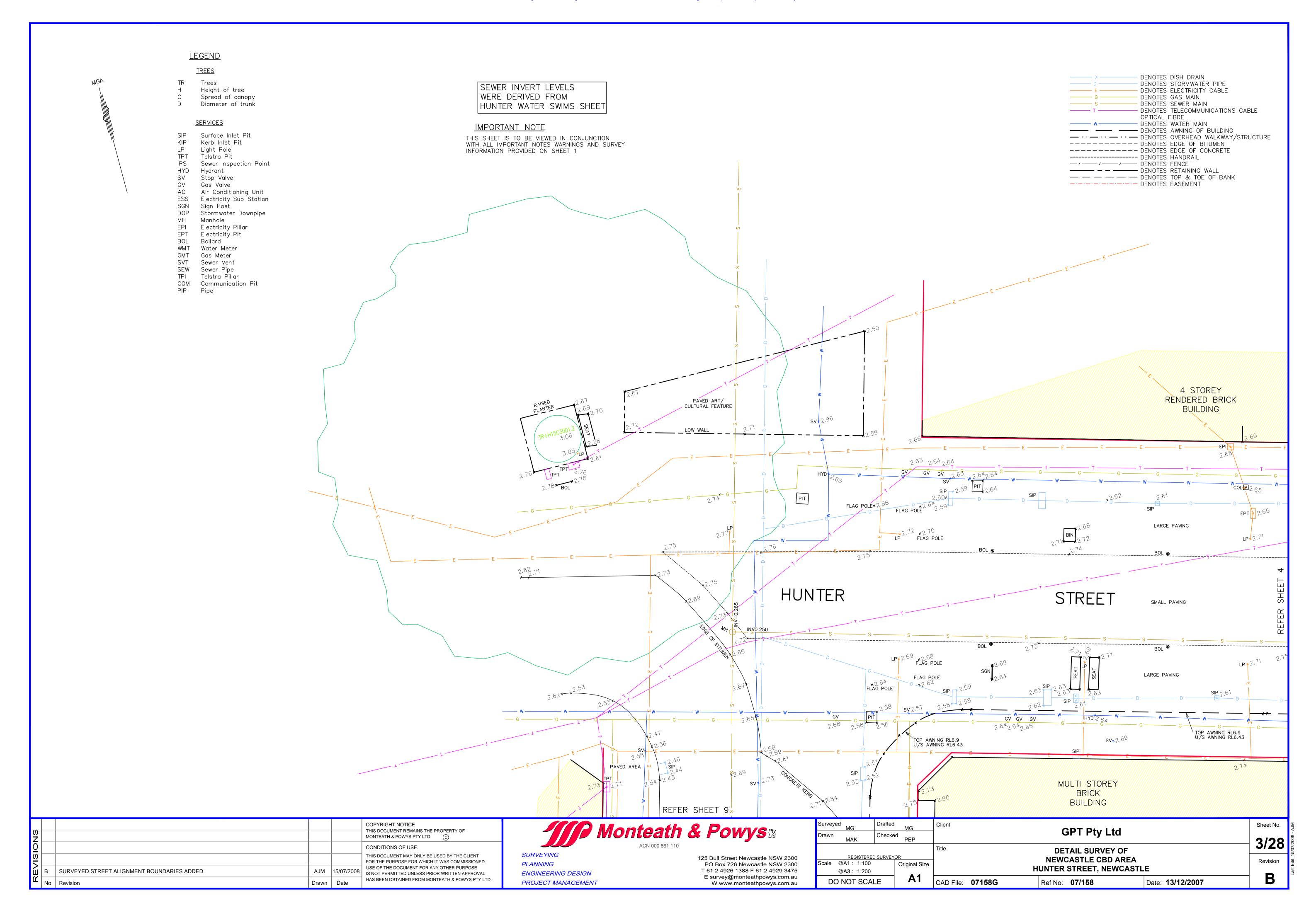


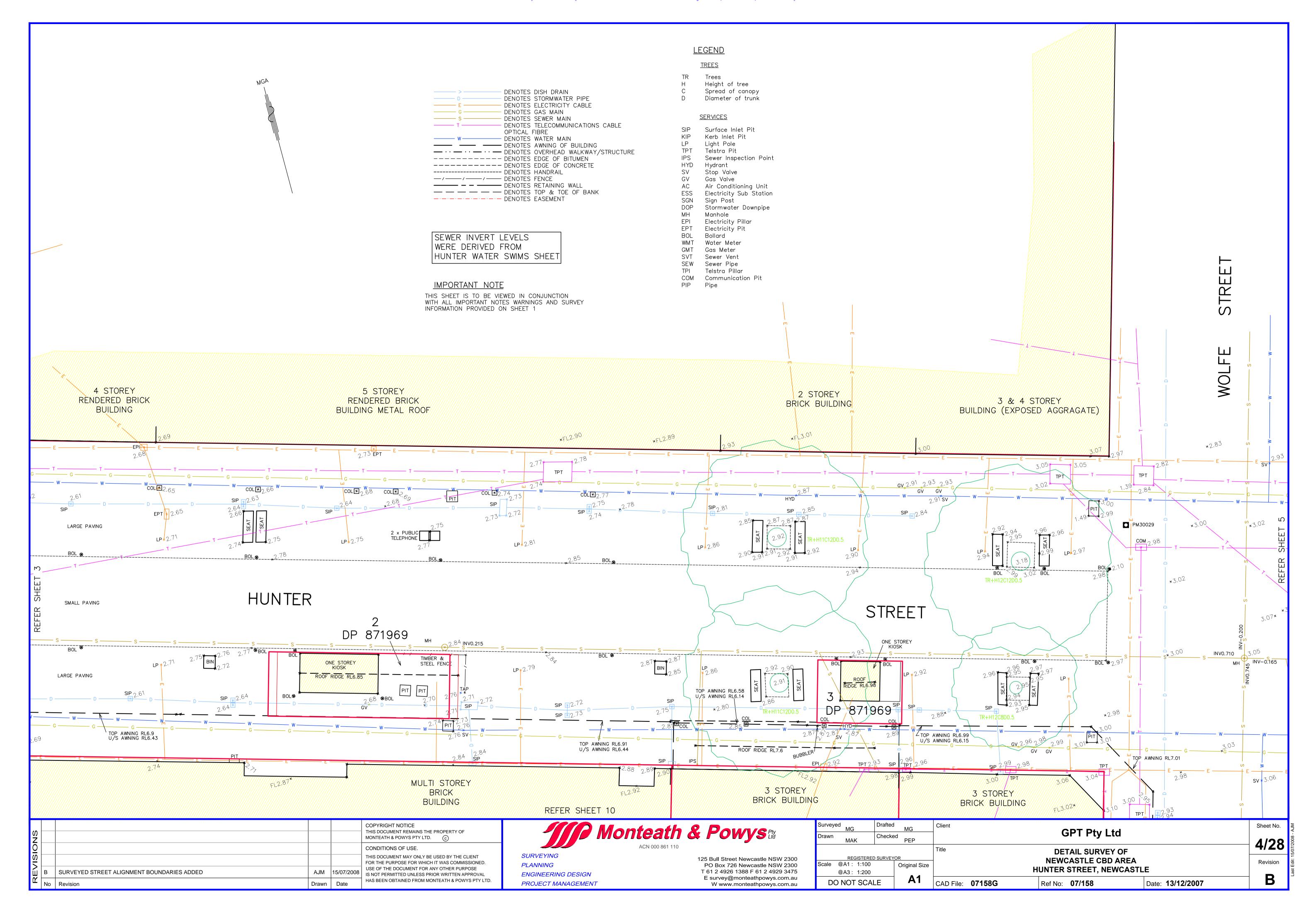
APPENDIX C - DETAIL SURVEY

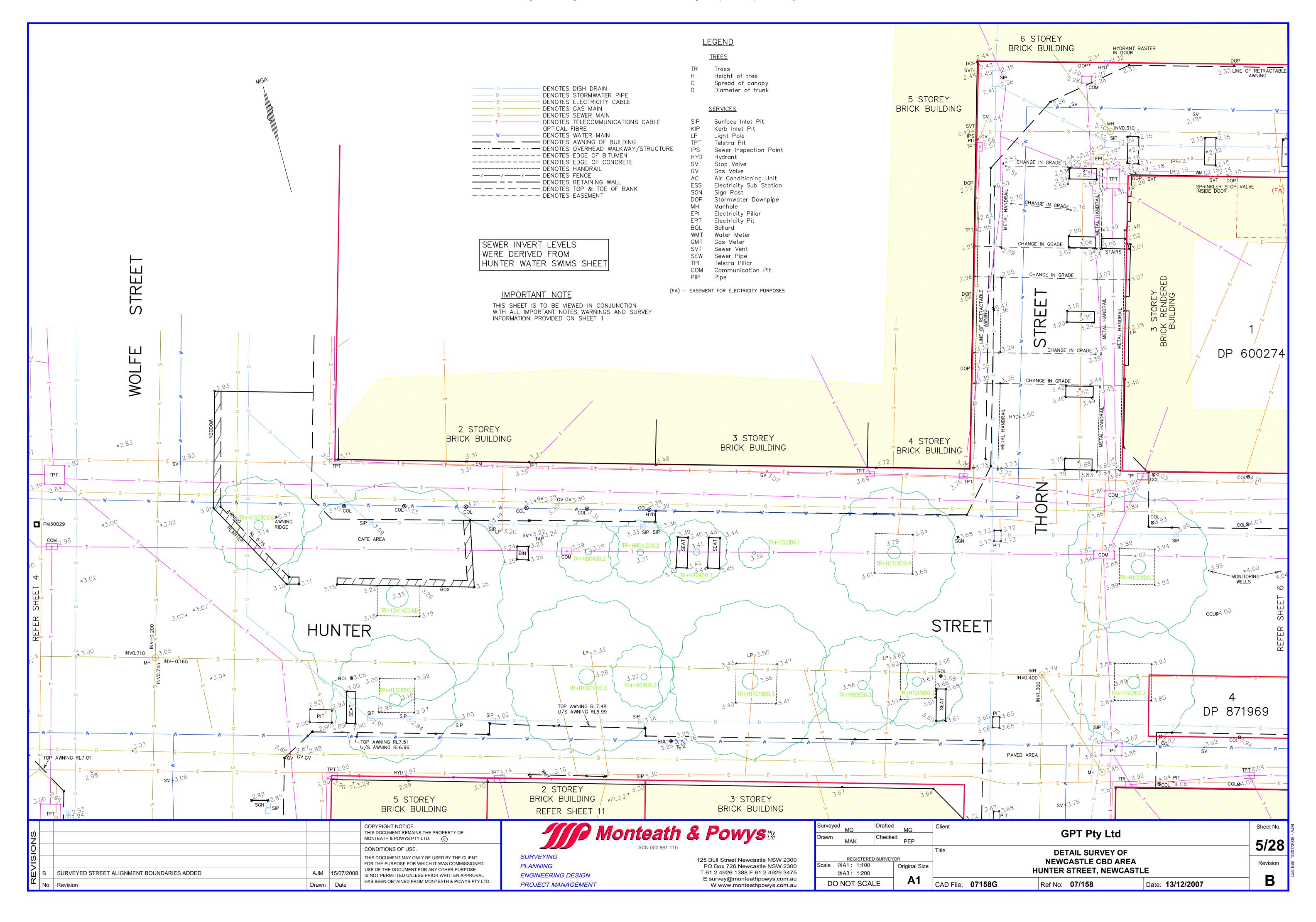


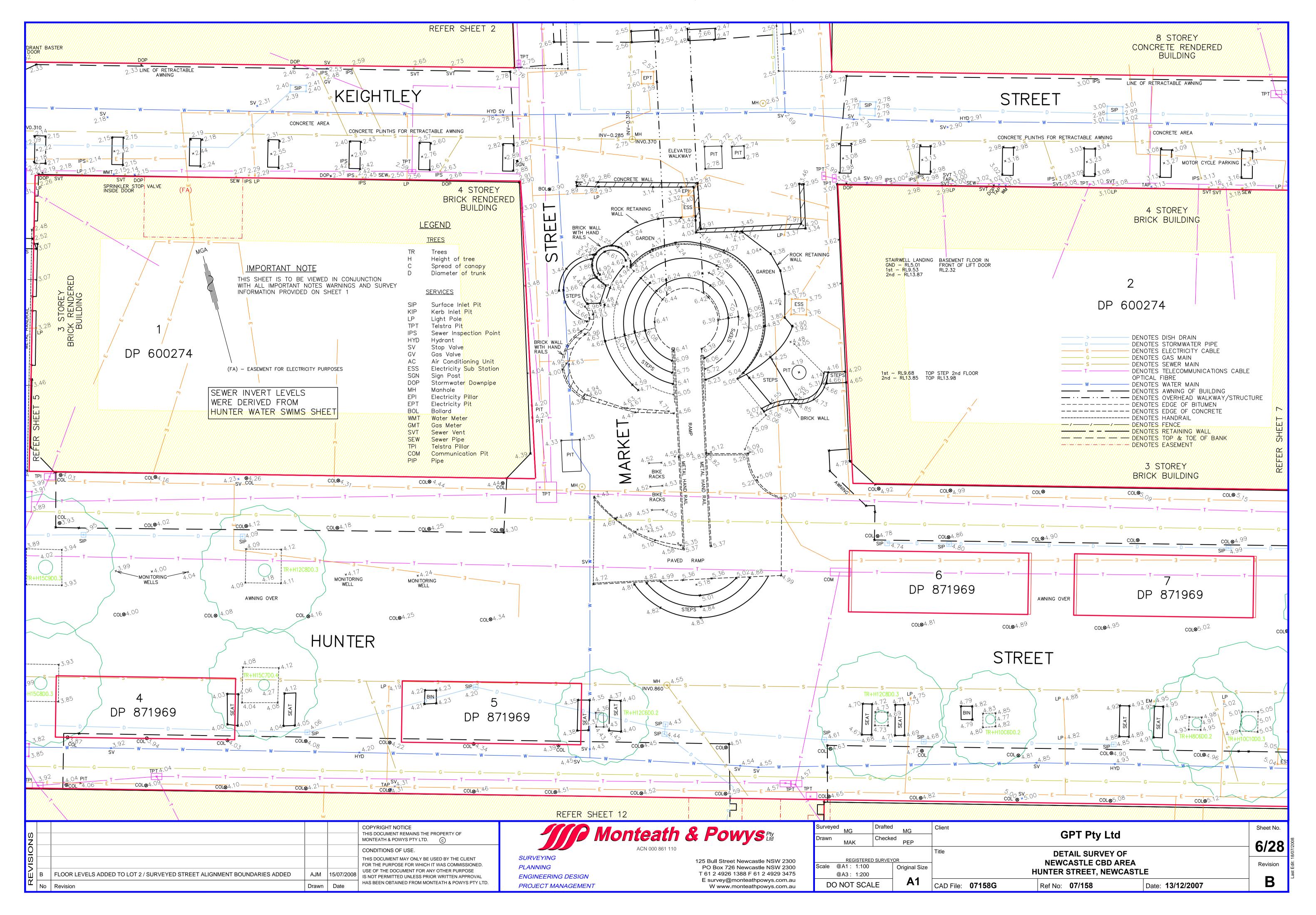


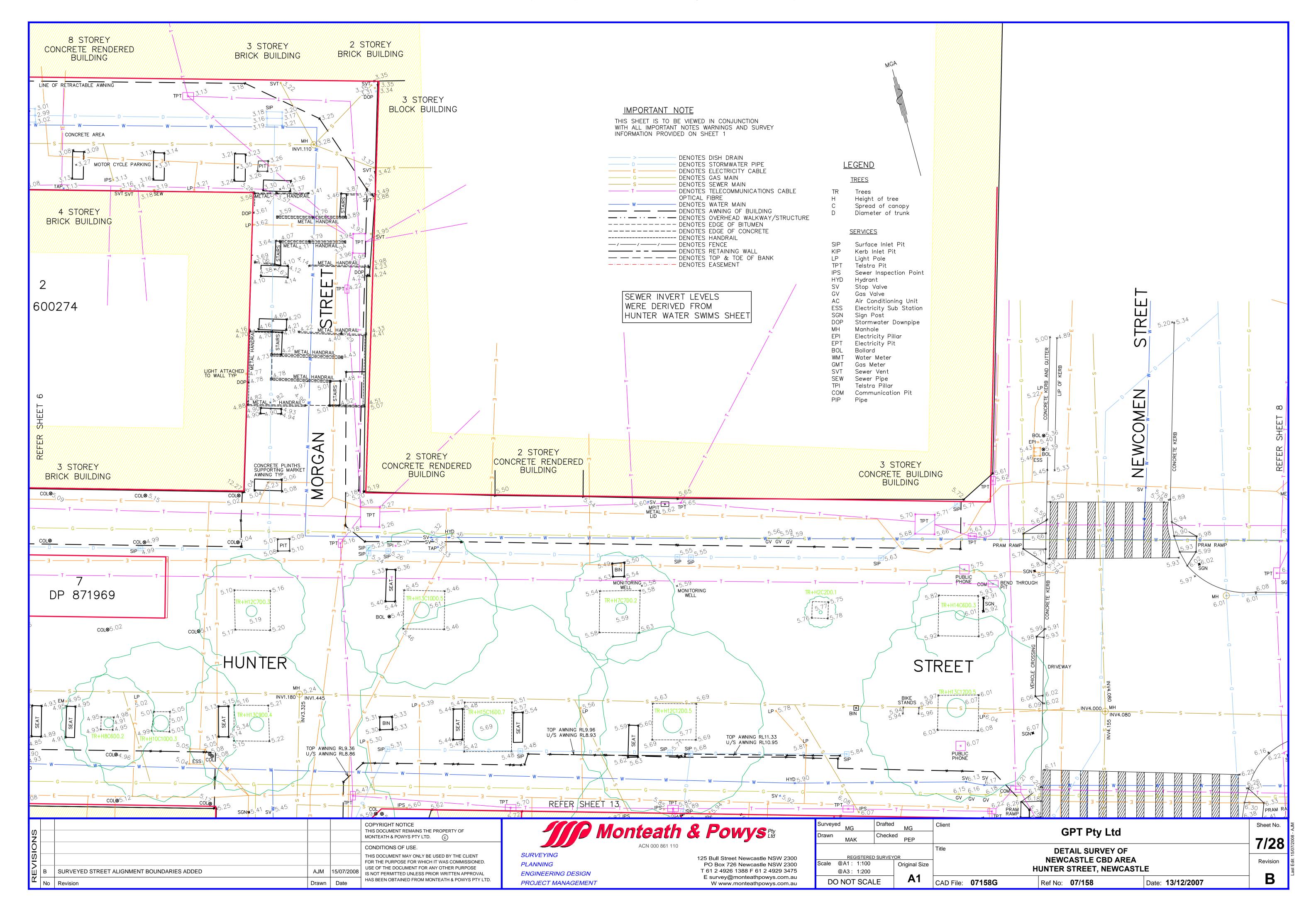


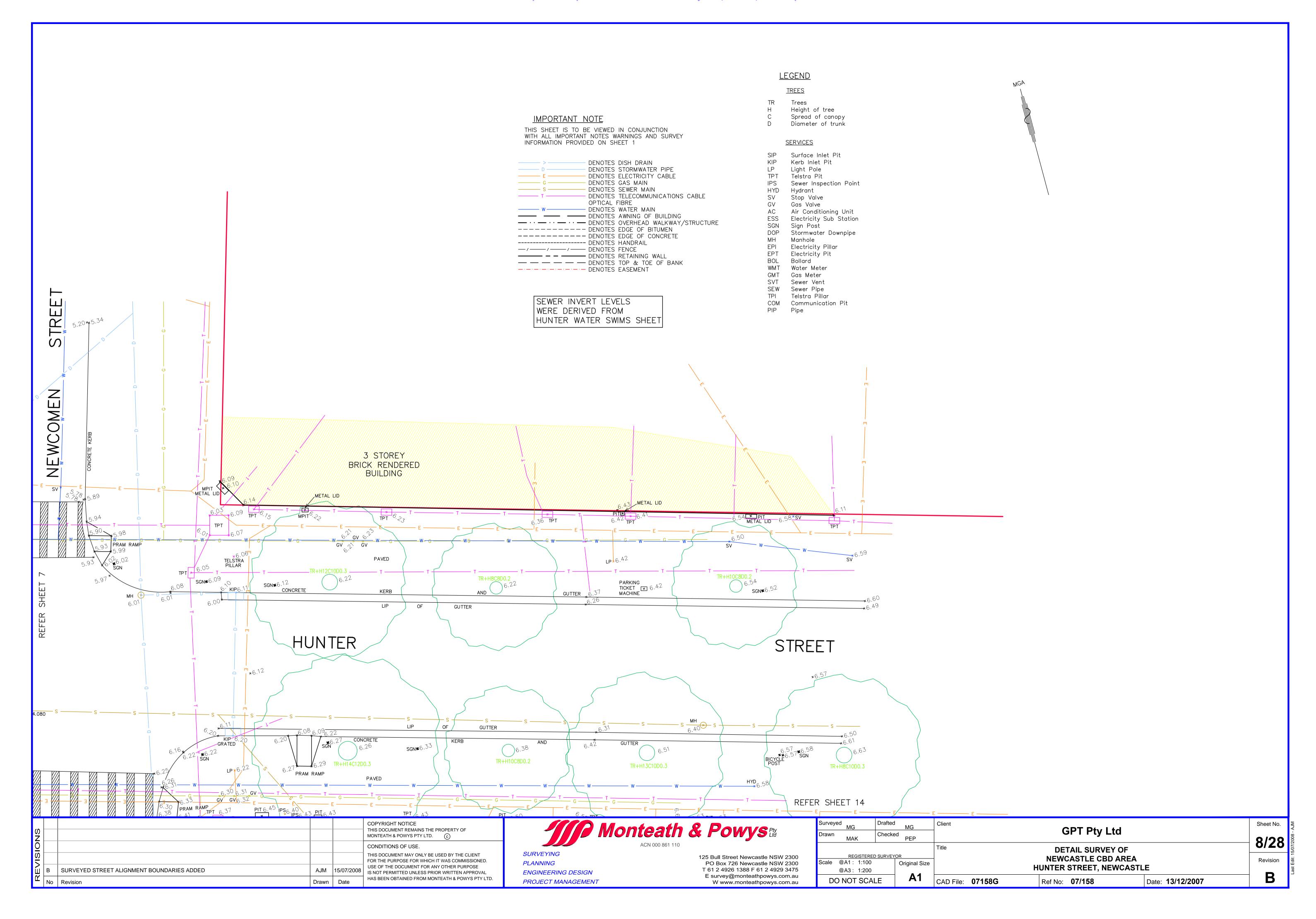


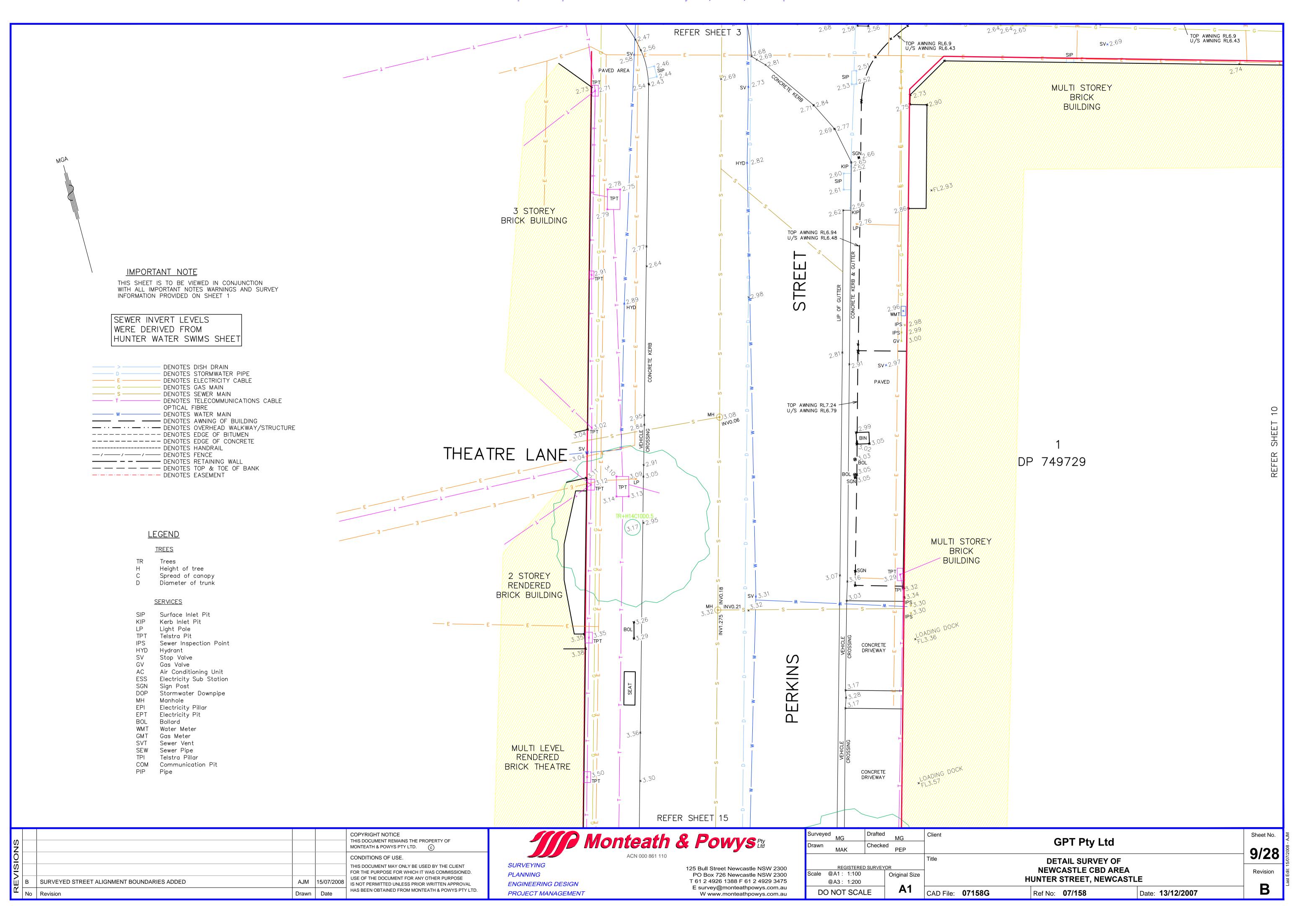


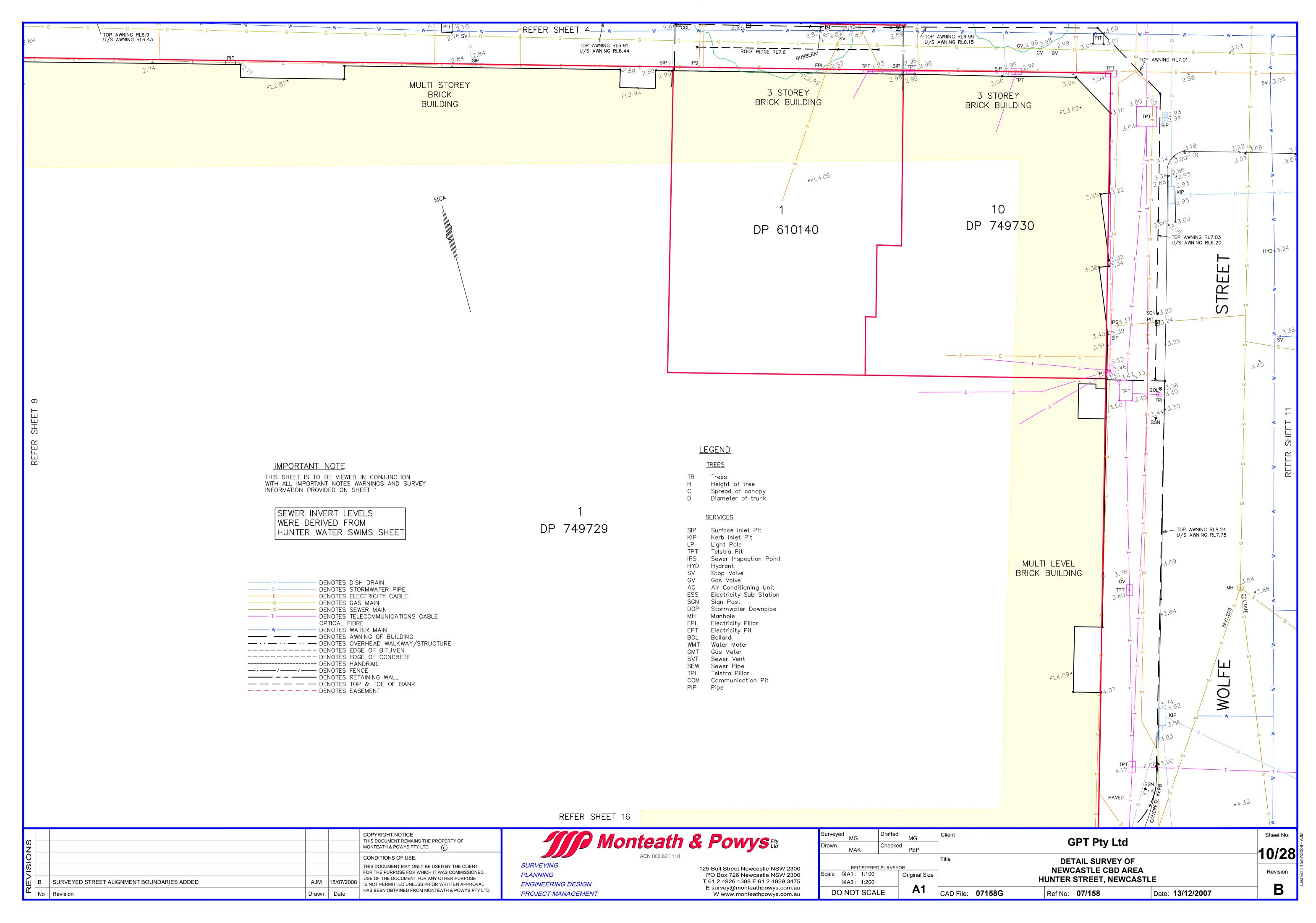


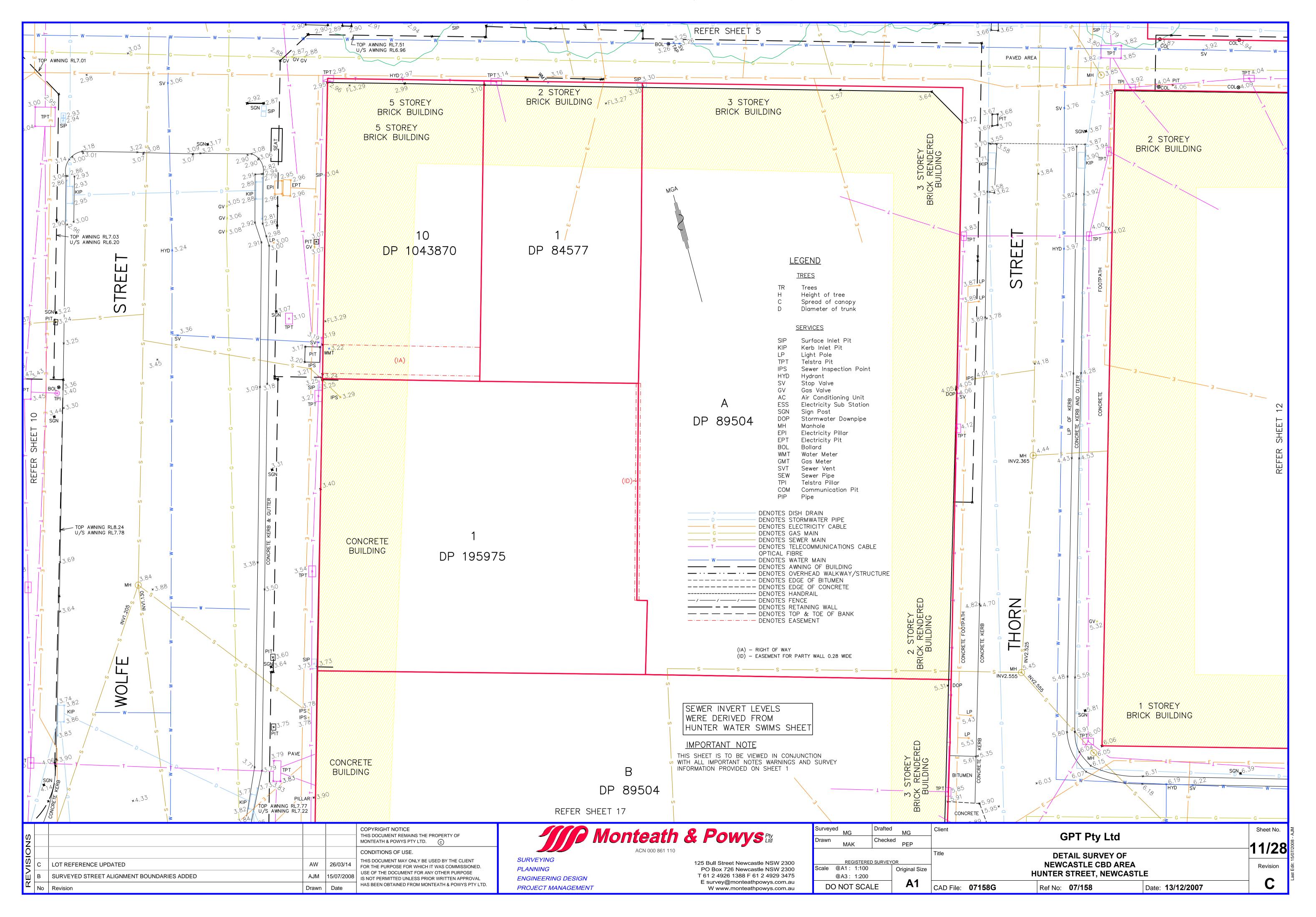


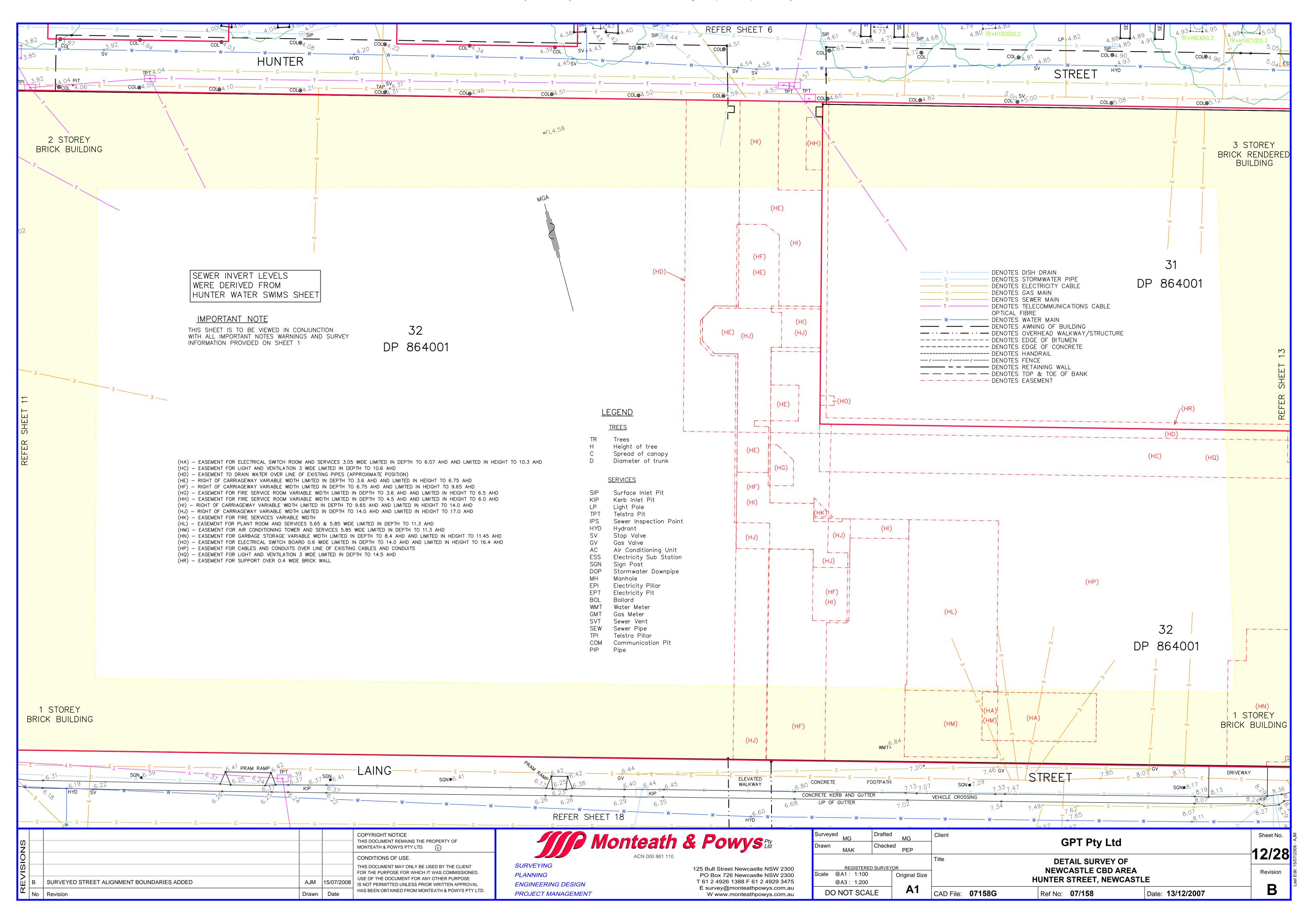


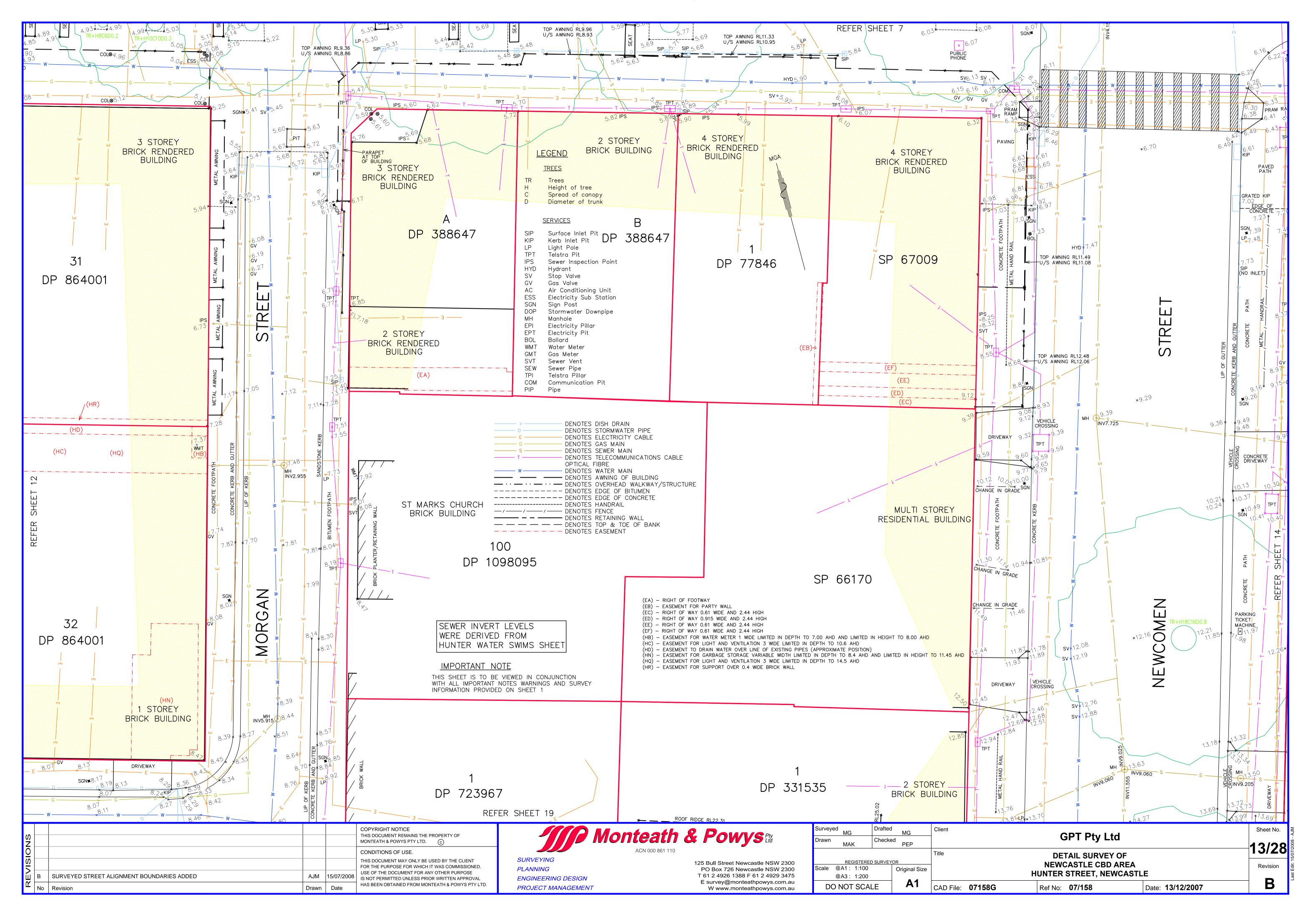


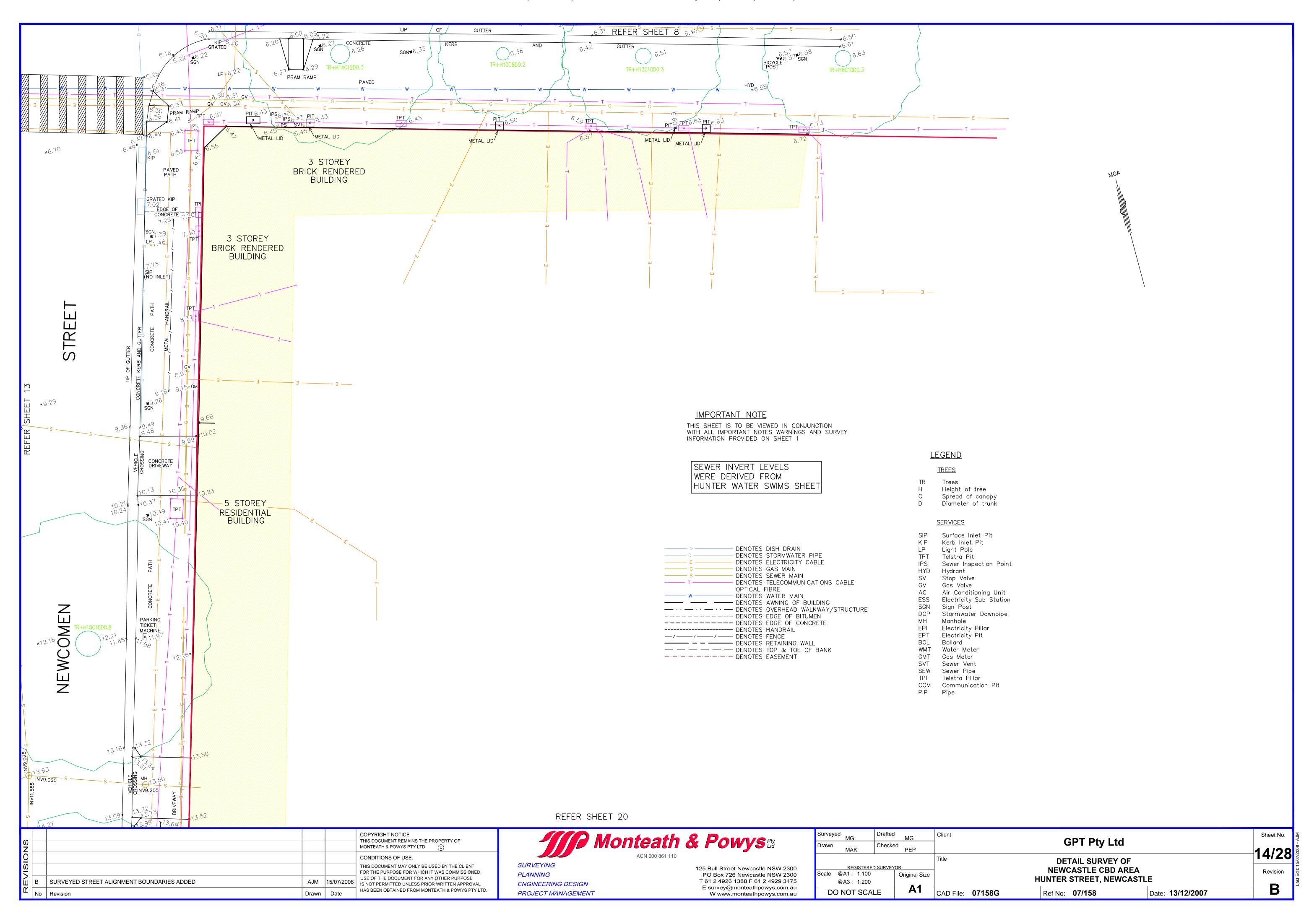


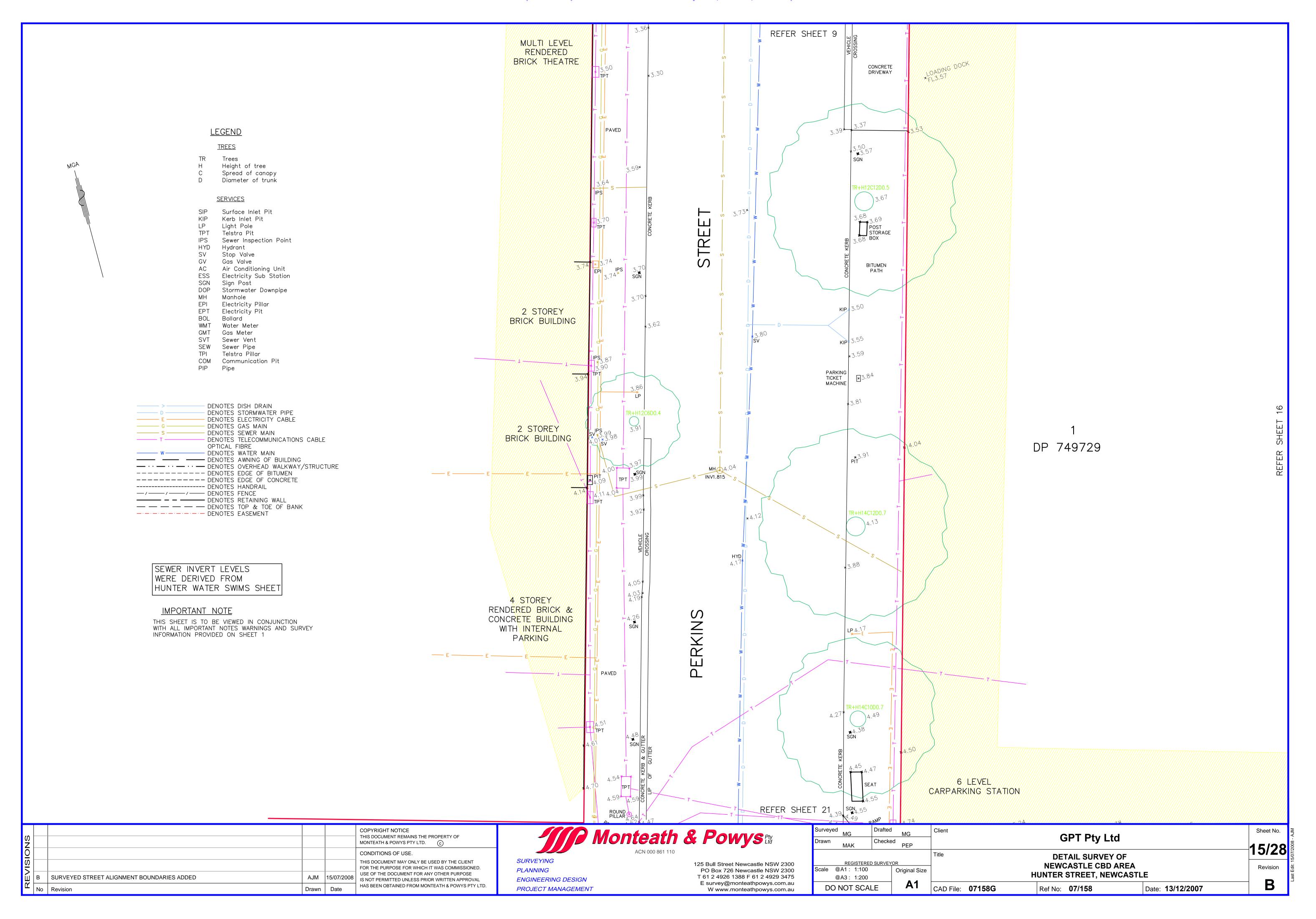


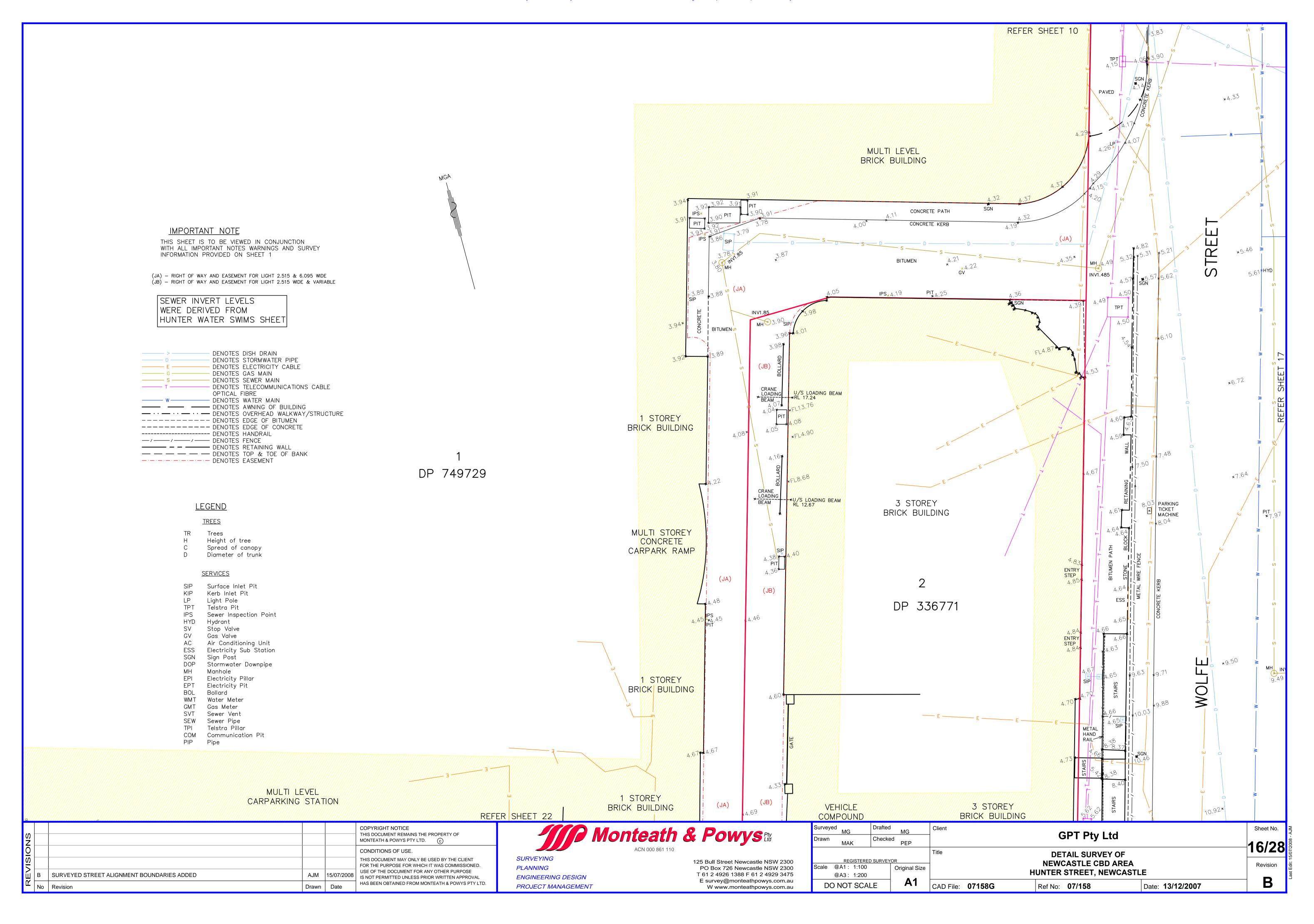


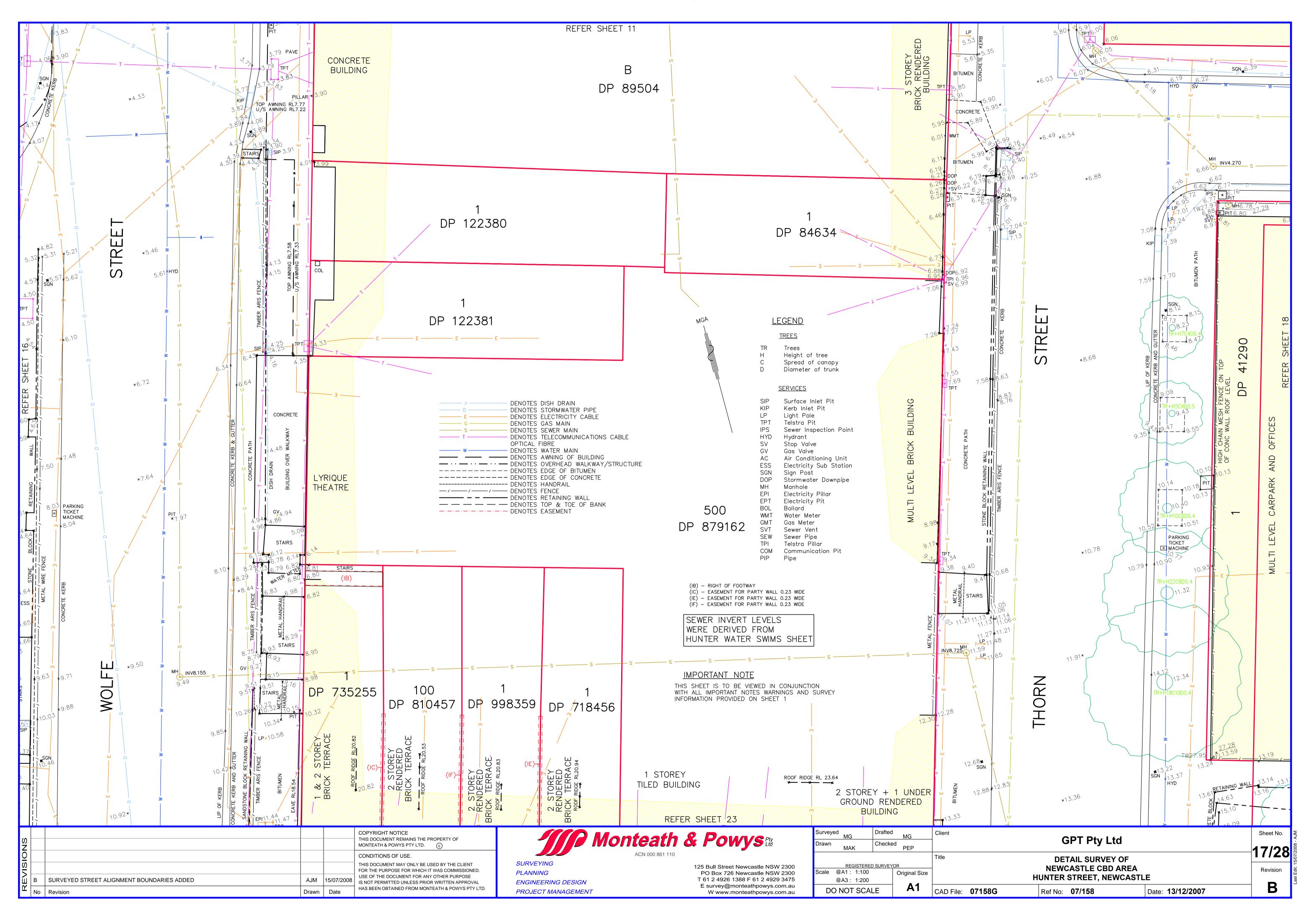


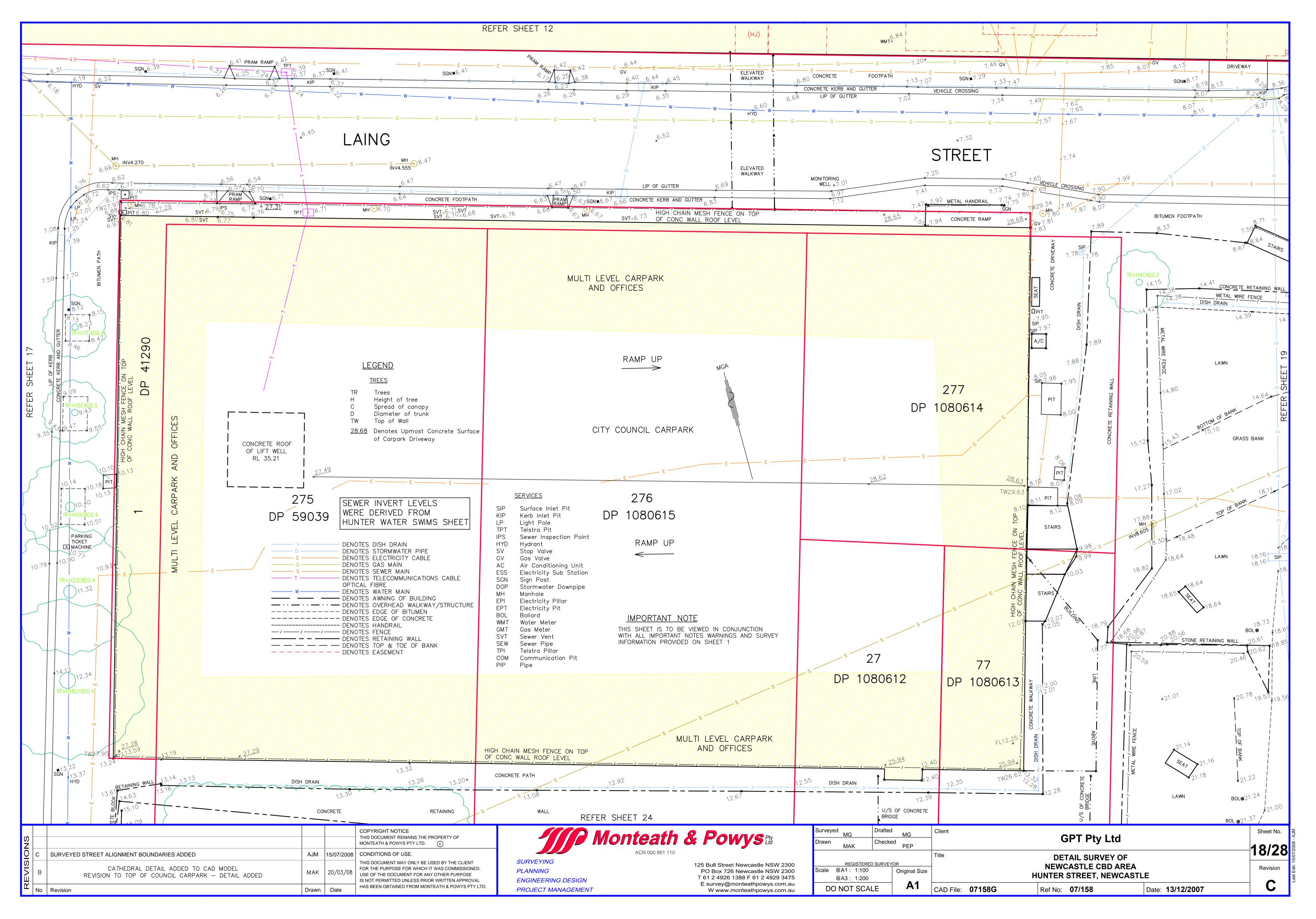


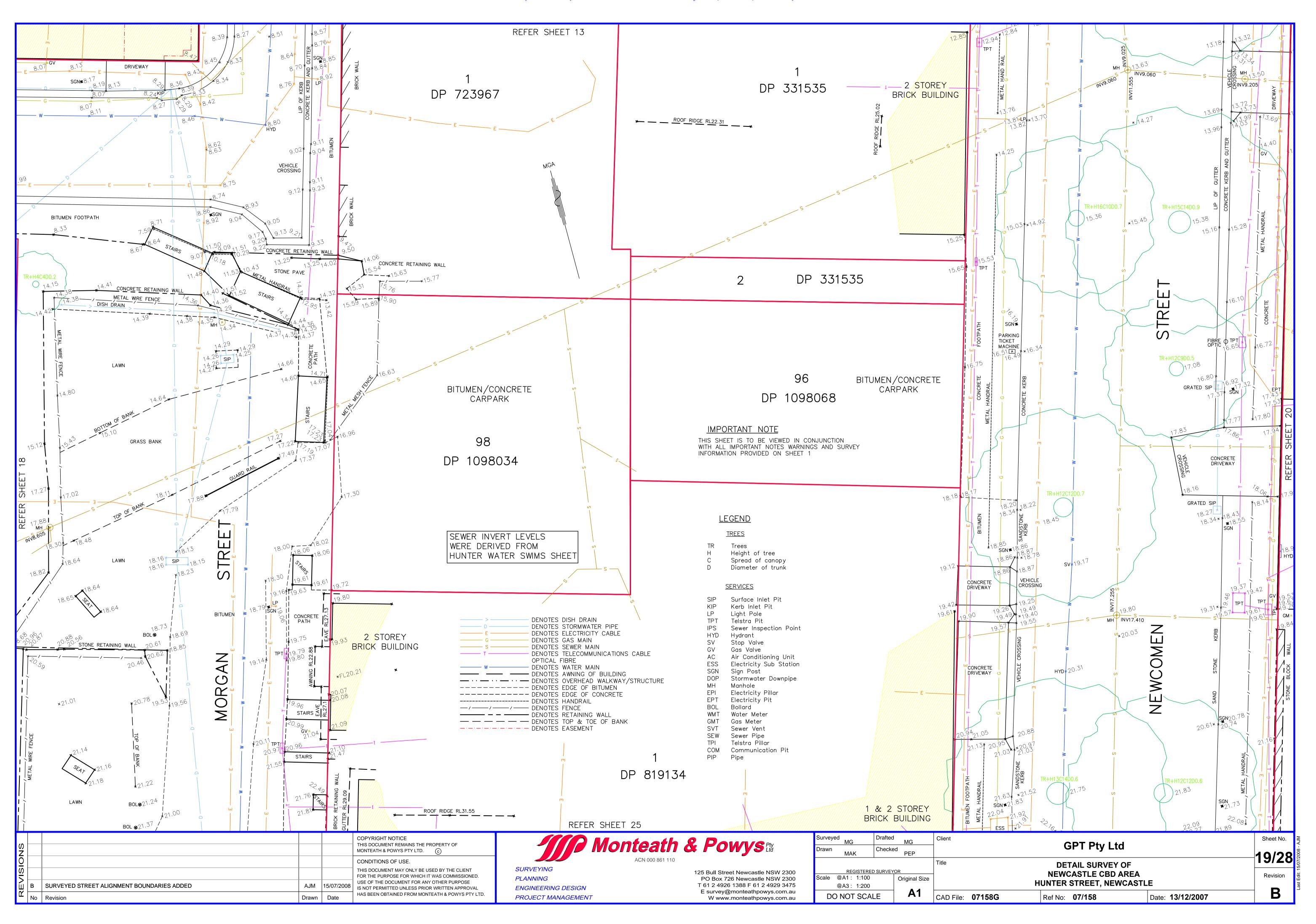


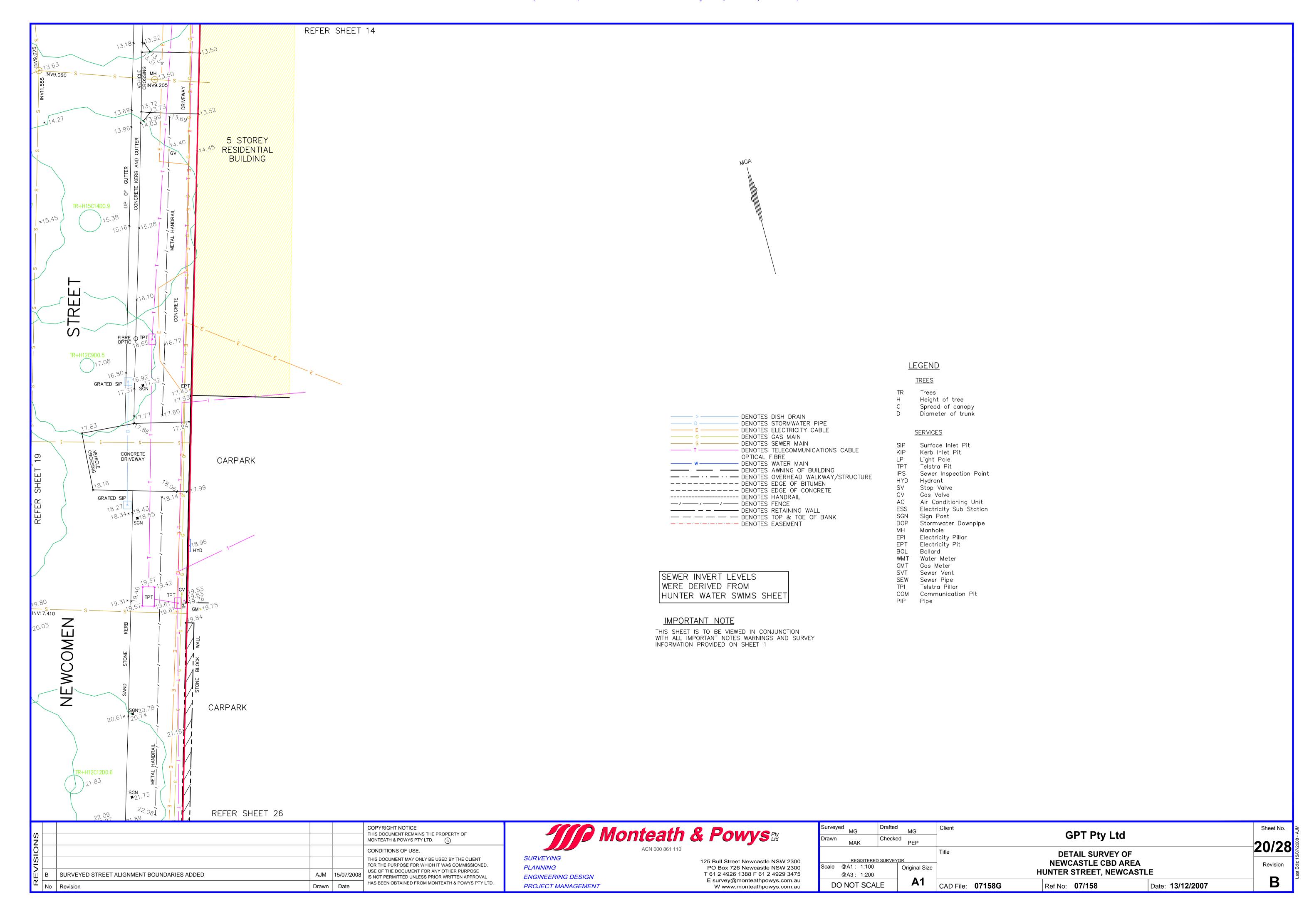


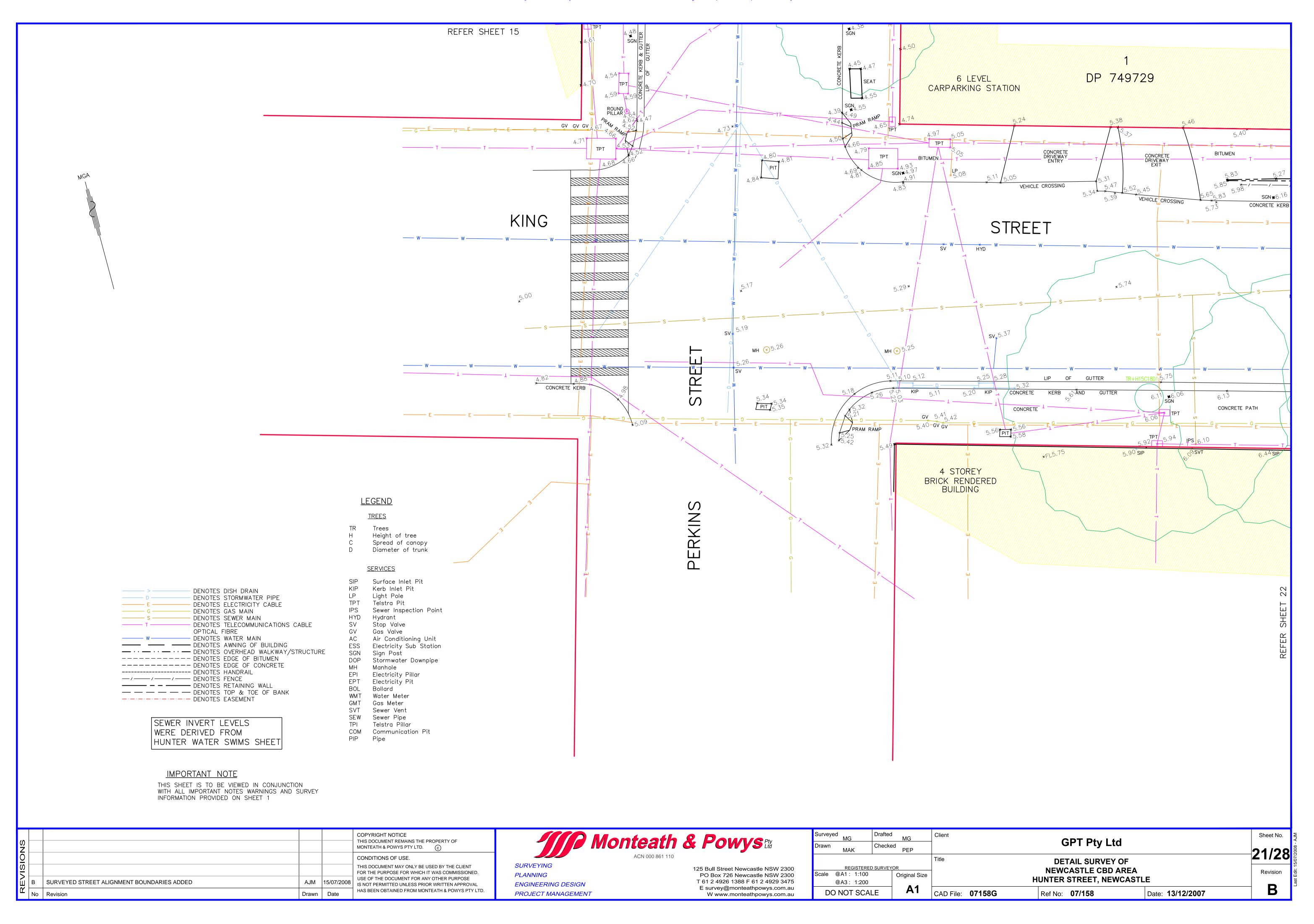


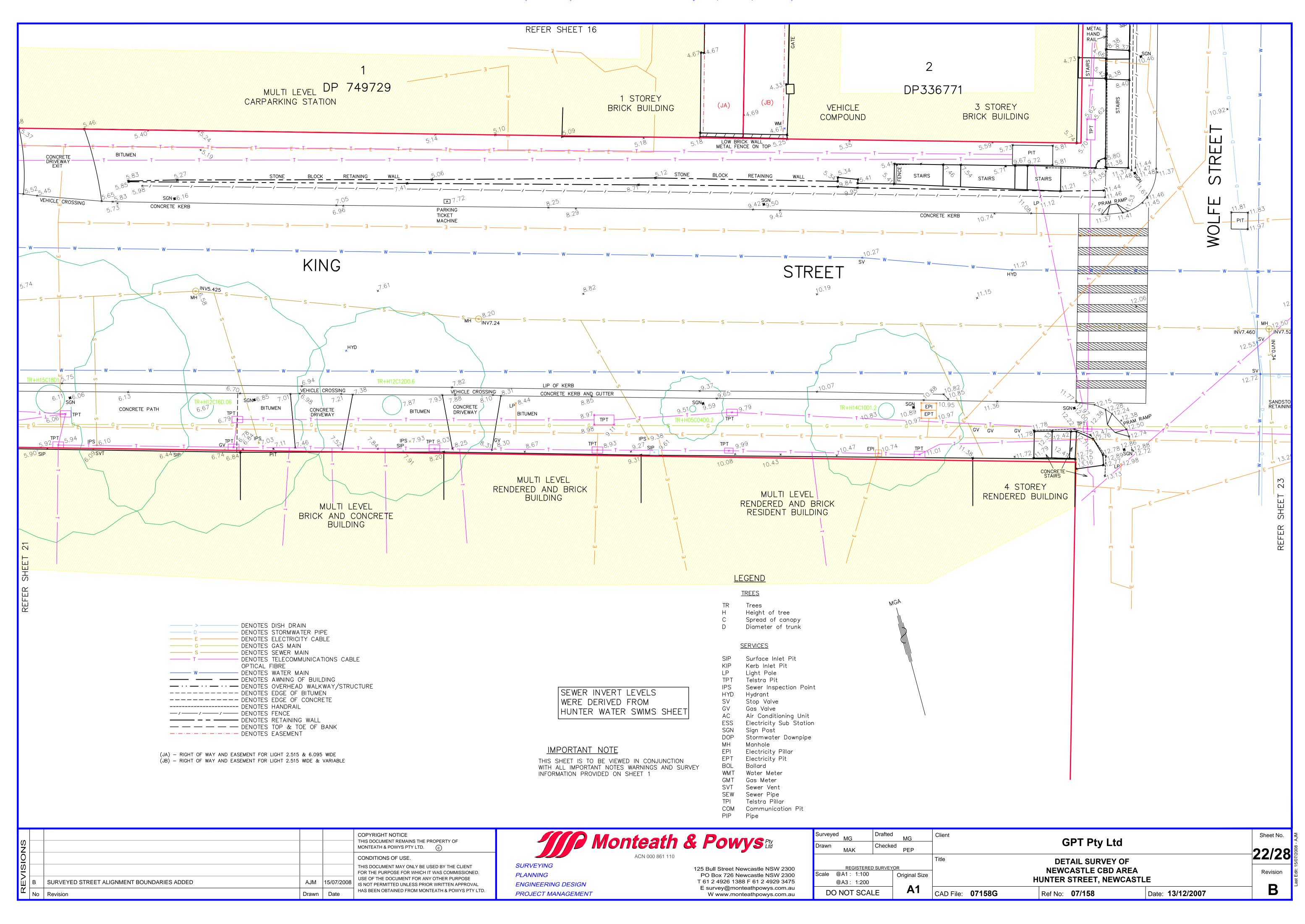


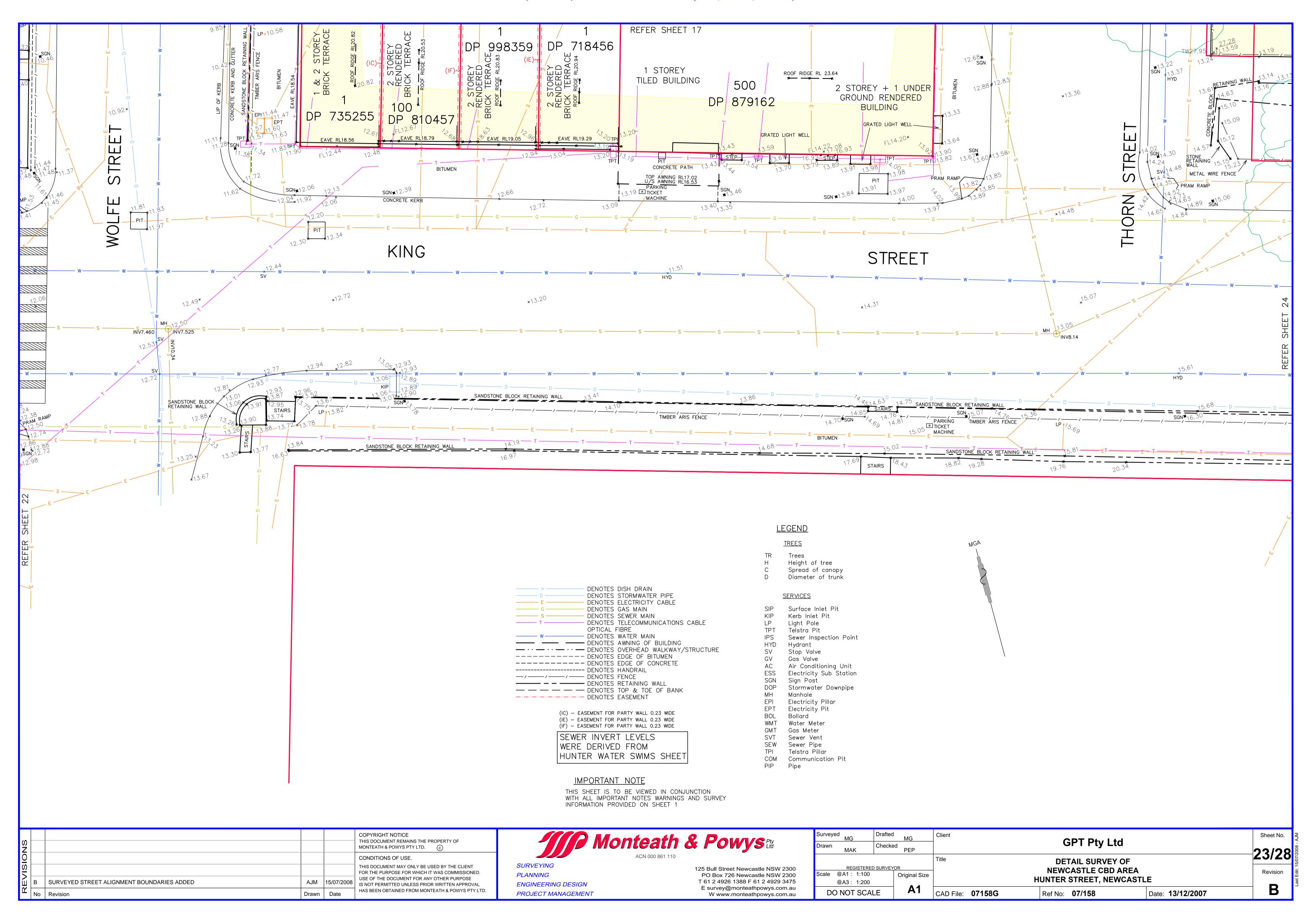


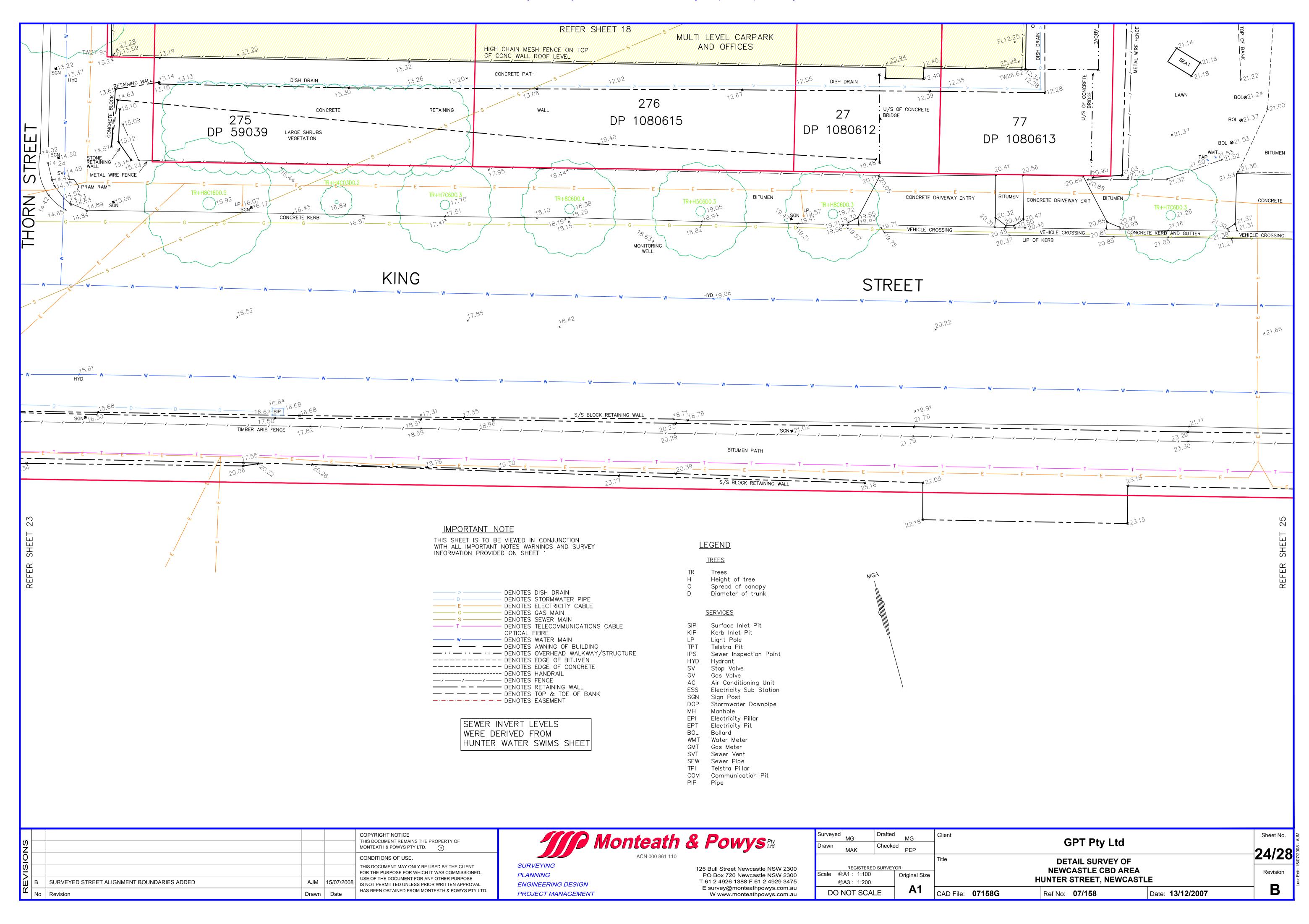


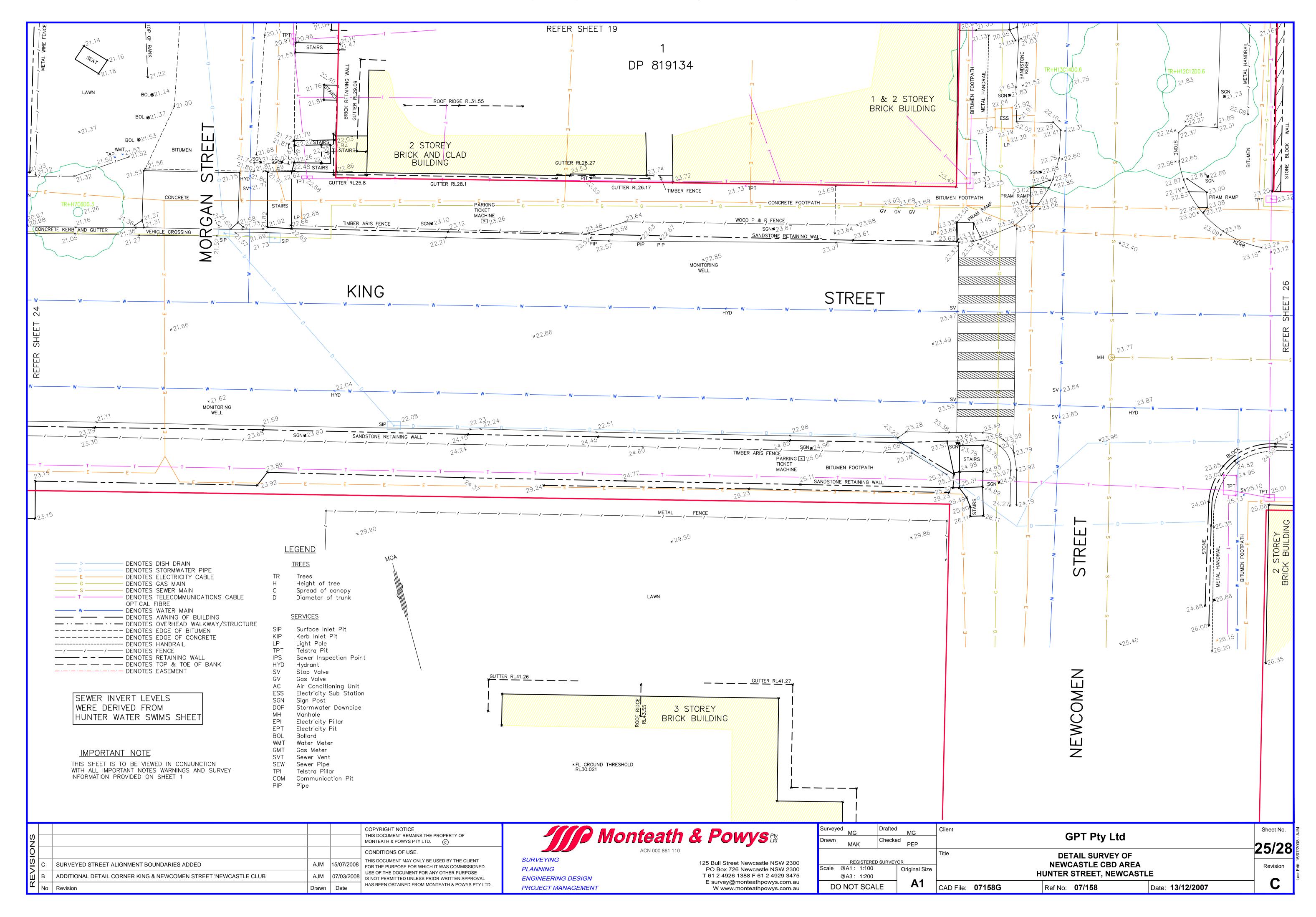


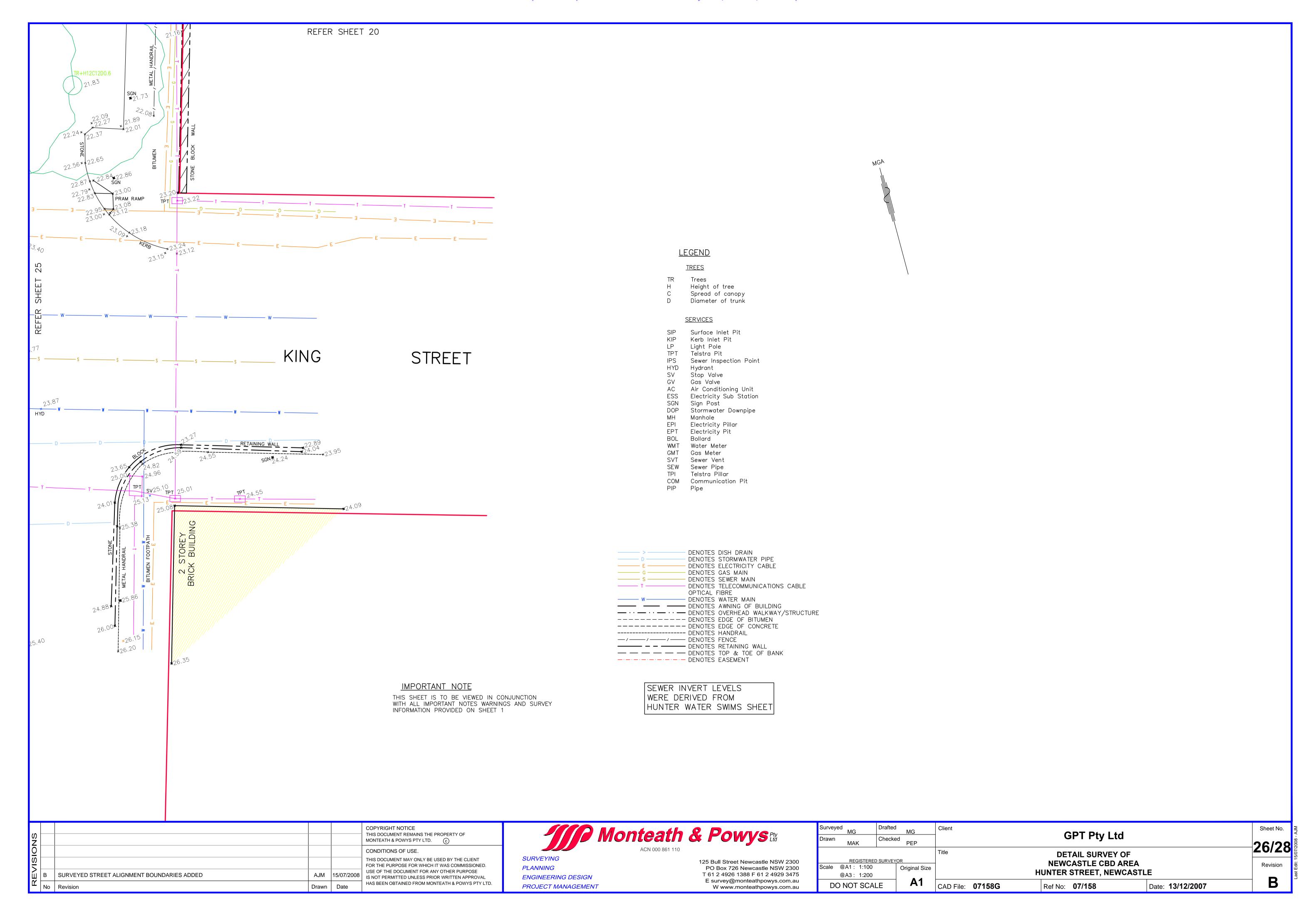


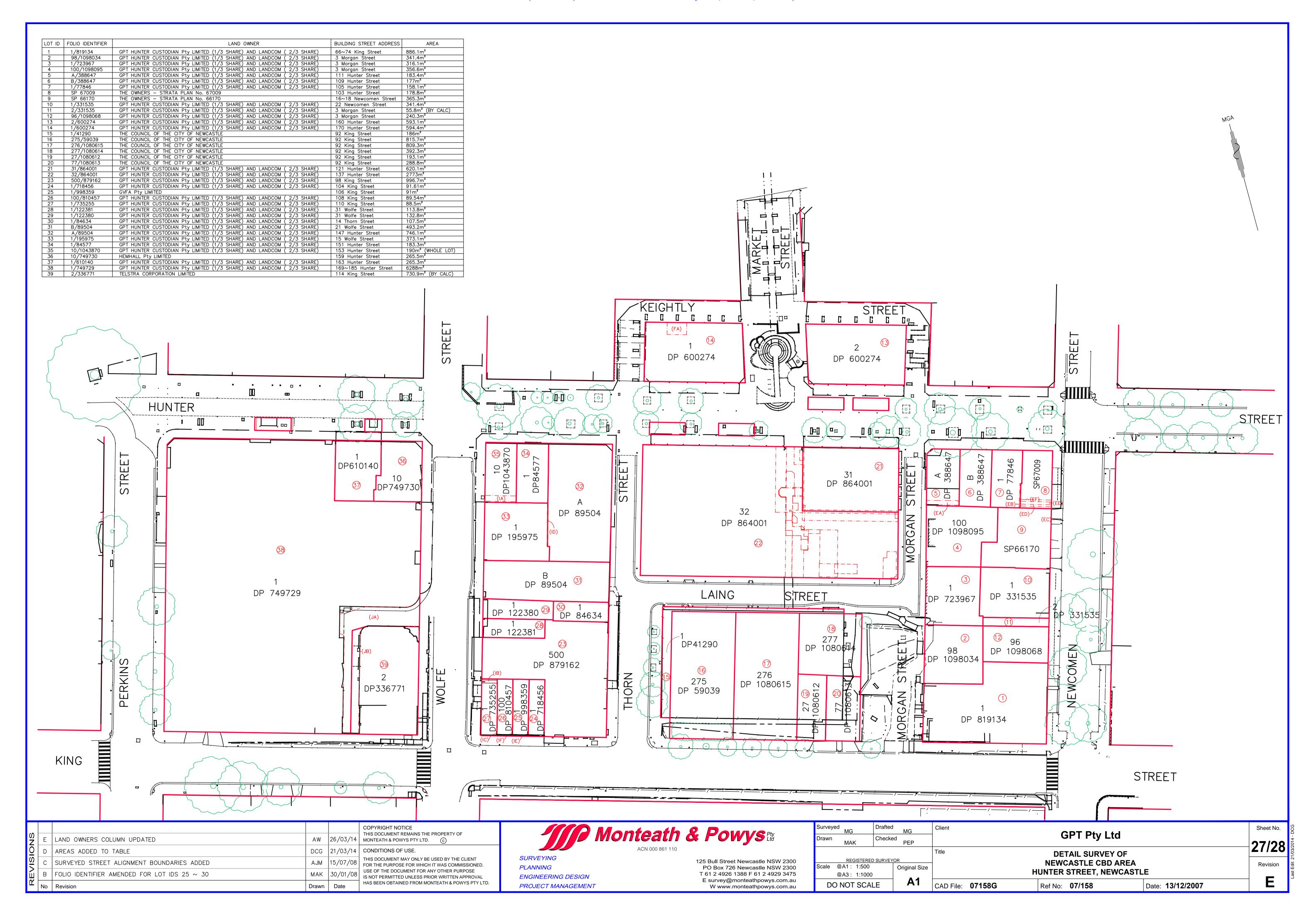


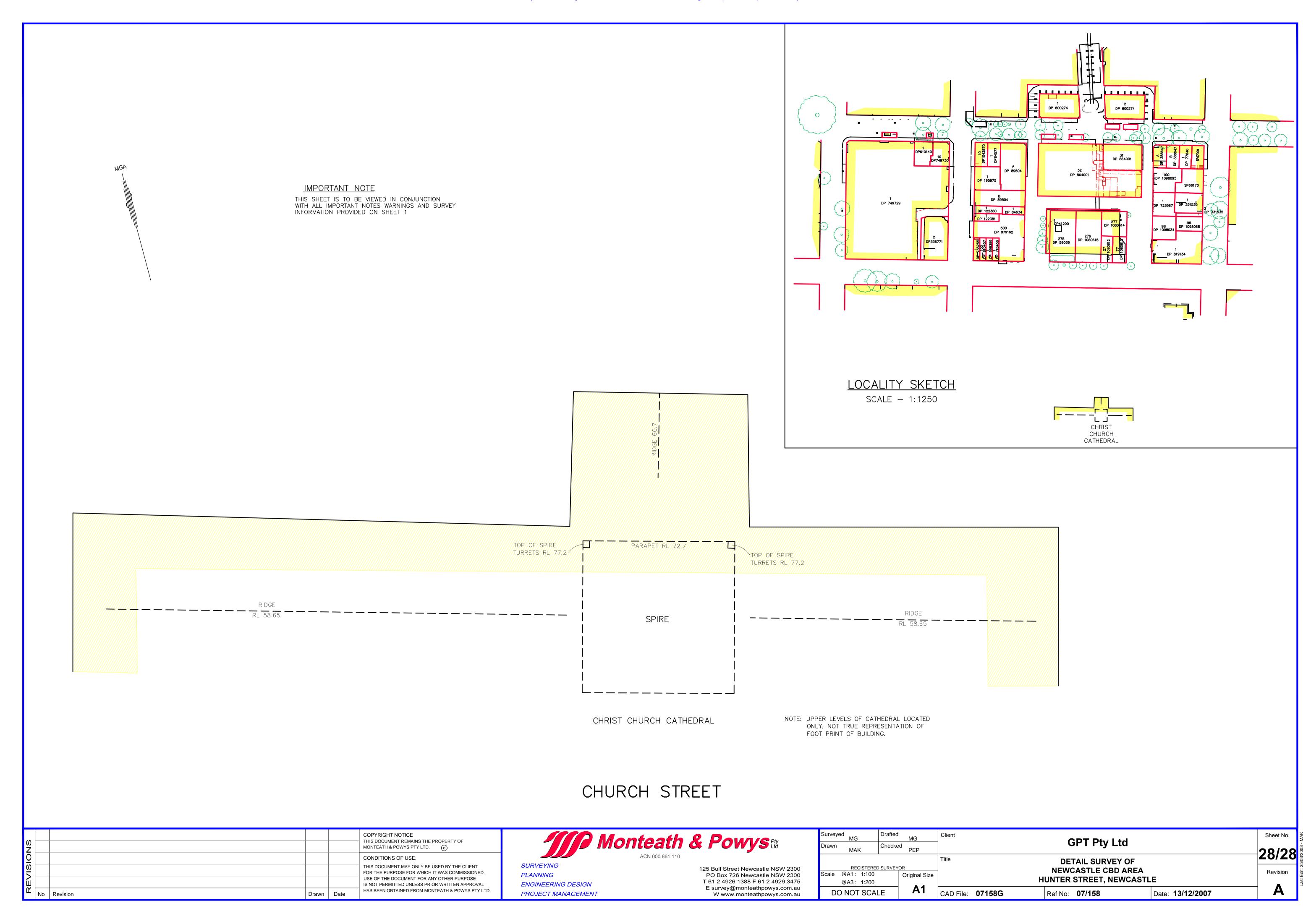






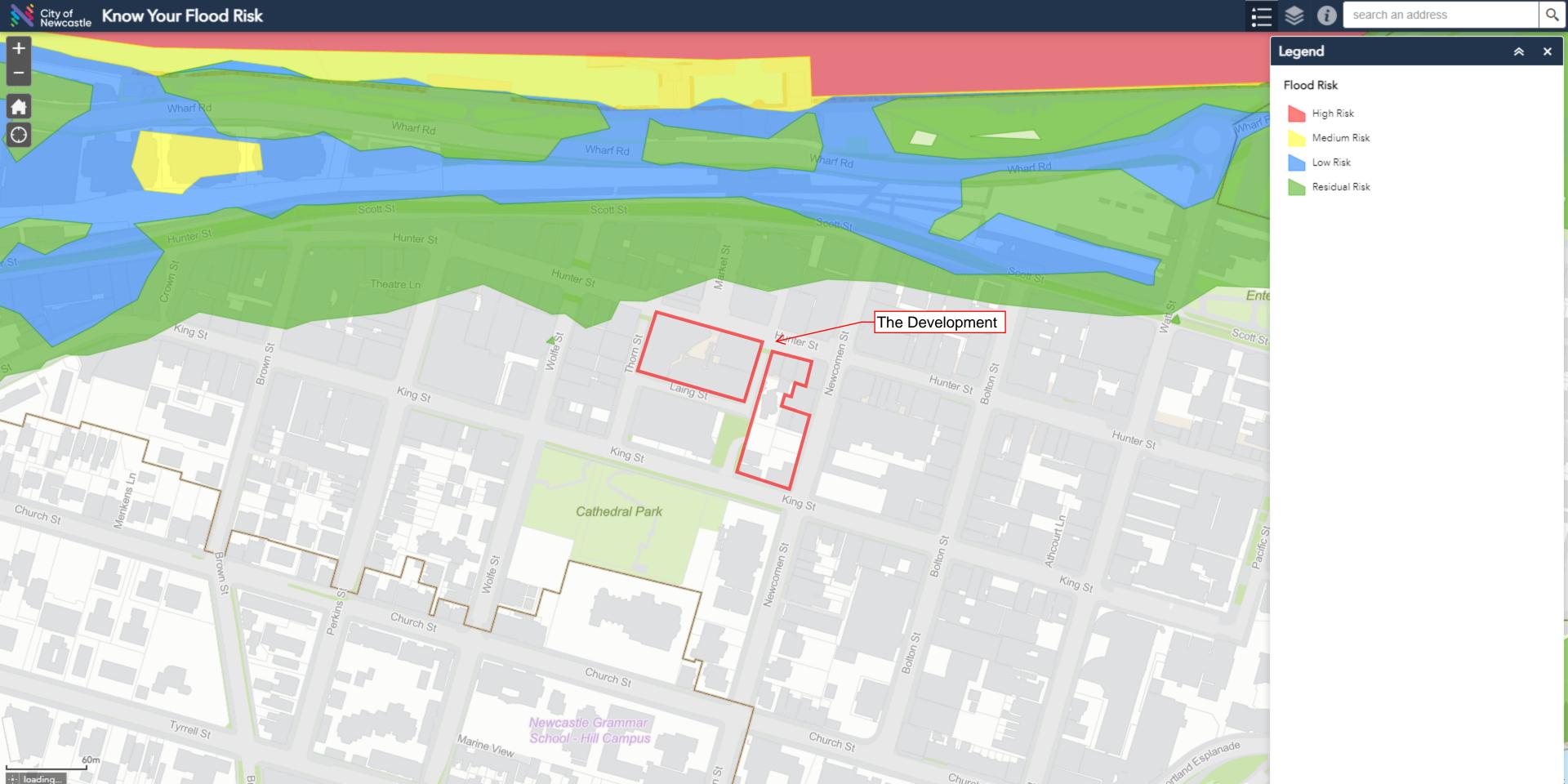


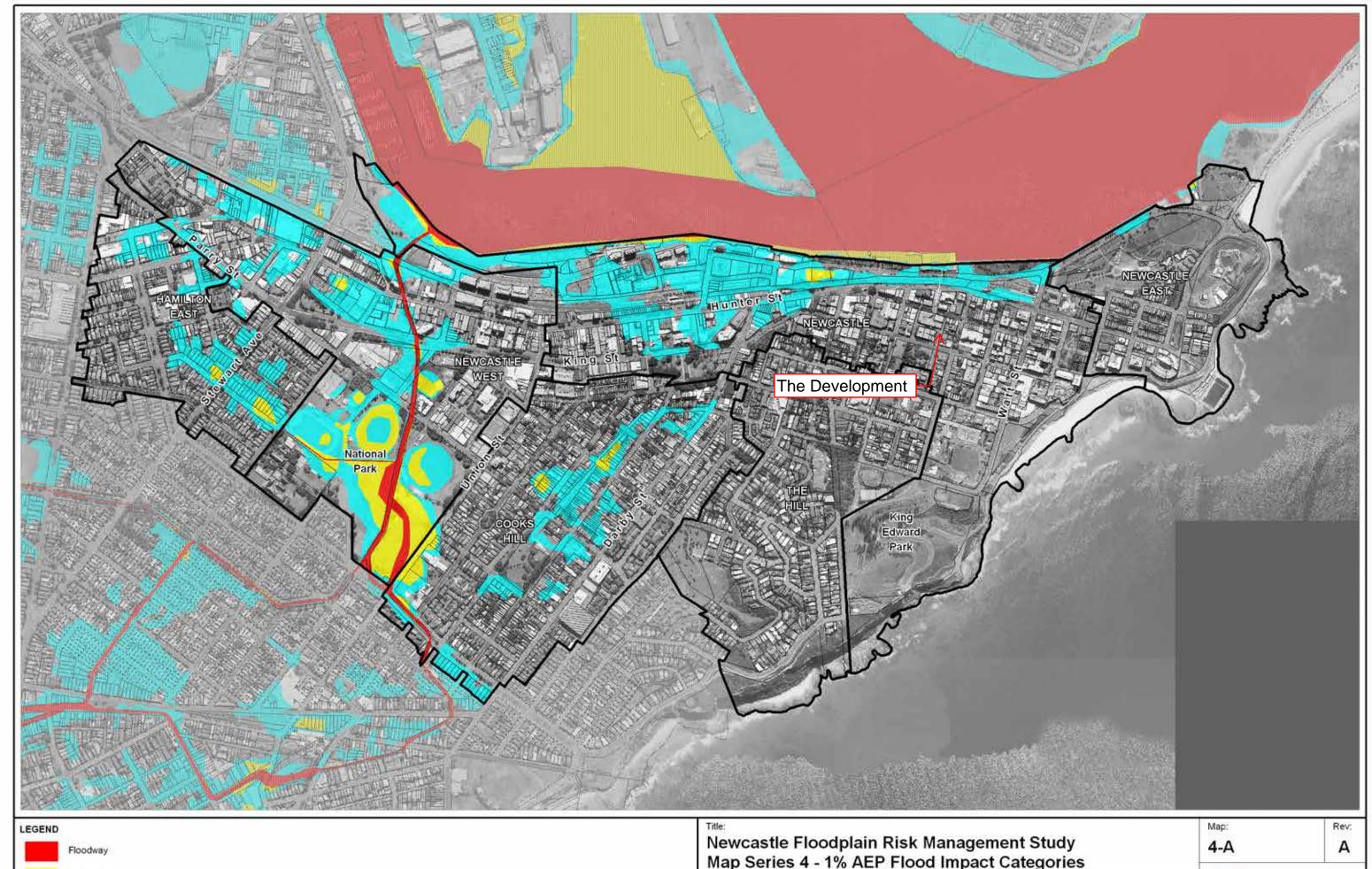




APPENDIX D - FLOOD MAPS









Newcastle Floodplain Risk Management Study Map Series 4 - 1% AEP Flood Impact Categories

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.





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