APPENDIX F - CONCEPTUAL STORMWATER MANAGEMENT PLAN

Kehoe Myers Consulting Engineers

CONCEPTUAL STORMWATER MANAGEMENT PLAN

45 HIGHFIELDS ROAD, HIGHFIELDS - SUBDIVISION

45 HIGHFIELDS DRIVE, HIGHFIELDS, QLD

LOUISE MCCORMICK & ROMIG TITUS

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1 INTRODUCTION AND EXECUTIVE SUMMARY

Kehoe Myers Consulting Engineers has been engaged to prepare a Conceptual Stormwater Management Plan (CSWMP) as part of the design documentation in support of the Development Application with the Toowoomba Regional Council (TRC) at45 Highfields Road, described as Lot 6 on SP146079 in Highfields, Queensland.

The proposed development consists of a 1 into 5 allotment subdivision on an existing residential allotment at 45 Highfields Road, Highfields. Works will include earthworks, stormwater, water reticulation, power and telecommunications. This report seeks to address onsite stormwater management for the proposed development. The following items will be addressed in this report:

- Hydraulic analysis to assess the required mitigation to ensure a case of 'non-worsening' or not incurring an actionable nuisance is achieved.
- Compliance with TRC's pollutant reduction policy and the State Planning Policy (SPP).

From the below analysis, it was determined that stormwater discharge conditions from the site can be maintained at or below pre-developed conditions, or within the capacity of the existing open channel and road drainage infrastructure. As such it is seen that the proposed development can achieve a case of 'non-worsening' or no 'actionable nuisance' at the lawful points of discharge.

As a result of this analysis, it is then shown that the proposed development complies with the guidelines set by both the TRC and Queensland Urban Drainage Manual (QUDM). The report below details the achievement of these lawful points of discharge requirements.

Additionally, the developed site was assessed for water quality requirements as per the TRC Planning Scheme and the Queensland State Planning Policy.

2 SITE DESCRIPTION

The proposed development is located on a 1.173-hectare site located at 45 Highfields Road, Highfields. The real property description is Lot 6 on SP146079. A Locality Plan highlighting the proposed development site is shown below.

Refer to **FIGURE 1** below for site location with respect to adjoining roads and lots.

FIGURE 1 AERIAL PHOTOGRAPH OF THE PROPOSED DEVELOPMENT SITE (*QUEENSLAND GLOBE* 2026)

2.1 EXISTING SITE CONDITIONS

Based on the available LiDAR elevation model, the site comprises an open, gently graded allotment. A single-storey dwelling is located toward the rear of the property, with associated sheds and a pool. The balance of the site is predominantly open grassed area with sparse vegetation. Existing driveway access is provided from Highfields Road however, the site also has road frontage to Acadia Court in the southwestern boundary corner.

Topographically, the site generally falls from the western corner toward the eastern corner of the lot. The average gradient across the allotment is approximately 2%, therefore, only minor earthworks are anticipated to achieve the proposed final lot levels with all allotments clear of the open channel on the eastern boundary.

A current aerial image of the proposed development site is shown below in **FIGURE 2**.

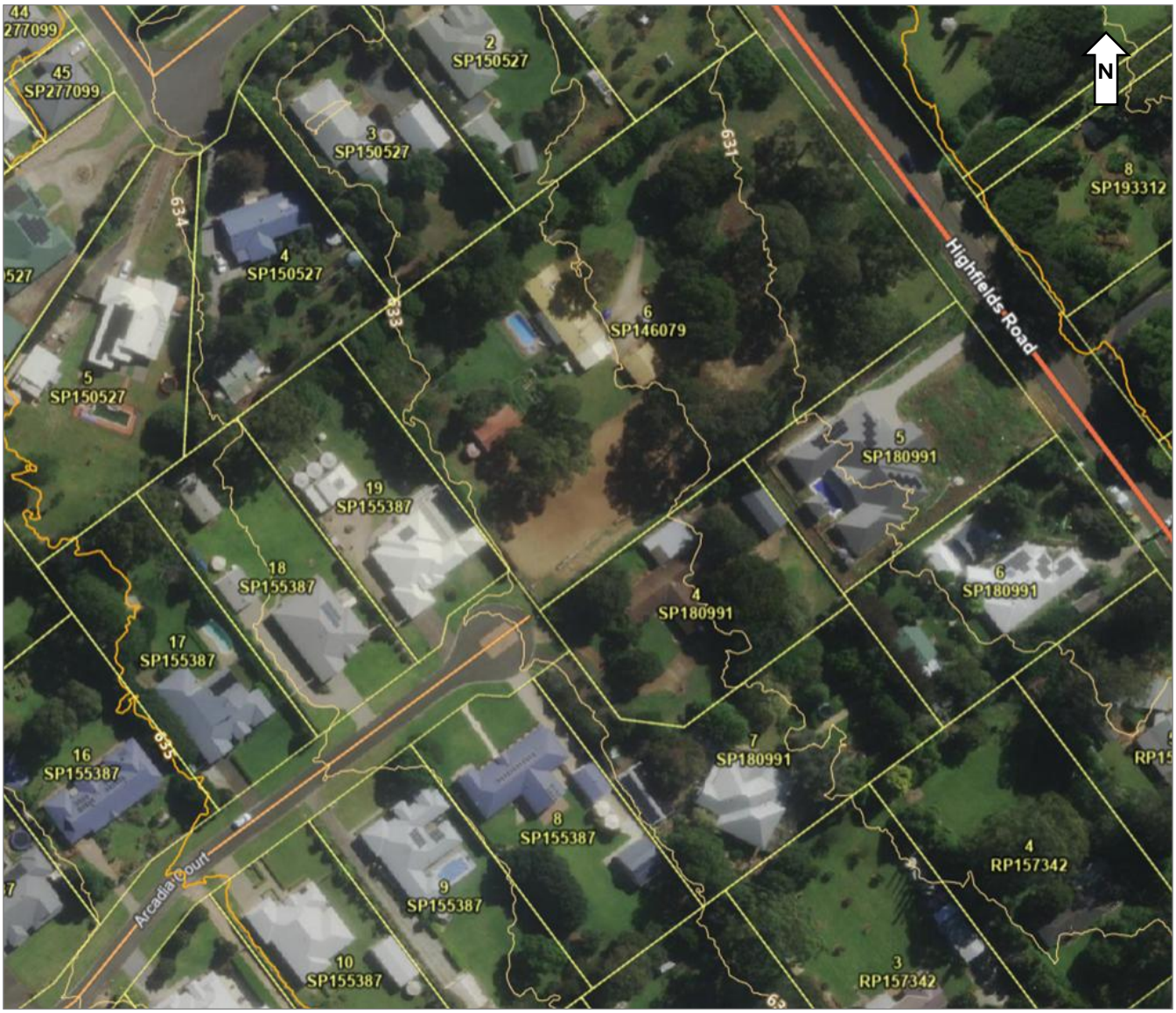

FIGURE 2 SITE AERIAL IMAGE (*QUEENSLAND GLOBE* 2026)

2.2 PROPOSED DEVELOPMENT

The proposed development layout has been prepared in consultation with the developer and planner. Based on the proposed site layout, a conceptual engineering design was undertaken to provide access and services for the proposed allotments. Lot 1 will retain the existing access from Highfields Road, with new access for Lots 2 and 3 proposed along Highfields Road. The proposed Lots 4 and 5 will have a shared access from Arcadia Court, with an easement in favour of Lot 5.

These proposed infrastructure services are detailed within the accompanying Engineering Infrastructure Report prepared by Kehoe Myers.

The proposed final 5-lot layout for the subdivision is shown below in **FIGURE 3** and a full plan of the proposed site is attached in **APPENDIX A**.

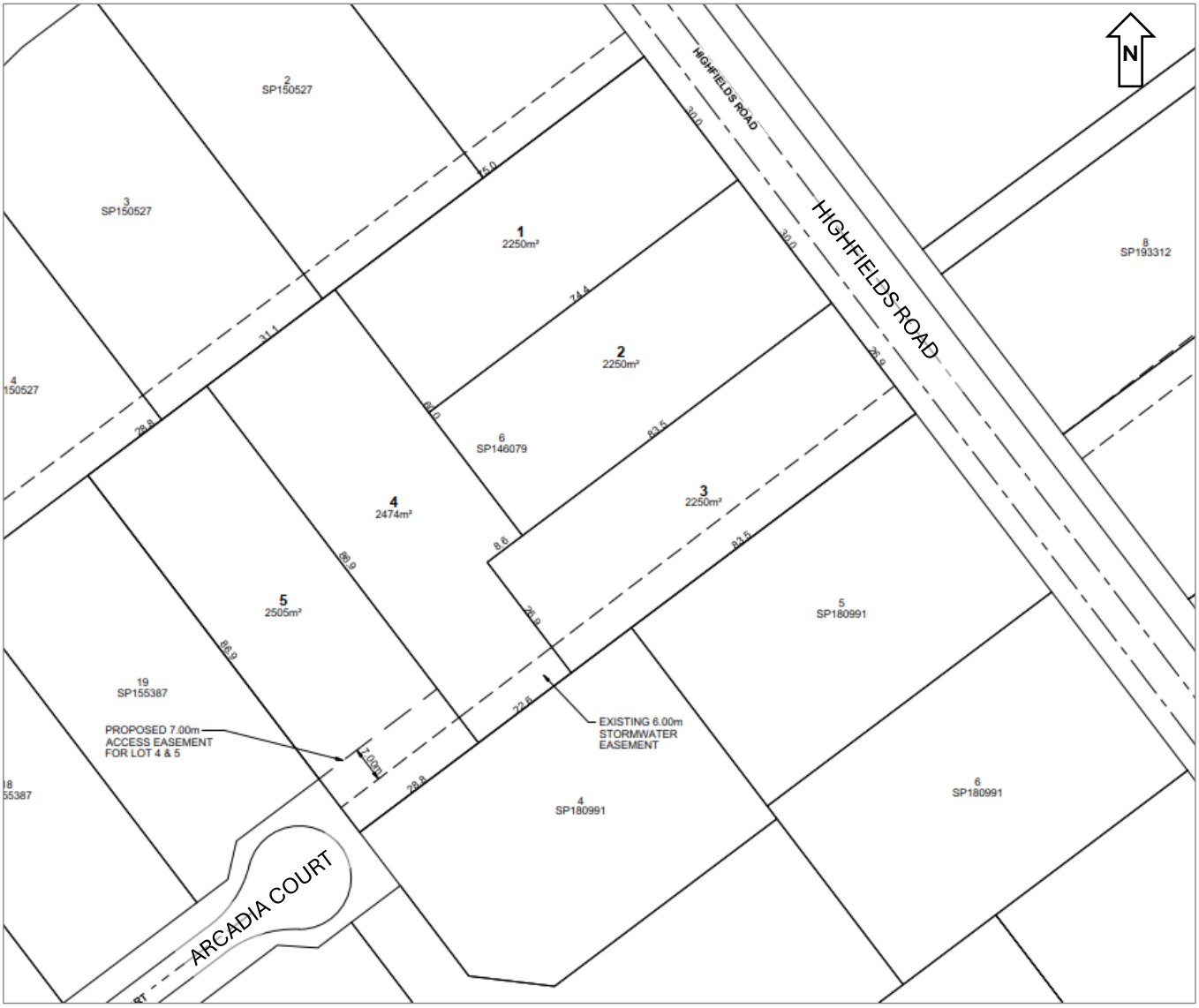

FIGURE 3 PROPOSED ALLOTMENT LAYOUT (*KEHOE MYERS* DRAWING: C2526370-DA01-A)

3 HYDROLOGY

To enable the detailed hydraulic analysis of the stormwater management system, the development site has been assessed for both the pre-developed and post-development cases. This analysis has been undertaken to check that the development achieves a case of 'non-worsening' or not incurring an actionable nuisance at the lawful point of discharge.

3.1 EXISTING SITE INFRASTRUCTURE

A review of the TRC Infrastructure mapping confirms there is an existing 6.0m wide stormwater easement containing piped drainage infrastructure within the development site running the full length of the eastern boundary.

As shown below in **Capacity checks** indicate that the existing pit and pipe network is adequate for minor events (50% AEP, ARI_2); however, surcharge and bypass are expected during major events (1% AEP, ARI_{100}). To maintain a controlled conveyance path and protect adjacent developed properties, an open stormwater channel is proposed within the existing drainage easement to convey major event flows to the lawful point of discharge, the verge in Highfields Road.

The proposed open grass lined channel has been designed in accordance with QUDM, using Manning's equation to assess flow conditions. The channel has been sized to convey an estimated major event bypass flow of approximately 0.48m^3/s, the difference between the major flow and the limiting pipe capacity. Based on this adopted design discharge, the channel geometry and lining parameters outlined below are required to safely contain the bypass flows for the major event.

Item	Upper Section 1	Lower Section 2
Bed Slope (%)	2.23	1.22
Bed Width (m)	2.0	2.0
Left Batter Slope (1:X)	4	4
Right Batter Slope (1:X)	4	4
n	0.030	0.030
Flow depth (m)	0.155	0.175
Q (m^3/s)	0.502	0.487
V (m/s)	1.24	1.00

, the road network adjacent to the development site contains a pit and pipe network. The drainage infrastructure network within Arcadia Court drains through the existing drainage easement within the development lot and discharges into existing pit and pipe network within Highfields Road before continuing downstream to the Kuhls Road Recreation Reserve. The existing pipe within the development has two sections with the top section slightly steeper than the lower section and also smaller being a 375mm pipe leading into a 450mm pipe at Highfields Road connection.

FIGURE 4 EXISTING STORMWATER NETWORK (*TRC* INFRASTRUCTURE MAPS 2026)

A hydrologic analysis was undertaken to estimate upstream flows and to evaluate the capacity of the existing drainage system, including the proportion of flow conveyed by the pipe network and any overland flow continuing through the easement or via open sheet flow. Peak flows from upstream catchments were calculated using the Rational Method. Refer **APPENDIX B** for preliminary stormwater plan and catchments. The adopted parameters are summarised below.

TABLE 1 UPSTREAM-CATCHMENT PROPERTIES

CATCHMENT NAME	AREA (Hectare)	FRACTION IMPERVIOUS (%)	FLOW DISTANCE (m)	TIME OF CONCENTRATION (Tc)
A	2.59	30	251	25
B	0.378	5	215	5
Total	**2.97**			**30**

Rainfall Intensity (based off Highfields Rainfall Data)

- ARI (2 years) - 55.2 mm/h
- ARI (100 years) - 124 mm/h

Peak flows were calculated at the existing stormwater pit at the end of Arcadia Court and represent the combined maximum peak stormwater flows expected to pass through this site have been estimated as follows:

- Q_2 flows: 0.23m^3/s
- Q_{100} flows: 0.74m^3/s

A calculation of pipe capacity using Manning's equation gives the capacity of a 375mm RCP at 2% grade (assumed) as 0.259m^3/s and the capacity of a 450mm RCP at 1% grade (assumed) as 0.297m^3/s

Pipe Flow Capacity Chart (For circular pipes running full but not under head)		
Computed by Q=1/n*AR^(2/3)*S^(1/2)		
Manning's n	0.013	0.013
Grade (m/m)	0.023	0.012
Pipe Size (mm)	375	450
Flow (m^3/s)	0.259	0.297
Velocity (m/s)	2.269	1.811

Capacity checks indicate that the existing pit and pipe network is adequate for minor events (50% AEP, ARI_2); however, surcharge and bypass are expected during major events (1% AEP, ARI_{100}). To maintain a controlled conveyance path and protect adjacent developed properties, an open stormwater channel is proposed within the existing drainage easement to convey major event flows to the lawful point of discharge, the verge in Highfields Road.

The proposed open grass lined channel has been designed in accordance with QUDM, using Manning's equation to assess flow conditions. The channel has been sized to convey an estimated major event bypass flow of approximately 0.48m^3/s, the difference between the major flow and the limiting pipe capacity. Based on this adopted design discharge, the channel geometry and lining parameters outlined below are required to safely contain the bypass flows for the major event.

Item	**Upper Section 1**	**Lower Section 2**
Bed Slope (%)	2.23	1.22
Bed Width (m)	2.0	2.0
Left Batter Slope (1:X)	4	4
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n	0.030	0.030
Flow depth (m)	0.155	0.175
Q (m^3/s)	0.502	0.487
V (m/s)	1.24	1.00

The subject land is an existing residential lot, as no change to the existing use is proposed, the resulting development fraction impervious should already be accounted for within the capacity and design of the surrounding stormwater infrastructure. As such, it is assumed that the downstream drainage network has been designed to accommodate residential development consistent with the proposed development.

The proposed 1 into 5 lot residential subdivision does not introduce a change in land use and will not result in an unreasonable increase in impervious area beyond that typically anticipated for residential development. Furthermore, development on proposed Lots 3 and 4 is constrained by the presence of an existing stormwater easement, which restricts the allowable building envelopes and limits the extent of impervious surfaces. Consequently, the impervious area for each lot will remain below 75%, consistent with the Queensland Urban Drainage Manual (QUDM) guidelines for assumed fraction impervious for low density urban residential development.

Stormwater from the proposed Lots 1-3 will be conveyed via kerb adaptors installed for each lot, directing runoff into the existing street drainage system within Highfields Road. Lot 4 and 5 will discharge roof water only to the proposed open channel. The resulting stormwater discharges are assumed to be within the design capacity of the existing road and drainage infrastructure, and the proposed subdivision is therefore not expected to result in any adverse impacts on existing stormwater conditions.

4 STORMWATER QUALITY MANAGEMENT

4.1 STORMWATER QUALITY LEGISLATION

The State Planning Policy (SPP) released in July 2017 provides guidelines on the requirement for stormwater quality treatment. Further advice on stormwater quality is provided in Toowoomba Regional Council's Planning Scheme Policy.

SPP states that the pollutant reduction design objectives for the Western Queensland climatic region are applicable to:

- A material change of use for an urban purpose that involves premises 2,500m^2 or greater in size and;
  - will result in six or more dwellings; or
  - an impervious area greater than 25 percent of the net developable area; or
- Reconfiguring a lot for an urban purpose that involves premises 2,500m^2 or greater in size and will result in six or more lots; or
- Operational Works for an urban purpose that involves disturbing a land area 2,500m^2 or greater in size.

The development site is located within the Western Queensland climatic region. In addition to the above, Appendix B Note 14 indicates that for areas within Western Queensland, the pollutant reduction design objectives only apply to population centres greater than 25,000 persons.

The population of Highfields at the 2021 Census was 8,568 and therefore this development does not trigger the water quality requirements listed in Table B of Appendix 2 of the SPP.

4.2 CONSTRUCTION PHASE STORMWATER QUALITY MANAGEMENT

While the development will ultimately comply with objectives of State Planning Policy - July 2017, Water Quality, Section 1, it is also required to comply with the requirements of Appendix 2 Table A: Construction Phase – Stormwater Management Design Objectives during the construction works.

Pollutants typically generated during the construction phase include:

- Litter.
- Sediment.
- Hydrocarbons.
- Toxic Materials.
- pH Altering Substances.

During the detailed design and construction phase, an erosion and sediment control plan will be prepared for the site. The erosion and sediment control plan will be based on the ICEA document *'Best Practice Erosion and Sediment Control',* International Erosional Control Association (Australasia) to achieve compliance under the *Environmental Protection Act 1994*.

The erosion and sediment control plan shall address the following:

- Use and location of sediment control devices including; sediment fencing and sediment traps for stormwater entry pits.
- Erosion control measures during earthworks, including any staging or sequencing of the works.

5 CONCLUSION

This report summarises the stormwater management practices proposed to manage the stormwater quantity and quality generated by the proposed development.

The development is not expected to result in an increase in flows from the site, noting the subject land is an existing residential lot and the proposed use is consistent with residential development that is considered within the capacity and design intent of the surrounding stormwater infrastructure. The proposed open channel will contain and convey major event bypass flows to the existing lawful point of discharge, without adverse impacts on the lots created under this RAL or surrounding properties. Roofwater will be captured and discharged to the appropriate approved discharge locations. Accordingly, the proposed development is not expected to incur actionable nuisance flows resulting in quantifiable loss to downstream properties.

The development does not trigger the stormwater pollutant reduction requirements of the SPP July 2017.

As such, the proposed development will meet both the stormwater Quantity and Quality objectives as detailed within the Queensland State Planning Policy and the Toowoomba Regional Council's Planning Scheme.

6 REFERENCES

Text References

Toowoomba Regional Council, Toowoomba Regional Planning Scheme
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7 APPENDICES

APPENDIX A. **PROPOSED SITE LAYOUT**
(*KEHOE MYERS* DRAWING: C2526370-PR01-A)

PROPOSED ALLOTMENT LAYOUT

SCALE:- 1:500 @ A1, 1:1000 @ A3

DATUM
PSM
SURVEYOR_INFORMATION

DRAWING ISSUE

ISSUE	DATE	DETAILS	INITIAL
A	28.05.26	FOR APPROVAL	GRP

0 5m 10m 15m 20m 25m

SCALE 1:500 @ A1
SCALE 1:1,000 @ A3

PRELIMINARY
NOT FOR CONSTRUCTION
DATE 28.05.26 12:31 PM

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PROJECT
45 HIGHFIELDS ROAD,
HIGHFIELDS - SUBDIVISION

DRAWING TITLE
PROPOSED ALLOTMENT LAYOUT

DESIGN		ORIGINAL SIZE	A1
DRAWN		PROJECT NUMBER	C2526370
CHECKED			
APPROVED		DRAWING NUMBER	PR01
DATE		ISSUE	A

APPENDIX B. PRELIMINARY STORMWATER PLAN (*KEHOE MYERS* DRAWING: C2526370-PR05-A)

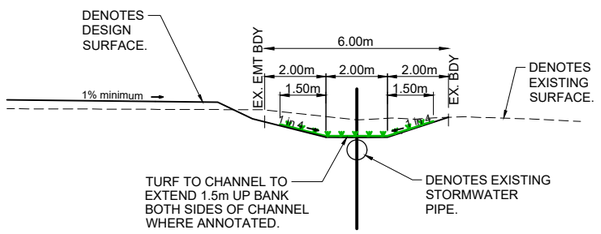
STORMWATER DRAINAGE LEGEND

PROPOSED WORKS

—— > ——	PROPOSED OPEN CHANNEL AND DIRECTION
	FLOW TO KERB ADAPTER
	FLOW TO OPEN CHANNEL
—— W ——	PROPOSED WATER MAIN
—— WS ——	PROPOSED WATER SERVICE
—— UG ——	PROPOSED UNDERGROUND ELECTRICAL LINE

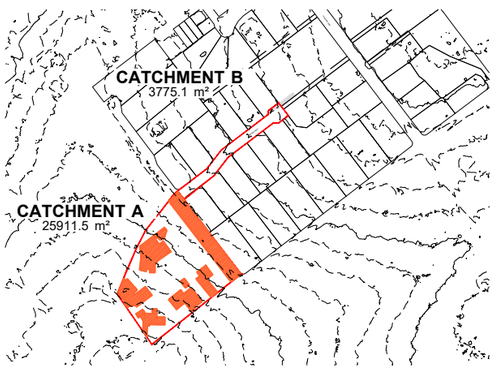
EXISTING WORKS

	EXISTING STORMWATER DRAINAGE PIPE, MANHOLE AND GULLY
—— S ——O——	EXISTING SEWER MAIN AND MANHOLE
——SRM——	EXISTING SEWER RISING MAIN
—— W ——	EXISTING WATER MAIN
—— WS ——	EXISTING WATER SERVICE
—— UG ——	EXISTING UNDERGROUND ELECTRICAL CONDUITS
—— OH ——PP	EXISTING OVERHEAD ELECTRICAL LINES AND POWER POLES
—— T ——	EXISTING TELECOMMUNICATION LINES



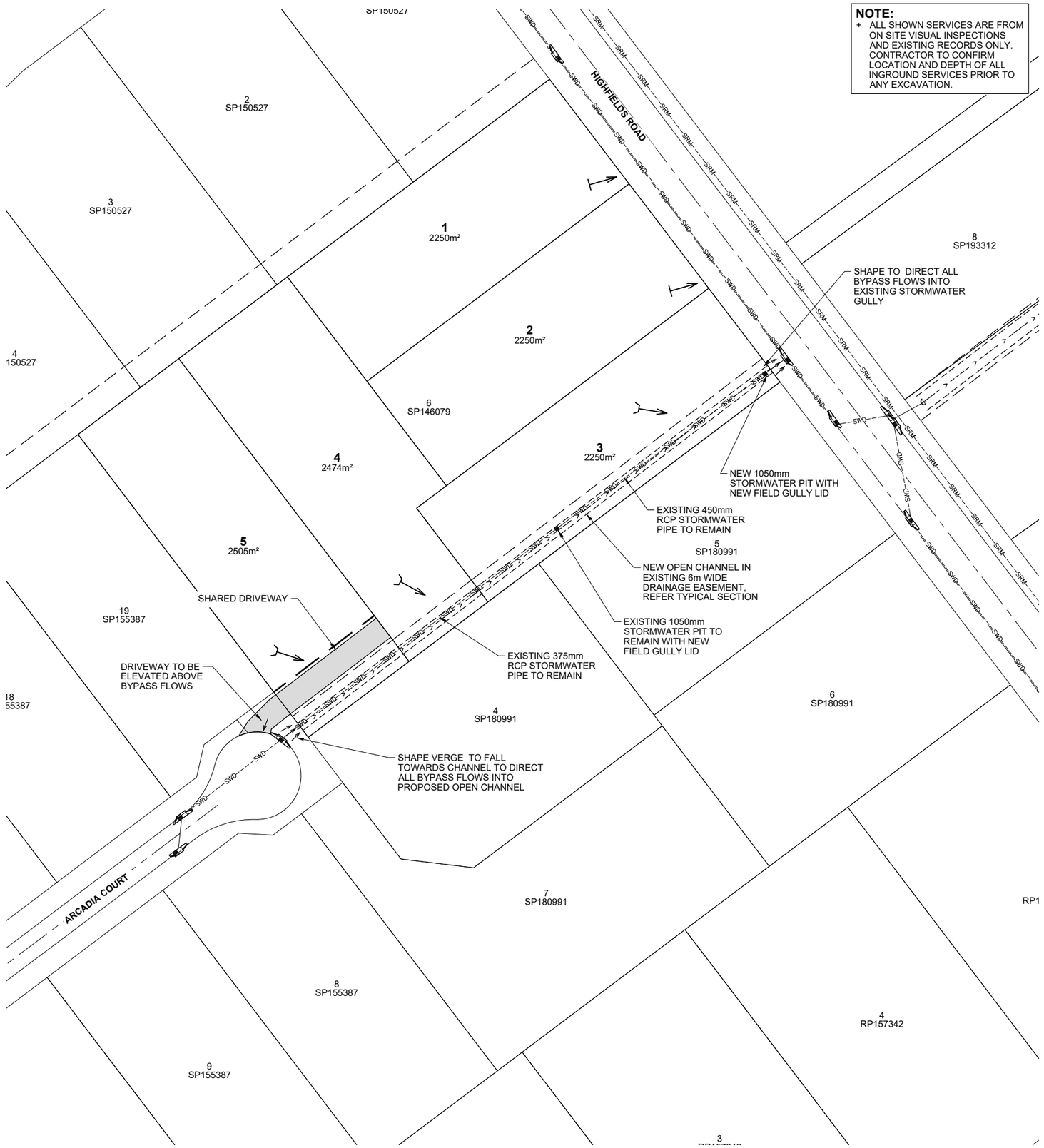
TYPICAL STORMWATER CHANNEL SECTION - TURF TREATMENT

SCALE:- 1:25 @ A1, 1:50 @ A3



STORMWATER CATCHMENT DETERMINATION

SCALE:- 1:5,000 @ A1, 1:10,000 @ A3



PRELIMINARY STORMWATER PLAN

SCALE:- 1:500 @ A1, 1:1000 @ A3

NOTE:
+ ALL SHOWN SERVICES ARE FROM ON SITE VISUAL INSPECTIONS AND EXISTING RECORDS ONLY. CONTRACTOR TO CONFIRM LOCATION AND DEPTH OF ALL INGROUND SERVICES PRIOR TO ANY EXCAVATION.

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