



NSW DEPARTMENT OF EDUCATION

Blakebrook Public School

Flood Impact Assessment

QC3008_001-REP-001-0





6 DECEMBER 2023



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1. INTRODUCTION

Engeny was commissioned by the New South Wales (NSW) Department of Education (DoE) to undertake a flood assessment (the Project) for Blakebrook Public School, located at 417 Rosehill Road, Blakebrook, NSW 2840 (the Site). A complete rebuild of the school is currently proposed, and as such the Project also includes a Flood Impact Assessment (FIA) of the proposed works. Flood behaviour and impacts were assessed for the critical flood event duration at the Site location for a range of flood event AEPs. The scope of works for this assessment and associated findings are outlined in the following sections.

1.1 Scope and Objectives

The key objectives of the Project were to:

- Define the Flood Planning Level and provide information to inform the proposed design and assess flood impacts.
- Base Case Assessment:
 - Utilise and modify the hydrologic and hydraulic models previously developed as part of the Lismore Floodplain Risk Management Study (FRMS) (Engeny, 2019) to represent local conditions related to the Site.
 - Produce a trimmed model for the hydraulic analysis of the existing conditions at the Site (with incorporation of existing topography provided by ADCO Constructions, dated 22 November 2023) and simulate the model for the 10%, 5%, 1%, 0.5%, 1:1,000, 1:2,000, 1:10,000, 1:100,000 AEP, and PMF flood events.
 - Provide information on the current flood immunity of the Site.
 - Provide mapping of flood levels, depths, velocity, and hazard at the Site.
- Post-Rebuild Case Assessment:
 - Undertake a hydraulic assessment of the proposed earthworks (supplied by ADCO Constructions, dated 22 November 2023) for the Site by incorporating the proposed design into the trimmed flood model and simulate the model for the 10%, 5%, 1%, 0.5%, 1:1,000, 1:2,000, 1:10,000, 1:100,000 AEP, and PMF events.
 - Define flood levels, depths, velocity, and hazard influencing the Site.
 - Provide information to inform flood evacuation.
 - Identify any flood impacts associated with the proposed development and provide suggestions for design improvement where applicable.
 - Provide mapping of flood levels, depths, velocity, hazard, and flood impacts at the Site.
- Summarise key findings and recommendations in a technical Flood Assessment report.

1.2 Site Locality

The Site is located within the floodplains of Terania Creek (to the east of the Site) and Goolmangar Creek (to the west of the Site), which are tributaries to Leycester Creek. The contributing catchment area to the Site is approximately 600 km². Elevations at the Site range from approximately 13.2 m AHD to 16.1 m AHD.

The Site locality is presented in Figure 1.1.



Figure 1.1: Site Locality

2. HYDRAULIC MODEL DEVELOPMENT

The TUFLOW hydraulic modelling package was utilised to undertake the hydraulic assessment of the Site, utilising the previously built model for the Lismore Floodplain Risk Management Study (FRMS) (Engeny, 2019). For the purpose of this assessment, and in order to establish the baseline or existing flooding conditions upon which flood impacts for the rebuilt school could be assessed, the model was extended upstream geographically and truncated at the downstream end to approximately 4 km from the Site and simulated for the 10%, 5%, 1%, 0.5%, 1:1,000, 1:2,000, 1:10,000, 1:100,000 AEP, and PMF flood events as specified by LCC. The extent of the base case model is presented in Figure 2.1. The total model area is 28.2 km². The adopted grid cell size is 5 m, which provides suitable definition of the road surface and waterways, without resulting in unreasonable simulation durations.

The following sections outline the hydraulic assessment and results.

2.1 Base Case Model Development

The parametrisation of the TUFLOW hydraulic model is summarised below:

- The Digital Elevation Model (DEM) used in the hydraulic model was based on Lismore 1m LiDAR 2010 retrieved from ELVIS Elevations, as well as incorporation of site existing topography provided by ADCO Constructions dated 22 November 2023 (ref. 'CIVIL TIN & EX TIN.dwg').
- The data input for the hydraulic structures are adopted from the data supplied by LCC, as well as asset data retrieved from LCC interactive mapping and Google Streetview. Hydraulic structures were input into TUFLOW, using either:
 - 1D structural elements, which includes upstream and downstream grid connection, invert levels, and size and number of culverts, and/or
 - Bridge layered flow constrictions to represent bridges and to account for two-dimensional flow behaviour and the alignment of the structure and interaction with piers.
- The Manning's 'n' roughness values applied in the model are presented in Table 2.1 below.
- Inflows for the 10%, 5%, 1%, 0.5%, 1:1,000, 1:2,000, 1:10,000, 1:100,000 AEP, and PMF rainfall scenarios from the Engeny URBS model developed for the Lismore Flood Risk Management Study (FRMS) were adjusted for the Site location. Critical durations and temporal patterns for each inflow location were also determined in the URBS model and applied to the hydraulic model. The inflows and the model extent are shown in Figure 2.1.

TABLE 2.1: MANNING'S ROUGHNESS VALUES

Land Use	Manning's 'n' Roughness
Pasture	0.05
Dams / Open Water	0.07
Creek Bed	0.025
Lightly Vegetated Creek	0.07
Medium Density Vegetation	0.07
Dense Vegetation	0.12

Land Use	Manning's 'n' Roughness
Sparse Vegetation	0.09
Sparse Urban Block	0.2
Road	0.025
Building	0.8
Cultivated Field	0.06

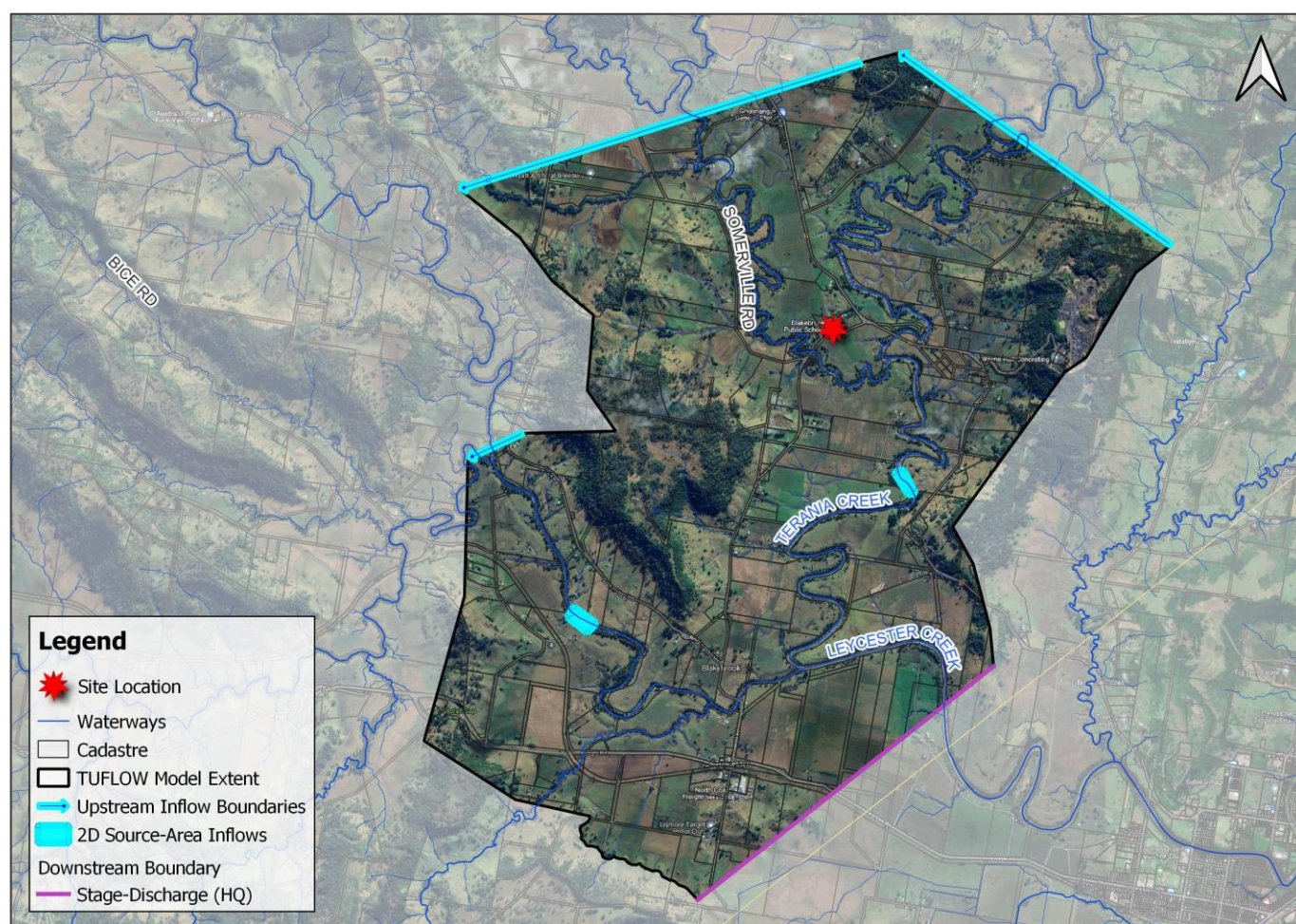


Figure 2.1: Model Extent and Inflow Locations

2.2 Post-Rebuild Case Model Development

The post-rebuild case TUFLOW model utilised all the same inputs as the base case, however, it also incorporated a design TIN representing works as supplied by ADCO Constructions dated 22 November 2023 (ref. 'CIVIL TIN & EX TIN.dwg'). The demolition of existing buildings in the post-rebuild case model was represented through adjustment of the Manning's roughness values by lowering the roughness to reflect surrounding land conditions, and the proposed school building was represented as a layered flow constriction in the model, based on the

supplied architectural plans by Pedavoli Architects dated 03/10/2023 (ref. 'BLA-ARC-PP-DWG-200[B]_ELEVATIONS.pdf' and ref. 'BLA-ARC-PP-DWG-201[B]_ELEVATIONS.pdf').

The post-rebuild case model setup is presented in Figure 2.2.



Figure 2.2: Post-Rebuild Case Model Representation

3. FLOOD RISK ASSESSMENT

3.1 Base Case Flood Risk Assessment

3.1.1 Immunity of Site

The existing flood immunity of the Site is presented in Figure 3.1 below, showing the flood extents for the 10%, 5%, and 1% AEP events. The existing site is generally flood immune in the 10% AEP flood event, with flooding only present at the south-eastern corner of the Site where there were no existing buildings located. The Site becomes partially inundated in the 5% AEP event, and almost completely inundated in the 1% AEP event, as shown in Figure 3.1 below. The 1% AEP flood depths surrounding the Site are presented in Figure 3.2 along with key reporting locations, which have been selected to indicate flood conditions over the roads to inform evacuation from the Site. As shown in Figure 3.2, all the roads surrounding the Site are inundated in the base case, blocking access to and from the Site in the 1% AEP event.

Mapping of the base case flood results for the full range of events from the 10% AEP to the PMF is provided in Appendix A.



Figure 3.1: Base Case Flood Immunity

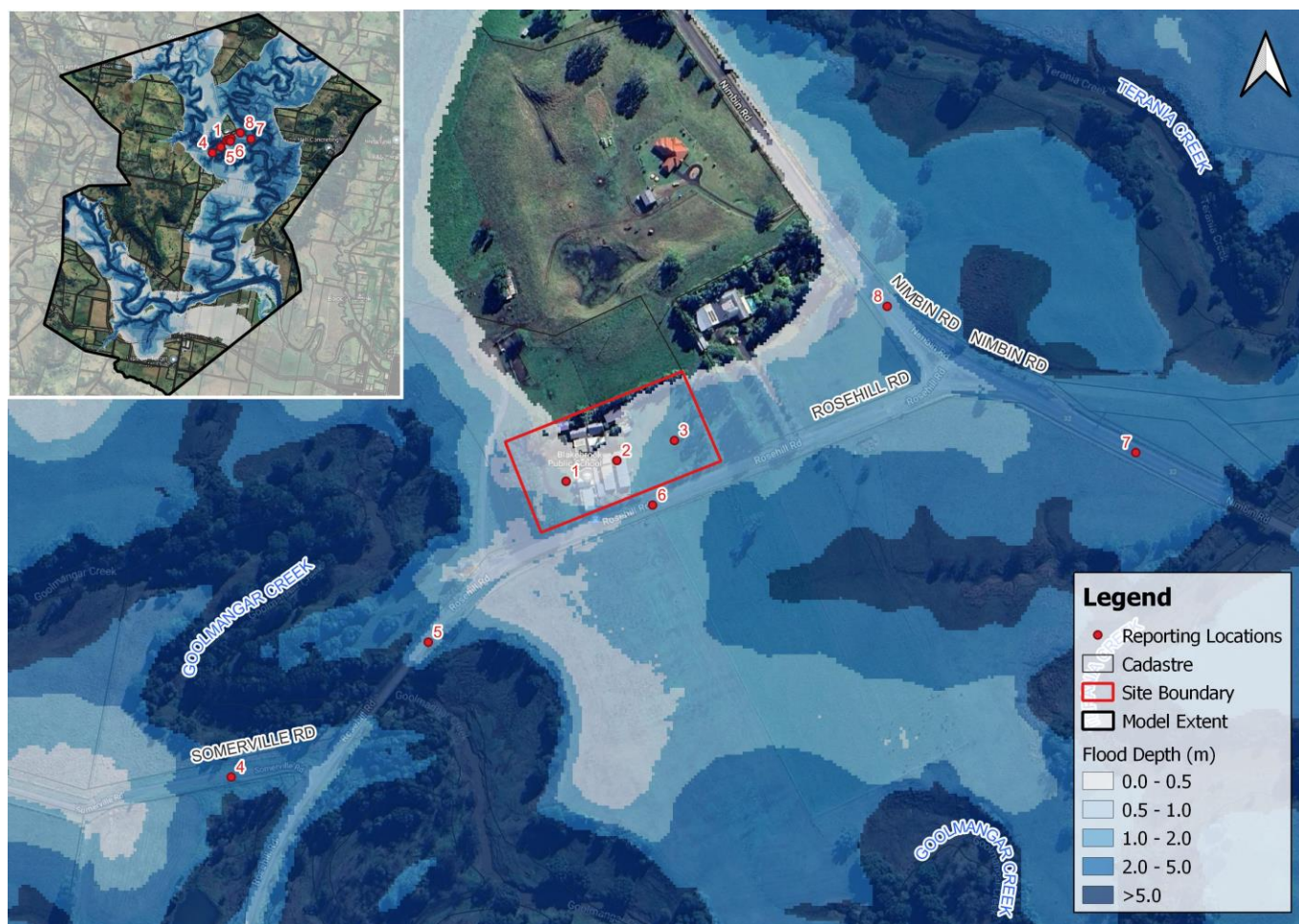


Figure 3.2: Base Case 1% AEP Flood Depth

3.2 Post-Rebuild Case Flood Risk Assessment

3.2.1 Proposed School Building Flood Risk Results

The flood depth, level, velocity, and hazard levels at the proposed new school building location for all AEPs are summarized in Table 3.1 below. Mapping of the post-rebuild case flood results for the full range of events from the 10% AEP to the PMF is provided in Appendix B.

TABLE 3.1: POST-REBUILD CASE FLOOD RESULTS AT REPORTING LOCATION 1 – ALL AEPs

AEP	Flood Depth (m)	Flood Height (m AHD)	Flood Velocity (m/s)	Flood Hazard (m ² /s)	Flood Hazard Classification (ZAEM1)
10 %	0.00	N/A	0.00	0.00	N/A
5 %	0.00	N/A	0.00	0.00	N/A
1 %	0.43	15.53	0.30	0.13	H2
0.5 %	0.75	15.84	0.35	0.26	H3

AEP	Flood Depth (m)	Flood Height (m AHD)	Flood Velocity (m/s)	Flood Hazard (m ² /s)	Flood Hazard Classification (ZAEM1)
1 in 1000	0.92	16.02	0.36	0.34	H3
1 in 2000	1.06	16.16	0.38	0.40	H3
1 in 10000	1.19	16.29	0.39	0.46	H3
1 in 100000	1.93	17.03	0.46	0.89	H4
PMF	3.29	18.38	0.58	1.91	H5

3.2.2 Broader Site Flood Risk Results

The 1% AEP flood depth and key reporting locations for the post-rebuild case are presented in Figure 3.3: below. Reporting locations have been selected within the Site boundary as well as at roads surrounding the Site to inform evacuation conditions.

The flood depth, level, velocity, hazard, and duration of inundation are presented in Table 3.2 below, with the flood hazard classification results and hazard category definitions presented in Figure 3.4 and Figure 3.5, respectively.

The flood hazard classifications presented in Figure 3.4 are in accordance with the Australian Rainfall & Runoff (ARR) 2019 guidelines safety design criteria to categorize hazard levels for pedestrians, vehicles, and buildings, which are based on the depth-velocity product as presented in Figure 3.5. As shown in Table 2.1 above, the lowest hazard classification over the roads surrounding the Site (reporting locations 4 to 8) in the 1% AEP event is H3, which is unsafe for vehicles, children, and the elderly. The duration of inundation above 10 mm over the roads (reporting locations 4 to 8) ranges from 16 hours to 31 hours. As access to and from the Site is via each of these roads, it is unlikely that evacuation from the Site will be possible in the 1% AEP event. However, these hazard levels have not changed in comparison to the base case and are consistent with the existing flooding conditions. The flood immunity of the school has also not altered from the base case as the flood extents are the same in the post-rebuild case. It is recommended that appropriate warning time be given in advance of major flood events to allow sufficient time for people to evacuate prior to the flood occurring.

TABLE 3.2: POST-REBUILD CASE 1% AEP FLOOD RESULTS

Reporting Location	Flood Depth (m)	Flood Height (m AHD)	Flood Velocity (m/s)	Flood Hazard (m ² /s)	Flood Hazard Classification (ZAEM1)	Duration of Inundation above 10mm (hr)
1 (Site)	0.43	15.53	0.30	0.13	H2	11
2 (Site)	0.45	15.49	0.04	0.02	H2	10
3 (Site)	1.26	15.49	0.03	0.02	H4	17
4 (Somerville Rd)	3.37	15.53	1.96	1.84	H5	31
5 (Rosehill Rd)	1.49	15.51	1.57	1.10	H5	21

Reporting Location	Flood Depth (m)	Flood Height (m AHD)	Flood Velocity (m/s)	Flood Hazard (m ² /s)	Flood Hazard Classification (ZAEM1)	Duration of Inundation above 10mm (hr)
6 (Rosehill Rd)	1.11	15.49	0.41	0.34	H3	16
7 (Nimbin Rd)	3.36	15.48	0.48	1.56	H5	30
8 (Nimbin Rd)	1.30	15.49	0.32	0.42	H4	18

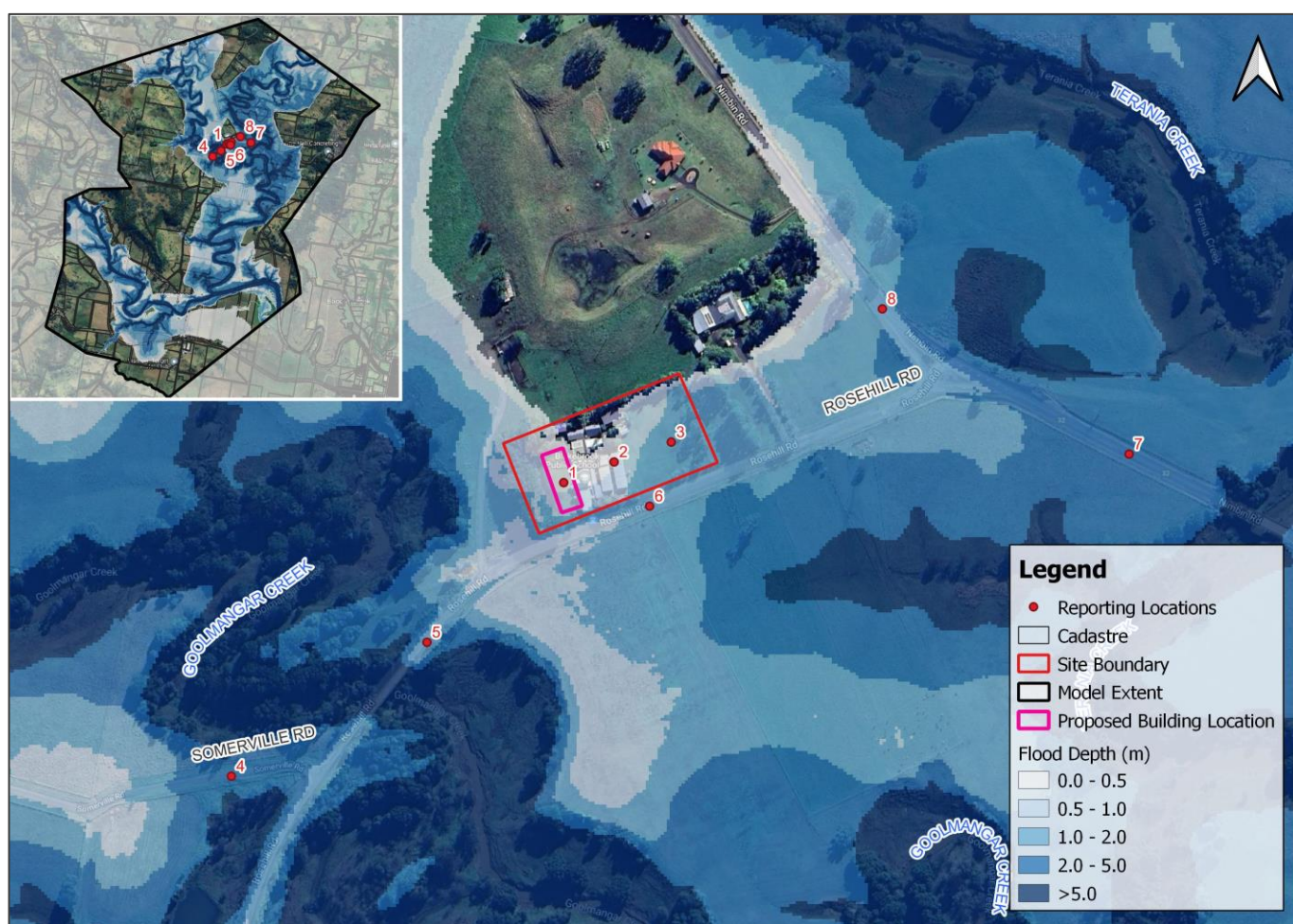


Figure 3.3: Post Rebuild Case 1% AEP Flood Depth

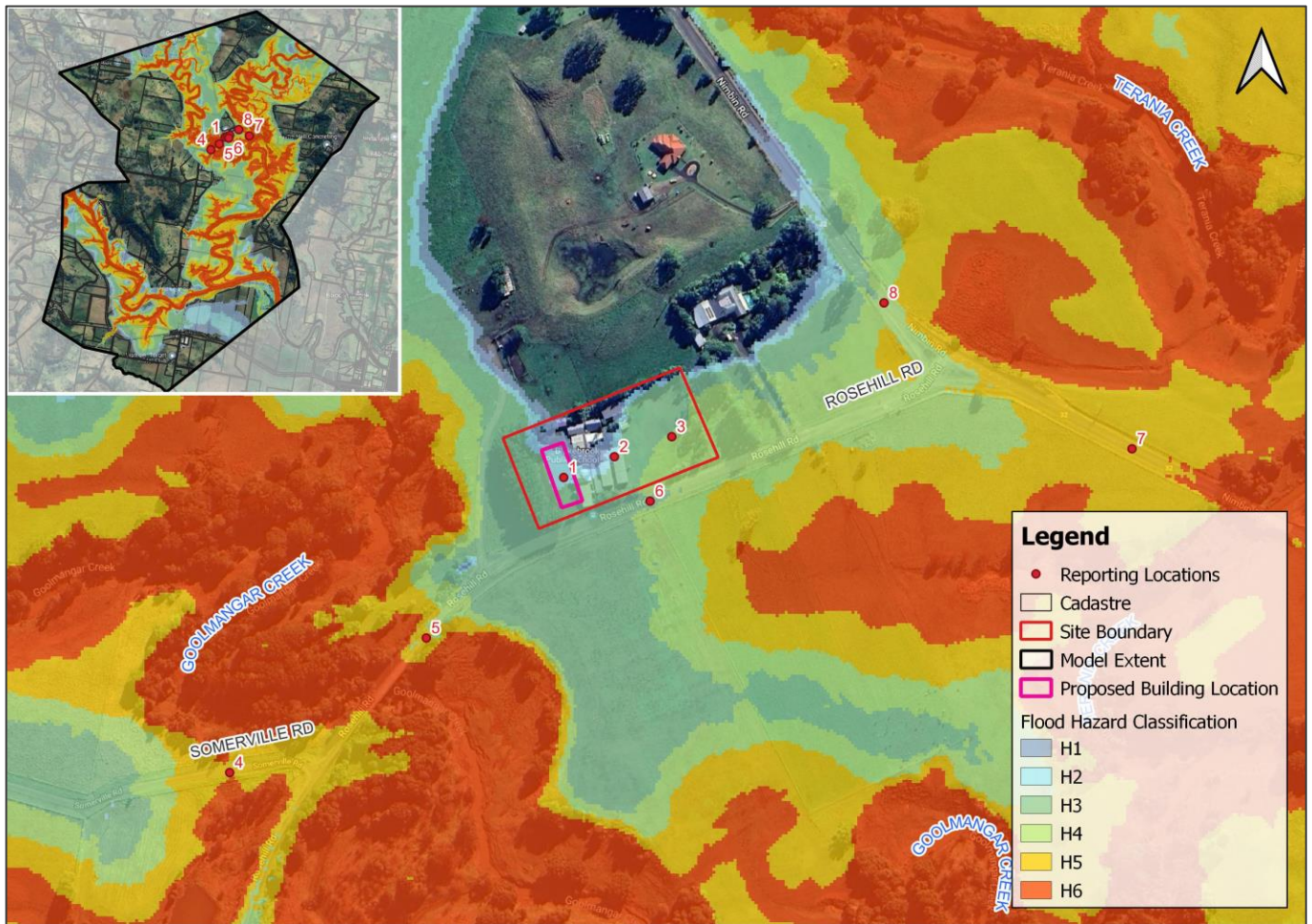


Figure 3.4: Post-Rebuild Case 1% AEP Flood Hazard Classification (ZAEM1)

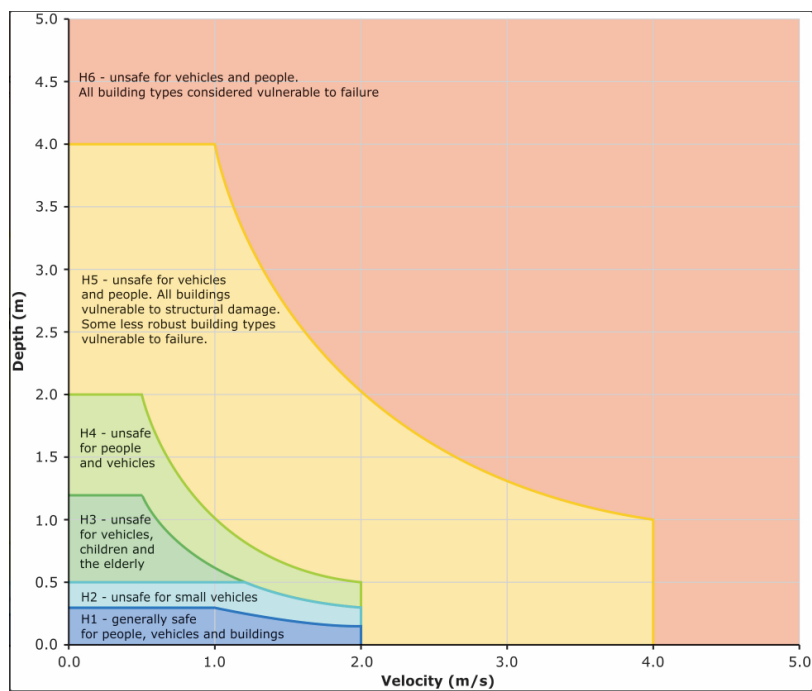


Figure 3.5: Combined Flood Hazard Curves (Smith et al., 2014)

3.2.3 Evacuation and Access

The flood results indicate that there is flooding over all access roads in the immediate vicinity of the Site from the 10% AEP event and higher. The depths in the 10% AEP event range from approximately 100 mm to 300 mm over the roads (Rosehill Rd and Nimbin Rd). However, if evacuation is required, the preferred route would likely be via Rosehill Rd to the south-west of the Site as the road is largely flood free after the Goolmangar Creek crossing approximately 700 m from the entrance to the school. The evacuation route would require travelling down Rosehill Rd to Kyogle Rd and then south-east towards the Lismore CBD. However, it is noted that there is likely to be significant flooding further downstream along the evacuation route at the Lismore CBD. It is advised that appropriate flood warning is given to allow for evacuation prior to any flood event occurring.

3.2.4 Immunity of Proposed School

The Defined Flood Event (DFE) for the Site is the 1% AEP event, plus 500mm freeboard required for the flood planning level (FPL), as per the NSW Government Flood Risk Management Manual (2023) referenced in the Lismore Local Environmental Plan 2012 (LEP 2012). The flood level for the 1% AEP at the proposed building location is 15.53 m AHD. The architectural plans provided by Pedavoli Architects dated 03/10/2023 (ref. 'BLA-ARC-PP-DWG-200[B]_ELEVATIONS.pdf' and ref. 'BLA-ARC-PP-DWG-201[B]_ELEVATIONS.pdf') indicate that the finished floor level (FFL) of the proposed building will be at 19.20 m AHD, which indicates that the school will be immune to flooding in this event with sufficient freeboard, noting that there is approximately 500 mm of flood depth over the building undercroft (set at 15 m AHD in the supplied architectural plans) as indicated by the flood depth results summarized in Table 3.1.

4. FLOOD IMPACT ASSESSMENT

The flood height impact results for the 10% AEP to the 1% AEP events are provided in Appendix C.

A summary of flood impacts at key reporting locations surrounding the proposed building and along Rosehill Rd at the frontage of the Site (refer Figure 4.1) is presented in Table 4.1 below.

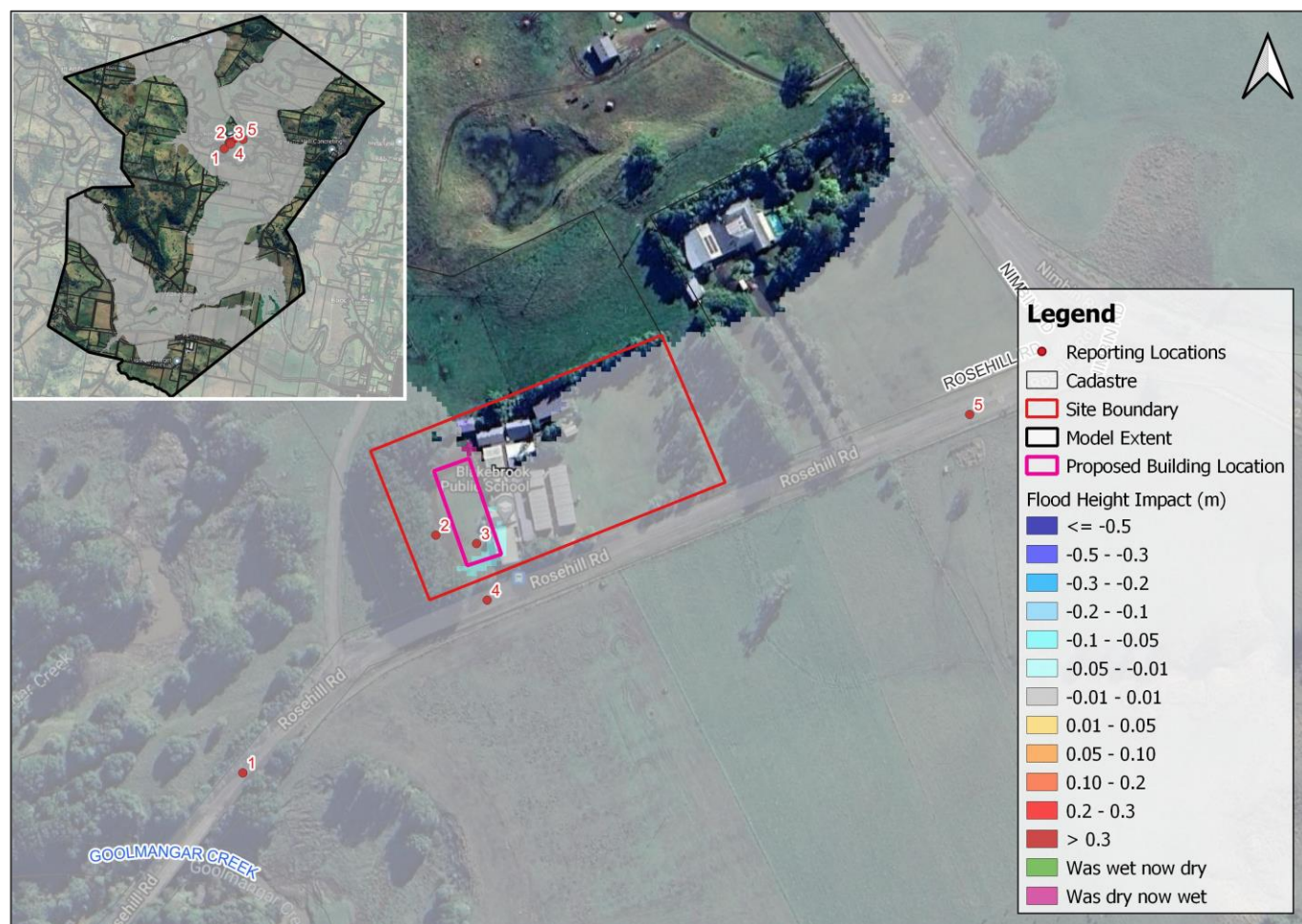


Figure 4.1: 1% AEP Flood Height Afflux and Reporting Locations

TABLE 4.1: FLOOD HEIGHT IMPACT RESULTS

Reporting Location	10% AEP Flood Height Impact (m)	5% AEP Flood Height Impact (m)	1% AEP Flood Height Impact (m)
1 (Rosehill Rd)	0.00	0.00	0.00
2 (Within Site Boundary)	0.00	0.03	0.00
3 (Rosehill Rd)	0.00	Was Inundated (Wet) Now Immune (Dry)	-0.01
4 (Within Site Boundary)	0.00	-0.02	0.00

Reporting Location	10% AEP Flood Height Impact (m)	5% AEP Flood Height Impact (m)	1% AEP Flood Height Impact (m)
5 (Rosehill Rd)	0.00	0.00	0.00

As shown in Table 4.1, there are no impacts external to the Site from the 10% AEP to the 1% AEP events as a result of the proposed school rebuild. There is an increase in flood level of 30 mm in the 5% AEP event to the west of the proposed building, which is expected due to the proposed building causing minor blockage of flows from the Goolmangar Creek system from the west that would otherwise flow through the Site.

5. SUMMARY AND CONCLUSION

The following is a summary of the flood assessment undertaken for the proposed reconstruction works at the Blakebrook Public School located at 417 Rosehill Road, Blakebrook, NSW 2840:

- Development and simulation of a base case and post-rebuild case hydraulic model for the following events: 10%, 5%, 1%, 0.5%, 1:1000, 1:2000, 1:10,000, 1:100,000 AEPs and PMF.
- Flood risk assessment to evaluate the flood immunity and evacuation conditions for the school in the base case and post-rebuild case.
- Flood impact assessment to identify potential impacts resulting from the proposed works at the school.

The assessment has identified the following:

- Flood Risk Assessment:
 - No change in flood immunity of the Site from the base case to the post-rebuild case.
 - Flood immunity for the 1% AEP event is achieved in the post-rebuild case as the proposed FFL (19.20 m AHD) is above the 1% AEP flood level (15.53 m AHD). Depths of up to approximately 500mm are predicted over the undercroft of the proposed building.
 - No change in flood conditions in relation to evacuation between the base case and post-rebuild case. All roads surrounding the Site are inundated in both the base case and post-rebuild case, with hazard levels exceeding safe levels for vehicles and pedestrians.
 - The preferred evacuation route would most likely be via Rosehill Rd in the south-west direction, down to Kyogle Rd, and then to the south-east towards the Lismore CBD, however it is noted that there may be significant flooding surrounding the Lismore CBD.
 - It is recommended that appropriate warning time be given in advance of major flood events to allow sufficient time for evacuation prior to the flood occurring.
- Flood Impact Assessment:
 - The proposed works for the Blakebrook Public School are not predicted to result in a material change to the existing flood behaviour from Goolmangar Creek and Terania Creek in the 10% AEP to the PMF events.
 - The model results show a maximum increase in flood level of 30mm adjacent to the proposed building location in the 5% AEP event, however, this is contained within the Site and does not impact any external properties or road.

The above assessment indicates that the proposed works at the Site are predicted to provide sufficient flood immunity for the school and are not expected to cause any adverse impacts external to the Site. It is recommended that appropriate flood warning and emergency response measures be taken to allow for evacuation from the Site to mitigate the risk of isolation in the event of flooding.

6. REFERENCES

NSW Government (2012). *Lismore Local Environmental Plan 2012 (2013 EPI 66)*.

NSW Government (2023). *Flood Risk Management Manual: The policy and manual for the management of flood liable land*.

Smith, G.P., Davey, E.K. and Cox, R.J. (2014), Flood Hazard UNSW Australia Water Research Laboratory Technical Report 2014/07 30 September 2014.

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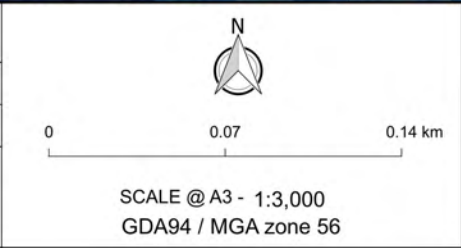
APPENDIX A: BASE CASE FLOOD MAPPING





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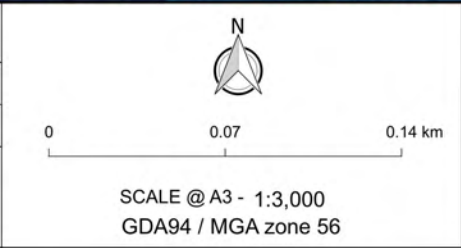
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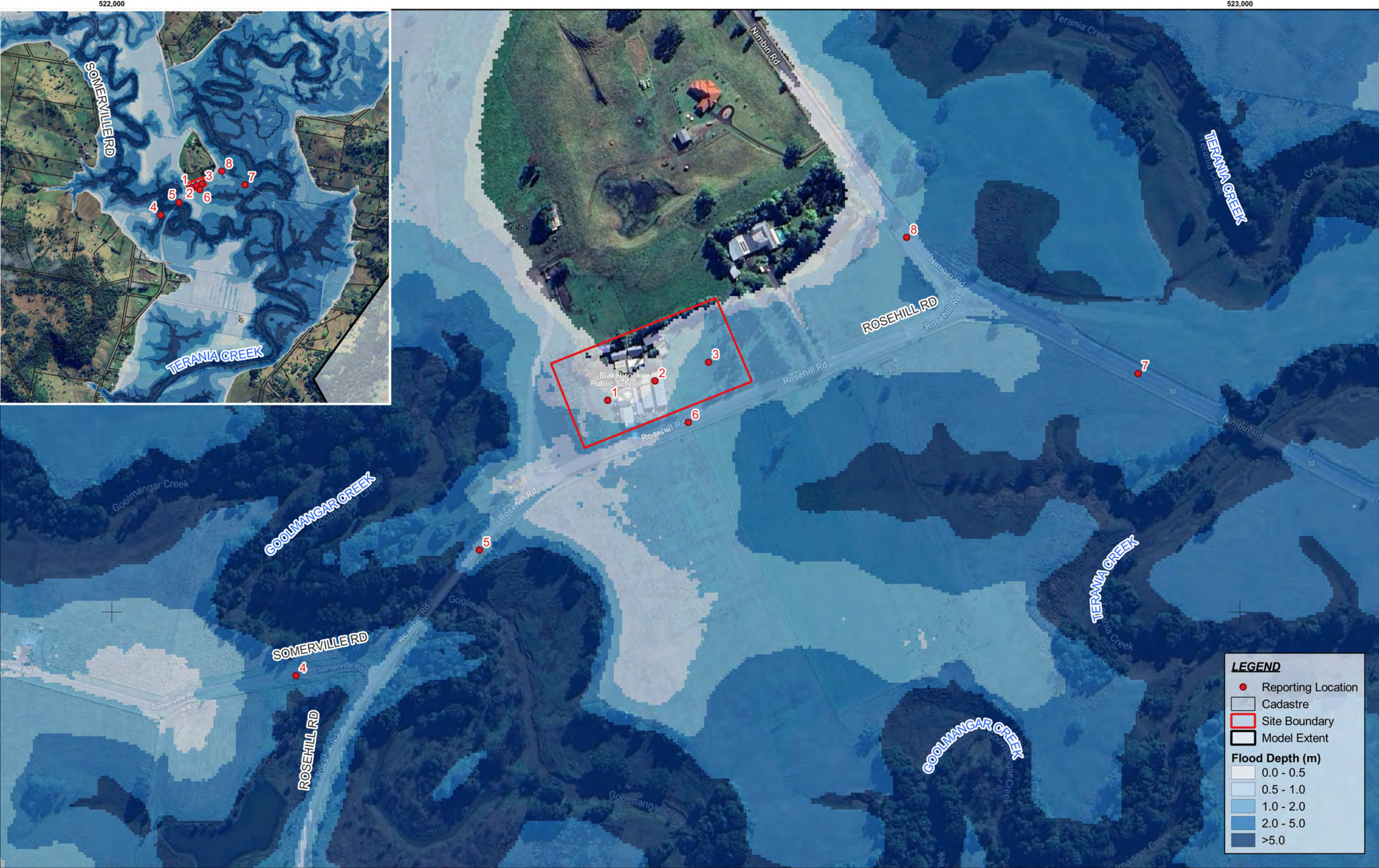
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Figure A2

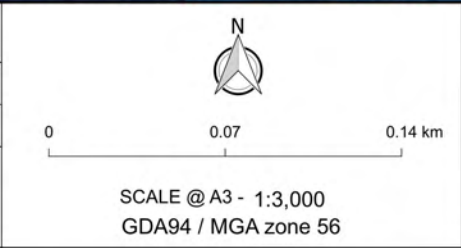
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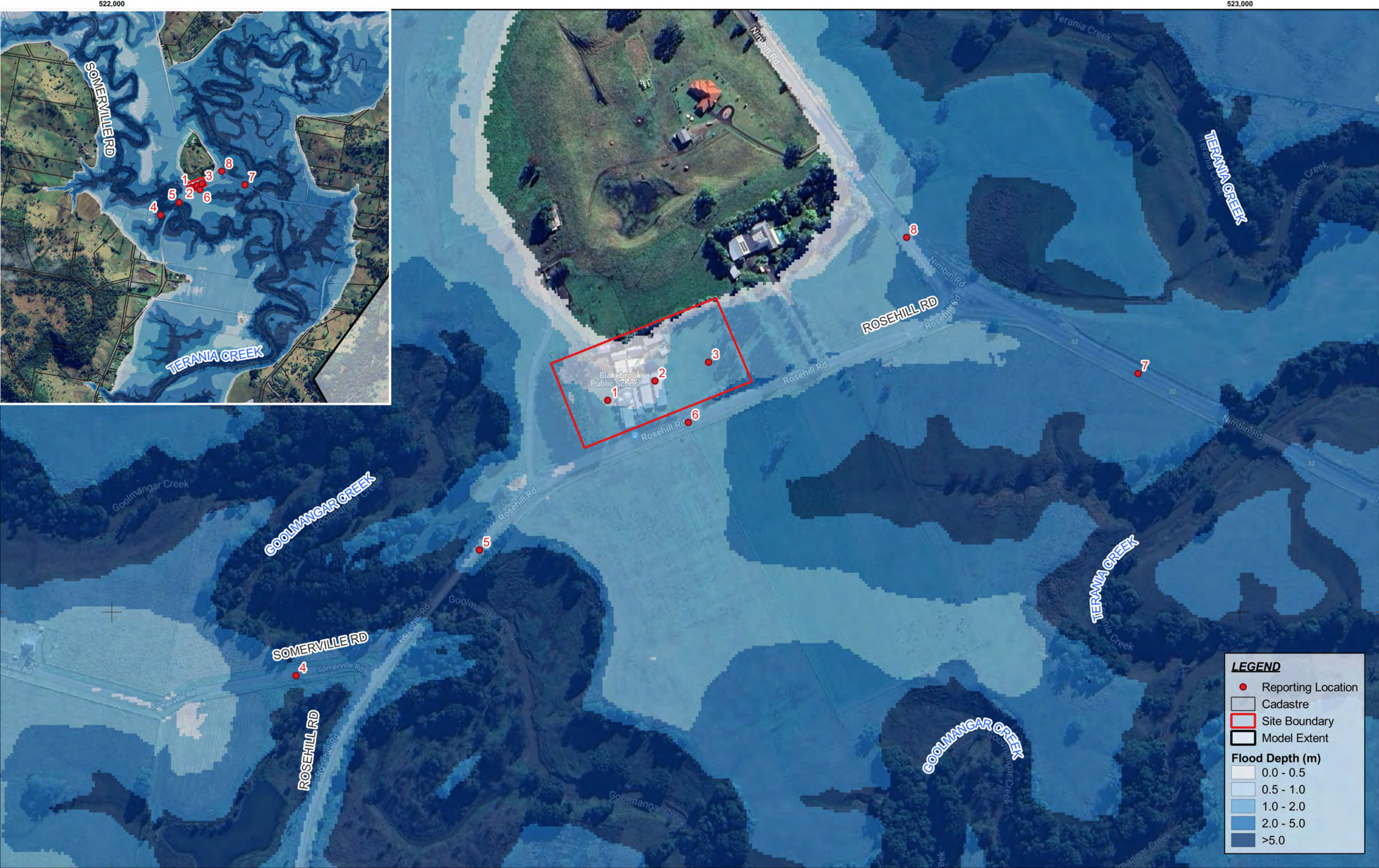
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Figure A3

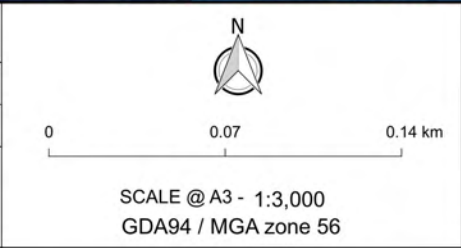
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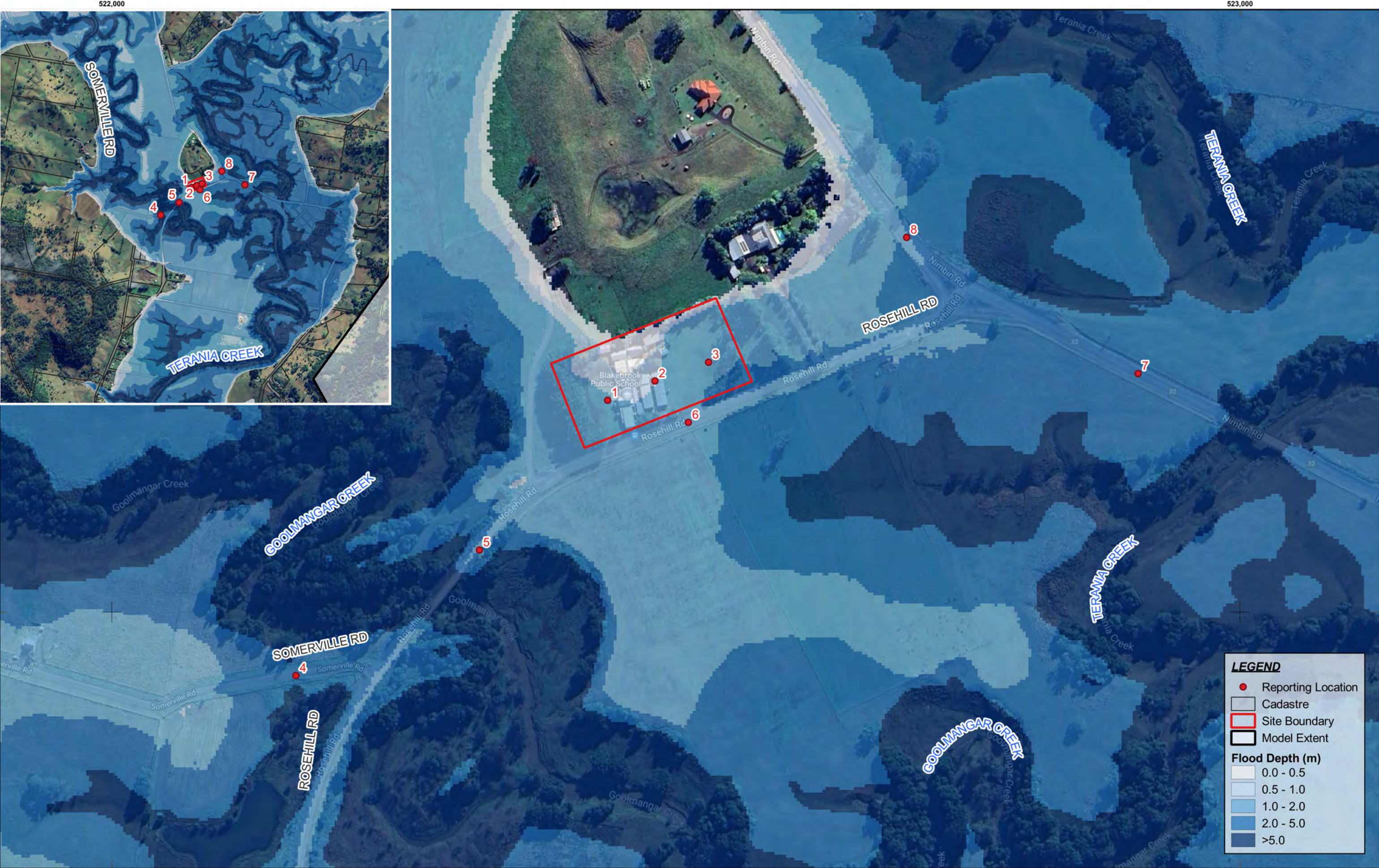
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Figure A4

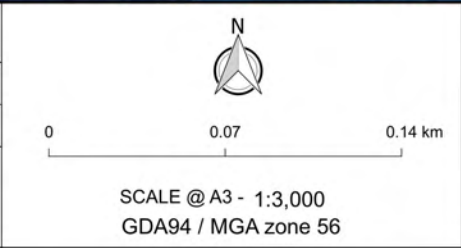
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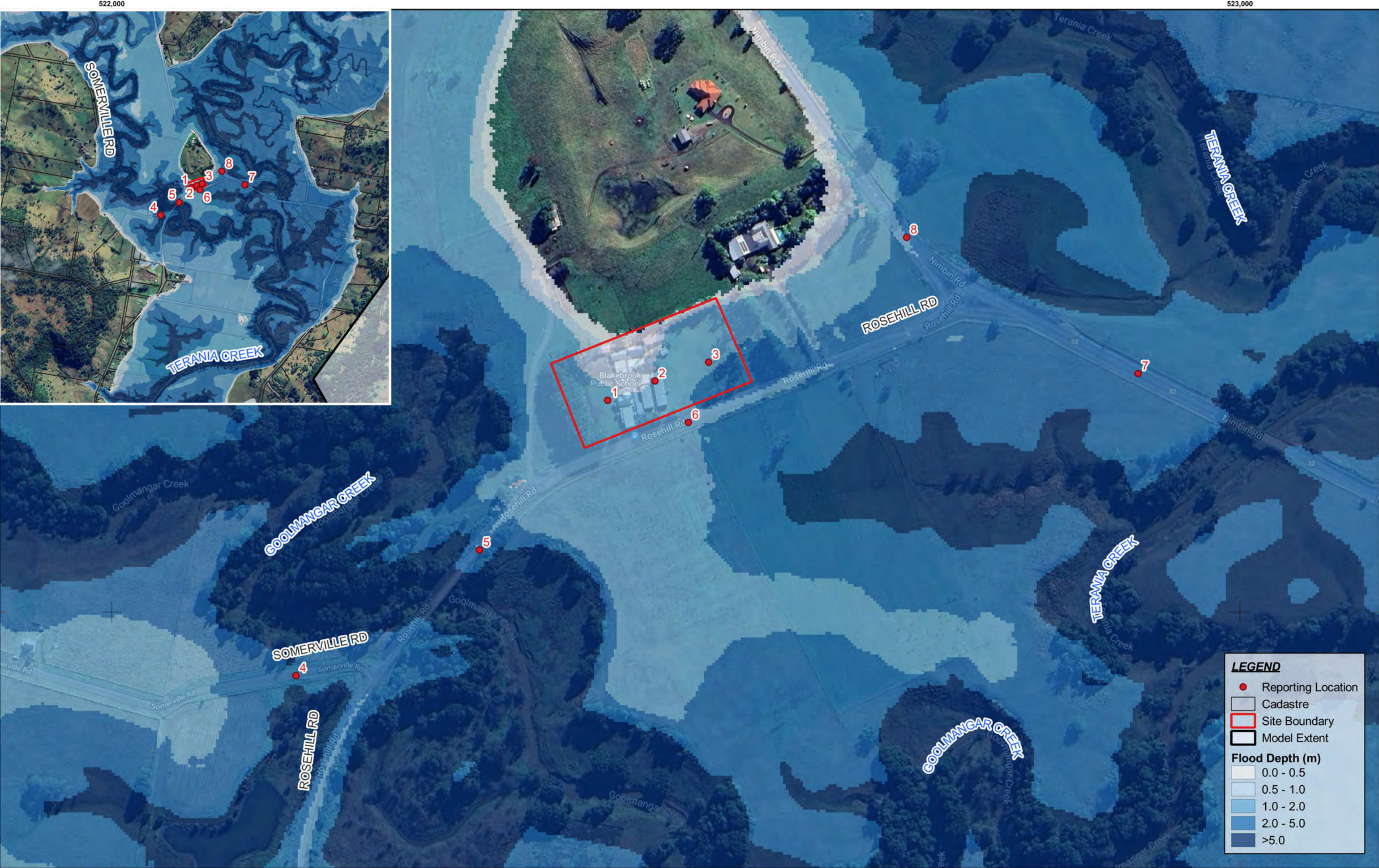
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Figure A5

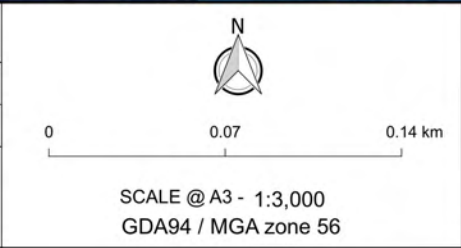
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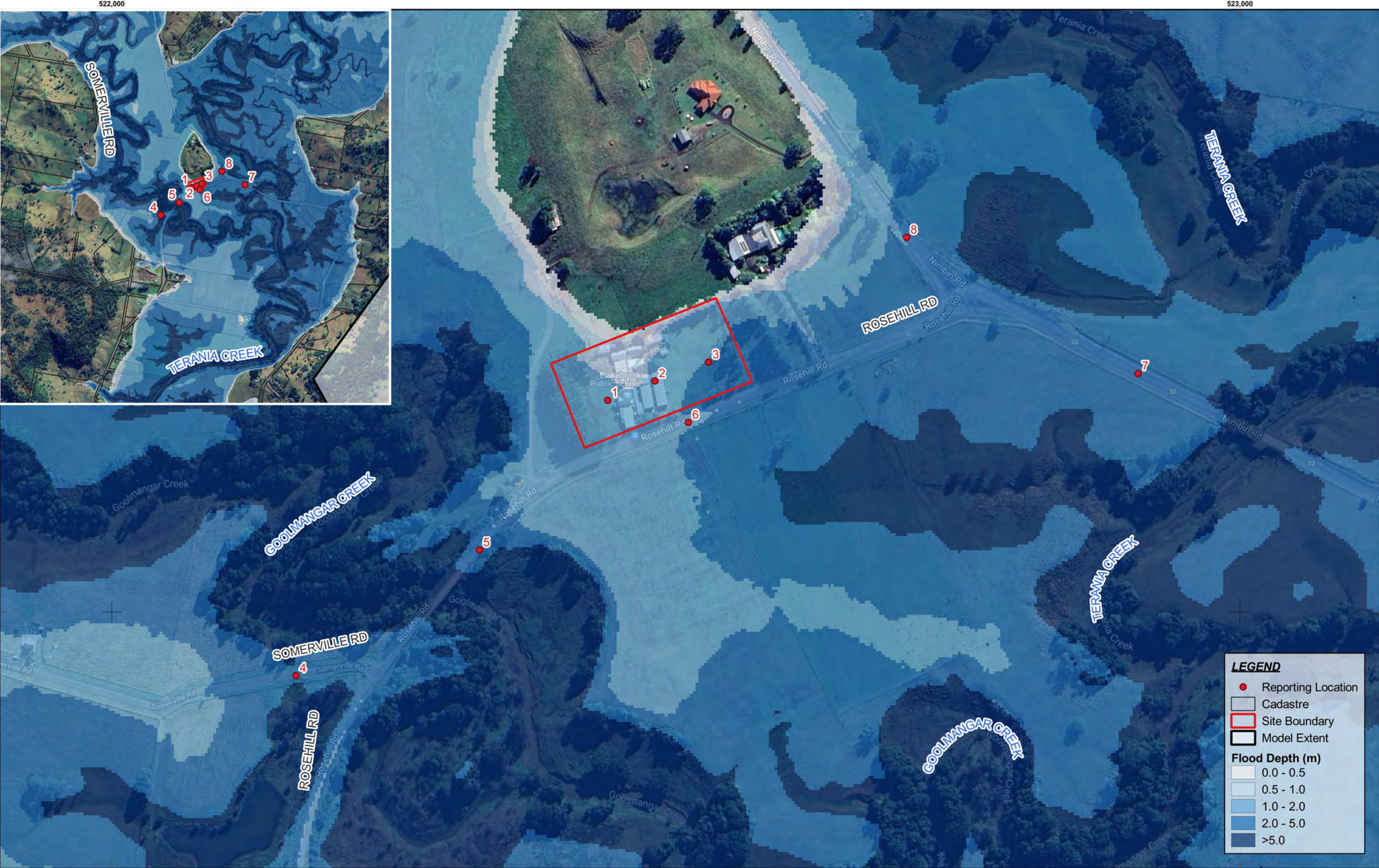
DATA SOURCE
QLD Government Open Data Source



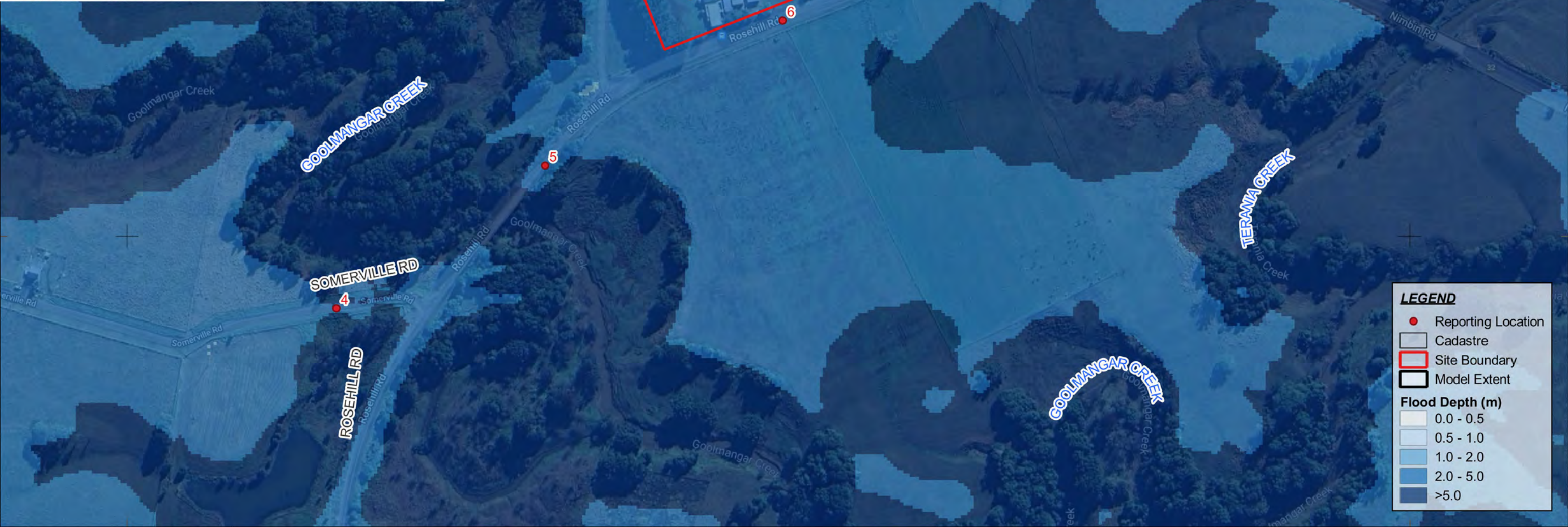
Figure A6

NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 2000 AEP Flood Depth

Dwg Ref:
QC3008_001-SKE-0001

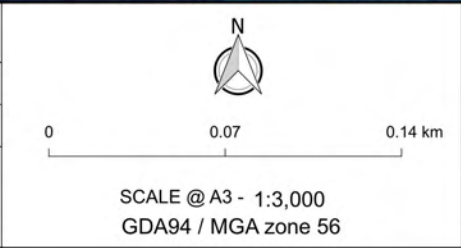


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1	Final Issue	05-12-2023	DRAWN	RS	CHECKED	KM					
			APPROVED	MP	DATE	05-12-2023					
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Figure A8

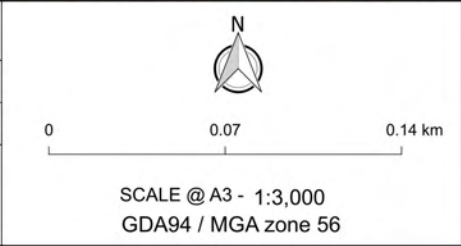
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 100000 AEP Flood Depth

Dwg Ref:
QC3008_001-SKE-0001



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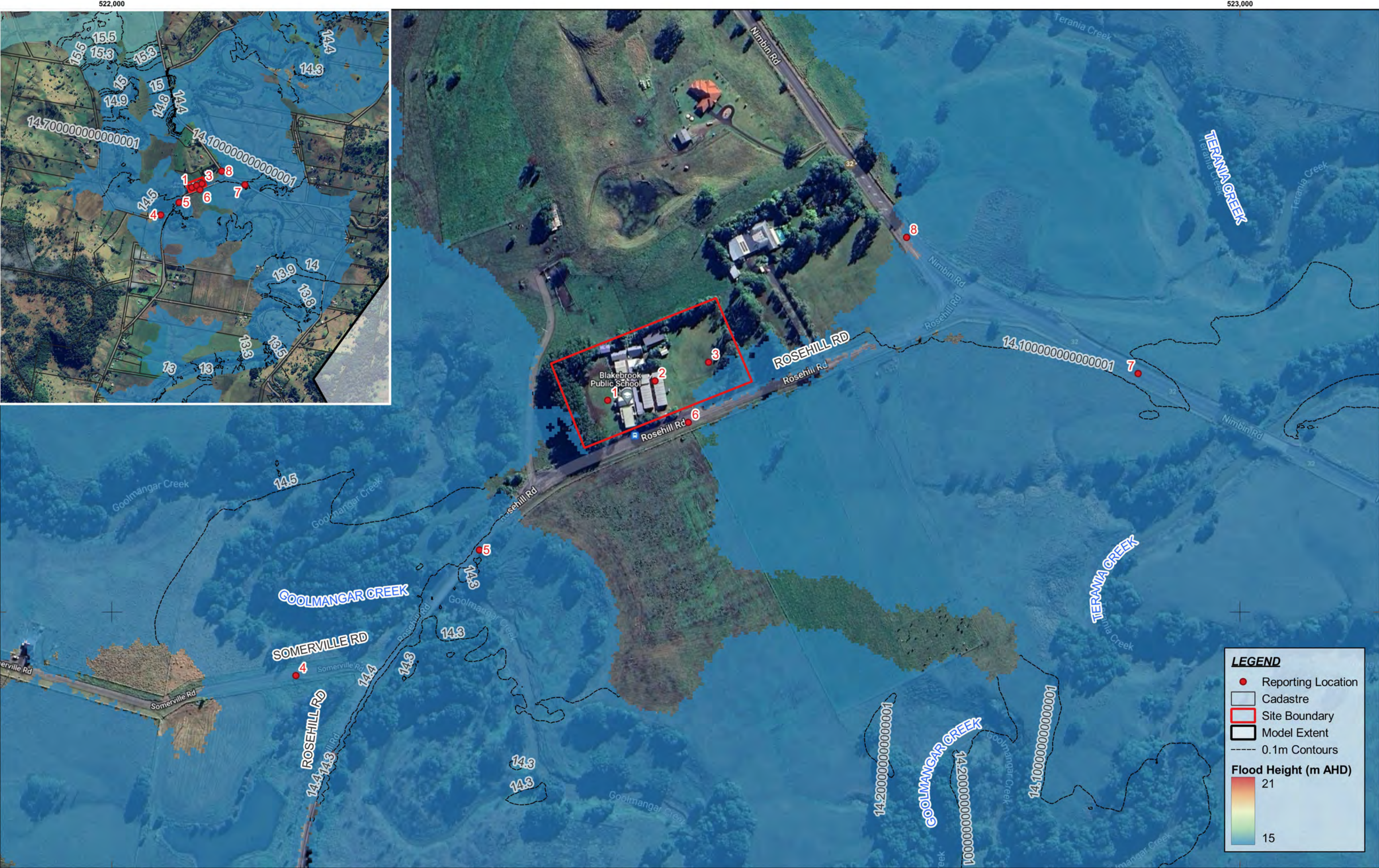
DATA SOURCE
QLD Government Open Data Source



Figure A9

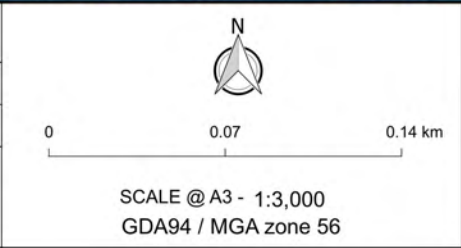
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case PMF Flood Depth

Dwg Ref:
QC3008_001-SKE-0001



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Figure A10

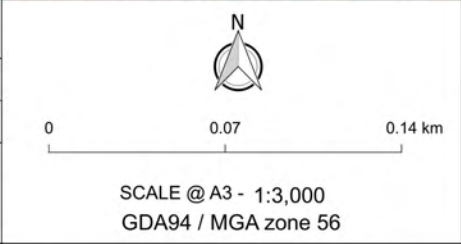
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 10% AEP Flood Height

Dwg Ref:
QC3008_001-SKE-0001



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Figure A11

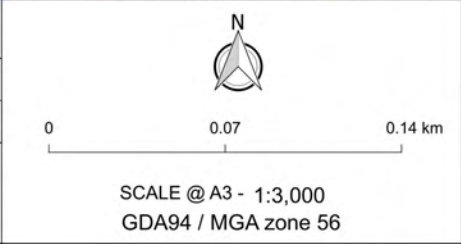
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 5% AEP Flood Height

Dwg Ref:
QC3008_001-SKE-0001



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Figure A12

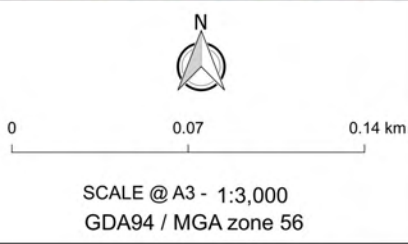
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1% AEP Flood Height

Dwg Ref:
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Figure A13

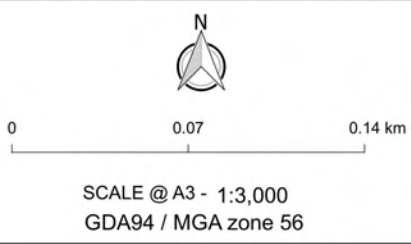
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 0.5% AEP Flood Height

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Figure A14

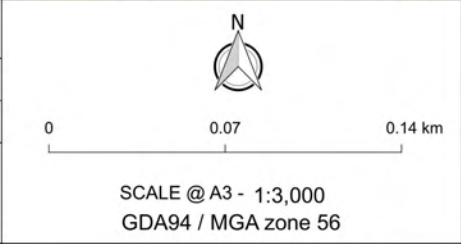
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 1000 AEP Flood Height

Dwg Ref:
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Figure A15

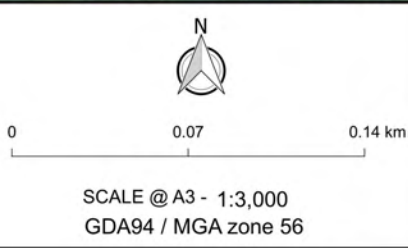
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 2000 AEP Flood Height

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QC3008_001-SKE-0001



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Figure A16

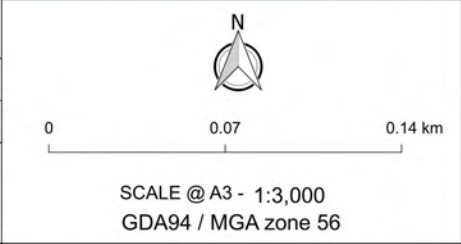
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 10000 AEP Flood Height

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Figure A17

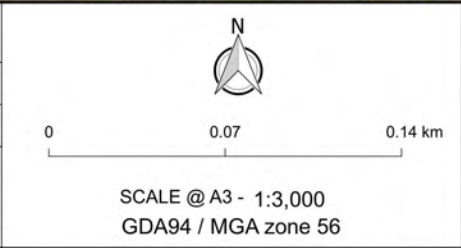
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 100000 AEP Flood Height

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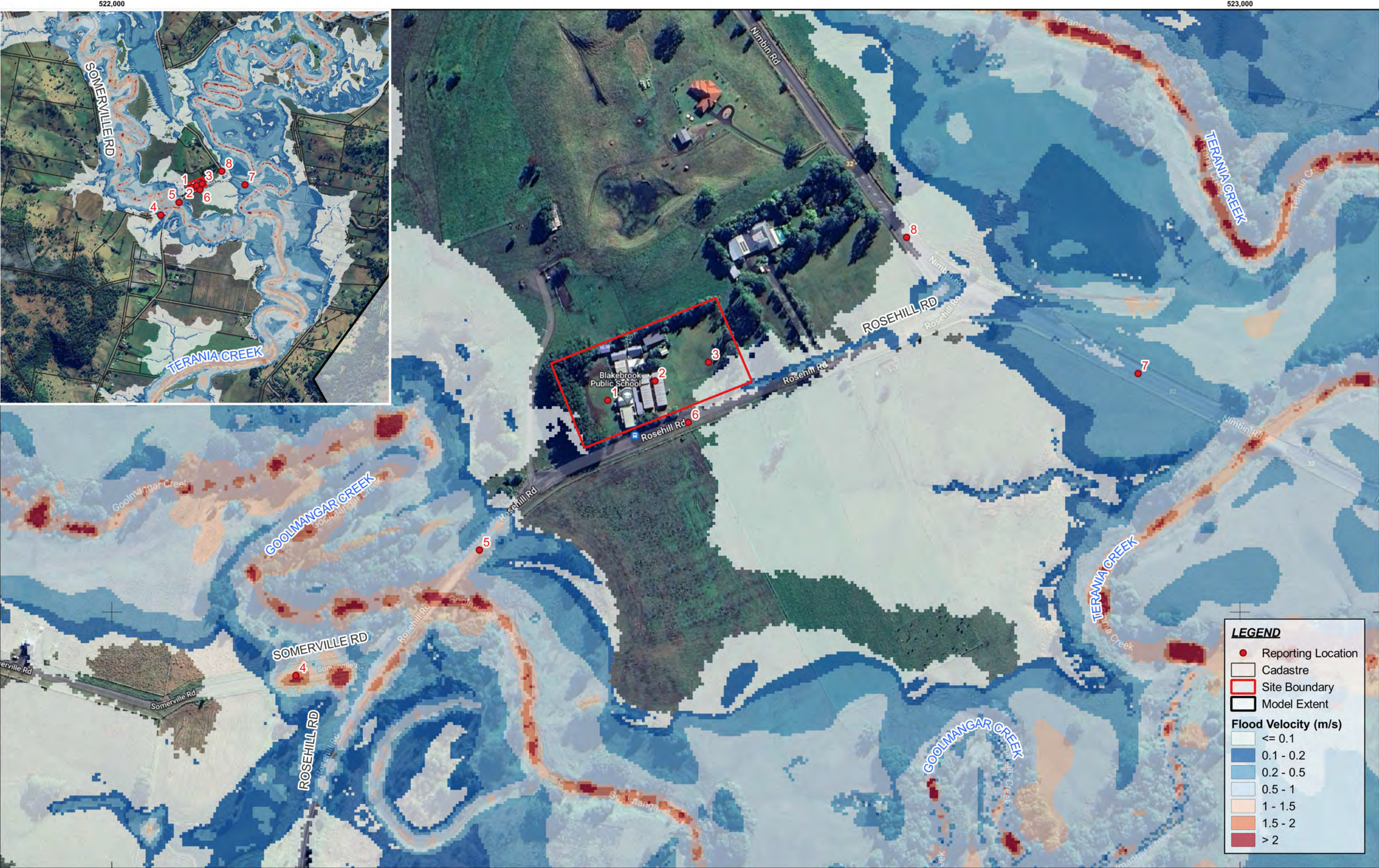
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QLD Government Open Data Source



Figure A18

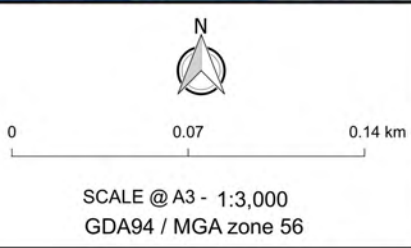
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case PMF Flood Height

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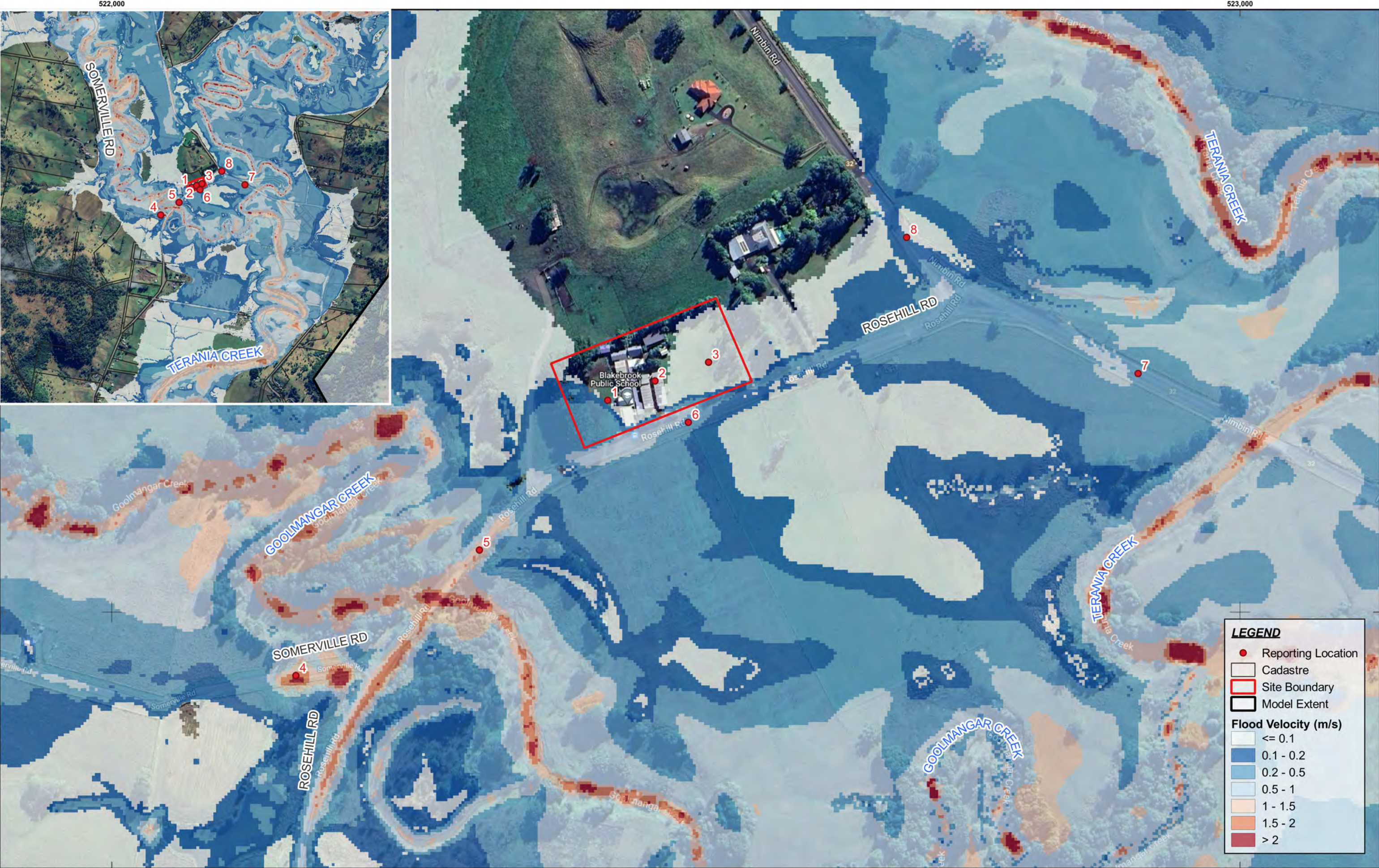
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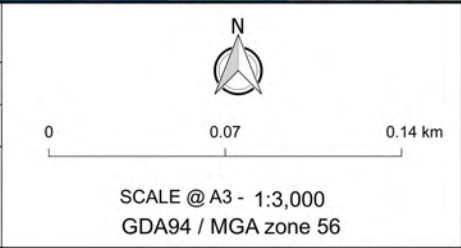
Figure A19
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 10% AEP Flood Velocity

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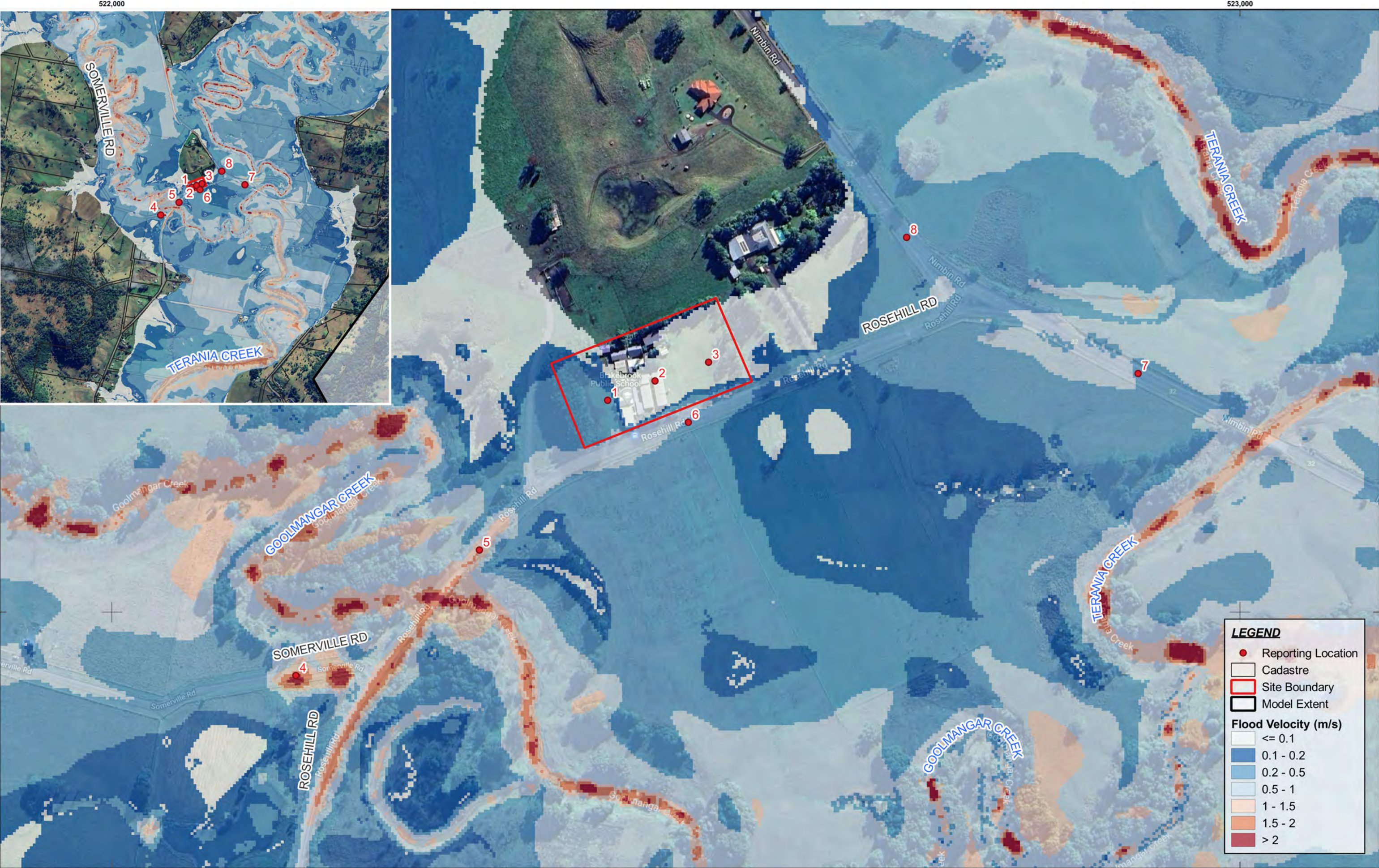
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QLD Government Open Data Source



Figure A20

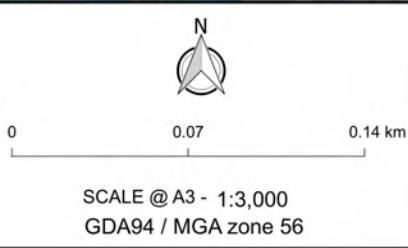
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 5% AEP Flood Velocity

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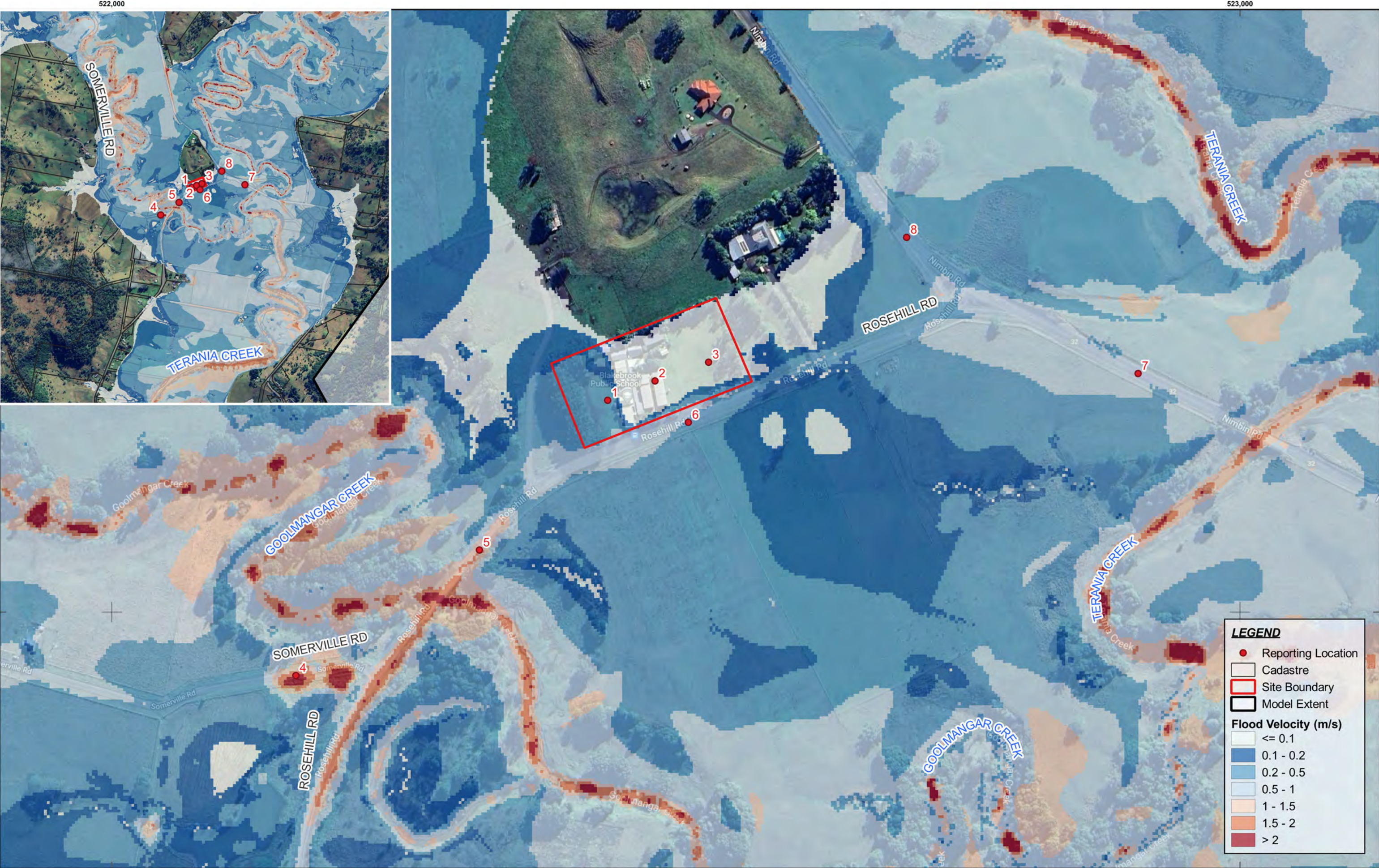
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Figure A21

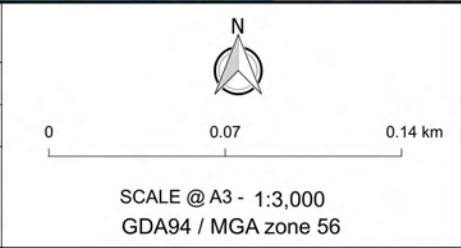
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1% AEP Flood Velocity

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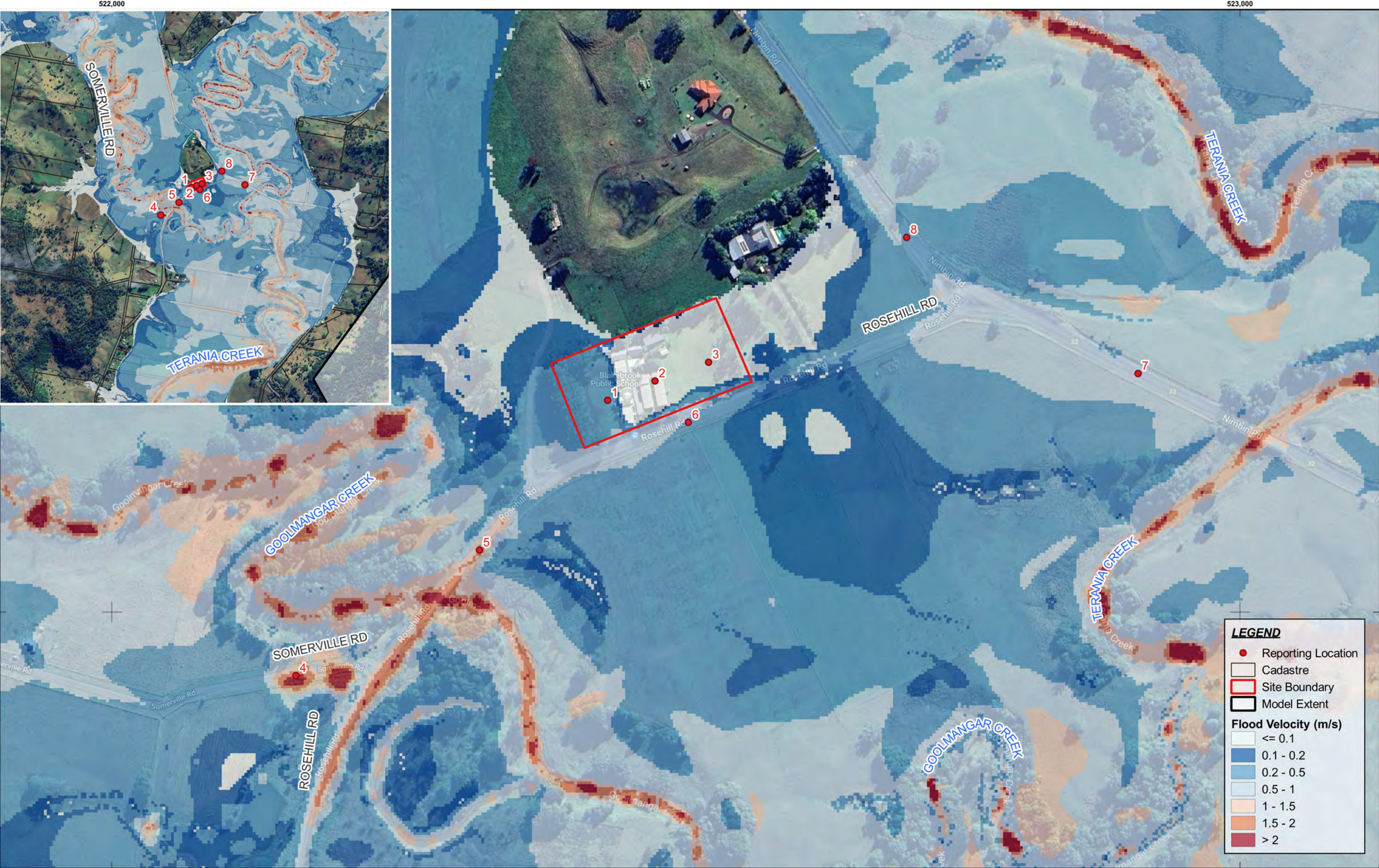
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Figure A22

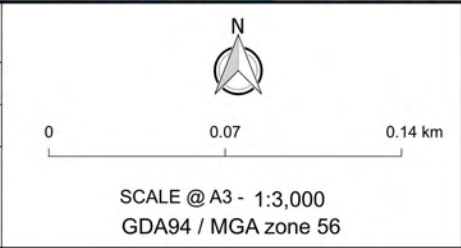
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 0.5% AEP Flood Velocity

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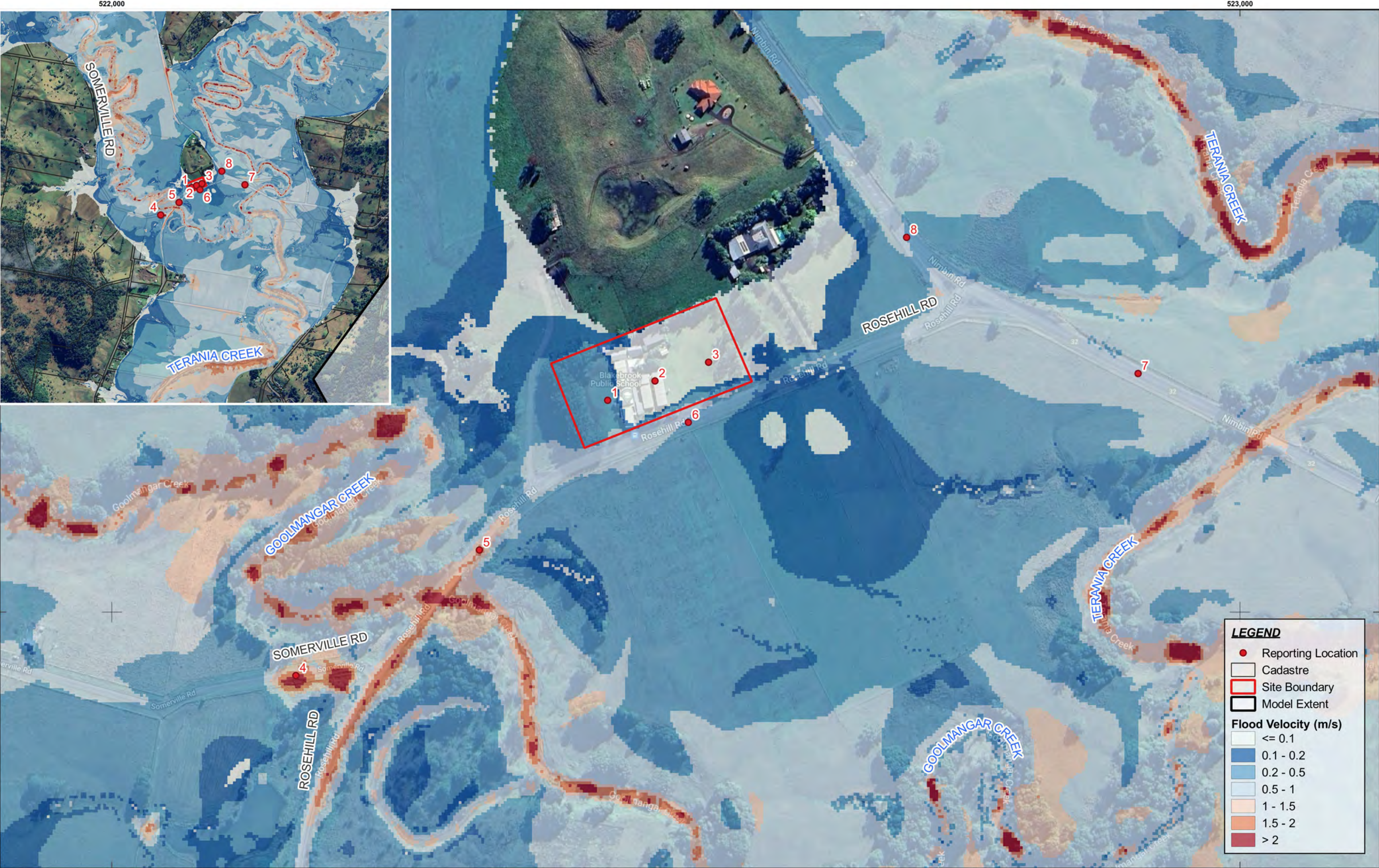
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QLD Government Open Data Source



Figure A23

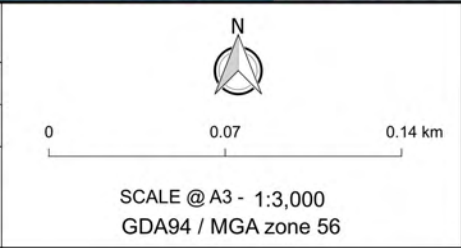
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 1000 AEP Flood Velocity

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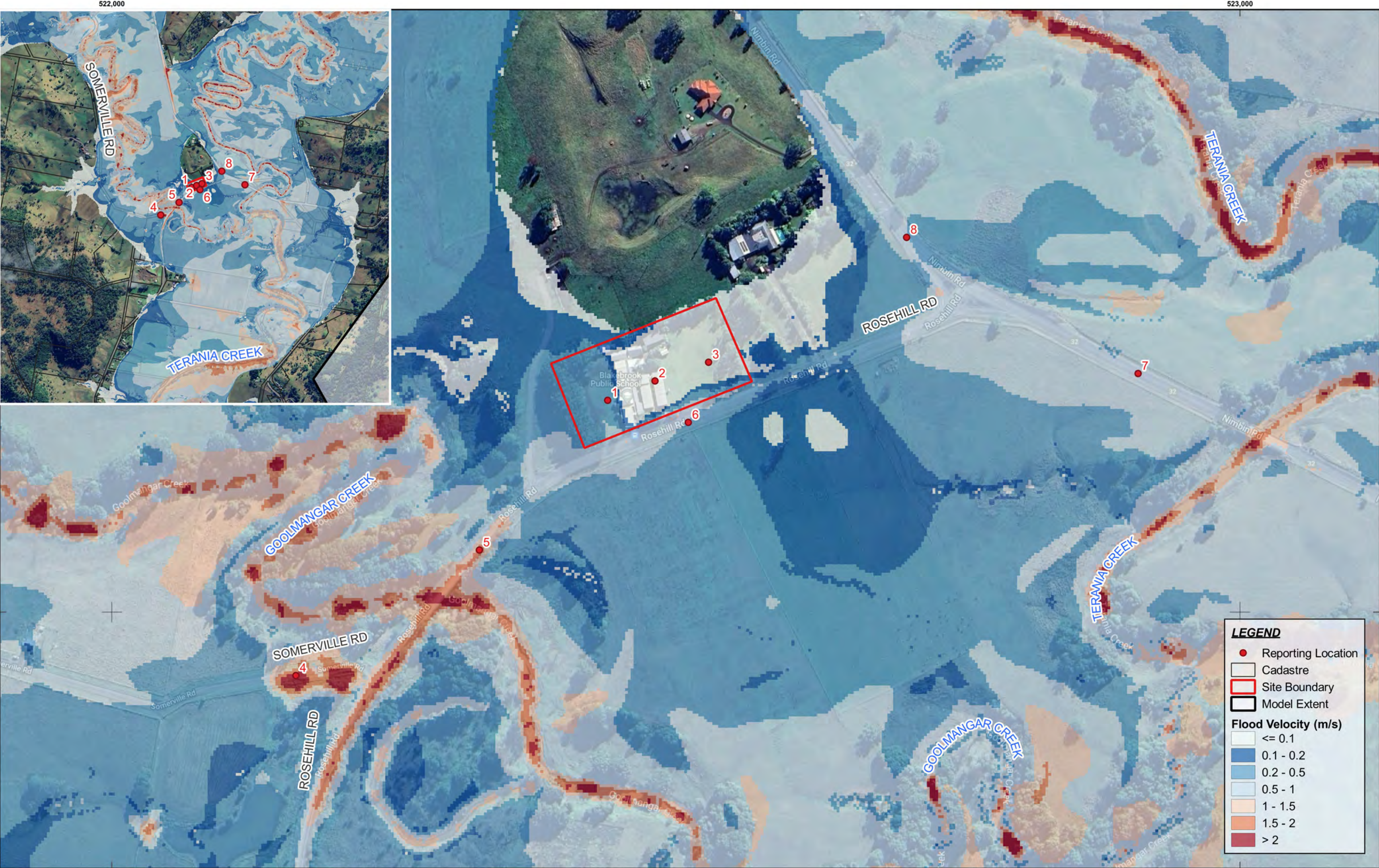
DATA SOURCE
QLD Government Open Data Source



Figure A24

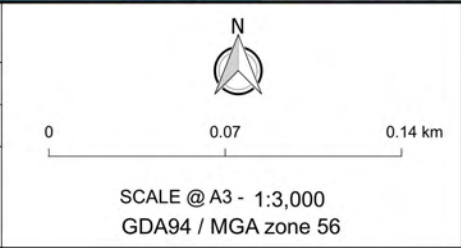
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 2000 AEP Flood Velocity

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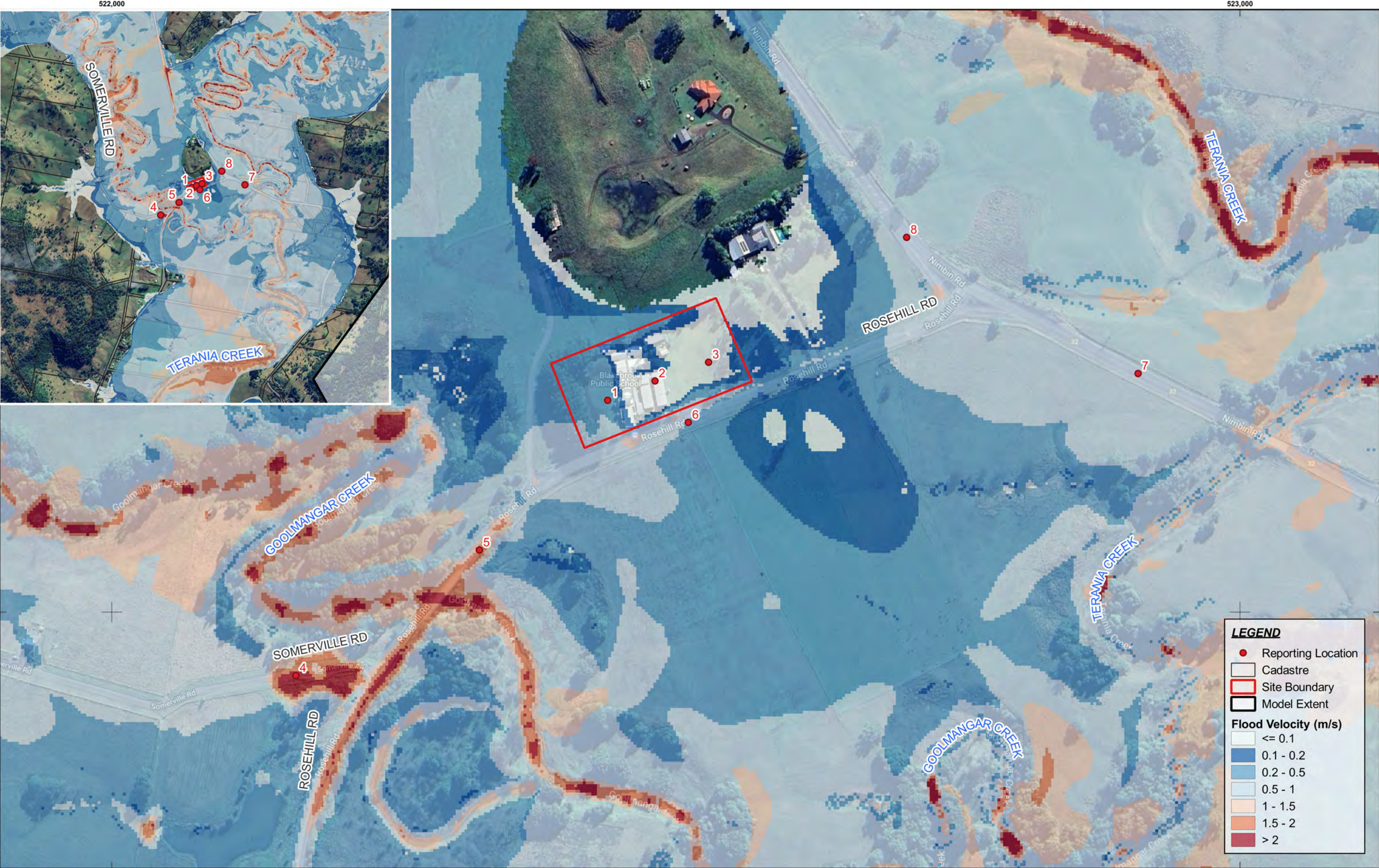
DATA SOURCE
QLD Government Open Data Source



Figure A25

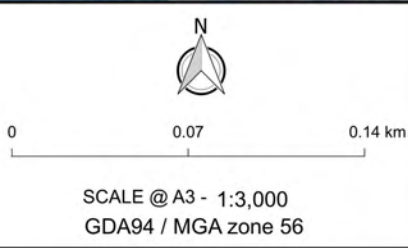
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 10000 AEP Flood Velocity

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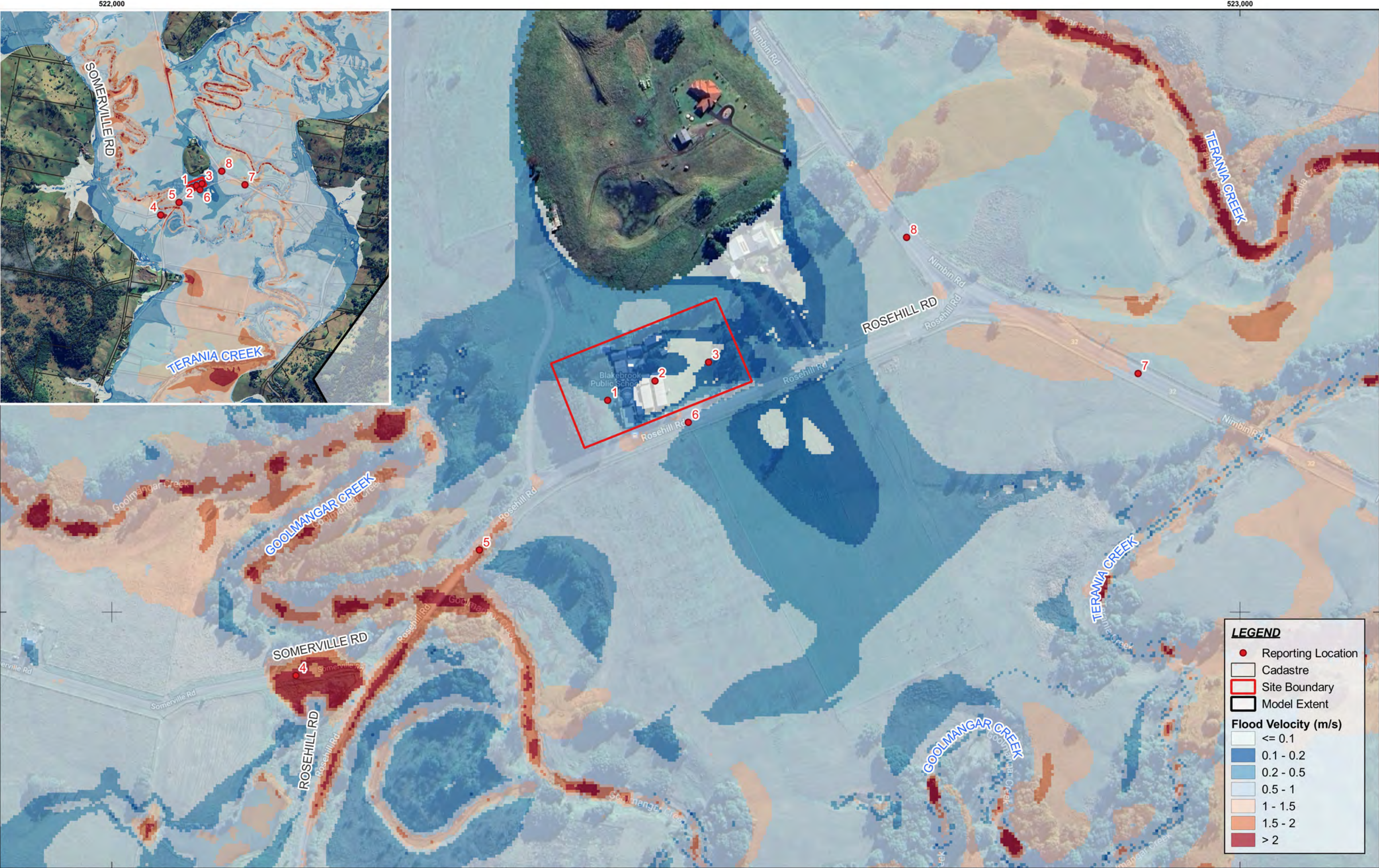
DATA SOURCE
QLD Government Open Data Source



Figure A26

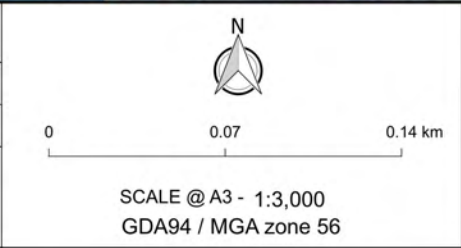
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 100000 AEP Flood Velocity

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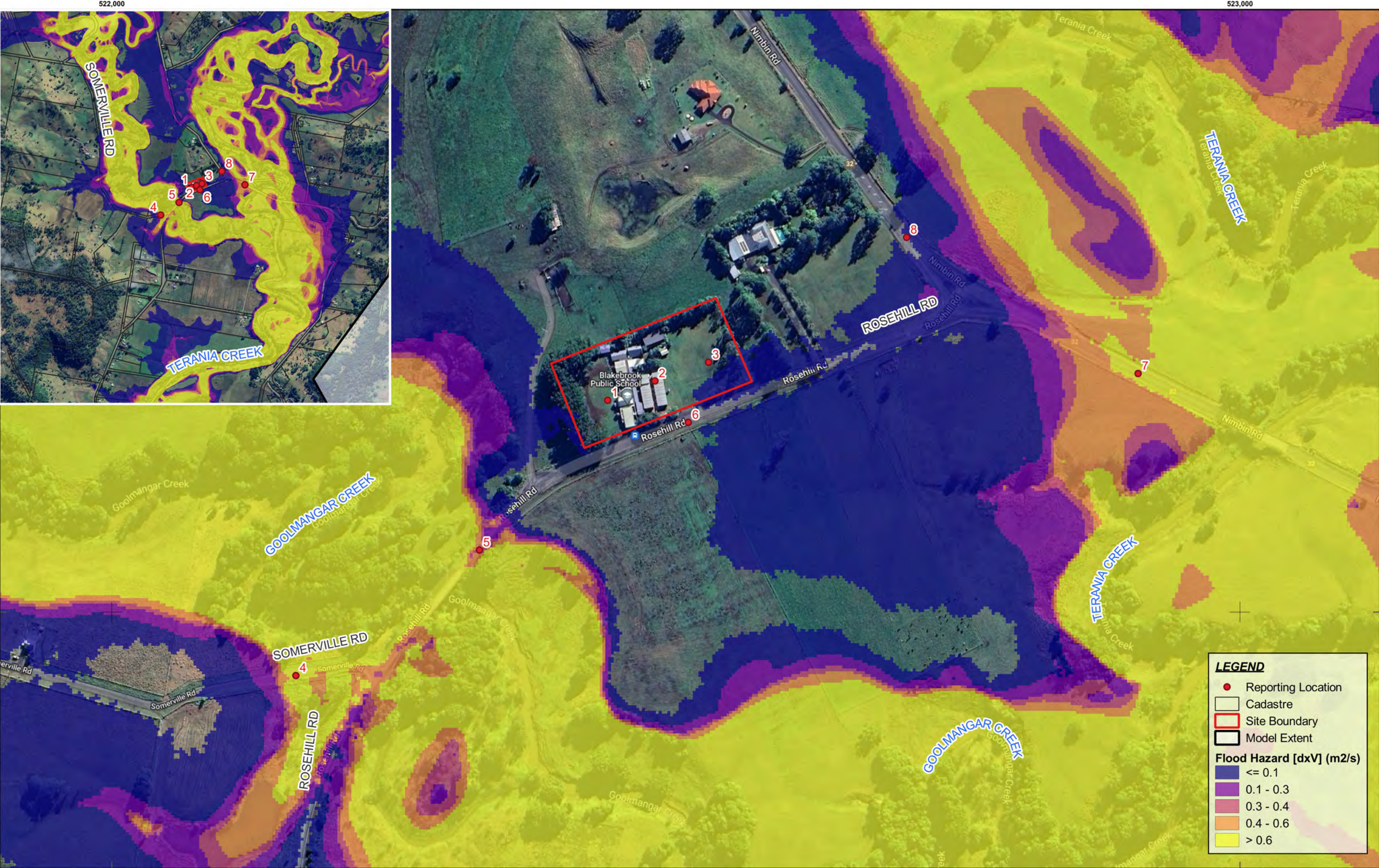
DATA SOURCE
QLD Government Open Data Source



Figure A27

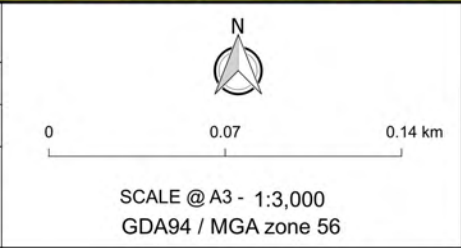
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case PMF Flood Velocity

Dwg Ref:
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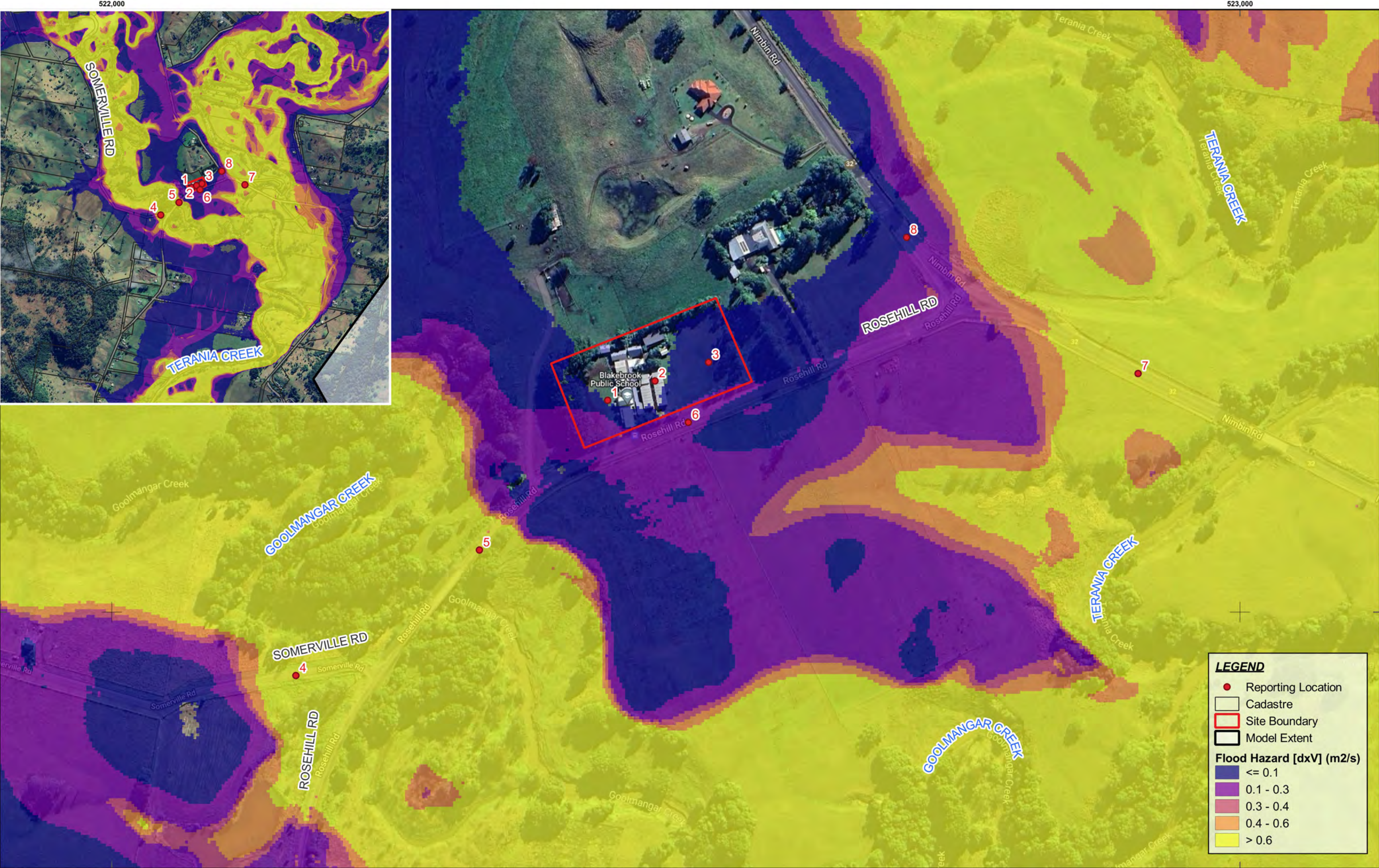
DATA SOURCE
QLD Government Open Data Source






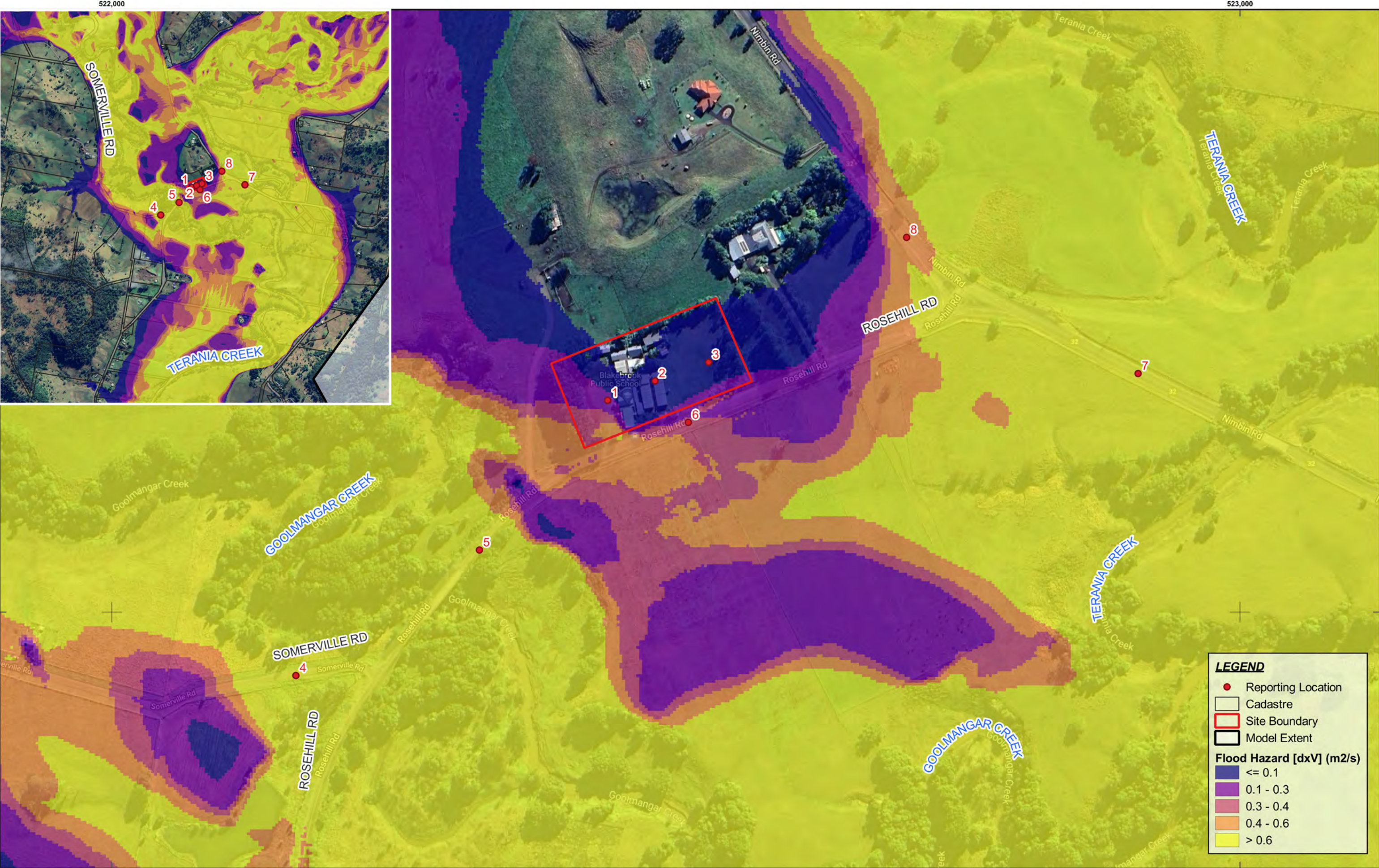
Figure A28

NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 10% AEP Flood Hazard (dxV)

Dwg Ref:
QC3008_001-SKE-0001




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1	Final Issue	05-12-2023	DRAWN	RS	CHECKED	KM					NSW Government - Department of Education Blakebrook Public School Flood Impact Assessment Base Case 5% AEP Flood Hazard (dxV)
			APPROVED	MP	DATE	05-12-2023					Dwg Ref. QC3008_001-SKE-0001
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0 0.07 0.14 km

SCALE @ A3 - 1:3,000
GDA94 / MGA zone 56

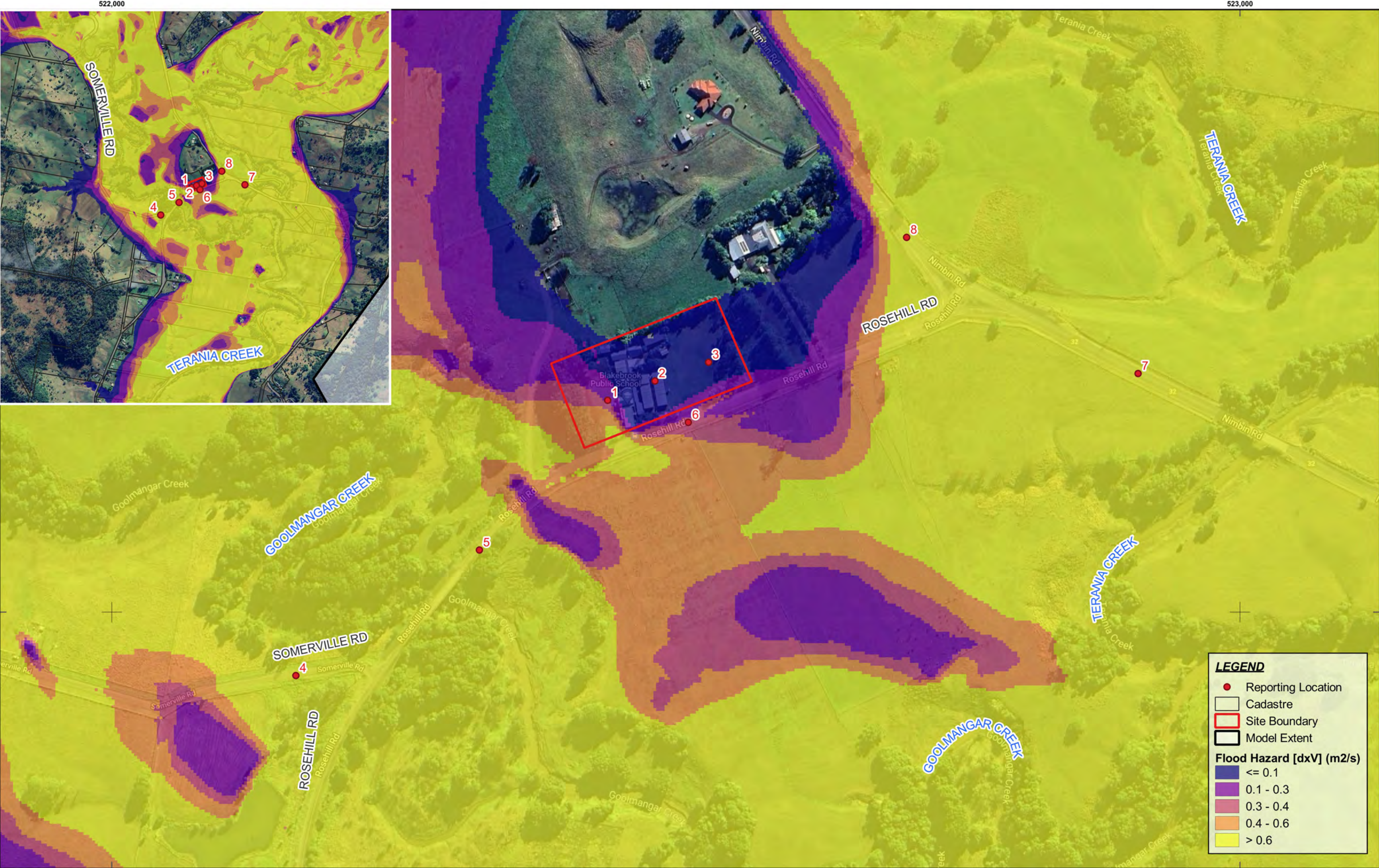
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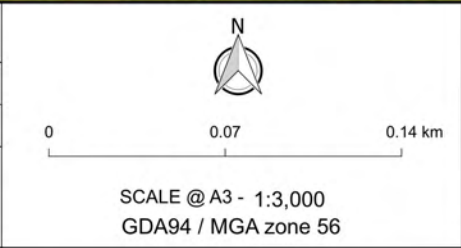
Figure A30
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1% AEP Flood Hazard (dxV)

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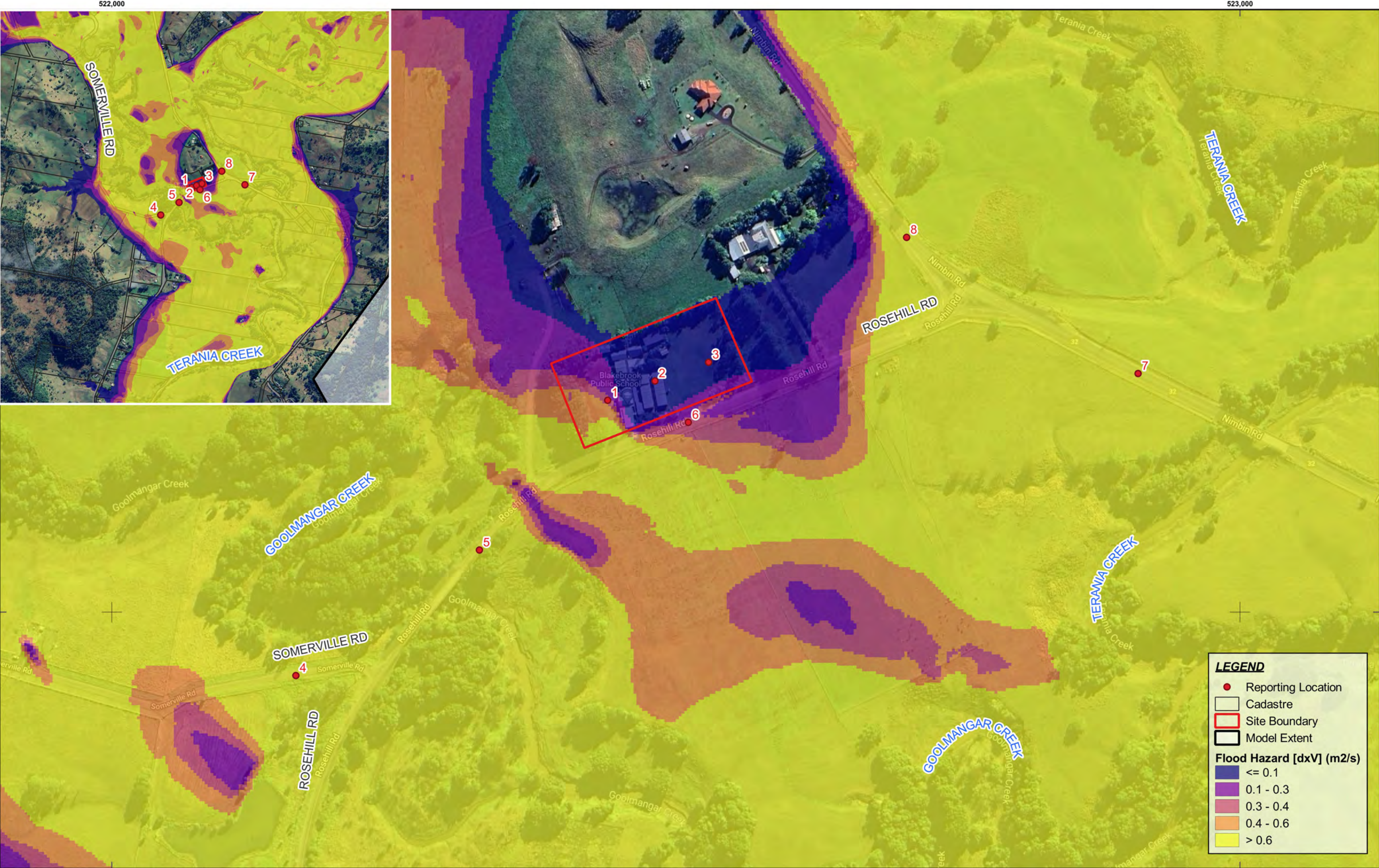
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Figure A31

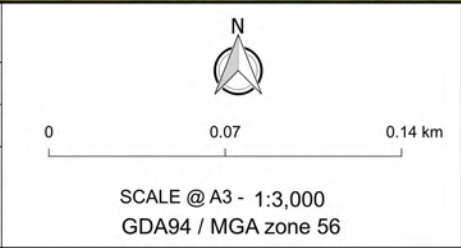
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 0.5% AEP Flood Hazard (dxV)

Dwg Ref:
QC3008_001-SKE-0001



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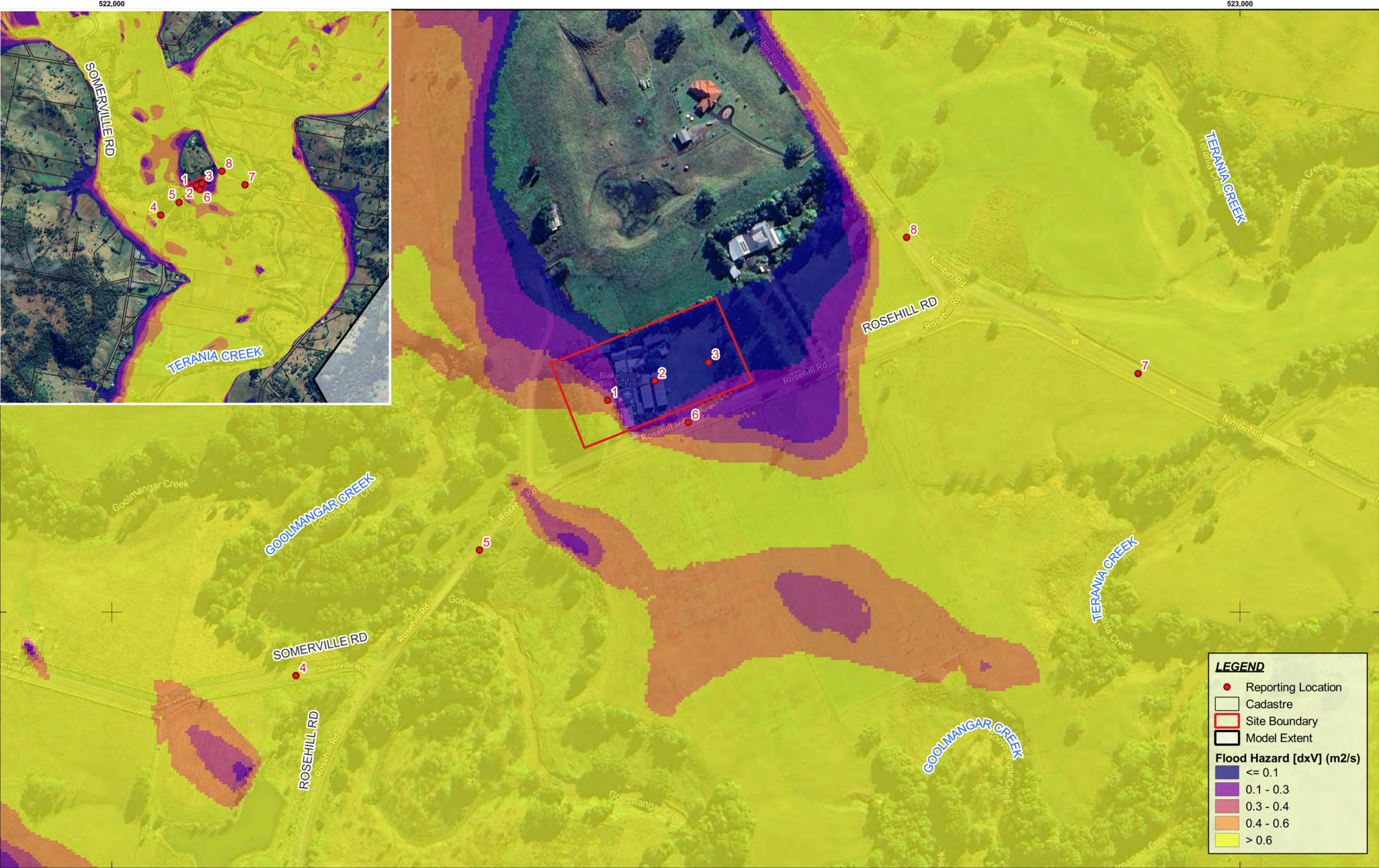
DATA SOURCE
QLD Government Open Data Source



Figure A32

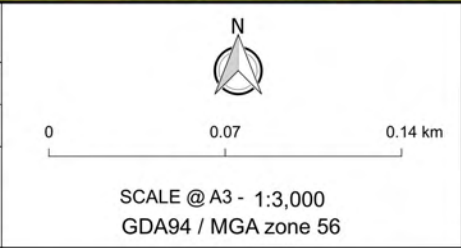
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 1000 AEP Flood Hazard (dxV)

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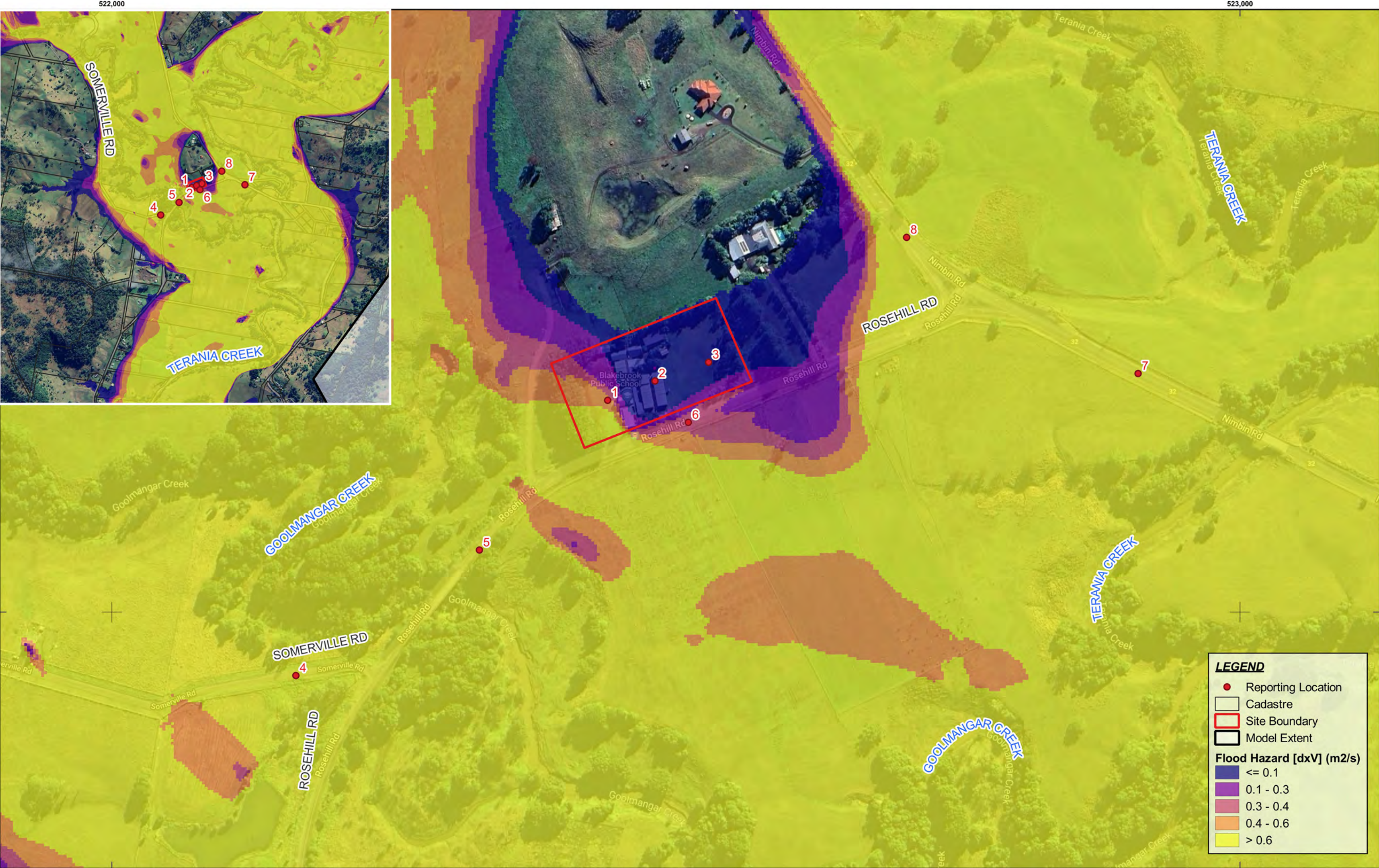
DATA SOURCE
QLD Government Open Data Source



Figure A33

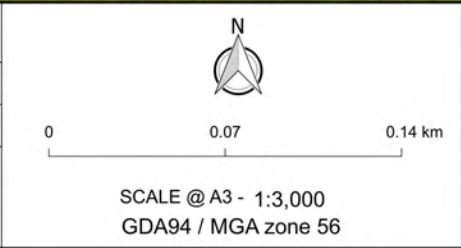
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 2000 AEP Flood Hazard (dxV)

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Figure A34


NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 10000 AEP Flood Hazard (dxV)

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0 0.07 0.14 km

SCALE @ A3 - 1:3,000
GDA94 / MGA zone 56

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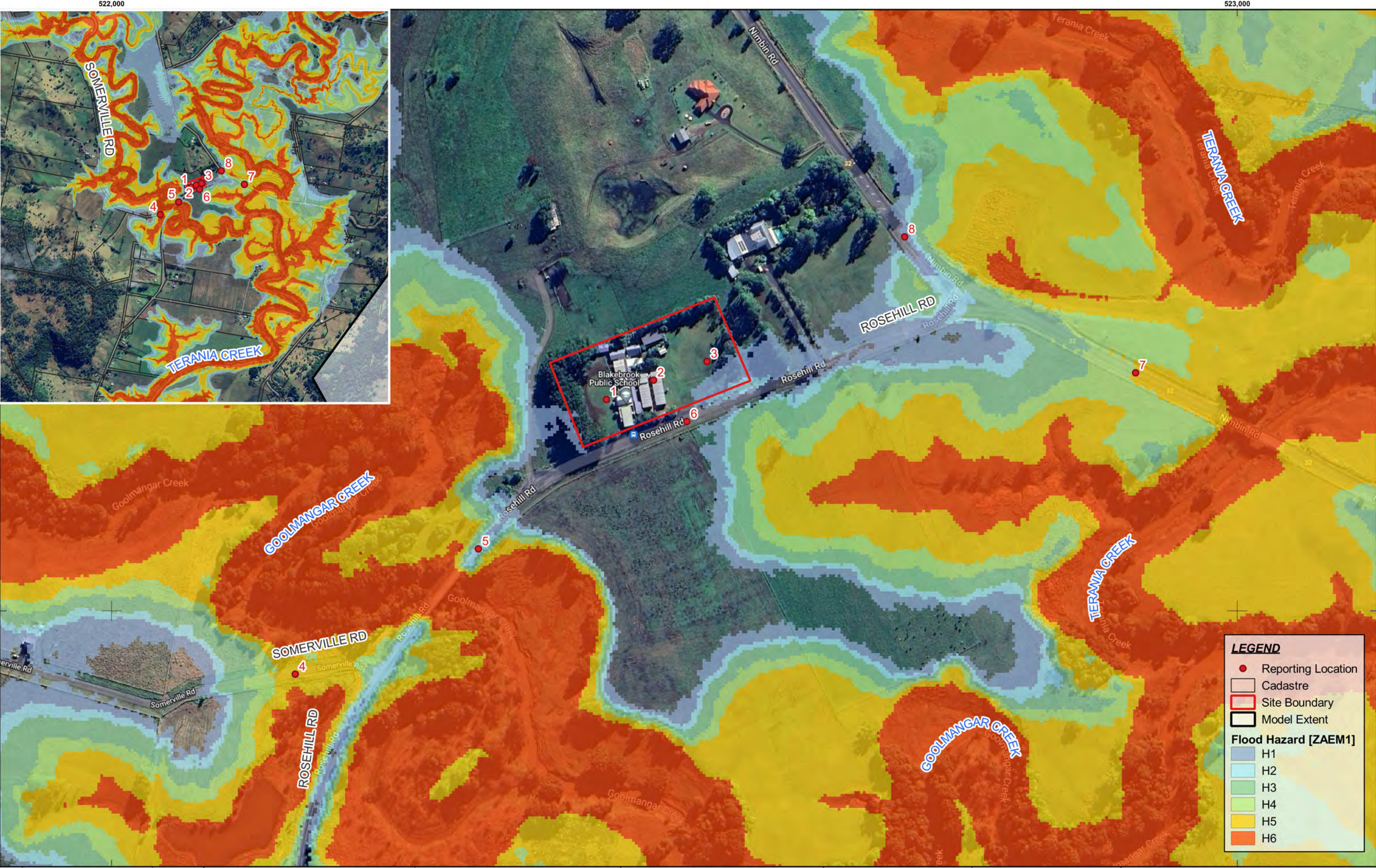


Figure A35
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 100000 AEP Flood Hazard (dxV)

Dwg Ref:
QC3008_001-SKE-0001

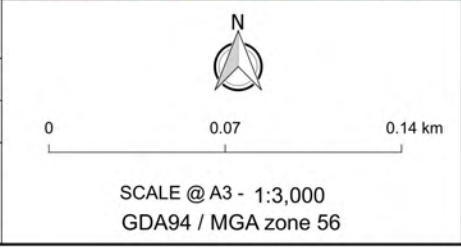


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1	Final Issue	05-12-2023	DRAWN	RS	CHECKED	KM	NSW Government - Department of Education Blakebrook Public School Flood Impact Assessment Base Case PMF Flood Hazard (dxv)					
			APPROVED	MP	DATE	05-12-2023						
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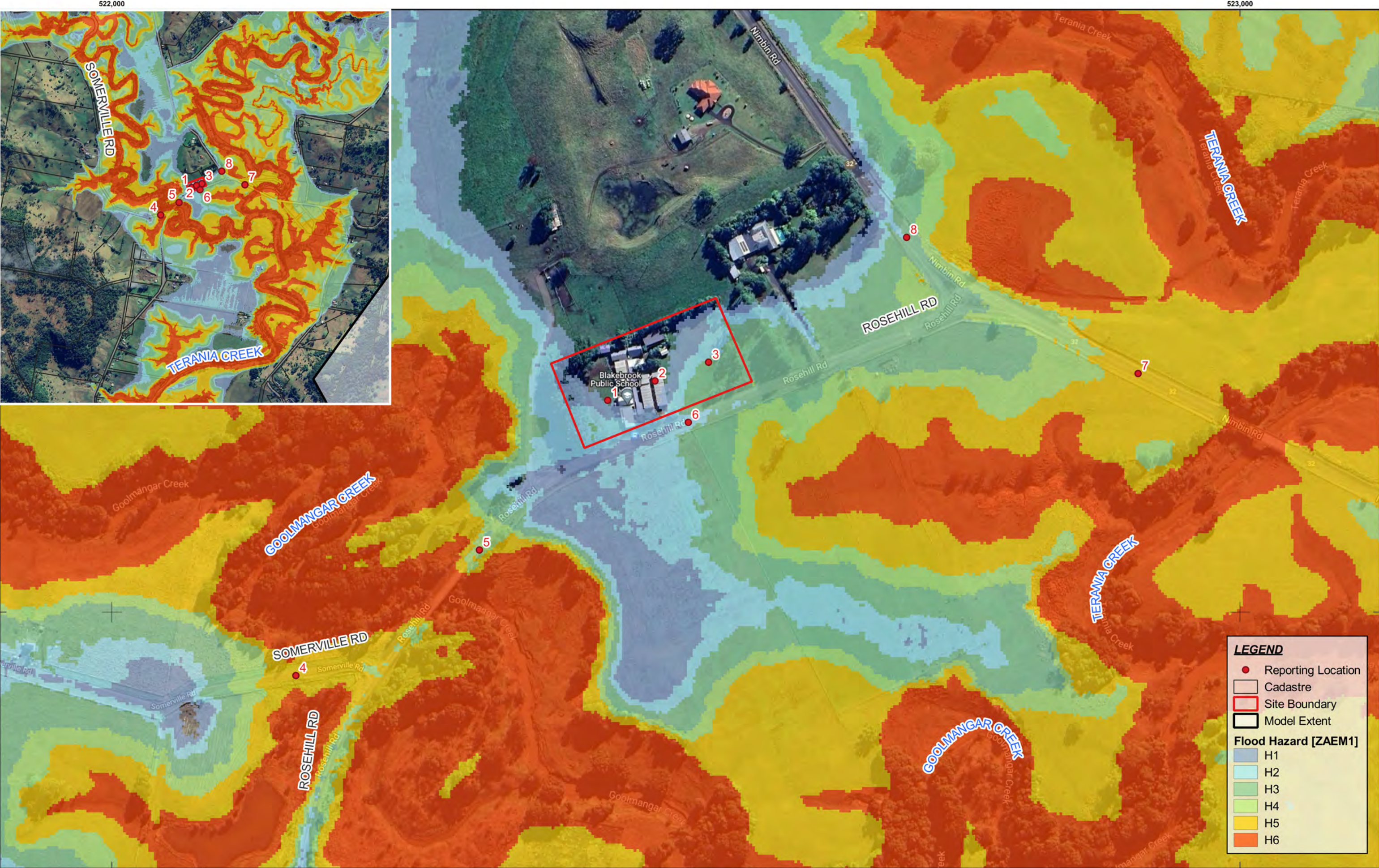
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Figure A37

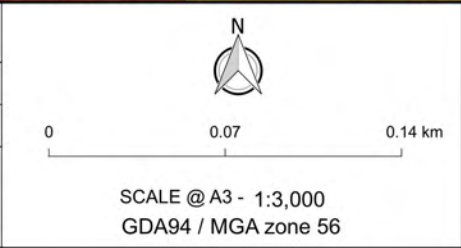
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 10% AEP Flood Hazard (ZAEM1)

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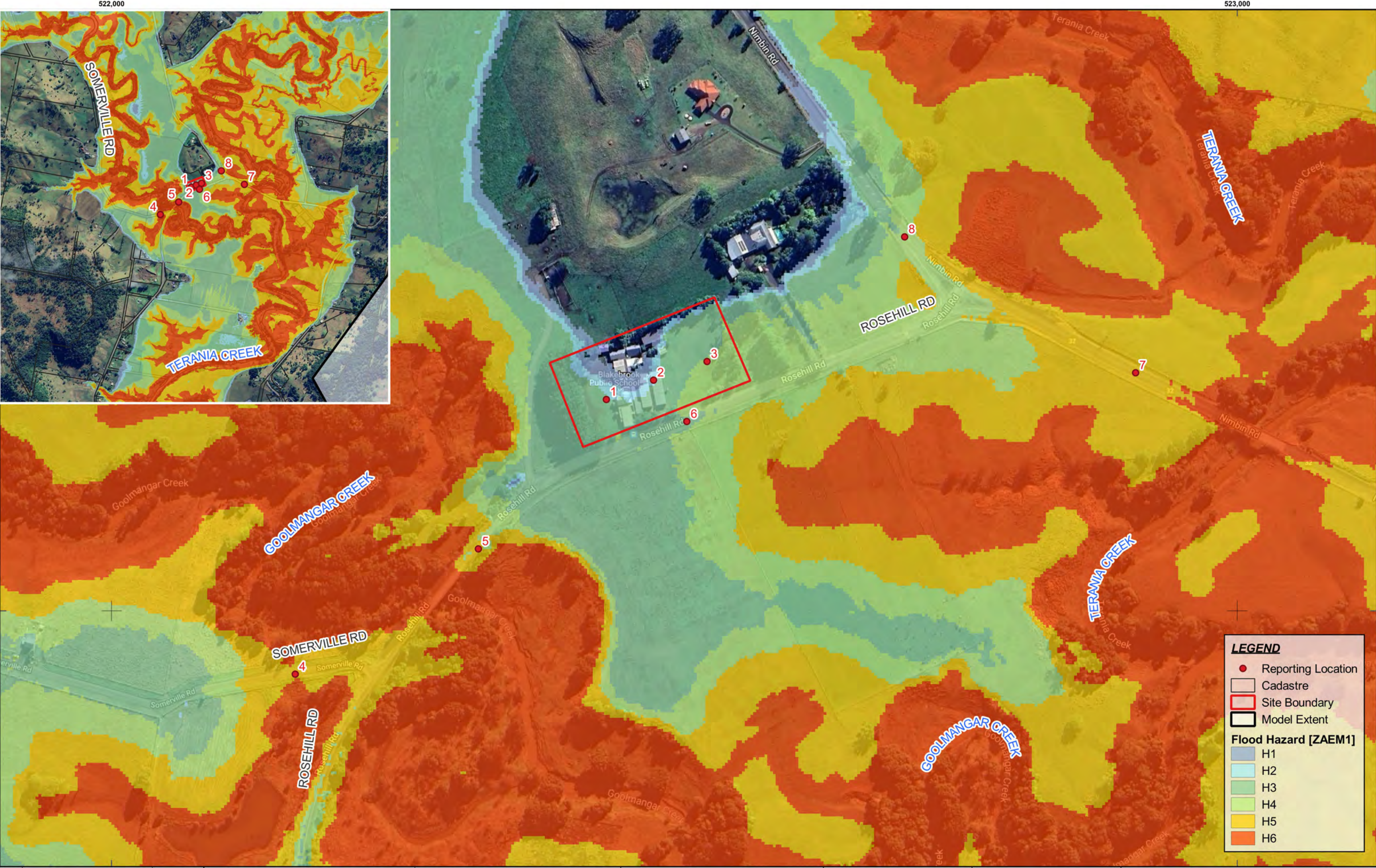
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Figure A38

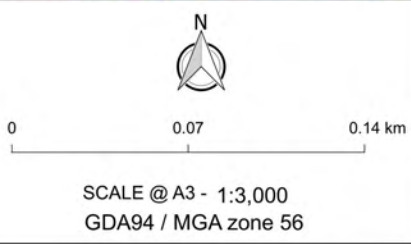
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 5% AEP Flood Hazard (ZAEM1)

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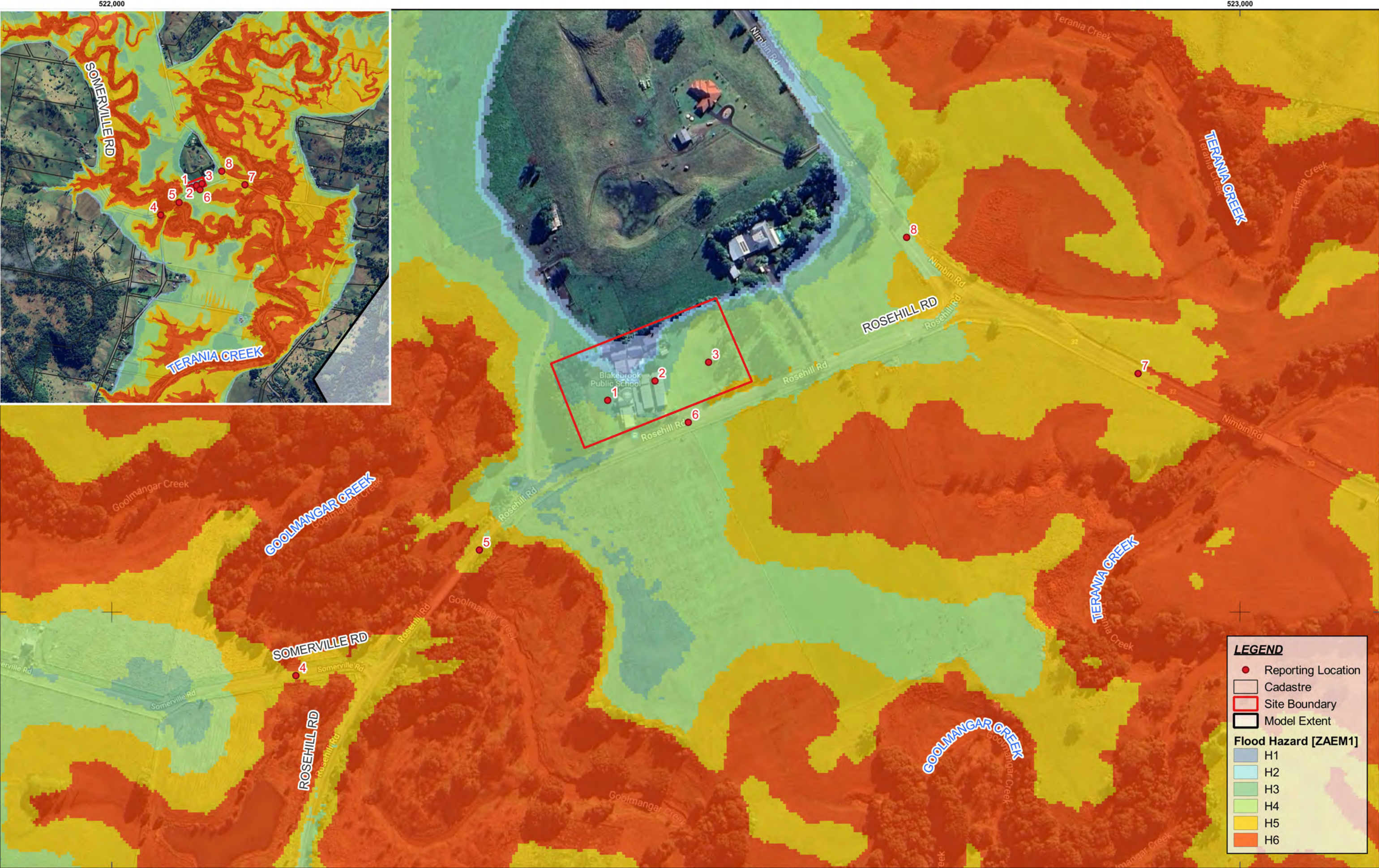
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Figure A39

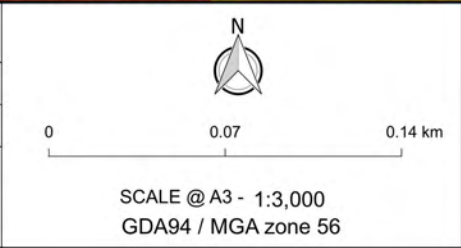
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1% AEP Flood Hazard (ZAEM1)

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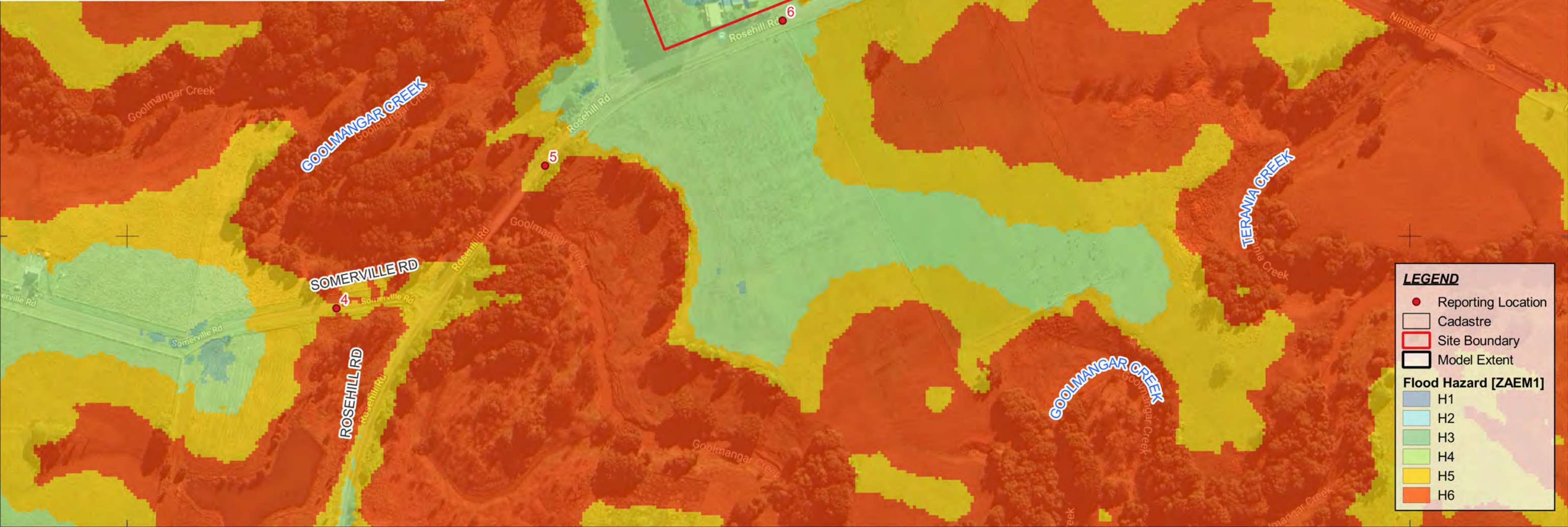
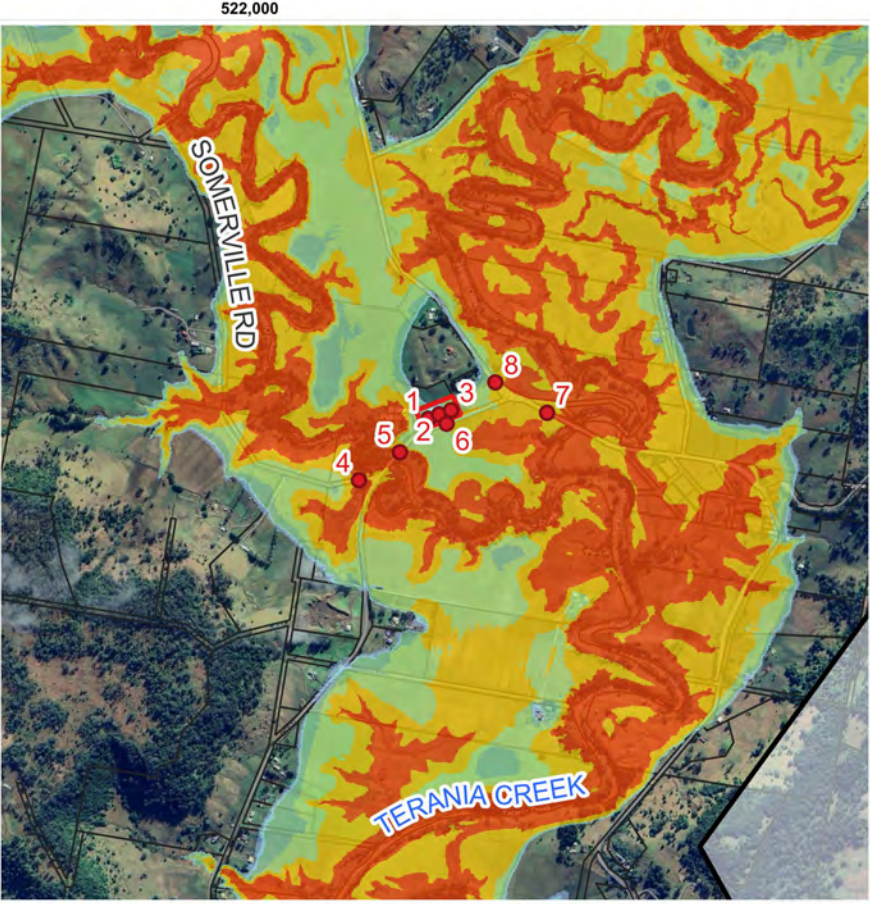
DATA SOURCE
QLD Government Open Data Source



Figure A40

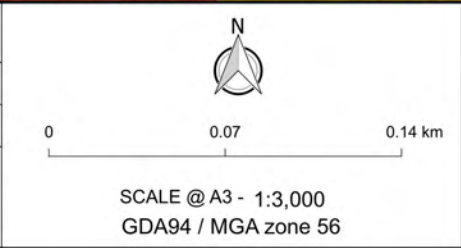
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 0.5% AEP Flood Hazard (ZAEM1)

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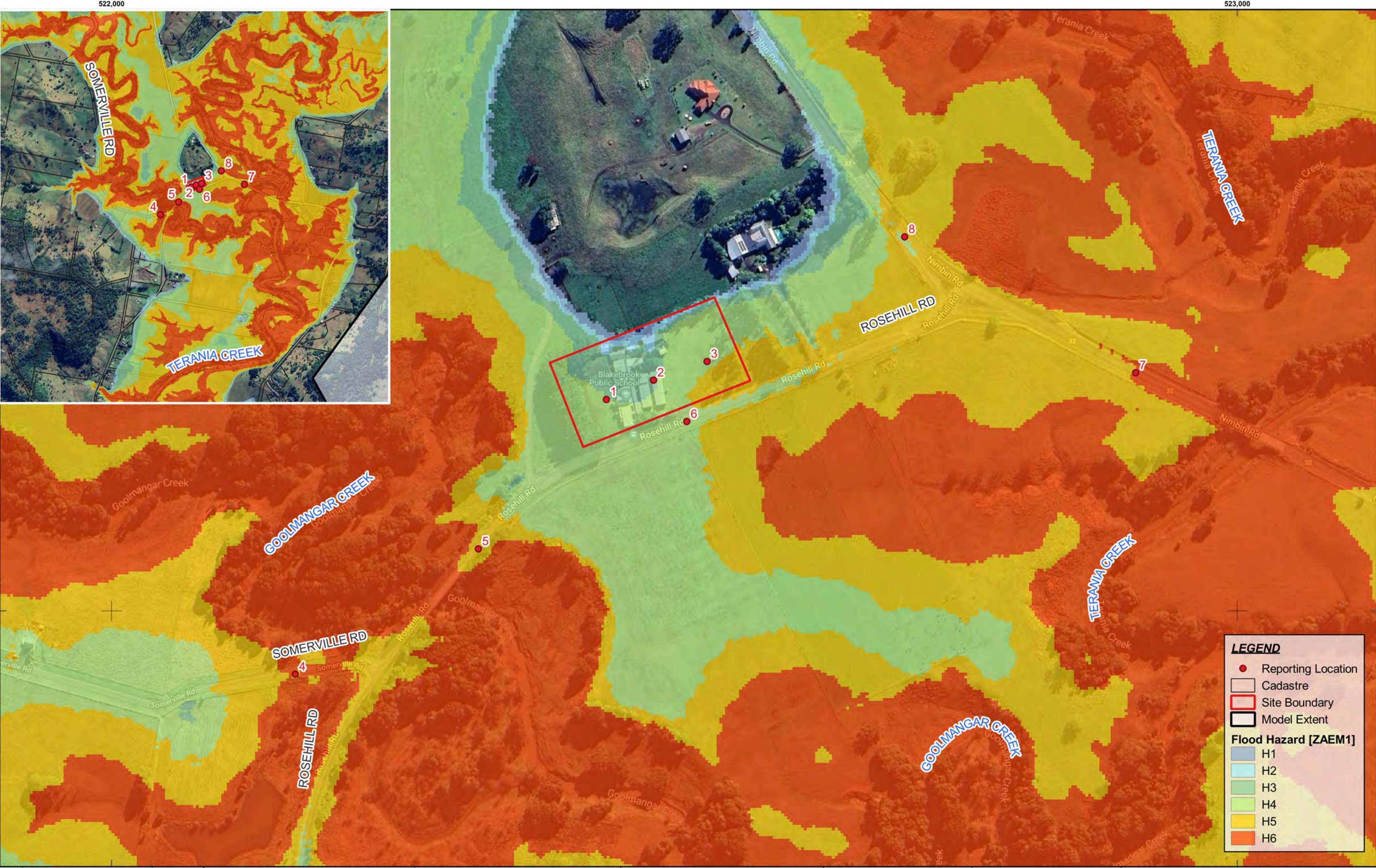
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Figure A41


NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 1000 AEP Flood Hazard (ZAEM1)

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0 0.07 0.14 km

SCALE @ A3 - 1:3,000
GDA94 / MGA zone 56

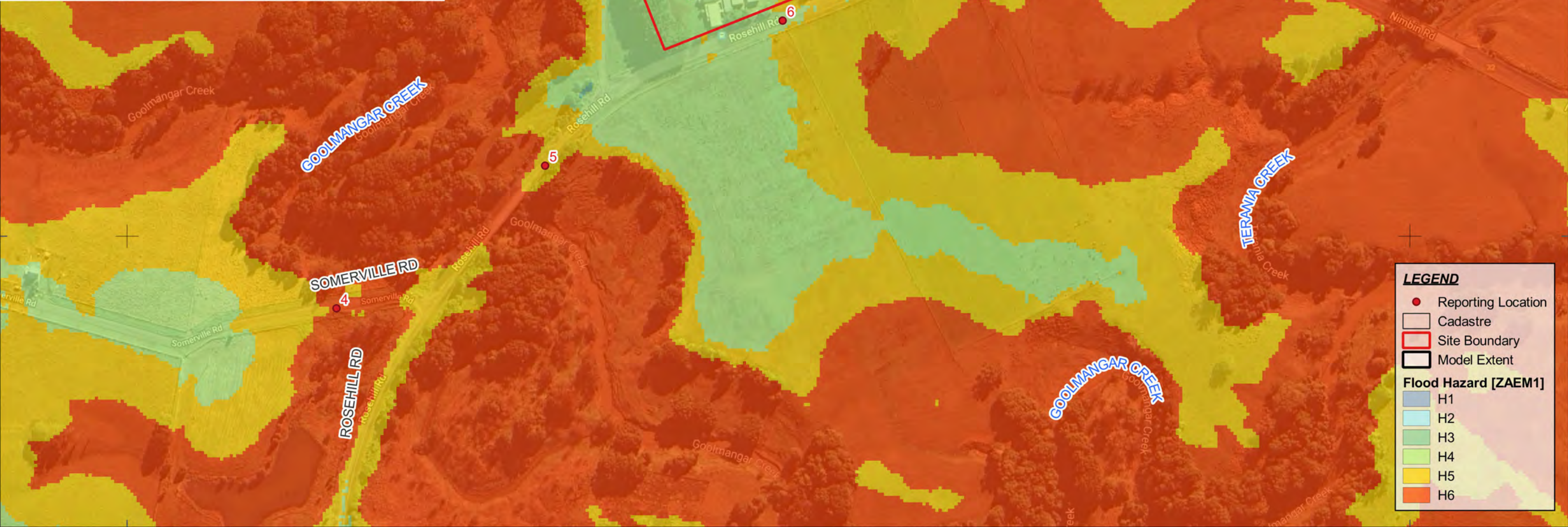
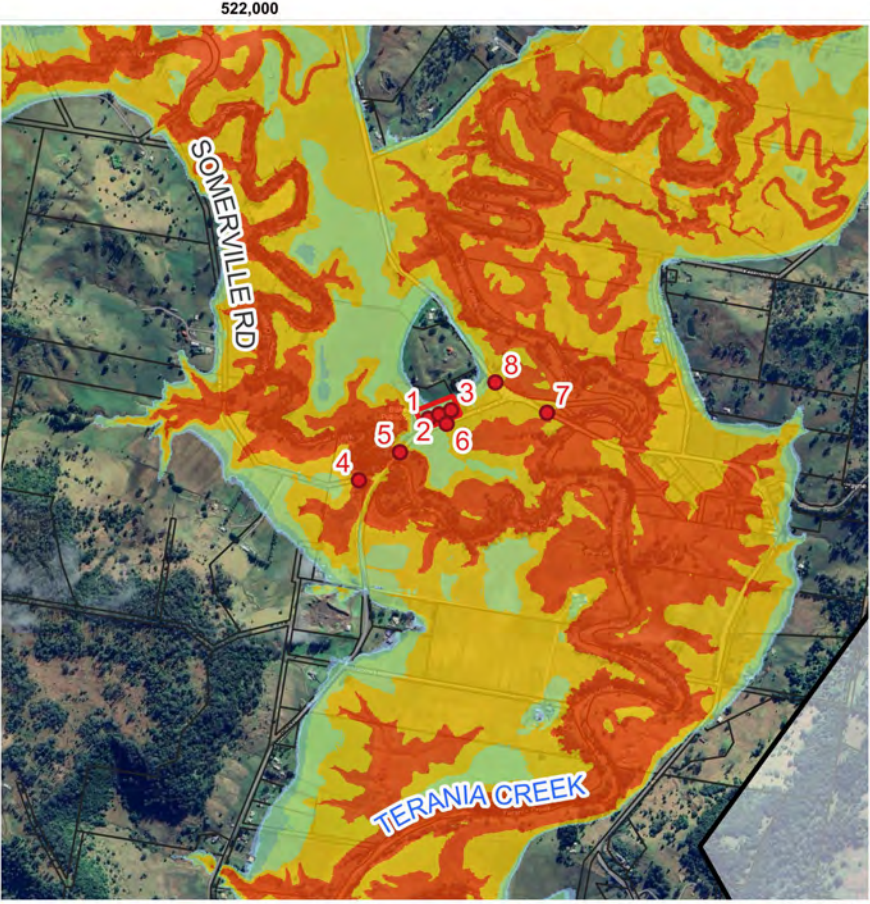
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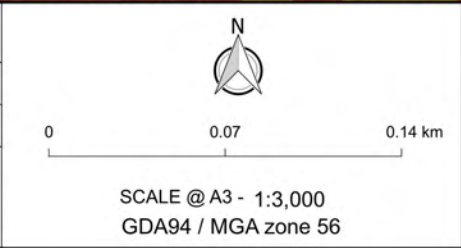
Figure A42
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 2000 AEP Flood Hazard (ZAEM1)

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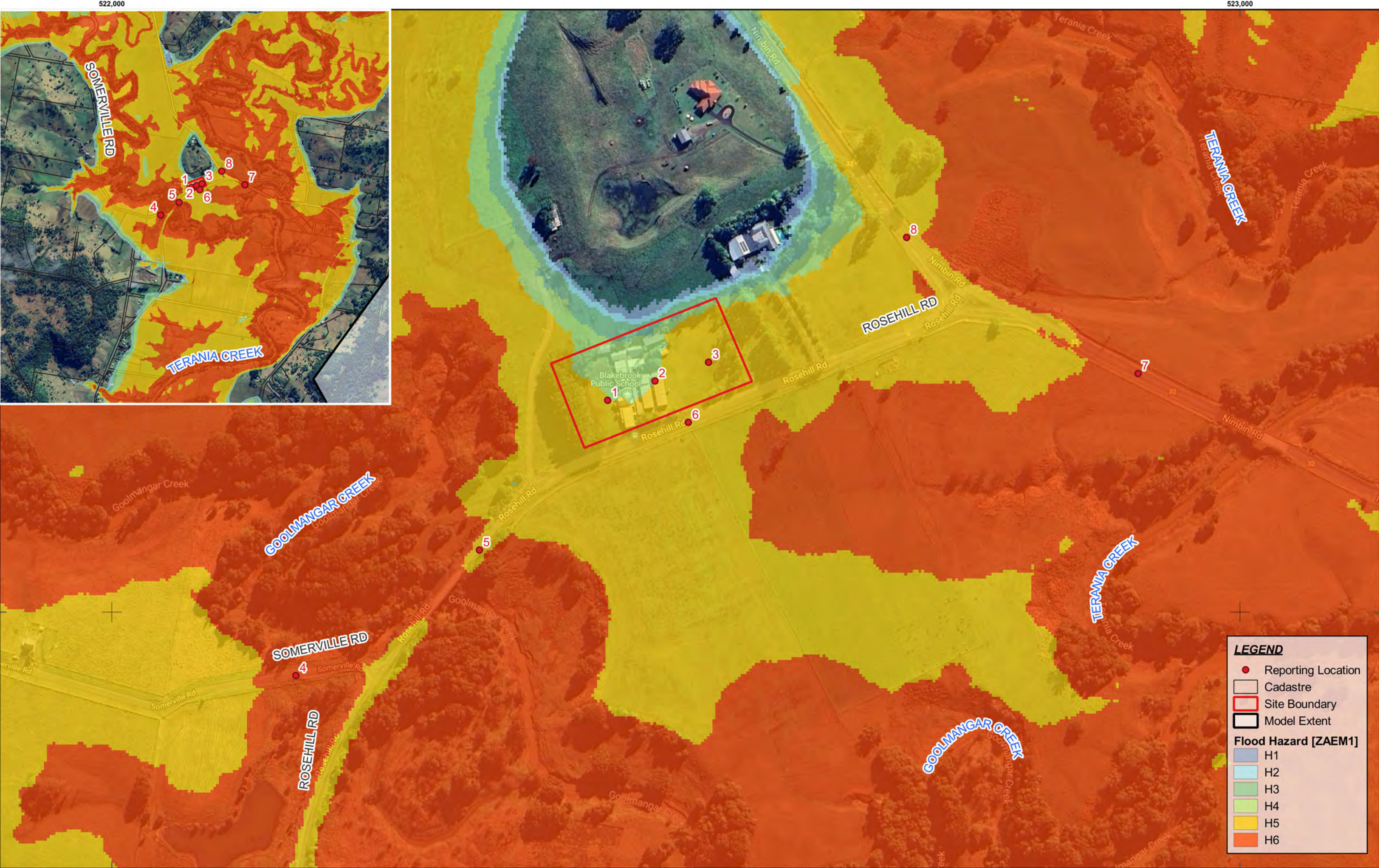
DATA SOURCE
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Figure A43

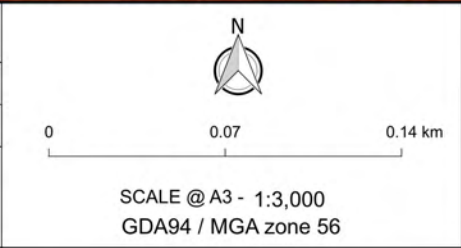
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 10000 AEP Flood Hazard (ZAEM1)

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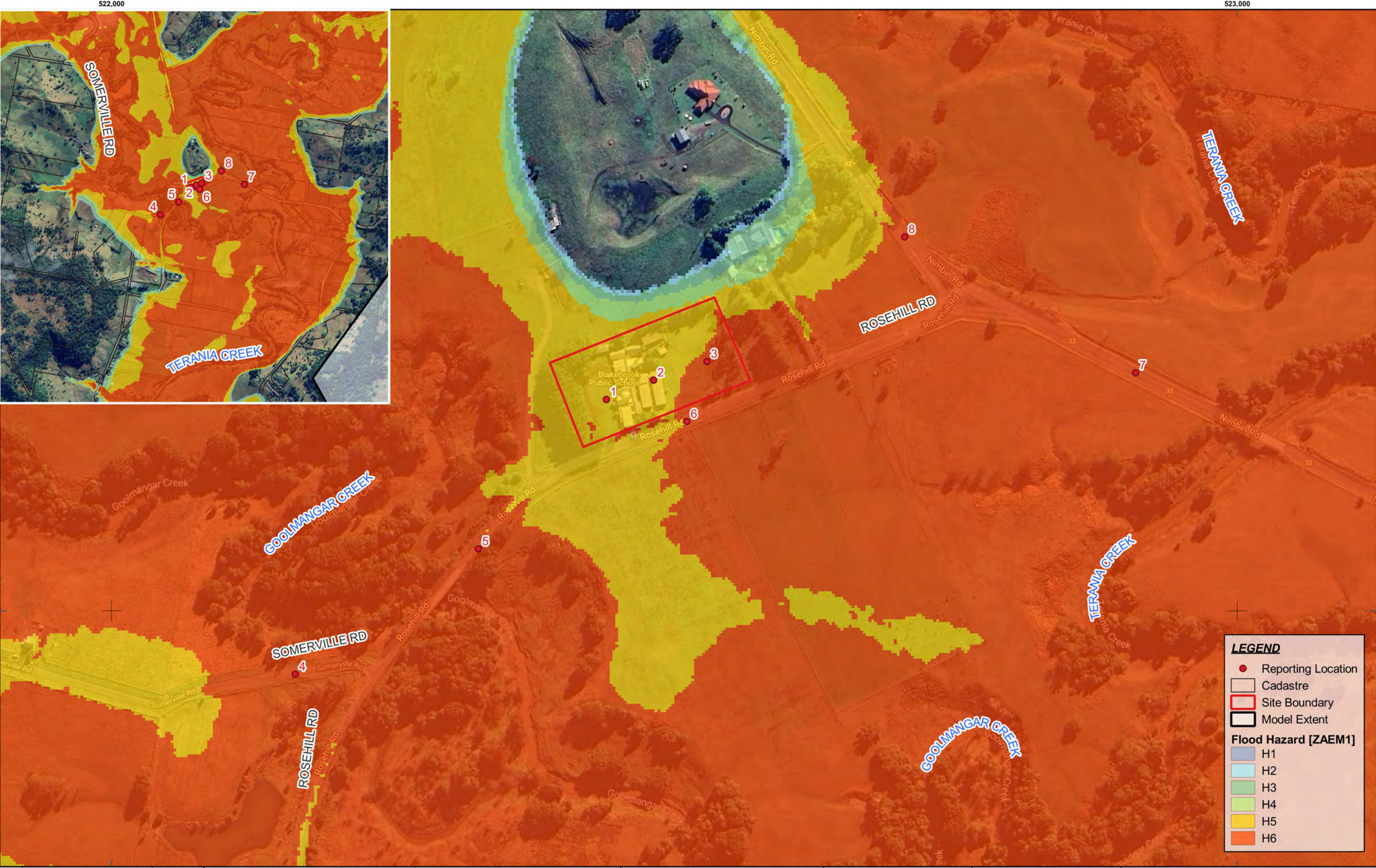
DATA SOURCE
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Figure A44

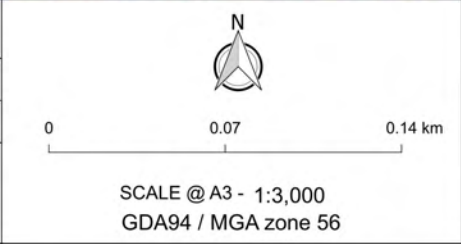
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Base Case 1 in 100000 AEP Flood Hazard (ZAEM1)

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Figure A45

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Flood Impact Assessment
Base Case PMF Flood Hazard (ZAEM1)

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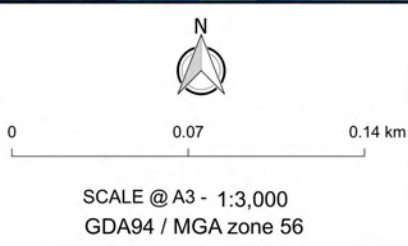
APPENDIX B: POST-REBUILD CASE FLOOD MAPPING





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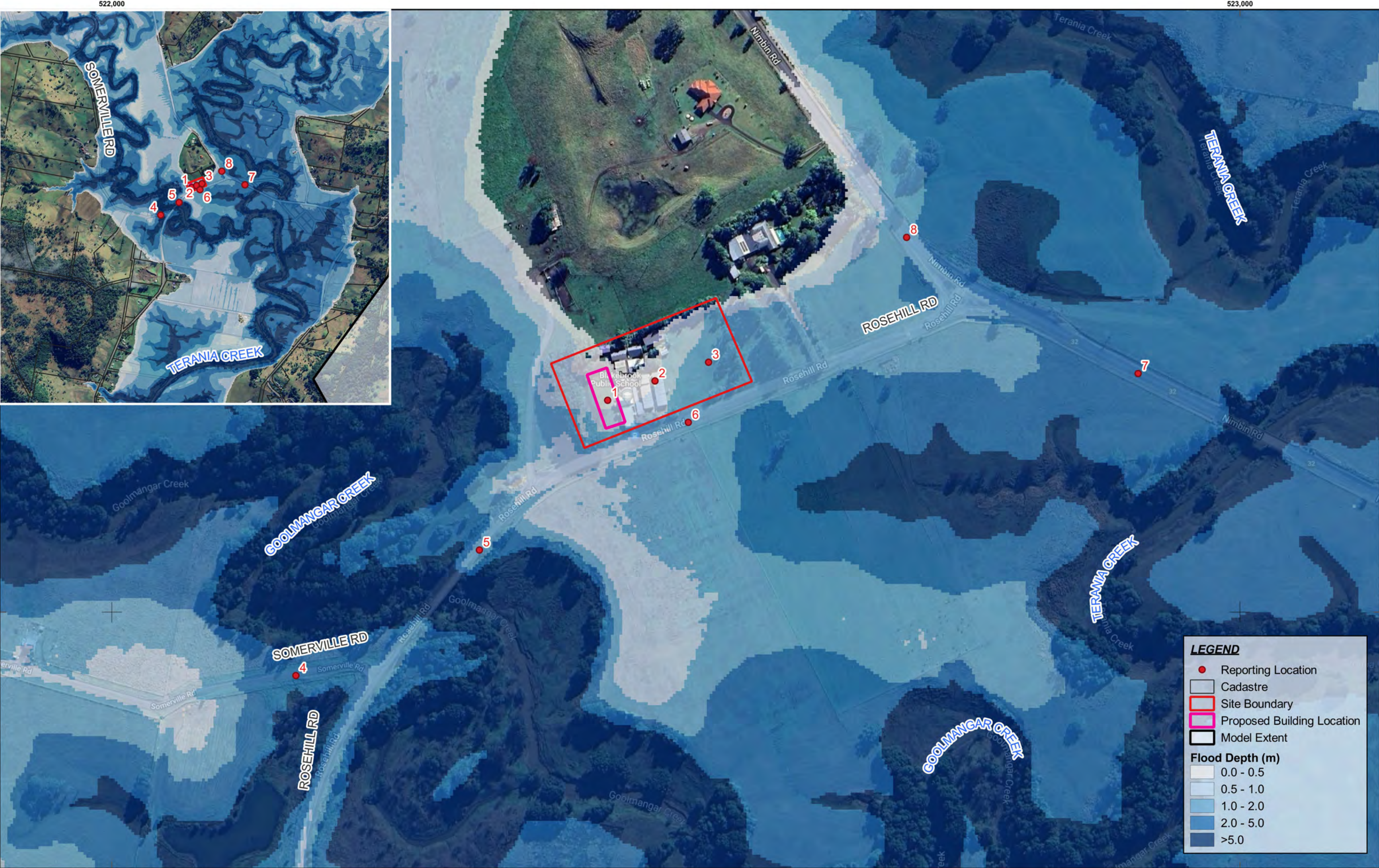
Figure B1

NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 10% AEP Flood Depth

Dwg Ref:
QC3008_001-SKE-0001

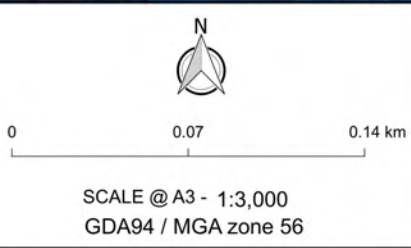


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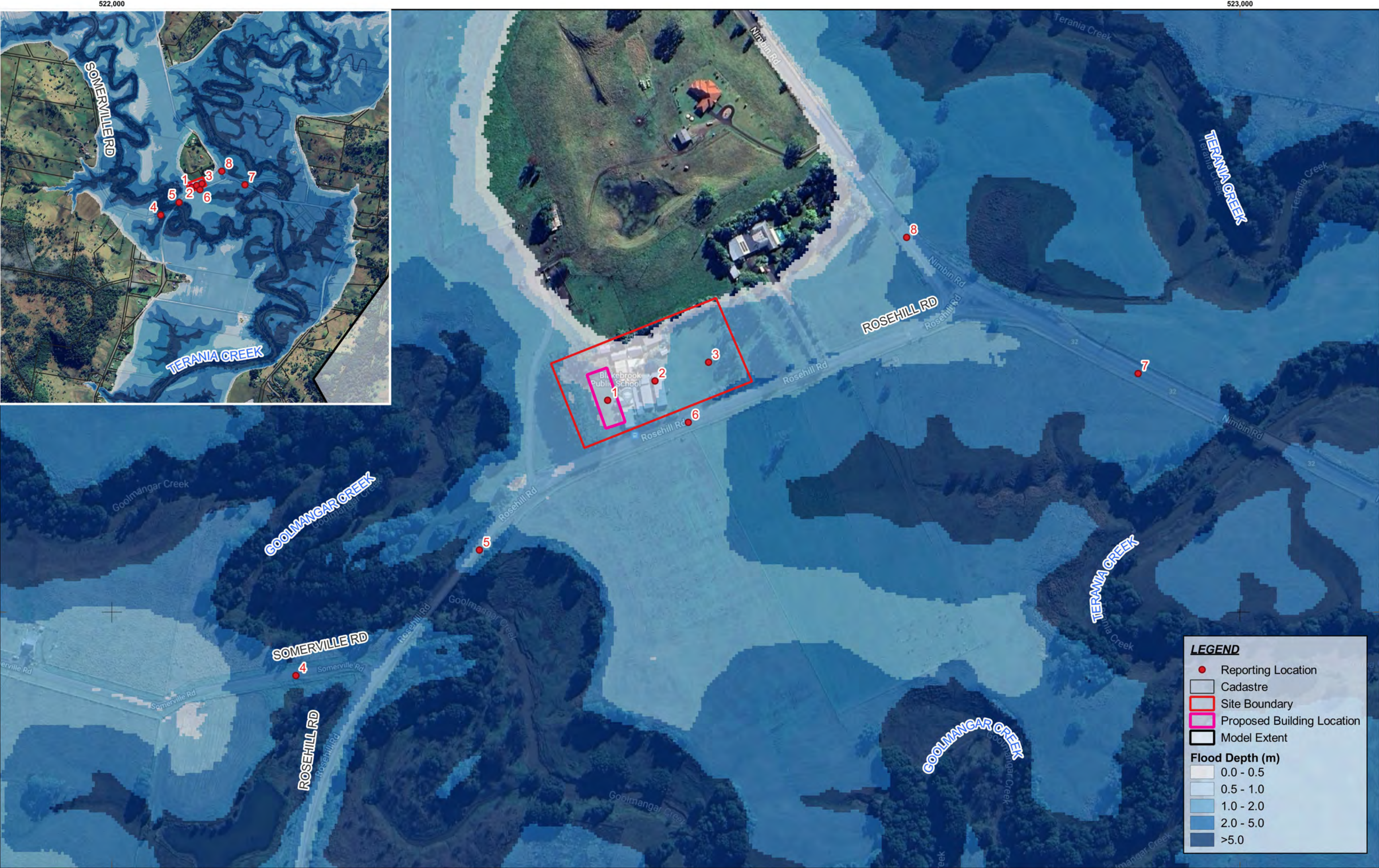
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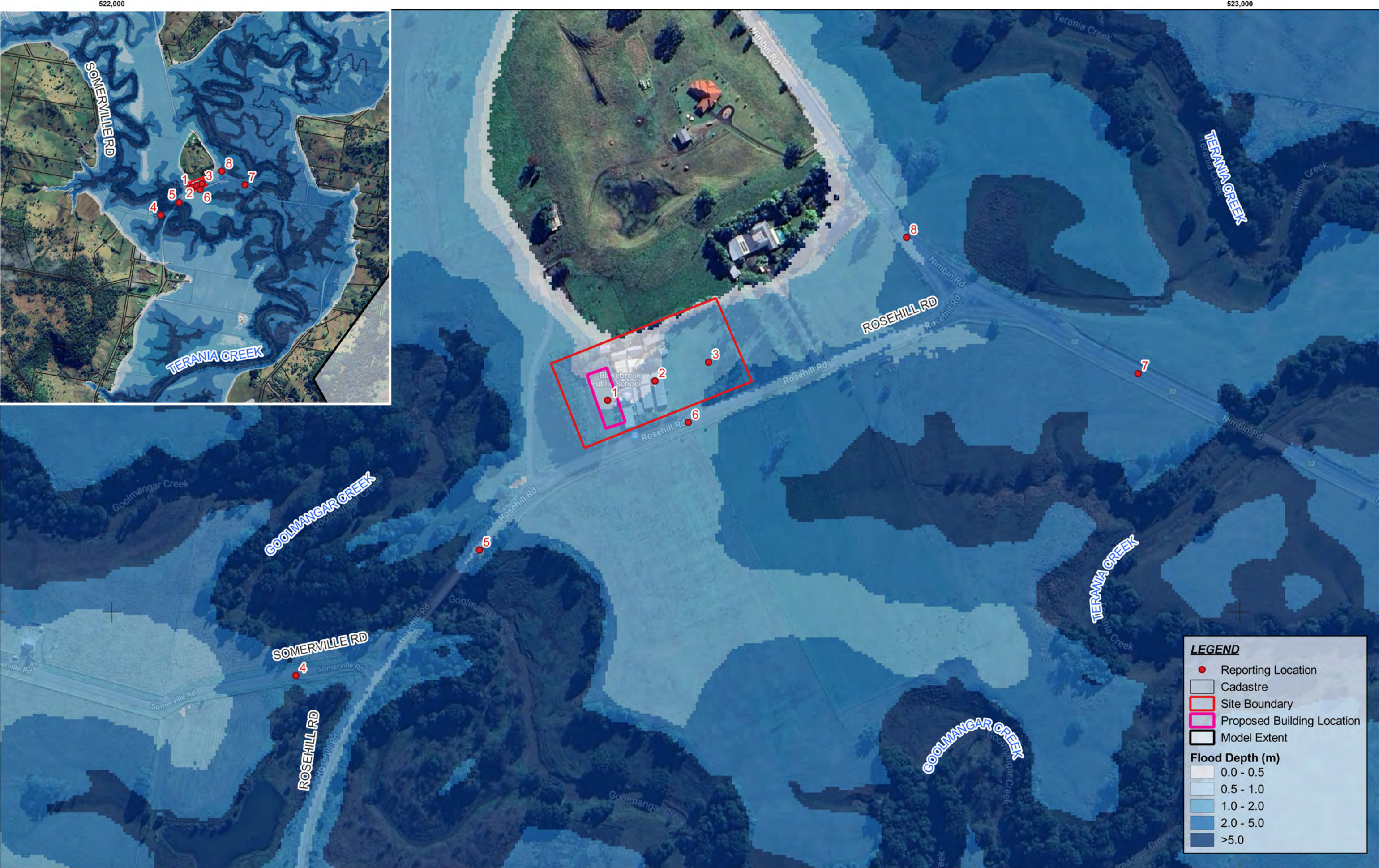
Figure B3

NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1% AEP Flood Depth

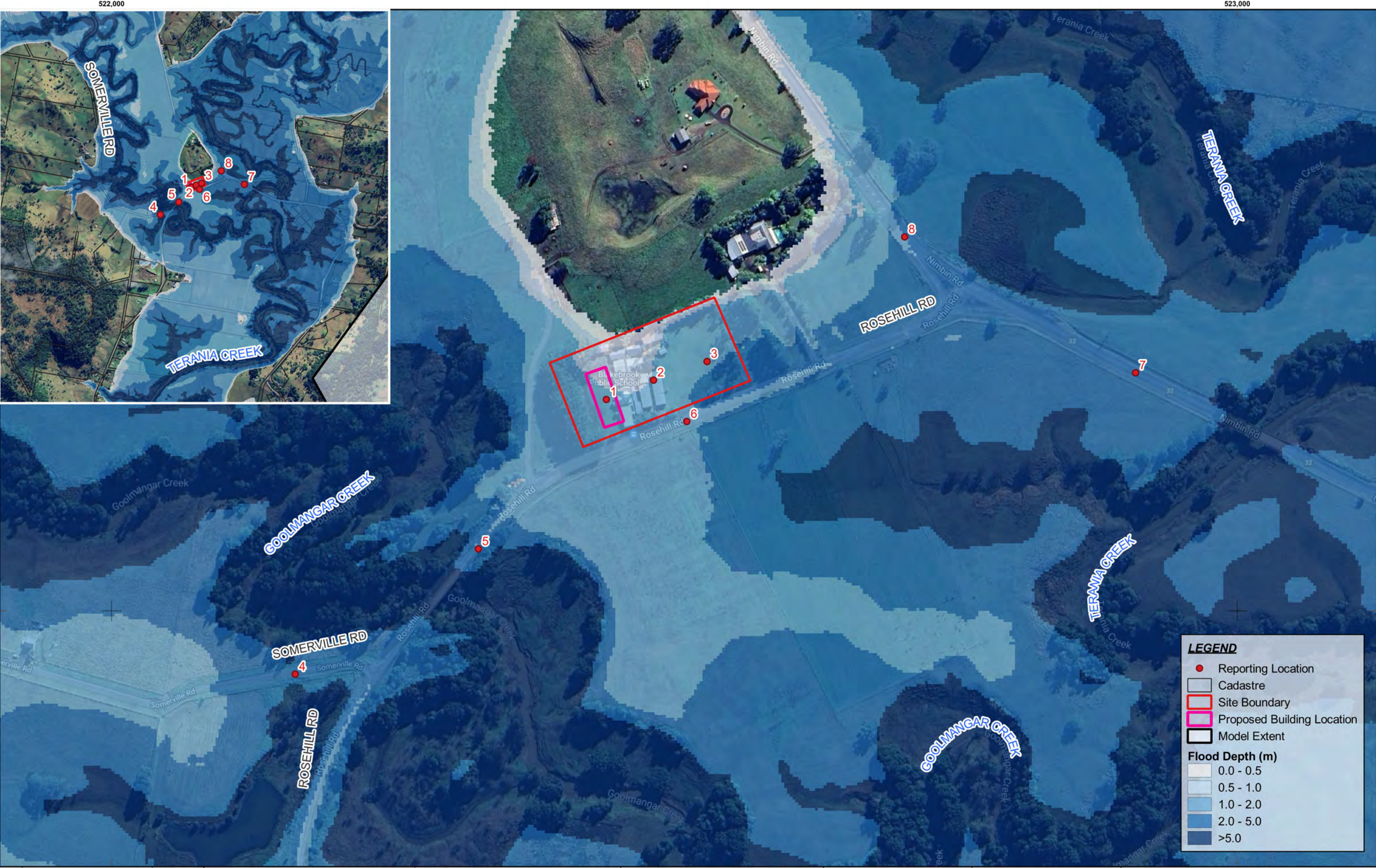
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1	Final Issue	05-12-2023	DRAWN	RS	CHECKED	KM					
			APPROVED	MP	DATE	05-12-2023					
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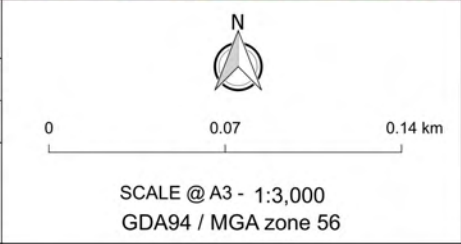


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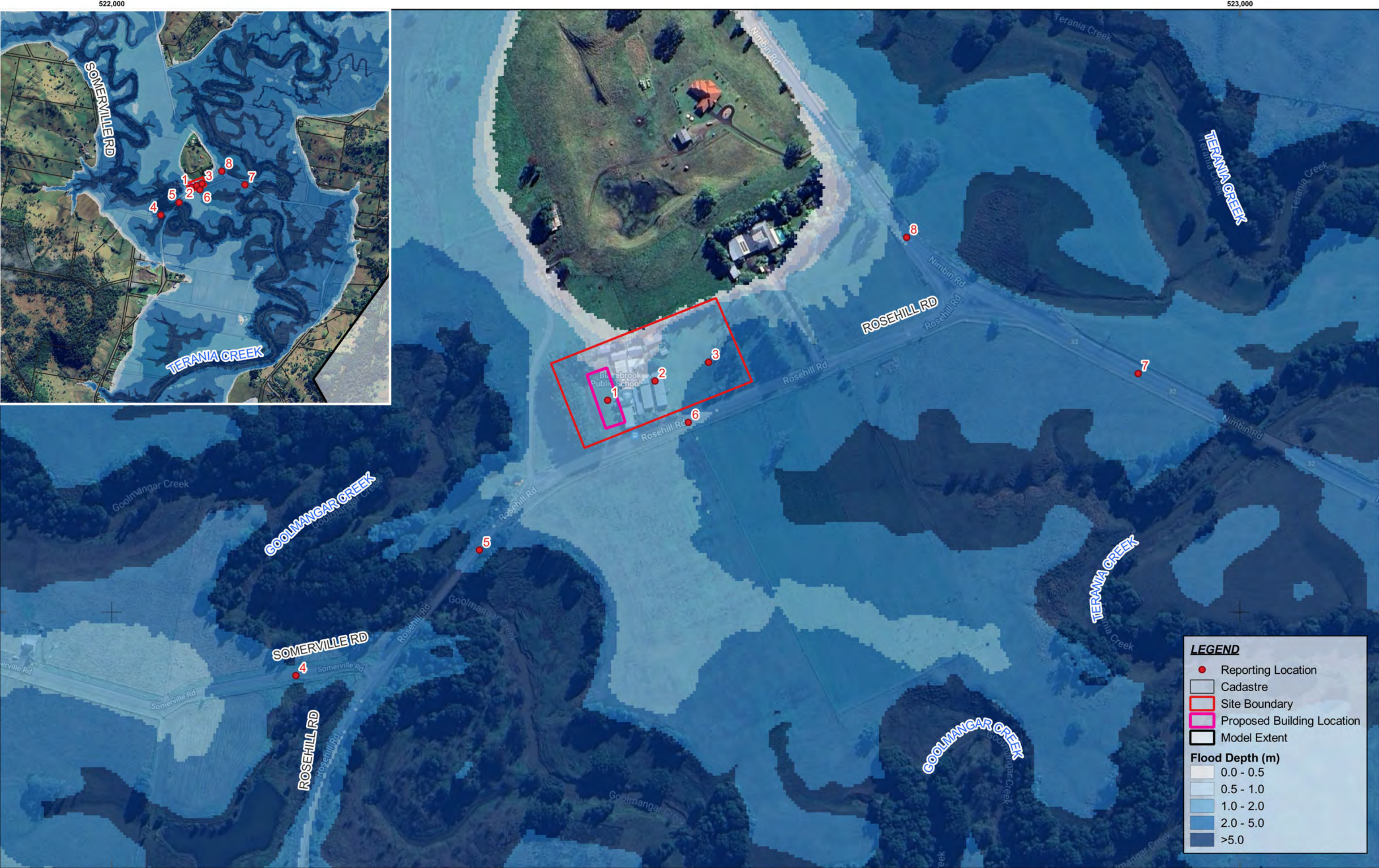
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Figure B6

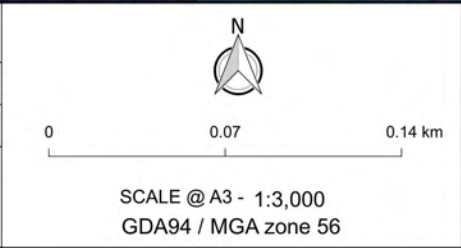
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
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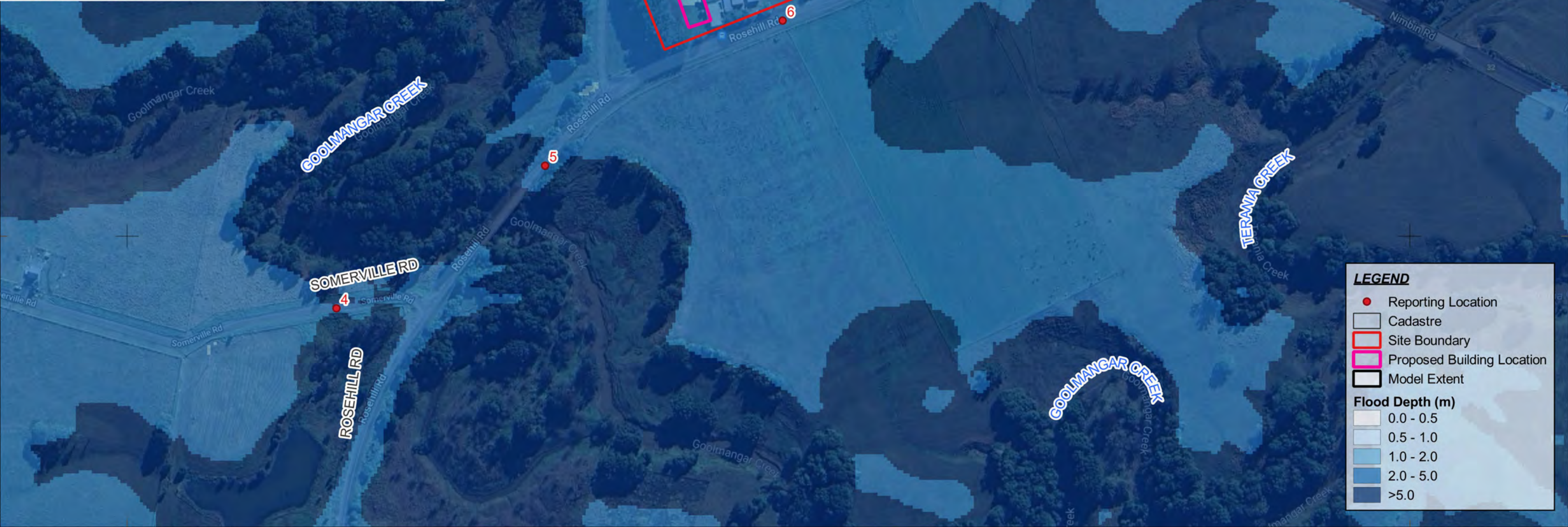
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Figure B7

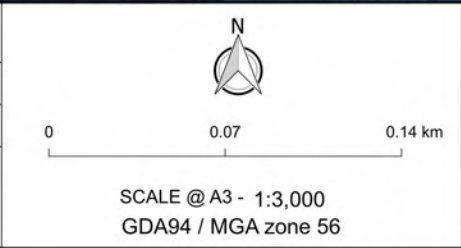
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
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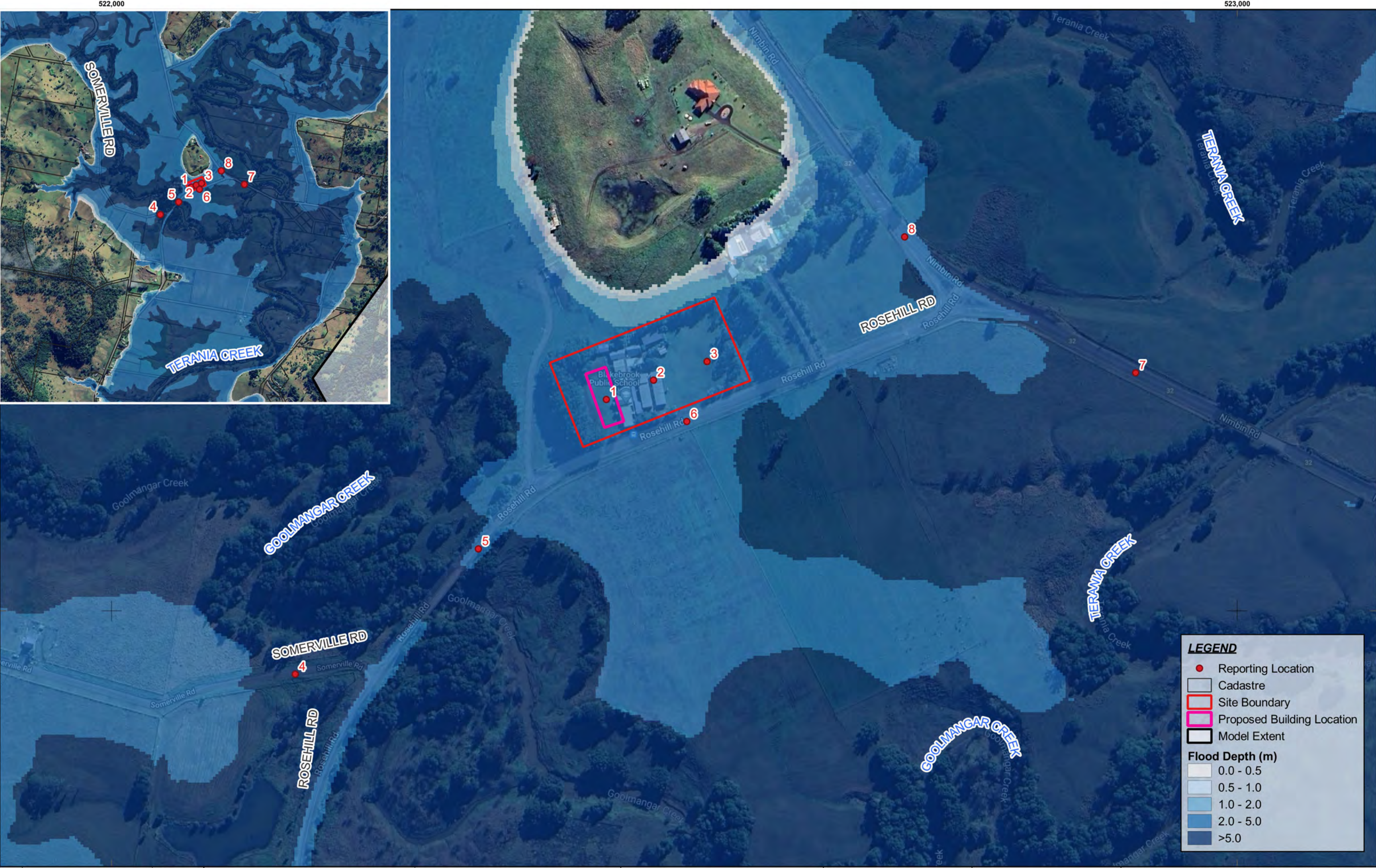
DATA SOURCE
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Figure B8

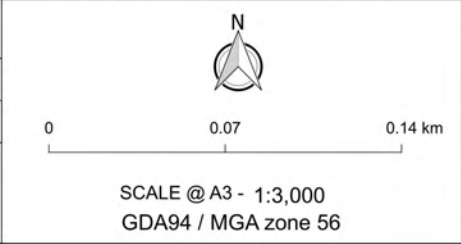
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
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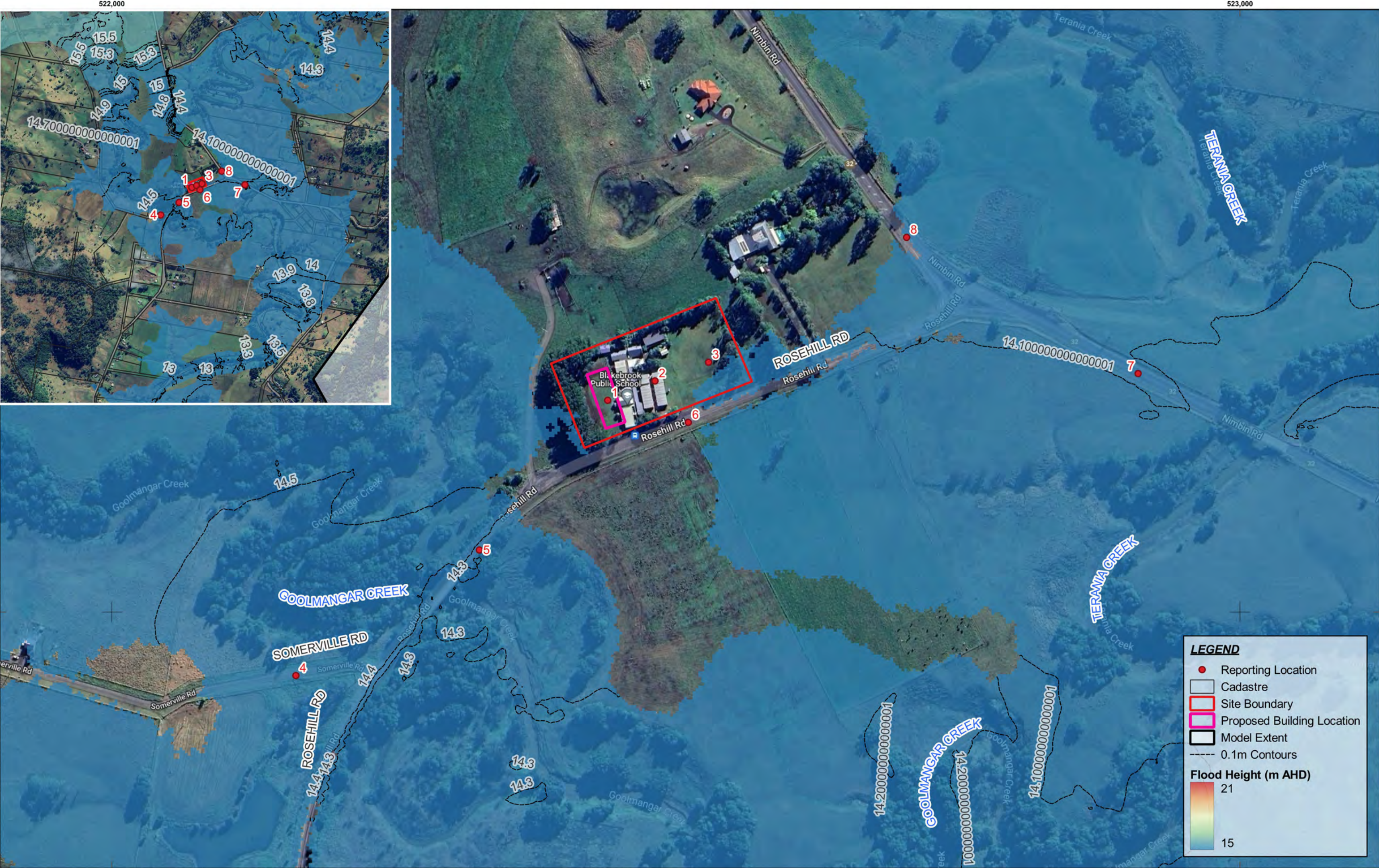
DATA SOURCE
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Figure B9

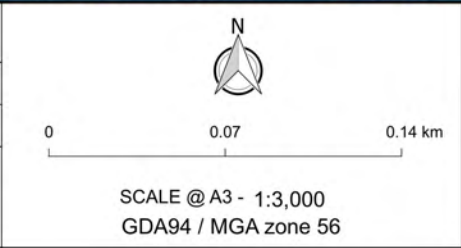
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case PMF Flood Depth

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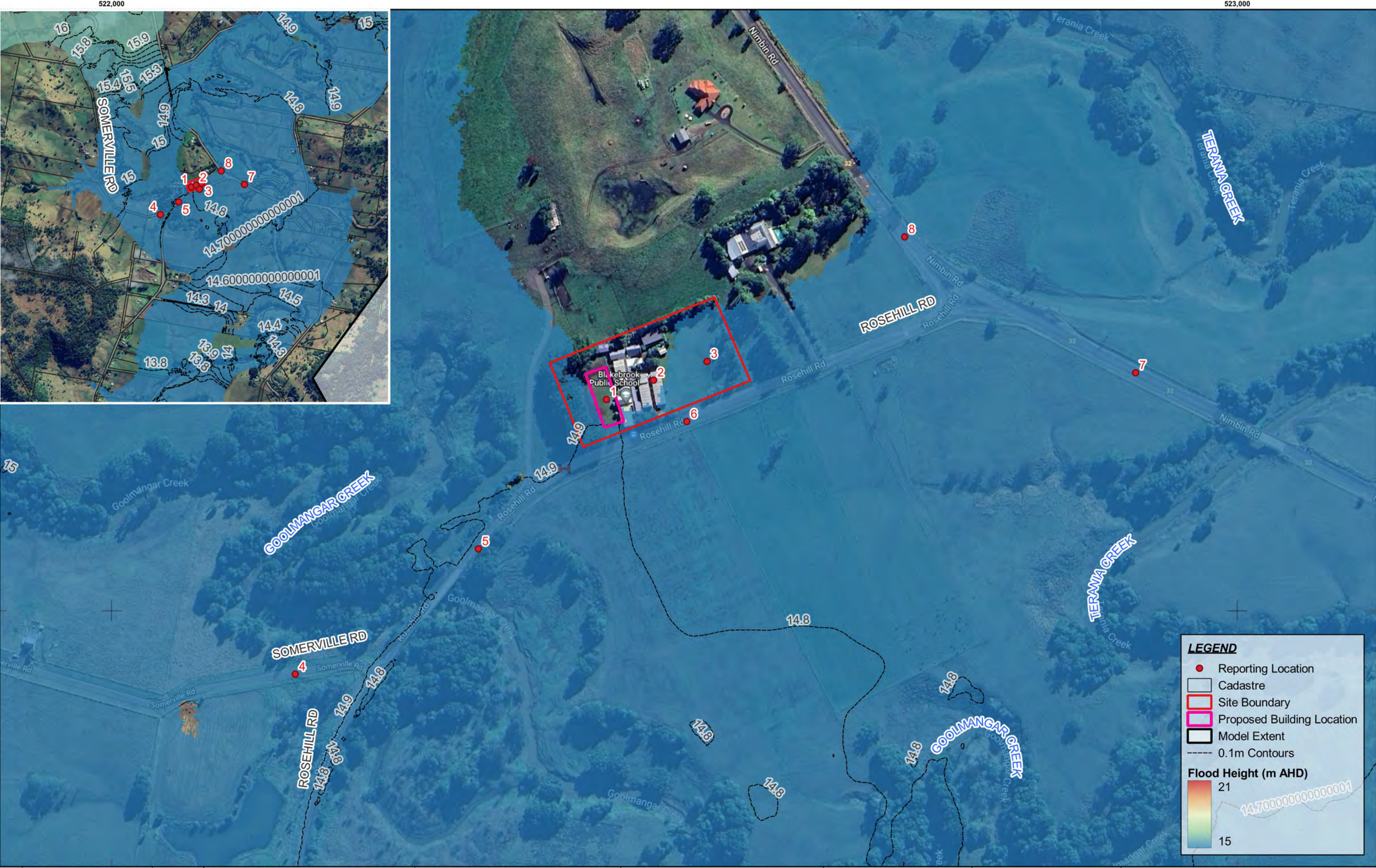
DATA SOURCE
QLD Government Open Data Source



Figure B10

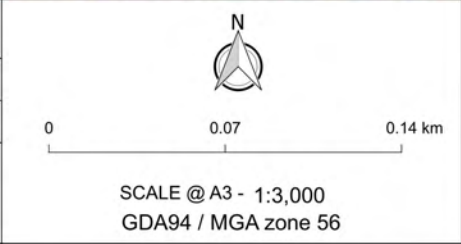
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 10% AEP Flood Height

Dwg Ref:
QC3008_001-SKE-0001



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Figure B11

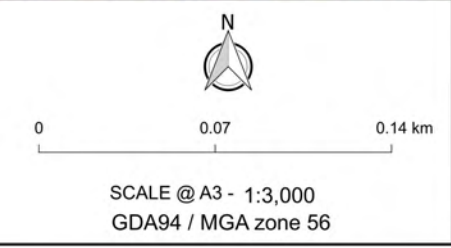
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 5% AEP Flood Height

Dwg Ref:
QC3008_001-SKE-0001



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Figure B12

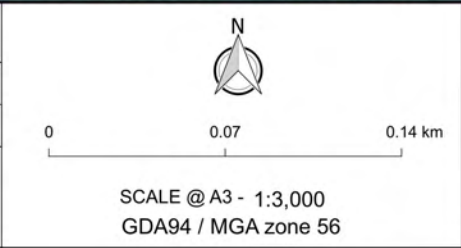
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1% AEP Flood Height

Dwg Ref:
QC3008_001-SKE-0001



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Figure B13

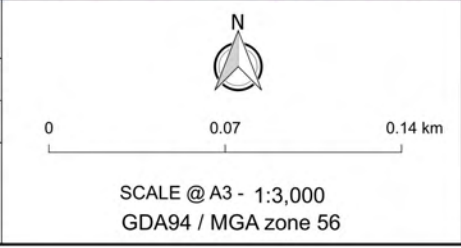
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 0.5% AEP Flood Height

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Figure B14

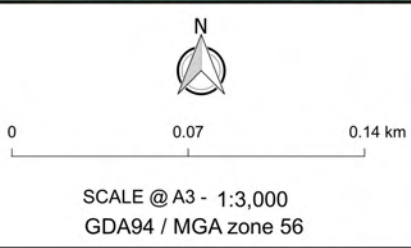
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1 in 1000 AEP Flood Height

Dwg Ref:
QC3008_001-SKE-0001




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Figure B15

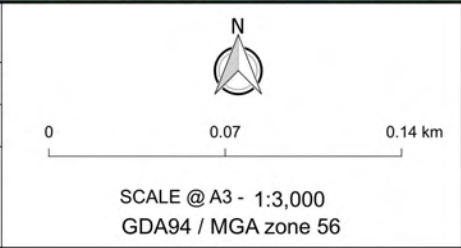
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1 in 2000 AEP Flood Height

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Figure B16

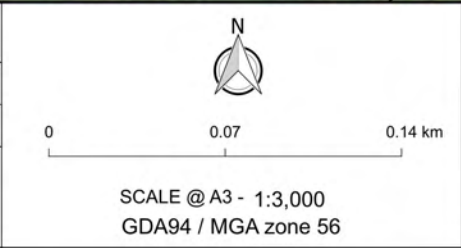
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1 in 10000 AEP Flood Height

Dwg Ref:
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Figure B17

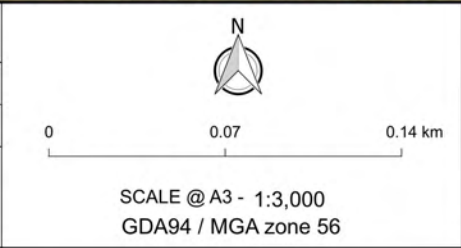
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1 in 100000 AEP Flood Height

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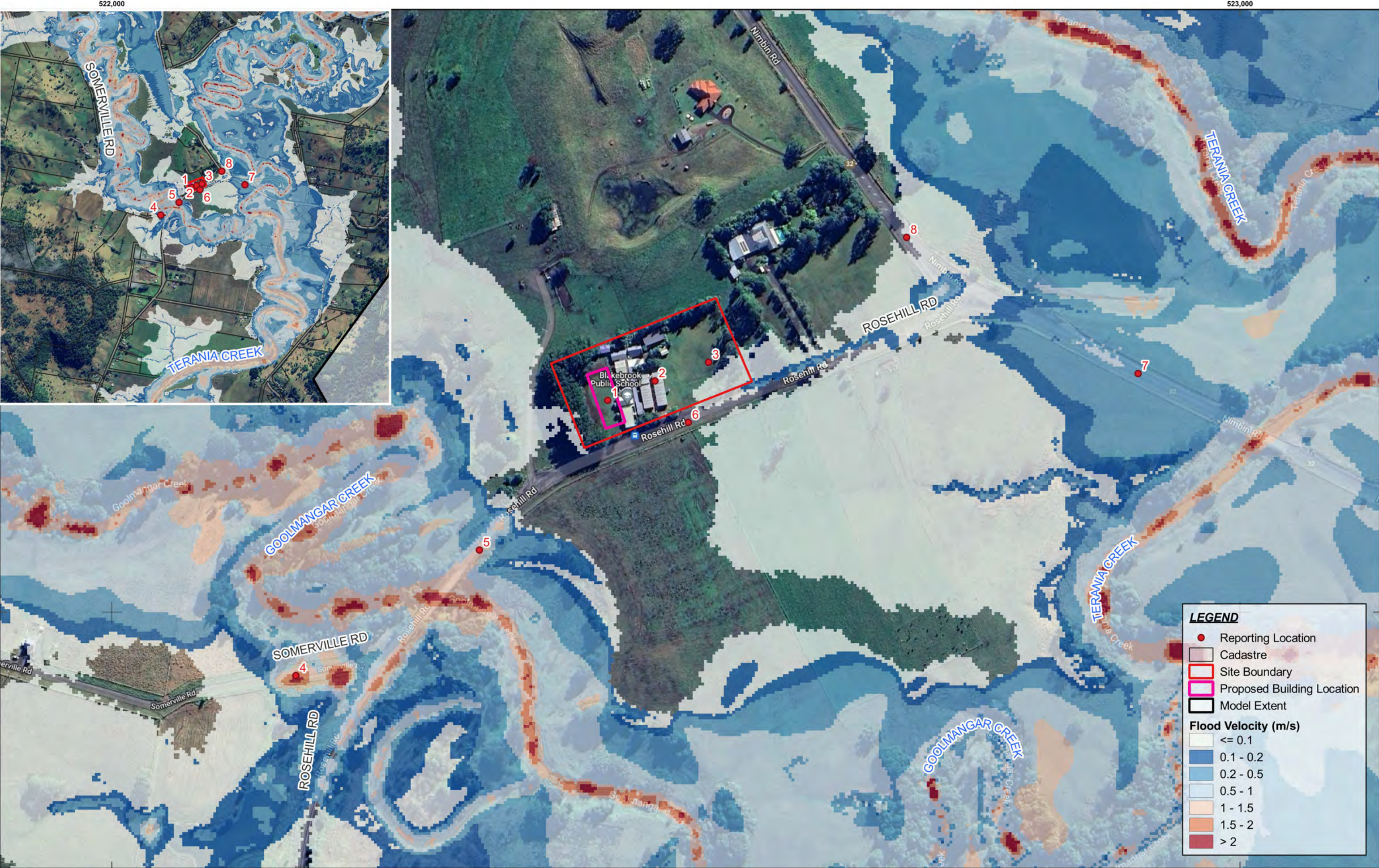
DATA SOURCE
QLD Government Open Data Source



Figure B18

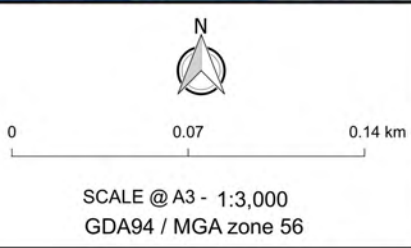
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case PMF Flood Height

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QC3008_001-SKE-0001



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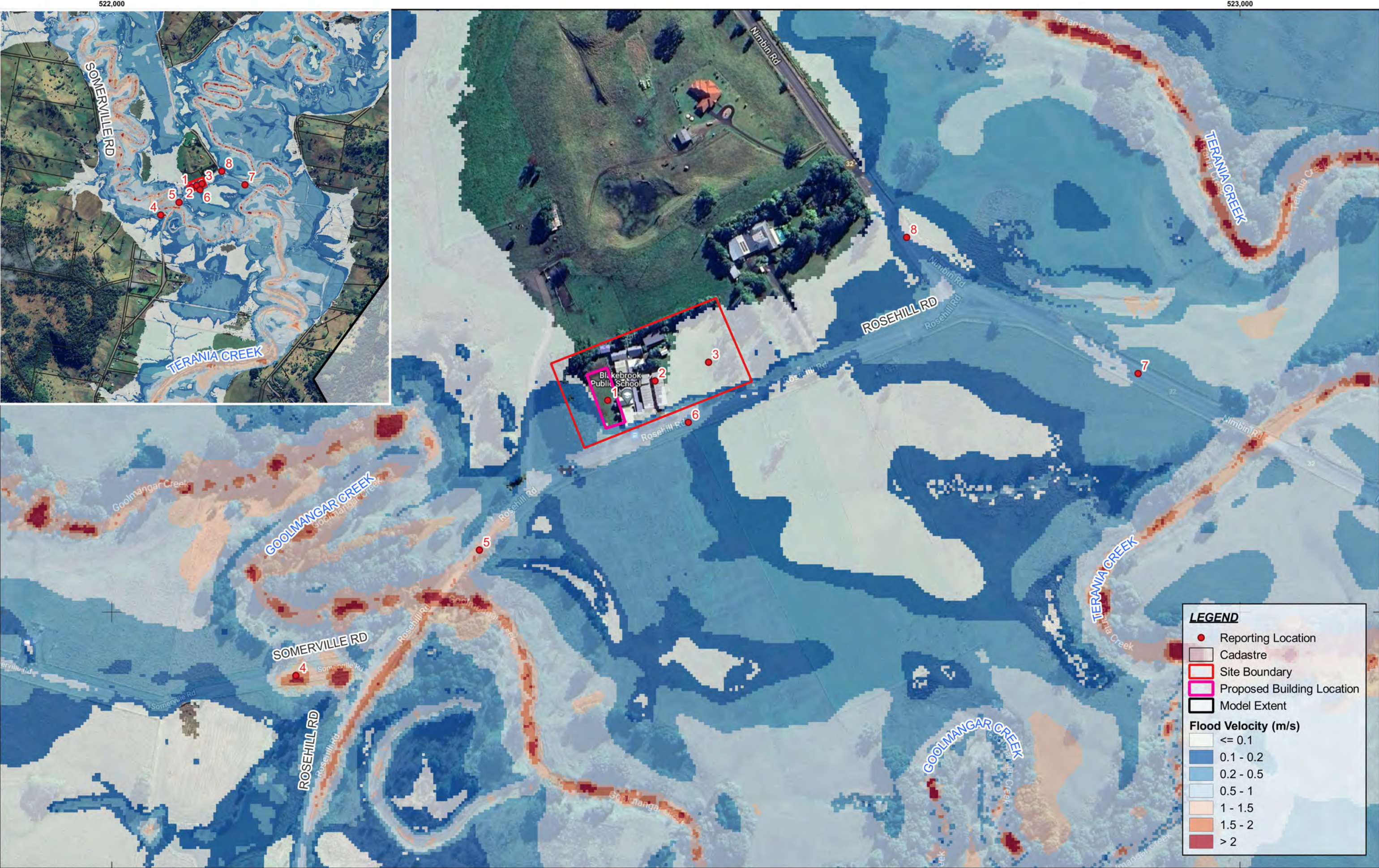
DATA SOURCE
QLD Government Open Data Source



Figure B19

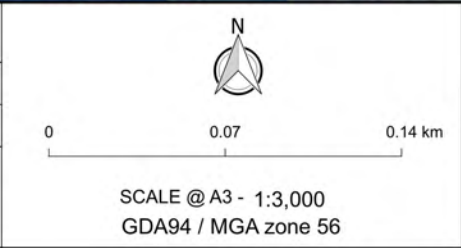
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 10% AEP Flood Velocity

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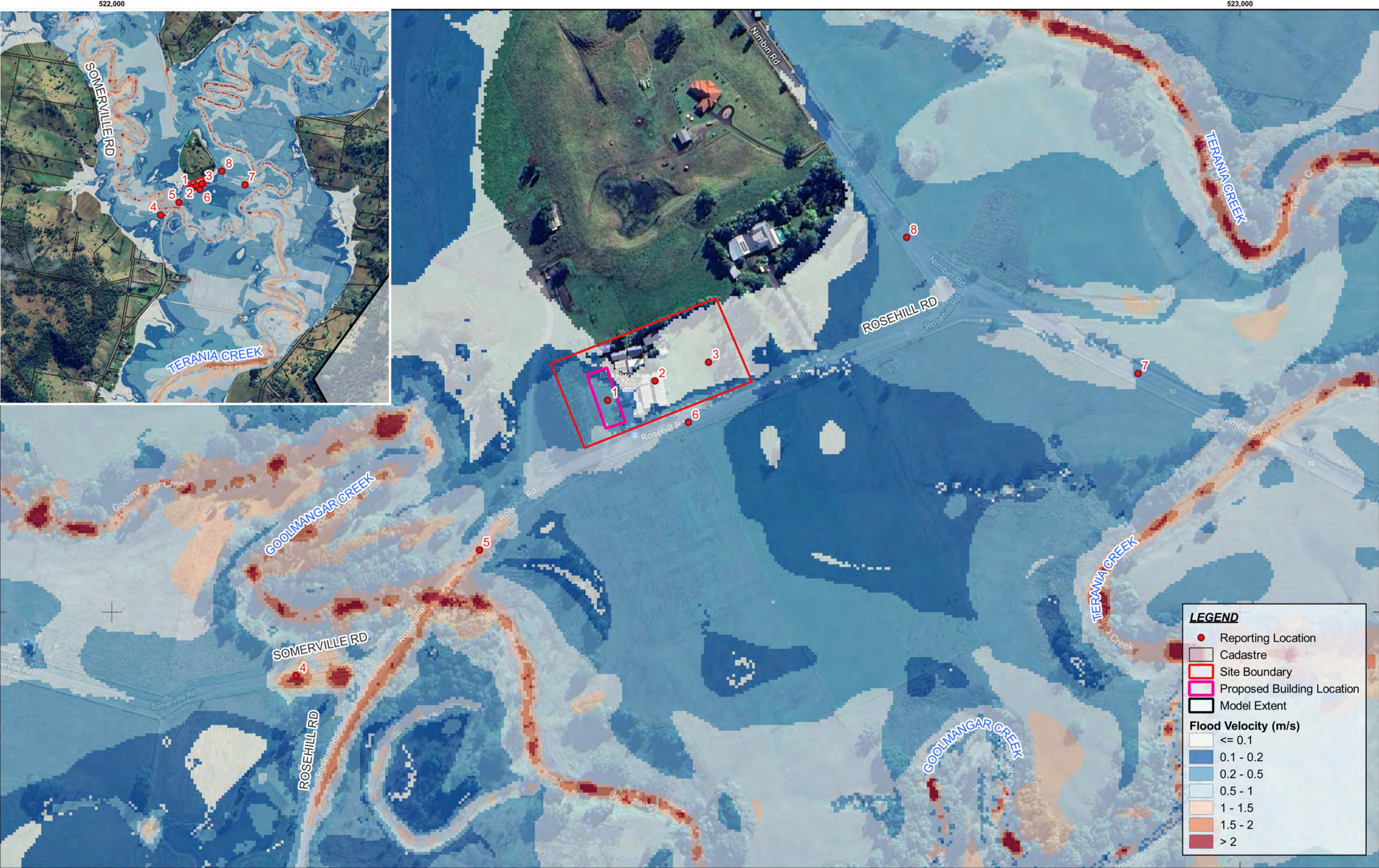
DATA SOURCE
QLD Government Open Data Source



Figure B20

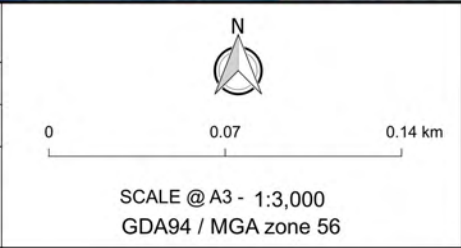
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 5% AEP Flood Velocity

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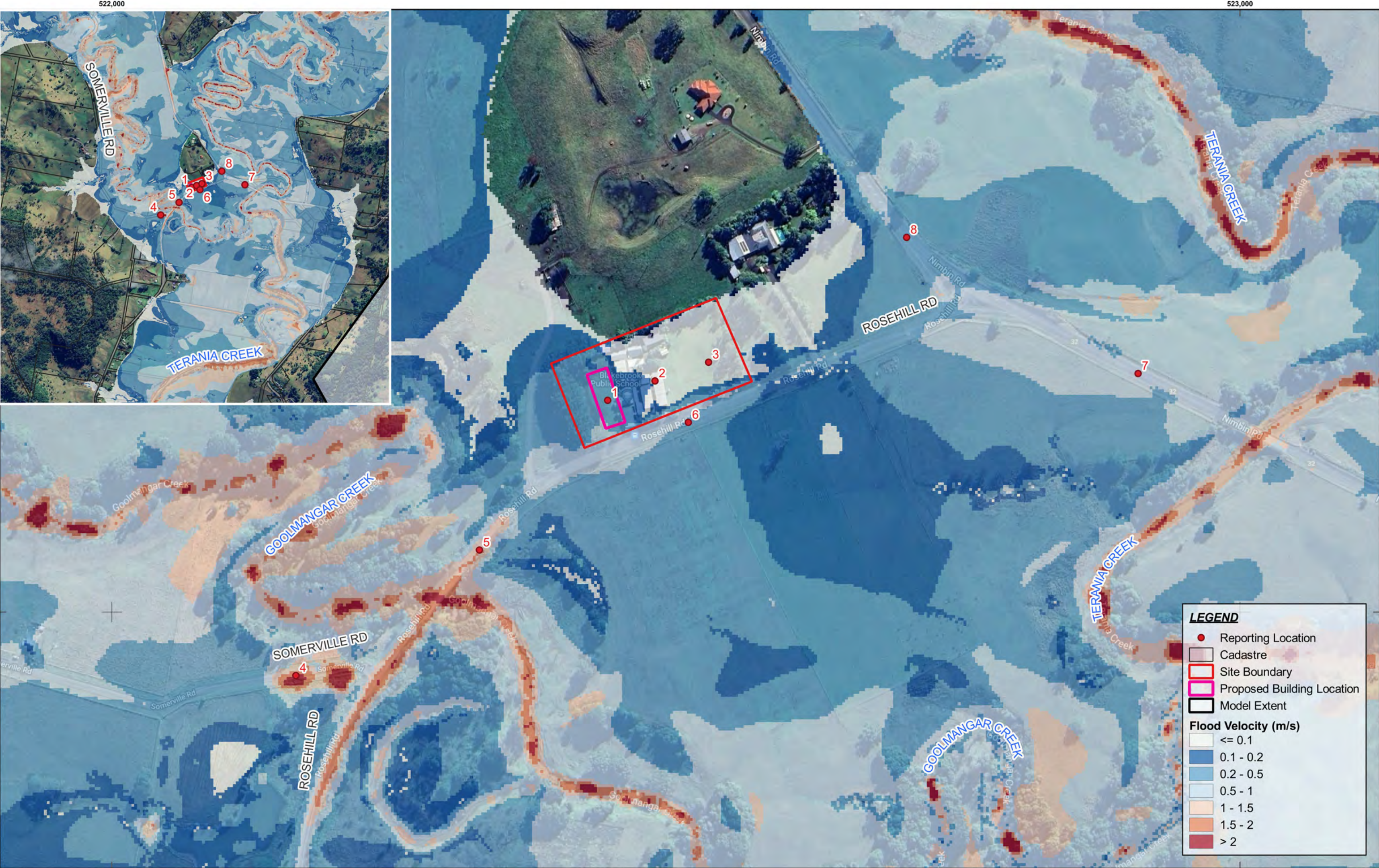
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QLD Government Open Data Source



Figure B21

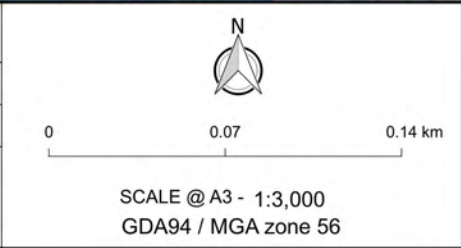
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1% AEP Flood Velocity

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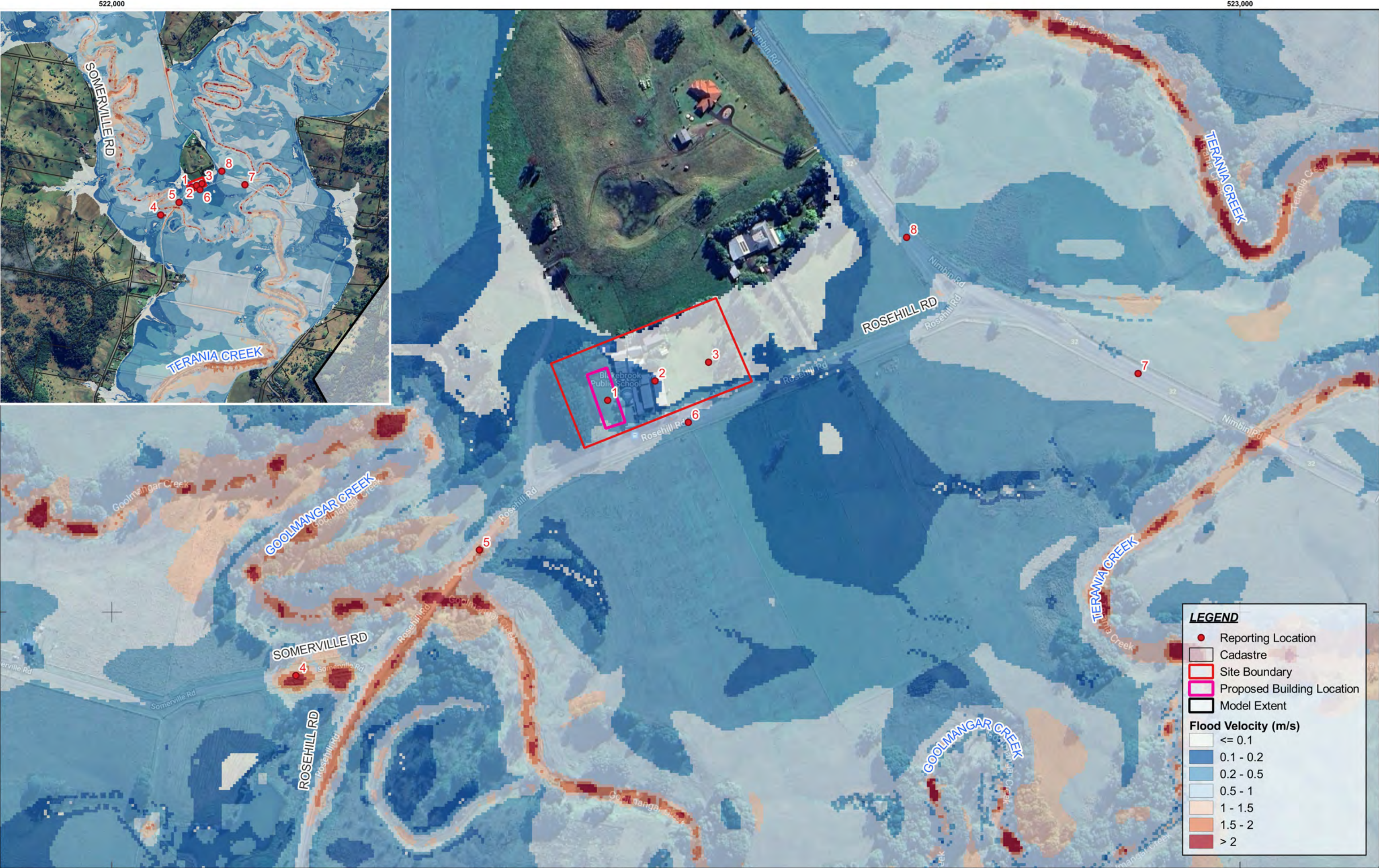
DATA SOURCE
QLD Government Open Data Source



Figure B22

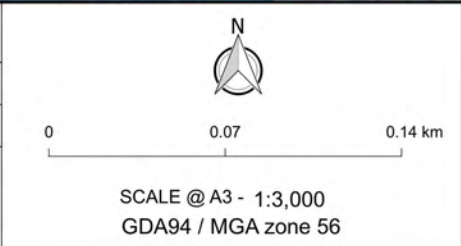
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 0.5% AEP Flood Velocity

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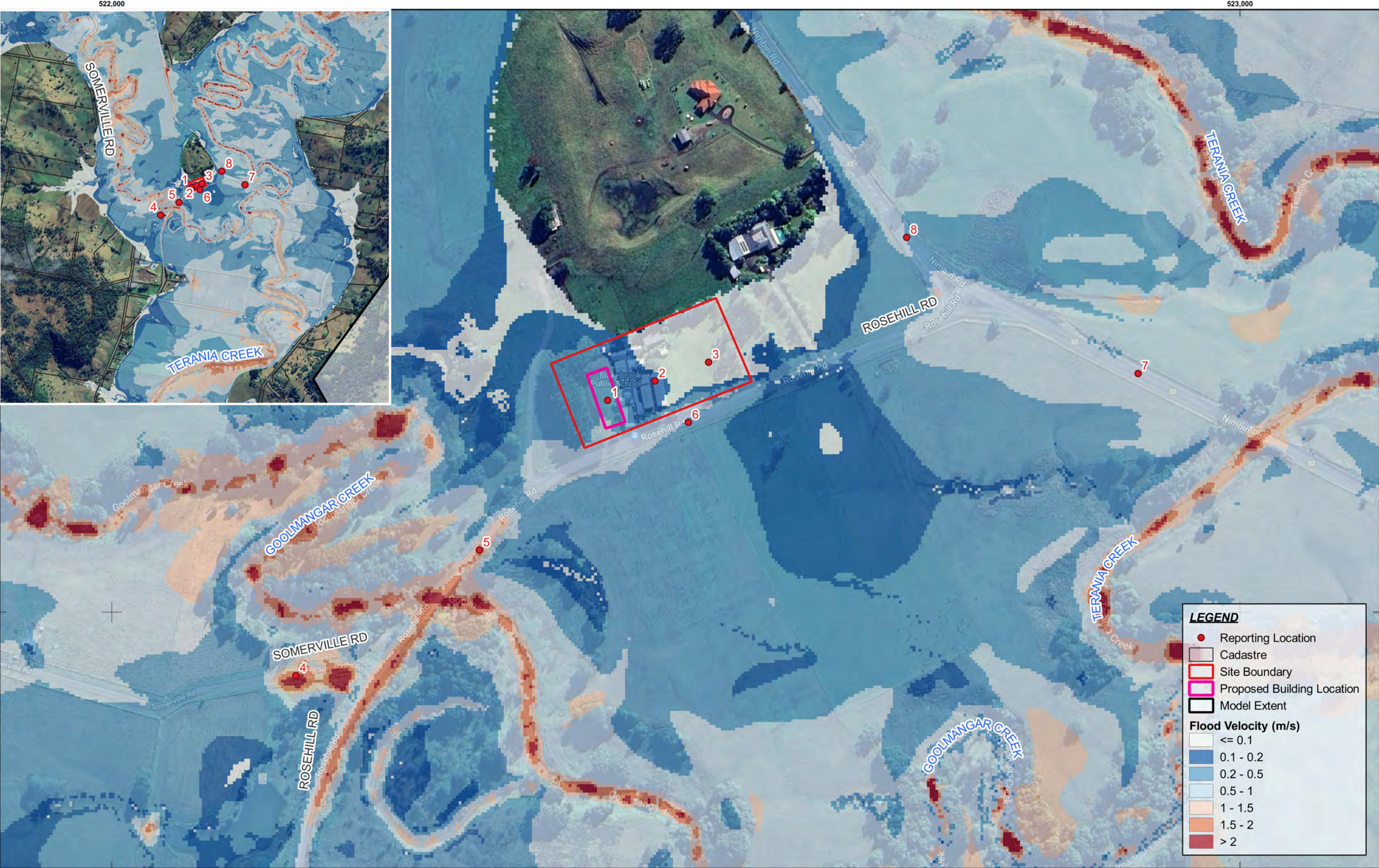
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QLD Government Open Data Source



Figure B23

NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1 in 1000 AEP Flood Velocity

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DATE: 05-12-2023

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0 0.07 0.14 km

SCALE @ A3 - 1:3,000
GDA94 / MGA zone 56

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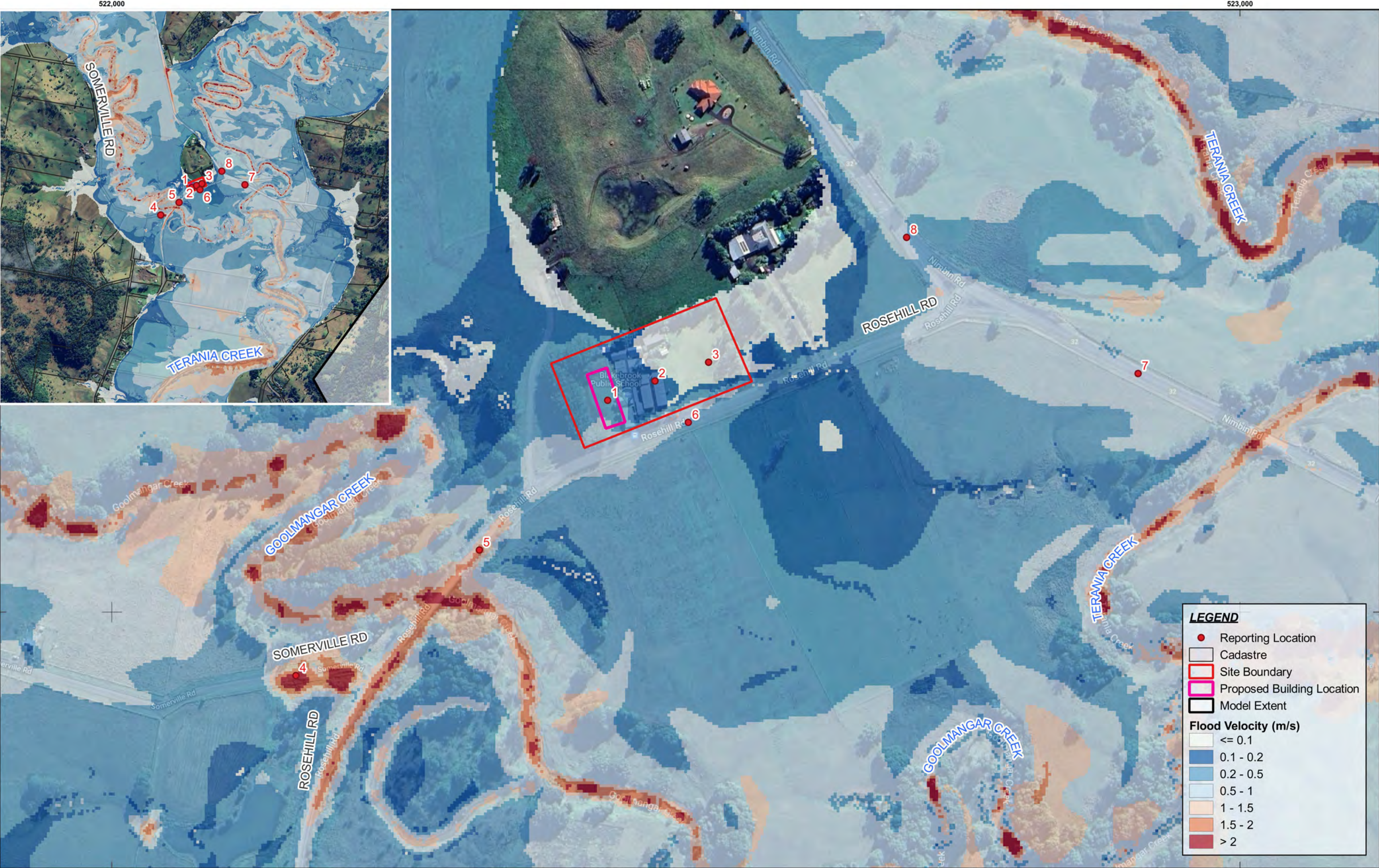
DATA SOURCE
QLD Government Open Data Source



Figure B24

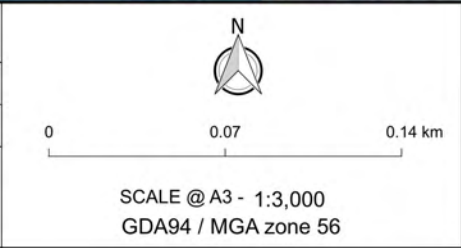
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1 in 2000 AEP Flood Velocity

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QC3008_001-SKE-0001



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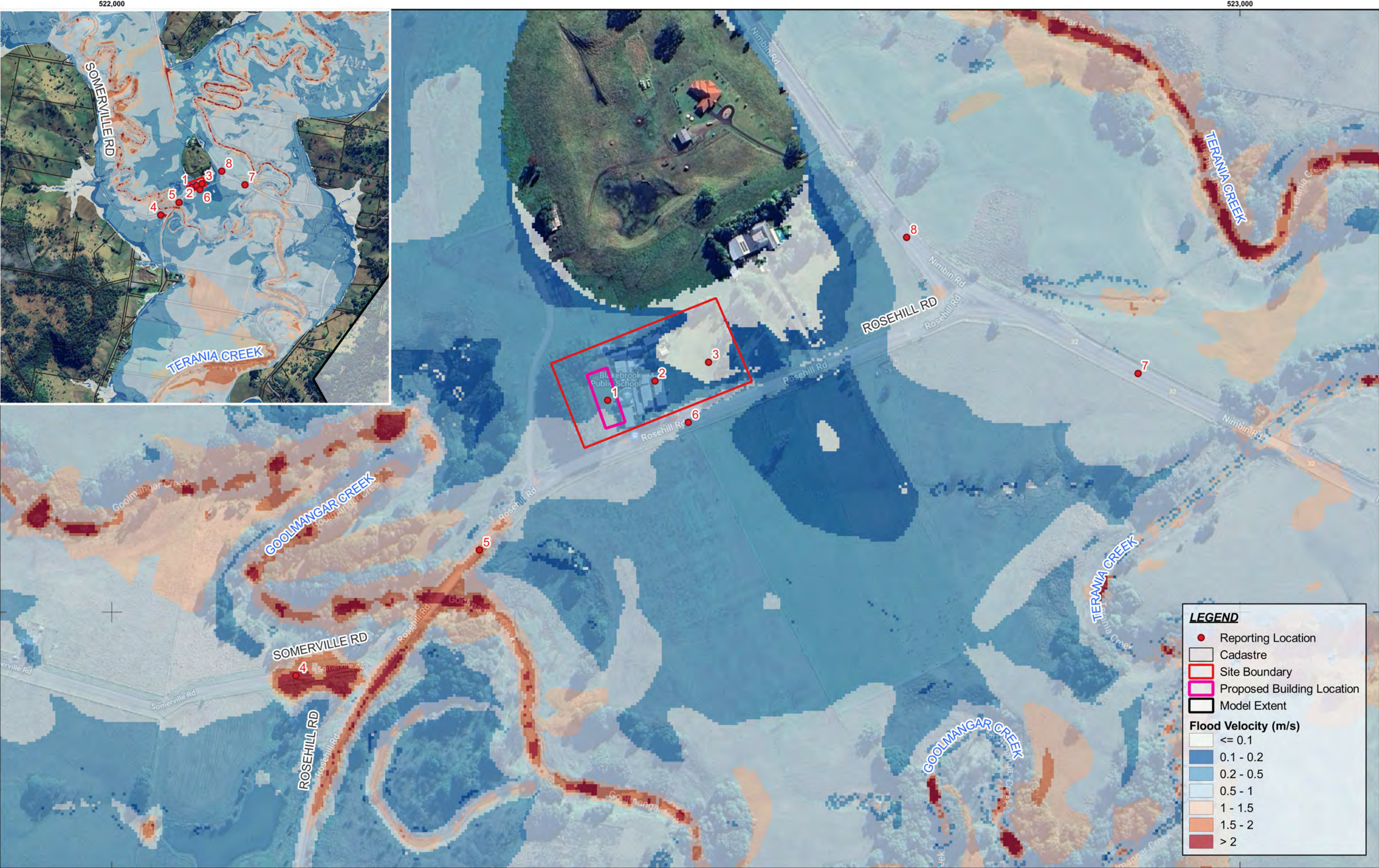
DATA SOURCE
QLD Government Open Data Source



Figure B25

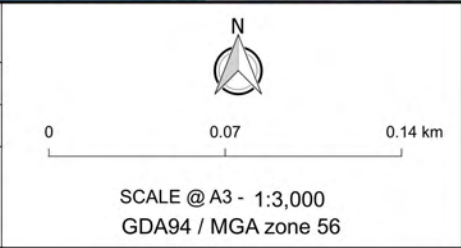
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1 in 10000 AEP Flood Velocity

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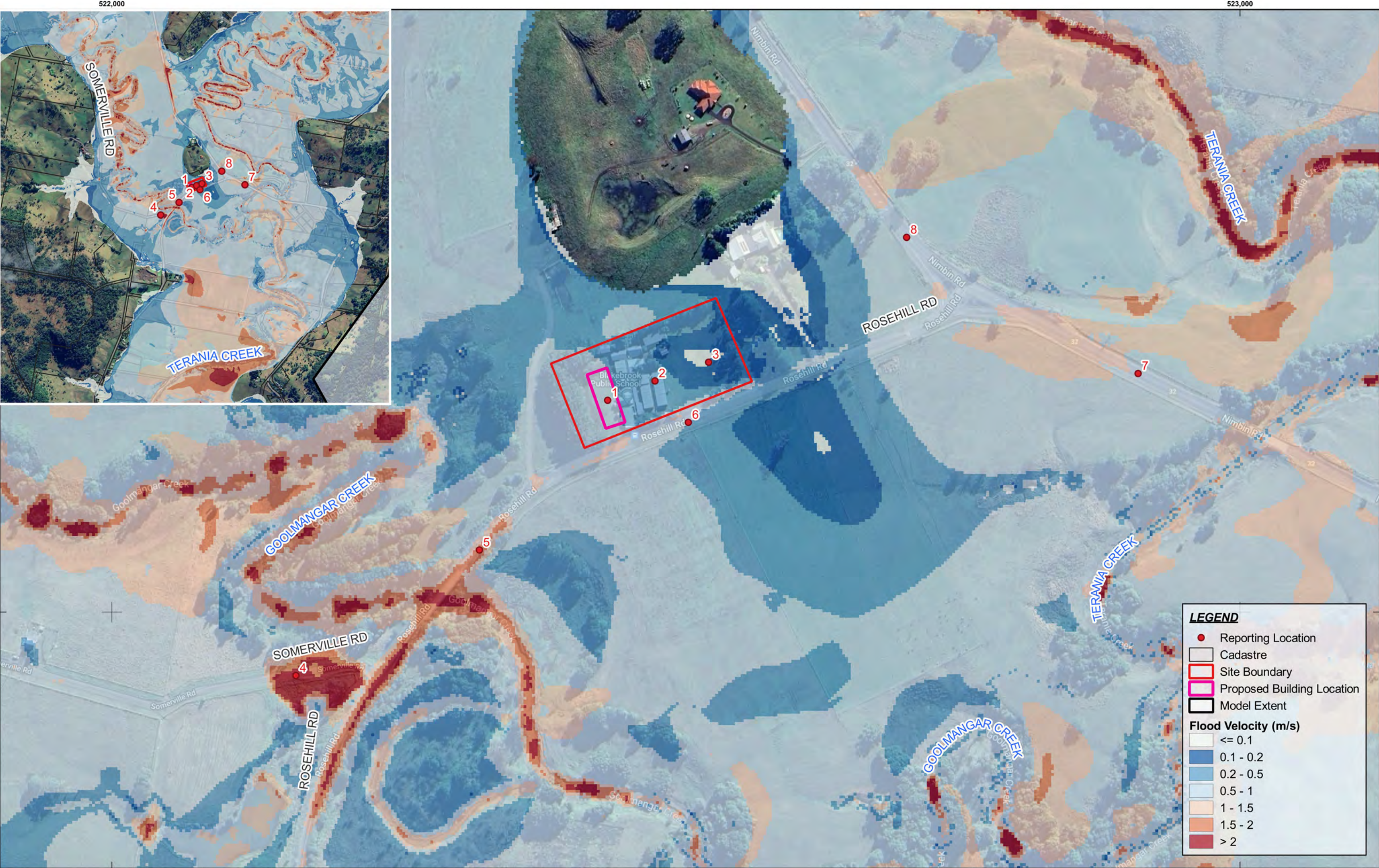
DATA SOURCE
QLD Government Open Data Source



Figure B26

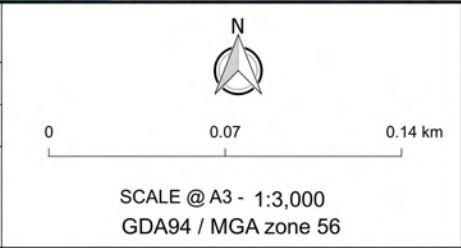
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1 in 100000 AEP Flood Velocity

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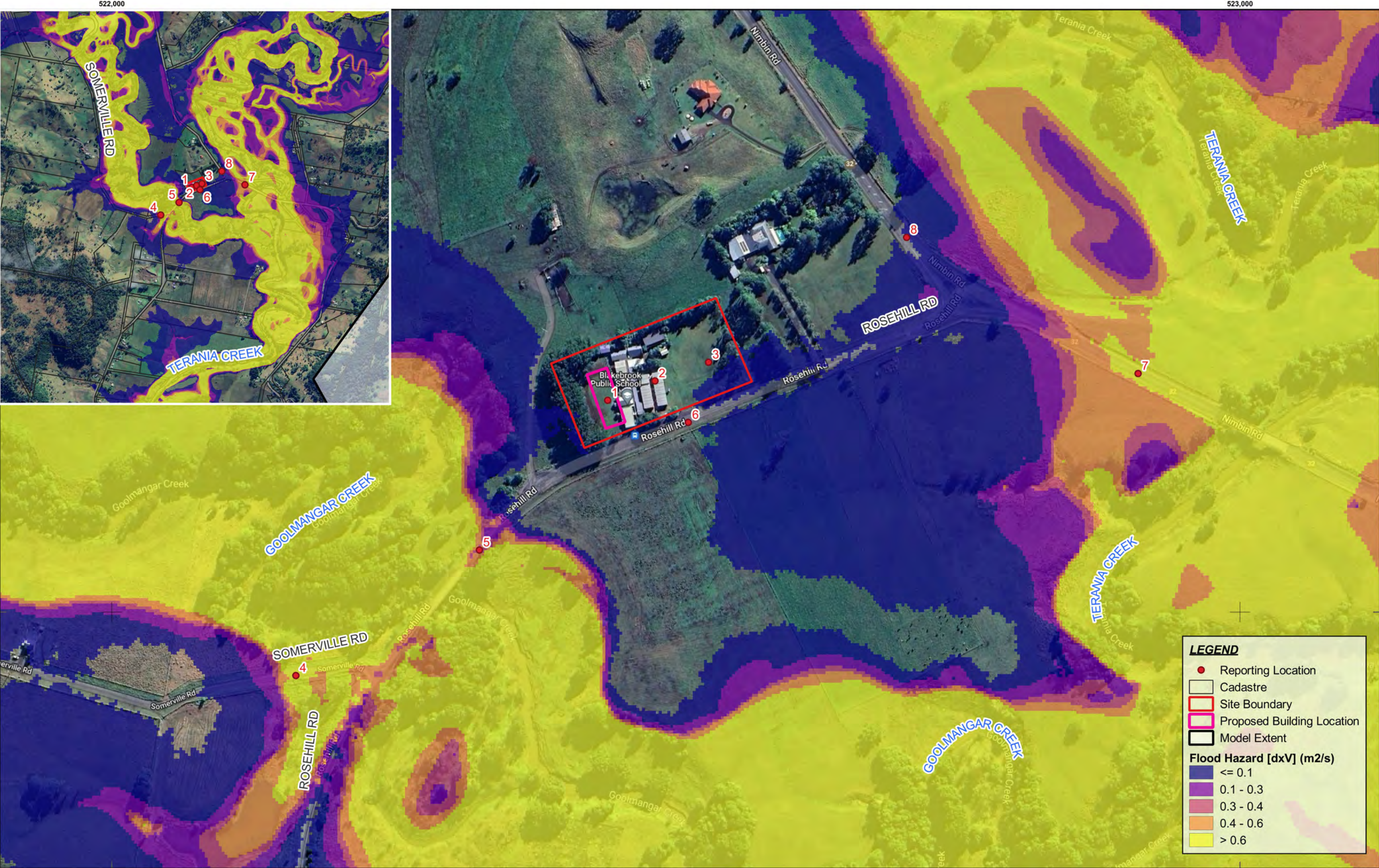
DATA SOURCE
QLD Government Open Data Source



Figure B27

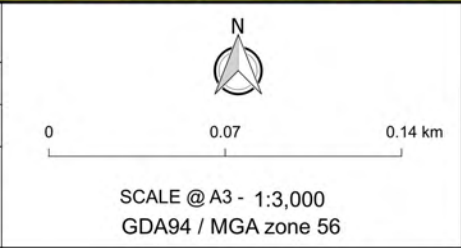
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case PMF Flood Velocity

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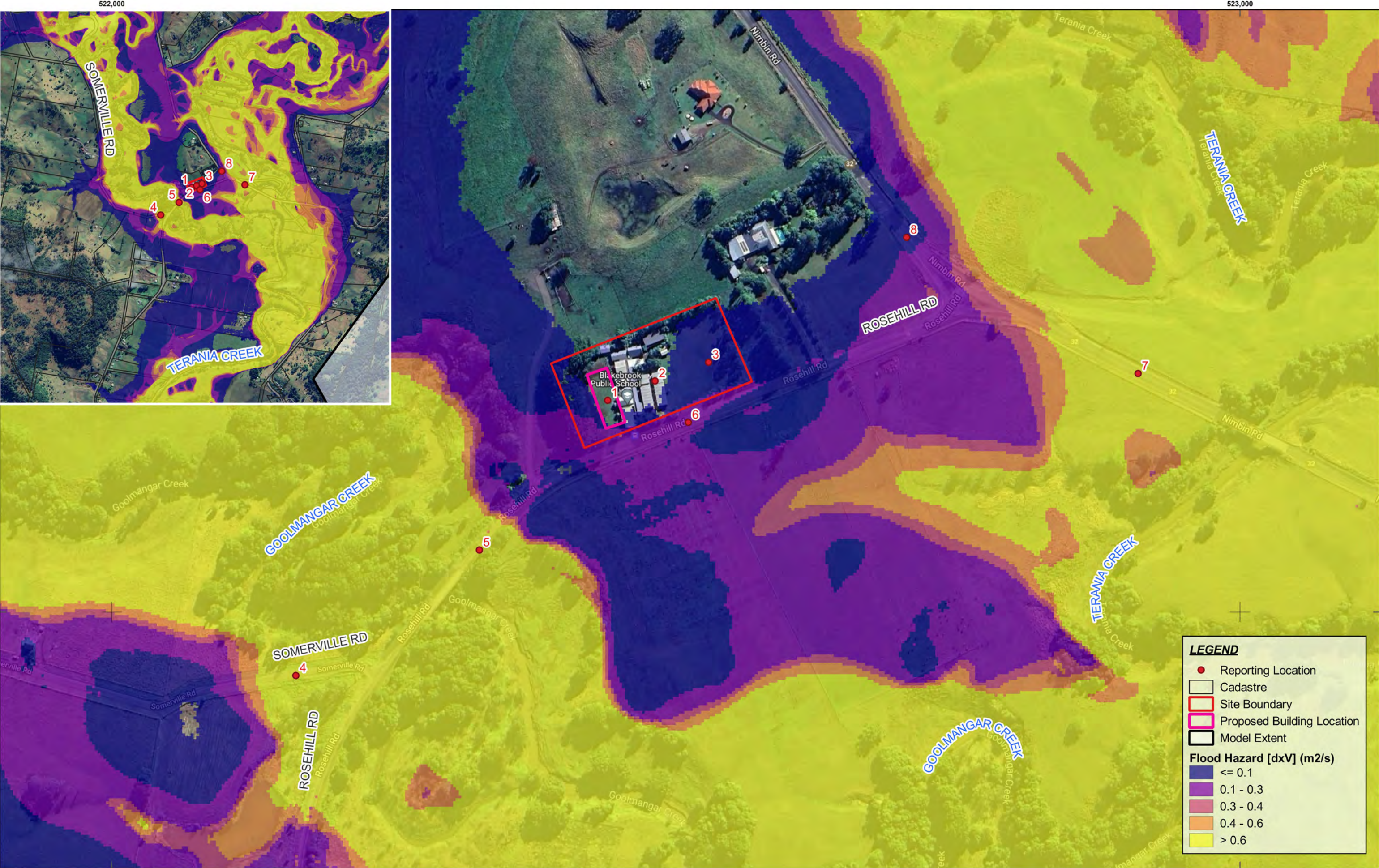
DATA SOURCE
QLD Government Open Data Source



Figure B28

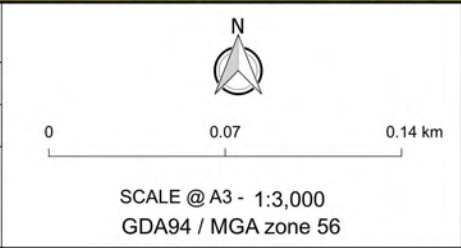
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 10% AEP Flood Hazard (dxV)

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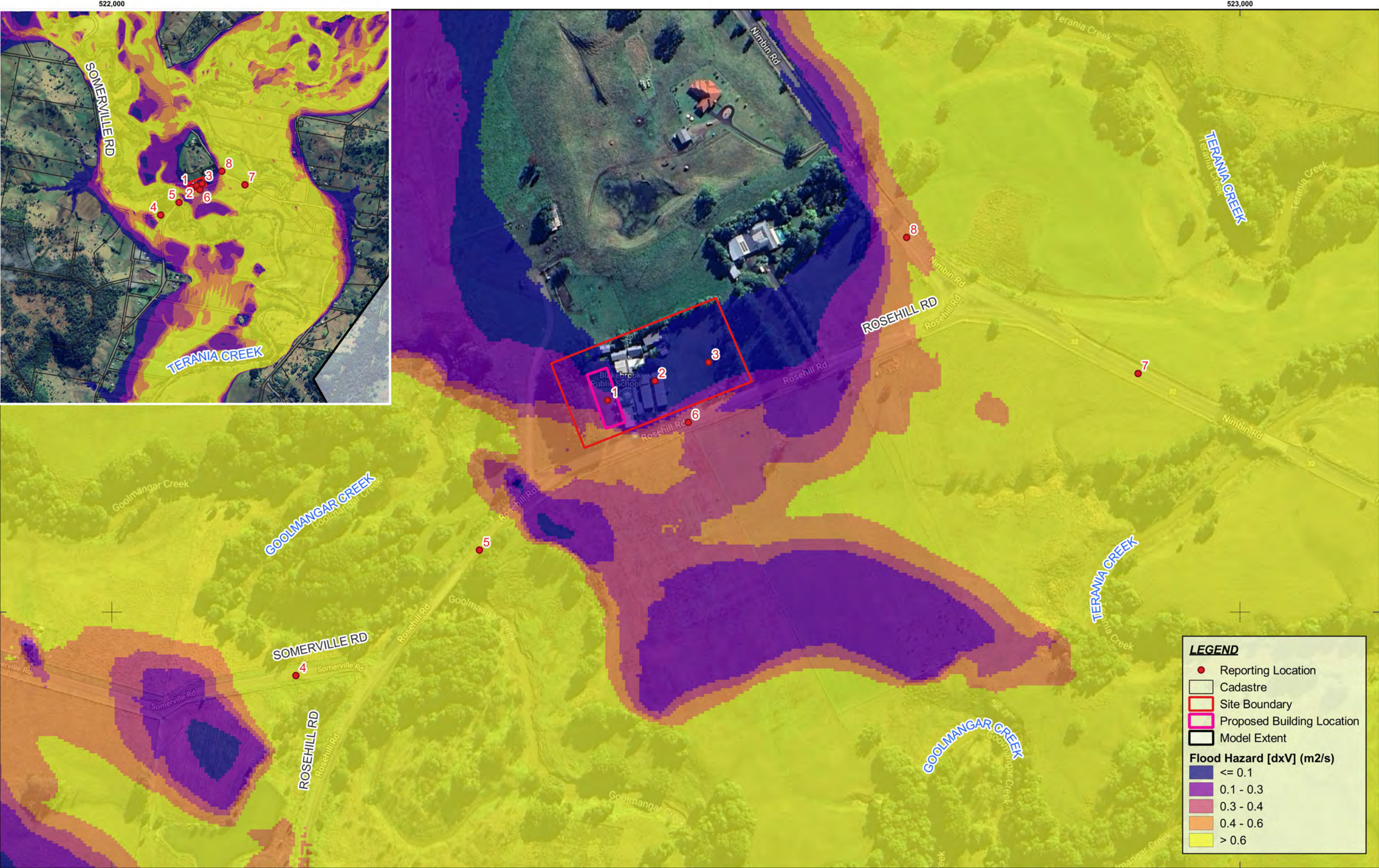
DATA SOURCE
QLD Government Open Data Source



Figure B29

NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 5% AEP Flood Hazard (dxV)

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0 0.07 0.14 km

SCALE @ A3 - 1:3,000
GDA94 / MGA zone 56

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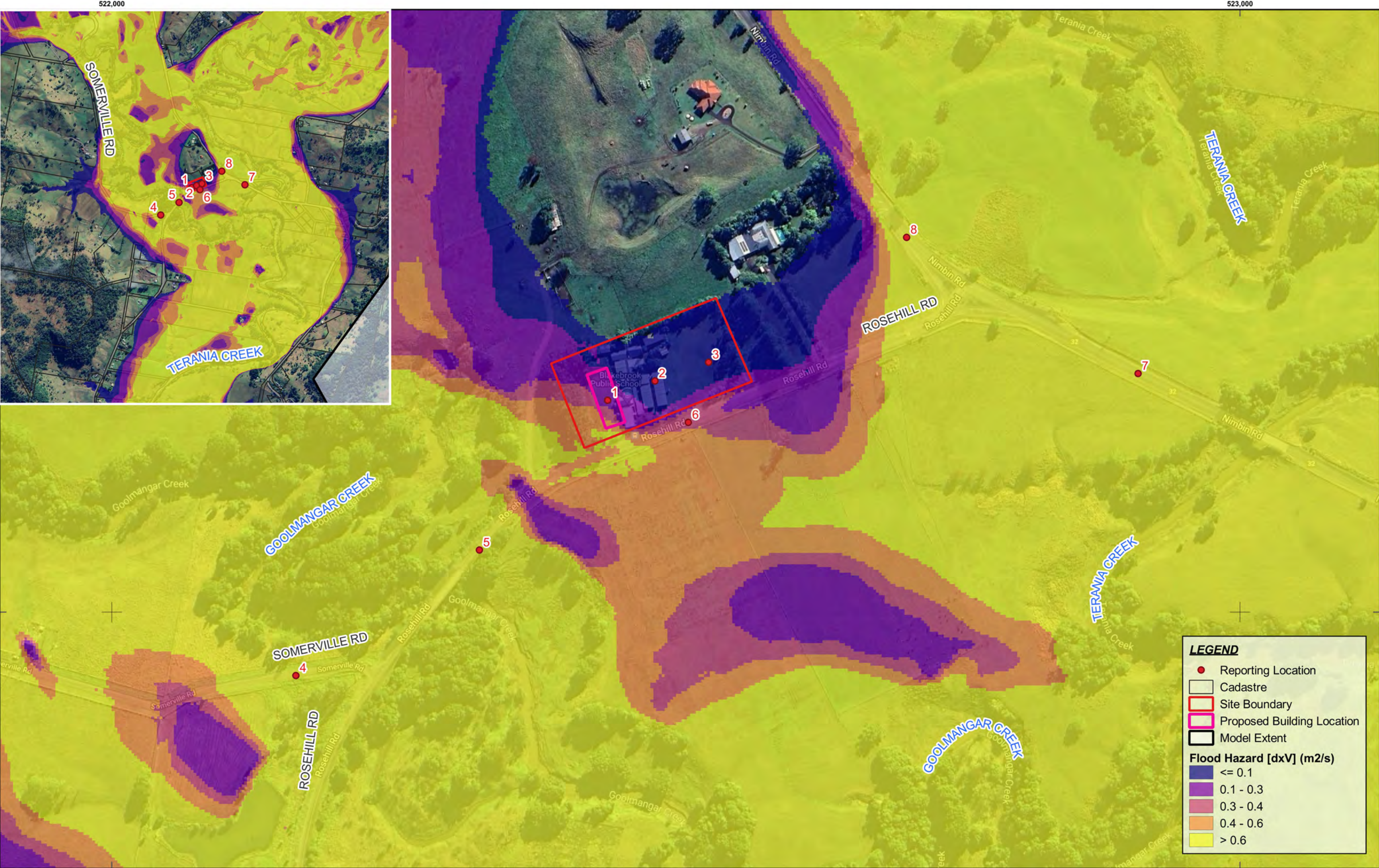
DATA SOURCE
QLD Government Open Data Source



Figure B30

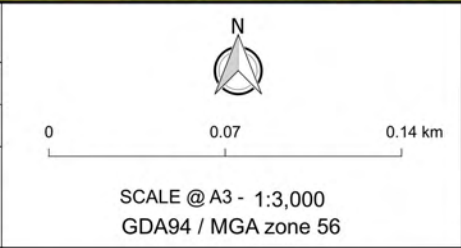
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1% AEP Flood Hazard (dxV)

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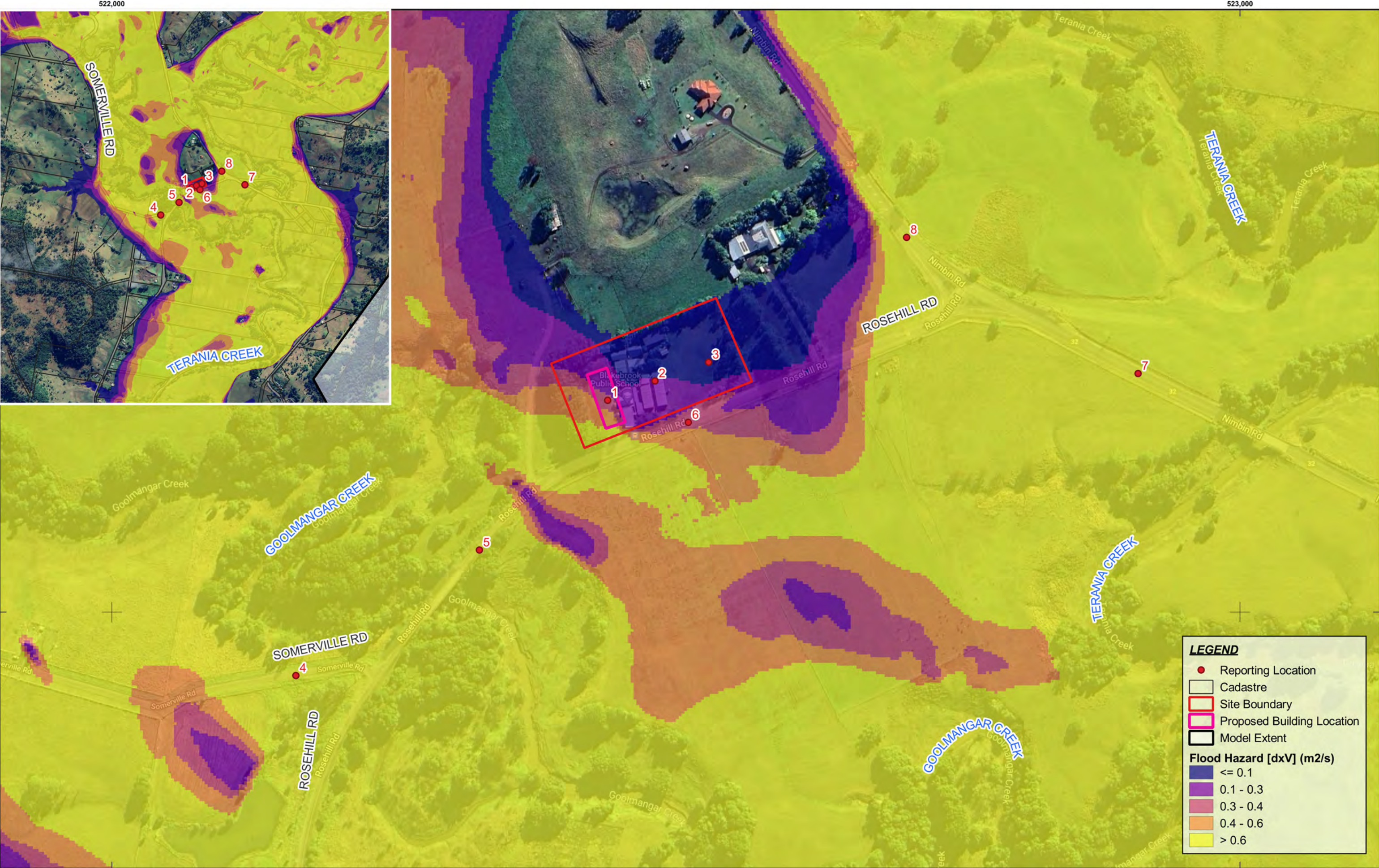
DATA SOURCE
QLD Government Open Data Source



Figure B31

NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 0.5% AEP Flood Hazard (dxV)

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0 0.07 0.14 km

SCALE @ A3 - 1:3,000
GDA94 / MGA zone 56

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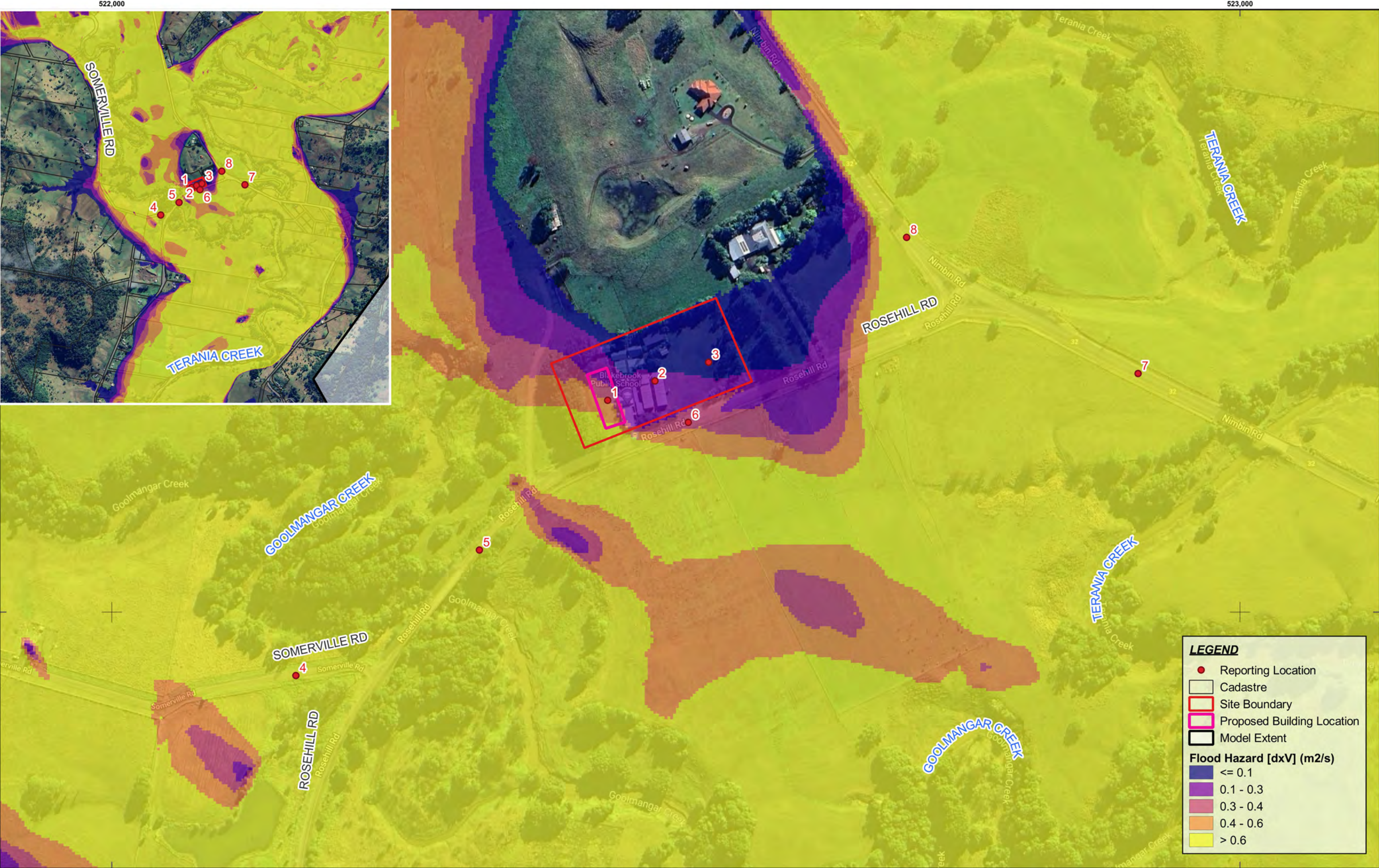
DATA SOURCE
QLD Government Open Data Source



Figure B32


NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1 in 1000 AEP Flood Hazard (dxV)

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0 0.07 0.14 km

SCALE @ A3 - 1:3,000
GDA94 / MGA zone 56

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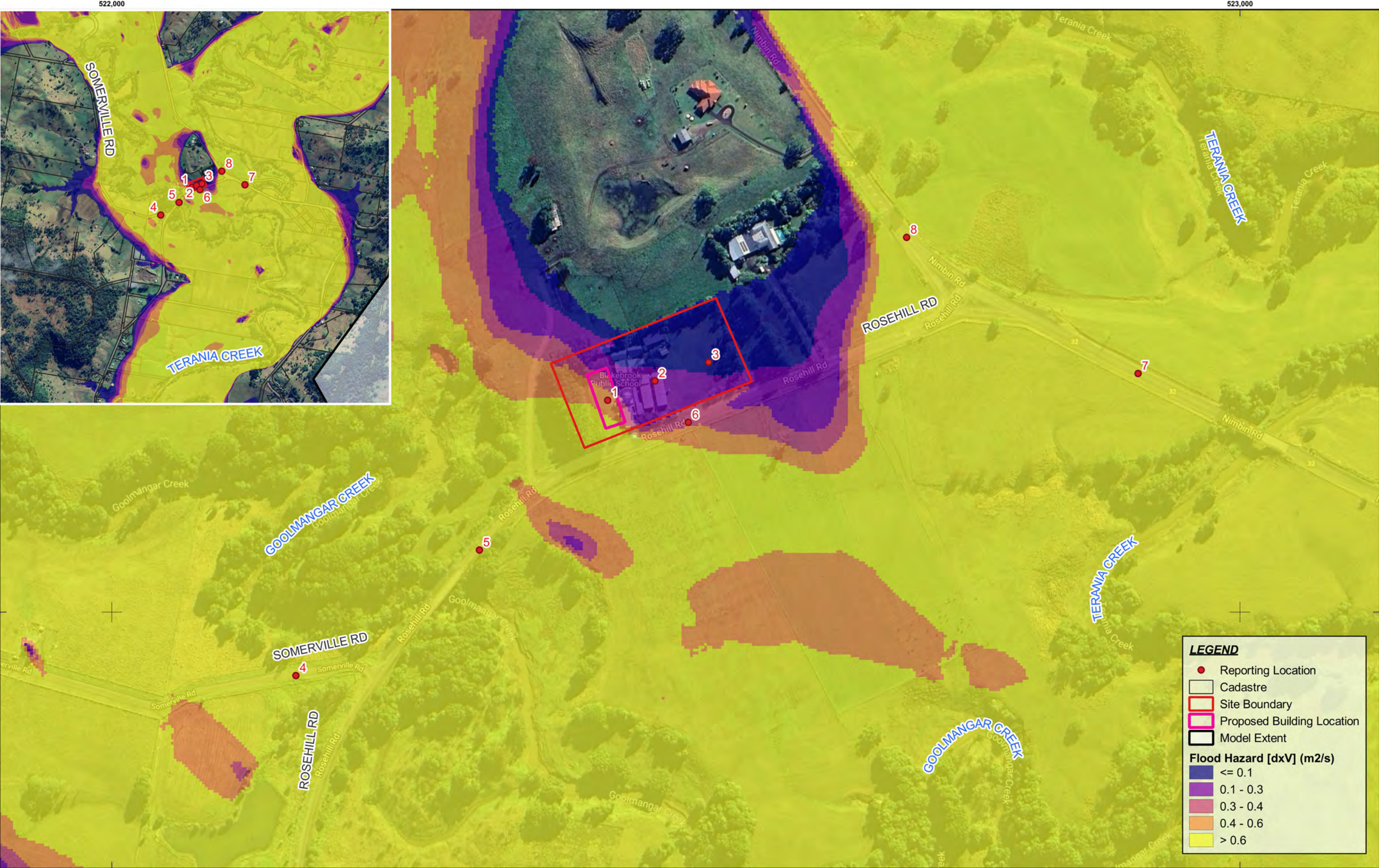
DATA SOURCE
QLD Government Open Data Source



Figure B33

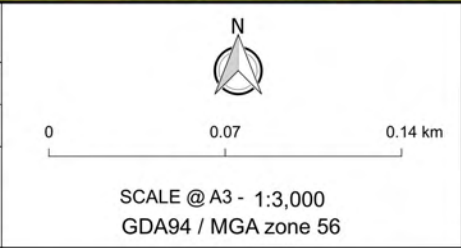
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1 in 2000 AEP Flood Hazard (dxV)

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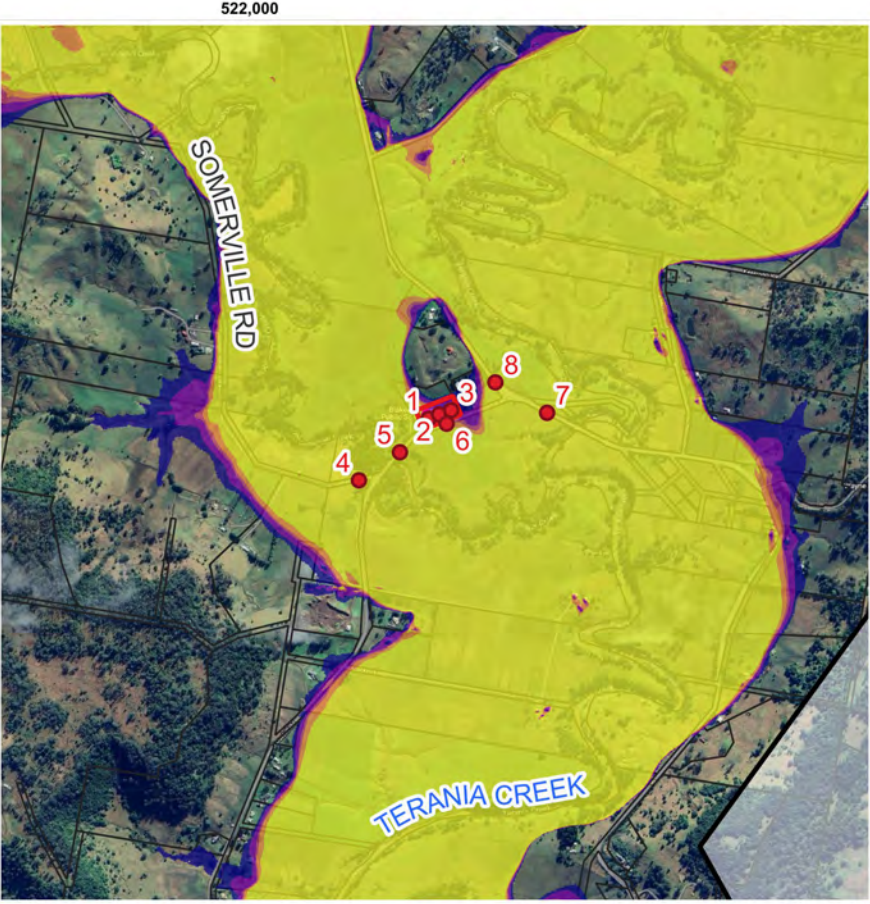
DATA SOURCE
QLD Government Open Data Source



Figure B34

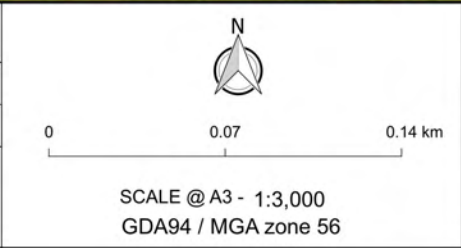
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1 in 10000 AEP Flood Hazard (dxV)

Dwg Ref:
QC3008_001-SKE-0001



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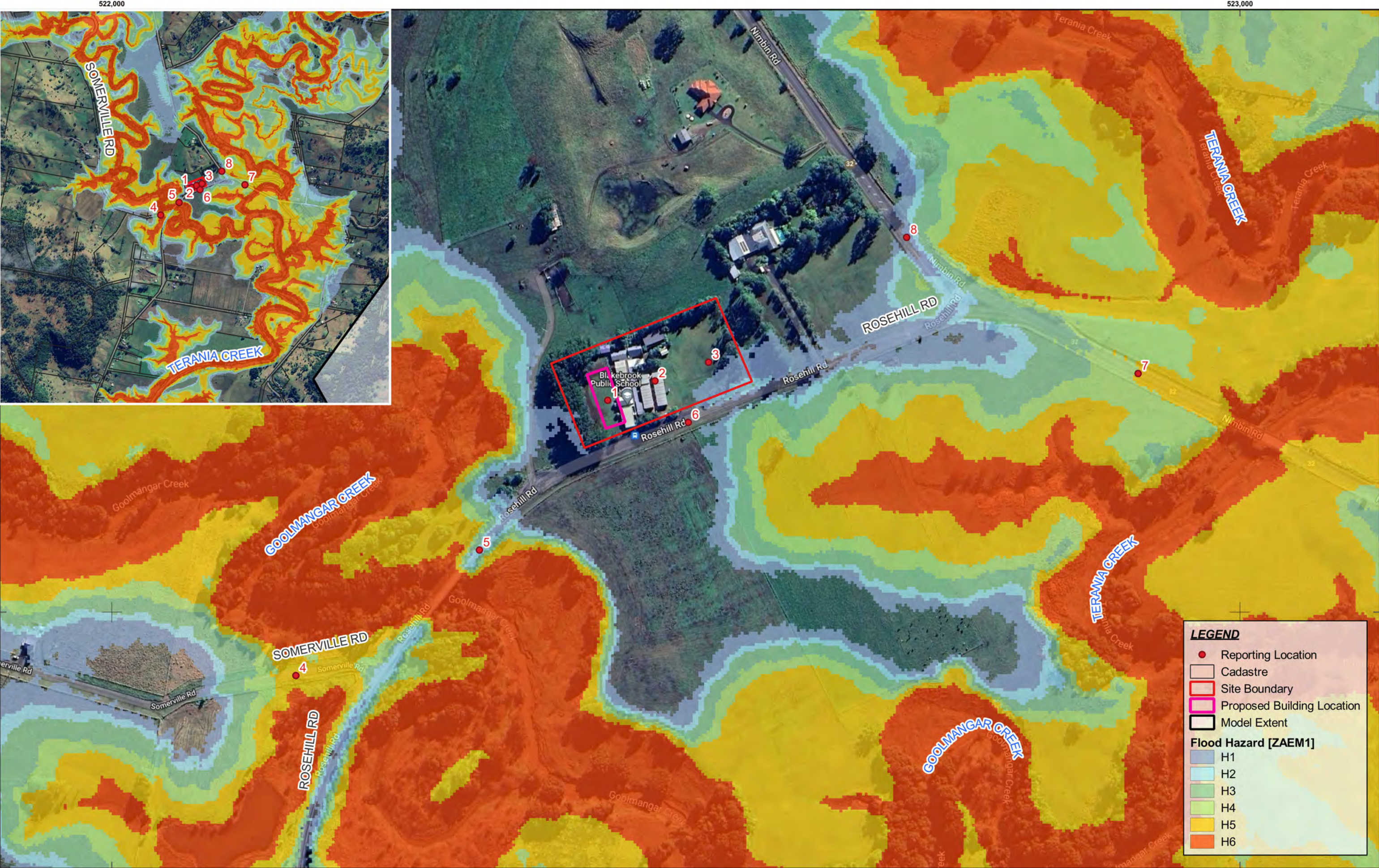
Figure B35

NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1 in 100000 AEP Flood Hazard (dxV)

Dwg Ref:
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1	Final Issue	05-12-2023	DRAWN	RS	CHECKED	KM					
			APPROVED	MP	DATE	05-12-2023					
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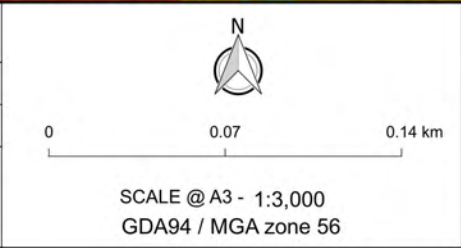


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DATE			

DATE			



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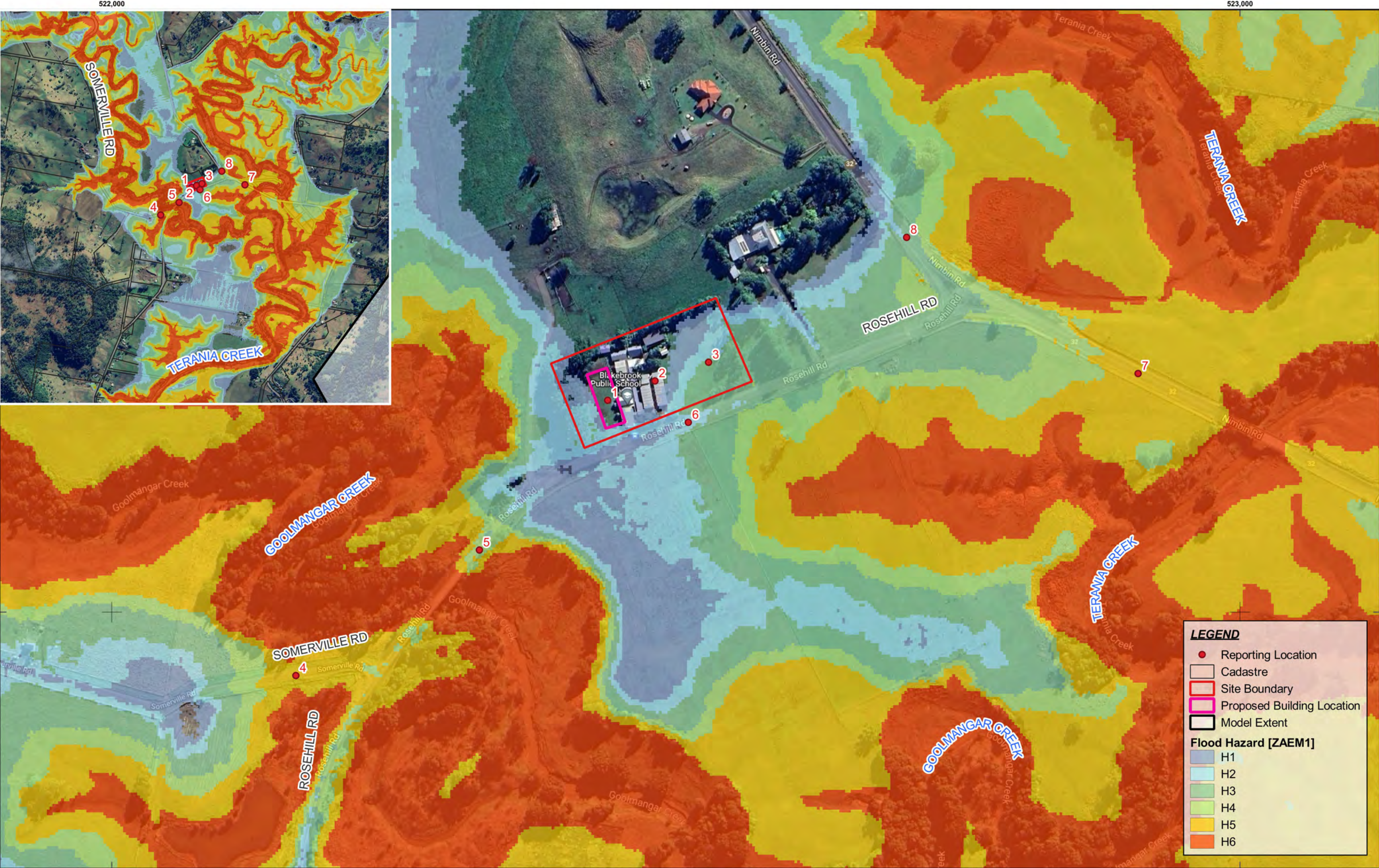
DATA SOURCE
QLD Government Open Data Source



Figure B37

NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 10% AEP Flood Hazard (ZAEM1)

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0 0.07 0.14 km

SCALE @ A3 - 1:3,000
GDA94 / MGA zone 56

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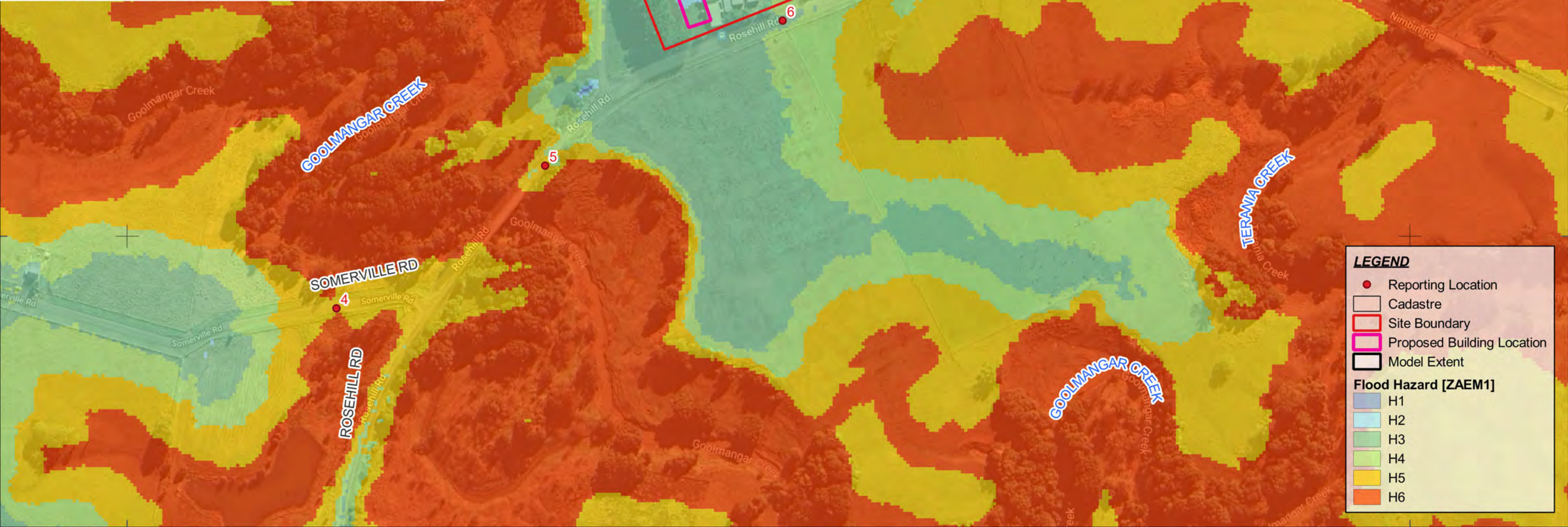
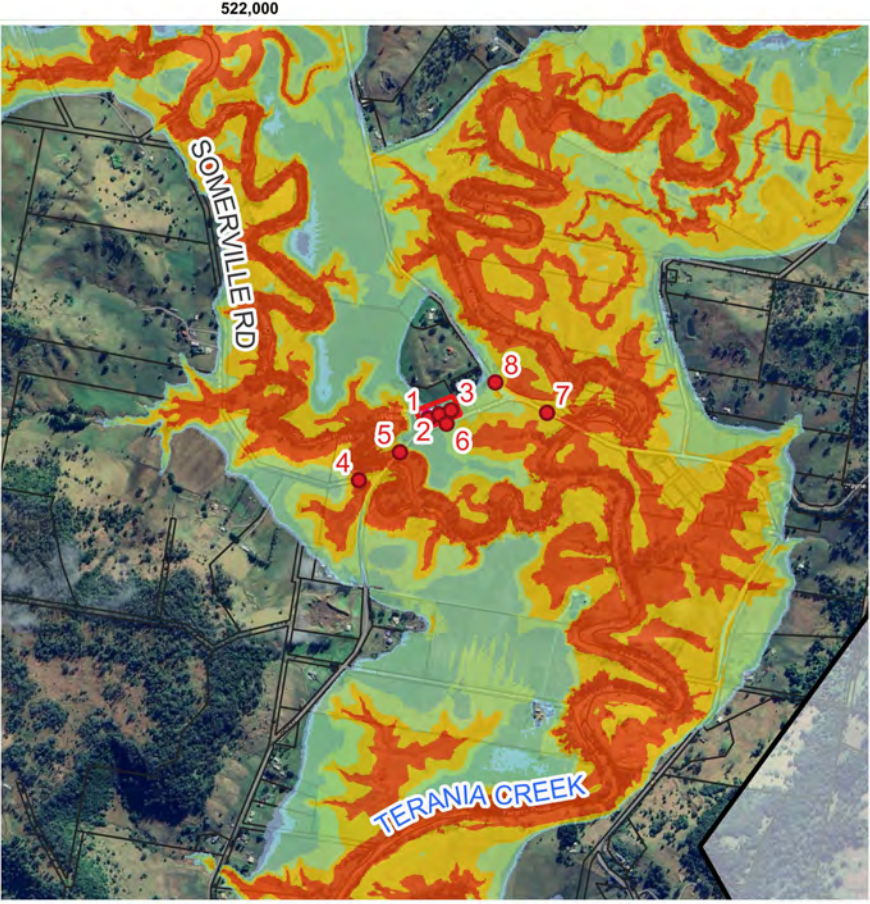
DATA SOURCE
QLD Government Open Data Source



Figure B38

NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 5% AEP Flood Hazard (ZAE M1)

Dwg Ref:
QC3008_001-SKE-0001



LEGEND

- Reporting Location
- Cadastre
- Site Boundary
- Proposed Building Location
- Model Extent

Flood Hazard [ZAEM1]

- H1
- H2
- H3
- H4
- H5
- H6

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0 0.07 0.14 km


SCALE @ A3 - 1:3,000
GDA94 / MGA zone 56

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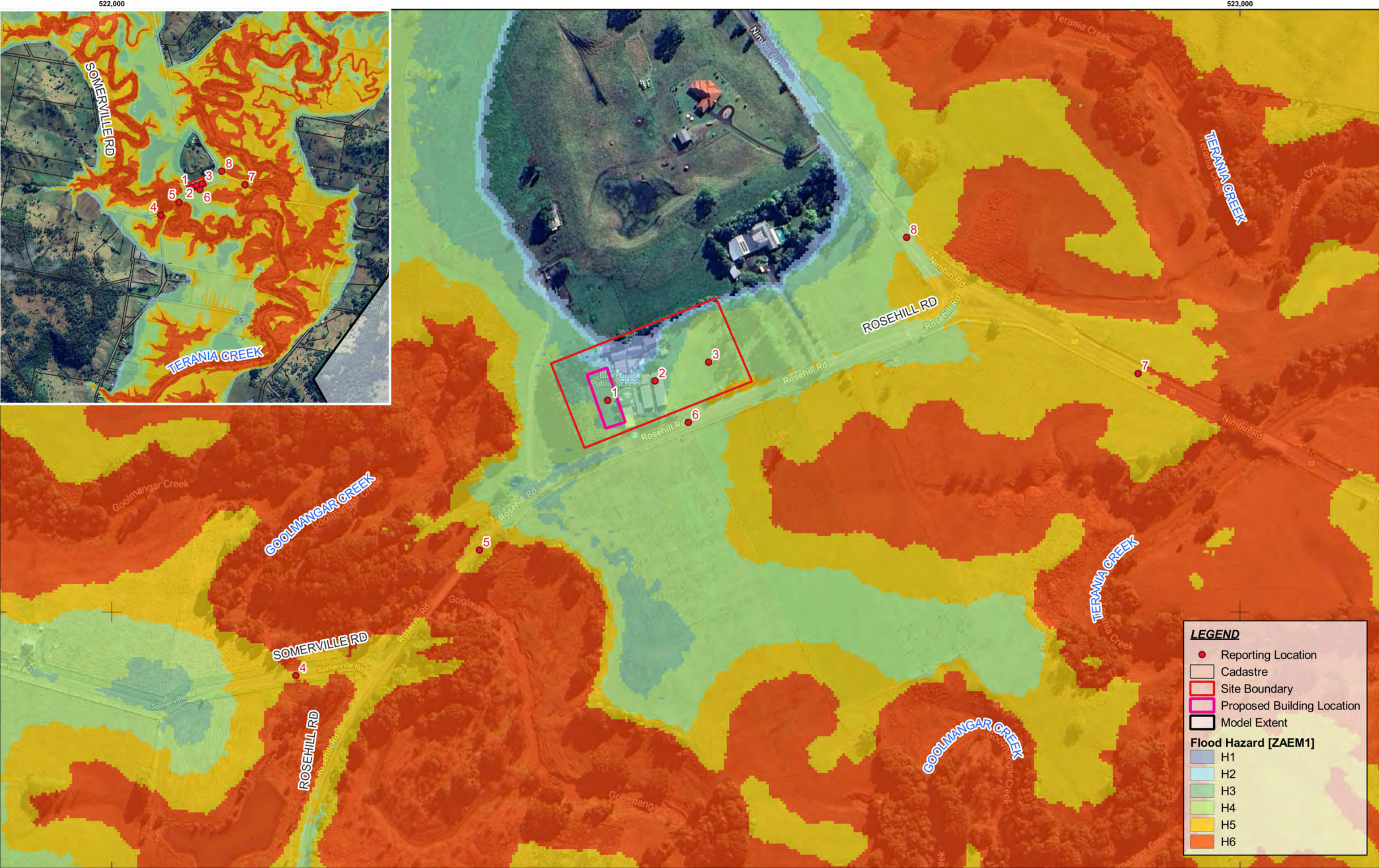


Figure B39

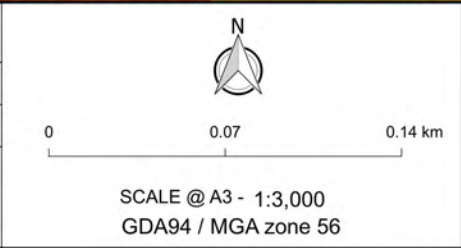
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 1% AEP Flood Hazard (ZAEM1)

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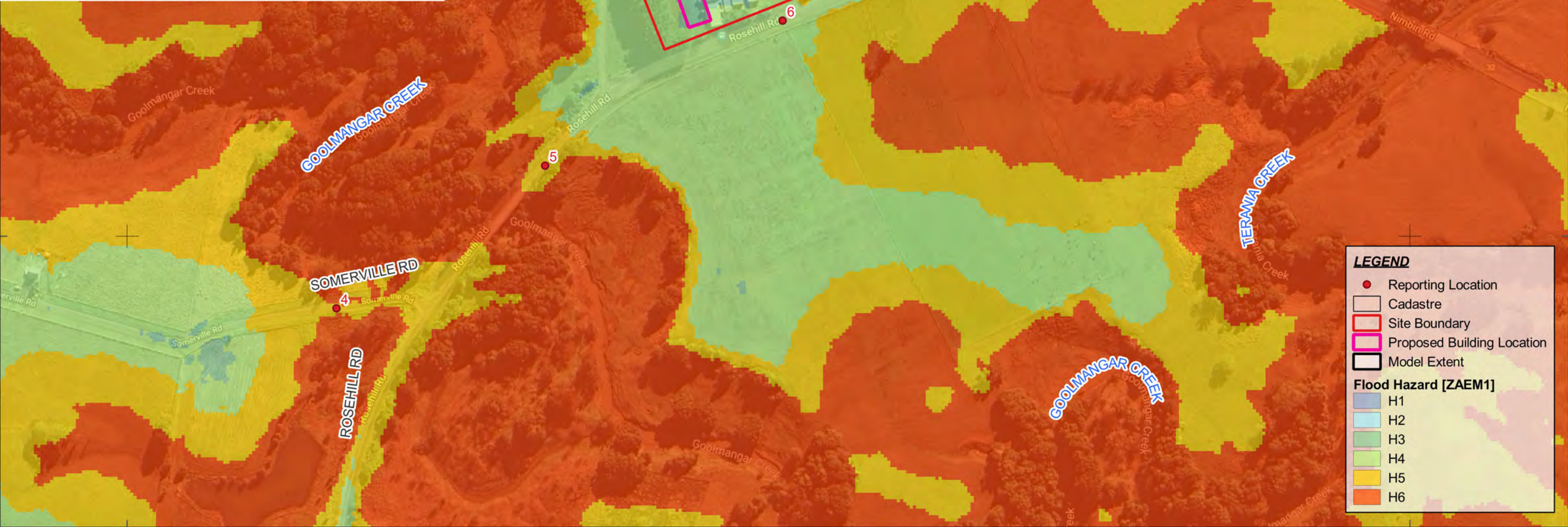
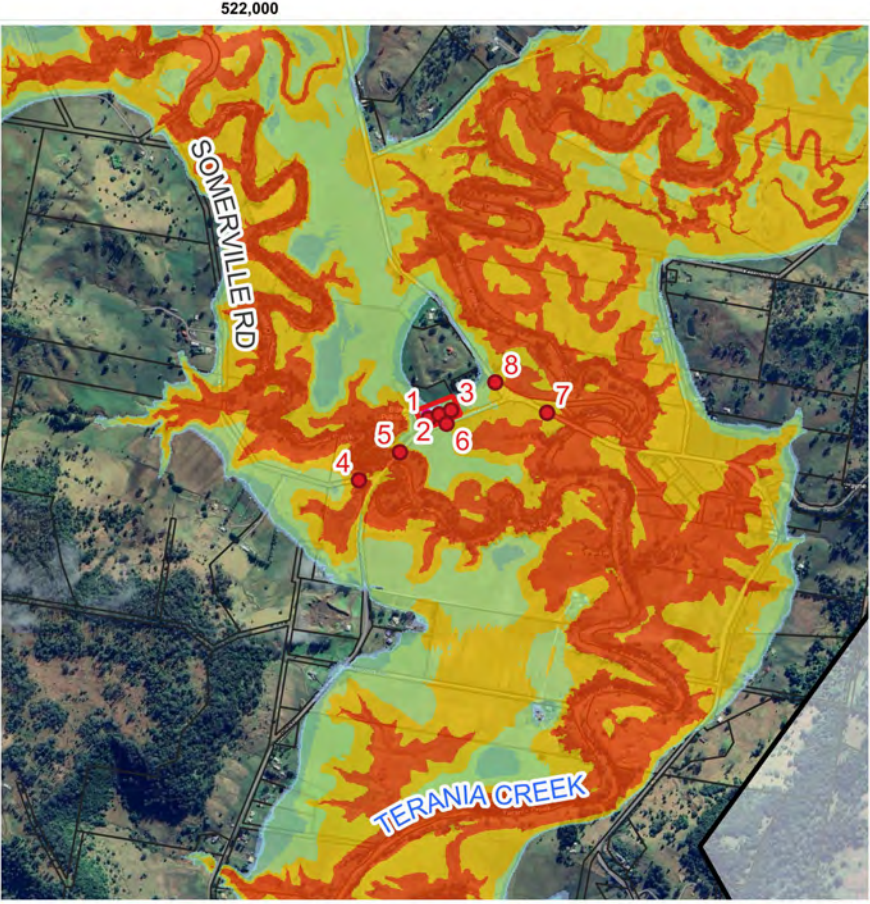
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Figure B40

NSW Government - Department of Education
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Post-Rebuild Case 0.5% AEP Flood Hazard (ZAEM1)

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0 0.07 0.14 km

SCALE @ A3 - 1:3,000
GDA94 / MGA zone 56

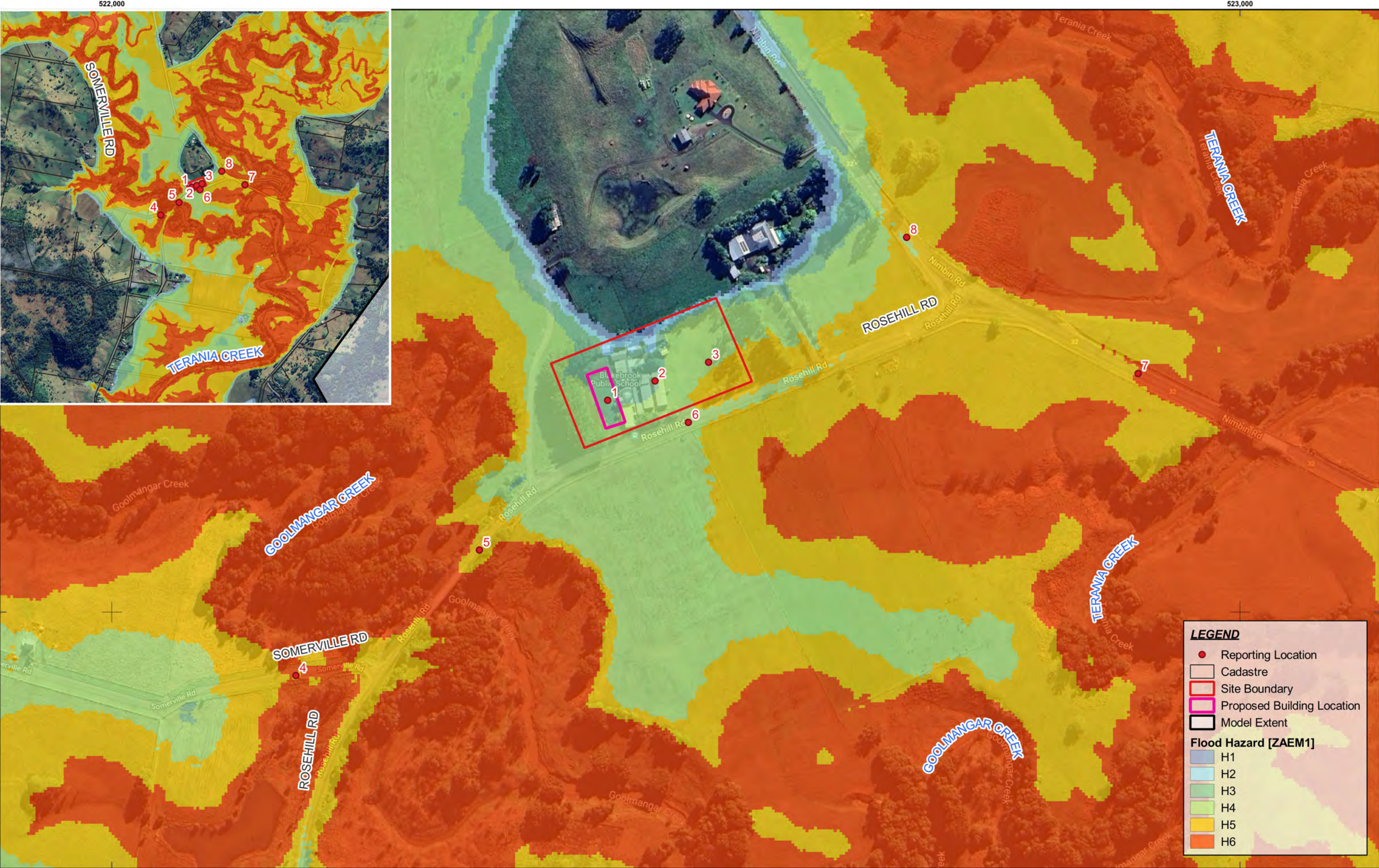
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Figure B41

NSW Government - Department of Education
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0 0.07 0.14 km

SCALE @ A3 - 1:3,000
GDA94 / MGA zone 56

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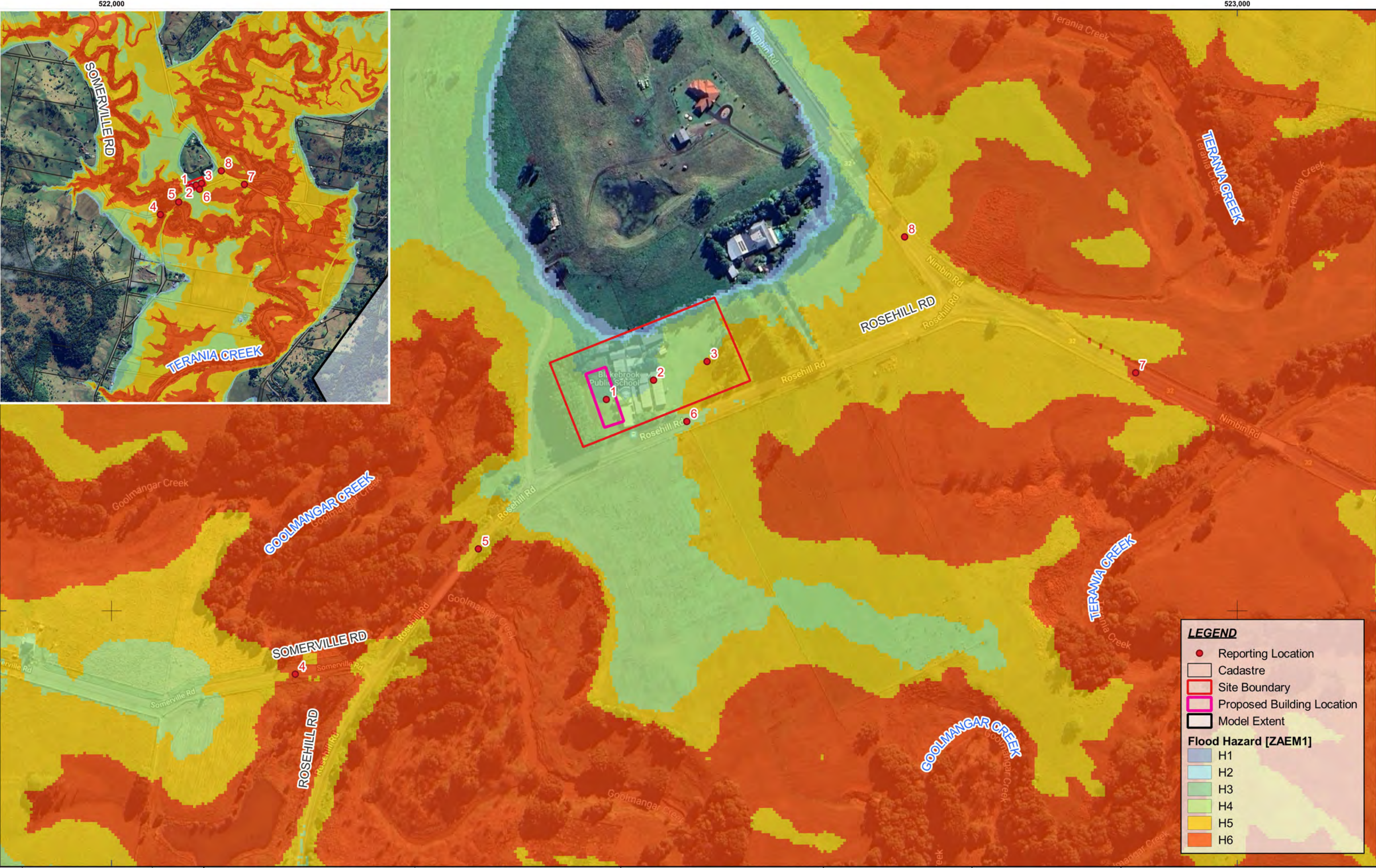
DATA SOURCE
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Figure B42

NSW Government - Department of Education
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Flood Impact Assessment
Post-Rebuild Case 1 in 2000 AEP Flood Hazard (ZAEM1)

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0 0.07 0.14 km

SCALE @ A3 - 1:3,000
GDA94 / MGA zone 56

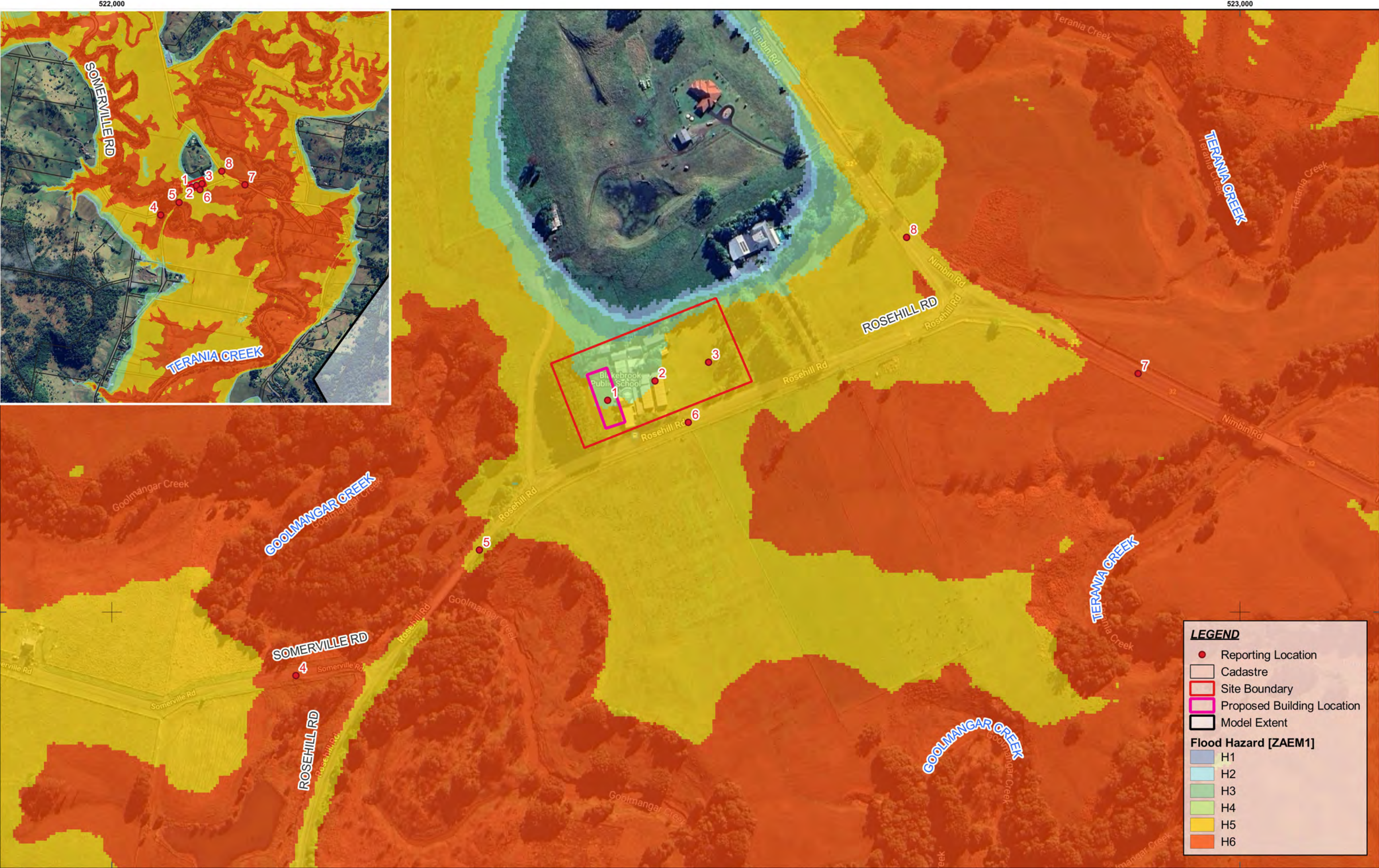
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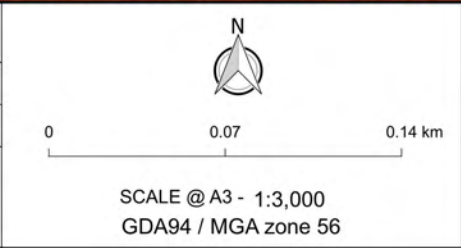
Figure B43
NSW Government - Department of Education
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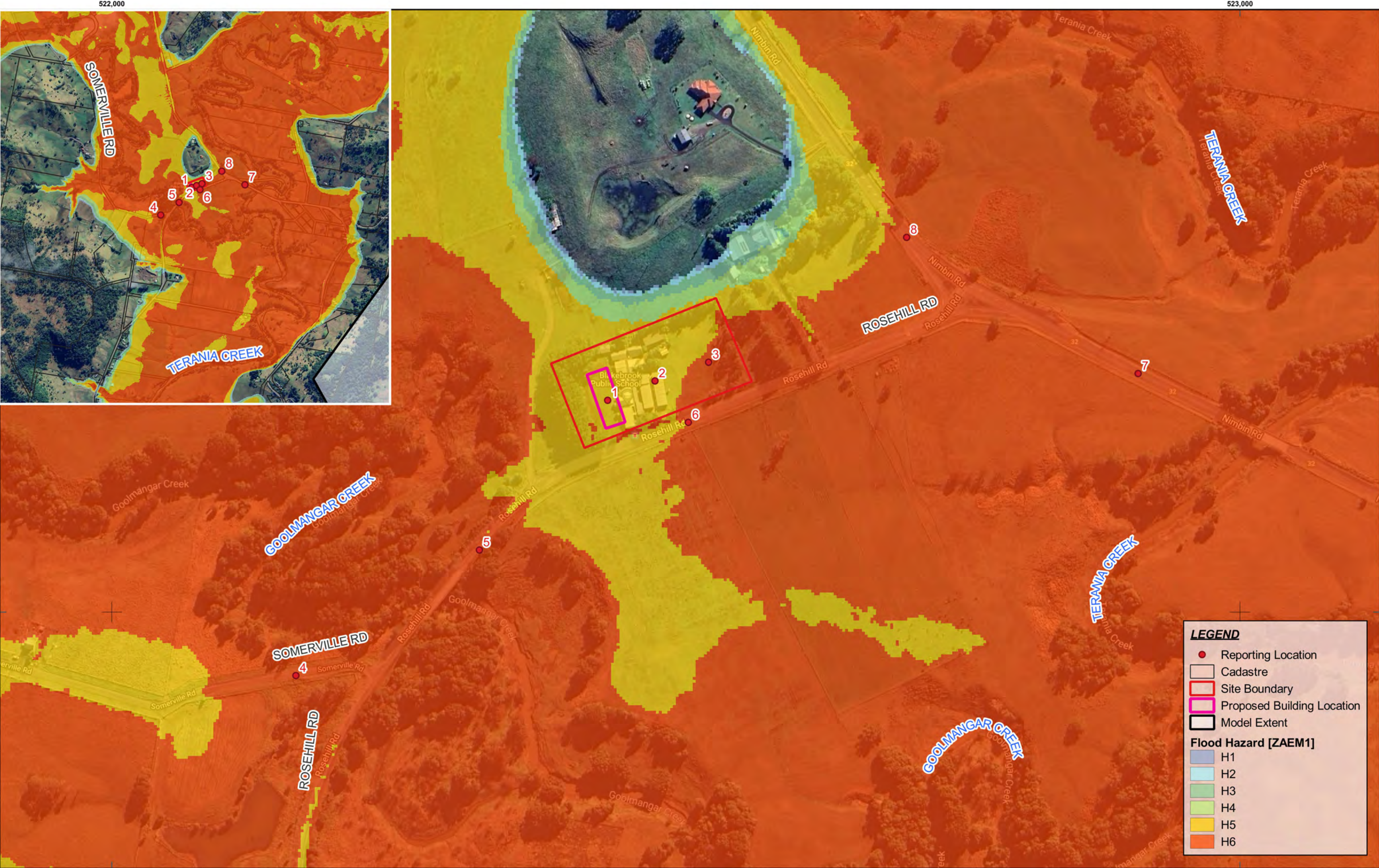
DATA SOURCE
QLD Government Open Data Source



Figure B44

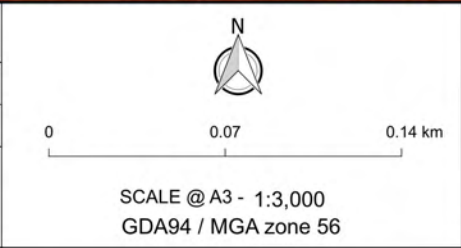
NSW Government - Department of Education
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Flood Impact Assessment
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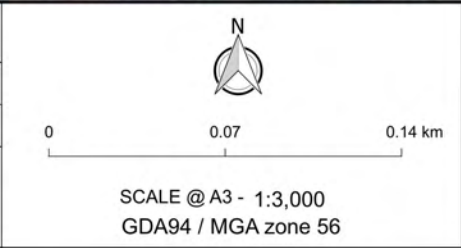
APPENDIX C: FLOOD IMPACT MAPPING





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Figure C1

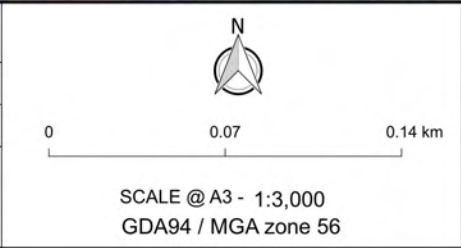
NSW Government - Department of Education
Blakebrook Public School
Flood Impact Assessment
Post-Rebuild Case 10% AEP Flood Height Impact

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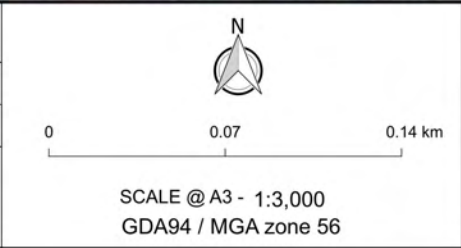
NSW Government - Department of Education
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Figure C3

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