Hydrodynamic Modelling of SDL Sites

MALLEE CMA

Vinifera Forest – Final Report

24 January 2017

Document history and status

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1. Introduction

1.1 Background

The Murray Darling Basin Plan has set legal limits on the amount of surface water and groundwater that can be extracted from the Basin for consumptive use. The sustainable diversion limits (SDLs) for surface water are set at a 2,750 GL/y reduction on current extraction levels. For groundwater, there is an SDL of 3,334 GL/y set on groundwater extraction across the basin. The Basin Plan also includes a mechanism for the adjustment of these SDLs where an equivalent environmental outcome can be achieved with less water.

Typically these SDL adjustment projects involve the installation of environmental infrastructure (works and measures) on a floodplain to enable inundation events using smaller quantities of water than would typically be needed without intervention. These works and measures are designed to allow for the replication of the volume and duration of natural floods to achieve environmental benefits using significantly less water than a comparable natural flooding event.

The Mallee CMA has identified a number of locations where SDL offset works and measures are expected to significantly enhance the existing watering regime. Vinifera Park is one of these sites, and has been subject to a preliminary options assessment and concept design for watering works (Mallee CMA, 2013). The works proposed for the Vinifera Park consist of:

- Regulating structure consisting of a pair of concrete box culverts at the downstream end of the Vinifera channel
- Rebuilding the embankment separating Crown and private land at the upstream end of the Vinifera channel
- Approximately 1.2 km of levees to contain the water within the proposed inundation area.

This report presents results of modelling of the impacts of the proposed works.

The next stages of the SDL offsets project include development of business cases to justify funding for the proposed capital works. Detailed design will also be undertaken for the proposed works and measures. The outcomes from this hydraulic modelling study will form a key input to those stages of work.

1.2 Hydraulic Model

Jacobs was commissioned by the Mallee CMA in May 2014 to develop a hydraulic model of the Nyah-Vinifera Park channels to simulate the existing conditions and effect of proposed SDL infrastructure. The Vinifera channel related to this report is located in the southern part of Nyah-Vinifera Park. The Vinifera channel is an anabranch of the River Murray to the south of Piangil in north west Victoria. It meanders for approximately 12 km before re-joining the Murray. The study area is shown in Figure 1 and Figure 2.

A previous report (Alluvium, 2013) identified potential modifications to the floodplain in Nyah-Vinifera Park. The purpose of these potential structures is to contain environmental water delivered to the area, retain flood water that enters the area and enable return from the River Murray. The overall aim of this project is to model the potential of these structures on the ability for the Nyah-Vinifera floodplain to achieve the proposed environmental and hydrological requirements.

As part of the same project, Jacobs was also to build a model of the Nyah Forest floodplain, approximately 8km northwest. To enable significant time and cost savings, the Nyah and Vinifera Forest floodplains covered by one model, which approximately covers the extent shown in.

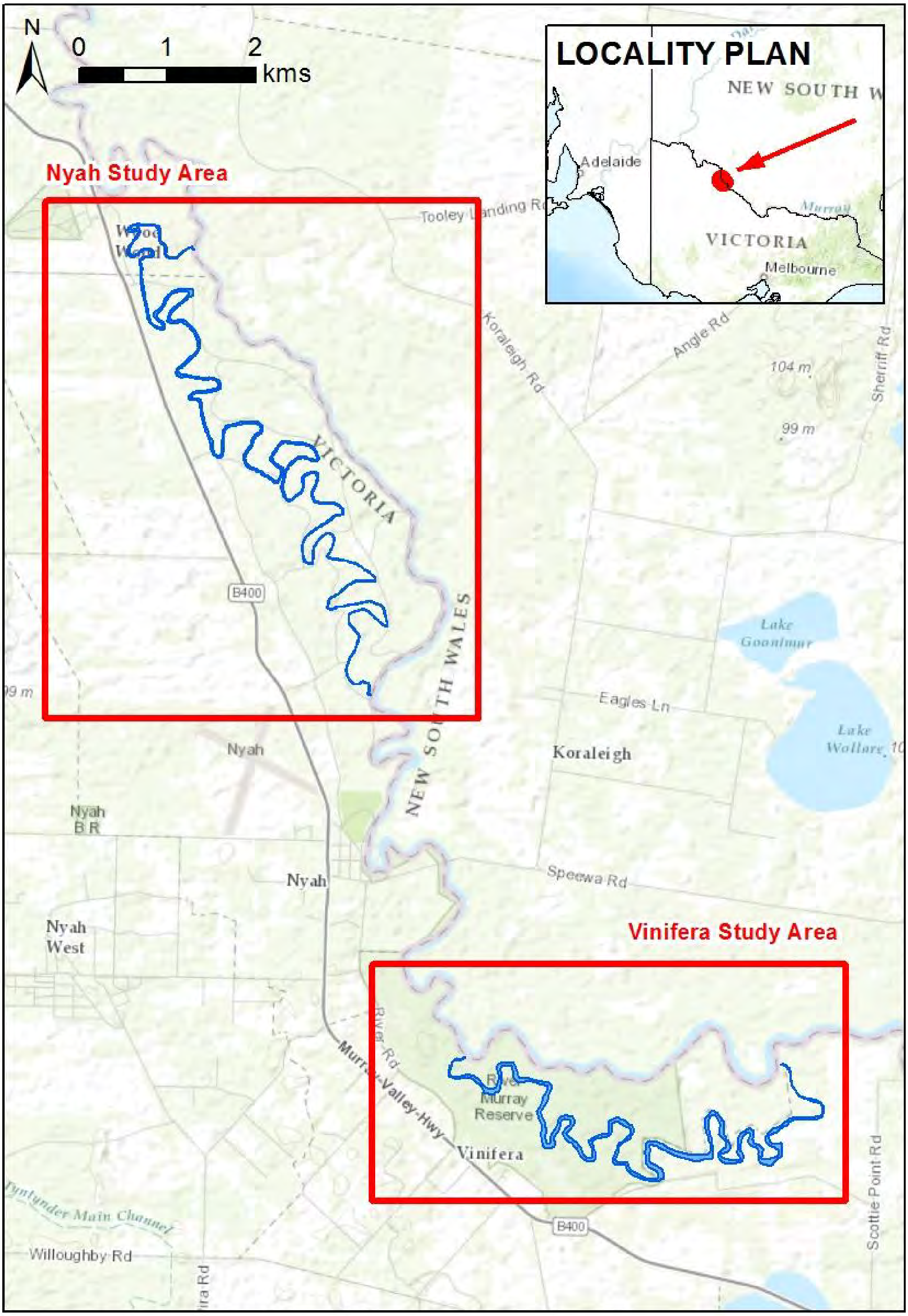


Figure 1 Nyah and Vinifera Study Area

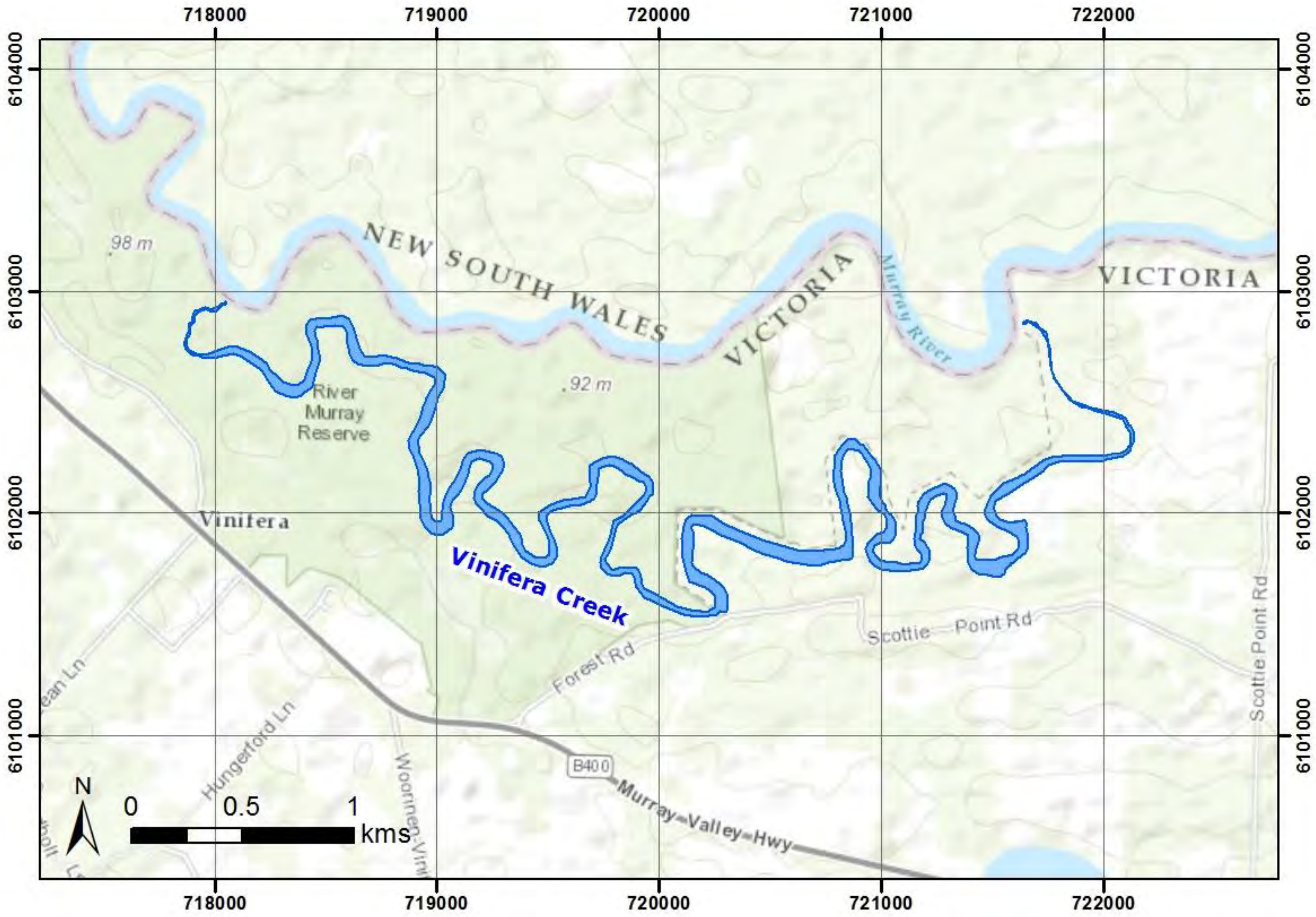


Figure 2 Vinifera Forest Floodplain Study Area

2. Model Development

2.1 LIDAR Review

The first stage of the model development was a brief review of the LIDAR for the area, which was provided by the Mallee CMA. Two LIDAR datasets were provided as 1m GIS raster files that covered approximately the same area, one of which was from approximately 2001, and the other of which was from 2010. Both datasets appeared to be of reasonable accuracy, although significant banding was apparent when the two sets were numerically subtracted from each other.

Mallee CMA indicated that the banding was present from the 2001 dataset, and that the 2010 dataset should be used exclusively as it is more accurate and more recent. Metadata was provided solely for the 2010 dataset, with key information as follows:

- Spatial Consultant – Fugro Spatial Solutions
- Acquisition Period – 19 May 2010 to 18 October 2010
- Horizontal Datum / Vertical Datum / Projection – GDA94 / AHD / MGA54
- Horizontal Accuracy – 67% of points ± 0.19m
- Vertical Accuracy – 100% of points ± 0.20m
- Average Point Spacing – 0.45m

There was one area towards the south west corner of the more recent dataset that was not included (Figure 3). In accordance with direction from the Mallee CMA, the 2001 LiDAR was mosaicked together with the new dataset and adjusted at the boundary to ensure there were no discontinuities. In all other locations, the more recent data was utilised.

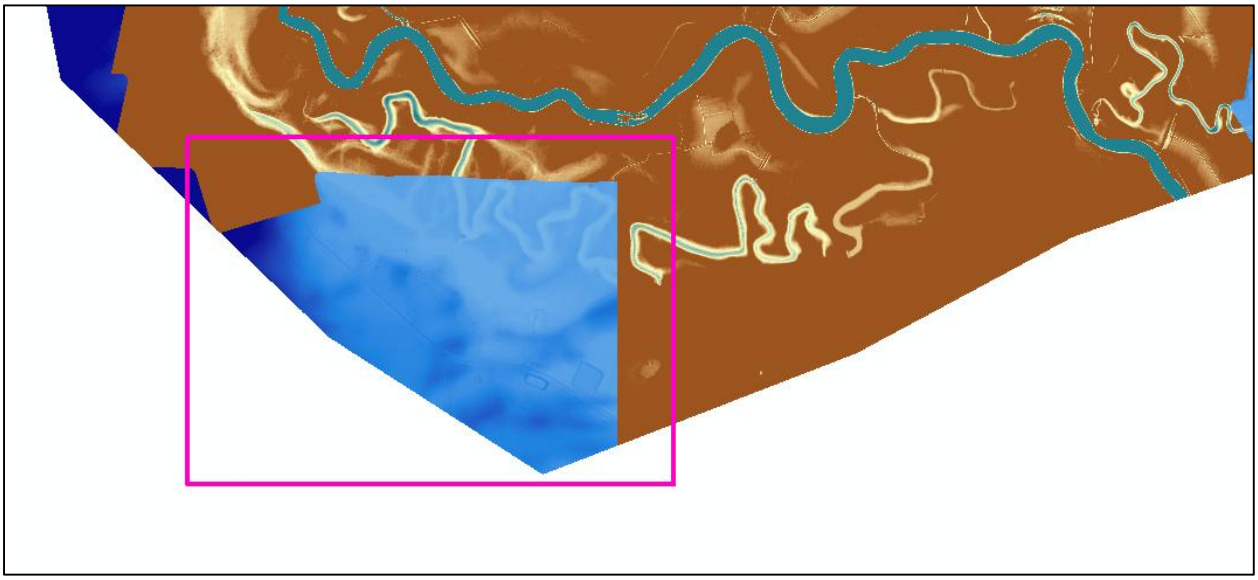


Figure 3 2010 LIDAR missing area

The topography of the Vinifera area is generally fairly flat and regular in nature, without any significant hills or ridges. The study area is bounded by the River Murray in the north and a ridge and road embankment that leads to the Murray Valley Highway in the south and covers approximately 8km^2. The area is split via a smaller embankment into lightly forested Crown land to the downstream (western) side and private, cleared farm land to the downstream (eastern) side.

The width of the River Murray ranges from approximately 50m to approximately 80m between the inlet and outlet of the channel that runs through the southern part of Nyah-Vinifera Park. The majority of the main channel through Vinifera is greater than 30m in width.

2.2 Model Schematisation

The model was built using the MIKE software package by DHI, with a 1D/2D coupled model approach. The model was built using the following information supplied by the Mallee CMA:

- LiDAR Survey – used to generate a grid of surface elevation and form the basis of the physical model;
- Aerial Imagery – to define a roughness map based on land use and to better define hydraulic features where site photos were not available; and
- Site Photos – to define hydraulic features.

It is important to note that the collection and use of feature survey for the purposes of modelling was not within the scope of the project. Consequently, elevations of low flow channels, existing structures and levee banks are generally only accurate to within the LiDAR tolerances stated above.

Further analysis of the LIDAR was undertaken to determine the best approach to the two-dimensional (2D) modelling. A number of grid sizes were trialled, with rough models run to ascertain run times and the validity of the selected grid size. Ultimately it was determined that a 7m grid would adequately resolve the important hydraulic features of the wider floodplain, while keeping run times manageable. This 7m grid was resampled from the 1m LiDAR provided by the Mallee CMA.

Figure 4 shows a section through Vinifera Creek, taken at the location shown in Figure 5. A rule of thumb stated by DHI is that channels modelled by a 2D grid should be at least 5 grid cells wide. Figure 4 shows that the Vinifera Creek channels are a minimum of approximately 8 cells wide, allowing them to be adequately modelled by the 2D grid. Analysis of the channel geometry at various other locations indicated that the channels shown in Figure 4 are at the narrower end of the spectrum, giving confidence to the modelling approach for the full extent of the Vinifera Creek floodplain.

As the LIDAR picked up the surface of the water in the River Murray, the channel had to be manually excavated in the model grid to account for this. No significant survey information was available for the River Murray channel at this location, though there were cross sections and river bathymetry data available at points further upstream and downstream. Using this information, it was estimated that there was approximately 2m of water in the Murray at the time the LIDAR was flown, and the channel cells were lowered accordingly.

This approach is approximate, and would need to be refined for future more detailed analysis when feature survey of the Murray channel may be available. On top of the estimated depth of water being approximate, this approach also results in a rectangular channel. While it is possible to reasonably model conveyance using this method, the distribution of velocity and depth across the channel section will not be entirely realistic.

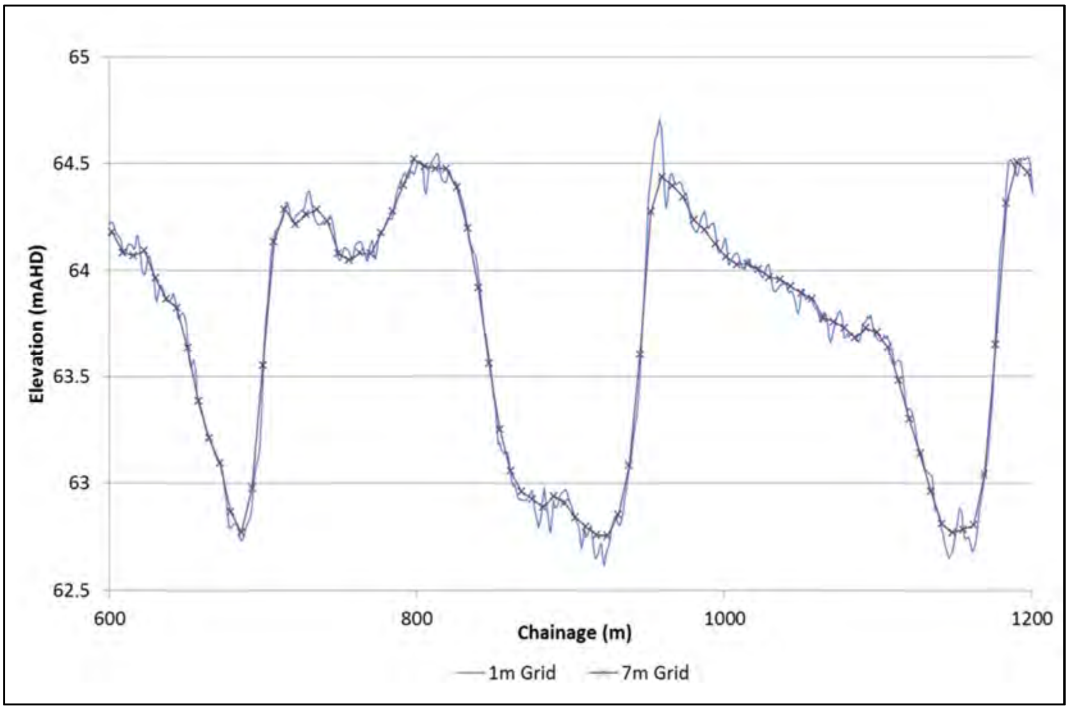


Figure 4 : Comparison between 7m and 1m grid

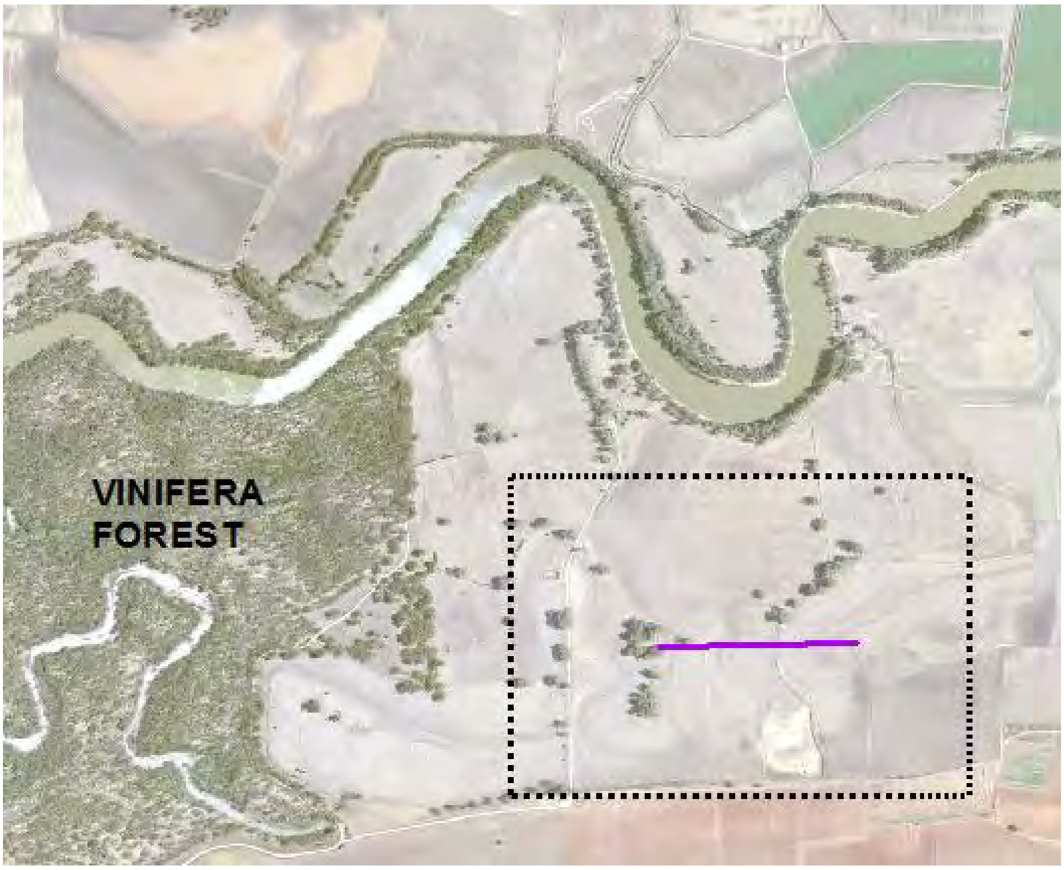


Figure 5 Location of Cross Section Represented in Figure 4

A Manning's n roughness map was digitised based on aerial imagery and LIDAR. The following roughness values were adopted:

- River/creek channels – 0.03
- Pasture/cleared areas – 0.05
- Lightly forested areas – 0.06
- Densely forested areas – 0.1

The values adopted were generally at the higher end of the range typically adopted for a 1D model. This is in line with the suggested approach by DHI for MIKE 2D models. In a 1D model, the roughness acts upon the entire wetted perimeter of the cross-section, including the bed and banks (ie side walls) of the channel. In a 2D model, the roughness applies solely to the bottom of the water column on each grid cell. Thus there is an effective decrease in roughness as no friction losses are applied to the channel bank (side wall). The higher values are adopted to account for side wall losses in the channel not calculated in the 2D model.

There are two boundaries in the model; an inflow boundary to south and an outflow boundary to the north. The steady state flows discussed subsequently were input through southern boundary while the northern outflow boundary was set as a rating curve (Figure 6). This rating curve was developed based on the results of early trial model runs and an assessment of various River Murray flow rates, levels and slopes. Slopes from the hydraulic model were compared with the slope of the water surface captured when the LiDAR was flown to provide confidence that the rating curve was appropriate.

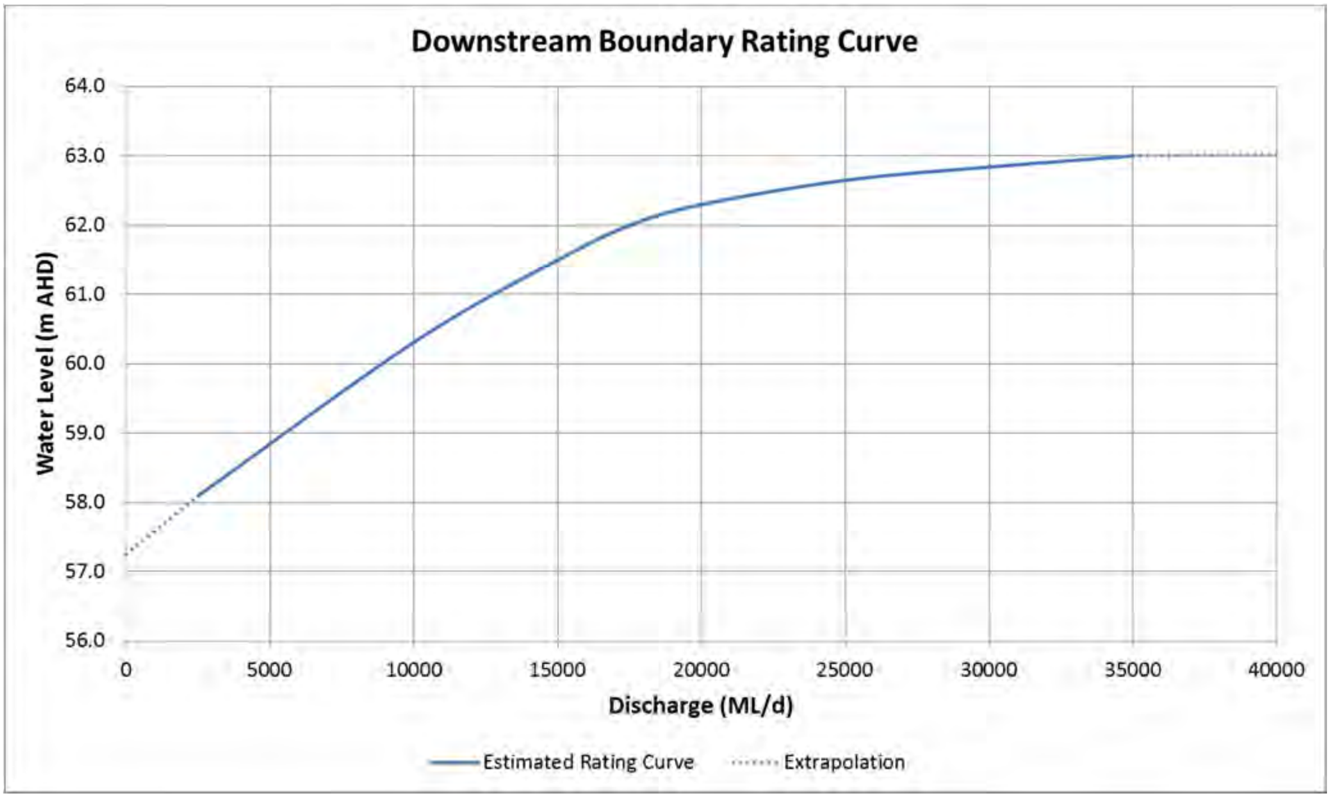


Figure 6 Nyah Vinifera Model Downstream Boundary Rating Curve

2.3 Modelling Scenarios

Modelling was undertaken for five distinct physical conditions as follows:

- Existing Conditions - Floodplain modelled in its current state, including all existing (but not proposed) hydraulic structures of significance.
- Natural Conditions – Existing conditions with significant existing man-made hydraulic features (eg culverts, levees) removed in order to model conditions prior to human intervention.
- Proposed Works Conditions – Existing conditions model with proposed SDL works, with all regulators/gates open.
- Water Retained by Proposed Works – Simulation of the water retained by the proposed SDL works once the River Murray flow recedes to in-channel levels.
- Maximum Inundation Achieved by Proposed Works – Proposed works with the upstream culvert open and downstream regulator closed, allowing the floodplain to fill to the water level at the upstream culvert.

For the existing conditions model all relevant existing hydraulic structures were included in the model, based on information obtained from site photos, aerial imagery and LIDAR. The schematic for this model is shown in Figure 7 with photos of some structures shown in Figure 8 and Figure 9. Photos of all structures were not available at the time of modelling.

To account for the significant amount of debris likely to obstruct the modelled culverts during flood events, relatively high roughnesses and head loss factors were applied. Culverts were input as MIKE11 structures, with culvert/weir combinations used to appropriately model conveyance, with levees stamped into the MIKE21 grid. Culvert inverts and weir sill levels were estimated based on site photos and LIDAR. Where site photos were not available, structure configurations were assumed based on the aerial imagery and LIDAR provided.

The natural conditions model was based on the existing conditions model (Figure 7), with all structures and major levees/roads removed. The aim was to best represent the landform as it was prior to any human intervention. While the model will approximate these conditions, there are some assumptions made given no historical survey information was available for the project.

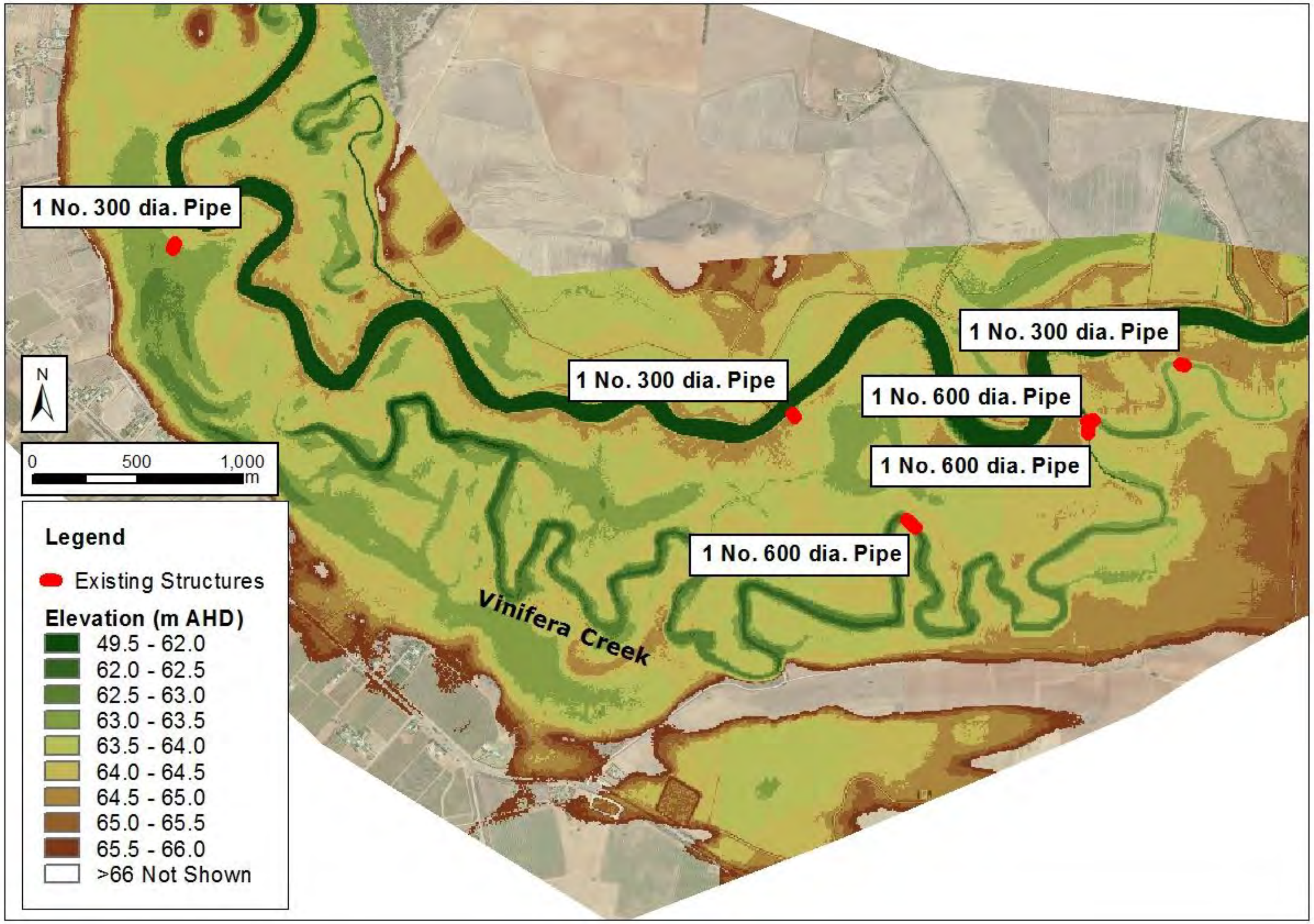


Figure 7 Vinifera Forest Modelled Area - Existing Conditions Model Schematic

Figure 8 Existing Culvert at 720345 E 6102799 N

Figure 9 Levee and Irrigation Channel at 721610 E 6102848 N

The proposed works model was based on design information provided by another Jacobs project team working on the proposed works concept design. This information was current at the 26th of September, 2014. The layout and configuration of these works is shown in Table 1 and Figure 10

The design is based on the following:

- Regulators have been sized to minimise the impact on the existing flow regime when open by maintaining current waterway areas;
- The levee is to have an elevation of 64.7 m AHD, which is designed to retain a water level of 64.4 m AHD with 300mm freeboard;
- There are a number of strengthened overflow sills at an elevation of 64.5 m AHD, which are designed to pass larger floods before the entire levee is overtopped.

The proposed works run aims to examine the impact the works have on flood extents. All gates and regulators were open as would be the strategy during a major riverine flooding event.

Table 1 Vinifera Proposed Regulators and Culverts

Structure	Type	No.	Size (mm)
V1	Regulator	10	1800x1800
V2	Regulator	4	1800x1800
V3	Culvert / Gate	1	1200 dia.
V4	Culvert / Gate	1	1200 dia.

The “Water Retained” models were schematised as follows:

- The steady state water level from the Proposed Works run was used as the initial conditions;
- Regulator and culvert gates were closed to block flow from entering or leaving the floodplain; and
- A nominal in-channel flow of 5,000 ML/d was run in the Murray.

Given the same nominal flow was run in the River Murray, for the lower flows where water doesn’t break out of the banks, the flood depth plots are identical (Appendix E).

The “Max Inundation” models were schematised to simulate the maximum possible inundation of the floodplain for each flow scenario. This meant opening the upstream gate and closing the downstream regulators. This scenario allowed the floodplain to fill to the level of Vinifera Creek at the upstream gate or the crest of the downstream regulator, whichever was lower.

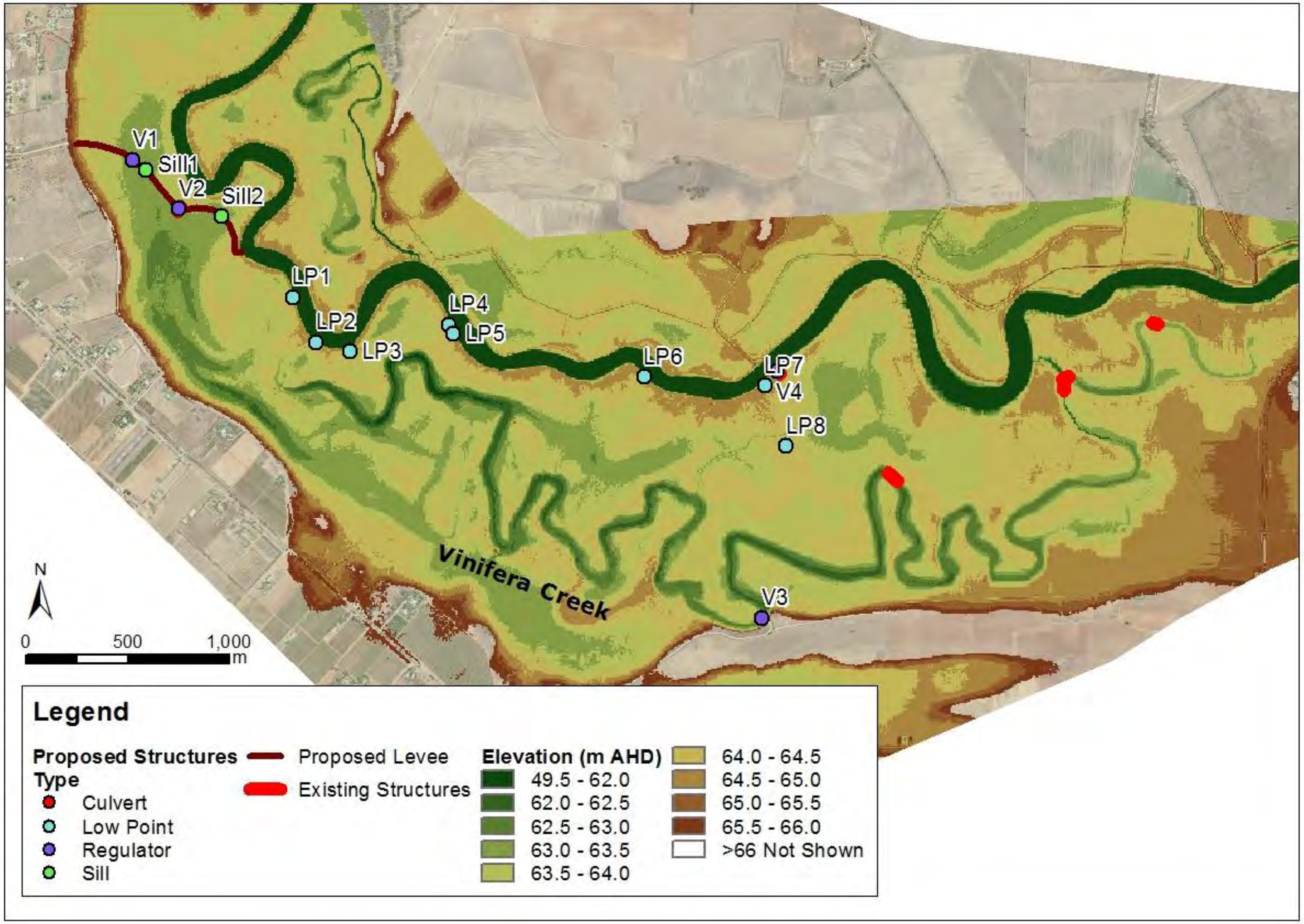


Figure 10 Vinifera Forest Floodplain Proposed Structures and Levees

2.4 Flow Scenarios

One of the key outcomes from this project was an understanding of the extent of peak inundation and retained water for a range of River Murray flow events. Some consideration was therefore given to the range and type of flow scenarios to be simulated. In conjunction with Mallee CMA, it was determined that a steady-state modelling approach would be a suitable means of simulating peak inundation events for this site. Steady-state conditions means that the upstream model boundary is configured with a constant inflow, representing a sustained flow rate in the River Murray. The model was then allowed to run for a sufficient time for water levels across the floodplain to reach equilibrium under these flow conditions.

One of the key advantages of steady-state modelling is that it simplifies the consideration of which events to model, as there is no need to account for the variability of real or synthetic hydrographs. It also decreases the total amount of required modelling time, as reaching equilibrium conditions is generally achieved more quickly than the amount of time required to simulate a full River Murray flood (typically 1-2 months or more in duration). This then enabled the project's tight deadlines to be met.

The main disadvantage is that steady-state conditions do not account for the volume of water inherent in real flood events – the basic assumption is that volume is infinite. This is an important consideration in some situations, for example when water is flowing some distance down an effluent channel to a confined lake, however it's likely not to significantly impact results in cases where water simply spills from the river into a relatively narrow floodplain.

Given that the Vinifera floodplain more resembles the latter case, steady-state modelling was adopted with confidence that it would provide a suitable level of accuracy.

The Mallee CMA provided the steady state flows to be run as outlined in Table 2.

Table 2 Flow Scenarios Run

Flow (ML/day)
2,500
5,000
7,500
10,000
12,500
15,000
17,500
20,000
22,500
25,000
27,500
30,000
32,500
35,000

2.5 Calibration

The only calibration information available for the Vinifera Forest floodplain is satellite imagery of flood events, RiMFIM and anecdotal evidence. CSIRO's RiMFIM (River Murray Floodplain Inundation Model) inundation models were developed in GIS using remote sensing and hydrological modelling. Floodplain inundation extents were detected from satellite imagery for a range of flows and interpolated to model flood growth patterns (Overton, 2006)

2.5.1 Satellite Imagery Calibration

Of the satellite imagery provided by the Mallee CMA for model calibration, imagery from the dates listed in Table 3 was utilised. Additional imagery was provided but was discounted due to poorly defined flood extents or duplication of similar sized events. Plots showing the satellite imagery overlain with modelled flood extents are shown in Appendix C.

Table 3 Satellite Imagery Dates & Flows

Date	Swan Hill (Gauge 409204) Flow (ML/d)
9/2/11	28,350
2/6/11	14,620

For the June 2011 event (14,620 ML/d), the satellite image appears to show water in the Vinifera Forest Channel, and potentially some areas of the floodplain. However, the imagery is not clear enough to be able to adequately define the extent of the inundated area. For the larger February 2011 event (28,350 ML/d) it appears that the majority of the Vinifera Forest floodplain is inundated, which matches the model results.

For the February 2011 event, the model also shows the agricultural land to the east as being inundated, where the satellite imagery does not. This land is protected by a series of levees that were modelled based on the crest level picked up from the LiDAR. To be able to accurately model the effect of these levees, detailed feature survey would be required, which was not available at the time of modelling.

On the NSW side of the Murray, the hydraulic model appears to over-predict flood extents when compared to the satellite imagery. This is may be explained by the fact that this region of the model is not as detailed as Vinifera Forest (the area of interest) and structures/levees were not purposefully input into the model due to the time constraints of the project. The assessment was made that there weren't significant flow paths through this section of the model and as the model was being run as steady state, volume effects would not be important.

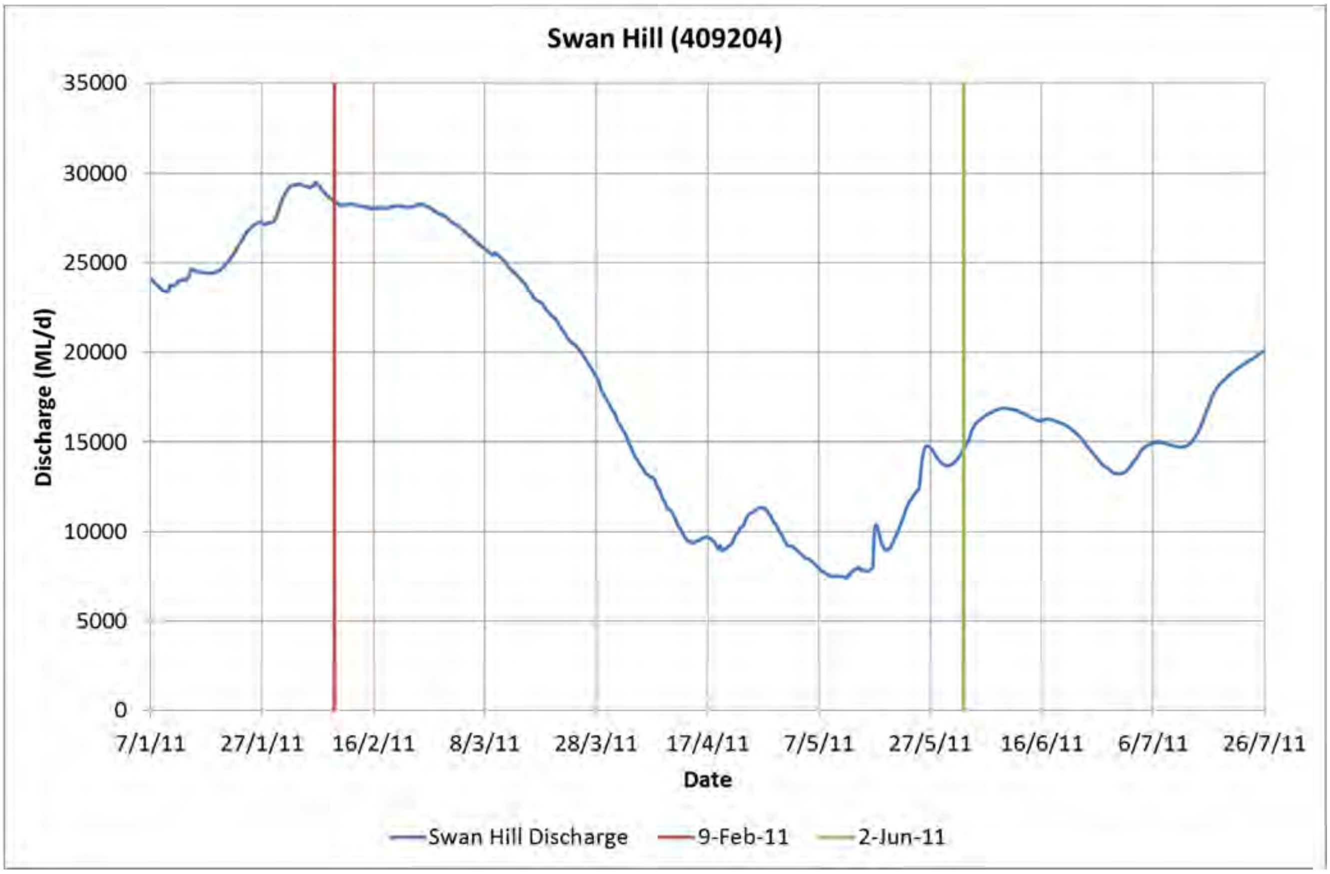


Figure 11 Satellite Imagery Calibration Events - Swan Hill Gauge

2.5.2 RiMFIM Calibration

Analysis of the RiMFIM modelled flood extents indicates that the approach is reasonably coarse and is primarily useful for larger flood events, particularly where there is significant connectivity between the River Murray and the floodplain. In the case of Vinifera Forest, RiMFIM appears to significantly under-predict flood extents when compared with satellite imagery and modelled extents, particularly for the range of events modelled for this project. The same two events compared with satellite imagery above are compared with RiMFIM predictions in Appendix C.

It appears that the primary reason for this under-prediction is the representation of tipping points into the Vinifera Forest in the RiMFIM method. For example, anecdotal (Malcolm Thompson, MCMA 2014, pers comm) and modelled evidence suggests that water tips into the downstream end of the Vinifera Forest from the River Murray at a flow of around 14,000 ML/d, whereas RiMFIM suggests over 20,000 ML/d.

Given the above analysis, RiMFIM is not considered useful for calibration of this model.

2.6 Analysis

Flood depth plots from the hydraulic model can be found in Appendix A to Appendix F for each of the discharges modelled. Note that the natural condition plots are not overlain with the aerial imagery to avoid confusion as to what was modelled (levees etc are visible on the imagery). For the Existing Conditions model water from the River Murray breaks into the Vinifera channel at a flow of approximately 15,000 ML/d. For flows of 20,000 ML/d and above large areas of the floodplain are inundated, suggesting that positive outcomes may be achieved by the proposed regulators.

Peak water levels at several locations shown in Figure 12 were extracted for each flow scenario and are presented in Table 4 to Table 8. These locations were selected to give reasonable coverage of the River Murray and the Vinifera Forest Floodplain. Tables showing afflux between the following scenarios are included:

- Existing Conditions relative to Natural Conditions (Table 9);
- Proposed Works relative to Existing Conditions (Table 10); and
- Maximum Inundation relative to Existing Conditions (Table 11).

Generally the difference in water levels between the natural and existing condition models is small for both the River Murray and Vinifera Forest floodplain. This would suggest that the existing structures on Vinifera Creek are not significantly impeding flow for the steady state events. This may partially be due to the relatively flat topography, allowing the floodplain to fill once a flow enters an area. However it is reemphasised that the configuration of these structures is approximate only, and this may be affecting the results. Running real or design hydrographs with properly surveyed structures will allow the hydraulic impact of these structures to be better defined.

The Maximum Inundation runs (Table 11 and Appendix F) show that this configuration does not increase inundation of the floodplain when compared with the Existing Conditions or Proposed Works scenarios. In fact, the 17,500 ML/d run shows a smaller inundation extent than with the regulators open. There are two reasons why this is occurring:

- The Vinifera floodplain is very flat, more resembling an offline depression than an anabranch. Consequently, once water is able to enter the floodplain it fills to a similar level, regardless of obstructions on the floodplain.
- For the lower flows, the Vinifera floodplain primarily fills from the downstream end as there channel is better defined in this location. Closing the downstream regulator restricts this flow and reduces the inundation area for these lower flows.

For the Maximum Inundation runs, the design inundation level (64.50 m AHD) is achieved at the downstream regulator for 20,000 ML/d. This does not represent an improvement over the Natural Conditions model, which also achieves this level for 20,000 ML/d.

The aim of the Proposed Works run was to ensure that the works would not have a significantly adverse impact on flooding during large events when the regulators would be left open. Comparing the levels to the existing conditions (Table 10) suggests the proposed works (while open) will not significantly increase flood levels on the Vinifera Forest floodplain. No significant adverse effects have been identified.

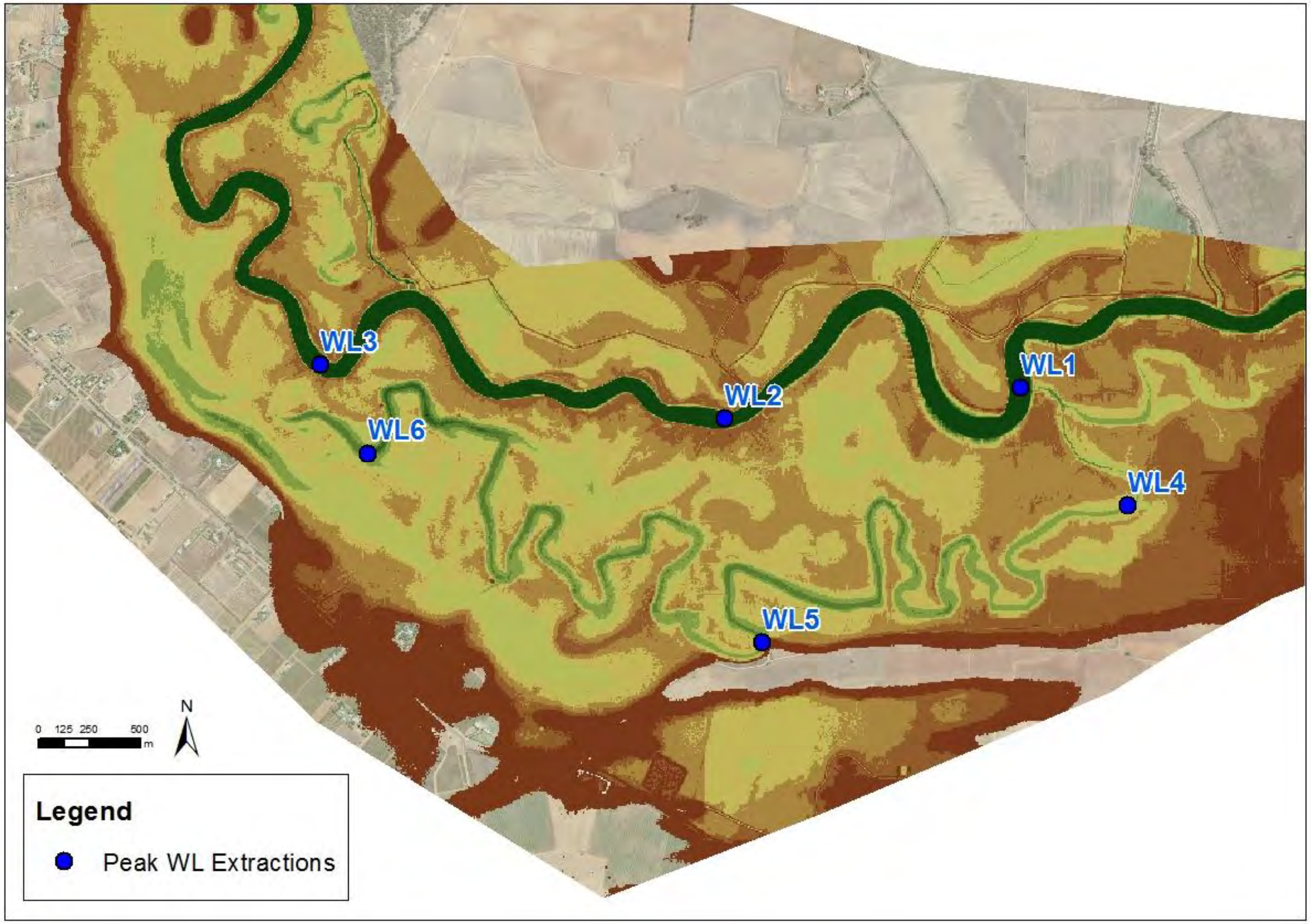


Figure 12 Peak Water Level Extraction Points

Table 4 Extracted Water Levels - Natural Conditions

Flow (ML/day)	WL1 (m AHD)	WL2 (m AHD)	WL3 (m AHD)	WL4 (m AHD)	WL5 (m AHD)	WL6 (m AHD)
2,500	60.59	60.48	60.33			
5,000	61.54	61.44	61.30			
7,500	62.29	62.19	62.04			
10,000	62.98	62.87	62.72			
12,500	63.59	63.48	63.33	63.30	63.14	63.07
15,000	64.14	64.04	63.90	64.05	64.03	64.00
17,500	64.54	64.46	64.35	64.50	64.46	64.38
20,000	64.78	64.71	64.63	64.76	64.72	64.66
22,500	64.91	64.85	64.77	64.90	64.86	64.81
25,000	65.00	64.94	64.86	64.99	64.95	64.90
27,500	65.07	65.01	64.93	65.07	65.02	64.97
30,000	65.14	65.08	65.00	65.13	65.09	65.03
32,500	65.20	65.14	65.06	65.20	65.15	65.09
35,000	65.26	65.19	65.11	65.26	65.20	65.15

Table 5 Extracted Water Levels - Existing Conditions

Flow (ML/day)	WL1 (m AHD)	WL2 (m AHD)	WL3 (m AHD)	WL4 (m AHD)	WL5 (m AHD)	WL6 (m AHD)
2,500	60.59	60.47	60.32			
5,000	61.54	61.43	61.29			
7,500	62.29	62.18	62.04			
10,000	62.97	62.86	62.72			
12,500	63.59	63.49	63.34			
15,000	64.16	64.05	63.90	64.07		63.72
17,500	64.67	64.56	64.42	64.65	64.64	64.26
20,000	64.95	64.86	64.75	64.92	64.92	64.70
22,500	65.06	64.96	64.87	65.02	65.02	64.88
25,000	65.16	65.06	64.99	65.12	65.12	65.00
27,500	65.23	65.14	65.07	65.19	65.19	65.09
30,000	65.29	65.20	65.13	65.25	65.24	65.16
32,500	65.34	65.26	65.19	65.31	65.30	65.21
35,000	65.39	65.31	65.24	65.36	65.34	65.26

Table 6 Extracted Water Levels -Proposed Works

Flow (ML/day)	WL1 (m AHD)	WL2 (m AHD)	WL3 (m AHD)	WL4 (m AHD)	WL5 (m AHD)	WL6 (m AHD)
2,500	60.59	60.47	60.32			
5,000	61.54	61.43	61.29			
7,500	62.29	62.18	62.04			
10,000	62.97	62.86	62.72			
12,500	63.59	63.49	63.34			
15,000	64.16	64.05	63.91	64.14	63.72	63.73
17,500	64.67	64.57	64.42	64.65	64.38	64.28
20,000	64.97	64.87	64.76	64.93	64.94	64.71
22,500	65.07	64.97	64.89	65.03	65.03	64.90
25,000	65.17	65.07	64.99	65.12	65.12	65.01
27,500	65.24	65.14	65.07	65.19	65.19	65.09
30,000	65.30	65.20	65.14	65.25	65.25	65.16
32,500	65.35	65.26	65.19	65.31	65.30	65.22
35,000	65.39	65.31	65.24	65.36	65.34	65.27

Table 7 Extracted Water Levels - Water Retained

Flow (ML/day)	WL1 (m AHD)	WL2 (m AHD)	WL3 (m AHD)	WL4 (m AHD)	WL5 (m AHD)	WL6 (m AHD)
2,500	60.59	60.47	60.32			
5,000	61.54	61.43	61.29			
7,500	62.29	62.18	62.04			
10,000	62.97	62.86	62.72			
12,500	61.57	61.46	61.32			
15,000	61.57	61.46	61.33	63.81	63.72	63.74
17,500	61.58	61.48	61.34	63.84	64.38	64.29
20,000	61.70	61.60	61.47	64.60	64.65	64.51
22,500	61.94	61.86	61.73	64.43	64.59	64.51
25,000	61.57	61.47	61.33	64.24	64.55	64.51
27,500	61.91	61.82	61.70	64.73	64.73	64.51
30,000	61.77	61.68	61.55	64.68	64.69	64.51
32,500	61.60	61.50	61.36	64.46	64.59	64.51
35,000	61.70	61.60	61.47	64.64	64.66	64.51

Table 8 Extracted Water Levels – Maximum Inundation

Flow (ML/day)	WL1 (m AHD)	WL2 (m AHD)	WL3 (m AHD)	WL4 (m AHD)	WL5 (m AHD)	WL6 (m AHD)
2,500	60.59	60.47	60.32			
5,000	61.54	61.43	61.29			
7,500	62.29	62.18	62.04			
10,000	62.97	62.86	62.72			
12,500	63.60	63.49	63.34			
15,000	64.16	64.05	63.91	64.15		
17,500	64.64	64.54	64.39	64.63	64.03	63.96
20,000	64.94	64.84	64.72	64.88	64.88	64.70
22,500	65.07	64.97	64.88	65.03	65.03	64.90
25,000	65.17	65.07	64.99	65.12	65.12	65.01
27,500	65.24	65.14	65.07	65.19	65.19	65.09
30,000	65.30	65.20	65.14	65.25	65.25	65.16
32,500	65.35	65.26	65.19	65.31	65.30	65.22
35,000	65.39	65.31	65.24	65.36	65.34	65.27

Table 9 Afflux due to Existing Conditions (relative to Natural Conditions)

Flow (ML/day)	WL1 (m)	WL2 (m)	WL3 (m)	WL4 (m)	WL5 (m)	WL6 (m)
2,500	0.00	0.00	0.00			
5,000	0.00	0.00	0.00			
7,500	-0.01	-0.01	-0.01			
10,000	-0.01	-0.01	-0.01			
12,500	0.01	0.01	0.01			
15,000	0.01	0.01	0.01	0.02		-0.28
17,500	0.13	0.10	0.07	0.15	0.18	-0.12
20,000	0.18	0.15	0.12	0.16	0.20	0.04
22,500	0.15	0.11	0.10	0.12	0.16	0.08
25,000	0.16	0.12	0.12	0.12	0.17	0.11
27,500	0.16	0.12	0.13	0.12	0.16	0.12
30,000	0.15	0.12	0.14	0.12	0.16	0.12
32,500	0.14	0.12	0.13	0.11	0.15	0.12
35,000	0.13	0.11	0.13	0.10	0.14	0.12

Table 10 Afflux due to Proposed Works (relative to Existing Conditions)

Flow (ML/day)	WL1 (m)	WL2 (m)	WL3 (m)	WL4 (m)	WL5 (m)	WL6 (m)
2,500	0.00	0.00	0.00			
5,000	0.00	0.00	0.00			
7,500	0.00	0.00	0.00			
10,000	0.00	0.00	0.00			
12,500	0.00	0.00	0.00			
15,000	0.01	0.01	0.01	0.07		0.01
17,500	0.00	0.00	0.00	-0.01	-0.26	0.02
20,000	0.02	0.01	0.01	0.01	0.02	0.01
22,500	0.01	0.01	0.01	0.01	0.01	0.02
25,000	0.01	0.01	0.01	0.01	0.01	0.01
27,500	0.00	0.01	0.01	0.00	0.00	0.01
30,000	0.00	0.00	0.00	0.00	0.00	0.01
32,500	0.00	0.00	0.00	0.00	0.00	0.00
35,000	0.00	0.00	0.00	0.00	0.00	0.00

Table 11 Afflux for Maximum Inundation Run (relative to Existing Conditions)

Flow (ML/day)	WL1 (m)	WL2 (m)	WL3 (m)	WL4 (m)	WL5 (m)	WL6 (m)
2,500	0.00	0.00	0.00			
5,000	0.00	0.00	0.00			
7,500	0.00	0.00	0.00			
10,000	0.00	0.00	0.00			
12,500	0.00	0.00	0.00			
15,000	0.00	0.00	0.00	0.07		
17,500	-0.02	-0.03	-0.03	-0.02	-0.61	-0.29
20,000	-0.02	-0.02	-0.03	-0.04	-0.04	0.00
22,500	0.01	0.01	0.01	0.01	0.01	0.02
25,000	0.01	0.01	0.01	0.01	0.01	0.01
27,500	0.00	0.01	0.01	0.00	0.00	0.01
30,000	0.00	0.00	0.00	0.00	0.00	0.00
32,500	0.00	0.00	0.00	0.00	0.00	0.00
35,000	0.00	0.00	0.00	0.00	0.00	0.00

2.7 MDBA Tables

Statistics were generated from the modelling for input into the MDBA's BIGMOD water resource model for both the Proposed Works and Water Retained model runs (Table 12 and

Murray Flow (ML/d)	Flow (ML/d)	WSL (m AHD) (UpS of DS Regulator)	Surface Area (ha)	Volume (ML)
2500	-	-	-	-
5000	-	-	-	-
7500	-	-	-	-
10000	-	-	-	-
12500	-	-	-	-
15000	91	63.7	145	813
17500	544	64.3	548	3800
20000	2091	64.6	643	6090
22500	5350	64.9	669	7450
25000	6902	65.0	684	8170
27500	8455	65.0	693	8710
30000	9616	65.1	699	9150
32500	10568	65.1	702	9550
35000	11714	65.2	705	9900

Table 13). Figure 13 contains a schematic of the BIGMOD model for the Vinifera Forest floodplain, for which the following information was extracted:

- Steady state flow into/out of the floodplain;
- Water surface elevation on the upstream side of the downstream regulator;
- Inundation area; and
- Inundation volume.

These statistics were calculated for the area of the floodplain shown in Figure 14, which represents the Vinifera Forest floodplain.

Table 12 MDBA BIGMOD Model Statistics – Proposed Works Scenario

Murray Flow (ML/d)	Flow (ML/d)	WSL (m AHD) (UpS of DS Regulator)	Surface Area (ha)	Volume (ML)
2500	-	-	-	-
5000	-	-	-	-
7500	-	-	-	-
10000	-	-	-	-
12500	-	-	-	-
15000	91	63.7	145	813
17500	544	64.3	548	3800
20000	2091	64.6	643	6090
22500	5350	64.9	669	7450
25000	6902	65.0	684	8170
27500	8455	65.0	693	8710
30000	9616	65.1	699	9150
32500	10568	65.1	702	9550
35000	11714	65.2	705	9900

Table 13 MDBA BIGMOD Model Statistics – Retained Water Scenario

Murray Flow (ML/d)	Water Level US of DS Regulator (m AHD)	Surface Area (ha)	Volume (ML)
2500	-	-	-
5000	-	-	-
7500	-	-	-
10000	-	-	-
12500	-	-	-
15000	63.7	145	813
17500	64.3	493	3390
20000	64.5	605	4910
22500	64.5	590	4680
25000	64.5	579	4510
27500	64.5	637	5210
30000	64.5	632	5100
32500	64.5	630	5050
35000	64.5	627	5000

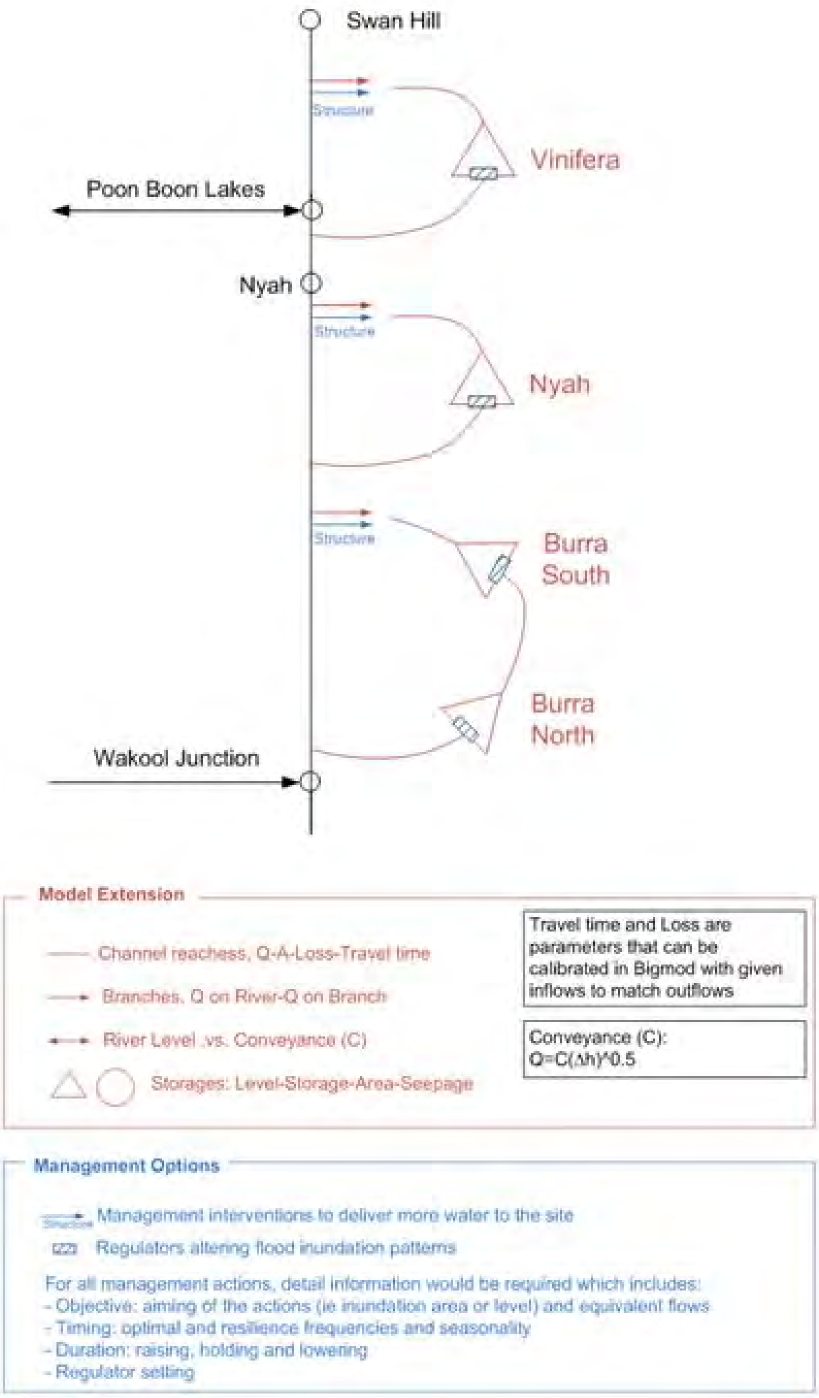


Figure 13 BIGMOD Model Schematic

JACOBS

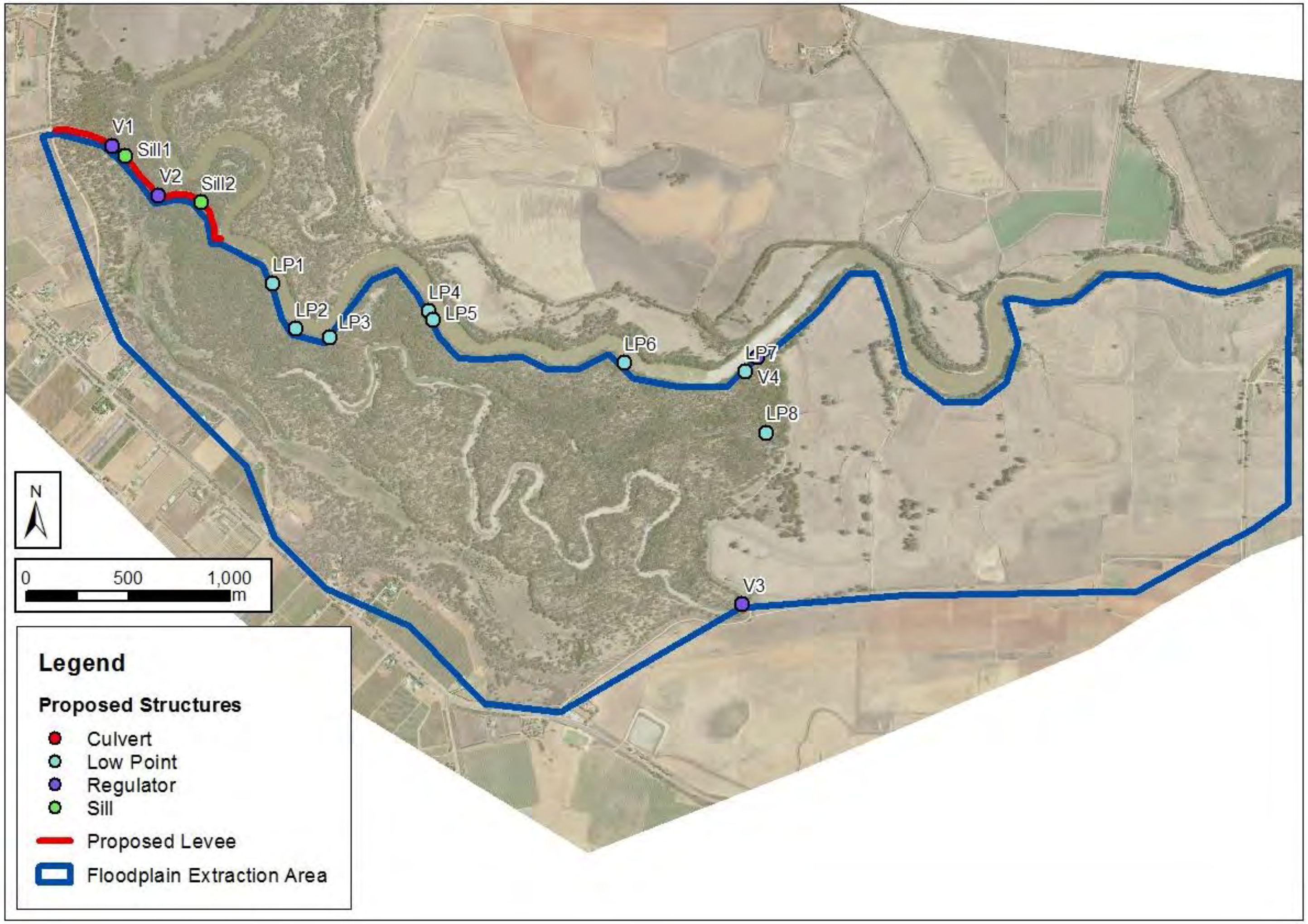


Figure 14 Vinifera Forest Floodplain Extraction Area

2.8 Conclusions and Recommendations

The model development and calibration stages of this project have revealed a number of valuable and important conclusions, including:

- The LiDAR data adopted for this project is fit for purpose with the exception of the missing area shown in Figure 3. This was filled in with the 2001 dataset for the purposes of this study but may need to be assessed further for future work. The collection of feature survey will assist with this.
- The accuracy of the modelling and reliability of the conclusions could be enhanced through collection of additional survey data. This includes cross-sections of the River Murray, field survey of critical levels in and around the floodplain and survey of key existing structures.
- The overall modelling approach is sufficiently detailed to simulate the key hydraulic processes in the channels and floodplains of the study area, including exchanges of flows between the River Murray, Vinifera Creek and movement of flow on the floodplain. In particular, the model grid size adopted and location and spacing of one-dimensional cross-sections has allowed the critical features to be modelled as accurately as the available data allows.
- Available calibration data is limited, with the most reliable information is anecdotal evidence on River Murray flows at which breakouts occur into the floodplain. The model results are consistent with this information.
- Adoption of a series of steady-state flow scenarios for design modelling has produced a useful database of results that can be used to determine a range of critical hydraulic features of the study area and also to provide information on how water moves through the study area under a range of physical conditions.

The modelling results have also revealed some key hydraulic features of the floodplain. For the Existing Conditions model:

- Water from the River Murray enters the Vinifera channel at a peak flow rate of approximately 15,000 ML/d.
- Water from the River Murray spills onto the Vinifera floodplain at a peak flow rate of approximately 20,000 ML/d.
- The majority of the floodplain is inundated at a flow rate of approximately 25,000 ML/d.

Modelling of the proposed regulators and levee banks has also revealed that:

- The proposed works will not appreciably affect flood levels and extents while the regulators are open;
- Operation (i.e. closing of the regulators) enables a significant volume of water to be retained on the floodplain; and
- The Maximum Inundation runs do not increase flood levels compared with existing conditions due to the flat topography of the Vinifera Forest floodplain.

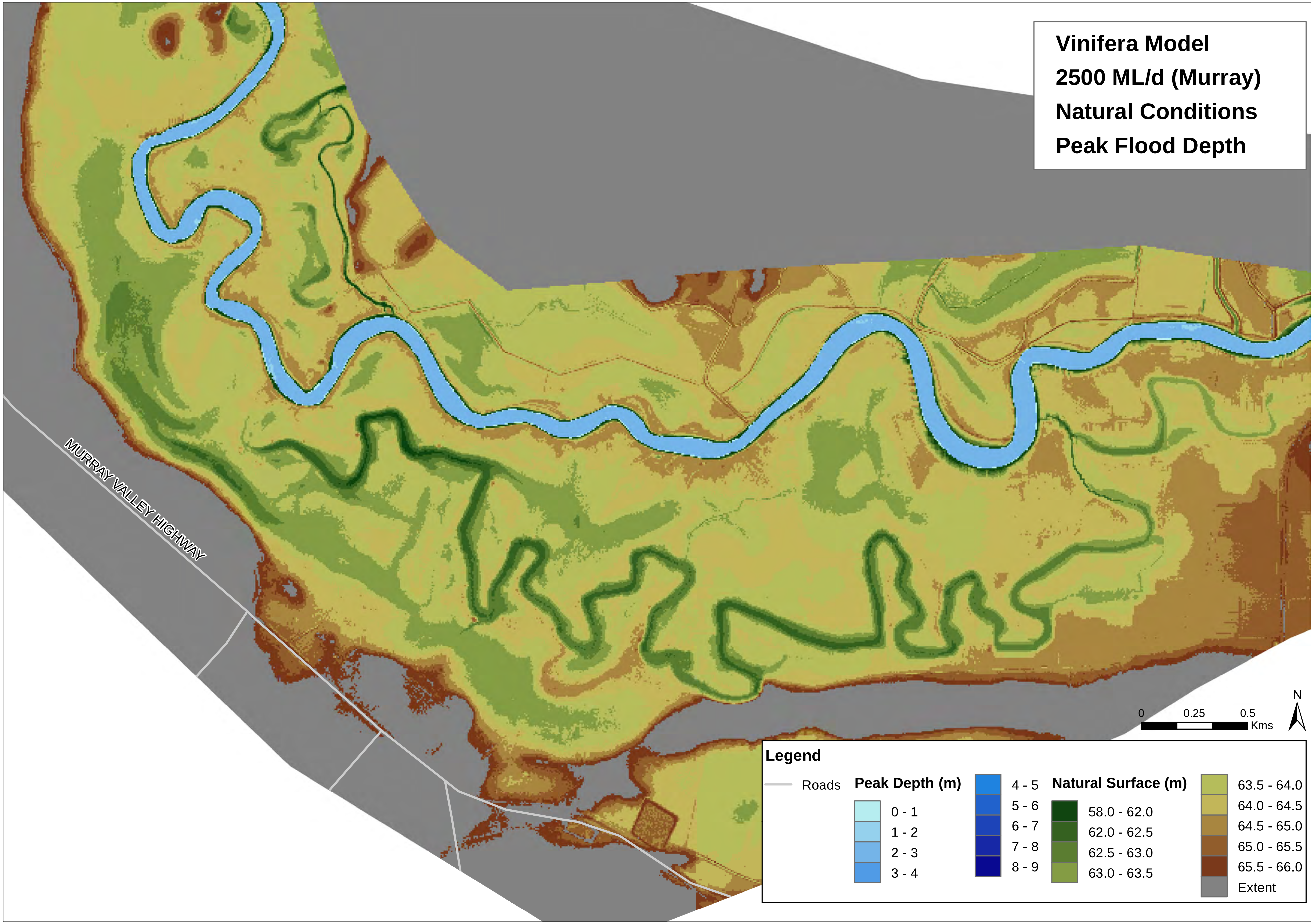
In addition, the modelling results have been used to derive a number of flow and volume relationships which can be used within a water resources model to better understand the benefits associated with long-term operation of these structures.

3. References

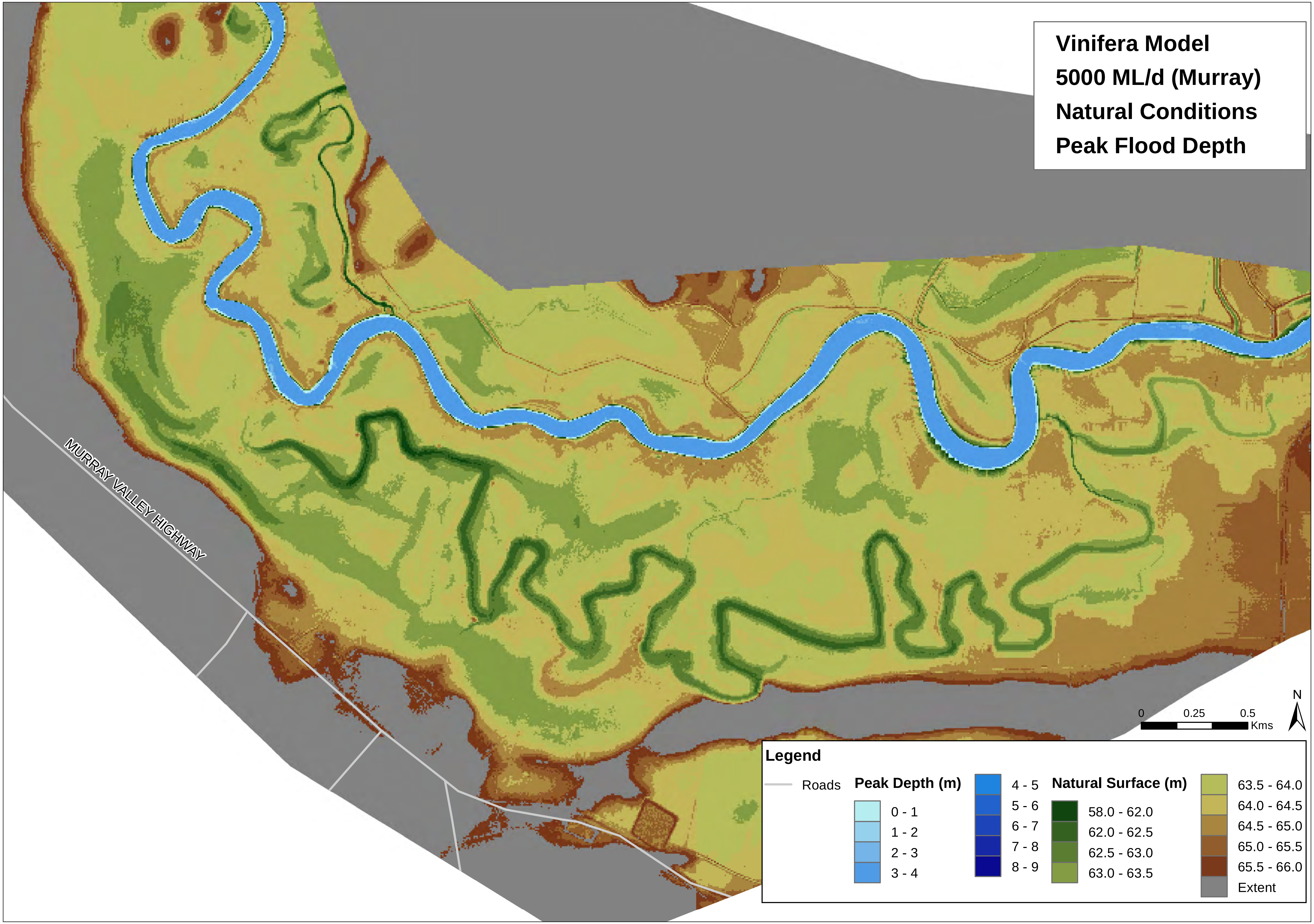
Alluvium (2013), *Vinifera Park Water Management Options Project*. Report produced May 2013 for Mallee CMA.

Overton (2006), *The River Murray Floodplain Inundation Model (RiM-FIM),* Report produced 2006 for CSIRO.

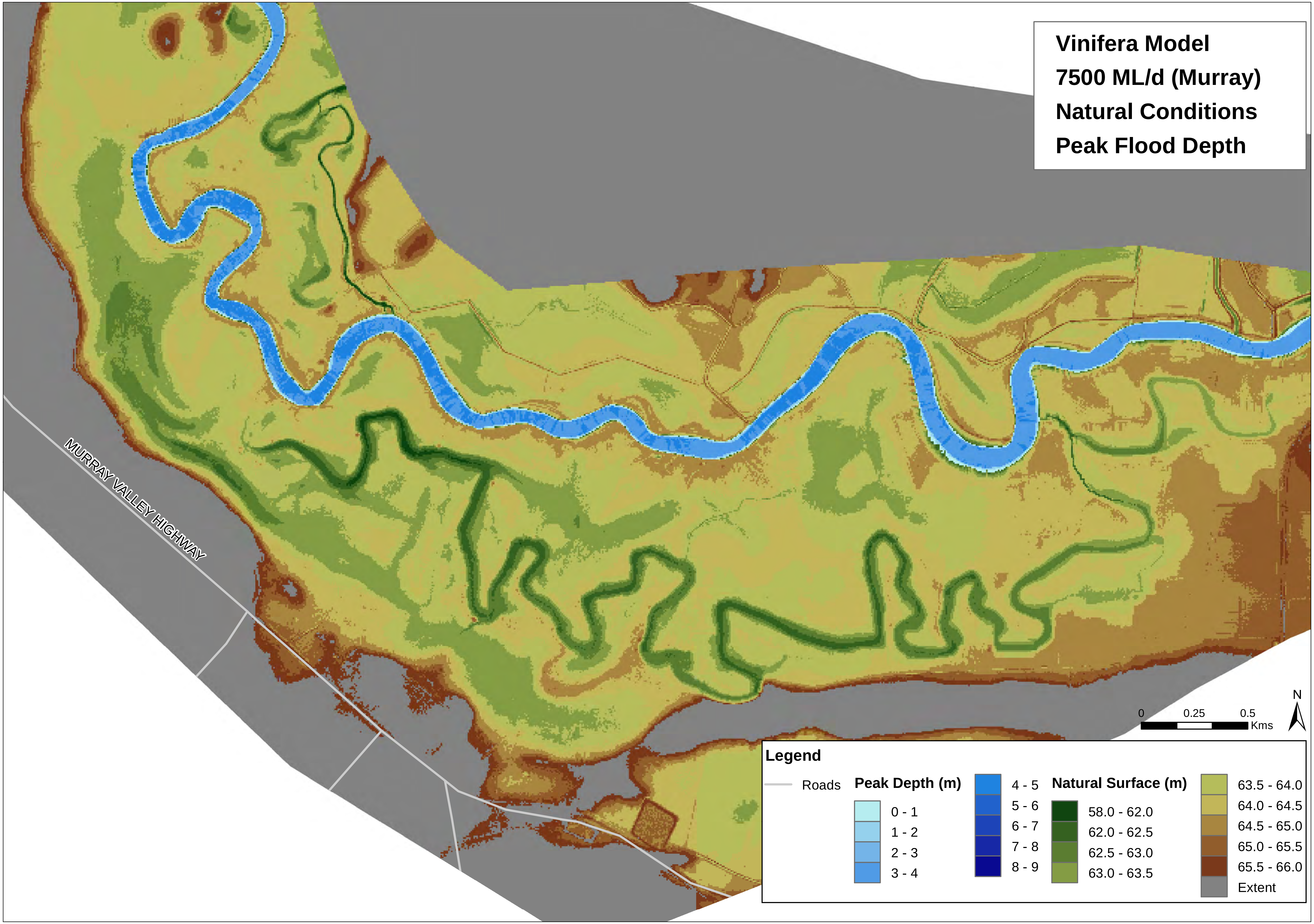
Appendix A. Natural Conditions Peak Depth Plots



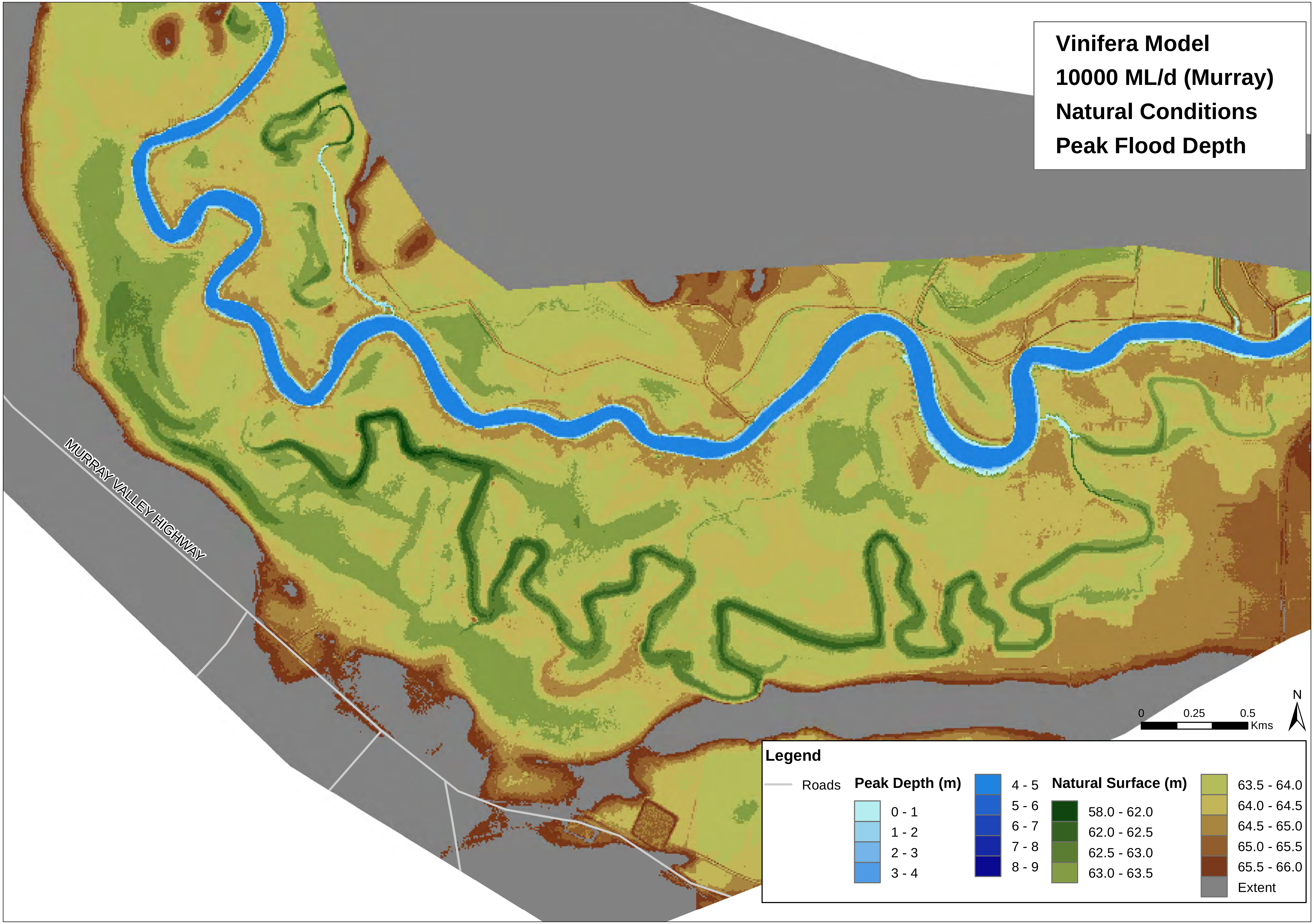
Vinifera Model
2500 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent

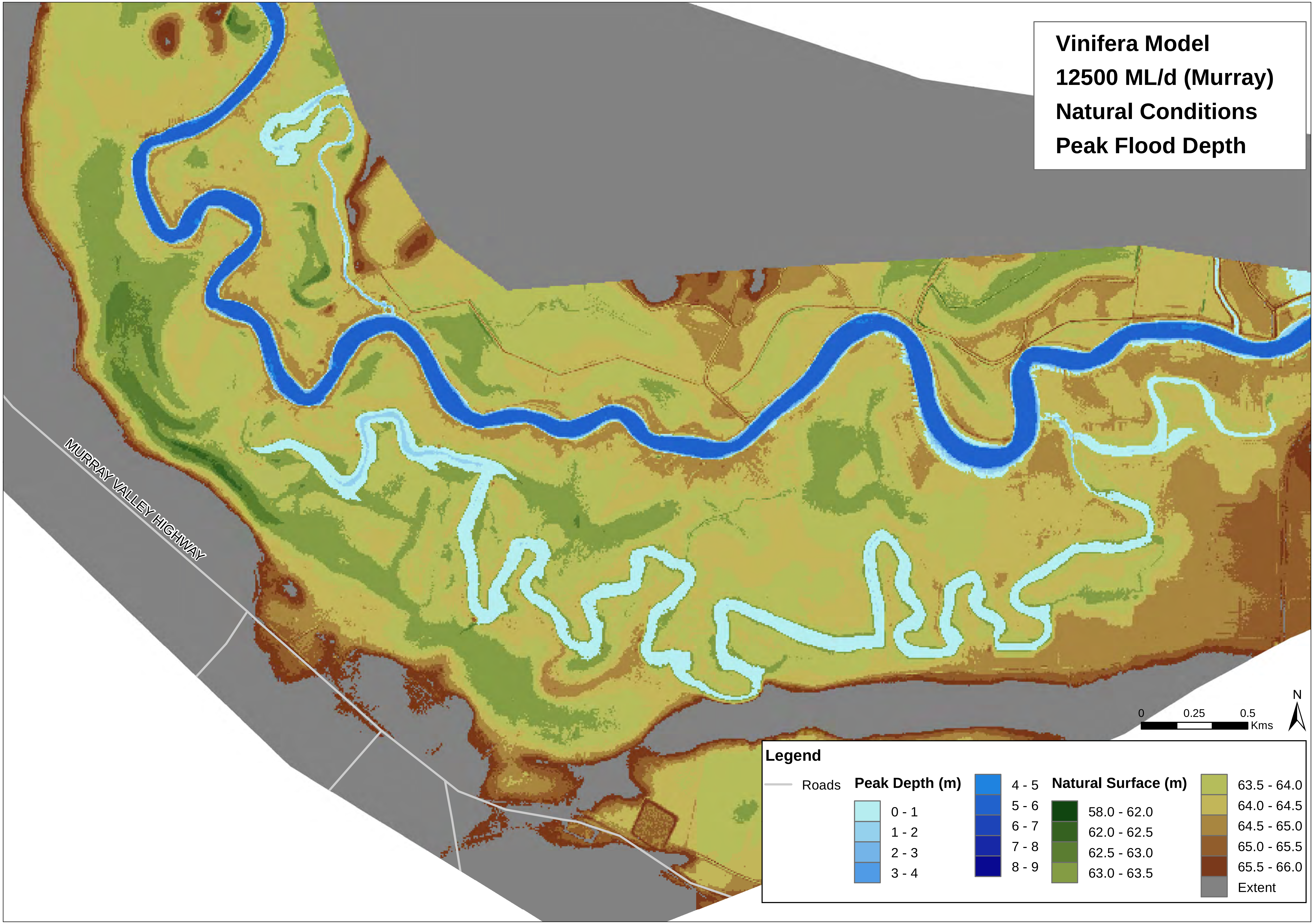


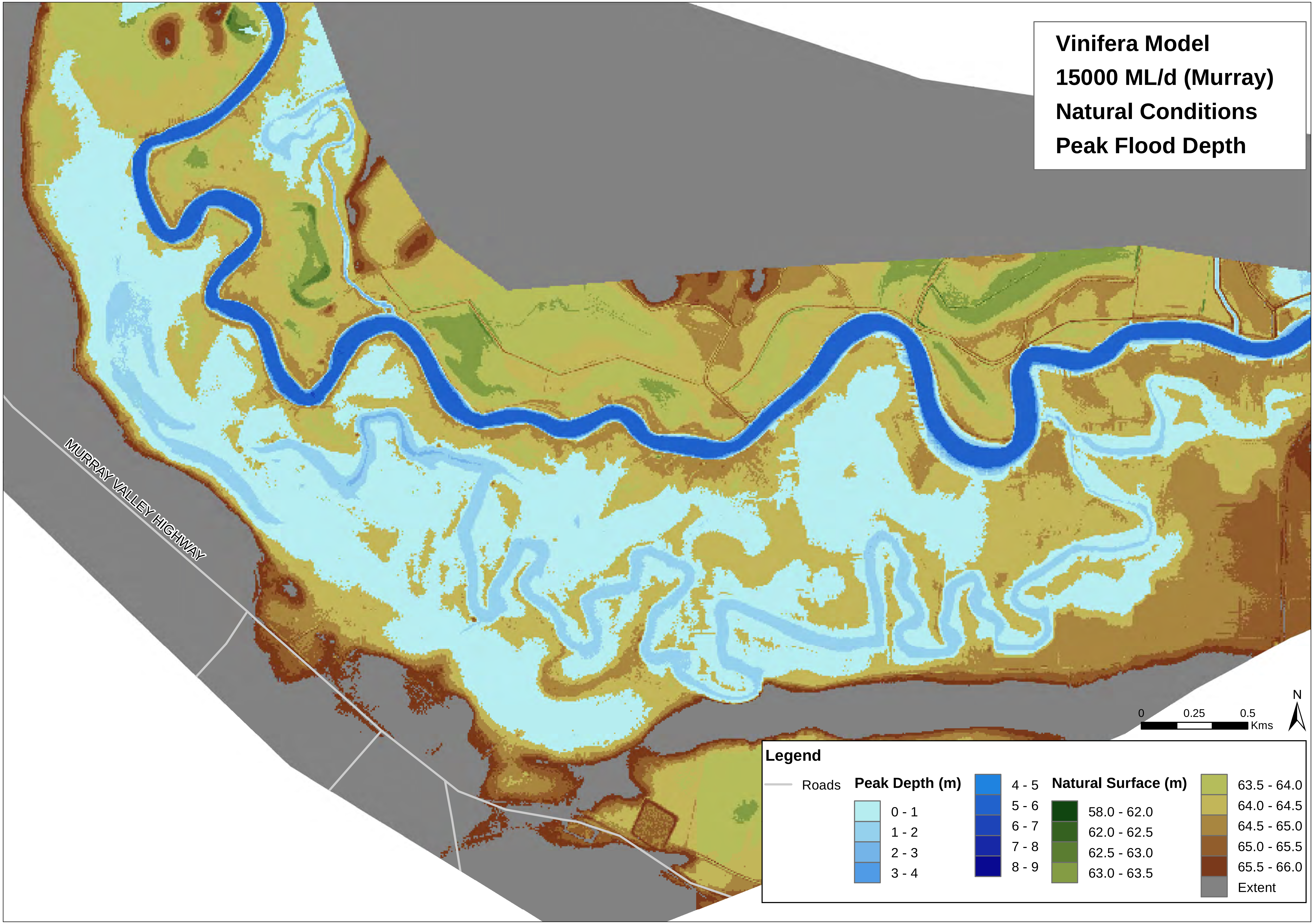
Vinifera Model
5000 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent

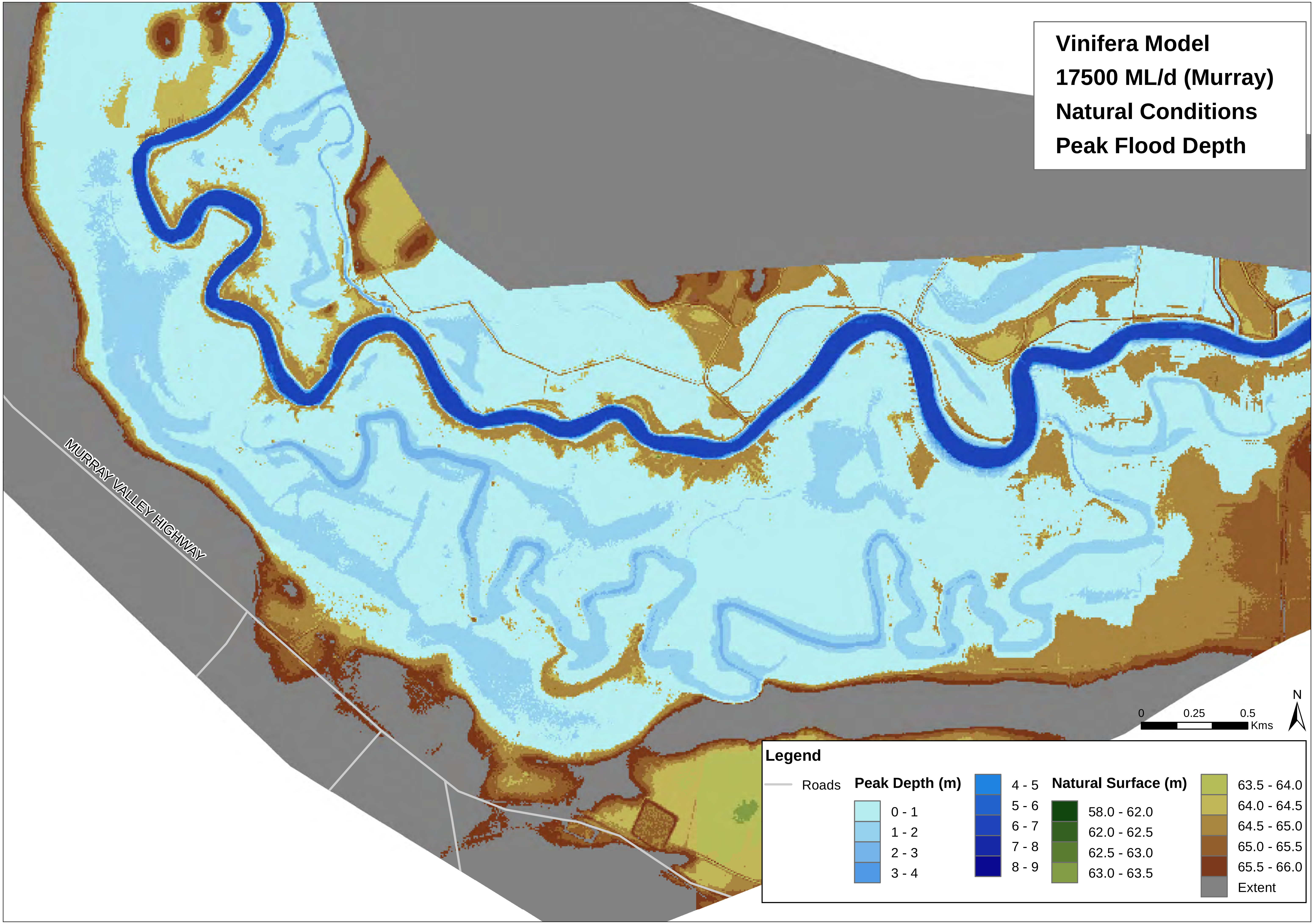


Vinifera Model
7500 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent

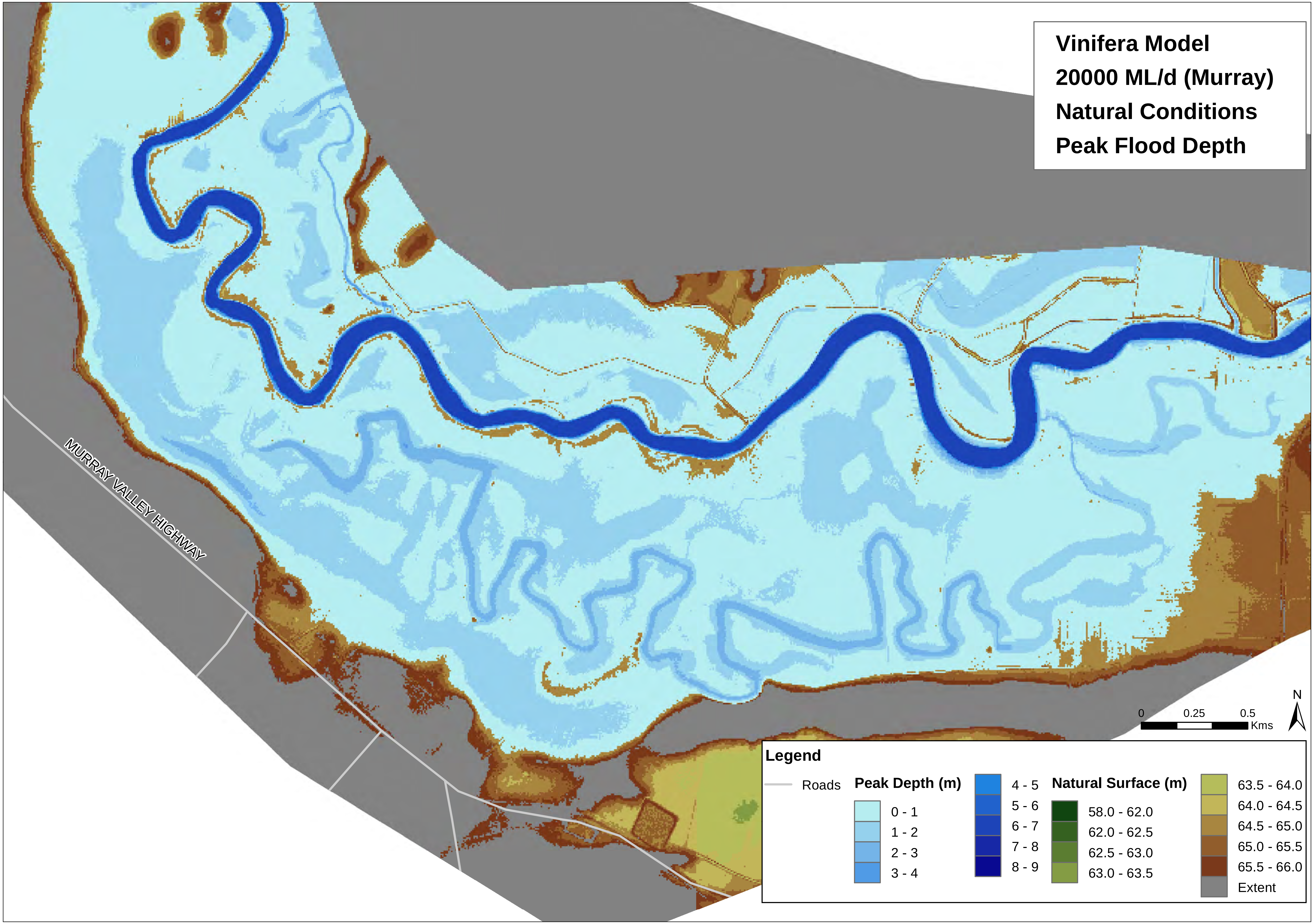

Vinifera Model
10000 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent


Vinifera Model
12500 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent

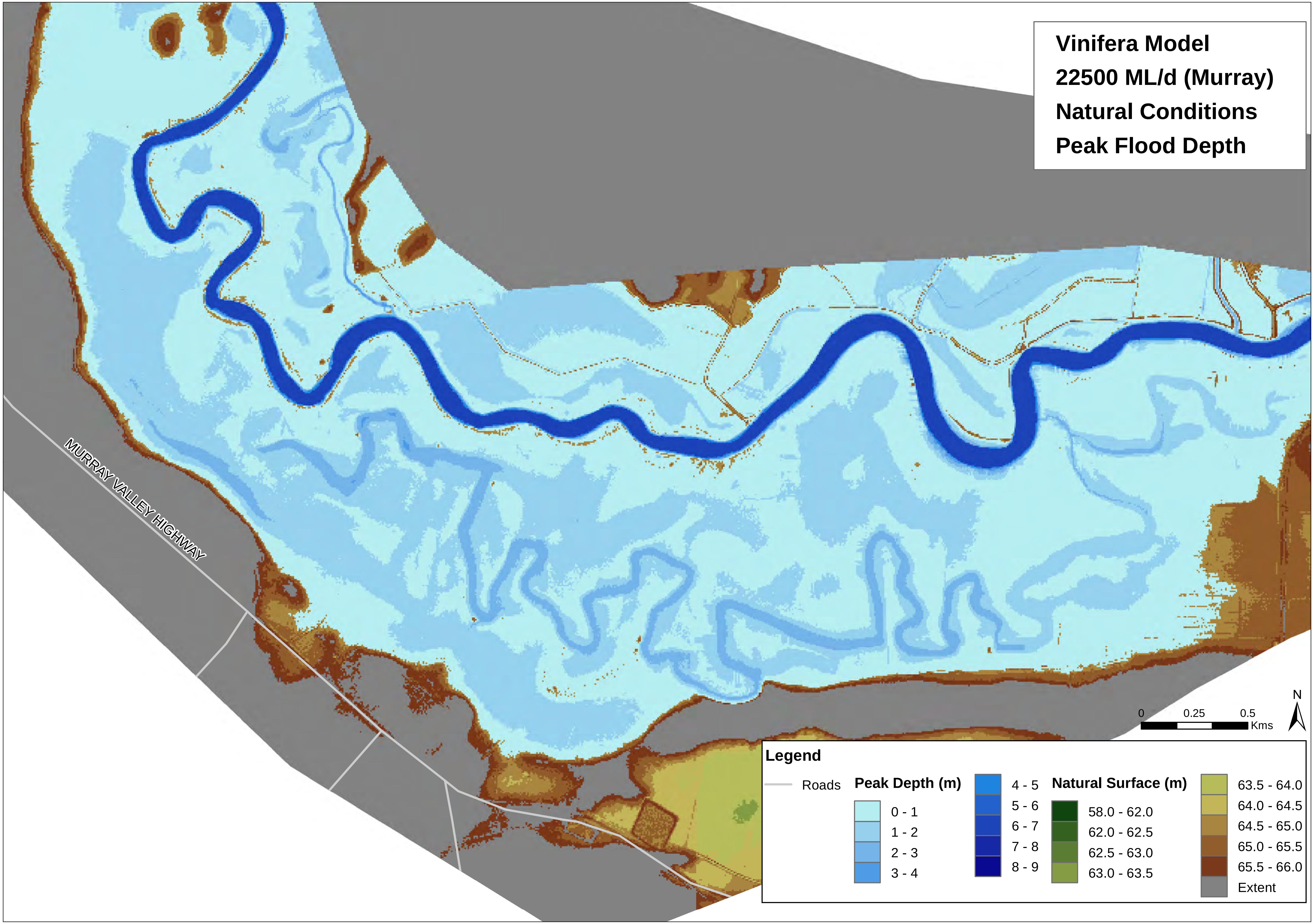

Vinifera Model
15000 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent



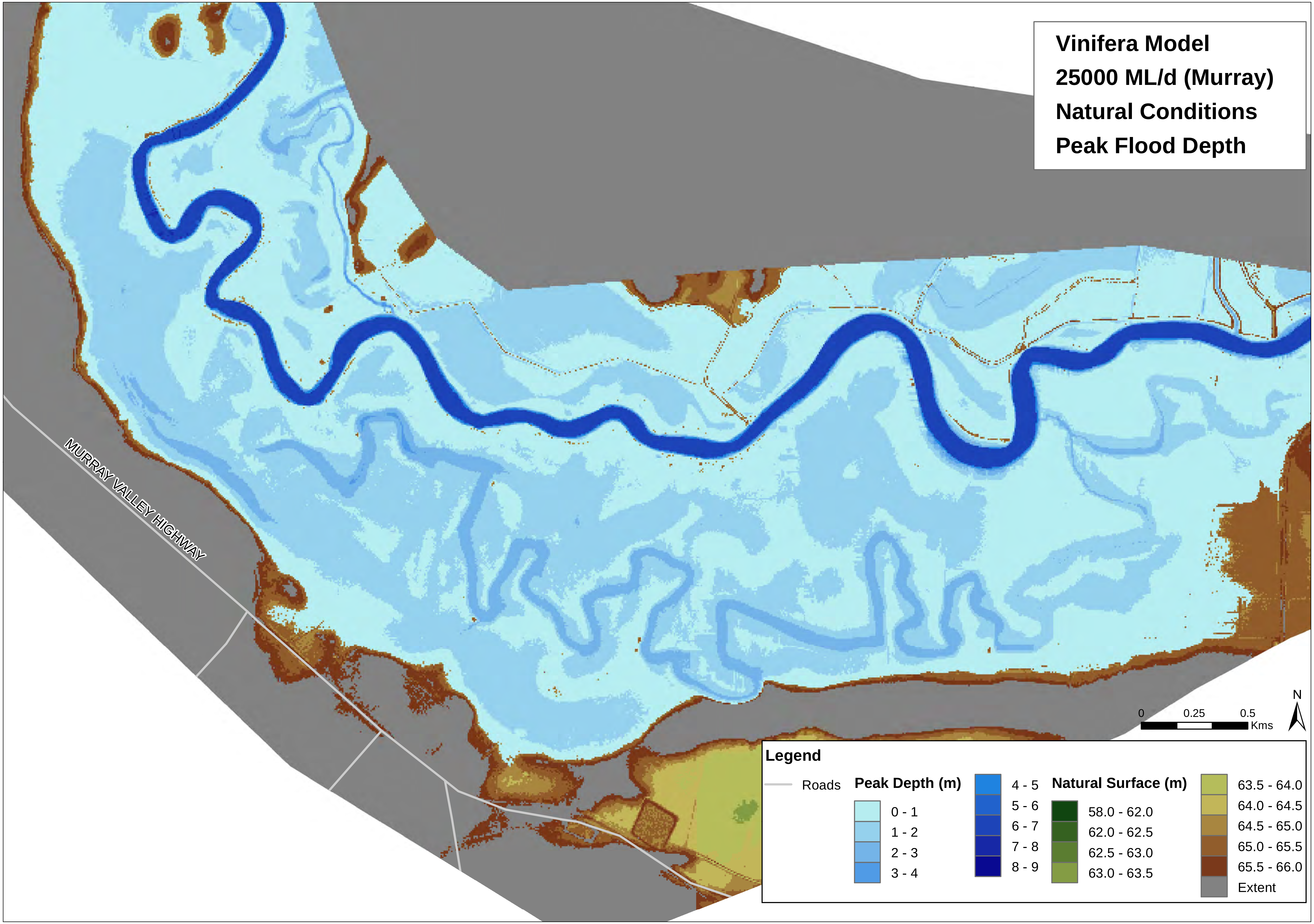
Vinifera Model
17500 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent



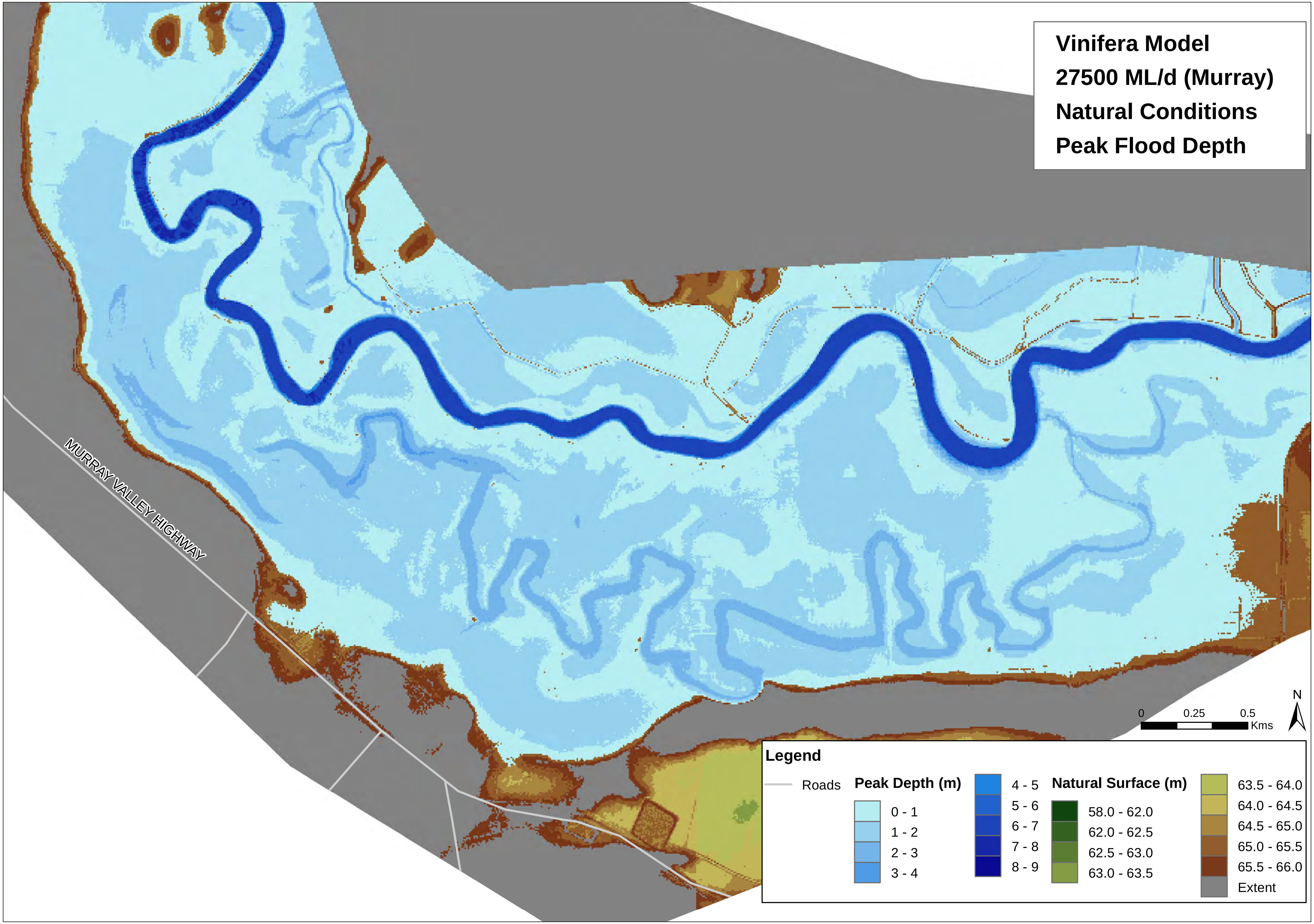
Vinifera Model
20000 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent

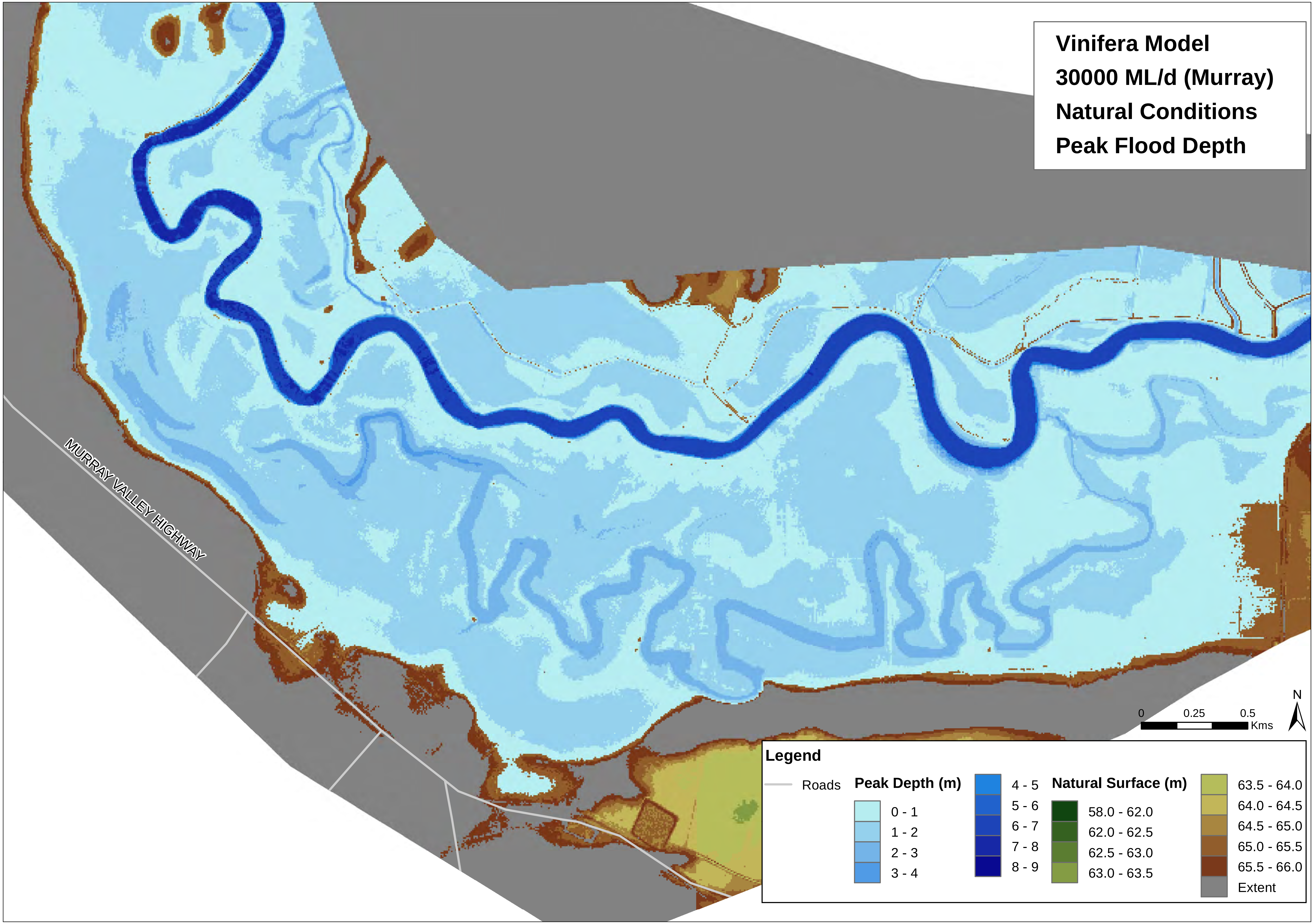


Vinifera Model
22500 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent

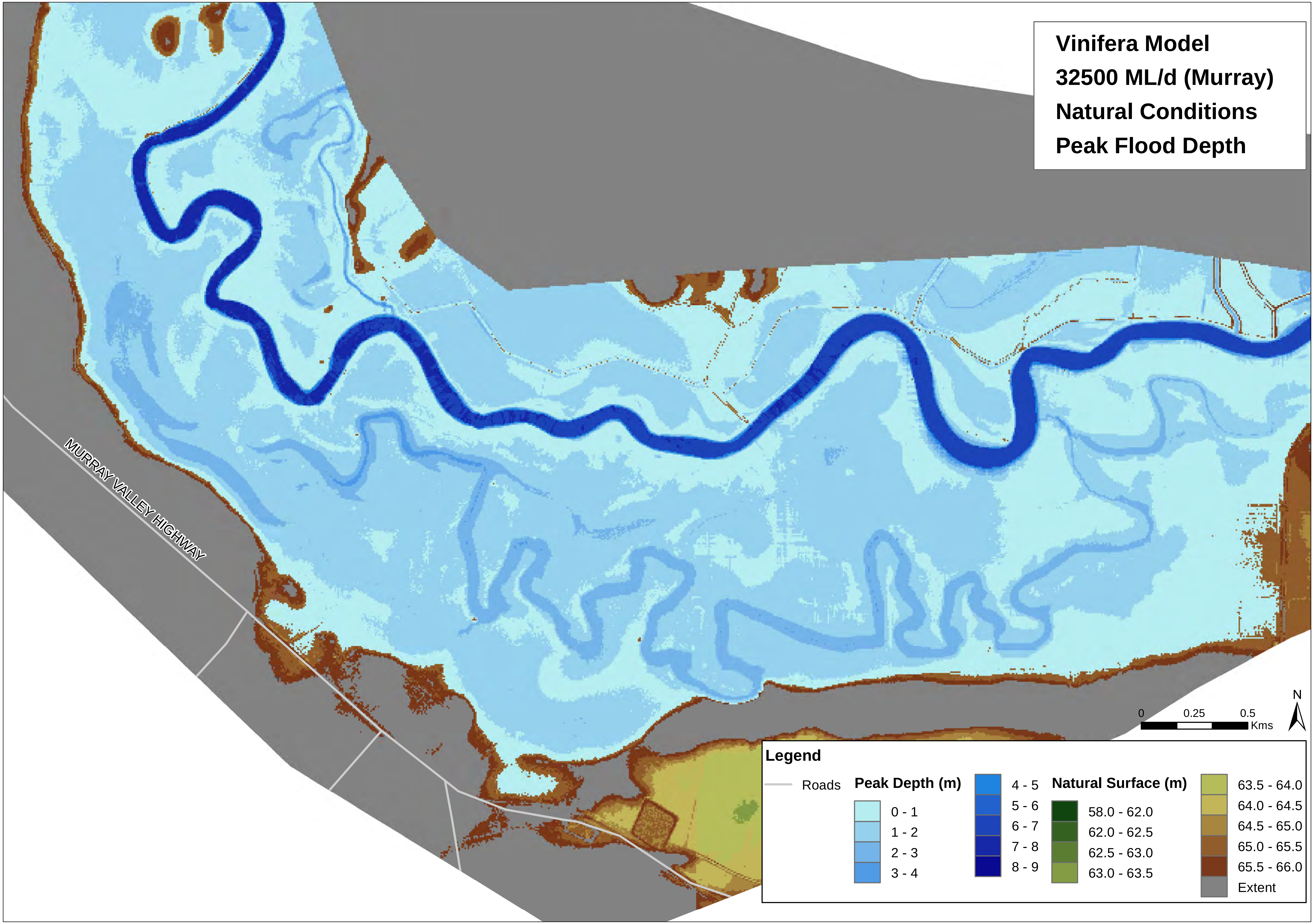


Vinifera Model
25000 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent

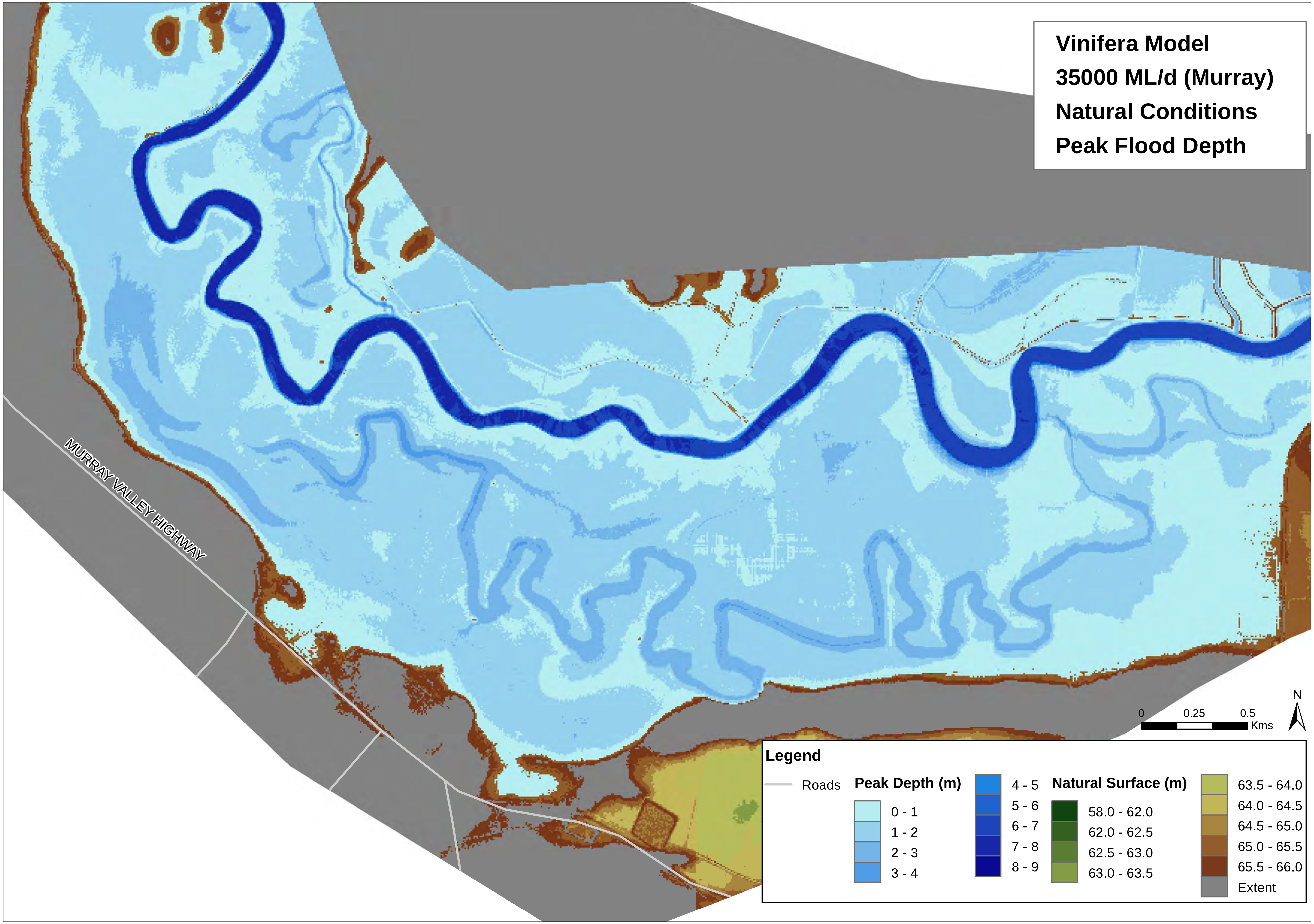

Vinifera Model
27500 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent



Vinifera Model
30000 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent

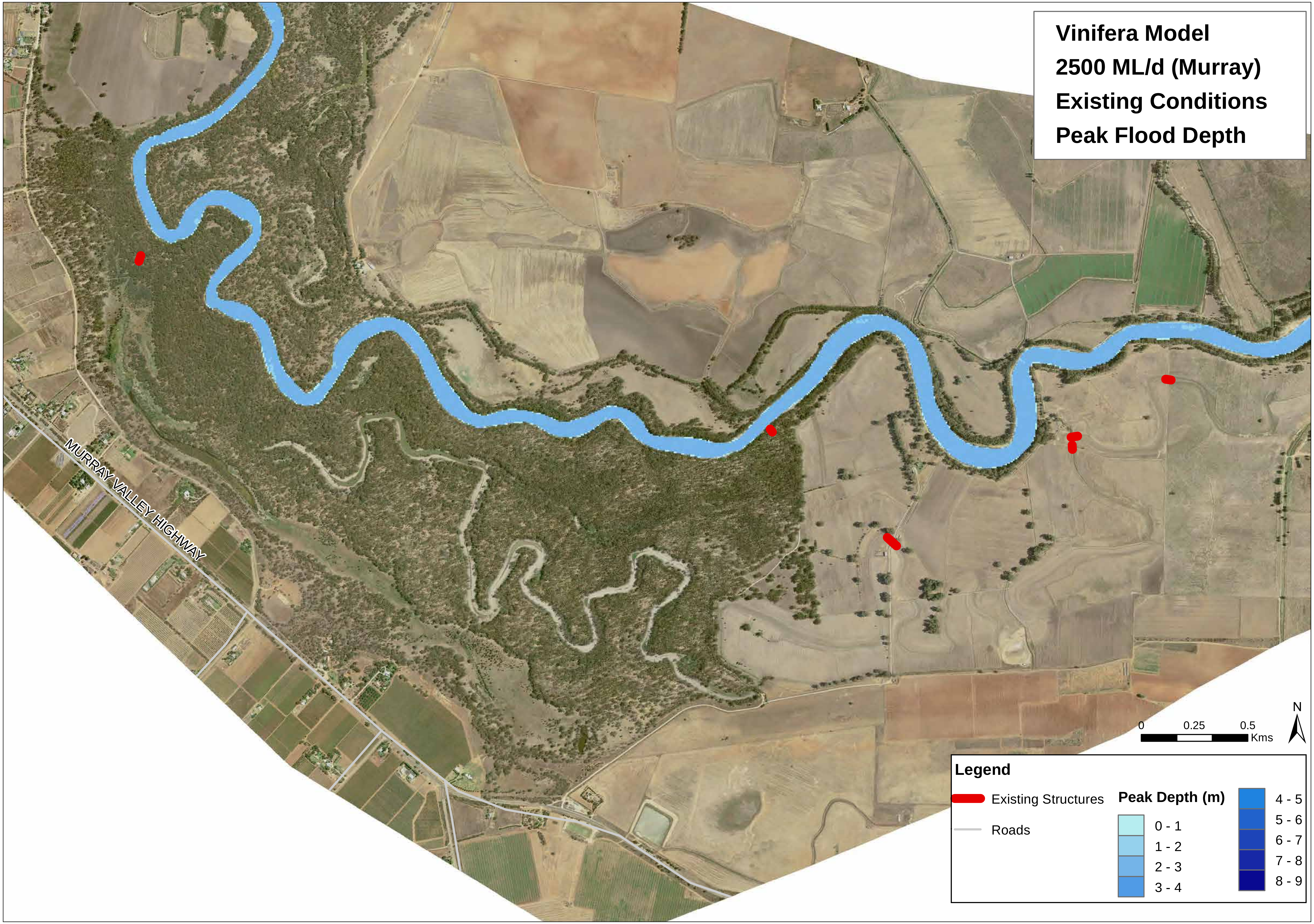


Vinifera Model
32500 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent

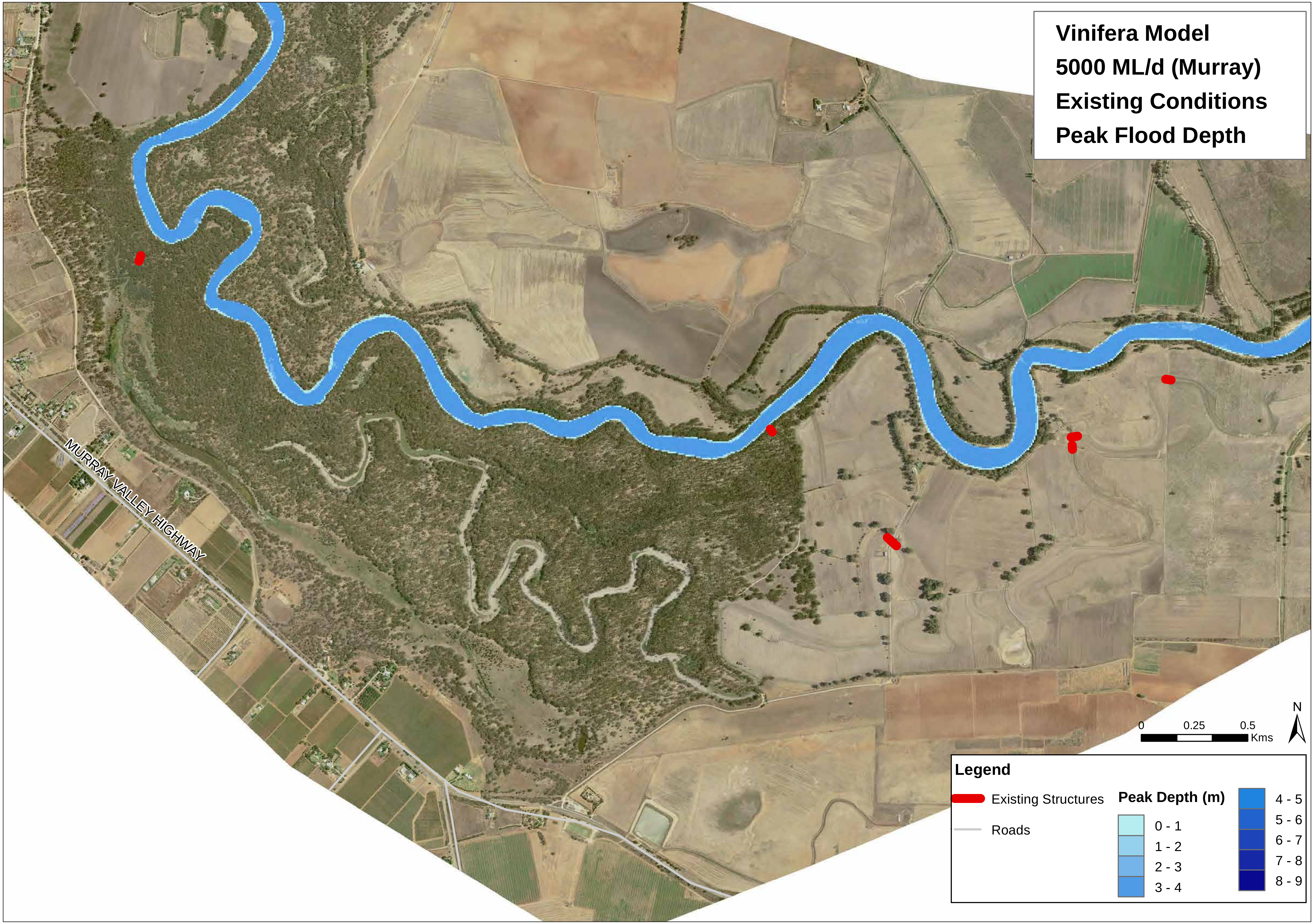


Vinifera Model
35000 ML/d (Murray)
Natural Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
Natural Surface (m)
58.0 - 62.0
62.0 - 62.5
62.5 - 63.0
63.0 - 63.5
63.5 - 64.0
64.0 - 64.5
64.5 - 65.0
65.0 - 65.5
65.5 - 66.0
Extent

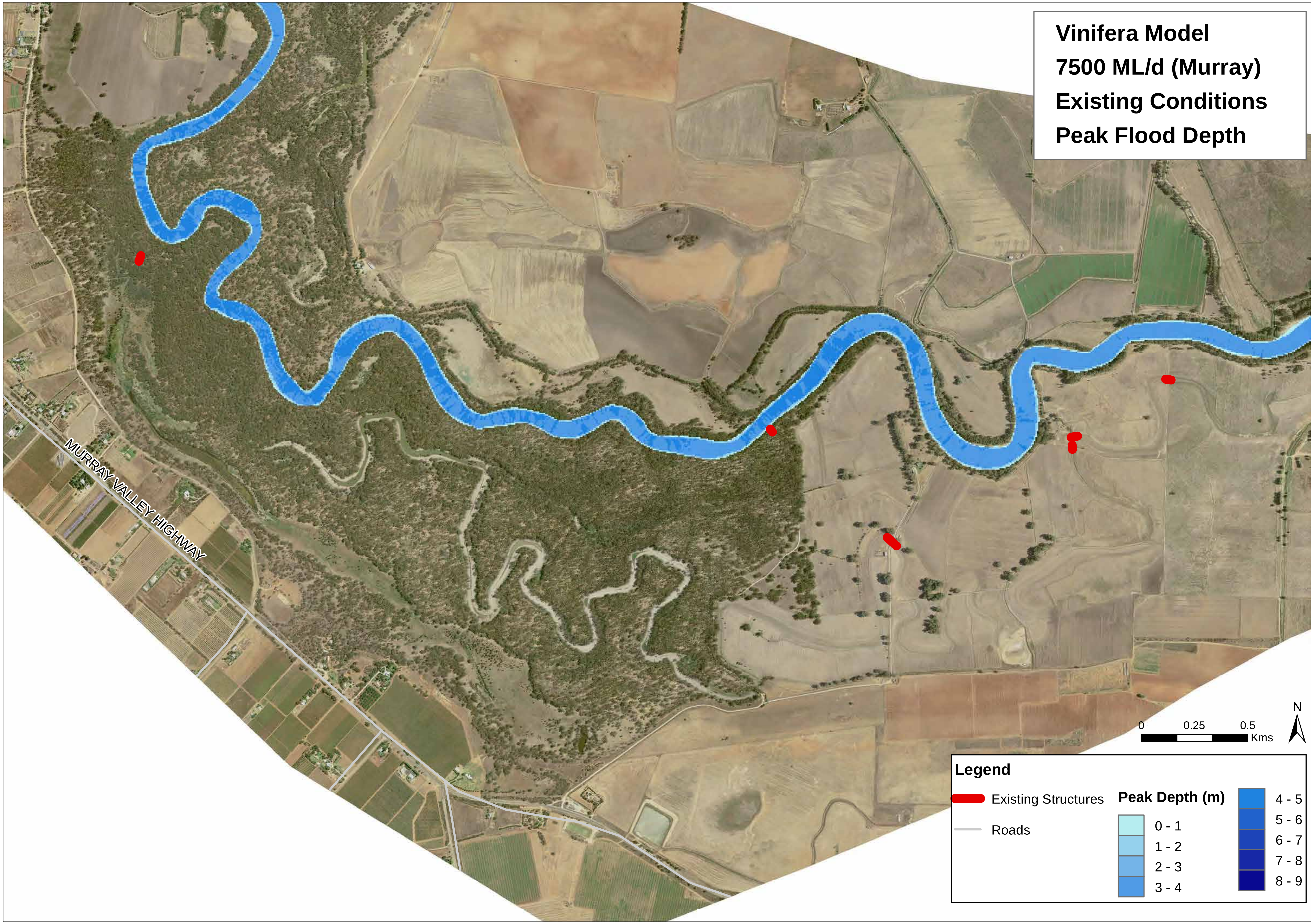
Appendix B. Existing Conditions Peak Depth Plots

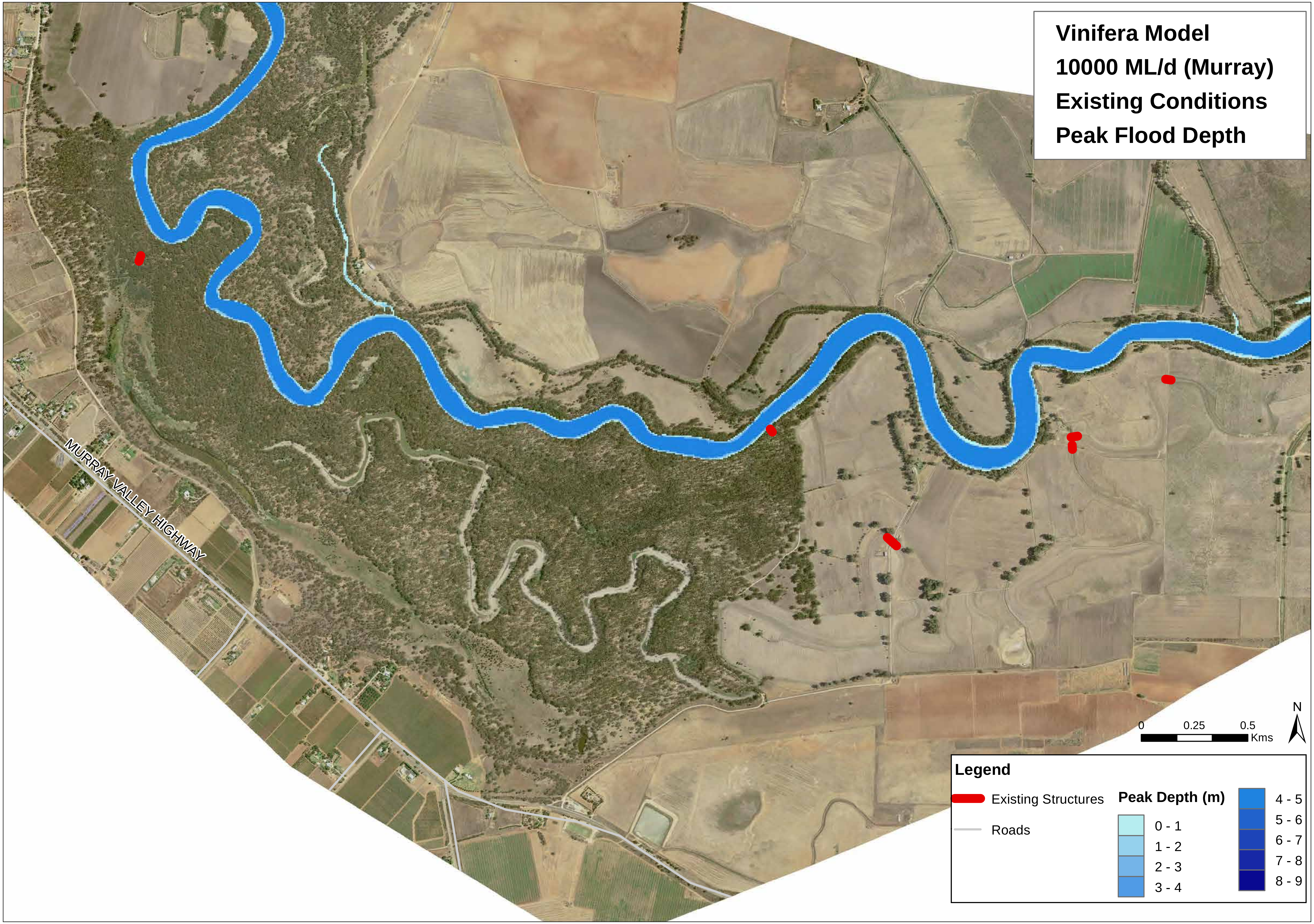


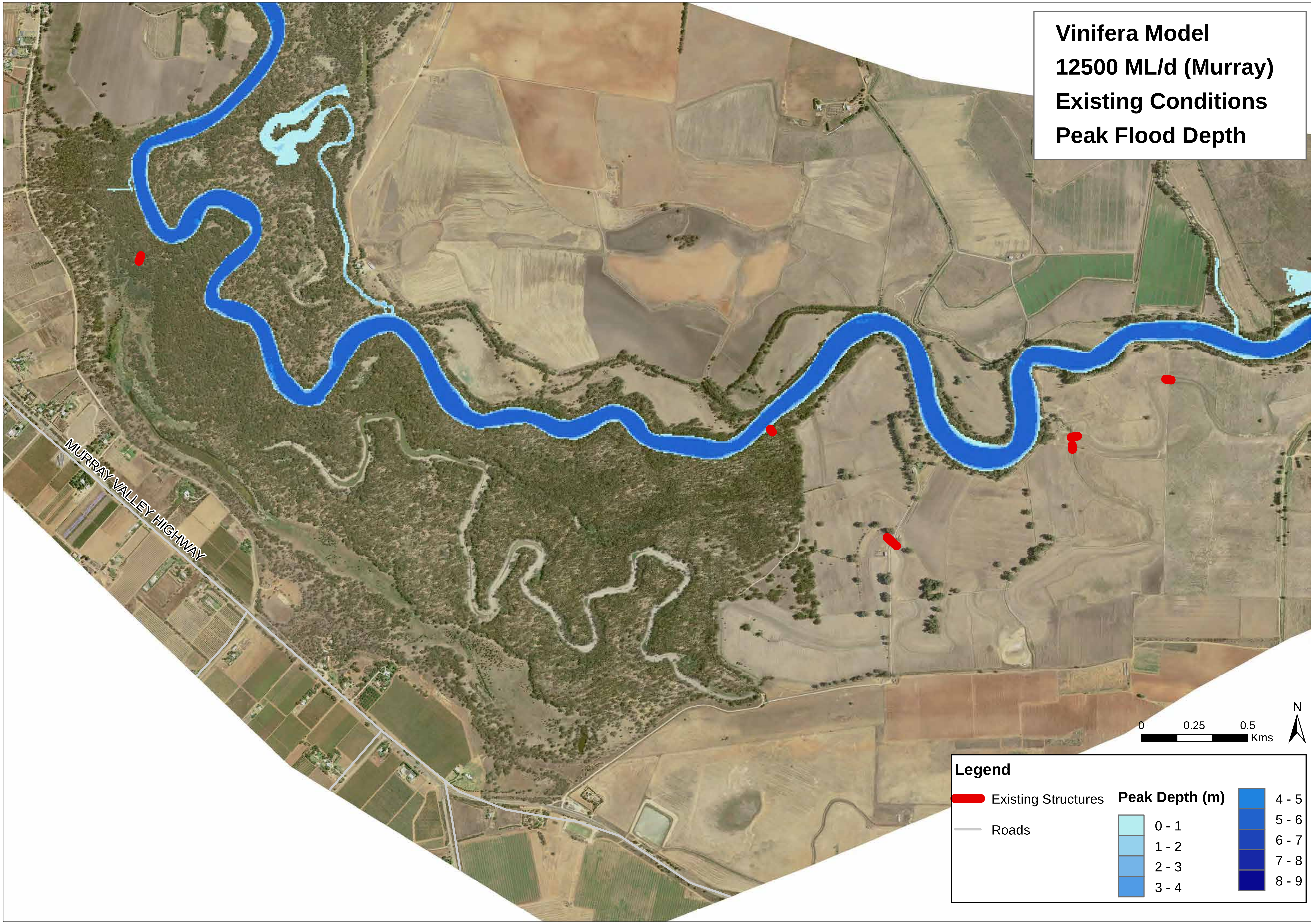
Vinifera Model
2500 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

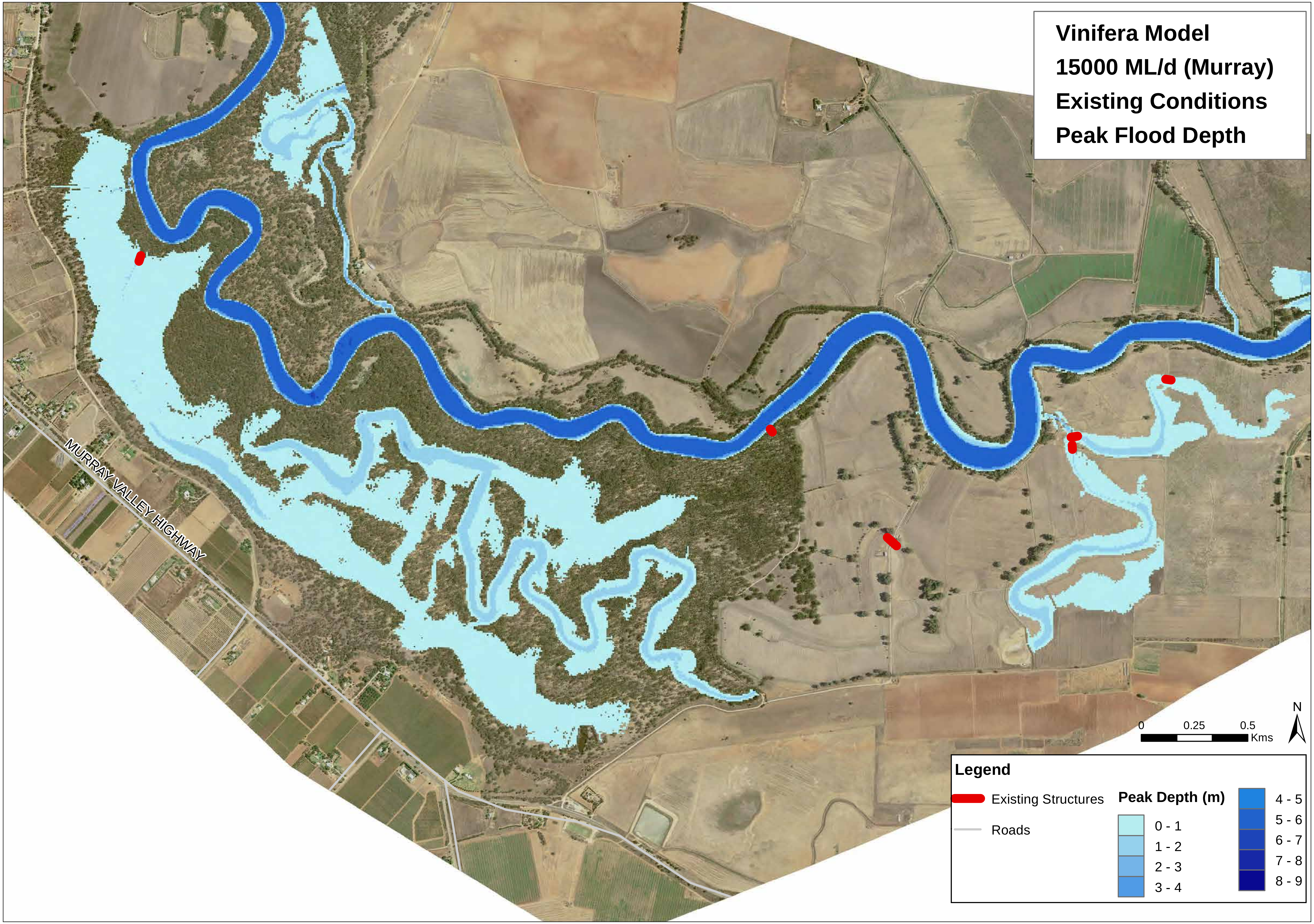


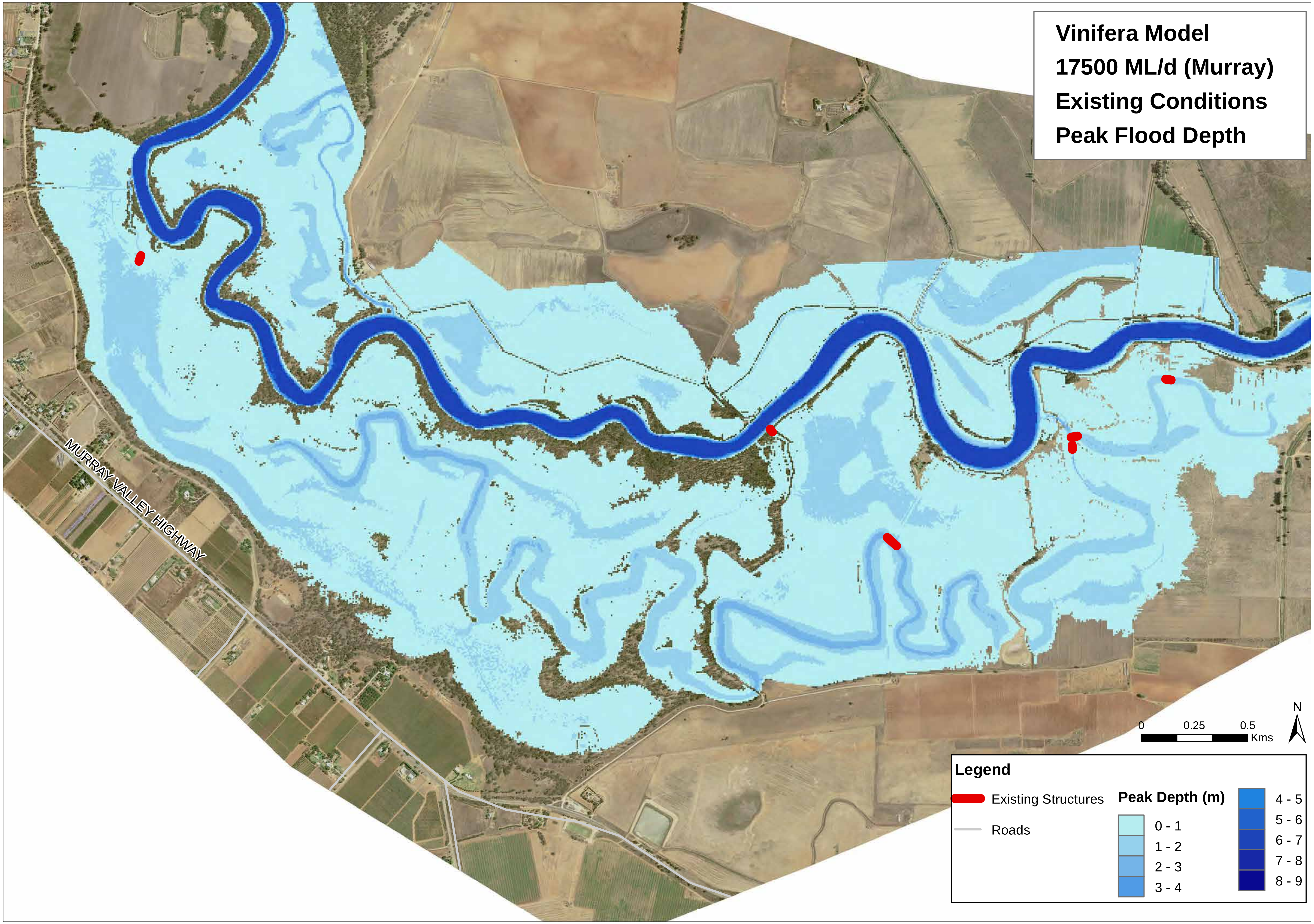
Vinifera Model
5000 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

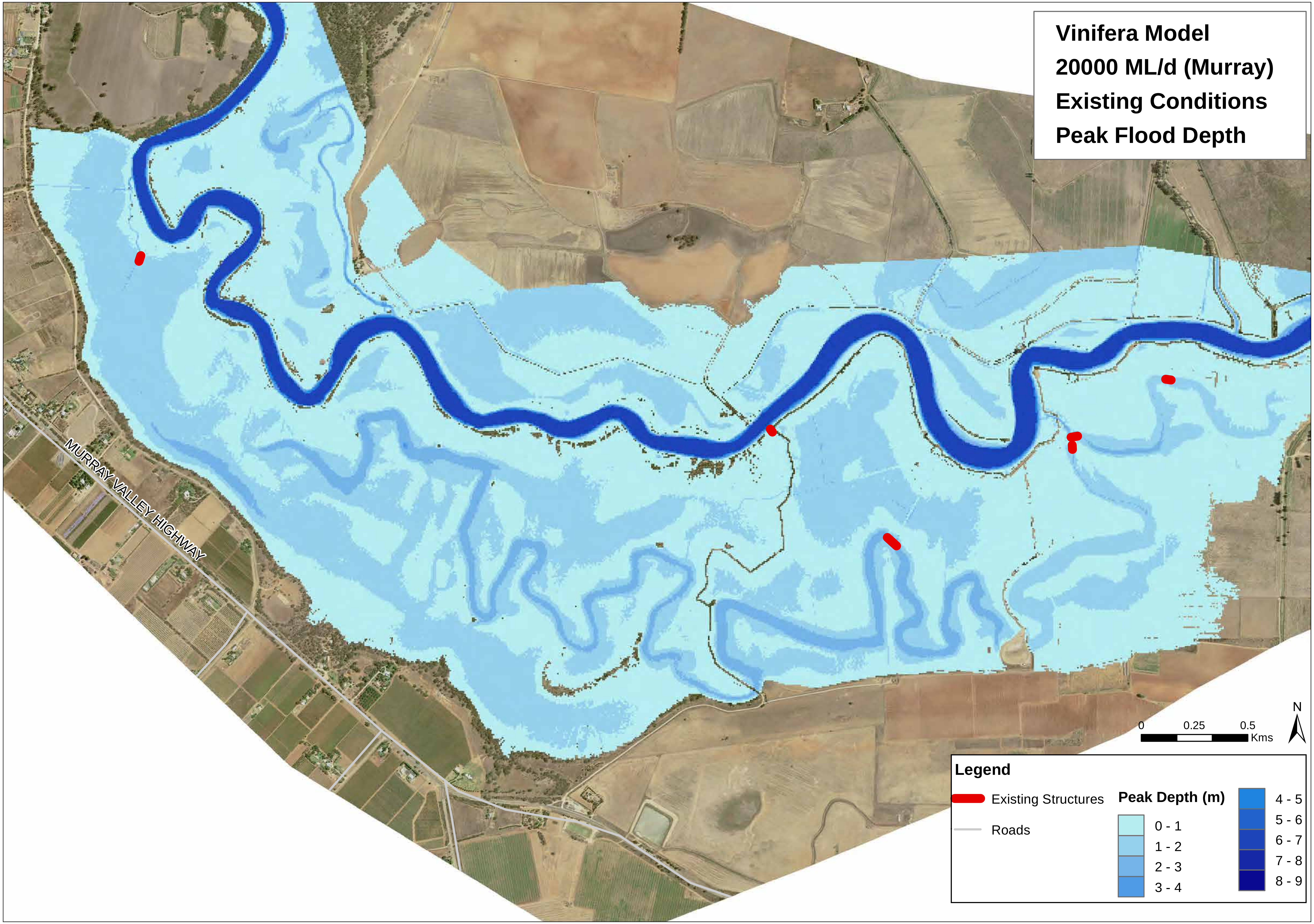

Vinifera Model
7500 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9


Vinifera Model
10000 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

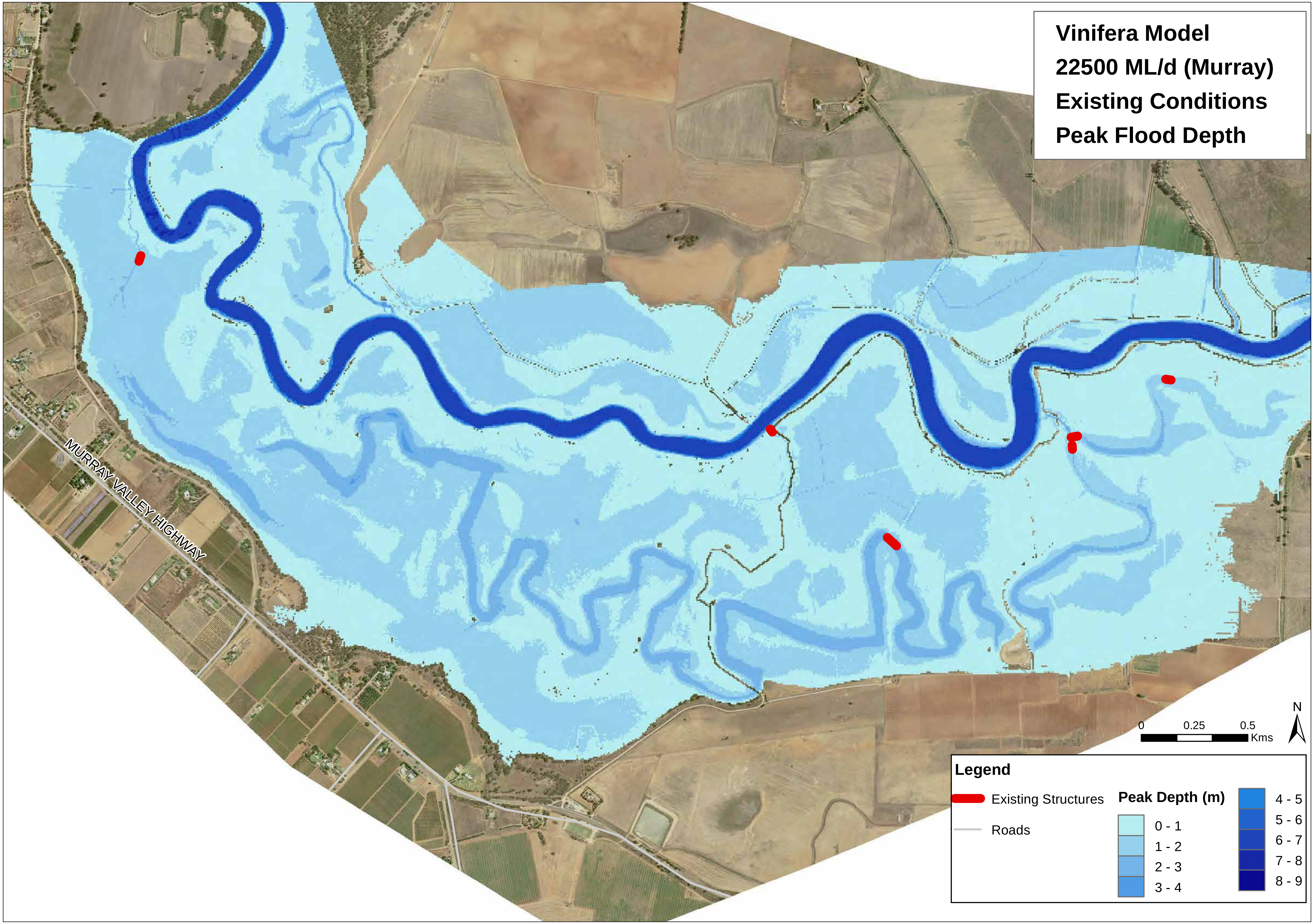

Vinifera Model
12500 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9


Vinifera Model
15000 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

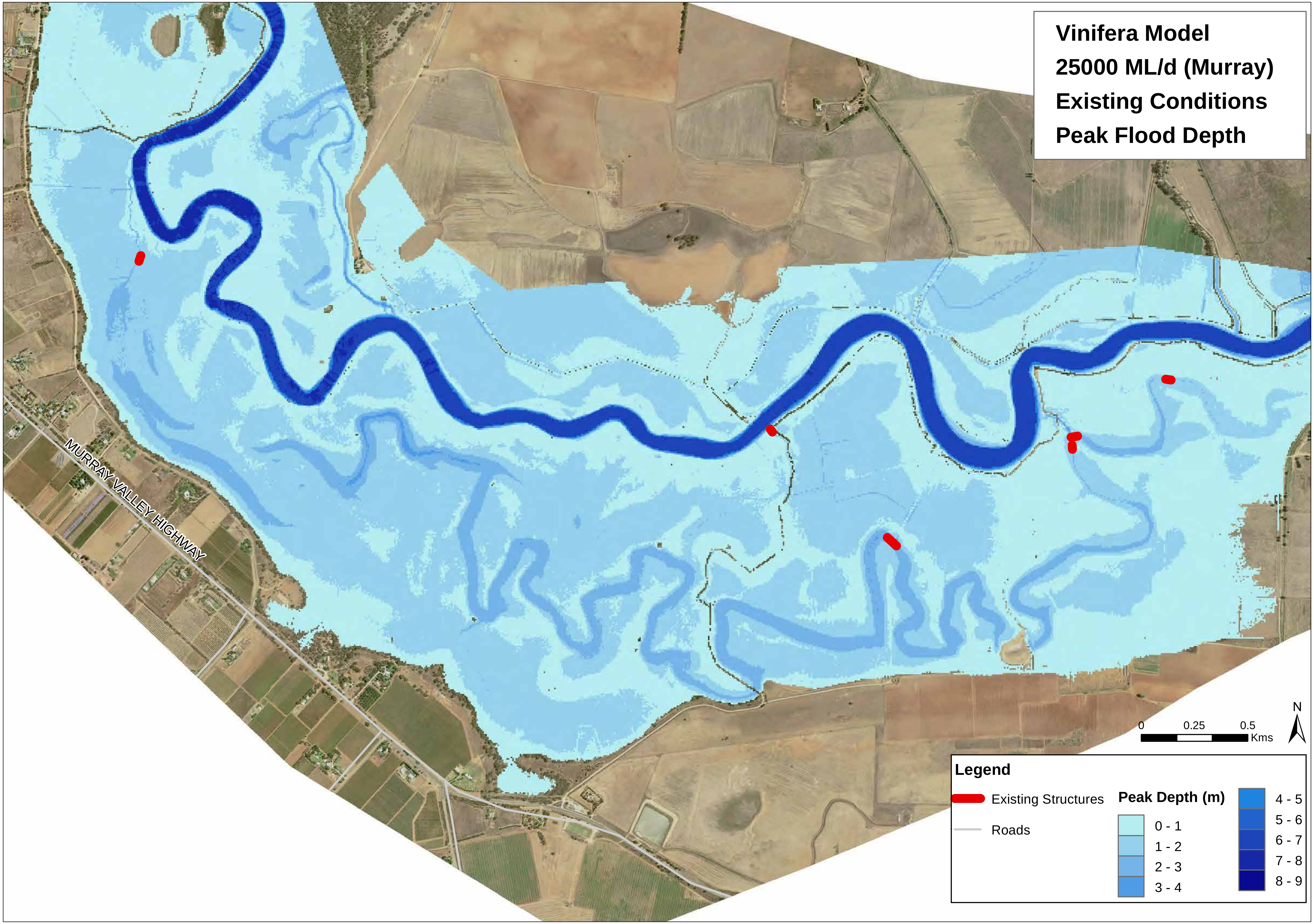

Vinifera Model
17500 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



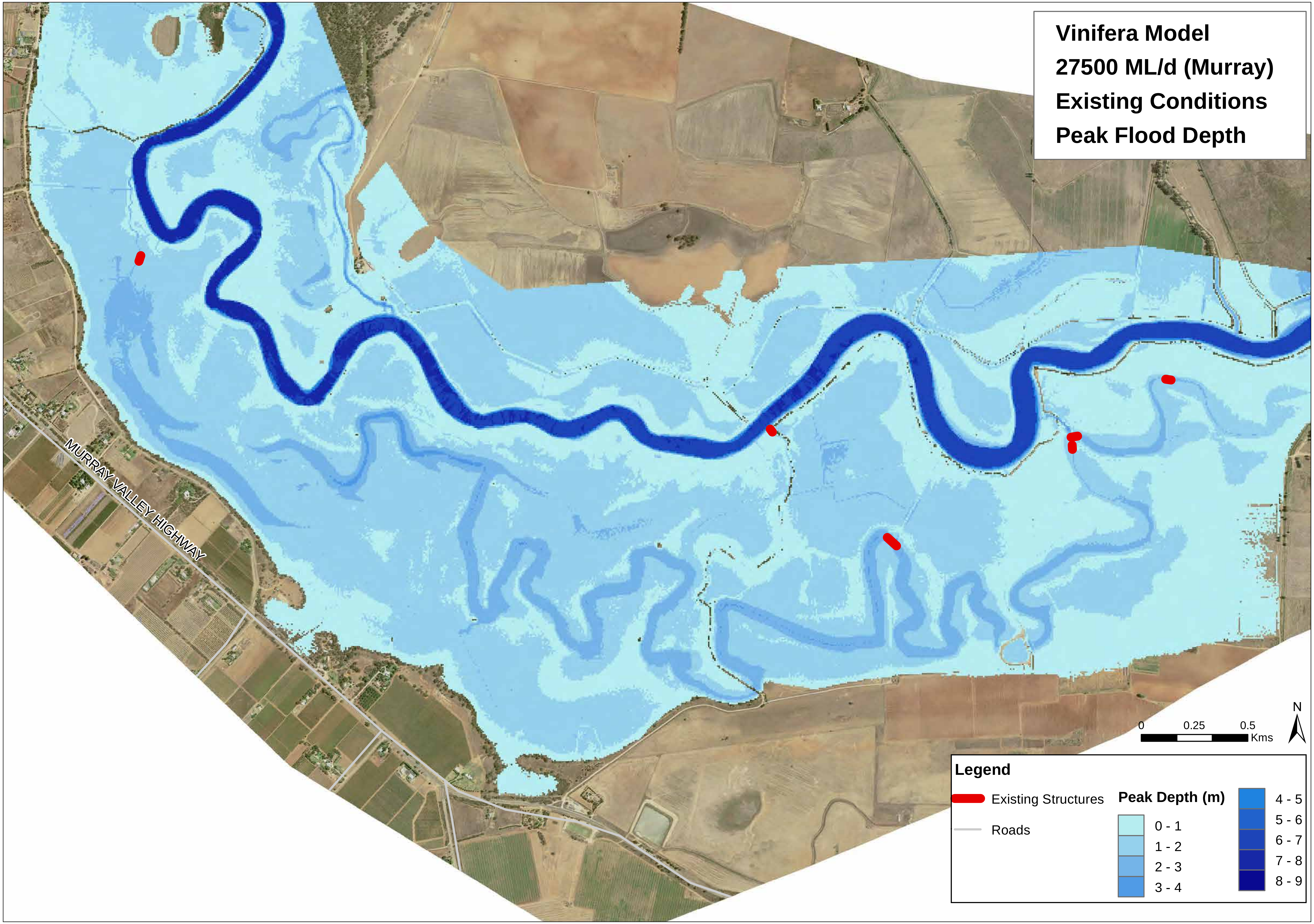
Vinifera Model
20000 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



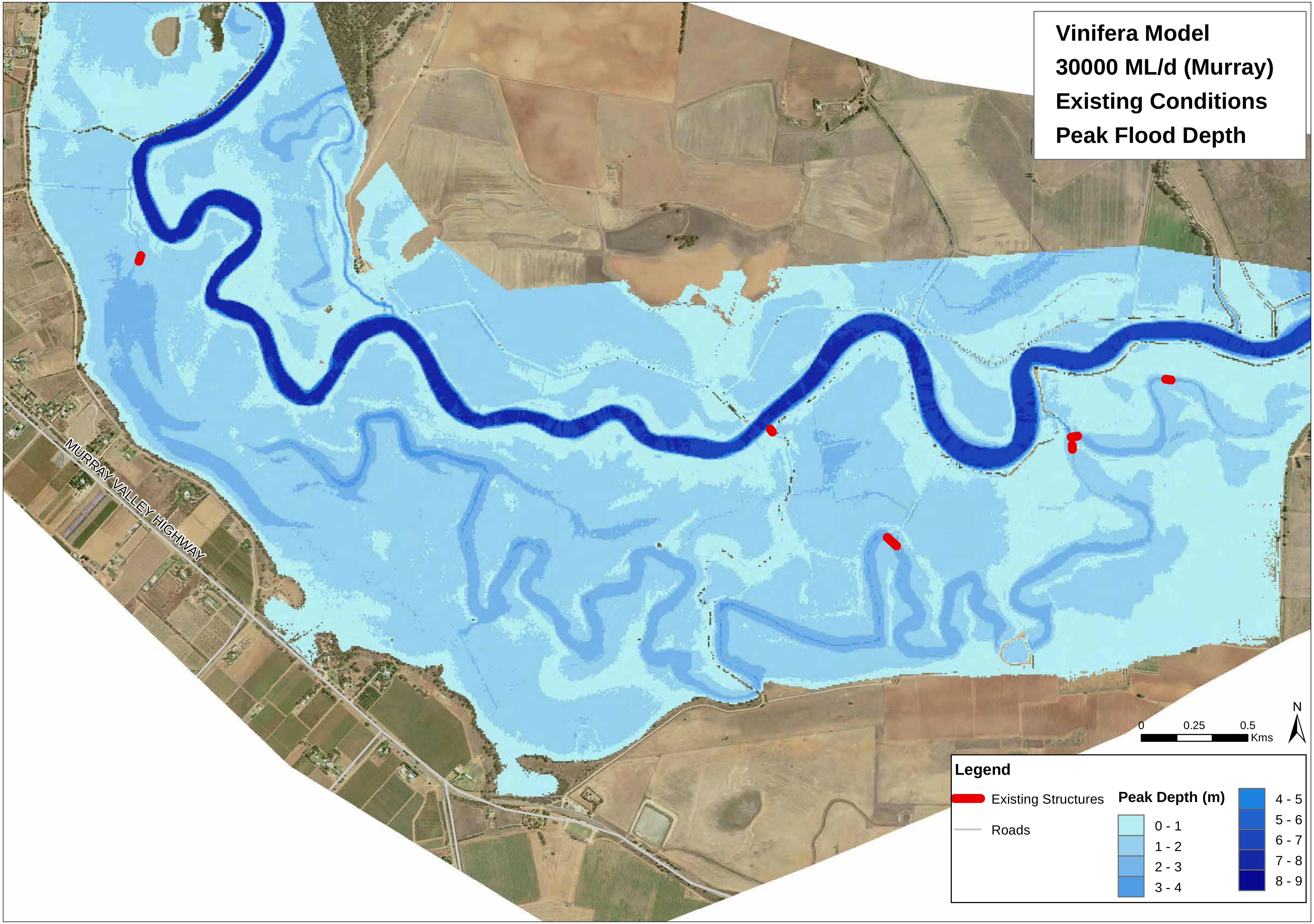
Vinifera Model
22500 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



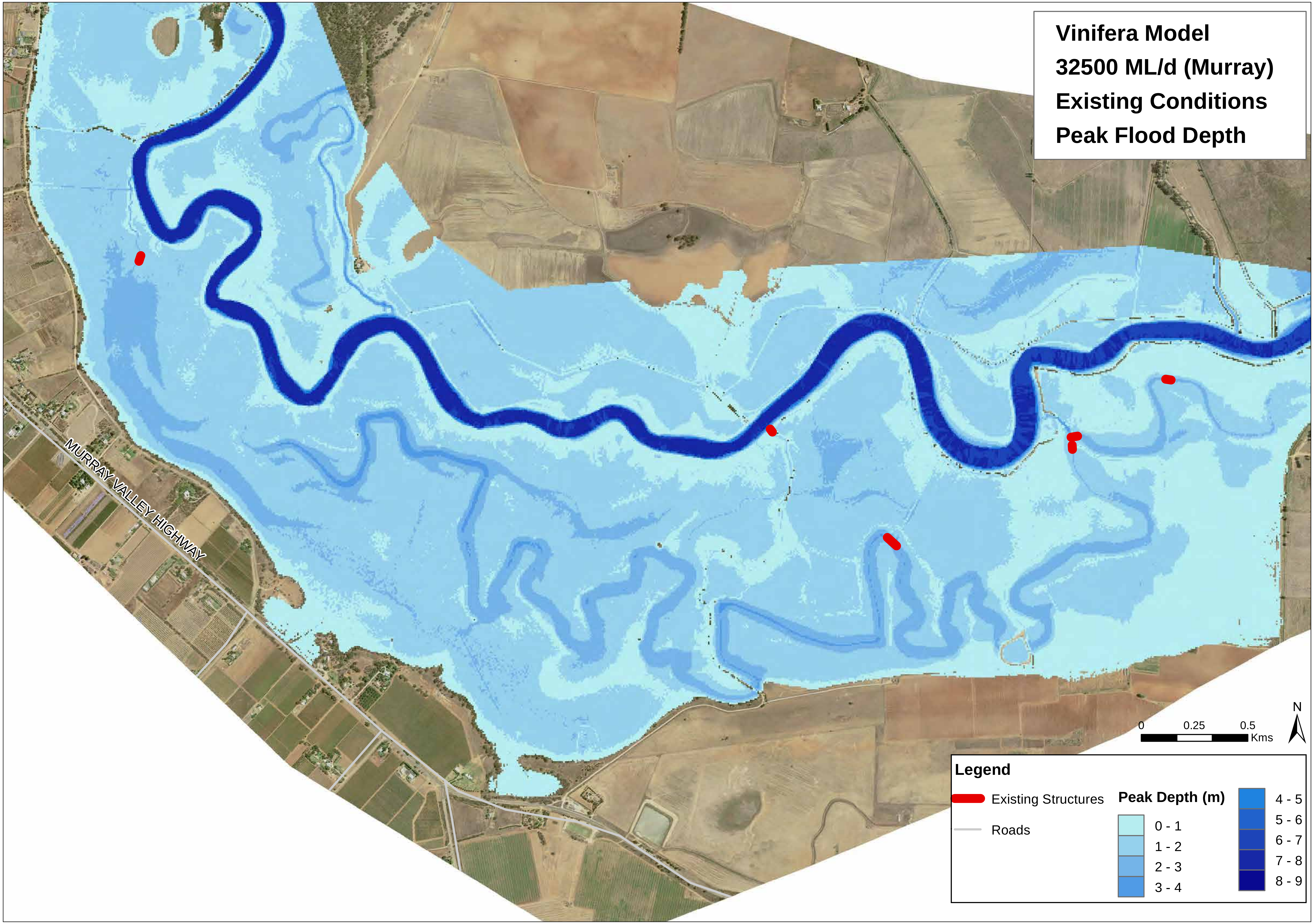
Vinifera Model
25000 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

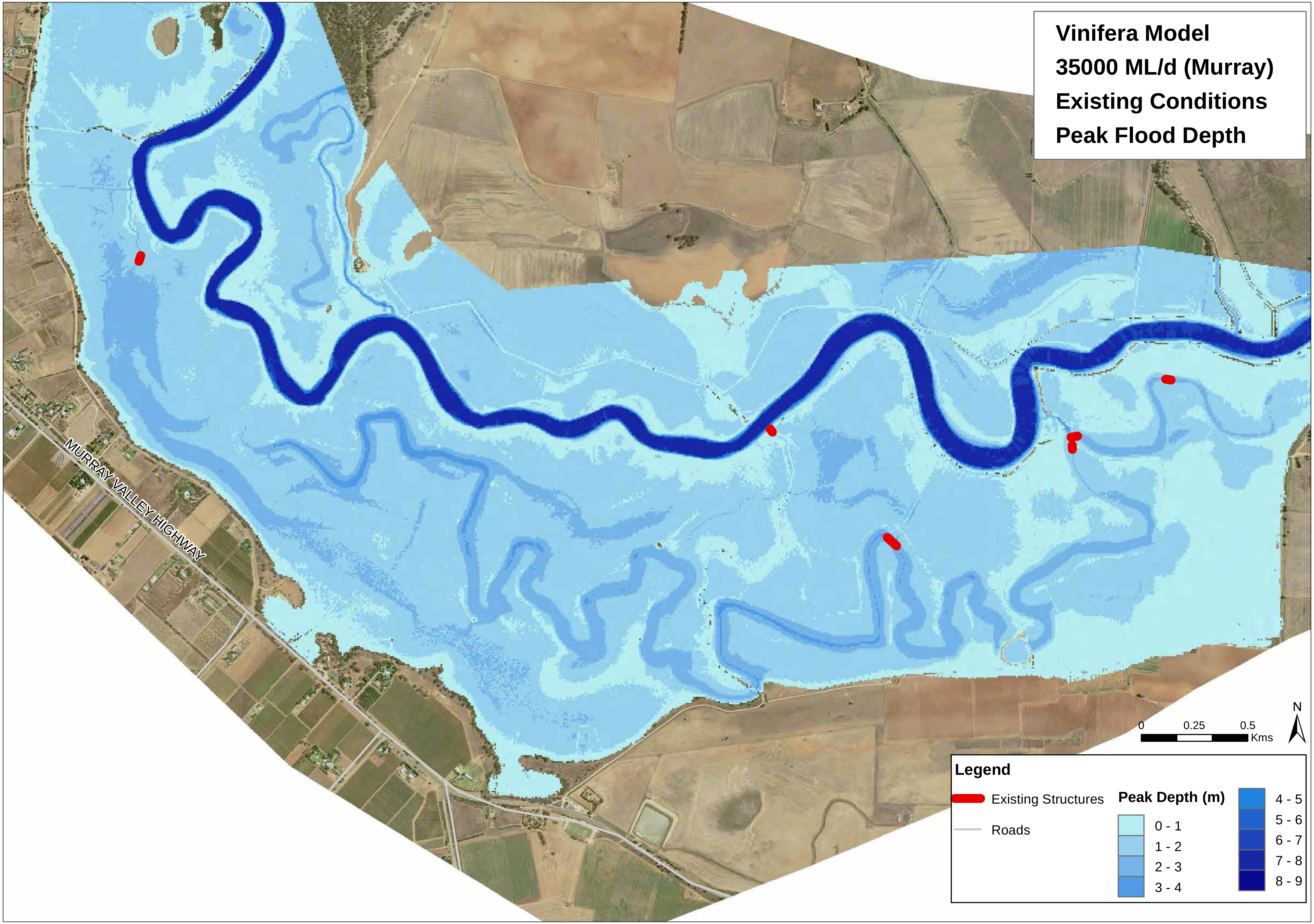


Vinifera Model
27500 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0
0.25
0.5
Kms
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



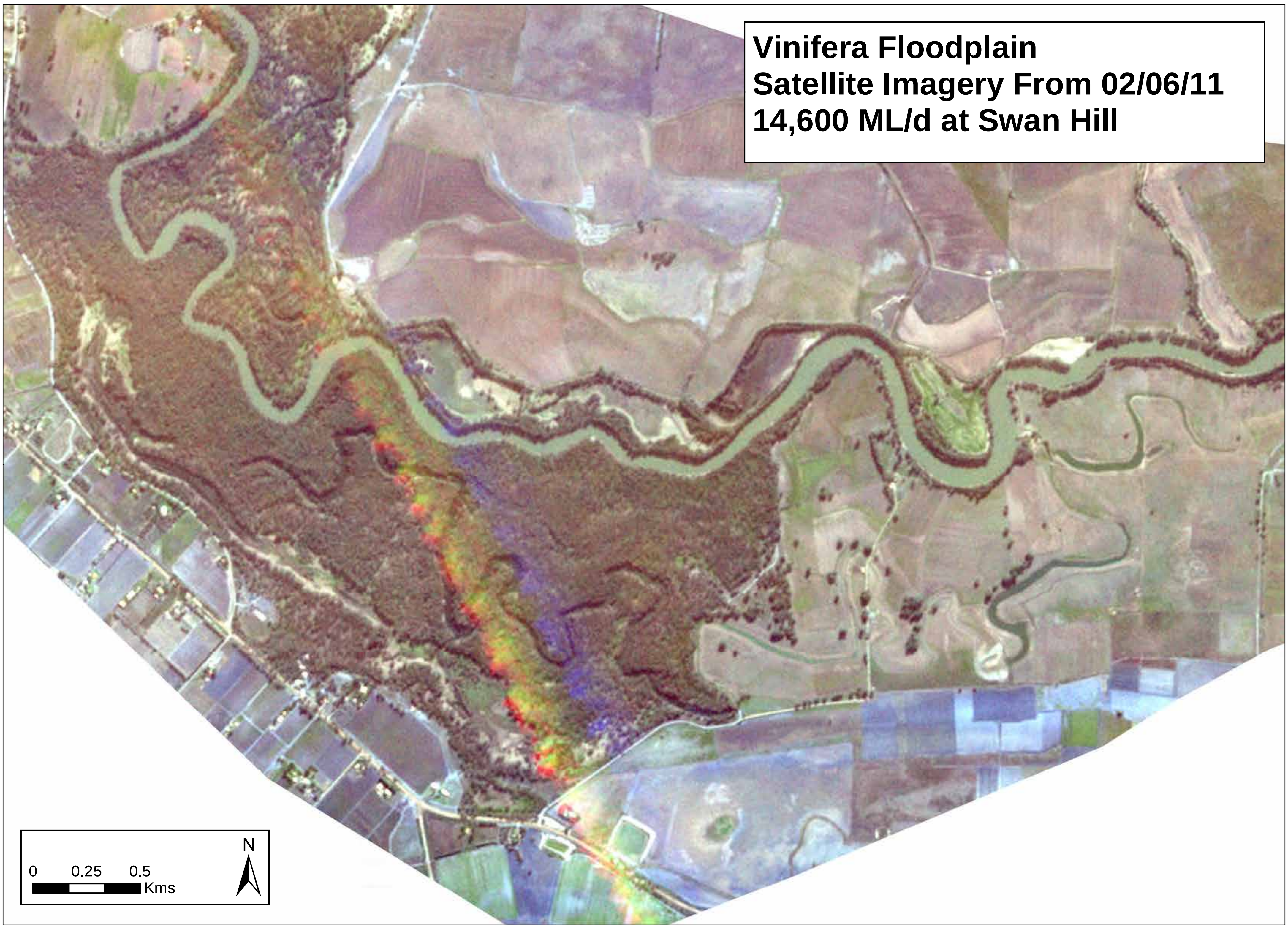
Vinifera Model
30000 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

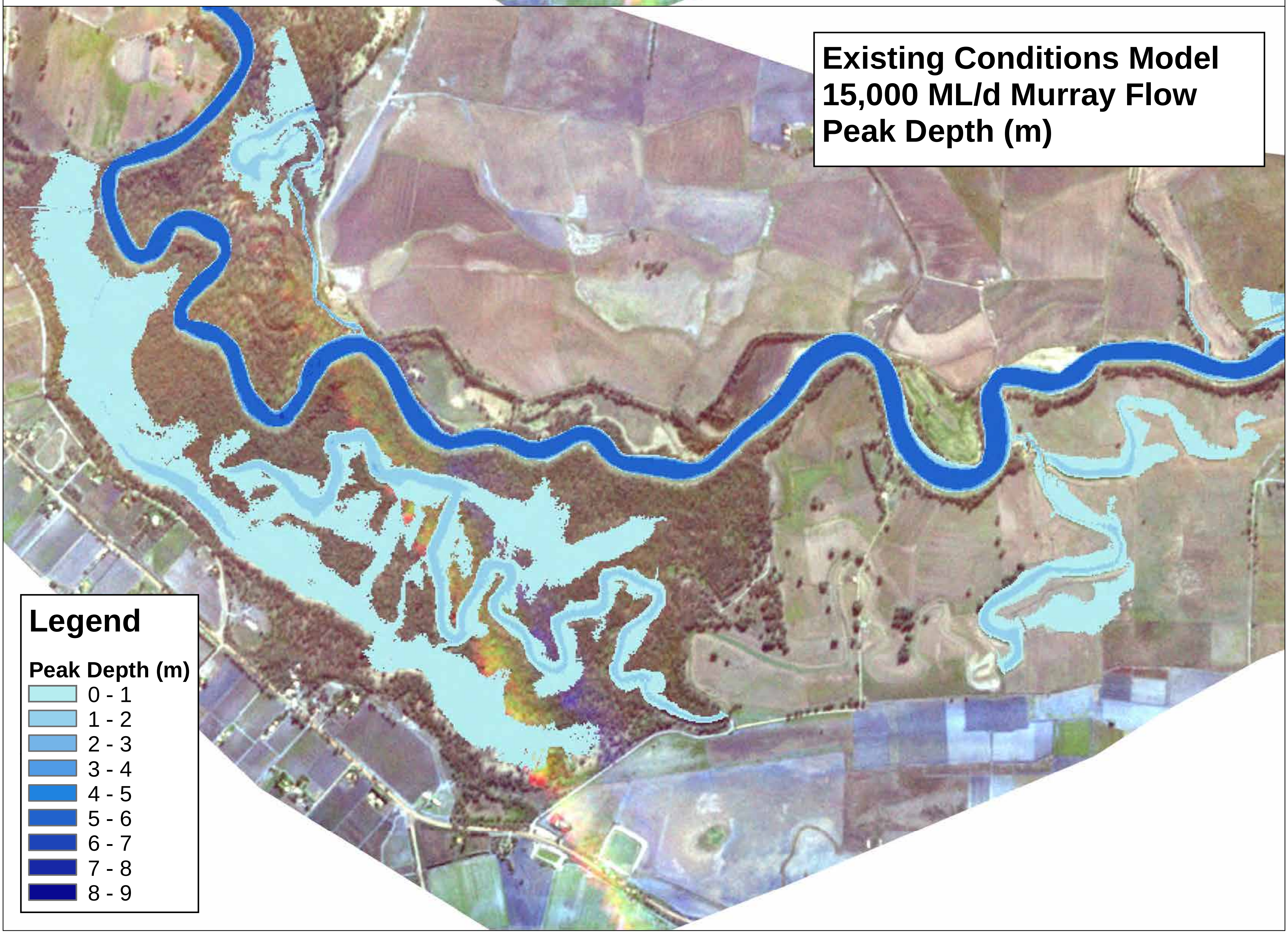

Vinifera Model
32500 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
N
0 0.25 0.5 Kms
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

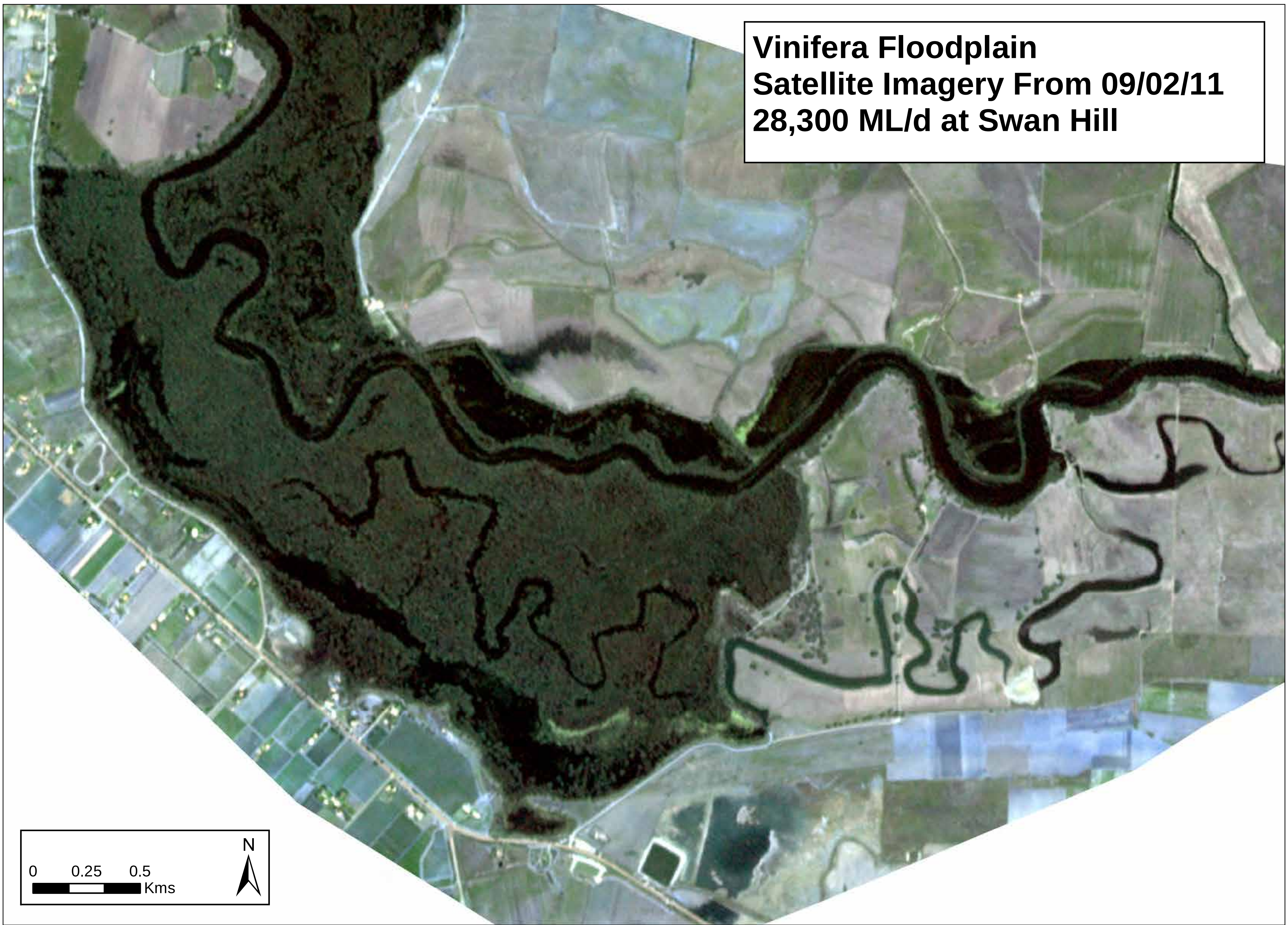


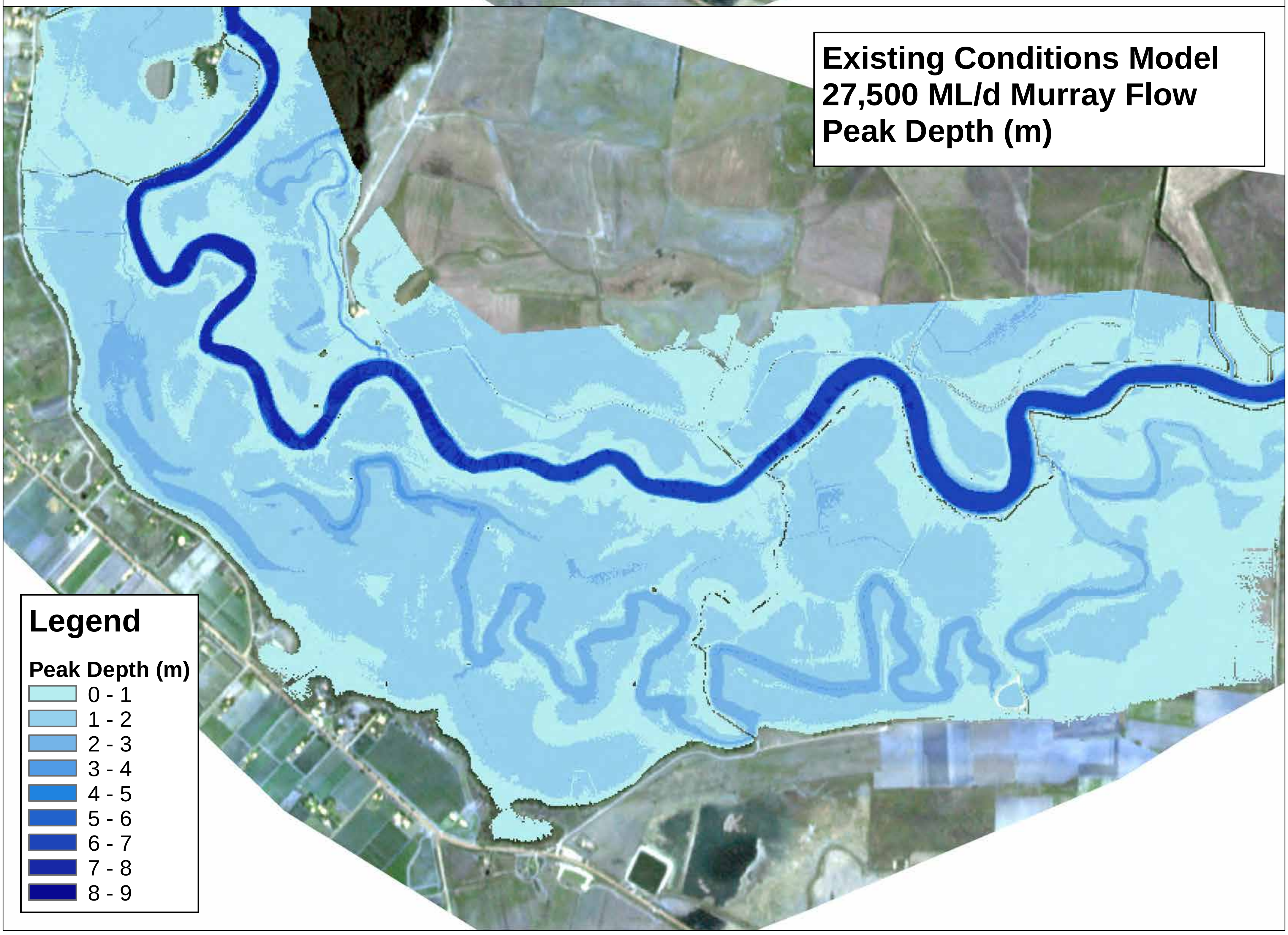
Vinifera Model
35000 ML/d (Murray)
Existing Conditions
Peak Flood Depth
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Existing Structures
Roads
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

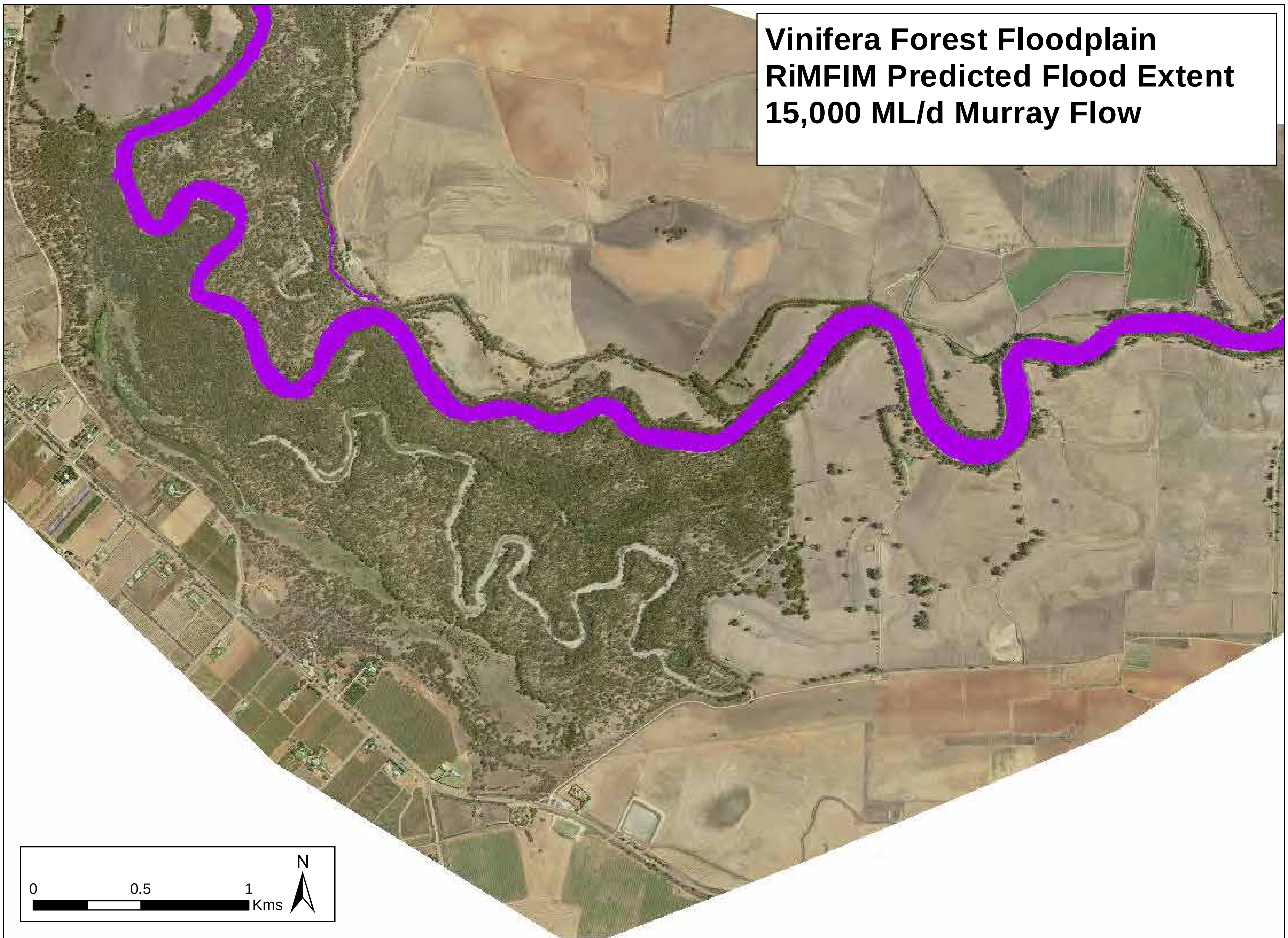
Appendix C. Calibration Plots

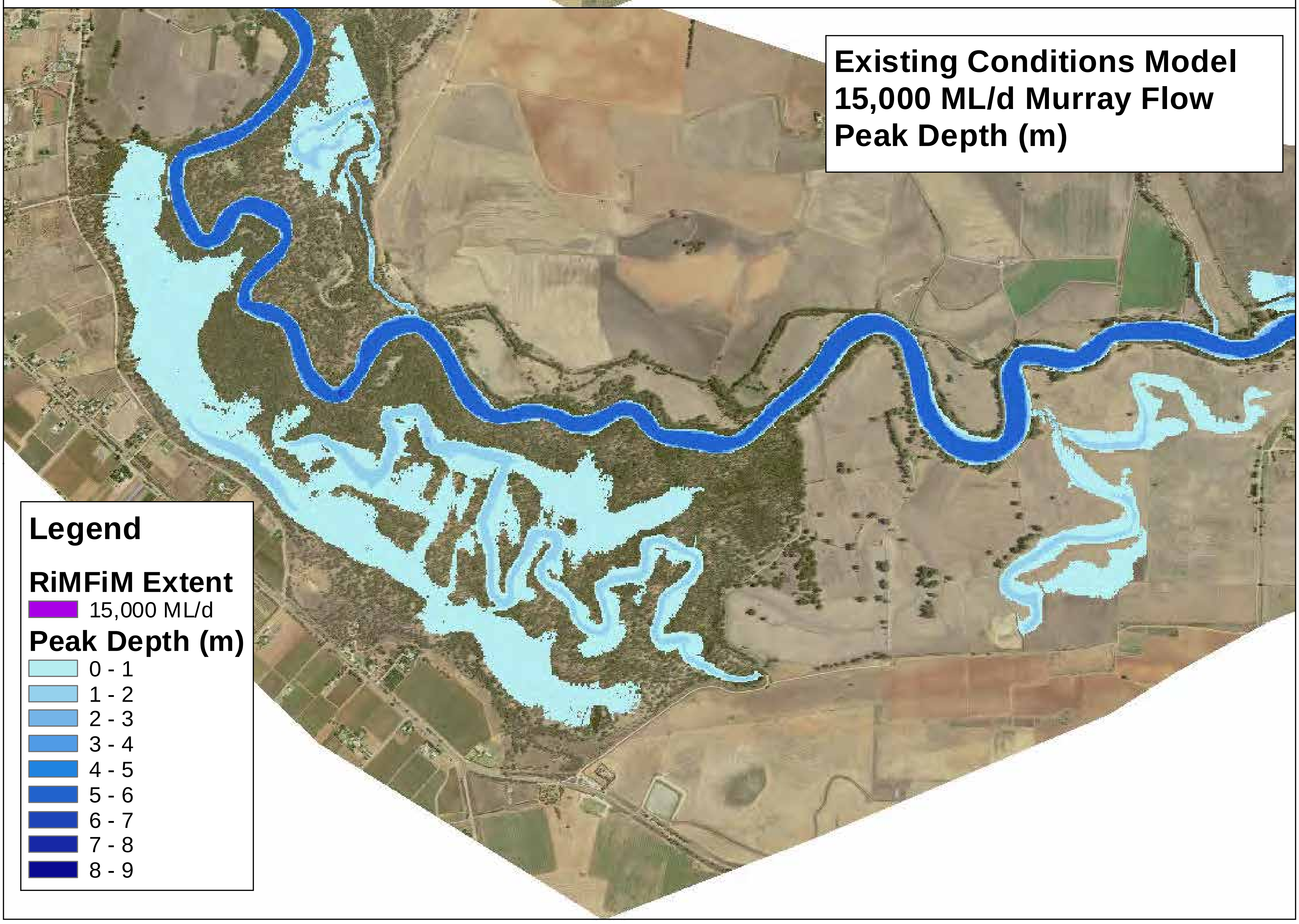

Vinifera Floodplain
Satellite Imagery From 02/06/11
14,600 ML/d at Swan Hill
0 0.25 0.5
Kms
N

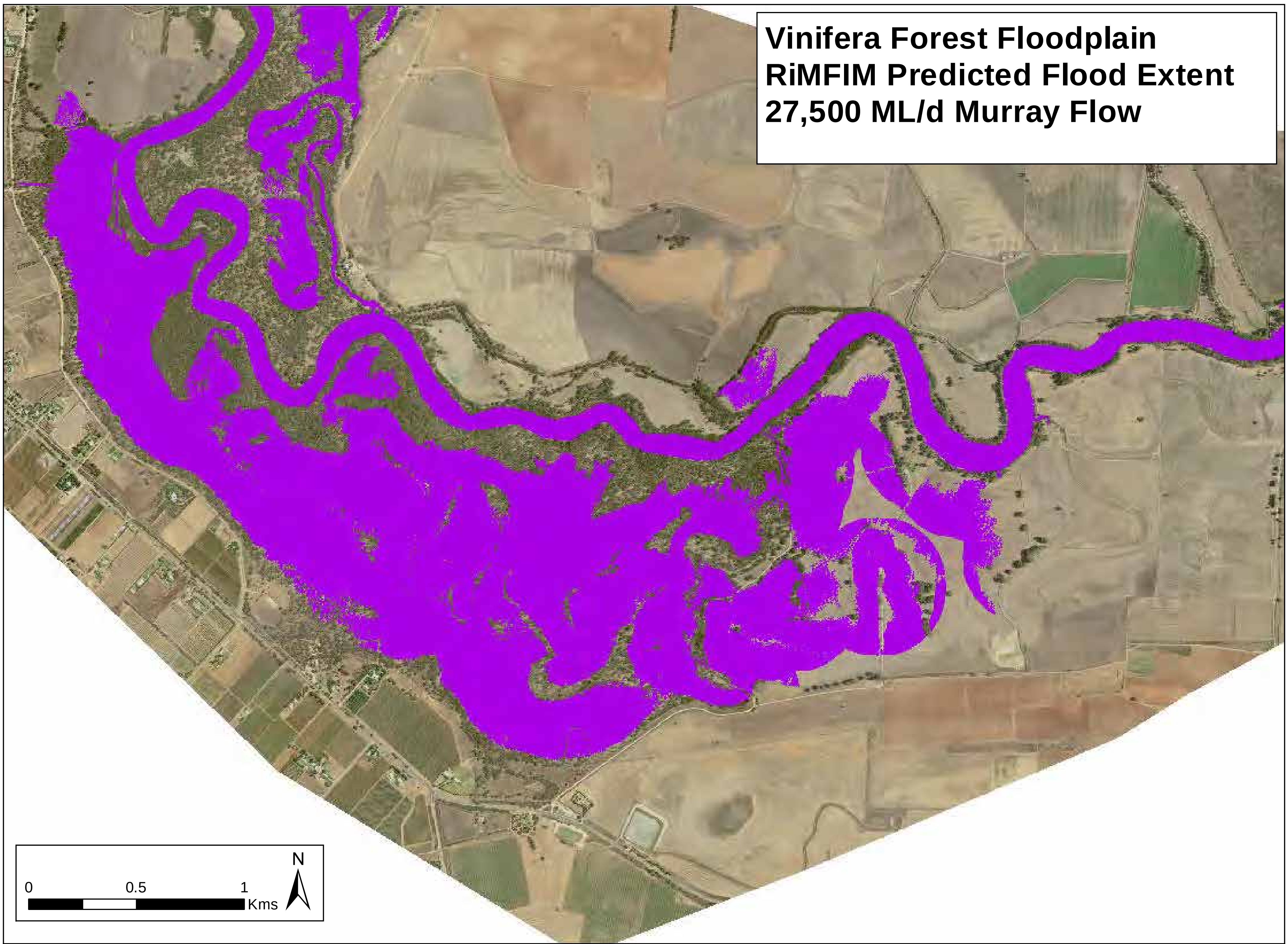

Existing Conditions Model
15,000 ML/d Murray Flow
Peak Depth (m)
Legend
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

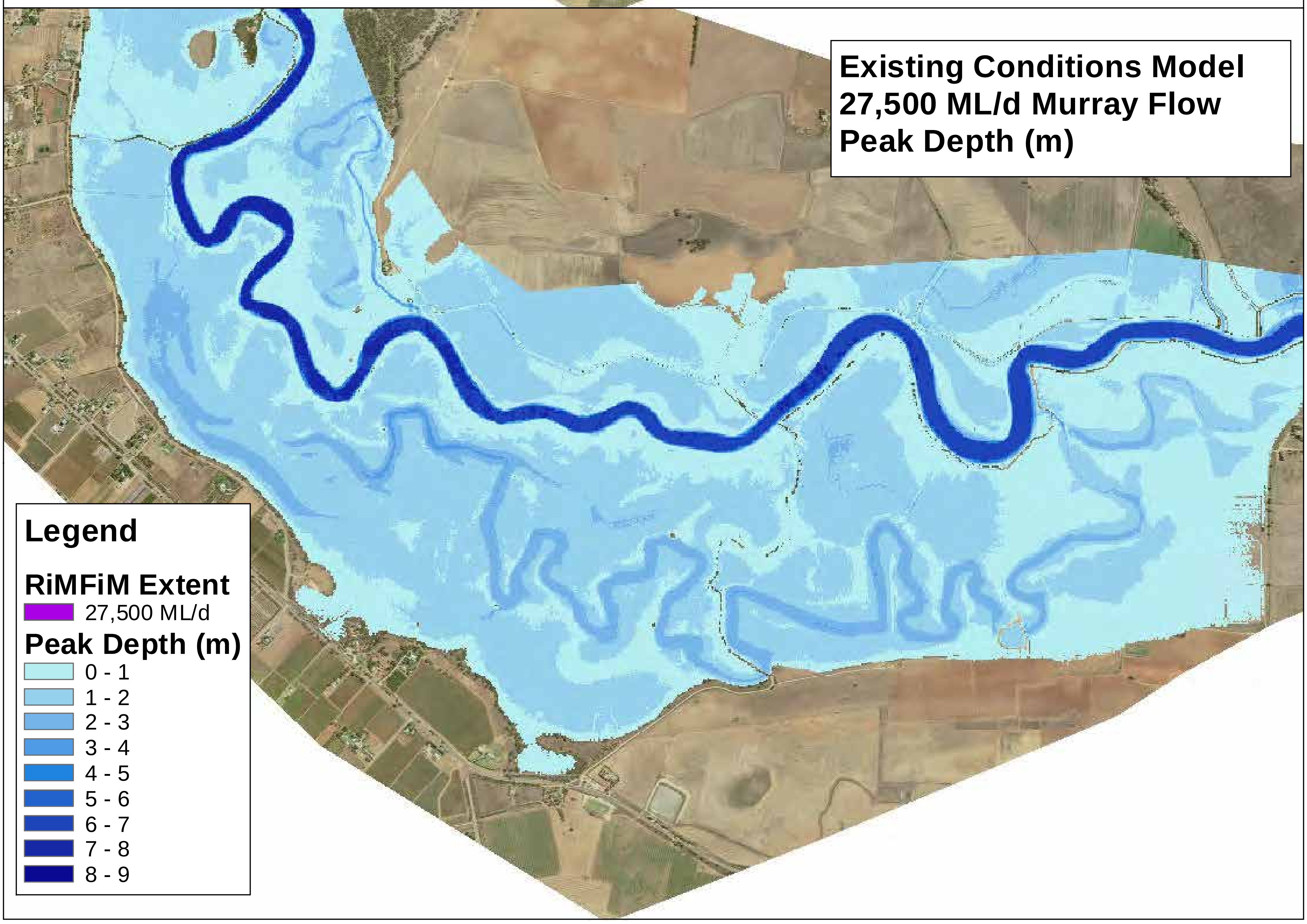

Vinifera Floodplain
Satellite Imagery From 09/02/11
28,300 ML/d at Swan Hill
N
0
0.25
0.5
Kms


Existing Conditions Model
27,500 ML/d Murray Flow
Peak Depth (m)
Legend
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

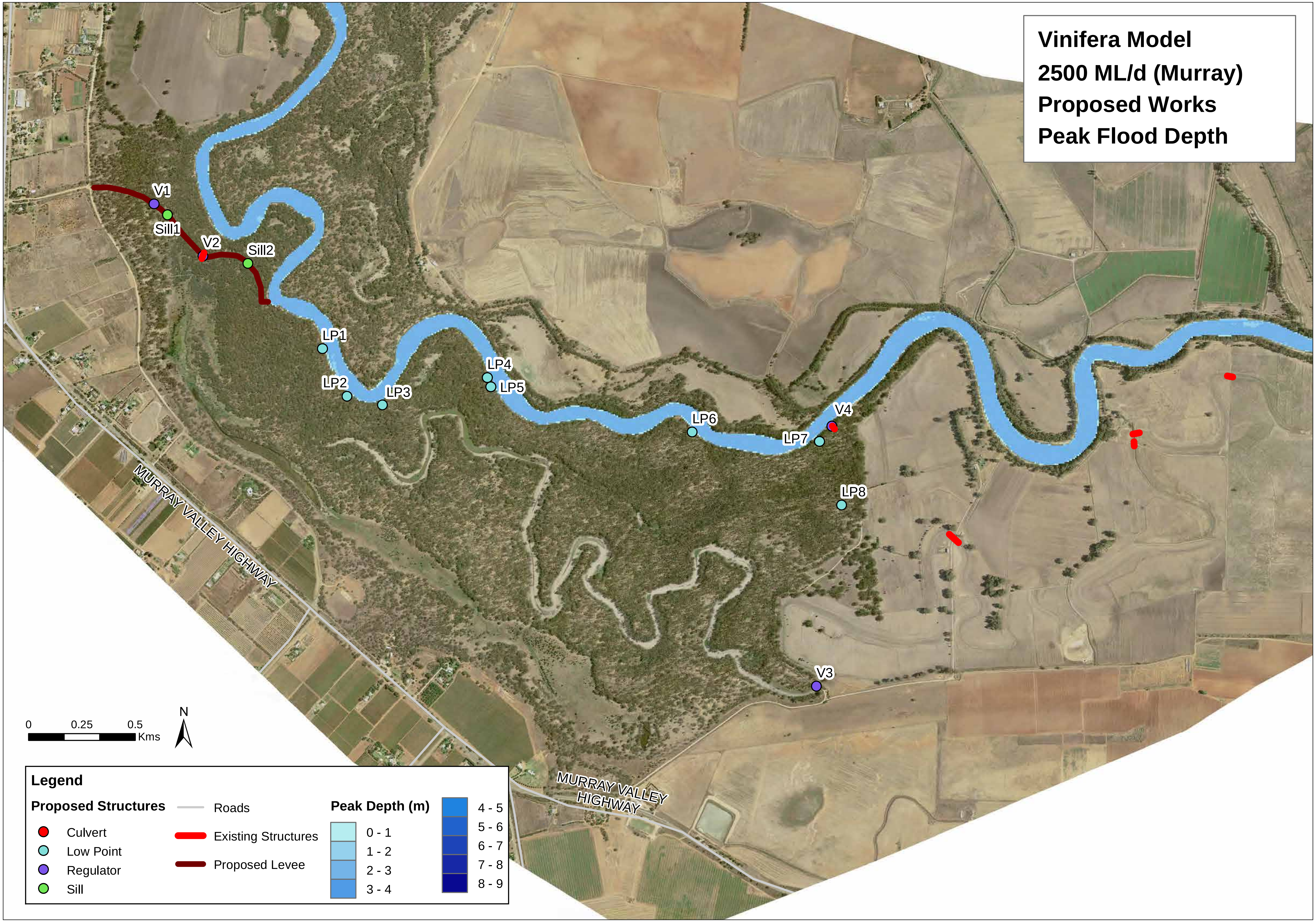

Vinifera Forest Floodplain
RiMFIM Predicted Flood Extent
15,000 ML/d Murray Flow
0
0.5
1
Kms
N

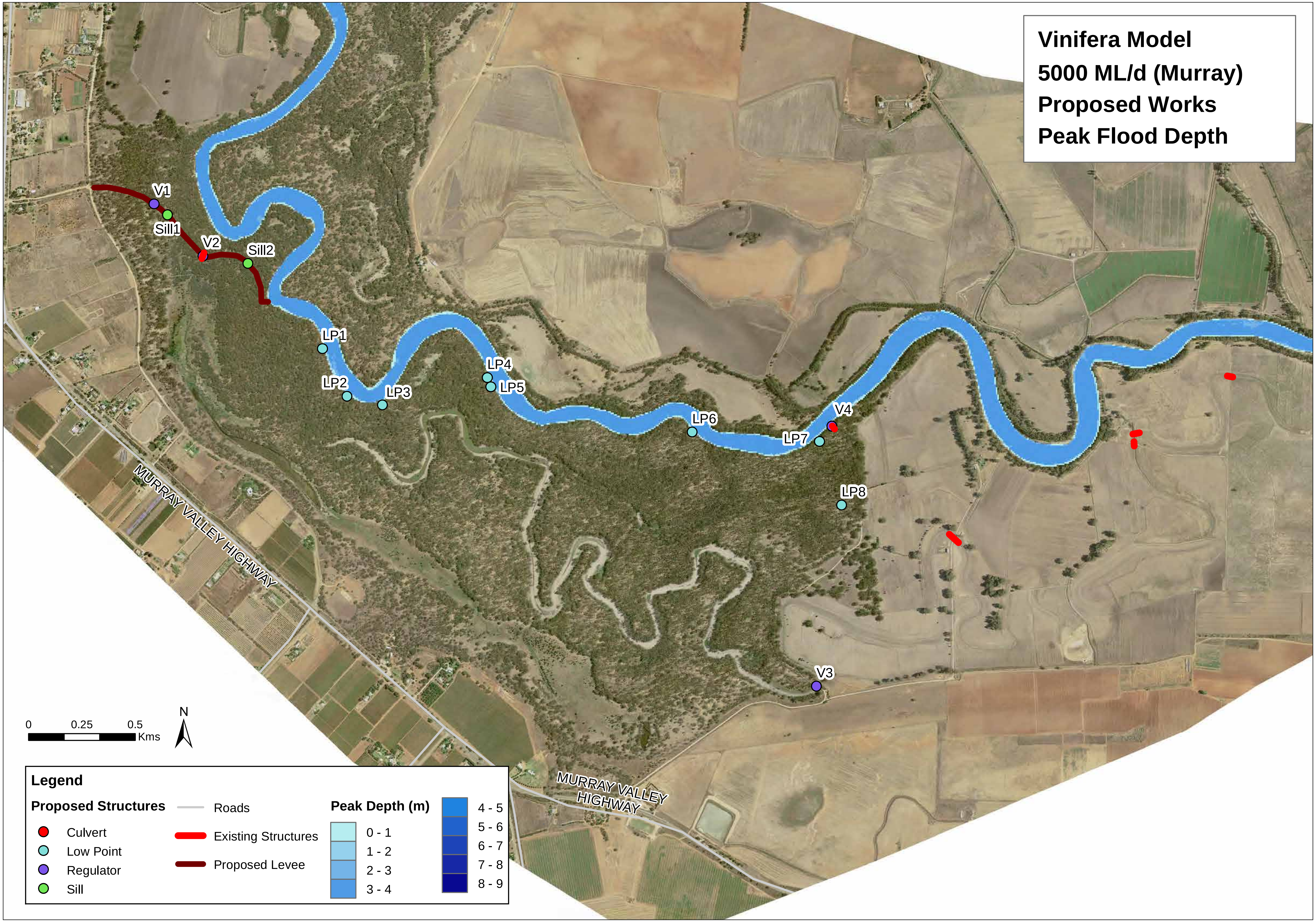

Existing Conditions Model
15,000 ML/d Murray Flow
Peak Depth (m)
Legend
RiMFiM Extent
15,000 ML/d
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

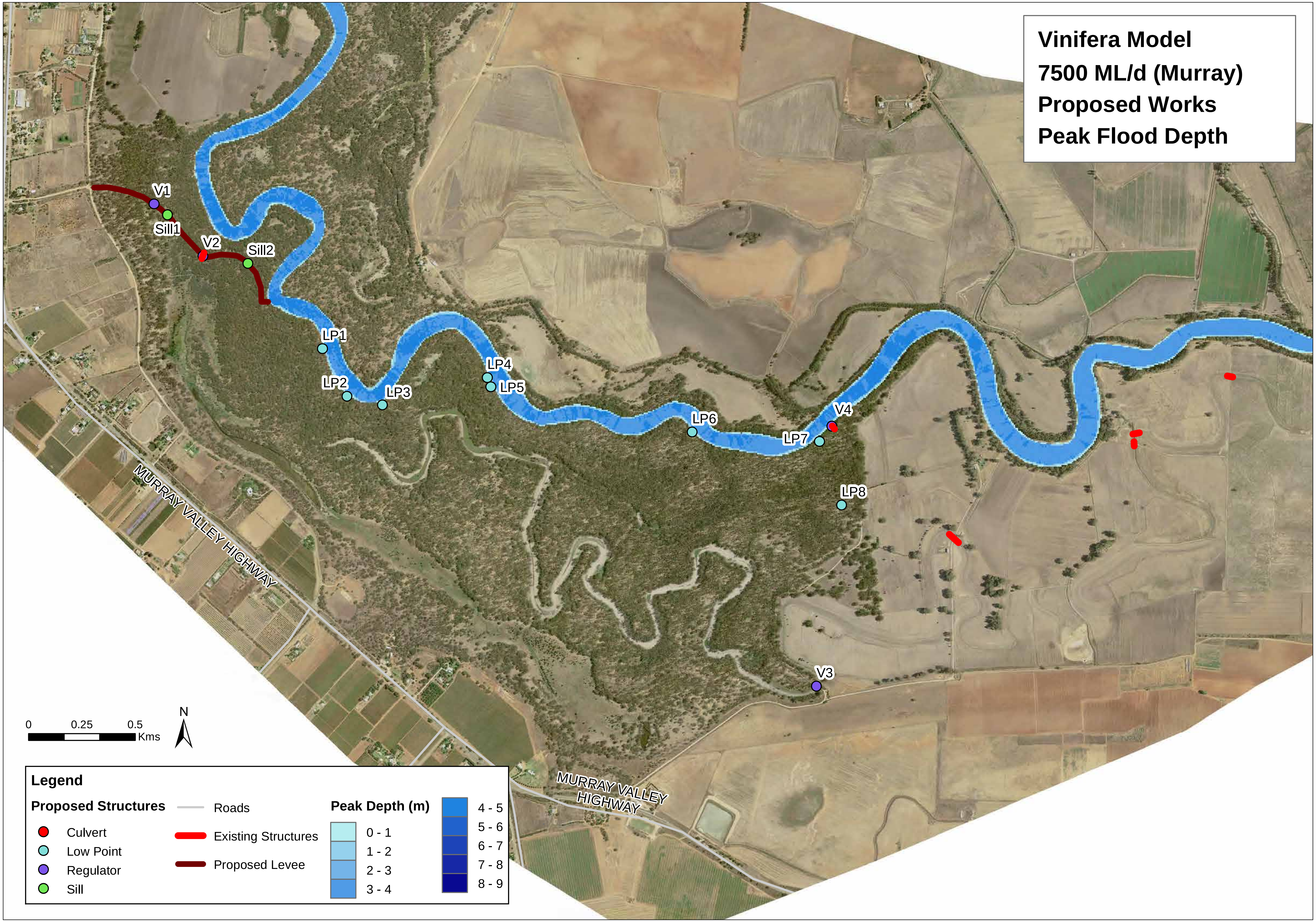

Vinifera Forest Floodplain
RiMFIM Predicted Flood Extent
27,500 ML/d Murray Flow
0
0.5
1
Kms
N


Existing Conditions Model
27,500 ML/d Murray Flow
Peak Depth (m)
Legend
RiMFiM Extent
27,500 ML/d
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

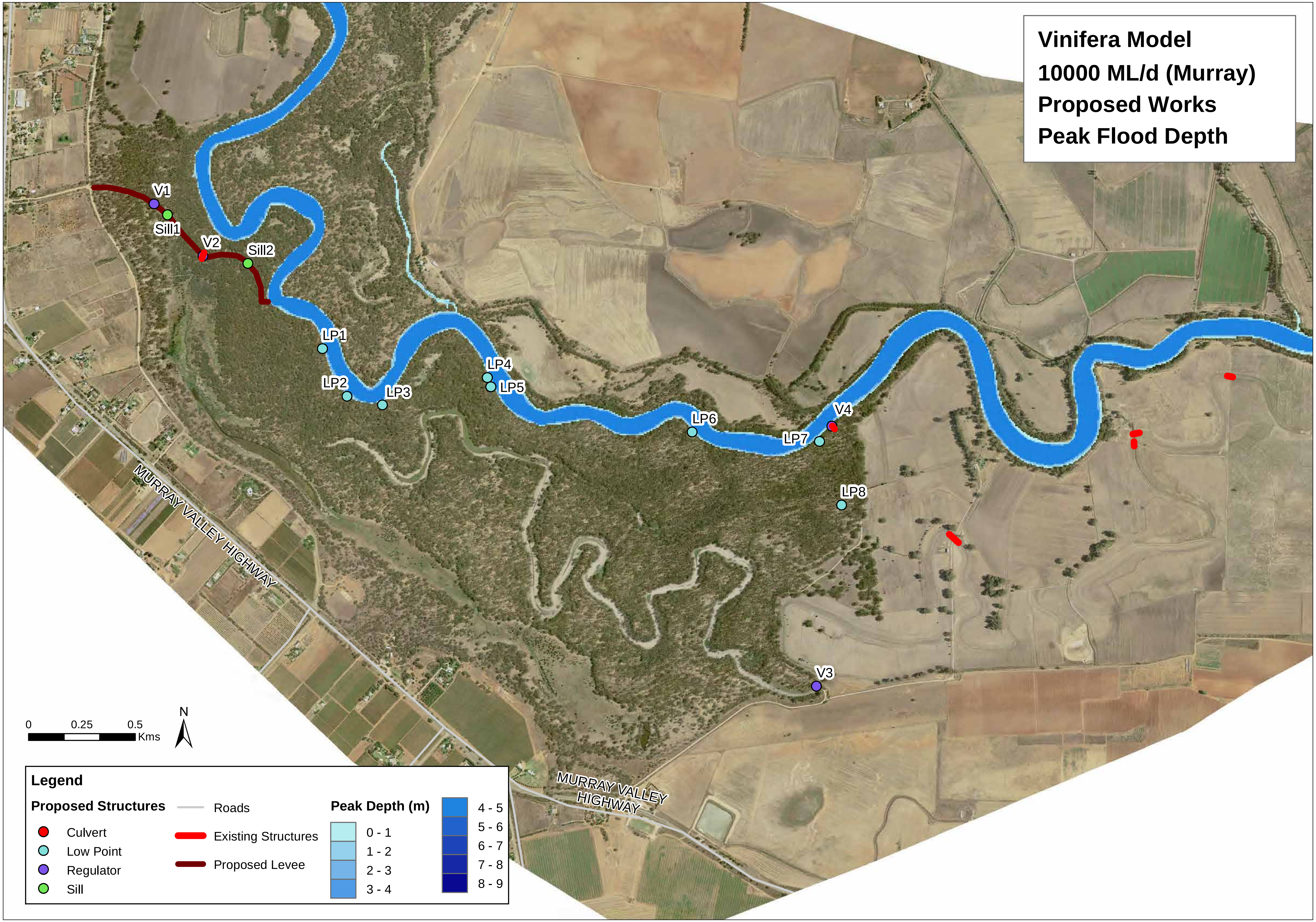
Appendix D. Proposed Works Peak Depth Plots


Vinifera Model
2500 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

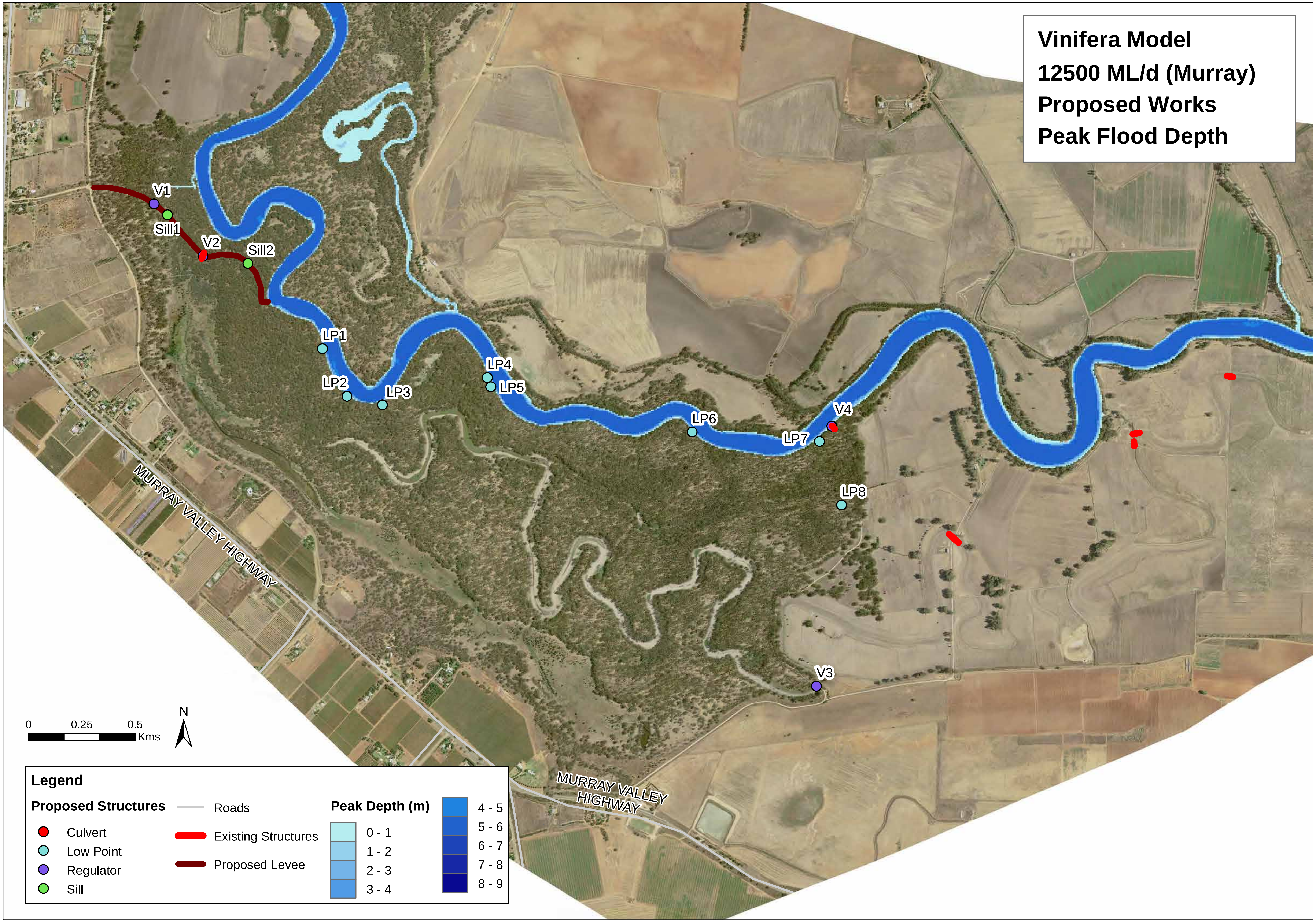

Vinifera Model
5000 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



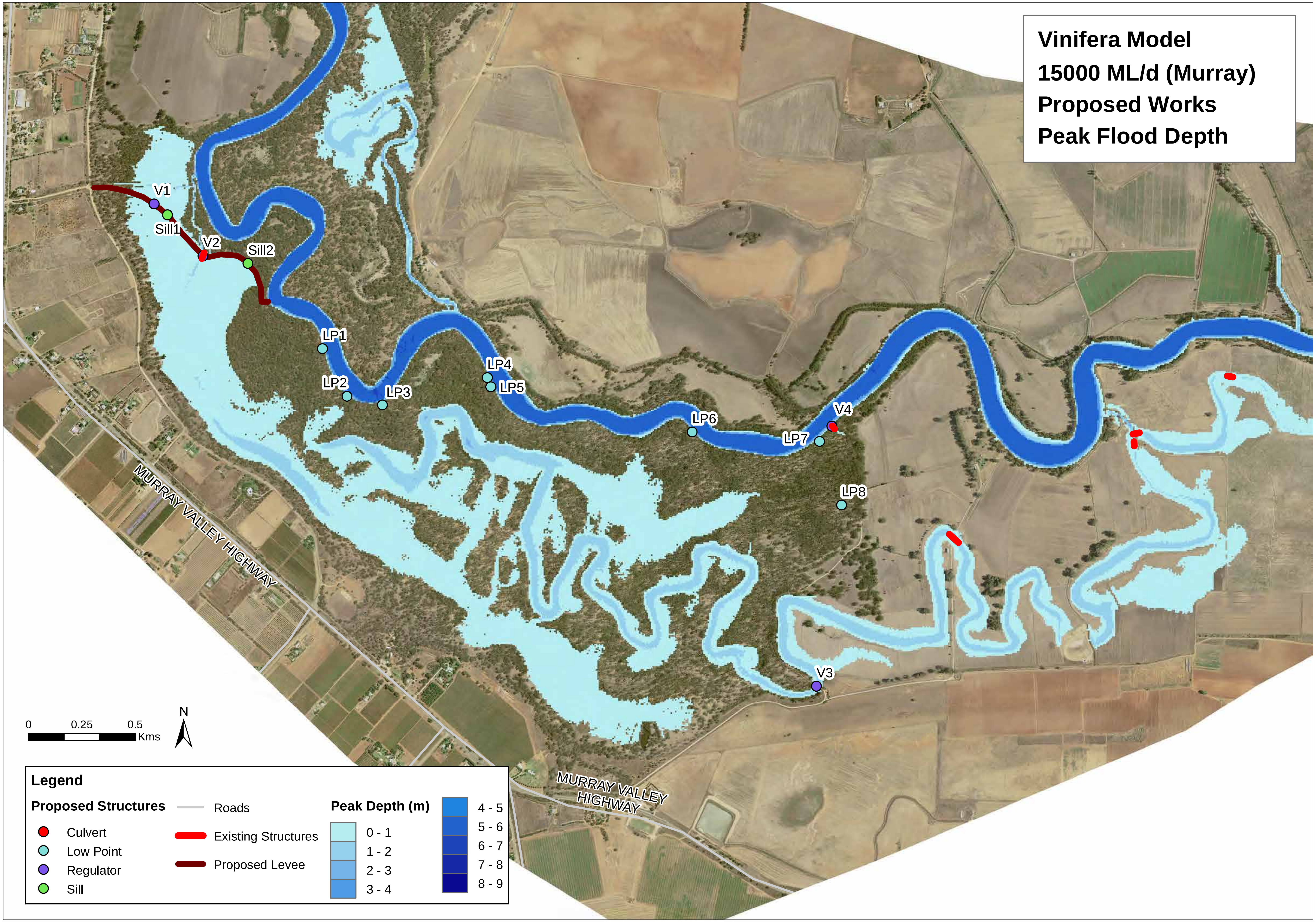
Vinifera Model
7500 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



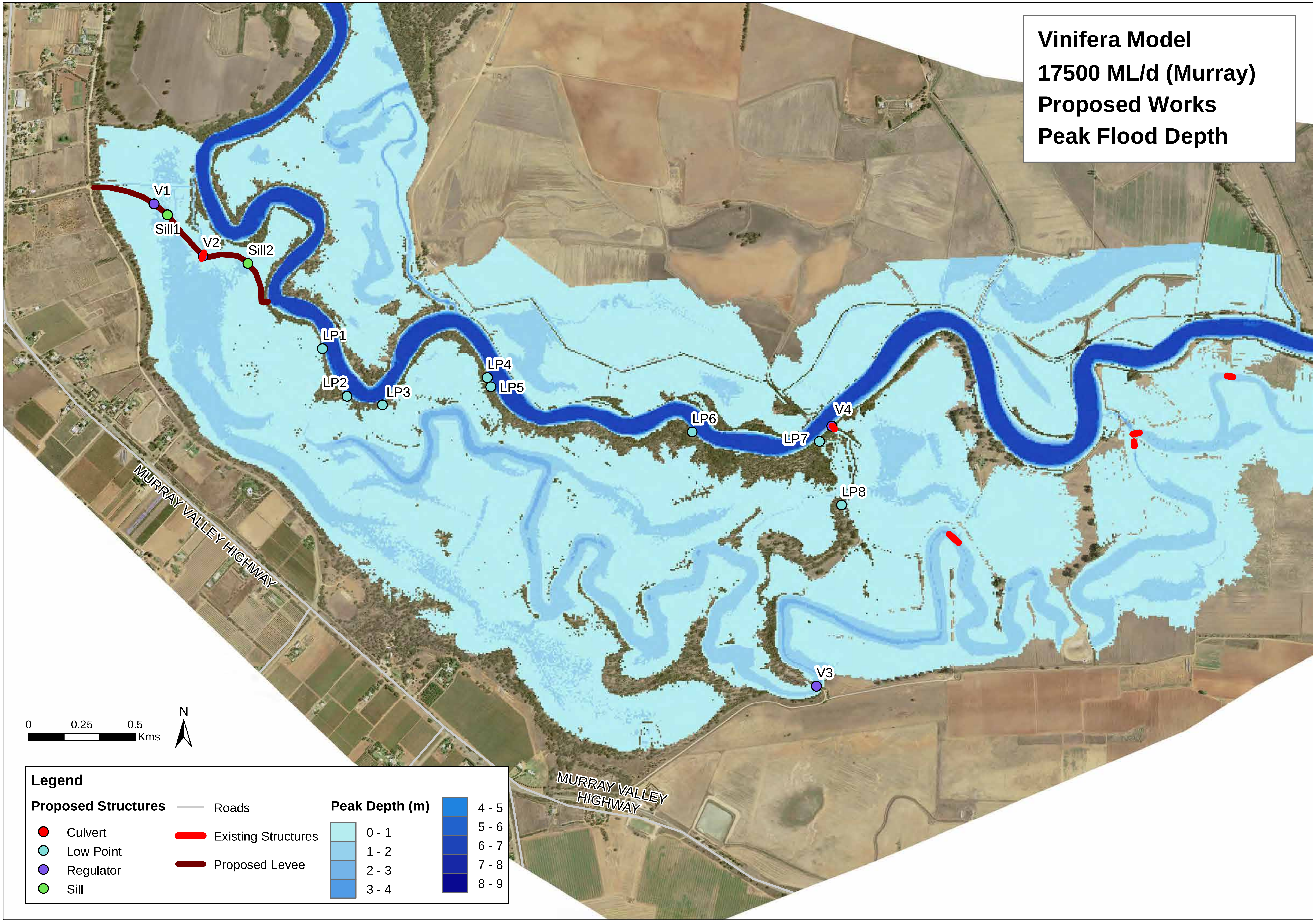
Vinifera Model
10000 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



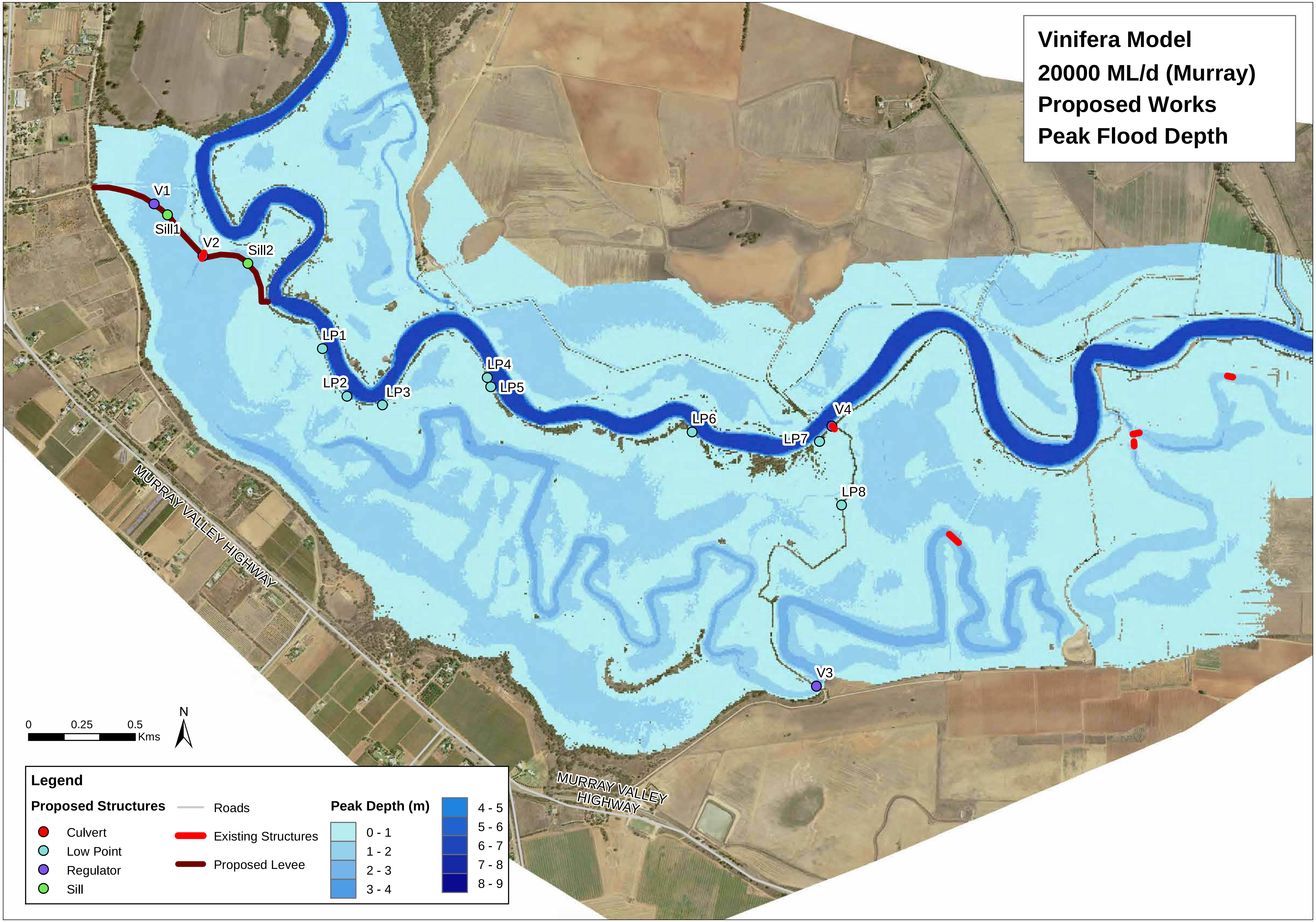
Vinifera Model
12500 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



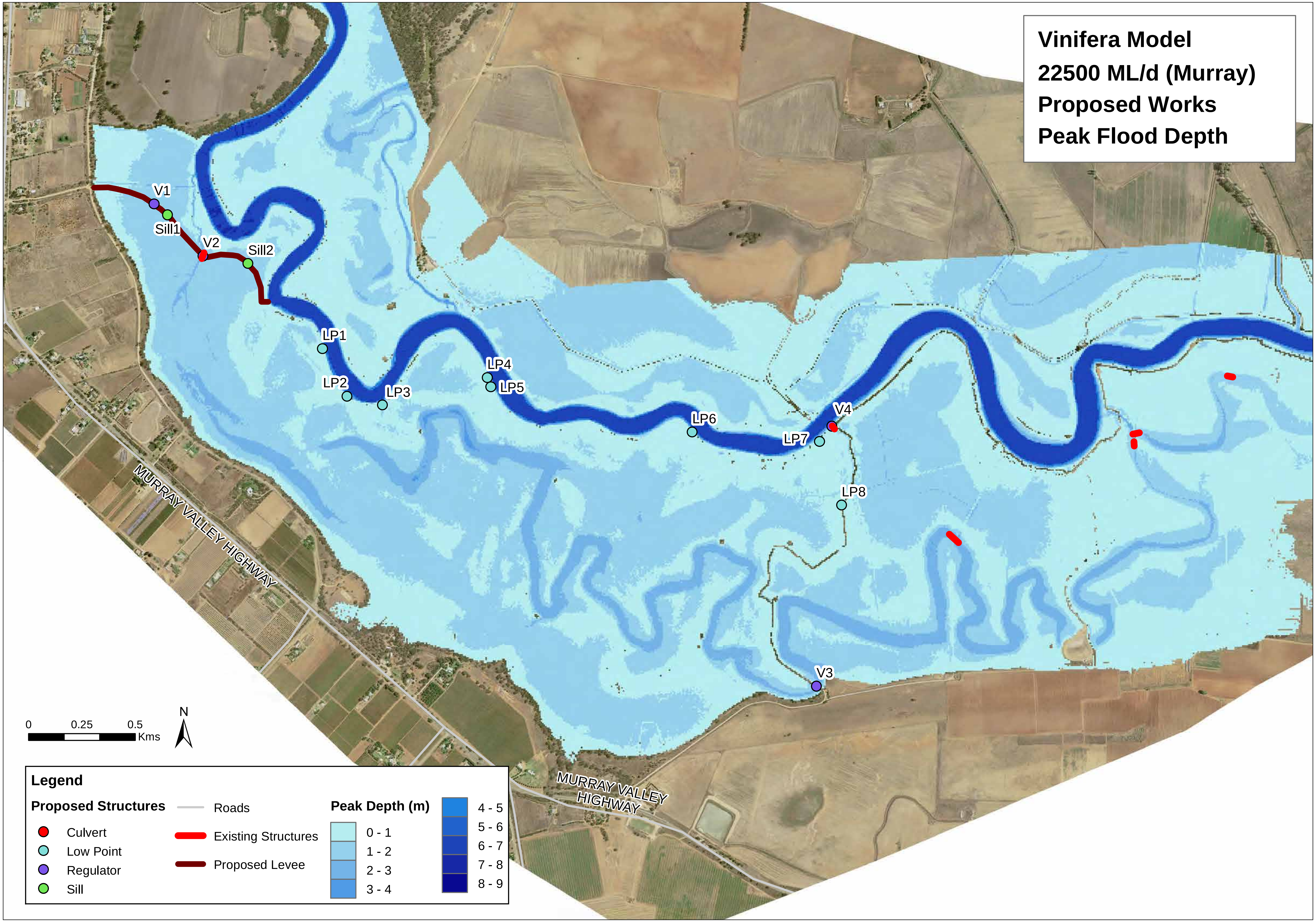
Vinifera Model
15000 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



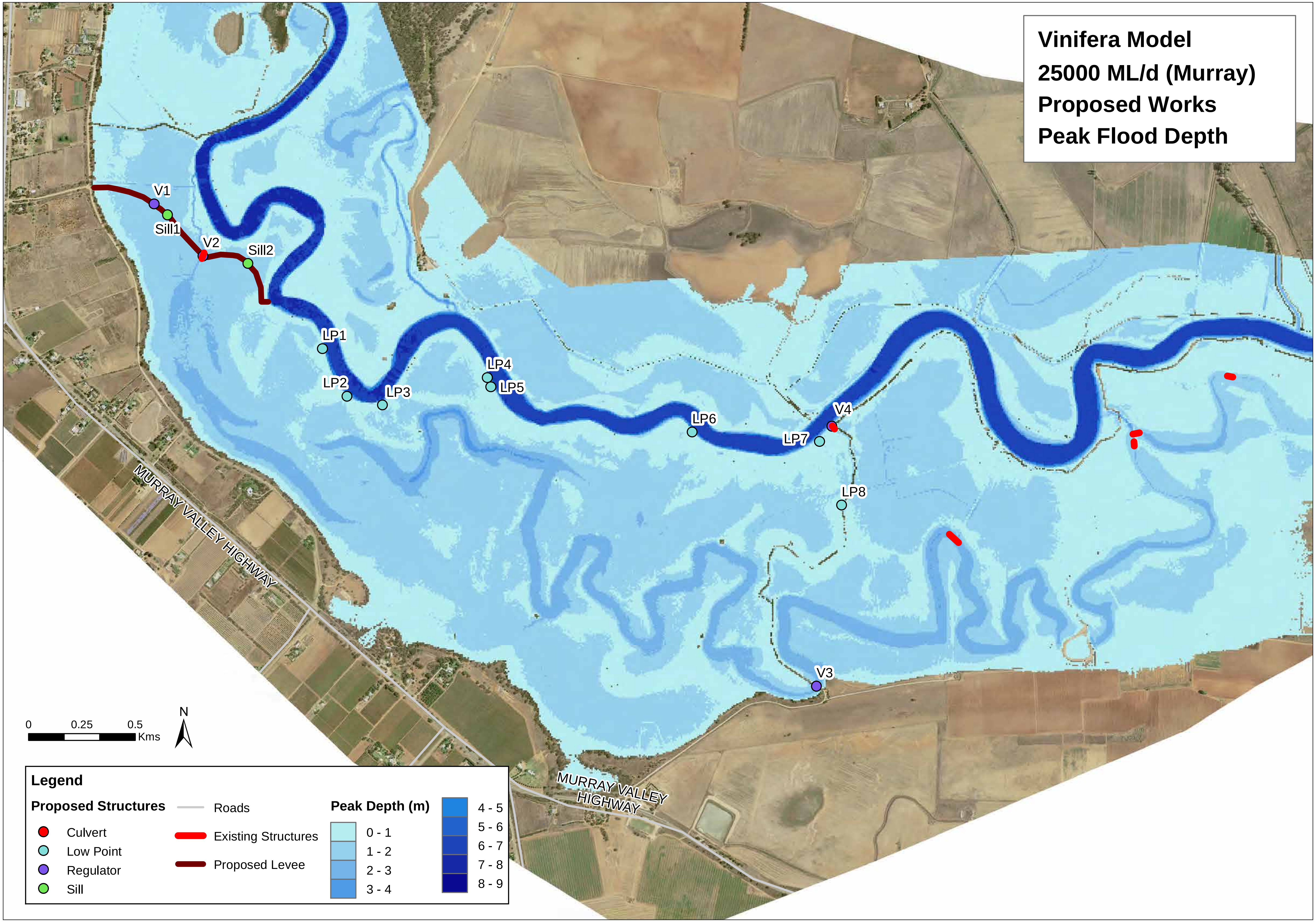
Vinifera Model
17500 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0 0.25 0.5 Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



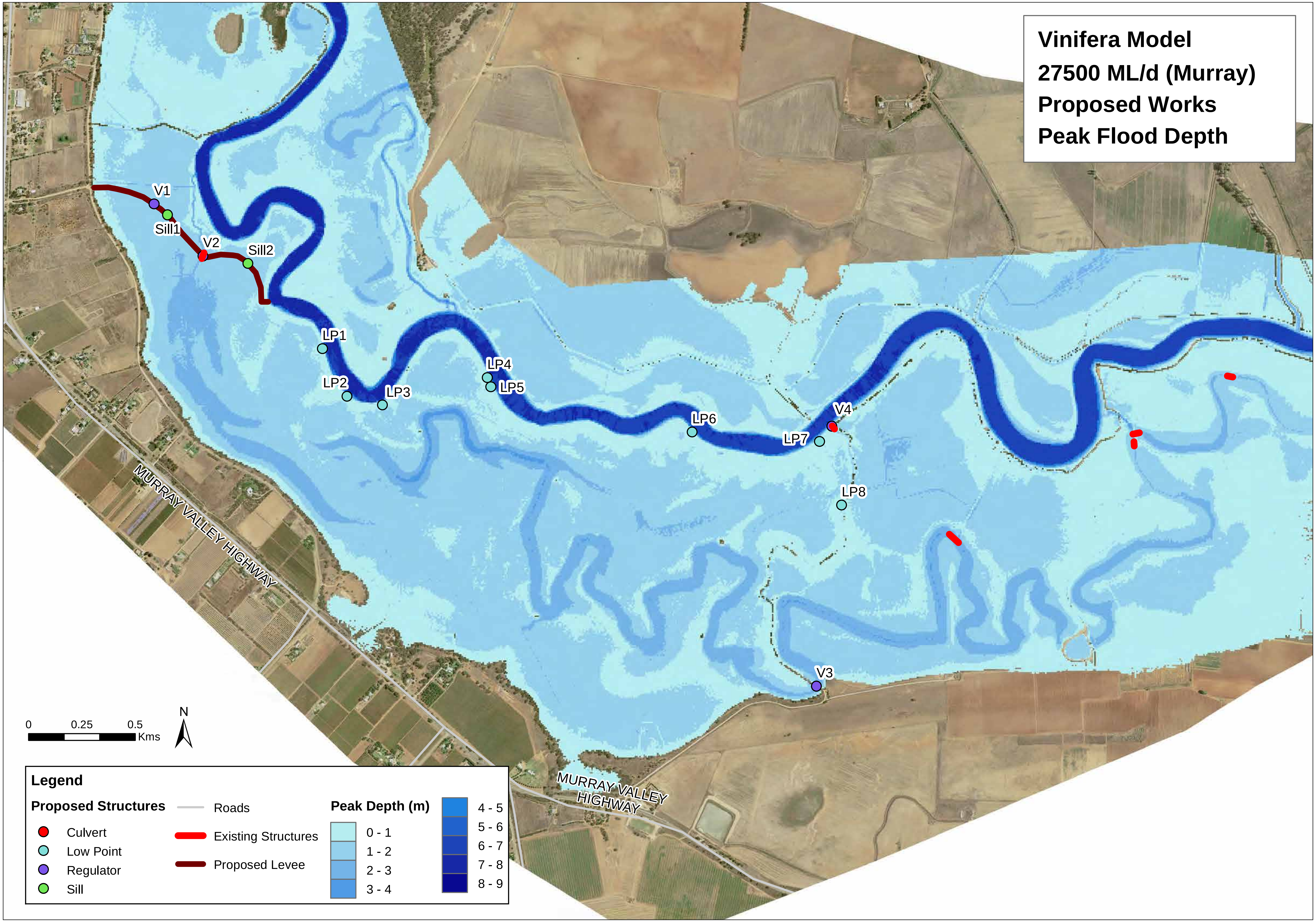
Vinifera Model
20000 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



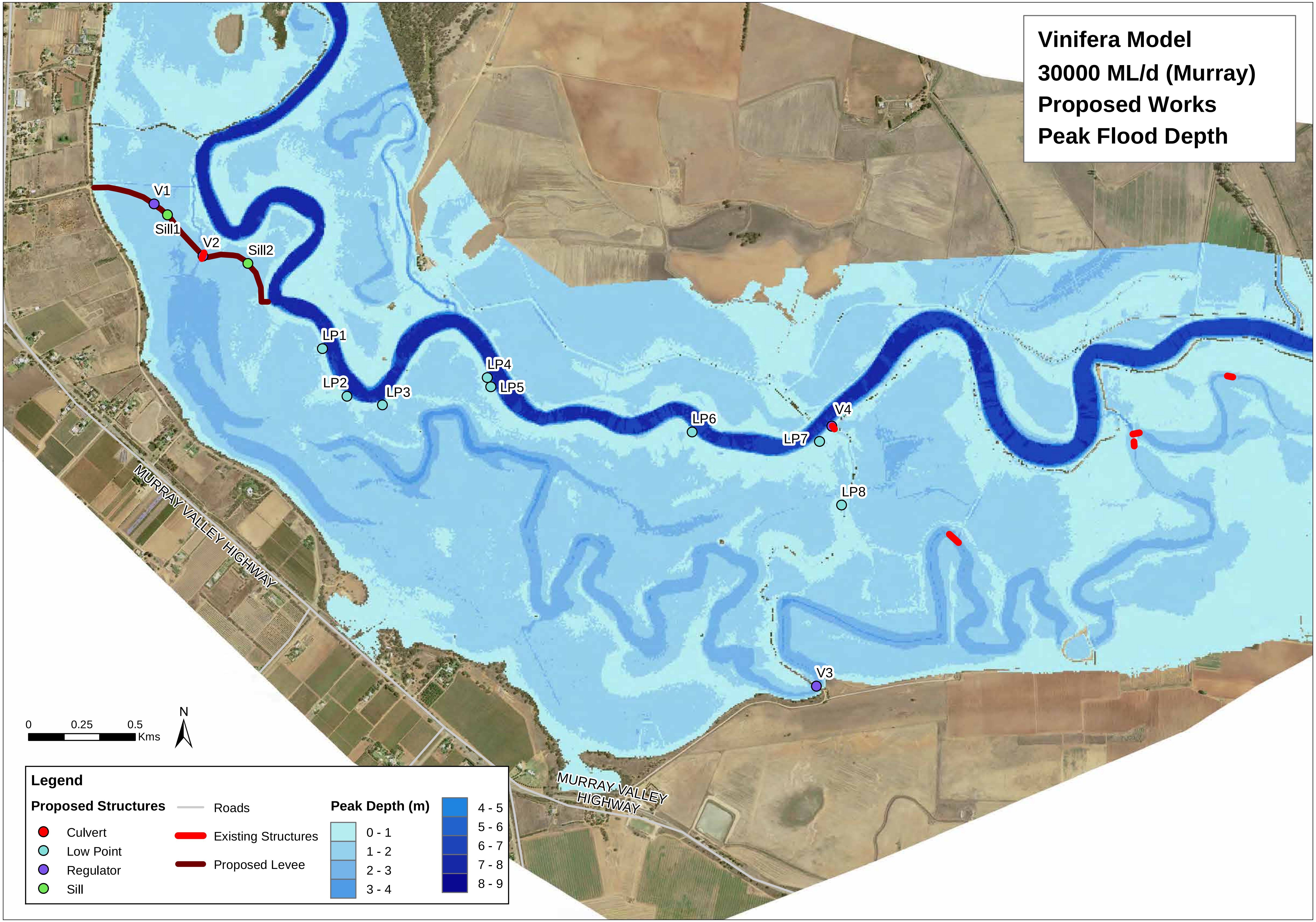
Vinifera Model
22500 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0 0.25 0.5 Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

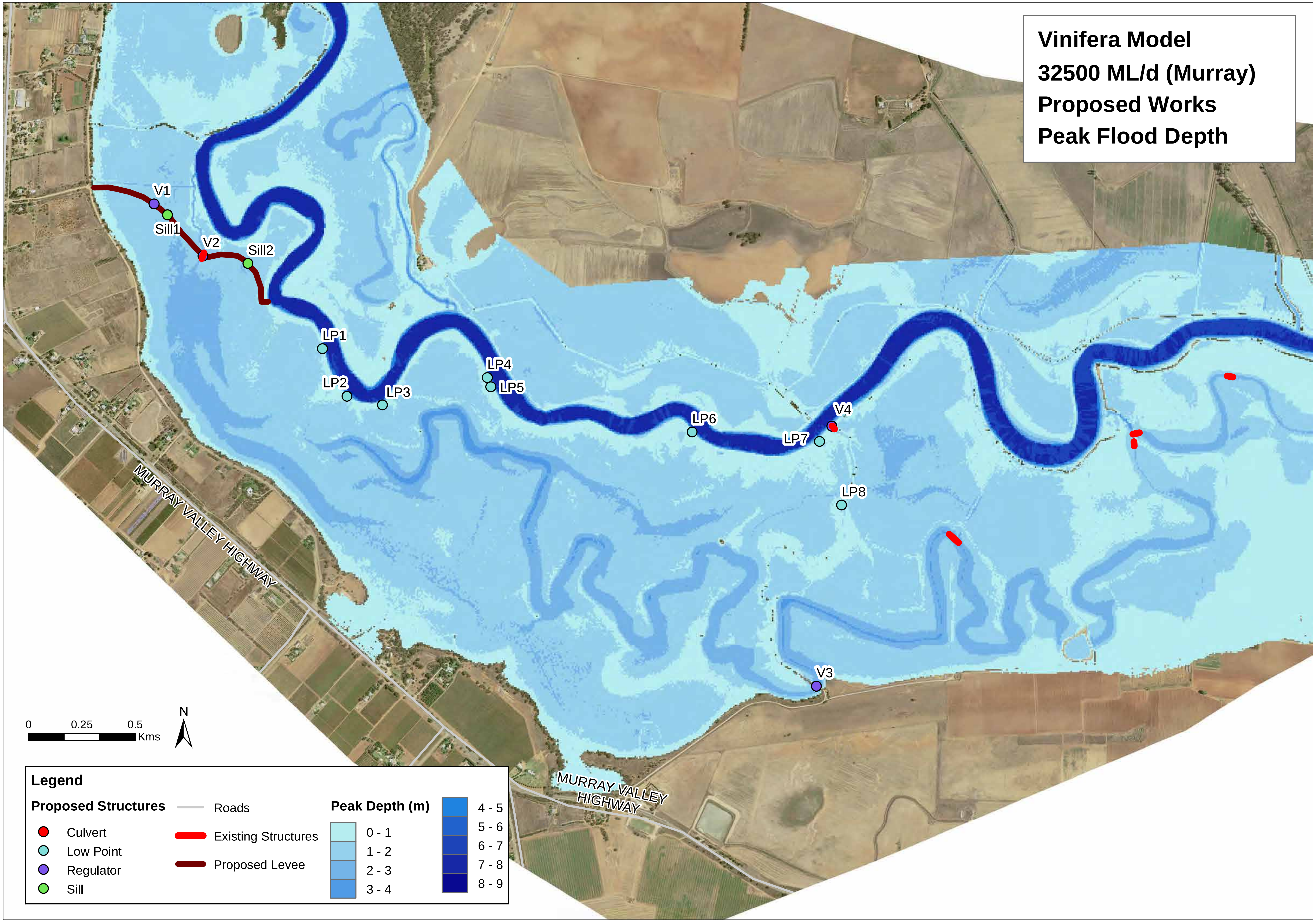


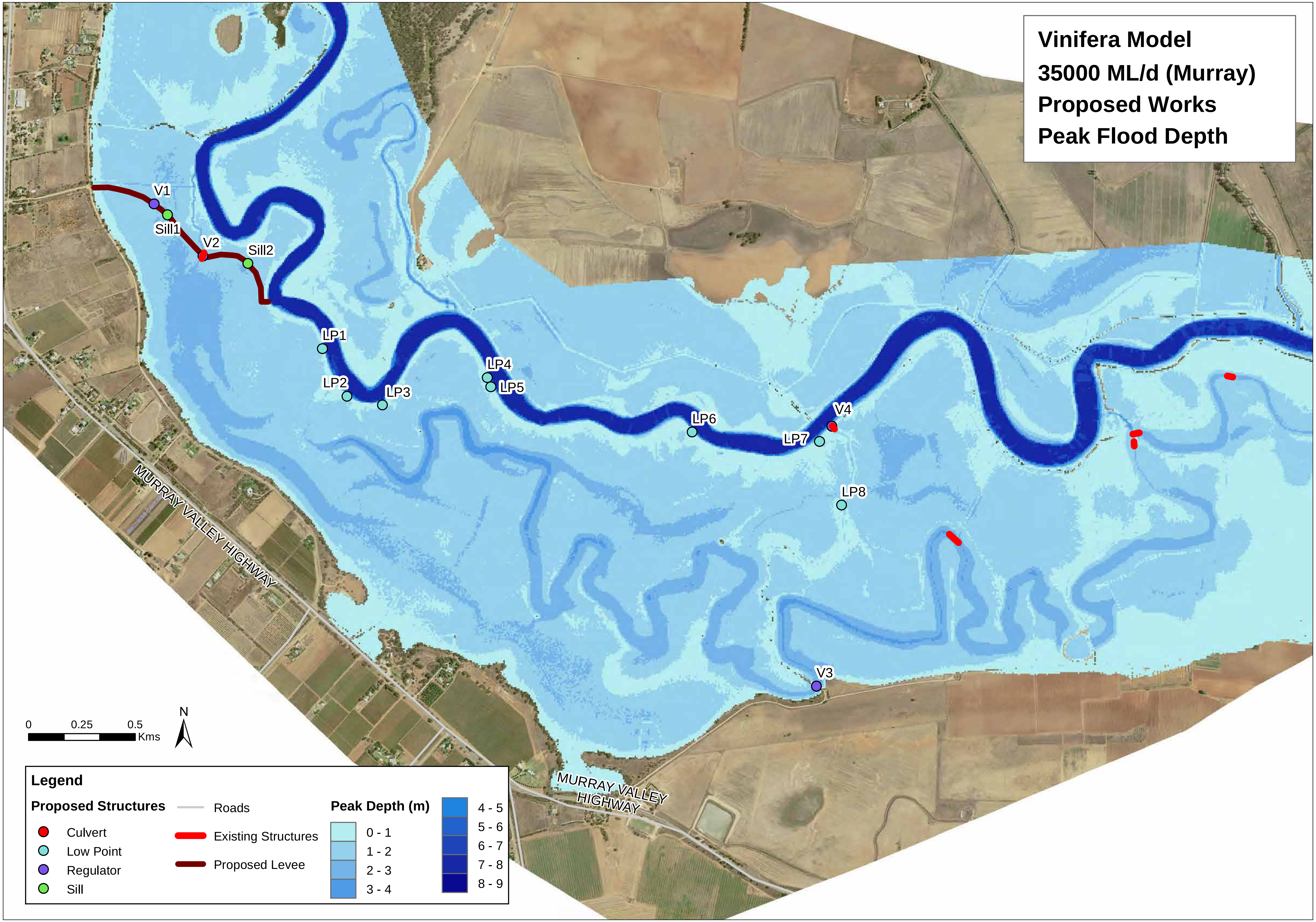
Vinifera Model
25000 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0 0.25 0.5 Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



Vinifera Model
27500 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

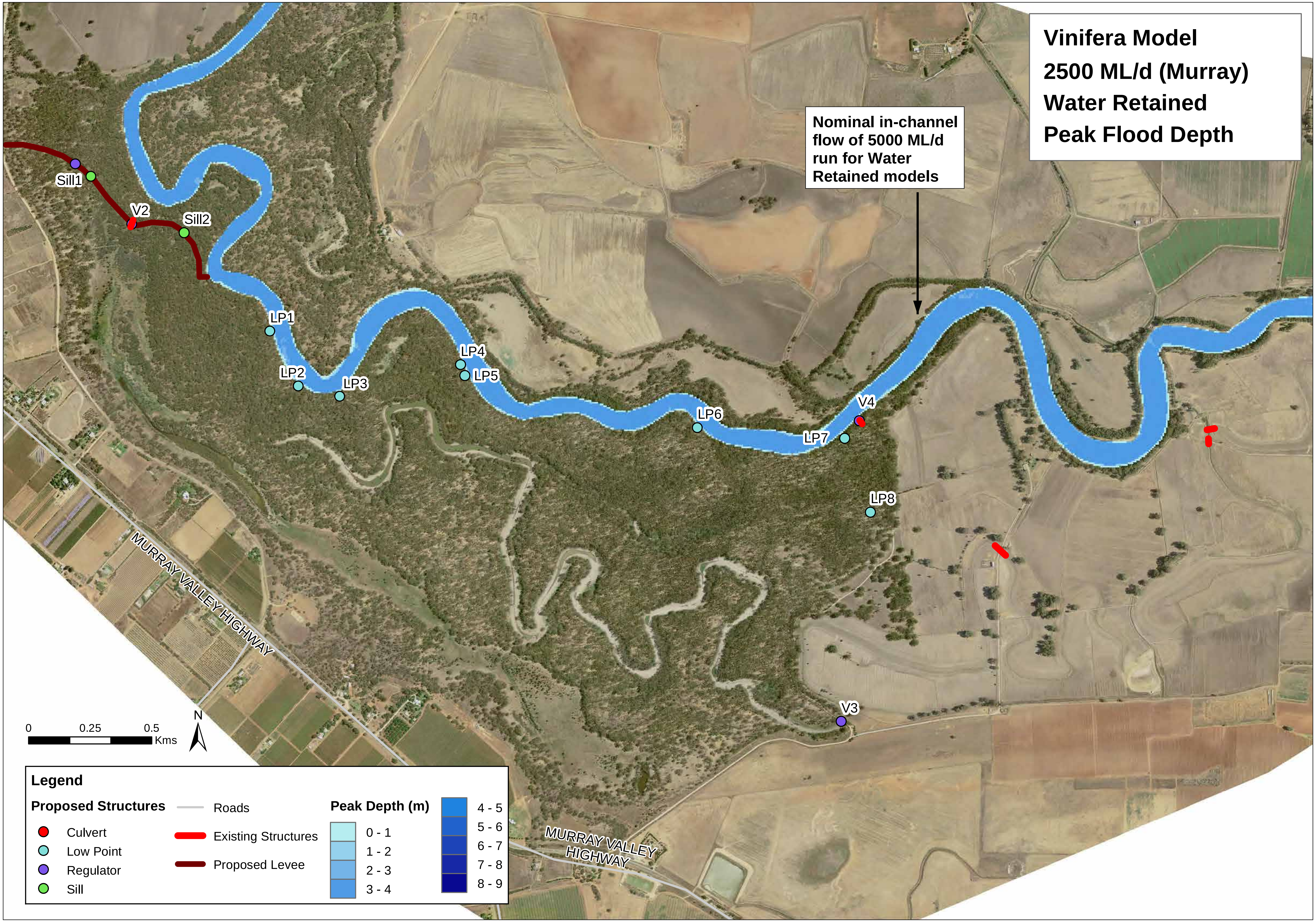

Vinifera Model
30000 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0 0.25 0.5 Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9


Vinifera Model
32500 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0 0.25 0.5 Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

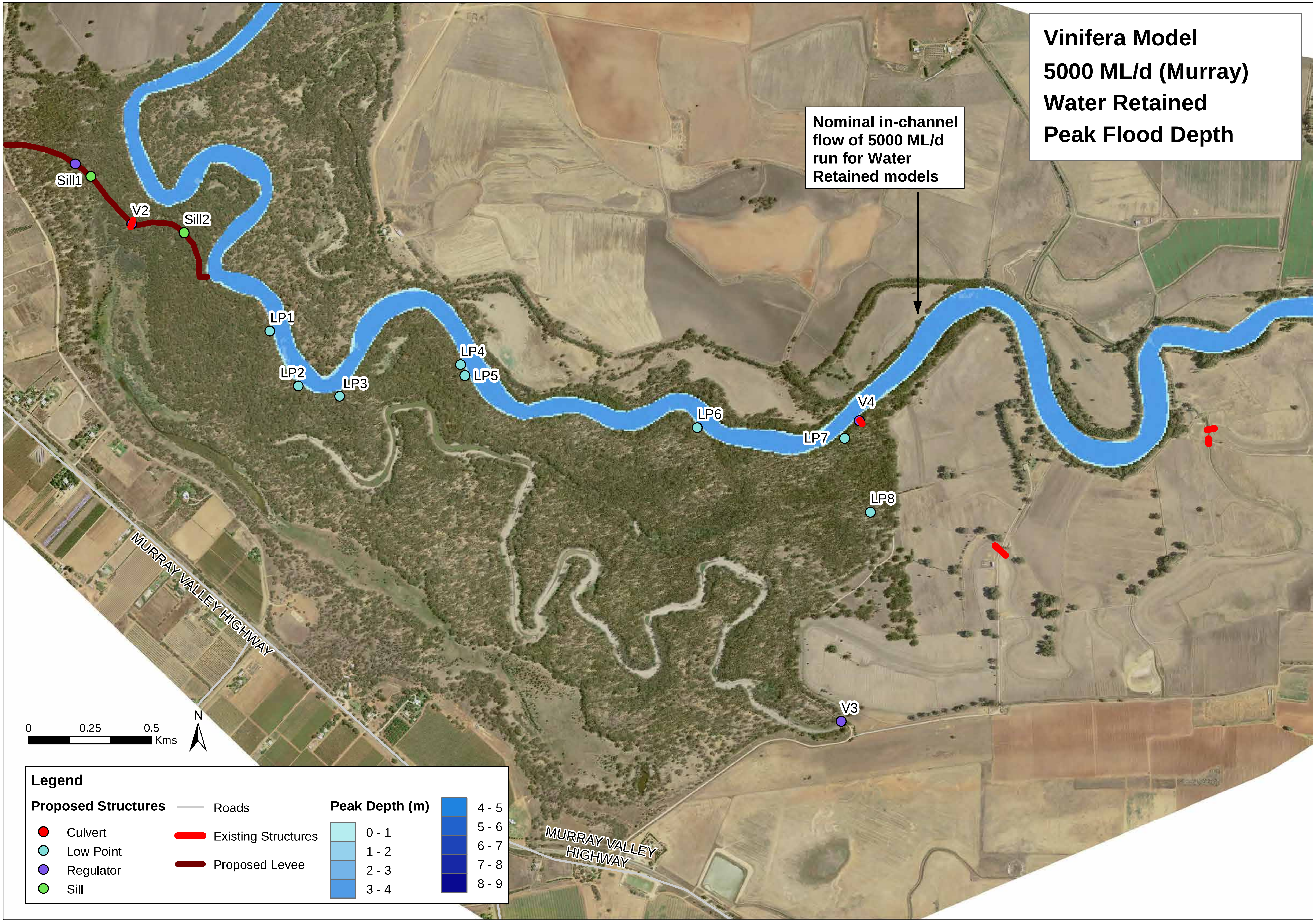


Vinifera Model
35000 ML/d (Murray)
Proposed Works
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

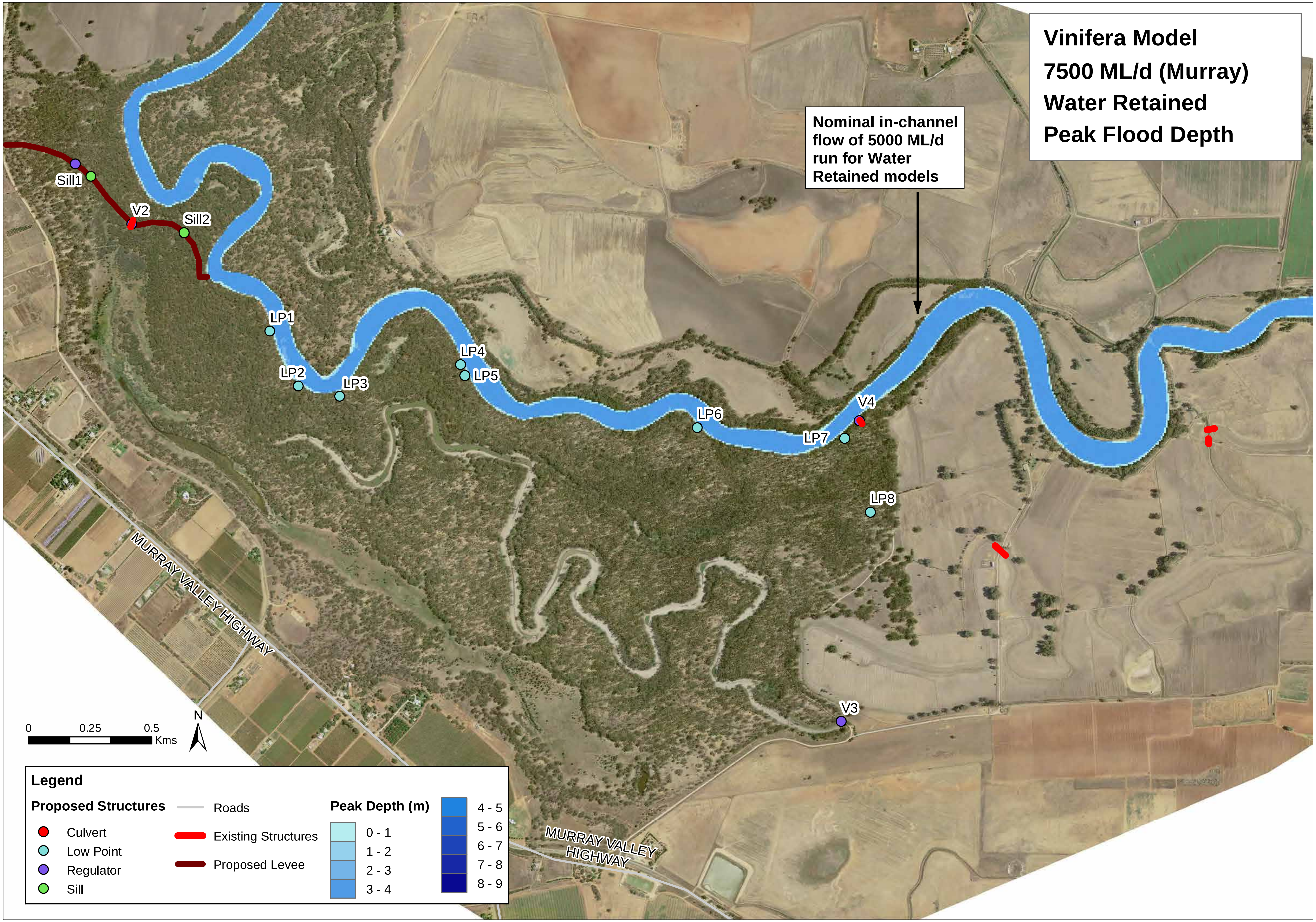
Appendix E. Water Retained Peak Depth Plots



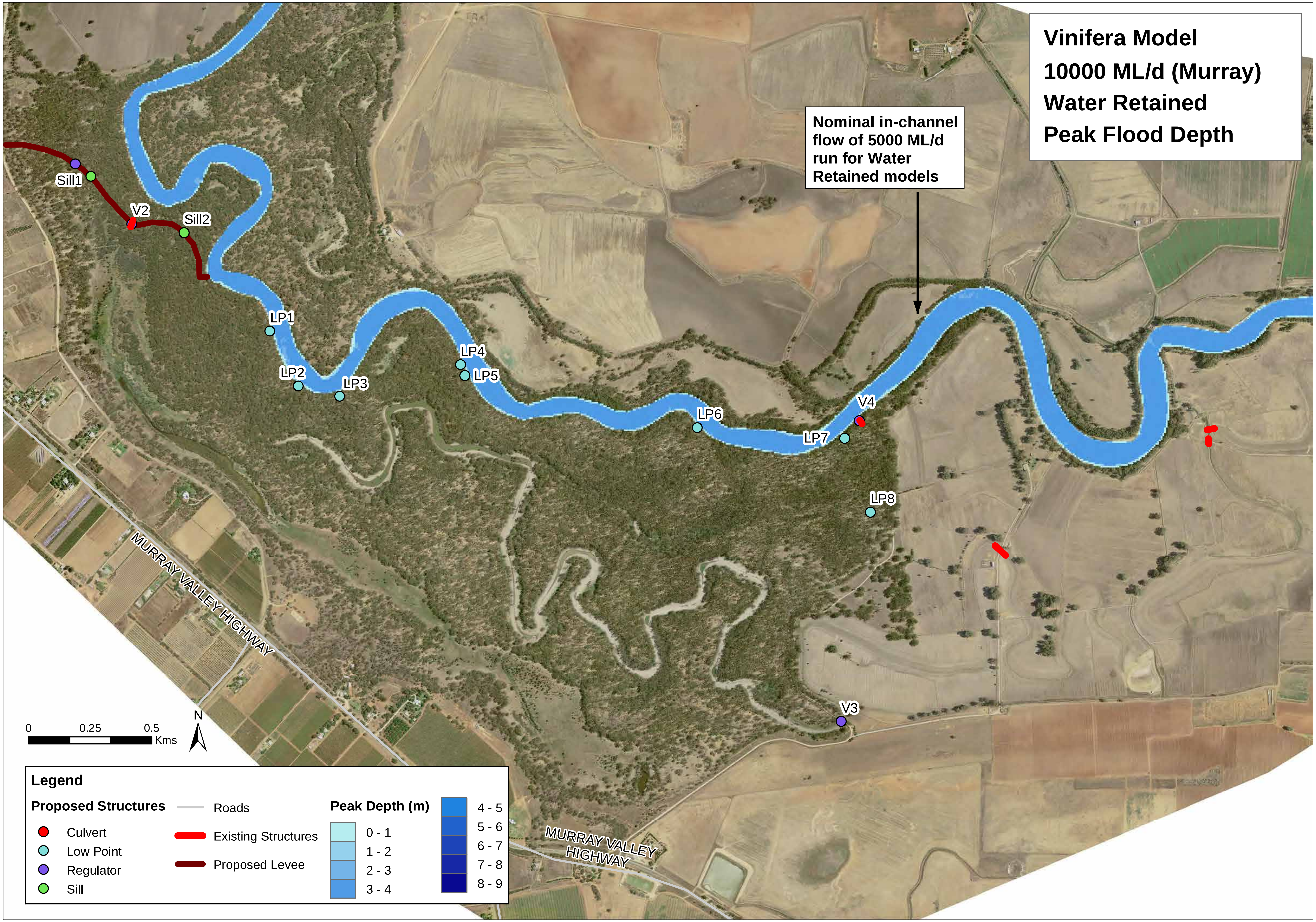
Vinifera Model
2500 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



Vinifera Model
5000 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

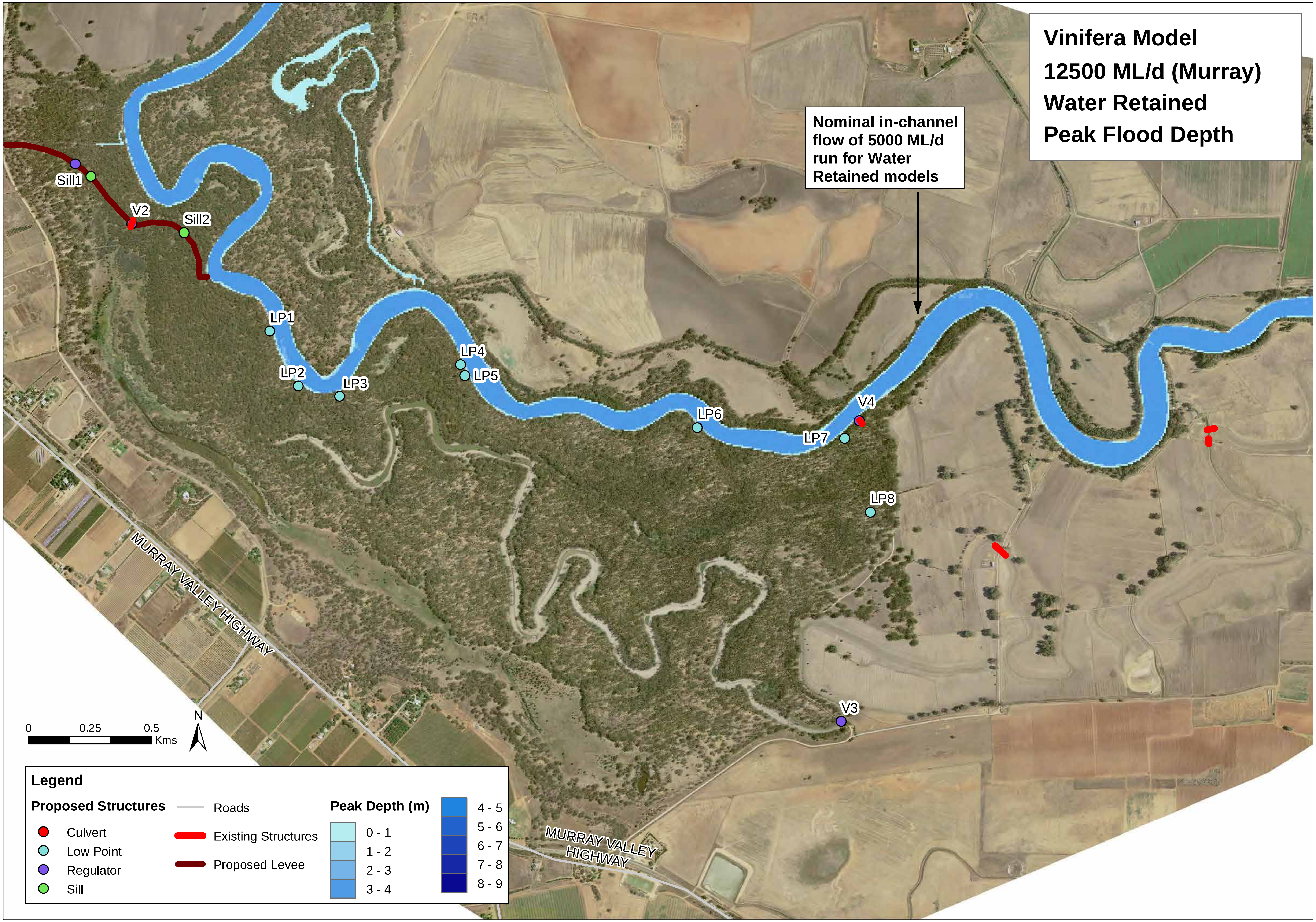


Vinifera Model
7500 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



Vinifera Model
10000 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
Sill2
V2
V3
V4
LP1
LP2
LP3
LP4
LP5
LP6
LP7
LP8
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

Vinifera Model
12500 ML/d (Murray)
Water Retained
Peak Flood Depth

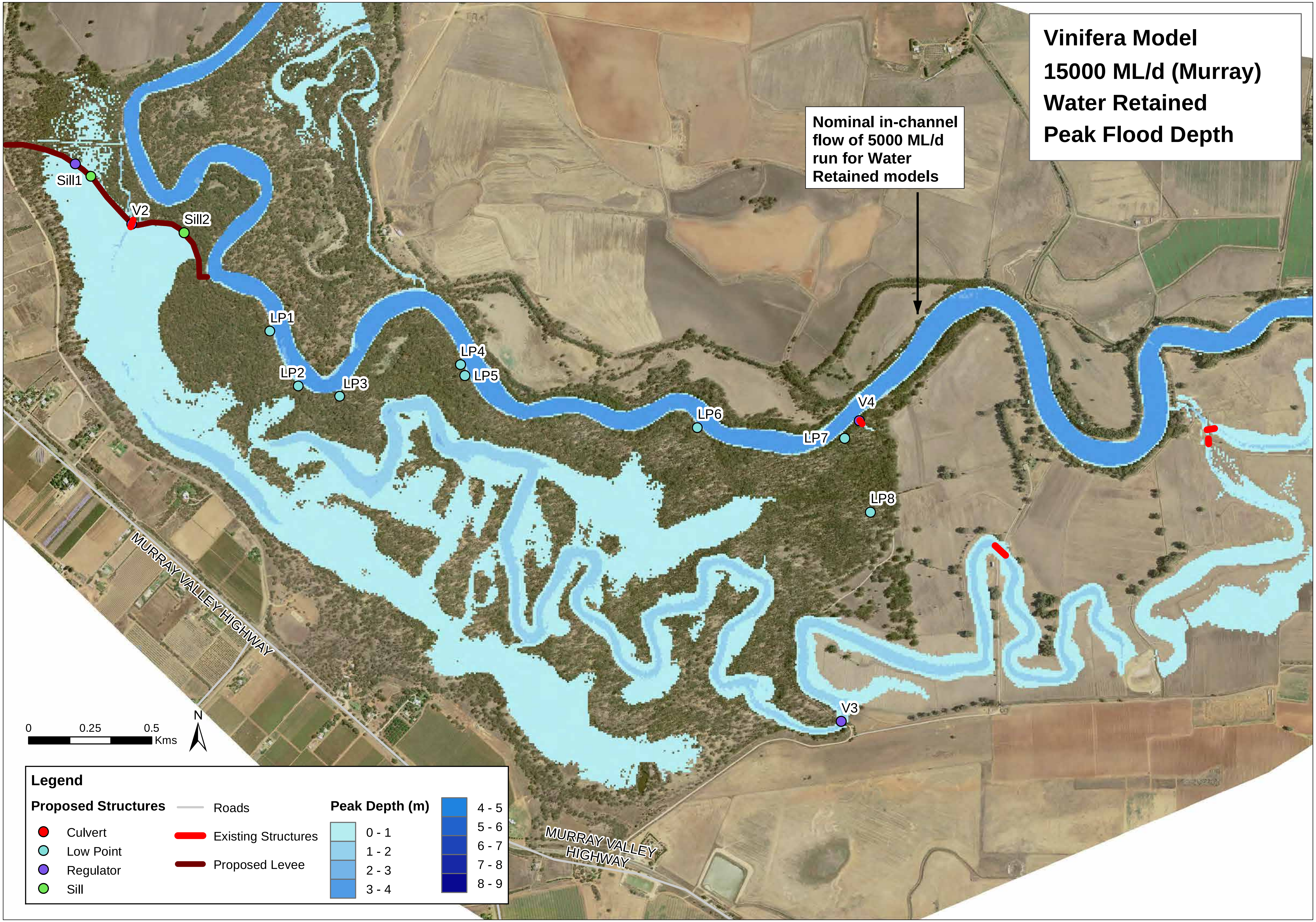


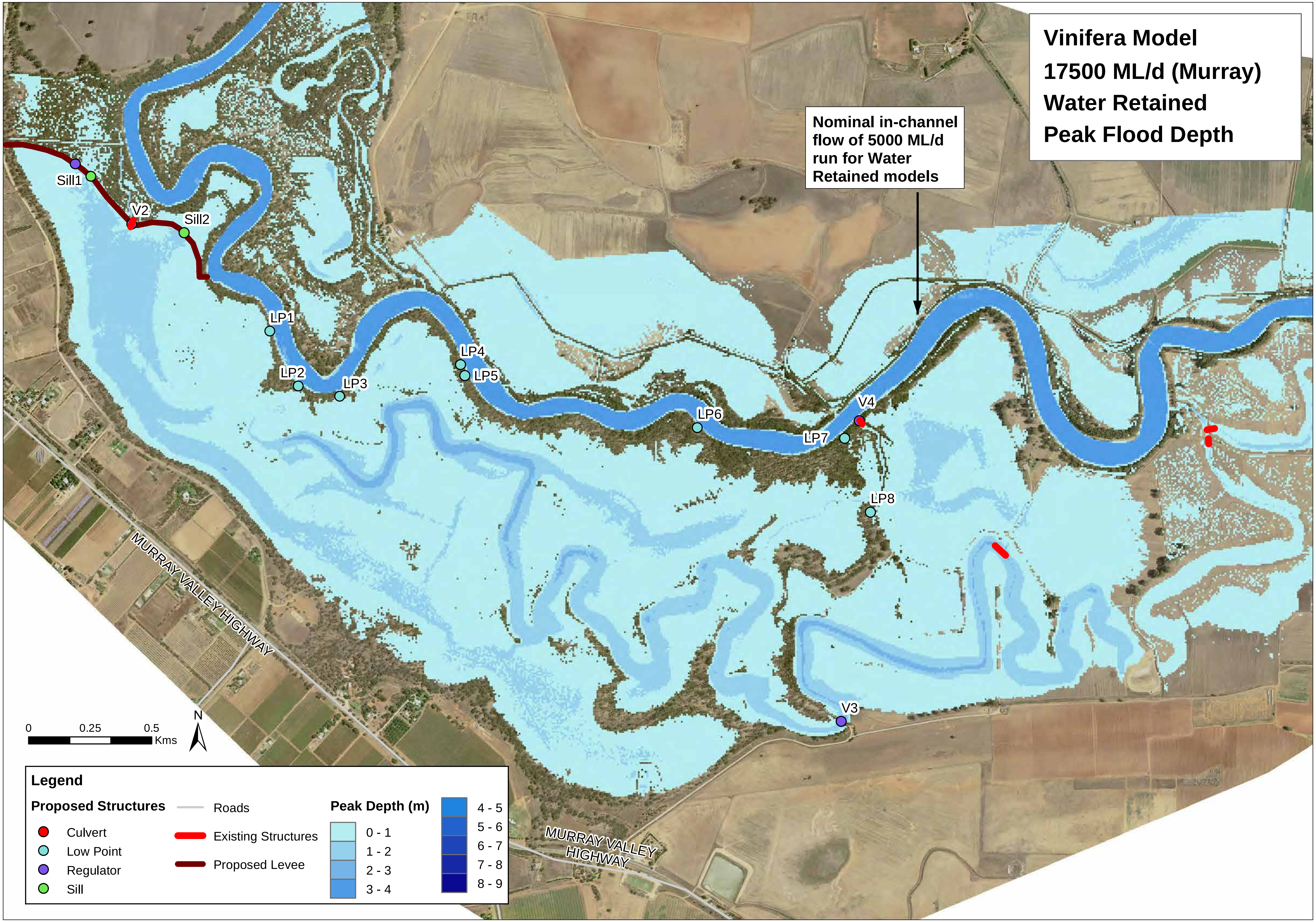
Legend

Proposed Structures
- Culvert
- Low Point
- Regulator
- Sill

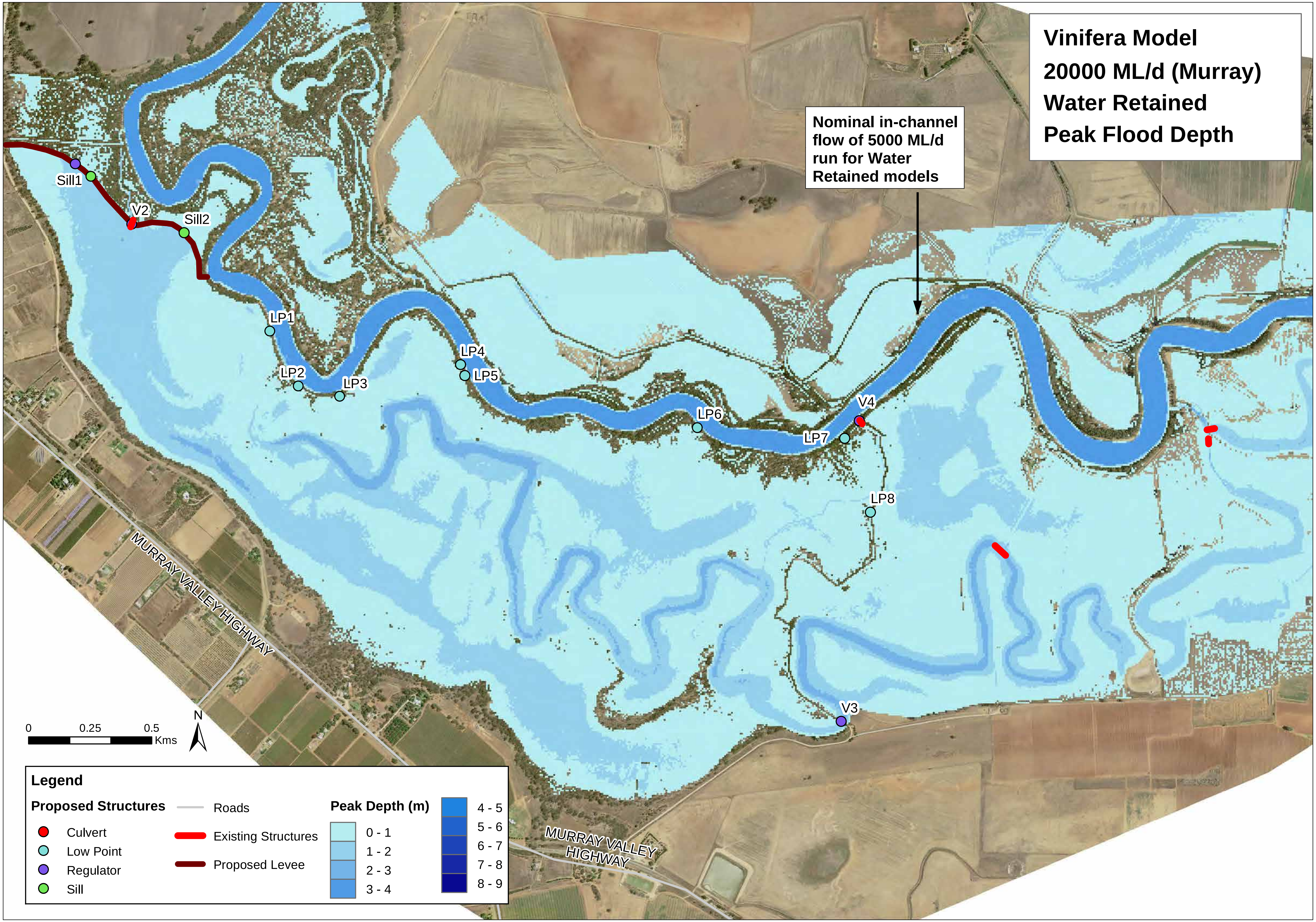
Roads
Existing Structures
Proposed Levee

Peak Depth (m)
- 0 - 1
- 1 - 2
- 2 - 3
- 3 - 4
- 4 - 5
- 5 - 6
- 6 - 7
- 7 - 8
- 8 - 9

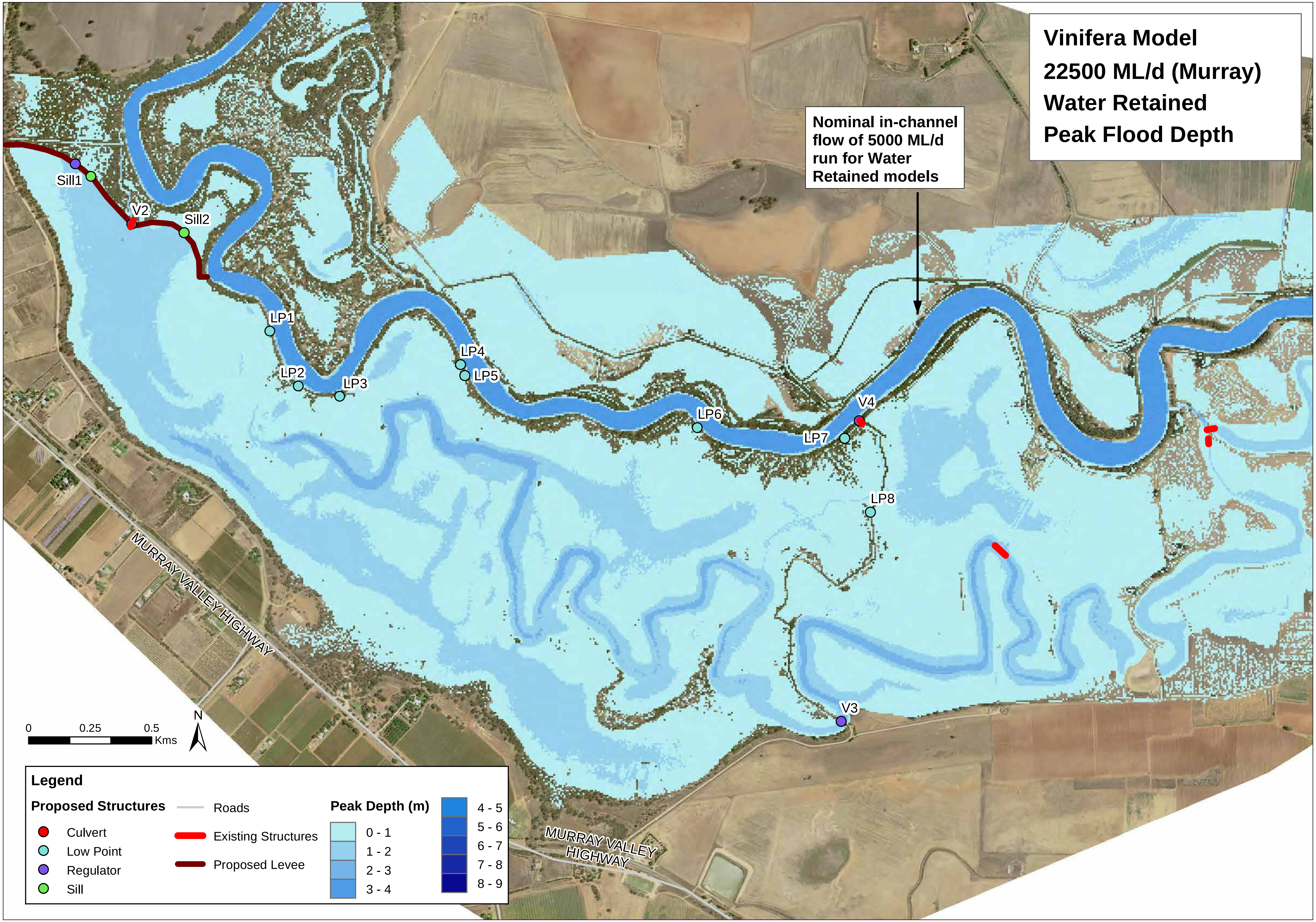

Vinifera Model
15000 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



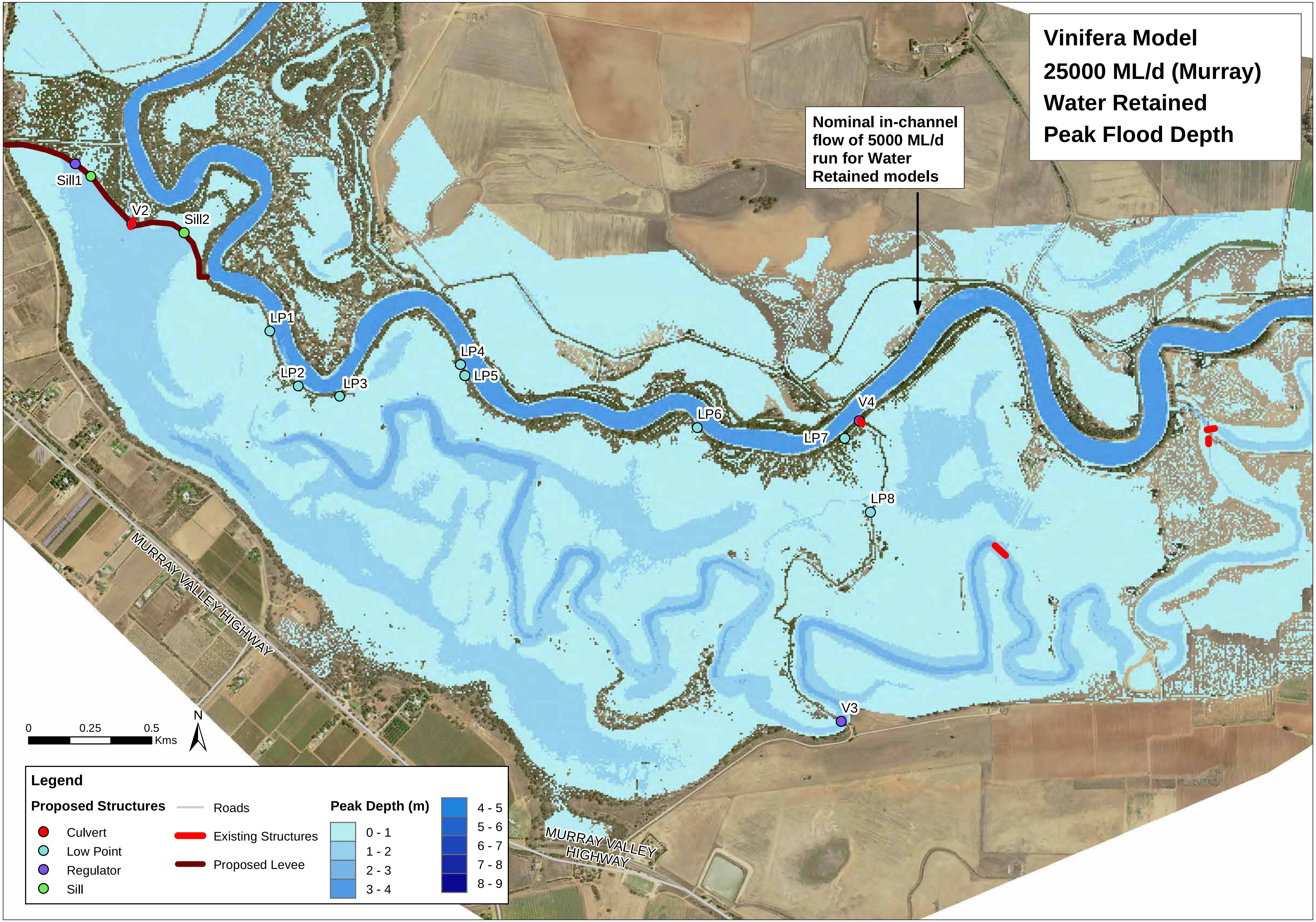
Vinifera Model
17500 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
Sill2
V2
V3
V4
LP1
LP2
LP3
LP4
LP5
LP6
LP7
LP8
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

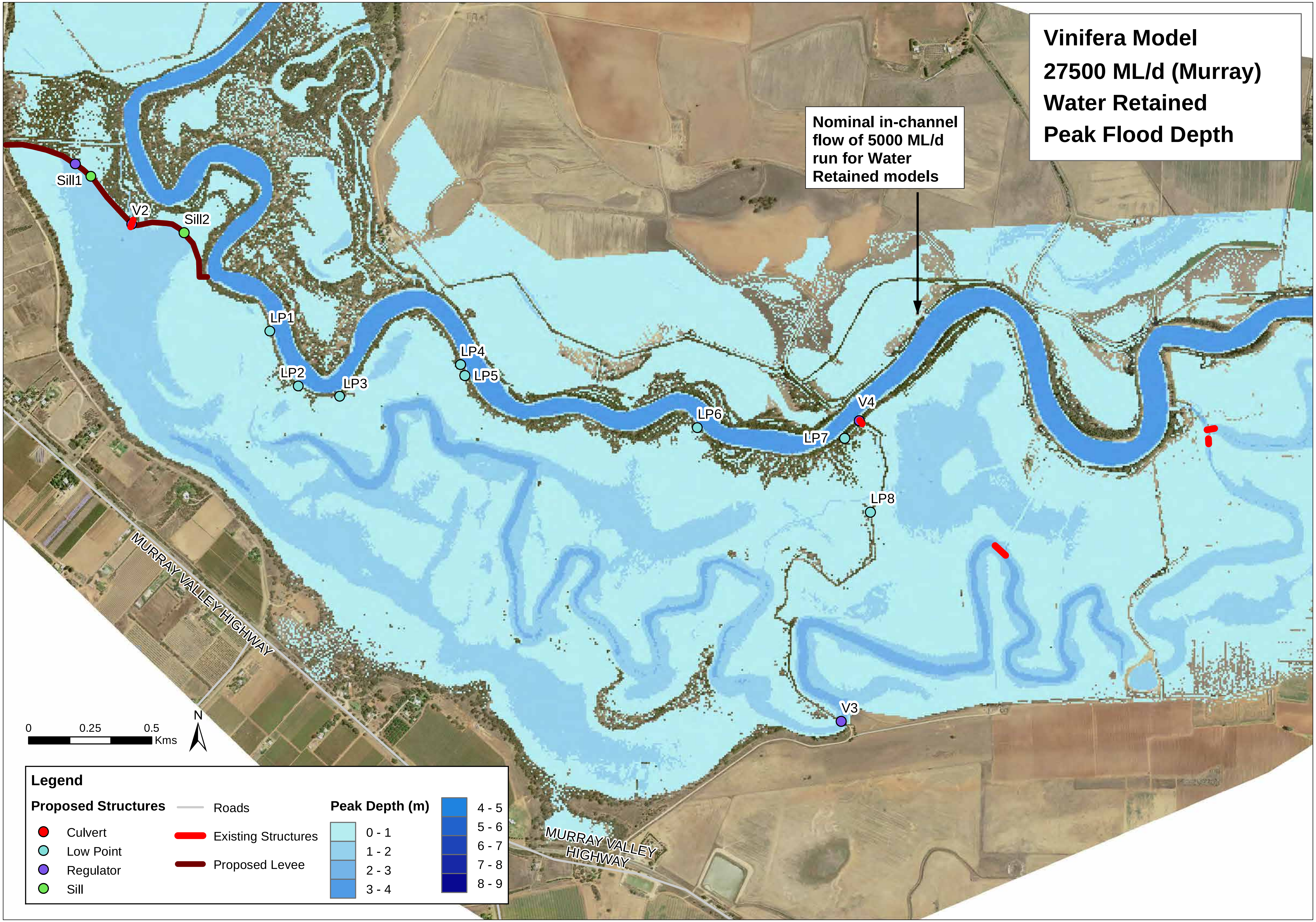


Vinifera Model
20000 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0 0.25 0.5 Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

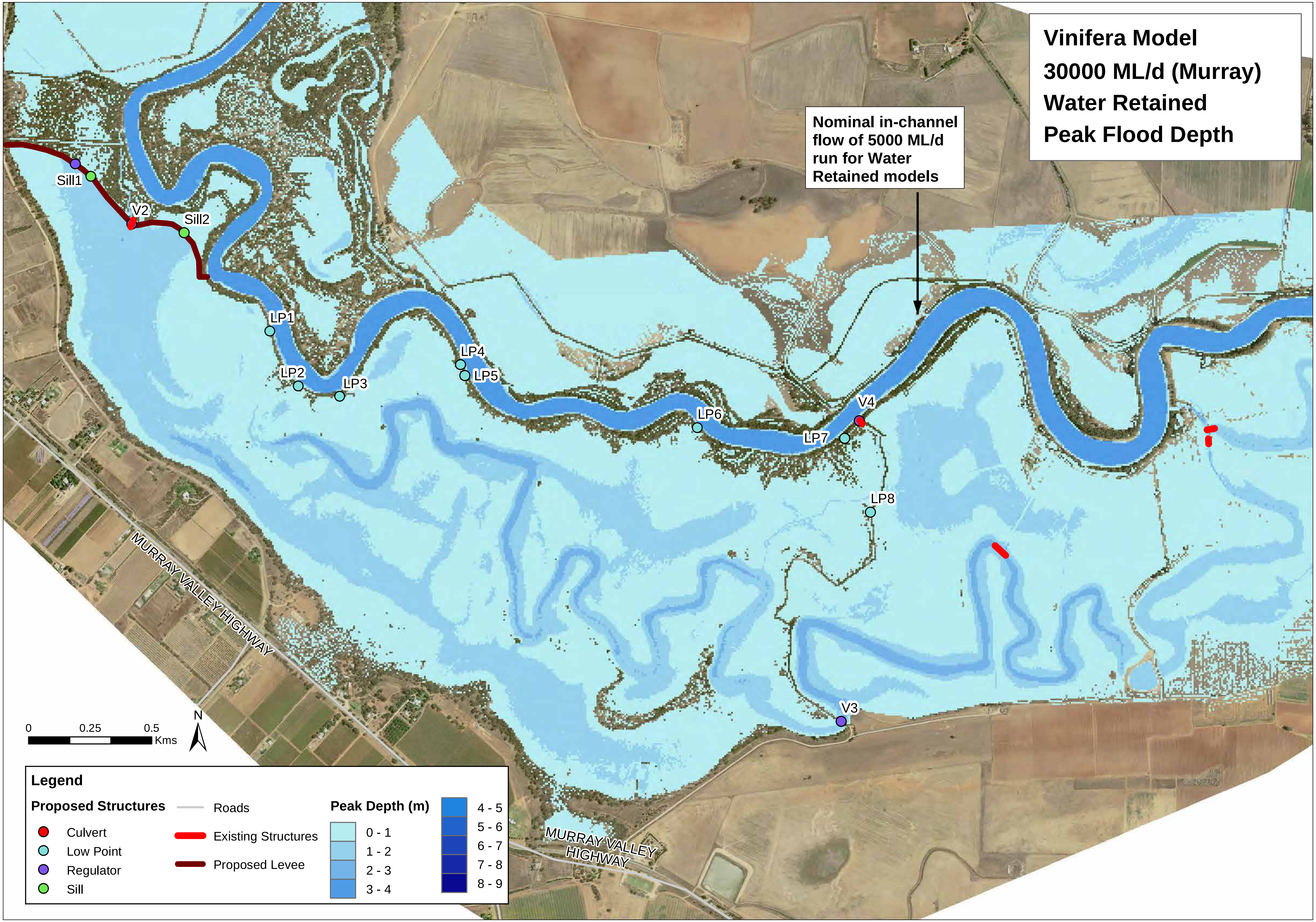


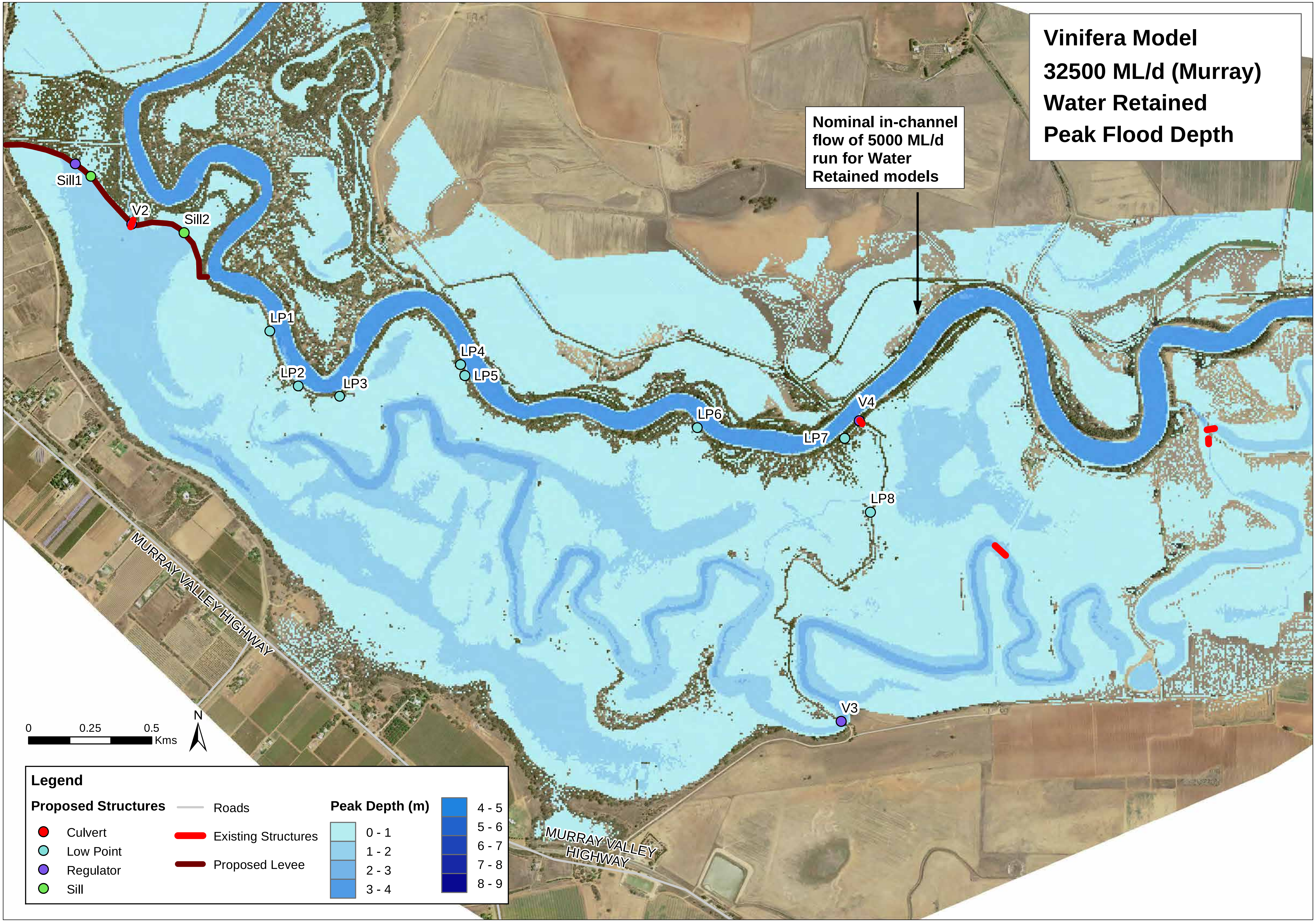
Vinifera Model
22500 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9


Vinifera Model
25000 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

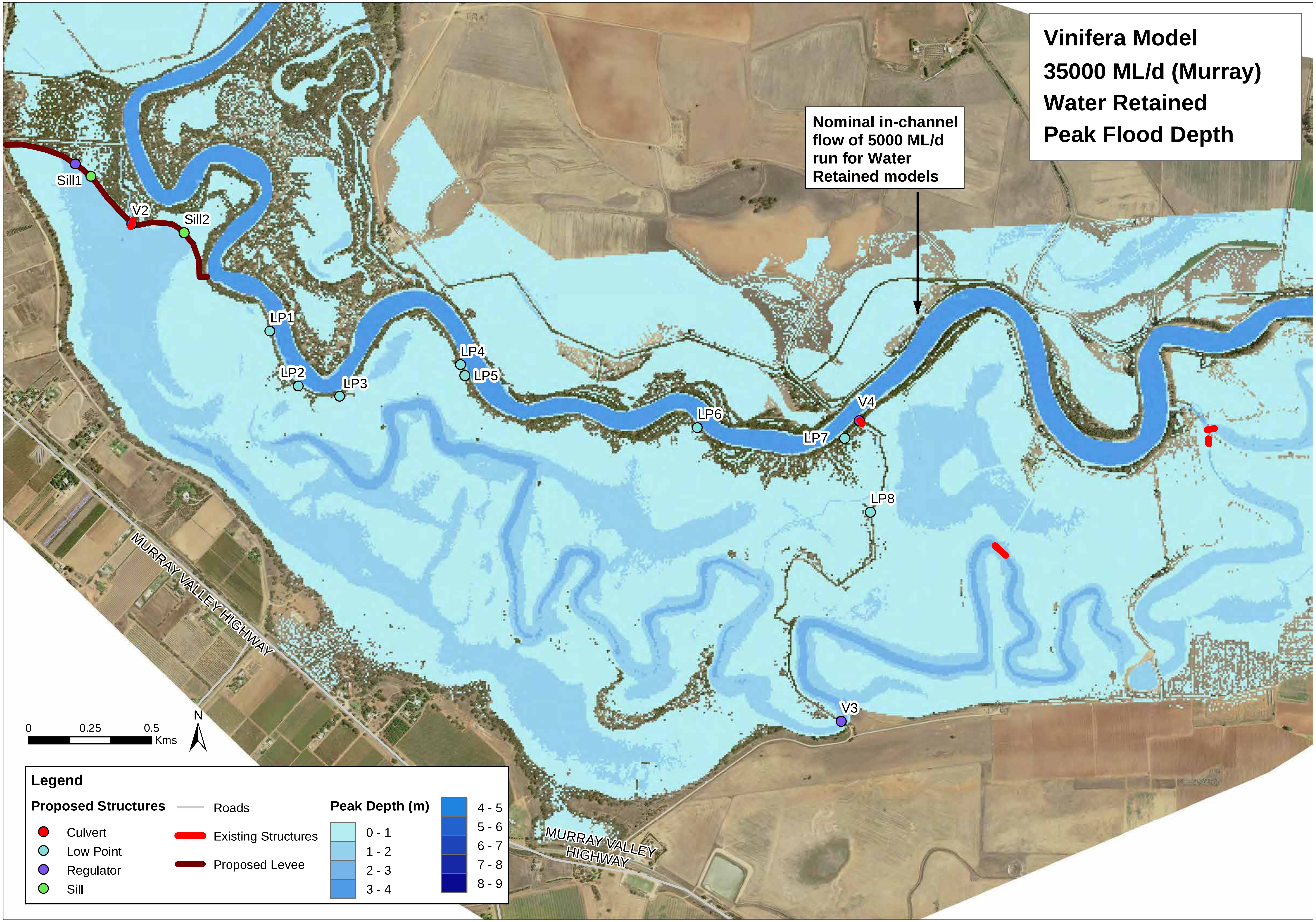


Vinifera Model
27500 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9


Vinifera Model
30000 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

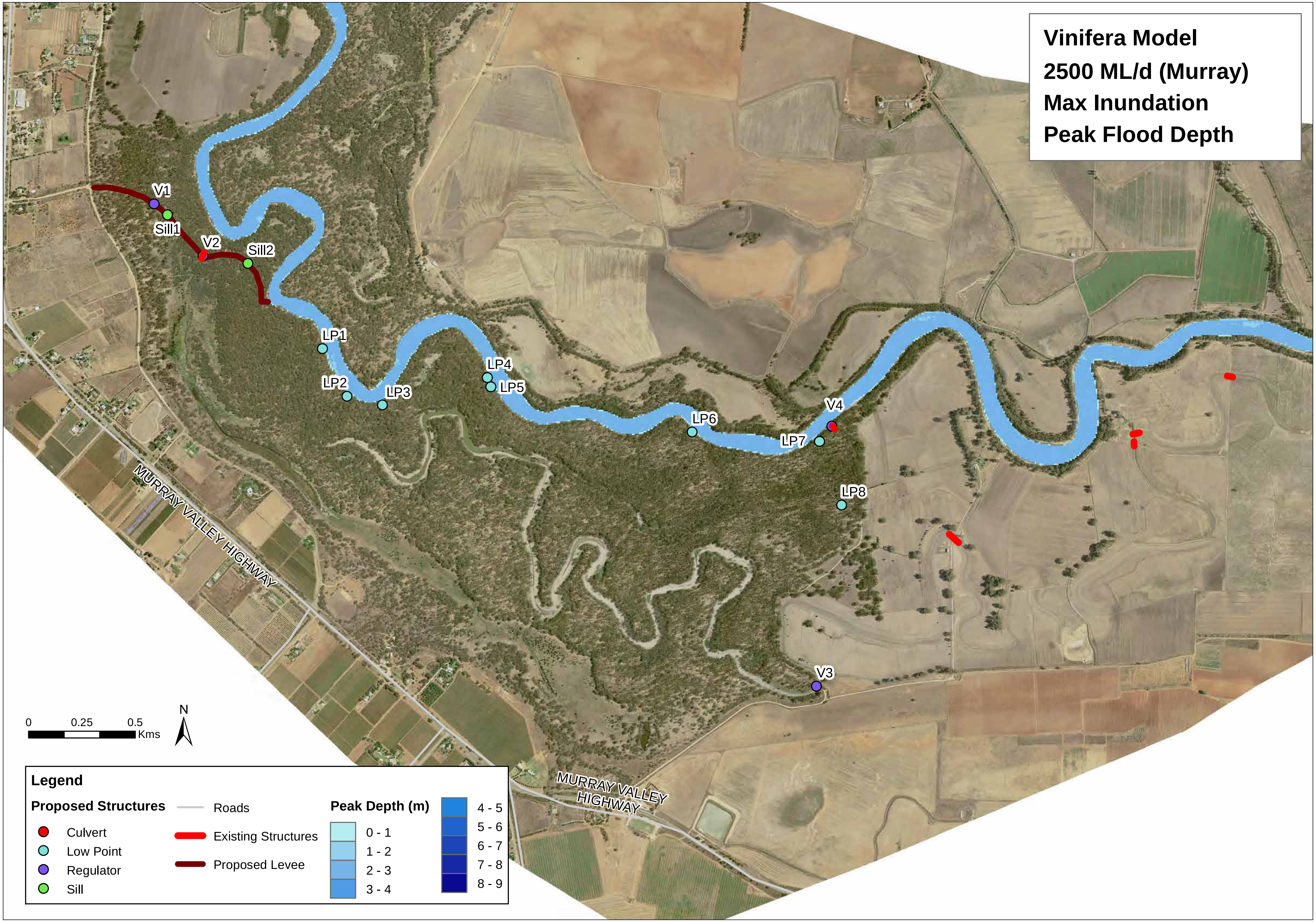


Vinifera Model
32500 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

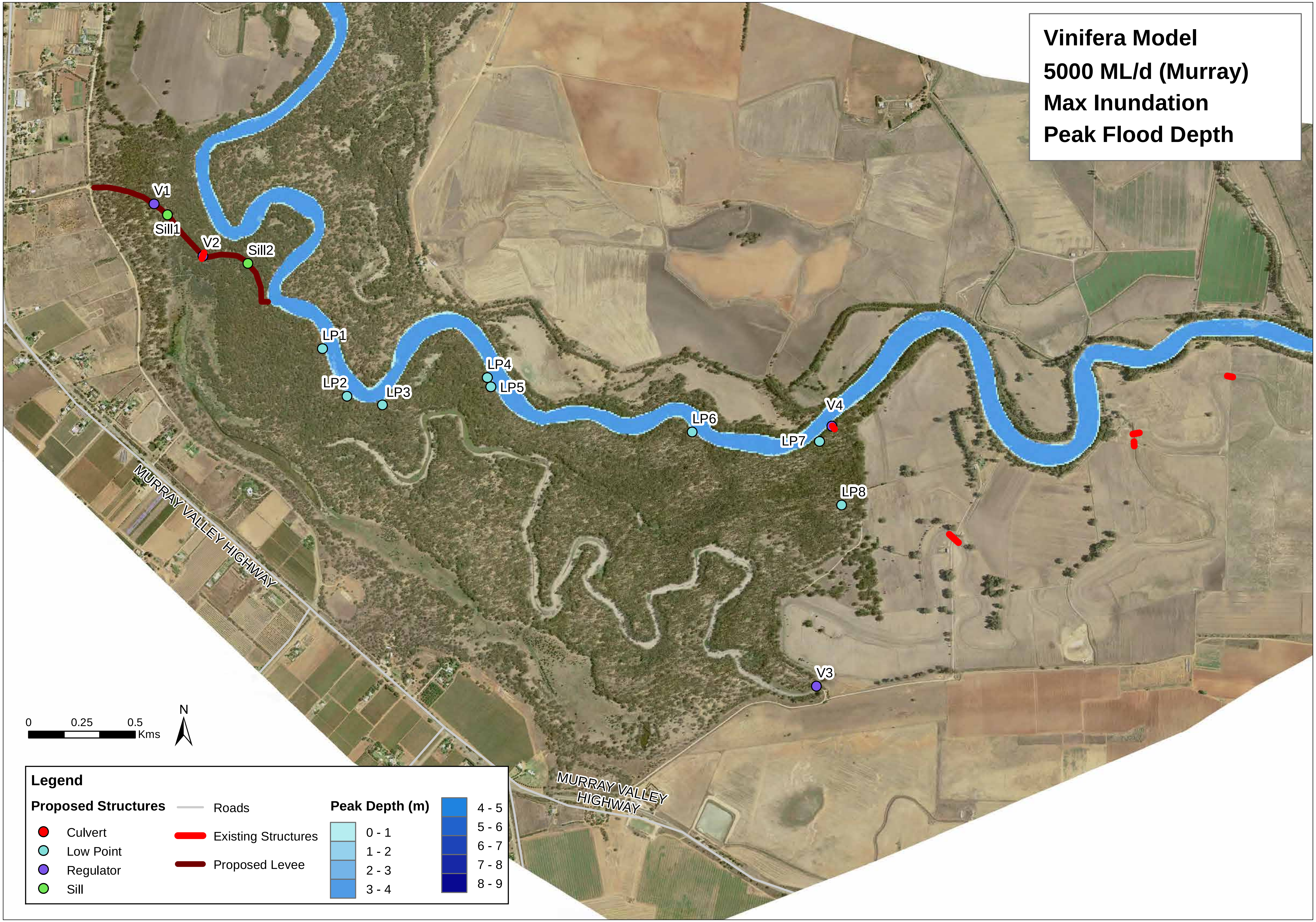


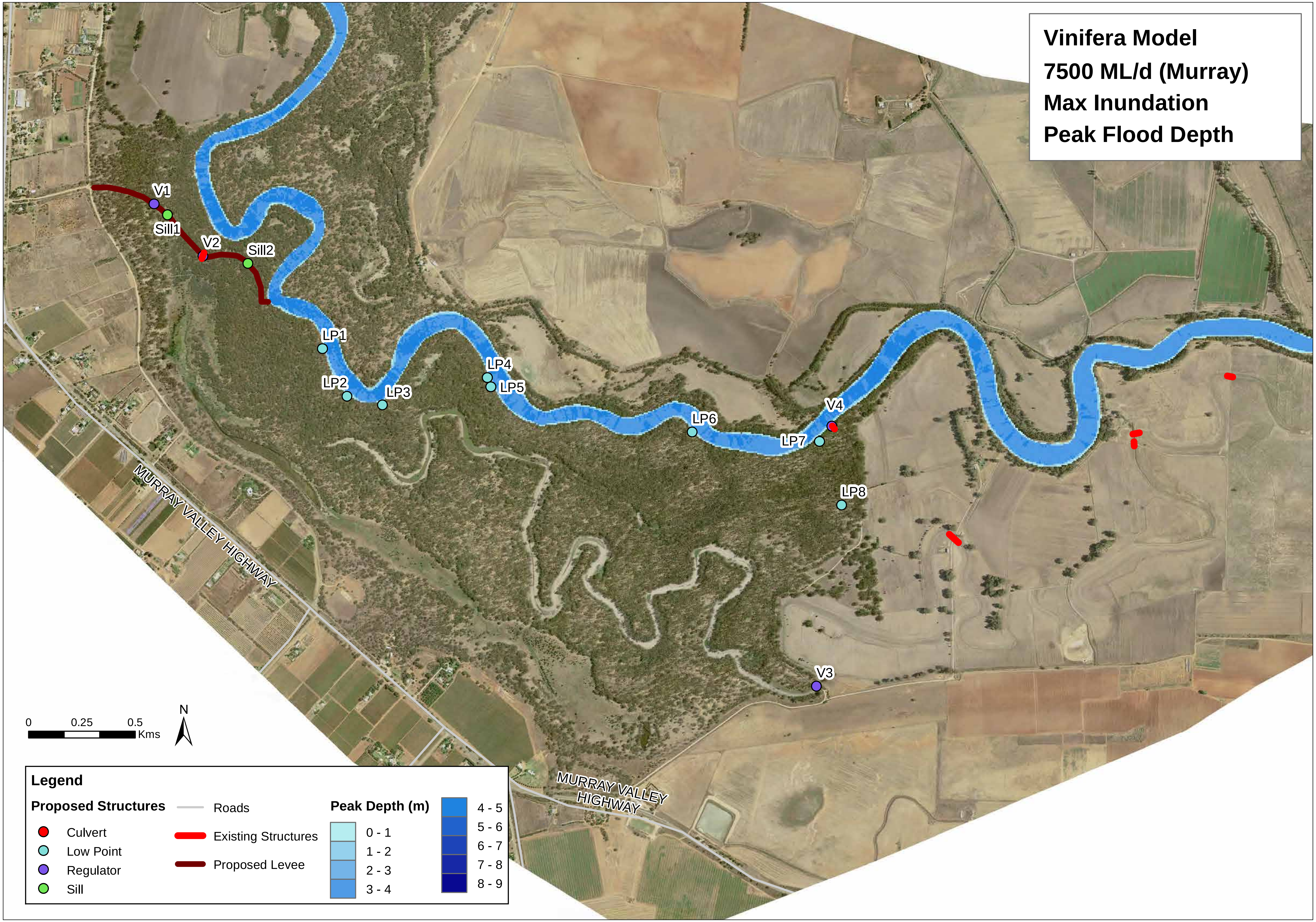
Vinifera Model
35000 ML/d (Murray)
Water Retained
Peak Flood Depth
Nominal in-channel flow of 5000 ML/d run for Water Retained models
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

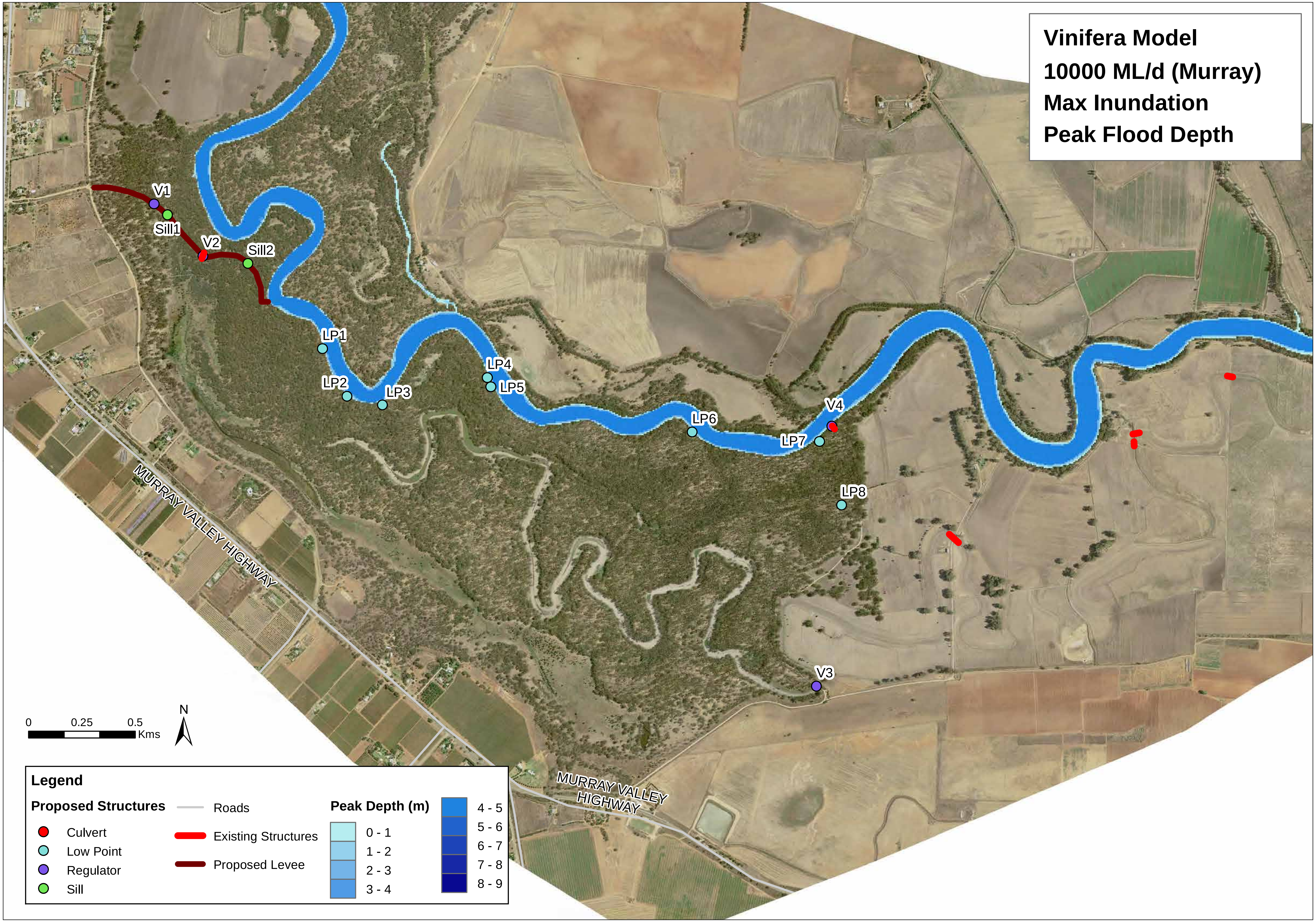
Appendix F. Maximum Inundation Peak Depth Plots



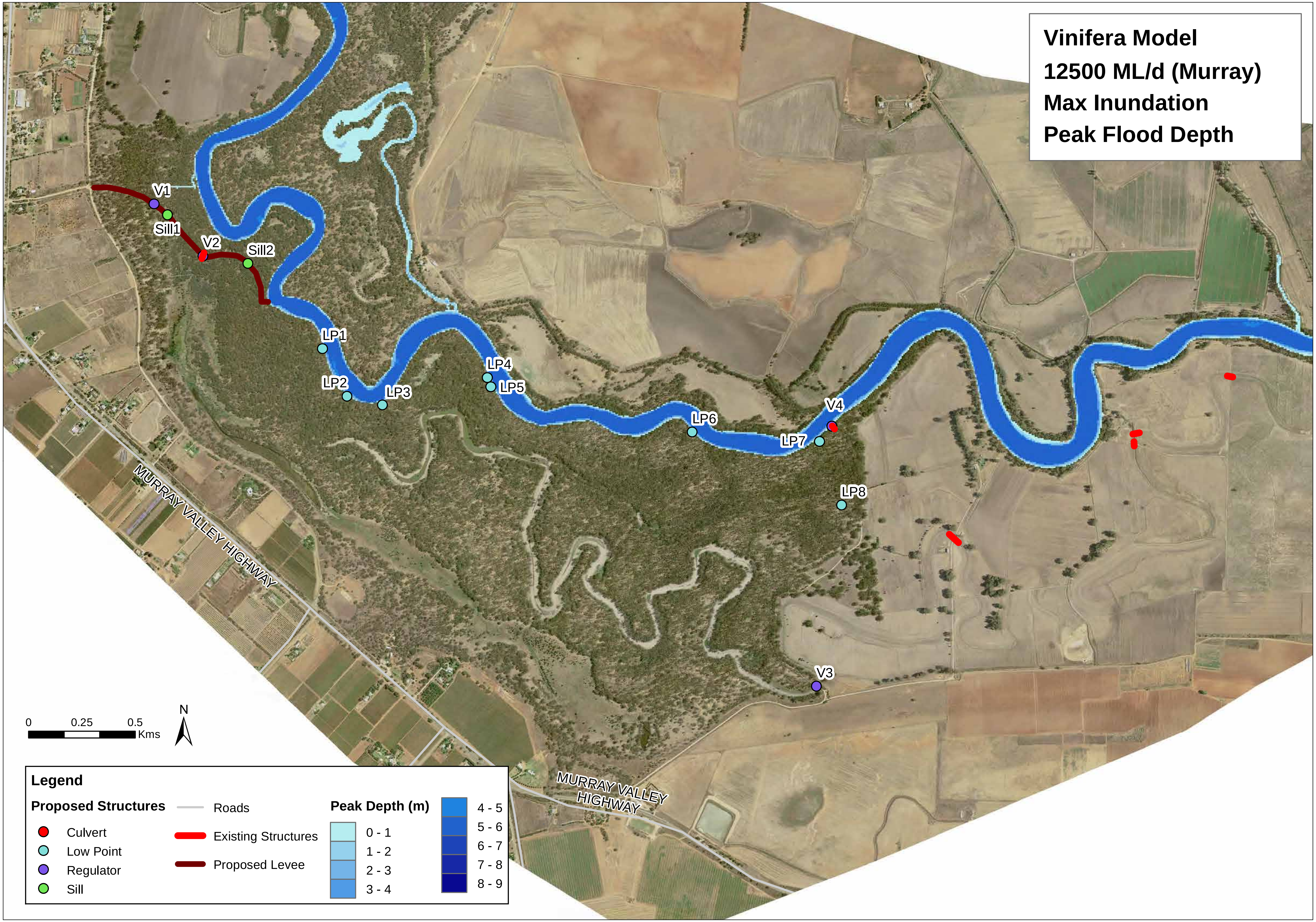
Vinifera Model
2500 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9


Vinifera Model
5000 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

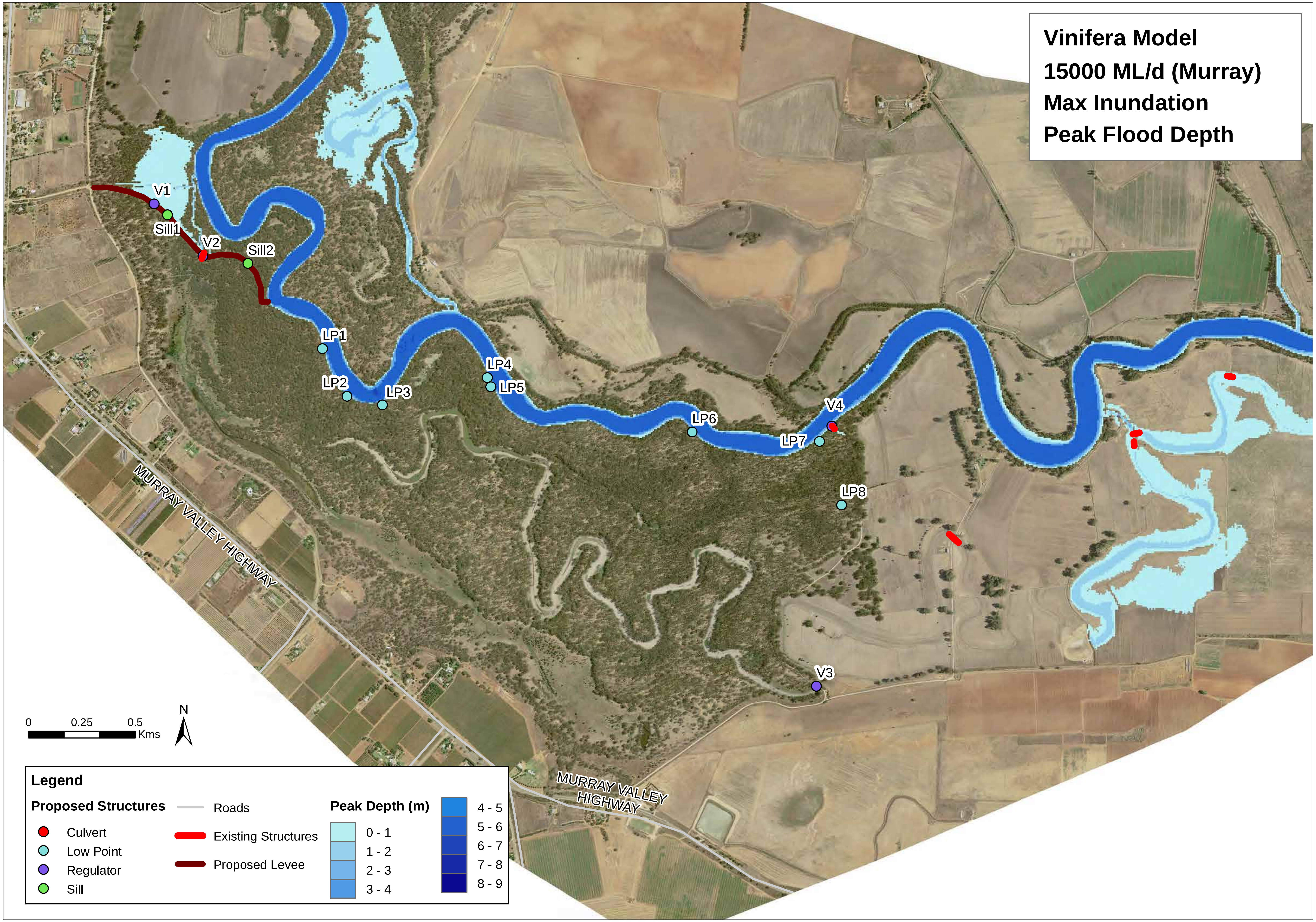

Vinifera Model
7500 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0 0.25 0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

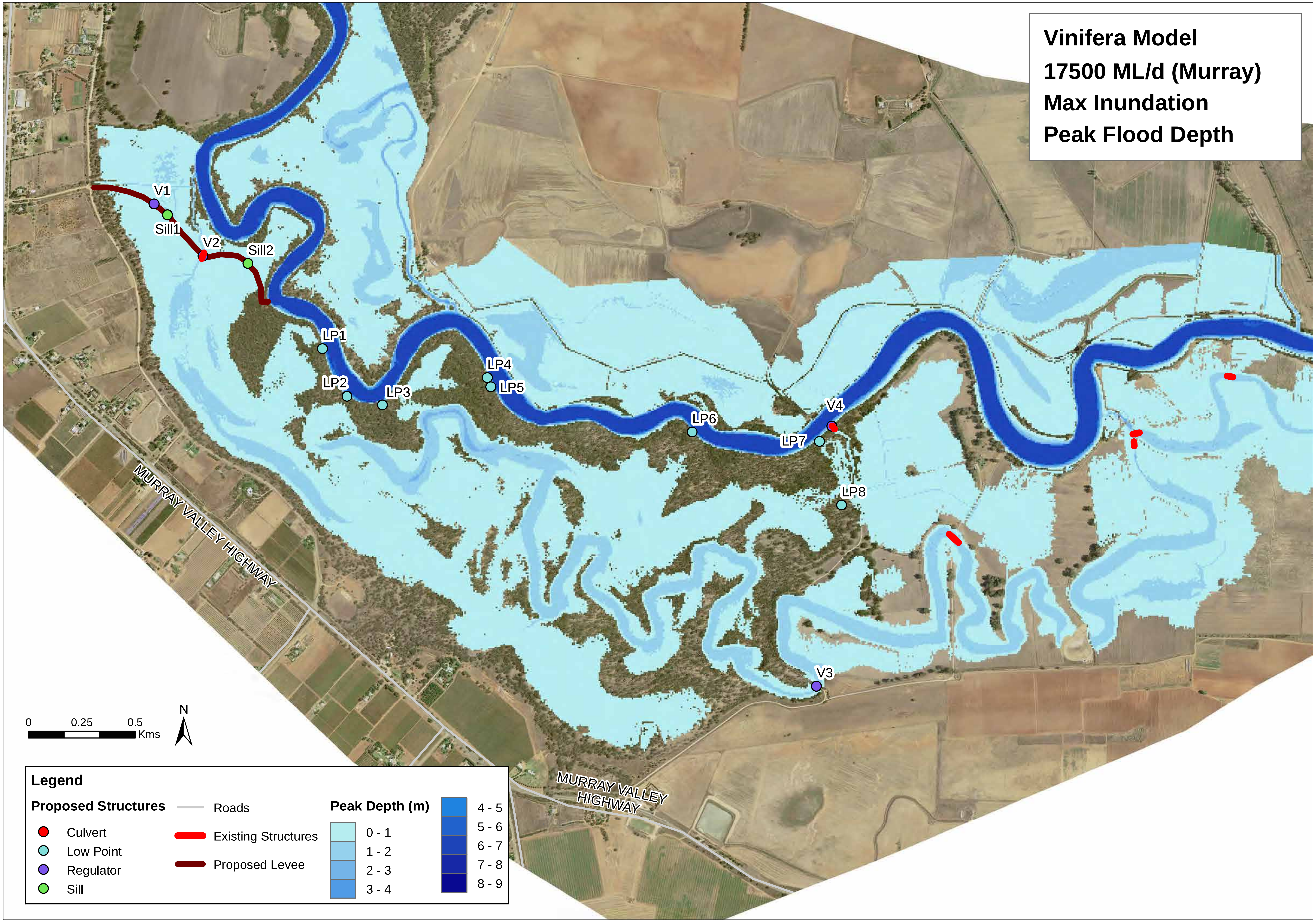


Vinifera Model
10000 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

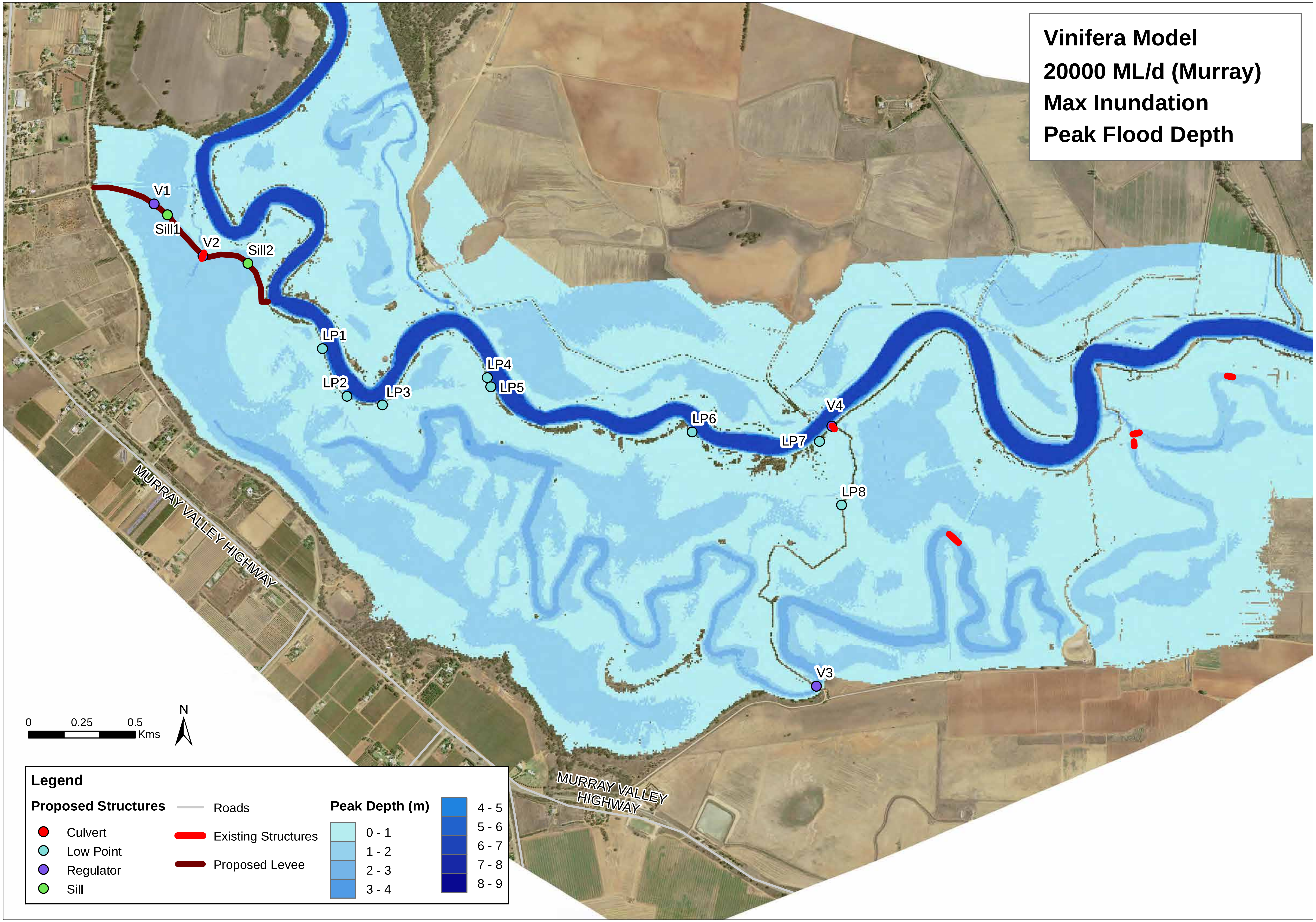


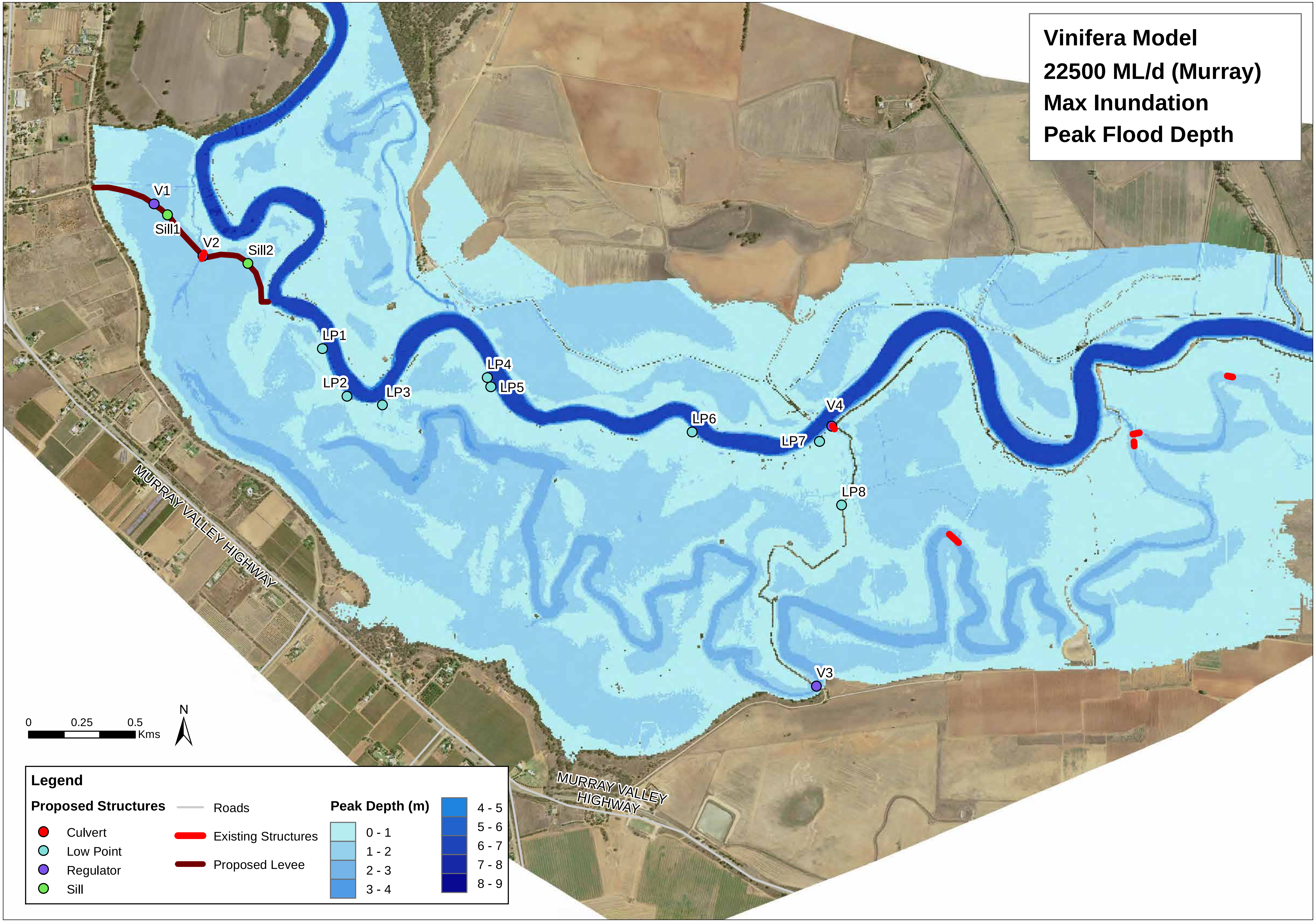
Vinifera Model
12500 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

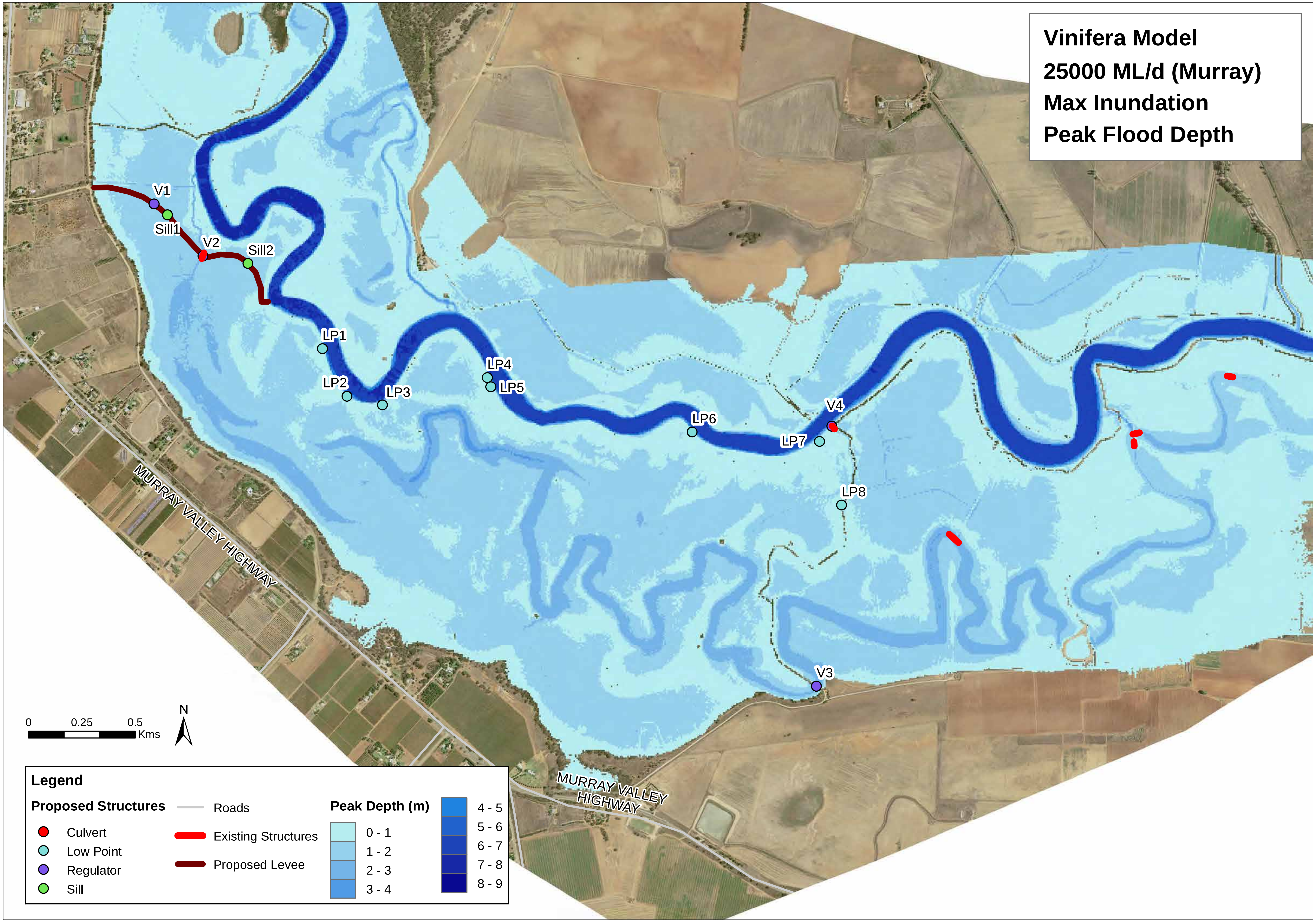

Vinifera Model
15000 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



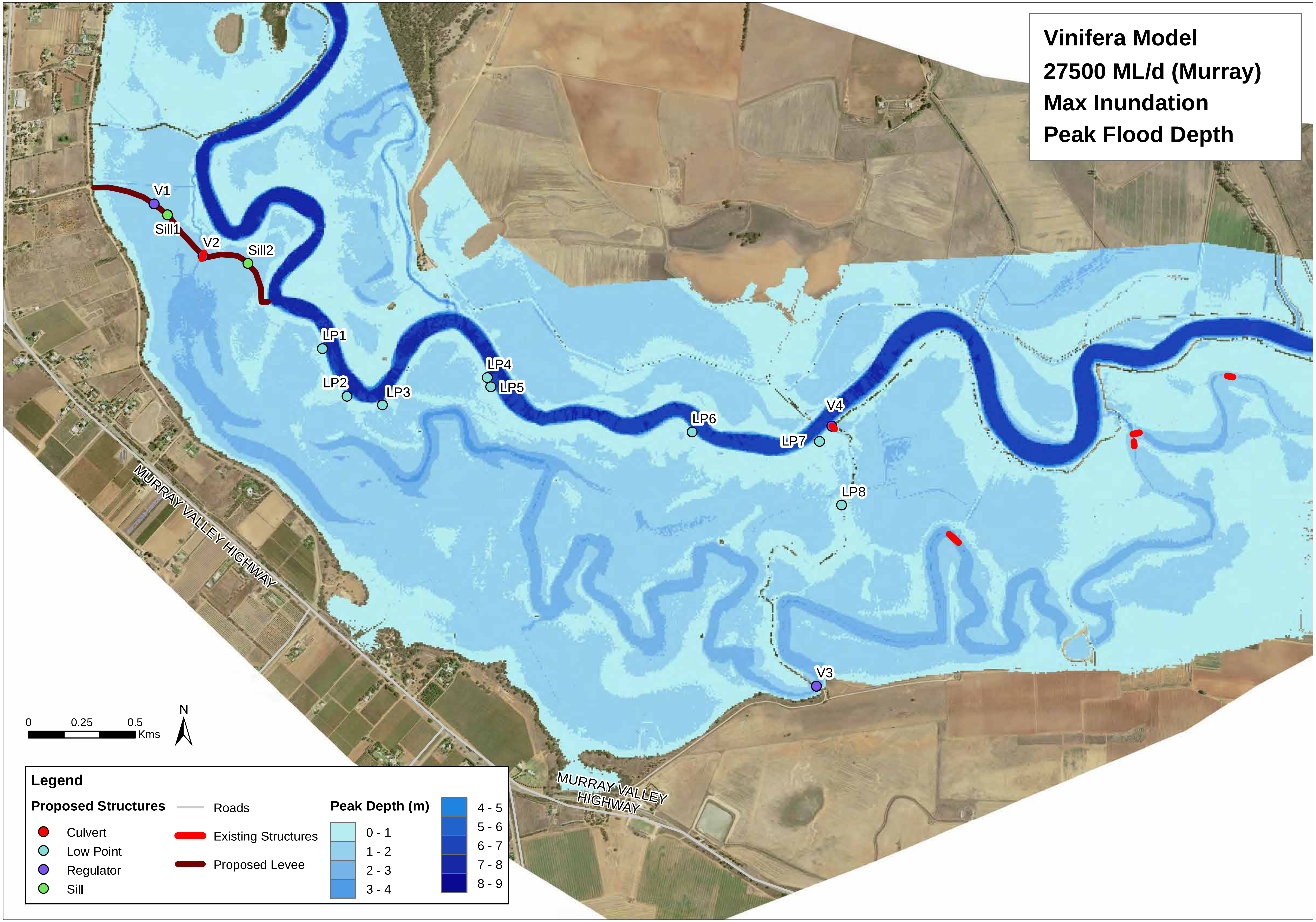
Vinifera Model
17500 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

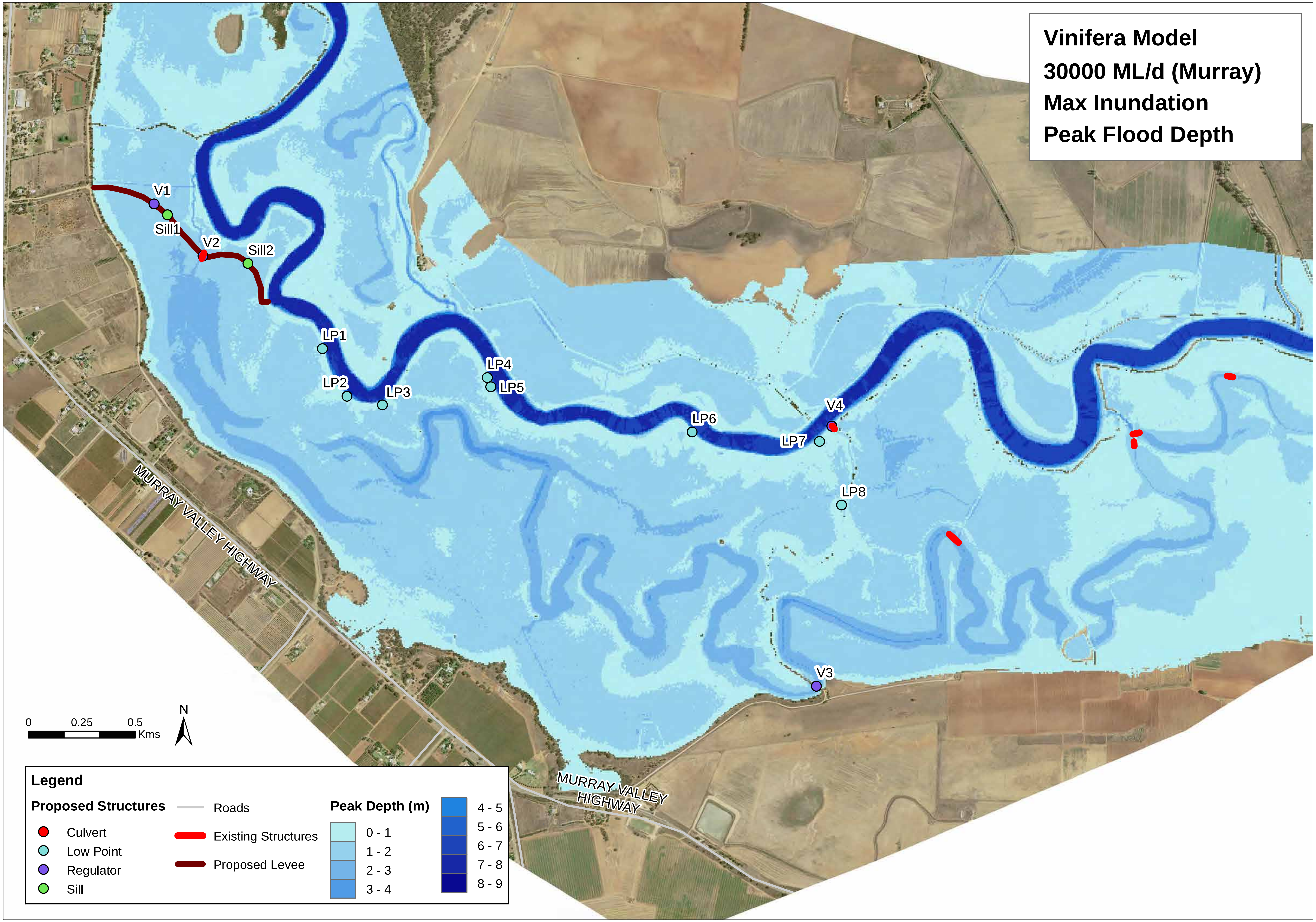

Vinifera Model
20000 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9


Vinifera Model
22500 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9

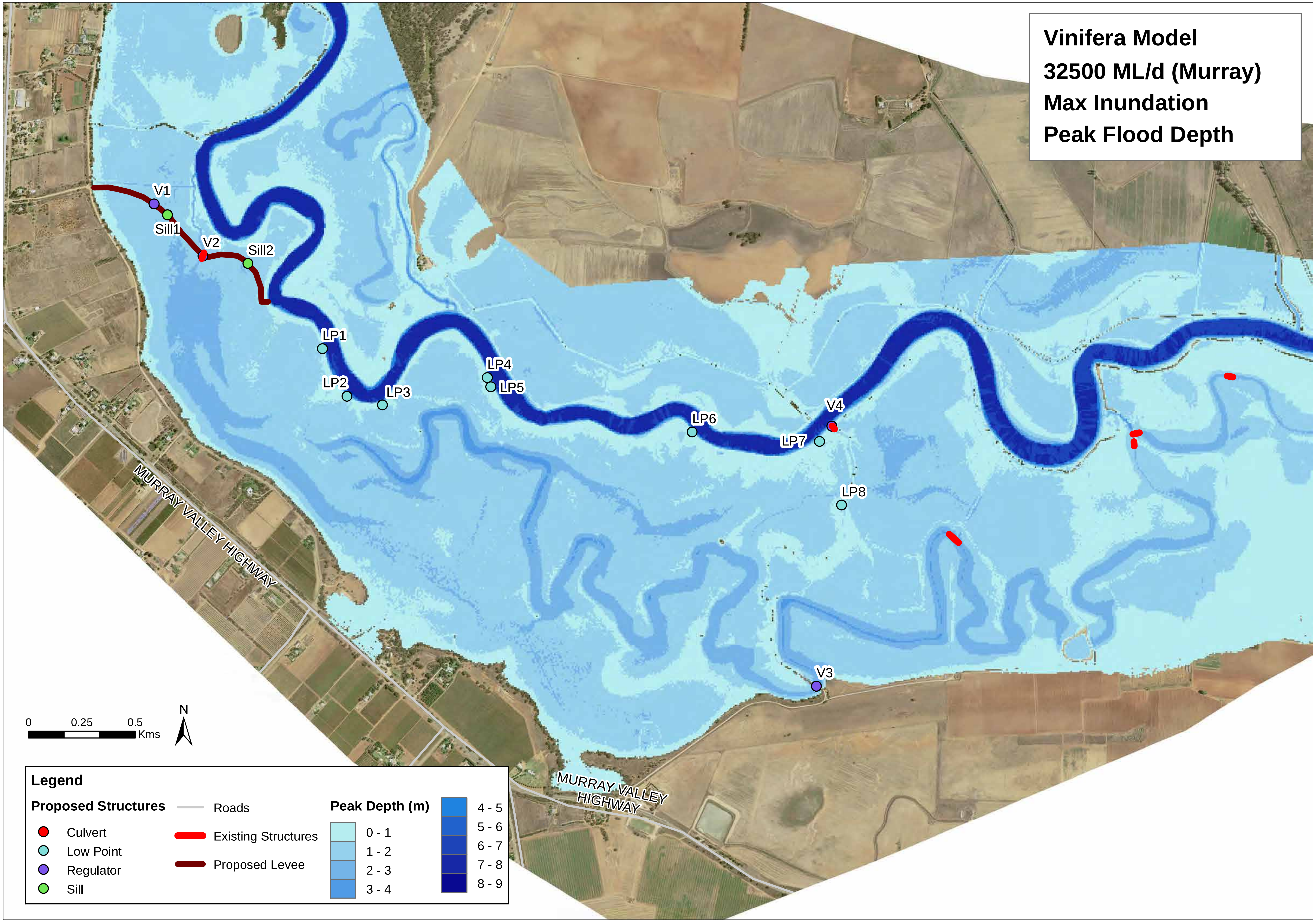


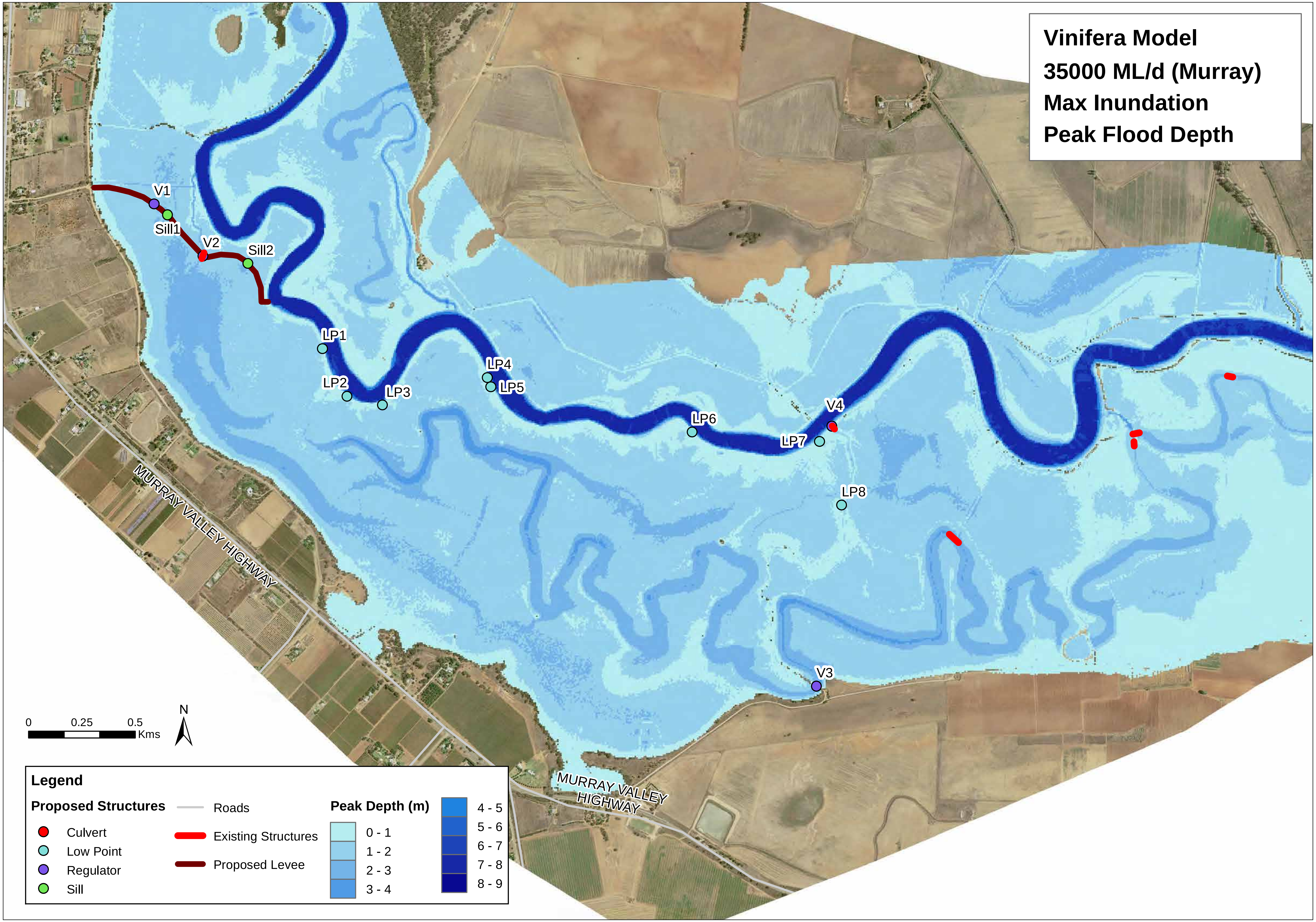
Vinifera Model
25000 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0 0.25 0.5 Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9


Vinifera Model
27500 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9



Vinifera Model
30000 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0 0.25 0.5 Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9


Vinifera Model
32500 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9


Vinifera Model
35000 ML/d (Murray)
Max Inundation
Peak Flood Depth
V1
Sill1
V2
Sill2
LP1
LP2
LP3
LP4
LP5
LP6
LP7
V4
LP8
V3
MURRAY VALLEY HIGHWAY
MURRAY VALLEY HIGHWAY
0
0.25
0.5
Kms
N
Legend
Proposed Structures
Culvert
Low Point
Regulator
Sill
Roads
Existing Structures
Proposed Levee
Peak Depth (m)
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9