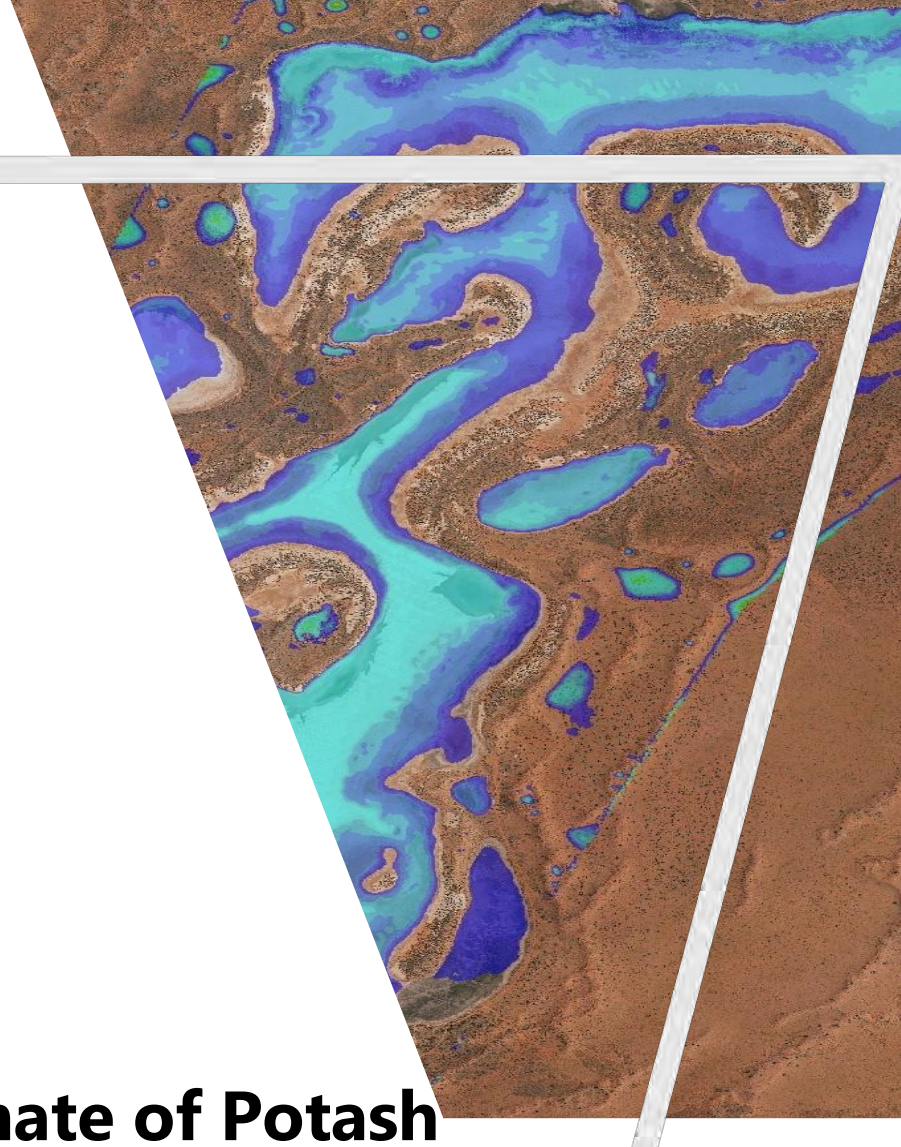

Beyondie Sulphate of Potash Project

Surface Water Assessment

16 April 2018

Level 4, 600 Murray St
West Perth WA 6005
Australia

201012-00663-HY-REP-0001

www.**advisian**.com

Advisian
WorleyParsons Group

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Project No: 201012-00663-HY-REP-0001 – Beyondie Sulphate of Potash Project : Surface Water Assessment

Rev	Description	Author	Review	Advisian Approval	Date
0	Issued for Use	M Heyting	S Atkinson	S Atkinson	16/04/2018

Table of Contents

Executive Summary

Advisian was commissioned by Kalium Lakes to characterise the surface water flooding regime and complete an impact assessment to determine the impact of proposed mining on flood levels and environmentally sensitive fringing vegetation (*Tecticornia Shrublands*) at Ten Mile Lake and Sunshine Lake under operational and closure scenarios. Hydrological and hydraulic models were developed and used to quantify the change in depth and extent of flooding at locations where fringing vegetation has been identified for the 63%, 50%, 20%, 10%, 5%, 2%, 1% Annual Exceedance Probability (AEP) events.

The results show negligible change in flood depths and extents under both operations and closure scenarios for the full range of AEP events. Therefore the proposed mining is expected to have no significant impact on the depth and duration of inundation where fringing vegetation is located.

1 Introduction

1.1 Background

Kalium Lakes Limited (KLL) is undertaking a Feasibility Study at the Beyondie Sulphate of Potash Project (BSOPP). The BSOPP consists of a number of potassium sulphate rich brine deposits hosted within groundwater aquifers in the vicinity of salt lakes. Brine is to be abstracted using trenches and production bores and processed via solar evaporation and purification to produce up to 150,000 tonnes per annum of sulphate of potash (SOP).

Advisian was commissioned by Kalium Lakes to characterise the surface water flooding regime and complete an impact assessment of the proposed mining on environmentally sensitive fringing vegetation (*Tecticornia Shrublands*) at Ten Mile Lake and Sunshine Lake under operational and closure scenarios.

1.2 Scope of Work

The following scope of work was completed:

- Develop 2D model for Sunshine Lake and Ten Mile Lake;
- Develop Hydrology Model to estimate flows for the 63%, 50%, 20%, 10%, 5%, 2%, 1% Annual Exceedance Probability (AEP) events (equivalent to the 1, 2, 5, 10, 20, 50 and 100 year ARI events);
- Simulate flooding using 2D hydraulic modelling under the following scenarios:
    - Existing Conditions;
    - Operations Conditions; and
    - Post Closure
- Map depth and extent of flooding for each of the events and compare across the three scenarios. Assess impacts of the mining operations and post closure landform design on the frequency of inundation at locations with environmentally sensitive vegetation (*Tecticornia Shrublands*) fringing Ten Mile Lake and Sunshine Lake.
- Summary report (this report) presenting the results of the investigation.

1.3 Supplied Data

The following data was supplied for completing this assessment:

- 1m DEM derived from ortho-imagery (metadata provided in Appendix A);

- High resolution Aerial Imagery;
- Vegetation mapping;
- Proposed infrastructure alignments; and
- SRTM topography data.

2 Site Analysis

2.1 Location

The two lakes of interest in this assessment are Ten Mile Lake and Sunshine Lake. The location of the lakes is presented in Figure 2-1. Ten Mile Lake is located approximately 70 km east of Kumarina Roadhouse in the Shire of Wiluna, while Sunshine Lake is located approximately another 30 km to the north east.

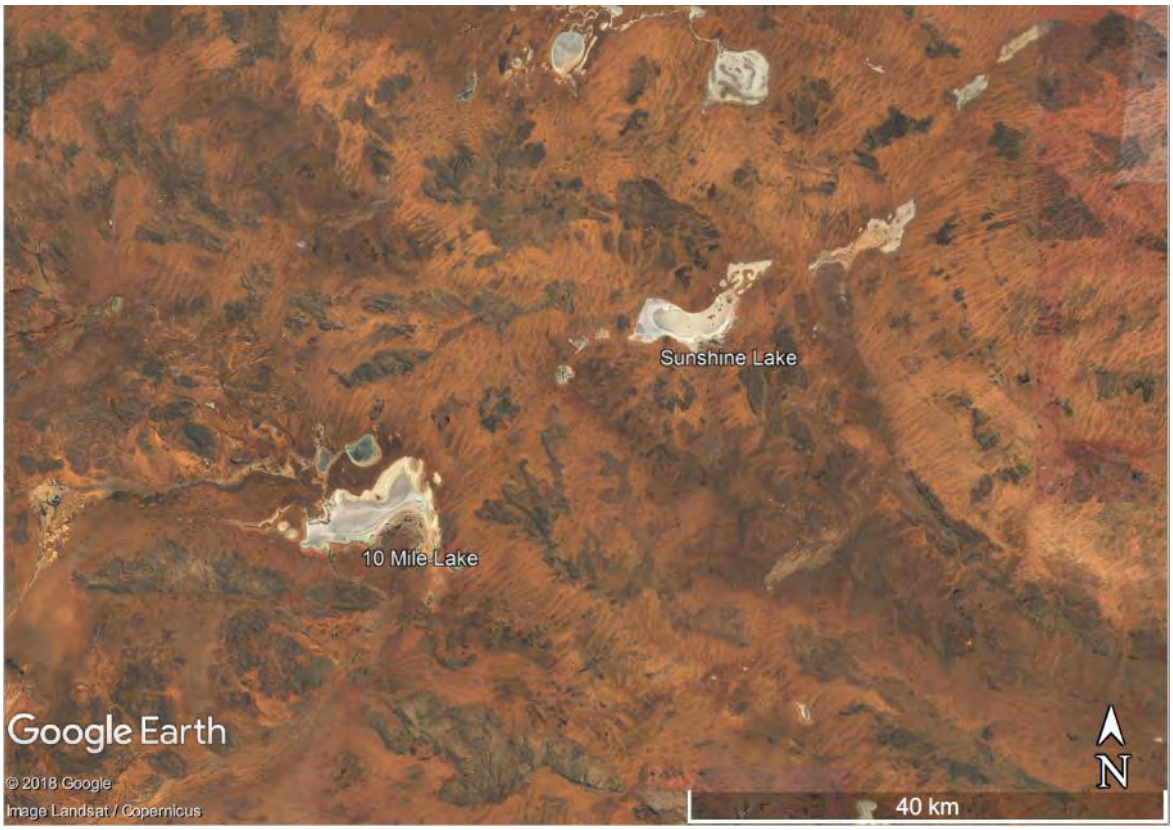


Figure 2-1: Location of Ten Mile Lake and Sunshine Lake

2.2 Proposed infrastructure

Trenches will be installed on Ten Mile and Sunshine lakes to abstract brine (groundwater) which is then piped to a processing facility north-east of Ten Mile lake. The brine processing includes the use to evaporation ponds with salt (predominantly NaCL) produced as a waste stream. The salt will be harvested from the ponds and stored in waste stockpiles on Ten Mile Lake. The proposed locations of the trenches are presented in Figure 2-2 and Figure 2-3 and extend for 22.2 km at Ten Mile Lake and 29.9 km at Lake Sunshine. The proposed trenches are expected to be approximately 3 m wide with a depth of up to 6 m. The waste salt stockpile is estimated to have an area of 1.45 km^2 at the end of mine life. The proposed location of this waste stockpile is shown in Figure 2-2.

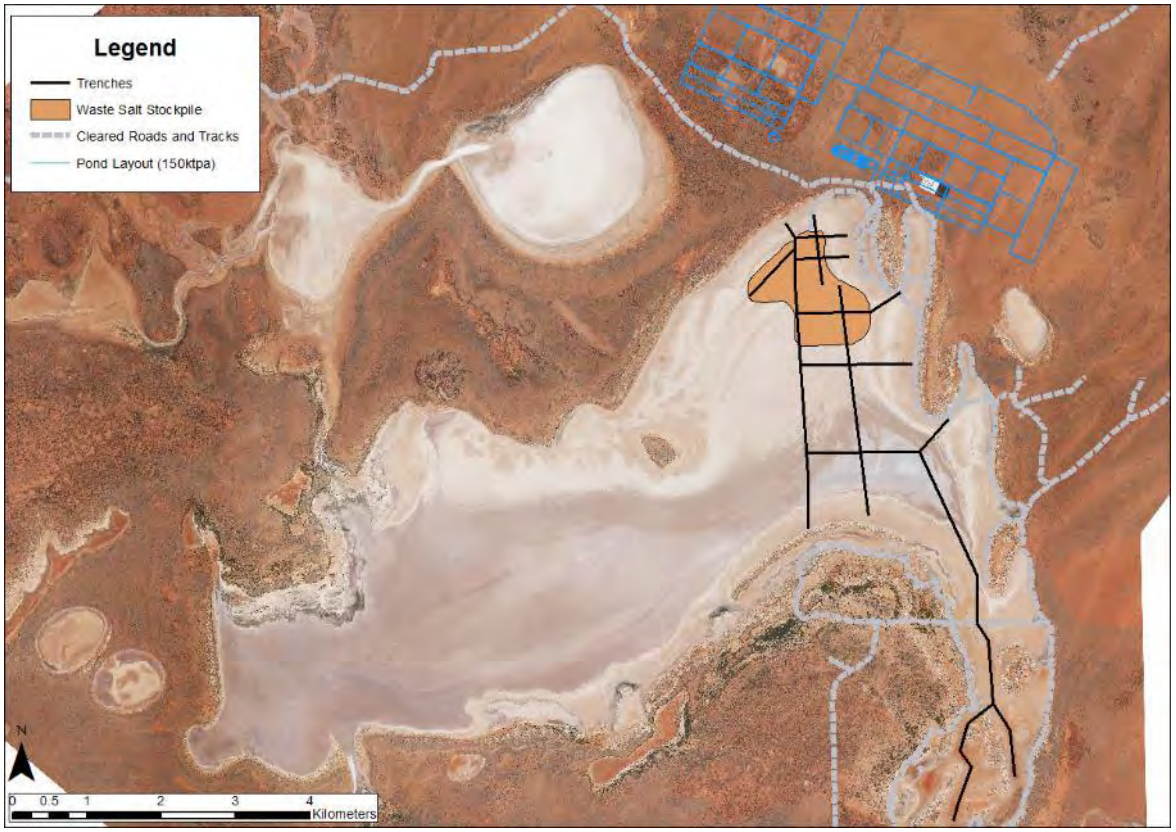


Figure 2-2: Proposed infrastructure at Ten Mile Lake

Figure 2-3: Proposed infrastructure at Sunshine Lake

3 Hydrology

Ten Mile Lake and Sunshine Lake have individual catchments that sit within the upper reaches of a much larger system. In the geological past, it is considered that the catchments used to be linked by a large palaeo-drainage system. The current landscape is now a function of the low rainfall and high evaporation rates within the region.

The catchment areas associated with Ten Mile Lake and Sunshine Lake are shown in Figure 3-1 and catchment details provided in Table 3-1. The ephemeral creeks associated with these catchments flow into the lake systems. Analysis of aerial imagery and topographic survey data suggests there is significant storage within the catchment areas, which limits the volume of runoff reaching the lakes. The storages are in the form of parallel dune systems and salt pans, as shown in Figure 3-2. Surface water is observed to be present on the lakes for periods of time following heavy rainfall events.

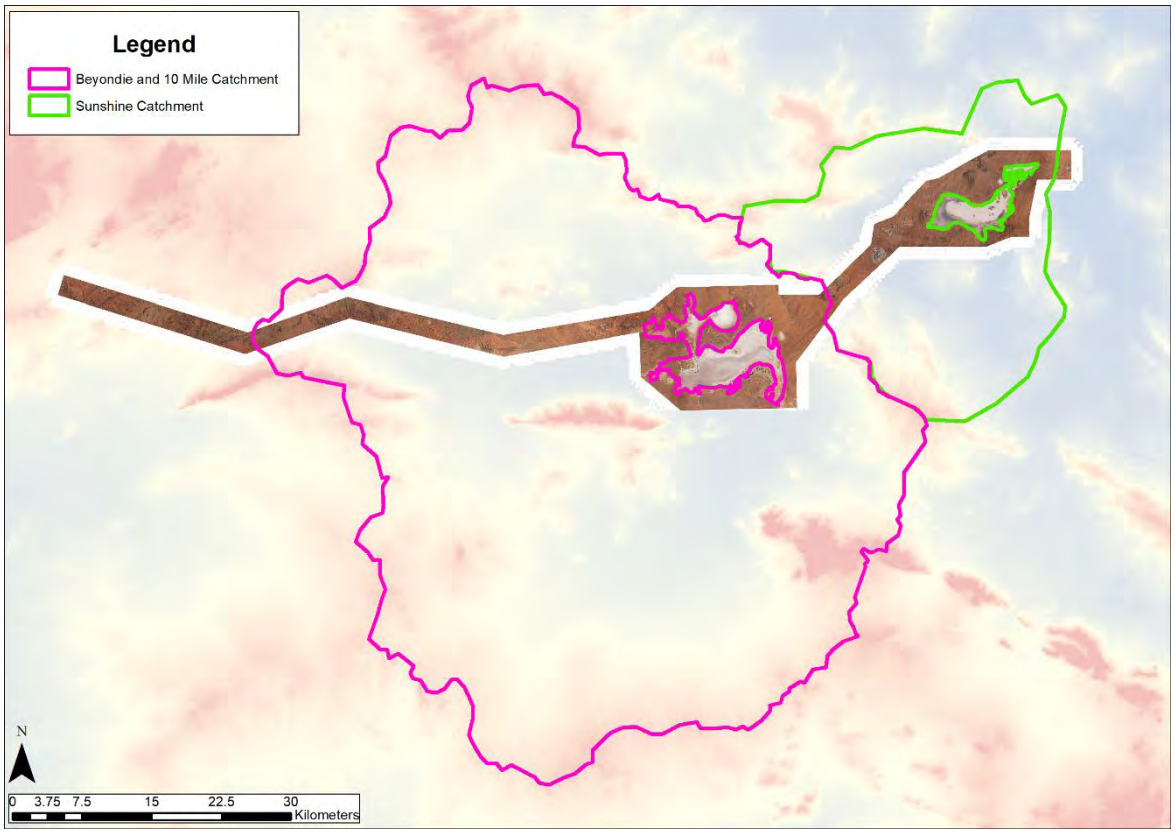


Figure 3-1: Catchment areas

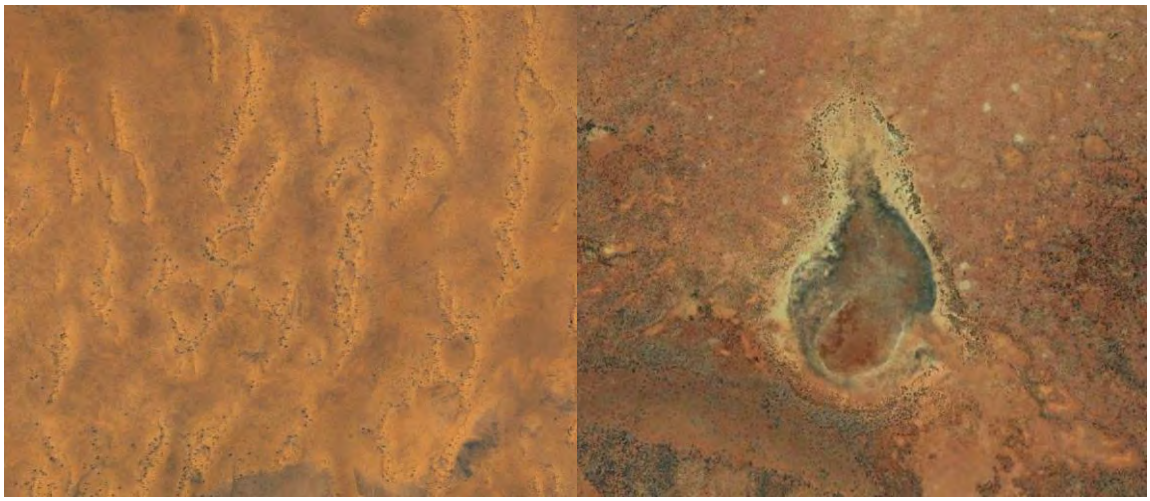


Figure 3-2: Examples of parallel dunes and salt pans within the catchment

Table 3-1: Catchment details

Catchment ID	Catchment Area (km²)	Catchment Centroid		Mainstream	
		Latitude (°S)	Longitude (°E)	Length (km)	Equal Area Slope (m/km)
Ten Mile and Beyondie Lake	3,160	24.8	120.2	61	0.80
Sunshine Lake	744.8	24.6	120.5	27	2.56

4 Modelling

4.1 Methodology

The following methodology was used to model flows into the Ten Mile Lake and Sunshine Lake systems, estimate associated flood levels and map flood extents under existing conditions:

- Estimate the likely volumes of flow entering the lakes for the 63%, 50%, 20%, 10%, 5%, 2%, 1% AEP events using:
  - available streamflow (if available);
  - regional peak flow estimation methods (if available); and/or
  - comparison of rainfall records and anecdotal evidence of flooding observed on site.
- Develop a simplified rainfall-runoff model and calibrate by varying the loss model (initial loss, runoff coefficient) to produce volumes that are similar to the target volumes;

- Develop a RORB rainfall-runoff model and use the runoff coefficients to produce flow hydrographs into the lakes for the 63%, 50%, 20%, 10%, 5%, 2%, 1% AEP events;
- Develop 2D TUFLOW models for each lake and use inflow hydrographs and direct rainfall to simulate flooding for the 63%, 50%, 20%, 10%, 5%, 2%, 1% AEP events; and
- Map the extent of flooding in each of the lakes for the range of flood events.

4.2 Target Volumes for Model Calibration

Flood frequency analysis of streamflow data is used when available to estimate the flow entering the lake systems for the 63%, 50%, 20%, 10%, 5%, 2%, 1% AEP events. However, this is not possible at Ten Mile Lake and Sunshine Lake as there are no streamflow gauging data available in or in proximity to the lake catchments.

In the absence of streamflow data, regional peak flow estimation methods can also be used to estimate the volume of flow to the lake. However, as the lake catchments fall within the arid interior zone, where there is limited guidance from literature, this estimation method was not possible. Peak flow estimates would also not be suitable as there is significant storage within the catchment which captures large volumes of runoff. Therefore, the catchment does not behave in a typical manner and only produces flows in large events.

A combination of anecdotal evidence, data available from the Bureau of Meteorology (BoM) and analysis of the aerial imagery was therefore used to estimate the volume of water entering the lakes for the 63%, 50%, 20%, 10%, 5%, 2%, 1% AEP events. The methodology used is described below.

4.2.1 Anecdotal Evidence of Flooding

Anecdotal evidence was then used to provide guidance on the resultant volumes of runoff reaching the lakes during different AEP rainfall events. For the more regular events, it was noted that there is generally no flow in creeks and the surface water on lakes was primarily due to direct rainfall.

Approximately 60 mm of rainfall fell over a 48-hour period during a rainfall event in late January 2018. Based on the IFD data in Table 4-1 this is equivalent to between a 50% and 20% AEP event (equivalent to 2yr and 5yr ARI event). No creek flow was seen entering the lakes and surface water depth on Sunshine Lake was estimated to be less than approximately 0.1 m. Topographic survey data was used to estimate the surface water levels and extents associated with the 50% and 20% AEP event on Sunshine Lake (Figure 4-1). The peak water level was estimated to be approximately 531.7 mAHD.

Table 4-1: IFD data for Ten Mile and Sunshine Lakes

	Annual Exceedance Probability / Average Recurrence Interval						
	63.20%	50%	20%	10%	5%	2%	1%
Duration	1yr	1.44yr	4.88yr	10yr	20yr	50yr	100yr
1 min	1.23	1.47	2.28	2.88	3.49	4.34	5.04
2 min	2.07	2.49	3.88	4.9	5.98	7.57	8.9
3 min	2.88	3.46	5.39	6.81	8.29	10.5	12.3
4 min	3.62	4.34	6.75	8.52	10.4	13	15.2
5 min	4.29	5.14	7.99	10.1	12.2	15.3	17.8
10 min	6.81	8.17	12.7	15.9	19.3	24	27.7
15 min	8.53	10.2	15.9	20	24.1	30	34.6
30 min	11.7	14	21.8	27.4	33.2	41.3	47.9
1 hour	15	18	28	35.3	42.9	53.7	62.6
2 hour	18.6	22.3	34.6	43.8	53.5	67.5	79.2
3 hour	20.9	25	39	49.5	60.5	76.5	89.9
6 hour	25.5	30.5	47.7	60.7	74.5	94.2	111
12 hour	31	37.2	58.5	74.6	91.7	115	135
24 hour	37.1	44.7	70.9	90.7	112	139	161
48 hour	42.9	52.1	83.5	107	132	163	188
72 hour	45.8	55.8	89.9	116	143	176	201
96 hour	47.4	57.9	93.6	120	149	183	209
120 hour	48.5	59.3	95.9	123	153	187	214
144 hour	49.3	60.2	97.4	125	155	190	217
168 hour	49.9	60.9	98.4	127	156	192	219

Figure 4-1: Flooding of Sunshine Lake during the estimated 50% to 20% AEP rainfall event

4.2.2 Estimated Flood Levels and Extents

Analysis of aerial imagery, topographic survey data, IFD and anecdotal evidence made it possible to estimate volumes entering the lakes. This was achieved for the 63%, 50%, 20%, 10%, 5%, 2%, 1% AEP events as follows:

- Use aerial imagery and observed water staining to estimate the bankfull depths which are generally representative of the 50% AEP (2 year ARI) flood extents;
- Interpolate and extrapolate water depths using the 50% AEP depths and the depths associated with the observed 50% to 20% AEP event described in Section 4.2.1; and
- Use topographic survey data and estimated water depths to map flood levels and extents.

Table 4-2 and Table 4-3 present the resulting estimated flood levels at Ten Mile and Sunshine Lakes respectively, with the corresponding flood extents mapped in Figure 4-2 and Figure 4-3.

4.2.3 Target Volumes

The target volumes for rainfall-runoff model calibration were estimated using the topographic survey data and presented in Table 4-2 and Table 4-3 for Ten Mile and Sunshine Lakes respectively.

Table 4-2: Estimated Flood levels and volumes at Ten Mile Lake under existing conditions

AEP	Estimated Level (mAHD)	Volume (m^3)
63%	558.9	954,442
50%	559	2,577,750
20%	559.2	6,868,116
10%	559.4	12,122,441
5%	559.6	18,192,215
2%	559.8	25,029,770
1%	560	32,438,991

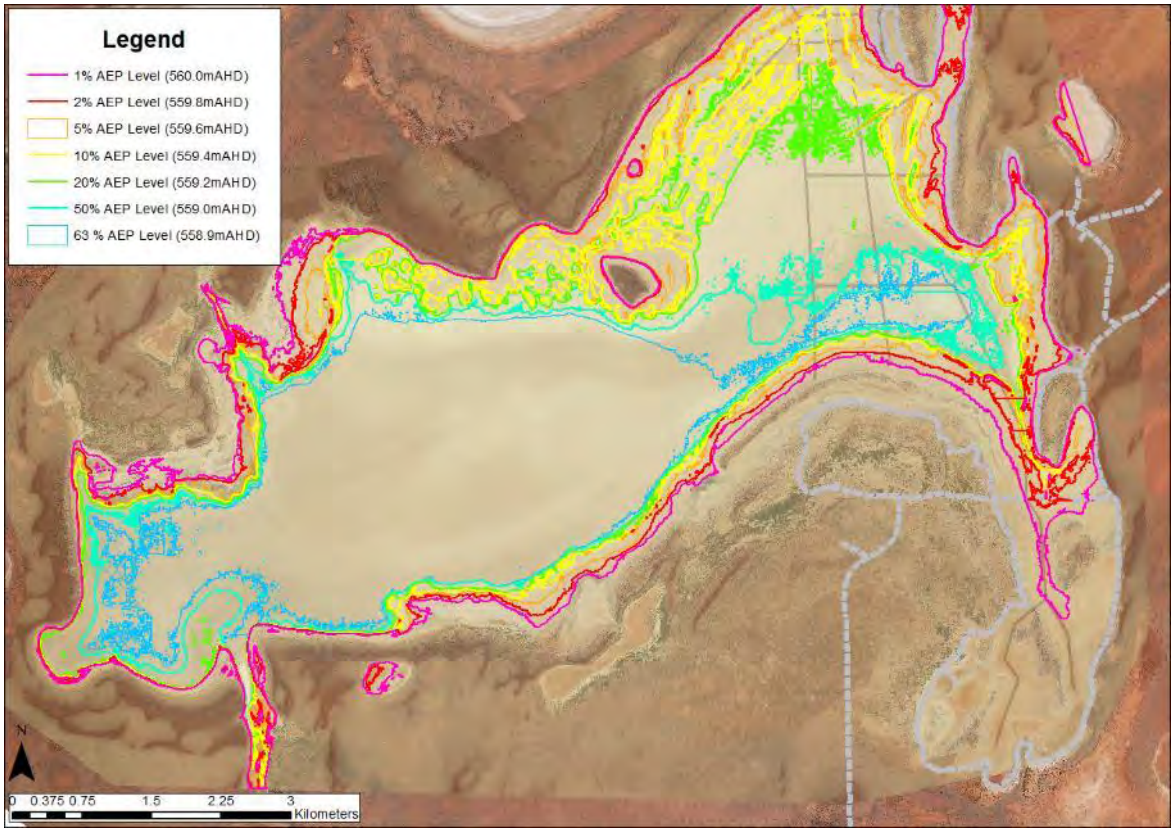


Figure 4-2: Existing conditions: Flood levels estimated for different storm events at Ten Mile Lake

Table 4-3: Estimated Flood levels and volumes at Sunshine Lake under existing conditions

AEP	Estimated Level (mAHD)	Volume (m^3)
63%	531.6	398,965
50%	531.7	1,101,984
20%	531.8	2,621,714
10%	532	6,609,357
5%	532.2	11,221,074
2%	532.4	16,433,500
1%	532.6	21,897,904

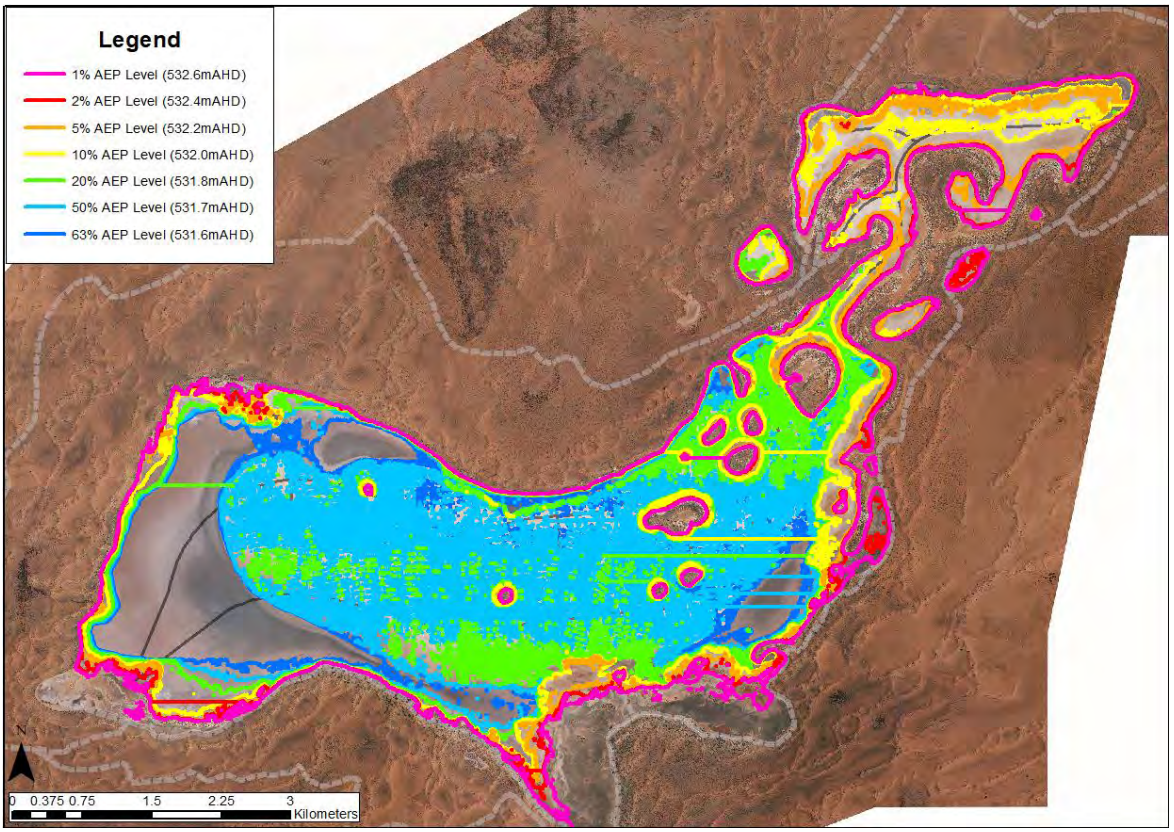


Figure 4-3: Existing conditions: Flood levels estimated for different storm events at Ten Mile Lake

4.3 Loss Model Estimation

A simplified rainfall-runoff model was developed and calibrated by varying the loss model to produce volumes that are similar to the target volumes.

The model for each lake comprised a single catchment area with an initial loss (IL) and runoff coefficient (RoC) which were varied. Flows from this catchment then feed into a lake area with 100% rainfall-runoff. The model setup is depicted in Figure 4-4. This approach is appropriate for estimation of runoff volumes reporting to the lake.

The resulting catchment runoff coefficients (IL and RoC) are presented in Table 4-4.

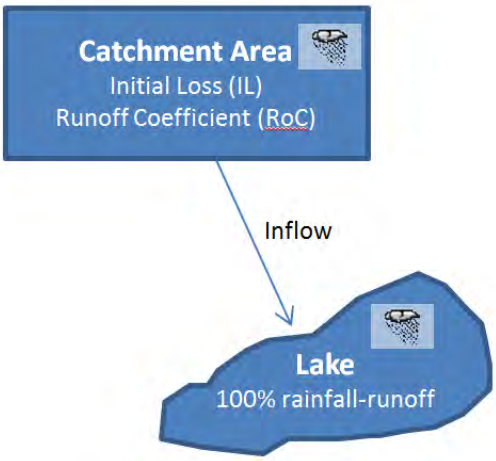


Figure 4-4: Simplified rainfall-runoff model setup for loss model estimation

Table 4-4: Loss models adopted for the catchments associated with Ten Mile and Sunshine Lakes

AEP	Ten Mile Lake		Sunshine Lake	
	Initial Loss (IL) (mm)	Runoff Coefficient (RoC)	Initial Loss (IL) (mm)	Runoff Coefficient (RoC)
63%	25	0	25	0
50%	25	0.01	25	0
20%	25	0.02	25	0.01
10%	25	0.03	25	0.05
5%	25	0.05	25	0.09
2%	25	0.06	25	0.11
1%	25	0.07	25	0.13

4.4 RORB Modelling

Runoff routing models for the Ten Mile and Sunshine Lake catchments were developed using RORB software. For this study this hydrological model served the following purposes:

- To apply estimates catchment loss models to estimate peak flows in ephemeral creeks reporting to the lakes for the 63%, 50%, 20%, 10%, 5%, 2%, 1% AEP events; and
- To generate creek flow hydrographs for the 63%, 50%, 20%, 10%, 5%, 2%, 1% AEP events.

The Ten Mile and Sunshine Lake catchment areas were divided into similar sized sub-catchments and catchment nodes and stream networks mapped using topographic contour data and aerial imagery. The resulting RORB catchment areas and stream networks are shown in Figure 4-5 and Figure 4-6 respectively. The loss models in Table 4-4 were applied and the models ran to produce flow hydrographs.

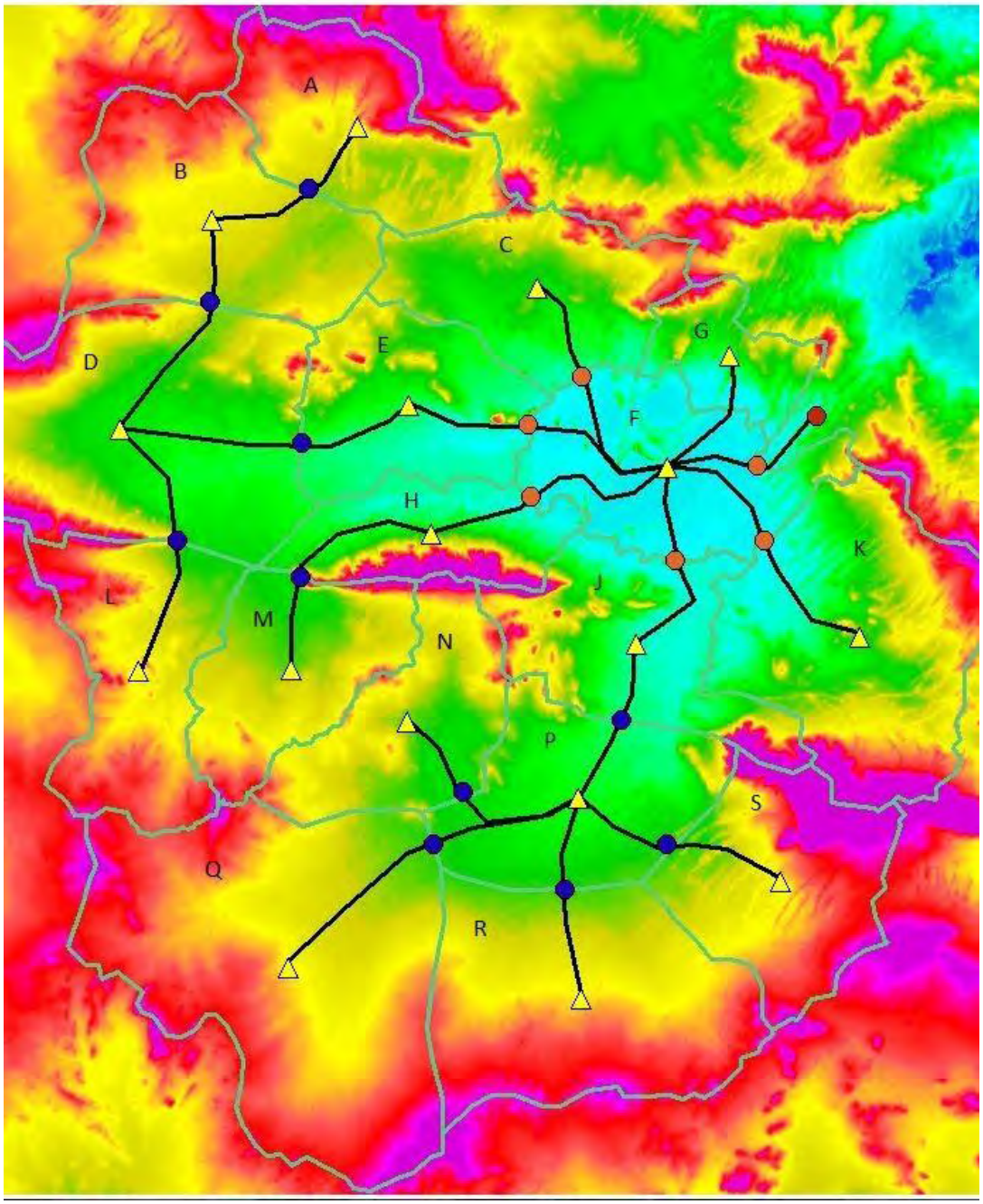


Figure 4-5: RORB model set up for Ten Mile Lake

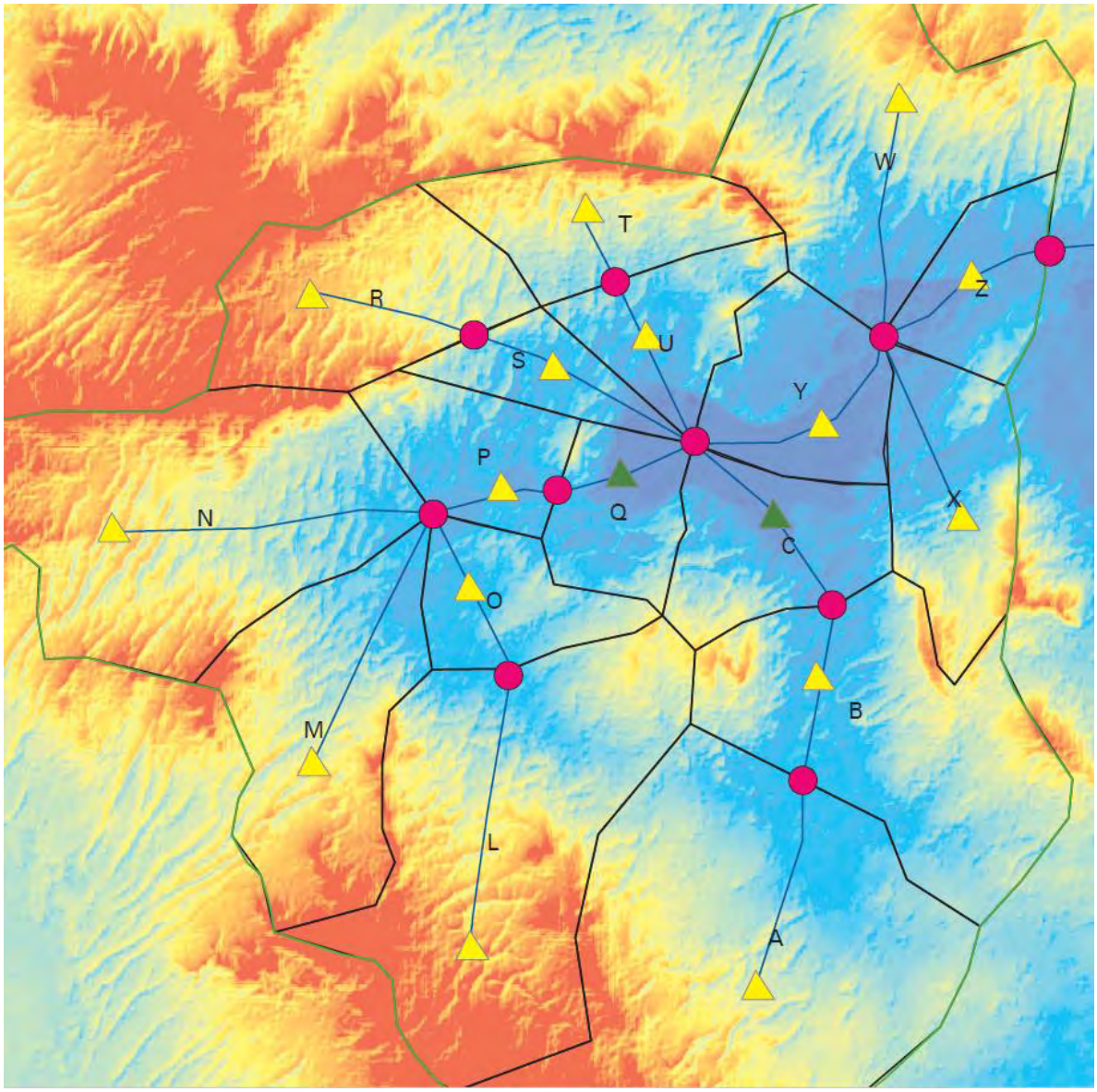


Figure 4-6: Sunshine Lake RORB model

4.5 2D Hydraulic Modelling

Two-Dimensional (2D) hydraulic modelling of each lake area under existing conditions was completed using the modelling software package TUFLOW (version: TUFLOW.2016-03-AE-w64). The software allowed for the estimation of time varying flood extents, depths and velocities across the modelled 2D domain for the 63%, 50%, 20%, 10%, 5%, 2%, 1% AEP events.

4.5.1 Model Set Up

Two separate models were set up to model Sunshine Lake and the Ten Mile lake system. The following inputs and parameters were applied to the 2D models:

- 10 m grid size resolution which provided sufficient resolution to analyse the volume and level of water within the lake systems. The modelling was not sensitive to the grid size when tested at a finer resolution;
- A uniform manning's n value of 0.03 was used for the lake areas;
- Runoff losses presented in Section 4.3; and
- Flow hydrographs extracted from the RORB models and applied as inflows at the TUFLOW model boundaries.

The extent of the TUFLOW models adopted for the Sunshine Lake and the Ten Mile Lake systems are shown in Figure 4-7 and Figure 4-8 respectively.

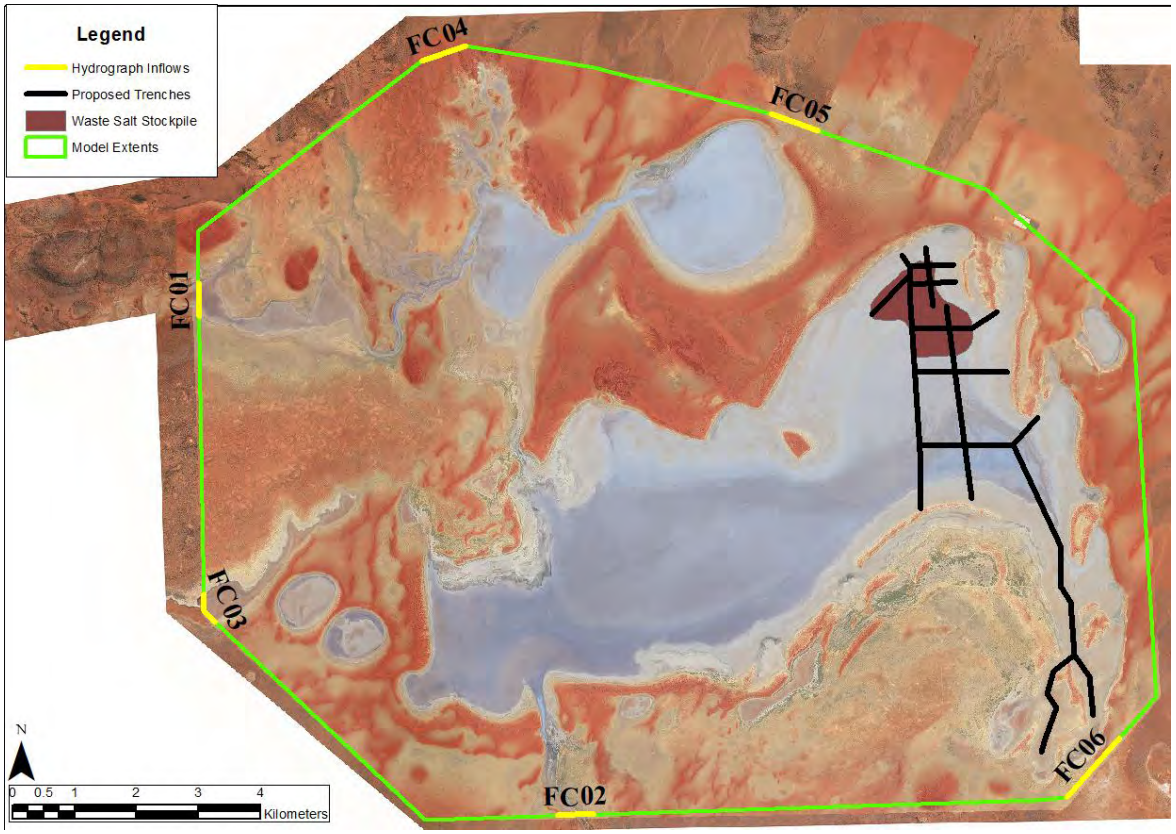


Figure 4-7: Ten Mile Lake TUFLOW Model

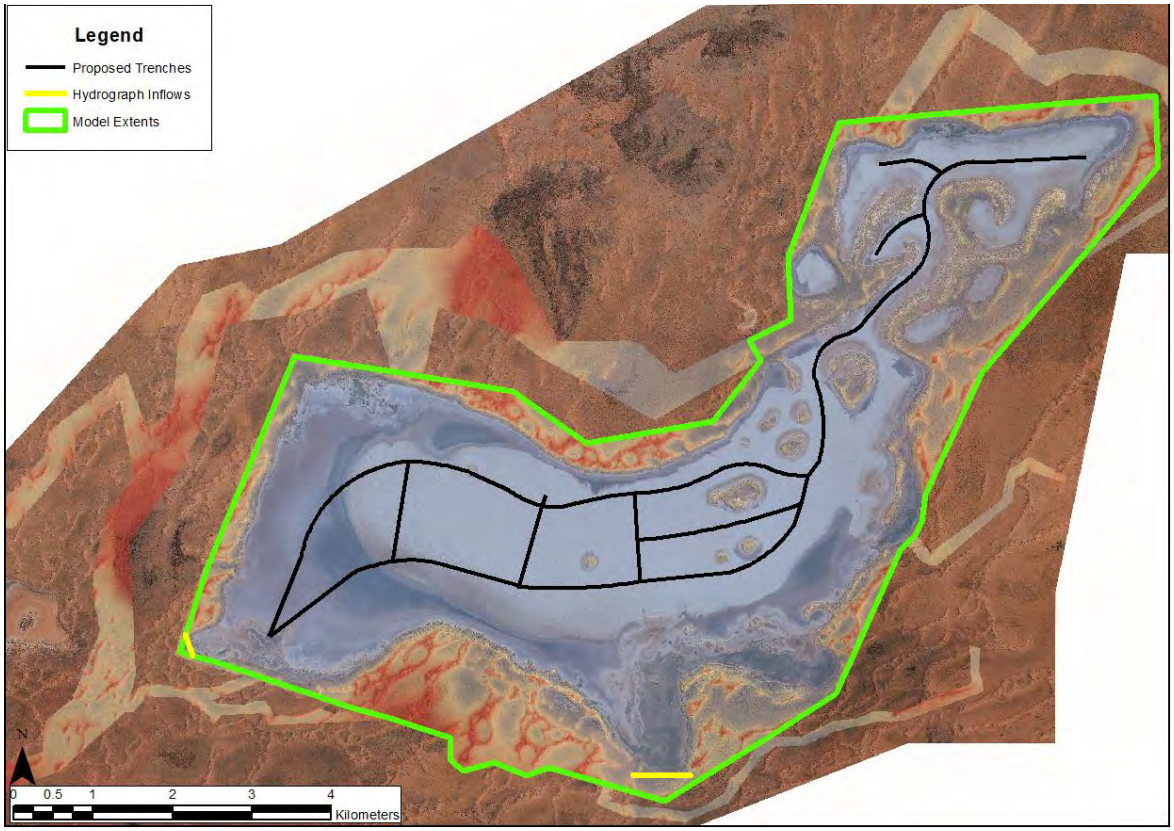


Figure 4-8: Sunshine Lake TUFLOW Model

4.5.2 Model Results: Existing Conditions

The TUFLOW models were run for the 63%, 50%, 20%, 10%, 5%, 2%, 1% AEP events and the depth and extent of flooding in the lakes presented for each scenario in Appendix B.

5 Impact Assessment

The TUFLOW models were used to assess the potential impacts mining operations may have on the environmentally sensitive vegetation fringing the lakes during operations and following mine closure.

The vegetation of primary interest is the *Tecticornia Shrublands* and is found at both Ten Mile Lake and Lake Sunshine (Figure 5-1 and Figure 5-2). The vegetation tends to be found on and above a specific contour line. For Sunshine Lake, the vegetation can be found on and above the contour level of 531.8 mAHD and for Ten Mile Lake this level is 559.2 mAHD. Both these levels are consistent with the 20 % AEP flood event levels presented in Section 4.2.2.

During mining operations, trenches will be installed in both lakes to extract brine for processing. The trenches will be approximately 3 m wide with a depth of up to 6 m. They will extend for 22.2 km for Ten Mile Lake and 29.9 km for Lake Sunshine. This results in total of volume of 398,900 m^3 and 538,400 m^3 of material removed from Ten Mile Lake and Sunshine Lake respectively.

At closure the trenches will be backfilled to natural surface. A waste salt stockpile will exist in Ten Mile Lake only.

To test the impact proposed mining may have on fringing vegetation, the TUFLOW model was amended as follows and 63%, 50%, 20%, 10%, 5%, 2%, 1% AEP events simulated:

- ***Operations Scenario:*** add all proposed trenches in the TUFLOW model DEMs for each lake. No waste salt stockpile present on Ten Mile Lake; and
- ***Closure Scenario:*** Amend the Ten Mile Lake TUFLOW model DEM to include full extent of waste salt stockpile. All trenches in both lakes will be backfilled to natural surface. So the Sunshine Lake will return to pre-development conditions. Therefore only Ten Mile Lake will be modelled to assess impacts at closure.

It is recognised that during operations there may be both trenches and part of the salt waste stockpile present. The operations and closure scenarios represent the cases with increased (maximum) lake storage and reduced (minimum) lake storage respectively. Therefore the two most extreme scenarios have been tested to assess impacts on fringing vegetation.

The resulting depth and extent of flooding for each scenario and each of the AEP events were then compared with the existing conditions modelling results presented in Section 4.5.2. The resulting change in final standing flood level in each lake are presented in Table 5-1 and flood difference maps showing the change in flood depths for each AEP presented in Appendix C. In almost all areas, there is almost no change in flood levels as shown in Figure 5-3. The only noticeable differences in flood levels were observed in the south-east corner of Ten Mile lake, where localised surface runoff drains into the lake (Figure 5-4). The results indicate a maximum reduction in flood water levels of approximately 0.06m in this area.

The results of modelling show negligible change in flood depths and extents under both operations and closure scenarios for the full range of AEP events at both lakes. Therefore the proposed mining is expected to have negligible impact on the depth and duration of inundation where fringing vegetation is located.

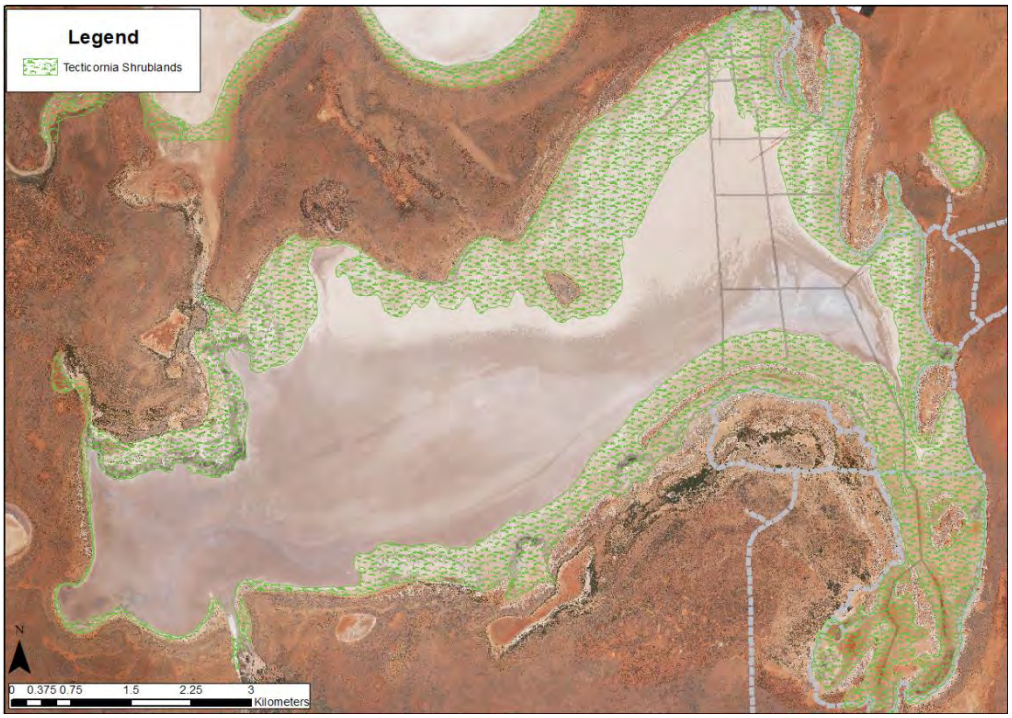


Figure 5-1: Tecticornia Shrublands at Ten Mile Lake

Figure 5-2: Tecticornia Shrublands found at Sunshine Lake

Table 5-1: Change in final standing flood level as a result of proposed mining (operational and closure scenarios)

Lake	Design Event (AEP)	Existing Water Level (mAHD)	Operations Water Level (mAHD)	Operations Difference (m)	Closure Water Level (mAHD)	Closure Difference (m)
Sunshine Lake	1%	532.36	532.35	-0.01	-	
	2%	532.20	532.18	-0.02	-	
	5%	532.09	532.07	-0.02	-	
	10%	531.93	531.91	-0.02	-	
	20%	531.92	531.90	-0.02	-	
	50%	531.73	531.67	-0.06	-	
	63%	531.69	531.62	-0.07	-	
Ten Mile Lake	1%	559.88	559.87	-0.01	559.91	+0.03
	2%	559.60	559.59	-0.01	559.62	+0.02
	5%	559.45	559.44	-0.01	559.46	+0.01
	10%	559.21	559.20	-0.01	559.22	+0.01
	20%	559.12	559.10	-0.02	559.11	+0.01
	50%	559.00	558.99	-0.01	559.00	0
	63%	558.96	558.94	-0.02	558.96	0

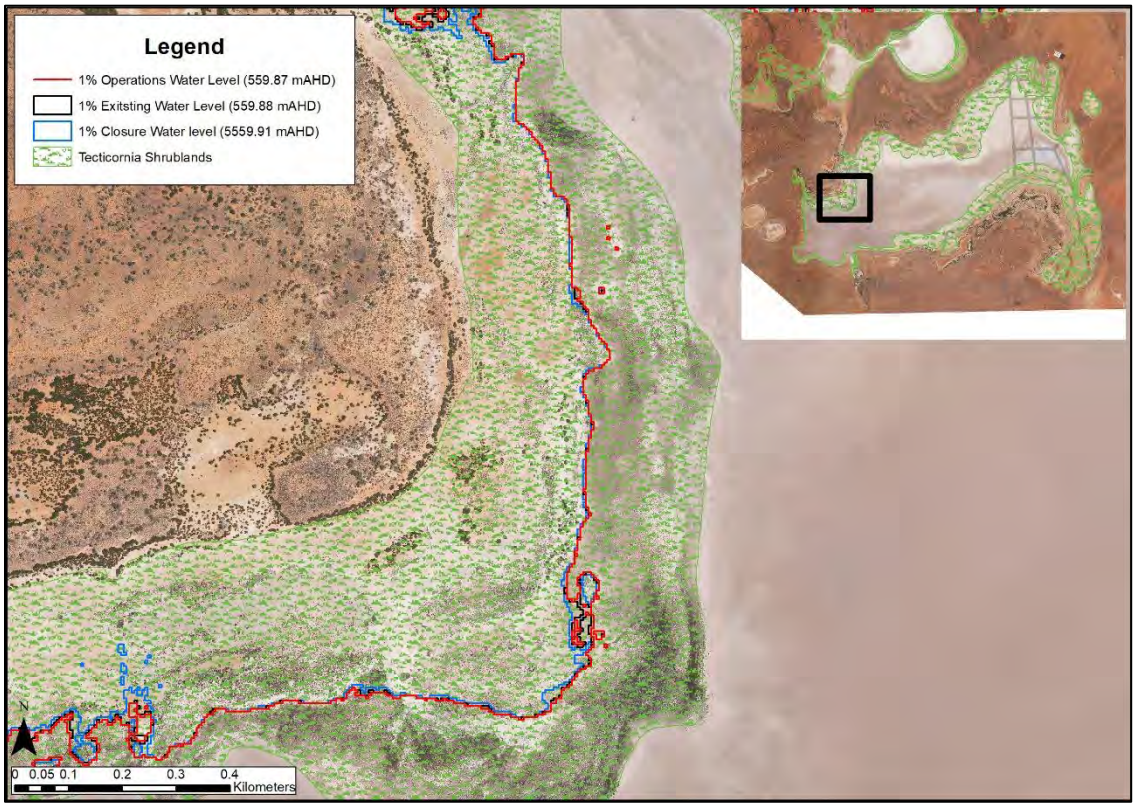


Figure 5-3: Flood extents map showing the change in extents where fringing Tecticornia Shrublands is located

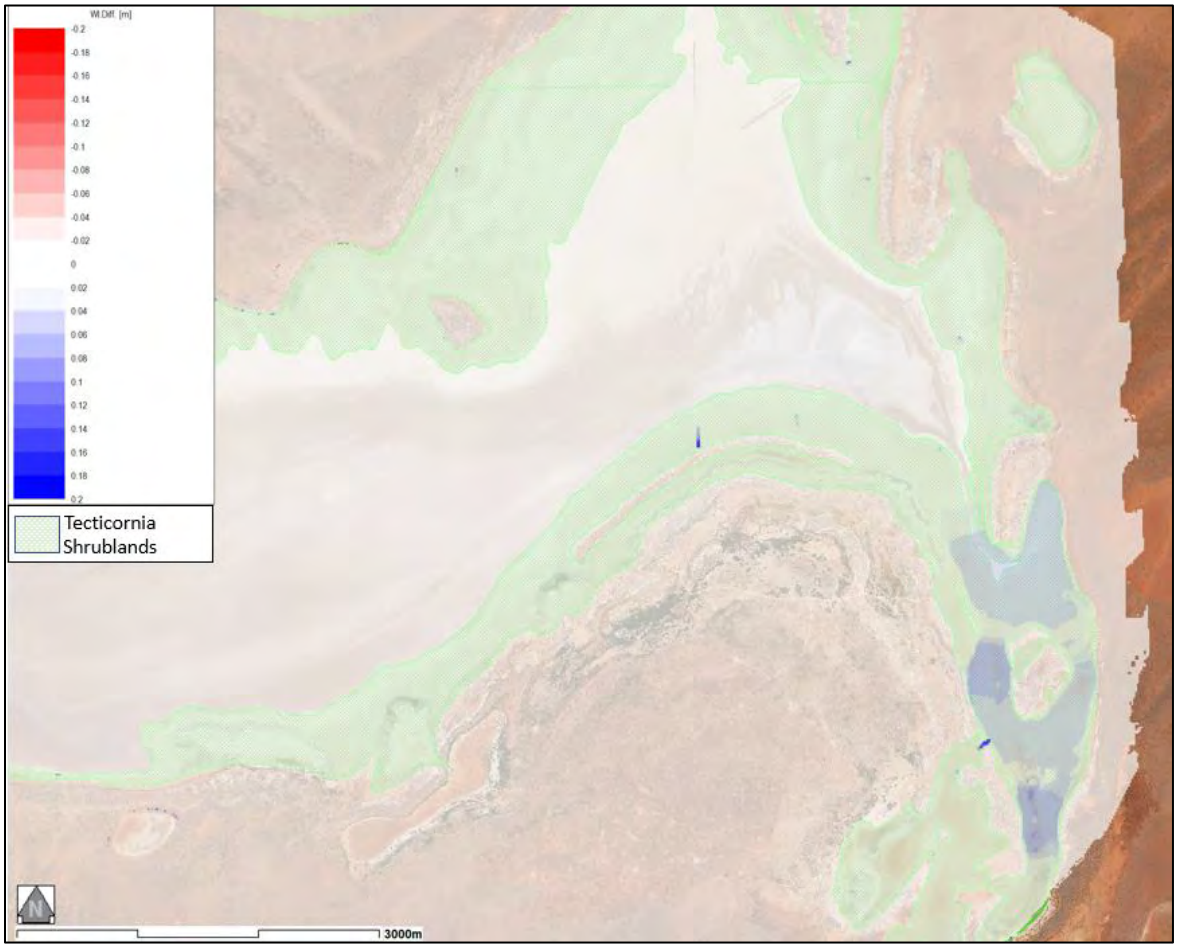


Figure 5-4: Flood level difference for the 1% AEP event under operations conditions showing the change in flood level where fringing Tecticornia Shrublands is located (maximum change ~0.06 m)

6 Conclusion

Advisian was commissioned by Kalium Lakes to characterise the surface water regime and complete an impact assessment to determine the impact of proposed mining on environmentally sensitive fringing vegetation (*Tecticornia Shrublands*) at Ten Mile Lake and Sunshine Lake under operational and closure scenarios. Hydrological and hydraulic models were developed and used to quantify the change in depth and extent of flooding at locations where fringing vegetation has been identified for the 63%, 50%, 20%, 10%, 5%, 2%, 1% Annual Exceedance Probability (AEP) events.

The results show negligible change in flood depths and extents under both operations and closure scenarios for the full range of AEP events. Therefore the proposed mining is expected to have no significant impact on the depth and duration of inundation where fringing vegetation is located.

7 Recommendations

Due to the lack of long term monitoring data, there is some uncertainty with regards to the magnitude of flooding associated with each AEP event. However, the methodology adopted in this study focuses on relative differences so the results are suitable for assessing impacts due to mining. It is recommended that ongoing monitoring is continued and calibration data collected to improve the accuracy of the model.

Appendix A DEM Metadata

Beyondie – Kalium Lakes

Aerometrex Project Number: A5377

Date of Photography: 16th and 17th December 2017

Camera: Ultracam X

Pixel Size: 10cm

Horizontal Datum: Geocentric Datum of Australia 1994 (GDA94)

Vertical Datum: Australian Height Datum (AHD)

Map Projection: MGA Zone 51 (MGA51)

Spatial Accuracy: Vertical: 1 Sigma = 0.08m

Supply Date: 7th March 2018

Data Summary:

CONTOURS

25cm contours of the Beyondie area with 1m index contours in DXF file format.

EAST\ Beyondie_Centre_25cm_Contours.dxf
EAST\ Beyondie_East_25cm_Contours.dxf
WEST\ Beyondie_Roads_West_25cm_Contours.dxf

DTM

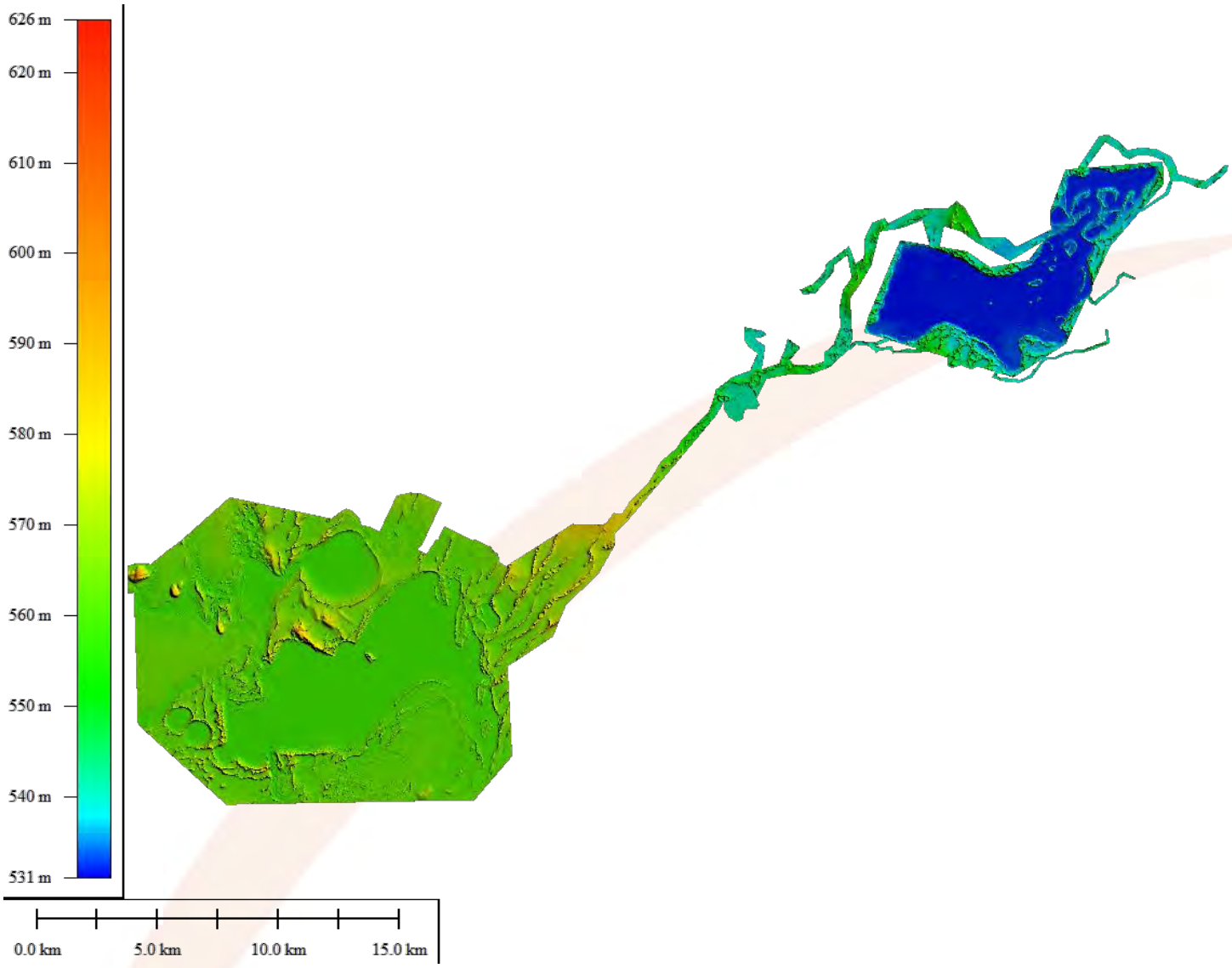
Keypoint DTM in LAS and ASCII XYZ file formats.

EAST\ Beyondie_East_Keypoint_DTM.las
EAST\ Beyondie_East_Keypoint_DTM.xyz
WEST\ Beyondie_Roads_West_Keypoint_DTM.las
WEST\ Beyondie_Roads_West_Keypoint_DTM.xyz

Any queries/feedback please contact Aerometrex - Adelaide
ph +61 8 8362 9911

OVERVIEW

Elevation overview of the Beyondie Eastern area



Any queries/feedback please contact Aerometrex - Adelaide
ph +61 8 8362 9911

Appendix B Flood Modelling Results

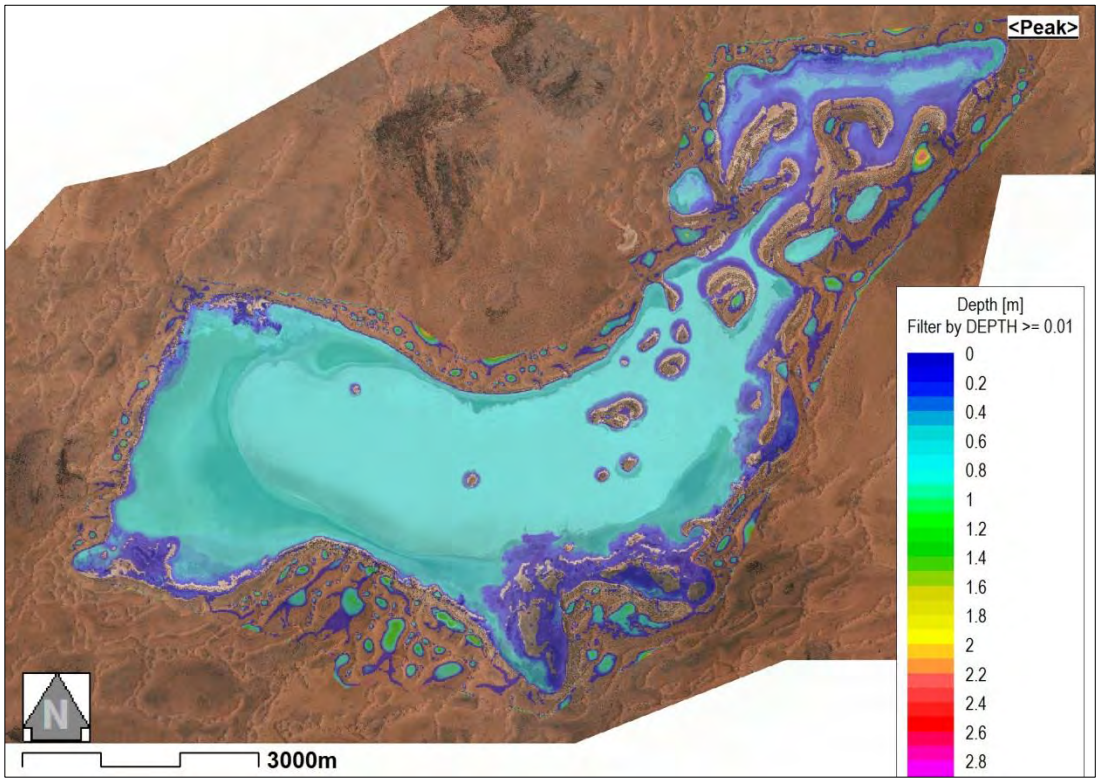


Figure B 1: 1% AEP Existing Flood Depth Map at Sunshine Lake

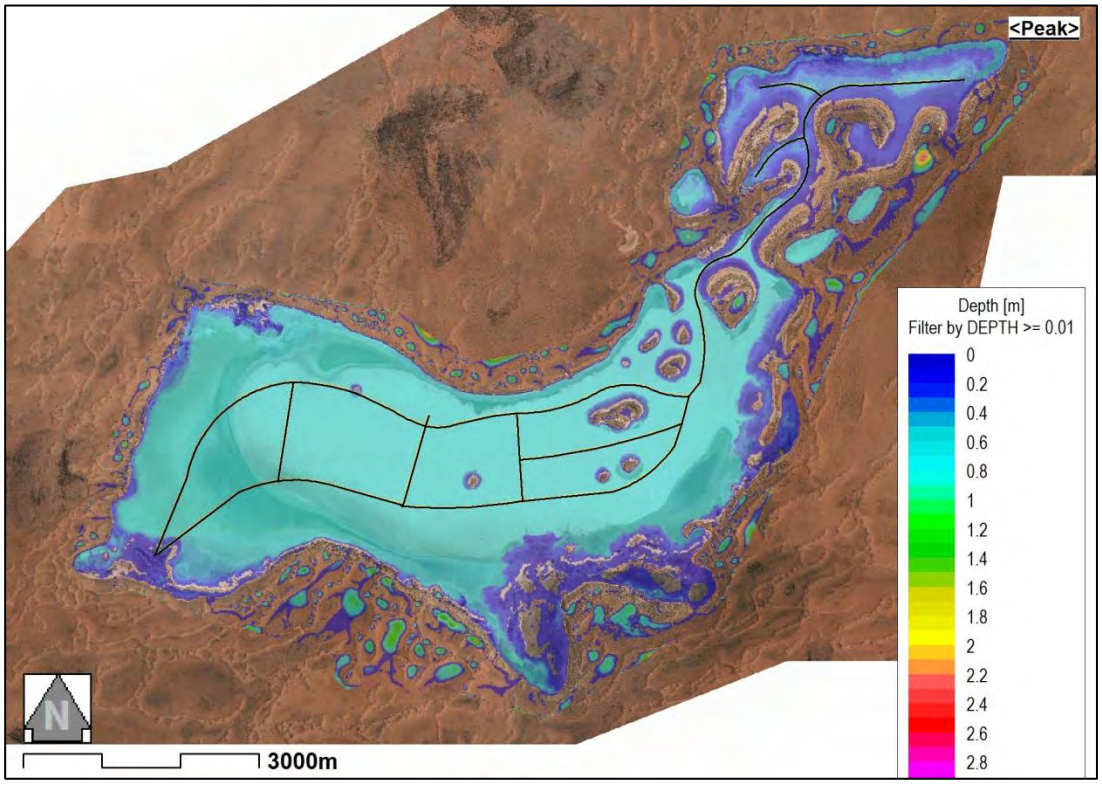


Figure B 2: 1% AEP Operations Flood Depth Map at Sunshine Lake

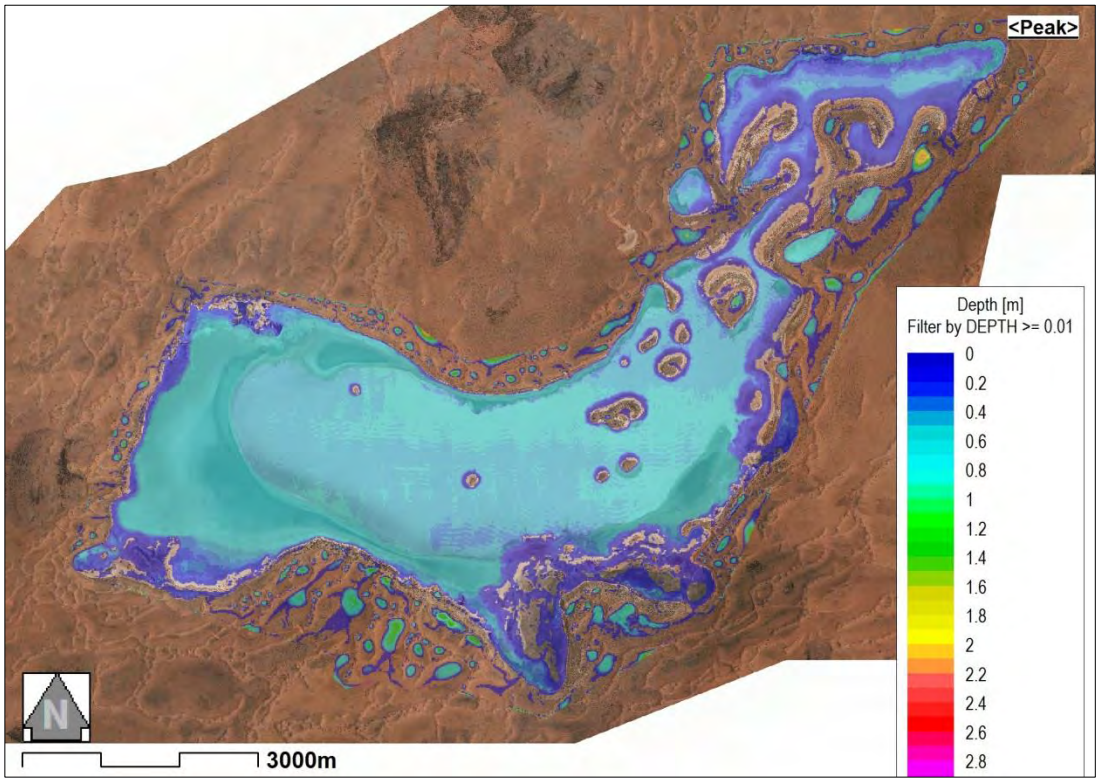


Figure B 3: 2% AEP Existing Flood Depth Map at Sunshine Lake

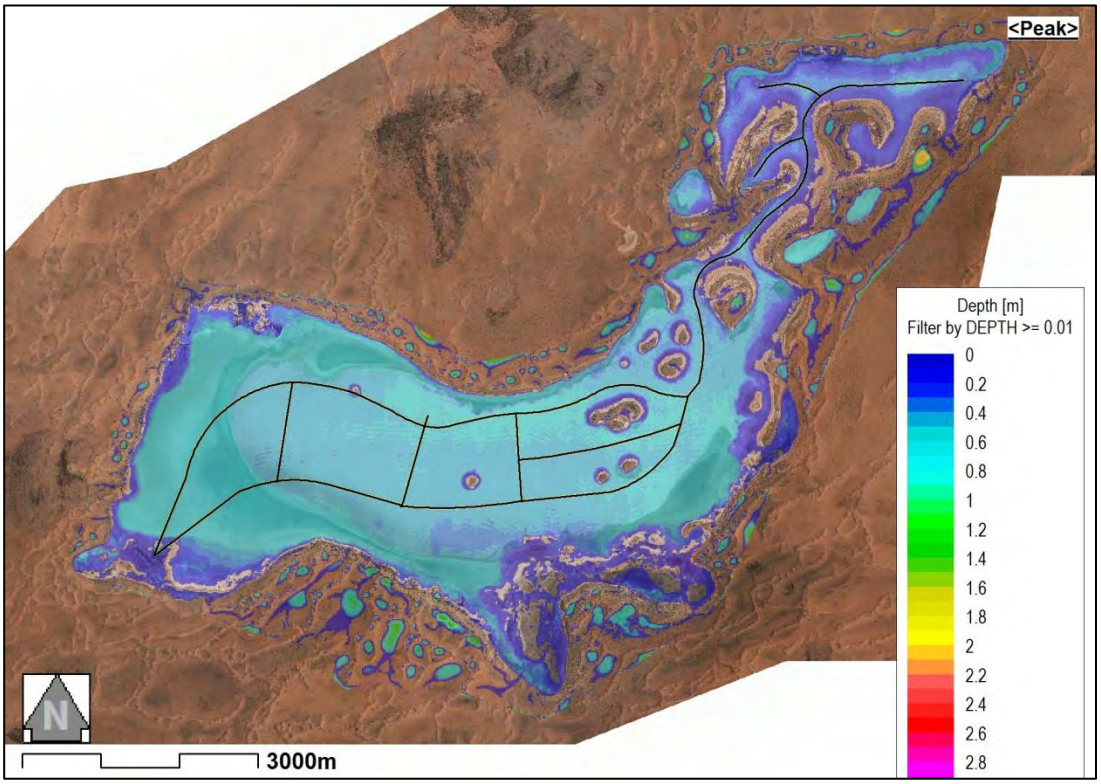


Figure B 4: 2% AEP Operations Flood Depth Map at Sunshine Lake

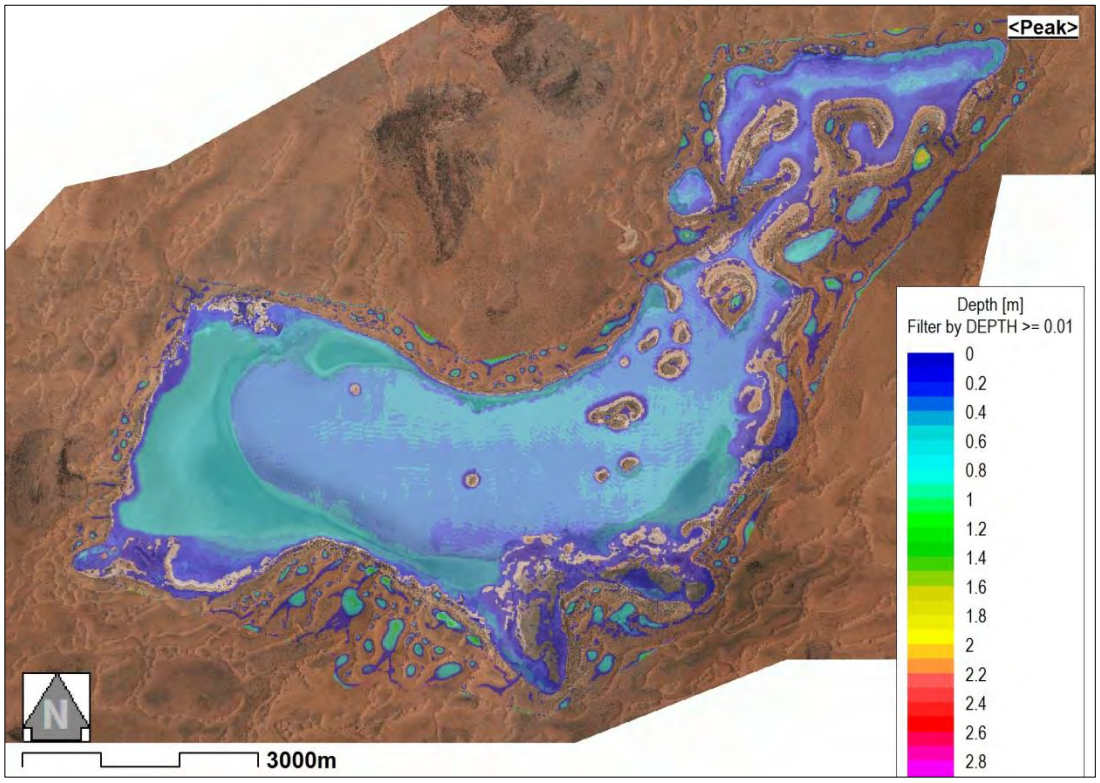


Figure B 5: 5% AEP Existing Flood Depth Map at Sunshine Lake

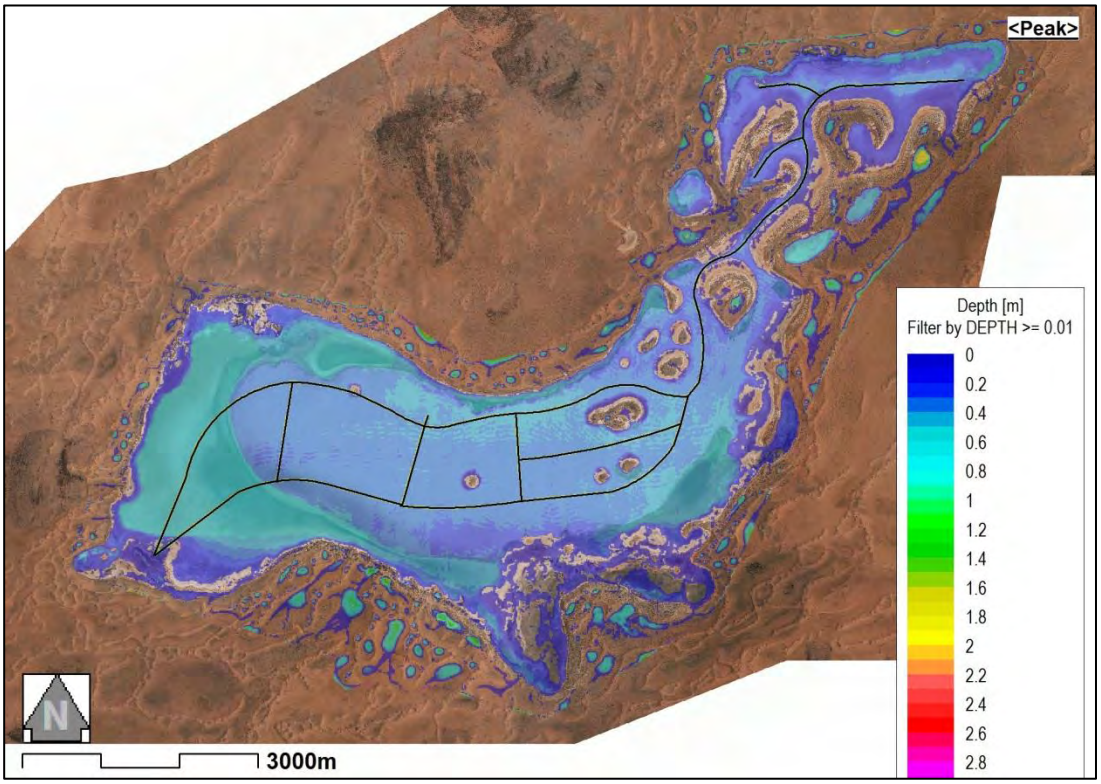


Figure B 6: 5% AEP Operations Flood Depth Map at Sunshine Lake

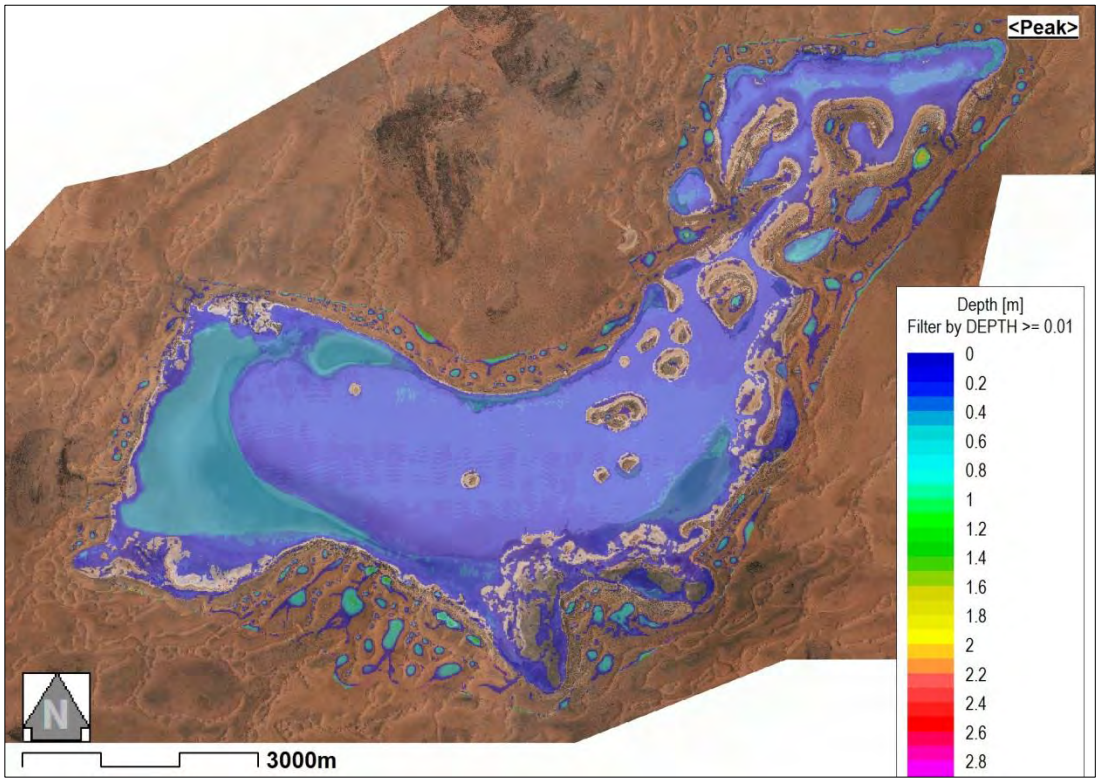


Figure B 7: 10% AEP Existing Flood Depth Map at Sunshine Lake

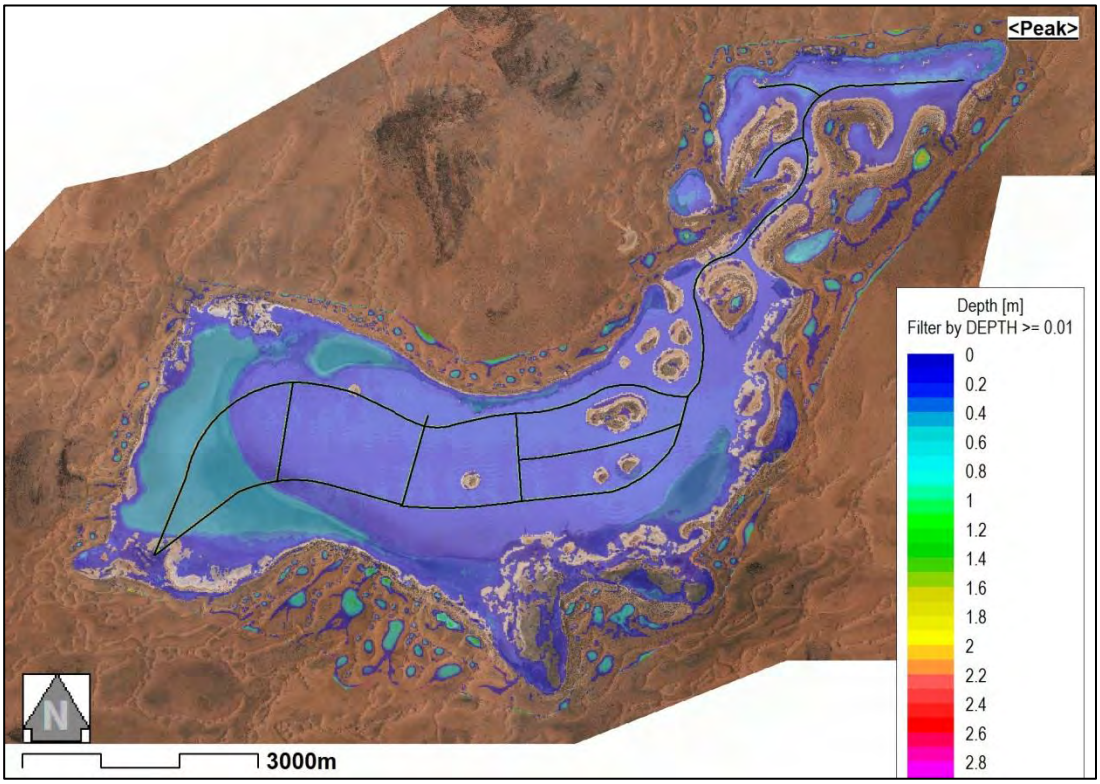


Figure B 8: 10% AEP Operations Flood Depth Map at Sunshine Lake

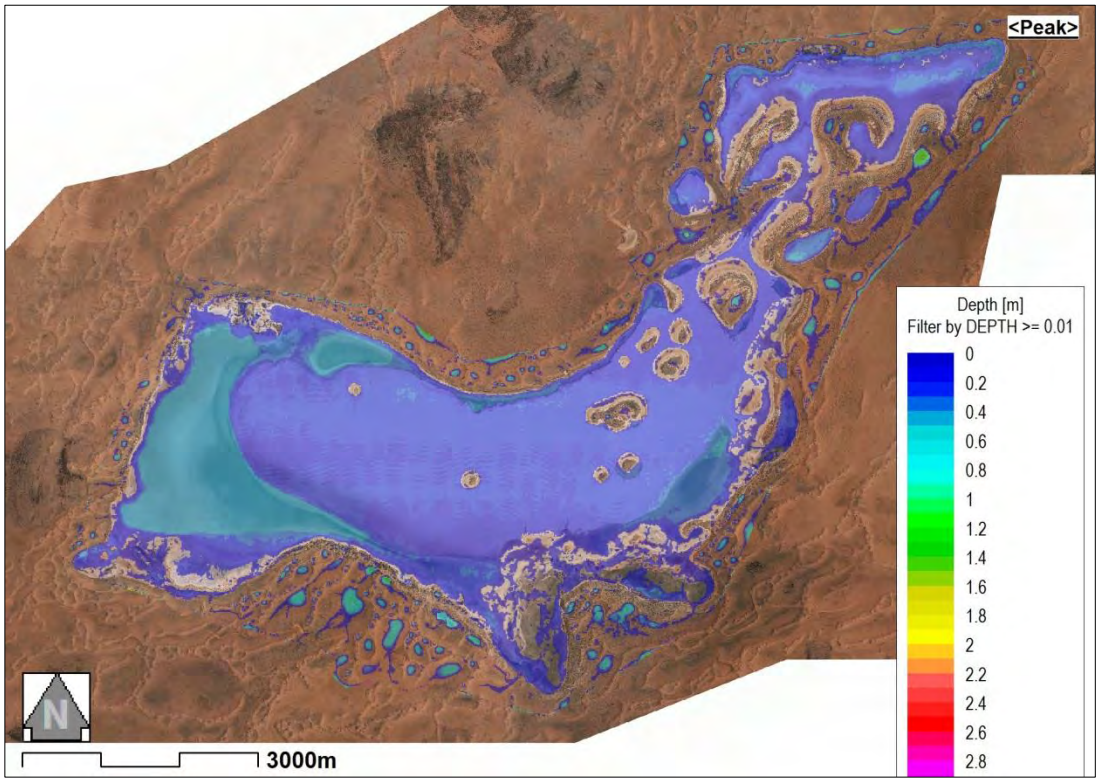


Figure B 9: 20% AEP Existing Flood Depth Map at Sunshine Lake

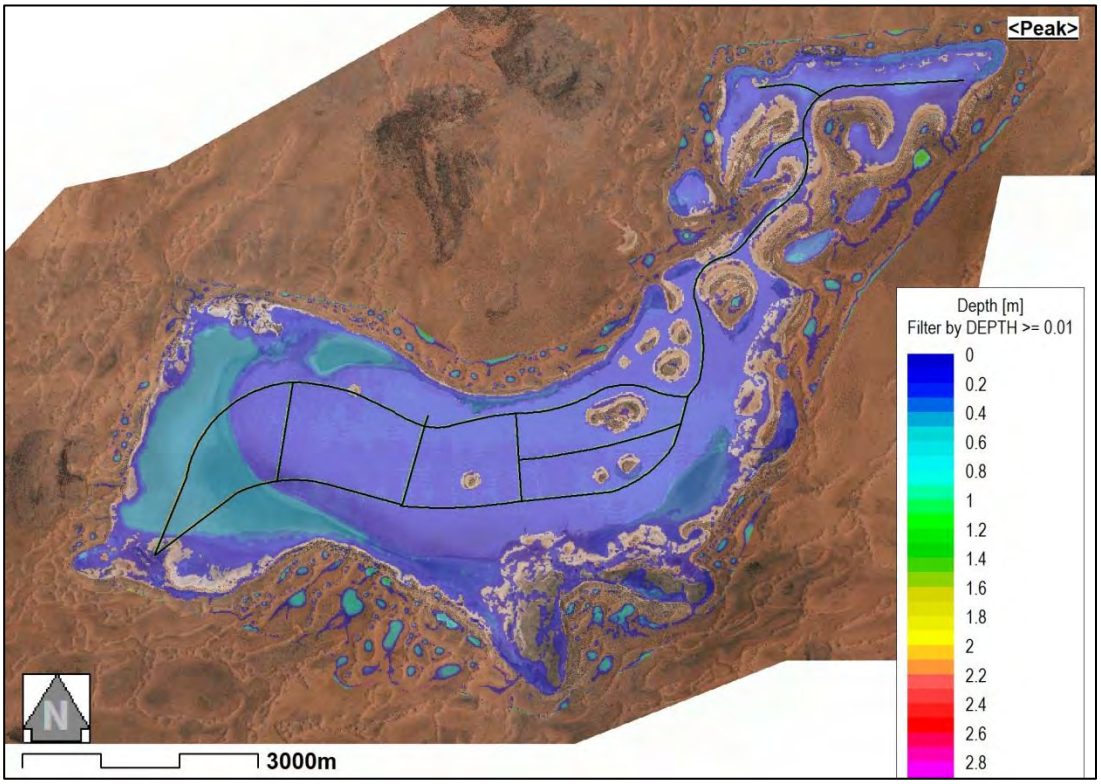


Figure B 10: 20% AEP Operations Flood Depth Map at Sunshine Lake

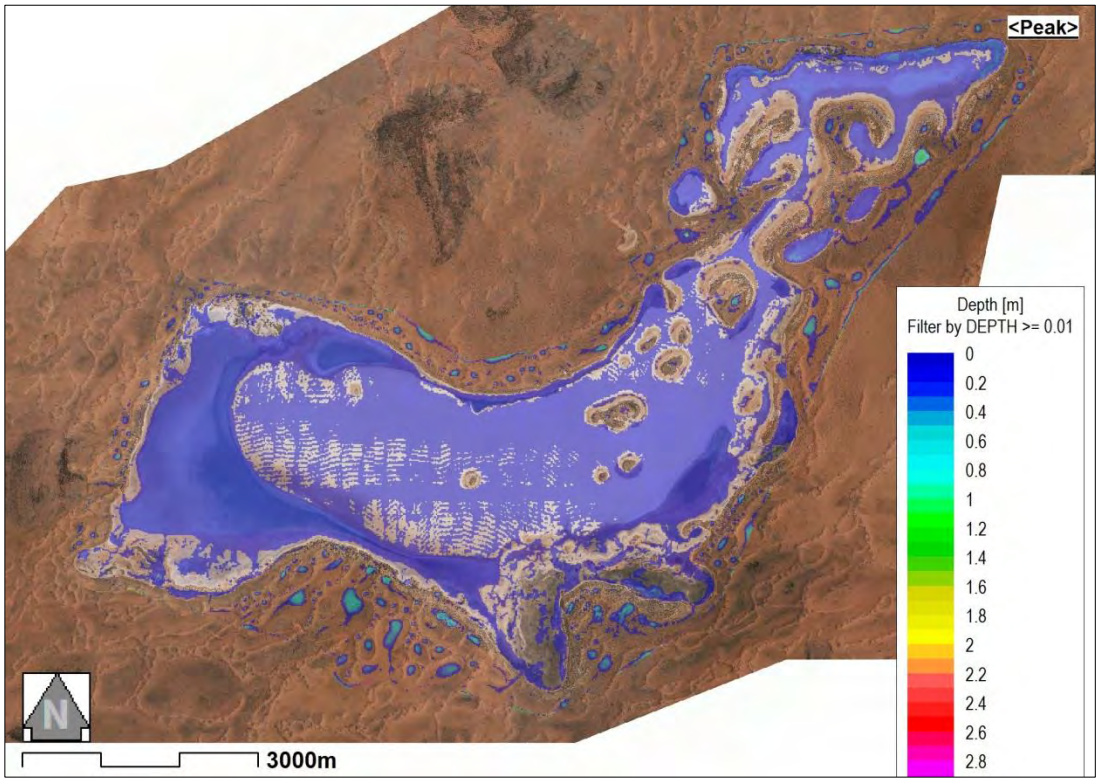


Figure B 11: 50% AEP Existing Flood Depth Map at Sunshine Lake

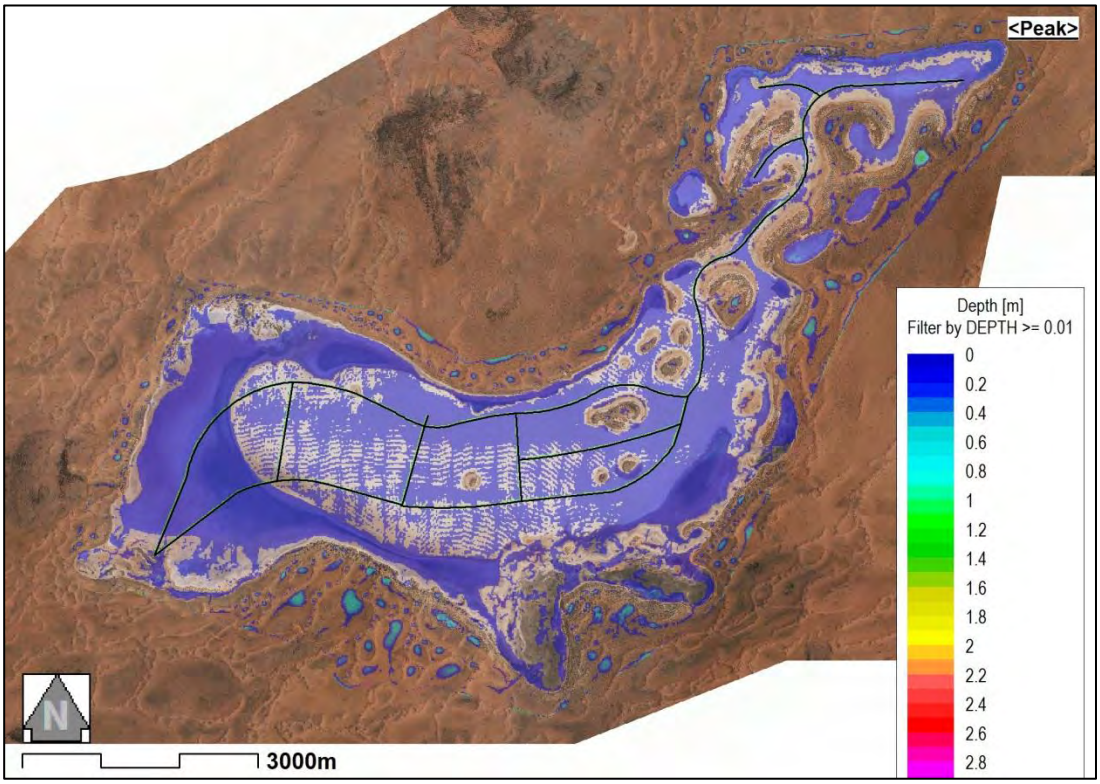


Figure B 12: 50% AEP Operations Flood Depth Map at Sunshine Lake

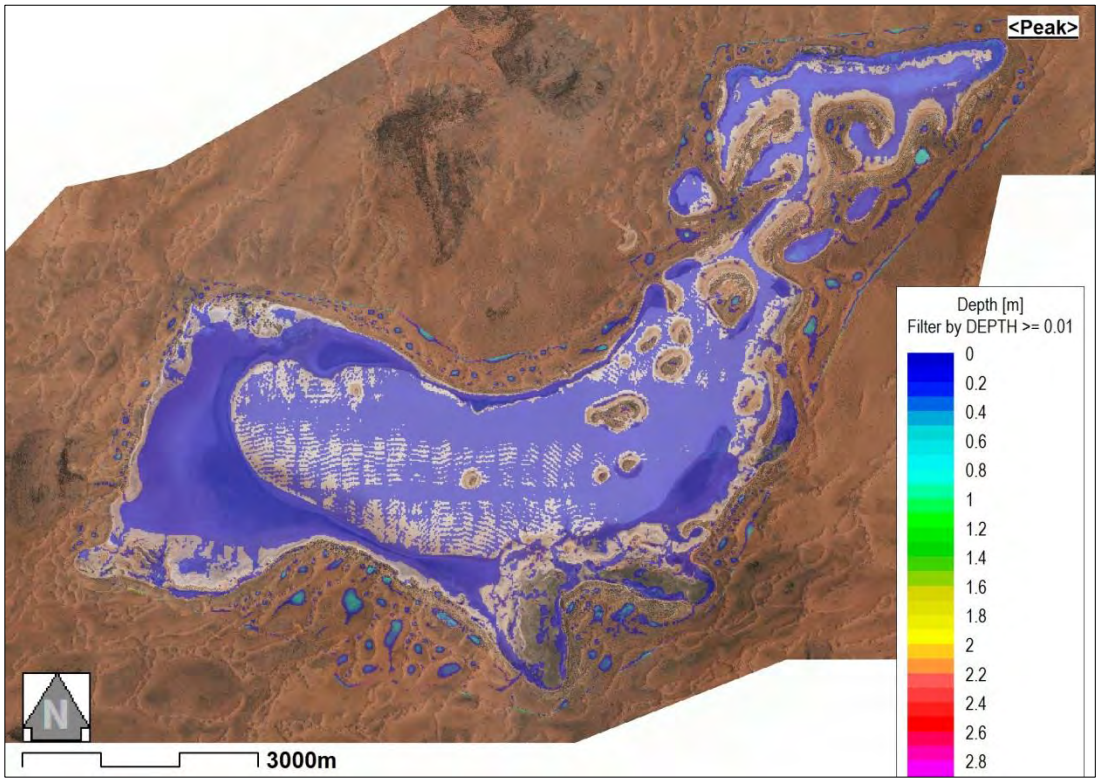


Figure B 13: 63% AEP Existing Flood Depth Map at Sunshine Lake

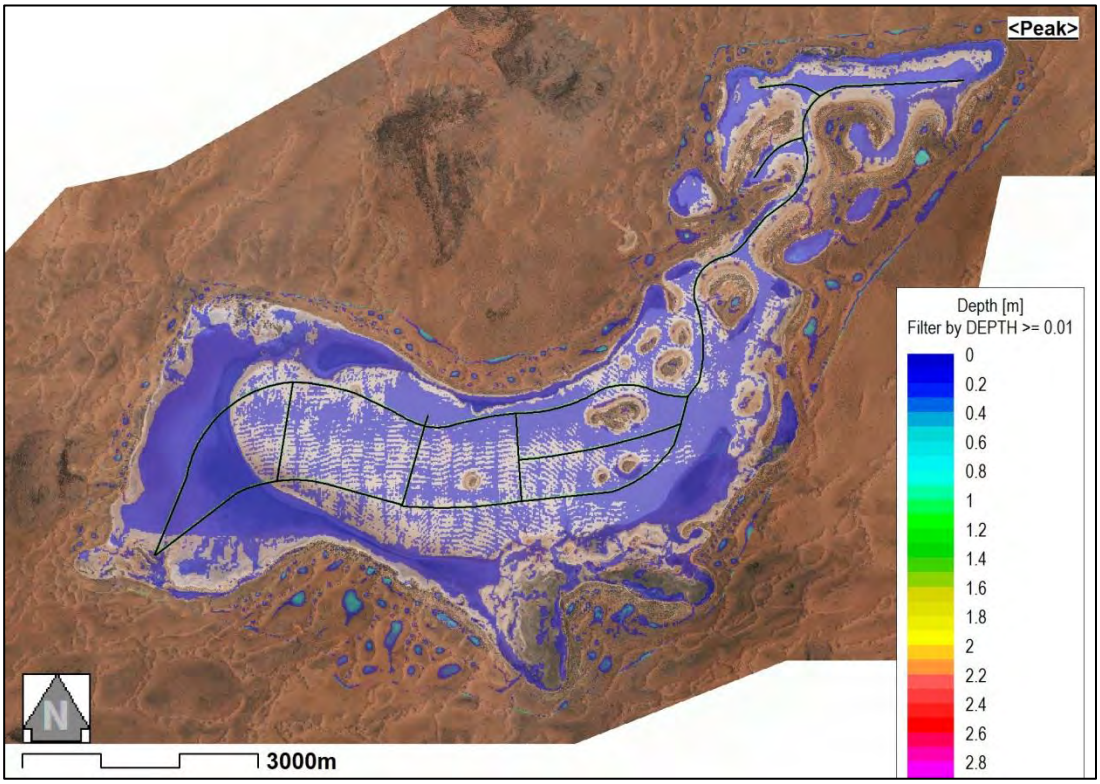


Figure B 14: 63% AEP Operations Flood Depth Map at Sunshine Lake

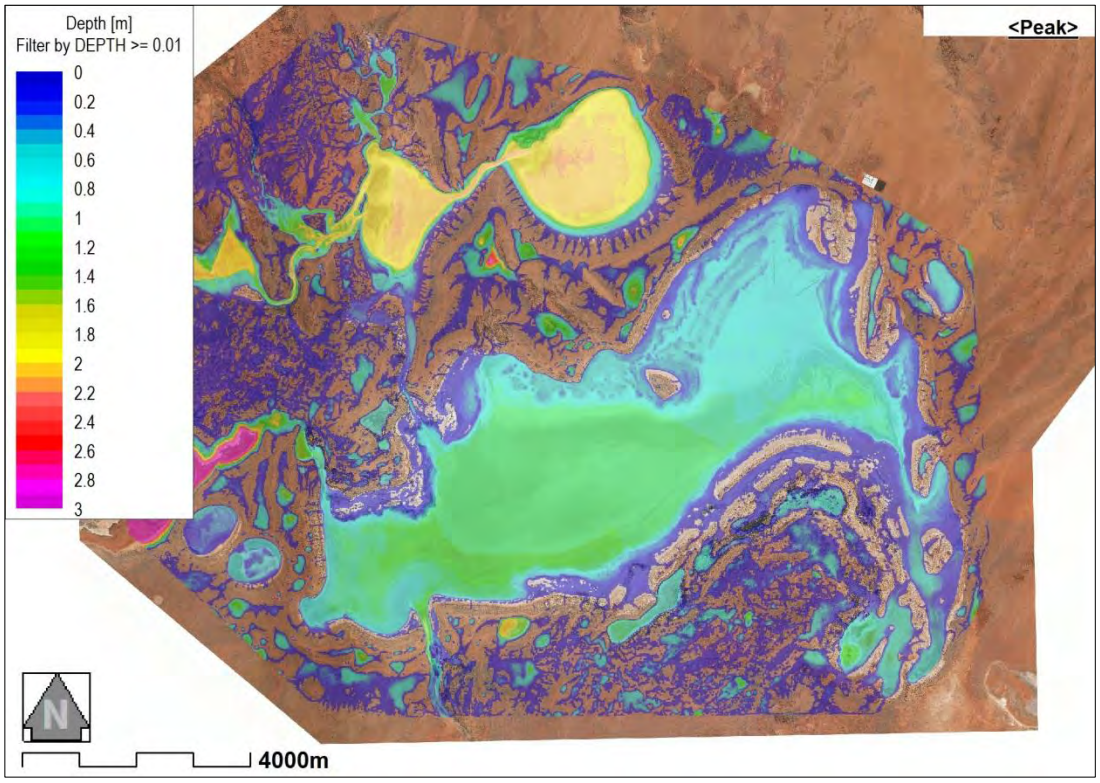


Figure B 15: 1% AEP Existing Flood Depth Map at Ten Mile Lake

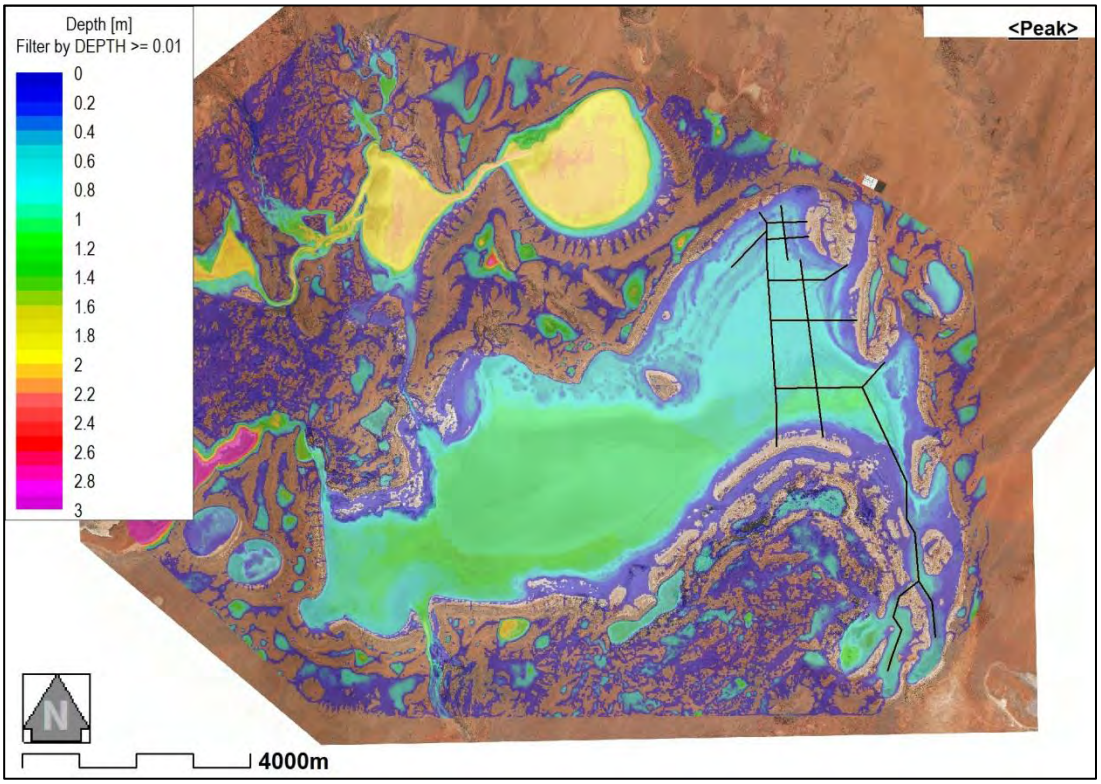


Figure B 16: 1% AEP Operations Flood Depth Map at Ten Mile Lake

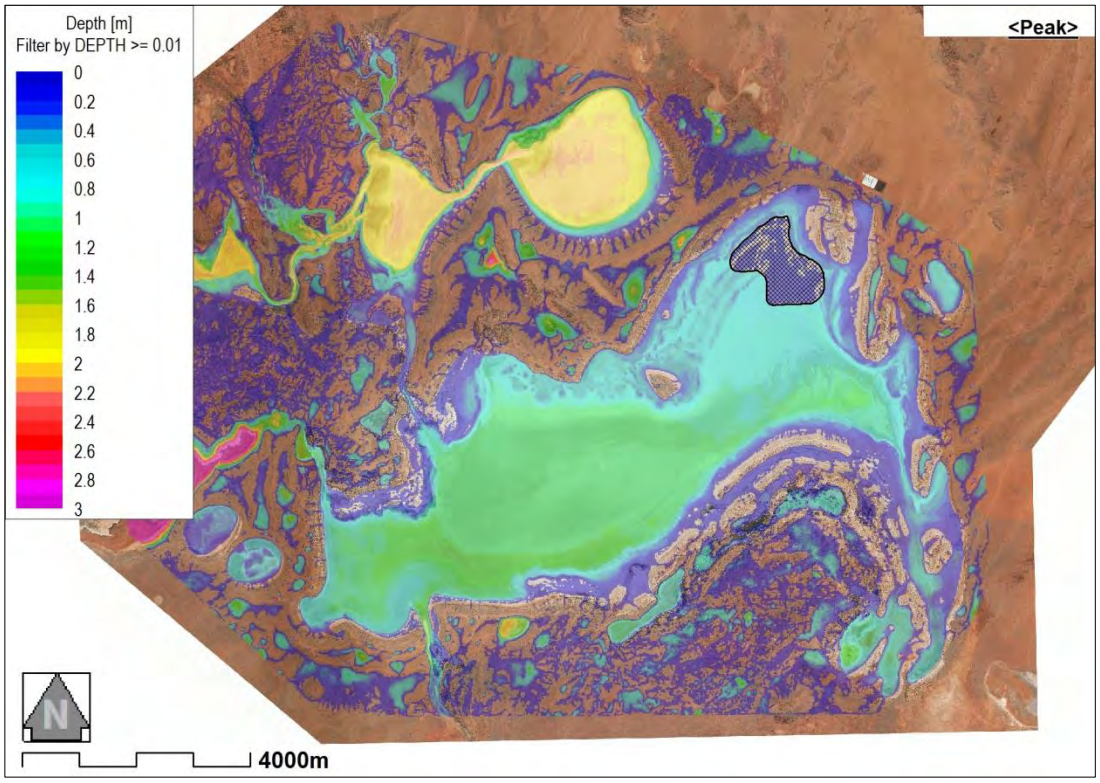


Figure B 17: 1% AEP Closure Flood Depth Map at Ten Mile Lake

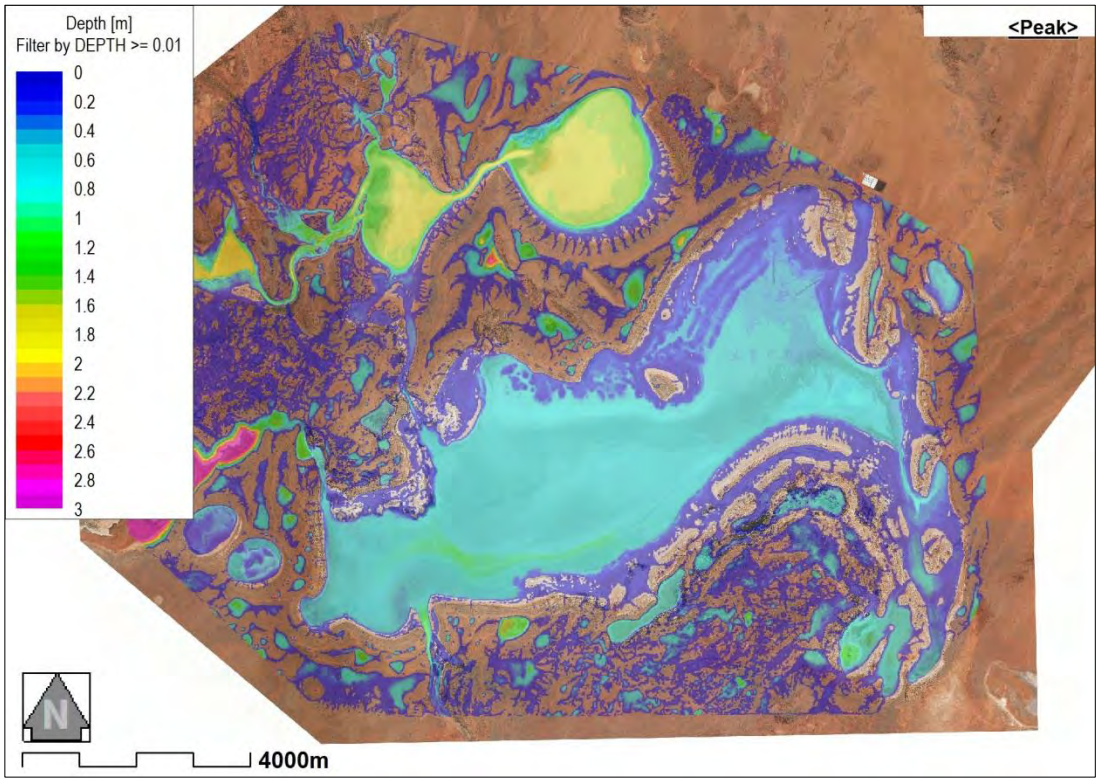


Figure B 18: 2% AEP Existing Flood Depth Map at Ten Mile Lake

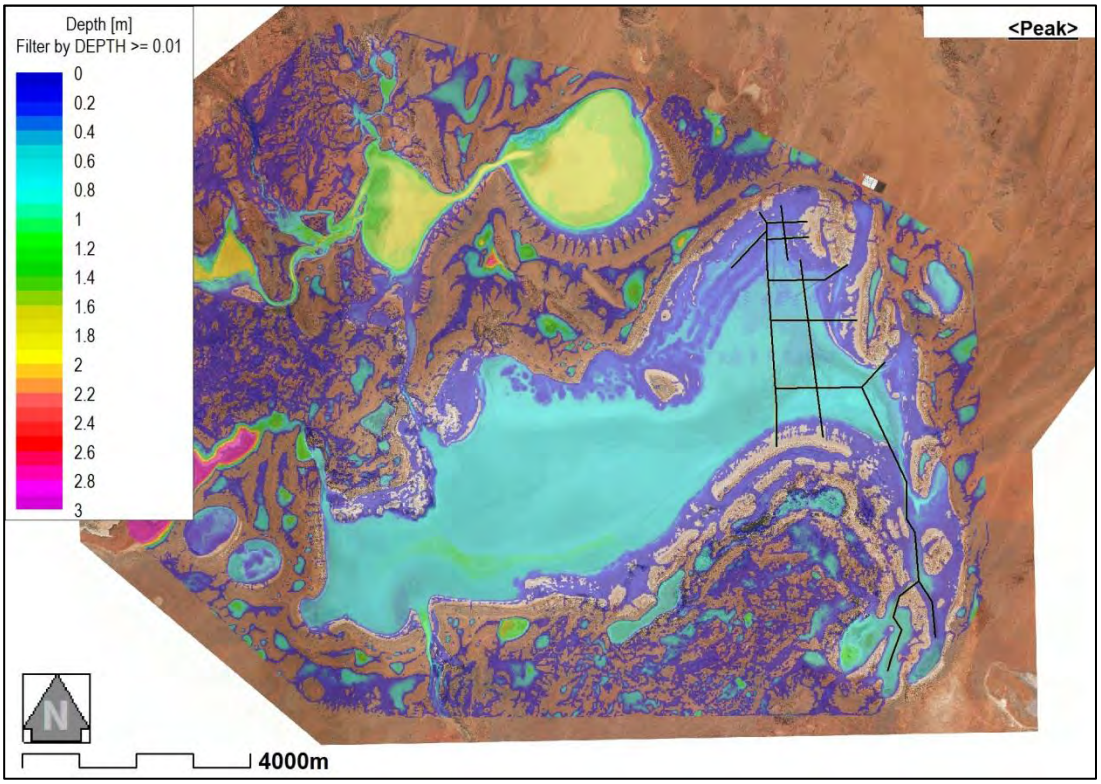


Figure B 19: 2% AEP Operations Flood Depth Map at Ten Mile Lake

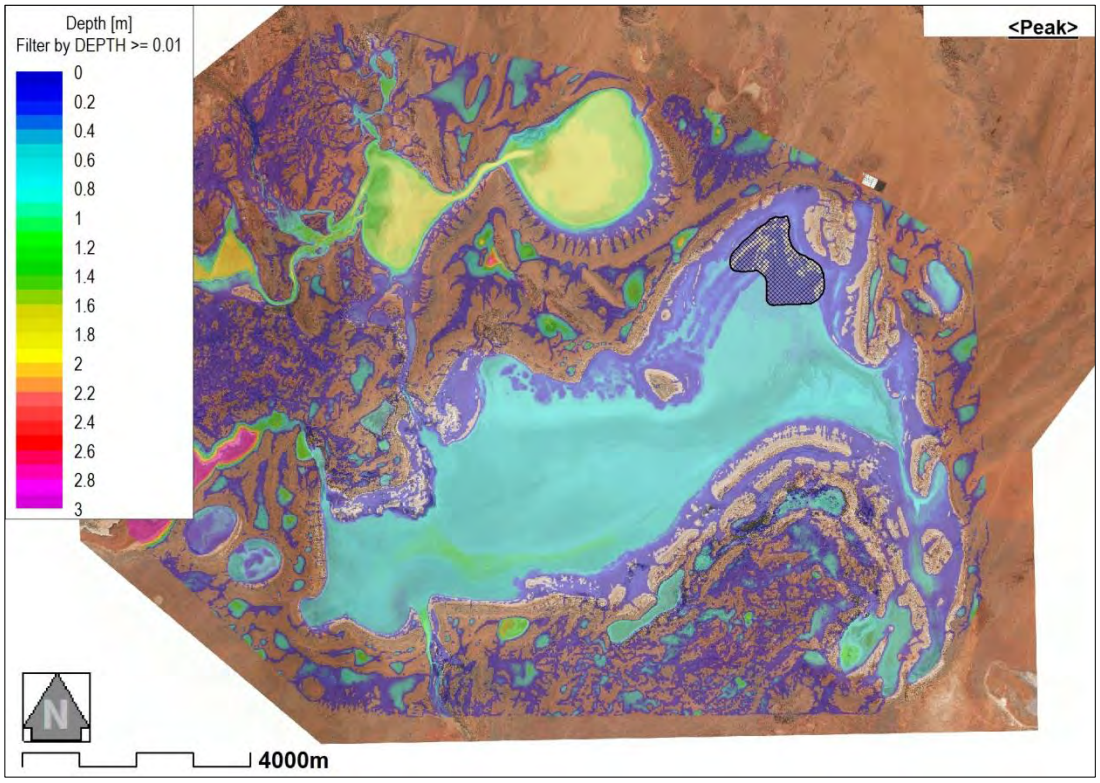


Figure B 20: 2% AEP Closure Flood Depth Map at Ten Mile Lake

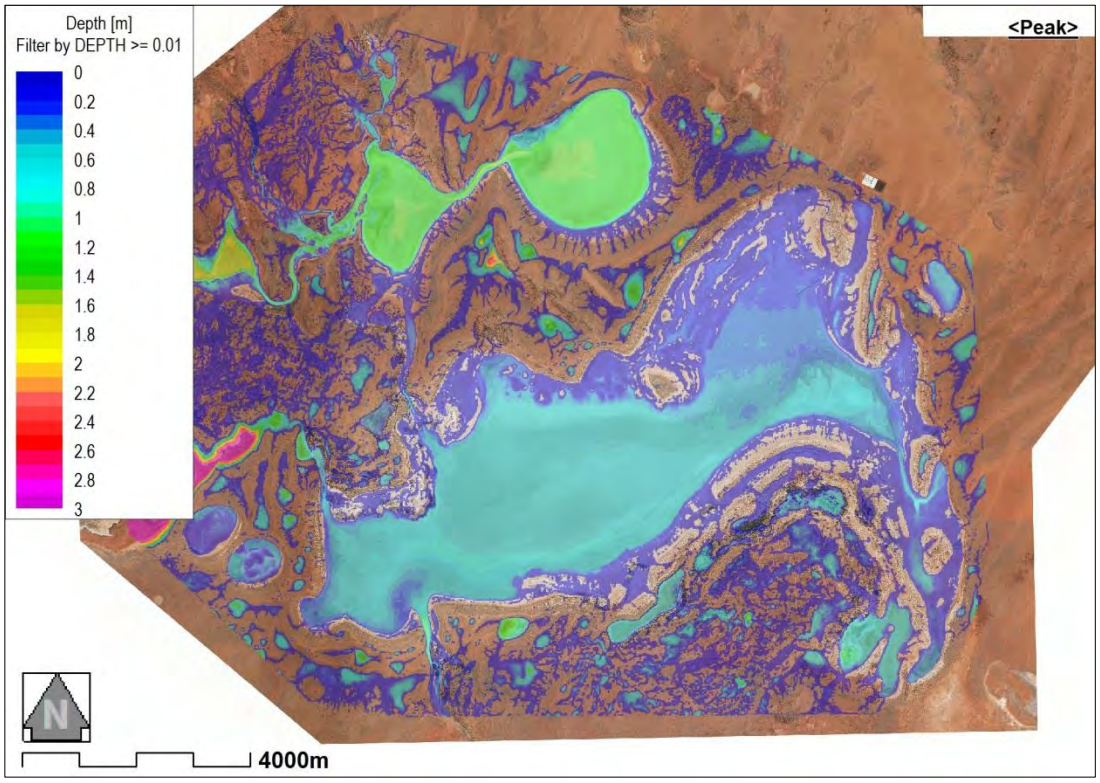


Figure B 21: 5% AEP Existing Flood Depth Map at Ten Mile Lake

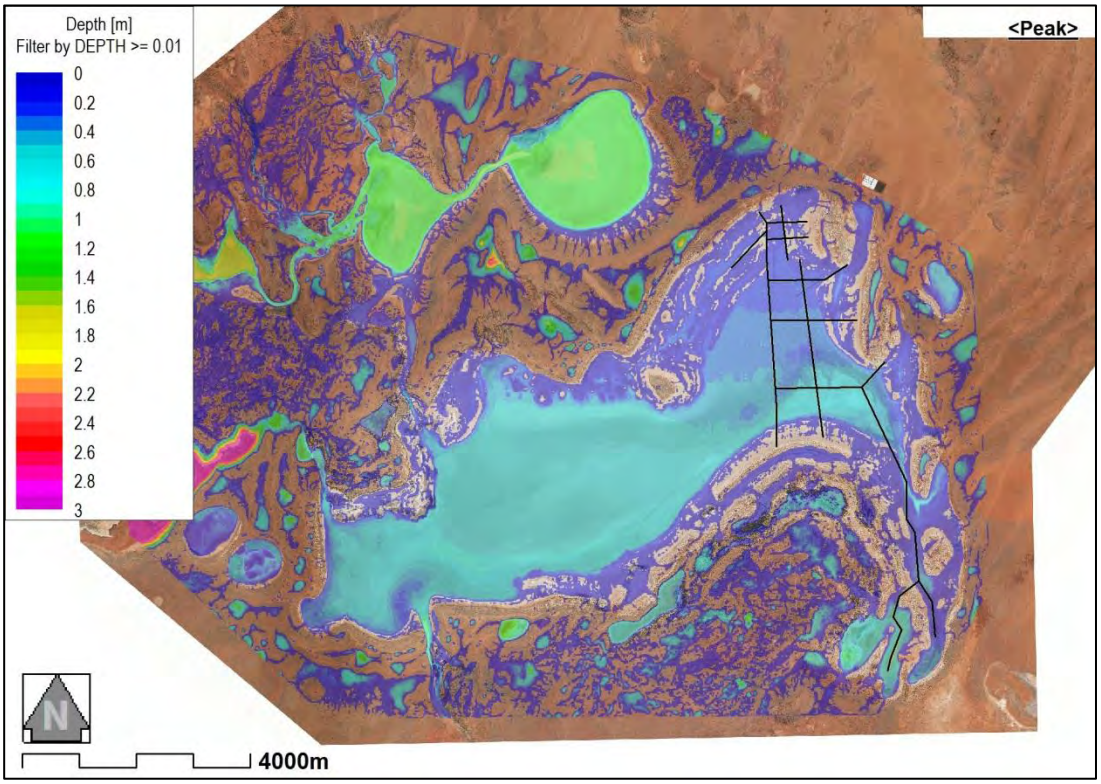


Figure B 22: 5% AEP Operations Flood Depth Map at Ten Mile Lake

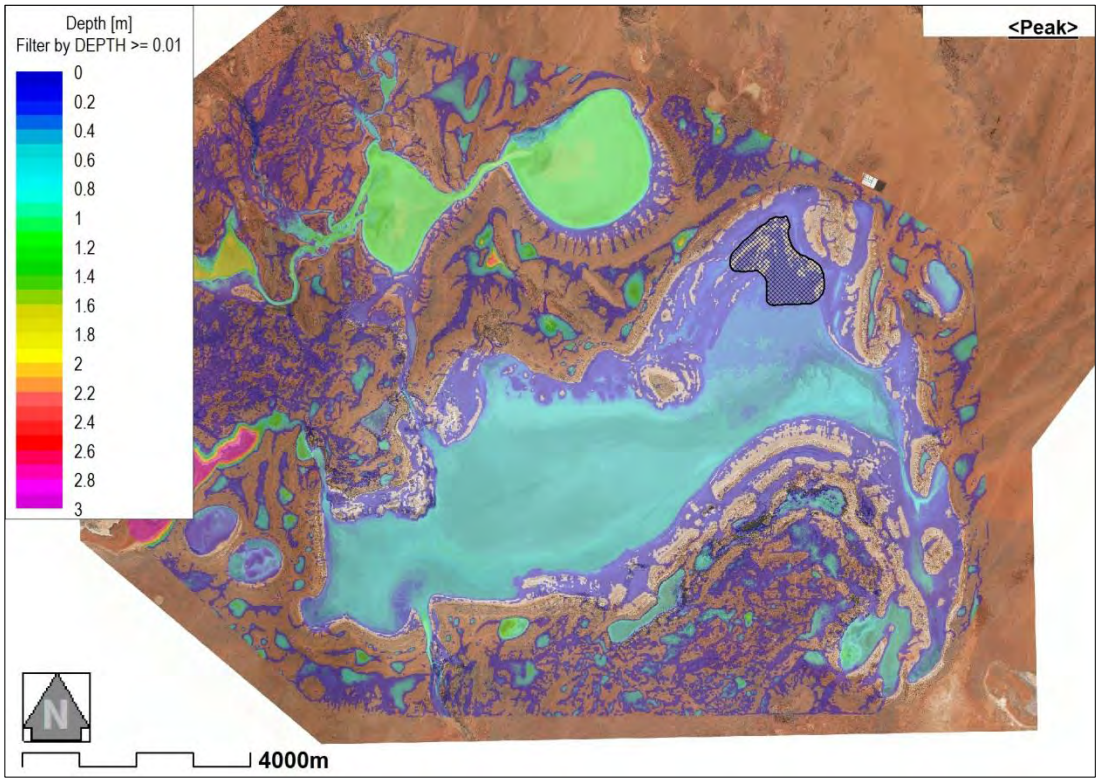


Figure B 23: 5% AEP Closure Flood Depth Map at Ten Mile Lake

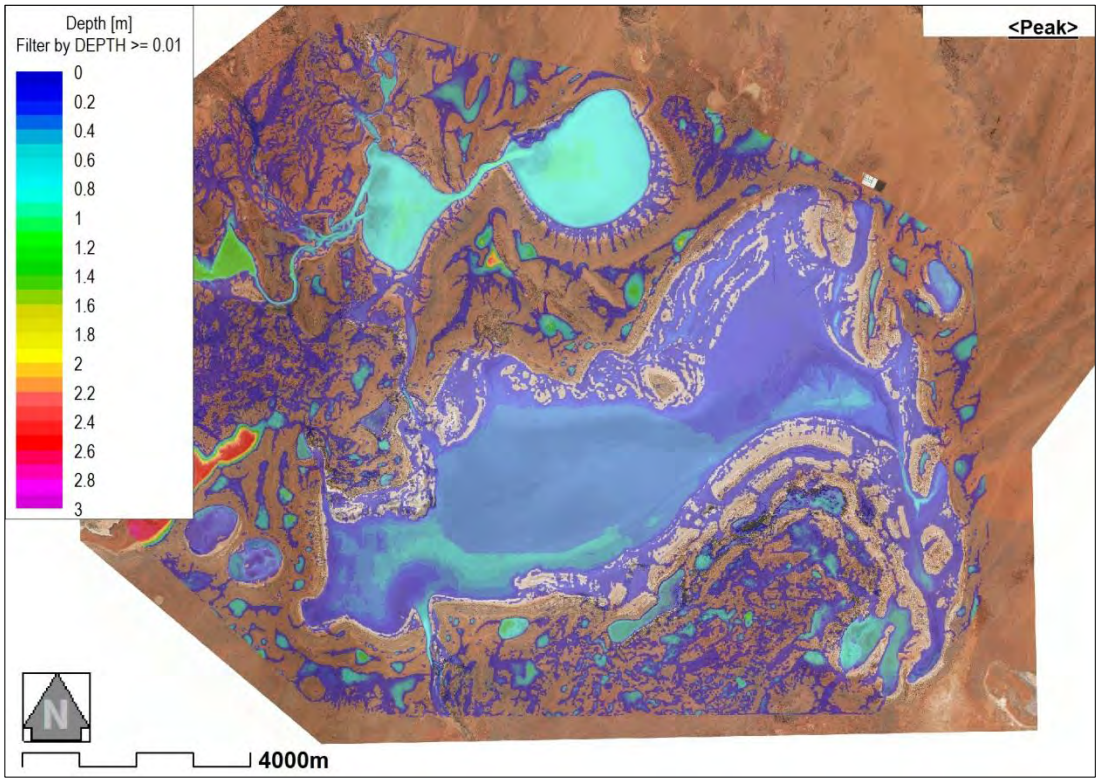


Figure B 24: 10% AEP Existing Flood Depth Map at Ten Mile Lake

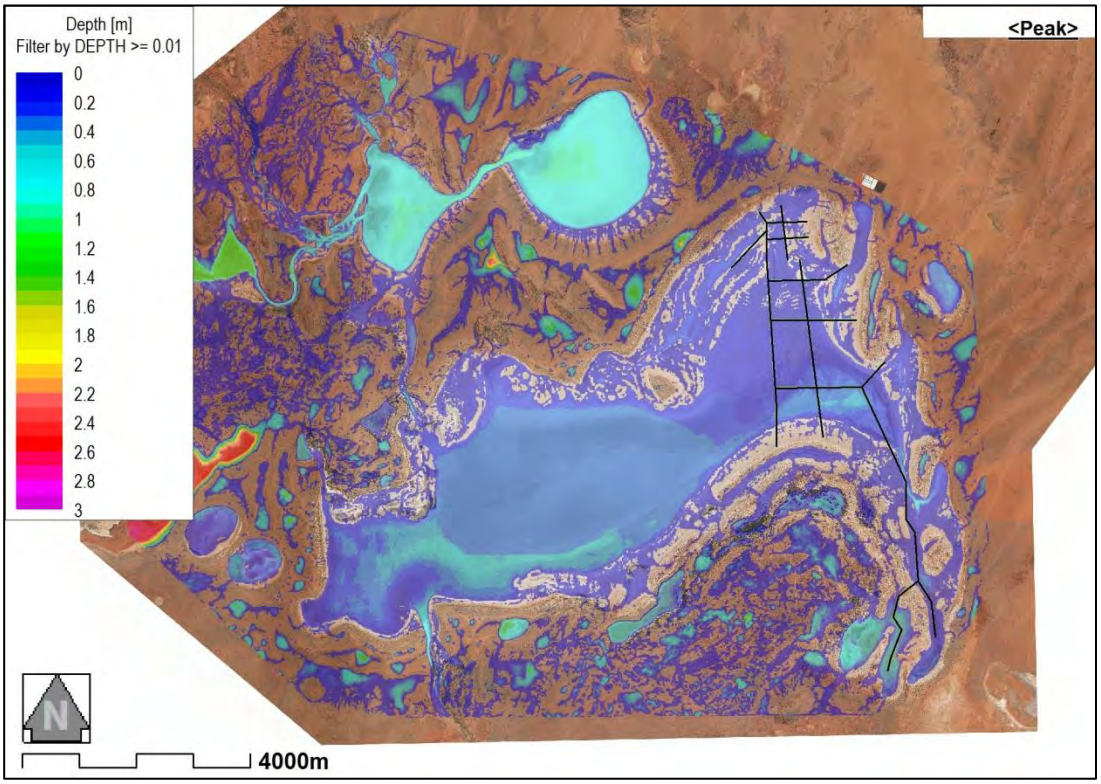


Figure B 25: 10% AEP Operations Flood Depth Map at Ten Mile Lake

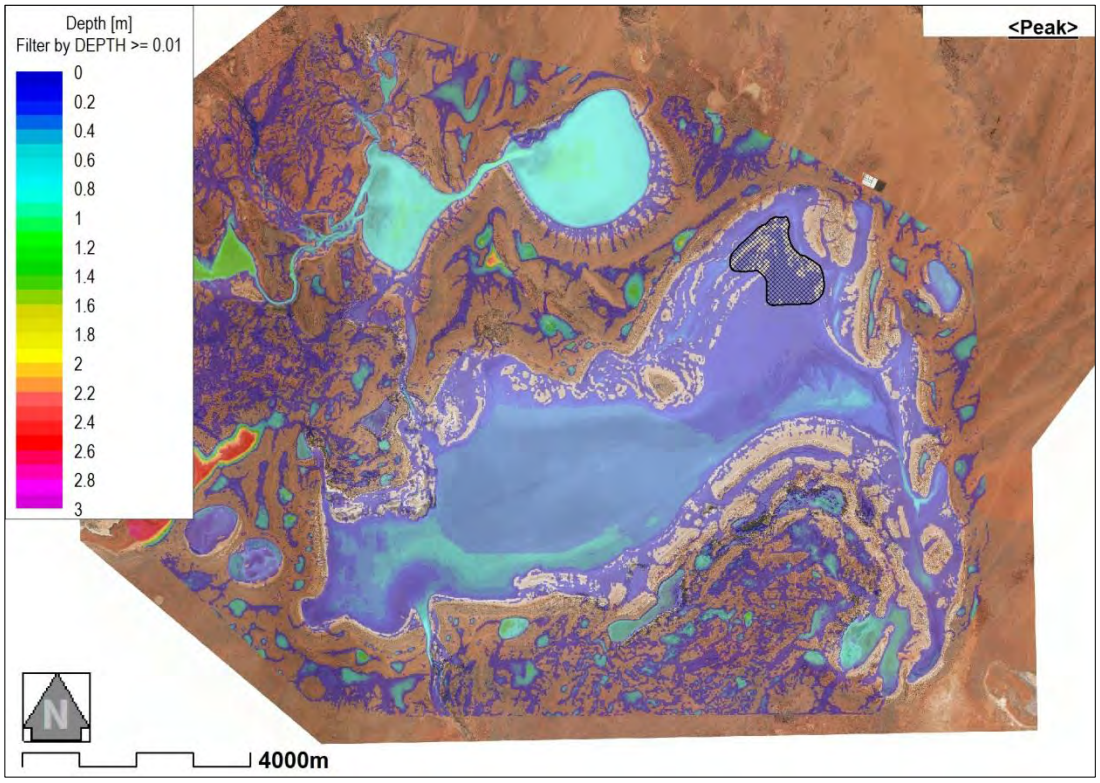


Figure B 26: 10% AEP Closure Flood Depth Map at Ten Mile Lake

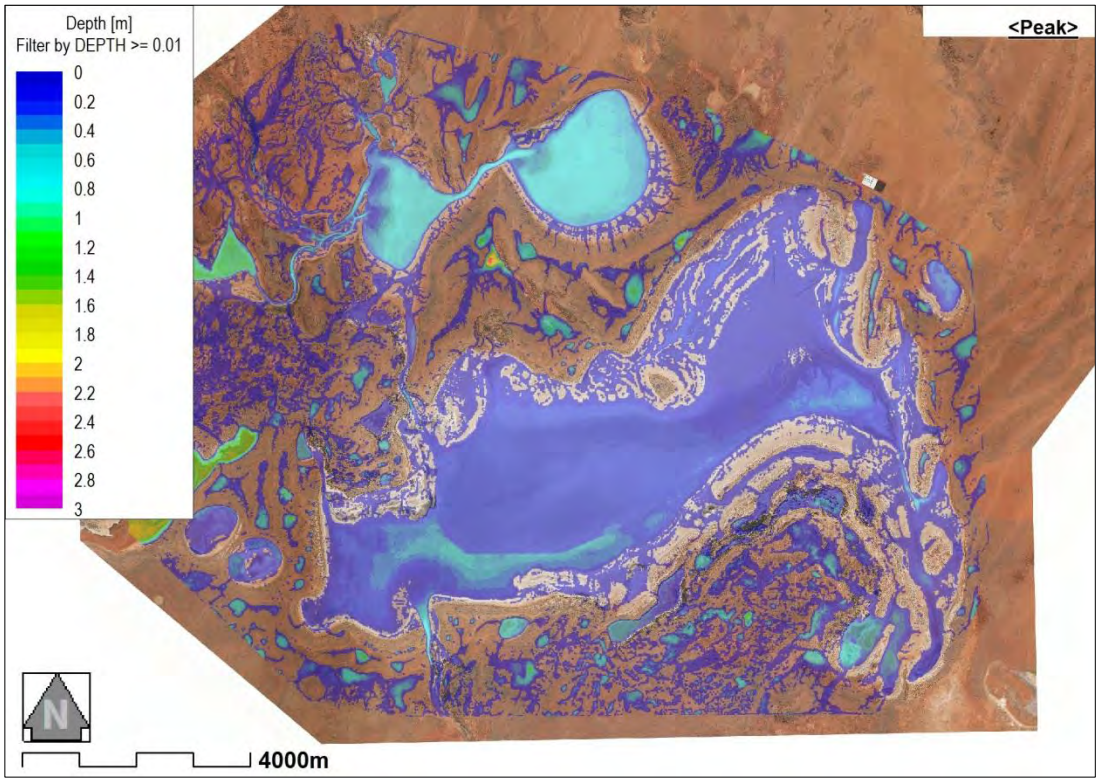


Figure B 27: 20% AEP Existing Flood Depth Map at Ten Mile Lake

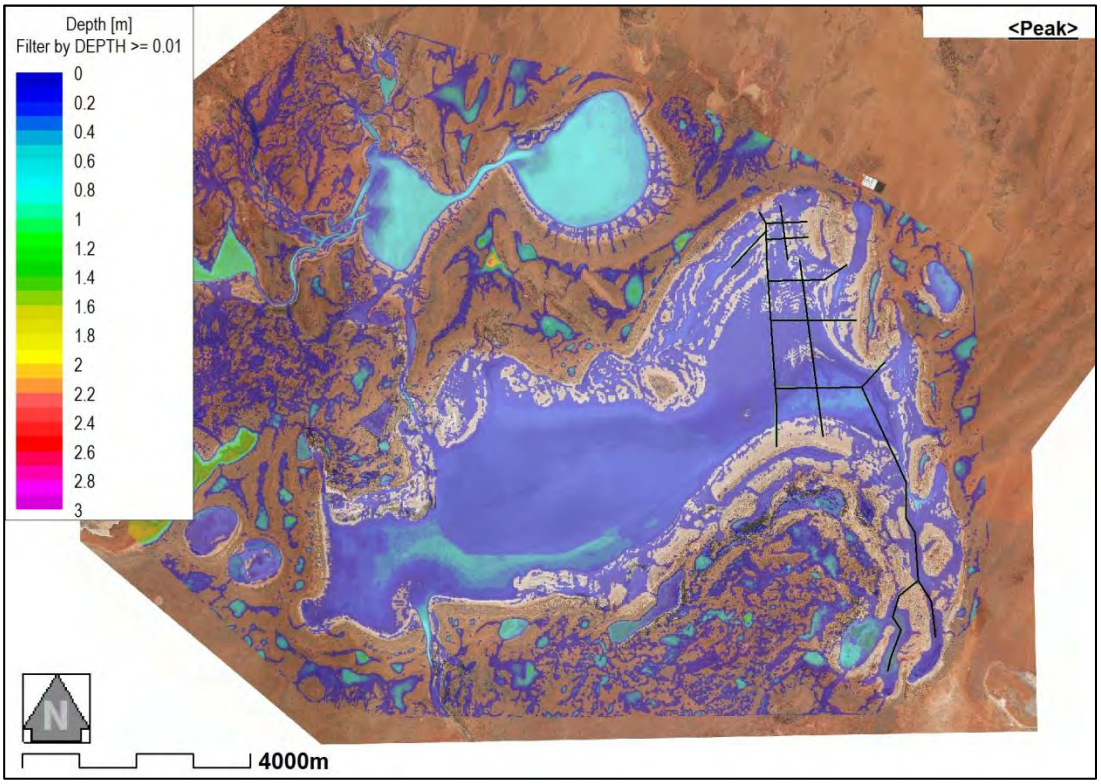


Figure B 28: 20% AEP Operations Flood Depth Map at Ten Mile Lake

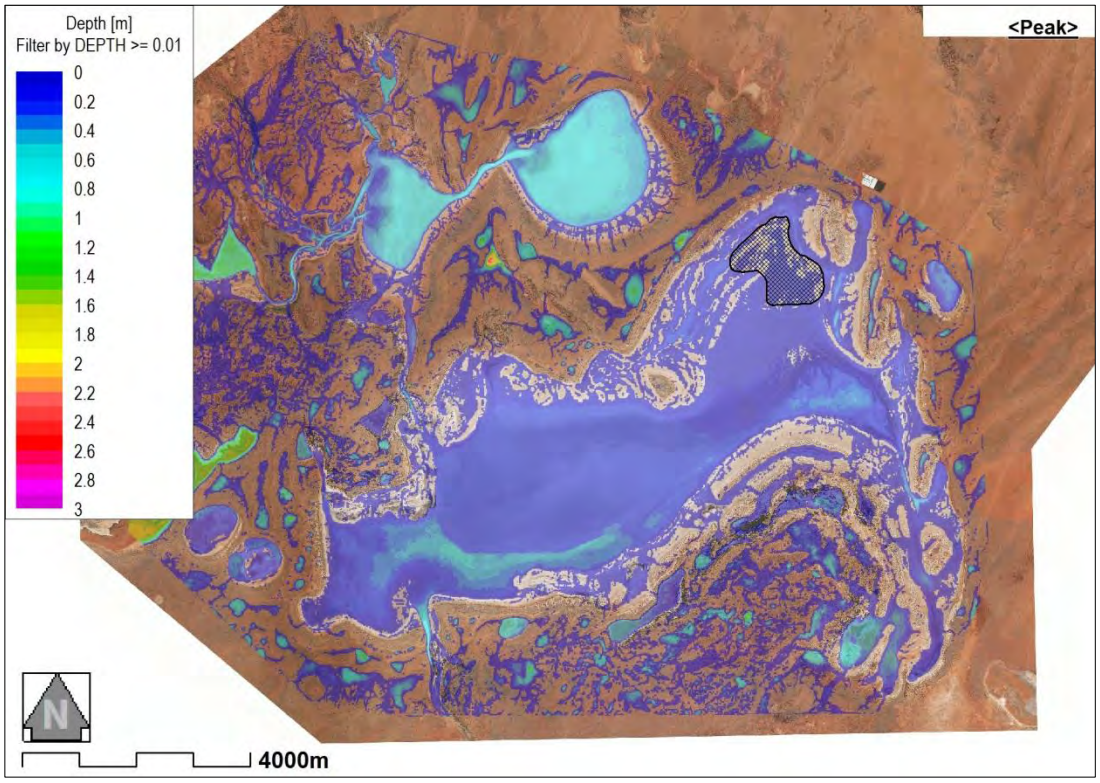


Figure B 29: 20% AEP Closure Flood Depth Map at Ten Mile Lake

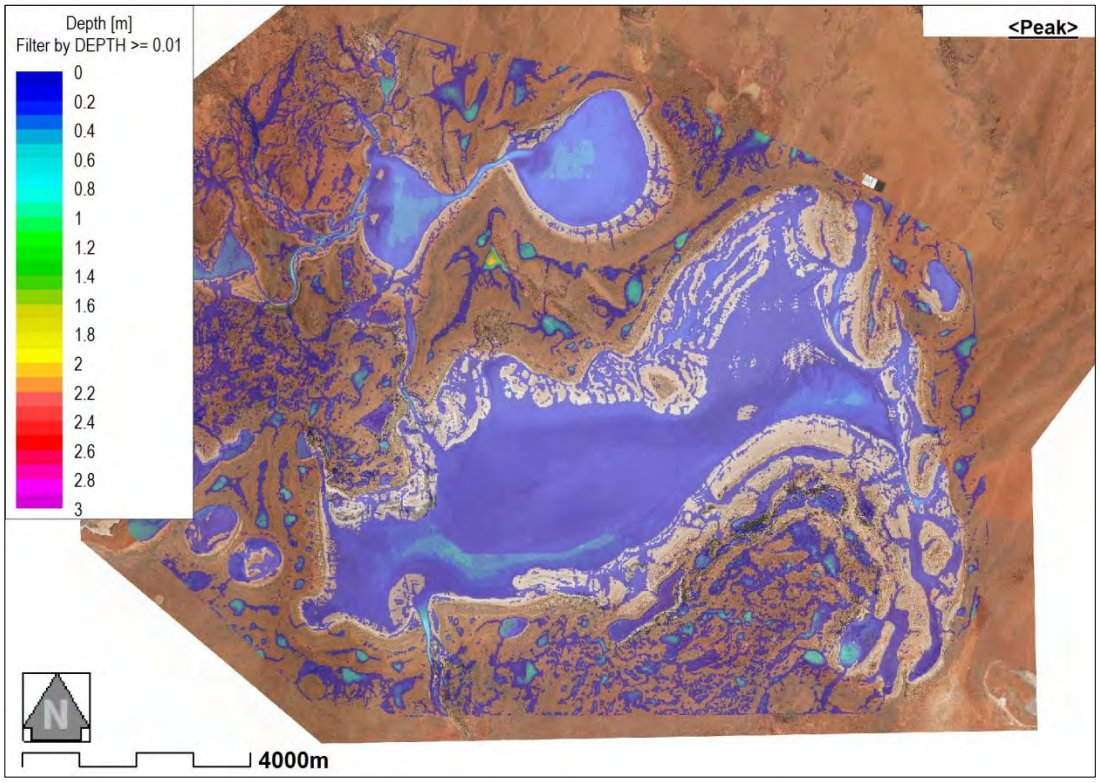


Figure B 30: 50% AEP Existing Flood Depth Map at Ten Mile Lake

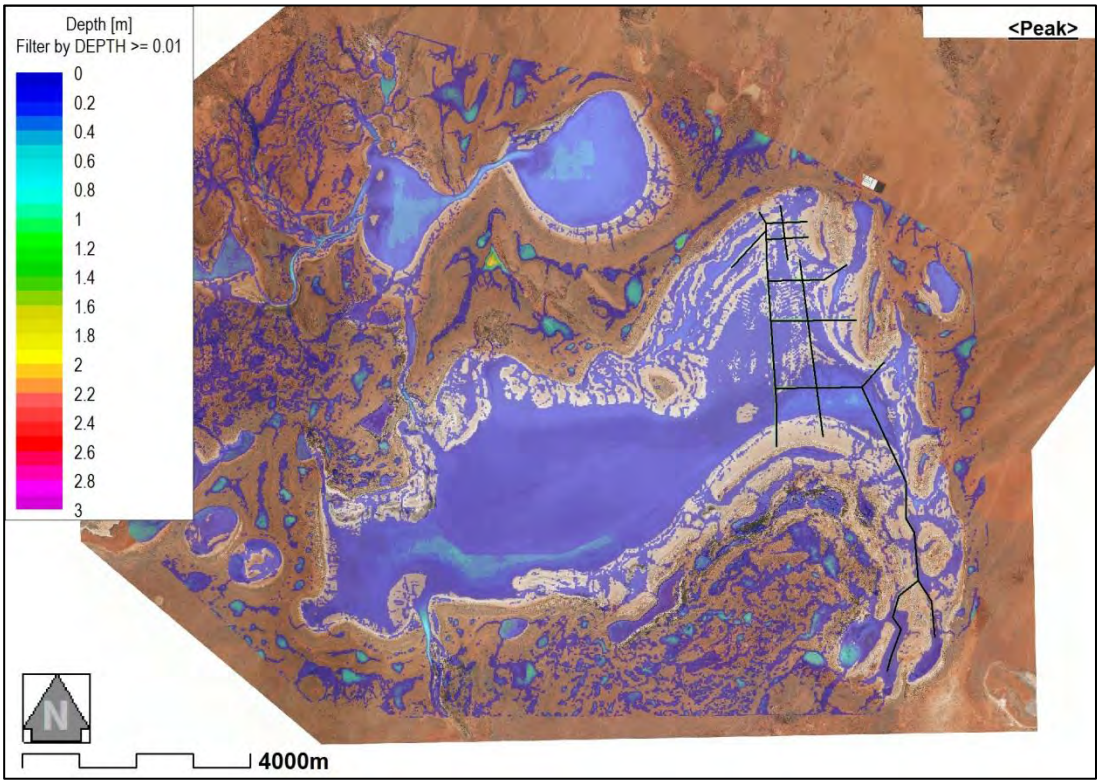


Figure B 31: 50% AEP Operations Flood Depth Map at Ten Mile Lake

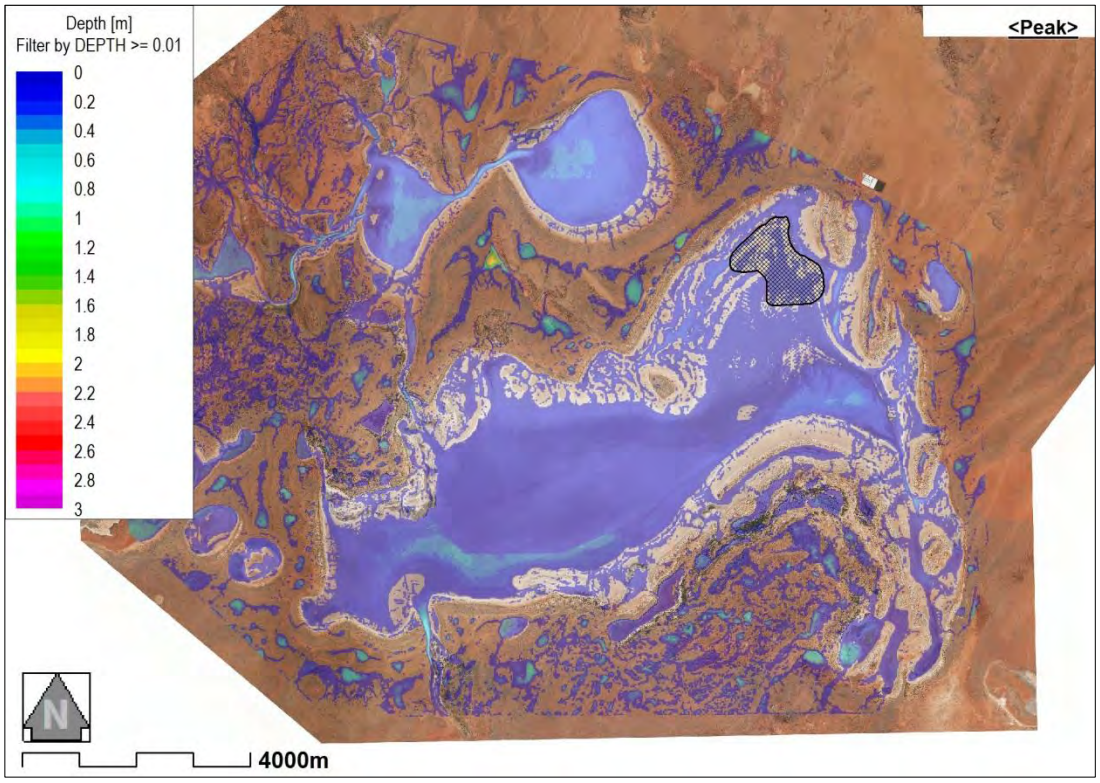


Figure B 32: 50% AEP Closure Flood Depth Map at Ten Mile Lake

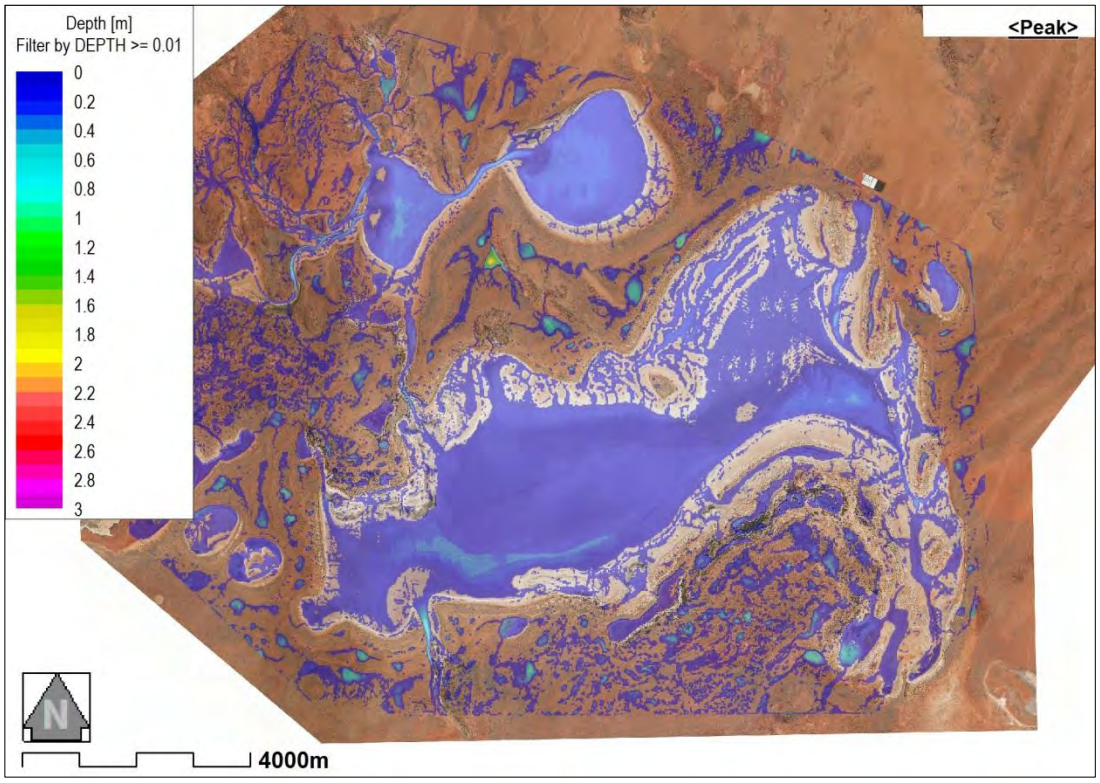


Figure B 33: 63% AEP Existing Flood Depth Map at Ten Mile Lake

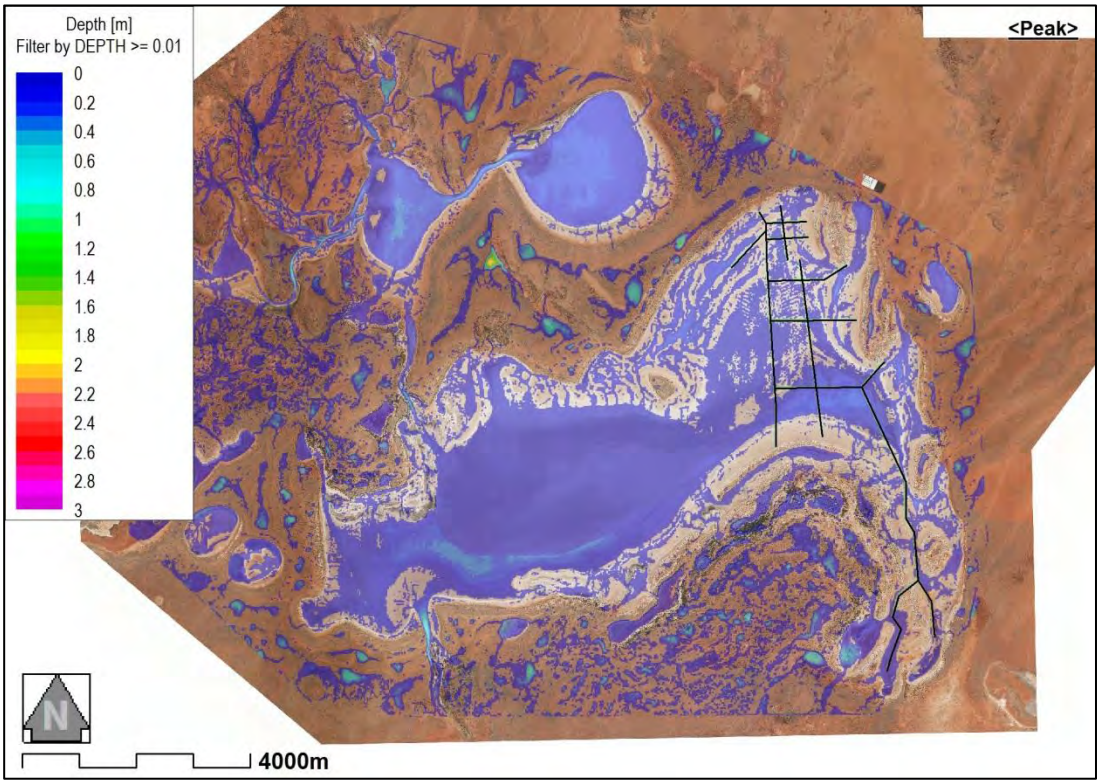


Figure B 34: 63% AEP Operations Flood Depth Map at Ten Mile Lake

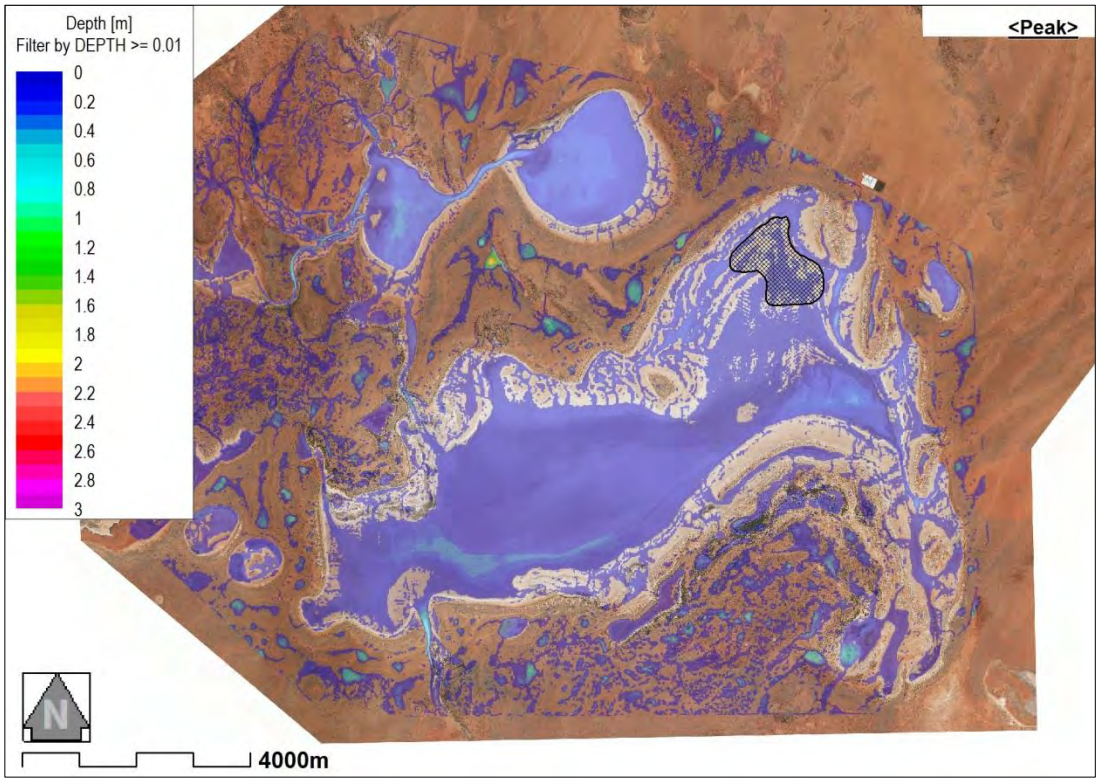
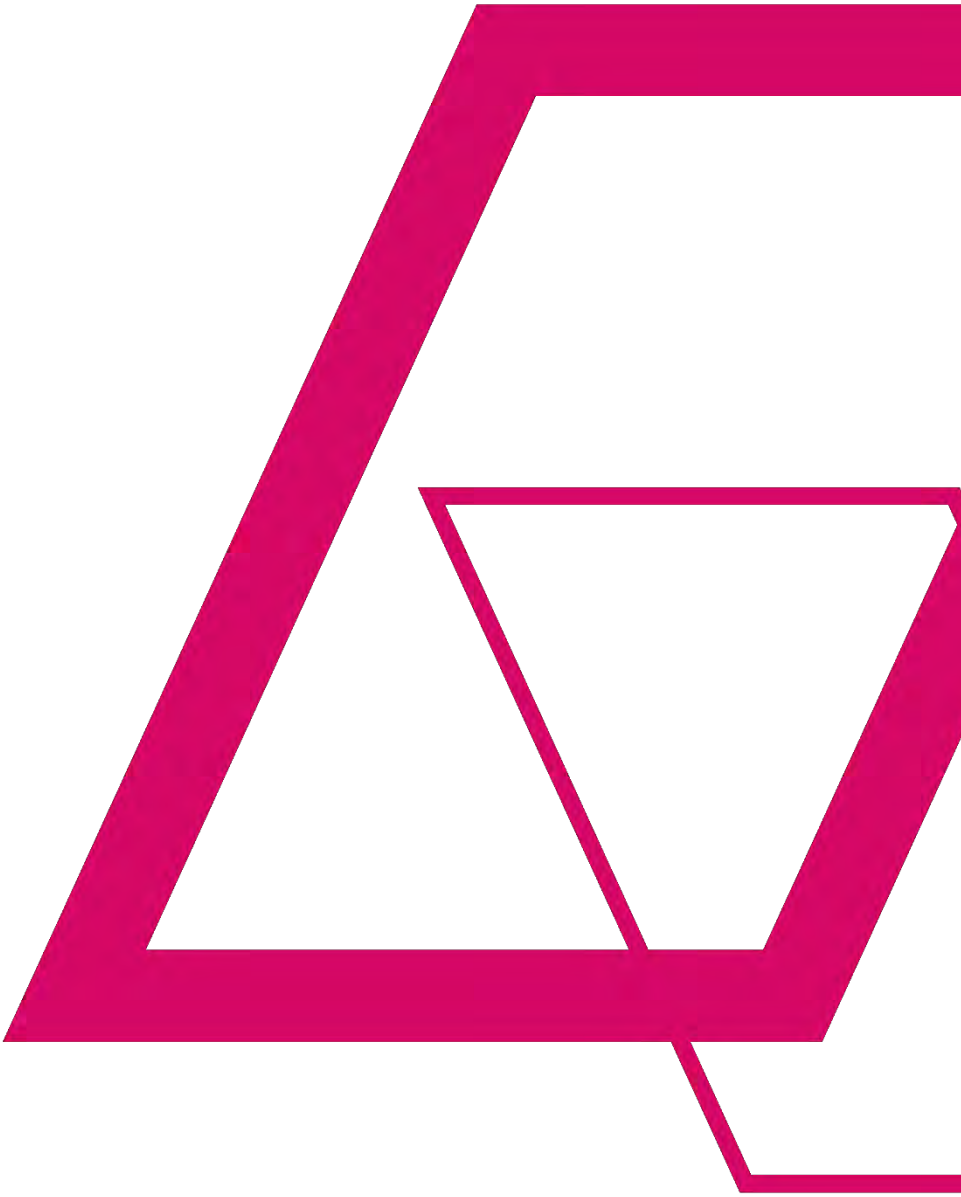


Figure B 35: 63% AEP Closure Flood Depth Map at Ten Mile Lake

Appendix C Difference Mapping



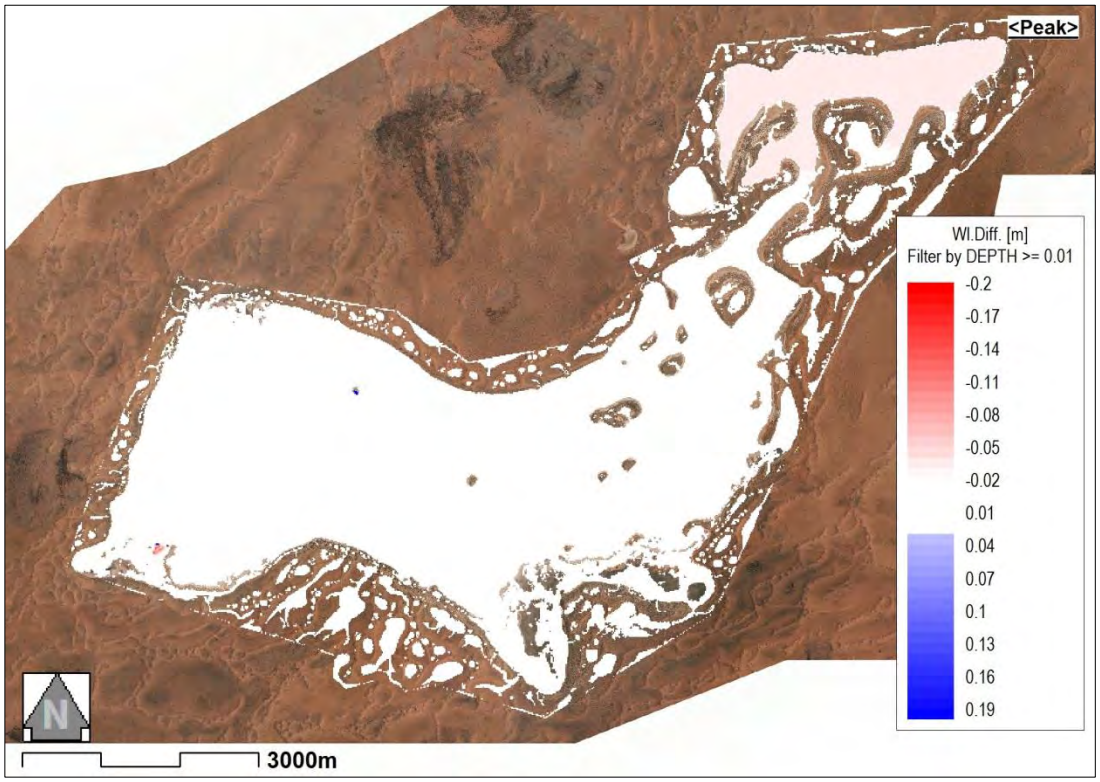


Figure C 1 : 1% AEP Water Level Difference Map (Operations – Existing) at Sunshine Lake

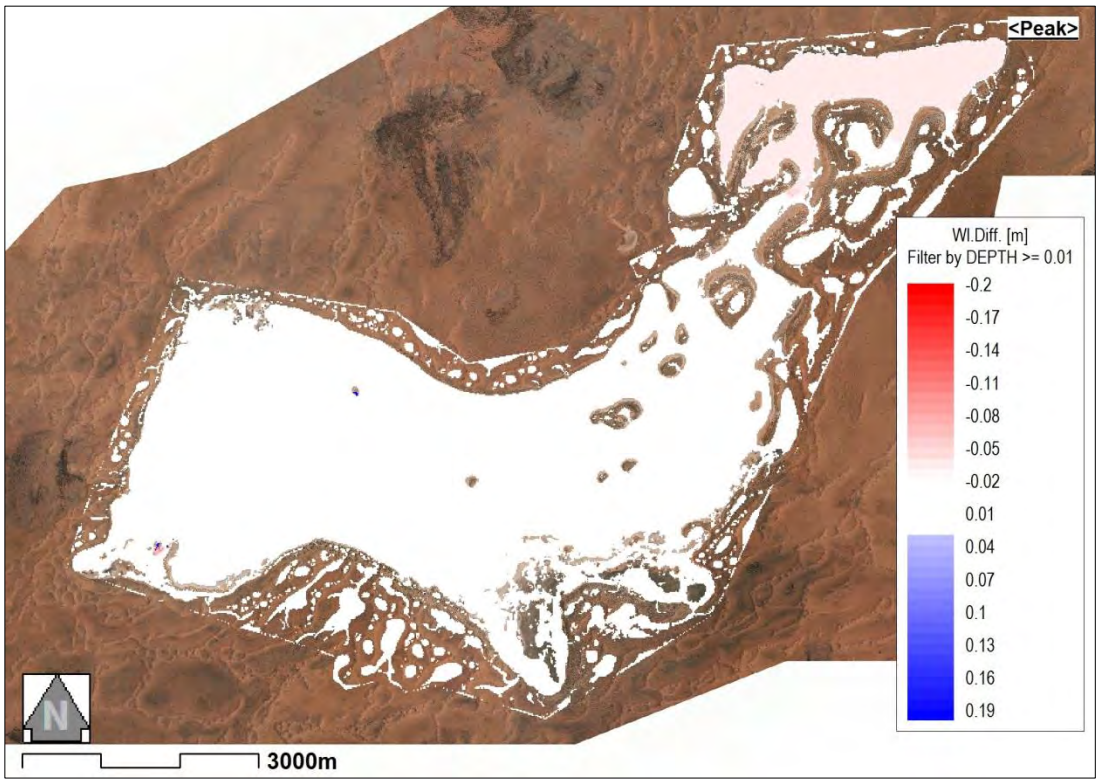


Figure C 2 : 2% AEP Water Level Difference Map (Operations – Existing) at Sunshine Lake

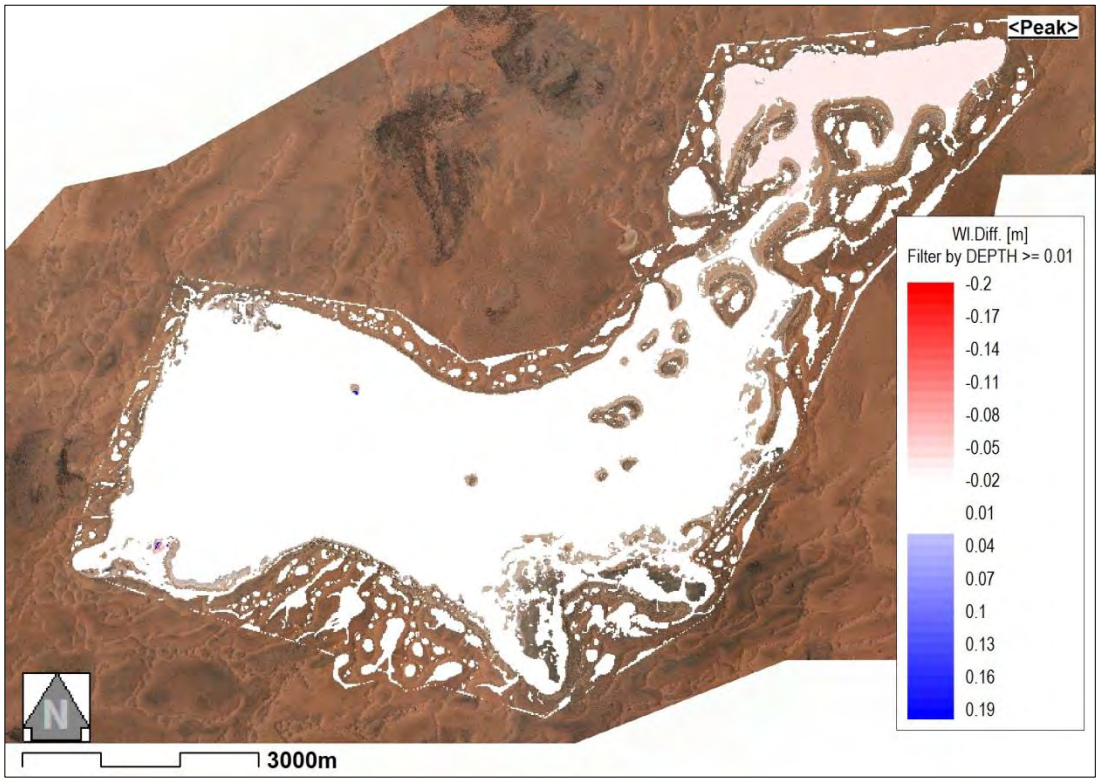


Figure C 3 : 5% AEP Water Level Difference Map (Operations – Existing) at Sunshine Lake

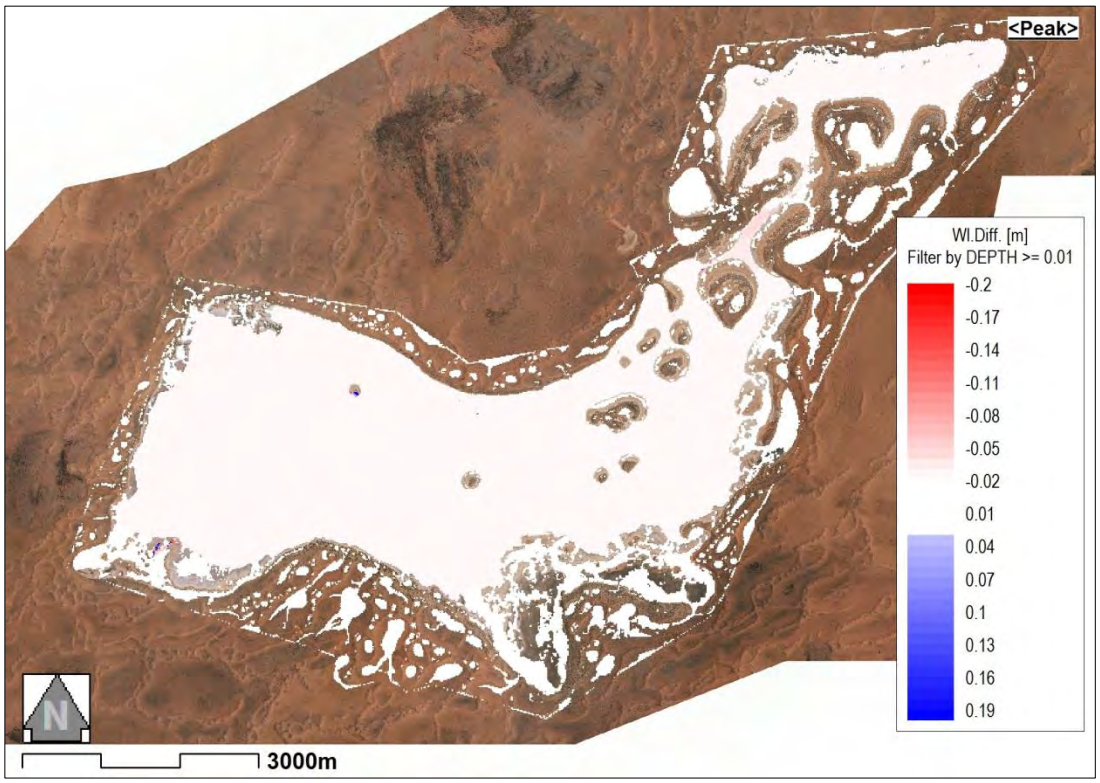


Figure C 4 : 10% AEP Water Level Difference Map (Operations – Existing) at Sunshine Lake

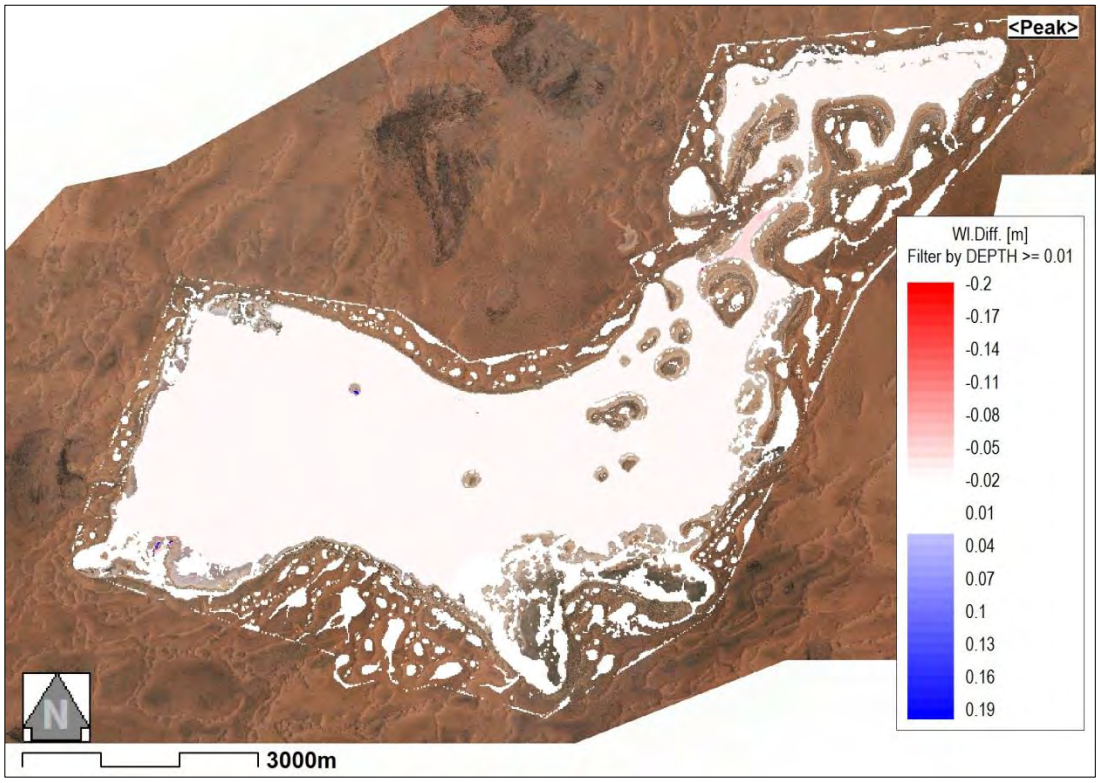


Figure C 5 : 20% AEP Water Level Difference Map (Operations – Existing) at Sunshine Lake

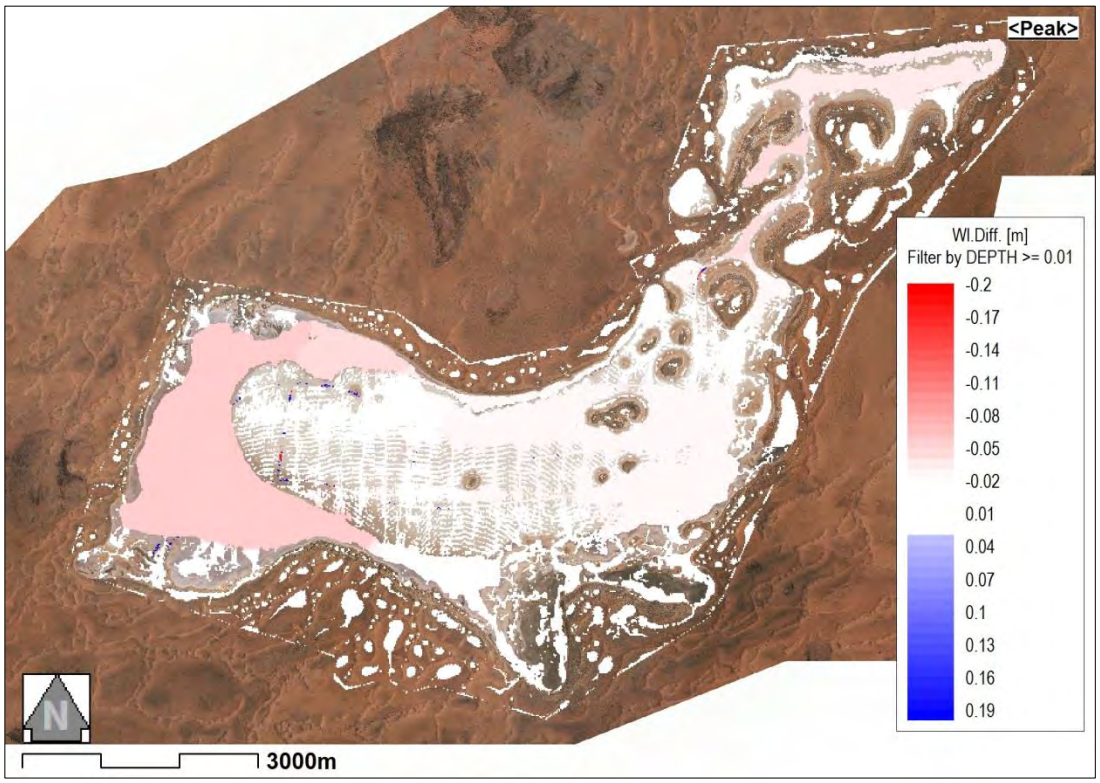


Figure C 6 : 50% AEP Water Level Difference Map (Operations – Existing) at Sunshine Lake

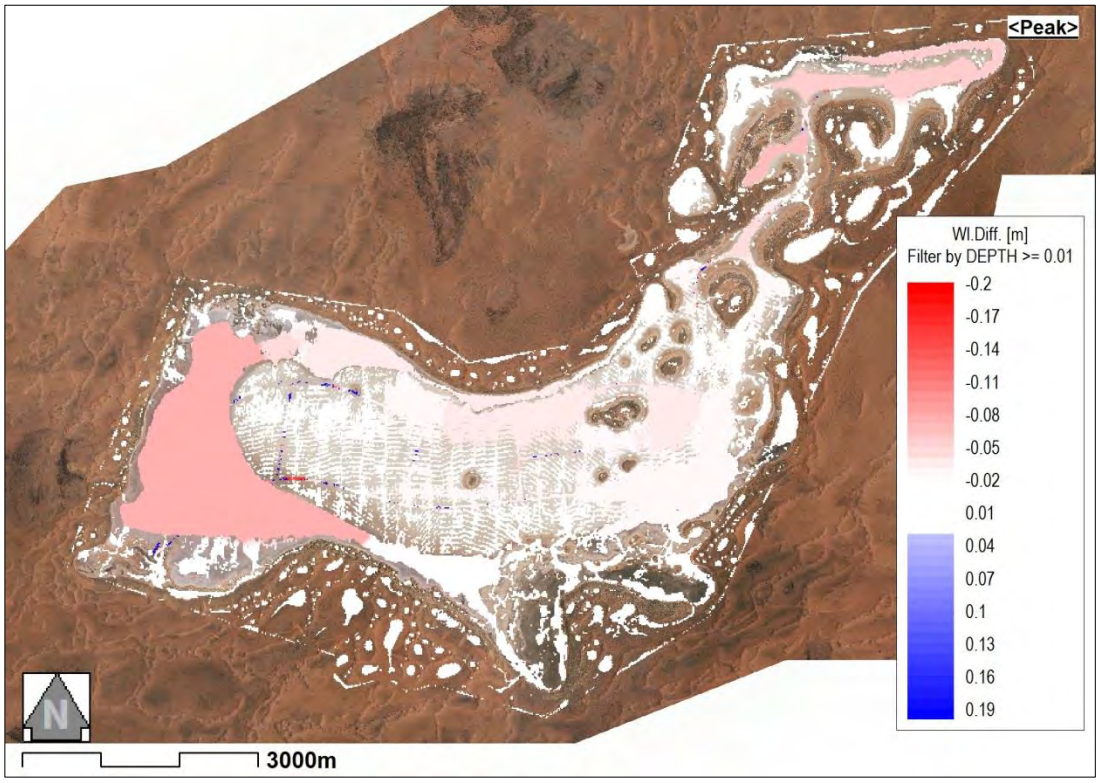


Figure C 7 : 63% AEP Water Level Difference Map (Operations – Existing) at Sunshine Lake

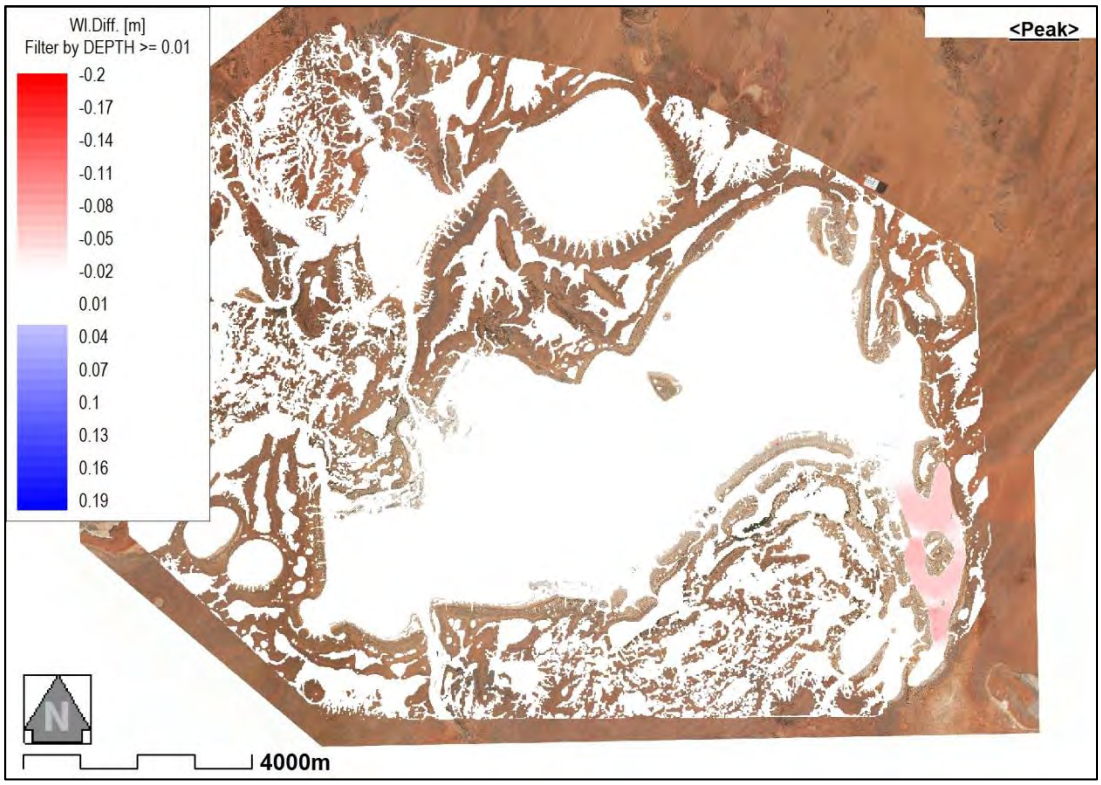


Figure C 8: 1% AEP Water Level Difference Map (Operations – Existing) at Ten Mile Lake

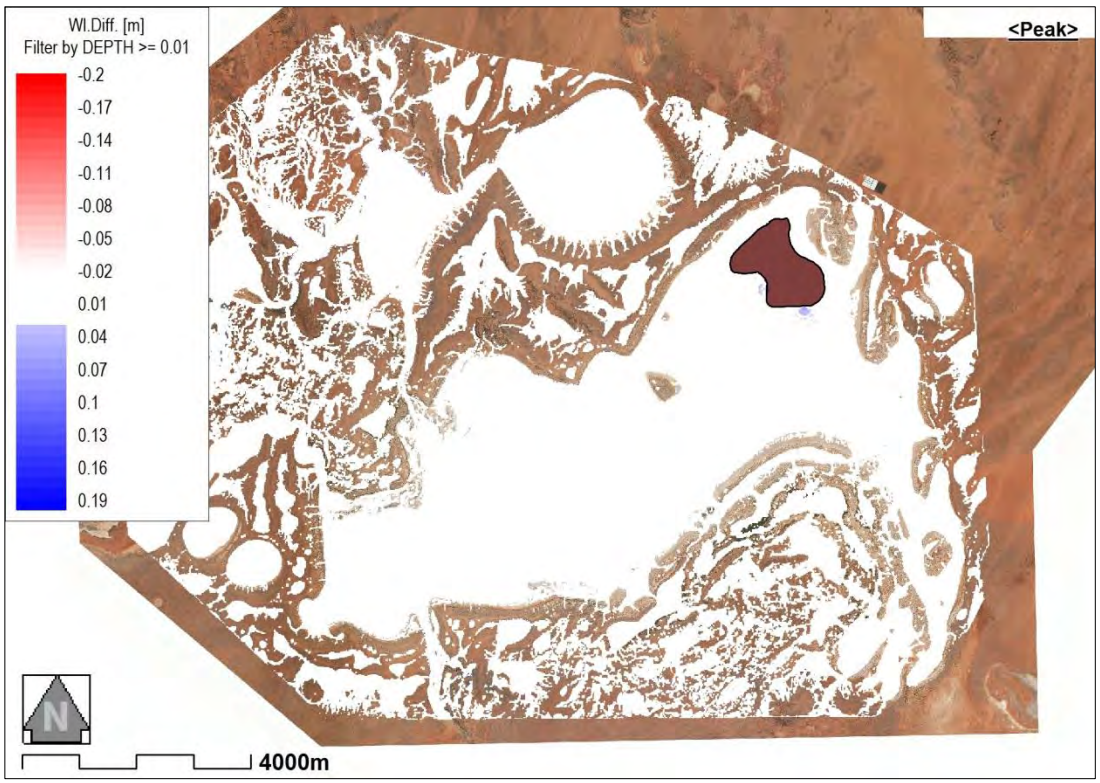


Figure C 9 : 1% AEP Water Level Difference Map (Closure – Existing) at Ten Mile Lake

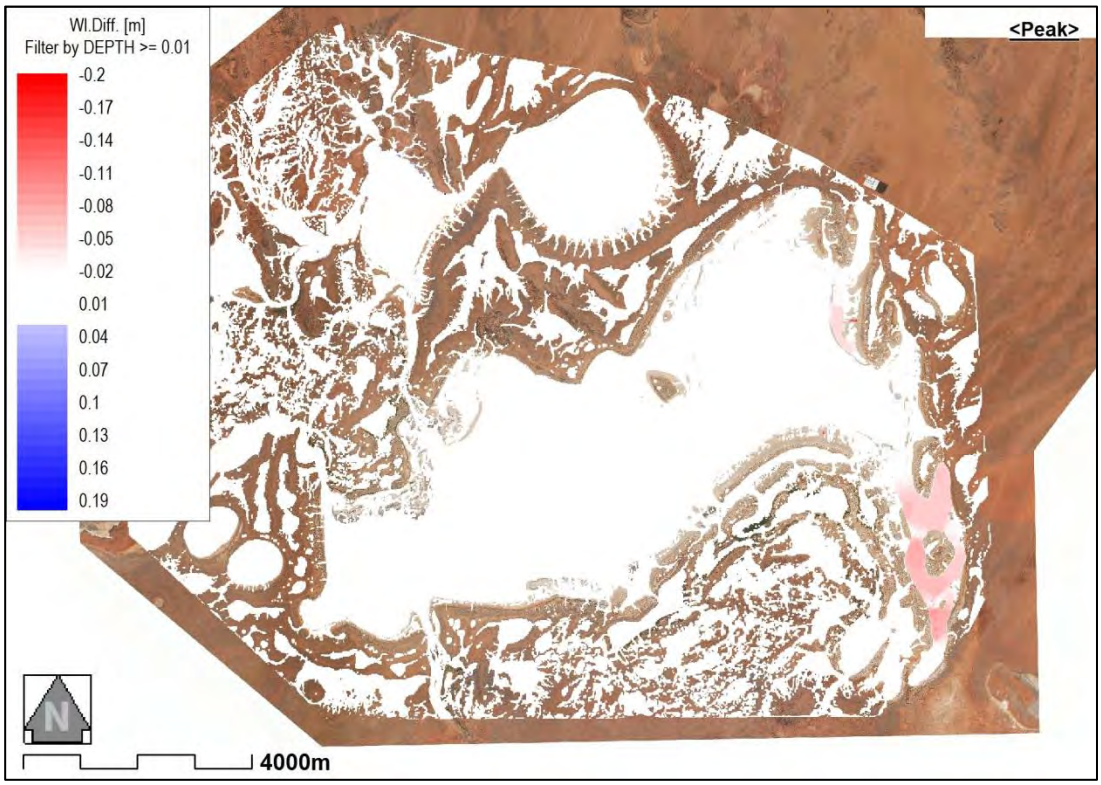


Figure C 10: 2% AEP Water Level Difference Map (Operations – Existing) at Ten Mile Lake

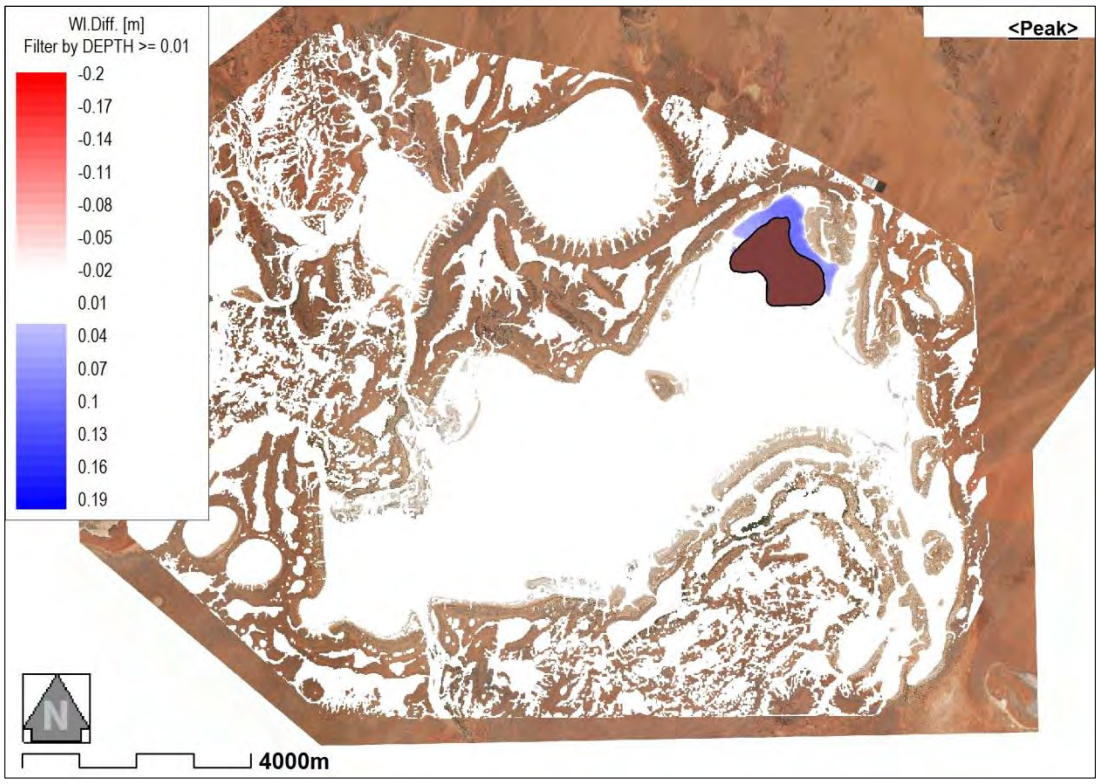


Figure C 11 : 2% AEP Water Level Difference Map (Closure – Existing) at Ten Mile Lake

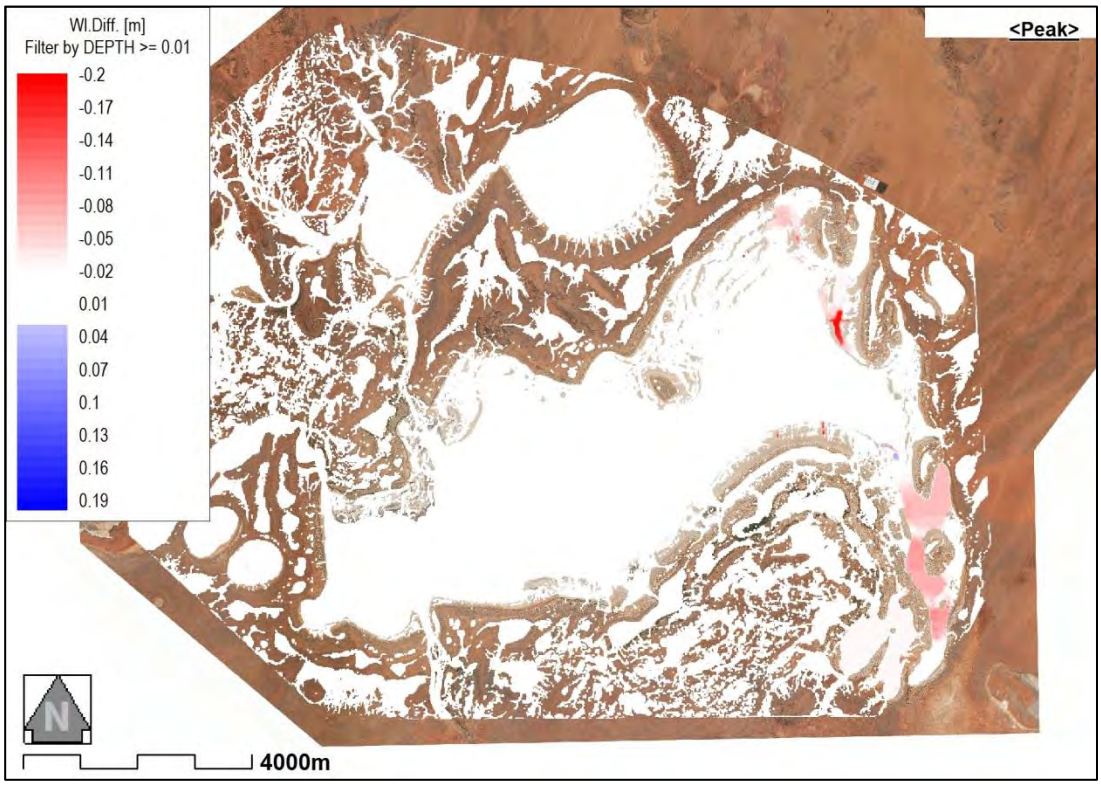


Figure C 12: 5% AEP Water Level Difference Map (Operations – Existing) at Ten Mile Lake

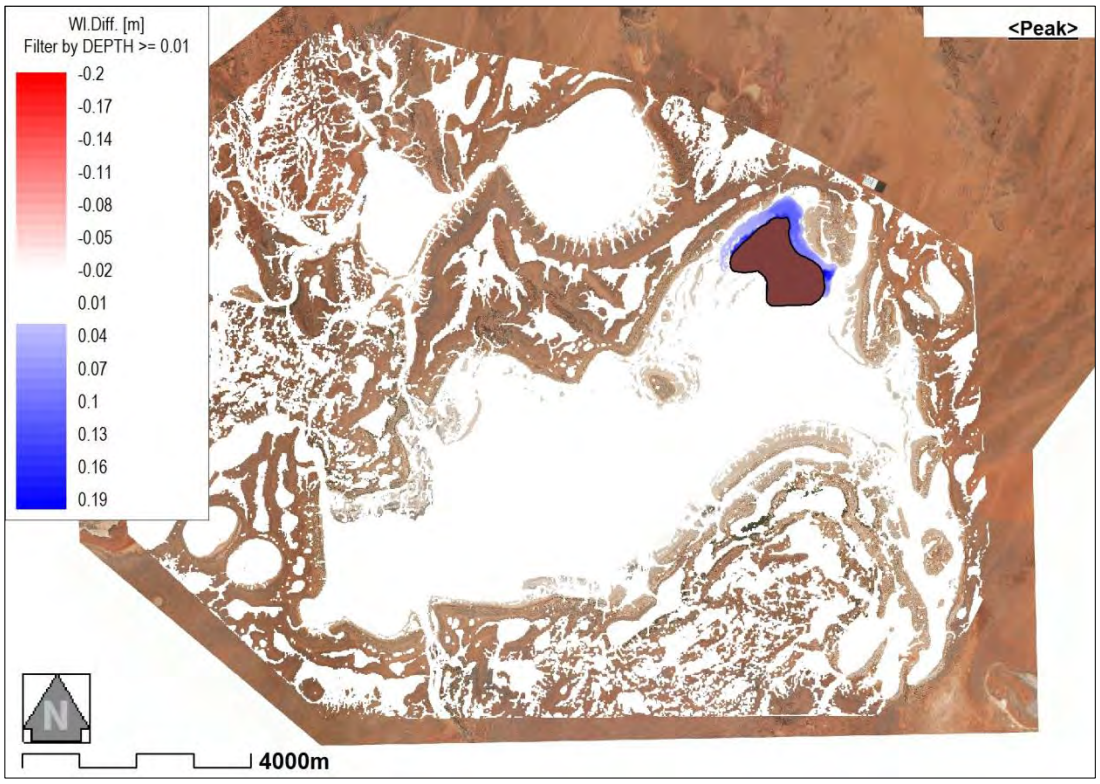


Figure C 13 : 5% AEP Water Level Difference Map (Closure – Existing) at Ten Mile Lake

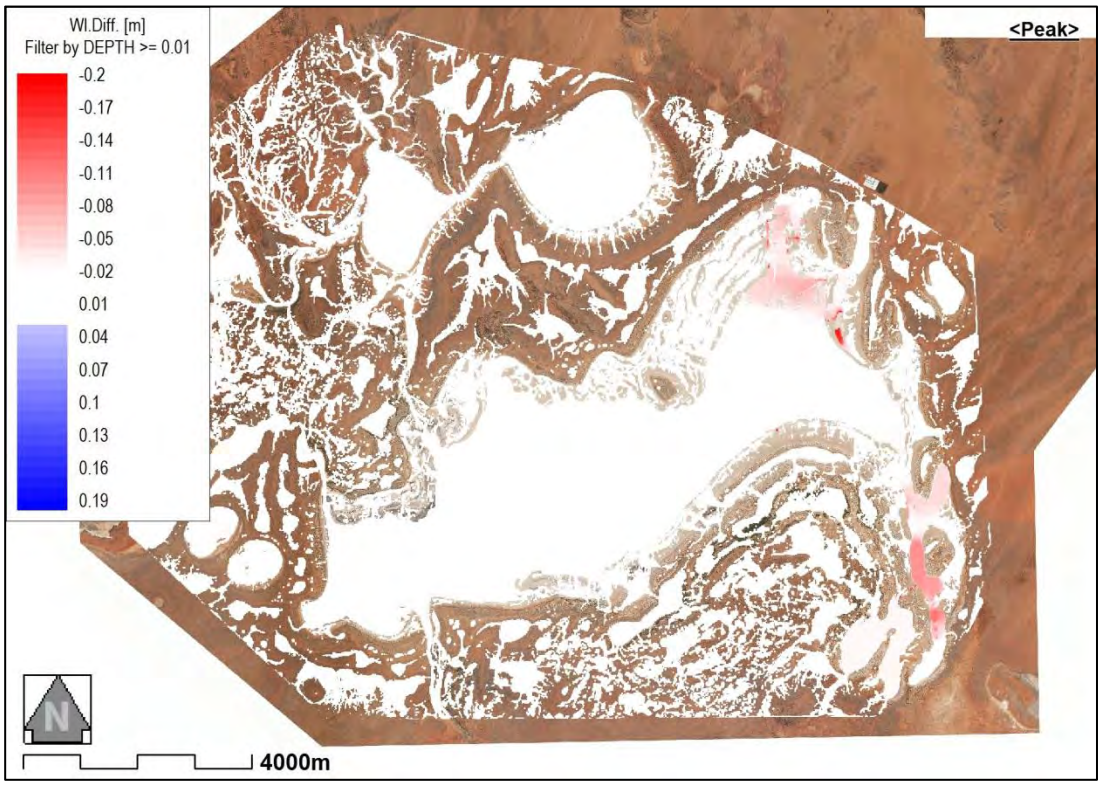


Figure C 14: 10% AEP Water Level Difference Map (Operations – Existing) at Ten Mile Lake

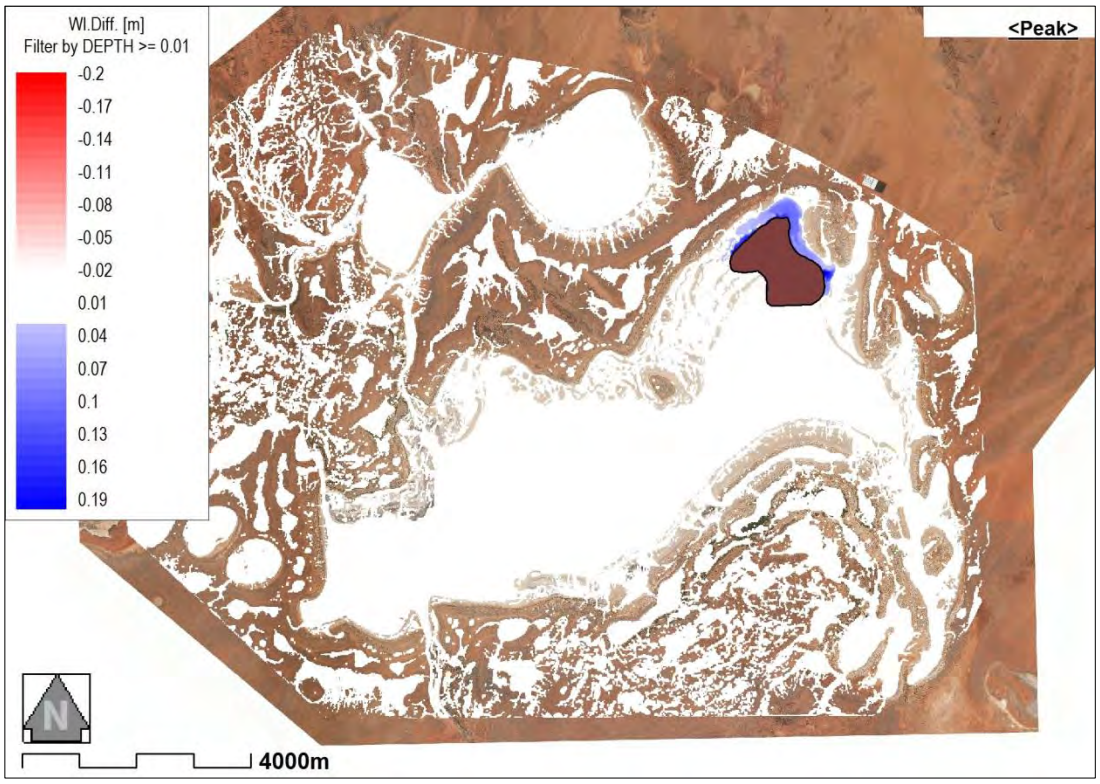


Figure C 15 : 10% AEP Water Level Difference Map (Closure – Existing) at Ten Mile Lake

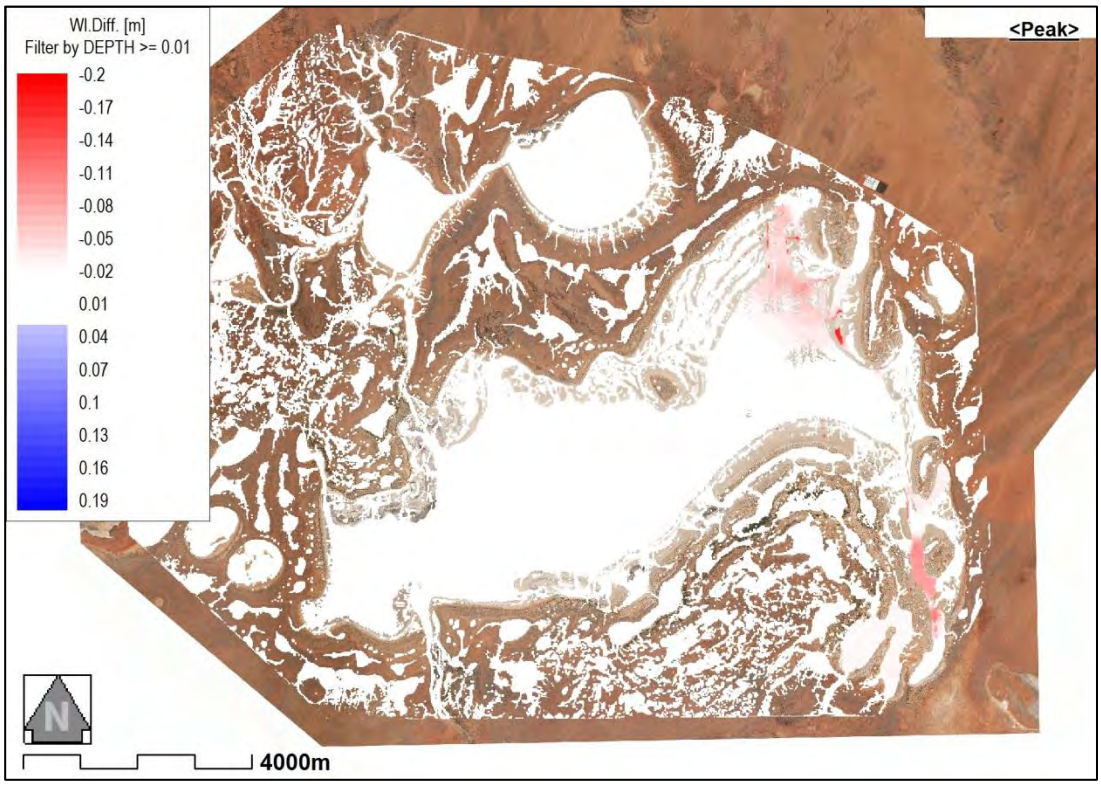


Figure C 16: 20% AEP Water Level Difference Map (Operations – Existing) at Ten Mile Lake

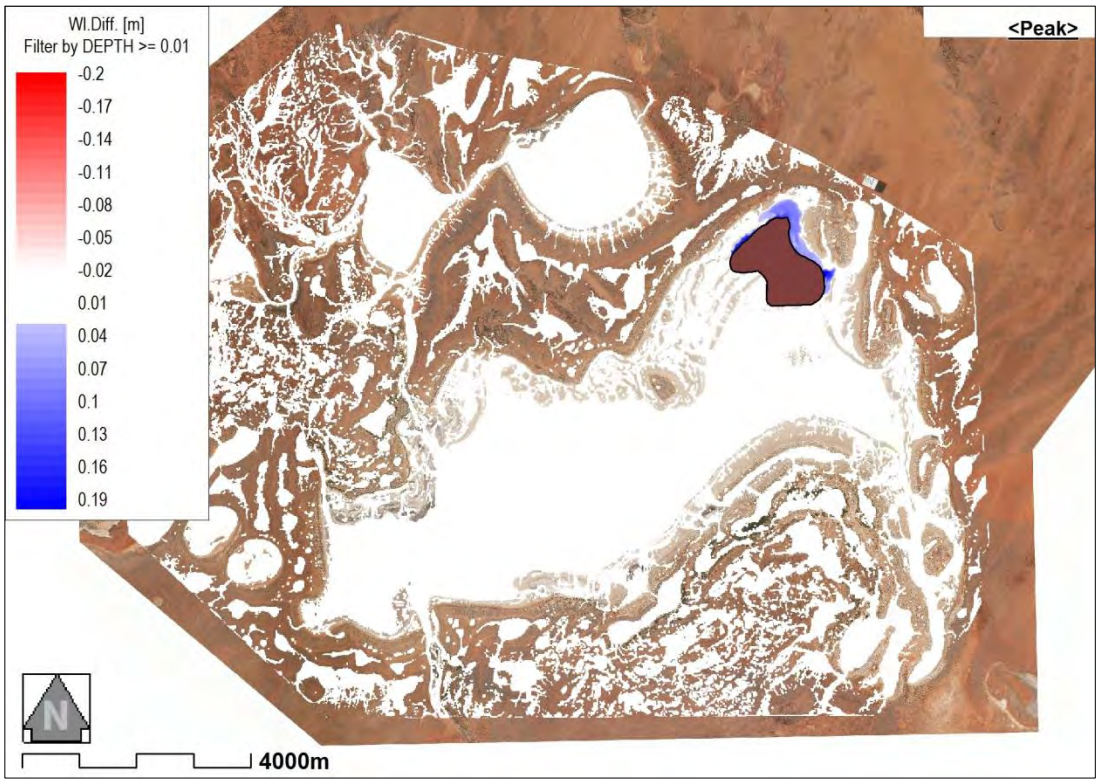


Figure C 17 : 20% AEP Water Level Difference Map (Closure – Existing) at Ten Mile Lake

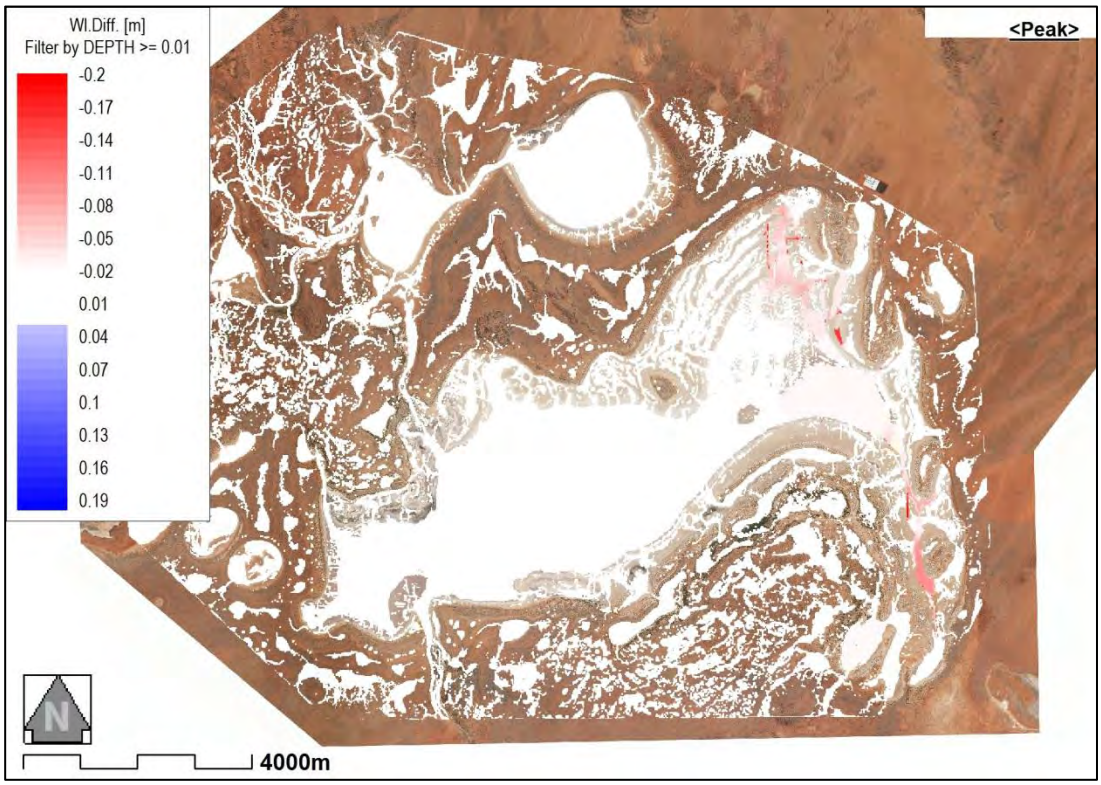


Figure C 18: 50% AEP Water Level Difference Map (Operations – Existing) at Ten Mile Lake

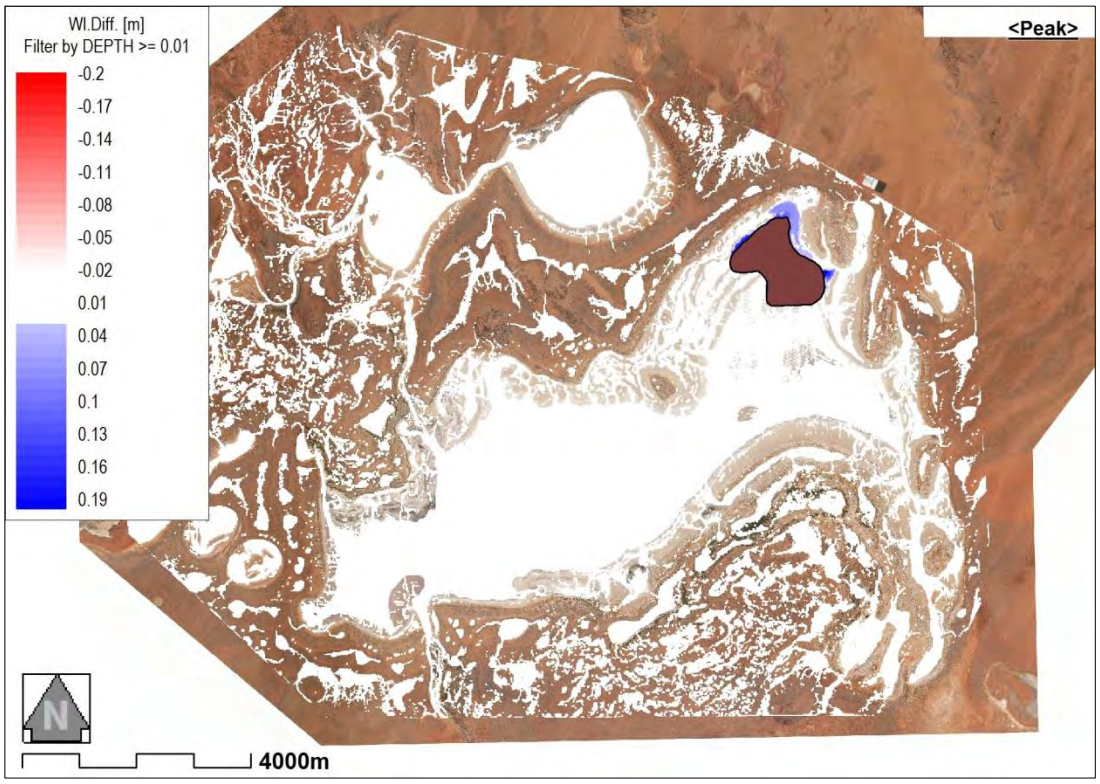


Figure C 19 : 50% AEP Water Level Difference Map (Closure – Existing) at Ten Mile Lake

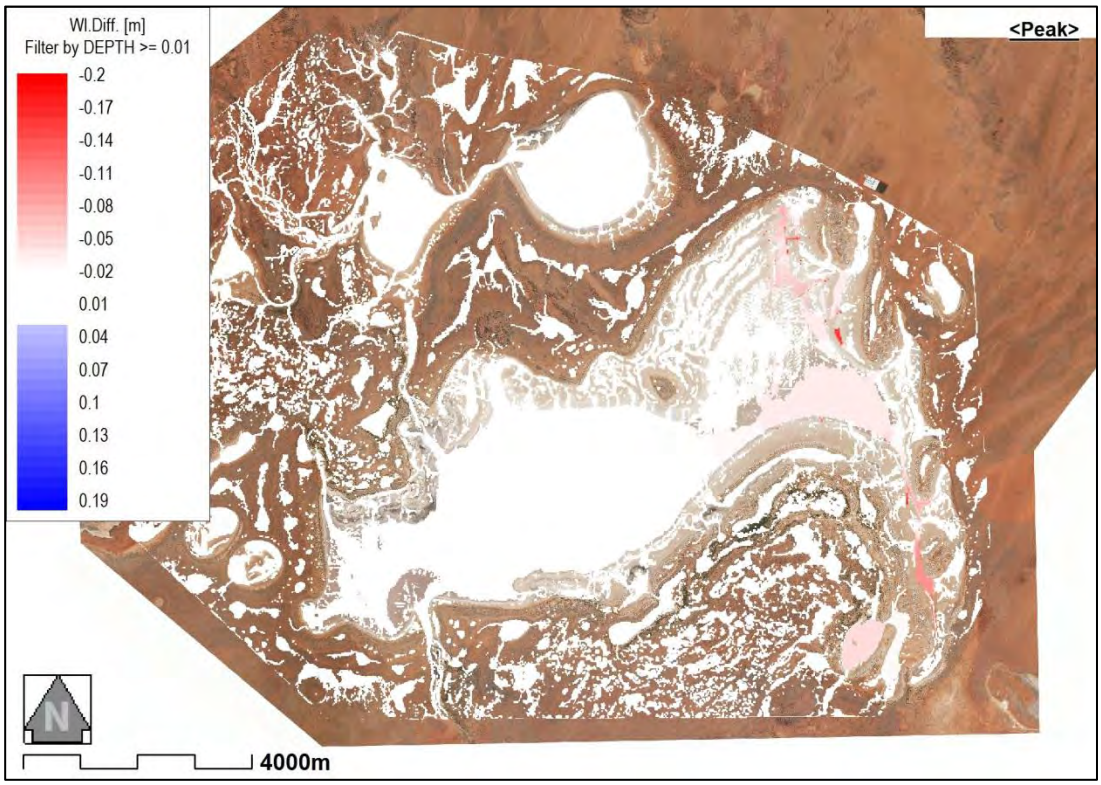


Figure C 20: 63% AEP Water Level Difference Map (Operations – Existing) at Ten Mile Lake

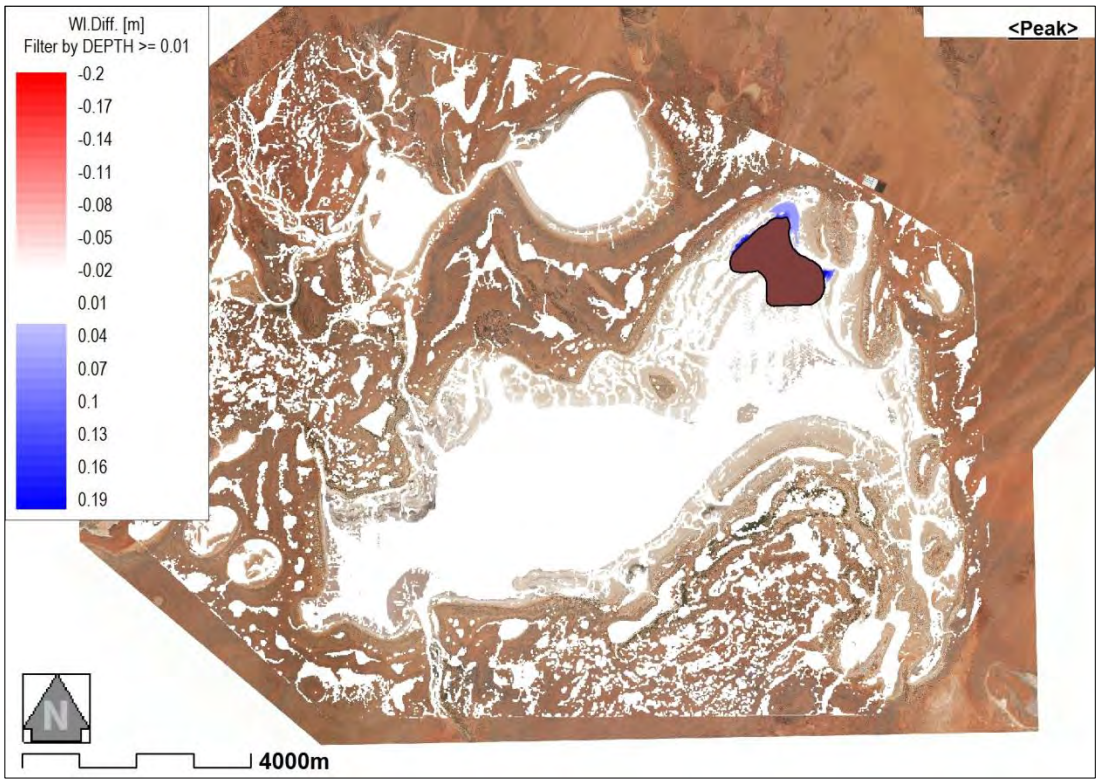


Figure C 21 : 63% AEP Water Level Difference Map (Closure – Existing) at Ten Mile Lake