Gap GeoPhysics
Exploration Services

OPERATIONS REPORT

Project 18112TODD:
Downhole Electromagnetic Surveys

Mt Hardy Project, Northern Territory

Gap Project Number:	18112TODD
Survey Type(s):	DHEM
Project:	Mt Hardy, NSW
Prospect(s):	EM1 and EM2
Location:	Yuendumu, Northern Territory
Client:	Todd River Resources
Conducted By:	Gap Geophysics Australia Pty Ltd
Issuing Office:	Brisbane
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Gap GeoPhysics Australia Pty Limited
T: +61 7 3846 0999 | F: +61 7 3844 0022 | **GapGeo.com**
2/16 Duncan Street | PO Box 5745 | West End QLD 4101
ABN: 67 116 407 580

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GAP's Client

The entity who commissioned this report, and who is Gap Geophysics Australia's (GAP's) Client is Todd River Resources.

Purpose of This Report

The surveys described in this report were commissioned for the purpose of assisting sub-surface geophysical investigation to map geological structure.

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Prepared By:	Daniel Eremenco Project Manager / Geophysicist
Reviewed By:	Mal Cattach Chief Geophysicist

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2	Montana GIS

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Project 18112TODD: Downhole Electromagnetic Surveys

Mt Hardy Project, Northern Territory.

Executive Summary

Gap Geophysics Australia Pty Ltd (GAP) was commissioned by Todd River Resources to conduct Downhole Electromagnetic (DHEM) surveys on twelve diamond drill holes at the Mt Hardy Project near Alice Springs, NT. The surveys were conducted between 1st and 22nd July 2018.

The surveys were conducted with the GAP DHEM system comprising of an EMIT DigiAtlantis system and Gap GeoPak HPTX transmitter.

Project Personnel

The personnel involved in the Project are listed in Table 1.

Table 1: Project Personnel.

Role	Personnel	Organisation
Client Representative	Dave McInnes	Montana GIS
Field Manager	Ben Trevenen	GAP
Field Crew	Jamie Shickle	GAP
Q/C Manager	Mal Cattach	GAP

Scope

The project scope comprised 12 DHEM surveys as defined by the documents and emails:

- 180619_EM1_DHEM_TxLoops.docx
- 180624_EM2_DHEMTxloops.docx
- Emails.doc

This document has been included with the Operations Report and Data in the Reference Documents Folder on the accompanying Project Data Disk.

The surveys conducted during this Project are summarised in Table 2 and illustrated in Figure 1.

Table 2: Downhole EM Survey Summary.

Hole ID	TX Loop	Prospect	Combined ID	Easting (m)	Northing (m)	RL (m)	AZ (deg)	Dip (deg)	Total Depth (m)
18MHRCDDH030	EM1TXNW18b	EM1	18MHRCDDH030 _EM1TXNW18b	761945	7552965	649	105	-47	245.85
18MHRCDDH031A	EM1TXNW18b	EM1	18MHRCDDH031A _EM1TXNW18b	761925	7552915	645	98	-47	261.4
18MHRCDDH031A	EM1TXSW18	EM1	18MHRCDDH031A _EM1TXSW18	761925	7552915	645	98	-47	261.4
18MHRCDDH032	EM1TXNW18b	EM1	18MHRCDDH032 _EM1TXNW18b	761935	7552990	638	90	-62	315.21
18MHRCDDH032	EM1TXSW18	EM1	18MHRCDDH032 _EM1TXSW18	761935	7552990	638	90	-62	315.21
18MHRCDDH034	EM1TXNW18b	EM1	18MHRCDDH034 _EM1TXNW18b	761922	7552912	645	90	-58	252.57
18MHRCDDH021A	EM1TXNW18b	EM1	18MHRCDDH021A _EM1TXNW18b	761924	7552975	638	90.9	-73	340
18MHDDH035	EM1TXNW18b	EM1	18MHDDH035 _EM1TXNW18b	761933	7552870	640	80	-48	260
18MHDDH036		EM1		761933	7552870	640	90	-45	260
18MHDDH037	EM1TXNW18b	EM1	18MHDDH037 _EM1TXNW18b	761956	7552837	640	78	-45	260
18MHDDH038		EM1		762037	7552856	655	64	-74	210
18MRCDDH033	EM2_TxL _NW18	EM2	18MHRCDDH033 _EM2_TxL_NW18	764996	7554083	635	115	-65	405

Total Anticipated Depth: 3386.64
*Coordinate System: WGS84, MGA Zone 52

The Holes surveyed are summarised in the following Sections. The column headings in the Tables are described below.

- The Hole ID is a unique identifier assigned to each hole.
- The TX Loop ID is a unique identifier assigned to each loop.
- Survey Mode – either DHEM or DHMMR.
- The Combined ID is a combination of Hole ID and Loop ID. It is used as the primary identifier as many holes are surveyed from multiple loops.
- The Eastings and Northings are the coordinates of the drillhole collars.
- Reduced Level (RL) is the elevation of the drillhole collars.
- The Dip is the dip of the hole in degrees from horizontal, at the drill collar.
- The Azimuth (AZ) is shown in degrees with respect to the coordinate system used.
- Total Depth is the anticipated depth of the hole in metres, determined from drilling and survey data.

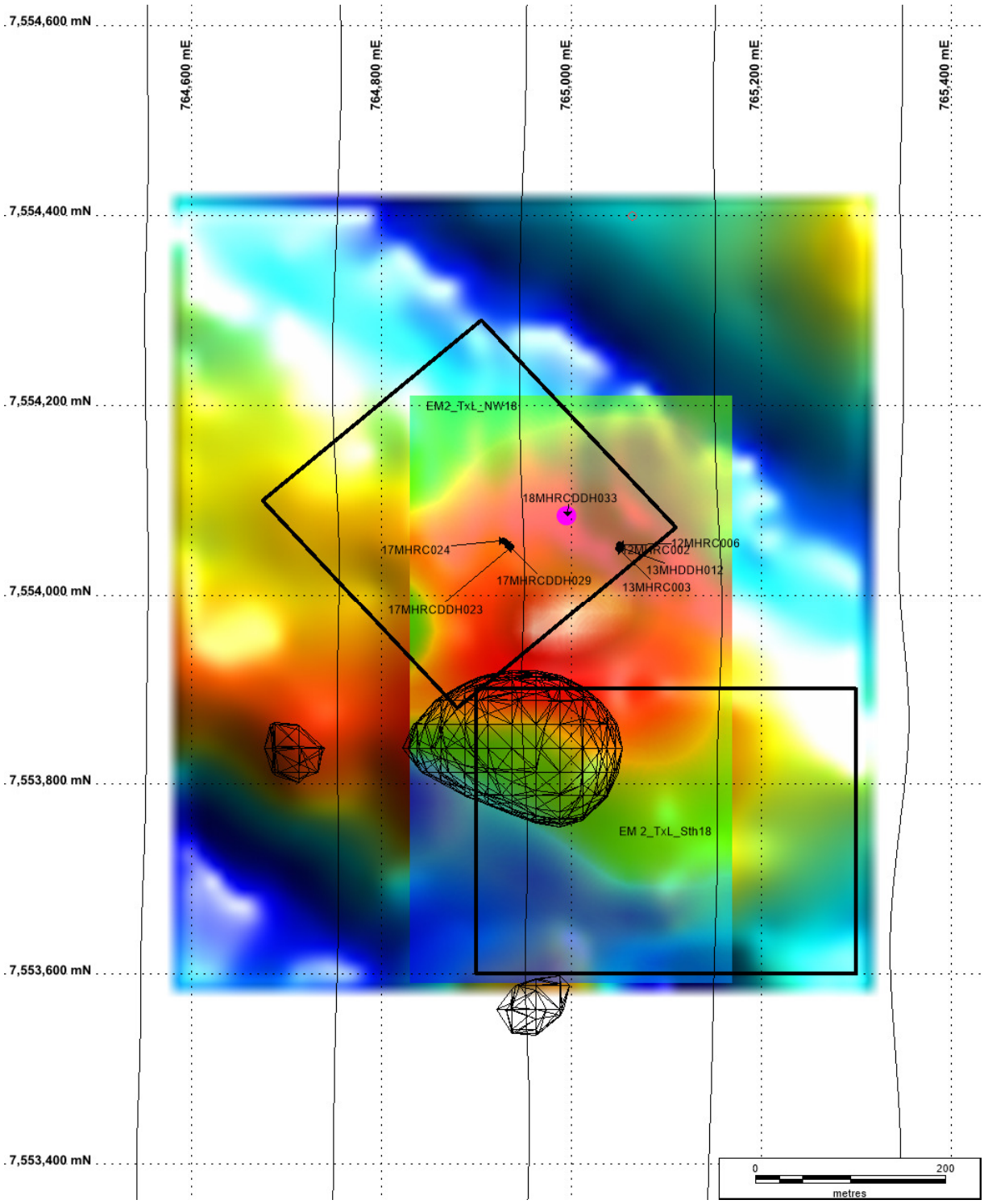

Figure 1: DHEM Survey Location Map.

GAP Downhole Instrumentation

The surveys were conducted using one of GAP's Deep Search Downhole systems which consist of an EMIT DigiAtlantis Borehole magnetometer and a High-Powered GeoPak Transmitter.

The GAP Downhole Survey System and its standard operating configuration is described in detail in the following document:

- Technical Reference Manual_GAP Downhole Surveys_v1.7.pdf

The GeoPak transmitters are described in detail in the following document:

- Technical Reference Manual_GAP GeoPak Transmitters_v1.3.pdf

These documents are included with the Operations Report and Data in the Reference Documents Folder on the accompanying Project Data Disk.

DigiAtlantis Receiver

An EMIT DigiAtlantis receiver was used with a SMARTem24 controller and 3-component fluxgate magnetometer. The survey parameters specific to this project are summarised in Table 3.

Table 3: SMARTem Survey Parameters.

Parameter	Value
Instrument	DigiAtlantis Probe 142
Acquisition Software	SMARTem 24 v 10.2.146.40570
Magnetic Inclination	-53.51
Magnetic Declination	3.77
Primary Start	-40 ms
Primary End	-20 ms

Transmitter

Table 4: Transmitter Specifications.

Transmitter	
Transmitter	Gap GeoPak HPTX-80 (GAP-801)
Turnoff Mode	Fast
Timing	External Control (EMIT DigiAtlantis) - GPS synchronisation
Tx Frequency / Duty Cycle	2.5Hz / 50%
Loop (turns x wire size)	1 x 35 mm^2 (cross-sectional area)

Survey Results

Details of the surveys are listed in Table 5. Three survey loops were deployed. The planned locations were used in processing and for calculation of the theoretical primary field, however a GPS'ed loop was supplied with Maxwell project.

Table 5: Downhole EM Survey Details.

Hole	Date(s)	Freq (Hz)	Current (A)	Ramp (ms)	No. Stacks	Interval (m)	Depth (m)	Sur File	Comments
18MHDDH035_EM1TXNW18b	22-July-18	2.5	180	1.86 - 2.08	256	5-10	225	.digi	
18MHDDH037_EM1TXNW18b	7-July-18	2.5	180	1.85 – 1.88	256	5-10	180	.digi	
18MHRCDDH021A_EM1TXNW18b	7-July-18	2.5	180	1.9 – 2.01	256	5-20	400	.digi	
18MHRCDDH030_EM1TXNW18b	3-July-18	2.5	180	1.87 – 2.06	256	5-10	240	.digi	
18MHRCDDH031A_EM1TXNW18b	2-July-18	2.5	180	1.83 – 1.89	256	5-20	240	.digi	
18MHRCDDH031A_EM1TXSW18	5-July-18	2.5	180	1.86 - 2.02	256	5-20	240	.digi	
18MHRCDDH032_EM1TXNW18b	3-July-18	2.5	180	1.85 – 1.96	256	5-20	305	.digi	
18MHRCDDH032_EM1TXSW18	5-July-18	2.5	180	1.80 – 1.88	256	5-20	305	.digi	
18MHRCDDH033_EM2_TxL_NW18	1-July-18	0.5	180	1.99 – 2.12	64	5-20	405	.digi	
18MHRCDDH034_EM1TXNW18b	4-July-18	2.5	180	1.88 – 1.95	256	10	120	.digi	
						Total Depth:	2660m		

EM1 Prospect

A plan of the EM1 prospect showing the loop and drill hole trajectory is shown in Figure 2. Logarithmic DHEM Response Profiles for the hole are included for reference in Figure 3 to Figure 11.

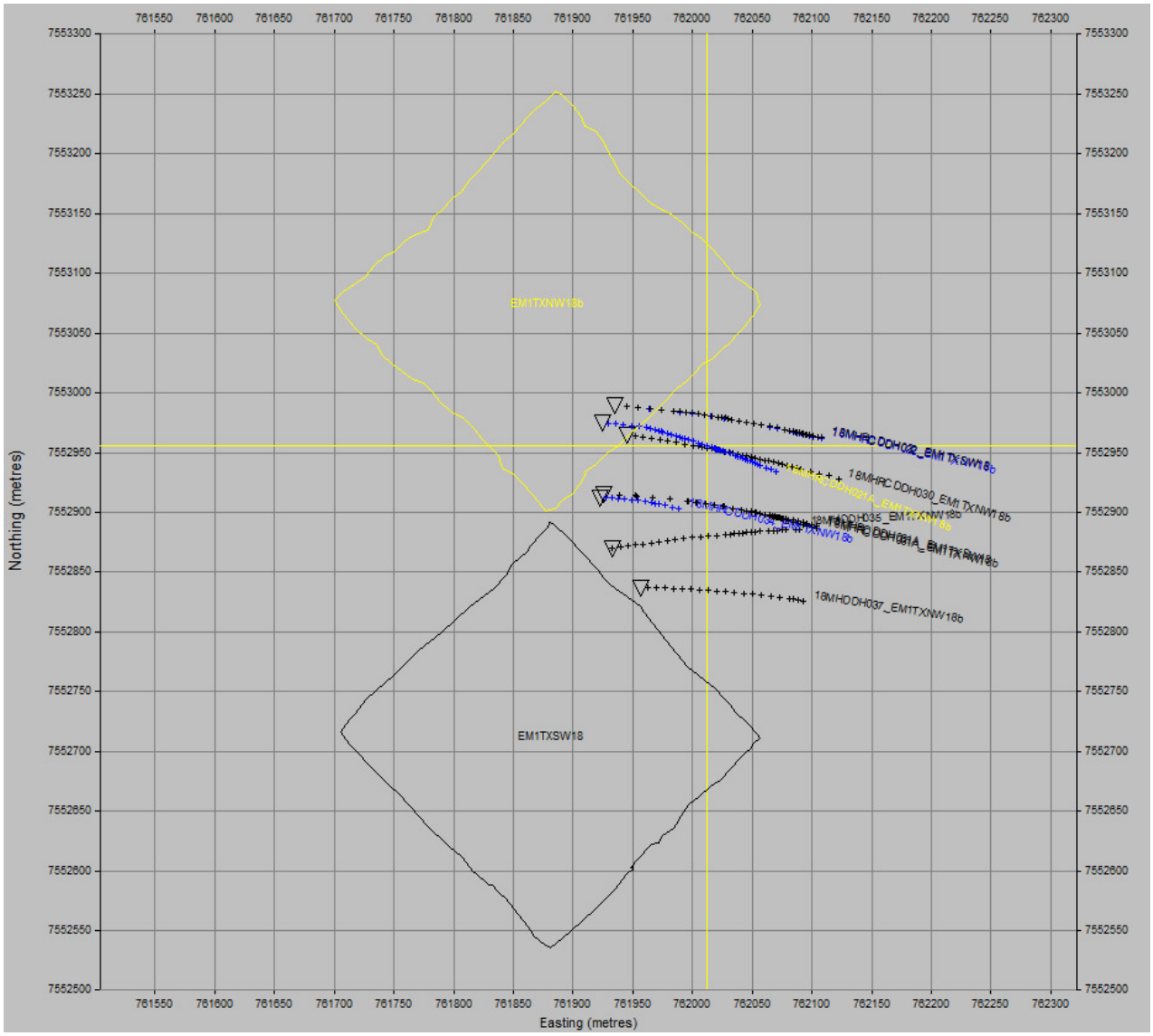

Figure 2: Layout of the DHEM survey at prospect EM1.

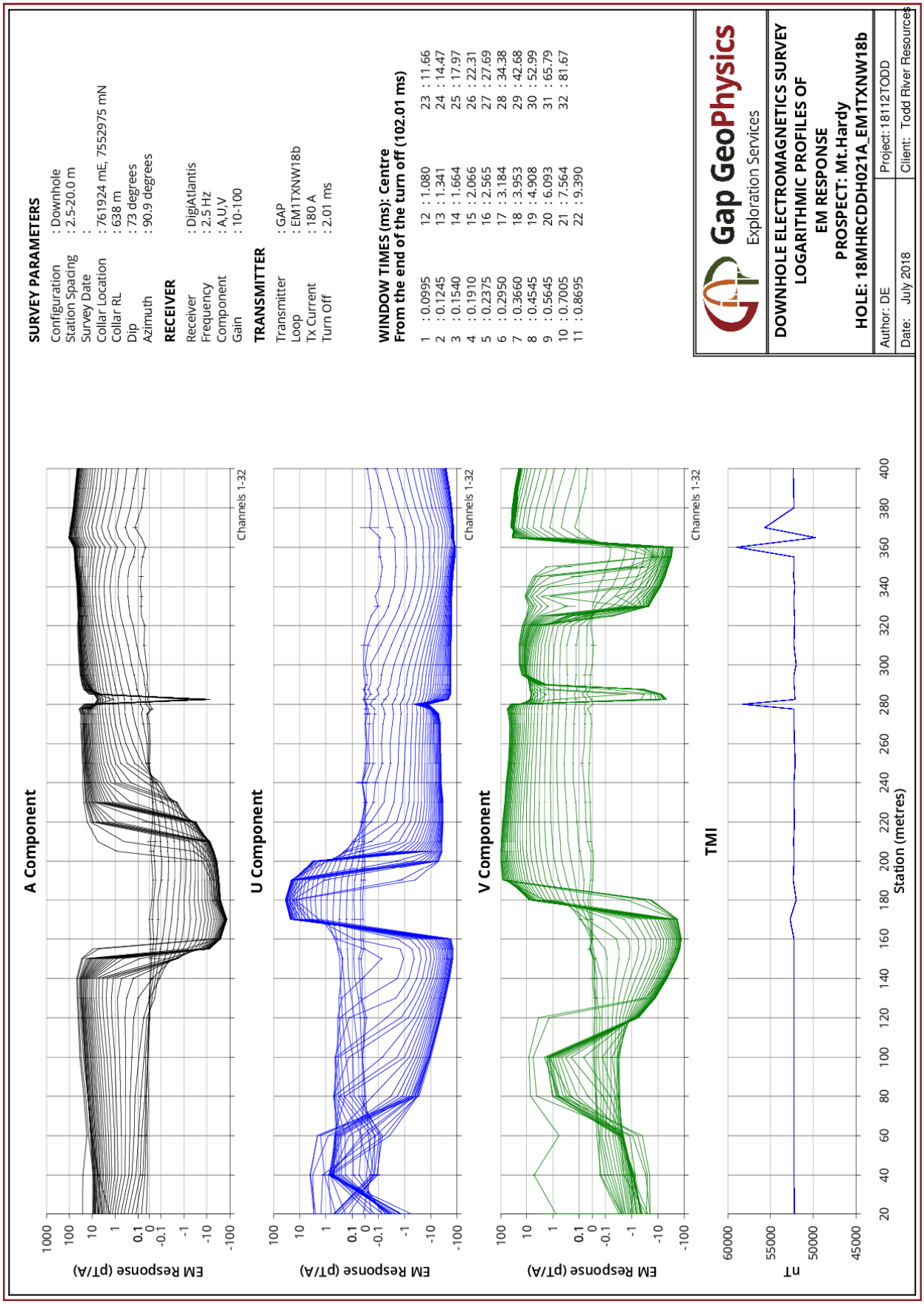

Figure 3: Logarithmic DHEM Response profiles for 18MHRCDDH021A_EM1TXNW18b.

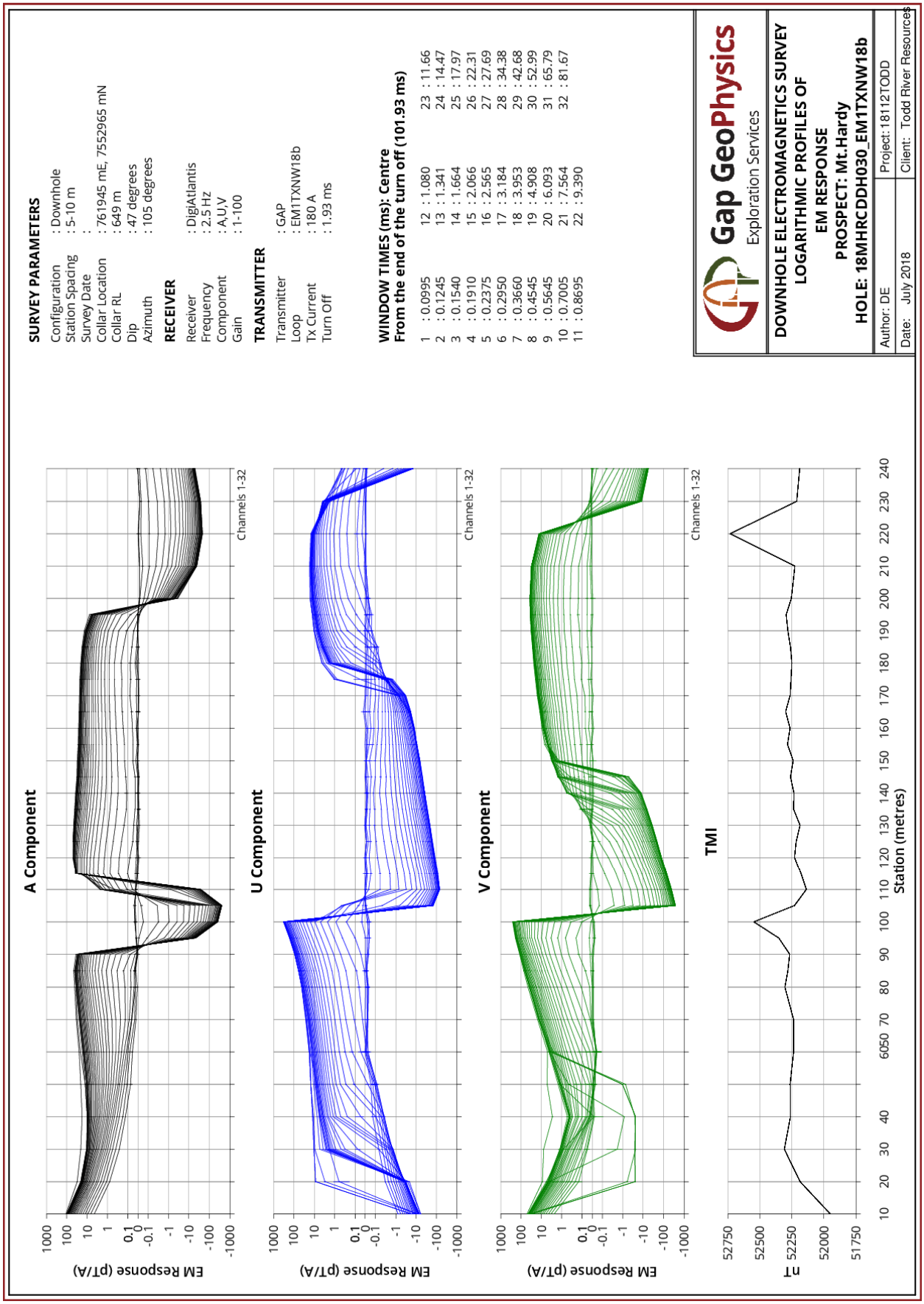

Figure 4: Logarithmic DHEM Response profiles for 18MHRCDDH030_EM1TXNW18b.

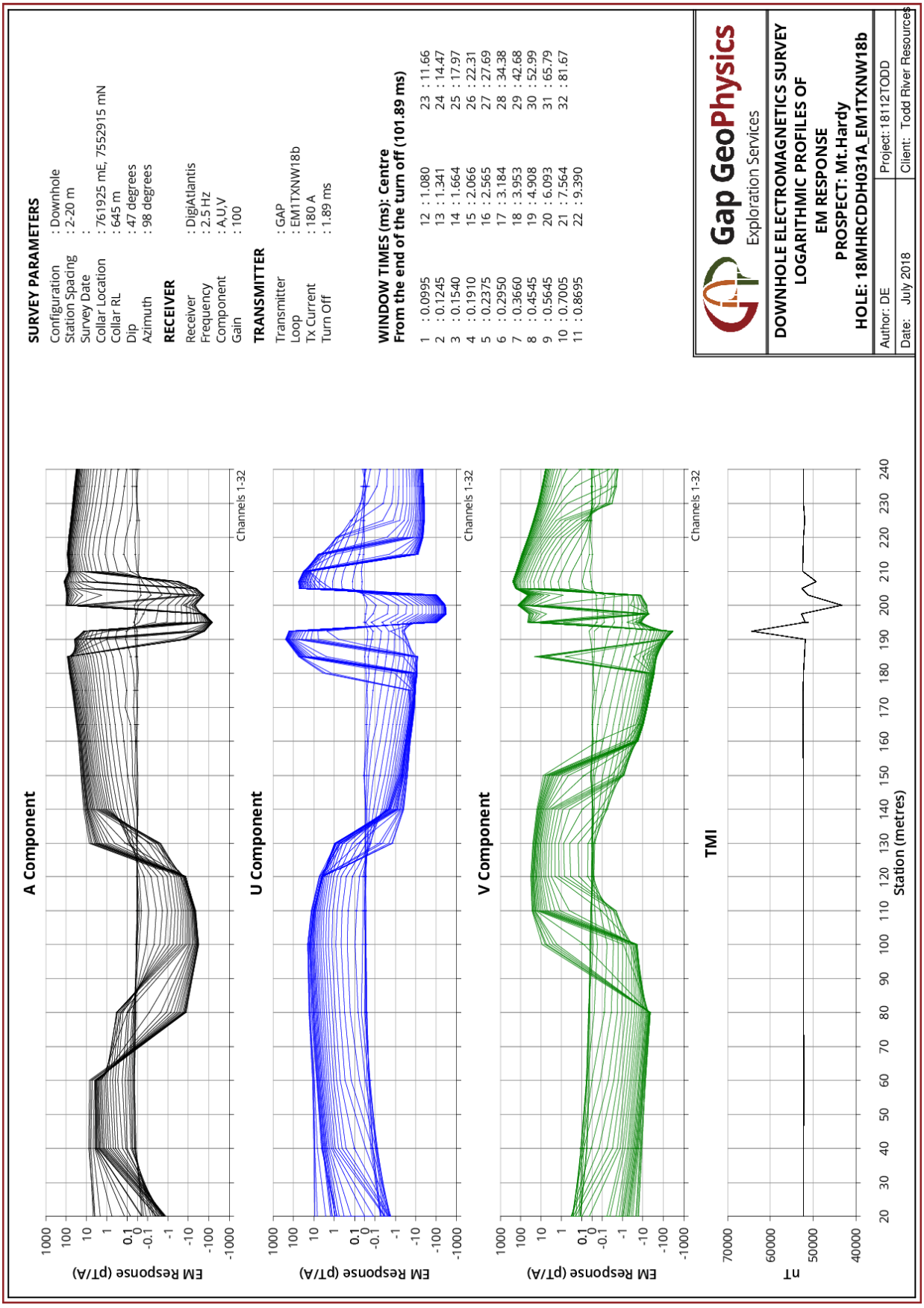

Figure 5: Logarithmic DHEM Response profiles for 18MHRCDDH031A_EM1TXNW18b.

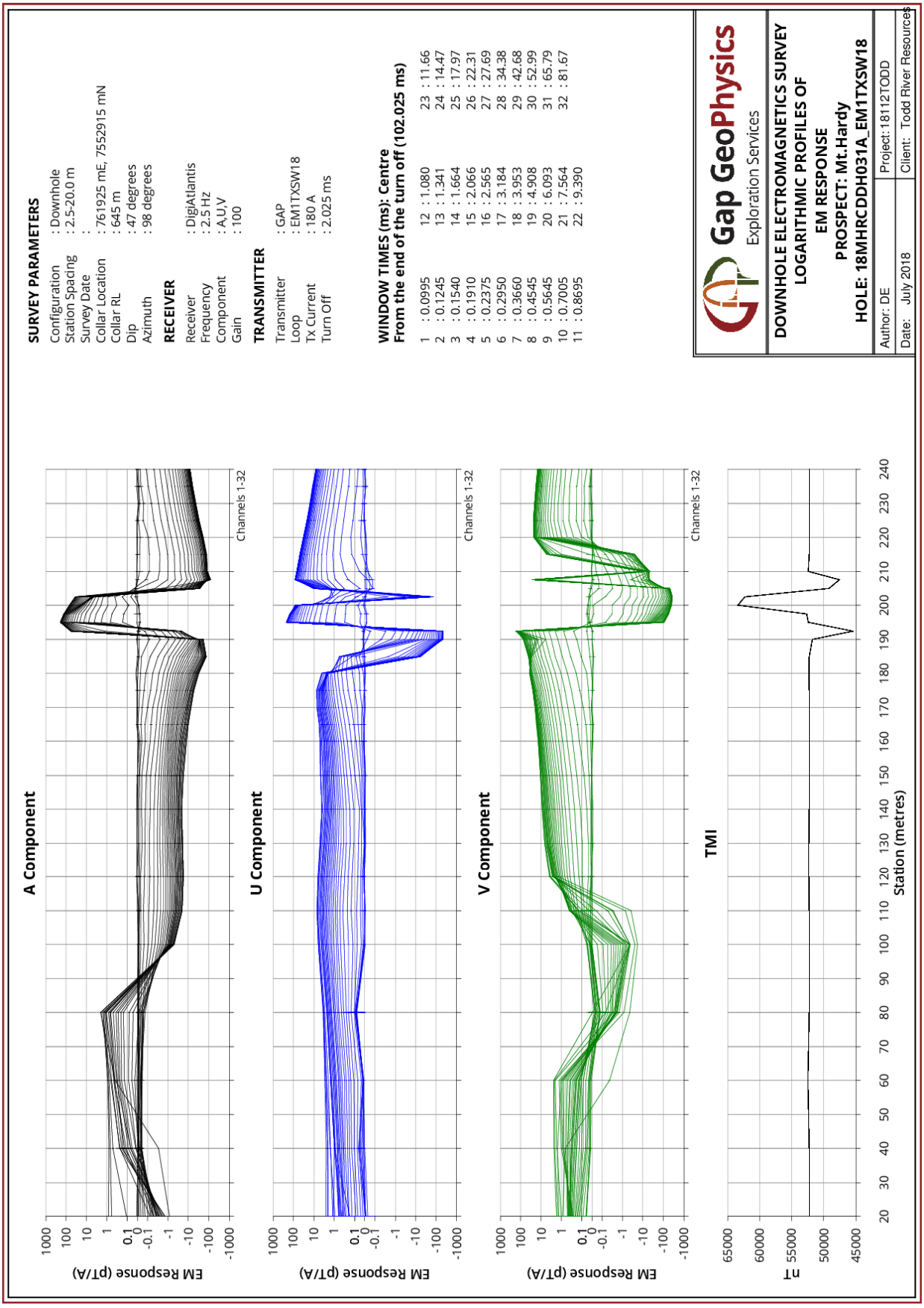

Figure 6: Logarithmic DHEM Response profiles for 18MHRCDDH031A_EM1TXSW18.

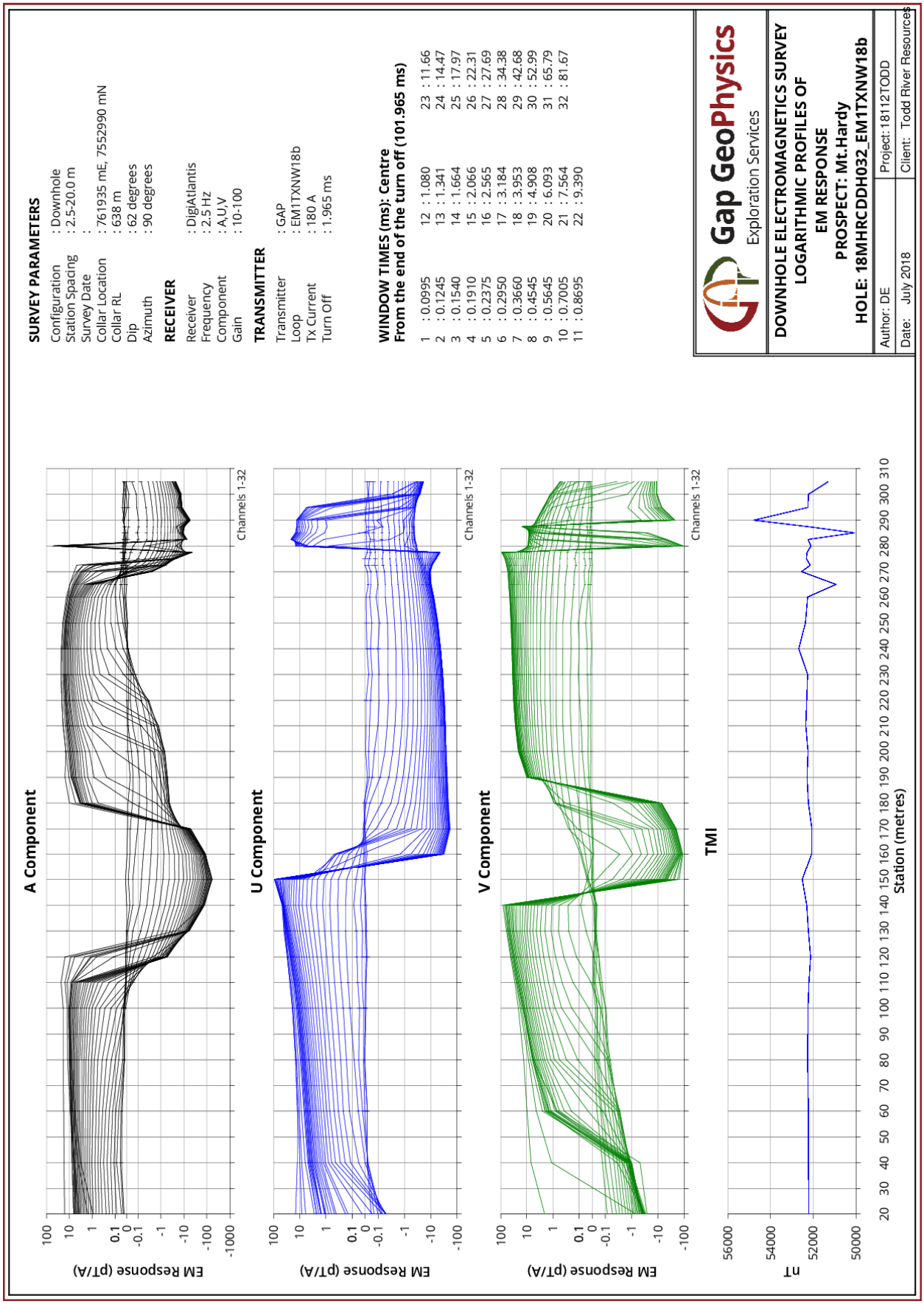

Figure 7: Logarithmic DHEM Response profiles for 18MHRCDDH032_EM1TXNW18b.

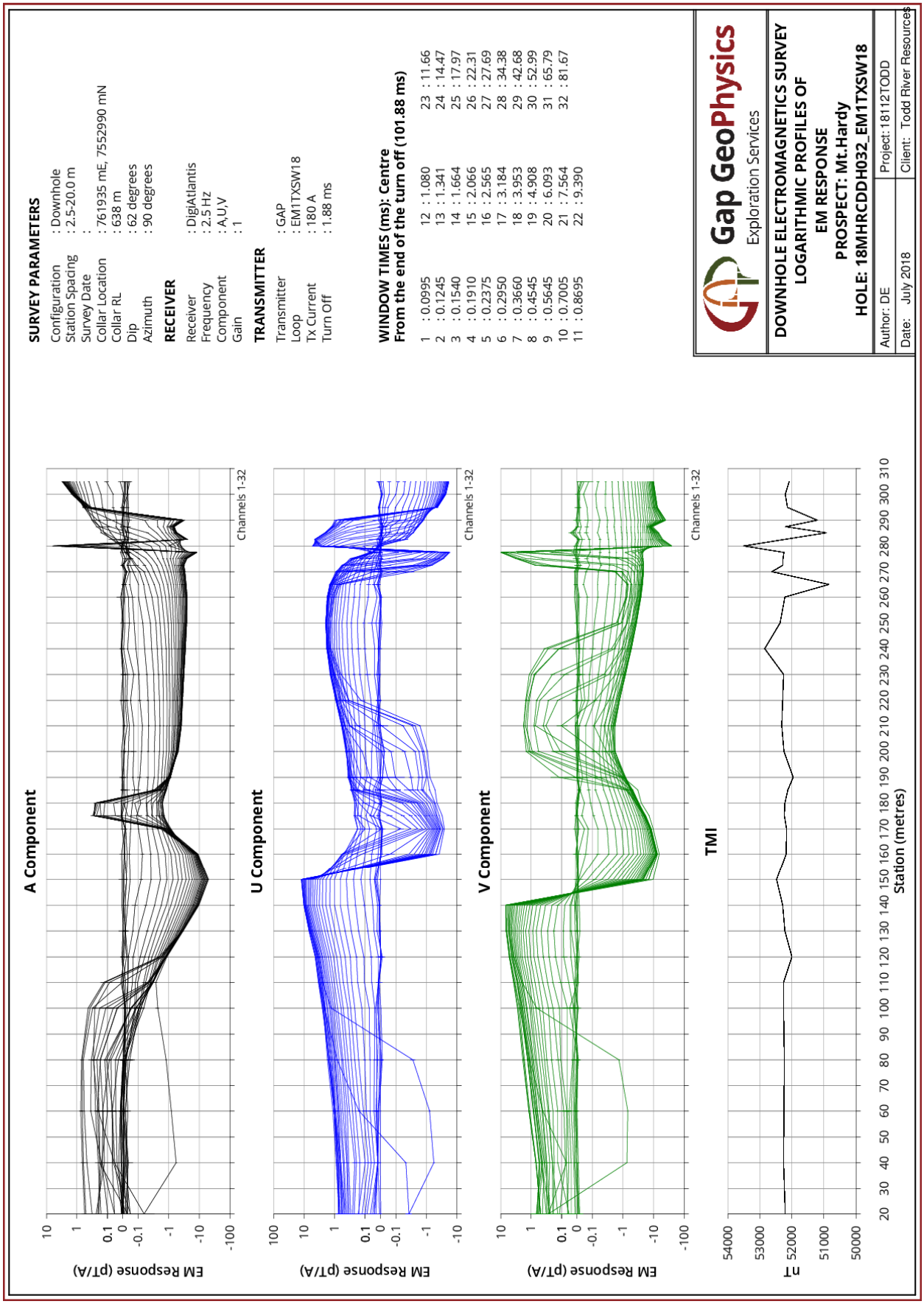

Figure 8: Logarithmic DHEM Response profiles for 18MHRCDDH032_EM1TXSW18.

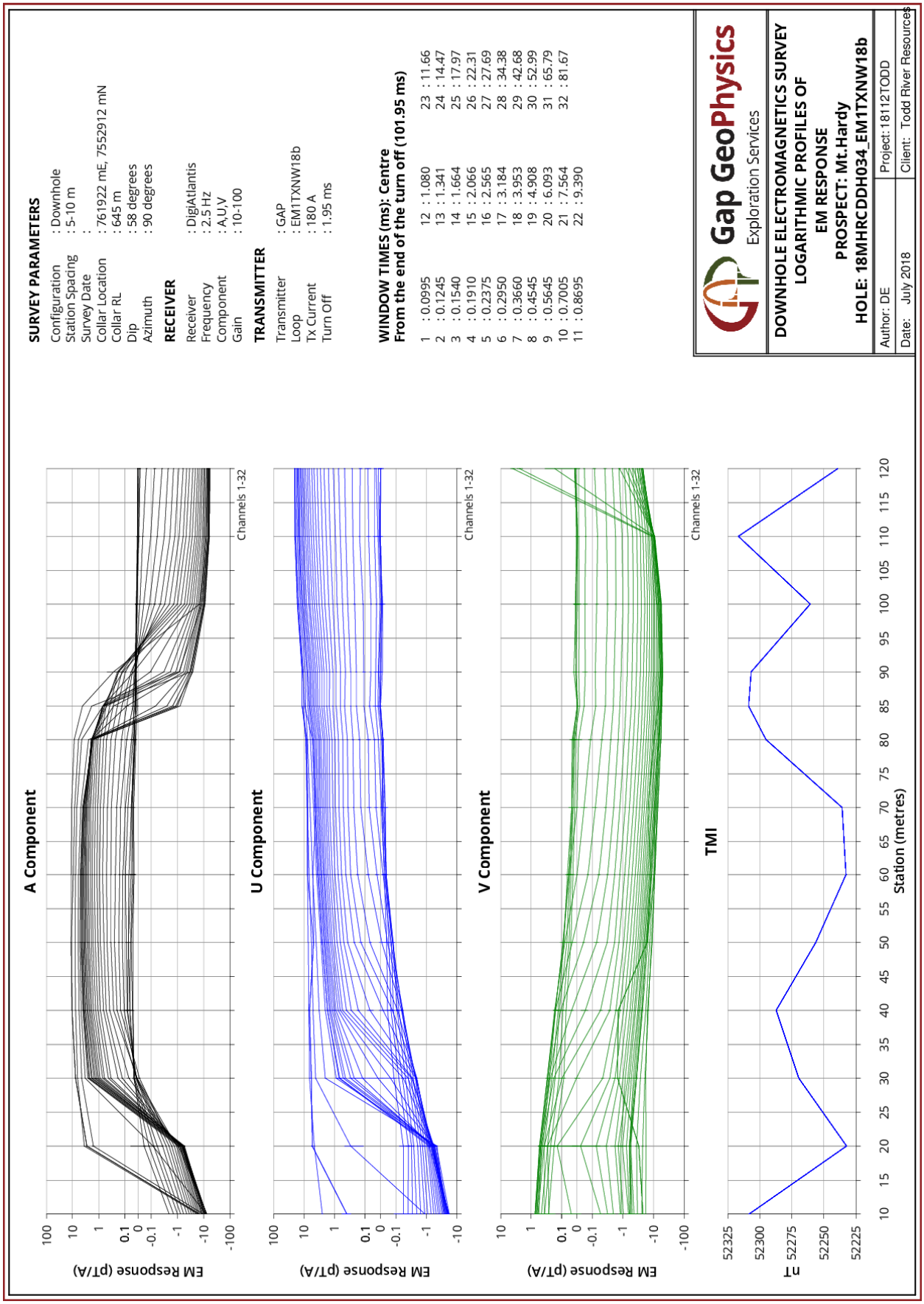

Figure 9: Logarithmic DHEM Response profiles for 18MHRCDDH034_EM1TXNW18b.

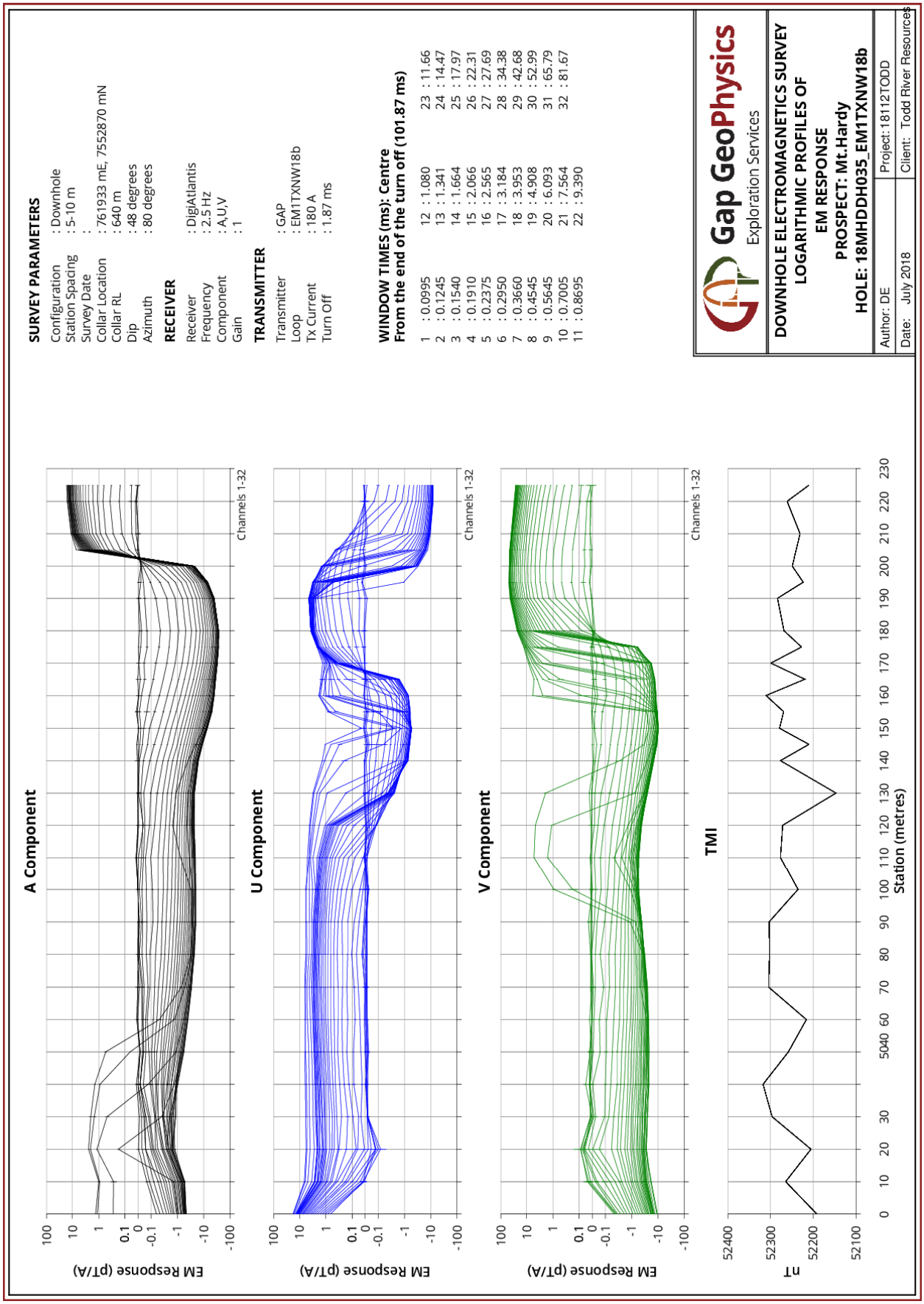

Figure 10: Logarithmic DHEM Response profiles for 18MHDDH035_EM1TXNW18b.

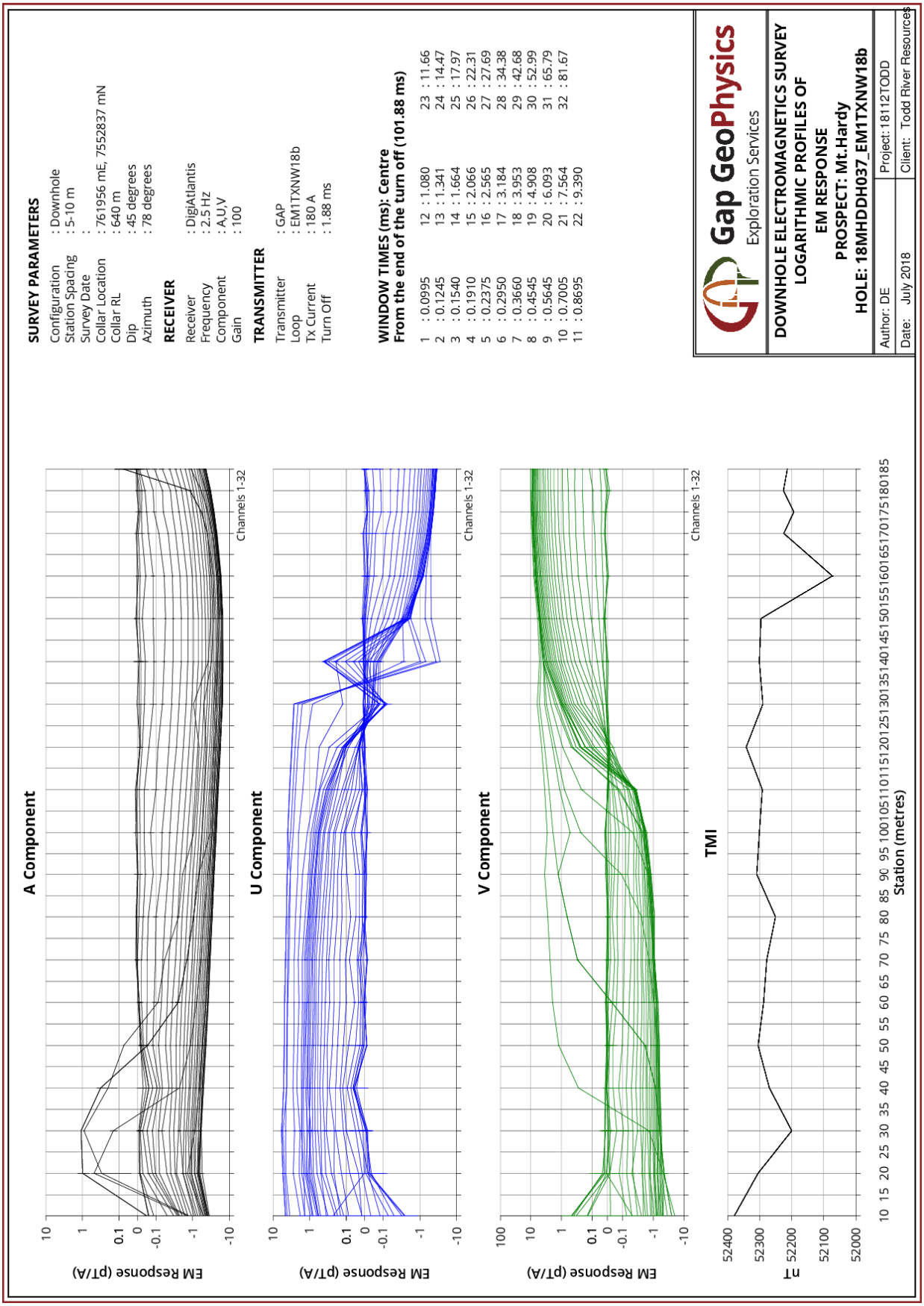

Figure 11: Logarithmic DHEM Response profiles for 18MHDDH037_EM1TXNW18b.

EM2 Prospect

A plan of the EM2 prospect showing the loop and drill hole trajectory is shown in Figure 12. Logarithmic DHEM Response Profiles for the hole are included for reference in Figure 13.

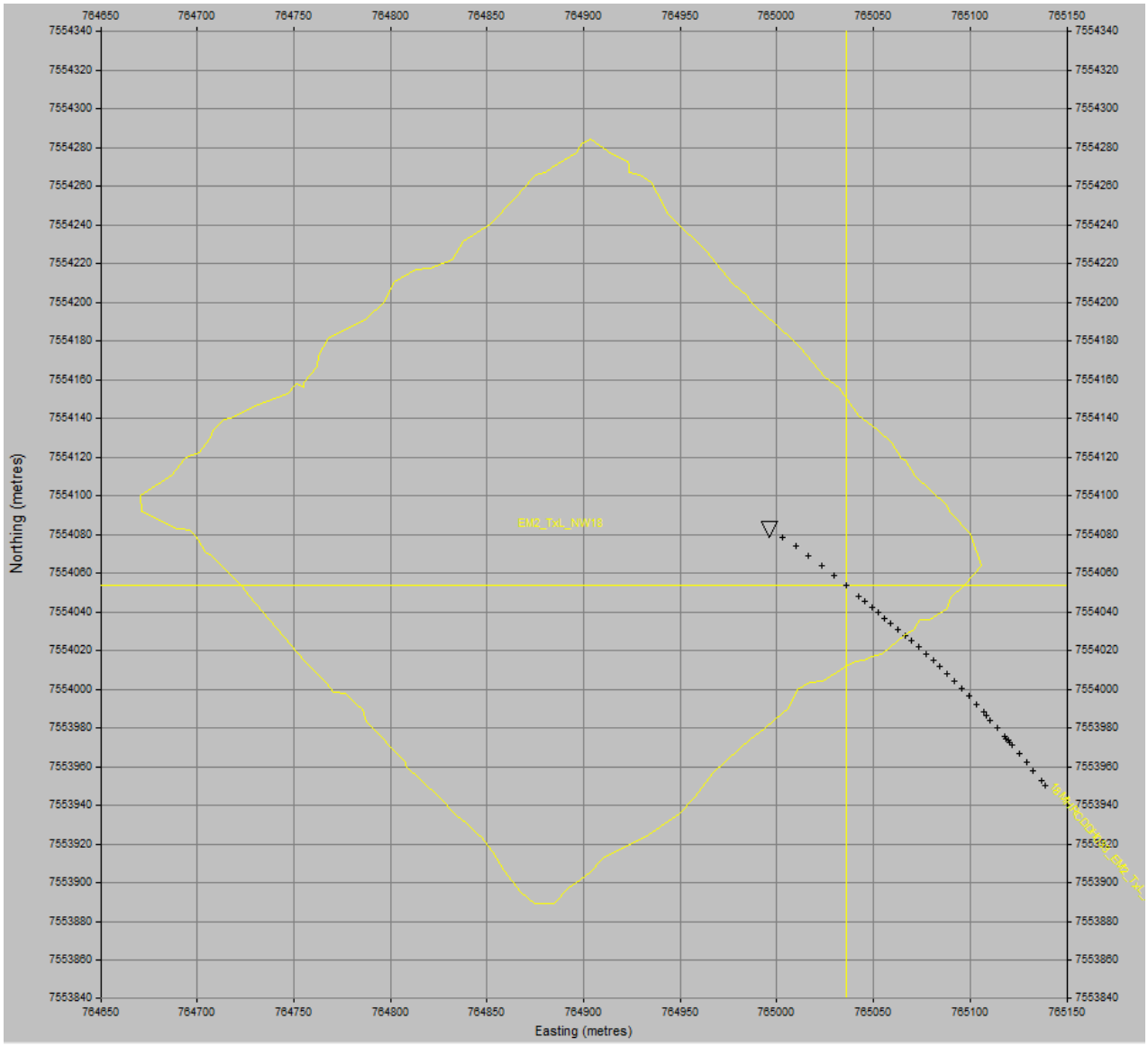

Figure 12: Layout of the DHEM survey at prospect EM2.

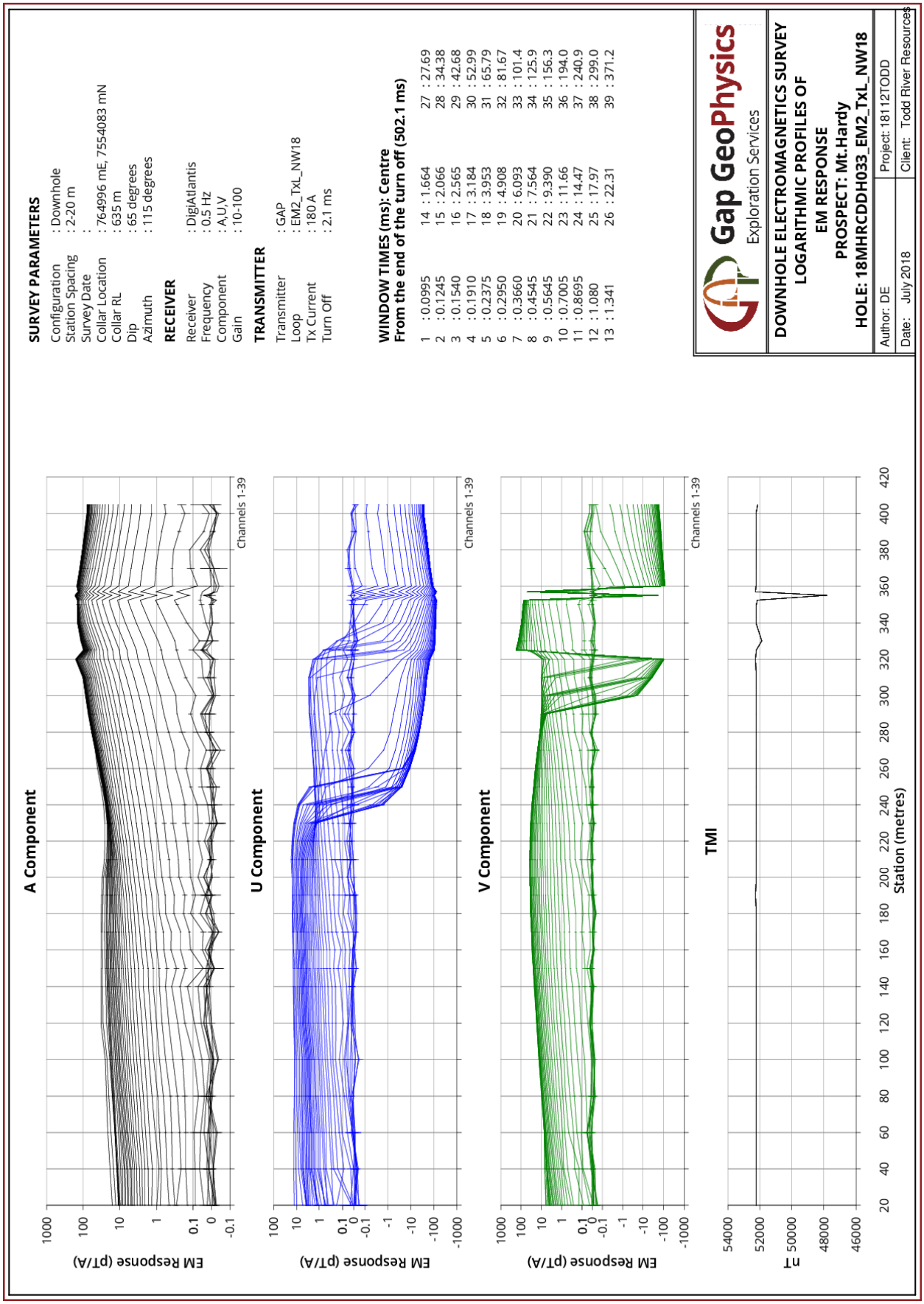

Figure 13: Logarithmic DHEM Response profiles for 18MHRCDDH033_EM2_TxL_NW18.

Digital Data Products

The Data is supplied as complete SMARTem Projects and complete Maxwell Projects on the accompanying media. The Folder structure and data files are described in the following document:

- Technical Reference Manual_GAP Downhole Surveys_v1.7.pdf

Final Comments

- Data are considered to be of very high quality.
- Some correlation evident between conductors and TMI response.

Reference Documents

1. 180619_EM1_DHEM_TxLoops.docx
2. 180624_EM2_DHEMTxloops.docx
3. Emails.doc
4. Technical Reference Manual_GAP Downhole Surveys_v1.7.pdf
5. Technical Reference Manual_GAP GeoPak Transmitters_v1.3.pdf