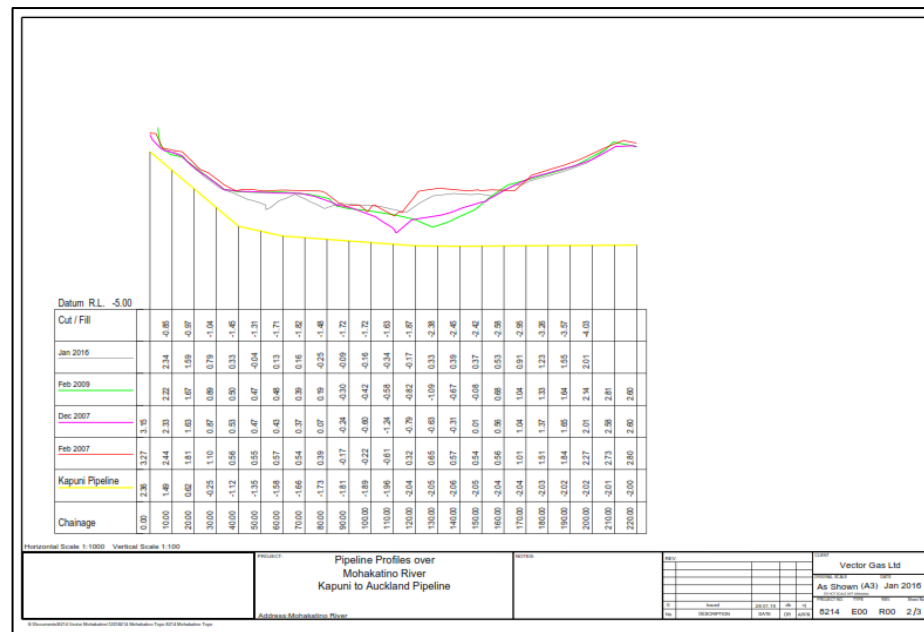
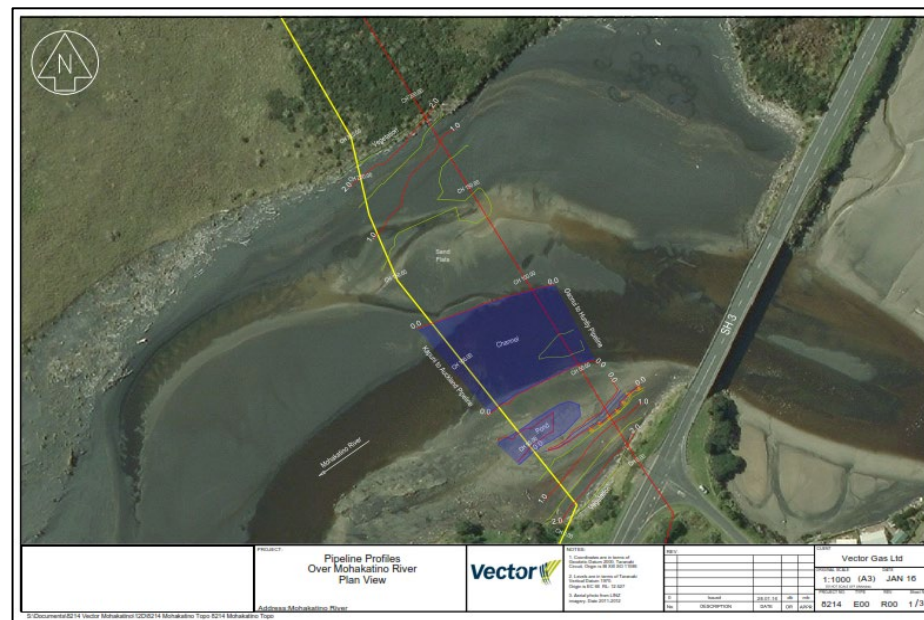


Development and Implementation of an Unmanned Survey Vessel (USV) for Pipeline waterway crossings

Firstgas

Waterway Crossing Surveys



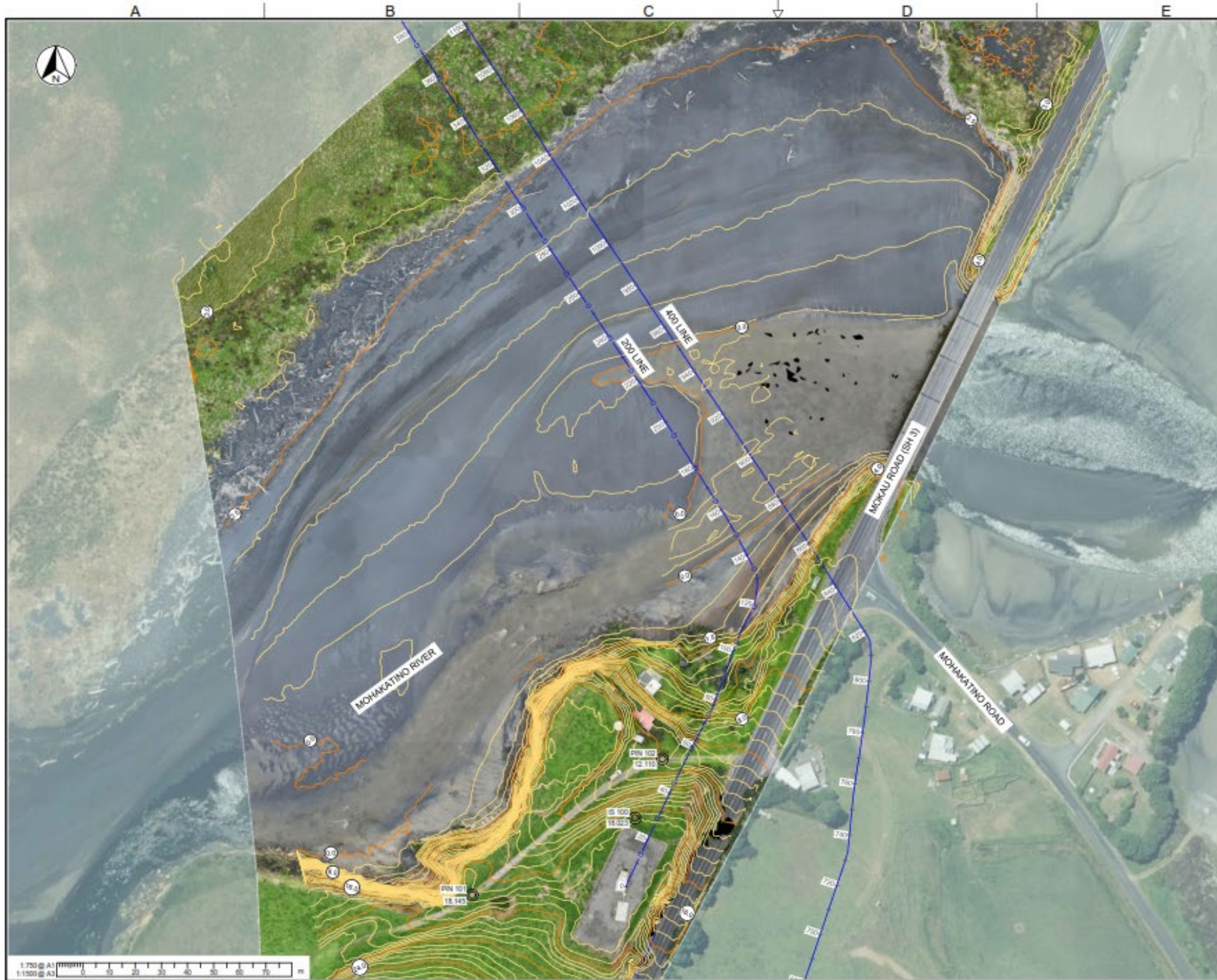
Started with the use of a modified kayak

- RTK GPS Positioning & Survey
- Single-beam echo sounder
- In combination with Unmanned Aerial Vehicle (UAV)

Developed into an Unmanned Survey Vessel (USV)

- Portable (1 m long 7 kg) shallow-draft hull
- 4G communication to Operator up to 1 km
- Single-beam echo sounder
- Inertial Measurement Unit (IMU) & GNSS positioning
- Obstacle avoidance
- High efficiency five m/s motors
- In combination with Unmanned Aerial Vehicle (UAV)





SURVEY DETAILS	
Surveyor	WSP NP - NC, SC
WSP Project Number	S-NB525.00
Survey date	26/10/2023
Equipment	GPS: TRIMBLE R10 B: 5330420580 R12 R: 604801320 R12 R: 621505825 UAV: DJI M3E RTK USV: APACHE 3 PRO
Location	MOHAKATINO RIVER (SHS)
Client	FIRST GAS LIMITED
Specification	TOPOGRAPHICAL
Cadastral boundary accuracy	N/A
DATUM NOTE	
Horizontal datum	NZGD2000 - NZTM
Horizontal origin	BP 1 SD 453 196 (EXBN)
Vertical datum	NZVD2016
Vertical origin	BP 1 SD 453 196 (EXBN)

COORDINATE SCHEDULE			
Nothing	Eastings	Level	Description
ST12801.085	1740136.475	32.77	AGM (NEW)
ST10998.728	1740022.355	36.46	AGM 44
ST12806.969	1740150.039	33.58	AGM 45
ST08962.441	1742504.951	4.42	BP 1 SD 453 196 (EXBN)
ST12202.400	1740587.956	12.22	EC 66 (AHSE)
ST11588.915	1740163.198	18.02	IS 100
ST11560.164	1740120.892	18.14	PIN 101
ST11612.780	1740193.665	12.11	PIN 102

NOTES:

1. POSITION AND DEPTH DATA OF FIRST GAS PIPELINES HAS BEEN PLOTTED USING IN LINE INSPECTION (ILI) DATA PROVIDED BY FIRST GAS FOR THE 200 LINE (2021) AND THE 400 LINE (2023). THE HORIZONTAL POSITION OF THE PIPELINE ILI DATA HAS BEEN CALIBRATED AGAINST THE ABOVE GROUND MARKS (AGM) SURVEYED ON SITE. THE DEPTH OF THE PIPELINE ILI DATA HAS BEEN CALIBRATED USING PIPE PROBES UNDERTAKEN ON SITE. THE PIPE DEPTH WAS PROBED AND SURVEYED AT SEVERAL LOCATIONS ON EITHER SIDE OF THE RIVER FOR EACH PIPELINE. THE POSITION AND DEPTH SHOWN IS THE CENTRE OF THE PIPE.
2. TOPOGRAPHICAL SURVEY DATA HAS BEEN CAPTURED WITH A UAV. FLIGHTS WERE UNDERTAKEN AT LOW TIDE FOR THE RIVER FLATS AND PADDOCKS EITHER SIDE OF THE RIVER. THE RIVER BED BELOW THE WATER LEVEL HAS BEEN CAPTURED USING AN ECHO SOUNDER AND GPS WHERE POSSIBLE.
3. AS THE GROUND SURFACE HAS BEEN BUILT USING UAV (PHOTOGRAMMETRY) DATA AND THE IMAGERY CAPTURES TOP OF VEGETATION, LARGE VEGETATION HAS BEEN REMOVED AS MUCH AS POSSIBLE FOR SURFACE CREATION. SMALL VEGETATION AND LONG GRASS WILL STILL BE INCLUDED IN THE SURFACE.
4. AERIAL IMAGERY IS FROM THE UAV SURVEY COMPLETED ON 26/10/2023 AND IMAGERY SOURCED FROM THE LINZ DATA SERVICE (<https://data.linz.govt.nz/layer/110561-general-025m-rural-aerial-photos-2021-2023>) AND IS LICENSED BY TARIKARI RECREATION COUNCIL FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENSE.

LEGEND:

- G — GAS PIPELINE CENTRE (ILI DATA)
- — CONTOUR LINES
- ⊙ SURVEY MARK

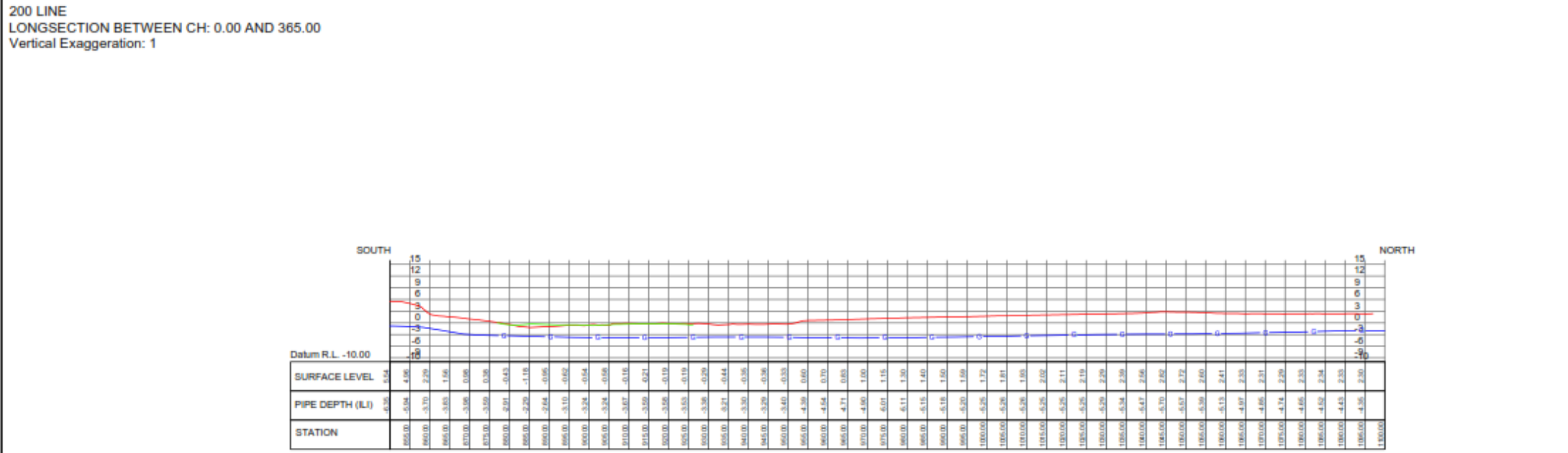
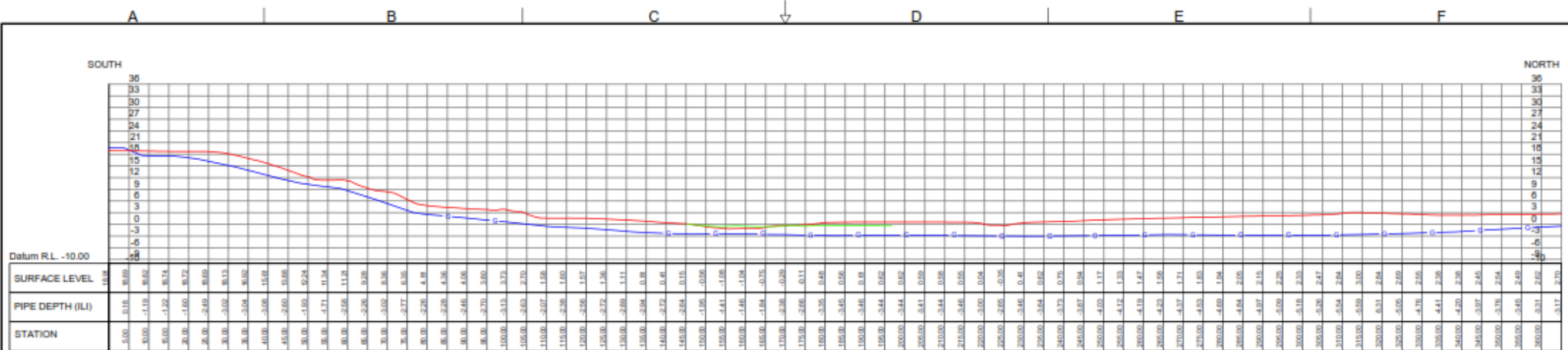
REV	FOR INFORMATION	N/C	S/C	D/C	DATE
1	FOR INFORMATION				03/03/2024
2	AMENDMENT	DRAWN	CHD	ENG	APPN

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OAONU-SOUTHDOWN
SURVEY PLAN
MOHAKATINO RIVER CROSSING SURVEY

SCALE	STATION/PIPELINE	SERIES	DRG NO.	SHT	D1	REV
1:750 @A1 DO NOT SCALE OFF DRG	400	0500	033	03	03 SHTS	1



LEGEND:

- G — GAS PIPELINE CENTRE (ILI DATA)
- EXISTING GROUND LEVEL (OCT 2023)
- EXISTING GROUND LEVEL APACHE USV (JAN 2024)

NOTES:

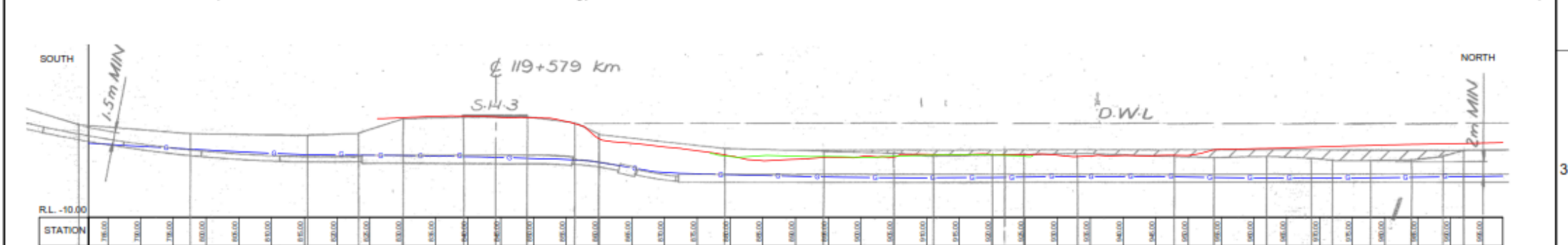
- POSITION AND DEPTH DATA OF FIRST GAS PIPELINES HAS BEEN PLOTTED USING IN-LINE INSPECTION (ILI) DATA PROVIDED BY FIRST GAS FOR THE 200 LINE (2021) AND THE 400 LINE (2023). THE HORIZONTAL POSITION OF THE PIPELINE ILI DATA HAS BEEN CALIBRATED AGAINST THE ABOVE GROUND MARKS (AGM/FI) SURVEYED ON SITE. THE DEPTH OF THE PIPELINE ILI DATA HAS BEEN CALIBRATED USING PIPE PROBES UNDERTAKEN ON SITE. THE PIPE DEPTH WAS PROBED AND SURVEYED AT SEVERAL LOCATIONS ON EITHER SIDE OF THE RIVER FOR EACH PIPELINE. THE POSITION AND DEPTH SHOWN IS THE CENTRE OF THE PIPE.
- AN UNMANNED SURVEY VESSEL (USV) WAS USED TO INFILL THE AREA IN THE MIDDLE OF THE RIVER CHANNEL. THIS SEPARATE SURVEY HAS CAPTURED A CHANGE ON THE RIVERBED AS DISPLAYED IN THE LONG SECTION.

1:500 @ A1
1:1000 @ A2

Typical variations between As-Built & ILI Data

ALIGNMENT - 200 LINE
LONGSECTION BETWEEN CH: 50.00 AND 418.00
Vertical Exaggeration: 5

30 RIVER WEIGHTS AS SHOWN
ROCK SHIELD AND WOOD SLATTING



ALIGNMENT - 400 LINE
LONGSECTION BETWEEN CH: 782.00 AND 998.00
Vertical Exaggeration: 1

-142.00	3.98
-125.00	2.23
-107.00	2.03
-99.00	2.23
-92.50	4.29
-82.80	4.78
-78.00	
-73.20	4.68
-66.00	3.77
-62.50	1.17
-43.00	0.07
-28.00	-0.53
-16.00	-0.83
-4.00	-1.43
-2.00	-1.03
0.00	-1.13
3.00	-1.03
11.00	-1.21
26.00	-1.53
32.00	-1.53

NOTES:

- POSITION AND DEPTH DATA OF FIRST GAS PIPELINES HAS BEEN PLOTTED USING IN LINE INSPECTION (ILI) DATA PROVIDED BY FIRST GAS FOR THE 200 LINE (202 I) AND THE 400 LINE (202J). THE HORIZONTAL POSITION OF THE ILI DATA HAS BEEN CALIBRATED AGAINST THE ABOVE GROUND MARKS (AGM) SURVEYED ON SITE. THE DEPTH OF THE PIPELINE ILI DATA HAS BEEN CALIBRATED USING PIPE PROBES UNDERTAKEN ON SITE. THE PIPE DEPTH WAS PROBED AND SURVEYED AT SEVERAL LOCATIONS ON EITHER SIDE OF THE RIVER FOR EACH PIPELINE. THE POSITION AND DEPTH SHOWN IS THE CENTRE OF THE PIPE.
- HISTORICAL AS-BUILT DRAWINGS (200-003T-003-I01 AND 400-003T-043-E01), HAVE BEEN PROVIDED BY FIRST GAS AND HAVE BEEN VISUALLY CHECKED ONLY. DRAWING SHOULD BE USED FOR INDICATIVE PURPOSES ONLY.
- 200 LINE LONG-SECTION HAS BEEN EXAGGERATED 5 TIMES TO MATCH HISTORIC AS-BUILT DRAWING. 400 LINE LONG-SECTION HAS NOT BEEN EXAGGERATED TO MATCH HISTORIC AS-BUILT DRAWING.

3. POSITION AND DEPTH DATA OF FIRST GAS PIPELINES HAS BEEN PLOTTED USING IN-LINE INSPECTION (ILI) DATA PROVIDED BY FIRST GAS FOR THE 300 LINE (2021) AND THE 400 LINE (2020). THE HORIZONTAL POSITION OF THE PIPELINE I/LI DATA FROM CALIFORNIA PIPE LOGS (CPL) HAS BEEN USED TO CORRELATE THE DATA SURVEYED ON SITE. THE DEPTH OF THE PIPELINE I/LI DATA HAS BEEN DETERMINED USING PIPE PROFILES UNDERTAKEN ON SITE. THE PIPE DEPTH WAS CORRELATED AND SURVEYED LOCATIONS WERE IDENTIFIED ON EITHER THE REVER OR RAISED FOR EACH PIPELINE. THE POSITION AND DEPTH SHOWN IS THE CENTRE OF THE PIPE.

4. HISTORIC AS-BUILT DRAWINGS, (200-0607-008-01 AND 200-0607-043-01), HAVE BEEN PROVIDED BY FIRST GAS AND HAVE BEEN VISUALLY OVERLAIN ONLY FOR THE 200 LINE. THERE SHOULD BE NO DISCREPANCIES.

5. 200 LINE LONG-SECTION HAS BEEN EXAGGERATED 5 TIMES TO MATCH HISTORIC AS-BUILT DRAWING. 400 LINE LONG-SECTION HAS NOT BEEN EXAGGERATED TO MATCH HISTORIC AS-BUILT DRAWING.

— G — GAS PIPELINE CENTRE (ILI DATA)
— EXISTING GROUND LEVEL (OCT 2023)
— EXISTING GROUND LEVEL APACHE USV (JAN 2024)

1	FOR INFORMATION	N.C.	S.C.	D.G.	7/20/2024
REV	AMENDMENT	DRAWN	CHECKED	ENG	APPR DATE

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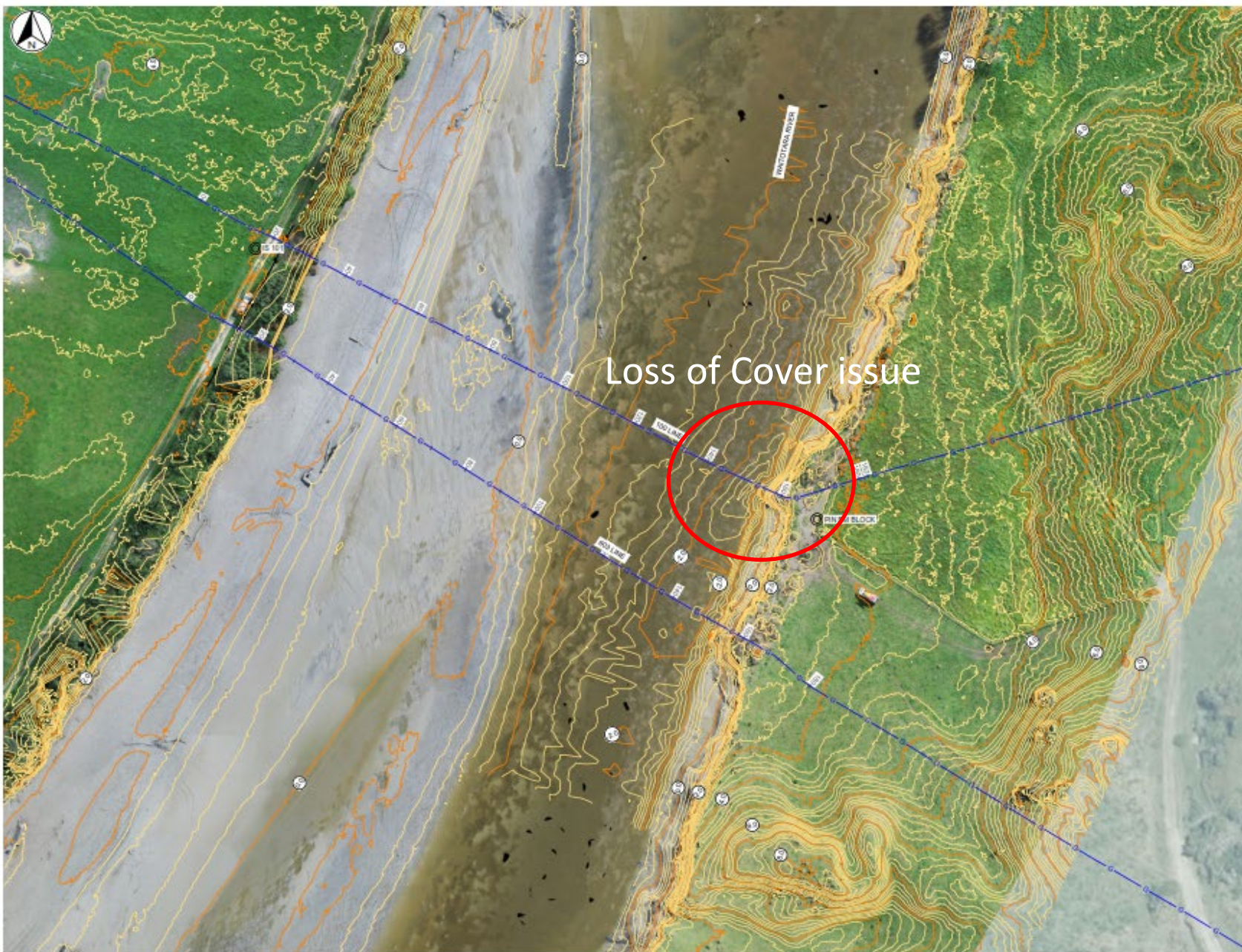
ACTUAL DRAWING SIZE : A1 FRAME A1 BORDER

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OAO NUI-SOUTHDOWN					
SURVEY PLAN					
MOHAKATINO RIVER CROSSING SURVEY					
SCALES: NTS DO NOT SCALE OFF DRG	STATION/PIPELINE 400	SERIES 0500	DRG NO. 033	SHT 03 OF 03 SHTS	REV 1

SCALES: NTS DO NOT SCALE OFF DRG	STATION/PIPELINE 400	SERIES 0500	DRG NO. 033	SHT 03 OF 03 SHTS	REV 1
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SURVEY DETAILS	
Surveyor	WSP NP - N.C.S.C
WSP Project Number	5-NB523.00
Survey date	22/09/2023
Equipment	GPS: TRIMBLE R10 B: 3330426965 R12 R: 504891330 R12 R: 521950826 UAV: DJI M4 RTK Sounding: CHIRIX SONAR-MATE
Location	WAITOTARA RIVER
Client	FIRST GAS LIMITED
Specification	TOPOGRAPHICAL
Cadastral boundary accuracy	N/A
DATUM NOTE	
Horizontal datum	NZGD2000 - NZTM
Horizontal origin	P NO 2 (Wairua SD) (BIV1)
Vertical datum	NZVD2016
Vertical origin	P NO 2 (Wairua SD) (BIV1)

COORDINATE SCHEDULE			
Northing	Easting	Level	Description
5586720.317	1745407.636	9.93	AGM 25 100LINE
5586285.520	1745725.721	25.93	AGM 26 100LINE
5586716.077	1745406.051	9.55	AGM 32 603LINE
5586262.334	1745721.799	25.76	AGM 33 603LINE
5586900.500	1745873.386	10.96	IS 100
5586516.058	1745774.334	2.90	IS 101
5586186.244	1745741.881	34.80	P NO 2 (Wairua SD) (BIV1)
5586448.549	1745911.821	2.88	PIN BM BLOCK

NOTES:

1. POSITION AND DEPTH DATA OF FIRST GAS PIPELINES HAS BEEN PLOTTED USING IN LINE INSPECTION (ILI) DATA PROVIDED BY FIRST GAS FOR THE 100 LINE (2020) AND THE 603 LINE. THE HORIZONTAL POSITION OF THE PIPELINE I/I DATA HAS BEEN CALIBRATED AGAINST THE ABOVE GROUND MARKS (AGM) SURVEYED ON SITE. THE DEPTH OF THE PIPELINE I/I DATA HAS BEEN CALIBRATED USING PIPE PROFILES UNDERTAKEN ON SITE. THE PIPE DEPTH WAS PROBED AND SURVEYED AT FOUR LOCATIONS ON EITHER SIDE OF THE RIVER FOR EACH PIPELINE. THE POSITION AND DEPTH SHOWN IS THE CENTRE OF THE PIPE.
2. TOPOGRAPHICAL SURVEY DATA HAS BEEN CAPTURED WITH A UAV. FLIGHTS WERE UNDERTAKEN AT LOW TIDE FOR THE RIVER FLATS AND PADDOCKS EITHER SIDE OF THE RIVER. THE RIVER BED BELOW THE WATER LEVEL HAS BEEN CAPTURED USING AN ECHO SOUNDER WHERE POSSIBLE.
3. AS THE GROUND SURFACE HAS BEEN BUILT USING UAV (PHOTOGRAMMETRY) DATA AND THE IMAGERY CAPTURES TOP OF VEGETATION, LARGE VEGETATION HAS BEEN REMOVED AS MUCH AS POSSIBLE FOR SURFACE CREATION. SMALL VEGETATION AND LONG GRASS WILL STILL BE INCLUDED IN THE SURFACE.
4. AERIAL IMAGERY IS FROM THE UAV SURVEY COMPLETED ON 22/09/2023 AND IMAGERY SOURCED FROM THE LINZ DATA SERVICE (<https://data.linz.govt.nz/layers/193981-kanaraki-025m-rural-aerial-photos-2021-2022>) AND IS LICENSED BY TARANAKI REGIONAL COUNCIL FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENSE.

LEGEND:

- G — GAS PIPELINE CENTRE (I/I DATA)
- CONTOUR LINES
- ⊙ SURVEY MARK

1:500 @ A1
1:1000 @ A3

REV	AMENDMENT	DRAWN	CHKD	ENG	APPR	DATE
2	DRAWING AMENDMENTS					10/10/2023
1	FOR INFORMATION					28/10/2023

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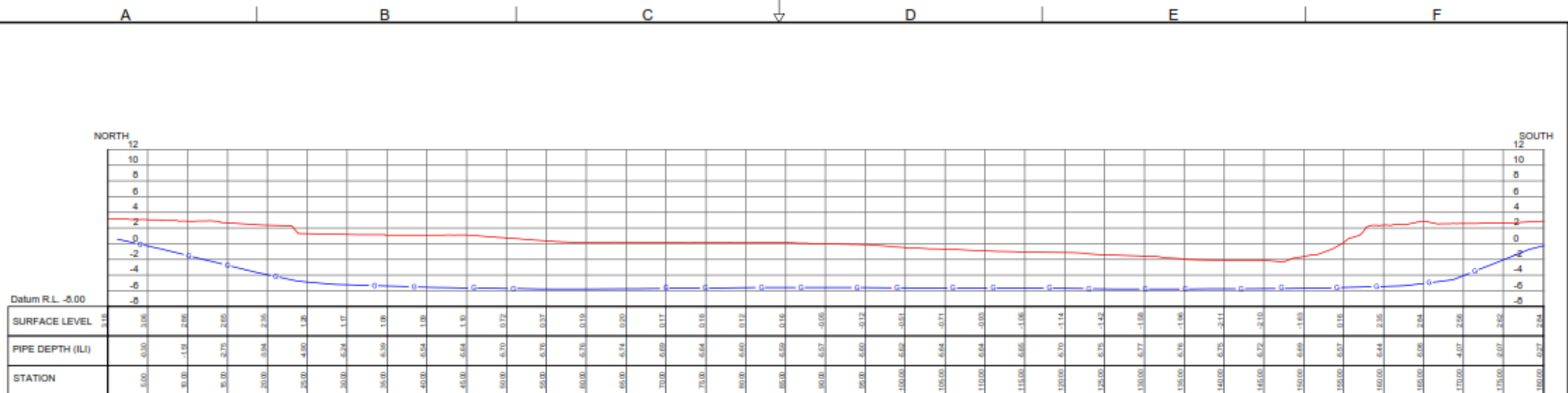
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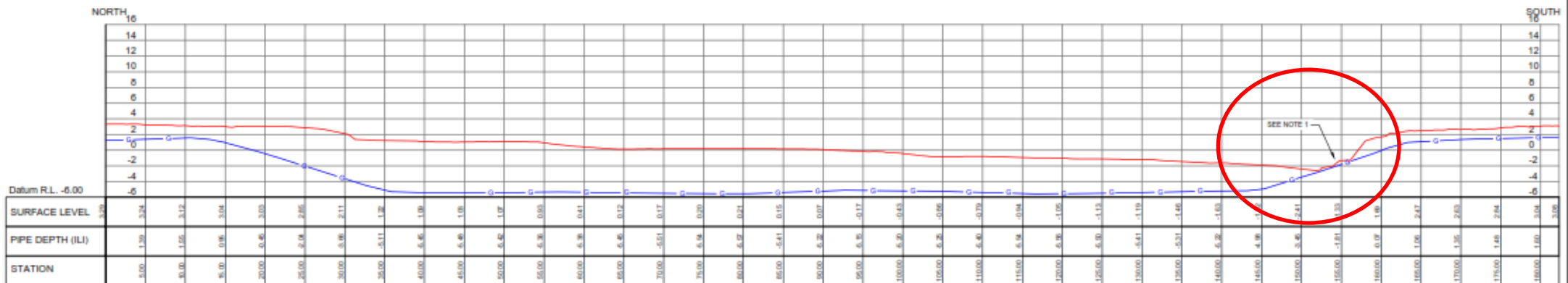
KAPUNI-WAITANGIRUA

SURVEY PLAN
WAITOTARA RIVER CROSSING SURVEY

SCALES	STATION/PIPELINE	SERIES	DRG NO.	SHT 1 OF 4 SHTS	REV
1:500 @ A1 DO NOT SCALE OFF DRG	100	500	002		2



Alignment - 603LINE
LONGSECTION BETWEEN CH: 0.00 AND 180.10
Vertical Exaggeration: 1



Alignment - 100LINE
LONGSECTION BETWEEN CH: 0.00 AND 182.31
Vertical Exaggeration: 1

LEGEND:
 — G — GAS PIPELINE CENTRE (ILI DATA)
 — — — EXISTING GROUND LEVEL

NOTES:
 1. POSITION AND DEPTH DATA OF FIRST GAS PIPELINES HAS BEEN PLOTTED USING IN LINE INSPECTION (ILI) DATA PROVIDED BY FIRST GAS FOR THE 100 LINE (0305) AND THE 603 LINE. THE HORIZONTAL POSITION OF THE PIPELINE (ILI DATA) HAS BEEN CALIBRATED AGAINST THE ABOVE GROUND MARKS (AGM) SURVEYED ON SITE. THE DEPTH OF THE PIPELINE (ILI DATA) HAS BEEN CALIBRATED USING PIPE PROFILES UNDERTAKEN ON SITE. THE PIPE DEPTH WAS PROBED AND SURVEYED AT FOUR LOCATIONS ON EITHER SIDE OF THE RIVER FOR EACH PIPELINE. THE POSITION AND DEPTH SHOWN IS THE CENTRE OF THE PIPE.

1:250 @ A1 (1/1000)
 1:500 @ A3 (1/2500)

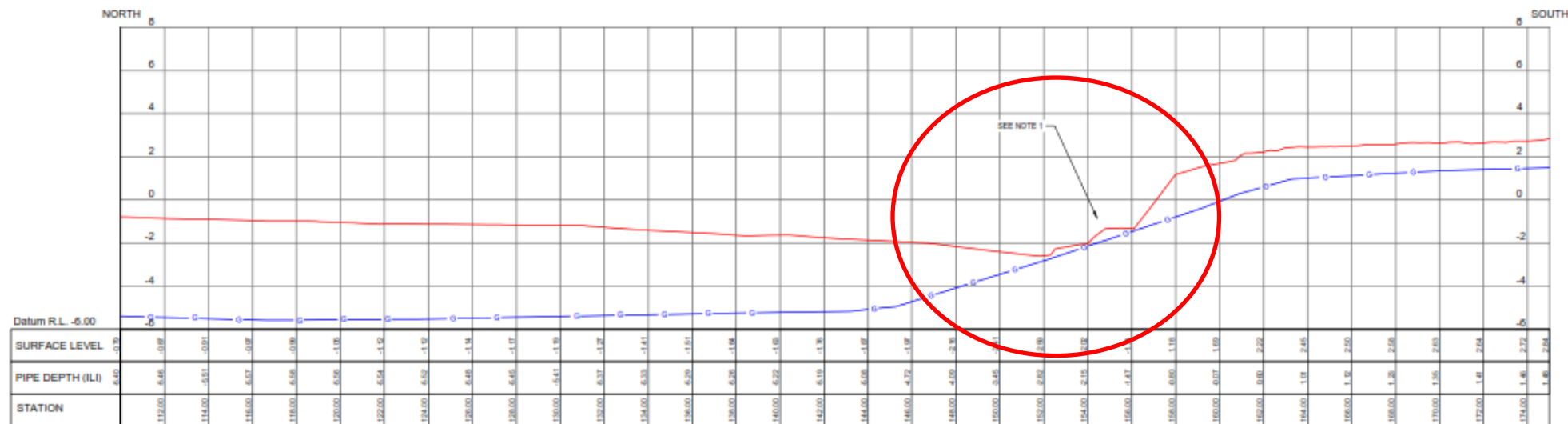
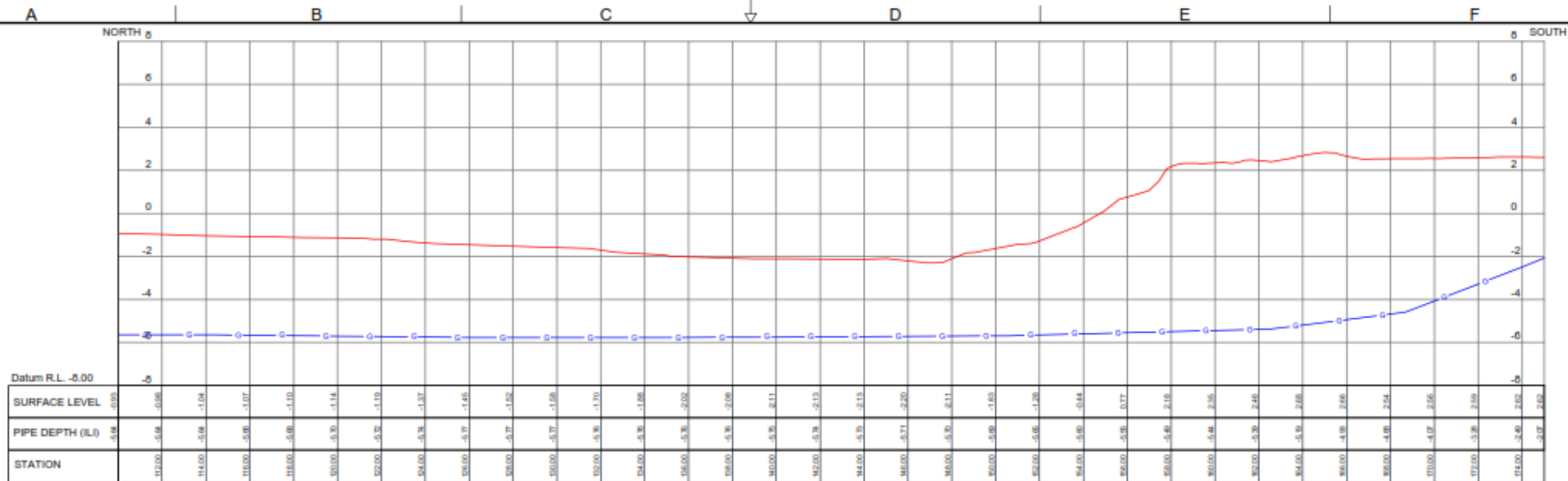
REV	AMENDMENT	DRAWN	CHECKD	ENG	APPR	DATE
2	DRAWING AMENDMENTS					10/10/2023
1	FOR INFORMATION					05/10/2023

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KAPUNI-WAITANGIRUA
SURVEY PLAN
PIPELINE LONGSECTION
 SCALES: 1:250 @ A1
 DO NOT SCALE OFF DRG

STATION/PIPELINE	SERIES	DRG NO.	SHT 2 OF 4 SHTS	REV
100	500	002		2



LEGEND:
 — G — GAS PIPELINE CENTRE (ILI DATA)
 — — — EXISTING GROUND LEVEL

NOTES:
 1. POSITION AND DEPTH DATA OF FIRST GAS PIPELINES HAS BEEN PLOTTED USING IN LINE INSPECTION (ILI) DATA PROVIDED BY FIRST GAS FOR THE 100 LINE (2020) AND THE 603 LINE. THE HORIZONTAL POSITION OF THE PIPELINE ILI DATA HAS BEEN CALIBRATED AGAINST THE ABOVE GROUND MARKS (AGM) SURVEYED ON SITE. THE DEPTH OF THE PIPELINE ILI DATA HAS BEEN CALIBRATED USING PIPE PROBES UNDERTAKEN ON SITE. THE PIPE DEPTH WAS PROBED AND SURVEYED AT FOUR LOCATIONS ON EITHER SIDE OF THE RIVER FOR EACH PIPELINE. THE POSITION AND DEPTH SHOWN IS THE CENTRE OF THE PIPE.

1:100 @ A1
 1:200 @ A3

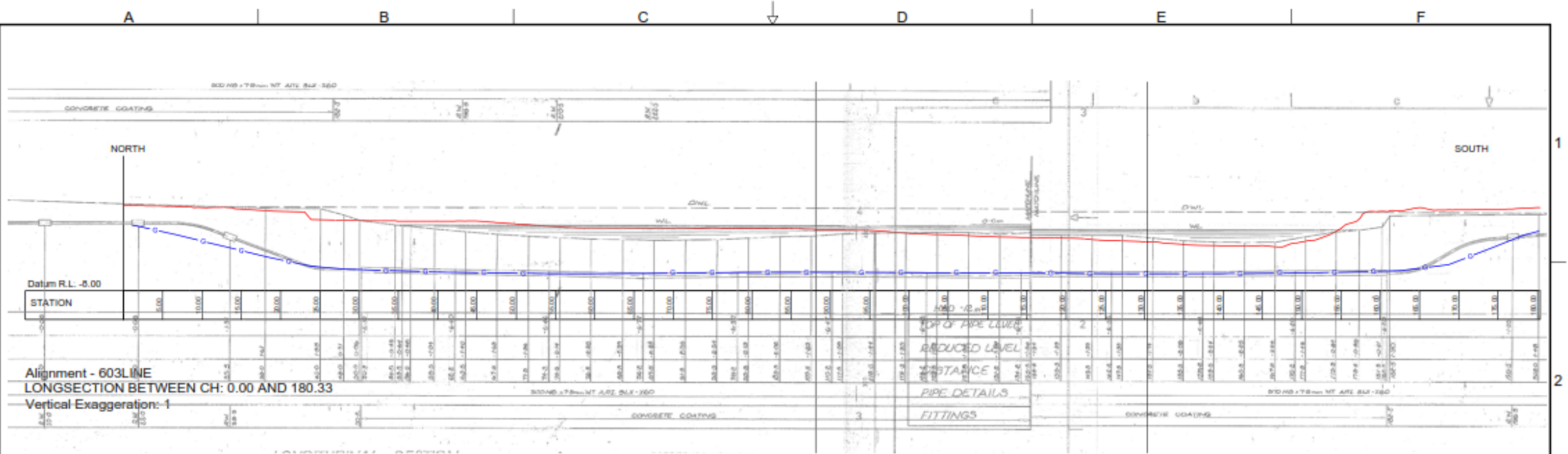
REV	AMENDMENT	DRAWN	CHKD	ENG	APPR	DATE
2	DRAWING AMENDMENTS					15/10/2023
1	FOR INFORMATION					25/10/2023

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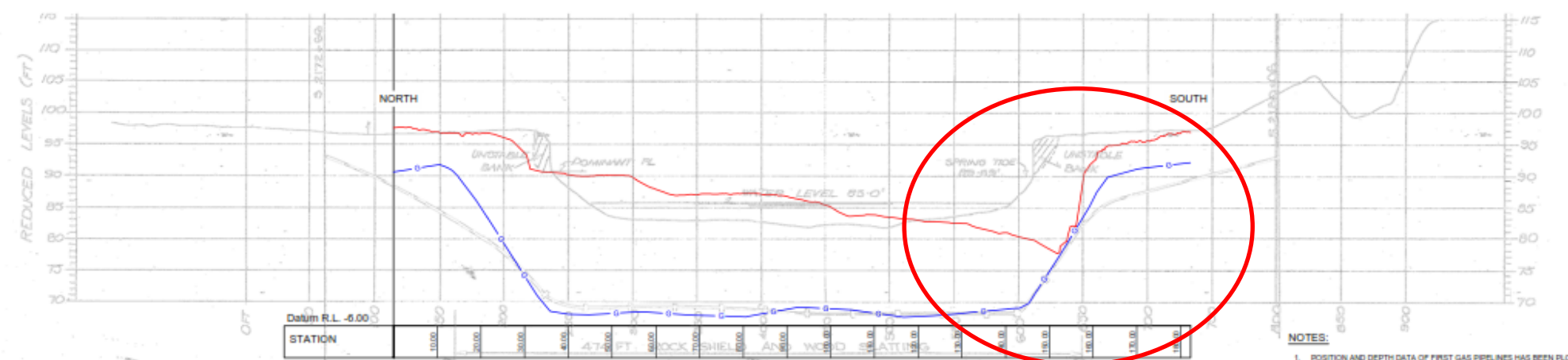
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KAPUNI-WAITANGIRUA
SURVEY PLAN
PIPELINE LONGSECTION CHAINAGE 110.00-175.00m

SCALES:	STATION/PIPELINE:	SERIES:	DRG NO.:	SHT OF	REV
1:100 @ A1 DO NOT SCALE OFF DRG	100	500	002	4 SHTS	2



Alignment - 603LINE
LONGSECTION BETWEEN CH: 0.00 AND 180.33
Vertical Exaggeration: 1



Alignment - 100LINE
LONGSECTION BETWEEN CH: 0.00 AND 182.31
Vertical Exaggeration: 5

- NOTES:**
1. POSITION AND DEPTH DATA OF FIRST GAS PIPELINES HAS BEEN PLOTTED USING IN LINE INSPECTION (ILI) DATA PROVIDED BY FIRST GAS FOR THE 100 LINE (2020) AND THE 603 LINE. THE HORIZONTAL POSITION OF THE PIPELINE (ILI) DATA HAS BEEN CALIBRATED AGAINST THE ABOVE GROUND MARKS (AGM) SURVEYED ON SITE. THE DEPTH OF THE PIPELINE (ILI) DATA HAS BEEN CALIBRATED USING PIPE PROBES UNDERTAKEN ON SITE. THE PIPE DEPTH WAS PROBED AND SURVEYED AT FOUR LOCATIONS ON EITHER SIDE OF THE RIVER FOR EACH PIPELINE. THE POSITION AND DEPTH SHOWN IS THE CENTRE OF THE PIPE.
 2. HISTORICAL ASBUILT DRAWINGS (100-0607-004-01 AND 603-0607-003-01) HAVE BEEN PROVIDED BY FIRST GAS AND HAVE BEEN VISUALLY OVERLAIN ONLY. DRAWING SHOULD BE USED FOR INDICATIVE PURPOSES ONLY.
 3. 100 LINE LONGSECTION HAS BEEN EXAGGERATED 5 TIMES TO MATCH HISTORIC ASBUILT DRAWING. 603 LINE LONGSECTION HAS NOT BEEN EXAGGERATED TO MATCH HISTORIC ASBUILT DRAWING.

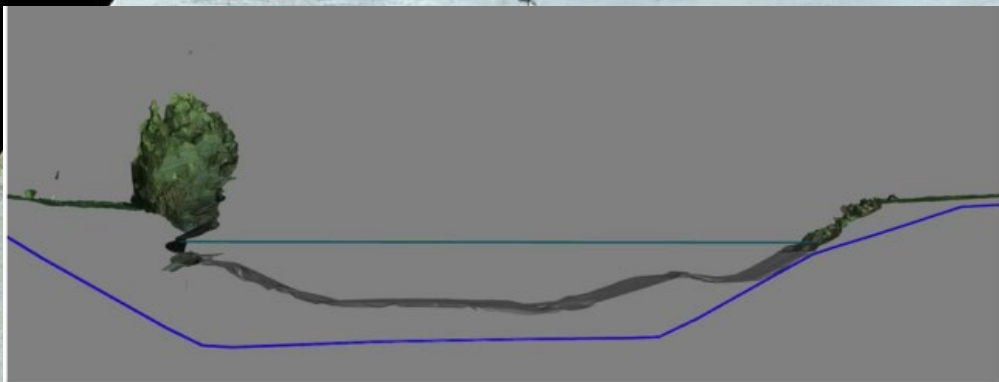
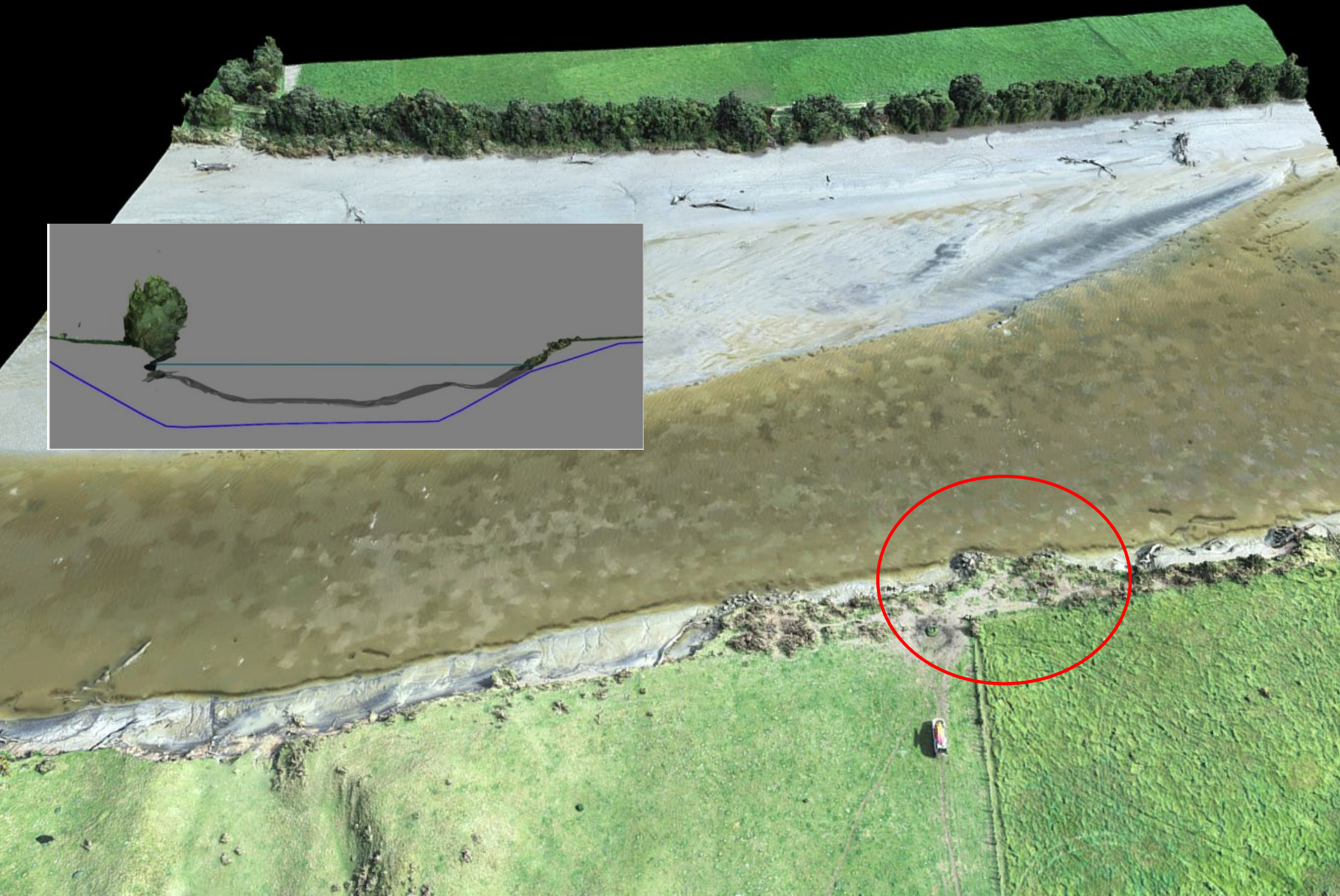
LEGEND:
 G- PIPE CENTRE (ILI DATA)
 EXISTING GROUND LEVEL

2	DRAWING AMENDMENTS	S/C	N/C	S/C	11/10/2023
1	FOR INFORMATION	S/C	N/C	S/C	05/10/2023
REV	AMENDMENT	DRAWN	CHKD	ENG	APPR DATE

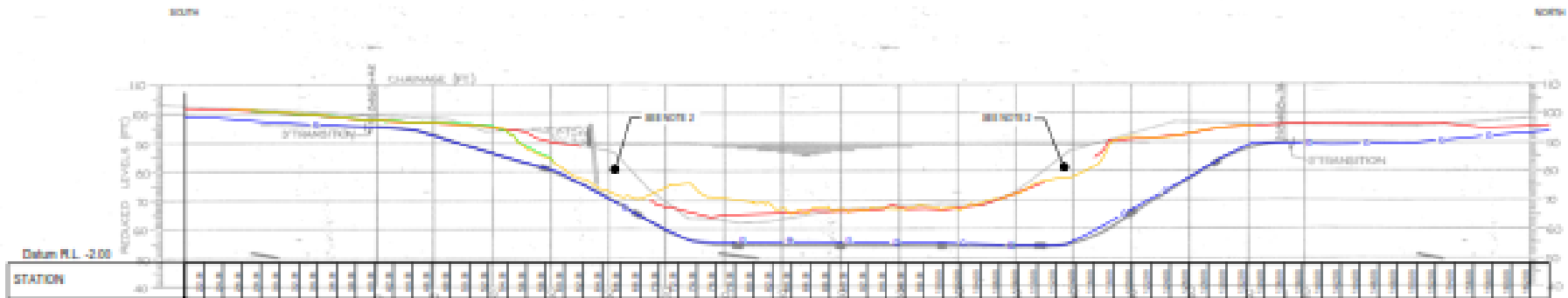
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KAPUNI-WAITANGIRUA					
SURVEY PLAN					
PIPELINE LONGSECTION WITH HISTORIC LONGSECTION OVERLAIN					
SCALES:	STATION/PIPELINE	SERIES	DRG NO.	SHT 4 OF 4	REV
N.T.S DO NOT SCALE OFF DRG	100	500	002		2

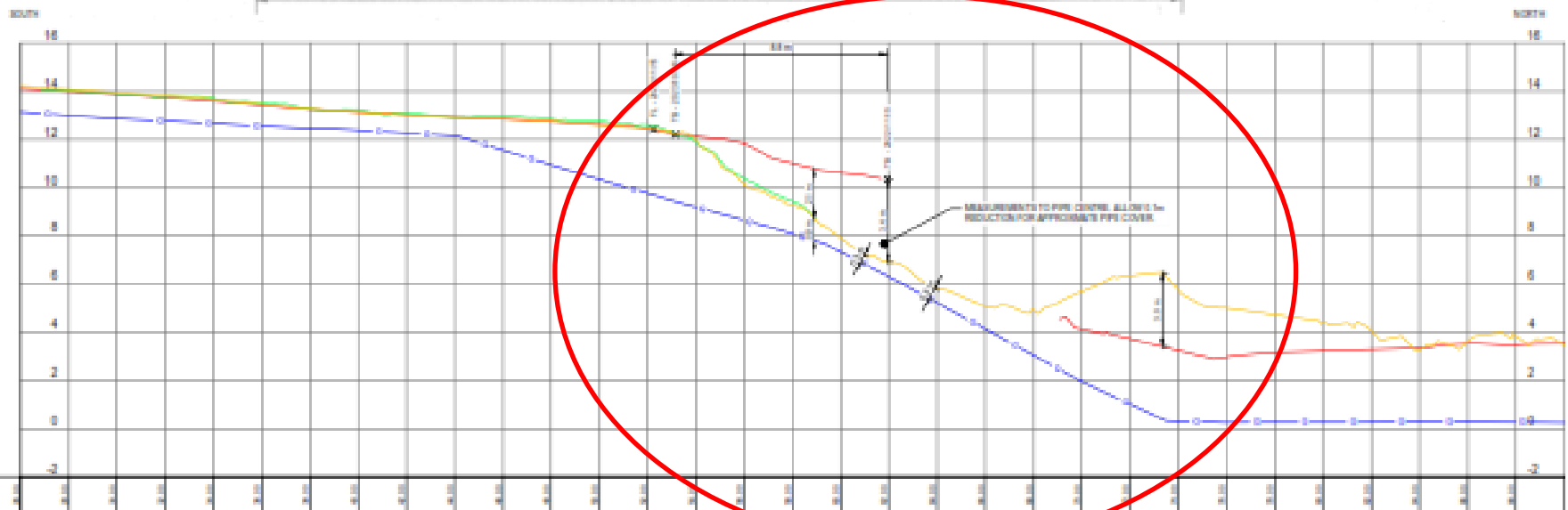


A B C D E F



Alignment - 200 LINE
LONGSECTION BETWEEN CH: 20.00 AND 104.00
Vertical Exaggeration: 1

332 FT 6 5/8" O.D. 0-332 R.T. A. 1000 1000 1000
DOUBLE COAT TRIPLE WARP PAINT



Alignment - 200 LINE
LONGSECTION BETWEEN CH: 26.00 AND 90.00
Vertical Exaggeration: 1

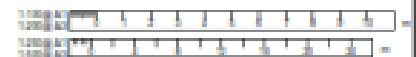
NOTES

1. POSITION AND DEPTH OF FIRST GAS PIPELINE HAS BEEN PLOTTED USING IN LINE INSPECTION (ILI) DATA PROVIDED BY FIRST GAS FOR THE 200 LINE (2021). THE PIPE POSITION AND DEPTH WAS ALSO PROBED AND SURVEYED ON SITE AT SEVERAL LOCATIONS ON EITHER SIDE OF THE RIVER. THE ILI DATA HAS BEEN CALIBRATED AGAINST THESE SURVEYED POSITIONS. THE ALIGNMENT SHOWN IS OF THE CENTRE OF THE PIPE.
2. TOPOGRAPHICAL SURVEY WAS UNDERTAKEN OF THE RIVER BANK AND PADDOCKS WITH GPS AND UAV. RIVER BED BELOW WATER LEVEL WAS CAPTURED USING AN ECHO SOUNDER WHERE POSSIBLE. THE SURVEY UNDERTAKEN ON 15/11/2023 COULD NOT CAPTURE THE BOTTOM OF BANK AREA ON EITHER SIDE OF THE RIVER IN DETAIL. THIS IS DUE TO OBSTRUCTIONS IN THE WATER, OVERHANGING VEGETATION AND LIMITED ACCESS DUE TO THE RIVER BANK INSTABILITY AT THE TIME.
3. HISTORIC WAIPA RIVER CROSSING DRAWINGS HAVE BEEN PROVIDED BY FIRST GAS AND HAVE BEEN VISUALLY OVERLAIN ONLY. DRAWING SHOULD BE USED FOR VISUAL PURPOSES ONLY.
4. 15/11/2023 SURVEY (NAV) DATA WAS CAPTURED BY FIRST GAS AND PROVIDED TO WSP FOR POST PROCESSING AND MODELING.

LONGSECTION
SCALE 1:1000

KEY

- EXISTING GROUND LEVEL (15/11/2023)
- EXISTING GROUND LEVEL (16/10/2023)
- EXISTING GROUND LEVEL (16/11/2023)
- GAS PIPELINE CENTRE (ILI DATA)
- FENCELINE
- TOP OF RIVERBANK



REV	AMENDMENT	DRAWN	CHEK	ENG	APPR	DATE
1	ISSUED FOR INFORMATION - 15/11/2023 SURVEY UPDATE	EC	EC		EC	2023/11/15
2	ISSUED FOR INFORMATION	EC	EC		EC	2023/11/15

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ACTUAL DRAWING SIZE: A1 - FRAMED AT BORDER

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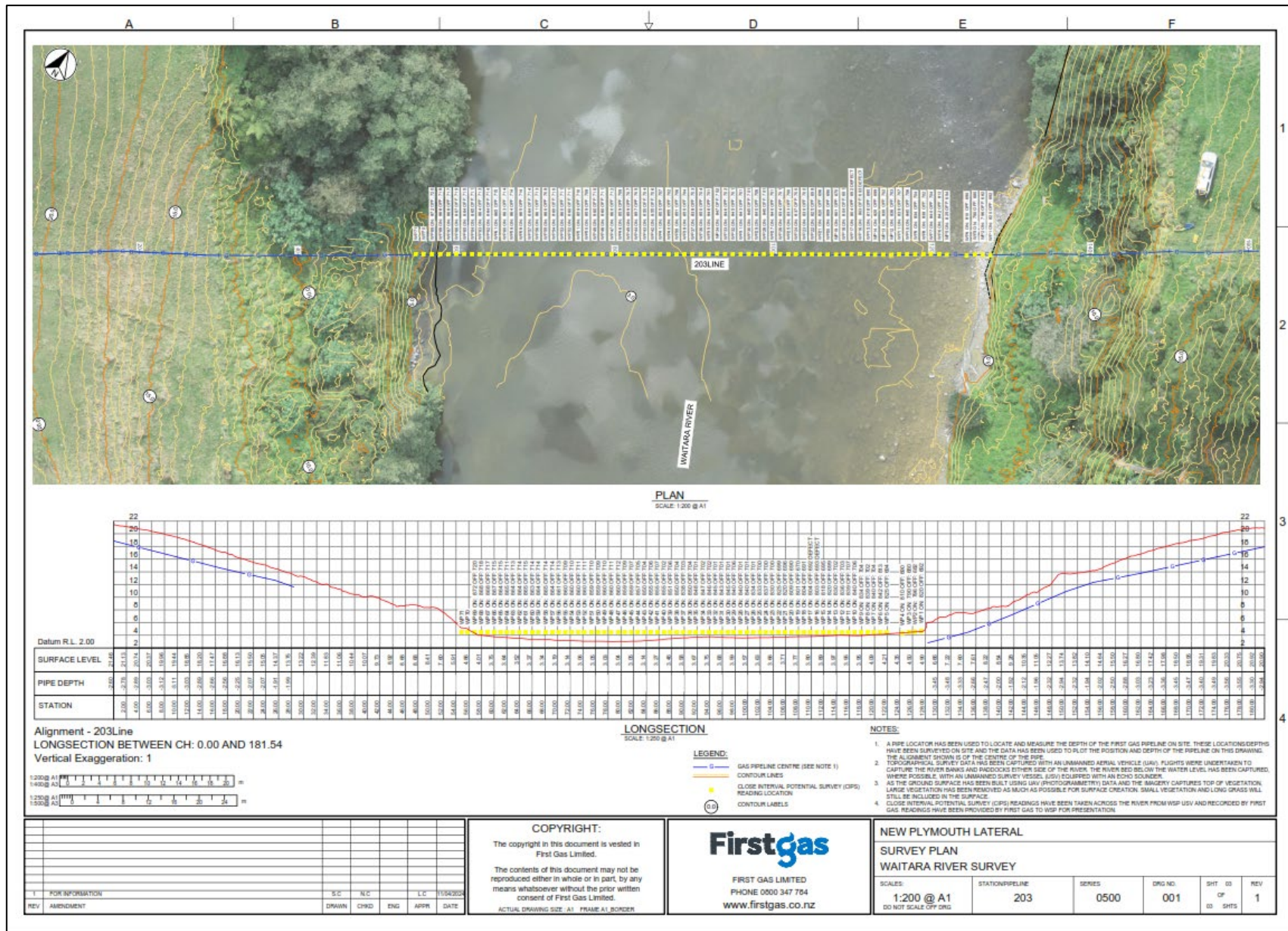
KAPUNI-PAPAKURA

SURVEY PLAN

2023 WAIPA RIVERBANK SLUMP - 200LINE

SCALE	STATION/PIPELINE	DEPTH	DRG NO.	DATE	REV
AS SHOWN DO NOT SCALE OFF DRG	200	300	000	2 OF 2 DATE	2

CIPS - Close Interval Pipeline Survey

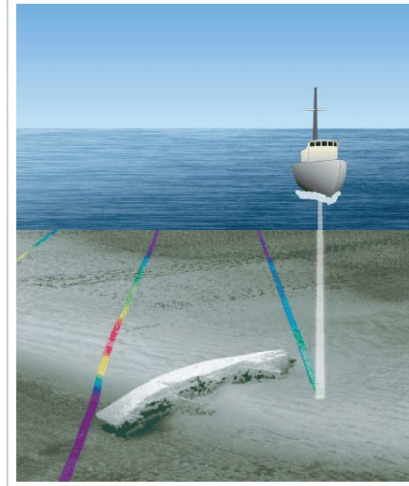


Way Forward

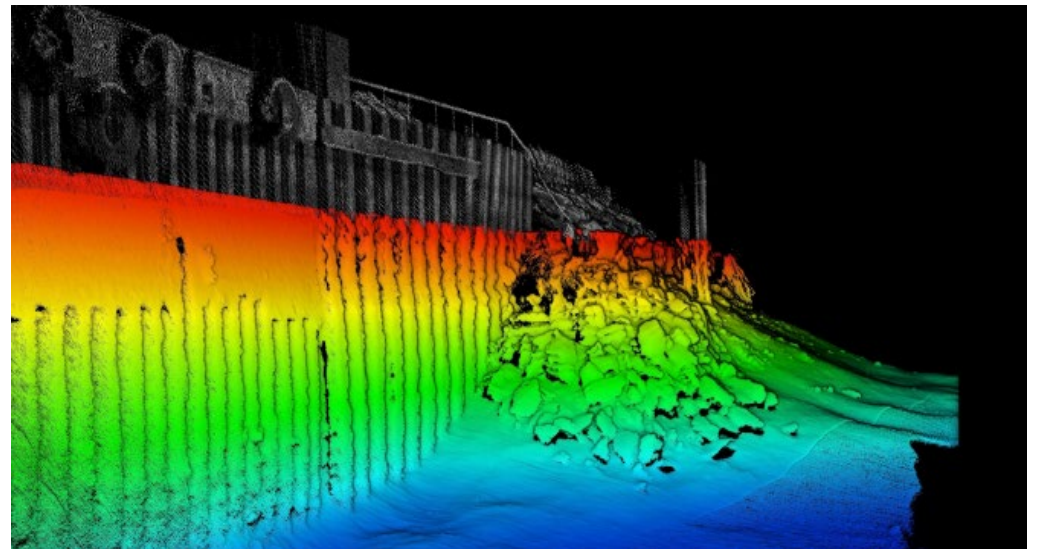
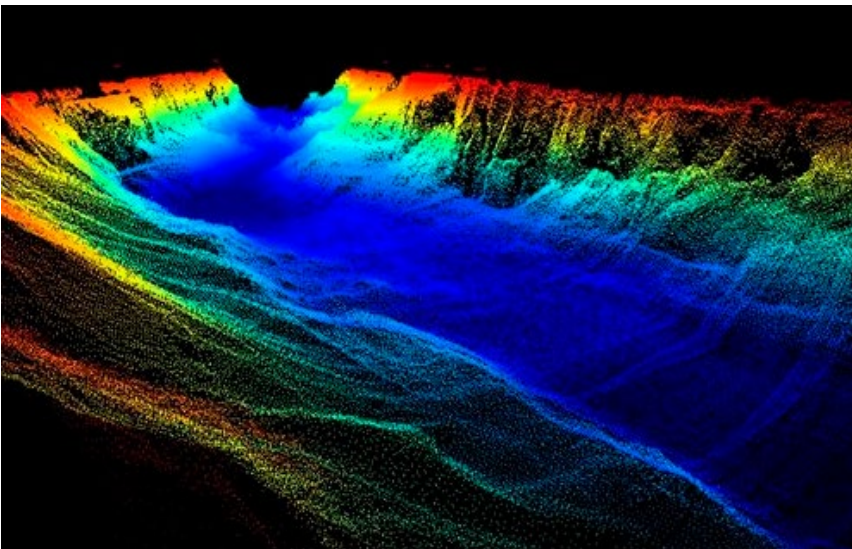
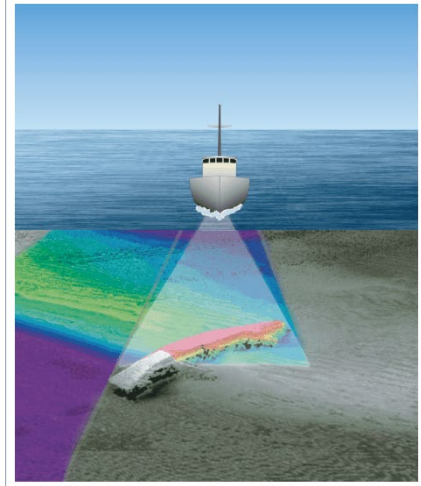
Moving to USV with multibeam echosounder, side-scan sonar and water quality probes.



Single-Beam Echo Sounder



Multi-Beam Echo Sounder





Questions

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