September 29, 2025

Alberta Transportation and Economic Corridors
4th Floor, Provincial Building
4920 – 51st Street
Red Deer, Alberta
T4N 6K8

Tony Penney, P.Eng.
Construction Engineer

Dear Mr. Penney:

CON0022160 Central Region GRMP Instrumentation Monitoring
Site C079; H53:12, km 0.684; Hwy 53 East of Battle River Slide
Section C – 2025 Fall Readings

1 GENERAL

One slope inclinometer (SI) (SI25-C079-01) and four vibrating wire piezometers (VWPs) (VW198272, VW198365, VW198266, and VW200090) were read at the C079 site in the Central Region on September 10, 2025 by Katrina Cereno, E.I.T. of Klohn Crippen Berger Ltd. (KCB). These instruments were read as part of the Central Region Geohazard Risk Management Program (GRMP). The site is located on Hwy 53:12, km 0.684, approximately 650 m east of the Battle River and 17 km east of Donalda, Alberta. The approximate site coordinates are 5826301 N, 409478 E (UTM Zone 12, NAD 83). A site plan is presented in Figure 1.

The geohazard at the site is instability of the north highway embankment slope that is impacting the guardrail (settlement) and pavement surface (cracking and settlement). The highway embankment slope at the site is a compound slope approximately 15 m tall with a slope of approximately 3H:1V for the upper 5 m and 2H:1V for the lower 10 m of the slope. The crest of the embankment slide is estimated to be 35 m wide. The site was first inspected by KCB and TEC in June 2025 during the 2025 Section B Inspection tour.

In March 2025, KCB conducted a geotechnical investigation to install geotechnical instruments and improve the understanding of existing subsurface conditions and to support potential future design work. Drilling was completed by Mobile Augers and Research Ltd. and monitored by KCB. The encountered stratigraphy was generally as follows: pavement (only encountered in the borehole drilled through the highway surface), overlying variable fill and overburden (sand, clay, silt), overlying bedrock (shale and sandstone).

KCB did not find any record of previous remedial action for site aside from regular pavement patching.

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1.1 Instrumentation

Instrumentation installation details are tabulated in Table 1.1. Instrument locations are presented in Figure 1.

In March 2025, KCB installed one SI (SI25-C079-01) and four VWPs (VW198272, VW198365, VW198266, and VW200090) to monitor depth of movement and groundwater conditions, respectively. The SI and two VWPs were installed in BH25-C079-01, located in the north (westbound) lane, and are protected with a flush-mounted protective headbox. The remaining two VWPs were installed in BH25-C079-02 located in the south (eastbound) ditch and are protected by an above-ground protective headbox.

The SI was read using the same metric RST Digital MEMS Inclinometer System that has been used to read the SI since the instrument was installed.

The VWPs were read using a Slope Indicator VW Data Recorder vibrating wire readout.

Table 1.1 Instrumentation Installation Details

Instrument ID	Instrument Type	Date Installed	UTM Coordinates[1] (m)		Ground Surface Elevation[2] (m)	Stick Up (m)	Depth (mbgs[3])	Condition
			Northing	Easting				
VW198272	VWP	Mar. 10, 2025	5826211	409319	706.6	N/A	4.6	Operable
VW198365	VWP	Mar. 10, 2025				N/A	9.1	Operable
SI25-C079- 01	SI	Mar. 10, 2025				0.0	15.1	Operable
VW198266	VWP	Mar. 11, 2025	5826200	409330	704.7	N/A	3.1	Operable
VW200090	VWP	Mar. 11, 2025				N/A	7.0	Operable

Notes:
[1] Borehole locations were not surveyed and were estimated based on satellite imagery. Coordinates are in the UTM Zone 12, NAD 83 coordinate system.
[2] Elevations were estimated from 2011 LiDAR data (UTM Zone 11, NAD83).
[3] Metres below ground surface (mbgs).

2 INTERPRETATION

2.1 General

For the SI, the cumulative displacement, incremental displacement, and displacement-time data was plotted in the A-direction (i.e., the direction of the A0-grooves) that align with the anticipated direction of movement (i.e., downslope).

For the VWPs, the recorded porewater pressures were converted to an equivalent water/piezometric elevation and plotted relative to ground surface elevation and the tip elevation for each instrument.

The SI and piezometer data plots are included in Appendix I, and a summary of the SI and piezometer data is provided in Table 2.1 and Table 2.2, respectively.

2.2 Zones of Movement

There has been a small amount of shallow discrete movement recorded in the upper 2 m and also recorded at approximately 5 m to 6 m below ground surface in SI25-C079-01.

2.3 Interpretation of Monitoring Results

The shallow movement recorded in top 2 m of SI25-C079-01 may be attributed to a soft zone of embankment fill or foundation material (e.g., poorly compacted fill or in-situ material that should have been sub-excavated during construction) where no recovery was observed during drilling (from approximately 1.5 m to 3.0 m below ground surface). The deeper zone of movement from approximately 5 m to 6 m below ground surface is approximately 1.5 m above the top bedrock (clay shale) and close to the elevation of a minor scarp observed on the highway embankment slope during the 2025 Section B Inspection. The deeper movement is recorded near a relatively soft zone observed during drilling (high plastic silt with some sand).

Since the water level stabilized shortly after installation, the recorded water levels have been relatively steady (±0.1 m) or decreasing (decreases between approximately 0.5 m and 0.9 m). Two instruments were installed in each borehole in the overburden and foundation materials. Based on the recorded water levels for each instrument, there appears to be two independent water tables at the site (one in the overburden and one in the foundation).

The near-surface water level recorded in the piezometer below the south (eastbound) ditch (VW198266) could indicate the ditch has relatively poor drainage (i.e., a flatter length of the ditch above the slide) which could lead to increased infiltration resulting in increased rates of movement after spring freshet or after periods of prolonged or increased rainfall.

Since the instruments have only been read four times between April and September 2025, more data is needed to assess seasonal trends for the instruments.

Table 2.1 Slope Inclinometer Reading Summary

Instrument ID	Date				Ground Surface Elevation[1] (m)	Depth of Movement (mbgs[2])	Direction of Movement	Cumulative Movement (mm)		Rate of Movement (mm/year)		
	Initialized	Previous Maximum Cumulative Movement Recorded	Previous Reading	Most Recent Reading				Maximum	Incremental Since Previous Maximum	Previous Maximum	Most Recent Reading	Change from Previous Reading
SI25-C079-01	Apr. 3, 2025	May 1, 2025	Jun. 10, 2025	Sep. 10, 2025	706.6	4.8 – 7.3	A-Direction	2.2	1.8	3.4	7.2	6.0

Notes:
[1] Ground surface elevation was estimated from 2011 LiDAR data.
[2] Metres below ground surface (mbgs).

Table 2.2 Vibrating Wire Piezometer Reading Summary

Instrument ID / Serial No.	Date			Ground Surface Elevation[1] (m)	Tip Depth (mbgs[1])	Water Level		
	Installed	Previous Reading	Most Recent Reading			Previous Reading (mbgs[2])	Most Recent Reading (mbgs[2])	Change from Previous Reading (m)
VW198272	Mar. 11, 2025	Jun. 10, 2025	Sep. 10, 2025	706.6	4.6	3.6	3.6	0.0
VW198365	Mar. 11, 2025	Jun. 10, 2025	Sep. 10, 2025		9.1	8.2	8.3	-0.1
VW198266	Mar. 12, 2025	Jun. 10, 2025	Sep. 10, 2025	704.7	3.1	0.2	0.5	-0.2
VW200090	Mar. 12, 2025	Jun. 10, 2025	Sep. 10, 2025		7.0	2.6	3.4	-0.8

Notes:
[1] Ground surface elevations were estimated from 2011 LiDAR data.
[2] Metres below ground surface (mbgs).

3 RECOMMENDATIONS

3.1 Future Work

All operable instruments should continue to be read twice per year (spring and fall).

The site should be regularly inspected by the Maintenance Contract Inspector (MCI) and inspected every two years as part of the Central Region GRMP Section B inspections.

3.2 Instrument Repairs and Maintenance

No instrument repairs or maintenance is required.

4 CLOSING

This report is an instrument of service of Klohn Crippen Berger Ltd. (KCB). The report has been prepared for the exclusive use of Alberta Transportation and Economic Corridors (Client) for the specific application to the Central Region Geohazard Risk Management Program (Contract No. CON0022160), and it may not be relied upon by any other party without KCB's written consent.

KCB has prepared this report in a manner consistent with the level of care, skill and diligence ordinarily provided by members of the same profession for projects of a similar nature at the time and place the services were rendered. KCB makes no warranty, express or implied.

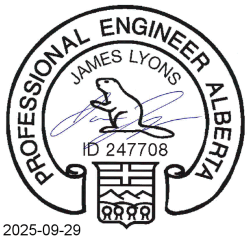
Use of or reliance upon this instrument of service by the Client is subject to the following conditions:

1. The report is to be read in full, with sections or parts of the report relied upon in the context of the whole report.
2. The observations, findings and conclusions in this report are based on observed factual data and conditions that existed at the time of the work and should not be relied upon to precisely represent conditions at any other time.
3. The report is based on information provided to KCB by the Client or by other parties on behalf of the client (Client-supplied information). KCB has not verified the correctness or accuracy of such information and makes no representations regarding its correctness or accuracy. KCB shall not be responsible to the Client for the consequences of any error or omission contained in Client-supplied information.
4. KCB should be consulted regarding the interpretation or application of the findings and recommendations in the report.
5. This report is electronically signed and sealed and its electronic form is considered the original. A printed version of the original can be relied upon as a true copy when supplied by the author or when printed from its original electronic file.

Please contact the undersigned if you have any questions or comments regarding this report.

Yours truly,

KLOHN CRIPPEN BERGER LTD.



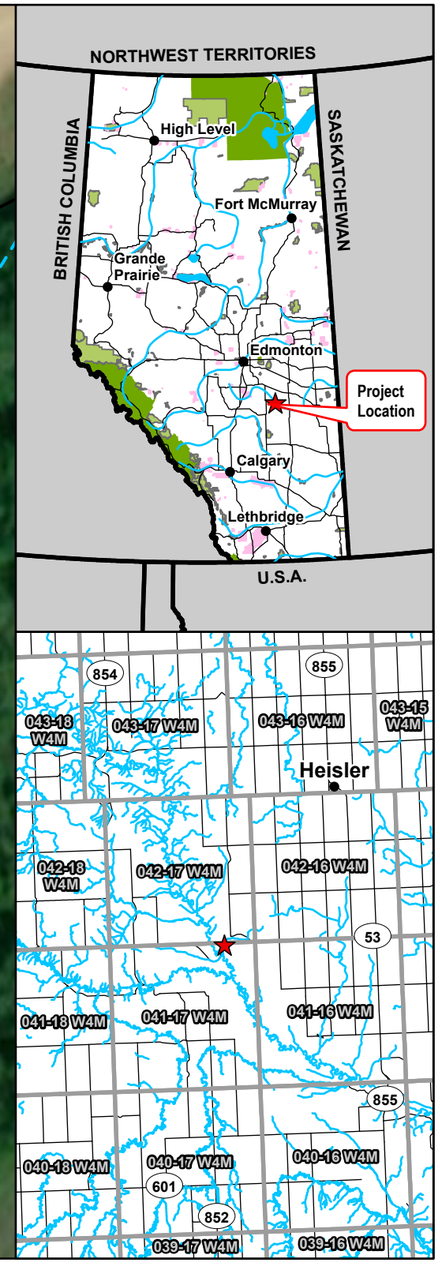
James Lyons, P.Eng.
Civil Engineer

JL:bb

PERMIT TO PRACTICE
KLOHN CRIPPEN BERGER LTD.
RM SIGNATURE: _____
RM APEGA ID #: 187607
DATE: 29 Sep. 2025
PERMIT NUMBER: P009196
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

ATTACHMENTS
Figure
Appendix I Instrumentation Plots

FIGURE



Legend

- Borehole
- Flow Direction
- Watercourse
- Pavement Crack
- Scarp
- TEC Right-of-Way
- Telus Trench
- Fence
- Guardrail

0 50 Metres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 12N
3. IMAGE SOURCE: 2024 MICROSOFT CORPORATION, MAXAR, CNES DISTRIBUTION AIRBUS DS.

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
C079 – H53 East of Battle River Slide
Hwy 53:12

SCALE	PROJECT No.	FIG No.
1:1,000	A05116A02	1

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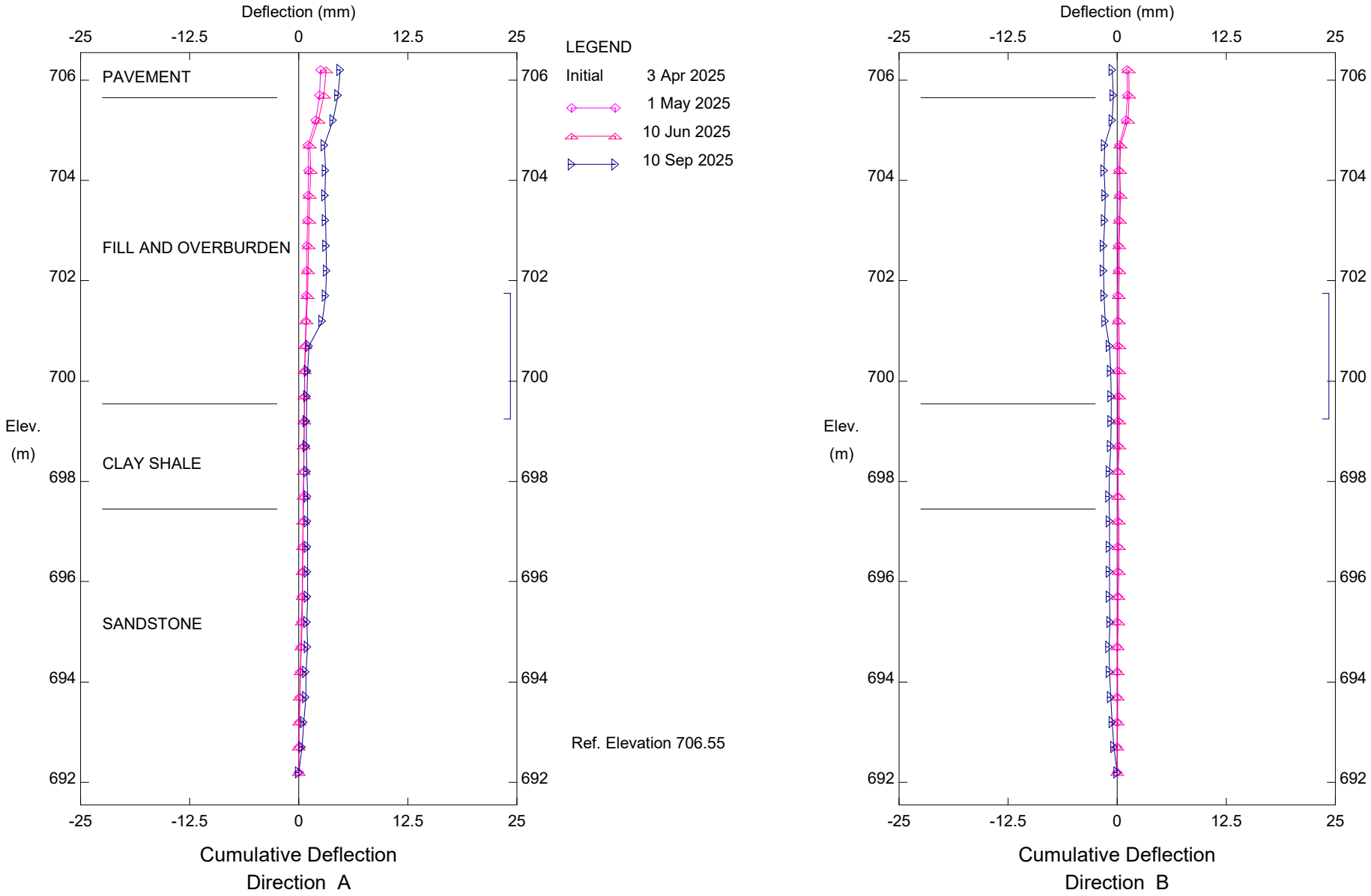
APPENDIX I

Instrumentation Plots

Klohn Crippen Berger - Calgary



H53 East of Battle River Slide, Inclinometer SI25-01

Alberta Transportation

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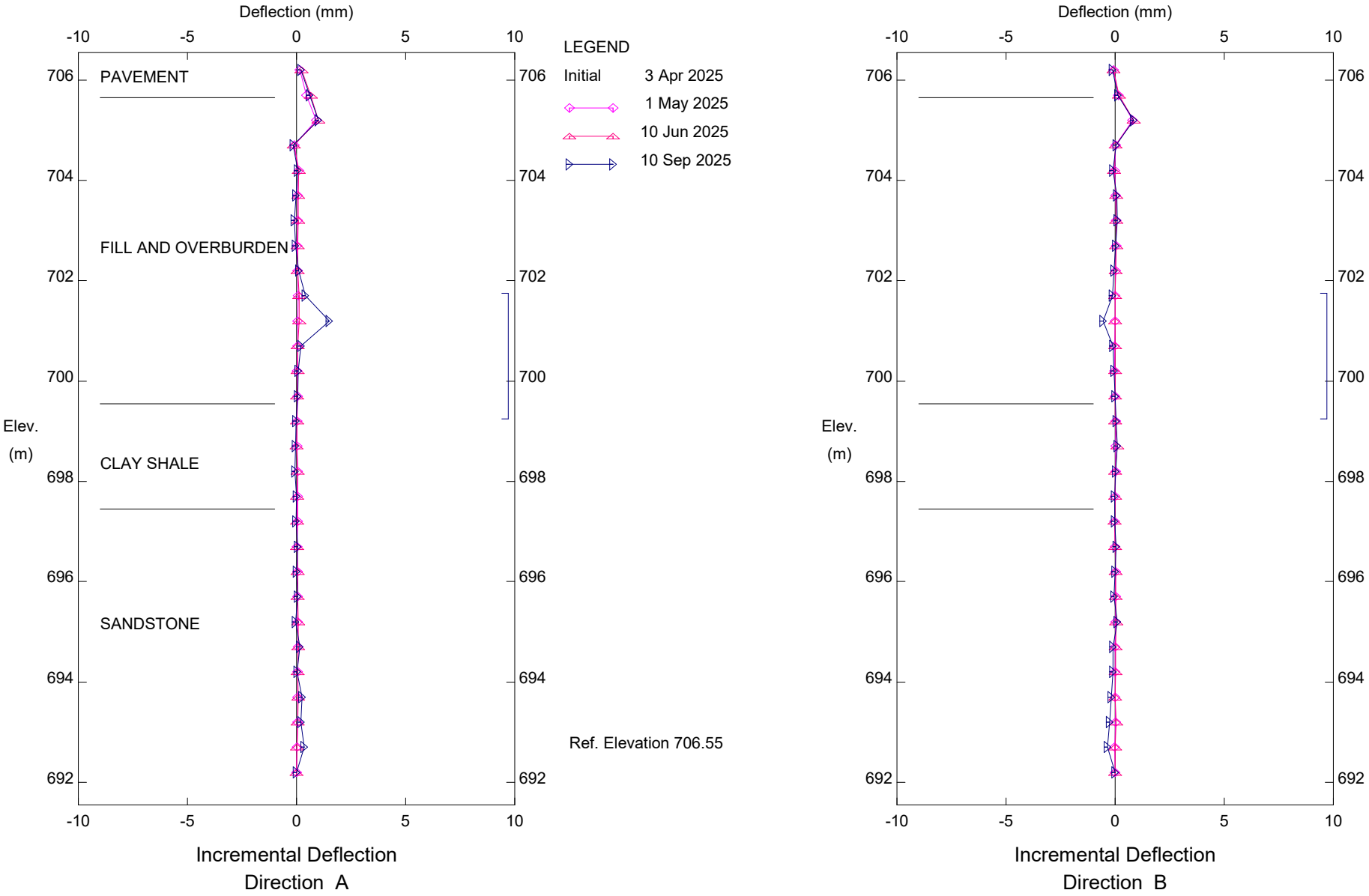
Klohn Crippen Berger - Calgary



H53 East of Battle River Slide, Inclinometer SI25-01

Alberta Transportation

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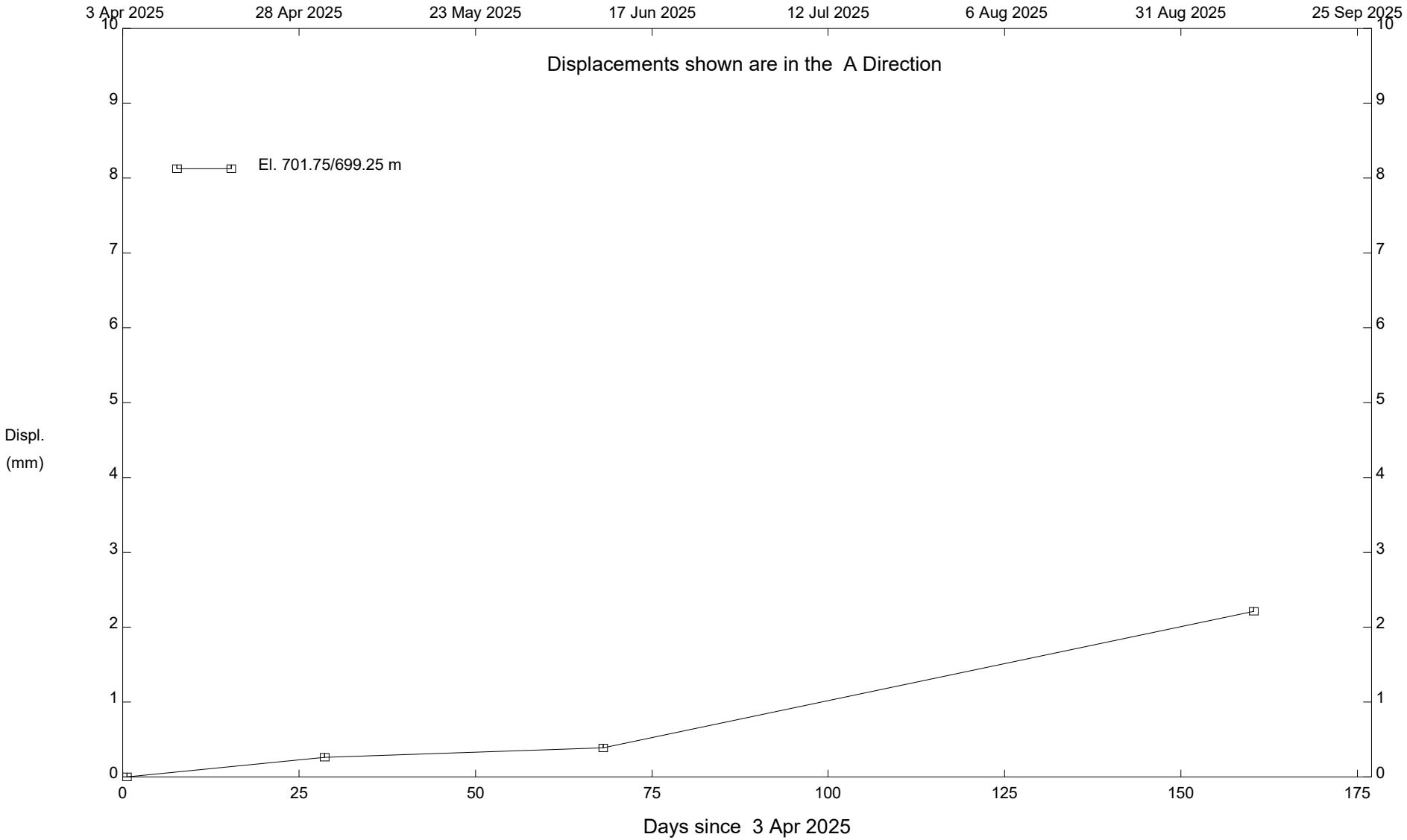
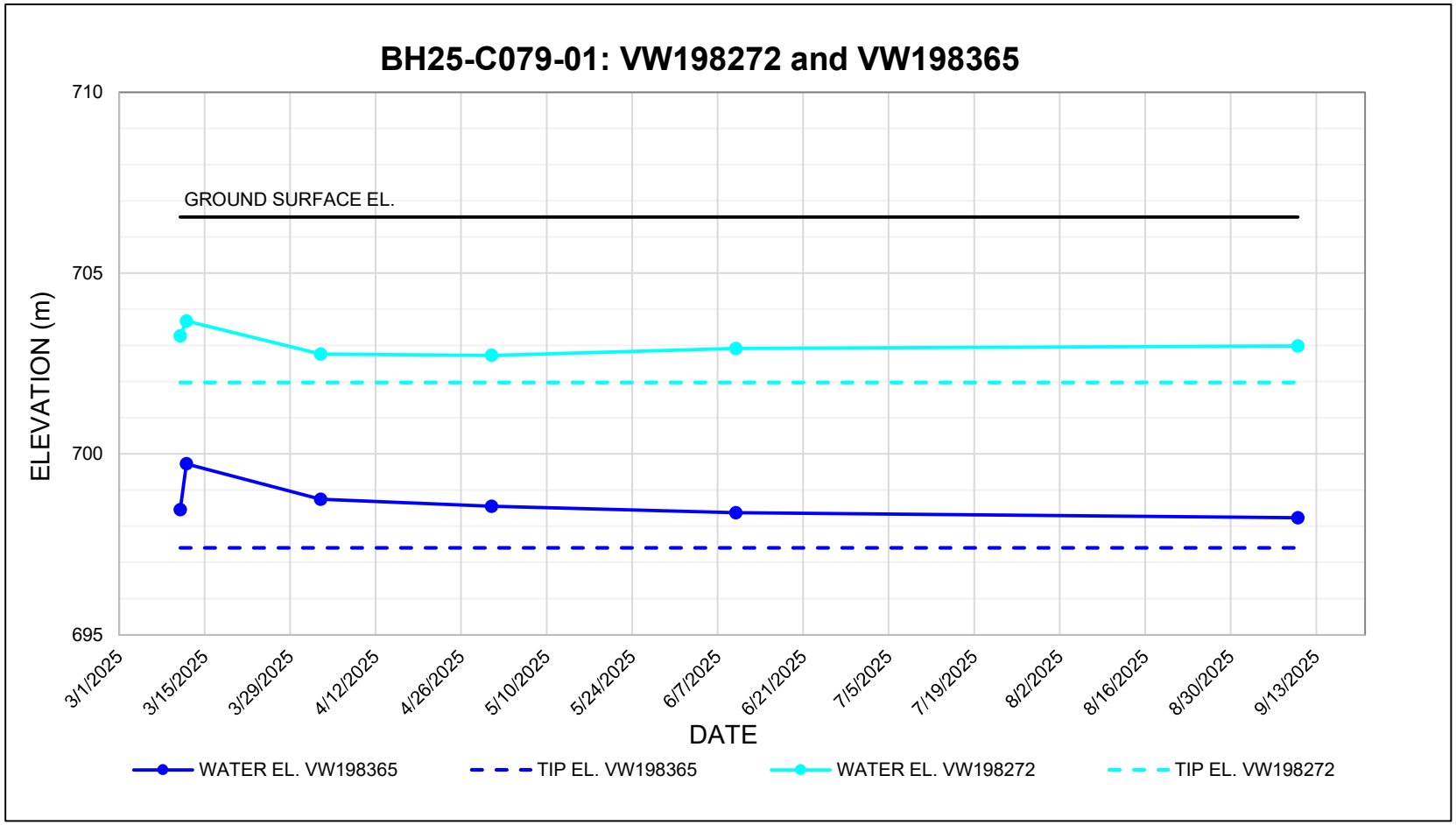
Klohn Crippen Berger - Calgary



H53 East of Battle River Slide, Inclinometer SI25-01

Alberta Transportation



NOTES:
1. GROUND SURFACE ELEVATION ESTIMATED FROM ALTALIS LIDAR DATA.

CLIENT Alberta

Klohn Crippen Berger

PROJECT CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE Piezometer Data
C079 Hwy 53 East of Battle River Slide
Hwy 53:12, km 0.684

SCALE	PROJECT No.	FIG No.
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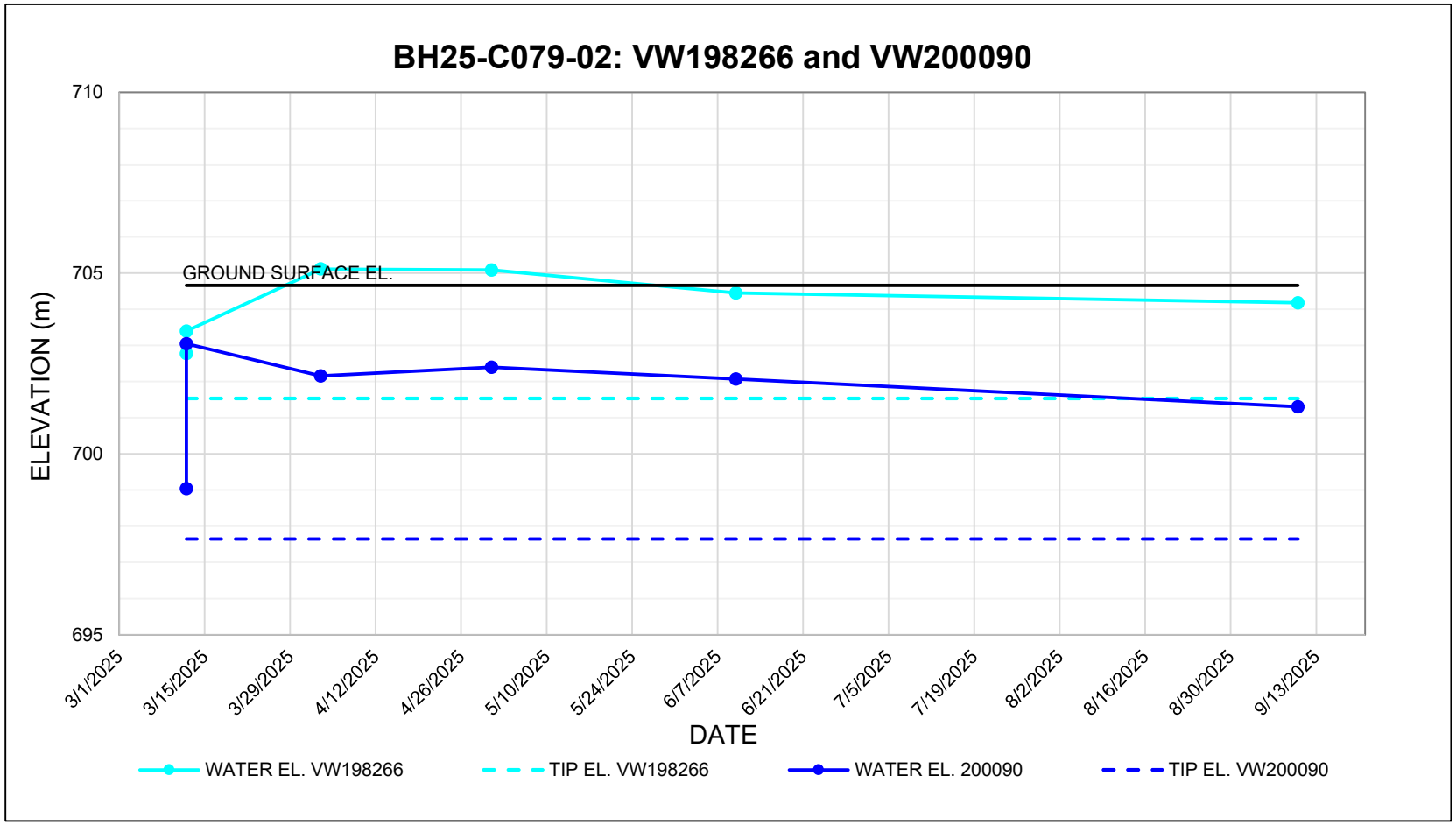

NOTES:
1. GROUND SURFACE ELEVATION ESTIMATED FROM ALTALIS LIDAR DATA.

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: CENTRAL REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Piezometer Data
C079 Hwy 53 East of Battle River Slide
Hwy 53:12, km 0.684

SCALE	PROJECT No.	FIG No.
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