CORROSION CONTROL ENGINEERING
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CCE Ref: W20889A/J740

7th February 2022

Frasers Property Australia
Level 2, 1C Homebush Bay Drive
Rhodes NSW 2138

Attention: Mr Chris Koukoutaris

Email: Chris.Koukoutaris@fraserspropery.com.au
Mobile: 0434 034 371

Dear Chris,

RE: ELECTROLYSIS RISK TESTING AT
12 STURT STREET, TELOPEA NSW 2117

Please find attached our revised report (to incorporate comments from TfNSW) for electrolysis risk testing at the above site. We trust you find our field work and report satisfactory. Should you have any queries, please do not hesitate to contact our office.

Yours faithfully,

Corrosion Control Engineering (NSW) Pty Ltd

Michael Barone
Corrosion Engineer
BEng (Mech) Hons
NACE Cathodic Protection Technician (#71716)

CORROSION CONTROL ENGINEERING

ELECTROLYSIS RISK TESTING
12 STURT STREET, TELOPEA NSW 2117
FRASERS PROPERTY AUSTRALIA

DOCUMENT NUMBER:	W20889A/J740
REVISION:	A
DATE:	7 February 2022



DOCUMENT CONTROL					
REVISION	**DATE**	**REASON FOR ISSUE**	**PREPARED**	**CHECKED**	**APPROVED**
0	26/05/2021	Issued to client.	Michael Barone & Andrew Chapman	Jim Galanos	Jim Galanos
A	07/02/2022	Revised to incorporate comments from TfNSW.	Michael Barone	Jim Galanos	Jim Galanos

Contents

Appendices

1. Introduction

As requested, on Monday 24th May 2021, Corrosion Control Engineering (NSW) Pty Ltd (CCE) conducted electrolysis testing at 12 Sturt Street, Telopea NSW 2117.

2. The Electrolysis Problem

Most of the DC current to power the electric trains returns to the railway substations via the rail lines. However, some leaks to ground (stray traction current) and in returning to the substation via this path can be picked up (and discharged) from buried metallic structures, leading to possible electrolysis type corrosion problems. The problems can be significant if:

- The metallic structures are sufficiently large or long enough and close to the electrified railway lines.
- The stray traction current leakages to soil are of sufficient frequency and magnitude.

3. Test Method

The in-ground stray traction, causing voltage fluctuation on the development site, was monitored by data logging voltage gradients and potentials over an approximate 4-hour period as follows:

1. Data logging voltage gradients between steel earth stakes across the north-south length of the site. In this case the earth stakes were installed approximately 90 metres apart.
2. Data logging voltage gradients between steel earth stakes across the east-west width of the site. In this case the earth stakes were installed approximately 70 metres apart.
3. Data logging the potential of an in-ground metallic structure. This was done on a railway boundary fence.
4. Data logging the potential of an in-ground metallic structure. This was done on a water service.

Note, TfNSW standards ‘THRCI 12080 ST: External Developments, Version 1.0’ and ‘THRCI 12051 ST: Development Near Rail Tunnels, Version 2.0’ do not provide any acceptance criteria for stray current effects. The NSW Electrolysis Committee adopts an acceptance criteria (low risk) of 20 mV anodic and 100 mV cathodic time weighted average shift over a period of up to 24 hours. Given there are no specified mitigation methods, the conclusions and recommendations in this report are based on CCE’s experience in this field.

4. Test Results

A summary of the test results is presented in the following table. The corresponding data logger charts are presented in Appendix A.

Test Number	Data Logging Test Performed	Test Duration	Observed Fluctuations
1	Voltage gradient recording between steel earth stakes, across north-south length of site, 90 metres apart.	4-hours	Most fluctuations ranged within 10 mV Maximum fluctuation range of 15 mV
2	Voltage gradient recording between steel earth stakes, across east-west width of site, 70 metres apart.	4-hours	Most fluctuations ranged within 11 mV Maximum fluctuation range of 22 mV
3	Potential recording of the railway fence.	4-hours	All fluctuations less than 10 mV
4	Potential recording of the water service.	4-hours	All fluctuations less than 10 mV

5. Discussion of Test Results

The test results show there are minor (low risk) traction currents effects present at the site.

1. The logger chart for the steel earth stakes across the north-south length of site shows minor traction current effects.

2. The logger chart for the steel earth stakes across the east-west width of site shows minor traction current effects.

3. The logger chart for the railway fence shows minor traction current effects.

4. The logger chart for the water meter shows minor traction currents effects.

6. Drawings & Documents Reviewed

The relevant drawings and documents provided to and reviewed by CCE are detailed below.

6.1 Architectural Drawings by Plus Architecture

- Project: Telopea Masterplan, Lot 5-7 Telopea 2117, Stage 1A Residential
- Job Number: 20320
- Date Drawings Received by CCE: 26-5-2021

Drawing Name	Drawing Number	Revision	Date
Basement 02 Plan	PLA-AR-DA0097	D	23-02-2021
Basement 01 Plan	PLA-AR-DA0098	C	10-11-2020
Lower Ground Floor Plan	PLA-AR-DA0099	C	10-11-2020
Upper Ground Floor Plan	PLA-AR-DA0100	B	10-11-2020
Stage 1 - West Elevation	PLA-AR-DA0200	A	18-08-2020
Stage 1 - North Elevation	PLA-AR-DA0201	A	18-08-2020
Stage 1 – South Elevation	PLA-AR-DA0202	A	18-08-2020
Stage 1 – South Elevation	PLA-AR-DA0203	A	17-08-2020
Stage 1 – East Internal Elevation	PLA-AR-DA0204	A	18-08-2020
Stage 1 – West and North Internal Elevation	PLA-AR-DA0205	A	18-08-2020
Stage 2 – North and East Elevation	PLA-AR-DA0210	A	18-08-2020
Stage 2 – East and South Elevation	PLA-AR-DA0211	A	18-08-2020
Stage 2 – West Elevation	PLA-AR-DA0212	A	18-08-2020
Stage 2 – West Elevation	PLA-AR-DA0213	A	18-08-2020
Stage 1 - Section 01	PLA-AR-DA0250	A	14-08-2020
Stage 1 – Section 02	PLA-AR-DA0251	A	14-08-2020
Stage 1 – Section 03	PLA-AR-DA0252	A	14-08-2020
Stage 1 – Section 04	PLA-AR-DA0253	A	14-08-2020
Stage 2 – Section 01	PLA-AR-DA0260	A	14-08-2020
Stage 2 – Section 02	PLA-AR-DA0261	A	14-08-2020
Stage 2 – Section 03	PLA-AR-DA0262	A	14-08-2020
Overall Section 01	PLA-AR-DA0270	A	14-08-2020

6.2 Structural Drawings by Robert Bird Group

- Project: Telopea Masterplan, Lot 5-7 Telopea 2117, Stage 1A Residential
- Job Number: 20137
- Date Drawings Received by CCE: 26-05-2021

Drawing Name	Drawing Number	Revision	Date
Cover Sheet and Drawing List	20137-RBG-DR-ST-00000	P01	22-04-2021
General Notes Sheet 1	20137-RBG-DR-ST-00001	P01	22-04-2021
General Notes Sheet 2	20137-RBG-DR-ST-00002	P01	22-04-2021
Bulk Earthwork Plan	20137-RBG-DR-ST-01001	P01	22-04-2021
Shoring Wall Elevations Sheet 1	20137-RBG-DR-ST-01002	P01	23-04-2021

7. Conclusion

Based on the site testing, the present stray traction currents at the proposed development site may present a minor (low risk) corrosion hazard to on-ground and in-ground metallic structures. It should be noted that stray traction current effects at the proposed development site will almost certainly change with time, and could become a significantly higher corrosion hazard.

8. Recommendations

Based on the site testing and review of the available development drawings/documents, CCE recommend the following conservative protective measures, where possible, to mitigate against long term stray current corrosion at on-ground and in-ground metallic structures:

1. The installation of heavy plastic membrane (e.g. Fortecon) under (or behind) all reinforced concrete slabs, permanent retaining walls, permanent anchors, piers/piles, and metallic posts/bollards to electrically isolate from soil and stray currents.

2. The use of high strength (minimum 32 MPa), high cover (minimum 50 mm) concrete to effectively prevent/limit soil moisture penetrating through to the steel/metal.

3. The use of plastic, rather than metallic, in-ground pipework and tanks where possible. In the event buried metallic pipework and/or cables are installed within the site, installation within sealed non-metallic conduit is recommended.

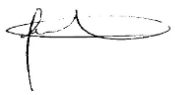
In addition to the above, in order to comply with the TfNSW standard 'THRCI 12051 ST: Development Near Rail Tunnels, Version 2.0, section 9.2.1', CCE recommend installation of basement rebar test points to allow for future electrolysis testing of the basement rebar post-construction. This can be achieved via welded test studs that protrude from the basement walls, at approximately knee-high level. CCE recommend 2-off rebar test points be installed per basement level, with one at each end of the basement level. See Appendix B for an example photo of a basement rebar test point/stud. Note, these welded studs can be installed relatively flush with the concrete surface, but must protrude enough (minimum 10 mm) so that a multimeter clip can still be connected onto them.

We trust you find our study and report satisfactory. Should you have any queries, please do not hesitate to contact our office.

Yours faithfully,

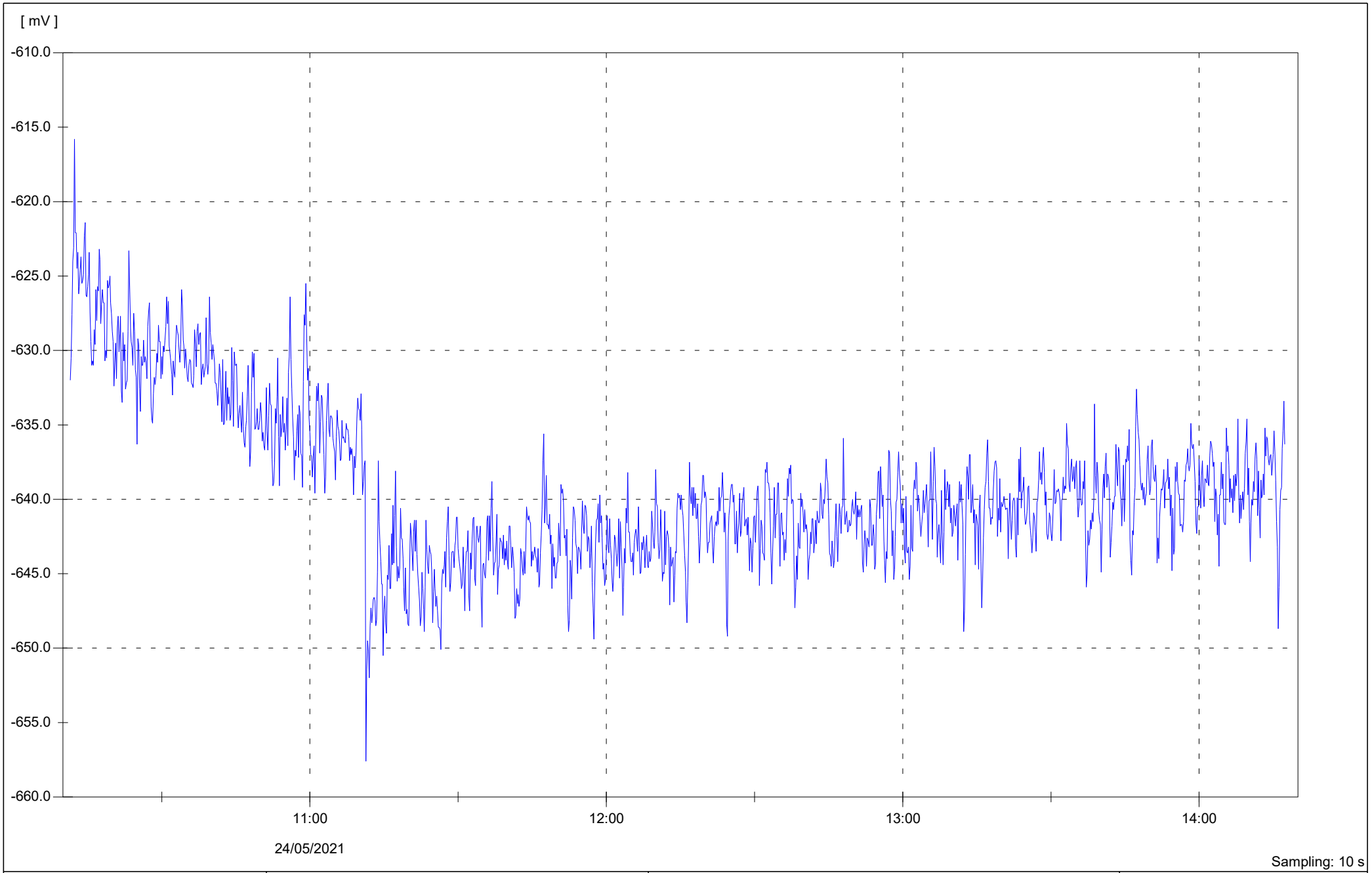
Corrosion Control Engineering (NSW) Pty Ltd

Michael Barone
Corrosion Engineer
BEng (Mech) Hons
NACE Cathodic Protection Technician (#71716)



Jim Galanos
Engineering Manager
NACE Cathodic Protection Specialist (#68057)

Appendix A: Data Logger Charts



Sampling: 10 s

— : Volts vs Cu/CuSO4

	Min	Max	Average	Std. dev.
DC 1	-0.658 V	-0.616 V	-0.639 V	0.005 V

Electrolysis Test
12 Sturt Street, Telopea
Logger Serial Number: 2734
North to South

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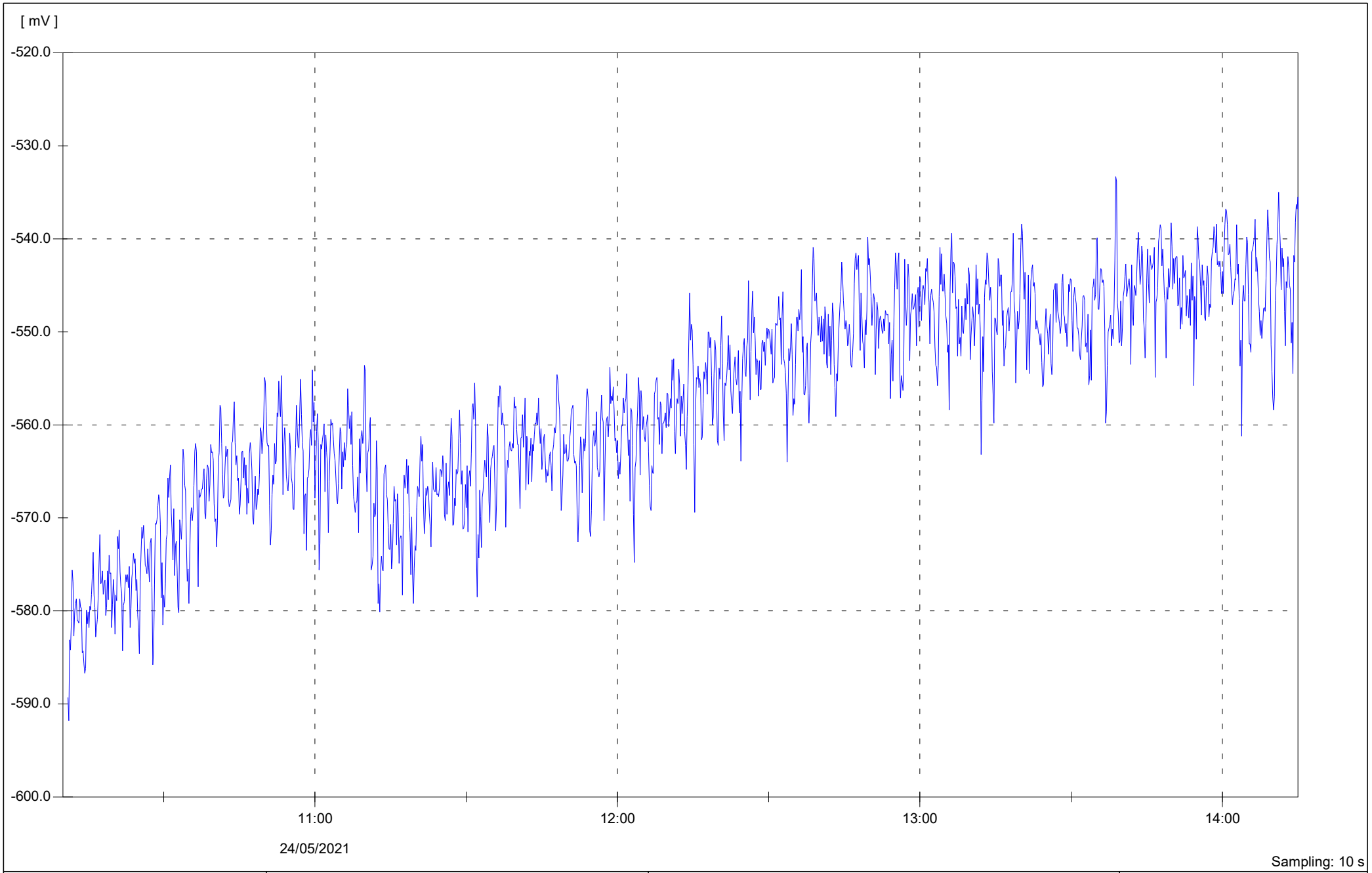
MiniLog2



Sampling: 10 s

— : Volts vs Cu/CuSO4

MiniLog2

	Min	Max	Average	Std. dev.
DC 1	-0.592 V	-0.533 V	-0.557 V	0.011 V

Electrolysis Test
12 Sturt Street, Telopea
Logger Serial Number: 2731
East to West

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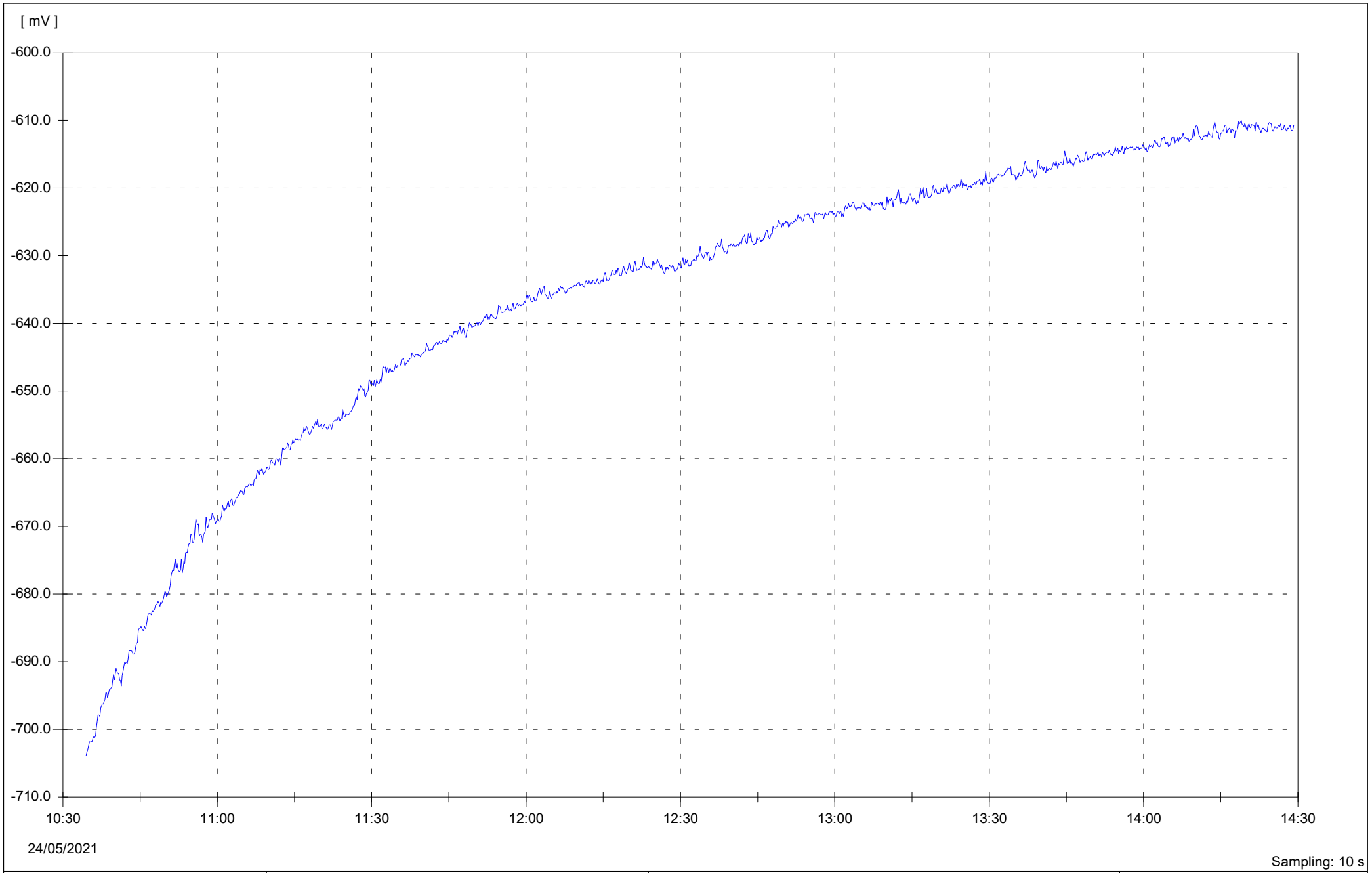

: Volts vs Cu/CuSO4

	Min	Max	Average	Std. dev.
DC 1	-0.704 V	-0.610 V	-0.636 V	0.022 V

Electrolysis Test
12 Sturt Street, Telopea
Logger Serial Number: 2732
Railway Fence

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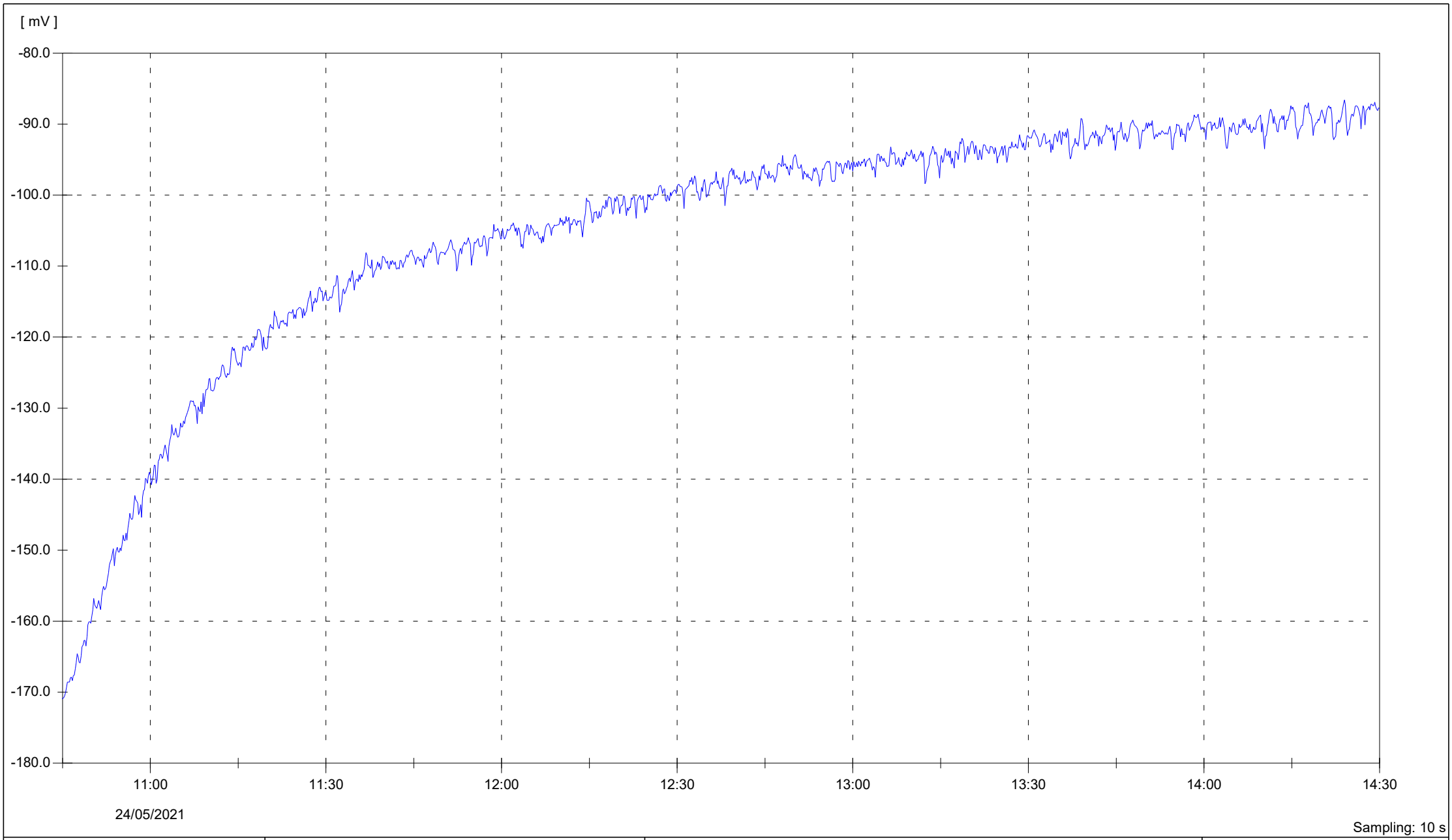
MiniLog2



: Volts vs Cu/CuSO4

	Min	Max	Average	Std. dev.
DC 1	-170.9 mV	-86.6 mV	-104.9 mV	17.7 mV

Electrolysis Test
12 Sturt Street, Telopea
Logger Serial Number: 2747
Water Service

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MiniLog2

Appendix B: Example Photo of a Basement Rebar Test Point/Stud