



June 6, 2019

Port of Olympia
Attn: Don Bache
606 Columbia Street NW, Suite 300
Olympia, WA 98501
donb@portolympia.com

Subject: **2019 CATHODIC PROTECTION SYSTEM INSPECTION
SHORELINE CONTAINMENT WALL
CASCADE POLE SITE
OLYMPIA, WASHINGTON**

Dear Mr. Bache:

On May 23, 2019, Norton Corrosion Limited (NCL) personnel completed an inspection of the impressed current cathodic protection (CP) system that protects the buried environmental containment wall at the Cascade Pole site from corrosion. Written authorization to perform this work was issued on April 2, 2019.

Work Performed

NCL thoroughly inspected all accessible components of the CP system to ensure safe and reliable operation. The rectifier was tested to ensure proper operation of all of its components. Current output measurements were recorded for each of the individual anodes. Structure-to-soil potential measurements were recorded at representative test locations along the wall to evaluate the level of CP being received. Both on and instant-off potential measurements were obtained along the inboard and outboard sides of the wall while interrupting the output of the rectifier. Adjustments and maintenance were performed as deemed necessary.

Criteria

NACE International has established criteria that indicate, when used separately or in combination, that adequate CP is being provided. NCL has evaluated your CP system based on the following criteria:

- Adequate CP is indicated by a potential difference of -0.850 volts or more negative between a steel structure and a saturated copper/copper sulfate (CSE) half-cell. This criterion requires all voltage drops, other than those across the structure-to-electrolyte boundary, to be considered for a valid interpretation of the potential data. Instant-off potential measurements were recorded to account for the voltage drops (IR drop) and have been used to evaluate the level of protection achieved. The equivalent criterion applicable to a saturated silver/silver chloride (sat. Ag/AgCl) half-cell is -0.750 volts.

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- Adequate protection is also indicated by a cathodic polarization shift of not less than 100 millivolts. This is equivalent to the difference between the instant-off (polarized) and native (depolarized) potential measurements.

Results and Conclusions

The attached data sheets detail the results of the inspection. Survey data indicated the CP system was functioning properly. All equipment was in good and operable condition with the exception of two anodes and the two half-cells that have been previously reported as inoperable. The system had a total current output of 22.0 amps as compared to 24.0 amps reported during last year's inspection. The lesser current output can be attributed to a low tide during the time of inspection.

Both permanent half-cells are out of acceptable limits and are no longer accurate enough for use.

The system was installed in 2001 and should have a 30-year service life. Thus, the anodes have been in service for approximately 60% of its intended design life.

Recommendations

NCL recommends monitoring the rectifier voltage and current output at least once every 60 days. The system should operate near 6 volts and have a minimum current output of 20 amps. The current varies with the tide, increasing as more water covers the anodes located offshore of the wall in the tidal flat.

This system should be inspected by a Corrosion Professional on an annual basis; the next inspection should be scheduled for summer 2020.

NCL appreciates the opportunity to serve the Port of Olympia. If you have any questions or additional concerns, please contact our office.

Sincerely,



Tye Ritz
NACE CP Specialist #9745

PORT OF OLYMPIA
CASCADE POLE SITE
SHORELINE CONTAINMENT WALL
CATHODIC PROTECTION SYSTEM

DATA SHEET: 1 OF 3
NCL JOB: O-22888-M
DATE: 5/23/2019
BY: T. RITZ

SHORELINE CONTAINMENT WALL

Structure

Description: Buried sheet pile containment wall.
Length: 400 feet long
Depth: 25 feet
Drawings: NCL, 21015

Rectifier

Manufacturer: Universal Rectifiers
Model No: CSA-ASAI 20-40
Serial No: 011757
AC Input Rating: 115/230 V, 9.9/4.9 A, 1Ø
DC Output Rating: 20 V, 40 A
Anode Bed: 24 – 1 ½ "ø x 60" cast iron canister anodes

<u>Field Measurements</u>	<u>Units</u>	<u>Readings</u>
<u>Panel Meters and Settings</u>		
Output:	V dc	6.0
	A dc	22.0
Primary Input:		Low V
Taps (4/5max):		1/5
<u>Portable Meter</u>		
Input:	V ac	119.9
Secondary:	V ac	7.61
Output:	V dc	5.53
	A dc	22.8
Shunt (50 A/50 mV):	mV	22.8

Conditions: 1340 hrs, mid 70°s F, dry, low tide.
Notes: Fluke 28. Interruption: 2 sec. off, 10 sec. cycle.

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SHORELINE CONTAINMENT WALL
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DATA SHEET: 2 OF 3
NCL JOB: O-22888-M
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Anode Output Measurements

<u>Anode Location</u>	<u>Shunt Reading</u>	<u>Current Output</u>
1 - West	6.5 mV	0.65 A
2	0.0	0.00
3	4.2	0.42
4	5.0	0.50
5	11.4	1.14
6	13.3	1.33
7	11.6	1.16
8	12.1	1.21
9	12.6	1.26
10	11.2	1.13
11	11.5	1.15
12	11.9	1.19
13	11.3	1.13
14	10.8	1.08
15	12.6	1.26
16	11.6	1.16
17	11.4	1.14
18	12.1	1.21
19	11.3	1.13
20	11.6	1.16
21	0.0	0.00
22	3.9	0.39
23	4.7	0.47
24 – East	3.9	0.39

Note: Shunts are 0.01 ohm.

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 CATHODIC PROTECTION SYSTEM

DATA SHEET: 3 OF 3
 NCL JOB: O-22888-M
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Cathodic Protection Readings

Structure-to Soil Potential Measurements (V dc)

<u>Location</u>	<u>Onshore of Wall (ref. CSE)</u>			<u>Offshore of Wall (ref CSE)</u>		
	<u>Native*</u>	<u>On</u>	<u>Instant Off</u>	<u>Native*</u>	<u>On</u>	<u>Instant Off</u>
Portable Cell:						
Fence post 1		-1.241	-1.072	-0.750	-1.377	-1.171
Post 5, adj. E TS	-0.600	-1.096	-0.994	-0.696	-1.362	-1.074
Post 10	-0.665	-1.069	-1.030	-0.806	-1.587	-1.186
Post 15	-0.692	-1.070	-1.031	-0.814	-1.654	-1.203
Post 20	-0.692	-1.100	-1.057	-0.820	-1.734	-1.205
Post 25	-0.644	-1.056	-1.015	-0.833	-1.698	-1.208
Post 27, adj. rect	-0.630	-1.041	-1.013	-0.832	-1.673	-1.204
Post 30	-0.656	-1.074	-1.047	-0.840	-1.663	-1.211
Post 35	-0.699	-1.057	-1.034	-0.843	-1.613	-1.211
Post 40	-0.710	-1.057	-1.029	-0.844	-1.508	-1.209
Post 45	-0.691	-1.278	-1.177	-0.810	-1.398	-1.182
Post 50		-1.316	-1.267	-0.756	-1.342	-1.169
East T.S. (Post 5):						
Port. Cell	-0.560	-0.984	-0.918			
West T.S. (Post 48):						
Port. Cell	-0.741	-1.120	-1.057			

Note: Native potentials recorded in March, 2012. Both permanent sat. Ag/AgCl cells had previously failed.

RECTIFIER LOG

OWNER: PORT OF OLYMPIA – Cascade Pole Site

STRUCTURE: Shoreline Environmental Containment Wall

RECOMMENDED CURRENT OUTPUT: 20 to 26 amps (may vary with tide)

DATE	VOLTS	AMPS	TAPS	INITIAL	COMMENTS
5/23/2019	6.0	22.0	1/5	TR	NCL annual inspection.

For assistance, contact NCL at 425-483-1616.