NORTON CORROSION LIMITED

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May 14, 2012

Port of Olympia
Attn: Don Bache
915 Washington Street NE
Olympia, WA 98501

Subject: **DEPOLARIZED CATHODIC PROTECTION INSPECTION**
SHORELINE CONTAINMENT WALL
CASCADE POLE SITE
REVISION 1

Mr. Bache:

On May 1, 2012, Norton Corrosion Limited (NCL) revisited the subject site after the cathodic protection (CP) system had remained off for an additional month to allow for extra time for depolarization. This visit was a continuation the March 23, 2012, site visit previously approved on March 13, 2012.

Work Performed

NCL performed a brief depolarized survey along the wall to determine if the potentials had further depolarized. Once complete, the CP system was re-energized and the panel meters of the rectifier were calibrated to a portable meter.

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:

1. 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. Instantaneous-off potential measurements recorded to account for the voltage drops (IR drop) have been used to evaluate the level of protection achieved. The equivalent criterion applicable to a saturated silver/silver chloride (Ag/AgCl) half-cell is -0.750 volts.

2. 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

Leaving the CP system off for an additional month to further depolarize the potentials along the wall proved to have a negligible effect upon the depolarized potentials. A select number

of locations decreased in potential value but not to warrant the system to remain off to try and further depolarize the wall.

As previously mentioned in the April 16, 2012 report, the depolarized potentials along the wall indicate adequate protection is being obtained at all locations tested.

NCL re-energized the CP system and calibrated the panel meters to a portable meter. Operating voltage and amperage measurements were recorded along with individual anode current outputs. See attached data sheets for results.

Recommendations

NCL recommends continuing to monitor the rectifier voltage and current output every 60 days. The current may be higher when the offshore anodes are underwater. The higher the tide, the higher the output may be.

This system should be inspected on an annual basis, so your next inspection should be scheduled for April 2013.

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

Sincerely,

for Kellen Daffy

Tye Ritz
Corrosion Engineer

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Enclosures (1)

NORTON CORROSION LIMITED

PORT OF OLYMPIA
SHORELINE CONTAINMENT WALL
CASCADE POLE SITE

DATA SHEET: 1 OF 3
NCL JOB: E-20596-M
DATE: 5/1/2012
BY: T. RITZ

SHORELINE CONTAINMENT WALL

Rectifier

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

Field Measurements	Reading
Panel Meters:	4.25 volts
	13.5 amps
Transformer (4/5 max.):	1/4
Portable Meter:	120.2 volts AC Input
	6.23 volts AC on taps
	4.349 volts
	13.4 amps
Shunt (50A/50 mV)	13.4 mV

Weather: cloudy & wet, 50° F, 2:00 p.m., high tide.

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PORT OF OLYMPIA
SHORELINE CONTAINMENT WALL
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DATA SHEET: 2 OF 3
NCL JOB: E-20596-M
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Anode Output Measurements

Anode Location	Reading	Current (amps DC)
1 - West	1.6 mV	0.16 amps
2	0.0	0.00
3	1.9	0.19
4	3.1	0.31
5	7.0	0.70
6	6.0	0.60
7	6.3	0.63
8	7.3	0.73
9	6.6	0.66
10	6.4	0.64
11	6.5	0.65
12	4.8	0.48
13	6.8	0.68
14	6.2	0.62
15	7.7	0.77
16	7.2	0.72
17	7.2	0.72
18	7.8	0.78
19	7.7	0.77
20	8.4	0.84
21	0.0	0.00
22	2.8	0.28
23	5.5	0.55
24 – East	5.1	0.51

Shunts are 0.01 ohm.

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PORT OF OLYMPIA
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DATA SHEET: 3 OF 3
NCL JOB: E-20596-M
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Potential Survey

	Potential (volts DC ref. CSE)					
	Onshore of Wall			Offshore of Wall		
Location	Native (3/2012)	On	Instant Off	Native (3/2012)	On	Instant Off
Portable Cell:						
Fence post 1				-0.750	-1.218	-1.080
Post 5, adj. East TS	-0.600	-0.927	-0.871	-0.696	-1.213	-1.069
Post 10	-0.665	-0.870	-0.845	-0.806	-1.208	-1.064
Post 15	-0.692	-0.820	-0.804	-0.814	-1.333	-1.083
Post 20	-0.692	-0.860	-0.840	-0.820	-1.406	-1.107
Post 25	-0.644	-0.885	-0.864	-0.833	-1.420	-1.123
Post 27, adj. rectifier	-0.630	-0.846	-0.824	-0.832	-1.417	-1.129
Post 30	-0.656	-0.851	-0.835	-0.840	-1.424	-1.135
Post 35	-0.699	-0.840	-0.824	-0.843	-1.494	-1.153
Post 40	-0.710	-0.894	-0.878	-0.844	-1.316	-1.138
Post 45	-0.691	-0.994	-0.910	-0.810	-1.283	-1.121
Post 50				-0.756	-1.218	-1.094
East T.S.: (Post 5)						
Perm. Sat Ag/AgCl Cell	-0.596	-0.606	-0.585			
Port. Cell	-0.560	-0.782	-0.752			
Perm. Ag/Port. CSE		-0.174				
West T.S.: (Post 48)						
Perm. Sat Ag/AgCl Cell	-0.220	-0.588	-0.571 (bad cell)			
Port. Cell	-0.741	-0.989	-0.947			
Perm. Ag/Port. CSE		-0.400				

Continuity Test:
- Wire Wheel: 16 ohms
- East TS to West TS: 18 ohms
- East TS to Rectifier negative: 18 ohms

Note: On and Instant off potentials were previously recorded on 9/9/2011.

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RECTIFIER LOG

OWNER: PORT OF OLYMPIA

STRUCTURE: Shoreline Containment Wall

RECOMMENDED CURRENT OUTPUT: 12 - 15 amps (may vary with tide)

DATE	VOLTS	AMPS	TAPS	INITIAL	COMMENTS
5-1-2012	4.25	13.5	1/4	TR	Start up, NCL

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