



ANODE SYSTEMS COMPANY

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February 22, 2018

Mr. Dan Green
 Pacific Energy and Mining Company
 5777 W. Century Blvd., Suite 1060
 Los Angeles, CA 90045

Subject: 2018 Paradox Pipeline aka 16" Greentown Pipeline Cathodic Protection ECDA Survey

Dear Mr. Green:

This report is to summarize the results of the cathodic protection survey that Anode Systems completed on February 22, 2018 on the above referenced pipeline in Grand County, Utah. This Cathodic Protection Specialist and technician, Reynaldo Fuentes performed an External Corrosion Direct Assessment (ECDA) survey with the impressed current rectifier on. The Greentown Compressor Station east rectifier output was 0.4 amps at 30 volts when we arrived. We increased the voltage to 46 volts which increased the output to 0.8 amps. In March 2015, this rectifier was impressing 2 amps at 30 volts. The current output has decreased due to a very dry winter. The anode is dry and this causes the current output to decrease. As soon as the ground becomes wet to any appreciable depth due to melting snow this spring, the current output will increase. The west rectifier output was 0.75 amps at 1.3 volts when we arrived. We increased the output to 5 amps by increasing the voltage to 9 volts. This rectifier is to protect the bare surface gathering lines to the west of the Greentown Compressor Station. It may provide current to the sales pipeline to the Northwest Pipeline Inter-connect at the Greentown Meter Station.

Pipe-to-soil potential readings were taken on the 16 in. FBE coated sales pipeline from the gas plant to the Northwest Inter-connect at the Greentown Meter Station. I am happy to report that all but one of the twenty-three readings were above -0.85 volts which exceeds the -0.85 volt criterion for cathodic protection established by the National Association of Corrosion Engineers in the NACE Standard, RP0169-92, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems" now known as NACE Standard Practice SP0169-2013, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems". Attached is a data sheet showing all the protected readings highlighted in green. The low pipe potential of -0.72 volts at CTS #10 will increase after the next good snowfall melts. The low pipe potential of -0.29 volts at CTS #12 is on the old Fidelity Pipeline outside the Fidelity Gas Plant which are now owned by Wesco Operating, Inc. The low reading of -0.47 volts at the railroad crossing is on the casing vent pipe and not the pipeline.

Inside the Greentown Compressor Station (also formerly known as the Paradox Gas Plant), the two 6" pipes at the flow meter are unprotected. They both need dielectric flange kits on the two flanges where the pipes connect to the flow meter. This could correct the low readings of -0.13 volts on the two pipes at the flanges.

Enterprise Products installed a large impressed current deep well anode bed and rectifier on September 21, 2017 at the Greentown sales meter station. One drives by it from Highway 191 to the Inter-Connect. I did not see any evidence that it interferes with the cathodic protection on Pacific Energy's Greentown 16" Sales pipeline.

Thank you for having Anode Systems Company perform this specialized engineering service for Pacific Energy. If there are any questions regarding the survey's observations, conclusions or this report, please let me know.

Yours truly,



Hans Schmoldt
NACE Cathodic Protection Specialist #4162