



June 12, 2023

Mr. Ken Tutt  
Project Representative  
Nutrien Ltd.  
Swift Creek Mine Float Plant  
15843 SE 78<sup>th</sup> Street  
White Springs, Florida 32096-2703

RE: CATHODIC PROTECTION SURVEY - SCM FLOAT PLANT  
2023 RECOMMENDATIONS

Dear Mr. Tutt;

Please review the general recommendations concerning the results of the Nutrien Ltd. – Swift Creek Mine Float Plant cathodic protection survey, performed beginning June 9, 2023. The following recommendations were cited during this inspection:

- All readings indicate cathodic protection above required minimum level
- CTP#3 no readings available due to possible / probable corroded test leads

I trust the information to be in sufficient detail, however, should you require additional information or would like to discuss these recommendations, please contact me. A copy of this report is available online at [www.cityservices.biz](http://www.cityservices.biz). Click on Clients → Nutrien → Corrosion Surveys. To obtain or change your username and password, contact us at 229.226.6569.

Sincerely,

A handwritten signature in black ink that reads 'W. L. Hays'.

W. L. Hays  
CITY SERVICES, INC.



CITYSERVICES, INC  
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# NUTRIEN LTD. SCM Float Plant

CATHODIC PROTECTION SURVEY  
JUNE 2023

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June 2023

Nutrien Ltd.  
Swift Creek Mine Float Plant  
15843 SE 78<sup>th</sup> Street  
White Springs, Florida 32096-2703  
ATTN: Mr. Ken Tutt  
Project Representative

Swift Creek Mine Float Plant  
Effectiveness of Cathodic Protection  
Survey Underground Natural Gas System

## **INTRODUCTION**

The annual cathodic protection survey was conducted for Nutrien Ltd. – Swift Creek Mine Float Plant beginning June 9, 2023. During this survey, the Swift Creek Mine Float Plant natural gas system was inspected for the effectiveness of cathodic protection, as applied. The cathodic protection system for the Swift Creek Mine Float Plant consists essentially of Galvomag Magnesium anodes placed in various locations throughout the natural gas system.

## **RESULTS AND ANALYSIS**

A total of Twelve [12] cathodic protection voltage readings, Two [2] Galvomag anode / CTP readings, Four [4] gas casing pipe readings and Six [6] gas pipeline readings were taken during this survey. As can be seen by the structure-to-soil potential measurements and the enclosed data sheet, 100% of the gas pipeline readings obtained are indicative of cathodic protection. A structure-to-soil potential of 850 millivolts [-0.850] or more negative direct current is the basis used in this report to confirm cathodic protection.

## **IR DROP CONSIDERATION**

Aging pipes and changing conditions can cause significant problems, such as an increase in applied CP levels and enlarged holidays in coating. In addition, increased environmental concerns also emphasize the need to minimize leaks as much as possible.

The effectiveness of any cathodic protection system can be determined by taking potential measurements between the structure and a reference electrode. These potential measurements have traditionally been recorded with “average reading” digital voltmeters while the protective current is flowing or applied. These potential measurements contain the error produced by the voltage drop in the soil (electrolyte resistance) and the voltage drop (current) in the structure being protected. This error is referred to as *IR* drop. Interpretation of a current applied measurement requires consideration of the significance of voltage drops in the earth and metallic paths.

An *IR* drop is a voltage across a resistance, in accordance with Ohm's law ( $V=IR$ ). Although there are several *IR* drops in a structure-to-electrolyte potential circuit, the *IR* drop of most concern is that which occurs between the reference electrode (half-cell) and the structure-to-electrolyte (pipe) boundary. This *IR* drop is due to a CP current in the resistance of the electrolyte and is an error in the measurement.

One way to reduce the *IR* drop is to bring the reference electrode close to the structure (pipe) to reduce the resistance of the electrolyte (soil). Another way to reduce the *IR* drop is to bring the current to zero by interrupting all sources of current (anodes) influencing that reference point at the same precise time.

## **SURVEY TEST INSTRUMENTATION & METHOD**

- Gas Electronics Model 601 Insulation Checker
- Fluke Model 71 Digital Multi-meter
- Tinker & Razor 6-B Reference Electrode [CSE]
- Cu/CuSO<sub>4</sub> Reference Electrode Calibration 06/07/2023 – 3.7 Mv



## RECOMMENDATIONS

Nutrien Ltd. – Swift Creek Mine Float Plant  
Underground Natural Gas System  
June 2023

The sacrificial galvanic anode arrangement designed to protect the coated and wrapped steel natural gas system indicates adequate current to afford cathodic protection to the steel distribution system. Structure-to-soil readings obtained from Cathodic Test Points and gas risers on the steel distribution system indicate CP readings above State and Federal minimum standards of -0.850 volts direct current. Four [4] gas pipeline casings, Two [2] Galvomag anodes / Cathodic Test Points and Six [6] gas pipeline contacts were inspected during this survey.

The coated and wrapped distribution main lines show a minimum structure-to-soil potential of -1.192 vdc and a maximum structure-to-soil potential of -1.677 vdc at various Cathodic Test Points in the Swift Creek Mine Float Plant distribution system. Continuity over the entire main line system is fair to good.

At the time of survey, the Natural Gas Distribution System for Nutrien Ltd.'s Swift Creek Mine Float Plant complex indicates cathodic protection levels exceeding State and Federal minimum guidelines for applied cathodic protection. I trust the above information to be satisfactory and in sufficient detail, however, should you require additional information, please contact me.

Sincerely,



Mitchell L. Whitfield  
C.P. Tester

**CATHODIC TEST POINTS**

## CATHODIC TEST POINTS

Nutrien Ltd. – Swift Creek Mine Float Plant  
Underground Natural Gas System  
June 2023

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### Cathodic Test Point - #1

Black Anode Connection	-1.473 Vdc
Black Gas Pipeline Connection	-1.476 Vdc
White Casing Pipe Connection	-0.713 Vdc

### Cathodic Test Point - #2

Black Anode Connection	-1.230 Vdc
Black Gas Pipeline Connection	-1.677 Vdc
White Casing Pipe Connection	-0.612 Vdc

### Cathodic Test Point - #3

*CTP #3 is damaged, disconnected, out of service with no readings available. Probable / possible corroded test leads.*

Black Anode Connection	-0.000 Vdc
Green Gas Pipeline Connection	-0.000 Vdc



**STRUCTURE-TO-SOIL POTENTIALS**  
**GAS PIPE CASINGS**

**STRUCTURE-TO-SOIL POTENTIAL  
GAS PIPE CASINGS**

Nutrien Ltd. – Swift Creek Mine Float Plant  
Underground Natural Gas System  
June 2023

<u>Test Location</u>	<u>Energized Potentials Volts</u>
Railroad Casing - #1	-0.601
Railroad Casing - #2	-0.484

**STRUCTURE - TO - SOIL POTENTIAL DATA**

## STRUCTURE – TO – SOIL POTENTIAL DATA

Nutrien Ltd. – Swift Creek Mine Float Plant

Underground Natural Gas System

June 2023

<u>Test Location</u>	<u>Energized Potentials Volts</u>
Gas Metering Station - Inlet	-1.233
Gas Metering Station – Outlet	-1.192
4" Gas Riser @ Plant	-1.439
2" Gas Riser @ Boiler Room	-1.416