State of Ohio

OHIO PUBLIC WORKS FOR YOU

Public Works Commission

Application for Financial Assistance

IMPORTANT: Please consult "Instructions for Financial Assistance for Capital Infrastructure Projects" for guidance in completion of this form.

Applicant

Applicant: City of Englewood Subdivision Code: 113-25396

District Number: 4 County: Montgomery Date: 08/29/2022

Contact: Eric Smith Phone: (937) 836-3106
(The individual who will be available during business hours and who can best answer or coordinate the response to questions)

Email: smith@englewood.oh.us FAX:

Project

Project Name: Wenger Road Water Main Replacement Zip Code: 45322

Subdivision Type	Project Type (Select single largest component by $)	Funding Request Summary (Automatically populates from page 2)	
City	1. Road	Total Project Cost:	977,328 .00
	2. Bridge/Culvert	1. Grant:	125,000 .00
	x 3. Water Supply	2. Loan:	375,000 .00
	4. Wastewater	3. Loan Assistance/ Credit Enhancement:	0 .00
	5. Solid Waste		
	6. Stormwater	Funding Requested:	500,000 .00

District Recommendation (To be completed by the District Committee)

Funding Type Requested (Select one)

- State Capital Improvement Program
- Local Transportation Improvement Program
- Revolving Loan Program
- Small Government Program

District SG Priority: _____

SCIP Loan - Rate: ____ % Term: ____ Yrs Amount: _____ .00

RLP Loan - Rate: ____ % Term: ____ Yrs Amount: _____ .00

Grant: Amount: _____ .00

LTIP: Amount: _____ .00

Loan Assistance / Credit Enhancement: Amount: _____ .00

For OPWC Use Only

STATUS

Project Number: _____

_____

Release Date: _____

OPWC Approval: _____

Grant Amount: _____ .00

Loan Amount: _____ .00

Total Funding: _____ .00

Local Participation: _____ %

OPWC Participation: _____ %

Loan Type: ☐ SCIP ☐ RLP

Date Construction End: _____

Date Maturity: _____

Rate: _____ %

Term: _____ Yrs

1.0 Project Financial Information (All Costs Rounded to Nearest Dollar)

1.1 Project Estimated Costs

Engineering Services

Preliminary / Final Design: 0 .00

Construction Administration: 0 .00

Total Engineering Services:	a.)	.00	0 %
Right of Way:	b.)	.00	
Construction:	c.)	977,328 .00	
Permits, Advertising, Legal:	e.)	0 .00	
Construction Contingencies:	f.)	0 .00	
Total Estimated Costs:	g.)	977,328 .00	

1.2 Project Financial Resources

Local Resources

Local In-Kind or Force Account:	a.)	.00	
Local Revenues:	b.)	477,328 .00	
Other Public Revenues:			
Local / ODOT - Let:	d.)	.00	
ODOT PID:			
OEPA / OWDA:	e.)	.00	
CDBG:	f.)	.00	
Other:	g.)	0 .00	
Subtotal Local Resources:	i.)	477,328 .00	48.8 %

OPWC Funds (Check all requested and enter Amount)

Grant: 25 % of OPWC Funds	j.)	125,000 .00	
Loan: 75 % of OPWC Funds	k.)	375,000 .00	30 yrs
Loan Assistance / Credit Enhancement:	l.)	.00	
Subtotal OPWC Funds:	m.)	500,000 .00	51.2 %
Total Financial Resources:	n.)	977,328 .00	100 %

1.3 Availability of Local Funds

Attach a statement signed by the Chief Financial Officer listed in section 5.2 certifying all local resources required for the project will be available on or before the earliest date listed in the Project Schedule section. The OPWC Agreement will not be released until the local resources are certified. Failure to meet local share may result in termination of the project. Applicant needs to provide written confirmation for funds coming from other funding sources.

2.0 Repair / Replacement or New / Expansion

2.1 Total Portion of Project New / Expansion: 0 .00

3.0 Project Schedule

3.1 Engineering / Design / Right of Way	Begin Date:	02/01/2023	End Date:	06/01/2023
3.2 Bid Advertisement and Award	Begin Date:	07/01/2023	End Date:	08/01/2023
3.3 Construction	Begin Date:	09/15/2023	End Date:	06/02/2024

Construction cannot begin prior to release of executed Project Agreement and issuance of Notice to Proceed.

Failure to meet project schedule may result in termination of agreement for approved projects. Modification of dates must be requested in writing by project official of record and approved by the Commission once the Project Agreement has been executed.

4.0 Project Information

If the project is multi-jurisdictional, information must be consolidated in this section.

4.1 Useful Life / Cost Estimate / Age of Infrastructure

Project Useful Life: 50 Years Age: 1968 (Year built or year of last major improvement)

Attach Registered Professional Engineer's statement, with seal or stamp and signature confirming the project's useful life indicated above and detailed cost estimate.

4.2 User Information

Road or Bridge: Current ADT _____ Year _____

Water / Wastewater: Based on monthly usage of 4,500 gallons per household; attach current ordinances.

Residential Water Rate	Current $	26	Number of households served:	~~5,000~~ 16
Residential Wastewater Rate	Current $	0	Number of households served:	
Stormwater:			Number of households served:	

4.3 Project Description

A: SPECIFIC LOCATION (Supply a written location description that includes the project termini; a map does not replace this requirement.) 2000 character limit.

Wenger Road between Main Street and Taywood Road.

B: IDENTIFY THE PROBLEM (Describe the issue to be addressed) 2000 character limit.

A special 2022 Wenger Road Corrosion Assessment Report was conducted by Farwest Corrosion Control Company after two major breaks revealed an unusual deterioration of the ductile iron pipe. In short, the field study concluded that soil conditions were largely responsible for "excessive corrosion and unexpected releases due to wide spread external corrosion pitting". For this reason, the number of breaks experienced is not relevant but rather section 10, Health/Safety/Condition, per General Requirements and per sub-category water lines should apply under the most severe category. Ten (10) points is requested as "severe condition problem i.e. failure" and "replace due to structural failure" certainly qualifies as best describing the situation based upon an engineer's report.

C: PROJECT SCOPE (Describe the work to be completed) 2000 character limit.

Replacement of 3,028 feet of ductile iron water main. The components include 16" PVC water main, valves, tapping sleeves, service connections, sidewalk repair, and landscaping restoration.

5.0 Project Officials

Changes in Project Officials must be submitted in writing from an officer of record.

5.1 Chief Executive Officer

(Person authorized in legislation to sign project agreements)

Name: Eric Smith

Title: City Manager

Address: 333 West National Road

City: Englewood State: OH Zip: 45322

Phone: (937) 836-3106

FAX:

E-Mail: smith@englewood.oh.us

5.2 Chief Financial Officer

(Can not also serve as CEO)

Name: DELLA STEARNS

Title: Finance Director

Address: 333 West National Road

City: Englewood State: OH Zip: 45322

Phone: (937) 836-5106

FAX:

E-Mail: stearns@englewood.oh.us

5.3 Project Manager

Name: ERIC SMITH

Title: City Manager

Address: 333 West National Road

City: Englewood State: OH Zip: 45322

Phone: (937) 836-3106

FAX:

E-Mail: smith@englewood.oh.us

6.0 Attachments / Completeness review

Confirm in the boxes below that each item listed is attached (Check each box)

x A certified copy of the legislation by the governing body of the applicant authorizing a designated official to sign and submit this application and execute contracts. This individual should sign under 7.0, Applicant Certification, below.

x A certification signed by the applicant's chief financial officer stating the amount of all local share funds required for the project will be available on or before the dates listed in the Project Schedule section. If the application involves a request for loan (RLP or SCIP), a certification signed by the CFO which identifies a specific revenue source for repaying the loan also must be attached. Both certifications can be accomplished in the same letter.

x A registered professional engineer's detailed cost estimate and useful life statement, as required in 164-1-13, 164-1-14, and 164-1-16 of the Ohio Administrative Code. Estimates shall contain an engineer's seal or stamp and signature.

A cooperative agreement (if the project involves more than one subdivision or district) which identifies the fiscal and administrative responsibilities of each participant.

Farmland Preservation Review - The Governor's Executive Order 98-IIV, "Ohio Farmland Protection Policy" requires the Commission to establish guidelines on how it will take protection of productive agricultural and grazing land into account in its funding decision making process. Please include a Farm Land Preservation statement for projects that have an impact on farmland.

Capital Improvements Report. CIR Required by O.R.C. Chapter 164.06 on standard form.

x Supporting Documentation: Materials such as additional project description, photographs, economic impact (temporary and/or full time jobs likely to be created as a result of the project), accident reports, impact on school zones, and other information to assist your district committee in ranking your project. Be sure to include supplements which may be required by your local District Public Works Integrating Committee.

7.0 Applicant Certification

The undersigned certifies: (1) he/she is legally authorized to request and accept financial assistance from the Ohio Public Works Commission as identified in the attached legislation; (2) to the best of his/her knowledge and belief, all representations that are part of this application are true and correct; (3) all official documents and commitments of the applicant that are part of this application have been duly authorized by the governing body of the applicant; and, (4) should the requested financial assistance be provided, that in the execution of this project, the applicant will comply with all assurances required by Ohio Law, including those involving Buy Ohio and prevailing wages.

Applicant certifies that physical construction on the project as defined in the application has NOT begun, and will not begin until a Project Agreement for this project has been executed with the Ohio Public Works Commission. Action to the contrary will result in termination of the agreement and withdrawal of Ohio Public Works Commission funding from the project.

Certifying Representative (Printed form, Type or Print Name and Title)

Original Signature / Date Signed

CITY OF ENGLEWOOD

IN

MONTGOMERY COUNTY, OHIO

RESOLUTION NO: 23-22 **PASSED: July 26, 2022**

A RESOLUTION: **AUTHORIZING THE CITY MANAGER TO SUBMIT APPLICATIONS TO THE OHIO PUBLIC WORKS COMMISSION FOR THE STATE CAPITAL IMPROVEMENT PROGRAM (SCIP) AND LOCAL TRANSPORTATION IMPROVEMENT PROGRAM (LTIP) FOR THE 2023 (ROUND 37) PROGRAM YEAR, AUTHORIZING THE CITY MANAGER TO EXECUTE CONTRACTS AS REQUIRED**

WHEREAS, the voters of Ohio re-approved the State Capital Improvement Program (SCIP) and Local Transportation Improvement Program (LTIP) which authorizes the State of Ohio to issue bonds for the purpose of financing or assisting local governments in financing public infrastructure capital improvements; and

WHEREAS, Montgomery County has been defined as District 4 by enabling legislation, and has elected a review committee of nine members which as promulgated such rules and procedures as are considered necessary to categorize and review projects for funding; and

WHEREAS, the State Legislature enacted a one cent gasoline tax for local road and bridge improvements, the proceeds of which shall be added to the Issue II funding pot to be similarly distributed; and

WHEREAS, applications for year thirty-seven funding and gas tax projects must be submitted to the District 4 Public Works Integrating Committee by August 31, 2022; and

WHEREAS, applications must include a commitment for partial funding of proposed projects, and must be reviewed by the legislative authority of each applicant; and

WHEREAS, the City of Englewood has an adopted Capital Improvement Program (CIP) and has had an ongoing CIP process for many years;

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF ENGLEWOOD, MONTGOMERY COUNTY, OHIO, AS FOLLOWS:

SECTION I: That the City Manager is herewith authorized to submit an application for projects listed in the improvements schedule attached, and that such schedule and supporting documentation be considered an addendum and full part of the Englewood Capital Improvements Program.

SECTION II: That the City Manager be authorized to either directly, or through his designee, provide such information as may be requested by the District 4 Public Works Integrating Committee, or by the State Commission, or by its directors or administrators.

SECTION III: That the City Manager be authorized to determine the best source of matching funding for the capital improvements projects requested, and City Council agrees that any or all monies or services pledged be provided.

SECTION IV: That the City Manager is further authorized to enter into any contracts and/or agreements as may be necessary and appropriate for obtaining this financial assistance.

SECTION V: That the City of Englewood agrees to an assessment for the expenses of the District 4 Public Works Integrating Committee, said assessment not to exceed one percent (1%) of funded project estimates, loans or credit enhancement.

SECTION VI: That the City of Englewood recognizes that cost overruns may not be funded by the District 4 Committee.

SECTION VII: It is hereby found and determined that all formal actions of this Council concerning and relating to the passage of this Resolution were taken in an open meeting of this Council, and that all deliberations of this Council and of any committees that resulted in those formal actions were in meetings open to the public, in compliance with all legal requirements.

SECTION VIII: That this Resolution shall be in full force and effect at the earliest date allowed by law.

PASSED this 26th day of July, 2022.

Thomas Franz

Thomas Franz, Mayor

ATTEST:

Kerry Norman

Kerry Norman, Clerk of Council

Attachment "A"

1. Camborne Drive Water Main Replacement
2. Wenger Road Water Main Replacement
3. Water Tower Rehab

CERTIFICATE

I, Kerry Norman, Clerk of Council of the City of Englewood, Montgomery County, Ohio, do hereby certify the foregoing is a true and correct copy from the ***Record of Proceedings*** of said City. **WITNESS** my signature this 26th day of July, 2022.

Kerry Norman, Clerk of Council

CERTIFICATE OF POSTING

I, Kerry Norman, Clerk of Council of the City of Englewood, Montgomery County, Ohio, do hereby certify publication of the foregoing **RESOLUTION** was made as designated by Sections 224.01 and 24.02 of the Englewood Code.

Kerry Norman, Clerk of Council

CITY OF ENGLEWOOD
333 West National Road, Englewood, Ohio 45322-1495, (937) 836-5106
Fax (937) 836-7426 Internet Address: www.englewood.oh.us

CHIEF FINANCIAL OFFICER'S CERTIFICATION OF AVAILABILITY OF FUNDS AND OF LOAN REPAYMENT

Date: August 31, 2022

I, Della Stearns, Finance Director of the City of Englewood, hereby certify that the City of Englewood has the amount of $477,328.00 in the Water Fund and that this amount will be used to pay the local share and/or loan repayment for the Wenger Rd. Water Main Replacement when it is required.

The loan repayment schedule the City anticipates is 0% for thirty (30) years.

Della Stearns
Finance Director

CITY OF ENGLEWOOD
333 West National Road, Englewood, Ohio 45322-1495, (937) 836-5106
Fax (937) 836-7426 Internet Address: www.englewood.oh.us

CHIEF FINANCIAL OFFICER'S CERTIFICATION OF AVAILABILITY OF FUNDS AND OF LOAN REPAYMENT

Date: August 31, 2022

I, Della Stearns, Finance Director of the City of Englewood, hereby certify that the City of Englewood has the amount of $375,000.00 in the Water Fund and that this amount will be used to pay the local share and/or loan repayment for the Wenger Rd. Water Main Replacement when it is required.

The loan repayment schedule the City anticipates is 0% for thirty (30) years.

Della Stearns
Finance Director

Engineers Opinion of Cost

Village of Englewood, Ohio

Wenger Road Water Main Replacement

Item No.	Description	Unit	Est. Amount	Est. Cost/Unit	Total Est. Cost of Item	Total Est. Cost of Item ($1,000)	Useful Life (Yrs)	Useful Life Product
	Water Distribution System							
	Mobilzation & Demobilization	LS	1	$ 50,000.00	$50,000.00	$50.00	50	$2,500.00
	16" Water Main (Type B)	LF	1,800	$ 275.00	$495,000.00	$495.00	50	$24,750.00
	16" Water Main (Type C)	LF	895	$ 215.00	$192,425.00	$192.43	50	$9,621.25
	12" Water Main (Type B)	LF	333	$ 175.00	$58,283.75	$58.28	50	$2,914.19
	16" Gate Valve and Box	EA	1	$ 16,000.00	$16,000.00	$16.00	50	$800.00
	16" x 16" Tapping Sleeve, Valve and Box	EA	1	$ 20,000.00	$20,000.00	$20.00	50	$1,000.00
	12" x 12" Tapping Sleeve, Valve and Box	EA	1	$ 10,000.00	$10,000.00	$10.00	50	$500.00
	8" x 8" Tapping Sleeve, Valve and Box	EA	4	$ 7,200.00	$28,800.00	$28.80	50	$1,440.00
	6" x 6" Tapping Sleeve, Valve and Box	EA	1	$ 5,400.00	$5,400.00	$5.40	50	$270.00
	16" x 6" Tee	EA	1	$ 3,800.00	$3,800.00	$3.80	50	$190.00
	16" x 8" Tee	EA	4	$ 4,000.00	$16,000.00	$16.00	50	$800.00
	16" x 12" Tee	EA	1	$ 5,300.00	$5,300.00	$5.30	50	$265.00
	16" x 16" Tee	EA	1	$ 8,000.00	$8,000.00	$8.00	50	$400.00
	Service Connections	EA	17	$ 2,500.00	$42,500.00	$42.50	50	$2,125.00
	Sidewalk Repair, 4-Inch Concrete Sidewalk	SF	5,482	$ 10.00	$54,820.00	$54.82	25	$1,370.50
	Pavement Repair	SY	350	$ 60.00	$21,000.00	$21.00	20	$420.00
	Construction Total				**$977,328.75**	**$977.33**		**$46,865.94**

The project useful life is : 48 Years

I hereby certify these estimates to be true and accurate to the best of my knowledge.

Jakob Meinerding,PE;, Jones & Henry Engineers, Ltd.

By: Jones & Henry Engineers, Ltd.
Cincinnati, Ohio
Updated September 28, 2022

LF = Linear Foot
EA = Each
SF = Square Foot

City of Englewood, Ohio
Distribution System Improvements
Wenger Road Water Main Replacement
August 24, 2022

Engineer's Opinion of Probable Cost and Useful Life

Project

The project involves replacing 3,028 feet of water main underneath Wenger Road extending from Fallview Avenue, across Main Street (S.R. 48) and connecting to an existing water main underneath E Wenger Road. The existing water main is a 16-inch ductile iron pipe and was installed in 1968. It has experienced extensive external corrosion and pitting which can be seen in the Corrosion Assessment attached. This pipe was recommended to be replaced due to its age and corrosion. The new pipe is to be connected to an existing water line underneath the intersection of Wenger and Fallview. The water line will then be placed alongside the road as well as underneath the sidewalk before crossing north underneath Wenger Road and east across Main Street. The main will then extend south back underneath Wenger before extending east and connecting to an existing water line. The proposed piping path can be seen in the map attached.

Total Construction Costs: $977,328

I, Jakob Meinerding, PE certify to the best of my knowledge, the Engineer's opinion of probable cost and the estimated useful life of the project are true and accurate,

Jakob Meinerding

Useful Life 50 years

OHIO PUBLIC WORKS COMMISSION
DISTRICT 4
Round 2022-2023 Supplemental Questionnaire

Applicant: City of Englewood

Project Title: Wenger Rd. Water Main Replacement

Application Summary:

Briefly describe the project:

A special 2022 Wenger Road Corrosion Assessment Report was conducted by Farwest Corrossion Control Company after two major main breaks revealed an unusual deterioration of the ductile iron pipe. In short, the field study concluded that soil conditions were largely responsible for "excessive corrosion and unexpected releases due to wide spread external corrosion pitting". The complete 27 page report is available upon request.

For this reason, the number of breaks experienced is not relevant but rather section 10, Health/Safety/Condition, per General Requirements and per sub-category water lines should apply under the most severe category.

Ten (10) points is requested as "severe condition problem i.e. failure" and "replace due to structural failure" certainly qualifies as best describing the situation based upon an engineer's report.

Priority:

Is this application your priority project? (Circle One)	
Yes ○	No ◉

Generation of Revenue:

Will new user fees or assessments be assessed as part of this project? (Circle One)	
Yes ○	No ◉
What will the new user fees or assessments be used for?	

Additional Funding:

Will OPWC match, in part, a committed grant or loan? (Circle One)	
Yes ○	No ◉
If no, was the project submitted to an appropriate agency for funding, but denied due to lack of funding? (Circle One)	
Yes – Appropriate Documentation Attached ○	No ○

Readiness of Project:

Will this project be substantially underway on or before June 1, 2024? (Circle One)	
Yes ◉	No ○

Health & Safety:

Describe the specific health or safety issue being addressed by this project. What deficiency or condition is causing the health or safety issue?
The project description on the previous page details the serious health and safety issues. Again, an engineer's field investigation revealed a "severe condition problem i.e. failure and recommends immediate replacement due to "excessive corrosion and unexpected releases due to wide spread external corrosion pitting". This main supply's the entire city with water directly from the well fields at the east end of Wenger Road.

Addresses District Infrastructure Needs:

Is this project located in more than one community? (Circle One)	
Yes ○	No ◉

What percentage of the community will be served by this project? (Circle One)		
Less than 25% ○	25% to 40% ○	More than 40% ◉

Economic Development

How many jobs are being created as a result of this project?	
How many jobs will be retained as a result of this project?	

Why is it necessary to fund this improvement to secure this development?

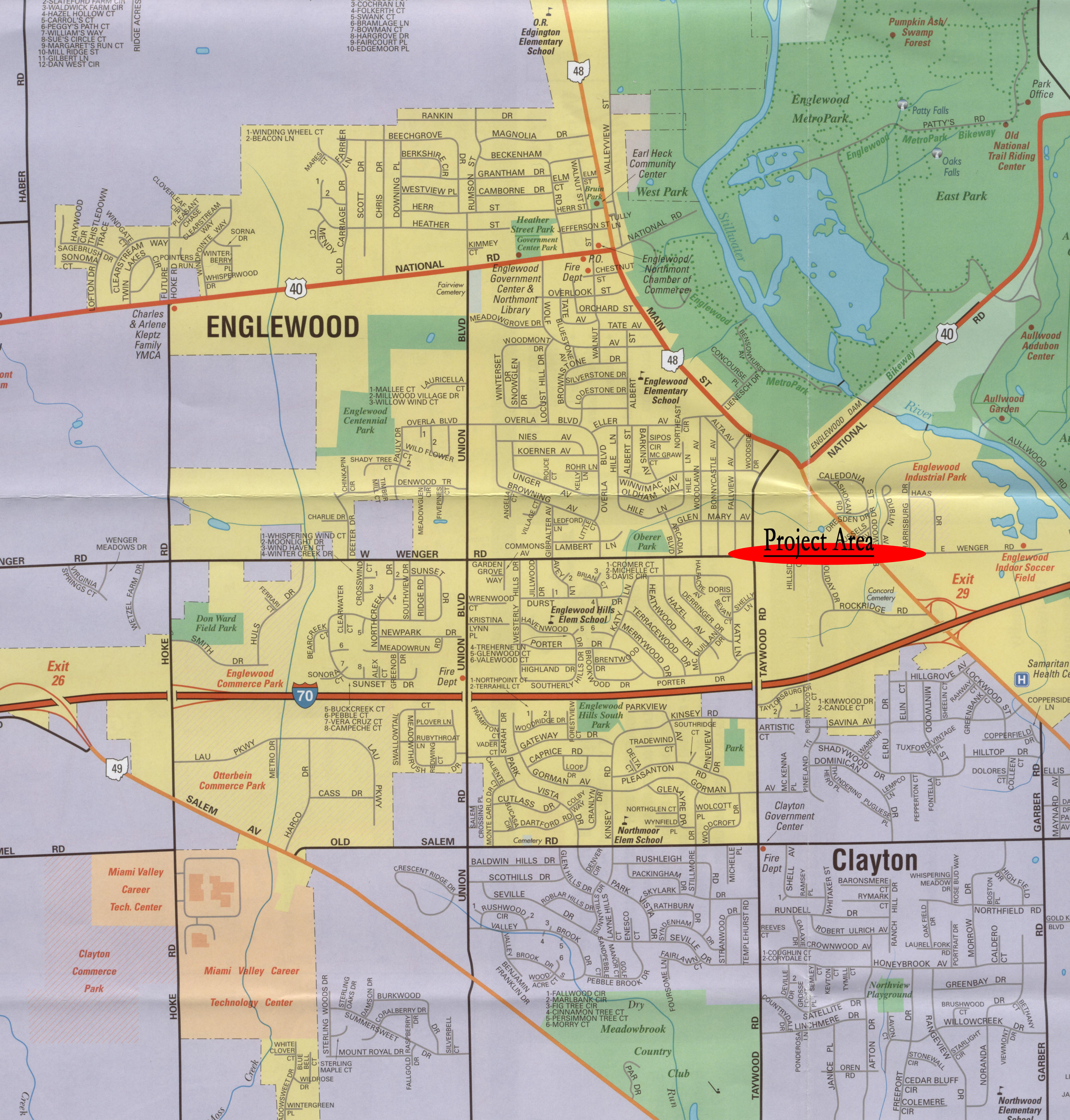
What type of industry is proposed in this development?

Relieve Existing Traffic Congestion:

What is the level of service?	

Other Factors

What other factors exist that make this project more important than other like projects?


Project Area
ENGLEWOOD
Clayton
Englewood MetroPark
West Park
East Park
Pumpkin Ash/ Swamp Forest
Patty Falls
Oaks Falls
Park Office
Old National Trail Riding Center
Aullwood Audubon Center
Aullwood Garden
Englewood Industrial Park
Englewood Indoor Soccer Field
Samaritan Health Center
Exit 29
Exit 26
O.R. Edgington Elementary School
Earl Heck Community Center
Bruin Park
Heather Street Park
Government Center Park
Englewood Government Center & Northmont Library
Englewood/ Northmont Chamber of Commerce
Fire Dept
P.O.
Fairview Cemetery
Charles & Arlene Kleptz Family YMCA
Englewood Centennial Park
Englewood Elementary School
Oberer Park
Englewood Hills Elem School
Don Ward Field Park
Englewood Commerce Park
Englewood Hills South Park
Otterbein Commerce Park
Northmoor Elem School
Clayton Government Center
Miami Valley Career Tech. Center
Clayton Commerce Park
Miami Valley Career Technology Center
Meadowbrook Country Club
Northview Playground
Concord Cemetery
Northwood Elementary School
Stillwater River
NATIONAL RD
MAIN ST
WENGER RD
UNION BLVD
UNION RD
HOKE RD
TAYWOOD RD
GARBER RD
SALEM AV
OLD SALEM RD
HABER RD
AULLWOOD RD
40
48
49
70

N

WATER LINE REPLACEMENT MAP

ENGLEWOOD, OH
WATER LINE REPLACEMENT

NO.	DATE	REVISIONS AFTER ISSUED FOR BID	BY

Jones & Henry Engineers, Ltd.

Fluid thinking.©
www.jhleng.com

JOB NO 157-7977.001

SCALE 1" = 180'

THIS LINE SCALES 1" WHEN PLOTTED TO NOTED SCALE

FILE CARD FOR WATER MAINS

[x] MAIN BREAK [ ] MAIN LOCATION

STREET Wenger @ Hillside DATE: 05-27-07

WEATHER Cloudy TEMPERATURE 67°

TIME:

STARTED 3:00 AM WATER OFF –

COMPLETED _____ WATER ON –

TYPE OF BREAK Bottom Half Circular

SIZE OF MAIN 16" DEPTH OF MAIN 60"

LOCATION: 18'2" South of North curb & 8' West of Hillside branch valve

REMARKS: _____

BOIL ADVISORY: [ ] YES [ ] NO

HOUSES AFFECTED: _____

(drawing on back)

FILE CARD FOR WATER MAINS

[x] MAIN BREAK [ ] MAIN LOCATION

STREET 21 W Wenger DATE: Nov. 28, 2021

WEATHER Cloudy TEMPERATURE 39

TIME:

STARTED 9:30 PM (Nov. 28, 2021) WATER OFF _____

COMPLETED Midnight (Nov. 30, 2021) WATER ON _____

TYPE OF BREAK Hole

SIZE OF MAIN 16" DEPTH OF MAIN 54"

LOCATION: _____

REMARKS: Had 2 inserta valves done @ 17 W. Wenger. Bad valve @ main / W. Wenger (Valve #523)

BOIL ADVISORY: [x] YES [ ] NO

HOUSES AFFECTED: [illegible], [illegible], [illegible], 17, 21 & 23 W. Wenger

(drawing on back)

CITY OF ENGLEWOOD

IN

MONTGOMERY COUNTY, OHIO

ORDINANCE NO: 22-02 **PASSED: January 11, 2022**

AN ORDINANCE: AMENDING SECTION 1044.10, CHARGES FOR WATER SUPPLIED WITHIN THE CITY; SECTION 1044.11, CHARGES FOR WATER SUPPLIED OUTSIDE THE CITY; SECTION 1052.11, CHARGES FOR SEWER SERVICE WITHIN THE CITY; AND SECTION 1052.12, CHARGES FOR SEWER SERVICE OUTSIDE THE CITY, OF THE CODIFIED ORDINANCES OF ENGLEWOOD, OHIO, 1972, AS AMENDED

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF ENGLEWOOD, OHIO, AS FOLLOWS:

SECTION I That Section 1044.10: **CHARGES FOR WATER SUPPLIED WITHIN THE CITY**, of the Codified Ordinances of Englewood, Ohio, 1972, as amended, is hereby amended to read as follows:

1044.10 CHARGES FOR WATER SUPPLIED WITHIN THE CITY

Each consumer or owner whose premises within the City is connected to the water system shall pay to the City for the connection and for water at the rate of not less than twenty-five dollars and seventy-eight cents ($ 25.78) bimonthly for each dwelling, commercial, manufacturing or other unit served, plus five dollars and seventeen cents ($ 5.17) per 1,000 gallons of water delivered bimonthly over 5,000 gallons for each such unit served.

SECTION II That Section 1044.11: **CHARGES FOR WATER SUPPLIED OUTSIDE THE CITY**, of the Codified Ordinances of Englewood, Ohio, 1972, as amended, is hereby amended to read as follows:

1044.11 CHARGES FOR WATER SUPPLIED OUTSIDE THE CITY

Each consumer or owner whose premises outside the City is connected to the water system shall pay to the City for the connection and for water at the rate of not less than thirty-eight dollars and sixty-eight cents ($38.68) bimonthly for each dwelling, commercial, manufacturing or other unit served, plus seven dollars and seventy-six cents ($7.76) per 1,000 gallons of water delivered bimonthly over 5,000 gallons for each such unit served.

SECTION III That Section 1052.11, **CHARGES FOR SEWER SERVICE WITHIN THE CITY**, of the Codified Ordinances of Englewood, Ohio, 1972, as amended, is hereby amended to read as follows:

1052.11 CHARGES FOR SEWER SERVICE WITHIN THE CITY

Each consumer or owner whose premises within the City is connected to the sewer system shall pay to the City for the connection and for sewer service at the rate of not less than twenty-three dollars and sixty-two cents ($ 23.62) bimonthly for each dwelling, commercial, manufacturing or other unit served, plus four dollars and seventy-two cents ($ 4.72) per 1,000 gallons of water delivered bimonthly over 5,000 gallons for each such unit served.

Each consumer or owner whose premises within the City is connected to the sewer system but not the water system shall pay to the City for the connection and for sewer service at the flat rate of seventy dollars and eighty-five cents ($70.85) bimonthly for each unit served.

SECTION IV That Section 1052.12, **CHARGES FOR SEWER SERVICE OUTSIDE THE CITY**, of the Codified Ordinances of Englewood, Ohio, 1972, as amended, is hereby amended to read as follows:

1052.12 CHARGES FOR SEWER SERVICE OUTSIDE THE CITY

Each consumer or owner whose premises outside the City is connected to the sewer system shall pay to the City for the connection and for sewer service at the rate of not less than thirty-five dollars and forty-two cents ($ 35.42) bimonthly for each dwelling, commercial, manufacturing or other unit served, plus seven dollars and eight cents ($ 7.08) per 1,000 gallons of water delivered bimonthly over 5,000 gallons for each such unit served.

SECTION V That all prior ordinances in conflict herewith are hereby repealed.

SECTION VI It is hereby found and determined that all formal actions of this Council concerning and relating to the passage of this Ordinance were taken in an open meeting of this Council, and that all deliberations of this Council and of any committees that resulted in those formal actions were in meetings open to the public, in compliance with all legal requirements.

SECTION VII That this ordinance shall be in full force and effect at the earliest date allowed by law and shall be implemented on all utility bills generated after February 1, 2022.

PASSED this 11th day of January, 2022.

Thomas Franz

Thomas Franz, Mayor

ATTEST:

Kerry Norman

Kerry Norman, Clerk of Council

CERTIFICATE

I, Kerry Norman, Clerk of Council of the City of Englewood, Montgomery County, Ohio, do hereby certify the foregoing is a true and correct copy from the ***Record of Proceedings*** of said City. **WITNESS** my signature this 11th day of January, 2022.

Kerry Norman, Clerk of Council

CERTIFICATE OF POSTING

I, Kerry Norman, Clerk of Council of the City of Englewood, Montgomery County, Ohio, do hereby certify publication of the foregoing **ORDINANCE** was made as designated by Sections 224.01 and 24.02 of the Englewood Code.

Kerry Norman, Clerk of Council

2022 WENGER ROAD CORROSION ASSESSMENT REPORT

The City of Englewood
1111 Union Road
Englewood, OH 45322

Date of Attendance:
March 29-30, 2022

Prepared for:

City of Englewood Ohio
The City of Englewood, Ohio

Prepared by:
FARWEST CORROSION CONTROL COMPANY
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Farwest Job Number: C-128
May 2, 2022

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INTRODUCTION

On March 29-30, 2022 Farwest Corrosion Control Company (Farwest) performed a Corrosion Assessment of the 16-inch ductile iron watermain on Wenger Road in the City of Englewood, OH. The Assessment was performed to determine the cause of the reported corrosion on the subject piping. Authorization to perform this work was issued per Purchase Order No. RG018049 executed on March 9, 2022.

PROJECT SCOPE AND GOALS

The goal of the project was to assess the condition of the ductile iron pipe (DIP) and the probable cause of the active external corrosion occurring at the pipe-to-soil (P/S) interface. The data obtained will be utilized to assist in determining the cause and extent of the active corrosion at the three (3) test locations mentioned in this report and to provide recommendations to mitigate further corrosion.

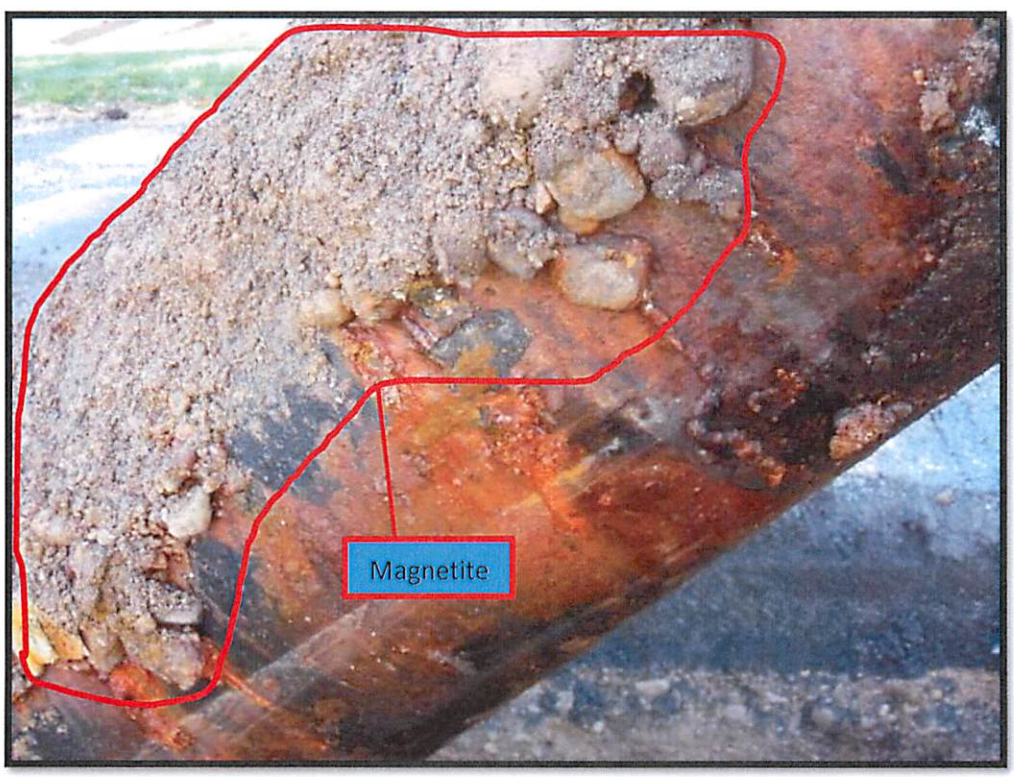
The scope of the project consisted of the following:

- Review all CP related drawings and reports provided by The City of Englewood
- Obtain soil samples at pipe depth at three locations and measure soil resistivity
- Measure pH values utilizing an Antimony pH Electrode
- Measure P/S potentials at the three test locations
- Measure corrosion pit depths if identified
- Attach two #10 AWG stranded THHN/THWN test leads by Cad Weld to the 12" DIP Water Main at three locations approximately 500 feet apart on Wenger Road
- Perform electrical continuity testing between the newly installed test points
- Test for 120 Hz on water main to determine if foreign cathodic interference is present
- Test for interference with cooperation of local Gas Company if required
- Supervise installation of anodes
- Measure anode open-circuit (AOC) potentials and "On" P/S potentials
- Take digital photos of process for reporting purposes
- Generate comprehensive report with test results, analysis, photos and recommendations in PDF format

PROJECT HISTORY

The City of Englewood (COE) installed the subject 16-inch DIP on Wenger Road in 1968. The class

of pipe is not indicated on any of the drawings provided by COE and remained unknown at the time of this report. The piping was not provided cathodic protection (CP), CP test stations, polyethylene wrap or electrical bonding of the joints at the time of installation. Historically, the water main has experienced numerous corrosion related releases at multiple locations. See photos provided by COE below:


Magnetite

2022 Corrosion Assessment Test Site Locations

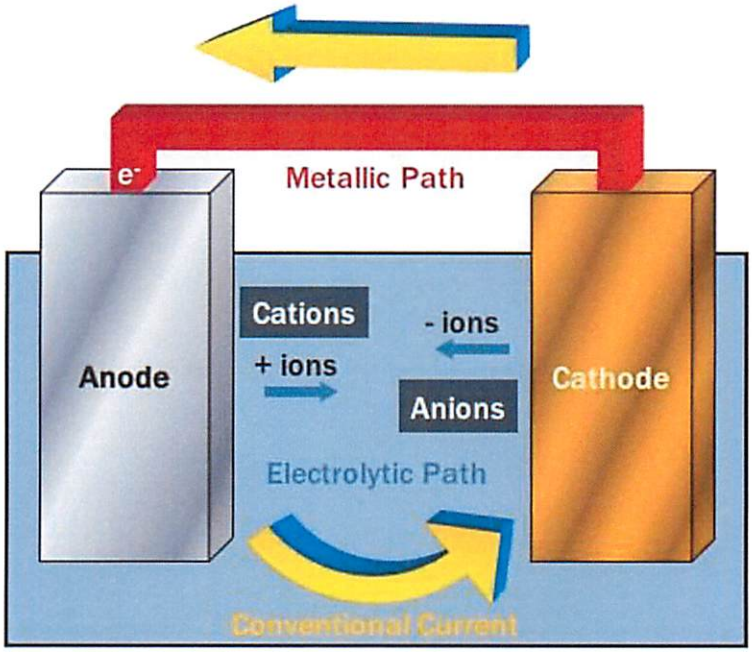
CORROSION THEORY

An understanding of corrosion is helpful in discerning the results, methods and conclusions of this report. The electrochemical corrosion cell is the basis for corrosion theory. Manipulation of the electrochemical corrosion cell provides methods to prevent and mitigate corrosion.

Corrosion is an electrochemical process involving the flow of electrons and ions. Metal loss (corrosion) occurs at the anode. No metal loss occurs at the cathode (the cathode is protected).

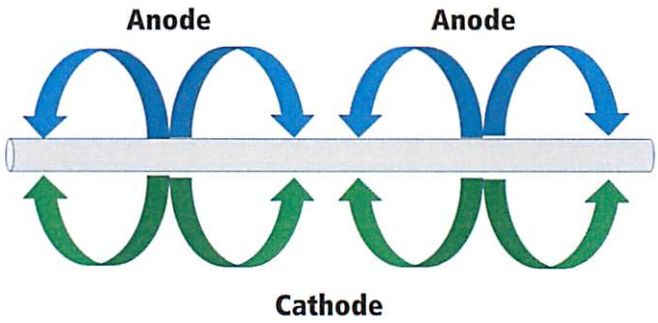
Electrochemical corrosion involves the transfer of electrons across metal/electrolyte interfaces. Corrosion occurs within a corrosion cell. A corrosion cell consists of four parts as illustrated below:

- Anode (oxidation reaction)
- Cathode (reduction reaction)
- Electrolyte (cations [+] and anions [-], ionic transfer)
- Metallic Path (electron transfer)



Corrosion Cell

The anode and the cathode can be on different metals or on the same metal as shown below:

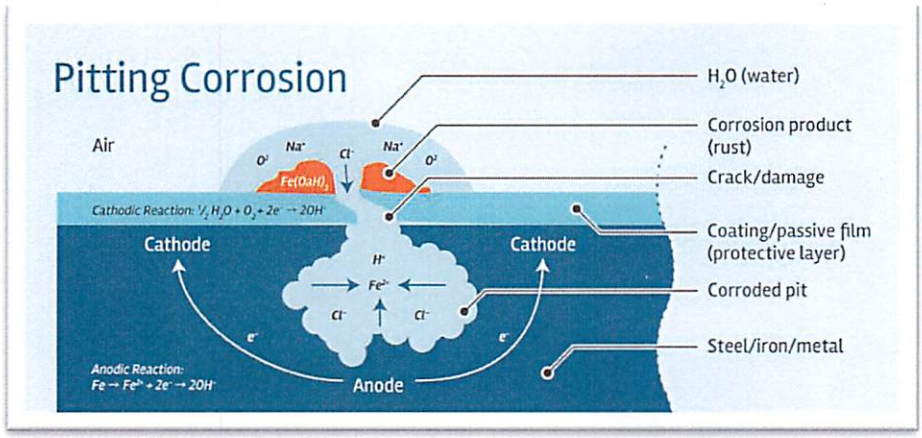


Nearly all of the corrosion you will encounter can be divided into one of two types—either a natural reaction or a stray current reaction. Naturally occurring corrosion takes place because of local action cells on the surface of the structure. These cells result from voltage differences caused by such factors as surface irregularities, mill scale, oxygen concentrations, differences in the electrolyte (soil) around the structure, and others. Stray current reactions occur when some source of current, external to the structure itself, causes corrosion on the structure.

The metal itself may be a source for the driving voltage of a corrosion cell. A difference in voltage may arise due to differences in the natural energy levels of different metals or composition variations formed during alloying.

Dissimilar soils, such as clay and sand, due to their differences in resistivity (reciprocal of conductivity) and oxygen content, may provide the driving force for corrosion. The metal in the vicinity of the lower resistivity soil is usually more active and is the anode.

The below diagram shows pitting corrosion, which is what has been observed during this assessment.



TEST METHODS AND PROCEDURES

Pipe-to-Soil (P/S) Potential Measurements

The following NACE Test Method was utilized to obtain potential measurements on the DIP and anodes, NACE Test Method (TM 0497-2018) was utilized. See Appendix B for excerpts from the NACE Standards and Test Methods.

A calibrated Fluke model 87 Series V digital multi-meter (DMM) was utilized with a portable MC Miller RE-5C copper-copper sulfate reference electrode (CSE) to obtain all measured and recorded structure-to-soil (S/S) potential measurements. Potentials were measured by connecting the black (-) test lead to the reference electrode, the red test lead (+) is connected to the structure; a negative voltage is indicated when measured as described. The "On" and "Instant Off" (polarized) S/S potential measurements were obtained and recorded at each test point.

Note: Due to the time required for full polarization to occur on a bare DIP pipe, polarized potentials were not recorded.

Soil Resistivity

A calibrated MC Miller model 400A analog resistance meter and a MC Miller soil box was utilized to measure the resistivity of the soil (electrolyte) within the excavation. The resistivity of the backfill is critical in determining the corrosivity of the soil at the pipe-to-soil interface.

The soil is placed in the soil box, "As-found", and compressed by hand. The black C1 and C2 (Current) leads are attached to the outside posts. The red P1 and P2 (Potential) leads are attached to the inner posts. The "Ohms" dial and "Ohms Multiply by" dials are adjusted to obtain a Null reading on the meter and the measurement is recorded. See photo below:

Dig Site 1 (Saturated)

After the "As-found" resistivity is measured and recorded, distilled water is poured over the soil box saturating the soil. Time is allowed for complete saturation. The resistivity is again measured and recorded.

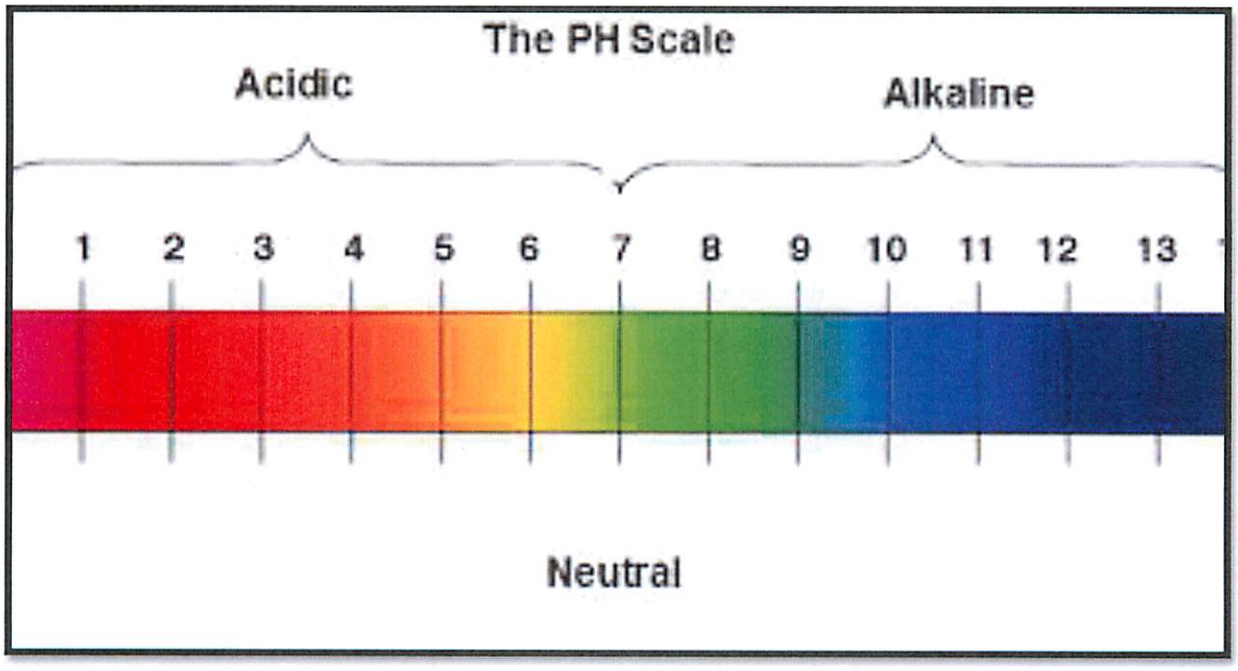
Electrical Continuity Test

Current was circulated through the pipe section being tested by using a DC power supply, a long test cable, a calibrated shunt, and one pipe lead at each end of the pipe span. Current was measured using the shunt. A digital volt meter was used to measure the voltage drop in the pipe span being tested by using the second pipe lead at each test station and a second long test lead. Total pipe circuit resistance was calculated using Ohm's Law (Voltage / Current = Resistance). Theoretical pipe resistance was determined using DIP tables of resistances for the various classes of pipe. There are no existing electrical joint bonds to add to the test circuit.

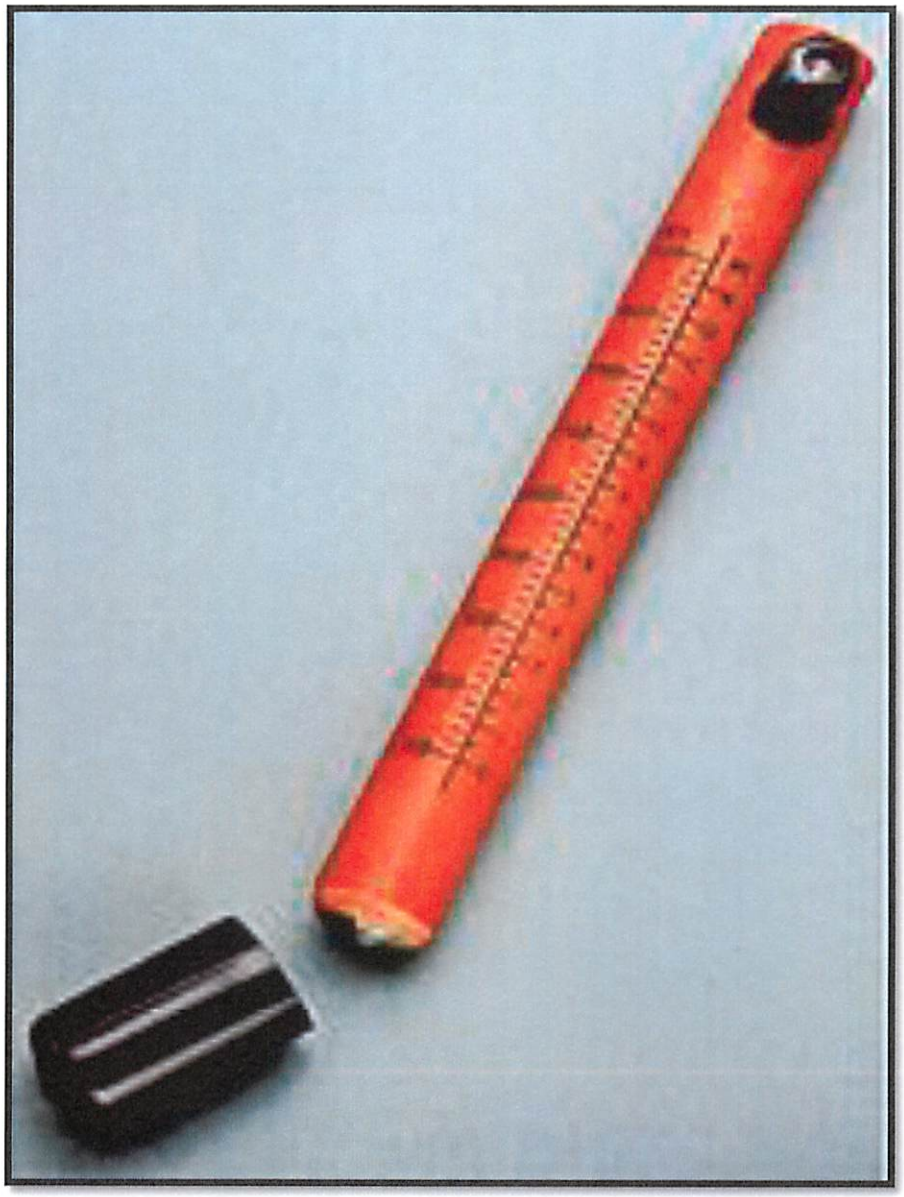
pH Testing

pH is a measure of electrolytes acidity / alkalinity. The range is measured from 0 – 14, with 7 being neutral. A pH of less than 7 indicate acidity, whereas a pH of greater than 7 indicates a base.

The Agra Antimony pH Electrode is used in conjunction with a copper sulfate reference electrode to form a pH sensitive cell. The voltage developed between the two electrodes, in contact with the same electrolyte, delivers a measurement that when converted is the pH of the electrolyte.



pH Scale



pH Antimony Electrode

Interference Testing

Definition of Interference:

Interference is any electrical disturbance on a metallic structure caused by a stray current. Stray current may be defined as current flowing on a structure that is not part of the intended electrical circuit. For corrosion to occur as the result of stray currents there must be an exchange of current between metallic structures in an electrolytic environment.

Sources:

Stray currents can be produced by any system conducting an electric current that has two or more points of contact with an electrolyte. These points of contact must have a voltage between them. Typical sources of stray currents are:

1. Cathodic protection systems (120Hz) on underground or submerged structures (this is called interference).
2. Electric powered mass transit systems (often called stray traction current).
3. Welding where structure ground is at some distance from the welding electrodes.
4. Electric transmission lines (danger of induced AC and AC corrosion).
5. High voltage DC (HVDC) transmission systems (mainly in monopolar operation).
6. Telluric currents (associated with sun spot activity and the earth's magnetic field).

Regardless of the source, currents flowing in an electrolyte produce voltage differences (gradients) in the electrolyte. If a voltage gradient is crossed by a metallic structure such as a pipe, cable, foundation pile, etc., current will be created on the structure. Where current is picked up, the structure is protected; corrosion occurs where the current leaves the metal and re-enters the electrolyte.

RESULTS AND ANALYSIS

Farwest reviewed plan drawings, reviewed history and conditions with staff, measured soil resistivity, measured pH levels, recorded pit depths, measured pipe wall thickness and performed visual inspections.

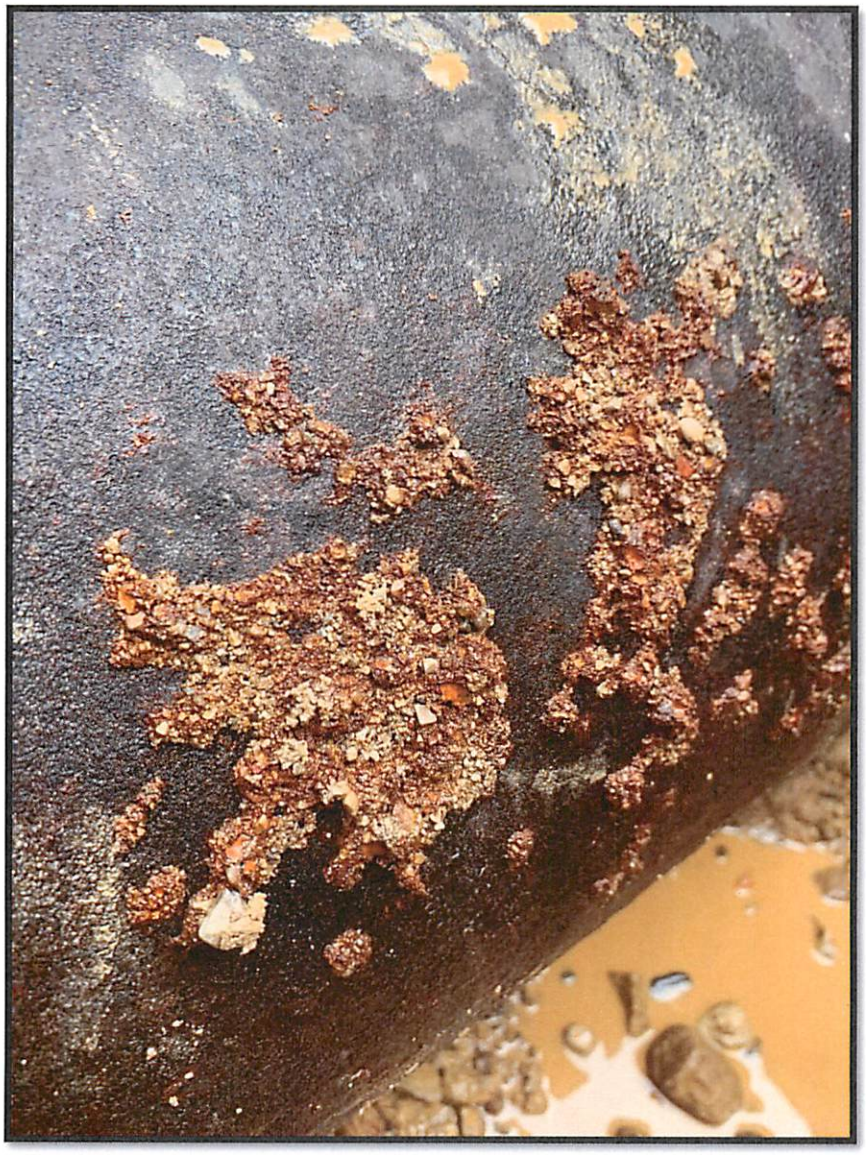
Three locations were selected on Wenger Road for evaluation.

Site Number	Location Description	GPS Coordinates
1	West bound lane Wenger Rd. East of Holiday Dr.	N39°51'44.26" W84°17'14.48"
2	West bound lane Wenger Rd. East of Hillside Ct.	N39°51'44.23" W84°17'23.07"
3	West bound lane Wenger Rd. East of Taywood Rd.	N39°51'44.19" W84°17'30.43"

Pipe Assessments

Pits ranging from negligible to .190" were observed. Dig sites 1 and 2 had negligible pitting present in the exposed areas while dig site 3 had significant pitting ranging from .080" to .190". At a wall thickness of .330", this leaves .140" of wall thickness at the point of the most aggressive pitting.

Ductile Iron Pipe (DIP) is produced by alloying iron with graphite. The graphite is present in the form of nodules in DIP. In cast iron pipe the graphite is in the form of flakes. The difference in graphite composition produces different failure mechanisms. In cast iron pipe, failures are typically longitudinal cracks due to the brittle nature of the pipe. DIP failures are typically pits that continue to increase in depth and diameter. DIP possesses an asphalt coating. The coating provides no corrosion resistance. When magnetite, a corrosion product, is present, it must be removed to accurately assess pitting behavior. Magnetite is a hard corrosion product that adheres to the pipe (See below).



Magnetite (Dig 3)

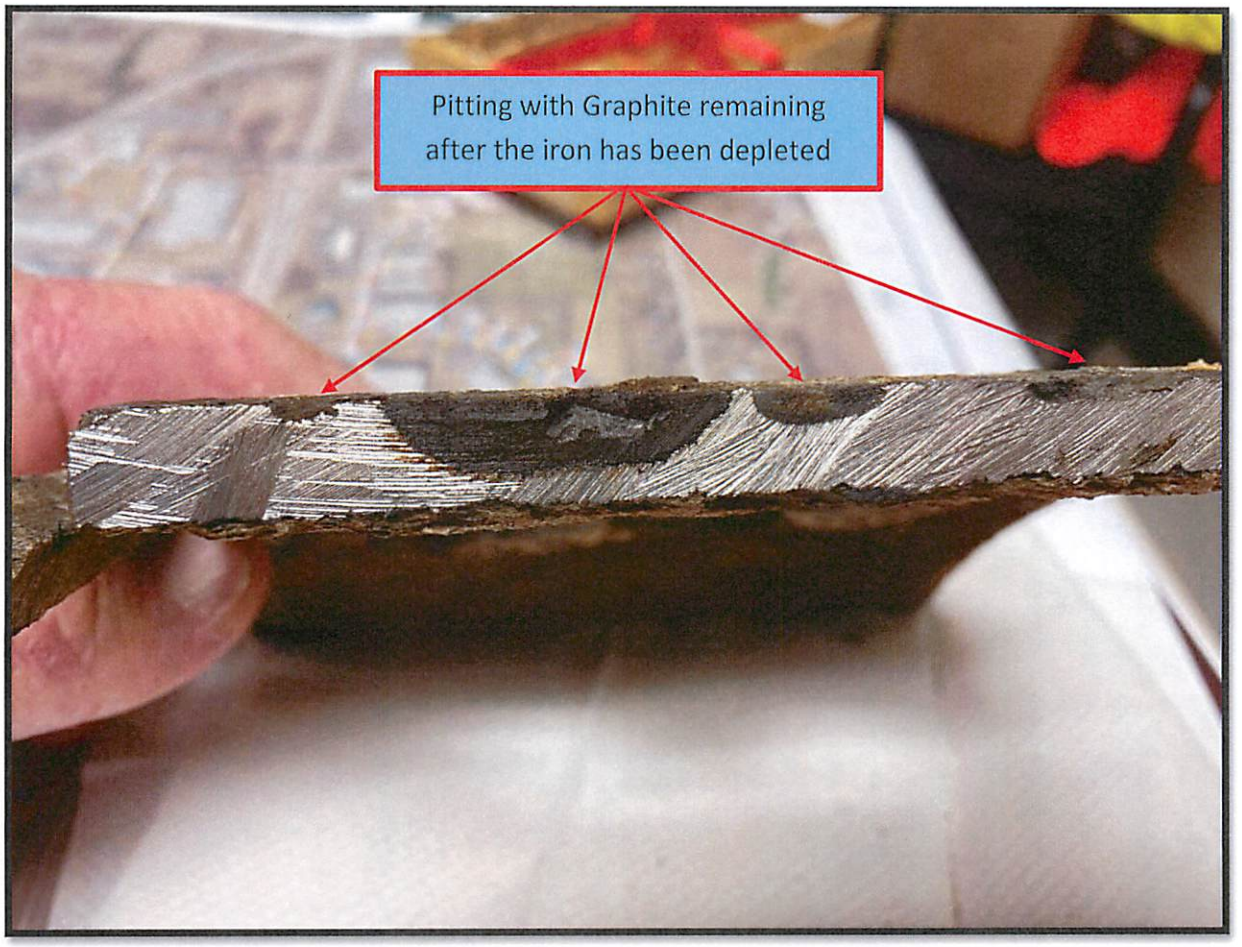


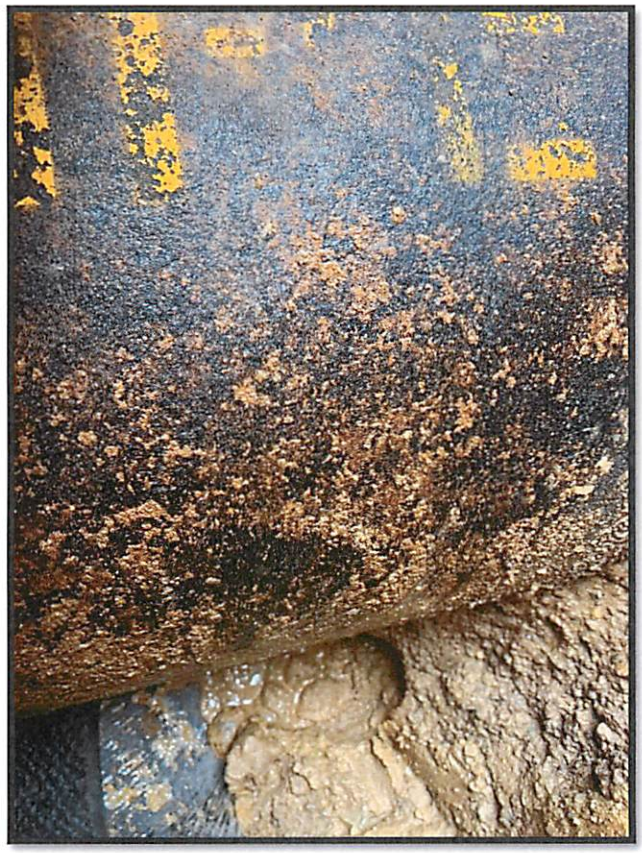
Photo Provided by COE

Pits were exposed utilizing a narrow screwdriver tip and the blade of a pocket knife, followed by rotary wire brushing. Pipe WT was measured and recorded utilizing a digital ultrasonic thickness gauge. Pits were measured and documented with a pit depth gauge. Pit morphology dimensions were marked and photographed. The pipe manufacturing specification allow for a 12.5% casting tolerance for thickness. Most manufacturers produce pipe as close as possible to the lower tolerance to reduce material cost. The DIP class was unknown at the time of the assessment. Measured wall thicknesses ranged from .308" to .353". 16" DIP Thickness Class 50 has a WT of .34" (Pressure Class 350PSI) with a tolerance of .07". This pipe was installed in 1968. As of the assessment date, the pipe has been in service for 54 years.

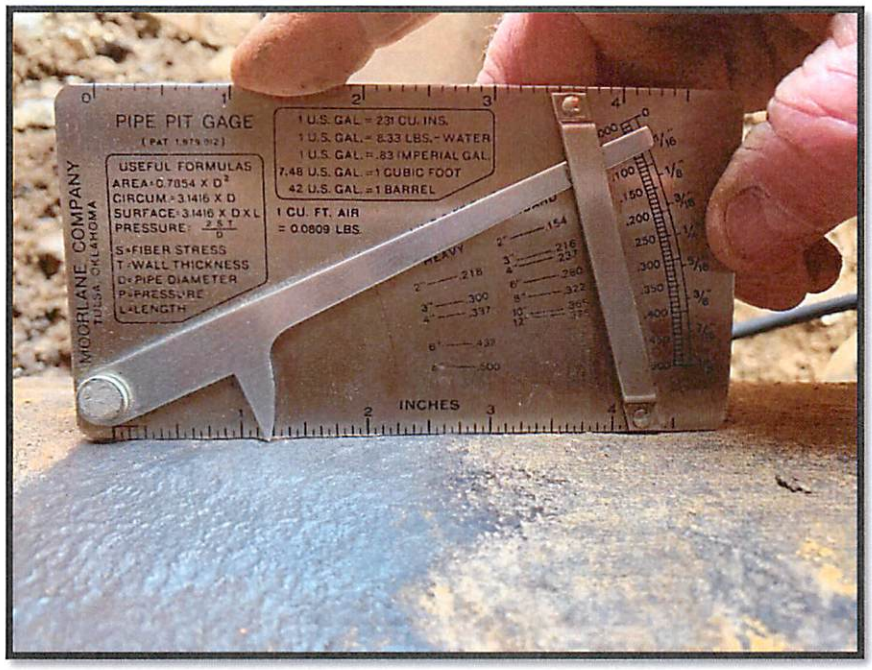
MPY (mils per year) and allowable MPY: For the purpose of this assessment, the corrosion rate is calculated based on a linear progression of pit development. Pitting was measured in Dig 3 from 0.080" to the deepest pit measured 0.190". The linear rate of pitting over 54 years would equate to 0.0015" to 0.0035" respectively. This equates to 1.5 to 3.5 mils per year (MPY). However,

corrosion does not necessarily occur at a linear rate. Many factors must be considered, such as, seasonal changes, soil composition, temperature and age. It is possible that the corrosion rate can decrease or increase over time, for example, the first 10 years may have had a corrosion rate of 1 MPY but is now experiencing 5 or more MPY. In order to accurately measure the corrosion rate in real time an electrical resistance (E/R) probe would need to installed and checked periodically. The National Association of Corrosion Engineers (NACE) considers less than 1 MPY acceptable criteria for mitigating corrosion. The general consensus is 10 MPY requires immediate action (NACE TM0169 Laboratory Corrosion Testing of Metals increases testing frequency at 10 MPY). NACE SP0189 (Online Monitoring of Cooling Water Systems) considers 10 MPY severe corrosion. Life expectancy also is influenced by operating pressures. The COE should determine the minimal wall thickness allowed at the present operating pressure (plus a 100-psi surge) to determine the life expectancy at the current linear corrosion rate.

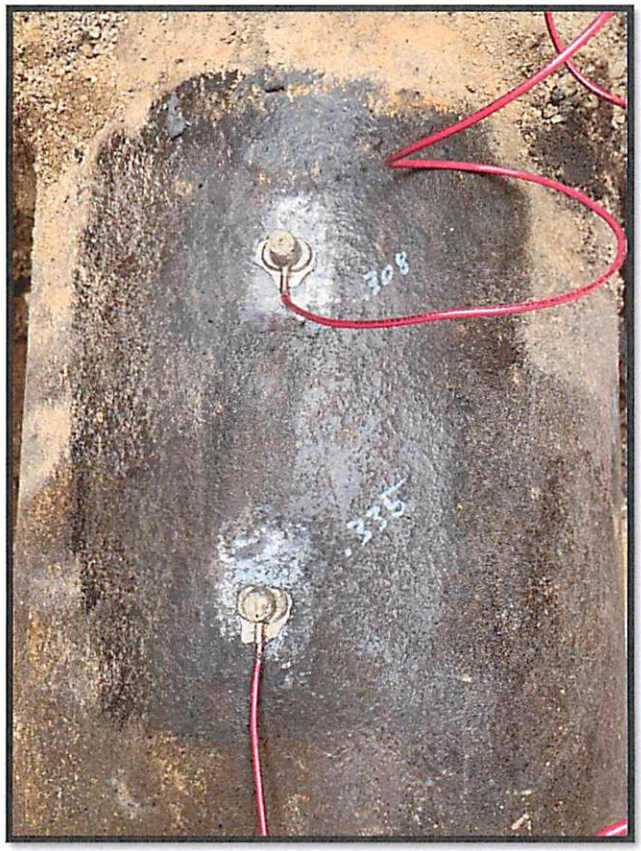
See photos below of the pipe assessment at each dig site.



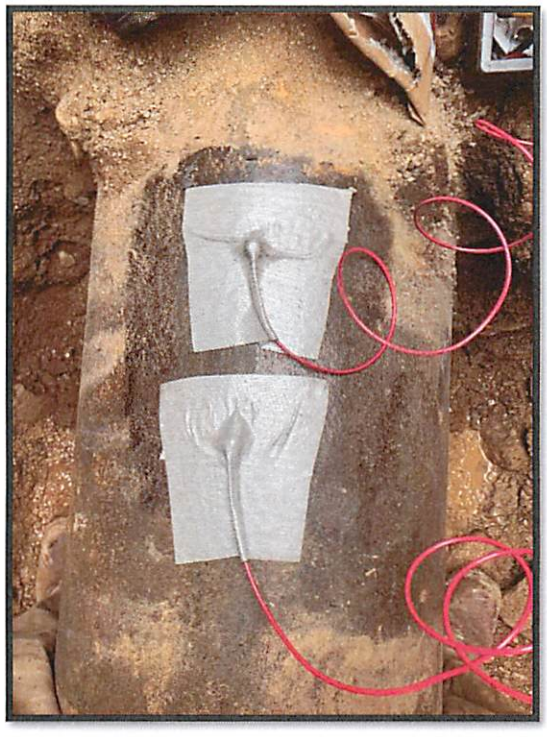
Dig Site #1 Visible paint from manufacturer



Negligible pitting after wire wheel cleaning (Typical at sites 1 & 2)



Dig site 1 cadwelds with respective wall thickness



Cadweld covers (Typical)

Dig Site 2 negligible uniform pitting

Magnetite (Dig 3)

Joint at Dig 3

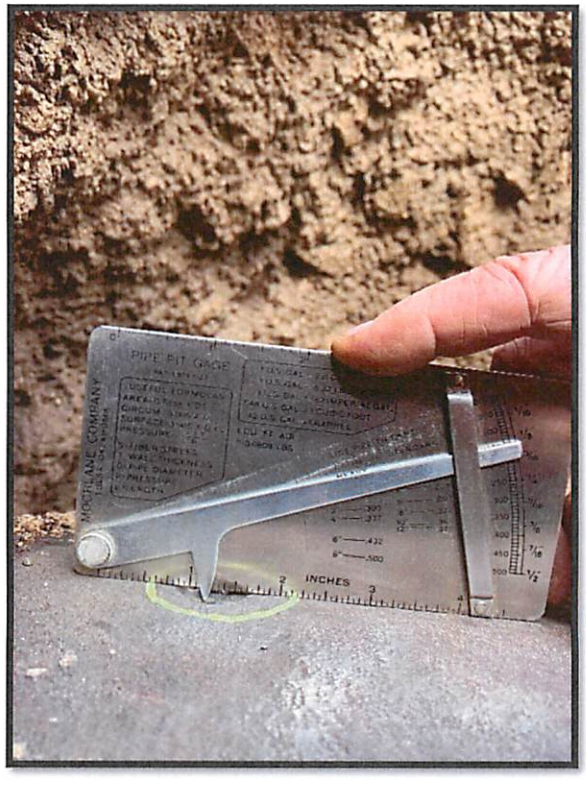
Magnetite at Dig 3 joint

Pitting Dig 3

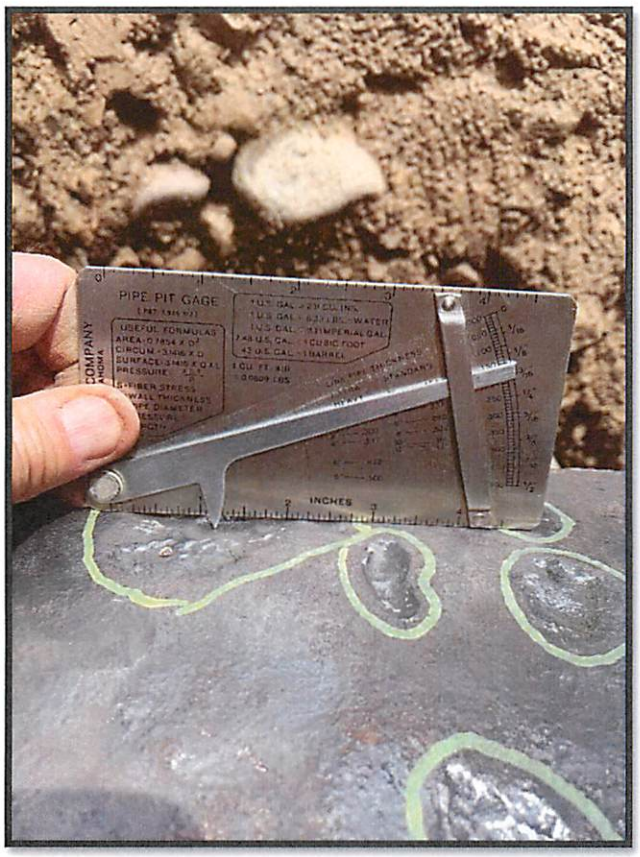
Pitting revealed after cleaning

Dig 3 Pitting

Dig 3



Measuring Pit Depth in Dig 3


PIPE PIT GAGE
INCHES

Dig 3


PIPE PIT GAGE
(PAT. 1,979,912)
USEFUL FORMULAS
AREA = 0.7854 X D²
1 U.S. GAL. = 231 CU. INS.
1 U.S. GAL. = 8.33 LBS. - WATER
1 U.S. GAL. = .83 IMPERIAL GAL.
7.48 U.S. GAL. = 1 CUBIC FOOT
42 U.S. GAL. = 1 BARREL
1 CU. FT. AIR
= 0.0809 LBS
INCHES

Dig 3

Dig 3

Dig 3

Dig 3

Dig 3

Dig 3 Cadweld

Dig 3 Pipe Test Leads

Two 32# anodes installed at Dig 3

Soil Resistivity

Farwest obtained soil samples in each excavation at pipe depth at the pipe-to-soil interface to measure soil resistivity. Soil resistivity indicates the ease with which conventional current will travel through an electrolyte. Soil is the electrolyte for the corrosion cell in this analysis. Corrosion occurs in a galvanic cell with an anode and cathode metallically connected in the same electrolyte. An electrolyte with a lower resistivity will allow a larger amount of current to flow. It is this flow of current that causes the anode of the corrosion cell to corrode. The higher the current, the larger amount of metal loss occurring. See measured results below:

Location	Ohms Dial Reading	Ohms (Multiply By) Dial Reading	As-found Ohms (cm)	Saturated Ohms (cm)	Corrosivity
Dig Site 1	1.65	1K (1000)	1650	1250	Mod. Corrosive
Dig Site 2	2.90	1K (1000)	2900	1600	Mod. Corrosive
Dig Site 3	1.20	1K (1000)	1200	1100	Borderline Corrosive

Farwest's referenced source for soil resistivity is "Underground Corrosion" Romanoff and the N.A.C.E. Corrosion Basics Manual. See table below:

Table 5.5 Soil Resistivity vs. Degree of Corrosivity

Soil resistivity (ohm-cm)	Degree of corrosivity
0–500	Very corrosive
500–1,000	Corrosive
1,000–2,000	Moderately corrosive
2,000–10,000	Mildly corrosive
Above 10,000	Negligible

Reference: *NACE Corrosion Basics.*

It can be seen from the data obtained that Dig Site 3, where significant corrosion pitting was observed, has the more corrosive soil.

Electrical Continuity

Electrical continuity testing of the pipeline, between test sites, indicated the piping is not electrically continuous. It can be assumed that other sections of piping are also not continuous. Electrical continuity of the pipeline would be required to provide complete cathodic protection of the pipeline without having to install an independent anode on each pipe stick. In order to achieve electrical continuity of the entire length of pipeline, it would be necessary to electrically bond each joint. Both of these options are cost prohibitive but could be achieved. See data in Appendix A

Interference Testing

Cooperative interference testing with Center Point Energy (CPE) was not necessary. Testing indicated that there was no cathodic interference present on the line. In addition, CPE confirmed all piping in the area of the COE water main is protected by galvanic anodes and does not have any impressed current cathodic protection (ICCP) systems within a mile. The corrosion pitting observed also does not suggest it was caused by stray current interference.

ASSESSMENT SUMMARY

The purpose of this study was to determine the cause of the excessive corrosion and unexpected releases due to wide spread external corrosion pitting. Prior to this corrosion study, cathodic interference from foreign ICCP systems was suspected by the COE. The assessment performed, which is the basis of this report, indicates that the pipeline is experiencing uniform galvanic corrosion and not cathodic interference caused by stray currents. The level of corrosion pitting observed was due to moderately corrosive to borderline corrosive soil and time (54 years).

Thirty-two-pound magnesium anodes (provided by the COE) were installed at each dig site to mitigate the active galvanic corrosion on the exposed DIP stick(s). Two anodes were installed at Dig 3 (one on each stick at the exposed joint. Due to electrical discontinuity of the pipeline, the anode will only protect the pipe joint to which it is attached. Full cathodic protection of the pipeline could be achieved; however, it would be cost prohibitive. One option would be to design and install an ICCP system which would require electrical continuity. Each coupling would need to be exposed and bond wires installed on every coupling. The other option would be to install an anode on each joint. Neither of these options are recommended due the age of the pipe and the cost involved. "Hotspot" protection is immediately recommended as an interim measure. At locations of leaks or when pipe is exposed, anodes should be installed at the repair site as a matter of standard operating procedure (SOP). Anodes should also be installed when installing or replacing valves and fittings along with coating of bolts and fittings. Cathodic Protection design is beyond the scope of this assessment.

RECOMMENDATIONS

In order to extend the life of the piping the following recommendations are made:

- Develop a Standard Operating Procedure (SOP) for the cathodic protection of existing and new pipe and fittings when exposed for maintenance or replacement to include "Hotspot" cathodic protection, coatings and material selection
- Consider installing electrical resistance E/R probe(s) with remote monitoring units (RMU) to measure and record real time corrosion rates to predict the life span of the piping and to assist in prioritizing pipe section replacement
- Full cathodic protection of the pipeline is achievable but does not repair the existing condition of the pipeline and is cost prohibited
- Keep records of reports, drawings, photos and all pertinent information for the life of the system

Farwest appreciated this opportunity to have served The City of Englewood. Please let us know if we can be of further assistance.

Sincerely,
Farwest Corrosion Control Company

Mark Englebright
NACE CP Technician (CP2) #14402

Attachments:

Appendix A	Data Sheets
Appendix B	NACE Criteria and Test Method Excerpts
Appendix C	Operator Qualifications & NACE Certifications

APPENDIX A

DATA SHEETS

1. Electrical Continuity
2. Potentials

The City of Englewood, OH - Wenger Road Corrosion Assessment

Technician: Mark Englebright

Pipe Data

ID =	16	(in)
OD =	16.68	(in)
Wall thickness =	0.34	(in)
Cross-sect. area (in^2) =	17.453432	(sq in)
		(ft)

Pipe Length = 18 (ft)

Resistivity of material being used (choose from below) : 2.76E-05

Common Resistivities (ohm-in)

1025 SAE AISI Steel		6.65E-06
Copper (drawn)		6.79E-07
Cast Iron	(from)	2.96E-05
Cast Iron	(to)	3.89E-05
Ductile Iron		2.76E-05
Lead		8.66E-06
Steel Trolley Wire		5.00E-06
Tin		4.58E-06

16" DIP Private Driveway

Survey Station (ft)		Distance	mV	mV	Current	Resistance (ohms)			
From	*To*	(ft)	*Voff*	*Von*	*mA*	*Calculated*	*Measured*	Ratio	Comments
0+00	6+60	660.00	62.00	1590.00	1600	0.29038	0.955	(3.29)	New 16" DIP section
6+60	12+30	570.00	42.00	2739.00	1450	0.25078	1.860	(7.42)	Isolated from existing 16"

*** The data above indicates the 16" DIP is not electrically continuous**

FARWEST CORROSION CONTROL COMPANY
A Certified Woman Business Enterprise (WBE)

POTENTIAL DATA SHEET

City of Englewood Ohio

CLIENT: The City of Englewood, OH
LOCATION: Wenger Road
TESTERS: Mark Englebright
DATE: March 29-30, 2022

PIPE-TO-SOIL POTENITAL DATA:

TEST LOCATION	Native (V)	Anode Open-Circuit (V)	On (V)	Anode Current (mA)	NOTES
Dig 1	-536	-1714	-591	6	East of Holiday
Dig 2	-571	-1706	-596	2	East of Hillside
Dig 3	-563	-1729 -1862	-531	7	East of Taywood

APPENDIX B

NACE CRITERIA EXCERPTS

1. NACE STANDARD PRACTICE SP0169-2013, Control of External Corrosion on Underground or Submerged Metallic Piping Systems.

NACE TEST METHODS

1. NACE STANDARD TEST METHOD TM0497-2018, Measurement Techniques Related to Criteria for Cathodic Protection on Underground or Submerged Metallic Piping Systems.

NACE STANDARD PRACTICE SP0169-2013

CONTROL OF EXTERNAL CORROSION ON UNDERGROUND OR SUBMERGED METALLIC PIPING SYSTEMS

SECTION 6: CRITERIA AND OTHER CONSIDERATIONS FOR CATHODIC PROTECTION

6.2 Criteria

6.2.1 Criteria for Steel and Gray or Ductile Cast-Iron Piping

6.2.1.1 Criteria that have been documented through empirical evidence to indicate corrosion control effectiveness on specific piping systems may be used on those piping systems or others with the same characteristics.

6.2.1.2 A minimum of 100 mV of cathodic polarization. Either the formation or the decay of polarization must be measured to satisfy this criterion.

6.2.1.3 A structure-to-electrolyte potential of –850 mV or more negative as measured with respect to a saturated copper/copper sulfate (CSE) reference electrode. This potential may be either a direct measurement of the polarized potential or a current- applied potential. Interpretation of a current-applied measurement requires consideration of the significance of voltage drops in the earth and metallic paths.

6.2.1.3.1.1 Measuring or calculating the voltage drop(s) to establish whether a potential of –850 mV or more negative across the structure-to-electrolyte boundary has been achieved,

Note: *Voltage drop(s) are considered (minimized) by placing the reference electrode adjacent to the pipe or structure risers.*

NACE STANDARD TEST METHOD TM0497-2018

Section 8: Test Method 1—Negative 850 mV Pipe-to-Electrolyte Potential Of Steel and Cast-Iron Piping with Cathodic Protection Applied

8.1 Scope

Test Method 1 describes a procedure to assess the adequacy of cathodic protection on a steel or cast-iron pipeline according to the criterion stated in NACE Standard RP0169,1 Paragraph 6.2.2.1.1: A negative (cathodic) potential of at least 850 mV with the cathodic protection applied. This potential is measured with respect to a saturated copper/copper sulfate reference electrode (CSE) contacting the electrolyte. Voltage drops other than those across the structure-to-electrolyte boundary must be considered for valid interpretation of this voltage measurement.
NOTE: Consideration is understood to mean the application of sound engineering practice in determining the significance of voltage drops by methods such as:

(a) Measuring or calculating the voltage drop(s);
(b) Reviewing the historical performance of the cathodic protection system;
(c) Evaluating the physical and electrical characteristics of the pipe and its environment; and
(d) Determining whether there is physical evidence of corrosion.

8.2 General

8.2.1 Cathodic protection current shall remain "on" during the measurement process. This potential is commonly referred to as the "on" potential.

8.2.2 Test Method 1 measures the pipe-to-electrolyte potential as the sum of the polarized potential and any voltage drops in the circuit. These voltage drops include those through the electrolyte and pipeline coating from current sources such as impressed current, galvanic anodes, and telluric effects.

8.2.3 Because voltage drops other than those across the pipe metal/electrolyte interface may be included in this measurement, these drops shall be considered, as discussed in Paragraph 8.6.

8.3 Comparison with Other Methods

8.3.1 Advantages

(a) Minimal equipment, personnel, and vehicles are required; and
(b) Less time is required to make measurements.

8.3.2 Disadvantages

(a) Potential measured includes voltage drops other than those across the pipe metal/electrolyte interface;
and
(b) Meeting the requirements for considering the significance of voltage drops (see Paragraph 8.6) can result in added time to assess adequacy of cathodic protection at the test site.

8.4 Basic Test Equipment

8.4.1 Voltmeter with adequate input impedance. Commonly used digital instruments have a nominal impedance of 10 megaohms. An analog instrument with an internal resistance of 100,000 ohms per volt may be adequate in certain circumstances in which the circuit resistance is low. A potentiometer circuit may be necessary in other instances.

8.4.2 Two color-coded meter leads with clips for connection to the pipeline and reference electrode.

8.4.3 Reference Electrode

8.4.3.1 CSE.

8.4.3.2 Other standard reference electrodes may be substituted for the CSE. These reference electrodes are described in Appendix A, Paragraph A2.

8.5 Procedure

8.5.1 Before the test, verify that cathodic protection equipment has been installed and is operating properly. Time should be allowed for the pipeline potentials to reach polarized values.

8.5.2 Determine the location of the site to be tested. Selection of a site may be based on:

(a) Location accessible for future monitoring;
(b) Other protection systems, structures, and anodes that may influence the pipe-to-electrolyte potential;
(c) Electrical midpoints between protective devices;
(d) Known location of an ineffective coating if the line is coated; and
(e) Location of a known or suspected corrosive environment.

8.5.3 Make electrical contact between the reference electrode and the electrolyte at the test site, directly over the centerline of the pipeline or as close to it as is practical.

8.5.4 Connect the voltmeter to the pipeline and reference electrode as described in Paragraph 5.6.

8.5.5 Record the pipe-to-electrolyte potential and its polarity with respect to the reference electrode.

8.6 Considering the Significance of Voltage Drops for Valid Interpretation of the Criterion

8.6.1 The significance of voltage drops can be considered by:

8.6.1.1 Comparing historical levels of cathodic protection with physical evidence from the pipeline to determine whether corrosion has occurred.

8.6.1.2 Comparing soil corrosiveness with physical evidence from the pipeline to determine whether corrosion has occurred.

8.6.2 Physical evidence of corrosion is determined by evaluating items such as:

(a) Leak history data;

(b) Buried pipeline inspection report data regarding locations of coating failures, localized conditions of more-corrosive electrolyte, or substandard cathodic protection levels have been experienced; and/or

(c) Verification of in-line inspection-tool metal loss indications by follow-up excavation of anomalies and inspection of the pipe external surface.

8.6.3 Cathodic protection shall be judged adequate at the test site if:

(a) The pipe-to-electrolyte potential measurement is negative 850 mV, or more negative, with respect to a CSE; and

(b) The significance of voltage drops has been considered by applying the principles described in Paragraphs 8.6.1 or 8.6.2.

Section 9: Test Method 2—Negative 850 mV Polarized Pipe-to-Electrolyte Potential of Steel and Cast -Iron Piping

9.1 Test Method 2 describes the most commonly used test method to satisfy this criterion (see Paragraph 9.2). This method uses current interruption to determine whether cathodic protection is adequate at the test site according to the criterion.

9.2 Scope

This method uses an interrupter(s) to eliminate the cathodic protection system voltage drop from the pipe-to-electrolyte potential measurement for comparison with the criterion stated in NACE Standard RP0169,1 Paragraph 6.2.2.1.2: A negative polarized potential of at least 850 mV relative to a saturated copper/copper sulfate reference electrode (CSE).

9.3 General

9.3.1 Interrupting the known cathodic protection current source(s) eliminates voltage drops associated with the protective currents being interrupted. However, significant voltage drops may also occur because of currents from other sources, as discussed in Section 7.

9.3.2 To avoid significant depolarization of the pipe, the "off" period should be limited to the time necessary to make an accurate potential measurement. The "off" period is typically less than 3 seconds.

9.3.3 The magnitude and duration of a voltage spike caused by current interruption can vary, but the duration is typically within 0.5 second. After the current is interrupted, the time elapsed until the measurement is recorded should be long enough to avoid errors caused by voltage spiking. On-site measurements with appropriate instruments may be necessary to determine the duration and magnitude of the spiking.

9.3.4 Current sources that can affect the accuracy of this test method include the following:

(a) Unknown, inaccessible, or direct-connected galvanic anodes;
(b) Cathodic protection systems on associated piping or foreign structures;
(c) Electric railway systems;
(d) HVDC electric power systems;
(e) Telluric currents;
(f) Galvanic, or bimetallic, cells;
(g) DC mining equipment;
(h) Parallel coated pipelines, electrically connected and polarized to different potentials;
(i) Uninterrupted current sources;
(j) Unintentional connections to other structures or bonds to mitigate interference; and
(k) Long-line currents.

9.4 Comparison with Other Methods

9.4.1 Advantages

(a) Voltage drops associated with the protective currents being interrupted are eliminated.

9.4.2 Disadvantages

(a) Additional equipment is required;
(b) Additional time, personnel, and vehicles may be required to set up equipment and to make pipe-to-electrolyte potential measurements; and
(c) Test results are difficult or impossible to analyze when stray currents are present or direct-connected galvanic anodes or foreign impressed current devices are present and cannot be interrupted.

9.5 Basic Test Equipment

9.5.1 Voltmeter with adequate input impedance. Commonly used digital instruments have a nominal impedance of 10 megaohms. An analog instrument with an internal resistance of 100,000 ohms per volt may be adequate in certain circumstances in which the circuit resistance is low. A potentiometer circuit may be necessary in other instances.

9.5.2 Two color-coded meter leads with clips for connection to the pipeline and reference electrode.

9.5.3 Sufficient current interrupters to interrupt influential cathodic protection current sources simultaneously.

9.5.4 Reference electrode

9.5.4.1 CSE.

9.5.4.2 Other standard reference electrodes may be substituted for the CSE. These reference electrodes are described in Appendix A, Paragraph A2.

9.6 Procedure

9.6.1 Before the test, verify that cathodic protection equipment has been installed and is operating properly. Time should be allowed for the pipeline potentials to reach polarized values.

9.6.2 Install and place in operation necessary interrupter equipment in all significant DC sources protecting the pipe at the test site, and place in operation with a synchronized and/or known "off" and "on" cycle. The "off" cycle should be kept as short as possible but still long enough to read a polarized pipe-to-electrolyte potential after any "spike" as shown in Figure 3a has collapsed.

9.6.3 Determine the location of the site to be tested. Selection of a site may be based on:

(a) Location accessible for future monitoring;
(b) Other protection systems, structures, and anodes that may influence the pipe-to-electrolyte potential;
(c) Electrical midpoints between protection devices;
(d) Known location of an ineffective coating when the pipeline is coated; and
(e) Location of a known or suspected corrosive environment.

9.6.4 Make electrical contact between the reference electrode and the electrolyte at the test site, directly over the centerline of the pipeline or as close to it as is practicable.

9.6.5 Connect voltmeter to the pipeline and reference electrode as described in Paragraph 5.6.

9.6.5.1 If spiking may be present, use an appropriate instrument, such as an oscilloscope or high-speed recording device, to verify that the measured values are not influenced by a voltage spike.

9.6.6 Record the pipe-to-electrolyte "on" and "off" potentials and their polarities with respect to the reference electrode.

9.7 Evaluation of Data

Cathodic protection shall be judged adequate at the test site if the polarized pipe-to-electrolyte potential is negative 850 mV, or more negative, with respect to a CSE.

9.8 Monitoring

When the polarized pipe-to-electrolyte potential has been determined to equal or exceed a negative 850 mV, the pipeline "on" potential may be used for monitoring unless significant environmental, structural, coating integrity, or cathodic protection system parameters have changed.

APPENDIX C

OPERATOR QUALIFICATION AND NACE CERTIFICATE

OQ Report

Last Name	First Name	Company Name	Number	Course Name	Type	Result	Completed Date	Expiration Date	Proctor / Evaluator	Assigned By UserGroup	Client
Englebright	Mark	Farwest Corrosion Control Co.	CT01	Conducting Annual Cathodic Protection Surveys	Knowledge	Pass	12/11/2020 19:22:01	12/11/2023	Schifferle, Michael		
Englebright	Mark	Farwest Corrosion Control Co.	CT01	Conducting Annual Cathodic Protection Surveys	Skills	Pass	12/29/2020 06:00:00	12/29/2023	Hedrick, Ricky		
Englebright	Mark	Farwest Corrosion Control Co.	CT02	Maintain Test Leads	Skills	Pass	12/29/2020 06:00:00	12/29/2023	Hedrick, Ricky		
Englebright	Mark	Farwest Corrosion Control Co.	CT02	Maintain Test Leads	Knowledge	Pass	12/11/2020 21:14:44	12/11/2023	Schifferle, Michael		
Englebright	Mark	Farwest Corrosion Control Co.	CT03	Inspect Cathodic Protection Rectifiers	Skills	Pass	12/29/2020 06:00:00	12/29/2023	Hedrick, Ricky		
Englebright	Mark	Farwest Corrosion Control Co.	CT03	Inspect Cathodic Protection Rectifiers	Knowledge	Pass	12/11/2020 20:39:51	12/11/2023	Schifferle, Michael		
Englebright	Mark	Farwest Corrosion Control Co.	CT04	Cathodic Protection Rectifier Maintenance and Repair	Skills	Pass	12/29/2020 06:00:00	12/29/2023	Hedrick, Ricky		
Englebright	Mark	Farwest Corrosion Control Co.	CT04	Cathodic Protection Rectifier Maintenance and Repair	Knowledge	Pass	12/11/2020 20:17:25	12/11/2023	Schifferle, Michael		
Englebright	Mark	Farwest Corrosion Control Co.	CT08	Conducting Cathodic Protection Remediation	Knowledge	Pass	12/11/2020 23:16:07	12/11/2023	Schifferle, Michael		
Englebright	Mark	Farwest Corrosion Control Co.	CT08	Conducting Cathodic Protection Remediation	Skills	Pass	12/29/2020 06:00:00	12/29/2023	Hedrick, Ricky		
Englebright	Mark	Farwest Corrosion Control Co.	CT10	Inspect (Examine) Buried Pipe When Exposed	Knowledge	Pass	12/11/2020 22:47:47	12/11/2023	Schifferle, Michael		
Englebright	Mark	Farwest Corrosion Control Co.	CT19	Provide Temporary Marking of Buried Pipeline Prior to Excavation	Skills	Pass	12/29/2020 06:00:00	12/29/2023	Hedrick, Ricky		

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Last Name	First Name	Company Name	Number	Course Name	Type	Result	Completed Date	Expiration Date	Proctor / Evaluator	Assigned By UserGroup	Client
Englebright	Mark	Farwest Corrosion Control Co.	CT19	Provide Temporary Marking of Buried Pipeline Prior to Excavation	Knowledge	Pass	12/11/2020 22:11:18	12/11/2023	Schifferle, Michael		
Englebright	Mark	Farwest Corrosion Control Co.	CT60	General Abnormal Operating Conditions	Knowledge	Pass	12/11/2020 17:48:50	12/11/2023	Schifferle, Michael		
Englebright	Mark	Farwest Corrosion Control Co.	CT0031	Inspect and Monitor Galvanic Ground Beds/Anodes	Skills	Pass	12/29/2020 06:00:00	12/29/2023	Hedrick, Ricky		
Englebright	Mark	Farwest Corrosion Control Co.	CT0031	Inspect and Monitor Galvanic Ground Beds/Anodes	Knowledge	Pass	12/22/2020 17:59:13	12/22/2023	Loomis, Jonathan		
Englebright	Mark	Farwest Corrosion Control Co.	CT1291	Locate Underground Pipelines	Knowledge	Pass	12/11/2020 22:20:00	12/11/2023	Schifferle, Michael		
Englebright	Mark	Farwest Corrosion Control Co.	CT1291	Locate Underground Pipelines	Skills	Pass	12/29/2020 06:00:00	12/29/2023	Hedrick, Ricky		

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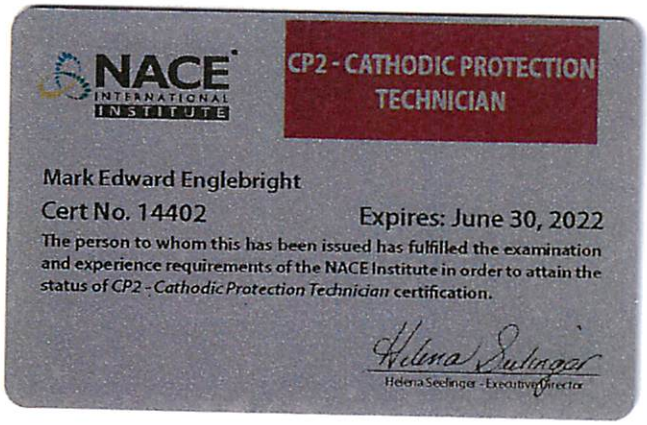

NACE INTERNATIONAL INSTITUTE

CP2 - CATHODIC PROTECTION TECHNICIAN

Mark Edward Englebright

Cert No. 14402 Expires: June 30, 2022

The person to whom this has been issued has fulfilled the examination and experience requirements of the NACE Institute in order to attain the status of *CP2 - Cathodic Protection Technician* certification.

Helena Seelinger - Executive Director