FINAL
FARMINGTON CANAL IMPROVEMENT STUDY

Prepared for:

City of Hampton
Department of Public Works
Hampton, Virginia

Prepared by:

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Newport News, Virginia

WRA Project No. 19282.005

February 2023

FINAL

Farmington Canal Improvement Study

Hampton, Virginia

Date: February 2023

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Whitman, Requardt & Associates, LLP

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Executive Summary

Whitman, Requardt and Associates, LLP was tasked by the City of Hampton, to evaluate feasible alternatives to stabilize and rehabilitate the Farmington Canal drainage system. Included in the evaluation is investigating ways to facilitate access for future maintenance along the canal while exploring feasible options for incorporating Chesapeake Bay Total Maximum Daily Load credits into design alternatives.

The nearly 6,850 LF Farmington Canal has degraded over the years which has resulted in a loss of capacity due to sediment build up and overgrowth. The sides of the canal along several sections of the canal are suffering from erosion, undercutting, and sloughing. Additionally, some inverts of inlet pipes into the canal are lower than the canal bottom potentially creating upstream drainage issues. For the purposes of analysis, the canal was broken into five (5) distinct segments for evaluation.

This report analyzes the rehabilitation of the canal in two ways: evaluating the project as one of maintenance only for each of the five segments and evaluating the project in a way that includes a combination of both maintenance components and a linear BMP along one or more of the segments.

The two most upstream segments of the canal were deemed best suited to support a linear BMP as there are no easement constraints and due to a more manageable contributing drainage area.

Rehabilitating the canal will require extensive clearing and grubbing, grading, and slope stabilization measures. The maintenance design scenario will restore and increase hydraulic capacity while providing a maintenance access path along the banks of the canal for routine maintenance. The high-level projected construction cost to rehabilitate the entire canal is approximately $6,400,000.

Two design scenarios are explored for the upstream segments of the canal; the first widening the canal bottom to create as much storage as feasible within the land constraints while using 1.5:1 and 2:1 side slopes whenever possible, and the second scenario which is like the first but uses gabion baskets whenever possible, rather than grassed slopes, to create maximum storage.

The first linear wetland design with side slopes is the most cost-effective of the two scenarios and will produce approximately 29 lb of Total Phosphorous removal. The high-level projected construction cost to retrofit the two upstream segments of the canal is approximately $2,650,000.

A hybrid approach or maintenance only and linear wetlands is the recommended option for improving Farmington Canal. The three downstream segments of the canal will follow the maintenance design scenario while the two upstream segments will implement the first linear wetland design scenario. The high-level projected construction cost of a hybrid approach to rehabilitate the entire canal is $6,955,000. Project development and construction can occur in two separate phases, phase 1 being the three downstream segments and phase 2 being the two remaining upstream segments.

1. Introduction

The City of Hampton (City) has tasked Whitman, Requardt & Associates (WRA) to conduct a feasibility study for improving the Farmington Canal drainage system. Farmington Canal is in need maintenance as it is experiencing severe overgrowth, loss of capacity and bank failures. This study evaluates feasible alternatives to improve canal stability and facilitate access for future maintenance along the canal. It will also investigate potential options for incorporating Chesapeake Total Maximum Daily Load (TMDL) credits into the design alternatives.

2. Existing Conditions

Farmington Canal begins at Bethel High School and runs for approximately 6,850 LF before it outfalls through a 5'x12' box culvert into Newmarket Creek. The canal runs adjacent to Bethel High School and George P. Phenix School (both owned by The City of Hampton School Board), the Westwood Apartments Complex, the Michaels Woods neighborhood, and the Farmington neighborhood. A portion of the canal runs through Farmington Canal homeowner's property.

The canal has five (5) distinct segments marked by changes in horizontal alignment including four (4) near 90° bends, see **Figure 1**. A survey of the canal was completed in May of 2022 by Michael Surveying & Mapping, P.C.

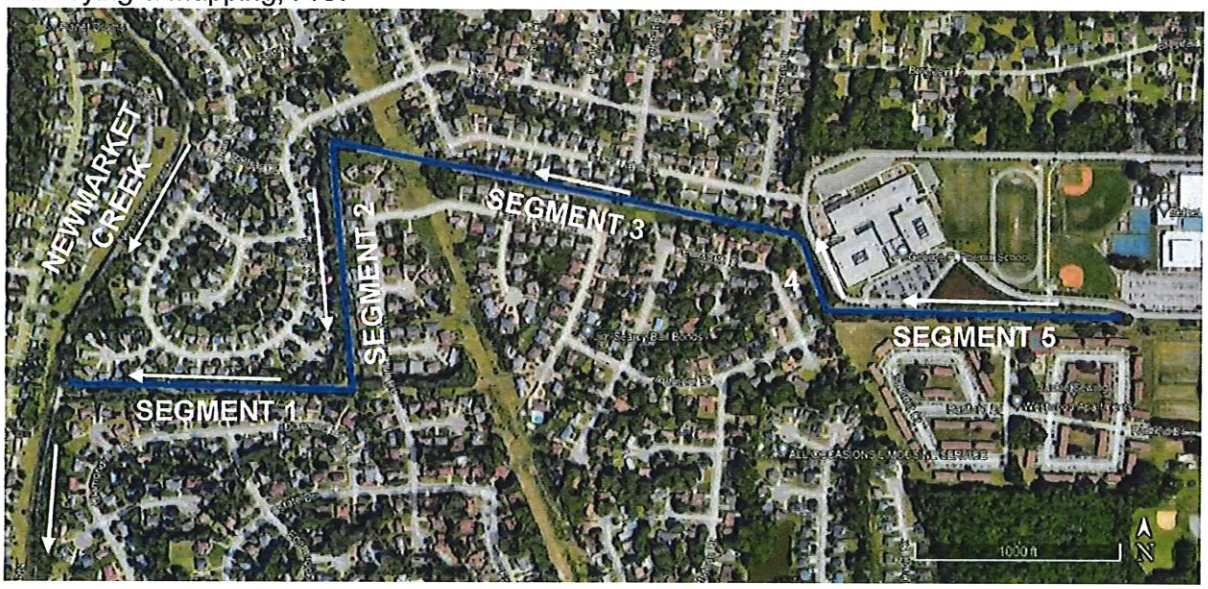

Figure 1 - Farmington Canal Overview

The total contributing drainage area is 448.37 acres of which 160.93 (36%) is impervious. The contributing drain area and subdrainage areas for the canal were derived from a previous study done for the City by AECOM, titled the *Michaels Woods & Orcutt Watersheds Study*, and checked using City-furnished GIS topographic and storm sewer shapefiles. See **Appendix B** for the watershed map for the canal and a summary of the watershed characteristics.

The existing canal has degraded over the years which has resulted in a loss of capacity due to sediment build up and overgrowth. The sides of the canal along several sections of the canal are suffering from erosion, undercutting, and sloughing. Additionally, some inverts of inlet pipes into the canal are lower than the canal bottom potentially creating upstream drainage issues.

Appendix G identifies two specific "Hot Spot" locations along the canal that have eroded to a point where residents have voiced concern with the City.

3. Basis of Design

Design Constraints

A review of the existing site conditions has revealed the following design constraints:

- **Property Lines.** The last two downstream portions of the canal (Segments 1 & 2) are located within the property lines of Farmington residents. Segments 3, 4 & 5 are owned by the City of Hampton according to City of Hampton GIS.
- **Easements.** Segment 1 has a 75-foot drainage easement along its entire length. Segment 2 has a 60-foot drainage and utility easement along its entire length and within it there is a 20-foot road and building restriction access along the Farmington side of the canal. Segment 3 has a 60-foot drainage and utility easement along its entire length with an additional variable 5- to 10-foot drainage and utility easement along portions of it. Within the 60-foot drainage and utility easement there is a 20-foot road and building restriction access along the Farmington side of the canal. Segments 4 & 5 have no easements. **Table 1** summarizes the existing easements and property information along the canal.
- **Obstructions.** Along the Canal there are private fences, sheds and foot bridges which are located within the various easements some of which are within the 20-foot road and building restriction access. Improvements to the canal will require the removal or relocation of several obstructions.
- **Environmental and Wetland Conditions.** A National Wetlands Inventory (NWI) Mapping study done for the canal area shows one riverine wetland flowing through the project area. See **Appendix F – Environmental Review** for more information.

See **Appendix A – Plan Sheets** for the locations and sizes of the various easements, property owner information and locations of the various obstructions.

See **Table 1** for a summary of the canals design constraints broken down by segment.

Table 1 – Canal Segment Summary				
Segment	**Segment Length (LF)**	**Owner(s)**	**Easements**	**Easement Location**
1	1,435	Farmington Residents (14)	75' Total Drainage (1,435 LF)	
2	1,235	Farmington Residents (13)	60' Total Drainage (1,235 LF)	
			20' Access Road & Building Restriction Area (1,235 LF)	Farmington
3	2,370	City of Hampton	60' Total Drainage (1,235 LF)	
			20' Access Road & Building Restriction Area (1,235 LF)	Farmington
			5' – 10' Drainage & Utility	Both Sides
4	440	City of Hampton	None	
5	1,370	City of Hampton	None	

Evaluation Approach

WRA analyzed the rehabilitation of the canal in two ways: evaluating the project as one of maintenance only for each of the five segments and evaluating the project in a way that includes a combination of both maintenance components and a linear BMP along one or more of the segments.

Each of the five segments were assessed for their ability to be retrofited into a linear BMP. Upstream Segments 4 & 5 were deemed best suited to support a BMP as there are no easement constraints and a more manageable contributing drainage area (CDA) (107 acres for Segment 4 & 5 combined, compared to 211 acres for Segment 3 alone).

WRA evaluated two different design configurations for linear BMP implementation along Segments 4 & 5: a constructed linear wetland and a wet swale. Linear wetlands are typically preferred to a wet swale according to DEQ's design specifications. The maximum contributing drainage area for a wet swale is recommended to not exceed 5 acres to avoid excessive flow rates; therefore, a linear wetland design which thrives with larger drainage areas is more suitable for this design application.

Design Configuration – Maintenance Access [Segments 1–5]

The Maintenance Access design configuration was developed to provide a 15' minimum width access path at the top of the canal, minimum 1.5:1 side slopes with gabion baskets being used where 1.5:1 is not possible, and a 8.5' – 10' bottom width that increases as the canal progresses to provide more storage in the system. By keeping the downstream and upstream inverts at their existing elevations the canal will have a slope of approximately 0.06%. This design configuration is applied to Segments 1-5 and provides no treatment volume.

Design Configuration – Wetlands [Segments 4–5]

The Wetlands Design Configuration was developed to provide a 15' minimum width access path at the top of the canal, minimum 1.5:1 side slopes with gabion baskets being used where 1.5:1 is not possible, and the bottom width is maximized as much as space permits without having to reduce the access path or side slopes. The longitudinal slope is approximately 0.06%.

The Wetlands Design Configuration uses a series of weirs (6 total) along Segments 4 & 5 to store up to 1-ft of runoff for treatment in the linear wetlands in accordance with DEQ Specification No. 13 – Constructed Wetlands.

The total available treatment volume for runoff storage is approximately 35,319 ft^3 or 0.81 acre-feet. Calculations for treatment volume can be found in **Appendix D – TMDL Calculations.**

Design Configuration – Wetlands Maximum Storage [Segments 4–5]

The Wetlands Maximum Design Configuration was developed to provide a 15' minimum width access path at the top of the canal, gabion baskets are used on side slopes, and the bottom width will be maximized as much as space permits without having to reduce the access path or side slopes. The longitudinal slope is approximately 0.06%.

The design of the Wetlands Max configuration is identical to the previous wetlands configuration, but the side slopes have been replaced with gabion baskets to maximize storage in the system. Converting the side slopes with a near vertical gabion basket wall created an extra approximate 0.20 acre-feet of storage in the system.

The total available treatment volume for runoff storage is approximately 44,100 ft^3 or 1.01 acre-feet. Calculations for treatment volume can be found in **Appendix D – TMDL Calculations.**

Included in all design configurations is the clearing and grubbing of the entire canal area, removing obstructions as necessary, and creating a minimum of three maintenance entrance paths of #57 Stone for City vehicles to be able to access the canal.

Plan and section sheets can be found in **Appendix A.**

4. Hydraulic and Hydrology Model

Modeling Background

WRA was provided a Hydraulic and Hydrology (H&H) model of the Michael's Woods and Orcutt Watershed where Farmington Canal is located which was developed as part of the *Michaels Woods & Orcutt Watersheds Study* by AECOM and is run on the PCSWMM software package. In the provided model, channel characteristics for Farmington Canal were determined based on spot surveys, field observations, and assumptions.

The provided model has been revised with updated existing conditions based on detailed survey obtained for this study. Proposed models were also generated for each design configuration.

The purpose of modeling the canal is to get a more accurate picture of how the canal is currently functioning and to show that each proposed design configuration will not overtop the canal's banks for the 10-yr storm event.

Existing Conditions

The existing conditions H&H model has been revised for this study with channel characteristics derived from the survey performed by Michael Surveying & Mapping in March 2022. Updates to the channel characteristics include correcting: side slopes, channel bottom widths, channel depth, and channel slope. Design storm depths were also updated to reflect guidance from the Hampton Roads PDC Resilient Stormwater Design Standards from October 2022. The 2-yr storm depth was increased from 3.58" to 4.29" and the 10-yr storm depth was increased from 5.53" to 6.64".

Some characteristics from the existing model were not changed including channel length, Manning's roughness coefficients of the channel, and the canal's drainage area characteristics. Changes were not made to these items because they were either unchanged since the AECOM study or were reasonably correct.

The existing model, updated with recent survey information, surcharges for the 10-yr storm event in three locations along Segment 5 though does flood.

Proposed Condition – Maintenance Design Configuration [Segments 1–5]

The proposed model of the Maintenance Design Configuration assumes a uniform cross section for each segment in the model as shown in accordance with the proposed plans shown in **Appendix A.**

Manning's roughness coefficient "n" for each section was revised to be 0.050 to match a channel with weeds, stones, some pools and shoals.

The proposed maintenance design model does not surcharge at any locations along the canal for the 10-yr storm event.

Proposed Condition – Wetlands & Wetlands Max Design Configuration [Segments 4–5]

The proposed models for the Wetlands Design Configurations assume a uniform cross section for each segment of the model. The proposed condition's bottom width is variable so an average width is attributed to each section. The six (6) 12-inch-high weirs were added at the appropriate locations in the model along Segments 4 & 5 to match the design plans.

Since the Wetlands Design Configuration only applies to upstream Segments 4 & 5, downstream Segments 1-3 use the Maintenance Design Configuration.

The proposed wetland design models do not surcharge at any locations along the canal for the 10-yr storm event.

See **Appendix C** for results of the PCSWMM modeling.

5. Design Configuration Cross-Section Comparison

Important to rehabbing Farmington Canal is that each design configuration must provide storage equal to or greater than the existing condition. **Table 2** shows a summary of the cross-sectional areas along several typical sections of the canal. Each proposed design configuration shows a net gain in area except for the most downstream section(s) in Segment 1 where the canal bottom needs to be raised to promote positive slope to the outlet box culvert. The area reduction to the cross-section in Section 1.1 does not cause the canal to overflow its bank under a 10-yr design storm event as their as ample capacity in the system.

Table 2 - Design Scenario Cross Sectional Area Comparison

X-Section	Canal Segment	Cross Section Area (ft^2)				
		Existing	City Provided H&H Model	Prop - Maintenance	Prop - Wetlands	Prop - Wetlands Max
1.1	1	150	169	131		
1.2	1	153	169	160		
1.3	1	196	169	217		
2	2	195	135	230		
3.1	3	177	105	195		
3.2	3	105	105	146		
3.3	3	170	105	225		
4	4	125	131	193	330	330
5.1	5	122	66	198	272	318
5.2	5	90	66	108	112	119
5.3	5	76	66	119	179	172

See **Appendix A** for cross-sections of the updated existing conditions based on survey, the City provided model cross-sections, and cross-sections of each design scenario.

6. TMDL Load Calculations

The pollutant loadings of total phosphorous (TP) and total nitrogen (TN) were calculated using the subdrainage areas summarized in Section II and the DEQ Virginia Runoff Reduction Method New Development Compliance Spreadsheet - Version 3.0 with 2013 Draft BMP Standards and Specifications. Total suspended solids (TSS) were calculated using the ratio provided in Permit No. VA0088633 in Table 3: Ratio of Phosphorus Loading Rate to Nitrogen and Total Suspended Solids Loading Rate for Chesapeake Bay Basins. **Table 3** provides a summary of the pollutant loads for each subdrainage area.

Table 3 - Pollutant Load Summary

Segments	Pollutant Load, (lb/yr)		
	TP	TN	TSS
4.1	11.26	80.52	4,769
5.1	25.27	180.21	10,702
5.2	93.47	668.68	39,585
Total Pollutant Loads	**130.00**	**929.41**	**55,055**

To obtain the total pollutant reduction credit for a Level 1 Wetlands, the required treatment volume for the 1-inch storm is 35,319 ft3 or 0.81 acre-feet. This required treatment volume was obtained using subdrainage areas summarized in **Appendix B** and the DEQ Virginia Runoff Reduction Method New Development Compliance Spreadsheet - Version 3.0 with 2013 Draft BMP Standards and Specifications.

The required treatment volume exceeded the available treatment volume in both design configurations for wetlands. Therefore, the Stormwater Treatment Retrofit Equations provided in the Chesapeake TMDL Special Condition Guidance, GM15-2005 were used to obtain the removal efficiencies for TP, TN, and TSS. **Table 4** provides a summary of the pollutant reductions for both design configurations. Calculations can be found in Appendix D – TMDL Calculations.

Table 4 - TMDL Calculation Summary

Pollutant	Pollutant Load, (lb/yr)	Design Configuration - Wetlands		Design Configuration - Wetlands Max	
		Efficiency (%)	Pollutant Load Reduction (lb/yr)	Efficiency (%)	Pollutant Load Reduction (lb/yr)
TP	130.00	22%	29.13	27%	34.76
TN	929.41	14%	132.46	17%	158.11
TSS	55,055	29%	15,704	34%	18,742

7. Cost Summary

Construction costs were estimated for each design configuration. **Table 5** provides a summary of the total cost broken down by canal segment, and cost per pound of pollutant removed. Detailed cost estimates for both design configurations can be found in **Appendix E – Cost Estimates.**

Table 5 - Farmington Canal Cost Estimate Summary		
Segment	Scenario	Estimate
1	Maintenance	$1,035,000
2	Maintenance	$1,140,000
3	Maintenance	$2,130,000
Segment 1-3 Maintenance Subtotal		**$4,305,000**
4	Maintenance	$520,000
5	Maintenance	$1,560,000
Segment 4 & 5 Maintenance Subtotal		**$2,080,000**
4 & 5	**TMDL (29 lb TP)**	**$2,650,000**
	$/lb TP	**$91,379**
4 & 5	**TMDL Max (34 lb TP)**	**$5,000,000**
	$/lb TP	**$147,059**

8. Results

Segments 4 and 5 of the project may qualify for Stormwater Local Assistance Funding (SLAF) through VDEQ and may be considered for future funding. The SLAF program provides matching funds to local governments for the planning, design, and implementation of stormwater BMPs including retrofits that are cost effective in reducing water quality pollutant loads. In previous years, DEQ has used $50,000/lb TP removed as the upper end for funding consideration. The Wetlands Design Configuration, as it is, will remove an estimated **29 lbs TP** at a cost of approximately $2,650,000 for an efficiency of **$91,400/lb TP**. The Wetlands Max Storage Design Configuration, as it is, will remove an estimated **34 lbs TP** at a cost of approximately $5,000,000 for an efficiency of **$147,000/lb TP**.

9. Conclusions and Recommendations

A project to rehabilitate the over 1.25-mile-long Farmington Canal will face a number of challenges including; constructability, high construction costs, and homeowner opposition. WRA is of the opinion that a suitable course of action will be to break the Farmington Canal rehab project into two concurrent projects;

1. A maintenance rehab focused project for Segments 1 – 3, and
2. A constructed linear wetlands project for Segments 4 – 5 with the objective of applying for VA DEQ SLAF grant funds.

The wetlands design configuration for Segments 4 & 5 offers the most reasonable rate of $/lb of TP as compared to the Max option. However, it does increase the cost of the maintenance only configuration by around 25%.

Appendix A – Plan Sheets

FARMINGTON CANAL

HAMPTON, VA 23666

FEBRUARY 2023

MICHAEL SURVEYING & MAPPING, P.C.
41 OLD OYSTER POINT ROAD
SUITE B
NEWPORT NEWS, VA. 23602
TEL 757.873.1762
FAX 757.873.1772

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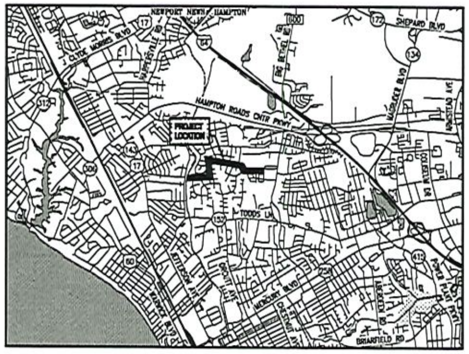

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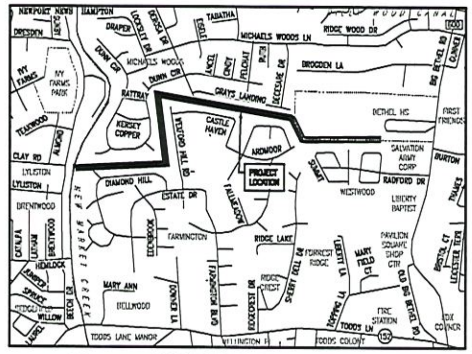

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SHEET INDEX

SEQ. NO	SHEET	TITLE
1	G-1	COVER SHEET, SURVEY NOTES, SHEET INDEX, & LEGEND
2	C-1	EXISTING CONDITIONS
3	C-2	EXISTING CONDITIONS
4	C-3	EXISTING CONDITIONS
5	C-4	EXISTING CONDITIONS
6	C-5	EXISTING CONDITIONS
7	C-6	EXISTING CONDITIONS
8	C-7	EXISTING CONDITIONS
9	C-1A	PROPOSED CONDITIONS – MAINTENANCE
10	C-2A	PROPOSED CONDITIONS – MAINTENANCE
11	C-3A	PROPOSED CONDITIONS – MAINTENANCE
12	C-4A	PROPOSED CONDITIONS – MAINTENANCE
13	C-5A	PROPOSED CONDITIONS – MAINTENANCE
14	C-6A	PROPOSED CONDITIONS – MAINTENANCE
15	C-7A	PROPOSED CONDITIONS – MAINTENANCE
16	C-5B	PROPOSED CONDITIONS – WETLANDS
17	C-6B	PROPOSED CONDITIONS – WETLANDS
18	C-7B	PROPOSED CONDITIONS – WETLANDS
19	C-5C	PROPOSED CONDITIONS – WETLANDS MAX
20	C-6C	PROPOSED CONDITIONS – WETLANDS MAX
21	C-7C	PROPOSED CONDITIONS – WETLANDS MAX
22	P-1A	PROPOSED MAINTENANCE CROSS SECTIONS
23	P-2A	PROPOSED MAINTENANCE CROSS SECTIONS
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25	P-2C	PROPOSED WETLANDS MAXIMUM STORAGE CROSS SECTIONS
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27	EX-2	EXISTING CONDITIONS AND CITY H&H MODEL CROSS SECTIONS
28	D-1	CIVIL DETAILS & NOTES

SYMBOL LEGEND

- IPF (IRON PIPE FOUND)
- IRF (IRON ROD FOUND)
- CMF (CONC MON FOUND)
- IRS (IRON ROD SET)
- IPS (IRON PIPE SET)
- WM (WATER METER)
- WV – WV (WATER VALVE)
- FH – FH (FIRE HYDRANT)
- LP – LIGHT POLE
- PP – POWER POLE
- GV – GAS VALVE
- GM – GAS METER
- TELEPHONE MANHOLE
- TEL PED – TELEPHONE PEDESTAL
- MONITORING WELL
- ELECTRIC CONTROL BOX
- BOLLARD
- ANTENNA
- FORCE MAIN VALVE/VENT

LINETYPE LEGEND

- DENOTES TREELINE/DRIPLINE
- DENOTES ELEC. PAINT BY OTHERS
- DENOTES TELEPHONE PAINT BY OTHERS
- DENOTES FORCE MAIN PAINT BY OTHERS
- DENOTES WATER PAINT BY OTHERS
- DENOTES GAS PAINT MARKED BY OTHERS
- DENOTES OVERHEAD UTILITY LINES

REVISIONS		

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

SIGNATURE

NOT FOR CONSTRUCTION

Whitman, Requardt & Associates, LLP
11870 Merchants Walk, Suite 100, Newport News, Virginia 23606

COVER SHEET, SURVEY NOTES, SHEET INDEX, & LEGEND

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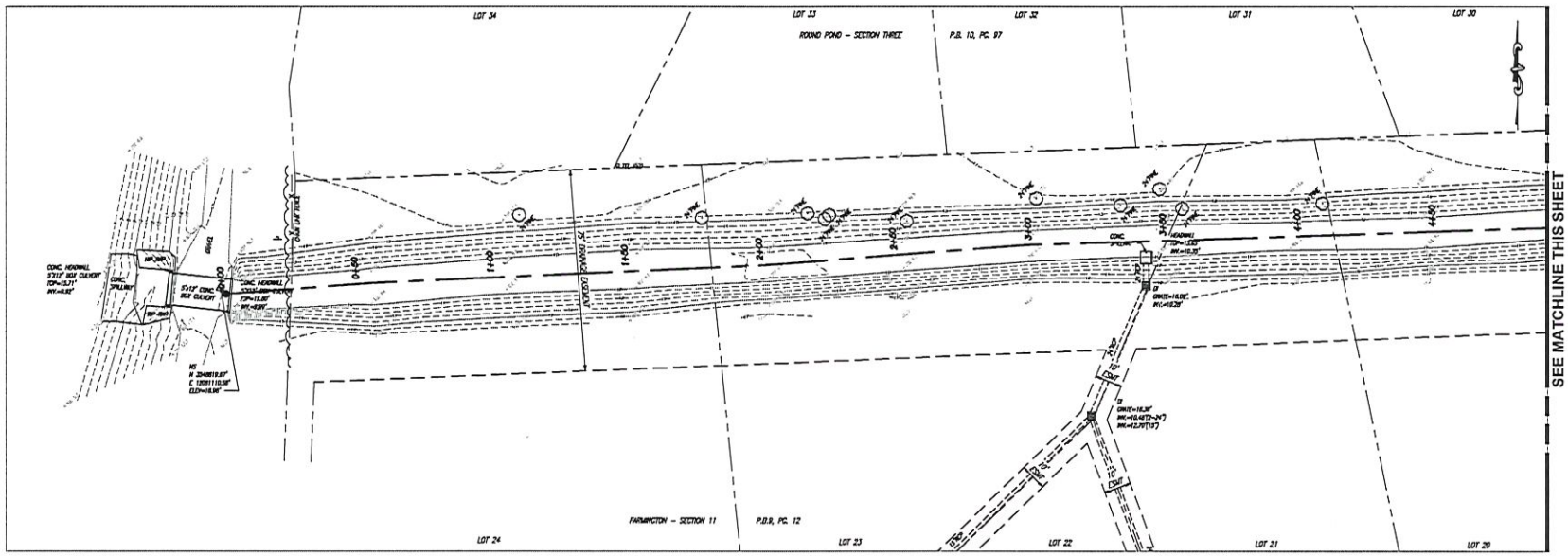

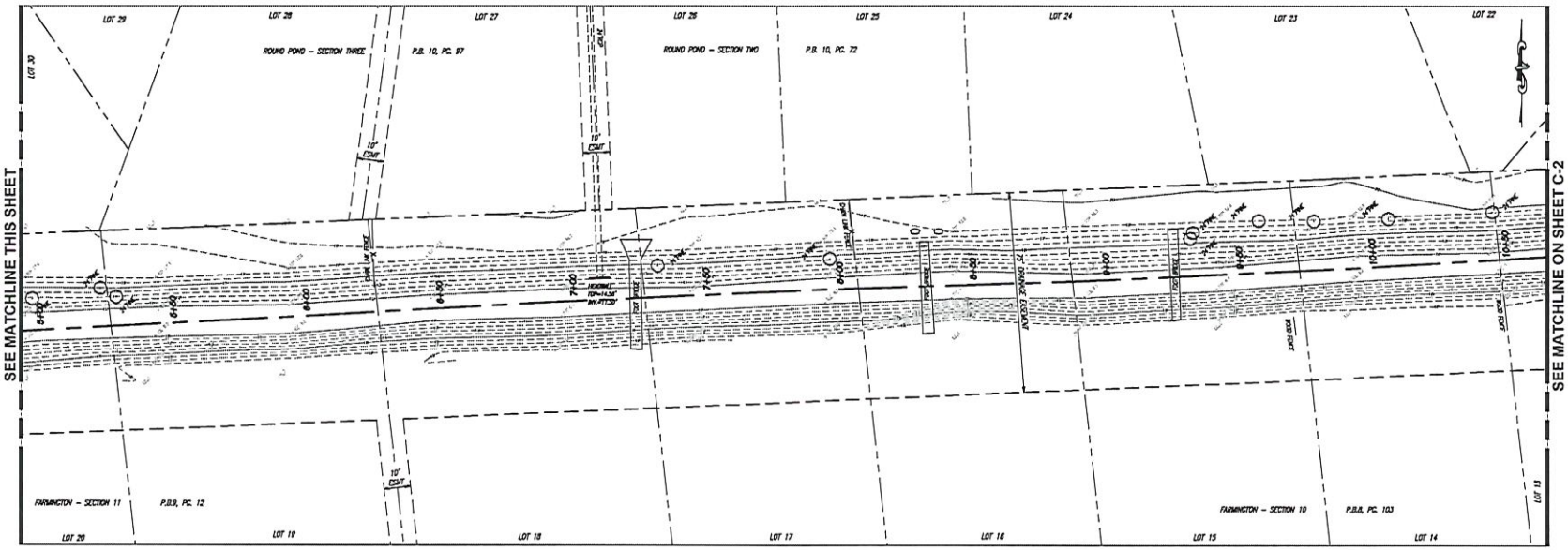

REVISIONS

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

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SCALE: 1" = 20'

SIGNATURE

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WRA
Whitman, Requardt & Associates, LLP
11870 Merchants Walk, Suite 100, Newport News, Virginia 23606

EXISTING CONDITIONS

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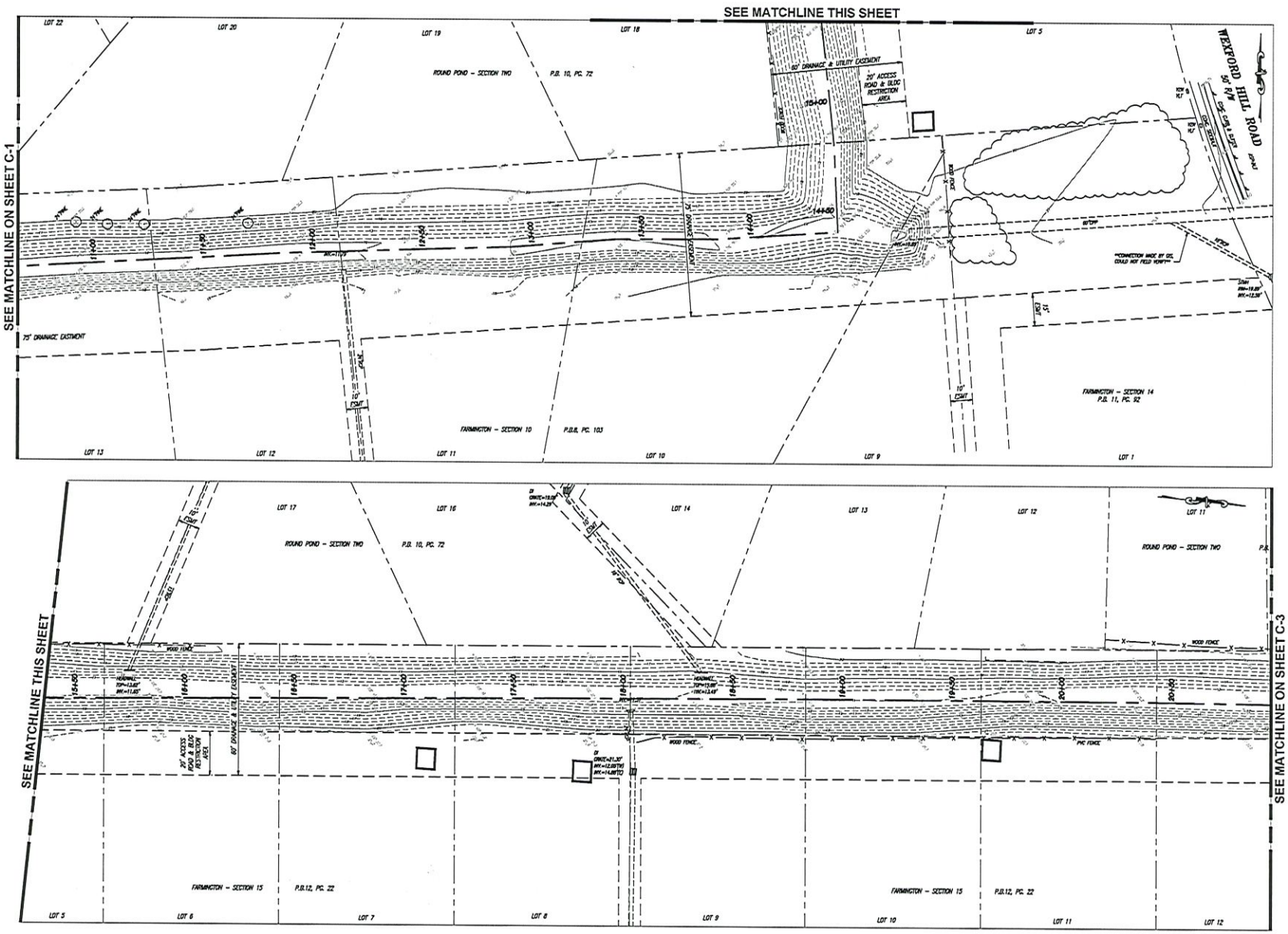

REVISIONS		

CITY OF HAMPTON VIRGINIA

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

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EXISTING CONDITIONS

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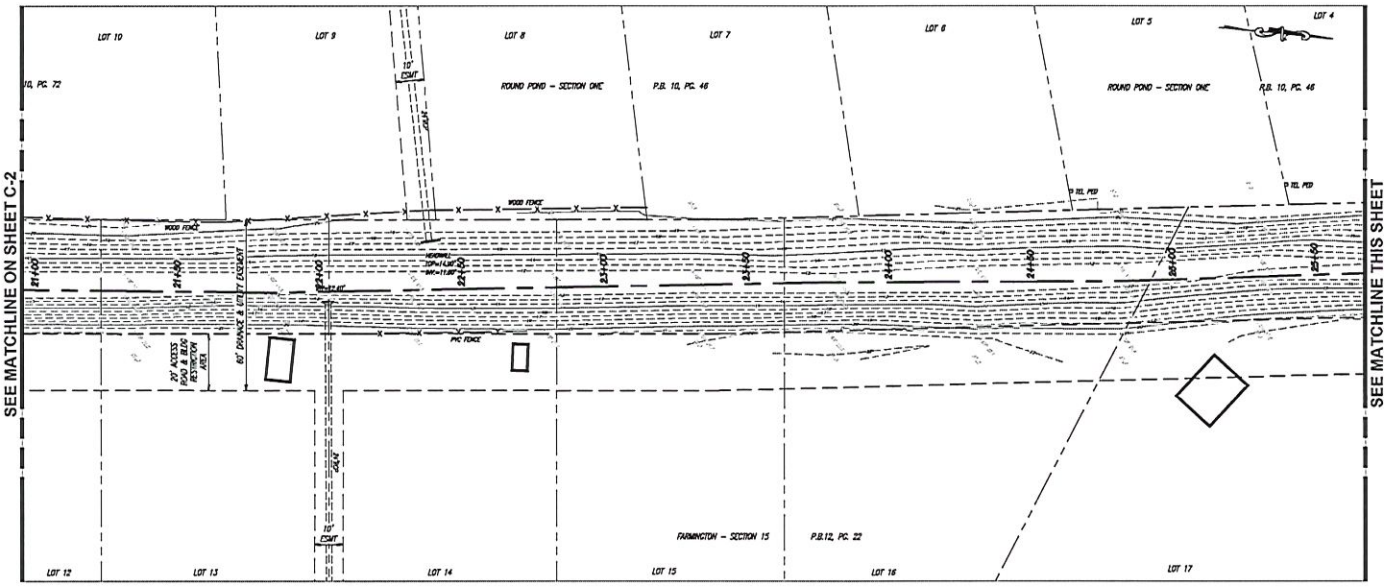

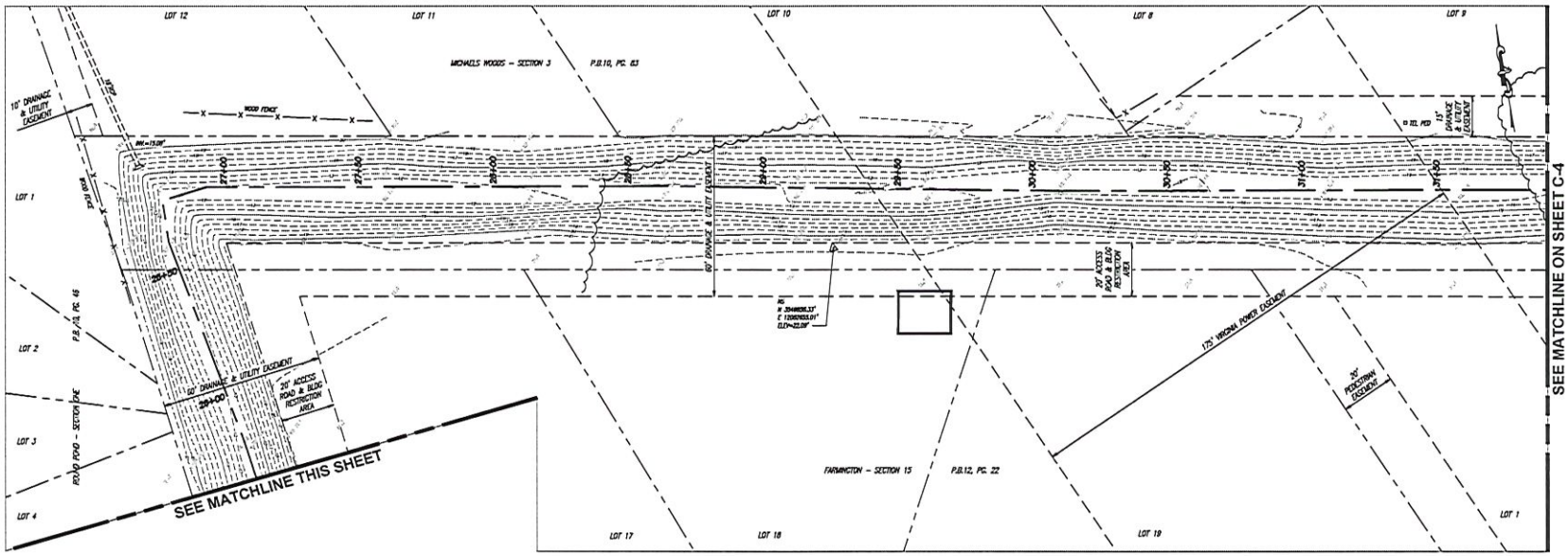

REVISIONS

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

0 10' 20' 40'

SCALE: 1" = 20'

SIGNATURE

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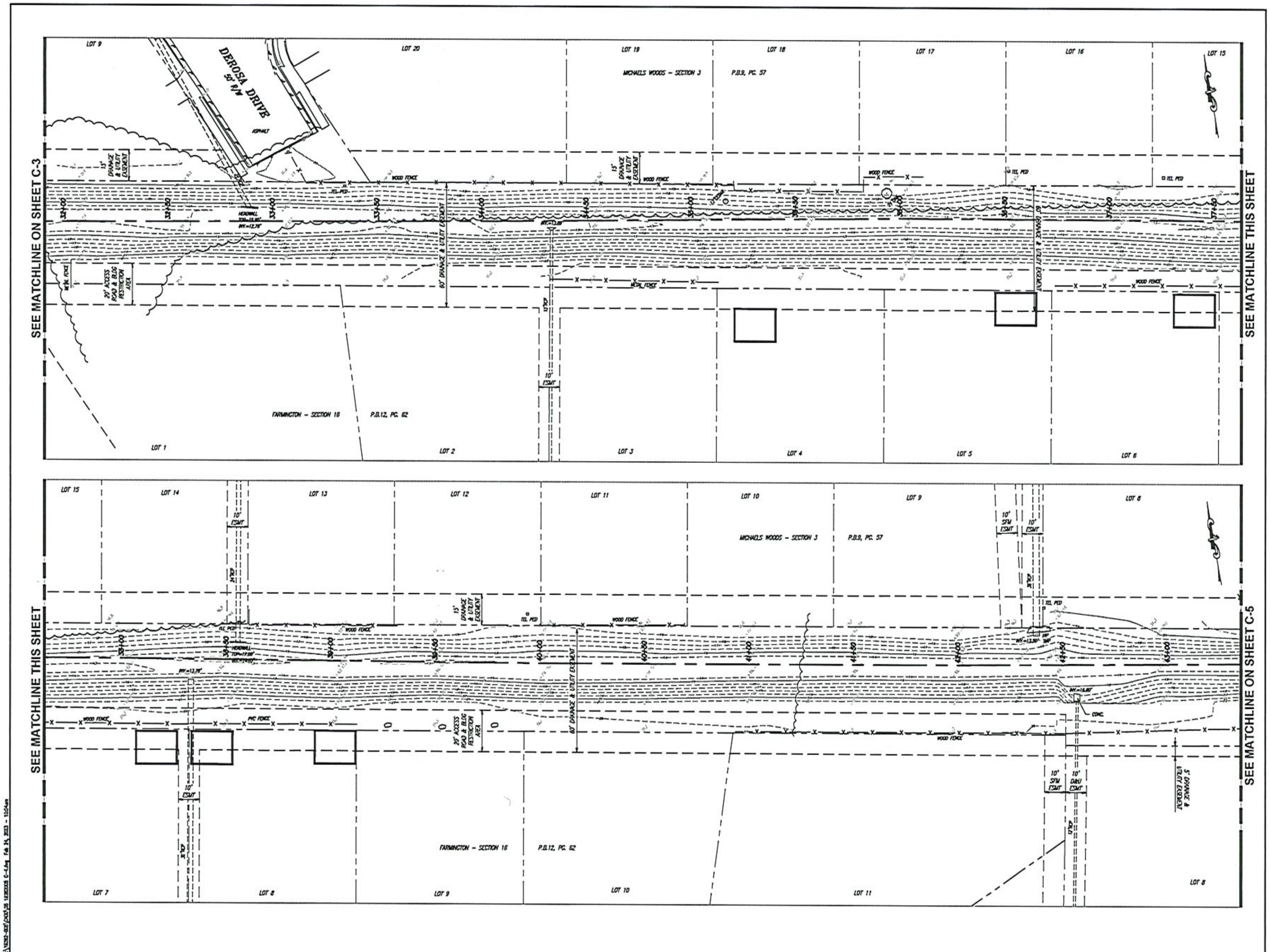
EXISTING CONDITIONS

DRAWING NO.

C-3

SCALE: 1" = 20'		
DATE: FEB 2023		SHEET 04 OF 25
DES: MM	DRAWN: GSL	CHECK: LEA


SEE MATCHLINE ON SHEET C-3
SEE MATCHLINE THIS SHEET
SEE MATCHLINE ON SHEET C-5
LOT 9
LOT 20
LOT 19
LOT 18
LOT 17
LOT 16
LOT 15
DEROSA DRIVE
50' R/W
ASPHALT
MICHAELS WOODS - SECTION 3
P.B.9, PG. 57
FARMINGTON - SECTION 16
P.B.12, PG. 62
LOT 1
LOT 2
LOT 3
LOT 4
LOT 5
LOT 6
WOOD FENCE
15' DRAINAGE & UTILITY EASEMENT
60' DRAINAGE & UTILITY EASEMENT
20' ACCESS ROAD & BLDG RESTRICTION AREA
10' ESMT
LOT 14
LOT 13
LOT 12
LOT 11
LOT 10
LOT 8
LOT 7
PVC FENCE
10' SFM ESMT
10' DRAIN ESMT
5' DRAINAGE & UTILITY EASEMENT
CONC.

REVISIONS

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

0 10' 20' 40'
SCALE: 1" = 20'

SIGNATURE

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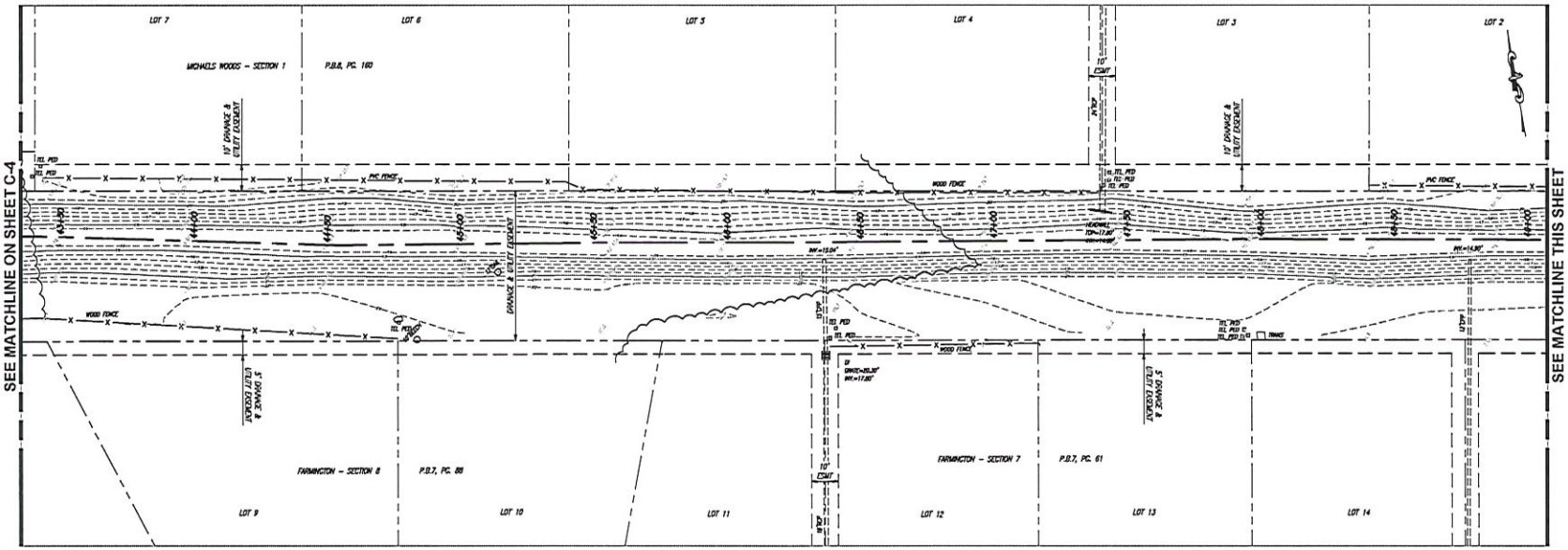
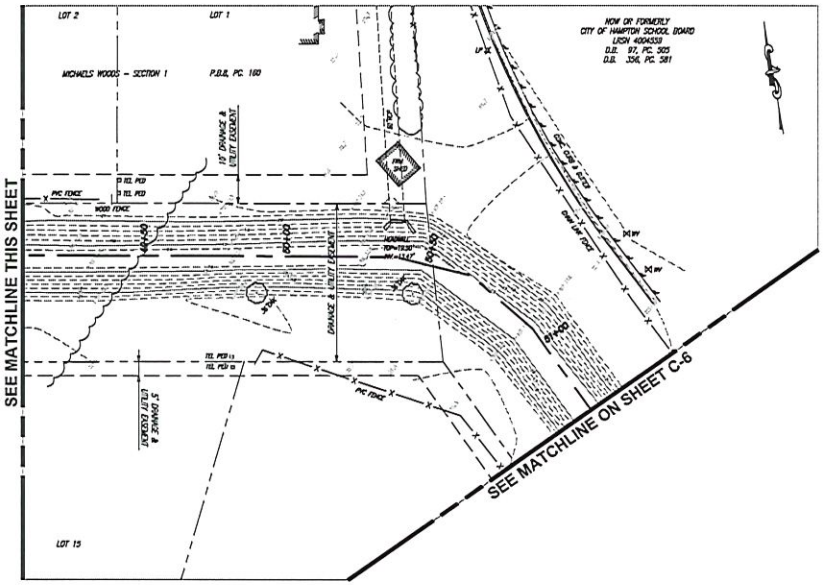
EXISTING CONDITIONS

DRAWING NO.

C-4

SCALE: 1" = 20'	
DATE: FEB 2023	SHEET 05 OF 25
DES: MM	DRAWN: GSL / CHECK: LEA





REVISIONS

CITY OF HAMPTON VIRGINIA
JULY 9 1610
HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

0 10' 20' 40'
SCALE: 1" = 20'

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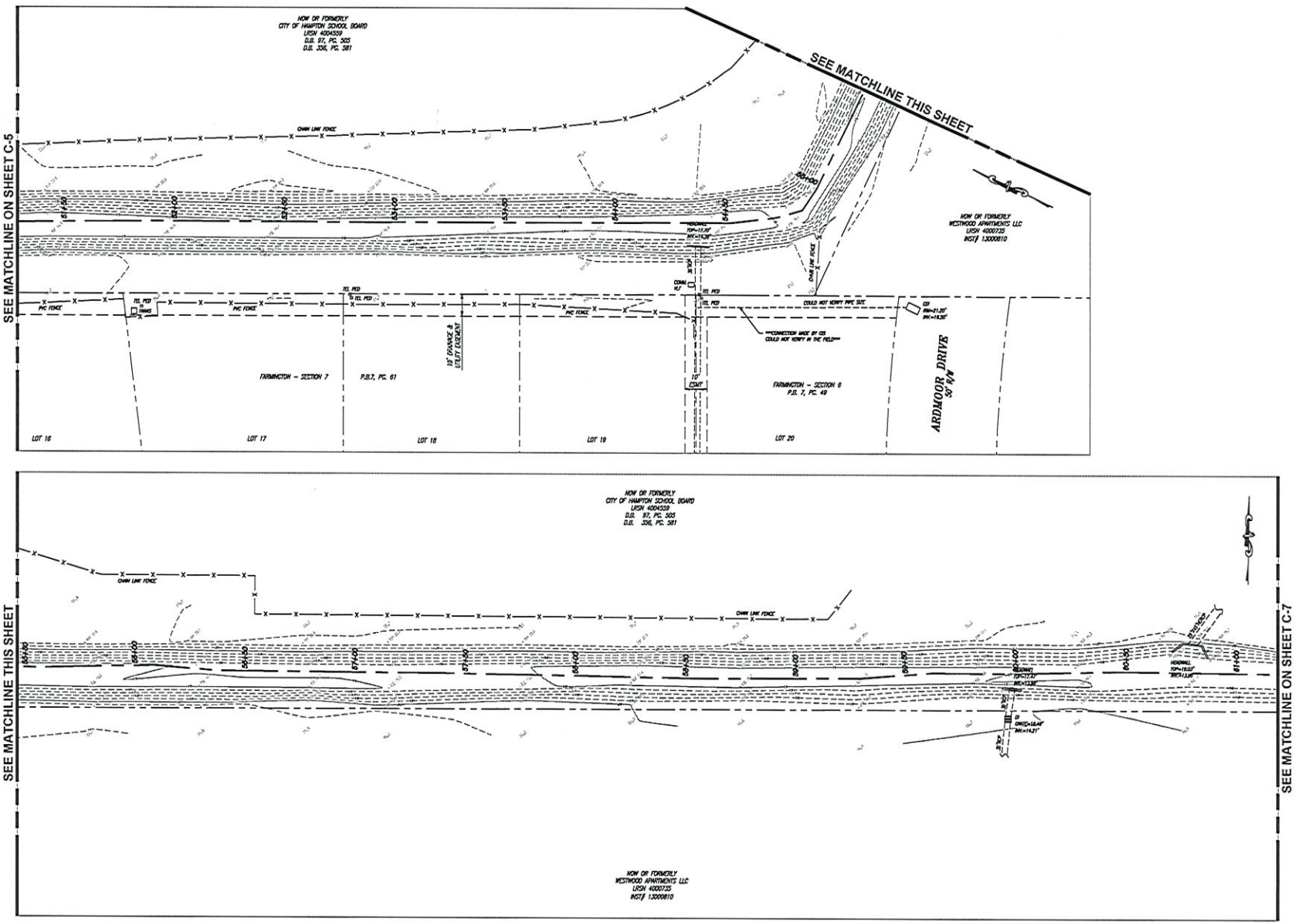
EXISTING CONDITIONS

DRAWING NO.
C-5

SCALE: 1" = 20'		
DATE: FEB 2023		SHEET 06 OF 28
DES: MM	DRAWN: GSL	CHECK: LEA



REVISIONS		

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

0 10' 20' 40'

SCALE: 1" = 20'

SIGNATURE

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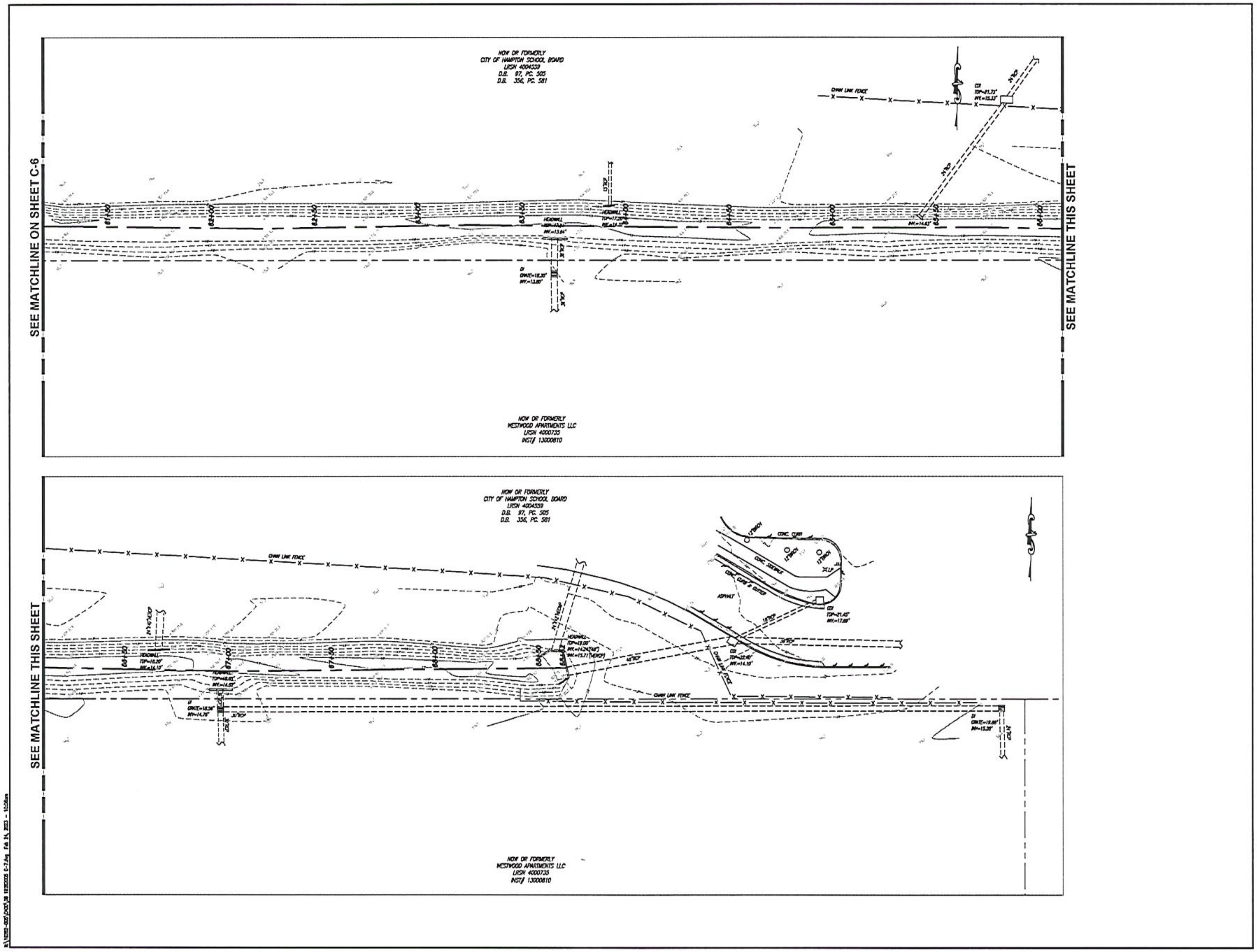
EXISTING CONDITIONS

DRAWING NO.

C-6

SCALE: 1" = 20'		
DATE: FEB 2023		SHEET 07 OF 28
DES: MM	DRAWN: CSL	CHECK: LKA



REVISIONS

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

0 10' 20' 40'
SCALE: 1" = 20'

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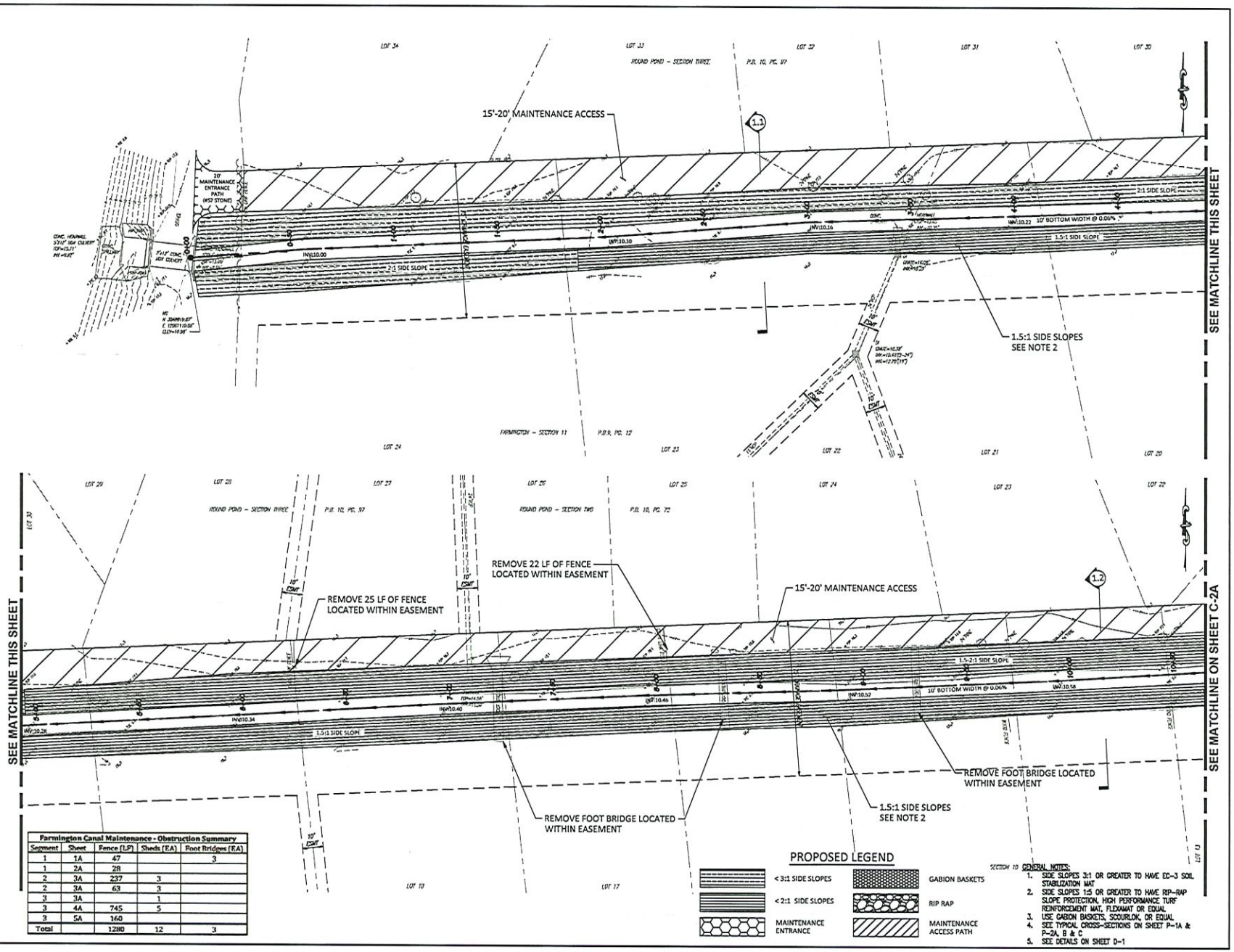
EXISTING CONDITIONS

DRAWING NO.

C-7

SCALE: 1" = 20'
DATE: FEB 2023 | SHEET 08 OF 28
DES: MM | DRAWN: CSL | CHECK: LEA



Farmington Canal Maintenance - Obstruction Summary				
Segment	Sheet	Fence (LF)	Sheds (EA)	Foot Bridges (EA)
1	1A	47		3
1	2A	28		
2	3A	237	3	
2	3A	63	3	
3	3A		1	
3	4A	745	5	
3	5A	160		
Total		1280	12	3

PROPOSED LEGEND

- < 3:1 SIDE SLOPES
- < 2:1 SIDE SLOPES
- MAINTENANCE ENTRANCE
- GABION BASKETS
- RIP RAP
- MAINTENANCE ACCESS PATH

SECTION 10 GENERAL NOTES:

1. SIDE SLOPES 3:1 OR GREATER TO HAVE EC-3 SOIL STABILIZATION MAT
2. SIDE SLOPES 1:1 OR GREATER TO HAVE RIP-RAP SLOPE PROTECTION, HIGH PERFORMANCE TURF REINFORCEMENT MAT, FLEXAMAT OR EQUAL
3. USE GABION BASKETS, SCOURLOK, OR EQUAL
4. SEE TYPICAL CROSS-SECTIONS ON SHEET P-1A & P-2A, B & C
5. SEE DETAILS ON SHEET D-1

REVISIONS

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

0 10' 20' 40'

SCALE: 1" = 20'

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PROPOSED CONDITIONS MAINTENANCE

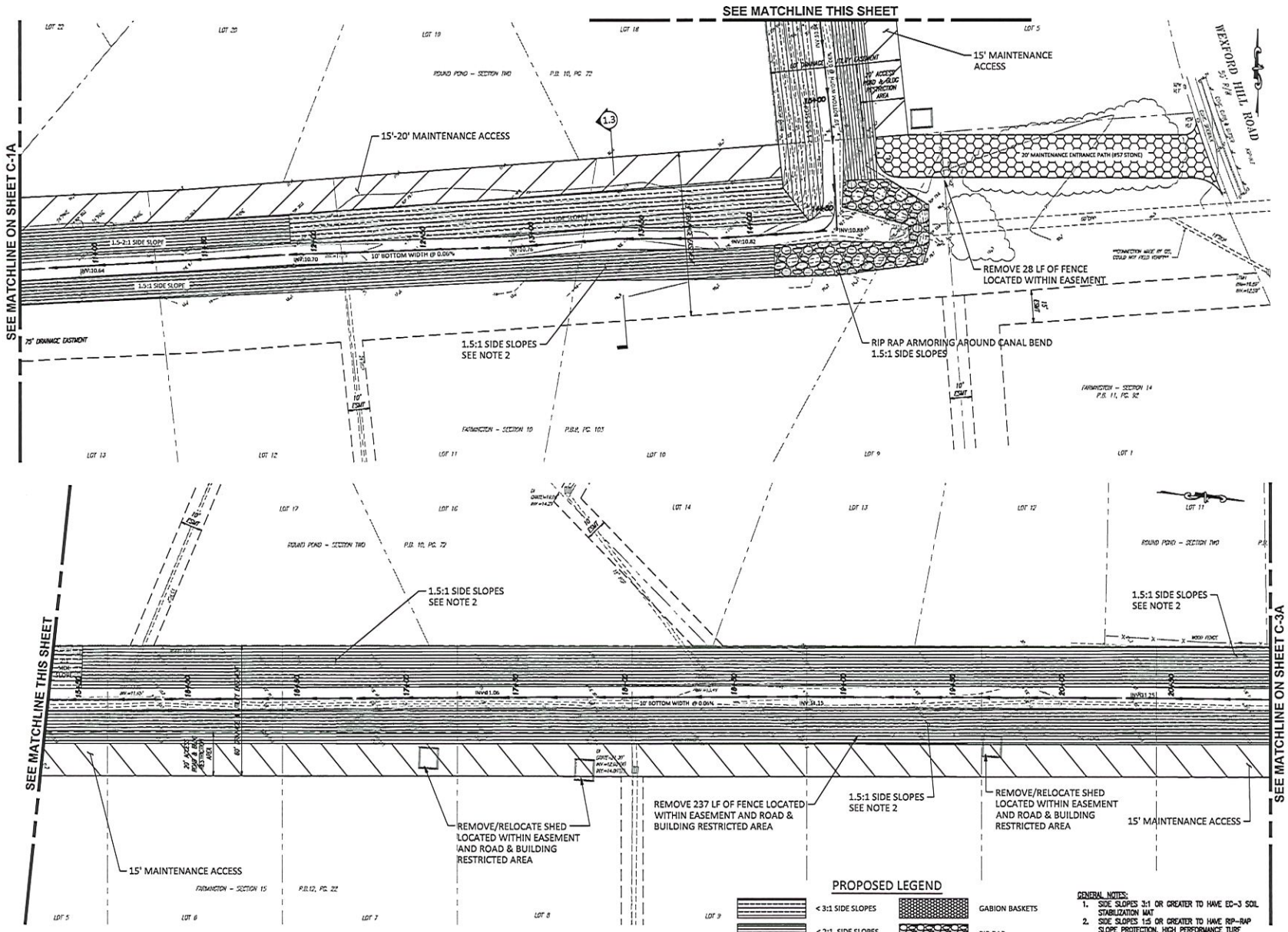
DRAWING NO.

C-1A

SCALE: 1" = 20'

DATE: FEB 2023 | SHEET 09 OF 25

DES: MDM | DRAWN: MDM | CHECK: LEA



GENERAL NOTES:
1. SIDE SLOPES 3:1 OR GREATER TO HAVE EC-3 SOIL STABILIZATION MAT
2. SIDE SLOPES 1:5 OR GREATER TO HAVE RIP-RAP SLOPE PROTECTION, HIGH PERFORMANCE TURF REINFORCEMENT MAT, FLEXAMAT OR EQUAL
3. USE GABION BASKETS, SCOURLOK, OR EQUAL
4. SEE TYPICAL CROSS-SECTIONS ON SHEET P-1A & P-2A, B & C
5. SEE DETAILS ON SHEET D-1

REVISIONS

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

0 10' 20' 40'
SCALE: 1" = 20'

SIGNATURE

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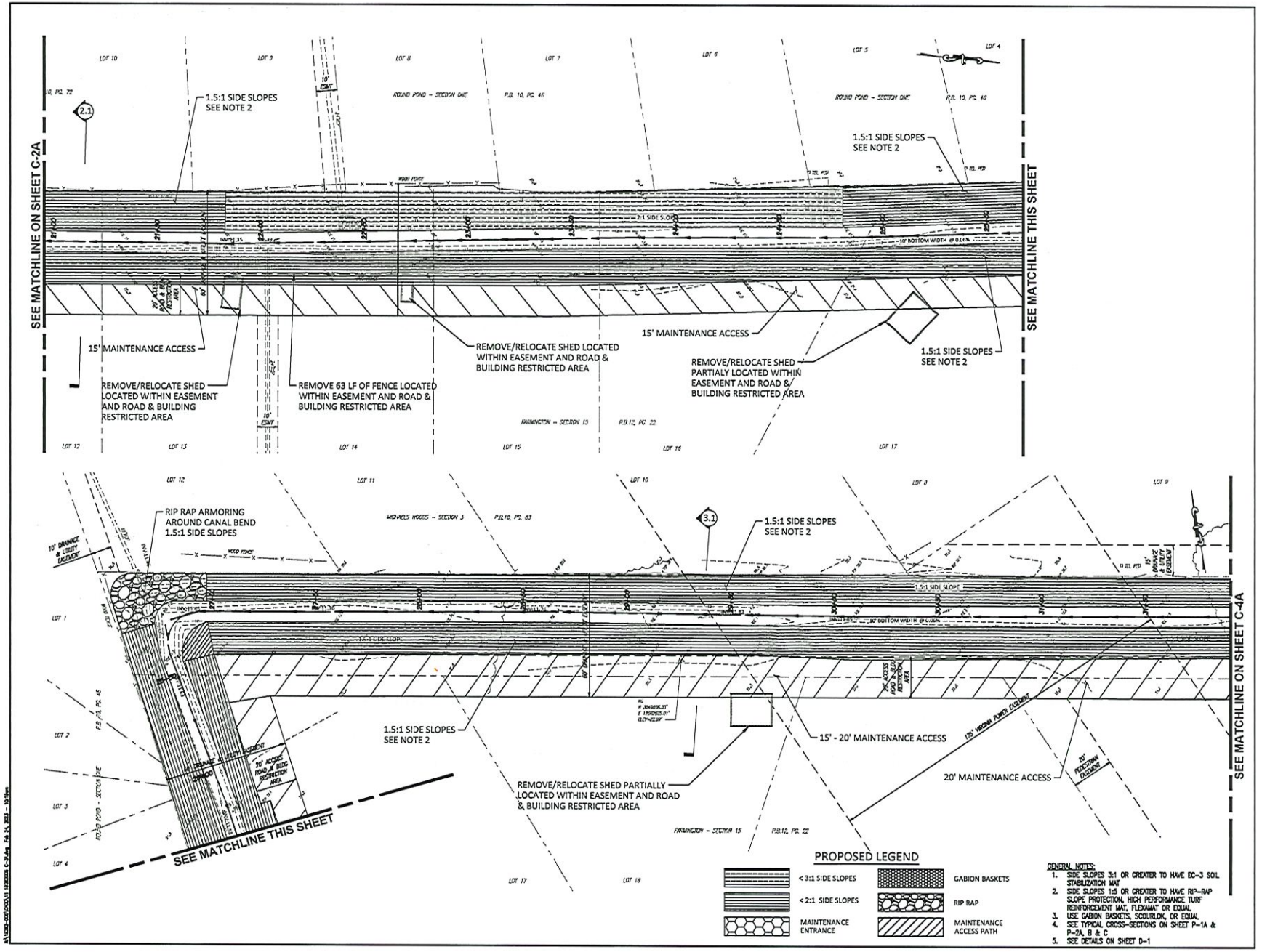
PROPOSED CONDITIONS MAINTENANCE

DRAWING NO.

C-2A

SCALE: 1" = 20'		
DATE: FEB 2023		SHEET 10 OF 28
DES: MDM	DRAWN: GSL	CHECK: LRA



GENERAL NOTES:
1. SIDE SLOPES 3:1 OR GREATER TO HAVE EC-3 SOIL STABILIZATION MAT
2. SIDE SLOPES 1:1 OR GREATER TO HAVE RIP-RAP SLOPE PROTECTION, HIGH PERFORMANCE TURF REINFORCEMENT MAT, FLEXAMAT OR EQUAL
3. USE GABION BASKETS, SCOURLOK, OR EQUAL
4. SEE TYPICAL CROSS-SECTIONS ON SHEET P-1A & P-2A, B & C
5. SEE DETAILS ON SHEET D-1

REVISIONS

CITY OF HAMPTON VIRGINIA

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

0 10' 20' 40'
SCALE: 1" = 20'

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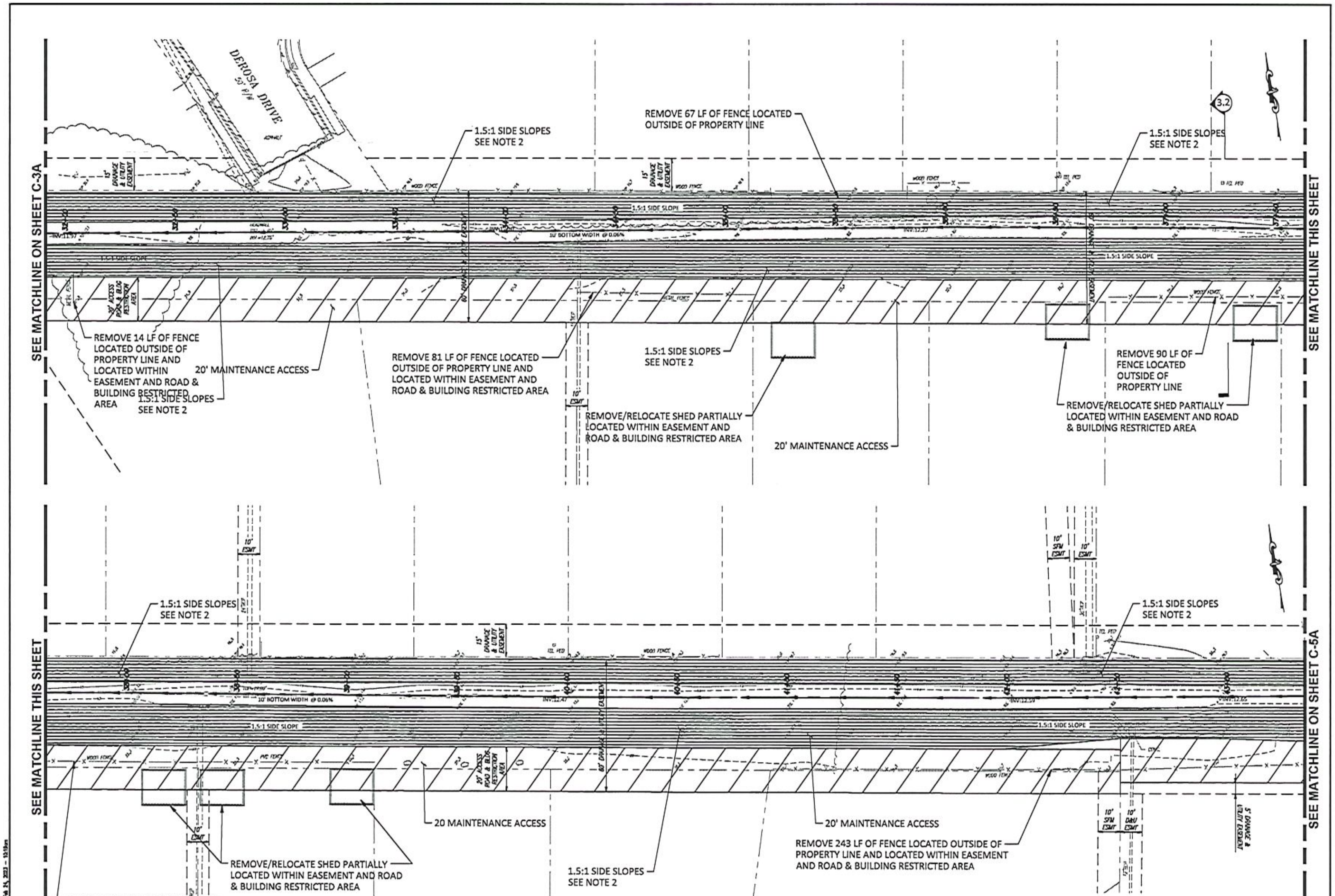
PROPOSED CONDITIONS MAINTENANCE

DRAWING NO.
C-3A

SCALE: 1" = 20'	
DATE: FEB 2023	SHEET 11 OF 28
DES: MDM	DRAWN: CSL CHECK: LEA


DEROSA DRIVE
50' R/W
SEE MATCHLINE ON SHEET C-3A
SEE MATCHLINE THIS SHEET
SEE MATCHLINE ON SHEET C-5A
1.5:1 SIDE SLOPES
SEE NOTE 2
REMOVE 67 LF OF FENCE LOCATED OUTSIDE OF PROPERTY LINE
REMOVE 14 LF OF FENCE LOCATED OUTSIDE OF PROPERTY LINE AND LOCATED WITHIN EASEMENT AND ROAD & BUILDING RESTRICTED AREA
20' MAINTENANCE ACCESS
REMOVE 81 LF OF FENCE LOCATED OUTSIDE OF PROPERTY LINE AND LOCATED WITHIN EASEMENT AND ROAD & BUILDING RESTRICTED AREA
REMOVE/RELOCATE SHED PARTIALLY LOCATED WITHIN EASEMENT AND ROAD & BUILDING RESTRICTED AREA
REMOVE 90 LF OF FENCE LOCATED OUTSIDE OF PROPERTY LINE
10' BOTTOM WIDTH @ 0.06%
1.5:1 SIDE SLOPE
WOOD FENCE
20 MAINTENANCE ACCESS
REMOVE 243 LF OF FENCE LOCATED OUTSIDE OF PROPERTY LINE AND LOCATED WITHIN EASEMENT AND ROAD & BUILDING RESTRICTED AREA
REMOVE 250 LF OF FENCE LOCATED OUTSIDE OF PROPERTY LINE AND LOCATED WITHIN EASEMENT AND ROAD & BUILDING RESTRICTED AREA
10' ESMT
5' DRAINAGE & UTILITY EASEMENT

PROPOSED LEGEND

< 3:1 SIDE SLOPES		GABION BASKETS	
< 2:1 SIDE SLOPES		RIP RAP	
MAINTENANCE ENTRANCE		MAINTENANCE ACCESS PATH	

GENERAL NOTES:

1. SIDE SLOPES 3:1 OR GREATER TO HAVE EC-3 SOIL STABILIZATION MAT
2. SIDE SLOPES 1:5 OR GREATER TO HAVE RIP-RAP SLOPE PROTECTION, HIGH PERFORMANCE TURF REINFORCEMENT MAT, FLEXAMAT OR EQUAL
3. USE GABION BASKETS, SCOURLOK, OR EQUAL
4. SEE TYPICAL CROSS-SECTIONS ON SHEET P-1A & P-2A, B & C
5. SEE DETAILS ON SHEET D-1

REVISIONS

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

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SCALE: 1" = 20'

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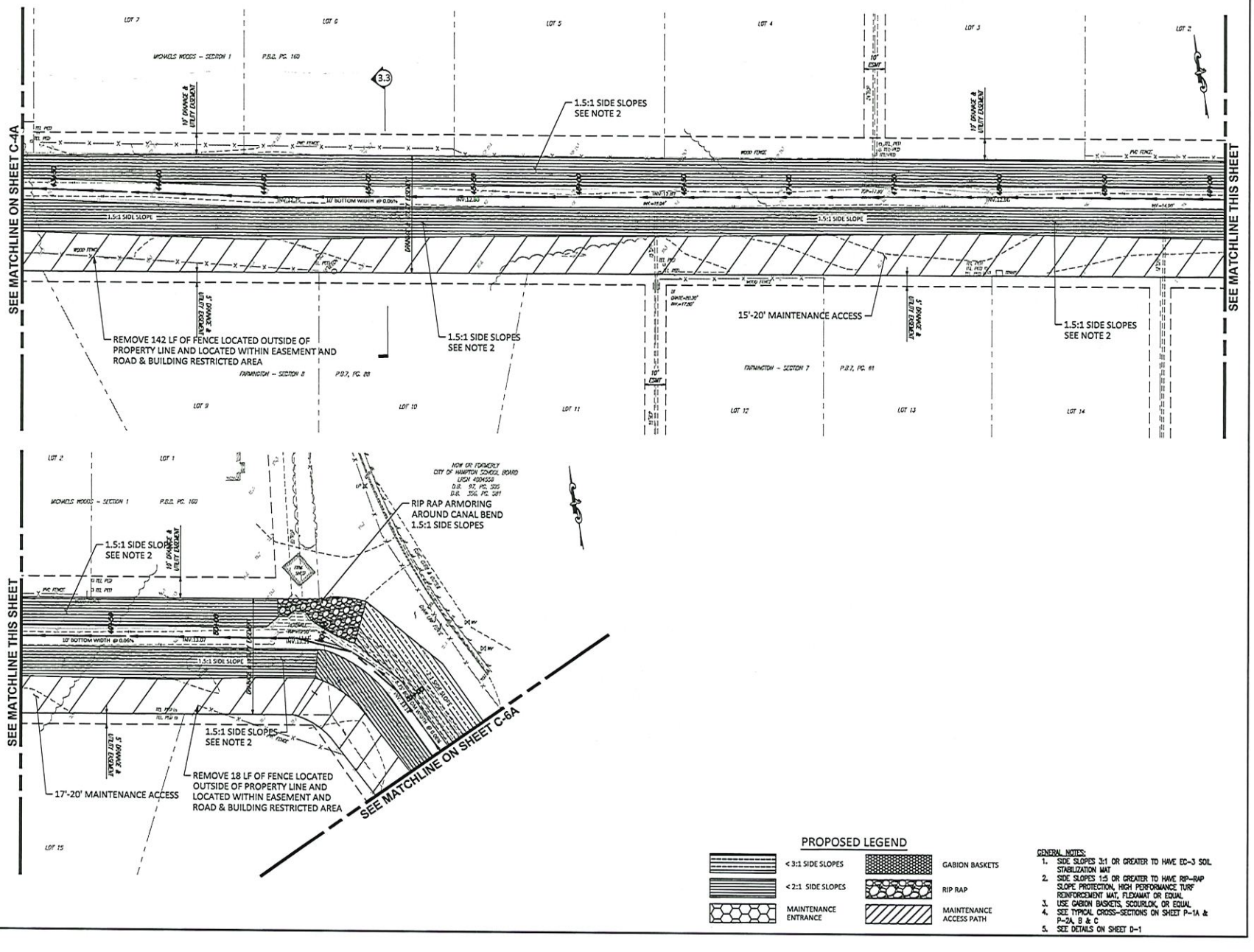
PROPOSED CONDITIONS MAINTENANCE

DRAWING NO.

C-4A

SCALE: 1" = 20'		
DATE: FEB 2023	SHEET 12 OF 28	
DES: MDM	DRAWN: CSL	CHECK: LEA



GENERAL NOTES:

1. SIDE SLOPES 3:1 OR GREATER TO HAVE EC-3 SOIL STABILIZATION MAT
2. SIDE SLOPES 1:1 OR GREATER TO HAVE RIP-RAP SLOPE PROTECTION, HIGH PERFORMANCE TURF REINFORCEMENT MAT, FLEXAMAT OR EQUAL
3. USE GABION BASKETS, SCOURLOK, OR EQUAL
4. SEE TYPICAL CROSS-SECTIONS ON SHEET P-1A & P-2A, B & C
5. SEE DETAILS ON SHEET D-1

REVISIONS			

CITY OF HAMPTON VIRGINIA
JULY 9 1849
HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

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SCALE: 1" = 20'

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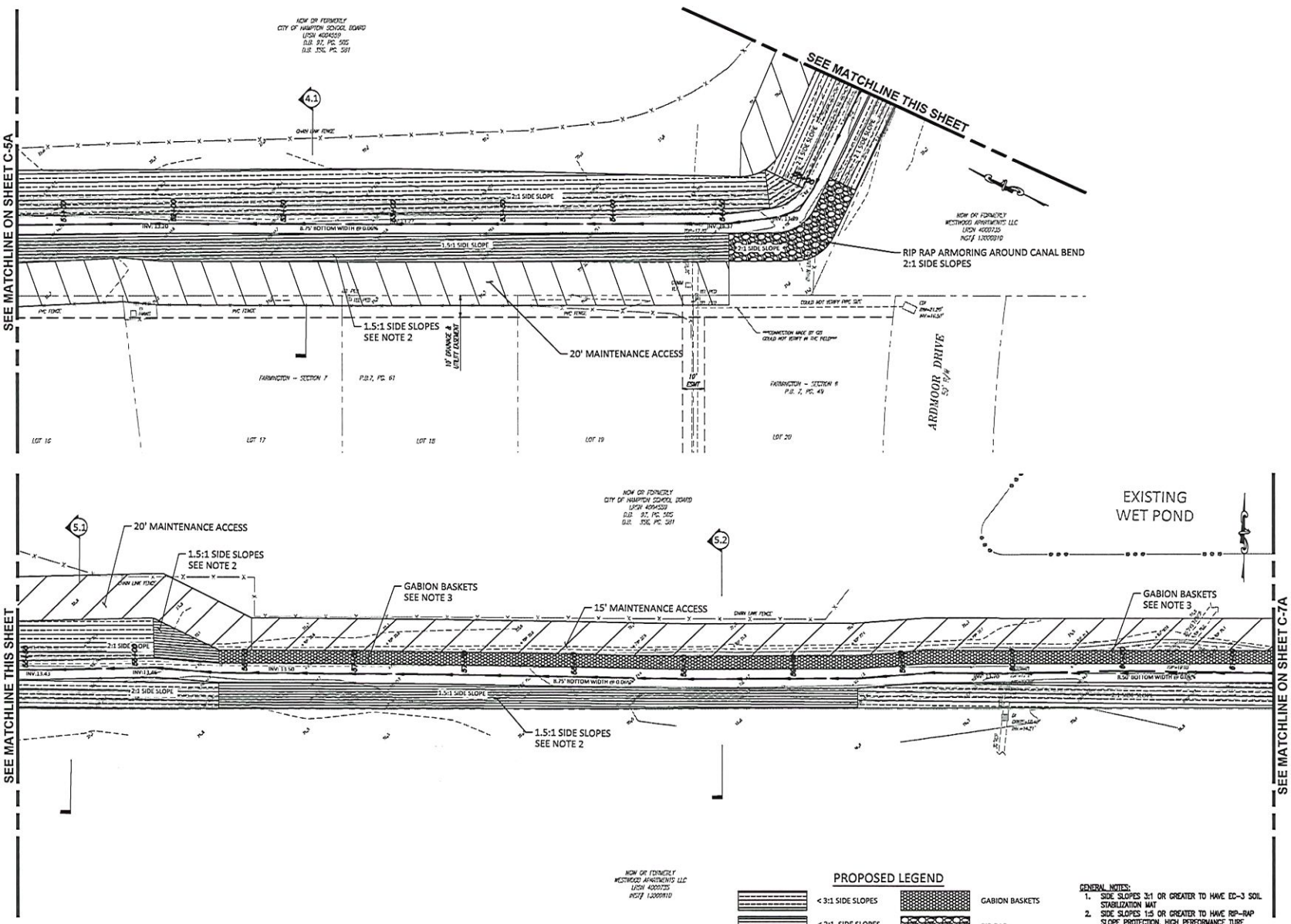
PROPOSED CONDITIONS MAINTENANCE

DRAWING NO.
C-5A

SCALE: 1" = 20'		
DATE: FEB 2023		SHEET 13 OF 25
DES: MDM	DRAWN: CSL	CHECK: LEA



GENERAL NOTES:

1. SIDE SLOPES 3:1 OR GREATER TO HAVE EC-3 SOIL STABILIZATION MAT
2. SIDE SLOPES 1:1 OR GREATER TO HAVE RIP-RAP SLOPE PROTECTION, HIGH PERFORMANCE TURF REINFORCEMENT MAT, FLEXAMAT OR EQUAL
3. USE GABION BASKETS, SCOURLOK, OR EQUAL
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5. SEE DETAILS ON SHEET D-1

REVISIONS		

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

0 10' 20' 40'

SCALE: 1" = 20'

SIGNATURE

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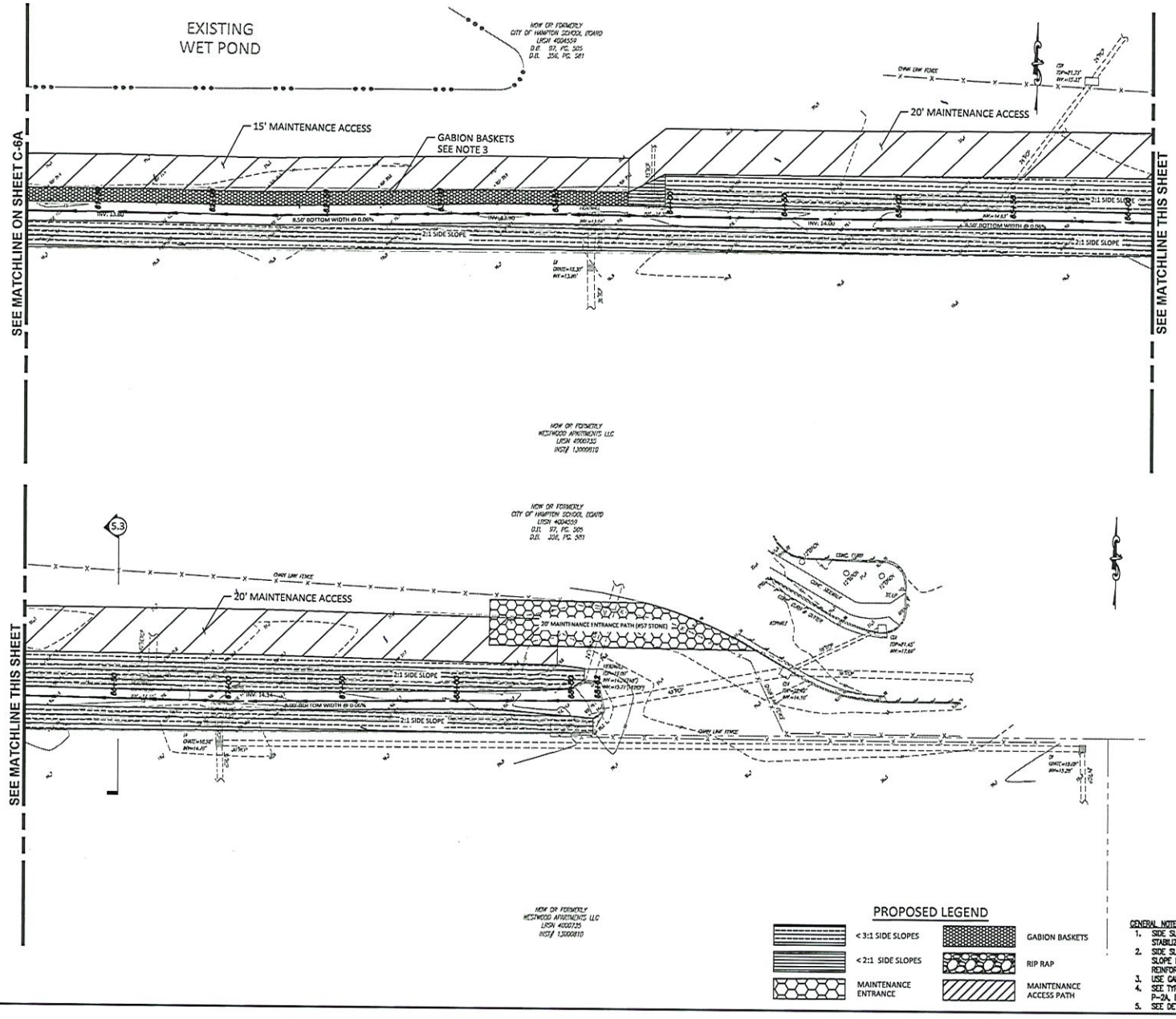
PROPOSED CONDITIONS MAINTENANCE

DRAWING NO.

C-6A

SCALE: 1" = 20'		
DATE: FEB 2023		SHEET 14 OF 28
DES: MDM	DRAWN: GSL	CHECK: LEA



GENERAL NOTES:

1. SIDE SLOPES 3:1 OR GREATER TO HAVE EC-3 SOIL STABILIZATION MAT
2. SIDE SLOPES 1:5 OR GREATER TO HAVE RIP-RAP SLOPE PROTECTION, HIGH PERFORMANCE TURF REINFORCEMENT MAT, FLEXAMAT OR EQUAL
3. USE GABION BASKETS, SCOURLOK, OR EQUAL
4. SEE TYPICAL CROSS-SECTIONS ON SHEET P-1A & P-2A, B & C
5. SEE DETAILS ON SHEET D-1

REVISIONS		

HAMPTON VA

FARMINGTON CANAL

KEY PLAN

GRAPHIC SCALES

0 10' 20' 40'

SCALE: 1" = 20'

SIGNATURE

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PROPOSED CONDITIONS MAINTENANCE

DRAWING NO.

C-7A

SCALE: 1" = 20'		
DATE: FEB 2023	SHEET 15 OF 28	
DES: MDM	DRAWN: GSL	CHECK: LRA