Ellicott City 'Safe and Sound' Plan: Flood Mitigation Options

Howard County Executive Calvin Ball
April 17, 2019

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Letter from the County Executive

Dear Neighbors,

Ellicott City has shown courage and resilience in response to two devastating floods. Our community is a symbol of strength, a center of commerce, and a jewel for our County, State, and Nation. We need bold, innovative solutions that won't be a "band-aid" for this town until the next storm, but a long term and sustainable plan that will reduce the amount of potential flood water in Ellicott City, making our town safer and respecting the taxpayer investment.

After I was sworn in as your county executive in December 2018, I announced the Ellicott City Safe and Sound plan. The multi-phase plan is about moving with urgency to improve safety, help businesses, and prepare for a changing climate by making communal decisions regarding Ellicott City's future.

Phase One had four focus areas: ensuring public safety, supporting business and property owners, maintaining Ellicott City's historic charm, and developing a more inclusive, community-driven process. We created an Emergency Public Alert System and cleared several tons of debris from our waterways. We provided flood mitigation assistance grants and deployed an ombudsman for Historic Ellicott City. We created a Community Development Corporation (CDC) Exploration Committee. We researched alternative plans that would allow us to protect some of our historic buildings that support Ellicott City's economy.

Phase Two builds upon Phase One and begins now. This stage of our Safe and Sound plan will include comprehensive infrastructure projects to better mitigate flooding and keep more flood water off Main Street. As I promised, I want this process to be transparent and collaborative. That is why we have created five flood mitigation plans for your consideration and input. We will be choosing a final plan in mid-May.

We are creating a future for Ellicott City that keeps people safe, preserves the historic and cultural value of Main Street, and gives businesses a reason to invest. Thank you for your continued input and support during this process.

Sincerely,

Calvin Ball
Howard County Executive

Executive Summary

To better safeguard Ellicott City against future flood events, we will invest in mitigation projects to create safer infrastructure and divert water. The 5 options presented in this document each represent a comprehensive collection of mitigation projects that decrease the impacts of flooding and preserve Main Street's economic vitality.

This document provides the following details on each option: the projects included, the estimated cost, as well as the overall impact on flood depths. Each of these plans varies slightly, but all present a stronger picture for the future of Ellicott City. Under the previous plan, a 100-year level storm would have left several feet of water on Main Street. We believe each of the five proposed options will remove more water from Main Street than the previous plan, based on the model runs.

OPTION 3F.5

- This plan is estimated to be 6 years and $91.5 million, including building acquisitions. The maximum flood depth on Lower Main, above Maryland Ave., would drop to 4 feet in a July 2016-level storm, 2-3 feet in a May 2018-level storm, and 2-3 feet in a 100 year-level storm.

OPTION 3G.5

- This plan is estimated to be 6 years and $79.5 million, including building acquisitions. The maximum flood depth on Lower Main, above Maryland Ave., would drop to 4 feet in a July 2016-level storm, 2-3 feet in a May 2018-level storm, and 3 feet in a 100 year-level storm.

OPTION 3G.6.0

- This plan is estimated to be 4 years and $63.0 million, including building acquisitions. The maximum flood depth on Lower Main, above Maryland Ave., would drop to 4-5 feet in a July 2016-level storm, 2-3 feet in a May 2018-level storm, and 2-3 feet in a 100 year-level storm.

OPTION 3G.7.0

- This plan is estimated to be 5 years and between $113.5 - $140.5 million, including building acquisitions. The maximum flood depth on Lower Main, above Maryland Ave., would drop to 3 feet in a July 2016-level storm, less than 1 foot in a May 2018-level storm, and less than 1 foot in a 100 year-level storm.

OPTION 3G.8.0

- This plan is estimated to be 7 years and between $135 - $175 million, including building acquisitions. The maximum flood depth on Lower Main, above Maryland Ave., would drop to 2-3 feet in a July 2016-level storm, less than 1 foot in a May 2018-level storm, and less than 1 foot in a 100 year-level storm.

Flood Mitigation Options Comparison

	Previous 5-Year Plan (16C)	Option 3F.5	Option 3G.5	Option 3G.6.0	Option 3G.7.0	Option 3G.8.0
Modified Floodplain	10 Buildings Removed	4 Buildings Removed	6 Buildings Removed	4 Buildings Removed	4 Buildings Removed	4 Buildings Removed
Quaker Mill Pond	✔	✔	✔	✔	✔	✔
Lot D Channel Expansion (Hudson Bend)	✔	✔	✔	✘	✘	✘
T-1 Pond	✘	✔	✔	✔	✔	✔
H-7 Pond	✔	✔	✔	✔	✔	✔
NC-3 Pond	✘	✘	✔	✔	✔	✔
Maryland Avenue Culverts	✔	✔	✔	✔	✔	✔
West End Floodplain & Conveyance Projects	✔	✔	✔	✔	✔	✔
H1-UG1 and H8-UG1	✘	✔	✘	✘	✘	✘
H1-UG2	✘	✔	✘	✘	✘	✘
H-4 Pond	✘	✔	✘	✔	✔	✔
H-3 Pond	✘	✔	✘	✘	✘	✘
H8-UG2, H8-UG3, and H8-UG4	✘	✔	✘	✘	✘	✘
North Tunnel	✘	✘	✘	✘	✔	✔
South Tunnel	✘	✘	✘	✘	✘	✔
Average Depth*	4.1 feet	2.7 feet	3.2 feet	3.6 feet	2 feet	1.7 feet
Estimated Cost	$56.5 million	$91.5 million	$79.5 million	$63.5 million	$113.5 - $140.5 million	$136 - $175 million
Estimated Timeline	5 years	6 years	6 years	4 years	5 years	7 years

**Average depth from Caplan's to Maryland Ave. during July 2016 storm conditions*

Water Depths Comparison

	Previous 5 year plan (16C)	Option 3F.5	Option 3G.5	Option 3G.6.0	Option 3G.7.0	Option 3G.8.0
Max Depth - Lower Main (100 year storm)*	4.5 feet	2 to 3 feet	3 feet	2 to 3 feet	Less than 1 foot	Less than 1 foot
Average Depth, Caplan's to Md Ave (100 year storm)	3.2 feet	1.7 feet	1.8 feet	2.1 feet	0.4 feet	0.3 feet
Max Depth - Lower Main (July 2016 storm)*	5.5 feet	4 feet	4 feet	4 to 5 feet	3 feet	2 to 3 feet
Average Depth, Caplan's to Md Ave (July 2016 storm)	4.1 feet	2.7 feet	3.2 feet	3.6 feet	2 feet	1.7 feet
Max Depth - Lower Main (May 2018 storm)*	Unknown	2 to 3 feet	2 to 3 feet	2 to 3 feet	Less than 1 foot	Less than 1 foot
Average Depth, Caplan's to Md Ave (May 2018 storm)	Unknown	1.2 feet	1.5 feet	1.8 feet	0.2 feet	0.2 feet

**Maximum depth reflects water depths on Lower Main Street above Maryland Avenue.*

OPTION 3F.5

What's included?

Quaker Mill Dry Flood Mitigation Pond	YES
Lot D Channel Expansion	YES
T-1 Dry Flood Mitigation Pond	YES
H-7 Dry Flood Mitigation Pond	YES
NC-3 Dry Flood Mitigation Pond	NO
Maryland Ave Culvert	YES
WE Floodplain	YES
WE Conveyance	YES
H1-UG1 & H8-UG1 Lot F/Roger Carter	YES
H1-UG2	YES
H4 Dry Flood Mitigation Pond	YES
H-3 Dry Flood Mitigation Pond	YES
H8-UG2, H8-UG3, H8-UG4	YES
North Tunnel	NO
South Tunnel	NO

Each specific project description and cost is found in the Appendix.

What's the timeline?

- Individual projects would be completed between FY19 and FY25, all of Option 3F.5 would be completed in 6 years.

What will it cost?

- The total, estimated cost is $91.5 million. This number includes building acquisition costs.

What is the impact?

- The maximum flood depth on Lower Main, above Maryland Ave., would drop to 4 feet in a July 2016-level storm, 2-3 feet in a May 2018-level storm, and 2-3 feet in a 100 year-level storm.

For more details on Option 3F.5, as well as a comparison of all Options, turn to the Appendix.

OPTION 3G.5

What's included?

Quaker Mill Dry Flood Mitigation Pond	YES
Lot D Channel Expansion	YES
T-1 Dry Flood Mitigation Pond	YES
H-7 Dry Flood Mitigation Pond	YES
NC-3 Dry Flood Mitigation Pond	YES
Maryland Ave Culvert	YES
WE Floodplain	YES
WE Conveyance	YES
H1-UG1 & H8-UG1 Lot F/Roger Carter	NO
H1-UG2	NO
H4 Dry Flood Mitigation Pond	NO
H-3 Dry Flood Mitigation Pond	NO
H8-UG2, H8-UG3, H8-UG4	NO
North Tunnel	NO
South Tunnel	NO

Each specific project description and cost is found in the Appendix.

What's the timeline?

- Individual projects would be completed between FY19 and FY25, all of Option 3G.5 would be completed in 6 years.

What will it cost?

- The total, estimated cost is $79.5 million. This number includes building acquisition costs.

What is the impact?

- The maximum flood depth on Lower Main, above Maryland Ave., would drop to 4 feet in a July 2016-level storm, 2-3 feet in a May 2018-level storm, and 3 feet in a 100 year-level storm.

For more details on Option 3G.5, as well as a comparison of all Options, turn to the Appendix.

OPTION 3G.6.0

What's included?

Quaker Mill Dry Flood Mitigation Pond	YES
Lot D Channel Expansion	NO
T-1 Dry Flood Mitigation Pond	YES
H-7 Dry Flood Mitigation Pond	YES
NC-3 Dry Flood Mitigation Pond	NO
Maryland Ave Culvert	YES
WE Floodplain	YES
WE Conveyance	YES
H1-UG1 & H8-UG1 Lot F/Roger Carter	NO
H1-UG2	NO
H4 Dry Flood Mitigation Pond	YES
H-3 Dry Flood Mitigation Pond	NO
H8-UG2, H8-UG3, H8-UG4	NO
North Tunnel	NO
South Tunnel	NO

Each specific project description and cost is found in the Appendix.

What's the timeline?

- Individual projects would be completed between FY 19 and FY23, all of Option 3G.6.0 would be completed in 4 years.

What will it cost?

- The total, estimated cost is $63.0 million. This number includes building acquisition costs.

What is the impact?

- The maximum flood depth on Lower Main, above Maryland Ave., would drop to 4-5 feet in a July 2016-level storm, 2-3 feet in a May 2018-level storm, and 2-3 feet in a 100 year-level storm.

For more details on Option 3G.6.0, as well as a comparison of all Options, turn to the Appendix.

OPTION 3G.7.0

What's included?

Quaker Mill Dry Flood Mitigation Pond	YES
Lot D Channel Expansion	NO
T-1 Dry Flood Mitigation Pond	YES
H-7 Dry Flood Mitigation Pond	YES
NC-3 Dry Flood Mitigation Pond	YES
Maryland Ave Culvert	YES
WE Floodplain	YES
WE Conveyance	YES
H1-UG1 & H8-UG1 Lot F/Roger Carter	NO
H1-UG2	NO
H4 Dry Flood Mitigation Pond	YES
H-3 Dry Flood Mitigation Pond	NO
H8-UG2, H8-UG3, H8-UG4	NO
North Tunnel	YES
South Tunnel	NO

Each specific project description and cost is found in the Appendix.

What's the timeline?

- Individual projects would be completed between FY19 and FY24, all of Option 3G.7.0 would be completed in 5 years.

What will it cost?

- The total, estimated cost is between $113.5 - $140.5 million. These numbers include building acquisition costs.

What is the impact?

- The maximum flood depth on Lower Main, above Maryland Ave., would drop to 3 feet in a July 2016-level storm, less than one foot in a May 2018-level storm, and less than one foot in a 100 year-level storm.

For more details on Option 3G.7.0, as well as a comparison of all Options, turn to the Appendix.

OPTION 3G.8.0

What's included?

Quaker Mill Dry Flood Mitigation Pond	YES
Lot D Channel Expansion	NO
T-1 Dry Flood Mitigation Pond	YES
H-7 Dry Flood Mitigation Pond	YES
NC-3 Dry Flood Mitigation Pond	YES
Maryland Ave Culvert	YES
WE Floodplain	YES
WE Conveyance	YES
H1-UG1 & H8-UG1 Lot F/Roger Carter	NO
H1-UG2	NO
H4 Dry Flood Mitigation Pond	YES
H-3 Dry Flood Mitigation Pond	NO
H8-UG2, H8-UG3, H8-UG4	NO
North Tunnel	YES
South Tunnel	YES

Each specific project description and cost is found in the Appendix.

What's the timeline?

- Individual projects would be completed between FY19 and FY26, all of Option 3G.8.0 would be completed in 7 years.

What will it cost?

- The total, estimated cost is $135 - $175 million. These numbers include building acquisition costs.

What is the impact?

- The maximum flood depth on Lower Main, above Maryland Ave., would drop to 2-3 feet in a July 2016-level storm, less than one foot in a May 2018-level storm, and less than one foot in a 100 year-level storm

For more details on Option 3G.8.0, as well as a comparison of all Options, turn to the Appendix.

Next Steps

A public meeting has been scheduled to provide community input on the plan's second phase. The meeting will take place on May 2, 2019 in the Howard High School cafeteria (8700 Old Annapolis Road in Ellicott City) at 7:00 PM.

During this meeting County Executive Ball, along with representatives from county departments, will provide a brief overview of the initiatives included in Phase 2 of the plan and will be ready to address your questions and concerns.

Comments can also be submitted at ECSafeandSound.org or via email at ecsafeandsound@howardcountymd.gov

A final decision on a flood mitigation plan will be made in May.

Phase Two of the Safe and Sound Plan also includes:

- Building Acquisition, Demolition, and Renovation
- Emergency, Public Access Points
- Capital Projects Tracker
- Resuming the Ellicott City Master Plan

For more details visit ECSafeandSound.Org

Appendix

A. Project Costs***

PROJECT	ESTIMATED COST
Quaker Mill Dry Flood Mitigation Pond	$2,500,000
Lot D Channel Expansion	$20,000,000
T-1	$20,000,000
H-7	$5,000,000
NC-3	$5,000,000
MD Avenue Culverts	$3,000,000
West End Improvements	$5,000,000
H1-UG-1, H8-UG-1 (Roger Carter)	$3,000,000
H1-UG-2	$3,000,000
H-4	$4,000,000
H-3	$2,000,000
H8-UG2, H8-UG3, H8-UG4	$5,000,000
North Tunnel	$50,000,000 to $77,000,000
South Tunnel	$22,500,000 to $34,500,000

***These individual project costs do NOT include building acquisition costs. The cost of acquisitions is dependent on scenario and cannot be accurately reflected in the project cost.

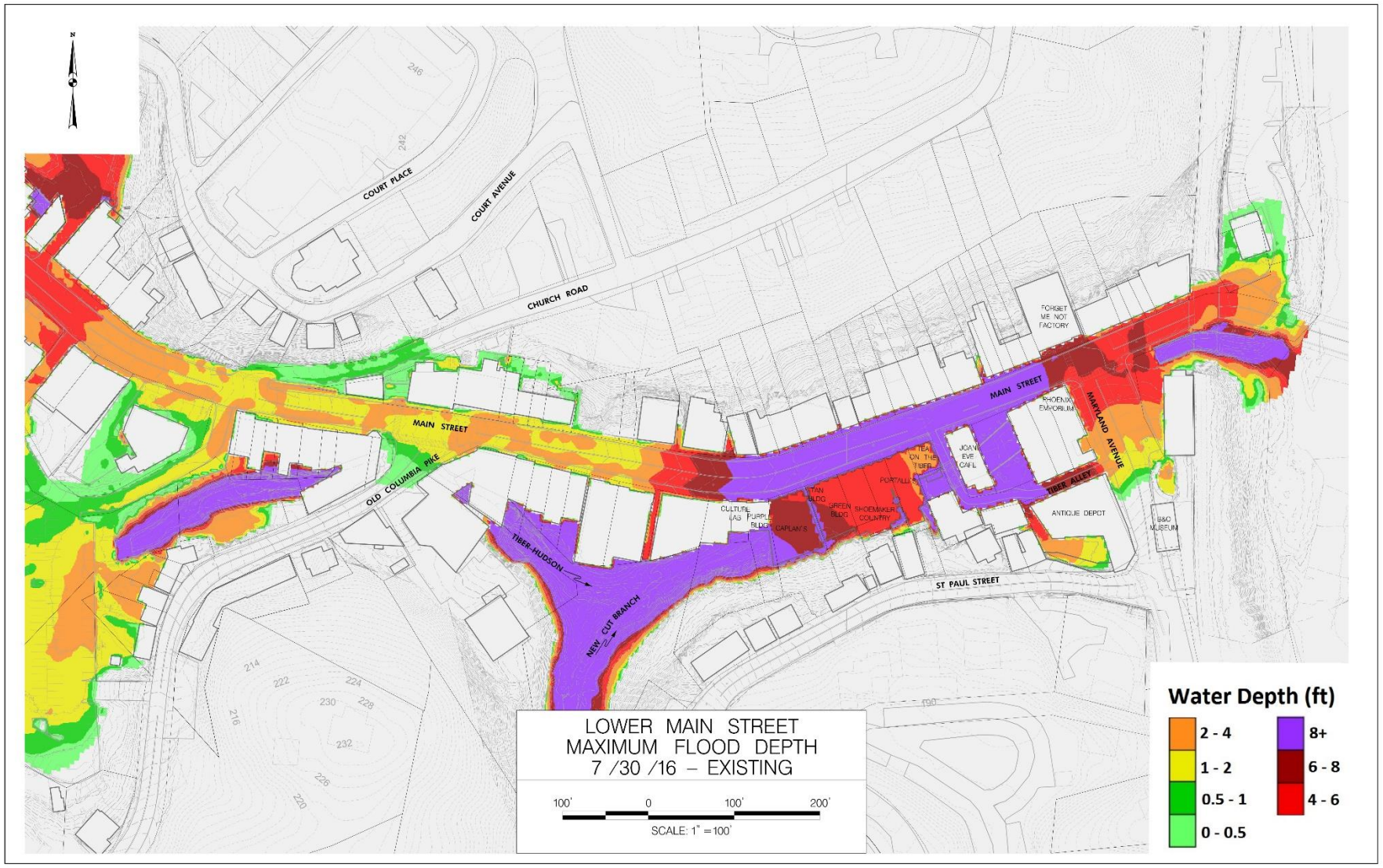
B. Project Descriptions

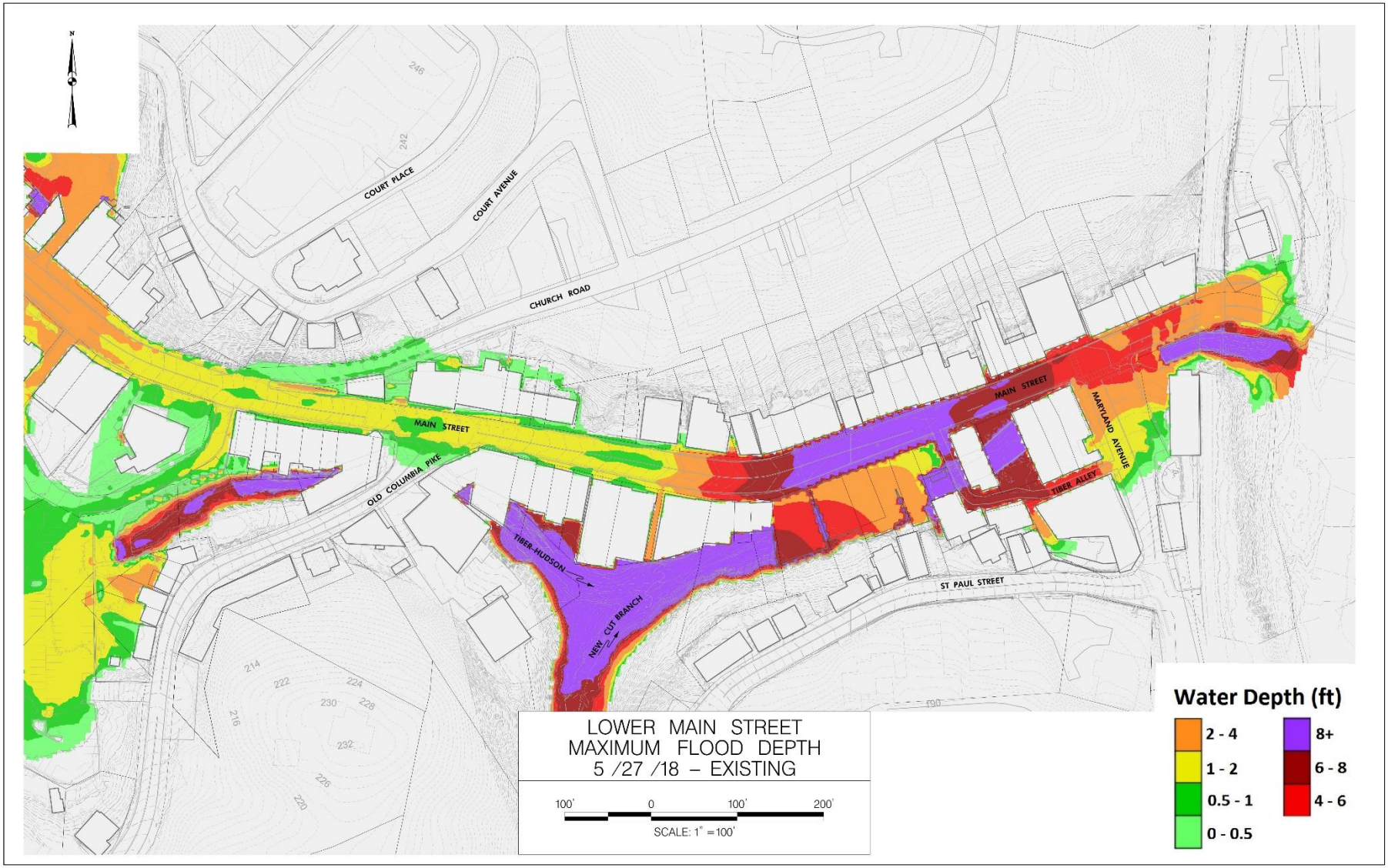
PROJECT	DESCRIPTION
Quaker Mill Dry Flood Mitigation Pond	A 10-acre-foot dry flood mitigation pond off Rogers Avenue
Lot D Channel Expansion	A project to widen the stream channel between Lots F and E and widen the culvert under Main Street at the Brewery
T-1	A 70-acre-foot dry flood mitigation pond located on the Tiber tributary
H-7	A 13-acre- dry flood mitigation pond located in the US 29/US40 interchange
NC-3	A 63-acre-foot dry flood mitigation pond located the Autumn Branch in the New Cut watershed
MD Avenue Culverts	Two 10-ft diameter pipes installed under Maryland Ave connecting the Tiber Hudson to the Patapsco
West End Improvements	8977 Frederick Road Upsize Culvert 8600 Frederick Road Replace 84/108 Pipe 8600 Frederick Road Construct High Flow By Pass Pipe 8552 Frederick Road Construct Diversion Berm 8534 Frederick Road Construct High Flow By Pass Pipe Rogers Avenue Storm Drain Improvements
H1-UG-1, H8-UG-1, Roger Carter	An underground storage facility located under Parking Lot F and under Parking Lot G (formerly the Old Roger Carter Center)
H1-UG-2	An underground storage facility located at the West End Service.
H-4	A 15.6-acre-foot dry flood mitigation pond
H-3	An 11-acre-foot dry flood mitigation pond
H8-UG2, H8-UG3, H8-UG4	A 9.5-acre-foot and an 11-acre-foot underground pipe storage facility located within the BGE right of way
North Tunnel	A 15-ft diameter tunnel Bore running 1600-ft, beginning in Lot F and running to the Patapsco River on the north side of Main Street
South Tunnel	A 15-ft diameter tunnel Bore running 700 feet, beginning in the New Cut tributary and running to the Patapsco River on the south side of Main Street

C. Average Flood Velocities in Feet Per Second (FPS) for 2016 Flood

Area along Main Street	Distance on Road Profile (feet)	Existing (FPS)	16C (FPS)	3F.5 (FPS)	3G.5 (FPS)	3G.6.0 (FPS)	3G.7.0 (FPS)	3G.8.0 (FPS)
Old Col. Pk to MD Ave (entire length previously provided)	0-840	10.3	3.0	3.0	3.1	6.4	2.9	2.8
Abbreviated length – Appx. Caplans to MD Ave	430-840	11.1	2.8	2.8	2.9	4.3	2.6	2.5
Abbreviated length – Appx. Tea on Tiber to MD Ave	600-840	13.9	3.5	3.0	3.3	3.0	2.5	2.4

Lower Main Street Comparison

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COURT AVENUE
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MAIN STREET
OLD COLUMBIA PIKE
TIBER HUDSON
NEW CUT BRANCH
ST PAUL STREET
MARYLAND AVENUE
TIBER ALLEY
LOWER MAIN STREET
MAXIMUM FLOOD DEPTH
5 /27 /18 – EXISTING
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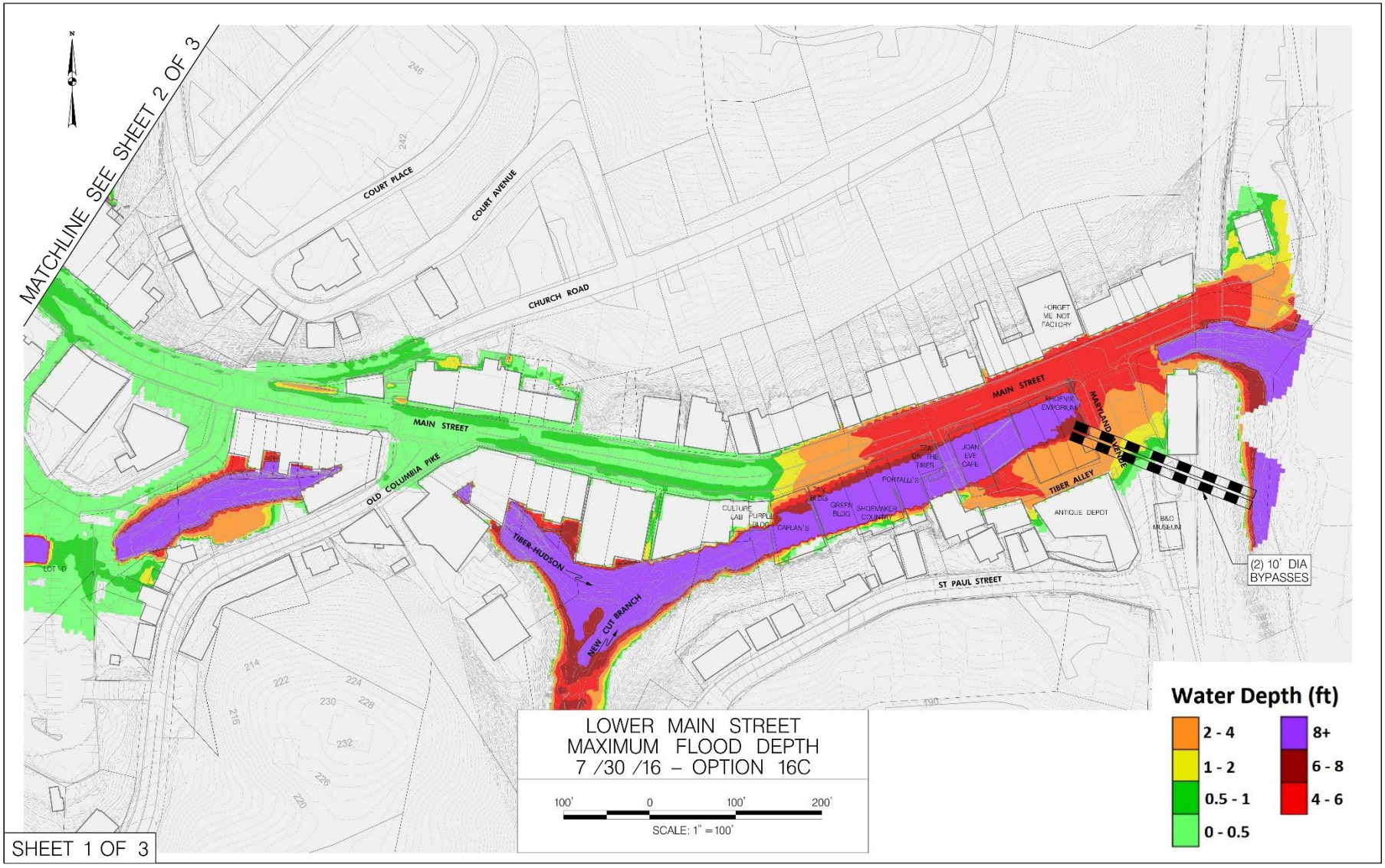
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MAIN STREET
MARYLAND AVENUE
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NEW CUT BRANCH
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LOWER MAIN STREET
MAXIMUM FLOOD DEPTH
7/30/16 – OPTION 16C
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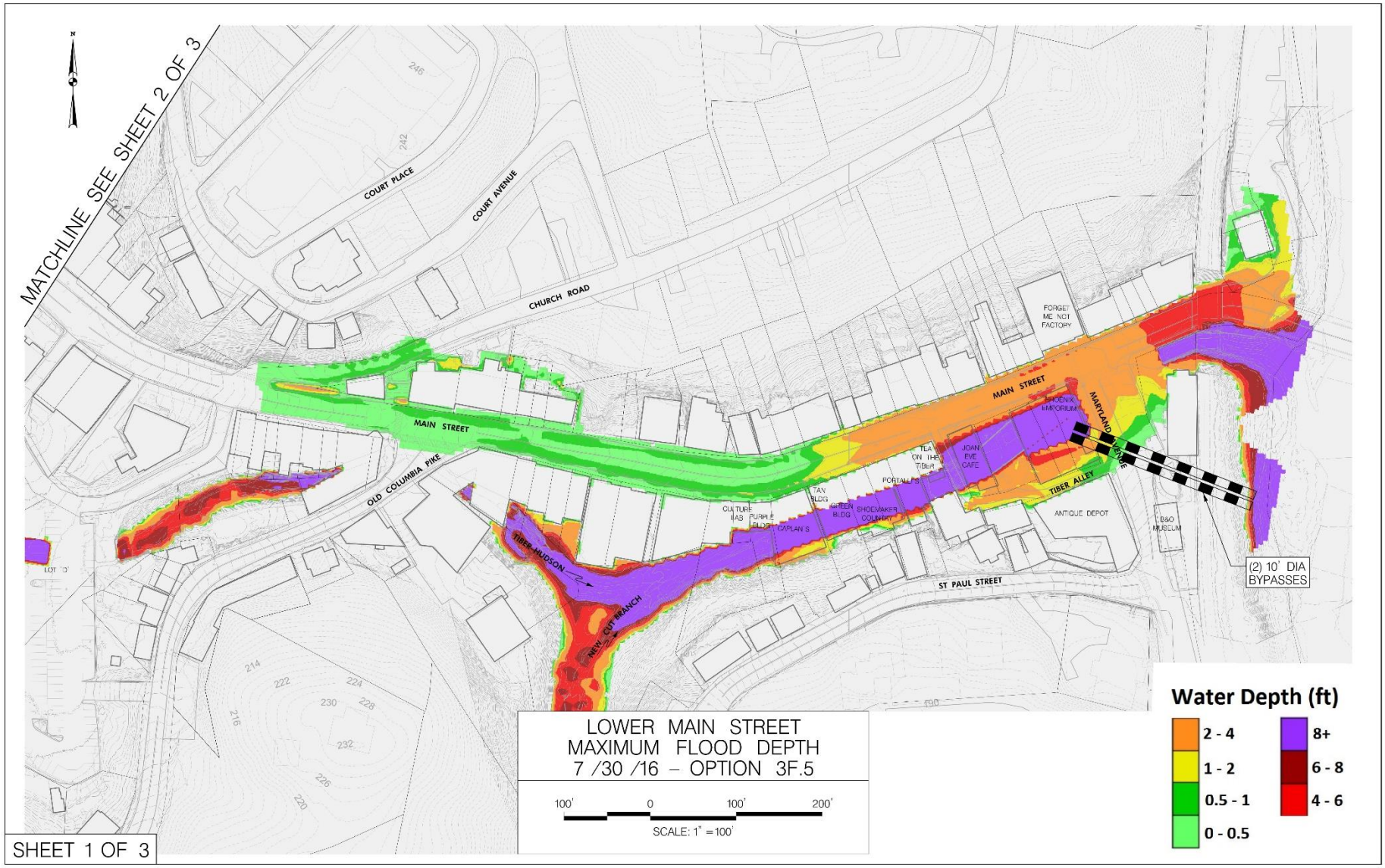
SHEET 1 OF 3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NEW CUT BRANCH
ST PAUL STREET
TIBER ALLEY
MARYLAND AVENUE
FORGET ME NOT FACTORY
PHOENIX EMPORIUM
TEA ON THE TIBER
JOANN EVE CAFE
PORTALO'S
TAV BLDG
CULTURE HAB
PURPLE BLDG
GREEN BLDG
SHOEMAKER COUNTRY
CAPLAN'S
ANTIQUE DEPOT
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7 /30 /16 – OPTION 3F.5
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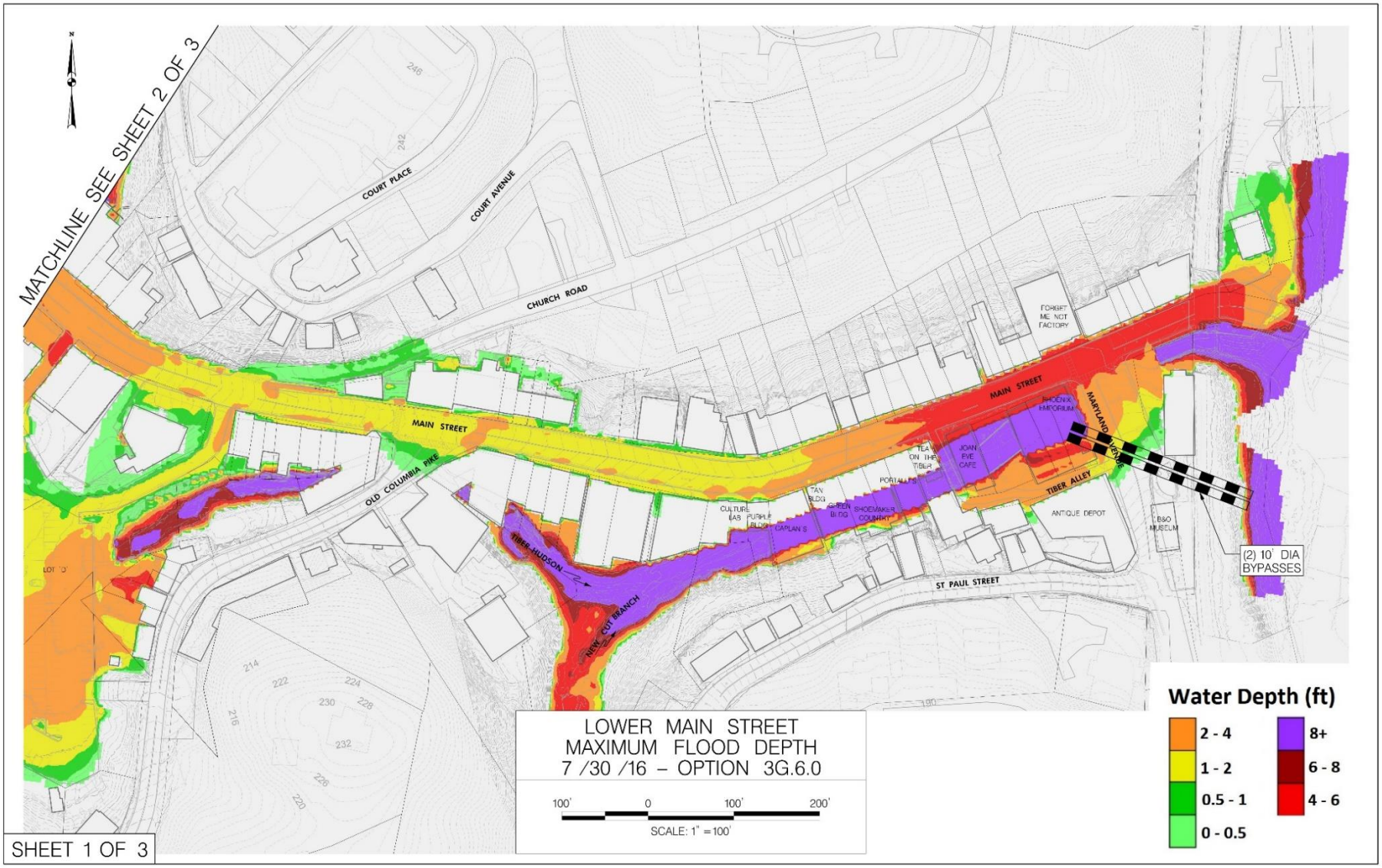
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7 /30 /16 – OPTION 3G.6.0
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Water Depth (ft)
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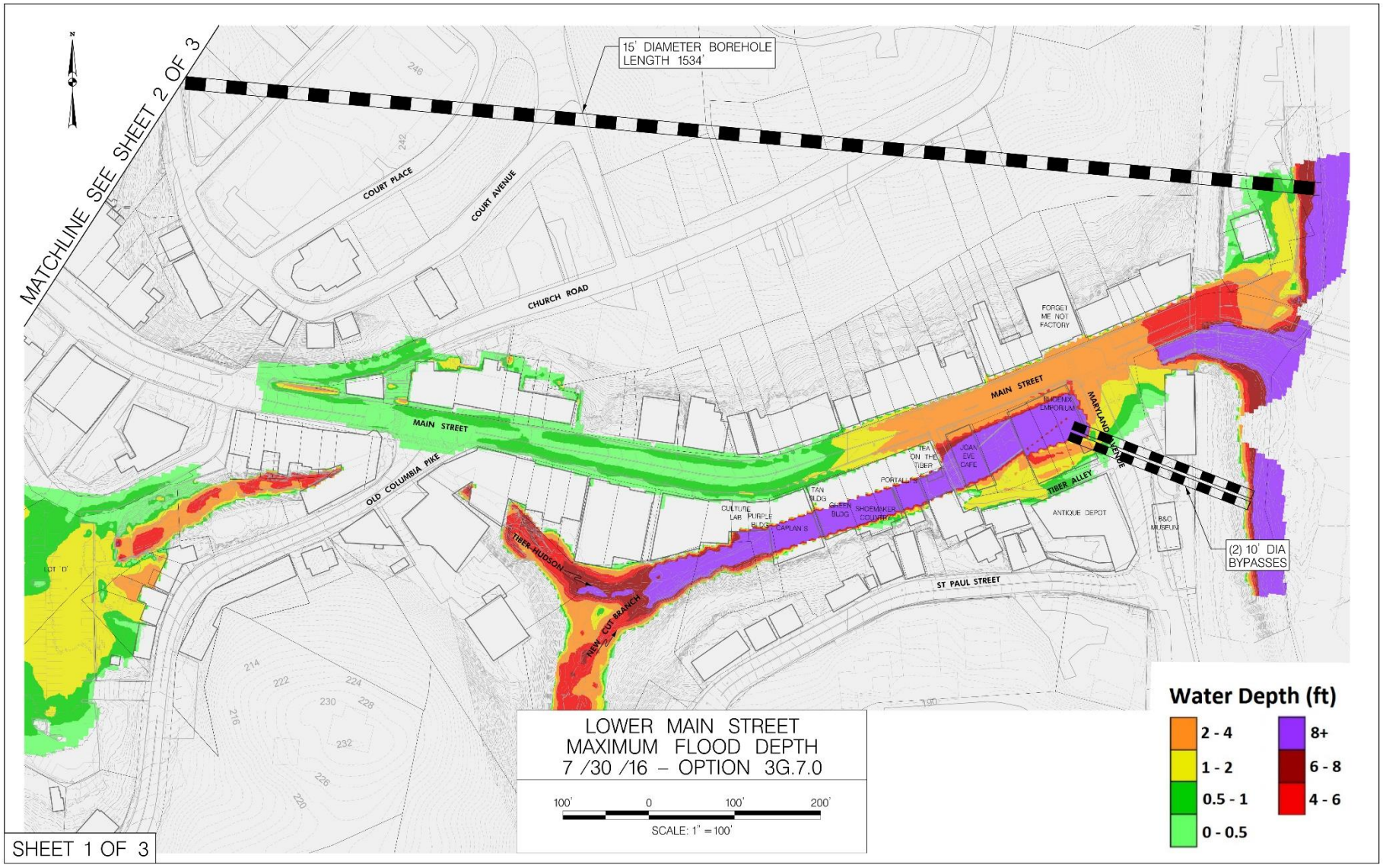
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15' DIAMETER BOREHOLE
LENGTH 1534'
COURT PLACE
COURT AVENUE
CHURCH ROAD
MAIN STREET
OLD COLUMBIA PIKE
FORGET ME NOT FACTORY
PHOENIX EMPORIUM
MARYLAND AVENUE
TEA ON THE TIBER
JOAN EVE CAFE
PORTAL
TAN BLDG
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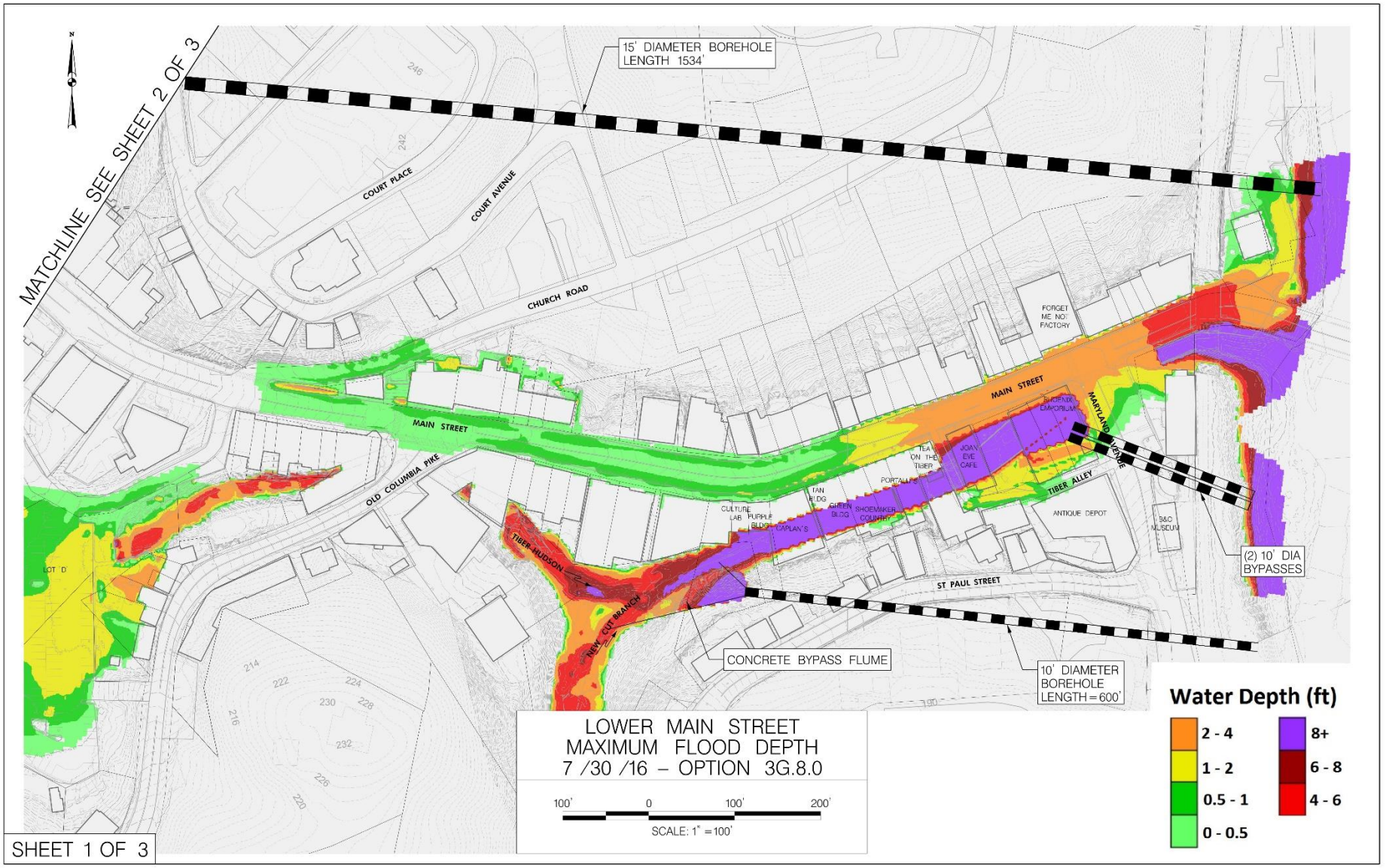
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15' DIAMETER BOREHOLE
LENGTH 1534'
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COURT AVENUE
CHURCH ROAD
MAIN STREET
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CAPLAN'S
TAN BLDG
GREEN BLDG
SHOEMAKER COUNTRY
PORTALUPI
TIBER-HUDSON
NEW CUT BRANCH
ST PAUL STREET
CONCRETE BYPASS FLUME
10' DIAMETER BOREHOLE LENGTH = 600'
LOT D
LOWER MAIN STREET
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 3G.8.0
100' 0 100' 200'
SCALE: 1" = 100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
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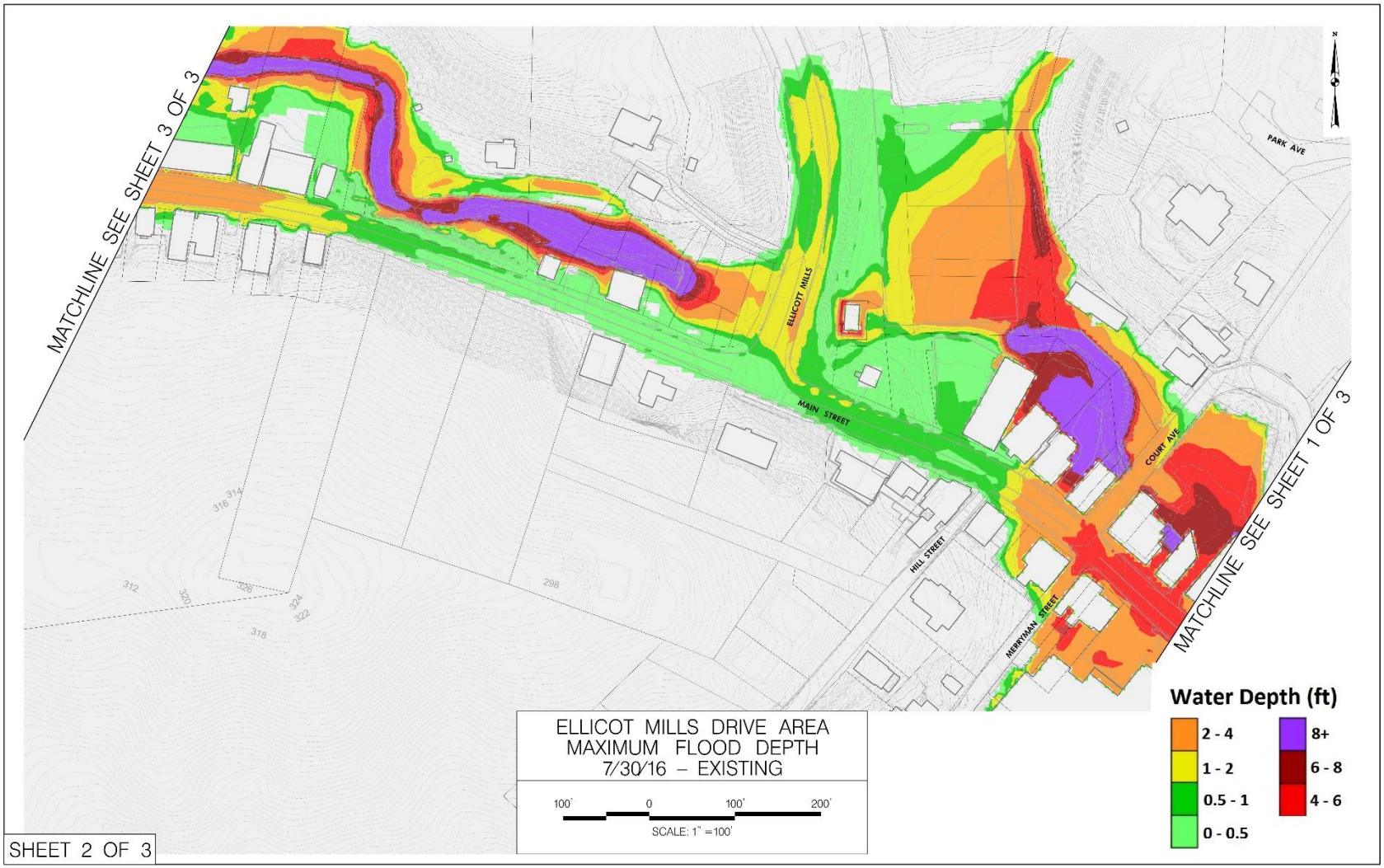
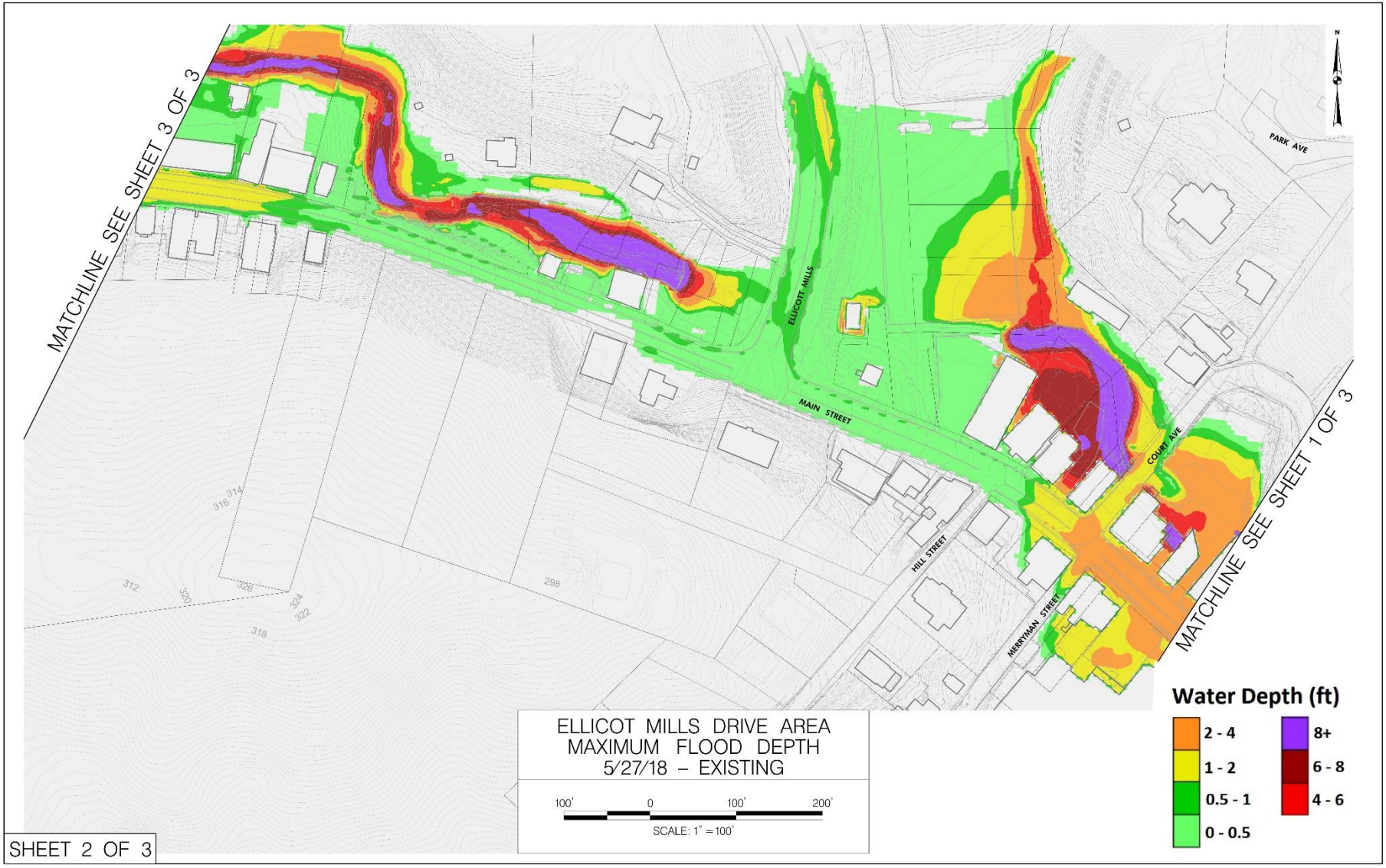
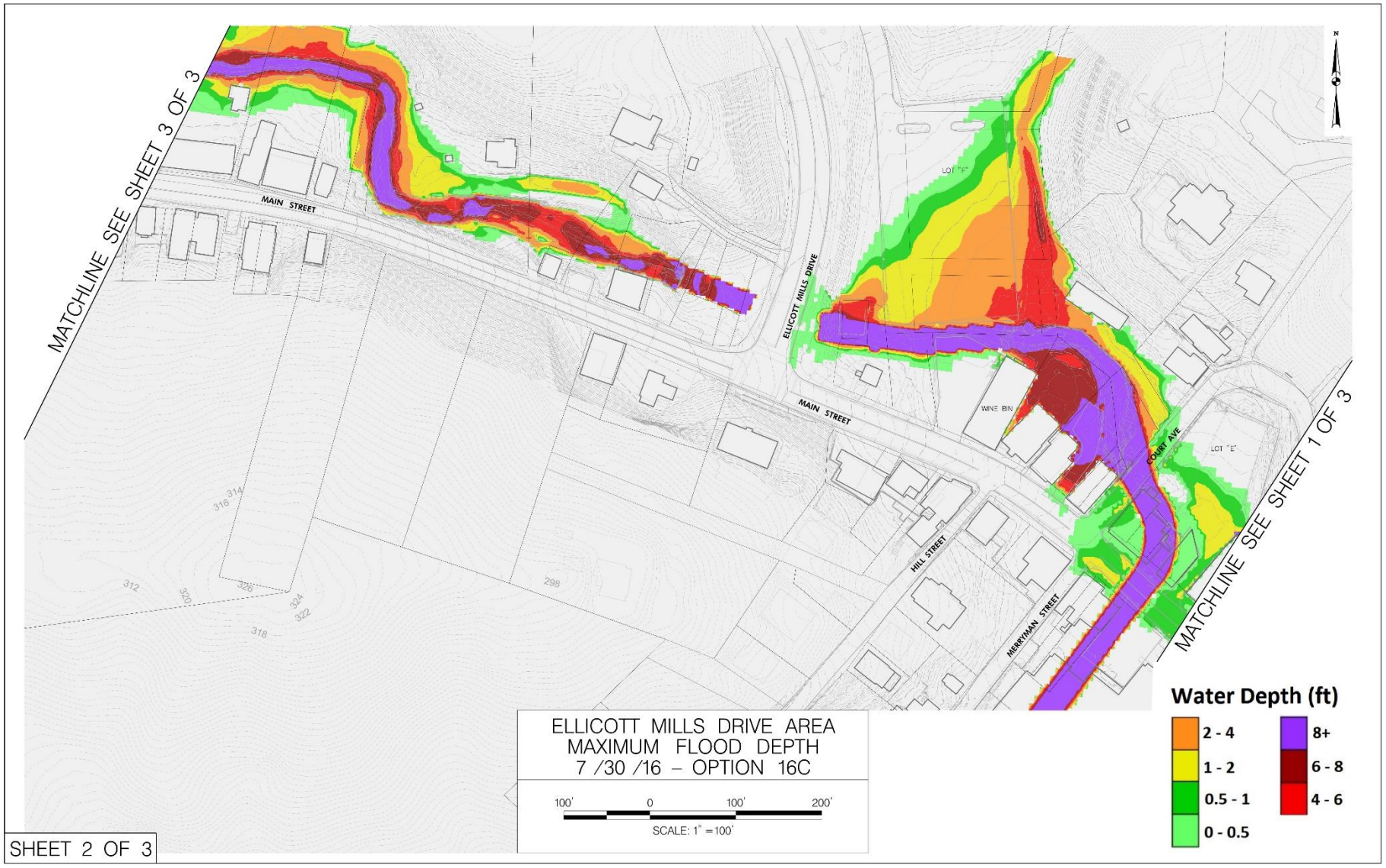
SHEET 1 OF 3

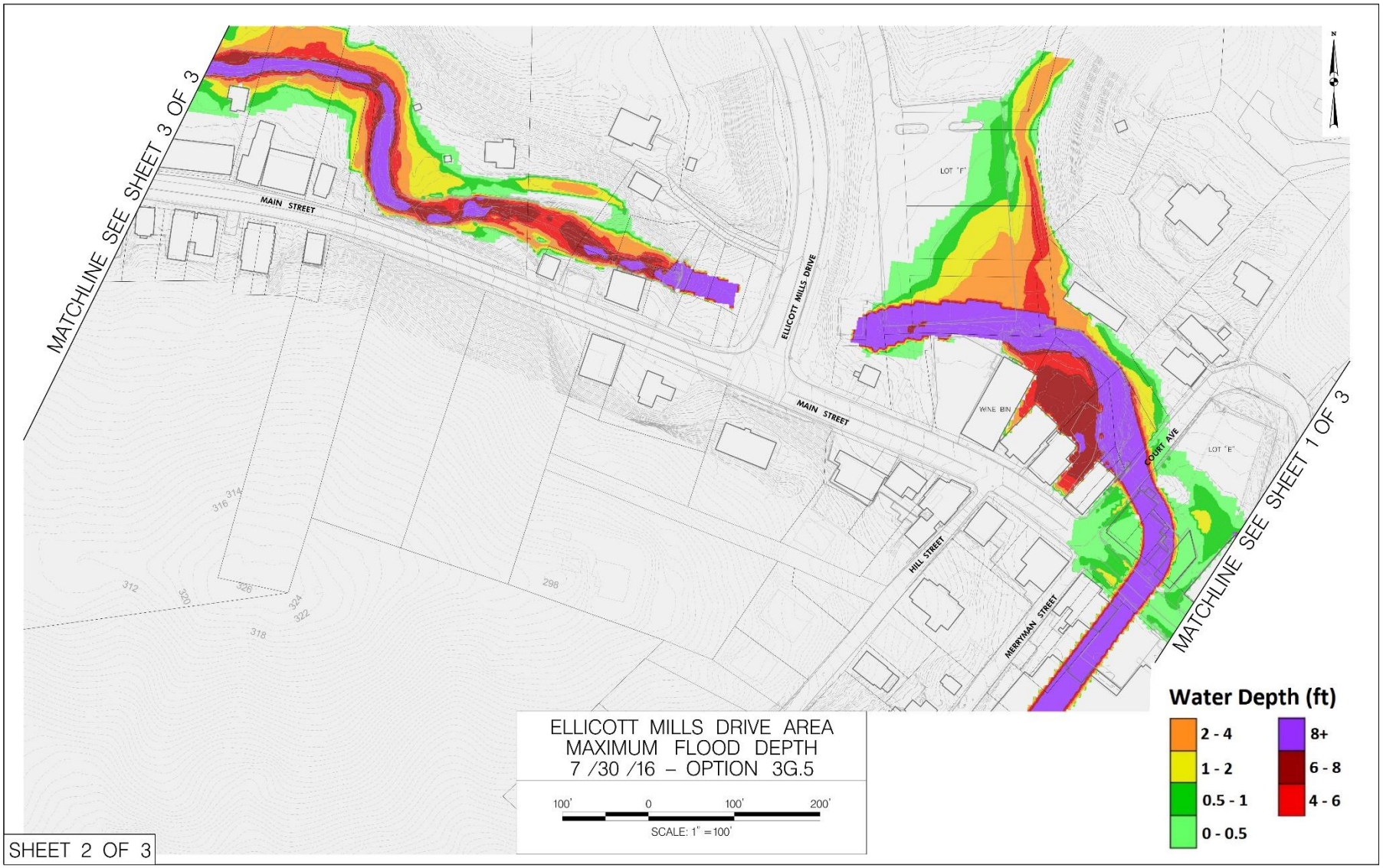
Ellicott Mills Comparison

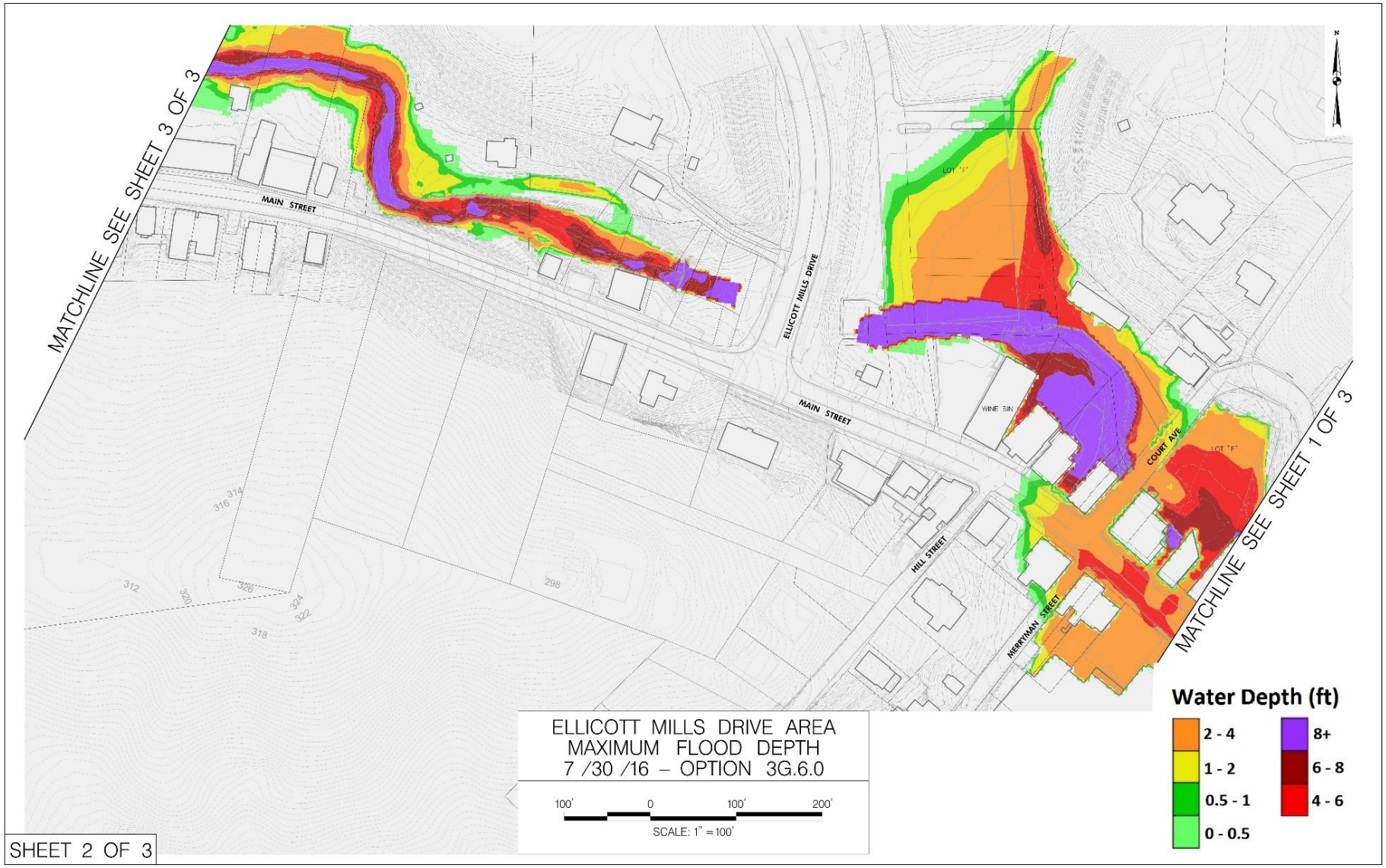



MATCHLINE SEE SHEET 3 OF 3
MATCHLINE SEE SHEET 1 OF 3
MAIN STREET
ELLICOTT MILLS
HILL STREET
COURT AVE
MERRYMAN STREET
PARK AVE
316
314
312
320
326
324
322
318
298
ELLICOT MILLS DRIVE AREA
MAXIMUM FLOOD DEPTH
5/27/18 – EXISTING
100' 0 100' 200'
SCALE: 1" = 100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
SHEET 2 OF 3


MATCHLINE SEE SHEET 3 OF 3
MAIN STREET
ELLICOTT MILLS DRIVE
MAIN STREET
WINE BIN
COURT AVE
LOT "F"
LOT "E"
HILL STREET
MERRYMAN STREET
MATCHLINE SEE SHEET 1 OF 3
316
314
312
320
326
324
322
318
298
ELLICOTT MILLS DRIVE AREA
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 16C
100' 0 100' 200'
SCALE: 1" =100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
SHEET 2 OF 3


MATCHLINE SEE SHEET 3 OF 3
MAIN STREET
ELLICOTT MILLS DRIVE
MAIN STREET
LOT "F"
WINE BIN
COURT AVE
LOT "E"
HILL STREET
MERRYMAN STREET
MATCHLINE SEE SHEET 1 OF 3
316
314
312
320
326
324
322
318
298
ELLICOTT MILLS DRIVE AREA
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 3F.5
100' 0 100' 200'
SCALE: 1" = 100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
SHEET 2 OF 3

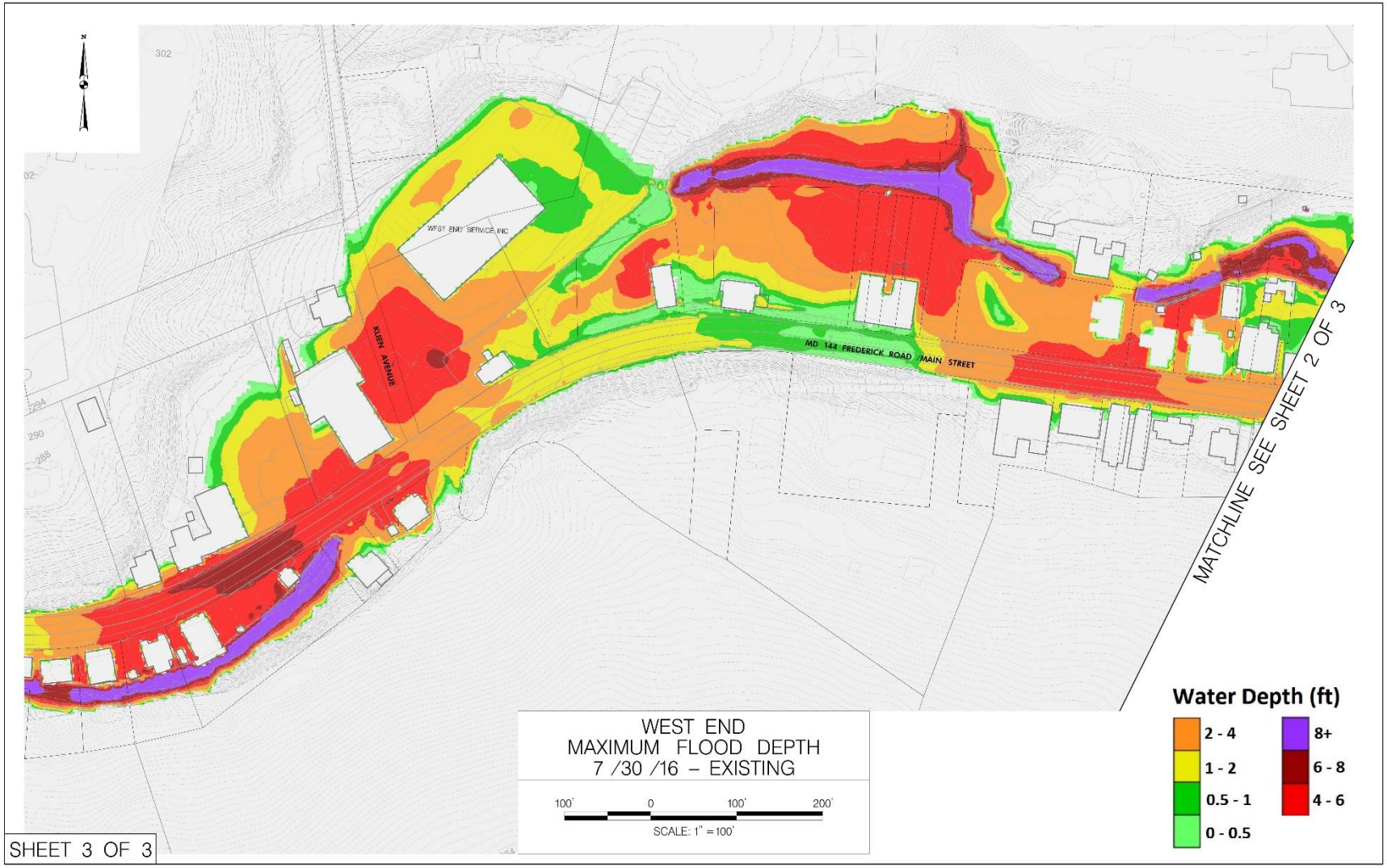

MATCHLINE SEE SHEET 3 OF 3
MATCHLINE SEE SHEET 1 OF 3
MAIN STREET
MAIN STREET
ELLICOTT MILLS DRIVE
HILL STREET
MERRYMAN STREET
COURT AVE
WINE BIN
LOT "F"
LOT "E"
316
314
312
320
326
324
322
318
298
ELLICOTT MILLS DRIVE AREA
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 3G.5
100' 0 100' 200'
SCALE: 1" =100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
SHEET 2 OF 3

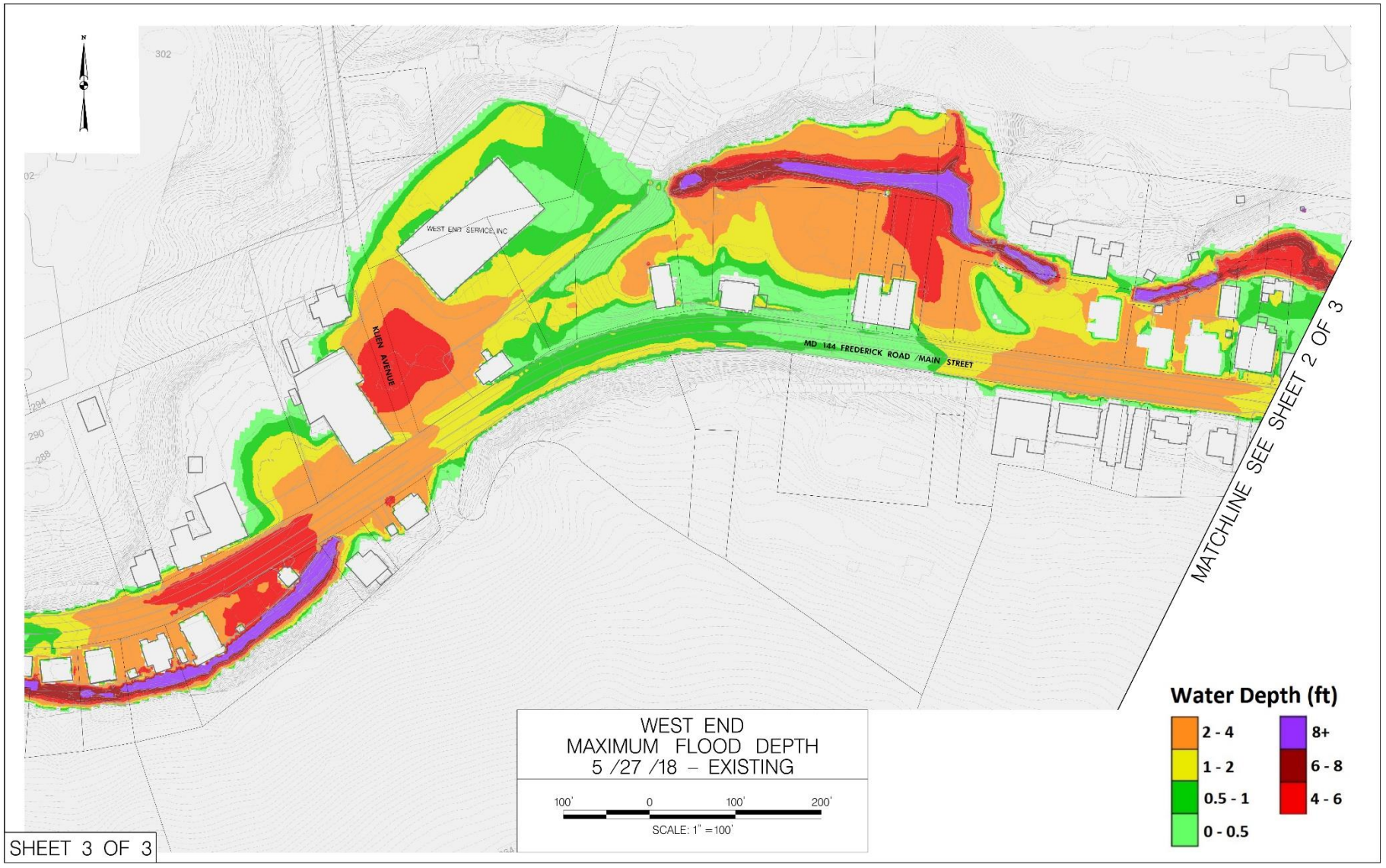

MATCHLINE SEE SHEET 3 OF 3
MATCHLINE SEE SHEET 1 OF 3
MAIN STREET
MAIN STREET
ELLICOTT MILLS DRIVE
COURT AVE
HILL STREET
MERRYMAN STREET
WINE BIN
LOT "F"
LOT "F"
316
314
312
320
326
324
322
318
298
ELLICOTT MILLS DRIVE AREA
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 3G.6.0
100' 0 100' 200'
SCALE: 1" = 100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
SHEET 2 OF 3

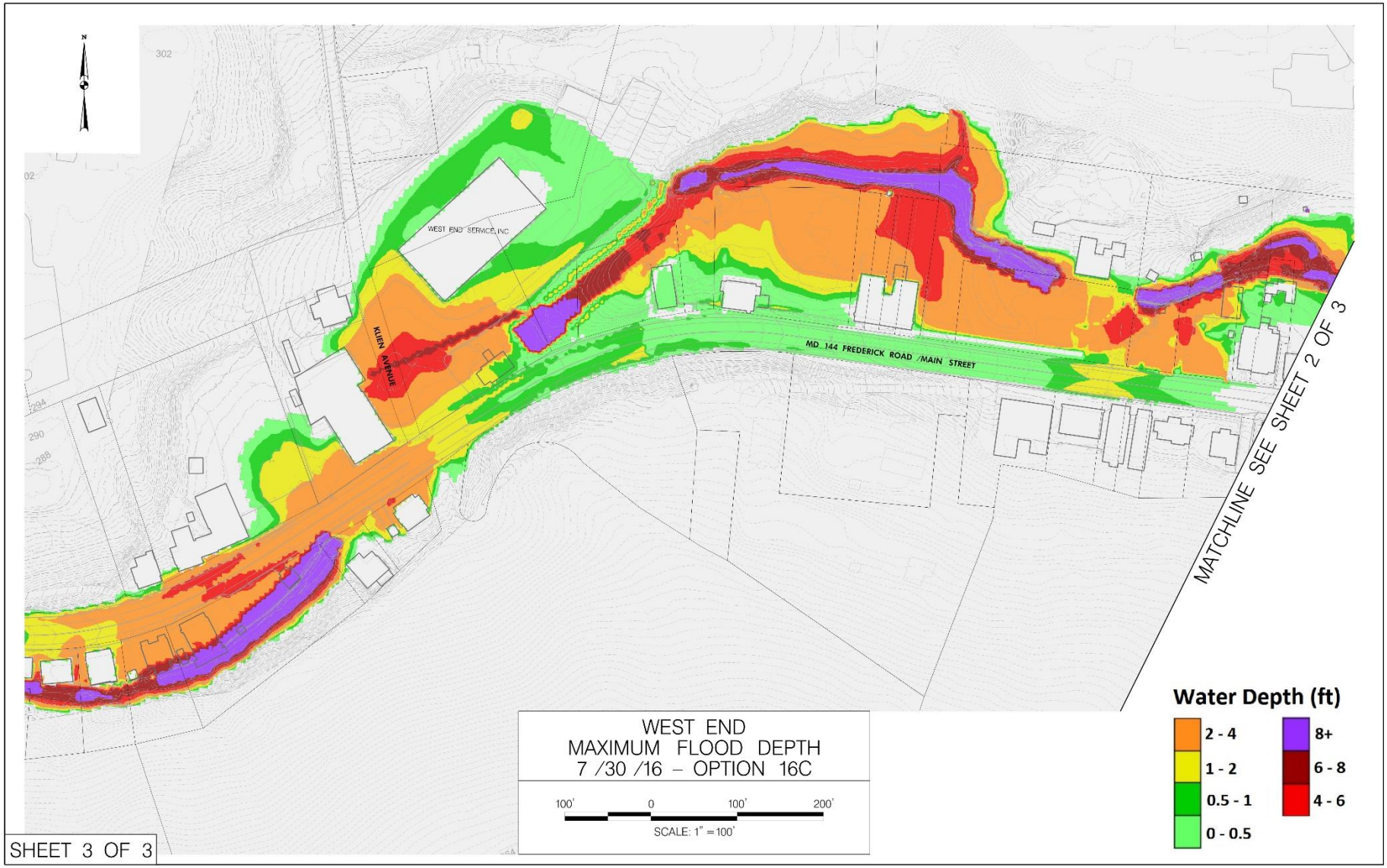

MATCHLINE SEE SHEET 3 OF 3
MAIN STREET
ELLICOTT MILLS DRIVE
MAIN STREET
WINE BIN
COURT AVE
HILL STREET
MERRYMAN STREET
LOT "F"
LOT "E"
15' DIAMETER BOREHOLE LENGTH 1534'
MATCHLINE SEE SHEET 1 OF 3
316
314
312
320
326
324
322
318
298
ELLICOTT MILLS DRIVE AREA
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 3G.7.0
100' 0 100' 200'
SCALE: 1" = 100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
SHEET 2 OF 3

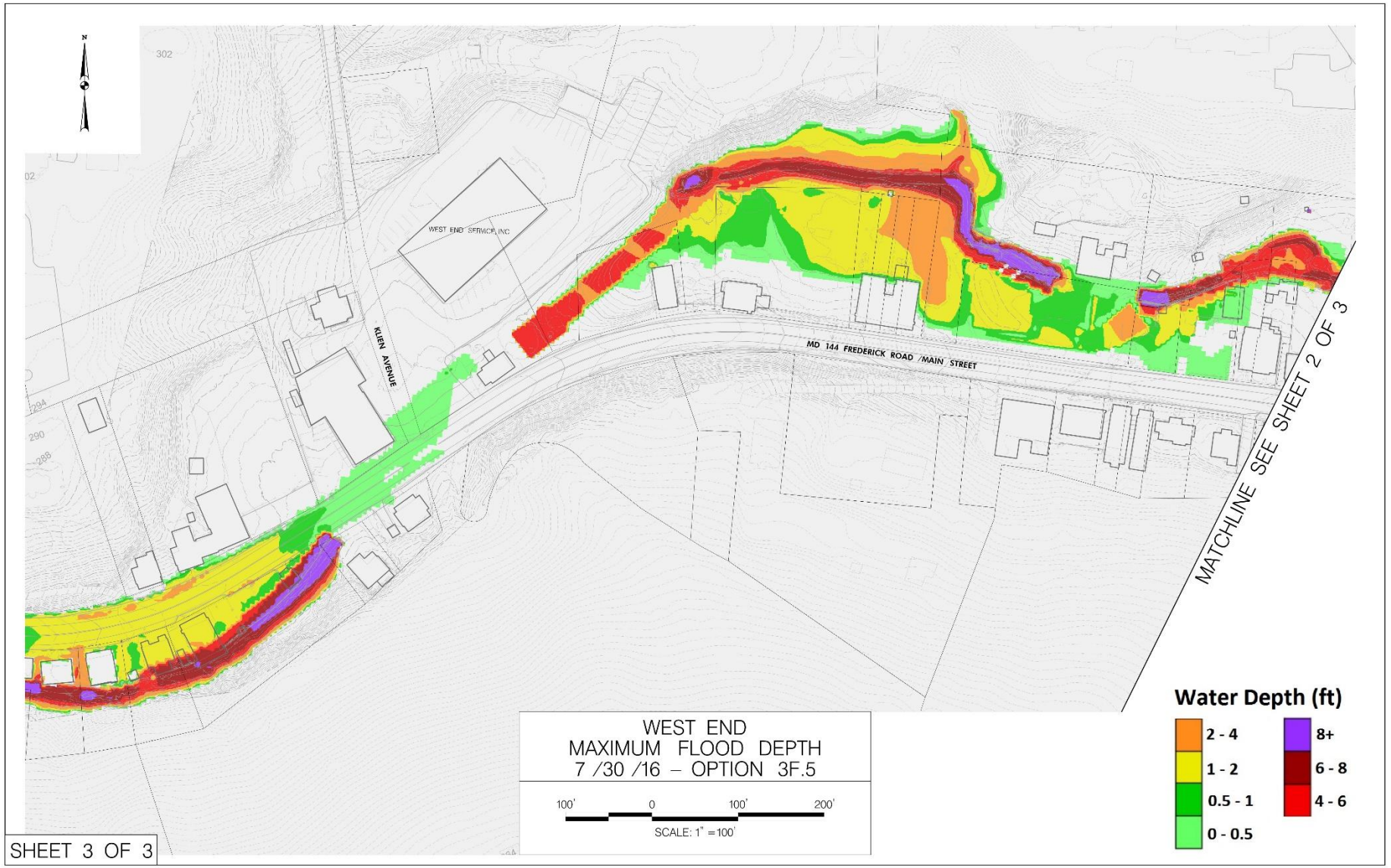

MATCHLINE SEE SHEET 3 OF 3
MATCHLINE SEE SHEET 1 OF 3
MAIN STREET
MAIN STREET
ELLICOTT MILLS DRIVE
HILL STREET
MERRYMAN STREET
COURT AVE
WINE BIN
LOT "F"
LOT "F"
15" DIAMETER BOREHOLE LENGTH 1534'
316
314
312
320
326
324
322
318
298
ELLICOTT MILLS DRIVE AREA
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 3G.8.0
100' 0 100' 200'
SCALE: 1" =100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
SHEET 2 OF 3

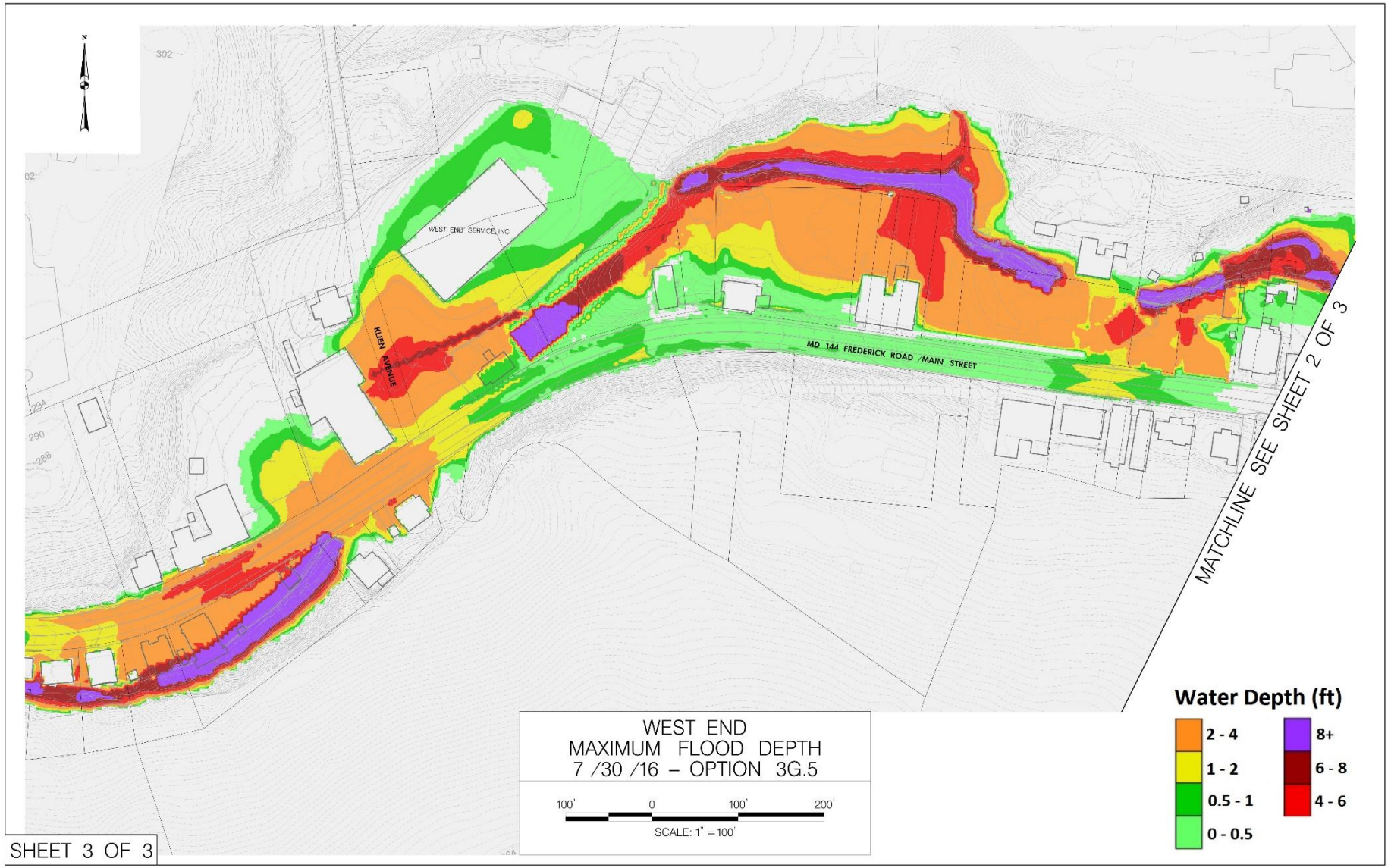
West End Comparison

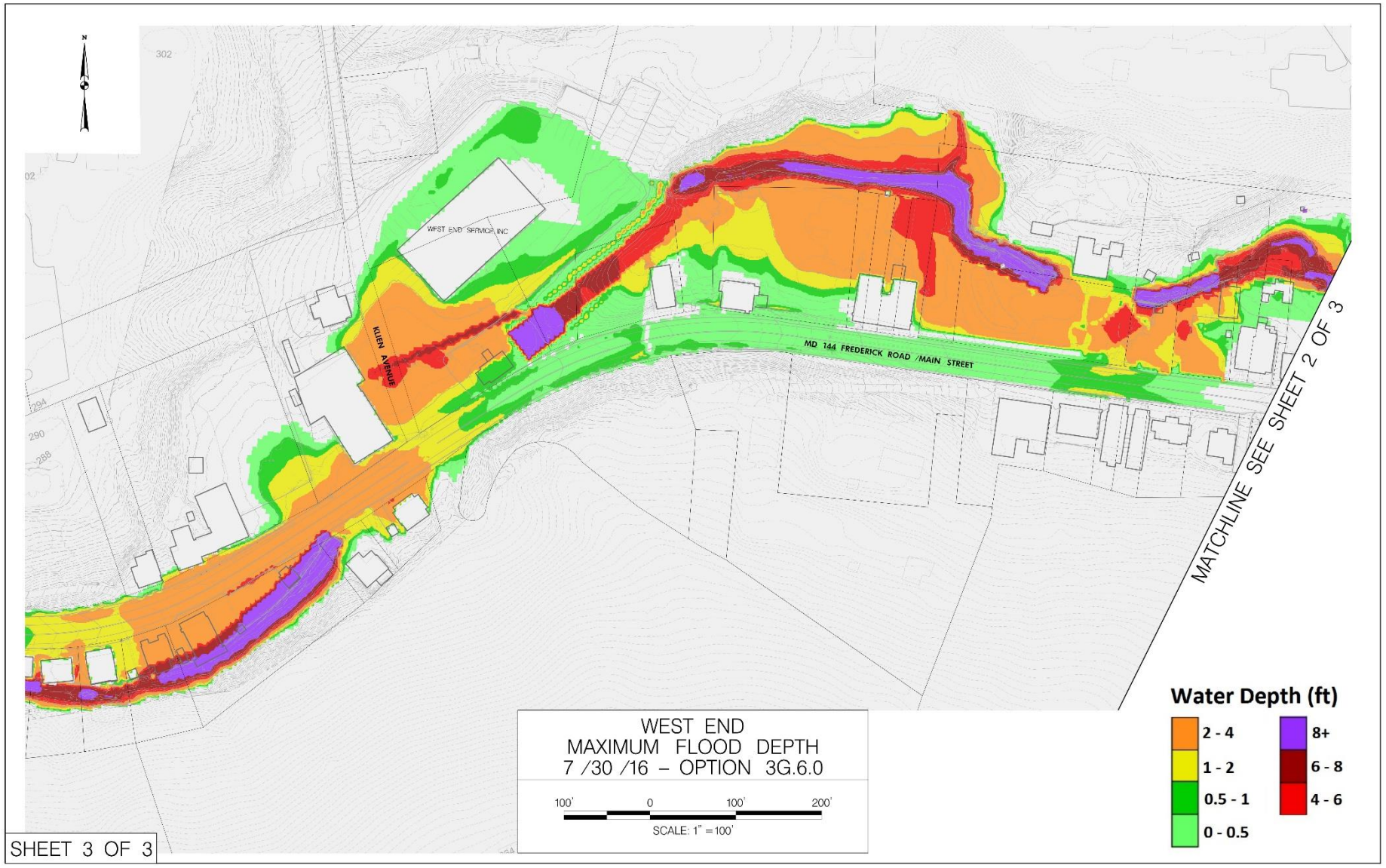


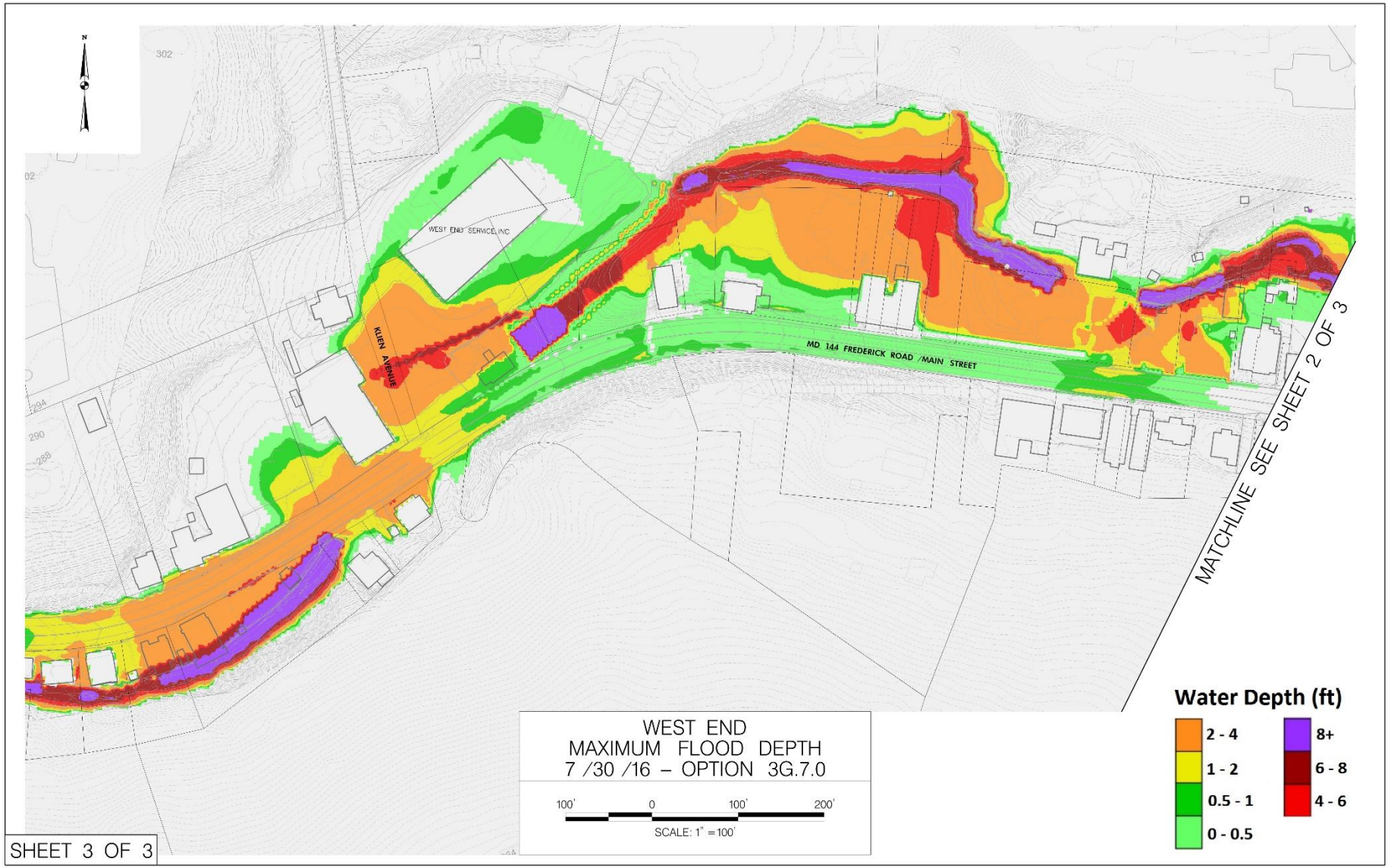

WEST END
MAXIMUM FLOOD DEPTH
5 /27 /18 – EXISTING
100' 0 100' 200'
SCALE: 1" =100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
MD 144 FREDERICK ROAD /MAIN STREET
KUEN AVENUE
WEST END SERVICE, INC
MATCHLINE SEE SHEET 2 OF 3
SHEET 3 OF 3

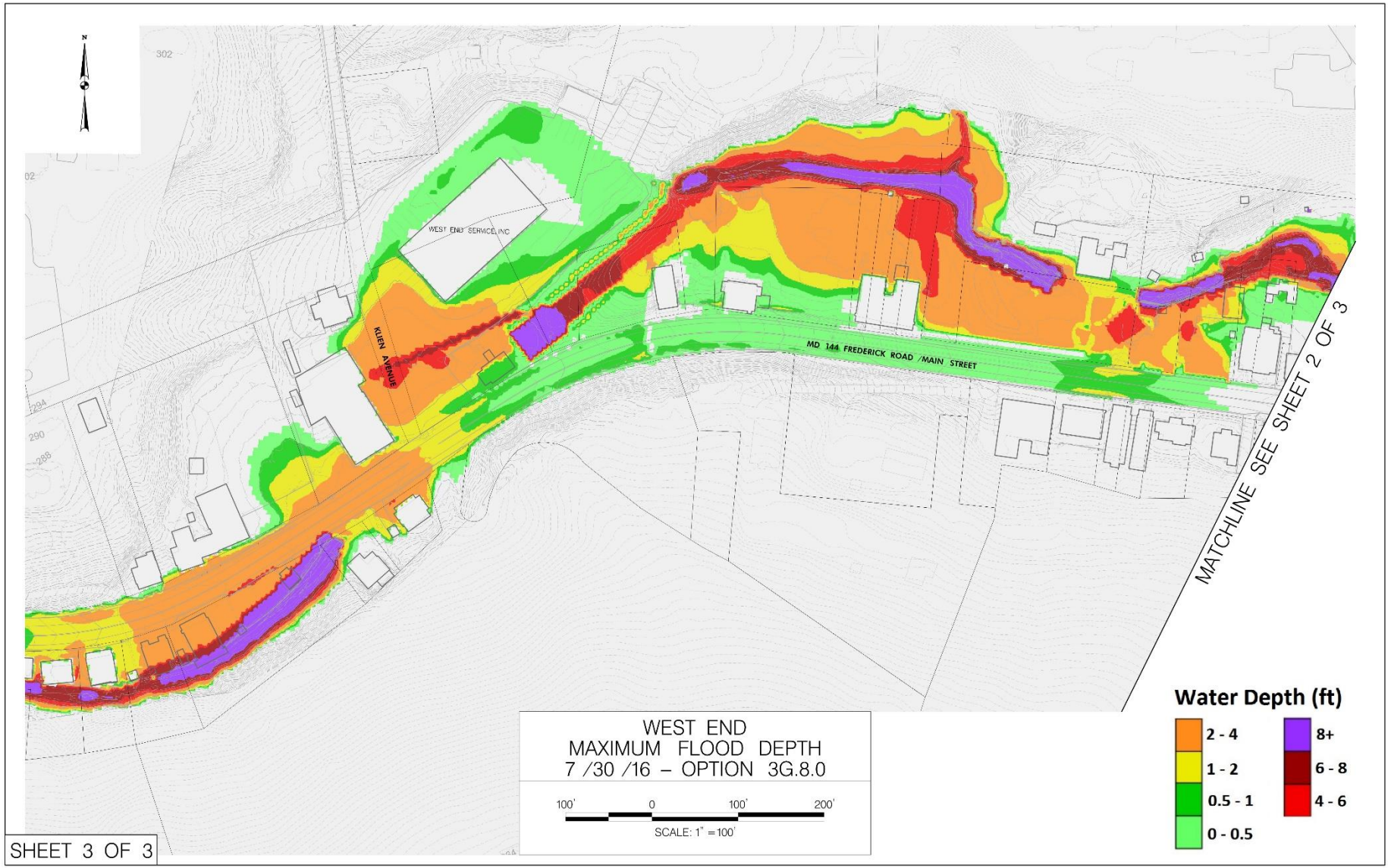

WEST END SERVICE, INC
KLIEN AVENUE
MD 144 FREDERICK ROAD /MAIN STREET
MATCHLINE SEE SHEET 2 OF 3
WEST END
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 16C
100' 0 100' 200'
SCALE: 1" = 100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
SHEET 3 OF 3


WEST END SERVICE, INC
KLIEN AVENUE
MD 144 FREDERICK ROAD /MAIN STREET
MATCHLINE SEE SHEET 2 OF 3
WEST END
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 3F.5
100' 0 100' 200'
SCALE: 1" =100'
SHEET 3 OF 3
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6


WEST END SERVICE, INC
KLEIN AVENUE
MD 144 FREDERICK ROAD /MAIN STREET
MATCHLINE SEE SHEET 2 OF 3
WEST END
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 3G.5
100' 0 100' 200'
SCALE: 1" = 100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
SHEET 3 OF 3


WEST END SERVICE, INC
KLIEN AVENUE
MD 144 FREDERICK ROAD /MAIN STREET
MATCHLINE SEE SHEET 2 OF 3
WEST END
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 3G.6.0
100' 0 100' 200'
SCALE: 1" = 100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
SHEET 3 OF 3


WEST END SERVICE, INC
KLIEN AVENUE
MD 144 FREDERICK ROAD /MAIN STREET
MATCHLINE SEE SHEET 2 OF 3
WEST END
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 3G.7.0
100' 0 100' 200'
SCALE: 1" = 100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
SHEET 3 OF 3


WEST END SERVICE, INC
KLEIN AVENUE
MD 144 FREDERICK ROAD /MAIN STREET
MATCHLINE SEE SHEET 2 OF 3
WEST END
MAXIMUM FLOOD DEPTH
7 /30 /16 – OPTION 3G.8.0
100' 0 100' 200'
SCALE: 1" = 100'
Water Depth (ft)
2 - 4
1 - 2
0.5 - 1
0 - 0.5
8+
6 - 8
4 - 6
SHEET 3 OF 3