

December 1, 2020

Final - Flood Gate Study Report

MADISON ROAD GATE

at Duck Creek
Cincinnati, Ohio

prepared for:

City of Cincinnati
Stormwater Management Utility
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Cincinnati, Ohio 45232



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Introduction and Background

The subject flood gate is located on Madison Road, immediately west of an existing bridge over Duck Creek. The flood gate, as well as the related flood wall system and Madison Road traffic control railroad arms, were installed by the U.S. Army Corps of Engineers (the Corps) in 2008. Since its installation, the City of Cincinnati Stormwater Management Utility (SMU) has experienced problems with the operation of the flood gate and traffic control railroad arms.

In July 2019, a Request for Proposal (RFP) was issued by SMU for a study to develop options for improvements to the operation of the Madison Road Project gate system, or for elimination of the gate and railroad arms. Options for improvements to the operation of two other flood gates at Mehring Way and Carr Street were also included in the study. The Kleingers Group (Kleingers) was selected in December 2019. Three subconsultants, 143Engineers (WBE), Shrewsbury Associates (MBE), and Motz Engineering are on Kleingers team for the Madison Road Project. This report pertains to the Madison Road Project only.

Existing Conditions

History

The Madison Road flood gate was designed and constructed by the US Army Corps of Engineers and went into operation in 2008. The original design included telemetry to communicate gate operations to the City. In 2012, the City of Cincinnati SMU took over all operations and maintenance activities. In 2018, the City installed a SCADA communication to record water levels and provide a record of gate activities.

Since taking over the operation of the Madison Road Flood gate, the City has not recorded any incidents of gate deployment during a flood event. The City has provided recent data (January 2020 – March 2020) on water levels in Duck Creek which indicate little variation in stream levels. Statistics generated from this data record are presented in Table 1 below. In addition, the City reports that since Scada records began in August of 2018, the maximum recorded elevation was 532.7.

Table 1
Duck Creek Water Level Statistics
At Madison Road Flood Gate
January – March, 2020

AVE	530.5
MEAN	530.5
MEDIAN	530.5
STD DEV	0.14

Operations

Gate operations at Madison Road are dependent on water level readings in Duck Creek. Water level measurements consist of the primary radar level indication, a backup pressure transducer, and a tertiary float switch. At a reading of 539.5, the railroad arms drop and an alarm sounds warning traffic not to enter the area. At elevation 540.0, the flood gate deploys to prevent floodwater from impacting surrounding properties. A traffic loop senses if a vehicle is in the area of the flood gate and prevents the gate from closing until the vehicle has cleared the area. As installed, an auto dialer will alert the city of cross arm and gate deployment. When the creek level recedes, the City is again notified to deploy a crew to manually open the gate. More detailed information on operation of the flood gate and warning mechanisms can be found in the O&M manual.

Noted Operational Difficulties

The City has not experienced any notable problems with the deployment of the flood gate. Railroad arms, however, are periodically deployed during non-flood events due to failure of a small transformer located in the power supply in the cross-arm motor box. The default condition causes the arms to drop when the transformer fails. When this occurs, city personnel raise the cross arm manually and secure it until the transformer is replaced. Then, a work order is initiated and an electrician dispatched to replace the transformer. Typically, the transformer can be replaced in one to two working days at a cost of approximately \$145 for the power transformer and approximately 4 hours in labor.

In addition, the City has observed significant depths of standing water on Madison Road, without flooding at the bridge and without the railroad arms deploying. The low point in Madison Road is east of the bridge over Duck Creek. The flood flow is getting to this low point by jumping the bank of Duck Creek upstream from the Madison Road bridge and upstream of the railroad bridge. See Attachments A-1 and A-2, as well as Stream Sta. 4.800 on the third page of Attachment A-3. This low point can flood before the flood level in the creek gets high enough to activate the sensors at the Madison Road bridge that start the deployment of the railroad arms.

HEC-RAS Analysis

To provide a flood level baseline for the improvement options to be considered, a HEC-RAS analysis of Duck Creek for the existing conditions was performed. The current FEMA HEC-RAS hydraulic model was obtained. The entire flood profile, the floodplain sections in the vicinity of Madison Road and the upstream railroad bridge, and the entire summary table from that model are included in Attachment A-3. The 500-year (0.2% AEP), 100-year (1% AEP) and 50-year (2% AEP) floods all overtop the existing Madison Road bridge. The 10-year (10% AEP) flood contacts the bottom of the deck.

Existing Madison Road Bridge Drawings

For use in analyzing the improvement options, a copy of the drawings for the existing Madison Road bridge was obtained from the City of Cincinnati Department of Transportation and Engineering. See Attachment A-4.

Corps Involvement

Mike Brunner of Kleingers met with the Corps at their Louisville office on February 3, 2020. There were approximately eight Corps employees at the meeting. The meeting was brief, and no attendance sheet was circulated, so information about every one of the attendees is not available. Key Corps contacts are Bonnie Jennings (bonnie.f.jennings@usace.army.mil), Section 408 Coordinator and Dave Lasoski (David.b.lasoski@usace.army.mil), who is in charge of the entire flood wall, gate and levee system in the City of Cincinnati.

The purpose of the meeting was limited to identifying “red lights” to concepts for improving the operation of the Madison Road gate. Concepts discussed were the three options identified below. No red lights were identified.

Regarding how to proceed with getting Corps review of the actual design of a chosen option started:

1. Kleingers was referred to the following online resource for guidance:
<https://www.lrl.usace.army.mil/Missions/Civil-Works/Levee-Safety/Alterations/>
2. Per that resource:
 - a. “An alteration is any action by an entity other than the U.S. Army Corps of Engineers (USACE) that builds upon, alters, improves, moves, or occupies an existing USACE civil works projects. There are two types of alterations, Section 408s and LNOs (Letter of No Objection). As a general rule, any work within 50 feet from the project must have USACE review.”
 - b. The Corps review process is started by submitting an LRL-803 Application Form for a Section 408 review and an LNO Application Form for an LNO review.
 - c. The review timeline, for either application, is 30 days for a Completeness Determination and 90 days for a Corps Review and Decision.

Please note that the Corps made special mention that the costs for all Corps design review would be the City’s responsibility. An estimate of what those costs will be was not given, but the indication was that once the Application Form is submitted, the Corps may be able to provide an estimate.

Proposed Options

Three options for were developed for improving the operation of the gates and railroad arms, or for elimination of them.

Proposed Option 1 – Maintain Current Flood Gate and Railroad Arm Configuration

As part of this study, improvements to the flood gate were examined which would allow for continued operation in the current configuration. Two viable alternatives were considered, No Action and Replacement of the Railroad Arm Closure Mechanisms.

Alternative 1 - No Action

The No Action alternative would provide continued operations of the flood gate and railroad arms in their current configuration, with no changes to the flood channel or existing bridge. Periodic disruptions from transformer failures will continue.

The cost opinion for this alternative would be \$3,270 per year (Assumes 6 failures at cost of \$545 ea.). CV at 2% over 20 years is \$53,500.

Alternative 2 - Replace Railroad Arm Closure Mechanisms

This alternative would include the replacement of the cross-arm closure mechanisms. This assumes that the new mechanisms can be mounted in the existing cabinet and connected to the existing control system.

The cost opinion for this alternative would be \$60,000 (4 mechanisms at \$15,000 each). The assumed life of the closure mechanism is 20 years.

Costs assume only replacement of the gate closure mechanism and do not include replacement of the gates, posts, control cabinets or signals. This also assumes the replacement mechanism can be mounted in the existing enclosure and connected to the existing control system. Specific costs for replacement are not currently available due to lack of communications from the equipment manufacturer. The original manufacturer, Safetran Systems, was acquired by Siemens in 2013. Repeated attempts to contact Siemens for information regarding possible replacement mechanisms were unsuccessful. Therefore, a best guess on costs was based on prices available through internet research and assumed that 50% of the equipment costs would be attributed to installation and calibration of the new mechanisms.

As described in the Existing Conditions section of this report, flooding of Madison Road has been observed without flooding at the bridge and without the railroad arms being activated. In order to manage this, one of the following three items could be added to either alternative:

- Construction of a 50'± long levee that eliminates the potential for Duck Creek overbank flooding just upstream of the railroad embankment. See Attachment A-2. The design and construction cost opinion, including a 25% contingency, for this levee is \$249,000. See Attachment A-5. An additional HEC-RAS analysis was run with this levee included. See Attachment A-6. The analysis predicts no increase in the flood elevations upstream from the levee vs the HEC-RAS analysis without the levee (Attachment A-3).
- Installation of an additional water elevation sensor, near the location shown in Attachment A-2 where the flooding overtops the left bank. The sensor would activate the railroad arms before the flood waters jump the bank of Duck Creek. The sensor would be mounted on a post 20'± south from the top of the bank. This location will allow it to sense the water level without being subject to high velocities and debris in Duck Creek. Power and signal wires/conduit would be run from the sensor south to the north side of Madison Road, along Madison Road and on the side of the bridge to the west side of Duck Creek, and then to the control building. The total length of the conduits is 525' each. The cost opinion for engineering and installation of this additional

sensor and the associated electric and controls is \$20,000. The actual sensor part of the cost opinion is \$2,500, with the remainder being the power and signal wires/conduit.

- Reprogramming of the existing sensors at the Madison Road bridge so that they lower the railroad arms at a water level at this bridge that is lower than their current setting. The setting would have to be at a lower water level because the HEC-RAS analyses that were performed shows that the water level at the Madison Road bridge is from 2' to 3' lower than that at the bank upstream of the railroad bridge where it gets overtopped. This is essentially a "no cost" solution. However, it's very difficult to determine the difference in the water surface elevations at the two locations with precision. Hydraulic calculations can predict values, but there is always significant uncertainty.

Additional scope was added to this study in Fall 2020 to investigate and evaluate the condition of the cross-arm controllers to try and determine where the power supply fails (causing the cross-arms to close on their own). This investigation (performed by Motz Engineering) is included in Attachment A-16.

Proposed Option 2 – Upstream Park with Flood Storage

An investigation was performed that examined the concept of eliminating the need for the flood gate and railroad arms thorough upstream flood storage. The flood storage would be incorporated into a park upstream of Madison Road, with no alteration to the existing Madison Road bridge or roadway. The amount of flood storage considered was that required to reduce the 100-year flood peak flow rate at the Madison Road bridge to a peak flow that would not overtop the bridge or roadway.

The Nation Resources Conservation Service (NRCS) hydrology program WinTR-55/TR-20, along with Exhibit XII-5 from the SMU Rules and Regulations, were used to estimate the volume of flood storage that would be required to reduce the 100-year flood peak flow rate to the 10-year flood peak flow rate. See Attachments A-7 and A-8. The required storage volume is:

TR-55/TR-20		Exhibit XII-5	TR-55/TR-20			Exhibit XII-5	
10-year Peak Outflow, q_o (cfs)	100-year Peak Inflow, q_i (cfs)	q_o/q_i	100-year Runoff Depth (inches)	Watershed Area (sq. mi.)	100-year Runoff Volume, V_r (acre-ft)	V_s/V_r	Flood Storage Req'd, V_s (acre-ft)
2114.42	3427.50	0.617	4.058	6.3	1363.5	0.235	320.4

Attachment A-9 shows the land area between Kennedy Avenue, Duck Creek Road, Oaklawn Drive, and Madison Road that makes sense, topographically, to consider for flood storage. The existing railroad embankment is excluded. The total area is 29.8 acres. To achieve the required flood storage, the impoundment would have to be an average of 320.4 acre-ft / 29.8 acres = 10.75 feet deep.

A number of properties would have to be purchased, including a large tract owned by IlSCO Corporation. The City owns a strip of land that generally follows Duck Creek.

The cost for this option would be very large. The excavation cost alone would be:

29.8 acres x 10.75 feet deep = 517,000 cy
517,000 cy x \$5/cy = \$2.6 million ±

Proposed Option 3 – Replace the Madison Road Bridge

This third option would allow the existing flood gate and railroad arms to be removed, because none of the floods analyzed would overtop the new bridge or other parts of Madison Road. An added benefit is the flood levels would also be lowered upstream, thereby benefitting upstream properties. Since the flood profile is sub-critical, downstream flood levels would not be changed except immediately downstream where the influence of the bridge is still present.

We estimate that an ODOT-standard 117' long, three-span, continuous, cast-in-place concrete bridge on capped pile abutments and piers would be the best new bridge option. Continuous cast-in-place bridges typically provide the thinner decks than box beam or steel beam bridges, and concrete bridges provide good lateral resistance to flood water that may contact the deck. In addition, with the combination of this type of new bridge deck and the existing bridge deck being box beams, part-width construction that maintains traffic on Madison Road is a possible option. This size bridge actually fits rather nicely between the adjacent driveways. See Attachment A-10.

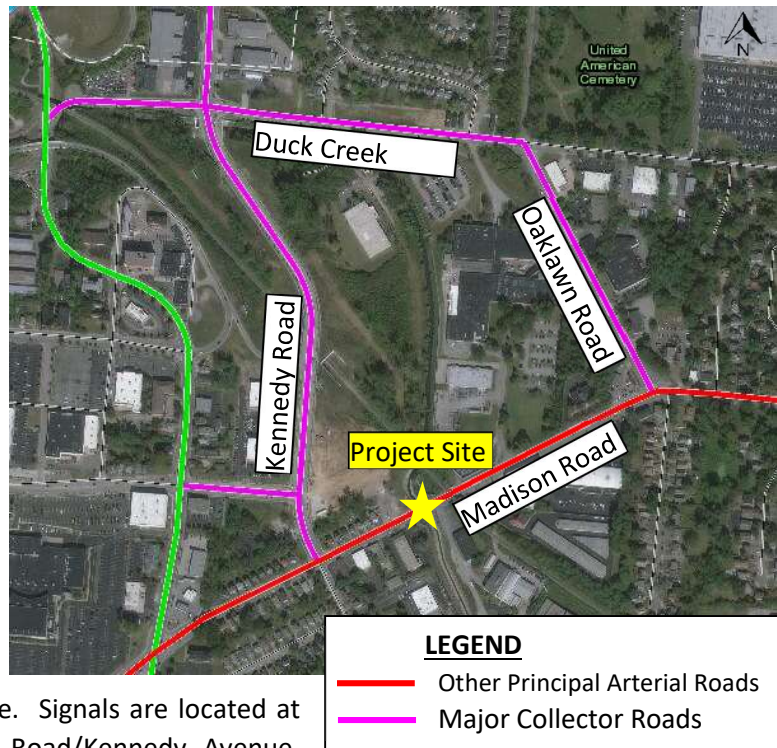
A HEC-RAS hydraulic model was created for this new bridge by starting with the current FEMA model discussed above, and then replacing the existing bridge with the new one. The entire flood profile, the floodplain sections in the vicinity of Madison Road, and the entire summary table from that model are included in Attachment A-11. Note that even though flood elevations are reduced compared to the existing conditions, they are still high enough at Stream Sta. 4.800 that Madison Road will still flood without the new levee shown in Attachment A-2. An additional HEC-RAS analysis was performed with the levee. See Attachment A-12. As was the case with the existing conditions, the levee does not raise the flood elevations upstream from it.

There are two options for the maintenance of traffic. They are as follows:

- Detour; and
- Maintain Traffic on Madison Road: Part-Width Construction

Detour

This is a detour around the site of the new bridge utilizing City of Cincinnati roadways. The roadways proposed for the detour all have a functional classification of Major Collector or above. The detour is shown in Attachment A-13. The detour shows eastbound Madison Road to be detoured to Kennedy Avenue to Duck Creek Road to Oaklawn Drive. The detour shows westbound Madison Road to be detoured along Oaklawn Drive to Duck Creek Road to Kennedy Avenue. Signals are located at the intersections of Madison Road/Kennedy Avenue, Kennedy Avenue/Duck Creek Road, Duck Creek Road/Oaklawn Drive, and Oaklawn Drive/Madison Road. Once the detour is in place, field review of the signals during the AM and PM Peak hours should take place at each intersection so that signal timing adjustments can be made while the detour is in place.



Maintain Traffic on Madison Road: Part-Width Construction.

The existing bridge is made up of adjacent box beams, so part-width construction is possible. The construction plans for the maintenance of traffic plan will detail which beams will be used for each phase. The maintenance of traffic plans for Phase 1 and Phase 2 are shown in Attachment A-14.

Phase 1 of the project narrows eastbound Madison Road from two lanes to one lane in the eastbound direction. It then directs the eastbound Madison Road to the southern-most westbound Madison Road lanes. The westbound Madison Road traffic is directed to the northmost westbound Madison Road. One lane is maintained in each direction over the existing westbound Madison Road traffic lanes.

Phase 2 of the project narrows eastbound Madison Road from two lanes to one lane in the eastbound direction. It then directs the eastbound Madison Road to the southern-most eastbound Madison Road lanes. The westbound Madison Road traffic is directed to the remaining existing eastbound traffic lane. One lane is maintained in each direction over the existing eastbound Madison Road traffic lanes.

These lane changes for both phases are directed utilizing orange barrels, as shown on the drawings in the Appendix. The site of the bridge replacement is protected with portable concrete barriers.

The design and construction cost opinion, including a 25% contingency, for proposed bridge is \$2.372 million. See Attachment 15. The total for this option, including the levee, is \$2.621 million.

Recommended Proposed Option

Considering cost only, Option 1 – Alternative 1 would be the obvious choice, with the cost opinion over 20 years being $\$53,500 + \$75,000 = \$128,500$. However, given the history of the low reliability of the existing system design, there are questions if this approach would be a good long-term investment.

Option 2 would be very expensive, complicated and time-consuming. Property assessments and negotiations, and coordination with other City departments and governmental agencies, would take years. There is also the basic question of whether or not this is even a desirable location for a new park. We recommend against further consideration of Option 2.

Option 3 is not inexpensive or without difficulties, but it **is our recommended option**. There are a number of sound reasons for choosing this option:

- The existing bridge deck and tops of the abutments are 30 years old. Those parts were renovated in 1990. The original bridge was built in 1929, and that original substructure is still being used. While it probably has a number of years of service remaining, it would not be an unreasonable candidate for replacement.
- The existing bridge is a severe restriction to the flood flows in Duck Creek. Per the FEMA HEC-RAS model, from 54' downstream of the bridge to 37' upstream from the bridge, the water surface profile for the 100-year flood is raised about 5.7 feet. The waterway opening is simply far too small for this stream.
- With Option 3, the 100-year water surface profile difference between the same two locations is only raised 2.4 feet. This is a reduction that results in Madison Road not being flooded during even the 500-year flood, as well as less backwater far upstream. As a result, flood insurance requirements for properties upstream will be positively impacted.
- The new bridge can be constructed while maintaining traffic on Madison Road without temporary signals.
- Once completed, the new bridge would represent a maintenance-free solution to the flooding issues at Madison Road. There would be no mechanical or electrical monitoring/control systems to maintain.
- Because it would address both structural and flood protection improvements, replacing this bridge would be a good candidate for design and construction fund assistance from State and Federal programs. Possible programs are:
 - **Federal funds: STBG – Surface Transportation Block Grant; funding agency is OKI:**
Bridge qualifies as Madison Road is a principle arterial; truck volume is 3.6%; ADT is

19,433; area surrounding has elderly, minority, low-income, zero car populations. Funding up to \$6M, or 75% of total construction cost; local share can come from any non-federal source.

- **State funds: SCIP/LTIP - Ohio Public Works Commission; funding through District 2 Integrating Committee:** Bridge qualifies as it is located on a public roadway in Ohio. No limit on total funding request, but is restrained on amount of grants/loans available to the District. Bridge qualifies in both funding categories. Loans can be used to help with engineering costs; entire project is available for loan funding if desired, up to 30 year term, no interest. Project funding also available as 50% grant, 50% loan; no local share required as loan counts for that.
- **Local funds: MRF – Municipal Road Funds – funding agency is Hamilton County:** Bridge qualifies as it is listed as an eligible public road with Hamilton County. Limited funding requests – can expect approximately \$250K as a maximum; Cincinnati currently gets \$1M/YR for bridge maintenance program, as per 1968 program requirement. Funds can be used as a local share, or for engineering; program emphasizes bridges.
- **Local funds: Sales Tax – funding agency is the District 2 Integrating Committee:** Sales tax issue was passed by voters in April 2020 election cycle. Amount available not yet known, but upwards of \$30M will be distributed throughout Hamilton County. Funds can be used for local share, engineering.

Attachment A-1

Existing - Photos



WEST TRAFFIC
CONTROL GATE

FLOOD
GATE

MADISON ROAD
BRIDGE

RAILROAD
BRIDGE

PATH OF OVERLAND
FLOW FROM EAST OF
THE RAILROAD
EMBANKMENT TO
LOW POINT

EAST TRAFFIC
CONTROL GATE

LOW POINT IN
MADISON ROAD
PROFILE

WEST TRAFFIC
CONTROL GATE

LOOKING EAST



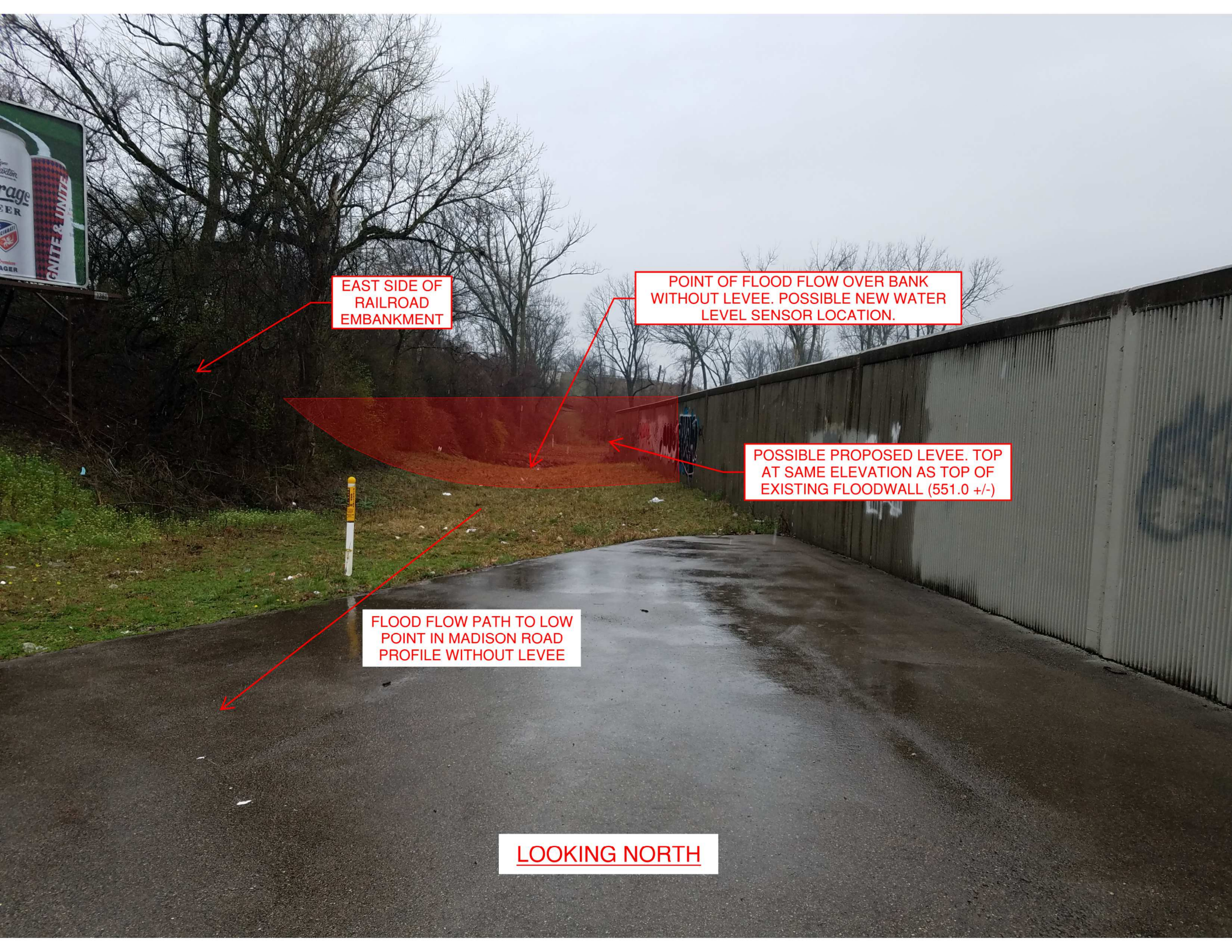
WEST TRAFFIC
CONTROL GATE

WEST TRAFFIC
CONTROL GATE

FLOOD
GATE

MADISON ROAD
BRIDGE

LOOKING WEST



EAST SIDE OF
RAILROAD
EMBANKMENT

POINT OF FLOOD FLOW OVER BANK
WITHOUT LEVEE. POSSIBLE NEW WATER
LEVEL SENSOR LOCATION.

POSSIBLE PROPOSED LEVEE. TOP
AT SAME ELEVATION AS TOP OF
EXISTING FLOODWALL (551.0 +/-)

FLOOD FLOW PATH TO LOW
POINT IN MADISON ROAD
PROFILE WITHOUT LEVEE

LOOKING NORTH



EAST TRAFFIC
CONTROL
GATE

LOW POINT IN
MADISON ROAD
PROFILE IS TO THE
WEST OF HERE

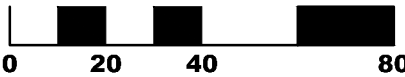
LOOKING EAST

Attachment A-2

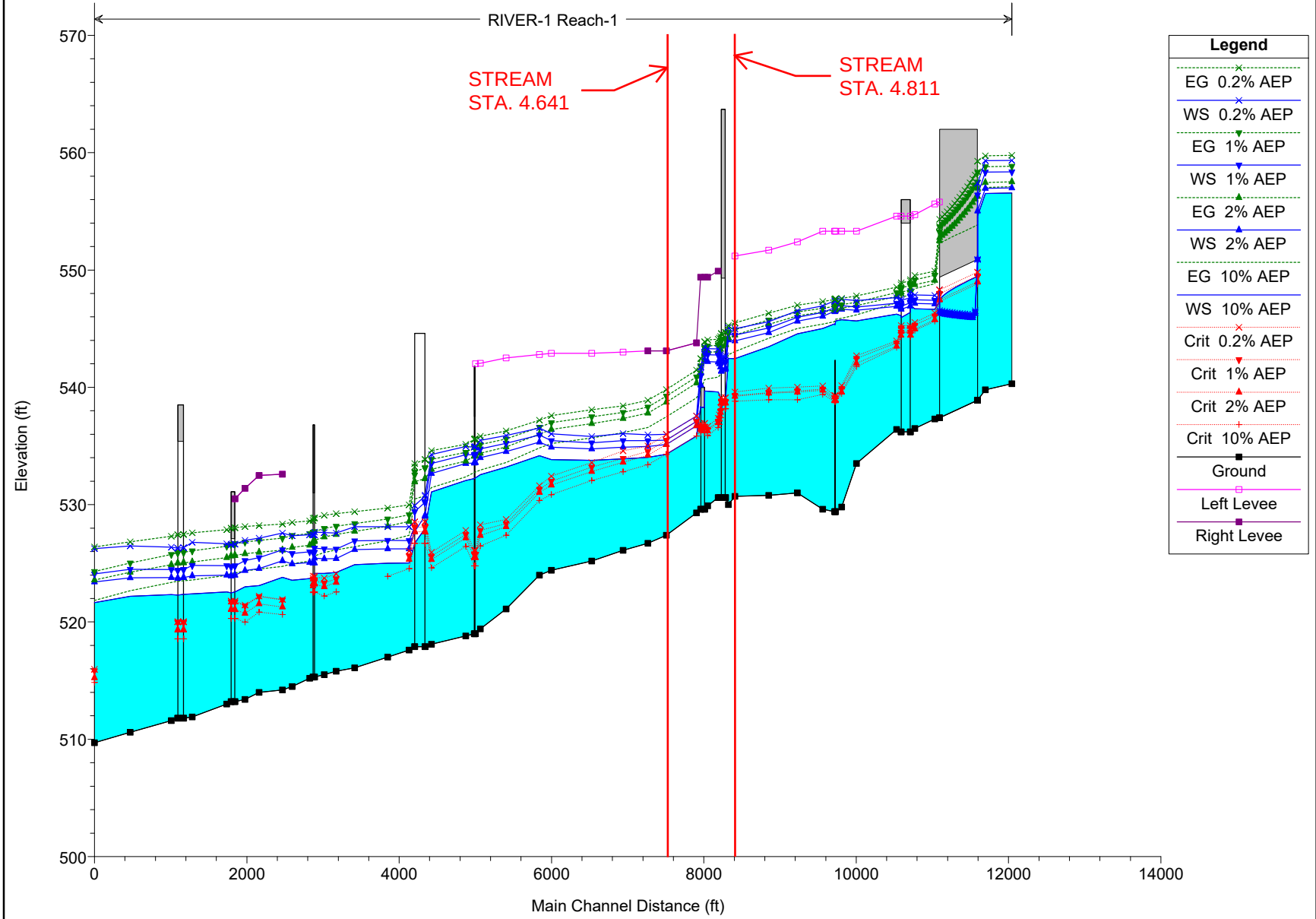
Existing - Overland Flow Path and Proposed Levee



ATTACHMENT A-2 - EXISTING OVERLAND FLOW PATH AND PROPOSED LEVEE

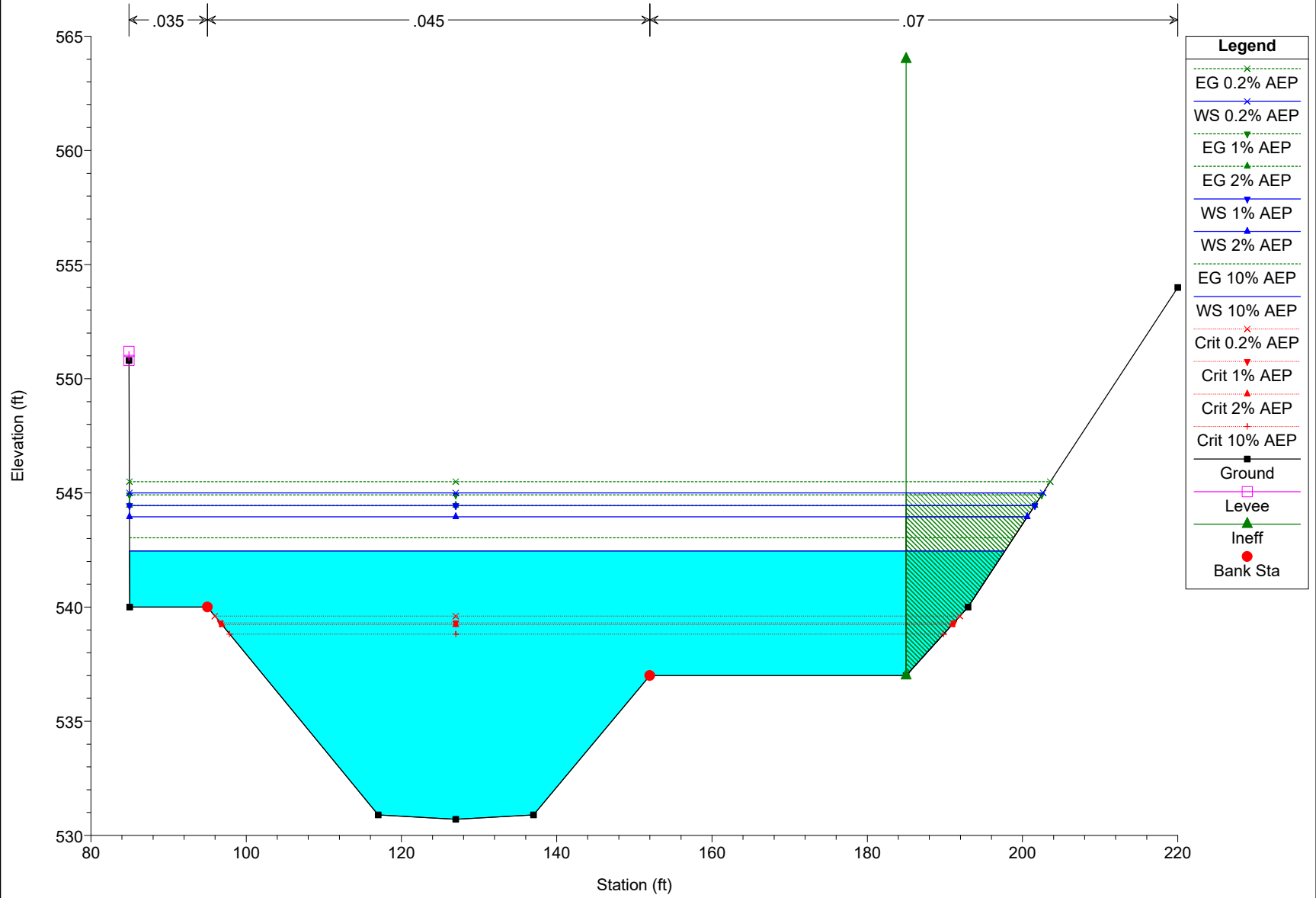


Attachment A-3
Existing – HEC-RAS Output



FLOOD PROFILE

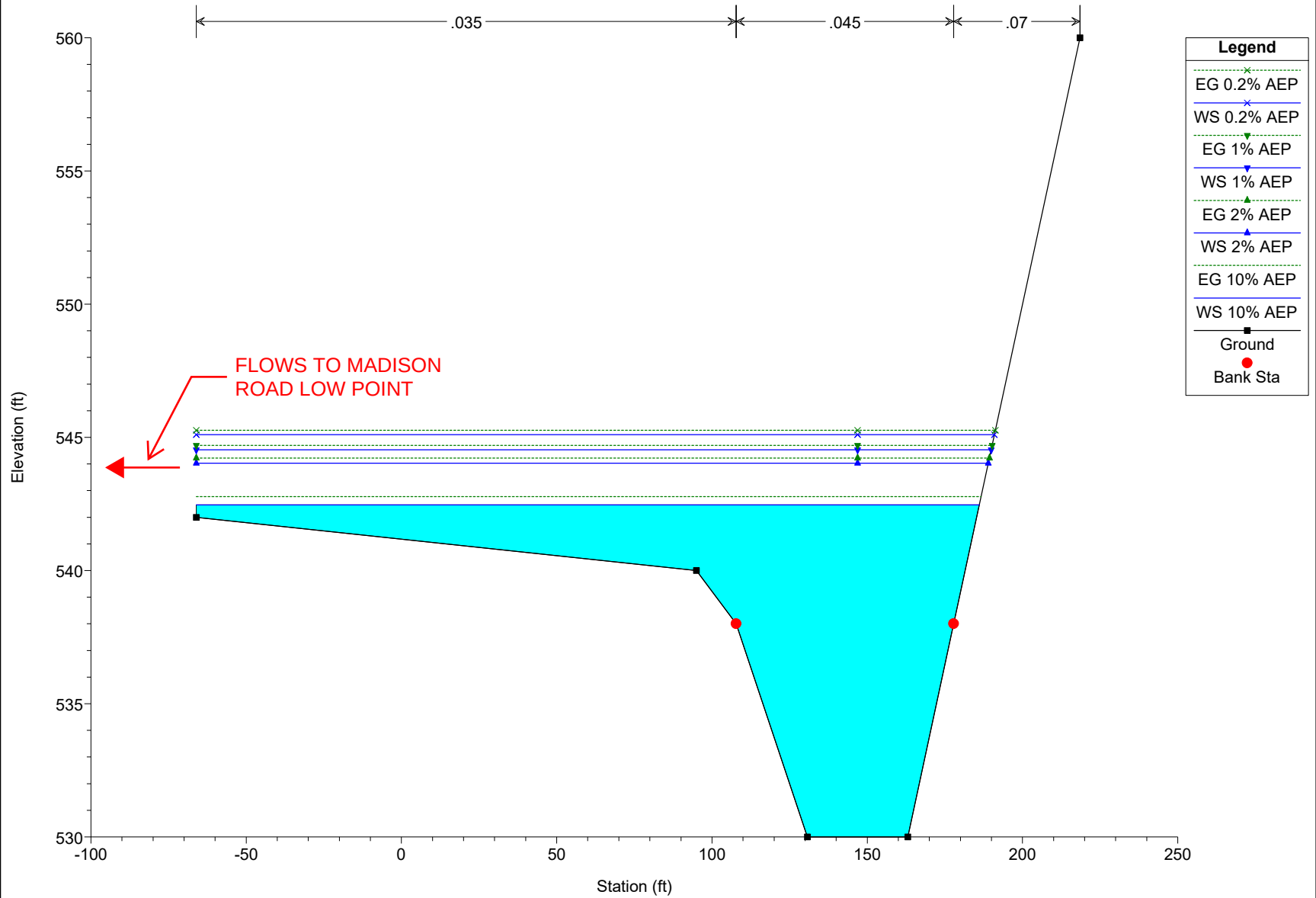
Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-existing 6/15/2020



STREAM STA. 4.811

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-existing 6/15/2020

At left bank overflow to Madison Road

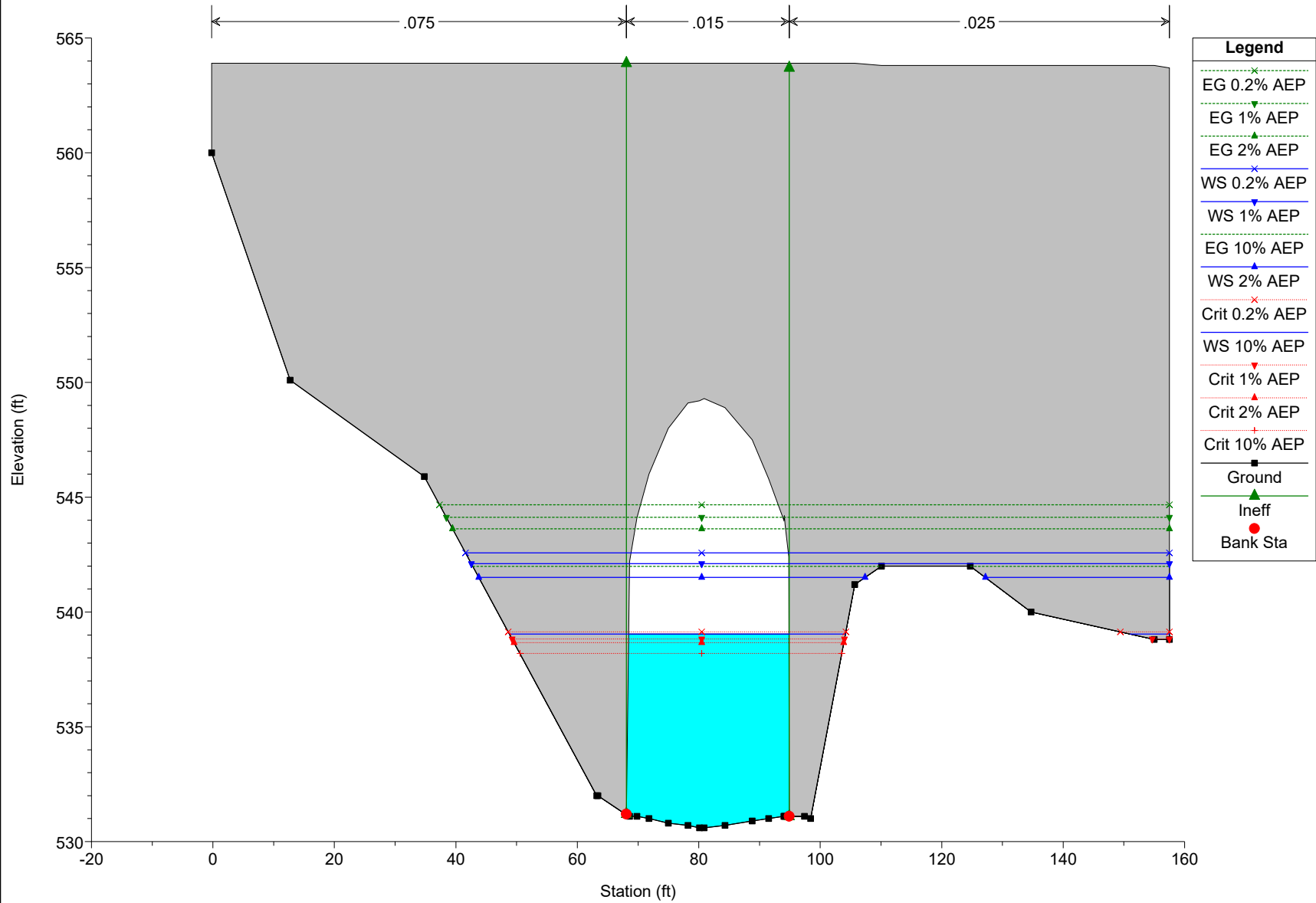


STREAM STA. 4.800
AT LEFT BANK OVERFLOW

Duck Creek Feasibility Study-FEMA_LOMR

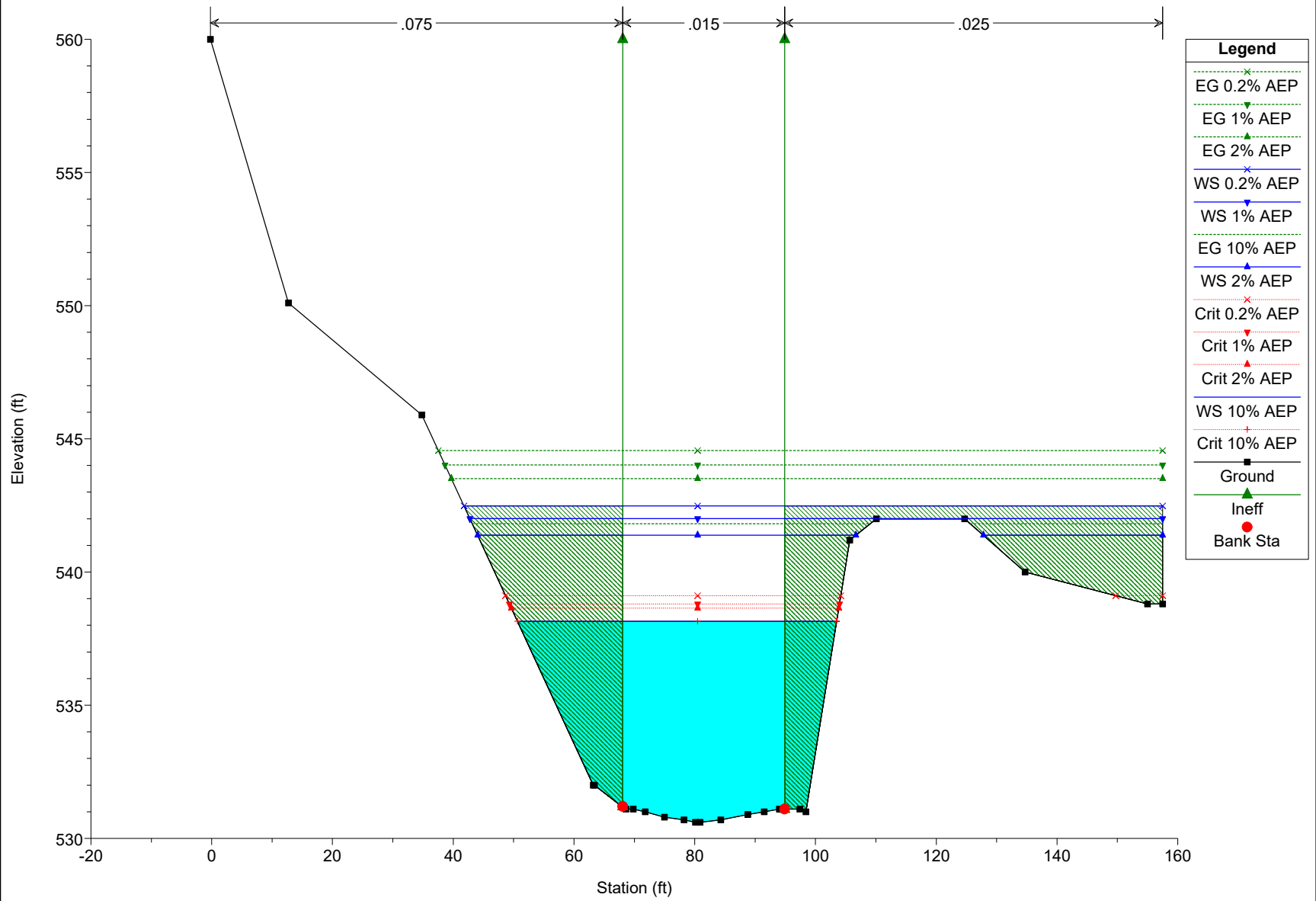
Plan: MEB-existing 6/15/2020

Conrail #7



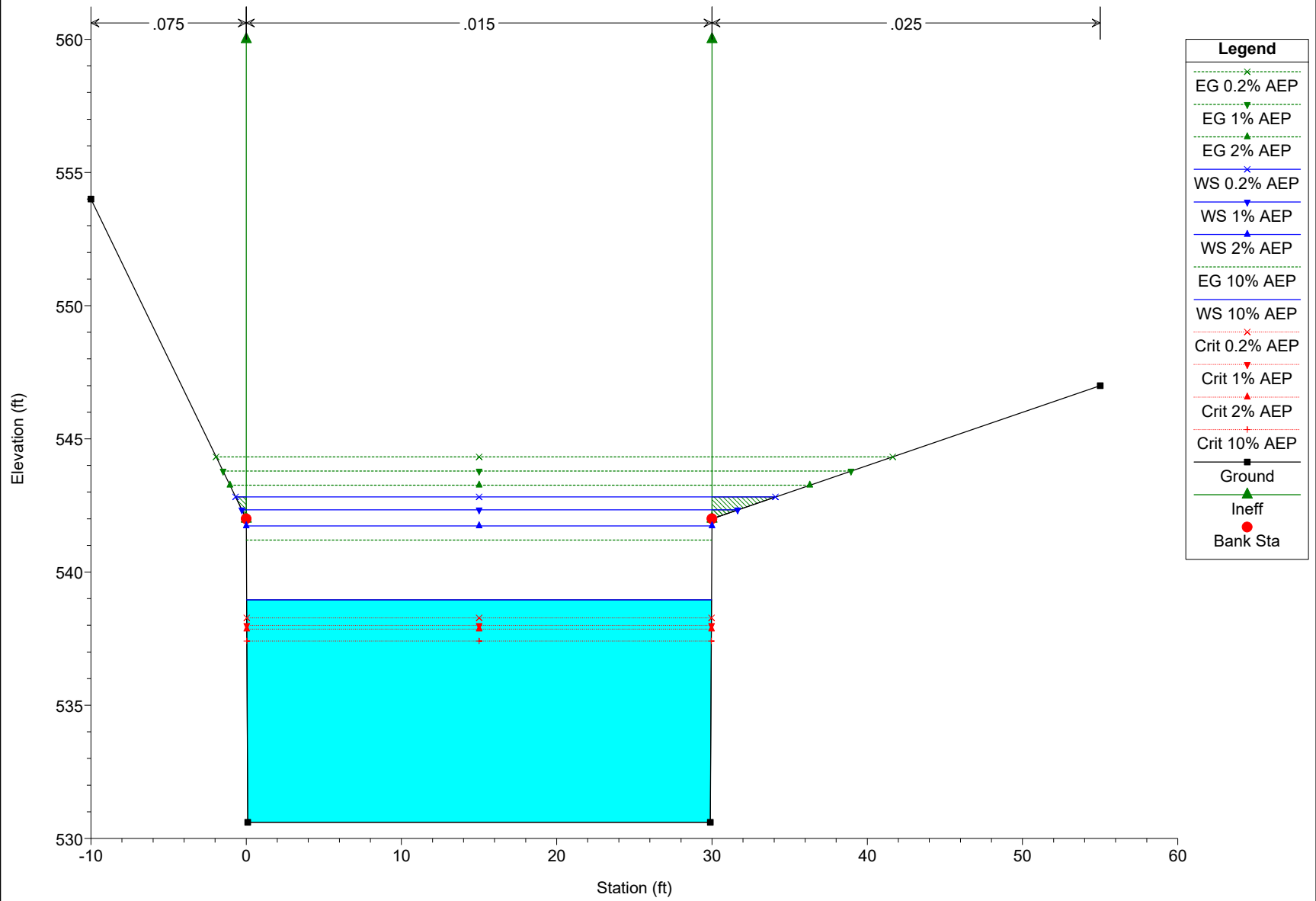
UPSTREAM EDGE OF RAILROAD BRIDGE

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-existing 6/15/2020

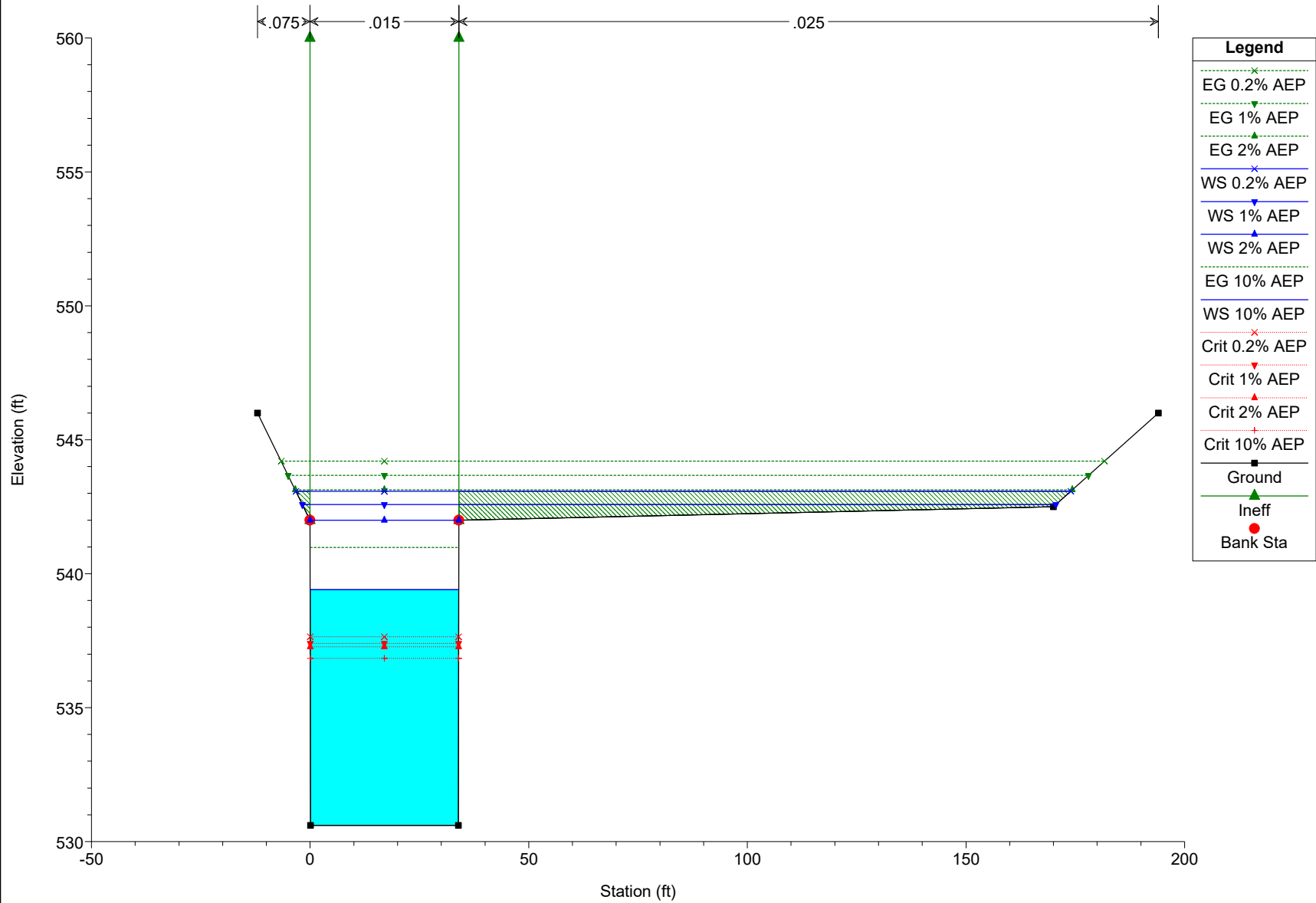


STREAM STA. 4.778

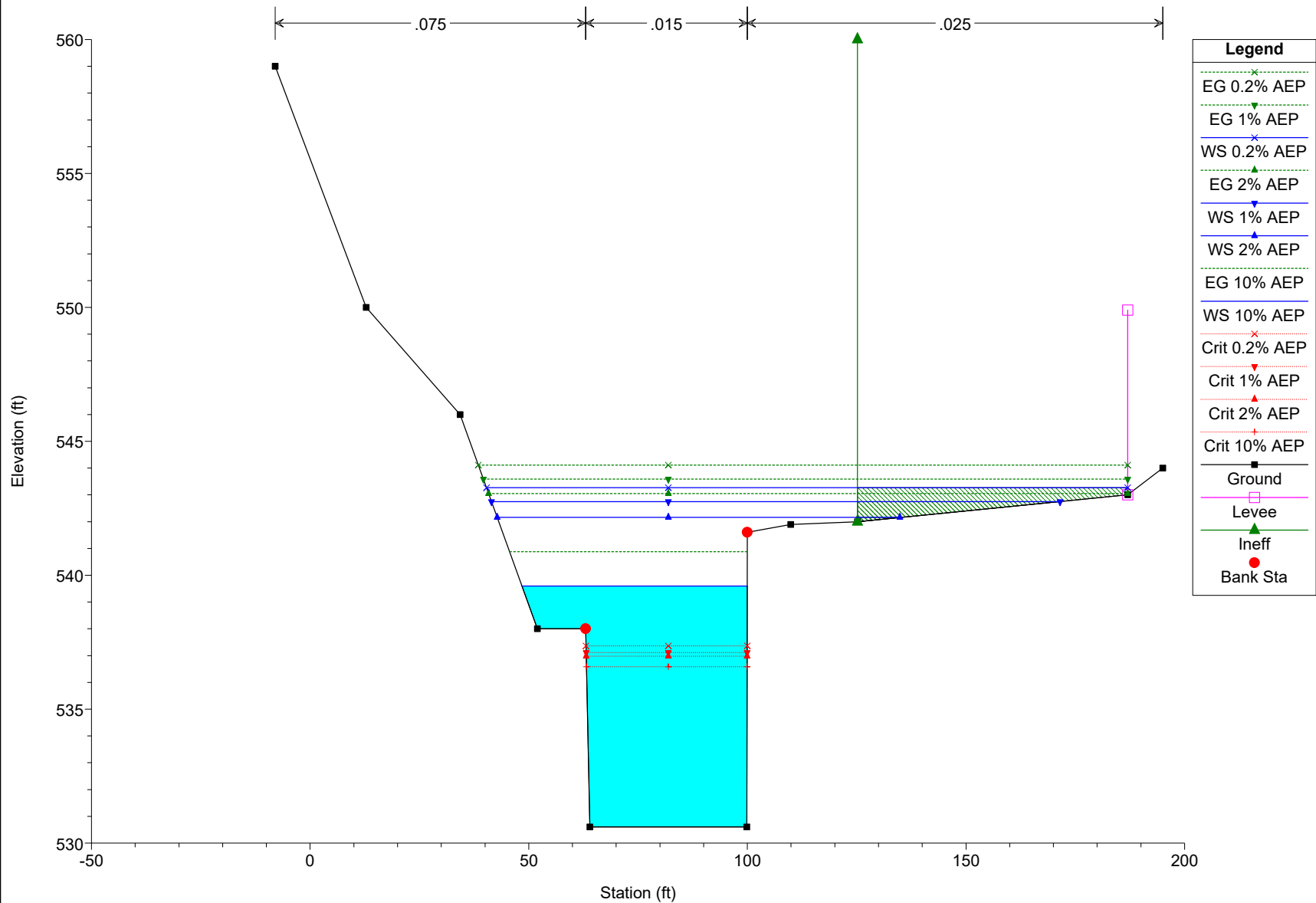
Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-existing 6/15/2020



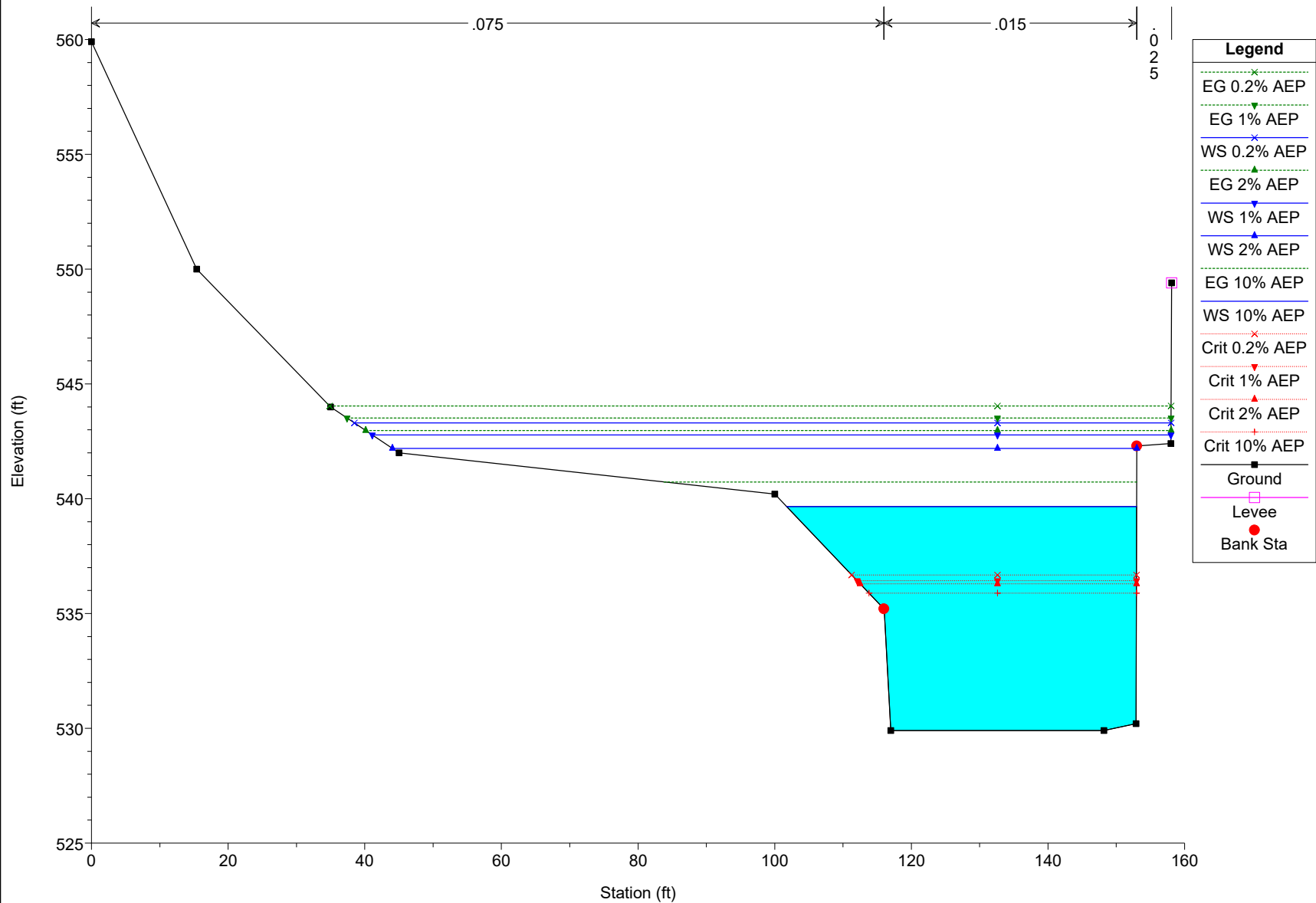
STREAM STA. 4.775



STREAM STA. 4.772



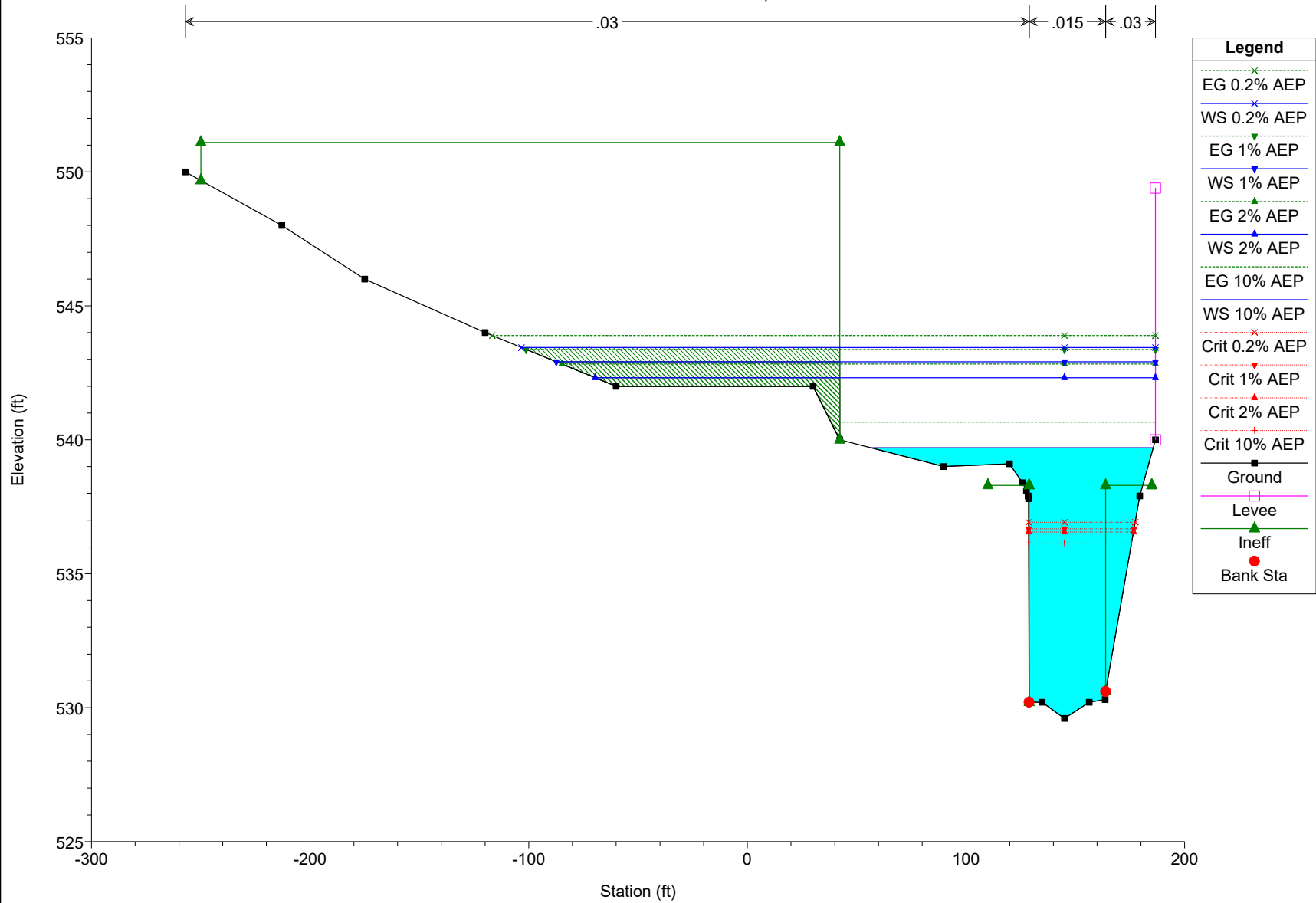
STREAM STA. 4.769



STREAM STA. 4.743

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-existing 6/15/2020

This is a REPEATED section. Levee in LOB represents elevated ra

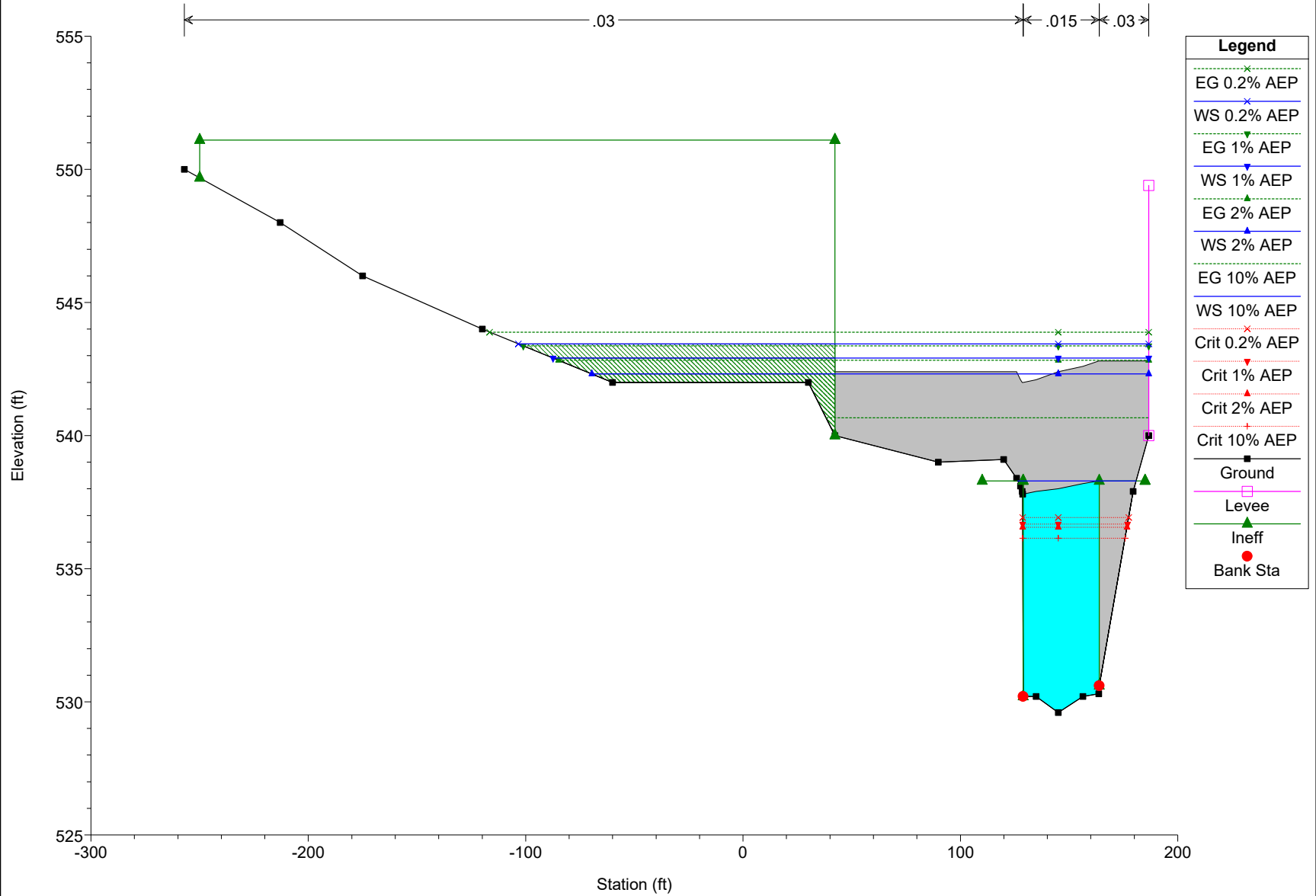


STREAM STA. 4.736

Duck Creek Feasibility Study-FEMA_LOMR

Plan: MEB-existing 6/15/2020

Madison Ave

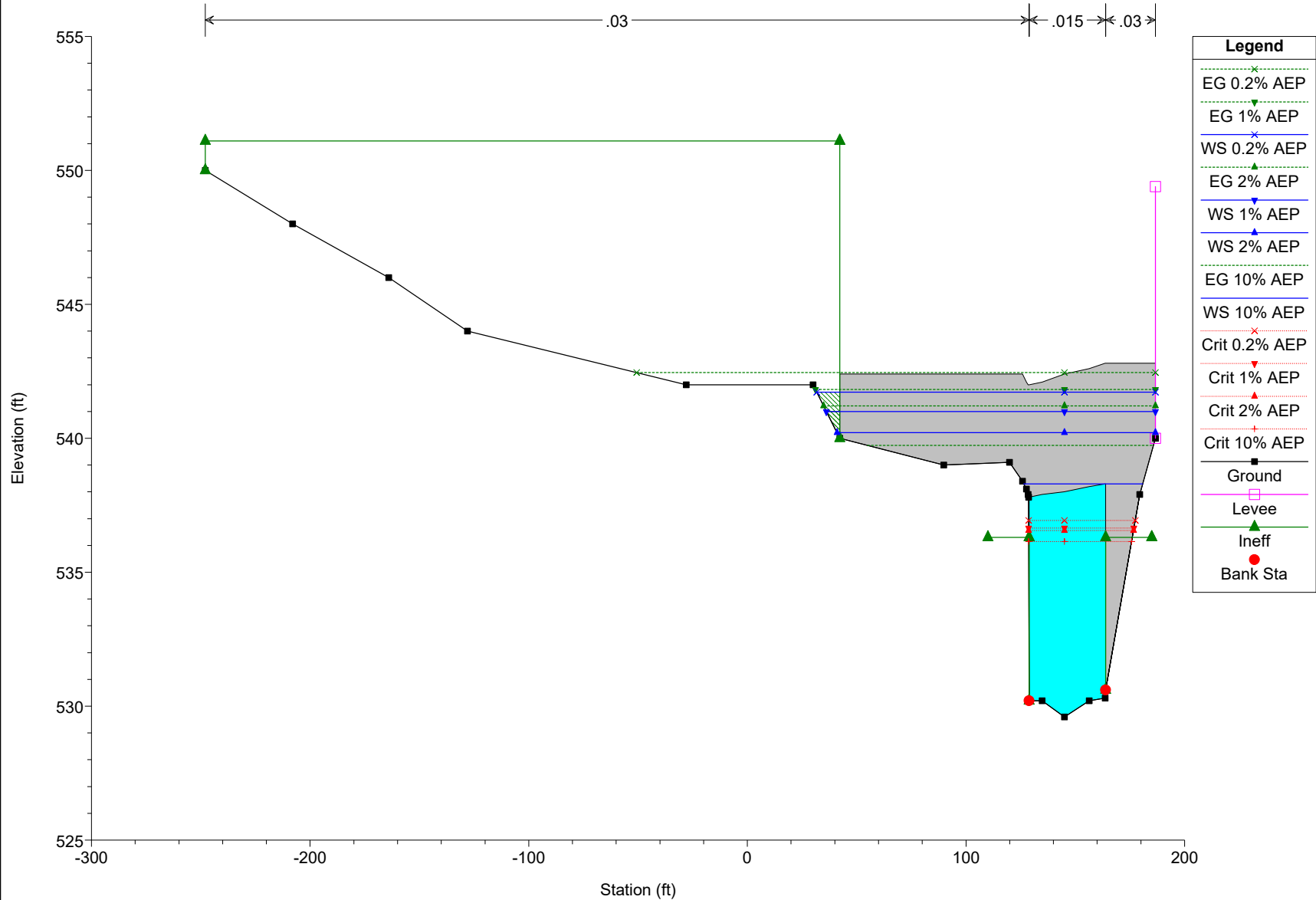


Duck Creek Feasibility Study-FEMA_LOMR

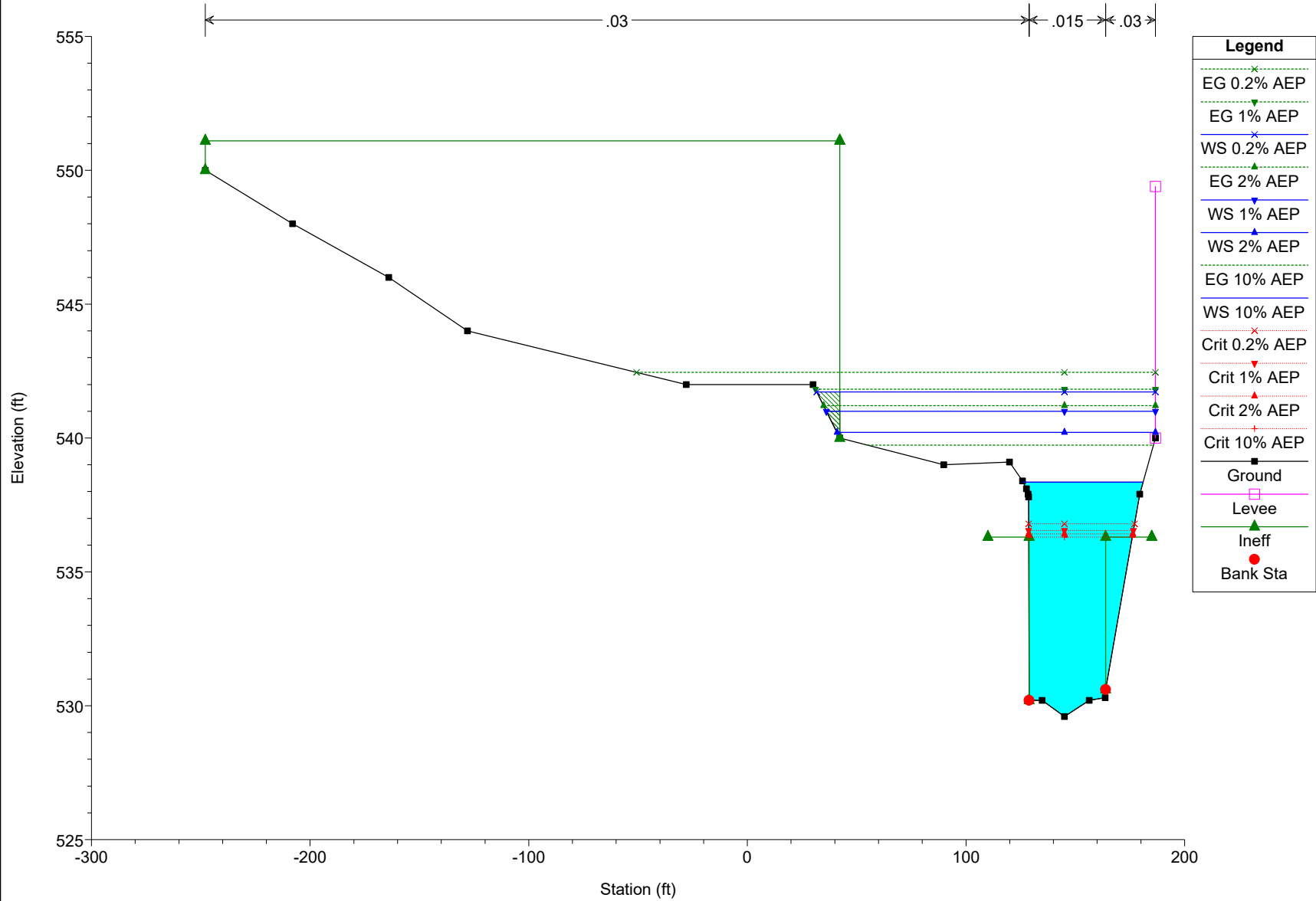
Plan: MEB-existing

6/15/2020

Madison Ave

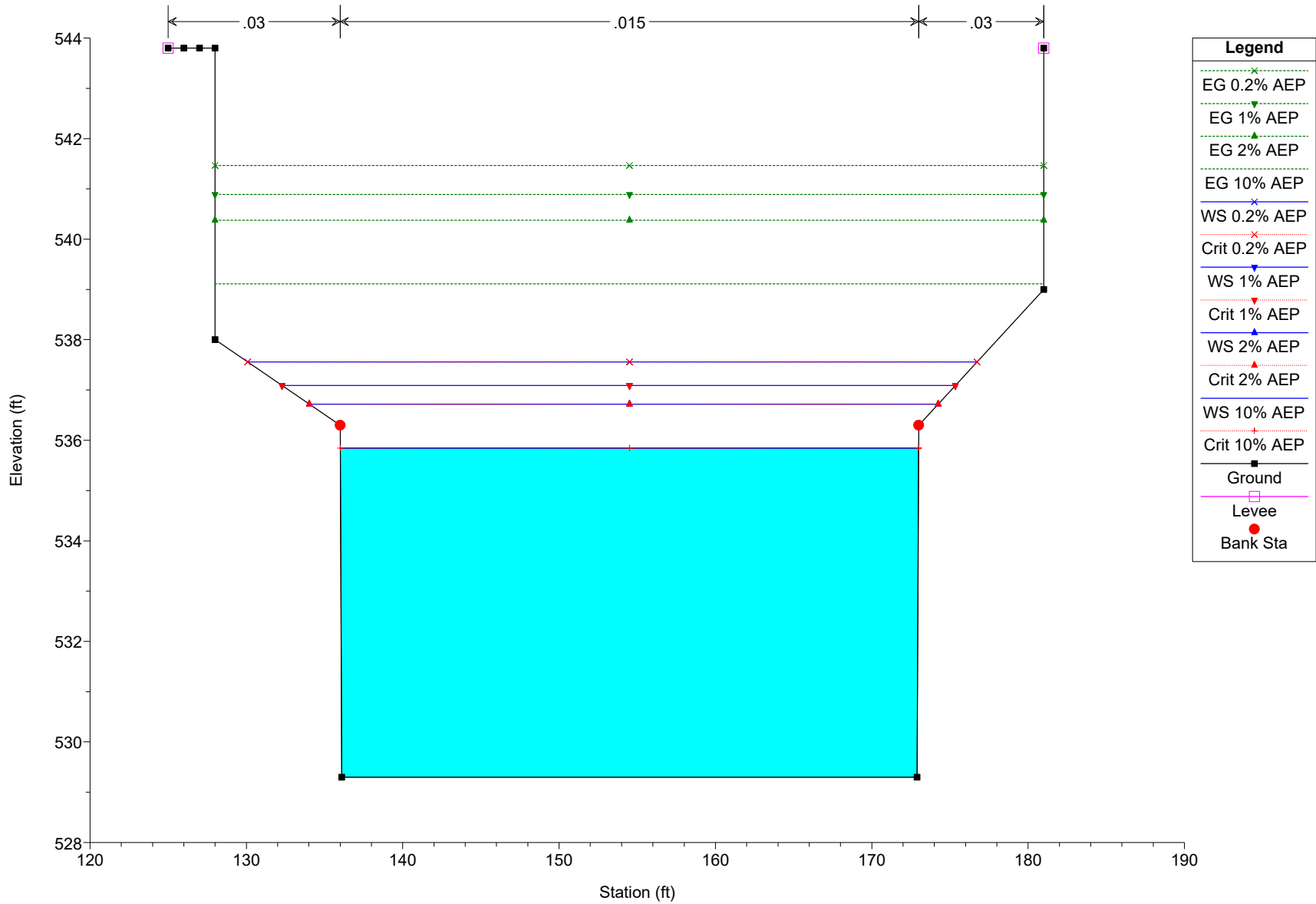


Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-existing 6/15/2020
MADISON AVE



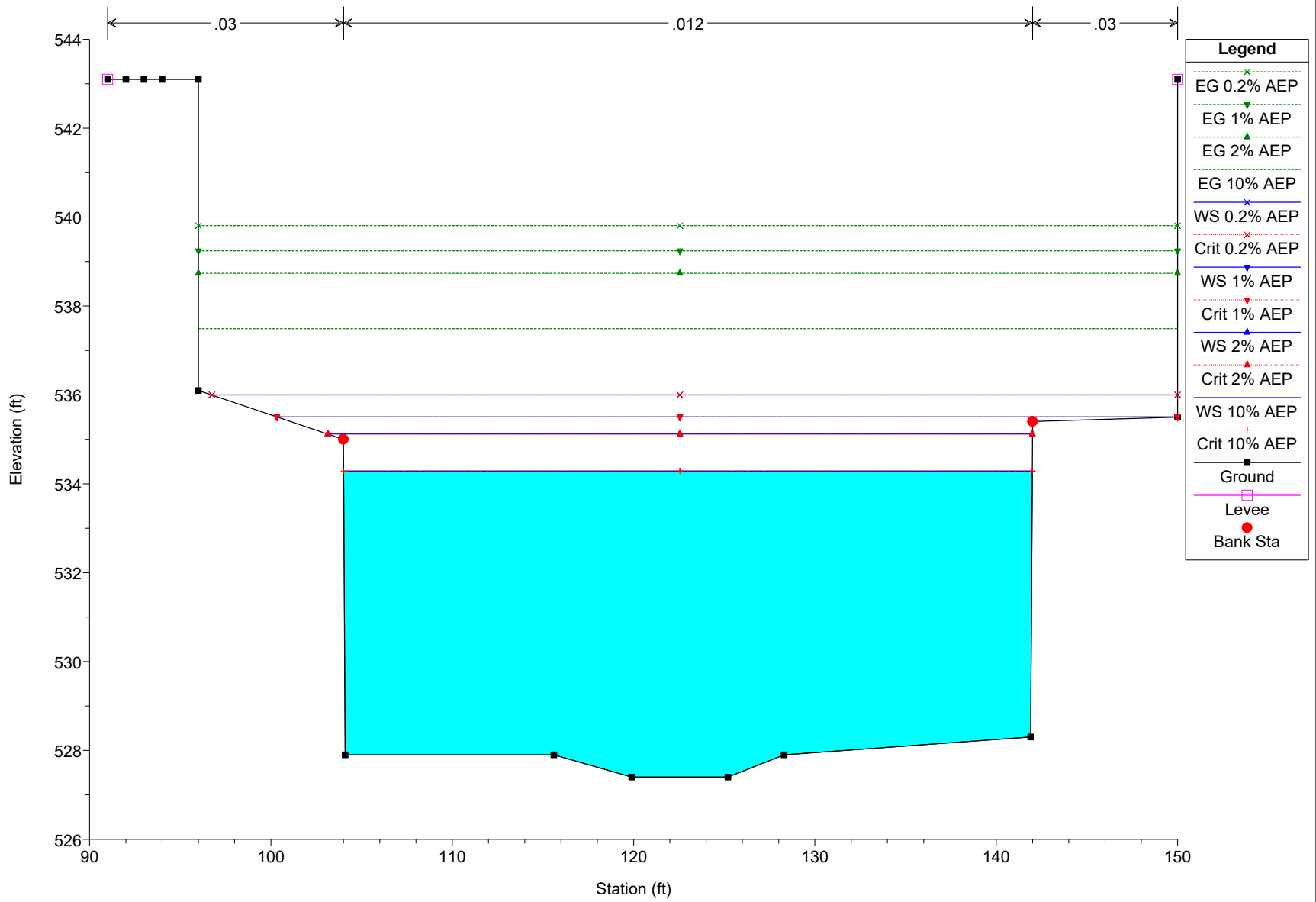
STREAM STA. 4.727

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-existing 6/15/2020



STREAM STA. 4.716

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-existing 6/15/2020



STREAM STA. 4.641

HEC-RAS Plan: MEB-existing River: RIVER-1 Reach: Reach-1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	5.5	10% AEP	3900.00	540.30	556.56		557.10	0.000177	5.92	676.24	80.39	0.32
Reach-1	5.5	2% AEP	4000.00	540.30	556.99		557.52	0.000163	5.83	713.13	88.53	0.30
Reach-1	5.5	1% AEP	4300.00	540.30	558.37		558.84	0.000127	5.55	863.26	141.93	0.27
Reach-1	5.5	0.2% AEP	4500.00	540.30	559.35		559.78	0.000106	5.33	1008.07	154.28	0.25
Reach-1	5.434	10% AEP	3900.00	539.80	556.52		557.03	0.000164	5.77	692.50	79.63	0.30
Reach-1	5.434	2% AEP	4000.00	539.80	556.96		557.46	0.000152	5.69	729.36	87.83	0.29
Reach-1	5.434	1% AEP	4300.00	539.80	558.34		558.80	0.000119	5.43	878.72	141.57	0.26
Reach-1	5.434	0.2% AEP	4500.00	539.80	559.32		559.74	0.000100	5.23	1023.88	153.97	0.25
Reach-1	5.415	10% AEP	3900.00	538.90	554.59	548.80	556.56	0.001069	11.26	346.25	22.14	0.50
Reach-1	5.415	2% AEP	4000.00	538.90	555.02	548.97	556.99	0.001049	11.24	355.84	22.14	0.49
Reach-1	5.415	1% AEP	4300.00	538.90	556.40	549.47	558.33	0.000984	11.13	386.39	22.15	0.47
Reach-1	5.415	0.2% AEP	4500.00	538.90	557.39	549.79	559.27	0.000939	11.02	408.17	22.16	0.45
Reach-1	5.3675		Culvert									
Reach-1	5.32	10% AEP	3900.00	537.40	547.32	547.32	552.25	0.003550	17.80	219.13	22.17	1.00
Reach-1	5.32	2% AEP	4000.00	537.40	547.47	547.47	552.50	0.003588	17.99	222.40	22.17	1.00
Reach-1	5.32	1% AEP	4300.00	537.40	547.98	547.98	553.24	0.003626	18.40	233.76	22.18	1.00
Reach-1	5.32	0.2% AEP	4500.00	537.40	548.31	548.31	553.73	0.003660	18.67	240.99	22.18	1.00
Reach-1	5.308	10% AEP	3900.00	537.30	546.65	545.63	548.84	0.001324	11.86	328.70	49.49	0.81
Reach-1	5.308	2% AEP	4000.00	537.30	547.12	545.76	549.12	0.001153	11.36	352.02	50.89	0.76
Reach-1	5.308	1% AEP	4300.00	537.30	547.42	546.10	549.55	0.001185	11.70	367.44	51.80	0.77
Reach-1	5.308	0.2% AEP	4500.00	537.30	547.84	546.33	549.91	0.001106	11.55	389.61	53.09	0.75
Reach-1	5.259	10% AEP	3900.00	536.50	546.70	544.85	548.41	0.000946	10.50	371.50	52.04	0.69
Reach-1	5.259	2% AEP	4000.00	536.50	547.16	544.96	548.74	0.000837	10.11	395.82	53.44	0.65
Reach-1	5.259	1% AEP	4300.00	536.50	547.46	545.30	549.15	0.000865	10.43	412.27	54.36	0.67
Reach-1	5.259	0.2% AEP	4500.00	536.50	547.88	545.53	549.54	0.000816	10.33	435.49	55.64	0.65
Reach-1	5.248	10% AEP	3900.00	536.20	546.98	544.30	548.04	0.000598	8.26	472.30	67.60	0.55
Reach-1	5.248	2% AEP	4000.00	536.20	547.42	544.43	548.40	0.000529	7.96	502.41	68.96	0.52
Reach-1	5.248	1% AEP	4300.00	536.20	547.75	544.71	548.79	0.000541	8.19	525.15	69.97	0.53
Reach-1	5.248	0.2% AEP	4500.00	536.20	548.16	544.89	549.19	0.000508	8.11	554.72	71.27	0.51
Reach-1	5.234		Bridge									

HEC-RAS Plan: MEB-existing River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	5.224	10% AEP	3900.00	536.20	546.12	544.30	547.49	0.000858	9.38	415.57	64.95	0.65
Reach-1	5.224	2% AEP	4000.00	536.20	546.80	544.43	547.98	0.000675	8.68	460.68	67.06	0.58
Reach-1	5.224	1% AEP	4300.00	536.20	547.07	544.71	548.32	0.000702	8.99	478.38	67.87	0.60
Reach-1	5.224	0.2% AEP	4500.00	536.20	547.55	544.89	548.75	0.000637	8.80	511.56	69.37	0.57
Reach-1	5.213	10% AEP	3900.00	536.40	546.23	543.41	547.22	0.002500	8.04	503.13	79.02	0.51
Reach-1	5.213	2% AEP	4000.00	536.40	546.90	543.49	547.75	0.001953	7.51	556.25	79.99	0.45
Reach-1	5.213	1% AEP	4300.00	536.40	547.17	543.79	548.09	0.002013	7.78	578.02	80.38	0.46
Reach-1	5.213	0.2% AEP	4500.00	536.40	547.65	543.97	548.53	0.001817	7.66	616.68	81.08	0.45
Reach-1	5.113	10% AEP	3900.00	533.50	545.66	541.76	546.18	0.001239	6.18	824.22	156.93	0.36
Reach-1	5.113	2% AEP	4000.00	533.50	546.56	542.04	546.96	0.000869	5.51	968.23	162.29	0.31
Reach-1	5.113	1% AEP	4300.00	533.50	546.84	542.46	547.26	0.000890	5.68	1014.08	163.12	0.31
Reach-1	5.113	0.2% AEP	4500.00	533.50	547.40	542.70	547.79	0.000776	5.49	1105.65	164.77	0.29
Reach-1	5.076	10% AEP	3900.00	529.80	545.77	539.46	545.88	0.000650	3.07	1495.48	286.95	0.16
Reach-1	5.076	2% AEP	4000.00	529.80	546.66	539.58	546.75	0.000435	2.64	1759.61	306.31	0.13
Reach-1	5.076	1% AEP	4300.00	529.80	546.95	539.89	547.04	0.000437	2.69	1850.21	312.73	0.13
Reach-1	5.076	0.2% AEP	4500.00	529.80	547.51	540.13	547.59	0.000370	2.54	2028.20	325.05	0.12
Reach-1	5.061	10% AEP	3900.00	529.40	545.65	538.80	545.81	0.000895	3.57	1341.61	297.83	0.18
Reach-1	5.061	2% AEP	4000.00	529.40	546.59	538.86	546.70	0.000557	2.96	1626.41	305.80	0.15
Reach-1	5.061	1% AEP	4300.00	529.40	546.89	539.11	547.00	0.000551	2.99	1716.71	307.87	0.15
Reach-1	5.061	0.2% AEP	4500.00	529.40	547.46	539.28	547.56	0.000454	2.80	1893.69	311.88	0.13
Reach-1	5.060		Bridge									
Reach-1	5.059	10% AEP	3900.00	529.40	545.41	538.80	545.59	0.001020	3.75	1269.77	288.16	0.20
Reach-1	5.059	2% AEP	4000.00	529.40	546.49	538.86	546.60	0.000589	3.03	1594.25	305.06	0.15
Reach-1	5.059	1% AEP	4300.00	529.40	546.79	539.11	546.90	0.000581	3.06	1685.33	307.15	0.15
Reach-1	5.059	0.2% AEP	4500.00	529.40	547.38	539.28	547.48	0.000472	2.84	1868.75	311.32	0.14
Reach-1	5.029	10% AEP	4000.00	529.60	545.02	539.39	545.39	0.000749	4.93	858.93	113.50	0.28
Reach-1	5.029	2% AEP	4500.00	529.60	546.06	539.76	546.43	0.000669	4.94	981.18	122.22	0.26
Reach-1	5.029	1% AEP	4600.00	529.60	546.38	539.85	546.73	0.000632	4.88	1020.28	124.42	0.26
Reach-1	5.029	0.2% AEP	5000.00	529.60	546.94	540.12	547.31	0.000626	5.00	1091.56	128.34	0.26
Reach-1	4.966	10% AEP	4000.00	531.00	544.55	538.95	545.02	0.001732	5.56	756.29	99.08	0.31
Reach-1	4.966	2% AEP	4500.00	531.00	545.63	539.59	546.09	0.001521	5.58	867.98	108.42	0.29

HEC-RAS Plan: MEB-existing River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.966	1% AEP	4600.00	531.00	545.97	539.68	546.42	0.001425	5.51	905.23	111.36	0.29
Reach-1	4.966	0.2% AEP	5000.00	531.00	546.53	540.02	547.00	0.001416	5.67	968.58	116.19	0.29
Reach-1	4.895	10% AEP	4000.00	530.80	543.45	538.94	544.18	0.002779	6.95	606.08	73.20	0.39
Reach-1	4.895	2% AEP	4500.00	530.80	544.65	539.49	545.37	0.002354	6.90	695.71	75.91	0.36
Reach-1	4.895	1% AEP	4600.00	530.80	545.05	539.55	545.74	0.002171	6.79	726.38	76.82	0.35
Reach-1	4.895	0.2% AEP	5000.00	530.80	545.59	539.93	546.32	0.002187	7.02	767.58	78.02	0.36
Reach-1	4.811	10% AEP	4000.00	530.70	542.45	538.82	543.03	0.002231	6.54	719.15	112.75	0.38
Reach-1	4.811	2% AEP	4500.00	530.70	543.96	539.23	544.46	0.001580	6.10	869.66	115.67	0.33
Reach-1	4.811	1% AEP	4600.00	530.70	544.45	539.31	544.91	0.001393	5.90	918.91	116.62	0.31
Reach-1	4.811	0.2% AEP	5000.00	530.70	545.00	539.60	545.49	0.001373	6.05	974.16	117.69	0.31
Reach-1	4.800	10% AEP	4000.00	530.00	542.46		542.78	0.001002	4.80	1020.08	252.14	0.26
Reach-1	4.800	2% AEP	4500.00	530.00	544.03		544.23	0.000559	3.94	1418.45	255.04	0.20
Reach-1	4.800	1% AEP	4600.00	530.00	544.53		544.70	0.000461	3.68	1546.53	255.97	0.18
Reach-1	4.800	0.2% AEP	5000.00	530.00	545.10		545.26	0.000422	3.62	1692.78	257.02	0.18
Reach-1	4.788	10% AEP	3000.00	530.60	539.20	538.17	542.00	0.001085	13.41	223.63	65.09	0.82
Reach-1	4.788	2% AEP	3300.00	530.60	541.62	538.65	543.66	0.000562	11.44	288.48	95.39	0.61
Reach-1	4.788	1% AEP	3400.00	530.60	542.21	538.79	544.15	0.000500	11.17	304.26	115.16	0.58
Reach-1	4.788	0.2% AEP	3600.00	530.60	542.69	539.10	544.70	0.000487	11.35	317.22	116.15	0.58
Reach-1	4.783		Bridge									
Reach-1	4.778	10% AEP	3000.00	530.60	538.15	538.15	541.81	0.001697	15.34	195.55	52.89	1.00
Reach-1	4.778	2% AEP	3300.00	530.60	541.38	538.65	543.51	0.000606	11.70	282.03	92.37	0.64
Reach-1	4.778	1% AEP	3400.00	530.60	542.01	538.80	544.02	0.000531	11.38	298.80	114.75	0.60
Reach-1	4.778	0.2% AEP	3600.00	530.60	542.49	539.11	544.56	0.000517	11.55	311.63	115.72	0.60
Reach-1	4.775	10% AEP	3000.00	530.60	538.96	537.41	541.20	0.001564	12.01	249.76	29.95	0.73
Reach-1	4.775	2% AEP	3300.00	530.60	541.73	537.86	543.26	0.000844	9.91	332.87	30.00	0.52
Reach-1	4.775	1% AEP	3400.00	530.60	542.33	537.99	543.79	0.000763	9.69	350.80	31.93	0.50
Reach-1	4.775	0.2% AEP	3600.00	530.60	542.82	538.28	544.33	0.000746	9.85	365.41	34.77	0.50
Reach-1	4.772	10% AEP	3000.00	530.60	539.41	536.84	540.98	0.000988	10.05	298.41	33.95	0.60
Reach-1	4.772	2% AEP	3300.00	530.60	542.00	537.27	543.13	0.000574	8.54	386.40	34.00	0.45
Reach-1	4.772	1% AEP	3400.00	530.60	542.58	537.40	543.67	0.000516	8.37	406.22	172.30	0.43
Reach-1	4.772	0.2% AEP	3600.00	530.60	543.08	537.65	544.20	0.000505	8.51	423.06	177.18	0.43

LEFT BANK
OVERFLOW
LOCATION

HEC-RAS Plan: MEB-existing River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.769	10% AEP	3000.00	530.60	539.60	536.58	540.88	0.000726	9.08	349.24	51.52	0.54
Reach-1	4.769	2% AEP	3300.00	530.60	542.16	536.98	543.05	0.000387	7.66	495.38	92.09	0.40
Reach-1	4.769	1% AEP	3400.00	530.60	542.75	537.12	543.59	0.000342	7.44	544.60	130.02	0.38
Reach-1	4.769	0.2% AEP	3600.00	530.60	543.27	537.36	544.11	0.000327	7.48	588.39	146.66	0.37
Reach-1	4.743	10% AEP	3000.00	529.90	539.66	535.89	540.73	0.000525	8.33	388.93	51.25	0.47
Reach-1	4.743	2% AEP	3300.00	529.90	542.19	536.29	542.97	0.000304	7.17	582.57	108.95	0.36
Reach-1	4.743	1% AEP	3400.00	529.90	542.78	536.43	543.52	0.000271	6.98	650.02	116.91	0.34
Reach-1	4.743	0.2% AEP	3600.00	529.90	543.30	536.68	544.04	0.000262	7.04	711.38	119.51	0.34
Reach-1	4.736	10% AEP	3000.00	529.60	539.69	536.15	540.66	0.000335	8.20	471.24	128.82	0.46
Reach-1	4.736	2% AEP	3300.00	529.60	542.32	536.55	542.83	0.000143	6.28	847.92	256.27	0.32
Reach-1	4.736	1% AEP	3400.00	529.60	542.91	536.68	543.37	0.000123	6.01	933.92	274.14	0.30
Reach-1	4.736	0.2% AEP	3600.00	529.60	543.44	536.92	543.89	0.000115	5.97	1010.38	290.03	0.29
Reach-1	4.7315	Bridge										
Reach-1	4.727	10% AEP	3000.00	529.60	538.35	536.30	539.73	0.000573	9.70	357.52	54.94	0.59
Reach-1	4.727	2% AEP	3300.00	529.60	540.21	536.42	541.21	0.000328	8.40	543.60	145.70	0.46
Reach-1	4.727	1% AEP	3400.00	529.60	541.00	536.55	541.82	0.000252	7.73	657.51	150.55	0.41
Reach-1	4.727	0.2% AEP	3600.00	529.60	541.73	536.79	542.45	0.000212	7.41	762.25	155.01	0.38
Reach-1	4.716	10% AEP	3500.00	529.30	535.84	535.84	539.11	0.002616	14.50	241.44	36.99	1.00
Reach-1	4.716	2% AEP	4200.00	529.30	536.72	536.72	540.37	0.002537	15.34	274.47	40.21	0.99
Reach-1	4.716	1% AEP	4500.00	529.30	537.09	537.09	540.89	0.002471	15.64	289.94	43.06	0.99
Reach-1	4.716	0.2% AEP	4850.00	529.30	537.56	537.56	541.47	0.002356	15.88	310.90	46.64	0.98
Reach-1	4.641	10% AEP	3500.00	527.40	534.29	534.29	537.49	0.001637	14.36	243.77	37.97	1.00
Reach-1	4.641	2% AEP	4200.00	527.40	535.12	535.12	538.73	0.001636	15.25	275.38	38.86	1.00
Reach-1	4.641	1% AEP	4500.00	527.40	535.50	535.50	539.24	0.001590	15.51	291.38	49.67	0.99
Reach-1	4.641	0.2% AEP	4850.00	527.40	536.00	536.00	539.81	0.001494	15.68	316.74	53.26	0.97
Reach-1	4.595	10% AEP	3500.00	526.70	534.02	533.40	536.58	0.001196	12.83	272.84	39.98	0.87
Reach-1	4.595	2% AEP	4200.00	526.70	534.96	534.21	537.80	0.001154	13.53	313.96	49.03	0.86
Reach-1	4.595	1% AEP	4500.00	526.70	535.45	534.55	538.32	0.001075	13.61	338.46	50.00	0.84
Reach-1	4.595	0.2% AEP	4850.00	526.70	535.95	535.00	538.89	0.001021	13.79	363.59	50.00	0.82
Reach-1	4.533	10% AEP	3500.00	526.10	533.89	532.80	536.13	0.000981	12.01	291.53	39.97	0.78

EXISTING
MADISON
ROAD
BRIDGE

HEC-RAS Plan: MEB-existing River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.533	2% AEP	4200.00	526.10	534.89	533.61	537.34	0.000933	12.60	373.04	121.97	0.77
Reach-1	4.533	1% AEP	4500.00	526.10	535.47	533.94	537.87	0.000855	12.52	430.29	154.04	0.74
Reach-1	4.533	0.2% AEP	4850.00	526.10	536.05	534.58	538.43	0.000798	12.53	488.72	184.64	0.72
Reach-1	4.455	10% AEP	3500.00	525.20	533.78	532.06	535.68	0.000767	11.05	317.59	42.96	0.69
Reach-1	4.455	2% AEP	4200.00	525.20	534.75	532.83	536.91	0.000768	11.80	364.03	52.72	0.70
Reach-1	4.455	1% AEP	4500.00	525.20	535.27	533.20	537.48	0.000735	11.92	393.21	58.09	0.69
Reach-1	4.455	0.2% AEP	4850.00	525.20	535.81	533.58	538.09	0.000717	12.14	425.54	63.50	0.68
Reach-1	4.355	10% AEP	3500.00	524.40	533.84	530.85	535.21	0.000454	9.42	405.33	73.82	0.55
Reach-1	4.355	2% AEP	4200.00	524.40	534.90	531.67	536.42	0.000442	10.00	486.81	79.78	0.55
Reach-1	4.355	1% AEP	4500.00	524.40	535.47	531.99	536.99	0.000417	10.07	532.66	82.57	0.54
Reach-1	4.355	0.2% AEP	4850.00	524.40	536.04	532.42	537.59	0.000401	10.21	580.76	85.40	0.53
Reach-1	4.325	10% AEP	3500.00	524.00	534.16	530.36	534.84	0.004063	6.69	550.35	95.60	0.41
Reach-1	4.325	2% AEP	4200.00	524.00	535.33	531.04	536.01	0.003489	6.78	664.88	100.23	0.39
Reach-1	4.325	1% AEP	4500.00	524.00	535.93	531.31	536.59	0.003138	6.70	725.49	102.60	0.38
Reach-1	4.325	0.2% AEP	4850.00	524.00	536.54	531.63	537.19	0.002879	6.68	788.81	105.01	0.36
Reach-1	4.242	10% AEP	3500.00	521.10	533.19	527.39	533.59	0.001908	5.17	728.31	105.57	0.29
Reach-1	4.242	2% AEP	4200.00	521.10	534.53	528.11	534.92	0.001654	5.24	873.01	111.13	0.27
Reach-1	4.242	1% AEP	4500.00	521.10	535.22	528.39	535.60	0.001489	5.17	951.12	114.02	0.26
Reach-1	4.242	0.2% AEP	4850.00	521.10	535.90	528.73	536.28	0.001383	5.17	1029.09	116.83	0.26
Reach-1	4.178	10% AEP	3500.00	519.40	532.56	526.49	532.95	0.001852	5.32	736.24	285.73	0.28
Reach-1	4.178	2% AEP	4200.00	519.40	534.00	527.38	534.38	0.001531	5.24	890.95	288.42	0.26
Reach-1	4.178	1% AEP	4500.00	519.40	534.76	527.80	535.11	0.001350	5.10	973.40	289.83	0.24
Reach-1	4.178	0.2% AEP	4850.00	519.40	535.47	528.28	535.82	0.001241	5.06	1052.16	291.16	0.23
Reach-1	4.166	10% AEP	3500.00	519.00	532.28	524.78	532.78	0.002544	5.66	617.89	241.75	0.28
Reach-1	4.166	2% AEP	4200.00	519.00	533.59	525.48	534.19	0.002661	6.18	680.04	269.32	0.29
Reach-1	4.166	1% AEP	4500.00	519.00	534.30	525.77	534.92	0.002602	6.31	713.59	284.56	0.29
Reach-1	4.166	0.2% AEP	4850.00	519.00	534.96	526.11	535.62	0.002620	6.51	744.80	298.73	0.29
Reach-1	4.165		Bridge									
Reach-1	4.164	10% AEP	3500.00	519.00	532.23	524.78	532.73	0.002577	5.69	615.44	389.16	0.28
Reach-1	4.164	2% AEP	4200.00	519.00	533.54	525.48	534.14	0.002696	6.20	677.39	463.66	0.29
Reach-1	4.164	1% AEP	4500.00	519.00	534.25	525.77	534.87	0.002634	6.33	710.98	616.68	0.29

HEC-RAS Plan: MEB-existing River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.164	0.2% AEP	4850.00	519.00	534.91	526.11	535.57	0.002652	6.54	742.13	620.60	0.29
Reach-1	4.142	10% AEP	3500.00	518.80	532.07	526.43	532.36	0.002244	4.75	995.79	518.99	0.27
Reach-1	4.142	2% AEP	4200.00	518.80	533.50	527.15	533.72	0.001560	4.34	1343.61	705.75	0.23
Reach-1	4.142	1% AEP	4500.00	518.80	534.26	527.46	534.46	0.001266	4.08	1531.72	785.13	0.21
Reach-1	4.142	0.2% AEP	4850.00	518.80	534.97	527.80	535.14	0.001096	3.94	1706.21	823.04	0.19
Reach-1	4.057	10% AEP	3500.00	518.10	531.07	524.61	531.45	0.001758	5.03	758.12	111.11	0.27
Reach-1	4.057	2% AEP	4200.00	518.10	532.65	525.31	533.02	0.001464	5.04	940.65	120.57	0.26
Reach-1	4.057	1% AEP	4500.00	518.10	533.51	525.61	533.86	0.001276	4.93	1046.87	125.75	0.24
Reach-1	4.057	0.2% AEP	4850.00	518.10	534.27	525.93	534.61	0.001175	4.91	1143.03	133.16	0.23
Reach-1	4.041	10% AEP	3500.00	517.90	528.00	526.70	530.75	0.001128	13.28	263.48	96.41	0.79
Reach-1	4.041	2% AEP	4200.00	517.90	529.09	527.69	532.22	0.001104	14.19	295.90	100.38	0.79
Reach-1	4.041	1% AEP	4500.00	517.90	530.26	528.09	533.14	0.000873	13.60	330.85	104.14	0.72
Reach-1	4.041	0.2% AEP	4850.00	517.90	530.82	528.54	533.85	0.000862	13.96	347.45	105.64	0.72
Reach-1	4.0285	Bridge										
Reach-1	4.016	10% AEP	3500.00	517.90	526.70	526.70	530.47	0.001922	15.58	224.58	87.87	1.00
Reach-1	4.016	2% AEP	4200.00	517.90	527.68	527.68	531.93	0.001842	16.55	253.76	94.29	1.00
Reach-1	4.016	1% AEP	4500.00	517.90	528.09	528.09	532.54	0.001809	16.92	265.94	96.78	1.00
Reach-1	4.016	0.2% AEP	4850.00	517.90	528.54	528.54	533.22	0.001782	17.36	279.38	98.77	1.00
Reach-1	4.001	10% AEP	3500.00	517.60	525.03	524.55	527.40	0.001435	12.55	347.21	76.07	0.85
Reach-1	4.001	2% AEP	4200.00	517.60	526.22	525.33	528.56	0.001162	12.59	443.41	85.28	0.79
Reach-1	4.001	1% AEP	4500.00	517.60	526.93	525.65	529.13	0.000980	12.25	505.70	89.69	0.74
Reach-1	4.001	0.2% AEP	4850.00	517.60	528.11	526.05	529.98	0.000720	11.43	615.06	100.24	0.64
Reach-1	3.948	10% AEP	3500.00	517.00	525.01	523.89	526.92	0.001048	11.36	386.47	76.29	0.74
Reach-1	3.948	2% AEP	4200.00	517.00	526.23		528.16	0.000872	11.48	485.48	85.16	0.69
Reach-1	3.948	1% AEP	4500.00	517.00	526.95		528.78	0.000751	11.24	548.69	91.00	0.65
Reach-1	3.948	0.2% AEP	4850.00	517.00	528.12		529.72	0.000567	10.58	661.15	100.61	0.58
Reach-1	3.866	10% AEP	3500.00	516.10	524.88		526.41	0.000794	10.32	457.96	83.95	0.65
Reach-1	3.866	2% AEP	4200.00	516.10	526.17		527.72	0.000662	10.43	572.36	92.53	0.61
Reach-1	3.866	1% AEP	4500.00	516.10	526.91		528.39	0.000577	10.26	643.64	101.04	0.58
Reach-1	3.866	0.2% AEP	4850.00	516.10	528.11		529.41	0.000443	9.70	773.17	115.08	0.51

HEC-RAS Plan: MEB-existing River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.82	10% AEP	3500.00	515.80	524.22	522.56	526.14	0.001188	11.12	317.34	48.42	0.70
Reach-1	3.82	2% AEP	4200.00	515.80	525.40	523.36	527.46	0.001061	11.54	385.50	66.15	0.68
Reach-1	3.82	1% AEP	4500.00	515.80	526.21	523.68	528.17	0.000903	11.28	443.95	78.61	0.63
Reach-1	3.82	0.2% AEP	4850.00	515.80	527.58	524.09	529.25	0.000657	10.49	568.95	103.88	0.55
Reach-1	3.79	10% AEP	3500.00	515.50	524.13	522.20	525.92	0.001070	10.74	336.25	71.71	0.66
Reach-1	3.79	2% AEP	4200.00	515.50	525.39	522.99	527.24	0.000928	11.01	431.26	79.22	0.63
Reach-1	3.79	1% AEP	4500.00	515.50	526.24	523.32	527.97	0.000779	10.69	500.79	85.04	0.59
Reach-1	3.79	0.2% AEP	4850.00	515.50	527.62	523.75	529.09	0.000571	9.96	627.64	101.24	0.52
Reach-1	3.766	10% AEP	3500.00	515.30	524.14	522.53	525.63	0.001147	9.80	357.23	53.31	0.67
Reach-1	3.766	2% AEP	4200.00	515.30	525.44	523.21	526.95	0.000955	9.83	427.14	53.64	0.61
Reach-1	3.766	1% AEP	4500.00	515.30	526.30	523.47	527.70	0.000805	9.51	472.97	53.85	0.57
Reach-1	3.766	0.2% AEP	4850.00	515.30	527.67	523.80	528.89	0.000604	8.87	547.03	54.19	0.49
Reach-1	3.7645		Bridge									
Reach-1	3.763	10% AEP	3450.00	515.30	523.60	522.49	525.31	0.001443	10.50	328.60	53.18	0.74
Reach-1	3.763	2% AEP	4100.00	515.30	525.02	523.09	526.62	0.001076	10.14	404.39	53.53	0.65
Reach-1	3.763	1% AEP	4700.00	515.30	525.95	523.66	527.61	0.000993	10.35	454.13	53.76	0.63
Reach-1	3.763	0.2% AEP	4750.00	515.30	527.42	523.72	528.65	0.000624	8.90	533.65	54.13	0.50
Reach-1	3.754	10% AEP	3450.00	515.20	523.70		525.19	0.000937	9.79	352.31	49.66	0.65
Reach-1	3.754	2% AEP	4100.00	515.20	525.07		526.54	0.000785	9.74	420.84	51.03	0.60
Reach-1	3.754	1% AEP	4700.00	515.20	525.98		527.54	0.000761	10.05	467.85	52.22	0.59
Reach-1	3.754	0.2% AEP	4750.00	515.20	527.43		528.61	0.000503	8.71	545.35	54.18	0.48
Reach-1	3.71	10% AEP	3450.00	514.50	523.56		524.96	0.000834	9.50	363.05	48.27	0.61
Reach-1	3.71	2% AEP	4100.00	514.50	524.94		526.35	0.000718	9.52	430.51	49.70	0.57
Reach-1	3.71	1% AEP	4700.00	514.50	525.84		527.36	0.000692	9.88	476.91	53.05	0.56
Reach-1	3.71	0.2% AEP	4750.00	514.50	527.34		528.50	0.000447	8.62	561.23	59.45	0.46
Reach-1	3.686	10% AEP	3450.00	514.20	523.81	520.63	524.74	0.000479	7.73	446.19	58.89	0.50
Reach-1	3.686	2% AEP	4100.00	514.20	525.20	521.28	526.14	0.000396	7.74	532.29	66.78	0.46
Reach-1	3.686	1% AEP	4700.00	514.20	526.15	521.87	527.14	0.000370	8.00	599.38	74.23	0.45
Reach-1	3.686	0.2% AEP	4750.00	514.20	527.58	521.91	528.34	0.000237	7.02	707.04	76.44	0.37
Reach-1	3.628	10% AEP	3450.00	514.00	523.10	520.83	524.50	0.000821	9.49	363.36	48.04	0.61
Reach-1	3.628	2% AEP	4100.00	514.00	524.55	521.55	525.94	0.000657	9.44	447.67	66.02	0.55

HEC-RAS Plan: MEB-existing River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.628	1% AEP	4700.00	514.00	525.47	522.16	526.95	0.000619	9.78	508.32	66.04	0.55
Reach-1	3.628	0.2% AEP	4750.00	514.00	527.14	522.21	528.22	0.000370	8.39	618.55	66.09	0.43
Reach-1	3.593	10% AEP	3450.00	513.40	522.99	519.99	524.35	0.000752	9.35	369.13	40.79	0.55
Reach-1	3.593	2% AEP	4100.00	513.40	524.39	520.74	525.81	0.000663	9.59	440.62	56.00	0.52
Reach-1	3.593	1% AEP	4700.00	513.40	525.24	521.38	526.82	0.000663	10.11	490.63	60.75	0.53
Reach-1	3.593	0.2% AEP	4750.00	513.40	526.96	521.43	528.13	0.000412	8.76	603.49	70.31	0.43
Reach-1	3.568	10% AEP	3450.00	513.20	522.56	520.31	524.19	0.000829	10.24	336.76	44.30	0.63
Reach-1	3.568	2% AEP	4100.00	513.20	523.99	521.05	525.67	0.000694	10.38	395.05	59.41	0.59
Reach-1	3.568	1% AEP	4700.00	513.20	524.78	521.71	526.67	0.000705	11.01	426.91	65.51	0.60
Reach-1	3.568	0.2% AEP	4750.00	513.20	526.65	521.77	528.04	0.000418	9.45	502.45	76.02	0.47
Reach-1	3.5635		Bridge									
Reach-1	3.559	10% AEP	3450.00	513.20	522.47	520.30	524.14	0.000855	10.35	333.46	44.24	0.64
Reach-1	3.559	2% AEP	4100.00	513.20	523.93	521.06	525.62	0.000711	10.45	392.29	58.54	0.59
Reach-1	3.559	1% AEP	4700.00	513.20	524.71	521.71	526.62	0.000722	11.09	423.83	64.92	0.60
Reach-1	3.559	0.2% AEP	4750.00	513.20	526.59	521.76	527.99	0.000425	9.50	500.04	89.76	0.48
Reach-1	3.548	10% AEP	3450.00	513.00	522.56		523.96	0.000790	9.52	362.51	39.99	0.56
Reach-1	3.548	2% AEP	4100.00	513.00	524.00		525.47	0.000690	9.74	431.77	59.57	0.53
Reach-1	3.548	1% AEP	4700.00	513.00	524.79		526.45	0.000707	10.36	481.41	65.78	0.54
Reach-1	3.548	0.2% AEP	4750.00	513.00	526.67		527.86	0.000422	8.86	633.66	89.92	0.43
Reach-1	3.462	10% AEP	3450.00	511.90	522.39		523.59	0.000611	8.78	417.89	103.47	0.49
Reach-1	3.462	2% AEP	4100.00	511.90	523.94		525.12	0.000507	8.82	632.22	173.47	0.46
Reach-1	3.462	1% AEP	4700.00	511.90	524.82		526.06	0.000495	9.16	788.11	178.22	0.46
Reach-1	3.462	0.2% AEP	4750.00	511.90	526.79		527.59	0.000275	7.54	1147.88	190.79	0.35
Reach-1	3.441	10% AEP	3450.00	511.80	522.35	518.56	523.52	0.000375	8.67	397.82	68.56	0.49
Reach-1	3.441	2% AEP	4100.00	511.80	523.79	519.31	525.05	0.000338	9.00	455.43	79.24	0.47
Reach-1	3.441	1% AEP	4700.00	511.80	524.47	519.97	525.94	0.000365	9.74	482.77	84.31	0.49
Reach-1	3.441	0.2% AEP	4750.00	511.80	526.34	520.02	527.46	0.000231	8.52	557.54	98.17	0.40
Reach-1	3.434		Bridge									
Reach-1	3.427	10% AEP	3450.00	511.80	522.29	518.55	523.47	0.000383	8.73	395.38	68.11	0.49
Reach-1	3.427	2% AEP	4100.00	511.80	523.73	519.31	525.00	0.000343	9.05	453.13	78.81	0.47

HEC-RAS Plan: MEB-existing River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.427	1% AEP	4700.00	511.80	524.40	519.97	525.89	0.000372	9.79	480.13	83.82	0.50
Reach-1	3.427	0.2% AEP	4750.00	511.80	526.29	520.02	527.43	0.000233	8.54	555.89	97.86	0.40
Reach-1	3.41	10% AEP	3450.00	511.60	522.32		523.37	0.000491	8.22	443.06	72.68	0.45
Reach-1	3.41	2% AEP	4100.00	511.60	523.78		524.89	0.000440	8.49	560.86	88.76	0.43
Reach-1	3.41	1% AEP	4700.00	511.60	524.48		525.75	0.000473	9.14	625.27	96.42	0.45
Reach-1	3.41	0.2% AEP	4750.00	511.60	526.38		527.30	0.000290	7.86	828.45	117.35	0.36
Reach-1	3.308	10% AEP	3450.00	510.60	522.18		522.67	0.002946	6.17	695.75	95.23	0.33
Reach-1	3.308	2% AEP	4100.00	510.60	523.76		524.23	0.002443	6.16	856.08	107.87	0.31
Reach-1	3.308	1% AEP	4700.00	510.60	524.49		525.03	0.002591	6.59	939.05	118.45	0.32
Reach-1	3.308	0.2% AEP	4750.00	510.60	526.47		526.83	0.001521	5.54	1208.03	154.94	0.25
Reach-1	3.219	10% AEP	3500.00	509.70	521.65	514.85	521.83	0.000991	3.41	1055.25	137.56	0.20
Reach-1	3.219	2% AEP	4000.00	509.70	523.41	515.23	523.57	0.000705	3.23	1309.37	149.23	0.17
Reach-1	3.219	1% AEP	4800.00	509.70	524.10	515.84	524.30	0.000819	3.63	1413.58	152.83	0.19
Reach-1	3.219	0.2% AEP	5000.00	509.70	526.25	515.96	526.40	0.000488	3.13	1754.45	168.84	0.15

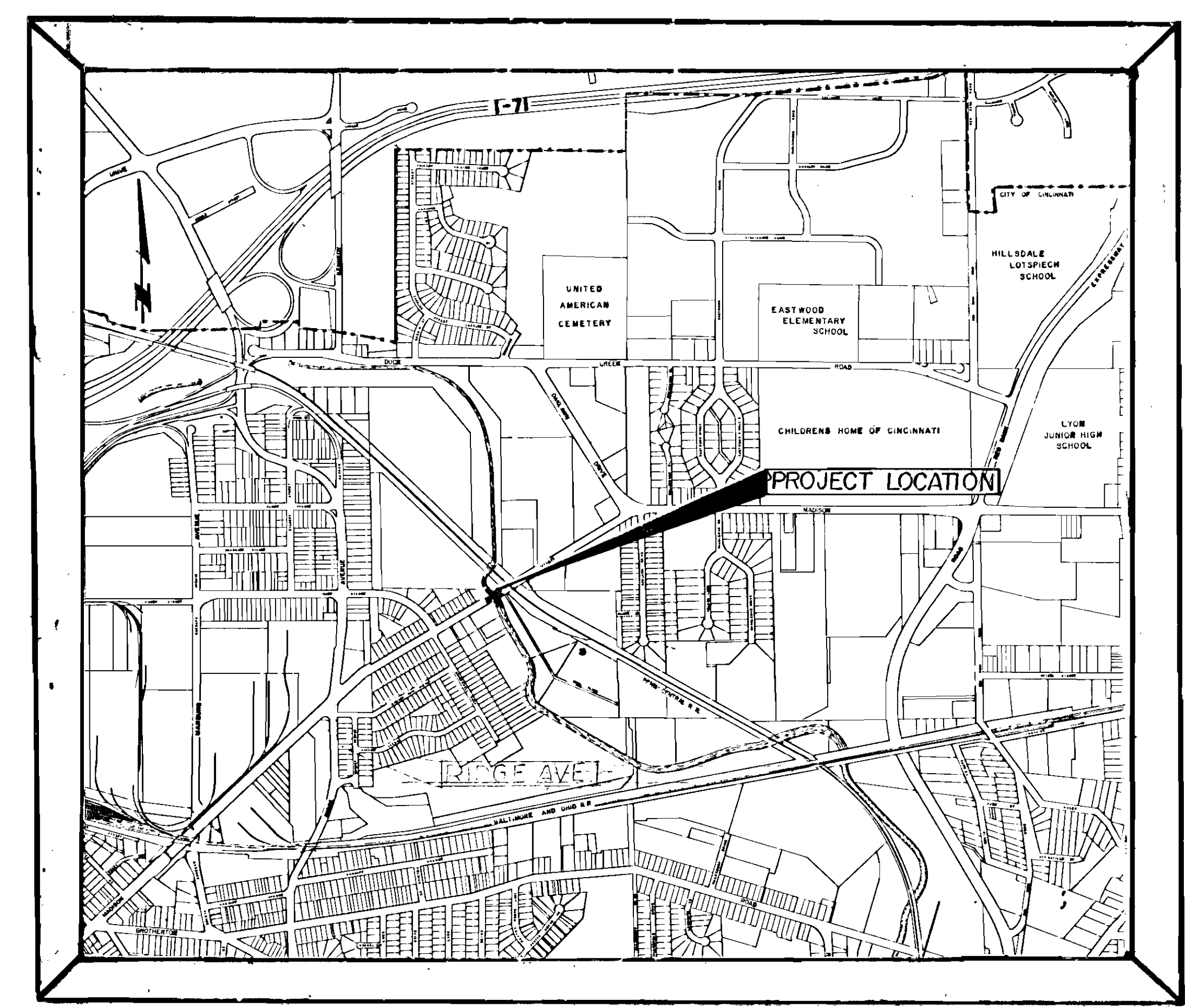
Attachment A-4

Existing – Madison Road Bridge Drawings

CITY OF CINCINNATI
DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENGINEERING
1990 STATE ISSUE II - CONTRACT NO.5 - PROP. IMPROVEMENT
MADISON ROAD BRIDGE
(OVER DUCK CREEK REHABILITATION)
INCLUDING WIDENING RIDGE AVENUE - MADISON RD. TO 450'± SOUTH

INDEX OF SHEETS

TITLE SHEET	1
MAINTENANCE OF TRAFFIC	2-4
ROADWAY PLANS	5-7
STRUCTURES OVER 20'	8-21
CONSTRUCTION SCHEDULE	22
RIDGE AVE. PLAN	22a



SUBMITTED: BC Hutches
PRINCIPAL STRUCTURAL DESIGN ENGINEER

RECOMMENDED: TEH na
CITY ENGINEER

APPROVED: TEH na
ACT. DIRECTOR OF PUBLIC WORKS

APPROVED: Michael A. B...
CITY MANAGER

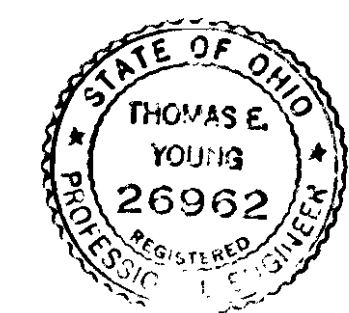
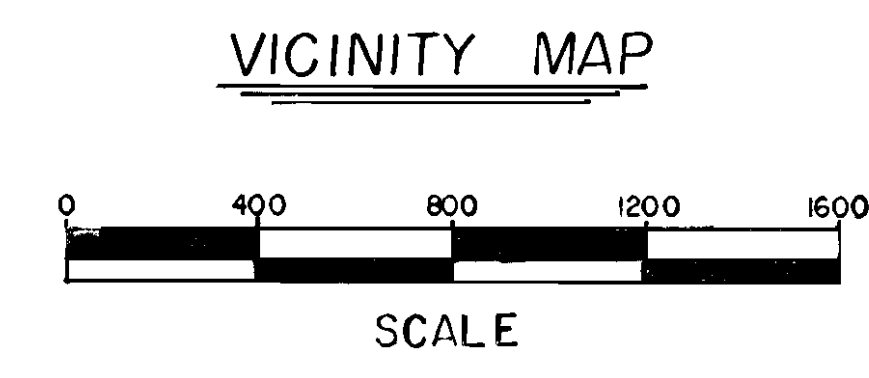
APPROVED: David C. ...
HAMILTON COUNTY ENGINEER

BY, FOR, ON BEHALF OF, AND IN THE NAME OF THE COUNTY OF HAMILTON AND UNDER THE AUTHORITY OF ITS BOARD OF COUNTY COMMISSIONERS BY VIRTUE OF SECTION 305.30 REVISED CODE OF OHIO, AND THE RESOLUTION ADOPTED AUGUST 14, 1978, & ENTERED IN THE JOURNAL OF SAID BOARD.

APPROVED: Thomas W. Weir 11-14-70
COUNTY ADMINISTRATOR

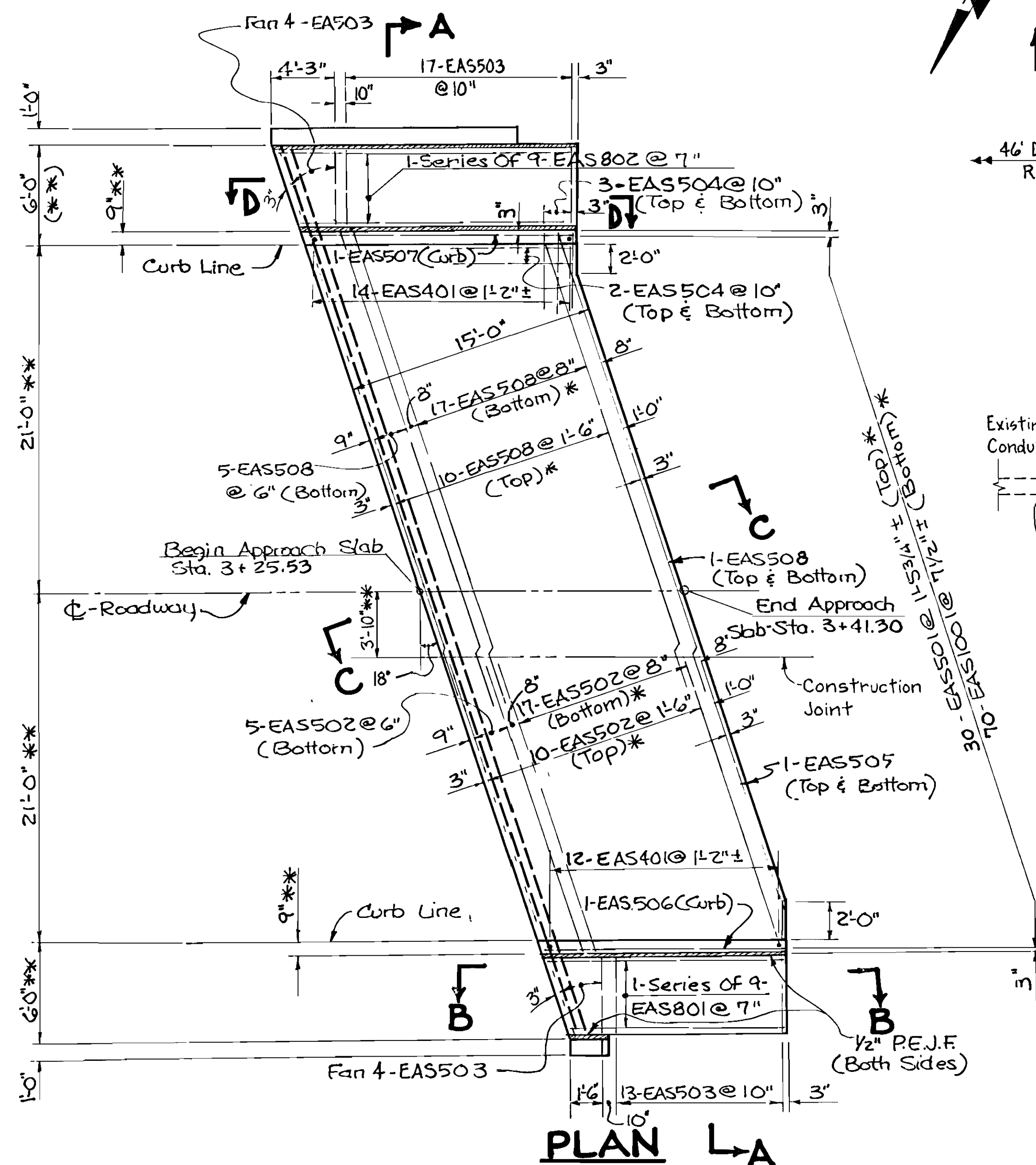
CAUTION UNDERGROUND UTILITIES
2 WORKING DAYS
BEFORE YOU DIG
CALL 800-362-2764 (TOLL FREE)
OHIO UTILITIES PROTECTION SERVICE
CALL NON-SERVICE MEMBERS DIRECT:

SEWER	352-4866	CITY COM.	352-2388
WATER	352-4653	WESTERN U.	421-1819
LIGHTING	352-3705	CABLE TV.	489-1111

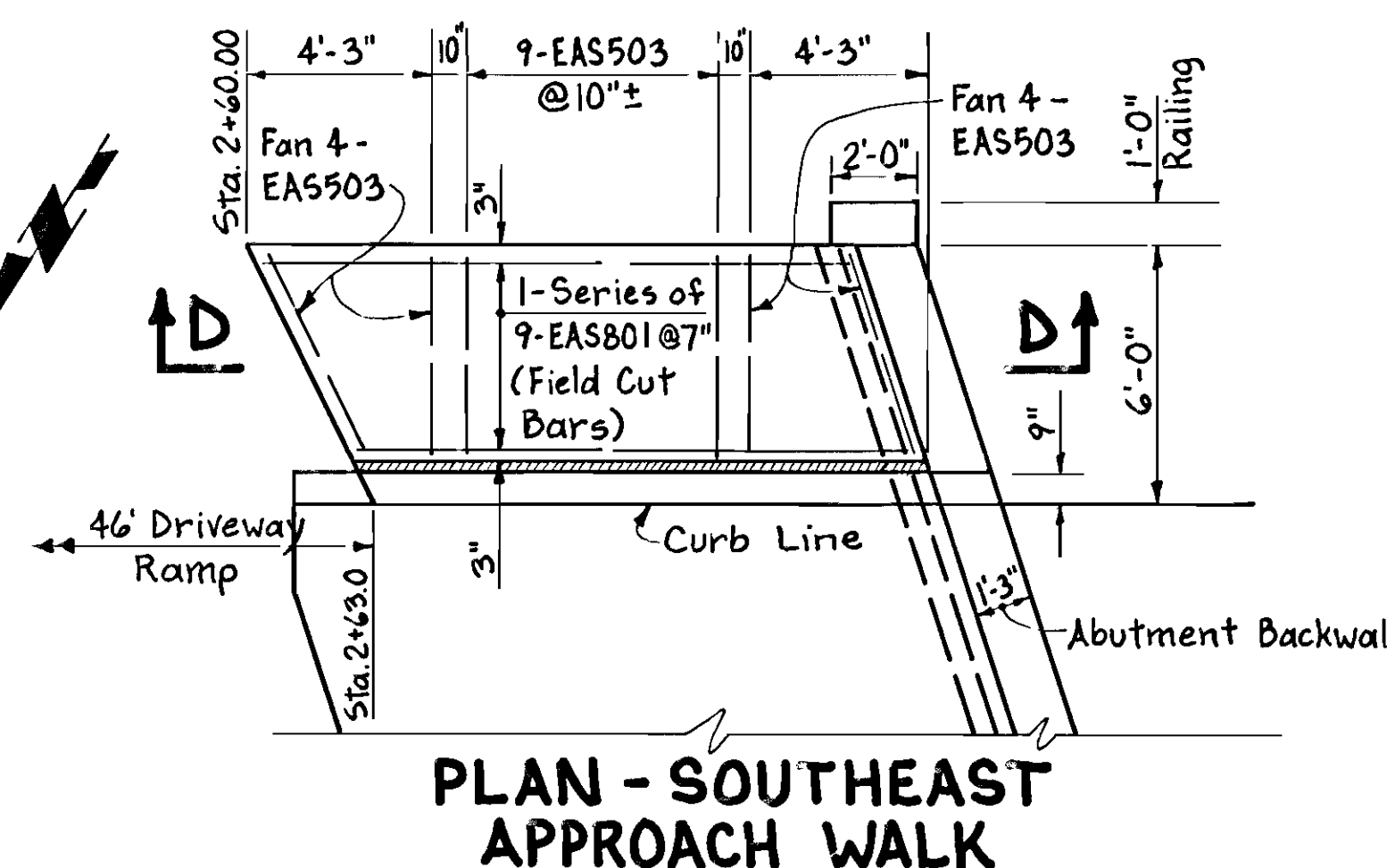


**CONTRACT
DRAWING**

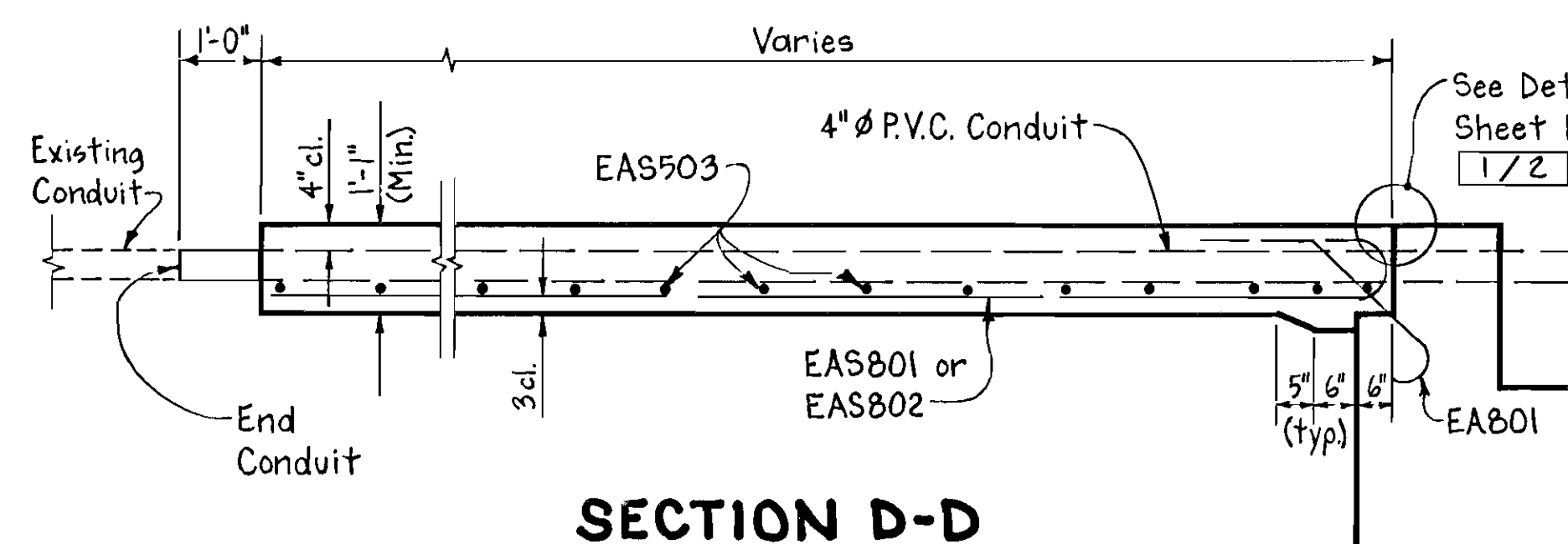
PRINTS NOT BEARING THIS STAMP
WERE MADE PRIOR TO ADVERTISING
FOR BIDS AND ARE TO BE CONSIDERED
OBSOLETE FOR CONTRACT PURPOSES.



(West Approach Slab Shown)
(East Approach Slab Similar
But Opposite Hand.)

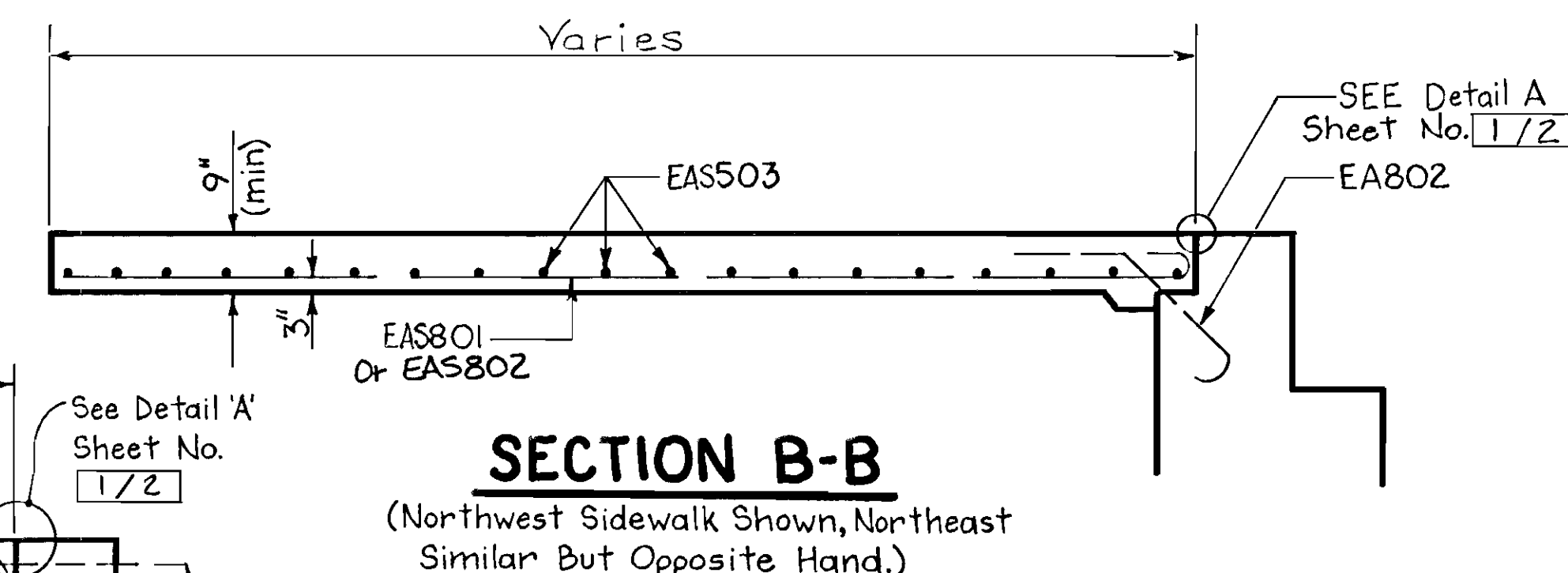


**PLAN - SOUTHEAST
APPROACH WALK**



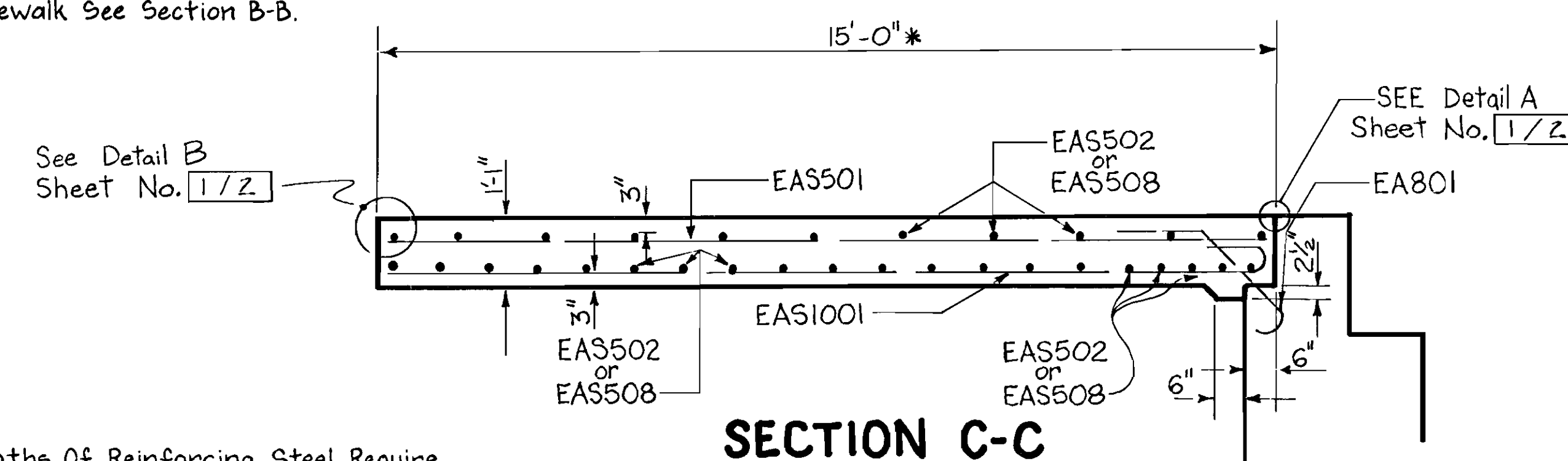
SECTION D-D

4" P.V.C. Conduit Is Carried In The Bridge Quantities.
For Northeast And Northwest Sidewalk See Section B-B.



SECTION B-B

(Northwest Sidewalk Shown, Northeast
Similar But Opposite Hand.)

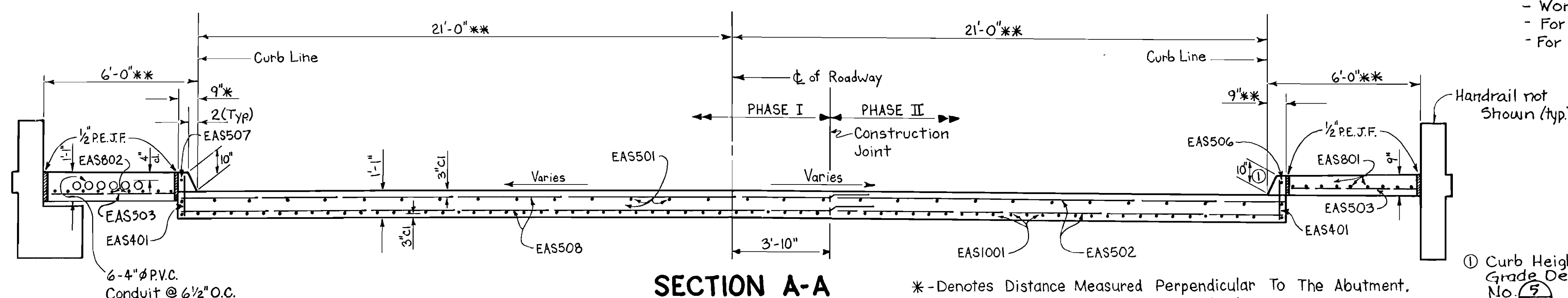


SECTION C-C

NOTE: Plan Lengths Of Reinforcing Steel Require
The Contractor To Field Bend And Then Straighten
Reinforcing Steel In Order To Clear Existing
Concrete During Phase I. Any Damage Done To
Epoxy Coating Shall Be Repaired In Accordance
With Item 509. The Contractor Has The Option
To Use Mechanical Splices That Develop 125%
Yield Strength Of The Spliced Reinforcement.
The Cost Of These Splices And/Or Field Bending
Shall Be Included For Payment Under Item 611.

NOTES:

- PEJ.F. Denotes Preformed Expansion Joint Filler.
- Minimum Splice Length For EAS 5 Bars Is 2'-0".
- For Reinforcing Steel List, See Sheet No. 1/2.
- For Estimated Quantities, See Sheet No. 1/2.
- Work This Sheet With Sheet No. 22.
- For Details Of Bars EA801 & EA802 See Sheet No. 1/2.
- For Approach Railing Details See Sheet No. 20/22.



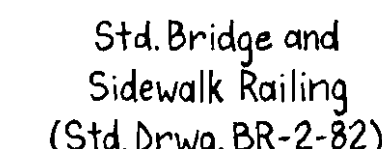
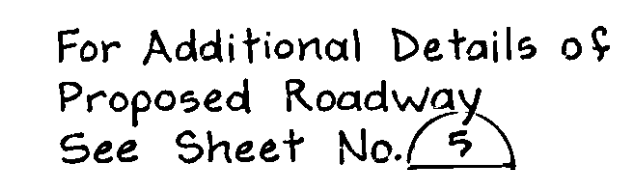
SECTION A-A

(West Approach Shown, East Similar
But Opposite Hand.)

* - Denotes Distance Measured Perpendicular To The Abutment.
** - Denotes Distance Measured Perpendicular To Roadway C.

① Curb Height Varies. See
Grade Details, Sheet
No. 22.

CITY OF CINCINNATI DEPARTMENT OF PUBLIC WORKS DIVISION OF ENGINEERING					
2 / 2					
APPROACH SLAB MADISON ROAD BRIDGE OVER DUCK CREEK					
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	DATE
LAR	BRB	JJD	JGW	GCH	11-5-90
					REVISED



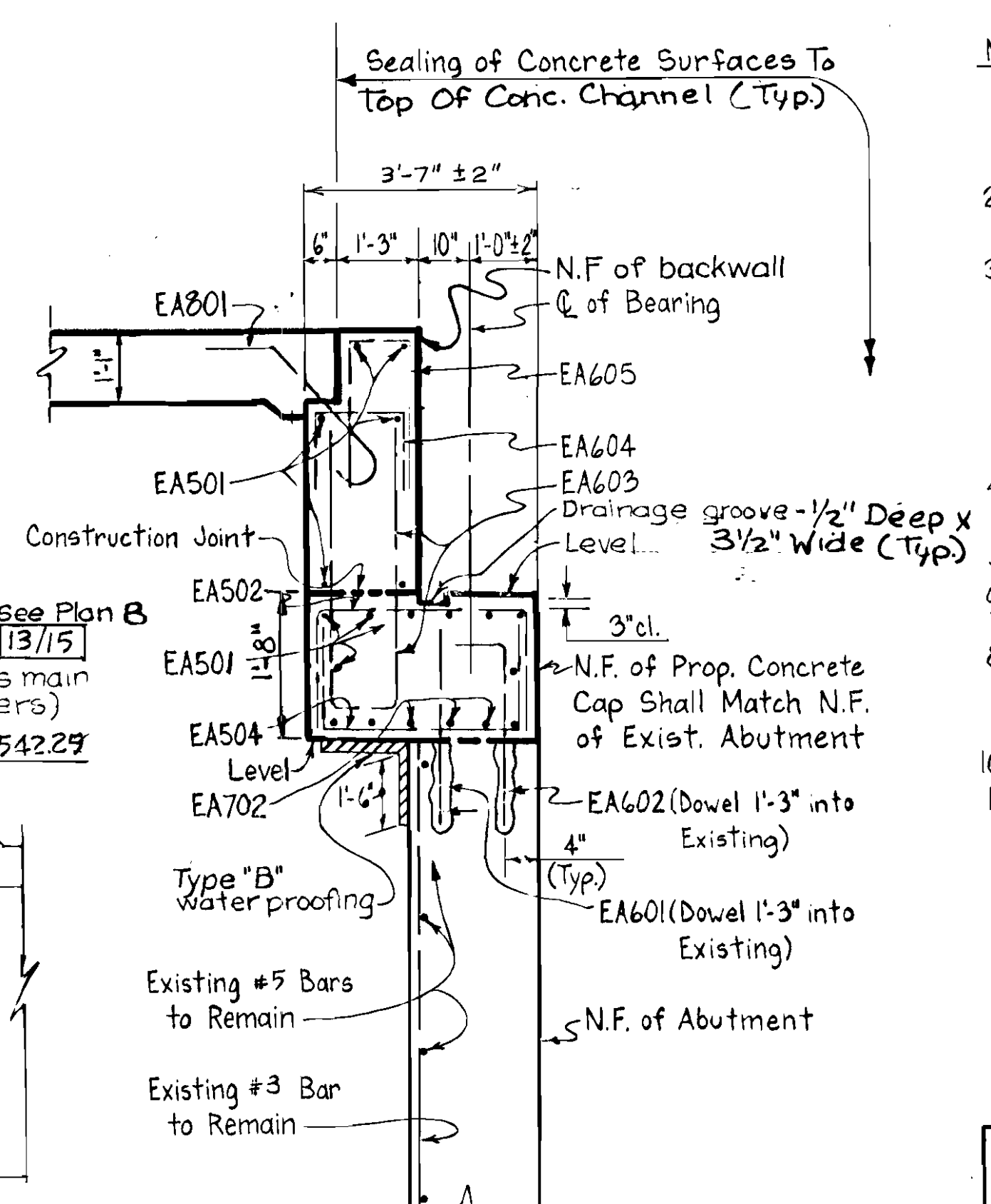
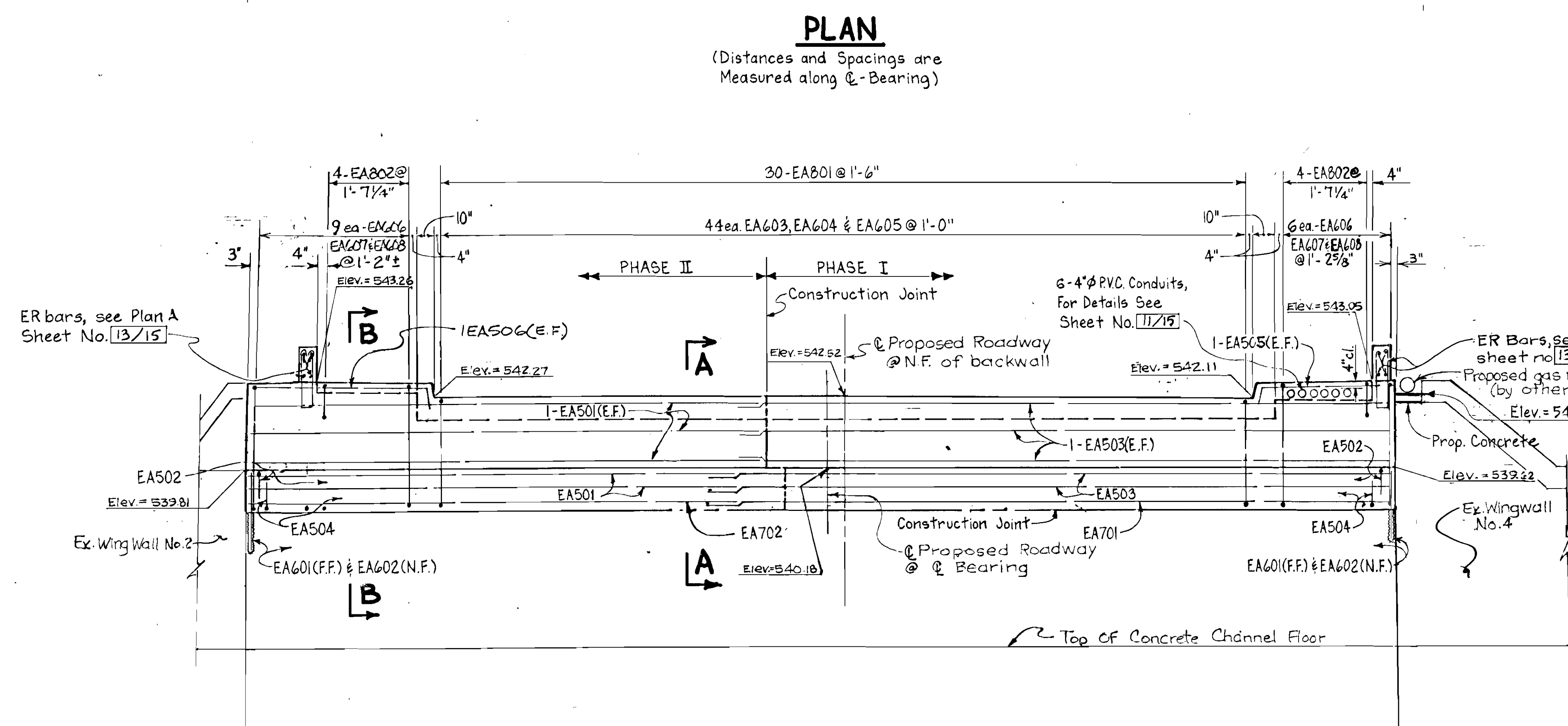
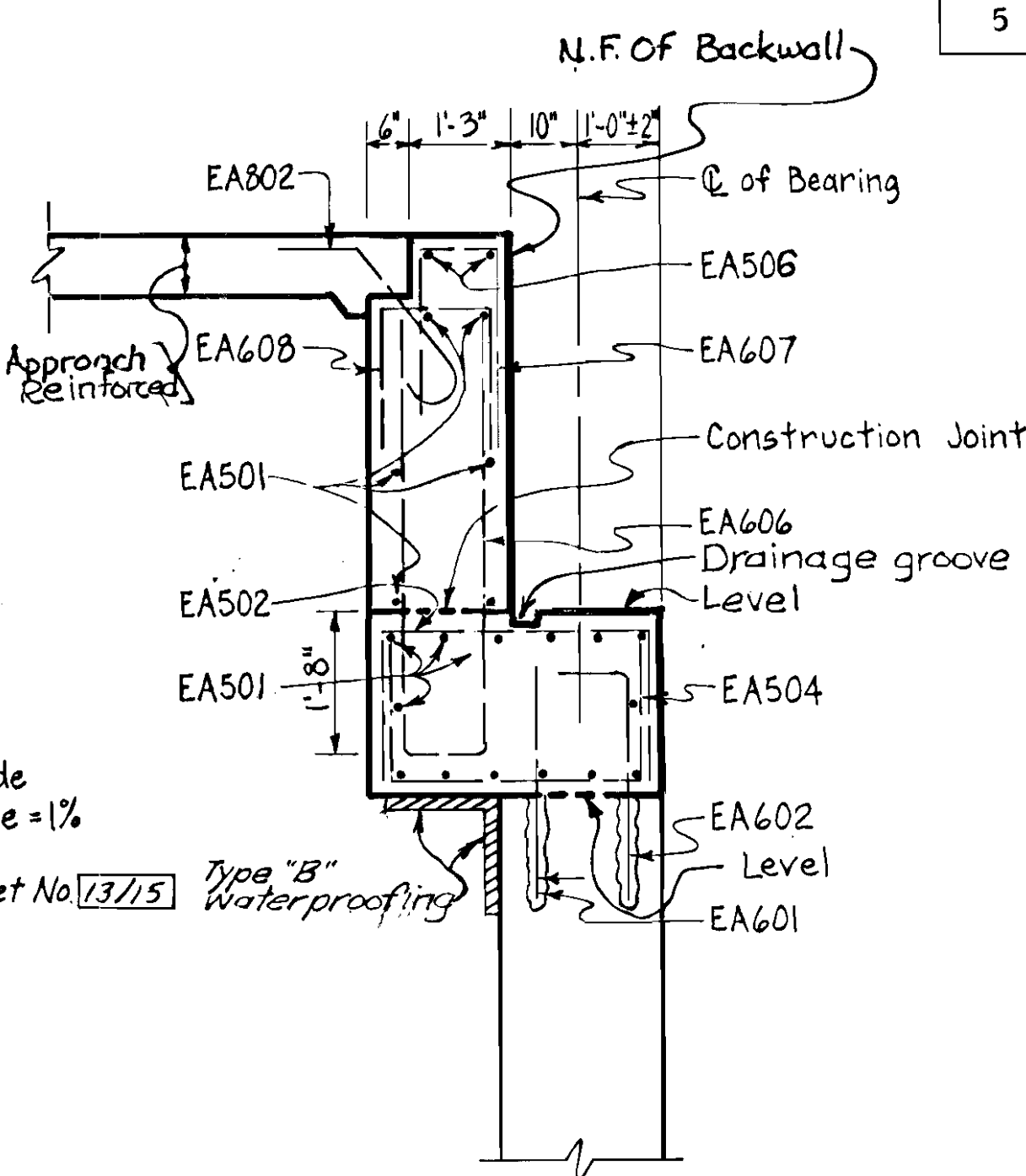
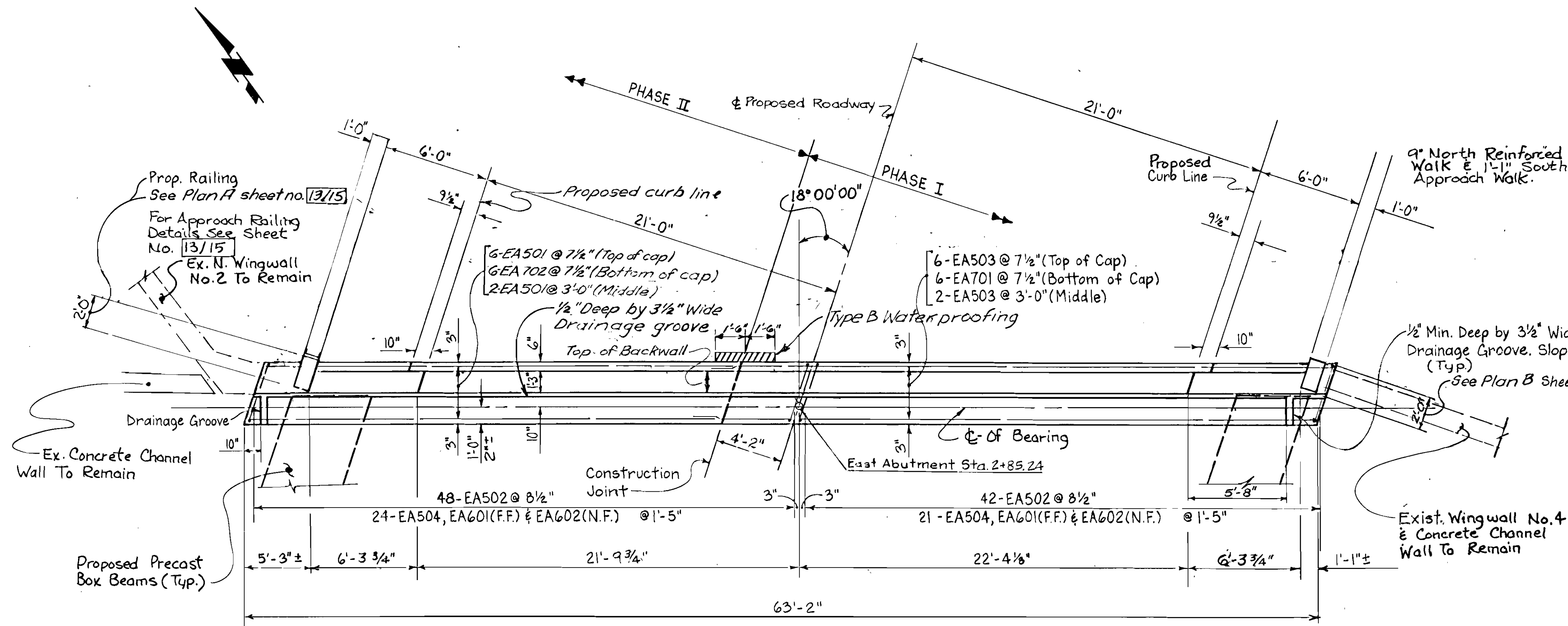
(Unless otherwise noted profile
and distances are along
centerline of Roadway)

PROPOSED SECTION

SITE PLAN MADISON ROAD BRIDGE OVER DUCK CREEK

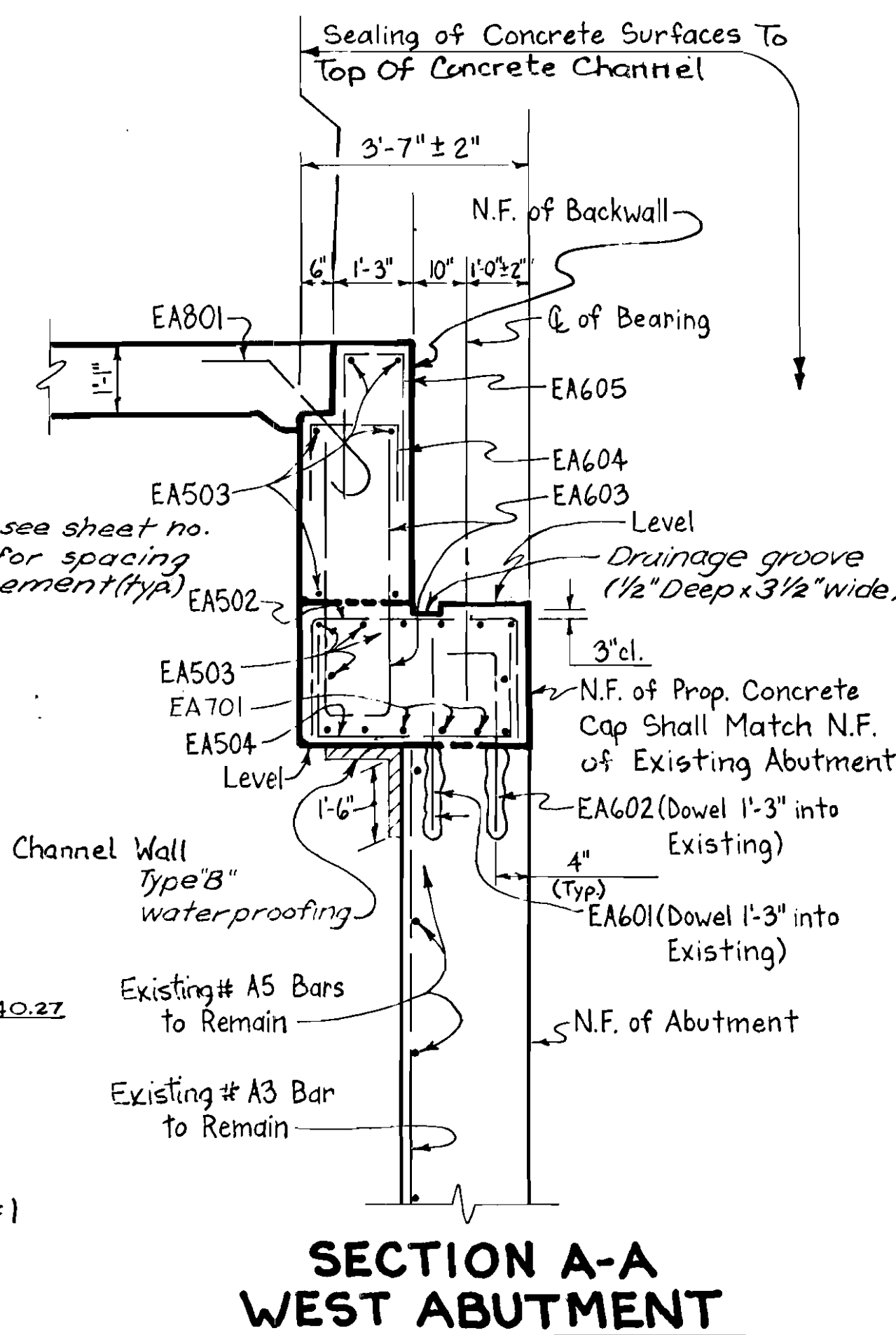
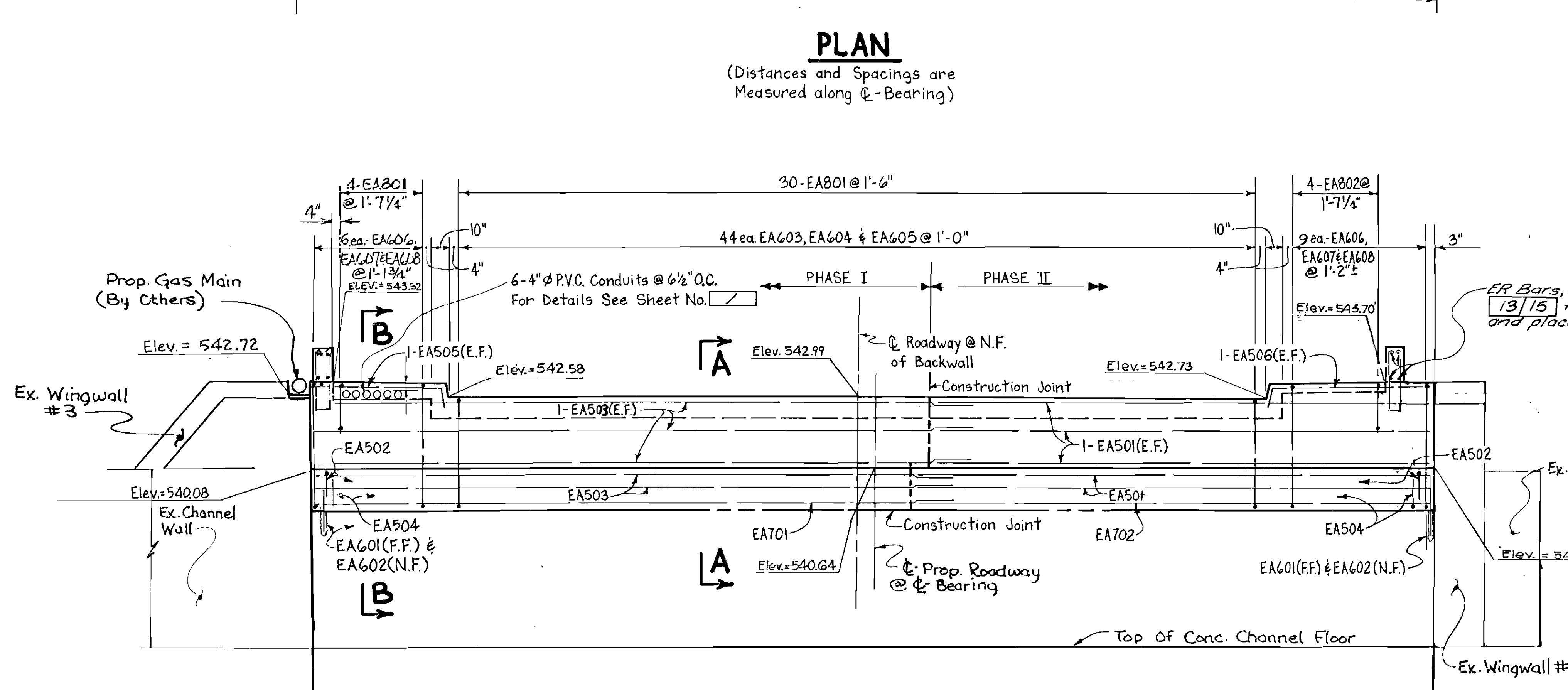
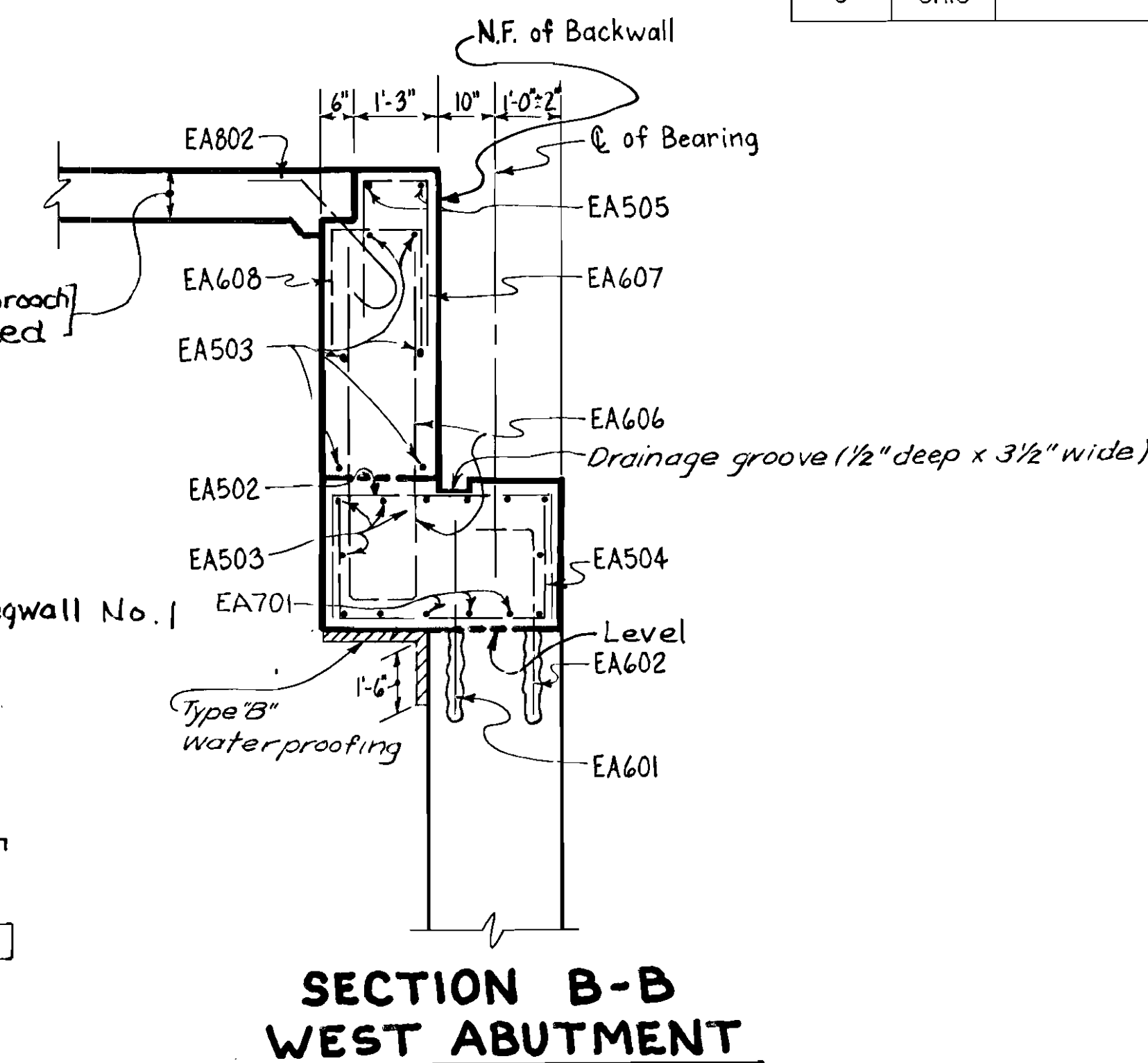
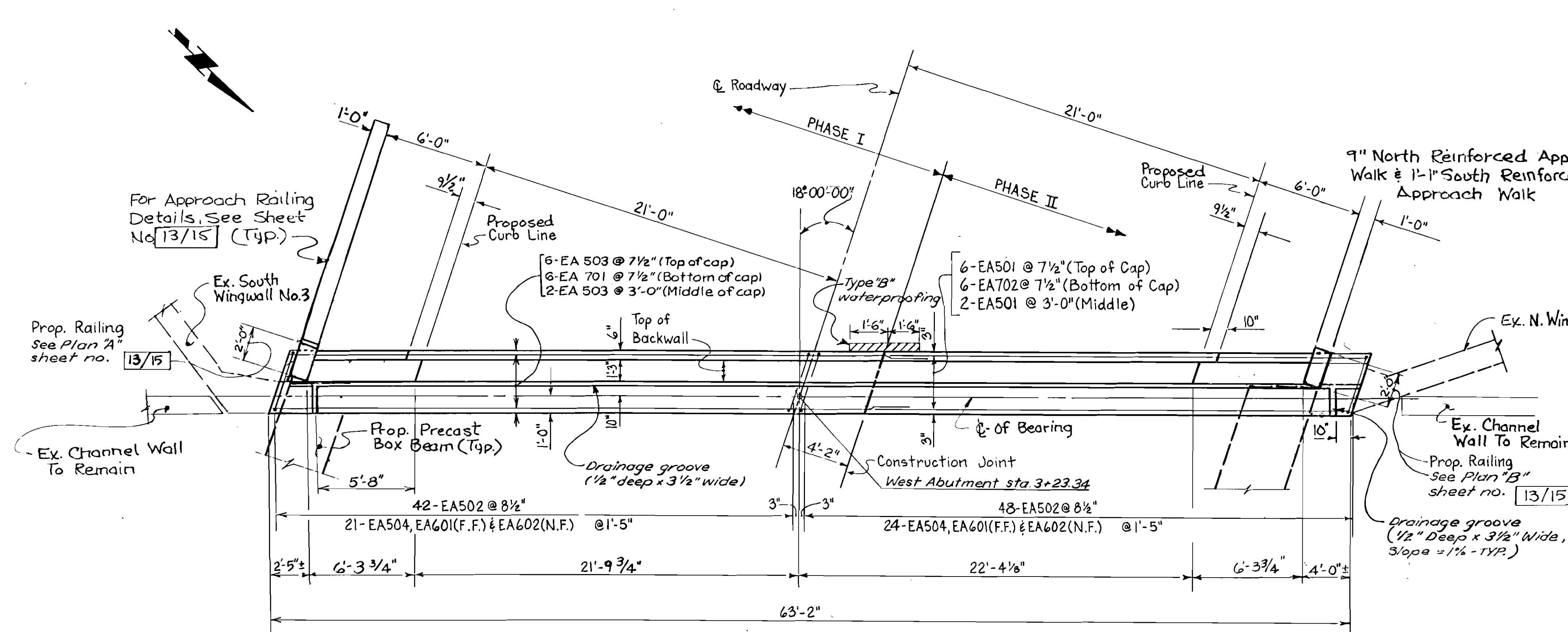
22-57-77

ACC NO. 26996



- NOTES:**
- The Abutment Backwall Shall Not Be Constructed Until The Box Beams Have Been Set In Their Final Positions.
 - For Elastomeric Bearing Details, See Sheet No. 10/15
 - Bridge Seat Reinforcing: Reinforcing Steel In The Vicinity Of The Bridge Seat Shall Be Accurately Placed To Avoid Interference With The Drilling Of Bearing Anchor Holes On The Presetting Of Bearing Anchors.
 - For Proposed West Abutment See Sheet No. 8/15
 - N.F. Denotes Near Face.
 - E.F. Denotes Each Face.
 - F.F. Denotes Far Face.
 - For Details of Proposed Backfill Material, See Sheet No. 5/15
 - Splice Length #5 bar = 2'-0"
 - Splice Length #7 bar = 3'-0"
 - For Expansion Joint Detail, See Sheet No. 10/15

CITY OF CINCINNATI DEPARTMENT OF PUBLIC WORKS DIVISION OF ENGINEERING						7/15
PROPOSED EAST ABUTMENT MODIFICATIONS MADISON ROAD BRIDGE OVER DUCK CREEK						
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	DATE	REVISED
LAR	LAR	JUD	JGW	GCH	11-5-90	



- NOTES:**
- The Abutment Backwall Shall Not Be Constructed Until The Box Beams Have Been Set In Their Final Positions.
 - For Elastomeric Bearing Details, See Sheet No. 10/15.
 - Bridge Seat Reinforcing: Reinforcing Steel In The Vicinity Of The Bridge Seat Shall Be Accurately Placed To Avoid Interference With The Drilling Of Bearing Anchor Holes On The Presetting Of Bearing Anchors.
 - For Proposed East Abutment See Sheet No. 7/15.
 - N.F. Denotes Near Face.
 - E.F. Denotes Each Face.
 - F.F. Denotes Far Face.
 - For Details of Proposed Backfill Material, see Sheet No. 6/15.
 - Splice Length #5 bar = 2'-0".
 - Splice Length #7 bar = 3'-0".
 - For Expansion Joint Detail, see Sheet No. 10/15.

CITY OF CINCINNATI DEPARTMENT OF PUBLIC WORKS DIVISION OF ENGINEERING					
PROPOSED WEST ABUTMENT MODIFICATIONS MADISON ROAD BRIDGE OVER DUCK CREEK					8/15
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	DATE
LAR	LAR	JJD	JGW	GCH	11-5-90

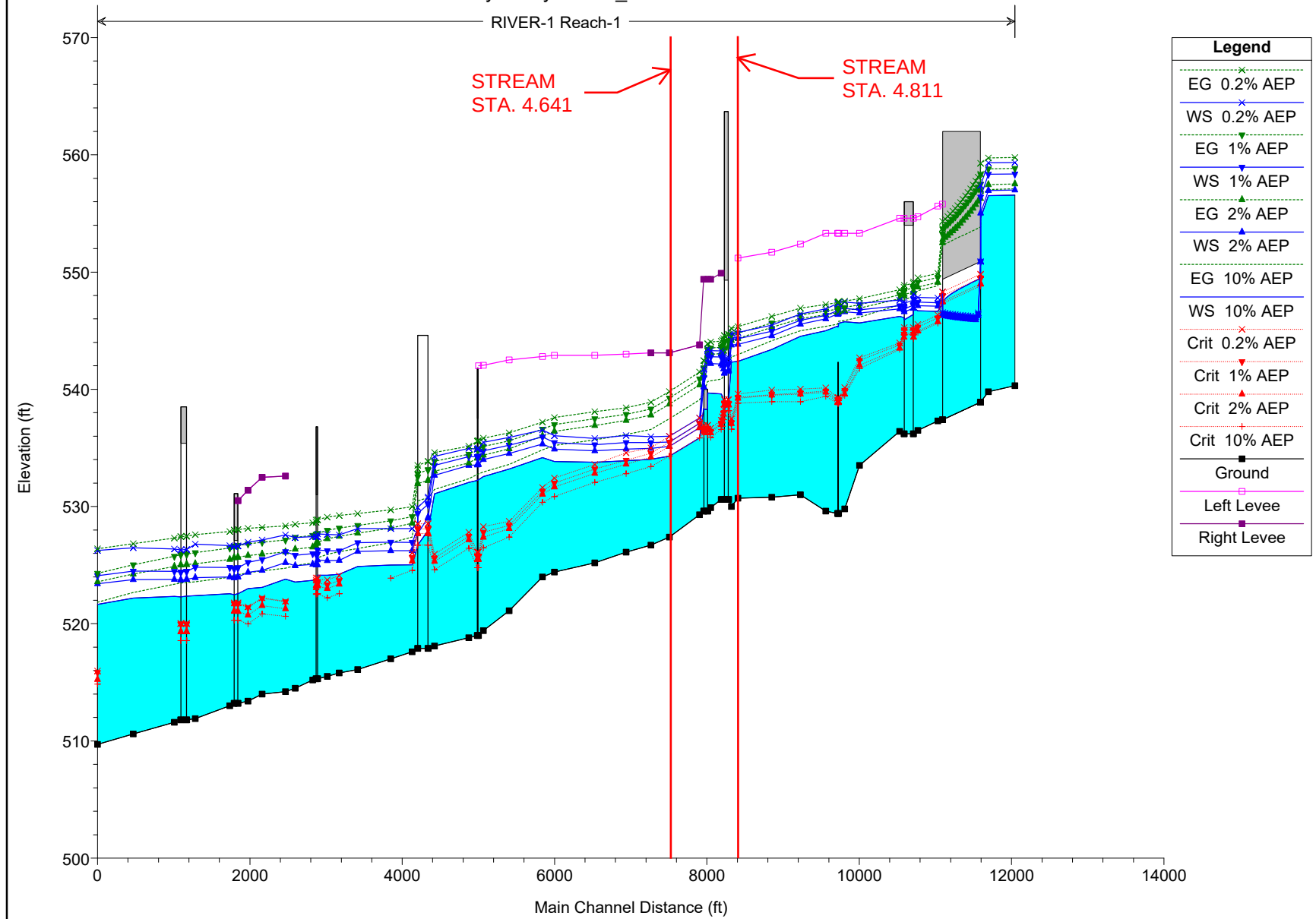
**Attachment A-5
Proposed Levee – Cost Summary**

**Attachment 5
Proposed Levee
Cost Summary**

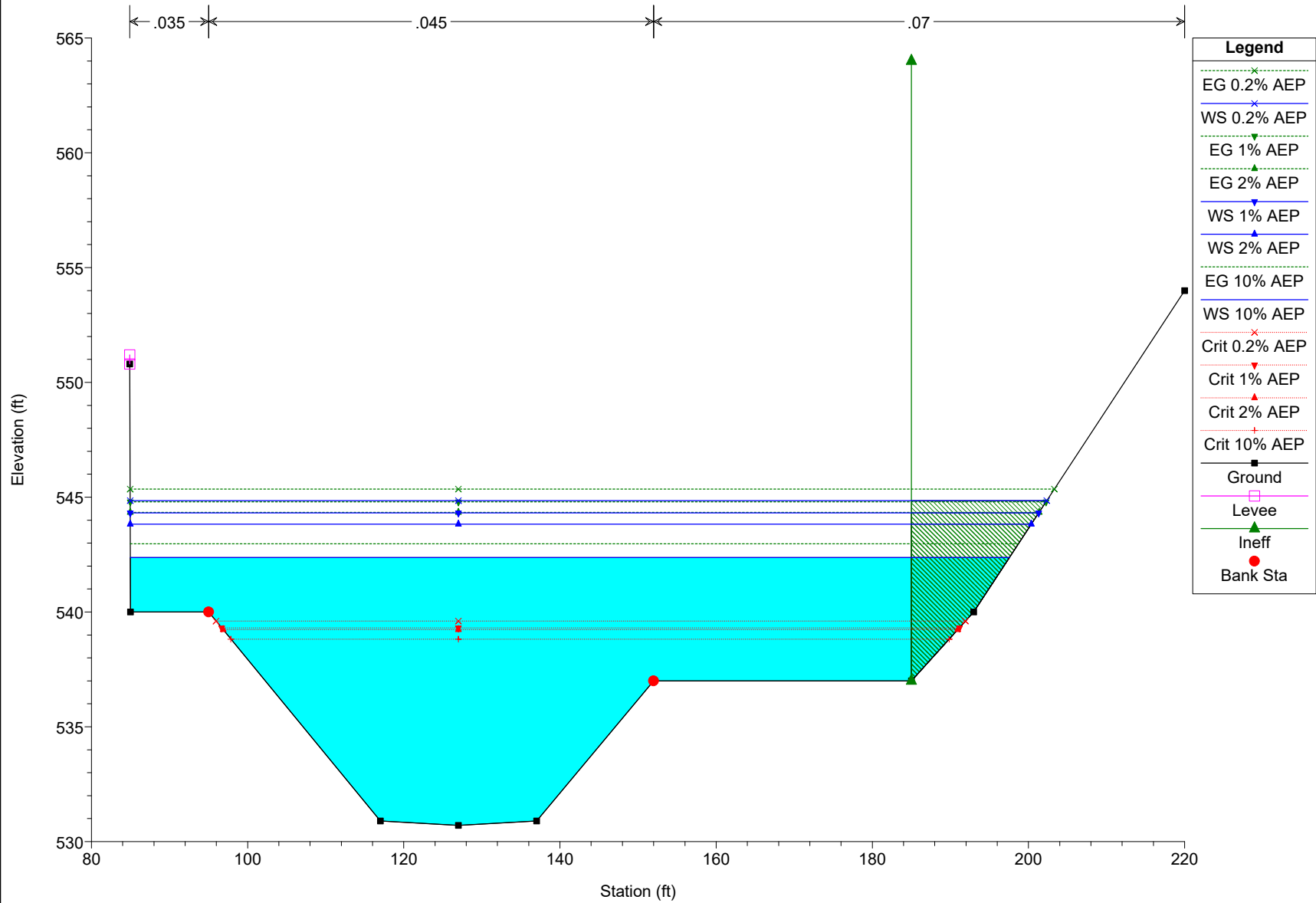
Item No.	Description	Unit	Quantity	Unit Cost	Extension
	LEVEE				
201	CLEARING AND GRUBBING	LS	1	\$10,000	\$10,000
203	EXCAVATION	CY	400	\$50	\$20,000
203	EMBANKMENT	CY	500	\$50	\$25,000
601	ROCK CHANNEL PROTECTION, TYPE A WITH FILTER	CY	120	\$100	\$12,000
659	SEEDING AND MULCHING	SY	160	\$6	\$960
SPCL	REINFORCE EXISTING FLOOD WALL FOR LATERAL EARTH PRESSURE	LS	1	\$80,000	\$80,000
	MISCELLANEOUS				
614	MAINTAINING TRAFFIC (on Madison Road)	LS	1	\$10,000	\$10,000
623	CONSTRUCTION LAYOUT STAKES AND SURVEYING	LS	1	\$5,000	\$5,000
624	MOBILIZATION	LS	1	\$10,000	\$10,000
				Sub-Total =	\$172,960
				15% Design Fee =	\$25,944
				Sub-Total =	\$198,904
				25% Contingency =	\$49,726
				Total =	\$248,630

Attachment A-6

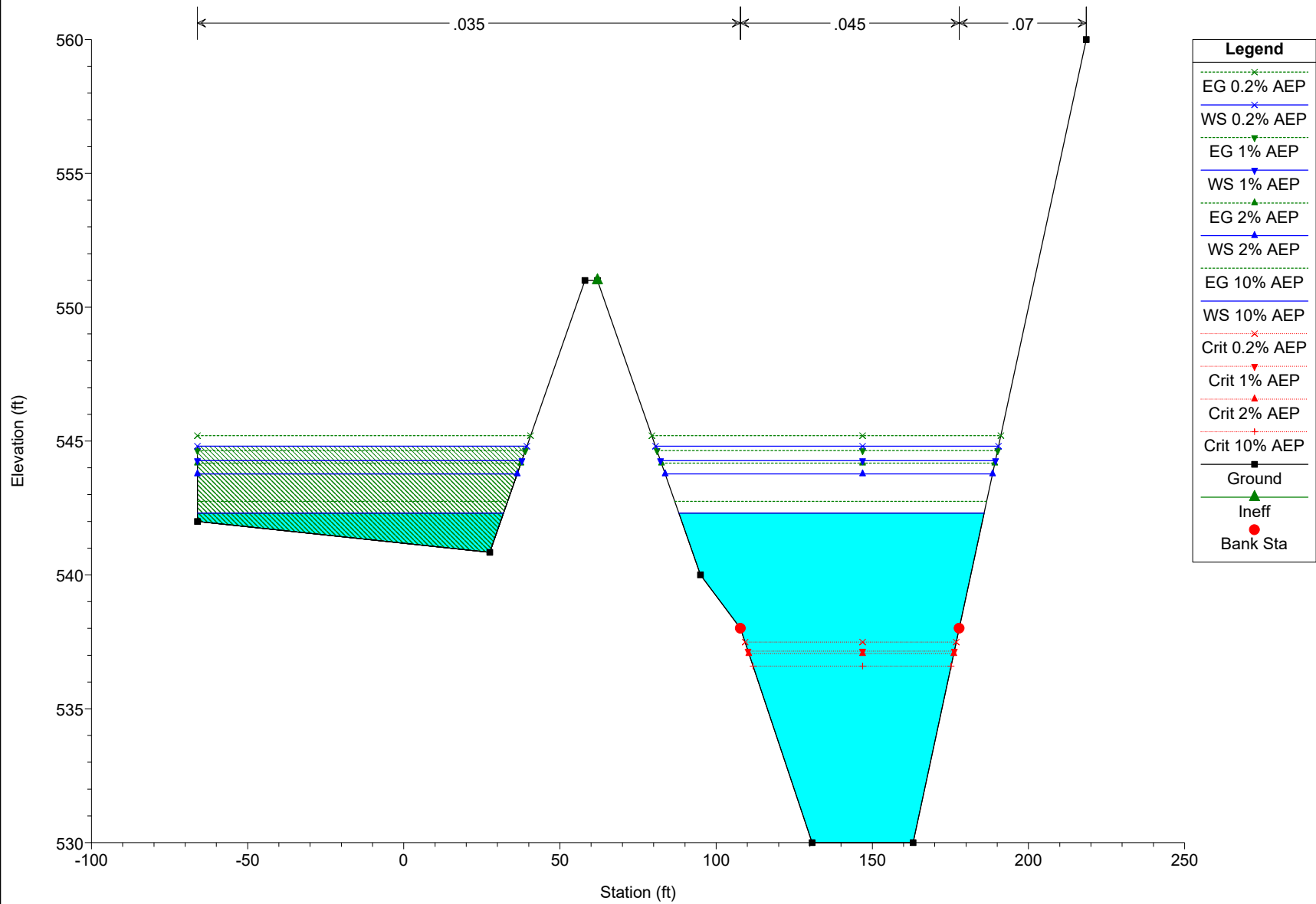
Existing with Levee – HEC-RAS Output



Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new levee 6/15/2020



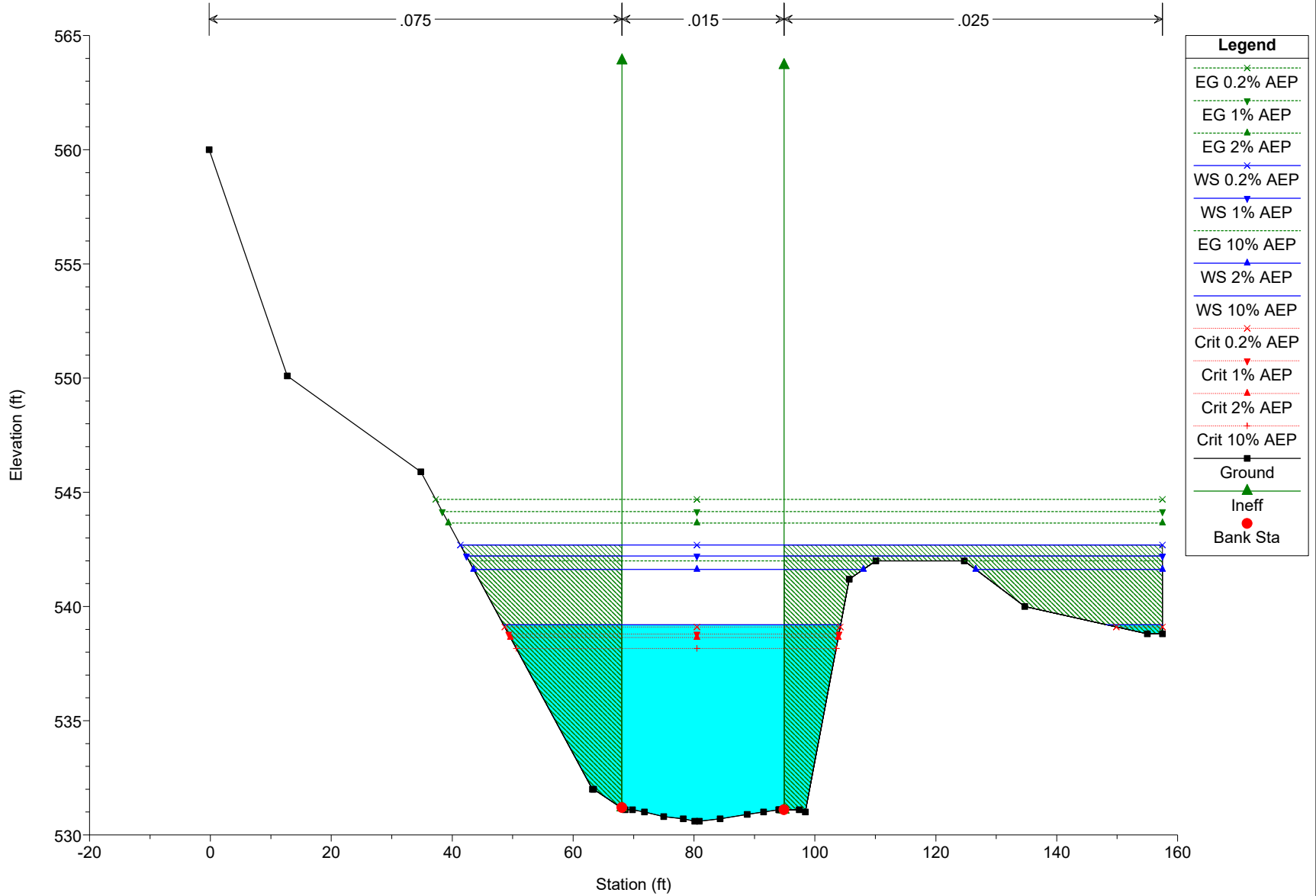
STREAM STA. 4.811



STREAM STA. 4.800
AT LEVEE

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new levee 6/15/2020

This is a REPEATED section.

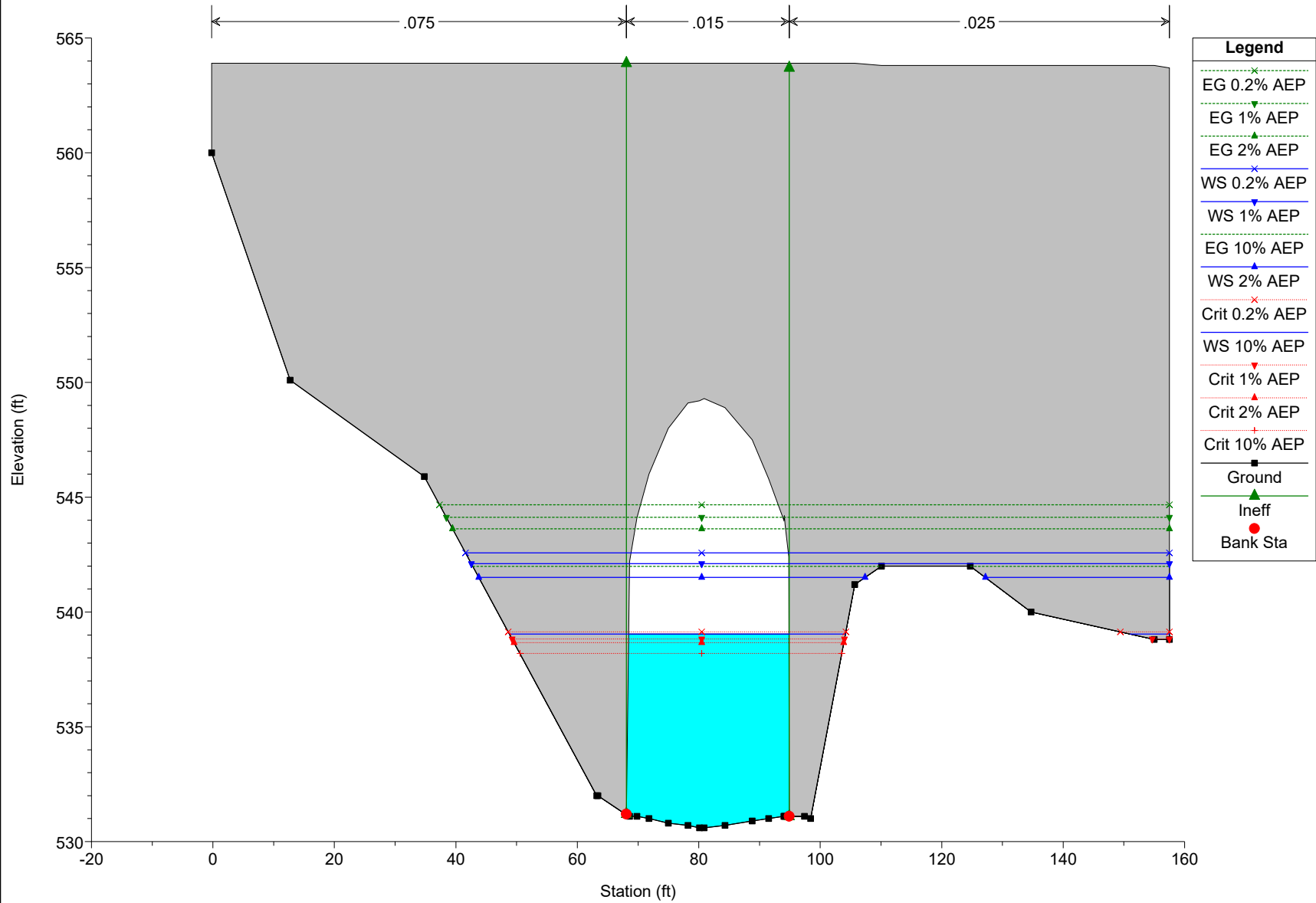


STREAM STA. 4.788

Duck Creek Feasibility Study-FEMA_LOMR

Plan: MEB-new levee 6/15/2020

Conrail #7

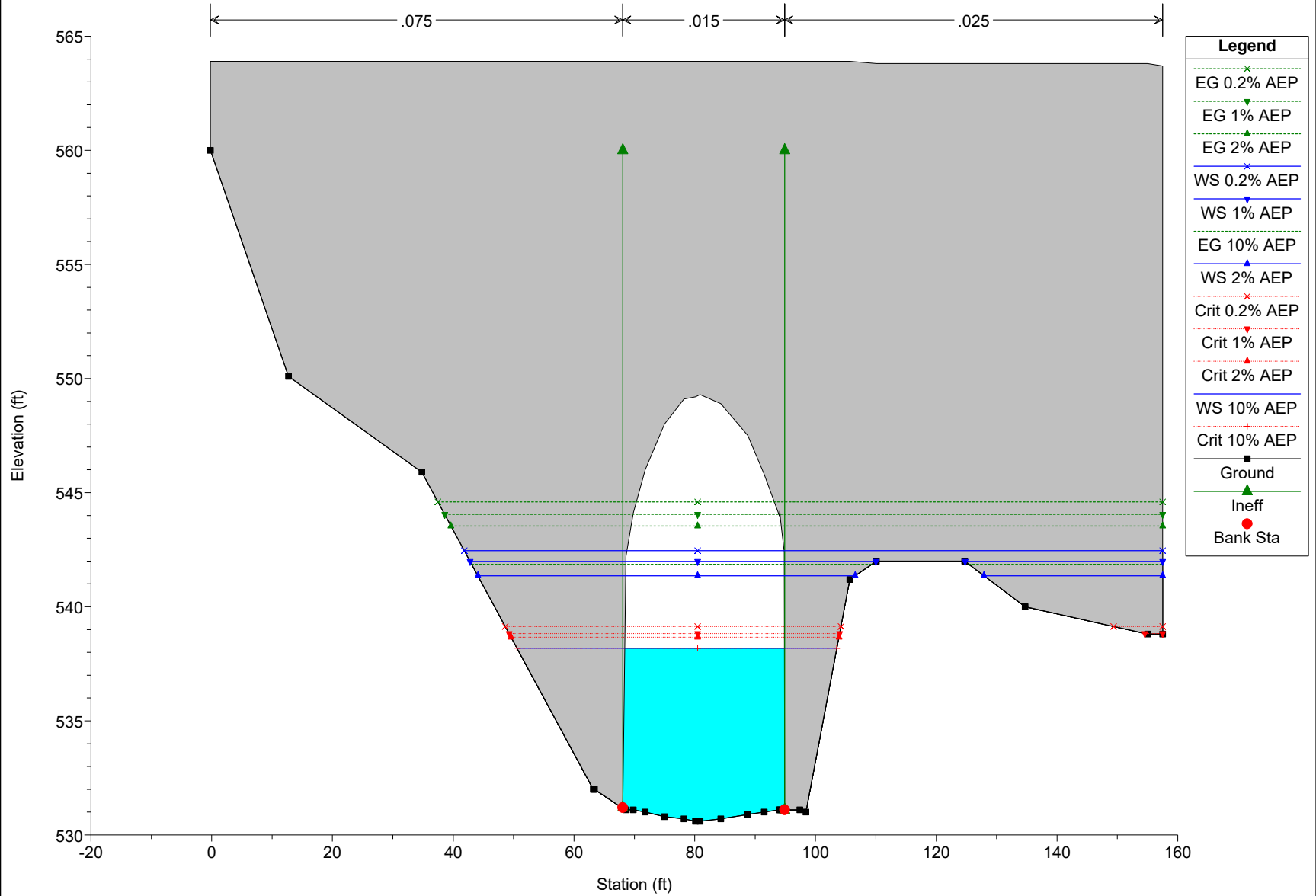


UPSTREAM EDGE OF RAILROAD BRIDGE

Duck Creek Feasibility Study-FEMA_LOMR

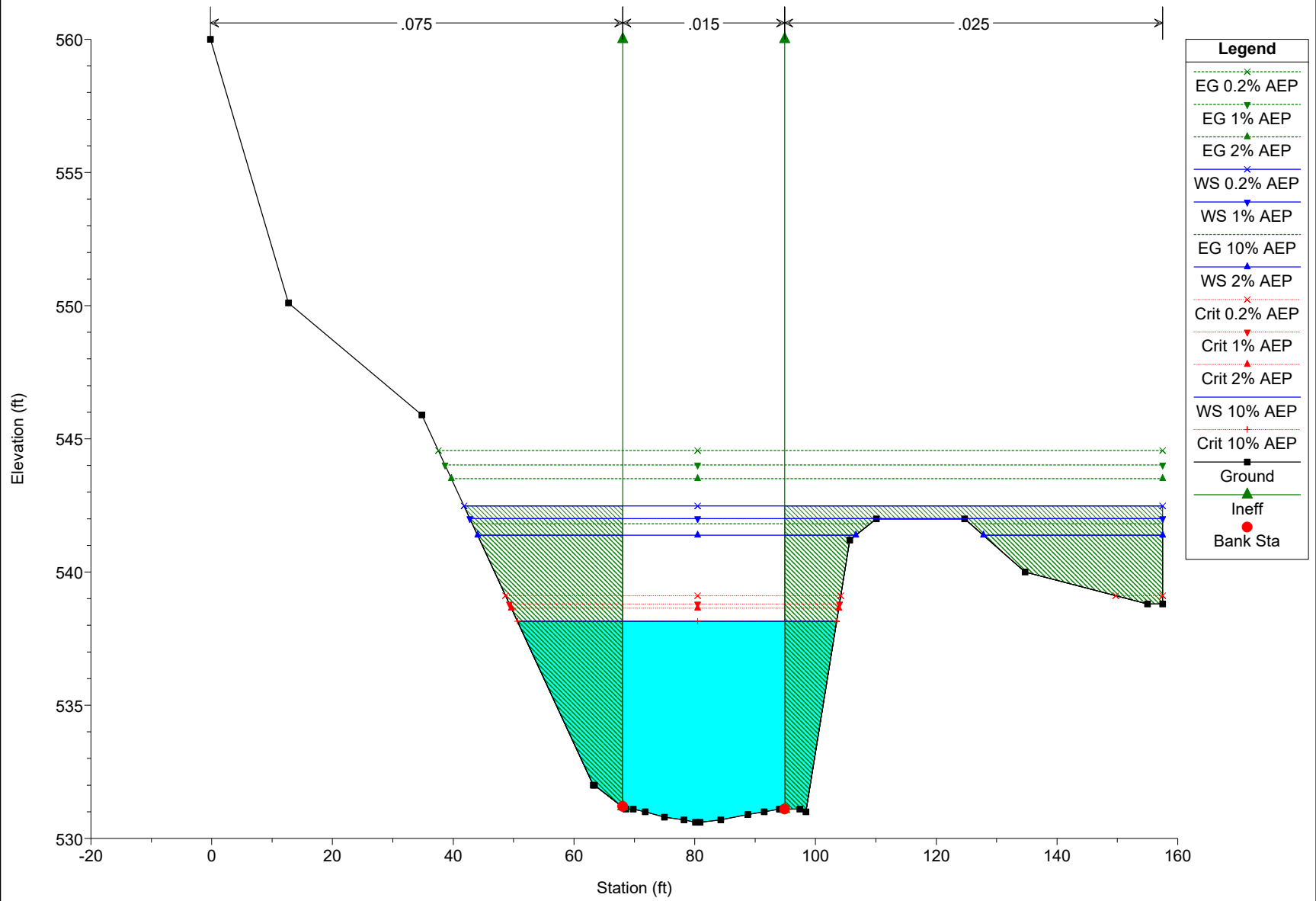
Plan: MEB-new levee 6/15/2020

Conrail #7



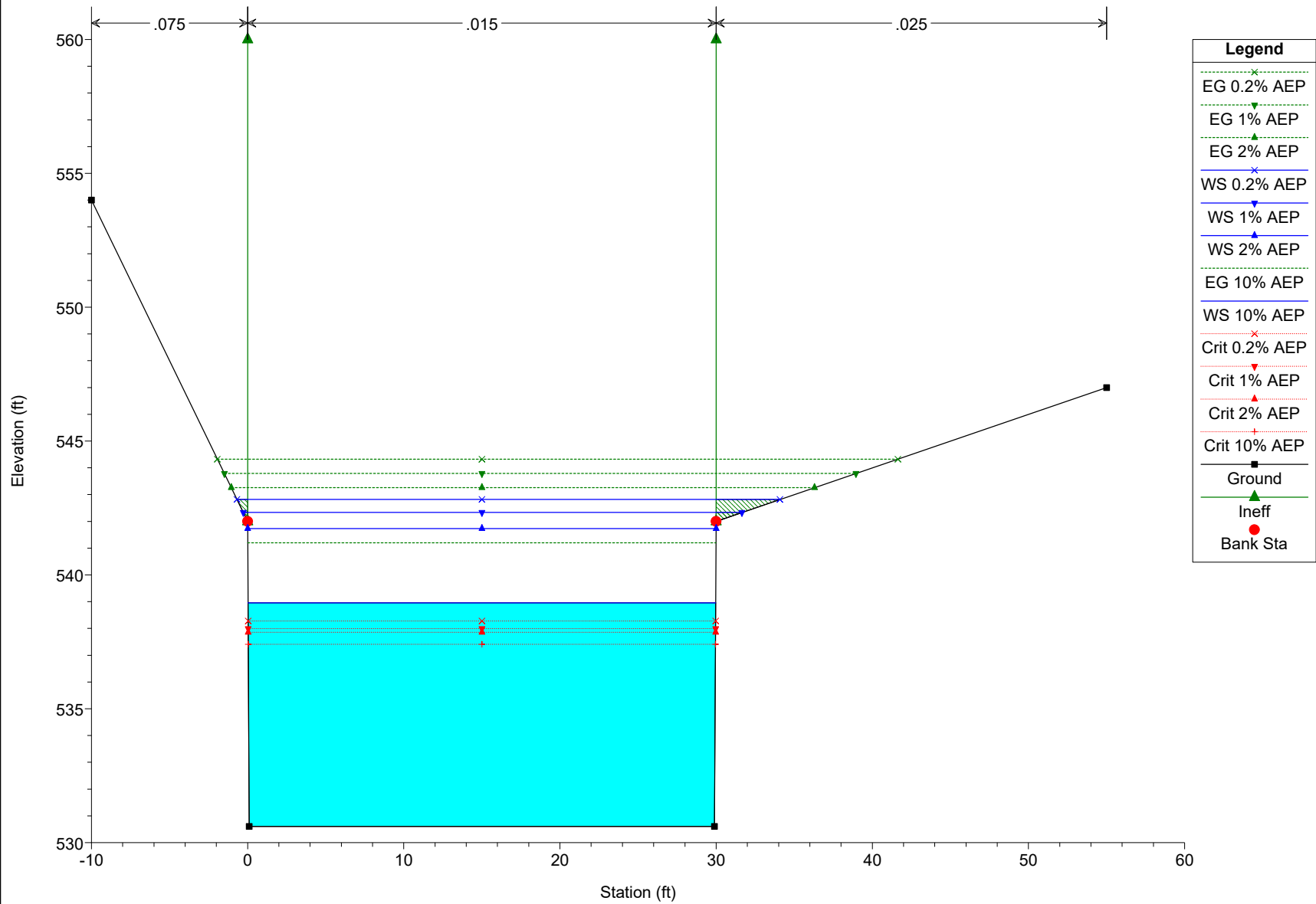
DOWNSTREAM EDGE OF RAILROAD BRIDGE

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new levee 6/15/2020



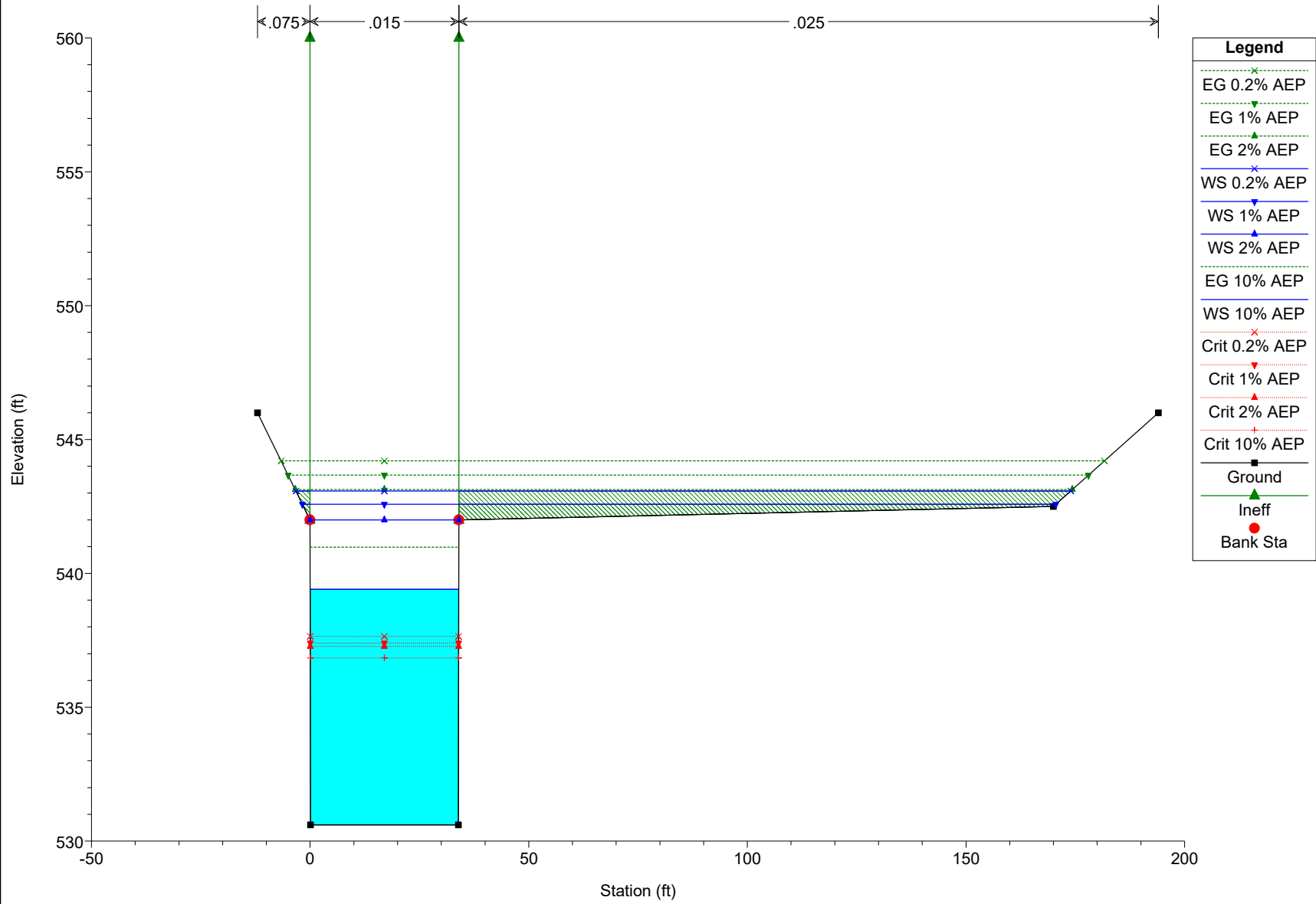
STREAM STA. 4.778

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new levee 6/15/2020

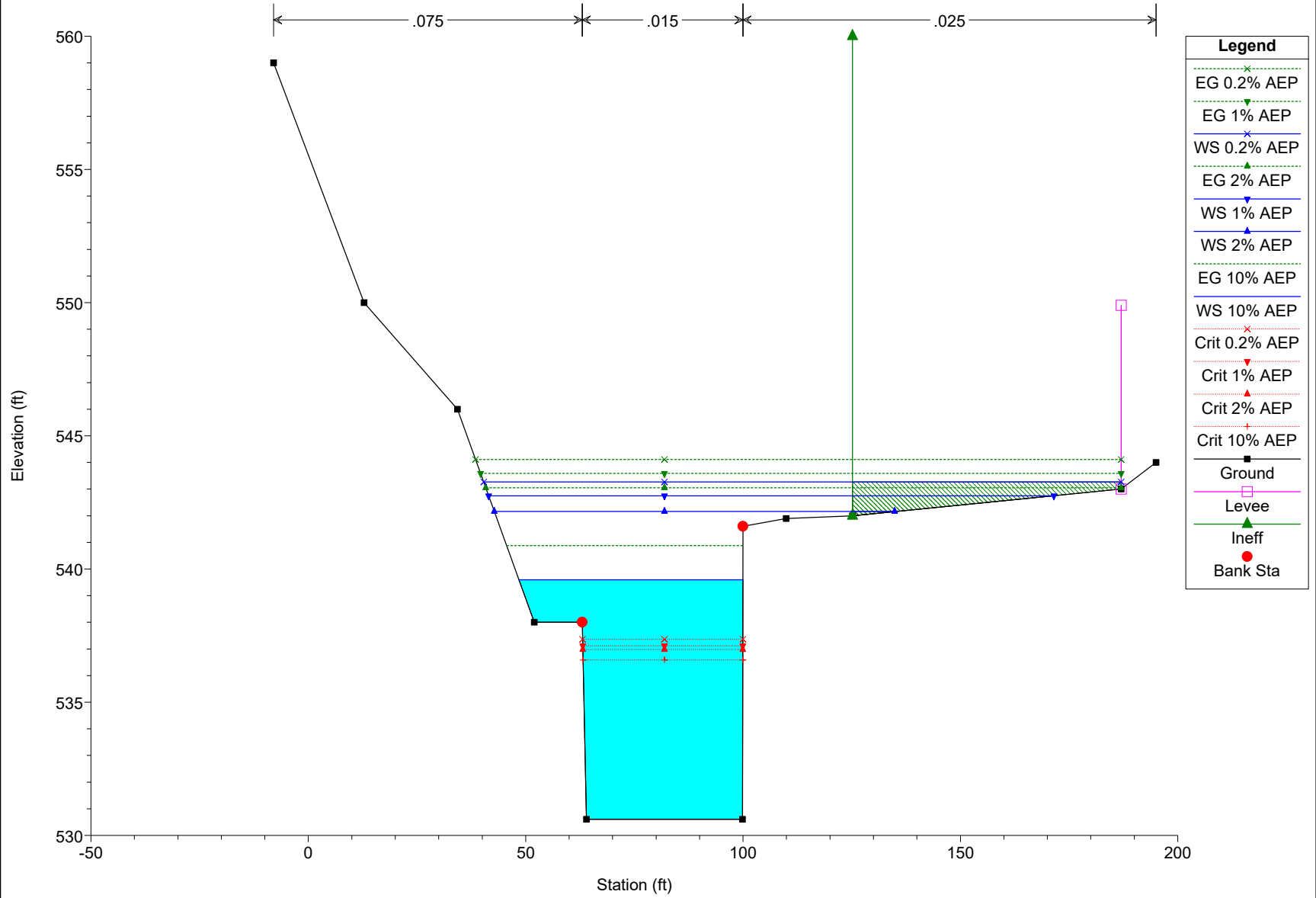


STREAM STA. 4.775

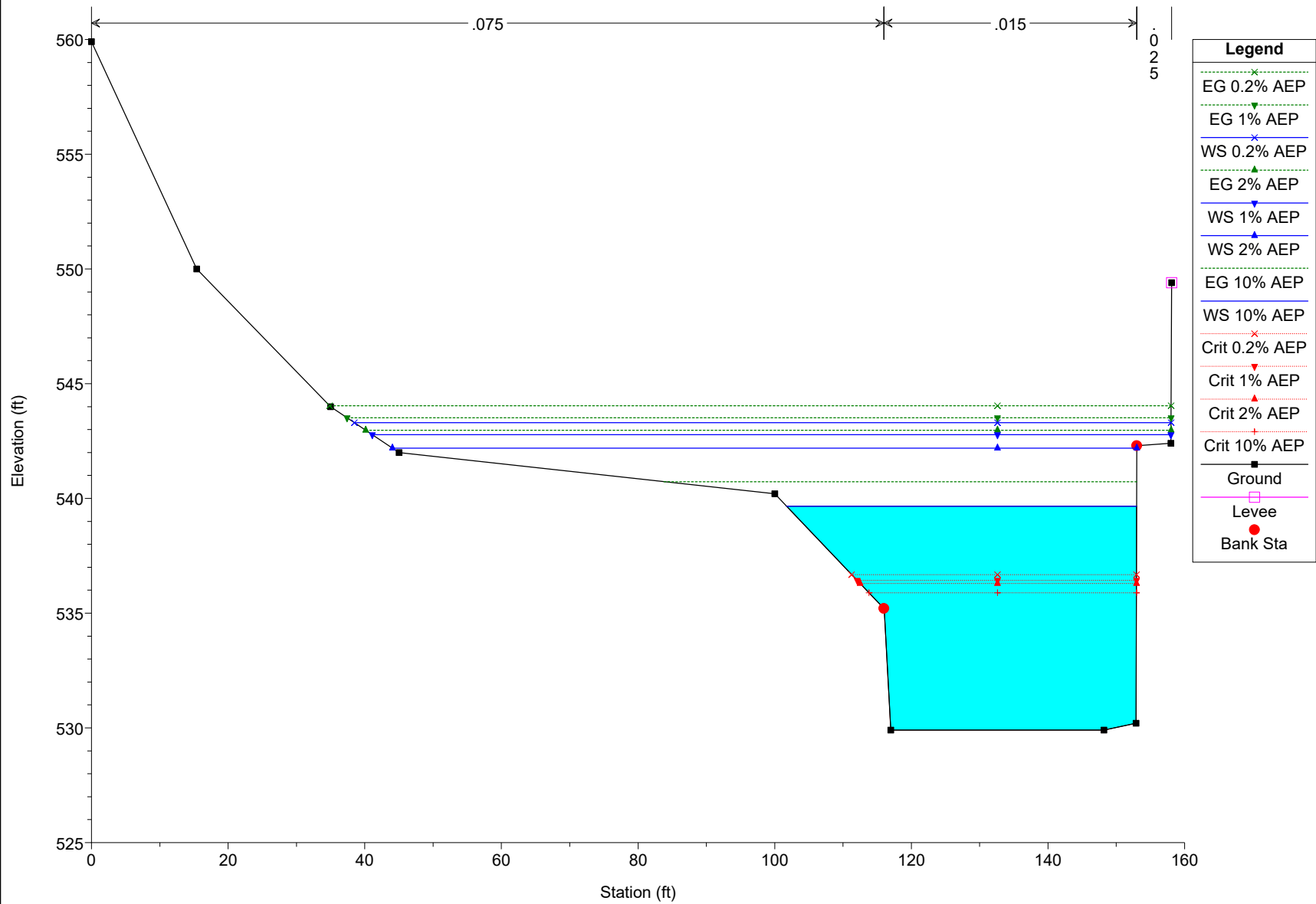
Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new levee 6/15/2020



STREAM STA. 4.772



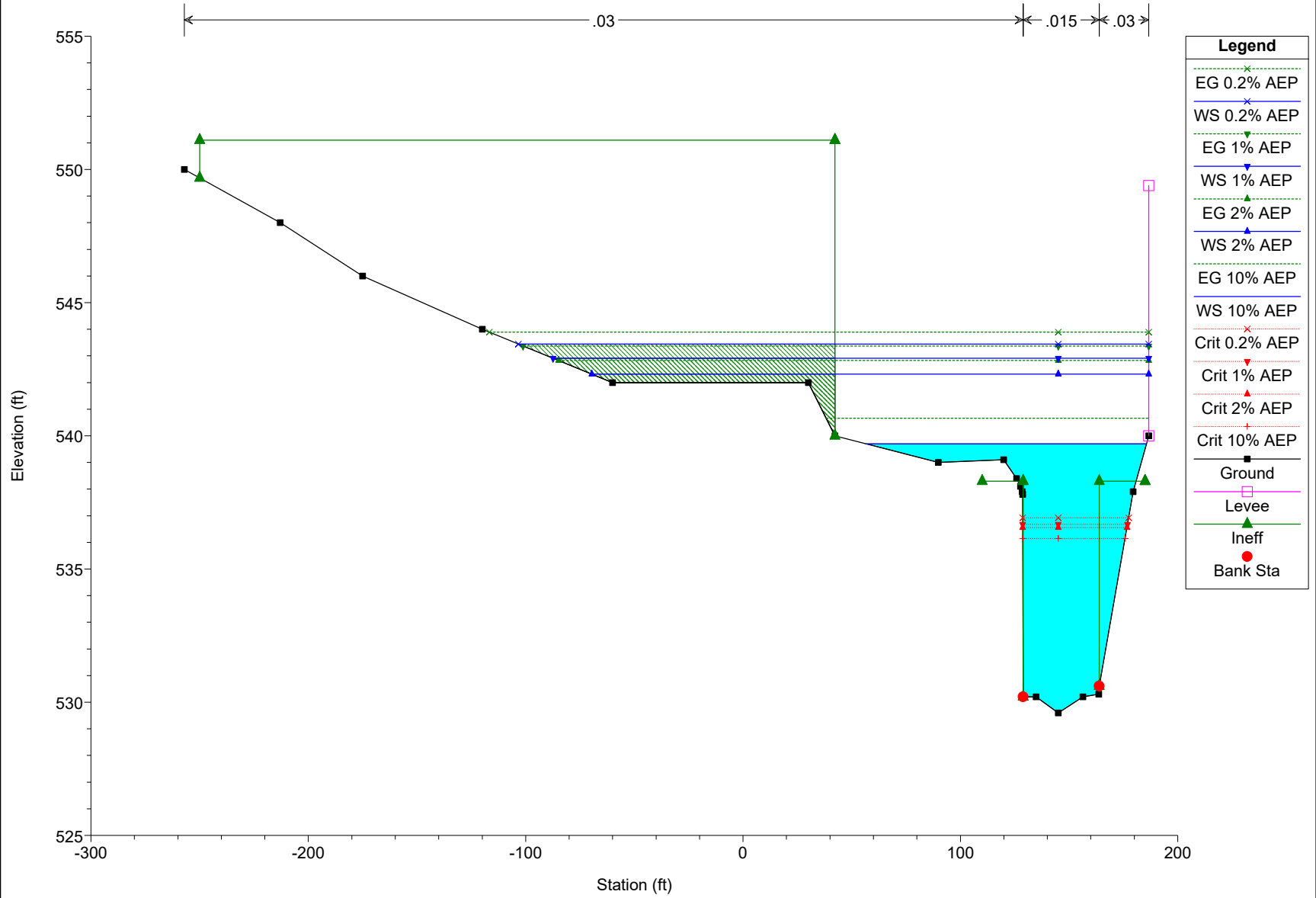
STREAM STA. 4.769



STREAM STA. 4.743

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new levee 6/15/2020

This is a REPEATED section. Levee in LOB represents elevated ra

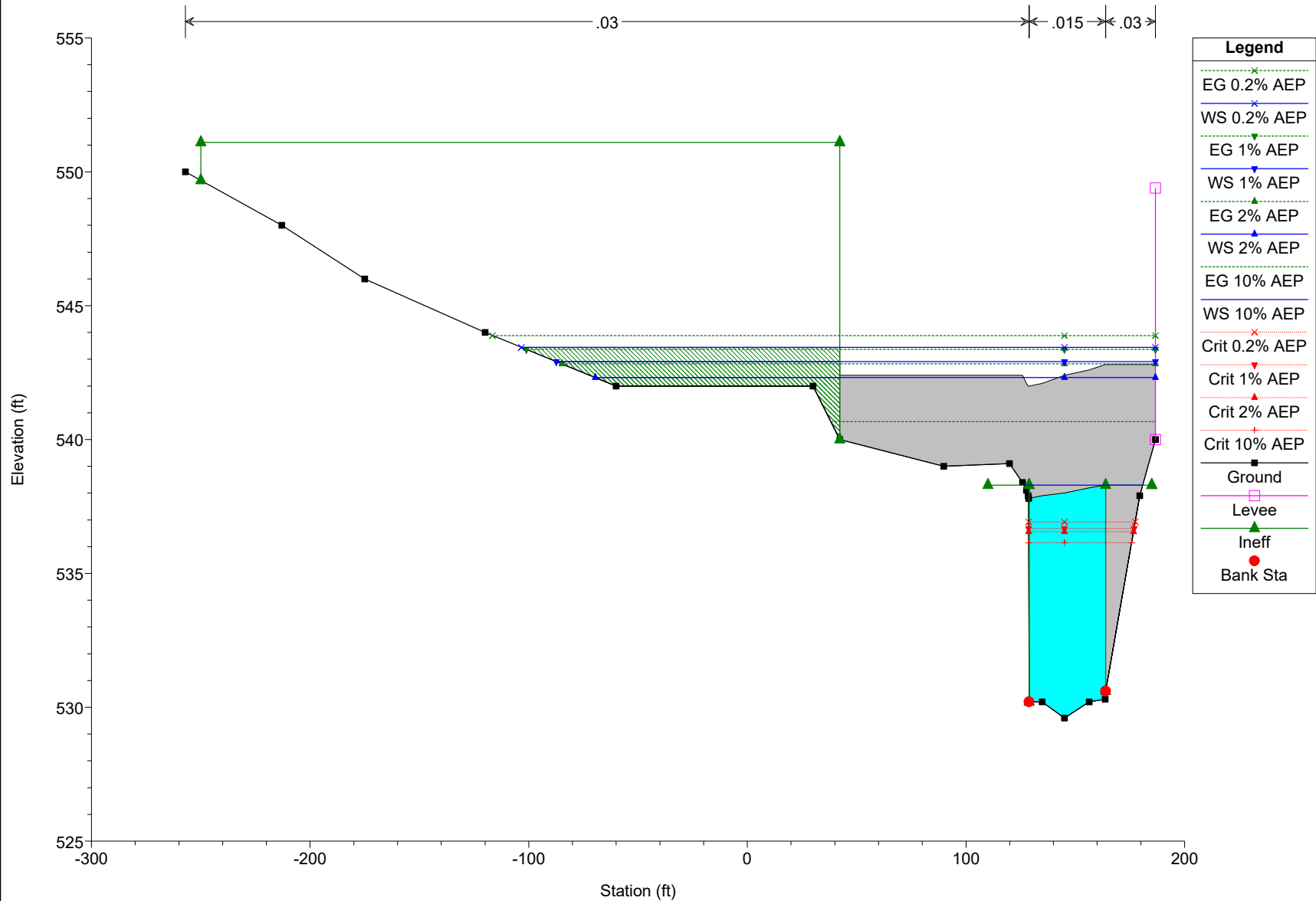


STREAM STA. 4.736

Duck Creek Feasibility Study-FEMA_LOMR

Plan: MEB-new levee 6/15/2020

Madison Ave

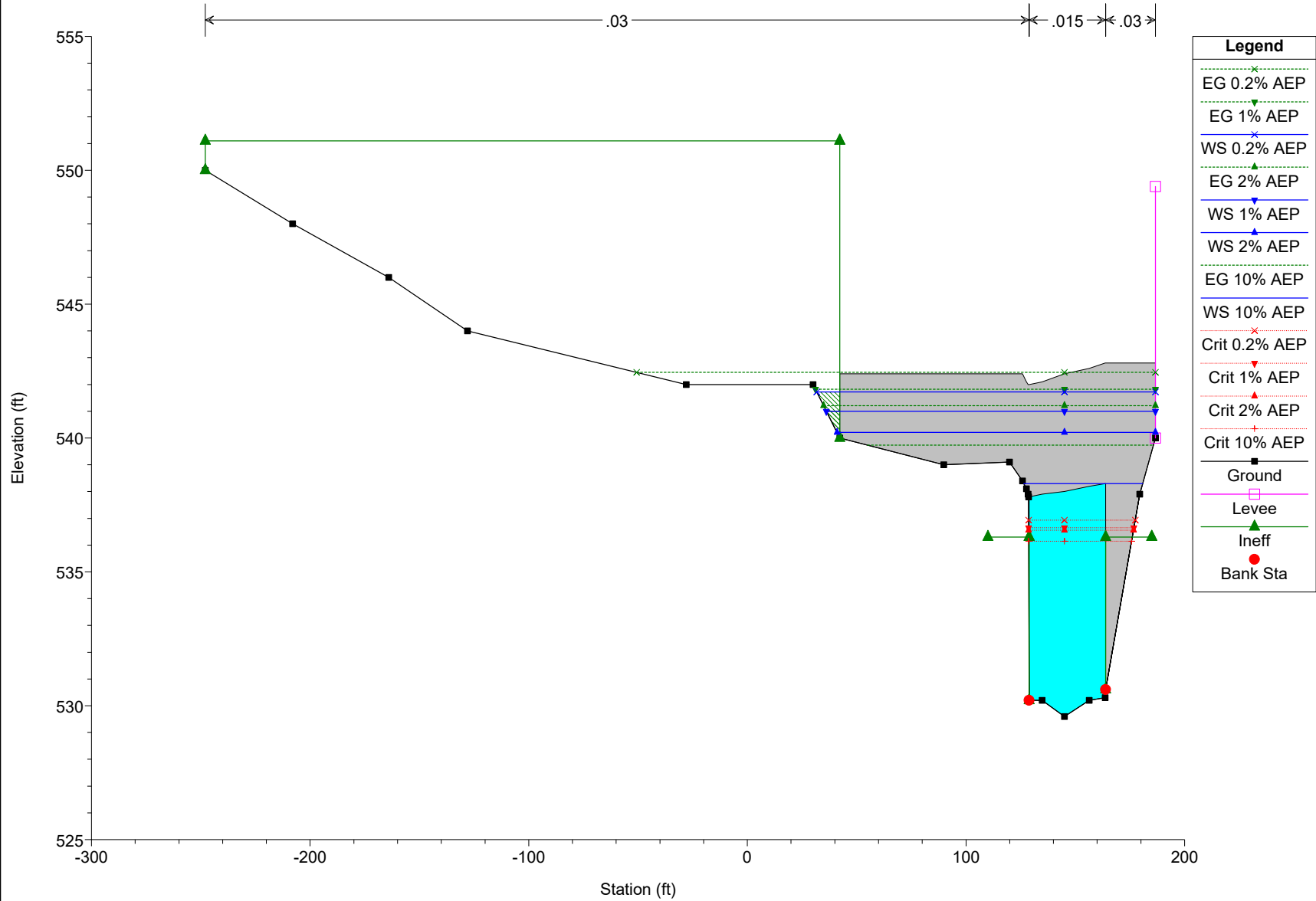


UPSTREAM EDGE OF EXISTING MADISON ROAD BRIDGE

Duck Creek Feasibility Study-FEMA_LOMR

Plan: MEB-new levee 6/15/2020

Madison Ave

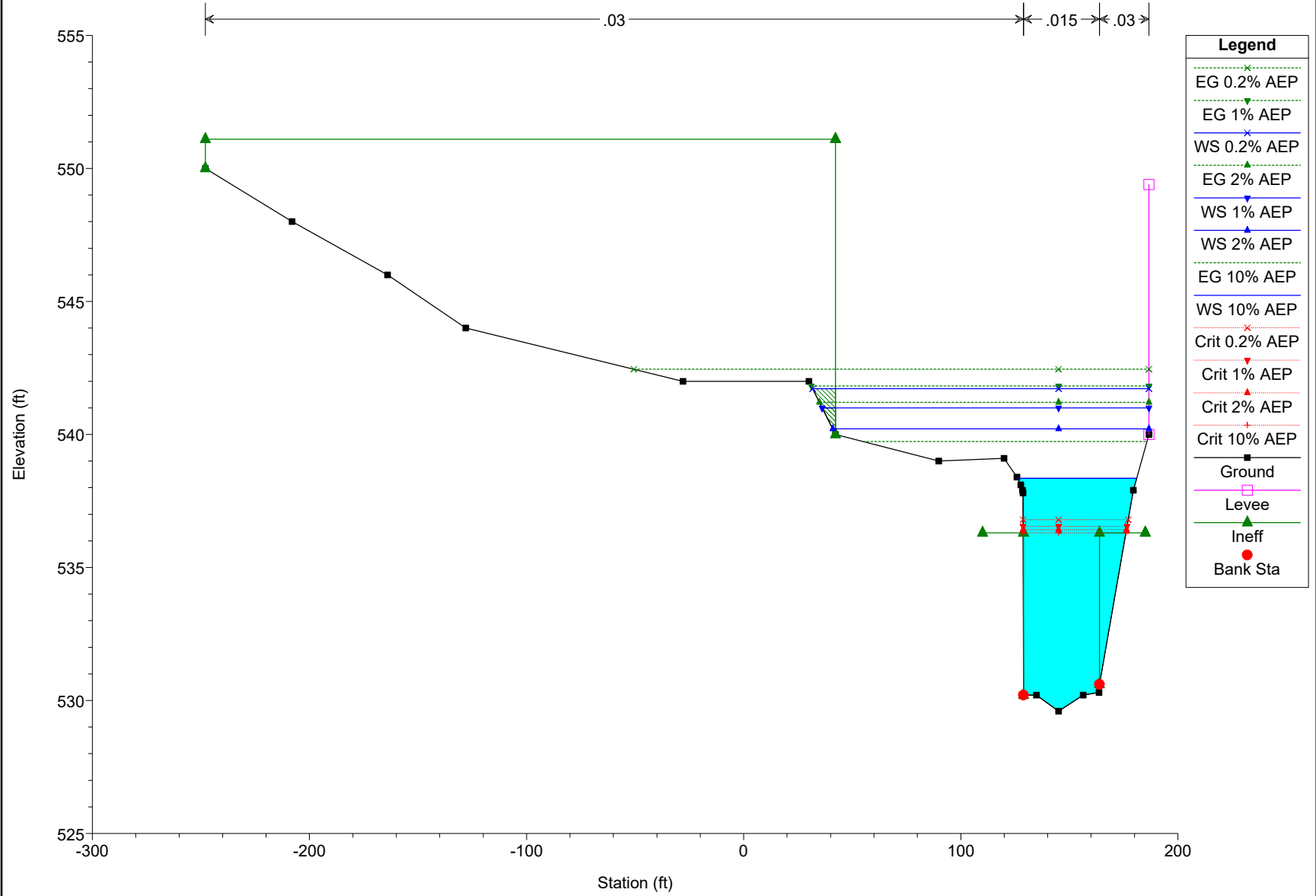


DOWNSTREAM EDGE OF EXISTING MADISON ROAD BRIDGE

Duck Creek Feasibility Study-FEMA_LOMR

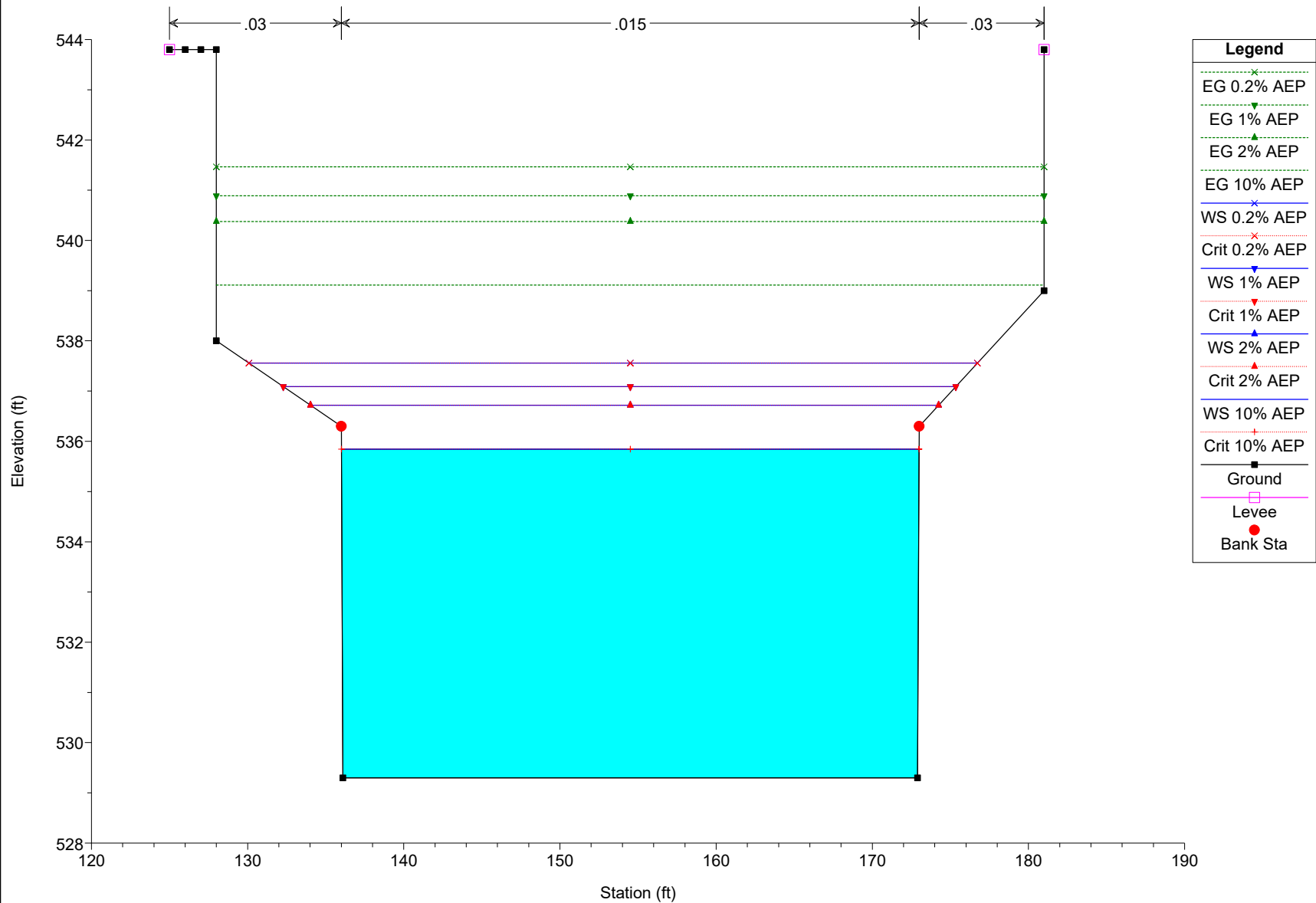
Plan: MEB-new levee 6/15/2020

MADISON AVE



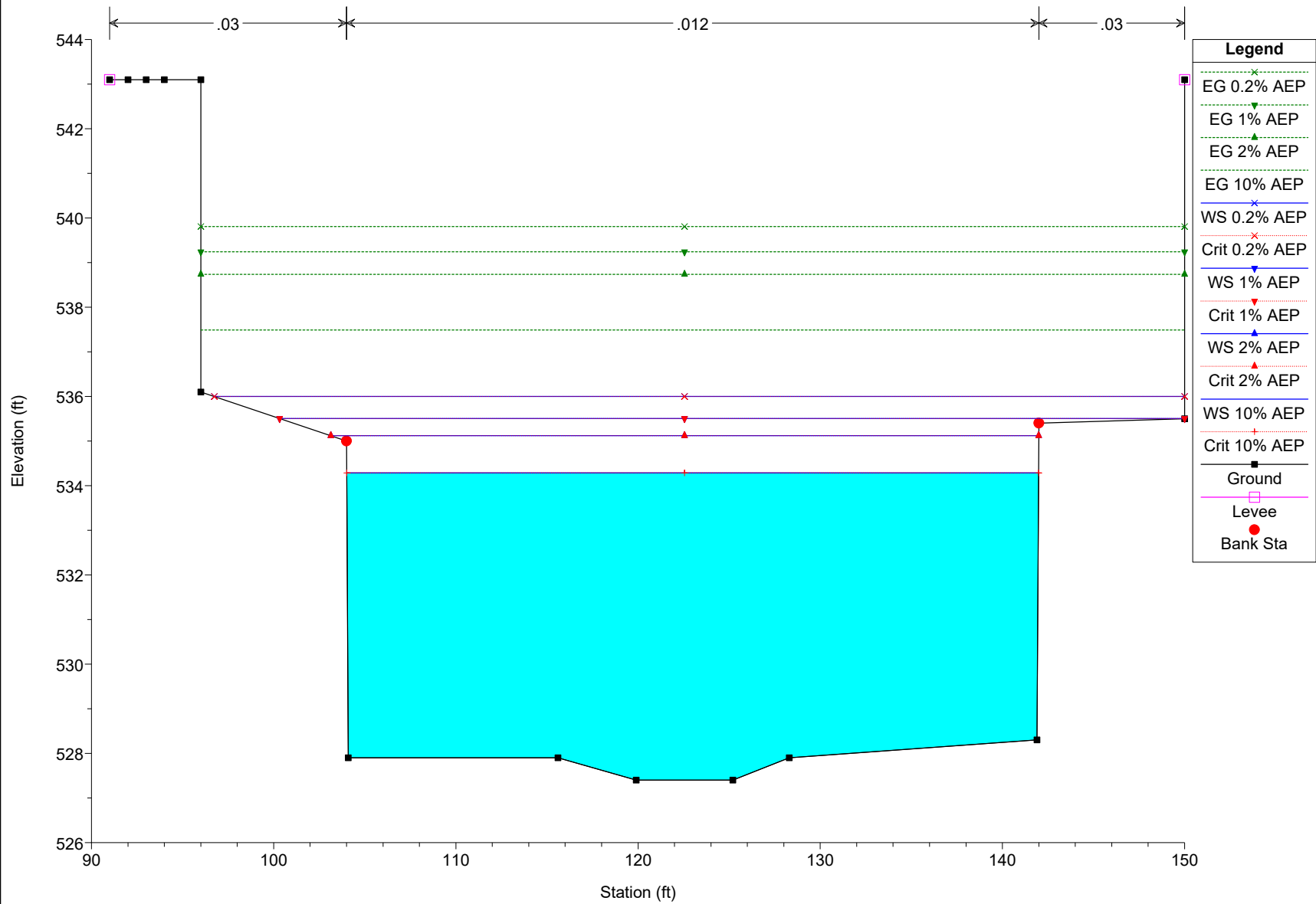
STREAM STA. 4.727

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new levee 6/15/2020



STREAM STA. 4.716

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new levee 6/15/2020



STREAM STA. 4.641

HEC-RAS Plan: MEB-new levee River: RIVER-1 Reach: Reach-1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	5.5	10% AEP	3900.00	540.30	556.56		557.10	0.000177	5.92	676.24	80.39	0.32
Reach-1	5.5	2% AEP	4000.00	540.30	556.99		557.52	0.000163	5.83	713.13	88.53	0.30
Reach-1	5.5	1% AEP	4300.00	540.30	558.37		558.84	0.000127	5.55	863.26	141.93	0.27
Reach-1	5.5	0.2% AEP	4500.00	540.30	559.35		559.78	0.000106	5.33	1008.07	154.28	0.25
Reach-1	5.434	10% AEP	3900.00	539.80	556.52		557.03	0.000164	5.77	692.50	79.63	0.30
Reach-1	5.434	2% AEP	4000.00	539.80	556.96		557.46	0.000152	5.69	729.36	87.83	0.29
Reach-1	5.434	1% AEP	4300.00	539.80	558.34		558.80	0.000119	5.43	878.72	141.57	0.26
Reach-1	5.434	0.2% AEP	4500.00	539.80	559.32		559.74	0.000100	5.23	1023.88	153.97	0.25
Reach-1	5.415	10% AEP	3900.00	538.90	554.59	548.80	556.56	0.001069	11.26	346.25	22.14	0.50
Reach-1	5.415	2% AEP	4000.00	538.90	555.02	548.97	556.99	0.001049	11.24	355.84	22.14	0.49
Reach-1	5.415	1% AEP	4300.00	538.90	556.40	549.47	558.33	0.000984	11.13	386.39	22.15	0.47
Reach-1	5.415	0.2% AEP	4500.00	538.90	557.39	549.79	559.27	0.000939	11.02	408.17	22.16	0.45
Reach-1	5.3675		Culvert									
Reach-1	5.32	10% AEP	3900.00	537.40	547.32	547.32	552.25	0.003550	17.80	219.13	22.17	1.00
Reach-1	5.32	2% AEP	4000.00	537.40	547.47	547.47	552.50	0.003588	17.99	222.40	22.17	1.00
Reach-1	5.32	1% AEP	4300.00	537.40	547.98	547.98	553.24	0.003626	18.40	233.76	22.18	1.00
Reach-1	5.32	0.2% AEP	4500.00	537.40	548.31	548.31	553.73	0.003660	18.67	240.99	22.18	1.00
Reach-1	5.308	10% AEP	3900.00	537.30	546.65	545.63	548.84	0.001326	11.87	328.43	49.47	0.81
Reach-1	5.308	2% AEP	4000.00	537.30	547.09	545.76	549.11	0.001166	11.41	350.59	50.81	0.77
Reach-1	5.308	1% AEP	4300.00	537.30	547.39	546.10	549.53	0.001200	11.75	365.82	51.71	0.78
Reach-1	5.308	0.2% AEP	4500.00	537.30	547.80	546.33	549.89	0.001124	11.62	387.26	52.95	0.76
Reach-1	5.259	10% AEP	3900.00	536.50	546.69	544.85	548.41	0.000948	10.51	371.22	52.03	0.69
Reach-1	5.259	2% AEP	4000.00	536.50	547.13	544.96	548.73	0.000845	10.14	394.34	53.36	0.66
Reach-1	5.259	1% AEP	4300.00	536.50	547.43	545.30	549.14	0.000875	10.47	410.59	54.27	0.67
Reach-1	5.259	0.2% AEP	4500.00	536.50	547.84	545.53	549.52	0.000828	10.39	433.06	55.51	0.66
Reach-1	5.248	10% AEP	3900.00	536.20	546.97	544.30	548.03	0.000599	8.26	471.98	67.58	0.55
Reach-1	5.248	2% AEP	4000.00	536.20	547.39	544.43	548.38	0.000535	7.99	500.64	68.88	0.52
Reach-1	5.248	1% AEP	4300.00	536.20	547.72	544.71	548.77	0.000546	8.22	523.17	69.89	0.53
Reach-1	5.248	0.2% AEP	4500.00	536.20	548.12	544.89	549.16	0.000516	8.15	551.85	71.15	0.52
Reach-1	5.234		Bridge									

HEC-RAS Plan: MEB-new levee River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	5.224	10% AEP	3900.00	536.20	546.11	544.30	547.48	0.000862	9.40	414.87	64.91	0.66
Reach-1	5.224	2% AEP	4000.00	536.20	546.76	544.43	547.95	0.000686	8.73	458.01	66.94	0.59
Reach-1	5.224	1% AEP	4300.00	536.20	547.02	544.71	548.29	0.000715	9.05	475.24	67.73	0.60
Reach-1	5.224	0.2% AEP	4500.00	536.20	547.49	544.89	548.71	0.000651	8.87	507.49	69.19	0.58
Reach-1	5.213	10% AEP	3900.00	536.40	546.22	543.41	547.21	0.002512	8.05	502.30	79.00	0.51
Reach-1	5.213	2% AEP	4000.00	536.40	546.86	543.49	547.72	0.001986	7.55	553.16	79.93	0.46
Reach-1	5.213	1% AEP	4300.00	536.40	547.13	543.79	548.05	0.002051	7.83	574.41	80.32	0.47
Reach-1	5.213	0.2% AEP	4500.00	536.40	547.60	543.97	548.49	0.001858	7.72	612.07	81.00	0.45
Reach-1	5.113	10% AEP	3900.00	533.50	545.65	541.76	546.16	0.001248	6.19	821.68	156.78	0.36
Reach-1	5.113	2% AEP	4000.00	533.50	546.51	542.04	546.91	0.000888	5.55	960.12	162.14	0.31
Reach-1	5.113	1% AEP	4300.00	533.50	546.79	542.46	547.21	0.000912	5.72	1004.70	162.95	0.32
Reach-1	5.113	0.2% AEP	4500.00	533.50	547.33	542.70	547.72	0.000797	5.54	1094.32	164.57	0.30
Reach-1	5.076	10% AEP	3900.00	529.80	545.76	539.46	545.87	0.000656	3.09	1490.84	286.69	0.16
Reach-1	5.076	2% AEP	4000.00	529.80	546.61	539.58	546.70	0.000446	2.67	1744.60	305.24	0.13
Reach-1	5.076	1% AEP	4300.00	529.80	546.90	539.89	546.99	0.000449	2.72	1832.61	311.49	0.13
Reach-1	5.076	0.2% AEP	4500.00	529.80	547.45	540.13	547.53	0.000382	2.57	2006.32	323.55	0.12
Reach-1	5.061	10% AEP	3900.00	529.40	545.64	538.80	545.79	0.000904	3.58	1336.41	297.21	0.19
Reach-1	5.061	2% AEP	4000.00	529.40	546.54	538.86	546.65	0.000572	2.99	1610.76	305.44	0.15
Reach-1	5.061	1% AEP	4300.00	529.40	546.83	539.11	546.94	0.000568	3.03	1698.67	307.45	0.15
Reach-1	5.061	0.2% AEP	4500.00	529.40	547.39	539.28	547.49	0.000470	2.83	1872.04	311.39	0.14
Reach-1	5.060		Bridge									
Reach-1	5.059	10% AEP	3900.00	529.40	545.38	538.80	545.56	0.001033	3.77	1263.05	287.10	0.20
Reach-1	5.059	2% AEP	4000.00	529.40	546.43	538.86	546.55	0.000607	3.07	1577.43	304.67	0.15
Reach-1	5.059	1% AEP	4300.00	529.40	546.72	539.11	546.84	0.000601	3.10	1666.08	306.71	0.15
Reach-1	5.059	0.2% AEP	4500.00	529.40	547.31	539.28	547.41	0.000489	2.88	1845.99	310.81	0.14
Reach-1	5.029	10% AEP	4000.00	529.60	545.00	539.39	545.37	0.000756	4.94	856.08	113.29	0.28
Reach-1	5.029	2% AEP	4500.00	529.60	546.00	539.76	546.37	0.000683	4.97	973.77	121.80	0.27
Reach-1	5.029	1% AEP	4600.00	529.60	546.31	539.85	546.67	0.000646	4.92	1011.75	123.95	0.26
Reach-1	5.029	0.2% AEP	5000.00	529.60	546.86	540.12	547.24	0.000642	5.04	1081.19	127.78	0.26
Reach-1	4.966	10% AEP	4000.00	531.00	544.52	538.95	544.99	0.001751	5.58	753.35	98.82	0.31
Reach-1	4.966	2% AEP	4500.00	531.00	545.56	539.59	546.03	0.001556	5.62	860.46	107.81	0.30

HEC-RAS Plan: MEB-new levee River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.966	1% AEP	4600.00	531.00	545.89	539.68	546.35	0.001461	5.55	896.59	110.68	0.29
Reach-1	4.966	0.2% AEP	5000.00	531.00	546.43	540.02	546.92	0.001456	5.72	957.99	115.39	0.29
Reach-1	4.895	10% AEP	4000.00	530.80	543.41	538.94	544.14	0.002823	6.98	602.80	73.10	0.39
Reach-1	4.895	2% AEP	4500.00	530.80	544.56	539.49	545.29	0.002426	6.97	688.44	75.70	0.37
Reach-1	4.895	1% AEP	4600.00	530.80	544.95	539.55	545.65	0.002241	6.86	718.41	76.59	0.36
Reach-1	4.895	0.2% AEP	5000.00	530.80	545.47	539.93	546.22	0.002267	7.10	758.16	77.75	0.36
Reach-1	4.811	10% AEP	4000.00	530.70	542.38	538.82	542.97	0.002304	6.60	711.58	112.61	0.39
Reach-1	4.811	2% AEP	4500.00	530.70	543.83	539.23	544.34	0.001656	6.19	856.51	115.41	0.34
Reach-1	4.811	1% AEP	4600.00	530.70	544.32	539.31	544.79	0.001458	5.99	905.44	116.36	0.32
Reach-1	4.811	0.2% AEP	5000.00	530.70	544.85	539.60	545.35	0.001442	6.15	958.76	117.39	0.32
Reach-1	4.800	10% AEP	4000.00	530.00	542.31	536.59	542.75	0.001291	5.39	779.38	195.72	0.30
Reach-1	4.800	2% AEP	4500.00	530.00	543.77	537.06	544.17	0.000994	5.18	927.78	207.21	0.27
Reach-1	4.800	1% AEP	4600.00	530.00	544.27	537.15	544.64	0.000889	5.03	980.33	211.10	0.25
Reach-1	4.800	0.2% AEP	5000.00	530.00	544.80	537.49	545.20	0.000893	5.19	1038.30	215.29	0.26
Reach-1	4.788	10% AEP	3000.00	530.60	539.20	538.17	542.00	0.001085	13.41	223.63	65.09	0.82
Reach-1	4.788	2% AEP	3300.00	530.60	541.62	538.65	543.66	0.000562	11.44	288.48	95.39	0.61
Reach-1	4.788	1% AEP	3400.00	530.60	542.21	538.79	544.15	0.000500	11.17	304.26	115.16	0.58
Reach-1	4.788	0.2% AEP	3600.00	530.60	542.69	539.10	544.70	0.000487	11.35	317.22	116.15	0.58
Reach-1	4.783		Bridge									
Reach-1	4.778	10% AEP	3000.00	530.60	538.15	538.15	541.81	0.001697	15.34	195.55	52.89	1.00
Reach-1	4.778	2% AEP	3300.00	530.60	541.38	538.65	543.51	0.000606	11.70	282.03	92.37	0.64
Reach-1	4.778	1% AEP	3400.00	530.60	542.01	538.80	544.02	0.000531	11.38	298.80	114.75	0.60
Reach-1	4.778	0.2% AEP	3600.00	530.60	542.49	539.11	544.56	0.000517	11.55	311.63	115.72	0.60
Reach-1	4.775	10% AEP	3000.00	530.60	538.96	537.41	541.20	0.001564	12.01	249.76	29.95	0.73
Reach-1	4.775	2% AEP	3300.00	530.60	541.73	537.86	543.26	0.000844	9.91	332.87	30.00	0.52
Reach-1	4.775	1% AEP	3400.00	530.60	542.33	537.99	543.79	0.000763	9.69	350.80	31.93	0.50
Reach-1	4.775	0.2% AEP	3600.00	530.60	542.82	538.28	544.33	0.000746	9.85	365.41	34.77	0.50
Reach-1	4.772	10% AEP	3000.00	530.60	539.41	536.84	540.98	0.000988	10.05	298.41	33.95	0.60
Reach-1	4.772	2% AEP	3300.00	530.60	542.00	537.27	543.13	0.000574	8.54	386.40	34.00	0.45
Reach-1	4.772	1% AEP	3400.00	530.60	542.58	537.40	543.67	0.000516	8.37	406.22	172.30	0.43
Reach-1	4.772	0.2% AEP	3600.00	530.60	543.08	537.65	544.20	0.000505	8.51	423.06	177.18	0.43

LEFT BANK
LEVEE
LOCATION

HEC-RAS Plan: MEB-new levee River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.769	10% AEP	3000.00	530.60	539.60	536.58	540.88	0.000726	9.08	349.24	51.52	0.54
Reach-1	4.769	2% AEP	3300.00	530.60	542.16	536.98	543.05	0.000387	7.66	495.38	92.09	0.40
Reach-1	4.769	1% AEP	3400.00	530.60	542.75	537.12	543.59	0.000342	7.44	544.60	130.02	0.38
Reach-1	4.769	0.2% AEP	3600.00	530.60	543.27	537.36	544.11	0.000327	7.48	588.39	146.66	0.37
Reach-1	4.743	10% AEP	3000.00	529.90	539.66	535.89	540.73	0.000525	8.33	388.93	51.25	0.47
Reach-1	4.743	2% AEP	3300.00	529.90	542.19	536.29	542.97	0.000304	7.17	582.57	108.95	0.36
Reach-1	4.743	1% AEP	3400.00	529.90	542.78	536.43	543.52	0.000271	6.98	650.02	116.91	0.34
Reach-1	4.743	0.2% AEP	3600.00	529.90	543.30	536.68	544.04	0.000262	7.04	711.38	119.51	0.34
Reach-1	4.736	10% AEP	3000.00	529.60	539.69	536.15	540.66	0.000335	8.20	471.24	128.82	0.46
Reach-1	4.736	2% AEP	3300.00	529.60	542.32	536.55	542.83	0.000143	6.28	847.92	256.27	0.32
Reach-1	4.736	1% AEP	3400.00	529.60	542.91	536.68	543.37	0.000123	6.01	933.92	274.14	0.30
Reach-1	4.736	0.2% AEP	3600.00	529.60	543.44	536.92	543.89	0.000115	5.97	1010.38	290.03	0.29
Reach-1	4.7315	Bridge										
Reach-1	4.727	10% AEP	3000.00	529.60	538.35	536.30	539.73	0.000573	9.70	357.52	54.94	0.59
Reach-1	4.727	2% AEP	3300.00	529.60	540.21	536.42	541.21	0.000328	8.40	543.60	145.70	0.46
Reach-1	4.727	1% AEP	3400.00	529.60	541.00	536.55	541.82	0.000252	7.73	657.51	150.55	0.41
Reach-1	4.727	0.2% AEP	3600.00	529.60	541.73	536.79	542.45	0.000212	7.41	762.25	155.01	0.38
Reach-1	4.716	10% AEP	3500.00	529.30	535.84	535.84	539.11	0.002616	14.50	241.44	36.99	1.00
Reach-1	4.716	2% AEP	4200.00	529.30	536.72	536.72	540.37	0.002537	15.34	274.47	40.21	0.99
Reach-1	4.716	1% AEP	4500.00	529.30	537.09	537.09	540.89	0.002471	15.64	289.94	43.06	0.99
Reach-1	4.716	0.2% AEP	4850.00	529.30	537.56	537.56	541.47	0.002356	15.88	310.90	46.64	0.98
Reach-1	4.641	10% AEP	3500.00	527.40	534.29	534.29	537.49	0.001637	14.36	243.77	37.97	1.00
Reach-1	4.641	2% AEP	4200.00	527.40	535.12	535.12	538.73	0.001636	15.25	275.38	38.86	1.00
Reach-1	4.641	1% AEP	4500.00	527.40	535.50	535.50	539.24	0.001590	15.51	291.38	49.67	0.99
Reach-1	4.641	0.2% AEP	4850.00	527.40	536.00	536.00	539.81	0.001494	15.68	316.74	53.26	0.97
Reach-1	4.595	10% AEP	3500.00	526.70	534.02	533.40	536.58	0.001196	12.83	272.84	39.98	0.87
Reach-1	4.595	2% AEP	4200.00	526.70	534.96	534.21	537.80	0.001154	13.53	313.96	49.03	0.86
Reach-1	4.595	1% AEP	4500.00	526.70	535.45	534.55	538.32	0.001075	13.61	338.46	50.00	0.84
Reach-1	4.595	0.2% AEP	4850.00	526.70	535.95	535.00	538.89	0.001021	13.79	363.59	50.00	0.82
Reach-1	4.533	10% AEP	3500.00	526.10	533.89	532.80	536.13	0.000981	12.01	291.53	39.97	0.78

EXISTING
MADISON
ROAD
BRIDGE

HEC-RAS Plan: MEB-new levee River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.533	2% AEP	4200.00	526.10	534.89	533.61	537.34	0.000933	12.60	373.04	121.97	0.77
Reach-1	4.533	1% AEP	4500.00	526.10	535.47	533.94	537.87	0.000855	12.52	430.29	154.04	0.74
Reach-1	4.533	0.2% AEP	4850.00	526.10	536.05	534.58	538.43	0.000798	12.53	488.72	184.64	0.72
Reach-1	4.455	10% AEP	3500.00	525.20	533.78	532.06	535.68	0.000767	11.05	317.59	42.96	0.69
Reach-1	4.455	2% AEP	4200.00	525.20	534.75	532.83	536.91	0.000768	11.80	364.03	52.72	0.70
Reach-1	4.455	1% AEP	4500.00	525.20	535.27	533.20	537.48	0.000735	11.92	393.21	58.09	0.69
Reach-1	4.455	0.2% AEP	4850.00	525.20	535.81	533.58	538.09	0.000717	12.14	425.54	63.50	0.68
Reach-1	4.355	10% AEP	3500.00	524.40	533.84	530.85	535.21	0.000454	9.42	405.33	73.82	0.55
Reach-1	4.355	2% AEP	4200.00	524.40	534.90	531.67	536.42	0.000442	10.00	486.81	79.78	0.55
Reach-1	4.355	1% AEP	4500.00	524.40	535.47	531.99	536.99	0.000417	10.07	532.66	82.57	0.54
Reach-1	4.355	0.2% AEP	4850.00	524.40	536.04	532.42	537.59	0.000401	10.21	580.76	85.40	0.53
Reach-1	4.325	10% AEP	3500.00	524.00	534.16	530.36	534.84	0.004063	6.69	550.35	95.60	0.41
Reach-1	4.325	2% AEP	4200.00	524.00	535.33	531.04	536.01	0.003489	6.78	664.88	100.23	0.39
Reach-1	4.325	1% AEP	4500.00	524.00	535.93	531.31	536.59	0.003138	6.70	725.49	102.60	0.38
Reach-1	4.325	0.2% AEP	4850.00	524.00	536.54	531.63	537.19	0.002879	6.68	788.81	105.01	0.36
Reach-1	4.242	10% AEP	3500.00	521.10	533.19	527.39	533.59	0.001908	5.17	728.31	105.57	0.29
Reach-1	4.242	2% AEP	4200.00	521.10	534.53	528.11	534.92	0.001654	5.24	873.01	111.13	0.27
Reach-1	4.242	1% AEP	4500.00	521.10	535.22	528.39	535.60	0.001489	5.17	951.12	114.02	0.26
Reach-1	4.242	0.2% AEP	4850.00	521.10	535.90	528.73	536.28	0.001383	5.17	1029.09	116.83	0.26
Reach-1	4.178	10% AEP	3500.00	519.40	532.56	526.49	532.95	0.001852	5.32	736.24	285.73	0.28
Reach-1	4.178	2% AEP	4200.00	519.40	534.00	527.38	534.38	0.001531	5.24	890.95	288.42	0.26
Reach-1	4.178	1% AEP	4500.00	519.40	534.76	527.80	535.11	0.001350	5.10	973.40	289.83	0.24
Reach-1	4.178	0.2% AEP	4850.00	519.40	535.47	528.28	535.82	0.001241	5.06	1052.16	291.16	0.23
Reach-1	4.166	10% AEP	3500.00	519.00	532.28	524.78	532.78	0.002544	5.66	617.89	241.75	0.28
Reach-1	4.166	2% AEP	4200.00	519.00	533.59	525.48	534.19	0.002661	6.18	680.04	269.32	0.29
Reach-1	4.166	1% AEP	4500.00	519.00	534.30	525.77	534.92	0.002602	6.31	713.59	284.56	0.29
Reach-1	4.166	0.2% AEP	4850.00	519.00	534.96	526.11	535.62	0.002620	6.51	744.80	298.73	0.29
Reach-1	4.165		Bridge									
Reach-1	4.164	10% AEP	3500.00	519.00	532.23	524.78	532.73	0.002577	5.69	615.44	389.16	0.28
Reach-1	4.164	2% AEP	4200.00	519.00	533.54	525.48	534.14	0.002696	6.20	677.39	463.66	0.29
Reach-1	4.164	1% AEP	4500.00	519.00	534.25	525.77	534.87	0.002634	6.33	710.98	616.68	0.29

HEC-RAS Plan: MEB-new levee River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.164	0.2% AEP	4850.00	519.00	534.91	526.11	535.57	0.002652	6.54	742.13	620.60	0.29
Reach-1	4.142	10% AEP	3500.00	518.80	532.07	526.43	532.36	0.002244	4.75	995.79	518.99	0.27
Reach-1	4.142	2% AEP	4200.00	518.80	533.50	527.15	533.72	0.001560	4.34	1343.61	705.75	0.23
Reach-1	4.142	1% AEP	4500.00	518.80	534.26	527.46	534.46	0.001266	4.08	1531.72	785.13	0.21
Reach-1	4.142	0.2% AEP	4850.00	518.80	534.97	527.80	535.14	0.001096	3.94	1706.21	823.04	0.19
Reach-1	4.057	10% AEP	3500.00	518.10	531.07	524.61	531.45	0.001758	5.03	758.12	111.11	0.27
Reach-1	4.057	2% AEP	4200.00	518.10	532.65	525.31	533.02	0.001464	5.04	940.65	120.57	0.26
Reach-1	4.057	1% AEP	4500.00	518.10	533.51	525.61	533.86	0.001276	4.93	1046.87	125.75	0.24
Reach-1	4.057	0.2% AEP	4850.00	518.10	534.27	525.93	534.61	0.001175	4.91	1143.03	133.16	0.23
Reach-1	4.041	10% AEP	3500.00	517.90	528.00	526.70	530.75	0.001128	13.28	263.48	96.41	0.79
Reach-1	4.041	2% AEP	4200.00	517.90	529.09	527.69	532.22	0.001104	14.19	295.90	100.38	0.79
Reach-1	4.041	1% AEP	4500.00	517.90	530.26	528.09	533.14	0.000873	13.60	330.85	104.14	0.72
Reach-1	4.041	0.2% AEP	4850.00	517.90	530.82	528.54	533.85	0.000862	13.96	347.45	105.64	0.72
Reach-1	4.0285	Bridge										
Reach-1	4.016	10% AEP	3500.00	517.90	526.70	526.70	530.47	0.001922	15.58	224.58	87.87	1.00
Reach-1	4.016	2% AEP	4200.00	517.90	527.68	527.68	531.93	0.001842	16.55	253.76	94.29	1.00
Reach-1	4.016	1% AEP	4500.00	517.90	528.09	528.09	532.54	0.001809	16.92	265.94	96.78	1.00
Reach-1	4.016	0.2% AEP	4850.00	517.90	528.54	528.54	533.22	0.001782	17.36	279.38	98.77	1.00
Reach-1	4.001	10% AEP	3500.00	517.60	525.03	524.55	527.40	0.001435	12.55	347.21	76.07	0.85
Reach-1	4.001	2% AEP	4200.00	517.60	526.22	525.33	528.56	0.001162	12.59	443.41	85.28	0.79
Reach-1	4.001	1% AEP	4500.00	517.60	526.93	525.65	529.13	0.000980	12.25	505.70	89.69	0.74
Reach-1	4.001	0.2% AEP	4850.00	517.60	528.11	526.05	529.98	0.000720	11.43	615.06	100.24	0.64
Reach-1	3.948	10% AEP	3500.00	517.00	525.01	523.89	526.92	0.001048	11.36	386.47	76.29	0.74
Reach-1	3.948	2% AEP	4200.00	517.00	526.23		528.16	0.000872	11.48	485.48	85.16	0.69
Reach-1	3.948	1% AEP	4500.00	517.00	526.95		528.78	0.000751	11.24	548.69	91.00	0.65
Reach-1	3.948	0.2% AEP	4850.00	517.00	528.12		529.72	0.000567	10.58	661.15	100.61	0.58
Reach-1	3.866	10% AEP	3500.00	516.10	524.88		526.41	0.000794	10.32	457.96	83.95	0.65
Reach-1	3.866	2% AEP	4200.00	516.10	526.17		527.72	0.000662	10.43	572.36	92.53	0.61
Reach-1	3.866	1% AEP	4500.00	516.10	526.91		528.39	0.000577	10.26	643.64	101.04	0.58
Reach-1	3.866	0.2% AEP	4850.00	516.10	528.11		529.41	0.000443	9.70	773.17	115.08	0.51

HEC-RAS Plan: MEB-new levee River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.82	10% AEP	3500.00	515.80	524.22	522.56	526.14	0.001188	11.12	317.34	48.42	0.70
Reach-1	3.82	2% AEP	4200.00	515.80	525.40	523.36	527.46	0.001061	11.54	385.50	66.15	0.68
Reach-1	3.82	1% AEP	4500.00	515.80	526.21	523.68	528.17	0.000903	11.28	443.95	78.61	0.63
Reach-1	3.82	0.2% AEP	4850.00	515.80	527.58	524.09	529.25	0.000657	10.49	568.95	103.88	0.55
Reach-1	3.79	10% AEP	3500.00	515.50	524.13	522.20	525.92	0.001070	10.74	336.25	71.71	0.66
Reach-1	3.79	2% AEP	4200.00	515.50	525.39	522.99	527.24	0.000928	11.01	431.26	79.22	0.63
Reach-1	3.79	1% AEP	4500.00	515.50	526.24	523.32	527.97	0.000779	10.69	500.79	85.04	0.59
Reach-1	3.79	0.2% AEP	4850.00	515.50	527.62	523.75	529.09	0.000571	9.96	627.64	101.24	0.52
Reach-1	3.766	10% AEP	3500.00	515.30	524.14	522.53	525.63	0.001147	9.80	357.23	53.31	0.67
Reach-1	3.766	2% AEP	4200.00	515.30	525.44	523.21	526.95	0.000955	9.83	427.14	53.64	0.61
Reach-1	3.766	1% AEP	4500.00	515.30	526.30	523.47	527.70	0.000805	9.51	472.97	53.85	0.57
Reach-1	3.766	0.2% AEP	4850.00	515.30	527.67	523.80	528.89	0.000604	8.87	547.03	54.19	0.49
Reach-1	3.7645		Bridge									
Reach-1	3.763	10% AEP	3450.00	515.30	523.60	522.49	525.31	0.001443	10.50	328.60	53.18	0.74
Reach-1	3.763	2% AEP	4100.00	515.30	525.02	523.09	526.62	0.001076	10.14	404.39	53.53	0.65
Reach-1	3.763	1% AEP	4700.00	515.30	525.95	523.66	527.61	0.000993	10.35	454.13	53.76	0.63
Reach-1	3.763	0.2% AEP	4750.00	515.30	527.42	523.72	528.65	0.000624	8.90	533.65	54.13	0.50
Reach-1	3.754	10% AEP	3450.00	515.20	523.70		525.19	0.000937	9.79	352.31	49.66	0.65
Reach-1	3.754	2% AEP	4100.00	515.20	525.07		526.54	0.000785	9.74	420.84	51.03	0.60
Reach-1	3.754	1% AEP	4700.00	515.20	525.98		527.54	0.000761	10.05	467.85	52.22	0.59
Reach-1	3.754	0.2% AEP	4750.00	515.20	527.43		528.61	0.000503	8.71	545.35	54.18	0.48
Reach-1	3.71	10% AEP	3450.00	514.50	523.56		524.96	0.000834	9.50	363.05	48.27	0.61
Reach-1	3.71	2% AEP	4100.00	514.50	524.94		526.35	0.000718	9.52	430.51	49.70	0.57
Reach-1	3.71	1% AEP	4700.00	514.50	525.84		527.36	0.000692	9.88	476.91	53.05	0.56
Reach-1	3.71	0.2% AEP	4750.00	514.50	527.34		528.50	0.000447	8.62	561.23	59.45	0.46
Reach-1	3.686	10% AEP	3450.00	514.20	523.81	520.63	524.74	0.000479	7.73	446.19	58.89	0.50
Reach-1	3.686	2% AEP	4100.00	514.20	525.20	521.28	526.14	0.000396	7.74	532.29	66.78	0.46
Reach-1	3.686	1% AEP	4700.00	514.20	526.15	521.87	527.14	0.000370	8.00	599.38	74.23	0.45
Reach-1	3.686	0.2% AEP	4750.00	514.20	527.58	521.91	528.34	0.000237	7.02	707.04	76.44	0.37
Reach-1	3.628	10% AEP	3450.00	514.00	523.10	520.83	524.50	0.000821	9.49	363.36	48.04	0.61
Reach-1	3.628	2% AEP	4100.00	514.00	524.55	521.55	525.94	0.000657	9.44	447.67	66.02	0.55

HEC-RAS Plan: MEB-new levee River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.628	1% AEP	4700.00	514.00	525.47	522.16	526.95	0.000619	9.78	508.32	66.04	0.55
Reach-1	3.628	0.2% AEP	4750.00	514.00	527.14	522.21	528.22	0.000370	8.39	618.55	66.09	0.43
Reach-1	3.593	10% AEP	3450.00	513.40	522.99	519.99	524.35	0.000752	9.35	369.13	40.79	0.55
Reach-1	3.593	2% AEP	4100.00	513.40	524.39	520.74	525.81	0.000663	9.59	440.62	56.00	0.52
Reach-1	3.593	1% AEP	4700.00	513.40	525.24	521.38	526.82	0.000663	10.11	490.63	60.75	0.53
Reach-1	3.593	0.2% AEP	4750.00	513.40	526.96	521.43	528.13	0.000412	8.76	603.49	70.31	0.43
Reach-1	3.568	10% AEP	3450.00	513.20	522.56	520.31	524.19	0.000829	10.24	336.76	44.30	0.63
Reach-1	3.568	2% AEP	4100.00	513.20	523.99	521.05	525.67	0.000694	10.38	395.05	59.41	0.59
Reach-1	3.568	1% AEP	4700.00	513.20	524.78	521.71	526.67	0.000705	11.01	426.91	65.51	0.60
Reach-1	3.568	0.2% AEP	4750.00	513.20	526.65	521.77	528.04	0.000418	9.45	502.45	76.02	0.47
Reach-1	3.5635		Bridge									
Reach-1	3.559	10% AEP	3450.00	513.20	522.47	520.30	524.14	0.000855	10.35	333.46	44.24	0.64
Reach-1	3.559	2% AEP	4100.00	513.20	523.93	521.06	525.62	0.000711	10.45	392.29	58.54	0.59
Reach-1	3.559	1% AEP	4700.00	513.20	524.71	521.71	526.62	0.000722	11.09	423.83	64.92	0.60
Reach-1	3.559	0.2% AEP	4750.00	513.20	526.59	521.76	527.99	0.000425	9.50	500.04	89.76	0.48
Reach-1	3.548	10% AEP	3450.00	513.00	522.56		523.96	0.000790	9.52	362.51	39.99	0.56
Reach-1	3.548	2% AEP	4100.00	513.00	524.00		525.47	0.000690	9.74	431.77	59.57	0.53
Reach-1	3.548	1% AEP	4700.00	513.00	524.79		526.45	0.000707	10.36	481.41	65.78	0.54
Reach-1	3.548	0.2% AEP	4750.00	513.00	526.67		527.86	0.000422	8.86	633.66	89.92	0.43
Reach-1	3.462	10% AEP	3450.00	511.90	522.39		523.59	0.000611	8.78	417.89	103.47	0.49
Reach-1	3.462	2% AEP	4100.00	511.90	523.94		525.12	0.000507	8.82	632.22	173.47	0.46
Reach-1	3.462	1% AEP	4700.00	511.90	524.82		526.06	0.000495	9.16	788.11	178.22	0.46
Reach-1	3.462	0.2% AEP	4750.00	511.90	526.79		527.59	0.000275	7.54	1147.88	190.79	0.35
Reach-1	3.441	10% AEP	3450.00	511.80	522.35	518.56	523.52	0.000375	8.67	397.82	68.56	0.49
Reach-1	3.441	2% AEP	4100.00	511.80	523.79	519.31	525.05	0.000338	9.00	455.43	79.24	0.47
Reach-1	3.441	1% AEP	4700.00	511.80	524.47	519.97	525.94	0.000365	9.74	482.77	84.31	0.49
Reach-1	3.441	0.2% AEP	4750.00	511.80	526.34	520.02	527.46	0.000231	8.52	557.54	98.17	0.40
Reach-1	3.434		Bridge									
Reach-1	3.427	10% AEP	3450.00	511.80	522.29	518.55	523.47	0.000383	8.73	395.38	68.11	0.49
Reach-1	3.427	2% AEP	4100.00	511.80	523.73	519.31	525.00	0.000343	9.05	453.13	78.81	0.47

HEC-RAS Plan: MEB-new levee River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.427	1% AEP	4700.00	511.80	524.40	519.97	525.89	0.000372	9.79	480.13	83.82	0.50
Reach-1	3.427	0.2% AEP	4750.00	511.80	526.29	520.02	527.43	0.000233	8.54	555.89	97.86	0.40
Reach-1	3.41	10% AEP	3450.00	511.60	522.32		523.37	0.000491	8.22	443.06	72.68	0.45
Reach-1	3.41	2% AEP	4100.00	511.60	523.78		524.89	0.000440	8.49	560.86	88.76	0.43
Reach-1	3.41	1% AEP	4700.00	511.60	524.48		525.75	0.000473	9.14	625.27	96.42	0.45
Reach-1	3.41	0.2% AEP	4750.00	511.60	526.38		527.30	0.000290	7.86	828.45	117.35	0.36
Reach-1	3.308	10% AEP	3450.00	510.60	522.18		522.67	0.002946	6.17	695.75	95.23	0.33
Reach-1	3.308	2% AEP	4100.00	510.60	523.76		524.23	0.002443	6.16	856.08	107.87	0.31
Reach-1	3.308	1% AEP	4700.00	510.60	524.49		525.03	0.002591	6.59	939.05	118.45	0.32
Reach-1	3.308	0.2% AEP	4750.00	510.60	526.47		526.83	0.001521	5.54	1208.03	154.94	0.25
Reach-1	3.219	10% AEP	3500.00	509.70	521.65	514.85	521.83	0.000991	3.41	1055.25	137.56	0.20
Reach-1	3.219	2% AEP	4000.00	509.70	523.41	515.23	523.57	0.000705	3.23	1309.37	149.23	0.17
Reach-1	3.219	1% AEP	4800.00	509.70	524.10	515.84	524.30	0.000819	3.63	1413.58	152.83	0.19
Reach-1	3.219	0.2% AEP	5000.00	509.70	526.25	515.96	526.40	0.000488	3.13	1754.45	168.84	0.15

Attachment A-7

Proposed Option 2 – TR-55/TR-20 Output

WinTR-20 Printed Page File
TR20.inp

Beginning of Input Data List

WinTR-20: Version 1.10
SMU Flood Gate Study
Storage Option

0 0 0.05

SUB-AREA:

Entire Outlet 6.3 85. 3.627

STREAM REACH:

STORM ANALYSIS:

2-Yr	2.91	Type II	2
5-Yr	3.55	Type II	2
10-Yr	4.05	Type II	2
25-Yr	4.71	Type II	2
50-Yr	5.22	Type II	2
100-Yr	5.74	Type II	2
1-Yr	2.43	Type II	2

NRCS RAINFALL
DEPTHS FOR
HAMILTON COUNTY

STRUCTURE RATING:

GLOBAL OUTPUT:

2 0.05 YYYYN YYYYNN

WinTR-20 Printed Page File

End of Input Data List

SMU Flood Gate Study
Storage Option

Name of printed page file:
TR20.out

STORM 2-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
Entire	6.300		1.513		14.24	1262.72	200.43

2-YEAR
RESULTS

Line Start Time (hr)	----- (cfs)	Flow Values @ time increment of 0.229 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.744	0.13	0.35	0.76	1.46	2.57	4.19	6.43
10.348	9.40	13.25	18.16	24.41	32.42	42.87	59.85
11.951	101.24	175.89	277.61	410.14	578.14	770.11	948.71
13.555	1090.82	1188.68	1242.36	1262.72	1242.36	1198.38	1135.82
15.158	1051.44	949.48	853.31	773.88	704.68	644.03	591.89
16.762	545.06	501.18	462.19	428.42	398.04	370.84	346.46
18.365	324.94	305.10	287.83	272.39	258.48	245.96	234.63
19.969	223.96	214.18	204.94	196.52	188.52	180.94	174.20
21.572	167.96	162.12	156.66	151.58	146.87	142.51	138.49
23.176	134.88	132.09	129.71	127.57	125.52	123.24	120.47
24.780	116.98	112.49	106.72	99.61	91.47	82.72	73.76
26.383	64.89	56.37	48.47	41.25	34.82	29.34	24.82
27.987	21.06	17.88	15.18	12.88	10.91	9.23	7.81
29.590	6.61	5.59	4.72	3.98	3.35	2.82	2.38
31.194	2.00	1.68	1.40	1.17	0.97	0.80	0.66
32.797	0.54	0.43	0.35	0.27	0.21	0.15	0.11
34.401	0.07						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
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WinTR-20: Version 1.10
lood Gate Study
Storage Option

0 0 0.05

(continued)

STORM 2-Yr

SUB-AREA:

Entire Outlet 6.3 85. 3.627

STREAM REACH:

OUTLET 6.300 1.513 14.24 1262.72 200.43

Line Start Time (hr)	Flow Values @ time increment of 0.229 hr						
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
8.744	0.13	0.35	0.76	1.46	2.57	4.19	6.43
10.348	9.40	13.25	18.16	24.41	32.42	42.87	59.85
11.951	101.24	175.89	277.61	410.14	578.14	770.11	948.71
13.555	1090.82	1188.68	1242.36	1262.72	1242.36	1198.38	1135.82
15.158	1051.44	949.48	853.31	773.88	704.68	644.03	591.89
16.762	545.06	501.18	462.19	428.42	398.04	370.84	346.46
18.365	324.94	305.10	287.83	272.39	258.48	245.96	234.63
19.969	223.96	214.18	204.94	196.52	188.52	180.94	174.20
21.572	167.96	162.12	156.66	151.58	146.87	142.51	138.49
23.176	134.88	132.09	129.71	127.57	125.52	123.24	120.47
24.780	116.98	112.49	106.72	99.61	91.47	82.72	73.76
26.383	64.89	56.37	48.47	41.25	34.82	29.34	24.82

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SMU Flood Gate Study
Storage Option

Line Start Time (hr)	Flow Values @ time increment of 0.229 hr						
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
27.987	21.06	17.88	15.18	12.88	10.91	9.23	7.81
29.590	6.61	5.59	4.72	3.98	3.35	2.82	2.38
31.194	2.00	1.68	1.40	1.17	0.97	0.80	0.66
32.797	0.54	0.43	0.35	0.27	0.21	0.15	0.11
34.401	0.07						

STORM 5-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
Entire	6.300		2.060		14.12	1730.66	274.71

5-YEAR
RESULTS

Line Start Time (hr)	Flow Values @ time increment of 0.229 hr						
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.708	0.13	0.33	0.70	1.32	2.29	3.72	5.71
9.312	8.33	11.68	15.83	20.85	26.83	33.89	42.21
10.915	52.09	64.02	78.79	98.40	136.37	215.90	338.29
12.519	497.07	700.60	947.74	1205.65	1425.28	1586.94	1685.97
14.122	1730.66	1727.56	1675.60	1598.54	1495.40	1363.64	1221.04
15.726	1097.58	995.62	905.54	827.55	759.93	697.80	640.46
17.329	590.66	547.11	507.80	472.73	441.55	413.66	388.34
18.933	366.40	346.62	328.85	312.87	298.21	284.50	271.86
20.536	260.06	249.26	238.91	229.37	220.88	212.93	205.48
22.140	198.54	192.09	186.12	180.59	175.52	171.24	167.94
23.743	165.00	162.34	159.63	156.41	152.45	147.43	140.94
25.347	132.65	122.80	111.90	100.46	89.00	77.75	67.20

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WinTR-20: Version 1.10
lood Gate Study
Storage Option

0 0 0.05

(continued)

STORM 5-Yr

SUB-AREA:

Entire Outlet 6.3 85. 3.627

STREAM REACH:

26.950	57.47	48.68	40.99	34.60	29.34	24.90	21.14
28.554	17.95	15.22	12.87	10.89	9.22	7.80	6.59
30.157	5.56	4.69	3.95	3.33	2.80	2.35	1.97
31.761	1.64	1.37	1.13	0.93	0.76	0.62	0.50
33.364	0.40	0.31	0.23	0.17	0.11	0.07	

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Elevation (ft)	Peak Time (hr)	Flow Rate (cfs)	Rate (csm)
OUTLET	6.300		2.060		14.12	1730.66	274.71

Line Start Time (hr)	Flow (cfs)	Values (cfs)	@ time increment (cfs)	of 0.229 hr (cfs)	Flow Rate (cfs)	Rate (csm)	
7.708	0.13	0.33	0.70	1.32	2.29	3.72	5.71
9.312	8.33	11.68	15.83	20.85	26.83	33.89	42.21
10.915	52.09	64.02	78.79	98.40	136.37	215.90	338.29
12.519	497.07	700.60	947.74	1205.65	1425.28	1586.94	1685.97
14.122	1730.66	1727.56	1675.60	1598.54	1495.40	1363.64	1221.04

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SMU Flood Gate Study
Storage Option

Line Start Time (hr)	Flow (cfs)	Values (cfs)	@ time increment (cfs)	of 0.229 hr (cfs)	Flow Rate (cfs)	Rate (csm)	
15.726	1097.58	995.62	905.54	827.55	759.93	697.80	640.46
17.329	590.66	547.11	507.80	472.73	441.55	413.66	388.34
18.933	366.40	346.62	328.85	312.87	298.21	284.50	271.86
20.536	260.06	249.26	238.91	229.37	220.88	212.93	205.48
22.140	198.54	192.09	186.12	180.59	175.52	171.24	167.94
23.743	165.00	162.34	159.63	156.41	152.45	147.43	140.94
25.347	132.65	122.80	111.90	100.46	89.00	77.75	67.20
26.950	57.47	48.68	40.99	34.60	29.34	24.90	21.14
28.554	17.95	15.22	12.87	10.89	9.22	7.80	6.59
30.157	5.56	4.69	3.95	3.33	2.80	2.35	1.97
31.761	1.64	1.37	1.13	0.93	0.76	0.62	0.50
33.364	0.40	0.31	0.23	0.17	0.11	0.07	

STORM 10-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Elevation (ft)	Peak Time (hr)	Flow Rate (cfs)	Rate (csm)
Entire	6.300		2.503		14.18	2114.42	335.62

10-YEAR
RESULTS

Line Start Time (hr)	Flow (cfs)	Values (cfs)	@ time increment (cfs)	of 0.229 hr (cfs)	Flow Rate (cfs)	Rate (csm)	
7.076	0.15	0.38	0.80	1.50	2.57	4.09	6.14
8.679	8.79	12.11	16.19	21.09	26.88	33.64	41.43
10.283	50.36	60.56	72.32	86.10	102.59	122.92	151.50

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WinTR-20: Version 1.10
lood Gate Study
Storage Option

0 0 0.05

(continued)

STORM 10-Yr

SUB-AREA:

Entire Outlet 6.3 85. 3.627

STREAM REACH:

11.886	212.08	325.69	486.60	694.33	957.57	1265.69	1566.04
13.490	1810.63	1982.18	2078.19	2114.42	2087.15	2012.09	1907.26
15.093	1769.19	1599.85	1430.67	1288.35	1167.75	1061.86	970.77
16.697	890.54	816.13	749.00	690.94	639.49	593.35	552.14
18.300	515.74	482.68	453.40	427.67	404.53	383.76	365.08
19.904	347.73	331.73	316.81	303.11	290.35	278.19	267.24
21.507	257.31	248.00	239.29	231.18	223.65	216.67	210.22
23.111	204.38	199.70	195.91	192.53	189.41	186.11	182.14
24.714	177.22	170.96	162.87	152.69	140.80	127.83	114.37
26.318	100.99	87.97	75.84	64.71	54.70	46.04	38.90
27.921	33.01	28.02	23.79	20.20	17.11	14.47	12.25
29.525	10.37	8.76	7.40	6.24	5.27	4.43	3.73
31.129	3.14	2.64	2.21	1.84	1.53	1.26	1.04
32.732	0.85	0.69	0.55	0.44	0.34	0.25	0.18
34.336	0.12	0.07					

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	6.300		2.503		14.18	2114.42	335.62

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SMU Flood Gate Study
Storage Option

Line Start Time (hr)	----- (cfs)	Flow Values @ time increment of 0.229 hr (cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7.076	0.15	0.38	0.80	1.50	2.57	4.09	6.14
8.679	8.79	12.11	16.19	21.09	26.88	33.64	41.43
10.283	50.36	60.56	72.32	86.10	102.59	122.92	151.50
11.886	212.08	325.69	486.60	694.33	957.57	1265.69	1566.04
13.490	1810.63	1982.18	2078.19	2114.42	2087.15	2012.09	1907.26
15.093	1769.19	1599.85	1430.67	1288.35	1167.75	1061.86	970.77
16.697	890.54	816.13	749.00	690.94	639.49	593.35	552.14
18.300	515.74	482.68	453.40	427.67	404.53	383.76	365.08
19.904	347.73	331.73	316.81	303.11	290.35	278.19	267.24
21.507	257.31	248.00	239.29	231.18	223.65	216.67	210.22
23.111	204.38	199.70	195.91	192.53	189.41	186.11	182.14
24.714	177.22	170.96	162.87	152.69	140.80	127.83	114.37
26.318	100.99	87.97	75.84	64.71	54.70	46.04	38.90
27.921	33.01	28.02	23.79	20.20	17.11	14.47	12.25
29.525	10.37	8.76	7.40	6.24	5.27	4.43	3.73
31.129	3.14	2.64	2.21	1.84	1.53	1.26	1.04
32.732	0.85	0.69	0.55	0.44	0.34	0.25	0.18
34.336	0.12	0.07					

STORM 25-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
Entire	6.300		3.101		14.19	2625.78	416.79

25-YEAR
RESULTS

WinTR-20: Version 1.10
lood Gate Study
Storage Option

0 0 0.05

(continued)

STORM 25-Yr

SUB-AREA:

Entire Outlet 6.3 85. 3.627

STREAM REACH:

Line	Flow Values @ time increment of 0.229 hr						
Start Time	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.172	0.05	0.18	0.44	0.93	1.75	3.00	4.78
7.776	7.15	10.16	13.82	18.18	23.28	29.17	35.95
9.379	43.69	52.45	62.32	73.43	85.91	99.96	115.96
10.983	134.53	156.61	183.67	221.88	302.83	449.87	653.55
12.586	915.43	1245.50	1627.24	1991.69	2283.55	2483.80	2590.78
14.190	2625.78	2580.86	2480.90	2344.73	2167.43	1953.33	1744.23
15.793	1569.79	1421.04	1290.80	1179.02	1080.19	988.44	906.22
17.397	835.25	772.17	715.75	665.38	621.00	580.56	545.01
19.000	513.68	485.52	460.29	437.61	416.51	397.12	379.02
20.604	362.49	347.03	332.33	319.19	307.21	295.99	285.50
22.207	275.72	266.64	258.23	250.46	243.44	237.92	233.40
23.811	229.36	225.60	221.60	216.79	210.82	203.22	193.43
25.414	181.16	166.92	151.41	135.38	119.45	103.99	89.60
27.018	76.42	64.58	54.37	45.95	38.99	33.09	28.10
28.621	23.85	20.21	17.09	14.46	12.24	10.35	8.74
30.225	7.37	6.22	5.23	4.41	3.71	3.11	2.60
31.828	2.17	1.80	1.49	1.22	1.00	0.81	0.65
33.432	0.51	0.40	0.29	0.21	0.14	0.08	

SMU Flood Gate Study
Storage Option

Area or	Drainage	Rain Gage	Runoff	Peak Flow			
Reach	Area	ID or	Amount	Elevation	Time	Rate	Rate
Identifier	(sq mi)	Location	(in)	(ft)	(hr)	(cfs)	(csm)
OUTLET	6.300		3.101		14.19	2625.78	416.79

Line	Flow Values @ time increment of 0.229 hr						
Start Time	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
(hr)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
6.172	0.05	0.18	0.44	0.93	1.75	3.00	4.78
7.776	7.15	10.16	13.82	18.18	23.28	29.17	35.95
9.379	43.69	52.45	62.32	73.43	85.91	99.96	115.96
10.983	134.53	156.61	183.67	221.88	302.83	449.87	653.55
12.586	915.43	1245.50	1627.24	1991.69	2283.55	2483.80	2590.78
14.190	2625.78	2580.86	2480.90	2344.73	2167.43	1953.33	1744.23
15.793	1569.79	1421.04	1290.80	1179.02	1080.19	988.44	906.22
17.397	835.25	772.17	715.75	665.38	621.00	580.56	545.01
19.000	513.68	485.52	460.29	437.61	416.51	397.12	379.02
20.604	362.49	347.03	332.33	319.19	307.21	295.99	285.50
22.207	275.72	266.64	258.23	250.46	243.44	237.92	233.40
23.811	229.36	225.60	221.60	216.79	210.82	203.22	193.43
25.414	181.16	166.92	151.41	135.38	119.45	103.99	89.60
27.018	76.42	64.58	54.37	45.95	38.99	33.09	28.10
28.621	23.85	20.21	17.09	14.46	12.24	10.35	8.74
30.225	7.37	6.22	5.23	4.41	3.71	3.11	2.60
31.828	2.17	1.80	1.49	1.22	1.00	0.81	0.65
33.432	0.51	0.40	0.29	0.21	0.14	0.08	

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lood Gate Study
Storage Option

0 0 0.05

(continued)

STORM 25-Yr

SUB-AREA:

Entire Outlet 6.3 85. 3.627

STREAM REACH:

STORM 50-Yr							
Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
Entire	6.300		3.572		14.22	3025.18	480.19

50-YEAR
RESULTS

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment (cfs)	of 0.229 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
5.741	0.06	0.20	0.49	1.04	1.95	3.34	5.33
7.345	7.97	11.32	15.40	20.21	25.75	32.04	39.11
8.948	47.04	55.90	65.82	76.90	89.26	103.06	118.44
10.552	135.68	155.23	177.88	204.81	237.80	285.53	387.48
12.155	566.19	807.59	1116.97	1504.45	1945.34	2354.85	2675.79
13.759	2889.83	2997.53	3025.18	2959.32	2836.26	2672.12	2460.37
15.362	2209.27	1971.15	1774.51	1605.37	1457.71	1331.23	1218.71
16.966	1114.05	1021.08	940.93	869.38	805.55	748.58	698.47
18.570	652.63	612.69	577.30	545.53	517.09	491.50	467.61
20.173	445.76	425.30	406.72	389.24	372.68	358.00	344.51
21.777	331.89	320.08	309.09	298.88	289.43	280.70	272.87
23.380	266.85	261.82	257.31	253.05	248.44	242.87	235.94
24.984	227.10	215.75	201.68	185.48	167.96	149.95	132.10
26.587	114.87	98.87	84.22	71.14	59.91	50.66	42.99

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SMU Flood Gate Study
Storage Option

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment (cfs)	of 0.229 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
28.191	36.49	30.98	26.30	22.27	18.84	15.94	13.49
29.794	11.40	9.63	8.12	6.85	5.76	4.86	4.08
31.398	3.42	2.87	2.39	1.98	1.64	1.34	1.10
33.001	0.89	0.71	0.56	0.43	0.32	0.22	0.15
34.605	0.08						

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	----- Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
OUTLET	6.300		3.572		14.22	3025.18	480.19

Line Start Time (hr)	----- (cfs)	Flow Values @ time (cfs)	increment (cfs)	of 0.229 hr (cfs)	----- (cfs)	----- (cfs)	----- (cfs)
5.741	0.06	0.20	0.49	1.04	1.95	3.34	5.33
7.345	7.97	11.32	15.40	20.21	25.75	32.04	39.11
8.948	47.04	55.90	65.82	76.90	89.26	103.06	118.44
10.552	135.68	155.23	177.88	204.81	237.80	285.53	387.48
12.155	566.19	807.59	1116.97	1504.45	1945.34	2354.85	2675.79
13.759	2889.83	2997.53	3025.18	2959.32	2836.26	2672.12	2460.37

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lood Gate Study
Storage Option

0 0 0.05

(continued)

STORM 50-Yr

SUB-AREA:

Entire Outlet 6.3 85. 3.627

STREAM REACH:

15.362	2209.27	1971.15	1774.51	1605.37	1457.71	1331.23	1218.71
16.966	1114.05	1021.08	940.93	869.38	805.55	748.58	698.47
18.570	652.63	612.69	577.30	545.53	517.09	491.50	467.61
20.173	445.76	425.30	406.72	389.24	372.68	358.00	344.51
21.777	331.89	320.08	309.09	298.88	289.43	280.70	272.87
23.380	266.85	261.82	257.31	253.05	248.44	242.87	235.94
24.984	227.10	215.75	201.68	185.48	167.96	149.95	132.10
26.587	114.87	98.87	84.22	71.14	59.91	50.66	42.99
28.191	36.49	30.98	26.30	22.27	18.84	15.94	13.49
29.794	11.40	9.63	8.12	6.85	5.76	4.86	4.08
31.398	3.42	2.87	2.39	1.98	1.64	1.34	1.10
33.001	0.89	0.71	0.56	0.43	0.32	0.22	0.15
34.605	0.08						

STORM 100-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Elevation (ft)	Peak Time (hr)	Flow Rate (cfs)	Rate (csm)
Entire	6.300		4.058		14.07	3427.50	544.05

100-YEAR
RESULTS

Line Start Time (hr)	Flow (cfs)	Values @ time increment (cfs)	of 0.229 hr (cfs)	Flow (cfs)	Rate (cfs)	Rate (csm)
5.363	0.06	0.22	0.54	1.14	2.15	3.69
6.967	8.81	12.52	17.04	22.37	28.49	35.37
8.570	51.41	60.63	70.77	81.99	94.42	108.20

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SMU Flood Gate Study
Storage Option

Line Start Time (hr)	Flow (cfs)	Values @ time increment (cfs)	of 0.229 hr (cfs)	Flow (cfs)	Rate (cfs)	Rate (csm)
10.174	140.49	159.37	180.50	204.56	232.57	266.12
11.777	377.53	524.04	757.26	1056.44	1437.68	1904.61
13.381	2837.08	3154.12	3347.67	3427.50	3421.32	3309.96
14.984	2944.66	2683.68	2392.21	2136.70	1929.14	1745.89
16.588	1451.12	1327.48	1212.49	1112.68	1026.40	948.47
18.191	817.67	763.37	713.44	670.72	632.31	597.89
19.795	539.18	512.97	489.15	466.75	446.57	427.25
21.398	393.51	378.74	364.92	352.01	340.00	328.85
23.002	309.08	300.86	294.78	289.38	284.51	279.70
24.605	267.56	259.18	248.43	234.69	218.12	199.50
26.209	159.74	140.05	121.35	104.06	88.35	74.49
27.812	53.21	45.15	38.33	32.55	27.60	23.36
29.416	16.73	14.15	11.96	10.09	8.51	7.17
31.019	5.08	4.27	3.58	2.99	2.49	2.06
32.623	1.39	1.13	0.91	0.73	0.57	0.43
34.226	0.22	0.14	0.07			

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Elevation (ft)	Peak Time (hr)	Flow Rate (cfs)	Rate (csm)
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lood Gate Study
Storage Option

0 0 0.05

(continued)

STORM 100-Yr

SUB-AREA:

Entire Outlet 6.3 85. 3.627

STREAM REACH:

OUTLET 6.300 4.058 14.07 3427.50 544.05

Line Start Time (hr)	Flow (cfs)	Values @ time (cfs)	increment (cfs)	of 0.229 hr (cfs)	hr (cfs)		
5.363	0.06	0.22	0.54	1.14	2.15	3.69	5.89
6.967	8.81	12.52	17.04	22.37	28.49	35.37	43.01
8.570	51.41	60.63	70.77	81.99	94.42	108.20	123.50
10.174	140.49	159.37	180.50	204.56	232.57	266.12	308.35
11.777	377.53	524.04	757.26	1056.44	1437.68	1904.61	2406.25
13.381	2837.08	3154.12	3347.67	3427.50	3421.32	3309.96	3150.81
14.984	2944.66	2683.68	2392.21	2136.70	1929.14	1745.89	1587.15
16.588	1451.12	1327.48	1212.49	1112.68	1026.40	948.47	879.29
18.191	817.67	763.37	713.44	670.72	632.31	597.89	567.10
19.795	539.18	512.97	489.15	466.75	446.57	427.25	409.25
21.398	393.51	378.74	364.92	352.01	340.00	328.85	318.55
23.002	309.08	300.86	294.78	289.38	284.51	279.70	274.23
24.605	267.56	259.18	248.43	234.69	218.12	199.50	179.74
26.209	159.74	140.05	121.35	104.06	88.35	74.49	62.82
27.812	53.21	45.15	38.33	32.55	27.60	23.36	19.76
29.416	16.73	14.15	11.96	10.09	8.51	7.17	6.04
31.019	5.08	4.27	3.58	2.99	2.49	2.06	1.70
32.623	1.39	1.13	0.91	0.73	0.57	0.43	0.32
34.226	0.22	0.14	0.07				

STORM 1-Yr

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Elevation (ft)	Peak Flow Time (hr)	Rate (cfs)	Rate (csm)
Entire	6.300		1.123		14.21	922.59	146.44

1-YEAR
RESULTS

Line Start Time (hr)	Flow (cfs)	Values @ time (cfs)	increment (cfs)	of 0.229 hr (cfs)	hr (cfs)		
9.631	0.15	0.38	0.81	1.57	2.80	4.68	7.42
11.235	11.34	16.90	26.27	51.56	101.25	171.88	264.97
12.838	384.67	525.28	661.23	772.91	853.07	900.40	922.59
14.442	915.13	887.89	846.66	789.34	717.36	646.49	587.17
16.046	535.97	490.83	451.91	417.19	384.66	355.38	329.97
17.649	307.19	286.72	268.32	252.04	237.08	223.91	212.19
19.253	201.60	192.05	183.41	175.30	167.81	160.74	154.25
20.856	148.13	142.28	137.03	132.20	127.68	123.46	119.53
22.460	115.88	112.51	109.39	106.57	104.33	102.45	100.77
24.063	99.19	97.46	95.35	92.71	89.30	84.90	79.42
25.667	73.08	66.22	59.14	52.12	45.34	39.03	33.26
27.270	28.09	23.66	20.00	16.98	14.41	12.24	10.39

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(continued)

STORM 1-Yr

SUB-AREA:

Entire Outlet 6.3 85. 3.627

STREAM REACH:

28.874	8.80	7.44	6.30	5.33	4.50	3.80	3.21
30.477	2.71	2.28	1.92	1.61	1.35	1.13	0.94
32.081	0.78	0.65	0.53	0.43	0.35	0.28	0.22
33.684	0.17	0.13	0.09	0.06			

Area or Reach Identifier	Drainage Area (sq mi)	Rain Gage ID or Location	Runoff Amount (in)	Elevation (ft)	Time (hr)	Peak Flow Rate (cfs)	Rate (csm)
OUTLET	6.300		1.123		14.21	922.59	146.44

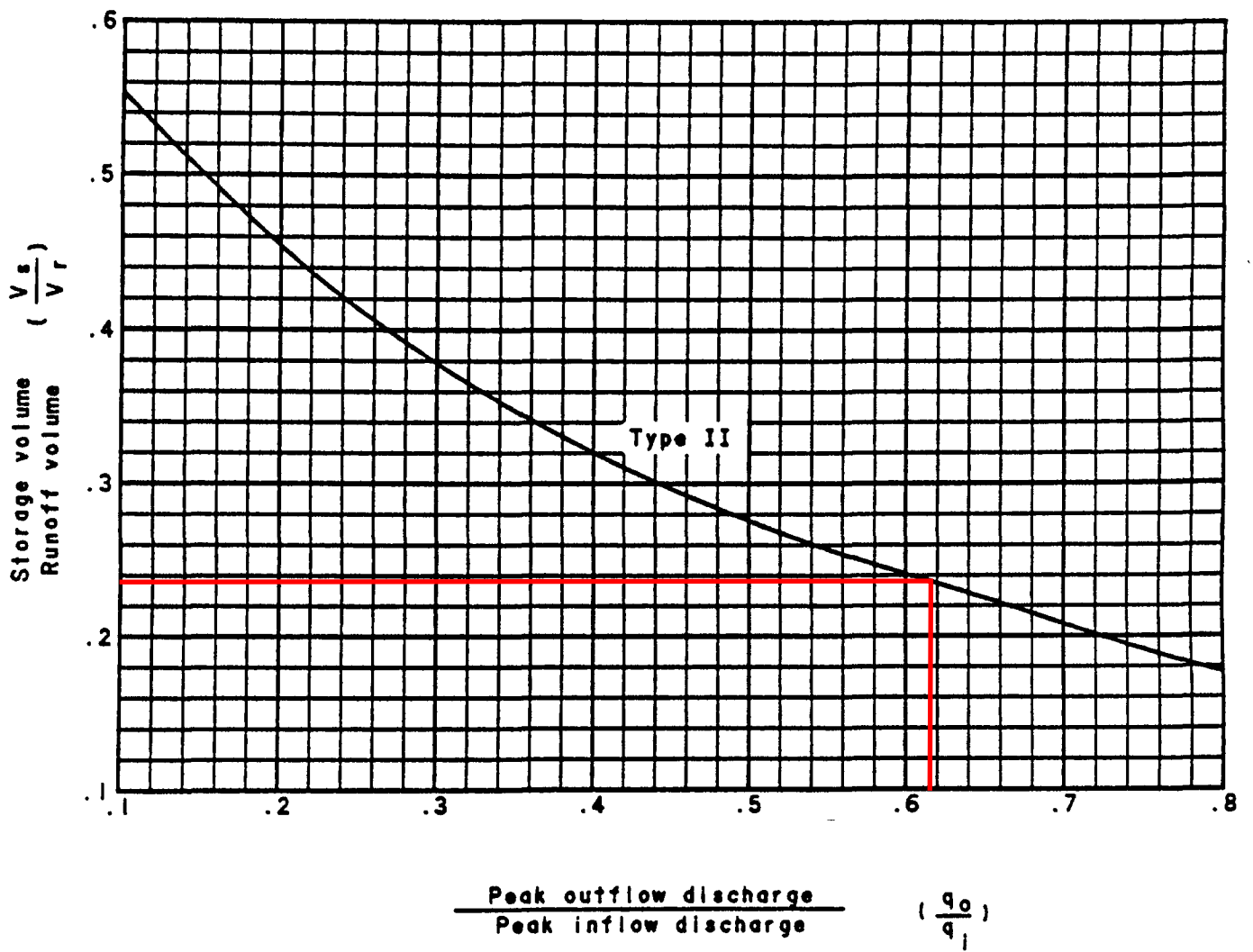
Line Start Time (hr)	Flow (cfs)	Values @ time (cfs)	increment (cfs)	of 0.229 hr (cfs)	Flow (cfs)	Rate (cfs)	Rate (cfs)
9.631	0.15	0.38	0.81	1.57	2.80	4.68	7.42
11.235	11.34	16.90	26.27	51.56	101.25	171.88	264.97
12.838	384.67	525.28	661.23	772.91	853.07	900.40	922.59
14.442	915.13	887.89	846.66	789.34	717.36	646.49	587.17
16.046	535.97	490.83	451.91	417.19	384.66	355.38	329.97
17.649	307.19	286.72	268.32	252.04	237.08	223.91	212.19
19.253	201.60	192.05	183.41	175.30	167.81	160.74	154.25
20.856	148.13	142.28	137.03	132.20	127.68	123.46	119.53
22.460	115.88	112.51	109.39	106.57	104.33	102.45	100.77
24.063	99.19	97.46	95.35	92.71	89.30	84.90	79.42
25.667	73.08	66.22	59.14	52.12	45.34	39.03	33.26
27.270	28.09	23.66	20.00	16.98	14.41	12.24	10.39
28.874	8.80	7.44	6.30	5.33	4.50	3.80	3.21
30.477	2.71	2.28	1.92	1.61	1.35	1.13	0.94
32.081	0.78	0.65	0.53	0.43	0.35	0.28	0.22
33.684	0.17	0.13	0.09	0.06			

SMU Flood Gate Study
Storage Option

Area or Reach Identifier	Drainage Area (sq mi)	Alternate	2-Yr (cfs)	5-Yr (cfs)	10-Yr (cfs)	25-Yr (cfs)	50-Yr (cfs)
Entire	6.300		1262.72	1730.66	2114.42	2625.78	3025.18
OUTLET	6.300		1262.72	1730.66	2114.42	2625.78	3025.18

Area or Reach Identifier	Drainage Area (sq mi)	Alternate	100-Yr (cfs)	1-Yr (cfs)	(cfs)	(cfs)	(cfs)
Entire	6.300		3427.50	922.59			
OUTLET	6.300		3427.50	922.59			

Attachment A-8
Proposed Option 2 – SMU Exhibit XII-5



APPROXIMATE DETENTION BASIN ROUTING

EXHIBIT XII-5

Attachment A-9

Proposed Option 2 – Upstream Park and Flood Storage



ATTACHMENT A-9 - OPTION 2 - UPSTREAMPARK AND FLOOD STORAGE

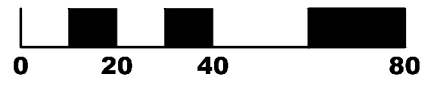


Attachment A-10

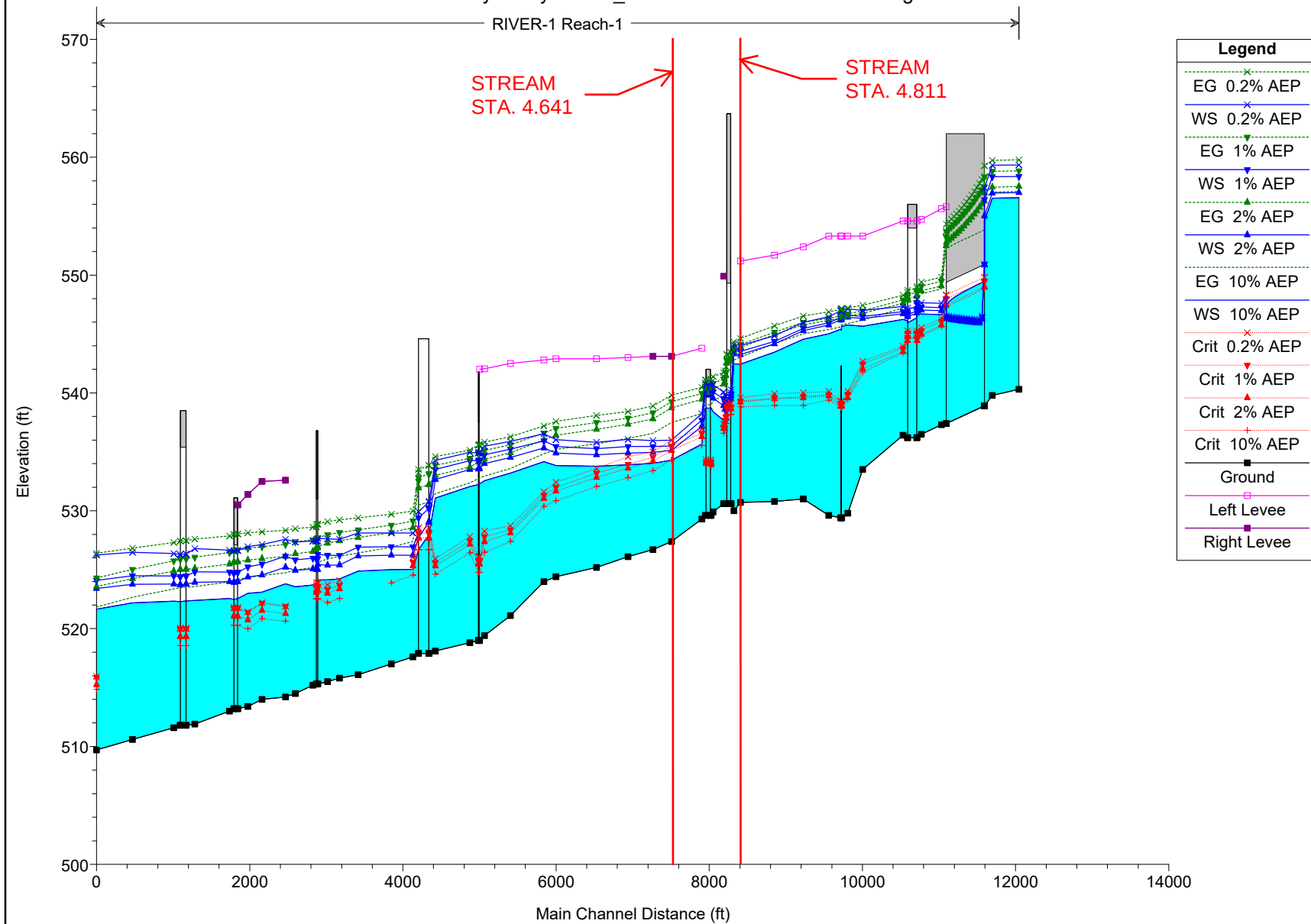
Proposed Option 3 – Plan of New Bridge



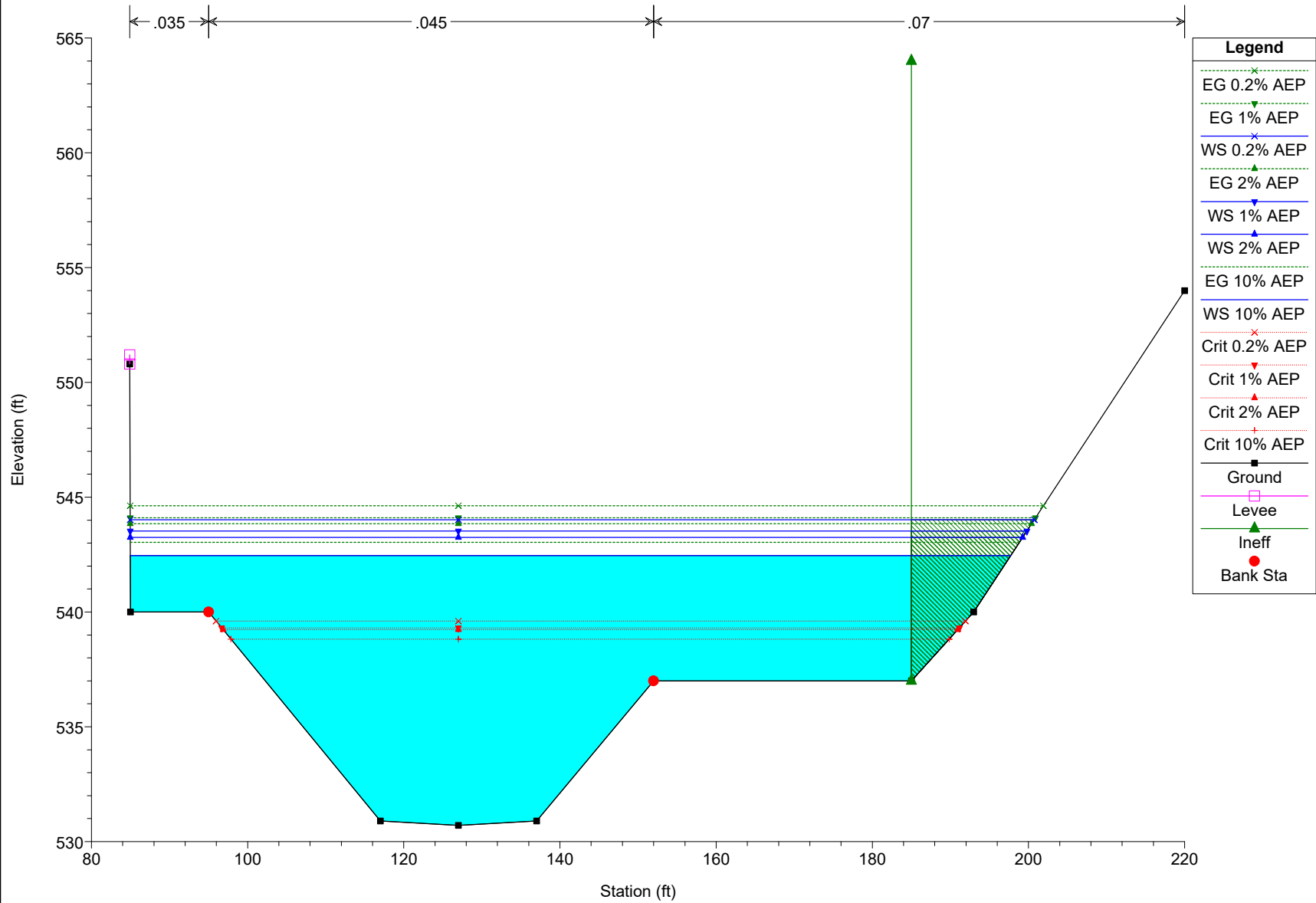
ATTACHMENT A-10 - OPTION 3 - PLAN OF NEW BRIDGE



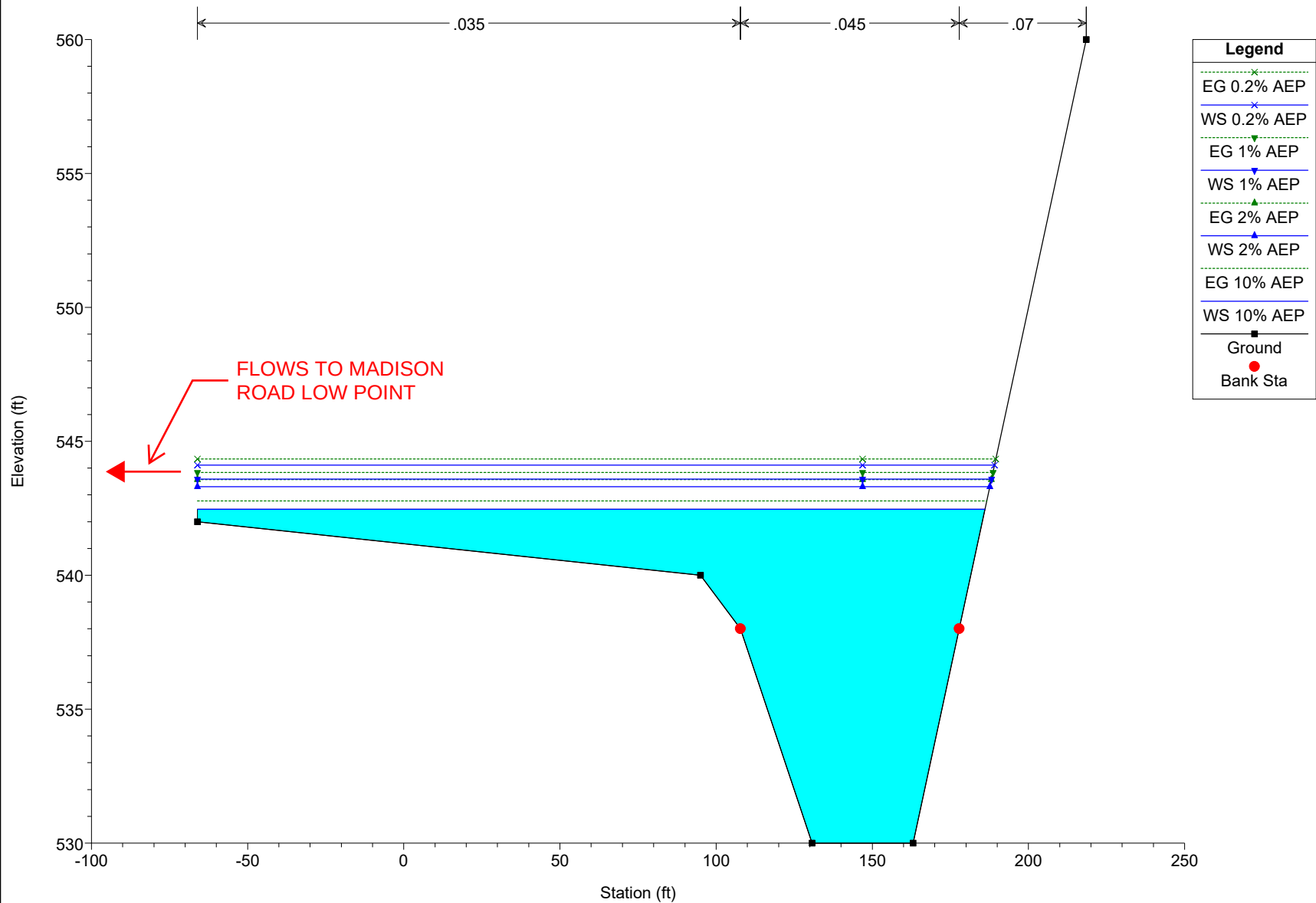
Attachment A-11
Proposed Option 3 – HEC-RAS Output



Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge 6/14/2020



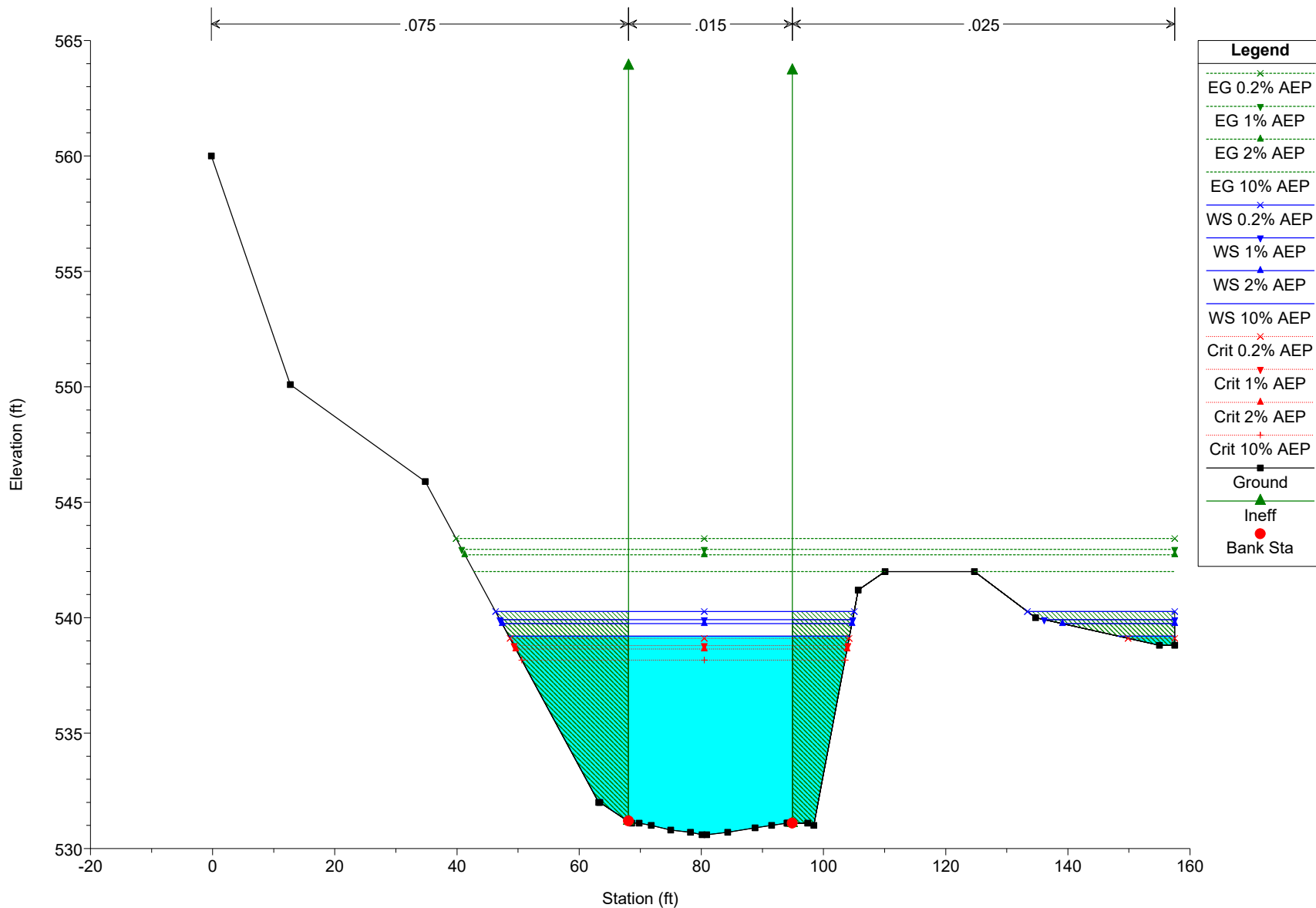
STREAM STA. 4.811



STREAM STA. 4.800
AT LEFT BANK OVERFLOW

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge 6/14/2020

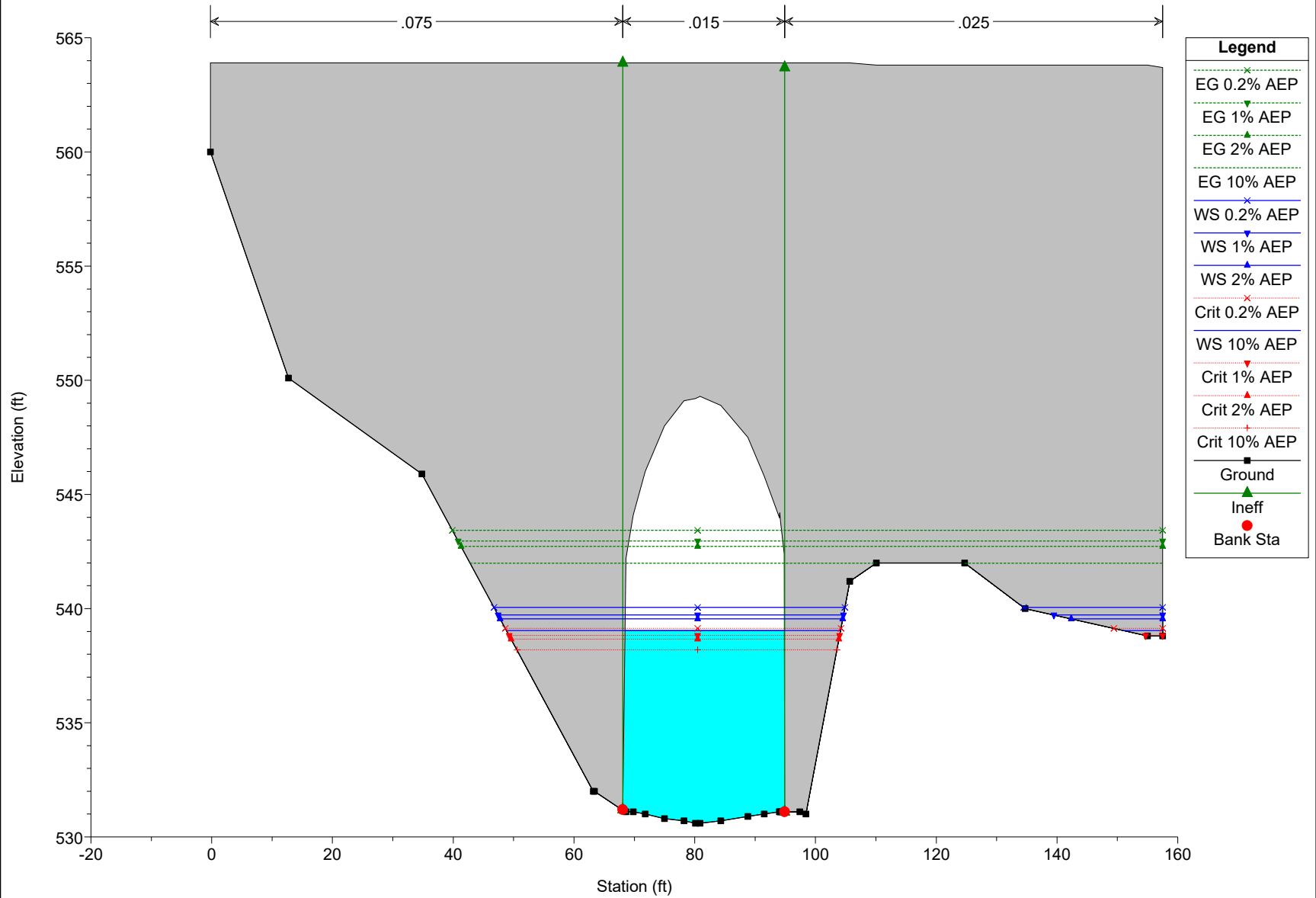
This is a REPEATED section.



STREAM STA. 4.788

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge 6/14/2020

Conrail #7



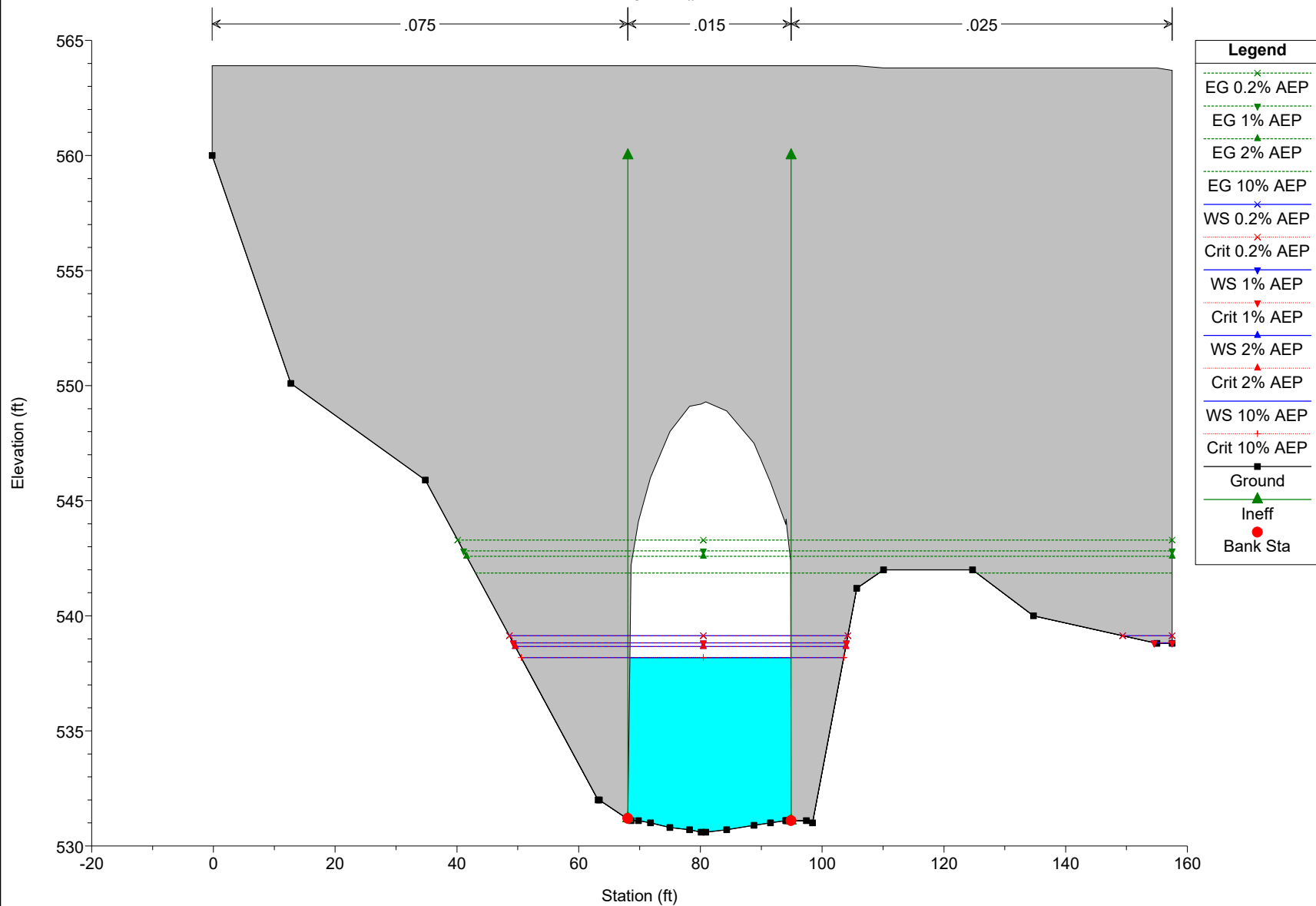
UPSTREAM EDGE OF RAILROAD BRIDGE

Duck Creek Feasibility Study-FEMA_LOMR

Plan: MEB-new bridge

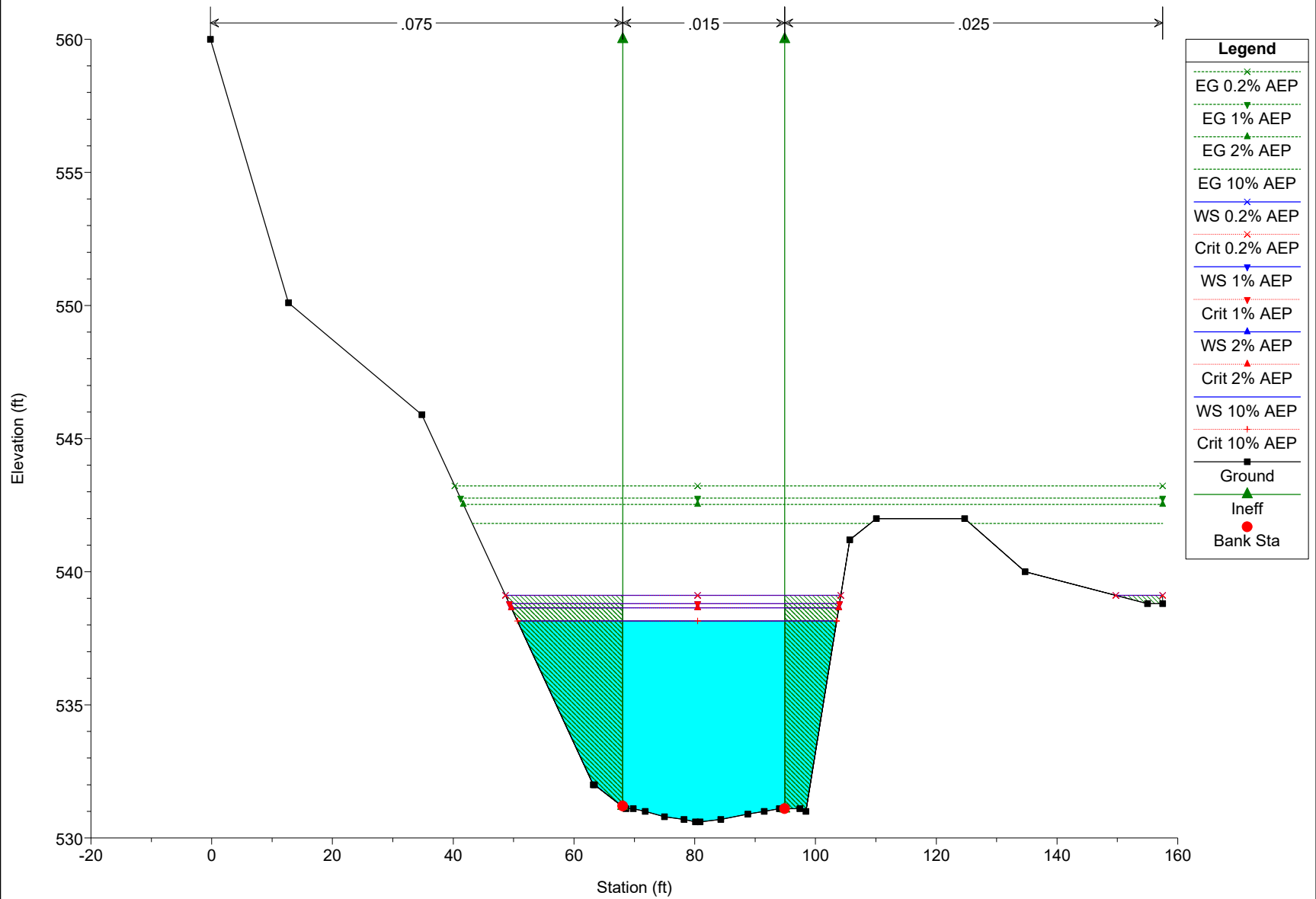
6/14/2020

Conrail #7



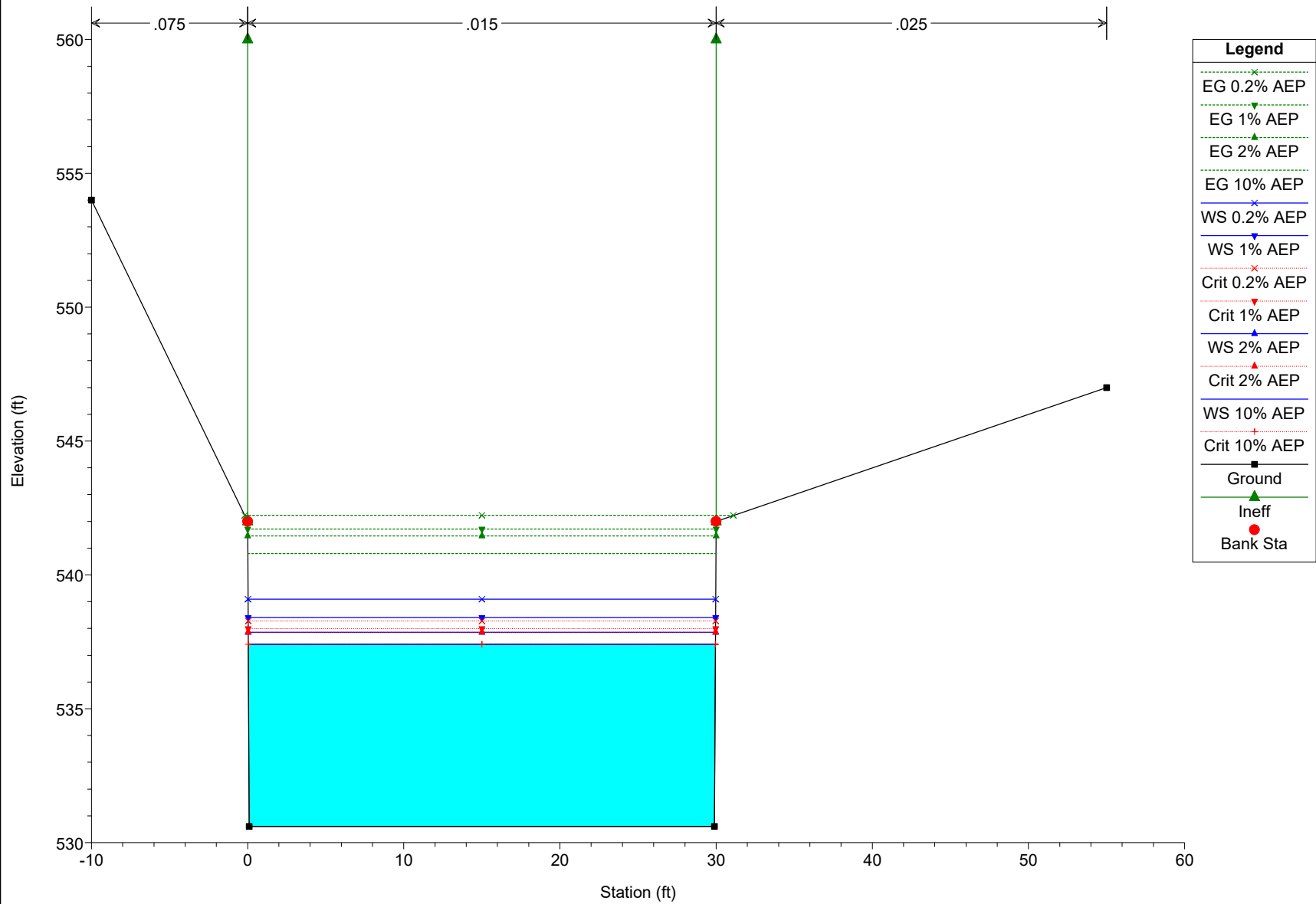
DOWNSTREAM EDGE OF RAILROAD BRIDGE

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge 6/14/2020



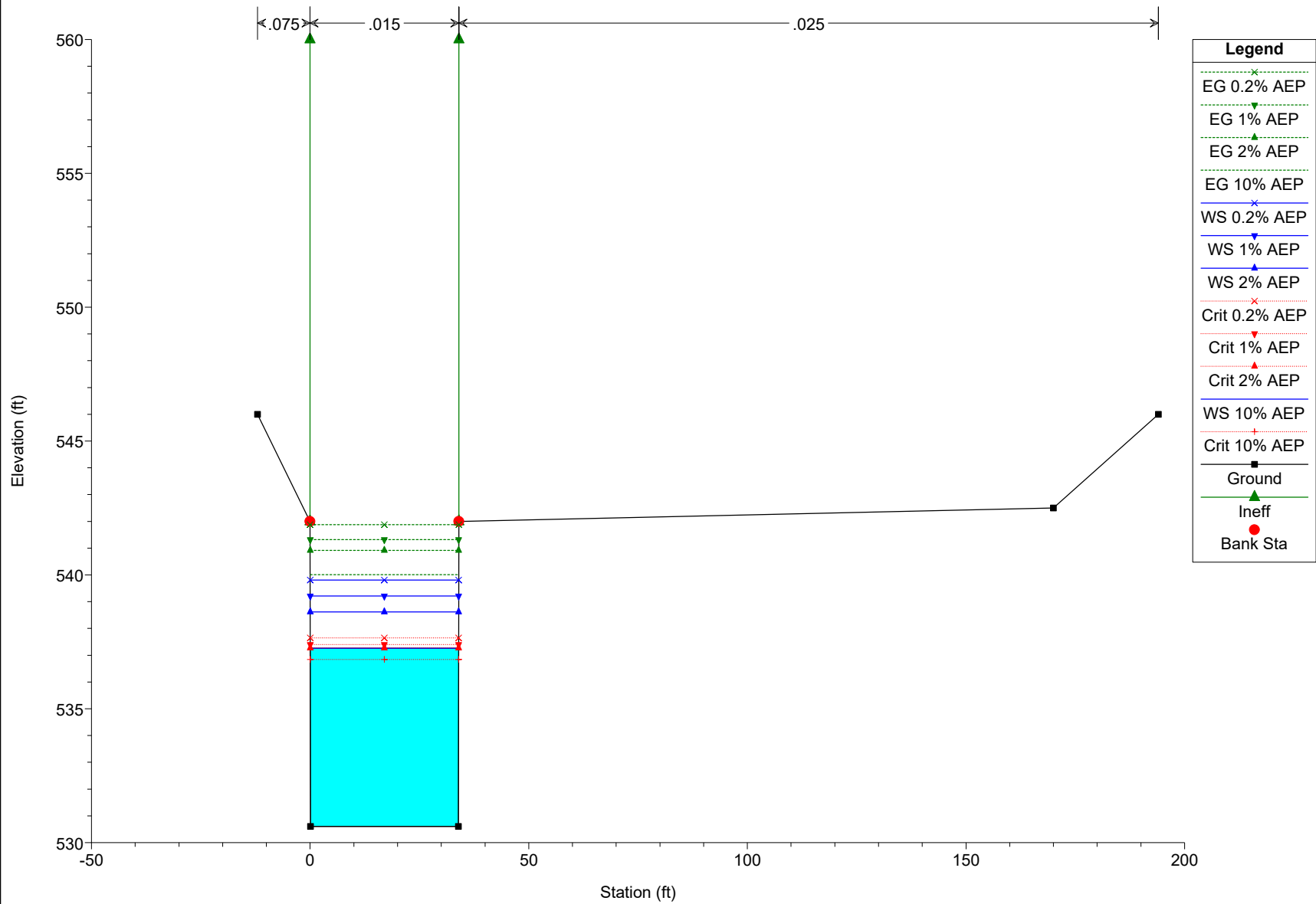
STREAM STA. 4.778

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge 6/14/2020

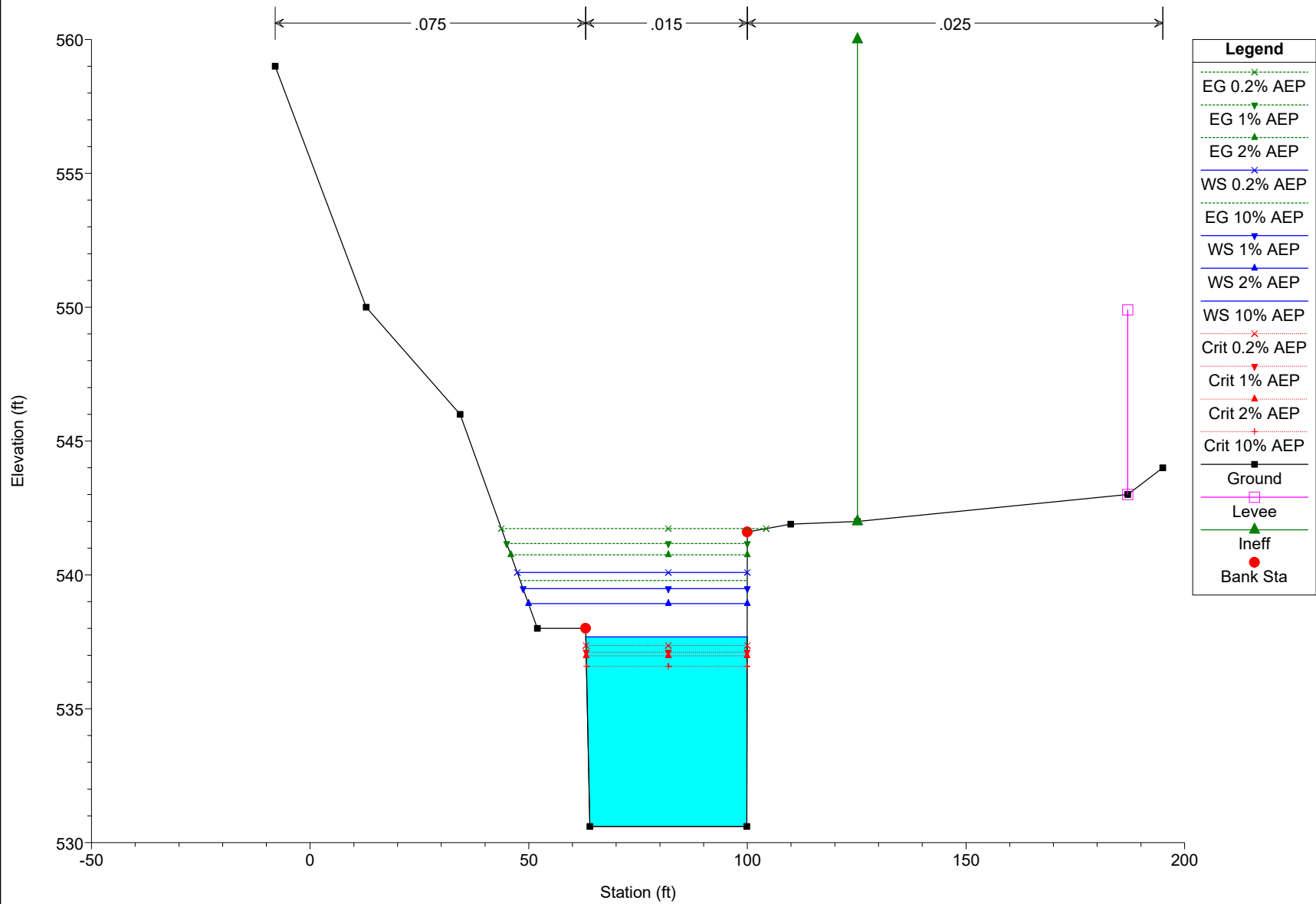


STREAM STA. 4.775

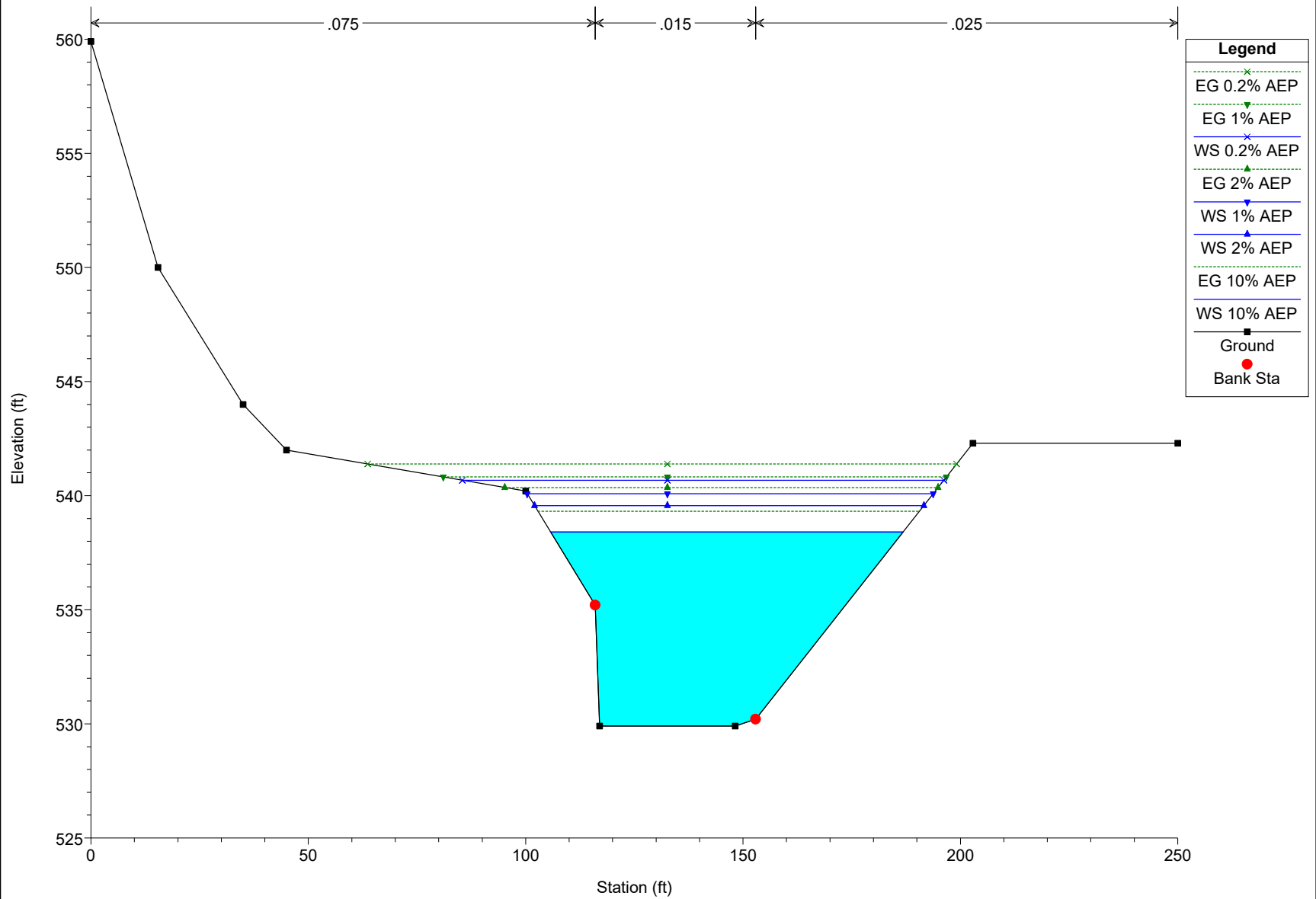
Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge 6/14/2020



STREAM STA. 4.772



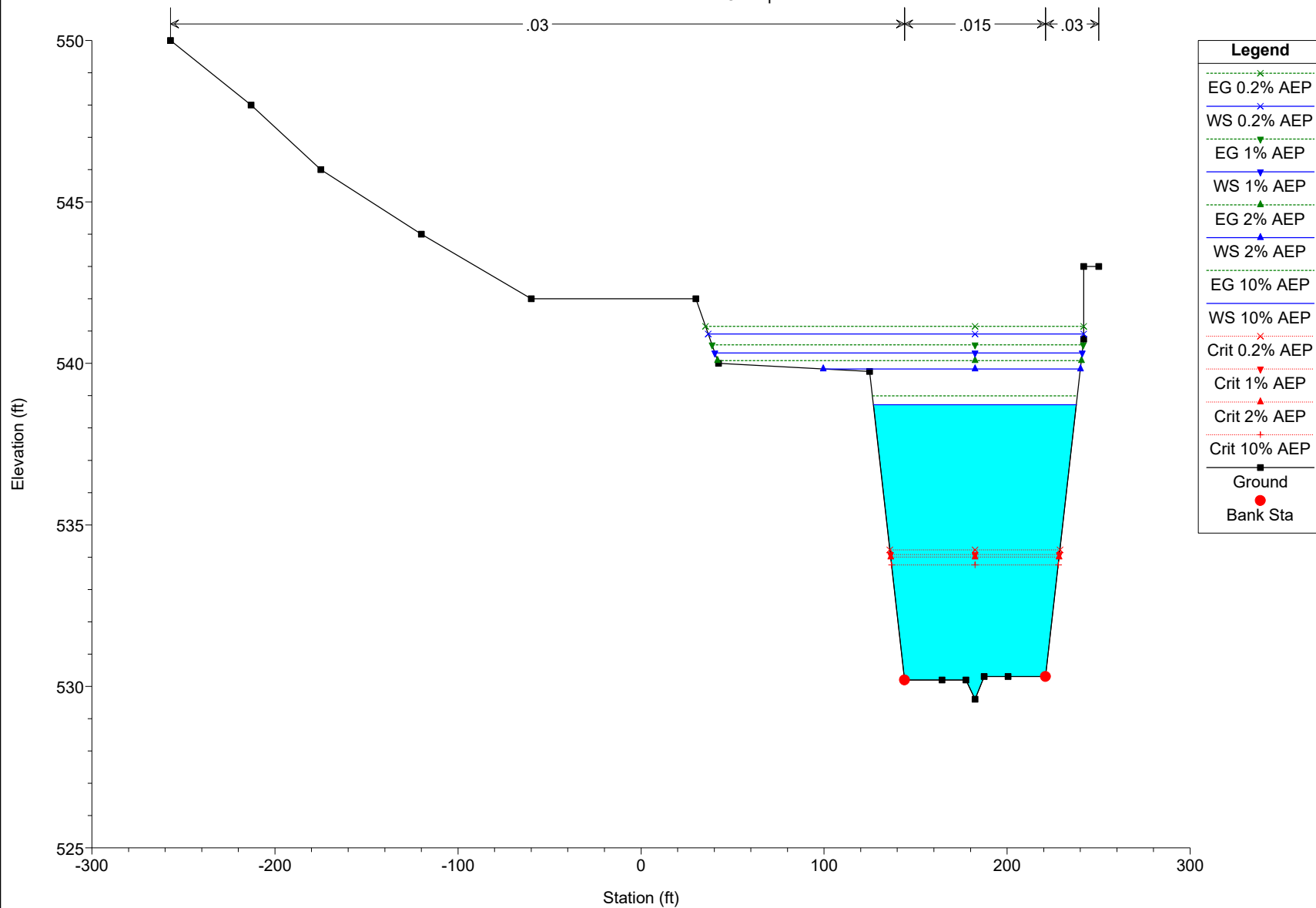
STREAM STA. 4.769



STREAM STA. 4.743

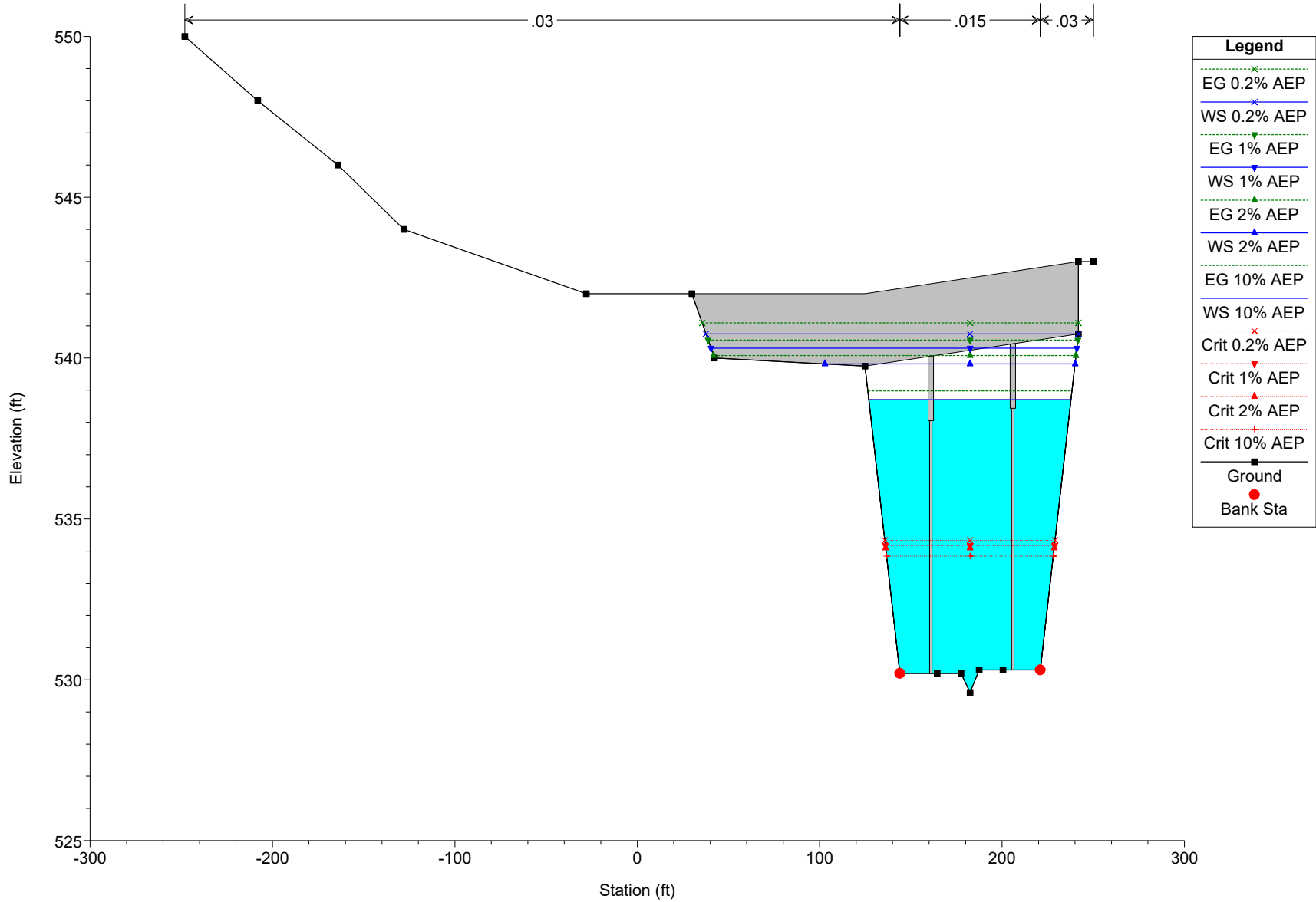
Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge 6/14/2020

This is a REPEATED section. Levee in LOB represents elevated ra



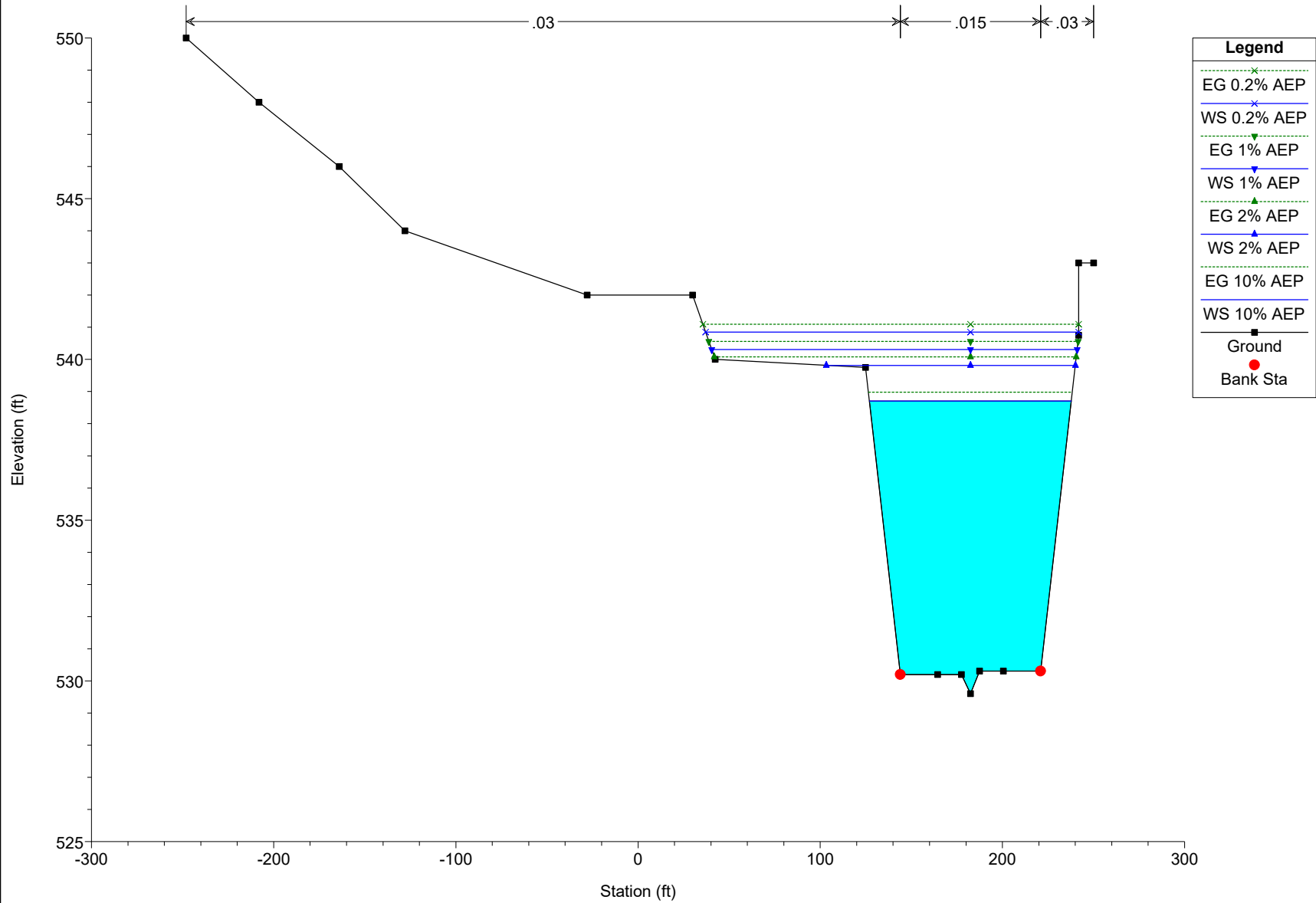
STREAM STA. 4.736

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge 6/14/2020
 Madison Ave



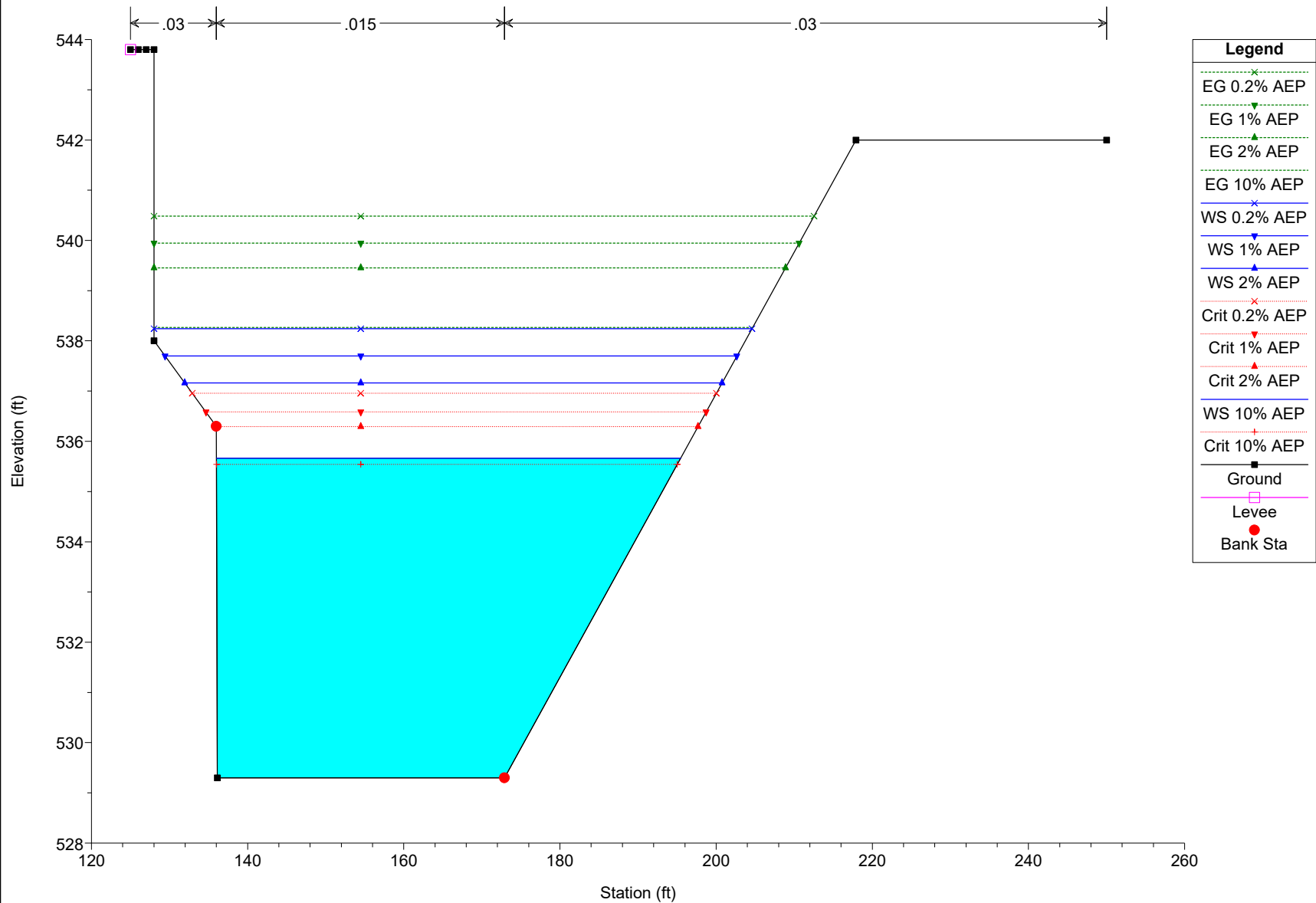
DOWNSTREAM EDGE OF PROPOSED MADISON ROAD BRIDGE

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge 6/14/2020
MADISON AVE



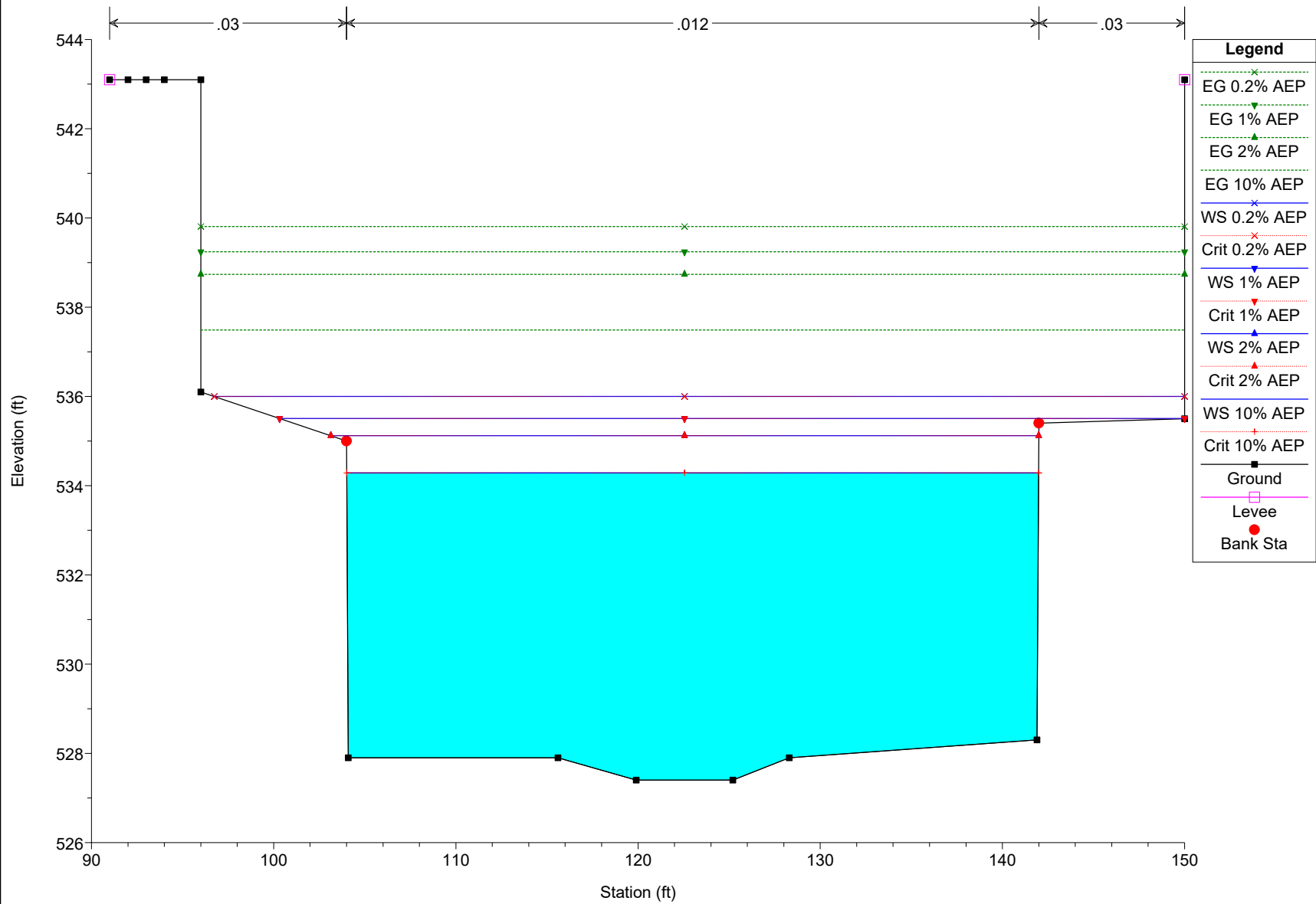
STREAM STA. 4.727

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge 6/14/2020



STREAM STA. 4.716

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge 6/14/2020



STREAM STA. 4.641

HEC-RAS Plan: MEB-new bridge River: RIVER-1 Reach: Reach-1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	5.5	10% AEP	3900.00	540.30	556.56		557.10	0.000177	5.92	676.24	80.39	0.32
Reach-1	5.5	2% AEP	4000.00	540.30	556.99		557.52	0.000163	5.83	713.13	88.53	0.30
Reach-1	5.5	1% AEP	4300.00	540.30	558.37		558.84	0.000127	5.55	863.25	141.93	0.27
Reach-1	5.5	0.2% AEP	4500.00	540.30	559.35		559.78	0.000106	5.33	1008.07	154.28	0.25
Reach-1	5.434	10% AEP	3900.00	539.80	556.52		557.03	0.000164	5.77	692.50	79.63	0.30
Reach-1	5.434	2% AEP	4000.00	539.80	556.96		557.46	0.000152	5.69	729.36	87.83	0.29
Reach-1	5.434	1% AEP	4300.00	539.80	558.34		558.80	0.000119	5.43	878.71	141.57	0.26
Reach-1	5.434	0.2% AEP	4500.00	539.80	559.32		559.74	0.000100	5.23	1023.88	153.97	0.25
Reach-1	5.415	10% AEP	3900.00	538.90	554.59	548.80	556.56	0.001069	11.26	346.25	22.14	0.50
Reach-1	5.415	2% AEP	4000.00	538.90	555.02	548.98	556.99	0.001049	11.24	355.84	22.14	0.49
Reach-1	5.415	1% AEP	4300.00	538.90	556.40	549.47	558.33	0.000984	11.13	386.39	22.15	0.47
Reach-1	5.415	0.2% AEP	4500.00	538.90	557.39	549.80	559.27	0.000939	11.02	408.17	22.16	0.45
Reach-1	5.3675		Culvert									
Reach-1	5.32	10% AEP	3900.00	537.40	547.32	547.32	552.25	0.003550	17.80	219.13	22.17	1.00
Reach-1	5.32	2% AEP	4000.00	537.40	547.47	547.47	552.50	0.003588	17.99	222.40	22.17	1.00
Reach-1	5.32	1% AEP	4300.00	537.40	547.98	547.98	553.24	0.003626	18.40	233.76	22.18	1.00
Reach-1	5.32	0.2% AEP	4500.00	537.40	548.31	548.31	553.73	0.003660	18.67	240.99	22.18	1.00
Reach-1	5.308	10% AEP	3900.00	537.30	546.65	545.63	548.84	0.001324	11.86	328.70	49.49	0.81
Reach-1	5.308	2% AEP	4000.00	537.30	546.99	545.76	549.07	0.001214	11.58	345.47	50.50	0.78
Reach-1	5.308	1% AEP	4300.00	537.30	547.24	546.10	549.48	0.001268	11.99	358.50	51.28	0.80
Reach-1	5.308	0.2% AEP	4500.00	537.30	547.60	546.33	549.82	0.001208	11.93	377.16	52.37	0.78
Reach-1	5.259	10% AEP	3900.00	536.50	546.70	544.85	548.41	0.000946	10.50	371.50	52.04	0.69
Reach-1	5.259	2% AEP	4000.00	536.50	547.03	544.96	548.67	0.000877	10.28	389.03	53.05	0.67
Reach-1	5.259	1% AEP	4300.00	536.50	547.29	545.30	549.06	0.000920	10.67	403.04	53.85	0.69
Reach-1	5.259	0.2% AEP	4500.00	536.50	547.65	545.53	549.41	0.000885	10.65	422.64	54.94	0.68
Reach-1	5.248	10% AEP	3900.00	536.20	546.98	544.30	548.04	0.000598	8.26	472.30	67.60	0.55
Reach-1	5.248	2% AEP	4000.00	536.20	547.30	544.43	548.32	0.000554	8.09	494.32	68.60	0.53
Reach-1	5.248	1% AEP	4300.00	536.20	547.59	544.71	548.68	0.000573	8.36	514.24	69.49	0.54
Reach-1	5.248	0.2% AEP	4500.00	536.20	547.95	544.89	549.03	0.000549	8.34	539.56	70.61	0.53
Reach-1	5.234		Bridge									

HEC-RAS Plan: MEB-new bridge River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	5.224	10% AEP	3900.00	536.20	546.12	544.30	547.49	0.000858	9.38	415.57	64.95	0.65
Reach-1	5.224	2% AEP	4000.00	536.20	546.61	544.43	547.85	0.000730	8.93	447.97	66.47	0.61
Reach-1	5.224	1% AEP	4300.00	536.20	546.79	544.71	548.15	0.000784	9.35	459.80	67.02	0.63
Reach-1	5.224	0.2% AEP	4500.00	536.20	547.22	544.89	548.54	0.000723	9.21	488.81	68.35	0.61
Reach-1	5.213	10% AEP	3900.00	536.40	546.23	543.41	547.22	0.002500	8.04	503.13	79.02	0.51
Reach-1	5.213	2% AEP	4000.00	536.40	546.72	543.49	547.61	0.002115	7.70	541.50	79.72	0.47
Reach-1	5.213	1% AEP	4300.00	536.40	546.91	543.79	547.89	0.002252	8.06	556.68	80.00	0.49
Reach-1	5.213	0.2% AEP	4500.00	536.40	547.33	543.97	548.29	0.002065	7.98	590.87	80.62	0.47
Reach-1	5.113	10% AEP	3900.00	533.50	545.66	541.76	546.18	0.001239	6.18	824.22	156.93	0.36
Reach-1	5.113	2% AEP	4000.00	533.50	546.32	542.04	546.75	0.000967	5.71	928.88	161.57	0.32
Reach-1	5.113	1% AEP	4300.00	533.50	546.49	542.46	546.96	0.001035	5.98	956.96	162.08	0.33
Reach-1	5.113	0.2% AEP	4500.00	533.50	547.01	542.70	547.44	0.000910	5.80	1040.73	163.60	0.32
Reach-1	5.076	10% AEP	3900.00	529.80	545.77	539.46	545.88	0.000650	3.07	1495.48	286.95	0.16
Reach-1	5.076	2% AEP	4000.00	529.80	546.42	539.58	546.52	0.000489	2.76	1687.10	301.08	0.14
Reach-1	5.076	1% AEP	4300.00	529.80	546.61	539.89	546.71	0.000516	2.87	1743.88	305.18	0.14
Reach-1	5.076	0.2% AEP	4500.00	529.80	547.13	540.13	547.22	0.000442	2.73	1903.94	316.47	0.13
Reach-1	5.061	10% AEP	3900.00	529.40	545.65	538.80	545.81	0.000895	3.57	1341.61	297.83	0.18
Reach-1	5.061	2% AEP	4000.00	529.40	546.34	538.86	546.46	0.000637	3.13	1550.14	304.04	0.16
Reach-1	5.061	1% AEP	4300.00	529.40	546.53	539.11	546.66	0.000666	3.23	1606.36	305.33	0.16
Reach-1	5.061	0.2% AEP	4500.00	529.40	547.06	539.28	547.17	0.000553	3.03	1769.47	309.07	0.15
Reach-1	5.060		Bridge									
Reach-1	5.059	10% AEP	3900.00	529.40	545.41	538.80	545.59	0.001020	3.75	1269.77	288.16	0.20
Reach-1	5.059	2% AEP	4000.00	529.40	546.22	538.86	546.34	0.000683	3.22	1511.55	303.14	0.16
Reach-1	5.059	1% AEP	4300.00	529.40	546.40	539.11	546.53	0.000715	3.32	1566.30	304.41	0.17
Reach-1	5.059	0.2% AEP	4500.00	529.40	546.96	539.28	547.07	0.000583	3.09	1738.04	308.35	0.15
Reach-1	5.029	10% AEP	4000.00	529.60	545.02	539.39	545.39	0.000749	4.93	858.93	113.50	0.28
Reach-1	5.029	2% AEP	4500.00	529.60	545.76	539.76	546.15	0.000738	5.10	944.90	119.77	0.28
Reach-1	5.029	1% AEP	4600.00	529.60	545.95	539.85	546.34	0.000725	5.11	967.72	121.38	0.27
Reach-1	5.029	0.2% AEP	5000.00	529.60	546.47	540.12	546.88	0.000724	5.25	1032.17	125.09	0.28
Reach-1	4.966	10% AEP	4000.00	531.00	544.55	538.95	545.02	0.001732	5.56	756.29	99.08	0.31
Reach-1	4.966	2% AEP	4500.00	531.00	545.28	539.59	545.78	0.001705	5.78	830.96	105.41	0.31

HEC-RAS Plan: MEB-new bridge River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.966	1% AEP	4600.00	531.00	545.48	539.68	545.98	0.001670	5.79	851.74	107.11	0.31
Reach-1	4.966	0.2% AEP	5000.00	531.00	545.99	540.02	546.52	0.001672	5.98	907.61	111.54	0.31
Reach-1	4.895	10% AEP	4000.00	530.80	543.45	538.94	544.18	0.002779	6.95	606.08	73.20	0.39
Reach-1	4.895	2% AEP	4500.00	530.80	544.16	539.49	544.95	0.002758	7.25	658.70	74.80	0.39
Reach-1	4.895	1% AEP	4600.00	530.80	544.38	539.55	545.17	0.002686	7.25	674.90	75.29	0.39
Reach-1	4.895	0.2% AEP	5000.00	530.80	544.85	539.93	545.70	0.002730	7.52	710.85	76.36	0.39
Reach-1	4.811	10% AEP	4000.00	530.70	542.45	538.82	543.03	0.002231	6.54	719.15	112.75	0.38
Reach-1	4.811	2% AEP	4500.00	530.70	543.25	539.23	543.84	0.002050	6.63	799.00	114.30	0.37
Reach-1	4.811	1% AEP	4600.00	530.70	543.52	539.31	544.10	0.001935	6.56	826.00	114.82	0.36
Reach-1	4.811	0.2% AEP	5000.00	530.70	544.01	539.60	544.62	0.001912	6.73	875.41	115.78	0.36
Reach-1	4.800	10% AEP	4000.00	530.00	542.46		542.78	0.001002	4.80	1020.08	252.14	0.26
Reach-1	4.800	2% AEP	4500.00	530.00	543.31		543.57	0.000805	4.53	1234.27	253.71	0.24
Reach-1	4.800	1% AEP	4600.00	530.00	543.59		543.83	0.000728	4.38	1305.81	254.23	0.23
Reach-1	4.800	0.2% AEP	5000.00	530.00	544.11		544.34	0.000665	4.31	1438.10	255.19	0.22
Reach-1	4.788	10% AEP	3000.00	530.60	539.20	538.17	542.00	0.001085	13.41	223.63	65.09	0.82
Reach-1	4.788	2% AEP	3300.00	530.60	539.74	538.65	542.73	0.001066	13.86	238.04	75.66	0.82
Reach-1	4.788	1% AEP	3400.00	530.60	539.92	538.79	542.96	0.001060	14.01	242.75	79.12	0.82
Reach-1	4.788	0.2% AEP	3600.00	530.60	540.26	539.10	543.43	0.001049	14.28	252.06	82.82	0.82
Reach-1	4.783		Bridge									
Reach-1	4.778	10% AEP	3000.00	530.60	538.15	538.15	541.81	0.001697	15.34	195.55	52.89	1.00
Reach-1	4.778	2% AEP	3300.00	530.60	538.65	538.65	542.53	0.001651	15.80	208.80	54.26	1.00
Reach-1	4.778	1% AEP	3400.00	530.60	538.80	538.80	542.76	0.001643	15.97	212.85	54.68	1.00
Reach-1	4.778	0.2% AEP	3600.00	530.60	539.11	539.11	543.23	0.001621	16.27	221.20	63.30	1.00
Reach-1	4.775	10% AEP	3000.00	530.60	537.41	537.41	540.79	0.002833	14.76	203.30	29.92	1.00
Reach-1	4.775	2% AEP	3300.00	530.60	537.86	537.86	541.46	0.002842	15.22	216.83	29.93	1.00
Reach-1	4.775	1% AEP	3400.00	530.60	538.41	537.99	541.71	0.002447	14.58	233.14	29.94	0.92
Reach-1	4.775	0.2% AEP	3600.00	530.60	539.09	538.28	542.22	0.002154	14.19	253.70	29.95	0.86
Reach-1	4.772	10% AEP	3000.00	530.60	537.26	536.84	540.01	0.002238	13.31	225.43	33.92	0.91
Reach-1	4.772	2% AEP	3300.00	530.60	538.62	537.27	540.91	0.001570	12.15	271.53	33.94	0.76
Reach-1	4.772	1% AEP	3400.00	530.60	539.21	537.40	541.32	0.001355	11.66	291.68	33.95	0.70
Reach-1	4.772	0.2% AEP	3600.00	530.60	539.81	537.65	541.88	0.001252	11.54	311.95	33.96	0.67

LEFT BANK
OVERFLOW
LOCATION

HEC-RAS Plan: MEB-new bridge River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.769	10% AEP	3000.00	530.60	537.68	536.58	539.79	0.001553	11.63	257.86	36.92	0.78
Reach-1	4.769	2% AEP	3300.00	530.60	538.93	536.98	540.75	0.001129	10.84	314.93	50.02	0.67
Reach-1	4.769	1% AEP	3400.00	530.60	539.49	537.12	541.17	0.000970	10.43	343.62	51.28	0.62
Reach-1	4.769	0.2% AEP	3600.00	530.60	540.09	537.36	541.73	0.000882	10.31	374.71	52.61	0.59
Reach-1	4.743	10% AEP	3000.00	529.90	538.41		539.32	0.000463	8.18	466.42	81.10	0.50
Reach-1	4.743	2% AEP	3300.00	529.90	539.57		540.36	0.000348	7.73	565.03	89.57	0.44
Reach-1	4.743	1% AEP	3400.00	529.90	540.09		540.82	0.000303	7.47	612.65	93.39	0.41
Reach-1	4.743	0.2% AEP	3600.00	529.90	540.68		541.39	0.000275	7.39	672.15	110.76	0.40
Reach-1	4.736	10% AEP	3000.00	529.60	538.72	533.76	538.99	0.000109	4.30	799.17	110.89	0.26
Reach-1	4.736	2% AEP	3300.00	529.60	539.83	534.01	540.09	0.000088	4.21	925.06	140.52	0.24
Reach-1	4.736	1% AEP	3400.00	529.60	540.32	534.08	540.57	0.000079	4.12	1019.16	200.75	0.23
Reach-1	4.736	0.2% AEP	3600.00	529.60	540.91	534.23	541.15	0.000071	4.05	1138.12	205.20	0.22
Reach-1	4.7315	Bridge										
Reach-1	4.727	10% AEP	3000.00	529.60	538.71		538.98	0.000109	4.31	797.31	110.82	0.26
Reach-1	4.727	2% AEP	3300.00	529.60	539.82		540.08	0.000089	4.21	923.47	136.69	0.24
Reach-1	4.727	1% AEP	3400.00	529.60	540.31		540.56	0.000079	4.12	1015.80	200.61	0.23
Reach-1	4.727	0.2% AEP	3600.00	529.60	540.85		541.09	0.000073	4.08	1126.13	204.84	0.22
Reach-1	4.716	10% AEP	3500.00	529.30	535.66	535.54	538.27	0.001952	13.52	306.06	59.43	0.95
Reach-1	4.716	2% AEP	4200.00	529.30	537.16	536.29	539.46	0.001349	12.82	400.94	68.80	0.81
Reach-1	4.716	1% AEP	4500.00	529.30	537.70	536.59	539.95	0.001221	12.75	439.07	73.23	0.78
Reach-1	4.716	0.2% AEP	4850.00	529.30	538.24	536.96	540.48	0.001128	12.78	480.01	76.58	0.75
Reach-1	4.641	10% AEP	3500.00	527.40	534.29	534.29	537.49	0.001637	14.36	243.77	37.97	1.00
Reach-1	4.641	2% AEP	4200.00	527.40	535.12	535.12	538.73	0.001636	15.25	275.38	38.86	1.00
Reach-1	4.641	1% AEP	4500.00	527.40	535.50	535.50	539.24	0.001590	15.51	291.38	49.67	0.99
Reach-1	4.641	0.2% AEP	4850.00	527.40	536.00	536.00	539.81	0.001494	15.68	316.74	53.26	0.97
Reach-1	4.595	10% AEP	3500.00	526.70	534.02	533.40	536.58	0.001196	12.83	272.84	39.98	0.87
Reach-1	4.595	2% AEP	4200.00	526.70	534.96	534.21	537.80	0.001154	13.53	313.96	49.03	0.86
Reach-1	4.595	1% AEP	4500.00	526.70	535.45	534.55	538.32	0.001075	13.61	338.46	50.00	0.84
Reach-1	4.595	0.2% AEP	4850.00	526.70	535.95	535.00	538.89	0.001021	13.79	363.59	50.00	0.82
Reach-1	4.533	10% AEP	3500.00	526.10	533.89	532.80	536.13	0.000981	12.01	291.53	39.97	0.78

PROPOSED
MADISON
ROAD
BRIDGE

HEC-RAS Plan: MEB-new bridge River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.533	2% AEP	4200.00	526.10	534.89	533.61	537.34	0.000933	12.60	373.04	121.97	0.77
Reach-1	4.533	1% AEP	4500.00	526.10	535.47	533.94	537.87	0.000855	12.52	430.29	154.04	0.74
Reach-1	4.533	0.2% AEP	4850.00	526.10	536.05	534.58	538.43	0.000798	12.53	488.72	184.64	0.72
Reach-1	4.455	10% AEP	3500.00	525.20	533.78	532.06	535.68	0.000767	11.05	317.59	42.96	0.69
Reach-1	4.455	2% AEP	4200.00	525.20	534.75	532.83	536.91	0.000768	11.80	364.03	52.72	0.70
Reach-1	4.455	1% AEP	4500.00	525.20	535.27	533.20	537.48	0.000735	11.92	393.21	58.09	0.69
Reach-1	4.455	0.2% AEP	4850.00	525.20	535.81	533.58	538.09	0.000717	12.14	425.54	63.50	0.68
Reach-1	4.355	10% AEP	3500.00	524.40	533.84	530.85	535.21	0.000454	9.42	405.33	73.82	0.55
Reach-1	4.355	2% AEP	4200.00	524.40	534.90	531.67	536.42	0.000442	10.00	486.81	79.78	0.55
Reach-1	4.355	1% AEP	4500.00	524.40	535.47	531.99	536.99	0.000417	10.07	532.66	82.57	0.54
Reach-1	4.355	0.2% AEP	4850.00	524.40	536.04	532.42	537.59	0.000401	10.21	580.76	85.40	0.53
Reach-1	4.325	10% AEP	3500.00	524.00	534.16	530.36	534.84	0.004063	6.69	550.35	95.60	0.41
Reach-1	4.325	2% AEP	4200.00	524.00	535.33	531.04	536.01	0.003489	6.78	664.88	100.23	0.39
Reach-1	4.325	1% AEP	4500.00	524.00	535.93	531.31	536.59	0.003138	6.70	725.49	102.60	0.38
Reach-1	4.325	0.2% AEP	4850.00	524.00	536.54	531.63	537.19	0.002879	6.68	788.81	105.01	0.36
Reach-1	4.242	10% AEP	3500.00	521.10	533.19	527.39	533.59	0.001908	5.17	728.31	105.57	0.29
Reach-1	4.242	2% AEP	4200.00	521.10	534.53	528.11	534.92	0.001654	5.24	873.01	111.13	0.27
Reach-1	4.242	1% AEP	4500.00	521.10	535.22	528.39	535.60	0.001489	5.17	951.12	114.02	0.26
Reach-1	4.242	0.2% AEP	4850.00	521.10	535.90	528.73	536.28	0.001383	5.17	1029.09	116.83	0.26
Reach-1	4.178	10% AEP	3500.00	519.40	532.56	526.49	532.95	0.001852	5.32	736.24	285.73	0.28
Reach-1	4.178	2% AEP	4200.00	519.40	534.00	527.38	534.38	0.001531	5.24	890.95	288.42	0.26
Reach-1	4.178	1% AEP	4500.00	519.40	534.76	527.80	535.11	0.001350	5.10	973.40	289.83	0.24
Reach-1	4.178	0.2% AEP	4850.00	519.40	535.47	528.28	535.82	0.001241	5.06	1052.16	291.16	0.23
Reach-1	4.166	10% AEP	3500.00	519.00	532.28	524.78	532.78	0.002544	5.66	617.89	241.75	0.28
Reach-1	4.166	2% AEP	4200.00	519.00	533.59	525.48	534.19	0.002661	6.18	680.04	269.32	0.29
Reach-1	4.166	1% AEP	4500.00	519.00	534.30	525.77	534.92	0.002602	6.31	713.59	284.56	0.29
Reach-1	4.166	0.2% AEP	4850.00	519.00	534.96	526.11	535.62	0.002620	6.51	744.80	298.73	0.29
Reach-1	4.165		Bridge									
Reach-1	4.164	10% AEP	3500.00	519.00	532.23	524.78	532.73	0.002577	5.69	615.44	389.16	0.28
Reach-1	4.164	2% AEP	4200.00	519.00	533.54	525.48	534.14	0.002696	6.20	677.39	463.66	0.29
Reach-1	4.164	1% AEP	4500.00	519.00	534.25	525.77	534.87	0.002634	6.33	710.98	616.68	0.29

HEC-RAS Plan: MEB-new bridge River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.164	0.2% AEP	4850.00	519.00	534.91	526.11	535.57	0.002652	6.54	742.13	620.60	0.29
Reach-1	4.142	10% AEP	3500.00	518.80	532.07	526.43	532.36	0.002244	4.75	995.79	518.99	0.27
Reach-1	4.142	2% AEP	4200.00	518.80	533.50	527.15	533.72	0.001560	4.34	1343.61	705.75	0.23
Reach-1	4.142	1% AEP	4500.00	518.80	534.26	527.46	534.46	0.001266	4.08	1531.72	785.13	0.21
Reach-1	4.142	0.2% AEP	4850.00	518.80	534.97	527.80	535.14	0.001096	3.94	1706.21	823.04	0.19
Reach-1	4.057	10% AEP	3500.00	518.10	531.07	524.61	531.45	0.001758	5.03	758.12	111.11	0.27
Reach-1	4.057	2% AEP	4200.00	518.10	532.65	525.31	533.02	0.001464	5.04	940.65	120.57	0.26
Reach-1	4.057	1% AEP	4500.00	518.10	533.51	525.61	533.86	0.001276	4.93	1046.87	125.75	0.24
Reach-1	4.057	0.2% AEP	4850.00	518.10	534.27	525.93	534.61	0.001175	4.91	1143.03	133.16	0.23
Reach-1	4.041	10% AEP	3500.00	517.90	528.00	526.70	530.75	0.001128	13.28	263.48	96.41	0.79
Reach-1	4.041	2% AEP	4200.00	517.90	529.09	527.69	532.22	0.001104	14.19	295.90	100.38	0.79
Reach-1	4.041	1% AEP	4500.00	517.90	530.26	528.09	533.14	0.000873	13.60	330.85	104.14	0.72
Reach-1	4.041	0.2% AEP	4850.00	517.90	530.82	528.54	533.85	0.000862	13.96	347.45	105.64	0.72
Reach-1	4.0285	Bridge										
Reach-1	4.016	10% AEP	3500.00	517.90	526.70	526.70	530.47	0.001922	15.58	224.58	87.87	1.00
Reach-1	4.016	2% AEP	4200.00	517.90	527.68	527.68	531.93	0.001842	16.55	253.76	94.29	1.00
Reach-1	4.016	1% AEP	4500.00	517.90	528.09	528.09	532.54	0.001809	16.92	265.94	96.78	1.00
Reach-1	4.016	0.2% AEP	4850.00	517.90	528.54	528.54	533.22	0.001782	17.36	279.38	98.77	1.00
Reach-1	4.001	10% AEP	3500.00	517.60	525.03	524.55	527.40	0.001435	12.55	347.21	76.07	0.85
Reach-1	4.001	2% AEP	4200.00	517.60	526.22	525.33	528.56	0.001162	12.59	443.41	85.28	0.79
Reach-1	4.001	1% AEP	4500.00	517.60	526.93	525.65	529.13	0.000980	12.25	505.70	89.69	0.74
Reach-1	4.001	0.2% AEP	4850.00	517.60	528.11	526.05	529.98	0.000720	11.43	615.06	100.24	0.64
Reach-1	3.948	10% AEP	3500.00	517.00	525.01	523.89	526.92	0.001048	11.36	386.47	76.29	0.74
Reach-1	3.948	2% AEP	4200.00	517.00	526.23		528.16	0.000872	11.48	485.48	85.16	0.69
Reach-1	3.948	1% AEP	4500.00	517.00	526.95		528.78	0.000751	11.24	548.69	91.00	0.65
Reach-1	3.948	0.2% AEP	4850.00	517.00	528.12		529.72	0.000567	10.58	661.15	100.61	0.58
Reach-1	3.866	10% AEP	3500.00	516.10	524.88		526.41	0.000794	10.32	457.96	83.95	0.65
Reach-1	3.866	2% AEP	4200.00	516.10	526.17		527.72	0.000662	10.43	572.36	92.53	0.61
Reach-1	3.866	1% AEP	4500.00	516.10	526.91		528.39	0.000577	10.26	643.64	101.04	0.58
Reach-1	3.866	0.2% AEP	4850.00	516.10	528.11		529.41	0.000443	9.70	773.17	115.08	0.51

HEC-RAS Plan: MEB-new bridge River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.82	10% AEP	3500.00	515.80	524.22	522.56	526.14	0.001188	11.12	317.34	48.42	0.70
Reach-1	3.82	2% AEP	4200.00	515.80	525.40	523.36	527.46	0.001061	11.54	385.50	66.15	0.68
Reach-1	3.82	1% AEP	4500.00	515.80	526.21	523.68	528.17	0.000903	11.28	443.95	78.61	0.63
Reach-1	3.82	0.2% AEP	4850.00	515.80	527.58	524.09	529.25	0.000657	10.49	568.95	103.88	0.55
Reach-1	3.79	10% AEP	3500.00	515.50	524.13	522.20	525.92	0.001070	10.74	336.25	71.71	0.66
Reach-1	3.79	2% AEP	4200.00	515.50	525.39	522.99	527.24	0.000928	11.01	431.26	79.22	0.63
Reach-1	3.79	1% AEP	4500.00	515.50	526.24	523.32	527.97	0.000779	10.69	500.79	85.04	0.59
Reach-1	3.79	0.2% AEP	4850.00	515.50	527.62	523.75	529.09	0.000571	9.96	627.64	101.24	0.52
Reach-1	3.766	10% AEP	3500.00	515.30	524.14	522.53	525.63	0.001147	9.80	357.23	53.31	0.67
Reach-1	3.766	2% AEP	4200.00	515.30	525.44	523.21	526.95	0.000955	9.83	427.14	53.64	0.61
Reach-1	3.766	1% AEP	4500.00	515.30	526.30	523.47	527.70	0.000805	9.51	472.97	53.85	0.57
Reach-1	3.766	0.2% AEP	4850.00	515.30	527.67	523.80	528.89	0.000604	8.87	547.03	54.19	0.49
Reach-1	3.7645		Bridge									
Reach-1	3.763	10% AEP	3450.00	515.30	523.60	522.49	525.31	0.001443	10.50	328.60	53.18	0.74
Reach-1	3.763	2% AEP	4100.00	515.30	525.02	523.09	526.62	0.001076	10.14	404.39	53.53	0.65
Reach-1	3.763	1% AEP	4700.00	515.30	525.95	523.66	527.61	0.000993	10.35	454.13	53.76	0.63
Reach-1	3.763	0.2% AEP	4750.00	515.30	527.42	523.72	528.65	0.000624	8.90	533.65	54.13	0.50
Reach-1	3.754	10% AEP	3450.00	515.20	523.70		525.19	0.000937	9.79	352.31	49.66	0.65
Reach-1	3.754	2% AEP	4100.00	515.20	525.07		526.54	0.000785	9.74	420.84	51.03	0.60
Reach-1	3.754	1% AEP	4700.00	515.20	525.98		527.54	0.000761	10.05	467.85	52.22	0.59
Reach-1	3.754	0.2% AEP	4750.00	515.20	527.43		528.61	0.000503	8.71	545.35	54.18	0.48
Reach-1	3.71	10% AEP	3450.00	514.50	523.56		524.96	0.000834	9.50	363.05	48.27	0.61
Reach-1	3.71	2% AEP	4100.00	514.50	524.94		526.35	0.000718	9.52	430.51	49.70	0.57
Reach-1	3.71	1% AEP	4700.00	514.50	525.84		527.36	0.000692	9.88	476.91	53.05	0.56
Reach-1	3.71	0.2% AEP	4750.00	514.50	527.34		528.50	0.000447	8.62	561.23	59.45	0.46
Reach-1	3.686	10% AEP	3450.00	514.20	523.81	520.63	524.74	0.000479	7.73	446.19	58.89	0.50
Reach-1	3.686	2% AEP	4100.00	514.20	525.20	521.28	526.14	0.000396	7.74	532.29	66.78	0.46
Reach-1	3.686	1% AEP	4700.00	514.20	526.15	521.87	527.14	0.000370	8.00	599.38	74.23	0.45
Reach-1	3.686	0.2% AEP	4750.00	514.20	527.58	521.91	528.34	0.000237	7.02	707.04	76.44	0.37
Reach-1	3.628	10% AEP	3450.00	514.00	523.10	520.83	524.50	0.000821	9.49	363.36	48.04	0.61
Reach-1	3.628	2% AEP	4100.00	514.00	524.55	521.55	525.94	0.000657	9.44	447.67	66.02	0.55

HEC-RAS Plan: MEB-new bridge River: RIVER-1 Reach: Reach-1 (Continued)

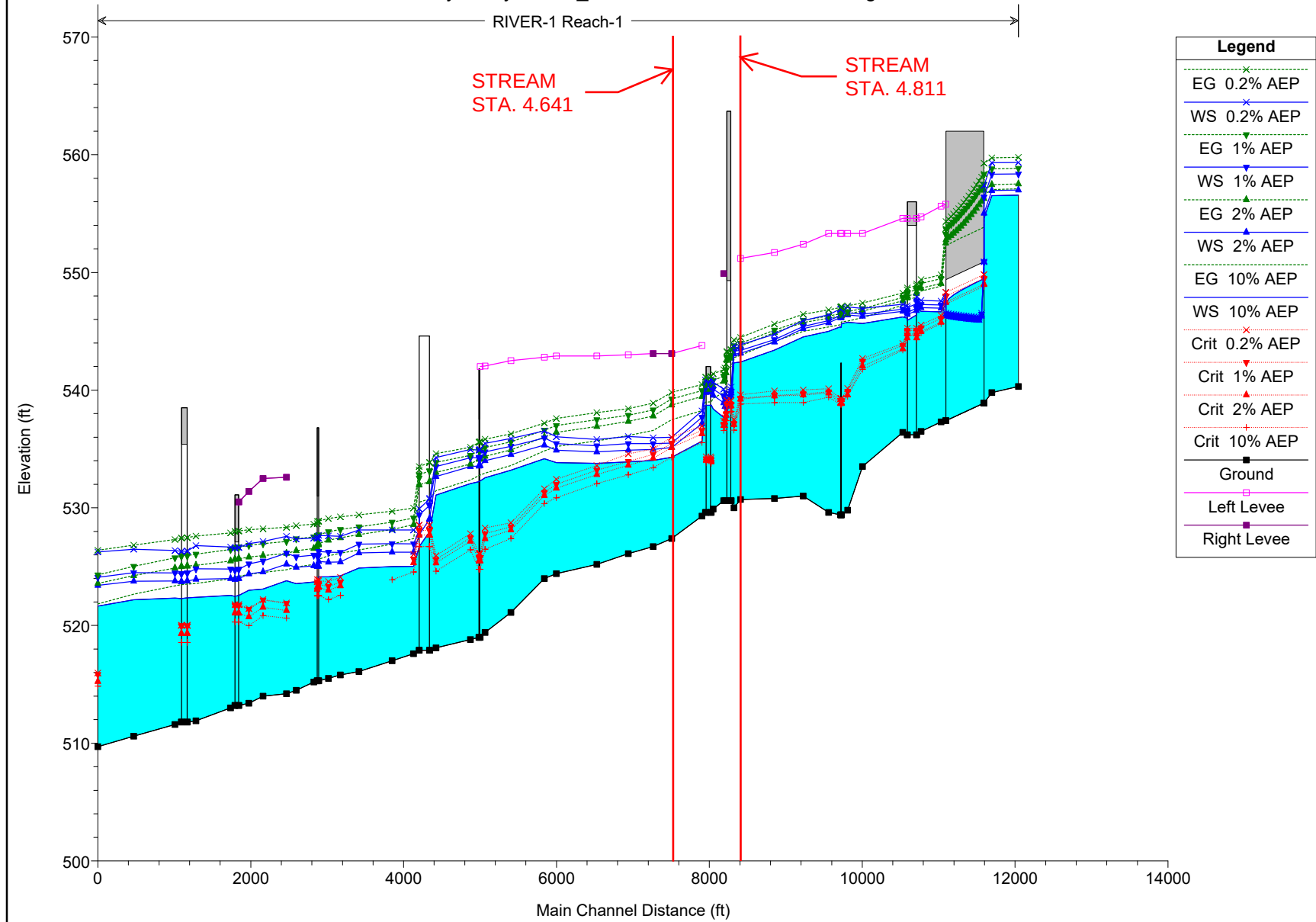
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.628	1% AEP	4700.00	514.00	525.47	522.16	526.95	0.000619	9.78	508.32	66.04	0.55
Reach-1	3.628	0.2% AEP	4750.00	514.00	527.14	522.21	528.22	0.000370	8.39	618.55	66.09	0.43
Reach-1	3.593	10% AEP	3450.00	513.40	522.99	519.99	524.35	0.000752	9.35	369.13	40.79	0.55
Reach-1	3.593	2% AEP	4100.00	513.40	524.39	520.74	525.81	0.000663	9.59	440.62	56.00	0.52
Reach-1	3.593	1% AEP	4700.00	513.40	525.24	521.38	526.82	0.000663	10.11	490.63	60.75	0.53
Reach-1	3.593	0.2% AEP	4750.00	513.40	526.96	521.43	528.13	0.000412	8.76	603.49	70.31	0.43
Reach-1	3.568	10% AEP	3450.00	513.20	522.56	520.31	524.19	0.000829	10.24	336.76	44.30	0.63
Reach-1	3.568	2% AEP	4100.00	513.20	523.99	521.05	525.67	0.000694	10.38	395.05	59.41	0.59
Reach-1	3.568	1% AEP	4700.00	513.20	524.78	521.71	526.67	0.000705	11.01	426.91	65.51	0.60
Reach-1	3.568	0.2% AEP	4750.00	513.20	526.65	521.77	528.04	0.000418	9.45	502.45	76.02	0.47
Reach-1	3.5635		Bridge									
Reach-1	3.559	10% AEP	3450.00	513.20	522.47	520.30	524.14	0.000855	10.35	333.46	44.24	0.64
Reach-1	3.559	2% AEP	4100.00	513.20	523.93	521.06	525.62	0.000711	10.45	392.29	58.54	0.59
Reach-1	3.559	1% AEP	4700.00	513.20	524.71	521.71	526.62	0.000722	11.09	423.83	64.92	0.60
Reach-1	3.559	0.2% AEP	4750.00	513.20	526.59	521.76	527.99	0.000425	9.50	500.04	89.76	0.48
Reach-1	3.548	10% AEP	3450.00	513.00	522.56		523.96	0.000790	9.52	362.51	39.99	0.56
Reach-1	3.548	2% AEP	4100.00	513.00	524.00		525.47	0.000690	9.74	431.77	59.57	0.53
Reach-1	3.548	1% AEP	4700.00	513.00	524.79		526.45	0.000707	10.36	481.41	65.78	0.54
Reach-1	3.548	0.2% AEP	4750.00	513.00	526.67		527.86	0.000422	8.86	633.66	89.92	0.43
Reach-1	3.462	10% AEP	3450.00	511.90	522.39		523.59	0.000611	8.78	417.89	103.47	0.49
Reach-1	3.462	2% AEP	4100.00	511.90	523.94		525.12	0.000507	8.82	632.22	173.47	0.46
Reach-1	3.462	1% AEP	4700.00	511.90	524.82		526.06	0.000495	9.16	788.11	178.22	0.46
Reach-1	3.462	0.2% AEP	4750.00	511.90	526.79		527.59	0.000275	7.54	1147.88	190.79	0.35
Reach-1	3.441	10% AEP	3450.00	511.80	522.35	518.56	523.52	0.000375	8.67	397.82	68.56	0.49
Reach-1	3.441	2% AEP	4100.00	511.80	523.79	519.31	525.05	0.000338	9.00	455.43	79.24	0.47
Reach-1	3.441	1% AEP	4700.00	511.80	524.47	519.97	525.94	0.000365	9.74	482.77	84.31	0.49
Reach-1	3.441	0.2% AEP	4750.00	511.80	526.34	520.02	527.46	0.000231	8.52	557.54	98.17	0.40
Reach-1	3.434		Bridge									
Reach-1	3.427	10% AEP	3450.00	511.80	522.29	518.55	523.47	0.000383	8.73	395.38	68.11	0.49
Reach-1	3.427	2% AEP	4100.00	511.80	523.73	519.31	525.00	0.000343	9.05	453.13	78.81	0.47

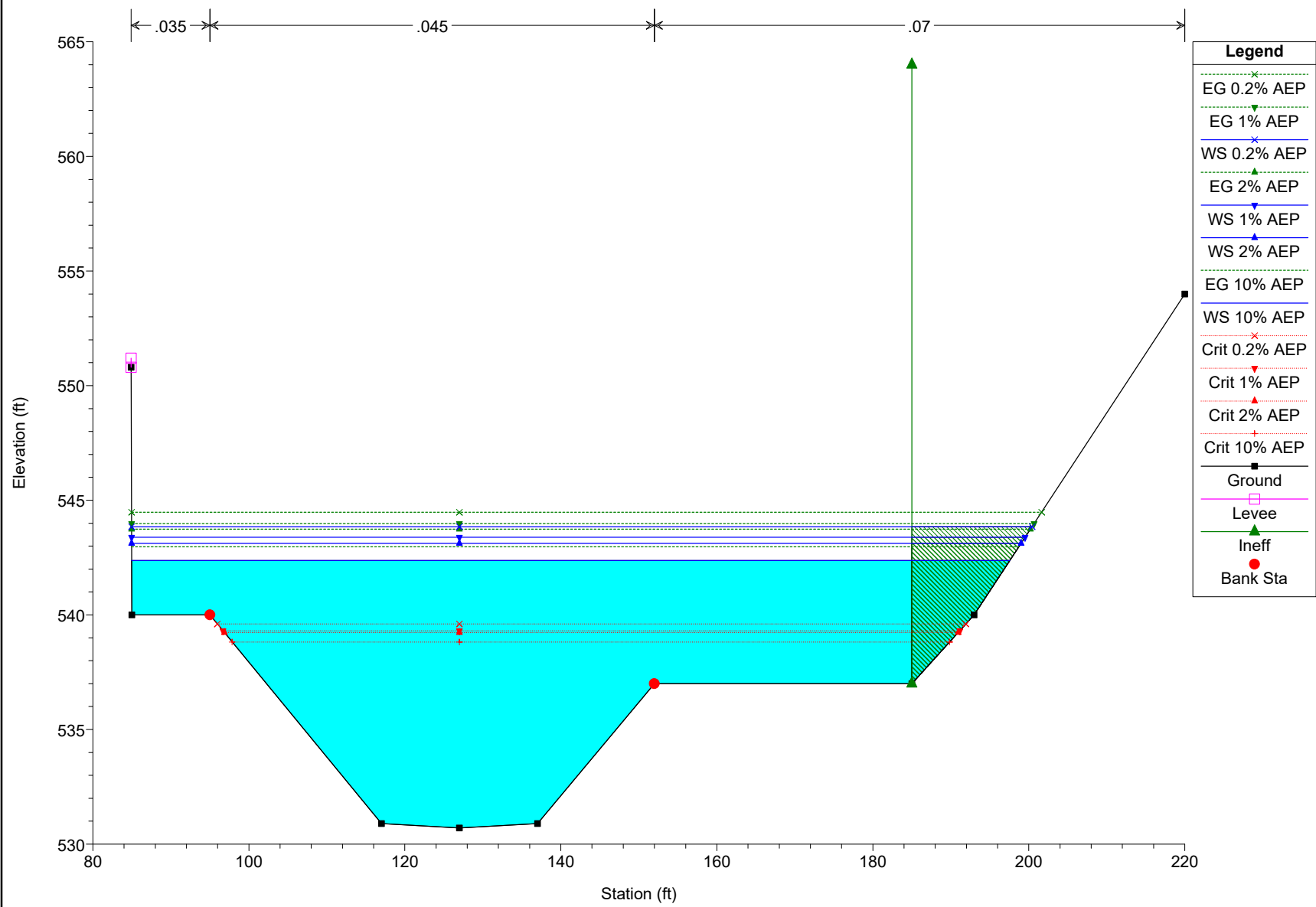
HEC-RAS Plan: MEB-new bridge River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.427	1% AEP	4700.00	511.80	524.40	519.97	525.89	0.000372	9.79	480.13	83.82	0.50
Reach-1	3.427	0.2% AEP	4750.00	511.80	526.29	520.02	527.43	0.000233	8.54	555.89	97.86	0.40
Reach-1	3.41	10% AEP	3450.00	511.60	522.32		523.37	0.000491	8.22	443.06	72.68	0.45
Reach-1	3.41	2% AEP	4100.00	511.60	523.78		524.89	0.000440	8.49	560.86	88.76	0.43
Reach-1	3.41	1% AEP	4700.00	511.60	524.48		525.75	0.000473	9.14	625.27	96.42	0.45
Reach-1	3.41	0.2% AEP	4750.00	511.60	526.38		527.30	0.000290	7.86	828.45	117.35	0.36
Reach-1	3.308	10% AEP	3450.00	510.60	522.18		522.67	0.002946	6.17	695.75	95.23	0.33
Reach-1	3.308	2% AEP	4100.00	510.60	523.76		524.23	0.002443	6.16	856.08	107.87	0.31
Reach-1	3.308	1% AEP	4700.00	510.60	524.49		525.03	0.002591	6.59	939.05	118.45	0.32
Reach-1	3.308	0.2% AEP	4750.00	510.60	526.47		526.83	0.001521	5.54	1208.03	154.94	0.25
Reach-1	3.219	10% AEP	3500.00	509.70	521.65	514.85	521.83	0.000991	3.41	1055.25	137.56	0.20
Reach-1	3.219	2% AEP	4000.00	509.70	523.41	515.23	523.57	0.000705	3.23	1309.37	149.23	0.17
Reach-1	3.219	1% AEP	4800.00	509.70	524.10	515.84	524.30	0.000819	3.63	1413.58	152.83	0.19
Reach-1	3.219	0.2% AEP	5000.00	509.70	526.25	515.96	526.40	0.000488	3.13	1754.45	168.84	0.15

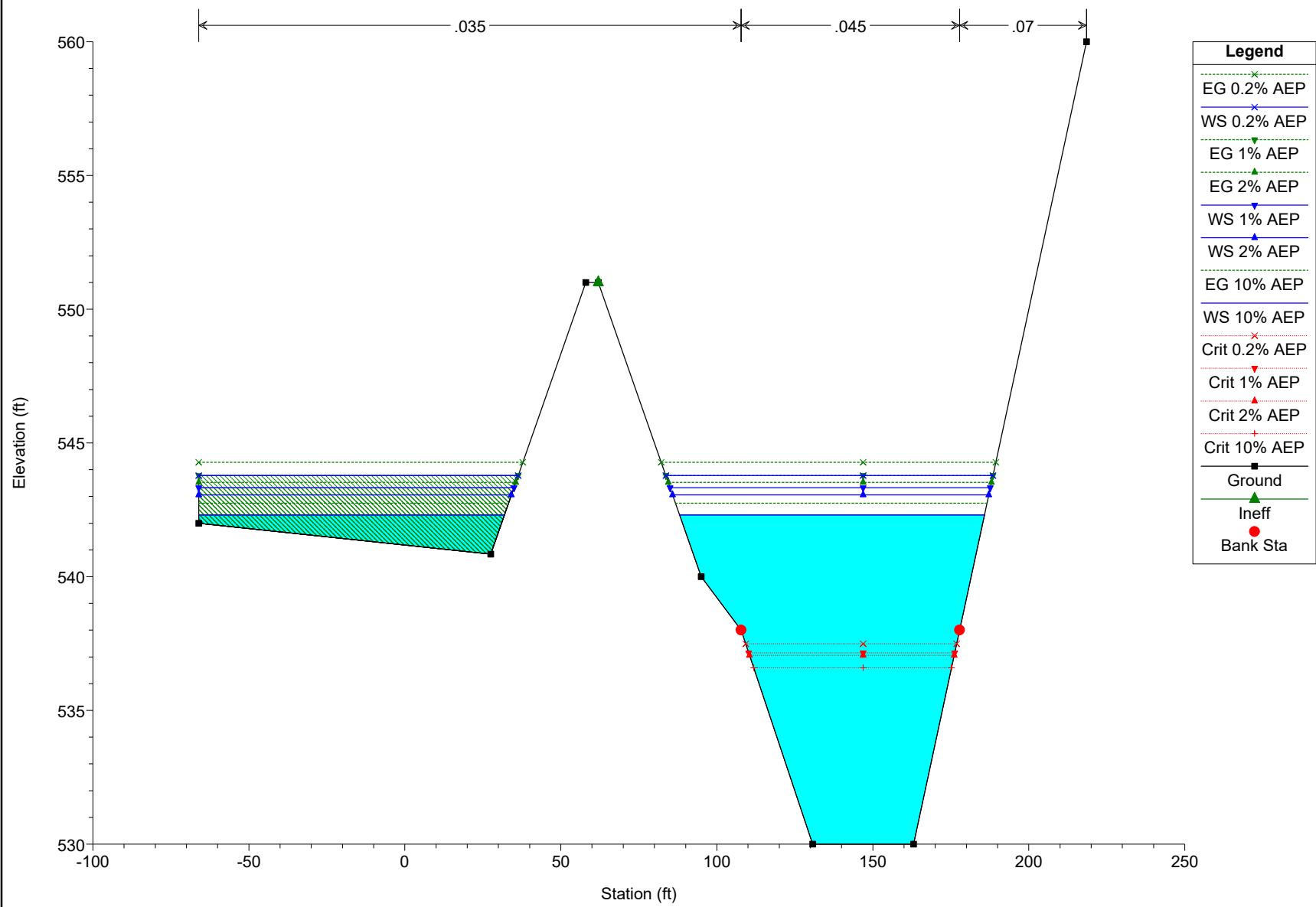
Attachment A-12

Proposed Option 3 with Levee – HEC-RAS Output





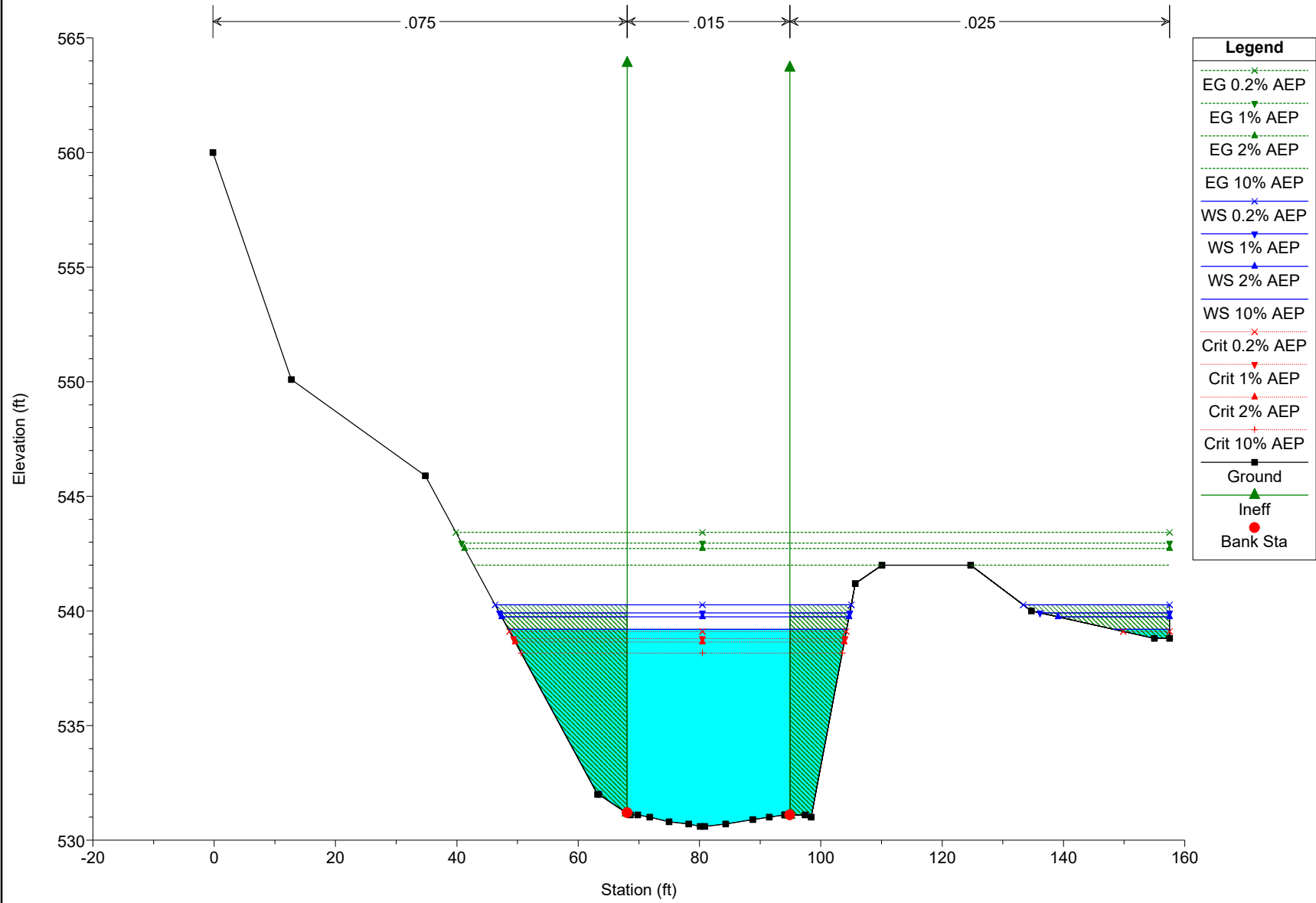
STREAM STA. 4.811



STREAM STA. 4.800
AT LEVEE

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge w/levee 6/15/2020

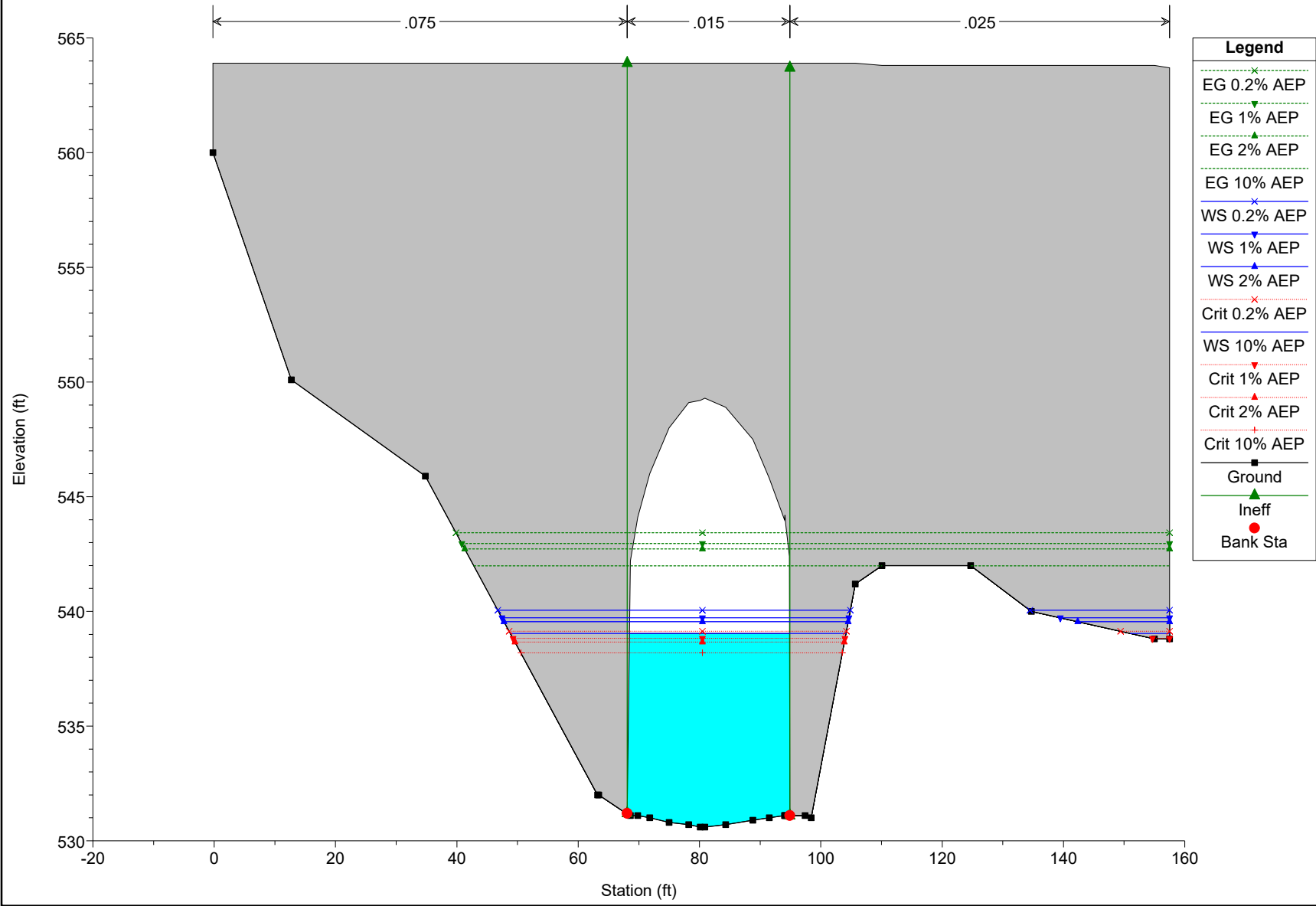
This is a REPEATED section.



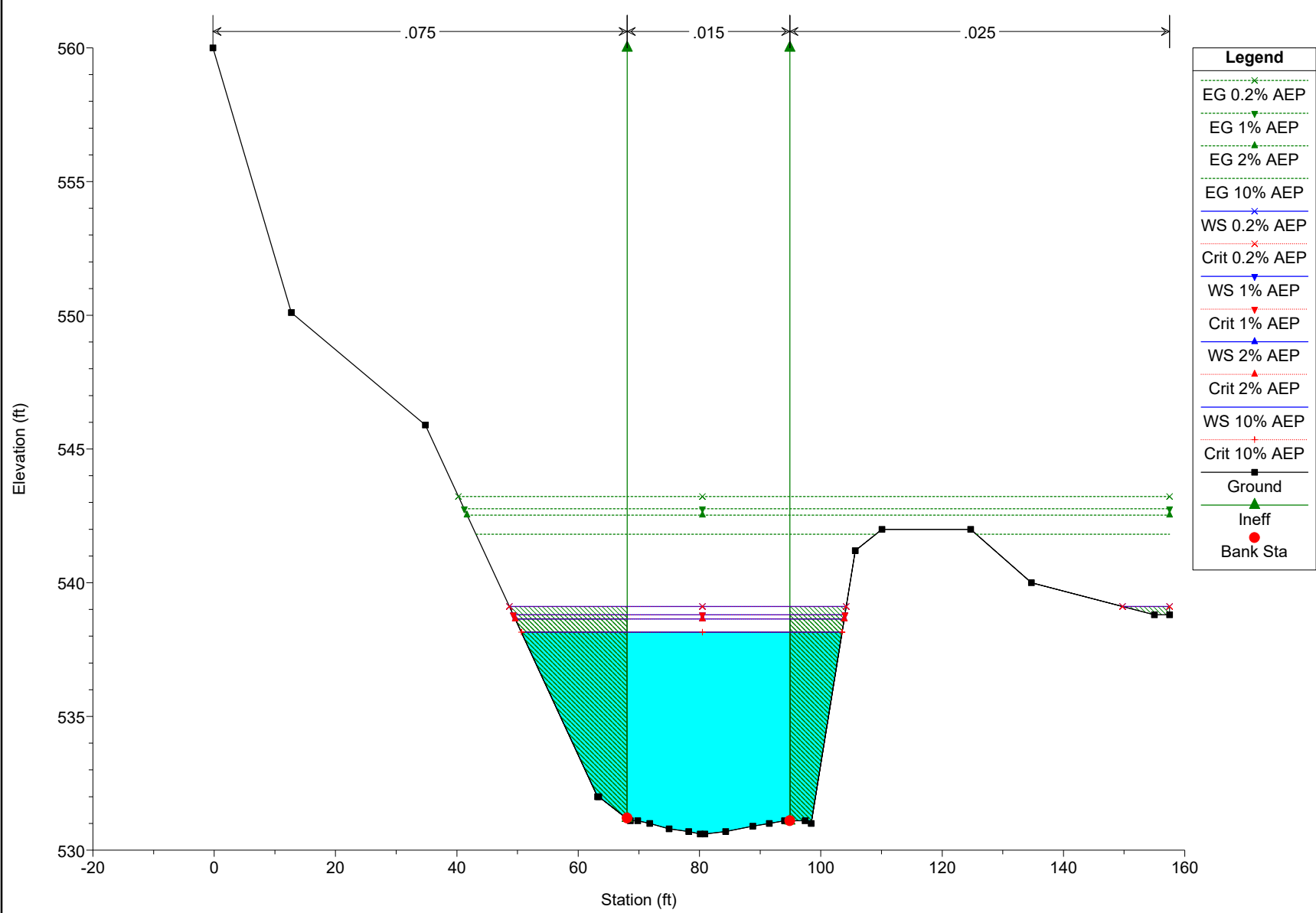
STREAM STA. 4.788

Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge w/levee 6/15/2020

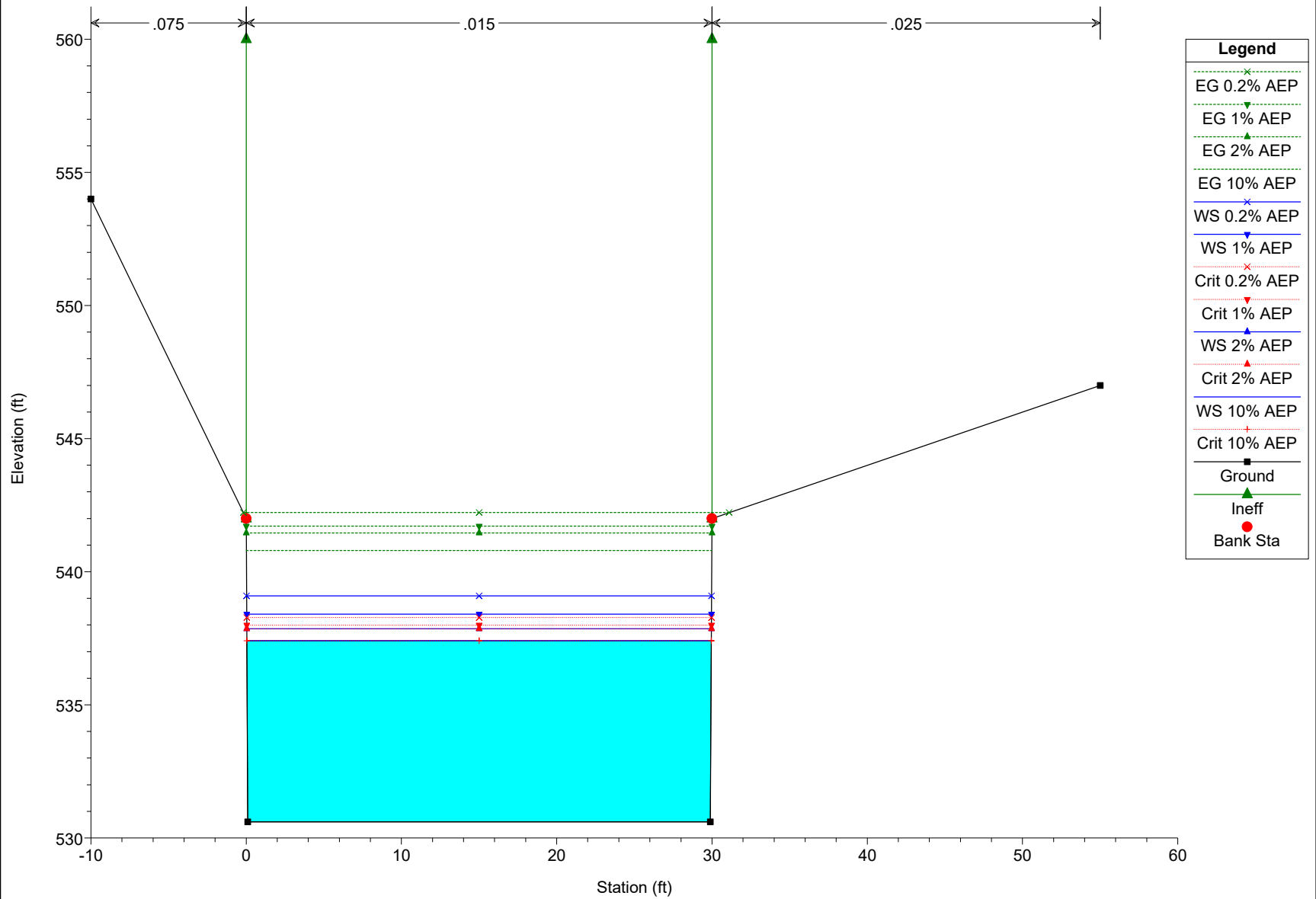
Conrail #7



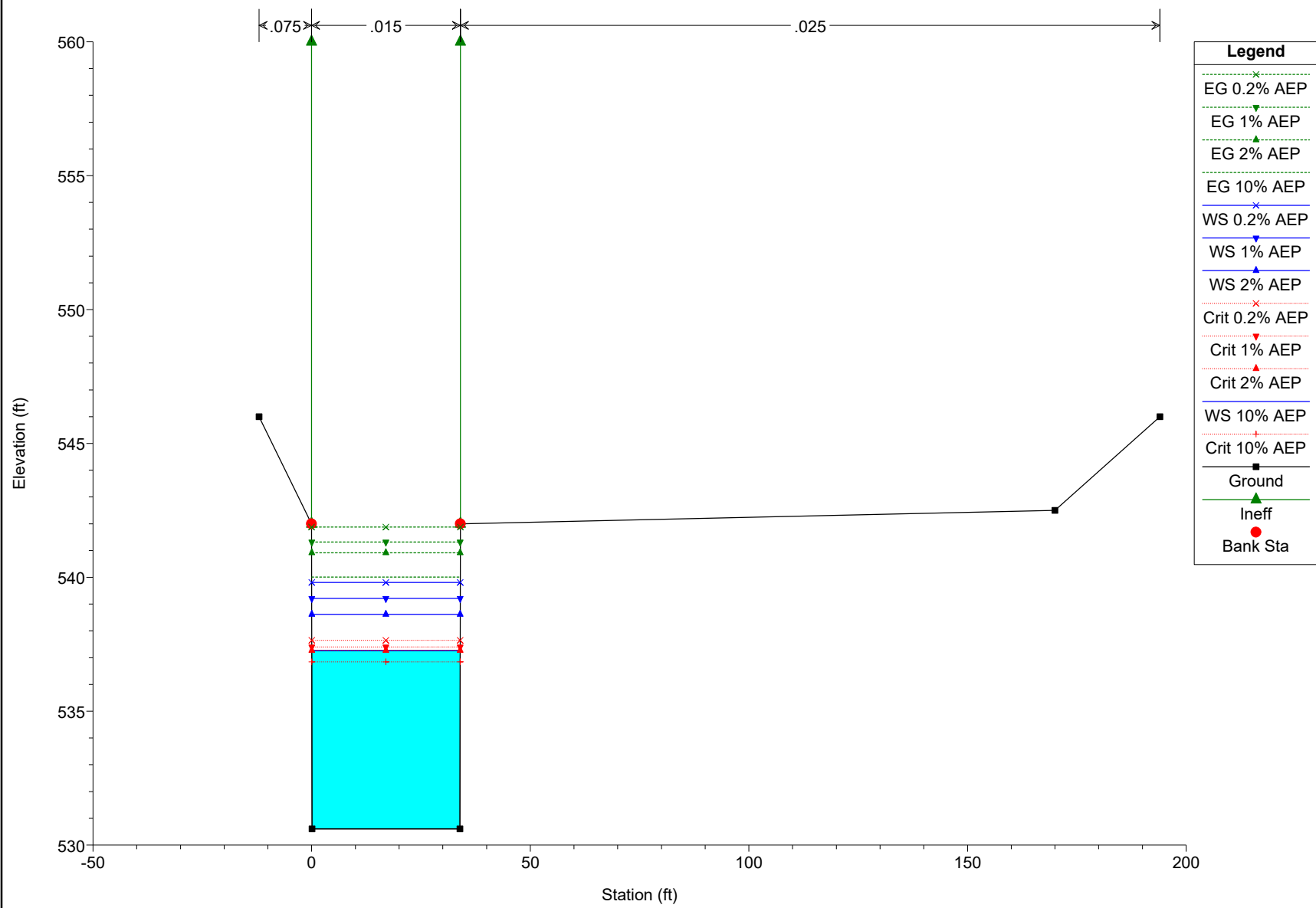
UPSTREAM EDGE OF RAILROAD BRIDGE



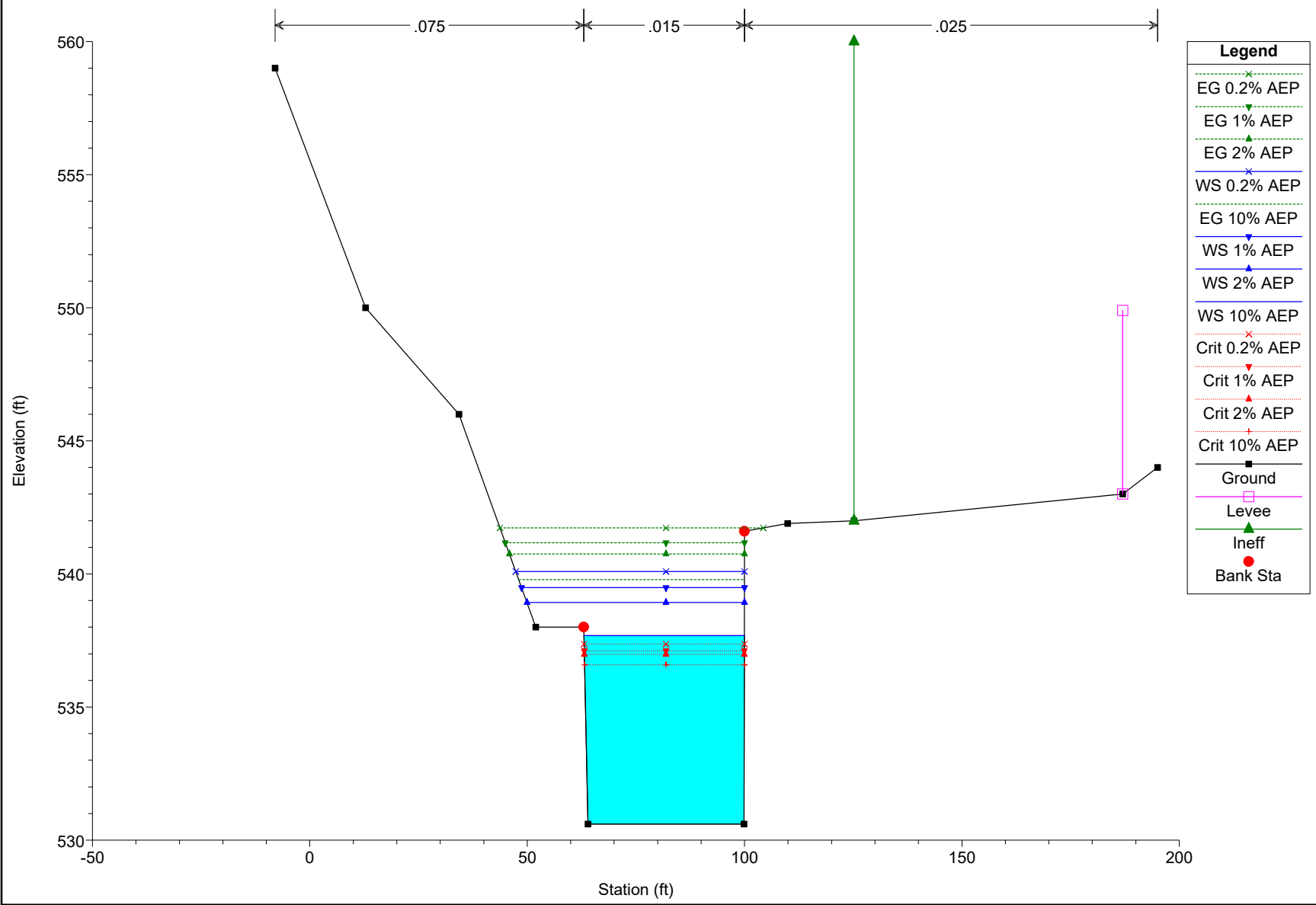
STREAM STA. 4.778



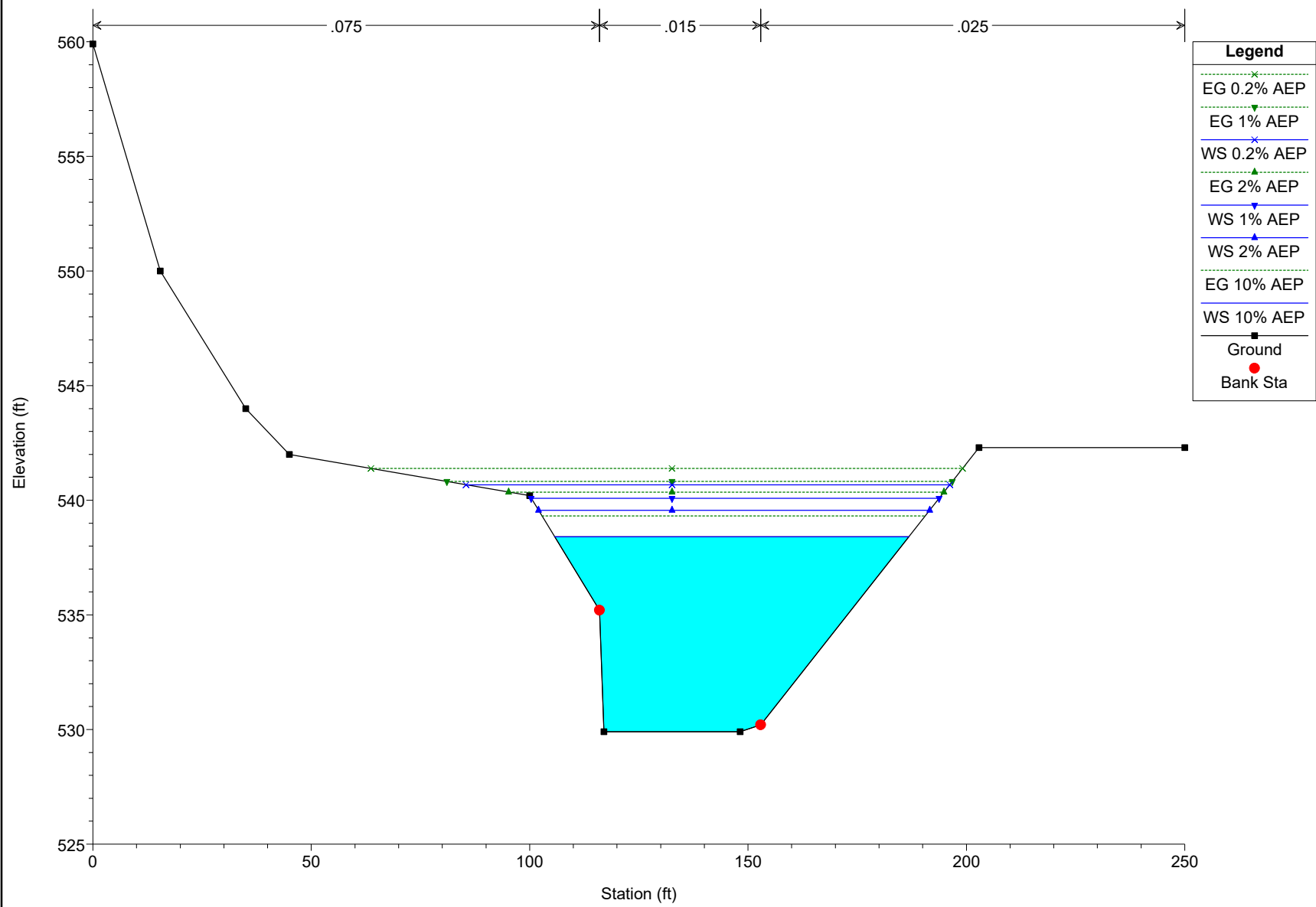
STREAM STA. 4.775



STREAM STA. 4.772



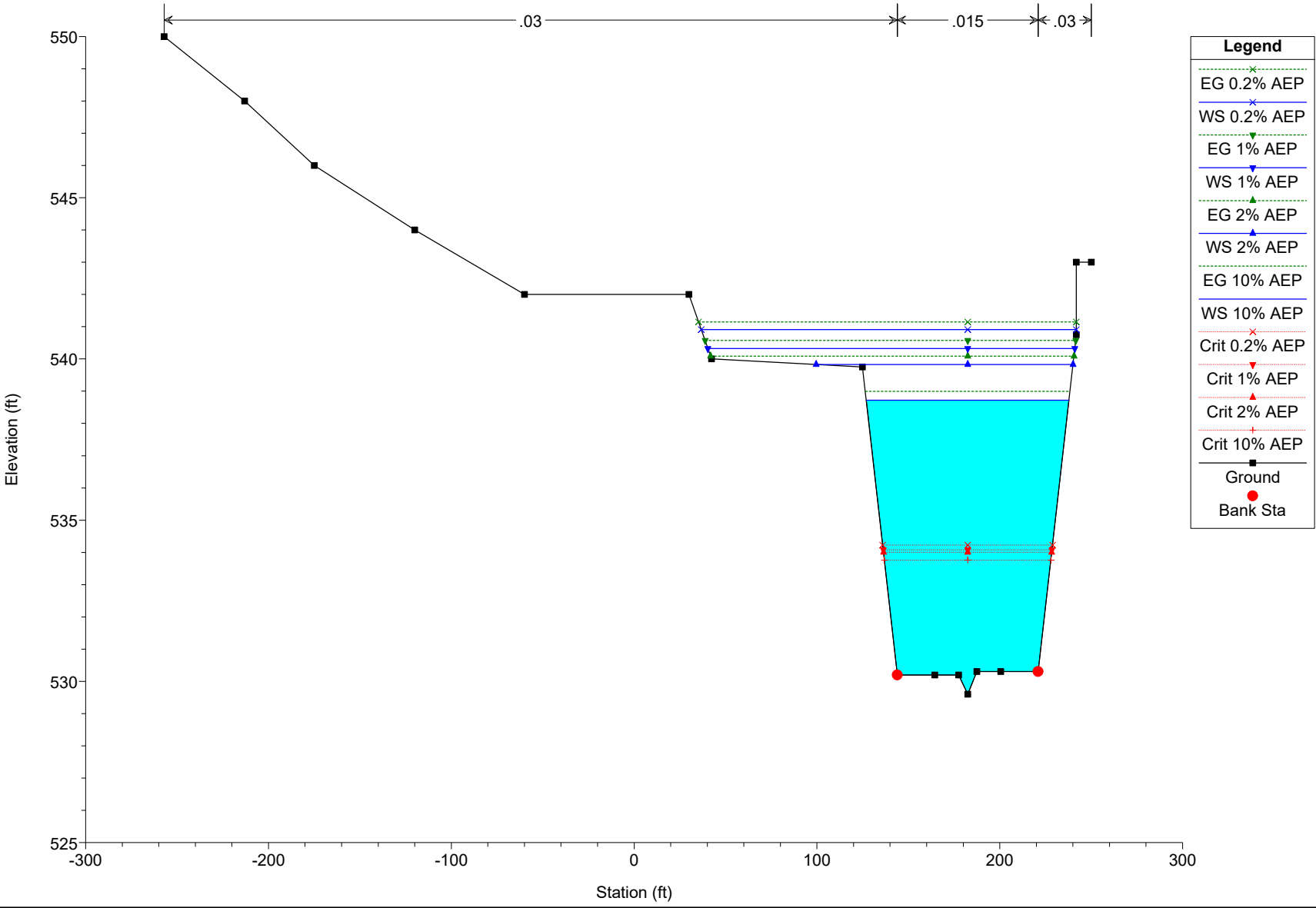
STREAM STA. 4.769



STREAM STA. 4.743

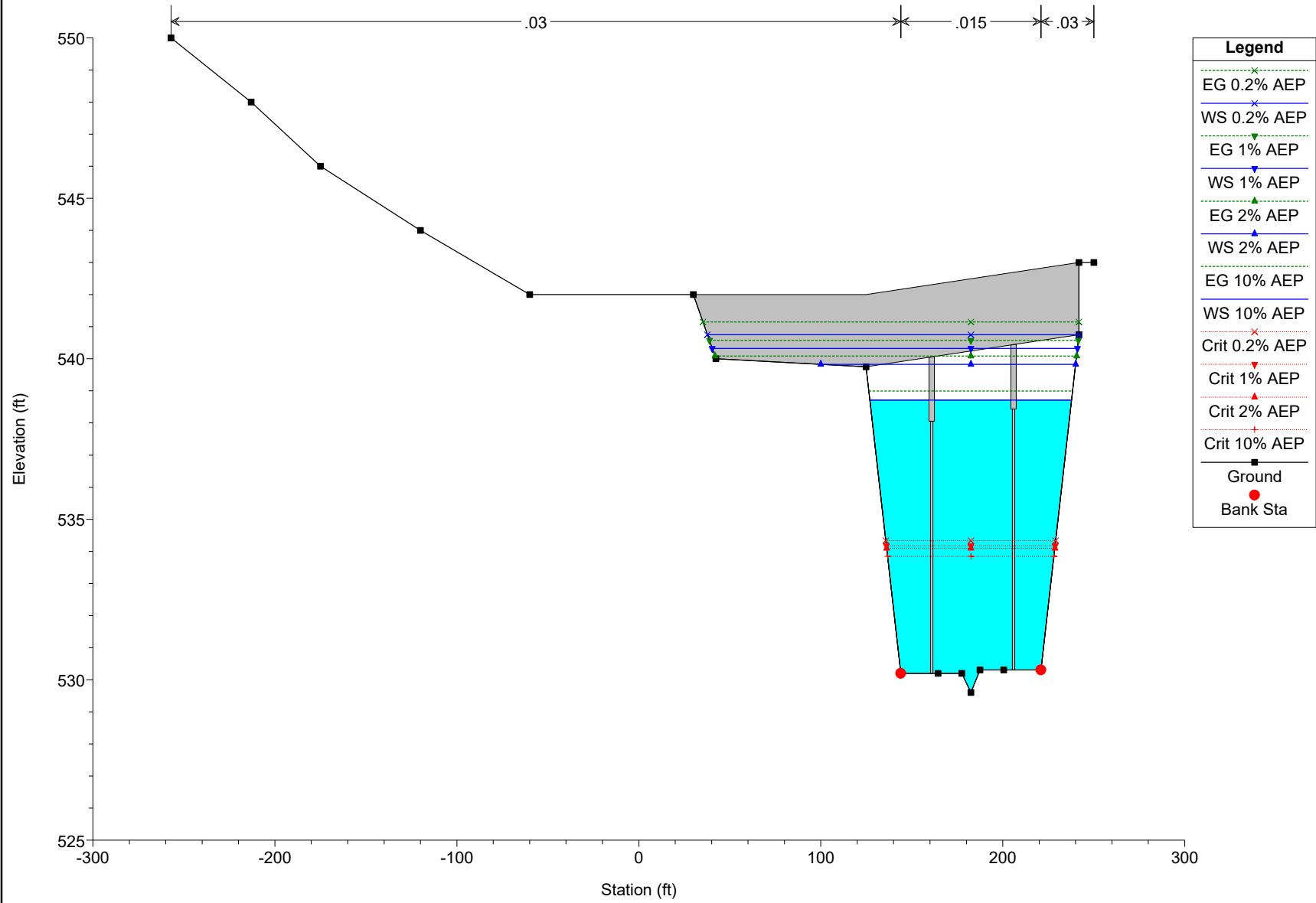
Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge w/levee 6/15/2020

This is a REPEATED section. Levee in LOB represents elevated ra



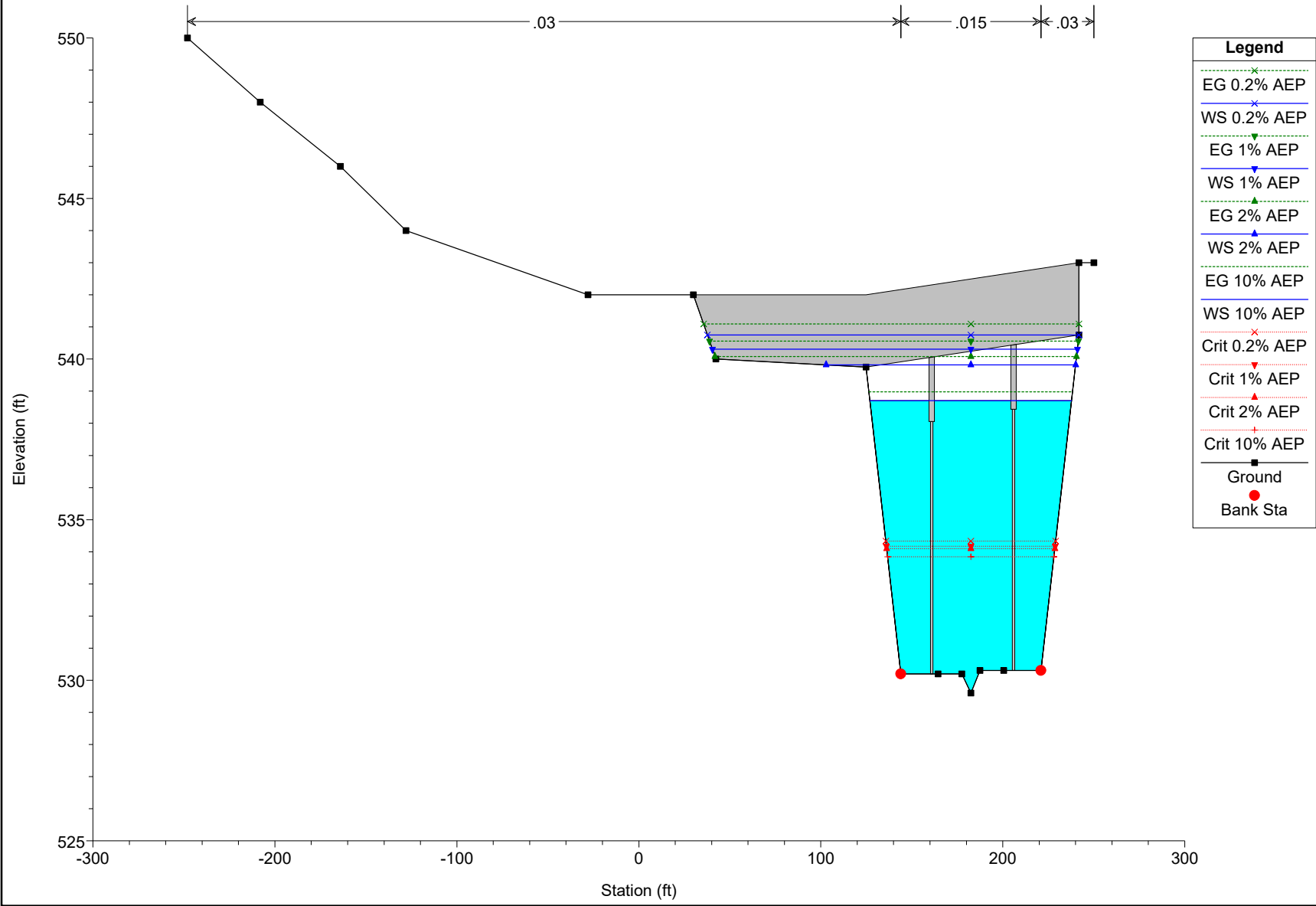
STREAM STA. 4.736

Madison Ave



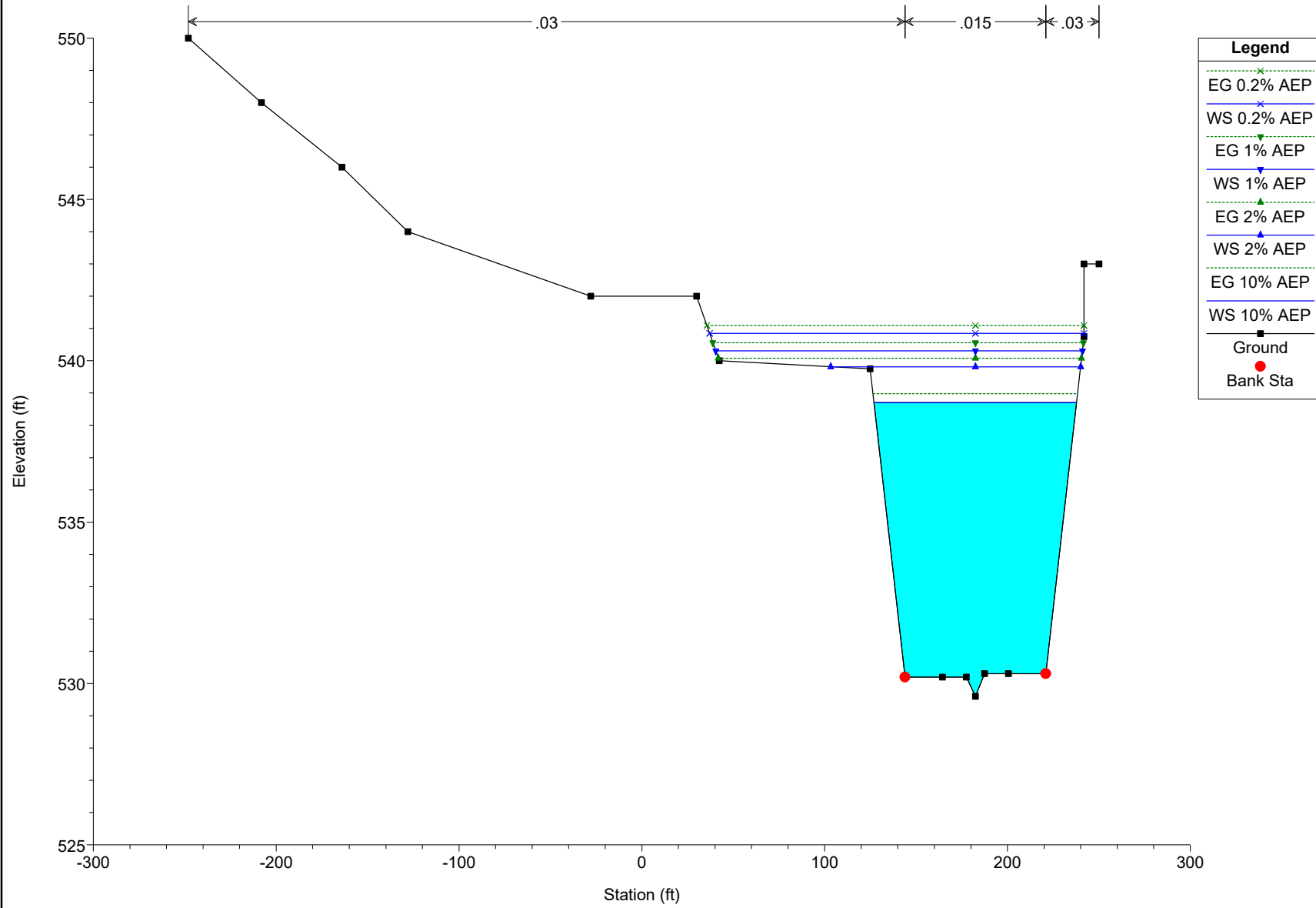
Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge w/levee 6/15/2020

Madison Ave

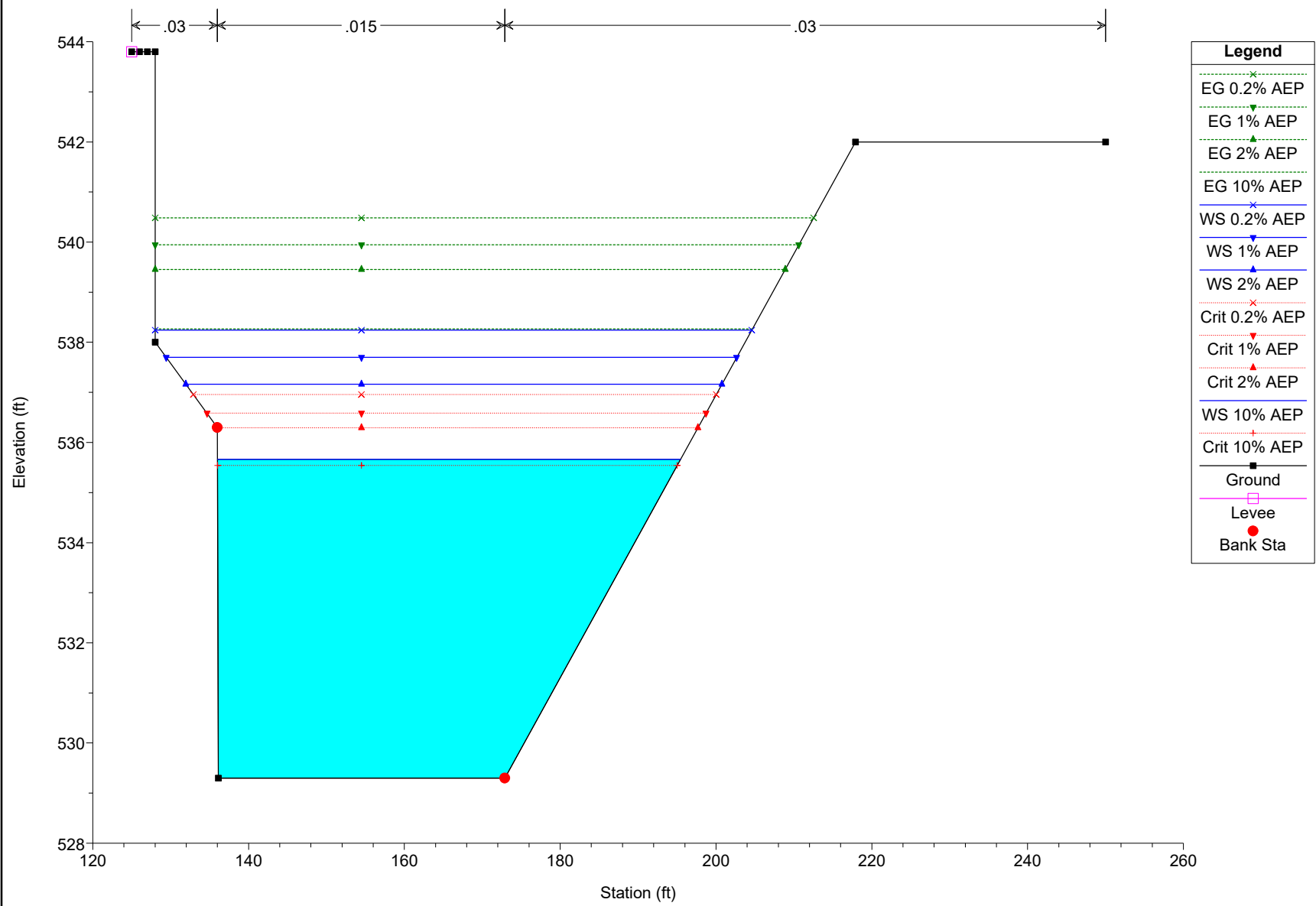


DOWNSTREAM EDGE OF PROPOSED MADISON ROAD BRIDGE

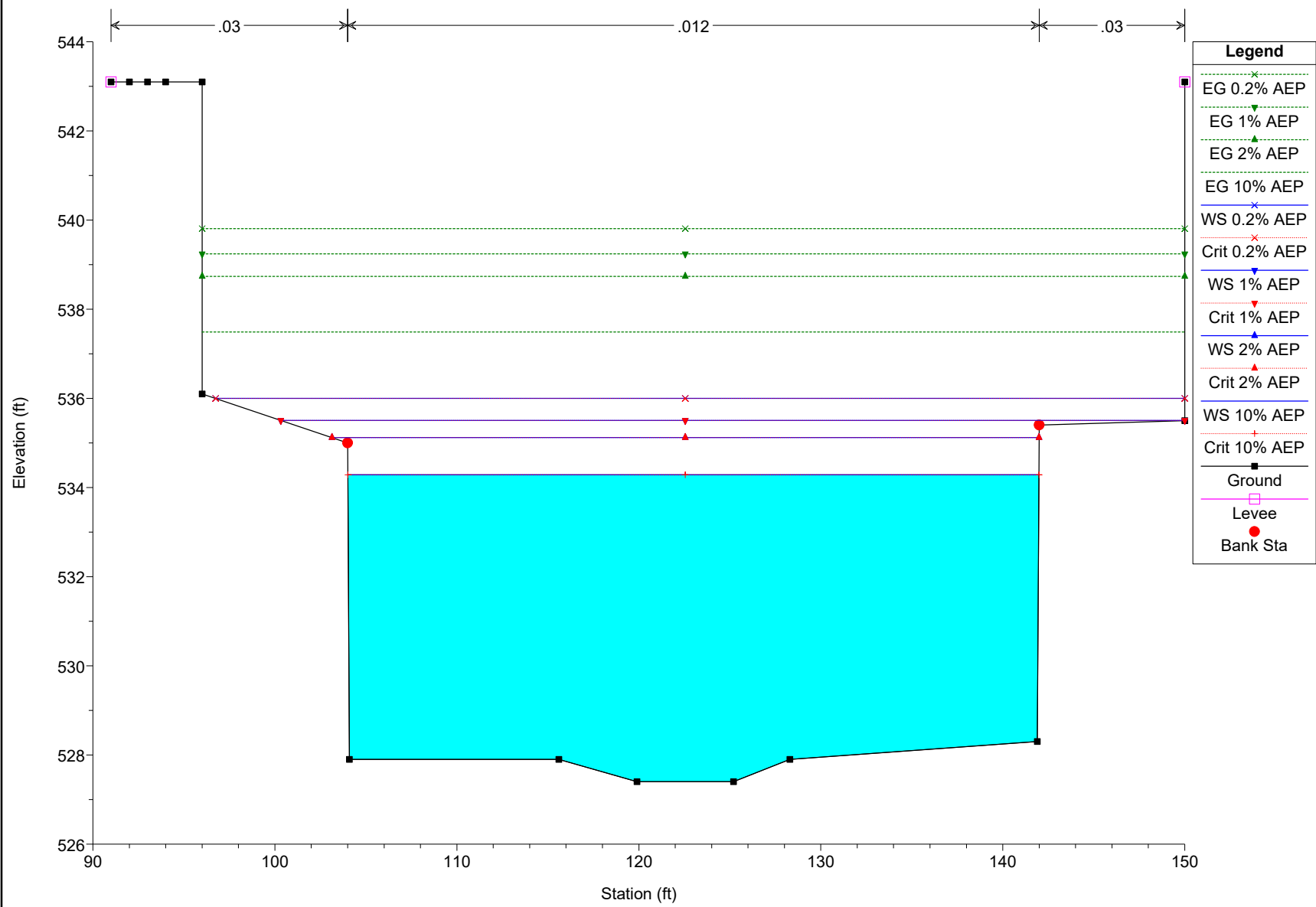
Duck Creek Feasibility Study-FEMA_LOMR Plan: MEB-new bridge w/levee 6/15/2020
MADISON AVE



STREAM STA. 4.727



STREAM STA. 4.716



STREAM STA. 4.641

HEC-RAS Plan: MEB-new br wlev River: RIVER-1 Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	5.5	10% AEP	3900.00	540.30	556.56		557.10	0.000177	5.92	676.24	80.39	0.32
Reach-1	5.5	2% AEP	4000.00	540.30	556.99		557.52	0.000163	5.83	713.13	88.53	0.30
Reach-1	5.5	1% AEP	4300.00	540.30	558.37		558.84	0.000127	5.55	863.25	141.93	0.27
Reach-1	5.5	0.2% AEP	4500.00	540.30	559.35		559.78	0.000106	5.33	1008.07	154.28	0.25
Reach-1	5.434	10% AEP	3900.00	539.80	556.52		557.03	0.000164	5.77	692.50	79.63	0.30
Reach-1	5.434	2% AEP	4000.00	539.80	556.96		557.46	0.000152	5.69	729.36	87.83	0.29
Reach-1	5.434	1% AEP	4300.00	539.80	558.34		558.80	0.000119	5.43	878.71	141.57	0.26
Reach-1	5.434	0.2% AEP	4500.00	539.80	559.32		559.74	0.000100	5.23	1023.88	153.97	0.25
Reach-1	5.415	10% AEP	3900.00	538.90	554.59	548.80	556.56	0.001069	11.26	346.25	22.14	0.50
Reach-1	5.415	2% AEP	4000.00	538.90	555.02	548.98	556.99	0.001049	11.24	355.84	22.14	0.49
Reach-1	5.415	1% AEP	4300.00	538.90	556.40	549.47	558.33	0.000984	11.13	386.39	22.15	0.47
Reach-1	5.415	0.2% AEP	4500.00	538.90	557.39	549.80	559.27	0.000939	11.02	408.17	22.16	0.45
Reach-1	5.3675		Culvert									
Reach-1	5.32	10% AEP	3900.00	537.40	547.32	547.32	552.25	0.003550	17.80	219.13	22.17	1.00
Reach-1	5.32	2% AEP	4000.00	537.40	547.47	547.47	552.50	0.003588	17.99	222.40	22.17	1.00
Reach-1	5.32	1% AEP	4300.00	537.40	547.98	547.98	553.24	0.003626	18.40	233.76	22.18	1.00
Reach-1	5.32	0.2% AEP	4500.00	537.40	548.31	548.31	553.73	0.003660	18.67	240.99	22.18	1.00
Reach-1	5.308	10% AEP	3900.00	537.30	546.65	545.63	548.84	0.001326	11.87	328.43	49.47	0.81
Reach-1	5.308	2% AEP	4000.00	537.30	546.97	545.76	549.06	0.001223	11.61	344.58	50.45	0.78
Reach-1	5.308	1% AEP	4300.00	537.30	547.23	546.10	549.47	0.001277	12.02	357.59	51.23	0.80
Reach-1	5.308	0.2% AEP	4500.00	537.30	547.57	546.33	549.80	0.001222	11.98	375.64	52.28	0.79
Reach-1	5.259	10% AEP	3900.00	536.50	546.69	544.85	548.41	0.000948	10.51	371.22	52.03	0.69
Reach-1	5.259	2% AEP	4000.00	536.50	547.01	544.96	548.66	0.000883	10.31	388.11	53.00	0.67
Reach-1	5.259	1% AEP	4300.00	536.50	547.27	545.30	549.05	0.000926	10.69	402.10	53.79	0.69
Reach-1	5.259	0.2% AEP	4500.00	536.50	547.62	545.53	549.40	0.000894	10.69	421.08	54.85	0.68
Reach-1	5.248	10% AEP	3900.00	536.20	546.97	544.30	548.03	0.000599	8.26	471.98	67.58	0.55
Reach-1	5.248	2% AEP	4000.00	536.20	547.28	544.43	548.31	0.000557	8.11	493.22	68.55	0.53
Reach-1	5.248	1% AEP	4300.00	536.20	547.57	544.71	548.66	0.000577	8.38	513.14	69.44	0.54
Reach-1	5.248	0.2% AEP	4500.00	536.20	547.92	544.89	549.01	0.000554	8.37	537.73	70.53	0.53
Reach-1	5.234		Bridge									

HEC-RAS Plan: MEB-new br wlev River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	5.224	10% AEP	3900.00	536.20	546.11	544.30	547.48	0.000862	9.40	414.87	64.91	0.66
Reach-1	5.224	2% AEP	4000.00	536.20	546.59	544.43	547.84	0.000739	8.97	446.15	66.39	0.61
Reach-1	5.224	1% AEP	4300.00	536.20	546.76	544.71	548.13	0.000794	9.40	457.67	66.92	0.63
Reach-1	5.224	0.2% AEP	4500.00	536.20	547.18	544.89	548.51	0.000736	9.26	485.79	68.21	0.61
Reach-1	5.213	10% AEP	3900.00	536.40	546.22	543.41	547.21	0.002512	8.05	502.30	79.00	0.51
Reach-1	5.213	2% AEP	4000.00	536.40	546.69	543.49	547.60	0.002140	7.73	539.39	79.68	0.47
Reach-1	5.213	1% AEP	4300.00	536.40	546.88	543.79	547.87	0.002281	8.10	554.22	79.95	0.49
Reach-1	5.213	0.2% AEP	4500.00	536.40	547.29	543.97	548.26	0.002101	8.02	587.42	80.55	0.48
Reach-1	5.113	10% AEP	3900.00	533.50	545.65	541.76	546.16	0.001248	6.19	821.68	156.78	0.36
Reach-1	5.113	2% AEP	4000.00	533.50	546.28	542.04	546.72	0.000982	5.75	923.09	161.46	0.32
Reach-1	5.113	1% AEP	4300.00	533.50	546.45	542.46	546.92	0.001054	6.02	950.09	161.96	0.34
Reach-1	5.113	0.2% AEP	4500.00	533.50	546.95	542.70	547.39	0.000931	5.85	1031.78	163.44	0.32
Reach-1	5.076	10% AEP	3900.00	529.80	545.76	539.46	545.87	0.000656	3.09	1490.84	286.69	0.16
Reach-1	5.076	2% AEP	4000.00	529.80	546.39	539.58	546.48	0.000498	2.78	1676.52	300.31	0.14
Reach-1	5.076	1% AEP	4300.00	529.80	546.57	539.89	546.67	0.000526	2.89	1731.21	304.27	0.14
Reach-1	5.076	0.2% AEP	4500.00	529.80	547.07	540.13	547.16	0.000453	2.75	1887.03	315.30	0.13
Reach-1	5.061	10% AEP	3900.00	529.40	545.64	538.80	545.79	0.000904	3.58	1336.41	297.21	0.19
Reach-1	5.061	2% AEP	4000.00	529.40	546.31	538.86	546.43	0.000650	3.15	1538.90	303.78	0.16
Reach-1	5.061	1% AEP	4300.00	529.40	546.48	539.11	546.61	0.000682	3.26	1592.97	305.03	0.16
Reach-1	5.061	0.2% AEP	4500.00	529.40	547.00	539.28	547.12	0.000569	3.06	1752.29	308.68	0.15
Reach-1	5.060		Bridge									
Reach-1	5.059	10% AEP	3900.00	529.40	545.38	538.80	545.56	0.001033	3.77	1263.05	287.10	0.20
Reach-1	5.059	2% AEP	4000.00	529.40	546.17	538.86	546.30	0.000700	3.25	1498.68	302.84	0.16
Reach-1	5.059	1% AEP	4300.00	529.40	546.35	539.11	546.49	0.000734	3.36	1551.57	304.07	0.17
Reach-1	5.059	0.2% AEP	4500.00	529.40	546.90	539.28	547.02	0.000601	3.13	1719.80	307.94	0.15
Reach-1	5.029	10% AEP	4000.00	529.60	545.00	539.39	545.37	0.000756	4.94	856.08	113.29	0.28
Reach-1	5.029	2% AEP	4500.00	529.60	545.71	539.76	546.11	0.000750	5.13	939.27	119.37	0.28
Reach-1	5.029	1% AEP	4600.00	529.60	545.90	539.85	546.29	0.000738	5.14	961.26	120.92	0.28
Reach-1	5.029	0.2% AEP	5000.00	529.60	546.41	540.12	546.82	0.000739	5.29	1023.89	124.63	0.28
Reach-1	4.966	10% AEP	4000.00	531.00	544.52	538.95	544.99	0.001751	5.58	753.35	98.82	0.31
Reach-1	4.966	2% AEP	4500.00	531.00	545.23	539.59	545.74	0.001737	5.82	825.17	104.93	0.31

HEC-RAS Plan: MEB-new br wlev River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.966	1% AEP	4600.00	531.00	545.42	539.68	545.92	0.001704	5.83	845.09	106.57	0.31
Reach-1	4.966	0.2% AEP	5000.00	531.00	545.91	540.02	546.45	0.001714	6.02	899.05	110.87	0.31
Reach-1	4.895	10% AEP	4000.00	530.80	543.41	538.94	544.14	0.002823	6.98	602.80	73.10	0.39
Reach-1	4.895	2% AEP	4500.00	530.80	544.08	539.49	544.89	0.002834	7.31	652.60	74.62	0.40
Reach-1	4.895	1% AEP	4600.00	530.80	544.29	539.55	545.09	0.002766	7.32	668.09	75.09	0.39
Reach-1	4.895	0.2% AEP	5000.00	530.80	544.74	539.93	545.61	0.002827	7.60	702.33	76.11	0.40
Reach-1	4.811	10% AEP	4000.00	530.70	542.38	538.82	542.97	0.002304	6.60	711.58	112.61	0.39
Reach-1	4.811	2% AEP	4500.00	530.70	543.12	539.23	543.74	0.002154	6.74	786.22	114.05	0.38
Reach-1	4.811	1% AEP	4600.00	530.70	543.38	539.31	543.98	0.002036	6.67	812.36	114.56	0.37
Reach-1	4.811	0.2% AEP	5000.00	530.70	543.85	539.60	544.48	0.002027	6.86	858.95	115.46	0.37
Reach-1	4.800	10% AEP	4000.00	530.00	542.31	536.59	542.75	0.001291	5.39	779.38	195.72	0.30
Reach-1	4.800	2% AEP	4500.00	530.00	543.06	537.06	543.52	0.001259	5.58	853.78	201.58	0.30
Reach-1	4.800	1% AEP	4600.00	530.00	543.32	537.15	543.78	0.001204	5.55	880.75	203.66	0.29
Reach-1	4.800	0.2% AEP	5000.00	530.00	543.79	537.49	544.28	0.001222	5.74	929.03	207.31	0.30
Reach-1	4.788	10% AEP	3000.00	530.60	539.20	538.17	542.00	0.001085	13.41	223.63	65.09	0.82
Reach-1	4.788	2% AEP	3300.00	530.60	539.74	538.65	542.73	0.001066	13.86	238.04	75.66	0.82
Reach-1	4.788	1% AEP	3400.00	530.60	539.92	538.79	542.96	0.001060	14.01	242.75	79.12	0.82
Reach-1	4.788	0.2% AEP	3600.00	530.60	540.26	539.10	543.43	0.001049	14.28	252.06	82.82	0.82
Reach-1	4.783		Bridge									
Reach-1	4.778	10% AEP	3000.00	530.60	538.15	538.15	541.81	0.001697	15.34	195.55	52.89	1.00
Reach-1	4.778	2% AEP	3300.00	530.60	538.65	538.65	542.53	0.001651	15.80	208.80	54.26	1.00
Reach-1	4.778	1% AEP	3400.00	530.60	538.80	538.80	542.76	0.001643	15.97	212.85	54.68	1.00
Reach-1	4.778	0.2% AEP	3600.00	530.60	539.11	539.11	543.23	0.001621	16.27	221.20	63.30	1.00
Reach-1	4.775	10% AEP	3000.00	530.60	537.41	537.41	540.79	0.002833	14.76	203.30	29.92	1.00
Reach-1	4.775	2% AEP	3300.00	530.60	537.86	537.86	541.46	0.002842	15.22	216.83	29.93	1.00
Reach-1	4.775	1% AEP	3400.00	530.60	538.41	537.99	541.71	0.002447	14.58	233.14	29.94	0.92
Reach-1	4.775	0.2% AEP	3600.00	530.60	539.09	538.28	542.22	0.002154	14.19	253.70	29.95	0.86
Reach-1	4.772	10% AEP	3000.00	530.60	537.26	536.84	540.01	0.002238	13.31	225.43	33.92	0.91
Reach-1	4.772	2% AEP	3300.00	530.60	538.62	537.27	540.91	0.001570	12.15	271.53	33.94	0.76
Reach-1	4.772	1% AEP	3400.00	530.60	539.21	537.40	541.32	0.001355	11.66	291.68	33.95	0.70
Reach-1	4.772	0.2% AEP	3600.00	530.60	539.81	537.65	541.88	0.001252	11.54	311.95	33.96	0.67

LEFT BANK
LEVEE
LOCATION

HEC-RAS Plan: MEB-new br wlev River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.769	10% AEP	3000.00	530.60	537.68	536.58	539.79	0.001553	11.63	257.86	36.92	0.78
Reach-1	4.769	2% AEP	3300.00	530.60	538.93	536.98	540.75	0.001129	10.84	314.93	50.02	0.67
Reach-1	4.769	1% AEP	3400.00	530.60	539.49	537.12	541.17	0.000970	10.43	343.62	51.28	0.62
Reach-1	4.769	0.2% AEP	3600.00	530.60	540.09	537.36	541.73	0.000882	10.31	374.71	52.61	0.59
Reach-1	4.743	10% AEP	3000.00	529.90	538.41		539.32	0.000463	8.18	466.42	81.10	0.50
Reach-1	4.743	2% AEP	3300.00	529.90	539.57		540.36	0.000348	7.73	565.03	89.57	0.44
Reach-1	4.743	1% AEP	3400.00	529.90	540.09		540.82	0.000303	7.47	612.65	93.39	0.41
Reach-1	4.743	0.2% AEP	3600.00	529.90	540.68		541.39	0.000275	7.39	672.15	110.76	0.40
Reach-1	4.736	10% AEP	3000.00	529.60	538.72	533.76	538.99	0.000109	4.30	799.17	110.89	0.26
Reach-1	4.736	2% AEP	3300.00	529.60	539.83	534.01	540.09	0.000088	4.21	925.06	140.52	0.24
Reach-1	4.736	1% AEP	3400.00	529.60	540.32	534.08	540.57	0.000079	4.12	1019.16	200.75	0.23
Reach-1	4.736	0.2% AEP	3600.00	529.60	540.91	534.23	541.15	0.000071	4.05	1138.12	205.20	0.22
Reach-1	4.7315	Bridge										
Reach-1	4.727	10% AEP	3000.00	529.60	538.71		538.98	0.000109	4.31	797.31	110.82	0.26
Reach-1	4.727	2% AEP	3300.00	529.60	539.82		540.08	0.000089	4.21	923.47	136.69	0.24
Reach-1	4.727	1% AEP	3400.00	529.60	540.31		540.56	0.000079	4.12	1015.80	200.61	0.23
Reach-1	4.727	0.2% AEP	3600.00	529.60	540.85		541.09	0.000073	4.08	1126.13	204.84	0.22
Reach-1	4.716	10% AEP	3500.00	529.30	535.66	535.54	538.27	0.001952	13.52	306.06	59.43	0.95
Reach-1	4.716	2% AEP	4200.00	529.30	537.16	536.29	539.46	0.001349	12.82	400.94	68.80	0.81
Reach-1	4.716	1% AEP	4500.00	529.30	537.70	536.59	539.95	0.001221	12.75	439.07	73.23	0.78
Reach-1	4.716	0.2% AEP	4850.00	529.30	538.24	536.96	540.48	0.001128	12.78	480.01	76.58	0.75
Reach-1	4.641	10% AEP	3500.00	527.40	534.29	534.29	537.49	0.001637	14.36	243.77	37.97	1.00
Reach-1	4.641	2% AEP	4200.00	527.40	535.12	535.12	538.73	0.001636	15.25	275.38	38.86	1.00
Reach-1	4.641	1% AEP	4500.00	527.40	535.50	535.50	539.24	0.001590	15.51	291.38	49.67	0.99
Reach-1	4.641	0.2% AEP	4850.00	527.40	536.00	536.00	539.81	0.001494	15.68	316.74	53.26	0.97
Reach-1	4.595	10% AEP	3500.00	526.70	534.02	533.40	536.58	0.001196	12.83	272.84	39.98	0.87
Reach-1	4.595	2% AEP	4200.00	526.70	534.96	534.21	537.80	0.001154	13.53	313.96	49.03	0.86
Reach-1	4.595	1% AEP	4500.00	526.70	535.45	534.55	538.32	0.001075	13.61	338.46	50.00	0.84
Reach-1	4.595	0.2% AEP	4850.00	526.70	535.95	535.00	538.89	0.001021	13.79	363.59	50.00	0.82
Reach-1	4.533	10% AEP	3500.00	526.10	533.89	532.80	536.13	0.000981	12.01	291.53	39.97	0.78

PROPOSED
MADISON
ROAD
BRIDGE

HEC-RAS Plan: MEB-new br wlev River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.533	2% AEP	4200.00	526.10	534.89	533.61	537.34	0.000933	12.60	373.04	121.97	0.77
Reach-1	4.533	1% AEP	4500.00	526.10	535.47	533.94	537.87	0.000855	12.52	430.29	154.04	0.74
Reach-1	4.533	0.2% AEP	4850.00	526.10	536.05	534.58	538.43	0.000798	12.53	488.72	184.64	0.72
Reach-1	4.455	10% AEP	3500.00	525.20	533.78	532.06	535.68	0.000767	11.05	317.59	42.96	0.69
Reach-1	4.455	2% AEP	4200.00	525.20	534.75	532.83	536.91	0.000768	11.80	364.03	52.72	0.70
Reach-1	4.455	1% AEP	4500.00	525.20	535.27	533.20	537.48	0.000735	11.92	393.21	58.09	0.69
Reach-1	4.455	0.2% AEP	4850.00	525.20	535.81	533.58	538.09	0.000717	12.14	425.54	63.50	0.68
Reach-1	4.355	10% AEP	3500.00	524.40	533.84	530.85	535.21	0.000454	9.42	405.33	73.82	0.55
Reach-1	4.355	2% AEP	4200.00	524.40	534.90	531.67	536.42	0.000442	10.00	486.81	79.78	0.55
Reach-1	4.355	1% AEP	4500.00	524.40	535.47	531.99	536.99	0.000417	10.07	532.66	82.57	0.54
Reach-1	4.355	0.2% AEP	4850.00	524.40	536.04	532.42	537.59	0.000401	10.21	580.76	85.40	0.53
Reach-1	4.325	10% AEP	3500.00	524.00	534.16	530.36	534.84	0.004063	6.69	550.35	95.60	0.41
Reach-1	4.325	2% AEP	4200.00	524.00	535.33	531.04	536.01	0.003489	6.78	664.88	100.23	0.39
Reach-1	4.325	1% AEP	4500.00	524.00	535.93	531.31	536.59	0.003138	6.70	725.49	102.60	0.38
Reach-1	4.325	0.2% AEP	4850.00	524.00	536.54	531.63	537.19	0.002879	6.68	788.81	105.01	0.36
Reach-1	4.242	10% AEP	3500.00	521.10	533.19	527.39	533.59	0.001908	5.17	728.31	105.57	0.29
Reach-1	4.242	2% AEP	4200.00	521.10	534.53	528.11	534.92	0.001654	5.24	873.01	111.13	0.27
Reach-1	4.242	1% AEP	4500.00	521.10	535.22	528.39	535.60	0.001489	5.17	951.12	114.02	0.26
Reach-1	4.242	0.2% AEP	4850.00	521.10	535.90	528.73	536.28	0.001383	5.17	1029.09	116.83	0.26
Reach-1	4.178	10% AEP	3500.00	519.40	532.56	526.49	532.95	0.001852	5.32	736.24	285.73	0.28
Reach-1	4.178	2% AEP	4200.00	519.40	534.00	527.38	534.38	0.001531	5.24	890.95	288.42	0.26
Reach-1	4.178	1% AEP	4500.00	519.40	534.76	527.80	535.11	0.001350	5.10	973.40	289.83	0.24
Reach-1	4.178	0.2% AEP	4850.00	519.40	535.47	528.28	535.82	0.001241	5.06	1052.16	291.16	0.23
Reach-1	4.166	10% AEP	3500.00	519.00	532.28	524.78	532.78	0.002544	5.66	617.89	241.75	0.28
Reach-1	4.166	2% AEP	4200.00	519.00	533.59	525.48	534.19	0.002661	6.18	680.04	269.32	0.29
Reach-1	4.166	1% AEP	4500.00	519.00	534.30	525.77	534.92	0.002602	6.31	713.59	284.56	0.29
Reach-1	4.166	0.2% AEP	4850.00	519.00	534.96	526.11	535.62	0.002620	6.51	744.80	298.73	0.29
Reach-1	4.165		Bridge									
Reach-1	4.164	10% AEP	3500.00	519.00	532.23	524.78	532.73	0.002577	5.69	615.44	389.16	0.28
Reach-1	4.164	2% AEP	4200.00	519.00	533.54	525.48	534.14	0.002696	6.20	677.39	463.66	0.29
Reach-1	4.164	1% AEP	4500.00	519.00	534.25	525.77	534.87	0.002634	6.33	710.98	616.68	0.29

HEC-RAS Plan: MEB-new br wlev River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	4.164	0.2% AEP	4850.00	519.00	534.91	526.11	535.57	0.002652	6.54	742.13	620.60	0.29
Reach-1	4.142	10% AEP	3500.00	518.80	532.07	526.43	532.36	0.002244	4.75	995.79	518.99	0.27
Reach-1	4.142	2% AEP	4200.00	518.80	533.50	527.15	533.72	0.001560	4.34	1343.61	705.75	0.23
Reach-1	4.142	1% AEP	4500.00	518.80	534.26	527.46	534.46	0.001266	4.08	1531.72	785.13	0.21
Reach-1	4.142	0.2% AEP	4850.00	518.80	534.97	527.80	535.14	0.001096	3.94	1706.21	823.04	0.19
Reach-1	4.057	10% AEP	3500.00	518.10	531.07	524.61	531.45	0.001758	5.03	758.12	111.11	0.27
Reach-1	4.057	2% AEP	4200.00	518.10	532.65	525.31	533.02	0.001464	5.04	940.65	120.57	0.26
Reach-1	4.057	1% AEP	4500.00	518.10	533.51	525.61	533.86	0.001276	4.93	1046.87	125.75	0.24
Reach-1	4.057	0.2% AEP	4850.00	518.10	534.27	525.93	534.61	0.001175	4.91	1143.03	133.16	0.23
Reach-1	4.041	10% AEP	3500.00	517.90	528.00	526.70	530.75	0.001128	13.28	263.48	96.41	0.79
Reach-1	4.041	2% AEP	4200.00	517.90	529.09	527.69	532.22	0.001104	14.19	295.90	100.38	0.79
Reach-1	4.041	1% AEP	4500.00	517.90	530.26	528.09	533.14	0.000873	13.60	330.85	104.14	0.72
Reach-1	4.041	0.2% AEP	4850.00	517.90	530.82	528.54	533.85	0.000862	13.96	347.45	105.64	0.72
Reach-1	4.0285	Bridge										
Reach-1	4.016	10% AEP	3500.00	517.90	526.70	526.70	530.47	0.001922	15.58	224.58	87.87	1.00
Reach-1	4.016	2% AEP	4200.00	517.90	527.68	527.68	531.93	0.001842	16.55	253.76	94.29	1.00
Reach-1	4.016	1% AEP	4500.00	517.90	528.09	528.09	532.54	0.001809	16.92	265.94	96.78	1.00
Reach-1	4.016	0.2% AEP	4850.00	517.90	528.54	528.54	533.22	0.001782	17.36	279.38	98.77	1.00
Reach-1	4.001	10% AEP	3500.00	517.60	525.03	524.55	527.40	0.001435	12.55	347.21	76.07	0.85
Reach-1	4.001	2% AEP	4200.00	517.60	526.22	525.33	528.56	0.001162	12.59	443.41	85.28	0.79
Reach-1	4.001	1% AEP	4500.00	517.60	526.93	525.65	529.13	0.000980	12.25	505.70	89.69	0.74
Reach-1	4.001	0.2% AEP	4850.00	517.60	528.11	526.05	529.98	0.000720	11.43	615.06	100.24	0.64
Reach-1	3.948	10% AEP	3500.00	517.00	525.01	523.89	526.92	0.001048	11.36	386.47	76.29	0.74
Reach-1	3.948	2% AEP	4200.00	517.00	526.23		528.16	0.000872	11.48	485.48	85.16	0.69
Reach-1	3.948	1% AEP	4500.00	517.00	526.95		528.78	0.000751	11.24	548.69	91.00	0.65
Reach-1	3.948	0.2% AEP	4850.00	517.00	528.12		529.72	0.000567	10.58	661.15	100.61	0.58
Reach-1	3.866	10% AEP	3500.00	516.10	524.88		526.41	0.000794	10.32	457.96	83.95	0.65
Reach-1	3.866	2% AEP	4200.00	516.10	526.17		527.72	0.000662	10.43	572.36	92.53	0.61
Reach-1	3.866	1% AEP	4500.00	516.10	526.91		528.39	0.000577	10.26	643.64	101.04	0.58
Reach-1	3.866	0.2% AEP	4850.00	516.10	528.11		529.41	0.000443	9.70	773.17	115.08	0.51

HEC-RAS Plan: MEB-new br wlev River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.82	10% AEP	3500.00	515.80	524.22	522.56	526.14	0.001188	11.12	317.34	48.42	0.70
Reach-1	3.82	2% AEP	4200.00	515.80	525.40	523.36	527.46	0.001061	11.54	385.50	66.15	0.68
Reach-1	3.82	1% AEP	4500.00	515.80	526.21	523.68	528.17	0.000903	11.28	443.95	78.61	0.63
Reach-1	3.82	0.2% AEP	4850.00	515.80	527.58	524.09	529.25	0.000657	10.49	568.95	103.88	0.55
Reach-1	3.79	10% AEP	3500.00	515.50	524.13	522.20	525.92	0.001070	10.74	336.25	71.71	0.66
Reach-1	3.79	2% AEP	4200.00	515.50	525.39	522.99	527.24	0.000928	11.01	431.26	79.22	0.63
Reach-1	3.79	1% AEP	4500.00	515.50	526.24	523.32	527.97	0.000779	10.69	500.79	85.04	0.59
Reach-1	3.79	0.2% AEP	4850.00	515.50	527.62	523.75	529.09	0.000571	9.96	627.64	101.24	0.52
Reach-1	3.766	10% AEP	3500.00	515.30	524.14	522.53	525.63	0.001147	9.80	357.23	53.31	0.67
Reach-1	3.766	2% AEP	4200.00	515.30	525.44	523.21	526.95	0.000955	9.83	427.14	53.64	0.61
Reach-1	3.766	1% AEP	4500.00	515.30	526.30	523.47	527.70	0.000805	9.51	472.97	53.85	0.57
Reach-1	3.766	0.2% AEP	4850.00	515.30	527.67	523.80	528.89	0.000604	8.87	547.03	54.19	0.49
Reach-1	3.7645		Bridge									
Reach-1	3.763	10% AEP	3450.00	515.30	523.60	522.49	525.31	0.001443	10.50	328.60	53.18	0.74
Reach-1	3.763	2% AEP	4100.00	515.30	525.02	523.09	526.62	0.001076	10.14	404.39	53.53	0.65
Reach-1	3.763	1% AEP	4700.00	515.30	525.95	523.66	527.61	0.000993	10.35	454.13	53.76	0.63
Reach-1	3.763	0.2% AEP	4750.00	515.30	527.42	523.72	528.65	0.000624	8.90	533.65	54.13	0.50
Reach-1	3.754	10% AEP	3450.00	515.20	523.70		525.19	0.000937	9.79	352.31	49.66	0.65
Reach-1	3.754	2% AEP	4100.00	515.20	525.07		526.54	0.000785	9.74	420.84	51.03	0.60
Reach-1	3.754	1% AEP	4700.00	515.20	525.98		527.54	0.000761	10.05	467.85	52.22	0.59
Reach-1	3.754	0.2% AEP	4750.00	515.20	527.43		528.61	0.000503	8.71	545.35	54.18	0.48
Reach-1	3.71	10% AEP	3450.00	514.50	523.56		524.96	0.000834	9.50	363.05	48.27	0.61
Reach-1	3.71	2% AEP	4100.00	514.50	524.94		526.35	0.000718	9.52	430.51	49.70	0.57
Reach-1	3.71	1% AEP	4700.00	514.50	525.84		527.36	0.000692	9.88	476.91	53.05	0.56
Reach-1	3.71	0.2% AEP	4750.00	514.50	527.34		528.50	0.000447	8.62	561.23	59.45	0.46
Reach-1	3.686	10% AEP	3450.00	514.20	523.81	520.63	524.74	0.000479	7.73	446.19	58.89	0.50
Reach-1	3.686	2% AEP	4100.00	514.20	525.20	521.28	526.14	0.000396	7.74	532.29	66.78	0.46
Reach-1	3.686	1% AEP	4700.00	514.20	526.15	521.87	527.14	0.000370	8.00	599.38	74.23	0.45
Reach-1	3.686	0.2% AEP	4750.00	514.20	527.58	521.91	528.34	0.000237	7.02	707.04	76.44	0.37
Reach-1	3.628	10% AEP	3450.00	514.00	523.10	520.83	524.50	0.000821	9.49	363.36	48.04	0.61
Reach-1	3.628	2% AEP	4100.00	514.00	524.55	521.55	525.94	0.000657	9.44	447.67	66.02	0.55

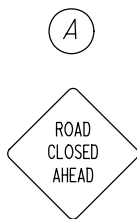
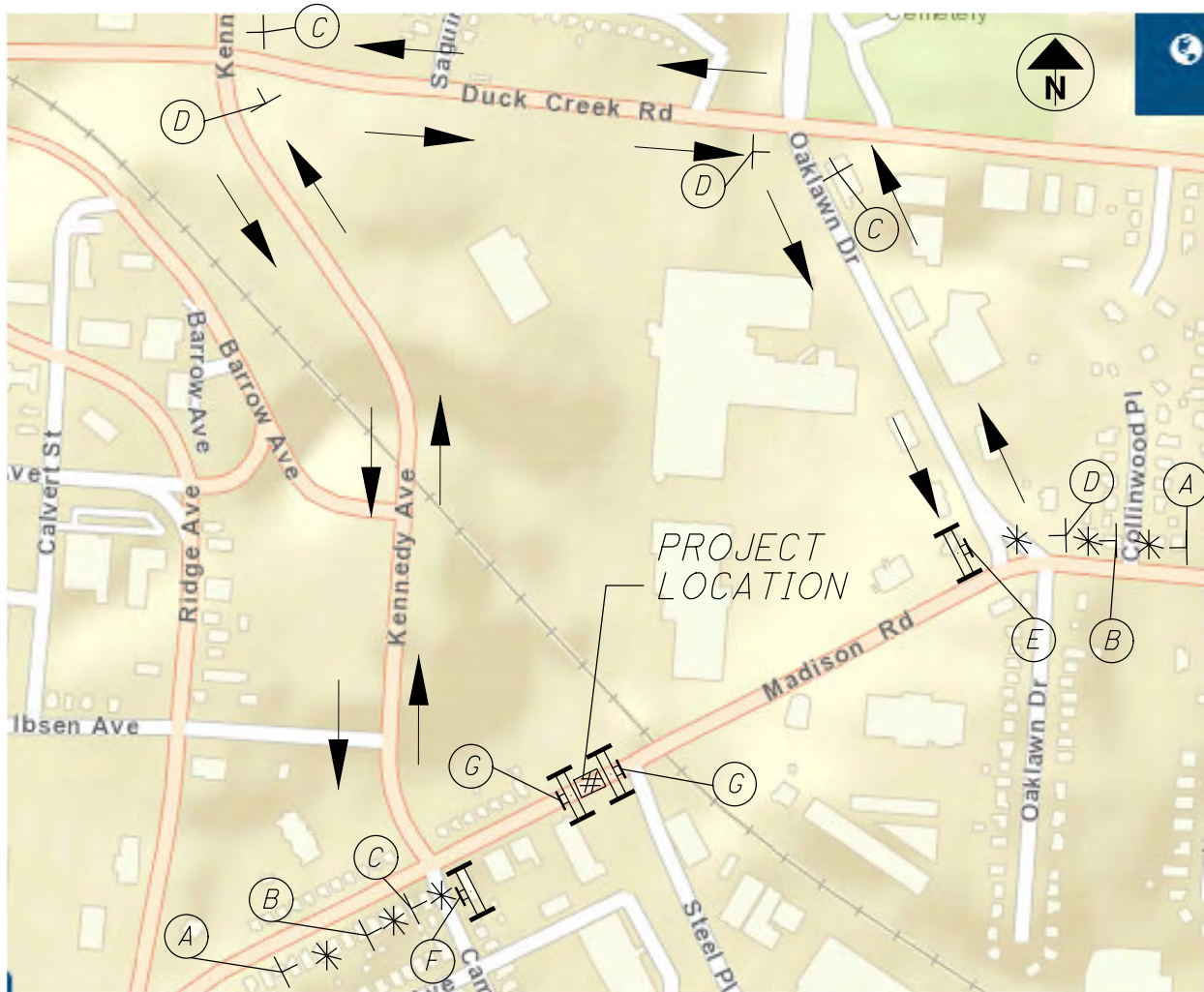
HEC-RAS Plan: MEB-new br wlev River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.628	1% AEP	4700.00	514.00	525.47	522.16	526.95	0.000619	9.78	508.32	66.04	0.55
Reach-1	3.628	0.2% AEP	4750.00	514.00	527.14	522.21	528.22	0.000370	8.39	618.55	66.09	0.43
Reach-1	3.593	10% AEP	3450.00	513.40	522.99	519.99	524.35	0.000752	9.35	369.13	40.79	0.55
Reach-1	3.593	2% AEP	4100.00	513.40	524.39	520.74	525.81	0.000663	9.59	440.62	56.00	0.52
Reach-1	3.593	1% AEP	4700.00	513.40	525.24	521.38	526.82	0.000663	10.11	490.63	60.75	0.53
Reach-1	3.593	0.2% AEP	4750.00	513.40	526.96	521.43	528.13	0.000412	8.76	603.49	70.31	0.43
Reach-1	3.568	10% AEP	3450.00	513.20	522.56	520.31	524.19	0.000829	10.24	336.76	44.30	0.63
Reach-1	3.568	2% AEP	4100.00	513.20	523.99	521.05	525.67	0.000694	10.38	395.05	59.41	0.59
Reach-1	3.568	1% AEP	4700.00	513.20	524.78	521.71	526.67	0.000705	11.01	426.91	65.51	0.60
Reach-1	3.568	0.2% AEP	4750.00	513.20	526.65	521.77	528.04	0.000418	9.45	502.45	76.02	0.47
Reach-1	3.5635		Bridge									
Reach-1	3.559	10% AEP	3450.00	513.20	522.47	520.30	524.14	0.000855	10.35	333.46	44.24	0.64
Reach-1	3.559	2% AEP	4100.00	513.20	523.93	521.06	525.62	0.000711	10.45	392.29	58.54	0.59
Reach-1	3.559	1% AEP	4700.00	513.20	524.71	521.71	526.62	0.000722	11.09	423.83	64.92	0.60
Reach-1	3.559	0.2% AEP	4750.00	513.20	526.59	521.76	527.99	0.000425	9.50	500.04	89.76	0.48
Reach-1	3.548	10% AEP	3450.00	513.00	522.56		523.96	0.000790	9.52	362.51	39.99	0.56
Reach-1	3.548	2% AEP	4100.00	513.00	524.00		525.47	0.000690	9.74	431.77	59.57	0.53
Reach-1	3.548	1% AEP	4700.00	513.00	524.79		526.45	0.000707	10.36	481.41	65.78	0.54
Reach-1	3.548	0.2% AEP	4750.00	513.00	526.67		527.86	0.000422	8.86	633.66	89.92	0.43
Reach-1	3.462	10% AEP	3450.00	511.90	522.39		523.59	0.000611	8.78	417.89	103.47	0.49
Reach-1	3.462	2% AEP	4100.00	511.90	523.94		525.12	0.000507	8.82	632.22	173.47	0.46
Reach-1	3.462	1% AEP	4700.00	511.90	524.82		526.06	0.000495	9.16	788.11	178.22	0.46
Reach-1	3.462	0.2% AEP	4750.00	511.90	526.79		527.59	0.000275	7.54	1147.88	190.79	0.35
Reach-1	3.441	10% AEP	3450.00	511.80	522.35	518.56	523.52	0.000375	8.67	397.82	68.56	0.49
Reach-1	3.441	2% AEP	4100.00	511.80	523.79	519.31	525.05	0.000338	9.00	455.43	79.24	0.47
Reach-1	3.441	1% AEP	4700.00	511.80	524.47	519.97	525.94	0.000365	9.74	482.77	84.31	0.49
Reach-1	3.441	0.2% AEP	4750.00	511.80	526.34	520.02	527.46	0.000231	8.52	557.54	98.17	0.40
Reach-1	3.434		Bridge									
Reach-1	3.427	10% AEP	3450.00	511.80	522.29	518.55	523.47	0.000383	8.73	395.38	68.11	0.49
Reach-1	3.427	2% AEP	4100.00	511.80	523.73	519.31	525.00	0.000343	9.05	453.13	78.81	0.47

HEC-RAS Plan: MEB-new br wlev River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	3.427	1% AEP	4700.00	511.80	524.40	519.97	525.89	0.000372	9.79	480.13	83.82	0.50
Reach-1	3.427	0.2% AEP	4750.00	511.80	526.29	520.02	527.43	0.000233	8.54	555.89	97.86	0.40
Reach-1	3.41	10% AEP	3450.00	511.60	522.32		523.37	0.000491	8.22	443.06	72.68	0.45
Reach-1	3.41	2% AEP	4100.00	511.60	523.78		524.89	0.000440	8.49	560.86	88.76	0.43
Reach-1	3.41	1% AEP	4700.00	511.60	524.48		525.75	0.000473	9.14	625.27	96.42	0.45
Reach-1	3.41	0.2% AEP	4750.00	511.60	526.38		527.30	0.000290	7.86	828.45	117.35	0.36
Reach-1	3.308	10% AEP	3450.00	510.60	522.18		522.67	0.002946	6.17	695.75	95.23	0.33
Reach-1	3.308	2% AEP	4100.00	510.60	523.76		524.23	0.002443	6.16	856.08	107.87	0.31
Reach-1	3.308	1% AEP	4700.00	510.60	524.49		525.03	0.002591	6.59	939.05	118.45	0.32
Reach-1	3.308	0.2% AEP	4750.00	510.60	526.47		526.83	0.001521	5.54	1208.03	154.94	0.25
Reach-1	3.219	10% AEP	3500.00	509.70	521.65	514.85	521.83	0.000991	3.41	1055.25	137.56	0.20
Reach-1	3.219	2% AEP	4000.00	509.70	523.41	515.23	523.57	0.000705	3.23	1309.37	149.23	0.17
Reach-1	3.219	1% AEP	4800.00	509.70	524.10	515.84	524.30	0.000819	3.63	1413.58	152.83	0.19
Reach-1	3.219	0.2% AEP	5000.00	509.70	526.25	515.96	526.40	0.000488	3.13	1754.45	168.84	0.15

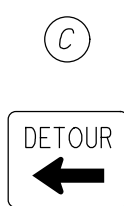
Attachment A-13
Proposed Option 3 – Detour



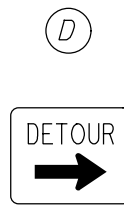
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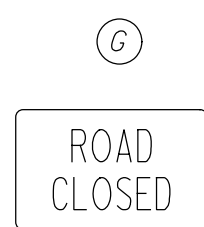
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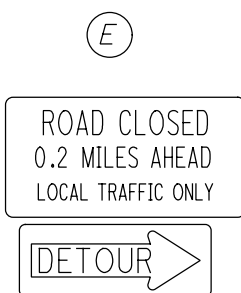
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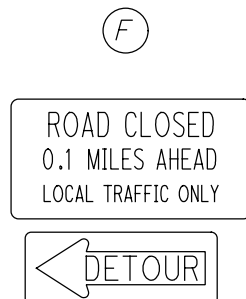
M4-9R-30



R11-2-48



R11-3a-60
M4-10R-48



R11-3a-60
M4-10L-48

* 500' SPACING OF SIGNS

A-13 PROPOSED OPTION 3 - DETOUR

Attachment A-14

Proposed Option 3 – Maintenance of Traffic



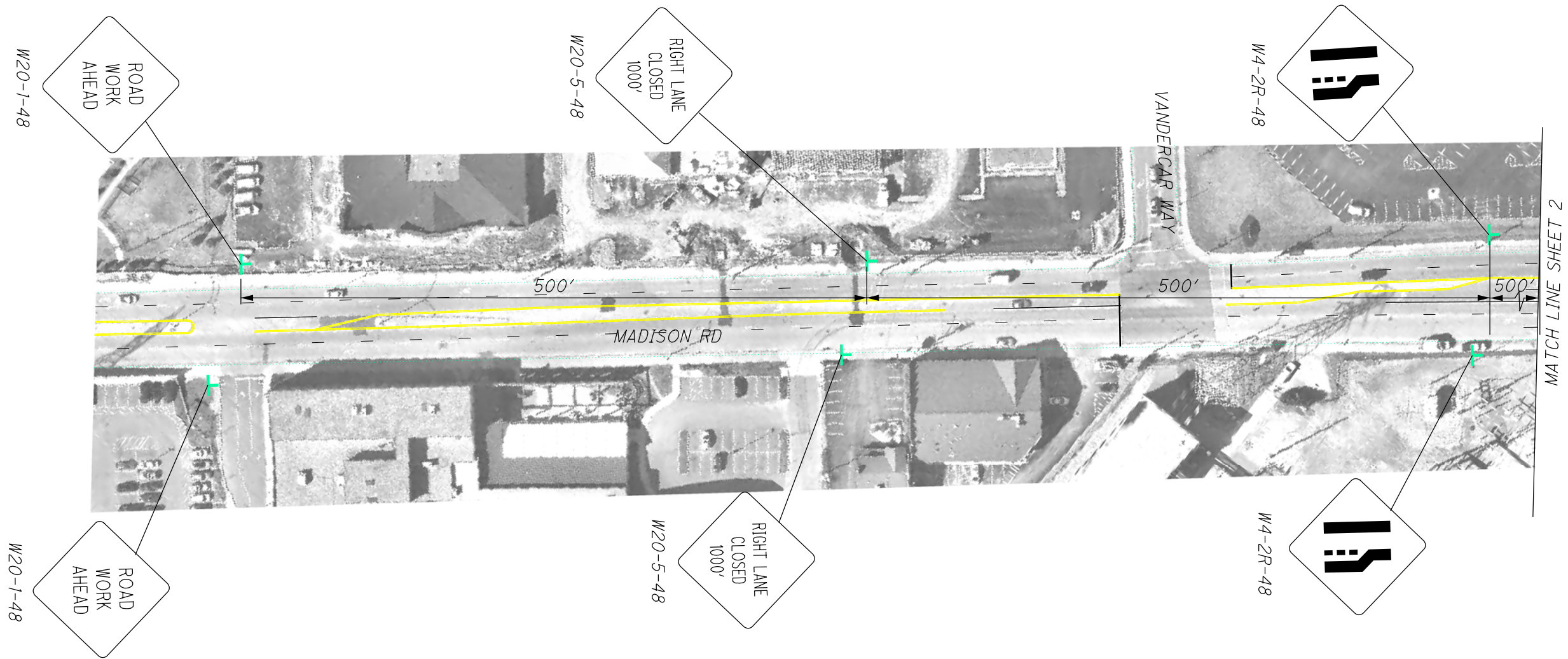
CALCULATED	CDS	CHECKED	CFD
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MAINTENANCE OF TRAFFIC PHASE 1

HAM-MADISON RD

LEGEND

-  SIGN
-  BARREL
-  ARROW BOARD
-  PORTABLE CONCRETE BARRIER (PCB)
-  WORK ZONE

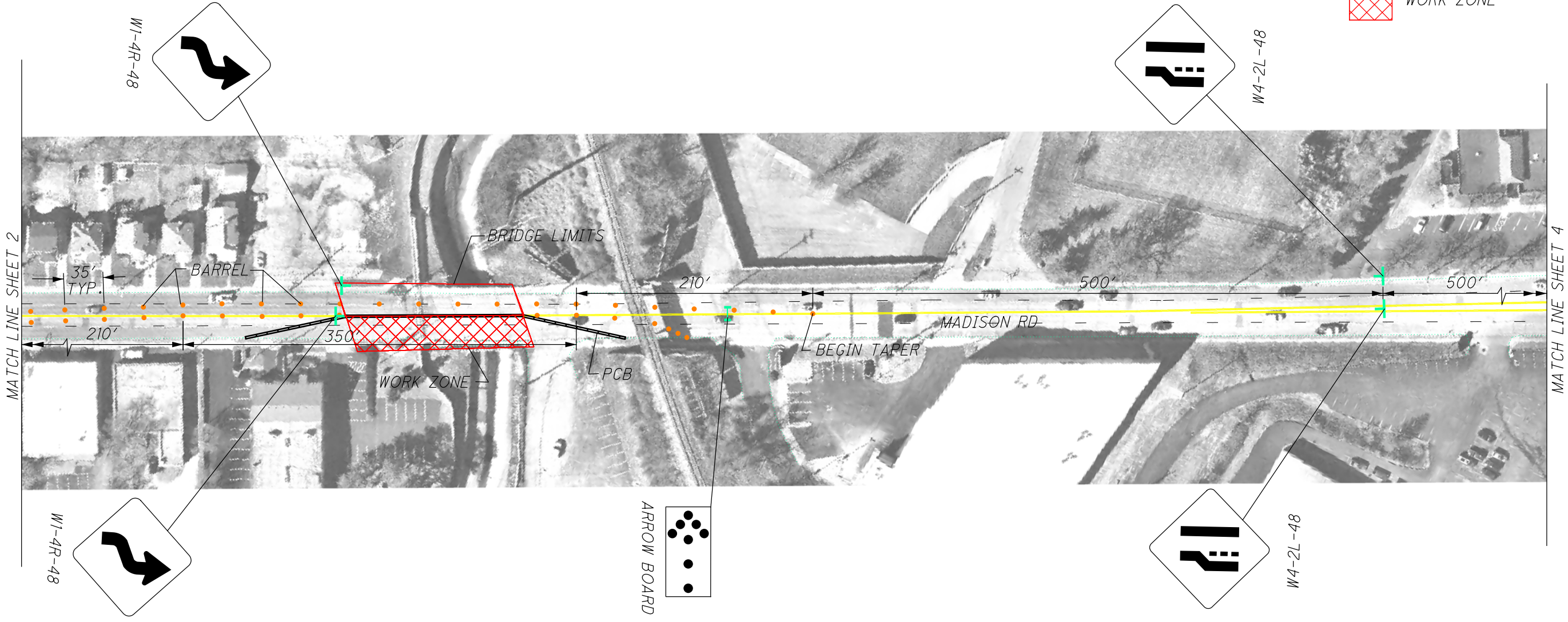




- LEGEND
- SIGN
 - BARREL
 - ARROW BOARD
 - PORTABLE CONCRETE BARRIER (PCB)
 - WORK ZONE



MAINTENANCE OF TRAFFIC
PHASE 1



- LEGEND
- SIGN
 - BARREL
 - ARROW BOARD
 - PORTABLE CONCRETE BARRIER (PCB)
 - WORK ZONE

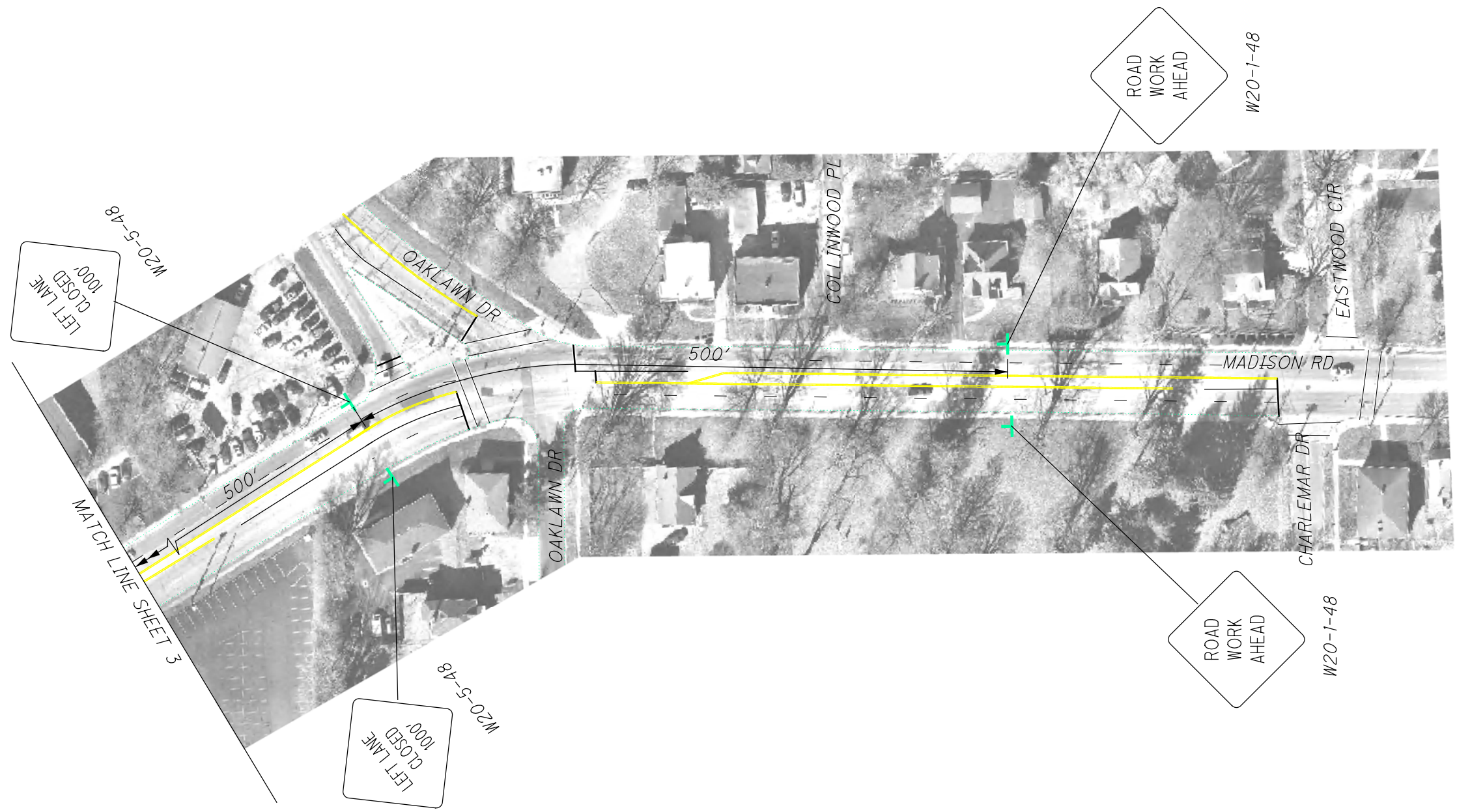
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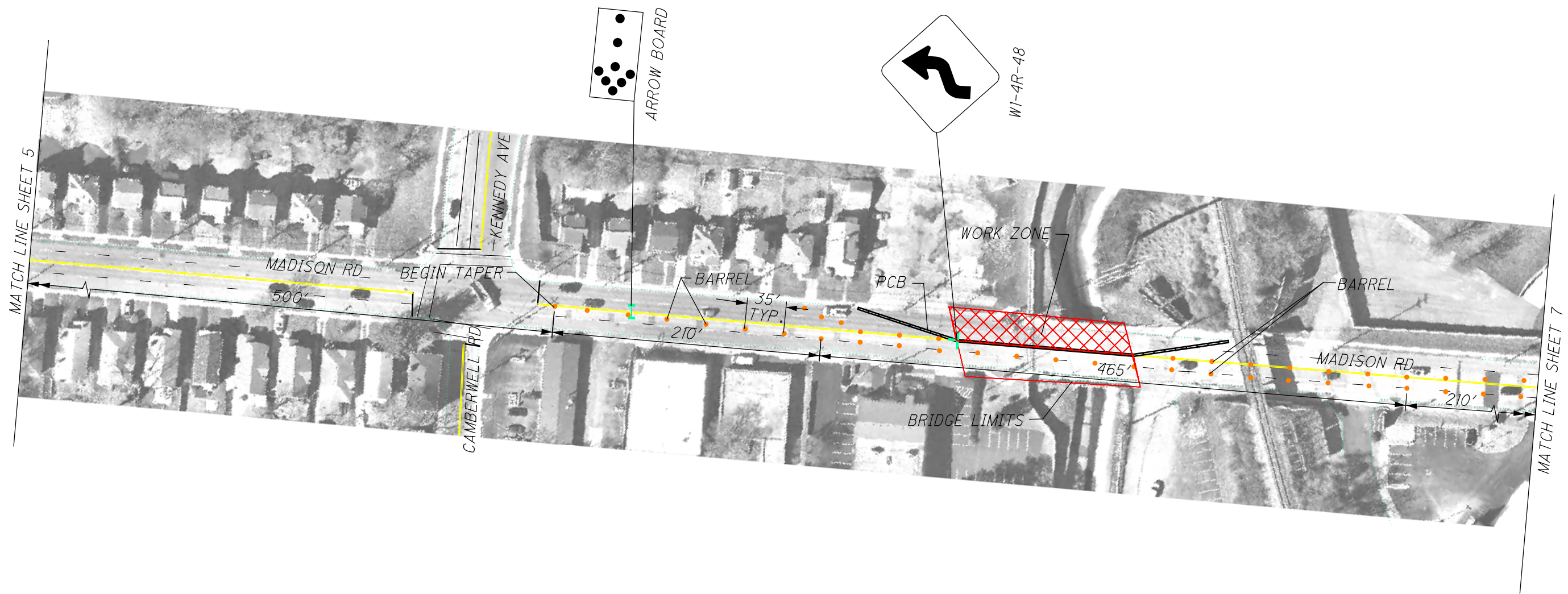
HORIZONTAL SCALE IN FEET

MAINTENANCE OF TRAFFIC
PHASE 1

HAM-MADISON RD



- LEGEND
- SIGN
 - BARREL
 - ARROW BOARD
 - PORTABLE CONCRETE BARRIER (PCB)
 - WORK ZONE



LEGEND

- SIGN
- BARREL
- ARROW BOARD
- PORTABLE CONCRETE BARRIER (PCB)
- WORK ZONE

CALCULATED

CDS

CHECKED

CFD

0

25

50

100

HORIZONTAL SCALE IN FEET

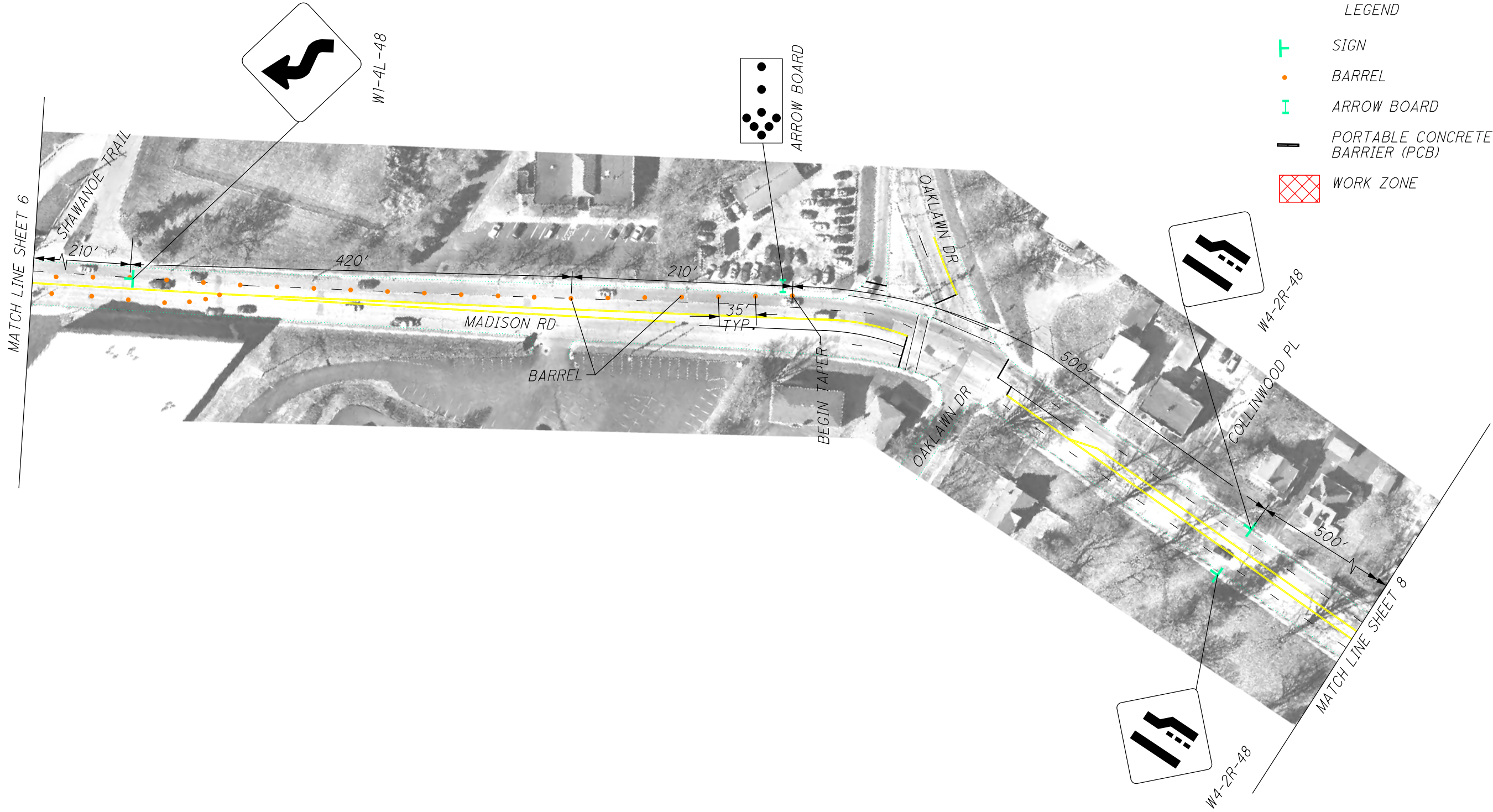
MAINTENANCE OF TRAFFIC
PHASE 2

8

0

HAM-MADISON RD

○ ○ ○ ○ ○

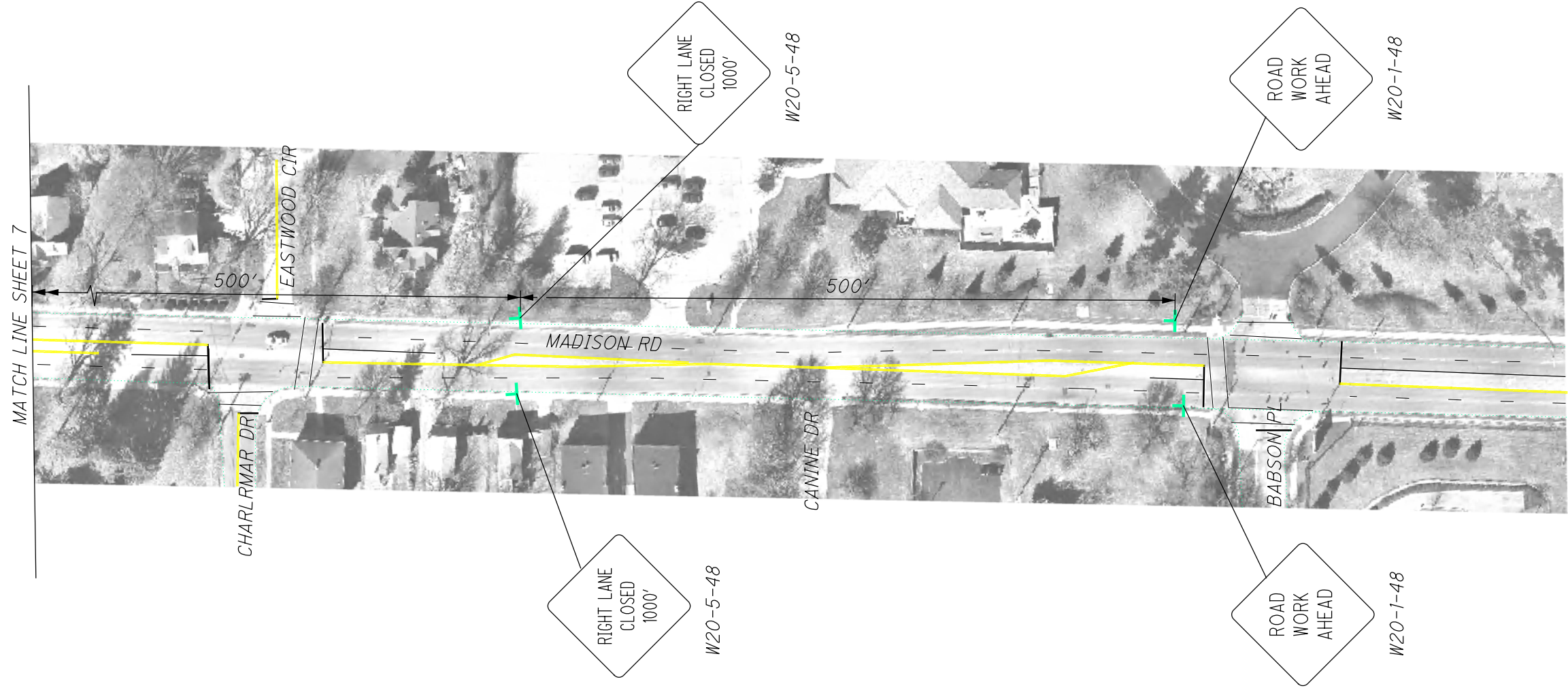


**MAINTENANCE OF TRAFFIC
PHASE 2**

HAM-MADISON RD

CALCULATED
CDS
CHECKED
CFD





LEGEND

-  SIGN
-  BARREL
-  ARROW BOARD
-  PORTABLE CONCRETE BARRIER (PCB)
-  WORK ZONE



MAINTENANCE OF TRAFFIC
PHASE 2

Attachment A-15

Proposed Option 3 Bridge – Cost Summary

Attachment 15
Proposed Option 3 Bridge
Cost Summary

Item No.	Description	Unit	Quantity	Unit Cost	Extension
	ROADWAY				
201	CLEARING AND GRUBBING	LS	1	\$10,000	\$10,000
202	APPROACH SLAB REMOVED	SY	190	\$50	\$9,500
202	PAVEMENT REMOVED	SY	520	\$15	\$7,800
202	WALK REMOVED	SF	900	\$5	\$4,500
202	CURB REMOVED	FT	250	\$10	\$2,500
202	PIPE REMOVED, 24" AND UNDER	FT	100	\$15	\$1,500
202	GUARDRAIL REMOVED	FT	100	\$5	\$500
203	EXCAVATION	CY	3000	\$20	\$60,000
203	EMBANKMENT	CY	500	\$20	\$10,000
606	GUARDRAIL, TYPE 5	FT	100	\$20	\$2,000
606	ANCHOR ASSEMBLY, TYPE A	EACH	4	\$1,000	\$4,000
608	4" CONCRETE WALK	SF	120	\$20	\$2,400
609	CURB, TYPE 6	FT	30	\$40	\$1,200
611	12" CONDUIT, TYPE B	FT	50	\$65	\$3,250
	PAVEMENT				
301	ASPHALT CONCRETE BASE, PG64-22	CY	35	\$375	\$13,125
304	AGGREGATE BASE	CY	35	\$85	\$2,975
441	ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE 1, (448)	CY	12	\$450	\$5,400
441	ASPHALT CONCRETE SURFACE COURSE, TYPE 1, (448), PG64-22	CY	8	\$450	\$3,600
	BRIDGE				
202	BRIDGE REMOVED	LS	1	\$10,000	\$10,000
503	COFFERDAMS AND EXCAVATION BRACING	LS	1	\$10,000	\$10,000
503	UNCLASSIFIED EXCAVATION	CY	160	\$85	\$13,600
505	PILE DRIVING EQUIPMENT MOBILIZATION	LS	1	\$15,000	\$15,000
507	14" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN	FT	1200	\$20	\$24,000
507	14" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED	FT	1200	\$50	\$60,000
507	16" CAST-IN-PLACE REINFORCED CONCRETE PILES, DRIVEN	FT	1200	\$20	\$24,000
507	16" CAST-IN-PLACE REINFORCED CONCRETE PILES, FURNISHED	FT	1200	\$60	\$72,000
509	EPOXY COATED REINFORCING STEEL	LB	115000	\$1	\$115,000
511	CLASS QC2 CONCRETE, SUPERSTRUCTURE	CY	550	\$900	\$495,000
511	CLASS QC1 CONCRETE, PIER CAP	CY	35	\$1,200	\$42,000
511	CLASS QC1 CONCRETE, ABUTMENT	CY	80	\$1,000	\$80,000
512	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)	SY	455	\$25	\$11,375
517	RAILING (CONCRETE PARAPET WITH TWIN STEEL TUBE RAILING)	FT	240	\$200	\$48,000
518	POROUS BACKFILL	CY	65	\$85	\$5,525
518	6" PERFORATED CORRUGATED PLASTIC PIPE	FT	140	\$15	\$2,100
518	6" NON-PERFORATED PERFORATED CORRUGATED PLASTIC PIPE, INCLUDING SPECIALS	FT	30	\$10	\$300
526	REINFORCED CONCRETE APPROACH SLABS (T=12')	SY	190	\$175	\$33,250
526	TYPE A INSTALLATION	FT	30	\$150	\$4,500

Attachment 15
Proposed Option 3 Bridge
Cost Summary

Item No.	Description	Unit	Quantity	Unit Cost	Extension
	UTILITIES				
SPCL	SANITARY SEWER	LS	1	\$10,000	\$10,000
SPCL	GAS	LS	1	\$20,000	\$20,000
SPCL	WATER	LS	1	\$10,000	\$10,000
	FLOOD CONTROL SYSTEM				
202	REMOVE FLOOD WALLS	LS	1	\$20,000	\$20,000
202	REMOVE CHANNEL LINING	LS	1	\$10,000	\$10,000
202	REMOVE TRAFFIC CONTROL GATES	LS	1	\$2,000	\$2,000
SPCL	FLOOD WALLS	CY	200	\$1,000	\$200,000
SPCL	CHANNEL LINING	SY	3000	\$50	\$150,000
	MISCELLANEOUS				
614	MAINTAINING TRAFFIC	LS	1	\$10,000	\$10,000
623	CONSTRUCTION LAYOUT STAKES AND SURVEYING	LS	1	\$3,000	\$3,000
624	MOBILIZATION	LS	1	\$5,000	\$5,000
Sub-Total =					\$1,649,900
15% Design Fee =					\$247,485
Sub-Total =					\$1,897,385
25% Contingency =					\$474,346
Total =					\$2,371,731

Attachment A-16

Existing Cross-Arm Controller Investigation

MADISON ROAD FLOOD GATE STUDY



NOVEMBER 2020



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3.2 Option 2 - Active Cooling Installation	5
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1. Executive Summary

Motz Engineering was engaged by Daniel Lindsay with Shrewsberry and Associates to evaluate the existing conditions of the cross-arm controllers at the Madison Road Flood Gate. The city has a recurring problem where the power supply fails, and the cross-arm closes on its own. This closure requires City personnel to be dispatched to the flood gates, manually raise the cross-arm, and secure it in its raised position. This also requires an electrician be sent to replace the failed power supply. Our report is intended to illustrate the existing conditions found from field observations and provide recommendations to address this recurring problem.

While on-site, the root problem identified was dirt and moisture infiltration into the control enclosure caused by a lack of filter media installed over the fan inlet. Motz recommends mitigating this infiltration by one of two options:

- Option 1 – Installation of ventilation grills, with filters, in the sides of the enclosures and reversing the fan in the bottom of the enclosure. This will draw filtered air in through the new side ventilation grills, through the enclosure and force it out the bottom.
- Option 2 – Installation of a complete cooling package on the side of the enclosure and removing the existing fan. This will eliminate the dirt infiltration and reduce the humidity in the enclosure.

Each option will address the failure issue in different ways. While Option 2 would address all the issues in the panels, it is approximately 2 to 3 times the cost of Option 1. This is due to the full cooling, the sealing of the enclosure, and the additional power requirements to power the cooling equipment. Option 1 provides a cleaner panel interior at a much lower cost, and the dirt infiltration seems to be the major driver with the power supply failures. It is our recommendation that the city proceed with option 1 and modify the panels accordingly.



2. Observation of the Existing Conditions

General

The four (4) flood gate cross arms and associated controllers are located in the 3700 block of Madison Avenue and were installed in the fall of 2007. Two are located on the south side of the creek crossing and two located on the north side, north of the elevated train bridge. The cross-arms work in conjunction with the flood gate itself to indicate the road is closed prior to the flood gate closing and blocking the road. Both the cross-arms and the flood gate are controlled via a controller located in a utility house on the south side of the creek.

Electrical

Under normal operations, the cross arm is held open by a “gate motor” mounted above the controller. When the controller receives a signal from the utility house, power is removed from the gate motor and the cross-arm lowers into position. The cross-arm controller has four (4) DIN rail mounted power supplies serving the various system components of the arm. When any single power supply fails, the system fails safe which causes the cross-arm to close.

During a site visit on October 27th, 2020, it was noted that the inside of the enclosure had dirt and debris located in the bottom and had surface rust developing on the backplane. (see Appendix A for photos of equipment) It was noted that the fan installed in the bottom of the enclosure is orientated to draw air from the outside to the inside of the enclosure and the air being drawn in is not filtered or conditioned in anyway. Rahn Wuest, with City of Cincinnati, indicated that the other 3 control boxes were installed the same manor and are in similar conditions with debris in the control box and rust developing in the panel.

The power supplies were noted to have dirt accumulating on the ventilation slots which indicates that the internal components of the power supplies are becoming very dirty.



3. Options

3.1 Option 1 – Fan Modification / Filter Installation

Motz recommends inverting the existing fan in the bottom of the enclosure so that air will be pulled from the enclosure versus pushing outdoor air directly into the enclosure. Ventilation slots with a weather hood should also be cut into the side of the enclosures with filters installed over the openings. This will improve airflow through the enclosure and help keep out dirt and debris. However, this option will not prevent the ingress of water which has led to rust problems in the enclosures.

3.2 Option 2 - Active Cooling Installation

A second option is to install an active cooling solution on to the side of the control enclosures in addition to filtering the air. This would require mounting a small AC unit to the side to provide closed cycle cooling for the enclosure. For this option, the existing fan in the bottom of the enclosure would be removed and the opening sealed. A small AC unit, like a Hoffman T-Series Compact Outdoor unit, would be installed on the side of the enclosure to provide closed cycle cooling. This option would provide protection from both dirt/debris infiltration and control the humidity inside the enclosure. However, this option would be about 3 times the cost of Option 1 and may require additional power be provided to each gate arm.



Appendix A: Sample Enclosure Photographs

Photo 1: Panel interior showing rust and dirt accumulation in the bottom of the enclosure.

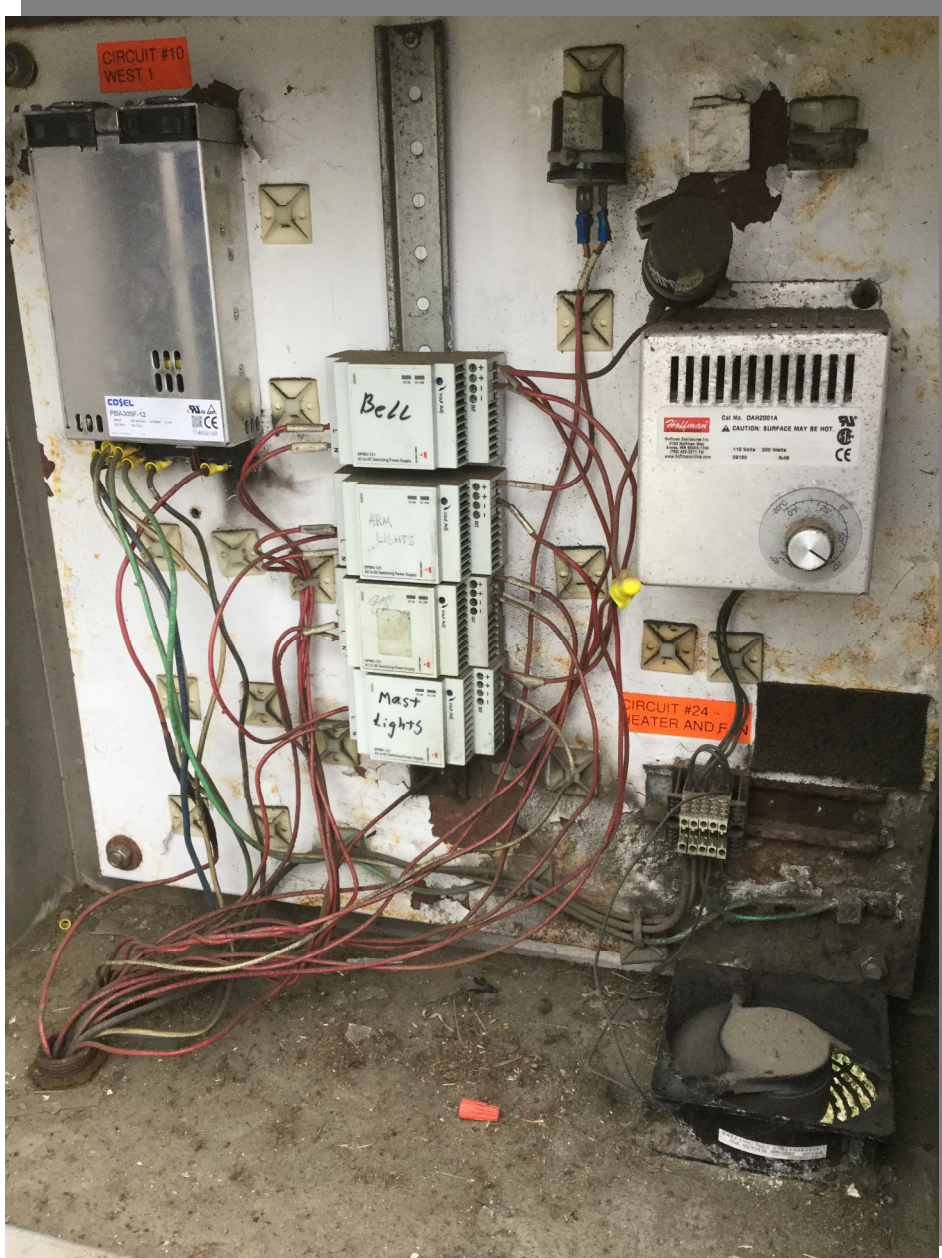


Photo 2: Panel interior showing the dirt accumulating on the power supplies. Specifically, the bottom two power supplies.

