

ILLINOIS STATE TOLL HIGHWAY AUTHORITY



2700 Ogden Ave., Downers Grove, IL 60515

VOLUME 1 PART 1
CONCEPT DRAINAGE REPORT
FOR
CENTRAL TRI-STATE TOLLWAY (I-294)
ROADWAY STUDY

95TH STREET (M.P. 17.5) TO
CERMAK ROAD (M.P. 29.5)
CONTRACT RR-14-4223

PREPARED BY: Exp / TranSystems / SE3 TEAM
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Volume 7A

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1 EXECUTIVE SUMMARY

This roadway study is part of a larger corridor study to reconstruct and widen the Central Tri-State Tollway (I-294) from 95th Street to Balmoral Avenue. This study is located along I-294 from North of the 95th Street Interchange (milepost 17.5) to north of the Cermak Road Interchange (milepost 29.9) in Cook County, IL and bordering DuPage County for a portion between 31st Street and Cermak Road. There are two omissions in this study between milepost 20.4 and milepost 22.7 where the Mile-Long Bridge (MLB) is being studied under contract RR-14-4221, and at the BNSF Railroad Crossing near milepost 26.7 that is included in contract RR-14-4222. This roadway is located within many Chicago suburban municipalities including Bridgeview, Countryside, Hickory Hills, Hinsdale, Hodgkins, Indian Head Park, and Willow Springs. It also shares a border with Burr Ridge, Oak Brook, and Western Springs.

This project is located within five watersheds: The southern project limit at 95th Street to Roberts Road drains to the Lucas Diversion Ditch, Roberts Road to the southern limit of the MLB exclusion drains to the Illinois and Michigan (I & M) Canal, the northern limit of the MLB exclusion to Willow Springs Road drains to the Des Plaines River, Willow Spring Road to just south of Ogden Avenue drains to Flagg Creek, and Ogden Avenue to the northern project limit just north of Cermak Road drains to Salt Creek. The first two watersheds (Lucas Diversion Ditch and I&M Canal) are part of the Calumet-Sag Channel watershed and the remaining watersheds are all part of the Lower Des Plaines River watershed.

There are two mainline bridge crossings over the Flagg Creek floodplain and one mainline bridge over the Salt Creek floodplain. There are also twenty-one major culvert crossings, twelve of which are affected by floodplain and/or Waters of the US (WOUS).

Between the two Flagg Creek bridge crossings, the creek floodplain parallels northbound I-294 in close proximity for approximately 3000 feet. Both Flagg Creek and Salt Creek have mapped FEMA floodplains. For the majority of the project site, Flagg Creek is Zone AE floodplain with elevations determined and a designated floodway. However, the detailed study stops just downstream of the northern I-294 crossing, and the floodplain through this crossing and upstream of it is unnumbered Zone A floodplain with no defined floodway. Salt Creek is Zone AE floodplain with elevations determined and a designated floodway in DuPage County, just upstream of the I-294 crossing. However, Cook County which includes the crossing and downstream of that is unnumbered Zone A floodplain with no defined floodway.

There are two major stormwater management facilities along the Central Tri-State Tollway corridor within the project limits. The Central Detention Pond is located just north of 95th Street, east of the I-294 and west of Indiana Harbor Belt Railroad. Hickory Hills Reservoir is bounded generally by 87th Street on the south, 83rd Avenue on the west, and the Central Tri-State Tollway on the northeast.

The existing I-294 roadway drainage system consists of both open and closed drainage infrastructure that convey roadway storm water runoff. There is a system of drainage structures

along the center of the median that collect runoff from the median shoulder and inside lane. This median drainage system outlets to a system of open roadside ditches and closed drainage storm sewer on the outside of the interstate. The outside lanes and shoulder sheet flow to the roadside ditches in open drainage areas and to drainage structures and storm sewer in sections where gutter is present.

The recommended roadway Alternative 8R includes pavement reconstruction and widening in both directions and new shoulders. A concrete barrier median will be constructed throughout the project length. Existing storm sewers and drainage infrastructure within the pavement reconstruction limits will be removed and replaced with new infrastructure designed to meet current Tollway design standards. Existing drainage infrastructure in rehabilitated sections will be improved as needed to address identified drainage issues. Existing storm sewers to remain in place are to be televised and their condition evaluated for further use in Phase II.

Runoff from the median on the roadway tangent sections will flow to median drainage structures and a median storm sewer system which will outlet to outside drainage ditches or storm sewers. Runoff from the outside travel lanes will drain into the roadside ditches or the closed drainage system. For areas with proposed retaining walls, noise walls, cut sections with backslopes, or areas with steep front slopes, the proposed roadway typical cross section will utilize a gutter unless sheet flow is feasible for drainage of the outside lanes.

Major cross culverts are proposed to be rehabilitated and extended or replaced when deemed hydraulically and/or structurally necessary. Minor culvert crossings will be removed and, at approximately the same locations, new culverts will be installed.

The existing drainage patterns are maintained and the existing outlets are utilized in the proposed conditions as much as possible. The volume of detention provided for Tollway runoff will maintain the existing detention volume provided, and add volume as required for new impervious surface. Infrastructure to improve water quality is also proposed to be provided, and compensatory storage volume is being provided for all fills within the Flagg Creek and Salt Creek floodplains. Regional opportunities to provide additional detention benefitting adjacent communities have been identified.

2 EXISTING DRAINAGE CONDITIONS

2.1 GENERAL LOCATION DRAINAGE MAP

Please see Appendix A, Section 5.1 for the General Location Drainage Map.

2.2 EXISTING DRAINAGE PLANS

The existing I-294 roadway drainage system consists of both open and closed drainage infrastructure that convey roadway storm water runoff. There is a system of drainage structures along the center of the median that collect runoff from the median shoulder and inside lane. This median drainage system outlets to a system of open roadside ditches and closed drainage storm sewer on the outside of the interstate. The outside lanes and shoulder sheet flow to the roadside ditches in open drainage areas and to drainage structures and storm sewer in sections where gutter is present.

Within this roadway study, there are 44 existing outlets. These outlet to five major watersheds: The southern project limit at 95th Street to Roberts Road drains to the Lucas Diversion Ditch (milepost 17.5 to 18.7), Roberts Road to the southern limit of the Mile Long Bridge (MLB) exclusion drains to the Illinois and Michigan (I & M) Canal (milepost 18.7 to 20.7), the northern limit of the MLB exclusion to Willow Springs Road drains to the Des Plaines River (milepost 22.2 to 23.1), Willow Spring Road to just south of Ogden Avenue drains to Flag Creek (milepost 23.1 to 27.5), and Ogden Avenue to the northern project limit just north of Cermak Road drains to Salt Creek (milepost 27.5 to 29.9). The first two watersheds (Lucas Diversion Ditch and I&M Canal) are part of the Calumet-Sag Channel watershed and the remaining watersheds are all part of the Lower Des Plaines River watershed. The existing drainage patterns and existing outlets will be maintained as much as possible.

The five major tributary areas and the 44 outlets were delineated based on the contours and information generated from LIDAR survey performed for this project and provided by the Tollway, site specific survey performed for this contract, Cook and DuPage contours provided by the Tollway, and USGS Mapping including the Hydrologic Atlases.

There are two major stormwater management facilities along the Central Tri-State Tollway corridor within the project limits. The Central Detention Pond (CDP) is located just north of 95th Street, east of the I-294 and west of Indiana Harbor Belt Railroad. The CDP has a storage volume of 40.1 acre-feet and a total tributary area of 241 acres. Hickory Hills Reservoir (HHR) is bounded generally by 87th Street on the south, 83rd Avenue on the west, and the Central Tri-State Tollway on the northeast. The HHR has a storage volume of 203 acre-feet.

Starting at the smallest catchment areas, the existing sub-divide areas are identified with a dash and number suffix following the outlet name (19A-01, 19A-02, etc.). These areas are

combined in the outlets. The outlets are named by the milepost of the outlet location (e.g., 19A).

Existing stormwater detention is provided in ponds (most commonly located in the infield areas of interchanges), in oversized underground storm sewers, and in oversized ditch systems with control structures to mitigate the release rate. The existing stormwater detention locations are shown on the Existing Drainage Plans (EDP).

The Central Tri-State Tollway consists exclusively of closed median drainage for the inside lane and shoulder. The outside lanes and shoulder sheet flow to the roadside ditches in open drainage areas and to drainage structures and storm sewer in sections where gutter is present. Open ditch locations are summarized in Table 1.

Table 1: Existing Ditch Locations

Start Station	End Station	Alignment	Offset	Description
977+00	1008+00	PR I-294	LT	Roadway Ditch
977+00	988+00	PR I-294	RT	Roadway Ditch
994+00	998+20	PR I-294	RT	Roadway Ditch
1004+50	1009+00	PR I-294	RT	Roadway Ditch
1202+00	1022+00	PR I-294	RT	Roadway Ditch
1026+00	1036+50	PR I-294	RT	Roadway Ditch
51+50	62+00	RAMP E	RT	NB Archer Entrance Ramp to SB I-294
1072+50	1075+00	PR I-294	LT	Roadway Ditch
107+00	113+00	NB Archer Ave	RT	NB Archer Ave (IL 171)
33+50	36+00	RAMP D	RT	Entrance Ramp to SB I-294
31+00	35+00	RAMP D	LT	Entrance Ramp to SB I-294
217+50	224+50	SB Archer Ave Ramp	LT	SB Archer Ave Ramp
1083+50	1095+00	PR I-294	LT	Roadway Ditch
108+00	111+00	Ramp A	LT	SB I-294 to Hodgkins
1178+50	1192+50	PR I-294	LT	Roadway Ditch
1176+50	1191+50	PR I-294	RT	Roadway Ditch
56+00	59+00	5th Ave	LT	5th Ave Cut-Off, North to South
56+00	59+00	5th Ave	RT	5th Ave Cut-Off, North to South
500+50	507+00	Ramp A	RT	From NB I-294
506+50	510+50	Ramp A	LT	From NB I-294
1201+00	1205+00	PR I-294	RT	Roadway Ditch
1207+50	1212+50	PR I-294	RT	Roadway Ditch
1216+50	1224+00	PR I-294	LT	Roadway Ditch
1221+00	1230+00	PR I-294	RT	Roadway Ditch (Ditch Detention)
1229+00	1234+00	PR I-294	LT	Roadway Ditch

Start Station	End Station	Alignment	Offset	Description
1231+00	1235+00	PR I-294	RT	Roadway Ditch
12+50	18+00	RAMP N	LT	NB I-294 Exit to Wolf Rd
15+00	18+00	RAMP N	RT	NB I-294 Exit to Wolf Rd
1236+00	1246+00	PR I-294	LT	Roadway Ditch (Ditch Detention)
1236+00	1246+00	PR I-294	RT	Roadway Ditch (Ditch Detention)
1248+00	1256+00	PR I-294	LT	Roadway Ditch (Ditch Detention)
1248+00	1257+00	PR I-294	RT	Roadway Ditch (Ditch Detention)
1263+03	1271+42	PR I-294	RT	Roadway Ditch
224+00	235+00	Ramp B	RT	SB I-294 Exit Joliet Rd Ditch
29+25	40+00		LT	Ramp A, Joliet Rd to NB I-294 Ditch
1280+10	1290+06		LT	Roadway Ditch
1292+37	1305+55		LT	Roadway Ditch
1297+70	1306+19		RT	Roadway Ditch
1306+48	1313+56		LT	Roadway Ditch
59+57	66+50		RT	Ramp D, Hinsdale Oasis to SB I-294 Ditch
1306+85	1316+43		RT	Roadway Ditch
1318+03	1322+99		RT	Roadway Ditch
1328+00	1338+50		LT	Roadway Ditch (Frontage Road)
1331+05	1345+03		RT	Roadway Ditch
21+36	29+00		RT	Ramp C, SB I-294 to Hinsdale Oasis Ditch
1340+24	1345+35		LT	Roadway Ditch
1347+03	1363+97		LT	Roadway Ditch
1347+41	1398+64		RT	Roadway Ditch
1365+74	1399+32		LT	Roadway Ditch
1400+96	1404+27		RT	Roadway Ditch
1401+44	1405+50		LT	Roadway Ditch
1405+31	1408+82		RT	Roadway Ditch
1406+65	1408+80		LT	Roadway Ditch
1410+83	1445+02		RT	Roadway Ditch
1410+97	1449+29		LT	Roadway Ditch
107+20	118+20		RT	Ramp E, NB I-294 to Odgen Ditch
407+20	409+80		RT	Ramp H, Odgen to SB I-294 Ditch
312+00	318+20		RT	Ramp G, SB I-294 to Ogden Ditch
1470+09	1480+16		RT	Roadway Ditch
1493+25	1534+66		RT	Roadway Ditch
1496+11	1508+24		LT	Roadway Ditch
1510+44	1528+22		LT	Roadway Ditch
1532+02	1541+02		LT	Roadway Ditch
1534+85	1546+14		RT	Roadway Ditch

Start Station	End Station	Alignment	Offset	Description
52+50	64+00		RT	EB I-88 to SB I-294 Ramp Ditch
50+00	53+80		LT	EB I-88 to SB I-294 Ramp Ditch
1548+40	1559+06		RT	Roadway Ditch
1564+05	1565+66		RT	Roadway Ditch

Please see Appendix A Section 5.2 for the Existing Drainage Plans.

2.3 IDENTIFIED DRAINAGE CONCERNS

The following drainage concerns have been identified within or adjacent to our study limits. For those concerns that were identified by the Tollway as Special Issues (SI) an assigned number follows the description. Other drainage concerns were discovered either via public outreach, study of existing conditions, or field investigation. Any of the local concerns that required action by this Study are included in the Identified Drainage Concerns. Reference Appendix B, Section 6.8 for back-up information and any calculations related to these Special Issues.

2.3.1 95th Street Flooding (SI 434)

Water from the Central Detention Pond (CDP) overtops the existing berm at the SW corner of the basin, flows onto the NB I-294 entrance ramp, and then drains down along 95th Street to the east where it causes flooding. The water eventually gets to IDOT Pump Station 25. The purpose of this study is to investigate the existing drainage problem at the CDP and to evaluate proposed alternatives.



Figure 1: 95th Street Flooding

The Tollway originally designed and constructed the CDP for their use in early 90's and then the CDP was later turned over to the jurisdiction of the Village of Bridgeview, where it was expanded to its current size to account for additional runoff from a subdivision located upstream. The original design for the CDP had a higher berm elevation, and a larger restrictor opening than those actually constructed, and it was designed with TP 40 rainfall rather than Bulletin 70 rainfall.

IDOT performed drainage studies as part of their study of the 95th Street and Harlem ave interchange. They evaluated the flooding along 95th Street and the overflow from the CDP to Pump Station 25. There were various alternatives discussed to minimize the overflow from the CDP but the Village was not in favor of raising the berm of the CDP nor increasing the restrictor opening since those actions could result in additional flooding to upstream or downstream areas. The various correspondence between the Tollway, IDOT, Bridgeview, Robinson Engineering (Village's consultant), MACTEC, Harry O. Hefter Associates (HOH) and Mackie consultants is included in Appendix B, Section 6.8.1. This correspondence was provided by the Tollway (GEC Drainage Special Issues) as a part of the data collection.

It was observed during the field visit that the CDP has heavy vegetation growth at the pond bottom and on the side slopes. This heavy vegetation growth results in loss of detention storage.



Figure 2: Heavy Vegetation Growth in the CDP



Figure 3: Overflow Berm Location of CDP Looking West at 95th St WB Entrance Ramp to I-294 NB, 95th St Flooding

As shown on the drainage delineation area exhibit (Appendix B, Section 6.8.1), the area bounded by I-294, 87th Street and Indiana Harbor Belt R.R. Co. drains to a pond (Pond-17C on exhibit) near I-294 MP 17.7. Pond-17C is then connected to the CDP with 2 – 24” x 38” culverts. The remaining area east of Indiana Harbor Belt R.R. Co. (sub basin 17C-04) drains to the CDP through a 72” RCP under the Indiana Harbor Belt R.R. Co. on the NE corner of the CDP. The total area tributary to the CDP is 241 acres. The subbasin curve number (CN) and time of concentration (Tc) computations are also attached in Appendix B, Section 6.8.1.

The existing stage storage table was developed for the Pond-17C and the CDP based on corridor surface and Cook County contours. The existing Pond-17C detention volume at elevation 611.50 is 4.9 acre-ft. The CDP outlet and overflow locations were recently surveyed and the overflow elevation for the CDP was determined to be 608.50. Overtopping occurs at a low point in the berm near the southwest corner of the CDP where the I-294 NB entrance ramp diverges from 95th Street. The existing CDP detention volume at elevation 608.50 is 40.08 acre-ft.

Storm water modeling program XPSWMM was used to perform hydrologic and hydraulic analyses. SCS hydrologic method is used to generate hydrographs and these are routed through the detention ponds. The existing ditches along I-294, Indiana Harbor Belt R.R. Co. and major storm sewers are included in the XPSWMM model. Rainfall values from Bulletin 70 Isohyetals with Huff Distributions are used for this analysis.

The summary of results for the existing conditions are presented in Appendix B, Section 6.8.1. It is found that the CDP overtops onto the I-294 NB entrance ramp during 50- year and 100- year storm events. It is noted that the CDP doesn't overtop during the 10- year storm event, so the CDP begins to overtop for a storm event between 10- year and 50- year in existing conditions.

The Pond-17C (Tollway pond) to which I-294 NB (Tollway) drains does not overtop for the 100- year storm event. The 100- year WSE is 611.46, and the Pond-17C berm elevation is 611.50. However, this doesn't meet the Tollway criteria of minimum 2' freeboard from 100-year WSE to the top of berm in the existing conditions.

Tollway runoff is being detained in the Pond-17C before discharging into the CDP. Therefore, the CDP overtopping is caused by flow from the subdivision (sub basin 17C-04 on the exhibit) northeast of the Indiana Harbor Belt R.R. Co. which drains directly into the CDP.

Please see Section 4.3.1 of the report for the proposed alternatives and recommended solutions to this drainage issue. Please see Appendix B, Section 6.8.1 for additional information on this drainage issue.

2.3.2 Flooding Issues along the Tollway Row in the Village of Justice - Outlets Evaluation (19A, 19D, 19E & 19F)

The Village of Justice reported that they experience flooding all along the Tollway ROW, and especially in the area bounded by the Tollway, 79th St. and Roberts Rd. Most of the flooding is understood to be concentrated at the intersection of 84th Court and 85th Avenue. There is a 36-inch pipe draining from the Tollway that flows into the Tollway ditch and eventually drains into local undersized 12" storm sewer pipe, resulting in flooding at residential properties. The neighborhood street lacks a well-defined stormwater management system. In general, there are flooding concerns all along the Tollway ROW and near noise walls. There is no flooding reported near 79th St and Frontage Rd.



downstream information on the local system was requested from Justice, but no information has been obtained as of this date. The outlet peak flow at the ROW is 53.6 cfs for the 50-year storm event. The inadequate capacity of the downstream 36" CMP to handle flow from outlet 19A results in flooding near the Tollway ROW. The Village of Justice reported flooding problems in this general area. The existing Tollway storm sewer has the capacity to drain the 50-yr design storm, however, the existing storm sewer system will be removed and replaced under the reconstructed pavement in the proposed conditions. The existing storm sewers will remain in place in the plaza omission area where the pavement is not reconstructed. The existing storm sewers to remain are shown and labeled on the Proposed Drainage Plan (PDP). Proposed detention will be provided to accommodate runoff from the additional impervious area for the recommended roadway Alternative 8R and to reduce the release rates at the outlet to improve the conditions downstream. The peak flow at the outlet is reduced to 50.9 cfs in the proposed conditions (from 58.9 cfs in the existing conditions) for the 100-yr storm.

Outlets 19B and 19C drain these areas, 0.88 and 1.12 acres respectively, outside the Tollway pavement in the existing conditions. The drainage areas will remain the same for the recommended alternative 8R in the proposed conditions. There are no proposed improvements in this plaza omission area. The existing system has the capacity to drain the 50-yr storm event and meets the Tollway design criteria. The release rates for outlets 19B and 19C will remain the same in the proposed conditions. There is no specific flooding reported at these outlets, and they are suitable for continued use.

Outlet 19D drains 12.6 acres of upstream area which includes a total existing available detention volume of 1.09 acre-ft (1 acre-ft detention in pond-19D and 0.09 acre-ft of inline detention). However, only a total of 0.56 acre-ft of storage is being utilized in existing conditions during the 100-year storm event based on the XPSWMM model results. The existing storm sewer system has the capacity to drain the 50-yr storm event and meets the Tollway design criteria with one exception. A portion of the storm sewer system that runs along mainline I-294 northbound outside shoulder from Station 1024+00 to Station 1025+00. On this portion of the storm sewer the HGL is within the 2' of structure rim elevations for the 50-yr storm due to back up of inline detention provided in the median storm sewer. The capacity of the downstream 18" local storm sewer is 16.0 cfs but the Tollway release rate at the ROW (outlet) is 19.1 cfs for the 50-yr storm event. The Village of Justice reported flooding problems in this area. Proposed detention will be provided to accommodate runoff from the additional impervious area for the recommended roadway alternative 8R and to reduce the release rate at the outlet to improve the conditions downstream.

Outlet 19E drains 10.2 acres of upstream area which includes a total existing available detention volume of 0.5 acre-ft (0.35 acre-ft detention in pond-19E and 0.15 acre-ft of inline detention). However, only a total of 0.46 acre-ft of storage is being utilized in existing conditions during the 100-year storm event based on the XPSWMM model results. The existing 42" storm sewer system that crosses I-294 at Station 1038+00 is used as inline detention. Due to the 6" restrictor in the median control structure, this storm sewer system

surcharge at the low point on the I-294 southbound outside shoulder (Station 1038+00 LT) during the 50-yr design storm. The existing restrictor information used in the model is based on record plans MIP-87-406. The existing peak flow at the outlet near the Tollway ROW is 28.6 cfs for the 50-year storm and the downstream local pipe is a 12" plastic pipe. The capacity of the 12" local pipe is 2.1 cfs. The downstream local system doesn't have the capacity to handle the flow from upstream resulting in local flooding at the outlet. Justice has reported drainage issues of flooding in this area. In the proposed conditions, the detention will be increased to reduce the peak flow at the outlet. The existing 42" RCP crossing would be replaced to a lower elevation and the additional proposed detention is provided, over what is required, to reduce the release rate at the outlet and improve the conditions downstream. The peak flow rates are reduced more than 50% in the proposed conditions for the 10-yr, 50-yr and 100-yr storm events.

Outlet 19F drains 21.1 acres of upstream area which includes a total existing available detention volume of 1.32 acre-ft (0.7 acre-ft detention pond-19F and 0.62 acre-ft of inline detention). However, only a total of 0.75 acre-ft of storage is being utilized in existing conditions during the 100-year storm event based on the XPSWMM model results. The existing system has the capacity to drain the 50-yr storm event and meets Tollway design criteria. The existing detention pond on the upstream does not fill up based on existing conditions model results and the 60" inline detention that runs along the I-294 northbound outside shoulder is under-utilized due to the previous control structure design (based on record plans MIP-87-406) with overflow weir elevation at half the diameter of the storage pipe (60" RCP). There is no control structure at the outlet, but it's restricted by the pipe size change from 60" to 36" at a structure located at Station 1050+60, 107' RT. However, the existing peak flow at the outlet is 63.7 cfs for the 50-year storm and the downstream local 36" CMP storm sewer has a capacity of 13 cfs. The downstream local storm sewer system doesn't have the capacity to handle the flow from upstream resulting in local flooding at the outlet. The Village of Justice reported flooding problems in this area. See MWRD proposed improvements below to address this issue in this area. The control structure on I-294 northbound outside shoulder 60" storage pipe would be redesigned in the proposed conditions to fully utilize the existing detention storage. There are no changes proposed to existing detention pond-19F on the upstream end. The existing 42" oversized pipe will be removed and a 54" RCP inline detention will be provided along the southbound outside lanes to account for lost existing detention volume and runoff from the added impervious area in the proposed conditions. The proposed peak flows are slightly reduced compared to the existing conditions.

MWRD is preparing a stormwater master plan (2016) for the Roberts Road drainage area, and it is recommended to coordinate I-294 improvements with MWRD and the Village of Justice to address drainage problems all along the Tollway ROW in Justice. The MWRD study proposes to improve the inlet and storm sewer system in general between 79th Street and the Tollway ROW (downstream of the 19 outlets). The MWRD study proposes to replace the existing local 36" pipe with a 60" storm sewer downstream of outlet 19F to improve the capacity of the downstream storm sewer system. However, as part of this CTST corridor study, the proposed peak flows are reduced at all these outlets compared to

the existing peak flows and significant reduction in peak flows were achieved at the outlet 19E. And, once the MWRD improvements (timelines are unknown) are completed, the drainage problems along the Tollway ROW in the Village of Justice would be addressed.

An additional proposed drainage alternative has been added to the Concept Drainage Report for the outlets 19A, 19D and 19E to divert the stormwater runoff from these outlets to Hickory Hills Reservoir. The alternative pros and cons were discussed in Section 4.6 of this report. Phase II DSE will investigate the feasibility of this alternative.

All the outlets 19A, 19B, 19C, 19D, 19E and 19F are suitable for continued use and there would not be any increase in the peak flow to the outlets in the proposed conditions.

The existing conditions at these sensitive outlets are documented with pictures at the end of Appendix B, Section 6.9 – Outlet Evaluation.

Refer to Appendix B, Section 6.9 for calculations and exhibits on these drainage issue.

2.3.3 Drainage Issues Near Archer Avenue (SI 1104)

There was flooding at milepost 20.5 along I-294 NB & SB in August 2014. All SB and NB lanes were flooded and traffic was operating on the shoulder only.

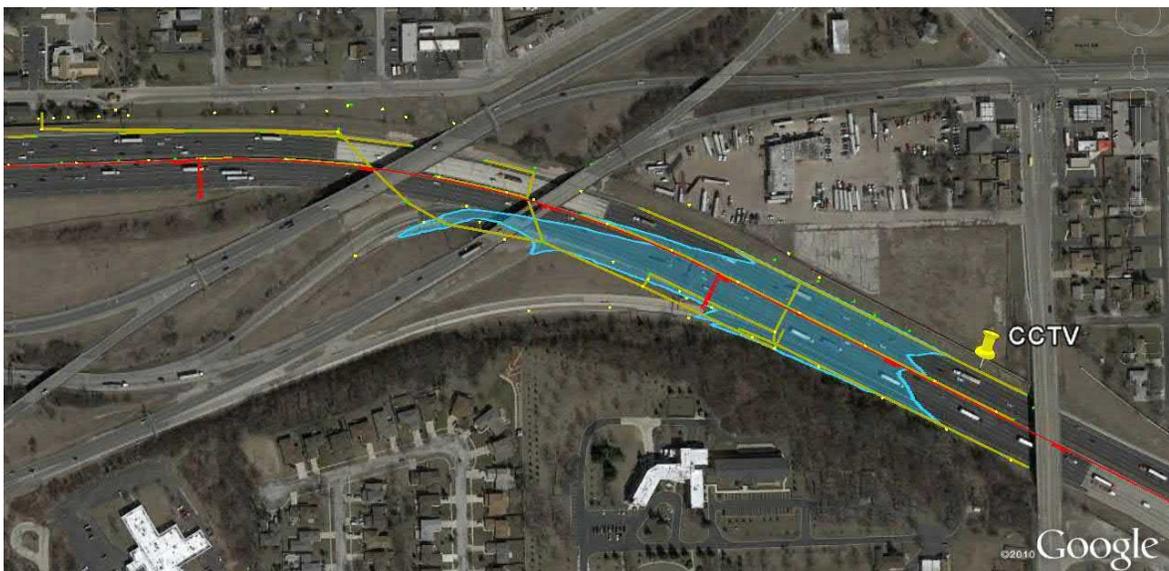


Figure 5: I-294 Flooding Near Archer Ave (Google earth kmz file obtained from GEC)

Existing Drainage Plans (Appendix A, Section 5.2) show the drainage delineation of sub basin 20A and outlet 20A for this area. The Tollway tributary area to the outlet is 53.1 acres and the Tollway station range that drains to the outlet is approximately from Sta. 1050+00 to Sta. 1083+85 (Existing alignment). The trunk outlet storm sewer 48" RCP leaves the Tollway Right-Of-Way (ROW) at 1088+80 RT and runs about 830' north to the Sterling Estates trailer park and then connects to a 36" storm sewer system which runs west

eventually discharging into the I&M Canal. Based on CBBEL (2011) study, “the 36” storm sewer is undersized compared to the capacity of the 48” RCP storm sewer along the tollway. Because the 36” system has many surface inlets throughout the trailer park, the height of the hydraulic grade line (HGL) is limited to the ground surface through the park. Based on the contour mapping, the ground slope will allow surcharge from the 36” storm sewer to run over the surface toward the I&M Canal”.

The existing Tollway storm sewer system contains two locations of inline detention from Sta. 1068+00 to Sta. 1074+80 LT and from Sta. 1057+20 to Sta. 1060+06 RT for a total storage volume of 0.65 Acre-ft.

Storm water modeling program XPSWMM was used for performing hydrologic and hydraulic analyses. Rainfall values from Bulletin 70 Isohyetals with Huff Distributions are used for this analysis. A tail water condition at the 48” RCP outlet was also evaluated to check the upstream storm sewer capacity in the existing and proposed conditions. A tail water elevation of 594.00, which is the ground surface at the end of the 48” RCP, was used as a starting HGL for outlet 20A. This tailwater was considered due to the undersized downstream 36” storm sewer and surcharge of overflow occurs at the ground surface which sheet flows to the I&M Canal.

The existing peak flows for the 48” RCP exiting the Tollway ROW are tabulated in the summary of results for free outfall and tail water condition (TWE = 594.00) for the 2, 50, and 100- year design storms.

The existing storm sewer system has the capacity to handle the 50- year design storm even under tailwater conditions. The existing hydraulic grade line (HGL) is at least 2’ below the rim elevation of the structures for the 50- year design storm. The flooding in 2014 may have been caused due to the presence of silt/debris in the storm sewers resulting in capacity reduction. This storm sewer system was cleaned in October/November of 2014 as part of the Design Contract RR-14-5691 subsequent to the flooding. The full capacity of the storm sewer was restored after removing silt and debris that was present in the pipes and no flooding has been reported since then. All the existing storm sewer system in this area will be replaced and rerouted through the proposed detention basin in the proposed conditions. The proposed storm sewer system is designed based on the recommended roadway Alternative 8R and storm sewer sizing was based on 50- year storm event.

The actual rainfall event for the flooding occurrence was determined as shown below to compare the actual storm event with the design storm. The approximate recurrence interval for the storm on 8/22/2014 is 25- year. The design criteria for the Tollway inlet spacing and storm sewer sizing is the 50- year storm event. As stated in the above paragraph, the existing storm sewers have been sized for the 50- year storm event which is higher than the rainfall event of flooding occurrence.

Table 2: Rainfall Event for the Flooding Occurrence

Official (NWS) Weather Stations	Name	Daily Precipitation (inches)		
		8/22/14	5/11/14	8/26/12
Chicago Midway	KMDW	3.17	0.41	3.66
Chicago O'Hare International	KORD	1.58	0.12	0.57
	Average (inches):	2.38	0.27	2.12
	For shaded location			
	Approx. Storm Duration (hours):	2	3	4
	Approx. Recurrence Interval (years):	25	1	25
Sources: www.wunderground.com Bulletin 70 Rainfall data, ISWS				

Please see Section 4.3.2 of the report for the proposed alternatives and recommended solutions to this drainage issue. Please see Appendix B, Section 6.8.2 for additional information on this drainage issue.

2.3.4 Standing water under the I-294 bridge at Wolf Road

Through community outreach, Cook County has provided information that there was recently standing water under the I-294 bridge at Wolf Road. The cause of flooding at this location is unknown and further investigation will be needed during the design phase.

2.3.5 Outfall Washout, East Bank of Flagg Creek south of Plainfield Rd (SI 807)

Along the east bank of Flagg Creek, a large area of washout was reported beneath the pipe coming from the park, east of Flagg Creek. This issue is occurring outside of the Tollway ROW. The Tollway will need to coordinate this with the Village of Indian Head Park and will evaluate the recommended solutions to repair the undermined revetment blanket in the design phase.

2.3.6 Hinsdale Oasis Flooding (SI 1315)

Unexpected flooding was identified on 9/8/2015 in the ditch located in the grass gore area between northbound I-294 and the northbound exit ramp (Ramp E) to the Hinsdale Oasis at

approximately Sta. 1318+00. No other occurrences of flooding at this location have been logged or identified since this date.

Currently this area is drained by an inlet (Type D-1) with a T-1 frame and grate. This inlet is a part of a storm sewer system that starts with an inlet in the grass gore area between southbound I-294 and the southbound entrance ramp from the Hinsdale Oasis that drains to a 24" storm sewer under the southbound lanes to an inlet in the median. The median inlet accepts a 30" storm sewer that drains from the north along the median. From the median inlet there is a 36" storm sewer that carries the flow under the northbound lanes to the inlet where the flooding was identified in the grass gore area between the northbound I-294 lanes and the northbound exit ramp to the Hinsdale Oasis. From this inlet the system drains to a 36" storm sewer that carries the flow under the northbound Oasis exit ramp and into the ditch. The ditch then drains to a 42" culvert that carries the water northeast to a ditch system that carries the water further north.

At the inlet intended to drain the flooding area the distance from the rim of the inlet to the invert of the 36" sewer is 9.17 feet. The fact that the sewer is so deep and would require over 10 feet of head to build up in order to flood this area we suspect that the flooding may have been caused by the inlet opening being blocked by debris or vegetation or a grate that has insufficient opening area to handle the flow coming to it. Since this sewer system and inlet has been in place since 1992 and no other instances of flooding have occurred other than in 2015, we conclude that the flooding was caused by the inlet being blocked by debris or vegetation. Coordination with the GEC will be performed to monitor and ensure that this inlet is cleaned of debris or cleared of vegetation that may be preventing water from entering the inlet.

Under the preferred alternative the inlets, grading and storm sewer system in this area will be required to be redesigned. Due to the widening, the grading in this area will be significantly different than in existing conditions. As we move toward Advanced Engineering the details of the grading and inlets to be provided in this location will be evaluated. The main sewer in this location was evaluated and the details are provided in the Proposed Drainage Plan see Appendix A, Section 5.6.

Please see Appendix B, Section 6.8.6 for additional information on this drainage issue.



Figure 6: Hinsdale Oasis Flooding

2.3.7 Corroded Culvert Under Creek Drive near M.P. 26.2 (SI 985)

An existing 11.6'W x 7.33'H arch-shape CMP culvert carrying ditch flow under Creek Drive at approximate Sta. 1385+54 (at approximate milepost 26.2, 425 feet east of the Central Tri-State center line) was found to be corroded. A previous recommendation was made to replace this culvert with a new RCP box culvert, then transfer ownership of the culvert to the Village of Western Springs. This culvert is located immediately downstream of I-294 culvert crossing WC 21 and within the regulatory floodplain. The culvert will be replaced with 12' (W) x 6' (H) box culvert. Please refer to Sections 2.6.2.13 and 4.8.2.13 for additional information.



Figure 7: 11.6' (W) x 7.33' (H) Arch CMP Culvert under Creek Drive

2.3.8 Off System Structure and Ditch Just Downstream of Creek Drive (SI 966)

An on-line concrete water control structure was observed in the ditch line just downstream of the Creek Drive culvert, within the Village of Western Springs. Immediately downstream of this concrete structure, significant erosion scour was observed on both sides of the channel, apparently resulting from flow leaving the structure.



Figure 8: Downstream of Concrete Grate Structure



Figure 9: Concrete Grate Structure, downstream of Creek Drive

Additional information on this structure and its intended function was requested from the Village of Western Springs, but the information has not yet been obtained. Once information is received from the Village, further investigation of the structure will be completed and a recommendation for addressing this issue will be provided.

2.3.9 Backyard Drainage Issues from Oak Street to Walnut Street (MP 27 to MP 27.3 East side of I-294) in the Village of Western Springs

James J. Benes and Associates, Inc. the consulting engineers for the Village of Western Springs (Village) stated in a letter to the Tollway dated September 10, 2015 (see letter in Appendix D) that there have been historical drainage issues in the rear residential yards behind an earthen sound berm located behind the Tollway noise wall on the east side of I-294 from Oak Street to Walnut Street (approximately Sta. 1427+00 to 1443+00). The Villages' engineers believe that the lack of ground slope in the area along with a very shallow drainage swale and a lack of a storm sewer along the east side of I-294 is contributing to the very poor drainage in the area. In the letter, the Village requests the consideration of a storm sewer drain in this area that will permit the Village to extend drainage improvements to the residential rear yards. The Village stated that there is a single cross culvert under the earthen sound berm. The existing culvert the Village mentioned has been verified by survey as an 18" RCP culvert that enters the Tollway right of way at approximately Sta. 1433+00.

Based on a review of the existing contours, corridor cross-sections and existing drainage patterns, the highpoint of the Tollway ditch in this area is located at the pedestrian bridge at Maple Street at approximately Sta. 1434+40. The Tollway ditch south of the pedestrian bridge outfalls to a single 6'W x 5'H reinforced concrete box culvert at approximately Sta. 1410+80 (Crossing #23) to the south which then drains west under I-294. The Tollway ditch north of the pedestrian bridge outfalls to a 42" RCP that goes under the northbound I-294 to eastbound Ogden Avenue exit ramp. Due to outfall constraints, the ditches in this area will not be able to be significantly deepened.

The recommendations below, for solving backyard issues in this area, have been provided for information only. Since the backyard flooding issues in this area are not on Tollway right of way, the Tollway will not be the lead agency for fixing these issues. However, the Tollway will be placing a storm sewer along the northbound side of the Tollway that the Village of Western Springs could drain to, as long as a permit is obtained from the Tollway.

South of the pedestrian bridge the drainage issues occurring in the backyards seem to be caused by the lack of defined grading on the east side of the earthen sound berm, which is private property. The 18" culvert under the berm at approximately Sta. 1433+00 is the outlet for the area on the east side of the berm. Currently, the east side of the earthen sound berm is not properly graded to drain to the 18" culvert.

In order to improve the drainage behind the earthen sound berm, south of the pedestrian bridge, it appears there is a need to regrade the swale on the east side of the berm from the pedestrian bridge to the location of the 18" culvert under the berm and also from Walnut Street to the location of the 18" culvert under the berm. This swale will be very flat, approximately 0.4%, however, it would provide positive drainage to the 18" culvert in areas where positive drainage does not currently exist. Near Sta. 1433+00, the 18" culvert under the berm can be extended to direct the flow from the swale on the east side of the berm to the Tollway storm sewer.

North of the pedestrian bridge the drainage on the east side of the earthen sound berm has more defined grading than on the south side of the pedestrian bridge and flows north along the berm towards a low point south of Oak Street.

In order to improve the drainage behind the earthen sound berm, north of the pedestrian bridge, it appears there is a need to regrade a swale on the east side of the berm from the pedestrian bridge to just south of Oak Street. Just south of Oak Street a culvert can be placed under the berm to direct the flow from the swale on the east side of the berm to the Tollway storm sewer.

Please see Appendix B, Section 6.8.9 for additional information on this drainage issue.



Figure 10: Backyard Drainage Issues from Oak Street to Walnut Street

2.3.10 Flooding Near the Southbound to Westbound Ogden Avenue Ramp G (SI 1115)

On April 17-18, 2013, the southbound I-294 to westbound Ogden Avenue exit ramp (Ramp G) was closed due to flooding. Primera-EJM was hired by the Tollway to study the cause of the ramp flooding. Primera-EJM compiled three options to address the ramp flooding for Tollway consideration. They are as follows:

1. Raise the Ramp G Profile
2. Utilizing a check valve to prevent stormwater from backing onto the Tollway from Salt Creek, which would require stormwater detention to be provided within the southwest and northwest loop ramps to detain the 100-year storm with minimal (zero) release rate.
3. No build.

In order to address the flooding at this location, the Tollway decided to go with Option #1 and raised the Ramp G profile for approximately 700 feet, this was completed and verified on 5/12/2015 as per Special Issues Log #1115.

Please see Appendix B, Section 6.8.10 for additional information on this drainage issue.



Figure 11: I-294 and Ramp G (Image obtained from Primera-EJM)



Figure 12: Ogden Avenue Exit Ramp G Shoulder Looking North



Figure 13: Ogden Avenue Exit Ramp G Shoulder Looking South

2.3.11 Flooding upstream of the I-294 Bridge over Salt Creek in the Graue Mill Subdivision located in the Village of Hinsdale within DuPage County.

Due to storm events, on July 23-24th, 2010 and April 17-18th, 2013 severe flooding occurred in the Graue Mill Subdivision located upstream of the I-294 Bridge over Salt Creek Sta. 1492+00 (MP 28.2). The July 2010 storm event produced approximately 6.5 inches of rain over 6 hours. The April 2013 storm event produced peak flood elevations that exceeded the July 2010 storm event by approximately 1 foot.

Further investigation is ongoing regarding how this flooding issue will affect the Central Tri-State Tollway project. Coordination with DuPage County and the Village of Hinsdale regarding this flooding issue is ongoing and more information will be provided in a future submittal.

2.3.12 Erosion of Bridge Cone on North Side of Cermak Road (SI 828)

Erosion of the Cermak Road bridge cone, on the north side of the bridge located along northbound I-294 (east side of I-294) at approximately Sta.1560+50 (MP 29.5), was identified. An attempt was made by the Tollway to fix the erosion issue; however, the erosion control measures put in to place have failed and some erosion still remains. This location will be evaluated during the design phase to see if reestablishing the existing slope and providing additional permanent erosion control measures will prevent future erosion of the slope.

Please see Appendix B, Section 6.8.11 for additional information on this drainage issue.

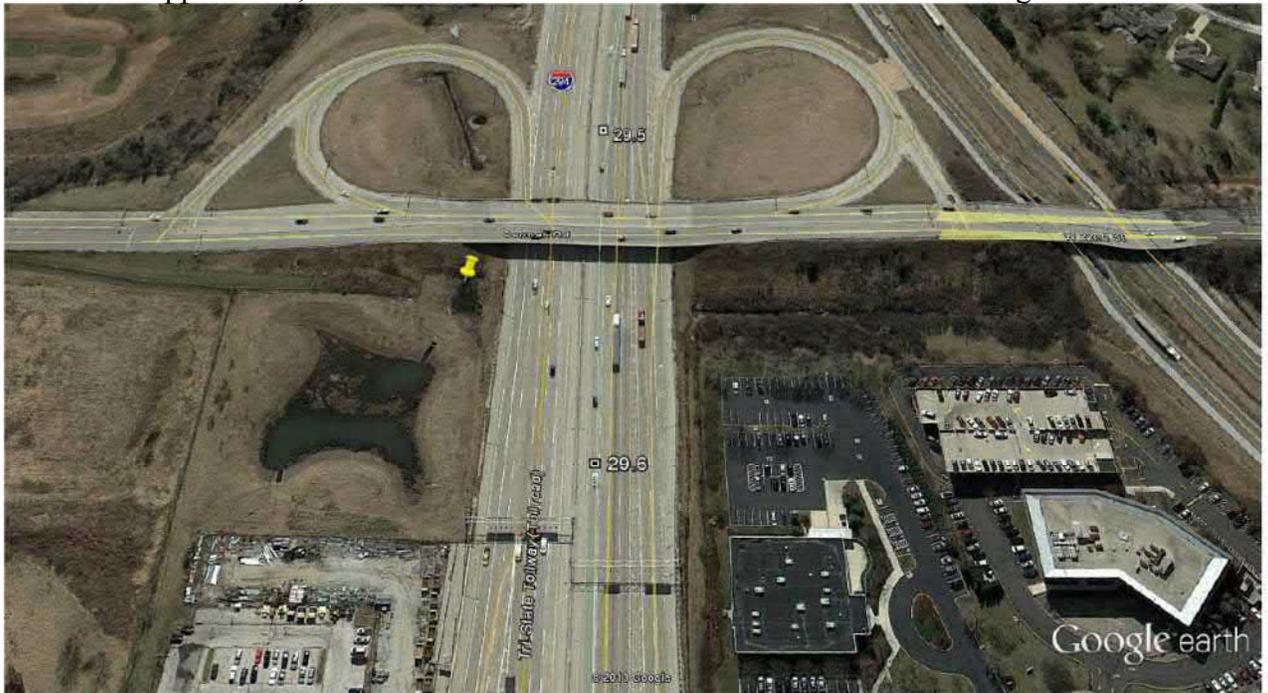


Figure 14: I-294 and Cermak Road Bridge



Figure 15: Erosion of the Cermak Road Bridge along I-294



Figure 16: Erosion of the Cermak Road Bridge along I-294

2.3.13 I-294 and Cermak Road (MP 29.5) Flooding (SI 95)

Severe flooding was reported along I-294 between Cermak Road and 31st Street on the morning of July 24, 2010. There was at least six inches of standing water across all eight lanes of I-294 for 10 hours (3:00 AM to 1:00 PM), with traffic backups several miles long. The adjacent IDOT and local road drainage systems were also reported to have severe flooding during this storm event. Per subsequent field investigations, it was determined that the I-294 mainline and the southbound Cermak exit ramp were completely flooded resulting in up to 32 inches of standing water on the pavement.

The area where this issue exists currently flows south to Salt Creek via an existing 36” to 48” private storm sewer system. The northern project limits for this Master Plan are at the ridge of the divide that is tributary to this area.

The Tollway selected EJM to study the flooding and provide engineering services for the preparation of contract plan documents for Tri-State Tollway (I-294) drainage improvements. The drainage improvements are located along the northbound I-294 ditch between Salt Creek Sta. 1492+00 (MP 28.2) to just south of Cermak Road Sta. 1560+50 (MP 29.5). The existing drainage conditions and proposed improvements were documented in the Technical Memoranda dated March 3, 2014, November 20, 2014, February 2, 2015 and April 28, 2015 (see Appendix D).

There are several factors that contributed to the flooding at the Cermak Road Interchange including upstream land development and the elimination of the overland flow route, which existed prior to the construction of a landfill and golf course adjacent to I-294. The elimination of the overland flow route has forced all flow from the existing 2-60” diameter culverts under the Cermak Road entrance ramp to northbound I-294 (Ramp B) into a private 36” storm sewer system running parallel to the Tollway. The limited capacity of the existing 36” storm sewer system results in excess runoff overflow into the Tollway ditch and onto Tollway pavement during major storm events.

Initial design options to relieve the flooding included combinations of open channel and enclosed conduit flows to convey the surge flows from the undersized private storm sewer system. Unsuccessful efforts to obtain additional right-of-way required for open channel flow presented limited options for flood control resolution. The remaining option of providing an enclosed culvert system to re-route the overflow was selected for development of contract plans. The contract plans were taken to a Pre-Final plan level and were submitted to the Tollway on February 2, 2015 for review and comments. Since then, the project has been placed on hold due to the high cost of project and the issues associated with the relocation of a Nicor gas main. The Tollway master planning activities for the I-294 corridor improvements will now incorporate the design created by EJM and Primera.

The proposed design included in the Drainage Improvements – Cermak Road Pre-Final plans for the Central Tri State Tollway (see Appendix B Section 6.8.12 for the Pre-Final Drainage Plans) created by EJM and Primera consisted of a 9’ wide by 4’ high box culvert beginning south of the Cermak Road entrance ramp to northbound I-294 (Ramp B). This is the location where the existing 2-60” diameter culvert pipes from under the Cermak ramp discharge to the existing 36” to 48” private storm sewer system. The proposed box culvert system conveys the overflow from this location south to the Tollway ditch on the northbound side of I-294 at approximately Sta.1495+00 (RT). The Tollway ditch then conveys the flow south to a proposed 12’W x 3’H box culvert to be placed under the Cook County Forest Preserve bike path that runs beneath the I-294 Bridge over Salt Creek.

At the beginning of the proposed culvert system, the 9' wide by 4' high box culvert runs in a southerly direction underneath the existing I-294 northbound right ditch/embankment and is located within the existing Tollway right-of-way. At approximately Sta. 1534+00, the proposed culvert system moves to be underneath the proposed northbound shoulder and barrier wall. The proposed construction includes connections to the culvert from the detention pond west of I-294 and west of I-88 WB ramp. Near Sta. 1532+00, the proposed box culvert connects to a proposed 54" RCP under I-294 draining water from the Tear Drop Lake subdivision west of I-294 and continues south with a 10' wide by 4' high box culvert.

Just north of 31st Street, the box culvert alignment is in conflict with an existing 36" diameter Nicor gas main, with a 42" steel casing, which runs east-west under the ditch and I-294 pavement. The concrete box culvert was initially selected to allow the drainage conduit to be built to cross above the Nicor gas line. Late in the project, Nicor indicated they would be able to relocate/lower the gas main and that the culvert could be built underneath the existing I-294 shoulder pavement. However, on February 6, 2015, Nicor advised that they would not be able to perform the relocation in 2015 and their relocation design effort had been placed on hold.

From south of 31st Street, the proposed box culvert continues underneath the proposed northbound shoulder and barrier wall and outlets into the I-294 northbound right ditch near Sta. 1495+00. The proposed improvement also involves ditch re-grading for approximately 195' downstream of the proposed box culvert outlet and improvement of the existing outlet at Salt Creek by providing a 12'W x 3'H high box culvert under the existing Cook County Forest Preserve District bike path. Coordination with the Cook County Forest Preserve District regarding the proposed improvements is necessary due to the proposed culvert crossing the bike path.

Please see Appendix B, Section 6.8.12 for additional information on this drainage issue.



Figure 17: Cermak Road Flooding (Image obtained from EJM-Primer)



Figure 18: I-294 NB Flooding (Image obtained from EJM-Primer)



Figure 19: I-294 SB Flooding looking at Cermak Exit Ramp – debris on pavement shows HWL (Photo from EJM- Primera)

2.3.14 Televising Recommendation (SI 1004)

A recommendation was made that the entire closed drainage system along the Central Tri-State corridor be televised in order to identify storm sewers that can remain in service. Televising of portions of the existing drainage system was completed by National Power Rodding in 2010; however, the entire existing storm sewer system was not televised then.

In proposed conditions, the existing drainage system will be upgraded to meet current Tollway design standards and existing storm sewer infrastructure underneath reconstructed pavements will be removed and replaced, with the exception of major Reinforced Concrete Pipe (RCP) culvert crossings where replacement is not warranted and existing storm sewers which are outside the reconstruction limits (plaza omission). Existing storm sewer that will remain must be televised prior to reconstruction, and this televising should be performed under the design contracts for the specific DSE sections as part of final design of these sections. Existing storm sewer to remain are summarized in Table 3.

Table 3: Existing Storm Sewers to Remain

Start Station	End Station	Offset	Pipe Size (inches)	Material	Remarks
929+89	940+30	LT	54	RCP	Televis Ex SS to remain
933+00	940+53	LT	15, 18, 24	RCP	Televis Ex SS to remain
1015+00	1022+05	LT	15	RCP	Televis Ex SS to remain

Start Station	End Station	Offset	Pipe Size (inches)	Material	Remarks
1016+00	1022+80	RT	24, 18 & 15	RCP	Televise Ex SS to remain
1023+00	1031+10	RT	15 & 24	RCP	Televise Ex SS to remain
1024+10	1026+50	LT	15	RCP	Televise Ex SS to remain
1027+50	1029+50	LT	15	RCP	Televise Ex SS to remain
1032+00	1040+00	RT	18, 24 & 36	RCP	Televise Ex SS to remain
1031+10	1042+80	LT	15, 12, 24 & 18	RCP	Televise Ex SS to remain
1041+00	1050+50	RT	60	RCP	Televise Ex SS to remain
1043+10	1050+50	LT	30	RCP	Televise Ex SS to remain
1054+10	1056+10	RT	12	RCP	Televise Ex SS to remain
1433+00	1434+00	RT	18	RCP	Televise Ex SS to remain
1446+00	1447+10	RT	42	RCP	Televise Ex SS to remain
1448+50	1450+00	LT	42	RCP	Televise Ex SS to remain
1452+00	1455+00	LT	42	RCP	Televise Ex SS to remain
1452+00	1455+00	RT	42	RCP	Televise Ex SS to remain
1457+00	1458+75	RT	24,12	RCP	Televise Ex SS to remain
1460+00	1460+50	RT	24	RCP	Televise Ex SS to remain
1457+00	1459+00	LT	15	RCP	Televise Ex SS to remain
1458+50	1463+00	LT	12,18,42,48	RCP	Televise Ex SS to remain
1492+00	1558+00	RT	36,48	RCP	Televise Ex SS to remain
1544+25	1548+00	LT	18, 24	CMP, RCP	Televise Ex SS to remain
1594+50	1553+75	LT	18, 36	RCP	Televise Ex SS to remain

2.4 IDENTIFIED BASE FLOODPLAINS

Please see Appendix A Section 5.3 for floodplain mapping.

2.4.1 Flagg Creek

Flagg Creek begins just north of the BNSF Railroad, west of I-294 Sta. 1407+20 (MP 26.6) and flows generally north to south along the I-294 project limits. The Flagg Creek mainstem floodplain encroaches the Tollway right-of-way in two areas. Firstly, the northern floodplain crosses the Tollway right-of-way north of 47th Street, where floodplain extends from Sta. 1404+30 to Sta. 1413+00. According to FEMA Flood Insurance Rate Map number 17031C0466J (Revised on August 19, 2008), the I-294 Bridge over Flagg Creek and upstream creek area is mapped as Zoned A with no base flood elevation determined. The unsteady HEC-RAS model prepared for the MWRD's *Detailed Watershed Plan (DWP) for the Lower Des Plaines River Watershed*, dated February 28, 2011 was reviewed for additional information on Flagg Creek. It was agreed through coordination with IDNR-OWR that the hydrologic and hydraulic flood elevations information and related modeling included in the DWP will be utilized as the basis of design and permitting analysis of Flagg Creek. Based on the MWRD model, the 100-year floodplain elevation for the face of the upstream and downstream of I-294 Bridge over Flagg Creek is approximately 642.7.

For the southern floodplain encroachment, area near the Flagg Creek Water Reclamation District (FCWRD), the floodplain crosses the Tollway right-of-way from roughly Sta. 1256+75 to Sta. 1258+00. According to FEMA Flood Insurance Rate Map number 17031C0469J (Revised on August 19, 2008), Flagg Creek is mapped Zoned AE with floodway and base flood elevations determined. The FEMA 100-year floodplain elevation for the face of upstream and downstream of I-294 Bridge is approximately 636.1. The MWRD 100-year floodplain elevation is approximately 636.6 (0.5 feet higher).

Within the Project limits, there are two more floodplain encroachments present through the Flagg Creek Tributaries: 63rd St. Ditch and Plainfield Road Ditch. The 63rd St. Ditch crosses I-294, with a flow direction west to east, just south of Hinsdale Oasis Sta 1307+00 (MP 24.7). According to FEMA Flood Insurance Rate Map number 17031C0468J (Revised on August 19, 2008), the Flagg Creek is mapped Zoned AE with floodway and base flood elevations determined. The FEMA 100-year floodplain elevation is approximately 640.0 on both the upstream and downstream ends of the I-294 culvert (triple 15'W x 5'H). The MWRD 100-year floodplain elevation is approximately 639.5 (0.5 feet lower).

The Plainfield Road Ditch crosses I-294, with a flow direction west to east, south of Plainfield Rd approximately Sta. 1279+50 (MP 24.2). According to FEMA Flood Insurance Rate Map number 17031C0468J (Revised on August 19, 2008), the Flagg Creek is mapped Zoned AE with floodway and base flood elevations determined. The FEMA 100-year floodplain elevation is approximately 638.2 on both the upstream and downstream ends of the I-294 culvert (double 10'W x 5'H). The MWRD 100-year floodplain elevation is approximately 638.1.

2.4.2 Salt Creek

Salt Creek's flow direction is from the west side of I-294 to the east side. The Salt Creek floodplain on the west side of I-294 begins at approximately Sta. 1463+00 (approximately MP 27.65), near the southbound I-294 exit ramp (Ramp G) to westbound Ogden Avenue and runs north to approximately Sta. 1498+00 (approximately MP 28.3), which is north of the I-294 bridge over Salt Creek located at approximately Sta. 1492+00 (MP 28.2). The Salt Creek floodplain on the east side of I-294 begins at approximately Sta. 1481+50 (MP 28.0) and runs north along I-294 to the I-294 bridge over Salt Creek at approximately Sta. 1492+00 (MP 28.2). The floodplain on the east side does not extend north beyond the Salt Creek bridge. The floodplain on the west side of I-294, south of the I-294 bridge over Salt Creek, encroaches on to a Tollway easement from approximately Sta. 1463+00 to approximately Sta. 1464+00 near the southbound I-294 exit ramp to westbound Ogden Avenue. The floodplain on the west side also encroaches on Tollway right-of-way from approximately Sta. 1467+00 to the I-294 bridge over Salt Creek. North of the I-294 bridge over Salt Creek, the floodplain on the west side of I-294 encroaches onto Tollway right-of-way from the Salt Creek bridge at approximately Station 1492+00 to approximately Sta. 1498+00. The floodplain on the east side of I-294, south of the I-294 bridge over Salt Creek, encroaches on to the Tollway right-of-way starting at approximately Sta. 1481+50 to approximately Sta. 1485+00 and at the area of the I-294 bridge over Salt Creek. On the east side of I-294, the floodplain does not extend north of the Salt Creek Bridge.

According to FEMA Flood Insurance Rate Map numbers 17043C0609H (dated December 16, 2004) and 17031C0458J (revised August 19, 2008), the area of the Salt Creek floodplain upstream of the I-294 Bridge is mapped as Zone AE with a base flood elevation of approximately 643. The area of the Salt Creek floodplain within the Tollway right-of-way and downstream of the I-294 Bridge is mapped as Zone A with no base flood elevation determined. An existing FEQ model of the Lower Salt Creek Floodplain that was created by DuPage County and will become the FEMA regulatory model near the middle of 2018 or beginning of 2019 and is currently in the mapping stage, (see memo to Reed Panther dated 3/23/17 in Appendix D, Section 8.1 for more information on the modeling and the revision to the FIRM map) will be utilized as the basis for the design and permitting analysis of Salt Creek for this Tollway project. Based on the FEQ model, the 100-year floodplain elevation at the upstream face of the I-294 Bridge over Salt Creek is approximately 642.1. The current regulatory FEMA 100 year floodplain elevation at the upstream face of the I-294 Bridge over Salt Creek is not provided since the I-294 Bridge was not included in the current FEMA model.

2.5 OUTLET EVALUATION

There are 44 outlets within this study. All existing outlets are suitable for continued use, but outlets 19A, 19D, 19E, and 19F are identified as sensitive outlets which drain into the Justice Sewer System along 79th Street where there are community identified flooding issues.

Table 4 provides the drainage outlet number corresponding to the existing drainage plans, outlet location, and brief description. Appendix B, Section 6.9 contains detailed calculations and additional information of all outlets.

Table 4: Existing Outlets

Outlet ID	Station	LT/RT	Outlet Description	Major Outfall	Watershed	Outlet Condition (Sensitive)
17A	929+58	LT	42" RCP leaving Tollway ROW at 76th Ave	Bridgeview, sewer system	Lucas Diversion Ditch Watershed	Suitable for continued use
17C-A	935+64	RT	(2) 24"x38" Elliptical RCP leaving Tollway ROW	Bridgeview, sewer system	Lucas Diversion Ditch Watershed	Suitable for continued use
Suboutlet 18A.1	990+20	RT	36" RCP leaving Tollway ROW at Roberts Rd	Hickory Hills, sewer system	Lucas Diversion Ditch Watershed	Suitable for continued use
Suboutlet 18A.2	989+05	RT				
Suboutlet 18A.3	991+87	LT				
Suboutlet 18A.4	990+43	LT				
19A	1007+20	RT	36" CMP leaving Tollway ROW	Justice, sewer system	79th Street Sewer	Suitable for continued use (Sensitive)
19B	1022+11	RT	12" RCP leaving Tollway ROW at 83rd St	Justice, sewer system	79th Street Sewer	Suitable for continued use (Sensitive)
19C	1025+16	RT	12" RCP leaving Tollway ROW at 83rd St	Justice, sewer system	79th Street Sewer	Suitable for continued use (Sensitive)
19D	1031+00	RT	18" PLP leaving Tollway ROW at 84th Ave	Justice, sewer system	79th Street Sewer	Suitable for continued use (Sensitive)
19E	1036+70	RT	12" PLP leaving Tollway ROW at 82nd St	Justice, sewer system	79th Street Sewer	Suitable for continued use (Sensitive)

Outlet ID	Station	LT/RT	Outlet Description	Major Outfall	Watershed	Outlet Condition (Sensitive)
19F	1050+60	RT	36" CMP leaving Tollway ROW at 81st St	Justice, sewer system	79th Street Sewer	Suitable for continued use (Sensitive)
20A	1088+76	RT	48" RCP leaving Tollway ROW at 79th Street	Justice, sewer system	I&M Canal	Suitable for continued use (Sensitive)
20B (Outletting from contract 4223 limit)	1093+50	RT	54" SS under 79th St	79th Street Sewer System	I&M Canal	Suitable for continued use
20C (Outletting from contract 4223 limit)	1103+40	LT	SB ditch to MLB (RR-14-4221) limits	6'X5.5' RCBC under 79th St to ditch in Sterling trailer park	I&M Canal	Suitable for continued use
20F	1073+03	RT	15" RCP from 79th St connects to 54" SS	79th Street Sewer System	I&M Canal	Suitable for continued use
20G	1084+62	RT	swale drains to 79th St 54" SS	79th Street Sewer System	I&M Canal	Suitable for continued use
20H	1072+15	RT	24" RCP from structure between existing SB Archer and 79th St	Justice Ditch	I&M Canal	Suitable for continued use
Suboutlet 21F.1 (Outletting from contract 4223 limit to Outlet 21F)	1176+62	LT	SB ditch to MLB (RR-14-4221) limits	Outlet 21F - Dual 60" storm sewer outfall south end of the industrial park	Des Plaines River	Suitable for continued use
Suboutlet 21F.2 (Outletting from contract 4223 limit to Outlet 21F)	1176+62	MEDIAN	Median 24" SS to MLB (RR-14-4221) limits	Outlet 21F - Dual 60" storm sewer outfall south end of the industrial park	Des Plaines River	Suitable for continued use

Outlet ID	Station	LT/RT	Outlet Description	Major Outfall	Watershed	Outlet Condition (Sensitive)	
23A	1226+00	LT	36" RCP leaving Tollway ROW at I-294 SB entry ramp from I-55 NB	Flagg Creek	Flagg Creek	Suitable for continued use	
Suboutlet 23B.1	1227+50	RT	NB ditch to Flagg Creek (U/S OF 48" CMP Culvert)	Outlet 23B - Double 5'Hx10'W box culvert leaving Tollway ROW at Wolf Rd		Suitable for continued use	
Suboutlet 23B.2	1231+60	RT	NB ditch to Flagg Creek (U/S OF 54" Culvert)			Suitable for continued use	
Suboutlet 23B.3	1229+60	LT	SB ditch to Flagg Creek (D/S OF 48" CMP Culvert)			Suitable for continued use	
Suboutlet 23B.4	1233+70	LT	SB ditch to Flagg Creek (East of Wolf Rd, South of I-294)			Suitable for continued use	
23C	1239+52	LT	SB ditch to Flagg Creek	Flagg Creek		Suitable for continued use	
23D	1255+70	LT	SB ditch to Flagg Creek	Flagg Creek		Suitable for continued use	
23E	1257+50	RT	NB ditch to Flagg Creek	Flagg Creek		Suitable for continued use	
23F	1257+60	LT	Ditch flowing South into Flagg Creek	Flagg Creek		Flagg Creek	Suitable for continued use
24A	1276+00	RT	12" RCP to paved ditch into Flagg Creek	Flagg Creek		Flagg Creek	Suitable for continued use
24B	1279+00	RT	Double 10'x5' box culvert to Flagg Creek	Flagg Creek	Flagg Creek	Suitable for continued use	
24C	1290+00	RT	15" RCP into Flagg Creek	Flagg Creek	Flagg Creek	Suitable for continued use	
24D	1297+00	RT	Ditch flowing South into Flagg Creek	Flagg Creek	Flagg Creek	Suitable for continued use	

Outlet ID	Station	LT/RT	Outlet Description	Major Outfall	Watershed	Outlet Condition (Sensitive)
25A	1338+00	RT	7'x5' box culvert into Flagg Creek	Flagg Creek	Flagg Creek	Suitable for continued use
25B/D	1353+00	RT	15" RCP leaving Tollway ROW (Tollway runoff will be re-routed to outlet 25D in proposed conditions)	Flagg Creek	Flagg Creek	Suitable for continued use (Sensitive)
25C	1367+00	RT	15" RCP leaving Tollway ROW (Tollway runoff will be re-routed to Outlet 26A in proposed conditions)	Flagg Creek	Flagg Creek	Suitable for continued use (Sensitive)
26A	1386+00	RT	8'x8' RCBC leaving Tollway ROW	Flagg Creek	Flagg Creek	Suitable for continued use
26B	1404+00	RT	Ditch flowing North into Flagg Creek	Flagg Creek	Flagg Creek	Suitable for continued use
26C	1405+00	LT	Ditch flowing North into Flagg Creek	Flagg Creek	Flagg Creek	Suitable for continued use
26D	1405+00	RT	Ditch flowing South into Flagg Creek	Flagg Creek	Flagg Creek	Suitable for continued use
26E	1406+00	LT	Ditch flowing South into Flagg Creek	Flagg Creek	Flagg Creek	Suitable for continued use
26F	1411+00	LT	6'x5' RCBC to ditch leaving Tollway ROW	Flagg Creek	Flagg Creek	Suitable for continued use
27A	1465+00	LT	60" RCP leaving Tollway ROW	Salt Creek	Salt Creek	Suitable for continued use
27B	1477+00	LT	24" RCP draining to ditch to Salt Creek	Salt Creek	Salt Creek	Suitable for continued use
28A-1	1491+50	RT	36" RCP draining to Salt Creek	Salt Creek	Salt Creek	Outlet will be replaced due to roadway widening

Outlet ID	Station	LT/RT	Outlet Description	Major Outfall	Watershed	Outlet Condition (Sensitive)
28A-2.1	1492+00	RT	Private 48" RCP draining to Salt Creek	Salt Creek	Salt Creek	Suitable for continued use (Sensitive)
28A-2.2	1492+75	RT	21" RCP draining under Forest Preserve bike path to Salt Creek	Salt Creek	Salt Creek	Outlet will be replaced with 12'x3' box culvert (as proposed in Pre-Final plans for the Cermak Road Interchange Flood Impact Reduction)
28A-3	1492+90	LT	48" RCP draining under Forest Preserve bike path to Salt Creek	Salt Creek	Salt Creek	Outlet will be replaced due to roadway widening
Summary of Outlets on North Side of Salt Creek (28A, 28A-2, 28-3) (Outlet Evaluations using EPA SWMM model from Cermak Road Interchange Flood Impact Reduction modified for RR-14-4223 project)						
28B	1532+00	RT	54" CMP into storm sewer system leaving Tollway ROW (will be tied into proposed box culvert under northbound side of I-294 that goes to Outlet 28A-2)	Private golf course sewer and Tollway ditch to Salt Creek	Salt Creek	Suitable for continued use (Sensitive)
29A	1538+00	RT	15" CMP into ditch leaving Tollway ROW (will be tied into proposed box culvert under northbound side of I-294 that goes to Outlet 28A-2)	Private golf course sewer and Tollway ditch to Salt Creek	Salt Creek	Suitable for continued use (Sensitive)

29C	1552+50	RT	Private 36" RCP (will be tied into proposed box culvert under northbound side of I-294 that goes to Outlet 28A-2)	Private golf course sewer and Tollway ditch to Salt Creek	Salt Creek	Suitable for continued use (Sensitive)
29B	1558+00	RT	36" RCP leaving Tollway ROW	Private golf course sewer to Salt Creek	Salt Creek	Sensitive

A description of the existing conditions of each major outfall is provided below including drainage area, hydraulic capacity of the existing Tollway storm sewer system, and capacity of the existing outlet. The existing and proposed peak flows are included in outlet evaluation calculations in Appendix B, Section 6.9.

Lucas Diversion Ditch Watershed

The Lucas Diversion Ditch Watershed contains three outlets 17A, 17C-A and 18A.

Outlet 17A drains 92.49 acres to the 42" RCP storm sewer at 95th Street which drains to Lucas Diversion Ditch Watershed. It is a closed drainage system along the 95th Street Ramp C and open and closed drainage system along southbound I-294 in the existing and proposed conditions. Existing detention for this outlet is located within the 95th Street infield (Pond-17A) which will be maintained in the proposed conditions. There is reduction of 4.48 acres of drainage area to outlet 17A that is diverted to outlet 17C-A, also within the Lucas Diversion Ditch Watershed.

Outlet 17C-A drains 104.64 acres to (2) 24"x 38" elliptical RCP culverts at the outlet which drains into the CDP and Lucas Diversion Ditch Watershed. It is an open drainage system along southbound I-294 in the existing and proposed conditions. Existing detention is located at the outlet (Pond-17C) which will be maintained in the proposed conditions. There is an increase of 4.48 acres of drainage area to this outlet that is diverted from outlet 17A. The proposed peak flows are reduced by providing detention volume in POND-PR-17.

Outlet 18A consists of the I-294 bridge over Roberts Road/87th Street and outlets to the 36" RCP on Roberts Road which flows south to the Lucas Diversion Ditch Watershed. For the purposes of outlet evaluation, outlet 18A is split into four outlets to which the I-294 bridge drains directly to. The drainage area to these outlets is maintained in the proposed conditions. Since the same drainage area drains to the outlet as in the existing conditions, the peak flow will remain same to the 36" RCP (outlet) that runs south on Roberts Road. This outlet is sensitive to the flow increase due to the limited downstream capacity of the local storm sewer.

The outlet is suitable for continued use and there would not be any increase in the peak flow to the outlet in the proposed conditions.

79th Street Sewer Watershed

The 79th Street Watershed contains outlets 19A, 19B, 19C, 19D, 19E and 19F. A detailed discussion of outlets 19A, 19D, 19E and 19F is provided in Section 2.3.2 of this report (Flooding Issues along the Tollway Row in the Village of Justice).

I&M Canal Watershed

The I&M Canal Watershed contains outlets 20A, 20B, 20C, 20F, 20G and 20H. Refer to Section 2.3.3 of this report for description of the outlet 20A (Drainage Issues Near Archer Avenue (SI 1104)).

As coordinated with the RR-14-4221 design team, outlet 20B (79th Street Storm Sewer) and outlet 20C (I&M Canal) will be evaluated in the RR-14-4221 drainage report.

Outlets 20F and 20G drains 2.29 and 1.42 acres within the project limits to the 79th Street Storm Sewer. The entrance ramp to SB Archer Avenue from 79th Street and Archer Avenue/79th Street are under IDOT jurisdiction and IDOT design criteria applies to the outlets. For Outlet 20F, the ramp drains by combination of open and closed drainage system before it connects to the 79th Street Storm Sewer. The inlets are clogged and shallow ditches near the bridge are present in the existing conditions. For Outlet 20G, the area between 79th Street and the Tollway ROW drains to a catch basin connected to the 79th Street Storm Sewer. The proposed improvements include re-alignment of southbound Archer Avenue over I-294 and which reduces the proposed drainage areas to outlets 20F and 20G to 2.11 acres and 0.41 acres respectively. This 1.19 acre reduction in drainage area is diverted to outlet 20A. There is no detention provided for outlets 20F and 20G. A ditch along SB Archer Avenue ramp and additional inlets are proposed for outlet 20F.

Outlet 20H drains 5.42 acres to the 24" RCP at the outlet which drains to the Justice Ditch. It is a closed drainage system along W 79th Street and open drainage system along Archer Avenue in the existing conditions. There is no existing detention for the outlet. The outlet pipe has capacity for the 10-yr design storm. The proposed improvements include re-alignment of Archer Avenue in this area separating Archer Avenue from 79th Street, which provides room in between for a proposed detention facility. The proposed peak flows are reduced by providing more detention volume than is required. The outlet is suitable for continued use and there would not be any increase in the peak flow to the outlet in the proposed conditions.

Des Plaines River Watershed

The outlet 21F drains 85.2 acres at the contract limits with RR-14-4221, which drains to the Des Plaines River Watershed. The area is drained by a combination of closed and open drainage systems. During coordination with the RR-14-4221 drainage team, existing and

proposed conditions drainage information was provided at the project tie-in location. The RR-14-4221 team will provide detention and water quality volumes within their project limits for the added impervious area in this contract RR-14-4223 and complete the outlet evaluation for outlet 21F.

Flagg Creek Watershed

Outlet 23A drains 4.24 acres to the 18" RCP which leaves the Tollway ROW connecting to an IDOT storm sewer system which drains to the Flagg Creek Watershed. There is no detention in the existing conditions. The proposed detention basin will reduce peak flows to the IDOT storm sewer system.

For the purposes of outlet evaluation, outfall 23B is divided into four outlets 23B.1 to 23B.4 and only the drainage area within the Tollway ROW is included to accurately compare the existing and proposed conditions. The off-site area is not included in the outlet evaluation calculations. All the outlets drain to outfall 23B, a double 10'W x 5'H RCBC under Wolf Road discharging into Flagg Creek. The drainage patterns remain the same for outlets 23B.1 and 23B.4 in the proposed conditions. However, some of the drainage area from outlet 23B.3 is diverted to outlet 23B.2 to fully utilize the proposed detention pond. The peak flows from the outlets are maintained or reduced in the proposed conditions.

For the purposes of evaluating outlet 23C, the off-site area is not included, only the drainage area within the Tollway ROW in order to accurately compare the existing and proposed conditions. In existing conditions, storm water run-off drains to the Tollway outside ditches where it is detained before outletting into Flagg Creek. The detention pond replaces the existing ditch detention in the proposed conditions and reduces peak flows.

Outlet 23D drains 1.6 acres through the Tollway ditch where it is detained before outletting into Flagg Creek. The existing ditch detention will be replaced in the proposed conditions to accommodate the new roadway typical section.

For the purposes of evaluating outlet 23E, the off-site area is not included, only the drainage area within the Tollway ROW in order to accurately compare the existing and proposed conditions. In existing conditions, storm water run-off drains to the Tollway outside ditch where it is detained before outletting into Flagg Creek. The existing ditch detention will be replaced in the proposed conditions to accommodate the new roadway typical section.

For the purposes of evaluating outlet 23F, the large off-site areas were not included. Only off-site areas that make it to the Tollway ditch before outletting at 23F were included in order to accurately compare the existing and proposed conditions. In proposed conditions 0.60 ac-ft of detention is provided in detention pipe 2.

For the purposes of evaluating outlet 24A, the off-site area is not included, only the drainage area within the Tollway ROW in order to accurately compare the existing and proposed conditions. In existing conditions there is a 48" RCP that provides inline detention. In

proposed conditions the water at 24A is rerouted to 24B and 23F in lieu of replacing existing inline detention.

For the purposes of evaluating outlet 24B, the off-site area is not included, only the drainage area within the Tollway ROW in order to accurately compare the existing and proposed conditions. In proposed conditions 1.10 ac-ft of detention is provided in detention pipe 4.

At outlet 24C in existing conditions there is a 38"x60" RCPE that provides inline detention. In proposed conditions some of the water at 24C is rerouted to 24B in lieu of replacing existing inline detention.

Outlet 24D drains 4.25 acres of roadway drainage to Flagg Creek. In proposed conditions outlet 24D is rerouted to outlet 24E where it is detained in Basin 13A.

For the purposes of outlet evaluation, outfall 24E is divided into four outlets 24E.1 to 24E.4 and only the drainage area within the Tollway ROW is included to accurately compare the existing and proposed conditions. The off-site area is not included in the outlet evaluation calculations. All the outlets drain to outfall 24E, a triple 15'W x 5'H RCBC under I-294 discharging into Flagg Creek. In proposed conditions detention is provided in detention basin 13A for outlet 24E.1 and in detention pipe 9 for outlet 24E.4. Outlet 24E.3 is rerouted to outlet 24F in proposed conditions.

For the purposes of evaluating outlet 24F, the off-site area is not included, only the drainage area within the Tollway ROW in order to accurately compare the existing and proposed conditions. Some of the drainage area for 24F has been rerouted to 25A in proposed conditions. In proposed conditions detention pipe 10 is providing 0.90 ac-ft of detention at outlet 24F.

For the purposes of evaluating outlet 25A, the large off-site areas were not included. Only off-site areas that make it to the Tollway ditch before outletting at 25A were included in order to accurately compare the existing and proposed conditions. In proposed conditions some of the water from 25A is rerouted to basin 13C before outletting at 25D.

For the purposes of evaluating outlets 25B and 25D, the off-site area is not included, only the drainage area within the Tollway ROW in order to accurately compare the existing and proposed conditions. In existing conditions, storm water run-off drains to the Tollway outside ditch where it is detained before outletting. In proposed conditions the storm water run-off is rerouted through detention basin 13C and outlets at 25D into Flagg Creek. Detention basin 13C provides 2.30 ac-ft of detention.

At outlet 25C in existing conditions, storm water run-off drains to the Tollway outside ditch where it is detained before outletting into Flagg Creek. In proposed conditions most of the storm water run-off is rerouted to outlet 26A in lieu of replacing the existing detention. The remaining water is detained in Basin 13E before it outlets into Flagg Creek.

For the purposes of evaluating outlet 26A, the off-site area is not included, only the drainage area within the Tollway ROW in order to accurately compare the existing and proposed conditions. In proposed conditions 1.60 ac-ft of detention is provided in detention basin 13D and detention pipe 11.

Outlets 26B, 26C, 26D, and 26E all outlet at the Flagg Creek crossing at approximately 1405+00. For the purposes of evaluating outlets 26B, 26C, 26D, and 26E, the off-site area is not included, only the drainage area within the Tollway ROW in order to accurately compare the existing and proposed conditions.

For the purposes of evaluating outlet 26F, the large off-site areas were not included. Only off-site areas that make it to the Tollway ditch before outletting at 26F were included in order to accurately compare the existing and proposed conditions. For the offsite areas that were included the Clark Unit Hydrograph method was utilized to remain consistent with the MWRD model of Flagg Creek. For any detained areas the SCS method was utilized. In proposed conditions 1.40 ac-ft of detention was provided in Basin 14A.

Salt Creek Watershed

For the purposes of evaluating outlet 27A, the large off-site areas were not included. Only off-site areas that make it to the Tollway ditch before outletting at 27A were included in order to accurately compare the existing and proposed conditions. In existing conditions there is a 36" RCP that provides inline detention. In proposed conditions detention pipes S1 and S2 provide 0.88 ac-ft of storage.

For the purposes of evaluating outlet 27B, the large off-site areas were not included. Only off-site areas that make it to the Tollway ditch before outletting at 27B were included in order to accurately compare the existing and proposed conditions. In existing conditions a 42" RCP provides 0.12 ac-ft of inline detention.

For the purposes of evaluating outlet 28A-1, the large off-site areas were not included. Only off-site areas that make it to the Tollway ditch before outletting at 28A-1 were included in order to accurately compare the existing and proposed conditions. Outlet 28A-1 outlets into Salt Creek where it ultimately leaves the ROW at outfall 28A.

The Outlets North of Salt Creek Evaluation is based on approved proposed conditions model for the Cermak Road Interchange Flood Impact Reduction project. The proposed box culvert recommended in the Cermak Road Interchange Flood Impact Reduction project is shown on the proposed drainage plans and is to be constructed with the RR-14-4223 project. This box culvert will re-route flow to existing outlets 28B, 29A, 29C, and 29B into the proposed box culvert which ultimately releases to Outlet 28A-2.2.

For the existing conditions model, areas 28A-3_Exist and 28A-2-01_Ditch were added to the original proposed model in order to evaluate the total flow at Salt Creek outlets 28A-2.1, 28A-2.2, and 28A-3 and the impacts of the 95th Street to Cermak Road (Contract RR-14-4223).

For the proposed model, Proposed detention on southbound I-294 in Detention Pipes S3, S4, and S5 were added to the model and drainage areas were adjusted to reflect the drainage areas being re-routed from the proposed box culvert for the Cermak Road Interchange Flood Impact Reduction to the proposed detention box culverts. This proposed model was used to evaluate peak flows at outlets on north side of Salt Creek and determine impacts for the 95th Street to Cermak Road (Contract RR-14-4223) project. The proposed model shows that the cumulative flow to Salt Creek through Outlets 28A-2.1, 28A-2.2, and 28A-3 (outlets on north side of Salt Creek) is reduced in proposed conditions with the addition of the detention pipes on the southbound side north of Salt Creek.

2.6 BRIDGES AND CULVERTS

Within the project limits, there are three major mainline bridge crossings, two over Flagg Creek and one over Salt Creek. There are also eleven culvert crossing that are affected by floodplains and/or Water of the US (WOUS). Additionally, there are nine existing non-WOUS major culverts within the study limits that are included in this section. Non-WOUS culverts that are included in this section are those with a single barrel with a cross-sectional opening greater than 7.5 square feet, any multi-barrel culverts, or those draining more than 20 acres within this project area.

Table 5 lists the major waterway crossings within this study. Please see Appendix A Exhibits 5.1 and 5.2 for locations of existing waterway crossings and Appendix B, Section 6.2 and Section 6.3 for Bridge and Major Culvert/Storm Sewer respectively hydrologic and hydraulic modeling results.

Proposed bridge and culvert crossings are described in Section 4.8.

Table 5: Major Waterway Crossing Locations

Waterway Crossing #	Mile Post	Station	Existing Size/Description	Floodplains	WOUS	Major Crossing Analysis Required
BRIDGES						
16	23.8	1257+00	2-Span PCC girder Bridge	Yes - Flag Creek (Zone AE)	Yes	Yes
22	26.5	1405+00	3-Span PCC girder Bridge	Yes - Flag Creek (Zone AE)	Yes	Yes
25	28.2	1492+50	3-Span PCC girder Bridge	Yes - Salt Creek	Yes	Yes
CULVERTS						
1	17.6	931+45	54" RCP *			Yes
2	19.0	1007+20	42" RCP	Yes - Hickory Hills Reservoir (Zone AE)	Yes, Likely	Yes
5	19.6	1038+23	42" RCP *			Yes
6	19.8	1050+60	60" RCP *			Yes
7	20.2	1068+09	48" RCP *			Yes
8	20.4	1080+20	48" RCP *			Yes
13	23.2	1228+07	48" CMP, Lined	Yes - Drains to Flag Creek (Zone AE)		Yes
14	23.3	1231+53	54" CMP, Lined	Yes - Drains to Flag Creek (Zone AE)	Yes	Yes
15	23.4	1239+52	54" CMP, Lined	Yes - Drains to Flag Creek (Zone AE)		Yes
17	24.2	1279+66	Double 10'x5' RCBC	Yes - Plainfield Road Ditch (Zone AE)	Yes	Yes
18	24.7	1306+54	Triple 15'x5' RCBC	Yes - 63rd Street Ditch (Zone AE)	Yes	Yes
19	24.9	1318+55	Combination of 24" RCP and 36" RCP *	Yes - 59th Street Ditch (Zone AE)		Yes
20	25.3	1338+54	7'x5' RCBC	Yes - Drains to Flag Creek (Zone AE)	Yes	Yes

Waterway Crossing #	Mile Post	Station	Existing Size/Description	Floodplains	WOUS	Major Crossing Analysis Required
21	26.2	1386+54	8'x8' RCBC	Yes - Drains to Flag Creek (Zone AE)	Yes	Yes
Creek Drive	26.2	1385+54 (425' east of I-294)	11.6' x 7.33' - CMP Arch	Yes - Drains to Flag Creek (Zone AE)	Yes	Yes
23	26.7	1410+80	6'x5' RCBC	Yes - Drains to Flag Creek (Zone A)	Yes	Yes
24	27.7	1464+55	60" RCP	Yes - Drains to Salt Creek	Yes	Yes
26	29.0	1532+05	54" CMP, Lined			Yes
27	29.4	1553+70	42" RCP			Yes
28	29.6	1563+63	Double 60" RCP		Yes	Yes
29	29.5	1562+30	Double 60" CMP, Lined And 48" RCP			Yes

* Waterway crossings is a storm sewer system

2.6.1 Bridge Spans Over Waterways

There are 3 bridge spans over waterways.

2.6.1.1 I-294 Over Flag Creek - South Crossing (#16)– STA 1257+00 (M.P. 23.8)

Two-span precast prestressed concrete I-beam bridges, 163'-3" (Face to face abutments along the girder) in length.

These bridges each carry four lanes of traffic on I-294 over Flag Creek. Flag Creek conveys drainage from the Flag Creek watershed on the north (east) side of I-294 to the south (west) side of I-294.

Peak flows for the crossing were taken from an existing MWRD unsteady flow HEC-RAS model prepared as part of the "*Detailed Watershed Plan (DWP) for the Lower Des Plaines River Watershed*". Bridge hydraulics were analyzed by modifying the existing MWRD model. The model was extended upstream of the structure and surveyed cross sections were added approximately 1000', 500', and 50' upstream and

downstream of the structure. Additionally, cross sections were added at both faces of the structure as well as at approximately 100' upstream and downstream of the structure to encompass the curve in Flagg Creek. The model was run as a steady flow model using the peak flows from the MWRD model.

Under existing conditions all freeboard and low chord clearance criteria are met. There is 6.7' between the low chord of the structure and the natural 50-year design storm highwater elevation. Low chord criteria was also checked for the 100-year storm event with the 100 year event having 6.1' of clearance. Freeboard criteria was checked at the low road station of 1264+00. For the 50-year storm event 6.3' of freeboard was obtained between the edge of pavement and the existing created head elevation. In addition, the existing headwater elevation for 500-year event is well below the existing low pavement grade elevation. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.2.

Contraction, pier, and abutment scour analyses for the existing bridge were run using HEC-RAS which incorporates a combination of the methods in the FHWA's HEC-18 and IDOT Drainage Manual. Degradation scour was calculated using the method found in Section 6.4.2 of HEC-20. Scour calculations were performed for the 100-year and 500-year storm event. The largest amount of total scour (contraction, pier, abutment, and degradation) is occurring on the pier and the left abutment. The large amount of scour indicates the need for scour counter measures. Acceptable countermeasures shall be proposed in the design phase to prevent scour. Streambed material data from the geotechnical was utilized for the scour analysis.

2.6.1.2 I-294 Over Flagg Creek - North Crossing (#22) – STA 1405+00 (M.P. 26.5)

Three-span continuous precast prestressed concrete girder bridge, 121' (Face to face abutments along the girder) in length.

These bridges each carry four lanes of traffic on I-294 over Flagg Creek. Flagg Creek conveys drainage from the Flagg Creek watershed on the Northwest side of I-294 to the Southeast side of I-294.

Peak flows for the crossing were taken from an existing MWRD unsteady flow HEC-RAS model prepared as part of the "*Detailed Watershed Plan (DWP) for the Lower Des Plaines River Watershed*". Bridge hydraulics were analyzed by modifying the existing MWRD model. The model was extended upstream of the structure and surveyed cross sections were added approximately 1000', 500', and 50' upstream and downstream of the structure. Additionally, cross sections were added at both faces of the structure as well as at approximately 100' upstream and downstream of the structure to encompass the curve in Flagg Creek. The model was run as a steady flow model using the peak flows from the MWRD model.

Under existing conditions all freeboard criteria are met but not the low chord clearance criteria. There is 1.0' between the low chord of the structure and the natural highwater elevation for the 50-year storm event. Low chord clearance criteria was also checked for the 100-year storm event and for the 100-year event, headwater elevation exceeded the low chord elevation. Freeboard criteria was checked at the low road station of 1407+50. For a 50-year storm event 5.0' of freeboard was obtained between the edge of pavement and the existing created head elevation. In addition, the existing headwater elevation for 500-year event is well below the existing low pavement grade elevation. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.2.

Contraction, pier, and abutment scour analyses for the existing bridge were run using HEC-RAS which incorporates a combination of the methods in the FHWA's HEC-18 and IDOT Drainage Manual. Degradation scour was calculated using the method found in Section 6.4.2 of HEC-20. Scour calculations were performed for the 100-year and 500-year storm event. The largest amount of total scour (contraction, pier, abutment, and degradation) is occurring on both abutments and both piers. The large pier and abutment scour indicates the need for scour counter measures. Acceptable countermeasures shall be provided for proposed bridge to prevent scour. Streambed material data from the geotechnical was utilized for the scour analysis.

2.6.1.3 I-294 Over Salt Creek (#25) – STA 1492+50 (M.P. 28.2)

Two three-span simply supported precast prestressed concrete girder bridges, 155'-0" in length.

These bridges each carry 4 lanes of traffic on I-294 over Salt Creek. Salt Creek conveys drainage from the Salt Creek watershed on the West side of I-294 to the East side of I-294.

Peak flows and the boundary conditions for the crossing were taken from an existing FEQ model of the Lower Salt Creek Floodplain that was created by DuPage County and will become the FEMA regulatory model near the middle of 2018 or beginning of 2019 and is currently in the mapping stage (See memo to Reed Panther dated 3/23/17 in Appendix D, Section 8.1 for more information on the modeling). Bridge hydraulics were analyzed by recreating the FEQ model in HEC-RAS. See Appendix B, Section 6.2.3 for more details on how the HEC-RAS model was created and extended based on the FEQ model. The HEC-RAS model was run as a steady flow model using the peak flows and boundary conditions from the FEQ model.

Under existing conditions all freeboard and low chord criteria are met. There is 4.2' clearance between the low chord of the structure and the natural high water elevation for the 50-year storm event. Low chord criteria was also checked for the 100-year and 500-year storm events with the 100 year event having 4.0' of clearance and the 500-year event having 3.2' of clearance. Freeboard criteria was checked at the low road station of 1471+00. For a 50-year storm event 3.6' of freeboard was obtained between

the edge of pavement and the existing created head elevation. The Waterway Information Table is provided in Appendix A, Section 5.4.

2.6.2 Waters of the US (WOUS) Culverts

There are 10 crossings that were identified by our environmental staff as having WOUS and/or regulated wetlands present at one or both ends of the crossing.

2.6.2.1 STA 1007+20 (M.P. 19.0) – Crossing #2

Single 42" RCP, 224' in length

Note that record drawings for Crossing #2 provide conflicting information about the crossing. For this analysis we assumed the culvert flows from southwest to northeast as most record drawings indicate. However, some record drawings indicate the culvert flows in the opposite direction toward the reservoir. Additional survey and investigation is needed to confirm the assumptions made in this analysis. This culvert conveys drainage from Tollway right of way along I-294 southbound from milepost 19.33 to milepost 18.72. In addition to approximately 1.3 acres of urban area in Hickory Hills. The Hickory Hills Reservoir is located adjacent to the culvert inlet west of I-294. Record drawings indicate that upstream of the culvert, water is allowed to overflow into the reservoir. Downstream of the culvert, flow continues through a short section of ditch and into a storm sewer system through the residential development east of I-294.

Peak flows were taken from the existing conditions SWMM model for Outlet Evaluation 19A. The tailwater condition was obtained from the water surface elevations in the SWMM model at the 36" CMP located downstream of Crossing #2. The natural highwater elevations were obtained by projecting these water surface elevations up the slope of the Crossing #2 culvert. Culvert hydraulics was analyzed using HY-8 Culvert Analysis Program. Flow through this culvert is outlet controlled. HY-8 output summary table is provided in Appendix B, Section 6.2. The existing conditions negative created head values were changed to zero and the headwater elevations were changed to the natural highwater elevations in the WIT table. The negative values occurred due to the tailwater condition and the actual friction slope being less than the slope of the pipe used to calculate the natural highwater elevations.

There is approximately 3.99' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4.

2.6.2.2 STA 1231+53 (M.P. 23.3) – Crossing #14

Single 54" CMP, Lined, 305' in length, drains to Flagg Creek Floodplain

This culvert conveys drainage from the east (northbound) I-294 ditch and from an approximately 0.0671 square mile (43 acres) urban watershed in Countryside (city)

under I-294. It is then conveyed by a short ditch and 2 - 10' (W) x 5' (H) culvert under Wolf Rd and then discharges into Flagg Creek.

HEC-HMS Clark Unit Hydrograph method (Bulletin 70, Huff distributions) was used to generate critical duration peak flows for the crossing. Culvert hydraulics was analyzed using HEC-RAS. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 22.5' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.2.3 STA 1279+66 (M.P. 24.2) – Crossing #17

Double 10' (W) x 5' (H) RCBC, 462.33' in length, Plainfield Road Ditch Crossing

This culvert conveys drainage from the west Plainfield Road Ditch and from an approximately 1.69 square miles urban watershed in Burr Ridge under I-294. It is then confluence with Flagg Creek at east end of the I-294 culvert.

Peak flows for the crossing were taken from FIS study since FIS flows are higher than the MWRD flows. Culvert hydraulics were analyzed by modifying the existing MWRD model. The model was extended upstream of the structure and surveyed cross sections were added approximately 1000', 500', and 50' upstream and downstream of the structure. The model was run as a steady flow model using the FIS peak flows. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 4.8' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.2.4 STA 1306+54 (M.P. 24.7) – Crossing # 18

Triple 15' (W) x 5' (H) RCBC, 233.5' in length, 63rd Street Ditch Crossing

This culvert conveys drainage from the west 63rd St. Ditch and from an approximately 5.38 square miles urban watershed in Hinsdale and Burr Ridge under I-294. It is then confluence with Flagg Creek at east end of the I-294 culvert.

Peak flows for the crossing were taken from an existing MWRD unsteady flow HEC-RAS model. Culvert hydraulics were analyzed by modifying the existing MWRD model. The model was extended upstream of the structure and surveyed cross sections were added approximately 1000', 500', and 50' upstream and downstream of the structure. The model was run as a steady flow model using the peak flows from the

MWRD model. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 6.1' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.2.5 STA 1338+54 (M.P. 25.3) – Crossing # 20

Single 7' (W) x 5' (H) RCBC, 388' in length.

This culvert conveys drainage from the west (southbound) I-294 ditch line and from an approximately 0.24 square mile (150.4 acres) urban watershed in Burr Ridge and Hinsdale under I-294. It is then conveyed by a short ditch and discharges into Flagg Creek.

HEC-HMS Clark Unit Hydrograph method (Bulletin 70, Huff distributions) was used to generate critical storm duration peak flows for the crossing. Culvert hydraulics were analyzed using HEC-RAS. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 5.5' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.2.6 STA 1386+54 (M.P. 26.2) – Crossing # 21

Single 8' (W) x 8' (H) RCBC, 287' in length.

This culvert conveys drainage from the west (southbound) I-294 ditch line and from an approximately 0.72 square mile urban watershed in Hinsdale under I-294. It is then conveyed by a ditch and series of culverts and discharges into Flagg Creek.

HEC-HMS Clark Unit Hydrograph method (Bulletin 70, Huff distributions) was used to generate critical storm duration peak flows for the crossing. Culvert hydraulics were analyzed using HEC-RAS. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 5.2' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.2.7 STA 1410+80 (M.P. 26.7) – Crossing # 23

Single 6' (W) x 5' (H) RCBC, 165' in length, drains to Flagg Creek Floodplain

This culvert conveys drainage from the east (northbound) I-294 ditch line and from an approximately 0.25 square mile (161 acres) urban watershed in Western Springs under I-294. It is then conveyed by a short ditch and discharges into Flagg Creek.

HEC-HMS Clark Unit Hydrograph method (Bulletin 70, Huff distributions) was used to generate critical storm duration peak flows for the crossing. Culvert hydraulics were analyzed using HEC-RAS. Because flow through this culvert is controlled by the tailwater from Flagg Creek, this crossing was modeled as an addition to the Northern Flagg Creek Bridge (Crossing 22) HEC-RAS hydraulic model.

There is approximately 3.8' of freeboard for the 50-year event, and the I-294 pavement at this culvert does overtop for events between 100-year and 500-year. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.2.8 STA 1464+55 (M.P. 27.7) – Crossing # 24

Single 60" RCP, 287' in length, drains to Salt Creek floodplain

This culvert conveys drainage from tollway right-of-way along I-294 northbound at Ogden Avenue including the infields east of I-294, approximately 184 acres of residential area in Western Springs, south of Ogden Avenue and east of I-294, and approximately 134 acres of the Bemis Woods Forest Preserve, north of Ogden Avenue and east of I-294. The culvert outfalls to a ditch west of I-294 and north of Ogden Avenue that drains to Salt Creek.

The USGS Urban Regression Equations were used to generate peak flows for the crossing. Culvert hydraulics were analyzed using HY-8 Culvert Analysis Program. Flow through this culvert is outlet controlled. HY-8 output summary table is provided in Appendix B, Exhibit 6.2. Since the downstream end of the culvert is within the Salt Creek floodplain, the 10-year water surface elevation (643.26) of the Salt Creek floodplain was used as the tailwater and downstream natural highwater elevations in the model. The slope and length of the pipe were used to calculate the natural highwater elevations at the upstream end of the culvert. For the 10-year event, the existing condition negative created head values were changed to zero and the headwater elevations were changed to the natural highwater elevations in the WIT Table. The negative value occurred due to the tailwater condition and the actual friction slope being less than the slope of the pipe used to calculate the natural highwater elevations.

Existing headwater elevations overtop the low edge of pavement for the 10-year through 500-year storm frequencies. Therefore, this culvert is not meeting 50-year freeboard or 500-year design criteria in the existing condition due to the high tailwater

elevation. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.2.9 STA 1563+63 (M.P. 29.6) – Crossing # 28

Double 60” RCP, 268’ in length

This double barrel culvert conveys drainage from approximately 60 acres of commercially developed area located northwest of the I-294 and Cermak Road interchange, and east of the I-88 Ramp. Additional drainage is received from approximately 17 acres consisting of I-88 ramp and commercially developed land west of I-88 ramp and bisected by Cermak Road. Flow from Crossing #28 outfalls into a small holding pond northeast of Cermak Road and I-294 Interchange, and directly upstream of Water Crossing 29 inlet.

The proposed roadway pavement limits for the project end at approximately 1545+00. WC # 28 and # 29 are not proposed to be replaced. The tollway approved EPASWMM model used in conjunction with the Pre-Final Plans for Drainage Improvements – Cermak Road Central Tristate Tollway (I-294) was modified to incorporate survey information about flowlines and culvert linings for WC # 28 and WC # 29. The modified model was used to generate the WWIT for these crossings. The proposed conditions model was used as the existing conditions for this project as it includes the effects of the tailwater conditions at Cermak being relieved with the addition of the proposed box culvert on the northbound side of I-294.

EPASWMM output and summary table are provided in Appendix B, Exhibit 6.3. Natural highwater elevations of this culvert were obtained by using the water surface elevation at node J11 in the EPASWMM model which is at the downstream end of WC # 29 in the model. The natural water surface elevations were then projected to the upstream face of the culvert for WC# 29 and this elevation was projected to the upstream face of WC # 28 using the length and slope of WC # 28.

There is approximately 3.52’ of freeboard for the 50-year event. The I-294 pavement at this culvert does not overtop for the events up to and including 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.2.10 STA 1385+54 (M.P. 26.2) – Crossing at Creek Drive

Single 11.6’ (W) x 7.33’ (H) CMP Arch Culvert, 50’ in length.

This culvert is located immediately downstream of I-294 culvert crossing 21 (Refer to Section 2.6.2.8) and modeled with culvert crossing 21. This culvert drains approximately 0.72 square mile urban watershed in Hinsdale. It is then conveyed by a ditch and culvert and discharges into Flagg Creek.

HEC-HMS Clark Unit Hydrograph method (Bulletin 70, Huff distributions) was used to generate critical storm duration peak flows for the crossing. Culvert hydraulics were analyzed using HEC-RAS. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 0.1' of freeboard for the 50-year event, and the Creek Drive pavement at this culvert overtop for a storm event between 50-year and 100-year. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.3 Non-WOUS Culverts

There are 11 crossings where WOUS are not present but require a crossing analysis.

2.6.3.1 STA 931+45 (M.P. 17.6) – Crossing # 1

Single 54" RCP, 115' in length

This storm sewer conveys drainage from the Tollway ditch on the west side of I-294 which begins just south of 87th Street. Drainage structures along the center median and southbound curb line discharge into this ditch. The City of Hickory Hills constructed a 42" overflow storm sewer along 93rd Street which connects into the storm sewer at drainage structure ES-084L. This overflow sewer was constructed under Permit TS-93-24.

The storm sewer was analyzed using the rational method with Hydraflow Storm Sewers. The HGL in the storm sewer system is approximately 8' below the rim elevation for the 50-year storm and 7' below the rim elevation for the 100-year storm event. The calculations are provided in Appendix B, Section 6.3.

2.6.3.2 STA 1038+23 (M.P. 19.6) – Crossing # 5

Single 42" RCP Storm Sewer, 296' in length.

The Crossing consists of storm sewer system 42" RCP under SB and NB lanes of I-294. It is then conveyed by 12" PLP local storm sewer system at the Tollway ROW and then discharges to I&M Canal through the Justice storm sewer system. This storm sewer system conveys drainage from an approximately 10 acres of the Tollway pavement and the upstream residential area in Justice.

SCS method (Bulletin 70, Huff distributions) was used to generate critical storm duration peak flows for the crossing. Storm sewer hydraulics were analyzed using XP SWMM. Flow through this crossing is controlled by the control structure at the downstream.

The existing conditions (restrictor information) are modeled based on the record drawings. The I-294 crossing pipe 42" RCP surcharges at the low point on I-294 for 50-yr design storm. The calculations are provided as part of Outlet 19E evaluation. See Appendix B, Section 6.9.

2.6.3.3 STA 1050+60 (M.P. 19.8) – Crossing # 6

Single 60" RCP, 310' in length.

The Crossing consists of storm sewer system 60" RCP under SB and NB lanes of I-294. It is then conveyed by 36" CMP local storm sewer system at the Tollway ROW and then discharges to I&M Canal through the Justice storm sewer system. This storm sewer system conveys drainage from an approximately 21 acres of the Tollway property and the upstream commercial/industrial areas in Justice.

SCS method (Bulletin 70, Huff distributions) was used to generate critical storm duration peak flows for the crossing. Storm sewer hydraulics were analyzed using XP SWMM. Flow through this crossing is controlled by the control structure at the downstream.

The existing conditions (restrictor information) are modeled based on the record drawings. The HGL in the storm sewer system is at least 2' below the rim elevation for the 50-year design event, and the I-294 pavement at this crossing does not overtop for events up to and including the 100-year event. The calculations are provided as part of outlet 19F evaluation. See Appendix B, Section 6.9.

2.6.3.4 STA 1068+09 (M.P. 20.2) – Crossing # 7

Single 48" RCP.

This 48" storm sewer crossing was not located in the field and appears to be abandoned in the existing conditions and the existing conditions were not analyzed. The roadway runoff in this area drains through the Crossing #8 to outlet 20A.

2.6.3.5 STA 1080+20 (M.P. 20.4) – Crossing # 8

Single 48" RCP, 260' in length.

The Crossing consists of storm sewer system 48" RCP crossing I-294 SB and NB lanes diagonally at centerline I-294 station 1080+00. It is then conveyed by 48" RCP storm sewer system and then discharges to the I&M Canal through the Justice storm sewer system. This storm sewer system conveys drainage from an approximately 53 acres of the Tollway property and the upstream commercial and residential areas in Justice.

SCS method (Bulletin 70, Huff distributions) was used to generate critical storm duration peak flows for the crossing. Storm sewer hydraulics were analyzed using XP

SWMM. Flow through this crossing is controlled by the control structure at the downstream.

The existing conditions (restrictor information) are modeled based on the record drawings. The HGL in the storm sewer system is at least 2' below the rim elevation for the 50-year design event, and the I-294 pavement at this crossing does not overtop for events up to and including the 100-year event. The calculations are provided as part of special issues and outlet 20A evaluation. See Appendix B, Section 6.8.2.

2.6.3.6 STA 1228+07 (M.P. 23.2) – Crossing # 13

Single 48" CMP, Lined, 324' in length, drains to Flagg Creek Floodplain.

This culvert conveys drainage from the east (northbound) I-294 ditch and from an approximately 0.0754 square mile (48.25 acres) urban watershed in Countryside (city) under I-294. It is then conveyed by a short ditch and 2 - 10' (W) x 5' (H) culvert under Wolf Rd and then discharges into Flagg Creek.

HEC-HMS Clark Unit Hydrograph method (Bulletin 70, Huff distributions) was used to generate critical storm duration peak flows for the crossing. Culvert hydraulics was analyzed using HY-8 Culvert Analysis Program. Flow through this culvert is inlet controlled.

There is approximately 12.5' of freeboard for the 50-year event with respect to I-294 NB exit ramp to I-55 SB, and the I-294 and NB exit ramp pavement at this culvert does not overtop for events up to and including the 500-year event. The culvert hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.3.7 STA 1239+52 (M.P. 23.4) – Crossing # 15

Single 54" CMP, Lined, 233' in length, drains to Flagg Creek Floodplain

This culvert conveys drainage from the east (northbound) I-294 ditch and from an approximately 0.0253 square mile (16.2 acres) urban watershed in Indian Head Park (Village) under I-294. It is then conveyed by a short ditch and 38" CMP culvert under Roofers Rd and then discharges into Flagg Creek.

HEC-HMS Clark Unit Hydrograph method (Bulletin 70, Huff distributions) was used to generate critical duration peak flows for the crossing. Culvert hydraulics was analyzed using HEC-RAS. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 19.4' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.3.8 STA 1318+55 (M.P. 24.9) – Crossing # 19

Combination of 24” RCP and 36” RCP, total 310’ in length

The Crossing consists of storm sewer system 24” RCP under SB lanes, 36” RCP under NB lanes, 36” RCP under NB exit ramp. It is then conveyed by 42” CMP culvert and then by a short ditch discharges into Flagg Creek. This culvert system conveys drainage from an approximately 13.4 acres of the Hinsdale Oasis area in Hinsdale under I-294.

SCS method (Bulletin 70, Huff distributions) was used to generate critical storm duration peak flows for the crossing. Culvert hydraulics were analyzed using XP SWMM. Flow through this culvert is inlet controlled. However, since Flagg Creek is adjacent to the crossing it was checked for the coincidental occurrences of 10, 50 and 100-year design frequencies for the area ratio of 1000 based on methodology outlined in HEC 22. It was found that water surface elevations at the upstream of the culvert with free outfall conditions were higher than that of outfall with tail water conditions from Flagg Creek.

The HGL in the storm sewer system is at least 2’ below the rim elevation for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 100-year event. The calculations are provided in Appendix B, Section 6.3 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.3.9 STA 1532+05 (M.P. 29.0) – Crossing # 26

Single 54” CMP, Lined, 250’ in length

This culvert conveys drainage from tollway right-of-way along I-294 southbound, north of STA 1528+80 (MP 28.9) and south of STA 1539+26 (MP 29.1). Tear Drop Lake is located to the west of I-294, and adjacent to the culvert inlet. Tear Drop Lake receives runoff from approximately 48 acres of a residential area and outflows to crossing 26 via a shallow grass-lined swale. The culvert outfalls to the I-294 northbound ditch which continues to Salt Creek.

Critical storm duration peak flows for the crossing were obtained from the approved EPA SWMM model that was created in conjunction with the Pre-Final Plans for Drainage Improvements – Cermak Road Central TriState Tollway (I-294) by EJM Engineering/Primera. Culvert hydraulics was analyzed using HY-8 Culvert Analysis Program. Flow through this culvert is inlet controlled. HY-8 output summary table is provided in Appendix B, Exhibit 6.2. Natural highwater elevations were obtained by projecting the tailwater elevations up the slope of the existing pipe. The tailwater elevations were obtained based on a normal depth calculation of a 48” diameter culvert (downstream condition).

There is approximately 6.67' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for the events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.3.10 STA 1553+70 (M.P. 29.4) – Crossing # 27

Single 42" RCP, 214' in length

This culvert conveys drainage from a small detention pond in the southwest quadrant of I-294 and Cermak Road Interchange. The pond receives drainage from Tollway right of way bounded by I-294, north of STA 1539+26 (MP 29.1) and south of Cermak Road. Drainage is then conveyed via a storm sewer system east of I-294.

Critical storm duration peak flows for the crossing were obtained from the approved EPA SWMM model that was created in conjunction with the Pre-Final Plans for Drainage Improvements – Cermak Road Central TriState Tollway (I-294) by EJM Engineering/Primera. Culvert hydraulics was analyzed using HY-8 Culvert Analysis Program. Flow through this culvert is outlet controlled. HY-8 output summary table is provided in Appendix B, Exhibit 6.2. The existing condition tailwater was taken from Node 7R in the existing conditions EPA SWMM model.

Natural highwater elevations were obtained by taking the water surface elevations at node 159+02_42infromWestPond in the proposed EPASWMM model. This elevation was then projected to the upstream face of Crossing # 27. The proposed conditions model was used to determine the natural headwater because it includes the effects of tailwater conditions being relieved with the flood reduction box culvert. The box culvert is shown in the proposed drainage plan and to be constructed with this project.

The existing Crossing # 27 culvert only provides 1.58' of freeboard for the 50-year event. I-294 pavement at this culvert does not overtop for the events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

2.6.3.11 STA 1562+30 (M.P. 29.6) – Crossing # 29

Double 60" CMP (Lined to 24" and 38") and 48" RCP, 195' in length

This multiple opening culvert conveys drainage from Crossing #28, and from a detention pond located northeast of the I-294 and Cermak Road interchange. The detention pond receives drainage from Tollway pavement north of Cermak Road and south of MP 30, and an Illinois Tollway maintenance yard east of I-294 and north of Cermak Road. Crossing #29 runs parallel to I-294 and crosses under Cermak Road.

The proposed roadway pavement limits for the project end at approximately 1545+00. WC # 28 and # 29 are not proposed to be replaced. The tollway approved EPASWMM model used in conjunction with the Pre-Final Plans for Drainage Improvements – Cermak Road Central Tristate Tollway (I-294) was modified to incorporate survey information about flowlines and culvert linings for WC # 28 and WC # 29. The modified model was used to generate the WWIT for these crossings. The proposed conditions model was used as the existing conditions for this project as it includes the effects of the tailwater conditions at Cermak being relieved with the addition of the proposed box culvert on the northbound side of I-294.

EPASWMM output and summary table are provided in Appendix B, Exhibit 6.3. Natural highwater elevations of this culvert were obtained by using the water surface elevation at node J11 in the EPASWMM model which is at the downstream end of WC # 29 in the model. The natural water surface elevations were then projected to the upstream face of the culvert.

There is approximately 4.05' of freeboard for the 50-year event. The freeboard elevation is in reference to the lowest edge of pavement on I-294 adjacent to the culvert. The I-294 pavement at this culvert does not overtop for the events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

3 DRAINAGE DESIGN CRITERIA

Tollway drainage design criteria is listed in the 2017 Drainage Design Manual. Local drainage design criteria for Bridgeview, Burr Ridge, Countryside, Hickory Hills, Hodgkins, Indian Head Park, Oak Brook, Western Springs and Willow Springs follow the Metropolitan Water Reclamation District of Greater Chicago (MWRD) July 2014 Watershed Management Ordinance. The Village of Hinsdale follows the April 2013 DuPage County Stormwater and Flood Plain Ordinance.

The Drainage Design Criteria for the Central Tri-State Corridor, provided by the DCM, is included in Appendix A, Section 5.5.

4 PROPOSED DRAINAGE CONDITIONS

4.1 PROPOSED DRAINAGE DESCRIPTION

Existing storm sewers and drainage infrastructure within the pavement reconstruction limits will be removed and replaced with new infrastructure designed to meet current Tollway design standards. Existing drainage infrastructure in rehabilitated sections will be improved as needed to address identified drainage issues. Existing storm sewers to remain in place are to be televised and their condition evaluated for further use in Phase II.

Runoff from the median on the roadway tangent sections will flow to median drainage structures and a median storm sewer system which will outlet to outside drainage ditches or storm sewers. Runoff from the outside travel lanes will drain into the roadside ditches or the closed drainage system. For areas with proposed retaining walls, noise walls, cut sections with backslopes, or areas with steep front slopes, the proposed roadway typical cross section will utilize a gutter unless sheet flow is feasible for drainage of the outside lanes. New RCP storm sewer systems will be provided. Due to construction staging, interim drainage will be required, and will be designed as part of the Phase II.

Major cross culverts are proposed to be rehabilitated and extended or replaced when deemed hydraulically and/or structurally necessary. Minor culvert crossings will be removed and, at approximately the same locations, new culverts will be installed.

There were proposed roadway profile adjustments made to the I-294 SB mainline and the CD road near Archer Avenue interchange to meet HGL criteria for storm sewers which would drain to the Pond-PR-20A.

The existing drainage patterns are maintained and the existing outlets are utilized in the proposed conditions as much as possible. The volume of detention provided for Tollway runoff will maintain the existing detention volume provided, and add volume as required for new impervious surface. Infrastructure to improve water quality is also proposed to be provided.

4.2 PROPOSED DRAINAGE PLAN

The proposed drainage plans are included in Appendix A, Section 5.6.

4.3 PROPOSED DRAINAGE ALTERNATIVE FOR IDENTIFIED DRAINAGE CONCERNS

4.3.1 95th Street Flooding (SI 434)

The following two alternatives have been analyzed to evaluate overflow/overtopping from the CDP.

1. Regrade CDP to lower the pond bottom by 3' (outlet invert elev 594.7) with existing 15" orifice

2. Regrade CDP to lower the pond bottom by 3' (outlet invert elev 594.7) and increase orifice size from 15" to 24" (This is MWRD proposed alternative L.2 as part of the stormwater master plan for the Roberts Road drainage area)

The proposed improvements are modeled in XPSWMM for the two alternatives and the summary of results are presented in Appendix B, Section 6.8.1. The proposed detention volume to the elevation 608.50 is 57.01 acre-ft. It was found that the CDP overflows for 50- year and 100- year storm events for proposed Alternative #1 and 100- year WSE is 609.29.

Proposed Alternative #2 (MWRD proposed alternative L.2) shows that there is no overflow/overtopping from the CDP for 100- year storm event. The 100-year WSE is reduced to 607.55 providing a freeboard of 0.95' for this alternative. However, there is an increase in the release rate due to change in the orifice size from 15" to 24". This increase in release rate will be attenuated by downstream detention per MWRD master plan for the Roberts Road Drainage Area proposed Alternative L.2.

There are no changes proposed to Pond-17C (Tollway pond) to which the Tollway drains. The water surface elevation (WSE) in Pond-17C went down due to the lowered WSE in the CDP for the 100- year storm for both the proposed alternatives. The Tollway criteria to provide a minimum freeboard of 2' from the 100- year WSE to the top of berm for Pond-17C is being met for proposed alternative 2.

Based on preliminary conversations with IDOT, they studied this basin and the flooding issues along 95th Street as part of their plans to improve 95th Street at Harlem Ave. It is our understanding that their current proposed alternative does not include any changes to the CDP. They are instead addressing flooding in the area by providing additional detention within the 95th St and Harlem Ave interchange. Coordination with IDOT will continue as design progresses to determine any benefits their project may have on flooding in this area and coordination construction scheduling.

Since MWRD is preparing a storm water master plan for the Roberts Road drainage area, it is recommended to coordinate I-294 improvements with the MWRD and the Village of Bridgeview to address storm water quality and quantity issues with the proposed regional detention. The cost sharing for the proposed CDP improvements will also be coordinated with the Village of Bridgeview and MWRD.

CDP overtopping does not occur for the proposed Alternative #2, but there is an increase in release rate due to change in restrictor size from 15" to 24". MWRD is proposing improvements (detention) downstream to attenuate this increase in flow and to maintain existing peak flows downstream. Since there will be no overflow down on to 95th Street from the CDP, it also helps by not overwhelming the IDOT pump station #25 and potentially reduces flooding downstream areas from the pump station. It is concluded herein that proposed Alternative #2 will improve the CDP performance and reduce flooding downstream.

Since proposed Alternative #2 is dependent on the MWRD improvements downstream, it is recommended that Alternative #1 be implemented during interim conditions (interim preferred alternative). When the proposed improvements by MWRD take place downstream, it is recommended that Alternative #2 be implemented for ultimate conditions (ultimate preferred alternative).

Please see Appendix B, Section 6.8.1 for additional information on this drainage issue.

Continue coordination with Bridgeview, IDOT and MWRD will be required and more information will be provided in a future submittal.

4.3.2 Drainage Issues Near Archer Avenue (SI 1104)

The existing trunk sewer will be replaced in the proposed conditions and the alignment of the proposed trunk storm sewer from the detention basin to the outfall would be just north of the NB outside shoulder barrier wall. The proposed detention basin is provided within tollway ROW and bounded by I-294, 88th Avenue and 79th Place. The total detention provided is 8.46 acre-ft for the additional impervious area and to compensate for existing lost inline storage. The schematic of proposed detention basin preliminary grading is shown below.

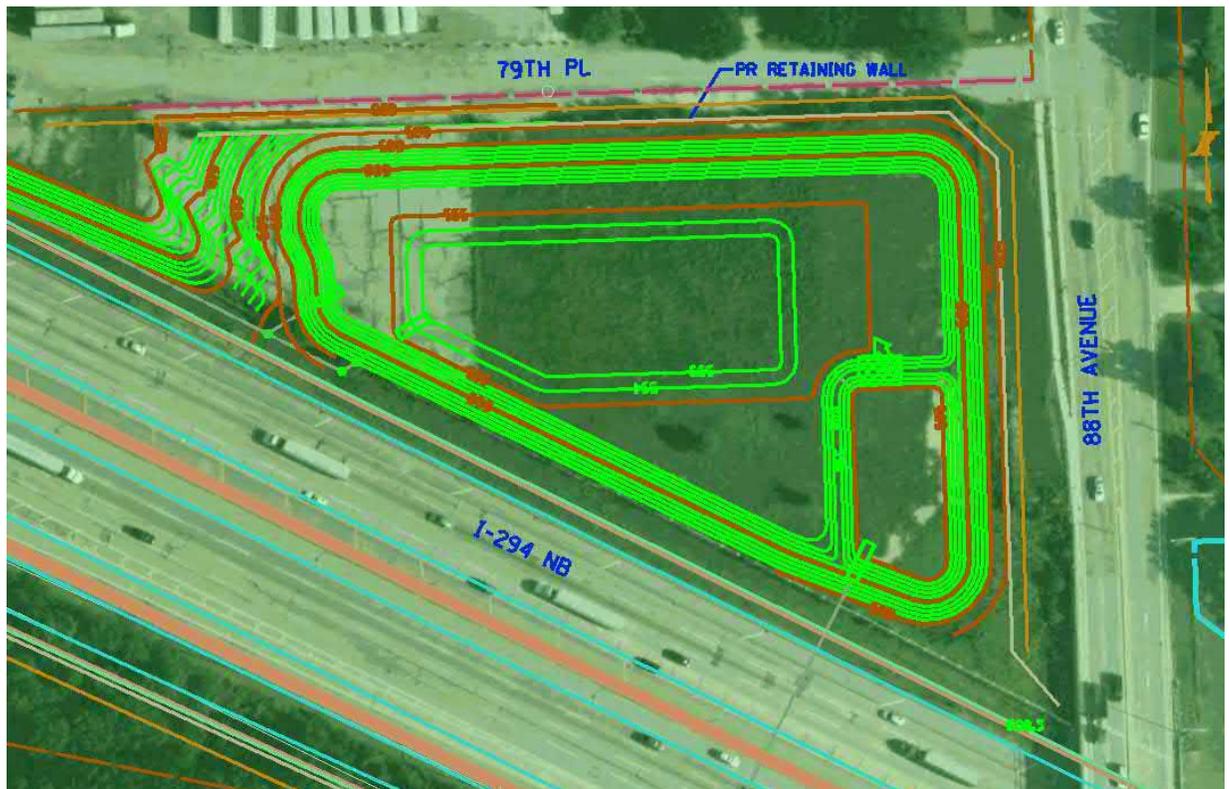


Figure 20: Proposed detention basin preliminary grading – Outlet 20A



Figure 21: Proposed detention site looking southeast

The entire closed drainage system will be replaced in the proposed conditions and designed for 50-yr storm event. The proposed conditions divert some of the areas from Outlet 20C and 20G due to the proposed northbound entrance ramp onto I-294 from SB Archer Avenue. Since these outlets are all part of the I&M Canal watershed, it is not shown as diversion on the Proposed Drainage Plans. The proposed conditions have been analyzed with free outfall and outfall with tail water condition (elevation 594.00). The summary of results for the proposed conditions are provided in Appendix B Section 6.8.2. The Peak flows in the proposed conditions at the outlet 48" RCP leaving Tollway have significantly reduced all storm events in the proposed conditions due to the increased upstream proposed detention, thereby improving downstream conditions. The outlet is suitable for continued use.

Please see Appendix B Section 6.8.2 for additional information on this drainage issue.

4.4 STORMWATER DETENTION ANALYSIS

The required 100-yr stormwater detention volume, based on the additional bridge and pavement area for the roadway recommended Alternative 8R, was estimated using the graphic method shown in the Tollway Drainage Design Manual Appendix G1. Additionally, runoff hydrographs have been appropriately routed through the proposed conditions to ensure that, at the major outfalls, the 2-year and 100-year release rates do not exceed the maximum allowable release rates. The Proposed 100-year release rate (maximum release rate) was calculated by multiplying the total added impervious area by a factor of 0.15 cfs/acre (0.04 cfs/acre for the 2-year storm) and added to the non-impacted existing discharge. A detailed summary of detention volume and water quality treatment volume are included in Appendix B, Section 6.1.

All the existing detention will be maintained where feasible within the corridor. The lost existing detention volume is added to the required detention volume for additional impervious area to calculate the total required detention volume. Additional right-of-way acquisition will be required, as discussed in Section 4.5 of this report to accommodate several new detention and water quality facilities. Table 6 shows required detention and water quality volumes. Locations of potential detention facilities (pending ROW acquisitions) are included in Appendix A, Section 5.11.

There are drainage alternatives being considered for detention for some of the outlets as discussed in Section 4.6. It should also be noted that due to the proximity of the Flagg Creek and Salt Creek floodplains to the Tollway and the flat topography in this area, we are currently unable to provide Tollway required detention volumes while meeting the Tollway criteria of not providing detention below the 100-year floodplain. If a variance is received to store water below the 100-year flood, the required detention volume will be able to be provided in culverts and in the above ground detention ponds with the use of backflow preventers. Please see the Flagg Creek discussion below for options to provide the remainder of required detention.

Table 6: Stormwater Detention and Water Quality Volumes Summary

Watershed	Outlet(s)	Existing Detention lost within Tollway ROW	Required Detention Volume (100 Year)	Total Required Detention Volume including existing lost at each outlet (100 Year)	Total Provided Detention Volume (100 Year)	Required Water Quality (WQ) Volume at each outlet (1.00-inch x added impervious area)	Provided Water Quality (WQ) Volume																																																						
				by watershed	by watershed	by watershed	by watershed																																																						
		Acre-Ft	Acre-Ft	Acre-Ft	Acre-Ft	CU-FT	CU-FT																																																						
Lucas Diversion Ditch	17A	0.00	-1.48	1.81	5.33	12543	18295																																																						
	17C-A	0.00	3.29					79th Street Sewer	19A	0.13	1.02	3.46	4.49	10067	9305	19B	0.00	0.00	19C	0.10	0.00	19D	0.56	0.29	19E	0.46	0.09	19F	0.75	0.02	20F	0.00	0.15	20G	0.00	-0.11	I&M Canal	20A *	0.65	3.36	4.73	8.46	28211	55461	20B **	0.00	0.08	20C **	0.00	0.63	Justice Ditch	20H	0.00	0.24	0.24	0.70	1683	0	Des Plaines River	21F **	0.00
79th Street Sewer	19A	0.13	1.02	3.46	4.49	10067	9305																																																						
	19B	0.00	0.00																																																										
	19C	0.10	0.00																																																										
	19D	0.56	0.29																																																										
	19E	0.46	0.09																																																										
	19F	0.75	0.02																																																										
	20F	0.00	0.15																																																										
	20G	0.00	-0.11																																																										
I&M Canal	20A *	0.65	3.36	4.73	8.46	28211	55461																																																						
	20B **	0.00	0.08																																																										
	20C **	0.00	0.63																																																										
Justice Ditch	20H	0.00	0.24	0.24	0.70	1683	0																																																						
Des Plaines River	21F **	0.00	1.00	1.00	Provided in Contract RR-14-4221	6912	Provided in Contract RR-14-4221																																																						

Watershed	Outlet(s)	Existing Detention lost within Tollway ROW	Required Detention Volume (100 Year)	Total Required Detention Volume including existing lost at each outlet (100 Year)	Total Provided Detention Volume (100 Year)	Required Water Quality (WQ) Volume at each outlet (1.00-inch x added impervious area)	Provided Water Quality (WQ) Volume
				by watershed	by watershed	by watershed	by watershed
		Acre-Ft	Acre-Ft	Acre-Ft	Acre-Ft	CU-FT	CU-FT
Flagg Creek	23A	0.00	0.12	15.68	15.52	100001	17342
	23B.1	0.05	0.04				
	23B.2	0.00	0.61				
	23B.3	0.00	-0.44				
	23B.4	0.00	-0.03				
	23C	0.39	1.70				
	23D	0.05	0.03				
	23E	0.00	-1.26				
	23F	0.00	3.99				
	24A	0.05	-3.05				
	24B	0.00	4.94				
	24C	0.08	-0.69				
	24D	0.00	-1.39				
	24E	0.00	3.58				
	24F	0.00	-1.86				
	25A	0.00	3.25				
	25B/D	0.30	4.77				
	25C	0.30	-0.40				
	26A	0.00	-0.89				
	26B	0.00	0.22				
	26C	0.00	0.08				
26D	0.00	-0.04					
26E	0.00	0.25					
26F	0.00	0.96					
Salt Creek	27A	0.03	1.63	5.33	4.98	28813	Not known yet
	27B	0.12	0.55				
	28A-1***	0.00	0.00				
	28A-2***	0.00	0.97				
	28A-3***	0.00	1.37				

	28B***	0.04	0.35				
	29A***	0.00	0.27				

Per Illinois State Toll Highway Authority Drainage Design Manual (March 2016) Appendix G-2 (Detention Volume Chart), Proposed Detention Storage Volume required was calculated 0.525 Acre-Ft/Acre of added impervious area for 100-Year and 0.20 Acre-Ft/Acre for 2-Year.

* additional impervious area is not included for new entrance and exit ramp improvements by the Village of Justice at 88th Avenue to I294.

** Added impervious area calculations resulting from Contract RR-14-4223 project limits. Overall detention requirements would be evaluated in the Contract RR-14-4221 outlet analysis.

*** Required water quality volume calculation performed using 1.25" x added impervious area per DuPage County.

**** Due to the proximity of the Flagg Creek and Salt Creek floodplains to the Tollway and the flat topography in this area, we are currently unable to provide Tollway required detention volumes while meeting the Tollway criteria of not providing detention below the 100-year floodplain. Please see the Flagg Creek discussion below for options to provide the remainder of required detention.

The stormwater detention is discussed in the following section on a watershed basis to include discussion on ownership and maintenance responsibilities, detention site selection, mention of drainage alternatives, water quality provision and diversion of areas, if any, from one outlet to another.

Lucas Diversion Ditch Watershed

The proposed detention pond for the outlet 17C-A is provided in the area bounded by the Tollway right of way, Indiana Harbor Belt Railroad Company, 95th Street and 87st Street. The detention site is located upstream of the outlet and this area requires acquisition of ten properties. The detention pond will be owned and maintained by the Tollway. This is dry pond and includes the required water quality volume. The detention pond will provide the required detention storage for outlets 17A and 17C-A since both outlets drain to Lucas Diversion Ditch Watershed. There will be no modifications to the existing detention pond-17A located near Outlet 17A or pond-17C located near outlet 17C-A.

There is no stormwater detention provided for outlet 18A as there is no increase in impervious area in the proposed conditions.

79th Street Sewer Watershed

The proposed detention pond for outlet 19A is provided in the area bounded by the Tollway right of way, 85th Street and 81st Avenue. The detention site is located near the outlet and this area requires acquisition of three properties. Please refer to Exhibit 5.11.2 in Appendix A, Section 5.11. The detention pond will be owned and maintained by the Tollway. This is wet pond and includes the required water quality volume. An inline detention drainage alternative is investigated and discussed in Section 4.6.

There is no stormwater detention provided for outlets 19B and 19C as there is no increase in impervious area in the proposed conditions.

The stormwater detention for outlet 19D is achieved by lowering the existing detention pond by about 5 feet. Please refer to Exhibit 5.11.3 in Appendix A, Section 5.11. The proposed control structure will be located in the median and the pipes connecting the proposed pond and the control structure will be used as inline detention. This acts as a back-up detention storage system like the existing conditions. There is no water quality volume provided for the outlet, a mechanical water quality separator will be considered in final design. All the storm sewers from the proposed detention pond to the outlet will be replaced. The existing pipes that remain on southbound outside shoulder and northbound plaza departing area will be televised. The cross-road pipes, replaced under the existing pavement which is outside the reconstruction limits, should be considered for jacking under the roadway during the contract plans preparation phase.

The stormwater detention for outlet 19E is achieved by lowering the existing detention pond-19F and constructing a new pond by acquiring property east of 85th Avenue, south of the Tollway. Please refer to Exhibit 5.11.3 in Appendix A, Section 5.11. The detention pond will be owned and maintained by the Tollway. Additional detention over what is required is provided for this outlet to reduce the peak flows at the outlet where flooding problems are reported. Refer to Section 2.3.12 of this report for drainage problems along the Tollway ROW in the Village of Justice. The proposed control structure will be located in the median and the pipes connecting the proposed pond and the control structure will be used as inline detention. This acts as a back-up detention storage system like the existing conditions. There is no water quality volume provided for the outlet. The existing pipes that remain on southbound and northbound outside shoulders will be televised. The cross-road pipe 42" RCP is lowered to gain additional cover. However, the storm sewer system still doesn't meet HGL requirements for the design storm. It is improved from the existing conditions but doesn't meet 2' HGL criteria at the low point on southbound outside shoulder. A design deviation will be sought for this condition. The replaced 42" RCP under the existing pavement should be considered for jacking under the roadway during the contract plans preparation phase. A detention drainage alternative is investigated and discussed in Section 4.6.

The stormwater detention for outlet 19F makes use of the existing 60" oversized pipe along the northbound outside shoulder by replacing the control structure at the downstream. Special drainage structures will be designed over the 60" RCP to align the frame & grate with the

proposed barrier wall. Additional storage is provided in new 54" RCP along the southbound outside shoulder for additional impervious area and to compensate for existing lost 42" RCP inline detention. There will be no modifications to the existing detention pond-19F on the upstream. The existing cross-road 60" RCP to remain in the proposed conditions will be televised to evaluate the condition of the pipe for further use. Please refer to Exhibit 5.11.4 in Appendix A, Section 5.11 for additional information.

I&M Canal Watershed

Refer to Section 2.3.3 and Section 4.3.2 of this report for stormwater detention of the outlet 20A (Drainage Issues Near Archer Avenue (SI 1104)).

The stormwater detention for the outlet 20B and outlet 20C would be provided in the contract RR-14-4221. Refer to the Master Plan of this contract.

There is no stormwater detention provided for outlets 20F and 20G as there is no increase in impervious area combined for the outlets in the proposed conditions.

The stormwater detention for the outlet 20H is provided in the area between W 79th Street and the re-aligned SB Archer Avenue. The detention site is located near the outlet and this detention area is in IDOT's property. The detention pond will be owned and maintained by IDOT. This is dry pond and the water quality volume is not provided. Please refer to Exhibit 5.11.6 in Appendix A, Section 5.11.

Des Plaines River Watershed

The stormwater detention for the outlet 21F would be provided in the contract RR-14-4221. Refer to the Master Plan of this contract. A drainage alternative for the northbound outside ditch is investigated and discussed in Section 4.6.

Flagg Creek Watershed

The stormwater detention for the outlet 23A is provided in the area bounded by I-294 southbound, I-55 northbound and Ramp K. The detention site is located near the outlet and most of this detention area is in the Tollway property, but partially in IDOT's property. The detention pond will be owned and maintained by the Tollway. This is dry pond and the water quality volume is not provided. Please refer to Exhibit 5.11.7 in Appendix A, Section 5.11.

The stormwater detention for the outlet 23B.1 is provided in the northbound ditch upstream of the 48" culvert. Please refer to Exhibit 5.11.7 in Appendix A, Section 5.11. The stormwater detention for the outlet 23B.2 is provided in a detention pond located between mainline northbound and south of Ramp N. Please refer to Exhibit 5.11.8 in Appendix A, Section 5.11. Some of the area along I-294 southbound is diverted to the detention pond in the proposed conditions. The detention pond will be owned and maintained by the Tollway. This is a wet

pond and the water quality volume is provided as required. There is no stormwater detention provided for outlets 23B.3 and 23B.4 as there is no increase in impervious area for the outlets in the proposed conditions.

The stormwater detention for the outlet 23C is provided in the area bounded by the Tollway ROW, Vine Street and Joliet Road. Please refer to Exhibit 5.11.8 in Appendix A, Section 5.11. The existing ditch detention will be removed on all four sides of 54" cross-road culvert and the volume is included for the proposed detention required storage. The Tollway storm water is conveyed through the closed drainage system on both sides of Joliet Road to drain to the detention pond. The closed drainage system runs against the roadway profile in this area since the detention pond is located near the high point of the roadway profile. The drainage area from outlet 23E is diverted to the pond in the proposed conditions. However, it is not identified as diversion on the Proposed Drainage Plans since both the outlets drain to Flagg Creek Watershed. This pond requires acquisition of the property and the pond will be owned and maintained by the Tollway. This is a wet pond and the water quality volume is provided as required. A detention drainage alternative is investigated and discussed in Section 4.6.

The stormwater detention for the outlet 23D is provided in the southbound ditch with a weir wall to replace the existing ditch detention. The ditch detention and weir wall is located outside Flagg Creek floodplain boundary. Please refer to Exhibit 5.11.9 in Appendix A, Section 5.11. The water quality volume is not provided. A detention drainage alternative is investigated and discussed in Section 4.6.

The stormwater detention for the outlet 23E is provided in the northbound ditch with a weir wall to replace the existing ditch detention. The ditch detention and weir wall is located within Flagg Creek floodplain boundary like in the existing conditions. The proposed ditch where it outlets to Flagg Creek is re-routed to the north of the existing ditch location due to erosion issues adjacent to slope wall. Please refer to Exhibit 5.11.9 in Appendix A, Section 5.11.

The proposed detention provided for the Flagg Creek watershed north of Sta. 1257+00 (the South Flagg Creek crossing) will be provided with a combination of above ground ponds and underground box culverts. In order to achieve a minimum velocity of 2 ft/sec in the box culverts it was necessary to include a parallel conveyance system which will also be counted towards detention. For the AES design, EPA SWMM modeling of one of the parallel conveyance systems in Salt Creek was performed to verify the overall functionality of this configuration. The sizing of the conveyance systems is shown on the PDP, however, the sizing of any of the overflow pipes from the conveyance system to the detention system and any restrictors needed on the conveyance system to fill up the detention pipe will need to be performed in Phase 2. See the Proposed Drainage Plans for more details.

Providing detention in the proposed ditches along the Tollway corridor was investigated, however, due to the widening of the Tollway the ditches are not large enough. Another location for potential detention in the Flagg Creek watershed was provided to the Tollway from the Village of Western Springs. The Village identified approximately 1 Ac-Ft of detention volume that is available in the recently constructed Timber Trails Subdivision pond.

However, due to Flagg Creek being located between the Tollway and the subdivision, this storage has not been utilized because getting water from the Tollway to the pond would not be feasible. As a result, to utilize this detention, the Tollway would need to work with the Village of Western Springs to adjust or modify the detention pond and possibly the Timber Trails subdivision drainage systems to utilize the 1 Ac-Ft. As built plans for the detention pond have not yet been received from the Village.

The detention volume required for the Flagg Creek watershed cannot all be provided above the 100 year floodplain elevation. The fact that Flagg Creek runs parallel to the Tollway throughout this watershed, and topography is very flat, makes it difficult to provide detention above the 100-yr flood. In order to achieve the required detention underground box culverts and above ground ponds were lowered to the 10 year water surface elevation. Backflow preventers will be utilized to prevent mixing compensatory storage and detention storage based on Tollway requirements.

Another option to minimize the use of detention below the 100-year is providing volume control in existing paved areas in which detention was not provided during the original construction of the Tollway (i.e. the Hinsdale Oasis). This volume control would be provided by paving the public parking lots (not the truck parking) with permeable pavers to provide volume control and to reduce imperviousness. This option should be looked at further during the phase 2 design.

Salt Creek Watershed

The proposed detention in the Salt Creek Watershed will be provided in underground detention culverts as shown on the Proposed Drainage Plan, see Appendix A Section 5.6. The remaining detention required in the Salt Creek watershed is proposed to be provided at the Buck Road detention site in the 4224 contract. However, now that it has been determined that the DuPage County FEQ model will become the FEMA regulatory model for the Salt Creek watershed the flood elevations are known. As a result, the ability to provide detention in the Ogden Avenue interchange may be possible by regrading the SE quadrant loop ramp. This will be looked into more closely during the phase 2 design.

In order to achieve a minimum velocity of 2 ft/sec in the box culverts it was necessary to include a parallel conveyance system which will also be counted towards detention. An EPA SWMM modeling of one of the detention boxes was performed to verify the functionality of the storage and conveyance systems interaction. However, the overflow pipe sizing and any restrictors on the conveyance pipes to allow the detention to fill up will need to be verified in Phase 2.

Other locations to provide detention within the Salt Creek watershed were investigated. A soil boring and a monitoring well investigation that was performed within the Bemis Woods area on the west side of I-294 Sta 1460+00 (MP 27.6) showed this site was not viable for detention. Expanding the detention pond north of Cermak Road on the east side of I-294 was evaluated, however, since reconstructing and widening of the Tollway in this area is not being

proposed, along with the fact that the property costs are high, this area is not seen as being viable for detention. Providing detention in the proposed ditches along the Tollway corridor was investigated, however, due to the widening of the Tollway the ditches are not large enough.

4.5 RIGHT OF WAY ANALYSIS

Table 7 shows the ROW needs for preferred detention basin locations. The ROW needs to provide ditches and drainage conveyance along the corridor have also been assessed throughout the study area and included with the roadway ROW analysis included in the Master Plan for the corridor.

Table 7: ROW Summary

Proposed Detention Basin / Compensatory Storage Sites	Station	Direction	PIN	Owner	Municipality
POND-PR-17A	953+00	NB	23-01-106-004	NA	Village of Bridgeview
			23-01-106-005	Bridgeview Park District	
			23-01-106-011	Cook County Treasurer	
			23-01-106-013	Bridgeview	
			23-01-300-012	Lamar Advertising Co	
			23-01-300-014	Firstmerit BK	
			23-01-300-016	Bridgeview Village	
			23-01-300-018	Hartz Construction	
			23-01-300-022	Liability Acquisition GRP LLC	
			23-01-301-008	Bergquist Inc	
POND-PR-19A	1006+00	NB	18-35-407-054	Jaroslav Makowki	Justice
			18-35-407-055	Fakhry Natour	
			18-35-407-056	Edward & Kathie Para	
POND-PR-19E	1036+00	SB	18-35-109-012	Maka Mary	Justice
POND-PR-23C	1244+00	NB	18-19-404-005	SDLL COPR	Indian Head Park
			18-19-404-008		
			18-19-404-009		
			18-19-404-010		
			18-19-404-011		
13A	1303+00	NB	18-18-301-005	Teglia Dean J	Western Springs
			18-18-412-001	Western Springs Once LLC	
13C	1348+00	NB	18-07-999-001	NA	Western Springs
			18-07-418-003	Flagg Creek Water Reclamation Dist	
			18-07-418-004		

			18-07-418-005		
			18-07-418-006		
13D	1376+00	NB	18-07-117-007	Hartz Construction	Woodridge
			18-07-117-008		
			18-07-117-009		
13E	1367+00	NB	18-07-400-009		Western Springs
CS-4 (Compensatory Storage Site)	1396+00	NB	18-07-103-001	Commonwealth Comm Vent	Western Springs
			18-07-103-002		
			18-07-103-003		
			18-07-103-004		
			18-07-103-009	Bruckert Commwllth VLG	
			18-07-103-010		
CS-3 (Compensatory Storage Site)	1402+00	NB	18-06-321-003	Spring Rock Park	Western Springs
14B	1425+00	SB	18-06-303-001	Judith Cizmar	Hinsdale
			18-06-303-002	Laverne Foran	
			18-06-303-005	George Petroni	
			18-06-303-022	Christa Palit	

NA = Property Owner Information Not Available on Cook County Recorder of Deeds website.

4.6 DRAINAGE ALTERNATIVES

Drainage alternatives were considered during preparation of the proposed drainage plans and the drainage alternative exhibits are included in Appendix A, Section 5.8.

Outlet 19A: A detention pond POND-PR-19A is proposed as a preferred option in the area bounded by the Tollway ROW, 85th Street and 81st Avenue by acquiring three properties. A drainage alternative of inline detention in lieu of the detention pond is investigated to avoid property acquisition. A total of 2600 feet of 60" oversized storm sewer is required to provide the required detention, but the benefits of natural open detention, water quality and ease of construction and maintenance outweigh the benefits of inline detention. The construction of 60" RCP at about 20 feet deep adjacent to the retaining wall is also another constructability issue with inline detention.

Outlet 19E: The existing detention pond Pond-19E could be expanded and lowered to provide additional detention as a sole detention pond. However, the acquisition of additional property provides more detention volume and reduces the peak flows at the outlet 19E where the Village of Justice reported the flooding problems.

Outlets 19A, 19D and 19E (Hickory Hills Reservoir Expansion): The proposed drainage plan preferred option reduces the peak flow at these outlets, however, the flooding issues continue

at the downstream of the Tollway outlets because of the undersized existing local storm sewer system on the downstream. An additional drainage alternative is investigated to drain the Tollway pavement and off-site area from the outlets 19A, 19D and 19E to Hickory Hills Reservoir (HHR). The exhibit showing the alternative is shown on Appendix A, Section 5.8. The northbound and southbound mainline pavement will be drained to HHR with main trunk storm sewer located under the southbound outside shoulder. It will require hydrologic and hydraulic analysis of the HHR to evaluate the additional Tollway runoff into the reservoir and options to expand the HHR should also be evaluated. The trunk storm sewer will require the outside shoulder to be reconstructed for the major portion which otherwise would not require reconstruction. However, the advantages include reduced or no flooding at the outlets 19A, 19D and 19E and elimination of inline detention pipes and the proposed detention ponds POND-PR-19A, POND-PR-19E2. This will minimize the property acquisition for these proposed ponds. Phase II DSE will evaluate feasibility of this alternative and determine if the alternative can be made the preferred alternative for the proposed conditions after coordinating with the DCM, City of Hickory Hills and the Tollway. In addition, through community outreach meeting City of Hickory Hills mentioned that there are opportunities to expand the size of the HHR with the purchase of few parcels.

Outlet 21F: The proposed drainage along I-294 northbound from 5th Avenue Cutoff on the north to the project limits with the contract RR-14-4221 to the south is designed to convey stormwater through the ditch as a preferred option by acquiring ROW. A drainage alternative is investigated in this area to provide a 7' (Wide) X 3' (High) box culvert outside the proposed roadway shoulder as a drainage alternative to avoid or minimize ROW acquisition in this area.

Outlet 23C: A detention pond POND-PR-23C is proposed as a preferred option in the area bounded by the Tollway ROW, Vine Street and Joliet Road by acquiring a property. A drainage alternative is investigated to avoid property acquisition by providing ditch detention on all four quadrants of outlet 23C and constructing new pond just east of Wolf Road to divert some drainage area to this pond in outlet 23B from outlet 23C. This diverted area is basically an additional impervious area that is added in the proposed conditions for the roadway recommended Alternative 8R.

Outlet 23D: A standard 4 feet wide ditch detention is proposed in the PDP for this outlet to meet the detention requirements. However, if the property for the detention pond POND-PR-23C is not acquired, a drainage alternative of providing 16 feet wide ditch detention is investigated for outlet 23D and divert some of the increased drainage area in the proposed conditions from outlet 23E.

4.7 FLOODPLAIN ENCROACHMENT EVALUATION

The floodplain encroachment evaluation was conducted in accordance with EO 11988 "Floodplain Management," the "Assessment and Documentation of Flood Plain Encroachment" as contained in the BDE Manual (IDOT, 2011), "Floodway/Floodplain Encroachments" in the Tollway Drainage Design Manual (Tollway, 2017), "Floodplain Encroachments" in the Illinois Drainage Manual (IDOT, 2011), Illinois Administrative Code

3708 “Floodway Construction in Northeastern Illinois,” and Illinois Administrative Code 3700 “Construction in Floodways of Rivers, Lakes, and Streams.” Guidance from the MWRDGC Watershed Management Ordinance (WMO), DuPage County Stormwater Management Division, and the various local municipalities was applied in determining floodplain impacts and compensatory storage requirements.

Potential floodplain encroachments were identified by overlaying recommended roadway Alternative 8R onto FIRMs published by the FEMA and then calculated based on determined base (100-year) flood elevations (BFE). The proposed project would result in transverse and longitudinal floodplain and floodway encroachments onto Flagg Creek and Salt Creek floodplains. The discussion below provides the detailed description of encroachment type, encroachment volume and compensatory storage volume to mitigate encroachments.

Flagg Creek:

The transverse floodplain encroachments will occur at mainline bridge over Flagg Creek at Sta. 1405+00 due to widening of the bridges to accommodate proposed roadway Alternative 8R. There will also be transverse encroachments due to the extension of three culvert crossings that lie within the floodplain of Flagg Creek tributaries. The proposed roadway widening would result in longitudinal encroachment on six locations of Flagg Creek, and Flagg Creek tributaries floodplains. Floodplain and floodway impacts at Flagg Creek floodplain as summarized in Table 8.

Compensatory storage is provided for all regulatory floodway and floodplain fills per Part 3708 rules. In regulatory floodway and floodplains, fill shall be compensated for at a ratio of 1:1 for volume of flood storage lost below the 100-year flood elevation. Compensatory storage shall be provided incrementally at a 1:1 ratio below the 10-year flood elevation and between the 10- and 100-year flood elevations. The proposed improvement mostly impact regulatory floodway and floodplain except the northern section, beginning upstream of I-294 bridge over Flagg Creek, that lies in mapped floodplain, Zona A. The Part 3700 Rules do not require compensatory storage volume for fill in the floodway or floodplain. However, local ordinances do regulate floodplain fill. The project is within Cook County, which is regulated under the MWRD Watershed Management Ordinance (WMO) amended July 10, 2014. Section 602.9 of the WMO requires compensatory storage volume equal to at least 1.1 times for volume of flood storage lost below the base (100-year) flood elevation (BFE). Please see Appendix A Section 5.6 Proposed Drainage Plan for Compensatory storage site locations.

Salt Creek:

The encroachment of the floodplain of Salt Creek due to the proposed widening of I-294 will occur on both the east and west side of the Tollway (See Section 2.4.2). There were two scenarios (Scenario #1 and Scenario #2) of roadway geometry and retaining walls developed for I-294 within the Salt Creek floodplain in which compensatory storage calculations were performed, see Appendix B, Section 6.7 for calculations.

The calculations provided for Scenario #1 show a scenario where there are retaining walls designed on both the east (northbound) and west (southbound) sides of I-294. Because there are retaining walls on both sides of I-294 this provides the flexibility of raising and lowering the roadway profiles with minimal impact to the compensatory storage required. This scenario allows the roadway profiles to be raised in order to meet the Tollway criteria for both freeboard (50-year + 3 feet) and to have no encroachment of the 500 year flood elevation to the low edge of pavement for the water surface elevations provided in the DuPage County FEQ model. See WC #24 in Section 4.8.2.10 for an exception to meeting the Tollway freeboard criteria. The DuPage County FEQ model was approved by the IDNR and will become the regulatory model sometime in mid-2018 or early 2019, it is currently in the mapping phase. Just to note, in Scenario #1, as stated above, retaining walls will be provided on both the east and west sides of I-294 however, the current AES plans for this area only show a retaining wall on the west side. The wall on the east side of I-294 was removed from the design, by direction from the Tollway, to show as much right-of-way acquisition as necessary to not need a retaining wall. In Scenario #1, the total fill in the Salt Creek floodplain/floodway using the DuPage County FEQ model is approximately 2.65 Ac-Ft for the 0–10-yr level and 1.96 Ac-Ft for the 10 yr.–100 yr. level (see calculations in Appendix B, Section 6.7). Please note that these numbers are approximate, as further minor revisions to the I-294 roadway and the Ogden Ave. interchange Ramp G profiles may be required in Phase II. Also note that the calculations provided in Appendix B show the fill on the west side of the Tollway as floodway fill, this was intentional and may change in Phase II depending on requirements from the IDNR during permitting and also due to the revisions to the regulatory floodplain mapping currently ongoing. Currently the floodway on the draft revised DuPage County FIRM map based on the FEQ model shows the floodway ending at the county line, which does not match the topography of the area. Since the Tollway project is in Cook County, compensatory storage for fill in the floodplain must be provided at a 1.1:1 ratio based on the Metropolitan Water Reclamation District of Greater Chicago (MWRD) ordinance. As a result for this scenario, the compensatory storage required is 2.92 Ac-Ft for the 0–10-yr level and 2.16 Ac-Ft for the 10 yr.–100 yr. level. It is important to note that according to the MWRD ordinance, the additional compensatory storage required beyond a one to one ratio (1:1) may be placed above or below the 10-year flood elevation. As stated above, the proposed Tollway project is in Cook County in this location, however, the floodplain in Cook County is an unstudied Zone A floodplain (i.e. no flood elevations determined). To be conservative, the fill in the floodplain was calculated using the DuPage County FEQ model which is the model that provided the highest flood elevations for the Salt Creek floodplain. Other models of the floodplain in the area include the current FEMA regulatory model which does not extend into Cook County and an MWRD model that was created for the Detailed Watershed Plan for the Lower Des Plaines River Watershed, which models Salt Creek in Cook County (See memo to Reed Panther dated 3/23/17 in Appendix D, Section 8.1 for more information on the modeling). The plan for providing the compensatory storage for this fill in the floodplain/floodway is to provide the storage in the Bemis Woods site on the west side of I-294 near MP 27.8 (approximately Sta. 1469+00 LT). See Appendix A Section 5.6,

Proposed Drainage Plan and Appendix B Section 6.7 for location. There is a hill within the forest preserve that can be excavated to provide the compensatory storage for the fill in the floodplain/floodway for Scenario #1. Coordination with the Forest Preserve District of Cook County is ongoing to determine if this location can be utilized for compensatory storage. Continued coordination will be required with the IDNR, MWRD, DuPage County and the Forest Preserve District of Cook County regarding this plan.

Scenario #2 was in response to the removal of the retaining wall on the east side of I-294 as discussed above. The retaining wall was replaced with an embankment slope down to existing ground. With this scenario, the total fill in the Salt Creek floodplain/floodway using the DuPage County FEQ model increases to approximately 4.50 Ac-Ft for the 0–10-yr level and 3.00 Ac-Ft for the 10 yr.–100 yr. level. The compensatory storage required at a 1.1:1 ratio increases to 4.95 Ac-Ft for the 0–10-yr level and 3.30 Ac-Ft for the 10 yr.–100 yr. level. See calculations in Appendix B, Section 6.7. Similar to the Scenario #1, the plan for providing the compensatory storage for the fill in the floodplain/floodway for Scenario #2 is to provide most of the compensatory storage in the Bemis Woods site mentioned above. However, not all of the compensatory storage for the 10 yr.-100 yr. level can be provided at the Bemis Woods site for this scenario. Coordination with DuPage County and the Forest Preserve District of Cook County is ongoing to determine additional locations where the remaining compensatory storage can be provided for this scenario. Most importantly, since this scenario was performed prior to raising the profiles of I-294 and Ramp G of the Ogden Avenue Interchange to provide freeboard and prevent encroachment of the 500-year onto the edge of pavement based on the FEQ model elevations, the floodplain fill numbers for Scenario #2 will increase more if no retaining wall is provided on the east side of I-294.

Table 8: Summary of Compensatory Storage at Flagg Creek and Salt Creek Floodplain

Waterway	Waterway Crossing	Encroachment Type	Location and Description	Total Required Compensatory Storage (ac-ft)		Total Provided Compensatory Storage (ac-ft)		Compensatory Storage Site Locations	
				NWL-10 yr	10-100 yr	NWL-10 yr	10-100 yr		
Western Spring Ditch, Tributary to Flagg Creek	Water Crossing # 23	Floodplain (longitudinal)	Northwest ditch fill due to roadway widening - Sta 1423+00 to Sta 1410+60 (SB)					Combination of following sites: 1) CS-1: Storage on culvert (6'x5') running on SB shoulder @ Sta 1410+90 LT to 1424+50 LT 2) CS-2: Excess Comp Storage available in Contract RR-14-4222 comp site 3) CS-3: Comp Site @ Sta 1402+00 RT 4) CS-4: Comp Site @ Sta 1395+00 RT	
Flagg Creek	Water Crossing # 22	Floodplain (longitudinal)	Southwest ditch fill due to roadway widening - Sta 1409+00 to Sta 1401+00 (SB)	0.13	2.75	0.53	3.20		
		Floodplain (longitudinal)	Southeast ditch fill due to roadway widening - Sta 1409+00 to Sta 1400+50 (NB)						
		Floodway (transverse)	U/S and D/S of new single span Flagg Creek Bridge						
Flagg Creek	Water Crossing # 21	Floodplain (longitudinal)	Northbound ditch fill due to roadway widening - Sta 1398+00 to Sta 1386+53 (NB)						
63rd St Ditch, Tributary to Flagg Creek	Water Crossing # 18	Floodplain (longitudinal)	Southbound ditch fill due to roadway widening - Sta 1317+00 to Sta 1297+00 (SB)	-0.04	0.11	0.05	0.21		CS-5: Oversize ditch for comp storage, located at upstream of culvert crossing WC # 18
		Floodway (transverse)	Culvert Extension						
Plainfield Rd Ditch, Tributary to Flagg Creek	Water Crossing # 17	Floodplain (longitudinal)	Southbound ditch fill due to roadway widening - Sta 1284+00 to Sta 1277+00 (SB)	0.07	0.06	0.12	0.27	CS-6: Oversize ditch for comp storage, located at upstream of culvert crossing WC # 17	
		Floodway (transverse)	Culvert Extension						
Flagg Creek	Water Crossing # 16	Floodplain (longitudinal)	Northbound ditch fill due to roadway widening - Sta 1285+00 to Sta 1274+00 (NB)	-0.09	-0.87			Not Required	
		Floodplain (longitudinal)	Southbound and Northbound ditches fill due to roadway widening - Sta 1268+00 to Sta 1244+00 (SB & NB)						
		Floodway (transverse)	U/S and D/S of new single span Flagg Creek Bridge						
Flagg Creek	Water Crossing # 15	Floodplain (longitudinal)	Southbound ditch fill due to roadway widening - Sta 1244+00 to Sta 1234+00 (SB)	0.00	-0.55			Not Required	
Salt Creek	Water Crossing # 25	Floodplain (transverse & longitudinal)	Southbound ditch fill and embankment widening due to roadway widening - Sta. 1462+00 to Sta. 1499+00 (LT) and Northbound ditch fill and embankment widening due to roadway widening - Sta. 1481+00 to Sta. 1492+00 (RT).	2.92	2.16	8.72	2.18	A potential compensatory storage site located in Bemis Woods on the west side (SB) of I-294 near MP 27.8 (approximately Sta. 1469+00 (LT))	

Note: Minus (-) number in amount of fills column shows excess cut.

4.8 BRIDGES AND CULVERTS

4.8.1 Bridge Spans Over Waterways

There are 3 bridge spans over waterways.

4.8.1.1 I-294 Over Flagg Creek - South Crossing (#16)– STA 1257+00 (M.P. 23.8)

The existing bridge will be replaced with a smaller single span jointless bridge. Superstructure will consist of new IL63 PPC beams spanning 123.67' (Face to face abutments along the girder) over the Flagg Creek. There will be no piers in the stream, eliminating the concern for scour. These bridges will each carry the Flex Lane and 4 lanes of I-294 traffic (4 lanes Northbound and 4 lanes Southbound) over Flagg Creek. Flagg Creek conveys drainage from the Flagg Creek watershed on the North side of I-294 to the South side of I-294.

Peak flows for the crossing were taken from an existing MWRD unsteady flow HEC-RAS model. Bridge hydraulics were analyzed by modifying the existing MWRD model. The model was extended upstream of the structure and surveyed cross sections were added approximately 1000', 500', and 50' upstream and downstream of the structure. Additionally, cross sections were added at both faces of the structure as well as at approximately 100' upstream and downstream of the structure to encompass the curve in Flagg Creek. The existing structure was modified to incorporate the Alternative 8R design. The model was run as a steady flow model using the peak flows from the MWRD model.

The widening of the bridge has no significant impact upon the calculated water surface elevation at this crossing. Under proposed conditions all freeboard and low chord clearance criteria are met. There is 4.5' between the proposed low chord of the structure and the natural highwater elevation for the 50-year storm event. Low chord criteria was also checked for the 100-year storm event with the 100 year event having 3.9' of clearance. Freeboard criteria was checked at the proposed low road station of 1264+00. For a 50-year storm event 6.2' of freeboard was obtained between the edge of pavement and the proposed created head elevation. In addition, the proposed headwater elevation for 500-year event is well below the proposed low pavement grade elevation. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.2.

4.8.1.2 I-294 Over Flagg Creek - North Crossing (#22) – STA 1405+00 (M.P. 26.5)

The existing bridge will be replaced with a shorter single span jointless bridge. Superstructure will consist of new IL27 PPC beams spanning 70' (Face to face abutments along the girder) over the Flagg Creek. There will be no piers in the stream, eliminating the concern for scour. These bridges will each carry the Flex Lane and 5 lanes of I-294 traffic (5 lanes Northbound and 5 lanes Southbound) over Flagg Creek.

The proposed Alternative 8R design includes raising the Mainline profile to improve hydraulic clearance and drainage along the corridor. Flagg Creek conveys drainage from the Flagg Creek watershed on the North side of I-294 to the South side of I-294.

Peak flows for the crossing were taken from an existing MWRD unsteady flow HEC-RAS model. Bridge hydraulics were analyzed by modifying the existing MWRD model. The model was extended upstream of the structure and surveyed cross sections were added approximately 1000', 500', and 50' upstream and downstream of the structure. Additionally, cross sections were added at both faces of the structure as well as at approximately 100' upstream and downstream of the structure to encompass the curve in Flagg Creek. The existing structure was modified to incorporate the recommended Alternative 8R design. The model was run as a steady flow model using the peak flows from the MWRD model.

The widening of the bridge will have no significant impact upon the calculated water surface elevation at this crossing. However, the roadway profile and superstructures have raised by up to 1.8 feet. Under proposed conditions all freeboard and low chord clearance criteria are met. There is 2.2' between the proposed low chord of the structure and the natural highwater elevation for the 50-year storm event. Low chord clearance criteria was also checked for the 100-year storm event with the 100 year event having 1.1' of clearance. Freeboard criteria was checked at the proposed low road station of 1401+00. For a 50-year storm event 4.4' of freeboard was obtained between the edge of pavement and the proposed created head elevation. In addition, the proposed headwater elevation for 500-year event is well below the proposed low pavement grade elevation. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.2.

4.8.1.3 I-294 Over Salt Creek (#25) – STA 1492+50 (M.P. 28.2)

The existing two three-span simply supported precast prestressed concrete girder bridges will be replaced with two single span structures that will be 130 feet from face of abutment to face of abutment, both the bridges will be approximately 107.08 feet wide to accommodate the recommended Alternative 8R. The proposed design includes a complete bridge replacements.

These bridges will each carry 6 lanes of I-294 traffic (6 lanes Northbound and 6 lanes Southbound) over Salt Creek. Salt Creek conveys drainage from the Salt Creek watershed on the West side of I-294 to the East side of I-294.

Peak flows and boundary conditions for the crossing were taken from an existing FEQ model of the Lower Salt Creek Floodplain that was created by DuPage County and will become the FEMA regulatory model near the middle of 2018 or beginning of 2019 and is currently in the mapping stage (See memo to Reed Panther dated 3/23/17 in Appendix D, Section 8.1 for more information on the modeling). Bridge hydraulics were analyzed by recreating the FEQ model in HEC-RAS. See Appendix B, Section 6.2.3 for more details on how the HEC-RAS model was created and extended based on

the FEQ model. The HEC-RAS model was run as a steady flow model using the peak flows and boundary conditions from the FEQ model. The existing structure was replaced in the model by the proposed bridges that are being designed for recommended Alternative 8R. The HEC-RAS model was run as a steady flow model using the peak flows and boundary conditions from the original FEQ model.

The widening of the bridges have no significant impact upon the calculated water surface elevations at this crossing. However, the roadway profiles (northbound and southbound) has changed. Under proposed conditions the low chord criteria is met. There is 3.48' between the proposed low chord of the structure and the natural high water elevation plus backwater effect for the 50-year storm event. Low chord criteria was also checked for the 100-year and 500-year storm events with the 100 year event having 3.11' of clearance and the 500-year event having 1.92' of clearance. Freeboard criteria (50-year + 3 feet) was checked at the proposed low road station of 1476+50.5. For the 50-year storm event 6.12' of freeboard was obtained between the low edge of pavement on the low side of the superelevation on the southbound side of I-294 and the proposed created head elevation. The Waterway Information Table is provided in Appendix A, Section 5.4.

It is important to note that in order to obtain freeboard (50-year WSE + 3 feet) and to insure no encroachment of the 500 year onto the proposed low edge of pavement based on the Salt Creek floodplain elevations from the FEQ model, the profile of I-294 will have to be a split profile for the northbound and southbound roadways in the area of the Salt Creek floodplain. In order to achieve this split profile a retaining wall will be required in the median that ranges from approximately 0 to 6 feet tall and is approximately 4200 feet long. Another issue that is important to note is that these revised profiles do not provide 3 feet of freeboard to the 50-year headwater elevation of Water Crossing #24. However, the 500 year headwater elevation of Water Crossing #24 does not encroach on the low edge of pavement, see Water Crossing #24 in Section 4.8.2.10 for more details.

It should also be noted that revisions to the Salt Creek FEQ model are currently being made by the GEC and the Phase II consultant will need to coordinate with them to determine any changes to floodplain elevations at this location and any impact it may have on the I-294 bridge.

4.8.2 Waters of the US (WOUS) Culverts

There are 10 crossings that were identified by our environmental staff as having WOUS and/or regulated wetlands present at one or both ends of the crossing.

All crossing that were identified as having WOUS in the vicinity are listed here, however, only crossings that carry an active flow, would allow for creature crossing, and are proposed to be completely replaced will be subject to the Sensitive Crossing Analysis as described in Appendix K of the Tollway Drainage Design Manual. This analysis will be completed in the design phase for the few crossings that require it.

4.8.2.1 STA 1007+20 (M.P. 19.0) – Crossing #2

Single 42” RCP, 232’ in length.

The single 42” RCP will be extended approximately 8’ total (8’ to the east) to accommodate Roadway Alternative 8R.

This culvert conveys drainage from Tollway right of way along I-294 southbound from milepost 19.33 to milepost 18.72, in addition to approximately 1.3 acres of urban area in Hickory Hills. The Hickory Hills Reservoir is located adjacent to the culvert inlet west of I-294.

Record drawings indicate that upstream of the culvert, water is allowed to overflow into the reservoir. Downstream of the culvert, flow continues through a short section of ditch and into a storm sewer system through the residential development east of I-294. Proposed culvert hydraulics was analyzed using HY-8 Culvert Analysis Program. The flow through this culvert is outlet controlled. HY-8 output summary table is provided in Appendix B, Section 6.2. The proposed condition negative created head values were changed to zero and the headwater elevations were changed to the natural highwater elevation in the WIT table. The negative values occurred due to the tailwater condition and the actual friction slope being less than the slope of the pipe used to calculate the natural highwater elevations.

There is approximately 3.20’ of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for the events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4.

4.8.2.2 STA 1231+53 (M.P. 23.3) – Crossing #14

Single 54” RCP, 321’ in length.

The single 54” CMP with a 40” insertion liner will be replaced with a 54” RCP culvert, 321’ in length to accommodate Roadway Alternative 8R. This culvert conveys drainage from the east (northbound) I-294 ditch and from an approximately 0.0671 square mile (43 acres) urban watershed in Countryside (city) under I-294. It is then conveyed by a short ditch and 2 - 10’ (W) x 5’ (H) culvert under Wolf Rd and then discharges into Flagg Creek.

HEC-HMS Clark Unit Hydrograph method (Bulletin 70, Huff distributions) was used to generate critical duration peak flows for the crossing. Culvert hydraulics was analyzed using HEC-RAS. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 24.7’ of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The

Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

4.8.2.3 STA 1279+66 (M.P. 24.2) – Crossing #17

Double 10' (W) x 5' (H) RCBC, 491.33' in length, Plainfield Road Ditch Crossing.

This culvert will be extended approximately 29 feet to the west to accommodate Roadway Alternative 8R.

Peak flows for the crossing were taken from FIS study since FIS flows are higher than the MWRD flows. Culvert hydraulics were analyzed by modifying the existing MWRD model. The model was extended upstream of the structure and surveyed cross sections were added approximately 1000', 500', and 50' upstream and downstream of the structure. The model was run as a steady flow model using the FIS peak flows. The existing structure was modified to incorporate the Alternative 8R design. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 7.4' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

4.8.2.4 STA 1306+54 (M.P. 24.7) – Crossing # 18

Triple 15' (W) x 5' (H) RCBC, 291.92 in length, 63rd Street Ditch Crossing.

This culvert will be extended approximately 61'-11" total (55'-9" to the east and 6'-2" feet to the west) to accommodate Roadway Alternative 8R.

Peak flows for the crossing were taken from an existing MWRD unsteady flow HEC-RAS model. Culvert hydraulics were analyzed by modifying the existing MWRD model. The model was extended upstream of the structure and surveyed cross sections were added approximately 1000', 500', and 50' upstream and downstream of the structure. The model was run as a steady flow model using the peak flows from the MWRD model. The existing structure was modified to incorporate the Alternative 8R design. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 5.2' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

4.8.2.5 STA 1338+54 (M.P. 25.3) – Crossing # 20

Single 7'W x 5'H RCBC, 388' in length.

The single 7'W x 5'H RCBC will not require extension as it already spans outside of Frontage Roads, which are not impacted by the proposed Roadway Alternative 8R, on both (SB and NB) the sides of I-294.

This culvert conveys drainage from the west (southbound) I-294 ditch line and from an approximately 0.24 square mile (150.4 acres) urban watershed in Burr Ridge and Hinsdale under I-294. It is then conveyed by a short ditch and discharges into Flagg Creek.

Proposed culvert hydraulics were analyzed using HEC-RAS. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 7.1' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

4.8.2.6 STA 1386+54 (M.P. 26.2) – Crossing # 21

Single 8'W x 8'H RCBC, 313' in length.

The single 8'W x 8'H RCBC will be extended approximately 26' total (26 feet to the west) to accommodate recommended Roadway Alternative 8R.

This culvert conveys drainage from the west (southbound) I-294 ditch line and from an approximately 0.72 square mile urban watershed in Hinsdale under I-294. It is then conveyed by a ditch and series of culverts and discharges into Flagg Creek.

Proposed culvert hydraulics were analyzed using HEC-RAS. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 5.3' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

4.8.2.7 STA 1410+80 (M.P. 26.7) – Crossing # 23

Single 14'W x 6'H RCBC with 1.0' embedment, 225' in length.

The single 6'W x 5'H RCBC will be replaced with 14'W x 6'H RCBC, 225' in length to accommodate recommended Roadway Alternative 8R.

This culvert conveys drainage from the east (northbound) I-294 ditch line and from an approximately 0.25 square mile (161 acres) urban watershed in Western Springs under I-294. It is then conveyed by a short ditch and discharges into Flagg Creek.

Proposed culvert hydraulics were analyzed using HEC-RAS. Flow through this culvert is controlled by the tailwater from Flagg Creek. Based on coordination with the Tollway and the GEC, it was determined that a coincidental tailwater analysis should be utilized at this location, so the 500-year run used in this study utilizes 500-year discharge values with a 250-year tailwater from Flagg Creek.

There is approximately 3.4' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

4.8.2.8 STA 1464+55 (M.P. 27.7) – Crossing # 24

Single 60" RCP, 287' in length, drains to Salt Creek floodplain.

The single 60" RCP will not be extended in proposed conditions. Headwalls and wingwalls may be needed at ends of pipe to accommodate recommended Alternative 8R.

This culvert conveys drainage from Tollway right of way along I-294 northbound at Ogden Avenue to include the infields east of I-294, approximately 184 acres of residential area in Western Springs, south of Ogden Avenue and east of I-294; and approximately 134 acres of the Bemis Woods Forest Preserve, north of Ogden Avenue and east of I-294. Flow is then conveyed via a ditch west of I-294 and north of Ogden Avenue to outfall into Salt Creek.

Proposed culvert hydraulics were analyzed using HY-8 Culvert Analysis Program. Flow through this culvert is outlet controlled, since the downstream end of the culvert is within the Salt Creek floodplain, the 10-year Salt Creek floodplain elevation (643.26) was used as the tailwater elevation and downstream natural highwater elevation for the HY-8 model of this culvert. HY-8 output summary table is provided in Appendix B, Section 6.3. The slope and length of the pipe were used to calculate the natural highwater elevations at the upstream end of the culvert. For the 10-year event, the proposed condition negative created head values were changed to zero and the headwater elevations were changed to the natural highwater elevations in the WIT Table. The negative values occurred due to the tailwater condition and the actual friction slope being less than the slope of the pipe used to calculate the natural highwater elevations.

Freeboard criteria (50-year + 3 feet) and encroachment of the 500 year flood elevation onto the proposed low edge of pavement was checked at the low road elevation (647.71) at Station 1458+86.25. The freeboard provided to the 50-year headwater

elevation of the culvert is 2.40'. This freeboard does not meet the Tollway freeboard criteria of the 50-year + 3 feet, however, the 500-year proposed headwater elevation for this culvert (647.08) does not encroach on the low road elevation. A revised roadway profile to raise the low road elevation to meet the Tollway freeboard criteria for this culvert will be looked into during Phase II design. If the Tollway freeboard criteria cannot be met, a variance will need to be obtained during Phase II design. The Waterway Information Table is provided in Appendix A, Section 5.4.

4.8.2.9 STA 1563+63 (M.P. 29.6) – Crossing # 28

Double 60" RCP, 268' in length.

The proposed roadway pavement limits for the project end at approximately 1545+00. WC # 28 and # 29 are not proposed to be replaced. Therefore, this culvert is not impacted by this project. See Section 2.6.2 for a description of the existing hydraulics of WC # 28. Existing culverts to remain are to be televised during Phase 2 to determine if condition is acceptable.

The Waterway Information Table is provided in Appendix A, Section 5.4.

4.8.2.10 STA 1385+54 (M.P. 26.2) – Crossing at Creek Drive

Single 12'W x 6'H RCBC, 50' in length.

The existing corroded 11.6'W x 7.33'H CMP arch culvert will be replaced with 12'W x 6'H RCBC. This culvert is located immediately downstream of I-294 culvert crossing 21 and modeled with culvert crossing 21. This culvert drains approximately 0.72 square mile urban watershed in Hinsdale. It is then conveyed by a ditch and culvert and discharges into Flagg Creek.

Proposed culvert hydraulics were analyzed using HEC-RAS. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 0.2' of freeboard for the 50-year event, and the Creek Drive pavement at this culvert overtop for a storm event between 50-year and 100-year. The Waterway Information Table is provided in Appendix A, Section 5.4.

4.8.3 Non-WOUS Culverts

There are 11 crossings where WOUS are not present but require a crossing analysis.

4.8.3.1 STA 931+45 (M.P. 17.6) – Crossing # 1

Single 54” RCP, 115’ in length

The existing 54” storm sewer crossing would remain in place for the preferred roadway alternative 8R. This storm sewer conveys drainage from the tollway ditch on the west side of I-294 which begins just south of 87th Street. The Village of Hickory Hills constructed a 42” overflow storm sewer along 93rd Street which connected into the storm sewer at drainage structure ES-084L. This overflow sewer was constructed under Permit TS-93-24.

The storm sewer was analyzed using the rational method with Hydraflow Storm Sewers. The HGL in the storm sewer system is approximately 8’ below the rim elevation for the 50-year storm and 7’ below the rim elevation for the 100-year storm event. The calculations are provided in Appendix B, Section 6.3.

Please refer to section 2.3.12 of this report for additional information of this crossing and refer to outlet 19F evaluation, Appendix B, Section 6.9 for the detailed calculations.

4.8.3.2 STA 1038+23 (M.P. 19.6) – Crossing # 5

Single 42” RCP, 287’ in length.

The existing 42” storm sewer crossing would be replaced to a lower elevation for the preferred roadway alternative 8R and would be analyzed as part of the proposed drainage plan. Please refer to section 2.3.12 of this report for additional information of this crossing and refer to outlet 19E evaluation, Appendix B, Section 6.9 for the detailed calculations.

4.8.3.3 STA 1050+60 (M.P. 19.8) – Crossing # 6

Single 60” RCP, 310’ in length.

The existing 60” storm sewer crossing would be remained in place for the preferred roadway alternative 8R and would be analyzed as part of the proposed drainage plan. Please refer to section 2.3.12 of this report for additional information of this crossing and refer to outlet 19F evaluation, Appendix B, Section 6.9 for the detailed calculations.

4.8.3.4 STA 1069+00 (M.P. 20.2) – Crossing # 7

The Crossing is abandoned and the proposed conditions were not analyzed.

4.8.3.5 STA 1063+50 (M.P. 20.2) – Crossing # 8

48” and 60” RCP Storm Sewer, 186’ in length.

The proposed crossing will be relocated to the north side of I-294 NB and the proposed conditions were analyzed for the preferred roadway Alternative 8R.

This storm sewer system conveys drainage from an approximately 53 acres of the Tollway property and the upstream commercial and residential areas in Justice. SCS method (Bulletin 70, Huff distributions) was used to generate critical storm duration peak flows for the crossing. Culvert hydraulics were analyzed using XP SWMM. Flow through this culvert is outlet controlled.

Please refer to Section 2.3.2 of this report for additional information of this crossing. The calculations are provided as part of outlet 20A evaluation. See Appendix B, Section 6.8.2.

4.8.3.6 STA 1228+07 (M.P. 23.1) – Crossing # 13

Single 48” RCP, 381’ in length.

The single 48” CMP with a 34” insertion liner will be replaced with a 48" RCP culvert, 381’ in length to accommodate Roadway Alternate 8R. This culvert conveys drainage from the east (northbound) I-294 ditch and from an approximately 0.0754 square mile (48.3 acres) urban watershed in Countryside (city) under I-294. It is then conveyed by a short ditch and 2 - 10’ (W) x 5’ (H) culvert under Wolf Rd and then discharges into Flagg Creek.

HEC-HMS Clark Unit Hydrograph method (Bulletin 70, Huff distributions) was used to generate critical storm duration peak flows for the crossing. Culvert hydraulics was analyzed using HY-8 Culvert Analysis Program. Flow through this culvert is inlet controlled.

There is approximately 13.6’ of freeboard for the 50-year event with respect to I-294 NB exit ramp to I-55 SB, and the I-294 and NB exit ramp pavement at this culvert does not overtop for events up to and including the 500-year event.

4.8.3.7 STA 1239+52 (M.P. 23.4) – Crossing # 15

Single 54” RCP, 266’ in length.

The single 54” CMP with a 40” insertion liner will be replaced with a 54" RCP culvert, 266’ in length to accommodate Roadway Alternate 8R. This culvert conveys drainage from the east (northbound) I-294 ditch and from an approximately 0.0253 square mile (16.2 acres) urban watershed in Indian Head Park (Village) under I-294. It is then conveyed by a short ditch and 38” CMP culvert under Roofers Rd and then discharges into Flagg Creek.

HEC-HMS Clark Unit Hydrograph method (Bulletin 70, Huff distributions) was used to generate critical duration peak flows for the crossing. Culvert hydraulics was

analyzed using HEC-RAS. Flow through this culvert is outlet controlled by the tailwater from Flagg Creek.

There is approximately 20.2' of freeboard for the 50-year event, and the I-294 pavement at this culvert does not overtop for events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4 and hydrologic and hydraulic modeling results are included in Appendix B, Section 6.3.

4.8.3.8 STA 1318+55 (M.P. 24.9) – Crossing # 19

The existing 24" storm sewer crossing would be relocated for the preferred roadway alternative 8R and would be analyzed as part of the proposed drainage plan. See Section 5.6 Proposed Drainage Plan.

4.8.3.9 STA 1532+05 (M.P. 29.0) – Crossing # 26

Single 54" RCP, 225' in length.

The single 54" CMP with a 44" insertion liner will be replaced with a 225', 54" RCP and connected to the proposed box culvert on the northbound side that was originally proposed in the Pre-Final Plans for Drainage Improvements – Cermak Road Central TriState Tollway (I-294) by EJM Engineering/Primera. The shorter length of the proposed structure is due to the culvert being connected to the box culvert on the northbound side.

This culvert conveys drainage from tollway right of way along I-294 southbound, north of milepost 28.9 and south of milepost 29.1. An existing detention pond called Tear Drop Lake located to the west of I-294 and adjacent to the culvert inlet receives runoff from approximately 48 acres of a residential area and outflows to Crossing #26 via shallow grass covered swale. Flow is then conveyed southward via proposed storm sewer system east of I-294 that outfalls into Salt Creek.

Proposed culvert hydraulics was analyzed using HY-8 Culvert Analysis Program. Flow through this culvert is inlet controlled. HY-8 output summary table is provided in Appendix B, Section 6.3.

There is approximately 5.97' of freeboard for the 50-year event. Decrease from the existing freeboard is due to the lower proposed Alternative 8 edge of pavement elevation. The I-294 pavement at this culvert does not overtop for the events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4.

4.8.3.10 STA 1553+70 (M.P. 29.4) – Crossing # 27

Single 42” RCP, 217’ in length

This culvert will be extended slightly to a proposed 9’x4’ box culvert storm sewer system that was originally proposed in the Pre-Final Plans for Drainage Improvements – Cermak Road Central TriState Tollway (I-294) by EJM Engineering/Primera. This culvert conveys drainage from a small detention pond southwest of I-294 and Cermak Road Interchange. The pond receives drainage from Tollway right of way bounded by I-294, north of milepost 29.1 and south of Cermak Road. Drainage is then conveyed via a proposed storm sewer system east of I-294 that outfalls into Salt Creek.

Proposed culvert hydraulics was analyzed using HY-8 Culvert Analysis Program. Flow through this culvert is outlet controlled. HY-8 output summary table is provided in Appendix B, Section 6.2. The proposed tailwater condition is based on water surface elevations in the proposed EPA SWMM model for the Cermak Road Interchange Flood Impact Reduction which causes water surface elevations to decrease for this culvert in proposed conditions. The 9’x4’ and 10’x4’ culverts from the Cermak Interchange Flood Impact Reduction are shown in the proposed drainage plan and are to be constructed with this project.

There is approximately 6.08’ of freeboard for the 50-year event. The I-294 pavement at this culvert does not overtop for the events up to and including the 500-year event. The Waterway Information Table is provided in Appendix A, Section 5.4.

4.8.3.11 STA 1562+30 (M.P. 29.6) – Crossing # 29

Double 60” CMP (Lined to 24” and 38”) and 48” RCP, 195’ in length.

The proposed roadway pavement limits for the project end at approximately 1545+00. WC # 28 and # 29 are not proposed to be replaced. Therefore, this culvert is not impacted by this project. See Section 2.6.3 for a description of the existing hydraulics of WC # 29. Existing culverts to remain are to be televised during Phase 2 to determine if condition is acceptable.

The Waterway Information Table is provided in Appendix A, Section 5.4.

4.9 PERMIT REQUIREMENTS

The following permits will be required for drainage related items within the project area.

Table 9: Required Permits

Permit	Responsible Agency	Comment
Floodway Construction Permit	IDNR-OWR	Required due to construction of widened and new roadway section within a floodway and temporary construction activities with the floodway/floodplain. IDNR-OWR has jurisdiction over construction activities in regulatory floodways.
Section 401, Clean Water Act, Water Quality Certification	IEPA	Required in conjunction with Section 404 permit process by Clean Water Act.
Section 402, Clean Water Act, NPDES	IEPA	Disturbance and construction impact to an area greater than one acre. Required notification to the IEPA through Illinois Tollway joint agreement with IEPA
Section 404 Permit, Clean Water Act	USACE, Chicago District	Discharge of dredged or fill material into Waters of the U.S., including jurisdictional wetlands and streams. It appears that the USACE is going to require an individual permit, however this is under review. Wetland impact requires mitigation.
National Pollution Discharge Elimination System Permit	IEPA	Disturbance area is greater than 1 acre.
Erosion Control Review	<ul style="list-style-type: none"> • North Cook County Soil and Water Conservation District • Will / South Cook Conservation district 	SWCD review of erosion control plan required understanding agreement with Chicago District USACE Section 404 permit process.

Permit	Responsible Agency	Comment
Watershed Management Ordinance Permit	MWRD	<i>(Not Anticipated)</i> As coordinated with MWRD, the improvements will be exempt from the stormwater management requirements and related permits from the MWRD Watershed Management Ordinance (WMO) as stated in Article 200.4.G of the WMO.

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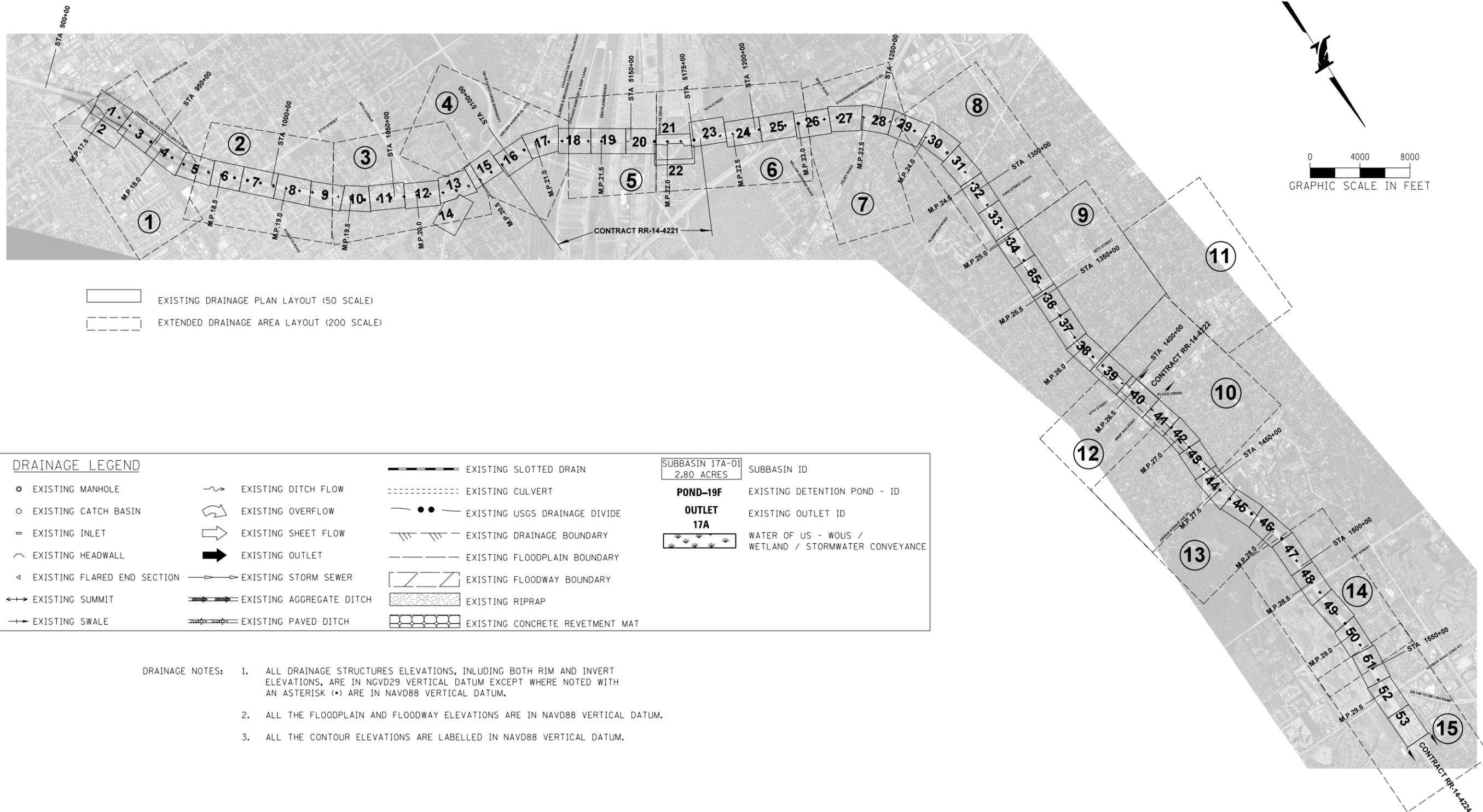
5 APPENDIX A - EXHIBITS

- 5.1 GENERAL LOCATION DRAINAGE MAP**
- 5.2 EXISTING DRAINAGE PLAN**
- 5.3 IDENTIFIED BASE FLOODPLAIN MAPS**
- 5.4 WATERWAY INFORMATION TABLE**
- 5.5 DRAINAGE DESIGN CRITERIA**
- 5.6 PROPOSED DRAINAGE PLAN**
- 5.7 DRAINAGE PROFILE**
- 5.8 PROPOSED DRAINAGE ALTERNATIVES**
- 5.9 EXISTING TYPICAL CROSS SECTIONS**
- 5.10 PROPOSED TYPICAL CROSS SECTIONS**
- 5.11 CONCEPTUAL DETENTION BASIN LAYOUTS**

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5.1 GENERAL LOCATION DRAINAGE MAP

5.2 EXISTING DRAINAGE PLAN



EXISTING DRAINAGE PLAN LAYOUT (50 SCALE)
 EXTENDED DRAINAGE AREA LAYOUT (200 SCALE)

DRAINAGE LEGEND

● EXISTING MANHOLE	~> EXISTING DITCH FLOW	— — — — — EXISTING SLOTTED DRAIN	□ SUBBASIN 17A-01 2.80 ACRES	SUBBASIN ID
○ EXISTING CATCH BASIN	↪ EXISTING OVERFLOW	- - - - - EXISTING CULVERT	■ POND-19F	EXISTING DETENTION POND - ID
▭ EXISTING INLET	→ EXISTING SHEET FLOW	— ● — EXISTING USGS DRAINAGE DIVIDE	□ OUTLET 17A	EXISTING OUTLET ID
∧ EXISTING HEADWALL	➔ EXISTING STORM SEWER	— / / — EXISTING DRAINAGE BOUNDARY	▭ WATER OF US - WOUS / WETLAND / STORMWATER CONVEYANCE	
◁ EXISTING FLARED END SECTION	→ EXISTING AGGREGATE DITCH	— — — — — EXISTING FLOODPLAIN BOUNDARY		
↔ EXISTING SUMMIT	→ EXISTING PAVED DITCH	▭ EXISTING FLOODWAY BOUNDARY		
→ EXISTING SWALE		▭ EXISTING RIPRAP		
		▭ EXISTING CONCRETE REVETMENT MAT		

- DRAINAGE NOTES:**
- ALL DRAINAGE STRUCTURES ELEVATIONS, INCLUDING BOTH RIM AND INVERT ELEVATIONS, ARE IN NGVD29 VERTICAL DATUM EXCEPT WHERE NOTED WITH AN ASTERISK (*) ARE IN NAVD88 VERTICAL DATUM.
 - ALL THE FLOODPLAIN AND FLOODWAY ELEVATIONS ARE IN NAVD88 VERTICAL DATUM.
 - ALL THE CONTOUR ELEVATIONS ARE LABELLED IN NAVD88 VERTICAL DATUM.

12/22/2017
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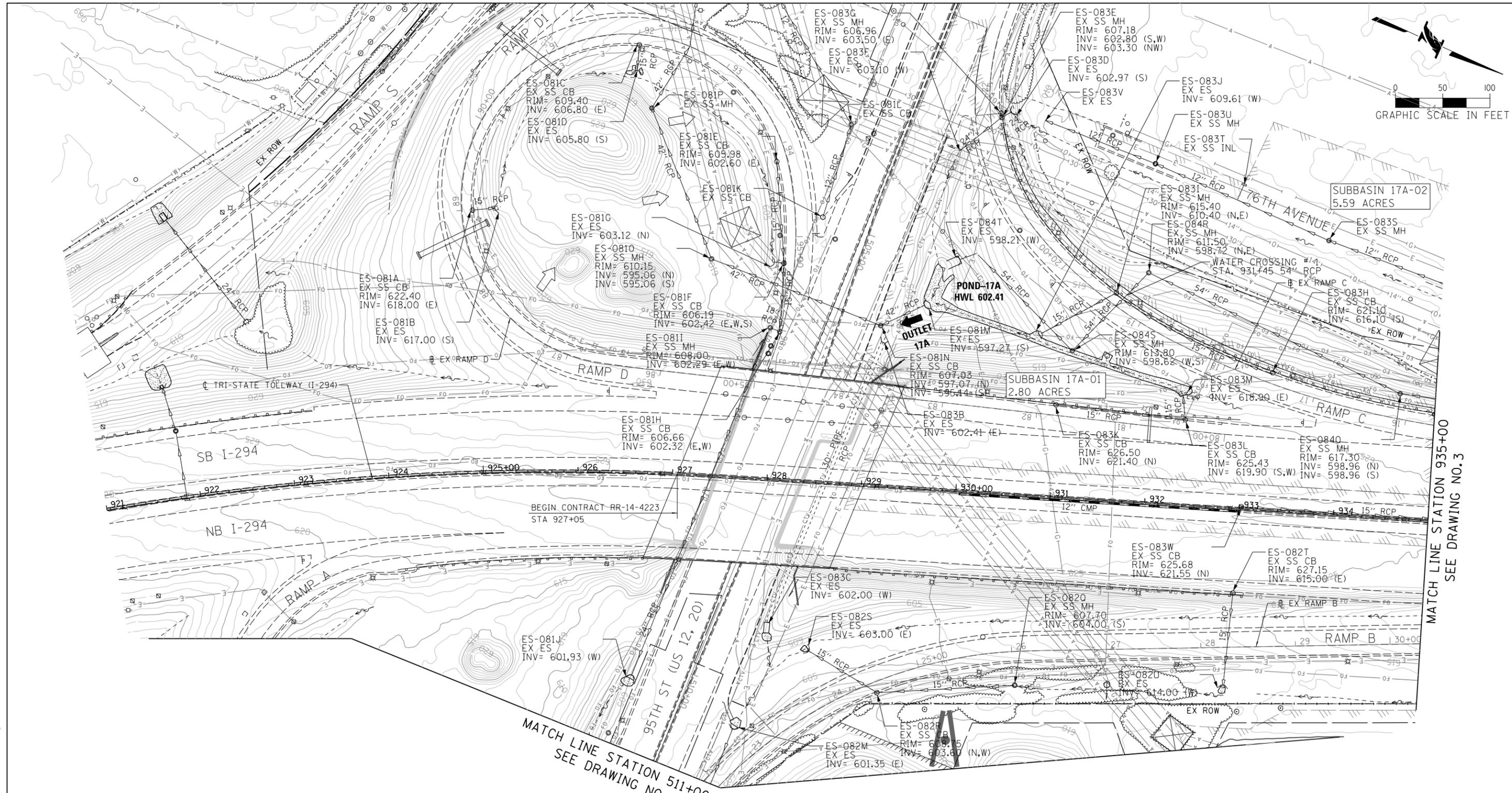
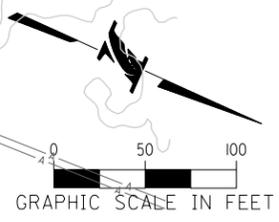
exp U.S. Services Inc.
 Chicago, IL
 BUILDINGS • EARTH & ENVIRONMENT • ENERGY
 INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

REVISIONS		
NO.	DATE	DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 DRAINAGE LEGEND AND SHEET PLAN

SHEET NO.
 IN-1
 DRAWING NO.
 1 OF 1



SUBBASIN 17A-02
5.59 ACRES

SUBBASIN 17A-01
2.80 ACRES

POND-17A
HWL 602.41

MATCH LINE STATION 511+00
SEE DRAWING NO.2

MATCH LINE STATION 935+00
SEE DRAWING NO.3

DETENTION DATA - FOR OUTLET 17A
(BASED ON EXISTING CONDITIONS ANALYSIS)
AREA = 96.97 AC
Q RELEASE = 138.4 CFS
STORAGE VOLUME (100 YR) = 0.13 AC FT
DETAINED IN POND-17A (929+67 LT)
HWE (100-YR) = 602.41

12/22/2017
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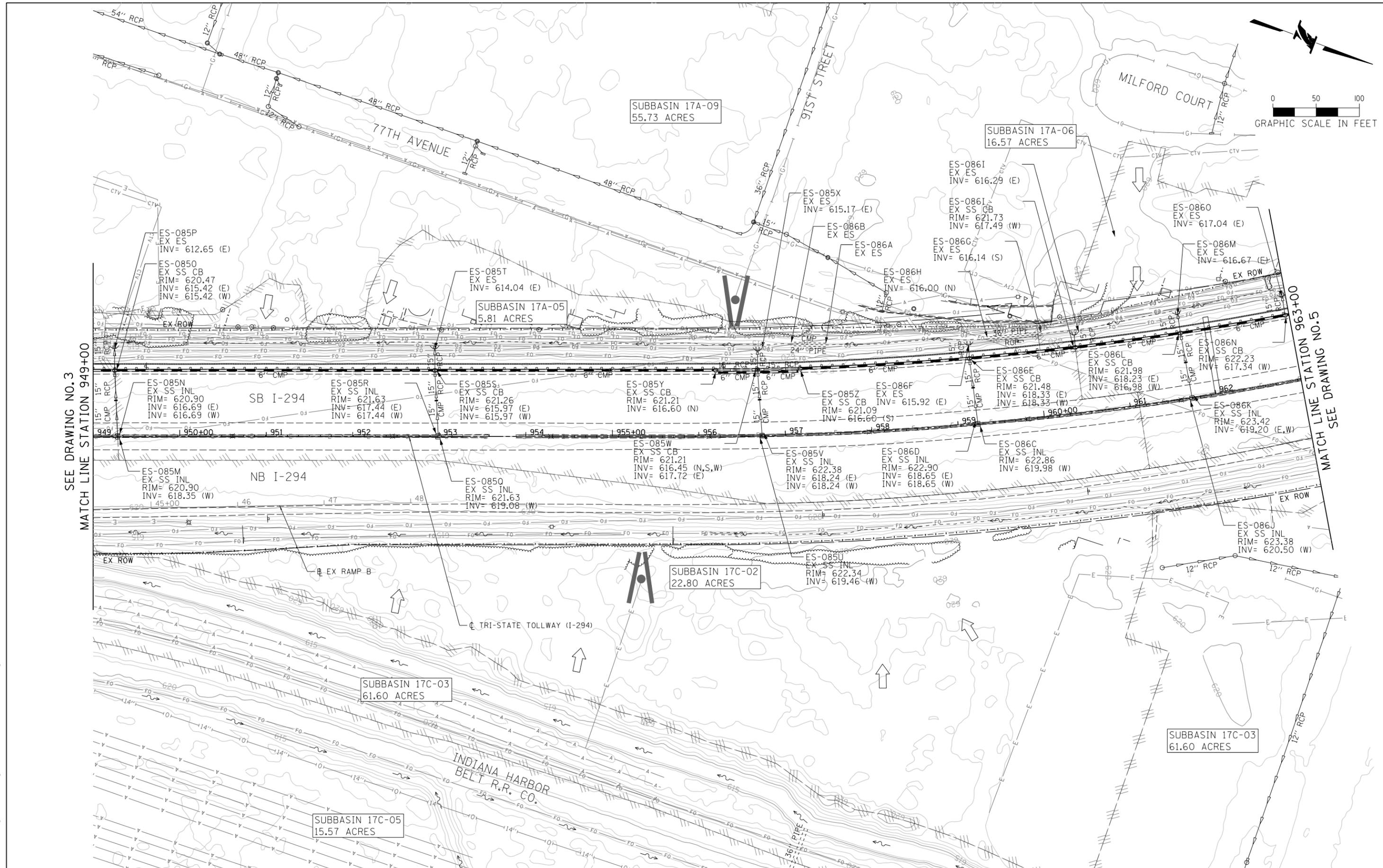
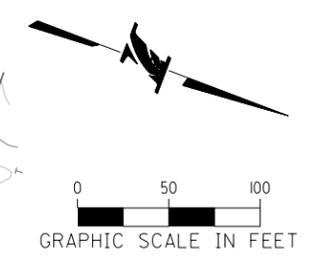
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NO.		REVISIONS	
NO.	DATE	DESCRIPTION	

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EXISTING DRAINAGE PLAN
STA 921+00 TO STA 935+00

SHEET NO. ED-1
DRAWING NO. 1 OF 53



SEE DRAWING NO.3
MATCH LINE STATION 949+00

MATCH LINE STATION 963+00
SEE DRAWING NO.5

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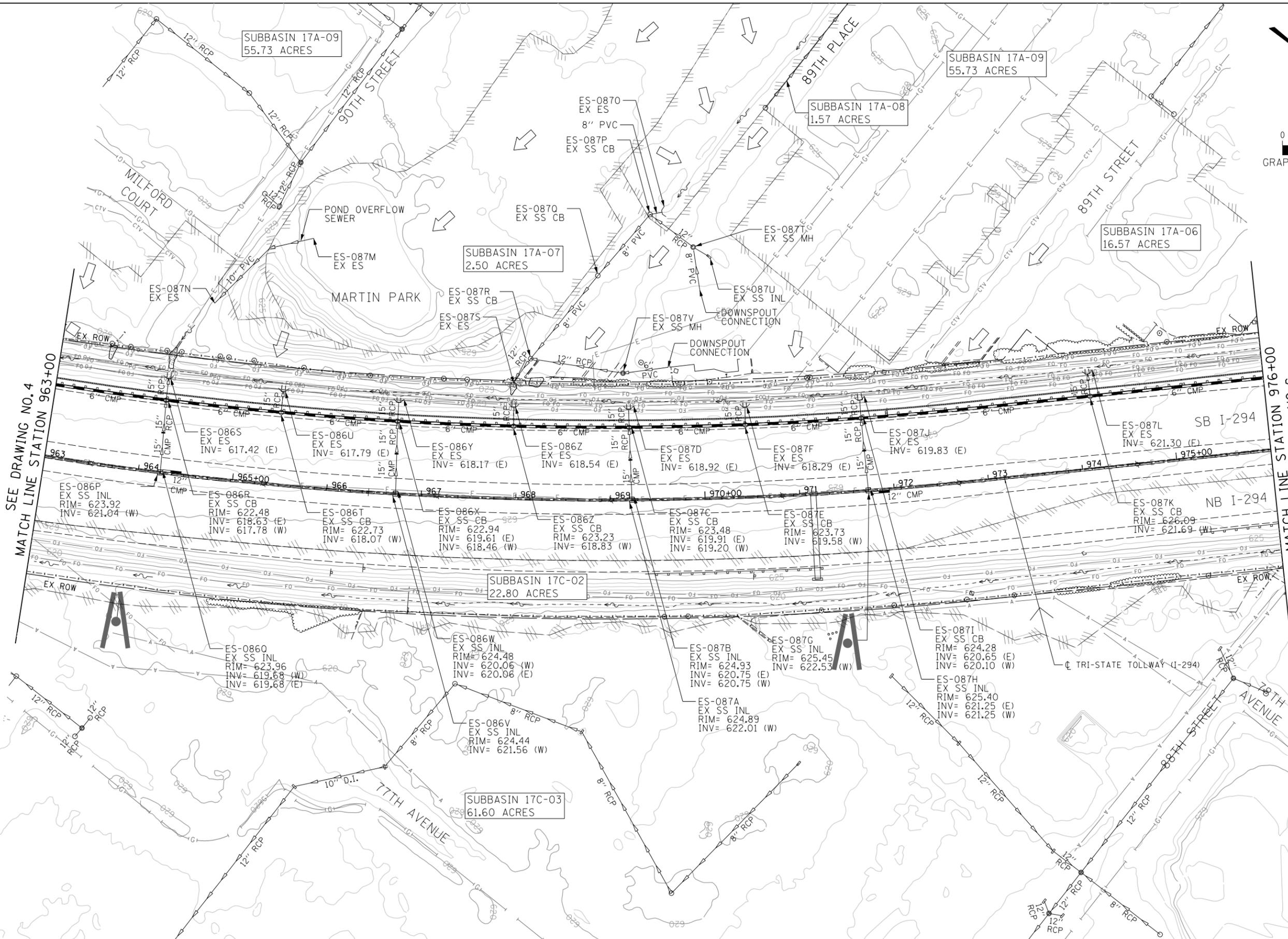
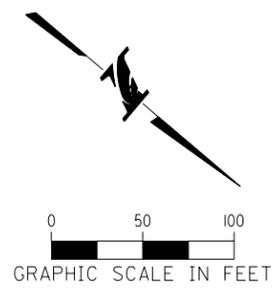
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REVISIONS		
NO.	DATE	DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 949+00 TO STA 963+00

SHEET NO. ED-4
 DRAWING NO. 4 OF 53



SEE DRAWING NO. 4
MATCH LINE STATION 963+00

MATCH LINE STATION 976+00
SEE DRAWING NO. 6

12/22/2017
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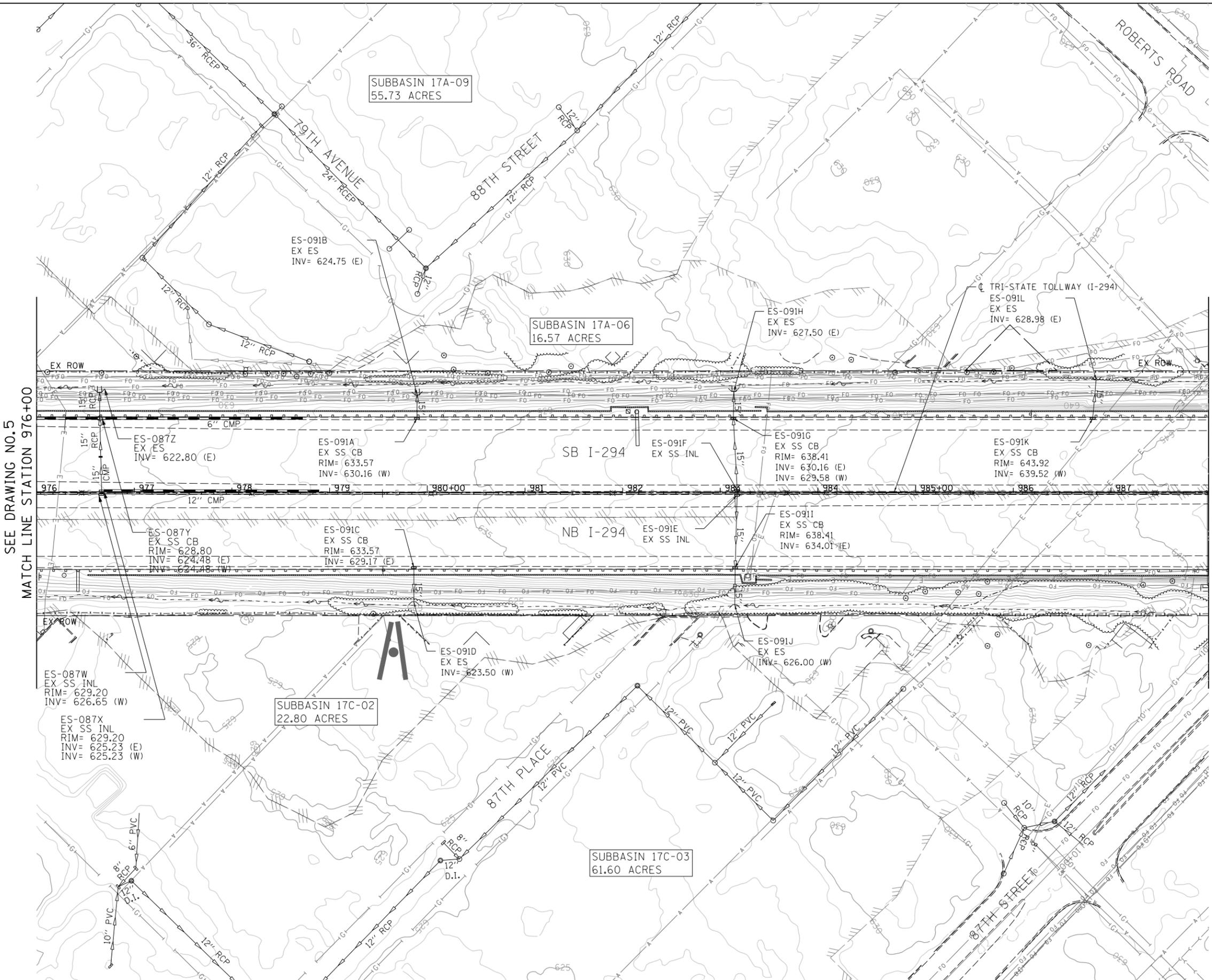
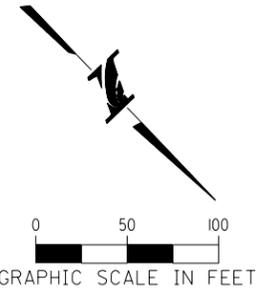
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 CHECKED BY DW DATE 10/27/17



NO.		REVISIONS	
NO.	DATE	DESCRIPTION	

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 963+00 TO STA 976+00

SHEET NO. ED-5
 DRAWING NO. 5 OF 53



SEE DRAWING NO.5
MATCH LINE STATION 976+00

MATCH LINE STATION 988+00
SEE DRAWING NO.7

SUBBASIN 17A-09
55.73 ACRES

SUBBASIN 17A-06
16.57 ACRES

SUBBASIN 17C-02
22.80 ACRES

SUBBASIN 17C-03
61.60 ACRES

ES-091B
EX ES
INV= 624.75 (E)

ES-091H
EX ES
INV= 627.50 (E)

TRI-STATE TOLLWAY (I-294)
ES-091L
EX ES
INV= 628.98 (E)

ES-087Z
EX ES
INV= 622.80 (E)

ES-091A
EX SS CB
RIM= 633.57
INV= 630.16 (W)

ES-091F
EX SS INL

ES-091G
EX SS CB
RIM= 638.41
INV= 630.16 (E)
INV= 629.58 (W)

ES-091K
EX SS CB
RIM= 643.92
INV= 639.52 (W)

ES-087Y
EX SS CB
RIM= 628.80
INV= 624.48 (E)
INV= 624.48 (W)

ES-091C
EX SS CB
RIM= 633.57
INV= 629.17 (E)

ES-091E
EX SS INL

ES-091I
EX SS CB
RIM= 638.41
INV= 634.01 (E)

ES-087W
EX SS INL
RIM= 629.20
INV= 626.65 (W)

ES-087X
EX SS INL
RIM= 629.20
INV= 625.23 (E)
INV= 625.23 (W)

ES-091D
EX ES
INV= 623.50 (W)

ES-091J
EX ES
INV= 626.00 (W)

12/22/2017
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 12/22/2017

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CHECKED BY DW DATE 10/27/17

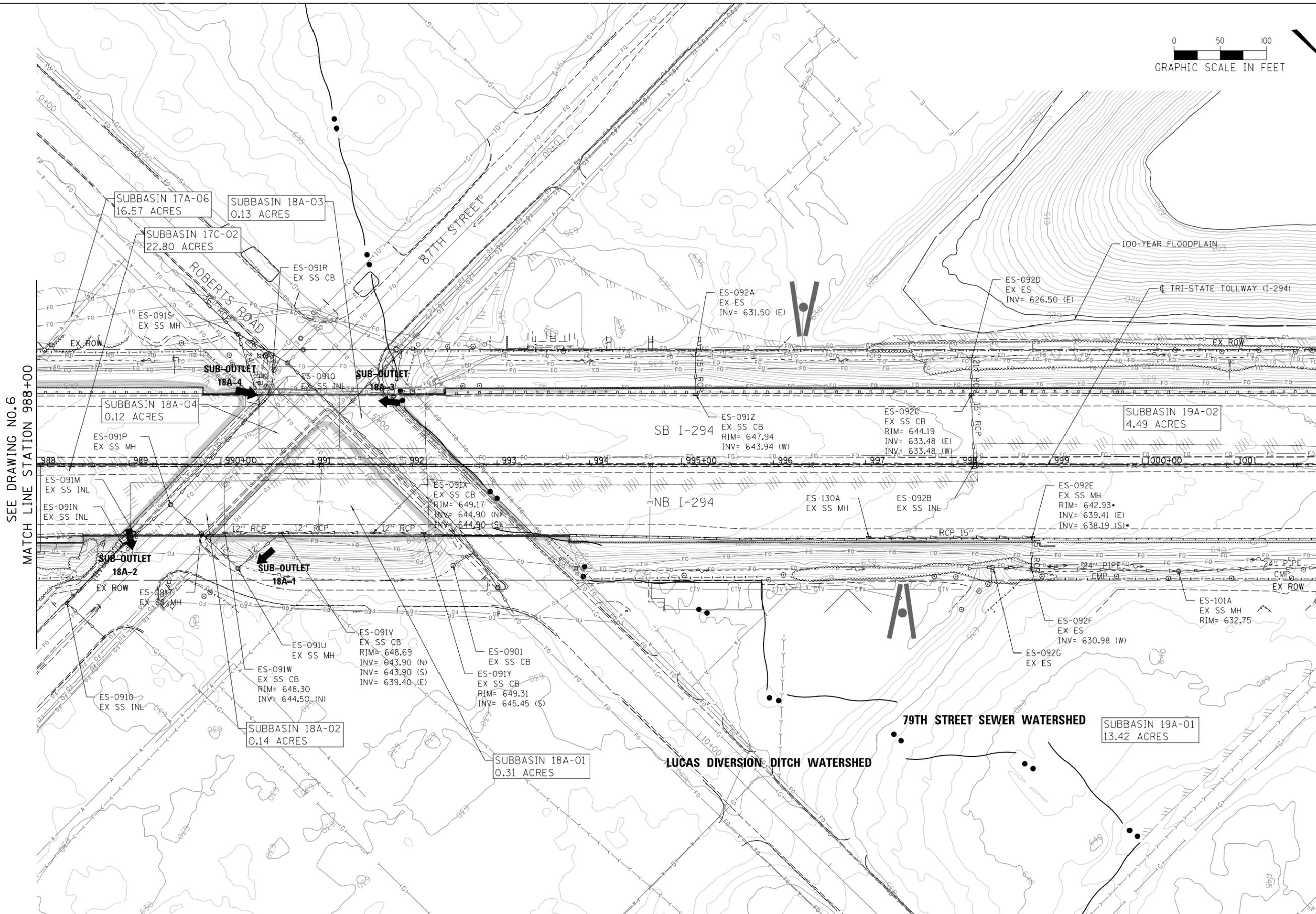
SEA
3041 WOODCREEK DRIVE, SUITE 211 - DOWNERS GROVE, IL 60515
(630) 641-9900

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
2700 OGDEN AVENUE
DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 976+00 TO STA 988+00

SHEET NO. ED-6
DRAWING NO. 6 OF 53



SEE DRAWING NO. 6
MATCH LINE STATION 988+00

MATCH LINE STATION 1002+00
SEE DRAWING NO. 8

12/22/2017
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DRAWN BY HDU SCALE 1"=50'
 CHECKED BY KS DATE 10/27/17

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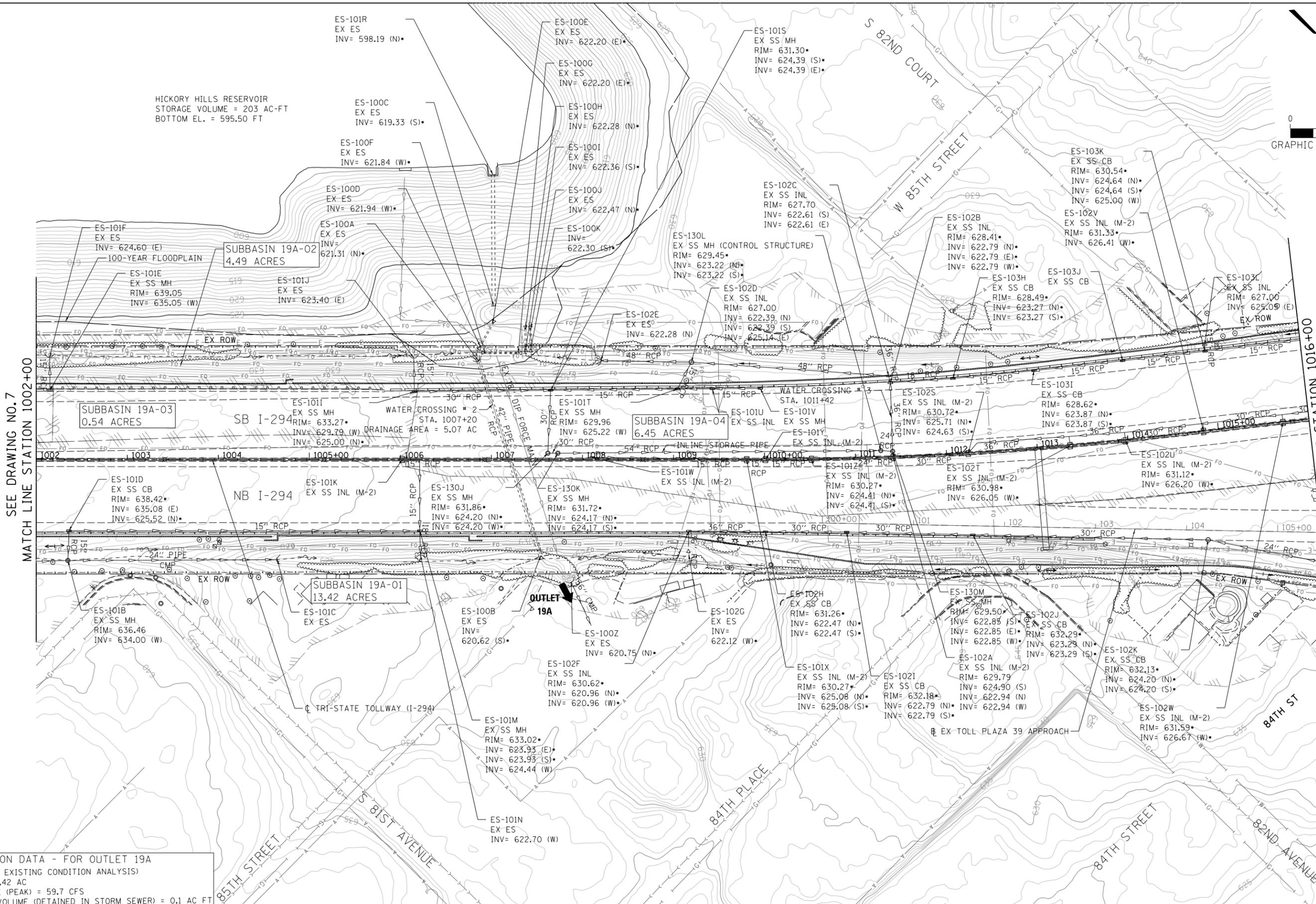
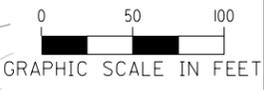
THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 988+00 TO STA 1002+00

SHEET NO. ED-7
 DRAWING NO. 7 OF 53

HICKORY HILLS RESERVOIR
STORAGE VOLUME = 203 AC-FT
BOTTOM EL. = 595.50 FT



SEE DRAWING NO.7
MATCH LINE STATION 1002+00

MATCH LINE STATION 1016+00
SEE DRAWING NO.9

DETENTION DATA - FOR OUTLET 19A
(BASED ON EXISTING CONDITION ANALYSIS)
AREA = 13.42 AC
Q RELEASE (PEAK) = 59.7 CFS
STORAGE VOLUME (OBTAINED IN STORM SEWER) = 0.1 AC FT

DRAWN BY HDU SCALE 1"=50'
CHECKED BY KS DATE 10/27/17

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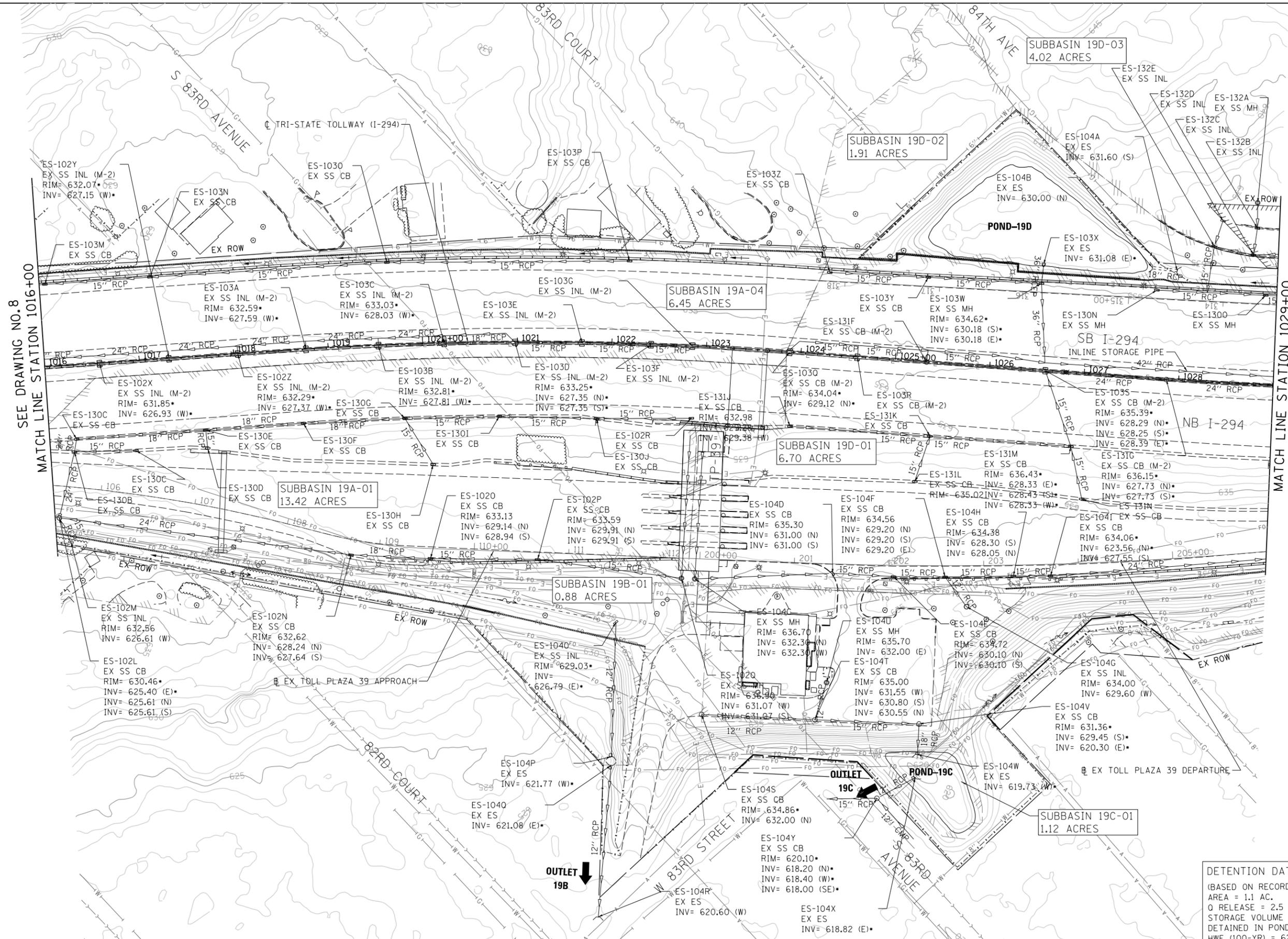
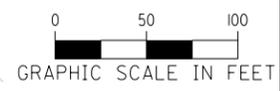
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DOWNERS GROVE, ILLINOIS 60515

REVISIONS		DESCRIPTION
NO.	DATE	

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1002+00 TO STA 1016+00

SHEET NO. ED-8
DRAWING NO. 8 OF 53

12/22/2017 C:\Users\jgarcia\Documents\Projects\RR-14-4223\1002-1016\1002-1016.dgn



SEE DRAWING NO. 8
MATCH LINE STATION 1016+00

MATCH LINE STATION 1029+00
SEE DRAWING NO. 10

DETENTION DATA - FOR OUTLET 19C
(BASED ON RECORD PLAN INFORMATION)
AREA = 1.1 AC.
0 RELEASE = 2.5 CFS
STORAGE VOLUME (100 YR) = 0.1 AC FT
DETAINED IN POND-19C (1025+75 RT)
HWE (100-YR) = 621.0

DRAWN BY HDU SCALE 1"=50'
CHECKED BY KS DATE 10/27/17

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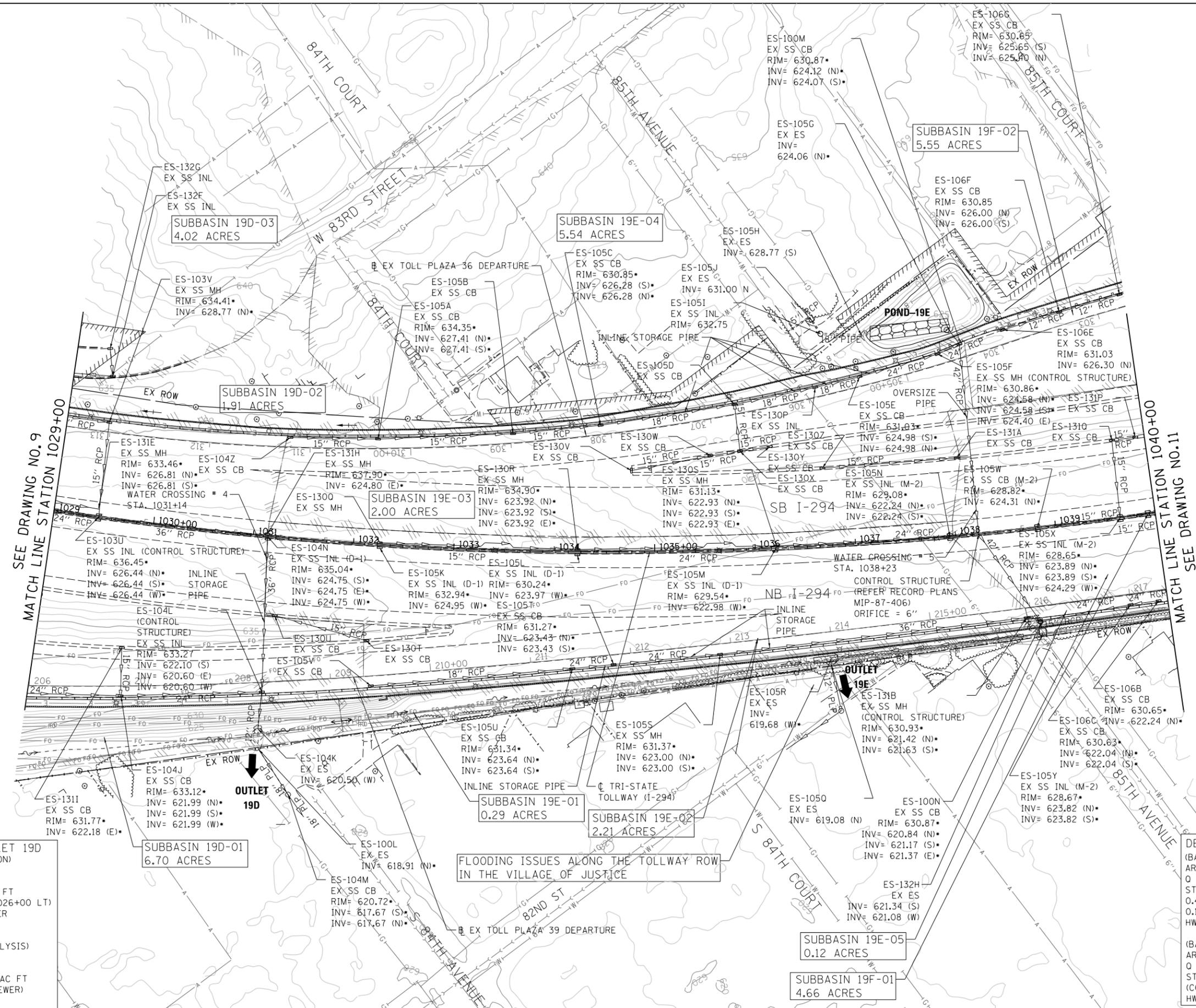
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NO.	DATE	REVISIONS DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1016+00 TO STA 1029+00

SHEET NO. ED-9
DRAWING NO. 9 OF 53

12/22/2017
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SEE DRAWING NO. 9
MATCH LINE STATION 1029+00

MATCH LINE STATION 1040+00
SEE DRAWING NO. 11

DETENTION DATA - FOR OUTLET 19D
(BASED ON RECORD PLAN INFORMATION)
AREA = 10.7 AC
Q RELEASE = 10.0 CFS
STORAGE VOLUME (100 YR) = 1.2 AC FT
1.1 AC FT DETAINED IN POND-19D (1026+00 LT)
0.1 AC FT DETAINED IN STORM SEWER
HWE (100-YR) = 628.9

(BASED ON EXISTING CONDITION ANALYSIS)
AREA = 13.1 AC
Q RELEASE (PEAK) = 9.8 CFS
STORAGE VOLUME (100 YR) = 0.82 AC FT
(COMBINED IN POND-19D & STORM SEWER)
HWE (100-YR) = 633.3

DETENTION DATA - FOR OUTLET 19E
(BASED ON RECORD PLAN INFORMATION)
AREA = 8.8 AC
Q RELEASE = 18.0 CFS
STORAGE VOLUME (100 YR) = 0.5 AC FT
0.4 AC FT DETAINED IN POND-19E (1038+00 LT)
0.1 AC FT DETAINED IN STORM SEWER
HWE (100-YR) = 629.2

(BASED ON EXISTING CONDITION ANALYSIS)
AREA = 10 AC
Q RELEASE (PEAK) = 21.0 CFS
STORAGE VOLUME (100 YR) = 0.45 AC FT
(COMBINED IN POND-19E & STORM SEWER)
HWE (100-YR) = 628.6

12/22/2017
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 JGarcia

DRAWN BY HDU SCALE 1"=50'
CHECKED BY KS DATE 10/27/17

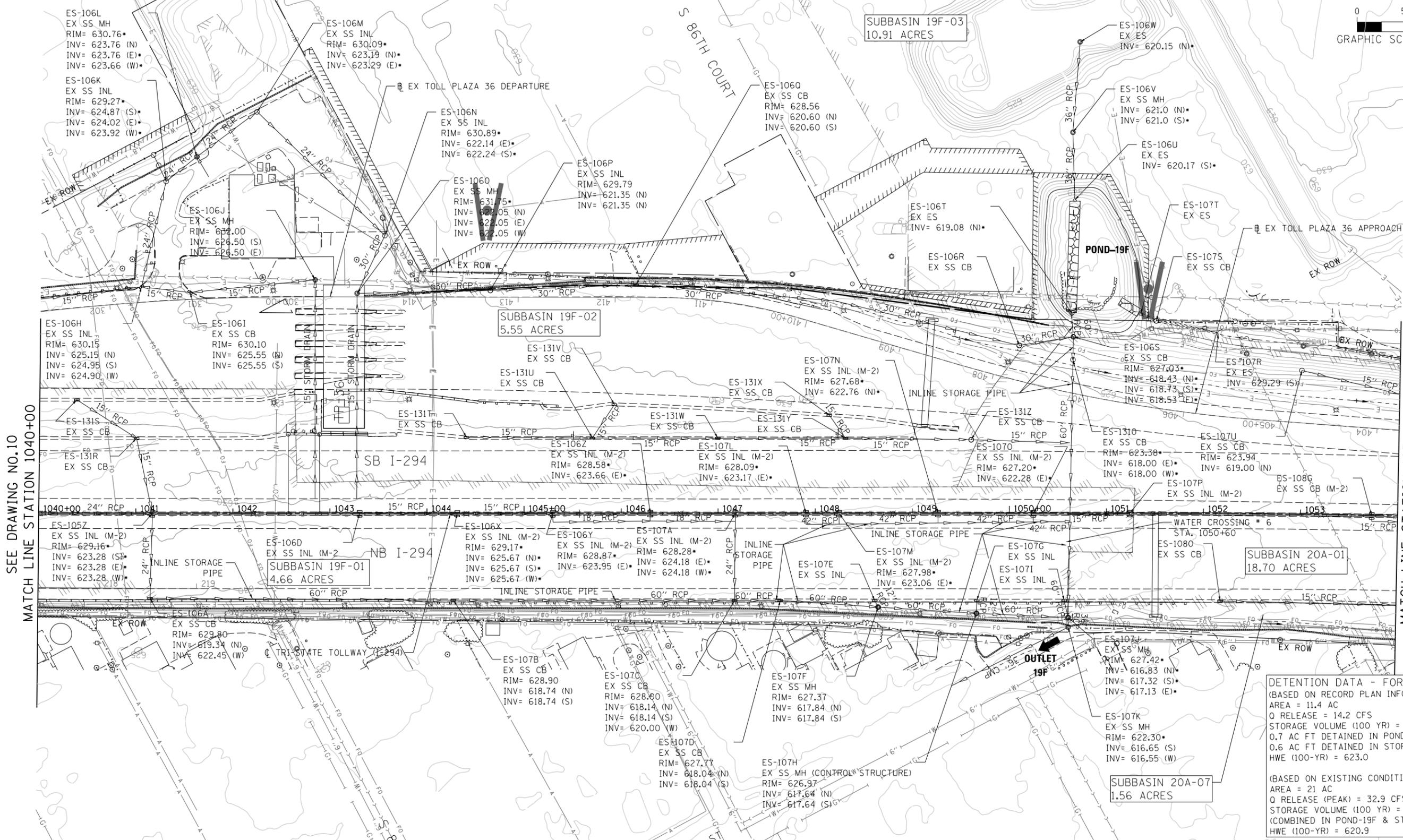
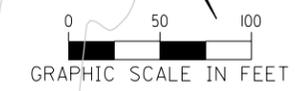
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INDUSTRIAL-INFRASTRUCTURE-SUSTAINABILITY

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DOWNERS GROVE, ILLINOIS 60515

REVISIONS		
NO.	DATE	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1029+00 TO STA 1040+00

SHEET NO. ED-10
DRAWING NO. 10 OF 53



SEE DRAWING NO.10
MATCH LINE STATION 1040+00

MATCH LINE STATION 1054+00
SEE DRAWING NO.12

DETENTION DATA - FOR OUTLET 19F
(BASED ON RECORD PLAN INFORMATION)
AREA = 11.4 AC
Q RELEASE = 14.2 CFS
STORAGE VOLUME (100 YR) = 1.3 AC FT
0.7 AC FT DETAINED IN POND-19F (1050+80 LT)
0.6 AC FT DETAINED IN STORM SEWER
HWE (100-YR) = 623.0

(BASED ON EXISTING CONDITION ANALYSIS)
AREA = 21 AC
Q RELEASE (PEAK) = 32.9 CFS
STORAGE VOLUME (100 YR) = 0.48 AC FT
(COMBINED IN POND-19F & STORM SEWER)
HWE (100-YR) = 620.9

12/22/2017
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CHECKED BY KS DATE 10/27/17

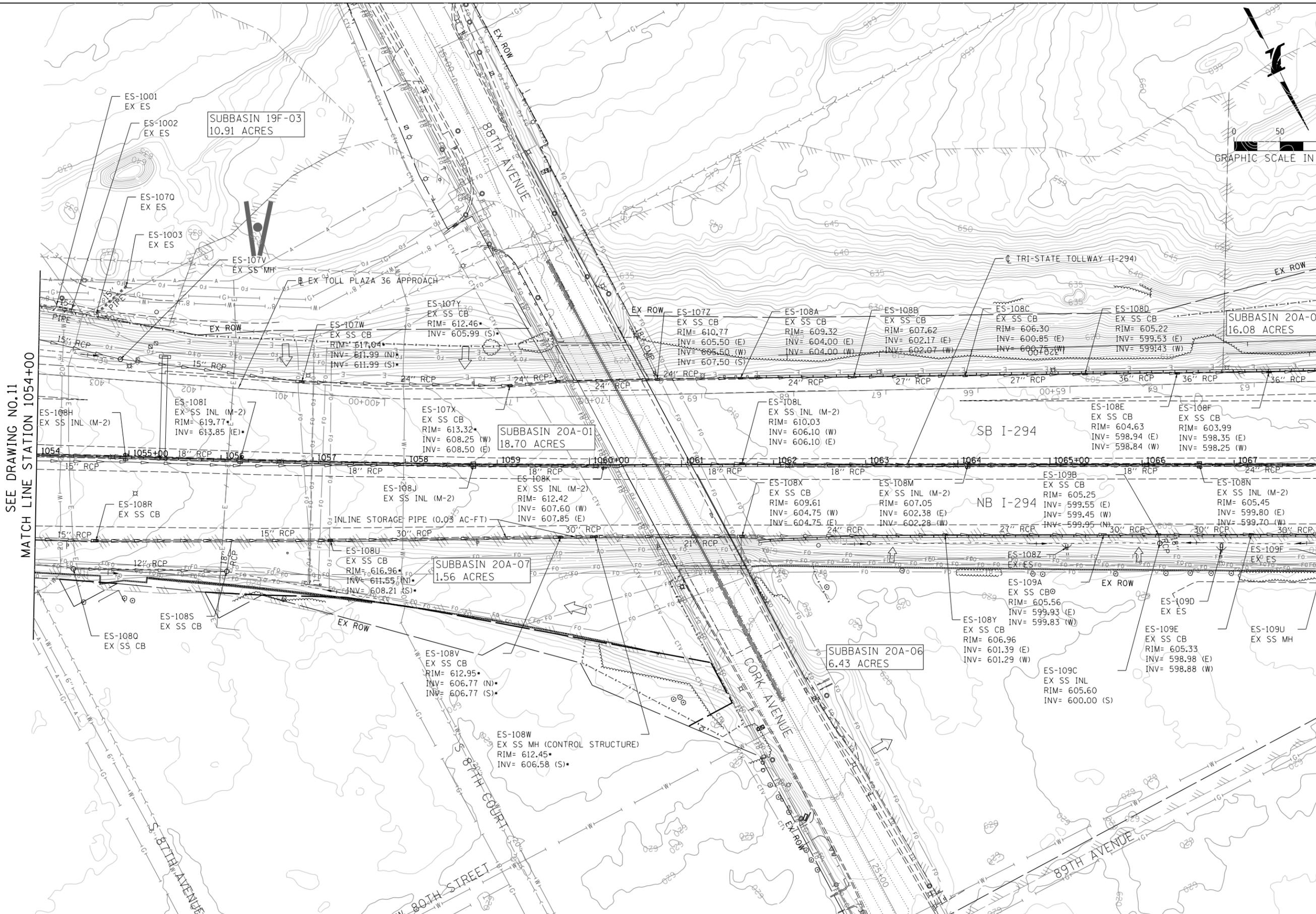
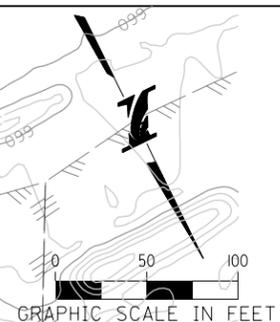
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NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1040+00 TO STA 1054+00

SHEET NO. ED-11
DRAWING NO. 11 OF 53



SEE DRAWING NO.11
MATCH LINE STATION 1054+00

MATCH LINE STATION 1068+00
SEE DRAWING NO.13

12/22/2017
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DRAWN BY HDU SCALE 1"=50'
 CHECKED BY KS DATE 10/27/17

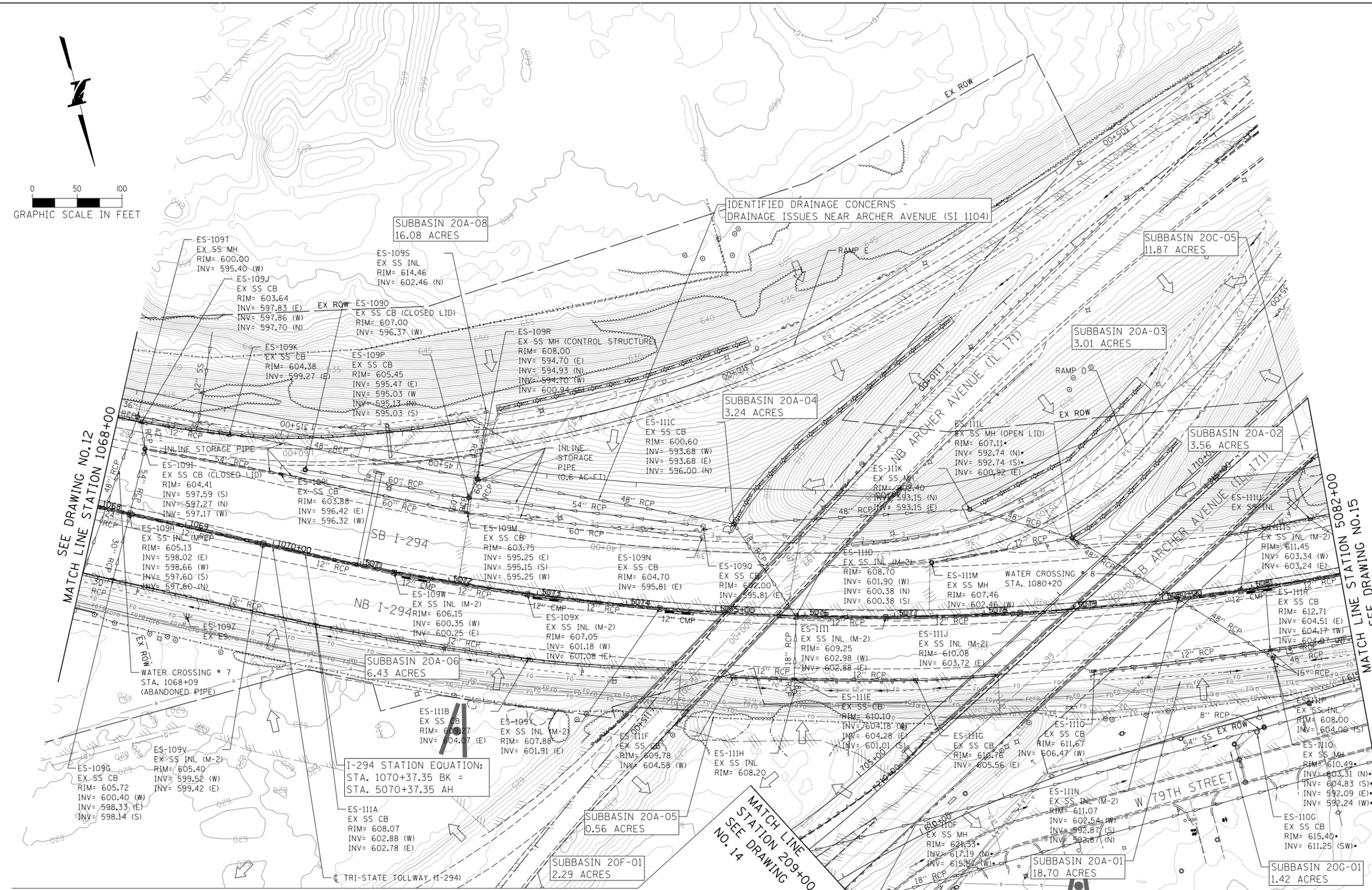
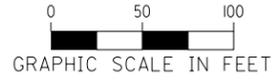

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NO.	DATE	REVISIONS DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1054+00 TO STA 1068+00

SHEET NO.
 ED-12
 DRAWING NO.
 12 OF 53



IDENTIFIED DRAINAGE CONCERNS -
DRAINAGE ISSUES NEAR ARCHER AVENUE (SI 1104)

I-294 STATION EQUATION:
STA. 1070+37.35 BK =
STA. 5070+37.35 AH

12/22/2017
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DRAWN BY HDU SCALE 1"=50'
CHECKED BY KS DATE 10/27/17

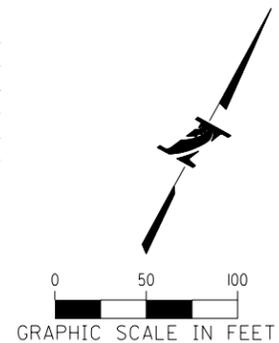
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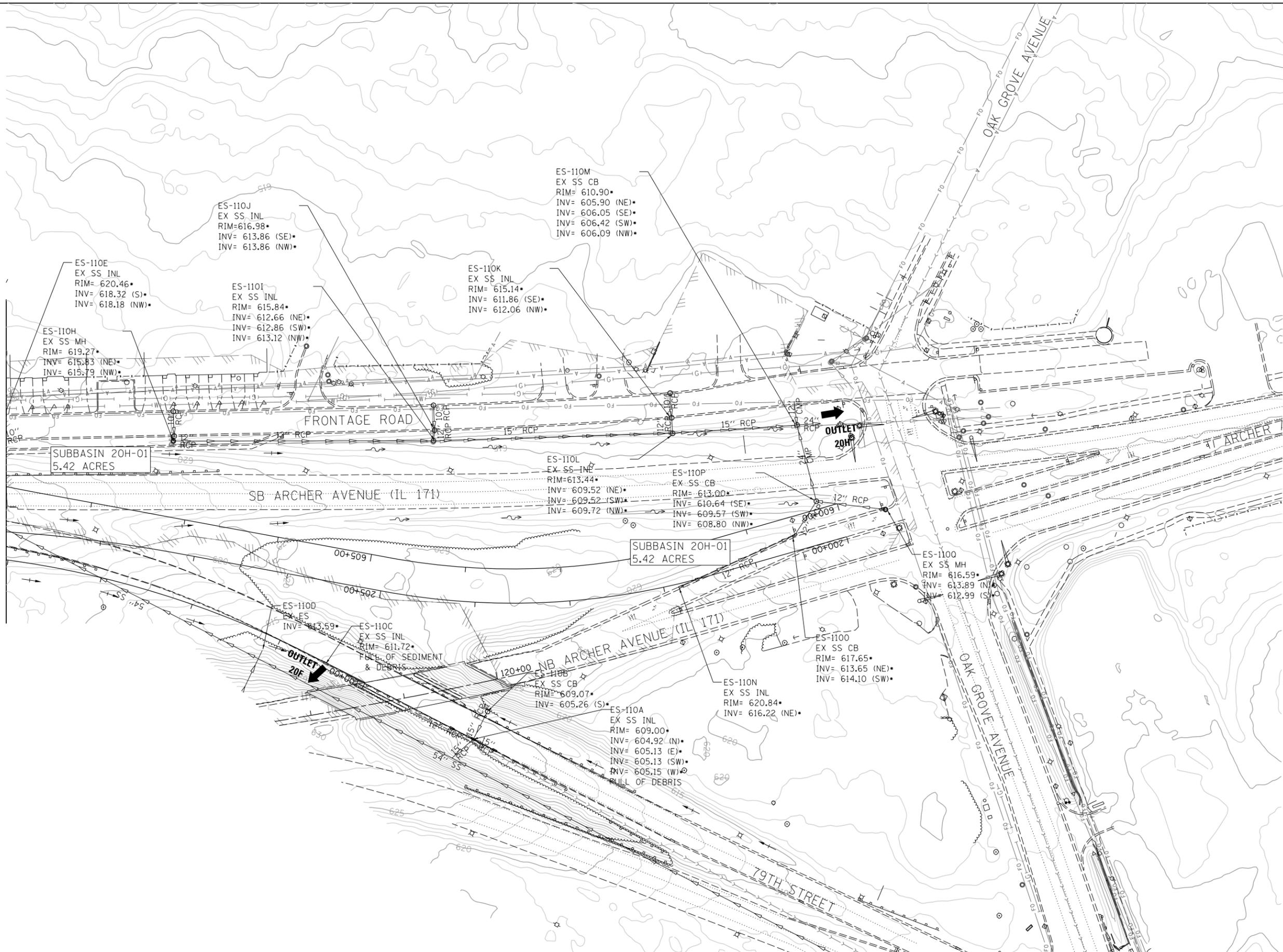
NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1068+00 TO STA 5082+00

SHEET NO. ED-13
DRAWING NO. 13 OF 53



MATCH LINE STATION 209+00
SEE DRAWING NO.13



12/22/2017
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CHECKED BY KS DATE 10/27/17

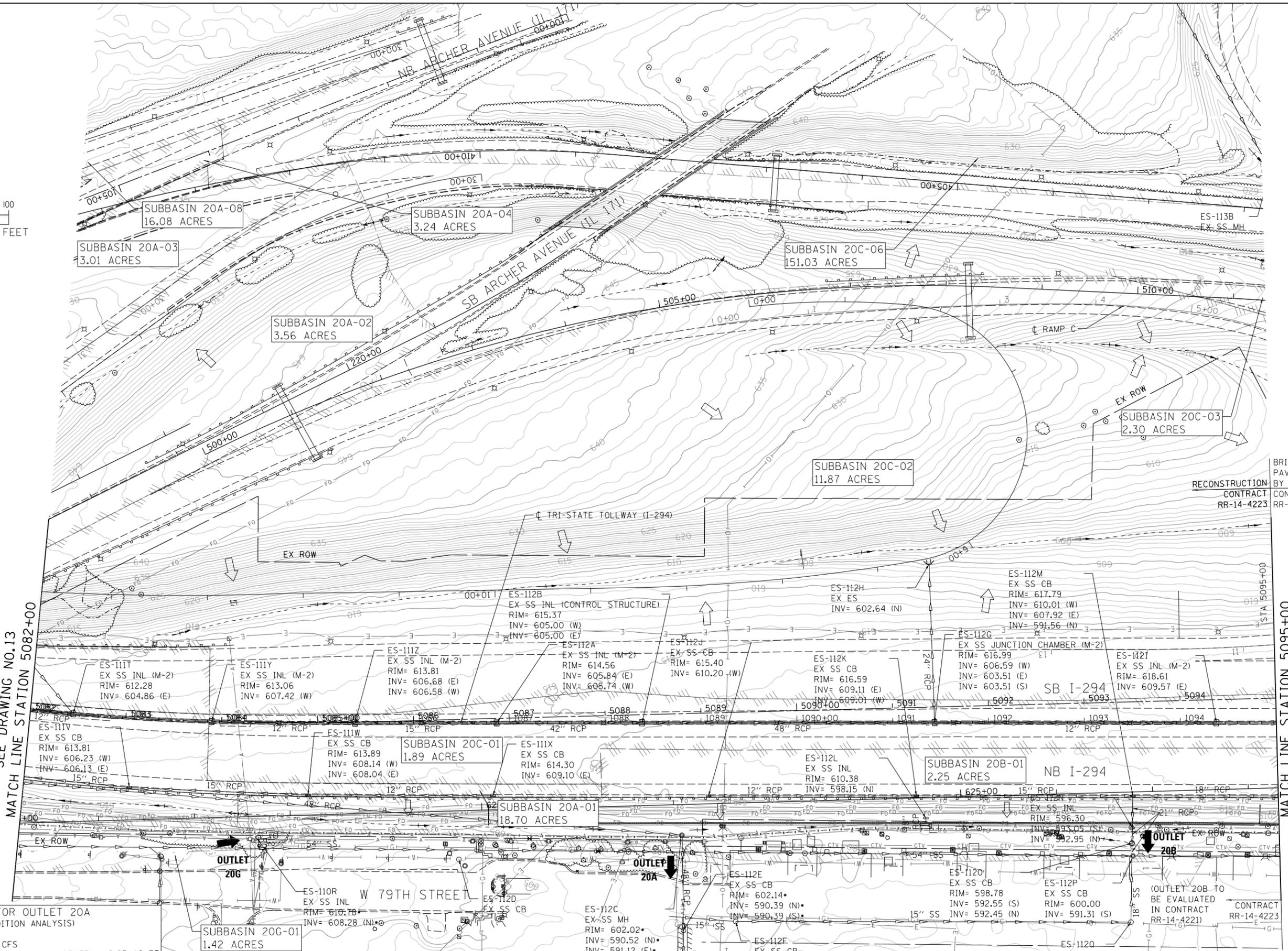
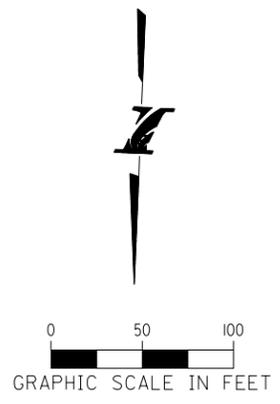
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REVISIONS		
NO.	DATE	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1068+00 TO STA 5082+00

SHEET NO.
ED-14
DRAWING NO.
14 OF 53



SEE DRAWING NO.13
MATCH LINE STATION 5082+00

MATCH LINE STATION 5095+00
SEE DRAWING NO.16

BRIDGE AND PAVEMENT BY OTHERS
CONTRACT RR-14-4221
RECONSTRUCTION CONTRACT RR-14-4223

DETENTION DATA - FOR OUTLET 20A
(BASED ON EXISTING CONDITION ANALYSIS)
AREA = 53.1 AC
Q RELEASE (PEAK) = 77.3 CFS
STORAGE VOLUME (DETAINED IN STORM SEWER) = 0.63 AC FT

SUBBASIN 20G-01
1.42 ACRES

SUBBASIN 20B-01
2.25 ACRES

DRAWN BY HDU
CHECKED BY KS
SCALE 1"=50'
DATE 10/27/17

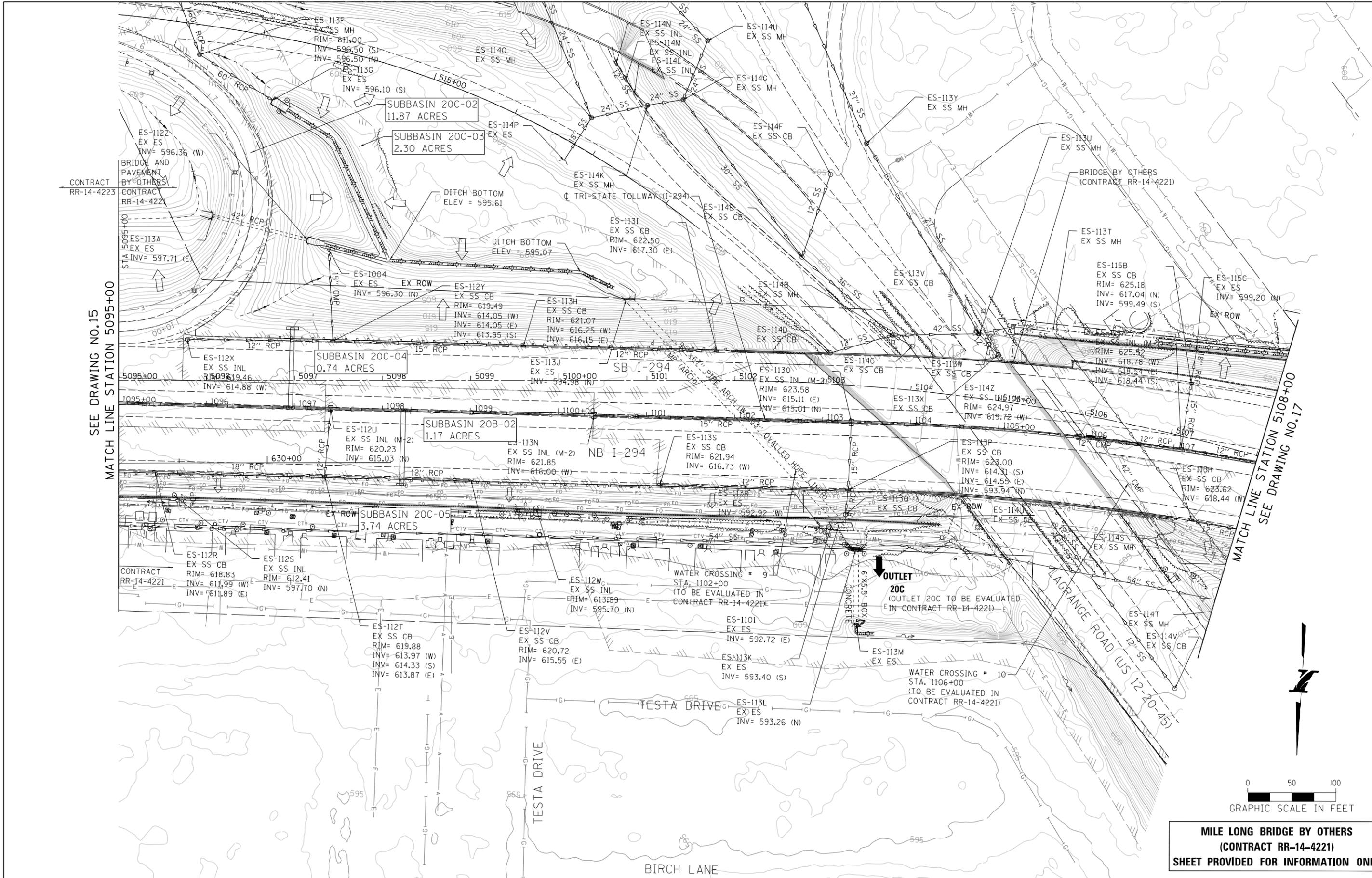
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Chicago, IL
BUILDINGS-EARTH & ENVIRONMENT-ENERGY
INDUSTRIAL-INFRASTRUCTURE-SUSTAINABILITY

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
2700 OGDEN AVENUE
DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 5082+00 TO STA 5095+00

SHEET NO. ED-15
DRAWING NO. 15 OF 53



**MILE LONG BRIDGE BY OTHERS
(CONTRACT RR-14-4221)
SHEET PROVIDED FOR INFORMATION ONLY**

DRAWN BY HDU SCALE 1"=50'
CHECKED BY KS DATE 9/19/16

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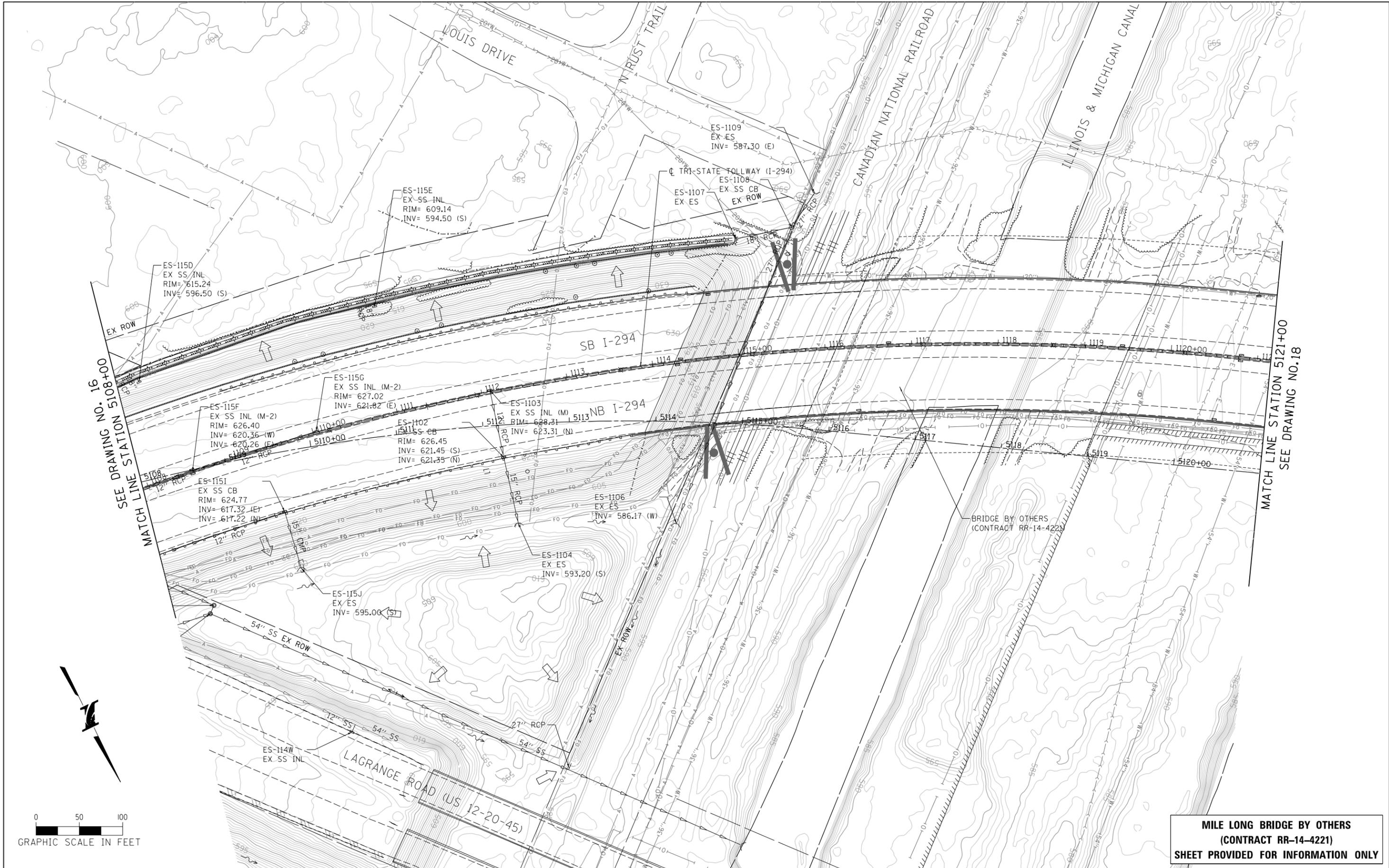
THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
2700 OGDEN AVENUE
DOWNERS GROVE, ILLINOIS 60515

NO.		REVISIONS	
NO.	DATE	DESCRIPTION	

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 5095+00 TO STA 5108+00

SHEET NO.
ED-16
DRAWING NO.
16 OF 53

12/22/2017
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 12/22/2017 12:22:20 PM



MATCH LINE STATION 5108+00
SEE DRAWING NO. 16

MATCH LINE STATION 5121+00
SEE DRAWING NO. 18

**MILE LONG BRIDGE BY OTHERS
(CONTRACT RR-14-4221)
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DRAWN BY HDU SCALE 1"=50'
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NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 5108+00 TO STA 5121+00

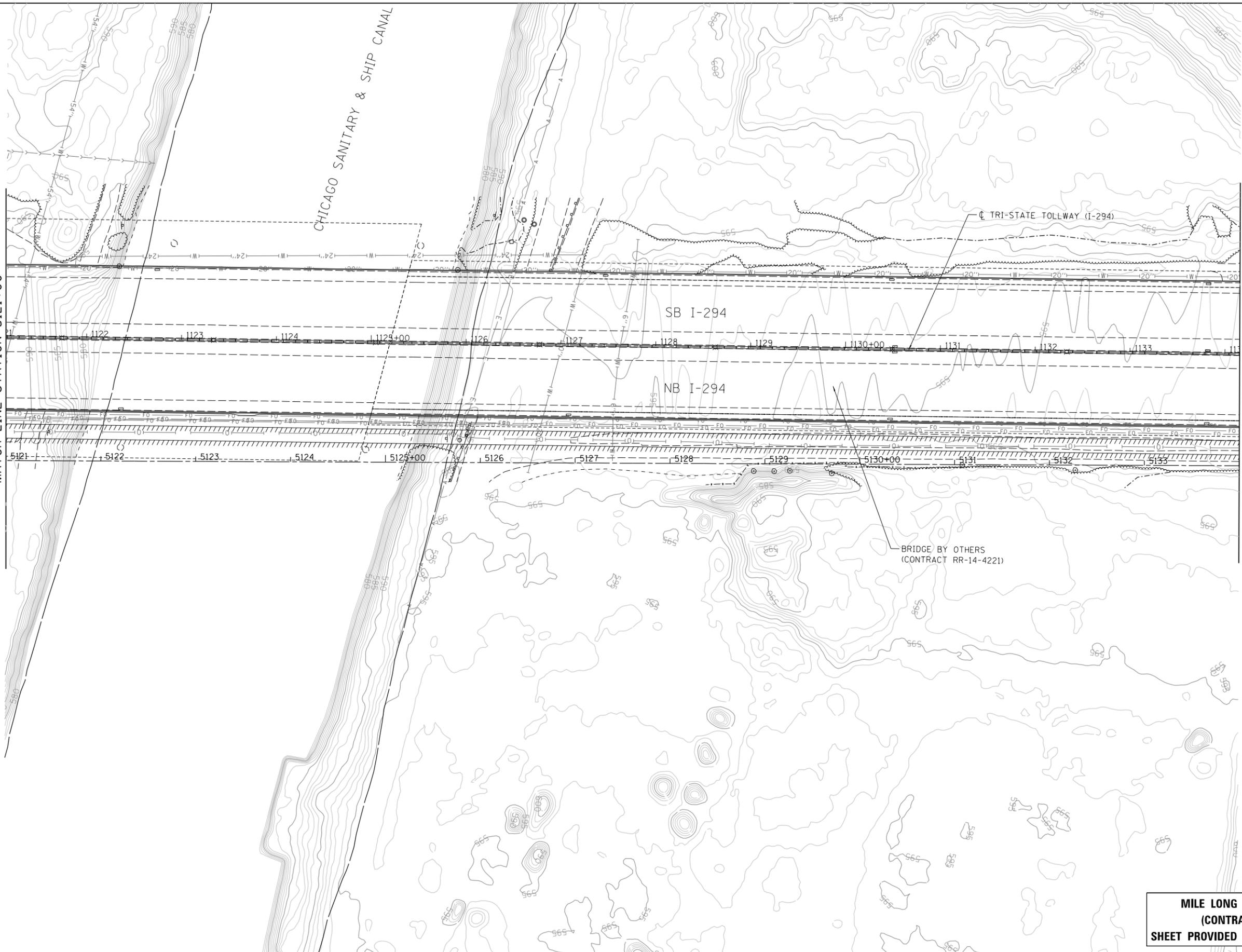
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DRAWING NO. 17 OF 53

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SEE DRAWING NO. 17
MATCH LINE STATION 5121+00

MATCH LINE STATION 5134+00
SEE DRAWING NO. 19



**MILE LONG BRIDGE BY OTHERS
(CONTRACT RR-14-4221)
SHEET PROVIDED FOR INFORMATION ONLY**

12/22/2017
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CHECKED BY KS DATE 10/27/17

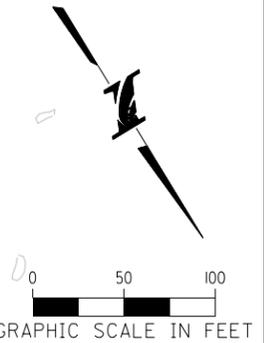
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REVISIONS		
NO.	DATE	DESCRIPTION

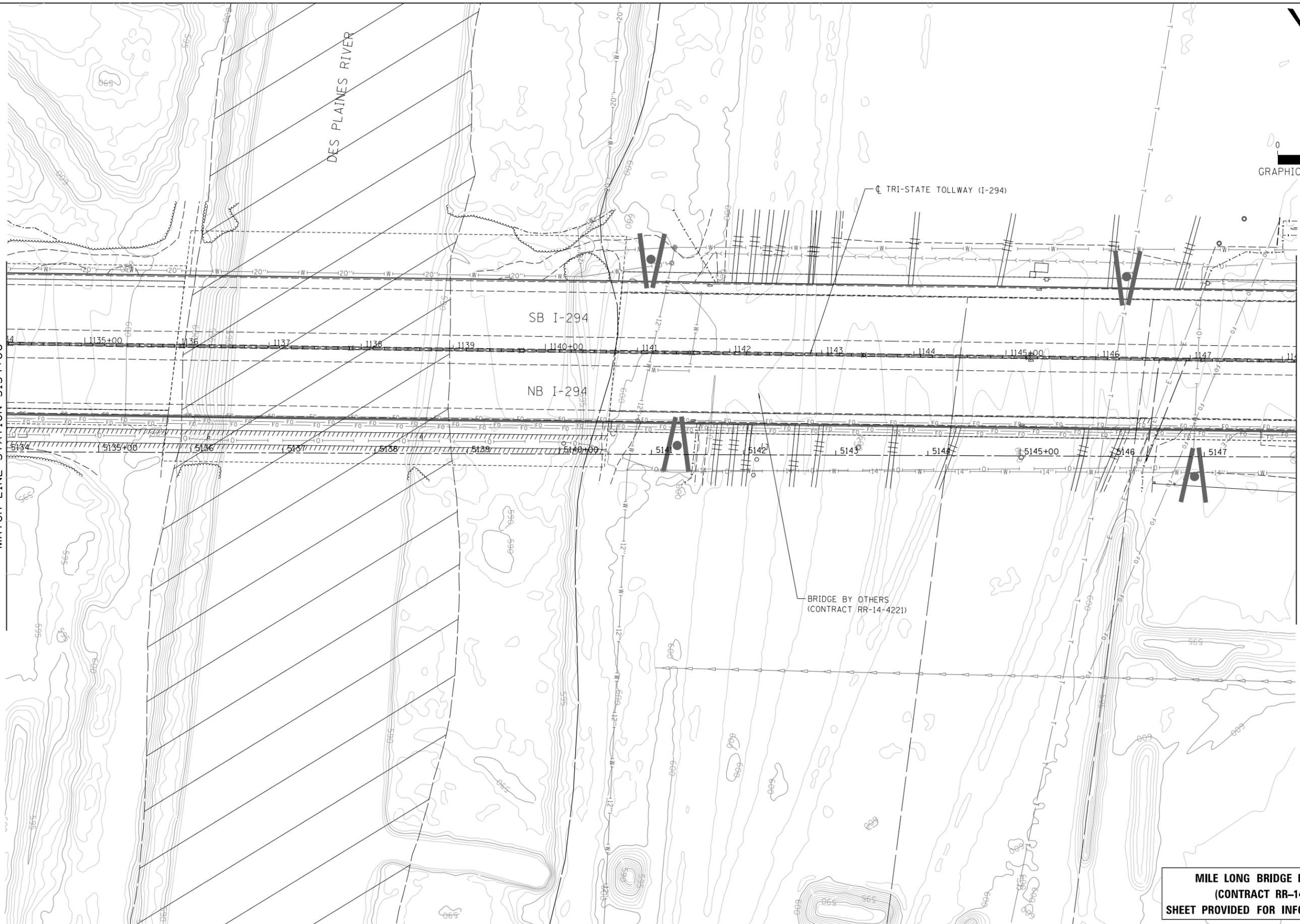
CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 5121+00 TO STA 5134+00

SHEET NO. ED-18
DRAWING NO. 18 OF 53



SEE DRAWING NO.18
MATCH LINE STATION 5134+00

MATCH LINE STATION 5148+00
SEE DRAWING NO.20



**MILE LONG BRIDGE BY OTHERS
(CONTRACT RR-14-4221)
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 CHECKED BY KS DATE 10/27/17

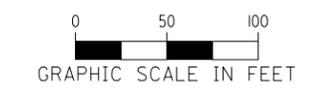
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NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 5134+00 TO STA 5148+00

SHEET NO.
 ED-19
 DRAWING NO.
 19 OF 53



SEE DRAWING NO.19
MATCH LINE STATION 5148+00

MATCH LINE STATION 5160+00
SEE DRAWING NO.21



**MILE LONG BRIDGE BY OTHERS
(CONTRACT RR-14-4221)
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DRAWN BY SB
CHECKED BY KS
SCALE 1"=50'
DATE 10/27/17

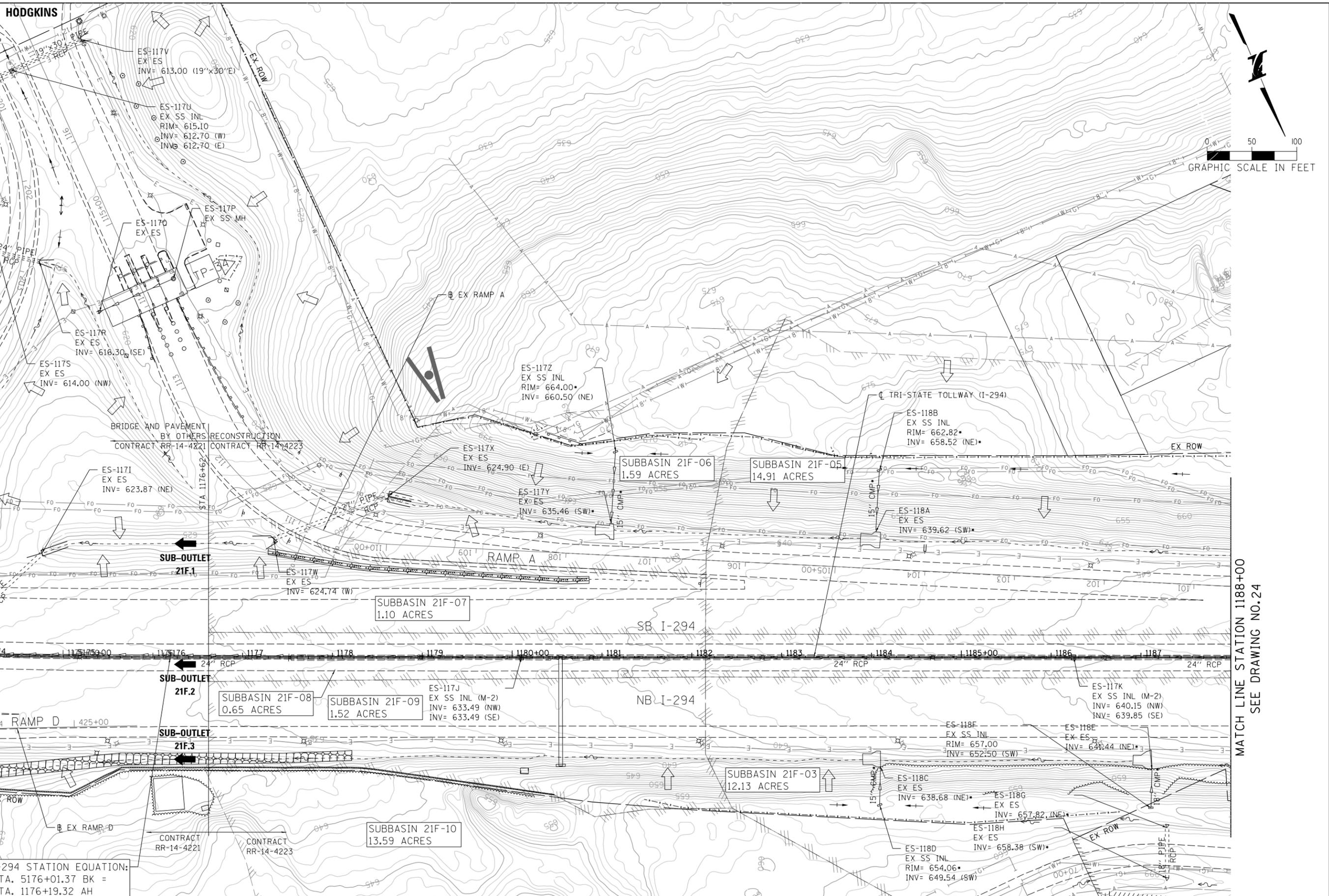
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REVISIONS		DESCRIPTION
NO.	DATE	

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 5148+00 TO STA 5160+00

SHEET NO. ED-20
DRAWING NO. 20 OF 53



MATCH LINE STATION 1188+00
SEE DRAWING NO.24

I-294 STATION EQUATION:
STA. 5176+01.37 BK =
STA. 1176+19.32 AH

DRAWN BY SB SCALE 1"=50'
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NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 5174+00 TO STA 1188+00

SHEET NO. ED-23
DRAWING NO. 23 OF 53

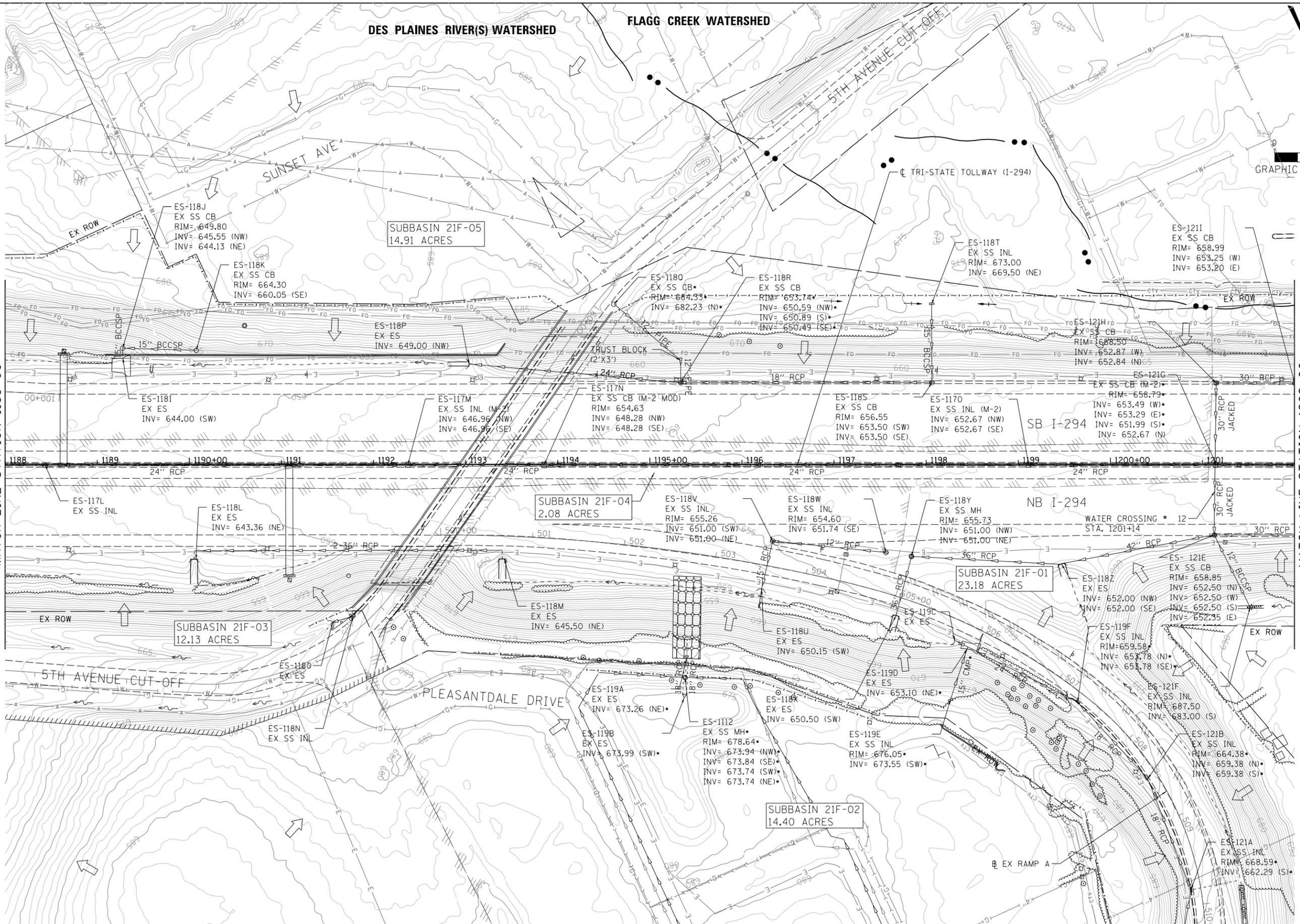
12/22/2017
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 JST:KSP

DES PLAINES RIVER(S) WATERSHED FLAGG CREEK WATERSHED



SEE DRAWING NO. 23
MATCH LINE STATION 1188+00

MATCH LINE STATION 1202+00
SEE DRAWING NO. 25



12/22/2017
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 User: jstevens

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NO.	DATE	REVISIONS DESCRIPTION

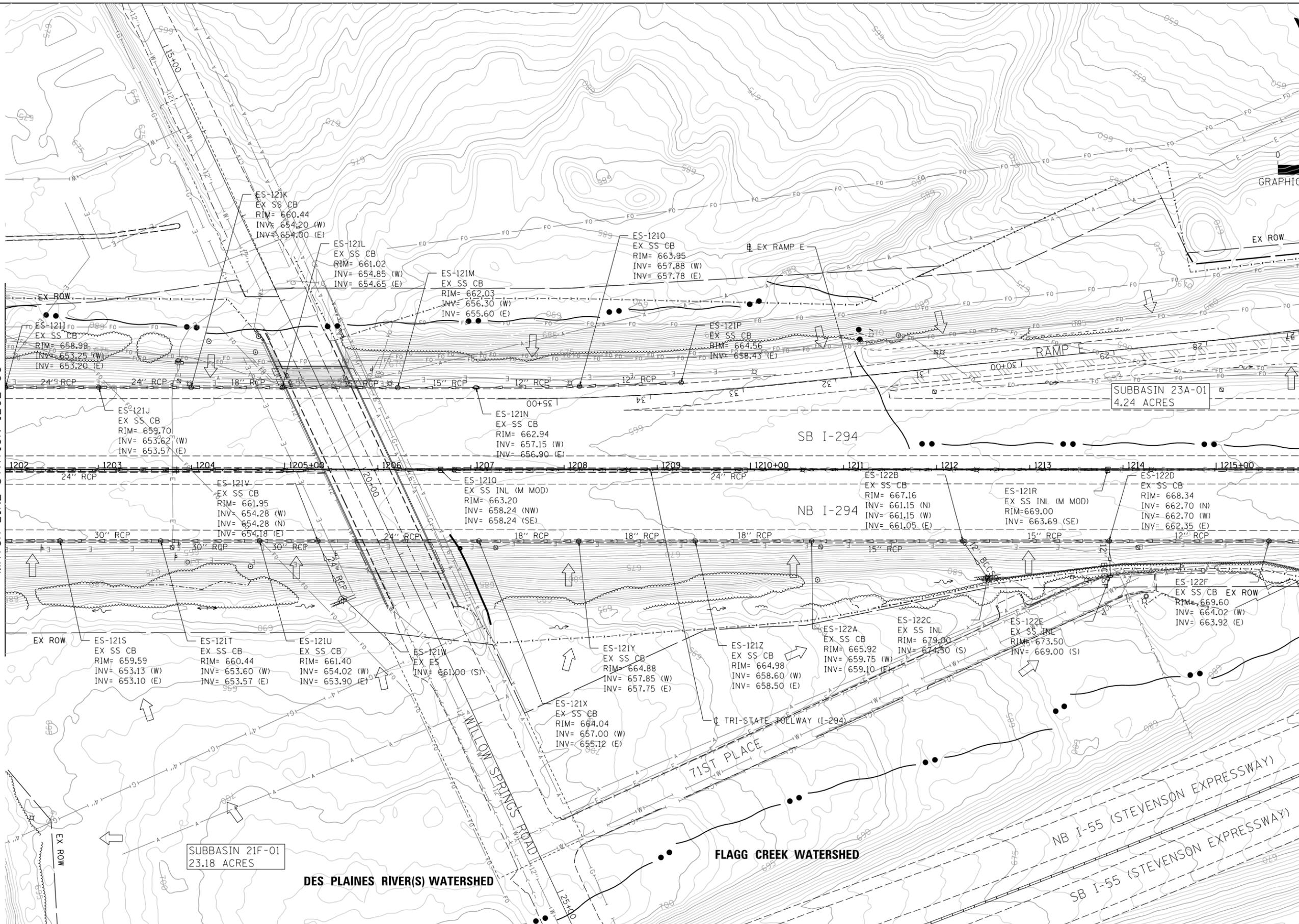
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 STA 1188+00 TO STA 1202+00

SHEET NO. ED-24
 DRAWING NO. 24 OF 53



SEE DRAWING NO.24
MATCH LINE STATION 1202+00

MATCH LINE STATION 1216+00
SEE DRAWING NO.26



SUBBASIN 21F-01
23.18 ACRES

SUBBASIN 23A-01
4.24 ACRES

DES PLAINES RIVER(S) WATERSHED

FLAGG CREEK WATERSHED

DRAWN BY SB SCALE 1"=50'
CHECKED BY KS DATE 10/27/17

exp. U.S. Services Inc.
Chicago, IL
BUILDINGS • EARTH & ENVIRONMENT • ENERGY
INDUSTRIAL • INFRASTRUCTURE • SUSTAINABILITY

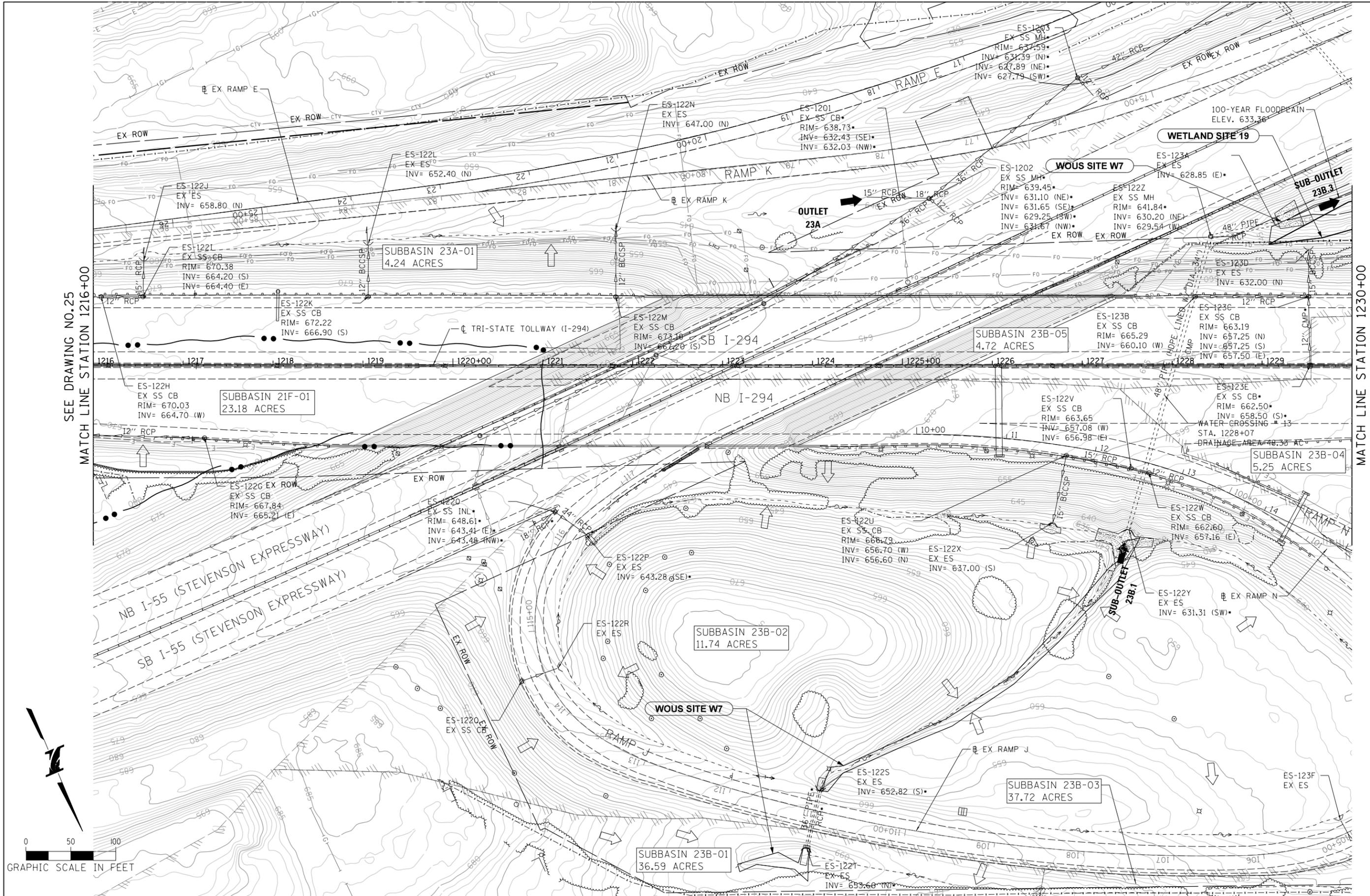
THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
2700 OGDEN AVENUE
DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1202+00 TO STA 1216+00

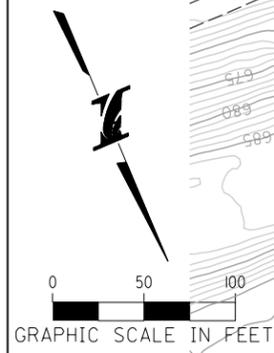
SHEET NO. ED-25
DRAWING NO. 25 OF 53

12/22/2017
 C:\Users\jstevens\OneDrive\Documents\Projects\RR-14-4223\Drawings\ED-25.dgn
 User: jstevens



SEE DRAWING NO. 25
MATCH LINE STATION 1216+00

MATCH LINE STATION 1230+00
SEE DRAWING NO. 27



DRAWN BY SB SCALE 1"=50'
CHECKED BY KS DATE 10/27/17

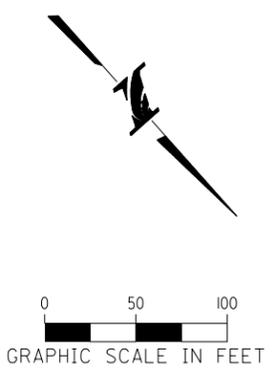
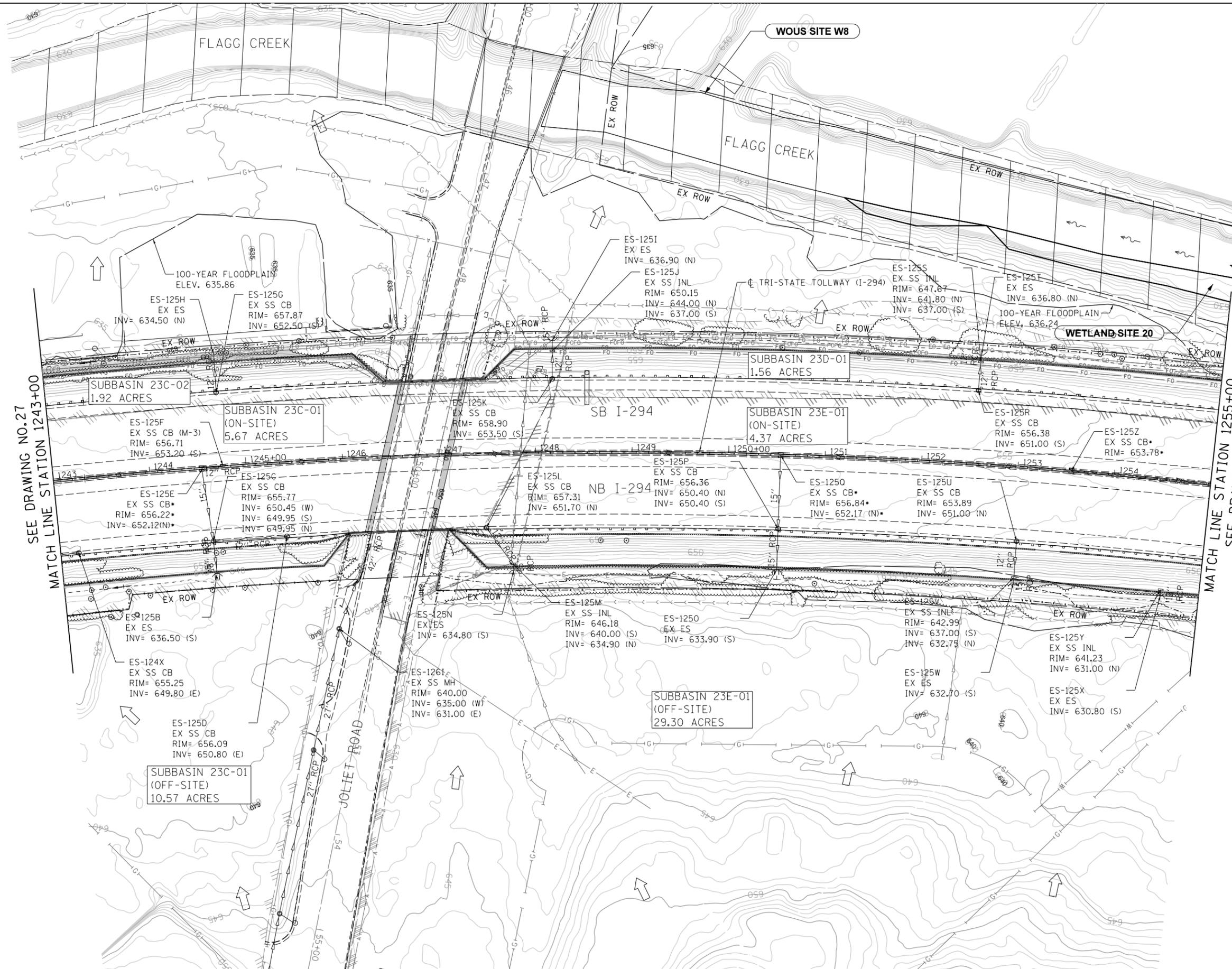
exp. exp U.S. Services Inc.
Chicago, IL
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THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
2700 OGDEN AVENUE
DOWNERS GROVE, ILLINOIS 60515

REVISIONS		
NO.	DATE	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1216+00 TO STA 1230+00

SHEET NO. ED-26
DRAWING NO. 26 OF 53



SEE DRAWING NO. 27
MATCH LINE STATION 1243+00

MATCH LINE STATION 1255+00
SEE DRAWING NO. 29

12/22/2017
 C:\Users\jstevens\OneDrive\Work\Projects\RR-14-4223\14223-shd-Drain-135.dgn
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DRAWN BY SB SCALE 1"=50'
 CHECKED BY KS DATE 10/27/17

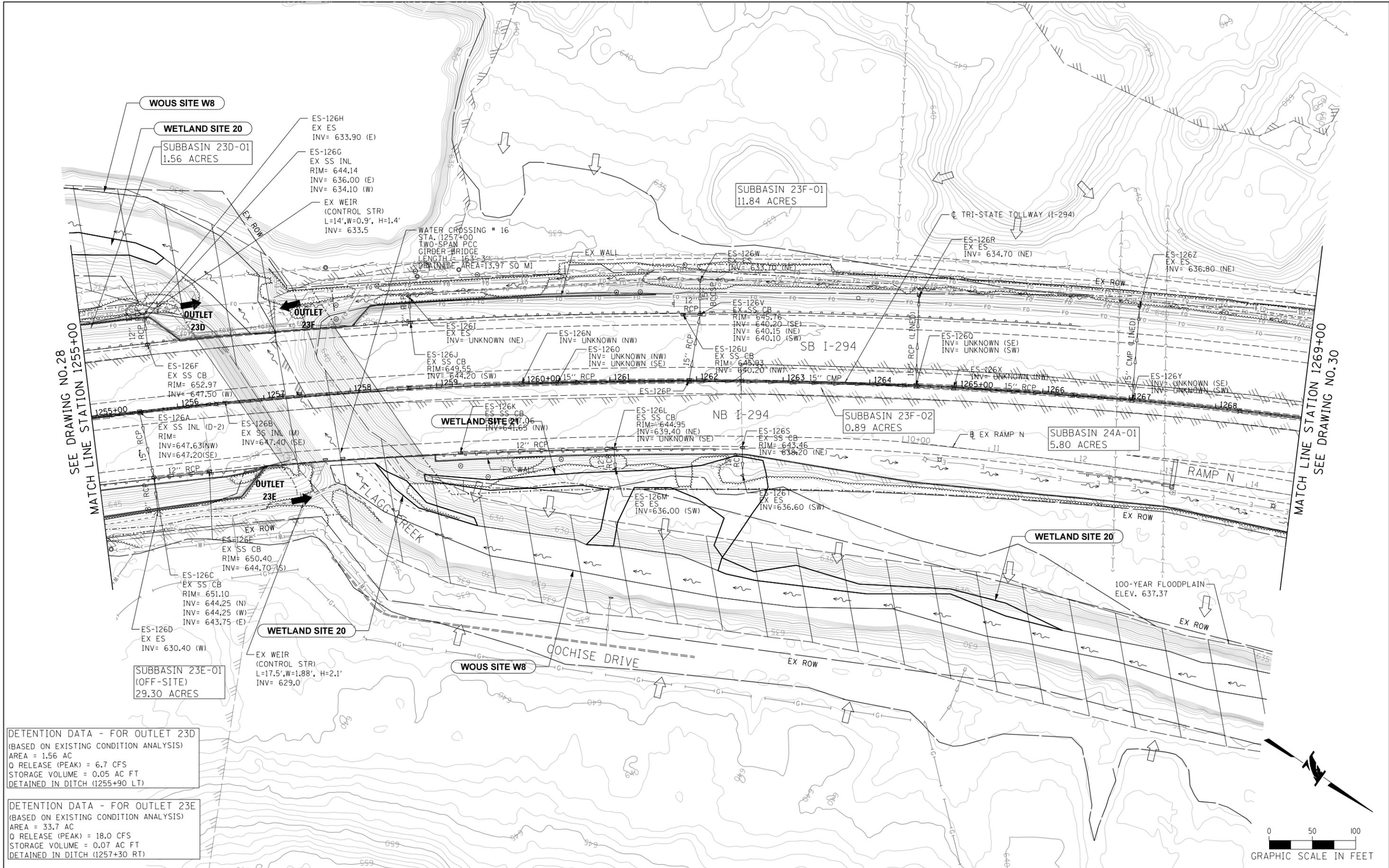
exp. U.S. Services Inc.
 Chicago, IL
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THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
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 DOWNERS GROVE, ILLINOIS 60515

REVISIONS		
NO.	DATE	DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1243+00 TO STA 1255+00

SHEET NO. ED-28
 DRAWING NO. 28 OF 53

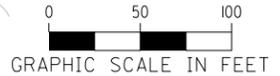


SEE DRAWING NO. 28
MATCH LINE STATION 1255+00

MATCH LINE STATION 1269+00
SEE DRAWING NO. 30

DETENTION DATA - FOR OUTLET 23D
(BASED ON EXISTING CONDITION ANALYSIS)
AREA = 1.56 AC
Q RELEASE (PEAK) = 6.7 CFS
STORAGE VOLUME = 0.05 AC FT
DETAINED IN DITCH (1255+90 LT)

DETENTION DATA - FOR OUTLET 23E
(BASED ON EXISTING CONDITION ANALYSIS)
AREA = 33.7 AC
Q RELEASE (PEAK) = 18.0 CFS
STORAGE VOLUME = 0.07 AC FT
DETAINED IN DITCH (1257+30 RT)



12/22/2017
 C:\Users\jgates\Documents\Projects\RR-14-4223\Drawings\ED-29.dgn
 JGates

DRAWN BY SED SCALE 1"=50'
CHECKED BY JWC DATE 10/27/17

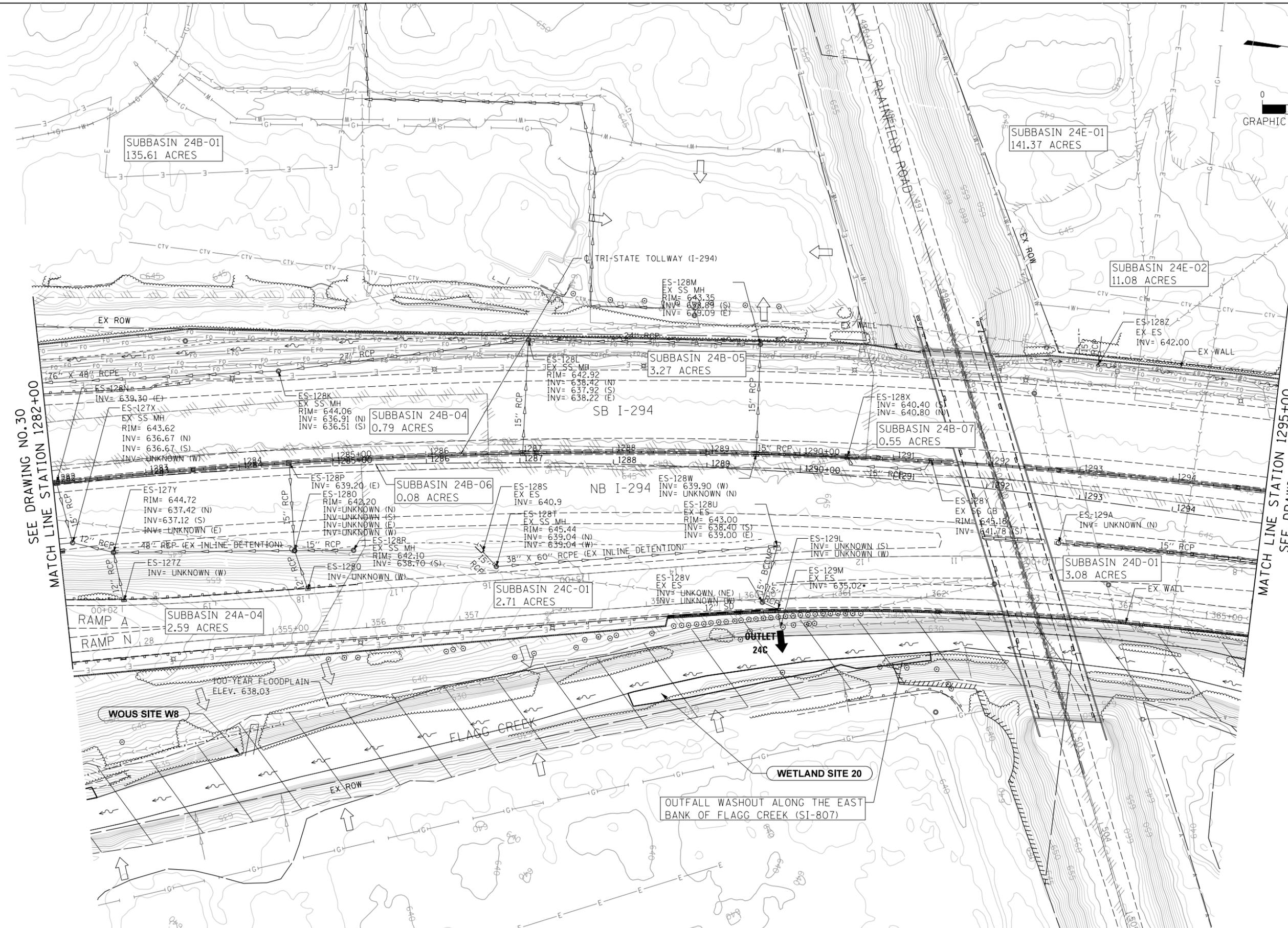
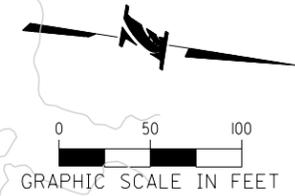
exp. U.S. Services Inc.
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THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
2700 OGDEN AVENUE
DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1255+00 TO STA 1269+00

SHEET NO. ED-29
DRAWING NO. 29 OF 53



SEE DRAWING NO.30
MATCH LINE STATION 1282+00

MATCH LINE STATION 1295+00
SEE DRAWING NO.32

SUBBASIN 24B-01
135.61 ACRES

SUBBASIN 24E-01
141.37 ACRES

SUBBASIN 24E-02
11.08 ACRES

SUBBASIN 24B-05
3.27 ACRES

SUBBASIN 24B-04
0.79 ACRES

SUBBASIN 24B-07
0.55 ACRES

SUBBASIN 24B-06
0.08 ACRES

SUBBASIN 24C-01
2.71 ACRES

SUBBASIN 24D-01
3.08 ACRES

SUBBASIN 24A-04
2.59 ACRES

WOUS SITE W8

WETLAND SITE 20

OUTFALL WASHOUT ALONG THE EAST
BANK OF FLAGG CREEK (SI-807)

12/22/2017
C:\Users\jgates\Documents\Projects\14-4223\14-4223-138.dgn

DRAWN BY SED SCALE 1"=50'
CHECKED BY JWC DATE 10/27/17

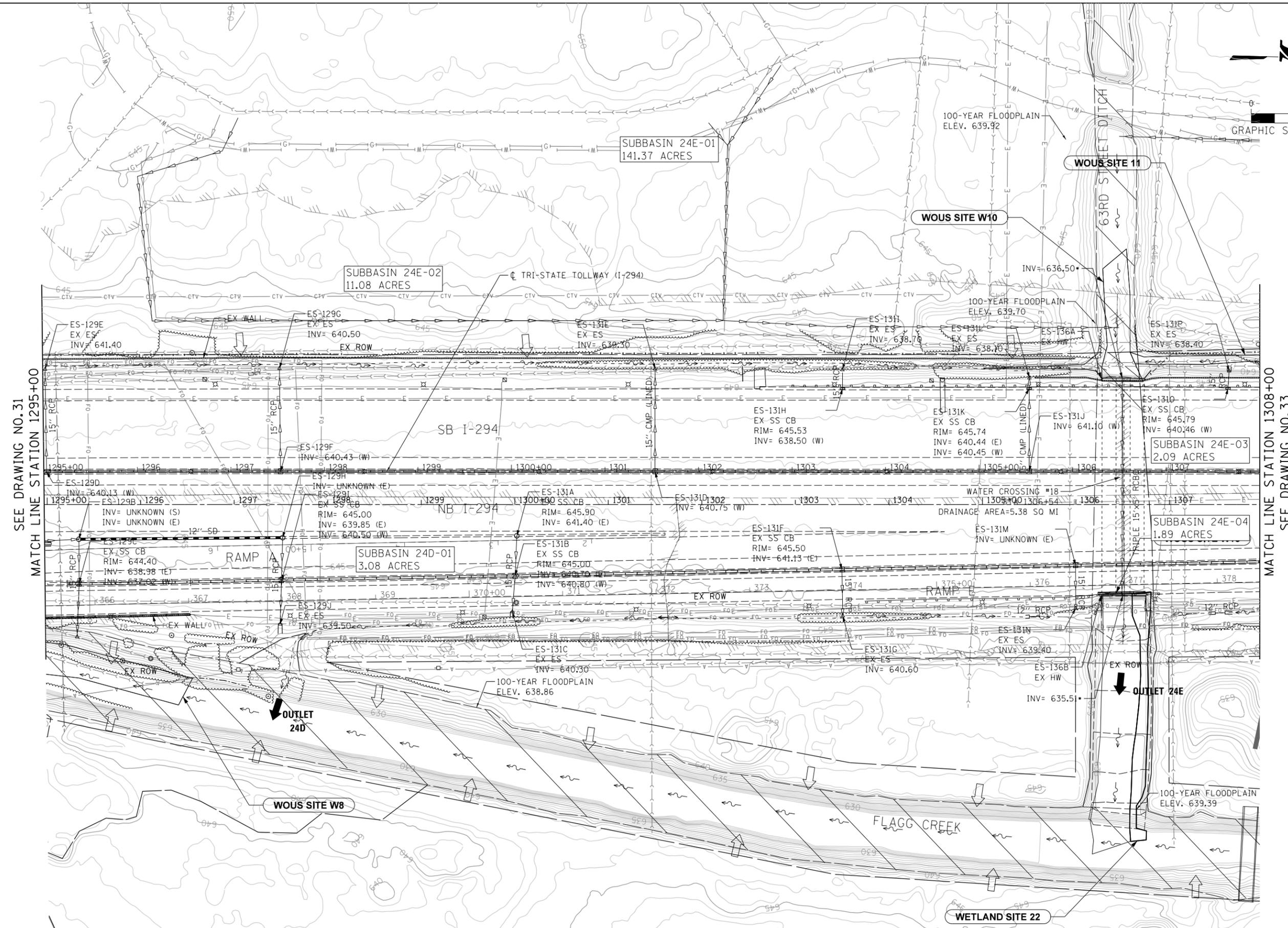
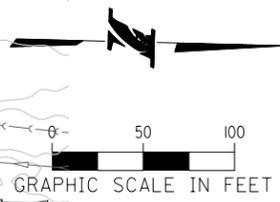


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
2700 OGDEN AVENUE
DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1282+00 TO STA 1295+00

SHEET NO. ED-31
DRAWING NO. 31 OF 53



12/22/2017
 C:\Users\jstevens\Documents\Projects\RR-14-4223\Drawings\ED-32.dgn
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DRAWN BY SED SCALE 1"=50'
 CHECKED BY JWC DATE 10/27/17

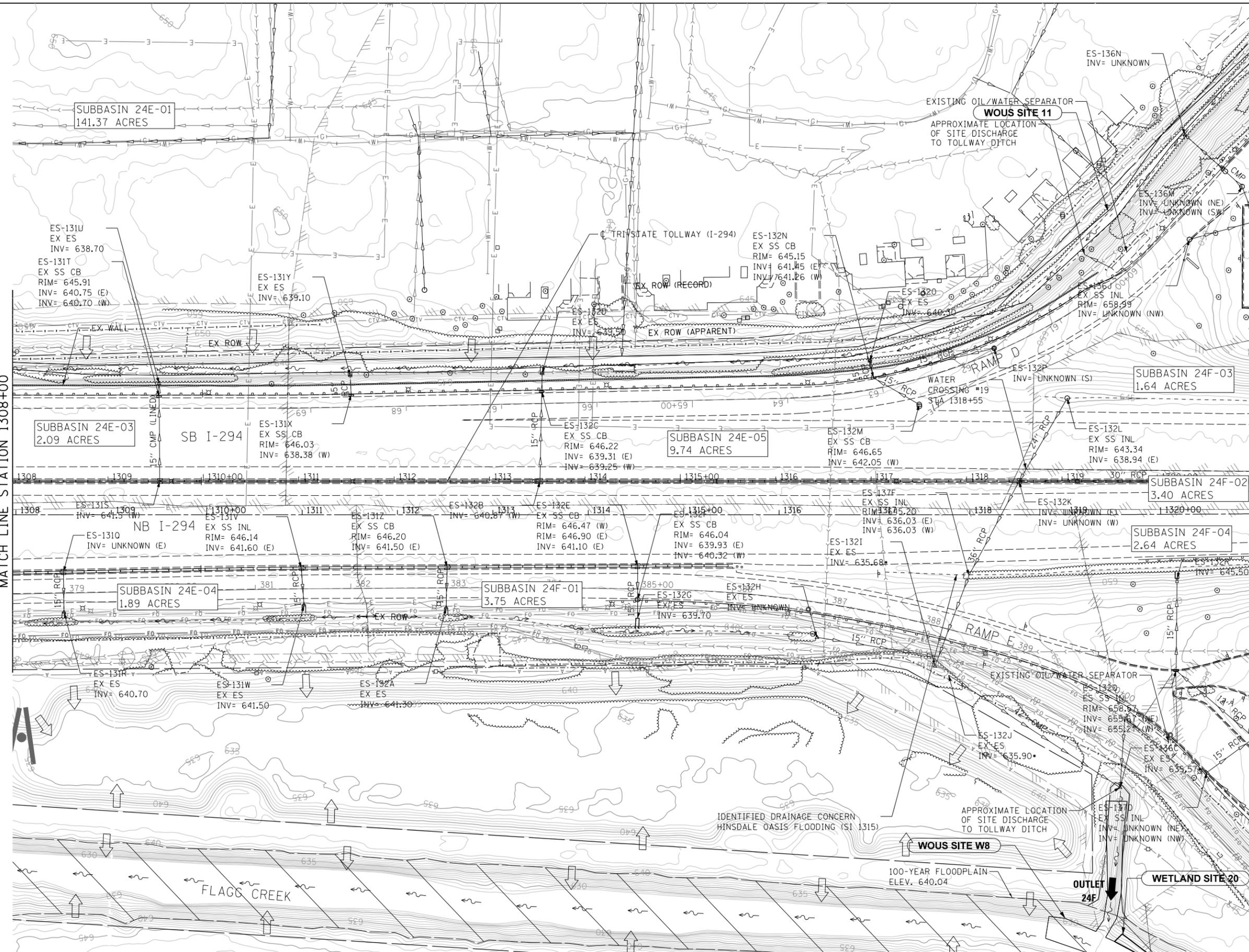


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

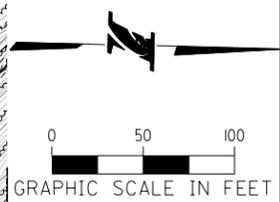
CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1295+00 TO STA 1308+00

SHEET NO. ED-32
 DRAWING NO. 32 OF 53



SEE DRAWING NO.32
MATCH LINE STATION 1308+00

MATCH LINE STATION 1321+00
SEE DRAWING NO.34



12/22/2017
 C:\Users\jstevens\OneDrive\Documents\Projects\RR-14-4223\Drawings\148.dgn
 148.dgn

DRAWN BY SED SCALE 1"=50'
 CHECKED BY JWC DATE 10/27/17

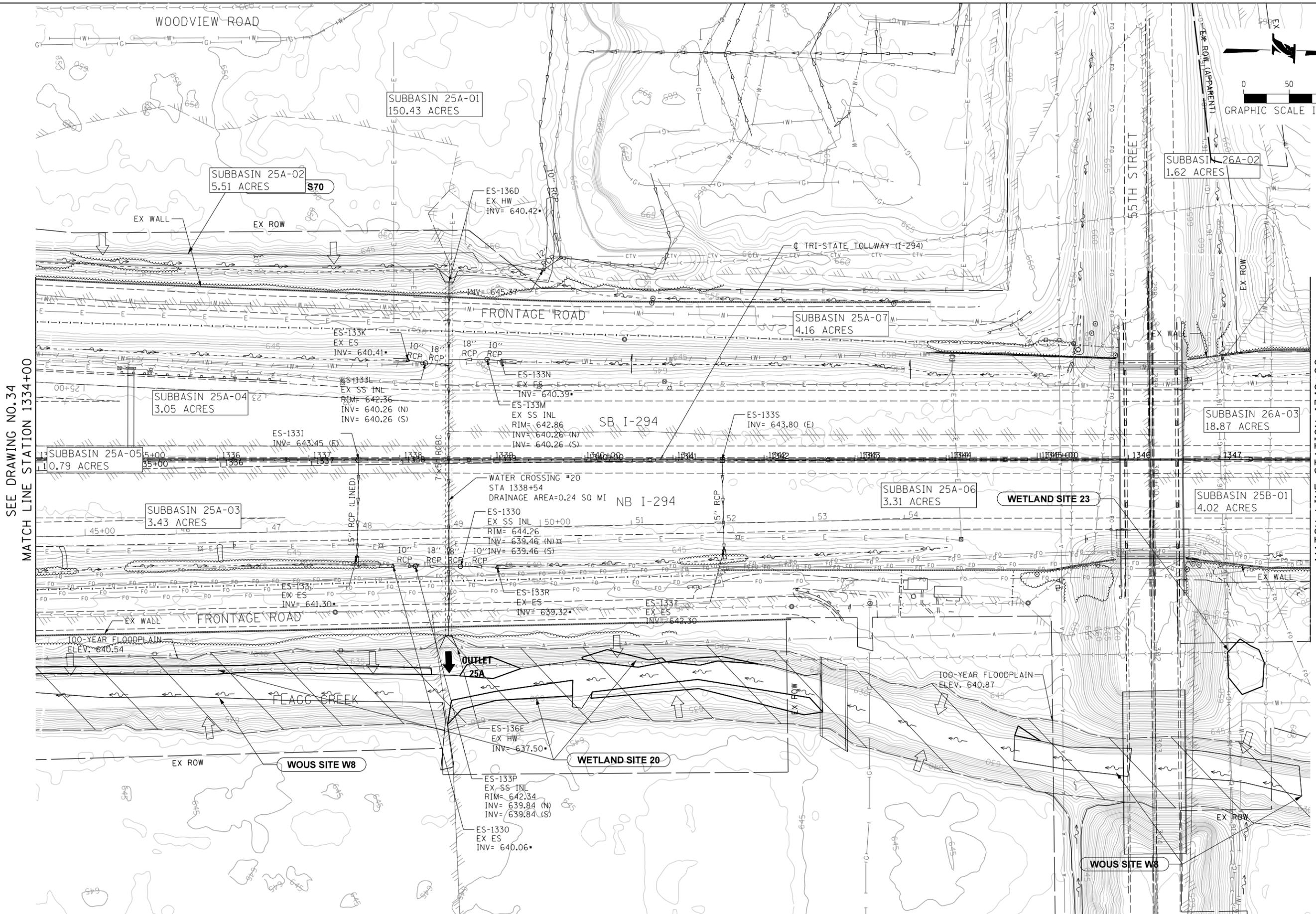
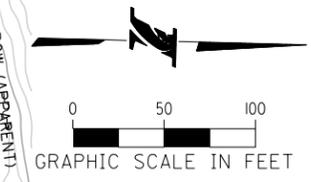


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1308+00 TO STA 1321+00

SHEET NO. ED-33
 DRAWING NO. 33 OF 53



SEE DRAWING NO. 34
MATCH LINE STATION 1334+00

MATCH LINE STATION 1348+00
SEE DRAWING NO. 36

12/22/2017
 C:\Users\jstevens\OneDrive\Documents\Projects\RR-14-4223\Drawings\ED-35\Drawings\ED-35.dwg
 JST
 142.dgn

DRAWN BY SED SCALE 1"=50'
 CHECKED BY JWC DATE 10/27/17

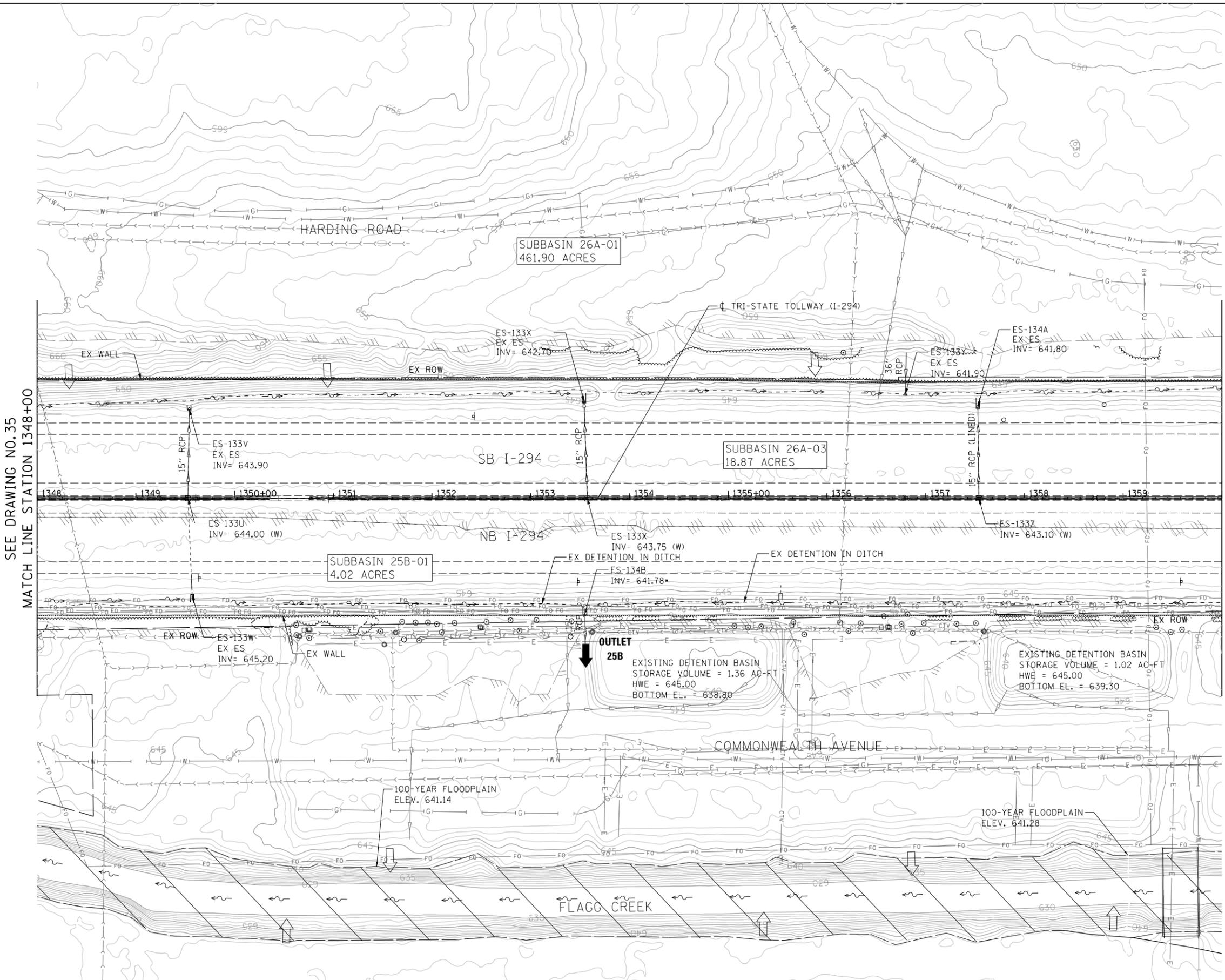
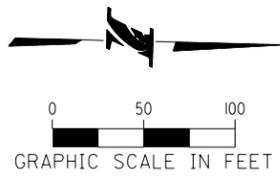


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1334+00 TO STA 1348+00

SHEET NO. ED-35
 DRAWING NO. 35 OF 53



SEE DRAWING NO. 35
MATCH LINE STATION 1348+00

MATCH LINE STATION 1360+00
SEE DRAWING NO. 37

12/22/2017
 C:\Users\jgarcia\Documents\Projects\RR-14-4223\14223-shd-DrainEx-143.dgn
 JGarcia

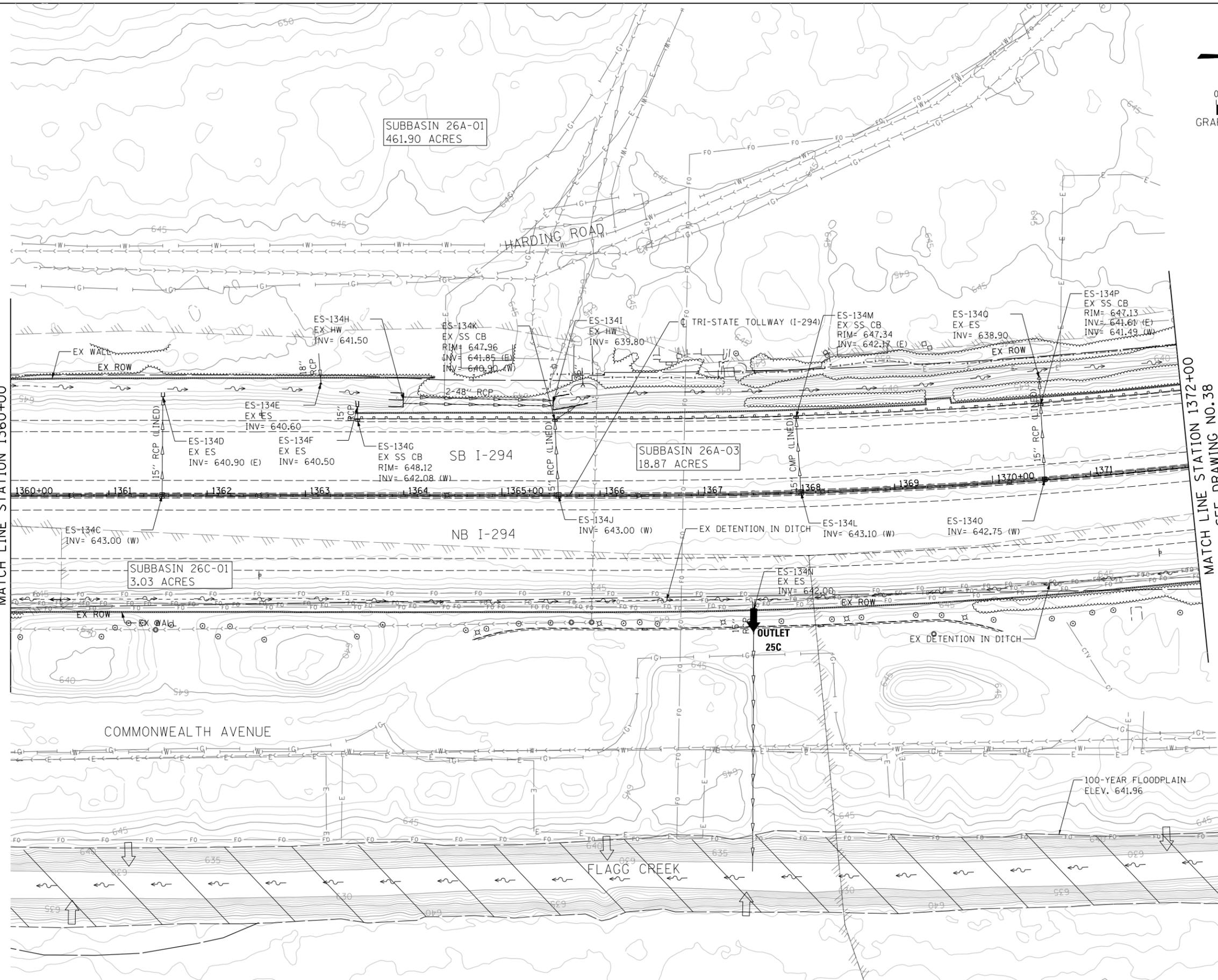
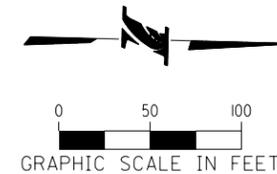
DRAWN BY SED SCALE 1"=50'
 CHECKED BY JWC DATE 10/27/17



REVISIONS		DESCRIPTION
NO.	DATE	

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1348+00 TO STA 1360+00

SHEET NO. ED-36
 DRAWING NO. 36 OF 53



SEE DRAWING NO.36
MATCH LINE STATION 1360+00

MATCH LINE STATION 1372+00
SEE DRAWING NO.38

12/22/2017
 C:\Users\jwong\Documents\Projects\RR-14-4223\Drawings\ED-37.dwg
 J. Wong

DRAWN BY SED SCALE 1"=50'
 CHECKED BY JWC DATE 10/27/17

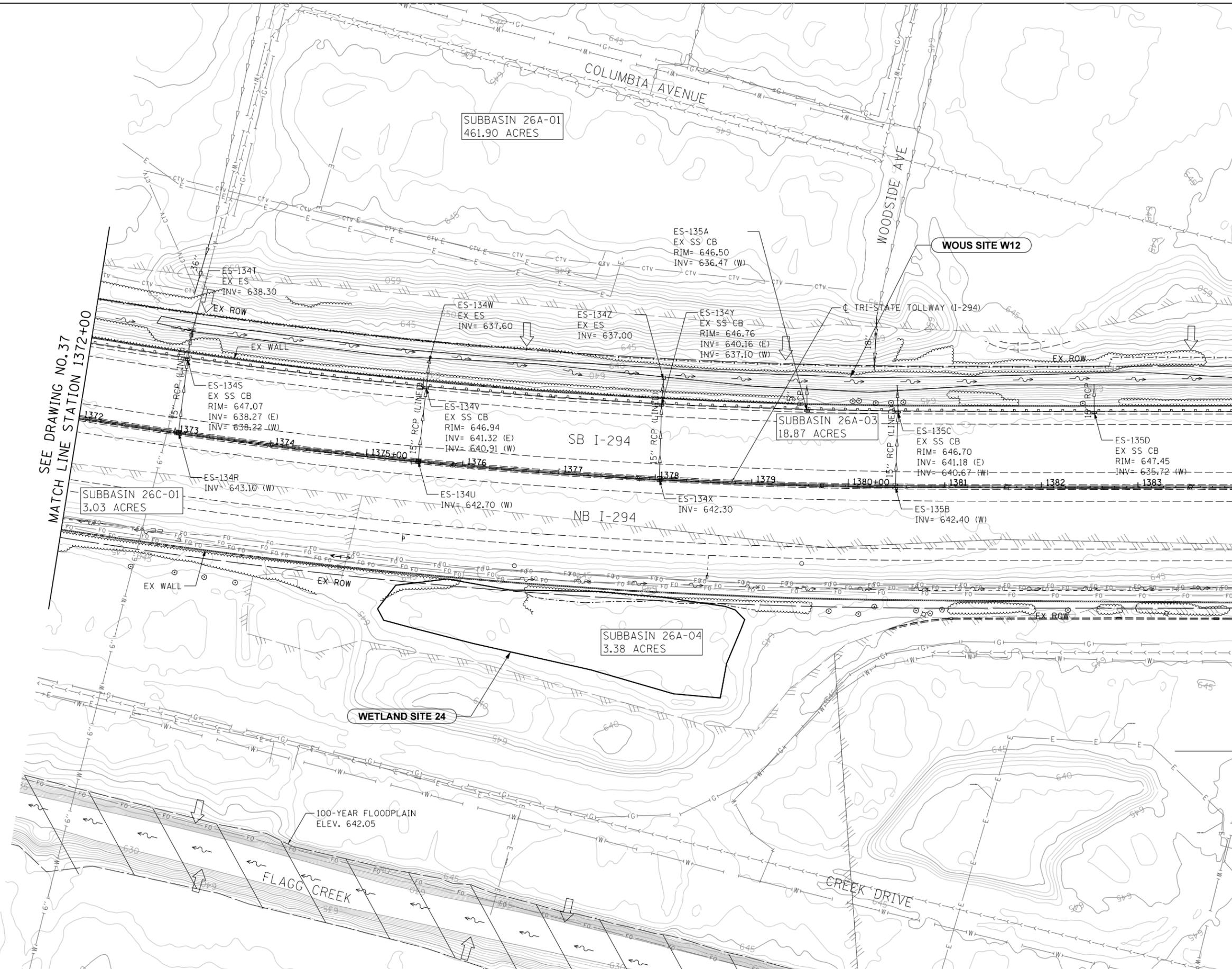
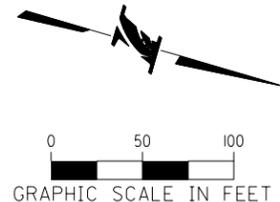


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1360+00 TO STA 1372+00

SHEET NO. ED-37
 DRAWING NO. 37 OF 53



SEE DRAWING NO. 37
MATCH LINE STATION 1372+00

MATCH LINE STATION 1384+00
SEE DRAWING NO. 39

12/22/2017
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DRAWN BY SED SCALE 1"=50'
CHECKED BY JWC DATE 10/27/17

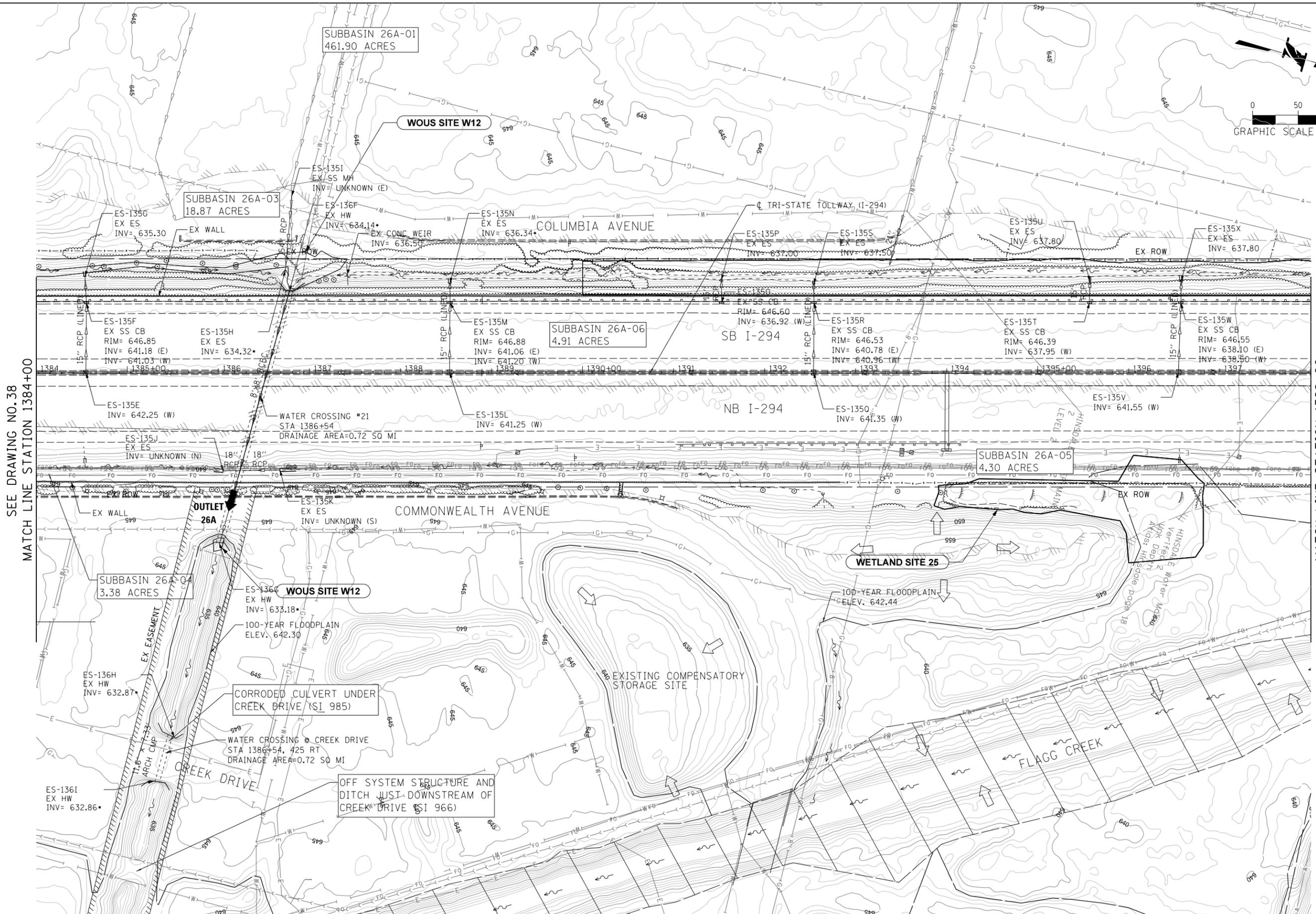
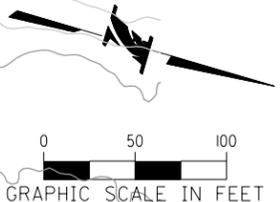


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
2700 OGDEN AVENUE
DOWNERS GROVE, ILLINOIS 60515

REVISIONS		DESCRIPTION
NO.	DATE	

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1372+00 TO STA 1384+00

SHEET NO. ED-38
DRAWING NO. 38 OF 53



SEE DRAWING NO. 38
MATCH LINE STATION 1384+00

MATCH LINE STATION 1398+00
SEE DRAWING NO. 40

12/22/2017
C:\Users\jwong\Documents\Projects\RR-14-4223\Drawings\ED-39\Drawings\ED-39.dwg

DRAWN BY SED SCALE 1"=50'
CHECKED BY JWC DATE 10/27/17

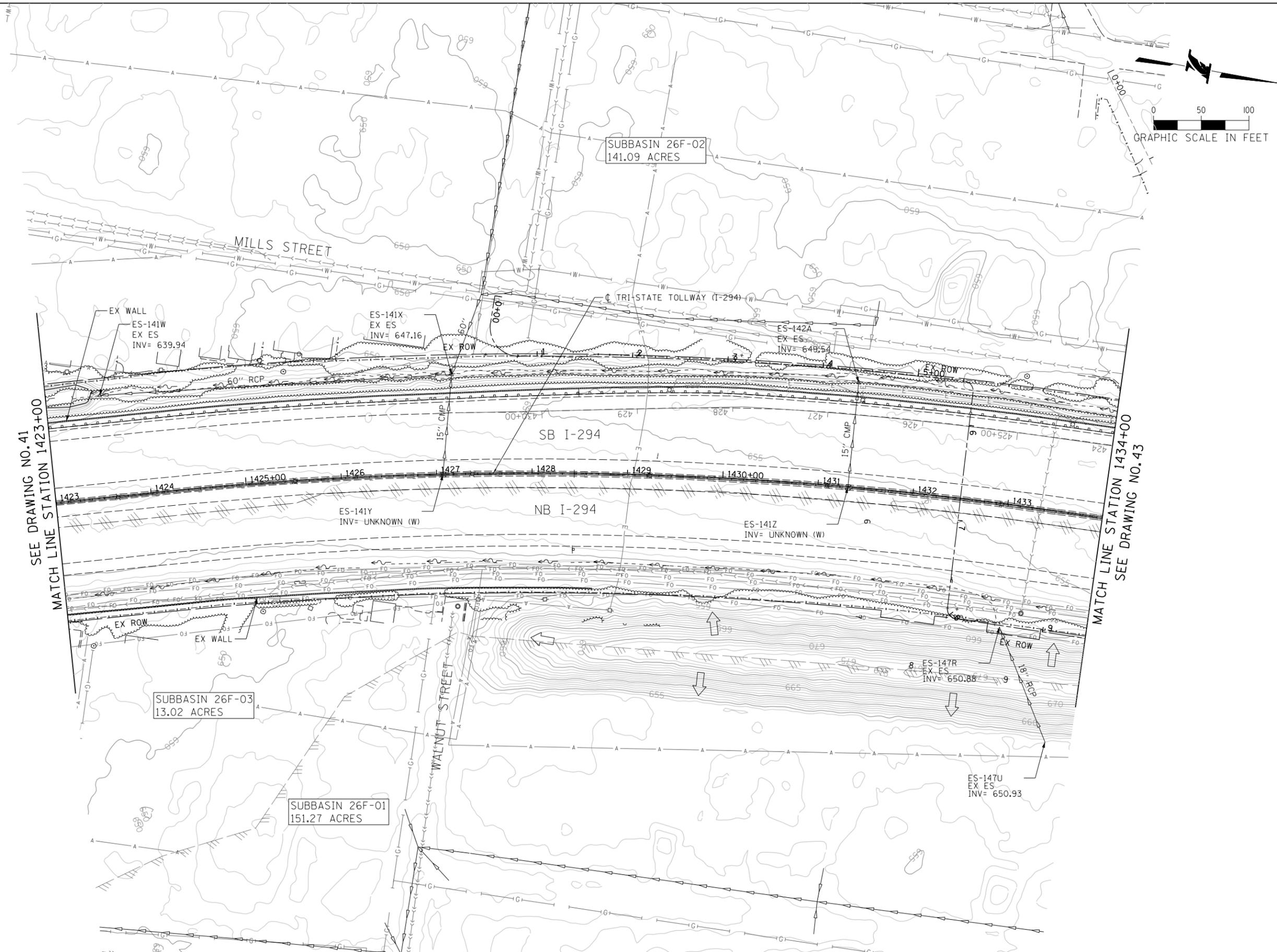


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
2700 OGDEN AVENUE
DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1384+00 TO STA 1398+00

SHEET NO. ED-39
DRAWING NO. 39 OF 53



12/22/2017
 C:\Users\jwong\Documents\Projects\RR-14-4223\Drawings\ED-42.dwg

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 CHECKED BY JWC DATE 10/27/17

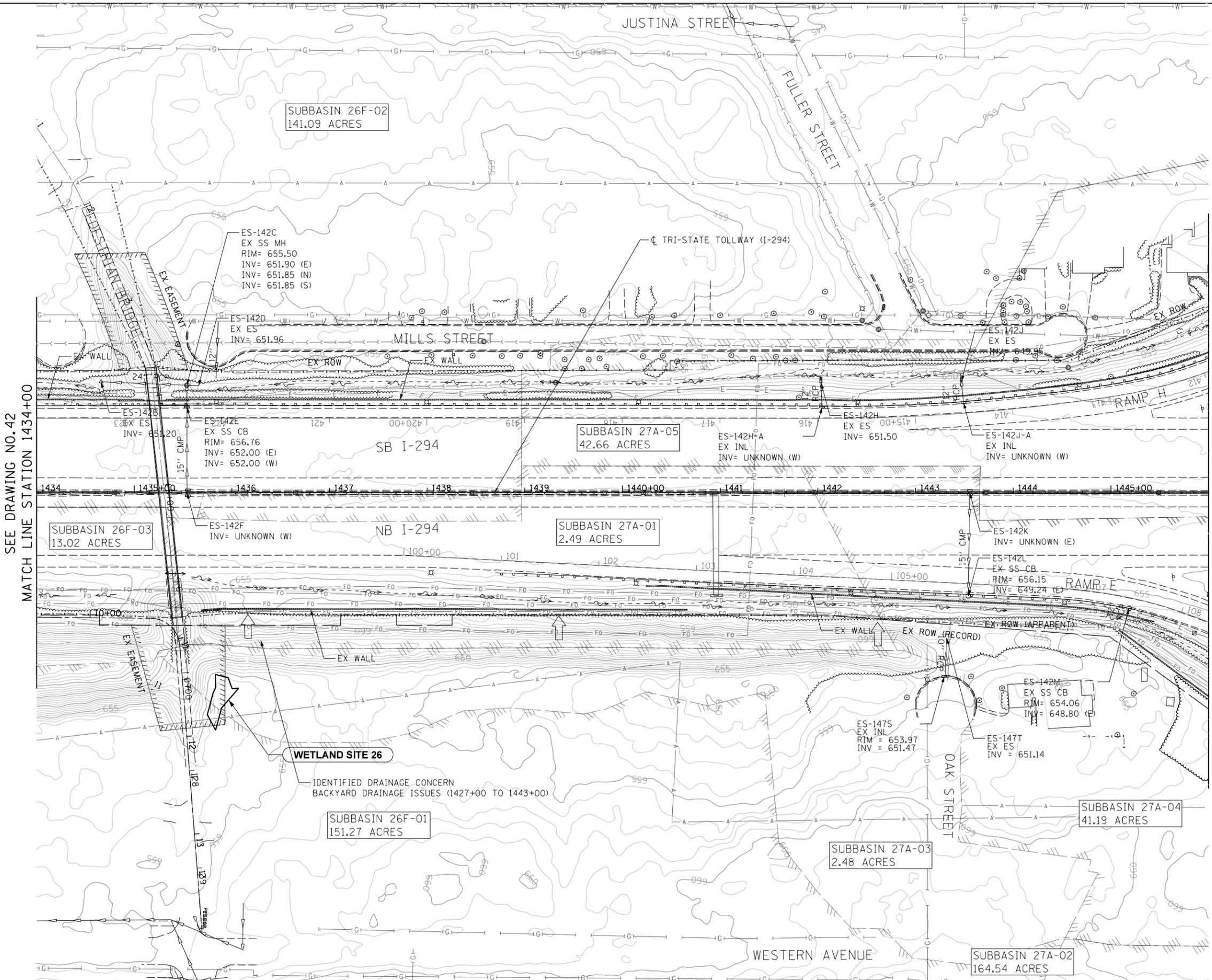
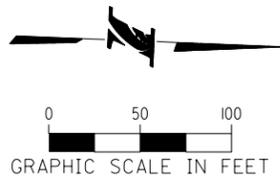


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1423+00 TO STA 1434+00

SHEET NO.
 ED-42
 DRAWING NO.
 42 OF 53



SEE DRAWING NO. 42
MATCH LINE STATION 1434+00

MATCH LINE STATION 1446+00
SEE DRAWING NO. 44

12/22/2017
 C:\Users\jwong\Documents\Projects\RR-14-4223\Drawings\ED-43.dgn
 J. Wong

DRAWN BY SED SCALE 1"=50'
 CHECKED BY JWC DATE 10/27/17



THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

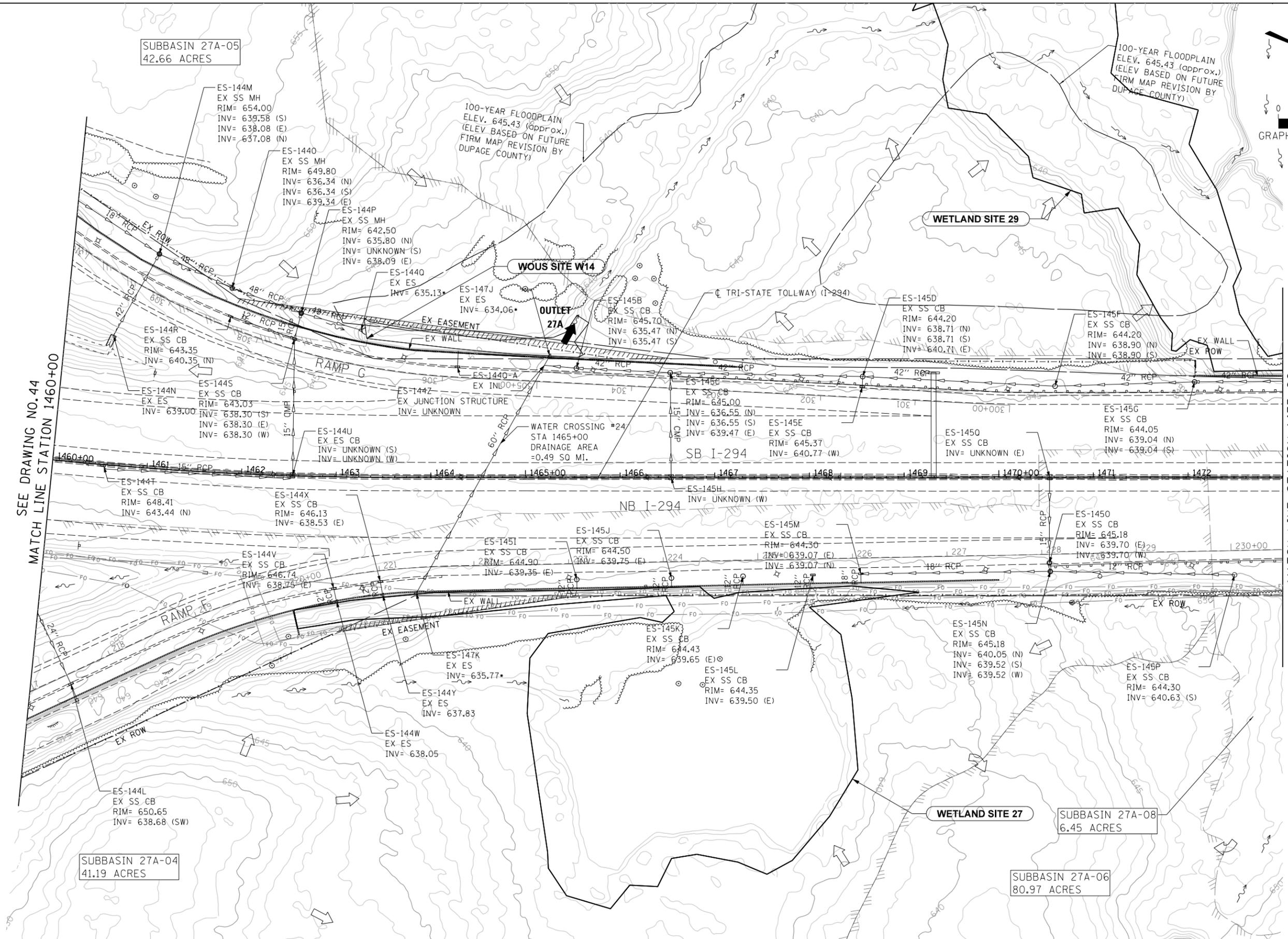
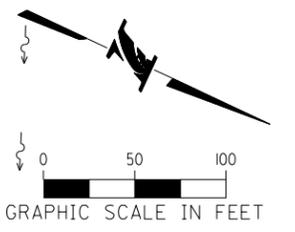
NO.	DATE	REVISIONS DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1434+00 TO STA 1446+00

SHEET NO. ED-43
 DRAWING NO. 43 OF 53

SUBBASIN 27A-05
42.66 ACRES

100-YEAR FLOODPLAIN
ELEV. 645.43 (approx.)
(ELEV BASED ON FUTURE
FIRM MAP REVISION BY
DUPAGE COUNTY)



SEE DRAWING NO. 44
MATCH LINE STATION 1460+00

MATCH LINE STATION 1473+00
SEE DRAWING NO. 46

SUBBASIN 27A-04
41.19 ACRES

SUBBASIN 27A-06
80.97 ACRES

SUBBASIN 27A-08
6.45 ACRES

DRAWN BY SED SCALE 1"=50'
CHECKED BY JWC DATE 10/27/17



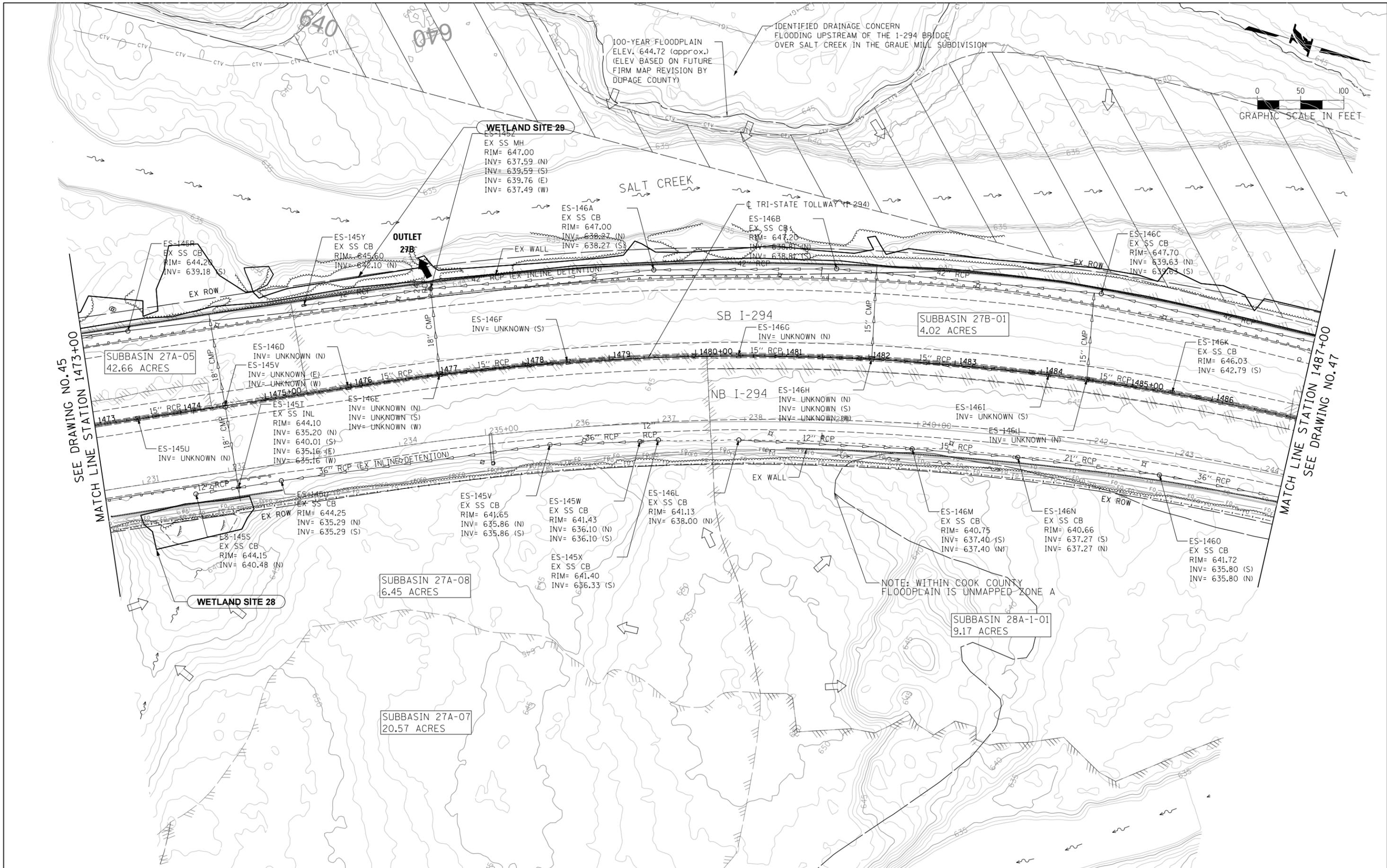
THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
2700 OGDEN AVENUE
DOWNERS GROVE, ILLINOIS 60515

REVISIONS		
NO.	DATE	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1460+00 TO STA 1473+00

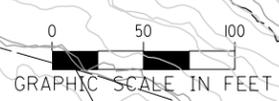
SHEET NO. ED-45
DRAWING NO. 45 OF 53

12/22/2017
C:\Users\jstevens\OneDrive\Documents\Projects\RR-14-4223\1460-1473\1460-1473.dgn



IDENTIFIED DRAINAGE CONCERN
FLOODING UPSTREAM OF THE I-294 BRIDGE
OVER SALT CREEK IN THE GRAUE MILL SUBDIVISION

100-YEAR FLOODPLAIN
ELEV. 644.72 (approx.)
(ELEV BASED ON FUTURE
FIRM MAP REVISION BY
DUPAGE COUNTY)



WETLAND SITE 29
ES-145Z
EX SS MH
RIM= 647.00
INV= 637.59 (N)
INV= 639.59 (S)
INV= 639.76 (E)
INV= 637.49 (W)

ES-145R
EX SS CB
RIM= 644.20
INV= 639.18 (S)

ES-145Y
EX SS CB
RIM= 645.60
INV= 642.10 (N)

ES-146A
EX SS CB
RIM= 647.00
INV= 638.27 (N)
INV= 638.27 (S)

ES-146B
EX SS CB
RIM= 647.20
INV= 638.87 (N)
INV= 638.87 (S)

ES-146C
EX SS CB
RIM= 647.70
INV= 639.63 (N)
INV= 639.63 (S)

SUBBASIN 27A-05
42.66 ACRES

ES-146D
INV= UNKNOWN (N)
ES-145V
INV= UNKNOWN (E)
INV= UNKNOWN (W)

ES-146F
INV= UNKNOWN (S)

ES-146G
INV= UNKNOWN (N)

SUBBASIN 27B-01
4.02 ACRES

ES-146K
EX SS CB
RIM= 646.03
INV= 642.79 (S)

ES-145U
INV= UNKNOWN (N)

ES-145T
EX SS INL
RIM= 644.10
INV= 635.20 (N)
INV= 640.01 (S)
INV= 635.16 (E)
INV= 635.16 (W)

ES-146E
INV= UNKNOWN (N)
INV= UNKNOWN (S)
INV= UNKNOWN (W)

ES-146H
INV= UNKNOWN (N)
INV= UNKNOWN (S)
INV= UNKNOWN (W)

ES-146I
INV= UNKNOWN (S)
ES-146J
INV= UNKNOWN (N)

WETLAND SITE 28

SUBBASIN 27A-08
6.45 ACRES

ES-145V
EX SS CB
RIM= 644.25
INV= 635.29 (N)
INV= 635.29 (S)

ES-145W
EX SS CB
RIM= 641.65
INV= 635.86 (N)
INV= 635.86 (S)

ES-145X
EX SS CB
RIM= 641.40
INV= 636.33 (S)

ES-145Z
EX SS CB
RIM= 641.43
INV= 636.10 (N)
INV= 636.10 (S)

ES-146L
EX SS CB
RIM= 641.13
INV= 638.00 (N)

ES-146M
EX SS CB
RIM= 640.75
INV= 637.40 (S)
INV= 637.40 (W)

ES-146N
EX SS CB
RIM= 640.66
INV= 637.27 (S)
INV= 637.27 (N)

ES-146O
EX SS CB
RIM= 641.72
INV= 635.80 (S)
INV= 635.80 (N)

SUBBASIN 28A-1-01
9.17 ACRES

NOTE: WITHIN COOK COUNTY
FLOODPLAIN IS UNMAPPED ZONE A

SUBBASIN 27A-07
20.57 ACRES

SEE DRAWING NO. 45
MATCH LINE STATION 1473+00

MATCH LINE STATION 1487+00
SEE DRAWING NO. 47

12/22/2017
 C:\Users\jstevens\OneDrive\Documents\Projects\14-4223\14-4223-shl-Drain-153.dgn
 TranSystems

DRAWN BY SED SCALE 1"=50'
CHECKED BY JWC DATE 10/27/17

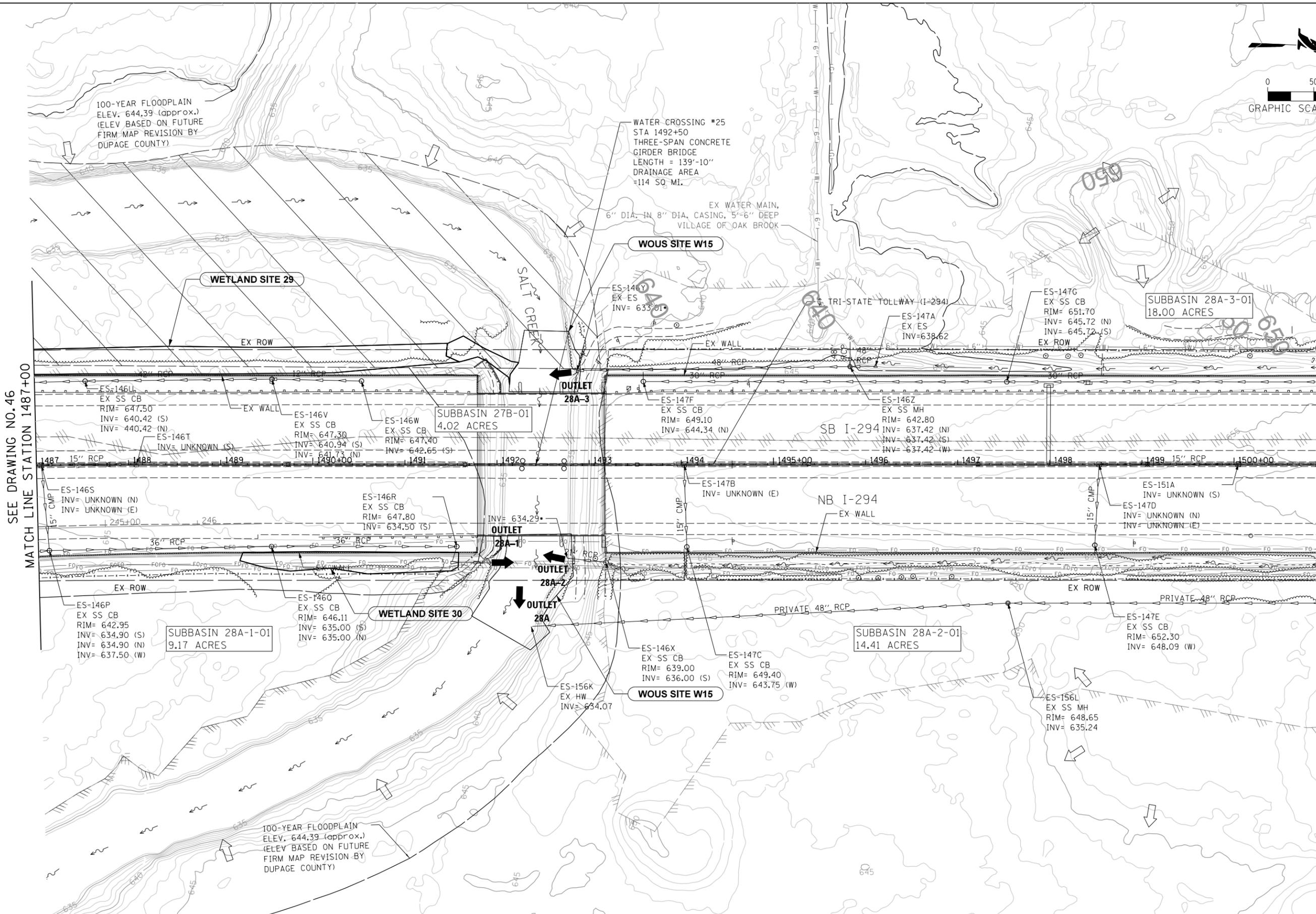
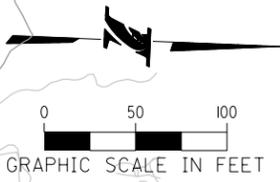


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
2700 OGDEN AVENUE
DOWNERS GROVE, ILLINOIS 60515

REVISIONS		
NO.	DATE	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1473+00 TO STA 1487+00

SHEET NO. ED-46
DRAWING NO. 46 OF 53



SEE DRAWING NO. 46
MATCH LINE STATION 1487+00

MATCH LINE STATION 1501+00
SEE DRAWING NO. 48

12/22/2017
 C:\Users\jstevens\OneDrive\Documents\Projects\RR-14-4223\Drawings\ED-47.dgn
 JST

DRAWN BY SED SCALE 1"=50'
 CHECKED BY JWC DATE 10/27/17

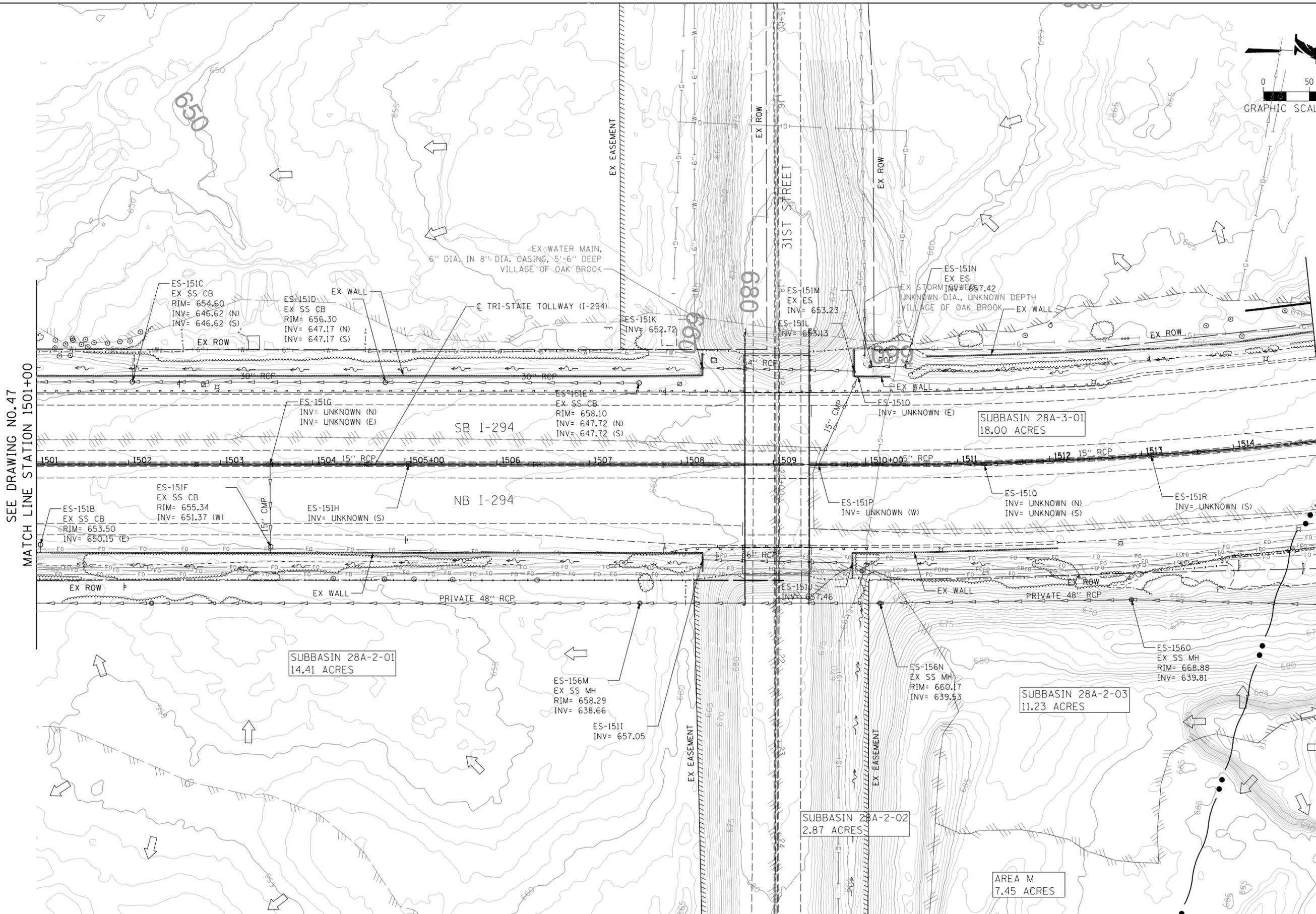
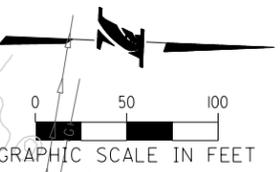


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1487+00 TO STA 1501+00

SHEET NO. ED-47
 DRAWING NO. 47 OF 53



SEE DRAWING NO. 47
MATCH LINE STATION 1501+00

MATCH LINE STATION 1515+00
SEE DRAWING NO. 49

12/22/2017
 C:\Users\jwong\Documents\Projects\RR-14-4223\Drawings\ED-48.dgn
 J.Wong

DRAWN BY SED SCALE 1"=50'
 CHECKED BY JWC DATE 10/27/17

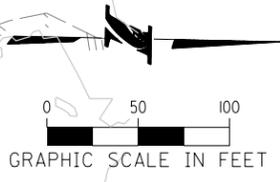


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1501+00 TO STA 1515+00

SHEET NO. ED-48
 DRAWING NO. 48 OF 53



SUBBASIN 28B-01
49.46 ACRES

WOUS SITE W16

TRI-STATE TOLLWAY (I-294)

SUBBASIN 29A-03
0.88 ACRES

SUBBASIN 28A-3-01
18.00 ACRES

SB I-294

RAMP N (I-88 EB)

SUBBASIN 29C-02
3.88 ACRES

SUBBASIN 29A-02
7.68 ACRES

NB I-294

WATER CROSSING #26
STA 1532+05
DRAINAGE AREA
= 0.0773 SQ MI.

SEE DRAWING NO. 49
MATCH LINE STATION 1529+00

MATCH LINE STATION 1542+00
SEE DRAWING NO. 51

ES-152G
EX ES
RIM= 672.6
INV= 665.08 (S)
INV= 665.08 (E)
42" RCP (EX INLINE DETENTION)

ES-152I
EX SS CB
RIM= 674.10
INV= 669.45 (E)

ES-152L
INV= UNKNOWN (N)
INV= UNKNOWN (S)
15" RCP

ES-152J
EX ES
INV= 668.09

ES-152K
EX SS CB
RIM= 673.51
INV= 669.46 (N)

ES-152M
INV= UNKNOWN (N)
INV= UNKNOWN (S)
15" RCP

ES-152N
EX SS INL
RIM= 673.06
INV= 668.77 (E)
INV= 668.67 (S)

SUBBASIN 28B-02
3.85 ACRES

ES-156S
EX SS MH
RIM= 659.52
INV= 645.47

SUBBASIN 29A-01
8.07 ACRES

RAMP M (I-88 WB CONNECTOR)

ES-152O
EX ES
INV= 665.60

ES-152P
EX ES
INV= 664.00

ES-152R
EX ES
INV= 659.96

ES-152Q
EX ES
INV= 662.10

ES-156T
EX SS MH
RIM= 679.20
INV= 673.63 (SE)
INV= 653.37 (W)

PRIVATE 36" RCP

ES-156U
EX SS MH
RIM= 675.30
INV= 654.82

AREA GC
23.52 ACRES

12/22/2017
 C:\Users\jwong\Documents\Projects\RR-14-4223\Drawings\ED-50.dgn
 J. Wong

DRAWN BY SED SCALE 1"=50'
CHECKED BY JWC DATE 10/27/17

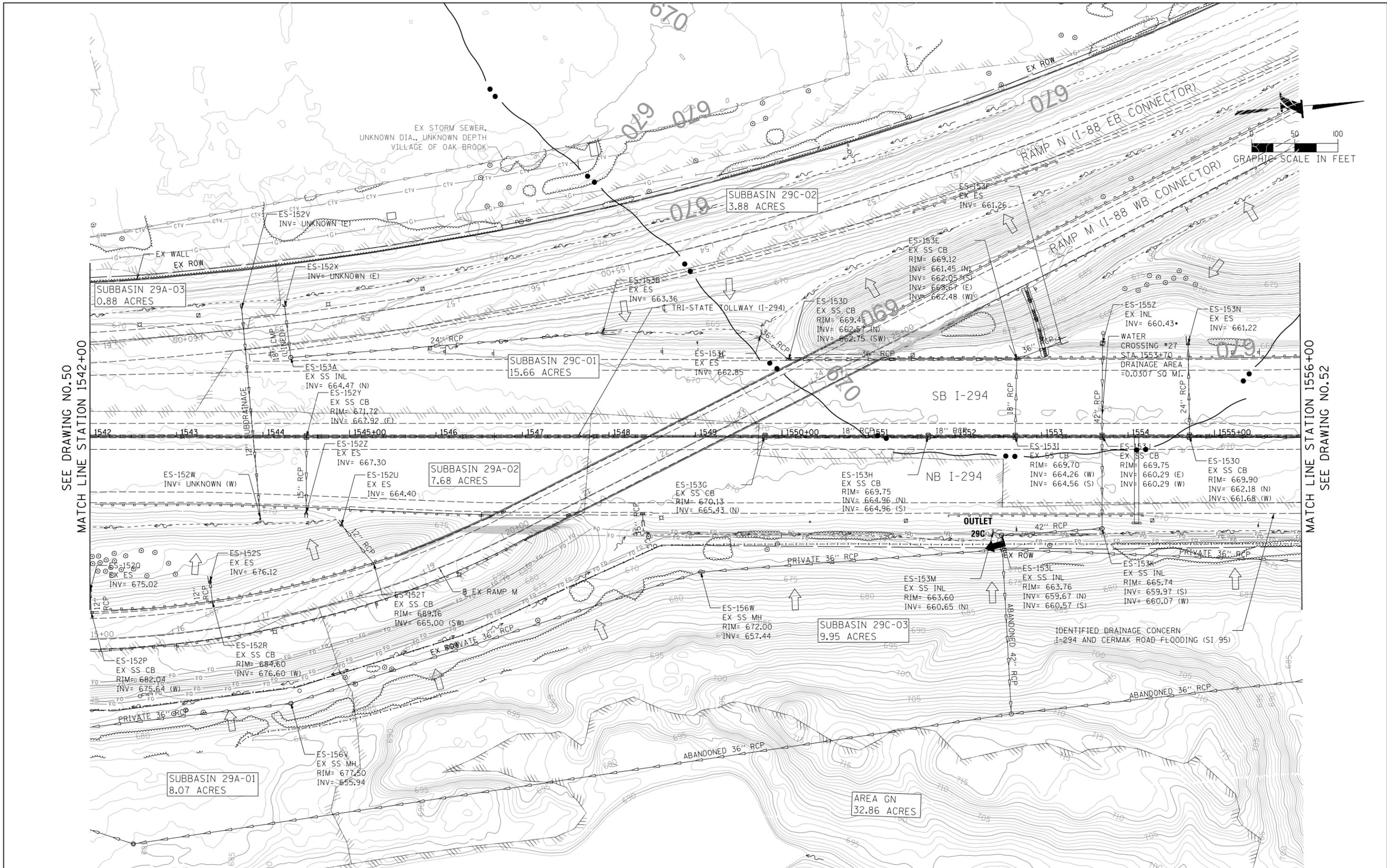


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1529+00 TO STA 1542+00

SHEET NO. ED-50
 DRAWING NO. 50 OF 53



SEE DRAWING NO.50
MATCH LINE STATION 1542+00

MATCH LINE STATION 1556+00
SEE DRAWING NO.52

12/22/2017
 C:\Users\jwong\Documents\Projects\RR-14-4223\Drawings\DRN\ED-51.dgn
 J.Wong

DRAWN BY SED SCALE 1"=50'
 CHECKED BY JWC DATE 10/27/17

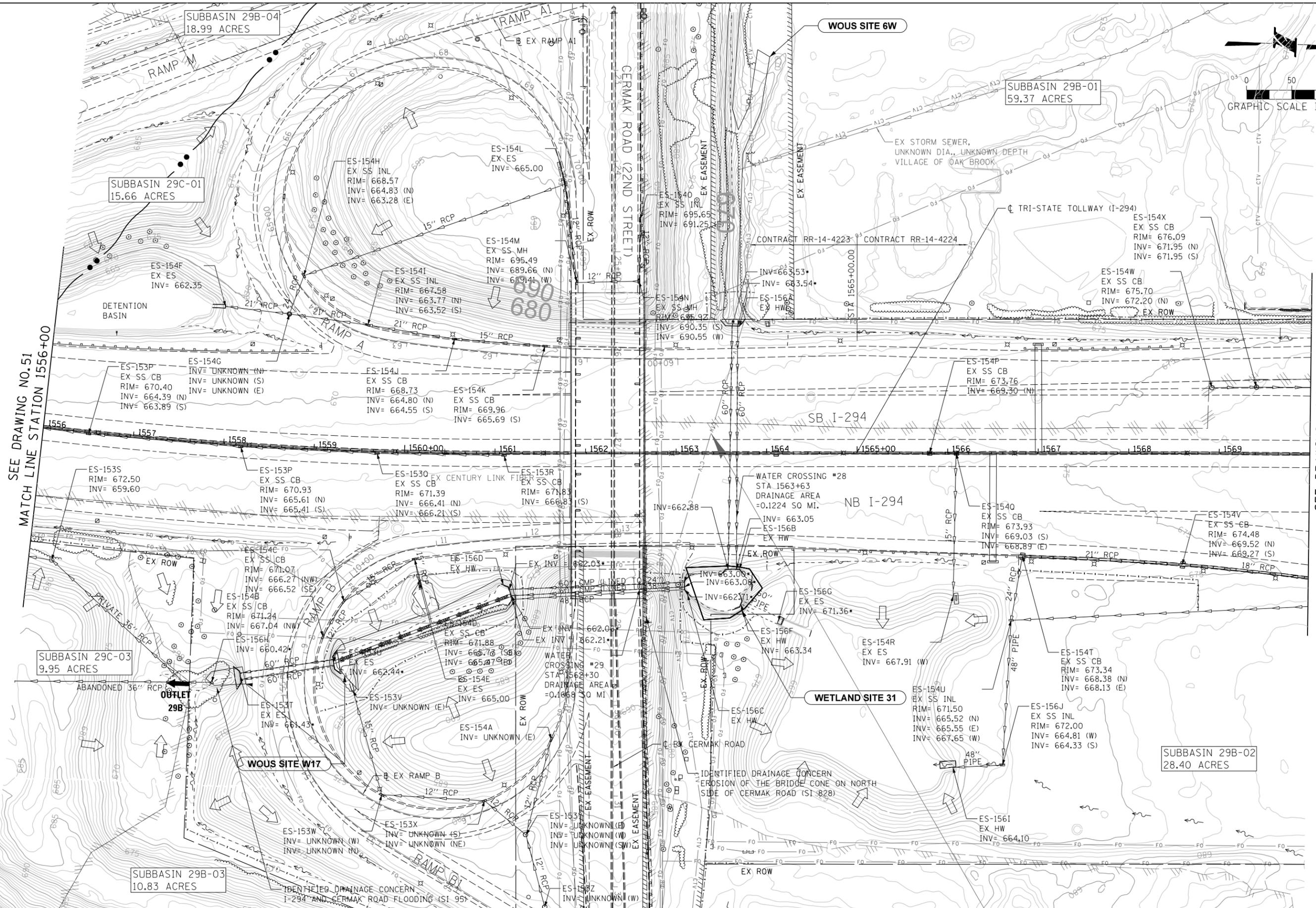
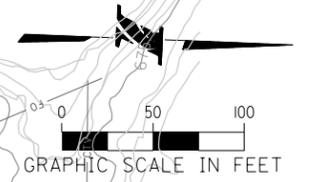


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1542+00 TO STA 1556+00

SHEET NO.
 ED-51
 DRAWING NO.
 51 OF 53



SEE DRAWING NO. 51
MATCH LINE STATION 1556+00

SEE DRAWING NO. 53
MATCH LINE STATION 1570+00

DRAWN BY SED SCALE 1"=50'
CHECKED BY JWC DATE 10/27/17



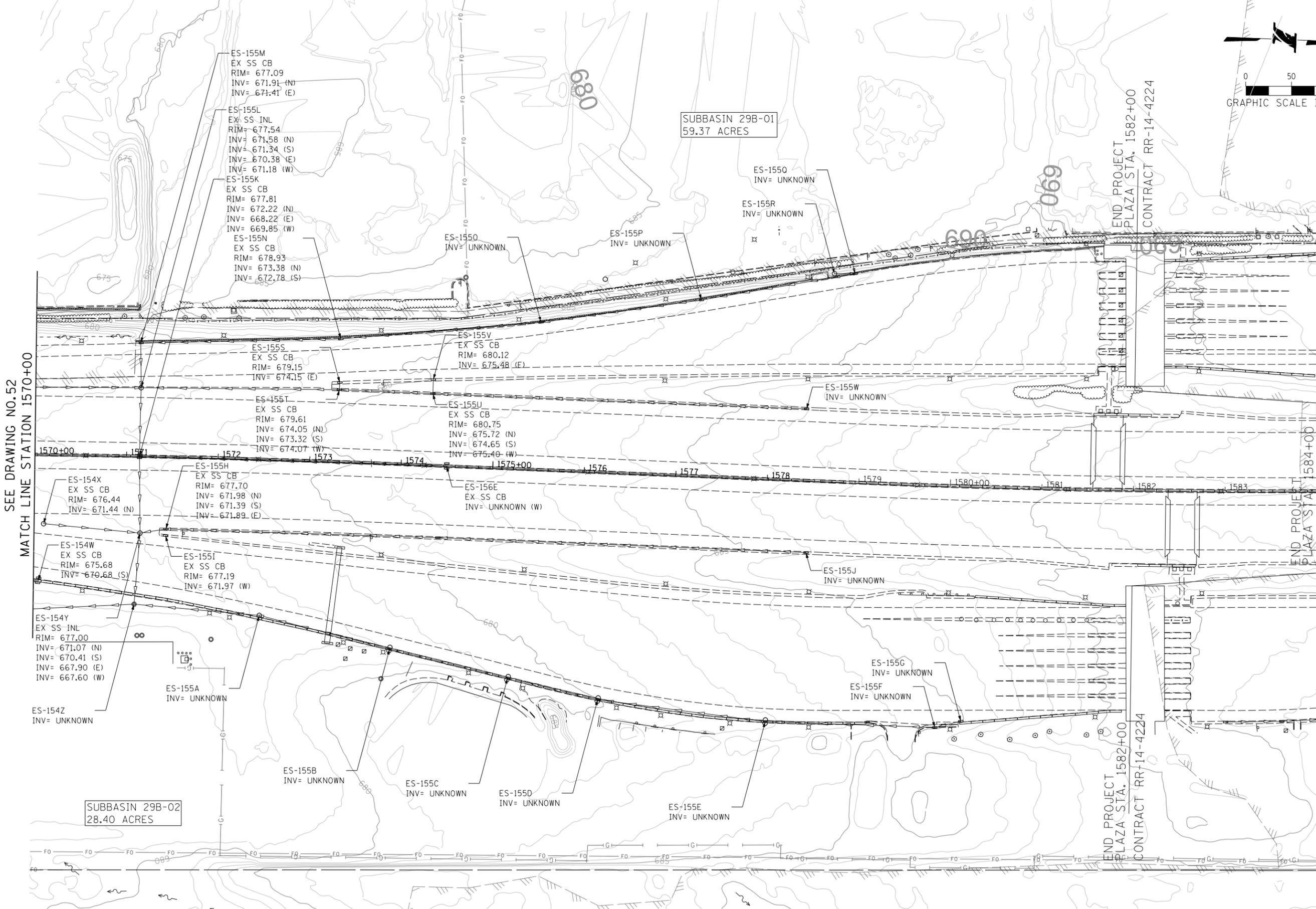
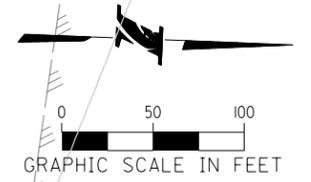
THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
2700 OGDEN AVENUE
DOWNERS GROVE, ILLINOIS 60515

NO.	DATE	REVISIONS	DESCRIPTION

CONTRACT NO. RR-14-4223
EXISTING DRAINAGE PLAN
STA 1556+00 TO STA 1570+00

SHEET NO. ED-52
DRAWING NO. 52 OF 53

12/22/2017
 C:\Users\jwong\Documents\Projects\1704223-ehs-Drain-1556-1570.dgn
 JWC



SEE DRAWING NO.52
MATCH LINE STATION 1570+00

END PROJECT
PLAZA STA. 1584+00

SUBBASIN 29B-02
28.40 ACRES

SUBBASIN 29B-01
59.37 ACRES

12/22/2017
 C:\Users\jwong\Documents\Projects\2017\14223\14223-shd-DrainEx-159.dgn
 J.Wong

DRAWN BY SED SCALE 1"=50'
CHECKED BY JWC DATE 10/27/17

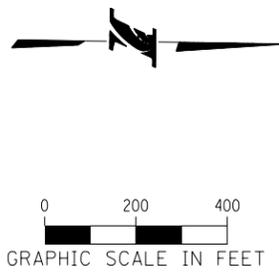
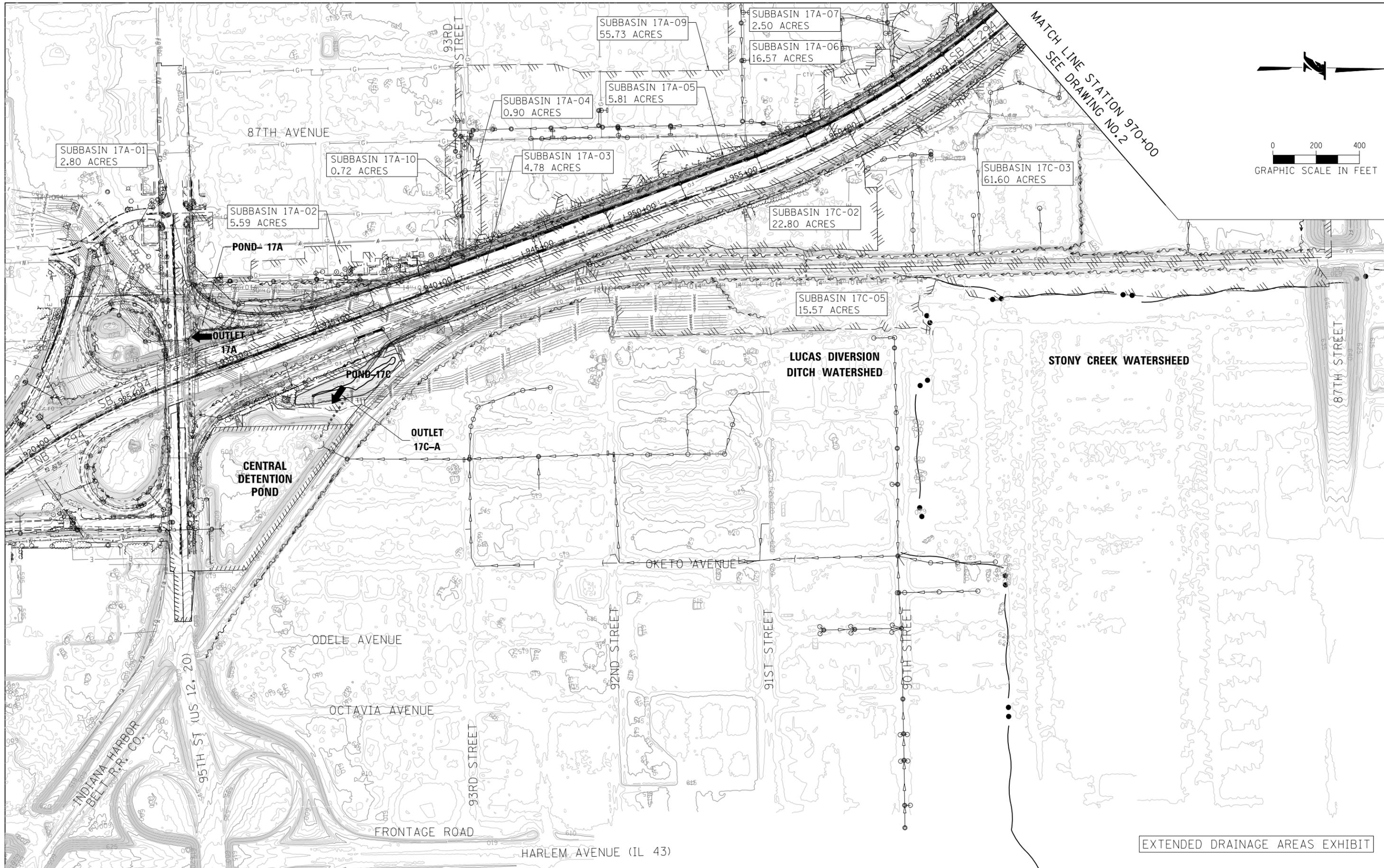


THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

NO.		REVISIONS	
NO.	DATE	DESCRIPTION	

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 1570+00 TO STA 1584+00

SHEET NO. ED-53
 DRAWING NO. 53 OF 53



EXTENDED DRAINAGE AREAS EXHIBIT

12/22/2017
 C:\Users\jstevens\OneDrive\Documents\Projects\14223\14223-shs-DrainEx-211.dgn
 Dr. Faulstich

DRAWN BY SMS SCALE 1"=200'
 CHECKED BY DGW DATE 10/27/17

SE3
 3041 WOODCREEK DRIVE, SUITE 211 - DOWNERS GROVE, IL 60515
 (630) 641-9900

THE ILLINOIS STATE TOLL HIGHWAY AUTHORITY
 2700 OGDEN AVENUE
 DOWNERS GROVE, ILLINOIS 60515

NO.		REVISIONS	
NO.	DATE	DESCRIPTION	

CONTRACT NO. RR-14-4223
 EXISTING DRAINAGE PLAN
 STA 919+00 TO STA 970+00

SHEET NO. EED-1
 DRAWING NO. 1 OF 15