

Ikenberry Commons
Comprehensive Drainage Study
Final Report



Aerial Perspective

Ikenberry Commons
Comprehensive Drainage Study

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IKENBERRY COMMONS DRAINAGE STUDY
May 27, 2011

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May 27, 2011

UNIVERSITY OF ILLINOIS –IKENBERRY COMMONS COMPREHENSIVE DRAINAGE STUDY

EXECUTIVE SUMMARY

The *University of Illinois* (Urbana-Champaign campus), through the Facilities & Services Planning Division and University Housing, engaged Foth Infrastructure and Environment, LLC on July 21, 2010 to conduct a comprehensive drainage study to identify infrastructure needs for the overall site improvements for Ikenberry Commons. The project area is bounded by First Street on the west, Gregory Drive on the north, Fourth Street on the east and Peabody Drive on the south. The entire project is located within the City of Champaign.

This drainage study supplements improvements already made within the project area and is intended as a master plan for future drainage infrastructure necessary to serve subsequent redevelopment in Ikenberry Commons. Identified improvements include conveyance (piping) and detention storage to meet the University's design policies and objectives.

A hydrologic and hydraulic study was completed for the project area. This study identified:

- Existing hydraulic deficiencies within and immediately surrounding the project area.
- Storm sewer improvements necessary to serve planned redevelopment while reducing flood potential within the project area. This included storm sewers within the redevelopment area and along the bounding roadways.
- Impacts of existing underground (recently constructed) stormwater detention within the project area.
- Need for future (additional) stormwater detention to further reduce flooding potential while meeting University design policies and objectives.

Key Findings

- Several storm sewers along the project area perimeter (Gregory Drive and Fourth Street) are undersized and contribute to site flooding (*this is being addressed by the Gregory Drive storm sewer improvements project, under construction during the summer of 2011*).
- The intersection of First Street and Peabody Drive is flood-prone, largely due to an undersized sewer on First Street and additional flooding bypass from areas east of Fourth Street flowing towards this intersection via Peabody Drive.
- The proposed Ikenberry Commons redevelopment is estimated to only slightly increase impervious area coverage, from 37% to 39%, however the *University of Illinois* stormwater mitigation policy relating to receiving sewers is the controlling factor in the recommendations of this study.

Key Recommendations

- Construct 2.8 acre-feet of underground stormwater storage at existing Weston Hall locations when the building is demolished. This will supplement existing underground storage and will control peak discharge from the Ikenberry Commons to the First Street storm sewer system. The addition of the Weston Hall detention storage will *not* reduce flood potential along First Street, although it will allow the University to meet its stormwater design criteria due to the increase in impervious area coverage under buildout conditions.
- Construct an upgraded internal storm sewer collection system to serve recent and future redevelopment within the project area. This will include modifications to the outlet of the existing underground stormwater storage area. See the *Figures SERIES C* for proposed storm sewer and underground storage layout, including construction phasing recommendations.
- The University can mitigate flooding in and around the First/Peabody intersection by constructing stormwater detention west of First Street and adding storm sewer on First Street. Although this option was studied in detail, it is not recommended as an integral part of the Ikenberry Commons development. The University may consider the First Street detention/conveyance option as a future stormwater capital improvement project, should the need arise to address regional flooding concerns.
- The construction costs associated with the storm sewer conveyance system and the detention options are shown on the attached series of Exhibits. The primary variable is the Weston storage cost estimate at \$1.1 mm (with contingencies) vs. the First Street conveyance cost estimate of \$0.5 mm (with contingencies) and West First Street Detention cost estimate at \$2.6 mm (with contingencies) that represents a more regional drainage solution.

The following summary is the Foth Scope of Services for the subject project, with a brief explanation of design responses included in the interim report and presentation to University of Illinois on October 28, 2010, the detention study cost comparison study dated March 1, 2011 and this Final Report dated May 27, 2011.

All design narrative responses to the Scope of Services are in italics.

BASIC SERVICES:

1. Compile and review information of record including:

These items were completed before 10/28/10. The basement drain details for Scott Hall were not received, however were not considered critical for the drainage analysis or for the final report.

- a. Aerial mapping and 2-foot contours outside the limits of Ikenberry Commons prepared by Champaign County GIS Consortium.
- b. *University of Illinois* utility maps outside the limits of Ikenberry Commons.
- c. City of Champaign Storm Sewer Maps.
- d. Utility maps (by owners) of the area.
- e. Topographic survey of Ikenberry Commons – surrounded by Gregory and Peabody Drive and Fourth and First Streets.
- f. As-built topographic surveys of construction to date of recent buildings within Ikenberry Commons.
- g. Utility plans by consultants for the recent new buildings within Ikenberry Commons including SDRP and Phase 1 Residence Hall.
- h. *University of Illinois* Champaign Housing Landscape and Lighting plans, dated 1/5/10, *University of Illinois* Project #U07093.
- i. Basement drainage system and details for Scott Hall (*University of Illinois* to provide).

2. Compile and review existing studies and design calculations of subject area

These items were completed before 10/28/10 with the exception of reviewing the HOH design calculations for the underground storage that was constructed in 2010. It was noted in the review that the inlet (48”) storm sewer and the outlet (36”) storm sewer have been constructed within the Step 6 Building footprint. The phased construction of the new on-site storm sewers as proposed in this report will include new construction that addresses this conflict. The Foth hydrologic and hydraulic analysis included this storage volume at the constructed location and its impact on the overall alternate solutions was included.

- a. Six Pack Drainage Study by Foth Infrastructure & Environment, LLC, d. 1/18/08, *University of Illinois* WO. #R-10.
- b. Gregory Drive Drainage Study by Donohue & Associates, Inc., d. November, 2009.
- c. Drainage Design Calculations for *University of Illinois* Champaign Housing Landscape and Lighting Plan, d. 1/5/10 by HOH Engineers, Inc.
- d. Gregory Drive Storm Sewer Improvement Plans

- e. Strategic Plan for Ikenberry Commons d. 2010
- f. Climate Action Plan for *University of Illinois* d. 2010

3. Review current *University of Illinois* and City of Champaign Storm Water Control Ordinances/Policies.

This was completed with the observation that the City of Champaign criteria is more restrictive than University of Illinois criteria unless the receiving sewer constraints are taken into account. The University of Illinois criteria state that, under developed conditions, peak flows from a 100 year event should be equal to or less than the peak flow from a 5 year event prior to construction. The University of Illinois criteria further state that, in the event that the existing downstream channel or storm drainage piping system is inadequate to accommodate the required release rate, the allowable release rate should be reduced to that rate permitted by the capacity of the downstream channel or storm drain system without overflowing of banks or surcharging of piping. The City of Champaign requirement, as outlined in their Manual of Practice, is to detain flows from a 100 year event with post construction improvements in place and release flows at a rate of 0.18 cubic feet per second per developed acre.

4. Validate limits of drainage areas, existing storm sewer systems and surface drainage systems that impact the overall drainage constraints.

Completed. See attached Figure A-1. During the hydrologic and hydraulic analysis, it was determined that the project site drainage may also be influenced by the hydraulic grade line that extends westerly from the Dorner Drive Detention Basin to Fourth Street. At the October 28th, 2010 meeting, this issue was disclosed and the potential of an additional basin, located east of Fourth Street was discussed. The matter was not pursued further as it is outside the scope of this project.

5. Conduct supplemental field surveys to verify recent site improvements and utilities constructed with SDRP and Residence Hall No. 1, and also outside the limits of Ikenberry Commons to verify record information by others, as required to build an adequate hydraulic model of the existing drainage system.

Completed to the level required for this report. Field verified critical piping systems.

6. Evaluate existing and planned site improvements ~ buildings and impervious areas resultant from planned and programmed improvements in Ikenberry Commons. Include a summary of impervious areas of existing and planned improvements.

Completed. Existing impervious areas within the SDRP, and phases A and C of the residence halls in place are 37 % impervious area. Buildout impervious area coverage is estimated at 39%.

7. Meet with *University of Illinois* staff for collaboration and coordination including near-term construction schedules of buildings and site work. (One meeting is anticipated.)

This meeting was held on August 20, 2010 and attended by:

Planning: Matt Edmonson, Sandy Yoo
Housing: Jack Collins, John Humlicek, Jeff Riddle, Mike Scott
Utilities: Keith Erickson, Kent Reifsteck
F&S: Elizabeth Stegmaier

A copy of the July 2010 Ikenberry Master Plan was received at this meeting for Foth use in the drainage study.

At this meeting the Foth Scope was reviewed and comments received by attendees that included a request for two reviews by University of Illinois. One meeting when the outline of solutions and alternatives are determined and one meeting for a Pre-Final Report. The schedule was accordingly proposed as:

October 28, 2010 Meet with University of Illinois to present the findings of the SWMM modeling and present the dynamic modeling as well as the outline of the final report.

November 23, 2010 Submit Pre-Final Report (Date relaxed by UI internal meeting needs)

December 17, 2010 Submit Final Report (Date relaxed by UI internal meeting needs)

The October 28th meeting was held and attended by:

<i>University of Illinois:</i>	<i>Keith Erickson, Fred Hahn, John Humlicek, Sandra Yoo, Jeff Riddle, Mike Scott, Kent Reifsteck, Jill Maxey, Eliana Brown, Matt Edmonson, Frank Schwarz, Jack Collins, Elizabeth Stegmair and Jack Dempsey.</i>
<i>Foth:</i>	<i>John Dabrowski, Greg Kacvinsky and Tom Jordan.</i>

The following is a summary memo of the 10/28/10 meeting. Items are not listed in sequence of discussion or order of importance.

- a. Foth presented a summary of the 10/28/10 Report ending with a two dimensional demonstration of the hydraulic/hydrologic modeling which replicates surface flows during a design event. Modeling was shown along Fourth Street, Gregory Drive and First Street (with emphasis on First and Peabody).*
- b. Jack C- The building sequence starts with building no. 2 at the SW corner of the project area. (This is Step 1 as summarized in the report).*
- c. Matt- There has been a submittal for the building no. 2 plans. Recommended FFE for this building is the same for Foth as the design architect, being 736.00. Berns, Clancy and Associates was cited as the civil engineer for the building site. Elizabeth will share Foth's draft study and recommendations with Berns, Clancy and Associates (BCA). [This was done and the drainage plan for building No. 2 was revised by BCA and their revision is incorporated into this Final Report]*
- d. Jack C- There is a current \$2.9mm budget program estimate for the Ikenberry interior sitework and landscaping.*
- e. Jack C- What is the life expectancy of the Storm Trap underground detention system?
John D- 100 years.*

- f. *Jack C- Can equipment be driven over the top of the Storm Trap system?
John D. Yes, the units are design for a H2O loading system, similar to IDOT traffic loads over a culvert or bridge.*
- g. *Eliana- Can the Storm Trap system be designed for gray water usage.
Answer is yes, with a calculated water usage for irrigation over a specified area.*
- h. *Question- Can the Dorner Drive detention system be expanded?
Answer- not practical to have an impact on this locale due to the difference in elevation from Fourth Street to the Dorner Drive basin.*
- i. *Keith- Data from the Dorner Drive basin is being gathered for transmittal to Foth.*
- j. *Matt- The current University of Illinois Master Plan (page 77) describes the future Military Axis as a “managed natural landscape representing the native Illinois landscape inclusive of prairie, savanna, wetland, and woodland communities.” Current plan is for a building to be constructed south of Huff, but Jack D. expects that this plan will change and the area will be reprogrammed for open space.*
- k. *Greg- If the First Street West basin is constructed to relieve the First Street hydraulics, the Weston Basin will not likely be needed.*
- l. *Discussed an open basin option for the First Street basin with likely grade minus 5 feet as a target for an open basin with dry (dewatered) surface.
Discussed range of slopes from grade to bottom from 4:1 to 6:1.*
- m. *John D- Estimates Storm Trap system at \$200 to \$250k / acre foot.*
- n. *Jack C- Believes that Campus Rec. will want continued use of the open space west of First Street and wants input from them before further discussion of basin at that location. Jack C. will meet with Campus Rec. to discuss possibilities.*
- o. *Jack D- If Military Axis is planned for open detention, he thinks all of the area should be depressed for open detention.*
- p. *Jack C- Questions funding source for detention outside of the Ikenberry Commons site.*
- q. *Eliana- Is the storage solution a possible candidate for Illinois Green Infrastructure Grant funding?
Greg- Outside funding from IEPA will require a water quality component.*
- r. *Jack C is okay with relaxing the Foth project schedule to allow University of Illinois to make critical decisions re: the Drainage Study findings to date.*
- s. *Final decision at this meeting was for University of Illinois to identify internal stakeholders in range of solutions and then provide feedback to Foth for further direction about completing the study.*

This feedback was received as a result of an internal meeting at University of Illinois held on Jan 4th, 2011.

Direction was given to Foth to provide a cost comparison for open and closed storage at the West First Street Basin. The interim report was prepared and submitted dated March 1, 2011 and included following narrative entitled “Summary of Study Option”.

A. *SUMMARY OF STUDY OPTION (from University of Illinois Jan. 4th, 2010 meeting):*

At the October 28th, 2010 Ikenberry Drainage Study presentation to University of Illinois, Foth presented a possible option of providing storage for storm water runoff from the Ikenberry Quadrangle at a location off of the Ikenberry site, by utilizing the open space where existing play fields are located on the west side of First Street (north of Stadium Drive and south of the existing tennis courts). At this presentation, both open storage (below street level) and underground storage were discussed with the general volume costs for a closed drainage system cited at approximately \$250,000 per acre foot. With an underground storage option, the benefits would include continued use as play fields and at the approximate same grade as the existing fields at this location. With no personnel at this meeting from the Division of Intercollegiate Athletics (DIA), it was thought best to consult with their staff before proceeding with any option that would impact this area use.

Subsequent to the October 28th meeting, University of Illinois staff did meet with DIA on January 4th, 2011 to present the basic idea and solicit their input on this potential use. As a result of the meeting, Foth was requested to further investigate the possible use of the West First Street site as a detention storage area, estimate the costs associated with open storage and underground storage options, and offer input to related advantages or disadvantages. This interim review intended to provide information for University of Illinois to make a more informed decision before proceeding with a final report and recommendations for the Ikenberry Drainage Study.

At the January 4th meeting, DIA mentioned two situations that might have potential bearing on the Ikenberry Drainage Study:

- a. There was reported underground storage constructed beneath the parking lot west of the ARC building. (Subsequent review of plans provided by University of Illinois reveals this to be two pipes (@ 42" dia.) and +/- 143 foot length (2,752 CF storage) and of eligible impact to a watershed storage solution.*
- b. There had been observed flooding in the lower driveway area between the ARC building and the stadium. In review of plans provided by University of Illinois, a storm pumping station was constructed in 2009 with reported associated relief to this lower area. The surface elevation of this lower drive at elev. +/- 730 is too low for any of the improvements studied in this report to have a gravity relief to this (isolated) area.*

B. FINDINGS

- 1. First Street conveyance: To provide conveyance from the Stadium drainage area to West First Street Detention, a 36" storm sewer has been considered, with the invert of the 36" set at the crown of the existing 42" storm sewer at First and Peabody in order to fully utilize the capacity of the existing First Street sewer before any storm flows enter the West First Street Detention basin. This is considered especially important for the open detention option to minimize times when storm flows would enter the lower level playing fields, thereby keeping the fields dry as long as practical.*

All inlets along First Street would continue to discharge into the existing First Street storm sewer and therefore no flows from this drainage would enter the basin until the existing First Street sewer is flowing at capacity. Allowance was made in estimating for costs to construct conflict manholes along the First Street reach to maximize this separation. This separation should account for the more frequent events, i.e. events occurring at a six months to one year return frequency.

To fully utilize the First Street conveyance system, high capacity inlets should be constructed at the intersection of First and Peabody to relieve the flooding that currently occurs frequently at this intersection. Attached to this summary are several exhibits that show limits of surface flooding at Peabody/First both currently (Figure E-1) and with the First Street detention storage constructed (Figure E-3 – modeled flooding during a 50 year event).

2. *Open Storage in the West First Street Play Fields:* *There are two existing play fields in the area being considered for detention storage, each field measuring +/- 120' x 300' with 15' separation between the fields. The south field is located 24' from the north sidewalk of Stadium Drive. With the open storage option:*

- Physical limits: Existing light at the center of the play fields, tennis courts, play field lights west of First Street and play field lights north of Stadium Drive.

- The (lowered) field would reduce available play area, and ultimately measure about 205' x 310'

- The lowered field would be approximately 6' below street level (731+/- to 725+/-).

- Side slopes from the lowered field would vary~ approx. 4:1 on the west, north and east, and from 6:1 to 8:1 on the south.

- The lowered field would be underdrained with discharge to the existing 30" storm sewer located (diagonally) across the northeast corner of the existing (east) playing fields.

- The existing irrigation lines would be removed and new irrigation lines connected to the existing NS supply line.

- Excavation for the lowered playing field would include undercutting and constructing an amended soil playing field over a 6" pea gravel drain media with the soil mixture being 10% topsoil, 80% sand and 10% peat moss. Sod was included as replacement turf for estimating purposes, with this item to be determined in final design.

- Connection to the existing First Street storm sewer would be a 54" storm sewer with the invert set at the crown of the existing 60" storm sewer on First Street. As with the First Street conveyance sewer, this would utilize the full capacity of the existing First Street system before any water would enter the open detention basin.

- There is an existing 30" storm sewer located diagonally (in a northwest direction) across the northeast corner of the site that would be necessary to by-pass the basin by constructing a new sewer around the basin.

3. Closed Storage in the West First Street Play Fields: For this alternate a Storm Trap system was considered with rectangular modules, open on the bottom and set on a ¾" stone foundation at 12" thick. See attached Figures SERIES D for preliminary design sheets provided by STORMTRAP, the product being used as a cost comparison for this option. This system would provide an opportunity for introduction of some stored water into the ground water, although this is not considered a major design advantage. The play field would be constructed at a slightly higher elevation than the existing ground with heights approximately one foot to 3 feet above the existing grade (to achieve a crown in the playing field).

- The outside dimensions of the storm trap units would measure approximately 250' 9" x 336' 8" as shown on Figure D-1.

- The field would either be underdrained with discharge to the existing 30" storm sewer located diagonally across the northeast corner of the existing (east) playing fields or a system of drainage designed to allow drainage through the top of the concrete box structures.

- The existing irrigation lines would be removed and new irrigation lines connected to the existing NS supply line.

- The playing field would consist of an amended soil with a 6" pea gravel drain media with the soil mixture being 10% topsoil, 80% sand and 10% peat moss. Sod has been included as replacement turf for estimating purposes, with this item to be determined in final design.

- Connection to the existing First Street storm sewer would be a 54" storm sewer with the invert set at the crown of the existing 60" storm sewer on First Street. As with the First Street conveyance sewer, this would utilize the full capacity of the existing First Street system before any water would enter the detention basin, although this is not considered as critical as with an open detention system.

- There is an existing 30" storm sewer located diagonally (in a northwest direction) across the northeast corner of the site that would be necessary to by-pass the basin by constructing a new sewer around the basin.

4. Cost of Options: As a baseline for cost comparisons, the information provided by University of Illinois for the existing Ikenberry underground pipe storage labyrinth of 60" pipes was used. This labyrinth was constructed in 2010 on the western open space area south of buildings phase C and D. As there were many other improvements constructed in addition to the storage component of that project, the general costs were proportioned and added to excavation and installation of the pipe labyrinth, including: general conditions, bonds, insurance, overhead/profit, mobilization, survey layout, erosion control and misc. items. When all costs are included, the cost was about \$332,500 per acre foot for the 1.6 acre feet of storage.

- The First Street Conveyance system referenced above is estimated at \$489,000 (with contingencies). See attached Exhibit F-1.

- The open storage system as outlined above is estimated at \$825,000 (with contingencies) or \$82,500 per acre-foot for 10 acre-feet of storage. See attached Figure F-3.

- The closed storage system as summarized above is estimated at \$2,586,000 (with contingencies) or \$258,600 per acre-foot for 10 acre-feet of storage. See attached Figure F-2.

5. Conclusions: It was recommended that University of Illinois review the contents of this interim report to judge the merits of constructing the West First Street Basin (with possible beneficiary distribution of cost sharing). Completion of the Ikenberry Drainage Report was done with direction from University of Illinois to not include the open detention option for the West First Street basin and to present only the closed option with associated storm sewers, and with the Weston Basin as the second alternate.

8. Develop a comprehensive storm water system model using EPA SWMM (Storm Water Management Model) to analyze the key system components. This exercise will identify/confirm existing constraints and analyze the impacts of the range of conveyance and storage solutions.

This was completed using XP-SWMM modeling software, and the graphic results attached as Figures A-1 through A-6 and Figures E-1 through E-3. The dynamic modeling was also demonstrated at the October 28, 2010 meeting.

9. Prepare an engineering analysis for an ultimate Summary Report which includes the following elements:

This has been completed and results are attached as Figures SERIES A, B, C, D, E and F. An interactive exchange of University of Illinois staff review comments and comments on the range of potential solutions was discussed at the October 28, 2010 meeting as outlined in the above memorandum summary. The dynamic modeling analyses was considered an important component of this report and the visual demonstration of the results was instrumental to an understanding of the resulting graphics included with the attached Exhibits.

It is noted that item 9.h.(below) was included as a part of the study, but the physical location of a storage solution alternates is shown on Figures A-1.a and A-1.b (Master Plan for Conveyance and Storage Systems) and also on Figures C-3.a and C-3.b..

- a. Identify storm sewer system hydraulic capacities under “in-pipe” flow and surcharged flow conditions.
- b. Verify surface overflow paths for extraordinary storm events.
- c. Evaluate surface ponding in sub-areas, estimate storage volumes, pool depths and resultant gradients of outfall storm sewer systems.
- d. Analyze the extension of hydraulic gradients from solution alternates along First Street and/or Gregory Drive into Ikenberry Commons interior block drainage.
- e. Determine appropriate elevations of floors, service areas, lower floors and drainage systems for existing, planned and programmed facilities in Ikenberry Commons.

These recommendations are included within the attached Figures C-1 through C-8.

- f. Identify the approximate footprint and depth of new stormwater detention at the northwest central section of Ikenberry Commons.
Initially this intuitively seemed to be the logical location for new storage, being the approximate low elevation of the Ikenberry Quadrangle, however this is the location of a new building (Building No. 3) in Step 2 of the phased construction. The division of the Ikenberry campus more logically planned this new storage at the demolished Weston Hall footprint (Alternate A) or at the west side of First Street (Alternate B). If a more comprehensive regional solution is pursued, construction of an underground detention basin on the west side of First Street (Alternate B) will negate the need for storage at

Weston and additionally provide relief from the current surface flooding at Peabody and First, as shown on the attached Figures SERIES "E".

- g. Evaluate the utilization of excess capacity in planned underground storage (as shown on the Champaign Housing Landscape and Lighting Project #U07093), as designed or might be expanded to provide additional storage volume.

See subparagraph 9.f. above.

- h. Identify additional stormwater detention at the northwest corner of the stadium drainage basin, i.e. southeast corner of First and Peabody.

If the First Street West detention and the First Street conveyance system are constructed, the volume needed for storage at this location will be included in the First Street West basin and require conveyance with conduit and increased inlet capacity at the First/Peabody intersection. This connection is shown on Figure A-4.b and Figure D-1.

- 10. Develop potential comprehensive alternatives from the information as outlined herein anticipated to include consideration of:

The attached Figures SERIES A, B and C address the Scope items following. It is noted that Figures C-1 through C-8 are numbered in the same sequence as the building steps outlined in the July 2010 Ikenberry Master Plan. Additionally, the sequence includes the storm sewers and storage systems recommended phasing that accompanies the building sequence. Specific comments that relate directly to the scope study items are noted accordingly.

- a. Sequence of building construction with the Base Plan and Alternate Plan of the Ikenberry Commons Strategic Plan and impacts on the existing storm sewer system, existing surface flow paths and planned/recommended subsurface, surface conveyance and storage solutions, i.e. interim storm water management.

- b. Investigations and recommendations to respect the desire for maximum infiltration of storm water, pedestrian path elevations (interim and final), swale depth of surface conveyance, and proposed building and site grading elevations.

In review of the soils investigations that were connected with the SDRP and Phases A and C, it is noted that there is a low water table within these recently constructed buildings. There were, however intermittent sand lenses found in the borings and encountered subsurface sands at the boring locations were not conclusive as to consistency, therefore future soils investigations would be necessary to see if there is sufficient opportunities for direct infiltration into the groundwater system. One possibility is to utilize the excavated sands if the Weston detention storage is constructed (Alternate A) and use as a media backfill (below the topsoil) over the basin with these soils creating a direct conveyance to the ground water at that footprint.

- c. Finished floor elevations of planned building will be recommended and consider that 50% to 75 % of the buildings will have basements. *University of Illinois staff input is necessary for typical vertical dimension from ground floor elevation to basement floor elevation and typical treatment of basement footing drainage. It is noted that the existing*

basement of Scott Hall will remain and a new building will be designed to fit over the existing basement.

Recommend finished floor elevations are shown in Figures C-1 through C-8. While there might be a variable percentage of basements in the programmed buildings, the basements are typically dewatered by pumping systems and do not rely on gravity outlets for drainage. With the low water table encountered with the SDRP and Phase A-C building soil borings, there is some expectation of a low water table at this site. Conclusive evidence will be obtained during design soil borings at the building locations. It is judged that this scope item will be addressed by basement pumping systems at the individual buildings.

- d. Increased inlet capacity to maximize surface flow conveyance into existing storm sewer systems with planned surcharging.
The conveyance of individual site drainage systems has been shown on Figures C-1 through C-8 and the planned routing of same.
- e. Account for the planned storm sewer upgrades with the Gregory Drive Storm Sewer Drainage Improvements.
See Figure A-2.
- f. Account for the planned surface improvements of the Gregory Drive street cross section (ROW to ROW) to direct surface overflows with the Gregory Avenue Storm Sewer Drainage Improvements.
See Figure A-2.
- g. Investigation of an improved outfall transport along First Street with increased sewer capacity or development of surface conveyance in the parkway section of First Street.
See Figures A-4 and A-5.
- h. New stormwater detention at location(s) within key limits of Ikenberry Commons, driven by Ikenberry Commons Strategic Plan.
All studied systems are shown on the attached figures and were demonstrated at the October 28, 2010 meeting with University of Illinois staff.
- i. Increase the storage volume of the new underground detention in University of Illinois Project #U07093.00.
See previous comments.
- j. New (increased) stormwater detention volume at the southeast corner of Peabody and First Street.
See previous comments.
- k. All solutions/alternatives to include surface overflow path analysis for extraordinary events.
The surface flow path through the planned improvements is shown graphically on Figure B-4. It is noted that the relief on the site runs from east (at Euclid Street) to the west and that the planned pedestrian path is conducive to maintaining this flow path. It is further noted that, if the studied drainage improvements are constructed, the surface flow of storm events will be very infrequent and of short duration.

11. Prepare a program construction cost estimate of outlined alternates.
Cost estimates for recommended systems have been prepared from direction and input received from University of Illinois staff at the October 28, 2010 meeting, the internal University of Illinois staff meeting on January 4, 2011 and the subsequent interim report submitted by Foth on March 1, 2011. See attached Figures SERIES F.
12. Develop a construction phasing recommendation if phasing impacts the overall drainage impacts.
A construction phasing plan for storm drainage and storage has been estimated commensurate with the building phasing plan established by the July 2010 Ikenberry Master Development Plan. See Figures SERIES C and estimates in Figures SERIES F.
13. Meet with *University of Illinois* staff to evaluate alternatives and select an alternate to include in the final report (three meetings are anticipated).

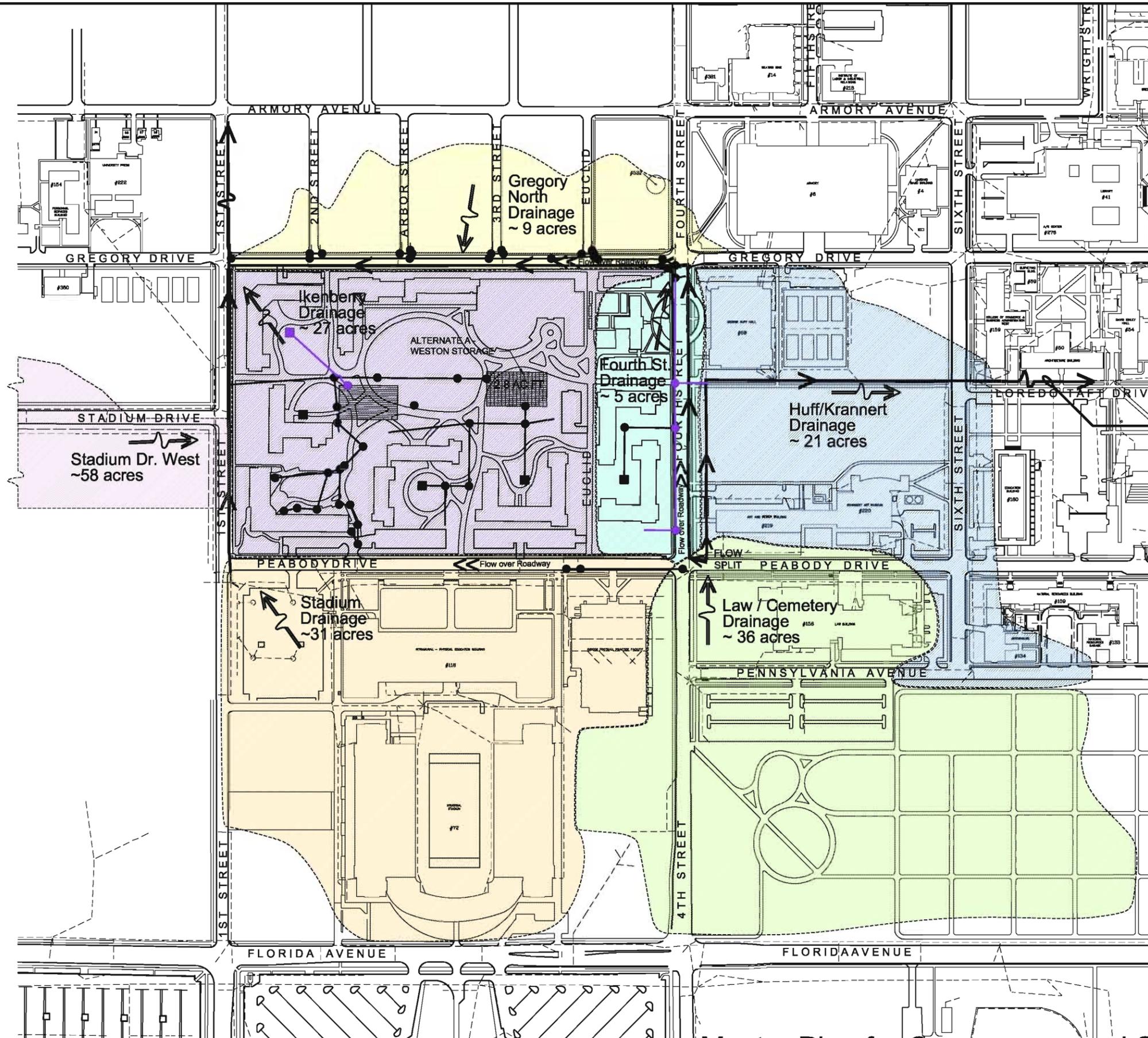
This will be completed with the University of Illinois /Foth meetings of August 20, 2010, October 28th, 2010 and the planned Final Report presentation of June 8, 2011.
14. Prepare final Drainage Report w/Exhibits.

ADDITIONAL SERVICES:

As of the date of final report submittal, no additional services were requested in preparation of this drainage report.

1. Extended evaluation of existing drainage systems outside limits the of the Ikenberry block, First Street and Gregory Drive.
2. Supplemental topographic surveys beyond estimated time allocation (to be approved by *University of Illinois*).

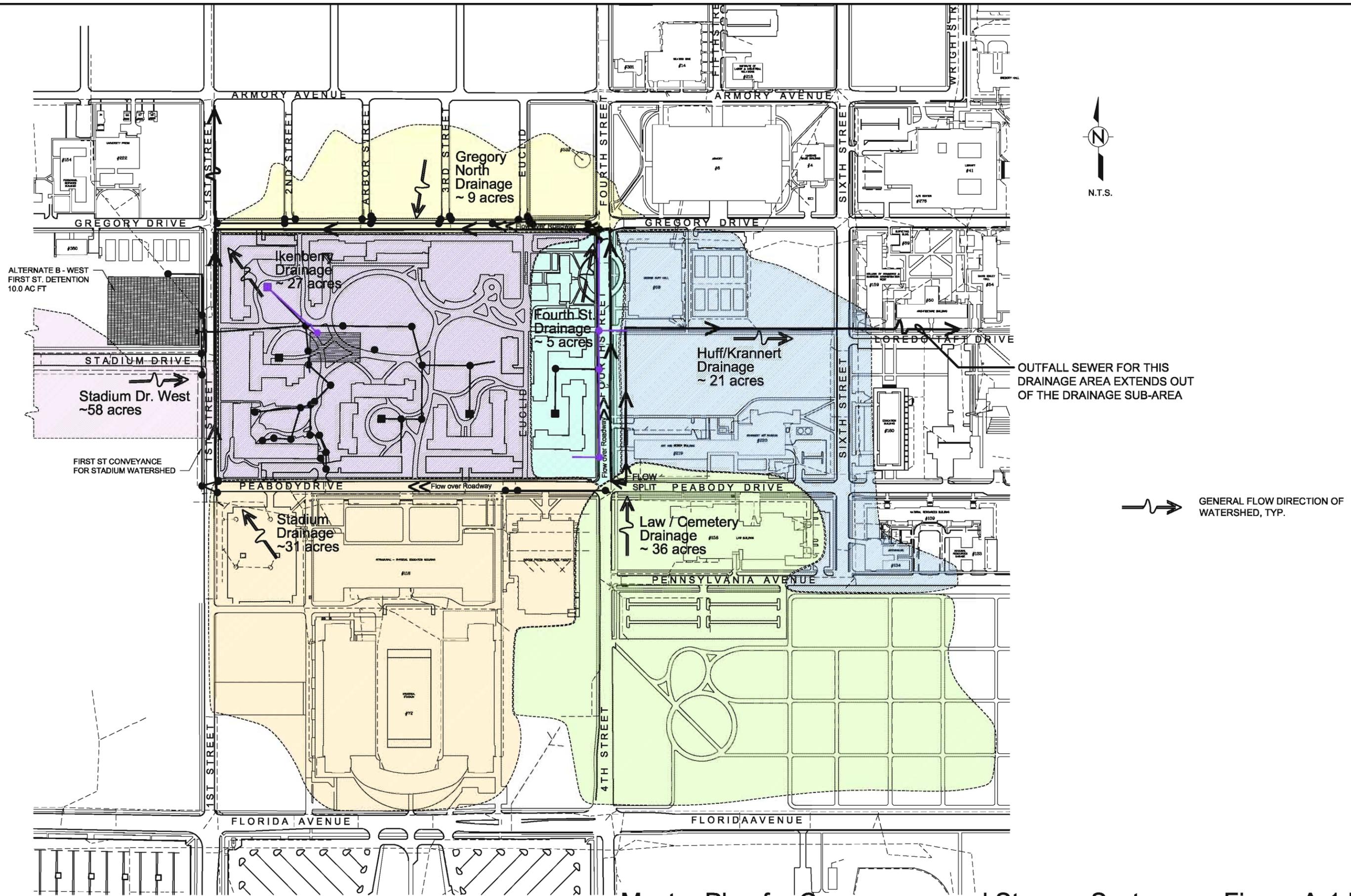
Series A:
Ikenberry Commons Watershed Drainage Improvements



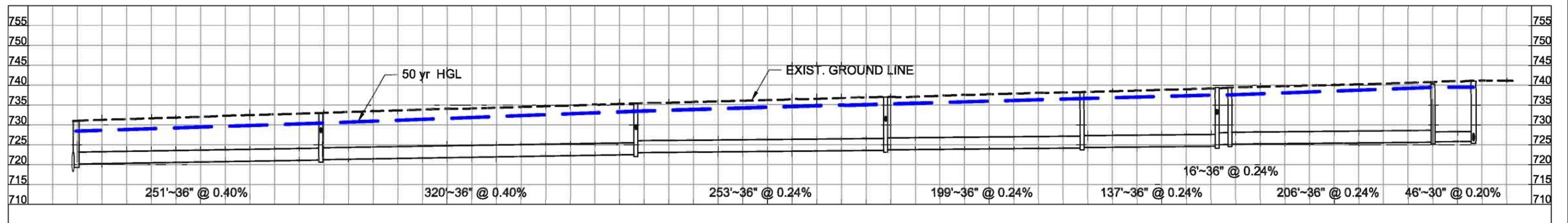
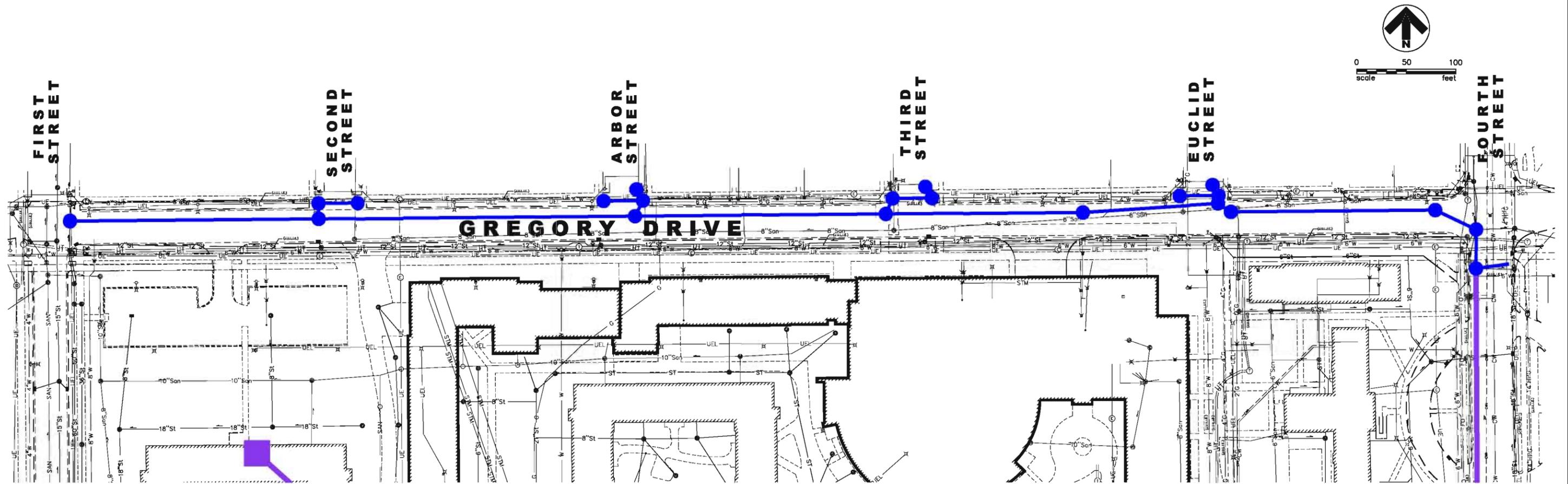
OUTFALL SEWER FOR THIS DRAINAGE AREA EXTENDS OUT OF THE DRAINAGE SUB-AREA

→ GENERAL FLOW DIRECTION OF WATERSHED, TYP.

Master Plan for Conveyance and Storage Systems - Figure A-1.a
 ALTERNATE A ~ DETENTION AT WESTON HALL LOCATION

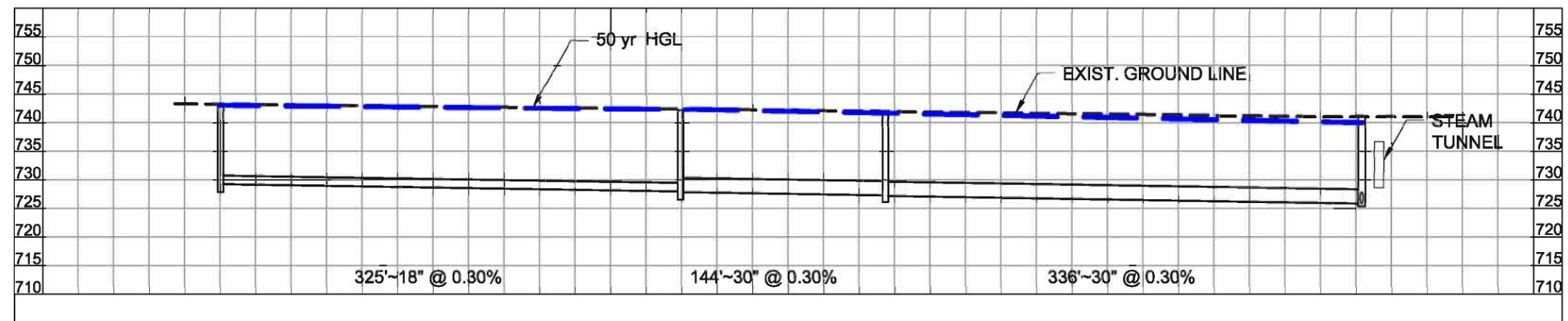
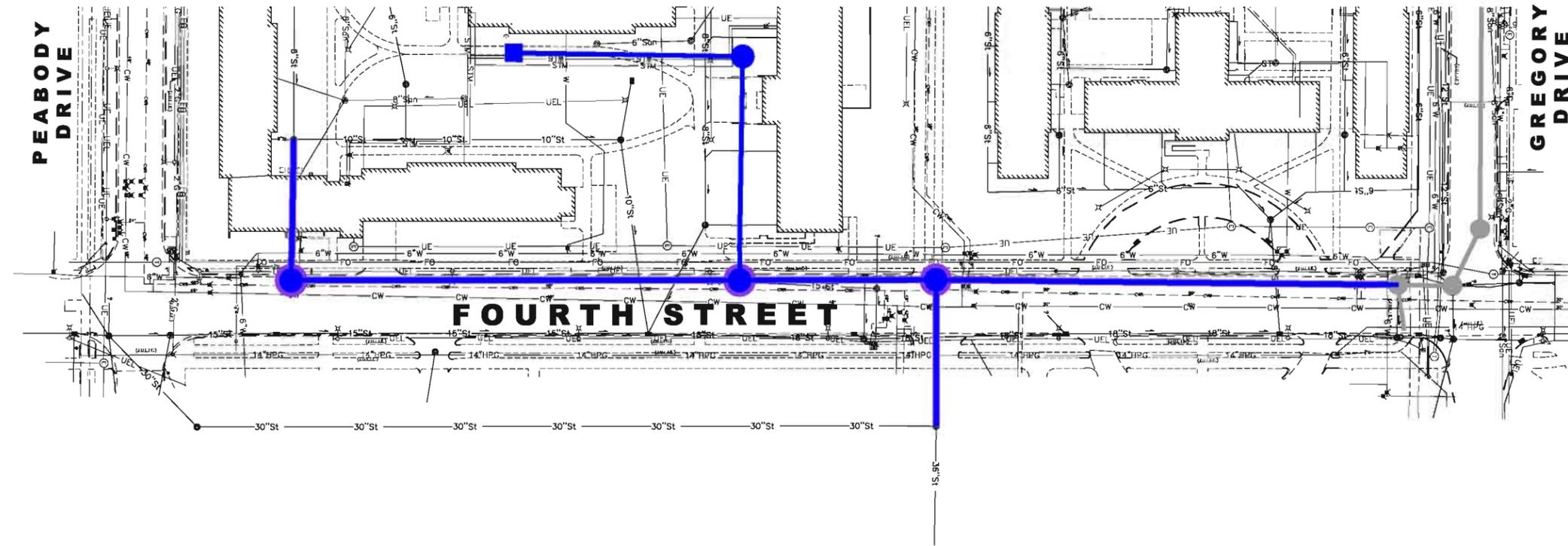
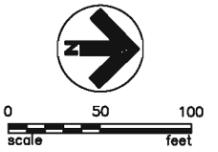


Master Plan for Conveyance and Storage Systems - Figure A-1.b
 ALTERNATE B ~ DETENTION AT WEST FIRST STREET LOCATION



730.98	732.84	735.13	736.78	738.17	738.86	739.31	740.20	741.12
---	727.95 (16"N)	728.76 (16"N)	730.86 (16"N)	---	732.60 (16"N)	---	---	---
720.12 (36")	721.22 (36"E)	722.98 (30"E)	723.69 (30"E)	724.27 (30"E)	725.00 (24"E)	725.14 (24"E)	725.73 (24"E)	725.92 (24"S)
718.2± (60")	721.12 (36"W)	722.50 (36"W)	723.59 (30"W)	724.17 (30"W)	724.60 (30"W)	725.04 (24"W)	725.63 (24"W)	725.82 (24"NW)

Gregory Drive Storm Sewer Improvements Plan & Profile - Figure A-2
(SYSTEM AS BID. APRIL 2011)



743.3

731.2 (12"W)
729.62 (18"N)

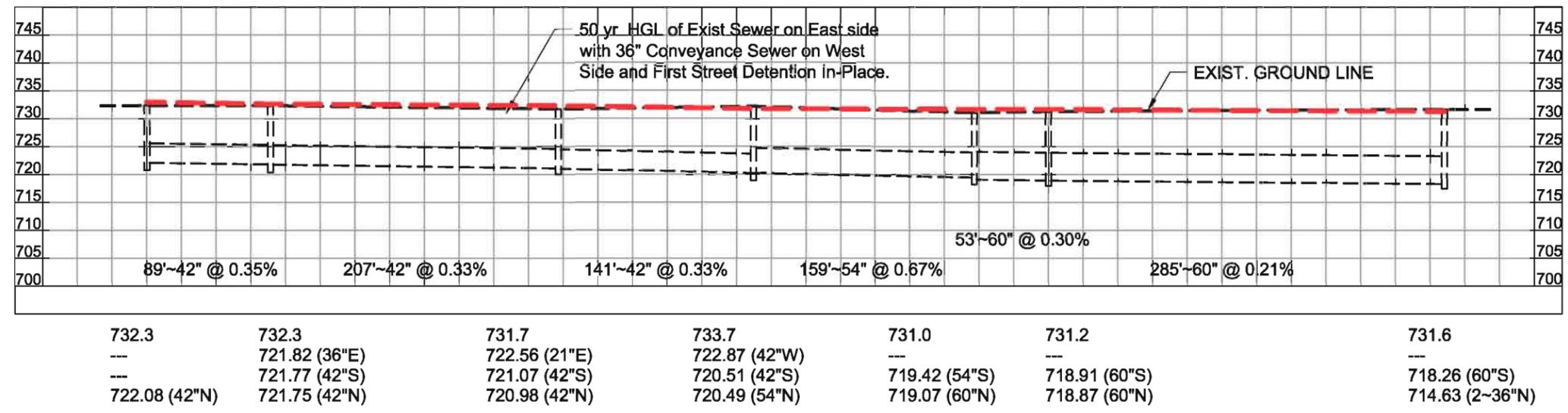
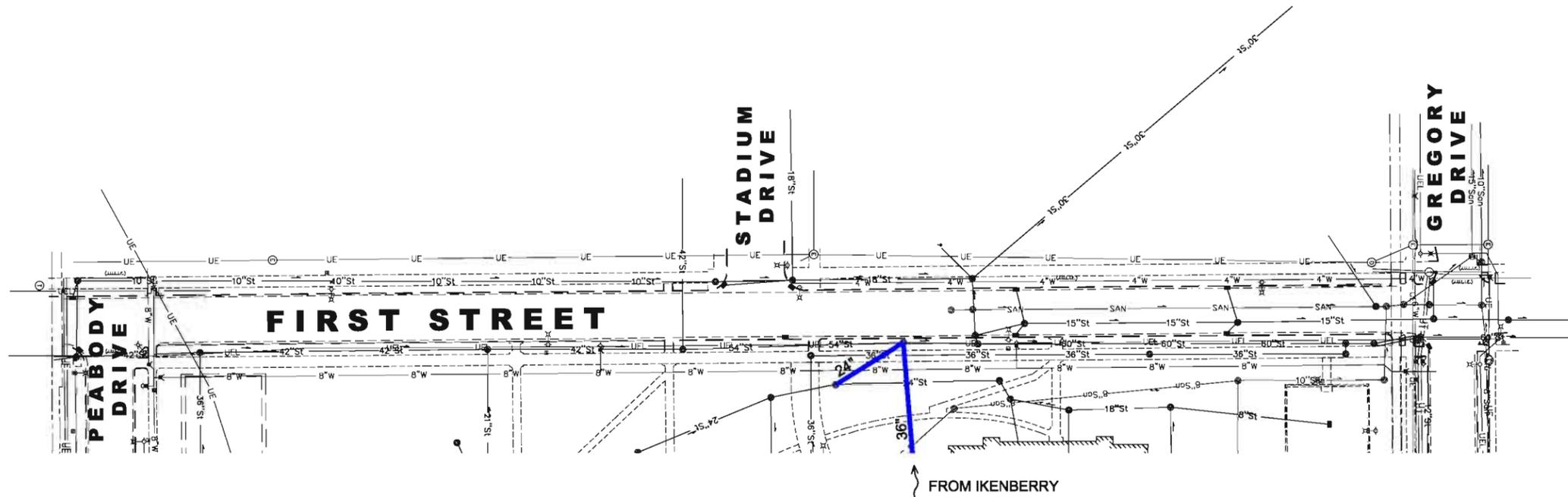
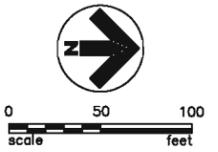
742.2
730.2 (15"W)
728.64 (18"S)
727.54 (30"N)

741.7

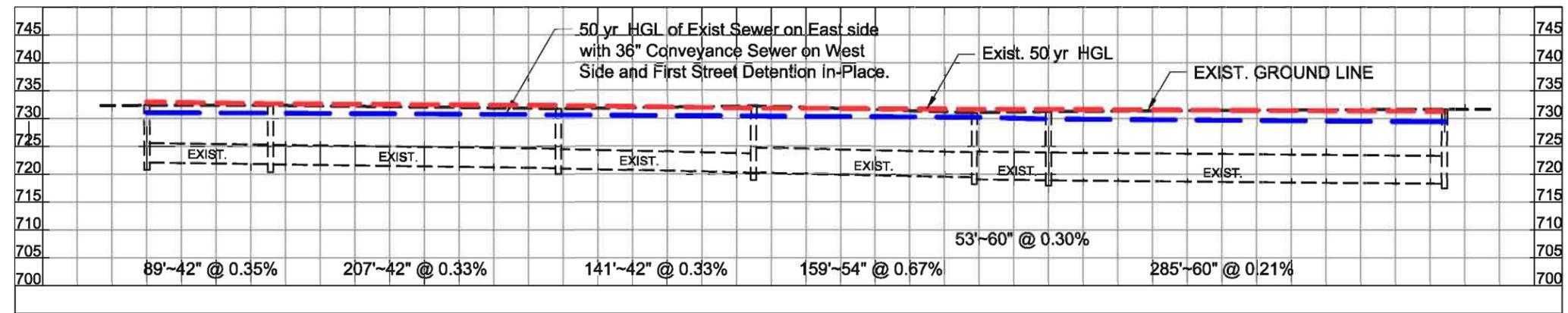
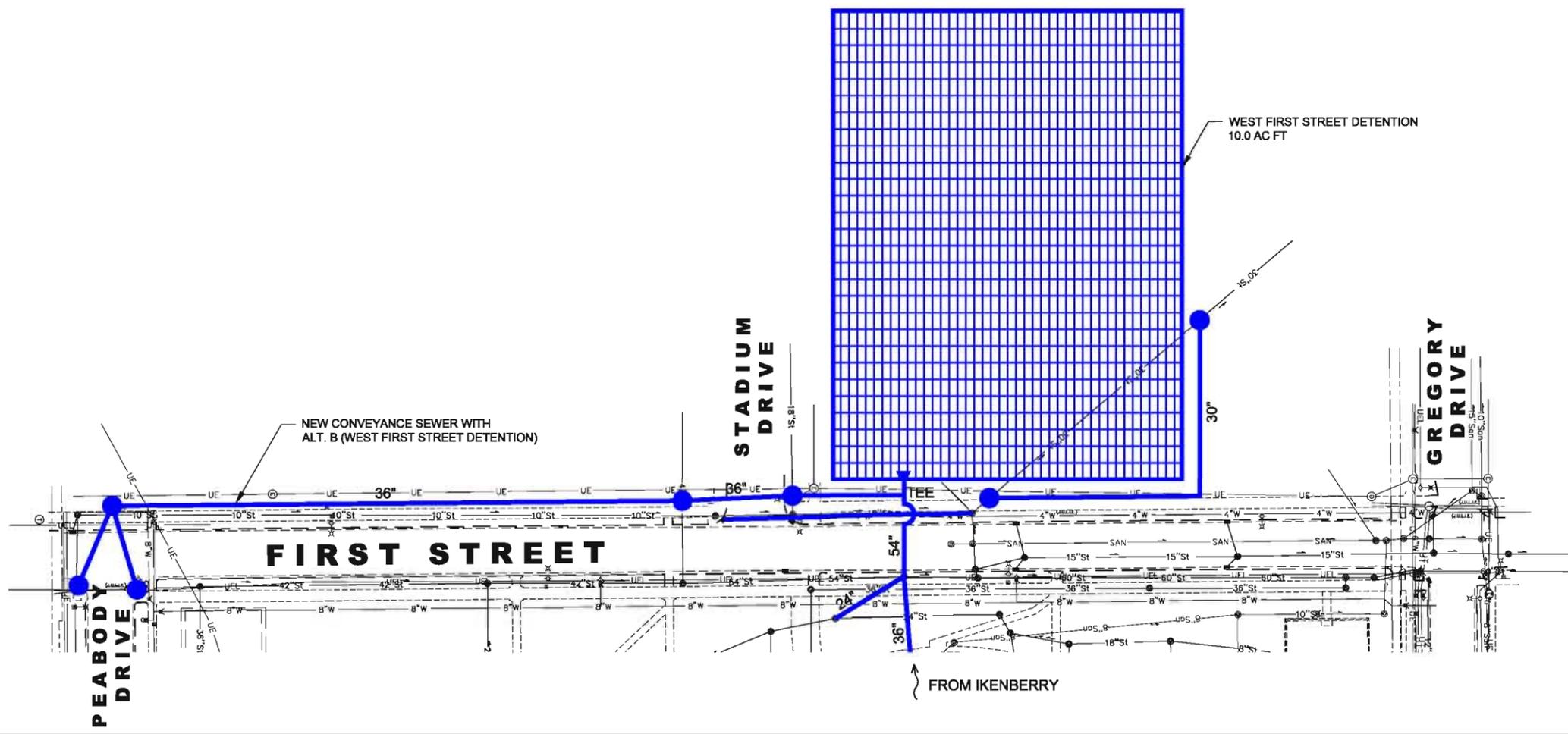
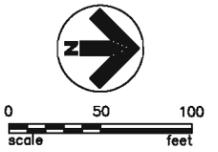
727.11 (30"S)
727.01 (30"N)

741.12
726.00 (30"S)
725.92 (24"N)
737.00 (18"E)

Fourth Street Storm Sewer Improvements Plan & Profile - Figure A-3

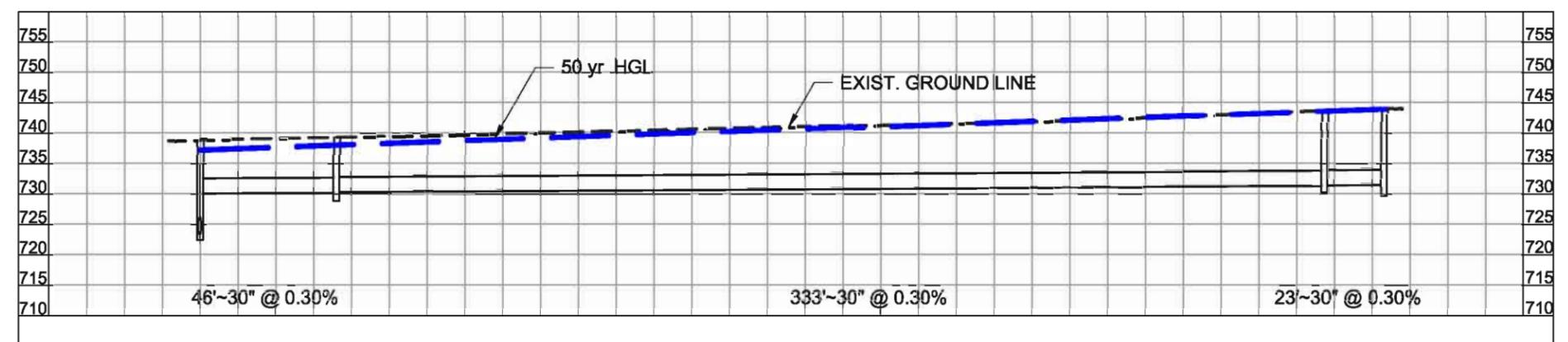
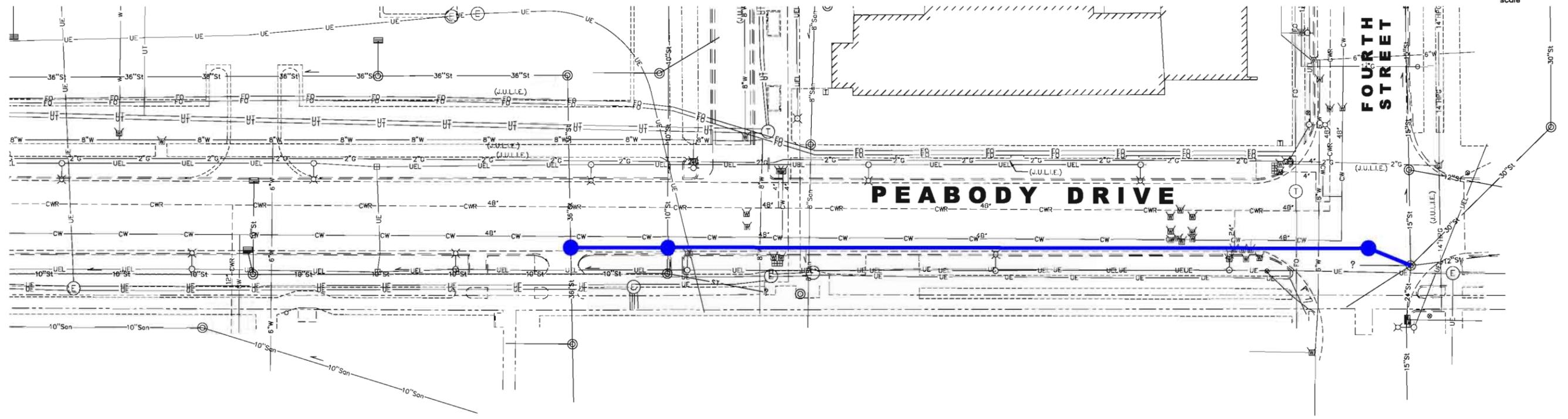


First Street Storm Sewer Improvements Plan & Profile - Figure A-4.a
 ALTERNATE A ~ DETENTION AT WESTON HALL LOCATION



732.3	732.3	731.7	733.7	731.0	731.2	731.6
---	721.82 (36"E)	722.56 (21"E)	722.87 (42"W)	---	---	---
---	721.77 (42"S)	721.07 (42"S)	720.51 (42"S)	719.42 (54"S)	718.91 (60"S)	718.26 (60"S)
722.08 (42"N)	721.75 (42"N)	720.98 (42"N)	720.49 (54"N)	719.07 (60"N)	718.87 (60"N)	714.63 (2~36"N)

First Street Storm Sewer Improvements Plan & Profile - Figure A-4.b
 ALTERNATE B ~ DETENTION AT FIRST STREET LOCATION



738.8	739.2
---	---
730.0 (30"W)	730.2 (30"E)
721.12 (36"W)	730.1 (30"W)

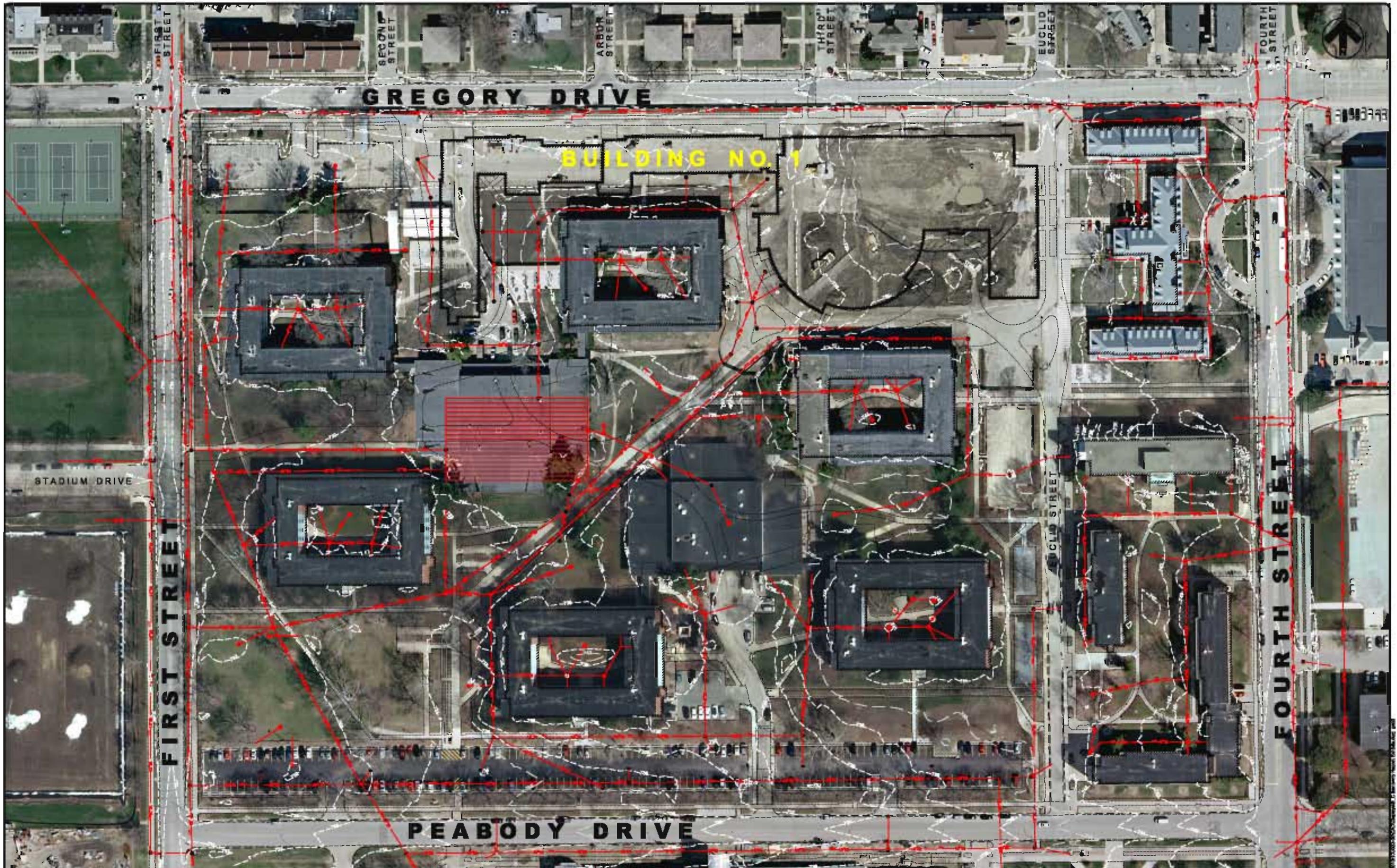
743.2	743.5
---	---
731.3 (30"E)	731.44 (30"NE)
731.2 (30"W)	731.4 (30"W)

Peabody Corridor Storm Sewer Improvements Plan & Profile - Figure A-5

Series B:
Ikenberry Commons Building and Site Improvements



2010 Buildings and Pedestrian Paths - Figure B-1



2010 Buildings and Storm/Storage Systems - Figure B-2

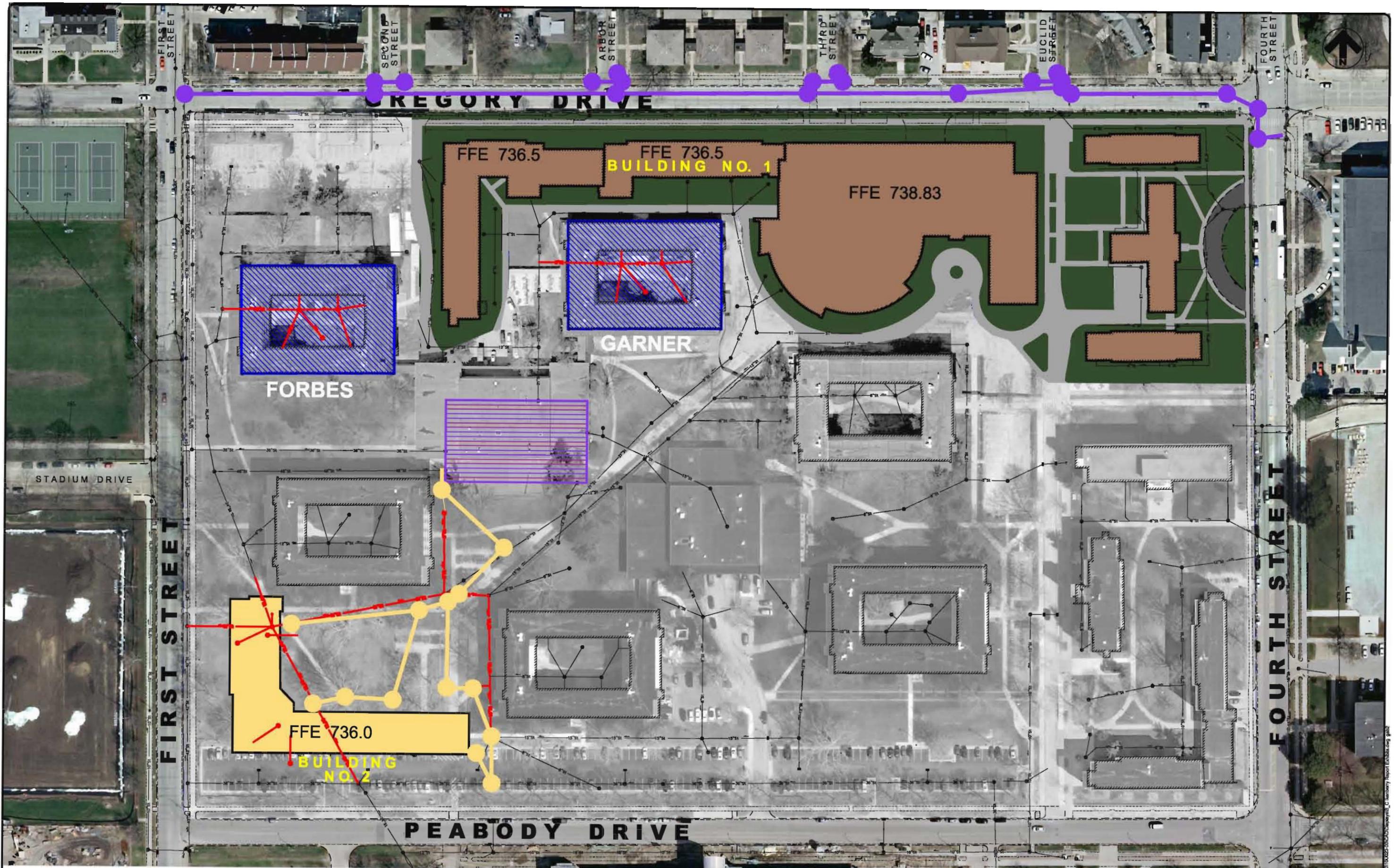


Buildout (Stage 7) Buildings and Pedestrian Paths - Figure B-3

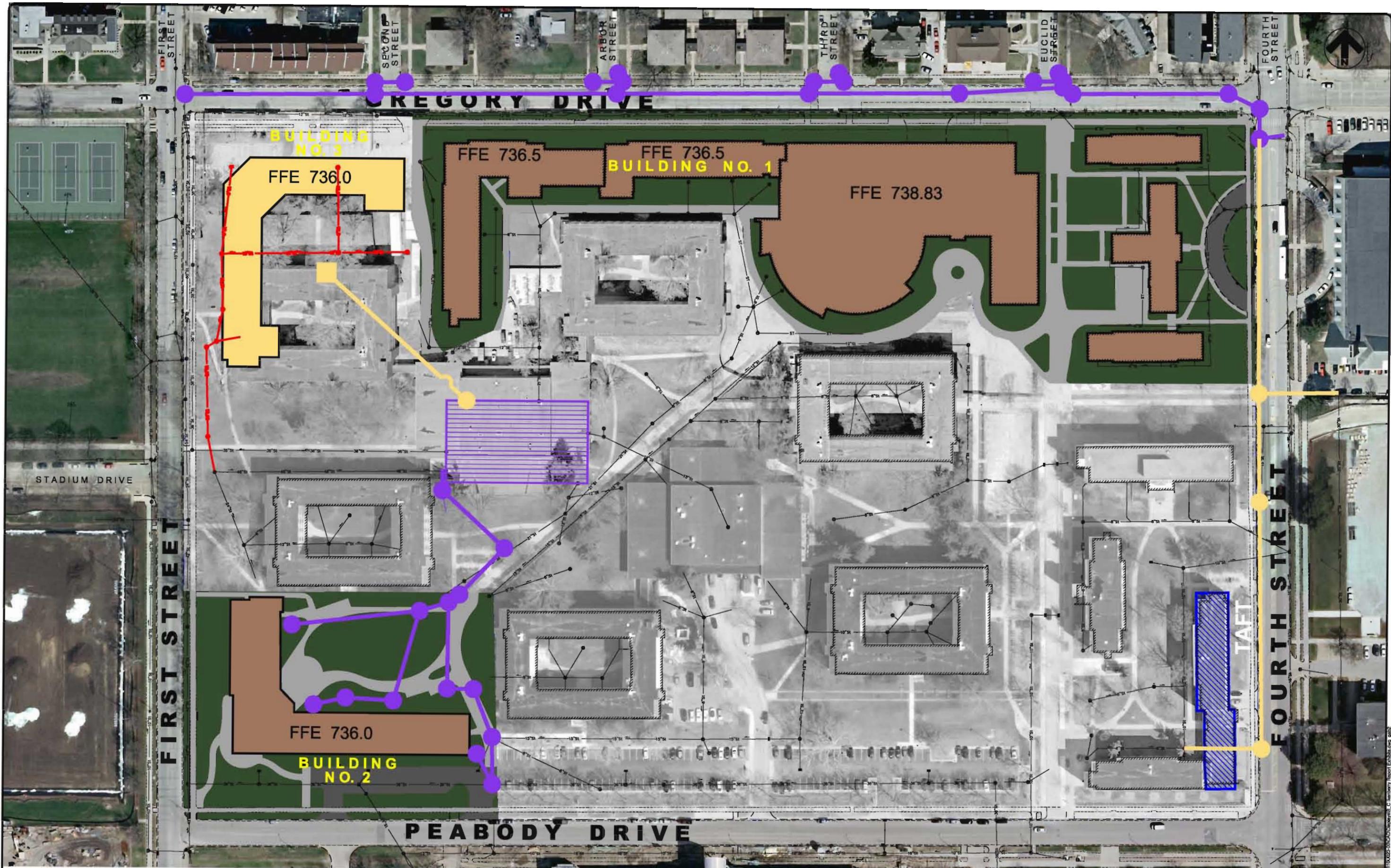


Buildout Primary Surface Flow Corridor - Figure B-4

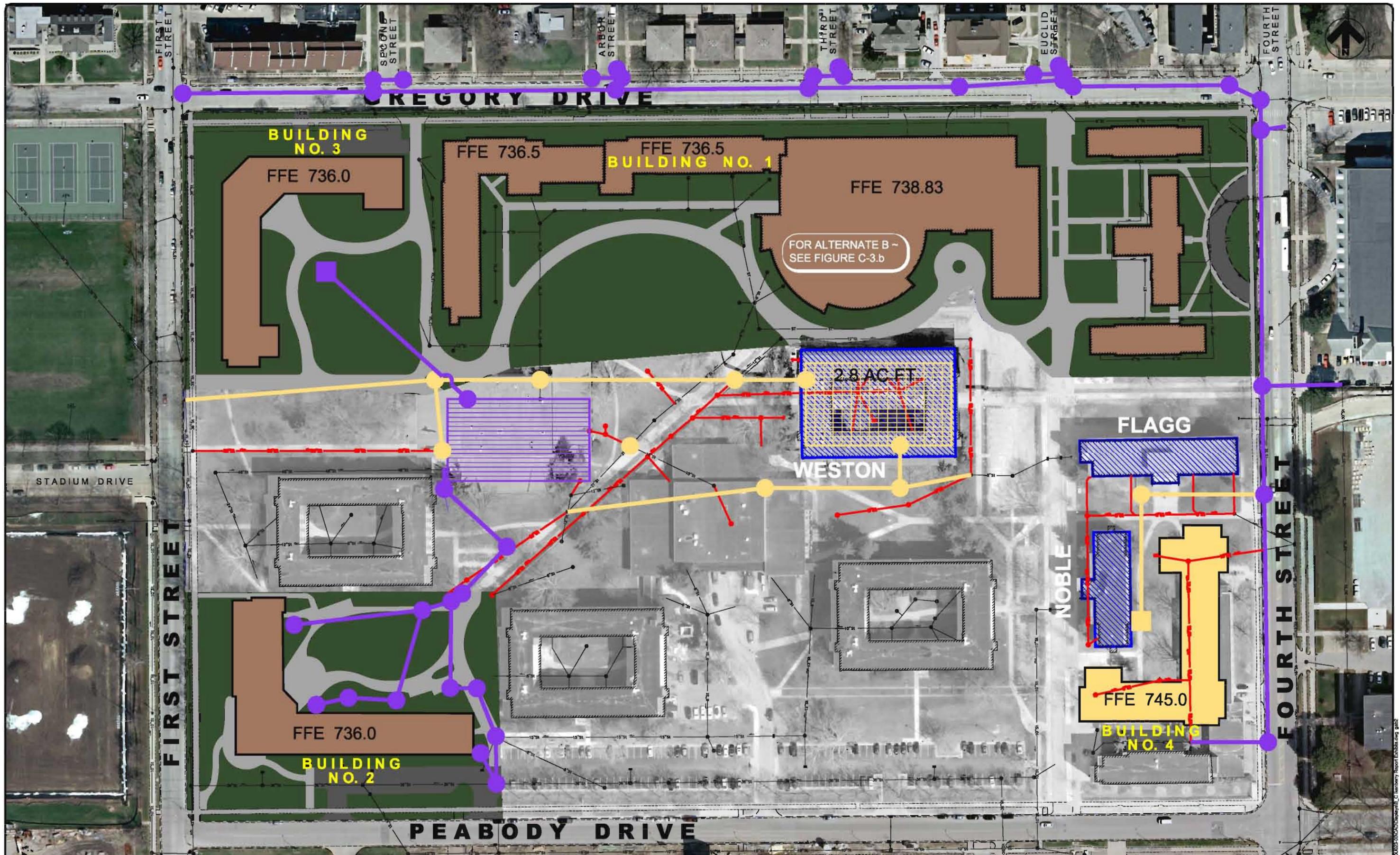
Series C:
Stage Construction



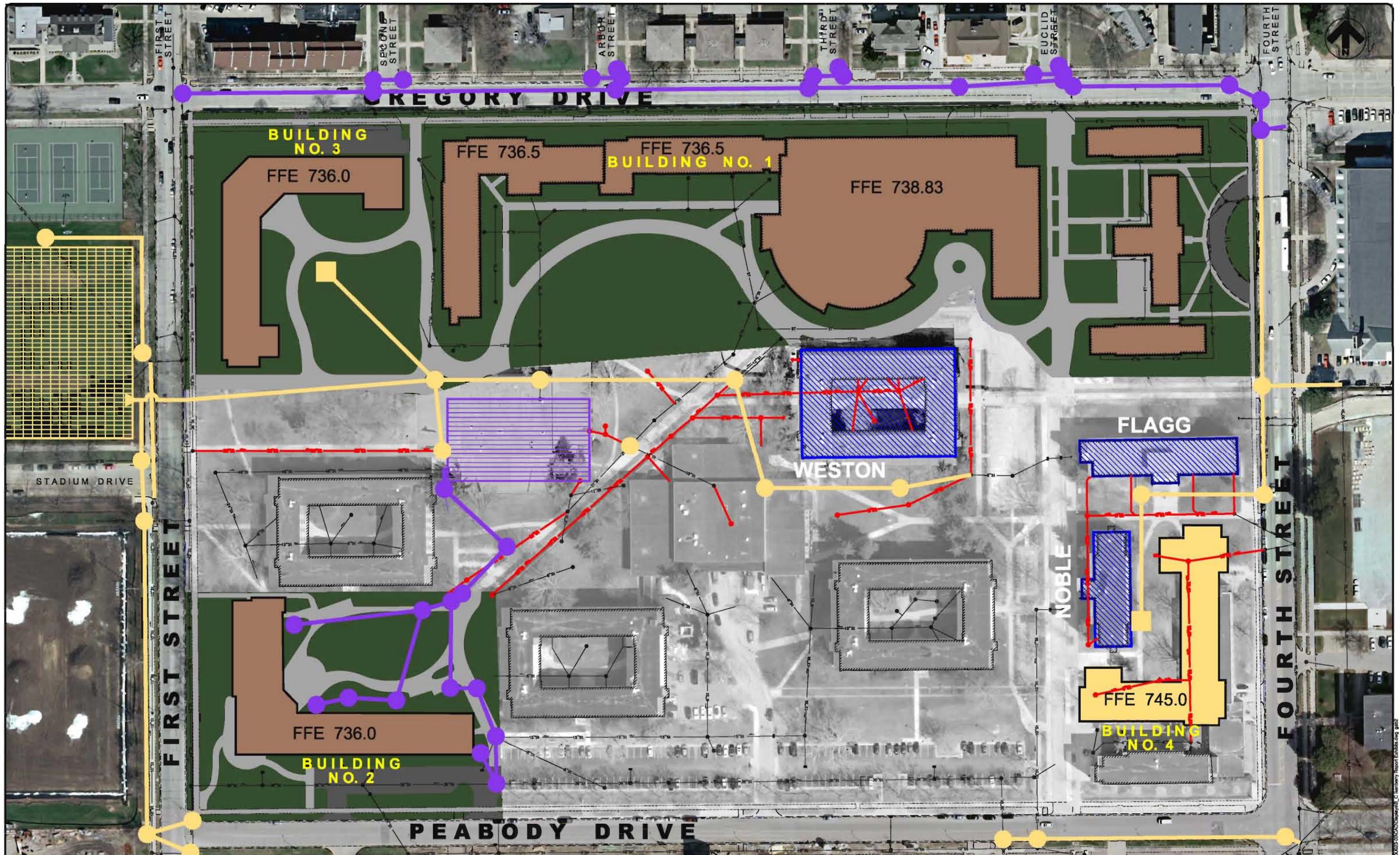
Step 1 Building/Demo/Storm Sewers - Figure C-1



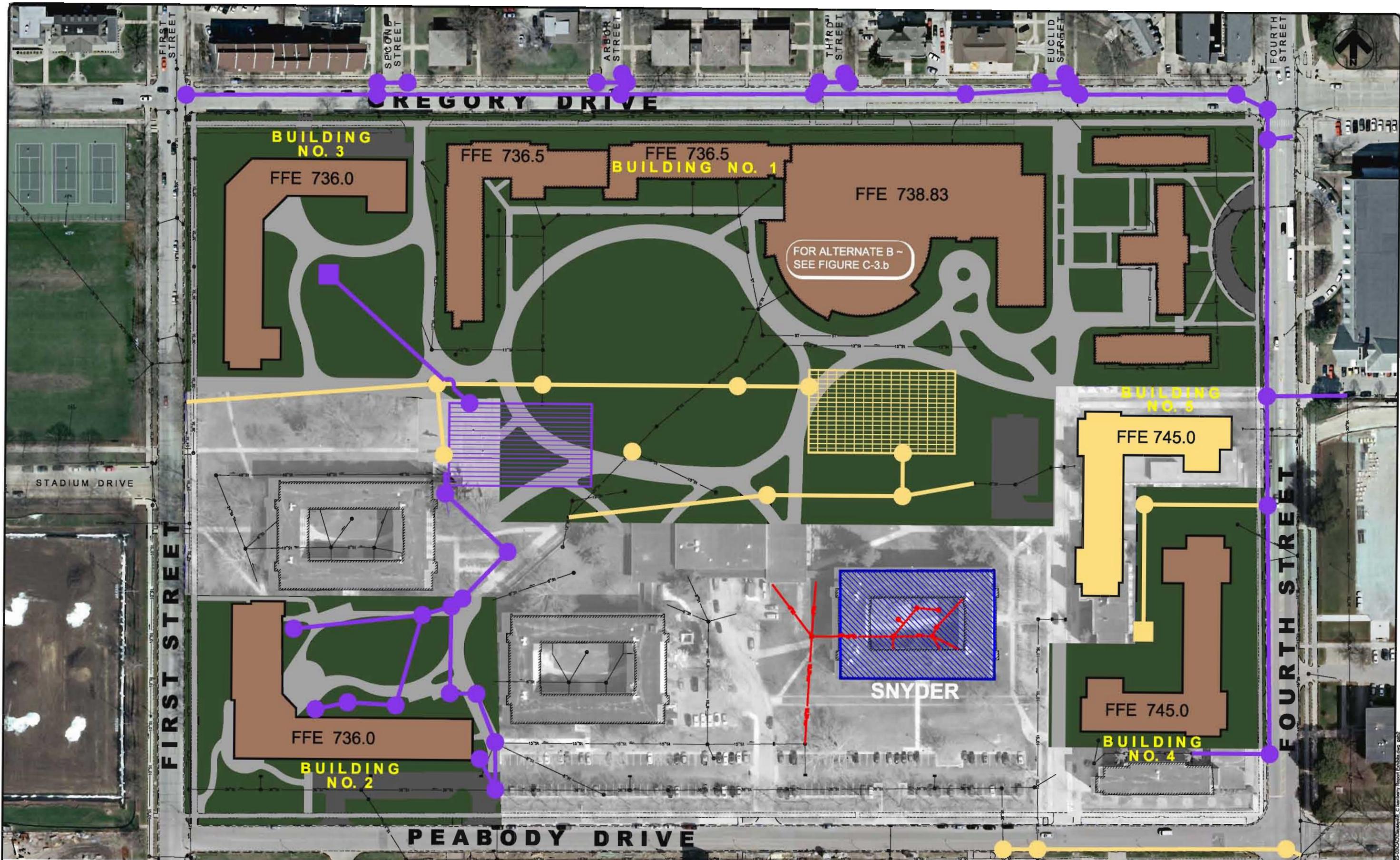
Step 2 Building/Demo/Storm Sewers - Figure C-2



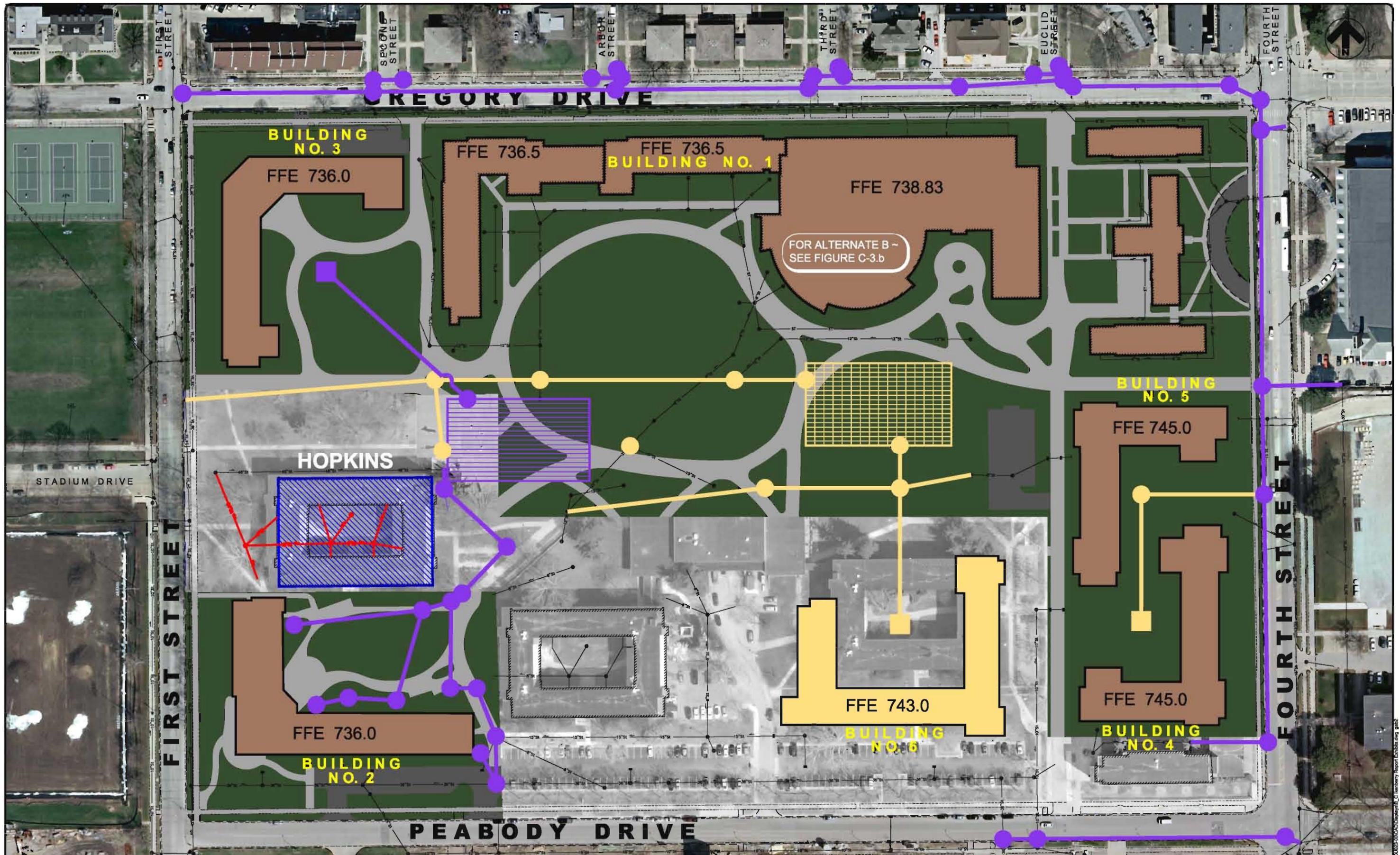
Step 3 Building/Demo/Storm Sewers - Figure C-3.a
 ALTERNATE A ~ DETENTION AT WESTON HALL LOCATION



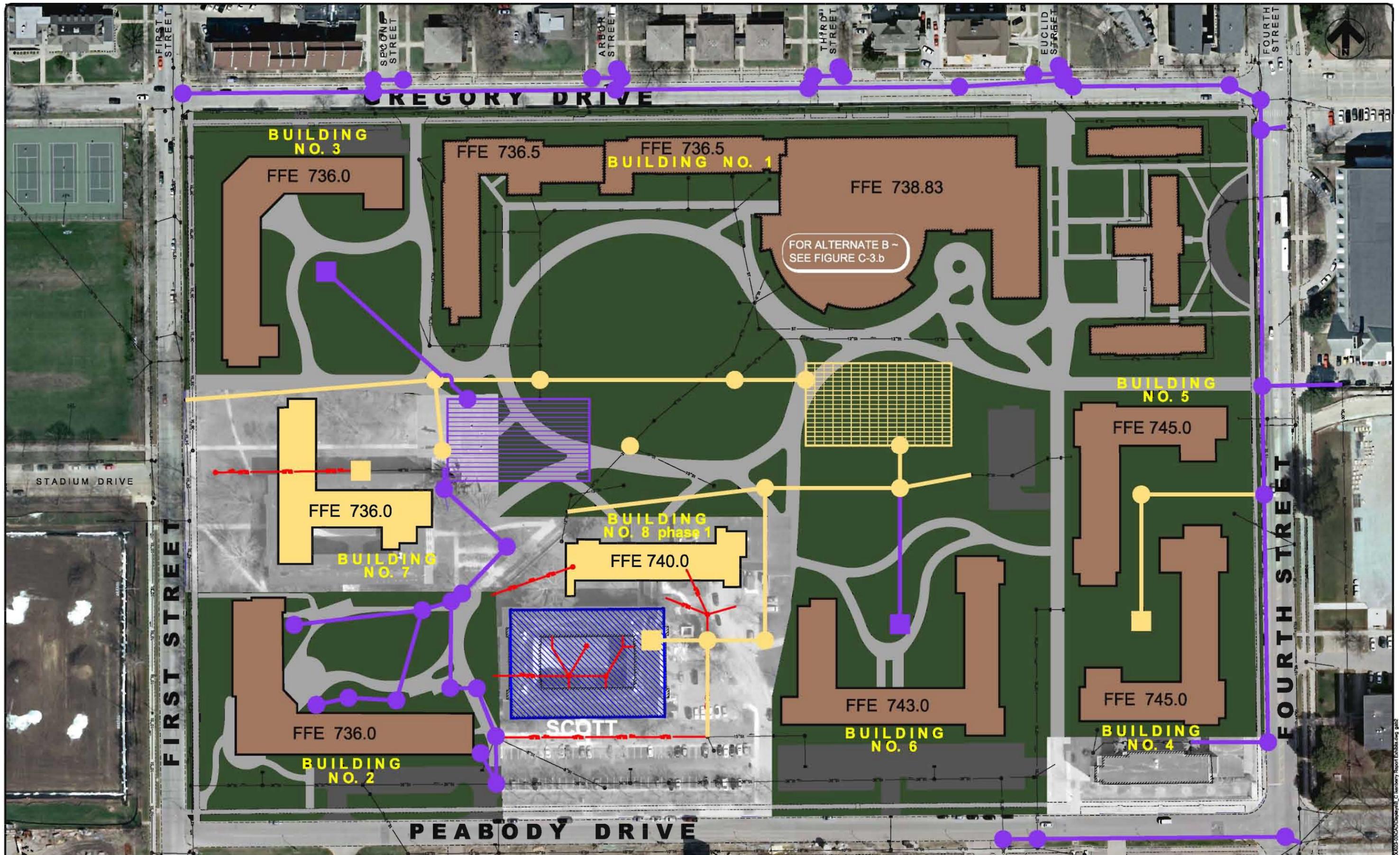
Step 3 Building/Demo/Storm Sewers - Figure C-3.b
 ALTERNATE B ~ DETENTION AT WEST FIRST STREET LOCATION



Step 4 Building/Demo/Storm Sewers - Figure C-4
(Alternate A Shown)



Step 5 Building/Demo/Storm Sewers - Figure C-5
 (Alternate A Shown)



Step 6 Building/Demo/Storm Sewers - Figure C-6
(Alternate A Shown)



Step 7 Building/Demo - Figure C-7
(Alternate A Shown)



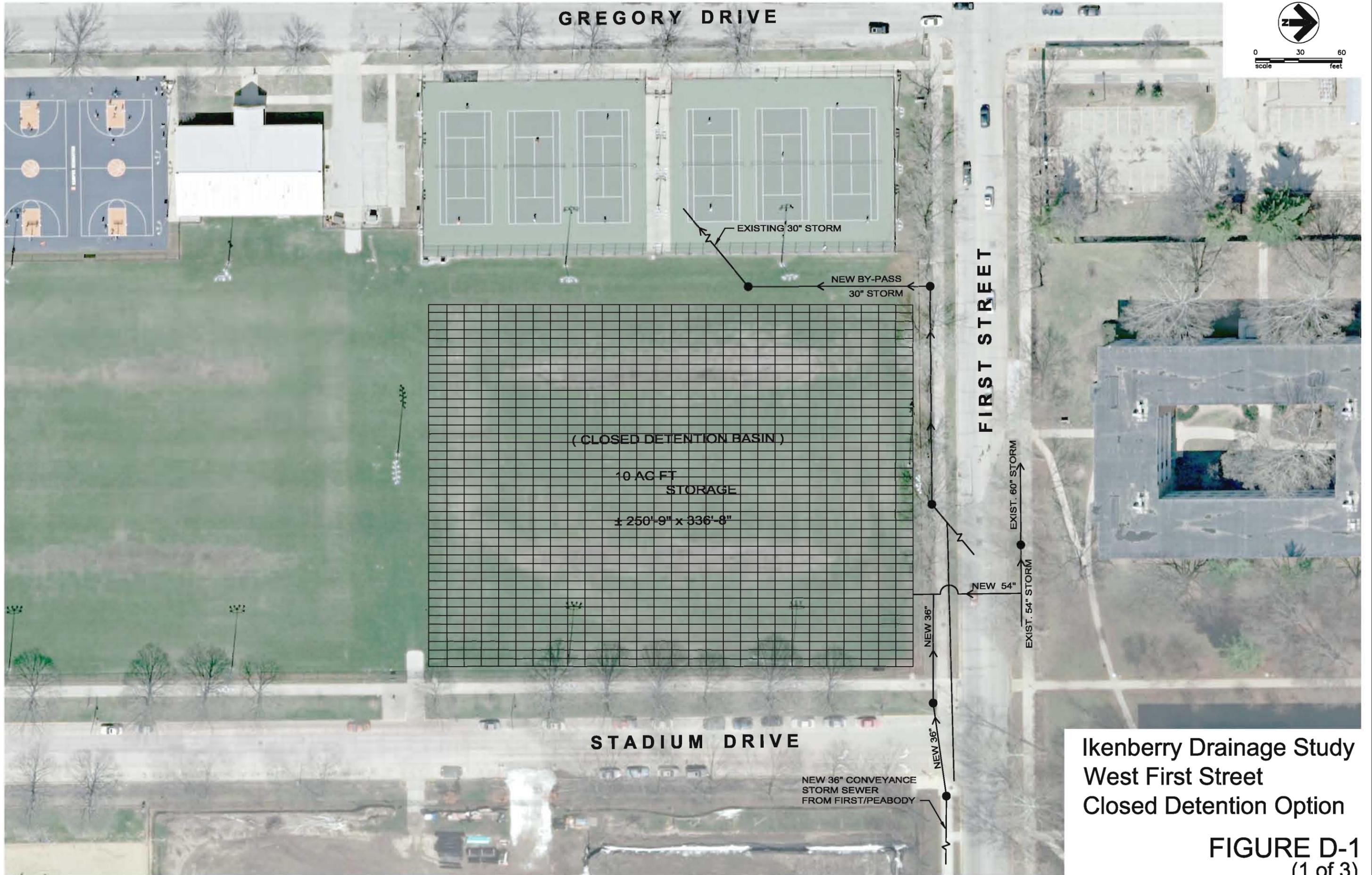
Step 8 Total On-Site Buildout Buildings and Drainage Master Plan - Figure C-8
 (Alternate A Shown)

**Series D:
Additional Information**

GREGORY DRIVE



0 30 60
scale feet



Ikenberry Drainage Study
West First Street
Closed Detention Option

FIGURE D-1
(1 of 3)

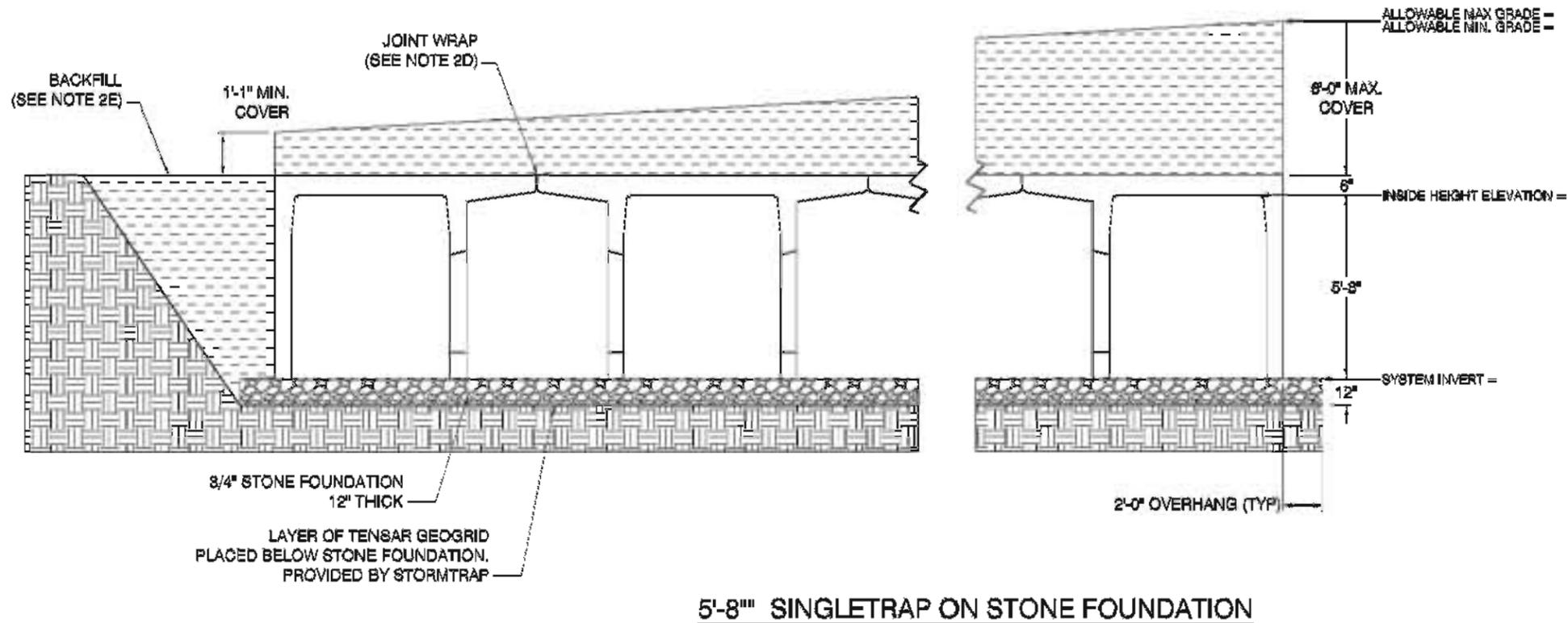
STORMTRAP INSTALLATION SPECIFICATION

1. STORMTRAP UNITS SHALL BE MANUFACTURED ACCORDING TO SHOP DRAWINGS APPROVED BY THE INSTALLING CONTRACTOR AND ENGINEER. THE SHOP DRAWINGS SHALL INDICATE SIZE AND LOCATION OF ROOF AND PIPE OPENINGS.
2. STORMTRAP SHALL BE INSTALLED IN ACCORDANCE WITH ASTM C891-90. STANDARD PRACTICE FOR INSTALLATION OF UNDERGROUND PRE-CAST CONCRETE UTILITY STRUCTURES. THE FOLLOWING ADDITIONS AND OR EXCEPTIONS SHALL APPLY:
 - A. ENGINEERS SPECIFICATIONS SHALL TAKE PRECEDENCE.
 - B. IF WATER INFILTRATION IS NOT NECESSARY, DISK, DRY AND COMPACT THE TOP 8 INCHES OF THE SUBGRADE SOILS TO 95% OF THE STANDARD DRY DENSITY AND 110% OPTIMUM MOISTURE CONTENT AS DETERMINED BY AASHTO T-99 TEST METHOD.
 1. STORMTRAP UNITS SHALL BE PLACED ON A LEVEL 12 INCH MINIMUM THICK CRUSHED AGGREGATE BED OVER A TENSAR BX 1500 OR EQUIVALENT GEOGRID. BOTH THE AGGREGATE AND GEOGRID SHALL BE PLACED WITH A MINIMUM 2'-0" OVERHANG BEYOND THE LIMITS OF THE STORMTRAP INSTALLATION TO BE GRADED BY THE INSTALLING CONTRACTOR.
 2. AGGREGATE SHALL BE GRADED TO WITHIN +/- 1/4" OF THE GRADE SHOWN ON THE PLANS.
 3. SOIL STRENGTHS SHALL BE CONFIRMED, BY OTHERS, TO BE A MINIMUM 3,000 PSF (1.5 TSP)
 - C. THE STORMTRAP UNITS SHALL BE PLACED SUCH THAT THE MAXIMUM SPACE BETWEEN ADJACENT MODULES DOES NOT EXCEED 3/4". IF THE SPACE EXCEEDS 3/4", THE UNITS SHALL BE RESET WITH THE APPROPRIATE ADJUSTMENT MADE THE GRADE TO BRING THE SPACE INTO SPECIFICATION.

- D. ALL VERTICAL EXTERIOR JOINTS BETWEEN ADJACENT STORMTRAP UNITS SHALL BE SEALED WITH PRE-FORMED, COLD-APPLIED, SELF-ADHERING ELASTOMERIC RESIN BONDED TO A WOVEN HIGHLY PUNCTURE RESISTANT POLYMER WRAP CONFORMING TO ASTM C891-90 AND SHALL BE 3'-0" INTEGRATED PRIMER SEALANT AS APPROVED BY STORMTRAP. THE ADHESIVE EXTERIOR JOINT WRAP SHALL BE INSTALLED ACCORDING TO THE FOLLOWING INSTALLATION INSTRUCTIONS:
 1. USE A BRUSH OR WET CLOTH TO THOROUGHLY CLEAN THE OUTSIDE SURFACE AT THE POINT WHERE THE JOINT WRAP IS TO BE APPLIED.
 2. A RELEASE PAPER PROTECTS THE ADHESIVE SIDE OF THE JOINT WRAP. PLACE THE ADHESIVE TAPE (ADHESIVE SIDE DOWN) AROUND THE STRUCTURE, REMOVING THE RELEASE PAPER AS YOU GO. PRESS THE JOINT WRAP FIRMLY AGAINST THE STORMTRAP MODULE SURFACE WHEN APPLYING.
- E. THE REMAINING BACKFILL PLACED AROUND THE STORMTRAP UNITS MUST BE DEPOSITED ON BOTH SIDES AT THE SAME TIME AND TO APPROXIMATELY THE SAME ELEVATION. AT NO TIME SHALL THE FILL BEHIND ONE SIDE WALL BE MORE THAN 2'-0" HIGHER THAN THE FILL ON THE OPPOSITE SIDE. BACKFILL SHALL BE COMPACTED TO 95% STANDARD PROCTOR DENSITY OR OTHERWISE SPECIFIED BY ENGINEER. CARE SHALL BE TAKEN TO PREVENT ANY WEDGING ACTION AGAINST THE STRUCTURE, AND ALL SLOPES BOUNDING OR WITHIN THE AREA TO BE BACKFILLED MUST BE STEPPED OR SEPARATED TO PREVENT WEDGE ACTION. (REFERENCE ARTICLE 302.10 (DOT 9996); CARE SHALL ALSO BE TAKEN AS NOT TO DISRUPT THE JOINT WRAP FROM THE JOINT DURING THE BACKFILL PROCESS. BACKFILL MATERIAL NOT TO EXCEED 120 PCF SOIL DENSITY OR 80 LBS PER FOOT OF LATERAL SATURATED PRESSURE. RECOMMENDED BACKFILL TO CONSIST OF 3/4" COARSE AGGREGATE STONE OR APPROVED EQUAL AND SHALL CONFORM TO THE ABOVE DENSITY/LATERAL SATURATED PRESSURE REQUIREMENTS.

STORMTRAP SPECIFICATION

1. TOTAL COVER: MIN. 1'-1" MAX. 2'-0" CONSULT STORMTRAP FOR ADDITIONAL COVER OPTIONS.
2. CONCRETE CHAMBER DESIGNED FOR AASHTO HS-20 WHEEL LOAD & APPLICABLE IMPACT. MIN. SOIL PRESSURE 3,000 PSF.
3. ALL DIMENSIONS AND SOIL CONDITIONS, INCLUDING BUT NOT LIMITED TO GROUNDWATER AND SOIL BEARING CAPACITY ARE TO BE VERIFIED IN THE FIELD BY OTHERS PRIOR TO STORMTRAP INSTALLATION.
4. FOR STRUCTURAL AND BUOYANCY CALCULATIONS, THE WATER TABLE IS ASSUMED TO BE BELOW THE INVERT OF THE SYSTEM IF DIFFERENT. CONTACT STORMTRAP IMMEDIATELY.
5. FOR STRUCTURAL CALCULATIONS THE SOIL DENSITY IS ASSUMED TO BE 120 PCF.
6. STORMTRAP IS NOT WATERTIGHT - PLEASE ADVISE IF A WATERTIGHT SOLUTION IS NEEDED.



ENGINEER INFORMATION:
 FOTH INFRASTRUCTURE & ENVIRONMENT, LLC
 1610 BROADMOOR DR
 CHAMPAIGN, IL 61821
 (217) 352-4169

PROJECT INFORMATION:
 UNIVERSITY OF ILLINOIS
 CHAMPAIGN, IL

CURRENT ISSUE DATE:
 01/24/11

APPROVED BY:

ISSUED FOR:
 PRELIMINARY

REV.	DATE	DESC.	BY:
1	01/24/11	ISSUED FOR PRELIMINARY	

SCALE:
 NTS

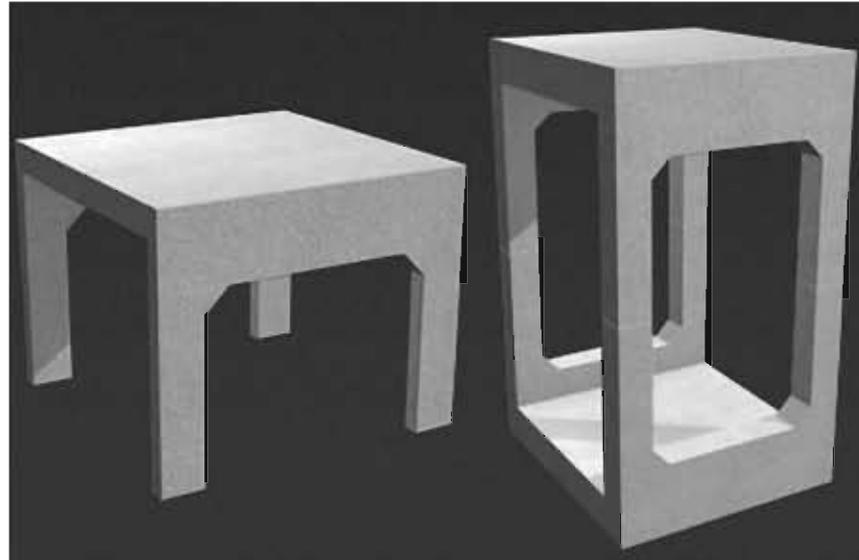
SHEET TITLE:
 SINGLETRAP INSTALLATION SPECIFICATIONS

SHEET NUMBER:
 02

Ikenberry Drainage Study
 West First Street
 Closed Detention Option

FIGURE D-1
 (2 of 3)

Precast Underground Concrete Storage Units (StormTrap)



- HS-20 loading with 6" of cover
- Single (open bottom) heights from 1'-2" to 5'-0".
- Double (closed bottom) heights from 2'-4" to 10'-0".
- Open bottom allows for the infiltration of storm water.
- Small overall footprint.

FIGURE D-2

Institute for Genomic Biology, University of Illinois



2010 Foth Infrastructure & Environment, LLC

FIGURE D-3

Institute for Genomic Biology, University of Illinois



FIGURE D-4

Institute for Genomic Biology, University of Illinois



FIGURE D-5

Institute for Genomic Biology, University of Illinois



FIGURE D-6

Institute for Genomic Biology, University of Illinois



FIGURE D-7

Institute for Genomic Biology, University of Illinois



2010 Foth Infrastructure & Environment, LLC

FIGURE D-8

Institute for Genomic Biology, University of Illinois



2010 Foth Infrastructure & Environment, LLC

FIGURE D-9

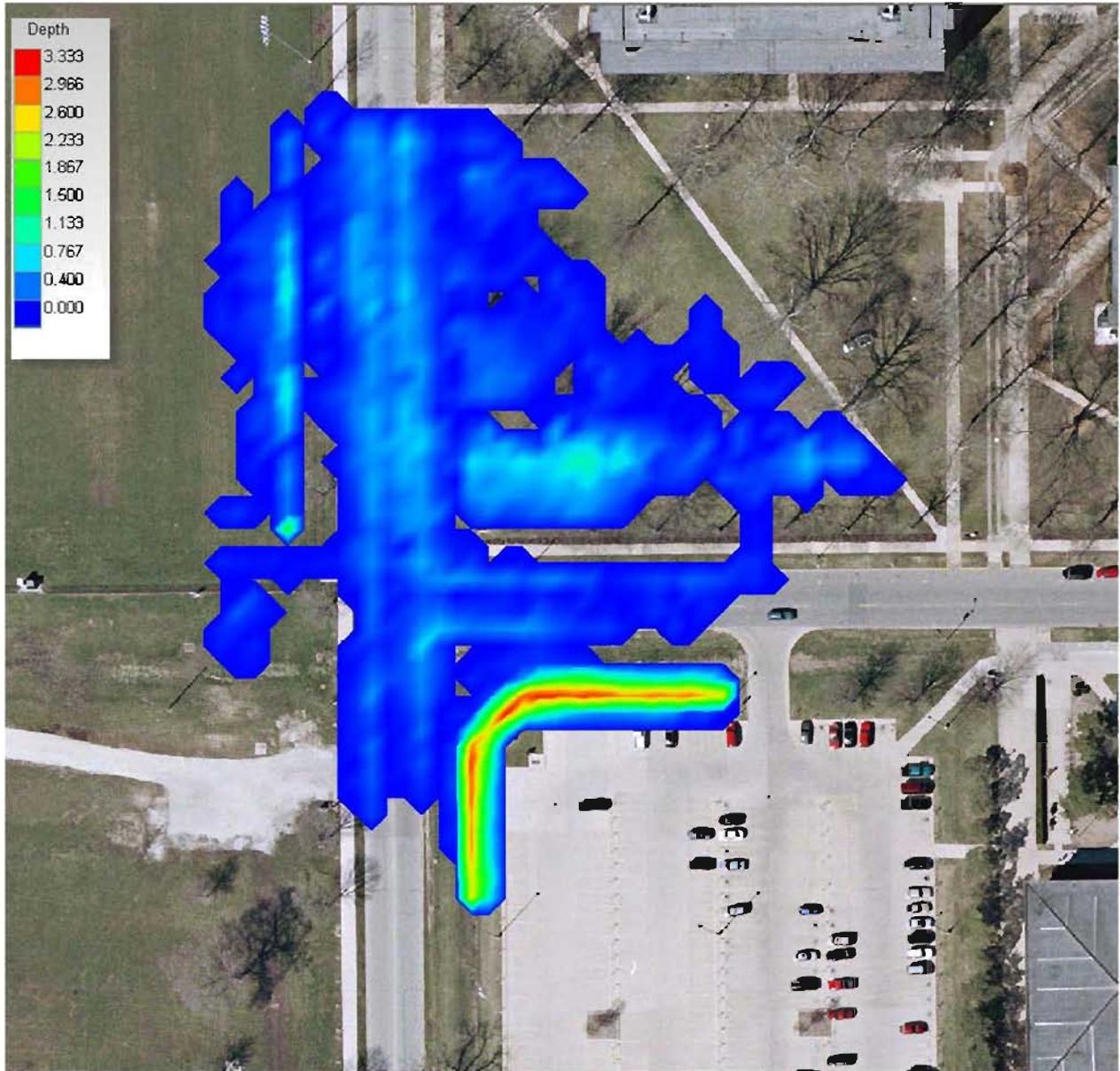
StormTrap Typical Installation



FIGURE D-10

Series E:
Modeled Flooding Study Results at
First & Peabody

UIUC – Ikenberry Commons
2D Flooding Results

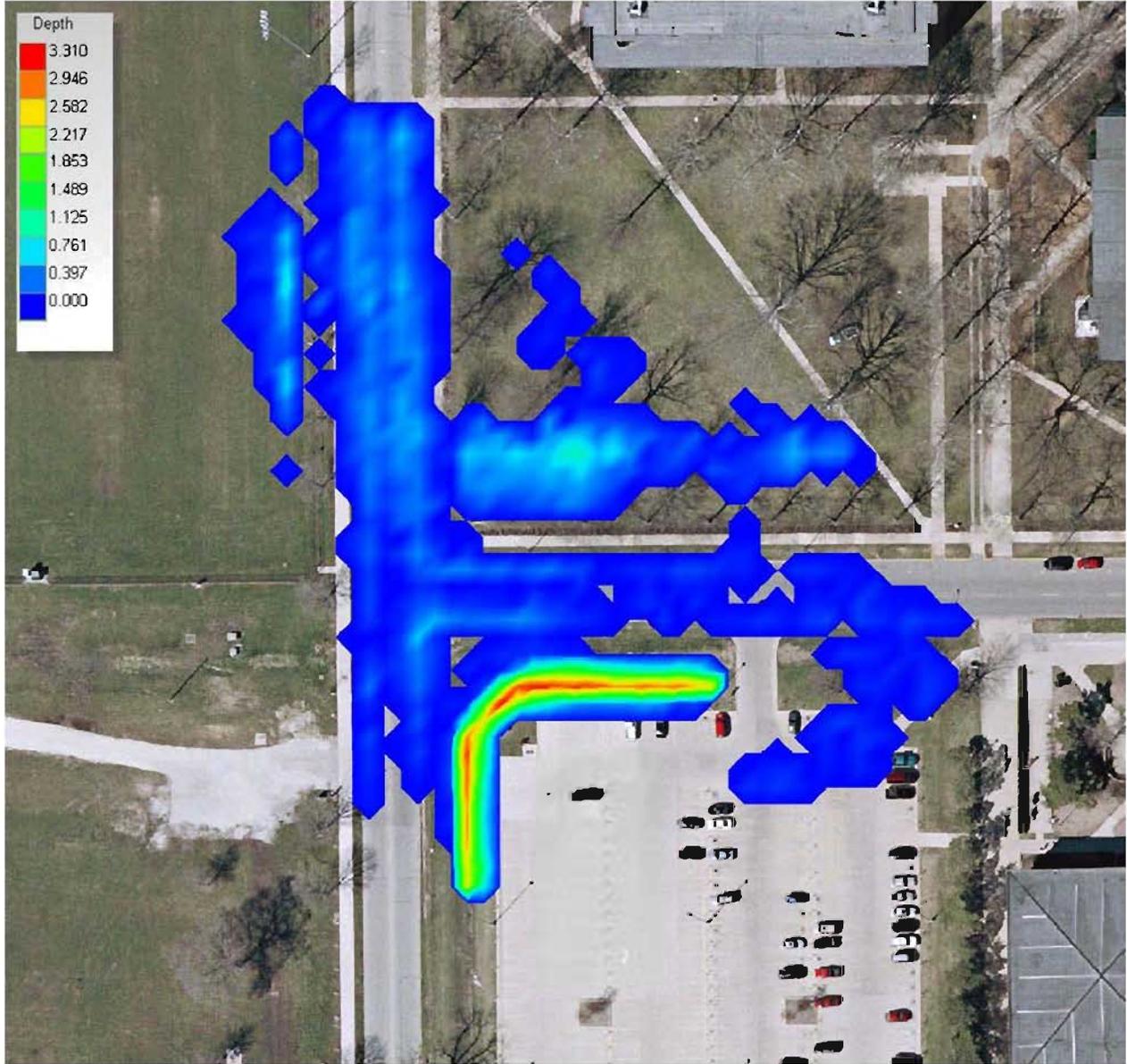


Proposed Conditions (without First Street Detention)

MODELED FLOODING
RECURRENT EVENT

FIGURE E-1

X:\CH\IE\2010\10\023-00\CAD\Displays\E1_3 Modeled Flooding.dwg gab2



With First Street Detention (without 36" relief sewer on west side of First Street)

**MODELED FLOODING
50 YEAR EVENT
FIGURE E-2**

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With First Street Detention AND 36" relief sewer on west side of First Street

**MODELED FLOODING
50 YEAR EVENT
FIGURE E-3**

**Series F:
Cost Estimates**

**West First Street Detention Storage System
Opinion of Construction Budget Cost**

#10u023.00

X:\CH\IE\2010\10u023.00\1200\West First Street Detention.02.10.11.xls

- Notes:
1. Transport Flow Cost from SE Corner of First and Peabody to North Stadium Soccer Field Area will be equal with both open detention and underground storage options.
 2. Include cost of conveyance from the 60" First Street Storm sewer to the new detention basin, i.e. Remove Existing MH, Special MH, Pavement R&R, CLSM Backfill, Sidewalk R&R, Traffic Control, Protection of Existing Utilities, Construction Fencing, Erosion Control, Sodding and Supplemental Watering.
 3. Construction items, quantities, and unit costs are programatic and subject to details of Final Design
 4. Drainage system assumed for the underground storage option may be impacted by Final Design

West First Detention/Both Options --- FIRST STREET CONVEYANCE COST

Pay Items	Unit	Quantity	Unit Cost	Extension	Comments
Traffic Control	LS	1	5,000.00	5,000.00	
Protection of Existing Utilities	LS	1	15,000.00	15,000.00	
Crossing Existing Utilities	LS	1	22,000.00	22,000.00	
Construction Fencing	LS	1	8,400.00	8,400.00	
Erosion Control	LS	1	7,000.00	7,000.00	
Pavement Removal and Replacement (Includes Adjacent Curb and Gutter)	SY	501	90.00	45,090.00	
PCC Sidewalk Removal and Replacement	SF	5240	10.00	52,400.00	
Remove Existing Inlets	EA	4	500.00	2,000.00	
Remove Existing Manholes	EA	5	900.00	4,500.00	
Remove Existing Storm Sewers	LF	700	5.00	3,500.00	
Inlets, Type A	EA	2	1,600.00	3,200.00	
High Capacity Inlet Box Special	EA	3	4,500.00	13,500.00	
Manholes, Type A, 6-FOOT Diameter	EA	3	7,000.00	21,000.00	
Manholes, Type A, 7-FOOT Diameter	EA	0	8,500.00	-	Not considered necessary unless Final Design alters Program Estimate
Manholes, Special	EA	2	12,000.00	24,000.00	
Conflict Manholes, Type A, 6-FOOT Diameter	EA	2	9,000.00	18,000.00	
Special Outlet Structure/Connection	EA	1	4,000.00	4,000.00	
RCCP Pipe Tee 54"x 36"	EA	1	4,500.00	4,500.00	
Storm Sewers Type 1, RCCP, 12"	LF	100	50.00	5,000.00	
Storm Sewers Type 1, RCCP, 36"	LF	605	130.00	78,650.00	
Storm Sewers Type 1, RCCP, 54"	LF	80	225.00	18,000.00	
Storm Sewers Special, (36" DIP)	LF	0	250.00	-	Center length of 36" RCP on conflict MHs to avoid use of DIP
Storm Sewers Special (42" DIP)	LF	0	300.00	-	Not considered necessary unless Final Design alters Program Estimate
Trench Backfill Storm Sewers (CLSM)	CY	247	65.00	16,055.00	
Trench Backfill Storm Sewers (Granular)	CY	650	45.00	29,250.00	
Sod	SY	730	5.00	3,650.00	
Supplemental Watering	LS	1	3,000.00	3,000.00	

Sub-Total Estimate Transport Flow	\$	407,000
Construction Estimate Contingency (20%)	\$	82,000
Total Estimate Transport Flow	\$	489,000

EXHIBIT F-1

West First Detention ---- At-Grade Soccer Field w/ Buried (Storm Trap) Detention Option

Opinion of Construction Budget Cost

Date: 2/10/2011

Replace current fields ~ 2 @ 120' x 300' w/ 15' offset between fields

Pay Items	Unit	Quantity	Unit Cost	Extension	Comments
Construction Fencing	LS	1	7,800.00	7,800.00	
Erosion Control	LS	1	6,500.00	6,500.00	
Topsoil Excavation and Stockpile for Re-Use	CY	1,766	10.00	17,660.00	
Topsoil Excavation and Remove Offsite	CY	1,817	15.00	27,255.00	
Earth Excavation and Stockpile for Re-Use	CY	4,888	10.00	48,880.00	
Earth Excavation and Remove Offsite	CY	18,709	15.00	280,635.00	
Storm Sewers Type 1, RCCP, 36"	LF	240	130.00	31,200.00	
Manholes, Type A, 6-FOOT Diameter	EA	3	7,000.00	21,000.00	
Storm Trap Units (Materials)	EA	664	1,346.00	893,744.00	
Installation of Storm Trap Units	EA	664	140.00	92,960.00	
Stone Base for Storm Trap Units	CY	3,221	72.00	231,912.00	
Stone Backfill to top of Storm Trap Units (at perimeter of system)	CY	2,117	72.00	152,424.00	
Remove Existing Irrigation Lines	LF	1,220	2.00	2,440.00	
Remove and Reinstall Existing Lighting Unit	EA	1	7,500.00	7,500.00	
Conduit in Trench, 1 1/4" Dia., PVC	LF	300	8.00	2,400.00	
Lighting Elec. Cable in Conduit, 600V (XLP-Type Use) 1/C NO. 8	LF	300	2.00	600.00	
New Irrigation lines and connection to existing N-S supply line	LF	1,220	8.00	9,760.00	
Pea Gravel Backfill 6"	CY	1,417	72.00	102,024.00	
Perforated Corrugated PE Underdrain, 6" w/ Geotextile Fabric Sock (50' o.c.)	LF	2,040	15.00	30,600.00	
Inlets, Type A (On underdrain lines~ 2 Each on 6 lines)	EA	12	1,200.00	14,400.00	
Special Soil Surface Treatment 12" (10% Existing Stockpiled Topsoil, 80% Sand, 10% Peat Moss)	CY	2,830	40.00	113,200.00	
Sod	SY	12,000	5.00	60,000.00	

Sub-Total Estimate Closed Detention	\$ 2,155,000
Construction Estimate Contingency (20%)	\$ 431,000
Total Estimate Closed Detention	\$ 2,586,000

At 10 AF~ Cost/AF = \$ 258,600

EXHIBIT F-2

West First Detention Storage System ---- Below-Grade Soccer Field Open Detention

Date: 2/10/2011

Opinion of Construction Budget Cost

Lower Level Field at +/- 205 Feet x 310 Feet (Final Design Dependent)

Pay Items	Unit	Quantity	Unit Cost	Extension	Comments
Construction Fencing	LS	1	8,000.00	8,000.00	
Erosion Control	LS	1	6,500.00	6,500.00	
Topsoil Excavation and Stockpile for Re-Use	CY	1,445	10.00	14,450.00	Stockpile on existing field to the west
Topsoil Excavation and Remove Offsite	CY	2,355	15.00	35,325.00	
Earth Excavation and Remove Offsite	CY	17,500	15.00	262,500.00	
Storm Sewers Type 1, RCCP, 36"	LF	240	130.00	31,200.00	
Manholes, Type A, 6-FOOT Diameter	EA	3	7,000.00	21,000.00	
Remove Existing Irrigation Lines	LF	1,220	2.00	2,440.00	
Remove and Reinstall Existing Lighting Unit	EA	1	7,500.00	7,500.00	Contingency Pay Item
Conduit in Trench, 1 1/4" Dia., PVC	LF	300	8.00	2,400.00	Contingency Pay Item
Lighting Elec. Cable in Conduit, 600V (XLP-Type Use) 1/C NO. 8	LF	300	2.00	600.00	Contingency Pay Item
New Irrigation lines and connection to existing N-S supply line	LF	1,220	8.00	9,760.00	
Perforated Corrugated PE Underdrain, 6" w/ Geotextile Fabric Sock (50' o.c.)	LF	1,800	15.00	27,000.00	
Inlets, Type A (On underdrain lines~ 2 Each on 5 lines)	EA	10	1,200.00	12,000.00	
Pea Gravel Backfill 6"	CY	1,250	72.00	90,000.00	
Special Amended Soil Surface Treatment 12" (10% Existing Stockpiled Topsoil, 80% Sand, 10% Peat Moss)	CY	2,500	40.00	100,000.00	
Sod	SY	11,250	5.00	56,250.00	

Sub-Total Estimate Open Detention	\$	687,000
Construction Estimate Contingency (20%)	\$	138,000
Total Estimate Open Detention	\$	825,000

At 10 AF~ Cost/AF = \$ 82,500

EXHIBIT F-3

Ikenberry Commons Drainage Study

Date: 5/17/2011

IKENBERRY COMMONS DRAINAGE SYSTEMS
Summary of Opinion of Construction Budget Cost

#10u023.00 X:\CH\IE\2010\10u023.00\1200\Ikenberry Drainage Est..05.17.11.xls

Notes: 1. *1 Include with general site demolition unless otherwise noted.

- 2. Contingency not applied to Gregory Drive Storm Sewer (As-Bid Cost)
- 3. Step 2 includes \$425,190 for construction of Fourth St. Storm Sewers (w/ Contingency)
- 4. Step 4 includes \$198,384 for construction of Peabody Storm Sewers (w/ Contingency)
- 5. Sewers with Building No. 5 to be constructed with demolition of Flagg Hall
- 6. Phase (Step) for construction of Storm Sewers is dependent on UIUC input
- 7. Total Storm Sewers in Adjacent Public Streets (Gregory, Fourth & Peabody) is Est'd at \$1,548,574 (Included)

PAY ITEMS	Unit	Unit Cost	STEP 1		STEP 2		STEP 3 - A		STEP 3 ~ B		STEP 4		STEP 5		Step 6		Step 7		Additional Option Studied			
			Quantity	Extension	Quantity	Extension	Quantity	Extension	Quantity	Extension	Quantity	Extension	Quantity	Extension	Quantity	Extension	Quantity	Extension	Quantity	Extension	Quantity	Extension
Traffic Control	LS	\$5,000	0		1.0	\$5,000	-	-	0	-	1.0	\$5,000	0		0		-		0			
Protection of Existing Utilities	LS	\$15,000	1	\$15,000	1.5	\$22,500	1.5	\$22,500	1.5	22,500.00	1.0	\$15,000	0.25	\$3,750	0.5	\$7,500	-		1.5	\$22,500		
Crossing Existing Utilities	LS	\$22,000	1	\$22,000	1.5	\$33,000	1.5	\$33,000	1.5	33,000.00	1.0	\$22,000	0.25	\$5,500	0.5	\$11,000	-		1.5	\$33,000		
Construction Fencing	LS	\$8,400	1	\$8,400	2.0	\$16,800	2.0	\$16,800	2	16,800.00	1.0	\$8,400	0.25	\$2,100	0.5	\$4,200	-		2.0	\$16,800		
Erosion Control	LS	\$7,000	1	\$7,000	1.5	\$10,500	1.5	\$10,500	1.5	10,500.00	1.0	\$7,000	0.25	\$1,750	0.5	\$3,500	-		1.5	\$10,500		
Pavement Removal and Replacement (Includes Adjacent Curb and Gutter) *1	SY	\$90	0		1120	\$100,800	0		0	-	536	\$48,240	0		0		-		0			
PCC Sidewalk Removal *1	LS	\$5,000	1	\$5,000	0		0		0	-		0		0		0		-		0		
Remove Existing Inlets *1	LS	\$3,000	1	\$3,000	1	\$3,000	2.0	\$6,000	0	-		0		0		0		-		0		
Remove Existing Manholes *1	LS	\$3,000	1	\$3,000	1	\$3,000	2.0	\$6,000	2	6,000.00		0		0		0		-		2.0	\$6,000	
Remove Existing Storm Sewers *1	LS	\$12,000	1	\$12,000	1	\$12,000	2.0	\$24,000	2	24,000.00		0		0		0		-		2.0	\$24,000	
Inlets, Type A	EA	\$1,600	1	\$1,600	2	\$3,200	-		0	-		0		0		0		-		0		
Manholes, Type A, 6-FOOT Diameter	EA	\$8,500	1	\$8,500	0		-		0	-		0		0		0		-		0		
Manholes, Type A, 5-FOOT Diameter	EA	\$7,000	8	\$56,000	2	\$14,000	-		5	35,000.00	3	21,000.00	0		0		-		5	\$35,000		
Manholes, Type A, 4-FOOT Diameter	EA	\$5,500	4	\$22,000	3	\$16,500	7	\$38,500	-		1	\$5,500	4	\$22,000	-		-		0			
Manholes, Special	EA	\$12,000	1	\$12,000	0		\$0		0	-		0		0		0		-		0		
Conflict Manholes, Type A, 6-FOOT Diameter	EA	\$9,000	0		0		\$0		0	-		0		0		0		-		0		
Special Outlet Structure/Connection	EA	\$6,000	1	\$6,000	1	\$6,000	4	\$24,000	1	6,000.00		0		0		0		-		1	\$6,000	
Weston Detention Basin ~ Pipe Labyrinth @ 2.8 Ac. Ft.	AF	\$332,500	0		2.8	\$931,000	0		0	-		0		0		0		-		0		
Gregory Drive Sewers (2011 Construction- As Bid)	LS	\$925,000	1	\$925,000																		
First Street Conveyance SEE EXHIBIT F-1	LS	\$407,000							1	\$ 407,000										1	\$407,000	
West First Street Detention (Below Grade-Open Storage@ 10 Ac. Ft.)	LS	\$687,000																		1	\$687,000	
West First Street Detention (Storm Trap- Closed Storage@ 10 Ac. Ft.) SEE EXHIBIT F-2	LS	\$2,155,000							1	\$ 2,155,000												
Storm Sewers Type 1, RCCP, 12"	LF	\$50	494	\$24,700	300	\$15,000	-		0	-		0		0		0		-		0		
Storm Sewers Type 1, RCCP, 15"		\$60			535	\$32,100	180	\$10,800.00	-			0		200	\$12,000	-		-		180	\$10,800	
Storm Sewers Type 1, RCCP, 18"	LF	\$65	37	\$2,405	725	\$47,125	437	\$28,405	165	10,725.00	178	\$11,570	200	\$13,000	-		-		165	\$10,725		
Storm Sewers Type 1, RCCP, 21"		\$70			490	\$34,300	0		0	-		0		0		0		-		0		
Storm Sewers Type 1, RCCP, 24"	LF	\$75	272	\$20,400	0		320	\$24,000	170	12,750.00		0		0		0		-		170	\$12,750	
Storm Sewers Type 1, RCCP, 30"	LF	\$100	100	\$10,000	480	\$48,000	-		414	41,400.00		0		0		0		-		414	\$41,400	
Storm Sewers Type 1, RCCP, 36"	LF	\$130	136	\$17,680	0		-		330	42,900.00		0		0		0		-		330	\$42,900	
Trench Backfill Storm Sewers (CLSM)	CY	\$65	75	\$4,875	160	\$10,400	-		0	-		0		0		0		-		0		
Trench Backfill Storm Sewers (Granular)	CY	\$45	180	\$8,100	2150	\$96,750	240	\$10,800	250	11,250.00	804	\$36,180	28	\$1,260	62	\$2,790	-		250	\$11,250		
Temporary Seeding	LS	\$2,000	1.0	\$2,000	1.5	\$3,000	2.0	\$4,000	2	4,000.00	0.5	\$1,000	0.25	\$500	0.5	\$1,000	-		2.0	\$4,000		
Supplemental Watering	LS	\$3,000	1.0	\$3,000	1.5	\$4,500	2.0	\$6,000	2	6,000.00	0.5	\$1,500	0.25	\$750	0.5	\$1,500	-		2.0	\$6,000		
Sub-Total Estimate by Construction Stages						\$ 1,199,660		\$ 471,075		\$ 1,251,905		\$ 2,855,625		\$ 165,320		\$ 32,680		\$ 78,490		\$ -		\$ 1,387,625
Estimate Contingency (20%)						\$ 54,932		\$ 94,215		\$ 250,381		\$ 571,125		\$ 33,064		\$ 6,536		\$ 15,698		\$ -		\$ 277,525
Total Estimate by Construction Stages						\$ 1,254,592		\$ 565,290		\$ 1,502,286		\$ 3,426,750		\$ 198,384		\$ 39,216		\$ 94,188		\$ -		\$ 1,665,150

TOTAL DRAINAGE ESTIMATE WESTON STORAGE OPTION Step 3A \$ 3,653,956

EXHIBIT F-4

TOTAL DRAINATE ESTIMATE WEST FIRST STREET CLOSED STORAGE OPTION Step 3B \$ 5,578,420

West First Street Open Storage@ 10 AF EXHIBIT F - 3