

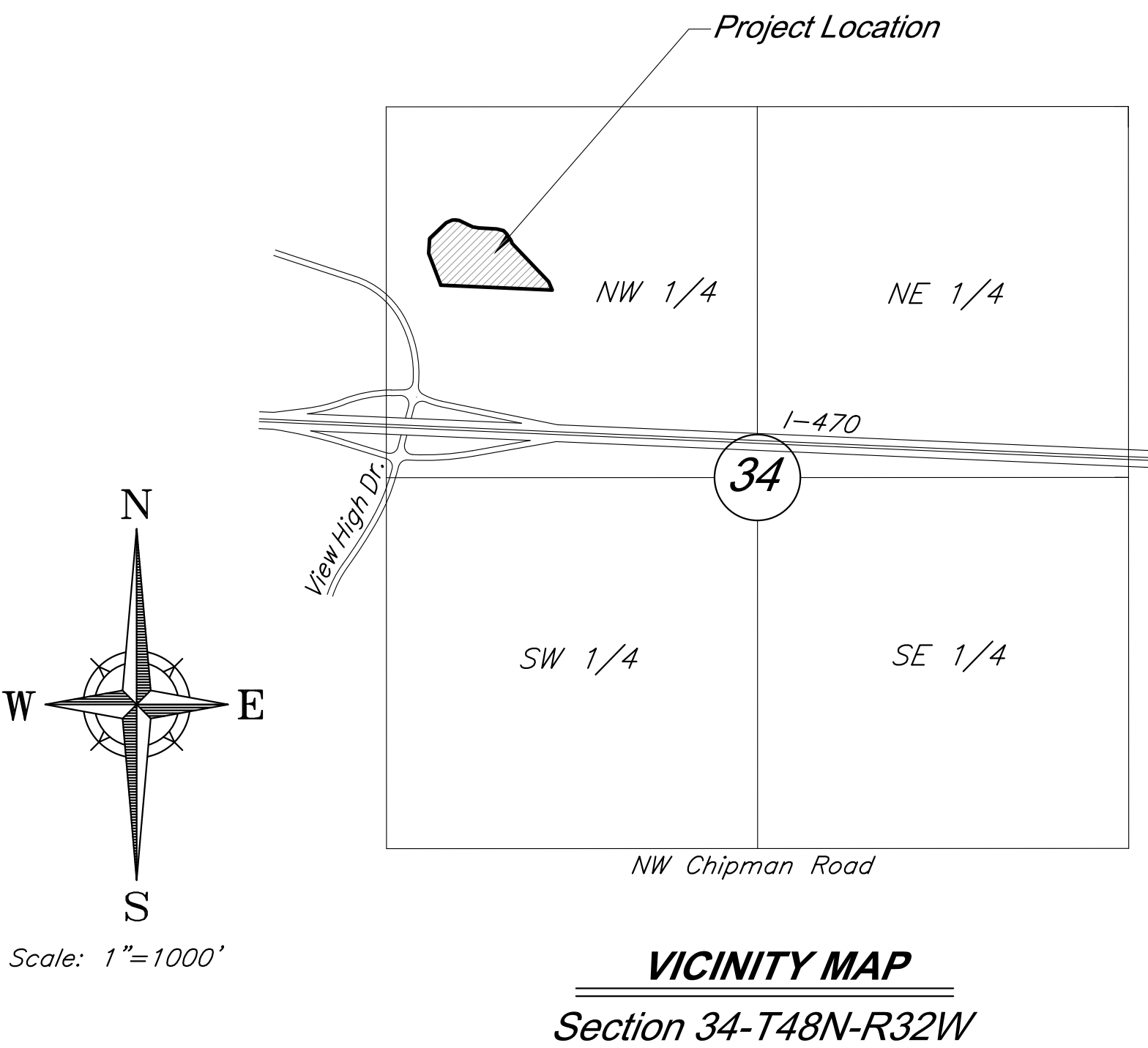
STORM SEWER IMPROVEMENTS AND MASS GRADING
FOR
PARAGON STAR MULTIFAMILY DEVELOPMENT
Sections 34–Township 48–Range 32
City of Lee’s Summit
Jackson County, Missouri

SUMMARY OF QUANTITIES

No.	DESCRIPTION	UNIT	QUANTITY
1	Mobilization	LS	1
2	Fill (Unadjusted)	C.Y.	29,179
3	Cut (Unadjusted)	C.Y.	2,520
4	Sediment Fence	L.F.	1,803
5	Inlet Protection	EA.	4
6	Straw Wattle	L.F.	926
7	Temporary Construction Entrance	EA.	1
8	6'x3' Curb Inlet	EA.	1
9	6'x4' Curb Inlet	EA.	1
10	6'-0" Dia. Storm MH	EA.	1
11	6'-0" Dia. Storm MH w/ Shallow Type Top and Pedestrian Grate	EA.	2
12	18" RCP	L.F.	117
13	24" RCP	L.F.	418
14	24" RCP Headwall w/ Conc. Toewall and Flaggate	Ea.	2
15	Riprap (D50=12")	S.Y.	59
16	Seeding (Temporary)	LS	1
17	Retaining Wall	S.F.	9,700

INDEX OF SHEETS

Sht. No.	Description
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3	General Layout
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5	Utility Plan
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7	Drainage Map
8	Drainage Calculations
9-10	Construction Details
11	Erosion Control Plan
12-13	Erosion Control Details



UTILITY CONTACTS

Sanitary Sewers	Mr. Jeff Thorn, PE City of Lee's Summit Water Utilities 1200 SE Hamblen Road Lee's Summit, MO 64063 (816) 969-1900 email: jeff.thorn@cityofLS.net	Gas	Mr. Donnie Richards Missouri Gas Energy 7500 E 35th Terrace Kansas City, MO 64129 (816) 472-9464 Fax (816) 472-3488 email: donnie.richards@sug.com
	Mr. Jeff Shook Little Blue Valley Sewer District 21101 East 78 Highway Independence, MO 64057 (816) 285-1522 email: jshook@lbvwd.net	Cable Television	Mr. Greg Thomas Time Warner Cable 8221 W. 119th Street Overland Park, KS 66213 (913) 643-1950 email: greg.thomas@twcable.com
Water	Mr. Jeff Thorn, PE City of Lee's Summit Water Utilities 1200 SE Hamblen Road Lee's Summit, MO 64063 (816) 969-1900 email: jeff.thorn@cityofLS.net	Telephone	Ms. Glenda Charles AT&T 1425 Oak Street Kansas City, MO 64106 (816) 365-1669 Fax (816) 275-1109 email: gc6954@att.com
Electric Service	Mr. Nathan Michael Kansas City Power & Light P.O. Box 418679 Kansas City, MO 64141 (816) 220-5210 Fax (816) 245-3623 email: Nathan.Michael@kcpl.com		

Missouri One Call System 1-800-344-7483 (DIG-RITE)

PROJECT BENCHMARK:

BM #11 - Chiseled "L" on top
Northeast corner of concrete guardrail
at the Northeast corner of I470 bridge
spanning View High Drive.
EL=833.80

DEVELOPED AND OWNED BY:
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LEE'S SUMMIT, MISSOURI 64086
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PROJECT ENGINEER: 6/25/21
DATE:

APPROVED:

CITY ENGINEER: DATE:

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engineers

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6/25/21

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EROSION AND SEDIMENT CONTROL NOTES

The layout of erosion control best management practices (BMPs) shown on the engineering plans is intended to control erosion and minimize, if not eliminate, the transport of sediment from the disturbed areas. The Contractor shall be responsible for the evaluation of existing surface drainage patterns and for making adjustments to the BMP locations to best control erosion and minimize, if not eliminate, the transport of sediment from the disturbed areas. The following are measures to achieve the control of erosion and sediment.

1. Stabilization Practices – Stabilization practices are very effective at preventing erosion by shielding the soil surface from the impact of rain, slowing the velocity of runoff, holding soils in place, and increasing infiltration of runoff and allowing the soil to absorb more rainfall.
- a. Temporary Seeding Stabilization – During acceptable growing periods (see Table 1 below); temporary seeding of annual vegetation with a straw mulch cover shall be used as a temporary cover until permanent vegetation is established. If there is a possibility that a vegetative cover will be required to control erosion for more than 1 year, then consider the addition of a perennial/permanent grass species as part of a seeding mixture.

Table 1. Temporary Seeding Dates and Minimum Application Rates

Seeding Dates	Temporary Seed Species	Minimum Application Rates (pure live seed lbs. per acre)	Straw Mulch (tons per acre)
Jan. 1 – Jan. 31	None	Not Applicable	2.5
Feb. 1 – May 31	Annual Ryegrass	120	1.5
June 1 – Aug.4	None	Not Applicable	2.5
Aug. 15 – Nov. 15	Cereal/Winter Rye	120	1.5
Nov. 16 – Dec. 31	None	Not Applicable	2.5

Seedbed Preparation – For broadcast seeding or drilling, loosen soil to depth of 3 inches. For no till drilling, loosen soil if it is compacted. Loosen compacted, hard or crusted soil surfaces with a disk, ripper, chisel, harrow or other tillage equipment. Avoid preparing the seedbed under excessively wet conditions. For establishment and long-term growth, apply a complete fertilizer at rates recommended by soil tests or as specified in plans and specifications. If soil pH is less than 6.0, apply lime according to soil tests. Incorporate necessary lime and fertilizer to a depth of 3 to 6 inches of soil.

Installation – For the best results use certified seed. Apply seed uniformly using a cyclone seeder, drag-type spreader, drill, cultipacker seeder or hydroseeder. When using a drill seeder, plant rye or other grains about 1 inch deep and plant grasses no more than ½ inch. A vegetative straw mulch cover shall be applied over the seed mixture to help germinate and establish plant cover, control weeds, and protect seed mixture against temperature extremes. Follow straw mulch preparation and application procedures described herein.

- b. Temporary Mulch Stabilization – During non-growing periods, a straw mulch cover shall be applied in unseeded areas to protect against erosion until temporary or permanent vegetation is established.

Site Preparation – Divert runoff water from areas above the site that will be mulched. Remove stumps, roots and other debris from the construction area. Grade area as needed to permit the use of equipment for seeding, mulching and maintenance. Shape area so that it is relatively smooth.

Application – Spread straw mulch uniformly over the area with a power blower, hydroseeder, or by hand. No more than 25% of the ground surface should be visible after spreading. Apply straw mulch at a rate of 1.5 tons per acre as a seed cover or 2.5 tons per acre as a stand alone cover. The straw should be dry, unchopped, unweathered; free of weed seeds and rot. In areas of steep slopes or high winds, or in critical areas such as swales, mulching may need to be secured to the ground with a binder, netting, or tacking.

- c. Permanent Seeding Stabilization – All disturbed areas shall be permanently seeded with a cool season grass mixture as specified in the Standards and Specifications of the City of Lee’s Summit, Missouri.

Seedbed Preparation – loosen soil to depth of 3 inches. For no till drilling, loosen soil if it is compacted. Loosen compacted, hard or crusted soil surfaces with a disk, ripper, chisel, harrow or other tillage equipment. Avoid preparing the seedbed under excessively wet conditions. For establishment and long-term growth, apply a complete fertilizer at rates recommended by soil tests or as specified in plans and specifications. If soil pH is less than 6.0, apply lime according to soil tests. Incorporate necessary lime and fertilizer to a depth of 3 to 6 inches of soil.

Installation – For the best results use certified seed. Apply seed uniformly using a hydroseeder. A vegetative straw mulch cover shall be applied over the seed mixture to help germinate and establish plant cover, control weeds, and protect seed mixture against temperature extremes. Follow straw mulch preparation and application procedures described in the Standards and Specifications of the City of Lee’s Summit, Missouri.

2. Structural Practices

- a. Silt Fence – A temporary sediment barrier consisting of a geotextile fabric shall be installed as shown on the attached engineering plans and details. Silt fencing shall be installed to maintain sediment onsite.

Minimum Requirements:

Location – Fence should be built on a nearly level grade and at least 10 feet from the toe of the slope to provide a broad shallow sediment pool. Install on the contour, where fence can intercept runoff as a sheet flow; not located crossing channels, waterways or other concentrated flow paths; not attached to existing trees.

Spacing of Support Posts – 10 feet maximum for fence supported by wire; 6 feet maximum for high strength fabric without supportive wire backing. Support posts should be driven into the ground a minimum of 10 inches deep.

Trench – Bottom 1 foot of fence must be buried minimum of 4 inches deep.

- b. Inlet Protection – When installation of the storm drainage system is complete, gravel curb inlet sediment traps will be placed at the drainage system inlets. Construction shall be in accordance with attached engineering plans and details.
- c. Stockpiles – The toe of stockpiles shall be placed a minimum of 10 feet from erosion control measures. If stockpiles are to remain for more than 14 days, they shall be temporarily stabilized with vegetative mulch and temporary seeding.

3. Maintenance – The contractor shall repair all erosion control measures or re-seed areas that are disturbed or damaged as a result of weather or other situations, within 2 days after the occurrence. This will include all areas bare of vegetation.

EROSION CONTROL GENERAL NOTES

1. The Contractor is responsible for erosion control during construction and until the Owner and City accepts the work as complete. The erosion control measures shown on this plan are a typical minimum installation. The Contractor shall be responsible for adjusting or adding to these measures as necessary during the phasing of the construction to assure adequate control.
2. Clearing and grubbing within 50’ of a defined drainage course should be avoided when possible. Where changes to a defined drainage course occur, work should be delayed until all materials and equipment necessary to protect and complete the drainage change are on site. Changes shall be completed as quickly as possible once the work has been initiated. The area impacted by the construction activities shall be revegetated or protected from erosion as soon as possible, areas within 50’ of a defined drainage ways should be recontoured as needed or otherwise protected within five (5) working days after grading has ceased.
3. Where soil disturbing activities cease in an area for more than 14 days, the disturbed areas shall be protected from erosion by stabilizing the area with mulch or other similarly effective erosion control measures. If the slope of the area is greater than 3:1 or if the slope is greater than 3% and greater than 150 feet in length, then the disturbed areas shall be protected from erosion by stabilizing the area with mulch or other similarly effective erosion control measures if activities cease for more than seven (7) days.

4. Existing vegetation shall be preserved to the extent and where practical. In no case shall disturbed areas remain without vegetative ground cover for a period in excess of 60 days.

5. Additional site management practices which shall be adhered to during the construction process shall include:

–Solid and hazardous waste management including providing trash containers and regular site clean up for proper disposal of solid waste such as building and construction material, product/material shipping waste, food containers and cups, and providing containers for the proper disposal of waste paints solvents, and cleaning compounds.

–Provisions of portable toilets for proper disposal of sanitary sewage.

–Storage of construction materials away from drainage courses and low areas.

–Installation of containment berms and use of drip pans at petroleum product and liquid storage tanks and containers.

6. All disturbed areas shall be seeded, fertilized and mulched, or sodded, in accordance with the Standards and Specifications adopted by the City of Lee’s Summit, Missouri and good engineering

practices. This shall be completed within fourteen (14) days after completing the work, in any area. If this is outside of the seeding period, silt barriers or other similarly effective measures shall be provided until such time that the areas can be seeded.

7. All erosion control measures, temporary or permanent, require maintenance to preserve their effectiveness. All erosion control devices shall be inspected immediately after each heavy rainstorm and at least daily during prolonged rainfall. Any required repairs should be made immediately. All costs associated with the repair work including related incidentals will be the contractor’s responsibility and shall be included in the Contractor’s bid for the proposed work. Only after the project is complete and accepted can the erosion control be removed.

8. Seeding shall be done before the proposed seedbed becomes eroded, crusted over, or dried out and shall not be done when the ground is frozen, or covered with snow. The seed shall comply with requirements of the Missouri Seed Law and the Federal Seed Act. Also, it shall contain no seed of any plant on the Federal Noxious Weed List. Other weed seed shall not exceed one percent by weight of mix.

9. During the dates Dec. 15 through May 30 ALL lime, fertilizer, seed, and mulch shall be applied to finished slopes of disturbed areas. During the months of June, July, October, and November 1st through December 15th, lime, fertilizer, seed, and mulch shall be applied at the following rates:

Lime – 100% of the specified quantity
Fertilizer – 75% of the specified quantity
Seed – 50% of the specified quantity
Mulch – 100% of the specified quantity

10. Mulch shall be Vegetative type, cereal straw form stalks of oats, rye, or barley, or approved equal. The straw shall be free of prohibited weed seed and relatively free of all other noxious and undesirable seed. Apply straw mulch at a rate of 1.5 tons per acre as a seed cover or 2.5 tons per acre as a stand alone cover. Mulch shall be embedded by a mulch anchoring tool or disk type roller having flat serrated disks spaced not more than 10 inches apart and cleaning scrapers shall be provided.

General Notes:

1. All Construction shall conform to the City of Lee’s Summit Technical Specifications in effect at the time of the City’s approval date shown on the approved plans and incorporated herein by reference.
2. All traffic control shall be the responsibility of the Contractor and shall be in conformance with the Manual of Uniform Traffic Control Devices (MUTCD).
3. Property Corners and/or Section corners disturbed or damaged by construction activities shall be reset by a Registered Land Surveyor licensed in the state of Missouri, at the Contractor’s expense.
4. The Contractor shall be responsible for the restoration of the Right-of-Way and for damaged improvements such as curbs, driveways, sidewalks, street light and traffic signal junction boxes, traffic signal equipment, irrigation systems, etc. Damaged improvements shall be repaired in conformance with the latest City standards and to the City’s satisfaction.
5. All work shall be confined within easements and/or construction limits as shown on the plans.
6. The Contractor shall, prior to the commencement of work, investigate surface and subsurface conditions to be encountered across the site and notify the Engineer if any discrepancies or changed conditions are noted.
7. All trash and debris identified on site shall be properly handled and disposed of in accordance with state of Missouri regulations.
8. All measurements on these plans are horizontal distances, not slope distances.
8. This project will include numerous activities occurring on site including storm sewer, sanitary sewer, grading, erosion control, etc. Contractor shall coordinate his work with other contractors on site.
9. Initial construction staking will be performed by GBA – Refer to Bid Documents.
10. All concrete shall be KCMMB 4,000 psi.

Permitting:

11. Contractor is responsible for obtaining all required permits, paying all fees, and for otherwise complying with all applicable regulations governing the work.
12. No work shall be completed within the existing floodway until the CLOMR has been issued.
13. No work shall be completed within the delineated wetland or regulatory stream channels until the U.S. Corps of Engineers Section 404 permit is issued. All work shall adhere to the terms and conditions of this permit.
14. All work within KCMO city limits shall adhere to KCMO Site disturbance requirements.

Erosion Control:

15. The Contractor is responsible for providing erosion and sediment control BMP’s to prevent sediment from reaching paved areas, storm sewer systems, drainage courses, and adjacent properties. In the event the prevention measures are not effective, the contractor shall remove any debris, silt, or mud and restore the Right-Of-Way, or adjacent properties to original or better condition.
16. Contractor shall ensure that all construction shall conform to the requirements of the Stormwater Pollution Prevention Plan (SWPPP) a copy of which shall be maintained and updated on site by the Contractor.
17. The Contractor shall sod all disturbed areas within the Public Street Right-of-Way unless otherwise noted in the plans.
18. No trees shall be damaged or removed without prior authorization from owner unless otherwise shown on this plan.

Earthwork:

19. Slopes shall be constructed to a maximum slope of 3:1 (Horiz:Vert) unless specifically noted otherwise in the referenced Geotechnical reports.
20. Refer to "Geotechnical Engineering Report – Paragon Star Roadways and Borrow Site" Dated December 8, 2016 – along with Addendum #1 dated 1/4/17, and "Geotechnical Engineering Report – Soccer Fields" Dated July 27, 2016 prepared by Terracon Consultants, Inc. for grading recommendations and boring logs. All earthwork shall conform to the recommendations of the Reports.
21. Unless otherwise noted, all spot elevations and contours are shown to "finish" grade surface.
22. All temporary slopes and excavations should conform to Occupational Safety and Health Administration (OSHA) standards for the Construction Industry (29 CFR part 1026, subpart P).
23. Earthwork for this phase of development is intended to balance. Contractor to cut only enough fill material from the borrow source at the north end of the project as required to accomplish the fills shown on this plan set.
24. All Permanent seeded area shall be dressed with 12" topsoil and permanent seed. All other disturbed areas shall be seeded with the temporary seed mix.
25. Shale fill shall be capped with a minimum of 24" of clay material.
26. Final tolerance for graded areas shall be +/- 0.2’.
27. Earthwork quantities shown on the plans assume 15% shrinkage for all fill material. The Contractor shall perform the fill to achieve the grades shown on the drawings. The determination of the actual adjustment of fill required due to shrink/swell of various materials shall be the responsibility of the Contractor.

Utility:

28. All Manholes, Catch Basins, Utility Valves, Meter Pits, and other utility equipment shall be adjusted or rebuilt to grade as required.
29. Prior to beginning work, the Contractor shall notify all utility companies who have facilities in the vicinity of the project area of the work to be performed.

Storm Sewer:

30. All RCP shall be Class III.
31. Pipe Lengths are called out from center of structure to center of structure.
32. Drainage across the project site during construction shall be the Contractor’s responsibility. Surface drainage shall be controlled to reduce or prevent the flow of surface water onto adjacent grounds. Contractor shall control downstream erosion and silting during construction. Flexibility is given to the Contractor to make minor grading revisions along roads or between building pads to improve drainage during construction, with prior approval of the engineer.
33. Prior to ordering precast storm sewer structures, Contractor shall provide shop drawings to the Engineer for review and approval.

General Notes

G:\12720\Civil 3D Production Drawings\Mass Grading\LS Multifamily\12720C0200.dwg, Layout: 3 General Layout -- Friday June 25, 2021, 1:44pm -- Copyright 2021, George Butler Associates, Inc./Architect 00212, Professional Engineer 00025, Professional Land Surveyor 000259

PROJECT BENCHMARK:

BM #11 – Chiseled “L” on top
Northeast corner of concrete guardrail
at the Northeast corner of 1470 bridge
spanning View High Drive.
EL=833.80



GBA
8901 Renner Blvd., Ste. 300
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gbaTEAM.com

DATE:	6/25/21
DESIGN BY:	JRH
DRAWN BY:	DRV
PROJECT NO.:	12720.21
SHEET NO.	TOTAL SHEETS
3	13

Clint Loumaster
Professional Engineer
License No. 21477

Storm Sewer Improvements and Mass Grading
Paragon Star Multifamily Development
Lee's Summit, Missouri

NO.	DATE	REVISIONS	BY	APPROVED

Boundary Description:

All that part of the Northwest Quarter of Section 34, Township 48 North, Range 32 West of the Fifth Principal Meridian, and a part of Lot 2, Paragon Star First Plat, a subdivision in the City of Lee's Summit, Jackson County, Missouri, more particularly described as follows:

Commencing at the Southwest Corner of the Northwest Quarter, of said Northwest Quarter, said point also being the Southwest Corner of Tract G, of said subdivision; thence South 86°26'21" East, along the South line of said Northwest Quarter of the Northwest Quarter, and along the South line of Tract G, and Tract C, of said subdivision, a distance of 319.46 feet; thence North 03°33'39" East, departing said South lines, a distance of 85.67 feet, to the Point of Beginning, said point being on the South line of Lot 2, of said subdivision; thence North 20°09'22" West, a distance of 247.83 feet; thence North 48°39'29" East, a distance of 254.39 feet; thence South 63°50'31" East, a distance of 122.88 feet; thence South 86°22'21" East, a distance of 218.47 feet, to a point on a non-tangent curve; thence Southeasterly, along said curve to the right, having a radius of 80.01 feet, a central angle of 04°56'54", and whose initial tangent bearing is South 51°54'22" East, a distance of 6.91 feet; thence South 03°38'17" West, a distance of 1.83 feet; thence South 86°21'14" East, a distance of 6.09 feet; thence South 42°55'25" East, a distance of 440.53 feet; thence South 03°39'29" West, a distance of 50.94 feet, to a point on the South line of said Lot 2; thence North 86°20'31" West, along said South line, a distance of 743.41 feet, to the Point of Beginning, containing 236,554.57 square feet, or 5.43 acres, more or less.

Total Disturbed Area:

6.13 AC















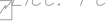



































FLOODPLAIN NOTE:

According to FEMA Flood Insurance Rate Map (FIRM) Community Panel No. 29095C0404G, effective Date 1/20/17, the tract lies partially within an area designated as Special Flood Hazard Areas. Special Flood Hazard Areas defined on portions of the site include regulatory floodway, Zone AE (with depths identified on site from 810 to 811), and 0.2% Annual Chance Flood Hazard Areas.

Existing Floodway/Floodplain refers to lines established on 1/20/2017 maps, proposed Floodway/Floodplain refers to lines established by the FEMA CLOMR dated 2/14/2020, Case No. 20–70–0520R.



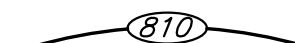

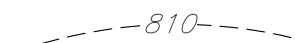
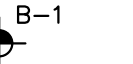
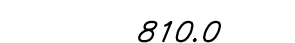

Legend

- | | |
|---|---|
|  Cable TV Pedestal |  Barbed Wire Fence |
|  Power Pole |  Centerline |
|  Guy Anchor |  Fiber Optic Line |
|  Electrical Manhole |  Gas Line |
|  Electric Meter |  Guard Rail |
|  Electrical Transformer |  Over Head Electric |
|  Electric Pedestal |  Over Head Telephone |
|  Power Pole/Telephone Pole |  Over Head Cable TV |
|  Power Pole/Light Pole |  Property Line |
|  Bollard/Guard Post |  Right-of-Way Line |
|  Gas Meter |  Sanitary Sewer Line |
|  Gas Valve |  Stream |
|  Curb Inlet |  Tree Line |
|  Junction Box |  Underground Electric |
|  Sanitary Sewer Manhole |  Underground Telephone |
|  Sanitary Cleanout |  Underground Cable TV |
|  Light Pole |  Water Line |
|  Yard Light |  Proposed Grades |
|  Boring Hole |  Proposed Storm Sewers |
|  Sign |  Existing Grades |
|  Property Corner |  Existing Storm Sewers |
|  Telephone Manhole |  Tree Deciduous |
|  Telephone Pedestal |  Fire Hydrant |
|  Telephone Pole |  Water Meter |
|  Traffic Signal Controller Box | |
|  Tree Coniferous | |

General Layout

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Legend

	Proposed Contour		Drainage Flow Arrow
	Existing Contour		Geotechnical Boring Location
	Proposed Spot Grade		Grading Limits

PROJECT BENCHMARK:

BM #11 - Chiseled "L" on top Northeast corner of concrete guardrail at the Northeast corner of 1470 bridge spanning View High Drive. EL=833.80

CAUTION:

Numerous utilities in area. Contractor to verify location and depth of all utilities prior to beginning any work.



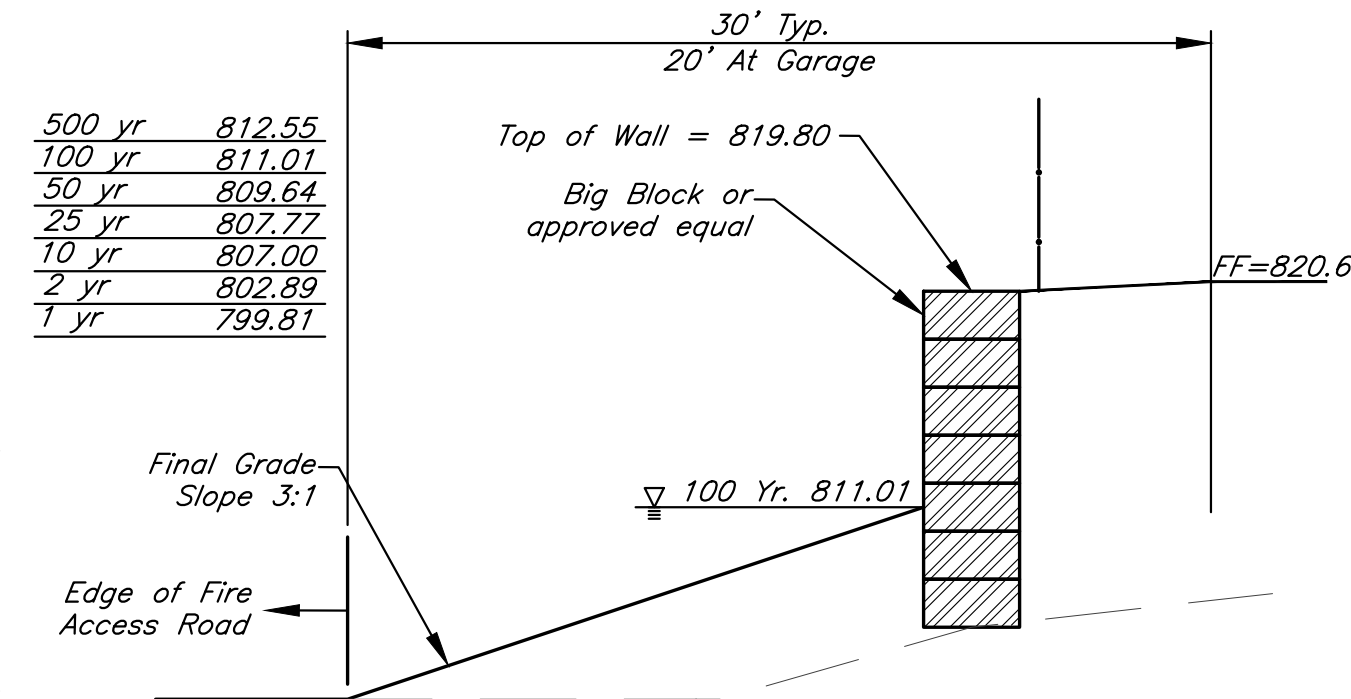
9801 Renner Blvd., Ste. 300
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4	13

Clint Loumaster
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License No. 21477

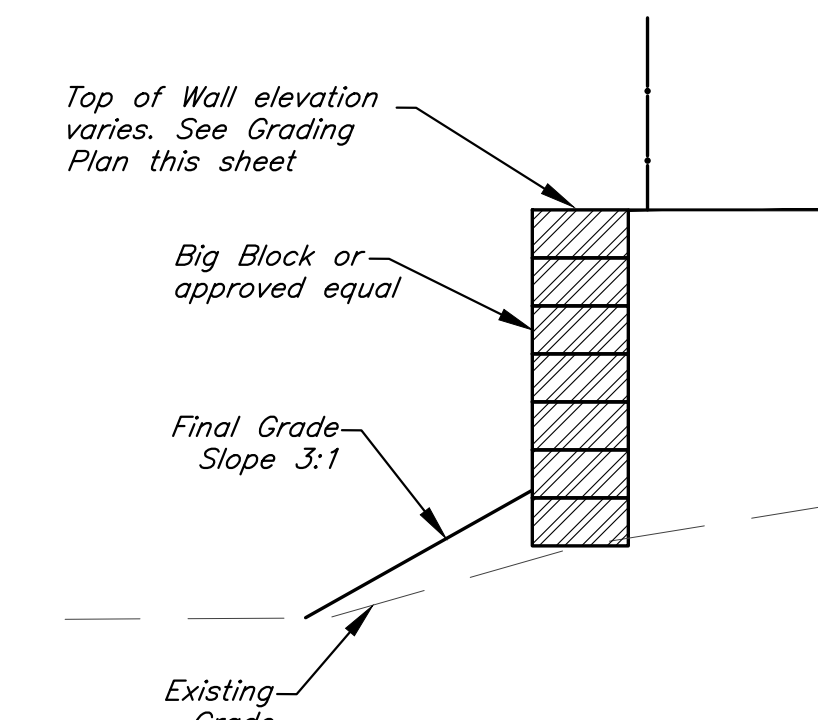
Storm Sewer Improvements and Mass Grading
Paragon Star Multifamily Development
Lee's Summit, Missouri

NO.	DATE	REVISIONS	BY	APPROVED



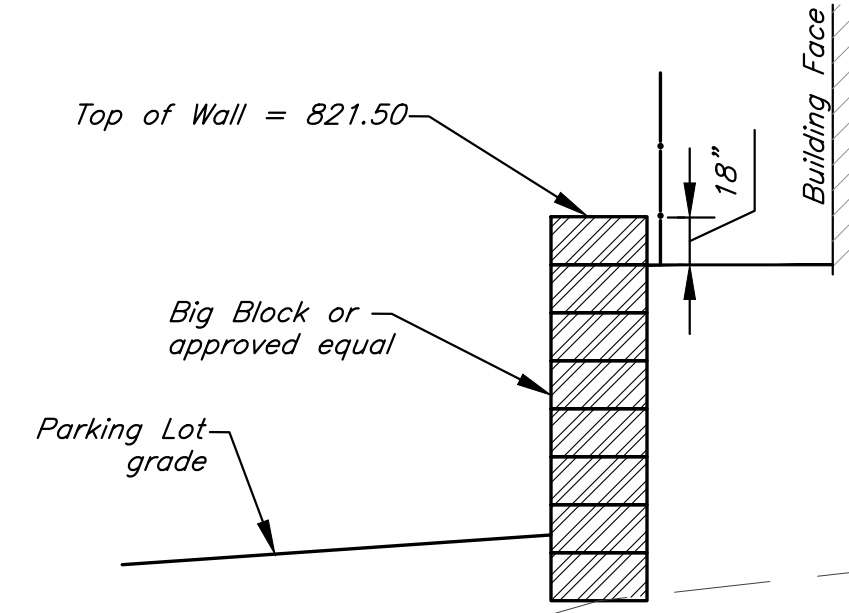
SITE WALL SECTION A-A

Not to Scale



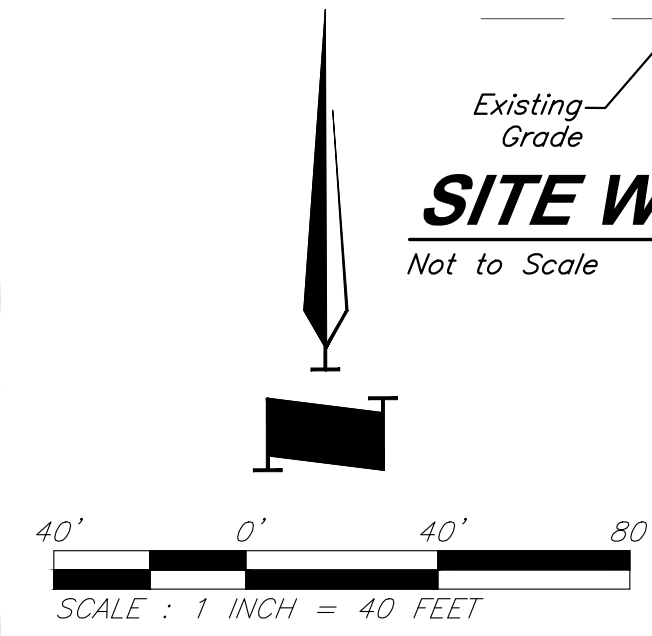
SITE WALL SECTION B-B

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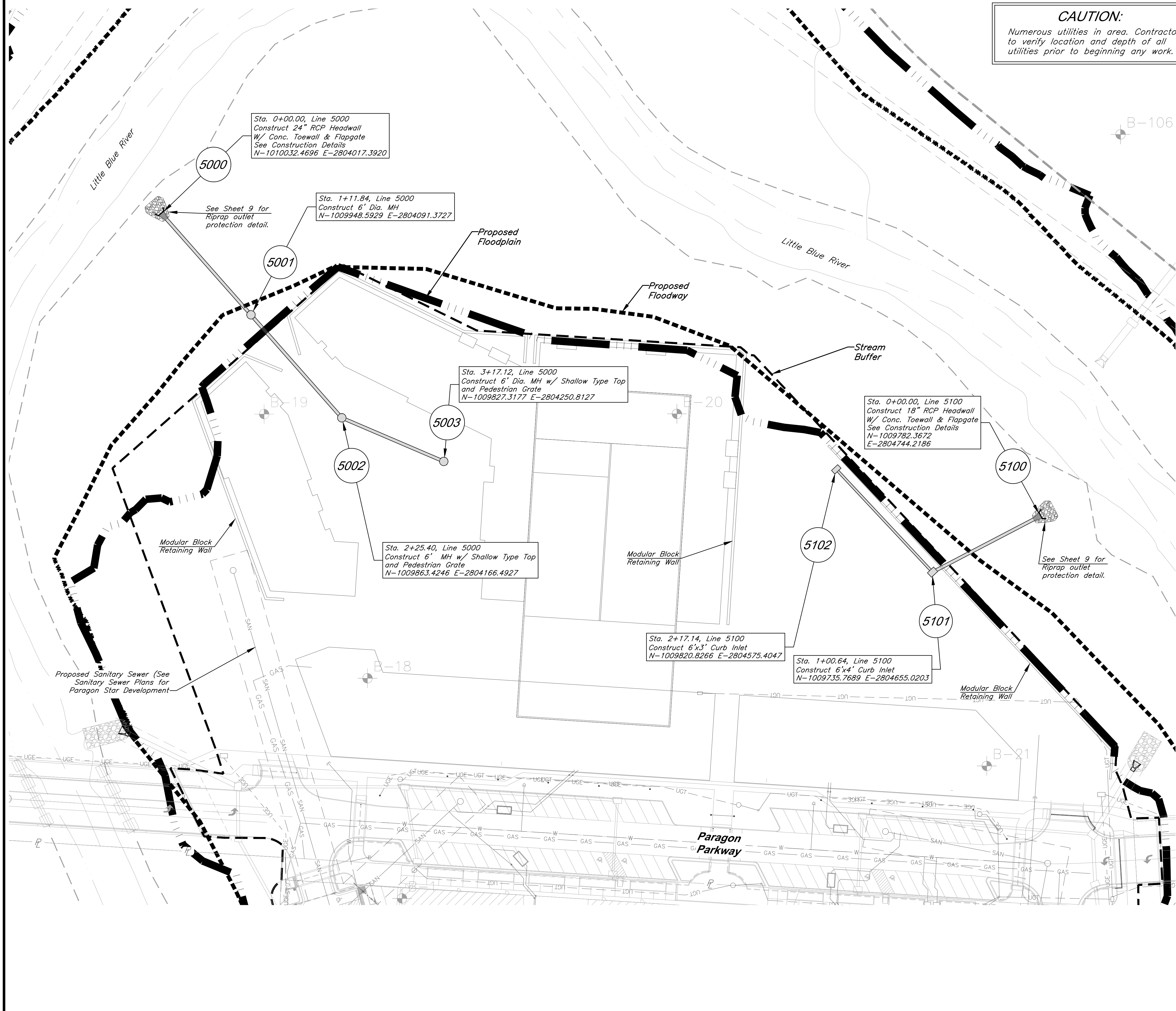
SITE WALL SECTION C-C

Not to Scale


































Grading and Dimension Plan

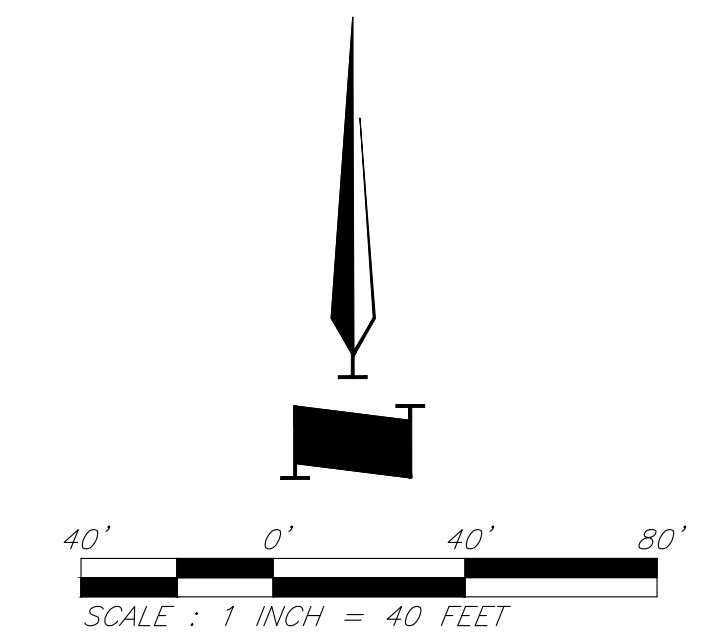
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8901 Renner Blvd., Ste. 300 Lenexa, KS 66219 913.492.0400 gbateam.com		
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NO.	DATE	REVISIONS
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- Storm Sewer General Notes:**
1. All RCP shall be class III.
 2. Storm sewer lengths are calculated from center of structure to center of structure.
 3. All pipe connections to Inlets shall occur at center of structure wall unless specifically noted otherwise.
 4. All work shall conform to City of Lee's Summit, MO standards.
 5. Precast structures shall be constructed with KCMMB 4,000 psi concrete. Shop drawings shall be submitted to the Engineer for review prior to casting.
 6. All in grade inlets shall match adjacent slope.
 7. Drainage across the project site during construction shall be the Contractor's responsibility. Surface drainage shall be controlled to reduce or prevent the flow of surface water onto adjacent grounds. Contractor shall control downstream erosion and silting during construction. Flexibility is given to the Contractor to make minor grading revisions along roads or between building pads to improve drainage during construction, with prior approval of the engineer.
 8. See Sheet 9 for rip rap details and construction details.

Utility Legend			
	Cable TV Pedestal		Water Meter
	Power Pole		Fiber Optic Line
	Guy Anchor		Fire Protection Line
	Electrical Manhole		Gas Line
	Electrical Transformer		Over Head Electric
	Gas Meter		Over Head Telephone
	Curb Inlet		Over Head Cable TV
	Sanitary Sewer Manhole		Property Line
	Sanitary Cleanout		Right-of-Way Line
	Light Pole		Sanitary Sewer Line
	Boring Hole		Underground Electric
	Telephone Pedestal		Underground Telephone
	Traffic Signal Post		Underground Cable TV
	Traffic Manhole		Water Line
	Fire Hydrant		Proposed Storm Sewer
			Future Storm Sewer



Utility Plan

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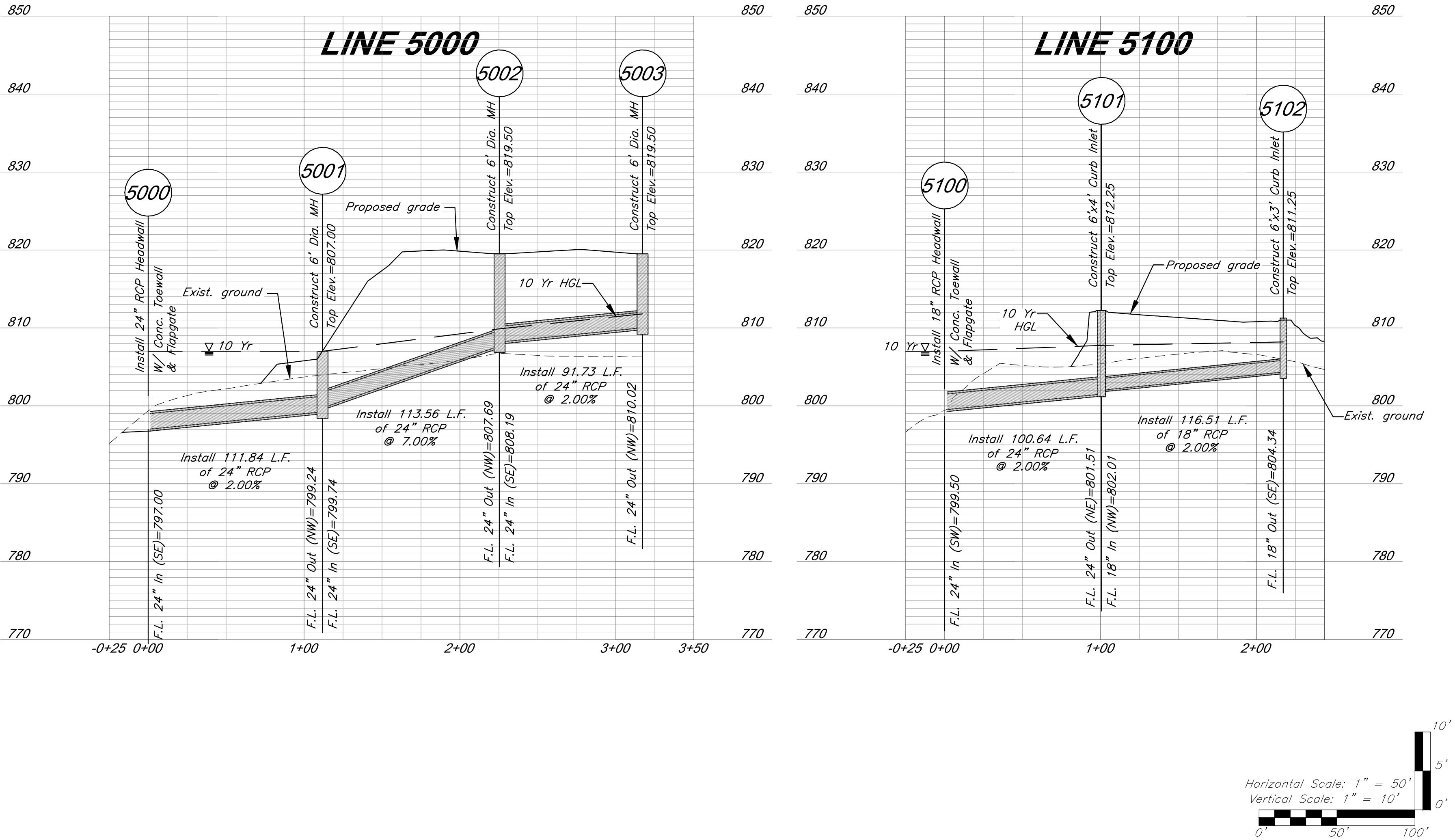
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PROJECT NO.: 12720.21	
SHEET NO.	TOTAL SHEETS
6	13

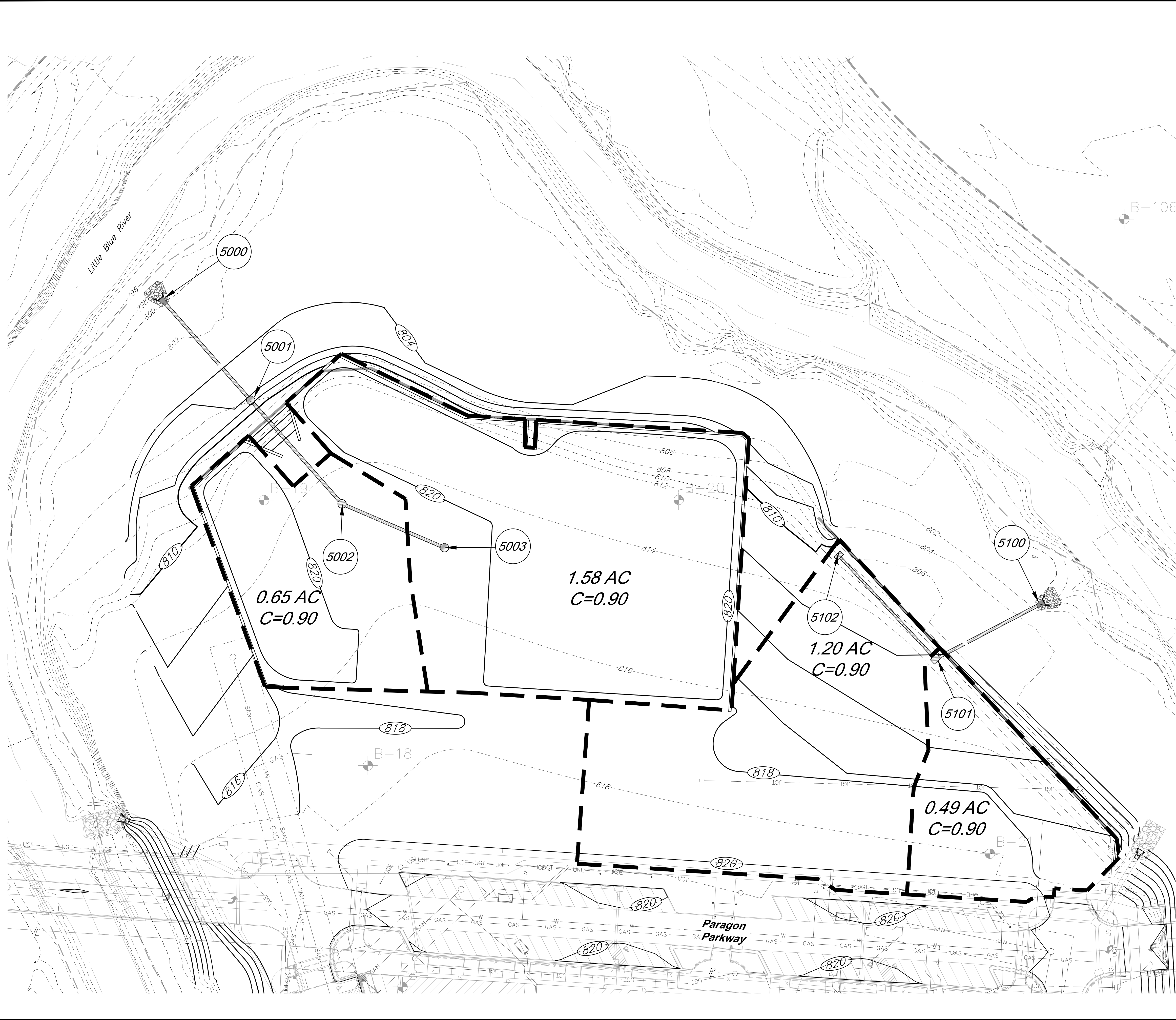
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Lee's Summit, Missouri

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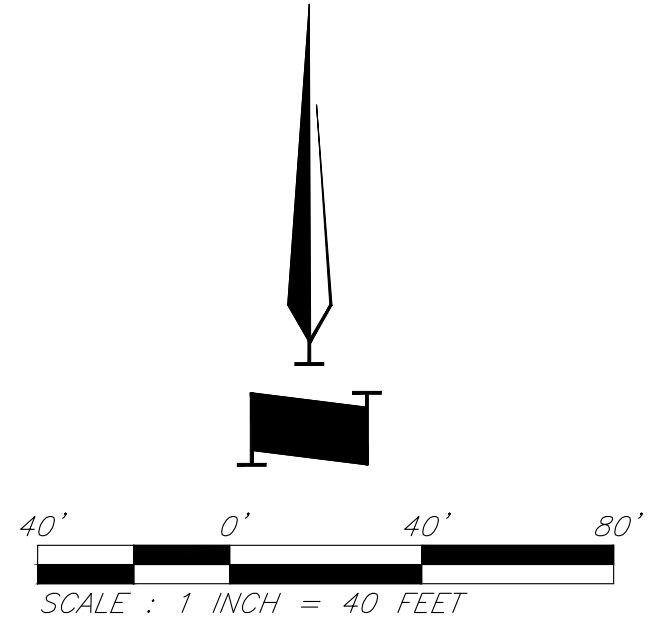


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Clint Loumaster Professional Engineer License No. 21477		
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- Legend**
- Proposed Contours
 - Existing Contour
 - Proposed Drainage Area
 - Drainage Area
 - Proposed Storm Sewer
 - Future Storm Sewer



Drainage Map

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Storm Sewer Improvements and Mass Grading
Paragon Star Multifamily Development
Lee's Summit, Missouri

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10 Year Storm																																
Structures		Runoff Calculations										Pipe Design										Design Checks										
From	To	Direct Area (acre)	Line In (acre)	Total Area (acre)	C	K	Tc (min)	Flow Time (min)	Intensity (in/hr)	Design Q (cfs)	Description	Pipe length (lin ft)	Pipe Slope Slope, %	Pipe dia (in)	Manning's n Value	Q full (cfs)	Pipe Area, sf	V full fps	Design V fps	Hw/D	outlet head, H	HW, Inlet Control, (ft)	HW, Outlet Control, (ft)	Inlet Top Elevation	Upstream flowline	Downstream flowline	Inlet Drop (ft)	Downstream Water Elevation	Hydraulic Grade Elev. (Calculated)	Hydraulic Grade (Allowable)	Comments	
Line 5000	5003	1.58			0.90	1.00	5.00		7.35	10.5	Grate Inlet													819.50					811.80	819.00		
	5002	0.65		1.58	0.90	1.00	5.00	0.17	7.35	10.5	RCP	91.73	2.00	24	0.013	32.08	3.14	10.21	9.12	0.9	0.64	811.80	810.53		810.02	808.19		809.89		819.00		
					0.90	1.00	5.00		7.35	4.3	Grate Inlet													819.50			0.5	809.89	809.89	819.00		
	5001	0.00		2.23	0.90	1.00	5.17	0.12	7.30	14.7	RCP	113.56	7.00	24	0.013	60.01	3.14	19.10	15.76	1.1	1.46	809.89	802.19		807.69	799.74		800.74		806.50		
		5000			2.23	0.90	1.00	5.00	0.19	7.35	0.0	MH												807.00			0.5	800.74	800.74	806.50		
					0.90	1.00	5.29		7.27	14.6	RCP	111.84	2.00	24	0.013	32.08	3.14	10.21	9.97	1.1	1.43	801.44	808.43		799.24	797.00		807.00		807.00		
Line 5100	5102	1.20			0.90	1.00	5.00		7.35	7.9	Curb Inlet													811.25					809.61	810.75		
	5101			1.20	0.90	1.00	5.00	0.23	7.35	7.9	RCP	116.51	2.00	18	0.013	14.90	1.77	8.43	8.54	1.2	1.85	806.15	809.61		804.34	802.01		807.76		811.75		
		0.49			0.90	1.00	5.00		7.35	3.2	Curb Inlet													812.25			0.5	807.76	807.76	811.75		
	5100			1.69	0.90	1.00	5.23	0.18	7.28	11.1	RCP	100.64	2.00	24	0.013	32.08	3.14	10.21	9.26	0.9	0.76	803.35	807.76		801.51	799.50		807.00		807.00		

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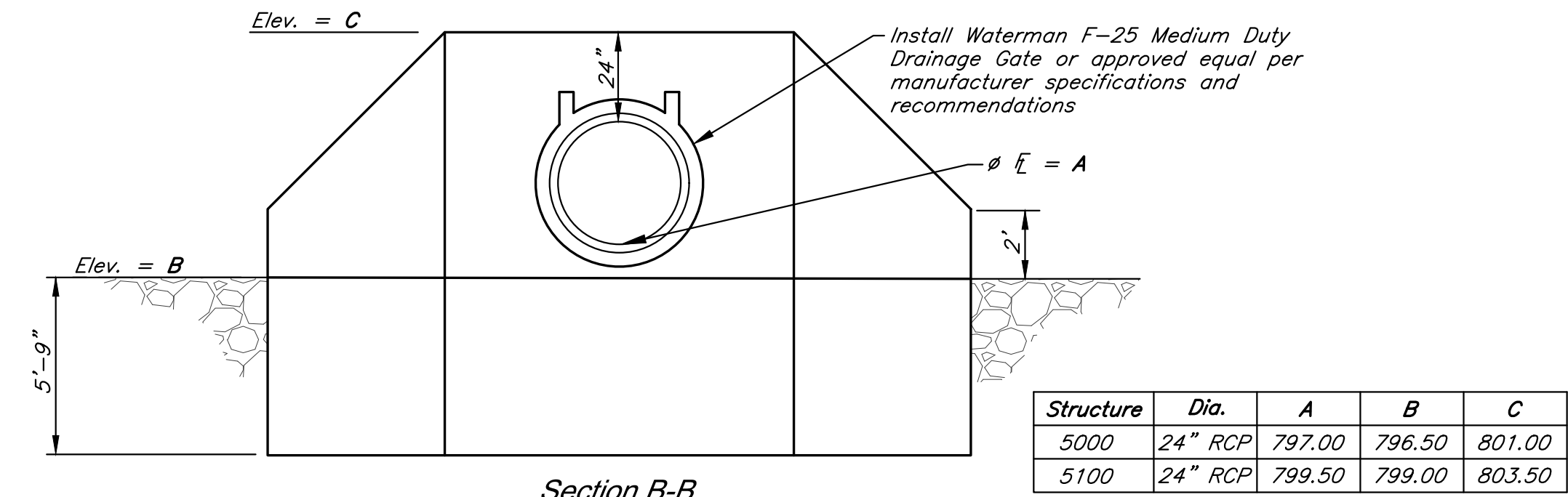
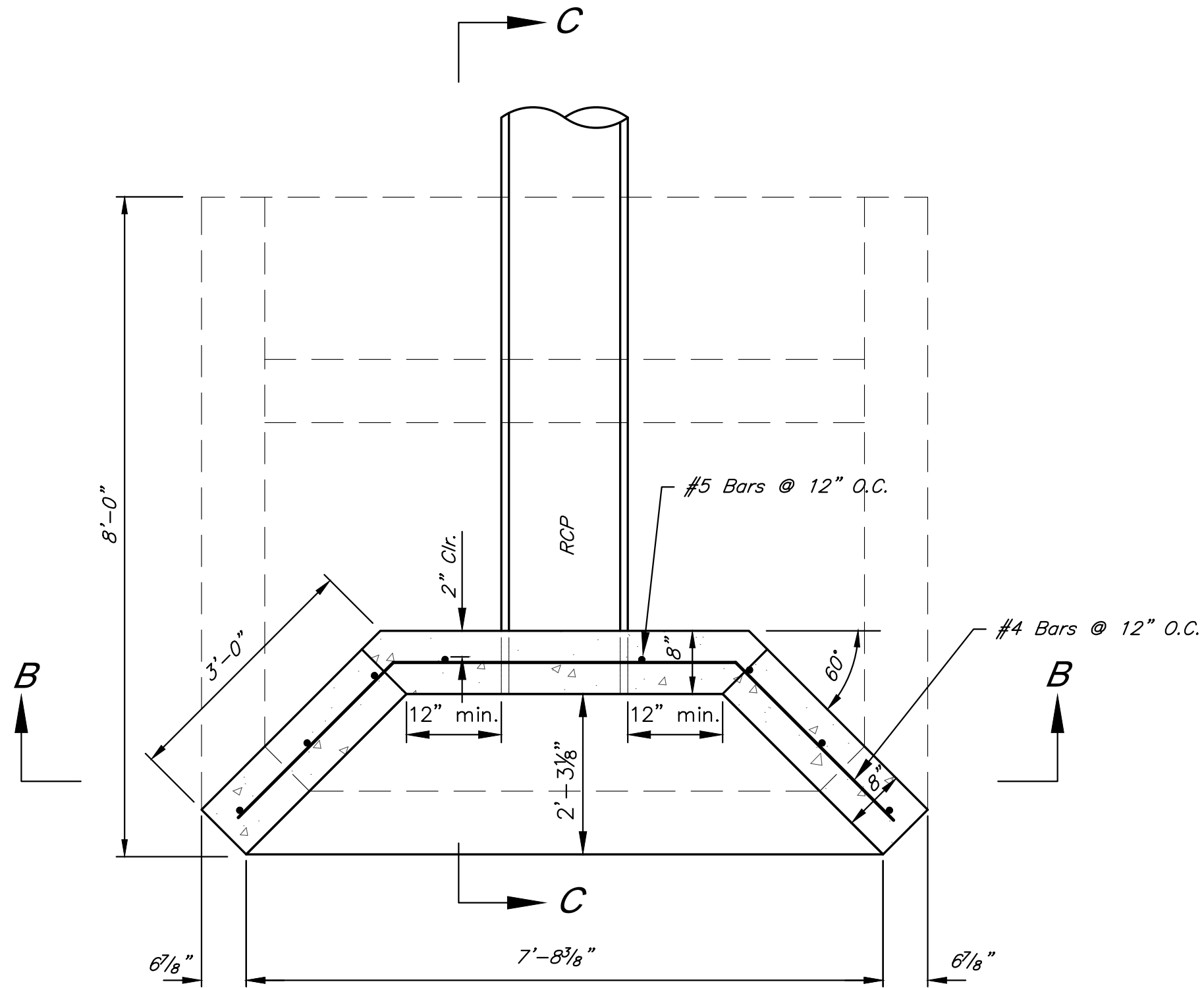
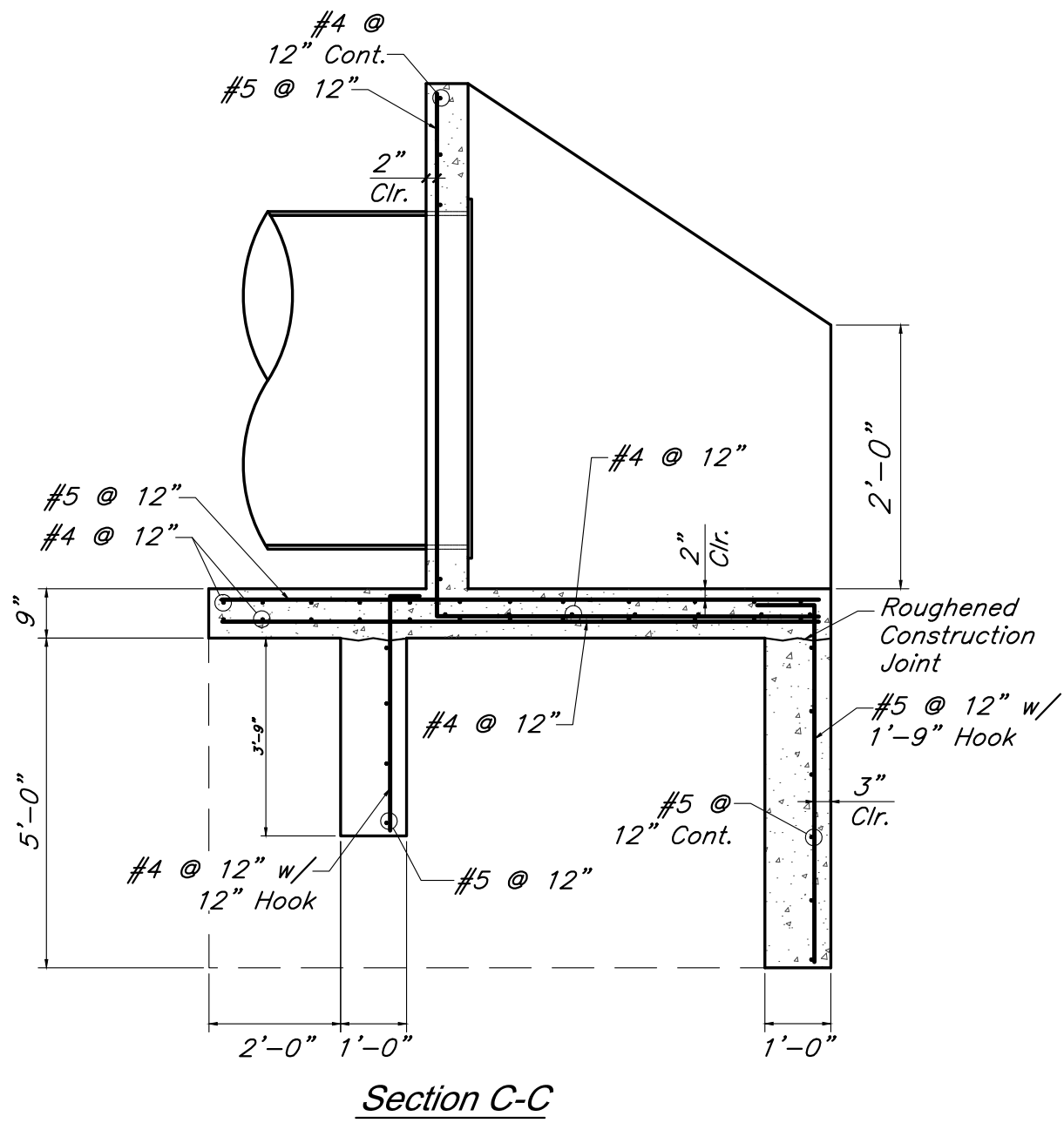
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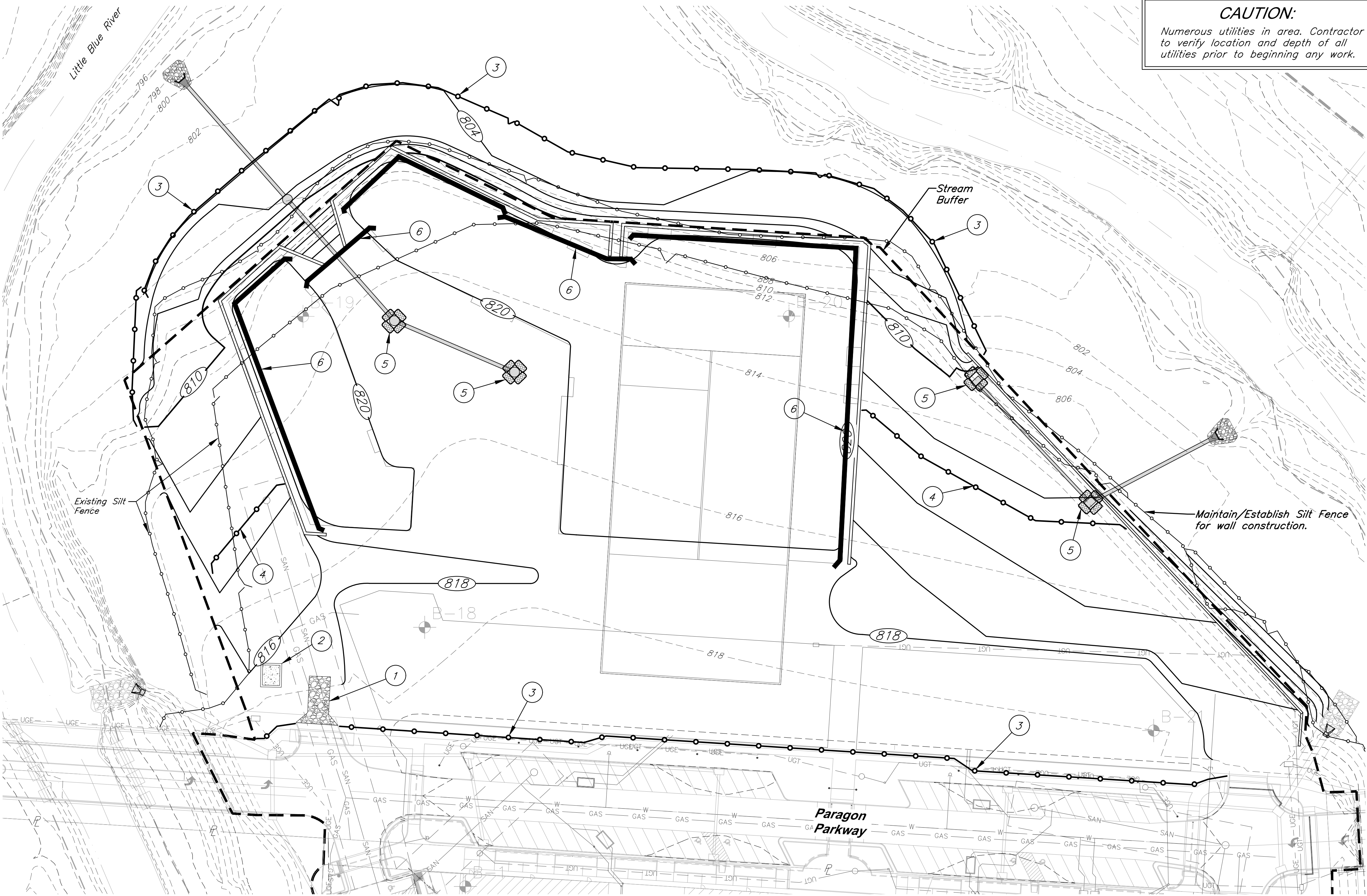
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HEADWALL DETAIL - STRUCTURE 5000/5100
Not to Scale

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CAUTION:
Numerous utilities in area. Contractor to verify location and depth of all utilities prior to beginning any work.



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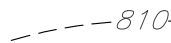




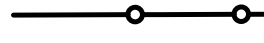
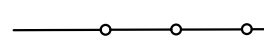
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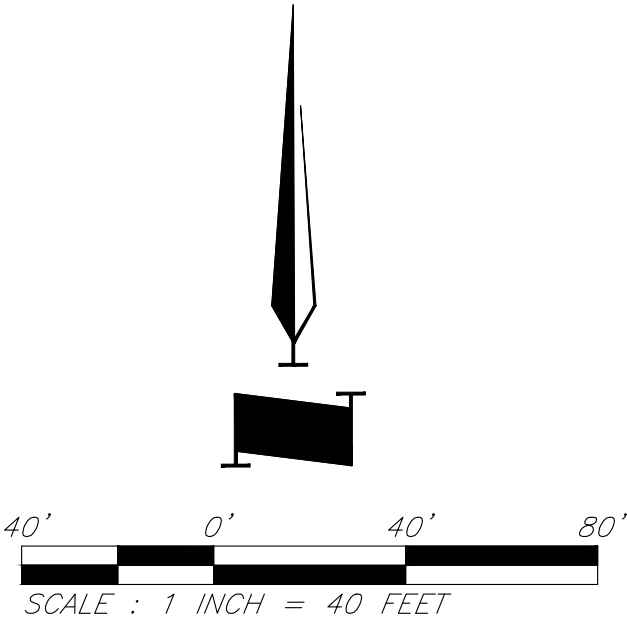
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PROJECT BENCHMARK:

BM #11 – Chiseled “L” on top
Northeast corner of concrete guardrail
at the Northeast corner of 1470 bridge
spanning View High Drive.
EL=833.80

Legend

-  Proposed Contour
-  Existing Contour
-  Geotechnical Boring Location
-  Straw Wattles
-  Inlet Filter Sock
-  Grading Limits
-  Sediment Fence
-  Exist. Sediment Fence (to be maintained)



EROSION & SEDIMENT CONTROL STAGING CHART

Project Stage	Ref. No.	BMP Description	May Remove after Stage	Notes
A. Prior to Multifamily Mass Grading	1	Const. Entrance & Staging Area	C	
	2	Construct Concrete Wash-out	C	
	3	Perimeter Silt Fence	C	
B. Mass Grading	4	Silt Fence	C	
	5	Inlet Protection	C	
	6	Straw Wattles	C	Wattles to be kept on hand for perimeter control where needed.
C. Permanent Stabilization*	7	Seed & Mulch or Blanket or Sod		Erosion control blanket to be installed w/ seed. Check approved seeding dates and install temporary stabilization if out of seeding season. Install blanket according to manufacturer's instructions and stapling pattern.

* Permanent Stabilization will be considered stabilized when 100% of disturbed area is established with perennial vegetation with a density of 70%.



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