

Preliminary Stormwater Management Plan

prepared for

Hook and Ward Mixed Use

Lee's Summit, MO 64081

October 9, 2025

Revised: November 10, 2025

Revised: December, 8, 2025

prepared by



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Lenexa, Kansas

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Schlagel & Associates Project 20-205

for

Griffin Riley Property Group

21 SE 29th Terrace

Lee's Summit, Missouri 64082

Executive Summary

October 9, 2025

Sue Pyles, P.E.
220 SE Green Street
Lee's Summit, MO 64063

**RE: Hook and Ward Mixed Use
SW Hook Road & SW Ward Road
Lee's Summit, MO 64081**

Dear Ms. Pyles,

We are submitting the enclosed preliminary stormwater management study in support of the site development plans for the multi-phase development Hook and Ward Mixed Use. Included in this development are a proposed Single-family and Multi-family development, proposed townhomes, and commercial use. This report has been prepared to address permitting requirements and provides preliminary design calculations for the required storm water detention and BMP facilities. We have modeled the existing site conditions as they existed at the time this report was prepared.

The proposed site is a 125.05-acre mixed use parcel located in Lee's Summit, MO at the intersection of SW Hook Road and SW Ward Road. The proposed development has been analyzed and designed to meet the APWA Comprehensive Control Strategy, which entails limiting post-development peak discharge rates from the site for the 2-Year, 10-Year, and 100-Year design storm events. One Extended Wet Detention Basin (EDDB) is being proposed with this development. Two previously constructed extended dry detention basins are currently located downstream of the proposed site and will be utilized for detention requirements. All basins have been designed to detain the mentioned events as well as provided 40-hour detention of runoff from the local 90% mean annual event. Additionally, to reduce downstream flooding concerns, additional detention has been provided to allow passage of the 100-year rainfall event through the existing outlet structure pipe in the event the primary outlet control device becomes clogged. All elements of the enclosed drainage system will be designed and constructed in accordance with all City of Lee's Summit, Missouri, requirements.

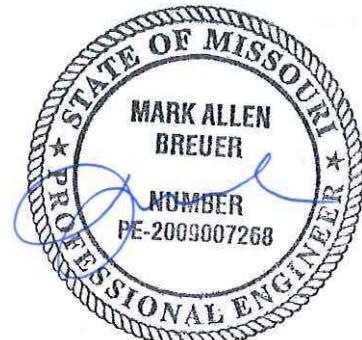
This project includes requesting a waiver for a small area located in the northeast corner of the site to allow free-release off-site without additional detention facilities to be implemented.

Sincerely,

Schlagel & Associates, P.A.

Nick Augustine, E.I.T.
Design Engineer

Mark Breuer, P.E.
Project Engineer



12.09.2025

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1.0 GENERAL INFORMATION

Griffin Riley Property Group is proposing to develop the 125.05 acres of land located in Section 20, Township 47 North, Range 31 West, Jackson County, Missouri. The property is located at the intersection of SW Hook Road and SW Ward Road. The proposed development consists of single-family lots, townhomes, apartments, and commercial use along with associated infrastructure. Currently, two existing dry detention basins exist on-site as part of the stormwater improvements performed by the City of Lee's Summit in 2014.

1.1 OBJECTIVE

The intent of this report is to provide information pertaining to the existing and proposed watersheds, identifying and addressing any downstream drainage issues, determine and address any detention requirements, provide 40-hour extended detention of runoff from the local 90% mean annual event, and address permitting requirements. This study provides the preliminary design calculations for the development of the facilities and associated infrastructure.

1.2 METHODOLOGY

The following were utilized in the assessment, preparation and analysis of watersheds in this design concept plan: *Section 5600, 2011, Storm Drainage Systems & Facilities* of the Standard Specifications & Design Criteria of the Kansas City Metropolitan Chapter of the American Public Works Association; *City of Lee's Summit, Missouri Design Criteria (2011 Revision), Storm Drainage Systems & Facilities*, prepared by the City of Lee's Summit, Missouri, Public Works Department.

Watersheds for the site were defined according to soil cover and type, tributary area, and runoff times of concentration. Soil cover was determined from inspection of the site and aerial photography. A soil survey for the project area was obtained from the United States Department of Agriculture, Natural Resources Conservation Service (NRCS), website and was utilized in determining soil type. The entire NRCS Soil Resource

Report can be found in Appendix B. Watershed size was determined from both aerial topography and topographical survey, and by the proposed grading plan.

Times of concentration were compiled according to *NRCS TR-55 Urban Hydrology for Small Watersheds (1986)* methodology for sheet flow, shallow concentrated flow, and channel flow. For this report, sheet flow travel lengths were modeled at a total distance of 100'. Travel times for channel flows were determined using the length and velocity of the open channel. *HydroCAD-10* was utilized to model the runoff. All storm events were modeled using *SCS 24-hour Type II* distributions and were modeled for 2-Year, 10-Year, and 100-Year storm events.

* * * * *

2.0 EXISTING CONDITIONS ANALYSIS

The site lies within the East Fork Little Blue River Watershed. The existing site contains 4 watersheds which have release points located in the northeast, northwest, and southern boundary of the site. Offsite stormwater comes into the site from north and southeast and drains to the release points located in the northwest and southeast release points, respectively.

2.1 TRIBUTARY AREAS

The existing drainage tributary map is provided in Appendix A, Figure A.1. The site release points have been identified as East RP, West RP, Northwest RP and Northeast RP. The area has been delineated according to the existing topography and an annotation callout of East DA – Onsite, East DA – Offsite, East Bypass, West DA – Onsite, West DA – Offsite, Northwest DA, Northwest DA – Offsite, and Northeast DA , on Figure A.2, have been provided for the watersheds that drain to the release points.

2.2 CURVE NUMBER AND TIME OF CONCENTRATION

The existing curve numbers and time of concentrations for each area have been established based on the procedures outlined in *NRCS TR-55 Urban Hydrology for Small Watersheds* (1986). Existing curve numbers were based upon aerial photography, site inspection, and the soil types present on site.

The NRCS Soil Resource Report indicated that a Hydrologic Soil Group (HSG) of C was present on site. A current aerial photograph can be found in Appendix A; it depicts the existing cover conditions. Table 2-1 found in section 2.3 Existing Flow Rates summarizes the curve numbers for each of the watershed areas.

The cover types for existing conditions were considered to be “Contoured Row Crops” in poor condition for the on-site area and off-site area. Procedures outlined in *NRCS TR-55 Urban Hydrology for Small Watersheds* recommends utilizing a curve number of 84 for HSG C contoured row crops.

Time of concentration flow paths were based upon sheet flow and shallow concentrated flow for the existing conditions. Sheet flow lengths were limited to where a grade break occurred. Flow was then considered shallow concentrated flow until a channel was visible either from the USGS topographic map or the aerial photograph, and then from that point was considered channel flow determined by the length of the channel and the velocity of flow.

2.3 EXISTING FLOW RATES

Existing flow rates were determined for the 2-Year, 10-Year, and 100-Year design storms. Offsite runoff is included in the calculations for Table 2-1 below for existing site conditions. Appropriate runoff coefficient curve numbers were based upon aerial photography, site inspection, and the soil types present on site. Detailed calculations with composite curve numbers and time of concentration can be found in the HydroCAD Model Output in Appendix B.

Table 2-1 - Existing Flow Rates

Drainage Sub-Basin	Area, AC	CN	Storm Event	Runoff, CFS
West DA - Onsite	54.09	84	2-YEAR	76.73
			10-YEAR	140.5
			100-YEAR	227.29
West DA - Offsite	6.31	84	2-YEAR	17.48
			10-YEAR	31.46
			100-YEAR	50.32
East DA - Onsite	27.83	84	2-YEAR	56.06
			10-YEAR	96.84
			100-YEAR	156.1
East DA - Offsite	19.55	84	2-YEAR	37.28
			10-YEAR	68.03
			100-YEAR	109.66
East Bypass	2.32	84	2-YEAR	6.52
			10-YEAR	11.74
			100-YEAR	18.72
Northwest DA	28.9	84	2-YEAR	57.1
			10-YEAR	104.19
			100-YEAR	167.92
Northwest DA - Offsite	2.4	84	2-YEAR	4.6
			10-YEAR	8.39
			100-YEAR	13.52
Northeast DA	10.99	84	2-YEAR	28.83
			10-YEAR	52.02
			100-YEAR	83.35

2.4 DOWNSTREAM DRAINAGE ISSUES

The existing downstream drainage system has been reviewed with this development plan. A FEMA FIRMette is included in Appendix A. The project lies outside of the identified FEMA floodplain per map 29095C0532G, dated January 20, 2017. The residential properties adjacent to the south of the proposed development has previously had drainage issues. In 2014, the City of Lee's Summit incorporated the two existing extended dry detention basins previously as part of the Stormwater Improvements Plans to help mitigate downstream flooding issues associated with the adjacent single family development. In 2020, Lamp Rynearson implemented additional stormwater improvements to add additional stormwater infrastructure to help mitigate flooding concerns.

2.5 AGENCY REVIEW

Permitting requirements of the following agencies were reviewed as part of the existing conditions analysis.

2.5.1 Corps of Engineers Review

The National Wetlands Inventory (NWI) map was reviewed for the site and there are no identified wetlands located within the project site. The NWI map can be found in Appendix A.

2.5.2 FEMA Requirements

No FEMA identified floodplain is located on the proposed property per Flood Insurance Rate Map Panel No. 29095C0532G, dated January 20, 2017 . There is currently no work proposed in the regulated floodplain. Please see the attached FEMA FIRMette in Appendix A.

2.5.3 Missouri Department of Natural Resources

All land disturbance activities will be permitted in accordance with the City of Lee's Summit, MO specifications as well as the Missouri Department of Water Pollution Control general permit under the National Pollution Discharge Elimination System (NPDES) and

an authorized Notice of Intent (NOI) application form. The disturbance of the site is greater than one acre; therefore, NPDES and NOI applications are required with the future permitting of the site in compliance with local, state and federal guidelines.

* * * * *

3.0 PROPOSED CONDITIONS ANALYSIS

With the proposed development, the site watershed will be divided into four sub-basins for analysis. Stormwater runoff will be conveyed through the site via open sheet flow, shallow concentrated flow, enclosed storm sewer, one extended wet detention basin, and two existing extended dry detention basins. All detention facilities have been designed to detain the 2-Year, 10- Year, and 100-Year storm events.

All components of the overland and enclosed storm sewer systems will meet or exceed the specifications provided in *Section 5600 – Storm Drainage Systems & Facilities* of the *Standard Specifications and Design Criteria* compiled by the Kansas City Metropolitan Chapter of the American Public Works Association.

3.1 TRIBUTARY AREAS

For the East RP, sub-catchments East DA – Onsite and East DA – Offsite will be collected by the existing extended dry detention basin located in the southeast corner of the site. All flows routed through the basin are released to an existing storm inlet structure located to the south in Tract G of Meadows at Summit Ridge, 4th Plat. West RP sub-catchments West DA – Onsite and West DA – Offsite will be collected by the existing dry detention basin located in the southwest corner of the site. Flows routed through the basin are released to an existing stormwater structure located in Tract H of Meadows at Summit Ridge, 5th Plat. Sub-catchments Northwest DA and Northwest DA – Offsite flow to NW RP and are collected by a proposed extended dry detention basin located along the eastern property line. Flows routed through the proposed basin will be released to the existing storm sewer located along SW Ward Road, where it flows to the west. For the NE RP, flows sheet flow off-site to the northeast as they currently do.

3.2 CURVE NUMBER AND TIME OF CONCENTRATION

Curve numbers for the proposed development were developed in a similar manner as the existing conditions. Hydrologic Soil Group (HSG) of D was utilized for post-development conditions. Cover types for the proposed conditions were considered to be 1/8 acre lots, Multi-Family, Single Family lots, and urban commercial in good condition.

Time of concentration was established in a similar manner as the existing conditions. Shallow concentrated flow lengths were shortened and considered paved. Detailed calculations with composite curve numbers and time of concentration can be found in the HydroCAD Model Output in Appendix B. Appendix A, Figure A.2 depicts the proposed drainage conditions.

3.3 PROPOSED FLOW RATES

Proposed flow rates were determined for the 2-Year, 10-Year, and 100-Year design storms for un-detained condition. Detailed calculations can be found in the HydroCAD Model Output Report in Appendix B.

Table 3-1 – HydroCAD Runoff Conditions

Drainage Sub-Basin	Area, AC	CN	Storm Event	Runoff, CFS
West DA - Onsite	56.1	83	2-YEAR	172.23
			10-YEAR	275.55
			100-YEAR	411.46
West DA - Offsite	6.31	84	2-YEAR	17.48
			10-YEAR	31.46
			100-YEAR	50.32
East DA - Onsite	31.59	92	2-YEAR	89.89
			10-YEAR	145.72
			100-YEAR	219.18
East DA - Offsite	19.55	84	2-YEAR	37.28
			10-YEAR	68.03
			100-YEAR	109.66
East Bypass	2.32	92	2-YEAR	8.38
			10-YEAR	13.52
			100-YEAR	20.28
Northwest DA	28.9	95	2-YEAR	109.23
			10-YEAR	170.63
			100-YEAR	251.59
Northwest DA - Offsite	2.4	84	2-YEAR	4.6
			10-YEAR	8.39
			100-YEAR	13.52
Northeast DA	5.14	92	2-YEAR	17.7
			10-YEAR	28.6
			100-YEAR	42.94

3.4 DETENTION ANALYSIS

The runoff hydrographs utilized to determine the peak flow volumes for each tributary area were determined using *TR-55* methodology and *HydroCAD-10*. For the 2-Year, 10-Year, and 100-Year storm events, the complete hydrograph routing and model output can be found in the *HydroCAD Model Output Report* in Appendix B.

The site will need to provide detention that meets the requirement under the Comprehensive Control release rates under Section 5608.4C1a and 5608.4C1b of the APWA. This entails limiting post-development peak discharge rates from the site for the 2-Year, 10-Year, and 100-Year design storm events, as well as providing 40-Hour extended detention of runoff from the local 90% mean annual event. The post-development peak discharge rates from the site shall not exceed the following:

- 50% storm peak rate less than or equal to 0.5 cfs per site acre
- 10% storm peak rate less than or equal to 2.0 cfs per site acre
- 1% storm peak rate less than or equal to 3.0 cfs per site acre

The sub-catchment for the NE release point does not meet the requirements of the comprehensive control plan, however it does not exceed existing site condition release rates. Therefore, we are requesting a waiver to allow for free release off-site without additional detention facilities to be implemented due to site limitations

Table 3-1 – *HydroCAD Runoff Conditions* are shown in Table 3-3.B - Required & Proposed Runoff Comparison. The proposed post-development design release rates are shown next to the allowable release rates for comparison.

Table 3-2.B – Allowable Release Rate Calculations

Release Point	Area, AC	Storm Event	Allowable Onsite Release Rate, CFS (A)	Allowable Offsite Release Rate, CFS (B)	Allowable Release Rate, CFS (A+B)	Existing Site Release Rate, CFS
West RP	62.66	2-YEAR	31.33	17.48	48.81	33.36
		10-YEAR	125.32	31.46	156.78	50.77
		100-YEAR	187.98	50.32	238.3	68.73
East RP	53.46	2-YEAR	26.73	37.28	64.01	35.55
		10-YEAR	106.92	68.03	174.95	46.34
		100-YEAR	160.38	109.66	270.04	65.48
NW RP	32.2	2-YEAR	16.1	4.6	20.7	61.69
		10-YEAR	64.4	8.39	72.79	112.58
		100-YEAR	96.6	13.52	110.12	181.44
NE RP	5.14	2-YEAR	2.57	0	2.57	28.83
		10-YEAR	10.28	0	10.28	52.02
		100-YEAR	15.42	0	15.42	83.35

Table 3-3.B - Required & Proposed Runoff Comparison

Release Point	Area, AC	Storm Event	Allowable Release Rate, CFS	Proposed Release Rate, CFS
West RP	62.66	2-YEAR	48.81	46.26
		10-YEAR	156.78	59.43
		100-YEAR	238.3	103.87
East RP	53.46	2-YEAR	64.01	40.69
		10-YEAR	174.95	50.32
		100-YEAR	270.04	91.15
NW RP	28.9	2-YEAR	20.7	14.8
		10-YEAR	72.79	51.28
		100-YEAR	110.12	65.58
NE RP	5.14	2-YEAR	2.57	17.7
		10-YEAR	10.28	28.6
		100-YEAR	15.42	42.94

Please note: Site release rates are not a direct addition of sub-basin runoff due to differences in the time peak as well as storage effects within the basins.

Proposed stormwater drainage structures will be located throughout the site to capture and convey proposed stormwater runoff to both wet and dry detention basins. The Water Quality volume for all proposed basins will be released over 40 hours. Water quality outlet structures have been provided for each basin and have been designed to meet the allowable release rates provided in Table 3-2 for the 2, 10, and 100-year storm events. The water quality storm event will be controlled by a V-notch weir for the proposed extended wet detention basin. Please refer to the Stormwater Improvement Plans provided in Appendix A for design of the water quality structures for the existing dry detention basins.

For each basin, the primary control device was removed from the HydroCAD model to simulate a clogged condition. For this clogged condition, detention storage has been provided to allow passage of the 100-year rainfall event through the existing outlet structure pipe without the use of an earthen weir overflow. The analysis of the existing dams were also included. With the primary control device assumed clogged, the 100-year storm event was able to be contained within both basins. With the proposed grading of the site, re-grading of the basins will be required to keep the 100-year clogged WSE a minimum of 20' off the property line. In addition to this, earthen weir emergency spillways will be provided for each basin per Section 5600 of the Design and Construction Manual. Each emergency spillway will be set at least 0.5 feet above the 100-year clogged water surface elevation and designed to carry the 100-year storm event. An additional 1 foot of freeboard will be provided from the water surface elevation in the spillway and the top of dam Reconstruction of the existing dams will be required to meet freeboard requirements. Details will be provided with final construction documents. Table 3-4 summarizes the results of this analysis.

Table 3-4 – Emergency Spillway Analysis

	Storm Event	Inflow to Basin (CFS)	Emergency Spillway Elevation (FT)	Emergency Spillway Length (FT)	Clogged Surface Elevation
EWDB #1	1% (100 Year)	262.18	1009	150	1009.67
East Basin	1% (100 Year)	324.66	1014	460	1014.53
West Basin	1% (100 Year)	454.65	1004	460	1003.89

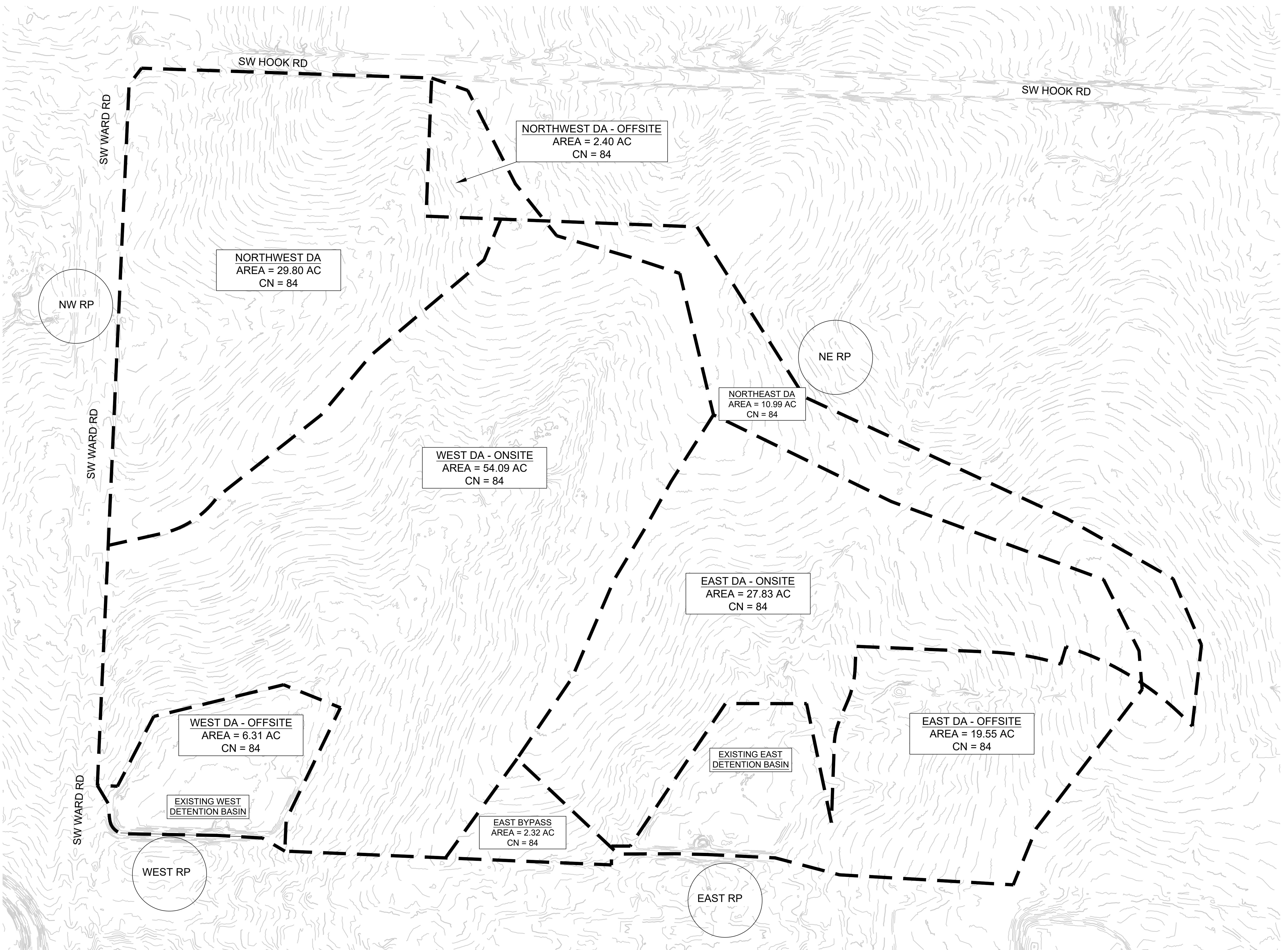
Additionally, erosion control procedures will be designed and implemented at the outlets to reduce impact on the site downstream.

* * * * *

4.0 SUMMARY AND RECOMMENDATIONS

The proposed drainage site is a 125.05-acre mixed use parcel of land located in Lee's Summit, MO at the intersection of SW Hook Road and SW Ward Road. The proposed development has been analyzed and designed to meet the APWA Comprehensive Control Strategy, which entails limiting post-development peak discharge rates from the site for the 2-Year, 10-Year, and 100-Year design storm events. One extended wet detention basin and two existing extended dry detention basins have been designed to detain the mentioned events as well as provided 40-hour detention of runoff from the local 90% mean annual event. All elements of the enclosed drainage system will be designed and constructed in accordance with all City of Lee's Summit, Missouri, requirements.

* * * *



PREPARED BY:

SCHLAGEL & ASSOCIATES, P.A.

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WARD AND HOOK MIXED USE HYDRO MAPS

SW WARD RD & SW HOOK RD LEE'S SUMMIT, MO

DRAINAGE MAP

A1



A scale bar diagram consisting of a horizontal line divided into 10 equal segments. The first 9 segments are black, representing 250 feet, while the 10th segment is white, representing 1 inch. Below the bar, the text "SCALE: 1" = 250' is centered.

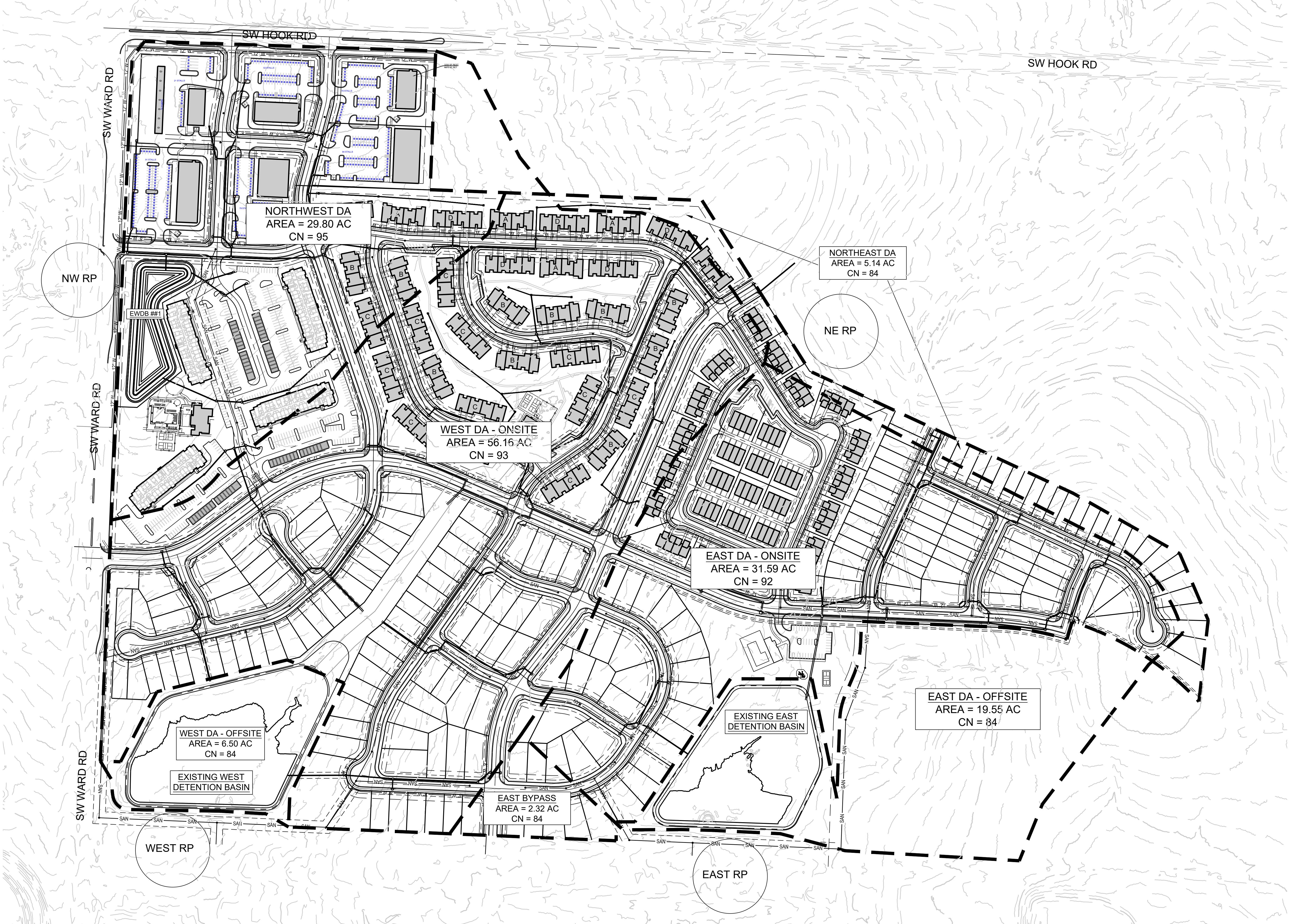
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DATE PREPARED: 04/11/2025	5 6	
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EXISTING DRAINAGE MAP		
SHEET A1		

WARD AND HOOK MIXED USE
HYDRO MAPS

SW WARD RD & SW HOOK RD LEE'S SUMMIT, MO



DRAWN BY:	REVISION DATE	DESCRIPTION
NCA	DATE	DESCRIPTION 1
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SHEET

A2

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SCALE: 1" = 250'