HAWTHORN RIDGE DEVELOPMENT STORMWATER MANAGEMENT FACILITY-BEST MANAGEMENT PRACTICES OPERATION AND MAINTENANCE PLAN

Prepared for:

Clayton Properties Group, Inc. dba Summit Homes

Lee's Summit, Missouri

October 2021

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PURPOSE

Stormwater Best Management Practices (BMPs) are implemented in this development to meet stormwater discharge water-quality standards of the City of Lee's Summit, Missouri. Permanent BMPs are provided via this development. In order for physical stormwater BMPs to be effective, proper maintenance is essential. Maintenance includes both routinely scheduled activities, as well as non-routine repairs that may be required after large storms, or because of other unforeseen conditions. Maintenance of site specific BMPs is the responsibility of the property owner and a requirement of approval for this development. The property owner, heirs and assigns shall maintain appropriate funds to provide all maintenance required up to and including replacement of said facilities at end of their useful life. The property owners shall require implementation of this manual for all BMPs transferred with land ownership transfer to subsequent property owners, heirs and assigns.

1. GENERAL SITE OVERVIEW

Hawthorn Ridge is proposed as a 204-lot single family residential subdivision on the south side of SW Hook Rd approximately 1,300 feet east of SW Pryor Road as shown on Figure 1. The site is bounded by SW Hook Rd to the north, and estate lot residential on the west, east, and south. This locates the development in the NW ¼ of Section 25, Township 47 N, Range 32 W, Lee's Summit, Jackson County, Missouri.

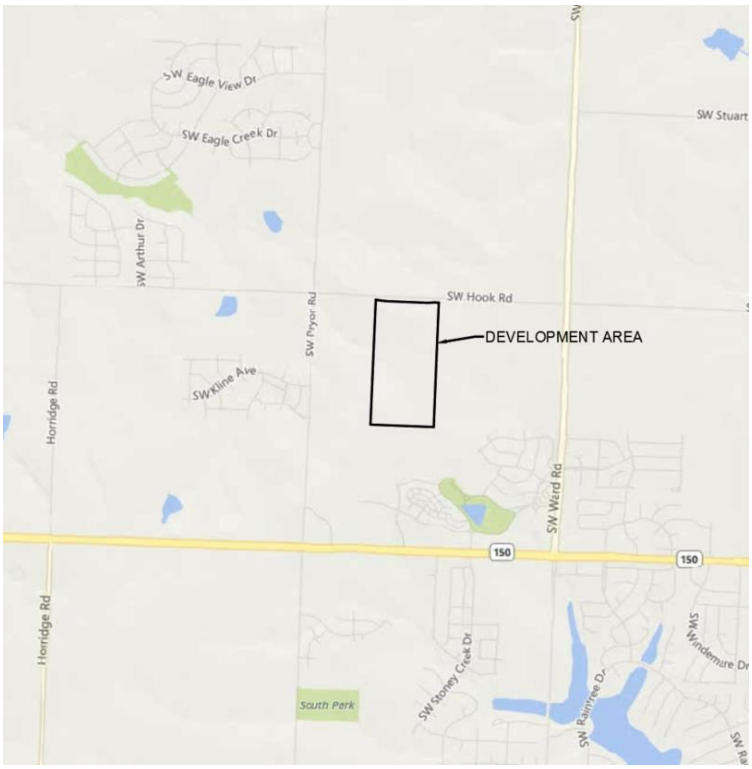


Figure 1. Location Map.

1.1 Locations of Stormwater Best Management Practices

The Hawthorn Ridge Development has two stormwater detention basins located within the development. Wet detention basin is in Tract B, south of SW Hook Road, east of SW Arboridge Drive, north and west of SW Arbor Creek Drive. Dry detention basin is in Tract E, west of SW Arboridge Drive. Refer to Appendix A for location of both detention basins on the development map.

1.2 Types of Stormwater Best Management Practices

There are many different measures which can provide stormwater BMPs. The below list are the ones utilized within this development.

- Native vegetation
- Stormwater dry detention basin
- Stormwater wet detention basin

2. MAINTENANCE OF STORMWATER MANAGEMENT FACILITIES

Stormwater management facilities need to be maintained to function properly. This section will discuss how to properly maintain the facilities within this development.

2.1 Native Vegetation

Native vegetation provides many benefits for stormwater management. Per the APWA/MARC BMP manual, dated October 2012, the below are some of these benefits:

- Containing species of plants indigenous to the area, vegetation will be able to thrive in the local climate with less maintenance.
- Deep roots enhance stormwater infiltration into the soil.
- With deep-rooted nature, native vegetation is able to withstand flooding events as well as extended dry periods.
- Reduces flow velocity of stormwater runoff.
- Attracts wildlife and improved biological diversity.
- Requires little to no fertilizer or chemical maintenance, as well as reduced amounts of water to survive.

With these benefits, the bottom of a stormwater basin is an ideal place for native vegetation to be planted. The basin located within Tract E, as well as portions of Tract D, are intended to be vegetated by natives. Some of the typical plants one may see are below:

- Prairie Cordgrass
- Dark Green Bulrush
- Dudley's Rush
- Milkweed
- Fox Sedge
- Water Plantain
- Aster
- Iris
- Sedge
- Coneflower
- Goldenrod
- Blazingstar
- Fescue
- Cattail*
- Switchgrass
- Indian Grass
- Little Bluestem
- Big Bluestem

*Cattail growth shall be monitored to limit spread and not crowd out other species.

The maintenance requirements for native vegetation will vary depending on the climate, thus the maintenance of such should be flexible and allowed to change over time to allow responses to nature. The plan laid out in the below table are recommendations, the formal maintenance shall be adoptive based on the recommendations in Table 1.

Table 1. Maintenance of Native Vegetation

Required Action	Maintenance Objective	Frequency of Action
Debris and Litter Removal	Removal of debris and litter from the basin area to minimize outlet clogging and improve aesthetics	Periodically and after large rain events
1st year of establishment-mowing*	To maintain a healthy level of vegetation	Mow no more than monthly to a minimum height of 5”
2nd year of establishment-mowing*	To maintain a healthy level of vegetation	Mow once in June to a minimum height of 8”, spot treat weeds as necessary
3rd year and beyond of establishment-mowing*	To maintain a healthy level of vegetation	Mow once in the off-season (Late October to Early March) to a minimum height of 8”
Removal of invasive species	To encourage a healthy native plant environment, growth of species invasive to the area shall not occur	Periodically
Seeding (recommend to use a mix with the above plantings)	To establish plantings in bare areas	Shall occur if areas are bare soil for extend period of time

*Native vegetation shall never be mowed in wet or muddy conditions.

2.2 Extended Dry Detention Basin

Extended dry detention basins provide detention for the water quality volume with a 40-hour release rate, along with detention for up to the 100-year storm event. These basins are typically simple in design, which helps make them relatively easy and inexpensive to maintain.

The basins within this development are planted with native vegetation, which maintenance requirements were discussed in Section 2.1, thus Table 2, is looking at the maintenance for the overall detention basin and not focused on the vegetation.

Table 2. Maintenance of Extended Dry Detention Basin

Required Action	Maintenance Objective	Frequency of Action
Debris and Litter Removal	Removal of debris and litter from the basin area to minimize outlet clogging and improve aesthetics	Periodically and after large rain events
Repairing Erosion	If erosional channels occur due to lack of vegetation and large rainfall events, the area shall be re-graded to fill in the channels and new vegetation shall be established per Section 2.1.	Periodically, as occurs after large rain events
Inspection of Outlet	To ensure the outlet box for the basin is function properly	Yearly in the springtime and periodically until winter
Inspection of the Spillway	To ensure spillway is stable and functioning correctly	Yearly in the springtime and periodically until winter
Removal of Sediment	To ensure the basin has enough volume to handle rainfall events and function as designed	Rare once the area draining to the basin is fully developed and vegetation established. Should occur if owner notices large amounts of silt in the bottom that is preventing the basin from draining/functioning.

Maintenance for the basin shall be minimal to the owner, however if unforeseen events happen, the owner shall restore the basin, per the Detention Basin As-built sheet, Appendix B.

2.3 Extended Wet Detention Basin

Extended wet detention basins are similar to dry detention basin with the difference that wet detention basins have a permanent body of water. Storm runoff is captured in the wet basin, raising the water level above the level of permanent pool. Then, the excess water accumulation dissipates at a 40-hour release rate. Detention capacity is enough to handle up to the 100-year storm events. Due to the constant presence of water, it is essential to keep the wet basin maintained at all times. Table 3 below is looking at the maintenance guidelines for the wet detention basin.

Table 3. Maintenance of Extended Wet Detention Basin

Required Action	Maintenance Objective	Frequency of Action
Debris and Litter Removal	Removal of debris and litter from the basin area to minimize outlet clogging and improve aesthetics	Periodically and after large rain events
Repairing Erosion	During the establishment phase, if erosional channels occur due to large rainfall events, the area shall	Periodically during the establishment phase, as occurs after large rain events

	be re-graded to fill in the channels and new vegetation, if needed, shall be established per Section 2.1.	
Evaluation of Plant Composition	To avoid woody invasion and plant/flower overtake	Yearly in the springtime/summer
Inspection of Outlet	To ensure the outlet box for the basin is function properly	Weekly
Inspection of the Spillway	To ensure spillway is stable and functioning correctly	Yearly in the springtime and periodically until winter
Inspection/Removal of Sediment	To ensure the basin has enough volume to handle rainfall events and function as designed	Yearly in the springtime and periodically until winter. Also when sediment reaches 18” from the outlet and/or when any pretreatment structures are 50% full.
Inspection of Aeration System Components	To ensure all aeration system components (fountains, bubblers, feeder hoses, electrical conduits) are functioning properly	Yearly in the springtime and periodically until springtime
Inspection of Pool Depth with Probing Rod	To ensure the basin has enough volume to handle rainfall events and function as designed	Every 3 years

2.4 Inspection of Facilities

The above sections mentioned maintenance and frequency for each action. When an inspection of the facilities is performed, the form found in Appendix C, shall be filled out and included in this report for record keeping. It is recommended that owner walks around the facility areas yearly to check conditions and make sure no major concerns are occurring. If they see something of concern, they should reach out to a licensed professional for a deeper inspection of the issues and guidance on repairs required.

2.5 Repairs to Facilities

Many maintenance items can be done by the owner, however if larger repairs are needed the owner shall seek out a qualified contractor. Items that may require a contractor to perform are:

- Removal of sediment build up.
    - If there is undeveloped land, in proximity of the basin, sediment may be placed there with proper erosion control measure and seeding shall occur.
    - If the surrounding area is fully developed, then sediment shall be hauled off site to a proper disposal location.
- Repairs to the concrete outlet structure, spillway, or outlet pipe.
- Major erosional channels occurring on the sides slopes of the basin.

3. CHANGES TO THE CURRENT PLAN

This section will discuss the process if changes are desired to the current Stormwater Management Facility-Best Management Practices Operation and Maintenance Plan.

3.1 Ownership Change

In the event of ownership change of the land which BMPs are located on, the following steps should be performed.

1. Current owner shall have all BMPs inspected and reviewed to be fully functioning, per this plan. If deficiencies are found both parties shall discuss and agree upon a plan to address deficiencies.
2. City shall be notified via writing of the ownership change within 30 days.
3. Appendix D shall be updated with the new owner information.

3.2 Additional Land Added to the Development

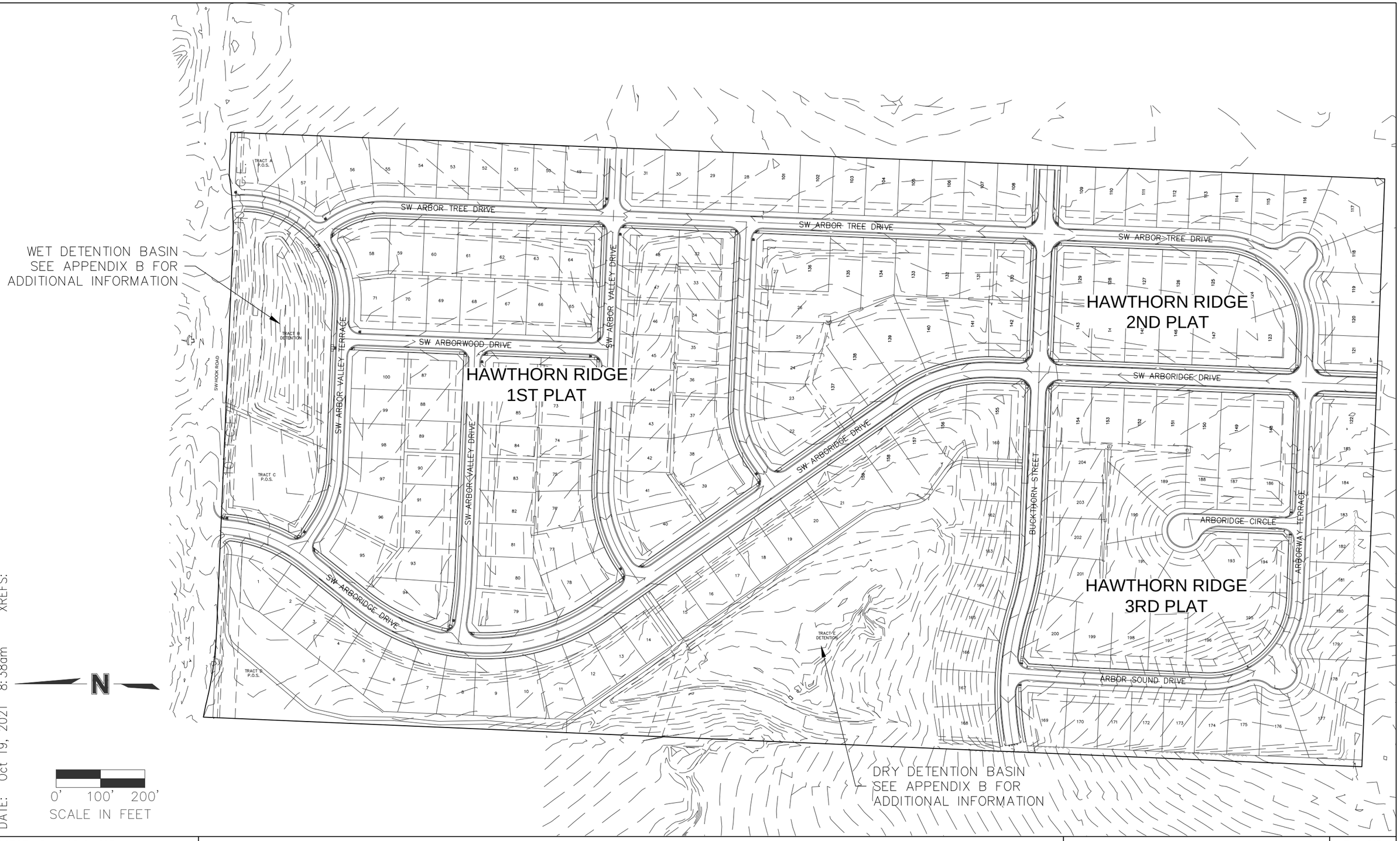
If additional land is added into the development, this document shall be updated to include any stormwater management facilities located within the additional area. A revision date shall be provided for the document along with a copy provided to the City of Lee's Summit, Missouri for review.

3.3 Changes to How Maintenance is Performed

If the owner has desire to change the recommended maintenance mentioned in this document, they shall prepare an update to this document and present it to Development Services Department with the City of Lee's Summit, Missouri to review. The City may require a licensed professional to update the recommendations.

APPENDIX A

Location of Stormwater Management Facilities



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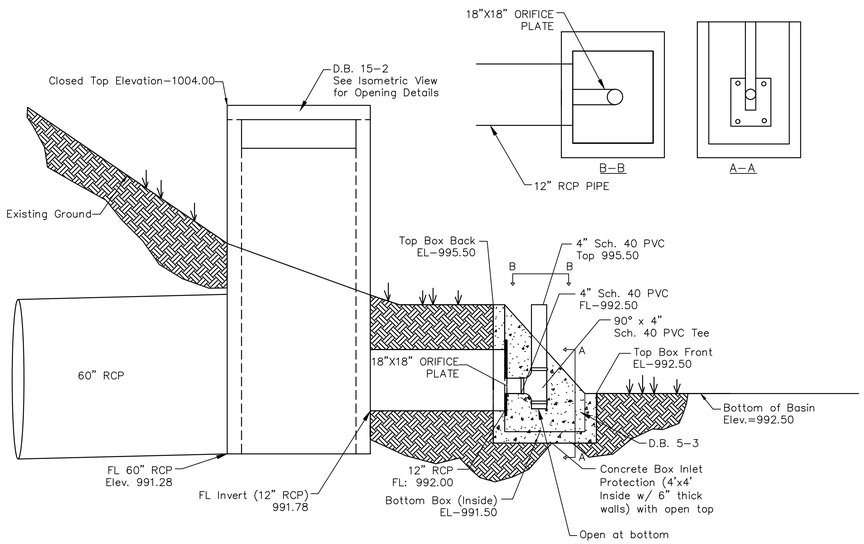
DATE: Oct 19, 2021 8:38am XREFS:

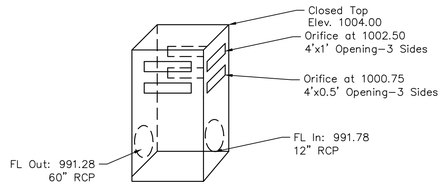
PROJECT NO: A019-1605	APPENDIX A-STORM WATER MANAGEMENT FACILITY LOCATION	olsson 1301 Burlington Street North Kansas City, MO 64116 TEL 816.361.1177	EXHIBIT 1
DRAWN BY: AA			
DATE: 2021.10.19			

APPENDIX B

Detention Basin As-Built Plan

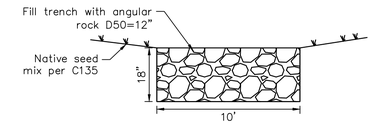


D.B. 15-2 and D.B. 15-3 Detail
N.T.S.



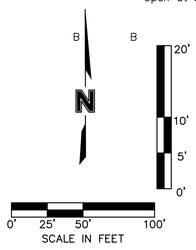
D.B. 15-2
DETENTION BASIN OUTLET CONTROL
N.T.S.

Riprap Calculations									
Sturcture	Discharge Flow (cfs)	Pipe Diameter (ft)	Class*	D50* (in)	Apron Length (ft)	Apron Depth (ft)	Apron Width (ft)	Area (SY)	
E.S. 15-1	164.51	5	4.00	14.00	30	2.57	35.00	~~74.18~~	**59.18 S.Y.**
*Per Table 10.1 HEC 14-FHWA-Energy Dissipators Pg. 10-18									

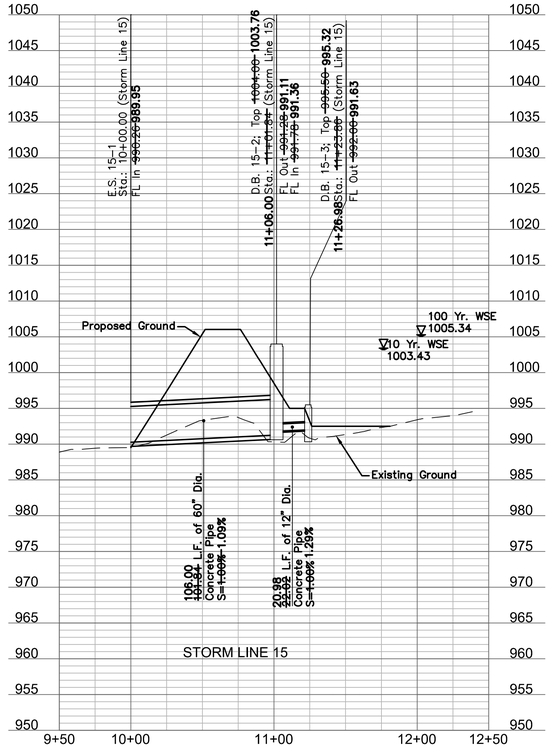


ROCK TRENCH
N.T.S.

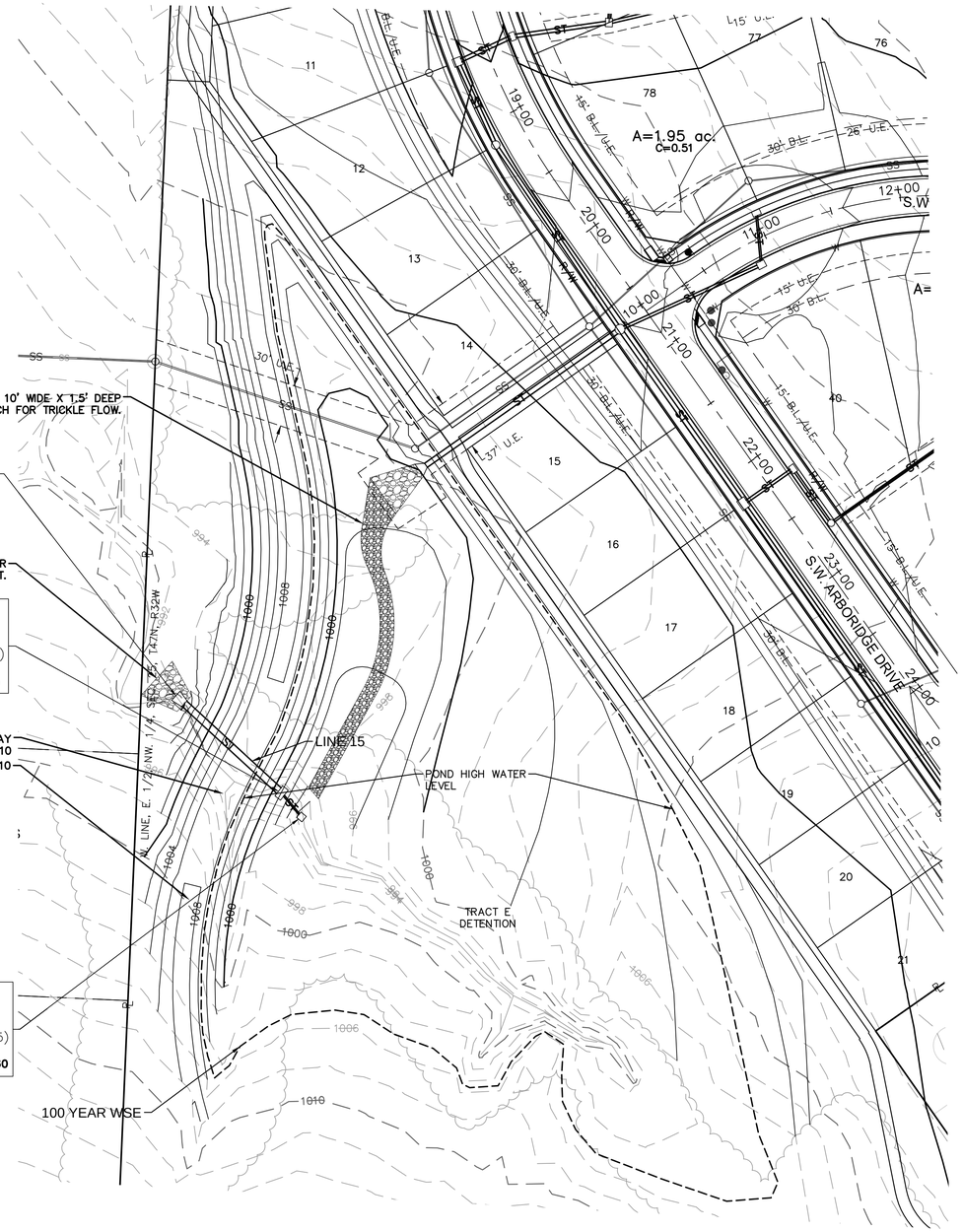
10yr. W.S.E.	100yr. W.S.E.
1003.43	1005.34



NOTE: CONTRACTOR SHALL FILL AND COMPACT TO 95% STANDARD DENSITY TO A POINT 18" MINIMUM ABOVE TOP OF PIPE PRIOR TO EXCAVATION FOR THE PIPE.



AS BUILT
DATE: 12/19/2018



OLSSON ASSOCIATES
Olsson Associates - Civil Engineering
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701 Ellis Street, Suite 100
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FAX 816.587.1393
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STATE OF MISSOURI
MELISSA G. DEGONIA
NUMBER PE-2011000892
PROFESSIONAL ENGINEER

REVISIONS

NO. REV.	DATE	REVISIONS DESCRIPTION	BY
1	04.19.2017	Revised detail	MGD
2	01.08.2018	Revised structures	MGD
5	02.14.2018	Added notes	MGD
6	03.08.2018	Plan sheet revised per city comments	

DETENTION BASIN PLAN

HAWTHORN RIDGE 1ST PLAT

LEE'S SUMMIT, MO

2018

drawn by: D.A.H.O
checked by: M.G.D.
designed by: P.M.D
QA/QC by: K.S.J
project no.: 017-0188
date: 03.03.2017

SHEET C124

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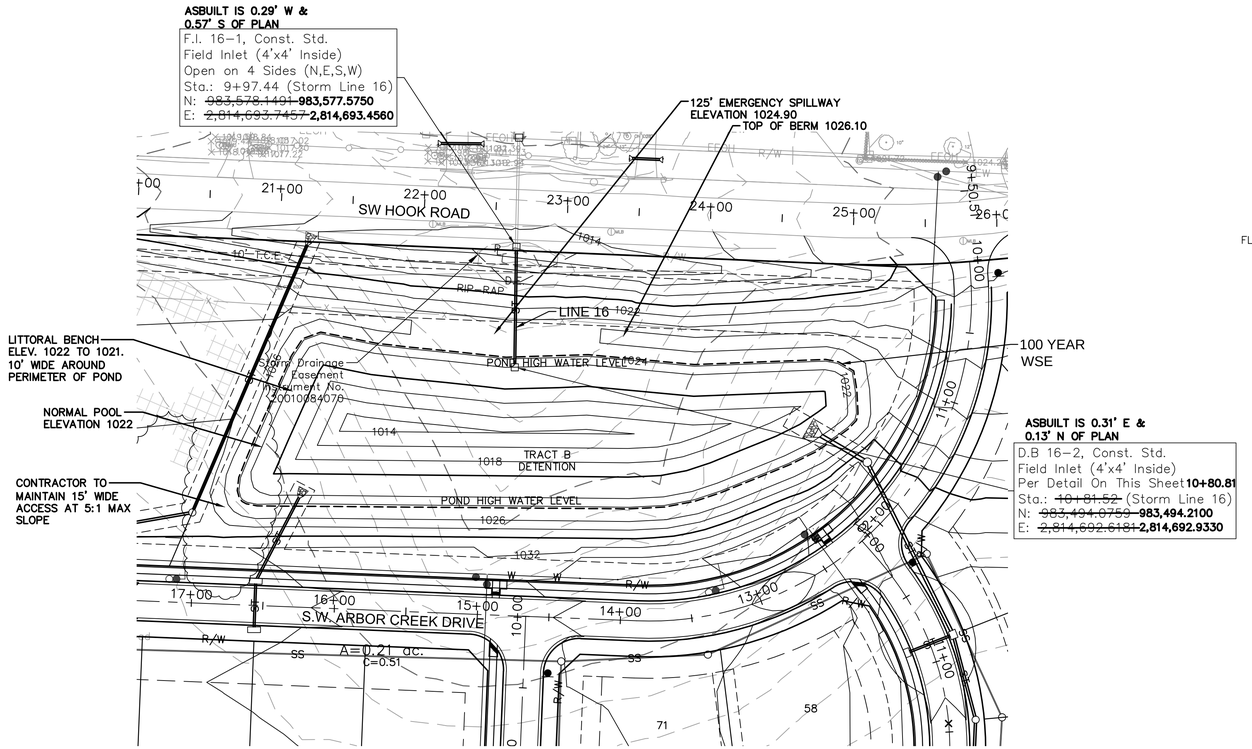
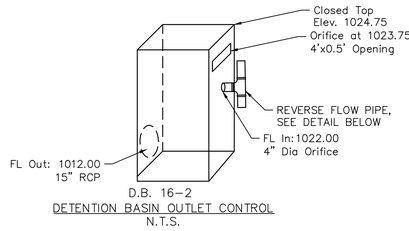
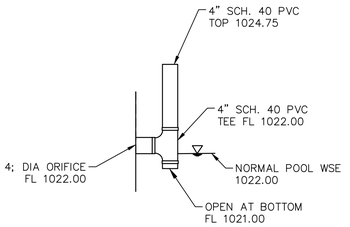
USER: dhernandez





D.B. 16-2

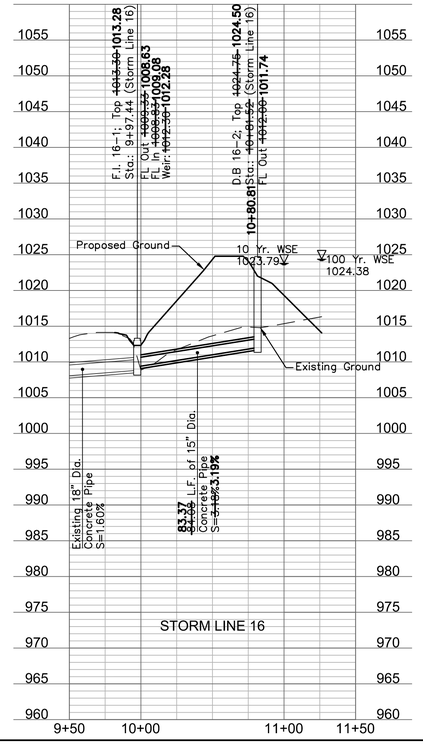
DETENTION BASIN OUTLET CONTROL
N.T.S.



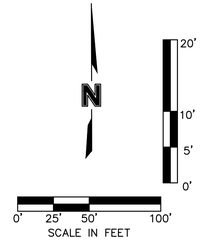
REVERSE FLOW PIPE
N.T.S.

NOTE: CONTRACTOR SHALL FILL AND COMPACT TO 95% STANDARD DENSITY TO A POINT 18" MINIMUM ABOVE TOP OF PIPE PRIOR TO EXCAVATION FOR THE PIPE.

AS BUILT
DATE: 12/19/2018



10yr. W.S.E.	100yr. W.S.E.
1023.79	1024.38



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STATE OF MISSOURI
MELISSA G. DEGONIA
NUMBER PE-2011000892
PROFESSIONAL ENGINEER

REVISIONS

NO. REV.	DATE	REVISIONS DESCRIPTION	BY
2	06.23.2017	Revised detail	MGD
3	12.04.2017	Revised inlet location	MGD
5	02.14.2018	Added notes	MGD
6	03.08.2018	Detail added and notes revised	

DETENTION BASIN PLAN

HAWTHORN RIDGE
1ST PLAT

LEE'S SUMMIT, MO

2018

drawn by: D.A.H.Q
checked by: M.G.D.
designed by: P.M.D
QA/QC by: K.S.J
project no.: 017-0188
date: 03.03.2017

SHEET
C125

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DATE: Feb 19, 2019 6:16pm
USER: dhernandez

APPENDIX C

Inspection Report Form

STORMWATER BMP INSPECTION REPORT FORM

Location of BMP:_____ BMP Type:_____

Date of Inspection:_____ Inspected by:_____

Features				
Maintenance Item	**Yes**	**No**	**N/A**	**Comments**
Functioning to avoid complaints				
Aesthetically maintained				
Free of trash and debris				
Good vegetation cover				
Free of invasive species				
Evidence of erosion				
Bottom of basin clear of excess sediment				
Outlet structure in working condition				
Spillway in working condition				

Action to be taken: _____

_____

_____

_____

_____

APPENDIX D

Ownership Information

OWNERSHIP INFORMATION

Ownership information shall be updated in the event the property owner where the stormwater BMP's are located changes. Below is contact information for the property owner, shall they need to be contacted regarding the stormwater BMPs.

Stormwater BMP Property Ownership	
Property Owner	Clayton Properties Group, dba Summit Homes
Contact Person	Travis Ruf
Address	120 SE 30th Street, Lee's Summit, MO 64082
Phone Number	816.246.6700
Email Address	development@summithomeskc.com

Stormwater BMP Property Change of Ownership	
Property Owner	
Contact Person	
Address	
Phone Number	
Email Address	

Stormwater BMP Property Change of Ownership	
Property Owner	
Contact Person	
Address	
Phone Number	
Email Address	

Stormwater BMP Property Change of Ownership	
Property Owner	
Contact Person	
Address	
Phone Number	
Email Address	