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DRAINAGE REPORT
Harlem Flex
300 N Grand Ave
Kansas City, MO
June 2022

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APPENDIX

INTRODUCTION

The Harlem Flex project consists of the construction of two 6,000 sf one story buildings to provide flex business / office space, at 300 N Grand Ave, located between N Grand Ave and N Walnut St on the north side of NE Harlem Rd. The property encompasses 0.63 ac made up of Lots 7, 8, 15 & 16 and the vacated alley of Bock 7, Harlem, a subdivision in Kansas City, Clay County, MO. This property is within 500 ft of the Missouri River Levee and is subject to the criteria of being within the zone of influence. The development will disturb approximately 0.63 acres.

Parcel ID: CL1790500060090001

An aerial photo is shown in Appendix A.

DRAINAGE CRITERIA

The drainage criteria for this study are APWA Section 5600 with KCMO supplemental sections. The detention / stormwater BMP sizing is based on retention of the 1.5 in / acre volume due to this property being located within a combination sewer district. Runoff for all storms larger than 1.5 in/ac will not be detained but will be released overland to the existing roadside ditch.

EXISTING CONDITIONS

The existing property consists of 0.63 acres between N Grand Ave and Walnut St on the north side of Harlem Rd. The property is currently vacant grass covered with a few trees, but has historically contained a building with drive. The site is relatively flat and the majority of the site slopes from northeast to southwest. The northwest area of the site, the location of the former building slopes to the north onto the neighboring property. There is no storm drainage infrastructure on the property. This property and the surrounding properties along Harlem Rd are served by a road side ditch for storm runoff conveyance. There is no public storm drainage infrastructure within this area. The drainage area is shown in the existing drainage map in Appendix F. This property is located within an area with reduced flood risk due to levee according to FIRM Map 29095C0252G, dated 1/20/2017. The FEMA map is shown in Appendix A.

The Clay County Soil Survey on the USDA website shows the existing soils as Urban Complex. The Geotechnical report performed for the project indicates the on site soil is composed of silt and silty clay. Percolation tests were performed on the soil providing an average percolation rate of 3.1 in/hr.

The existing conditions can be seen in Appendix C.

Existing Areas:
The existing analysis has been divided into the NW drainage area and the remainder of the site that drains to the existing roadside ditch along Harlem Rd.

Northwest Drainage Area:	5,749 sf / 0.13 ac
South Drainage Area:	21,812 sf / 0.50 ac

Existing flows:

STORM EVENT	EXISTING RUNOFF NW DA (CFS)	EXISTING RUNOFF SOUTH DA (CFS)
2 Year (50%)	0.09	0.25
100 Year (1.0%)	0.21	0.55

Calculated by Rational Method, 1 hour storm duration.

DEVELOPED CONDITIONS

The proposed Harlem Flex development consists of two 6,000 sf single story buildings with parking, drive and utilities. The improvements will contain 21,450 sf of impervious area, resulting in a 77.8% impervious site. The site runoff will be directed to the south side of the property and away from the neighboring property. Because there is no storm infrastructure in the area, the only system in the vicinity is the 8" sanitary sewer, this site storm drainage is designed in accordance with the Combined Sewer Ordinance requirements. Two bio-retention BMPs will be constructed to collect the maximum amount of runoff possible and infiltrate the runoff into the ground due to the pervious nature of the site soils. Runoff in excess of the 1.5" volume will flow into the existing roadside ditch. Refer to the Grading Plan in Appendix D.

The Geotechnical Report and percolation tests performed on the existing soils show this site has ideal soils for infiltration of stormwater. The infiltration rate of 3.1 in/hr will allow the runoff from the runoff volume to infiltrate over a span of 8 hours. The Rational method was used for runoff calculation due to the small size of the site. The Tc for each drainage area was calculated using TR-55 method. Calculations for developed conditions are shown in Appendix D.

The CivilStorm results for the developed conditions can be seen in Appendix D.

Proposed Areas:

East Drainage Area: 13,459 sf / 0.31 ac

West Drainage Area: 10,988 sf / 0.25 ac

Draining offsite: 3,114 sf / 0.07 ac

Proposed flows:

STORM EVENT	PROPOSED RUNOFF TO WEST BMP (CFS)	PROPOSED RUNOFF TO EAST BMP (CFS)	OFFSITE RUNOFF (CFS)
2 Year (50%)	0.38	0.44	0.04
100 Year (1.0%)	0.86	0.98	0.09

Calculated by Rational Method, 1 hour storm duration

BMP DESIGN

Two infiltration bio-retention cells are designed to capture the maximum amount of runoff from the site and allow it to infiltrate into the pervious soil beneath. The parking lot was laid out to include the minimum number of parking spaces required per the building and zoning code. All other area remaining on the south side are used for the bio-retention BMP. The area remaining provides a storage volume of 2,771 cu ft. This volume is adequate to infiltrate the Water Quality Volume but does retain the entire 1.5" water volume of 51,40 cu ft. Due to the proximity to the NKC Levee and the Levee District's requirements, the depth of permanent excavation is limited. The 2 ft of BMP depth provided is the maximum depth available for this site condition.

BMP calculations can be found in Appendix D.

SUMMARY

The proposed Harlem Flex development will provide new business to a long neglected area. The site is designed to meet both the City of Kansas City, MO and the NKC Levee District criteria. This property is within the zone of influence to the Missouri River Levee. The proposed BMP's are sized to retain the maximum volume possible for this 0.63 acre property. Although the 1.5" runoff volume could not be achieved, the BMP's do retain the WQv per APWA 5600. Additional information and data can be found in the attached Appendices.

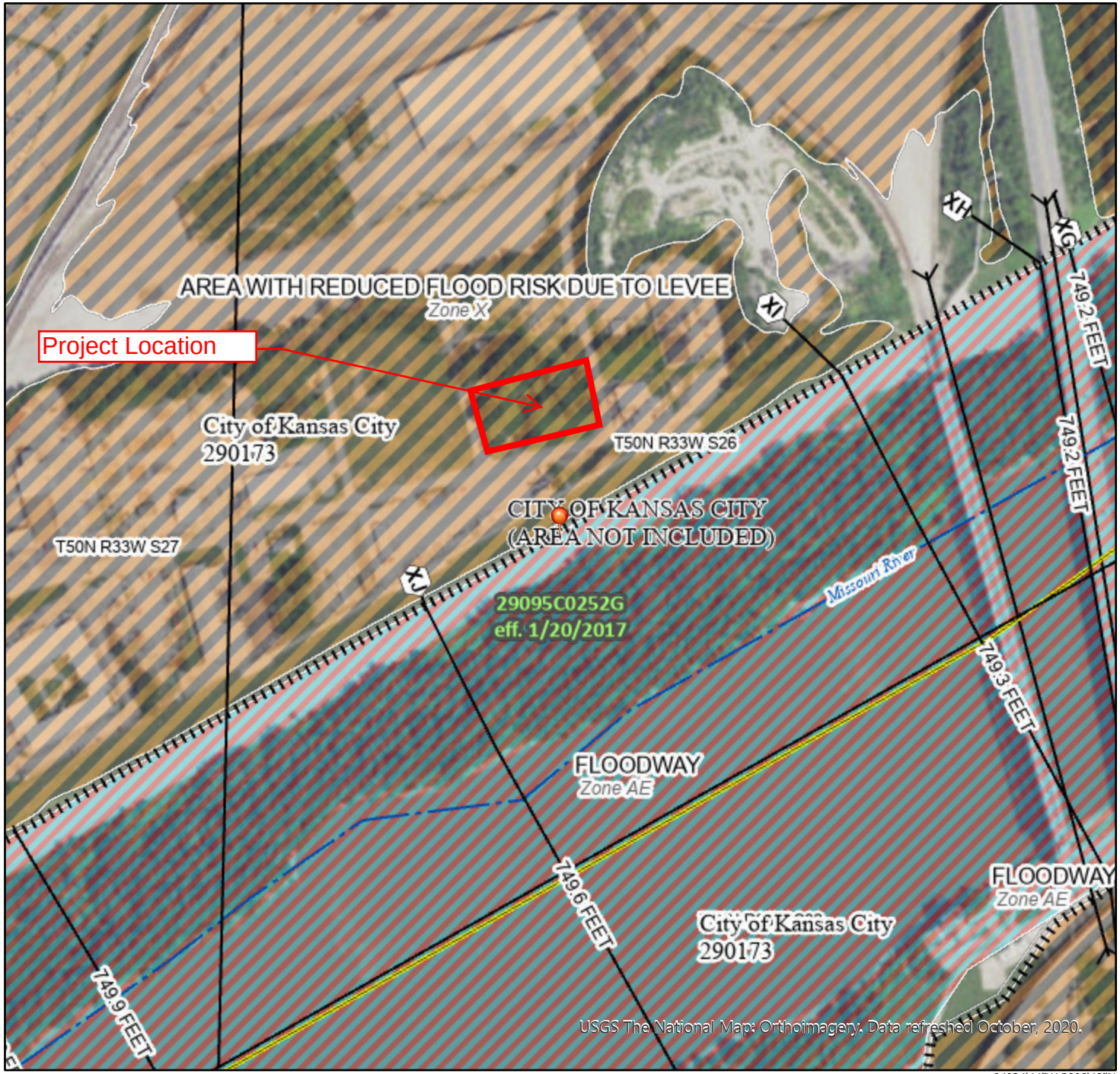
Appendix A

(Location Photo, FEMA map)


Harlem Flex
200 N Grand Ave
Northtown Testing
KC Hide Inc
EXL LUBE
Kansas City Asphalt Paving
Midwest Shredding Service
Hangar 4
KCFD Station 68
Charles B. Wheeler Downtown Airport
VMLY&R
Owen
Temporarily closed
Meisinger Aviation
Bodyworks Unlimited
Auto body shop
Jones Iron & Metal
Samson Irrigation Systems
Harlem Baptist Church
Southwest Mill Supply
Holiday Apartments
ASB Railroad Bridge
Twa Museum
MKC Aviation
Hangar 1, Charles Wheeler...
Broadway Ext
Richards Rd
Atlantic St
N Oak St
N Walnut St
N Main St
N Riley Ave
NE Harlem Rd
NW Harlem Rd
NE Levee Rd
Heart of America Bridge
Missouri River
Riverfront Heritage Trail
E Front St
CORE
Bar K
169
9
Google

National Flood Hazard Layer FIRMette

94°35'21"W 39°7'17"N



94°34'44"W 39°6'49"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/3/2020 at 3:01 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix B

(USDA Soil Information)

Soil Map—Clay County, Missouri
(Harlem Flex)

Map Scale: 1:1,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clay County, Missouri
Survey Area Data: Version 21, May 29, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 17, 2019—Sep 25, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
99017	Urban land, bottomland, 0 to 3 percent slopes, rarely flooded	3.4	100.0%
Totals for Area of Interest		**3.4**	**100.0%**

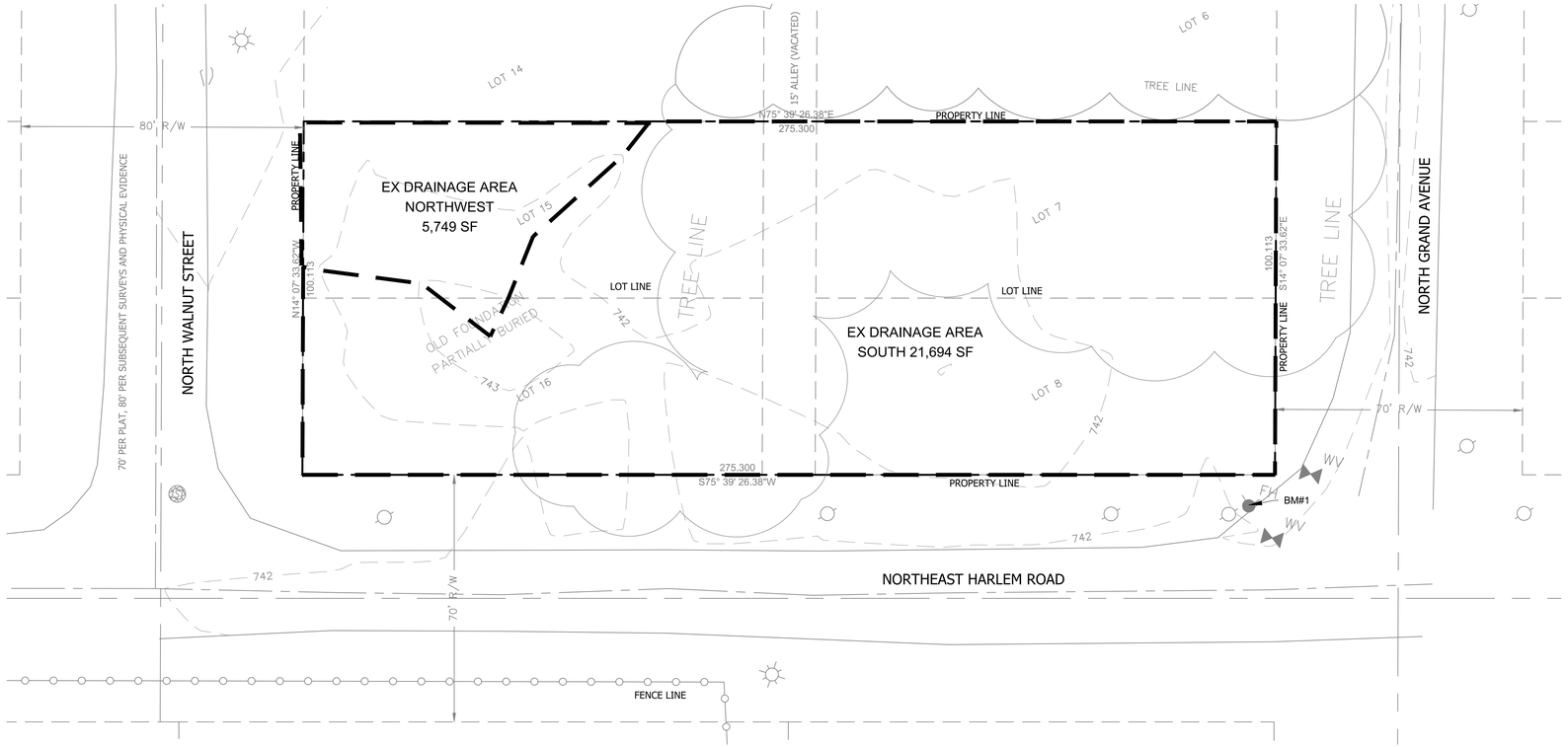
Appendix C

(Existing Conditions)

HARLEM FLEX
200 N GRAND AVE

EXISTING CONDITIONS DRAINAGE TABLE

Drainage Area	Area (ft^2)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Runoff (50%) (cfs)	Runoff (1%) cfs
CM-South	21,694.00	0.3	0.35	0.25	0.55
CM-Northwest	5,749.00	0.41	0.12	0.09	0.21



LEGEND

742 EX MINOR CONTOUR

740 EX MAJOR CONTOUR

DRAINAGE AREA LINE

20 0 10 20

1" = 20'

MISSOURI ONE CALL SYSTEM, INC. 1-800-344-7483 STOP-CALL BEFORE YOU DIG!

CAUTION

NOTICE TO CONTRACTOR

THE CONTRACTOR IS SPECIFICALLY CAUTIONED THE LOCATION AND ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS ARE BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE LOCAL UTILITY LOCATION CENTER AT LEAST 72 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATIONS OF THE UTILITIES.

wallace design collective

wallace design collective, pc
structural • civil • landscape • survey
1703 wyandotte street, suite 200
kansas city, missouri 64108
816.421.8282 • 800.364.5858
MISSOURI CA #001268 EXP 12/31/23
MARYCLARE.AMER@WALLACE.DESIGN

HARLEM FLEX

300 N GRAND AVENUE - KANSAS CITY, MO

REV	DESCRIPTION	DATE

DATE 06/13/2022

PROJECT NO. 2050025

SHEET NAME

EXISTING CONDITIONS

SHEET NO.

EX1

Appendix D

(Developed Conditions)

HARLEM FLEX
200 N GRAND AVE

DRAINAGE AREA TABLE

Drainage Area	Area (ft^2)	Runoff Coefficient (Rational)	Time of Concentration (hours)	Runoff (50%) (cfs)	Runoff (1%) cfs
CM-East	13,459.00	0.863	0.132	0.44	0.98
CM-West	10,988.00	0.98	0.083	0.38	0.86
CM-off site	3,114.00	0.36	0.083	0.04	0.09

HARLEM FLEX
200 N GRAND AVE

BIO-RETENTION INFILTRATION CELL

1 WATER QUALITY VOLUME (WQv)

VOLUMETRIC RUNOFF COEFFICIENT

Rv=0.05 + 0.009(I) I = % IMPERVIOUS

I = 77.8% 21450 / 27561

Rv= 0.7502

WATER QUALITY VOLUME

WQv = 1.2(Rv)(A)/12 0.63 AC

WQv= 0.047263 acre-ft 2180 CU FT

HARLEM FLEX
200 N GRAND AVE

STORMWATER CALCULATIONS FOR COMBINED SEWER ORDINANCE AREA

DETAIN FOR 1.5" RUNOFF VOLUME

Site Area:	27,561 sf
1.5" Volume:	0.125' x 27561 = 5,140 cu ft

BMP Volume Provided:

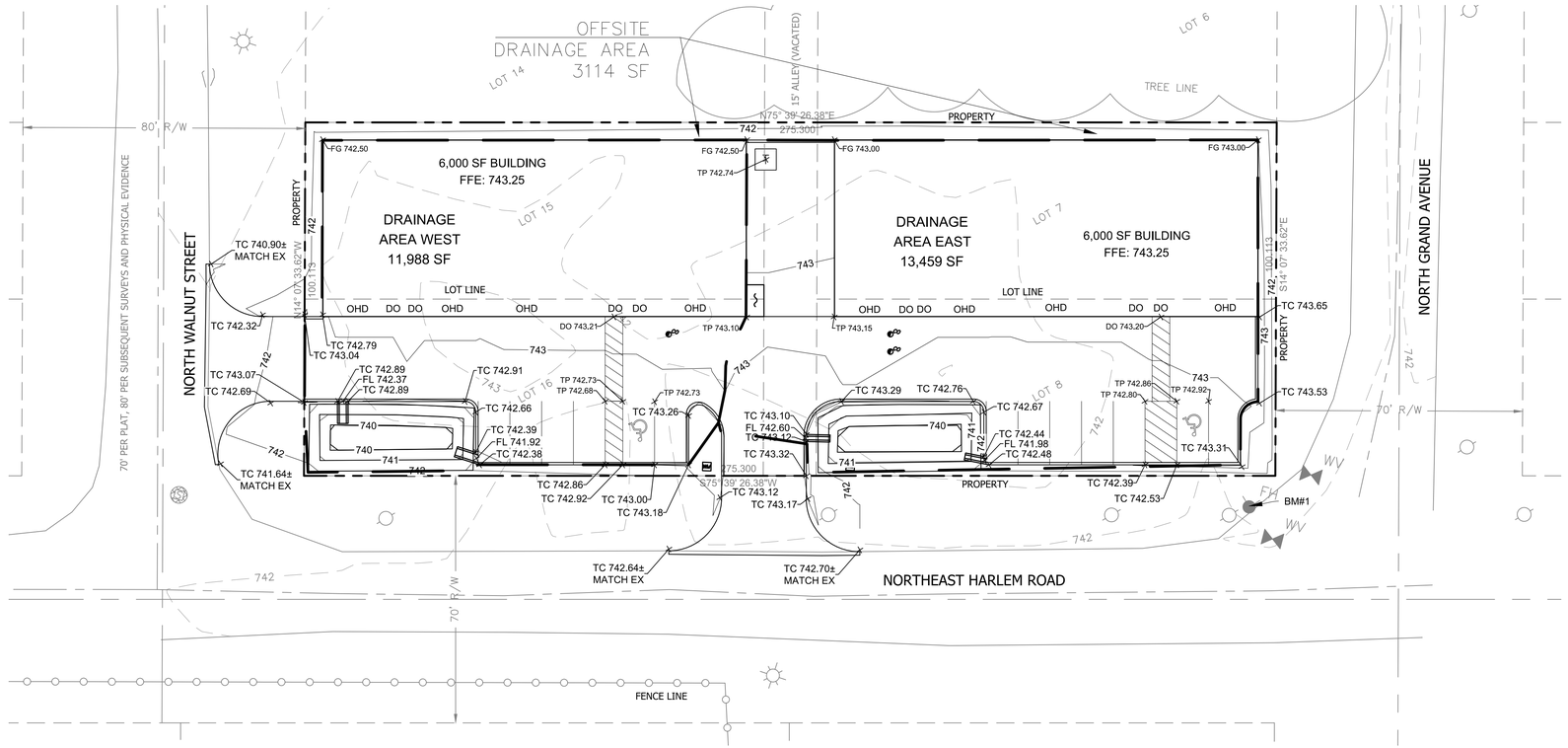
East BMP	1220 cu ft
West BMP	1551 cu ft
Total	2771 cu ft
WQv	2180 cu ft

INFILTRATION CALCULATION

	EAST	WEST
Infiltration Basin Area	857 sf	861 sf
Infiltration Rate	3.1 in / hr	3.1 in / hr
Depth of Basin	2 ft	2 ft
Time of infiltration	7.75 hrs	7.75 hrs

GENERAL GRADING NOTES

1. SITE GRADING SHALL NOT PROCEED UNTIL EROSION CONTROL MEASURES HAVE BEEN INSTALLED & INSPECTED AND APPROVED BY LOCAL AUTHORITIES.
2. ALL CUT OR FILL SLOPES SHALL BE 4:1 OR FLATTER UNLESS OTHERWISE NOTED.
3. CONTRACTOR SHALL ASSURE POSITIVE DRAINAGE AWAY FROM BUILDINGS AND STRUCTURES FOR ALL GRASSED AND PAVED AREAS.
4. CONSTRUCTION SHALL COMPLY WITH ALL APPLICABLE GOVERNING CODES AND BE CONSTRUCTED TO THE SAME.
5. CONTRACTOR IS RESPONSIBLE FOR TEMPORARY ACCESS ROADS AND SHALL MAINTAIN POSITIVE DRAINAGE OF ENTIRE SITE THROUGHOUT CONSTRUCTION AND AVOID PONDING OR RUTTING. TEMPORARY DEWATERING, INCLUDING PUMPING, MAY BE REQUIRED AND SHALL BE INCLUDED IN THE SCOPE OF WORK.
6. IF ANY EXISTING STRUCTURES TO REMAIN ARE DAMAGED DURING CONSTRUCTION IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO REPAIR OR REPLACE THE EXISTING STRUCTURE AS NECESSARY.



LEGEND

742	EX MINOR CONTOUR
740	EX MAJOR CONTOUR
742	PROP MINOR CONTOUR
740	PROP MAJOR CONTOUR
TP	TOP OF PAVEMENT
TR	TOP OF RIM
DO	DOOR OPENING
OHD	OVERHEAD DOOR OPENING
FG	FINISHED GRADE
	DRAINAGE AREA LINE

BENCHMARK #1

TOP WESTERNMOST FIRE HYDRANT BOLT
N= 1074755.6620
E= 2764946.2720
ELEV= 743.70 (NAVD88)

20 0 10 20
1" = 20'

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300 N GRAND AVENUE - KANSAS CITY, MO

REV	DESCRIPTION	DATE

DATE 06/13/2022
PROJECT NO. 2050025
SHEET NAME

GRADING PLAN

SHEET NO.
C5.0