

CITY OF RICHMOND, VIRGINIA
DEPARTMENT OF PARKS, RECREATION
AND COMMUNITY FACILITIES

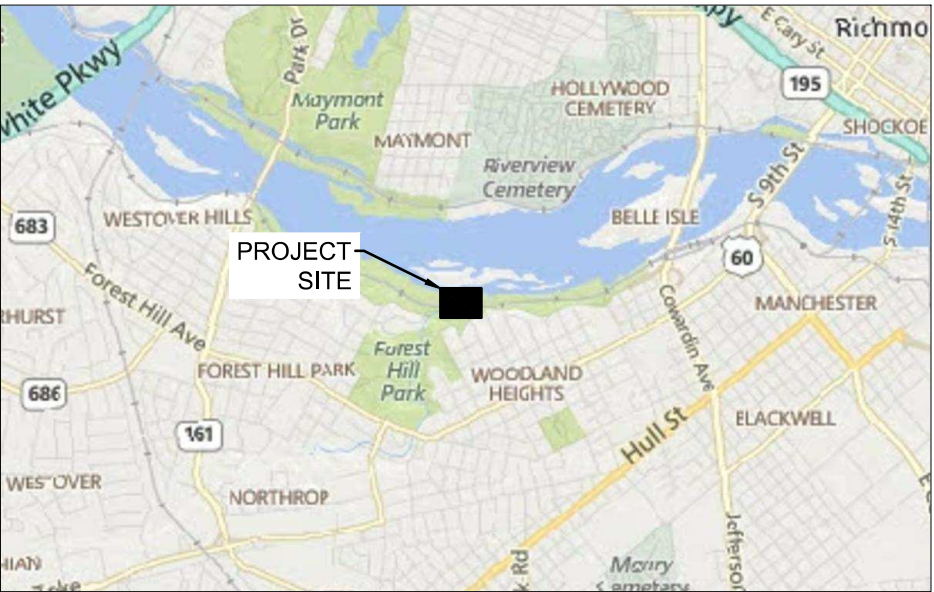


JAMES RIVER PARK SYSTEM WAREHOUSE SITE IMPROVEMENTS

3005 RIVERSIDE DRIVE, RICHMOND VA 23225

INDEX OF SHEETS

Table with 2 columns: SHEET TITLE and SHEET NO. listing various project components like COVER SHEET, NOTES AND DETAILS, EXISTING CONDITIONS AND DEMOLITION PLAN, etc.



VICINITY MAP

1"=2000'

MARCH 12, 2018

REQUIRED PERMITS:
• RSMP PERMIT

REVISIONS

Table with 3 columns: NO., DATE, COMMENTS. Contains revision history for the drawing.

OWNER
CITY OF RICHMOND PARKS, RECREATION &
COMMUNITY FACILITIES
4201 RIVERSIDE DRIVE
RICHMOND, VA 23225
TELEPHONE: (804) 646-5829
CONTACT: NATHAN BURRELL
EMAIL: NATHAN.BURRELL@RICHMONDGOV.COM

ENGINEER
TIMMONS GROUP
1001 BOULDERS PARKWAY, SUITE 300
RICHMOND, VA 23225
TELEPHONE: (804) 200-6544
CONTACT: AMELIA WEHUNT, PE
EMAIL: AMELIA.WEHUNT@TIMMONS.COM

LANDSCAPE ARCHITECT
TIMMONS GROUP
1001 BOULDERS PARKWAY, SUITE 300
RICHMOND, VA 23225
TELEPHONE: (804) 200-6424
CONTACT: SCOTT WILEY, PLA
EMAIL: SCOTT.WILEY@TIMMONS.COM

ARCHITECT
3 NORTH PLLC
201 WEST 7TH STREET
RICHMOND, VA 23224
TELEPHONE: (804) 232-8911, EXT. 109
CONTACT: KATIE HARRIGAN
EMAIL: KHARRIGAN@3NORTH.COM



DRAWING NO: 36157.001

GENERAL NOTES

1. THIS PROJECT IS PROPOSED BY: CITY OF RICHMOND
DEPARTMENT OF PARKS AND RECREATION
NATHAN BURRELL
DEPARTMENT OF PARKS AND RECREATION
4201 RIVERSIDE DRIVE
RICHMOND, VA 23225
(804) 646-5829

NUMBER OF LOTS AFFECTED BY THIS PROJECT: 1 — 4201 RIVERSIDE DRIVE, VA 23225-0

2. EXISTING ZONING OF PROPERTY THROUGH WHICH PROJECT IS PROPOSED: R-3
3. ALL CONSTRUCTION AND MATERIALS SHALL CONFORM WITH THE VIRGINIA DEPARTMENT OF TRANSPORTATION'S ROAD AND BRIDGE SPECIFICATIONS, DATED 2007, AND ROAD AND BRIDGE STANDARDS, DATED DECEMBER 2008, AS AMENDED BY CONTRACT PROVISIONS; THESE PLANS; CITY OF RICHMOND RIGHT-OF-WAY EXCAVATION AND RESTORATION MANUAL; CITY OF RICHMOND SANITARY SEWER SYSTEM DESIGN GUIDELINES AND STANDARD SPECIFICATIONS AND DETAILS; AND, CITY OF RICHMOND STORMWATER MANAGEMENT DESIGN AND CONSTRUCTION STANDARDS MANUAL.
4. LOCATE ALL EXISTING UTILITIES PRIOR TO THE START OF CONSTRUCTION. IF ANY UTILITY DIFFERS THAN WHAT IS SHOWN ON THE PLAN, CONTACT THE ENGINEER IMMEDIATELY.
5. IF THE ELEVATIONS SHOWN ON THESE PLANS ARE FOUND TO BE DIFFERENT THAN FIELD CONDITIONS, CONTACT THE ENGINEER IMMEDIATELY.
6. ACQUIRE ALL REQUIRED PERMITS PRIOR TO CONSTRUCTION. ALL FEES ASSOCIATED WITH PERMITS SHALL BE PAID BY THE CONTRACTOR UNLESS OTHERWISE SPECIFIED.
7. EXISTING CONDITIONS SHOWN HEREON COMPILED FROM CITY OF RICHMOND GIS INFORMATION AND FIELD SURVEY DATA FROM H&B SURVEYING AND MAPPING DATED APRIL 29, 2016.

DRAINAGE NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL CONFORM WITH THE VIRGINIA DEPARTMENT OF TRANSPORTATION'S ROAD AND BRIDGE SPECIFICATIONS DATED 2007, AND ROAD AND BRIDGE STANDARDS, DATED DECEMBER 2008, AS AMENDED BY CONTRACT PROVISIONS AND THESE PLANS. ALL CONSTRUCTION AND MATERIALS SHALL CONFORM WITH CITY OF RICHMOND STANDARDS AND SPECIFICATIONS, IF MORE STRINGENT.
2. ALL CONCRETE PIPE JOINTS ARE TO BE SEALED ACCORDING TO VDOT STANDARDS AND SPECIFICATIONS.
3. ALL STORM SEWERS SHALL BE ASTM, C-76, CLASS III, EXCEPT AS NOTED.
4. ALL STORM SEWERS AND STRUCTURES SHALL HAVE A MINIMUM OF 4" OF AGGREGATE BEDDING PLUS 1/10 DIAMETER.
5. ALL MANHOLE AND INLET INVERTS SHALL BE SHAPED IN ACCORDANCE WITH VDOT STANDARD IS-1, EXCEPT WHERE SPECIFIED.
6. IF DURING CONSTRUCTION, THE EXISTING CULVERT OR DITCH INVERT ELEVATIONS SHOWN ON THESE PLANS ARE FOUND TO DIFFER SIGNIFICANTLY FROM THE ELEVATIONS IN THE FIELD, THE CONTRACTOR MUST NOTIFY THE ENGINEER IMMEDIATELY FOR AN ADJUSTMENT IN ELEVATIONS.
7. ALL PIPE LENGTHS SHOWN ON PLANS ARE FROM CENTER OF CHAMBER TO CENTER OF CHAMBER, UNLESS OTHERWISE SPECIFIED.

CONSTRUCTION ACCESS AND MAINTENANCE OF TRAFFIC NOTES

1. IMPLEMENT THE NOTES AND DETAILS PROVIDED IN THE VDOT "VIRGINIA WORK AREA PROTECTION MANUAL STANDARDS AND GUIDELINES" AT ALL TIMES DURING CONSTRUCTION. MAINTAIN A COPY OF THIS MANUAL ONSITE AT ALL TIMES DURING CONSTRUCTION.
2. ALL WORK IS SUBJECT TO INSPECTION BY DPW INSPECTOR. NOTIFY APPROPRIATE CITY OFFICIALS 72 HOURS PRIOR TO START OF WORK.
3. CALL "MISS UTILITY" OF CENTRAL VIRGINIA 1-800-552-7001 (TOLL FREE) PRIOR TO CONSTRUCTION. VERIFY LOCATION AND ELEVATION OF ALL UNDERGROUND UTILITIES SHOWN ON THE PLANS IN AREAS OF CONSTRUCTION PRIOR TO STARTING WORK. CONTACT ENGINEER IMMEDIATELY IF LOCATION OR ELEVATION IS DIFFERENT FROM THAT SHOWN ON THE PLAN, IF THERE APPEARS TO BE A CONFLICT, OR UPON DISCOVERY OF ANY UTILITY NOT SHOWN ON THE PLANS.
4. TAKE ALL NECESSARY PRECAUTIONS TO PROTECT AND MAINTAIN UNINTERRUPTED UTILITY SERVICE AT ALL TIMES DURING CONSTRUCTION. ANY DAMAGE TO EXISTING STRUCTURES SHALL BE REPAIRED IMMEDIATELY TO THE SATISFACTION OF THE CITY UTILITY INSPECTOR, AT THE CONTRACTOR'S EXPENSE.
5. MAINTAIN SAFE VEHICULAR AND PEDESTRIAN ACCESS TO ALL PROPERTIES THROUGHOUT CONSTRUCTION AND PREPARE A TRAFFIC MAINTENANCE PLAN IF REQUIRED BY THE CITY. ANY DEVIATIONS FROM THIS PLAN SHALL BE APPROVED BY THE CITY TRAFFIC ENGINEER PRIOR TO IMPLEMENTATION.
6. STOCKPILES OF MATERIAL NOT PERMITTED IN THE TRAVELWAY.
7. THE COST OF ALL CONSTRUCTION SIGNS, SIGN POST, BARRICADES, DELINEATORS, CONCRETE CONSTRUCTION BARRIERS, FLASHING AND STEADY BURN LIGHTS, AND OTHER TRAFFIC CONTROL DEVICES WHICH ARE NECESSARY FOR CONSTRUCTION SHALL BE BORNE BY THE CONTRACTOR. IN ADDITION, THE COST OF ALL TRAFFIC CONTROL WHICH ARE REQUIRED AS A RESULT OF ANY CHANGE IN THE CONSTRUCTION STAGING, AND/OR EXTENSIONS OF TIME WHICH ARE REQUIRED BY THE CONTRACTOR AND ARE APPROVED BY THE TRAFFIC ENGINEER AND CONSTRUCTION ENGINEER, SHALL BE BORNE BY THE CONTRACTOR AND INCLUDED IN THE BID PRICE.
8. ALL SIGNS AND BARRICADES USED IN CONJUNCTION WITH THIS PROJECT SHALL CONFORM WITH THE LATEST EDITIONS OF THE "NATIONAL MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AND "THE VIRGINIA SUPPLEMENT TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS".
9. EXCAVATIONS WHICH ARE PROPOSED TO BE OPEN PAST NORMAL WORKING HOURS MUST BE APPROVED BY THE TRAFFIC ENGINEER. NO OPEN TRENCHES ARE ALLOWED OVERNIGHT—EITHER TEMPORARY STEEL PLATING OR TEMPORARY BACKFILL ARE REQUIRED. THE COST OF SIGNING AND BARRICADING THESE EXCAVATIONS IS THE RESPONSIBILITY OF THE CONTRACTOR AND MUST BE INCLUDED IN THE BID PRICE.
10. WHEN CONSTRUCTION OCCURS PARALLEL AND/OR PERPENDICULAR TO ROADS, INCLUDE IN THE TRAFFIC MAINTENANCE PLAN AT LEAST AN 11' MINIMUM TRAVEL LANE WITH FLAGMEN TO DIRECT TRAFFIC THROUGH THE WORK AREA.
11. DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE CITY TRAFFIC ENGINEER.
12. REMOVE UNSUITABLE MATERIAL IF ENCOUNTERED AND REPLACE WITH SUITABLE MATERIAL TO THE SPECIFICATION OF THE CITY INSPECTOR.
13. IF TREES DESIGNATED "TO REMAIN" ARE LOCATED WITHIN 10' OF CONSTRUCTION LIMITS, CONTACT DPW URBAN FORESTRY 48 HOURS PRIOR TO BEGINNING CONSTRUCTION.
14. PROVIDE TEMPORARY DRAINAGE WITHIN THE PROJECT LIMITS DURING CONSTRUCTION OR TO RELIEVE AREAS THAT MAY CAUSE DAMAGE TO ROADWAYS OR IMPEDE TRAFFIC AS DIRECTED BY THE CITY OF RICHMOND INSPECTOR.
15. CLEAN ALL DRAINAGE PIPES AND STRUCTURES OF DEBRIS AND ERODED MATERIAL AT ALL STAGES OF CONSTRUCTION TO THE SATISFACTION OF THE CITY OF RICHMOND INSPECTOR.
16. REFER TO THE LATEST VERSION OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION ROAD AND BRIDGE STANDARDS AND SPECIFICATIONS.
17. PERFORM ALL CUTS IN THE STREET UNDER A WORK IN STREET PERMIT. WORK SHALL BE MONITORED BY THE PERMIT INSPECTOR.
18. DO NOT BEGIN WORK UNTIL THE PERMIT INSPECTOR HAS BEEN NOTIFIED, A PRE-CONSTRUCTION CONFERENCE HAS BEEN HELD AND MISS UTILITY HAS MARKED ALL UTILITIES.
19. ASPHALT PAVEMENT CUTS SHALL BE AS CLEAN AND STRAIGHT AS POSSIBLE, WITH NO OUTLINE DIMENSIONS LESS THAN 3 FEET WITHOUT SPECIAL APPROVAL OF THE PERMIT INSPECTOR. REFER TO DETAIL ON THIS SHEET FOR PAVEMENT RESTORATION.
20. ALL ASPHALT PAVEMENT RESTORATION THICKNESS SHALL BE 1 1/2 TIMES THE EXISTING SECTION OR A MINIMUM OF 8-INCHES WHICHEVER IS GREATER. REFER TO THE DPW TRENCH CUT RESTORATION DETAIL ON THIS SHEET FOR THE TYPICAL CONFORMANCE STANDARDS.

21. THE FINAL RESTORATION ON OPEN TRENCH CUTS REQUIRES THE DISTURBED ASPHALT PAVEMENT ZONE TO BE A SQUARE POINTED OFF AND STRAIGHT LINE. THE AREA OF PAVEMENT RESTORATION IS TO BE FULLY ENVELOPED BY THE FINAL SURFACE COURSE REPAIRS. THE ADJOINING SURFACE/TOP COURSE LAYER IS TO BE OVER-MILLED A MINIMUM DEPTH OF 1.25 INCHES OR MORE, A MINIMUM DISTANCE OF ONE FOOT BEYOND EACH SIDE OF THE TRENCH WALL. THIS STEP OUT IS TO OCCUR ALONG THE ENTIRE TRENCH LINE RUN AND/OR SQUARED POINTED AREA.
22. FINAL ACCEPTANCE BY THE CITY SHALL NOT BE MADE UNTIL ALL WORK SHOWN ON THE APPROVED PLANS IS COMPLETE TO THE SATISFACTION OF THE CITY INSPECTOR AND PROJECT MANAGER.

CONSTRUCTION SEQUENCE GUIDELINES

1. PROVIDE A DETAILED SCHEDULE AND SEQUENCE OF CONSTRUCTION TO THE OWNER AND ENGINEER PRIOR TO CONSTRUCTION. CONSTRUCTION SEQUENCE GUIDELINES HAVE BEEN PROVIDED BELOW TO PROVIDE REQUIRED OPERATIONAL PARAMETERS DURING CONSTRUCTION.
2. ACQUIRE ALL REQUIRED PERMITS PRIOR TO CONSTRUCTION. ALL PERMIT FEES TO BE PAID BY CONTRACTOR.
3. SCHEDULE A PRE-CONSTRUCTION MEETING WITH THE CITY OF RICHMOND AND TIMMONS GROUP AT LEAST 72 HOURS PRIOR TO THE START OF WORK.
4. CALL "MISS UTILITY" AT 1-800-552-7001 AT LEAST 48 HOURS PRIOR TO CONSTRUCTION. CONTACT THE ENGINEER IMMEDIATELY IF:
- 4.1. LOCATION OR ELEVATION IS DIFFERENT FROM THAT SHOWN ON THE PLAN;
- 4.2. IF THERE APPEARS TO BE A CONFLICT;
- 4.3. OR UPON DISCOVERY OF ANY UTILITY NOT SHOWN ON THE PLANS.
5. PERFORM CONSTRUCTION SURVEY STAKEOUT FOR PROPOSED IMPROVEMENTS AND CONSTRUCTION LIMITS. ALL SURVEYING OPERATIONS MUST BE PERFORMED BY A VIRGINIA LICENSED SURVEYOR.
6. MAINTAIN UNINTERRUPTED UTILITY SERVICE TO ALL ADJACENT PROPERTIES AT ALL TIMES DURING CONSTRUCTION.
7. NOTE, THE BUILDING MATERIALS AT AND BELOW THE BASE FLOOD ELEVATIONS (BFE) HAVE TO BE FLOOD-RESISTANT MATERIAL. THE ELECTRICAL, HEATING, VENTILATION, PLUMBING, AIR CONDITIONING AND OTHER SERVICE EQUIPMENT SHALL BE DESIGNED OR LOCATED ABOVE THE BFE TO PREVENT WATER FROM ENTERING OR ACCUMULATING WITHIN THE COMPONENTS DURING FLOODING.
8. INSTALL THE PHASE I EROSION & SEDIMENT CONTROL MEASURES BEFORE COMMENCING ANY LAND DISTURBING ACTIVITIES. REFER TO SHEET C3.0 FOR PHASE I AND II EROSION & SEDIMENT CONTROL SEQUENCES.
9. DEMOLISH/REMOVE ITEMS INDICATED ON SHEET C2.0 ONLY AS NECESSARY FOR SITE CONSTRUCTION.
10. INSTALL AND MOVE TEMPORARY PUMPS AS NECESSARY TO DIVERT CLEAN WATER AROUND ACTIVE PORTION OF THE CONSTRUCTION SITE. PROVIDE TEMPORARY DRAINAGE MEASURES WITHIN THE PROJECT LIMITS AT THE END OF EACH DAY AS NECESSARY TO PREVENT FLOODING AND SEDIMENT RUNOFF INTO EXISTING STORMWATER SYSTEMS.
11. INSTALL STORM SEWER PER SHEET C5.0. INSTALL INLET PROTECTION ON ALL INLETS PER SHEET CC3.0.
12. INSTALL UTILITIES (WATER) PER SHEET C4.0
13. ROUGH GRADE SITE TO APPROXIMATE ELEVATIONS OF PROPOSED GRADE MINUS PAVEMENT/PAVER SECTION DEPTH, EXCLUDING LANDSCAPE AREAS. COMPACT SITE PRIOR TO INSTALLATION OF BUILDINGS.
14. INSTALL BUILDINGS. REFER TO ARCHITECTURAL PLANS.
15. INSTALL PHASE II EROSION & SEDIMENT CONTROL MEASURES AS SHOWN ON SHEET C3.0.
16. BRING SITE TO FINAL GRADE. REFER TO SHEET C5.0
17. MAINTAIN ALL EROSION & SEDIMENT CONTROL MEASURES AT ALL TIMES. NO MEASURE CAN BE REMOVED UNTIL APPROVED BY THE CITY OF RICHMOND INSPECTOR.

PERMEABLE PAVER CONSTRUCTION SEQUENCE AND MAINTENANCE NOTES

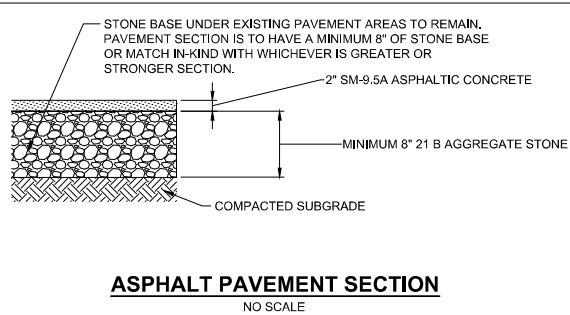
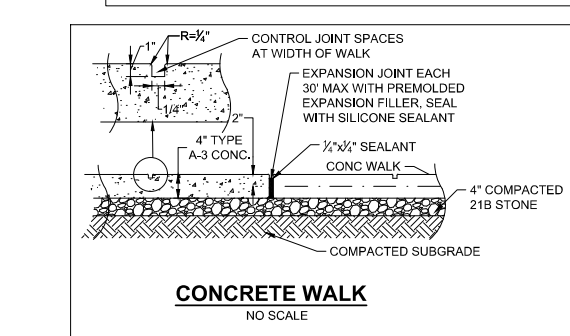
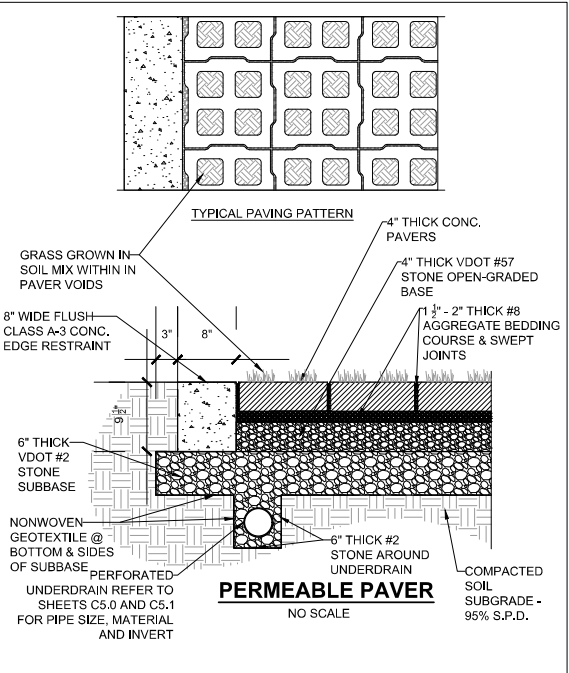
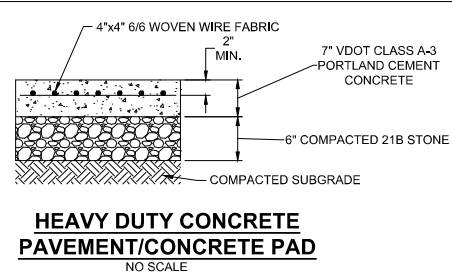
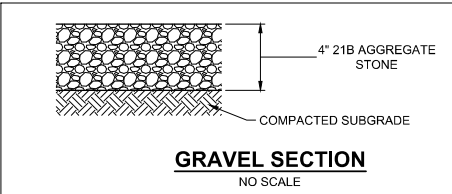
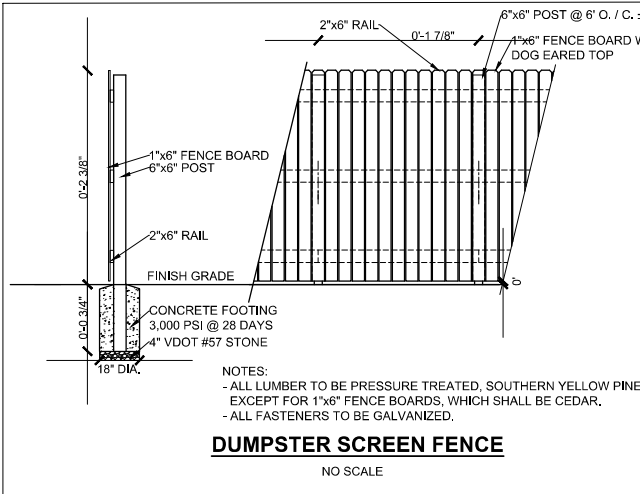
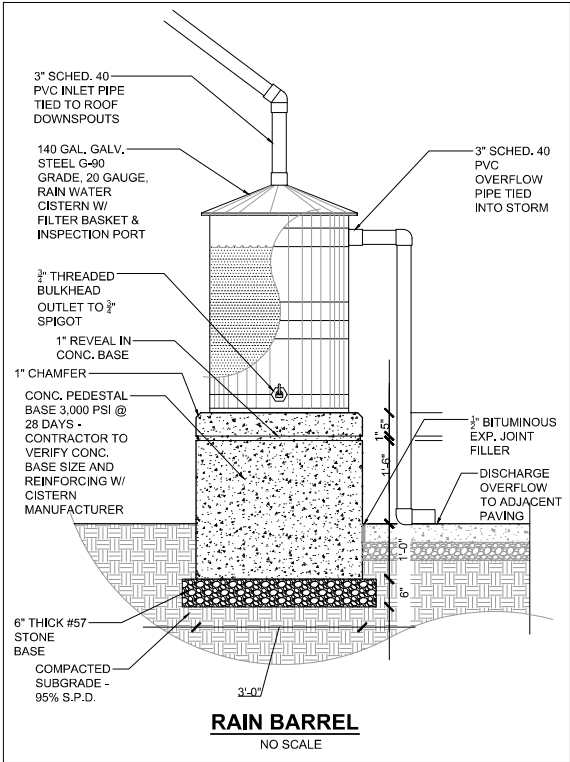
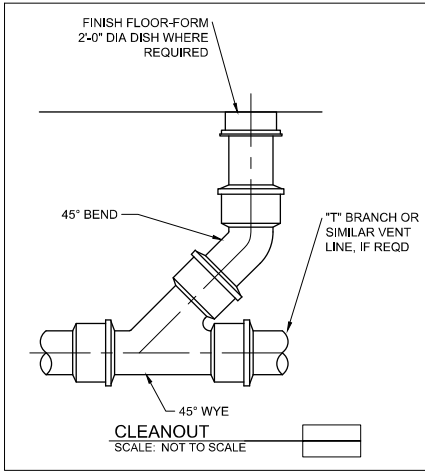
- CONSTRUCTION SEQUENCE:
1. CONSTRUCTION SHALL ONLY BEGIN AFTER ENTIRE CONTRIBUTING DRAINAGE AREA HAS BEEN STABILIZED, DO NOT INSTALL SYSTEM IN RAIN OR SNOW. DO NOT INSTALL FROZEN BEDDING MATERIALS.
2. TEMPORARY E&S MEASURES NEEDED DURING INSTALLATION TO KEEP PAVEMENT AREA SEDIMENT FREE DURING CONSTRUCTION.
3. WHERE POSSIBLE, EXCAVATORS OR BACKHOES SHOULD WORK FROM THE SIDES TO EXCAVATE THE RESERVOIR LAYER TO ITS APPROPRIATE DESIGN DEPTH AND DIMENSIONS.
4. THE NATIVE SOILS ALONG THE BOTTOM AND SIDES OF THE SYSTEM SHOULD BE SCARIFIED OR TILLED TO A DEPTH OF 3 TO 4 INCHES PRIOR TO THE PLACEMENT OF THE FILTER LAYER OR FILTER FABRIC.
5. FILTER FABRIC SHOULD BE INSTALLED ON THE BOTTOM AND SIDES OF THE RESERVOIR LAYER. FILTER FABRIC STRIPS SHOULD OVERLAP DOWN-SLOPE BY A MINIMUM OF 2 FEET, AND BE SECURED A MINIMUM OF 4 FEET BEYOND THE EDGE OF THE EXCAVATION.
6. PROVIDE A MINIMUM OF 2-INCHES OF AGGREGATE ABOVE AND BELOW THE UNDERDRAINS.
7. MOISTEN AND SPREAD 6-INCH LIFTS OF THE APPROPRIATE CLEAN, WASHED STONE AGGREGATE. PLACE AT LEAST 4-INCHES OF ADDITIONAL AGGREGATE ABOVE THE UNDERDRAIN, AND THEN COMPACT IT USING A VIBRATORY ROLLER IN STATIC MODE UNTIL THERE IS NO VISIBLE MOVEMENT OF THE AGGREGATE.
8. INSTALL THE DESIRED DEPTH OF THE BEDDING LAYER.
9. PAVING MATERIALS SHOULD BE INSTALLED IN ACCORDANCE WITH MANUFACTURER SPECIFICATIONS.

- MAINTENANCE NOTES:
1. AN ANNUAL INSPECTION SHOULD BE COMPLETED EACH YEAR TO IDENTIFY ANY POTENTIAL ISSUES.
2. IT IS RECOMMENDED THAT AN ANNUAL, DRY-WEATHER SWEEPING IN THE SPRING MONTHS BE COMPLETED, TO AVOID SUBSURFACE CLOGGING, ENSURE THE VACUUM SWEEPER DOES NOT USE WATER SPRAY.

GREEN ROOF CONSTRUCTION SEQUENCE AND MAINTENANCE NOTES

- CONSTRUCTION SEQUENCE:
1. CONSTRUCT ROOF DECK WITH APPROPRIATE SLOPE AND MATERIAL.
2. INSTALL WATERPROOFING METHOD ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
3. CONDUCT FLOOD TEST TO ENSURE SYSTEM IS WATER TIGHT BY PLACING 2-INCHES OF WATER OVER MEMBRANE FOR 48 HOURS TO CONFIRM INTEGRITY OF THE WATERPROOFING SYSTEM.
4. ADD ADDITIONAL SYSTEM COMPONENTS. GROWING MEDIA SHOULD BE MIXED PRIOR TO DELIVERY TO THE SITE. MEDIA SHOULD BE SPREAD EVENLY OVER THE FILTER FABRIC SURFACE. COVER GROWING MEDIA UNTIL PLANTING TO PREVENT WEEDS FROM GROWING.
5. VEGETATION SHOULD BE PLANTED PER THE PLANTING PLAN.

- MAINTENANCE NOTES:
1. WATER AS NEEDED TO PROMOTE PLANT GROWTH AND SURVIVAL.
2. INSPECT ROOF AND REPLACE ANY DEAD OR DYING VEGETATION.
3. INSPECT WATERPROOF MEMBRANE FOR LEAKING OR CRACKS.
4. ANNUAL FERTILIZATION (FIRST 5 YEARS).
5. WEEDING TO REMOVE INVASIVE PLANTS.
6. INSPECT ROOF DRAINS, SCUPPERS AND GUTTERS TO ENSURE THEY ARE NOT OVERGROWN. REMOVE ANY ACCUMULATED ORGANIC MATTER OR DEBRIS.



SYMBOLS

BOLLARD	R/W TANGENT POINT
BUSH	SANITARY MANHOLE
CAP	SIGNS
ELECTRIC BOX	STORM MANHOLE
ELECTRIC METER	TELEPHONE MANHOLE
ELECTRIC MANHOLE	TREE
FIRE HYDRANT	UTILITY BOX
GAS METER	UTILITY PEDESTAL
GAS VALVE	UTILITY POLE
GUY	WATER METER
LIGHT POLE	WATER VALVE
POWER POLE	YARD LIGHT
PROPERTY PIN	

LINE TYPES

---	EXISTING BUILDING
---	EXISTING GROUND EAST SIDE
---	EXISTING GROUND CENTERLINE
---	EXISTING GROUND WEST SIDE
---	GAS PIPE
---	PROPERTY LINE
---	SANITARY SEWER
---	SEWER EASEMENT
---	OVERHEAD ELECTRIC
---	OVERHEAD CABLE TV
---	UNDERGROUND CABLE TV
---	UNDERGROUND ELECTRIC
---	UNDERGROUND TELEPHONE
---	WATER PIPE

DATE: MARCH 12, 2018 DRAWN BY: K. ATKINSON

SCALE: 1" = 1' CHECKED BY: A. WEHUNT

REVISIONS	
REVISED PER WR'S 07/20/17	DATE
REVISED PER WR'S 08/15/17	
REVISED PER WR'S 12/22/17	
REVISED PER WR'S 03/12/18	
AS BUILT	

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.

Site Development	Residential	Infrastructure	Technology
YOUR VISION ACHIEVED THROUGH OURS.			
VIRGINIA	NORTH CAROLINA	WEST VIRGINIA	
THIS DRAWING PREPARED AT THE DOWNTOWN OFFICE			
117 S 14th Street Suite 303 Richmond, VA 23219			
TEL 804.521.1065 FAX 804.521.1068 www.timmons.com			
36157.001			

JAMES RIVER PARK SYSTEM
WAREHOUSE SITE
IMPROVEMENTS

NOTES AND
DETAILS

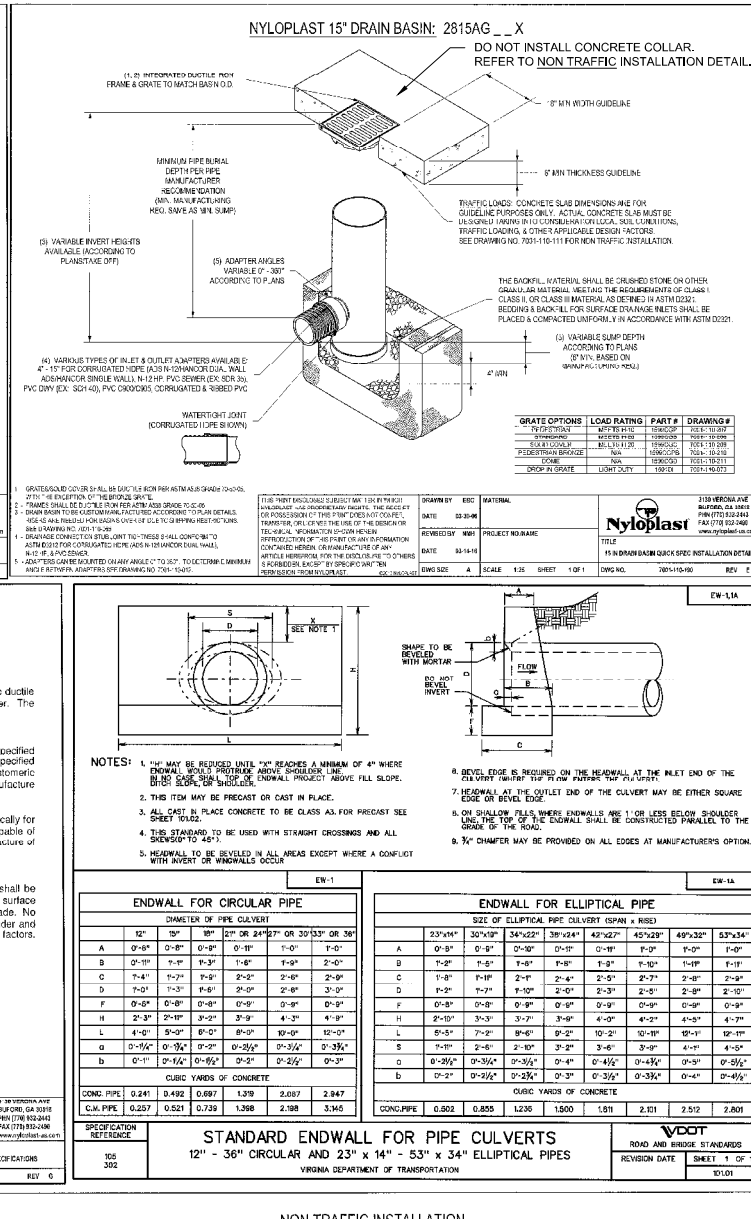
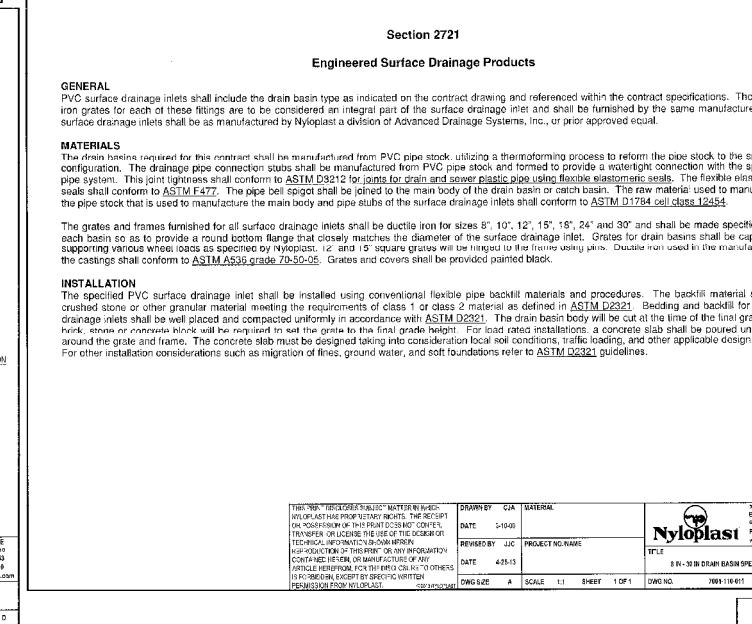
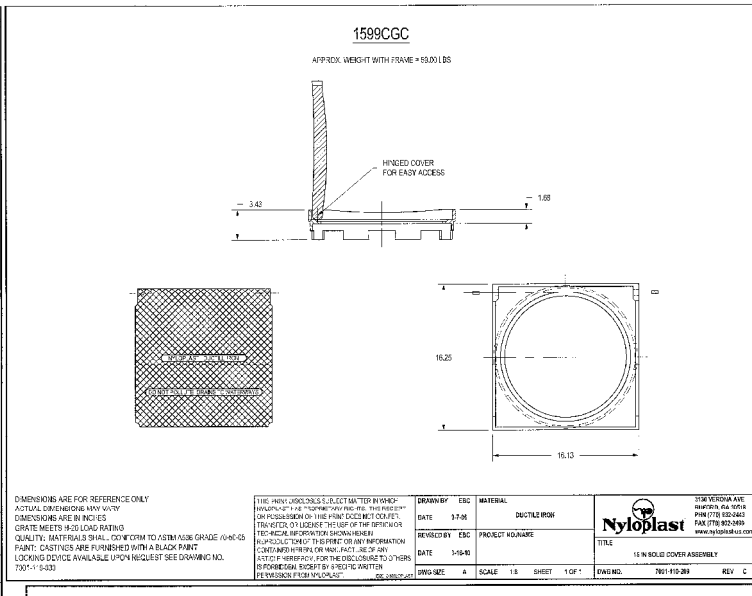
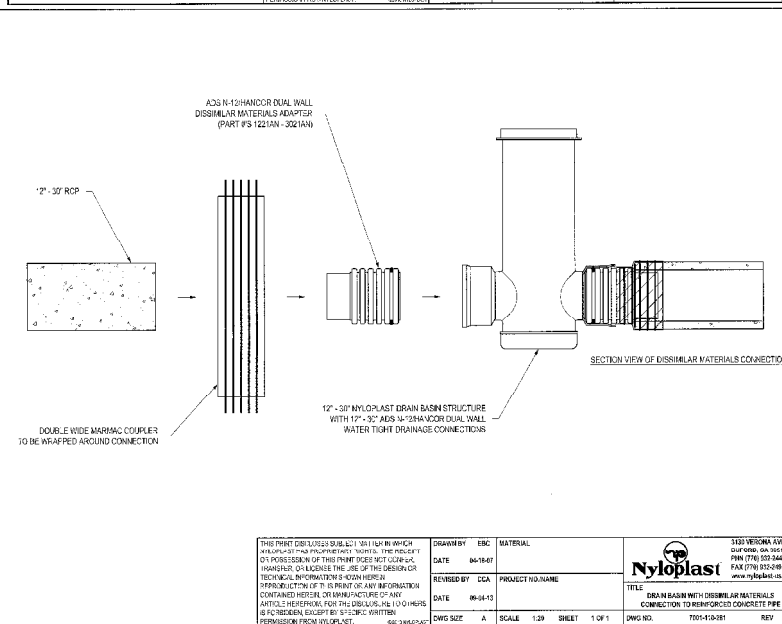




Figure 1 is a map of the study area. It shows a coastline with a study site marked by a black dot and labeled 'NAD 83'. A scale bar at the bottom indicates distances from 0 to 60 feet, with a midpoint at 30 feet. The text 'SCALE 1"=30\'' is printed above the scale bar.

LEGEND

	GRAVEL REMOVAL
	ASPHALT REMOVAL

SYMBOLS

- ## LINE TYPES

- DATE: MARCH 12, 2018 DRAWN BY: K. ATKINSON
SCALE: 1" = 30' CHECKED BY: A. WEHUNT

REVISIONS

REVISED PER WR'S	07/20/17
REVISED PER WR'S	08/15/17
REVISED PER WR'S	12/22/17
REVISED PER WR'S	03/12/18

AS BUILT	DATE
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Site Development	Residential	Infrastructure	Technology
YOUR VISION ACHIEVED THROUGH OURS.			
VIRGINIA	NORTH CAROLINA	WEST VIRGINIA	
THIS DRAWING PREPARED AT THE DOWNTOWN OFFICE 117 S 14th Street Suite 303 Richmond, VA 23219 TEL 804.521.1065 FAX 804.521.1068 www.timmons.com			

36157.001

JAMES RIVER PARK SYSTEM
WAREHOUSE SITE
IMPROVEMENTS

EXISTING CONDITIONS
AND DEMOLITION PLAN

DEPARTMENT OF PARKS AND RECREATION
CITY OF RICHMOND, VIRGINIA

SHEET NO.
C2.0

SURVEY NOTES:

1. INVERTS FOR PIPES AND STRUCTURES SHOWN HEREON ARE BASED ON FIELD MEASUREMENTS, HOWEVER THEY SHOULD BE VERIFIED PRIOR TO CONSTRUCTION.
2. PIPE SIZES, MATERIAL TYPE AND INVERT ELEVATIONS AS INDICATED ARE BASED UPON OBSERVATIONS MADE ABOVE GROUND. NO MEASUREMENTS HAVE BEEN PERFORMED BY PERSONNEL IN A CONFINED SPACE SITUATION.
3. EXISTING GROUND SURFACE LOCATION PERFORMED BY CONVENTIONAL INSTRUMENT SURVEY.
4. HORIZONTAL (NAD83) AND VERTICAL (NAV83) DATUM ESTABLISHED THROUGH REAL TIME KINEMATIC (RTK) GPS OBSERVATIONS ON MARCH 31, 2016. DIFFERENTIAL CORRECTIONS WERE DERIVED FROM THE NORTHERN CALIFORNIA STATE SURVEY (NCSS) OPERATING REFERENCE STATION (ORS) "WAD". COORDINATE VALUES, IF SHOWN HEREON, ARE BASED ON VIRGINIA STATE GRID, SOUTH ZONE.
5. UNDERGROUND UTILITIES WERE DESIGNATED (PAINTED) BY ACCUMARK. H & B SURVEYING AND MAPPING, LLC HAS FIELD LOCATED THE DESIGNATED LINES AS PAINTED AND IS NOT RESPONSIBLE FOR THE DEPTH OR LOCATION OF ANY UNDESIGNATED UTILITIES. IT IS THE USER'S DUTY TO OBTAIN UTILITY INFORMATION ON THIS DRAWING WILL NEED TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
6. THESE RECORDS WERE PREPARED BY VANDERHART CONSULTING GROUP, INC. (VCGI), PHONE: 1-800-552-7001 (OR 7011) 2 BUSINESS DAYS (48 HOURS) PRIOR TO CONSTRUCTION OR EXCAVATION ACTIVITIES.
7. THE PROPERTY SHOWN HEREON FALLS IN THE FOLLOWING FLOOD HAZARD ZONES: THE APPROXIMATE BOUNDARY ELEVATIONS DETERMINED (NAV83) ARE THE APPROXIMATE BOUNDARY LIMITS OF THESE AREAS ARE SHOWN GRAPHICALLY AS SCALED FROM FEMA FLOOD INSURANCE RATE MAP, MAP NUMBER 17010C0201A EFFECTIVE DATE: APRIL 2, 2009 AND MAP NUMBER 170129003R, EFFECTIVE DATE: JULY 16, 2014.
8. THERE ARE NO PROPERTY LINES SHOWN HEREON. THIS SURVEY DOES NOT CONSTITUTE A BOUNDARY SURVEY AND WAS PREPARED WITHOUT THE BENEFIT OF A TITLE COMMITMENT, THEREFORE ALL ADJACENT OWNERS ARE ADVISED THAT THIS SURVEY DOES NOT SHOW ANY BOUNDARIES.
9. THIS TOPOGRAPHIC SURVEY WAS COMPLETED UNDER THE DIRECT AND RESPONSIBLE CHARGE OF ALISON W. HANSON, LSU, FROM AN ACTUAL GROUND SURVEY MADE UNDER HER SUPERVISION. THE COLLECTED DATA WAS ENTERED INTO THE CAD FILE ON MAY 18, 2016. THIS PLAT MAP, DIGITAL GEOSPATIAL DATA INCLUDING METADATA MEETS MINIMUM ACCURACY STANDARDS UNLESS OTHERWISE NOTED.
10. WETLAND DELINEATION HAS BEEN PERFORMED BY OTHERS, WITH FIELD NOTES HOWEVER HOW FAR SURVEYING AND MAPPING LLC DOES NOT GUARANTEE THAT ALL FLAGS FROM THIS DELINEATION AREA

SANITARY STRUCTURES:

SANITARY MANHOLE #394
RIM=67.41'
INV IN= 57.74' (36" RCP FROM #1021 OFF SITE)
INV @ CHAMBER= 57.71'
INV OUT= 57.68' (36" RCP TO #1022)
(36" CONTINUOUS PIPE
WITH TOP CUT OFF FLOWING TO #1022)

SANITARY MANHOLE #1022
RIM= 67.41'
INV IN= 58.35' (36" RCP FROM #394)
INV OUT= 57.61' (36" RCP TO #455)

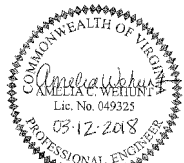
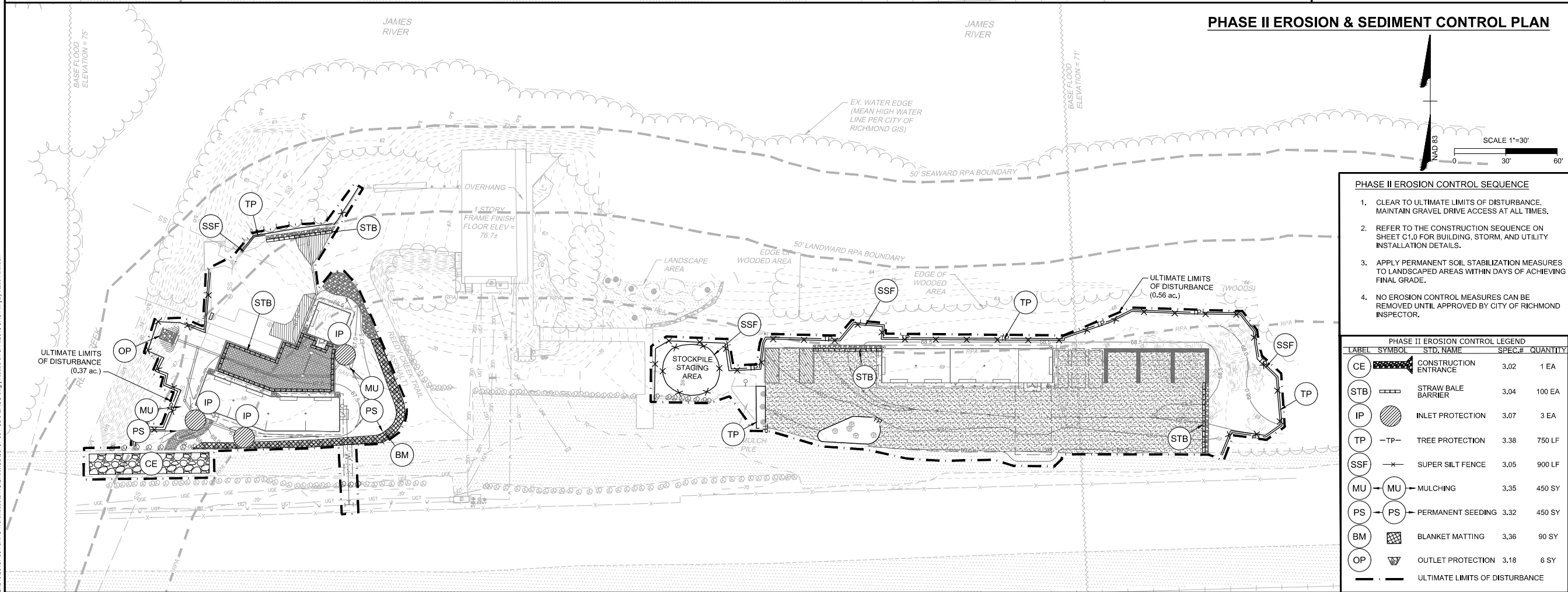
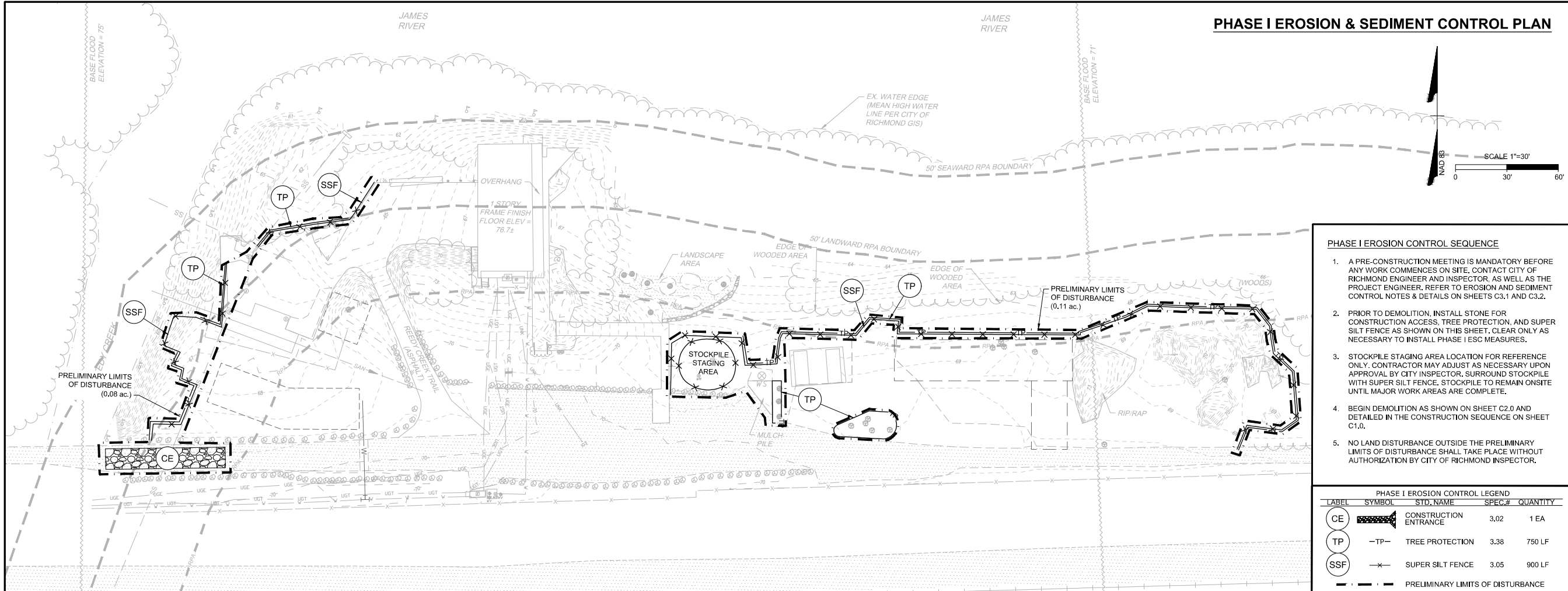
SANITARY MANHOLE #455 & #456 ARE PART OF
CONCRETE SANITARY VAULT
SANITARY MANHOLE #455
RIM= 66.96'
INV IN= 57.45' (36"RCP FROM #1022)
INV IN= 57.33' (36"RCP DRY A.D. TO POSSIBLE H
INV OUT= 56.00' (UNKNOWN SIZE RECESSED A.D.)
SANITARY MANHOLE #456
RIM=67.16'
RIM IS ACCESS TO CONCRETE VAULT.

LEGEND

These standard symbols will
be found in the drawing.

- HVAC UNIT
- BOLLARD
- ♀ SEWER CLEAN OUT
- △ CONTROL POINT
- ⊕ ELECTRIC TRANSFORMER
- ⊗ SANITARY MANHOLE
- SIGN
- SHRUB
- TRASH CAN
- ⊗ TELEPHONE PEDESTAL
- TREE
- ⊗ WATER METER
- ⊗ WATER SPIGOT
- ⊗ WETLAND FLAG
- ⊗ WATER VALVE
- RCP REINFORCED CONCRETE PIPE
- A.B. APPROXIMATE DIRECTION
- GRANITE BOULDER

RIP / RAF



SYMBOLS

- | | |
|------------------|-------------------|
| BOLLARD | R/W TANGENT POINT |
| BUSH | SANITARY MANHOLE |
| CAP | SIGNS |
| ELECTRIC BOX | STORM MANHOLE |
| ELECTRIC METER | TELEPHONE MANHOLE |
| ELECTRIC MANHOLE | TREE |
| FIRE HYDRANT | UTILITY BOX |
| GAS METER | UTILITY PEDESTAL |
| GAS VALVE | UTILITY POLE |
| GUY | WATER METER |
| LIGHT POLE | WATER VALVE |
| POWER POLE | YARD LIGHT |
| PROPERTY PIN | |

LINE TYPES

- | | |
|----------|----------------------------|
| [Symbol] | EXISTING BUILDING |
| [Symbol] | EXISTING GROUND EAST SIDE |
| [Symbol] | EXISTING GROUND CENTERLINE |
| [Symbol] | EXISTING GROUND WEST SIDE |
| [Symbol] | GAS PIPE |
| [Symbol] | PROPERTY LINE |
| [Symbol] | SANITARY SEWER |
| [Symbol] | SEWER EASEMENT |
| [Symbol] | OVERHEAD ELECTRIC |
| [Symbol] | OVERHEAD CABLE TV |
| [Symbol] | UNDERGROUND CABLE TV |
| [Symbol] | UNDERGROUND ELECTRIC |
| [Symbol] | UNDERGROUND TELEPHONE |
| [Symbol] | WATER PIPE |

DATE: MARCH 12, 2018 DRAWN BY: K. ATKINSON
SCALE: 1" = 30' CHECKED BY: A. WEHNER



REVISIONS

REVISED PER WR'S	07/20/17
REVISED PER WR'S	08/15/17
REVISED PER WR'S	12/22/17
REVISED PER WR'S	03/12/18
AS BUILT	DATE

TIMMONS GROUP
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Site Development	Residential	Infrastructure	Technology
YOUR VISION ACHIEVED THROUGH OURS.			
VIRGINIA	NORTH CAROLINA	WEST VIRGINIA	
THIS DRAWING PREPARED AT THE			
DOWNTOWN OFFICE			
117 S 14th Street Suite 303 Richmond, VA 23219			
TEL 804.521.1065 FAX 804.521.1068 www.timmons.com			
36157.001			

JAMES RIVER PARK SYSTEM
WAREHOUSE SITE
IMPROVEMENTS

EROSION AND SEDIMENT
CONTROL PHASE 1 AND 2

DEPARTMENT OF PARKS AND RECREATION
CITY OF RICHMOND, VIRGINIA

SHEET NO.
C3.0

EROSION CONTROL NARRATIVE

PROJECT DESCRIPTION

THIS PROJECT IS LOCATED IN THE CITY OF RICHMOND ON A PARCEL CURRENTLY OWNED BY THE CITY OF RICHMOND DEPARTMENT OF PARKS, RECREATION AND COMMUNITY FACILITIES. THIS PROJECT CONSISTS OF SITE IMPROVEMENTS TO THE EXISTING EQUIPMENT AND MATERIAL STORAGE YARD AS WELL AS THE ADATION OF THREE NEW WAREHOUSE/FLEX SPACE BUILDINGS FOR ADDITIONAL STORAGE AND EDUCATIONAL TRAINING PURPOSES. THE FOLLOWING ITEMS WILL POTENTIALLY BE STORED WITHIN EACH BUILDING:

- EQUIPMENT BUILDINGS A/B: BIKES, KAYAKS, OUTDOOR EQUIPMENT, AND TOOLS NECESSARY FOR TEACHING PEOPLE ABOUT WATERSHEDS, PARKS, AND CONSERVATION.
- MAINTENANCE BUILDING: TRACTORS, SMALL FUEL CONTAINERS, MAINTENANCE TOOLS, MOWERS, BLOWERS, EGGERS, AND OTHER SIMILAR MAINTENANCE EQUIPMENT.

THE TOTAL DISTURBED AREA WITHIN THIS PROJECT IS 0.93 ACRES.

EXISTING SITE CONDITIONS

THE SITE LIES ADJACENT TO THE JAMES RIVER AND SERVES AS THE JAMES RIVER PARK SYSTEM HEADQUARTERS. THE SITE CONSISTS OF ONE PARCEL AND CONTAINS A ONE-STORY BUILDING USED AS THE JRPS OFFICE SPACE. THE SITE IS FILLED WITH SEVERAL STORAGE CONTAINERS, MATERIAL STOCKPILES, MAINTENANCE EQUIPMENT, AND PILES OF DEBRIS. ZONING AREAS PLACE THE HEADQUARTERS WITHIN A SINGLE-FAMILY RESIDENTIAL DISTRICT.

THE MAJORITY OF THE SITE IS IMPERVIOUS CONTAINING ASPHALT AND GRAVEL ACCESS ROADWAYS AND PARKING AREAS, AND MINIMAL LANDSCAPED AREAS.

THERE IS NO EXISTING DRAINAGE INFRASTRUCTURE. THE SITE SHEET FLOWS DIRECTLY INTO THE JAMES RIVER AND IS LOCATED WITHIN THE 100YEAR FLOODPLAIN.

THE EXISTING SITE TOPOGRAPHY SHOWS DRAINAGE FROM THE SITE TOWARDS THE JAMES RIVER AT APPROXIMATELY A 10% SLOPE. THE REMAINDER OF THE SITE RANGES FROM A 1% TO 2% SLOPE DRAINING AWAY FROM EXISTING STRUCTURES.

THE MAJORITY OF THE EXISTING VEGETATION IS WITHIN THE SEAWARD 50' OF THE RPA AND PART OF A FOREST STAND CONTAINING SYCAMORE, OAK, MAPLE, CHERRY, HICKORY, AND OTHER HARDWOOD SPECIES TYPICAL OF THIS REGION. THE MAJORITY OF THIS VEGETATION HAS BEEN OVERTAKEN BY IVY AND OTHER INVASIVE SPECIES AND IS IN POOR CONDITION. BEYOND THE FOREST STAND, VEGETATION INCLUDES SOME SHRUB/SCRUB CLUSTERS AS WELL AS SEVERAL SMALL DECIDUOUS AND EVERGREEN TREES THAT HAVE BEEN NOTED ON THE EXISTING CONDITIONS PLAN SHEET ON C2.0.

ADJACENT SITE

THE SITE IS BOUND TO THE NORTH BY THE JAMES RIVER, TO THE EAST BY REEDY CREEK WALKING TRAIL, TO THE WEST BY REEDY CREEK AND FOREST HILL NEIGHBORHOOD, AND TO THE SOUTH BY WOODLAND HEIGHTS NEIGHBORHOOD AND FOREST HILL PARK.

OFF-SITE AREAS

OFFSITE BORROW WILL NOT BE REQUIRED FOR THE CONSTRUCTION OF THIS PROJECT.

SOILS

THE ENTIRE SITE BOUNDARY IS LOCATED WITHIN SOIL TYPE 40 (UDORTHERENTS-DUMPS COMPLEX) .

THE UDORTHERENTS-DUMPS COMPLEX, WHICH IS 50% UDORTHERENTS AND 50% DUMPS COMPRISES 100% OF THE SITE MAP. THIS SOIL IS NOT PRIME FARMLAND, DEPTH TO RESTRICTIVE FEATURE IS MORE THAN 80 INCHES, DEPTH TO WATER TABLE IS ALSO MORE THAN 80 INCHES. SHRINK-SWELL POTENTIAL IS LOW. THERE IS NO ZONE OF WATER SATURATION WITHIN A DEPTH OF 72 INCHES. THERE IS NO FREQUENCY OF FLOODING OR PONDING.

CRITICAL AREAS

THE PROJECT LIMITS LIE WITHIN AN RPA BOUNDARY.

STORMWATER RUN-OFF CONSIDERATIONS

EXISTING DRAINAGE OUTFALL PATTERNS WILL BE MAINTAINED. STORMWATER WILL BE CONVEYED THROUGH SHALLOW SWALES AND A PROPOSED STORM SYSTEM THAT DISCHARGE INTO GRAVEL DIAPHRAGMS AND SHEETFLOW INTO THE 100 YEAR FLOOD PLAN OF REEDY CREEK AND THE JAMES RIVER. REFER TO DRAINAGE AREA MAP ON SHEET CS.1.

RSMP/VSPM CONSIDERATIONS

THE SITE DISTURBANCE FOR THIS PROJECT IS 0.93 AC. THE PROJECT IS LOCATED WITHIN THE CHESAPEAKE BAY AREA. AN RSMP PERMIT WILL BE REQUIRED. REFER TO SHEET C6.0 FOR STORMWATER MANAGEMENT CALCULATIONS.

CHESAPEAKE BAY NARRATIVE

THIS PROJECT IS DESIGNED TO BE COMPLETED WITH LIMITED LAND DISTURBANCE AND MINIMAL IMPACT ON EXISTING VEGETATION. EXISTING CONDITIONS WITHIN THE PROJECT LIMITS ARE AN EXISTING BUILDING, GRAVEL PARKING, STORAGE CONTAINERS, MAINTENANCE EQUIPMENT ALL SURROUNDED BY MINIMAL GRASSY AREAS. THE TOTAL LAND DISTURBANCE IS 0.93ac (35,719 sf). ALL NEW IMPERVIOUS AREA WILL DRAIN THROUGH SHALLOW SWALES AND A PROPOSED STORM SYSTEM THAT DISCHARGE INTO GRAVEL DIAPHRAGMS AND SHEETFLOW INTO THE FLOODPLAIN AT REEDY CREEK AND THE JAMES RIVER. SILT FENCE, INLET PROTECTION, AND OUTLET PROTECTION WILL BE INSTALLED THROUGHOUT CONSTRUCTION TO PROHIBIT SEDIMENT RUNOFF FROM LEAVING THE PROJECT AREA. ALL DISTURBED GRASS AREAS WILL BE STABILIZED WITH TOPSOIL, SEED, AND STRAW. ALL STEEP GRASS AREAS WILL BE STABILIZED WITH VDOT EC-3 MATTING. REFER TO SHEET C3.0 FOR PHASED EROSION CONTROL PLANS.

PERMANENT STABILIZATION

ALL NON-PAVED AREAS DISTURBED BY CONSTRUCTION SHALL BE STABILIZED WITH PERMANENT SEEDING IMMEDIATELY FOLLOWING FINISHED GRADE. TOPSOIL SHALL BE PLACED TO A DEPTH OF 6" & SEEDING SHALL BE IN ACCORDANCE WITH STD. & SPEC. 3.32. PERMANENT SEEDING. IMPORTED TOPSOIL SHALL BE OBTAINED FROM A SITE WITH AN APPROVED ESC PLAN. SEED TYPE SHALL BE AS SPECIFIED FOR "MINIMUM CARE LAWNS" AND "GENERAL SLOPES" IN THE HANDBOOK. MULCH (STRAW OR FIBER) IN ACCORDANCE WITH STD. & SPEC. 3.35. SHALL BE USED ON ALL SEEDED SURFACES. EROSION CONTROL BLANKETS WILL BE INSTALLED OVER FILL SLOPES WHICH HAVE BEEN BROUGHT TO FINAL GRADE AND HAVE BEEN SEEDDED TO PROTECT THE SLOPES FROM RILL & GULLY EROSION AND TO ALLOW THE SEED TO GERMINATE PROPERLY. IN ALL SEEDING OPERATIONS SEED, FERTILIZER AND LIME SHALL BE APPLIED PER RECOMMENDATIONS OF THE SOIL TEST PRIOR TO MULCHING.

EROSION AND SEDIMENT CONTROL MEASURES

UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE CONSTRUCTED AND MAINTAINED ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK. THE MINIMUM STANDARDS OF THE VESCH SHALL BE ADHERED TO UNLESS OTHERWISE WAIVED OR APPROVED BY A VARIANCE BY LOCAL AUTHORITIES HAVING JURISDICTION.

STRUCTURAL PRACTICES

- CONSTRUCTION ENTRANCE - 3.02
A STONE PAD, LOCATED AT POINTS OF VEHICULAR INGRESS AND EGRESS ON A CONSTRUCTION SITE, TO REDUCE THE SOIL TRANSPORTED ONTO PUBLIC ROADS AND OTHER PAVED AREAS.
- STRAW BALE BARRIER - 3.04
A TEMPORARY SEDIMENT BARRIER COMPOSED OF A ROW OF ENTRENCHED AND ANCHORED STRAW BALES. APPLICABLE WHERE SHEET AND RILL EROSION MAY BE A PROBLEM IN DRAINAGE AREAS OF LIMITED SIZE. STRAW BALE BARRIERS ARE PLACED ACROSS OR AT THE TOE OF A SLOPE TO INTERCEPT AND DETAIN SEDIMENT AND DECREASE SHEET FLOW VELOCITIES. MAXIMUM EFFECTIVE LIFE IS 3 MONTHS.
- SUPER SILT FENCE BARRIER - 3.05
A TEMPORARY SEDIMENT BARRIER CONSISTING OF A SYNTHETIC FILTER FABRIC STRETCHED ACROSS AND ATTACHED TO SUPPORTING POSTS AND ENTRENCHED.
- STORM DRAIN INLET PROTECTION - 3.07
THE INSTALLATION OF VARIOUS KINDS OF SEDIMENT TRAPPING MEASURES AROUND DROP INLETS OR CURB INLET STRUCTURES PRIOR TO PERMANENT STABILIZATION OF THE DISTURBED AREA, LIMITED TO DRAINAGE AREAS NOT EXCEEDING ONE ACRE, AND NOT INTENDED TO CONTROL LARGE, CONCENTRATED STORMWATER FLOWS.

- OUTLET PROTECTION - 3.18
THE THE INSTALLATION OF RIPRAP CHANNEL SECTIONS AND/OR STILLING BASINS BELOW STORM DRAIN OUTLETS TO REDUCE EROSION AND UNDER-CUTTING FROM SCOURING AT OUTLETS AND TO REDUCE FLOW VELOCITIES BEFORE STORMWATER ENTERS RECEIVING CHANNELS BELOW THESE OUTLETS.
- SOIL STABILIZATION BLANKETS AND MATTING - 3.38
THE INSTALLATION OF A PROTECTIVE BLANKET (TREATMENT 1) OR A SOIL STABILIZATION MAT (TREATMENT 2) ON A PREPARED PLANTING OF A STEEP SLOPE, CHANNEL OR SHORELINE.
- TREE PRESERVATION AND PROTECTION - 3.38
PROTECTING EXISTING TREES FROM MECHANICAL AND OTHER INJURY DURING LAND-DISTURBING AND CONSTRUCTION ACTIVITY TO ENSURE THE SURVIVAL OF DESIRABLE TREES WHERE THEY WILL BE EFFECTIVE FOR EROSION AND SEDIMENT CONTROL AND PROVIDE OTHER ENVIRONMENTAL AND AESTHETIC BENEFITS.

VEGETATIVE PRACTICES

- PERMANENT SEEDING - 3.32
ESTABLISHMENT OF PERENNIAL VEGETATIVE COVER BY PLANTING SEED ON ROUGH-GRADED AREAS THAT WILL NOT BE BROUGHT TO FINAL GRADE FOR A YEAR OR MORE OR WHERE PERMANENT, LONG-LIVED VEGETATIVE COVER IS NEEDED ON FINE-GRADED AREAS.
- MULCHING - 3.35
APPLICATION OF PLANT RESIDUES OR OTHER SUITABLE MATERIALS TO DISTURBED SURFACES TO PREVENT EROSION AND REDUCE OVERLAND FLOW VELOCITIES. FOSTERS PLANT GROWTH BY INCREASING AVAILABLE MOISTURE AND PROVIDING INSULATION AGAINST EXTREME HEAT OR COLD. SHOULD BE APPLIED TO ALL SEEDING OPERATIONS. OTHER PLANT MATERIALS WHICH DO NOT PROVIDE ADEQUATE SOIL PROTECTION BY THEMSELVES AND BARE AREAS WHICH CANNOT BE SEEDDED DUE TO THE SEASON BUT WHICH STILL NEED PROTECTION TO PREVENT SOIL LOSS.

ESC CONTROL MEASURE MAINTENANCE
(REFER TO "MINIMUM STANDARDS" FOR ADD. INFORMATION).

- CONSTRUCTION ENTRANCE - 3.02
7.1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOW OF MUD ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC REPAIR AND/OR CLEANOUT OF ANY STRUCTURES USED TO TRAP SEDIMENT.
7.2. ALL MATERIALS SPILLED, DROPPED, WASHED, OR TRACKED FROM VEHICLES ONTO ROADWAYS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.
7.3. THE USE OF WATER TRUCKS TO REMOVE MATERIALS DROPPED, WASHED, OR TRACKED ONTO ROADWAYS WILL NOT BE PERMITTED UNDER ANY CIRCUMSTANCES.
- STRAW BALE BARRIER - 3.04
8.1. STRAW BALE BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL.
8.2. CLOSE ATTENTION SHALL BE PAID TO THE REPAIR OF DAMAGED BALES, END RUNS, AND UNDERCUTTING BENEATH BALES.
8.3. NECESSARY REPAIRS TO BARRIERS OR REPLACEMENT OF BALES SHALL BE ACCOMPLISHED PROMPTLY.
8.4. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH RAINFALL. THEY MUST BE REMOVED WHEN THE LEVEL OF DEPOSITION REACHES ONE-HALF THE HEIGHT OF THE BARRIER.
8.5. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE STRAW BALE BARRIER IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM TO THE EXISTING GRADE, PREPARED, AND SEEDDED.
- SUPER SILT FENCE BARRIER - 3.05
9.1. SILT FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
9.2. CLOSE ATTENTION SHALL BE PAID TO THE REPAIR OF DAMAGED SILT FENCE RESULTING FROM END RUNS AND UNDERCUTTING.
9.3. SHOULD THE FABRIC ON A SILT FENCE DECOMPOSE OR BECOME INEFFECTIVE PRIOR TO THE END OF THE EXPECTED USABLE LIFE AND THE BARRIER STILL BE NECESSARY, THE FABRIC SHALL BE REPLACED PROMPTLY.
9.4. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT. THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE-HALF THE HEIGHT OF THE BARRIER.
9.5. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE SILT FENCE IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM WITH THE EXISTING GRADE, PREPARED AND SEEDDED.
- STORM DRAIN INLET PROTECTION - 3.07
10.1. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
10.2. SEDIMENT SHALL BE REMOVED AND THE TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE HALF THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
10.3. STRUCTURE SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE REMAINING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
- OUTLET PROTECTION - 3.18
11.1. OUTLET PROTECTION SHOULD BE CHECKED REGULARLY FOR SEDIMENT ACCUMULATION OR VEGETATION GROWTH WITHIN THE STONE, SEDIMENT AND VEGETATION SHOULD BE REMOVED WHEN EITHER IS BLOCKING OR REDIRECTING FLOW FROM OUTLET.
11.2. EROSION CAUSED BY HIGH FLOWS AROUND THE EDGES OF THE RIPRAP SHOULD ALSO BE CORRECTED IMMEDIATELY.
- SOIL STABILIZATION BLANKETS AND MATTING - 3.38
12.1. ALL SOIL STABILIZATION BLANKETS AND MATTING SHOULD BE INSPECTED PERIODICALLY FOLLOWING INSTALLATION, PARTICULARLY AFTER RAINSTORMS TO CHECK FOR EROSION AND UNDERMINING. ANY DISLOCATION OR FAILURE SHOULD BE REPAIRED IMMEDIATELY. IF WASHOUTS OR BREAKAGE OCCURS, REINSTALL THE MATERIAL AFTER REPAIRING DAMAGE TO THE SLOPE OR DITCH. CONTINUE TO MONITOR THESE AREAS UNTIL WHICH TIME THEY BECOME PERMANENTLY STABILIZED; AT THAT TIME AN ANNUAL INSPECTION SHOULD BE ADEQUATE.
- TREE PROTECTION - 3.38
13.1. TREE PROTECTION SHOULD BE INSPECTED PERIODICALLY FOLLOWING INSTALLATION, PARTICULARLY AFTER RAINSTORMS TO CHECK FOR AREAS OF DAMAGE. ANY DISLOCATION, FAILURE, OR BREAKAGE THAT OCCURS SHOULD BE REPAIRED.
13.2. IF, IN SPITE OF ALL PRECAUTIONS, DAMAGE TO PROTECTED TREES OCCURS, FOLLOW THE MAINTENANCE GUIDELINES PER THE VIRGINIA 1992 EROSION AND SEDIMENT CONTROL HANDBOOK STANDARD AND SPECIFICATION 3.38.

GENERAL EROSION AND SEDIMENT CONTROL NOTES

- ES-1: UNLESS OTHERWISE INDICATED, CONSTRUCT AND MAINTAIN ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL PRACTICES ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK AND VIRGINIA REGULATIONS 9 VAC 25-840-40
- ES-2: NOTIFY THE DEPARTMENT OF PUBLIC UTILITIES ONE WEEK PRIOR TO THE PRE-CONSTRUCTION CONFERENCE, ONE WEEK PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITY, AND ONE WEEK PRIOR TO THE FINAL INSPECTION.
- ES-3: PLACE ALL EROSION AND SEDIMENT CONTROL MEASURES PRIOR TO OR AS THE FIRST STEP IN CLEARING, GRADING, OR LAND DISTURBANCE.
- ES-4: MAINTAIN A COPY OF THE APPROVED EROSION AND SEDIMENT CONTROL PLAN ON THE SITE AT ALL TIMES.
- ES-5: PRIOR TO COMMENCING LAND-DISTURBING ACTIVITIES IN AREAS OTHER THAN INDICATED ON THESE PLANS (INCLUDING, BUT NOT LIMITED TO, OFFSITE BORROW OR WASTE AREA), THE CONTRACTOR SHALL SUBMIT A SUPPLEMENTARY EROSION CONTROL PLAN TO THE

ARCHITECT/ENGINEER FOR REVIEW AND APPROVAL BY THE PLAN APPROVING AUTHORITY.

- ES-6: PROVIDE ADDITIONAL EROSION CONTROL MEASURES NECESSARY TO PREVENT EROSION AND SEDIMENTATION AS DETERMINED BY THE DPU INSPECTOR.
- ES-7: ALL DISTURBED AREAS ARE TO DRAIN TO APPROVED SEDIMENT CONTROL MEASURES AT ALL TIMES DURING LAND-DISTURBING ACTIVITIES AND DURING SITE DEVELOPMENT UNTIL FINAL STABILIZATION IS ACHIEVED.
- ES-8: DURING DEWATERING OPERATIONS, PUMP WATER INTO AN APPROVED FILTERING DEVICE.
- ES-9: INSPECT ALL EROSION CONTROL MEASURES DAILY AND AFTER EACH RUNOFF-PRODUCING RAINFALL EVENT. MAKE ANY NECESSARY REPAIRS OR CLEANUP TO MAINTAIN THE EFFECTIVENESS OF THE EROSION CONTROL DEVICES IMMEDIATELY.

CITY OF RICHMOND STANDARD E&S NOTES

- PERMANENT OR TEMPORARY SOIL STABILIZATION SHALL BE APPLIED TO DENUDED AREAS WITHIN SEVEN DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. TEMPORARY SOIL STABILIZATION SHALL BE APPLIED WITHIN SEVEN DAYS TO DENUDED AREAS THAT MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT (UNDISTURBED) FOR LONGER THAN 14 DAYS. PERMANENT STABILIZATION SHALL BE APPLIED TO AREAS THAT ARE TO BE LEFT DORMANT FOR MORE THAN ONE YEAR.
- EXCESS EXCAVATION DISPOSED OF OFF THE SITE SHALL BE DISPOSED OF IN ACCORDANCE WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK.
- EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED IN ACCORDANCE WITH VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK AND SHALL BE PLACED PRIOR TO OR AS THE FIRST STEP OF THE LAND DISTURBING ACTIVITY.
- EROSION AND SEDIMENT CONTROLS SHALL BE MAINTAINED SO THAT THE SEDIMENT CARRYING RUNOFF FROM THE SITE WILL NOT ENTER STORM DRAINAGE FACILITIES.
- EROSION AND SEDIMENT CONTROLS SHALL BE MAINTAINED UNTIL THE DISTURBED AREA IS STABILIZED.
- PROPERTIES ADJOINING THE SITE SHALL BE KEPT CLEAN OF MUD OR SILT CARRIED FROM THE SITE BY VEHICULAR TRAFFIC OR RUNOFF.
- THE DISPOSAL OF WASTE MATERIALS REMOVED FROM EROSION AND SEDIMENT CONTROL FACILITIES AND THE DISPOSAL OF THESE FACILITIES SHALL BE IN ACCORDANCE WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK.
- STABILIZATION MEASURES SHALL BE APPLIED TO EARTHEN STRUCTURES SUCH AS DAMS, DIKES AND DIVERSIONS IMMEDIATELY AFTER INSTALLATION.
- DURING CONSTRUCTION OF THE PROJECT, SOIL STOCKPILES SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. THE APPLICANT IS RESPONSIBLE FOR THE PROTECTION AND STABILIZATION OF ALL SOIL STOCKPILES.
- ALL MATERIALS SPILLED, DROPPED, WASHED, OR TRACKED FROM VEHICLES ONTO ROADWAYS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.
- THE USE OF WATER TRUCKS TO REMOVE MATERIALS DROPPED, WASHED, OR TRACKED ONTO ROADWAYS WILL NOT BE PERMITTED UNDER ANY CIRCUMSTANCES.

EROSION & SEDIMENT CONTROL MINIMUM STANDARDS

MS-1: STABILIZE OR PROTECT TEMPORARY SOIL STOCKPILES WITH SEDIMENT TRAPPING MEASURES. PROVIDE TEMPORARY PROTECTION AND PERMANENT STABILIZATION OF ALL SOIL STOCKPILES ON SITE AS WELL AS SOIL TRANSPORTED FROM THE PROJECT SITE.

MS-2: STABILIZE OR PROTECT TEMPORARY SOIL STOCKPILES WITH SEDIMENT TRAPPING MEASURES. PROVIDE TEMPORARY PROTECTION AND PERMANENT STABILIZATION OF ALL SOIL STOCKPILES ON SITE AS WELL AS SOIL TRANSPORTED FROM THE PROJECT SITE.

MS-3: ESTABLISH A PERMANENT VEGETATIVE COVER ON DENUDED AREAS NOT OTHERWISE PERMANENTLY STABILIZED. PERMANENT VEGETATION SHALL NOT BE CONSIDERED ESTABLISHED UNTIL A GROUND COVER IS ACHIEVED THAT IN THE OPINION OF THE ARCHITECT/ENGINEER, IS UNIFORM, MATURE ENOUGH TO SURVIVE AND WILL INHIBIT EROSION.

MS-4: CONSTRUCT SEDIMENT BASINS AND TRAPS, PERIMETER DIKES, SEDIMENT BARRIERS AND OTHER MEASURES INTENDED TO TRAP SEDIMENT AS A FIRST STEP IN ANY LAND-DISTURBING ACTIVITY AND MAKE THESE MEASURES FUNCTIONAL BEFORE UP-SLOPE LAND DISTURBANCE OR TIMBERING TAKES PLACE.

MS-5: APPLY STABILIZATION MEASURES TO EARTHEN STRUCTURES SUCH AS DAMS, DIKES AND DIVERSIONS IMMEDIATELY AFTER INSTALLATION.

MS-6: DESIGN AND CONSTRUCT SEDIMENT TRAPS AND SEDIMENT BASINS BASED UPON THE TOTAL DRAINAGE AREA TO BE SERVED BY THE TRAP OR BASIN.

- DESIGN THE MINIMUM STORAGE CAPACITY OF THE SEDIMENT TRAP TO BE 134 CUBIC YARDS PER ACRE OF DRAINAGE AREA AND THE MAXIMUM DRAINAGE AREA TO THE TRAP BE LESS THAN THREE ACRES.
- DESIGN THE SEDIMENT BASIN TO CONTROL SURFACE RUNOFF FROM DISTURBED AREAS COMPRISED OF FLOW FROM DRAINAGE AREAS GREATER THAN OR EQUAL TO THREE ACRES. ENSURE THE MINIMUM STORAGE CAPACITY OF THE SEDIMENT BASIN TO BE 134 CUBIC YARDS PER ACRE OF DRAINAGE AREA. CONSTRUCT THE OUTFALL SYSTEM TO, AT MINIMUM, MAINTAIN THE STRUCTURAL INTEGRITY OF THE BASIN DURING A 25-YEAR STORM OF 24-HOUR DURATION. WHEN COMPLETING RUNOFF CALCULATIONS, APPLY RUNOFF COEFFICIENTS THAT CORRESPOND TO A BARE EARTH CONDITION OR THOSE CONDITIONS EXPECTED TO EXIST WHILE THE SEDIMENT BASIN IS UTILIZED.

MS-7: CONSTRUCT CUT AND FILL SLOPES IN A MANNER THAT WILL MINIMIZE EROSION. PROVIDE SLOPES THAT ARE FOUND TO BE ERODING EXCESSIVELY WITHIN ONE YEAR OF PERMANENT STABILIZATION WITH ADDITIONAL SLOPE STABILIZING MEASURES UNTIL THE PROBLEM IS CORRECTED.

MS-8: CONCENTRATED RUNOFF SHALL NOT FLOW DOWN CUT OR FILL SLOPES UNLESS CONTAINED WITHIN AN ADEQUATE TEMPORARY OR PERMANENT CHANNEL, FLUME OR SLOPE DRAIN STRUCTURE.

MS-9: WHENEVER WATER SEEPS FROM A SLOPE FACE, PROVIDE ADEQUATE DRAINAGE OR OTHER PROTECTION.

MS-10: PROTECT ALL STORM SEWER INLETS THAT ARE MADE OPERABLE DURING CONSTRUCTION SO THAT SEDIMENT-LADEN WATER CANNOT ENTER THE CONVEYANCE SYSTEM WITHOUT FIRST BEING FILTERED OR OTHERWISE TREATED TO REMOVE SEDIMENT.

MS-11: BEFORE STORMWATER CONVEYANCE CHANNELS ARE MADE OPERATIONAL, PROVIDE ADEQUATE OUTLET PROTECTION AND ANY REQUIRED TEMPORARY OR PERMANENT CHANNEL LINING IN BOTH THE CONVEYANCE CHANNEL AND THE RECEIVING CHANNEL.

MS-12: WHEN WORK IN A LIVE WATERCOURSE IS PERFORMED, TAKE PRECAUTIONS TO MINIMIZE ENCROACHMENT, CONTROL SEDIMENT TRANSPORT AND STABILIZE THE WORK AREA TO THE GREATEST EXTENT POSSIBLE DURING CONSTRUCTION. PROVIDE NON-ERODABLE MATERIAL FOR THE CONSTRUCTION OF CAUSEWAYS AND COFFERDAMS. EARTHEN FILL MAY BE USED FOR THESE STRUCTURES IF ARMORED BY NON-ERODABLE COVER MATERIALS.

MS-13: WHEN A LIVE WATERCOURSE MUST BE CROSSED BY CONSTRUCTION VEHICLES MORE THAN TWICE IN ANY SIX-MONTH PERIOD, PROVIDE A TEMPORARY STREAM CROSSING CONSTRUCTED OF NON-ERODABLE MATERIAL.

MS-14: MEET ALL APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS PERTAINING TO WORKING IN OR CROSSING LIVE WATERCOURSES.

MS-15: STABILIZE THE BED AND BANKS OF A WATERCOURSE IMMEDIATELY FOLLOWING AFTER WORK IN THE WATERCOURSE IS COMPLETED.

MS-16: UNDERGROUND UTILITY LINES SHALL BE INSTALLED IN ACCORDANCE WITH THESE STANDARDS IN ADDITION TO OTHER APPLICABLE CRITERIA:

- OPEN NO MORE THAN 500 LINEAR FEET OF TRENCH AT ONE TIME.
- PLACE EXCAVATED MATERIAL ON THE UPHILL SIDE OF TRENCHES.
- FILTER EFFLUENT FROM DEWATERING OPERATIONS OR PASS THROUGH AN APPROVED SEDIMENT TRAPPING DEVICE, OR BOTH, AND DISCHARGE IN A MANNER THAT DOES NOT

ADVERSELY AFFECT FLOWING STREAMS OR OFFSITE PROPERTY.

- PROPERLY COMPACT MATERIAL USED FOR BACKFILLING TRENCHES IN ORDER TO MINIMIZE EROSION AND PROMOTE STABILIZATION.
- ACCOMPLISH RESTABILIZATION IN ACCORDANCE WITH THIS CHAPTER.
- COMPLY WITH ALL APPLICABLE SAFETY REGULATIONS.

EROSION & SEDIMENT CONTROL MINIMUM STANDARDS (CONT'D)

MS-17: WHERE CONSTRUCTION VEHICLE ACCESS ROUTES INTERSECT PAVED PUBLIC ROADS, MAKE PROVISIONS TO MINIMIZE THE TRANSPORT OF SEDIMENT BY VEHICULAR TRACKING ONTO THE PAVED SURFACE. WHERE SEDIMENT IS TRANSPORTED ONTO A PUBLIC ROAD SURFACE, CLEAN THE ROAD THOROUGHLY AT THE END OF EACH DAY. REMOVE SEDIMENT FROM THE ROADS BY SHOVELING OR SWEEPING AND TRANSPORT TO A SEDIMENT CONTROL DISPOSAL AREA. STREET WASHING SHALL BE ALLOWED ONLY AFTER SEDIMENT IS REMOVED IN THIS MANNER.

MS-18: REMOVE ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION OR AFTER THE TEMPORARY MEASURES ARE NO LONGER NEEDED, UNLESS OTHERWISE AUTHORIZED BY THE LOCAL AUTHORITY HAVING JURISDICTION. PERMANENTLY STABILIZE TRAPPED SEDIMENT AND THE DISTURBED SOIL AREAS RESULTING FROM THE DISPOSITION OF TEMPORARY MEASURES TO PREVENT FURTHER EROSION AND SEDIMENTATION.

MS-19: PROPERTIES AND WATERWAYS DOWNSTREAM FROM DEVELOPMENT SITES SHALL BE PROTECTED FROM SEDIMENT DEPOSITION, EROSION AND DAMAGE DUE TO INCREASES IN VOLUME, VELOCITY AND PEAK FLOW RATE OF STORMWATER RUNOFF FOR THE STATED FREQUENCY STORM OF 24-HOUR DURATION IN ACCORDANCE WITH THE FOLLOWING STANDARDS AND CRITERIA:

a. CONCENTRATED STORMWATER RUNOFF LEAVING A DEVELOPMENT SITE SHALL BE DISCHARGED DIRECTLY INTO AN ADEQUATE NATURAL OR MAN-MADE RECEIVING CHANNEL, PIPE OR STORM SEWER SYSTEM. FOR THOSE SITES WHERE RUNOFF IS DISCHARGED INTO A PIPE OR PIPE SYSTEM, DOWNSTREAM STABILITY ANALYSES AT THE OUTFALL OF THE PIPE OR PIPE SYSTEM SHALL BE PERFORMED.

b. ADEQUACY OF ALL CHANNELS AND PIPES SHALL BE VERIFIED IN THE FOLLOWING MANNER:

- THE APPLICANT SHALL DEMONSTRATE THAT THE TOTAL DRAINAGE AREA TO THE POINT OF ANALYSIS WITHIN THE CHANNEL IS PLAN VIEW TIMES GREATER THAN THE CONTRIBUTING DRAINAGE AREA OF THE PROJECT IN QUESTION; OR
- NATURAL CHANNELS SHALL BE ANALYZED BY THE USE OF A TWO-YEAR FREQUENCY STORM TO VERIFY THAT STORMWATER WILL NOT OVERTOP CHANNEL BANKS NOR CAUSE EROSION OF CHANNEL BED OR BANKS.
- ALL PREVIOUSLY CONSTRUCTED MAN-MADE CHANNELS SHALL BE ANALYZED BY THE USE OF A TEN-YEAR FREQUENCY STORM TO VERIFY THAT STORMWATER WILL NOT OVERTOP ITS BANKS AND BY THE USE OF A TWO-YEAR STORM TO DEMONSTRATE THAT STORMWATER WILL NOT CAUSE EROSION OF CHANNEL BED OR BANKS; AND
- PIPES AND STORM SEWER SYSTEMS SHALL BE ANALYZED BY THE USE OF A TEN-YEAR FREQUENCY STORM TO VERIFY THAT STORMWATER WILL BE CONTAINED WITHIN THE PIPE OR SYSTEM.

c. IF EXISTING NATURAL RECEIVING CHANNELS OR PREVIOUSLY CONSTRUCTED MAN-MADE CHANNELS OR PIPES ARE NOT ADEQUATE, THE APPLICANT SHALL:

- IMPROVE THE CHANNELS TO A CONDITION WHERE A TEN-YEAR FREQUENCY STORM WILL NOT OVERTOP THE BANKS AND A TWO-YEAR FREQUENCY STORM WILL NOT CAUSE EROSION TO THE CHANNEL, THE BED, OR BANKS; OR
- IMPROVE THE PIPE OR PIPE SYSTEM TO A CONDITION WHERE THE TEN-YEAR FREQUENCY STORM IS CONTAINED WITHIN THE APPURTENANCES
- DEVELOP A SITE DESIGN THAT WILL NOT CAUSE THE PRE-DEVELOPMENT PEAK RUNOFF RATE FROM A TWO-YEAR STORM TO INCREASE WHEN RUNOFF OUTFALLS INTO A NATURAL CHANNEL OR WILL NOT CAUSE THE PRE-DEVELOPMENT PEAK RUNOFF RATE FROM A TEN-YEAR STORM TO INCREASE WHEN RUNOFF OUTFALLS INTO A MAN-MADE CHANNEL; OR
- PROVIDE A COMBINATION OF CHANNEL IMPROVEMENT, STORMWATER DETENTION/RETENTION OR OTHER MEASURES WHICH IS SATISFACTORY TO THE VESCP AUTHORITY TO PREVENT DOWNSTREAM EROSION.

d. THE APPLICANT SHALL PROVIDE EVIDENCE OF PERMISSION TO MAKE THE IMPROVEMENTS.

e. ALL HYDROLOGIC ANALYSES SHALL BE BASED ON THE EXISTING WATERSHED CHARACTERISTICS AND THE ULTIMATE DEVELOPMENT CONDITION OF THE SUBJECT PROJECT.

f. IF THE APPLICANT CHOOSES AN OPTION THAT INCLUDES STORMWATER DETENTION, HE SHALL OBTAIN APPROVAL FROM THE VESCP OF A PLAN FOR MAINTENANCE OF THE DETENTION FACILITIES. THE PLAN SHALL SET FORTH THE MAINTENANCE REQUIREMENTS OF THE FACILITY AND THE PERSON RESPONSIBLE FOR PERFORMING THE MAINTENANCE.

g. OUTFALL FROM A DETENTION FACILITY SHALL BE DISCHARGED TO A RECEIVING CHANNEL, AND ENERGY DISSIPATORS SHALL BE PLACED AT THE OUTFALL OF ALL DETENTION FACILITIES AS NECESSARY TO PROVIDE A STABILIZED TRANSITION FROM THE FACILITY TO THE RECEIVING CHANNEL.

h. ALL ON-SITE CHANNELS MUST BE VERIFIED TO BE ADEQUATE.

i. INCREASED VOLUMES OF SHEET FLOWS THAT MAY CAUSE EROSION OR SEDIMENTATION ON ADJACENT PROPERTY SHALL BE DIVERTED TO A STABLE OUTLET, ADEQUATE CHANNEL, PIPE OR PIPE SYSTEM, OR TO A DETENTION FACILITY.

j. IN APPLYING THESE STORMWATER MANAGEMENT CRITERIA, INDIVIDUAL LOTS IN A RESIDENTIAL SUBDIVISION DEVELOPMENT SHALL NOT BE CONSIDERED TO BE SEPARATE DEVELOPMENT PROJECTS. INSTEAD, THE RESIDENTIAL SUBDIVISION DEVELOPMENT, AS A WHOLE, SHALL BE CONSIDERED TO BE A SINGLE DEVELOPMENT PROJECT. HYDROLOGIC PARAMETERS THAT REFLECT THE ULTIMATE SUBDIVISION DEVELOPMENT SHALL BE USED IN ALL ENGINEERING CALCULATIONS.

k. ALL MEASURES USED TO PROTECT PROPERTIES AND WATERWAYS SHALL BE EMPLOYED IN A MANNER WHICH MINIMIZES IMPACTS ON THE PHYSICAL, CHEMICAL AND BIOLOGICAL INTEGRITY OF RIVERS, STREAMS AND OTHER WATERS OF THE STATE.

l. ANY PLAN APPROVED PRIOR TO JULY 1, 2014, THAT PROVIDES FOR STORMWATER MANAGEMENT THAT ADDRESSES ANY FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS FOR NATURAL OR MAN-MADE CHANNELS SHALL SATISFY THE FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS FOR NATURAL OR MAN-MADE CHANNELS IF THE PRACTICES ARE DESIGNED TO (I) DETAIN THE WATER QUALITY VOLUME AND TO RELEASE IT OVER 48 HOURS; (II) DETAIN AND RELEASE OVER A 24-HOUR PERIOD THE EXPECTED RAINFALL RESULTING FROM THE ONE YEAR, 24-HOUR STORM; AND (III) REDUCE THE ALLOWABLE PEAK FLOW RATE RESULTING FROM THE 1.5, 2, AND 10-YEAR, 24-HOUR STORMS TO A LEVEL THAT IS LESS THAN OR EQUAL TO THE PEAK FLOW RATE FROM THE SITE ASSUMING IT WAS IN A GOOD FORESTED CONDITION, ACHIEVED THROUGH MULTIPLICATION OF THE FORESTED PEAK FLOW RATE BY A REDUCTION FACTOR THAT IS EQUAL TO THE RUNOFF VOLUME FROM THE SITE WHEN IT WAS IN A GOOD FORESTED CONDITION DIVIDED BY THE RUNOFF VOLUME FROM THE SITE IN ITS PROPOSED CONDITION, AND SHALL BE EXEMPT FROM ANY FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS FOR NATURAL OR MAN-MADE CHANNELS AS DEFINED IN ANY REGULATIONS PROMULGATED PURSUANT TO § 62.1-44.15.54 OR 62.1-44.15.65 OF THE ACT.

m. FOR PLANS APPROVED ON AND AFTER JULY 1, 2014, THE FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS OF § 62.1-44.15.52 A OF THE ACT AND THIS SUBSECTION SHALL BE SATISFIED BY COMPLIANCE WITH WATER QUANTITY REQUIREMENTS IN THE STORMWATER MANAGEMENT ACT (§ 62.1-44.15.24 ET SEQ. OF THE CODE OF VIRGINIA) AND ATTENDANT REGULATIONS, UNLESS SUCH LAND-DISTURBING ACTIVITIES ARE IN ACCORDANCE WITH PROVISIONS FOR THE TIME LIMITS ON APPLICABILITY OF APPROVED DESIGN CRITERIA IN 9VAC25-870-47 OR GRADE-FASTERING IN 9VAC25-870-48. OF THE VIRGINIA STORMWATER MANAGEMENT PROGRAM (VSPM) REGULATION, IN WHICH CASE THE FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS OF § 62.1-44.15.52 A OF THE ACT SHALL APPLY, OR ARE EXEMPT PURSUANT TO § 62.1-44.15.34 C7 OF THE ACT.

n. COMPLIANCE WITH THE WATER QUANTITY MINIMUM STANDARDS SET OUT IN 9VAC25-870-66 OF THE VIRGINIA STORMWATER MANAGEMENT PROGRAM (VSPM) REGULATIONS SHALL BE DEEMED TO SATISFY THE REQUIREMENTS OF SUBDIVISION 19 OF THIS SUBSECTION.



SYMBOLS

- | | |
|------------------|-------------------|
| BOLLARD | R/W TANGENT POINT |
| BUSH | SANITARY MANHOLE |
| CAP | SIGNS |
| ELECTRIC BOX | STORM MANHOLE |
| ELECTRIC METER | TELEPHONE MANHOLE |
| ELECTRIC MANHOLE | TREE |
| FIRE HYDRANT | UTILITY BOX |
| GAS METER | UTILITY PEDESTAL |
| GAS VALVE | UTILITY POLE |
| GUY | WATER METER |
| LIGHT POLE | WATER VALVE |
| POWER POLE | YARD LIGHT |
| PROPERTY PIN | |

LINE TYPES

- | | |
|------|----------------------------|
| --- | EXISTING BUILDING |
| ---- | EXISTING GROUND EAST SIDE |
| ---- | EXISTING GROUND CENTERLINE |
| ---- | EXISTING GROUND WEST SIDE |
| ---- | GAS PIPE |
| ---- | PROPERTY LINE |
| ---- | SANITARY SEWER |
| ---- | SEWER EASEMENT |
| ---- | OVERHEAD ELECTRIC |
| ---- | OVERHEAD CABLE TV |
| ---- | UNDERGROUND CABLE TV |
| ---- | UNDERGROUND ELECTRIC |
| ---- | UNDERGROUND TELEPHONE |
| ---- | WATER PIPE |

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SCALE: 1" = 1' CHECKED BY: A. WEHUNT

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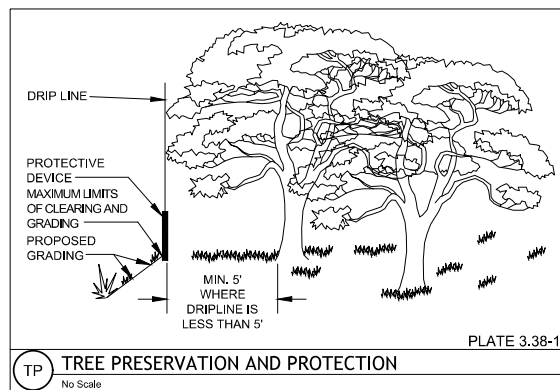
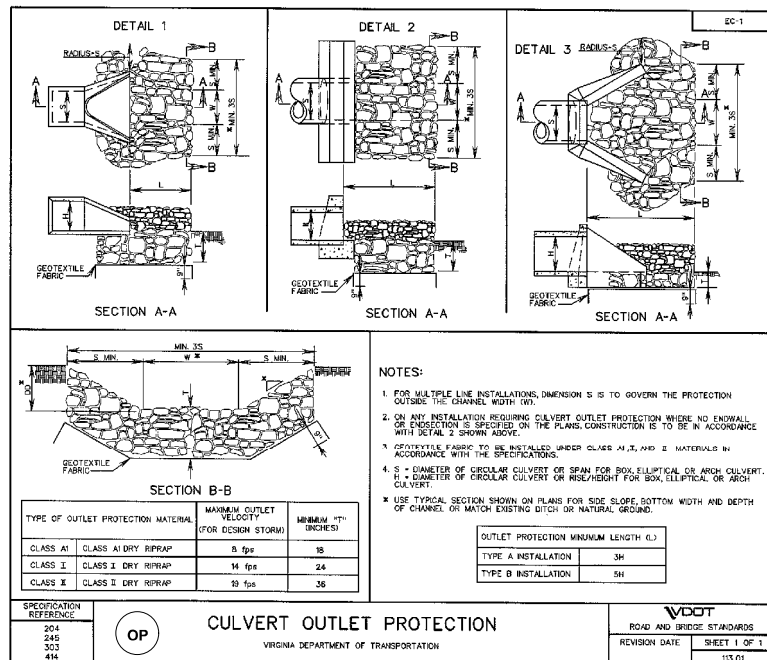
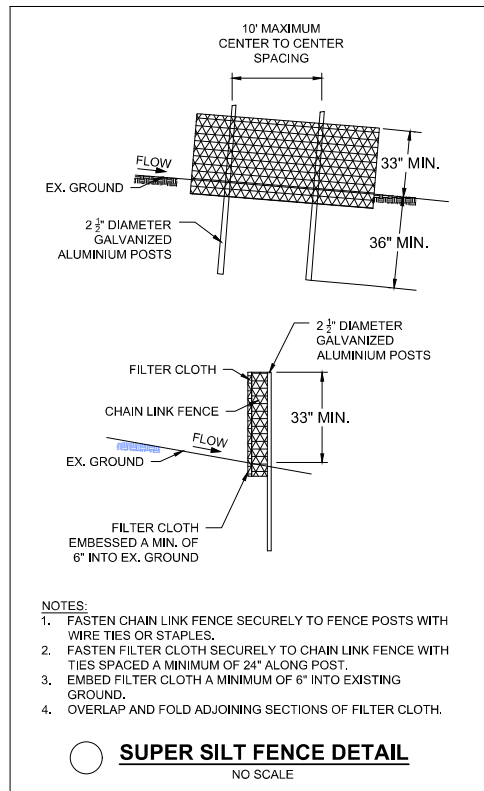
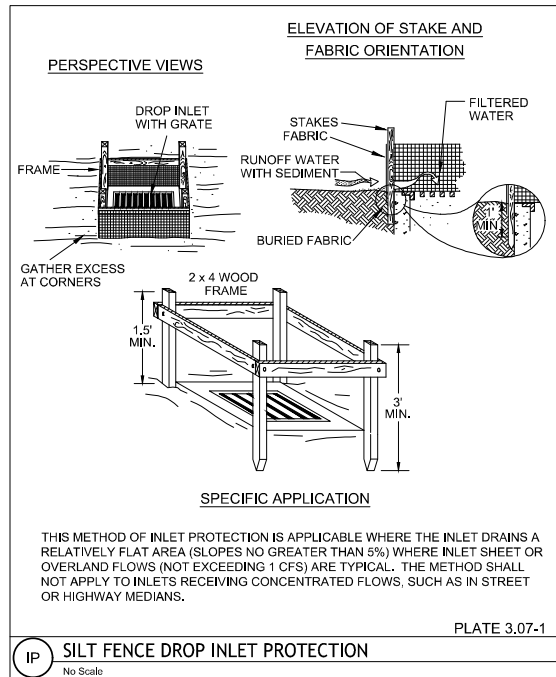
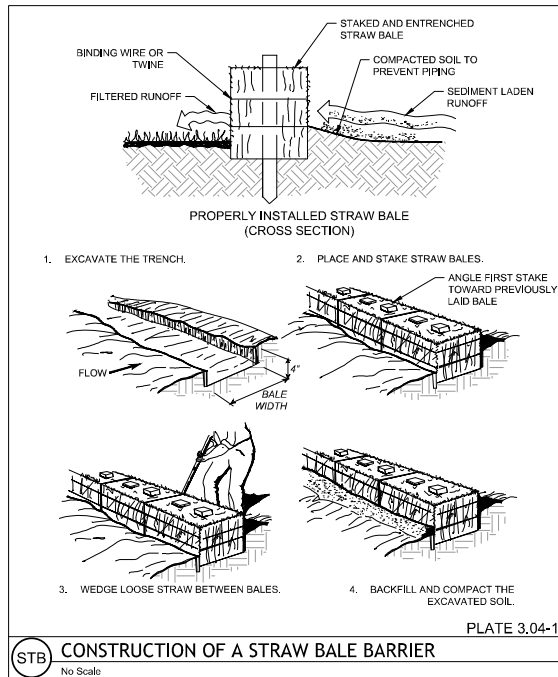
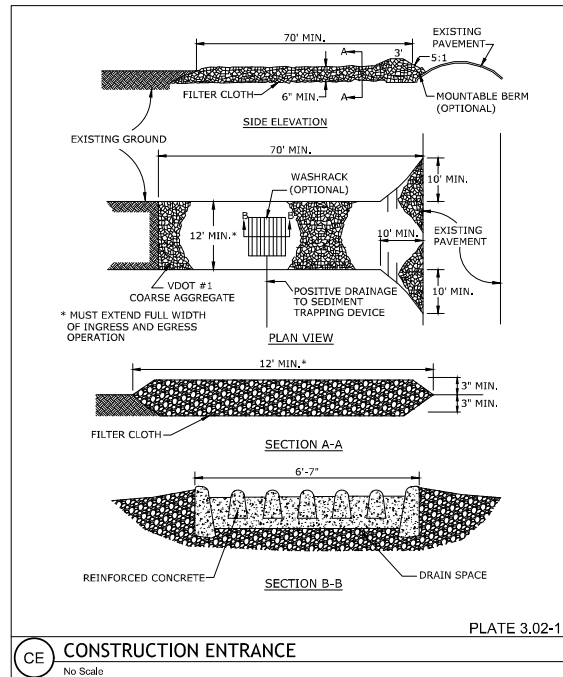
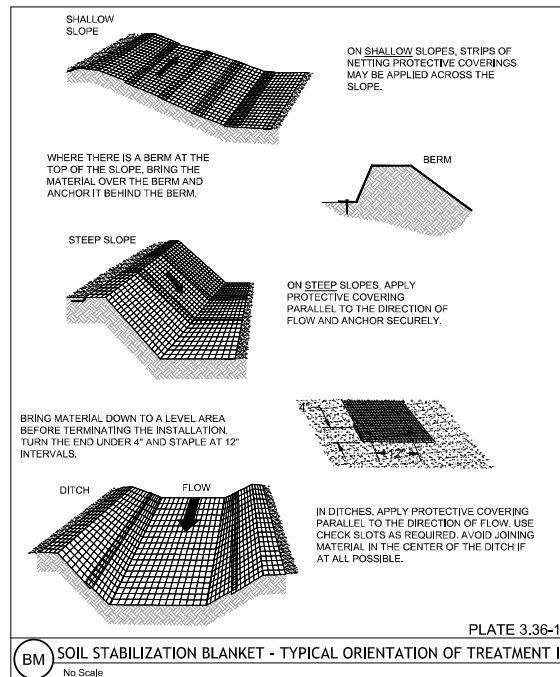


TABLE 3.31-B (REVISED June 2003) TEMPORARY SEEDING SPECIFICATIONS QUICK REFERENCE FOR ALL REGIONS		
<u>SEED</u>		
APPLICATION DATES	SPECIES	APPLICATION RATES
Sept. 1 - Feb. 15	50/50 Mix of Annual Ryegrass (lolium multi-florum) & Cereal (Winter) Rye (Secale cereale)	50 -100 (lbs/acre)
Feb. 16 - Apr. 30	Annual Ryegrass (lolium multi-florum)	60 - 100 (lbs/acre)
May 1 - Aug. 31	German Millet	50 (lbs/acre)
<u>FERTILIZER & LIME</u>		
<ul style="list-style-type: none"> • Apply 10-10-10 fertilizer at a rate of 450 lbs / acre (or 10lbs. / 1,000 sq. ft.) • Apply Pulverized Agricultural Lime at a rate of 2 tons / acre (or 90lbs. / 1,000 sq. ft.) 		
NOTE: 1 - A soil test is necessary to determine the actual amount of lime required to adjust the soil pH of site. 2 - Incorporate the lime and fertilizer into the top 4 - 6 inches of the soil by diskimg or by other means. 3 - When applying Slowly Available Nitrogen, use rates available in Erosion & Sediment Control Technical Bulletin #4 , 2003 Nutrient Management for Development Sites at http://www.dcr.state.vt.us/srsw/e&s.htm#pubs		

SEED ¹		
LAND USE	SPECIES	APPLICATION PER ACRE
MINIMUM CARE LAWN (COMMERCIAL OR RESIDENTIAL)	TALL FESCUE ¹ PERENNIAL RYEGRASS ² KENTUCKY BLUEGRASS ³	95-100 ¹ 0-5 ² 0-5 ³ TOTAL: 175-200 LB
HIGH-MAINTENANCE LAWN	TALL FESCUE ¹	TOTAL: 200-250 LB
GENERAL SLOPE (3:1 OR LESS)	TALL FESCUE ¹ RED TOP GRASS OR CREEPING RED FESCUE SEASONAL NURSE CROP ²	128 LB 2 LB 20 LB TOTAL: 150 LB
LOW-MAINTENANCE SLOPE (STEEPER THAN 3:1)	TALL FESCUE ¹ RED TOP GRASS OR CREEPING RED FESCUE SEASONAL NURSE CROP ² CROWN/VETCH ³	108 LB 2 LB 20 LB 20 LB TOTAL: 150 LB

1. WHEN SELECTING VARIETIES OF TURFGRASS, USE THE VIRGINIA CROP IMPROVEMENT ASSOCIATION (VCIA) RECOMMENDED TURFGRASS VARIETY LIST. QUALITY SEED WILL BEAR A LABEL INDICATING THAT THEY ARE APPROVED BY VCIA. A CURRENT TURFGRASS VARIETY LIST IS AVAILABLE AT THE LOCAL COUNTY EXTENSION OFFICE OR THROUGH VCIA AT 804-746-4884 OR AT [HTTP://SUDAN.CES.VT.EDU/HTML/TURF/TURF/PUBLICATIONS/PUBLICATIONS2.HTML](http://sudan.ces.vt.edu/html/turf/turf/publications/publications2.html)

2 - USE SEASONAL NURSE CROP IN ACCORDANCE WITH SEEDING DATES AS STATED BELOW:

FEBRUARY 16TH - APRIL	ANNUAL RYE
MAY 1ST - AUGUST 15TH	FOXTAIL MILLET
AUGUST 16TH - OCTOBER	ANNUAL RYE
NOVEMBER - FEBRUARY 15TH	WINTER RYE

3 - SUBSTITUTE SERICEA LESPEDEZA FOR CROWNVEET EAST OF FARMVILLE, VA (MAY THROUGH SEPTEMBER) USE HULLED SEED. ALL OTHER PERIODS USE UNHULLED SERICEA. IF FLATFLOE IS USED, INCREASE RATE TO 30 LBS./AC. WEEDING LOW GRASS IS USU. INC. IN RATE TO 40 LBS./AC. MAINTENANCE MIXTURE DURING WARMER SEEDING PERIODS. INCREASE TO 30-40

<u>FERTILIZER & LIME</u>	
•	APPLY 10-20-10 FERTILIZER AT A RATE OF 500 LBS. / ACRE (OR 12 LBS. / 1,000 SQ. FT.)
•	APPLY PULVERIZED AGRICULTURAL LIMESTONE AT A RATE OF 2 TONS/ACRE (90 LBS. / 1,000 SQ. FT.)

<u>FERTILIZER & LIME</u>	
•	APPLY 10-20-10 FERTILIZER AT A RATE OF 500 LBS. / ACRE (OR 12 LBS. / 1,000 SQ. FT.)
•	APPLY PULVERIZED AGRICULTURAL LIMESTONE AT A RATE OF 2 TONS/ACRE (90 LBS. / 1,000 SQ. FT.)

- A SOIL TEST IS NECESSARY TO DETERMINE THE ACTUAL AMOUNT OF LIME REQUIRED TO ADJUST THE SOIL pH OF SITE
- INCORPORATE THE LIME AND FERTILIZER INTO THE TOP 4 - 6 INCHES OF THE SOIL BY DISKING OR BY OTHER MEANS.
- WHEN APPLYING SLOWLY AVAILABLE NITROGEN, USE RATES AVAILABLE IN EROSION & SEDIMENT CONTROL TECHNICAL BULLETIN #4, 2003 NUTRIENT MANAGEMENT FOR DEVELOPMENT SITES AT [HTTP://WWW.DCR.STATE.VA.US/SWI/ES&S.HTM#PUBS](http://www.dcr.state.va.us/SWI/ES&S.HTM#PUBS)



SYMBOLS

	BOLLARD		R/W TANGENT POINT
	BUSH		SANITARY MANHOLE
	CAP		SIGNS
	ELECTRIC BOX		STORM MANHOLE
	ELECTRIC METER		TELEPHONE MANHOLE
	ELECTRIC MANHOLE		TREE
	FIRE HYDRANT		UTILITY BOX
	GAS METER		UTILITY PEDESTAL
	GAS VALVE		UTILITY POLE
	GUY		WATER METER
	LIGHT POLE		WATER VALVE
	POWER POLE		YARD LIGHT
	PROPERTY PIN		

LINE TYPES

	EXISTING BUILDING		EXISTING GROUND EAST SIDE
	EXISTING GROUND CENTERLINE		EXISTING GROUND WEST SIDE
	GAS PIPE		PROPERTY LINE
	SANITARY SEWER		SEWER EASEMENT
	OVERHEAD ELECTRIC		OVERHEAD CABLE TV
	UNDERGROUND CABLE TV		UNDERGROUND ELECTRIC
	UNDERGROUND ELECTRIC		UNDERGROUND TELEPHONE
	WATER PIPE		

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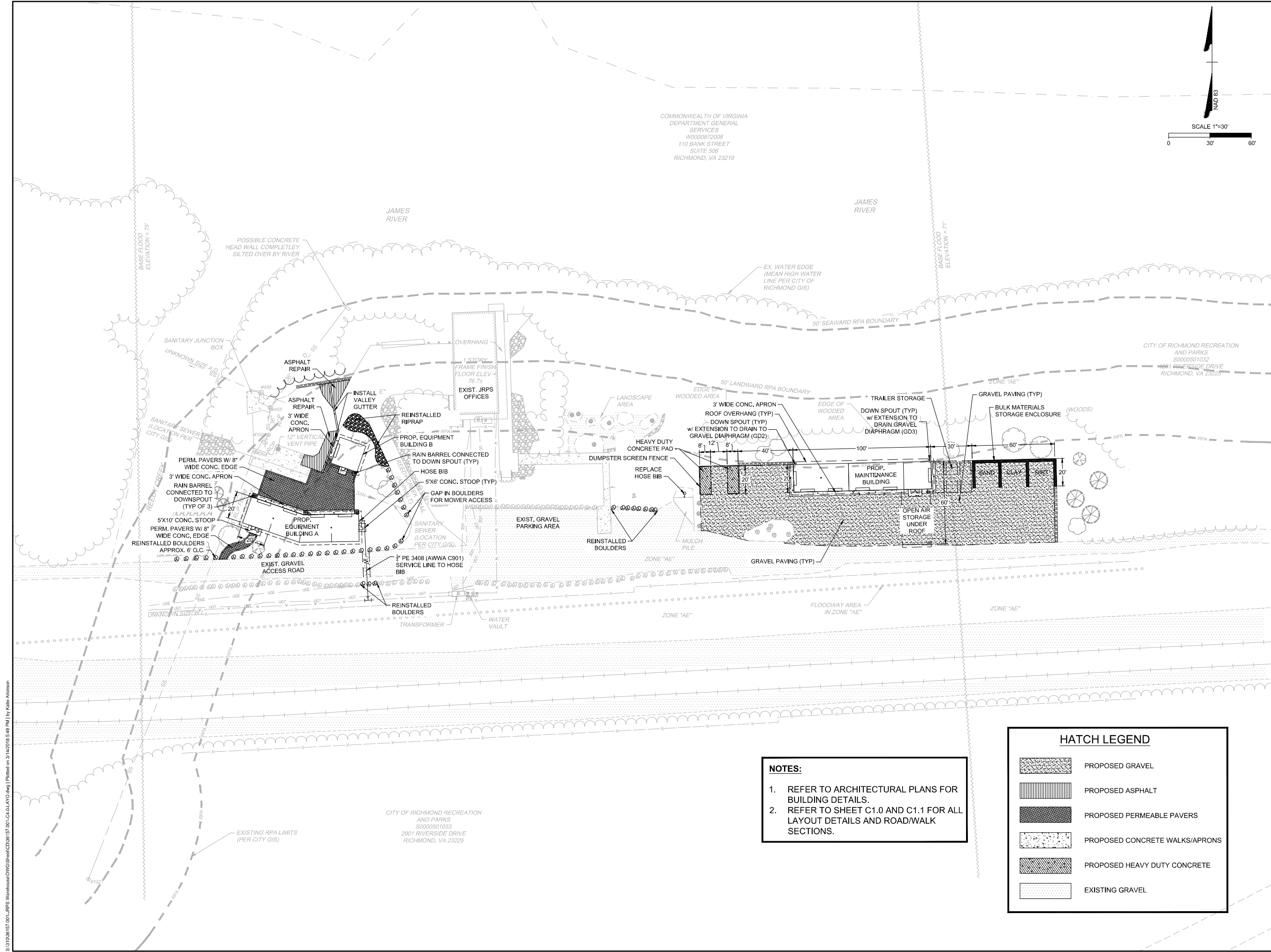


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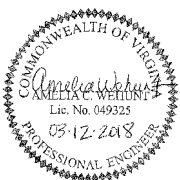
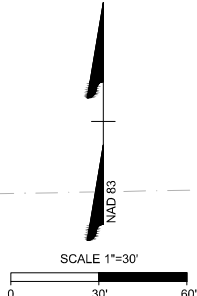
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WAREHOUSE SITE
IMPROVEMENTS
EROSION AND
SEDIMENT CONTROL
NOTES & DETAILS

DEPARTMENT OF PARKS AND RECREATION CITY OF RICHMOND, VIRGINIA	SHEET NO. C3.2
--	-------------------



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SYMBOLS

	BOLLARD		R/W TANGENT POINT
	BUSH		SANITARY MANHOLE
	CAP		SIGNS
	ELECTRIC BOX		STORM MANHOLE
	ELECTRIC METER		TELEPHONE MANHOLE
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	GAS VALVE		UTILITY POLE
	GUY		WATER METER
	LIGHT POLE		WATER VALVE
	POWER POLE		YARD LIGHT
	PROPERTY PIN		

LINE TYPES

	EXISTING BUILDING
	EXISTING GROUND EAST SIDE
	EXISTING GROUND CENTERLINE
	EXISTING GROUND WEST SIDE
	GAS PIPE
	PROPERTY LINE
	SANITARY SEWER
	SEWER EASEMENT
	OVERHEAD ELECTRIC
	OVERHEAD CABLE TV
	UNDERGROUND CABLE TV
	UNDERGROUND ELECTRIC
	UNDERGROUND TELEPHONE
	WATER PIPE

- NOTES:**
- REFER TO ARCHITECTURAL PLANS FOR BUILDING DETAILS.
 - REFER TO SHEET C1.0 AND C1.1 FOR ALL LAYOUT DETAILS AND ROAD/WALK SECTIONS.

HATCH LEGEND

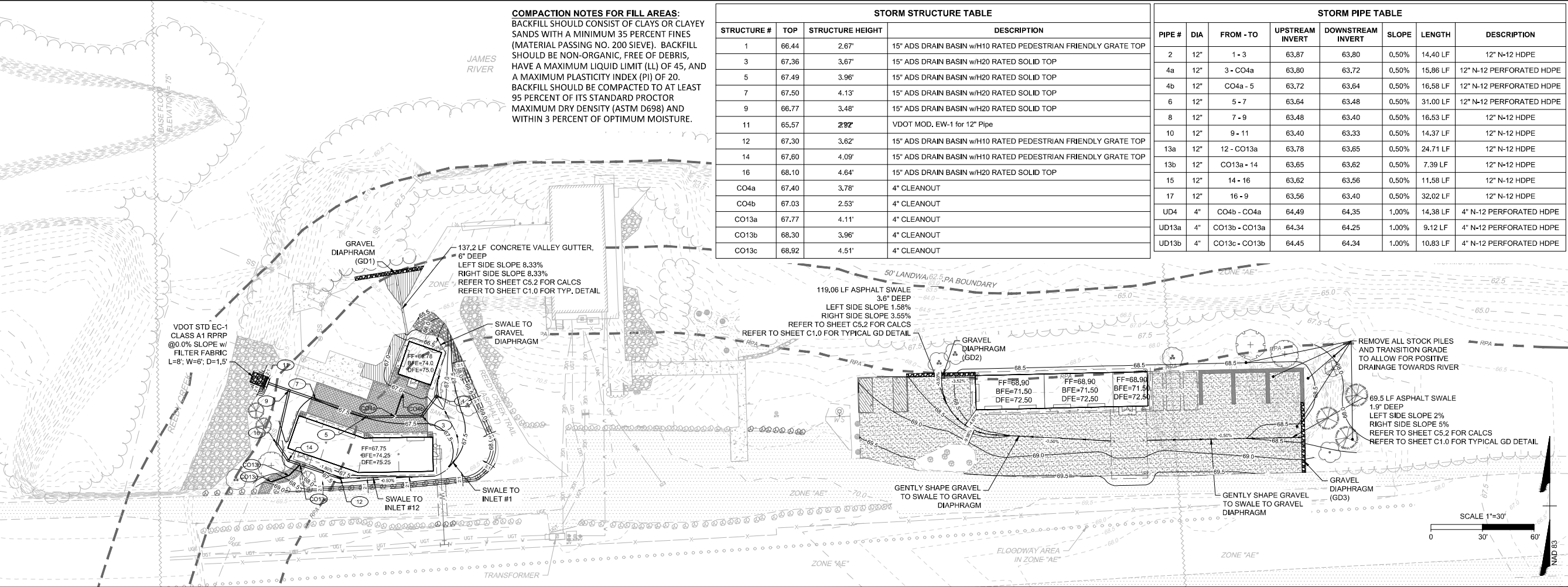
	PROPOSED GRAVEL
	PROPOSED ASPHALT
	PROPOSED PERMEABLE PAVERS
	PROPOSED CONCRETE WALKS/APRONS
	PROPOSED HEAVY DUTY CONCRETE
	EXISTING GRAVEL

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SYMBOLS

- BOLLARD
- BUSH
- CAP
- ELECTRIC BOX
- ELECTRIC METER
- ELECTRIC MANHOLE
- FIRE HYDRANT
- GAS METER
- GAS VALVE
- GUY
- LIGHT POLE
- POWER POLE
- PROPERTY PIN
- R/W TANGENT POINT
- SANITARY MANHOLE
- SIGNS
- STORM MANHOLE
- TELEPHONE MANHOLE
- TREE
- UTILITY BOX
- UTILITY PEDESTAL
- UTILITY POLE
- WATER METER
- WATER VALVE
- YARD LIGHT

LINE TYPES

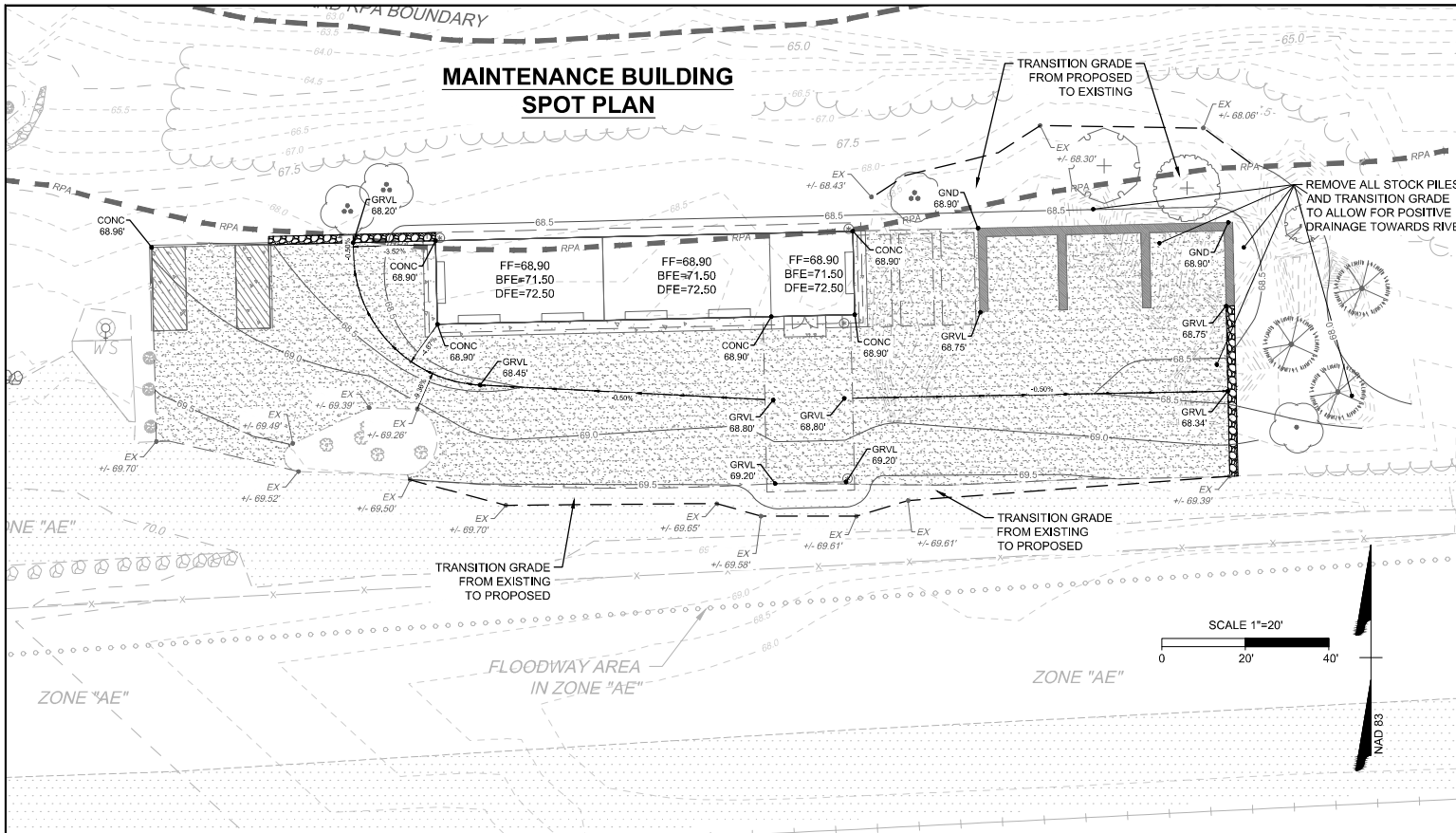
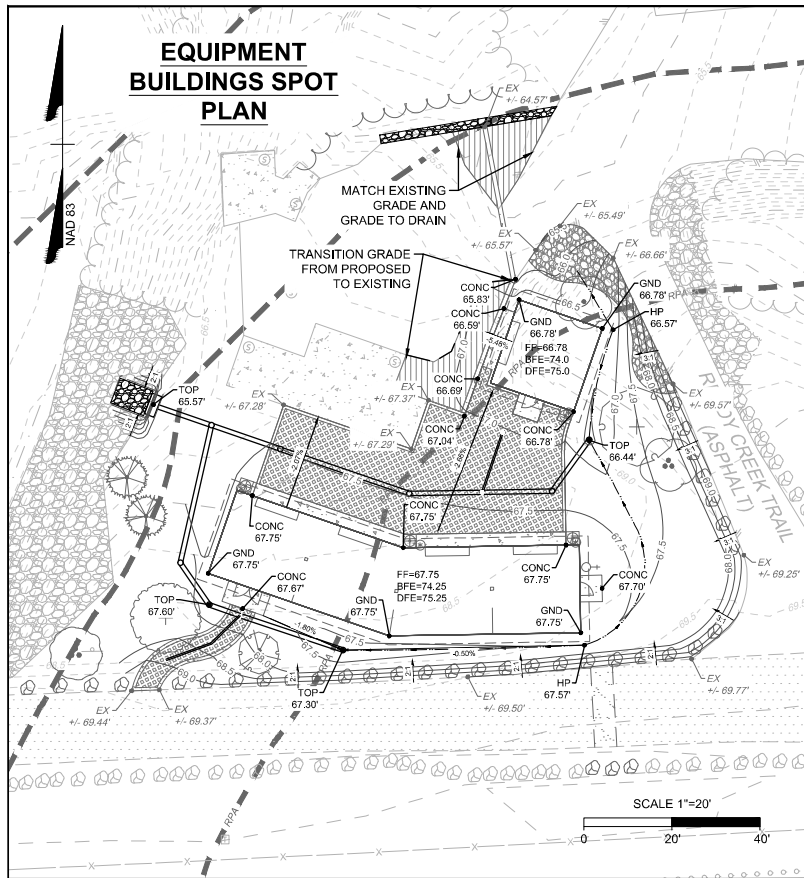
- EXISTING BUILDING
- EXISTING GROUND EAST SIDE
- EXISTING GROUND CENTERLINE
- EXISTING GROUND WEST SIDE
- GAS PIPE
- PROPERTY LINE
- SANITARY SEWER
- SEWER EASEMENT
- OVERHEAD ELECTRIC
- OVERHEAD CABLE TV
- UNDERGROUND CABLE TV
- UNDERGROUND ELECTRIC
- UNDERGROUND TELEPHONE
- WATER PIPE

NOTES:

FF = FINISHED FLOOR

BFE = BASE FLOOD ELEVATION

DFE = DESIGN FLOOD ELEVATION



DATE: MARCH 12, 2018 DRAWN BY: K. ATKINSON

SCALE: AS SHOWN CHECKED BY: A. WEHNT



REVISIONS

REVISED PER WR'S 07/20/17
REVISED PER WR'S 08/15/17
REVISED PER WR'S 12/22/17
REVISED PER WR'S 03/12/18

AS BUILT DATE

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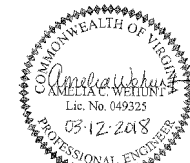
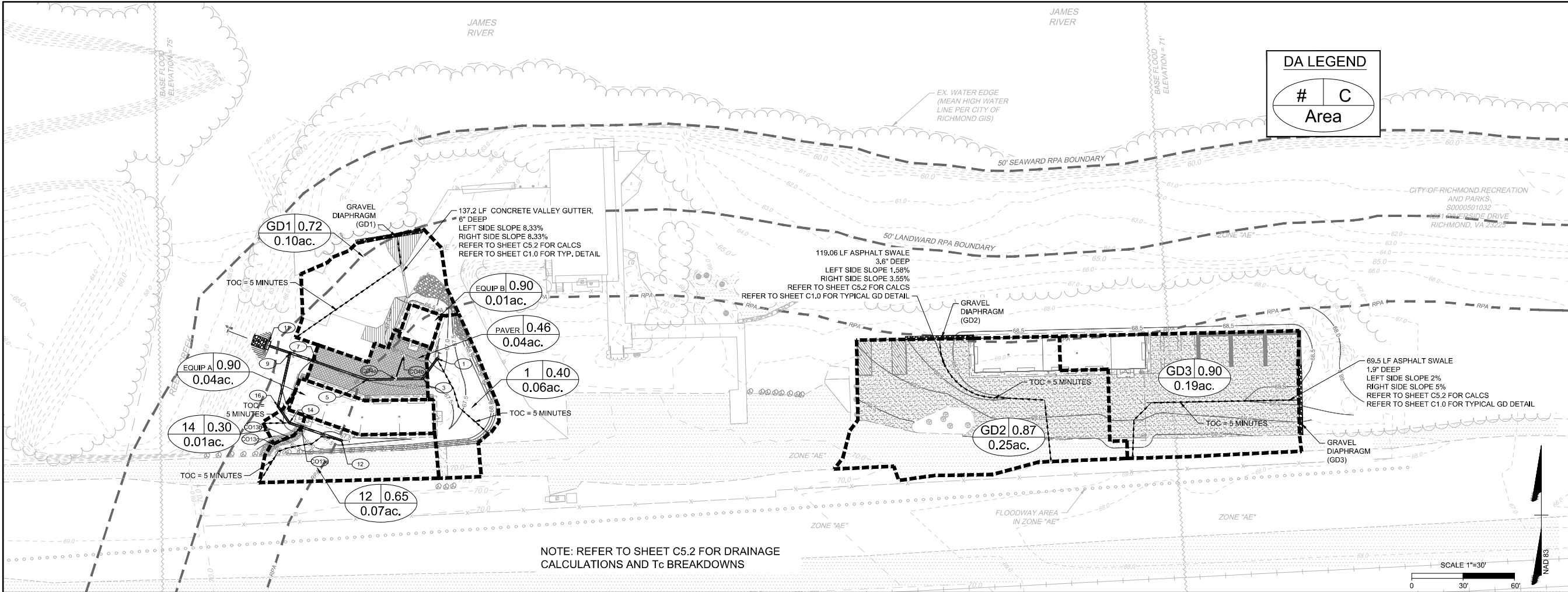
36157.001

JAMES RIVER PARK SYSTEM
WAREHOUSE SITE
IMPROVEMENTS

GRADING AND
DRAINAGE PLAN

DEPARTMENT OF PARKS AND RECREATION
CITY OF RICHMOND, VIRGINIA

SHEET NO.
C5.0



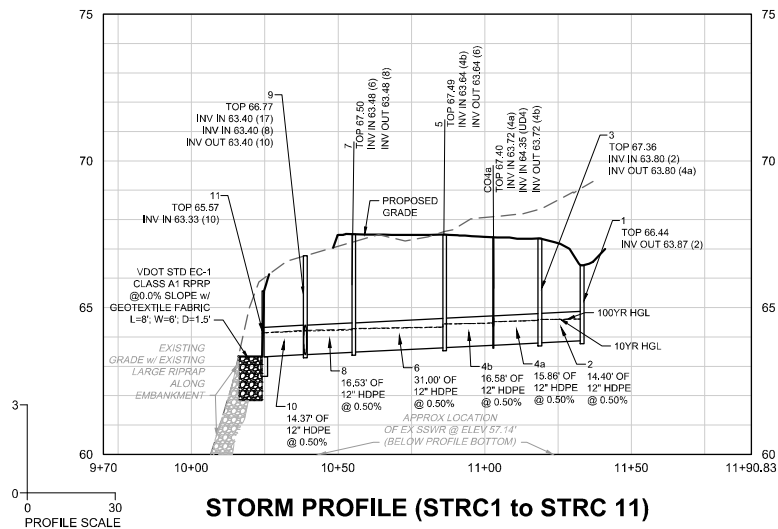
SYMBOLS

- | | |
|------------------|-------------------|
| BOLLARD | R/W TANGENT POINT |
| BUSH | SANITARY MANHOLE |
| CAP | SIGNS |
| ELECTRIC BOX | STORM MANHOLE |
| ELECTRIC METER | TELEPHONE MANHOLE |
| ELECTRIC MANHOLE | TREE |
| FIRE HYDRANT | UTILITY BOX |
| GAS METER | UTILITY PEDESTAL |
| GAS VALVE | UTILITY POLE |
| GUY | WATER METER |
| LIGHT POLE | WATER VALVE |
| POWER POLE | YARD LIGHT |
| PROPERTY PIN | |

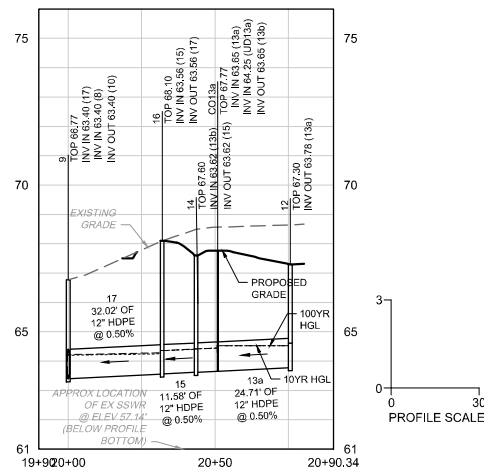
LINE TYPES

- | | |
|-----|----------------------------|
| --- | EXISTING BUILDING |
| --- | EXISTING GROUND EAST SIDE |
| --- | EXISTING GROUND CENTERLINE |
| --- | EXISTING GROUND WEST SIDE |
| --- | GAS PIPE |
| --- | PROPERTY LINE |
| --- | SANITARY SEWER |
| --- | SEWER EASEMENT |
| --- | OVERHEAD ELECTRIC |
| --- | OVERHEAD CABLE TV |
| --- | UNDERGROUND CABLE TV |
| --- | UNDERGROUND ELECTRIC |
| --- | UNDERGROUND TELEPHONE |
| --- | WATER PIPE |

THIS SHEET IS PROVIDED FOR CALCULATION PURPOSES ONLY AND IS NOT TO BE USED FOR CONSTRUCTION.



STORM PROFILE (STRC1 to STRC11)



STORM PROFILE (STRC12 to STRC9)

DATE: MARCH 12, 2018 DRAWN BY: K. ATKINSON
SCALE: AS SHOWN CHECKED BY: A. WEHNT

REVISIONS	
REVISED PER WR'S 07/20/17	DATE
REVISED PER WR'S 08/15/17	
REVISED PER WR'S 12/22/17	
REVISED PER WR'S 03/12/18	
AS BUILT	

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JAMES RIVER PARK SYSTEM
WAREHOUSE SITE
IMPROVEMENTS

DRAINAGE AREA MAP
& PROFILES

DEPARTMENT OF PARKS AND RECREATION
CITY OF RICHMOND, VIRGINIA

SHEET NO.
C5.1

GRAVEL DIAPHRAGM CAPACITY CALCULATIONS

Worksheet for GD1		Worksheet for GD2		Worksheet for GD3	
Project Description: Friction Method: Manning Formula Soil For: Normal Depth		Project Description: Friction Method: Manning Formula Soil For: Normal Depth		Project Description: Friction Method: Manning Formula Soil For: Normal Depth	
Results: Roughness Coefficient: 0.0150 ft/s Channel Slope: 0.0000 ft/s Left Side Slope: 0.00 1/s Right Side Slope: 0.00 1/s Discharge: 0.00 cfs		Results: Roughness Coefficient: 0.0150 ft/s Channel Slope: 0.0000 ft/s Left Side Slope: 0.00 1/s Right Side Slope: 0.00 1/s Discharge: 0.00 cfs		Results: Roughness Coefficient: 0.0150 ft/s Channel Slope: 0.0000 ft/s Left Side Slope: 0.00 1/s Right Side Slope: 0.00 1/s Discharge: 0.00 cfs	
Channel Data: Normal Depth: 0.00 ft Flow Area: 0.00 ft² Wetted Perimeter: 0.00 ft Hydraulic Radius: 0.00 ft Top Width: 0.00 ft Critical Depth: 0.00 ft Critical Slope: 0.0000 ft/s Velocity: 0.00 ft/s Velocity Head: 0.00 ft Specific Energy: 0.00 ft Friction Number: 0.00 Four Sides: Separation		Channel Data: Normal Depth: 0.00 ft Flow Area: 0.00 ft² Wetted Perimeter: 0.00 ft Hydraulic Radius: 0.00 ft Top Width: 0.00 ft Critical Depth: 0.00 ft Critical Slope: 0.0000 ft/s Velocity: 0.00 ft/s Velocity Head: 0.00 ft Specific Energy: 0.00 ft Friction Number: 0.00 Four Sides: Separation		Channel Data: Normal Depth: 0.00 ft Flow Area: 0.00 ft² Wetted Perimeter: 0.00 ft Hydraulic Radius: 0.00 ft Top Width: 0.00 ft Critical Depth: 0.00 ft Critical Slope: 0.0000 ft/s Velocity: 0.00 ft/s Velocity Head: 0.00 ft Specific Energy: 0.00 ft Friction Number: 0.00 Four Sides: Separation	
Overland Data: Overland Depth: 0.00 ft Overland Length: 0.00 ft Number Of Steps: 0 Overland Output Data: Upstream Depth: 0.00 ft Profile Description: Profile Headwater Downstream Velocity: 0.00 ft/s Upstream Velocity: 0.00 ft/s Normal Depth: 0.00 ft Critical Depth: 0.00 ft Channel Slope: 0.0000 ft/s Critical Slope: 0.0000 ft/s		Overland Data: Overland Depth: 0.00 ft Overland Length: 0.00 ft Number Of Steps: 0 Overland Output Data: Upstream Depth: 0.00 ft Profile Description: Profile Headwater Downstream Velocity: 0.00 ft/s Upstream Velocity: 0.00 ft/s Normal Depth: 0.00 ft Critical Depth: 0.00 ft Channel Slope: 0.0000 ft/s Critical Slope: 0.0000 ft/s		Overland Data: Overland Depth: 0.00 ft Overland Length: 0.00 ft Number Of Steps: 0 Overland Output Data: Upstream Depth: 0.00 ft Profile Description: Profile Headwater Downstream Velocity: 0.00 ft/s Upstream Velocity: 0.00 ft/s Normal Depth: 0.00 ft Critical Depth: 0.00 ft Channel Slope: 0.0000 ft/s Critical Slope: 0.0000 ft/s	

GD1
 AREA OF CHANNEL = 3 sqft
 AREA LESS 40% STONE VOID = 1.8 sqft
 AREA OF NORMAL FLOW THROUGH CHANNEL = 0.22 sqft
 PERCENT NORMAL FLOW THROUGH CHANNEL = 12.2% CAPACITY

GD2
 AREA OF CHANNEL = 4.13 sqft
 AREA OF NORMAL FLOW THROUGH CHANNEL = 1.07 sqft
 PERCENT NORMAL FLOW THROUGH CHANNEL = 25.9% CAPACITY

GD3
 AREA OF CHANNEL = 0.90 sqft
 AREA OF NORMAL FLOW THROUGH CHANNEL = 0.84 sqft
 PERCENT NORMAL FLOW THROUGH CHANNEL = 93.0% CAPACITY

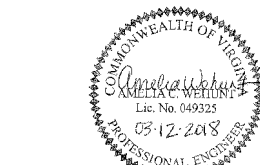
STRUCTURE	Equip B	C-factor	Area	C*A
Impenious	0.90	0.01	0.01	
Area: 0.01 Total C-factor: 0.90				
Overland: Length = 0 ft Slope = 1.0 % c-factor = 0.90 tc = 0.0 minutes				
Concentrated: Length = 0 ft H = 1 ft tc = 0.0 minutes				
Tc = 0.0 minutes				
I ₂ = 5.38 Q ₂ = 0.05 cfs I ₁₀ = 7.05 Q ₁₀ = 0.06 cfs I ₂₅ = 7.80 Q ₂₅ = 0.07 cfs I ₅₀ = 10.09 Q ₅₀ = 0.09 cfs I ₁₀₀ = 11.38 Q ₁₀₀ = 0.10 cfs				

STRUCTURE	Pavers	C-factor	Area	C*A
Lawn	0.40	0.04	0.02	
Impenious	0.90	0.01	0.00	
Area: 0.04 Total C-factor: 0.46				
Overland: Length = 0 ft Slope = 1.0 % c-factor = 0.45 tc = 0.0 minutes				
Concentrated: Length = 0 ft H = 1 ft tc = 0.0 minutes				
Tc = 0.0 minutes				
I ₂ = 5.38 Q ₂ = 0.11 cfs I ₁₀ = 7.05 Q ₁₀ = 0.14 cfs I ₂₅ = 7.80 Q ₂₅ = 0.16 cfs I ₅₀ = 10.09 Q ₅₀ = 0.20 cfs I ₁₀₀ = 11.38 Q ₁₀₀ = 0.23 cfs				

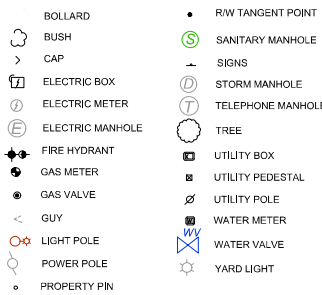
STRUCTURE	GD1	C-factor	Area	C*A
Lawn	0.30	0.03	0.01	
Impenious	0.90	0.07	0.06	
Area: 0.10 Total C-factor: 0.72				
Overland: Length = 75 ft Slope = 2.8 % c-factor = 0.90 tc = 3.0 minutes				
Concentrated: Length = 16 ft H = 1 ft tc = 0.2 minutes				
Tc = 5.0 minutes				
I ₂ = 5.38 Q ₂ = 0.40 cfs I ₁₀ = 7.05 Q ₁₀ = 0.53 cfs I ₂₅ = 7.80 Q ₂₅ = 0.58 cfs I ₅₀ = 10.09 Q ₅₀ = 0.75 cfs I ₁₀₀ = 11.38 Q ₁₀₀ = 0.85 cfs				

STRUCTURE	GD2	C-factor	Area	C*A
Lawn	0.30	0.01	0.00	
Impenious	0.90	0.24	0.22	
Area: 0.25 Total C-factor: 0.87				
Overland: Length = 36 ft Slope = 2.7 % c-factor = 0.90 tc = 2.2 minutes				
Concentrated: Length = 82 ft H = 1 ft tc = 1.8 minutes				
Tc = 5.0 minutes				
I ₂ = 5.38 Q ₂ = 1.18 cfs I ₁₀ = 7.05 Q ₁₀ = 1.55 cfs I ₂₅ = 7.80 Q ₂₅ = 1.71 cfs I ₅₀ = 10.09 Q ₅₀ = 2.21 cfs I ₁₀₀ = 11.38 Q ₁₀₀ = 2.49 cfs				

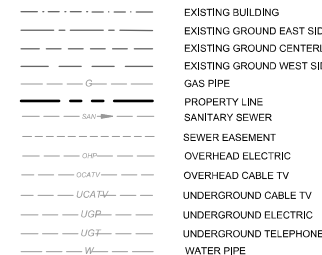
STRUCTURE	GD3	C-factor	Area	C*A
Lawn	0.30	0.00	0.00	
Impenious	0.90	0.19	0.17	
Area: 0.19 Total C-factor: 0.90				
Overland: Length = 37 ft Slope = 1.0 % c-factor = 0.90 tc = 2.7 minutes				
Concentrated: Length = 86 ft H = 1 ft tc = 1.6 minutes				
Tc = 5.0 minutes				
I ₂ = 5.38 Q ₂ = 0.94 cfs I ₁₀ = 7.05 Q ₁₀ = 1.23 cfs I ₂₅ = 7.80 Q ₂₅ = 1.36 cfs I ₅₀ = 10.09 Q ₅₀ = 1.76 cfs I ₁₀₀ = 11.38 Q ₁₀₀ = 1.98 cfs				



SYMBOLS



LINE TYPES



THIS SHEET IS PROVIDED FOR CALCULATION PURPOSES ONLY AND IS NOT TO BE USED FOR CONSTRUCTION.

10 YR STORM SEWER CALCULATIONS

James River Park System Storm Improvements
STORM SEWER DESIGN COMPUTATIONSPROJECT: James River Park System
LOCATION: City of RichmondDesigned by: L. Coffman
Checked by: L. Coffman

STORM FREQUENCY: 100YR

UNITS: ENGLISH

PIPE NO	FROM POINT	TO POINT	DRAIN AREA "A" Acres	COEFF "C"	INCRE-MENT	ACCU-MULATED	ADDTL. CA	INLET TIME Minutes	RAIN FALL In/Hr	RUNOFF Q CFS	INVERT ELEVATIONS UPPER END	LOWER END	LENGTH of Pipe Ft	SLOPE Ft/Ft	SIZE (Dia. Or Spun Pipe) In	SHAPE	Capacity CFS	Friction Slope Ft/Ft	VEL Vn Ft/Sec	FLOW TIME Sec	REMARKS
2	1	3	0.06	0.40	0.02	0.00	5.00	7.07	0.17	63.87	63.80	63.72	15.86	0.005	12	Circular	2.73	0.000	1.94	0.12	
4a	3	CO4a	0.00	0.00	0.00	0.06	0.04	5.12	7.04	0.43	63.80	63.72	15.86	0.005	12	Circular	2.73	0.000	2.53	0.10	
UD4	CO4a	CO4a	0.00	0.00	0.00	0.00	0.00	5.00	7.07	0.00	64.49	64.35	14.38	0.010	4	Circular	0.21	0.000	0.00	0.00	
4b	CO4a	5	0.00	0.00	0.00	0.06	0.00	5.23	7.00	0.42	63.72	63.64	16.58	0.005	12	Circular	2.73	0.000	2.53	0.11	
6	5	7	0.00	0.00	0.00	0.07	0.01	5.34	6.98	0.49	63.64	63.48	31.00	0.005	12	Circular	2.73	0.000	2.63	0.20	
8	7	9	0.00	0.00	0.00	0.08	0.01	5.53	6.90	0.54	63.48	63.40	16.53	0.005	12	Circular	2.73	0.000	2.71	0.10	
UD13b	CO13b	CO13b	0.00	0.00	0.00	0.00	0.00	5.00	7.07	0.00	64.45	64.34	10.83	0.010	4	Circular	0.21	0.000	0.00	0.00	
UD13a	CO13b	CO13a	0.00	0.00	0.00	0.00	0.00	5.00	7.07	0.00	64.34	64.25	9.12	0.010	4	Circular	0.21	0.000	0.00	0.00	
13a	12	CO13a	0.07	0.65	0.05	0.05	0.00	5.00	7.07	0.32	63.78	63.65	24.71	0.005	12	Circular	2.73	0.000	2.34	0.18	
13b	CO13a	14	0.00	0.00	0.00	0.05	0.00	5.18	7.04	0.32	63.65	63.62	7.39	0.005	12	Circular	2.73	0.000	2.33	0.05	
15	14	16	0.01	0.30	0.00	0.05	0.00	5.23	7.00	0.34	63.62	63.56	11.58	0.005	12	Circular	2.73	0.000	2.37	0.08	
17	16	9	0.00	0.00	0.00	0.05	0.00	5.31	6.98	0.34	63.56	63.40	32.02	0.005	12	Circular	2.73	0.000	2.37	0.23	
10	9	11	0.00	0.00	0.00	0.13	0.00	5.64	6.87	0.87	63.40	63.33	14.37	0.005	12	Circular	2.73	0.001	3.10	0.08	

JAMES RIVER PARK SYSTEM STORM IMPROVEMENTS
HYDRAULIC GRADE LINE ANALYSIS

PROJECT: JAMES RIVER PARK SYSTEM

DESIGNED BY: L. COFFMAN
Checked: L. COFFMAN

INCIDENCE PROBABILITY

10 YR

INLET OR JUNCTION	INLET STATION	OUTLET WATER SURFACE ELEV.	PIPE DIA. (In)	DESIGN DISCH Qo (CFS)	LENGTH Lo (Ft)	FRICTION SLOPE Sfo (Ft/Ft)	FRICTION LOSS Hf (Ft)	JUNCTION LOSS										FINAL H (Ft)	Inlet Water Surface Elevation	Rm Elev	Comments		
								Va	Ha (Ft)	Qi	Vi	QVi	Vp2g	Hi	Angle	Hs	Hs					13 Hs	0.5 Hs
9		64.13	12	0.87	14.37	0.05%	0.01	3.1	0.04	0.54	2.71	1.47	0.11	0.04	83.74	0.06	0.13	0	TRUE	0.07	64.2	66.77	OK -2.57
7		64.2	12	0.54	16.53	0.02%	0	2.71	0.03	0.49	2.63	1.28	0.11	0.04	0	0	0.07	0	TRUE	0.04	64.24	67.5	OK -3.27
5		64.28	12	0.49	31	0.02%	0	2.63	0.03	0.42	2.53	1.07	0.1	0.03	20	0.02	0.08	0	TRUE	0.05	64.33	67.49	OK -3.16
CO4a		64.44	12	0.42	16.50	0.01%	0	2.50	0.02	0.40	2.50	1.09	0.1	0.03	0	0	0.08	0	TRUE	0.03	64.47	67.4	OK -2.93
3		64.52	12	0.43	15.86	0.01%	0	2.53	0.02	0.17	1.94	0.33	0.06	0.02	53.18	0.03	0.07	0	TRUE	0.04	64.56	67.36	OK -2.8
1		64.6	12	0.17	14.4	0.00%	0	1.94	0.01	0	0	0	0	0	0	0	0.01	0.02	TRUE	0.01	64.61	66.44	OK -1.83
16		64.2	12	0.34	32.02	0.01%	0	2.37	0.02	0.34	2.37	0.81	0.09	0.03	47.1	0.04	0.1	0	TRUE	0.05	64.25	68.1	OK -3.85
14		64.36	12	0.34	11.58	0.01%	0	2.37	0.02	0.32	2.33	0.75	0.08	0.03	36.58	0.04	0.09	0	TRUE	0.04	64.4	67.6	OK -3.2
CO13a		64.42	12	0.32	7.39	0.01%	0	2.33	0.02	0.32	2.34	0.75	0.08	0.03	0.54	0	0.05	0	TRUE	0.03	64.44	67.77	OK -3.32
CO13b		64.52	4	0	9.12	0.00%	0	0	0	0	0	0	0	0	0	0	0	0	TRUE	0	64.52	68.3	OK -3.78
CO13c		64.61	4	0	10.83	0.00%	0	0	0	0	0	0	0	0	0	0	0	0	TRUE	0	64.61	68.92	OK -4.31
12		64.46	12	0.32	24.71	0.01%	0	2.34	0.02	0	0	0	0	0	0	0	0.02	0.03	TRUE	0.02	64.47	67.3	OK -2.82
CO4b		64.62	4	0	14.38	0.00%	0	0	0	0	0	0	0	0	0	0	0	0	TRUE	0	64.62	67.03	OK -2.41

James River Park System Storm Improvements
STORM SEWER DESIGN COMPUTATIONSPROJECT: James River Park System
LOCATION: City of RichmondDesigned by: L. Coffman
Checked by: L. Coffman

STORM FREQUENCY: 100YR

UNITS: ENGLISH

PIPE NO	FROM POINT	TO POINT	DRAIN AREA "A" Acres	COEFF "C"	INCRE-MENT	ACCU-MULATED	ADDTL. CA	INLET TIME Minutes	RAIN FALL In/Hr	RUNOFF Q CFS	INVERT ELEVATIONS UPPER END
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Site Summary

Total Rainfall (in)	43
Total Disturbed Acreage	0.93

Update Summary Sheet

Print Preview Print

Site Land Cover Summary

Pre-ReDevelopment Land Cover (acres)					
	A Soils	B Soils	C Soils	D Soils	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.55	59
Impervious Cover (acres)	0.00	0.00	0.00	0.38	32
	0.00	0.00	0.00	0.93	100

Post-ReDevelopment Land Cover (acres)					
	A Soils	B Soils	C Soils	D Soils	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.33	35
Impervious Cover (acres)	0.00	0.00	0.00	0.60	65
	0.00	0.00	0.00	0.93	100

Site Tn and Land Cover Nutrient Loads

	Final Post-Development (Post-ReDevelopment & New Impervious)	Post-ReDevelopment	Post-Development (New Impervious)	Adjusted Pre-Development
Site Re	0.70	0.58	0.95	0.58
Treatment Volume (ft ³)	2,369	1,334	1,035	1,334
TP Load (lb/yr)	1.49	0.84	0.65	0.84

	Pre-ReDevelopment TP Load per acre (lb/acre/yr)	Final Post-Development TP Load per acre (lb/acre/yr)	Post-ReDevelopment TP Load per acre (lb/acre/yr)
	1.61	1.60	1.33

Total TP Load Reduction Required (lb/yr)	0.61	0.08	0.53
--	------	------	------

	Final Post-Development Load (Post-ReDevelopment & New Impervious)	Pre-ReDevelopment
TP Load (lb/yr)	10.65	6.96

Site Compliance Summary

Maximum % Reduction Required Below Pre-ReDevelopment Load	10%
---	-----

Total Runoff Volume Reduction (ft ³)	300
Total TP Load Reduction Achieved (lb/yr)	0.13
Total TN Load Reduction Achieved (lb/yr)	0.91
Remaining Post-Development TP Load (lb/yr)	1.36
Remaining TP Load Reduction (lb/yr) Required	0.48

0.48 lb/yr WILL BE PURCHASED THROUGH A NUTRIENT BANK

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.14	0.19	0.00	0.00	0.00	0.33
Impervious Cover (acres)	0.13	0.17	0.00	0.00	0.00	0.30
Total Area (acres)	0.17	0.16	0.00	0.00	0.00	0.33

Drainage Area Compliance Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
TP Load Reduced (lb/yr)	0.08	0.08	0.00	0.00	0.00	0.13
TN Load Reduced (lb/yr)	0.95	0.56	0.00	0.00	0.00	0.91

Drainage Area A Summary

Land Cover Summary					
	A Soils	B Soils	C Soils	D Soils	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.14	38
Impervious Cover (acres)	0.00	0.00	0.00	0.13	62
	0.00	0.00	0.00	0.17	100

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft ³)	TP Load from Upstream Practices (lb/yr)	Unreated TP Load to Practice (lb/yr)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed
1a. Vegetated Roof #1 (Spec #5)	0.00	0.00	175.43	0.13	0.00	0.00	0.00	None

Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	0.00
Total TN Load Reduction Achieved in D.A. (lb/yr)	0.35

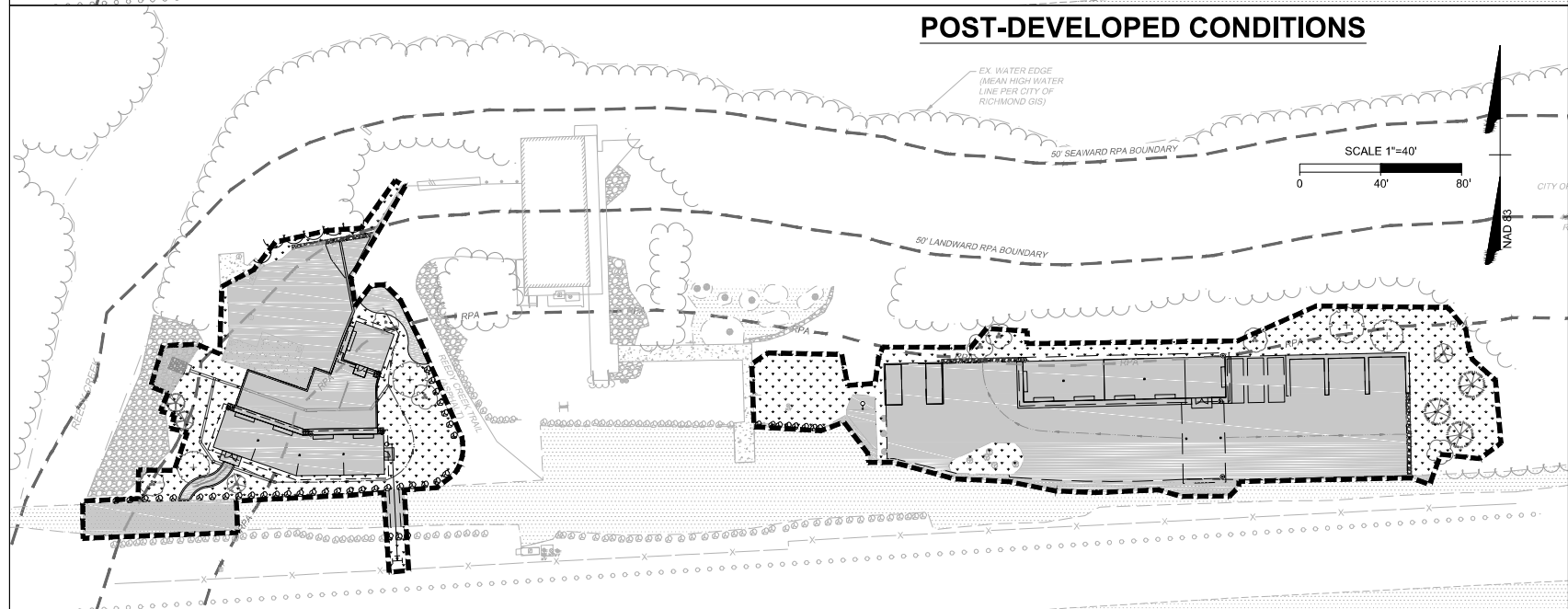
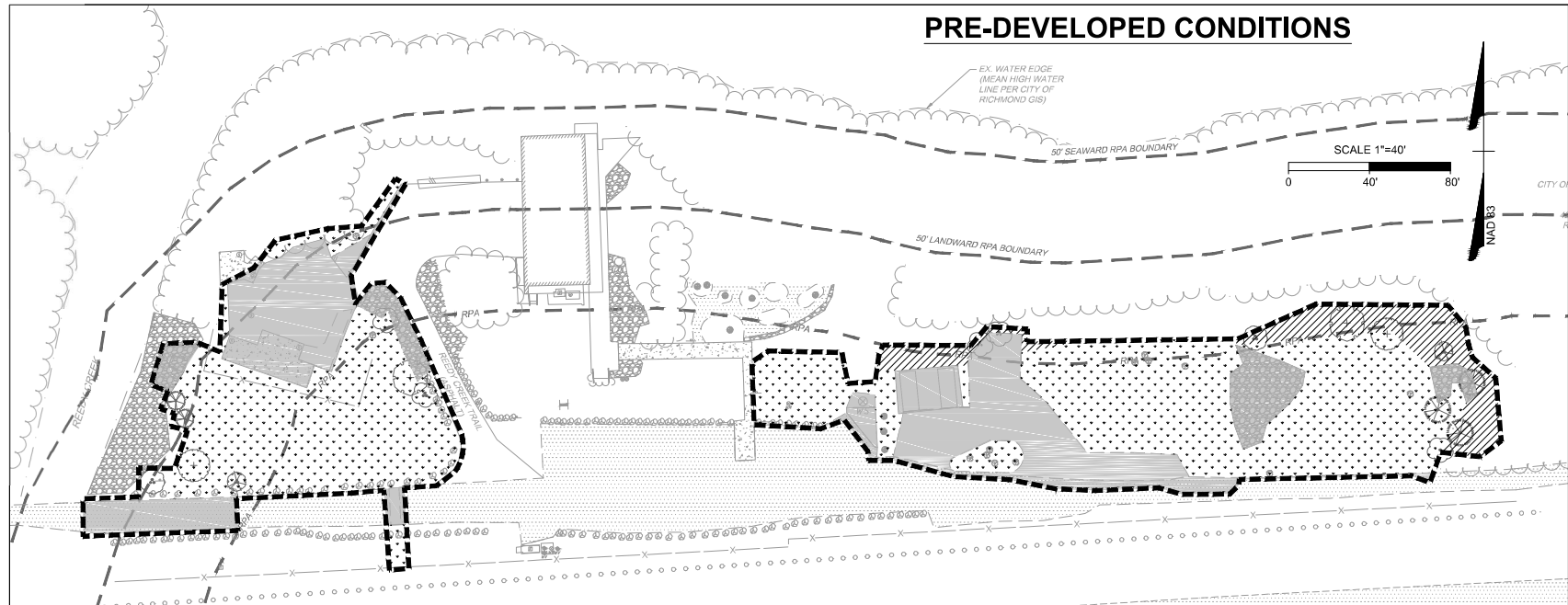
Drainage Area B Summary

Land Cover Summary					
	A Soils	B Soils	C Soils	D Soils	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.19	34
Impervious Cover (acres)	0.00	0.00	0.00	0.17	66
	0.00	0.00	0.00	0.16	100

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft ³)	TP Load from Upstream Practices (lb/yr)	Unreated TP Load to Practice (lb/yr)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed
1a. Vegetated Roof #1 (Spec #5)	0.00	0.00	276.89	0.13	0.00	0.00	0.10	None

Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	0.00
Total TN Load Reduction Achieved in D.A. (lb/yr)	0.16



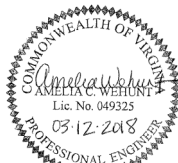
STORMWATER MANAGEMENT NARRATIVE - QUALITY

THE TOTAL WATER QUALITY COMPLIANCE AREA FOR THE PROJECT IS APPROXIMATELY 0.93 ACRES WHICH EQUALS THE LIMITS OF DISTURBANCE. THIS AREA INCLUDES THE INSTALLATION OF TWO EQUIPMENT BUILDINGS, A MAINTENANCE BUILDING, A MATERIAL STORAGE AREA AND STORM SEWER SYSTEM.

PER 9VAC25-870-63 AND 9VAC25-870-65 OF THE VIRGINIA STORMWATER REGULATIONS, WATER QUALITY REQUIREMENTS FOR THE PROJECT WERE DETERMINED USING THE VIRGINIA RUNOFF REDUCTION METHOD (VRRM) AND THE "REDEVELOPMENT" DESIGN CRITERIA. THE SOIL/AREA DATA WAS CALCULATED USING NRCS TR-55 METHOD AND INPUT INTO THE VRRM REDEVELOPMENT SPREADSHEET (v3.0) TO OBTAIN THE PHOSPHORUS REDUCTION REQUIREMENT. REFER TO THE VRRM SUMMARY BELOW.

WATER QUALITY REQUIREMENTS WILL BE MET THROUGH THE USE OF VEGETATIVE ROOFS (Spec#5), AND THE PURCHASE OF WATER QUALITY CREDITS PER 9VAC25-870-69. PERMEABLE PAVERS (Spec#7) AND RAIN BARRELS (Spec#6) ARE INCORPORATED TO PROVIDE NET WATER QUALITY BENEFITS, HOWEVER ARE NOT ACCOUNTED FOR IN THE STORMWATER REGULATORY COMPLIANCE CALCULATIONS. THE BMPs HAVE BEEN DESIGNED AND WILL BE CONSTRUCTED PER DEQ SPECIFICATIONS.

HATCH LEGEND	
	IMPERVIOUS COVER
	MANAGED TURF
	FOREST/OPEN
	SITE AREA / BOUNDARY



SYMBOLS

BOLLARD	R/W TANGENT POINT
BUSH	SANITARY MANHOLE
CAP	SIGNS
ELECTRIC BOX	STORM MANHOLE
ELECTRIC METER	TELEPHONE MANHOLE
ELECTRIC MANHOLE	TREE
FIRE HYDRANT	UTILITY BOX
GAS METER	UTILITY PEDESTAL
GAS VALVE	UTILITY POLE
GUY	WATER METER
LIGHT POLE	WATER VALVE
POWER POLE	YARD LIGHT
PROPERTY PIN	

LINE TYPES

---	EXISTING BUILDING
---	EXISTING GROUND EAST SIDE
---	EXISTING GROUND CENTERLINE
---	EXISTING GROUND WEST SIDE
---	GAS PIPE
---	PROPERTY LINE
---	SANITARY SEWER
---	SEWER EASEMENT
---	OVERHEAD ELECTRIC
---	OVERHEAD CABLE TV
---	UNDERGROUND CABLE TV
---	UNDERGROUND ELECTRIC
---	UNDERGROUND TELEPHONE
---	WATER PIPE

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DATE: MARCH 12, 2018 DRAWN BY: K. ATKINSON
SCALE: AS SHOWN CHECKED BY: A. WEHUNT



REVISIONS

REVISED PER WR'S 07/20/17
REVISED PER WR'S 08/15/17
REVISED PER WR'S 12/22/17
REVISED PER WR'S 03/12/18

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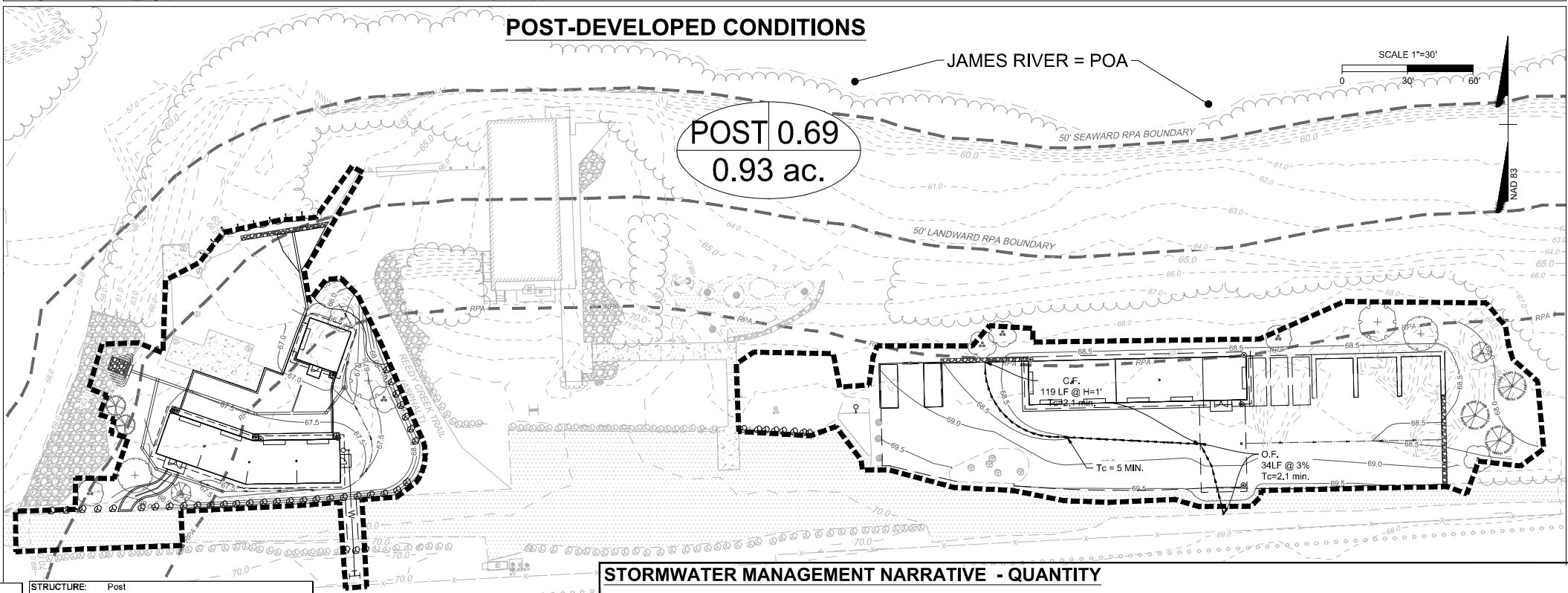
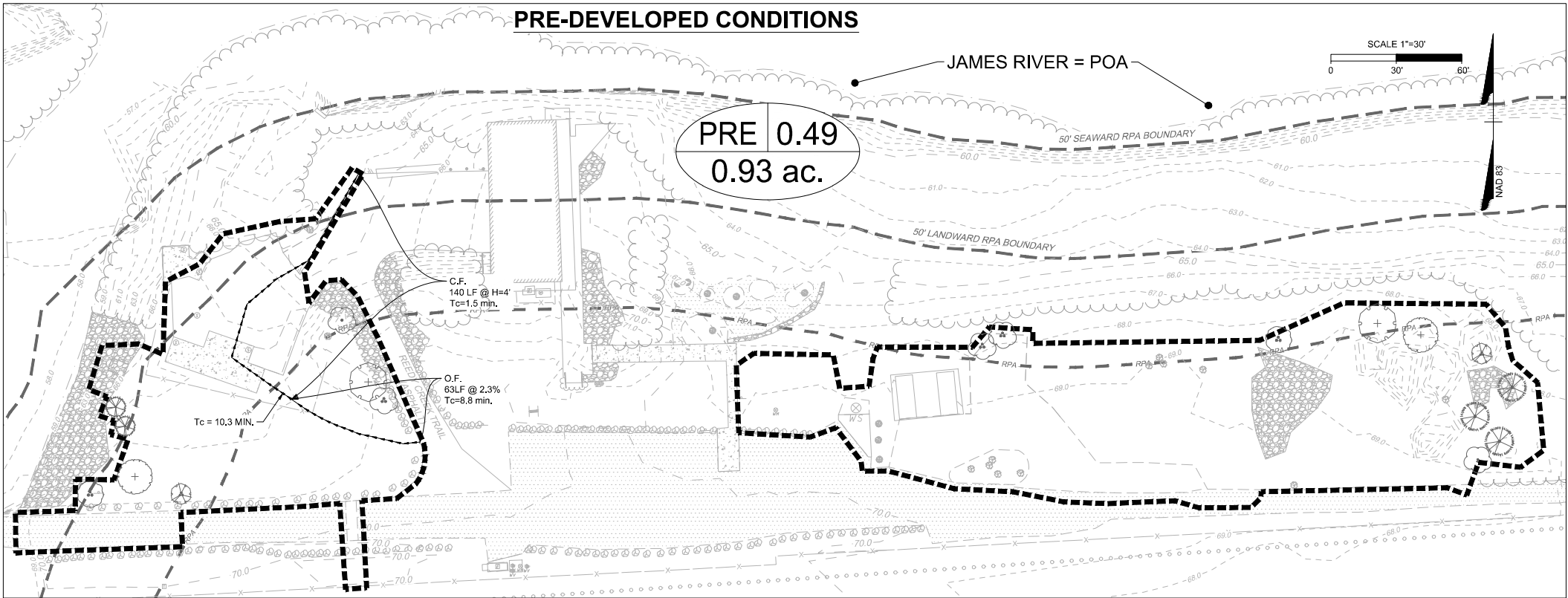
JAMES RIVER PARK SYSTEM
WAREHOUSE SITE
IMPROVEMENTS

SWM - QUALITY
CALCULATIONS

DEPARTMENT OF PARKS AND RECREATION
CITY OF RICHMOND, VIRGINIA

SHEET NO.
C6.0

S:\310\98157-001-RPS Warehouse\DWG\Sheet\CD\98157-001-C6.0-SWMP.dwg | Plotted on 3/14/2018 5:52 PM | by Katie Atkinson



STRUCTURE	Pre	Area	C*A
Lawn	0.30	0.55	0.17
Impervious	0.90	0.30	0.27
Forest	0.25	0.08	0.02

Area	Total C-factor
0.93	0.49

Tc:

Overland:	Length = 63 ft
	Slope = 2.3 %
	c-factor = 0.30
	tc = 8.8 minutes

Concentrated:	Length = 140 ft
	H = 5 ft
	Tc = 1.4 minutes
	Tc = 10.1 minutes

I ₂ = 4.28	Q ₂ = 1.95 cfs
I ₁₀ = 5.69	Q ₁₀ = 2.58 cfs
I ₂₅ = 6.23	Q ₂₅ = 2.83 cfs
I ₅₀ = 8.07	Q ₅₀ = 3.67 cfs
I ₁₀₀ = 9.07	Q ₁₀₀ = 4.12 cfs

STRUCTURE:	Post	Area	C*A
Lawn	0.30	0.33	0.10
Impervious	0.90	0.60	0.54

Area	Total C-factor
0.93	0.69

Tc:

Overland:	Length = 34 ft
	Slope = 3.0 %
	c-factor = 0.90
	tc = 2.1 minutes

Concentrated:	Length = 119 ft
	H = 1 ft
	Tc = 2.1 minutes
	Tc = 5.0 minutes

I ₂ = 5.38	Q ₂ = 3.41 cfs
I ₁₀ = 7.05	Q ₁₀ = 4.47 cfs
I ₂₅ = 7.80	Q ₂₅ = 4.95 cfs
I ₅₀ = 10.09	Q ₅₀ = 6.40 cfs
I ₁₀₀ = 11.38	Q ₁₀₀ = 7.22 cfs

LEGEND	
SITE AREA / BOUNDARY	

	PRE-DEVELOPMENT RUNOFF (cfs)	POST-DEVELOPMENT RUNOFF (cfs)
2-YR	1.95	3.41
10-YR	2.58	4.47
100-YR	4.12	7.22

STORMWATER MANAGEMENT NARRATIVE - QUANTITY

WATER QUANTITY COMPLIANCE HAS BEEN ADDRESSED PER 9VAC-25-870-66(D). ALL CONCENTRATED RUNOFF WITHIN THE WATER QUANTITY SITE BOUNDARY HAS BEEN CONVERTED TO SHEET FLOW THROUGH GRAVEL DIAPHRAGMS. THE POST DEVELOPED FLOWS THAT WILL PASS THROUGH THE GRAVEL DIAPHRAGMS ARE MINIMAL AND WILL NOT CAUSE OR CONTRIBUTE TO EROSION, SEDIMENTATION, OR FLOODING OF THE DOWN GRADIENT PROPERTY WHICH IS THE JAMES RIVER. REFER TO SHEET C5.2 FOR DRAINAGE AREA INFORMATION AND FLOWS TO EACH GRAVEL DIAPHRAGM OUTFALL. NO FURTHER WATER QUANTITY CONTROLS ARE REQUIRED.

THE LIMITS OF ANALYSIS FOR THIS PROJECT IS THE JAMES RIVER WHICH RUNS ADJACENT TO THE PARK SITE. PER THE CITY OF RICHMOND FLOOD INSURANCE STUDY DATED JULY 16, 2014, THE APPROXIMATE DRAINAGE AREA OF THE JAMES RIVER AT THE POINT OF ANALYSIS IS 6758 SQUARE MILES. THE LOCAL PROJECT DRAINAGE AREA OF 0.93 ACRES. THUS, THE SITES CONTRIBUTING DRAINAGE AREA IS LESS THAN 1% OF THE TOTAL WATERSHED AREA DRAINING TO THE POINT OF ANALYSIS.

PER THE CHESAPEAKE BAY SITE PLAN REQUIREMENTS AND WATER RESOURCE COMMENTS, THE PRE AND POST SITE RUN-OFF RATES FOR THE 2, 10, AND 100 YEAR STORMS ARE REQUIRED. THE TOTAL SITE AREA DRAINING TO THE JAMES RIVER IS 0.93 AC AS SHOWN ON THIS SHEET. THE LONGEST Tc FOR BOTH AREAS WAS CALCULATED AND USED TO FIND THE PRE/POST FLOWS USING THE RATIONAL METHOD. REFER TO THE PRE/POST CALCULATIONS AND TABLE OF FLOWS ON THIS SHEET FOR THE REQUIRED PRE/POST 2, 10, AND 100 YEAR FLOWS.

NOTE, THE 100YR FLOWS SHOWN ON THIS SHEET WERE USED IN THE FLOODPLAIN ANALYSIS/CERTIFICATION FOUND ON SHEET C7.0



SYMBOLS

- | | |
|------------------|-------------------|
| BOLLARD | R/W TANGENT POINT |
| BUSH | SANITARY MANHOLE |
| CAP | SIGNS |
| ELECTRIC BOX | STORM MANHOLE |
| ELECTRIC METER | TELEPHONE MANHOLE |
| ELECTRIC MANHOLE | TREE |
| FIRE HYDRANT | UTILITY BOX |
| GAS METER | UTILITY PEDESTAL |
| GAS VALVE | UTILITY POLE |
| GUY | WATER METER |
| LIGHT POLE | WATER VALVE |
| POWER POLE | YARD LIGHT |
| PROPERTY PIN | |

LINE TYPES

- | |
|----------------------------|
| EXISTING BUILDING |
| EXISTING GROUND EAST SIDE |
| EXISTING GROUND CENTERLINE |
| EXISTING GROUND WEST SIDE |
| GAS PIPE |
| PROPERTY LINE |
| SANITARY SEWER |
| SEWER EASEMENT |
| OVERHEAD ELECTRIC |
| OVERHEAD CABLE TV |
| UNDERGROUND CABLE TV |
| UNDERGROUND ELECTRIC |
| UNDERGROUND TELEPHONE |
| WATER PIPE |

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DATE: MARCH 12, 2018 DRAWN BY: K. ATKINSON
SCALE: AS SHOWN CHECKED BY: A. WEHUNT



REVISIONS

REVISED PER WR'S 07/20/17
REVISED PER WR'S 08/15/17
REVISED PER WR'S 12/22/17
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AS BUILT DATE

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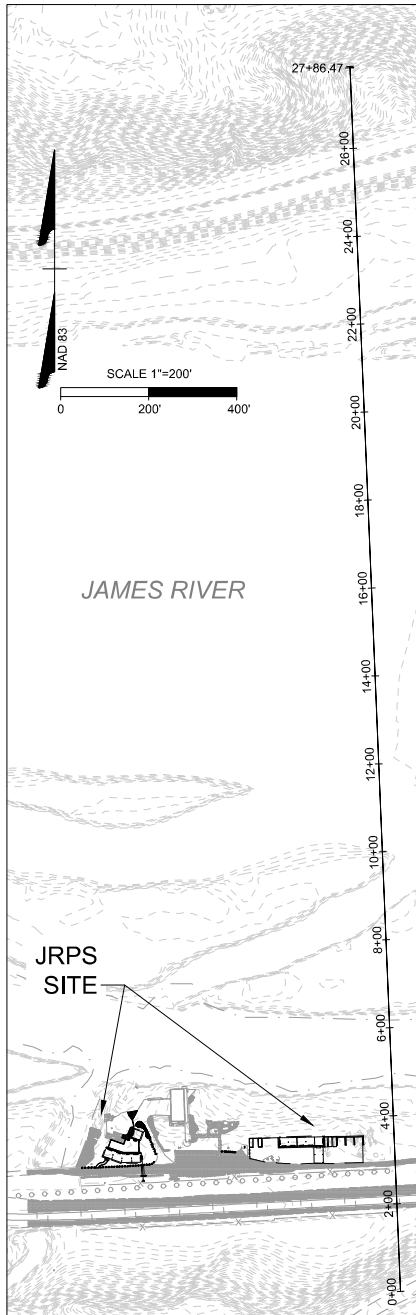
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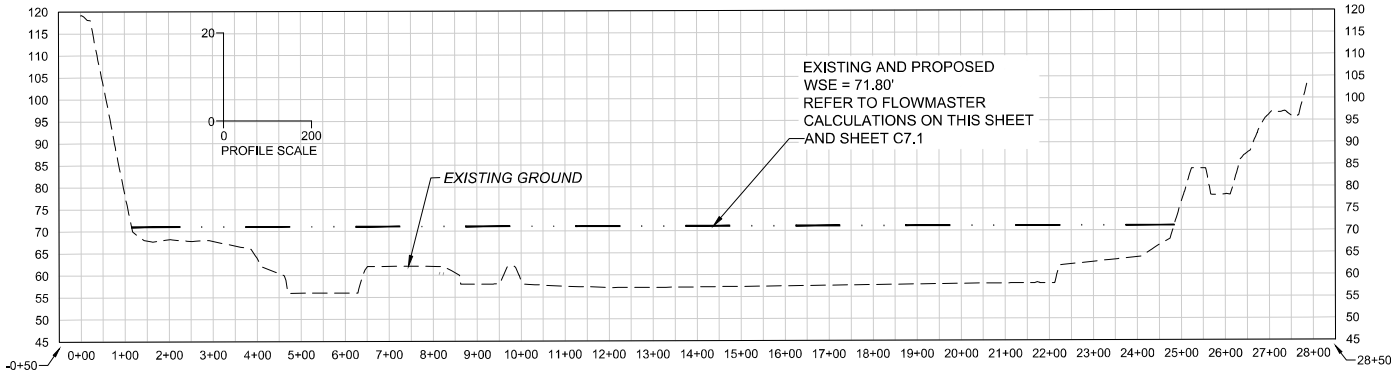
JAMES RIVER PARK SYSTEM
WAREHOUSE SITE
IMPROVEMENTS

SWM - QUANTITY
CALCULATIONS

DEPARTMENT OF PARKS AND RECREATION SHEET NO.
CITY OF RICHMOND, VIRGINIA C6.1



JAMES RIVER X-SEC



James River X-SEC

EXISTING FLOWMASTER INPUTS AND RESULTS			
Location File: C:\Users\jwhite\Documents\James River X-SEC\Flowmaster\Flowmaster Inputs and Results.mxd	Messages		
Source File: C:\Users\jwhite\Documents\James River X-SEC\Flowmaster\Flowmaster Inputs and Results.mxd	Number of Cells: 12	z	Friction Method: Manning Formula
Roughness Coefficient: 0.050	Flow Area: 27534.17	ft ²	
Channel Slope: 0.0050	Wetted Perimeter: 2378.18	ft	
Elevation: 71.80	Hydraulic Radius: 11.49	ft	
Elevation Range: 66.0 to 110.0 ft	Top Width: 2672.73	ft	
Discharge: 290004.12	Normal Depth: 16.80	ft	
	Critical Depth: 11.67	ft	
	Critical Slope: 0.0184	ft/ft	
	Velocity: 10.61	ft/s	
	Velocity Head: 1.75	ft	
	Specific Energy: 17.55	ft	
	Friction Factor: 0.38		
	Flow Type: Subcritical		

NOTE: REFER TO C7.1 FOR DETAILED FLOWMASTER CALCS.

PROPOSED FLOWMASTER INPUTS AND RESULTS			
Location File: C:\Users\jwhite\Documents\James River X-SEC\Flowmaster\Flowmaster Inputs and Results.mxd	Messages		
Source File: C:\Users\jwhite\Documents\James River X-SEC\Flowmaster\Flowmaster Inputs and Results.mxd	Number of Cells: 12	z	Friction Method: Manning Formula
Roughness Coefficient: 0.050	Flow Area: 27534.17	ft ²	
Channel Slope: 0.0050	Wetted Perimeter: 2378.18	ft	
Elevation: 71.80	Hydraulic Radius: 11.49	ft	
Elevation Range: 66.0 to 110.0 ft	Top Width: 2672.73	ft	
Discharge: 290004.12	Normal Depth: 16.80	ft	
	Critical Depth: 11.67	ft	
	Critical Slope: 0.0184	ft/ft	
	Velocity: 10.61	ft/s	
	Velocity Head: 1.75	ft	
	Specific Energy: 17.55	ft	
	Friction Factor: 0.38		
	Flow Type: Subcritical		

NOTE: REFER TO C7.1 FOR DETAILED FLOWMASTER CALCS.

FLOODPLAIN NARRATIVE:

THE CITY OF RICHMOND DEPARTMENT OF UTILITIES-WATER RESOURCE DIVISION REQUESTED THAT A CROSS SECTION OF THE JAMES RIVER BE ANALYZED JUST DOWNSTREAM OF THE PROPOSED IMPACTS USING THE PRE AND POST-DEVELOPED 100-YR FLOWS AT THE POINT OF ANALYSIS. THE OVERALL FLOW WITHIN THE JAMES RIVER WAS FOUND USING THE CITY OF RICHMOND'S FLOOD INSURANCE STUDY (FIS) DATED JULY 16, 2014. PER TABLE 1-SUMMARY OF DISCHARGES (PG.7) THE EXISTING 100-YR FLOW AT THE DOWNSTREAM CORPORATE LIMITS WAS 290,000 CFS. THIS FLOW WAS THE BASE FLOW AND ADDED THE EXISTING AND PROPOSED 100-YR FLOWS FROM OUR SITE TO THE OVERALL FLOW. AN IRREGULAR CROSS SECTION WAS THEN DEFINED IN BENTLEY'S FLOWMASTER USING CITY GIS TOPOGRAPHY AND STATION/ELEVATION POINTS ALONG THE CROSS SECTION. GOOGLE EARTH AERIAL IMAGERY WAS USED TO DEFINE THE MANNING'S N VALUES. THE CALCULATED FLOWS WERE THEN INPUT INTO THE CROSS SECTION, ALONG WITH THE CHANNEL SLOPE FROM THE CITY'S GIS TOPOGRAPHY, TO FIND THE RESULTING WATER SURFACE ELEVATION (WSE) FOR THE PRE AND POST DEVELOPED 100-YR FLOWS. REFER TO C7.1 FOR ADDITIONAL FLOWMASTER CALCULATIONS. THE FOLLOWING DATA WAS USED FOR THE ANALYSIS:

JAMES RIVER 100-YR FLOW PER CoR FIS STUDY = 290,000 CFS

EX. 100-YR FLOW FROM JRPS SITE = 4.12 CFS

PROP. 100-YR FLOW FROM JRPS SITE = 7.22 CFS

EX. 100-YR FLOW INPUT INTO FLOWMASTER = 290,004.12 CFS

EX. WSE RESULT = 71.80'

PROP. 100-YR FLOW INPUT INTO FLOWMASTER = 290,007.22 CFS

PROP. WSE RESULT = 71.80'

PER THE CROSS-SECTION ANALYSIS, THE PROPOSED WORK WILL NOT RESULT IN ANY INCREASE IN FLOOD LEVELS DURING OCCURRENCE OF THE BASE FLOOD.

TABLE 1-SUMMARY OF DISCHARGES					
Flowing Source and Location	Drainage Area (acres)	Peak Discharges (cubic feet per second)			
		10-Percent Annual Chance	2-Percent Annual Chance	1-Percent Annual Chance	0.2-Percent Annual Chance
BROAD ROCK CREEK					
At mouth	6.02	2,900	5,300	6,400	9,600
Central Avenue	3.71	1,900	3,200	3,800	6,700
Jefferson Davis Highway	2.39	900	1,200	1,300	4,900
Seaboard Coastline Railroad					
Crossing	2.25	1,400	2,500	3,000	4,700
Franklin Road	1.40	800	1,450	1,800	2,800
CHEROKEE CREEK					
At mouth	1.63	270	1,700	1,100	2,300
Gordon Street	6.31	110	270	490	1,130
Hobbyhill Road	0.24	70	210	480	1,100
GILLEN CREEK					
James River Road	14.23	5,200	5,800	7,100	11,600
GOODIES CREEK					
At mouth	1.82	600	1,300	1,800	4,300
Royall Avenue	1.16	0	400	800	2,900
GRINDALL CREEK					
At corporate limits	2.57	1,000	1,400	1,600	2,000
Cardwell Road	1.97	520	650	680	750
Upper Seaboard Coastline Railroad					
Crossing	1.66	1,100	2,100	2,600	3,900
Hopkins Road	0.85	400	1,200	1,600	2,300
JAMES RIVER					
At downstream corporate limits	6,258.00	131,000	232,000	290,000	475,000
PITAWAY CREEK					
At mouth	0.59	340	670	830	1,200
POCOUSHAM CREEK					
At mouth	5.97	2,100	4,000	5,000	9,500
Abner West Branch Pocosham Creek	4.07	1,600	3,100	3,800	6,600
Chippaham Parkway	1.07	600	1,100	1,400	2,100
POWHEE CREEK					
At mouth	12.09	2,200	4,200	5,300	8,200
RATLEIGH CREEK					
At mouth	2.72	1,150	2,200	2,700	4,000
Chippaham Parkway	1.80	670	1,300	1,600	2,400
STONY POINT CREEK					
At mouth	1.03	560	1,100	1,350	2,000

10-year flow upstream of Royall Avenue diverted by storm drain

7

PRE/POST SITE RUN-OFF CALCULATIONS			
STRUCTURE Pre			
C-factor	Area	C'A	
Urban	0.30	0.35	0.17
Impervious	0.30	0.30	0.27
Forest	0.25	0.08	0.02
Total C-factor: 0.93			
STRUCTURE Post			
C-factor	Area	C'A	
Urban	0.30	0.33	0.10
Impervious	0.30	0.60	0.54
Total C-factor: 0.93			
STRUCTURE Pre			
Area	Total C-factor		
0.93	0.93		
STRUCTURE Post			
Area	Total C-factor		
0.93	0.93		
STRUCTURE Pre			
Overland:	Length = 34 ft		
Slope = 3.0 %			
C-factor = 0.93			
tc = 2.1 minutes			
Concentrated:			
Length = 119 ft			
H = 1 ft			
tc = 2.1 minutes			
STRUCTURE Post			
Overland:	Length = 34 ft		
Slope = 3.0 %			
C-factor = 0.93			
tc = 2.1 minutes			
Concentrated:			
Length = 119 ft			
H = 1 ft			
tc = 2.1 minutes			

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1001 Boulsters Parkway
Suite 300
Richmond, VA 23225

P 804.200.6500
F 804.560.1010
www.timmons.com

July 18, 2017

Jonel Prevost-White, CFM
Operations Manager
DPU - Water Resources Division
730 East Broad Street
Richmond, VA 23219

RE: Insignificant Impact Certificate for the James River Park System Warehouse Site Improvements Plan

Dear Ms. Prevost-White,

James River Park System is the existing headquarters for the City Department of Parks, Recreation and Community Facilities (Department). This site also serves as the Department's maintenance and storage facility for their equipment, vehicles, and material storage. As an initiative to clean up the site and to comply with State NS-4 requirements, the Department proposes to build three small storage warehouses near their existing administration building, a covered storage area, and a material storage yard. The warehouses will be constructed of concrete block, pressure treated wood wall framing, exterior grade plywood on exterior walls and interior their eaves, galvanized fasteners, and include flood vents.

The James River Park System property is located adjacent to the James River and is within the 100-yr floodway. The three proposed storage warehouses will be constructed within the floodway as well. Per Section 14-84(c)(1) of the City of Richmond's Floodplain Management Ordinance, any "Encroachments, including all, new construction, substantial improvements and other developments are prohibited, unless certification (with supporting technical data) by a registered professional engineer is provided demonstrating that encroachments shall not result in any increase in flood levels during occurrence of the base flood."

Charles Banks, with Virginia Department of Conservation and Recreation's Dam Safety and Floodplain Management Division, further interprets this section of the Ordinance with the following directive:

Determine how high up the building the water will be during the 1% chance flood (BFE). Using the square footage of the building, calculate the cubic foot volume of the structures that the building will displace. At least that amount of volume needs to be removed from the floodway somewhere nearby to keep the building from causing an increase in the BFE. Properly done and documented, this can take the place of the complete flood study.

Following Mr. Banks' instruction, Timmons Group used the Federal Emergency Management Authority Flood Insurance Rate Maps (FIRM) 510129038D and 510129038E to find the approximate base flood elevation (BFE) near the proposed development. The displaced volume of the structures were calculated by multiplying the square footage of the structures by the difference in elevation between the structures finished floors and the proposed BFE's. The site was then graded to ensure the volume of cut would offset the volume of fill from the structures and site area. The grading and earth analysis was completed using AutoCAD Civil3D 2016. The proposed and existing surfaces were compared using a volume comparison tool in Civil3D. The following is a breakdown of the data used for the cut/fill analysis and the volume results:

Equipment Building A (1670sf)	FF = 67.75'	BFE = 74.25'	Vol = 400cy
Equipment Building B (400sf)	FF = 66.78'	BFE = 74.00'	Vol = 107cy
Maintenance Building (2000sf)	FF = 68.90'	BFE = 71.50'	Vol = 130cy

708cy CUT
708cy FILL

Site Grading in Civil3D (prop grade - ex ground)
Net Volume: 6cy CUT

As illustrated above, the net volume based on the cut/fill analysis is 6 cubic yards of cut, which means the volume of cut will offset the volume displaced by the structures and site area fill. Thus, the proposed grading plan meets Mr. Banks' directive and the requirements of the Flood Management Ordinance.

City of Richmond Department of Utilities-Water Resource Division also reviewed that a cross section of the James River be analyzed just downstream of the proposed impacts using the pre and post-developed 100-yr flows at the point of analysis. The overall flow within the James River was found using the City of Richmond's Flood Insurance Study (FIS) dated July 16, 2014. Per Table 1-Summary of Discharges (pg.7) the existing 100-yr flow at the downstream corporate limits was 290,000 cfs. We added this flow as the base flow and added the existing and proposed 100-yr flows from our site to the overall flow. A cross section was then defined in Bentley's Flowmaster using City GIS topography and station/elevation points along the cross section. The calculated flows were then input into the cross section to find the resulting water surface elevation (WSE) for the pre and post-developed 100-yr flows. The following data was used for the analysis:

James River 100-yr flow per CoR FIS Study = 290,000 cfs	
EX. 100-yr flow from JRPS Site = 4.12 cfs	
PROP. 100-yr flow from JRPS Site = 7.22 cfs	
EX. WSE RESULT = 71.80'	
PROP. WSE RESULT = 71.80'	

Per the cross-section analysis, the proposed work will not result in any increase in flood levels during occurrence of the base flood.

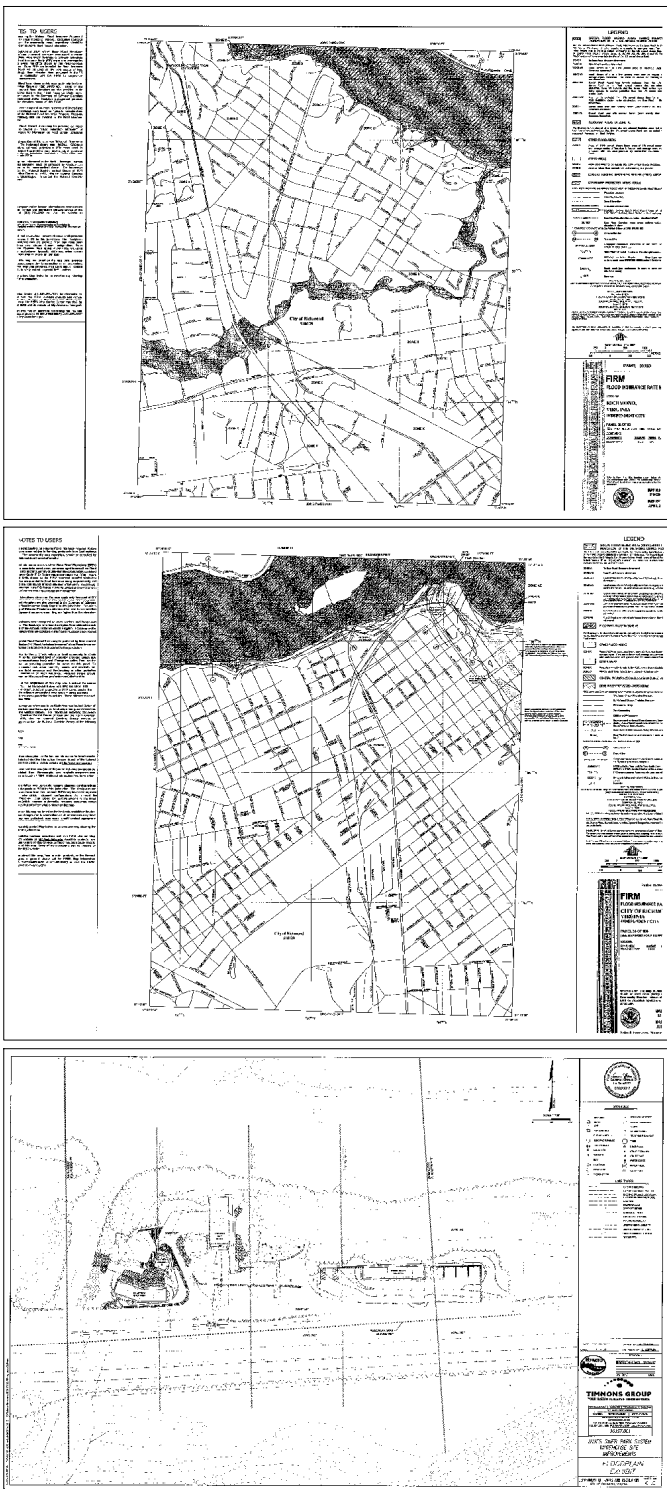
Refer to the following attached documents, which support all analyses.

- Interpretation email from Mr. Charles Banks;
- Federal Emergency Management Authority Flood Insurance Rate Map (City of Richmond, VA, Map Numbers 510129038D and 510129038E);
- AutoCAD Civil3D 2016 Site Grading Volume Comparison Output;
- Floodplain exhibit displaying design conditions, floodplain, and approximate BFE's;
- CoR FIS dated July 16, 2014 - Table 1-Summary of Discharges;
- Bentley's Flowmaster Results.

This letter is to certify that I am a qualified professional engineer licensed to practice in the Commonwealth of Virginia. It is to further certify, in my opinion, that the design data included within this letter supports the fact that the proposed development will not significantly impact the 100-year flood elevations, floodway elevation or floodway widths on the James River in the vicinity of the proposed development.

Your consideration and approval of this Insignificant Impact certificate for the James River Park System Warehouse Site Improvements is greatly appreciated. Please contact me at 804-200-6486 or via email at laurie.coffman@timmons.com.

Respectfully submitted,
Laurie Coffman
Laurie Coffman, PE
Senior Project Engineer



Cut/Fill Report

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Drawing: S:\31036157.001-JRPS Warehouse\DWG\C3D Model\31036157.001-JRPS Warehouse\DWG\C3D Model\36157.001-C-SMGRAD.dwg

Volume Summary

Name	Type	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Vol Check	full	1.00	1.00	28538.16	743.06	35.44	707.61<Cut>
Totals							
Total				28538.16	743.06	35.44	707.61<Cut>

* Value adjusted by cut or fill factor other than 1.0

* Value adjusted by cut or fill factor other than 1.0

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.

DATE: MARCH 12, 2018

SCALE: AS SHOWN

DRAWN BY: K. ATKINSON

CHECKED BY: A. WEHUNT

REVISIONS

NO.	DESCRIPTION	DATE
1	REVISED PER WR'S 07/20/17	07/20/17
2	REVISED PER WR'S 08/15/17	08/15/17
3	REVISED PER WR'S 12/27/17	12/27/17
4	REVISED PER WR'S 03/12/18	03/12/18

AS BUILT

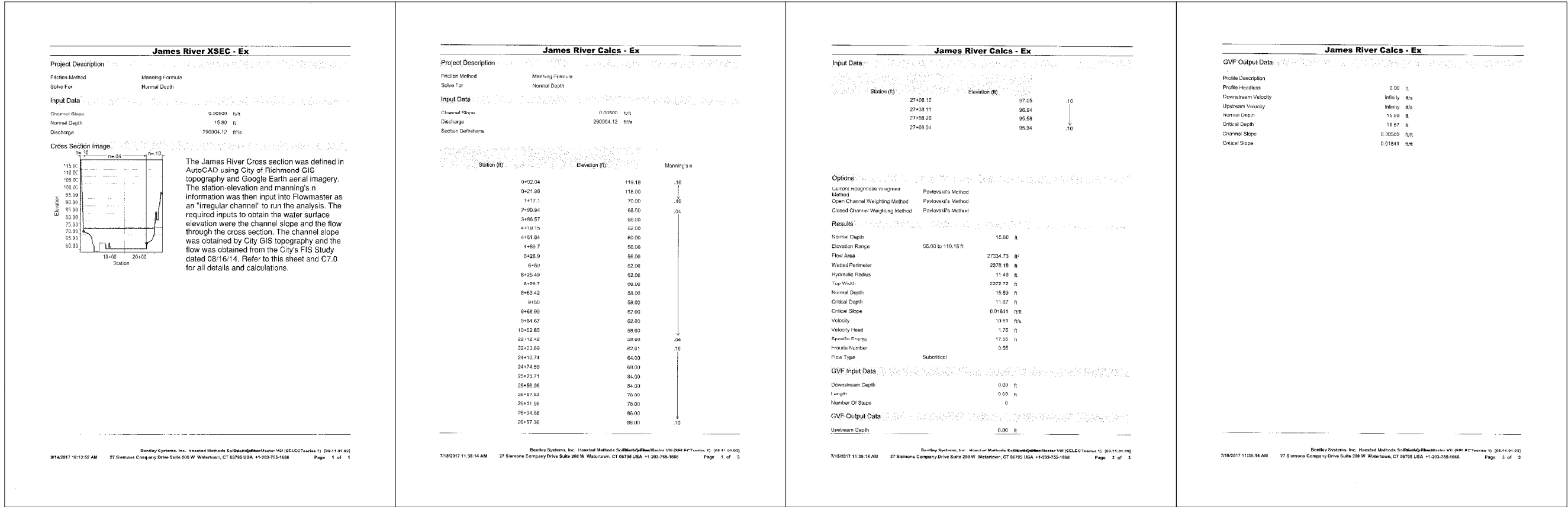
DATE

JAMES RIVER PARK SYSTEM
WAREHOUSE SITE
IMPROVEMENTS
FLOODPLAIN
CERTIFICATION AND
CALCS

DEPARTMENT OF PARKS AND RECREATION
CITY OF RICHMOND, VIRGINIA

SHEET NO.
C7.0

FLOWMASTER MODEL REPORT - EXISTING CONDITIONS



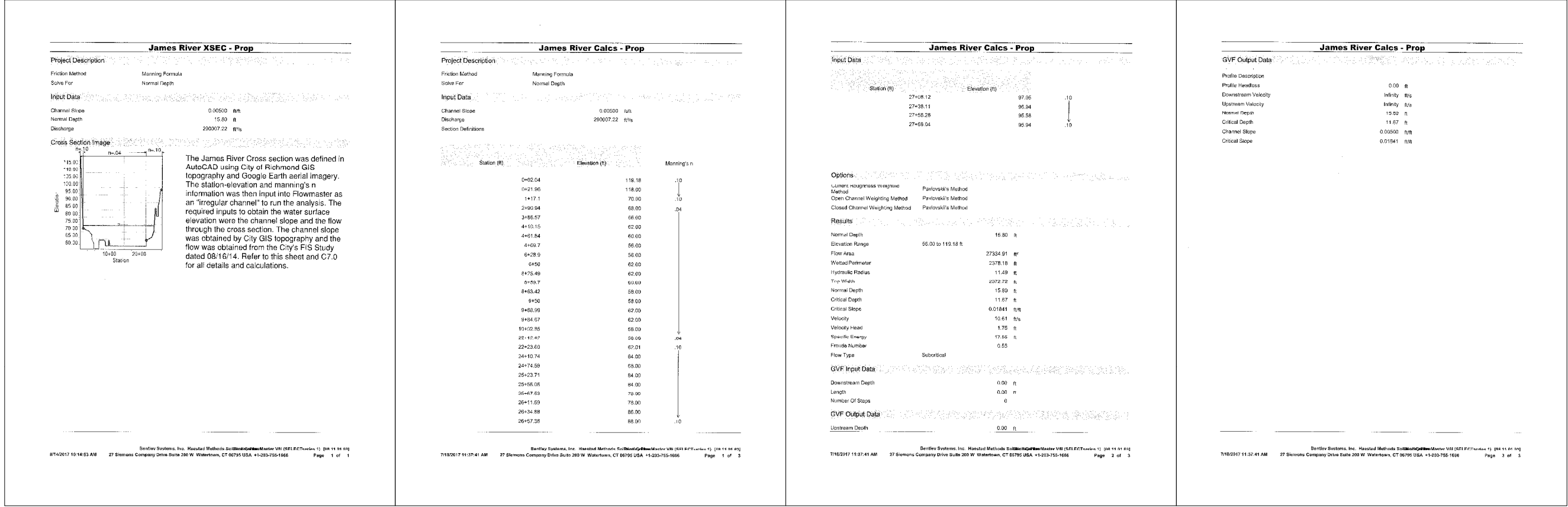
8/14/2017 18:13:52 AM 27 Siemens Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Page 1 of 1

7/18/2017 11:38:14 AM 27 Siemens Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Page 1 of 3

7/18/2017 11:38:14 AM 27 Siemens Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Page 2 of 3

7/18/2017 11:38:14 AM 27 Siemens Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Page 3 of 3

FLOWMASTER MODEL REPORT - PROPOSED CONDITIONS

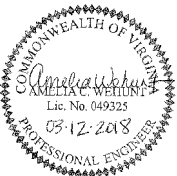


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7/18/2017 11:37:41 AM 27 Siemens Company Drive Suite 200 W Watertown, CT 06795 USA +1-203-755-1666 Page 3 of 3



SYMBOLS	
	BOLLARD
	BUSH
	CAP
	ELECTRIC BOX
	ELECTRIC METER
	ELECTRIC MANHOLE
	FIRE HYDRANT
	GAS METER
	GAS VALVE
	GUY
	LIGHT POLE
	POWER POLE
	PROPERTY PIN
	R/W TANGENT POINT
	SANITARY MANHOLE
	SIGNS
	STORM MANHOLE
	TELEPHONE MANHOLE
	TREE
	UTILITY BOX
	UTILITY PEDESTAL
	UTILITY POLE
	WATER METER
	WATER VALVE
	YARD LIGHT

LINE TYPES	
	EXISTING BUILDING
	EXISTING GROUND EAST SIDE
	EXISTING GROUND CENTERLINE
	EXISTING GROUND WEST SIDE
	GAS PIPE
	PROPERTY LINE
	SANITARY SEWER
	SEWER EASEMENT
	OVERHEAD ELECTRIC
	OVERHEAD CABLE TV
	UNDERGROUND CABLE TV
	UNDERGROUND ELECTRIC
	UNDERGROUND TELEPHONE
	WATER PIPE

THIS SHEET IS PROVIDED FOR CALCULATION PURPOSES ONLY AND IS NOT TO BE USED FOR CONSTRUCTION.

DATE: MARCH 12, 2018 DRAWN BY: K. ATKINSON
SCALE: AS SHOWN CHECKED BY: A. WEHNT

REVISIONS	
REVISED PER WR'S 07/20/17	DATE
REVISED PER WR'S 08/15/17	
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REVISED PER WR'S 03/12/18	
AS BUILT	

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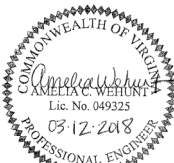
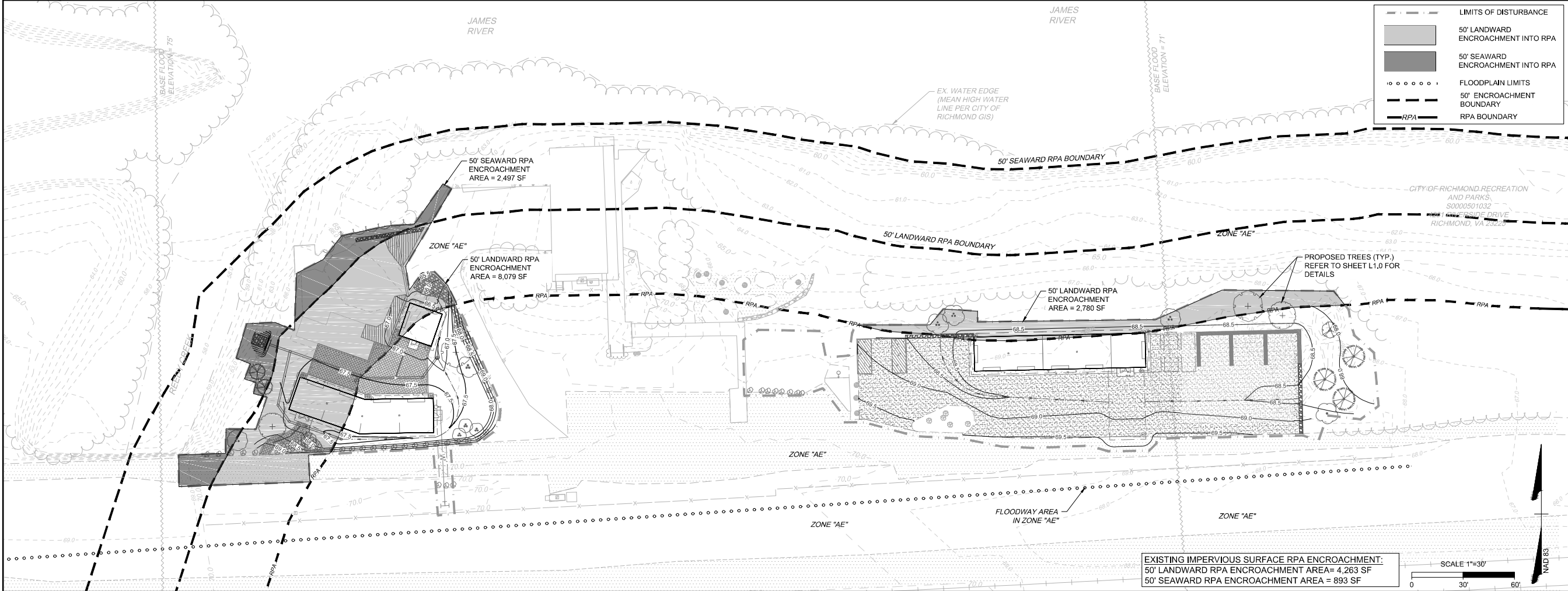
Site Development	Residential	Infrastructure	Technology
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JAMES RIVER PARK SYSTEM
WAREHOUSE SITE
IMPROVEMENTS

FLOODPLAIN CERTIFICATION
CALCULATIONS

DEPARTMENT OF PARKS AND RECREATION
CITY OF RICHMOND, VIRGINIA

SHEET NO.
C7.1



SYMBOLS

BOLLARD	R/W TANGENT POINT
BUSH	SANITARY MANHOLE
CAP	SIGNS
ELECTRIC HUX	STORM MANHOLE
ELECTRIC METER	TELEPHONE MANHOLE
ELECTRIC MANHOLE	TREE
FIRE HYDRANT	UTILITY BOX
GAS METER	UTILITY PEDESTAL
GAS VALVE	UTILITY POLE
GUY	WATER METER
LIGHT POLE	WATER VALVE
POWER POLE	YARD LIGHT
PROPERTY PIN	

LINE TYPES

EXISTING BUILDING
EXISTING GROUND EAST SIDE
EXISTING GROUND CENTERLINE
EXISTING GROUND WEST SIDE
GAS PIPE
PROPERTY LINE
SANITARY SEWER
SEWER EASEMENT
OVERHEAD ELECTRIC
OVERHEAD CABLE TV
UNDERGROUND CABLE TV
UNDERGROUND ELECTRIC
UNDERGROUND TELEPHONE
WATER PIPE

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JAMES RIVER PARK SYSTEM WATER QUALITY IMPACT ASSESSMENT

EXISTING CONDITIONS

THE SITE CURRENTLY SERVES AS THE JAMES RIVER PARK SYSTEM HEADQUARTERS AND CITY MAINTENANCE STORAGE YARD. IT CONTAINS A ONE-STORY OFFICE BUILDING ALONG WITH SEVERAL STORAGE CONTAINERS, MATERIAL STOCKPILES, MAINTENANCE EQUIPMENT, AND PILES OF DEBRIS. THE MAJORITY OF THE SITE IS COMPOSED OF PAVED PARKING AND GRAVEL WALKWAYS.

EXISTING HYDROLOGY

CURRENTLY, THE SITE CONSISTS MAINLY OF UDORTHERNTS-DUMPS SOIL (HSG: D), AND LIES WITHIN BOTH AN RPA BOUNDARY AND 100 YEAR FLOODPLAIN/FLOODWAY. ANY STORMWATER ON SITE SHEET FLOWS DIRECTLY INTO THE JAMES RIVER AT APPROXIMATELY A 10% SLOPE. ALL IMMEDIATELY ADJACENT LANDS DEMONSTRATE SIMILAR CHARACTERISTICS, AND SHEET FLOW DIRECTLY INTO THE JAMES RIVER. REEDY CREEK LIES TO THE WEST OF THE SITE AND OUTFALLS DIRECTLY INTO THE JAMES RIVER, WHICH LIES TO THE NORTH. WETLANDS BORDER THE NORTHERN SIDE OF THE SITE DIRECTLY ADJACENT TO THE RIVER. REFER TO SHEET C3.1 FOR MORE INFORMATION PERTAINING TO EXISTING HYDROLOGY.

PROPOSED SITE DEVELOPMENT

THE PROJECT CONSISTS OF SITE IMPROVEMENTS TO THE EXISTING EQUIPMENT AND MATERIAL STORAGE YARD AS WELL AS THE ADDITION OF THREE NEW WAREHOUSE/FLEX SPACE BUILDINGS FOR ADDITIONAL STORAGE AND EDUCATIONAL TRAINING PURPOSES. THIS PROJECT IS BEING COMPLETED IN ORDER TO COMPLY WITH CITY MS-4 REQUIREMENTS.

- THE PROPOSED PROJECT HAS BEEN SPECIFICALLY DESIGNED TO IMPROVE UPON EXISTING CONDITIONS WHILE ALSO MAKING SURE TO NOT CREATE ADDITIONAL HARMFUL IMPACTS TO EXISTING TOPOGRAPHY, SOILS, HYDROLOGY OR GEOLOGY.
- THE CUT/FILL BALANCE MEETS THE REQUIREMENTS OF THE FLOODPLAIN MANAGEMENT ORDINANCE. REFER TO C7.0 FOR CUT/FILL CALCULATIONS. FILL MATERIAL WILL BE SUPPLIED FROM EXCESS CUT MATERIAL, PROVIDED IT IS SUITABLE FOR USE. REFER TO SHEET C5.0 FOR FURTHER FILL DETAIL. ANY ADDITIONAL CUT WILL BE DISPOSED OF AT A LANDFILL OR OTHER APPROVED LOCATION.
- THE PROPOSED GRAVEL DIAPHRAGMS SERVE AS THE PRIMARY STORMWATER MANAGEMENT SYSTEM AND WILL IMPROVE WATER QUALITY BY MINIMIZING SEDIMENTATION BUILD-UP AND WILL RETURN CHANNELIZED FLOW BACK TO SHEET FLOW. REFER TO SHEET C1.0 FOR GRAVEL DIAPHRAGM TYPICAL DETAIL.
- EXISTING DRAINAGE OUTFALL PATTERNS AND STREAM CIRCULATION PATTERNS WILL BE MAINTAINED. THE SITE WILL BE GRADED TO DIRECT WATER FLOW TOWARDS THREE PROPOSED GRAVEL DIAPHRAGMS. REFER TO SHEET C5.0 FOR GRADING INFORMATION, AND SHEET C3.1 FOR STORMWATER RUN-OFF CONSIDERATIONS.
- THE PROJECT WILL HAVE MINIMAL IMPACT ON EXISTING VEGETATION. A SMALL PORTION OF VEGETATION WILL BE REMOVED AND ANY LAND DISTURBED BY CONSTRUCTION WILL BE STABILIZED AFTER CONSTRUCTION IS COMPLETED ACCORDING TO THE EROSION AND SEDIMENT CONTROL PLAN. REFER TO SHEET C3.0 FOR E&S DETAILS.
- WATER QUALITY REQUIREMENTS WILL BE MET THROUGH THE USE OF VEGETATIVE ROOFS, PERMEABLE PAVEMENT, AND THE PURCHASE OF WATER QUALITY CREDITS. REFER TO SHEET C6.0 FOR FURTHER WATER QUALITY INFORMATION.

MITIGATION MEASURES

BEYOND THE PROPOSED PROJECT'S DESIGN ARE MITIGATION MEASURES WHICH WILL ALSO SERVE TO MINIMIZE HARMFUL IMPACTS TO EXISTING ENVIRONMENTAL CONDITIONS.

- A COMPLETE EROSION AND SEDIMENT CONTROL PLAN HAS BEEN PREPARED TO ENSURE PROPER EROSION AND STORMWATER RUNOFF CONTROL THROUGHOUT THE CONSTRUCTION. REFER TO SHEET C3.0 FOR DETAILS.
- THE NECESSARY GRADING MEASURES WERE MINIMIZED TO AVOID MAJOR ENVIRONMENTAL IMPACTS.
- THE PROPOSED PROJECT HAS BEEN DESIGNED TO MINIMIZE REQUIRED VEGETATION CLEARING, CUT AND FILL EARTHWORK AND DISTURBANCE OF SURROUNDING NATURAL AREAS. ALL DENUDED AREAS WILL BE STABILIZED ACCORDING TO THE EROSION AND SEDIMENT CONTROL PLAN. REFER TO SHEET C5.0 FOR ADDITIONAL GRADING AND DRAINAGE INFORMATION.
- LANDSCAPING HAS BEEN PROVIDED IN AREAS WHERE EXISTING VEGETATION WILL BE DISTURBED. REFER TO LANDSCAPING PLAN ON SHEETS L1.0 AND L1.1 FOR DETAILS.

DATE: MARCH 12, 2018 DRAWN BY: K. ATKINSON

SCALE: AS SHOWN CHECKED BY: A. WEHNT



REVISIONS

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AS BUILT DATE

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JAMES RIVER PARK SYSTEM
WAREHOUSE SITE
IMPROVEMENTS

WATER QUALITY
IMPACT ASSESSMENT

DEPARTMENT OF PARKS AND RECREATION
CITY OF RICHMOND, VIRGINIA

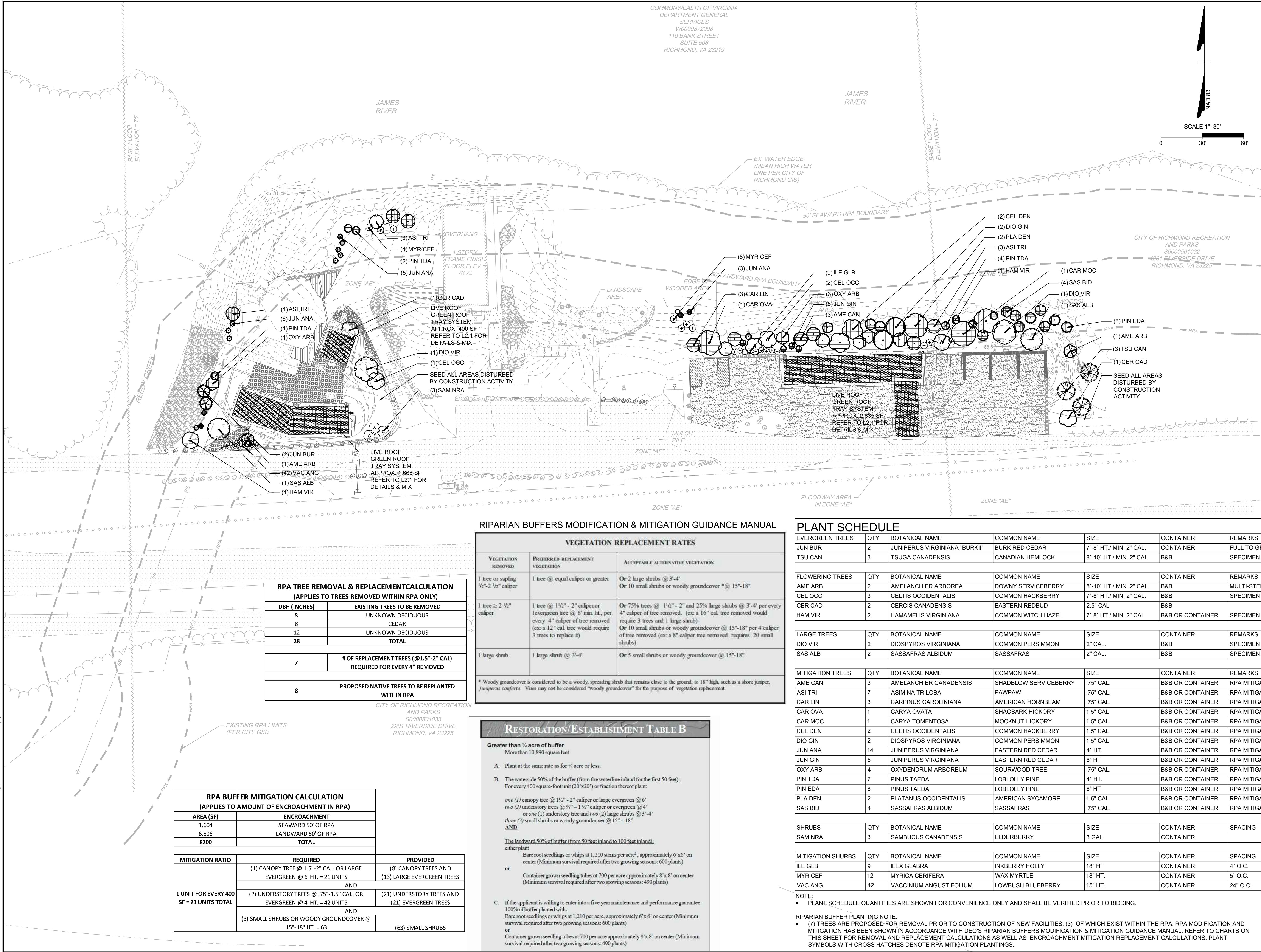
SHEET NO.
C8.0

SYMBOLS

	BOLLARD		RW TANGENT POINT
	BUSH		SANITARY MANHOLE
	CAP		SIGNS
	ELECTRIC BOX		STORM MANHOLE
	ELECTRIC METER		TELEPHONE MANHOLE
	ELECTRIC MANHOLE		TREE
	FIRE HYDRANT		UTILITY BOX
	GAS METER		UTILITY PEDESTAL
	GAS VALVE		UTILITY POLE
	GUY		WATER METER
	LIGHT POLE		WATER VALVE
	POWER POLE		YARD LIGHT
	PROPERTY PIN		

LINE TYPES

	EXISTING BUILDING
	EXISTING GROUND EAST SIDE
	EXISTING GROUND CENTERLINE
	EXISTING GROUND WEST SIDE
	GAS PIPE
	PROPERTY LINE
	SANITARY SEWER
	SEWER EASEMENT
	OVERHEAD ELECTRIC
	OVERHEAD CABLE TV
	UNDERGROUND CABLE TV
	UNDERGROUND ELECTRIC
	UNDERGROUND TELEPHONE
	WATER PIPE



RIPARIAN BUFFERS MODIFICATION & MITIGATION GUIDANCE MANUAL

VEGETATION REPLACEMENT RATES		
VEGETATION REMOVED	PREFERRED REPLACEMENT VEGETATION	ACCEPTABLE ALTERNATIVE VEGETATION
1 tree or sapling 1/2" - 2 1/2" caliper	1 tree @ equal caliper or greater	Or 2 large shrubs @ 3'-4" Or 10 small shrubs or woody groundcover @ 15"-18"
1 tree ≥ 2 1/2" caliper	1 tree @ 1 1/2" - 2" caliper, or 1 evergreen tree @ 6' min. ht., per every 4" caliper of tree removed (ex: a 12" cal. tree would require 3 trees to replace it)	Or 75% trees @ 1 1/2" - 2" and 25% large shrubs @ 3'-4" per every 4" caliper of tree removed. (ex: a 16" cal. tree removed would require 3 trees and 1 large shrub) Or 10 small shrubs or woody groundcover @ 15"-18" per 4" caliper of tree removed (ex: a 8" caliper tree removed requires 20 small shrubs)
1 large shrub	1 large shrub @ 3'-4"	Or 5 small shrubs or woody groundcover @ 15"-18"

* Woody groundcover is considered to be a woody, spreading shrub that remains close to the ground, to 18" high, such as a shore juniper, *juniperus conferta*. Vines may not be considered "woody groundcover" for the purpose of vegetation replacement.

PLANT SCHEDULE

EVERGREEN TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	REMARKS
JUN BUR	2	JUNIPERUS VIRGINIANA 'BURKII'	BURK RED CEDAR	7'-8" HT. / MIN. 2" CAL.	CONTAINER	FULL TO GR
TSU CAN	3	TSUGA CANADENSIS	CANADIAN HEMLOCK	8'-10" HT. / MIN. 2" CAL.	B&B	SPECIMEN
FLOWERING TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	REMARKS
AME ARB	2	AMELANCHIER ARBOREA	DOWNY SERVICEBERRY	8'-10" HT. / MIN. 2" CAL.	B&B	MULTI-STEM
CEL OCC	3	CELTIS OCCIDENTALIS	COMMON HACKBERRY	7'-8" HT. / MIN. 2" CAL.	B&B	SPECIMEN
CER CAD	2	CERCIS CANADENSIS	EASTERN REDBUD	2.5" CAL	B&B	
HAM VIR	2	HAMAMELIS VIRGINIANA	COMMON WITCH HAZEL	7'-8" HT. / MIN. 2" CAL.	B&B OR CONTAINER	SPECIMEN
LARGE TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	REMARKS
DIO VIR	2	DIOSPYROS VIRGINIANA	COMMON PERSIMMON	2" CAL.	B&B	SPECIMEN
SAS ALB	2	SASSAFRAS ALBIDUM	SASSAFRAS	2" CAL.	B&B	SPECIMEN
MITIGATION TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	REMARKS
AME CAN	3	AMELANCHIER CANADENSIS	SHADBLOW SERVICEBERRY	.75" CAL.	B&B OR CONTAINER	RPA MITIGA
ASI TRI	7	ASIMINA TRILOBA	PAWPAW	.75" CAL.	B&B OR CONTAINER	RPA MITIGA
CAR LIN	3	CARPINUS CAROLINIANA	AMERICAN HORNBEAM	.75" CAL.	B&B OR CONTAINER	RPA MITIGA
CAR OVA	1	CARYA OVATA	SHAGBARK HICKORY	1.5" CAL	B&B OR CONTAINER	RPA MITIGA
CAR MOC	1	CARYA TOMENTOSA	MOCKNUT HICKORY	1.5" CAL	B&B OR CONTAINER	RPA MITIGA
CEL DEN	2	CELTIS OCCIDENTALIS	COMMON HACKBERRY	1.5" CAL	B&B OR CONTAINER	RPA MITIGA
DIO GIN	2	DIOSPYROS VIRGINIANA	COMMON PERSIMMON	1.5" CAL	B&B OR CONTAINER	RPA MITIGA
JUN ANA	14	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	4' HT.	B&B OR CONTAINER	RPA MITIGA
JUN GIN	6	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	6' HT	B&B OR CONTAINER	RPA MITIGA
OXY ARB	4	OXYDENDRUM ARBOREUM	SOURWOOD TREE	.75" CAL.	B&B OR CONTAINER	RPA MITIGA
PIN TDA	7	PINUS TAEDA	LOBLOLLY PINE	4' HT.	B&B OR CONTAINER	RPA MITIGA
PIN EDA	8	PINUS TAEDA	LOBLOLLY PINE	6' HT	B&B OR CONTAINER	RPA MITIGA
PLA DEN	2	PLATANUS OCCIDENTALIS	AMERICAN SYCAMORE	1.5" CAL.	B&B OR CONTAINER	RPA MITIGA
SAS BID	4	SASSAFRAS ALBIDUM	SASSAFRAS	.75" CAL.	B&B OR CONTAINER	RPA MITIGA
SHRUBS	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	SPACING
SAM NRA	3	SAMBUCUS CANADENSIS	ELDERBERRY	3 GAL.	CONTAINER	
MITIGATION SHRUBS	QTY	BOTANICAL NAME	COMMON NAME	SIZE	CONTAINER	SPACING
ILE GLB	9	ILEX GLABRA	INKBERRY HOLLY	18" HT	CONTAINER	4" O.C.
MYR CEF	12	MYRICA CERIFERA	WAX MYRTLE	18" HT.	CONTAINER	5" O.C.
VAC ANG	42	VACCINIUM ANGUSTIFOLIUM	LOWBUSH BLUEBERRY	15" HT.	CONTAINER	24" O.C.

NOTE:
• PLANT SCHEDULE QUANTITIES ARE SHOWN FOR CONVENIENCE ONLY AND SHALL BE VERIFIED PRIOR TO BIDDING.

RIPARIAN BUFFER PLANTING NOTE:
• (7) TREES ARE PROPOSED FOR REMOVAL PRIOR TO CONSTRUCTION OF NEW FACILITIES; (3) OF WHICH EXIST WITHIN THE RPA. RPA MODIFICATION AND MITIGATION HAS BEEN SHOWN IN ACCORDANCE WITH DEQ'S RIPARIAN BUFFERS MODIFICATION & MITIGATION GUIDANCE MANUAL. REFER TO CHARTS ON THIS SHEET FOR REMOVAL AND REPLACEMENT CALCULATIONS AS WELL AS ENCROACHMENT MITIGATION REPLACEMENT CALCULATIONS. PLANT SYMBOLS WITH CROSS HATCHES DENOTE RPA MITIGATION PLANTINGS.

RPA TREE REMOVAL & REPLACEMENT CALCULATION (APPLIES TO TREES REMOVED WITHIN RPA ONLY)	
DBH (INCHES)	EXISTING TREES TO BE REMOVED
8	UNKNOWN DECIDUOUS
8	CEDAR
12	UNKNOWN DECIDUOUS
28	TOTAL
7	# OF REPLACEMENT TREES (@ 1.5"-2" CAL) REQUIRED FOR EVERY 4" REMOVED
8	PROPOSED NATIVE TREES TO BE REPLANTED WITHIN RPA

CITY OF RICHMOND RECREATION
AND PARKS
50000501033
2901 RIVERSIDE DRIVE
RICHMOND, VA 23225

RPA BUFFER MITIGATION CALCULATION (APPLIES TO AMOUNT OF ENCROACHMENT IN RPA)		
AREA (SF)		ENCROACHMENT
1,604		SEAWARD 50' OF RPA
6,596		LANDWARD 50' OF RPA
8200		TOTAL
MITIGATION RATIO	REQUIRED	PROVIDED
1 UNIT FOR EVERY 400 SF = 21 UNITS TOTAL	(1) CANOPY TREE @ 1.5"-2" CAL. OR LARGE EVERGREEN @ 6' HT. = 21 UNITS	(8) CANOPY TREES AND (13) LARGE EVERGREEN TREES
	AND	
	(2) UNDERSTORY TREES @ .75"-1.5" CAL. OR EVERGREEN @ 4' HT. = 42 UNITS	(21) UNDERSTORY TREES AND (21) EVERGREEN TREES
	AND	
	(3) SMALL SHRUBS OR WOODY GROUNDCOVER @ 15"-18" HT. = 63	(63) SMALL SHRUBS

RESTORATION/ESTABLISHMENT TABLE B

Greater than 1/4 acre of buffer
More than 10,890 square feet

A. Plant at the same rate as for 1/4 acre or less.

B. The waterside 50% of the buffer (from the waterline inland for the first 50 feet):
For every 400 square-foot unit (20'x20') or fraction thereof plant:

one (1) canopy tree @ 1 1/2" - 2" caliper or large evergreen @ 6'
two (2) understory trees @ 3/4" - 1 1/2" caliper or evergreen @ 4'
or one (1) understory tree and two (2) large shrubs @ 3'-4'
three (3) small shrubs or woody groundcover @ 15"-18"
AND
The landward 50% of buffer (from 50 feet inland to 100 feet inland):
either plant
Bare root seedlings or whips at 1,210 stems per acre¹, approximately 6'x6' on
center (Minimum survival required after two growing seasons: 600 plants)
or
Container grown seedling tubes at 700 per acre approximately 8'x8' on center
(Minimum survival required after two growing seasons: 490 plants)

C. If the applicant is willing to enter into a five year maintenance and performance guarantee:
100% of buffer planted with:
Bare root seedlings or whips at 1,210 per acre, approximately 6'x6' on center (Minimum
survival required after two growing seasons: 600 plants)
or
Container grown seedling tubes at 700 per acre approximately 8'x8' on center (Minimum
survival required after two growing seasons: 490 plants)

DATE: MARCH 12, 2018 DRAWN BY: K. ATKINSON
SCALE: 1" = 30' CHECKED BY: A. WEHUNT

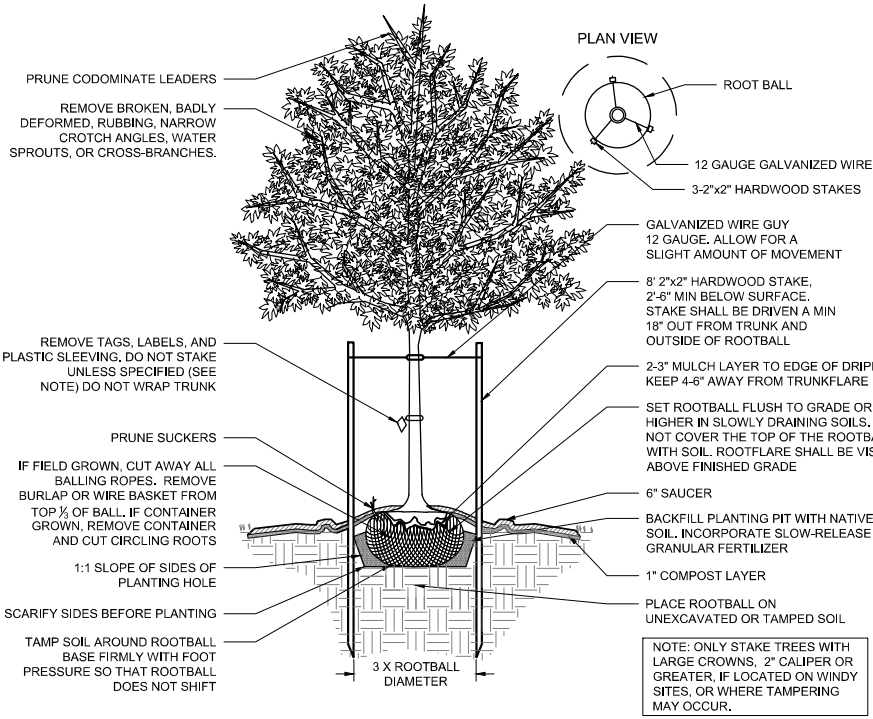
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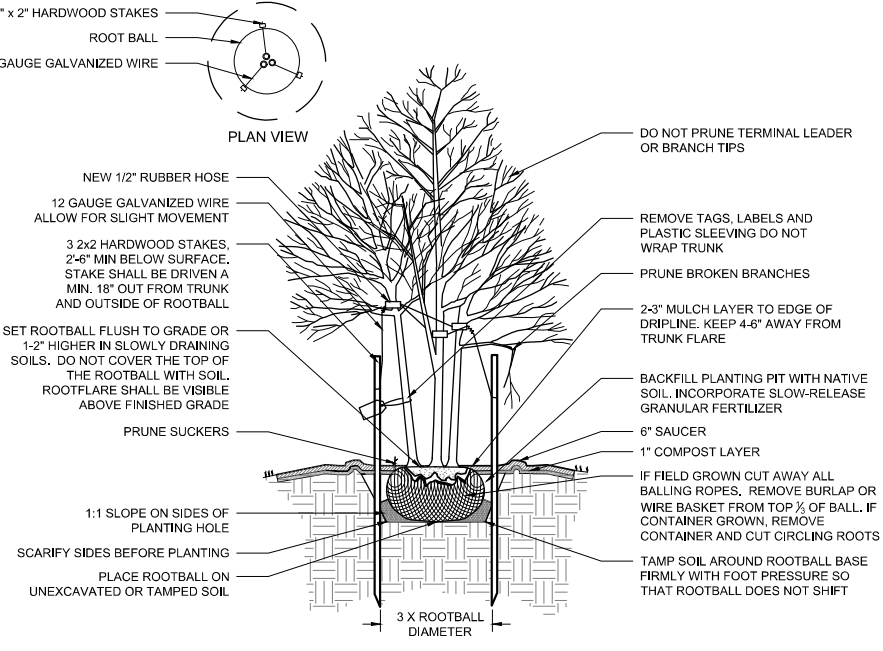
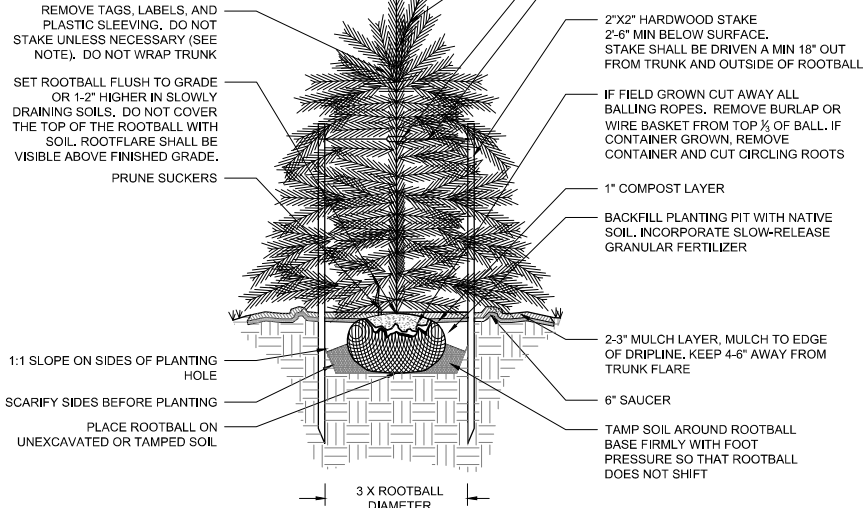
Site Development	Residential	Infrastructure	Technology
YOUR VISION ACHIEVED THROUGH OURS.			
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36157.001			

JAMES RIVER PARK SYSTEM
WAREHOUSE SITE
IMPROVEMENTS

LANDSCAPE PLAN



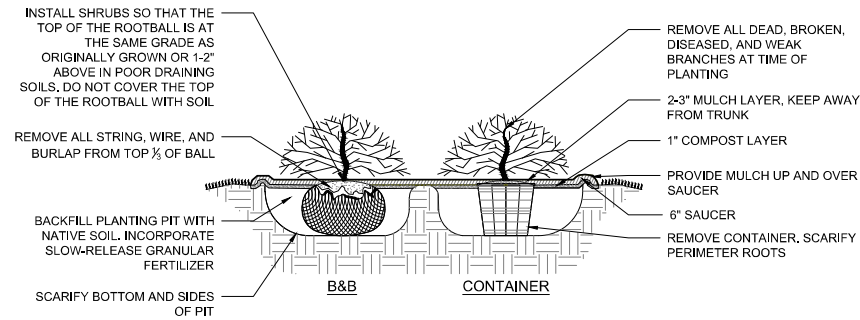
NOTE: STAKE EVERGREENS 6' OR TALLER, ON SLOPES, WITH LARGE CROWNS, OR IF LOCATED ON WINDY SITES.



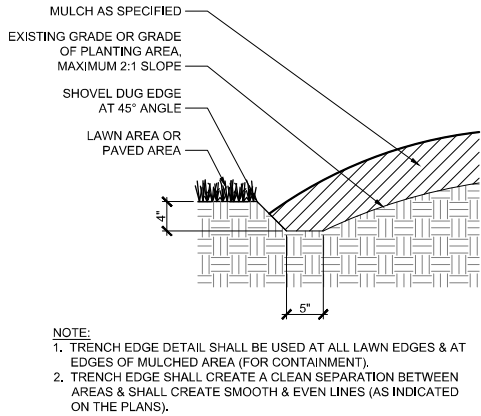
1 DECIDUOUS TREE - STAKING SPECIFIED NOT TO SCALE

2 EVERGREEN TREE - STAKING SPECIFIED NOT TO SCALE

3 MULTI-STEM TREE - STAKING SPECIFIED NOT TO SCALE



4 SHRUB PLANTING NOT TO SCALE



5 LANDSCAPE BED OR MULCH RING TRENCH EDGE NOT TO SCALE

GENERAL NOTES

PRE-CONSTRUCTION

- CONTRACTOR IS RESPONSIBLE FOR CONTACTING "MISS UTILITY" AT 1.800.552.7001 FOR LOCATION OF ALL UTILITY LINES. TREES SHALL BE LOCATED A MINIMUM OF 5 FEET FROM SEWER/WATER CONNECTIONS. NOTIFY LANDSCAPE ARCHITECT OF CONFLICTS.
- VERIFY ALL PLANT MATERIAL QUANTITIES ON THE PLAN PRIOR TO BIDDING, PLANT LIST TOTALS ARE FOR CONVENIENCE ONLY AND SHALL BE VERIFIED PRIOR TO BIDDING.
- PROVIDE PLANT MATERIALS OF QUANTITY, SIZE, GENUS, SPECIES, AND VARIETY INDICATED ON PLANS. ALL PLANT MATERIALS AND INSTALLATION SHALL COMPLY WITH RECOMMENDATIONS AND REQUIREMENTS OF ANSI Z60.1 "AMERICAN STANDARD FOR NURSERY STOCK". IF SPECIFIED PLANT MATERIAL IS NOT OBTAINABLE, SUBMIT PROOF OF NON AVAILABILITY TO THE ARCHITECTS, TOGETHER WITH PROPOSAL FOR USE OF EQUIVALENT MATERIAL.
- PROVIDE AND INSTALL ALL PLANTS AS IN ACCORDANCE WITH DETAILS AND CONTRACT SPECIFICATIONS
- SOIL TESTS SHALL BE PERFORMED TO DETERMINE SOIL CHARACTER AND QUALITY. NECESSARY SOIL AMENDMENTS SHALL BE PERFORMED PER TEST RESULTS TO ENSURE PLANT HEALTH.

CONSTRUCTION/INSTALLATION

- LANDSCAPE ARCHITECT RESERVES THE RIGHT TO REJECT ANY PLANTS AND MATERIALS THAT ARE IN AN UNHEALTHY OR UNSIGHTLY CONDITION, AS WELL AS PLANTS AND MATERIALS THAT DO NOT CONFORM TO ANSI Z60.1 "AMERICAN STANDARD FOR NURSERY STOCK"
- LABEL AT LEAST ONE TREE AND ONE SHRUB OF EACH VARIETY AND CALIPER WITH A SECURELY ATTACHED, WATERPROOF TAG BEARING THE DESIGNATION OF BOTANICAL AND COMMON NAME.
- INSTALL LANDSCAPE PLANTINGS AT ENTRANCES/EXITS AND PARKING AREAS ACCORDING TO PLANS SO THAT MATERIALS WILL NOT INTERFERE WITH SIGHT DISTANCES.
- CONTRACTOR IS RESPONSIBLE FOR WATERING ALL PLANT MATERIAL DURING INSTALLATION AND UNTIL FINAL INSPECTION AND ACCEPTANCE BY OWNER. CONTRACTOR SHALL NOTIFY OWNER OF CONDITIONS WHICH AFFECTS THE GUARANTEE.

INSPECTIONS/GUARANTEE

- UPON COMPLETION OF LANDSCAPE INSTALLATION, THE LANDSCAPE CONTRACTOR SHALL NOTIFY THE GENERAL CONTRACTOR WHO WILL VERIFY COMPLETENESS, INCLUDING THE REPLACEMENT OF ALL DEAD PLANT MATERIAL. CONTRACTOR IS RESPONSIBLE FOR SCHEDULING A FINAL INSPECTION BY THE LANDSCAPE ARCHITECT.
- ALL EXTERIOR PLANT MATERIALS SHALL BE GUARANTEED FOR ONE FULL YEAR AFTER DATE OF FINAL INSPECTION AGAINST DEFECTS INCLUDING DEATH AND UNSATISFACTORY GROWTH. DEFECTS RESULTING FROM NEGLIGENCE BY THE OWNER, ABUSE OR DAMAGE BY OTHERS, OR UNUSUAL PHENOMENA OR INCIDENTS WHICH ARE BEYOND THE CONTRACTORS CONTROL ARE NOT THE RESPONSIBILITY OF THE CONTRACTOR
- PLANT MATERIAL QUANTITIES AND SIZES WILL BE INSPECTED FOR COMPLIANCE WITH APPROVED PLANS BY A SITE PLAN REVIEW AGENT OF THE PLANNING DEPARTMENT PRIOR TO THE RELEASE OF THE CERTIFICATE OF OCCUPANCY.
- REMOVE ALL GUY WIRES AND STAKES 12 MONTHS AFTER INSTALLATION.



SYMBOLS

BOLLARD	R/W TANGENT POINT
BUSH	SANITARY MANHOLE
CAP	SIGNS
ELECTRIC BOX	STORM MANHOLE
ELECTRIC METER	TELEPHONE MANHOLE
ELECTRIC MANHOLE	TREE
FIRE HYDRANT	UTILITY BOX
GAS METER	UTILITY PEDESTAL
GAS VALVE	UTILITY POLE
GUY	WATER METER
LIGHT POLE	WATER VALVE
POWER POLE	YARD LIGHT
PROPERTY PIN	

LINE TYPES

---	EXISTING BUILDING
---	EXISTING GROUND EAST SIDE
---	EXISTING GROUND CENTERLINE
---	EXISTING GROUND WEST SIDE
---	GAS PIPE
---	PROPERTY LINE
---	SANITARY SEWER
---	SEWER EASEMENT
---	OVERHEAD ELECTRIC
---	OVERHEAD CABLE TV
---	UNDERGROUND CABLE TV
---	UNDERGROUND ELECTRIC
---	UNDERGROUND TELEPHONE
---	WATER PIPE

DATE: MARCH 12, 2018 DRAWN BY: K. ATKINSON
SCALE: N/A CHECKED BY: A. WEHUNT

REVISIONS	
REVISED PER WRS 07/20/17	
REVISED PER WRS 08/15/17	
REVISED PER WRS 12/22/17	
REVISED PER WRS 03/12/18	
AS BUILT	DATE

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JAMES RIVER PARK SYSTEM
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IMPROVEMENTS

LANDSCAPE
NOTES & DETAILS

