CITY OF ALEXANDRIA, VIRGINIA

STRAWBERRY RUN
CONCEPTUAL DESIGN

PROJECT DESCRIPTION

APPROXIMATELY 811 LINEAR FEET OF PROPOSED STREAM RESTORATION DOWNSTREAM OF AN EXISTING 72 INCH CORRUGATED METAL PIPE (CMP) OUTFALL. THROUGH THE PROCESS OF BANK EROSION, THIS SITE AREA CONTRIBUTES LARGE AMOUNTS OF SEDIMENT TO THE STREAM ALONG WITH ASSOCIATED NITROGEN AND PHOSPHORUS LOADS IN ORDER TO MEET THE CHESAPEAKE BAY TOTAL MAXIMUM DAILY LOAD (TMDL) REQUIREMENTS, RESTORATION OF THIS SITE USING STREAM RESTORATION TECHNIQUES COULD RESULT IN REDUCTIONS IN TOTAL SUSPENDED SOLIDS (TSS), TOTAL NITROGEN (TN) AND TOTAL PHOSPHORUS (TP). AS SUCH, THIS CONCEPTUAL RESTORATION DESIGN PLAN WAS SUBMITTED AS PART OF THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ) STORMWATER LOCAL ASSISTANCE FUND (SLAF) GRANT IN OCTOBER, 2018. BASED ON THE PRELIMINARY CONCEPT, THE APPROXIMATE LIMITS OF DISTURBANCE ARE ACRES. IT SHOULD BE NOTED THIS AREA MAY CHANGE AND NEED REVISING UPON COMPLETION OF A FIELD SURVEY AND THROUGHOUT THE DESIGN PROCESS.

EXISTING CONDITIONS NOTES

THE STREAM CHANNEL, HAS DOWNCUT WITH ABANDONED MEANDERS WHICH ARE APPROXIMATELY 3 FT. HIGHER THAN THE CURRENT STREAM BED, AND TRIBUTARIES ALONG THE RIVER BANKS ARE ADJACENT TO WOODS. SIGNIFICANT AMOUNTS OF BROKEN CONCRETE WERE OBSERVED IN THE CHANNEL, WHERE IT APPROACHES AND RUNS APPROXIMATELY 300 FT PARALLEL TO AFT AVENUE. DOWNSTREAM OF THE PROJECT REACH THERE IS A STREAM RESTORATION PROJECT THAT WAS COMPLETED IN 2010 NEAR THE VICINITY OF THE PEDESTRIAN BRIDGE. THIS RESTORATION PROJECT WAS FUNDED BY THE DEVELOPER TO MEET WATER QUALITY REQUIREMENTS AS PART OF THE AFT AVENUE DEVELOPMENT.

SOURCE: CITY OF ALEXANDRIA 2013 IMAGERY
LOCATION: FORT WILLIAMS PARK
(38.811423, -77.094672)
NOTE:
EXISTING STREAM CENTERLINE AND TOPOGRAPHIC DATA IS BASED ON THE CITY OF ALEXANDRIA’S GIS DATA.

EXISTING STREAM ALIGNMENT - PLAN VIEW

EXISTING CONDITIONS - PROFILE

EXISTING STREAM ALIGNMENT - PROFILE VIEW

1 inch = 50 feet
NOTE:
1. CONCEPT LAYOUT IS PRELIMINARY AND BASED ON FIELD RECONNAISSANCE AND THE CITY OF ALEXANDRIA'S GIS TOPOGRAPHIC DATA. AS SUCH, THE NUMBER OF STRUCTURES AND PLANIMETRIC LAYOUT IS SUBJECT TO CHANGE AND WILL BE REFINED UPON COMPLETION OF A FIELD SURVEY.
2. DEPENDING ON THE AVAILABILITY OF WOOD MATERIAL, ROCK TOE COULD BE SUBSTITUTED FOR TOE WOOD.
RIFFLE SECTION STRUCTURES

2 ROWS OF HEADER BOULDERS = 375 MM OR 700 GRAM 100% N.T.S.

V-SHAPED CREST LARGEST ROCKS AVAILABLE ON-SITE.

(SLOPED FROM TOE MATTING FLOODPLAIN RIF).

FLOWPATH = 375 MM CREATING MULTIPLE FLOW PATHS.

0.5' GAPS BETWEEN 40-50 GAP THE SIZE OF 1/2 ROCK WIDTH.

FLAT BOULDER USED CROSS-SECTION VIEW.

KEY IN TO ROOT BALL SHALL BE NOT USE RIVER ANCHOR BOULDERS TO BELOW FINAL GRADE.

HORIZONTAL SPACING FLOWPATH 0.5'

THE RIFFLE STRUCTURE, FINISHING THE UPPER SURFACE OF THE DOWNSTREAM FACE WITH LARGER EMERGENT ROCKS TO CREATE 4 OR 5 FLOW PATHS THROUGH THE RIFFLE (OFTEN ROUNDED ROCKS).

A GRADED MIX OF SMALLER DIAMETER COBBLES AND GRAVELS WILL FORM THE MATRIX OF THE RIFFLE ABOVE GRADE.

LOGS SHALL EXTEND INTO THE CHANNEL

LOGS SHALL EXTEND INTO THE CHANNEL.

0.5' KEYED INTO THE BANK MINIMUM OF 4 FT.

KGS.

USED EXISTING STREAMBED MATERIAL MATRIX OF THE LARGER BED MATERIAL AS DIRECTED BY TECHNICAL REPRESENTATIVE. SELECT GRAVEL MATERIAL OF THE LOG.

OF THE LOG.

GAP BETWEEN THE HEADER BOULDERS OF A 3%-5%.

HEADER AND FOOTER BOULDERS SHALL BE TIED SECURELY INTO THE BANK IN SUCH A WAY THAT IT ELIMINATES THE POSSIBILITY OF STREAMFLOW DIVERTING AROUND THEM.

THE GAP BETWEEN THE HEADER BOULDERS SHALL BE CHANGED BY HAND WITH GRAVEL AND COBBLE FROM THE UPSTREAM DIRECTION.

THE GAP BETWEEN THE HEADER AND FOOTER BOULDERS SHALL BE CHANGED BY HAND WITH GRAVEL AND CORRECT THE IMPACT OBTAINED.

THE GAP BETWEEN THE HEADER AND FOOTER EMBERS SHALL BE CHANGED BY HAND AND LEVELIZED TO MATCH SLOPES SHOWN ON THALWEG PROFILE.

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CROSS VANE NOTES

1. ALL STONES ARE TO BE STRUCTURE STONE. STRUCTURE STONE IS DEFINED AS BLOCK LIKE, CUBICAL, OR STRAIGHT EDGED BOULDERS.

2. GAPS BETWEEN BOULDERS SHALL BE MINIMIZED BY FITTING BOULDERS TOGETHER, PLUGGING WITH STRUCTURE STONE CLASS A AND/OR CONCRETE (AS APPROVED BY THE TOWN OF LEESBURG AND ADMIN STAFF) AND NO.57 OR CHINKING STONE, AS APPROVED BY THE FIELD ENGINEER.

3. DIMENSIONS AND SLOPES MAY BE ADJUSTED TO FIT BY THE TOWN OF LEESBURG'S QUALIFIED REPRESENTATIVE.

4. CONTRACTOR WILL BE REQUIRED TO FIT BOULDERS TIGHTLY.

5. FOOTER BOULDERS AND VANE BOULDERS SHALL BE NATIVE STONE OR SHOT ROCK, CUBICAL OR RECTANGULAR IN NATURE.

6. THE SLOPE OF THE VANE ARM FROM CENTERLINE ELEVATION TO THE TIE-IN AT THE BANK SHALL BE 2-5%.

7. THERE SHALL BE NO DROP GREATER THAN 1.0 FOOT. VERTICAL TOLERANCE SHALL BE 0.1' FOR CROSS VANE STRUCTURES.

8. THE POOL LENGTH OR POOL LENGTH TO THE END OF THE CROSS VANE ARMS (WHICHEVER IS GREATER) IS TO BE LINED WITH FLOOR ROCKS. SPLASH ROCKS SHALL EXTEND A MINIMUM LENGTH OF 3 FEET DOWNSTREAM OF THE FOOTER BOULDER AND BE PLACED TO PROVIDE A ROUGH SURFACE SUCH THAT ROCK EDGES PROTRUDE 0.3 TO 0.5 FT ABOVE THE BED SURFACE.

9. IF BEDROCK IS PRESENT DIRECTLY BELOW SURFACE BOULDER, FOOTING MAY NOT BE NECESSARY. HOWEVER, IF BEDROCK IS LOCATED BELOW THE CROSS VANE STRUCTURE, ADDITIONAL FOOTER BOULDERS MAY BE REQUIRED TO SEAT FOOTERS ON BEDROCK. CHIPPED BEDROCK 0.5' FOR PLACEMENT AND SEAT FOOTER BOULDER AT THE DIAMETER OF THE FOOTER BOLDER. CHIPPED BEDROCK 0.5' FOR PLACEMENT AND SEAT FOOTER BOULDER AT THE DIAMETER OF THE FOOTER BOLDER.


11. STREAM BANK Material or Additional Footer Requirements

12. UNLESS OTHERWISE NOTED, STREAM BANK MATERIAL OR ADDED FOOTERS REQUIRE APPROVAL BY THE FIELD ENGINEER.
ROCK TOE REVETMENT NOTES:
1. ROCK TOE REVETMENT NOTES ARE SIMPLIFIED AND ARE NOT TO SCALE.
2. ROCK TOE REVETMENT NOTES ARE NOT FOR CONSTRUCTION.
3. ROCK TOE REVETMENT MUST BE APPROVED BY THE ENGINEER BEFORE INSTALLATION.
4. ROCK TOE REVETMENT MUST BE INSTALLATION GUIDELINES.

INSTALLATION GUIDELINES:
1. EXCAVATE A TRENCH ALONG THE TOE OF THE STREAMBANK TO 2-3 FT BELOW THE STREAMBED INVERT.
2. PLACE FILTER CLOTH ALONG THE BACKSIDE OF THE TRENCH. PLACE FILTER FABRIC LOOSELY AND EVENLY ON THE PREPARED SLOPE AND SECURED WITH STAKES ON 2 FOOT CENTERS. ADJACENT STRIPS SHOULD OVERLAP 12 INCHES AND BE STAPLED ON 12 INCH CENTERS. THE UPSTREAM OR UPSLOPE FILTER FABRIC SHOULD ALWAYS BE PLACED OVER THE DOWNSTREAM OR DOWNSLOPE FILTER FABRIC.
3. PLACE STRUCTURE ROCK STARTING IN THE BOTTOM OF THE TRENCH WORKING UP THE BANK. ROCK MAY NEED TO BE HAND PLACED IN VOIDS TO ACHIEVE THE DESIRED STRUCTURAL EFFECTS.
4. PLACE JOINT PLANT LIVE STAKES THROUGHOUT THE REVETMENT TO MINIMIZE VOIDS AND FILL SPACES. VOID SPACES MAY NEED TO BE HAND CHOKED TO ACHIEVE THE DESIRED STRUCTURAL EFFECTS.
5. ABOVE TOE REVETMENT, BANK TREATMENT VARIES.
6. EXAMPLE IMBRICATED ROCK WALL: IMBRICATED ROCK WALL (SHOWN FOR INFORMATION ONLY)
7. CONTRACTOR TO INSTALL HARDWARE AND ROOFING MOUNTING BRACKETS AS REQUIRED.
8. CONTRACTOR TO INSTALL ROOFING MOUNTING BRACKETS AS REQUIRED.
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STRAWBERRY RUN CONCEPT DESIGN
**NOT FOR CONSTRUCTION**

TYPICAL TOE WOOD WITH BANK SHAPING IN BEND

NOTES:
1. SALVAGE TREE TOPS AND BRANCHES FROM FALLALN ON-SITE TREES FOR RE-USE AS COARSE WOODY DEBRIS.
2. MIX LAYERS OF TOPSOIL ON TopOOfCoarseWOODYDEBRIS.
3. FOR THE BOTTOM LAYER, INSTALL 6 ft STAKES ON TOP OF COARSE WOODY DEBRIS AND COVER WITH THE LAVER OF TOPSOIL. THIS SHALL BE A MINIMUM OF THINERS OR UPSTREAM OF BEND, IN THE BEND, TO THE STRAIGHT SECTIONS.
4. WOODY DEBRIS SHALL NOT EXTEND INTO THE CHANNELS MORE THAN 8 INCHES.
5. THE BOTTOM LAYER OF THINERS SHALL EXTEND FROM THE END OF VANE ARMS TO HEAD OF RIFLE.

TOE WOOD STRUCTURE NOTES:
1. SALVAGE TREE TOPS AND BRANCHES FROM ALL ON-SITE TREES FOR RE-USE AS COARSE WOODY DEBRIS.
2. MIX LAYERS OF TOPSOIL ON TOP OF COARSE WOODY DEBRIS.
3. FOR THE BOTTOM LAYER, INSTALL 6 FT STAKES ON TOP OF COARSE WOODY DEBRIS AND COVER WITH THE LAVER OF TOPSOIL. THIS SHALL BE A MINIMUM OF THINERS OR UPSTREAM OF BEND, IN THE BEND, TO THE STRAIGHT SECTIONS.
4. WOODY DEBRIS SHALL NOT EXTEND INTO THE CHANNELS MORE THAN 8 INCHES.
5. THE BOTTOM LAYER OF THINERS SHALL EXTEND FROM THE END OF VANE ARMS TO HEAD OF RIFLE.

EXAMPLE TOE WOOD
EXAMPLE ROCK WALL WITH TOE WOOD

TOE WOOD DETAILS

STREAM RESTORATION STRUCTURE DETAILS
TOE WOOD DETAILS
**NOT FOR CONSTRUCTION**

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STRAWBERRY RUN CONCEPT DESIGN

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CONSTRUCTED STEP POOL SYSTEMS

(STOWN FOR INFORMATION ONLY)

CONSTRUCTED STEP POOL SYSTEMS

(STOWN FOR INFORMATION ONLY)

PLUNGE POOL (FIRST POOL BELOW PIPE OUTFALL)

N.T.S.

PLUNGE POOL (FIRST POOL BELOW PIPE OUTFALL)

N.T.S.

CHANNEL BED MATERIAL SPECS


STRUCTURE DIMENSIONS


A = LENGTH (LONGEST DIMENSION)

B = WIDTH (INTERMEDIATE DIMENSION)

C = HEIGHT (SHORTEST DIMENSION)

**NOTE:**

THIS DESIGN WILL BE USED FOR OUTFALL TRIBUTARIES TO THE STREAM AND NOT FOR THE MAIN STREAM CHANNEL.

NOT TO SCALE
CASCADE WITH BOULDER STEPS AND LOGS

PLAN VIEW

NOT TO SCALE

CONSTRUCTED CASCADE

(SHOWN FOR INFORMATION ONLY)

CASCADE WITH BOULDER STEPS AND LOGS

PROFILE A-A' VIEW

NOT TO SCALE

CASCADE WITH BOULDER STEPS AND LOGS

CROSS-SECTION B-B' VIEW

NOT TO SCALE

NOTES

1. THE CASCADE STRUCTURE WITH OFFSET BOULDER STEPS AND LOG ROLLERS IS A STREAM AND RIVER RESTORATION DESIGN FEATURE THAT INCORPORATES COARSE ADDITIONS TO THE NATIVE CHANNEL BED MATERIAL WITH LARGER DIAMETER ROCK AND LARGE WOOD TO CREATE A RIFFLE THAT FUNCTIONS AS A RIGID GRADE CONTROL AND HABITAT FEATURE. LARGER ROCK MATERIAL AND WOOD ENHANCE FLOW DIVERSITY AND TURBULENCE UNDER BASE FLOW CONDITIONS WHICH PROMOTE AQUATIC HABITAT, NUTRIENT PROCESSING, AND RE-AERATION OF STREAM FLOW BENEFITING WATER QUALITY. THE D50, D85, D90, OR D100 PARTICLES OF THE CONSTRUCTED CASCADE SHOULD BE DESIGNED TO RESIST TURBULENCE WHILE ALLOWING SMALLER SUBSTRATE PARTICLES TO BE MOBILIZED AND REPLACED BY UPSTREAM SEDIMENT SUPPLY. THIS STRUCTURE MAY BE USED AS RIFFLE WITH STEEPER SLOPES AS GRADE CONTROL.

2. THE CASCADE STRUCTURE SHALL BE CHARGED WITH MATERIAL OF BREAK SIZE EQUAL TO OR SMALLER THAN THE CONSTRUCTED CASCADE SIZE, TO THE LENGTH OF THE STRUCTURE. THE ENGINEER MUST APPROVE THE USE OF ALL CHARGE MATERIAL.

3. THE GRAVEL AND COBBLE SUBSTRATE USED FOR THIS DESIGN FEATURE SHOULD BE PREFERENTIALLY HARVESTED FROM THE EXISTING CHANNEL AND OTHER DESIGNATED MINING AREAS ONSITE.

4. SORTING AND SIEVING OF THE HARVESTED RIFFLE SUBSTRATE IS INCIDENTAL TO THE CONSTRUCTION OF THIS STRUCTURE.

5. ALL LOGS SHALL HAVE MINIMUM DIAMETER OF 2.0 FEET. LOG LENGTH SHALL HAVE A MINIMUM LENGTH OF 8 FEET.

6. LOGS SHALL BE RELATIVELY STRAIGHT AND LIMBS AND BRANCHES SHALL BE TRIMMED FLUSH.

7. FOR INSTALLATION, THE CONTRACTOR SHALL OVER EXCAVATE THE LENGTH OF THE CASCADE, INSTALL 700 GRAM COIR FIBER EROSION CONTROL MATTING, KEY MATTING INTO THE CASCADE TRENCH AND BACKFILL WITH THE SPECIFIED SELECT CASCADE SUBSTRATE MATERIAL TO THE ELEVATIONS SHOWN ON THE PROPOSED PROFILE.

8. CONSTRUCTED CASCADE MATERIAL SHALL EXTEND A MINIMUM OF 15 FEET UPSTREAM OF THE P.T. INTO THE GLIDE AND DOWNSTREAM TO THE P.C.


10. THE VERTICAL SLOPE OF EACH LOG AND BOULDER ARM SHALL NOT EXCEED 2% UNLESS OTHERWISE DIRECTED BY THE ENGINEER. THE SLOPES WILL BE DICTATED BY THE WIDTH TO DEPTH RATIO OF THE REACH, TYPICAL RIFFLE INNER BERM CHANNEL, AND THE VERTICAL DROP OVER THE LOG AND LOG DIAMETER.

11. SELECT CASCADE MATERIAL SHALL BE USED AS BACKFILL MATERIAL AROUND THE STRUCTURE.

12. SECURE ALL GEOTEXTILE FABRIC ON TOP OF FOOTER LOGS USING 3 INCH 10D GALVANIZED COMMON NAIL ON 12 INCH SPACING ALONG LOG. NAIL NON-WOVEN GEOTEXTILE TO EDGE OF HEADER LOG AND BACKFILL.

13. SELECT RIFFLE MATERIAL DEPTH SHALL BE AT LEAST 2.5 TIMES THE D85.

14. SELECT RIFFLE MATERIAL WILL BE PLACED AT A UNIFORM THICKNESS.

15. THE SELECT CASCADE MATERIAL WILL BE PLACED SUCH THAT, IN CROSS-SECTION, ITS LOWEST ELEVATION OCCURS IN THE CENTER OF THE CHANNEL AS PER THE DETAIL. SELECT CASCADE MATERIAL SHALL BE COMPACTED USING TRACKED EQUIPMENT OR AN EXCAVATOR BUCKET SUCH THAT FUTURE SETTLEMENT OF THE MATERIAL IS KEPT TO A MINIMUM.

16. THE SURFACE OF THIS STRUCTURE SHALL BE FINISHED TO A SMOOTH AND COMPACT SURFACE IN ACCORDANCE WITH THE LINES, GRADES, AND CROSS-SECTIONS OR ELEVATIONS SHOWN ON THE DRAWINGS. THE DEGREE OF FINISH FOR INVERT ELEVATIONS SHALL BE WITHIN 0.1 FT OF THE GRADES AND ELEVATIONS INDICATED.

17. RE-DRESSING OF CHANNEL AND BANKFULL BENCH/FLOODPLAIN WILL LIKELY BE REQUIRED FOLLOWING INSTALLATION OF IN-STREAM STRUCTURES AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.

STRAWBERRY RUN CONCEPT DESIGN

**NOT FOR CONSTRUCTION**