BEST MANAGEMENT PRACTICES

1. Construction debris shall be promptly removed from the site daily or as required by the local authorities.

2. After construction is completed, the site shall be restored to prepare the site for an approved reuse.

3. Construction materials and equipment shall be stored in a manner that minimizes potential disruption of the stormwater system.

4. Vehicle tracking controls shall be used to ensure that all vehicles are properly equipped and maintained.

5. Construction materials and equipment shall be stored in a manner that minimizes potential disturbance of the stormwater system.

6. All material and equipment shall be stored in a manner that minimizes potential disturbance of the stormwater system.

7. All material and equipment shall be stored in a manner that minimizes potential disturbance of the stormwater system.

8. All material and equipment shall be stored in a manner that minimizes potential disturbance of the stormwater system.

9. All material and equipment shall be stored in a manner that minimizes potential disturbance of the stormwater system.

10. All material and equipment shall be stored in a manner that minimizes potential disturbance of the stormwater system.

WASTE MANAGEMENT

1. The contractor shall not be responsible for the preparation of materials to be used on the site.

2. The contractor shall be responsible for the preparation of materials to be used on the site.

3. The contractor shall be responsible for the preparation of materials to be used on the site.

4. The contractor shall be responsible for the preparation of materials to be used on the site.

5. The contractor shall be responsible for the preparation of materials to be used on the site.

HAZARDOUS MATERIALS

1. The contractor shall be responsible for the preparation of materials to be used on the site.

2. The contractor shall be responsible for the preparation of materials to be used on the site.

3. The contractor shall be responsible for the preparation of materials to be used on the site.

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10. The contractor shall be responsible for the preparation of materials to be used on the site.

HEAVY EQUIPMENT OPERATIONS AND MAINTENANCE

1. All equipment shall be maintained in accordance with the manufacturer's recommendations.

2. All equipment shall be maintained in accordance with the manufacturer's recommendations.

3. All equipment shall be maintained in accordance with the manufacturer's recommendations.

4. All equipment shall be maintained in accordance with the manufacturer's recommendations.

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9. All equipment shall be maintained in accordance with the manufacturer's recommendations.

10. All equipment shall be maintained in accordance with the manufacturer's recommendations.

GENERAL CARE OF WATER

1. Care for water shall be provided by the contractor in accordance with the manufacturer's recommendations.

2. Care for water shall be provided by the contractor in accordance with the manufacturer's recommendations.

3. Care for water shall be provided by the contractor in accordance with the manufacturer's recommendations.

4. Care for water shall be provided by the contractor in accordance with the manufacturer's recommendations.

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9. Care for water shall be provided by the contractor in accordance with the manufacturer's recommendations.

10. Care for water shall be provided by the contractor in accordance with the manufacturer's recommendations.

COFFER DAMS

1. Coffer dams shall be designed and constructed to prevent damage to the stormwater system.

2. Coffer dams shall be designed and constructed to prevent damage to the stormwater system.

3. Coffer dams shall be designed and constructed to prevent damage to the stormwater system.

4. Coffer dams shall be designed and constructed to prevent damage to the stormwater system.

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10. Coffer dams shall be designed and constructed to prevent damage to the stormwater system.

 special effects

1. Special effects shall be provided by the contractor in accordance with the manufacturer's recommendations.

2. Special effects shall be provided by the contractor in accordance with the manufacturer's recommendations.

3. Special effects shall be provided by the contractor in accordance with the manufacturer's recommendations.

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10. Special effects shall be provided by the contractor in accordance with the manufacturer's recommendations.
LEGEND:

PROJECT LINES (XX-Foot Buffers)
EXISTING CREEK
ZONE 1 - HUMID TERRACE, WETLAND PLUGS
ZONE 2A & 2B - WETLAND TREES & SHRUBS
ZONE 2C & 2D - WALLOW CUTTINGS & FILMPLUGS
ZONE 3 - UPPER & LOWER IMPAINTED TREES & SHRUBS
SECONDARY ELEMENTS
EXCLUDED AREAS/ACTIVITY UNDERTAKEN BY OTHERS NOT INCLUDED IN THIS PROJECT

1. TERMS: TOPOG. TO BE BUILT (WS) WITH ADDITIONAL TOPO/G. IN ALL ZONE 1 PLANNED AREAS EXCEPT UNLESS NOTED TO REMOTE.
2. REFER TO STREAM RESTORATION PLANS, SECTIONS, AND DETAILS FOR REQUIREMENTS RELATED TO TOPO/G. PLACERMENT (BEHIND SUMP/DESIGN/UNIT).
LEGEND:

- **AS-BUILT**
- **EXISTING CREEK**
- **ZONE 1 - PERMANENT WETLAND & PLUGS**
- **ZONE 2A & 2B - WETLAND TREES & SHRUBS**
- **ZONE 3C & 3D - WILLOW CUTTINGS & TURFING**
- **ZONE 3 - UP & LOWER RIPARIAN TREES & SHRUBS**
- **PLANTING ONLY**
- **EXCLUSION AREAS - NOT TO BE CHARACTERIZED OR PLANTED**

**NOTES:**
1. **PLANTING** TO BE SUBMITTED WITH ADDITIONAL SPECIES IN ALL ZONE 3 PLANTING AREAS SHOWN UNLESS NOTED OTHERWISE.
2. **EXCLUSION AREAS** - NOT TO BE PLANTED OR PLANTED WITH SPECIES OTHER THAN THE EXCLUSION AREAS.
NOTES:
1. CROSS-REFERENCE ABOVE TYPICAL CROSS-SECTION WITH PLANTING AND SEEDING SCHEDULES.
2. TRANSITION OR EXTENSION OF SPECIES BETWEEN ZONES MAY VARY DEPPENDING ON ACTUAL FIELD CONDITIONS, SLOPE, HYDROLOGY, MICRO-HABITAT, SOIL TEXTURE & MOISTURE CONDITIONS.
3. THE ECOLOGIST OVERSEEING PLANTING OPERATIONS WILL MAKE DISCRETIONARY CALLS ON PLANT LOCATIONS BASED ON IN-FIELD CONDITIONS.
4. ALL PLANTING AND SEEDING EFFORTS IN ALL ZONES ARE INTENDED TO INCREASE SOIL COHESION, REDUCE EROSION POTENTIAL, STABILIZE SEDIMENT AND ENHANCE THE RESILIENCY OF THE STREAMBANKS AND RIPARIAN CORRIDOR WITHIN THE PROJECT LIMITS.

TYPICAL RIPARIAN PLANT COMMUNITY CROSS-SECTION

ZONE 3
UPPER RIPARIAN

ZONE 3
LOWER RIPARIAN

ZONE 2D & 2C
WILLOW CUTTINGS & TUBLINGS

ZONE 1
WETLAND PLUGS

USFWS CLASSIFICATION
Forest/Shrub-Scrub (F/S/S)
Forest/Shrub-Scrub (F/S/S)
Pakistân Emergent (Shrub-Scrub (P/E/S/S))
Pakistân Emergent (P/E/M)

0.5' to 0.6'

Longitudinal Sheet Profile

10 YEAR+
5 YEAR TO 10 YEAR
2 YEAR - 5 YEAR
2 YEAR -

ELEVATION RELATIVE TO LOW FLOW NOBEL
+5.0' to +4.0'
+5.0' to +3.0'
+1.0' to +3.0'
(+persistent)
+1.0' to +0.0'
(+non-persistent)

Unconsolidated Bottom/Open Water
(US/FW)

PXS
TYPICAL PLANTING CROSS-SECTION
CROSS-SECTION NTS

AS-BUILT
6/1/2018
PLANT SPACING DETAIL

PLAN: NTS

NOTES:
1. REFER TO PLANT SCHEDULES FOR SPACING REQUIREMENTS.

TUBLING PLANTING DETAIL

CROSS-SECTION NTS

NOTES:
1. REFER TO PLANT SCHEDULES FOR SPECIES SIZE AND QUANTITY.

TREE & SHRUB PLANTING DETAIL

CROSS-SECTION NTS

NOTES:
1. WHERE APPLICABLE, CUT EROSION CONTROL FABRIC IN A "X" PATTERN AND LAY BACK PRIOR TO INSTALLING PLANTS. RETURN FABRIC TO ORIGINAL POSITION AND STAPLE/TAKE TO THE GROUND.
2. MAINTAIN AS DIRECTED IN NOTES & SPECIFICATIONS.
3. REFER TO PLANT SCHEDULES.
KEY:

- ZONE 3 - UPPER RIPARIAN TREE (CEL RET)
- ZONE 3 - UPPER RIPARIAN TREE (PRU AME)
- ZONE 3 - UPPER RIPARIAN SHRUB (RIB CER)
- ZONE 3 - LOWER RIPARIAN SHRUB (SYM OGC)
- ZONE 3 - LOWER RIPARIAN - (CRA ERY)
- ZONE 3 - LOWER RIPARIAN - (POP DEL)
- ZONE 3 - LOWER RIPARIAN (PRU VIR)
- ZONE 3 - LOWER RIPARIAN (ROS WOO)
- ZONE 3 - LOWER RIPARIAN (RIB AUR)
- ZONE 2D & 2C - WILLOW CUTTINGS & TUBLINGS
- ZONE 2B & 2A - WETLAND TREES & SHRUBS
- ZONE 1 - WETLAND HERBS

NOTES:
1. REFER TO PLANT SCHEDULES FOR PLANT SYMBOLOGY, QUANTITY & SPACING
2. FOR EVERY 1 POP DEL PLANT, GROUP THE FOLLOWING PLANTS:
   A. 1 - CEL RET EVERY 7TH GROUP
   B. 1 - PRU AME EVERY 3RD & 4TH GROUP
   C. 2 - RIB CER EVERY 7TH GROUP
   D. 1 - CRA ERY EVERY 7TH GROUP
   E. 2 - PRU VIR EVERY 3RD GROUP
   F. 2 - ROS WOO EVERY 3RD GROUP
   G. 2 - RIB AUR EVERY 3RD GROUP
   H. 2 - SYM OGC EVERY 2ND GROUP
3. REPEAT PATTERN SHOWN WITHIN PLANTING AREAS SHOWN ON THE PLANS,
4. WIDTH OF PLANTING ZONES MAY VARY (COMPRESS OR EXPAND) DEPENDING BANK SLOPE, WIDTH OF FLOODPLAIN, PROPERTY OWNERSHIP, PROJECT BOUNDARY & LIMITS OF DISTURBANCE.

REFER TO PLANT SCHEDULES FOR PLANT SPECIES SYMBOLOGY & SPACING
### Upper Riparian Seed Schedule

<table>
<thead>
<tr>
<th>Scientific Name</th>
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<th>Variability</th>
<th>Percent of Site</th>
<th>Seeds per Ac</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Arizona cypress</td>
<td>Cupressus arizonica</td>
<td>Low</td>
<td>25%</td>
<td>1,000</td>
<td>25</td>
<td>500</td>
<td>0.5</td>
<td>0.05</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>California sycamore</td>
<td>Acer californicum</td>
<td>High</td>
<td>50%</td>
<td>2,000</td>
<td>50</td>
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<td>1</td>
<td>0.1</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Cottonwood</td>
<td>Populus deltoides</td>
<td>Low</td>
<td>10%</td>
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<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>Ficus carica</td>
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<td>High</td>
<td>40%</td>
<td>4,000</td>
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<td>0.125</td>
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</tr>
</tbody>
</table>

**Notes:**
- Different species are to be selected for sections to the left of the main channel as indicated on "Seeding Only." (Refer to seed selections)
- Upper riparian seeding areas are known as riparian plantings (in a riparian, low flow area). Each species selected is known as a seed construction.
- All planting and seeding efforts shown on the map are intended to increase soil cover, reduce erosion potential, stabilize sediment, and enhance the resiliency of the streambanks and riparian corridor within the project limits.

### Lower Riparian Seed Schedule

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**Notes:**
- All planting and seeding efforts shown on the map are intended to increase soil cover, reduce erosion potential, stabilize sediment, and enhance the resiliency of the streambanks and riparian corridor within the project limits.

### St. Vrain River - Reach 3 Restoration (80% Design)

**Upper Riparian Seed Schedule**

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**Notes:**
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### Lower Riparian Seed Schedule

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**Upper Riparian Seed Schedule**

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<td>0.25</td>
<td></td>
</tr>
</tbody>
</table>
# ST. VRAIN CREEK REACH 3

## Scale Verification
- As Shown
- IF NOT ONE INCH ON THIS SHEET, ADJUST SCALE ACCORDINGLY.

## Engineering Analytics, Inc.
- 1600 Specht Point Road, Suite 209
- Fort Collins, CO 80525
- (970) 488-3111

## Plant Schedules

<table>
<thead>
<tr>
<th>Total Plants Installed (All Zones)</th>
<th>16,982</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants Installed by Boulder County (All Zones)</td>
<td>13,778</td>
</tr>
<tr>
<td>Cuttings Installed (All Zones)</td>
<td>11,584</td>
</tr>
</tbody>
</table>

## LS2

## PLANT SCHEDULES

### As-Built
- 6/19/2018

### TOTAL PLANTS INSTALLED (ALL ZONES):
- 16,982

### TOTAL PLANTS INSTALLED BY BOULDER COUNTY (ALL ZONES):
- 13,778

### TOTAL CUTTING INSTALLED (ALL ZONES):
- 11,584

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## Revisions

<table>
<thead>
<tr>
<th>Description</th>
<th>Date</th>
<th>Revision</th>
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</thead>
<tbody>
<tr>
<td>Polygon Adjustments</td>
<td>11/07/2017</td>
<td>1</td>
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<tr>
<td>As-Built Conditions</td>
<td>6/19/2018</td>
<td>2</td>
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<tr>
<td>Comment Revisions</td>
<td>7/30/2018</td>
<td>3</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>Preferred Size</td>
</tr>
<tr>
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</tbody>
</table>
| *St. Vrain River - Reach 3 Restoration (AS-BUILT)*

**STREAMBANK WETLAND SCHEME**

6/1/2018

<table>
<thead>
<tr>
<th>Phase 1 - Horizontal Wetland Phase</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Plant Species</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Total Plants Delivered:** 14,107

**Short of Original Plan:** 3,688

**AS-BUILT NOTES:**

**General Notes:**

As-built changes to the plant schemes and locations in the field are provided to the best of the consultant's knowledge based on information provided by SPCPO and ACG.

Final plant quantities, species, sizes and form, data provided to GCPSO is incorporated without audit.

*LC** by audit data was not provided or is inestimable an estimate of that quantities and locations based on progress on the final day of planting (5/23/16).

Reference line plan with these plant schemes. All plants shown as divided into subsurface.

Final seeding area remaining per plant (AS-BUILT)

**Plant Distribution Schedule History:**

Initial plant distribution schedules issued on 6/21/16, breaking master plant schedule to subareas (smaller planting projects).

Plant selection changed on 6/21/16 to reflect 5/23/16 best estimate of final plants delivered.

Periodic removal plant delivery schedules from SPCPSO. Any changes in plant quantities or species resulting from variable or subareas between 6/21/16 and 6/23/16 will be adjusted upon completion and replacing the last plant planting orders.

**Plant Species, Quantity and Location Changes:**

Items in red type indicate the addition of new species (I to the schedule or changes of plant quantities based on SPCPSO plant delivery schedules.

1. No plants delivered to the site were not planted or were dewatered to be delivered to the site prior to planting and per SPCPSO data report 33 unaccounted for quantities, numbers, and species. Enhanced searches for delivered plants not yet discovered.

As-built plant quantities per subsurface are subject to ACG/GC verification.

Note highlighted in yellow indicate changes in total quantity as a result of random species not being planted when they ran out of time.
"Type A bank stabilization was constructed in this area without a planting bench (3" topsoil layer and nursery grown plants) due to concerns from the contractor, project time constraints, and location on BNSF railroad property. ALL OTHER ELEMENTS OF TYPE A BANK STABILIZATION INSTALLED PER DESIGN PLAN.

*3" Topsoil Layer and Nursery Grown Plants not installed on this Type A (BS-14).

CONSTRUCTED PER DESIGN PLAN - NO DEVIATIONS
NOTE: GRADING WITHIN THE STREAM AND ADJACENT AREAS MAY VARY DEPENDING ON ACTUAL FIELD CONDITIONS AND SHALL BE PERFORMED IN A MANNER THAT PROTECTS TREES OR OTHER FEATURES AS DIRECTED IN THE FIELD.
BS-13 switched to south bank to better fit existing conditions and provide bank stabilization on the outside bend.

Bank stabilization (BS-13 - Type C) constructed in two sections (136+00 to 135+50 and 135+25 to 134+50) to preserve an existing tree providing stabilization on the bank and shade to the stream channel. BS-13 shortened by 30' from original design plan.
Bank Stabilization (BS-11) removed due to removal of bifurcation structure construction from the project scope.

Bank Stabilization (BS-12) stationing modified due to existing conditions (stable-vegetated banks were left as existing). As-Built stationing 124+10 to 122+80. BS-12 shortened by 50' from original design plan.

NOTE: GRADING WITHIN THE STREAM AND ADJACENT AREAS MAY VARY DEPENDING ON ACTUAL FIELD CONDITIONS AND SHALL BE PERFORMED IN A MANNER THAT PROTECTS TREES OR OTHER FEATURES AS DIRECTED IN THE FIELD.

See Below - Sheet R6 for modifications.
**Riffle Beginning (RB-15) Elev. changed to 5173.1’ (STA. 112+60)**

Riffle 14 - Stationing was shifted downstream due to location of overhead conveyor. Construction equipment was not able to work under conveyor. As-Built stationing (RB - 110+55) (RE - 110+05). Shifted 20’ downstream from original design.

**Riffle End (RE-15) Elev. changed to 5171.75’ (STA. 112+05)**

Bank Stabilization (BS-10) stationing modified due to overhead conveyor and stable vegetated banks on the downstream end. As Built stationing 110+55 to 109+75. Shortened by 15’ from original design plan.

**Riffle Beginning and End Elevations were changed due to elevation of the invert of an existing concrete box culvert so that flows were not restricted and to maintain riffle slope and proper riffle/pool sequence function.**
NOTE: GRADING WITHIN THE STREAM AND ADJACENT AREAS MAY VARY DEPENDING ON ACTUAL FIELD CONDITIONS AND SHALL BE PERFORMED IN A MANNER THAT PROTECTS TREES OR OTHER FEATURES AS DIRECTED IN THE FIELD.
Bank Stabilization (BS-4) Changed to Modified Type C. ADDED - SHEET RD3A
Bank Stabilization (BS-1) constructed as Type B from stations 13+95 to -15+75 due to existing conditions and tie-in points. Upstream of station 15+75 to 18+60 was constructed as Type A per original design plan.
EXISTING CHANNEL BOTTOM

RIFFLE BEGINNING CREATED WITH LARGER NATIVE COBBLE

PROVIDE RIFFLE BEGINNING WITH \( D_{50} = 6" \) AND LARGER NATIVE MATERIAL

RIFFLE SURFACE EXCAVATED FROM EXISTING STREAM BOTTOM SPOILS REMOVED AND COMPACT FINISHED SURFACE TO CONSISTENT SLOPE AS SPECIFIED IN PLANS THROUGH ENTIRE RIFFLE

GRADE CHANNEL BOTTOM TO MATCH GRADE OF DOWNSTREAM RIFFLE BEGINNING

MAX POOL DEPTH

EXISTING CHANNEL BOTTOM

POOL ELEVATION PER PLAN

RIFFLE END ELEVATION PER PLAN

HEAD IN

TAIL OUT

EXISTING BANK

RIFFLE SLOPE

PROVIDE LOW FLOW THALWEG

ENHANCE POINT BAR EDGE WITH COBBLE FORMED FROM \( D_{50} = 4" \) AND LARGER NATIVE MATERIALS

POINT BAR FORMED FROM COMPACTED NATIVE COBBLE - LOWER THAN BANKFULL ELEVATION

GRADE CHANNEL BOTTOM TO MATCH GRADE OF DOWNSTREAM RIFFLE BEGINNING

INSIDE BEND SIDE SLOPE

OUTSIDE BEND SIDE SLOPE

MAX POOL DEPTH

LOW FLOW THALWEG

GIDE

RIFFLE

POOL

NOTES:

1. MEANDERING LOW FLOW THALWEG UP TO 8 FEET WIDE BY APPROXIMATELY 6 INCHES DEEP TO BE CONSTRUCTED IN ALL AREAS WHERE STREAM IMPROVEMENTS OCCUR. THALWEG TO BE FIELD LOCATED BY OWNER’S STREAM RESTORATION SPECIALIST.

2. CHANNEL GRADING TO TIE-IN TO EXISTING VEGETATION LINE AND/OR BANKFULL CHANNEL WIDTH.
1. INSTALL A CONTINUOUS LAYER OF WILLOW CUTTINGS DURING PLACEMENT OF SOIL FILLED RIPRAP
2. APPROXIMATELY 3 WILLOW CUTTINGS SHALL BE PLACED SIDE BY SIDE PER LINEAR FOOT
3. MINIMUM 3" LAYER OF NATIVE SAND OR TOPSOIL REQUIRED
4. WILLOW STAKING SHALL BE INSTALLED AT BANKFULL ELEVATION
5. WILLOW CUTTINGS SHALL EXTEND BEYOND RIPRAP INTO NATIVE MATERIAL
6. WILLOW CUTTINGS SHALL BE HARVESTED FROM APPROVED LOCATIONS
7. CUTTINGS SHALL BE A MINIMUM LENGTH OF 4’
ROOTWAD NOTES:

GENERAL "ROOTWAD" CHARACTERISTICS:

1. TREES MUST BE NATIVE, NON-INVASIVE, SPECIES AND CAN SPECIFICALLY NOT INCLUDE "CRACK WILLOW."

2. TREES SHALL BE HEALTHY WITHOUT HOLLOW OR ROTTEN FEATURES AND WITHOUT SPLIT TRUNKS. BARK SHALL NOT BE REMOVED.

3. TREES MUST INCLUDE A BOLE WITH ATTACHED ROOT BALL.

4. TREE BOLE DIAMETER MUST BE 12 INCHES IN DIAMETER OR LARGER AS MEASURED FOUR AND A HALF FEET ABOVE THE TOP OF THE ROOT BALL.

5. TREE BOLE LENGTH MUST BE 8 TO 12 FEET MEASURED ABOVE THE TOP OF THE ROOT BALL. AS LONG AS IT CAN BE REASONABLY HANDLED/TRANSPORTED.

6. ROOT BALLS SHALL BE AS LARGE AND FULL AS POSSIBLE WITH ROOTS LEFT CONNECTED. THE MINIMUM ROOT BALL DIAMETER IS 6 FEET. ROOT BALL SHALL NOT BE TRIMMED OR CLEANED.

7. BRANCHES ATTACHED TO THE BOLE SHALL BE LEFT CONNECTED AND MAY BE TRIMMED TO A MINIMUM LENGTH OF TWO FEET AS MEASURED FROM THE OUTSIDE DIAMETER OF THE ATTFRIBUTED BOLE.
MODIFIED TYPE C BANK STABILIZATION (2-26-18)

- STANDARD TYPE C BANK STABILIZATION TO BE USED ALONG ENTIRE STABILIZATION AREA.
- ROOTWALLS TO BE INCORPORATED INTO CONSTRUCTED BANK ON 20' INTERVALS IN POOL AND GLIDE AREAS AS IDENTIFIED IN THE FIELD. RANDOM VARIATION IN SPACING IS ENCOURAGED.
- ROOTWALLS TO BE SECURED INTO BANK WITH 6' COMPACTED DILSILE AND 2 TONS OF TYPE H RIPRAP.
STREAM RESTORATION
CROSS SECTIONS (1 OF 2)

ALL SECTIONS ARE TAKEN IN THE UPSTREAM DIRECTION.