SR 520 Medina to SR 202: Eastside Transit and HOV Project (Yarrow Creek Streams) Mitigation Site

USACE NWS-2009-562

Northwest Region

2015 MONITORING REPORT

Wetlands Program

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Washington State Department of Transportation

Environmental Services Office

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SR 520 Medina to SR 202: Eastside transit and HOV Project (Yarrow Creek Streams) Mitigation Site

USACE NWS-2009-562

General Site Information		
USACE Number	NWS-2009-562	
WDFW HPA Number	117685-5	
Mitigation Location	Along the SR 520 corridor, east of Lake Washington, Bellevue, WA	
LLID Number	Pending	
Construction Date	2010-2014	
Monitoring Period	2015-2024	
Year of Monitoring	1 of 10	
Type of Project Impact	Permanent Stream Buffer	Temporary Stream Buffer
Area of Project Impact[1]	1.83 acres	3.01 acres
Type of Mitigation	Stream Buffer Creation	Stream Buffer Enhancement
Planned Area of Mitigation[1]	2.1 acres	3.09 acres

[1] Impact and planned area of mitigation acreage sourced from Medina to SR 202: Eastside Transit and HOV Project Final Streams Mitigation Report WSDOT 2010.

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Summary of Monitoring Results and Management Activities (2015)

Performance Standards	2015 Results	Management Activities
Habitat structures installation will be verified.	Present	
The in-stream structures (LWD) will remain intact and properly functioning as determined from visual inspection.	All intact and functioning	
The channel will not show signs of significant headcutting, avulsion, or subsurface seepage as determined from visual inspection.	No signs present	
The grade control structures and culverts will remain intact and properly functioning as determined from visual inspection.	All intact and functioning	
The vegetated rip-rap bank protection will not show signs of significant subsurface seepage or avulsion from the new channel to the old one (as determined from visual inspection) and will grow willow (*Salix* species) stakes in the voids between the rocks.	No signs present	
Velocities at the culvert facility shall be maintained such that WDFW (2003) *Fish Passage Design Criteria for Culvert Installation* are met.	Culverts B, D, E, and H conform to Stream Simulation Design Criteria. Culverts A, C, F, and G require steam bed corrections to bring them back to Stream Simulation Design specifications.	
The maximum hydraulic drop criteria will be satisfied at all flows between the low and high flow design criteria.	No hydraulic drop present at any culvert facilities	
100% survival of all installed native trees and shrubs one-year post installation.	90-98% survival in all planting areas	Planted 535 live stakes and 573 container plants Winter 2016.
King County-listed Class A noxious weeds identified on the site will be eradicated.	None present	Weed control efforts will continue to be performed.
Non-King County- listed Class A noxious weeds will be controlled in all years.	None present	Weed control efforts will continue to be performed.
King County-listed Class C noxious weeds will be contained on the site.	5-10% cover	Weed control was performed at a minimum of 28x'x during 2015.

Non-King County-listed Class B and C noxious weeds and reed canarygrass (*Phalaris arundinacea*), non-native blackberries (*Rubus* species), and Scotch broom (*Cytisus scoparius*) will not exceed 25% aerial cover in the rehabilitated wetlands.	5-10% cover in all planting areas B-H; 70% cover in planting area downstream of culvert A	Weed control was performed at a minimum of 28x'x during 2015. Reed canary grass control at culvert A has been addressed.

Report Introduction

This report summarizes first-year (Year-1) monitoring activities at the State Route (SR) 520 Yarrow Creek Streams Mitigation Site. Included are a site description, the performance criteria, an explanation of monitoring methods, and an evaluation of site development. Monitoring activities included vegetation surveys and photo-documentation on August 10-12, 2015, and stream channel and culvert inspections on September 29, 2015 and January 6, 2016.

What is the SR 520 Yarrow Creek Streams Mitigation Site?

This stream mitigation site (Figures 1 and 2) consists of stream channels, eight culverts, and 11 created or enhanced stream buffer planting areas (six acres total) along SR 520, east of Lake Washington. This site was created to compensate for the permanent and temporary stream and stream buffer impacts due to road improvements along SR 520 from Lake Washington to Interstate (I) 405. The stream buffer areas are designed to provide mitigation for lost stream buffer functions contributing to the health of the streams and the fish that inhabit them.

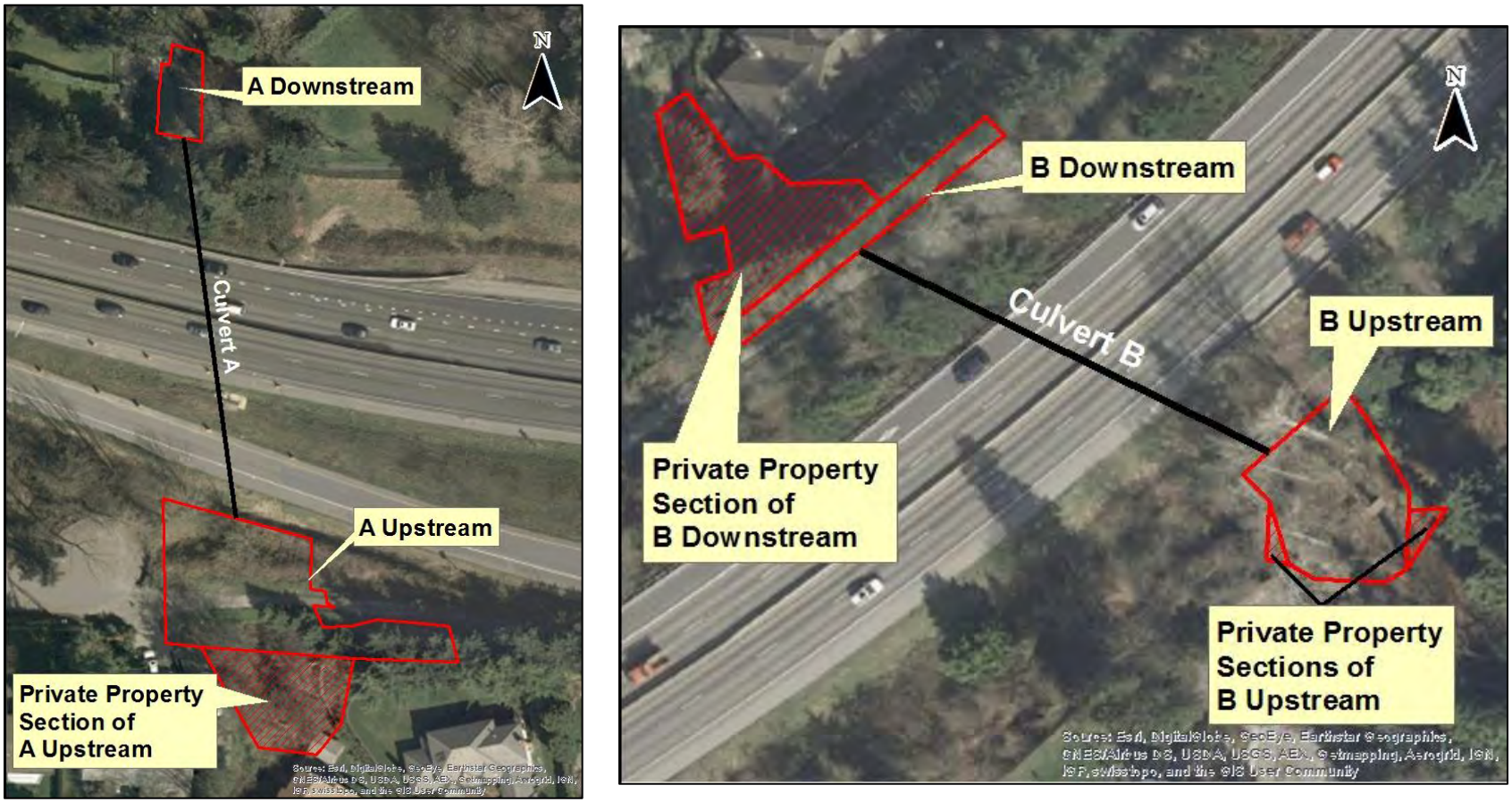


Figure 1 Yarrow Creek Streams Planting Areas (at ends of culverts A and B)

Figure 2 Yarrow Creek Streams Planting Areas (at ends of culverts C-H)

The SR 520 Yarrow Creek Streams Mitigation Site contains stream buffer planting areas at the upstream and/or downstream ends of eight culverts. Appendix 2 includes site directions.

What are the performance standards for this site?

Year 1

Performance Standard 1
Habitat structures will be verified and an as-built plan will document that all habitat structures were installed.

Performance Standard 2
The in-stream structure (LWD) will remain intact and properly functioning as determined from visual inspection. The inspection should look for evidence of structure movement, cover creation, sediment trapping, and development of pools.

Performance Standard 3
The channel will not show signs of significant headcutting, avulsion, or subsurface seepage as determined from visual inspection.

Performance Standard 4
The grade control structures and culverts will remain intact and properly functioning as determined from visual inspection. The inspection should look for evidence of settling, movement, undercutting, flanking, end running, and subsurface flow.

Performance Standard 5
The vegetated rip-rap bank protection will not show signs of significant subsurface seepage or avulsion from the new channel to the old one (as determined from visual inspection) and will grow willow stakes in the voids between the rocks in conformance with vegetation performance standards described herein.

Performance Standard 6
Velocities at the culvert facility shall be maintained such that WDFW (2003) *Fish Passage Design Criteria for Culvert Installation* are met.

Performance Standard 7
The maximum hydraulic drop criteria will be satisfied at all flows between the low and high flow design criteria.

Performance Standard 8
100 percent survival of all installed native trees and shrubs one-year post installation (warranty inspection). The performance criteria will be met if all dead plants are replaced at the end of Year 1.

Performance Standard 9
King County-listed Class A noxious weeds identified on the site will be eradicated.

Performance Standard 10
Non-King County-listed Class A noxious weeds will be controlled in all years.

Performance Standard 11
King County-listed Class C noxious weeds will be contained on the site.

Performance Standard 12
Non-King County-listed Class B and C noxious weeds and reed canarygrass, non-native blackberries, and Scotch broom will not exceed 25 percent aerial cover in the rehabilitated wetlands.

Appendix 1 shows the planting plan (WSDOT 2012).

How were the performance standards evaluated?

Performance Standards 1-7 were evaluated with a visual inspection. Performance standard 8 was measured by counting the total number of live plants and dividing it by the number of observed dead and living plants in each planting area. The invasive species standards (Performance Standards 9-12) were assessed qualitatively.

How is the site developing?

This site is developing well. Habitat and instream structures are in place and functioning. No significant signs of erosion of the stream channel were observed. All culverts remain stable and no hydraulic drops were observed. Although bed deformation is an issue at four of the eight culvert locations, site mangers are currently drafting a plan to bring the stream channel back into compliance with the Stream Simulation design criteria.

The woody plantings are becoming established. Invasive species management is needed in some areas, but cover is generally low across the sites. Reed canarygrass and field bindweed (*Convolvulus arvensis*) are established in some areas with individuals of other invasive species scattered throughout.

Results for Performance Standard 1
(Habitat structure installation verified):

All habitat structures were present at the time of monitoring.

Results for Performance Standard 2
(In-stream structures intact and functioning):

All in-stream structures were verified to be intact and functioning at the time of monitoring. (Photo 1)

Results for Performance Standard 3
(No signs of channel headcutting, avulsion, or subsurface seepage):

No signs of headcutting, avulsion, or subsurface seepage were observed in the channel at the time of monitoring.

Results for Performance Standard 4
(Grade control structures and culverts intact and functioning):

All grade control structures and culverts were observed to be intact and functioning at the time of monitoring.

Results for Performance Standard 5
(Rip-rap bank protection does not show signs of significant subsurface seepage or avulsion, and willow stakes are growing in the voids):

No signs of subsurface seepage or avulsion from the new channel to the old one were observed. No voids in the rip-rap bank protection present. (Photo 2)

Photo 1
LWD in the stream (August 2015)

Photo 2
Rip-rap bank (January 2016)

Results for Performance Standard 6
(Velocities maintained at the culverts):

Velocities have been maintained at the culverts facilities that still conform to Stream Simulation design parameters. These culverts are B, D, E, and H. The stream bed configuration at culverts A, C, F, and G are no longer consistent with Stream Simulation in that the channel profile is now flatter and shallower than the design specifications, so it cannot be determined that velocities have been maintained. Corrective measures are currently being determined to bring the bed configuration back to Stream Simulation

Results for Performance Standard 7
(Maximum hydraulic drop criteria satisfied at flow between low and high flow design criteria):

No hydraulic drop is present at any of the culverts. Upstream and downstream elevations at the culvert ends are designed to mimic the natural gradient of the stream reach (Photo 3)

Results for Performance Standard 8
(100% survival of installed native trees and shrubs):

Survival of planted native trees and shrubs is 90-98 percent in all planting areas (see Appendix 3, Table 1). These values are slightly below the performance standard target. Dominant species include Pacific ninebark (*Physocarpus capitatus*), redosier dogwood (*Cornus alba*), Nootka rose (*Rosa nutkana*), snowberry (*Symphoricarpos albus*), and Pacific willow (*Salix lasiandra*). (Photo 4)

Results for Performance Standard 9
(Eradicate King County-listed Class A noxious weeds):

No King County-listed Class A noxious weeds were observed at the time of monitoring.

Photo 3
Natural stream gradient present at culvert B (September 2015)

Photo 4
Survival of planted native trees and shrubs (August 2015)

Results for Performance Standard 10
(Control Non-King County-listed Class A noxious weeds):

No Non-King County-listed Class A noxious weeds were observed at the time of monitoring.

Results for Performance Standard 11
(King County-listed Class C noxious weeds contained on the site):

Class B and C weeds are present on site, generally as scattered individuals, including: reed canarygrass, Himalayan blackberry (*Rubus armeniacus*), climbing nightshade (*Solanum dulcamara*), Robert geranium (*Geranium robertianum*), Scotchbroom, paleyellow iris (*Iris pseudacorus*), English ivy (*Hedera helix*), poison hemlock (*Conium maculatum*), and bull thistle (*Cirsium vulgare*).

Results for Performance Standard 12
(Less than 25% cover non-King County-listed Class B and C noxious weeds and reed canarygrass, non-native blackberries, and Scotch broom in the rehabilitated wetlands):

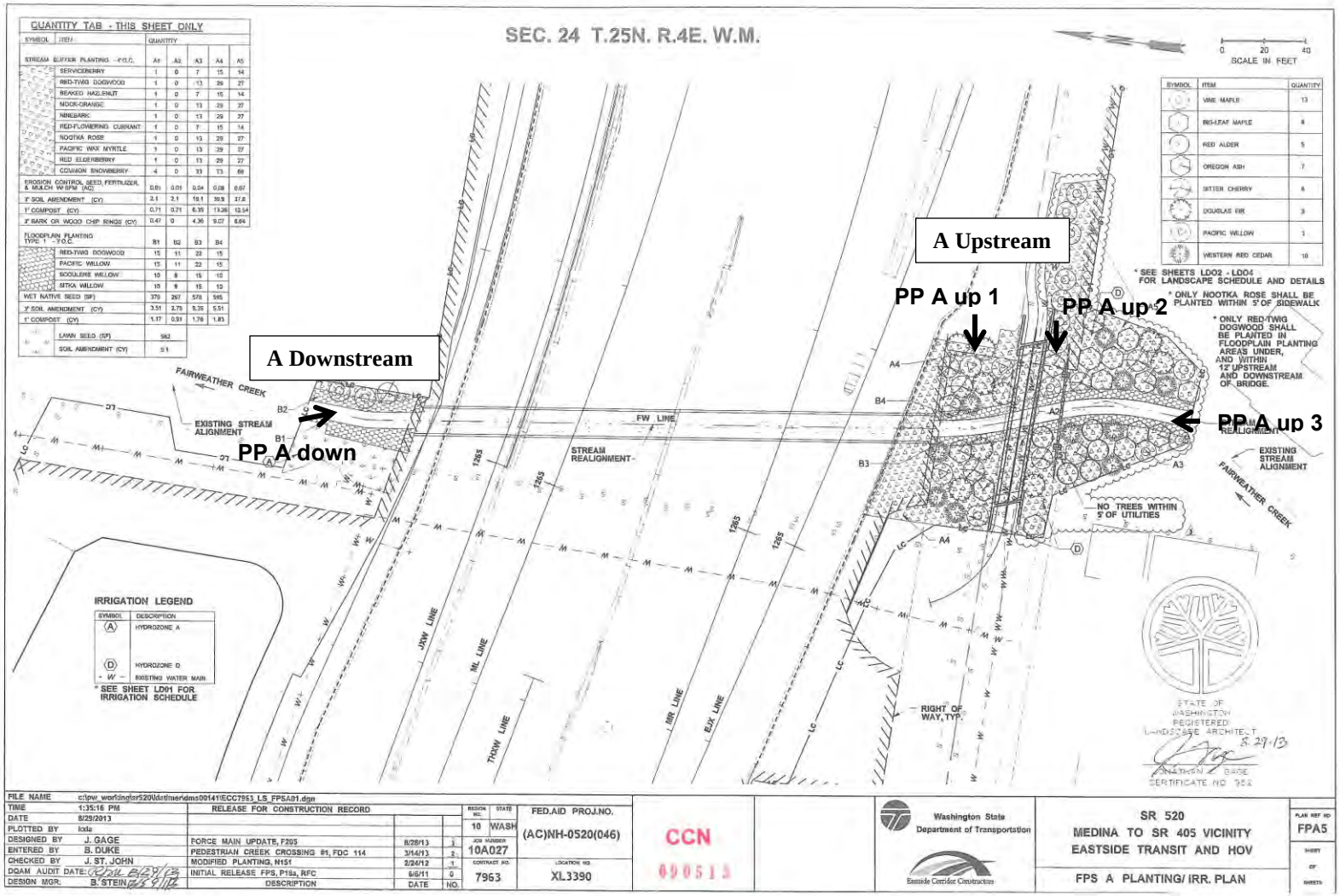
Cover of invasive species is qualitatively estimated at 5-10 percent in each planting area, with the exception of downstream culvert A. This area has well established reed canarygrass providing 70 percent cover. Woody plantings are sparse in this area. Also see results for performance standard 11.

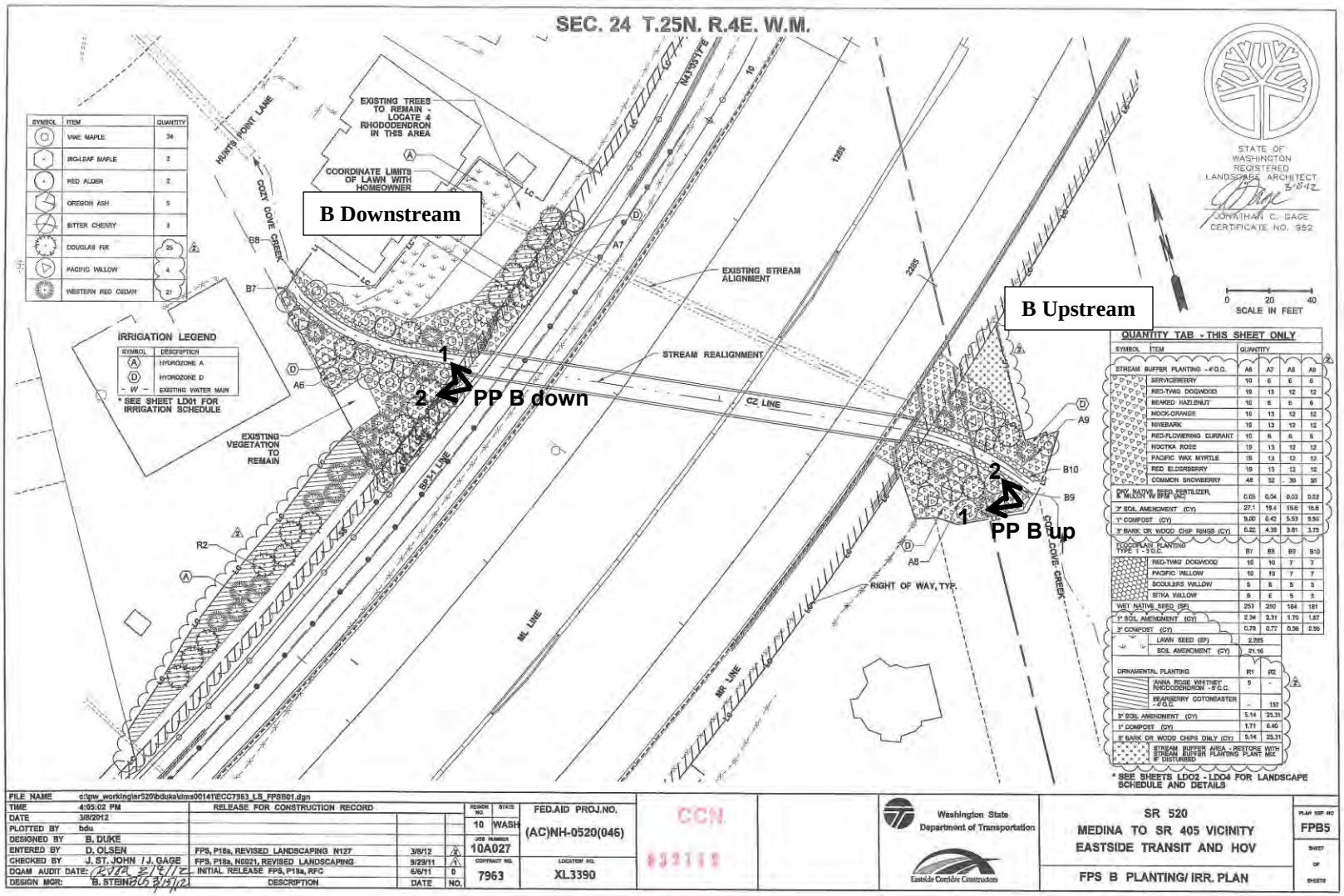
What is planned for this site?

Invasive species management, particularly for reed canarygrass and field bindweed, is planned for 2016.

Appendix 1 – Planting Plan with Photo Point (PP) Locations

(from WSDOT 2012)




SEC. 24 T.25N. R.4E. W.M.
B Downstream
B Upstream
PP B down
PP B up
EXISTING TREES TO REMAIN - LOCATE 4 RHODODENDRON IN THIS AREA
COORDINATE LIMITS OF LAWN WITH HOMEOWNER
EXISTING STREAM ALIGNMENT
STREAM REALIGNMENT
EXISTING VEGETATION TO REMAIN
HUNTS POINT LANE
COZY COVE CREEK
CZ LINE
ML LINE
MR LINE
RIGHT OF WAY, TYP.
IRRIGATION LEGEND
* SEE SHEET LD01 FOR IRRIGATION SCHEDULE
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
JONATHAN C. GAGE
CERTIFICATE NO. 952
SCALE IN FEET
QUANTITY TAB - THIS SHEET ONLY
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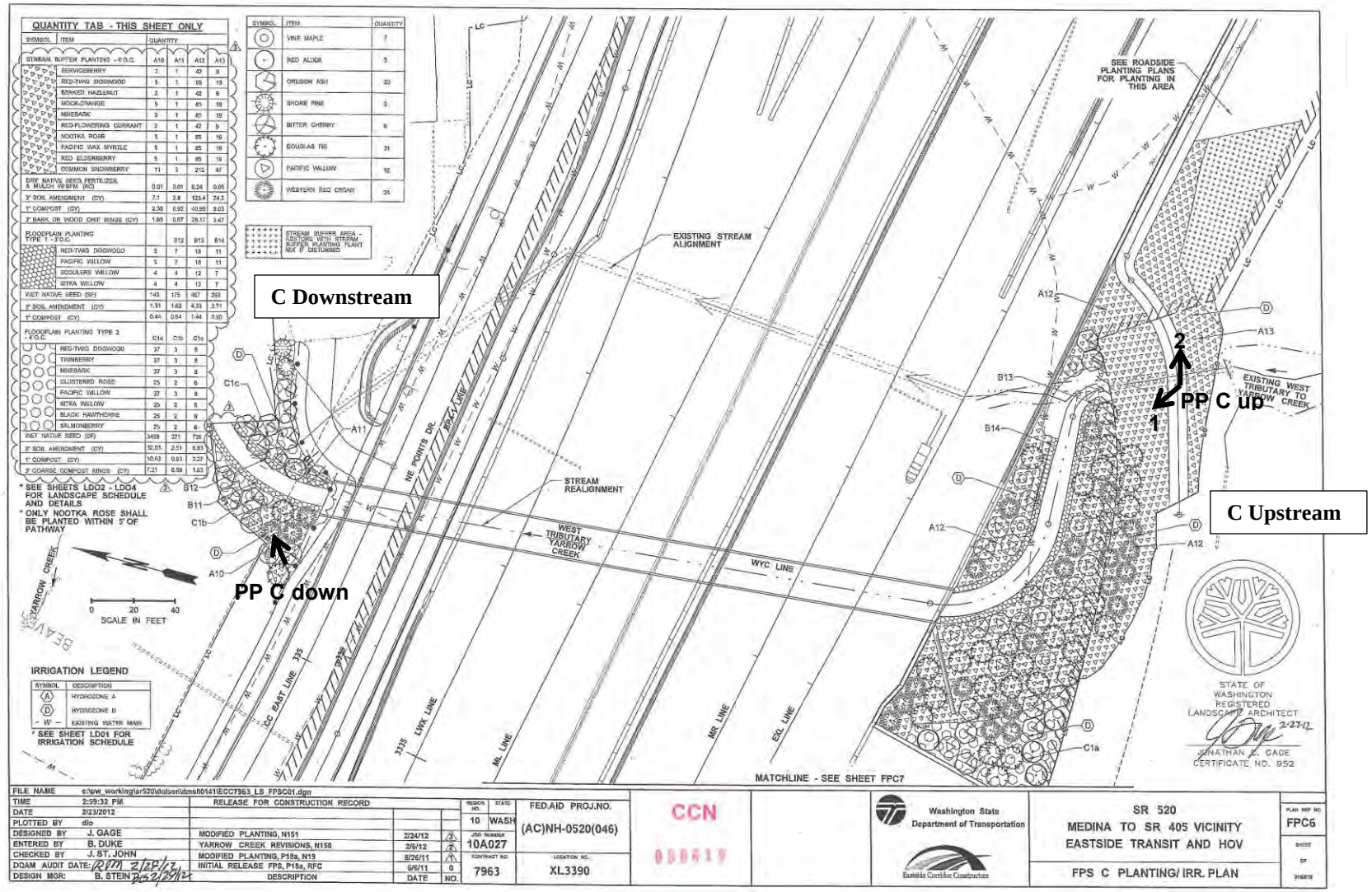
DATE 3/8/2012
PLOTTED BY bdu
DESIGNED BY B. DUKE
ENTERED BY D. OLSEN
CHECKED BY J. ST. JOHN / J. GAGE
DQAM AUDIT DATE:
DESIGN MGR: B. STEIN
RELEASE FOR CONSTRUCTION RECORD
FPS, P18a, REVISED LANDSCAPING N127 3/8/12
FPS, P18a, N0021, REVISED LANDSCAPING 9/29/11
INITIAL RELEASE FPS, P18a, RFC 6/6/11
DESCRIPTION DATE NO.
REGION NO. 10
STATE WASH
FED.AID PROJ.NO. (AC)NH-0520(046)
JOB NUMBER 10A027
CONTRACT NO. 7963
LOCATION NO. XL3390
CCN
Washington State Department of Transportation
Eastside Corridor Constructors
SR 520
MEDINA TO SR 405 VICINITY
EASTSIDE TRANSIT AND HOV
FPS B PLANTING/ IRR. PLAN
PLAN REF NO FPB5
SHEET OF SHEETS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C Downstream
C Upstream
PP C up
PP C down
1
2
EXISTING STREAM ALIGNMENT
STREAM REALIGNMENT
WEST TRIBUTARY YARROW CREEK
EXISTING WEST TRIBUTARY TO YARROW CREEK
SEE ROADSIDE PLANTING PLANS FOR PLANTING IN THIS AREA
NE POINTS DR.
WYC LINE
MATCHLINE - SEE SHEET FPC7
SCALE IN FEET
IRRIGATION LEGEND
* SEE SHEET LD01 FOR IRRIGATION SCHEDULE
* SEE SHEETS LD02 - LD04 FOR LANDSCAPE SCHEDULE AND DETAILS
* ONLY NOOTKA ROSE SHALL BE PLANTED WITHIN 5' OF PATHWAY
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
JONATHAN E. GAGE
CERTIFICATE NO. 952
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DATE 2/23/2012
PLOTTED BY dlo
DESIGNED BY J. GAGE
ENTERED BY B. DUKE
CHECKED BY J. ST. JOHN
DQAM AUDIT DATE:
DESIGN MGR: B. STEIN
RELEASE FOR CONSTRUCTION RECORD
MODIFIED PLANTING, N151 2/24/12
YARROW CREEK REVISIONS, N150 2/6/12
MODIFIED PLANTING, P18a, N19 8/26/11
INITIAL RELEASE FPS, P18a, RFC 6/6/11
DESCRIPTION DATE NO.
REGION NO. 10 STATE WASH
FED.AID PROJ.NO. (AC)NH-0520(046)
JOB NUMBER 10A027
CONTRACT NO. 7963
LOCATION NO. XL.3390
CCN
Washington State Department of Transportation
Eastside Corridor Constructors
SR 520
MEDINA TO SR 405 VICINITY
EASTSIDE TRANSIT AND HOV
FPS C PLANTING/ IRR. PLAN
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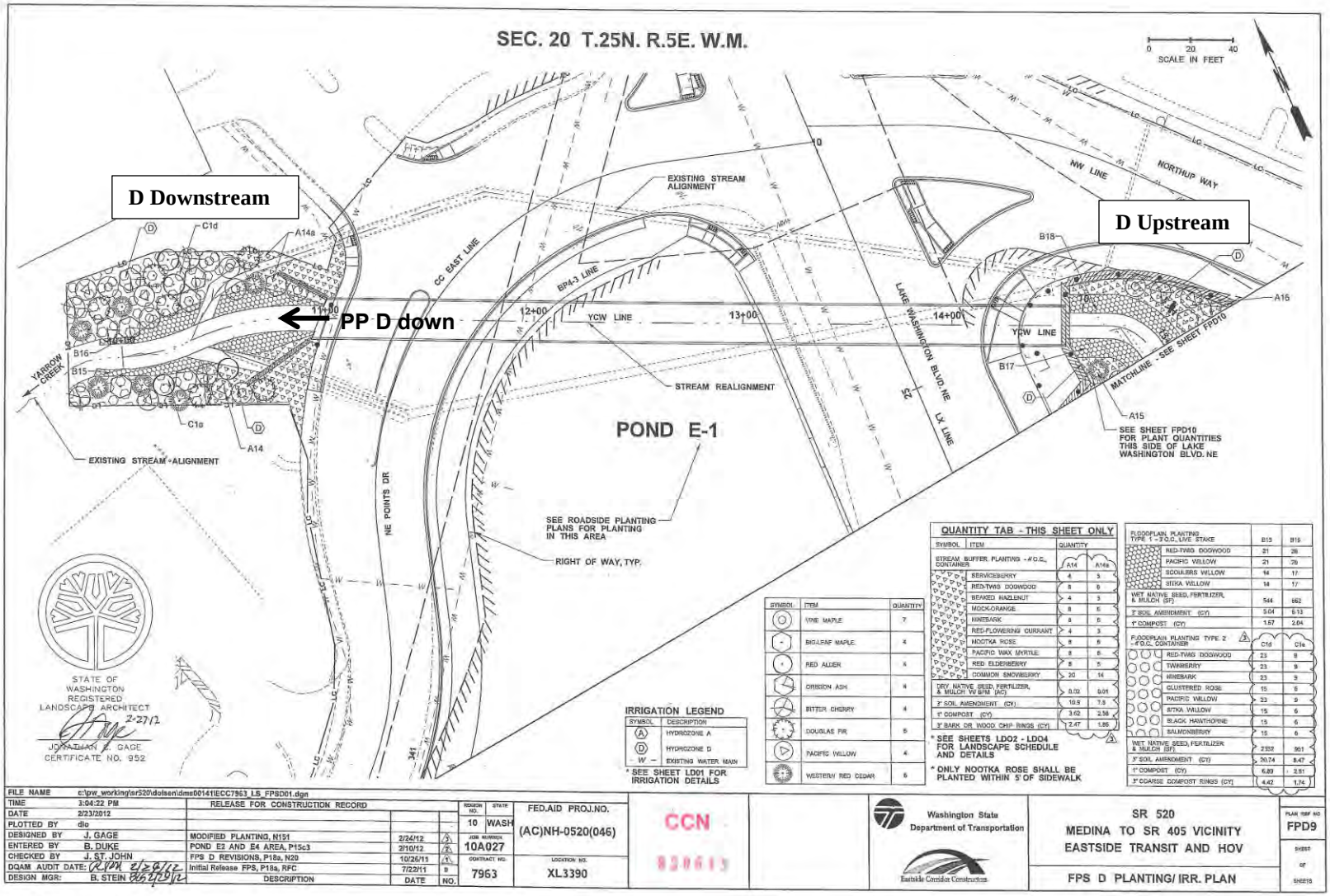
SEC. 20 T.25N. R.5E. W.M.
SCALE IN FEET
D Downstream
D Upstream
PP D down
EXISTING STREAM ALIGNMENT
STREAM REALIGNMENT
POND E-1
SEE ROADSIDE PLANTING PLANS FOR PLANTING IN THIS AREA
RIGHT OF WAY, TYP.
SEE SHEET FPD10 FOR PLANT QUANTITIES THIS SIDE OF LAKE WASHINGTON BLVD. NE
MATCHLINE - SEE SHEET FPD10
YARROW CREEK
NE POINTS DR
LAKE WASHINGTON BLVD. NE
NORTHUP WAY
NW LINE
YCW LINE
CC EAST LINE
BP4-3 LINE
LX LINE
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
JONATHAN E. GAGE
CERTIFICATE NO. 952
IRRIGATION LEGEND
SYMBOL DESCRIPTION
HYDROZONE A
HYDROZONE D
EXISTING WATER MAIN
* SEE SHEET LD01 FOR IRRIGATION DETAILS
QUANTITY TAB - THIS SHEET ONLY
SYMBOL ITEM QUANTITY
STREAM BUFFER PLANTING - #/O.C., CONTAINER
SERVICEBERRY
RED-TWIG DOGWOOD
BEAKED HAZELNUT
MOCK-ORANGE
NINEBARK
RED-FLOWERING CURRANT
NOOTKA ROSE
PACIFIC WAX MYRTLE
RED ELDERBERRY
COMMON SNOWBERRY
DRY NATIVE SEED, FERTILIZER, & MULCH VW BRM (AC)
3" SOIL AMENDMENT (CY)
1" COMPOST (CY)
3" BARK OR WOOD CHIP RINGS (CY)
* SEE SHEETS LD02 - LD04 FOR LANDSCAPE SCHEDULE AND DETAILS
* ONLY NOOTKA ROSE SHALL BE PLANTED WITHIN 5' OF SIDEWALK
SYMBOL DESCRIPTION QUANTITY
VINE MAPLE 7
BIG-LEAF MAPLE 4
RED ALDER 4
OREGON ASH 4
BITTER CHERRY 4
DOUGLAS FIR 5
PACIFIC WILLOW 4
WESTERN RED CEDAR 5
FLOODPLAIN PLANTING TYPE 1 - #O.C., LIVE STAKE
RED-TWIG DOGWOOD
PACIFIC WILLOW
SCOULERS WILLOW
SITKA WILLOW
WET NATIVE SEED, FERTILIZER, & MULCH (SF)
3" SOIL AMENDMENT (CY)
1" COMPOST (CY)
FLOODPLAIN PLANTING TYPE 2 - #O.C. CONTAINER
RED-TWIG DOGWOOD
TWINBERRY
NINEBARK
CLUSTERED ROSE
PACIFIC WILLOW
SITKA WILLOW
BLACK HAWTHORNE
SALMONBERRY
WET NATIVE SEED, FERTILIZER & MULCH (SF)
3" SOIL AMENDMENT (CY)
1" COMPOST (CY)
3" COARSE COMPOST RINGS (CY)
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DESIGNED BY J. GAGE
ENTERED BY B. DUKE
CHECKED BY J. ST. JOHN
DQAM AUDIT DATE:
DESIGN MGR: B. STEIN
RELEASE FOR CONSTRUCTION RECORD
MODIFIED PLANTING, N151 2/24/12
POND E2 AND E4 AREA, P15c3 2/10/12
FPS D REVISIONS, P18a, N20 10/26/11
Initial Release FPS, P18a, RFC 7/22/11
DESCRIPTION DATE NO.
REVISION NO. 10
STATE WASH
FED.AID PROJ.NO. (AC)NH-0520(046)
JOB NUMBER 10A027
CONTRACT NO. 7963
LOCATION NO. XL3390
CCN
Washington State Department of Transportation
Eastside Corridor Construction
SR 520
MEDINA TO SR 405 VICINITY
EASTSIDE TRANSIT AND HOV
FPS D PLANTING/ IRR. PLAN
PLAN REF NO FPD9
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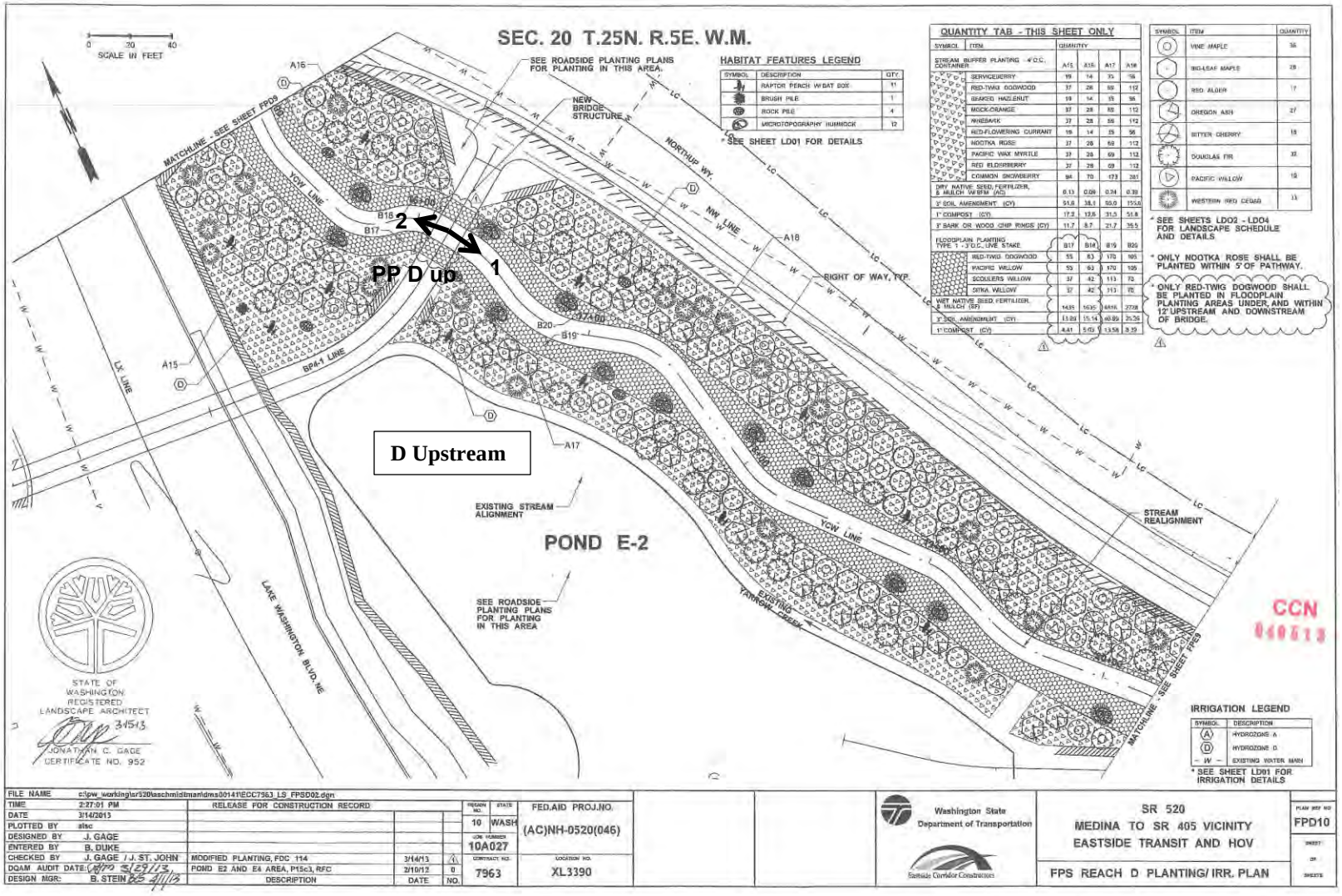
SEC. 20 T.25N. R.5E. W.M.
SCALE IN FEET
0 20 40
SEE ROADSIDE PLANTING PLANS FOR PLANTING IN THIS AREA.
HABITAT FEATURES LEGEND
SYMBOL DESCRIPTION QTY.
RAPTOR PERCH W/BAT BOX 11
BRUSH PILE 1
ROCK PILE 4
MICROTOPOGRAPHY HUMMOCK 12
* SEE SHEET LD01 FOR DETAILS
QUANTITY TAB - THIS SHEET ONLY
SYMBOL ITEM QUANTITY
STREAM BUFFER PLANTING - 4' O.C. CONTAINER A15 A16 A17 A18
SERVICEBERRY 19 14 35 16
RED-TWIG DOGWOOD 37 28 69 112
BEAKED HAZELNUT 19 14 35 56
MOCK-ORANGE 37 28 69 112
NINEBARK 37 28 69 112
RED-FLOWERING CURRANT 19 14 35 56
NOOTKA ROSE 37 28 69 112
PACIFIC WAX MYRTLE 37 28 69 112
RED ELDERBERRY 37 28 69 112
COMMON SNOWBERRY 94 70 173 281
DRY NATIVE SEED, FERTILIZER, & MULCH W/BFM (AC) 0.13 0.09 0.24 0.39
3" SOIL AMENDMENT (CY) 51.8 38.1 95.0 155.6
1" COMPOST (CY) 17.2 12.6 31.5 51.6
3" BARK OR WOOD CHIP RINGS (CY) 11.7 8.7 21.7 35.5
FLOODPLAIN PLANTING TYPE 1 - 3' O.C., LIVE STAKE B17 B18 B19 B20
RED-TWIG DOGWOOD 55 83 170 105
PACIFIC WILLOW 55 83 170 105
SCOULERS WILLOW 37 42 113 70
SITKA WILLOW 37 42 113 70
WET NATIVE SEED, FERTILIZER, & MULCH (SF) 1435 1635 4414 2708
3" SOIL AMENDMENT (CY) 13.89 15.14 40.89 25.26
1" COMPOST (CY) 4.41 5.03 13.58 8.39
SYMBOL ITEM QUANTITY
VINE MAPLE 36
BIG-LEAF MAPLE 28
RED ALDER 17
OREGON ASH 27
BITTER CHERRY 18
DOUGLAS FIR 32
PACIFIC WILLOW 10
WESTERN RED CEDAR 11
* SEE SHEETS LD02 - LD04 FOR LANDSCAPE SCHEDULE AND DETAILS
* ONLY NOOTKA ROSE SHALL BE PLANTED WITHIN 5' OF PATHWAY.
* ONLY RED-TWIG DOGWOOD SHALL BE PLANTED IN FLOODPLAIN PLANTING AREAS UNDER, AND WITHIN 12' UPSTREAM AND DOWNSTREAM OF BRIDGE.
MATCHLINE - SEE SHEET FPD9
NEW BRIDGE STRUCTURE
NORTHUP WY.
YCW LINE
NW LINE
RIGHT OF WAY, TYP.
PP D up
2
1
D Upstream
EXISTING STREAM ALIGNMENT
POND E-2
SEE ROADSIDE PLANTING PLANS FOR PLANTING IN THIS AREA
STREAM REALIGNMENT
EXISTING YARROW CREEK
LX LINE
BPA-1 LINE
LAKE WASHINGTON BLVD. NE
MATCHLINE - SEE SHEET FPD8
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
3/15/13
JONATHAN C. GAGE
CERTIFICATE NO. 952
IRRIGATION LEGEND
SYMBOL DESCRIPTION
A HYDROZONE A
D HYDROZONE D
W EXISTING WATER MAIN
* SEE SHEET LD01 FOR IRRIGATION DETAILS
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DATE 3/14/2013
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DESIGNED BY J. GAGE
ENTERED BY B. DUKE
CHECKED BY J. GAGE / J. ST. JOHN
QCAM AUDIT DATE
DESIGN MGR: B. STEIN
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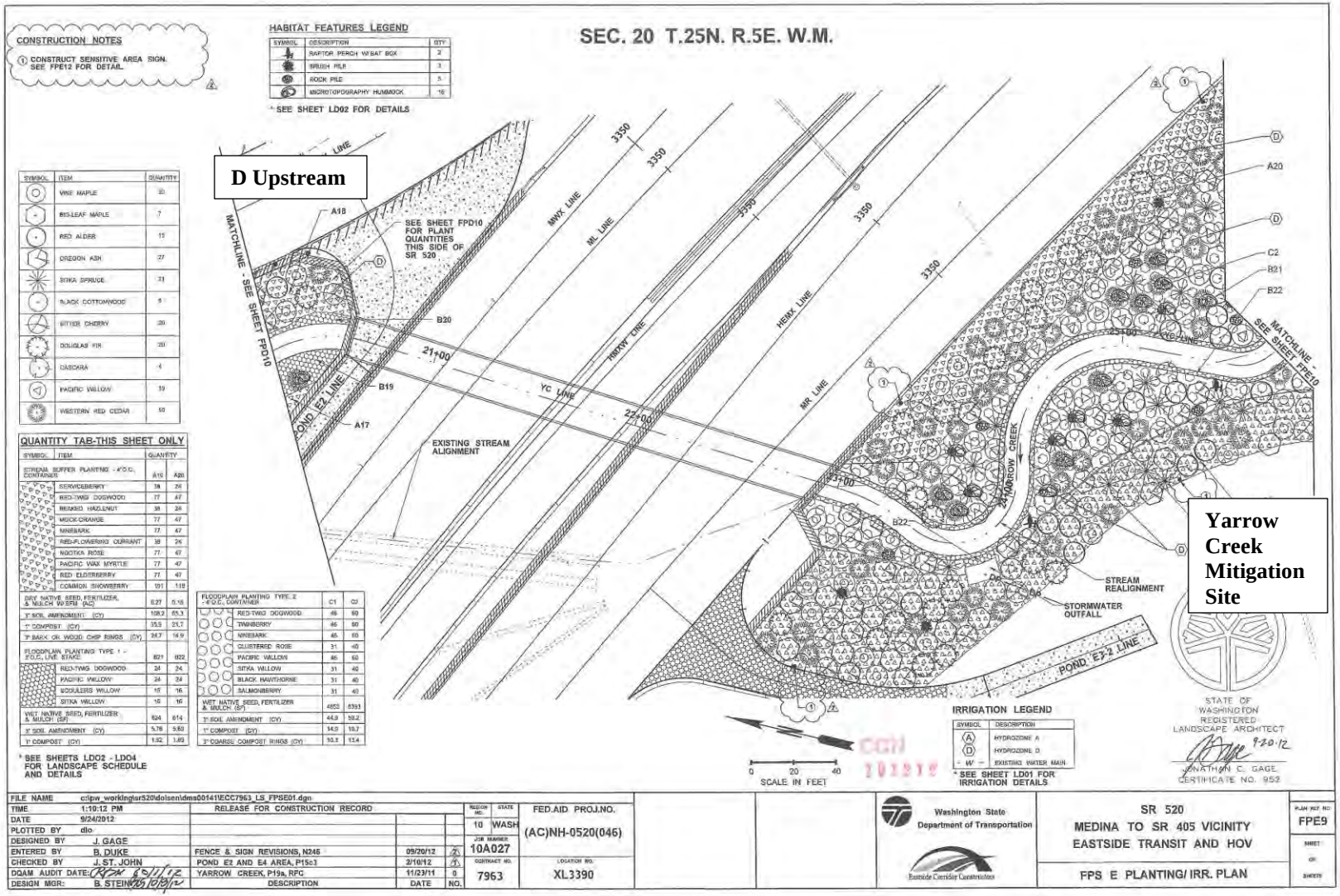
MODIFIED PLANTING, FDC 114 3/14/13 4
POND E2 AND E4 AREA, P15c3, RFC 2/10/12 0
DESCRIPTION DATE NO.
REGION NO. 10 STATE WASH
FED.AID PROJ.NO. (AC)NH-0520(046)
JOB NUMBER 10A027
CONTRACT NO. 7963
LOCATION NO. XL3390
Washington State Department of Transportation
Eastside Corridor Construction
SR 520
MEDINA TO SR 405 VICINITY
EASTSIDE TRANSIT AND HOV
FPS REACH D PLANTING/ IRR. PLAN
PLAN REF NO FPD10
SHEET OF SHEETS


SEC. 20 T.25N. R.5E. W.M.
CONSTRUCTION NOTES
① CONSTRUCT SENSITIVE AREA SIGN. SEE FPE12 FOR DETAIL.
HABITAT FEATURES LEGEND
SYMBOL DESCRIPTION QTY
RAPTOR PERCH W/BAT BOX 2
BRUSH PILE 3
ROCK PILE 5
MICROTOPOGRAPHY HUMMOCK 16
* SEE SHEET LD02 FOR DETAILS
D Upstream
Yarrow Creek Mitigation Site
SEE SHEET FPD10 FOR PLANT QUANTITIES THIS SIDE OF SR 520
MATCHLINE - SEE SHEET FPD10
MATCHLINE - SEE SHEET FPE10
EXISTING STREAM ALIGNMENT
STREAM REALIGNMENT
STORMWATER OUTFALL
POND E2 LINE
POND E3-2 LINE
YC LINE
MR LINE
HEMX LINE
HMXW LINE
ML LINE
MWX LINE
3350
21+00
22+00
23+00
A18
A17
A20
B19
B20
B22
C2
B21
SYMBOL ITEM QUANTITY
VINE MAPLE 30
BIG-LEAF MAPLE 7
RED ALDER 15
OREGON ASH 27
SITKA SPRUCE 21
BLACK COTTONWOOD 5
BITTER CHERRY 20
DOUGLAS FIR 20
CASCARA 4
PACIFIC WILLOW 39
WESTERN RED CEDAR 50
QUANTITY TAB-THIS SHEET ONLY
SYMBOL ITEM QUANTITY
STREAM BUFFER PLANTING - 4"O.C. CONTAINER A19 A20
SERVICEBERRY 38 24
RED-TWIG DOGWOOD 77 47
BEAKED HAZLENUT 38 24
MOCK-ORANGE 77 47
NINEBARK 77 47
RED-FLOWERING CURRANT 38 24
NOOTKA ROSE 77 47
PACIFIC WAX MYRTLE 77 47
RED ELDERBERRY 77 47
COMMON SNOWBERRY 191 118
DRY NATIVE SEED, FERTILIZER, & MULCH W/SFM (AC) 6.27 5.16
3" SOIL AMENDMENT (CY) 108.2 65.3
1" COMPOST (CY) 35.9 21.7
3" BARK OR WOOD CHIP RINGS (CY) 24.7 14.9
FLOODPLAIN PLANTING TYPE 1 - 3"O.C., LIVE STAKE B21 B22
RED-TWIG DOGWOOD 24 24
PACIFIC WILLOW 24 24
SCOULERS WILLOW 16 16
SITKA WILLOW 16 16
WET NATIVE SEED, FERTILIZER & MULCH (SF) 624 614
3" SOIL AMENDMENT (CY) 5.76 5.69
1" COMPOST (CY) 1.92 1.89
FLOODPLAIN PLANTING TYPE 2 - 4"O.C., CONTAINER C1 C2
RED-TWIG DOGWOOD 46 60
TWINBERRY 46 60
NINEBARK 46 60
CLUSTERED ROSE 31 40
PACIFIC WILLOW 46 60
SITKA WILLOW 31 40
BLACK HAWTHORNE 31 40
SALMONBERRY 31 40
WET NATIVE SEED, FERTILIZER & MULCH (SF) 4853 5393
3" SOIL AMENDMENT (CY) 44.9 59.2
1" COMPOST (CY) 14.9 19.7
3" COARSE COMPOST RINGS (CY) 10.3 13.4
* SEE SHEETS LD02 - LD04 FOR LANDSCAPE SCHEDULE AND DETAILS
IRRIGATION LEGEND
SYMBOL DESCRIPTION
A HYDROZONE A
D HYDROZONE D
- W - EXISTING WATER MAIN
* SEE SHEET LD01 FOR IRRIGATION DETAILS
0 20 40
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STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
9-20-12
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ENTERED BY B. DUKE
CHECKED BY J. ST. JOHN
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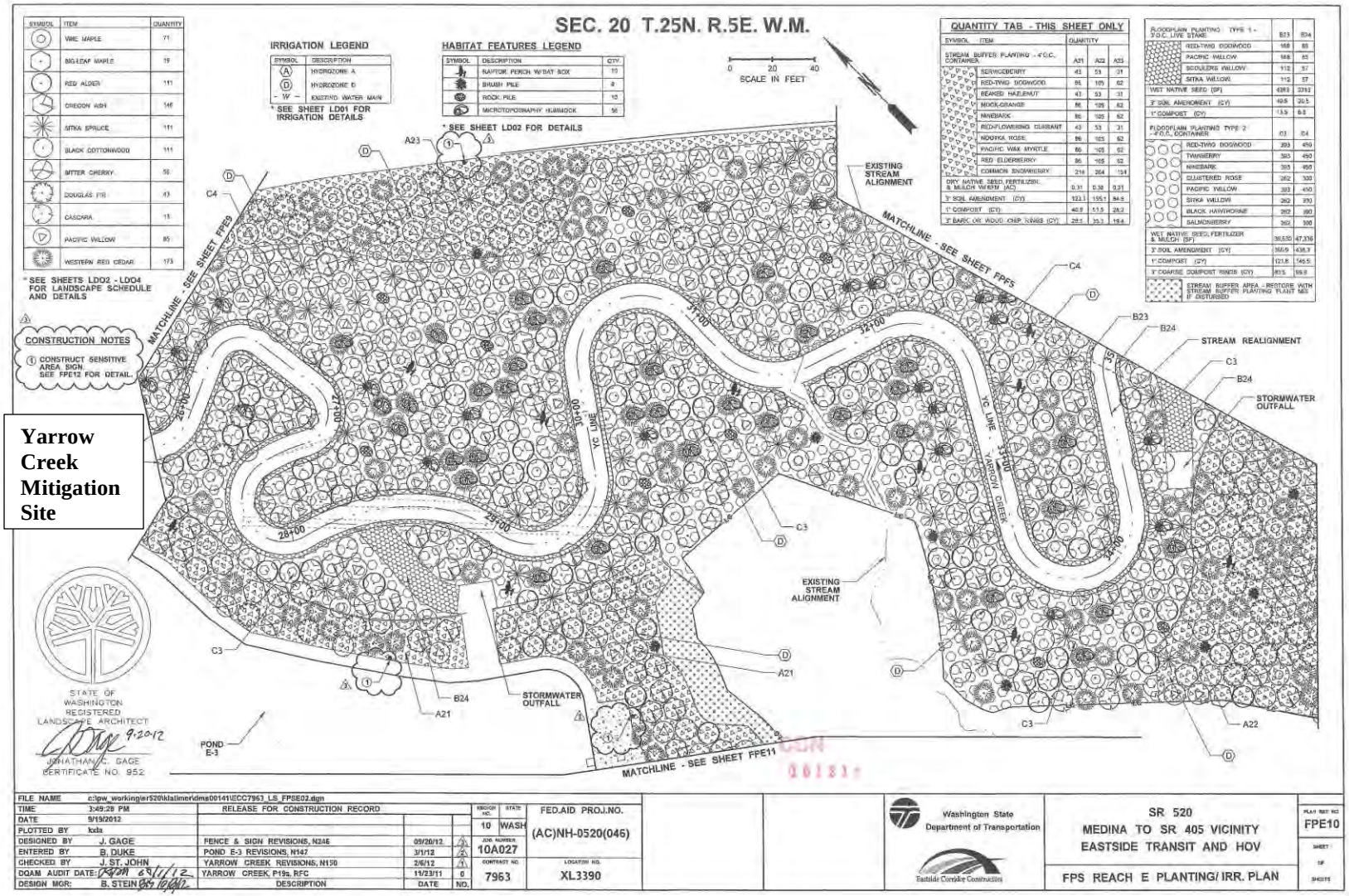
DESIGN MGR: B. STEIN
RELEASE FOR CONSTRUCTION RECORD
FENCE & SIGN REVISIONS, N246 09/20/12
POND E2 AND E4 AREA, P15c3 2/10/12
YARROW CREEK, P19a, RFC 11/23/11
DESCRIPTION DATE NO.
REGION NO. 10
STATE WASH
FED.AID PROJ.NO. (AC)NH-0520(046)
JOB NUMBER 10A027
CONTRACT NO. 7963
LOCATION NO. XL3390
Washington State Department of Transportation
Eastside Corridor Constructors
SR 520
MEDINA TO SR 405 VICINITY
EASTSIDE TRANSIT AND HOV
FPS E PLANTING/ IRR. PLAN
PLAN REF NO FPE9
SHEET OF SHEETS


SEC. 20 T.25N. R.5E. W.M.
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HABITAT FEATURES LEGEND
QUANTITY TAB - THIS SHEET ONLY
* SEE SHEET LD01 FOR IRRIGATION DETAILS
* SEE SHEET LD02 FOR DETAILS
* SEE SHEETS LD02 - LD04 FOR LANDSCAPE SCHEDULE AND DETAILS
CONSTRUCTION NOTES
① CONSTRUCT SENSITIVE AREA SIGN. SEE FPE12 FOR DETAIL.
Yarrow Creek Mitigation Site
MATCHLINE - SEE SHEET FPE5
MATCHLINE - SEE SHEET FPE5
MATCHLINE - SEE SHEET FPE11
EXISTING STREAM ALIGNMENT
STREAM REALIGNMENT
STORMWATER OUTFALL
POND E-3
YC LINE
YARROW CREEK
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
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ENTERED BY B. DUKE
CHECKED BY J. ST. JOHN
DQAM AUDIT DATE:
DESIGN MGR: B. STEIN
RELEASE FOR CONSTRUCTION RECORD
FENCE & SIGN REVISIONS, N246 09/20/12
POND E-3 REVISIONS, N147 3/1/12
YARROW CREEK REVISIONS, N150 2/6/12
YARROW CREEK, P19a, RFC 11/23/11
DESCRIPTION DATE NO.
REGION NO. 10
STATE WASH
FED.AID PROJ.NO. (AC)NH-0520(046)
JOB NUMBER 10A027
CONTRACT NO. 7963
LOCATION NO. XL3390
Washington State Department of Transportation
Eastside Corridor Construction
SR 520
MEDINA TO SR 405 VICINITY
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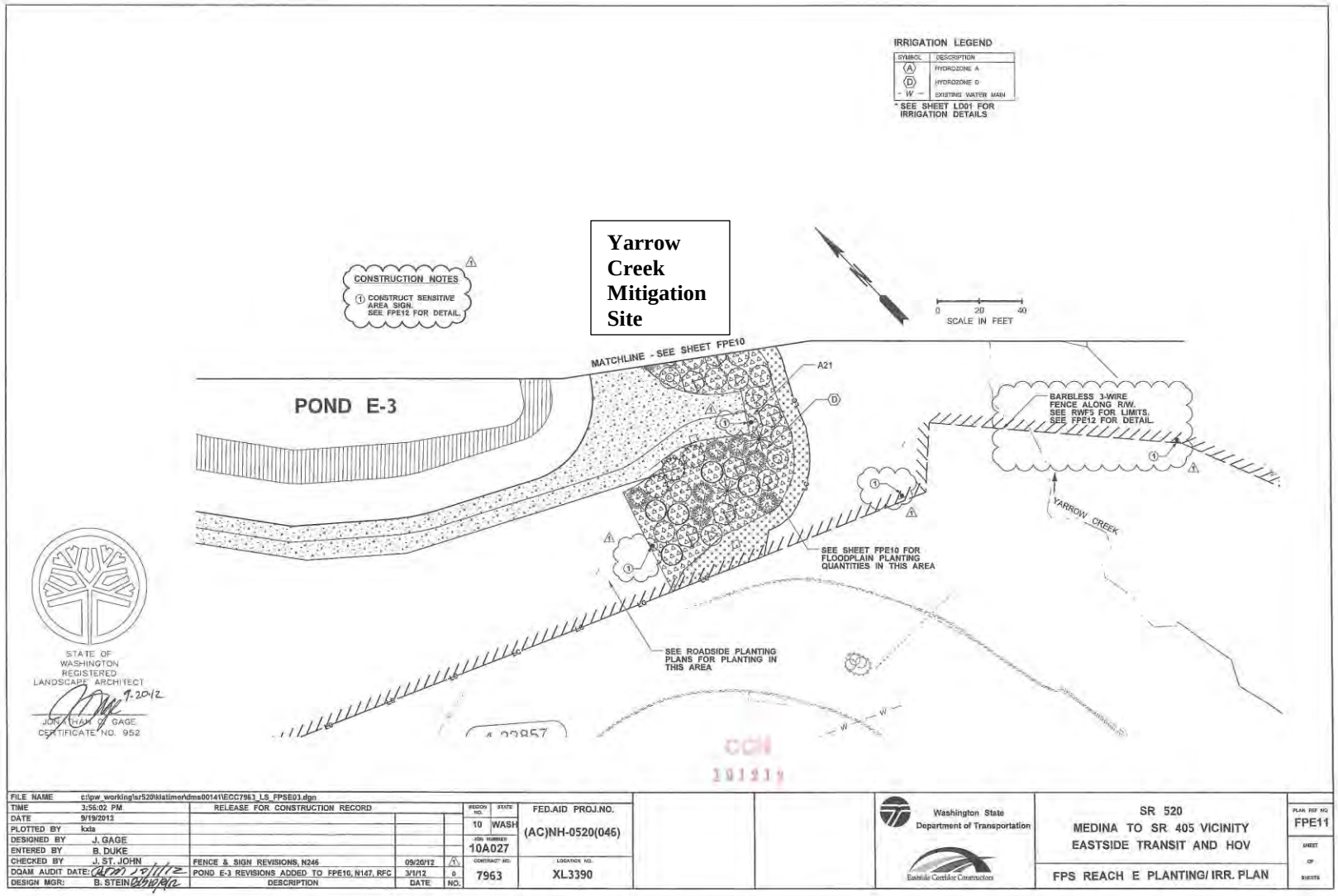
FPS REACH E PLANTING/ IRR. PLAN
PLAN SHEET NO. FPE10


IRRIGATION LEGEND
SYMBOL
DESCRIPTION
HYDROZONE A
HYDROZONE D
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* SEE SHEET LD01 FOR IRRIGATION DETAILS
Yarrow Creek Mitigation Site
CONSTRUCTION NOTES
1 CONSTRUCT SENSITIVE AREA SIGN. SEE FPE12 FOR DETAIL.
0 20 40
SCALE IN FEET
MATCHLINE - SEE SHEET FPE10
A21
POND E-3
BARBLESS 3-WIRE FENCE ALONG R/W. SEE RWF5 FOR LIMITS. SEE FPE12 FOR DETAIL.
YARROW CREEK
SEE SHEET FPE10 FOR FLOODPLAIN PLANTING QUANTITIES IN THIS AREA
SEE ROADSIDE PLANTING PLANS FOR PLANTING IN THIS AREA
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
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CHECKED BY J. ST. JOHN
DQAM AUDIT DATE:
DESIGN MGR: B. STEIN
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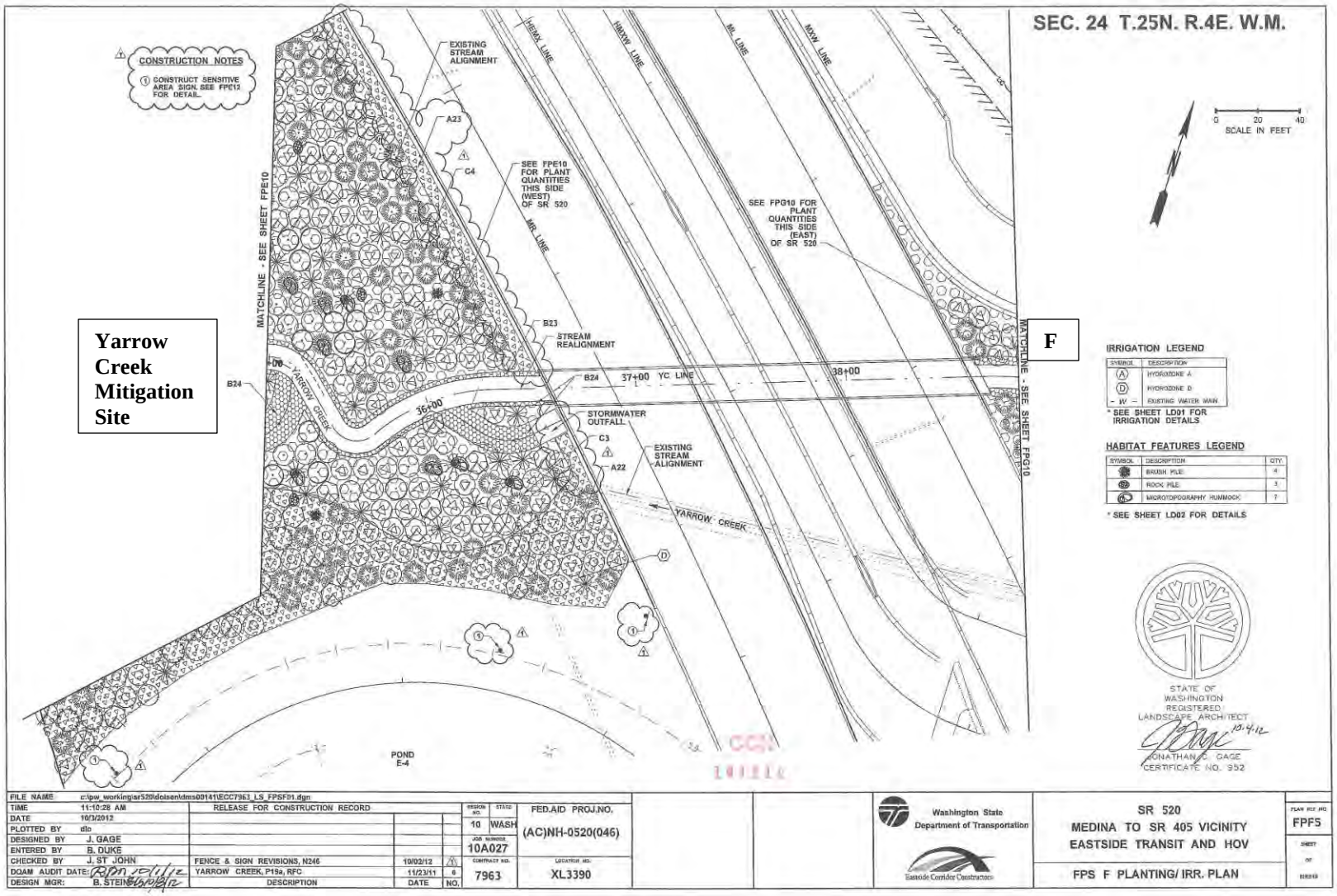
FENCE & SIGN REVISIONS, N246 09/20/12
POND E-3 REVISIONS ADDED TO FPE10, N147, RFC 3/1/12
DESCRIPTION DATE NO.
REGION NO. 10
STATE WASH
JOB NUMBER 10A027
CONTRACT NO. 7963
FED.AID PROJ.NO. (AC)NH-0520(046)
LOCATION NO. XL3390
Washington State Department of Transportation
Eastside Corridor Constructors
SR 520
MEDINA TO SR 405 VICINITY
EASTSIDE TRANSIT AND HOV
FPS REACH E PLANTING/ IRR. PLAN
PLAN REF NO FPE11
SHEET OF SHEETS



Yarrow Creek Mitigation Site

F

SEC. 20 T.25N. R.5E. W.M.
QUANTITY TAB - THIS SHEET ONLY
SYMBOL | ITEM | QUANTITY
STREAM BUFFER PLANTING - 4' O.C. CONTAINER | A24 | A25 | A26
SERVICEBERRY | 6 | 18 | 18
RED-TWIG DOGWOOD | 12 | 36 | 36
BEAKED HAZLENUT | 6 | 18 | 18
MOCK-ORANGE | 12 | 36 | 36
NINEBARK | 12 | 36 | 36
RED-FLOWERING CURRANT | 6 | 18 | 18
NOOTKA ROSE | 12 | 36 | 36
PACIFIC WAX MYRTLE | 12 | 36 | 36
RED ELDERBERRY | 12 | 36 | 36
COMMON SNOWBERRY | 31 | 91 | 90
DRY NATIVE SEED, FERTILIZER, & MULCH W/ BFM (AC) | 0.04 | 0.13 | 0.13
8" SOIL AMENDMENT (CY) | 16.2 | 51.8 | 51.4
1" COMPOST (CY) | 5.4 | 17.2 | 17.1
3" BARK OR WOOD CHIP RINGS (CY) | 3.7 | 11.8 | 11.7
FLOODPLAIN PLANTING TYPE 1 - 3' O.C. LIVE STAKE | B25 | B26 | B27 | B28 | B29 | B30
RED-TWIG DOGWOOD | 13 | 11 | 15 | 11 | 27 | 29
PACIFIC WILLOW | 13 | 11 | 15 | 11 | 27 | 29
SCOULERS WILLOW | 9 | 7 | 10 | 7 | 18 | 19
SITKA WILLOW | 9 | 7 | 10 | 7 | 18 | 19
WET NATIVE SEED (SF) | 336 | 280 | 383 | 293 | 706 | 757
3" SOIL AMENDMENT (CY) | 3.1 | 2.6 | 3.5 | 2.7 | 6.5 | 7.0
1" COMPOST (CY) | 1.0 | 0.9 | 1.2 | 0.9 | 2.2 | 2.3
FLOODPLAIN PLANTING TYPE 2 - 4' O.C. CONTAINER | C5 | C6 | C7 | C8 | C9
RED-TWIG DOGWOOD | 22 | 14 | 13 | 35 | 35
TRINBERRY | 22 | 14 | 13 | 35 | 35
NINEBARK | 22 | 14 | 13 | 35 | 35
CLUSTERED ROSE | 14 | 9 | 8 | 23 | 24
PACIFIC WILLOW | 22 | 14 | 13 | 35 | 35
SITKA WILLOW | 14 | 9 | 8 | 23 | 24
BLACK HAWTHORNE | 14 | 9 | 8 | 23 | 24
SALMONBERRY | 14 | 9 | 8 | 23 | 24
WET NATIVE SEED, FERTILIZER, & MULCH (SF) | 2136 | 1440 | 1248 | 3516 | 3358
5" SOIL AMENDMENT (CY) | 13.8 | 13.3 | 11.9 | 32.6 | 31.4
1" COMPOST (CY) | 6.0 | 4.4 | 3.9 | 10.8 | 10.4
3" COARSE COMPOST RINGS (CY) | 4.5 | 3.0 | 2.7 | 7.5 | 7.2
STREAM BUFFER AREA - RESTORE WITH STREAM BUFFER PLANTING PLANT MIX IF DISTURBED
SYMBOL | ITEM | QUANTITY
OREGON ASH | 61
PACIFIC WILLOW | 50
WESTERN RED CEDAR | 53
* SEE SHEETS LD02 - LD04 FOR LANDSCAPE SCHEDULE AND DETAILS
* ONLY NOOTKA ROSE SHALL BE PLANTED WITHIN 5' OF SIDEWALK
HABITAT FEATURES LEGEND
SYMBOL | DESCRIPTION | QTY.
RAPTOR PERCH W/ BAT BOX | 1
BRUSH PILE | 5
ROCK PILE | 2
MICROTOPOGRAPHY HUMMOCK | 5
* SEE SHEET LD02 FOR DETAILS
IRRIGATION LEGEND
SYMBOL | DESCRIPTION
A | HYDROZONE A
D | HYDROZONE D
- W - | EXISTING WATER MAIN
* SEE SHEET LD01 FOR IRRIGATION DETAILS
F
G
MATCHLINE - SEE SHEET FPF5
MATCHLINE - SEE SHEET FPG11
NORTHUP WY.
WMX LINE
YARROW CREEK
MXL LINE
VC LINE
MXW LINE
FPS G
STREAM REALIGNMENT
SEE ROADSIDE PLANTING PLANS FOR PLANTING IN THIS AREA
EXISTING SOUTH FORK YARROW CREEK
ML LINE
HEMX LINE
ST LINE
SOUTH FORK YARROW CREEK
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
JONATHAN C. GAGE
CERTIFICATE NO. 952
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DESIGNED BY J. GAGE
ENTERED BY B. DUKE
CHECKED BY J. GAGE / J. ST. JOHN
DQAM AUDIT DATE:
DESIGN MGR: B. STEIN
RELEASE FOR CONSTRUCTION RECORD
LC LINE REVISIONS, N120 | 4/13/12
YARROW CREEK REVISIONS, N150 | 2/6/12
YARROW CREEK, P19a, RFC | 11/23/11
DESCRIPTION | DATE | NO.
REGION NO. 10 | STATE WASH
FED.AID PROJ.NO. (AC)NH-0520(046)
JOB NUMBER 10A027
CONTRACT NO. 7963
LOCATION NO. XL3390
Washington State Department of Transportation
Eastside Corridor Constructors
SR 520
MEDINA TO SR 405 VICINITY
EASTSIDE TRANSIT AND HOV
FPS G PLANTING/ IRR. PLAN
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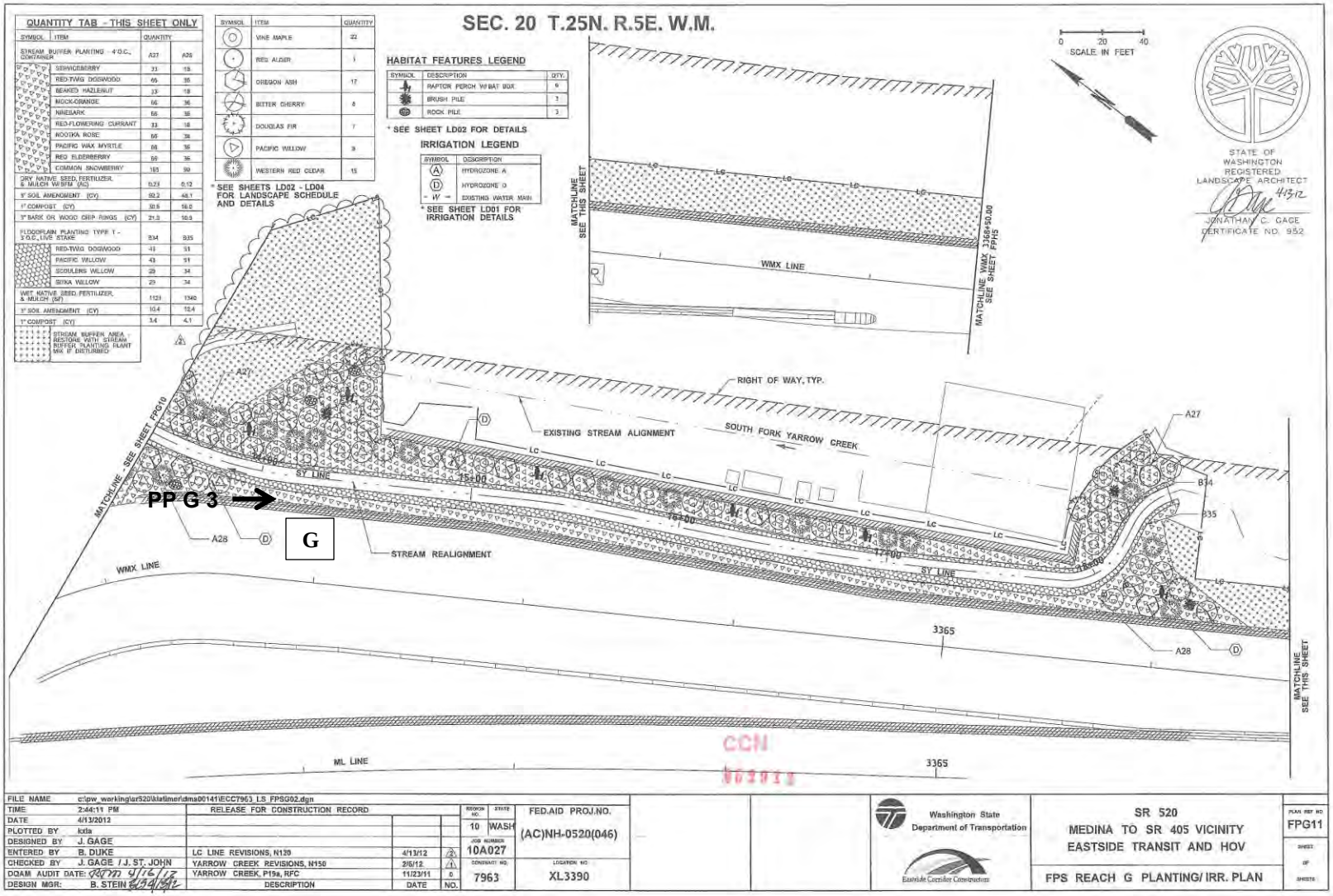
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QUANTITY TAB - THIS SHEET ONLY
HABITAT FEATURES LEGEND
IRRIGATION LEGEND
SCALE IN FEET
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
JONATHAN C. GAGE CERTIFICATE NO. 952
RIGHT OF WAY, TYP.
EXISTING STREAM ALIGNMENT
SOUTH FORK YARROW CREEK
STREAM REALIGNMENT
WMX LINE
SY LINE
ML LINE
MATCHLINE SEE THIS SHEET
MATCHLINE - SEE SHEET FPG10
PP G 3
G
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ENTERED BY B. DUKE
CHECKED BY J. GAGE / J. ST. JOHN
DESIGN MGR: B. STEIN
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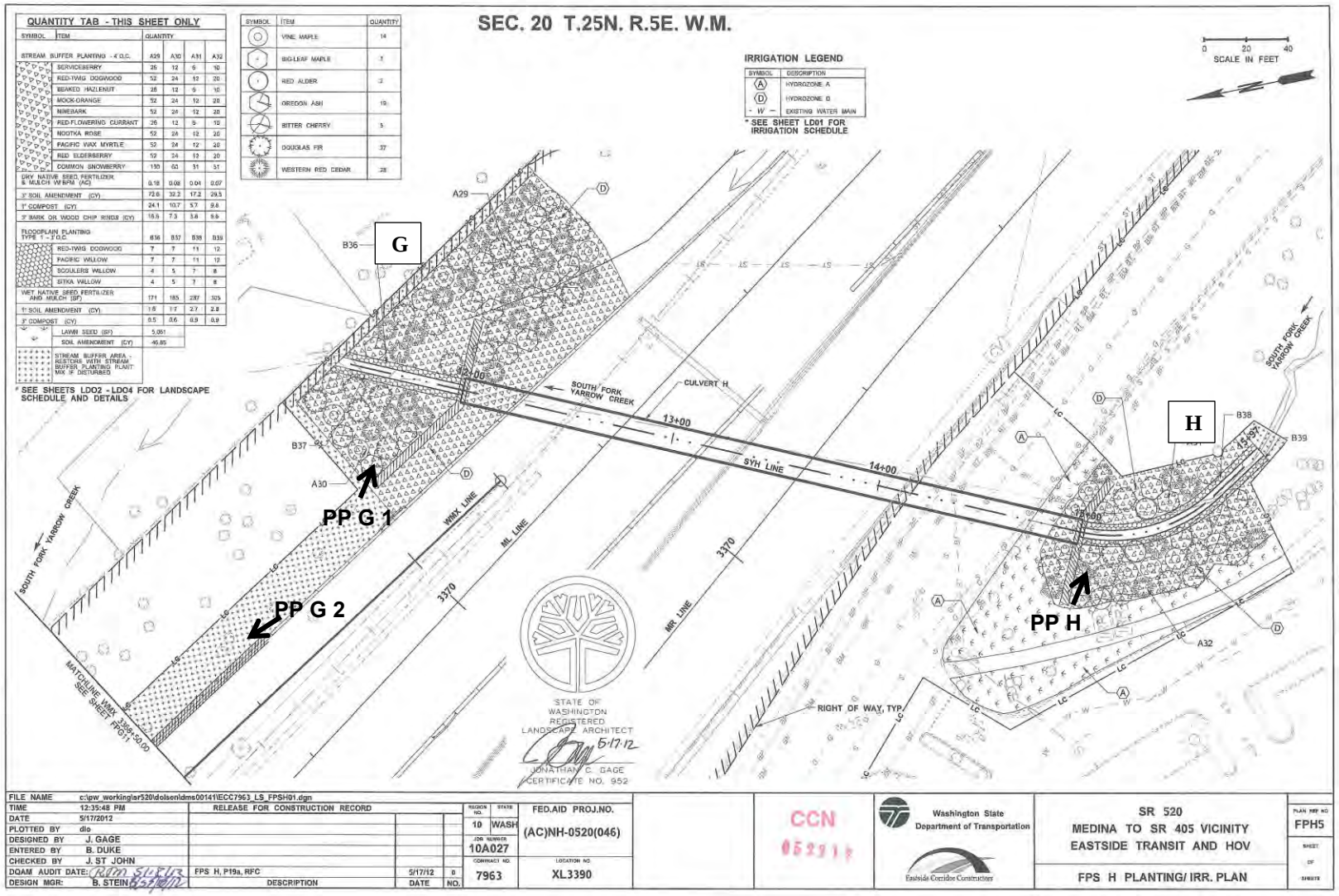
LC LINE REVISIONS, N120 4/13/12
YARROW CREEK REVISIONS, N150 2/5/12
YARROW CREEK, P19a, RFC 11/23/11
DESCRIPTION DATE NO.
FED.AID PROJ.NO. (AC)NH-0520(046)
XL3390
Washington State Department of Transportation
Eastside Corridor Consortium
SR 520
MEDINA TO SR 405 VICINITY
EASTSIDE TRANSIT AND HOV
FPS REACH G PLANTING/ IRR. PLAN
FPG11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QUANTITY TAB - THIS SHEET ONLY
SYMBOL ITEM QUANTITY
STREAM BUFFER PLANTING - 4' O.C. A29 A30 A31 A32
SERVICEBERRY 26 12 6 10
RED-TWIG DOGWOOD 52 24 12 20
BEAKED HAZELNUT 26 12 6 10
MOCK-ORANGE 52 24 12 20
NINEBARK 52 24 12 20
RED-FLOWERING CURRANT 26 12 6 10
NOOTKA ROSE 52 24 12 20
PACIFIC WAX MYRTLE 52 24 12 20
RED ELDERBERRY 52 24 12 20
COMMON SNOWBERRY 130 60 31 51
DRY NATIVE SEED, FERTILIZER & MULCH W/BFM (AC) 0.18 0.08 0.04 0.07
3" SOIL AMENDMENT (CY) 72.6 32.2 17.2 29.5
1" COMPOST (CY) 24.1 10.7 5.7 9.8
3" BARK OR WOOD CHIP RINGS (CY) 16.5 7.3 3.8 5.9
FLOODPLAIN PLANTING TYPE 1 - 2' O.C. 836 857 838 839
RED-TWIG DOGWOOD 7 7 11 12
PACIFIC WILLOW 7 7 11 12
SCOULER'S WILLOW 4 5 7 8
SITKA WILLOW 4 5 7 8
WET NATIVE SEED, FERTILIZER AND MULCH (SF) 171 185 287 305
1" SOIL AMENDMENT (CY) 1.6 1.7 2.7 2.8
3" COMPOST (CY) 0.5 0.6 0.9 0.9
LAWN SEED (SF) 5,051
SOIL AMENDMENT (CY) 46.85
STREAM BUFFER AREA - RESTORE WITH STREAM BUFFER PLANTING PLANT MIX IF DISTURBED
* SEE SHEETS LD02 - LD04 FOR LANDSCAPE SCHEDULE AND DETAILS
SYMBOL ITEM QUANTITY
VINE MAPLE 14
BIG-LEAF MAPLE 3
RED ALDER 2
OREGON ASH 19
BITTER CHERRY 5
DOUGLAS FIR 37
WESTERN RED CEDAR 28
IRRIGATION LEGEND
SYMBOL DESCRIPTION
A HYDROZONE A
D HYDROZONE D
W EXISTING WATER MAIN
* SEE SHEET LD01 FOR IRRIGATION SCHEDULE
0 20 40
SCALE IN FEET
G
H
PP G 1
PP G 2
PP H
A29
B36
B37
A30
B38
B39
A32
SOUTH FORK YARROW CREEK
CULVERT H
13+00
14+00
15+00
12+00
SYH LINE
WMX LINE
ML LINE
MR LINE
3370
RIGHT OF WAY, TYP.
MATCHLINE WMX SEE SHEET FPG11
STATE OF WASHINGTON REGISTERED LANDSCAPE ARCHITECT
JONATHAN C. GAGE
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CHECKED BY J. ST JOHN
DQAM AUDIT DATE:
DESIGN MGR: B. STEIN
RELEASE FOR CONSTRUCTION RECORD
FPS H, P19a, RFC 5/17/12 0
DESCRIPTION DATE NO.
REGION NO. 10 STATE WASH
FED.AID PROJ.NO. (AC)NH-0520(046)
JOB NUMBER 10A027
CONTRACT NO. 7963
LOCATION NO. XL3390
CCN 052911
Washington State Department of Transportation
Eastside Corridor Constructors
SR 520
MEDINA TO SR 405 VICINITY
EASTSIDE TRANSIT AND HOV
FPS H PLANTING/ IRR. PLAN
PLAN REF NO FPH5
SHEET OF SHEETS

Appendix 2 – Photo Points

The photographs below were taken from permanent photo-points on August 10 and 11, 2015 and document current site development.

Photo Point A Downstream

Photo Point A Upstream 1

Photo Point A Upstream 2

Photo Point A Upstream 3

Photo Point B Downstream 1

Photo Point B Downstream 2

Photo Point B Upstream 1

Photo Point B Upstream 2

Photo Point C Downstream

Photo Point C Upstream 1

Photo Point C Upstream 2

Photo Point D Downstream

Photo Point D Upstream 1

Photo Point D Upstream 2

Photo Point G 1

Photo Point G 2

Photo Point G 3

Photo Point H

Driving Directions:

Culvert A upstream and downstream (walk through culvert to access both planting areas)
From I-5, take exit 127 to merge onto WA-512 East toward Puyallup. Merge onto WA-167 North toward WA-410 East/Seattle/Yakima. Merge onto I-405 North toward Bellevue/Everett. Take Exit 14 for WA-520 toward Redmond East/Seattle West. Keep left at the fork and follow signs for 520 West and merge onto Highway 520 West/WA-520 West. Take the 92nd Avenue Northeast exit. At the traffic circle, take the fourth exit onto 92nd Avenue Northeast. Turn right onto Northeast 24th Street. Turn right onto Evergreen Point Road. Turn right onto Northeast 32nd Street. Turn right to stay on Northeast 32nd Street. Turn right onto 80th Avenue Northeast.

Culvert B upstream and downstream (walk through culvert to access both planting areas)
From I-5, take Exit 154 to merge onto I-405 North toward Renton. Take Exit 14 for WA-520 toward Renton East/Seattle West. Keep left at the fork and follow signs for 520 West and merge onto Highway 520 West/WA-520 West. Take the 92nd Avenue Northeast exit. At the traffic circle, take the fourth exit onto 92nd Avenue Northeast. Turn right onto Points Drive Northeast. Turn right onto 88th Avenue Northeast.

Culvert C upstream and downstream (walk through culvert to access both planting areas) and Culvert D upstream and downstream (walk bike trail to access both planting areas)
From I-5, take exit 154 to merge onto I-405 North toward Renton. Take Exit 14 for WA-520 toward Redmond East/Seattle West. Keep left at the fork and follow signs for 520 West. Merge onto Highway 520 West/WA-520 West. Take the 108th Avenue Northeast exit. Turn right onto 108th Avenue Northeast. Turn left onto Northup Way. Continue straight onto Northeast Points Drive.

Culvert H upstream
From I-5, take exit 154 to merge onto I-405 North toward Renton. Take Exit 14 for WA-520 toward Redmond East/Seattle West. Keep left at the fork and follow signs for 520 West. Merge onto Highway 520 West/WA-520 West. Take the 108th Avenue Northeast exit. Turn left onto 108th Avenue Northeast. Continue onto 112th Avenue Northeast. After 0.1mi, turn right. After 85ft, turn left and keep left.

Culvert H downstream (walk through culvert to access planting area F and wetland site)
From I-5, take exit 154 to merge onto I-405 North toward Renton. Take Exit 14 for WA-520 toward Redmond East/Seattle West. Keep left at the fork and follow signs for 520 West. Merge onto Highway 520 West/WA-520 West. Take the 108th Avenue Northeast exit. Turn right onto 108th Avenue Northeast.

Appendix 3 – Data Tables

Table 1. Percent Survival of Installed Native Trees and Shrubs in Each Planting Area

Planting Area	Survival
A Downstream	94%
A Upstream	98%
B Downstream	98%
B Upstream	90%
C DownStream	96%
C Upstream	97%
D DownStream	93%
D Upstream	97%
F	98%
G	95%
H	98%

Literature Cited

1. [USACE] US Army Corps of Engineers. 2011. Department of the Army Individual Permit Number NWS-2009-562.

2. [WSDOT] Washington State Department of Transportation. 2012. Medina to SR 202: Eastside Transit and HOV Project Final Wetland Mitigation Report Evans Creek Mitigation Site Addendum. Seattle (WA): Washington State Department of Transportation, Northwest Region.

3. [WSDOT] Washington State Department of Transportation. 2008. WSDOT Wetland Mitigation Site Monitoring Methods. http://www.wsdot.wa.gov/NR/rdonlyres/C211AB59-D5A2-4AA2-8A76-3D9A77E01203/0/MethodsWhitePaper052004.pdf