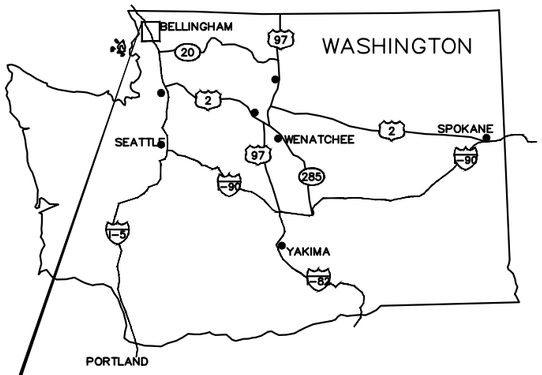
CITY OF BELLINGHAM, PUBLIC WORKS DEPARTMENT

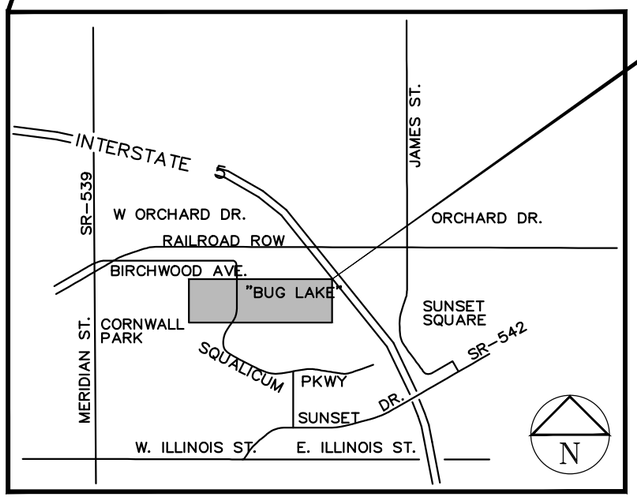
SQUALICUM CREEK RE-ROUTE PROJECT

PHASES 3 & 4

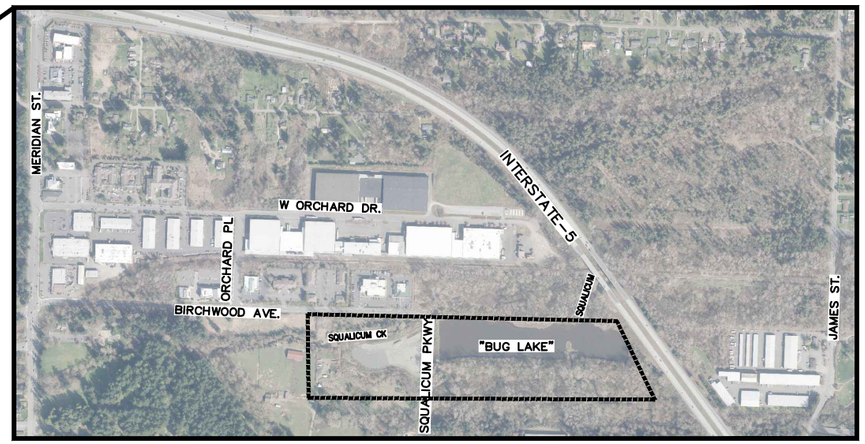
AS-BUILT DRAWINGS

EV-0148 & EV-0156





VICINITY MAP
NOT TO SCALE



PROJECT LOCATION

COORDINATES:
LATITUDE 48.776 (48°46'35"N)
LONGITUDE −122.461
(122°27'41"W)

SECTION 17; TOWNSHIP 48N;
RANGE 3E

WATERBODY: SQUALICUM CREEK
TRIBUTARY OF: BELLINGHAM BAY

SHEET INDEX

RECORD DRAWING CERTIFICATION

THIS DRAWING REFLECTS THE WORK AS CONSTRUCTED AND ALL MODIFICATIONS MEET THE PERFORMANCE STANDARDS OF THE ORIGINAL DESIGN.

ENGINEER OF RECORD: MICHAEL MCALLISTER, PE 38189
DATE MAY 9, 2021

CALL BEFORE YOU DIG
Call: TOLL FREE
1–800–424–5555

FUNDING PARTNERS:

EPA United States Environmental Protection Agency

DEPARTMENT OF ECOLOGY State of Washington

BRIAN ABBOTT FISH BARRIER REMOVAL BOARD

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CITY OF BELLINGHAM, PUBLIC WORKS DEPT.
104 W. MAGNOLIA STREET
BELLINGHAM, WA 98225
360.778.7900

Date	No	Revision	By
	4		
	3		
	2		
	1		

PROJECT ENGINEER MM
DESIGNED/DRAWN DF
INSPECTOR ----

DIRECTOR PUBLIC WORKS T.A.C.
CITY ENGINEER C.M.A.S.
ASSISTANT DIRECTOR R.L.

CITY OF BELLINGHAM, WASHINGTON
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

SCALE
Horiz. SHOWN
Vert. SHOWN

DATUM
NAD83/98-NAVD88

Job. No. EV-0148/EV-0156
Date 04/25/20
Field Bk. ____

SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
COVER SHEET, VICINITY MAPS, SHEET INDEX

SHEET 1 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900

THE CONTRACTOR SHALL ATTEND PRECONSTRUCTION CONFERENCES WITH THE CITY OF BELLINGHAM PRIOR TO BEGINNING CONSTRUCTION.

ALL WORK SHALL CONFORM TO THE CURRENT EDITIONS OF STANDARD PLANS AND SPECIFICATIONS OF THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (WSDOT), AND CITY OF BELLINGHAM STANDARDS UNLESS INDICATED OTHERWISE BY THE CONTRACT DOCUMENTS. IN CASE OF A CONFLICT BETWEEN THE REGULATORY STANDARDS OR SPECIFICATIONS, THE MORE STRINGENT WILL PREVAIL.

PROTECTION OF THE ENVIRONMENT: NO CONSTRUCTION RELATED ACTIVITY SHALL CONTRIBUTE TO THE DEGRADATION OF THE ENVIRONMENT, ALLOW MATERIAL TO ENTER SURFACE OR GROUND WATERS, OR ALLOW PARTICULATE EMISSIONS TO THE ATMOSPHERE, WHICH EXCEED STATE OR FEDERAL STANDARDS. ANY ACTIONS THAT POTENTIALLY ALLOW A DISCHARGE TO STATE WATERS MUST HAVE PRIOR APPROVAL OF THE WASHINGTON STATE DEPARTMENT OF ECOLOGY.

IN-WATER WORK PERIODS

IN-WATER WORK SHALL OCCUR DURING THE PERMITTED WORK PERIOD STATED IN THE HYDRAULIC PROJECT APPROVAL AND NATIONWIDE PERMIT: JULY 15 THROUGH SEPTEMBER 30. SEE HPA IN APPENDIX OF SPECIFICATIONS DOCUMENT.

EXISTING DATA

ELEVATIONS ARE RELATIVE TO CITY OF BELLINGHAM DATUM (NAVD88).

UTILITIES

UNDERGROUND UTILITIES ARE KNOWN TO EXIST IN THE AREA OF CONSTRUCTION. THE LOCATION OF EXISTING UTILITIES SHOWN IS APPROXIMATE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT ALL UTILITY OWNERS FOR LOCATIONS AND TO FIELD VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION. THE ONE-CALL NUMBER FOR UNDERGROUND UTILITIES IS 1-800-424-5555.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE INTEGRITY OF ALL EXISTING UTILITIES THROUGHOUT CONSTRUCTION.

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROMPTLY NOTIFY THE CITY OF ANY CONFLICT WITH EXISTING UTILITIES.

ALL EXISTING FACILITIES, LANDSCAPE IMPROVEMENTS, AND UTILITIES NOT SPECIFICALLY IDENTIFIED FOR REMOVAL SHALL BE PROTECTED THROUGHOUT CONSTRUCTION OR RESTORED AT COMPLETION OF THE WORK.

SOILS

SURFACE AND SUBSURFACE CONDITIONS WERE EXPLORED AND SAMPLED BY GEO-ENGINEERS, INC.. RESULTS INCLUDING SOIL CHARACTERIZATION AND GROUNDWATER LEVELS, SOIL REPORTS ARE ATTACHED TO THE PROJECT SPECIFICATIONS.

CONSTRUCTION ACCESS/TRAFFIC CONTROL

THE CONTRACTOR SHALL PROVIDE A TRAFFIC CONTROL PLAN TO THE CITY FOR REVIEW. CONSTRUCTION SHALL NOT COMMENCE UNTIL APPROVAL. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR IMPLEMENTING REQUIRED TRAFFIC CONTROL AS REVIEWED AND APPROVED BY OWNER'S REPRESENTATIVE.

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROVIDING ALL REQUIRED TRAFFIC CONTROL INCLUDING, BUT NOT LIMITED TO, SIGNAGE AND FLAGGERS.

ALL EQUIPMENT, MATERIALS AND PERSONNEL SHALL REMAIN WITHIN THE LIMITS OF DISTURBANCE.

THE CONTRACTOR SHALL KEEP THE WORK AREAS IN A CLEAN AND NEAT CONDITION FREE OF DEBRIS AND LITTER FOR THE DURATION OF THE PROJECT.

ALL AFFECTED AREAS INCLUDING ROADS AND ACCESS ROUTES SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER.

ALL DISTURBED AREAS OUTSIDE THE LIMITS OF DISTURBANCE SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER AT NO COST TO THE OWNER.

CONSTRUCTION STAKING

CONTRACTOR SHALL PROVIDE STAKING OF PROJECT LIMITS, CHANNEL CENTERLINE, EXTENTS OF FILL AREAS.

CONTRACTOR SHALL MEET WITH THE OWNER'S REPRESENTATIVE TO DEFINE AND MARK LIMITS OF DISTURBANCE PRIOR TO MOBILIZATION OF EQUIPMENT OR MATERIALS ONTO THE SITE.

THE CONTRACTOR SHALL REPLACE DAMAGED OR DESTROYED CONSTRUCTION STAKES AT NO COST TO THE OWNER.

CONSTRUCTION MATERIALS

EARTHWORK VOLUMES ARE THE DIFFERENCE BETWEEN DESIGN GROUND AND SURVEYED GROUND.
LOCATION, ALIGNMENT, SIZE, AND ELEVATION OF LOGS AND LOGS WITH ROOT WADS ARE SUBJECT TO CHANGE BASED ON FIELD CONDITIONS, AND MATERIAL SIZE.

ANY EXCESS MATERIALS SHALL BE STOCKPILED NEATLY WITHIN THE LIMITS OF DISTURBANCE OR OTHER APPROVED STOCKPILE AREA. THE MATERIAL SHALL BE REMOVED FROM THE SITE PRIOR TO THE COMPLETION OF WORK.

CONSTRUCTION DEWATERING

CONTRACTOR SHALL PERFORM CONSTRUCTION DEWATERING IN SUCH A MANNER AS TO PREVENT THE RELEASE OF SEDIMENT-LADEN WATER TO SURFACE WATERS. SEDIMENT LADEN WATER MAY BE ALLOWED TO SHEET FLOW THROUGH NON-WETLAND FORESTED AREAS BEFORE INFILTRATING INTO THE GROUND. THIS METHOD IS TYPICALLY USED WHERE THE THREAT TO FISH HABITATS IS SMALL, USUALLY AWAY FROM STREAMS. IN MORE SENSITIVE ENVIRONMENTS, A 'DIRT-BAG' OR SEDIMENT RETENTION STRUCTURE SHALL BE REQUIRED.

THE CONTRACTOR IS ADVISED THAT THE PROJECT AREA DRAINS TO A SALMON BEARING STREAM AND/OR STATE WATERS AND THAT THE CONTRACTOR IS RESPONSIBLE TO PROTECT THE RECEIVING WATERS FROM DELETERIOUS EFFECTS OF CONSTRUCTION.

THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE EROSION CONTROL MEASURES SHOWN OR DESCRIBED IN THE CONTRACT DOCUMENTS AND ANY ADDITIONAL MEASURES THAT MAY BE REQUIRED BY THE CONTRACTORS MEANS AND METHODS OF CONSTRUCTION AS NEEDED TO CONTROL EROSION AND SEDIMENT AT THE CONSTRUCTION SITE AND TO PREVENT VIOLATION OF SURFACE WATER QUALITY, GROUND WATER QUALITY, OR SEDIMENT MANAGEMENT STANDARDS.

VEHICLE OPERATIONS AND STAGING

VEHICLE CLEANING, MAINTENANCE, REFUELING, AND FUEL STORAGE SHALL OCCUR IN DESIGNATED STAGING AREAS THAT ARE 100 FEET OR MORE FROM ANY STREAM, WATER BODY OR WETLAND.

THE CONTRACTOR SHALL DIAPER ALL STATIONARY POWER EQUIPMENT (I.E. GENERATORS, PUMPS, CRANES) OPERATED WITHIN 100 FEET OF ANY STREAM, WATER BODY OR WETLAND TO PREVENT LEAKS, UNLESS SUITABLE CONTAINMENT IS PROVIDED TO PREVENT POTENTIAL SPILLS FROM ENTERING ANY STREAM OR WATER BODY.

THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING A SPILL CONTAINMENT AND CONTROL PLAN WITH NOTIFICATION PROCEDURES. SPECIFIC CLEANUP AND DISPOSAL INSTRUCTIONS FOR DIFFERENT PRODUCTS. THE CONTRACTOR SHALL STAGE QUICK RESPONSE CONTAINMENT AND CLEANUP MEASURES ON THE SITE, ALONG WITH PERSONEL TRAINED IN PROPOSED METHODS FOR DISPOSAL OF SPILLED MATERIALS AND SPILL CONTAINMENT.

CONTRACTOR SHALL INSPECT ALL VEHICLES OPERATED WITHIN 150 FEET OF ANY STREAM, WATER BODY OR WETLAND DAILY FOR FLUID LEAKS BEFORE LEAVING THE VEHICLE STAGING AREA. REPAIR ANY LEAKS DETECTED IN THE VEHICLE STAGING AREA BEFORE THE VEHICLE RESUMES OPERATION. DOCUMENT INSPECTIONS IN A RECORD THAT IS AVAILABLE FOR REVIEW UPON REQUEST.

BEFORE OPERATIONS BEGIN AND AS OFTEN AS NECESSARY DURING OPERATION, PRESSURE WASH ALL EQUIPMENT THAT WILL BE USED BELOW BANKFULL ELEVATION UNTIL ALL VISIBLE EXTERNAL OIL, GREASE, MUD, AND OTHER VISIBLE CONTAMINANTS ARE REMOVED.

WHEN TRUCKING SATURATED SOILS FROM THE SITE, WATERTIGHT TRUCKS MUST BE USED, OR LOADS SHALL BE DRAINED ON-SITE SO THAT WATER SEEPING FROM THE SOIL CANNOT DRAIN FROM THE VEHICLE. ALL VEHICLES LEAVING THE SITE SHALL HAVE TIRES CLEANED AT A TRUCK WASHING STATION.

STABILIZED CONSTRUCTION ENTRANCE (EXIT) AND TIRE WASH SHALL BE INSTALLED AT EACH LOCATION WHERE HIGHWAY HAULERS WILL LEAVE THE SITE ONTO PAVED ROADS.
EROSION CONTROL

PUBLIC RIGHTS OF WAY ARE TO BE KEPT IN A CLEAN AND SERVICEABLE CONDITION AT ALL TIMES. IN THE EVENT MATERIALS ARE INADVERTENTLY DEPOSITED ON ROADWAYS IT SHALL BE REMOVED PROMPTLY. MATERIALS SHALL BE SWEPT AND REMOVED PRIOR TO ANY STREET FLUSHING. PUBLIC AND PRIVATE DRAINAGE AND WATER WAYS ARE TO BE PROTECTED FROM POLLUTION.

CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND MAINTAINING ALL NECESSARY EROSION CONTROL FACILITIES TO COMPLY WITH APPLICABLE EROSION CONTROL REGULATIONS.

THE CONTRACTOR SHALL ENSURE THAT MATERIALS FOR EMERGENCY EROSION CONTROL ARE ONSITE, INCLUDING BUT NOT LIMITED TO: SEDIMENT CONTROL MATERIALS (I.E. SILT FENCE, STRAW BALES, STRAW WATTLES, DIRT BAGS); AN OIL-ABSORBING, FLOATING BOOM WHENEVER FLOWING SURFACE WATER IS PRESENT.

THE CONTRACTOR SHALL IMPLEMENT MEASURES TO CONTROL AND MINIMIZE WIND-BLOWN DUST FROM THE SITE.

THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR PROVIDING EROSION, SEDIMENT, AND POLLUTION CONTROL MEASURES TO COMPLY WITH ALL APPLICABLE REGULATIONS. NOTICE TO PROCEED WILL NOT BE ISSUED UNTIL THE CONTRACTOR OBTAINS AN APPROVED ESC PLAN.

THE CONTRACTOR SHALL SUBMIT NAME, ADDRESS AND 24-HOUR PHONE NUMBER OF PERSON RESPONSIBLE FOR EROSION PREVENTION AND SEDIMENT CONTROL MEASURES, AND SPILL CONTAINMENT.

THE IMPLEMENTATION OF EROSION, SEDIMENT, AND POLLUTION CONTROL MEASURES AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED, AND VEGETATION IS ESTABLISHED.

THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN WILL BE FLAGGED IN THE FIELD PRIOR TO CONSTRUCTION BY THE OWNER'S REPRESENTATIVE. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE FLAGGED CLEARING LIMITS SHALL BE PERMITTED. THE FLAGGING SHALL BE MAINTAINED BY THE CONTRACTOR FOR THE DURATION OF CONSTRUCTION.

EROSION, SEDIMENT, AND POLLUTION CONTROL MEASURES MUST BE IMPLEMENTED PRIOR TO ANY GROUND DISTURBING ACTIVITY ON THE PROJECT SITE, AND IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DO NOT LEAVE THE PROJECT SITE, ENTER THE DRAINAGE SYSTEM OR ROADWAYS, OR VIOLATE APPLICABLE WATER STANDARDS.

DURING THE CONSTRUCTION PERIOD, EROSION, SEDIMENT, AND POLLUTION CONTROL MEASURES SHALL BE UPGRADED AS NEEDED FOR STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE.

DURING CONSTRUCTION, THE CONTRACTOR SHALL MONITOR INSTREAM TURBIDITY AND INSPECT ALL EROSION CONTROLS DAILY DURING THE RAINY SEASON AND WEEKLY DURING THE DRY SEASON, OR MORE OFTEN AS NECESSARY, TO ENSURE THE EROSION CONTROLS ARE WORKING ADEQUATELY. IF MONITORING OR INSPECTION SHOWS THAT THE EROSION CONTROLS ARE INEFFECTIVE, MOBILIZE WORK CREWS IMMEDIATELY TO MAKE REPAIRS, INSTALL REPLACEMENTS, OR INSTALL ADDITIONAL CONTROLS AS NECESSARY. THE CONTRACTOR SHALL REMOVE SEDIMENT FROM EROSION CONTROLS ONCE IT HAS REACHED 1/3 OF THE EXPOSED HEIGHT OF THE CONTROL.

A STABILIZED TEMPORARY CONSTRUCTION EXIT IS REQUIRED AT THE EACH CONSTRUCTION ACCESS POINT FROM THE STREET. THE FACILITY SHALL BE MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO ENSURE THAT STREETS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.

FROM MAY 1 – SEPT 30 NO SUBSTANTIALLY UNWORKED SOILS SHALL REMAIN EXPOSED FOR MORE THAN SEVEN DAYS AT A TIME.

IN-CHANNEL WORK

SEE SEQUENCE, SHEET 7, FOR IN-CHANNEL WORK, AND TEMPORARY DAMS AND PUMPING SCHEME.

DEWATERING OF IN-CHANNEL WORK AREAS SHALL OCCUR CONCURRENT WITH FISH RESCUE. CONTRACTOR SHALL COORDINATE WITH THE CITY TO SCHEDULE WASHINGTON CONSERVATION CORP (WCC) FOR FISH RESCUE (MON-THUR). CONTRACTOR SHALL PROVIDE CITY 10 WORKING DAYS ADVANCED NOTICE TO SCHEDULE FISH RESCUE. UP TO 10 INDIVIDUALS WILL BE MADE AVAILABLE FOR FISH SALVAGE. IF CONTRACTOR REQUIRES MORE THAN 10, THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ADDITIONAL QUALIFIED PERSONNEL. IF DIVERSION FAILS DUE TO CONTRACTOR NEGLIGENCE, FISH RESCUE SHALL BE REPEATED BY CITY AT CONTRACTOR'S EXPENSE.

IF ADDITIONAL PUMPING IS REQUIRED TO DEWATER DURING CONSTRUCTION, PUMPED DISCHARGE SHALL RELEASE SEDIMENT-LADEN WATER IN A MANNER THAT DOES NOT CAUSE CONTAMINATION OR INCREASE TURBIDITY OF SURFACE WATERS. (SEE CONTROL DEWATERING).

PUMPS SHALL CONFORM TO LOCAL CODES FOR NOISE STANDARDS. PUMPS SHALL RUN 24 HRS PER DAY UNTIL CONSTRUCTION IS COMPLETED. CONTRACTOR SHALL PROVIDE BACK UP PUMPS. PUMP INTAKE SCREENS SHALL MEET NMFS CRITERIA. SEE http://swr.nmfs.noaa.gov/hcd/pumpcrit.htm

FISH RESCUE

FISH BARRIERS SHALL BE PROVIDED, INSTALLED, AND MAINTAINED BY THE CONTRACTOR.

CONTRACTOR SHALL PROVIDE SCREENED PUMPS FOR FISH RESCUE AND DEWATERING.

INITIAL CHANNEL DEWATERING SHALL OCCUR SLOWLY BY INCREMENTALLY REDUCING STREAM FLOWS OVER A PERIOD OF 30 MINUTES TO ALLOW TIME FOR FISH TO VOLITIONALLY MOVE DOWNSTREAM OR FIND RESIDUAL POOLS WITHOUT RISK OF SUDDEN STRANDING.

RESIDUAL POOLS WITHIN THE DEWATERED CONSTRUCTION SITE SHALL BE PUMPED DRY USING SCREENED PUMP INTAKES. VELOCITY THROUGH SCREEN SHALL BE LESS THAN 0.4 FEET PER SECOND. RESIDUAL DEWATERING PUMP INTAKES SHALL ADHERE TO NMFS SCREENING CRITERIA. NATIONAL MARINE FISHERIES SERVICE JUVENILE FISH SCREEN CRITERIA (REVISED FEBRUARY 16, 1995) AND ADDENDUM: JUVENILE FISH SCREEN CRITERIA FOR PUMP INTAKES (MAY 9, 1996). SEE http://swr.nmfs.noaa.gov/hcd/pumpcrit.htm

FISH RESCUE TO BE PERFORMED BY CITY IN PART THROUGH COORDINATION WITH WASHINGTON CONSERVATION CORPS CREWS.

CAUTION!!!
OVERHEAD AND UNDERGROUND UTILITIES ARE KNOWN TO EXIST IN AREA. NOT ALL ARE SHOWN IN PLANS.

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ABBREVIATIONS

APPROX	APPROXIMATE
CFS	CUBIC FEET PER SECOND
GPM	GALLONS PER MINUTE
LBS	POUNDS
MIN	MINIMUM
MAX	MAXIMUM
FT	FEET
LF	LINEAR FEET
SF	SQUARE FEET
SY	SQUARE YARDS
CY	CUBIC YARDS
AC	ACRES
OC	ON CENTER
PLS	PURE LIVE SEED
CL	CENTERLINE
XS	CROSS SECTION
AVE	AVERAGE OR AVENUE
ST	STREET
NTS	NOT TO SCALE
CS	CONTROL SUVERY
CSRPC	CONTROL SURVEY RED PLASTIC CAP
DISC	SURFACE MONUMENT DISC
CSHT	CHECK SHOT
LT	LEFT
RT	RIGHT
N	NORTHING
E	EASTING
PI	POINT OF INTERSECTION
PVI	POINT OF VERTICAL INTERSECTION
PC	POINT OF CURVATURE
PT	POINT OF TANGENCY
SSMH	SANITARY SEWER MANHOLE
TRIB	TRIBUTARY
LWM	LARGE WOODY MATERIAL
OHW	ORDINARY HIGH WATER
WS	WATER SURFACE
RR	RAILROAD
NB	NORTHBOUND
SB	SOUTHBOUND
CNG	CASCADE NATURAL GAS
HVF	HIGH VISIBILITY FENCE
TESC	TEMPORARY EROSION AND SEDIMENT CONTROL
SWPPP	STORMWATER POLLUTION PREVENTION PLAN
COB	CITY OF BELLINGHAM
WCC	WASHINGTON CONSERVATION CORPS
WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORATION
B2B	BAY TO BAKER
PSE	Pacific Surveying & Engineering
TYP	TYPICAL
EL	ELEVATION
IE	INVERT ELEVATION
REINF	REINFORCED
CONC	CONCRETE
EXIST	EXISTING

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MICHAEL R. McALLISTER STATE OF WASHINGTON 38189 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 09-25-2020

Date	No	Revision	By
	4		
	3		
	2		
	1		

PROJECT ENGINEER MM
DESIGNED/DRAWN DF
INSPECTOR ---

DIRECTOR PUBLIC WORKS T.A.C.
CITY ENGINEER C.M.A.S.
ASSISTANT DIRECTOR R.L.

CITY OF BELLINGHAM, WASHINGTON
PUBLIC WORKS DEPARTMENT
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Job. No. ---
Date 04/25/20
Field Bk. ---

SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
GENERAL NOTES

SHEET 2 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900

STORMWATER POLLUTION PREVENTION PLAN (SWPPP):

THE CONTRACTOR IS ADVISED THAT THE PROJECT AREA DRAINS TO A SALMON BEARING STREAM AND/OR STATE WATERS AND THAT THE CONTRACTOR IS RESPONSIBLE TO PROTECT THE RECEIVING WATERS FROM DELETERIOUS EFFECTS OF CONSTRUCTION.

THE OWNER HAS PREPARED THIS SWPPP. CONTRACTOR IS REQUIRED TO HAVE A COPY OF THE SWPPP ON SITE AT ALL TIMES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPORTING, INSTALLING, MAINTAINING, REPLACING, SUBSTITUTING, AND REMOVING BMP'S.

THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE EROSION CONTROL MEASURES SHOWN OR DESCRIBED IN THE CONTRACT DOCUMENTS AND ANY ADDITIONAL MEASURES THAT MAY BE REQUIRED BY THE CONTRACTORS MEANS AND METHODS OF CONSTRUCTION AS NEEDED TO CONTROL EROSION AND SEDIMENT AT THE CONSTRUCTION SITE AND TO PREVENT VIOLATION OF SURFACE WATER QUALITY, GROUND WATER QUALITY, OR SEDIMENT MANAGEMENT STANDARDS. EROSION CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE COURSE OF CONSTRUCTION AND UNTIL ALL DISTURBED EARTH IS STABILIZED IN FINISH GRADES.

CONTRACTOR'S TESC RECORD

WEEKLY REPORTS SUMMARIZING THE SCOPE OF INSPECTIONS, THE PERSONNEL CONDUCTING THE INSPECTION, THE DATE(S) OF THE INSPECTION, MAJOR OBSERVATIONS RELATING TO THE IMPLEMENTATION OF THIS SWPPP, AND ACTIONS TAKEN AS A RESULT OF THESE INSPECTIONS SHALL BE PREPARED AND RETAINED ON SITE BY THE CONTRACTOR. IN ADDITION, A RECORD OF THE FOLLOWING DATES SHALL BE INCLUDED IN THE REPORTS:

1. WHEN MAJOR GRADING ACTIVITIES OCCUR,
2. DATES OF RAINFALL EVENTS EITHER EXCEEDING 2 HOURS DURATION OR MORE THAN 0.5 INCHES/24 HOURS,
3. WHEN CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON SITE, OR ON A PORTION OF THE SITE,
4. WHEN STABILIZATION MEASURES ARE INITIATED FOR PORTIONS OF THE SITE.

SWPPP REQUIRED REPORTS SHALL BE MADE AVAILABLE TO THE OWNER AND ENGINEER ON REQUEST AND SHALL BE PROVIDED FOR REVIEW AND APPROVAL PRIOR TO APPLICATION FOR PAYMENT.

1. CLEARING LIMITS

CONSTRUCTION SHALL NOT BEGIN UNTIL AFTER CLEARING LIMITS, SENSITIVE AREAS, AND TREES TO BE PRESERVED HAVE BEEN DELINEATED IN THE FIELD BY THE ENGINEER OR OWNER.

2. CONSTRUCTION ACCESS

WHEN POSSIBLE, LIMIT CONSTRUCTION VEHICLE ACCESS AND EXIT TO ONE ROUTE. ALL ACCESS/EXIT POINTS SHALL BE STABILIZED WITH QUARRY SPALLS IN CONFORMANCE WITH THE STABILIZED CONSTRUCTION EXIT DETAIL. CONSTRUCTION ACCESS RESTORATION SHALL BE EQUAL TO OR BETTER THAN THE PRECONSTRUCTION CONDITION.

PUBLIC RIGHTS-OF-WAY SHALL BE KEPT IN A CLEAN AND SERVICEABLE CONDITION AT ALL TIMES. IN THE EVENT MATERIALS ARE INADVERTENTLY DEPOSITED ON ROADWAYS THE MATERIAL SHALL BE PROMPTLY REMOVED. MATERIALS ARE TO BE SWEPT AND REMOVED PRIOR TO ANY STREET FLUSHING.

3. CONTROL FLOW RATES

THIS PROJECT WILL NOT INCREASE RUNOFF VOLUME, VELOCITY, OR PEAK FLOW RATE OF STORMWATER.

4. SEDIMENT CONTROLS

THE DUFF LAYER, NATIVE TOP SOIL, AND NATURAL VEGETATION SHALL BE RETAINED IN AN UNDISTURBED STATE TO THE MAXIMUM EXTENT PRACTICABLE. THE CONTRACTOR SHALL MARK ALL AREAS WHICH ARE NOT TO BE DISTURBED, INCLUDING SETBACKS, SENSITIVE/CRITICAL AREAS AND THEIR BUFFERS. TREES AND DRAINAGE COURSES NOT TO BE DISTURBED SHALL BE MARKED AND FLAGGED BEFORE CONSTRUCTION ACTIVITIES ARE INITIATED. THESE AREAS SHALL BE PROTECTED BY THE CONTRACTOR WITH BARRIER FENCING AS SHOWN ON THE DRAWING AND AS DIRECTED BY THE ENGINEER WHEN MEASURES UNDER THIS SWPPP AND/OR CONSTRUCTION ACTIVITIES ARE INITIATED.

TO THE EXTENT PRACTICABLE, EXCAVATIONS SHALL OCCUR IN A MANNER AND CONFIGURATION THAT CAUSES STORMWATER OCCURING WITHIN THE PROJECT LIMITS TO DRAIN TOWARD EXCAVATED AREAS WITH NO OUTLET, THUS CAUSING THESE EXCAVATION AREAS TO BE SEDIMENT PONDS AND STORMWATER RETENTION FACILITIES. AS DEEPER EXCAVATIONS COME INTO CONTACT WITH GROUNDWATER, STORMWATER AND/OR SEDIMENT LADEN WATER SHALL BE DETAINED IN POND B AND BY SILT BARRIERS IN POND A.

THE CONTRACTOR MAY ELECT TO CONSTRUCT OTHER TEMPORARY SEDIMENTATION PONDS, TANKS, OR OTHER FACILITIES AS NECESSARY TO CONTROL RUNOFF AND/OR TO FILTER DEWATERING DISCHARGE. THE CONTRACTOR MAY MAKE TEMPORARY CONNECTIONS TO THE EXISTING STORM DRAINAGE SYSTEM AS NECESSARY TO CONVEY FLOW FROM TEMPORARY FACILITIES. TEMPORARY ON-SITE CONVEYANCE CHANNELS REQUIRED BY THE CONTRACTOR'S MEANS AND METHODS SHALL BE DESIGNED, CONSTRUCTED, AND STABILIZED TO PREVENT EROSION FROM THE EXPECTED VELOCITY OF A 2-YEAR, 24-HOUR FREQUENCY STORM FOR THE DEVELOPED CONDITION. IN LIEU OF DESIGN, THE CONTRACTOR MAY ELECT TO LINE TEMPORARY CHANNELS AND FACILITIES WITH EROSION CONTROL MAT AT CONTRACTOR'S EXPENSE.

5. STABILIZE SOILS

FROM MAY 1 THROUGH SEPTEMBER 30, ALL EXPOSED SOILS SHALL BE PROTECTED FROM EROSION BY MULCHING, PLASTIC SHEETING, HYDROSEED COVERING, OR OTHER APPROVED MEASURES WITHIN ONE WEEK OF GRADING. FROM OCTOBER 1 THROUGH APRIL 30, ALL EXPOSED SOILS SHALL BE PROTECTED WITHIN 2 DAYS OF GRADING. SOILS SHALL BE STABILIZED BEFORE A WORK SHUTDOWN, HOLIDAY OR WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST.

SOIL STOCKPILES SHALL BE STABILIZED AND PROTECTED WITH SEDIMENT TRAPPING MEASURES.

6. PROTECT SLOPES

CUT AND FILL SLOPES SHALL BE CONSTRUCTED AND PHASED IN A MANNER THAT WILL MINIMIZE EROSION.

EXISTING NATURAL DRAINAGE AND EXISTING STORMWATER COLLECTION AND ROUTING WILL DIVERT MOST RUN-ON AND UPSLOPE STORMWATER AROUND THE SITE. AS NEEDED, THE CONTRACTOR SHALL MODIFY DITCHES TO REDIRECT STORMWATER AROUND THE SITE.

ALL DISTURBED GROUND SHALL BE TOPSOILED, SEEDED, AND MULCHED OR COVERED WITH EROSION CONTROL BLANKET.

7. PROTECT DRAIN INLETS

ALL STORM DRAIN INLETS MADE OPERABLE DURING CONSTRUCTION SHALL BE PROTECTED SO THAT STORMWATER RUNOFF SHALL NOT ENTER THE CONVEYANCE SYSTEM WITHOUT FIRST BEING FILTERED OR TREATED TO REMOVE SEDIMENT.

ALL APPROACH ROADS SHALL BE KEPT CLEAN, AND ALL SEDIMENT AND STREET WASH WATER SHALL NOT BE ALLOWED TO ENTER STORM DRAINS WITHOUT PRIOR AND ADEQUATE TREATMENT UNLESS TREATMENT IS PROVIDED BEFORE THE STORM DRAIN DISCHARGES TO WATERS OF THE STATE.

8. STABILIZE CHANNELS AND OUTLETS

THIS PROJECT INCLUDES WORK IN AND NEAR STREAMS. THE CONSTRUCTED STREAMBED AND STREAMBANKS SHALL BE CONSTRUCTED USING THE MATERIALS AND METHODS SPECIFIED IN THE PLANS AND PROVISIONS SO THAT THE CHANNEL WILL REMAIN STABLE DURING ALL ANTICIPATED FLOW RATES. ALSO SHOWN IN THE PLANS ARE EXTRA EROSION CONTROL MEASURES THAT SHALL BE IMPLEMENTED WHERE A STORMWATER PIPE DISCHARGES TO THE CHANNEL.

9. CONTROL POLLUTANTS

CONTRACTOR MUST PREPARE A SPILL PREVENTION CONTROL AND COUNTER MEASURE (SPCC) PLAN AND IMPLEMENT REQUIRED MEASURES TO CONTROL POLLUTANTS. SEE THE SPECIAL PROVISIONS.

ALL POLLUTANT DISCHARGES OTHER THAN SEDIMENT THAT OCCUR ON SITE DURING CONSTRUCTION SHALL BE HANDLED AND DISPOSED OF IN A MANNER THAT DOES NOT CAUSE CONTAMINATION OF STORMWATER, GROUNDWATER, OR SOILS TO REMAIN ON SITE.

THE USE OF LIME, FLY ASH, OR OTHER SOIL AMENDMENTS THAT COULD

ALTER THE PH OF DISCHARGE WATERS IS PROHIBITED.

10. CONTROL DEWATERING

HIGHLY TURBID OR CONTAMINATED DEWATERING WATER FROM CONSTRUCTION EQUIPMENT OPERATION SHALL BE HANDLED SEPARATELY FROM STORMWATER. DISPOSAL OPTIONS FOR DEWATERING DISCHARGE INCLUDE:

1. INFILTRATION
2. TRANSPORT OFF SITE IN A VEHICLE, SUCH AS A VACUUM FLUSH TRUCK, FOR LEGAL DISPOSAL IN A MANNER THAT DOES NOT POLLUTE STATE WATERS.
3. USE OF AN APPROPRIATELY SIZED AND MAINTAINED SEDIMENTATION BAG (DIRTBAG) WITH OUTFALL TO A DITCH OR SWALE FOR SMALL VOLUMES OF LOCALIZED DEWATERING.
4. ON-SITE TREATMENT USING APPROVED CHEMICAL TREATMENT (MUST BE PRE-APPROVED BY DOE PRIOR TO CONSTRUCTION AND CLOSELY MONITORED DURING USE OF THIS METHOD).

11. MAINTAIN BMPS

ALL BEST MANAGEMENT PRACTICES (BMPs) SHALL BE INSPECTED, MAINTAINED, AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. ALL ON-SITE EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE EVERY SEVEN DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.5 INCHES OF RAIN PER 24 HOUR PERIOD.

SEDIMENT MUST BE REMOVED FROM SILT FENCES BEFORE IT REACHES APPROXIMATELY ONE THIRD THE HEIGHT OF THE FENCE, ESPECIALLY IF HEAVY RAINS ARE EXPECTED.

ALL TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHIEVED OR AFTER THE TEMPORARY BMPs ARE NO LONGER NEEDED. TRAPPED SEDIMENT SHALL BE REMOVED FROM THE SITE OR INCORPORATED INTO FINISHED GRADING. DISTURBED SOIL AREAS RESULTING FROM REMOVAL SHALL BE PERMANENTLY STABILIZED.

12. PROJECT MANAGEMENT

PHASING OF CONSTRUCTION – THE PROJECT SHALL BE PHASED TO PREVENT, TO THE MAXIMUM EXTENT PRACTICABLE, THE TRANSPORT OF SEDIMENT FROM THE SITE DURING CONSTRUCTION.

WHEN ESTABLISHING THE PERMITTED CLEARING AND GRADING AREAS, CONSIDERATION SHOULD BE GIVEN TO MINIMIZING REMOVAL OF EXISTING TREES AND MINIMIZING DISTURBANCE/COMPACTION OF NATIVE SOILS EXCEPT AS NEEDED FOR BUILDING PURPOSES. PERMITTED CLEARING AND GRADING AREAS AND ANY OTHER AREAS REQUIRED TO PRESERVE CRITICAL OR SENSITIVE AREAS, BUFFERS, NATIVE GROWTH PROTECTION EASEMENTS, OR TREE RETENTION AREAS, ARE DELINEATED ON THE SITE PLANS AND WILL BE DELINEATED IN THE FIELD PRIOR TO CONSTRUCTION.

WHENEVER INSPECTION AND/OR MONITORING REVEALS THAT THE BMPS IDENTIFIED IN THE CONSTRUCTION SWPPP ARE INADEQUATE, DUE TO THE ACTUAL DISCHARGE OF OR POTENTIAL TO DISCHARGE A SIGNIFICANT AMOUNT OF ANY POLLUTANT, THE SWPPP SHALL BE MODIFIED, AS APPROPRIATE, IN A TIMELY MANNER.

THE CONSTRUCTION SWPPP SHALL BE RETAINED ON-SITE. THE CONSTRUCTION SWPPP SHALL BE MODIFIED WHENEVER THERE IS A SIGNIFICANT CHANGE IN THE DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE OF ANY BMP.

A CERTIFIED PROFESSIONAL IN EROSION AND SEDIMENT CONTROL SHALL BE IDENTIFIED IN THE CONSTRUCTION SWPPP AND SHALL BE ON-SITE OR ON-CALL AT ALL TIMES.

13. PROTECT LOW IMPACT DEVELOPMENT BMPS.

(A) PROTECT ALL BIORETENTION AND RAIN GARDEN BMPS FROM SEDIMENTATION THROUGH INSTALLATION AND MAINTENANCE OF EROSION AND SEDIMENT CONTROL BMPS ON PORTIONS OF THE SITE THAT DRAIN INTO THE BIORETENTION AND/OR RAIN GARDEN BMPS. RESTORE THE BMPS TO THEIR FULLY FUNCTIONING CONDITION IF THEY ACCUMULATE SEDIMENT DURING CONSTRUCTION. RESTORING THE BMP MUST INCLUDE REMOVAL OF SEDIMENT AND ANY SEDIMENT-LADEN BIORETENTION/RAIN GARDEN SOILS, AND REPLACING THE REMOVED SOILS WITH SOILS MEETING THE DESIGN SPECIFICATION.

(B) PREVENT COMPACTING BIORETENTION AND RAIN GARDEN BMPS BY EXCLUDING CONSTRUCTION EQUIPMENT AND FOOT TRAFFIC. PROTECT COMPLETED LAWN AND LANDSCAPED AREAS FROM COMPACTION DUE TO CONSTRUCTION EQUIPMENT.

(C) CONTROL EROSION AND AVOID INTRODUCING SEDIMENT FROM SURROUNDING LAND USES ONTO PERMEABLE PAVEMENTS. DO NOT ALLOW MUDDY CONSTRUCTION EQUIPMENT ON THE BASE MATERIAL OR PAVEMENT. DO NOT ALLOW SEDIMENT-LADEN RUNOFF ONTO PERMEABLE PAVEMENTS OR BASE MATERIALS.

(D) PAVEMENT FOULED WITH SEDIMENTS OR NO LONGER PASSING AN INITIAL INFILTRATION TEST MUST BE CLEANED USING PROCEDURES IN ACCORDANCE WITH THE ECOLOGY MANUAL OR THE MANUFACTURER'S PROCEDURES.

(E) KEEP ALL HEAVY EQUIPMENT OFF EXISTING SOILS UNDER LID FACILITIES THAT HAVE BEEN EXCAVATED TO FINAL GRADE TO RETAIN THE INFILTRATION RATE OF THE SOILS.

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MICHAEL R. McALLISTER STATE OF WASHINGTON 38189 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 09-25-2020

Date	No	Revision	By
	4		
	3		
	2		
	1		

PROJECT ENGINEER MM
DESIGNED/DRAWN DF
INSPECTOR ----

DIRECTOR PUBLIC WORKS T.A.C.
CITY ENGINEER C.M.A.S.
ASSISTANT DIRECTOR R.L.

CITY OF BELLINGHAM, WASHINGTON
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

SCALE
Horiz. SHOWN
Vert. SHOWN

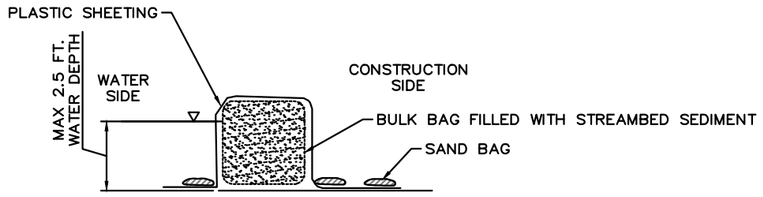
DATUM
NAD83/98-NAVD88

Job. No. ---
Date 04/25/20
Field Bk.

SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
SWPPP

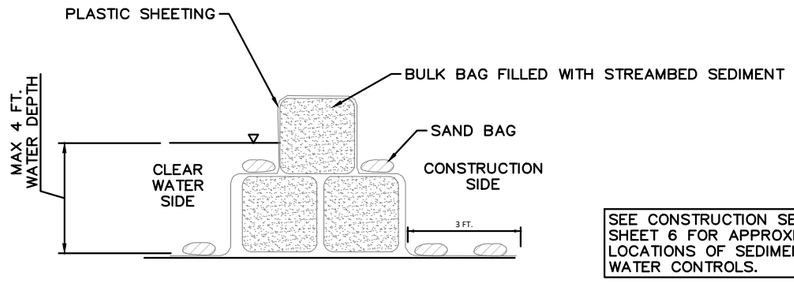
SHEET 3 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900



BULK BAG COFFERDAM

(WATER DEPTH LESS THAN 2.5')
NO SCALE



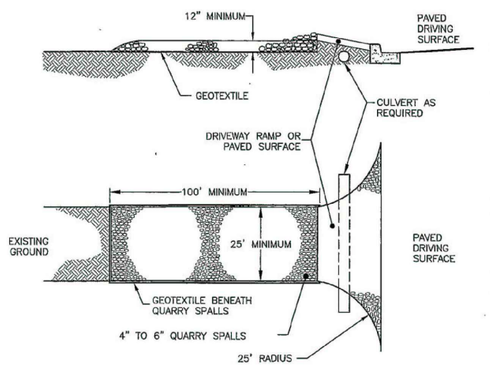
BULK BAG COFFERDAM

(WATER DEPTH LESS THAN 4')
NO SCALE

SEE CONSTRUCTION SEQUENCE, SHEET 6 FOR APPROXIMATE LOCATIONS OF SEDIMENT AND WATER CONTROLS.

BULK BAG NOTES:

1. BULK BAG COFFERDAM SHALL BE CONSTRUCTED OF SEVERAL UNITS OF BULK BAGS FILLED WITH STREAMBED SEDIMENT, AND ABUTTED SIDE BY SIDE TO CREATE A ROW THAT ISOLATES THE CONSTRUCTION SITE FROM THE RIVER.
2. IF WATER DEPTH EXCEEDS 85% OF THE BULK BAG HEIGHT, AN ADDITIONAL TOP ROW OF BULK BAGS SHALL BE INSTALLED, SUPPORTED BY TWO BOTTOM ROWS OF BULK BAGS.
3. BULK BAG COFFERDAM SHALL BE SEALED BY COVERING THE COFFERDAM WITH PLASTIC SHEETING HELD IN PLACE BY STANDARD SANDBAGS PLACED IN ROWS ON TOP OF COFFERDAM, AND AT TOE OF COFFERDAM. THE PLASTIC SHEETING SHALL BE DRAPED ALONG THE CHANNEL BOTTOM ON THE WORK AREA SIDE OF THE COFFERDAM WITH OUTWARD EDGE OF SHEETING MINIMUM 3-FEET FROM TOE OF COFFERDAM. THE DRAPED PORTION OF PLASTIC SHEETING SHALL BE PINNED TO THE CHANNEL BED BY MINIMUM TWO ROWS OF STANDARD SANDBAGS.
4. IF POSSIBLE, THE COFFERDAM SHALL BE EXTENDED ONTO A GRAVEL BAR AND OUT OF THE WATER. IF THE END MUST BE TERMINATED AT THE RIVERBANK, THE COFFERDAM SHALL BE TIGHTLY SEALED TO THE GROUND BY PLASTIC SHEETING AND STANDARD SANDBAGS. MULTIPLE LAYERS OF SHEETING AND SANDBAGS MAY BE REQUIRED TO FORM A WATERTIGHT SEAL.
5. BULK BAGS SHALL BE WATERPROOF CUBE-SHAPED POLYPROPYLENE WOVEN FABRIC BAGS WITH FULLY OPEN TOP, FLAT BOTTOM, FOUR LOOPS, MINIMUM 2-TON WEIGHT CAPACITY, MINIMUM 5:1 SAFETY FACTOR.
6. PLASTIC SHEETING SHALL BE MINIMUM 6-MIL THICKNESS. ROLL LENGTH SHALL BE LONG ENOUGH TO ENSURE THAT ENTIRE LENGTH OF COFFERDAM WILL BE COVERED WITHOUT A SEAM. MINIMUM 12-FT WIDE ROLL SHALL BE USED FOR SINGLE LAYER BULK BAG COFFERDAM. MINIMUM 16-FT WIDE ROLL SHALL BE USED FOR 2-LAYER STACKED BULK BAG COFFERDAM.
7. CONTRACTOR SHALL PROVIDE PUMPING TO DRAW DOWN WATER SURFACE ON THE CONSTRUCTION SIDE OF EACH IMPOUNDMENT SO THAT IF THERE ARE LEAKS IN COFFERDAM, LEAKING WILL BE INTO THE WORK AREA AND NOT OUT OF IT. DISCHARGE TURBID WATER TO INFILTRATION AREAS. NUMBER AND SIZE OF PUMPS REQUIRED SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE AND ADJUST AS NEEDED TO PREVENT TURBIDITY FROM ENTERING THE WATERWAY.
8. BULK BAG COFFERDAM SHALL BE COMPLETELY REMOVED AFTER CONSTRUCTION IS COMPLETED AND TURBIDITY HAS BEEN REMOVED.
9. ALTERNATE COFFERDAM MATERIALS AND CONFIGURATIONS MAY BE ALLOWED BUT SHALL NOT BE IMPLEMENTED WITHOUT REVIEW AND APPROVAL BY THE OWNER. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS AND/OR VENDOR CUT SHEETS FOR SUBSTITUTIONS.

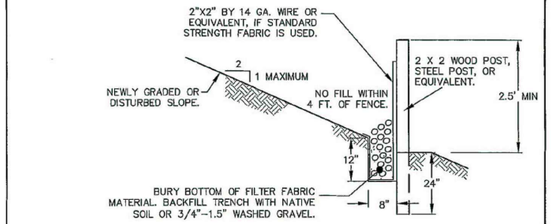


PLAN
NTS

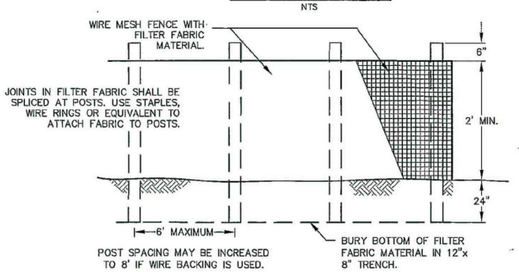
NOTES:

1. PAD SHALL BE REMOVED AND REPLACED WHEN SOIL IS EVIDENT ON THE SURFACE OF THE PAD OR AS DIRECTED BY THE CITY.
2. PAD SHALL BE INSTALLED IN PLANTING STRIP AS APPROPRIATE.
3. PAD THICKNESS SHALL BE INCREASED IF SOIL CONDITIONS DICTATE OR PER THE DIRECTION OF THE CITY.
4. MINIMUM DIMENSIONS MAY BE MODIFIED AS REQUIRED BY SITE CONDITIONS UPON APPROVAL OF THE CITY.

APPROVED		CITY OF BELLINGHAM	DRAWING
City Engineer	11/29/04 Date	TEMPORARY CONSTRUCTION EXIT-PLAT/COMMERCIAL	EC-600



TYPICAL CROSS SECTION
NTS



ELEVATION
NTS

NOTES:

1. FENCE SHALL NOT BE INSTALLED ON SLOPES STEEPER THAN 2:1.
2. JOINTS IN FILTER FABRIC SHALL BE OVERLAPPED 6 INCHES AT POST.
3. USE STAPLES, WIRE RINGS, OR EQUIVALENT TO ATTACH FABRIC TO WIRE FENCE.
4. REMOVE SEDIMENT WHEN IT REACHES 1/3 FENCE HEIGHT.

APPROVED		CITY OF BELLINGHAM	DRAWING
City Engineer	11/29/04 Date	REINFORCED SILT FENCE	EC-615

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MICHAEL R. McALLISTER STATE OF WASHINGTON 38189 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 09-25-2020

No	Date	Revision	By
4			
3			
2			
1			

PROJECT ENGINEER MM
DESIGNED/DRAWN DF
INSPECTOR ---

DIRECTOR PUBLIC WORKS T.A.C.
CITY ENGINEER C.M.A.S.
ASSISTANT DIRECTOR R.L.

CITY OF BELLINGHAM, WASHINGTON
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

SCALE
Horiz. SHOWN
Vert. SHOWN

DATUM
NAD83/98-NAVD88

Job. No. ---
Date 04/25/20
Field Bk. ---

SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
SWPPP DETAILS

SHEET 4 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900

BIRCHWOOD AVE.

SQUALICUM CK

TRIPLE CULVERTS

SQUALICUM PKWY.

PHASE 4

PHASE 3

PEACEHEALTH
380318325080000

PEACEHEALTH
380318350082000

PEACEHEALTH
380318386082000

SQUALICUM CK

INTERSTATE 5

BUG LAKE

SQUALICUM CREEK MEDICAL CENTER

HIDDEN MEADOW FARM LLC
380318163037000

FLAT CAR BRIDGE

HORSEFIELD CK
(NORTH TRIB)

CITY OF BELLINGHAM
380318378053000

PHASE 4 WETLAND A

CITY OF BELLINGHAM
380318226012000

CULVERT

PEACE HEALTH
380318445017000

PHASE 3 WETLAND

CULVERT

SOUTH TRIB.

PEACE HEALTH
380318366016000

PHASE 4 WETLAND B

PHASE 4 WETLAND C

N

0 80 160
SCALE IN FEET

LEGEND

- PROPERTY LINE
- RIGHT OF WAY
- EASEMENT
- OHW OHW OHW — ORDINARY HIGH WATER
- EXISTING WETLAND

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EXISTING STREAMS
THE EXISTING SQUALICUM CREEK BEGINS AT THE NORTHEAST CORNER OF BUG LAKE, FLOWING THROUGH THE POND, EXITING THE POND AT THE NORTHWEST CORNER, CONTINUING THROUGH THREE CULVERTS UNDER SQUALICUM PARKWAY TO A CHANNEL.

WETLANDS AND WETLAND MITIGATION AREAS ARE WITHIN AND ADJACENT TO THE PROJECT SITE.

EXISTING STORMWATER RUNOFF
IN PHASE 3 AREAS, STORMWATER FLOWS TO BUG LAKE OR WESTWARD TO CULVERTS THROUGH SQUALICUM PARKWAY. IN PHASE 4 AREAS, STORMWATER FLOWS TOWARD SQUALICUM CREEK OR TO DITCHES OR RELICT CHANNELS THAT FLOW TO THE CREEK.

EXISTING VEGETATION
VEGETATION IS RIPARIAN FOREST. COTTONWOOD AND RED ALDER OVERSTORY, WITH THICK UNDERSTORY SHRUB COMMUNITY, PREDOMINANTLY ROSE, DOGWOOD, AND SNOWBERRY, MIXED WITH HIMALAYAN BLACKBERRY.

MICHAEL R. McALLISTER
STATE OF WASHINGTON
35180
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES 08-25-2020

Date	No	Revision	By
	4		
	3		
	2		
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PROJECT ENGINEER MM
DESIGNED/DRAWN DF
INSPECTOR ----

DIRECTOR PUBLIC WORKS T.A.C.
CITY ENGINEER C.M.A.S.
ASSISTANT DIRECTOR R.L.

CITY OF BELLINGHAM, WASHINGTON
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

SCALE
Horiz. SHOWN
Vert. SHOWN

DATUM
NAD83/98-NAVD88

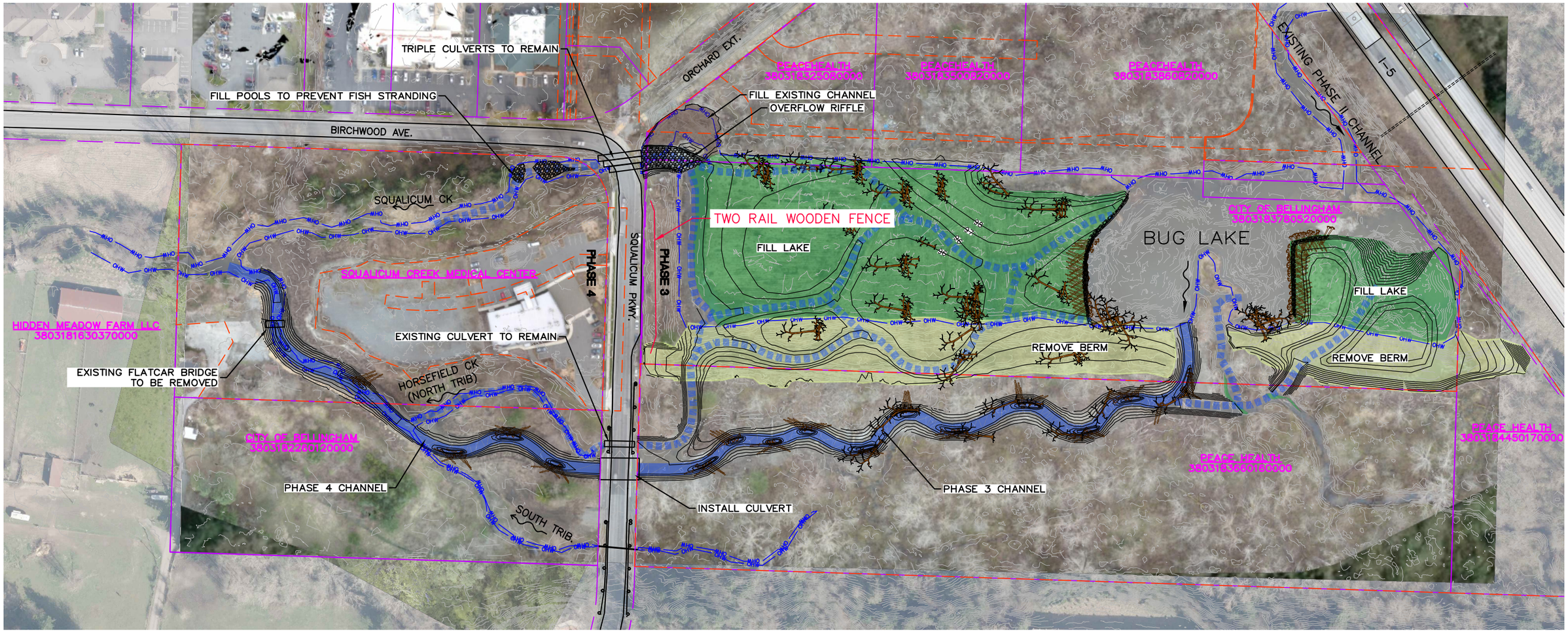
Job. No. ---
Date 04/25/20
Field Bk. ---

SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4

EXISTING CONDITIONS

SHEET 5 OF 36

CONTACT PERSON: CRAIG MUELLER P.E. , PROJECT ENGINEER AT 778-7900



PLAN VIEW

LEGEND

- ORDINARY HIGH WATER (OHW — OHW)
- EXISTING GROUND CONTOUR (90)
- DESIGN GROUND CONTOUR (90)
- PROPERTY LINE
- RIGHT OF WAY
- EASEMENT
- LOG WITH ROOTS
- SALVAGED TREE
- PROPOSED CHANNEL
- HIGH FLOW CHANNEL
- REMOVE BERM
- COMMON FILL
- STREAMBED SEDIMENT FILL
- SOIL STRIPPING (INVASIVE PLANT REMOVAL)

N

0 80 160

SCALE IN FEET

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MICHAEL R. McALLISTER — STATE OF WASHINGTON — 38189 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 09-25-2020

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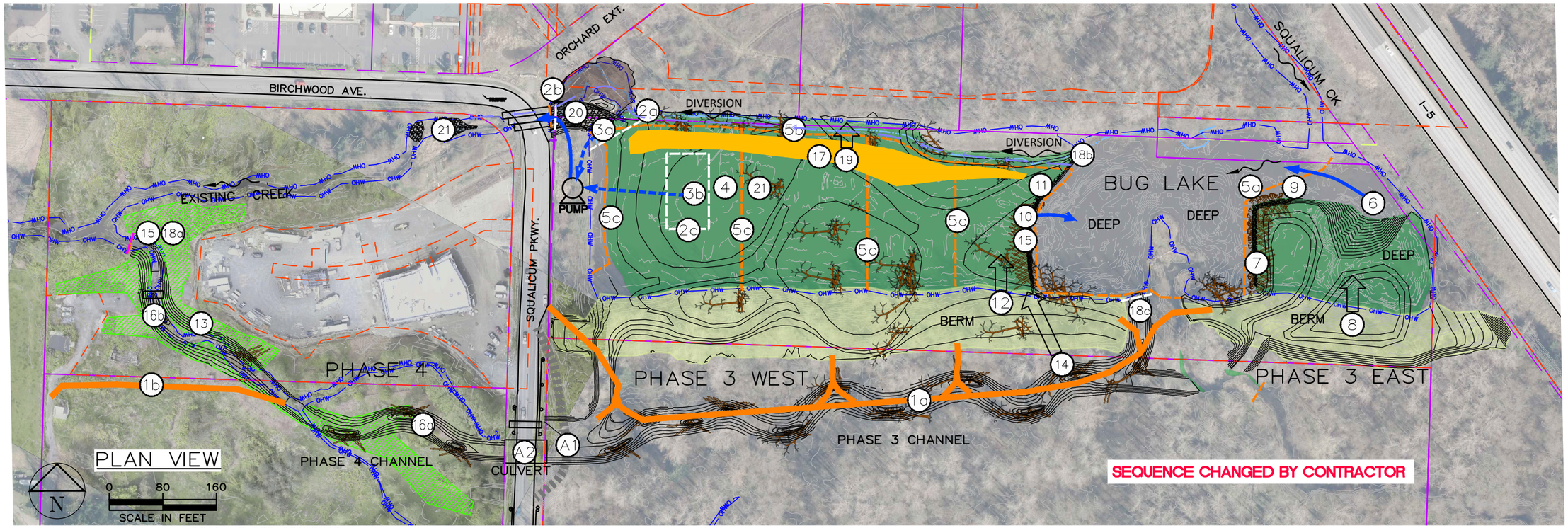
SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
PROPOSED CONDITIONS

SHEET 6 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900



RECOMMENDED SEQUENCE

A. INSTALL TEMPORARY ROAD BYPASS (A1) AND CULVERT (A2). THIS CAN BE ANYTIME IN SEQUENCE AS LONG AS IT IS COMPLETED BEFORE STEP 18. WHEN REMOVING ROAD BYPASS, USE REMOVED GRANULAR MATERIALS AS BUG LAKE FILL.

1. CLEAR ACCESS ROUTES (1a & 1b). CLEAR SOUTHERN HALF OF BERMS (DO NOT CREATE TURBIDITY IN POND). SALVAGE REMOVED TREES.
2. INSTALL FISH SCREENS 2a AND 2b FOR INITIAL PUMP INTAKE AREA (3a) AND SALVAGE FISH FROM SCREENED AREA.
3. INSTALL PUMP AT 3a AND PUMP WATER FROM SCREENED AREA (2a,2b), DISCHARGING TO CULVERT. PUMPING FROM 3a WILL BE THE INITIAL DRAWDOWN OF APPROXIMATELY 2 FT OF WATER LEVEL. WHEN DEPTH BECOMES MANAGEABLE FOR WADING, INSTALL FISH SCREEN 2c. SALVAGE FISH FROM SCREENED AREA 2c. MOVE PUMP INTAKE TO 3b AND CONTINUE LAKE DRAWDOWN.
4. SALVAGE FISH IN BUG LAKE WHILE LEVEL IS DRAWN DOWN.
5. WHEN FISH SALVAGE IS COMPLETE, EQUIPMENT MAY ENTER LAKE BED. INSTALL COFFERDAMS ALONG PERIMETERS OF EAST AND WEST FILL AREAS (5a, 5b), LEAVING DIVERSION CHANNEL ALONG NORTH SHORE. ADD LATERAL COFFERDAMS TO MAKE CELLS (5c).
6. PUMP DOWN EAST FILL AREA. DISCHARGE CLEAN WATER TO BUG LAKE. DISCHARGE CONSTRUCTION WATER (TURBIDITY) TO FLOODPLAIN FOR INFILTRATION.
7. INSTALL LARGE WOODY DEBRIS IN EAST FILL AREA.
8. CLEAR AND GRUB THE REST OF EAST BERM. SALVAGE REMOVED TREES. EXCAVATE EAST BERM AND FILL EAST AREA. APPLY 6" LAYER OF COMPOST AND BLEND WHILE DECOMPACTING FILL USING A DEEP SOIL RIPPER. APPLY 6" LAYER OF HOG FUEL.
9. REMOVE EAST PUMP AND COFFERDAM. EMPTY STREAM GRAVEL FROM BULKBAGS ONTO WATERWARD EDGE OF FILL AMONGST THE LWD.
10. PUMP DOWN FIRST CELL IN WEST AREA. DISCHARGE CLEAN WATER TO BUG LAKE. DISCHARGE CONSTRUCTION WATER (TURBIDITY) TO FLOODPLAIN FOR INFILTRATION.
11. INSTALL LARGE WOODY DEBRIS IN WEST AREA FIRST CELL.
12. CLEAR AND GRUB REMAINING PORTIONS OF WEST BERM. SALVAGE REMOVED TREES. BEGIN TO REMOVE WEST BERM AND FILL WEST CELL.
13. STRIPPING IN PHASE 4. DISPOSE OF STRIPPED MATERIAL IN LOW AREA OF BUG LAKE WHERE IT WILL BE COVERED BY >4' OF FILL.
14. CREATE PHASE 3 CHANNEL. HAUL FILL TO WEST AREA. REPEAT STEPS, 10,12,13 FOR EACH CELL. REMOVING COFFERDAMS AS EACH CELL IS COMPLETED. EMPTY THE BULK BAGS ON SITE.
15. INSTALL COFFERDAM DOWNSTREAM OF PHASE IV.
16. CREATE PHASE 4 CHANNEL. REMOVE RAILCAR BRIDGE. HAUL FILL TO WEST AREA FIRST CELL. IN DESIGNATED AREAS, REMOVE INVASIVE VEGETATION AND STRIP SOIL 12" DEEP.
17. STAGE CHANNEL FILL ALONG NORTH EDGE OF WEST AREA.
18. INSTALL COFFERDAM 17b TO CLOSE DIVERSION CHANNEL. INSTALL FISH SCREEN 17c AT PHASE 3 CHANNEL INLET. OPEN COFFERDAM AT PHASE 3 CHANNEL INLET TO INTRODUCE FLOW. PUMP FLOW FROM NEAR THE PHASE 4 COFFERDAM, DISCHARGING TO FOREST, UNTIL WATER IS CLEAR. WHEN FLOW IS CLEAR, REMOVE FISH SCREEN, AND PHASE 4 AND PHASE 3 COFFERDAMS.
19. FILL CHANNEL ALONG NORTH SHORE USING STAGED MATERIAL. REMOVE COFFERDAM 17b.
20. BUILD OVERFLOW CHANNEL WITH STREAM COBBLE.
21. TO ENTIRE WEST AREA, APPLY 3" LAYER COMPOST AND 3" LAYER TOPSOIL. BLEND WHILE DECOMPACTING USING A DEEP SOIL RIPPER. APPLY 6" LAYER OF WOOD MULCH TO EXCAVATION AND FILL AREAS.
22. FILL POOLS DOWNSTREAM OF TRIPLE CULVERTS WITH STREAMBED SEDIMENT.

LEGEND

- ACCESS
- FISH SCREEN
- COFFFERDAM
- TEMP. ROAD BYPASS
- OHW — ORDINARY HIGH WATER
- CREEK DIVERSION
- 90 — DESIGN GROUND CONTOUR
- PROPERTY LINE
- RIGHT OF WAY
- EASEMENT

- EXCAVATE BERM
- BUG LAKE FILL (COMMON)
- STREAMBED SEDIMENT FILL
- INVASIVE VEG REMOVAL
- TEMP. FILL STOCKPILE (FOR FILLING DIVERSION CHANNEL AFTER USE)

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MICHAEL R. McALLISTER — STATE OF WASHINGTON — 34189 — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 09-25-2020

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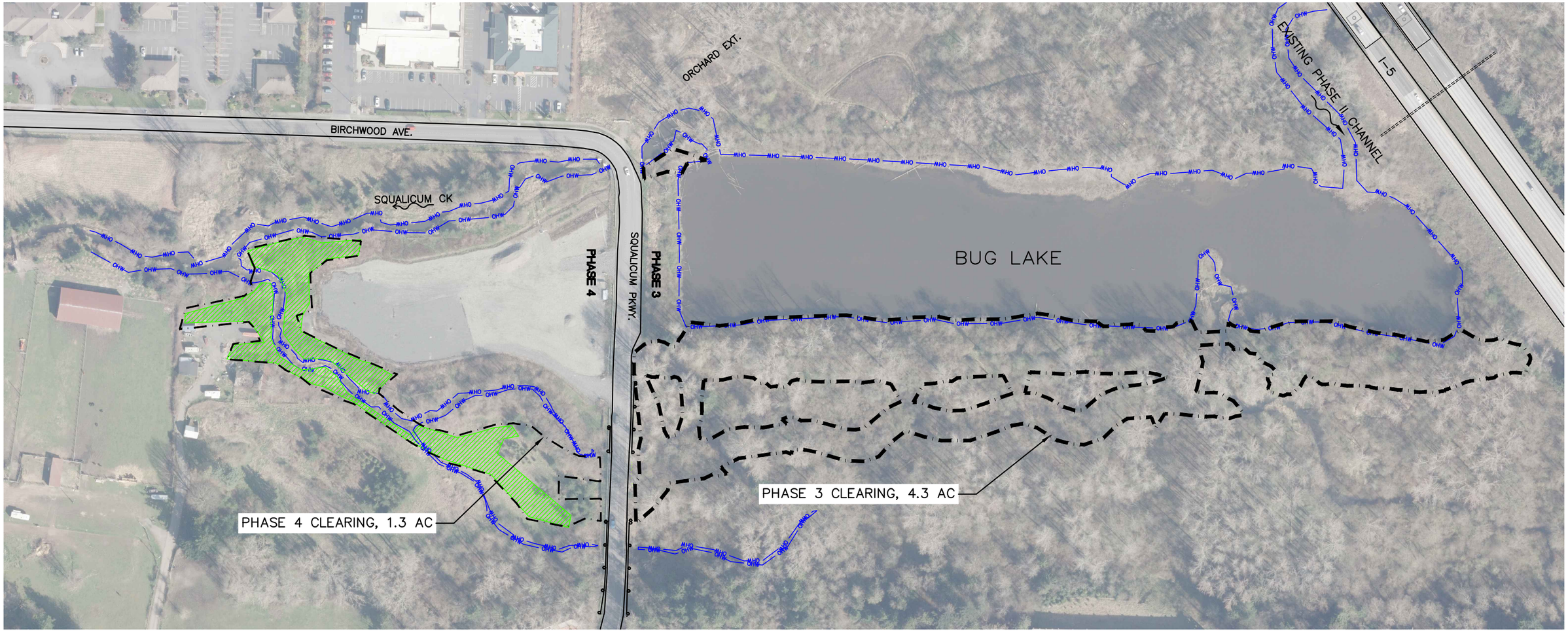
SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
SEQUENCE

SHEET 7 OF 36

CONTACT PERSON: CRAIG MUELLER P.E. , PROJECT ENGINEER AT 778-7900



PLAN VIEW

LEGEND

- OHW OHW — ORDINARY HIGH WATER
- 90 — EXISTING GROUND CONTOUR
- CLEARING LIMITS 5.4 AC
- SOIL STRIPPING (INVASIVE PLANT REMOVAL) 0.8 AC*

N

0 80 160

SCALE IN FEET

SOIL STRIPPING & SOIL STRIPPING INCL HAUL

1. SEE SPECIFICATIONS.
2. WHERE DESIGNATED BY THE OWNER, SOIL *STRIPPING INCL HAUL* SHALL BE TO EXCAVATE AREAS OF KNOTWEED AND HAUL MATERIAL TO A LEGAL DISPOSAL SITE.
3. OTHER AREAS DESIGNATED BY THE OWNER AS LIMITS OF *STRIPPING* SHALL BE FOR EXCAVATING 18–24" DEEP. HAUL THE MATERIAL TO THE BUG LAKE FILL AREA, AND PLACE IN LOW AREAS TO BE LATER COVERED BY >4' OF BURIAL. DO NOT INCLUDE ANY SOIL THAT CONTAINS KNOTWEED.
4. THE EXTENTS OF SOIL STRIPPING SHOWN ON THIS SHEET ARE APPROXIMATE AND INCLUDES BOTH *STRIPPING* AND *STRIPPING INCL HAUL*. ACTUAL EXTENTS TO BE DIRECTED BY THE OWNER.

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Date	No	Revision	By
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PROJECT ENGINEER MM
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CITY ENGINEER C.M.A.S.
ASSISTANT DIRECTOR R.L.

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DATUM
NAD83/98-NAVD88

Job. No. ---
Date 04/25/20
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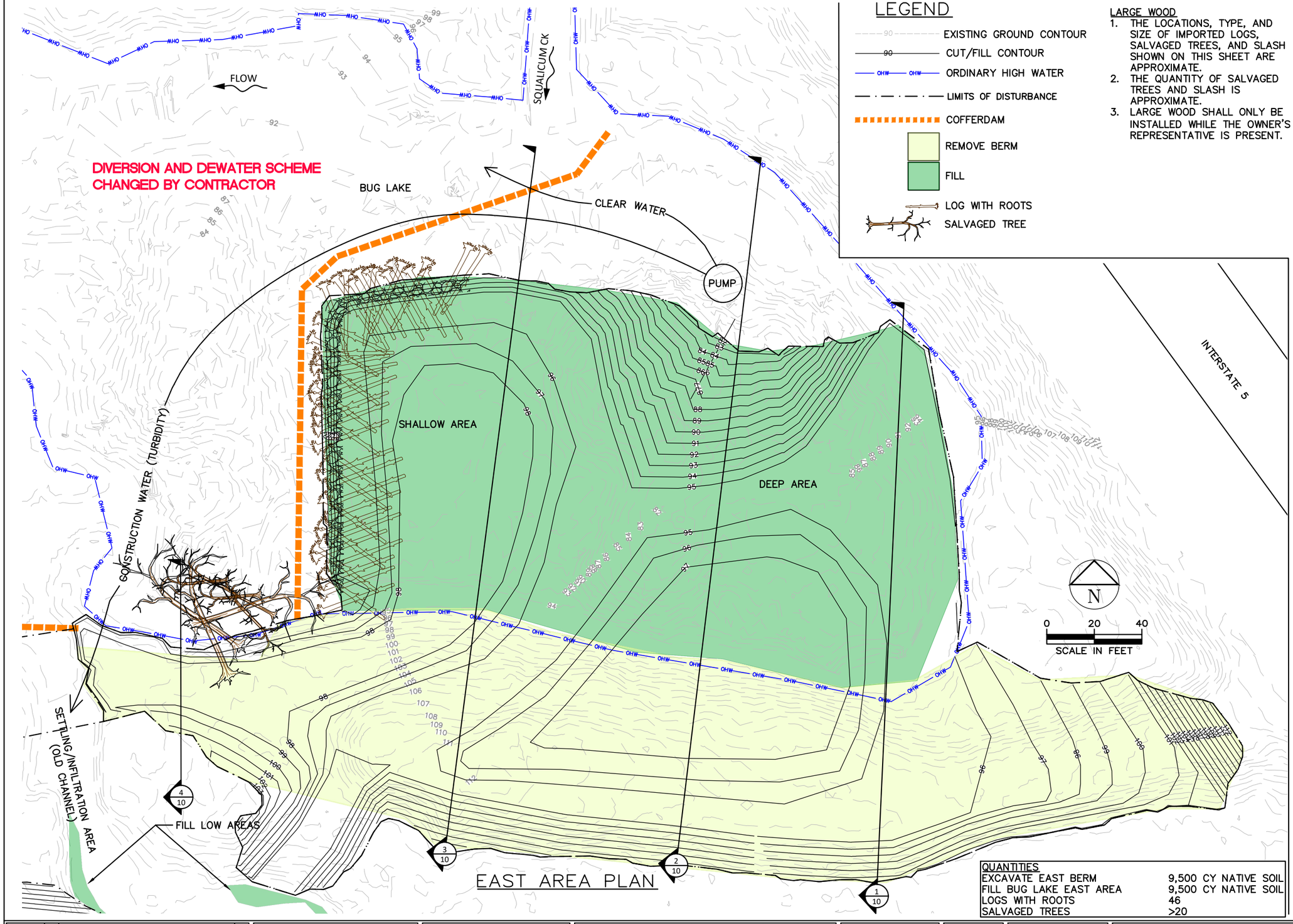
SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
CLEARING LIMITS

SHEET 8 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900



EAST AREA PLAN

LEGEND

- EXISTING GROUND CONTOUR
- CUT/FILL CONTOUR
- ORDINARY HIGH WATER
- LIMITS OF DISTURBANCE
- COFFERDAM
- REMOVE BERM
- FILL
- LOG WITH ROOTS
- SALVAGED TREE

LARGE WOOD

1. THE LOCATIONS, TYPE, AND SIZE OF IMPORTED LOGS, SALVAGED TREES, AND SLASH SHOWN ON THIS SHEET ARE APPROXIMATE.
2. THE QUANTITY OF SALVAGED TREES AND SLASH IS APPROXIMATE.
3. LARGE WOOD SHALL ONLY BE INSTALLED WHILE THE OWNER'S REPRESENTATIVE IS PRESENT.

RECOMMENDED SEQUENCE

1. CLEAR AND GRUB BERM EXCAVATION AREA. SALVAGE REMOVED TREES AND SHRUBS. STAGE COFFERDAM MATERIALS.
2. INSTALL COFFERDAM AFTER PUMPING DOWN LAKE AND RESCUING FISH (SEE OVERALL SEQUENCE (SHEET 7).
3. SET UP PUMP(S) TO DISCHARGE CLEAR WATER TO BUG LAKE,.OR WHEN DISCHARGE CONTAINS TURBIDITY, PUMP TO INFILTRATION AREA..
4. PUMP DOWN ~3' WITHIN IMPOUNDED AREA TO DRY OUT THE SHALLOW AREA. DEEP POOL CAN REMAIN. DISCHARGE CLEAN WATER TO BUG LAKE. MONITOR DISCHARGE.
5. INSTALL SALVAGED TREES AND LOGS ALONG FILL PERIMETER.
6. EXCAVATE BERM AND PLACE FILL OVER TREES AND LOGS. SEE TYPICAL SECTION 3, SHEET 20.
7. CONTINUE FILL TOWARD EDGE OF DEEP AREA.
8. PUMP DOWN DEEP AREA. DISCHARGE CLEAN WATER TO BUG LAKE. MONITOR DISCHARGE FOR TURBIDITY. MOVE DISCHARGE TO INFILTRATION AREA WHEN TURBIDITY OCCURS.
9. FILL DEEP AREA.
10. REMOVE COFFERDAM. EMPTY STREAMBED SEDIMENT FROM BULK BAGS ONTO WATERWARD FACE OF FILL.
11. PLACE REMAINING SALVAGED TREES AND SHRUBS AS SLASH ALONG SHORELINE.
12. MIX TOPSOIL AND COMPOST IN EQUAL PARTS AND APPLY AS A 6" LAYER TO A SUBGRADE THAT HAS BEEN RIPPED 18" DEEP (SEE SHEET 21).
13. APPLY 6" LAYER OF WOOD MULCH TO EXCAVATION AND FILL AREAS (SEE SHEET 21).

QUANTITIES

EXCAVATE EAST BERM	9,500 CY NATIVE SOIL
FILL BUG LAKE EAST AREA	9,500 CY NATIVE SOIL
LOGS WITH ROOTS	46
SALVAGED TREES	>20

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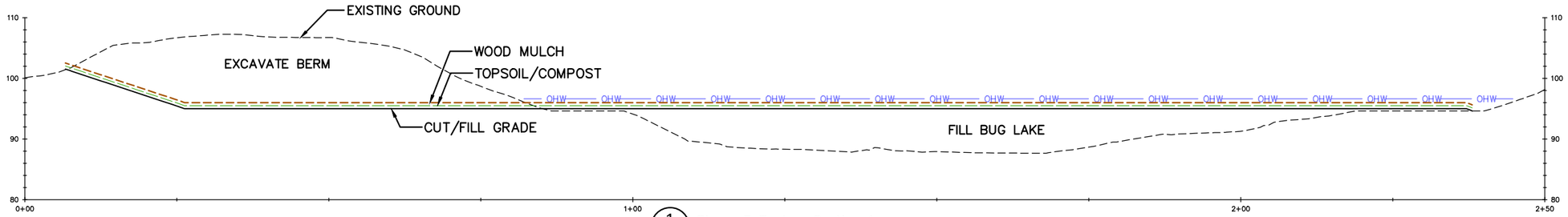
SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
PHASE 3 - EAST GRADING PLAN

SHEET 9 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900



1/9 Phase 3 East – Section 1

SECTION VIEWS ARE LOOKING DOWNSTREAM

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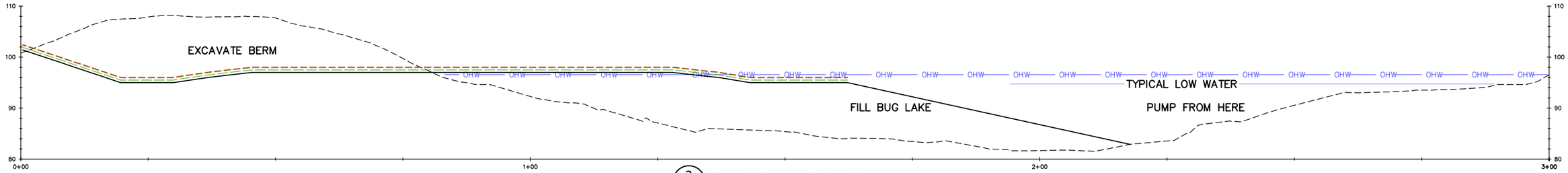
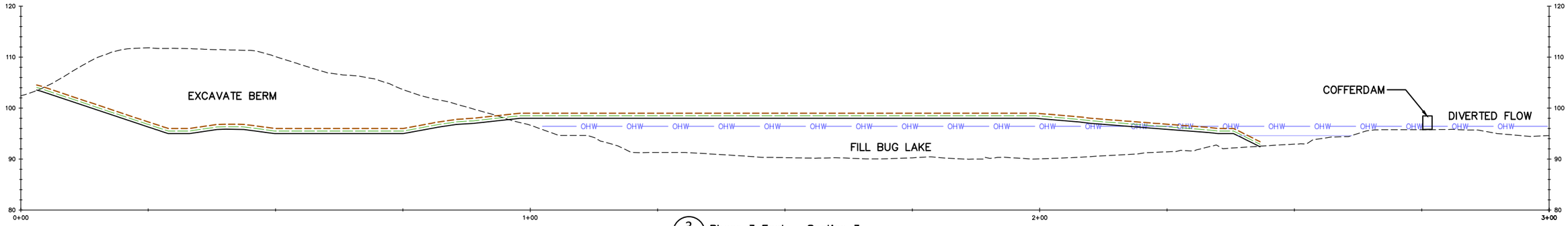
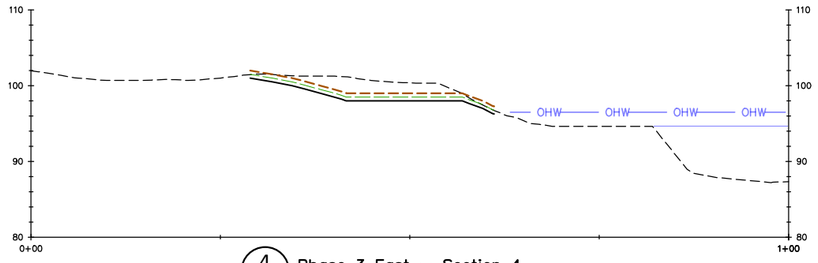
SCALE IN FEET



2/9 Phase 3 East – Section 2



3/9 Phase 3 East – Section 3



4/9 Phase 3 East – Section 4

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SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
PHASE 3 - EAST SECTION VIEWS

SHEET 10 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900

CHANNEL FILL & HIGH FLOW RIFFLE
SEE SHEET 15

CLEAR WATER

DIVERSION CHANNEL TO REMAIN OPEN UNTIL FLOW IS REDIRECTED TO NEW CHANNEL. SEE SEQUENCE.

DIVERSION CHANNEL

CLEAR WATER

PUMP

CONSTRUCTION WATER

SETTLING/INFILTRATION AREA

CONSTRUCTION WATER

PUMP

CLEAR WATER

PUMP

DIVERSION CHANNEL

DIVERSION AND DEWATER SCHEME CHANGED BY CONTRACTOR

BUG LAKE

PUMP

CLEAR WATER

CONSTRUCTION WATER (TURBIDITY)

CONSTRUCTION WATER

SETTLING/INFILTRATION AREA (OLD CHANNEL)

NEW CHANNEL (SHEET 13)

3
11

2
11

1
11

QUANTITIES	
EXCAVATE WEST BERM	18,650 CY
FILL BUG LAKE WEST AREA	~29,200 CY*
LOGS WITH ROOTS	32
SALVAGED TREES	>50

* WEST AREA FILL COMES FROM MULTIPLE ON-SITE EXCAVATION AREAS INCLUDING:
- WEST BERM REMOVAL (18,650 CY)
- PHASE 3-4 NEW CHANNELS (7,150 CY, 2,250 CY)
- REMOVAL OF TEMPORARY VEHICLE BYPASS (970 CY)
- REMOVAL OF PHASE 4 TEMPORARY ACCESS RAMP (170 CY)
- PHASE 4 STRIPPING AREAS (TBD)

WEST AREA PLAN

RECOMMENDED SEQUENCE

1. CLEAR AND GRUB BERM EXCAVATION AREA. SALVAGE REMOVED TREES AND SHRUBS. STAGE COFFERDAM MATERIALS.
2. INSTALL COFFERDAM AFTER PUMPING DOWN LAKE AND RESCUING FISH. SEE OVERALL SEQUENCE (SHEET 7).
3. SET UP PUMP(S) TO DISCHARGE CLEAR WATER TO BUG LAKE. WHEN DISCHARGE CONTAINS TURBIDITY, PUMP TO INFILTRATION AREA.
4. BEGINNING AT FIRST CELL, PUMP DOWN WITHIN IMPOUNDED AREA AND DISCHARGE CLEAN WATER TO BUG LAKE. MONITOR DISCHARGE FOR TURBIDITY AND FLOW PATHS.
5. INSTALL LOGS AND SALVAGED TREES ALONG FILL PERIMETER.
6. EXCAVATE BERM AND PLACE FILL OVER TREES AND LOGS (DETAIL 3, SHEET 20).
7. CONTINUE EXCAVATION AND FILLING CELL
8. STAGE EXTRA FILL ALONG NORTH EDGE TO BE USED TO FILL THE DIVERSION CHANNEL LATER.
9. REMOVE COFFERDAM FROM LAKE EDGE.
10. CONTINUE FOR EACH REMAINING CELL. PORTIONS OF FILL WILL BE FROM PHASES 3 & 4 CHANNEL CONSTRUCTION.
12. MIX TOPSOIL AND COMPOST IN EQUAL PARTS AND APPLY AS A 6" LAYER TO A SUBGRADE THAT HAS BEEN RIPPED 18" DEEP (SEE SHEET 21).
13. APPLY 6" LAYER OF WOOD MULCH TO EXCAVATION AND FILL AREAS (SEE SHEET 21).
14. INSTALL LARGE WOOD ON FILL AREA.
15. REFER TO OVERALL SEQUENCE FOR CHANNEL ACTIVATION, FILLING DIVERSION CHANNEL, REMOVING COFFERDAMS, WORK AT HIGH FLOW RIFFLE, AND APPLYING TOPSOIL, COMPOST AND WOOD MULCH.

LEGEND

- EXISTING GROUND CONTOUR
- CUT/FILL CONTOUR
- ORDINARY HIGH WATER
- LIMITS OF DISTURBANCE
- COFFERDAM
- REMOVE BERM
- FILL
- LOG WITH ROOTS
- SALVAGED TREE

LARGE WOOD

1. THE LOCATIONS, TYPE, AND SIZE OF IMPORTED LOGS, SALVAGED TREES, AND SLASH SHOWN ON THIS SHEET ARE APPROXIMATE.
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3. LARGE WOOD SHALL ONLY BE INSTALLED WHILE THE OWNER'S REPRESENTATIVE IS PRESENT.

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SCALE IN FEET

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SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
PHASE 3 - WEST GRADING PLAN

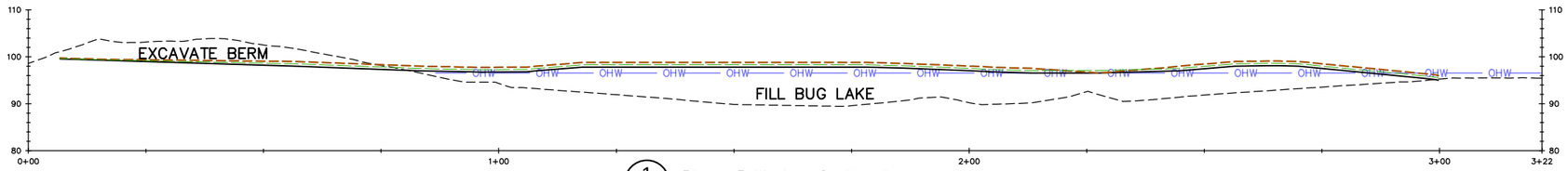
SHEET 11 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900

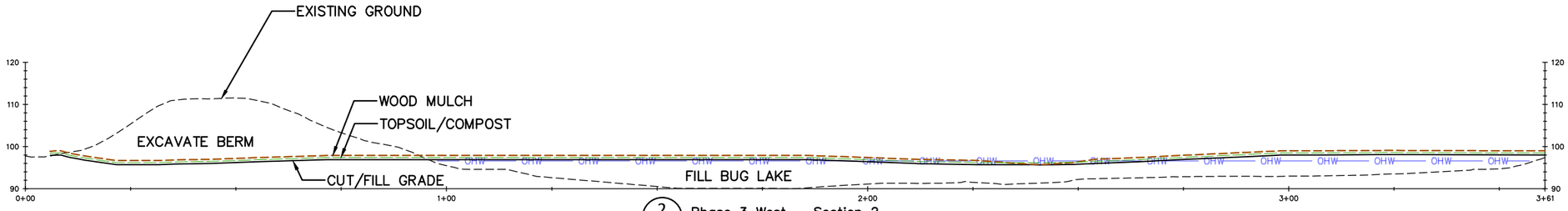
SECTION VIEWS ARE LOOKING DOWNSTREAM

0 15 30

SCALE IN FEET



1/11 Phase 3 West – Section 1



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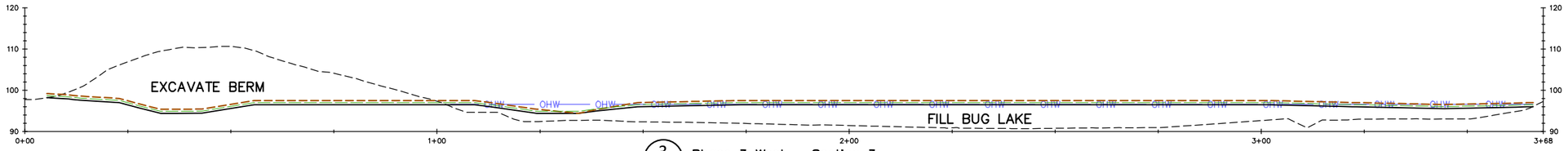

3/11 Phase 3 West – Section 3

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SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4

PHASE 3 - WEST SECTION VIEWS

SHEET 12 OF 36

CONTACT PERSON: CRAIG MUELLER P.E. , PROJECT ENGINEER AT 778-7900

RECOMMENDED SEQUENCE

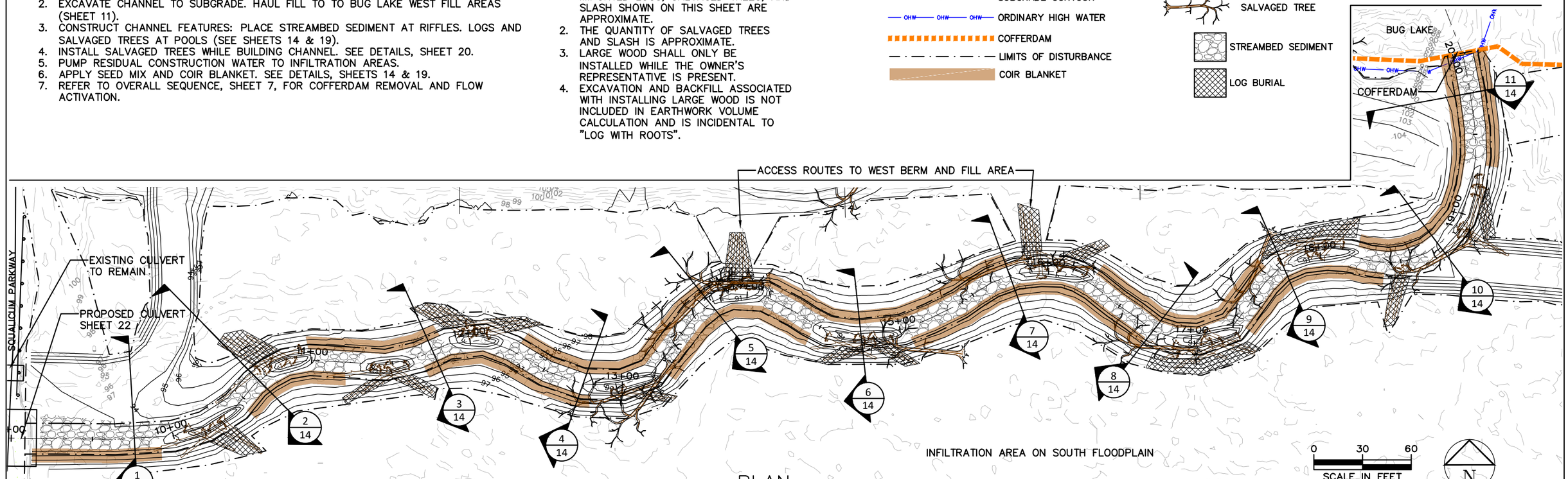
1. MARK CLEARING LIMITS. CLEAR AND GRUB EXCAVATION AREA. SALVAGE REMOVED TREES AND SHRUBS.
2. EXCAVATE CHANNEL TO SUBGRADE. HAUL FILL TO TO BUG LAKE WEST FILL AREAS (SHEET 11).
3. CONSTRUCT CHANNEL FEATURES: PLACE STREAMBED SEDIMENT AT RIFFLES. LOGS AND SALVAGED TREES AT POOLS (SEE SHEETS 14 & 19).
4. INSTALL SALVAGED TREES WHILE BUILDING CHANNEL. SEE DETAILS, SHEET 20.
5. PUMP RESIDUAL CONSTRUCTION WATER TO INFILTRATION AREAS.
6. APPLY SEED MIX AND COIR BLANKET. SEE DETAILS, SHEETS 14 & 19.
7. REFER TO OVERALL SEQUENCE, SHEET 7, FOR COFFERDAM REMOVAL AND FLOW ACTIVATION.

LARGE WOOD

1. THE LOCATIONS, TYPE, AND SIZE OF IMPORTED LOGS, SALVAGED TREES, AND SLASH SHOWN ON THIS SHEET ARE APPROXIMATE.
2. THE QUANTITY OF SALVAGED TREES AND SLASH IS APPROXIMATE.
3. LARGE WOOD SHALL ONLY BE INSTALLED WHILE THE OWNER'S REPRESENTATIVE IS PRESENT.
4. EXCAVATION AND BACKFILL ASSOCIATED WITH INSTALLING LARGE WOOD IS NOT INCLUDED IN EARTHWORK VOLUME CALCULATION AND IS INCIDENTAL TO "LOG WITH ROOTS".

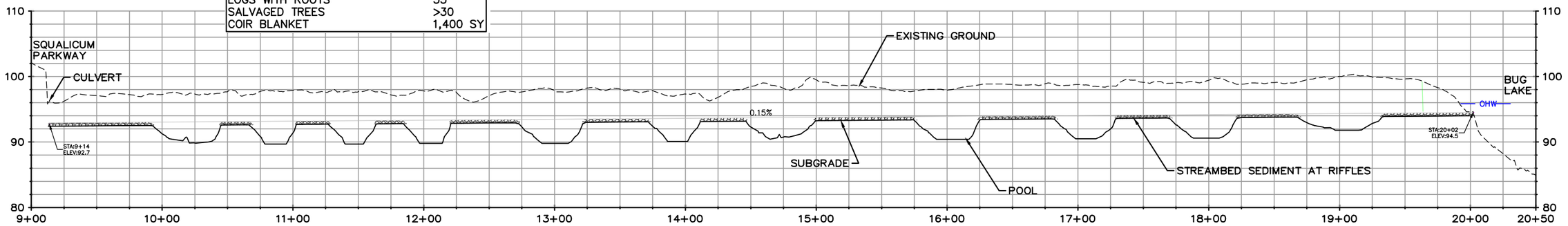
LEGEND

- EXISTING GROUND CONTOUR
- SUBGRADE CONTOUR
- ORDINARY HIGH WATER
- COFFERDAM
- LIMITS OF DISTURBANCE
- COIR BLANKET
- LOG WITH ROOTS
- SALVAGED TREE
- STREAMBED SEDIMENT
- LOG BURIAL



PLAN

QUANTITIES	
EXCAVATE PHASE 3 CHANNEL	7,150 CY
STREAMBED SEDIMENT	330 CY
LOGS WITH ROOTS	55
SALVAGED TREES	>30
COIR BLANKET	1,400 SY



PROPOSED CHANNEL PROFILE – SQUALICUM PARKWAY CROSSING TO BUG LAKE

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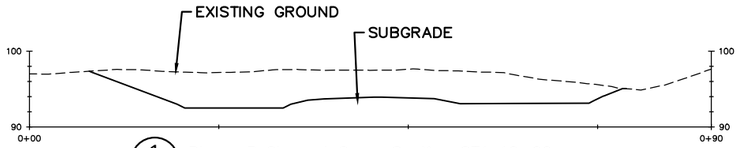
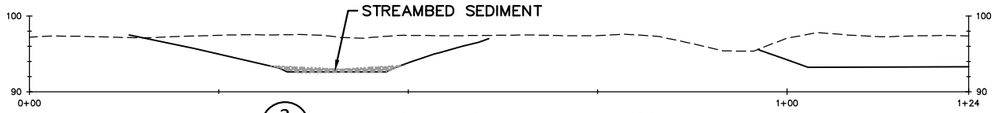
SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
PHASE 3 - CHANNEL GRADING PLAN

SHEET 13 OF 36

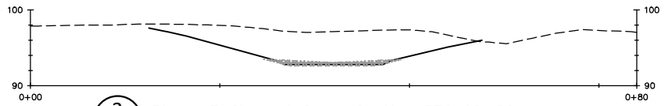
CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900



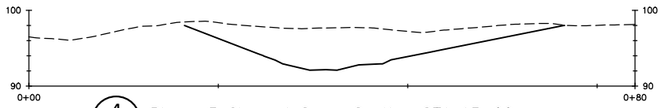
1/13 Phase 3 Channel Cross Section STA 10+00



2/13 Phase 3 Channel Cross Section STA 11+00



3/13 Phase 3 Channel Cross Section STA 12+00



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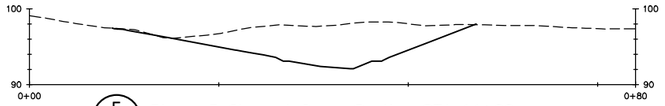

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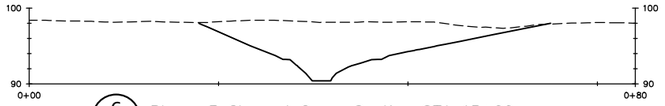

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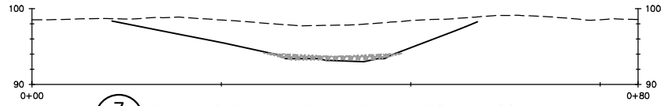

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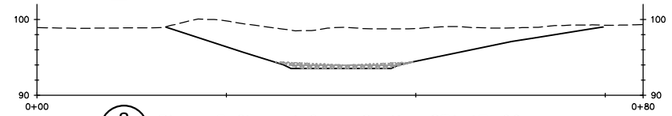
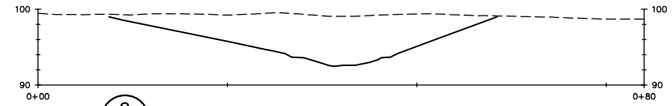
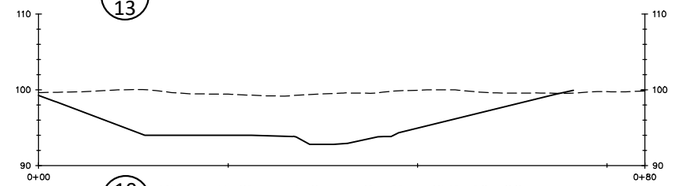


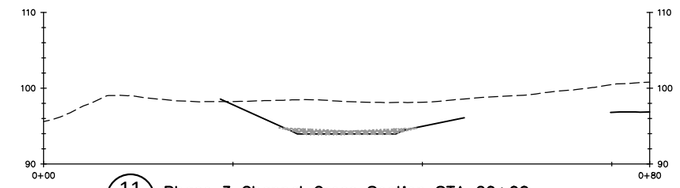
8/13 Phase 3 Channel Cross Section STA 17+00



9/13 Phase 3 Channel Cross Section STA 18+00



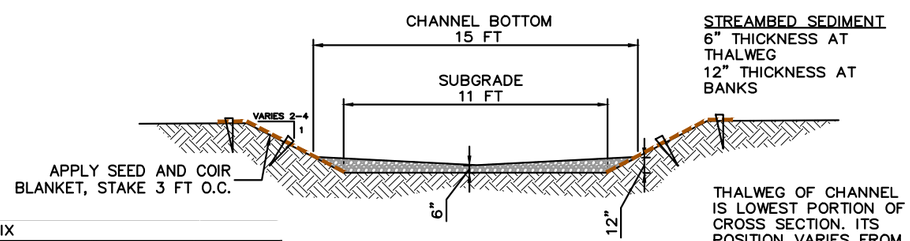
10/13 Phase 3 Channel Cross Section STA 19+00



11/13 Phase 3 Channel Cross Section STA 20+00

SECTION VIEWS ARE LOOKING DOWNSTREAM

0 10 20
SCALE IN FEET



SECTION VIEW
TYPICAL CHANNEL DIMENSIONS

SEED MIX

Seeding Rate = 21 lbs./acre	
Seed mix ingredients	**% by weight**
Slough sedge (Carex obnupta)	27
Smallwing sedge (Carex microptera)	25
Awlfruit sedge (Carex stipata)	29.5
Common spikerush (Eleocharis palustris)	15
Smallfruit Bulrush (Scirpus microcarpus)	3
Slender rush (Juncus tenuis)	0.5

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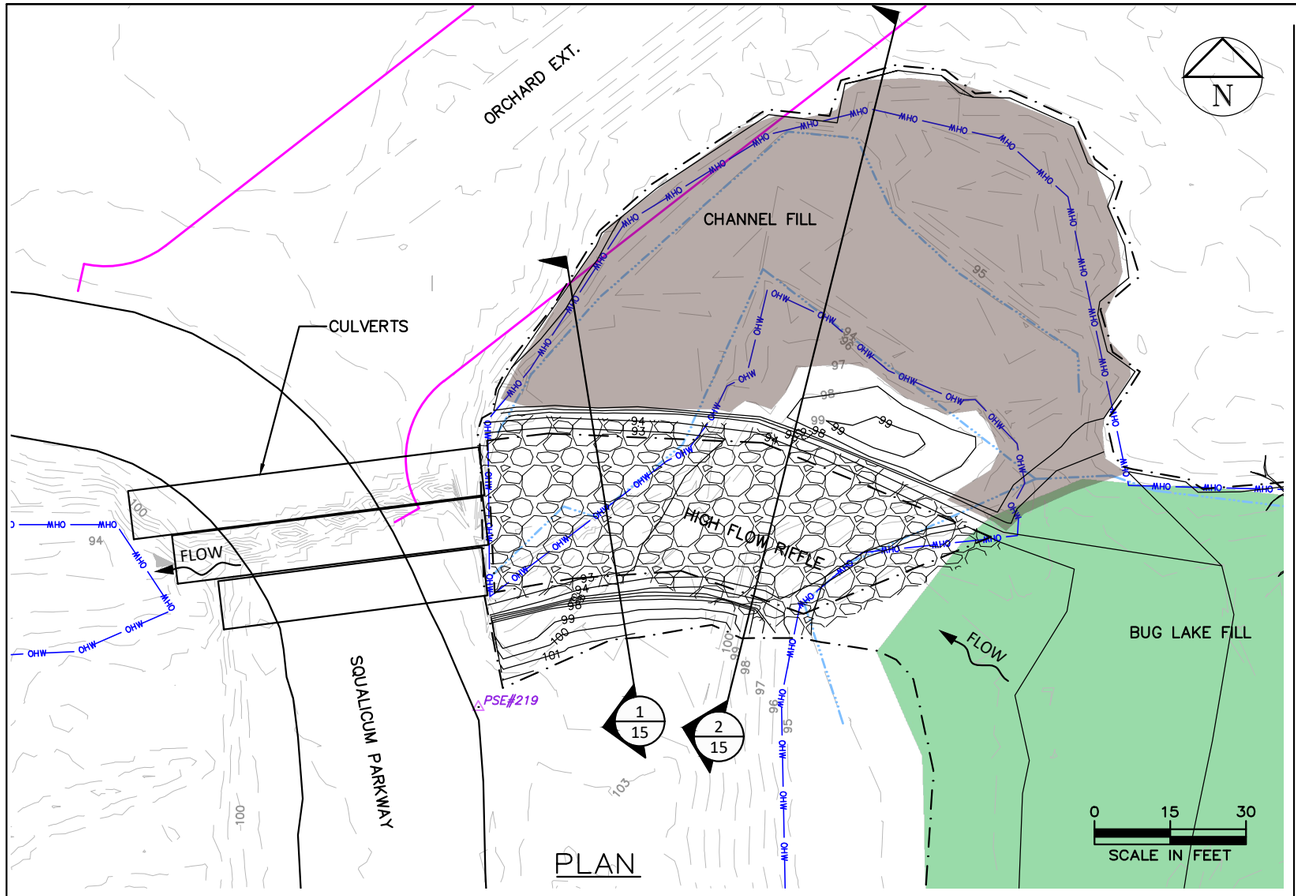
Field Bk. ---

SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
PHASE 3 - CHANNEL SECTION VIEWS

SHEET 14 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900



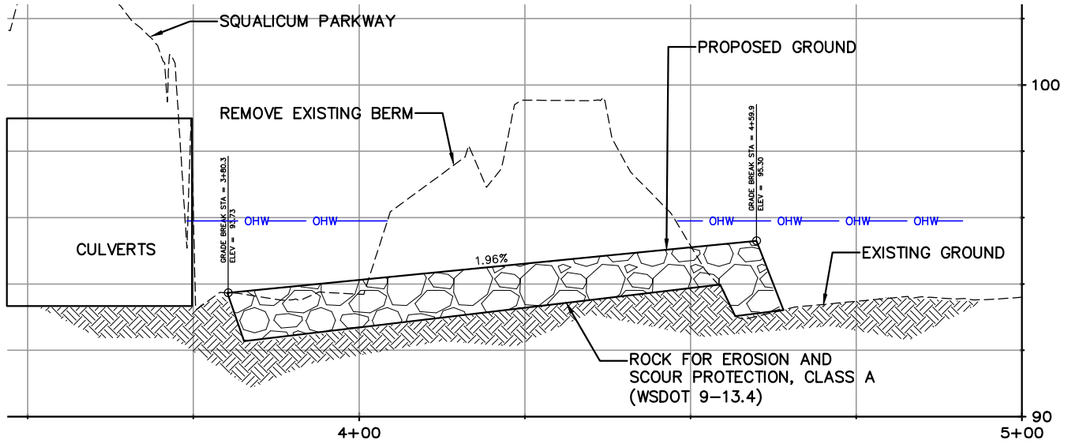
PLAN

LEGEND

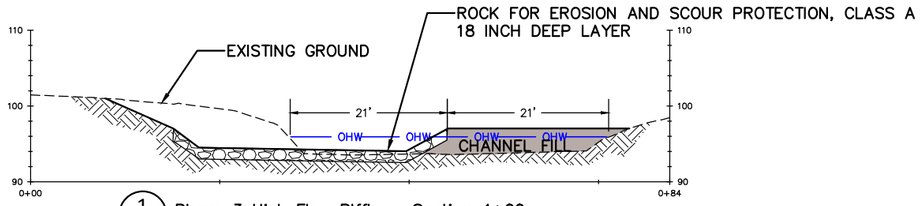
- EXISTING GROUND CONTOUR
- DESIGN GROUND CONTOUR
- ORDINARY HIGH WATER
- BUG LAKE FILL
- CHANNEL FILL
- ROCK FOR EROSION AND SCOUR PROTECTION

QUANTITIES

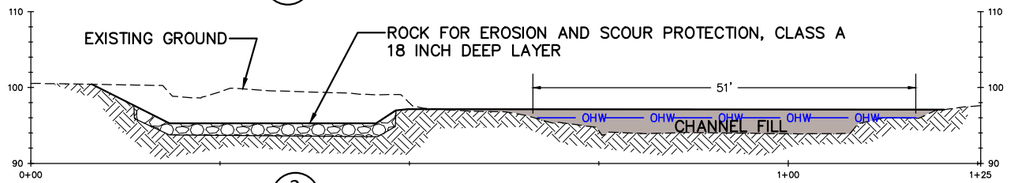
CHANNEL FILL (NATIVE SOIL FROM EXCAVATIONS)	570 CY
ROCK FOR EROSION AND SCOUR PROTECTION, CLASS A	170 CY



3/15 PROFILE VIEW - HIGH FLOW RIFFLE



1/15 Phase 3 High Flow Riffle – Section 4+00



2/15 Phase 3 High Flow Riffle – Section 4+30

1. REFER TO OVERALL SEQUENCE, SHEET 7
2. FILL EXISTING CHANNEL NEAR CULVERT INLET.
3. EXCAVATE THROUGH BERM TO FORM NEW CHANNEL SUBGRADE.
4. INSTALL STREAMBED COBBLES TO CONSTRUCT HIGH FLOW RIFFLE.

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Date 04/25/20
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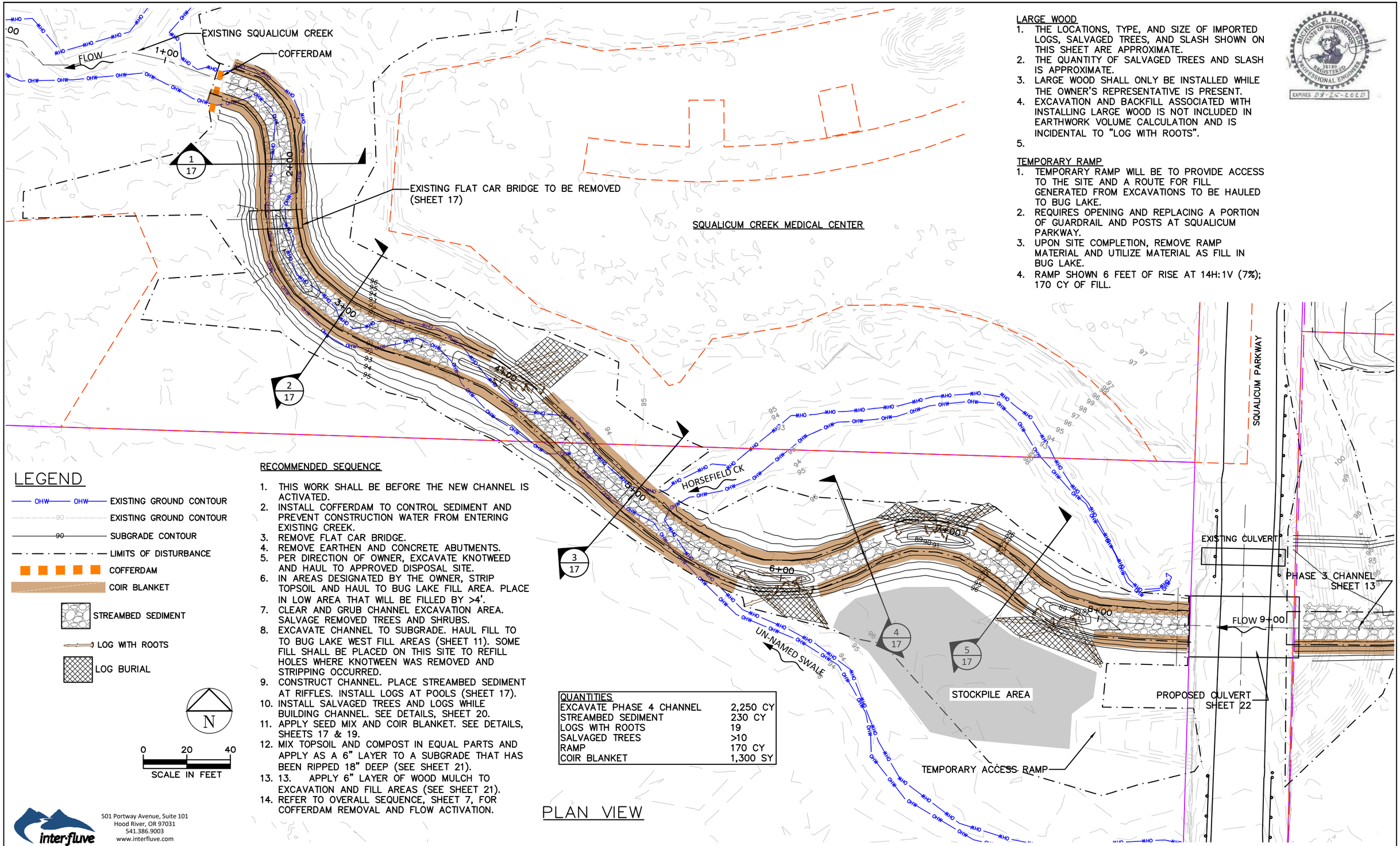
SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
PHASE 3 - HIGH FLOW RIFFLE

SHEET 15 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900



PLAN VIEW

LEGEND

- OHW — OHW — EXISTING GROUND CONTOUR
- 90 — EXISTING GROUND CONTOUR
- 90 — SUBGRADE CONTOUR
- LIMITS OF DISTURBANCE
- COFFERDAM
- COIR BLANKET
- STREAMBED SEDIMENT
- LOG WITH ROOTS
- LOG BURIAL

N

0 20 40

SCALE IN FEET

RECOMMENDED SEQUENCE

1. THIS WORK SHALL BE BEFORE THE NEW CHANNEL IS ACTIVATED.
2. INSTALL COFFERDAM TO CONTROL SEDIMENT AND PREVENT CONSTRUCTION WATER FROM ENTERING EXISTING CREEK.
3. REMOVE FLAT CAR BRIDGE.
4. REMOVE EARTHEN AND CONCRETE ABUTMENTS.
5. PER DIRECTION OF OWNER, EXCAVATE KNOTWEED AND HAUL TO APPROVED DISPOSAL SITE.
6. IN AREAS DESIGNATED BY THE OWNER, STRIP TOPSOIL AND HAUL TO BUG LAKE FILL AREA. PLACE IN LOW AREA THAT WILL BE FILLED BY >4'.
7. CLEAR AND GRUB CHANNEL EXCAVATION AREA. SALVAGE REMOVED TREES AND SHRUBS.
8. EXCAVATE CHANNEL TO SUBGRADE. HAUL FILL TO TO BUG LAKE WEST FILL AREAS (SHEET 11). SOME FILL SHALL BE PLACED ON THIS SITE TO REFILL HOLES WHERE KNOTWEEN WAS REMOVED AND STRIPPING OCCURRED.
9. CONSTRUCT CHANNEL. PLACE STREAMBED SEDIMENT AT RIFFLES. INSTALL LOGS AT POOLS (SHEET 17).
10. INSTALL SALVAGED TREES AND LOGS WHILE BUILDING CHANNEL. SEE DETAILS, SHEET 20.
11. APPLY SEED MIX AND COIR BLANKET. SEE DETAILS, SHEETS 17 & 19.
12. MIX TOPSOIL AND COMPOST IN EQUAL PARTS AND APPLY AS A 6" LAYER TO A SUBGRADE THAT HAS BEEN RIPPED 18" DEEP (SEE SHEET 21).
13. 13. APPLY 6" LAYER OF WOOD MULCH TO EXCAVATION AND FILL AREAS (SEE SHEET 21).
14. REFER TO OVERALL SEQUENCE, SHEET 7, FOR COFFERDAM REMOVAL AND FLOW ACTIVATION.

QUANTITIES	
EXCAVATE PHASE 4 CHANNEL	2,250 CY
STREAMBED SEDIMENT	230 CY
LOGS WITH ROOTS	19
SALVAGED TREES	>10
RAMP	170 CY
COIR BLANKET	1,300 SY

LARGE WOOD

1. THE LOCATIONS, TYPE, AND SIZE OF IMPORTED LOGS, SALVAGED TREES, AND SLASH SHOWN ON THIS SHEET ARE APPROXIMATE.
2. THE QUANTITY OF SALVAGED TREES AND SLASH IS APPROXIMATE.
3. LARGE WOOD SHALL ONLY BE INSTALLED WHILE THE OWNER'S REPRESENTATIVE IS PRESENT.
4. EXCAVATION AND BACKFILL ASSOCIATED WITH INSTALLING LARGE WOOD IS NOT INCLUDED IN EARTHWORK VOLUME CALCULATION AND IS INCIDENTAL TO "LOG WITH ROOTS".
5.

TEMPORARY RAMP

1. TEMPORARY RAMP WILL BE TO PROVIDE ACCESS TO THE SITE AND A ROUTE FOR FILL GENERATED FROM EXCAVATIONS TO BE HAULED TO BUG LAKE.
2. REQUIRES OPENING AND REPLACING A PORTION OF GUARDRAIL AND POSTS AT SQUALICUM PARKWAY.
3. UPON SITE COMPLETION, REMOVE RAMP MATERIAL AND UTILIZE MATERIAL AS FILL IN BUG LAKE.
4. RAMP SHOWN 6 FEET OF RISE AT 14H:1V (7%); 170 CY OF FILL.

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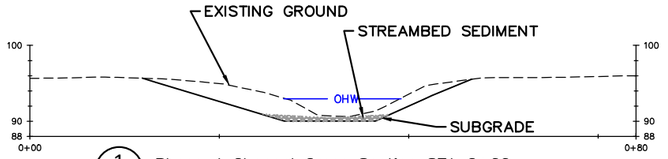
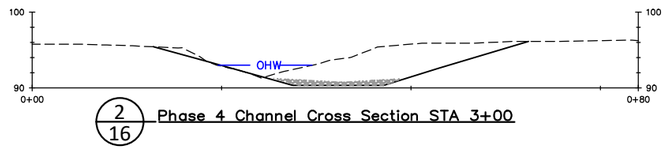
SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
PHASE 4 - NEW CHANNEL GRADING PLAN

SHEET 16 OF 36

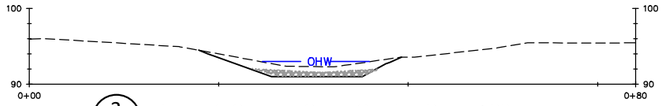
CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900



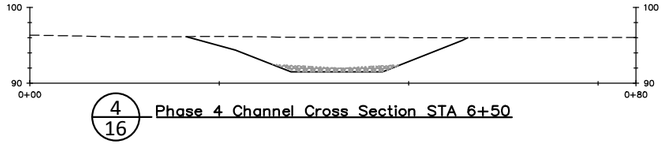
1/16 Phase 4 Channel Cross Section STA 2+00



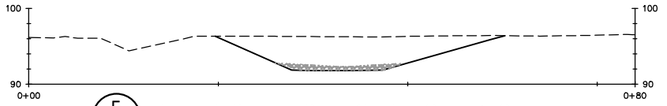
2/16 Phase 4 Channel Cross Section STA 3+00



3/16 Phase 4 Channel Cross Section STA 5+00



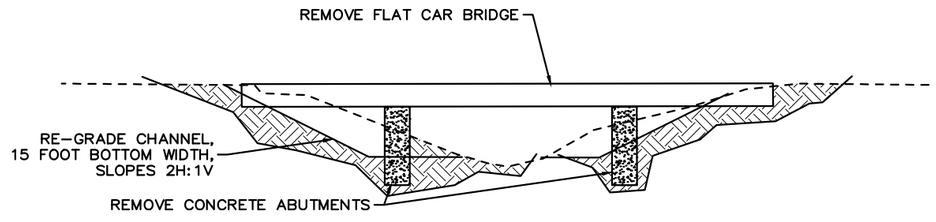
4/16 Phase 4 Channel Cross Section STA 6+50



5/16 Phase 4 Channel Cross Section STA 7+50

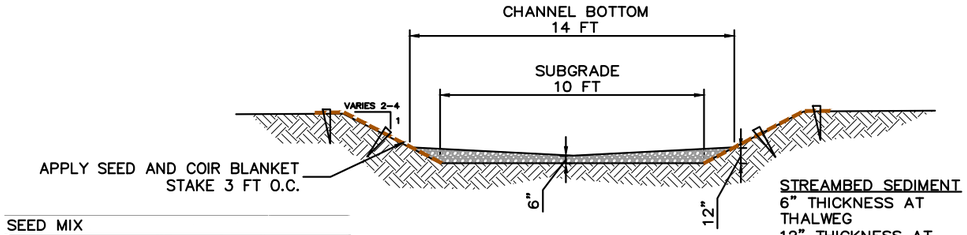
SECTION VIEWS ARE LOOKING DOWNSTREAM

0 10 20
SCALE IN FEET



1/17 SECTION - FLAT CAR BRIDGE REMOVAL

0 5 10
SCALE IN FEET

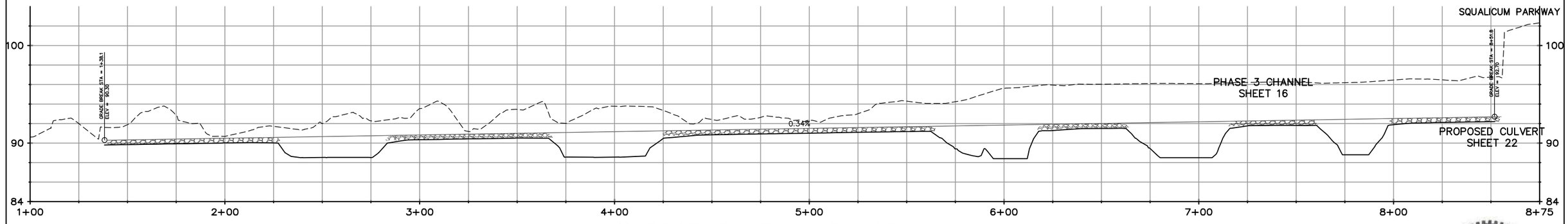


SECTION VIEW
TYPICAL CHANNEL DIMENSIONS

THALWEG OF CHANNEL IS LOWEST PORTION OF CROSS SECTION. ITS POSITION VARIES FROM RIGHT TO LEFT DEPENDING ON WHERE THE SECTION OCCURS ALONG THE CHANNEL ALIGNMENT.

SEED MIX

Seeding Rate = 21 lbs./acre	
Seed mix ingredients	**% by weight**
Slough sedge (Carex obnupta)	27
Smallwing sedge (Carex microptera)	25
Awlfruit sedge (Carex stipata)	29.5
Common spikerush (Eleocharis palustris)	15
Smallfruit Bulrush (Scirpus microcarpus)	3
Slender rush (Juncus tenuis)	0.5



2/17 PROFILE VIEW – PHASE 4

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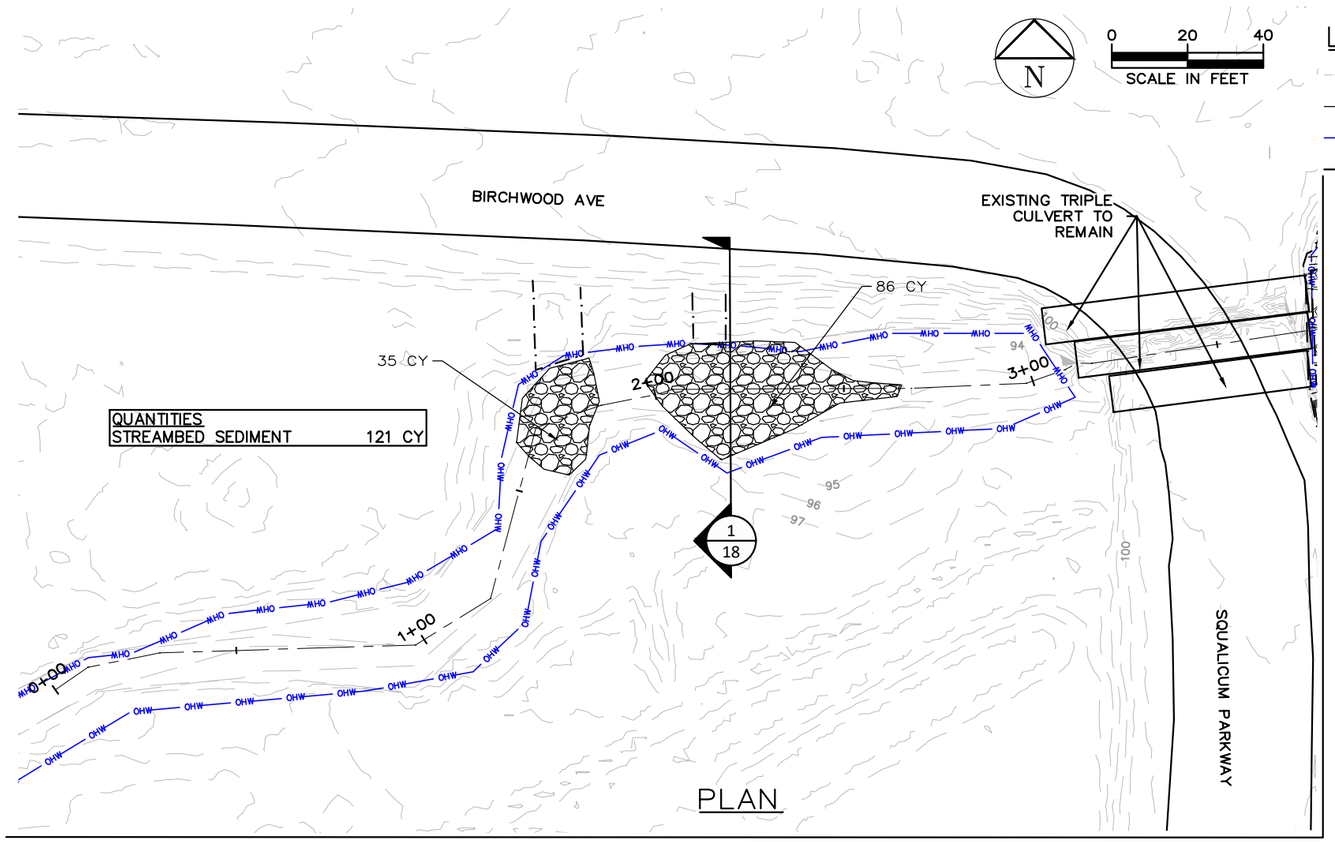
Field Bk. ---

SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
PHASE 4 - CHANNEL PROFILE & SECTION VIEWS

SHEET 17 OF 36

CONTACT PERSON: CRAIG MUELLER P.E. , PROJECT ENGINEER AT 778-7900

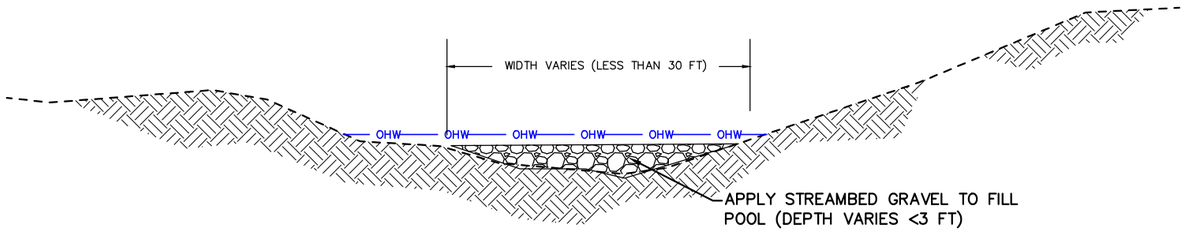


LEGEND

- EXISTING GROUND CONTOUR
- DESIGN GROUND CONTOUR
- ORDINARY HIGH WATER
- LIMITS OF DISTURBANCE
- FILL – STREAMBED GRAVEL

STREAMBED SEDIMENT NOTES:

1. APPLY STREAMBED SEDIMENTS TO LOW AREAS (POOLS) TO MATCH AVERAGE CHANNEL GRADE. THIS WILL BE BASED ON CONDITIONS AT TIME OF CONSTRUCTION AND "FIT IN THE FIELD".
2. APPLY STREAMBED SEDIMENT FROM ROAD.
3. STREAMBED SEDIMENT SHALL BE IMPORTED ROUNDED GRAVEL HAVING THE APPROXIMATE GRADATION OF WASHDOT STREAMBED SEDIMENT IN SECTION 9-03.11(1) OF THE STANDARD SPECIFICATIONS.
4. WORK IN THIS AREA SHALL BE "IN THE DRY", AFTER STREAM DIVERSION TO THE NEW CHANNEL.



1/18 FILL POOLS IN OVERFLOW CHANNEL

0 5 10
SCALE IN FEET

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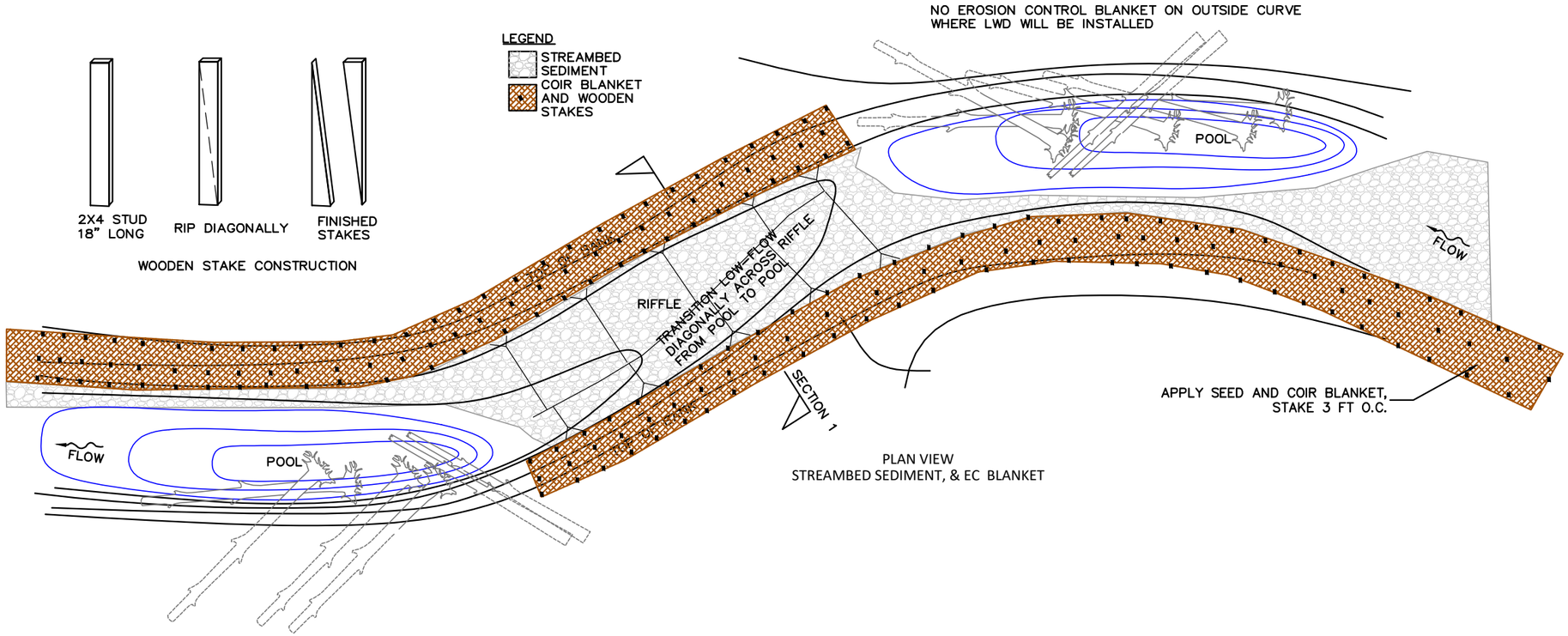
SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
PHASE 4 - OVERFLOW CHANNEL

SHEET 18 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900

WOODEN STAKE CONSTRUCTION



PLAN VIEW
STREAMBED SEDIMENT, & EC BLANKET

SEED MIX

Seeding Rate = 21 lbs./acre	
Seed mix ingredients	**% by weight**
Slough sedge (Carex obnupta)	27
Smallwing sedge (Carex microptera)	25
Awlfruit sedge (Carex stipata)	29.5
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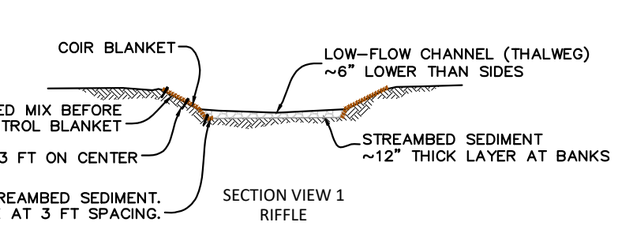
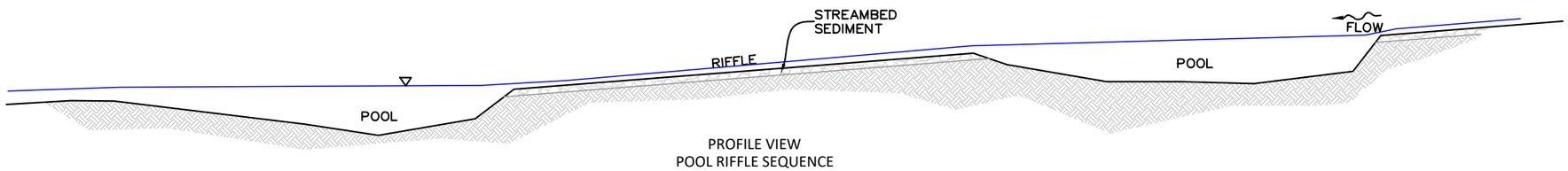


SECTION VIEW 1
RIFFLE



PROFILE VIEW
POOL RIFFLE SEQUENCE

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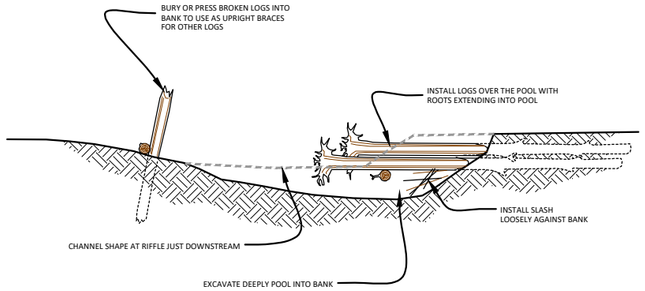
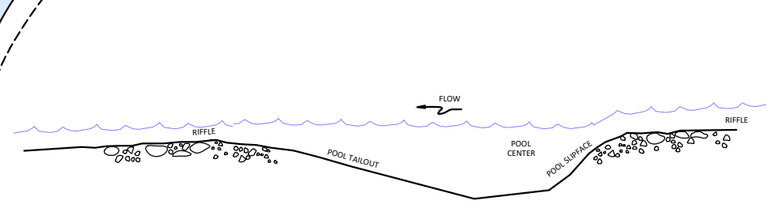
SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
TYPICAL DETAILS - CHANNEL

SHEET 19 OF 36

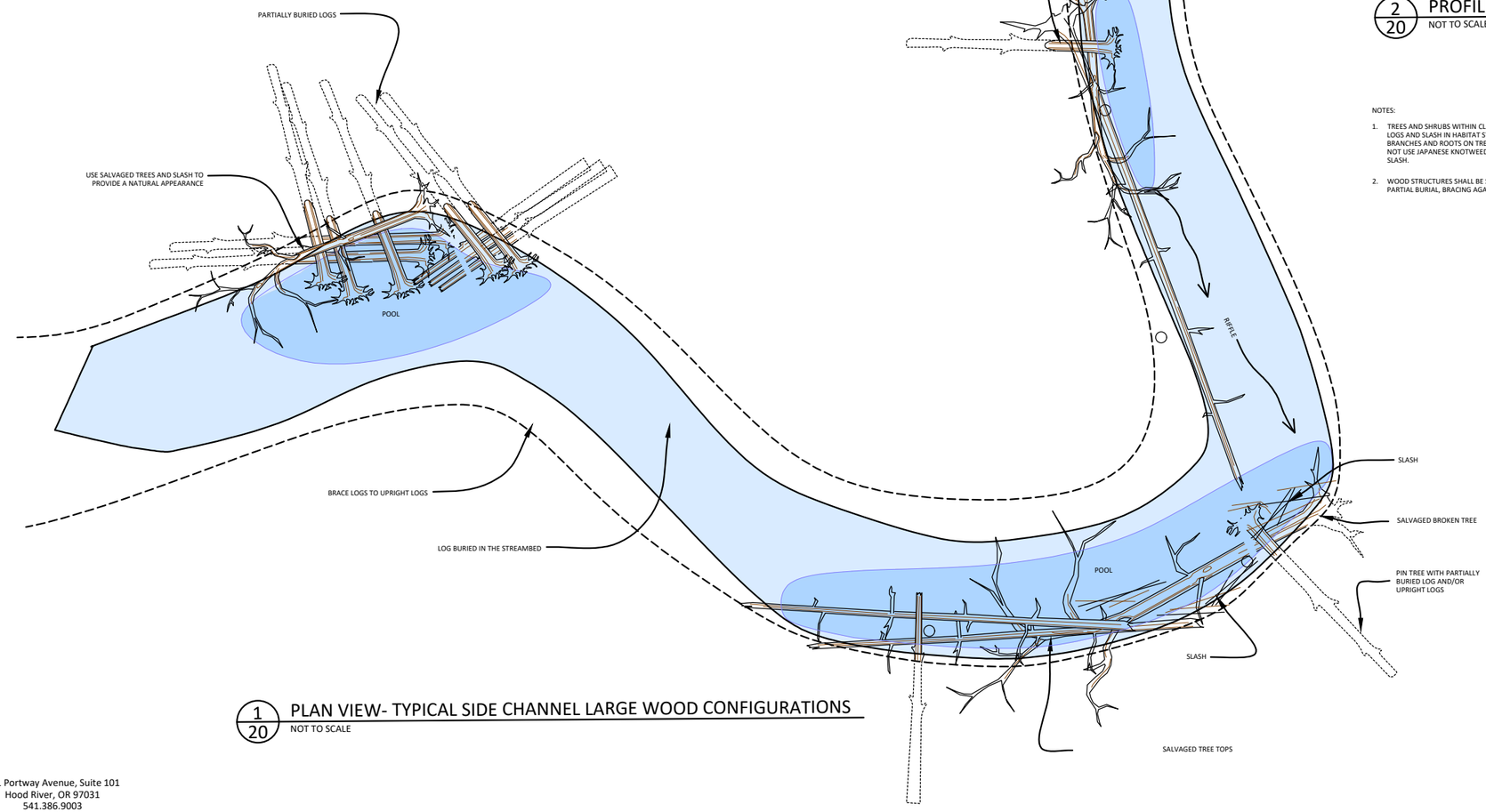
CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900



3/20 SECTION VIEW - TYPICAL POOL AND LWD
NOT TO SCALE



2/20 PROFILE VIEW - TYPICAL POOL AND RIFFLE
NOT TO SCALE



1/20 PLAN VIEW- TYPICAL SIDE CHANNEL LARGE WOOD CONFIGURATIONS
NOT TO SCALE

NOTES:

1. TREES AND SHRUBS WITHIN CLEARING LIMITS SHALL BE SALVAGED AND REUSED AS LOGS AND SLASH IN HABITAT STRUCTURES. TO THE EXTENT PRACTICABLE, PRESERVE BRANCHES AND ROOTS ON TREES REMOVED DURING CLEARING AND GRUBBING. DO NOT USE JAPANESE KNOTWEED, HIMALAYAN BLACKBERRY, OR ENGLISH HOLLY AS SLASH.
2. WOOD STRUCTURES SHALL BE STABILIZED. STABILIZATION METHODS INCLUDE PARTIAL BURIAL, BRACING AGAINST STANDING TREES, OR TIMBER PILES.

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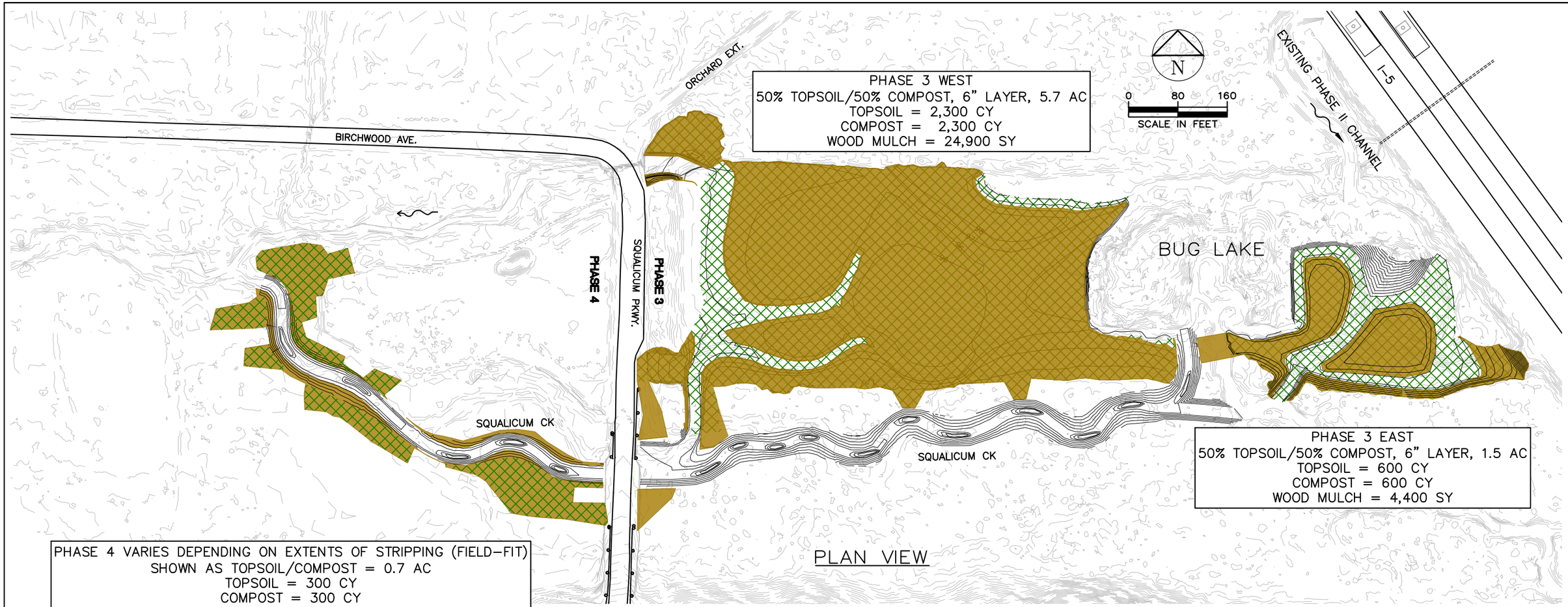
SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
TYPICAL DETAILS - WOOD

SHEET 20 OF 36

CONTACT PERSON: CRAIG MUELLER P.E. , PROJECT ENGINEER AT 778-7900

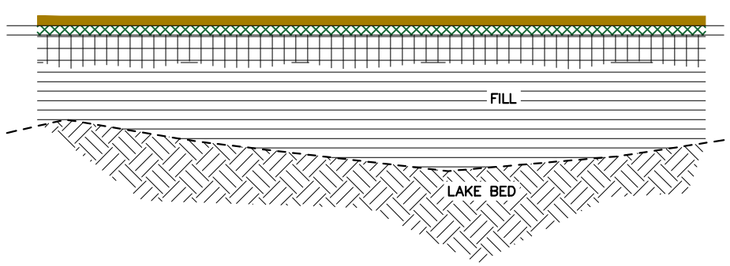


PLAN VIEW

LEGEND

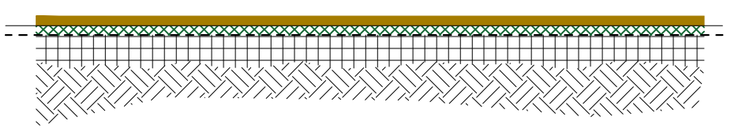
TOPSOIL/COMPOST

WOOD MULCH



TYPICAL SECTION VIEW (FILL AREA)

6 INCH LAYER WOOD MULCH
6 INCH LAYER, 50% COMPOST 50% TOPSOIL
DECOMPACT TOP 18 INCHES



TYPICAL SECTION VIEW (CUT AREA)

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SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
TOPSOIL-COMPOST & WOOD MULCH

SHEET 21 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900

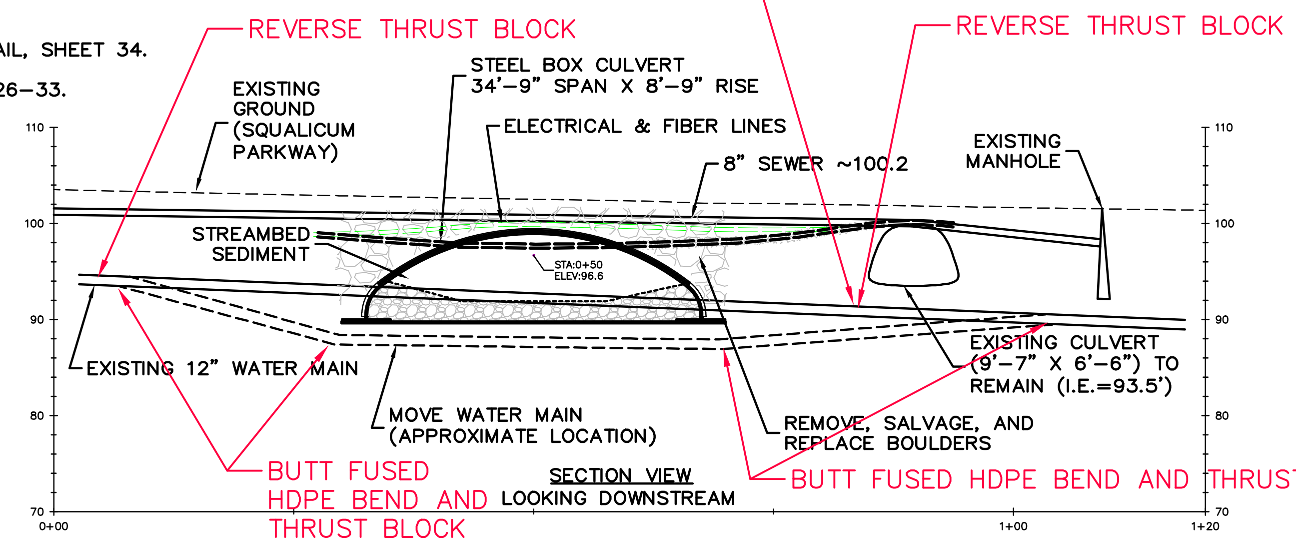
SUGGESTED CONSTRUCTION SEQUENCE

1. INSTALL TRAFFIC CONTROL FOR BOTH TRAFFIC LANES.
2. CLEAR AND GRUB. STOCKPILE REMOVED TREES.
3. INSTALL TEMPORARY TRAFFIC BYPASS. REMOVE GUARDRAIL POSTS AND BEAM MAKE OPENING FOR TRAFFIC.
4. REMOVE POST AND BEAM GUARDRAIL, ~110 LF ON EACH SIDE OF ROAD.
5. REMOVE BOULDERS, BOTH SIDES OF ROAD, STOCKPILE FOR RE-USE.
6. MOVE 12" WATER MAIN.
7. INSTALL ALUMINUM BOX CULVERT. SUPPORT AND PROTECT 8" SANITARY SEWER PIPE.
8. UTILIZE SALVAGED BOULDERS TO REBUILD ROCK WALL (BOTH SIDES) WHILE INSTALLING CULVERT BACKFILL.
9. REPLACE ROADWAY. MATCH EXISTING.
10. INSTALL WSDOT CONCRETE BARRIER TYPE 3, 50 LF, BOTH SIDES.
11. REPLACE REMOVED GUARDRAIL, TYPE 31, CONNECTING TO EXISTING GUARDRAIL AND ATTACHING TO CONCRETE BARRIER USING WSDOT BEAM GUARDRAIL TRANSITION WITH TYPE D CONNECTION (QUANTITY = 4).
12. REMOVE TRAFFIC CONTROLS.
13. REMOVE TRAFFIC BYPASS. STOCKPILE REMOVED MATERIAL TO BE USED AS BUG LAKE FILL.

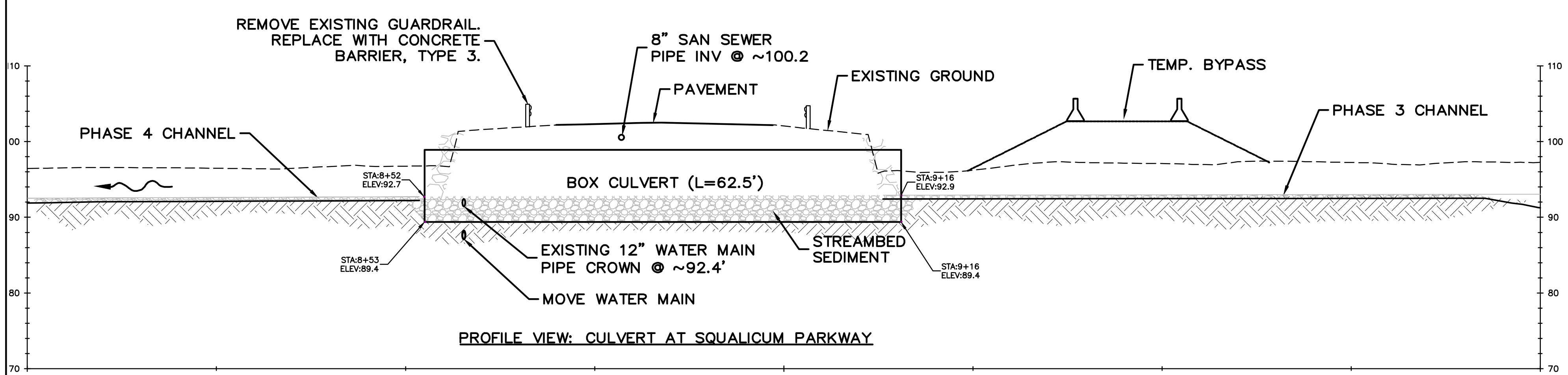
ASSOCIATED DETAILS:

1. CULVERT DETAILS, SHEETS 22–25.
2. PIPE DETAILS, SHEET 34.
3. PAVEMENT REPLACEMENT DETAIL, SHEET 34.
4. GUARDRAIL DETAILS, SHEETS 26–33.

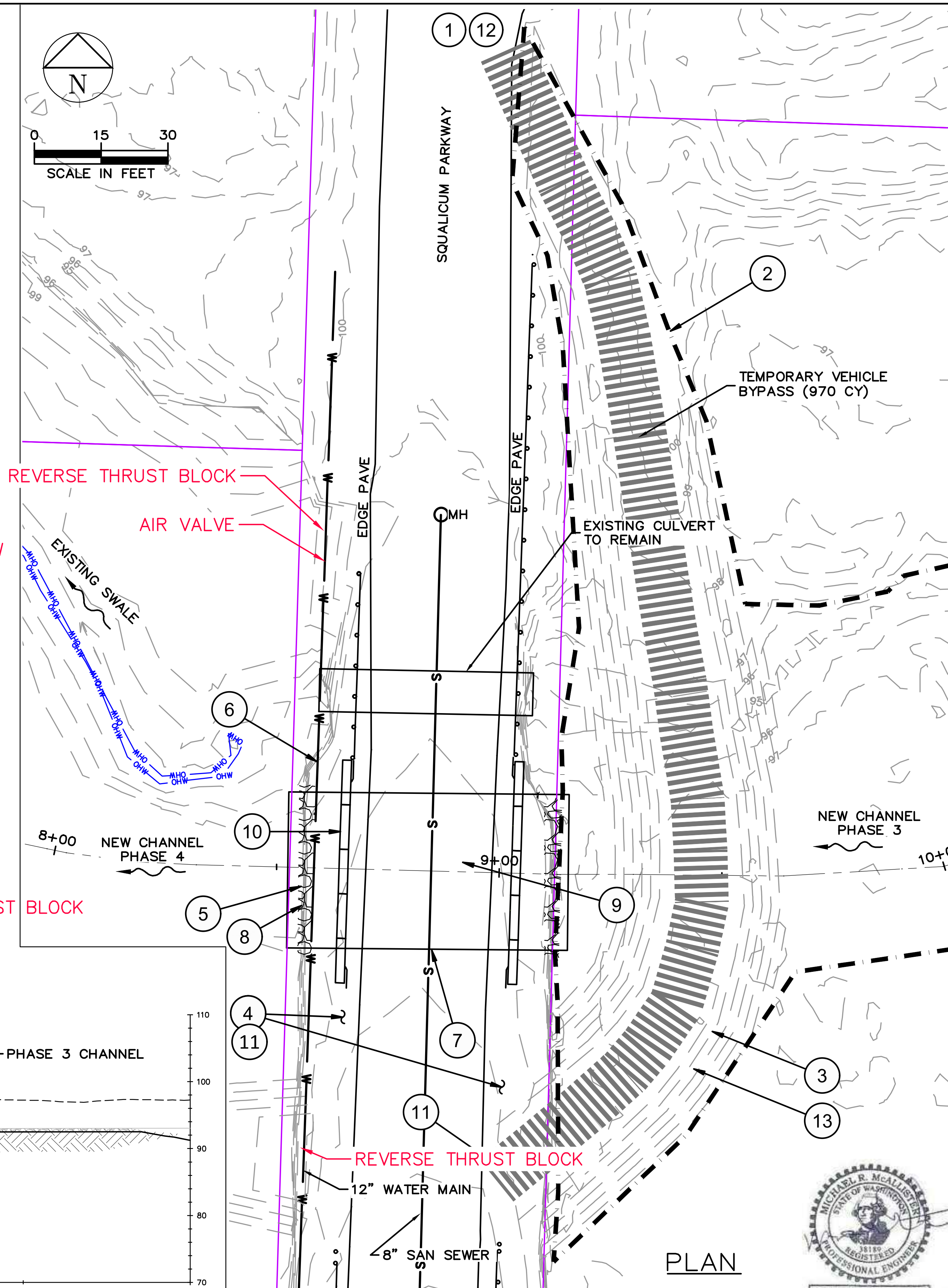
CULVERT NOTE:
PERFORM TRENCH EXCAVATION, BEDDING, AND BACKFILL PER GUIDANCE IN GEOTECHNICAL REPORT AND MANUFACTURERS INSTRUCTIONS.



SECTION VIEW
LOOKING DOWNSTREAM



PROFILE VIEW: CULVERT AT SQUALICUM PARKWAY



PLAN

MICHAEL R. McALLISTER, STATE OF WASHINGTON, 38189, REGISTERED PROFESSIONAL ENGINEER, EXPIRES 08-26-2020

Date	No	Revision	By
	4		
	3		
	2		
	1		

PROJECT ENGINEER MM DESIGNED/DRAWN DF INSPECTOR ----	DIRECTOR PUBLIC WORKS T.A.C. CITY ENGINEER C.M.A.S. ASSISTANT DIRECTOR R.L.	CITY OF BELLINGHAM, WASHINGTON PUBLIC WORKS DEPARTMENT ENGINEERING DIVISION	SCALE Horiz. SHOWN Vert. SHOWN	DATUM NAD83/98-NAVD88	Job. No. ---- Date 04/25/20 Field Bk.	SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4 CULVERT OVERVIEW	SHEET 22 OF 36

CONTACT PERSON: CRAIG MUELLER P.E. , PROJECT ENGINEER AT 778-7900

I - GENERAL

1.0 STANDARDS AND DEFINITIONS

1.1 STANDARDS - ALL STANDARDS REFER TO LATEST EDITION UNLESS OTHERWISE NOTED.

1.1.1 ASTM B-864 "STANDARD SPECIFICATION FOR CORRUGATED ALUMINUM BOX CULVERTS" (AASHTO DESIGNATION M-219).

1.1.2 AASHTO STANDARD SPECIFICATION FOR HIGHWAY BRIDGES - SECTION 12 DIVISION I - DESIGN.

1.1.3 AASHTO STANDARD SPECIFICATION FOR HIGHWAY BRIDGES - SECTION 26DIVISION II - CONSTRUCTION.

1.2 DEFINITIONS

1.2.1 OWNER - IN THESE SPECIFICATIONS THE WORD "OWNER" SHALL MEAN City of Bellingham.

1.2.2 ENGINEER - IN THESE SPECIFICATIONS THE WORD "ENGINEER" SHALL MEAN THE ENGINEER OF RECORD OR OWNER'S DESIGNATED ENGINEERING REPRESENTATIVE.

1.2.3 MANUFACTURER - IN THESE SPECIFICATIONS THE WORD "MANUFACTURER" SHALL MEAN CONTECH ENGINEERED SOLUTIONS, LLC 800-338-1122.

1.2.4 CONTRACTOR - IN THESE SPECIFICATIONS THE WORD "CONTRACTOR" SHALL MEAN THE FIRM OR CORPORATION UNDERTAKING THE EXECUTION OF ANY INSTALLATION WORK UNDER THE TERMS OF THESE SPECIFICATIONS.

1.2.5 APPROVED - IN THESE SPECIFICATIONS THE WORD "APPROVED" SHALL REFER TO THE APPROVAL OF THE ENGINEER OR HIS DESIGNATED REPRESENTATIVE.

1.2.6 AS DIRECTED - IN THESE SPECIFICATIONS THE WORDS "AS DIRECTED" SHALL REFER TO THE DIRECTIONS TO THE CONTRACTOR FROM THE OWNER OR HIS DESIGNATED REPRESENTATIVE.

2.0 GENERAL CONDITIONS

2.1 THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIAL AND EQUIPMENT AND PERFORM ALL WORK AND SERVICES EXCEPT THOSE SET OUT AND FURNISHED BY THE OWNER, NECESSARY TO COMPLETE IN A SATISFACTORY MANNER THE SITE PREPARATION, EXCAVATION, FILLING, COMPACTION, GRADING AS SHOWN ON THE PLANS AND AS DESCRIBED THEREIN. THIS WORK SHALL CONSIST OF ALL MOBILIZATION CLEARING AND GRADING, GRUBBING, STRIPPING, REMOVAL OF EXISTING MATERIAL UNLESS OTHERWISE STATED, PREPARATION OF THE LAND TO BE FILLED, FILLING OF THE LAND, SPREADING AND COMPACTION OF THE FILL, AND ALL SUBSIDIARY WORK NECESSARY TO COMPLETE THE GRADING OF THE CUT AND FILL AREAS TO CONFORM WITH THE LINES, GRADES, SLOPES, AND SPECIFICATIONS. THIS WORK IS TO BE ACCOMPLISHED UNDER THE OBSERVATION OF THE OWNER OR HIS DESIGNATED REPRESENTATIVE.

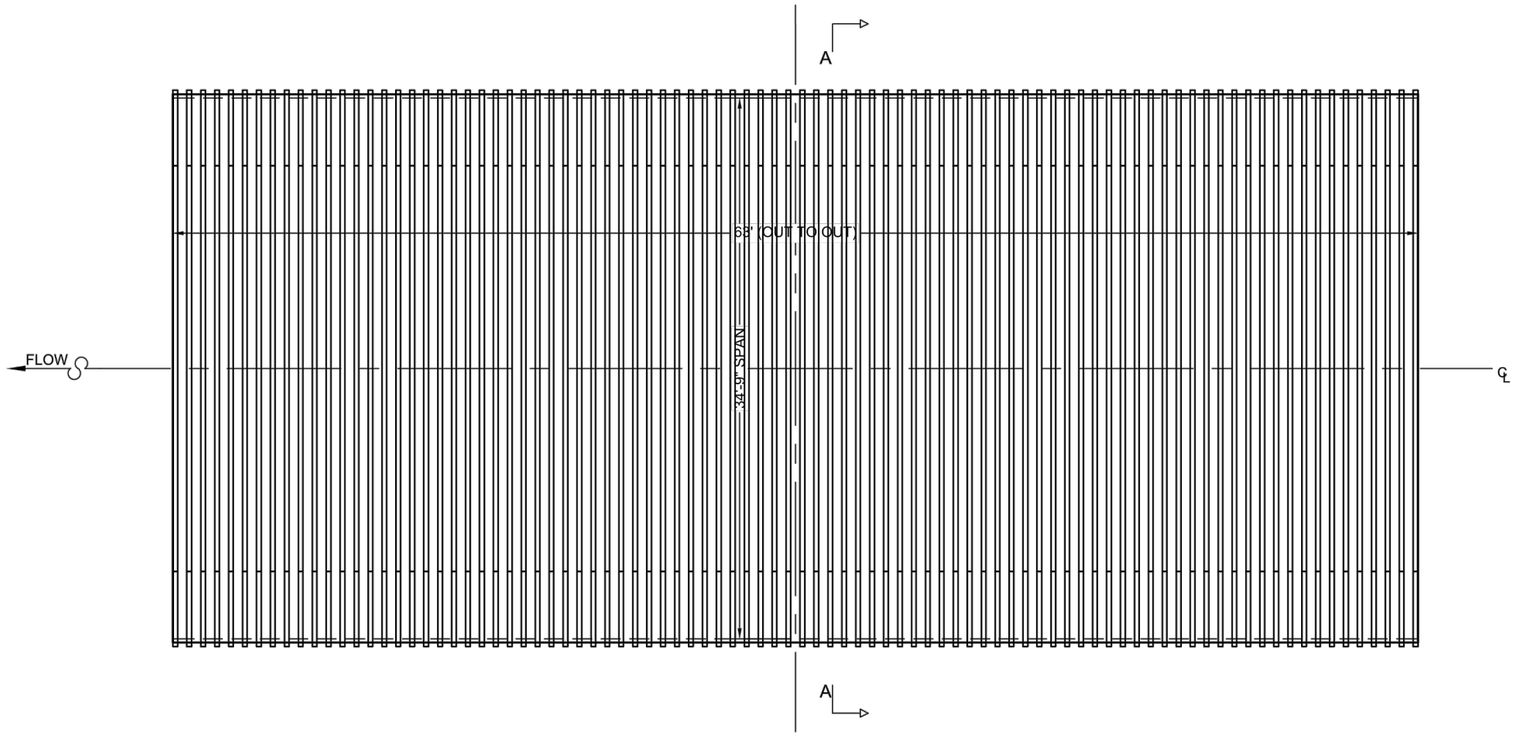
2.2 PRIOR TO BIDDING THE WORK, THE CONTRACTOR SHALL EXAMINE, INVESTIGATE AND INSPECT THE CONSTRUCTION SITE AS TO THE NATURE AND LOCATION OF THE WORK, AND THE GENERAL AND LOCAL CONDITIONS AT THE CONSTRUCTION SITE, INCLUDING WITHOUT LIMITATION, THE CHARACTER OF SURFACE OR SUBSURFACE CONDITIONS AND OBSTACLES TO BE ENCOUNTERED ON AND AROUND THE CONSTRUCTION SITE AND SHALL MAKE SUCH ADDITIONAL INVESTIGATION AS HE MAY DEEM NECESSARY FOR THE PLANNING AND PROPER EXECUTION OF THE WORK.

IF CONDITIONS OTHER THAN THOSE INDICATED ARE DISCOVERED BY THE CONTRACTOR, THE OWNER SHALL BE NOTIFIED IMMEDIATELY. THE MATERIAL WHICH THE CONTRACTOR BELIEVES TO BE A CHANGED CONDITION SHALL NOT BE DISTURBED SO THAT THE OWNER CAN INVESTIGATE THE CONDITION.

2.3 THE CONSTRUCTION SHALL BE PERFORMED UNDER THE DIRECTION OF THE ENGINEER.

2.4 ALL ASPECTS OF THE STRUCTURE DESIGN AND SITE LAYOUT INCLUDING FOUNDATIONS, BACKFILL, END TREATMENTS AND NECESSARY SCOUR CONSIDERATION SHALL BE PERFORMED BY THE ENGINEER.

ANY INSTALLATION GUIDANCE PROVIDED HEREIN SHALL BE ENDORSED BY THE ENGINEER OR SUPERSEDED BY THE ENGINEER'S PLANS AND SPECIFICATIONS.



BRIDGE PLAN

TYPE VI CROWN RIBS (TYP.) @ 9" O.C.
TYPE VI HAUNCH RIBS (TYP.) @ 9" O.C.

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CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH® STRUCTURAL PLATE

PROPOSAL DRAWING

ALBC #137 - 34'-9" X 8'-9"
SQUALICUM PARKWAY CULVERT
PREPARED FOR INTERFLUVE
BELLINGHAM, WA

PROJECT No.:	SEQ. No.:	DATE:
586993	010	4/23/2019
DESIGNED:	DRAWN:	
CHECKED:	APPROVED:	
SHEET NO.:		

II - ALUMINUM BOX CULVERT

1.0 GENERAL

1.1 Manufacturer shall fabricate the aluminum box culvert as shown on the plans. Fabrication shall conform to the requirements of ASTM B-864 and shall consist of plates, ribs, and appurtenant items.

Plate thickness, rib spacing, end treatment and type of invert and foundation shall be as indicated on the plans. All manufacturing processes including corrugating, punching, curving and required galvanizing shall be performed within the United States of America.

1.2 The contractor shall verify all field dimensions and conditions prior to ordering materials.

2.0 DIMENSIONS

Span: 34'-9" Rise: 8'-9"
Haunch Gage: 0.15 Crown Gage: 0.2
Haunch Rib Type: TYPE VI Crown Rib Type: TYPE VI
Haunch Rib Spacing: 9" Crown Rib Spacing: 9"

2.1 The proposed structure shall be an ALUMINUM BOX CULVERT with the following dimensions:

2.2 All plan dimensions on the contract drawings are measured in a true horizontal plan unless otherwise noted.

3.0 ASSEMBLY AND INSTALLATION

3.1 Bolts and nuts shall conform to the requirements of ASTM A-307 or ASTM A-449. The box culvert shall be assembled in accordance with the plate layout drawings provided by the manufacturer and per the manufacturer's recommendations.

Bolts shall be tightened using an applied torque of between 100 and 150 ft.-lbs.

3.2 The box culvert shall be installed in accordance with the plans and specifications, the manufacturer's recommendations, and AASHTO Standard Specification for Highway Bridges - Section 26 Division II - Construction.

3.3 Trench excavation shall be made in embankment material that is structurally adequate. The trench width shall be shown on the plans. Poor quality in situ embankment material must be removed and replaced with suitable backfill as directed by the Engineer.

3.4 Bedding preparation is critical to both structure performance and service life. The bed should be constructed to uniform line and grade to avoid distortions that may create undesirable stresses in the structure and/or rapid deterioration of the roadway. The bed should be free of rock formations, protruding stones, frozen lumps, roots, and other foreign matter that may cause unequal settlement.

3.5 Bedding shall provide a minimum of 4,000 psf bearing capacity. Foundation details for bearing capacity less than 4,000 psf shall be approved by the Engineer.

3.6 The structure shall be assembled in accordance with the Manufacturer's instructions. All plates shall be unloading and handled with reasonable care. Plates shall not be rolled or dragged over gravel rock and shall be prevented from striking rock or other hard objects during placement in trench or on bedding.

When installed on a full invert or on flexible footing pads, assembly of the invert or footing pads shall start at the downstream end. Circumferential seam laps shall shingle over the top of the downstream plates as assembly progresses upstream. Whether the box culvert is installed on a concrete footing, full metal invert, or flexible footing pad, assembly of the structure shell shall start at the upstream end. Downstream rings of plates shall be assembled outside of the upstream rings. (Circumferential seams are shingled downstream when viewed from the inside of the shell).

3.7 The structure shall be backfilled using clean well graded granular material that meets the requirements for soil classifications A-1, A-2-4, A-2-5 or A-3 modified to be more select than AASHTO M-145. See the information at the right of this sheet.

Backfill must be placed symmetrically on each side of the structure in 6 to 8 inch loose lifts. Each lift shall be compacted to a minimum of 90 percent density per AASHTO T-180

3.8 Construction loads that exceed highway load limits are not allowed to cross the structure without approval from the Engineer.

Normal highway traffic is not allowed to cross the structure until the structure has been backfilled and paved. If the road is unpaved, cover allowance to accommodate rutting shall be as directed by the Engineer.

BEDDING FOR THE STRUCTURE INVERT (INCLUDING BELOW THE FOOTING PLATES) SHOULD BE A BLANKET CONSISTING OF NON-CORROSIVE GRANULAR MATERIAL WITH A MINIMUM THICKNESS OF 5" AND A MAXIMUM PARTICLE SIZE OF 1.25". THIS MATERIAL SHOULD BE ANGULAR AND PLACED LOOSE TO ALLOW THE CORRUGATED PLATES TO SEAT INTO IT TO BECOME FULLY BEDDED.

A NET ALLOWABLE SOIL BEARING PRESSURE OF 3,600 PSF WAS ASSUMED FOR THE FLEXIBLE FOOTING DESIGN. THIS WOULD BE THE SOILS BELOW THE SUPPLEMENTAL FOOTING PLATES WHERE THE STRUCTURE BEARS – GENERALLY THE OUTER 4–5 FT ON EACH END OF THE INVERT. FOUNDATION SOILS IN THIS AREA SHOULD BE EVALUATED BY A QUALIFIED ENGINEER AND PREPARED AS THEY WOULD BE FOR A CONVENTIONAL FOOTING (INCLUDING ANY SOIL IMPROVEMENT IF NEEDED), WITH THE GRANULAR BEDDING PLACED ON THE PREPARED FOUNDATION SUBGRADE AS DESCRIBED ABOVE TO ALLOW NESTING INTO THE CORRUGATIONS.

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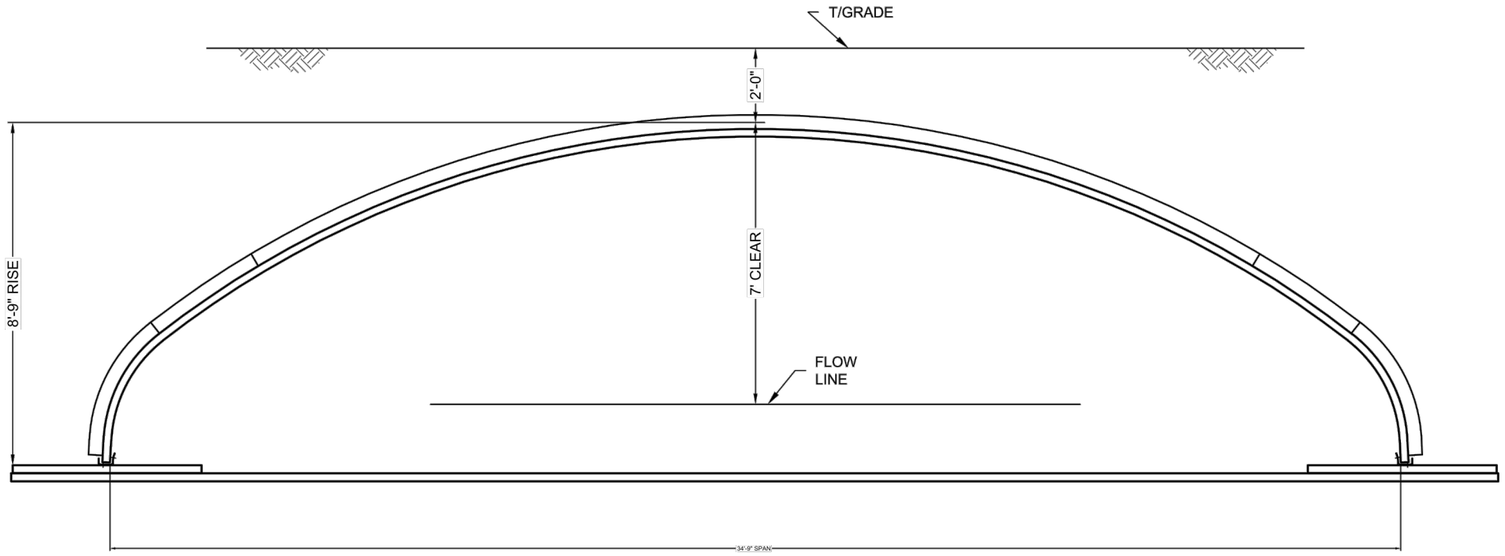

CROSS SECTION A-A

NOTES
•MEASUREMENTS ARE TO THE INSIDE CRESTS OF THE CORRUGATION
•DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES

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CONTECH® STRUCTURAL PLATE

PROPOSAL DRAWING

ALBC #137 - 34'-9" X 8'-9"
SQUALICUM PARKWAY CULVERT
PREPARED FOR INTERFLUVE
BELLINGHAM, WA

PROJECT No.:	SEQ. No.:	DATE:
586993	010	4/23/2019
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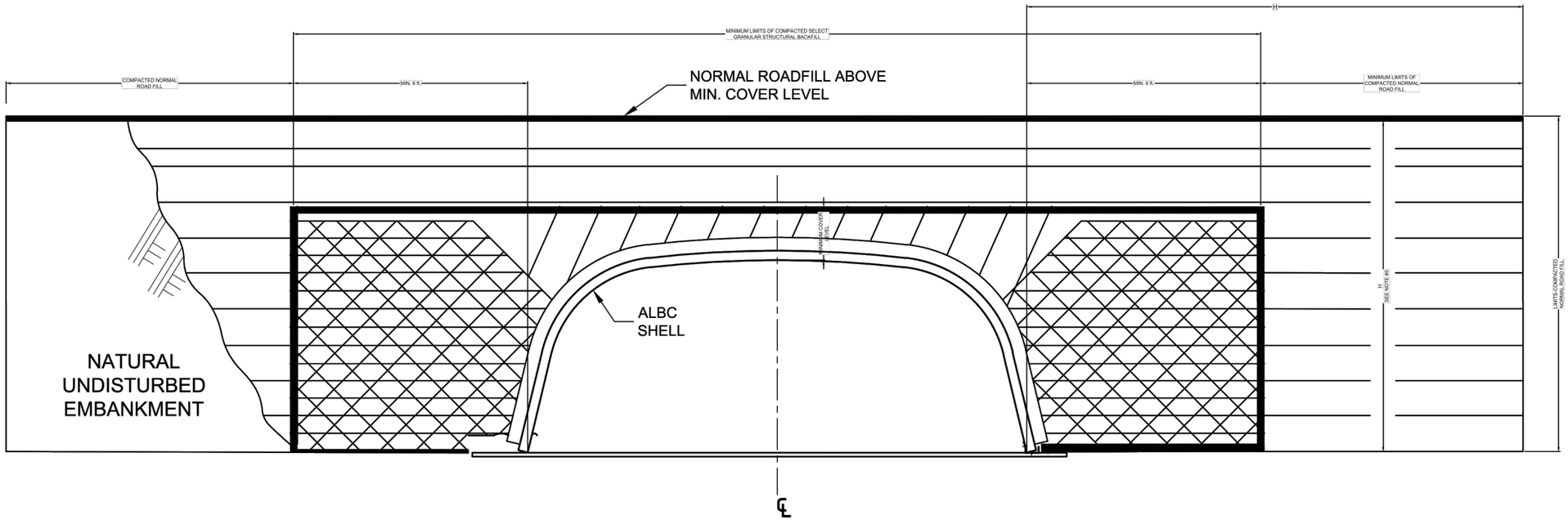

SECTION

CRITICAL BACKFILL ZONE, PRESSURE ON SOIL GREATEST HERE.

INITIAL LIFTS OVER CROWN OF STRUCTURE AS INDICATED BY SHADED AREA TO BE COMPACTED TO REQUIRED DENSITY WITH HAND OPERATED EQUIPMENT OR WITH SMALL TRACTOR (D-4 OR SMALLER) DRAWN EQUIPMENT.

SELECT GRANULAR STRUCTURAL BACKFILL LIMITS.

NOTES:

1. ALL SELECT GRANULAR BACKFILL TO BE PLACED IN A BALANCED FASHION IN THIN LIFTS (6"-8" LOOSE TYPICALLY) AND COMPACTED TO 90 PERCENT DENSITY PER AASHTO T-180.
2. COMPLETE AND REGULAR MONITORING OF THE ALUMINUM BOX CULVERT SHAPE IS NECESSARY DURING ALL BACKFILLING OF THE STRUCTURE.
3. PREVENT EXCESSIVE DISTORTION OF SHAPE AS NECESSARY BY VARYING COMPACTION METHODS AND EQUIPMENT.
4. TRENCH WIDTH OTHER THAN 6 ft. SHALL BE BY DIRECTION OF THE ENGINEER OF RECORD.
5. "H" = STRUCTURE RISE + MAXIMUM ALLOWABLE COVER FOR SHAPE DESIGN SPECIFIED.

ADDITIONAL BACKFILL NOTES:

SATISFACTORY BACKFILL MATERIAL, PROPER PLACEMENT, AND COMPACTION ARE KEY FACTORS IN OBTAINING MAXIMUM STRENGTH AND STABILITY.

THE BACKFILL MATERIAL SHOULD BE FREE OF ROCKS, FROZEN LUMPS, AND FOREIGN MATERIAL THAT COULD CAUSE HARD SPOTS OR DECOMPOSE TO CREATE VOIDS. BACKFILL MATERIAL SHOULD BE WELL GRADED GRANULAR MATERIAL THAT MEETS THE REQUIREMENTS OF AASHTO M-145 FOR SOIL CLASSIFICATIONS A-1, A-2-4, A-2-5. BACKFILL MUST BE REPLACED SYMMETRICALLY ON EACH SIDE OF THE STRUCTURE IN 6" LOOSE LIFTS. EACH LIFT IS TO BE COMPACTED TO A MINIMUM OF 90% DENSITY PER AASHTO T-180.

A HIGH PERCENTAGE OF SILT OR FINE SAND IN THE NATIVE SOILS SUGGESTS THE NEED FOR A WELL GRADED GRANULAR BACKFILL MATERIAL TO PREVENT SOIL MIGRATION.

DURING BACKFILL, ONLY SMALL TRACKED VEHICLES (D-4 OR SMALLER) SHOULD BE NEAR THE STRUCTURE AS FILL PROGRESSES ABOVE THE CROWN AND TO THE FINISHED GRADE.

MARK	DATE	REVISION DESCRIPTION	BY
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800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH STRUCTURAL PLATE

PROPOSAL DRAWING

ALBC #137 - 34'-9" X 8'-9"
SQUALICUM PARKWAY CULVERT
PREPARED FOR INTERFLUVE
BELLINGHAM, WA

PROJECT No.:	SEQ. No.:	DATE:
586993	010	4/23/2019
DESIGNED:	DRAWN:	
CHECKED:	APPROVED:	
SHEET NO.:		

SPECIFICATIONS FOR MANUFACTURE AND INSTALLATION OF CONTECH® ALUMINUM BOX CULVERT #137

I - GENERAL

1.0 STANDARDS AND DEFINITIONS

1.1 STANDARDS - All standards refer to latest edition unless otherwise noted.

1.1.1 ASTM B-864 "Standard Specification for Corrugated Aluminum Box Culverts" (AASHTO Designation M-219).

1.1.2 AASHTO Standard Specification for Highway Bridges - Section 12 Division I - Design.

1.1.3 AASHTO Standard Specification for Highway Bridges - Section 26 Division II - Construction.

1.2 DEFINITIONS

1.2.1 Owner - In these specifications the word "Owner" shall mean City of Bellingham.

1.2.2 Engineer - In these specifications the word "Engineer" shall mean the Engineer of Record or Owner's designated engineering representative.

1.2.3 Manufacturer - In these specifications the word "Manufacturer" shall mean CONTECH ENGINEERED SOLUTIONS 800-338-1122 Anne Pierce.

1.2.4 Contractor - In these specifications the word "Contractor" shall mean the firm or corporation undertaking the execution of any installation work under the terms of these specifications.

1.2.5 Approved - In these specifications the word "approved" shall refer to the approval of the Engineer or his designated representative.

1.2.6 As Directed - In these specifications the words "as directed" shall refer to the directions to the Contractor from the Owner or his designated representative.

2.0 GENERAL CONDITIONS

2.1 The Contractor shall furnish all labor, material and equipment and perform all work and services except those set out and furnished by the Owner, necessary to complete in a satisfactory manner the site preparation, excavation, filling, compaction, grading as shown on the plans and as described therein. This work shall consist of all mobilization clearing and grading, grubbing, stripping, removal of existing material unless otherwise stated, preparation of the land to be filled, filling of the land, spreading and compaction of the fill, and all subsidiary work necessary to complete the grading of the cut and fill areas to conform with the lines, grades, slopes, and specifications. This work is to be accomplished under the observation of the Owner or his designated representative.

2.2 Prior to bidding the work, the Contractor shall examine, investigate and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site, including without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site and shall make such additional investigation as he may deem necessary for the planning and proper execution of the work.

If conditions other than those indicated are discovered by the Contractor, the Owner shall be notified immediately. The material which the Contractor believes to be a changed condition shall not be disturbed so that the owner can investigate the condition.

2.3 The construction shall be performed under the direction of the Engineer.

2.4 All aspects of the structure design and site layout including foundations, backfill, end treatments and necessary scour consideration shall be performed by the Engineer.

Any installation guidance provided herein shall be endorsed by the Engineer or superseded by the Engineer's plans and specifications.

II - ALUMINUM BOX CULVERT

1.0 GENERAL

1.1 Manufacturer shall fabricate the aluminum box culvert as shown on the plans. Fabrication shall conform to the requirements of ASTM B-864 and shall consist of plates, ribs, and appurtenant items.

Plate thickness, rib spacing, end treatment and type of invert and foundation shall be as indicated on the plans. All manufacturing processes including corrugating, punching, curving and required galvanizing shall be performed within the United States of America.

1.2 The contractor shall verify all field dimensions and conditions prior to ordering materials.

2.0 DIMENSIONS

2.1 The proposed structure shall be an ALUMINUM BOX CULVERT with the following dimensions:

Span: 34'-9" Rise: 8'-9"
Haunch Gage: 0.15 Crown Gage: 0.2
Haunch Rib Type: TYPE VI Crown Rib Type: TYPE VI
Haunch Rib Spacing: 9" Crown Rib Spacing: 9"

2.2 All plan dimensions on the contract drawings are measured in a true horizontal plan unless otherwise noted.

3.0 ASSEMBLY AND INSTALLATION

3.1 Bolts and nuts shall conform to the requirements of ASTM A-307 or ASTM A-449. The box culvert shall be assembled in accordance with the plate layout drawings provided by the manufacturer and per the manufacturer's recommendations.

Bolts shall be tightened using an applied torque of between 100 and 150 ft.-lbs.

3.2 The box culvert shall be installed in accordance with the plans and specifications, the manufacturer's recommendations, and AASHTO Standard Specification for Highway Bridges - Section 26 Division II - Construction.

3.3 Trench excavation shall be made in embankment material that is structurally adequate. The trench width shall be shown on the plans. Poor quality in situ embankment material must be removed and replaced with suitable backfill as directed by the Engineer.

3.4 Bedding preparation is critical to both structure performance and service life. The bed should be constructed to uniform line and grade to avoid distortions that may create undesirable stresses in the structure and/or rapid deterioration of the roadway. The bed should be free of rock formations, protruding stones, frozen lumps, roots, and other foreign matter that may cause unequal settlement.

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3.7 The structure shall be backfilled using clean well graded granular material that meets the requirements for soil classifications A-1, A-2-4, A-2-5 modified to be more select than AASHTO M-145. See the information at the right of this sheet.

Backfill must be placed symmetrically on each side of the structure in 6 to 8 inch loose lifts. Each lift shall be compacted to a minimum of 90 percent density per AASHTO T-180

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Normal highway traffic is not allowed to cross the structure until the structure has been backfilled and paved. If the road is unpaved, cover allowance to accommodate rutting shall be as directed by the Engineer.

BEDDING FOR THE STRUCTURE INVERT (INCLUDING BELOW THE FOOTING PLATES) SHOULD BE A BLANKET CONSISTING OF NON-CORROSIVE GRANULAR MATERIAL WITH A MINIMUM THICKNESS OF 5" AND A MAXIMUM PARTICLE SIZE OF 1.25". THIS MATERIAL SHOULD BE ANGULAR AND PLACED LOOSE TO ALLOW THE CORRUGATED PLATES TO SEAT INTO IT TO BECOME FULLY BEDDED.

A NET ALLOWABLE SOIL BEARING PRESSURE OF 3,600 PSF WAS ASSUMED FOR THE FLEXIBLE FOOTING DESIGN. THIS WOULD BE THE SOILS BELOW THE SUPPLEMENTAL FOOTING PLATES WHERE THE STRUCTURE BEARS – GENERALLY THE OUTER 4–5 FT ON EACH END OF THE INVERT. FOUNDATION SOILS IN THIS AREA SHOULD BE EVALUATED BY A QUALIFIED ENGINEER AND PREPARED AS THEY WOULD BE FOR A CONVENTIONAL FOOTING (INCLUDING ANY SOIL IMPROVEMENT IF NEEDED), WITH THE GRANULAR BEDDING PLACED ON THE PREPARED FOUNDATION SUBGRADE AS DESCRIBED ABOVE TO ALLOW NESTING INTO THE CORRUGATIONS.

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GROUP CLASSIFICATION	A-1a	A-1-b	A-2-4	A-2-5
Sieve Analysis Percent Passing				
No. 10 (2.000 mm)	50 max.	----	----	----
No. 40 (0.425 mm)	30 max.	50 max.	----	----
No. 100 (0.150 mm)	----	----	50 max.	50 max.
No. 200 (0.075 mm)	35 max.	25 max.	20 max.	20 max.
Atterberg Limits for Fraction Passing No., 40 (0.425 mm)				
Liquid Limits	----	----	40 max.	41 max.
Plasticity Index	6 max.	6 max.	10 max.	10 max.
Usual Materials	Stone Fragment, Gravel and Sand		Silty or Clayey Gravel and Sand	

NOTE: Atterberg Limits are modified to provide material that are primarily granular

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SHEET NO.:		

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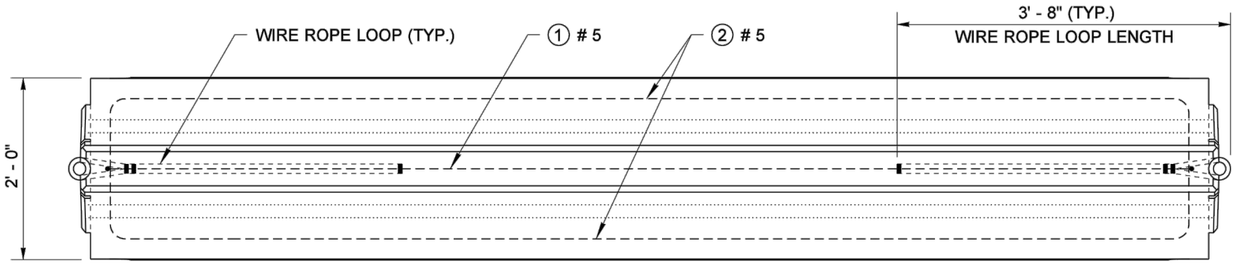
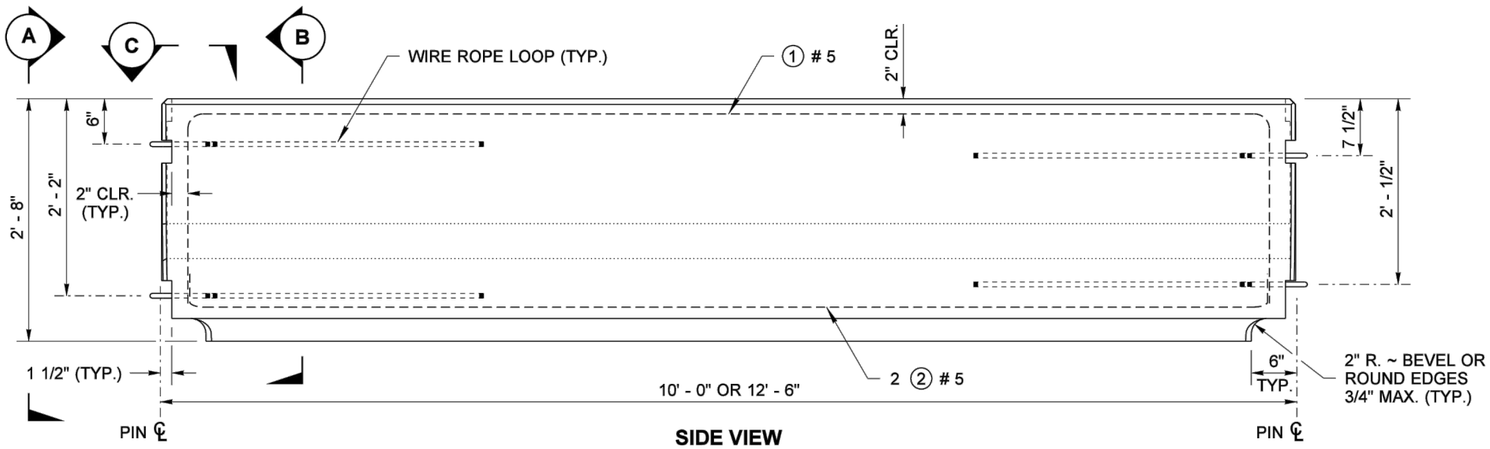
DRAWN BY: MARK SUJKA



TOP VIEW

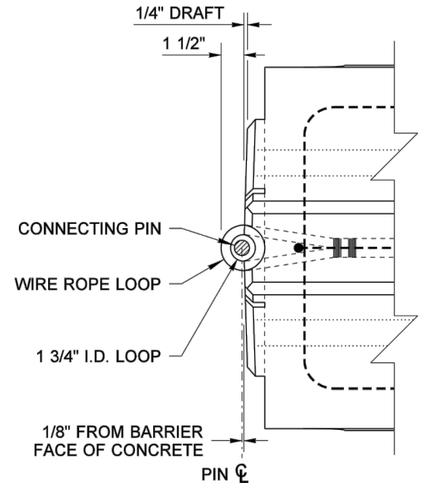


SIDE VIEW

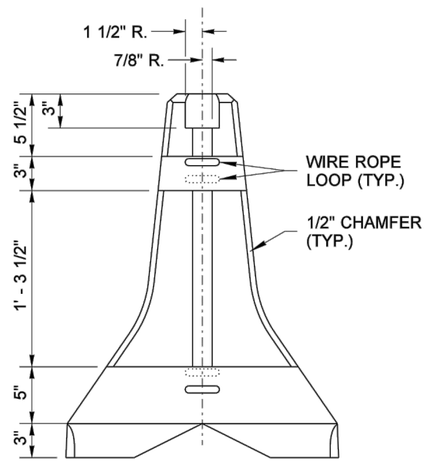
BARRIER SECTION

NOTES

1. Wire rope loops shall be 3' - 8" long, except for the top loop of the Barrier Terminal, which shall be 2' - 0" long.
2. Except for the locations of the wire rope loops, the dimensions shown in END VIEW "A" are typical for both ends of a Barrier Section or opposing ends of Barrier Terminals.
3. Connecting and Drift Pin head designs vary among different manufacturers. Pin designs that are shaped differently than those shown in the detail are acceptable, if the bearing surface is within the minimum and maximum widths specified.
4. The vertical spacing of the Wire Rope Loops in a Barrier Terminal is determined by the end of the Barrier Segment to which it is being connected. See BARRIER CONNECTION DETAIL (Sheet 2).

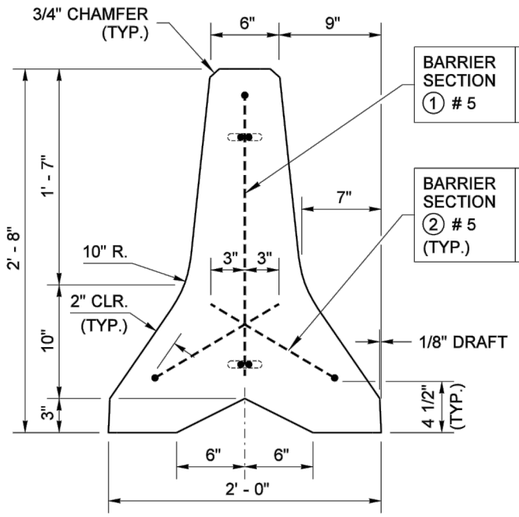


DETAIL C

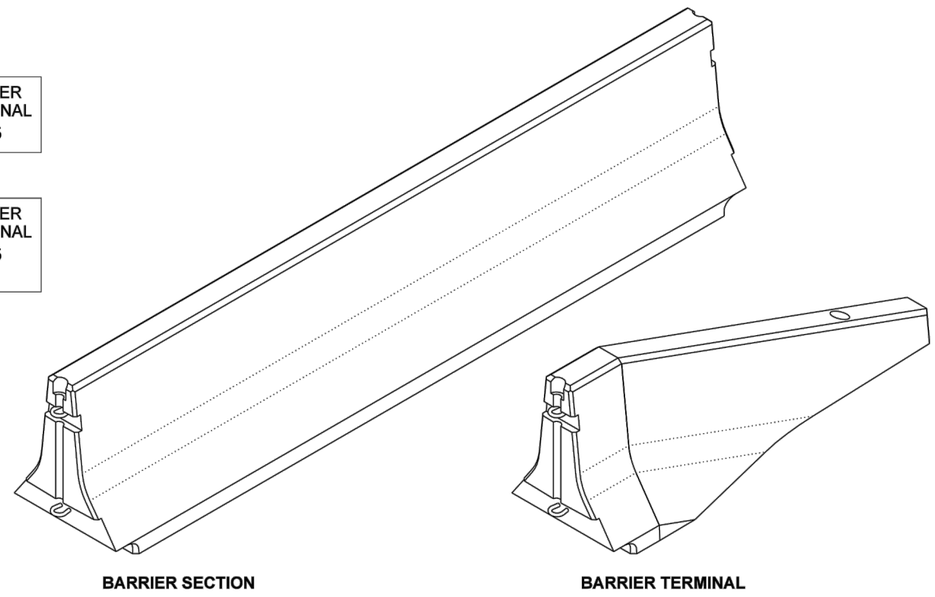


SEE NOTE 2

END VIEW (A)



SECTION (B)



ISOMETRIC VIEWS

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CONCRETE BARRIER TYPE 2

STANDARD PLAN C-8

SHEET 1 OF 2 SHEETS

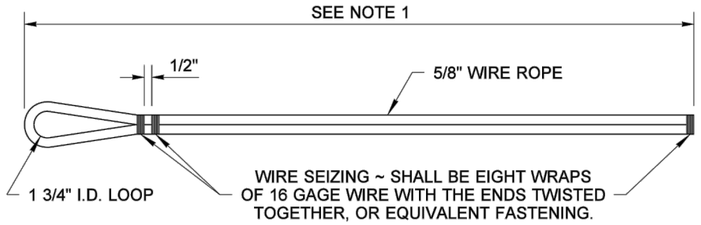
APPROVED FOR PUBLICATION

Pasco Bakotich III — STATE DESIGN ENGINEER

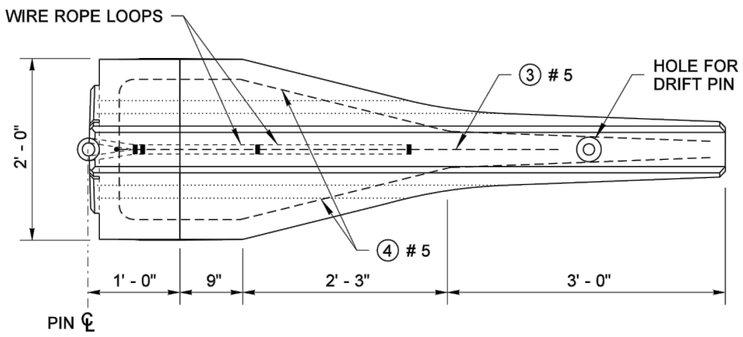
02-10-09 — DATE

Washington State Department of Transportation

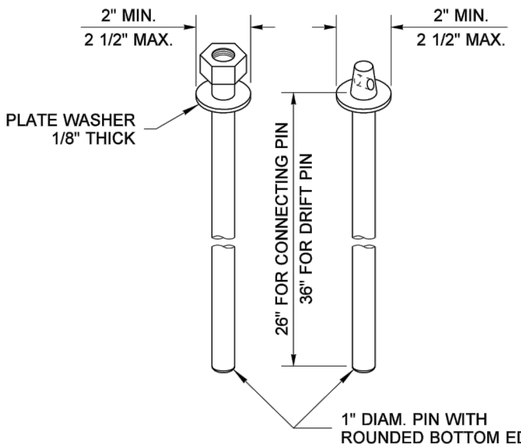
DRAWN BY: MARK SUJKA



WIRE ROPE LOOP DETAIL

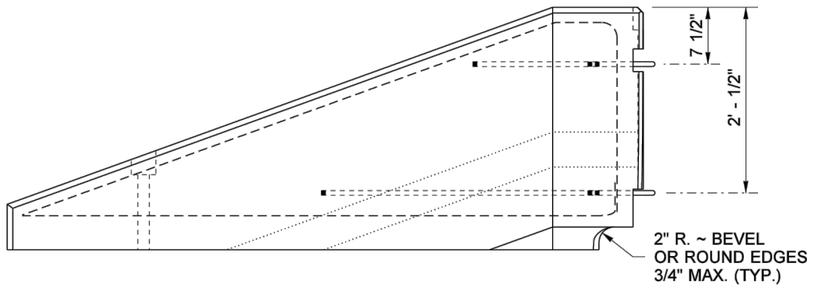


TOP VIEW

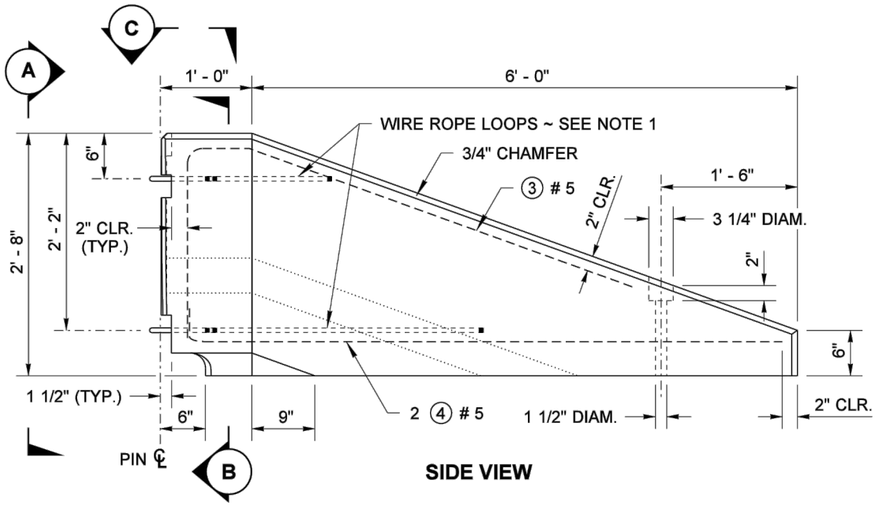


SEE NOTE 3

CONNECTING PINS AND DRIFT PINS



SIDE VIEW

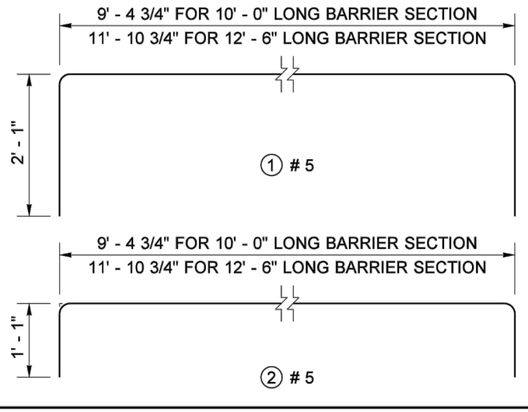


SIDE VIEW

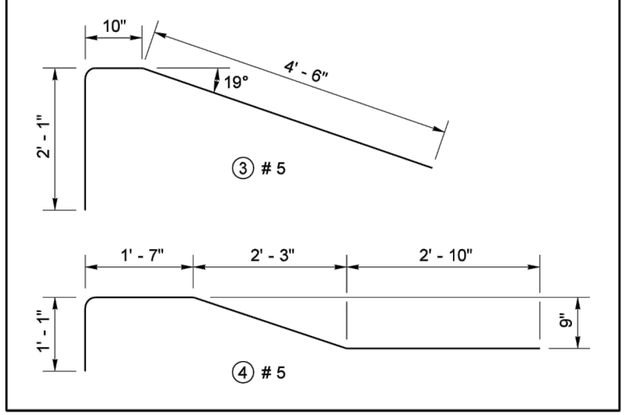
SEE NOTE 4

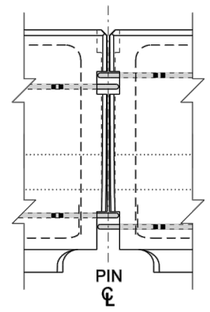
BARRIER TERMINAL

BARRIER SECTION
REINFORCING STEEL BENDING DIAGRAM



BARRIER TERMINAL
REINFORCING STEEL BENDING DIAGRAM





BARRIER CONNECTION DETAIL

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CONCRETE BARRIER TYPE 2

STANDARD PLAN C-8

SHEET 2 OF 2 SHEETS

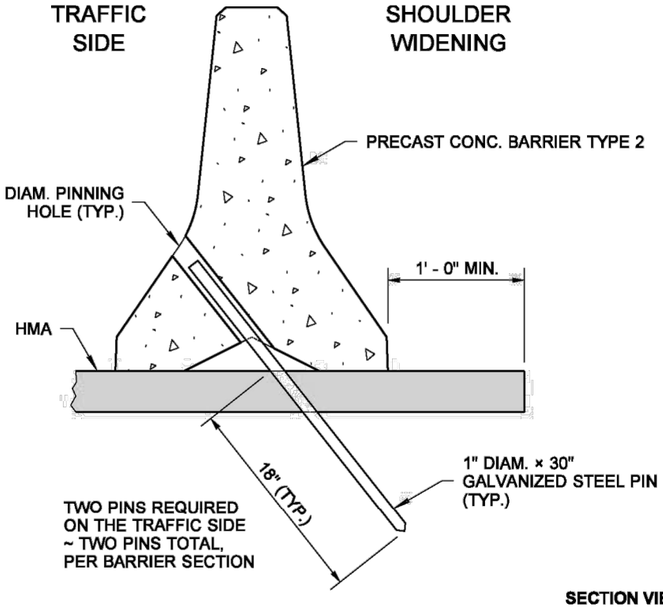
APPROVED FOR PUBLICATION

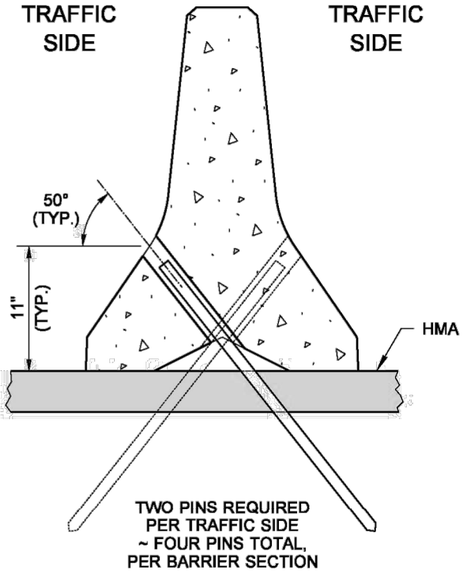
Pasco Bakotich III — STATE DESIGN ENGINEER

02-10-09 — DATE

Washington State Department of Transportation

DRAWN BY: MARK SUJKA



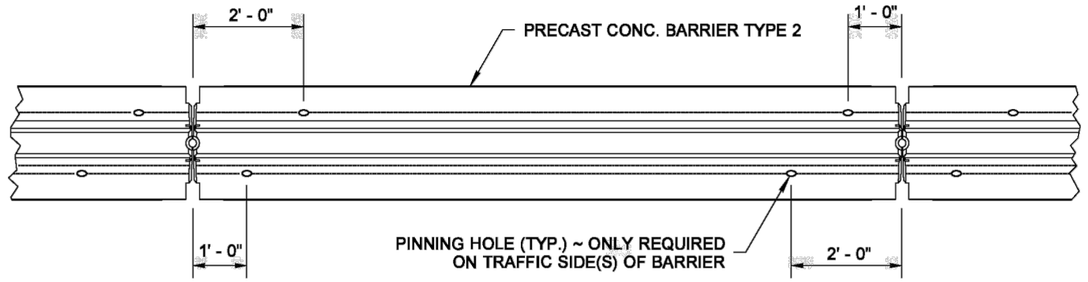


SECTION VIEWS

TYPE 3 ANCHOR
PIN LOCATIONS

NOTES

1. The intended use of this plan is for the permanent anchoring of Precast Concrete Barrier Type 2 (see Standard Plan C-8) on hot mix asphalt pavement.
2. Remove the Type 3 Anchors by first driving the steel pins down through the barrier further into the pavement to allow lifting the barrier without interference, then remove the pins from the pavement.
3. After removing the Type 3 Anchors, clean the pin holes and fill them with sealant according to Standard Specification 9-04.2.



PLAN VIEW

TYPE 3 ANCHOR
PIN LOCATIONS

RICHARD BARSTOW ALBIN
STATE OF WASHINGTON
34042
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES JULY 24, 2008

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PRECAST CONC. BARRIER ANCHOR ~ TYPE 3 (PERMANENT) STANDARD PLAN C-8e

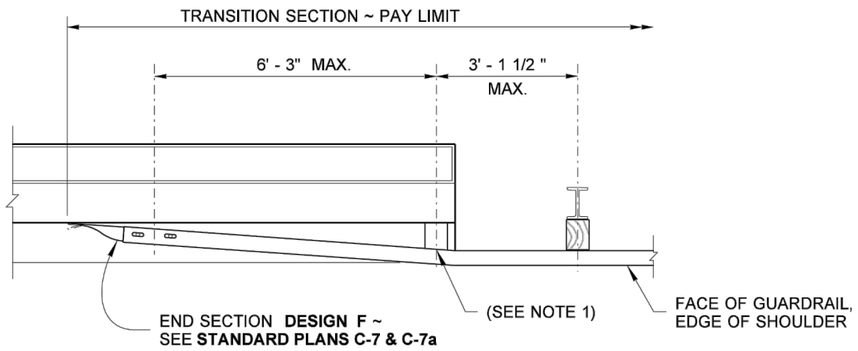
SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

Ken L. Smith — STATE DESIGN ENGINEER
02-21-07 — DATE

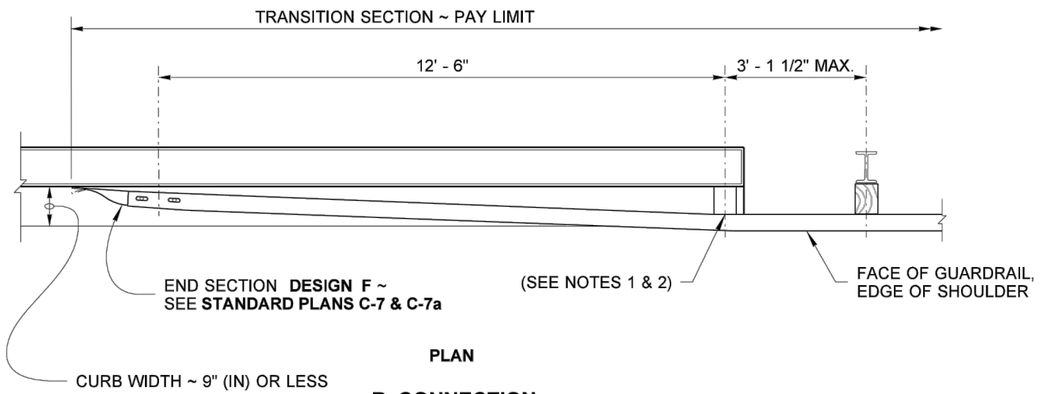
Washington State Department of Transportation

DATE	REVISION	BY
02/2007	REMOVED TEMPORARY ANCHORS	MAS



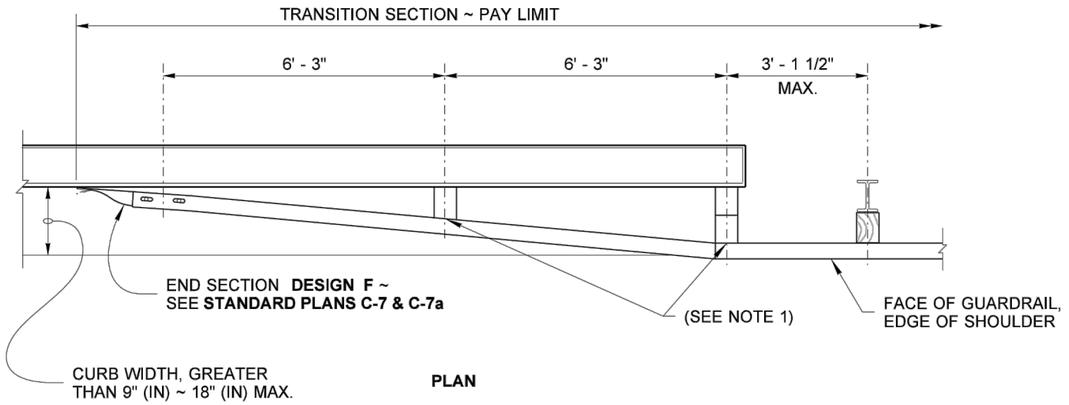
PLAN

A CONNECTION
(FOR UNRESTRAINED PRECAST CONCRETE BARRIER)



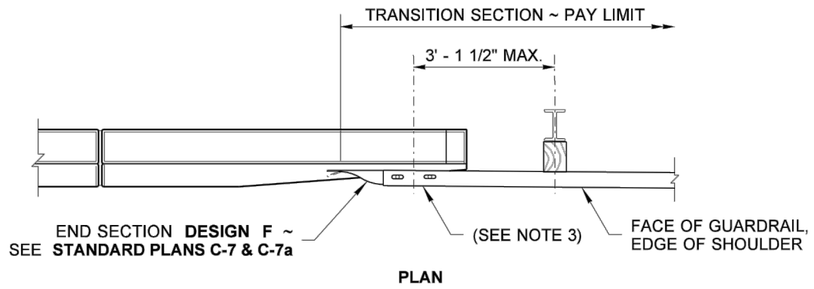
PLAN

B CONNECTION
(FOR BRIDGE RAILS WITH CURBS 9" (IN) OR LESS, OR SAFETY SHAPE (TYPE F, TYPE 2) BRIDGE RAIL AND CONCRETE BARRIERS)



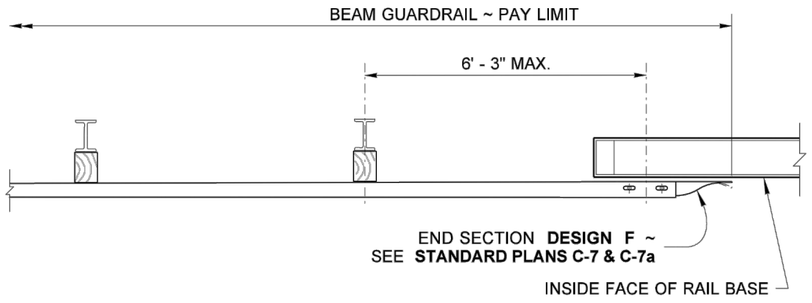
PLAN

C CONNECTION
(FOR BRIDGE RAILS WITH CURBS BETWEEN 9"(IN) AND 18"(IN))



PLAN

D CONNECTION
(FOR VERTICAL WALLS, SINGLE SLOPE BRIDGE RAIL AND CONCRETE BARRIER, OR TAPERED SAFETY SHAPE (TYPE F, TYPE 2) BARRIER)



PLAN

F CONNECTION
(FOR ALL BRIDGE RAIL AND CONCRETE BARRIER TYPES LOCATED ON TRAILING ENDS OF ONE-WAY TRAFFIC ROADWAYS)

NOTES

1. Attach guardrail to bridge rail or concrete barrier with 7/8" (in) diameter bolts in accordance with **Standard Specification, Section 9-06.5(4)**, with thin slab ferrule inserts or resin-bonded anchors. See Contract Plans.
2. If the last guardrail post is 3" (in) or less from the end of the bridge barrier, this attachment and blockout is not necessary.
3. See Bridge Plans for additional connection details.
4. Wood blocks shown. Blocks of alternate material may be used. See **Standard Specification, Section 9-16.3 (2).**
5. Steel posts shown. Timber posts may be used.

JOHN PATRICK DONAHUE
STATE OF WASHINGTON
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REGISTERED
PROFESSIONAL ENGINEER

GUARDRAIL CONNECTION TO BRIDGE RAIL OR CONCRETE BARRIER STANDARD PLAN C-24.10-02

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER

Washington State Department of Transportation

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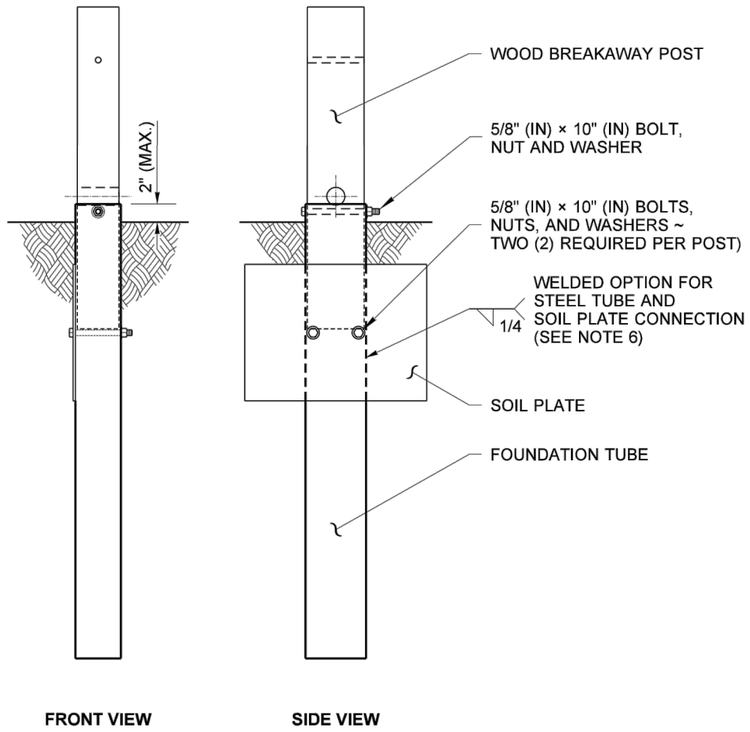
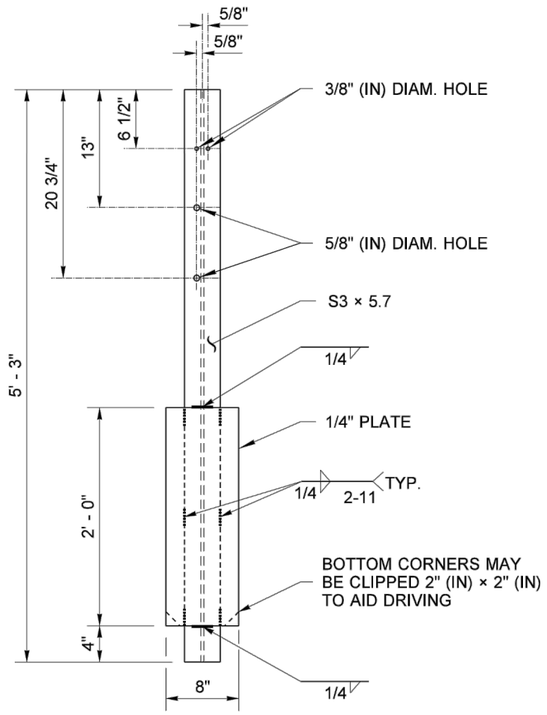


FRONT VIEW SIDE VIEW

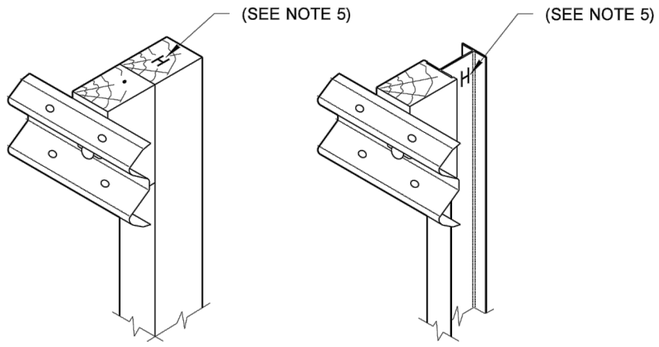
ANCHOR POST ASSEMBLY



G-2 POST

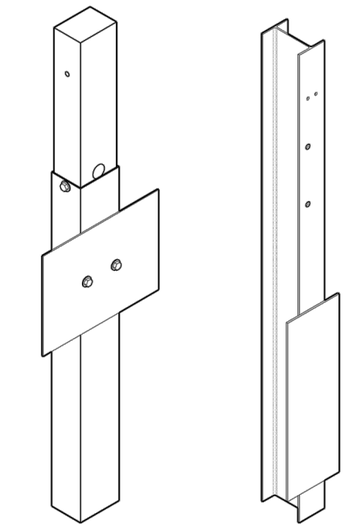
NOTES

1. Wood posts for all guardrail placement plans shall be 6 × 8 except where noted otherwise.
2. Lower hole is for Rub Rail of Type 2 and Type 3 Beam Guardrail.
3. W6×8.5 or W6×9 steel posts and timber blocks are alternates for 6×8 timber posts and blocks. W6×15 steel posts and timber blocks are alternates for 10×10 timber posts and blocks.
4. Attach blockouts to steel posts using bolt holes on approaching traffic side of post web.
5. When "Beam Guardrail Type - _ _ Ft. Long Post" is specified in the Contract, the post length shall be stamped with numbers, 1 1/2" (in) min. high and 3/4" (in) wide at the location where the letter "H" is shown in the ASSEMBLY DETAIL. For wood post applications, the letter shall be stamped to a minimum depth of 1/4" (in). For steel post applications, the letter shall be legible after the post is galvanized. After post installation, it shall be the Contractor's responsibility to ensure the stamped numbers remain visible.
6. Soil plate may be welded to foundation tube. If so, holes in soil plate and foundation tube may be omitted.



TIMBER POST STEEL POST

PARTIAL ASSEMBLY DETAIL



ANCHOR POST G-2 POST

ISOMETRIC

JOHN PATRICK DONAHUE
STATE OF WASHINGTON
29023
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PROFESSIONAL ENGINEER

BEAM GUARDRAIL POSTS AND BLOCKS

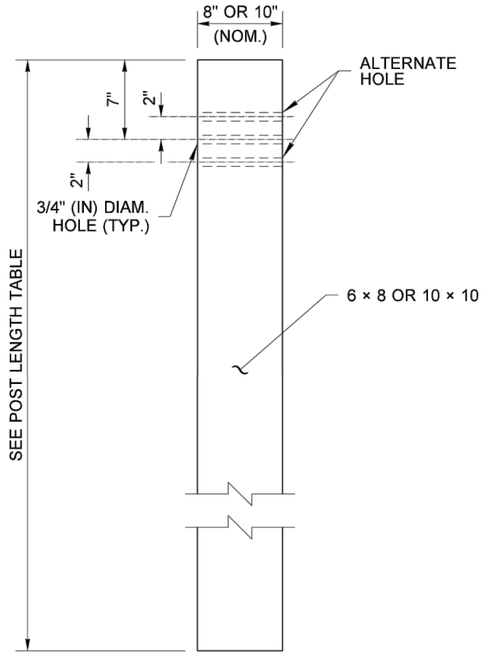
STANDARD PLAN C-1b

SHEET 1 OF 2 SHEETS

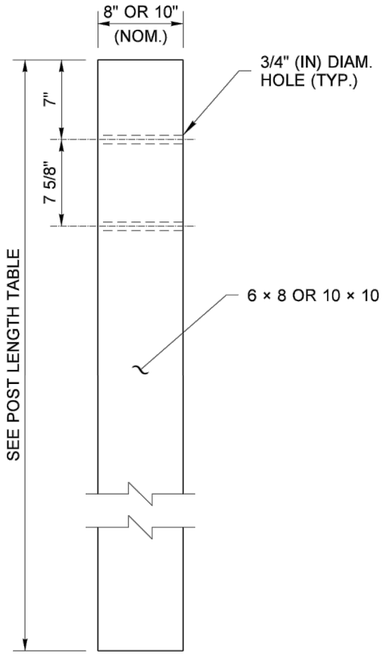
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER

Washington State Department of Transportation

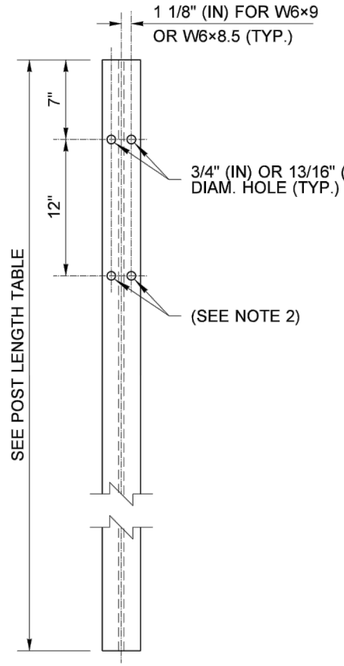


W-BEAM

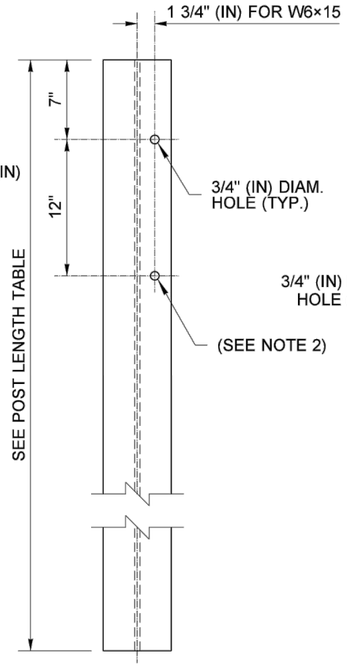


THRIE BEAM

WOOD POST



W-BEAM

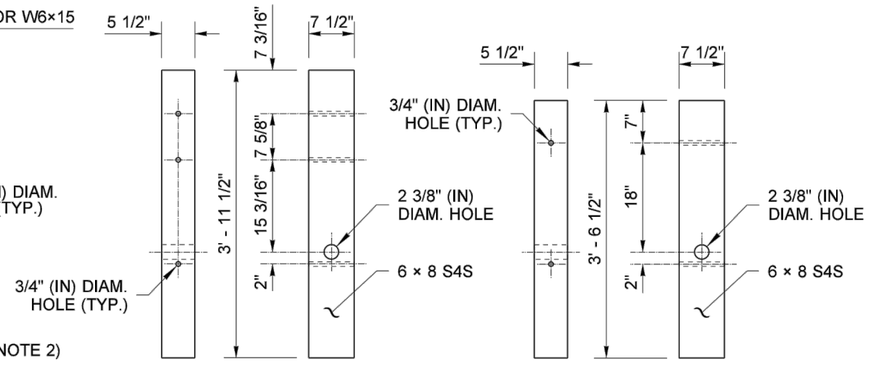


THRIE BEAM

STEEL POST
(SEE NOTES 3 AND 4)

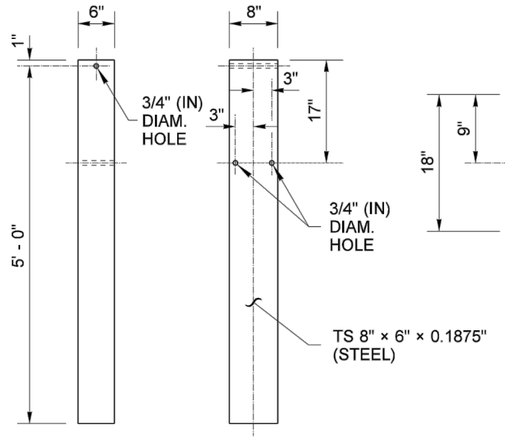
POST LENGTH TABLE	
GUARDRAIL TYPE	**LENGTH**
1 through 4 & 31	6' - 0" *
10 or 11	6' - 6"

* SEE CONTRACT FOR "BEAM GUARDRAIL TYPE - __ FT. LONG POST" LENGTHS. (SEE NOTE 5)

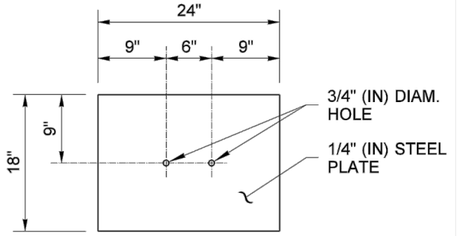


THRIE BEAM **W-BEAM**

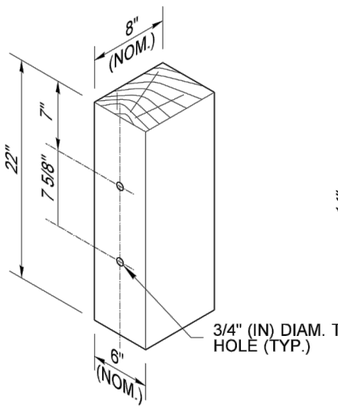
WOOD BREAKAWAY POST



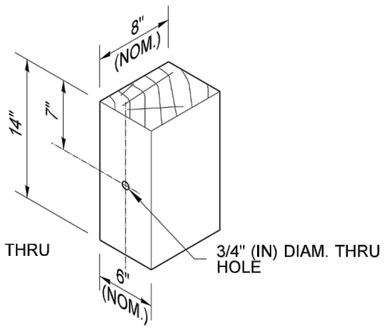
FOUNDATION TUBE



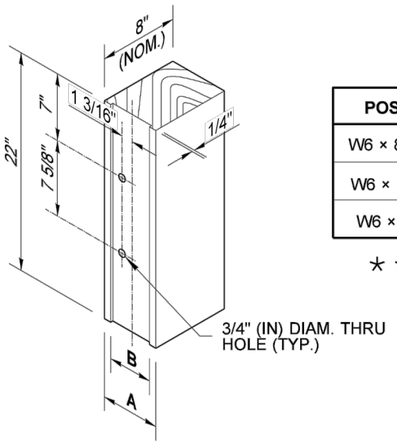
SOIL PLATE



THRIE BEAM WOOD BLOCK FOR WOOD POST



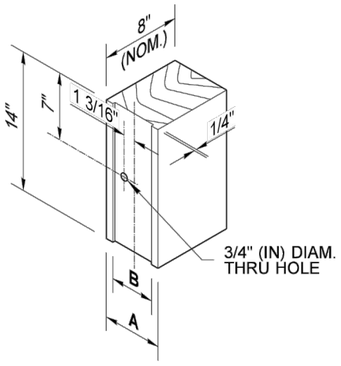
W-BEAM WOOD BLOCK FOR WOOD POST



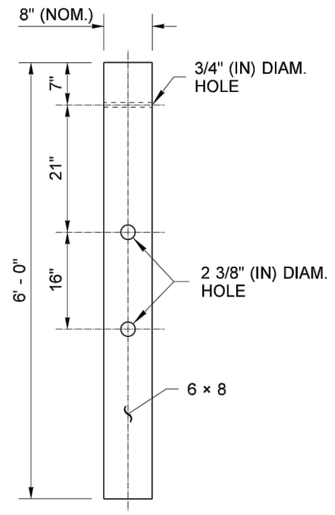
THRIE BEAM WOOD BLOCK FOR STEEL POST

POST	A	B
W6 × 8.5	8" **	6 1/4"
W6 × 15	8" **	6 1/4"
W6 × 9	6" **	4 1/4"

** NOMINAL (NOM.)



W-BEAM WOOD BLOCK FOR STEEL POST



CONTROLLED RELEASING TERMINAL (CRT) POST

JOHN PATRICK DONAHUE
STATE OF WASHINGTON
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REGISTERED
PROFESSIONAL ENGINEER

BEAM GUARDRAIL POSTS AND BLOCKS

STANDARD PLAN C-1b

SHEET 2 OF 2 SHEETS

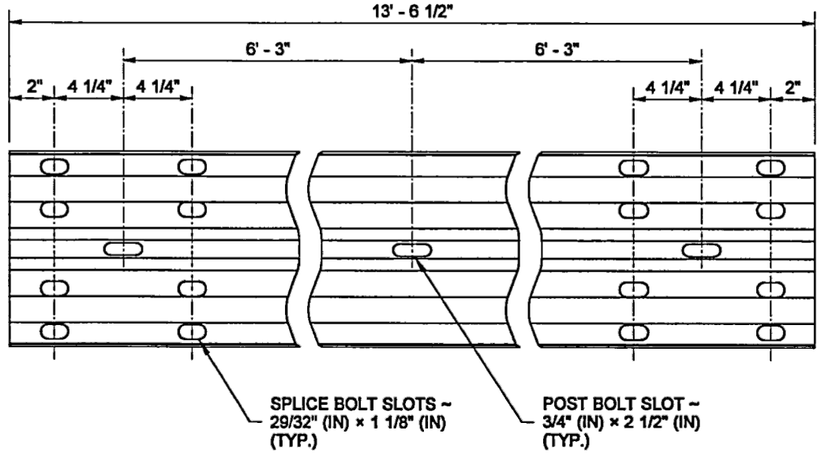
APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER

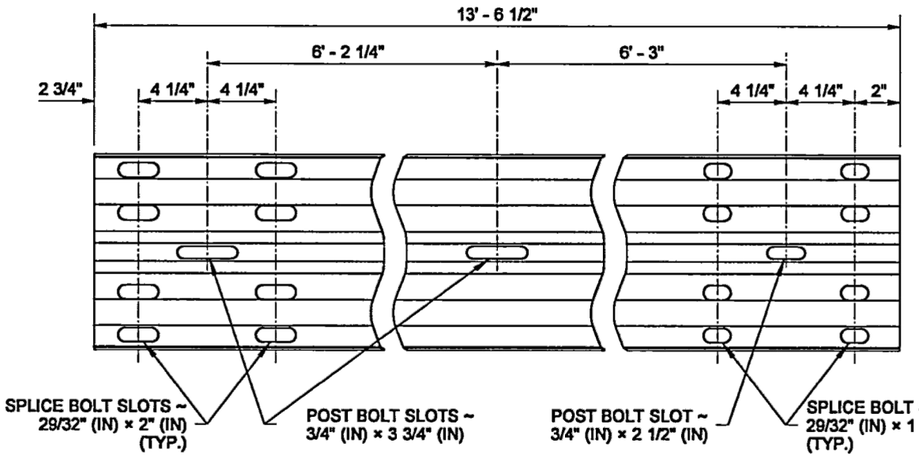
Washington State Department of Transportation

DRAWN BY: FERN LIDDELL

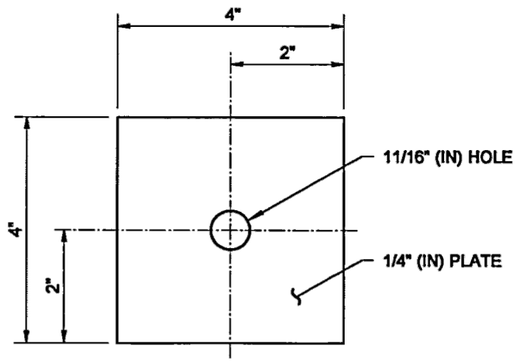
DRAWN BY: FERN LIDDELL



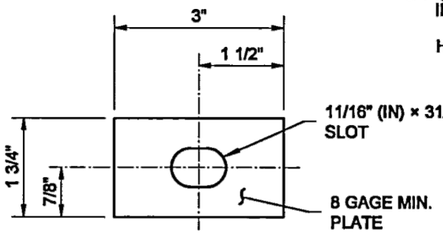
TYPICAL RAIL ELEMENT



EXPANSION SECTION



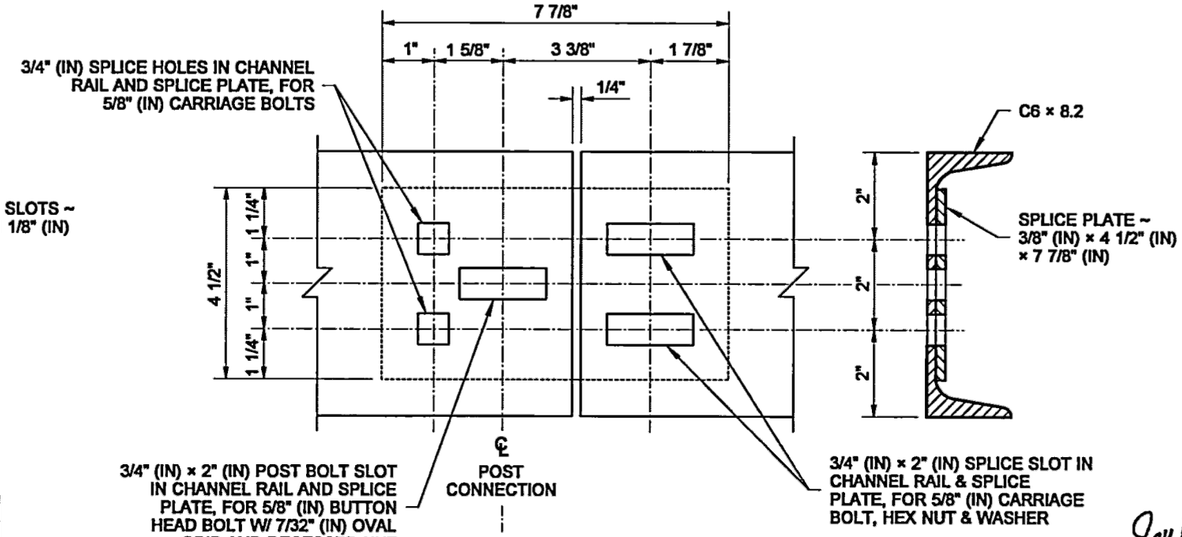
SNOW LOAD POST WASHER
SEE NOTE 1



SNOW LOAD RAIL WASHER
SEE NOTES 1 & 2

NOTES

1. When required by the Contract, a Snow Load Post Washer shall be used on the backside of the post (in lieu of the 1 3/4" (in) Post Bolt Washer) and a Snow Load Rail Washer shall be placed on the face side of Beam Guardrail Types 1 and 2. Snow Load Rail Washers shall not be installed on terminals.
2. Rail Washers, also called "Snow Load Rail Washers", are not required on new installation, except as called for in Note 1. Unnecessary Rail washers need not be removed from existing installations, except those on posts 2 through 8 of a BCT installation shall be removed.
3. Timber blocks shall be toe-nailed to the post with a 16d galvanized nail to prevent block rotation.
4. For post and block details, see **Standard Plan C-1b**.
5. When "Beam Guardrail Type - ___ Ft. Long Post" is specified in the Contract, the post length shall be stamped with numbers, 1 1/2" (in) min. high and 3/4" (in) wide at the location where the letter "H" is shown in the ASSEMBLY DETAIL. For wood post applications, the letter shall be stamped to a minimum depth of 1/4" (in). For steel post applications, the letter shall be legible after the post is galvanized. After post installation, it shall be the Contractor's responsibility to ensure the stamped numbers remain visible.
6. Existing posts shall not be raised. Replace posts as necessary to achieve required guardrail height.
7. Holes shall be located on approaching traffic side of web.



CHANNEL RAIL SPLICE

JEFFERY K. PETTERSON
STATE OF WASHINGTON
36937
REGISTERED
PROFESSIONAL ENGINEER

Petterson, Jeff (HQ Design)
Jul 6 2017 3:11 PM
cosign

BEAM GUARDRAIL TYPE 31 COMPONENTS

STANDARD PLAN C-20.11-00

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION
Carpenter, Jeff
Jul 21 2017 8:31 AM
cosign
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Washington State Department of Transportation

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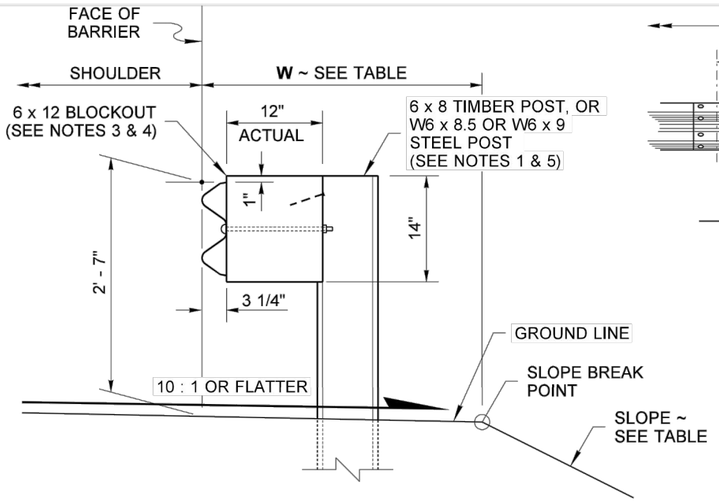
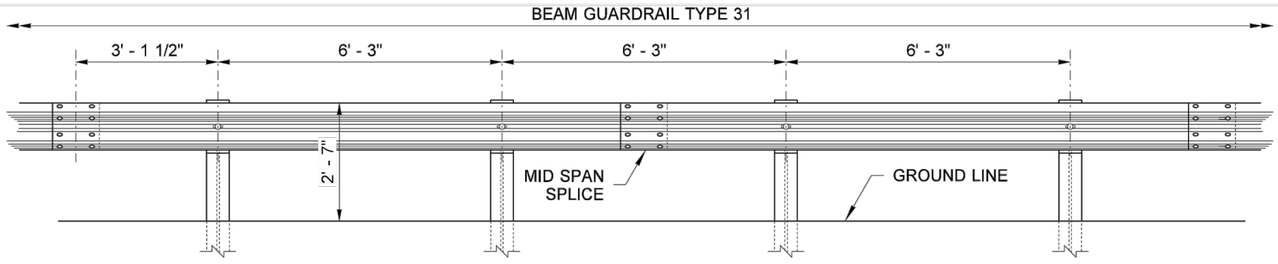
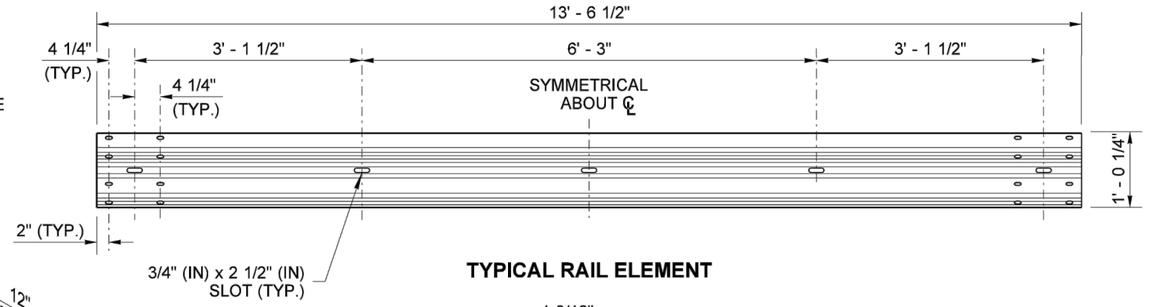


TYPICAL SECTION ~ WITHOUT CURB
(6' - 0" POSTS)



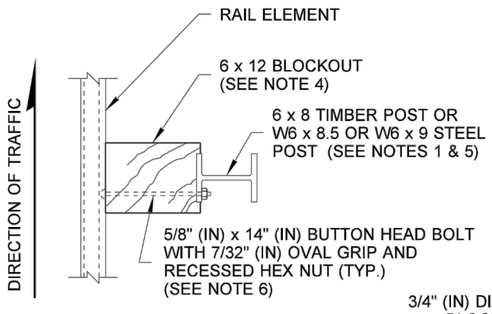
TYPICAL ELEVATION



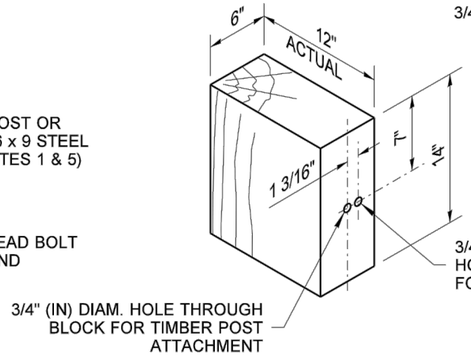
TYPICAL RAIL ELEMENT

NOTES

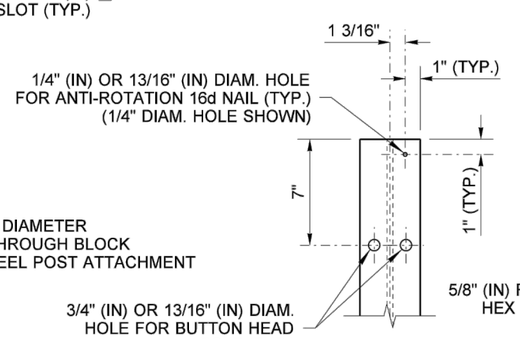
1. Refer to **Standard Plan C-1b** and **C-20.11** for additional details not shown on this plan.
2. Extend shoulder pavement to provide a base for the extruded curb. See Contract Plans for exceptions to distances shown.
3. Use a single block or combination of blocks (no more than two (2) to achieve the actual 12" (in) offset. See **Standard Specification, Section 9-16.3(2)**. Wood blocks shall be secured to the posts with anti-rotation nails. If combination blocks are used, the adjacent blocks shall be toenailed with two 16d galvanized nails to prevent block rotation.
4. Wood blocks are shown. Blocks of an approved alternative material may be used. See **Standard Specification, Section 9-16.3(2).**
5. All posts for any standard barrier run shall be of the same type: timber or steel.
6. Attach blockouts to steel posts using bolt holes on approaching traffic side of post web.



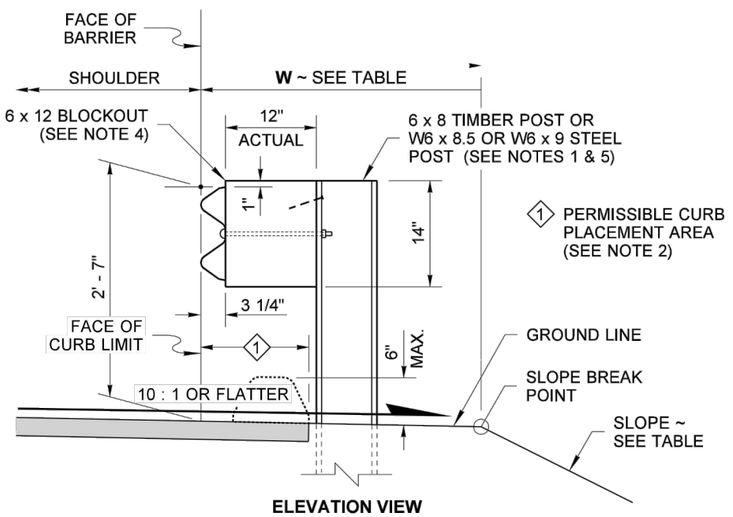
PLAN VIEW



WOOD BLOCK



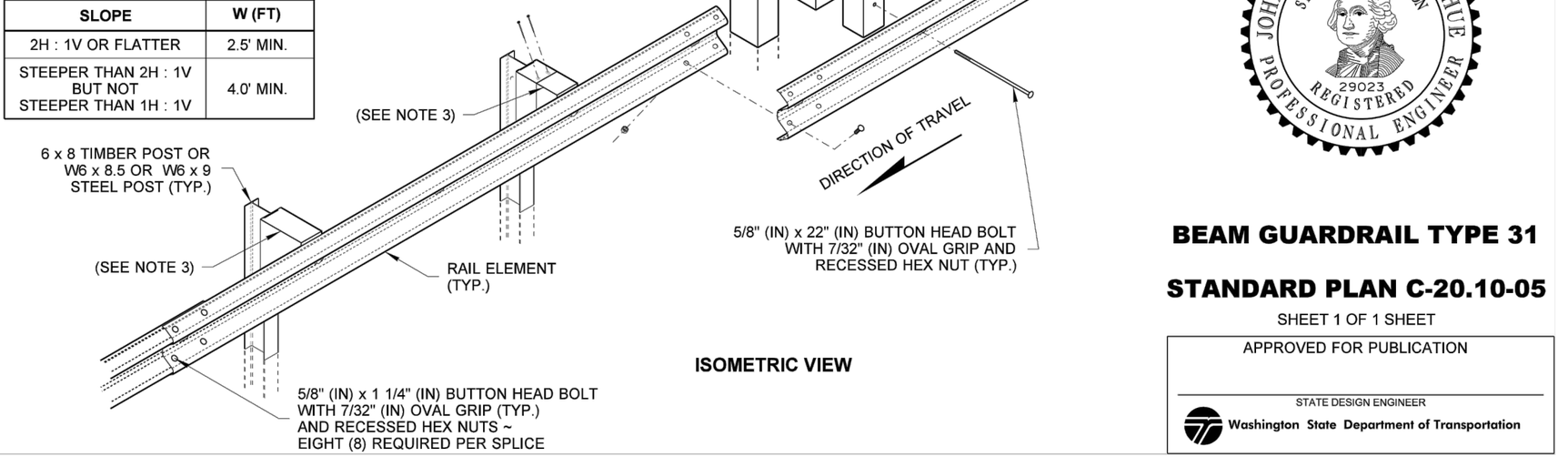
STEEL POST



ELEVATION VIEW

TYPICAL SECTION ~ WITH CURB
(6' - 0" LONG POSTS)

SLOPE \ EMBANKMENT TABLE FOR STD. 6' POSTS	
SLOPE	**W (FT)**
2H : 1V OR FLATTER	2.5' MIN.
STEEPER THAN 2H : 1V BUT NOT STEEPER THAN 1H : 1V	4.0' MIN.



ISOMETRIC VIEW

JOHN PATRICK DONAHUE
STATE OF WASHINGTON
29023
REGISTERED
PROFESSIONAL ENGINEER

BEAM GUARDRAIL TYPE 31

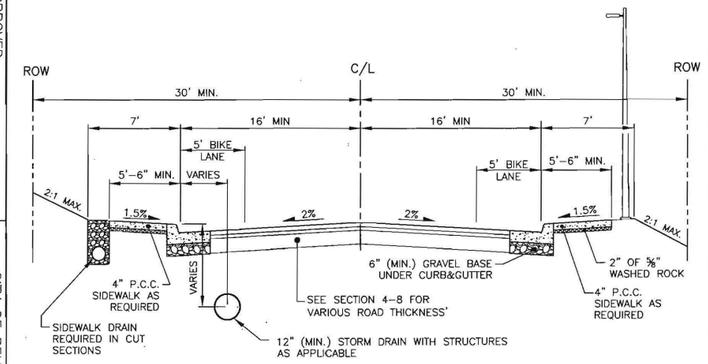
STANDARD PLAN C-20.10-05

SHEET 1 OF 1 SHEET

APPROVED FOR PUBLICATION

STATE DESIGN ENGINEER

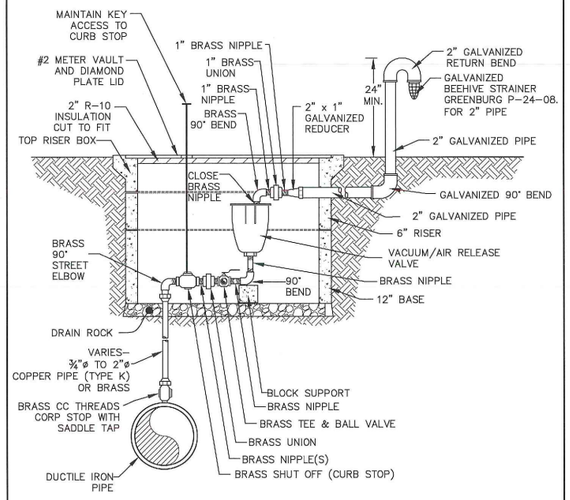
Washington State Department of Transportation



NOTES:

1. ALL MATERIAL AND WORKMANSHIP SHALL CONFORM TO THE PROVISIONS OF APWA "STANDARD SPECIFICATIONS" AND SHALL CONFORM TO THE REQUIREMENTS OF THE CITY ENGINEER.
2. SIDEWALK STANDARD VARIES DEPENDING UPON LOCATION, ROAD CLASSIFICATION AND ON-STREET PARKING.
3. 12' WIDE TURN LANES REQUIRED AT CROSS STREETS AND MAJOR DRIVEWAYS.

APPROVED	CITY OF BELLINGHAM	DRAWING
City Engineer — Date: 11-6-05	STANDARD STREET SECTION (COLLECTOR, SECONDARY OR PRINCIPAL ARTERIAL)	ST-132



NOTES:

1. MAINTAIN CONSTANT RISE IN PIPING.
2. STANDPIPE PROTECTION MAY BE REQUIRED DEPENDING ON LOCATION PER WA-804

APPROVED	CITY OF BELLINGHAM	DRAWING
City Engineer — Date: 19 AUG 2019	TYPICAL VACUUM/AIR RELEASE VALVE-BELOW GROUND	WA-818

BEDDING SPECIFICATIONS FOR DUCTILE IRON PIPE

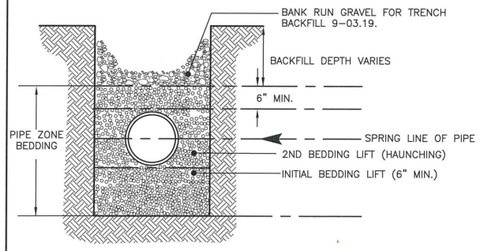
THE FOLLOWING SUPPLEMENTAL SPECIFICATIONS ARE TO BE USED IN CONJUNCTION WITH THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION, CURRENT EDITION:

BEDDING FOR WATERMAINS FOR DUCTILE IRON PIPE-

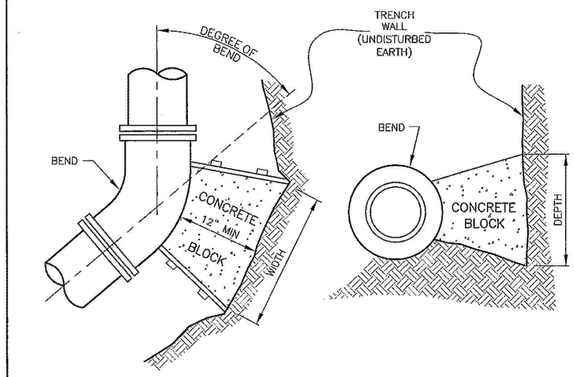
BEDDING MATERIAL FOR DUCTILE IRON PIPE SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS.

PIPE ZONE BEDDING - BEDDING SHALL BE A CLEAN GRANULAR MATERIAL FREE FROM ORGANIC MATTER AND CONFORMING TO THE STANDARD SPECIFICATION: 9-03.12(3), GRAVEL BACKFILL FOR PIPE ZONE BEDDING.

BACKFILL - WHEREVER A TRENCH IS EXCAVATED IN THE EXISTING OR PROPOSED ROADWAY, SIDEWALK OR OTHER AREAS WHERE SETTLEMENT WOULD BE DETRIMENTAL, THE ENTIRE TRENCH SHALL BE BACKFILLED WITH IMPORTED GRAVEL AND COMPACTED TO 95% OF MAXIMUM DENSITY.



APPROVED	CITY OF BELLINGHAM	DRAWING
City Engineer — Date: 12 SEPT 2016	WATER PIPE BEDDING DETAILS	WA-820



PLAN VIEW — SECTION VIEW

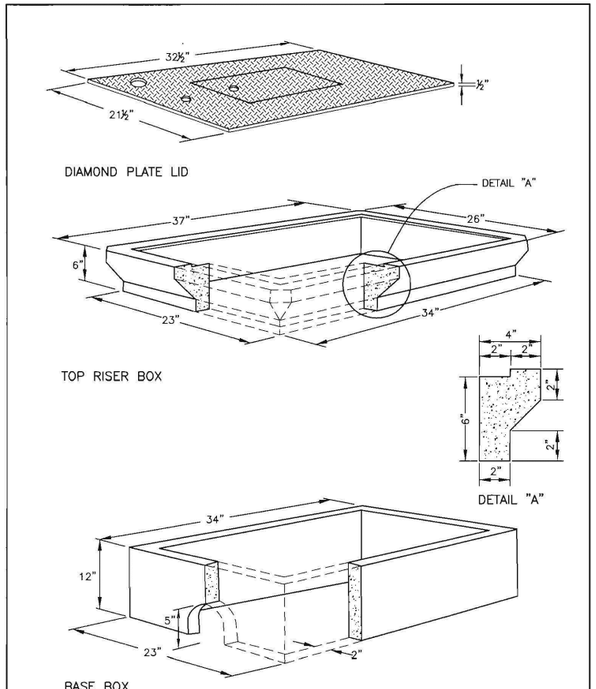
100 P.S.I. OPERATING PRESSURE

SIZE	1¼° WIDTH	1¼° DEPTH	22½° WIDTH	22½° DEPTH	45° WIDTH	45° DEPTH	90° WIDTH	90° DEPTH
6"	1'-0"	1'-0"	1'-0"	1'-0"	1'-6"	1'-6"	2'-3"	1'-6"
8"	1'-3"	1'-3"	1'-3"	1'-3"	1'-9"	1'-9"	3'-0"	2'-0"
10"	1'-9"	1'-6"	1'-9"	1'-6"	2'-3"	2'-3"	3'-6"	2'-6"
12"	2'-0"	1'-9"	2'-0"	1'-9"	2'-9"	2'-6"	4'-0"	3'-0"
16"	2'-9"	2'-3"	2'-9"	2'-3"	4'-0"	3'-0"	6'-3"	3'-6"
20"	3'-6"	2'-9"	3'-6"	2'-9"	4'-6"	4'-0"	8'-6"	4'-0"
24"	4'-6"	3'-0"	4'-6"	3'-0"	5'-6"	5'-0"	9'-9"	5'-0"

NOTE

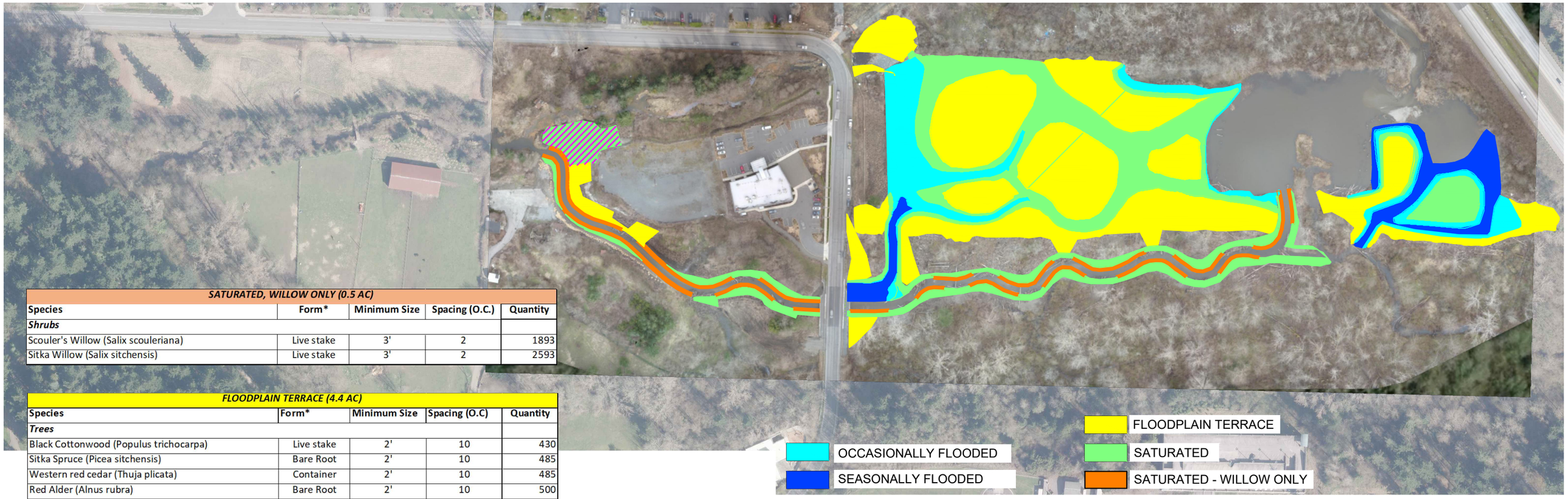
- ALL DIMENSIONS APPLY TO STABLE TRENCH WALLS. UNDER VARIABLE CONDITIONS, SIZE OF THRUST BLOCK SHALL BE DETERMINED BY THE CITY ENGINEER.
- WRAP ALL FITTINGS WITH VISQUINE MIN. 6" PAST FLANGES, PRIOR TO POURING CONCRETE THRUST BLOCK.

APPROVED	CITY OF BELLINGHAM	DRAWING
City Engineer — Date: 1/11/05	THRUST BLOCK-ELBOW	WA-860



NO SCALE

APPROVED	CITY OF BELLINGHAM	DRAWING
City Engineer — Date: 5-17-05	NUMBER 2 METER BOX	WA-846



SATURATED, WILLOW ONLY (0.5 AC)				
Species	**Form***	**Minimum Size**	**Spacing (O.C.)**	**Quantity**
Shrubs				
Scouler's Willow (Salix scouleriana)	Live stake	3'	2	1893
Sitka Willow (Salix sitchensis)	Live stake	3'	2	2593

FLOODPLAIN TERRACE (4.4 AC)				
Species	**Form***	**Minimum Size**	**Spacing (O.C)**	**Quantity**
Trees				
Black Cottonwood (Populus trichocarpa)	Live stake	2'	10	430
Sitka Spruce (Picea sitchensis)	Bare Root	2'	10	485
Western red cedar (Thuja plicata)	Container	2'	10	485
Red Alder (Alnus rubra)	Bare Root	2'	10	500
Shrubs				
Vine maple (Acer circinatum)	Bare Root	2'	4	2050
Douglas Spirea (Spiraea douglasii)	Live stake	2'	4	2036
Red-osier Dogwood (Cornus sericea)	Live stake	2'	4	1806
Pacific Ninebark (Physocarpus capitatus)	Bare Root	2'	4	2030
Nootka Rose (Rosa nutkana)	Bare Root	2'	4	2050

SATURATED (2.8 AC)				
Species	**Form***	**Minimum Size**	**Spacing (O.C.)**	**Quantity**
Trees				
Paper Birch (Betula papyrifera)	Bare Root	2'	10	300
Red Alder (Alnus rubra)	Container	2'	10	307
Sitka Spruce (Picea sitchensis)	Container	2'	10	307
Black Cottonwood (Populus trichocarpa)	Container	2'	10	307
Shrubs				
Pacific Ninebark (Physocarpus capitatus)	Bare Root	2'	4	820
Red Elderberry (Sambucus racemosa var racemosa)	Bare Root	2'	4	800
Douglas Spirea (Spiraea douglasii)	Bare Root	2'	4	806
Red-osier Dogwood (Cornus sericea)	Live stake	2'	4	806
Clustered Wild Rose (Rosa pisocarpa)	Bare Root	2'	4	800
Salmonberry (Rubus spectabalis)	Bare Root	2'	4	800
Scouler's Willow (Salix scouleriana)	Live stake	3'	4	274
Sitka Willow (Salix sitchensis)	Live stake	3'	4	806
Pacific Will (Salix lasiandra)	Live stake	3'	4	275
Paper Birch (Betula papyrifera)	Container	2'	10	98

OCCASIONALLY FLOODED (1.1 AC)				
Species	**Form***	**Minimum Size**	**Spacing (O.C.)**	**Quantity**
Shrubs				
Pacific Ninebark (Physocarpus capitatus)	Container	2'	4	387
Red Elderberry (Sambucus racemosa var racemosa)	Bare Root	2'	4	400
Douglas Spirea (Spiraea douglasii)	Bare Root	2'	4	387
Red-osier Dogwood (Cornus sericea)	Live stake	2'	4	387
Clustered Wild Rose (Rosa pisocarpa)	Container	2'	4	387
Salmonberry (Rubus spectabalis)	Container	2'	4	387
Pacific Willow (Salix lasiandra)	Live stake	3'	4	387
Sitka Willow (Salix sitchensis)	Live stake	3'	4	387

OCCASIONALLY FLOODED (1.1 AC)	
Seeding Rate = 21 lbs./acre	
Seed mix ingredients	**% by weight**
Slough sedge (Carex obnupta)	27
Smallwing sedge (Carex microptera)	25
Awlfruit sedge (Carex stipata)	29.5
Common spikerush (Eleocharis palustris)	15
Smallfruit Bulrush (Scirpus microcarpus)	3
Slender rush (Juncus tenuis)	0.5

SEASONALLY FLOODED (0.8 AC)	
Seeding Rate = 21 lbs./acre	
Seed mix ingredients	**% by weight**
Slough sedge (Carex obnupta)	27
Smallwing sedge (Carex microptera)	25
Awlfruit sedge (Carex stipata)	29.5
Common spikerush (Eleocharis palustris)	15
Smallfruit Bulrush (Scirpus microcarpus)	3
Slender rush (Juncus tenuis)	0.5

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Hood River, OR 97031
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No	Date	Revision	By
4			
3			
2			
1			

PROJECT ENGINEER MM
DESIGNED/DRAWN DF
INSPECTOR ---

DIRECTOR PUBLIC WORKS T.A.C.
CITY ENGINEER C.M.A.S.
ASSISTANT DIRECTOR R.L.

CITY OF BELLINGHAM, WASHINGTON
PUBLIC WORKS DEPARTMENT
ENGINEERING DIVISION

SCALE
Horiz. SHOWN
Vert. SHOWN

DATUM
NAD83/98-NAVD88

Job. No. ---
Date 04/25/20
Field Bk.

SQUALICUM CREEK RE-ROUTE PROJECT PHASE 3 & 4
PLANTING PLAN

SHEET 36 OF 36

CONTACT PERSON: CRAIG MUELLER P.E., PROJECT ENGINEER AT 778-7900