
FINAL REPORT

Metropolitan Greenspaces Program

Greenspaces Restoration Grant

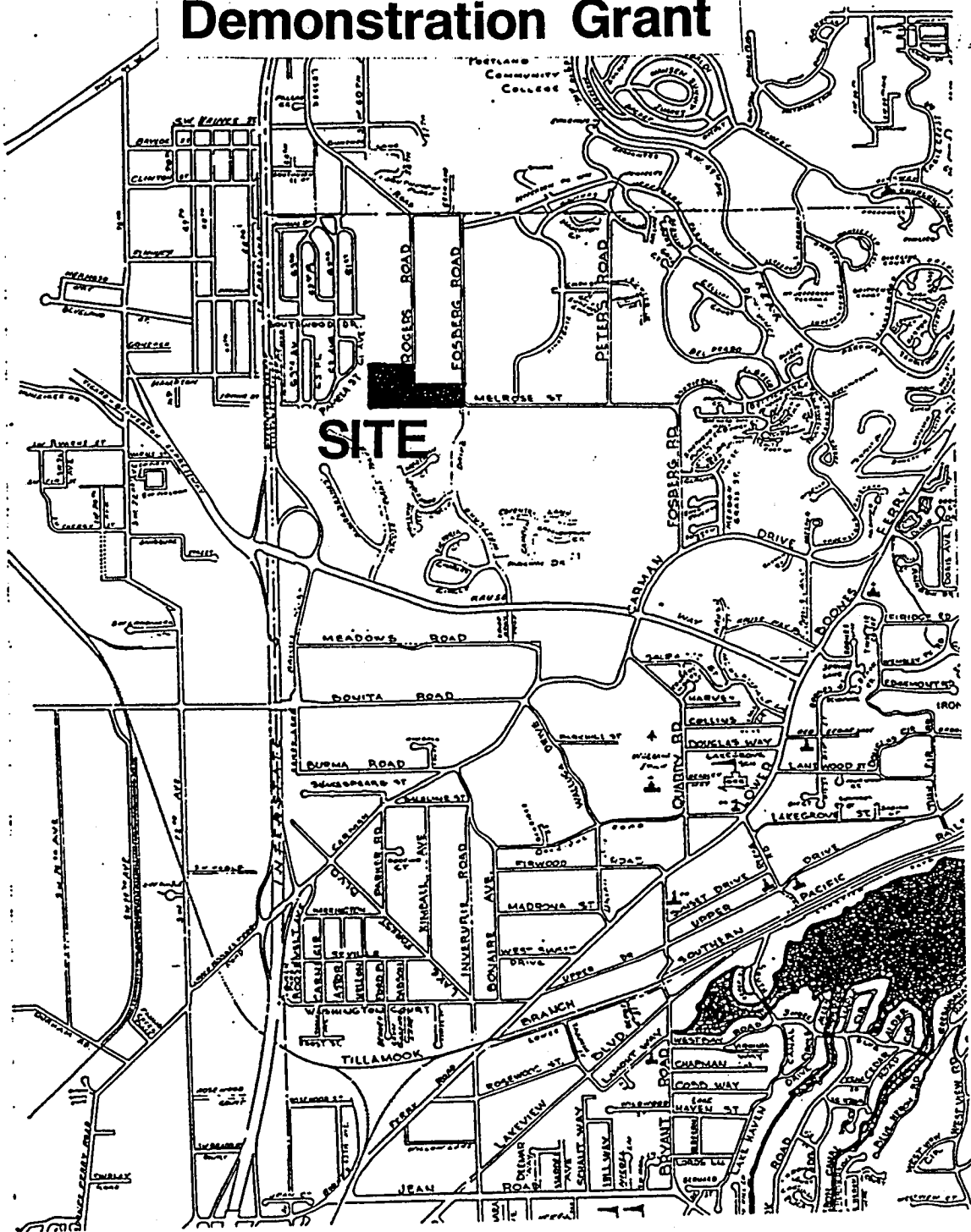
Ball Creek at Suncreek

City of Lake Oswego

March 22, 1995

Metropolitan Greenspaces Program

Demonstration Grant



VICINITY MAP

Ball Creek Restoration at Sun Creek

PROJECT DESCRIPTION.

The project involved the restoration of a 500 foot reach of Ball Creek in the Fanno Creek Drainage Basin. The project site is Northeast of the Mormon Temple in Lake Oswego. Access to the site is from the West end of Sun creek Drive. The stream corridor is in a designated City open space.

The restoration included placing boulders in the stream channel to reduce the gradient and velocity of the stream. We removed concrete lining a portion of the stream bed and replaced it with a mix of stream gravel. We covered exposed stream banks with coconut erosion control fabrics and planted willow and dogwood cuttings and other native riparian vegetation.

We also removed a 36 inch concrete culvert, restored the natural stream channel, and planted native riparian vegetation.

There was general clean-up of the area by volunteers. The volunteers removed Himalayan blackberry and undesirable debris like trash, discarded wood products, and old fencing materials from the project area.

Volunteers also planted over 500 native plants along the corridor including Oregon grape, cascara, serviceberry, red-flowering currant, red alder, willow, red elderberry, fern, vine maple, salal, snowberry, Nutka rose, and pacific dogwood.

PROJECT GOALS AND BENEFITS.

The project goals are to restore the natural stream channel, improve wildlife habitat, enhance stream corridor native vegetation, improve surface water quality, and develop model construction plans and specifications for future stream enhancement projects

The project will provide essential breeding, nesting, resting, feeding, and escape areas for wildlife. Riparian vegetation will lower water temperature, reduce stream velocity, and reduce stream bank erosion.

We now have designs and specifications for stream enhancement treatment that we can apply to other stream restoration projects.

WORK TASKS AND SCHEDULE.

Tasks	Dates
<u>Survey</u> - Survey project area.	September, 1992
<u>Conceptual Construction Plans.</u>	
Produce conceptual construction plans.	April, 1993
Confer with Metro review panel on plans.	April, 1993
Stream Corridor Clean-up Day.	May 1, 1993
<u>Plans</u> - Produce final construction plans.	June, 1993
<u>Permits</u> - Obtain permits:	
City of Lake Oswego	June 18, 1993
Division of State Lands	August 19, 1993
Corps of Engineers	September 20, 1993
<u>Construction</u> of stream improvements.	October 5, 1993
<u>Landscape Installation</u> by volunteers	October 16, 1993
<u>Installation</u> of Dogwood & Willow Cuttings.	April 15, 1994
Final Report	March, 1995

PROJECT BUDGET (Actual Funds Expended)

Items	Local Match Spent	Granted by Metro
1. <u>Personnel Costs</u>		\$2,000
a) Engineering Salaries (design)	\$9,473.80	
b) Engineering Salaries (surveying)	\$3,344.80	
c) Contracted Labor (under Item 2. a)		
d) Volunteer Hours		
Clean-up (5/1/93) 200 hrs. X \$4.75	\$950.00	
(50 volunteers for 4 hours)		
Planting (10/16/93) 180 hrs. X \$4.75	\$855.00	
(30 volunteers for 6 hours)		
Sub-Total	\$14,623.60	
2. <u>Materials, Plants and Supplies</u>		\$8,000
a) Construction & Materials	\$37,427.88	
b) Plants	\$2,581.50	
Sub-Total	\$40,009.76	
3. <u>Equipment Rental</u>	0	0
4. <u>Professional Services</u>		0
a) Consulting Services	\$10,241.83	
Total Funds	\$64,874.81	\$10,000

*in-house
staff.*

OK.

PROJECT STAFF, CONTRACTORS, AND VOLUNTEERS.

City staff included Andy Harris, Project Manager; Mark Schoening, Environmental Engineer; Jerry King, Chief of Survey; and Kathy Avery, Administrative Secretary.

Consultant Services for the design and supervision of construction included Lon Mikkelsen of Inter Fluve, Inc.

The Construction Contractor was Robert G. Thomas of Michael-Mark, LTD.

Volunteer Groups included:

The Lake Oswego Land Trust
Lake Oswego High School Eco Support Club
Girl Scout Troops 432, 496, 500, and 859
Brownie Troops 1, 113, and 909

WHAT WORKED/WHAT DIDN'T

Permits.

The project required permits from the Oregon Division of State Lands and The Army Corps of Engineers. The permits were submitted on June 18, 1993. DSL authorized their permit on August 19, 1993. The Corps authorized their permit September 20, 1993. This permit process takes a fair amount of time and effort. Project managers need to plan ahead and consider the narrow window of time in the fall allowed for working in stream corridors. I would like to see a special simplified permit process for restoration and enhancement type projects.

Clean-up Project.

The clean-up process went very well. We advertised for volunteers in the Lake Oswego Review and by direct mail from our volunteers mailing list. The Lake Oswego Land Trust provided refreshments and helped coordinate the volunteer clean-up day. The Lake Oswego Maintenance Department provided a portable toilet and disposed of all the clean-up materials.

Earthwork.

We did the earthwork for the project under the constant supervision of the consultant. This is critical to the success of any channel restoration work because it tends to be more art than engineering.

- The channel improvements have seen several unusually large storm events over the past winter and are adapting very well.

Plants.

All the plants came from two native plant nurseries. The nurseries delivered their plants the morning of the planting day to minimize vandalism of plant materials.

Planting.

We advertised the planting day in the Lake Oswego Review and by direct mail to our volunteers mailing list. We also hired two people from the nursery to help with the planting and with placing plants in suitable locations for the volunteers. The Lake Oswego Land Trust also provided refreshments and coordination help. The Lake Oswego Maintenance Department provided a portable toilet.

MONITORING AND MAINTENANCE PLAN.

The City of Lake Oswego approaches open space restoration as a continuing process that is compatible with and enhances the natural plant succession of the site. The monitoring and maintenance plan for the Ball Creek Restoration Project includes the following tasks.

The City Environmental Services Division (ESD) will inspect the project site during and after major storm events for signs of unusual erosion, flooding, and damage to riparian vegetation.

ESD staff will photograph the project site in the spring and summer to track plant succession and survival. Staff will also take photos of storm events and future planting projects.

ESD staff will inspect for returning Himalayan blackberries in the spring.

Neighborhood volunteers and City maintenance crews continue to remove invasive Himalayan blackberries from the project site.

A local neighborhood group is applying for a City open space enhancement grant to continue the effort to restore the native plant community. These grant are available annually to continue the replanting process.

Photos of the Ball Creek Restoration at Suncreek

Summer of 1992

1. This is one of three pathway entrances into the project site.
The view is looking west at the path located from the west end of Suncreek Dr.
2. The path crossing the project area.
The view is looking east to the Suncreek Drive pathway entrance.
3. The stream at the lower end of the project.
The view is looking south at the manhole in photo number 2.
4. The path crossing the project area.
The view is looking west at that manhole again.
5. A path to the stream area.
The view is looking north from the manhole in photos #3 & 4.
- 6 This is the stream section with a concrete bottom and a concrete culvert. We will remove the blackberries, the concrete and the culvert. We will restore the channel and native riparian vegetation.
7. A stream section with a concrete bottom
We will remove the blackberries and the concrete.
We will restore the channel and native riparian vegetation.
8. An eroding stream overgrown with blackberries.
9. The upper end of the stream showing trash and erosion.
We will clean up the trash and place large boulders to create a natural water feature.
10. The upper end of the stream showing trash and erosion.
11. The concrete culvert.

The Clean-Up Day, May 1, 1993

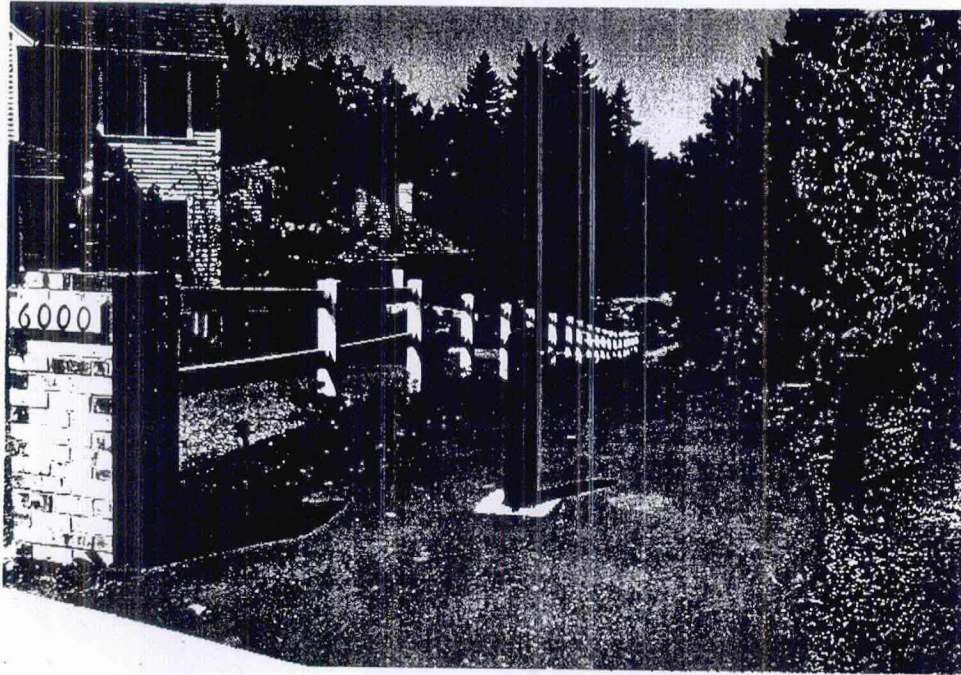
12. Blackberry removal from stream corridor.
13. Blackberry removal from stream corridor.
14. Blackberry removal from stream corridor.

Completed Stream Channel Restoration. October 16, 1993

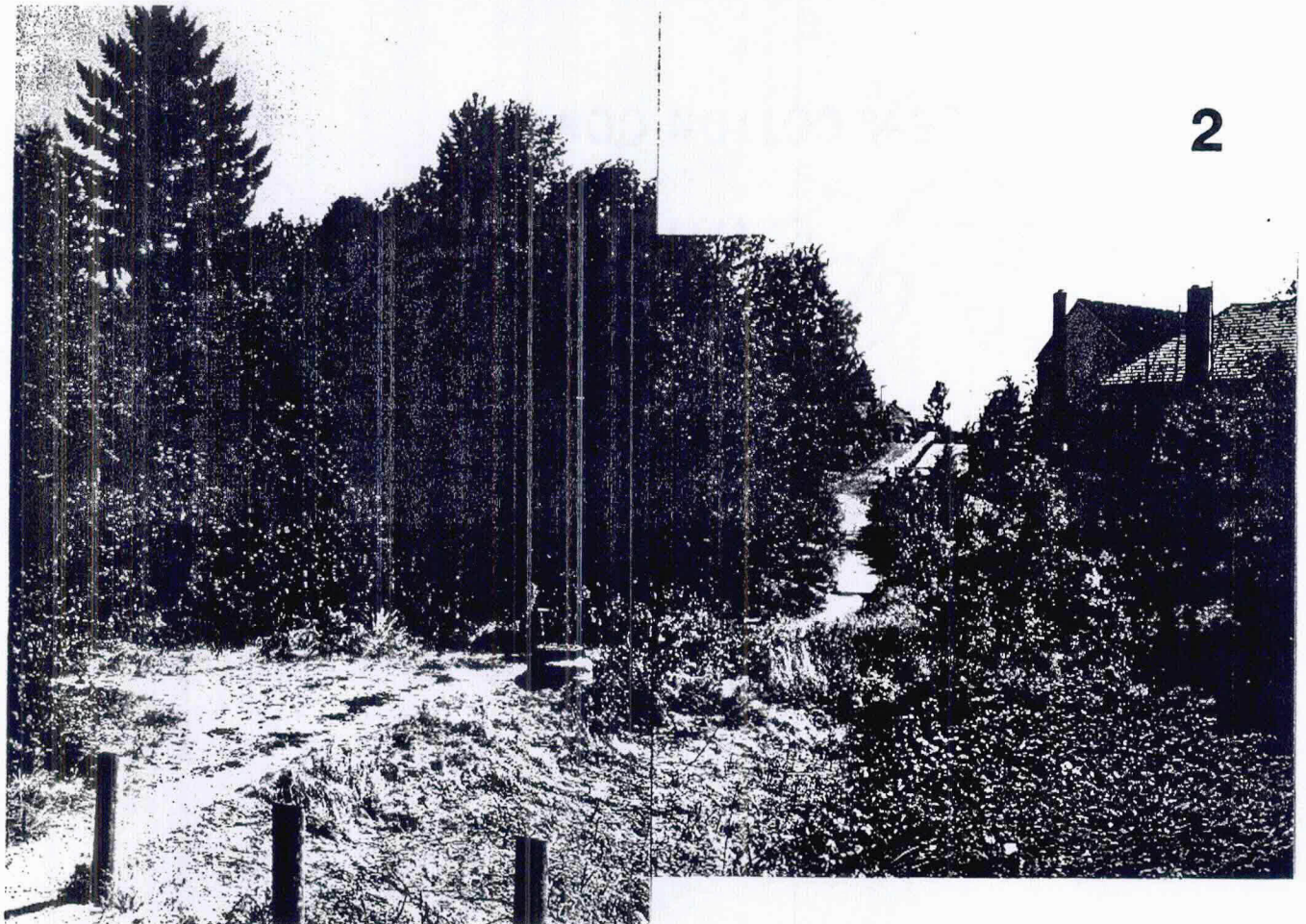
15. New stream bed after removal of concrete liner shown in photos 5 & 6.
16. New stream channel after removal of culvert shown in photos 6 & 11.
17. New stream channel and planting of upper stream.
18. Planting day on October 16, 1993.
19. Planting day on October 16, 1993.
20. Planting day on October 16, 1993.
21. Planting day on October 16, 1993.
22. This is the upper stream area on May 5, 1994. Formerly the culvert location.
23. This is the middle stream area on May 5, 1994.
24. Lower stream area on May 5, 1994. Formerly with the concrete channel.

METRO Greenspaces Program

Restoration and Enhancement Grant

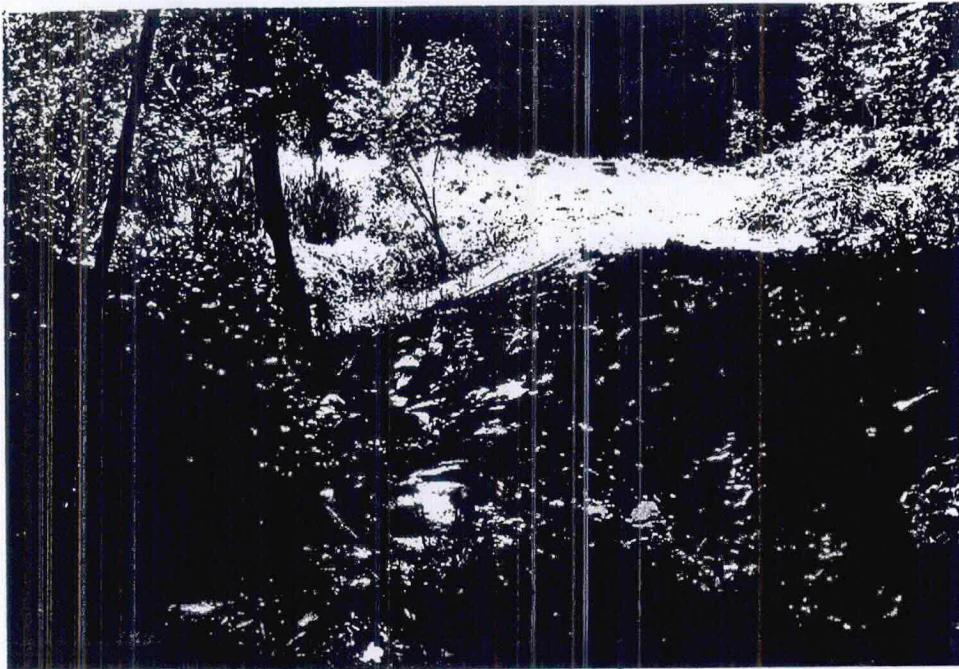


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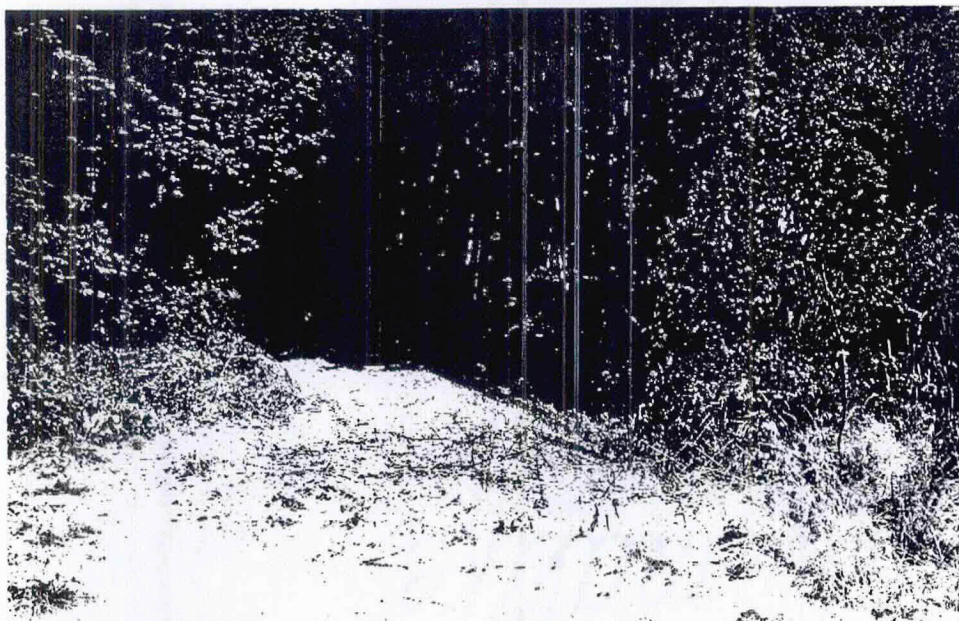
Ball Creek Restoration at Suncreek



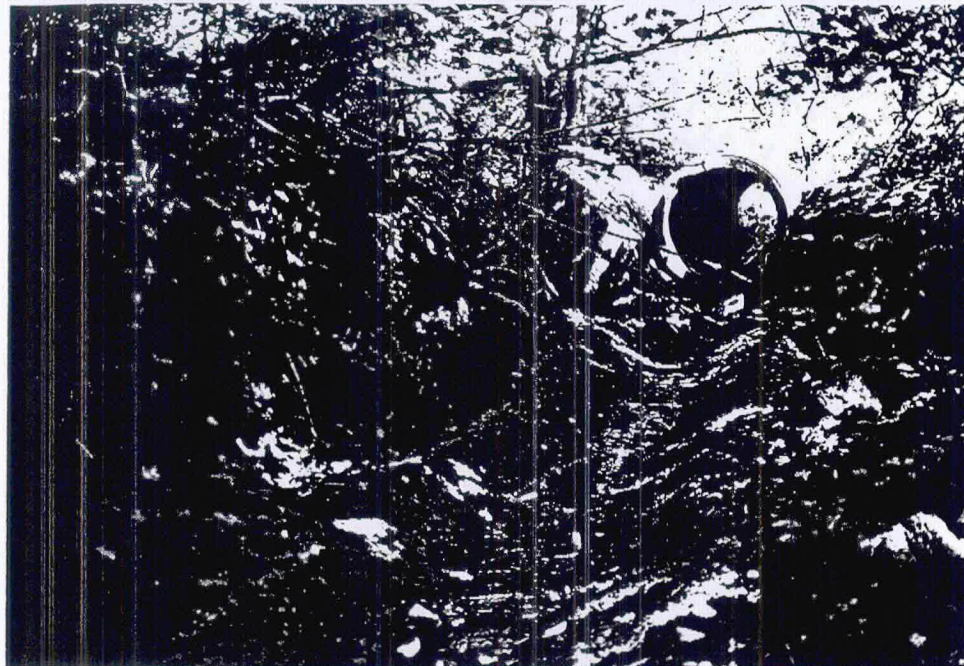
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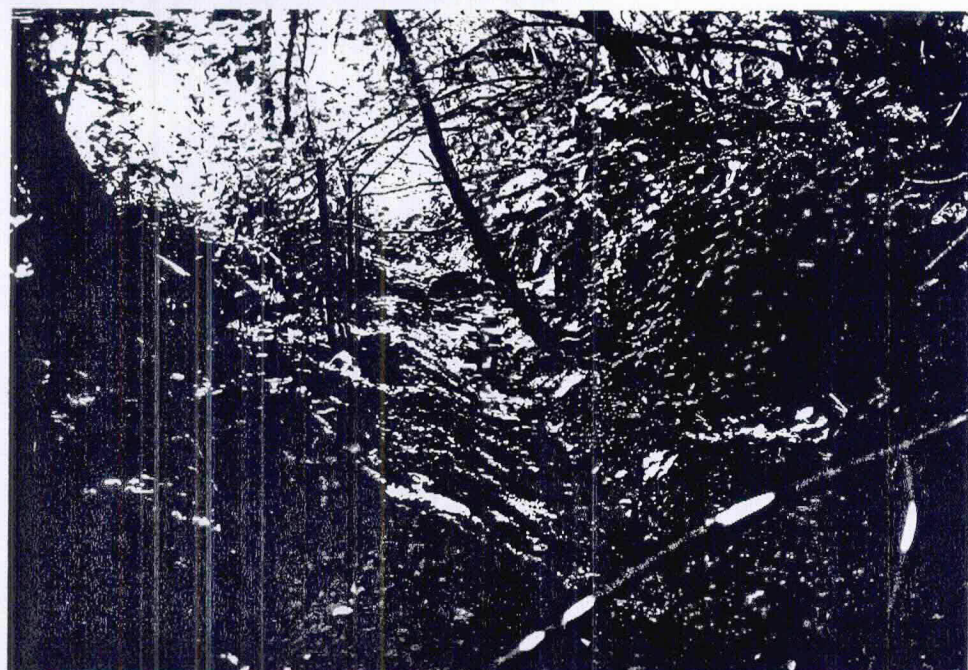
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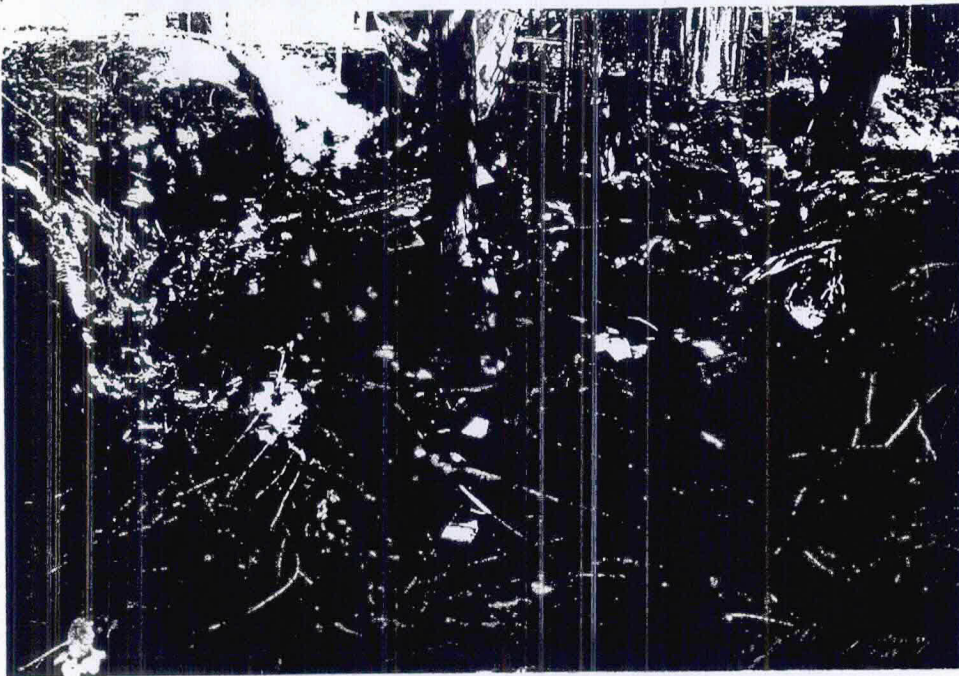
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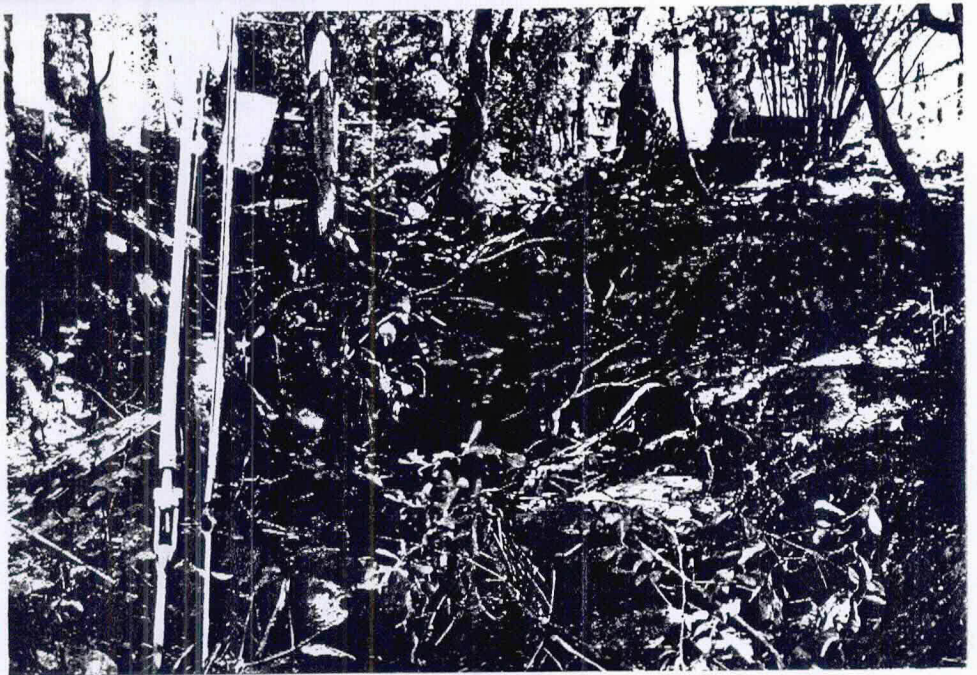
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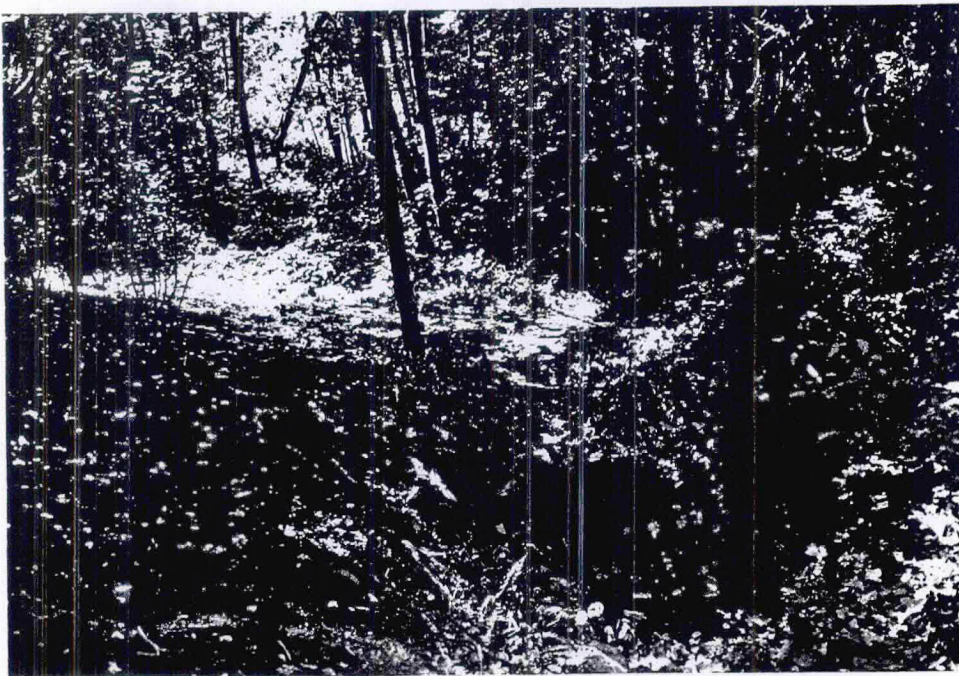
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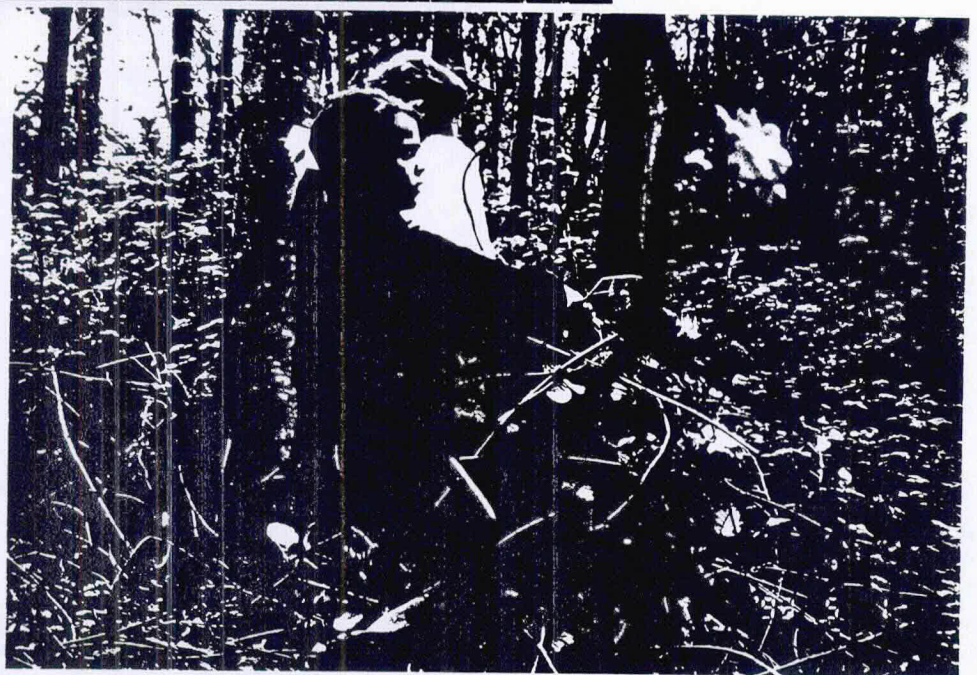
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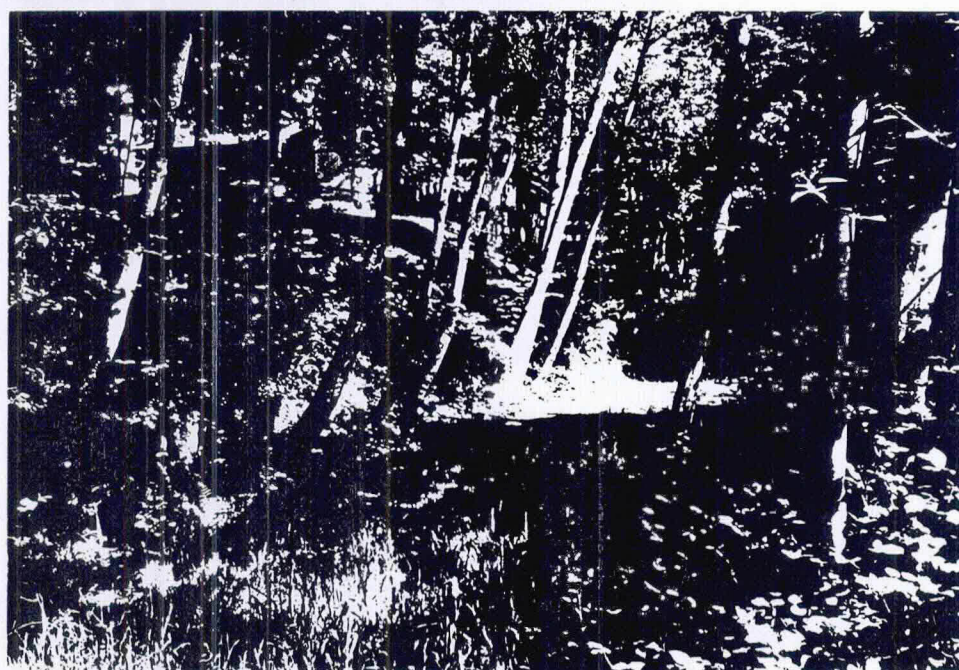
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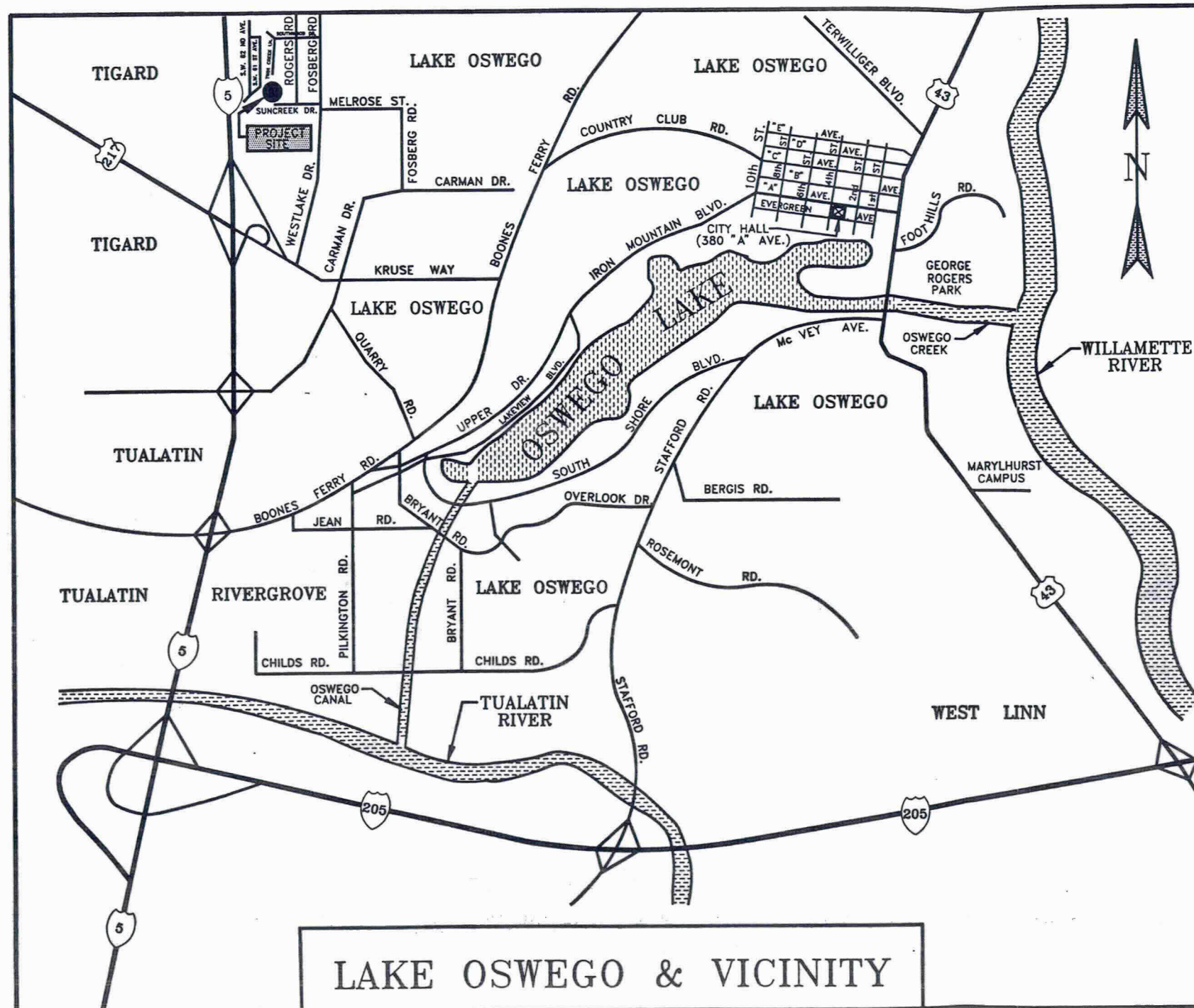
WORK ORDER 9956

INDEX

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- SHEET 5. TREATMENT PLAN OVERVIEW
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- SHEET 8. RE-VEGETATION PLAN
- SHEET 9. DETAILS


PROJECT NAME:

BALL CREEK RESTORATION
AT SUNCREEK DRIVE



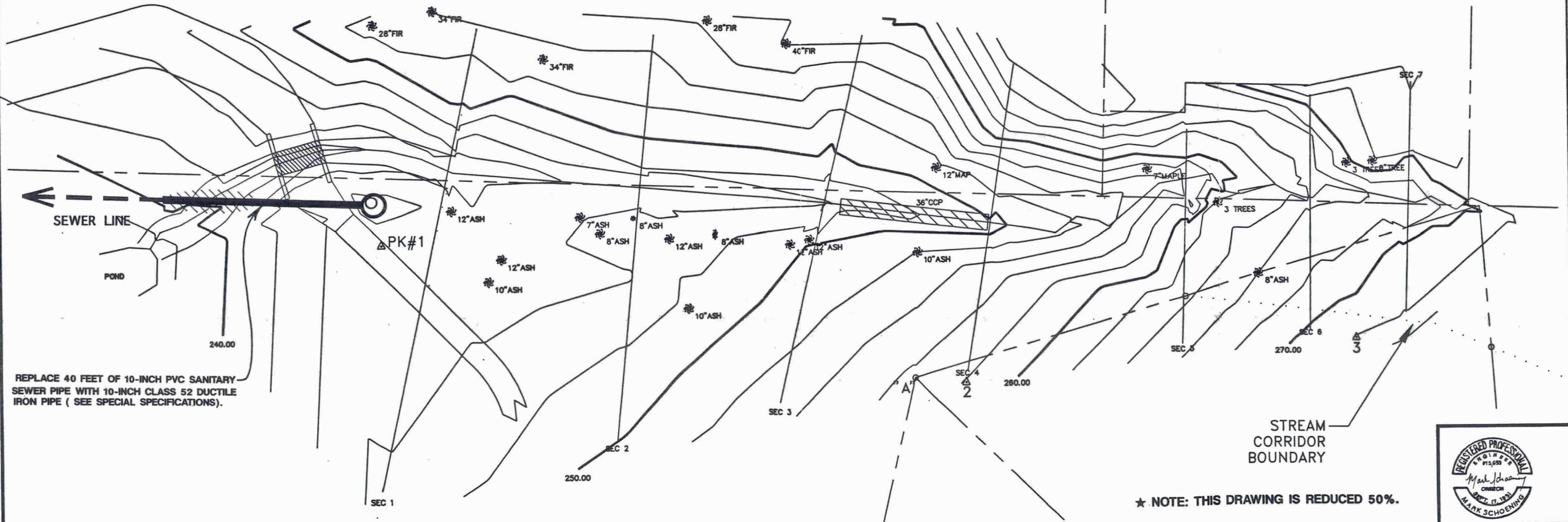
LAKE OSWEGO & VICINITY



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UNDEVELOPED CITY PARK

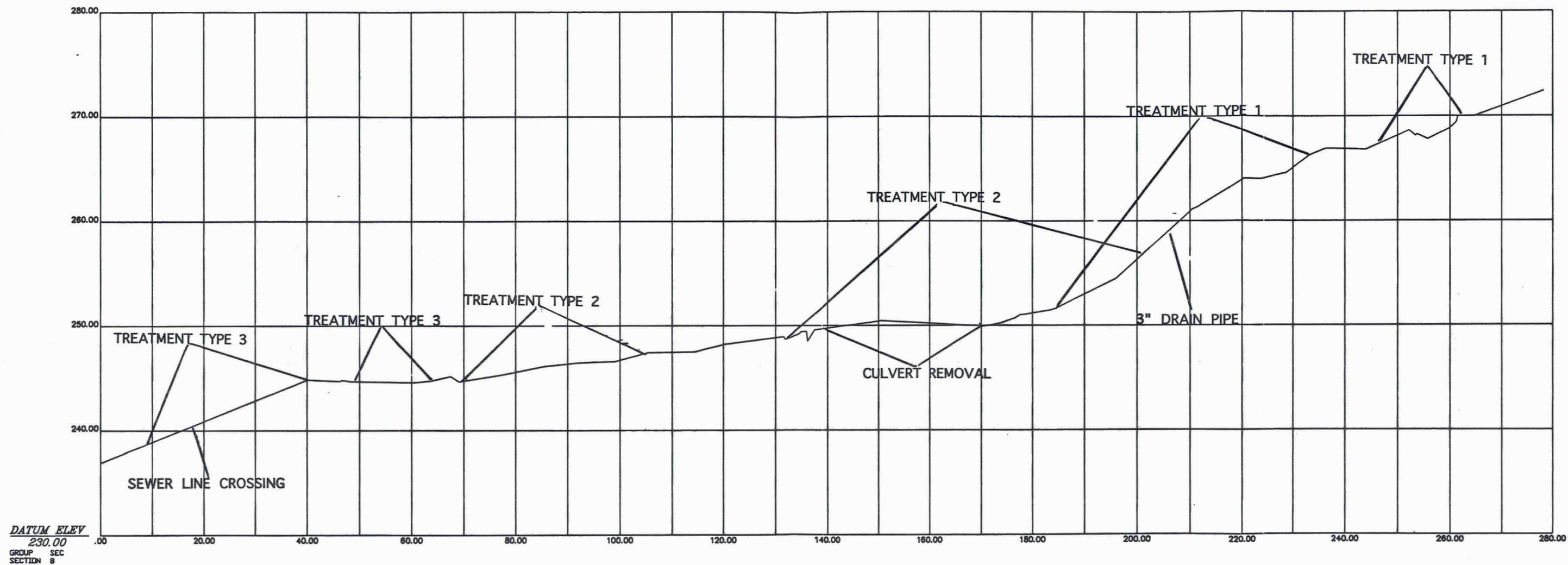
TL 1700
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LOT 17, BLOCK 1



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



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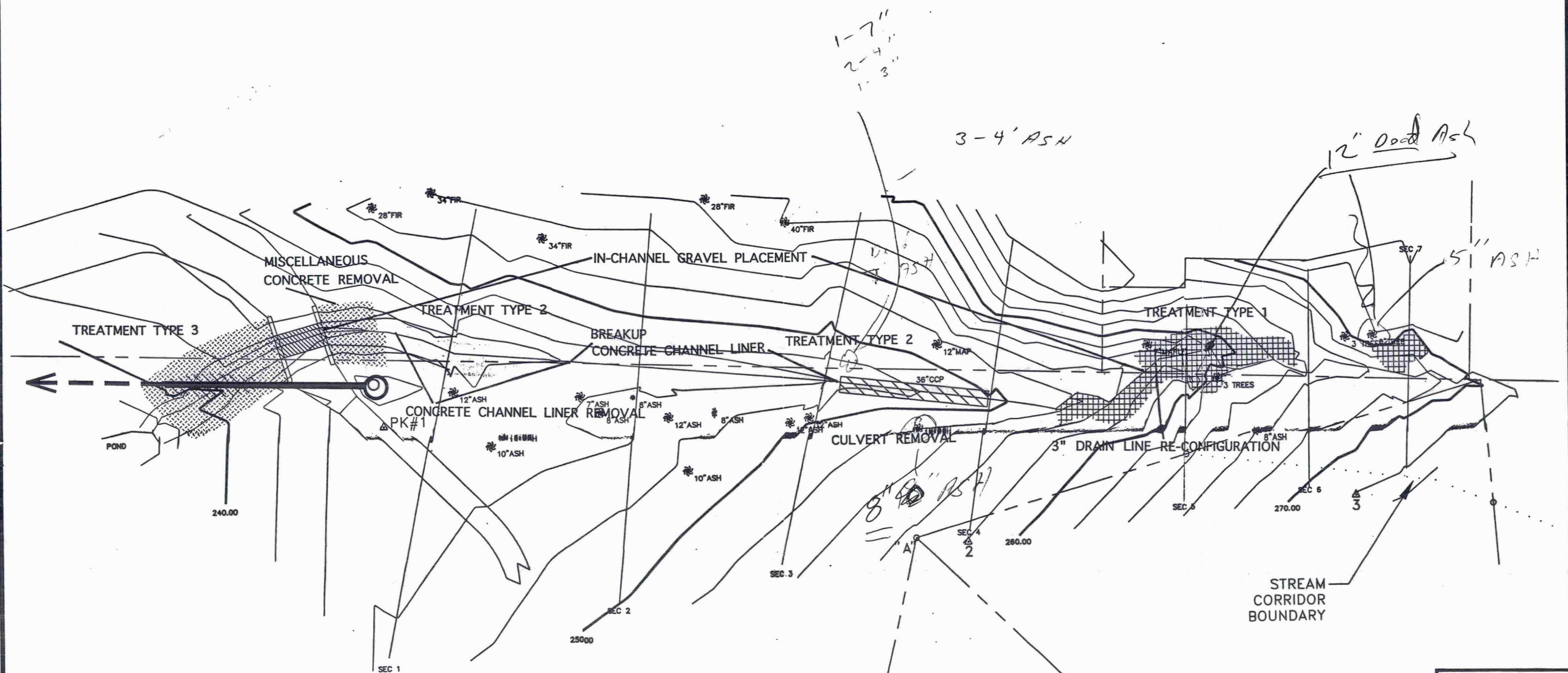
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TREATMENT TYPE 1 

TREATMENT TYPE 2 

TREATMENT TYPE 3 

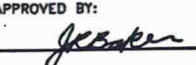



* IN-CHANNEL GRAVEL PLACEMENT TO OCCUR ALONG ENTIRE LENGTH OF STREAM SECTION. ACTUAL BOUNDARIES FOR PLACEMENT WILL BE IDENTIFIED IN THE FIELD BY PROJECT ENGINEER.

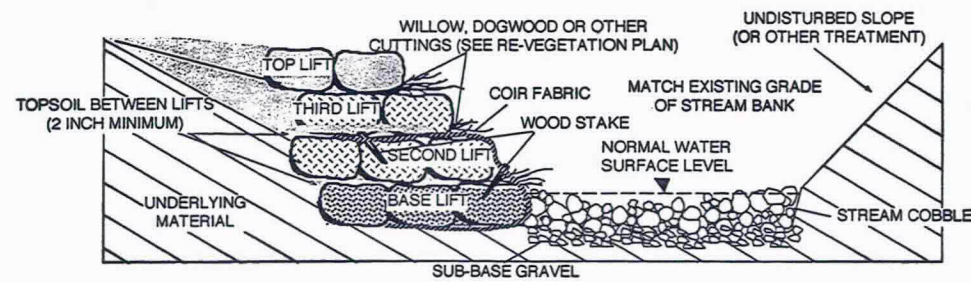
* CONCRETE CHANNEL LINER WILL EITHER BE BROKEN UP AND LEFT IN PLACE OR REMOVED FROM STREAM CHANNEL. ACTUAL BOUNDARIES FOR REMOVAL/BREAKUP WILL BE IDENTIFIED IN THE FIELD BY PROJECT ENGINEER.

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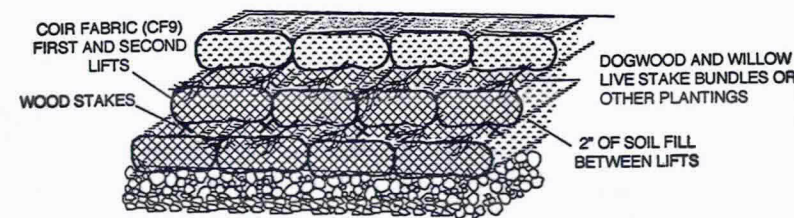


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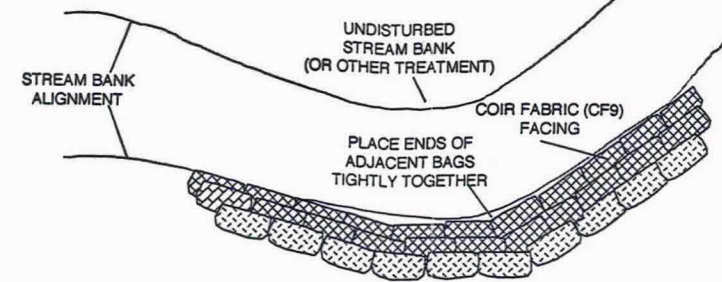
A. X-SECTION



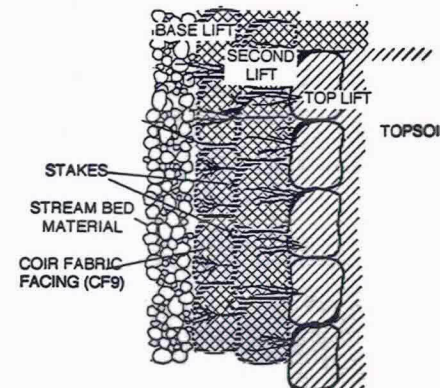
B. ISOMETRIC



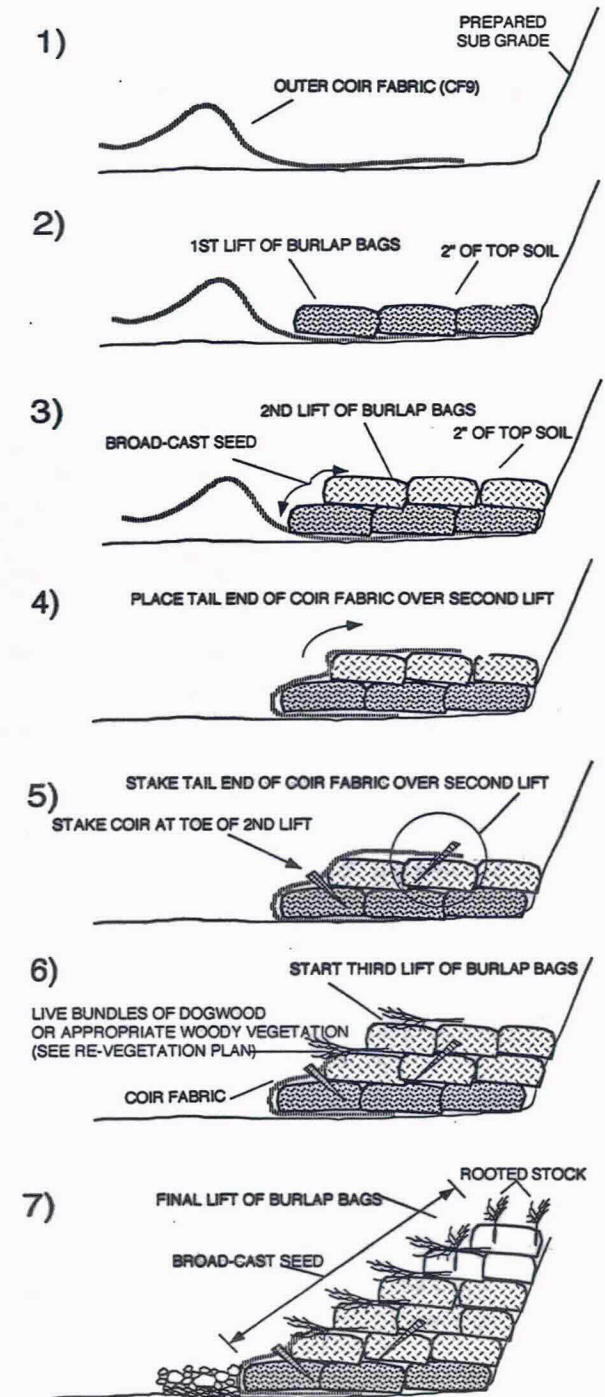
C. PLAN



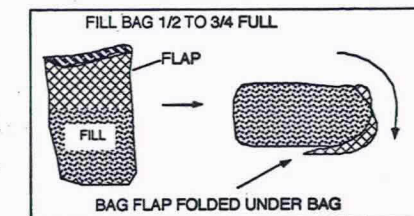
D. PLAN DETAIL



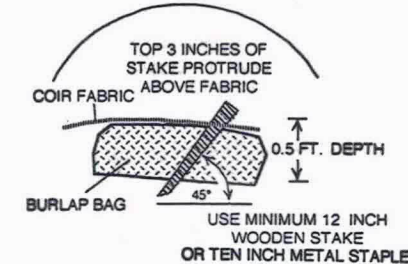
E. PLACEMENT OF BURLAP BAGS CONSTRUCTION SEQUENCE



BURLAP BAG FILL DETAIL



DETAIL OF STAKING



LEGEND



NOTE: IN CERTAIN APPLICATION AREAS, AS DIRECTED BY THE ON PROJECT ENGINEER, IT WILL BE REQUIRED TO CARRY THE COIR FABRIC FACING TO THE TOP LIFT OF BURLAP BAGS. THE NUMBER OF BURLAP BAG LIFTS APPLIED TO A SITE WILL BE DIRECTED BY THE PROJECT ENGINEER AND WILL NOT EXCEED 6 LIFTS FOR ANY ONE SITE.

TREATMENT 1. GENERAL NOTES ON INSTALLATION OF BURLAP BAG REVELTMENT

- 1) PREPARE TREATMENT SITE BY SALVAGING PLANTS AND TOP SOIL LAYER IMMEDIATELY PRIOR TO CONSTRUCTION AND AS DIRECTED BY THE SUPERVISING ENGINEER. TOP SOIL SALVAGED FROM THE SITE WILL BE USED AS FILL BETWEEN BURLAP REVELTMENT LIFTS AND IN THE TOP LIFT OF BURLAP BAGS (SEE NOTE 5). THE SALVAGED PLANTS WILL BE INCORPORATED INTO THE TREATMENT BANK DURING CONSTRUCTION.
- 2) SLOPE TREATMENT BANK AREAS AS DIRECTED BY THE SUPERVISING ENGINEER. MATERIAL REMOVED DURING THE SLOPING PROCESS CAN BE USED, (IF APPROPRIATE), TO FILL THE BURLAP BAGS IN THE REMAINING LIFTS AT THE SITE AND OTHERS ON THE PROJECT.
- 3) UNROLL THE OUTER COIR FABRIC (BON TERRA CF9 OR EQUIVALENT) PARALLEL TO THE CHANNEL AND PLACE IT SO THAT IT EXTENDS INTO THE BANK THE TOTAL EMBEDMENT LENGTH OF THE BASE LIFT OF BURLAP BAGS. ANTICIPATE FOR THE REMAINDER OF THE FABRIC TO BE PLACED OVER THE SECOND LIFT (FIGURE E-4).
- 4) PLACE THE BASE LIFT OF FILLED BURLAP BAGS ON THE COIR FABRIC SO THAT THE BAGS FOLLOW THE OUTLINE OF THE STREAM BANK (SEE FIGURES C AND D). BUTT THE SIDE OF THE BAGS TIGHTLY TOGETHER, PLACING THE FLAP END OF THE BAGS FACING IN TOWARDS THE BANK (SEE FIGURES A, E, AND). THE BASE LIFTS OF BURLAP BAGS WILL BE FILLED WITH SUB-BASE GRAVEL AND SOIL (SEE SHEET 7). APPROXIMATELY 4 CUBIC YARDS OF SUB-BASE GRAVEL WILL BE USED TO FILL THE BASE LIFT BURLAP BAGS ON THE PROJECT.
- 5) PLACE SECOND LIFT SO THAT A SECOND LIFT BAG SPANS THE JUNCTURE OF TWO BAGS ON THE BASE LIFT BELOW (SEE FIGURES A, B, AND E). PLACE A MINIMUM OF 2 INCHES OF SALVAGED SOIL ON TOP OF EACH LIFT PRIOR TO APPLYING THE NEXT LIFT (SEE FIGURE E-2-3-4). BROADCAST SEED THE BASE AND SECOND LIFTS (SEE FIGURE E-3). 340 BURLAP BAGS ARE ESTIMATED FOR USE ON THE TOTAL PROJECT.
- 6) FOLD THE LOOSE END OF THE COIR FABRIC OVER THE SECOND LIFT AND STRETCH TIGHT TAKING CARE TO LEAVE ENOUGH LOOSE FABRIC TO FORM CLOSELY AT THE TOE OF THE SECOND LIFT (SEE FIGURE E-4). STAKE THE FABRIC AT THE TOE OF THE SECOND LIFT EVERY 3 FEET TO REMOVE ANY VOIDS BETWEEN THE COIR FABRIC AND BURLAP BAGS (SEE FIGURES C, DETAIL OF STAKING AND E-5). STAKE THE TAIL END OF THE COIR FABRIC ON THE SECOND LIFT EVERY 4 FEET (SEE FIGURES A, E-5, AND F). STAKE REMAINING FABRIC AS PER MANUFACTURES SPECIFICATIONS.
- 7) SHRUB CUTTINGS CAN BE PLACED BETWEEN EACH BURLAP BAG LIFT AS DIRECTED BY SUPERVISING ENGINEER, (SEE FIGURES A, B, C, AND E). SEE ALSO SHEET 8.
- 8) ALL FABRIC AND BURLAP REVELTMENTS SHOULD BE BROADCAST SEEDING AND PLANTED UPON COMPLETION, (SEE FIGURE E-7), TO PROVIDE LONG TERM BANK STABILITY. PLACEMENT OF BARE ROOT SHRUBS SHOULD OCCUR FOLLOWING COMPLETION, (SEE FIGURES A, B, C, AND E-7), AND AS SPECIFIED ON SHEET 8.
- 9) WHEN BURLAP REVELTMENT IS COMPLETED, RIVER GRAVEL AND COBBLE CAN BE PLACED UP TO THE TOP OF THE BOTTOM LIFT AS DIRECTED BY THE SUPERVISING ENGINEER. 40 CY. OF RIVER GRAVEL AND COBBLE IS ESTIMATED FOR THE TOTAL PROJECT.
- 10) THE UP AND DOWN STREAM TERMINUS OF EACH TREATMENT SITE WILL BE TIED INTO EXISTING TOPOGRAPHIC AND STRUCTURAL FEATURES AS DIRECTED BY THE SUPERVISING ENGINEER.

★ NOTE: THIS DRAWING IS REDUCED 50%.

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DESIGNED BY: LM	APPROVED BY:
DRAWN BY: LM	<i>J. Baker</i>
CHECKED BY: GPK /MS	DATE: 7-20-93



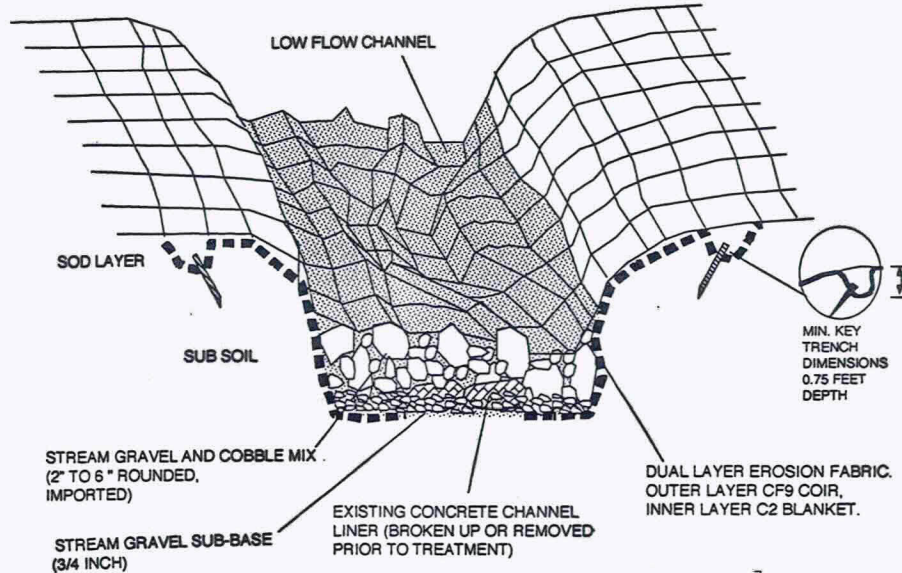
CITY OF LAKE OSWEGO
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
JERRY R. BAKER, P.E. CITY ENGINEER

TREATMENT TYPE 1 (DETAILS)

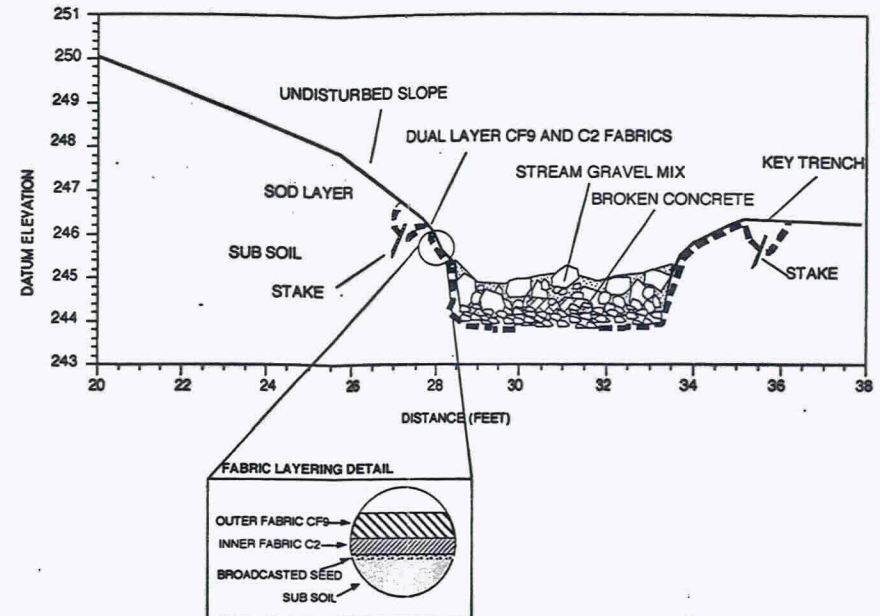
INTER-FLUVE, INC. FISHERIES HYDROLOGY RESOURCE ENHANCEMENT 1020 WASCO STREET, SUITE 1 HOOD RIVER, OREGON 97031 (503) 386-9003	SHEET 6 OF 9
SCALE:	DATE: JUNE 2, 1993 FILE: 1993-4 "BALL"



TREATMENT 2 ISOMETRIC



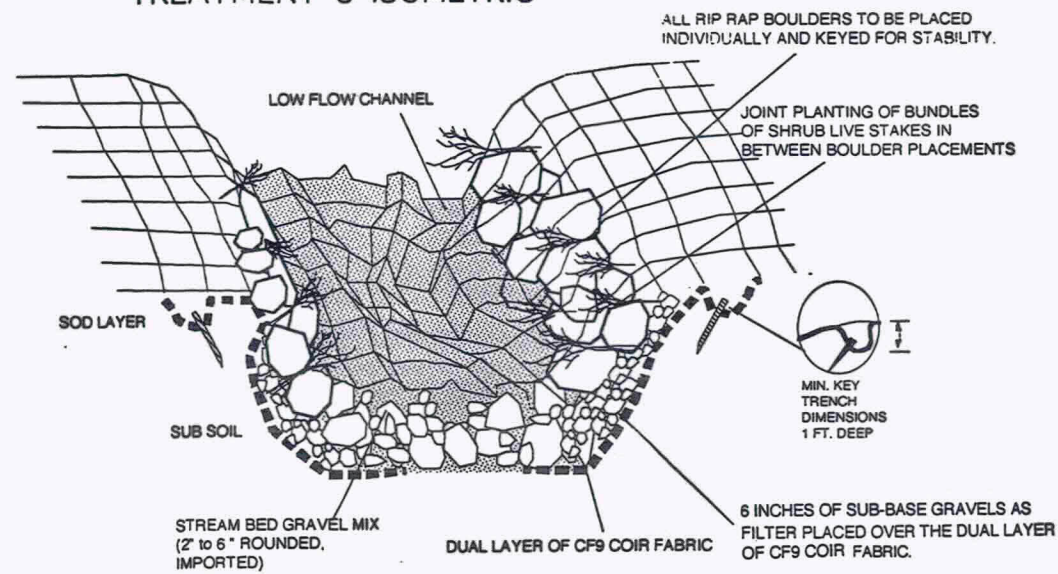
TREATMENT 2 SECTION



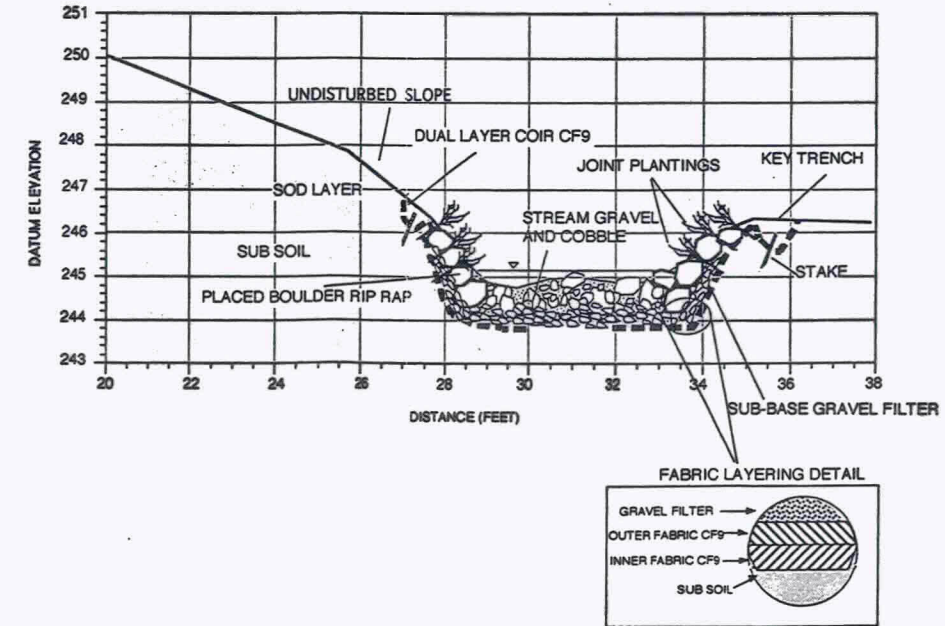
TREATMENT 2. GENERAL NOTES ON INSTALLATION

- 1) TREATMENT 2 BANKS SHALL BE SLOPED FROM THE STREAM BED ELEVATION BACK TO A STABLE ANGLE OF REPOSE AS SPECIFIED ON SITE BY THE PROJECT ENGINEER. WHERE BANK TOPOGRAPHY, BOULDERS, AND TREES HINDER SLOPING, THE ANGLE MAY EXCEED AN 1:1 SLOPE.
- 2) ALONG THE PROJECT LENGTH IT WILL BE REQUIRED TO BREAKUP AND REMOVE A CONCRETE LINER IN CHANNEL. IN AREAS WHERE HEAVY EQUIPMENT ACCESS IS LIMITED, THE CONCRETE WILL BE BROKEN TO A MAXIMUM MEAN DIAMETER OF 8" AND LEFT IN PLACE.
- 3) ONCE THE SITE HAS BEEN PREPARED, A DUAL LAYER OF FABRIC (BONTERRA CF9 AND C2), WILL BE APPLIED AS FOLLOWS: AN INNER LAYER OF C2 FABRIC AND AN OUTER LAYER OF CF9 WILL BE PLACED AT THE SUBGRADE LEVEL IN THE PREPARED CHANNEL PRIOR TO GRAVEL PLACEMENTS (AS DEPICTED IN THE SECTION AND AS DIRECTED BY THE PROJECT ENGINEER). BROADCAST SEED THE SLOPED BANKS PRIOR TO LAYING THE FABRICS OVER THE DISTURBED MATERIAL.
- 4) STAKE THE FABRIC A MINIMUM OF EVERY 3 SQUARE FEET AND AS DIRECTED BY THE FABRIC MANUFACTURE AND PROJECT ENGINEER.
- 5) THE ROUGH GRADE OF THE CHANNEL SHALL BE FINISHED WITH THE RIVER GRAVEL AND COBBLES. THIS MATERIAL WILL BE PLACED ON THE FABRIC LAYER THAT EXTENDS INTO THE CHANNEL AT THE SUBGRADE LEVEL. APPROXIMATELY 40 CUBIC YARDS OF GRAVEL WILL BE PLACED.
- 6) THE STREAM GRAVEL AND COBBLE WILL BE PLACED IN THE CHANNEL IN SUCH A MANNER AS TO REPLICATE AND ALLOW FOR THE FORMATION OF THALWEG, LOW ELEVATION POINT BARS POOLS AND RIFFLES. THESE PLACEMENTS WILL BE DIRECTED BY THE PROJECT ENGINEER (REFER TO ISOMETRIC).
- 7) ROOTED STOCK CAN BE PLANTED INTO THE FABRIC ONCE INSTALLATION IS COMPLETED AND AS DIRECTED BY THE PROJECT ENGINEER.

TREATMENT 3 ISOMETRIC



TREATMENT 3 SECTION



TREATMENT 3. GENERAL NOTES ON INSTALLATION

- 1) TREATMENT 3 BANKS SHALL BE SLOPED FROM THE STREAM BED ELEVATION BACK TO AN ANGLE AS SPECIFIED ON SITE BY THE PROJECT ENGINEER. THIS SLOPING PROCESS WILL BE SUCH AS TO ACCOMMODATE THE BOULDER RIP RAP AND FILTER GRAVEL WITH OUT REDUCING THE EXISTING CHANNEL CROSS SECTION. EXCAVATION FOR INDIVIDUAL BOULDERS MAY BE NECESSARY AND WILL BE DIRECTED BY THE PROJECT ENGINEER.
- 2) ONCE THE SLOPING HAS BEEN COMPLETED, A DOUBLE LAYER OF CF9 FABRIC WILL BE PLACED FROM MID-CHANNEL TO THE TOP OF THE CUT. PLACEMENT OF THE CF9 FABRIC WILL OCCUR AT THE SUB BASE LEVEL.
- 3) STAKE THE FABRIC A MINIMUM OF EVERY 3 FEET AND AS DIRECTED BY THE FABRIC MANUFACTURE AND PROJECT ENGINEER.
- 4) GRAVEL WILL BE USED AS A FILTER BETWEEN THE FABRIC AND BOULDERS. A MAXIMUM OF 6 INCHES WILL BE PLACED. THE GRAVEL WILL BE THE SAME SUB BASE GRAVEL USED IN TREATMENTS 1 AND 2 (SHEETS 6 AND 7) AND WILL TOTAL 4 YARDS.
- 5) 40 BOULDERS, (A MAXIMUM OF 2.5 FEET ON THE LONGEST AXIS AND A MINIMUM OF 1.5 FEET) WILL BE PLACED INDIVIDUALLY AND KEYED, AS DEPICTED IN THE SECTION DRAWING AND AS DIRECTED BY THE PROJECT ENGINEER. LIVE STAKES WILL BE PLACED IN BETWEEN BOULDERS DURING CONSTRUCTION AND AS DIRECTED BY THE PROJECT ENGINEER.
- 6) THE ROUGH GRADE OF THE CHANNEL SHALL BE FINISHED WITH THE RIVER GRAVEL AND COBBLES. THIS MATERIAL WILL BE PLACED ON THE FABRIC LAYER THAT EXTENDS INTO THE CHANNEL AT THE SUBGRADE LEVEL. THE STREAM GRAVEL AND COBBLE WILL BE PLACED IN THE CHANNEL IN SUCH A MANNER AS TO REPLICATE AND ALLOW FOR THE FORMATION OF THALWEG, LOW ELEVATION POINT BARS, POOLS AND RIFFLES. THESE PLACEMENTS WILL BE DIRECTED BY THE PROJECT ENGINEER (REFER TO ISOMETRIC).
- 7) LIVE STAKES AND ROOTED STOCK CAN BE JOINT PLANTED BETWEEN THE BOULDERS ONCE INSTALLATION IS COMPLETED AS DIRECTED BY THE PROJECT ENGINEER. BROADCAST SEED THE SITE WHEN COMPLETED WITH ALL CONSTRUCTION.

★ NOTE: THIS DRAWING IS REDUCED 50%.



GENERAL NOTES ON PLANTING

1) TO FACILITATE PLANTING, ONE PLANTING ZONE HAS BEEN ESTABLISHED TO ACCOMMODATE ALL THE SUGGESTED SPECIES. PLANTING DENSITIES WILL VARY WITH IN THIS ZONE AND ARE AS FOLLOWS: GENERALLY, STREAM SIDE PLANTINGS, WITHIN THE BANK FULL DISCHARGE AREA, WILL BE PLACED ON 1, 2, AND 3 FOOT CENTERS. AREAS OUT SIDE THE BANK FULL EVENTS WILL BE PLACED ON 1, 4, AND 6 FOOT CENTERS. PLANTING WILL VARY WITH PLANT GROUPINGS AND AS DIRECTED BY THE SUPERVISING ENGINEER. FOR TREATMENTS 1 AND 2, THE SITE SHOULD BE BROAD-CAST SEEDING WITH THE SEED MIX PRIOR TO FINAL APPLICATION OF COIR FABRIC.

2) WILLOW AND DOG WOOD CUTTINGS WILL BE PLACED THROUGH THE COIR AND BURLAP FABRICS AND GRAVEL BACK FILL. SHRUB AND TREE BARE ROOT STOCK WILL BE PLANTED AFTER THE GEOTEXTILE FABRIC IS INSTALLED. BARE ROOT STOCK PLANTING THROUGH FABRICS WILL BE DIRECTED BY THE SUPERVISING ENGINEER.

3) WILLOW CUTTINGS SHOULD BE A MINIMUM OF 3 FEET LONG AND A MAXIMUM OF 5 FEET LONG. THEY SHOULD BE 1/2 TO 1 INCH IN DIAMETER. IN TREATMENT 3, SHRUB CUTTINGS SHOULD BE PLACED IN BOULDER JOINTS DURING CONSTRUCTION, (SEE SHEET 7) AND WILL BE DIRECTED BY THE SUPERVISING ENGINEER. CUTTINGS SHOULD EXTEND NO LESS THAN 6 INCHES FROM THE FACE OF THE BACKFILL FILTER AND NO MORE THAN 12 INCHES, AND PLACED SO THAT THE GROWTH DIRECTION IS ORIENTED TOWARD THE CENTER OF THE STREAM AND ANGLED 45 DEGREES DOWN STREAM. CUTTING SHOULD BE PLACED AT INTERVALS OF NO LESS THAN 0.5 FEET. WILLOW CUTTINGS WILL BE OBTAINED ON SITE AS DIRECTED BY THE SUPERVISING ENGINEER.

"OUTSIDE THIS CONTRACT, TO BE DONE BY OTHERS".

4) IN ADDITION TO BARE ROOT STOCK, A RE-GREEN MIXTURE OF GRASS SEED WILL BE HAND BROAD-CAST IN ALL DISTURBED AREAS. THIS SEED MIX SHOULD BE INCORPORATED INTO THE TREATMENT AREAS DURING CONSTRUCTION AS DIRECTED BY THE SUPERVISING ENGINEER (SEE SHEETS 6, 7, AND 8). BROAD-CAST SEED SHOULD BE RAKED IN AND BE APPLIED AT A COMBINE RATE OF 30 POUNDS PER ACRE AND NO LESS THAN 120 LIVE SEED PER SQUARE FOOT OR AS DIRECTED BY THE PROJECT ENGINEER.

NOTE: ONLY PLANTING OF CUTTINGS AND SEED MIXTURE APPLY TO THIS CONTRACT.

A. DISTURBED SITE GROUND COVER.

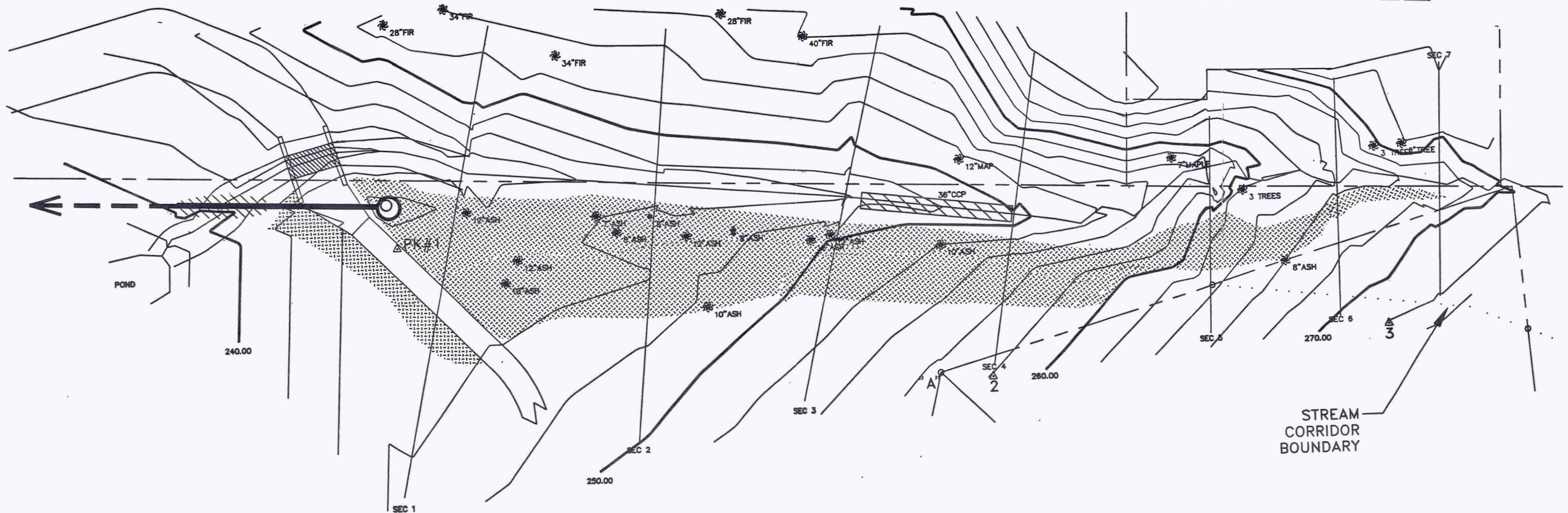
A SEED MIXTURE OF GRASSES AND ALDER SEED MAY BE USED FOR THE INITIAL GROUND COVER COMMUNITY. THIS SEED MIX WILL BE BROAD-CAST TO ALL TREATMENT TYPES AND RAKED INTO DISTURBED AREAS. PLANT SPECIES IN THIS SEED MIXTURE INCLUDE:

Alnus rubra	Red Alder
Beckmannia syzigachne	Slough grass
Deschampsia cespitosa	Tufted hair grass
Elymus glaucus	Blue wild rye
Festuca rubra	Red fescue

B. RIPARIAN WOODLAND SCRUB.

THIS PLANT COMMUNITY CAN BE APPLIED OVER THE ENTIRE DISTURBED AREAS OF THE PROJECT SITE, AS DIRECTED BY THE PROJECT ENGINEER, (SEE NOTES). ROOTED STOCK CAN BE PLANTED THROUGH THE COIR FABRIC OF TREATMENTS 1 AND 2 AND AS JOINT PLANTING IN TREATMENT 3 (SEE SHEETS 6, 7, AND 8). CONTAINERIZED PLANTS AND CUTTINGS IN THIS COMMUNITY INCLUDE:

Alnus rubra	Red Alder	Physocarpus capitatus	Pacific Nine Bark
Amelanchier alnifolia	Serviceberry	Acer circinatum	Vine Maple
Cornus stolonifera	Red-osier Dogwood - cuttings	Symphoricarpos albus	Snowberry
Rosa nutkana	Nootka Rose	Rhamnus purshiana	Cascara
Sambucus cerulea	Blue Elderberry	Salix spp.	Willow - cuttings on site
Symphoricarpos albus	Snowberry		
Rubus parviflorus	Thimble Berry		
Gaultheria shallon	Salal		
Berberis (Mahonia) aquifolium	Tall Oregon Grape		
Ledum glandulosum	Labrador Tea		
Ribes sanguineum	Red Flowering currant		
Athyrium filix-femina	Lady fern		
Polystichum monitum	Sword fern		
Vaccinium parvifolium	Red Huckleberry		
Thuja plicata	Western Red Cedar		
Sambucus racemosa	Red Elderberry		



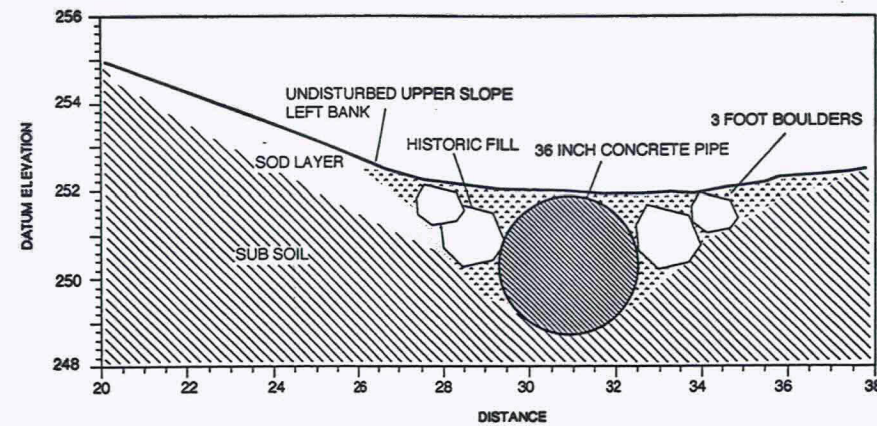
PLANTING DENSITIES OF 1, 2, AND 4 FEET
PLANTING DENSITIES OF 1, 4, AND 6 FEET

★ NOTE: THIS DRAWING IS REDUCED 50%.

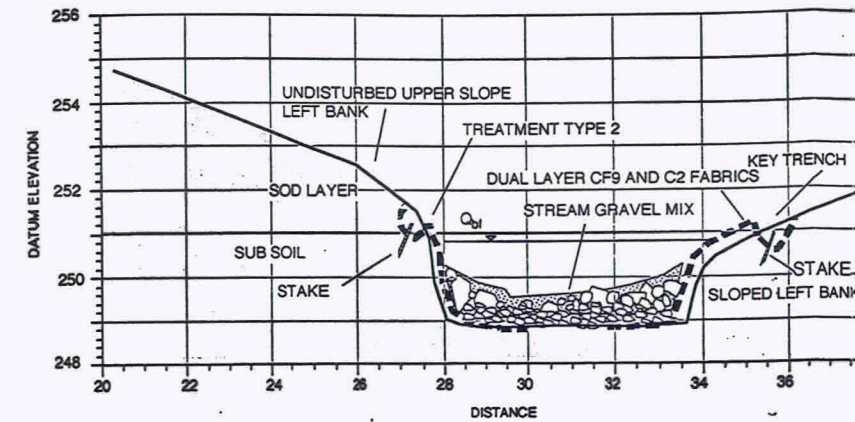


4/28/93	1	TITLE BLOCK	MAK	DESIGNED BY: LM	APPROVED BY: <i>Jessie</i>	CITY OF LAKE OSWEGO, OREGON	CITY OF LAKE OSWEGO DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION JERRY R. BAKER, P.E. CITY ENGINEER	RE-VEGETATION PLAN	INTER-FLUVE, INC. FISHERIES HYDROLOGY RESOURCE ENHANCEMENT 1020 WASCOS STREET, SUITE 1 HOOD RIVER, OREGON 97031 (503) 386-9003	SHEET 8 OF 9
				DRAWN BY: LM	DATE: 7-20-93					
DATE:	NO.	REVISIONS	BY:	CHECKED BY: GPK/MS						

CULVERT SECTION, EXISTING CONDITIONS

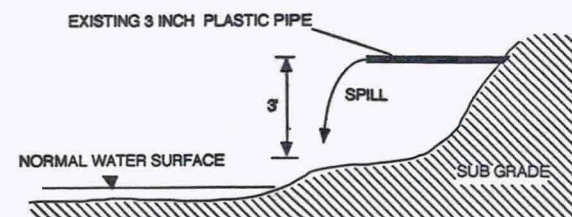


CULVERT SECTION RECLAIMED CONDITIONS

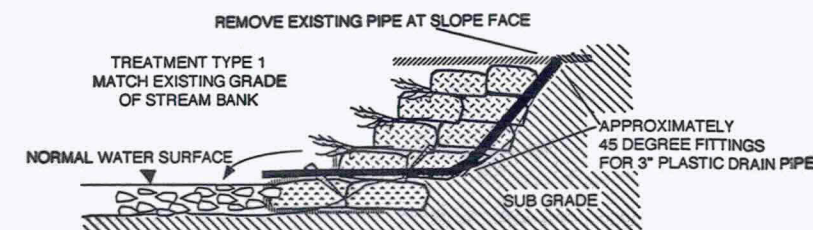


NOTE. CHANNEL TREATMENT TYPE 2 TO BE USED TO PROVIDE BANK EROSION PROTECTION. 36" PIPE TO BE REMOVED AND HAULED OFF-SITE. CHANNEL RE-CONFIGURATION SHOULD BE A SMOOTH TRANSITION BETWEEN UP AND DOWN STREAM SECTIONS AS DIRECTED BY THE SUPERVISING ENGINEER.

DRAIN LINE SECTION, EXISTING CONDITIONS



DRAIN LINE SECTION RECLAIMED CONDITIONS



NOTE. 3 INCH DRAIN LINE TO BE RE-ROUTED TO FIT EXISTING GROUND SURFACE. TREATMENT TYPE 1 TO BE USED AS BANK EROSION PROTECTION. NEW PIPE TO BE PLACED PRIOR TO CONSTRUCTION OF TREATMENT TYPE 1.

★ NOTE: THIS DRAWING IS REDUCED 50%.



4/28/93	1	TITLE BLOCK	MAK	DESIGNED BY: LM	APPROVED BY: <i>J.R. Baker</i>	CITY OF LAKE OSWEGO, OREGON	CITY OF LAKE OSWEGO DEPARTMENT OF PUBLIC WORKS ENGINEERING DIVISION JERRY R. BAKER, P.E. CITY ENGINEER	DETAILS	INTER-FLUVE, INC. FISHERIES HYDROLOGY RESOURCE ENHANCEMENT 1020 WASCO STREET, SUITE 1 HOOD RIVER, OREGON 97031 (503) 386-9003	SHEET 9 OF 9
				DRAWN BY: LM	DATE: 7-20-93					
DATE:	NO.	REVISIONS	BY:	CHECKED BY: GPK/MS	FILE: 1993-4 "BALL"					