Public Works Department
2525 13th Street, Boulder, CO 80306
Phone: 303-441-3900
Fax: 303-441-4594

Guidelines for Preparing an Operation and Maintenance Plan for Post-Construction Controls

Overview

Boulder County requires that an Operation and Maintenance (O&M) Site Plan (Plan) be submitted for all local projects including a permanent post construction control measure. The Plan shall consist of a single sheet, 22"x34" that includes all the necessary information for long-term maintenance of the site, and shall generally conform to the guidelines that follow. Graphical elements included on the sheet are to reflect as-built Record Drawing information associated with the completed project.

Contents of Maintenance Site Plan

The following outline shall be used to guide the development of the Maintenance Site Plan. Some items may not apply to all projects, and any unique features may warrant inclusion of additional information if pertinent to the anticipated maintenance of the site.

Section 1 - Project Information- can be listed in drawing title

1.0 General Information

A. Property Owner - Including contact number

B. Design Engineer- Including contact number

C. Project Completion Date

D. County Approval Block

1.1 Hydraulic Information

A. Flow Rates- All applicable flow rates should be listed, e.g. base flow, design flow, any storm flows that were evaluated, etc. Detention facilities should include inflow and outflow rates.

B. Facility Description- Include additional design information for the facility, including volumes, water surface elevations, and surface types for forebays and micropools.

C. Outlet Type

D. WQCV Drain Time

1.2 Miscellaneous Information

A. Project Survey Information- Include survey control information and at least one on-site "Maintenance Control Point" established during construction for use during maintenance activities.

B. Seed Mix

C. Mow Area- Include area in acres and description of mow limits.

D. Long Term Monitoring Requirements- If applicable, list monitoring requirements such as 404 Permit Reports or any other required monitoring.

Section 2 - Project Notes

2.0 General Facility Description- Include function, flow source, flow pattern through project, any special features, and any additional information that may be helpful in understanding the basic workings of the facility.

2.1 Maintenance Notes

A. Maintenance Frequency

B. Equipment and Special Tools Required

C. Power Source *(if applicable)*

2.2 Maintenance Procedure

A. Dewatering

B. Sediment Removal

C. Debris Removal

D. Site Inspection- List all general features and equipment that should be inspected to ascertain additional maintenance needs. See attached examples.

E. Materials Testing- List any contaminant testing requirements for sediment removed from the pond.

F. Post-Maintenance Considerations- Any additional maintenance-related tasks should be listed here. These may include restoring flow patterns, replacing or removing stoplogs, or additional cleanup requirements.

Section 3 – Site Plan

3.0 Vicinity Map

3.1 Plan View- All major features of the facility should be labeled, including the following:

- Trickle Channel
- Forebay, longest reach distance required from access road
- Micropool, longest reach distance required from access road
- Entrance Structure
- Outlet Structure

In addition, special maintenance-related information should be identified:

- Maintenance Control Pont location and elevation

- Maintenance entrance / access road / gates / turnarounds. List applicable information such as road material, width, maximum grade, etc.
- Power source
- Weight-restricted areas
- Wetland or natural areas to avoid

3.2 Hydraulic Profile

- Major features
- Permanent pool elevations
- Other applicable water surface elevations
- Flow direction
- Shading identifying forebay and micropool sediment removal zones

Section 4 – Details (relevant to the BMP on site- Rain Garden/PLD, EDB, Sand Filter Basin, etc)

4.0 Trickle Channel Section

4.1 Maintenance Road/Access

4.2 Inlet Structure(s)

4.3 Forebay Release Structure

4.4 Outlet Structure

Submittal Requirements

The Engineer shall submit one 22"x34" Maintenance Site Plan with the project's post-construction submittal package that is required for applicable development sites that disturb an acre or greater within the County's urbanized area. Any comments shall be addressed by the Engineer until approval has been granted by the County. Once approval has been granted, the final submittal shall include:

- One Electronic PDF of an 22"x34" Maintenance Site Plan (P.E., stamped)
- CAD Files

(EXAMPLE PLAN)

COTTONWOOD CR- : K - PEORIA STREET WATER QUALITY POND
MAINTENANCE SITE PLAN

MARCH, 2005

(PROJECT COMPLETED SPRING 2002)

PROJECT INFORMATIO

1.0 GENERAL INFORMATION

B. PROPERTY OWNER: CHERRY CREEK BASIN WATER QUALITY AUTHORITY
303-779-4525

C. DESIGN ENGINEER: MULLER ENGINEERING COMPANY
303-988-4939

1.1 HYDRAULIC INFORMATION

A. ONLINE OR OFFLINE FACILITY? ONLINE

B. FLOW RATES

	INFLOW	OUTFLOW
NORMAL LOW-FLOW	1-3 CFS	1-3 CFS
FULL WQCV		15 CFS
100-YEAR	4400 CFS	4400 CFS

C. POND DESCRIPTION

	WSEL	VOLUME	DEPTH	INVERT	SURFACE TYPE
MICROPOOL	5611.06	0.10 AF (160 CY)	2.06 FT	5609.0	EARTH
SEDIMENT BASIN	5611.00	0.57 AF (920 CY)	2.0 FT	5609.0	EARTH
WQCV	5616.75	11.6 AF			
TOTAL CAPACITY	5622.00	37.3 AF (100-YR + ½ WQCV)			

E. WQCV DRAIN TIME: 40 HOURS

1.2 MISCELLANEOUS INFORMATION

A. PROJECT SURVEY:
PLANIMETRIC SURVEY AND TOPOGRAPHY WAS PREPARED BY MILLER ENGINEERING AND SURVEYING INC., DATED APRIL 1997, JOB NO. 3294. SURVEY FOR CHERRY CREEK VISTA 17 AND DESIGN OF PEORIA STREET WAS PREPARED BY CARROL AND LANGE. TOPOGRAPHY BY MILLER WAS RAISED 0.50' TO MATCH DATUM FOR SURVEY BY CARROLL AND LANGE FOR CHERRY CREEK VISTA 17 (BASED ON USGS, 1992). HORIZONTAL CONTROL SHOWN IS BASED ON MILLER SURVEY.

SURVEY CONTROL POINT: WEST QUARTER CORNER OF SECTION 24, TOWNSHIP 5 SOUTH, RANGE 67 WEST (ALUMINUM CAP STAMPED LS 10717)

MAINTENANCE CONTROL POINT: SOUTH END OF SPILLWAY CRESTWALL AT FLOODWALL (SEE SITE PLAN FOR LOCATION), MARKED BY "X" CHISELED INTO TOP OF

B. SEED MIXES:

UPLAND SEED COMMON NAME	VARIETY	% OF MIX BY WEIGHT	WETLAND SEED COMMON NAME	VARIETY	% OF MIX BY WEIGHT
Wooly sedge	Native	1	Wooly sedge	Native	1
Nebraska sedge	Native	0.01	Nebraska sedge	Native	0.01
Blue grama	Lovington	5	Blue grama	Lovington	5
Buffalograss	Native	5.95	Buffalograss	Native	5.95
Inland saltgrass	Native	3	Inland saltgrass	Native	3
Baltic rush	Native	0.04	Baltic rush	Native	0.04
Prairie cordgrass	Native	15	Prairie cordgrass	Native	15
Sand dropseed	Native	5	Sand dropseed	Native	5
Switchgrass	Blackwell	28	Switchgrass	Blackwell	28
Western wheatgrass	Arriba	37	Western wheatgrass	Arriba	37

C. MOW AREA: 1.5 AC
THE MOW AREA IS GENERALLY BOUNDED BY SIDEWALKS ON THE EAST AND SOUTH, THE ACCESS ROAD ON THE NORTH, AND THE DENSE COTTONWOOD CREEK VEGETATION ON THE WEST. MOW LIMITS SHOULD BE WITHIN APPROXIMATELY 1 VERTICAL FOOT OF THE NORMAL WATER SURFACE ELEVATION. GRASSES SHOULD BE MAINTAINED AT A HEIGHT OF 4 TO 6 INCHES.

PROJECT NOTES

2.0 GENERAL FACILITY DESCRIPTION

THIS FACILITY IS AN EXTENDED DETENTION BASIN WITH WQCV INTENDED TO REDUCE SEDIMENT LOADS, THEREBY IMPROVING WATER QUALITY IN COTTONWOOD CREEK AND THE RECEIVING WATERS OF CHERRY CREEK RESERVOIR. THE POND HAS TWO INFLOW SOURCES – COTTONWOOD CREEK (ENTERING FROM THE NORTHWEST) AND PEORIA TRIBUTARY B (ENTERING FROM THE SOUTHEAST). THE POND RELEASES INTO COTTONWOOD CREEK.

UNDER NORMAL OPERATING CONDITIONS, COTTONWOOD CREEK FLOWS ENTER THE POND THROUGH AN INLET STRUCTURE. THIS STRUCTURE CAN ALSO BE USED TO DIRECT CREEK FLOWS TO THE OUTLET STRUCTURE, BYPASSING THE POND. FLOWS FROM BOTH COTTONWOOD CREEK AND PEORIA TRIBUTARY B PASS THROUGH A SEDIMENT BASIN AND MEANDERING WETLAND CHANNEL BEFORE REACHING THE WATER QUALITY OUTLET STRUCTURES. DURING STORM EVENTS, THE POND EXCEEDS THE WATER QUALITY CAPTURE VOLUME AND ALL EXCESS FLOWS OVERTOP THE CREST WALL AT THE PEORIA STREET TRIPLE BOX CULVERT.

A LIFT STATION IS LOCATED NORTH OF THE SITE.

2.1 MAINTENANCE NOTES

A. MAINTENANCE FREQUENCY
ROUTINE MAINTENANCE TASKS, INCLUDING MOWING, DEBRIS REMOVAL, AND SWEEPING OF THE PEDESTRIAN CROSSING, SHOULD BE PERFORMED ON AN AS-NEEDED BASIS. MOWING FREQUENCY IS TYPICALLY 3-4 TIMES PER YEAR, AND DEBRIS REMOVAL AND SWEEPING SHOULD BE DONE PRIOR TO THE SUMMER STORM SEASON AND FOLLOWING SIGNIFICANT RAINFALL EVENTS. IN ADDITION, THE PROPERTY OWNER SHOULD PERFORM A SITE INSPECTION ON AN ANNUAL BASIS TO EVALUATE THE NEED FOR ADDITIONAL MAINTENANCE, INCLUDING SEDIMENT REMOVAL, EROSION CONTROL, REVEGETATION, AND STRUCTURAL REPAIRS. IF ADDITIONAL MAINTENANCE IS REQUIRED, THE PROPERTY OWNER MAY REQUEST ASSISTANCE FROM UDFCD.

B. EQUIPMENT AND TOOLS REQUIRED
STOPLOGS FOR INLET STRUCTURE (USED TO DIRECT WATER INTO BYPASS PIPE – CONTACT UDFCD TO OBTAIN PREFABRICATED PANEL)
KEY FOR SLIDEGATE IN OUTLET STRUCTURE (#27 MASTER KEY – CONTACT UDFCD)
TWO (2) SIX-INCH ELECTRIC PUMPS
LONG-REACH TRACK EXCAVATOR
TANDEM DUMP TRUCKS

C. ELECTRICAL SERVICE
AN ELECTRICAL PANEL IS LOCATED ALONG THE ACCESS DRIVE FOR USE DURING MAINTENANCE OPERATIONS. SERVICE IS 100 AMP, 120/240 VOLT, SINGLE-PHASE SERVICE WITH TWO 30 AMP, 240 VOLT RECEPTACLES AND TWO 20 AMP, 120 VOLT RECEPTACLES. GAS-POWERED EQUIPMENT IS NOT PERMITTED DUE TO NOISE RESTRICTIONS. THERE IS A 6" METAL CONDUIT WITH FLEXIBLE MARKERS UNDER THE ACCESS DRIVE WHICH CAN BE USED TO PROTECT ELECTRICAL CORDS DURING MAINTENANCE.

2.2 MAINTENANCE PROCEDURE

A. DEWATERING
TO DIVERT COTTONWOOD CREEK FLOWS AROUND THE POND, PLACE PLYWOOD OR 2X6 BOARDS IN STOPLOG SLOTS IN INLET STRUCTURE (OPENING IS 6' WIDE X 2'-6" HIGH) AND REMOVE EXISTING REDWOOD STOPLOGS IN FRONT OF THE BYPASS PIPE. FLOWS WILL PASS DIRECTLY THROUGH THE BYPASS PIPE TO THE OUTLET STRUCTURE.

TO SPEED INITIAL DRAINING OF POND, OPEN SLIDE GATE IN OUTLET STRUCTURE (WITH KEY) AND REMOVE ANY STOPLOGS PLACED IN THE STRUCTURE

TO COMPLETELY DRAIN THE POND, PLACE PUMPS IN THE MICROPOOL AND THE SEDIMENT BASIN. THE SEDIMENT BASIN IS GRADED TO DRAIN TOWARD THE INLET STRUCTURE. DISCHARGE HOSES MUST BE PLACED TO PREVENT EROSION – IDEALLY, IN THE BYPASS PIPE AND IN THE NORTH MANHOLE OF THE OUTLET STRUCTURE. IF THE PUMPS DO NOT HAVE FINE SCREENING AT THE INTAKES, DISCHARGE MAY BE DIRECTED TO THE WATER QUALITY DETENTION POND NORTH OF THE SITE TO REDUCE SEDIMENT IN THE DISCHARGE.

INITIAL DEWATERING MAY TAKE 24 TO 36 HOURS

GROUNDWATER AND PEORIA TRIBUTARY B INFLOWS WILL REQUIRE CONTINUOUS PUMPING.

B. SEDIMENT REMOVAL

THE RIPRAP ACCESS BENCH PROVIDES ACCESS TO THE SEDIMENT BASIN. EXCESS SEDIMENT SHOULD BE REMOVED WITH A TRACK EXCAVATOR AND PLACED IN A TANDEM DUMP TRUCK FOR REMOVAL OFFSITE. THE SURFACED AREA BETWEEN THE TWO OUTLET STRUCTURES SERVES AS A TURNAROUND FOR THE DUMP TRUCK. THE RIPRAP ACCESS BENCH MAY RUT DURING SEDIMENT REMOVAL – IF THIS OCCURS, THE RUTS SHOULD BE FLATTENED AS PART OF THE MAINTENANCE PROCEDURE.

ANY SEDIMENT BUILDUP IN THE OUTLET STRUCTURE SHOULD BE REMOVED. THIS MUST BE DONE BY HAND – MANHOLES PROVIDE ACCESS.

C. DEBRIS REMOVAL
DEBRIS BUILDUP IS EXPECTED AT THE INLET STRUCTURE, THE GRATES OF EACH OUTLET STRUCTURE, ALONG THE CREST WALL, AND IN THE

GENERAL
- RIPRAP ACCESS BENCH
- ACCESS DRIVE
- EROSION
- VEGETATION
  - NATIVE WETLAND AND UPLAND GRASSES
  - WILLOWS, SEDGES, BULRUSH, AND OTHER RIPARIAN PLANTS AROUND EDGE OF POND
  - WILD PLUMS, CURRENT SHRUBS, COTTONWOOD TREES IN MIDDLE ELEVATIONS
  - SNOWBERRY AND BARBERRY/ROSH IN UPPER AREAS

EQUIPMENT AND STRUCTURES
- INLET STRUCTURE
  - CONCRETE STRUCTURE
  - STOPLOGS
  - GRATE
  - BYPASS PIPE
  - RIPRAP
- OUTLET STRUCTURE NO. 1
  - CONCRETE STRUCTURE
  - GRATE
  - PIPE
- OUTLET STRUCTURE NO. 2
  - CONCRETE STRUCTURE
  - GRATE
  - STOPLOGS
  - ORIFICE PLATES
  - SLIDE GATE
  - PIPES
  - BOULDERS AROUND STRUCTURE

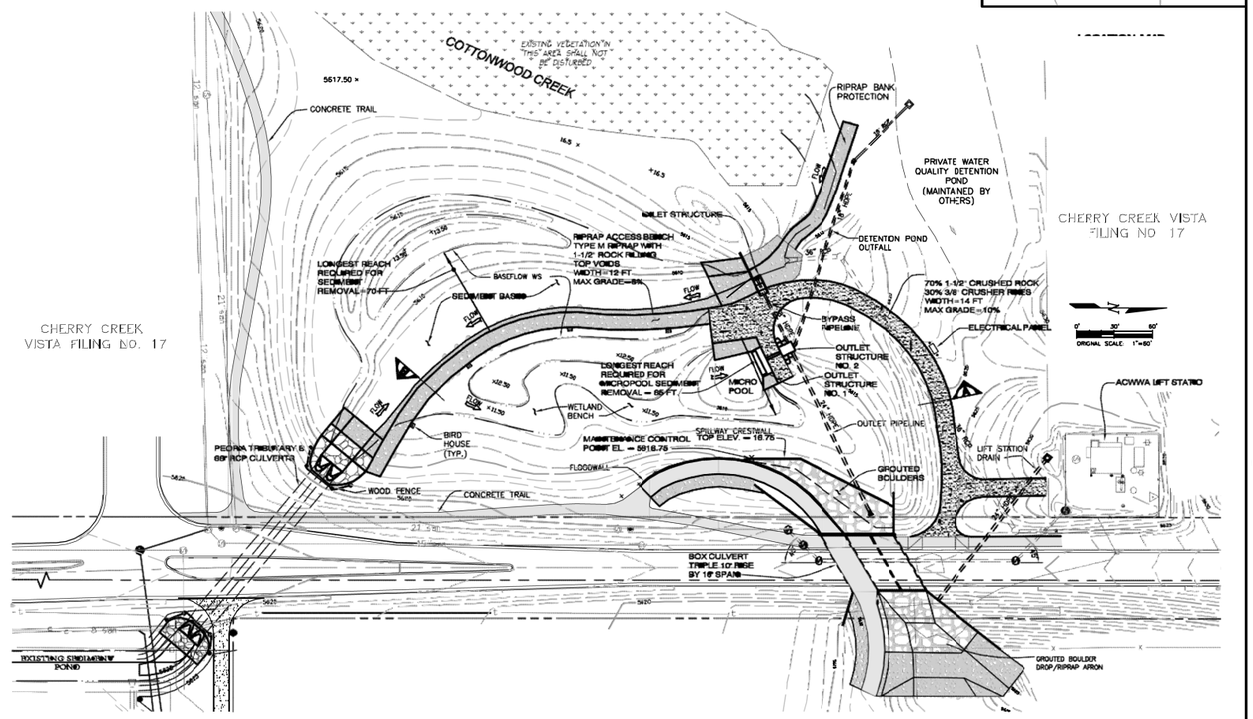
CRESTWALL
- PAINTED CONCRETE WALL (YOSEMITE BROWN, FLAT, MEDIUM TEXTURE)
- 24" HDPE PIPE OUTLET
- GROUTED BOULDERS AROUND OUTLET

ELECTRICAL SERVICE
- PANEL
- RECEPTACLES
- BOLLARDS
- METER
- FLEXIBLE MARKERS FOR CONDUIT

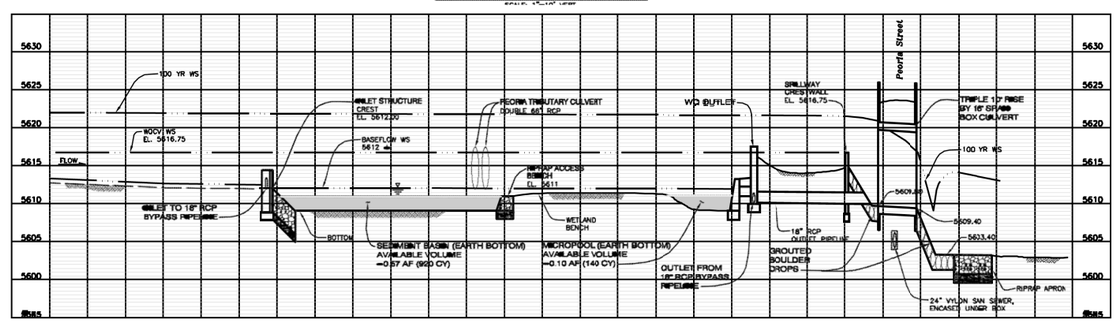
PEORIA STREET TRIBUTARY B CULVERTS
- 66" REINFORCED CONCRETE PIPES / JOINTS
- GROUTED BOULDERS
- CONCRETE DRIVEWAY

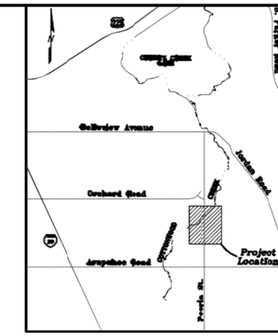
MISCELLANEOUS
- BIRDHOUSES AND POSTS

E. POST-MAINTENANCE CONSIDERATIONS
FOLLOWING COMPLETION OF MAINTENANCE ACTIVITIES, ALL STOPLOGS SHOULD BE RESTORED TO THEIR ORIGINAL POSITIONS, ALLOWING THE POND TO REFILL.
ALL DEBRIS, TRASH, AND EXCAVATED SEDIMENT MUST BE REMOVED OFFSITE. IF NECESSARY, PEORIA STREET MUST BE SWEPT CLEAN.



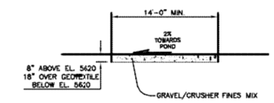
HYDRAULIC PROFILE



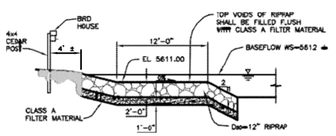


PROJECT DETAILS

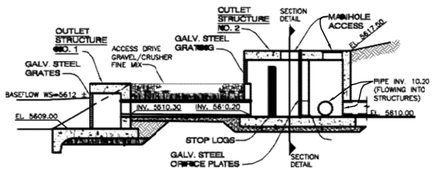
(NOT APPLICABLE)

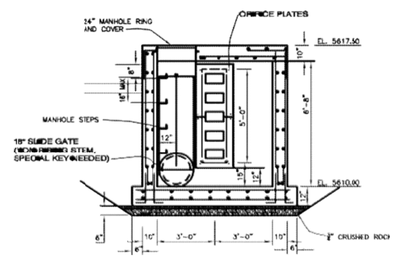


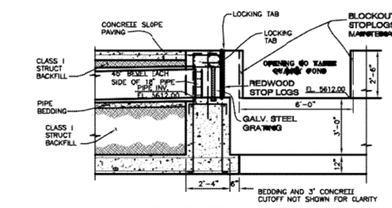
ACCESS DRIVE - SECTION (A)
SCALE: 1"=10'



RIPRAP ACCESS BENCH - SECTION (B)







INLET STRUCTURE SECTION
SCALE: 1/4"=1'-0"

MULLER ENGINEERING COMPANY, INC.
CONSULTING ENGINEERS
IRONGATE 4, SUITE 100
777 S. WADSWORTH BLVD.
LAKEWOOD, COLORADO 80226
(303) 988-4939

DRAINAGE AND FLOOD CONTROL DISTRICT
LANDMARK METROPOLITAN DISTRICT — CHERRY CREEK BASIN WATER QUALITY AUTHORITY
CITY OF GREENWOOD VILLAGE — ARAPAHOE COUNTY
ARAPAHOE COUNTY WATER AND WASTEWATER AUTHORITY

(EXAMPLE PLAN)

PANORAMA PARK REGIONAL WATER QUALITY DETENTION POND MAINTENANCE SITE PLAN

MARCH, 2005

(PROJECT COMPLETED APRIL, 2005)

PROJECT INFORMATION

1.0 GENERAL INFORMATION

A. UDFCD DRAINAGEWAY #5402, WILLOW CREEK (EAST TRIBUTARY)

B. PROPERTY OWNER: PANORAMA CORPORATE CENTER
C/O SPECIAL DISTRICT MANAGEMENT SERVICES, INC,
[illegible]

C. DESIGN ENGINEER: MULLER ENGINEERING COMPANY
303-988-4939

1.1 HYDRAULIC INFORMATION

A. ONLINE OR OFFLINE FACILITY? ONLINE

B. FLOW RATES

	INFLOW	OUTFLOW
10-YEAR	406 CFS	53 CFS
100-YEAR	758 CFS	177 CFS

C. POND DESCRIPTION

	VOLUME	WSEL	DEPTH	INVERT	SUR AC TYPE
MICROPOOL	0.26 AF (420 CY)	5739.5	3.5 FT.	5736.0	EAR"-
FOREBAY	0.28 AF (450 CY)	5742.0	1.5 FT.	5740.5	CONCRETE
WQCV	4.8 AF	5745.0			
10-YEAR	12.2 AF	5749.5			
TOTAL CAPACITY	22.0 AF	5754.0	(100-YR WS)		

D. OUTLET TYPES
10-YR - DROP BOX OUTLET STRUCTURE
[illegible]

E. WQCV DRAIN TIME: 40 HOURS

1.2 MISCELLANEOUS INFORMATION

A. PROJECT SURVEY:

SURVEY BENCHMARK: NE CORNER NW 1/4 SECTION 34 T5S R67W 3" BRASS CAP "PUBLIC SERVICE OF COLORADO PLS 19607"

MAINTENANCE CONTROL POINT: TOP OF FOREBAY WALL [illegible] VIEW FOR LOCATION) MARKED BY "X" CHISELED INTO TOP OF WALL

TRICKLE CHANNEL SECTION
SCALE: 1/2" = 1'-0"

B. SEED MIX:

SEED SPECIES AND VARIETY	PERCENTAGE OF MIX BY WEIGHT
WESTERN WHEATGRASS "ARRIBA"	25%
SIDEOATS GRAMA "VAUGHN"	10%
BLUE GRAMA "LOVINGTON"	20%
NEEDLE AND THREAD	10%
STREAMBANK WHEATGRASS "SODAR"	15%
INDIAN RICEGRASS "YAMONA"	5%
BUFFALOGRASS (NATIVE)	15%
	100%

C. MOW AREA: 1.5 AC
THE MOW AREA IS GENERALLY DESCRIBED AS THE INTERIOR SIDES AND BOTTOM OF THE ENTIRE POND UP TO THE APPROXIMATE ELEVATION OF 5760. GRASSES SHOULD BE MAINTAINED AT A HEIGHT OF 4-6 INCHES

PROJECT NOTES

2.0 GENERAL FACILITY DESCRIPTION

THIS FACILITY IS A REGIONAL DETENTION POND THAT HAS BEEN IMPROVED TO PROVIDE WQCV, REDUCE THE 100-YR DISCHARGE, AND PREVENT SMALL EVENTS FROM BYPASSING THE POND. INFLOWS ARE GENERATED THROUGH SURFACE RUNOFF FROM THE BUSINESS PARK AND ENTER THE POND FROM THE NORTHEAST. THE POND RELEASES INTO AN EAST TRIBUTARY OF WILLOW CREEK.

2.1 MAINTENANCE NOTES

A. MAINTENANCE FREQUENCY
ROUTINE MAINTENANCE TASKS, INCLUDING MOWING AND DEBRIS REMOVAL, SHOULD BE PERFORMED ON AN AS-NEEDED BASIS. DEBRIS REMOVAL SHOULD BE DONE PRIOR TO THE SUMMER STORM SEASON AND FOLLOWING SIGNIFICANT RAINFALL EVENTS. IN ADDITION, THE PROPERTY OWNER SHOULD PERFORM A SITE INSPECTION ON AN ANNUAL BASIS TO EVALUATE THE NEED FOR ADDITIONAL MAINTENANCE, INCLUDING SEDIMENT REMOVAL, EROSION CONTROL, REVEGETATION, AND STRUCTURAL REPAIRS. IF ADDITIONAL MAINTENANCE IS REQUIRED, THE PROPERTY OWNER MAY REQUEST ASSISTANCE FROM UDFCD.

B. EQUIPMENT AND SPECIAL TOOLS REQUIRED
SUBMERSIBLE PUMP / GENERATOR
LONG-REACH RAKE OR BROOM (7 FT)
LONG-REACH TRACK EXCAVATOR
SKID STEER
DUMP TRUCK

2.2 MAINTENANCE PROCEDURE

A. DEWATERING
THIS POND HAS NO NATURAL BASEFLOW BUT WILL RECIEVE STORM AND IRRIGATION RUNOFF ON A FREQUENT BASIS. BASEFLOW IS NOT EXPECTED FOLLOWING ELIMINATION OF BYPASS PIPE. PERMANENT POOLS FORM IN THE MICROPOOL AND FOREBAY. THESE TWO AREAS MUST BE PUMPED TO DEWATER. IF PUMP DOES NOT HAVE FINE SCREENING AT THE INTAKE, ALTERNATELY PUMP FROM ONE POOL TO THE OTHER TO PREVENT SEDIMENT-LADEN DISCHARGE.

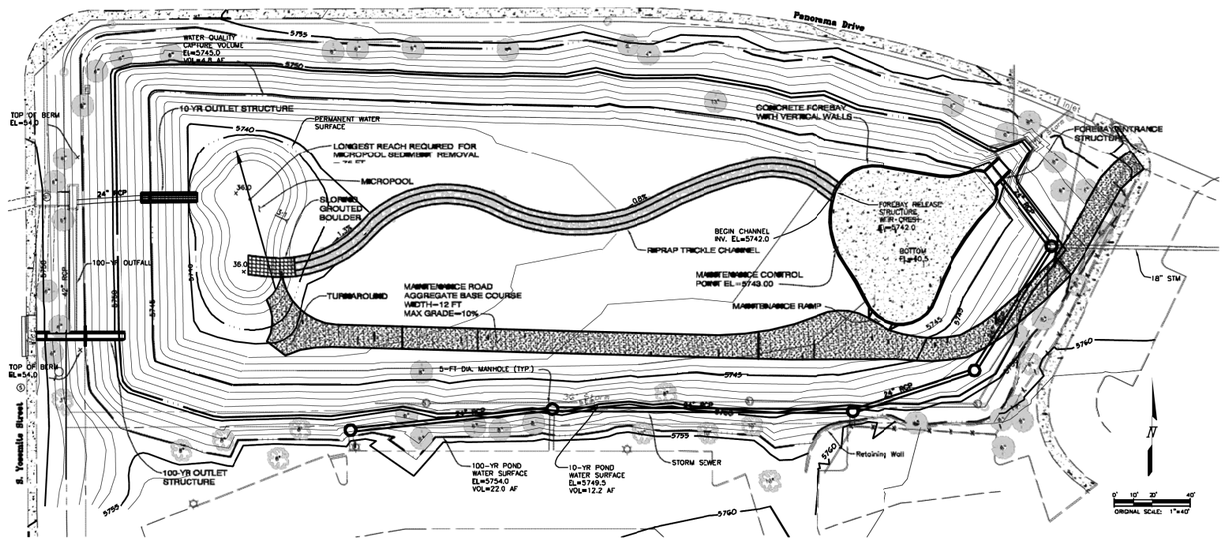
B. SEDIMENT REMOVAL
SEDIMENT MUST BE REMOVED FROM THE FOREBAY AND MICROPOOL WHEN THEY HAVE REACHED 3/4 CAPACITY. THE CONCRETE-LINED FOREBAY IS ACCESSED FROM A MAINTENANCE RAMP OFF THE MAINTENANCE ROAD, AND CAN BE CLEANED WITH A SKID-STEER OR LOADER. HAND REMOVAL MAY BE NECESSARY ADJACENT TO THE VERTICAL WALLS. THE MICROPOOL CAN BE CLEANED WITH A LONG-REACH EXCAVATOR OR BACKHOE FROM THE MAINTENANCE ROAD.

C. DEBRIS REMOVAL
DEBRIS BUILDUP IS EXPECTED AT THE 10-YR OUTLET STRUCTURE TRASH RACK AND WATER QUALITY SCREEN, AT THE 100-YR OUTLET STRUCTURE TRASH RACK, AND AT THE ENERGY DISSIPATOR UPSTREAM OF THE FOREBAY ENTRANCE STRUCTURE. ALL DEBRIS SHOULD BE COLLECTED AND DISPOSED OFFSITE. ACCESS TO THE WATER QUALITY SCREEN IN THE 10-YR STRUCTURE IS PROVIDED BY A TRAP DOOR ABOVE THE TRASH RACK. A LONG-REACH BROOM OR RAKE WILL BE NECESSARY TO CLEAN THE SCREEN.

D. SITE INSPECTION
THE FOLLOWING ITEMS SHOULD BE INSPECTED A MINIMUM OF ONCE PER YEAR AND MAINTAINED AS NEEDED:
GENERAL:
RIPRAP TRICKLE CHANNEL
MAINTENANCE ROAD
EROSION
VEGETATION

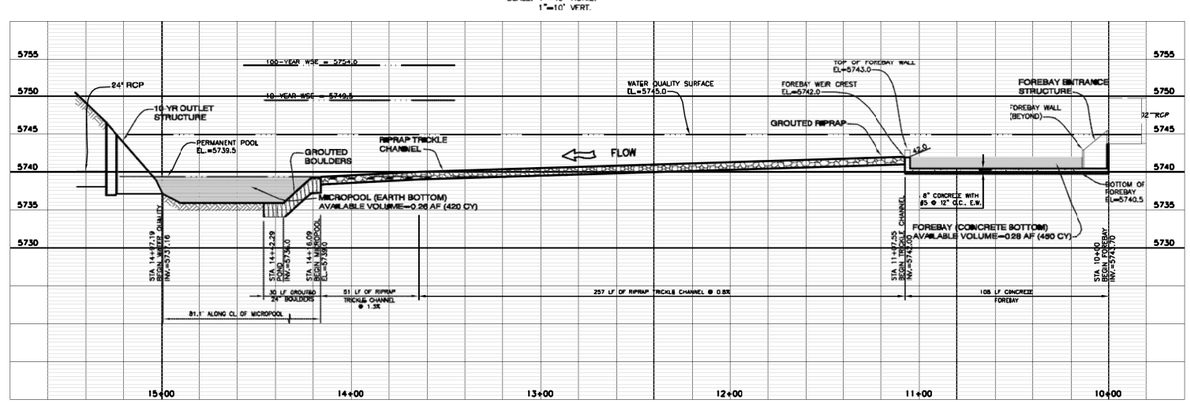
EQUIPMENT AND STRUCTURES
FOREBAY ENTRANCE STRUCTURE AND CONCRETE-LINED FOREBAY
CONCRETE ENTRANCE STRUCTURE
ENERGY DISSIPATOR
24" REINFORCED CONCRETE PIPE
CONCRETE SLAB AND VERTICAL WALLS
10-YR OUTLET STRUCTURE
CONCRETE STRUCTURE
OVERFLOW GRATE
TRASH RACK
WATER QUALITY SCREEN
FLOW CONTROL PLATE
24" REINFORCED CONCRETE PIPE
100-YR OUTLET STRUCTURE
CONCRETE STRUCTURE
INTERCEPTOR GRATE
42" REINFORCED CONCRETE PIPE
HANDRAIL
SLOPING GROUTED BOULDERS AT MICROPOOL

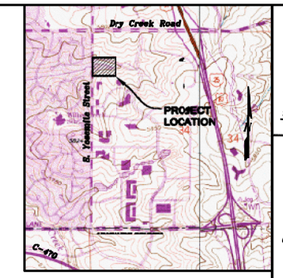
E. POST-MAINTENANCE CONSIDERATIONS
FOLLOWING COMPLETION OF MAINTENANCE ACTIVITIES, ALL DEBRIS, TRASH, AND EXCAVATED SEDIMENT MUST BE REMOVED OFFSITE. IF NECESSARY, PANORAMA DRIVE MUST BE SWEPT CLEAN



HYDRAULIC PROFILE

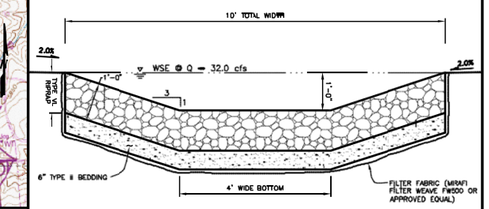
SCALE: 1"=40' HORIZ.
1"=10' VERT.

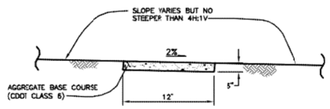




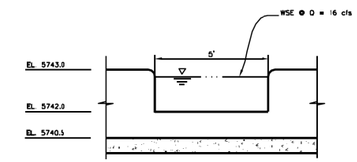
LOCATION MAP
SCALE: 1" = 2000'

PROJECT DETAILS

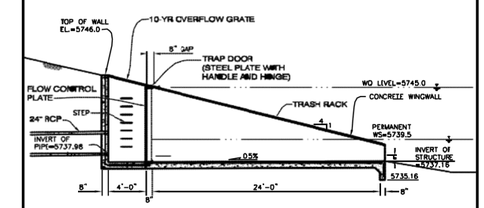




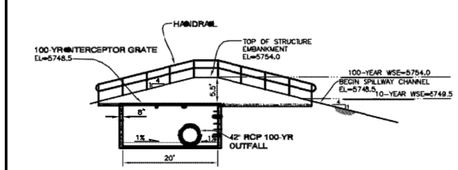
MAINTENANCE ROAD



FOREBAY RELEASE STRUCTURE



10-YR OUTLET STRUCTURE



100-YR OUTLET STRUCTURE

MULLER ENGINEERING COMPANY, INC.
CONSULTING ENGINEERS
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LAKEWOOD, CO. 80228

ARAPAHOE COUNTY

City Of Centennial
Public Works

SHEET 1 OF 1

NAME: P:\01-010\21 O&M Manual\01010-21-PANORAMA-exp.dwg DATE: MAR 28, 2005 TIME: 5:12 PM