



# Memo

**To:** File

**From:** Mike Dellies *MD*

**Date:** July 17, 2008

**DA #:** 2006029-15

**Re:** Revisions to iSWM Water Quality Calculations

The latest revisions to the iSWM water quality calculations include enlargement of the storm water quality pond and the pocket wetland. These changes were made in conjunction with the elimination of modifications to the NRCS pond spillway and the downsizing of the proposed culvert crossing Bonnie Brae. In addition, the overall treatment train now includes the treatments used in the parking lot in front of the junior anchors.

A comparison of the resulting pollutant removal rates is provided below for the previous iSWM (made on 2-13-08) submittal and the latest revisions (as of 7-17-08):

Pollutant Removal	Feb. 14, 2008 Submittal	July 17, 2008 Modifications	Change
Total Suspended Solids	95.6%	96.4%	+0.8%
Total Phosphorus	63.6%	64.7%	+1.1%
Total Nitrogen	47.9%	49.3%	+1.4%
Metals	70.0%	71.5%	+1.5%

2006029\_Memo\_2008-0717\_iSWM Calc Revisions.doc

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# **Final iSWM Study Report**

## **Rayzor Ranch Addition**

### **A Proposed Retail Development**

#### **General**

This iSWM study has been performed in compliance with the Water Quality, Section F, of the Overlay Ordinance for the Rayzor Ranch development in an effort to minimize pollution carried by storm water to the southern Northlake pond (SCS #16 reservoir). The project site currently has just 13 developed acres (the old K-Mart site and a self-storage site) which will be demolished for re-development with the project.

#### **Contributing Drainage Area**

The SCS #16 reservoir has a total drainage area a little over 1,000 acres in size. The drainage area contributing to SCS #16 from the west through the Bonnie Brae culvert is about 302 acres. Of these 302 acres, the Rayzor Ranch development contributing drainage area is approximately 214 acres, of which 138 acres lie north of Highway 380. The Rayzor Ranch area south of Highway 380, approximately 76 acres, will drain into the drainage system at Highway 380 and then through the Rayzor Ranch site to the Bonnie Brae culvert. The remaining 88 acres that contribute to the Bonnie Brae culvert is from an upstream residential and commercial development along Highway 380 and the Highway 380 right-of-way itself. Although the Overlay Ordinance only requires treatment of runoff from the Rayzor Ranch development itself, the treatment calculations of this study for various iSWM structures for the project include runoff from the 88 off-site acres that are not part of the development as well.

Approximately 6.5 acres of the existing low-lying area just upstream of Bonnie Brae are designated as FEMA Zone A floodplain. All but 2.5 acres of this Zone A designated area are proposed to be filled in with the project. An approximate 11.4-acre strip of land just upstream of the 2.5 acre area will be used to create a water quality pond as the most significant element for reducing pollutants from this development, as well as the 2.5 acre area being conformed into a shallow wetland to be used as the last iSWM treatment structure. A 404 permit has been obtained by Kimley-Horn & Associates through the

Corps of Engineers. A Conditional Letter of Map Revision (CLOMR) was obtained from the Federal Emergency Management Agency (FEMA) in the fall of 2007 to facilitate the recovery of the floodplain.

The developable land of the project provides for the area north of Highway 380 to be about 39 acres of high density residential, 86 acres of retail and commercial, two to three acres to be dedicated for street right-of-way, with 3 acres intended to be a gas well site. The entire 76 acres south of Highway 380 are to be a mixture of commercial and retail development.

### **Water Quality Issues**

The final design of the project's proposed storm drainage collection systems will incorporate the required aspects of the City of Denton's "Drainage Criteria Manual" to convey all 100-year peak runoff to the proposed water quality basin as shown by the preliminary design exhibit included with this report.

### **Water Quality Pond**

This "wet-extended pond" basin is intended both as an amenity as well as the major water quality structure in the "treatment-train" of the iSWM plan, wherein the first 1.5 inch of rainfall is to be retained for removals of various environmental pollutants. A water-edge perimeter will be included in the pond (15' wide) and will be planted with various aquatic plants for biological filtering of some pollutants. The side slopes of the pond will be lined with a permanent erosion control mat and grass that will perform as a filter strip, receiving some pavement surface runoff. Because of this pond's position within the watershed, it will also provide the benefit of attenuation of peak runoff rates released to SCS Reservoir #16 prior to reaching the Bonnie Brae culvert.

### **Pre-Treatment Measures**

Prior to the conveyance of the storm water runoff to the water quality pond discussed above, various storm water "treatment-train" structures have been employed, where practical, in an attempt to pre-treat the "first flush" flows. The iSWM structures being employed are filter strips, bio-retention areas and sedimentation fore-bays. The sedimentation fore-bays have been sized based on the area size and land use of the respective contributing drainage areas in accordance with iSWM Section 5.2.21.5.D.

The total water quality pond treatment volume required for the project, as calculated in conformance with iSWM Section 1.2.3.2, is 27.35 acre-feet. The actual volume provided will be 44.2 acre-feet. The volume calculations, including the upstream "treatment-train" drainage areas and pollutant removal calculations for the employed structures, are included on the iSWM Water Quality Plan exhibit provided with this study. The calculations for the "treatment-train" pollution removals have been performed in accordance with iSWM Section 5.1.6 "Using Structural Storm Water Controls in Series".

The removal of floatables from the project site will be achieved by the water quality structures in the "treatment train". Some of the pre-treatment structures are recognized as areas which will capture some floatable pollutants. A tall chain link fence enclosure will be provided at each outfall structure in the water quality basin's sedimentation fore-bays. These fence enclosures will trap the majority of the floatables not captured by the pre-treatment structures in the "treatment train" to meet the water quality ordinance goal for the removal of floatable pollutants.

#### **Inspection and Maintenance Plan**

As required by Section 2.4, "Inspections and Maintenance", of the Rayzor Ranch Overlay District Water Quality Protection Plan Requirements found in the Development Zoning Guidelines, maintenance and inspections of the storm water controls utilized throughout the site will be required.

#### **Inspections**

Inspections of the storm water controls will be performed by an association of the property owners (Association) within the Rayzor Ranch development. The frequency of inspections by the Association will be determined by the type of storm water control and the amount of precipitation that falls within the development. It is anticipated that the frequency of the inspections performed by the Association will be more frequent during the first two years of the development's life cycle until which time the vegetation at each storm water control becomes established. Inspections of the various storm water controls will be performed as each control comes online, and will continue throughout the life of the Rayzor Ranch project.

Inspections made during the initial two-year pre-establishment period will be made, at a minimum, on a monthly basis. The frequency of inspections during the pre-establishment period will be defined using the attached operations and maintenance inspection report checklists for storm water management ponds and for enhanced swales/grass channels/filter strips.

Following the initial two-year period, inspections performed during the post-establishment period will be made on a regular basis as defined on the attached maintenance schedule, and will vary for each storm water control type depending on control element used by each control to achieve the desired storm water quality.

In addition to the regular inspections listed in the maintenance schedule, all storm water controls will be inspected following each 1-1/2 inch rainfall over a 24-hour period to determine if there are any areas undercut or eroded by the storm water, determine the need for trash and debris removal at each control, and to identify areas that might need maintenance to repair undercut or eroded areas, as well as areas where rills or gullies may have formed. A rain gauge will be provided at the location shown on the attached iSWM Maintenance Plan to assist in determining when a rainfall event exceeds the stipulated 1-1/2 inches during a 24-hour period.

Immediately following the completion of each inspection, a report documenting the findings of the inspection shall be prepared and submitted to the City of Denton Environmental Department. An annual report that contains copies of all inspection reports made during the previous calendar year, including a list of recommendations for future maintenance, shall be made to the City of Denton Environmental Department.

#### Maintenance

The property owner association (Association) shall be responsible for the regular maintenance of all storm water controls utilized onsite and identified on the Final iSWM plan, throughout the life of the development. The Association shall be responsible for taking any actions necessary to address deficiencies or problems within the storm water controls found during the storm water control inspections in a timely manner.

Should the Association fail to correct any problems, the City will have the right, but not the obligation, to enter the site and remedy the outstanding deficiencies, and recover the

documented cost for the work from the Association, as authorized in the Final Plat for the development.

The anticipated maintenance schedule for the on-site storm water controls is provided at the end of this section. The schedule was developed based on the inspection and maintenance for each storm water control recommended in the North Central Texas Council of Governments' *integrated Storm Water Management (iSWM) Design Manual for Site Development* (2006). It is anticipated that the inspection and maintenance schedule will be modified as needed throughout the life of the Rayzor Ranch development based on the overall experience of the inspections and maintenance issues encountered.

In addition to the items listed in the operation and maintenance inspection report and the maintenance schedule, the following items will be included in the periodic inspection and maintenance:

- Review all landscaping related to the storm water controls a minimum of once every three months (quarterly) during the first two years to verify an 80% survival rate following the opening of the development. Any plant material identified as being dead shall be replaced once the overall plant mortality exceeds 20%. After the first two years, and upon establishment of an 80% landscaping survival rate, the condition of the landscaping will be monitored on an annual basis.
- The design volumes of the sedimentation forebays and the water quality pond shall be restored when the volumes of each are decreased by the accumulation of sediment as outlined in the Maintenance Schedule. Markers consisting of a concrete bollard will be provided in each forebay and in the pond to assist the Association in determining when the maximum allowable volume reductions have been exceeded. Any collected sediment and debris from all storm water controls, including ponds, shall be removed and transported to an off-site location in an appropriate manner.
- Regular monitoring of the water quality pond and wetland areas during the first two years following the opening of the development for potential mosquito breeding, and use of larvicides such as BTI or equivalent per manufacturer's recommendations shall be required.

# PRE-ESTABLISHMENT PERIOD MAINTENANCE SCHEDULE

January 2006

Appendix E

## Operation and Maintenance Inspection Report for Storm Water Management Ponds

(Adapted from Watershed Management Institute, Inc.)

Inspector Name \_\_\_\_\_ Project Location \_\_\_\_\_  
 Inspection Date \_\_\_\_\_  
 Storm Water Pond \_\_\_\_\_  
 Normal Pool \_\_\_\_\_  
 Normally Dry \_\_\_\_\_  
 Embankment Type: Earthen ☐ Concrete ☐ Watershed \_\_\_\_\_

Inspection Items	Checked? Yes / No	Maintenance Needed? Yes / No	Inspection Frequency	Comments
<b>Pond Components</b>				
1. Embankment and/or Emergency spillway				
a. Adequate vegetation and ground cover			A	
b. Embankment erosion			A	
c. Animal burrows			A	
d. Unauthorized plantings			A	
e. Cracking, bulging, or sliding of dam				
i. Upstream face			A	
ii. Downstream face			A	
iii. At or beyond toe Upstream			A	
Downstream			A	
iv. Emergency spillway			A	
f. Pond, toe & chimney drains clear and functioning			A	
g. Leaks on downstream face			A	
h. Abutment protection or riprap failures			A	
i. Visual settlement or horizontal misalignment of top of dam			A	
j. Emergency spillway clear of debris			A	
k. Other (specify)			A	
2. Riser and principal spillway				
Type: Reinforced concrete _____				
Corrugated pipe _____				
Masonry _____				
a. Low flow orifice obstructed			A	
b. Low flow trash rack			A	
i. Debris removal necessary			A	
ii. Corrosion control			A	



# PRE-ESTABLISHMENT PERIOD MAINTENANCE SCHEDULE

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January 2006

Inspection Items		Checked? Yes / No	Maintenance Needed? Yes / No	Inspection Frequency	Comments
c.	Weir trash rack			A	
	i. Debris removal necessary				
	ii. Corrosion control			A	
d.	Excessive sediment accumulation inside riser			A	
e.	Concrete/Masonry condition			A	
	Riser and barrels				
	i. Cracks or displacement				
	ii. Minor spalling (<1")			A	
	iii. Major spalling (rebars exposed)			A	
	iv. Joint failures			A	
	v. Water tightness			A	
f.	Metal pipe condition			A	
g.	Control valve			A	
	i. Operational/exercised				
	ii. Chained and locked			A	
h.	Pond drain valve			A	
	i. Operational/exercised			A	
	ii. Chained and locked			A	
i.	Outfall channels flowing			A	
j.	Other (specify)			A	
3.	Permanent pool (wet ponds)				
a.	Undesirable vegetative growth			M	
b.	Floating or floatable debris removal required			M	
c.	Visible pollution			M	
d.	High Water Marks			M	
e.	Shoreline problems			M	
f.	Sediment build-up			M	
g.	Other (specify)			M	
4.	Sediment forebays				
a.	Sedimentation Noted			M	
b.	Sediment removal when depth > 50% design depth			M	
5.	Dry pond areas				
a.	Vegetation adequate			M	
b.	Undesirable vegetative growth			M	
c.	Undesirable woody vegetation			M	
d.	Low flow channels clear of obstructions			M	
e.	Standing water or wet spots			M	
f.	Sediment and/or trash accumulation			M	
g.	Other (specify)			M	
6.	Condition of outfalls into pond				
a.	Riprap failures			A,S	

# PRE-ESTABLISHMENT PERIOD MAINTENANCE SCHEDULE

January 2006

Appendix E

Inspection Items	Checked? Yes / No	Maintenance Needed? Yes / No	Inspection Frequency	Comments
b. Slope erosion			A,S	
c. Storm drain pipes			A,S	
d. Endwalls/headwalls			A,S	
e. Other (specify)			A,S	
7. Other				
a. Encroachments on ponds or easement area			M	
b. Complaints from residents (describe on back)			M	
c. Aesthetics			M	
i. Grass height				
ii. Graffiti removal necessary			M	
iii. Other (specify)			M	
d. Any public hazards (specify)			M	
e. Maintenance access			M	
8. Constructed wetland areas				
a. Vegetation healthy and growing			A	
b. Evidence of invasive species			A	
c. Excessive sedimentation in wetland area			A	

Summary

Inspection Frequency Key A=Annual, M=Monthly, S=After major storm

1. Inspectors Remarks:

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2. Overall condition of Facility (Check one)

\_\_\_\_\_ Acceptable  
 \_\_\_\_\_ Unacceptable

3. Dates any maintenance must be completed by:

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Inspectors Signature

# PRE-ESTABLISHMENT PERIOD MAINTENANCE SCHEDULE

January 2006

Appendix E

## Operation and Maintenance Inspection Report for Enhanced Swales / Grass Channels / Filter Strips

(Adapted from Watershed Management Institute, Inc.)

Inspector Name \_\_\_\_\_ Project Location \_\_\_\_\_  
 Inspection Date \_\_\_\_\_  
 Watershed \_\_\_\_\_  
 As-built Plans available? \_\_\_\_\_

Inspection Items	Checked? Yes / No	Maintenance Needed? Yes / No	Inspection Frequency	Comments
1. Debris removal				
Facility and adjacent area clear of debris			M	
Inlets and outlets clear of debris			M	
Any dumping of yard wastes into facility			M	
Has litter (branches, etc.) been removed			M	
2. Vegetation				
Adjacent area stabilized			M	
Grass mowed			M	
Plant height not less than design water depth			M	
Fertilized per specifications			M	
Any evidence of erosion			M	
Is plant composition according to approved plans			M	
Any unauthorized or inappropriate plantings			M	
Any dead or diseased plants			M	
Any evidence of plant stress from inadequate watering			M	
Any evidence of deficient stakes or wires			M	
3. Oil and grease				
Any evidence of filter clogging			M	
4. Dewatering				
Facility dewaterers between storms			M	
5. Check dams/energy dissipators/sumps				
Any evidence of sedimentation buildup			A,S	
Are sumps greater than 50% full of sediment			A,S	
Any evidence of erosion at downstream toe of drop structures			A,S	

# PRE-ESTABLISHMENT PERIOD MAINTENANCE SCHEDULE

Appendix E

January 2006

Inspection Items	Checked? Yes / No	Maintenance Needed? Yes / No	Inspection Frequency	Comments
6. Sediment deposition				
Swale clean of sediments			A	
Sediments should not be > than 20% of swale design depth			A	
7. Outlets/overflow spillway				
Good condition (no need for repair)			A,S	
Any evidence of erosion			A,S	
Any evidence of blockages			A,S	
8. Integrity of facility				
Has facility been blocked or filled inappropriately			A	
9. Bioretention Planting Soil				
Any evidence of planting soil erosion			A	
10 Organic Layer				
Mulch covers entire area (NO voids) and to specified thickness			A	
Mulch is in good condition			A	

Inspection Frequency Key A=Annual, M=Monthly, S=After major storm

Necessary Action:

If any of the items above where answered Yes for "Maintenance Needed", a time frame needs to be established for repair or correction.

No action necessary. Continue routine inspections.  
Correct noted facility deficiencies by (date) \_\_\_\_\_

Facility repairs were previously indicated and completed. Site reinspection is necessary to verify corrections or improvements.

Site reinspection completed on (date) \_\_\_\_\_

Site reinspection was satisfactory.

Next routine inspection is scheduled for approximately (date): \_\_\_\_\_

Inspectors Signature \_\_\_\_\_

## **POST-ESTABLISHMENT MAINTENANCE SCHEDULE** **FOR STORM WATER CONTROLS**

Following each storm event that exceeds 1-1/2 inches over a 24-hour period:

All Storm Water Controls	Inspect and remove accumulated trash and debris.
Bioretention Areas	Replace mulch in bioretention areas when erosion is evident.
Water Quality Pond & Wetlands	Repair undercut or eroded areas in water quality pond and wetland areas.

### **Semi-monthly:**

Filter Strips	Mow grass in filter strips to maintain grass height of 2" to 4".
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### **Monthly**

Bioretention Areas	Replace mulch in bioretention areas when erosion is evident.
Wetlands	Ensure that inlets and outlets to each submerged gravel wetland cell are free from debris and are not clogged.
Water Quality Pond & Wetlands	Clean and remove debris from inlet and outlet structures of water quality pond and wetland areas. Mow side slopes of water quality pond and wetland areas. Repair undercut or eroded areas in water quality pond and wetland areas. Check storm visually for illegal dumping or other pollutants.

### **Semi-annually:**

Bioretention Areas	Inspect flow points for clogging and remove any sediment. Mow side slopes of water quality pond and wetland areas. Inspect filter strip/grass channel for erosion or gullyng. Re-seed or sod as necessary. Inspect trees and shrubs to evaluate their health and remove any dead or diseased vegetation.
Water Quality Pond	Inspect for invasive vegetation in wetland components.
Enhanced Swale * As Needed **For First Year	For Dry swales, mow grass to maintain a height of 4 to 6 inches. Remove grass clippings.* Roto-till or cultivate the surface of the sand/soil bed of dry swales if the swale does not draw down within 48 hours* Remove sediment build-up within the bottom of the swale once it has accumulated to 25% of the original design volume* Inspect grass along side slopes for erosion and formation of rills or gullies and correct** Remove trash and debris accumulated in the inflow forebay Inspect and correct erosion problems in the sand/soil bed of dry swales** Based on inspection, plant an alternative grass species if the original grass cover has not been successfully established**

## **POST-ESTABLISHMENT MAINTENANCE SCHEDULE** **FOR STORM WATER CONTROLS (Cont'd)**

Wetlands	Monitor wetland vegetation and perform replacement planting.
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### **Annually:**

Bioretention Areas	The planting soils should be tested for pH to establish acidic levels. If the pH is below 5.2, limestone should be applied. If the pH is above 7.0 to 8.0, then iron sulfate can be added to reduce the pH.
Filter Strips	Inspect pea gravel diaphragm for clogging and remove built-up sediment. Inspect vegetation for rills and gullies and correct. Seed or sod bare areas. Inspect to ensure that grass has established. If not, replace with an alternative species.
Water Quality Pond	Inspect for damage, particularly at the control structures. Check for signs of eutrophic conditions. Note signs of hydrocarbon build-up and remove appropriately. Examine to ensure that the inlet and outlet control devices are free of debris and are operational. Check the flap and gate valves. Check downstream face of embankment for seepage and settling. If needed, perform wetland plant management & harvesting.
Wetlands	Examine stability of the original depth zones and microtopographical features. Inspect for invasive vegetation and remove where possible. Inspect for damage to the embankment and inlet/outlet structures. Repair as necessary. Note signs of hydrocarbon build-up and remove appropriately. Monitor sediment accumulation in the facility. Examine to ensure that the inlet and outlet devices are free of debris and operational. Harvest wetland plants that have been "choked out" by sediment build-up.

### **Every 2-3 years:**

Bioretention areas	Replace mulch over the entire area. Replace pea gravel diaphragm if warranted (or when the voids are obviously filled with sediment and water is no longer infiltrating).
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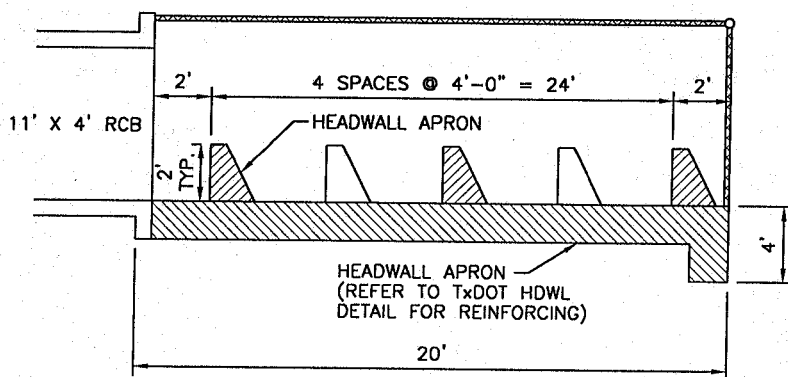
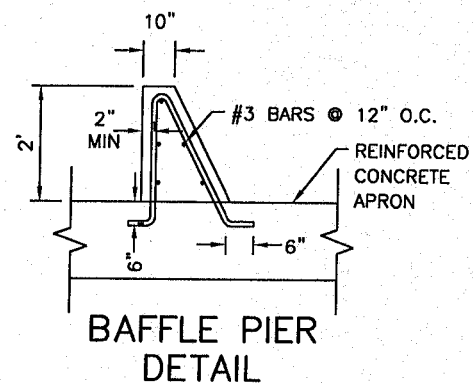
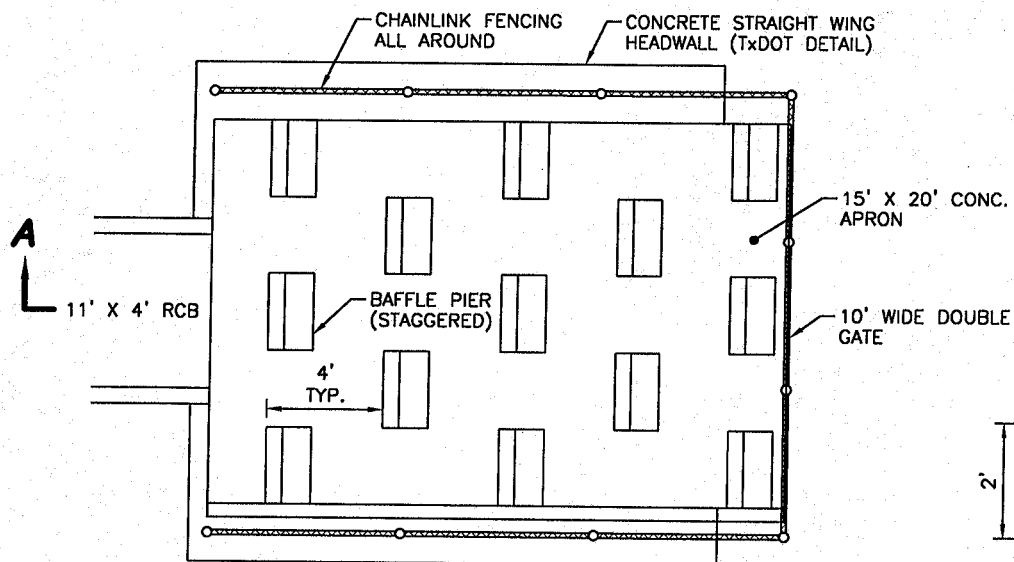
**POST-ESTABLISHMENT MAINTENANCE SCHEDULE**  
**FOR STORM WATER CONTROLS (Cont'd)**

Every 5-7 years or after 50% reduction in forebay capacity:

Water Quality Pond & Wetlands	Remove sediment from forebays.
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Every 10-20 years or after 25% reduction in pool/wetland volume:

Water Quality Pond & Wetlands	Monitor sediment accumulations and remove sediment when the pool volume has become reduced significantly (as shown on markers), the wetland plants are "choked" with sediment, or the pool or wetland becomes eutrophic.
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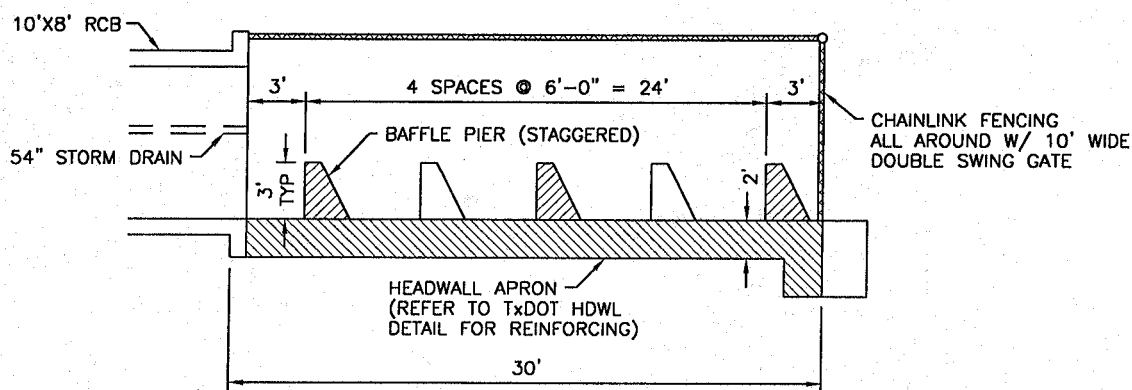
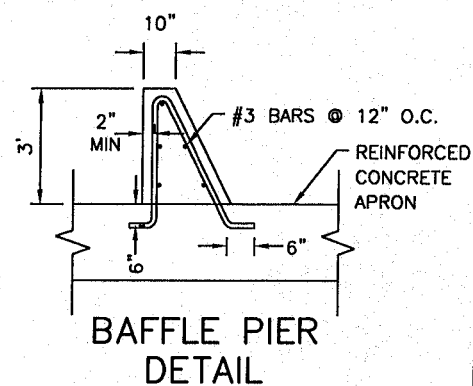
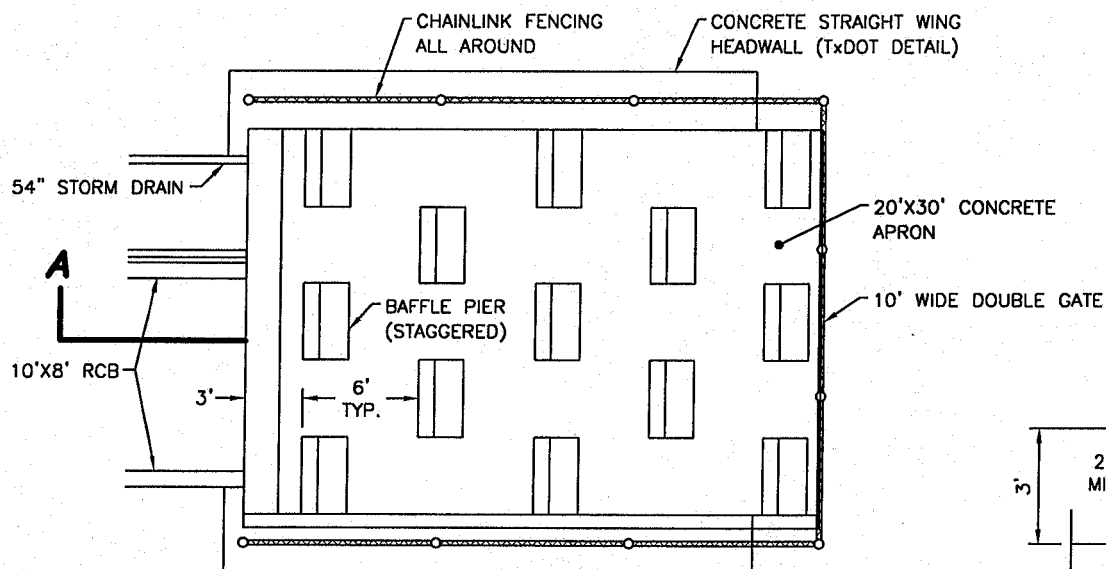


SECTION A-A

CONCRETE WINGWALL HEADWALL DETAIL  
W/ STRAIGHT WINGS AND BAFFLED APRON

NORTH ENTRY  
WEST SEDIMENTATION FOREBAY

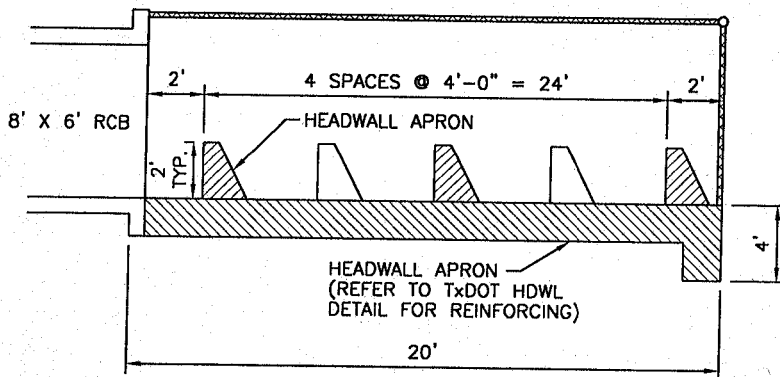
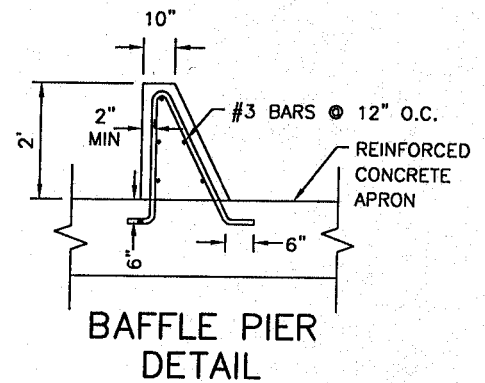
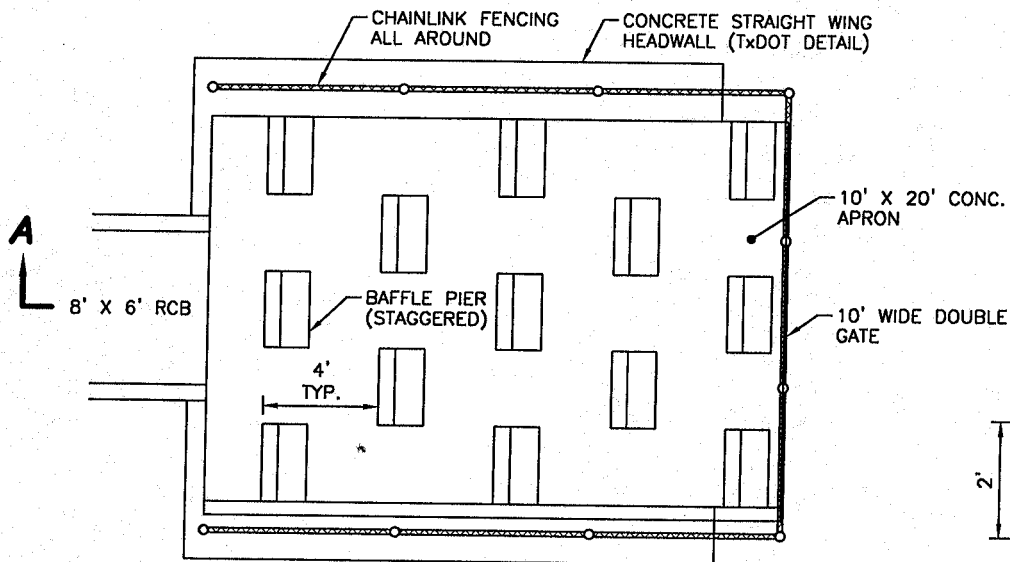




SECTION A-A

CONCRETE WINGWALL HEADWALL DETAIL  
W/ STRAIGHT WINGS AND BAFFLED APRON

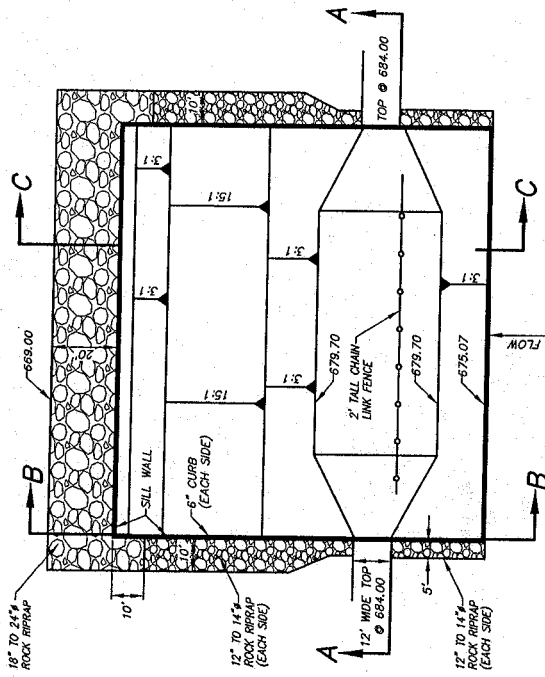
SOUTH ENTRY  
WEST SEDIMENTATION FOREBAY



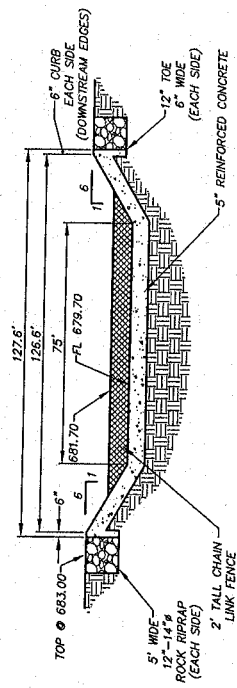
SECTION A-A

CONCRETE WINGWALL HEADWALL DETAIL  
W/ STRAIGHT WINGS AND BAFFLED APRON

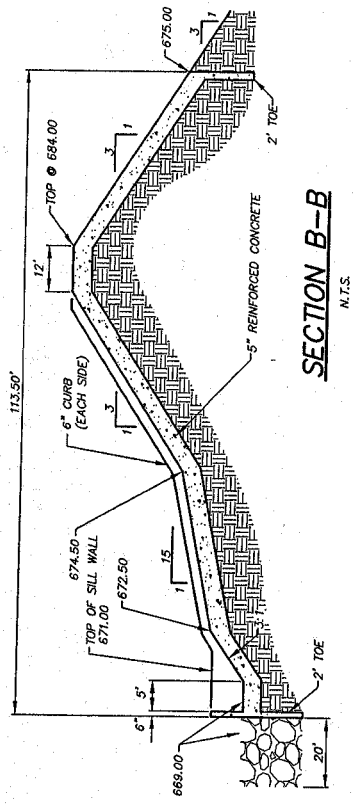
EAST SEDIMENTATION FOREBAY



PLAN  
1" = 40'

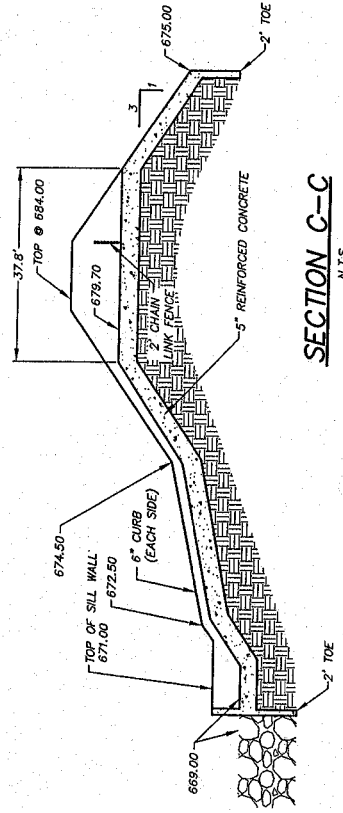


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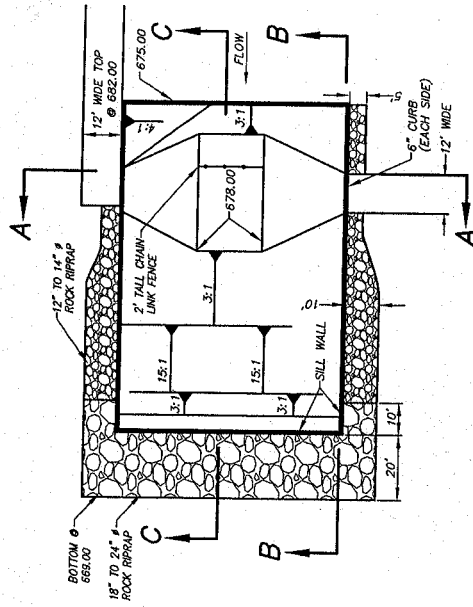
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N.T.S.

NOTE: ALL ROCK RIPRAP TO HAVE  
GEOTEXTILE FABRIC "AMERICAN  
EXPOSURE GTF-300"  
OR EQUAL

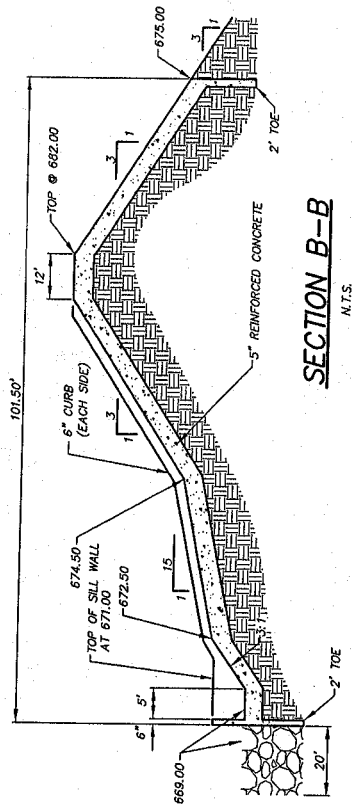


SECTION C-C  
N.T.S.

# WEST FOREBAY DAM

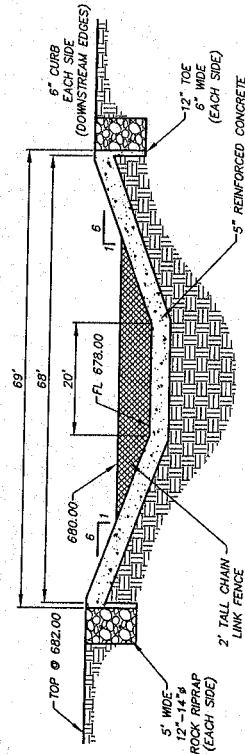


**PLAN**  
1" = 40'

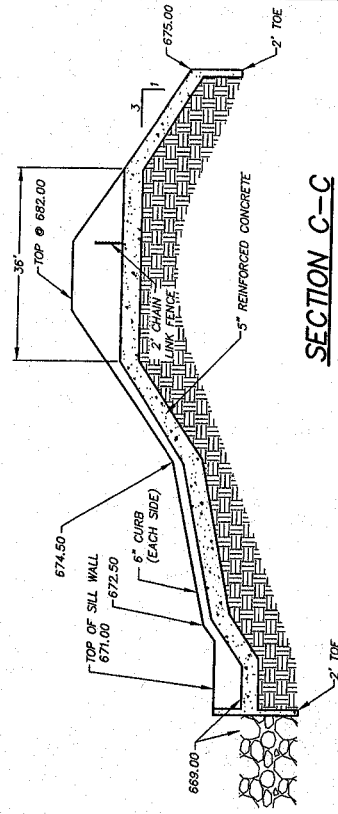


**SECTION B-B**  
N.T.S.

NOTE: ALL ROCK RIPRAP TO HAVE  
GEOTEXTILE FABRIC "AMERICAN  
SILVER CT-300"  
OR EQUAL

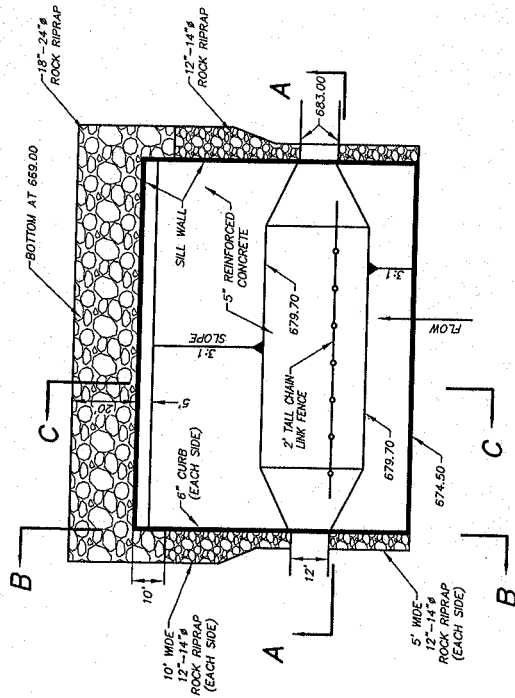


**SECTION A-A**  
N.T.S.

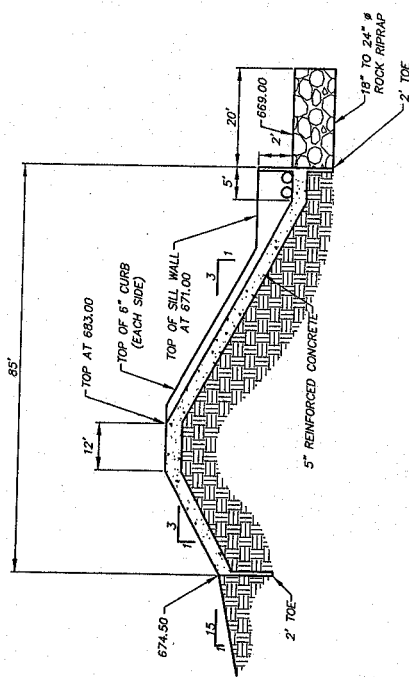


**SECTION C-C**  
N.T.S.

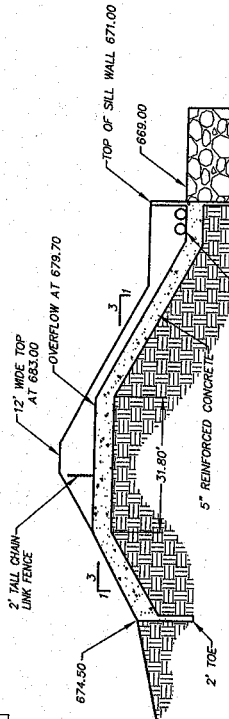
# EAST FOREBAY DAM



**PLAN**  
1" = 40'

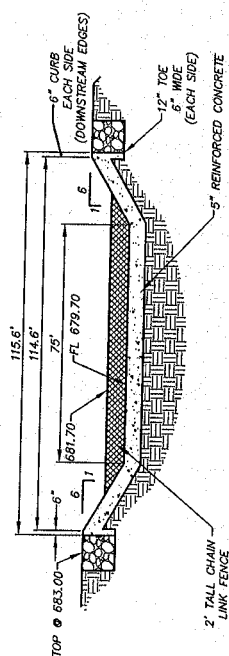


**SECTION B-B**  
N.T.S.



**SECTION C-C**  
N.T.S.

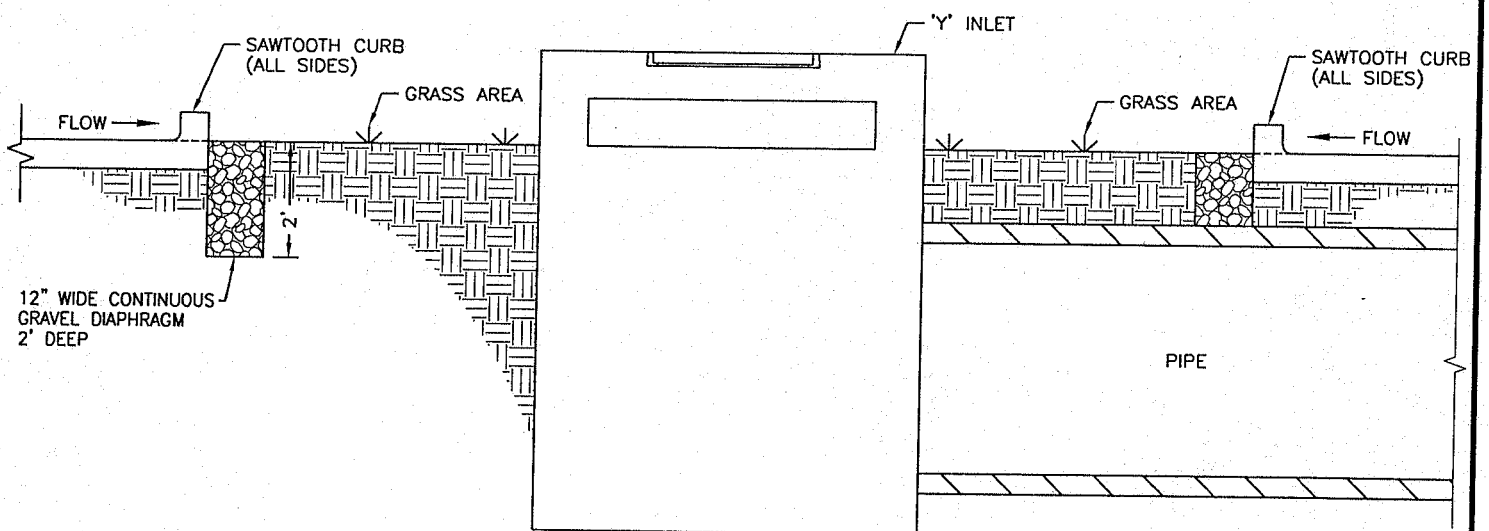
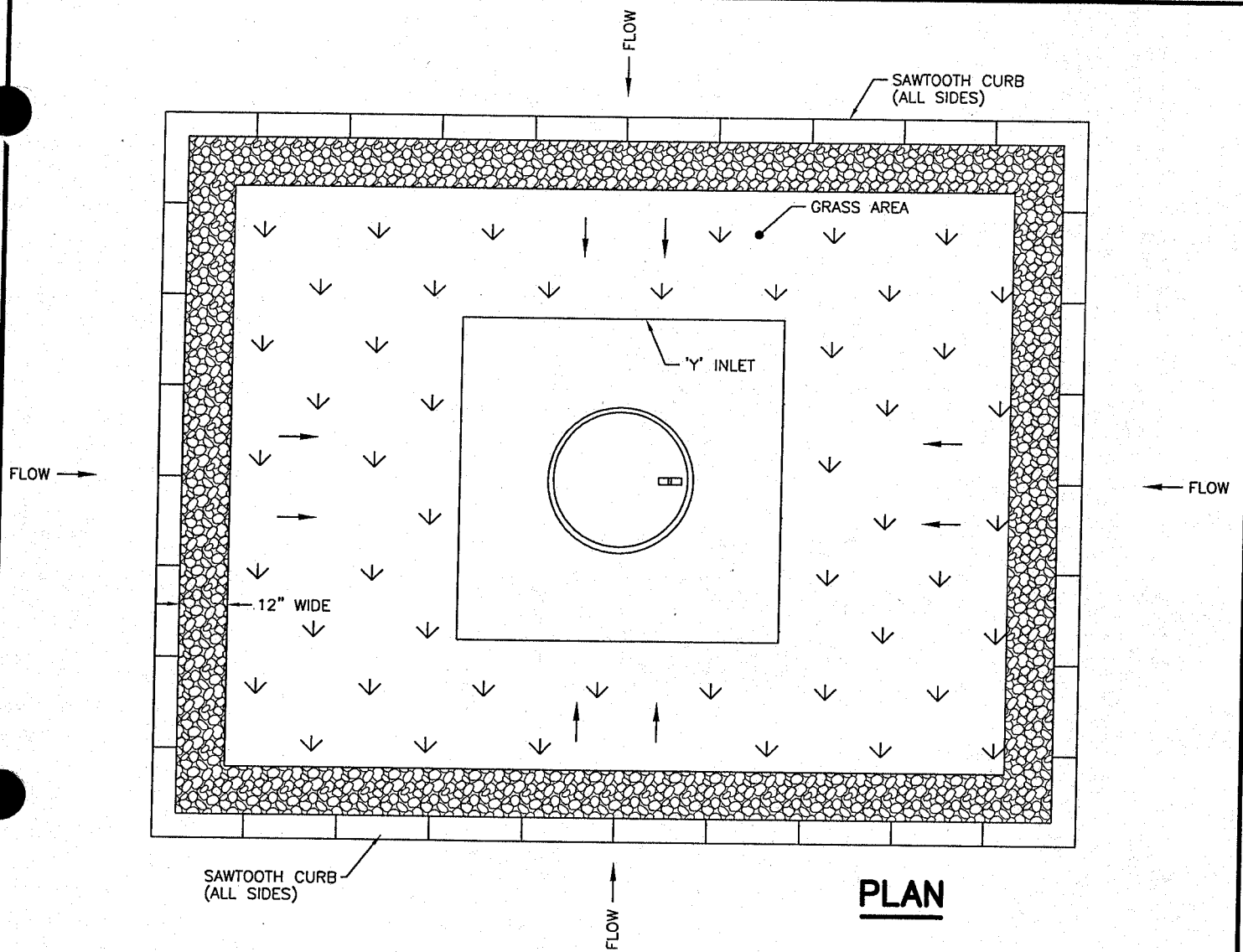
NOTE: ALL ROCK RIPRAP TO HAVE  
GEOTEXTILE FABRIC "AMERICAN  
EXCELSIOR GTF-300"  
OR EQUAL.



**SECTION A-A**  
N.T.S.

**DUNAWAY**  
1501 Mendocino Circle • Suite 100 • Fort Worth, TX 76107  
Tel: 817-336-1121 • Fax: 817-336-7437

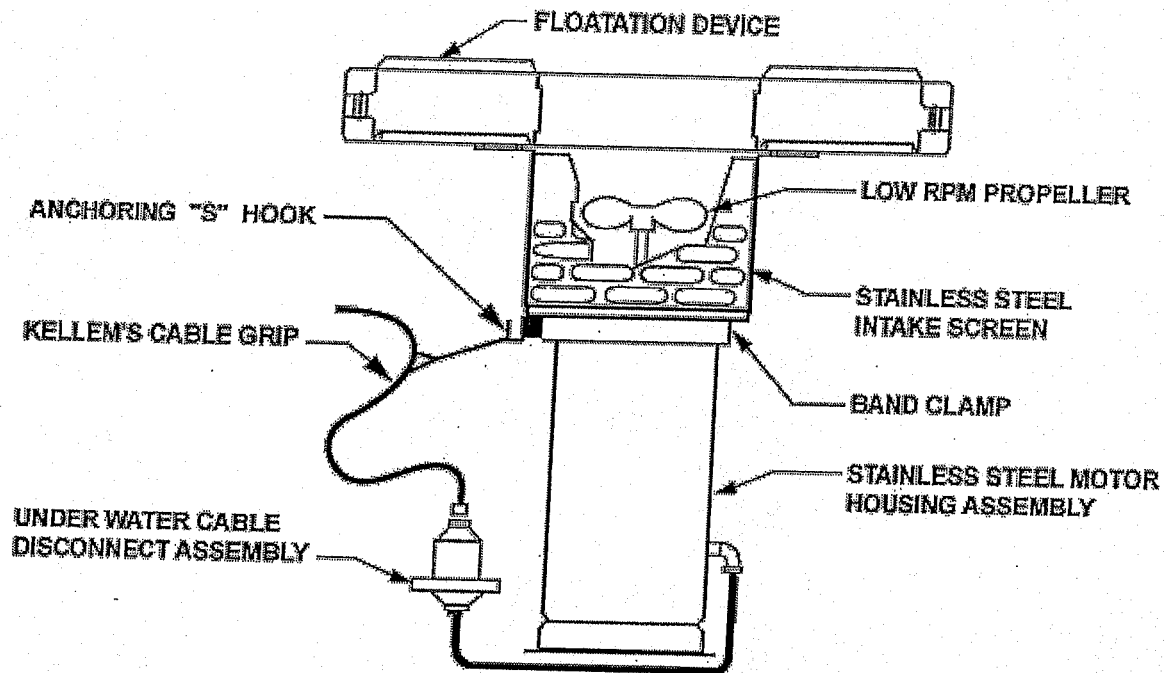
# WATER QUALITY DAM



**TYPICAL PARKING ISLAND FILTER STRIP**



## VOLCANO II FLOATING SURFACE AERATOR



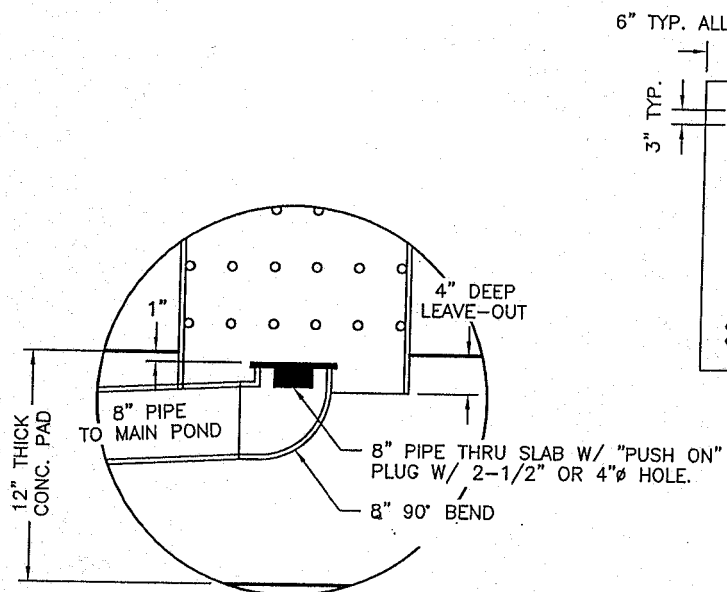
16024 CTH X  
 KIEL, WI 53042 USA  
 PH 920.693.3121  
 FX 920.693.3634  
 1.800.693.3144  
[Info@AquaMaster.com](mailto:Info@AquaMaster.com)



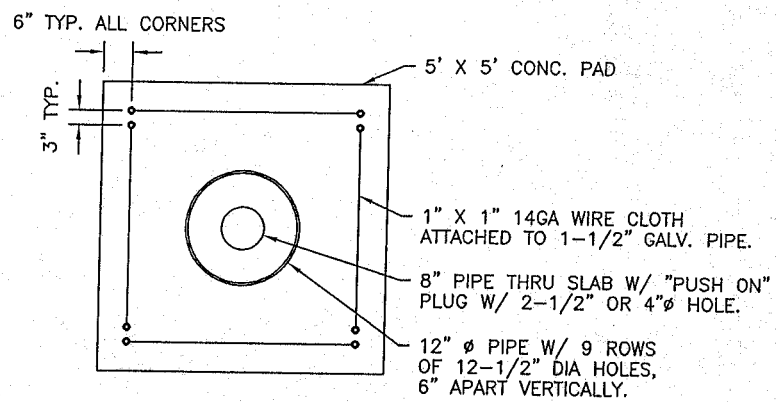
Home | AquaAir™ | Classic Fountains | The Masters Series® | Celestial Fountains®  
Fixed Fountains | Volcano | Oxymax® | Ultimax® | MasterClear | Warranty  
Distributors | Contact Us / Tell Us About Your Pond

Copyright 2005 AquaMaster. All rights reserved  
 Designed by Nigrelli Systems, Inc.

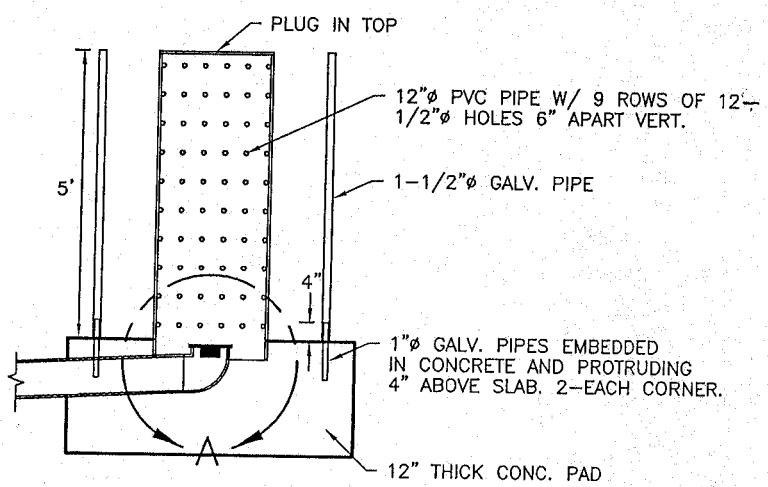
(5 REQUIRED)



DETAIL 'A'

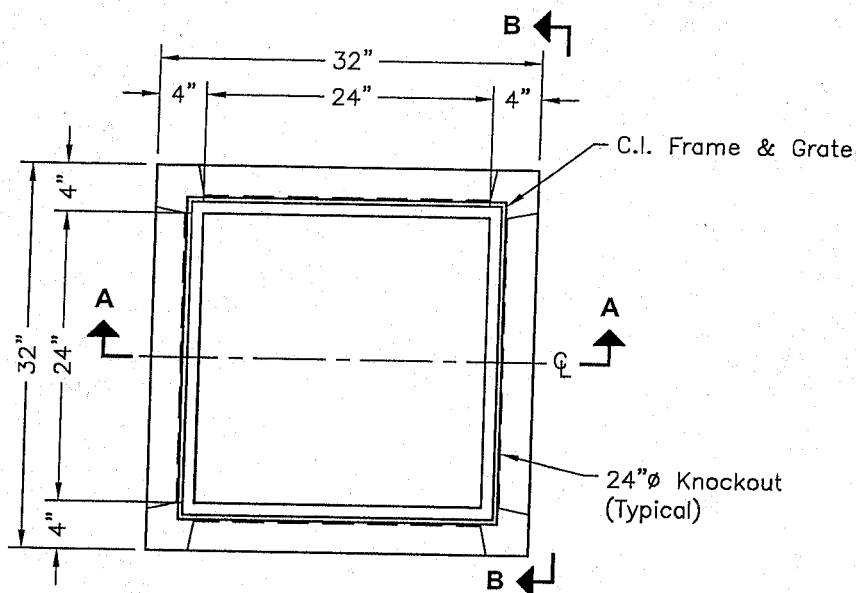


PLAN



FILTERED SEDIMENTATION OUTLET STRUCTURE





### PLAN VIEW

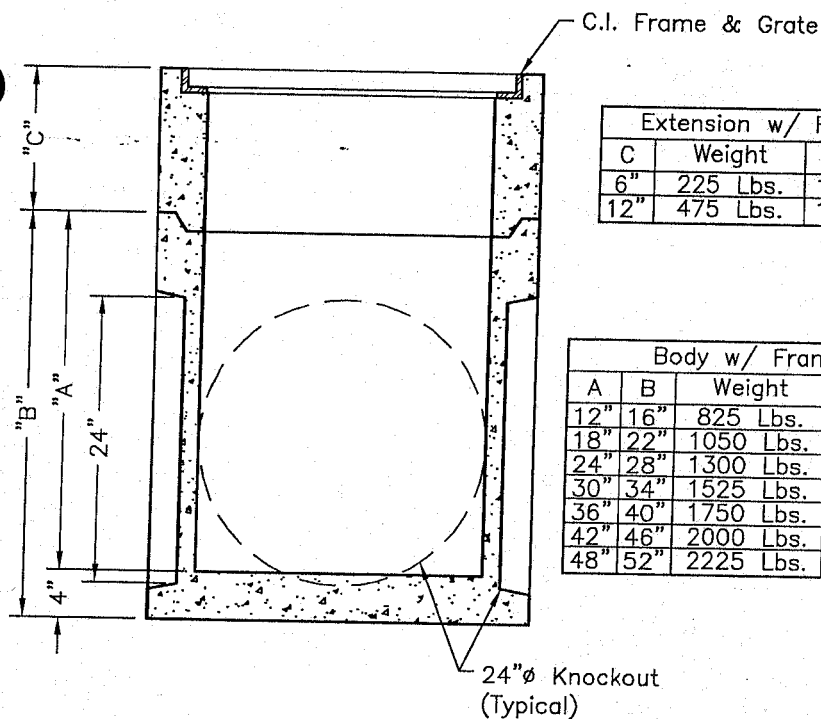
(C.I. Gate not Shown)

### SPECIFICATIONS:

1. Concrete: Has a Design Strength of 5,000 psi at 28 Days.
2. Steel Reinforcement: ASTM A-615, Grade 60 or ASTM A-497 Welded Wire Fabric.
3. Loading: Designed for H20 Loading.
4. C.I. Castings: ASTMA-48, Class 30/35.

### GENERAL NOTES:

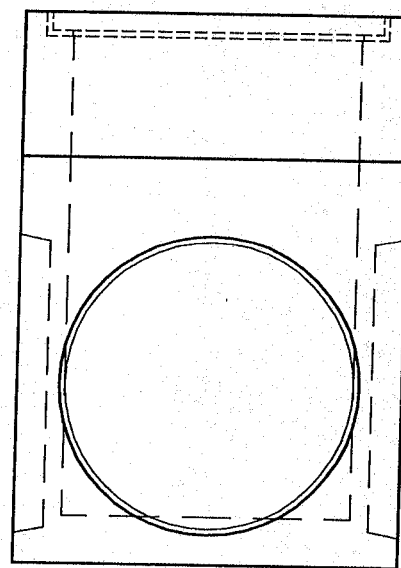
1. Different Height of Extensions and Bodies are Available by Request.
2. Frames may be Cast in Extension or Body. Frames are Cast Iron.



### SECTION A-A

Extension w/ Frame		
C	Weight	Item#
6"	225 Lbs.	1202400
12"	475 Lbs.	1202460

Body w/ Frame			
A	B	Weight	Item#
12"	16"	825 Lbs.	1202440
18"	22"	1050 Lbs.	1202480
24"	28"	1300 Lbs.	1202580
30"	34"	1525 Lbs.	1202660
36"	40"	1750 Lbs.	1202720
42"	46"	2000 Lbs.	1202800
48"	52"	2225 Lbs.	1202860



### ELEVATION B-B

SCALE: 3/4"=1'-0"



1100 Heritage Parkway, Mansfield, Texas 76063  
Phone: 817.453.1054 Fax: 817.453.4007

### CB-220

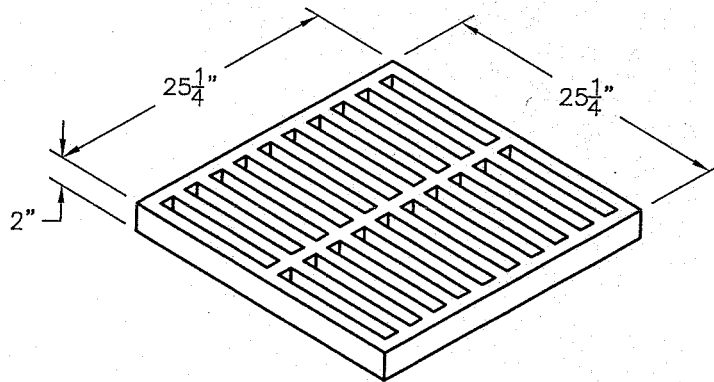
FILE NAME: 260DICC-220\_B.dwg

ISSUE DATE: January, 2003

[www.oldcastleprecast.com](http://www.oldcastleprecast.com)

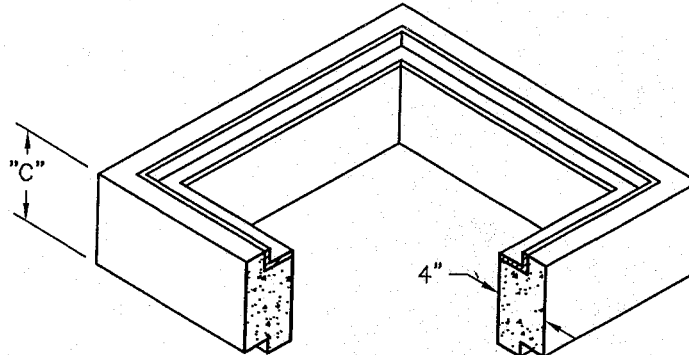
2'-0" x 2'-0" I.D.  
Catch Basin

Copyright © 2002 Oldcastle Precast, Inc.



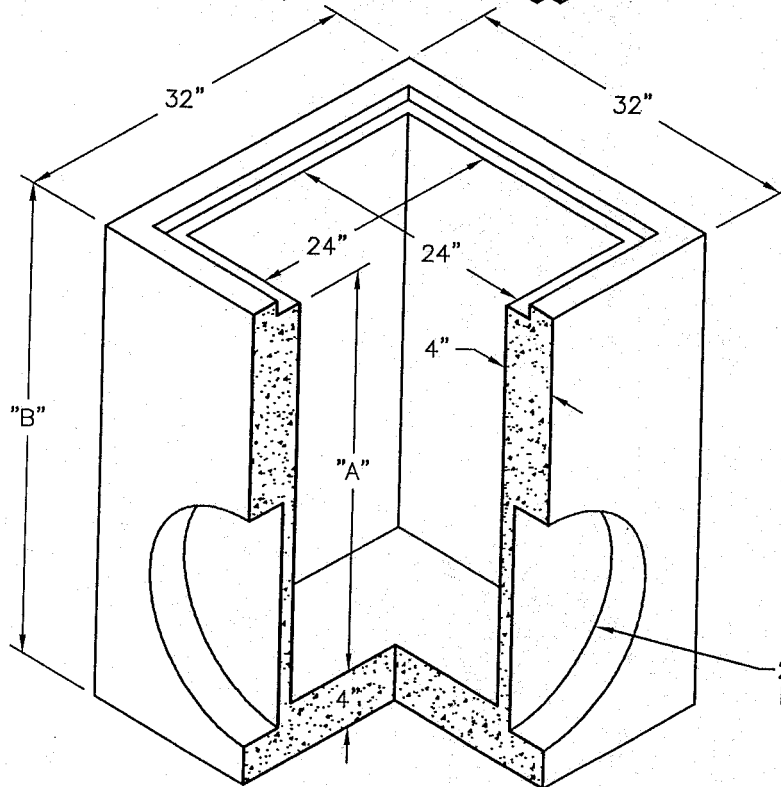
### **C.I. Grate**

Weight - 180 Lbs.  
Item# - 7105300



### **Extension w/ Frame**

Weight - See Table  
Item# - See Table



### **Body**

Weight - See Table  
Item# - See Table

SCALE: NONE



1100 Heritage Parkway, Mansfield, Texas 76063  
Phone: 817.453.1054 Fax: 817.453.4007

### **CB-220**

FILE NAME: 260DICC-220\_F.dwg

ISSUE DATE: January, 2003

[www.oldcastleprecast.com](http://www.oldcastleprecast.com)

**2'-0" x 2'-0" I.D.  
Catch Basin**

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# PRE-ESTABLISHMENT PERIOD MAINTENANCE SCHEDULE

January 2006

Appendix E

## Operation and Maintenance Inspection Report for Storm Water Management Ponds

(Adapted from Watershed Management Institute, Inc.)

Inspector Name \_\_\_\_\_ Project Location \_\_\_\_\_  
 Inspection Date \_\_\_\_\_  
 Storm Water Pond \_\_\_\_\_  
 Normal Pool \_\_\_\_\_  
 Normally Dry \_\_\_\_\_  
 Embankment Type: Earthen ☐ Concrete ☐ Watershed \_\_\_\_\_

Inspection Items	Checked? Yes / No	Maintenance Needed? Yes / No	Inspection Frequency	Comments
<b>Pond Components</b>				
1. Embankment and/or Emergency spillway				
a. Adequate vegetation and ground cover			A	
b. Embankment erosion			A	
c. Animal burrows			A	
d. Unauthorized plantings			A	
e. Cracking, bulging, or sliding of dam				
i. Upstream face			A	
ii. Downstream face			A	
iii. At or beyond toe Upstream			A	
Downstream			A	
iv. Emergency spillway			A	
f. Pond, toe & chimney drains clear and functioning			A	
g. Leaks on downstream face			A	
h. Abutment protection or riprap failures			A	
i. Visual settlement or horizontal misalignment of top of dam			A	
j. Emergency spillway clear of debris			A	
k. Other (specify)			A	
2. Riser and principal spillway				
Type: Reinforced concrete _____				
Corrugated pipe _____				
Masonry _____				
a. Low flow orifice obstructed			A	
b. Low flow trash rack			A	
i. Debris removal necessary				
ii. Corrosion control			A	

# PRE-ESTABLISHMENT PERIOD MAINTENANCE SCHEDULE

Appendix E

January 2006

Inspection Items		Checked? Yes / No	Maintenance Needed? Yes / No	Inspection Frequency	Comments
c.	Weir trash rack			A	
	i. Debris removal necessary			A	
	ii. Corrosion control			A	
d.	Excessive sediment accumulation inside riser			A	
e.	Concrete/Masonry condition			A	
	Riser and barrels				
	i. Cracks or displacement			A	
	ii. Minor spalling (<1")			A	
	iii. Major spalling (rebars exposed)			A	
	iv. Joint failures			A	
	v. Water tightness			A	
f.	Metal pipe condition			A	
g.	Control valve			A	
	i. Operational/exercised			A	
	ii. Chained and locked			A	
h.	Pond drain valve			A	
	i. Operational/exercised			A	
	ii. Chained and locked			A	
i.	Outfall channels flowing			A	
j.	Other (specify)			A	
3.	Permanent pool (wet ponds)				
a.	Undesirable vegetative growth			M	
b.	Floating or floatable debris removal required			M	
c.	Visible pollution			M	
d.	High Water Marks			M	
e.	Shoreline problems			M	
f.	Sediment build-up			M	
g.	Other (specify)			M	
4.	Sediment forebays				
a.	Sedimentation Noted			M	
b.	Sediment removal when depth > 50% design depth			M	
5.	Dry pond areas				
a.	Vegetation adequate			M	
b.	Undesirable vegetative growth			M	
c.	Undesirable woody vegetation			M	
d.	Low flow channels clear of obstructions			M	
e.	Standing water or wet spots			M	
f.	Sediment and/or trash accumulation			M	
g.	Other (specify)			M	
6.	Condition of outfalls into pond				
a.	Riprap failures			A,S	

# PRE-ESTABLISHMENT PERIOD MAINTENANCE SCHEDULE

January 2006

Appendix E

Inspection Items		Checked? Yes / No	Maintenance Needed? Yes / No	Inspection Frequency	Comments
b.	Slope erosion			A,S	
c.	Storm drain pipes			A,S	
d.	Endwalls/headwalls			A,S	
e.	Other (specify)			A,S	
7.	Other				
a.	Encroachments on ponds or easement area			M	
b.	Complaints from residents (describe on back)			M	
c.	Aesthetics			M	
	i. Grass height				
	ii. Graffiti removal necessary			M	
	iii. Other (specify)			M	
d.	Any public hazards (specify)			M	
e.	Maintenance access			M	
8.	Constructed wetland areas				
a.	Vegetation healthy and growing			A	
b.	Evidence of invasive species			A	
c.	Excessive sedimentation in wetland area			A	

Inspection Frequency Key A=Annual, M=Monthly, S=After major storm

## Summary

1. Inspectors Remarks:

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2. Overall condition of Facility (Check one)

☐ Acceptable  
☐ Unacceptable

3. Dates any maintenance must be completed by:

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Inspectors Signature

# PRE-ESTABLISHMENT PERIOD MAINTENANCE SCHEDULE

January 2006

Appendix E

## Operation and Maintenance Inspection Report for Enhanced Swales / Grass Channels / Filter Strips

(Adapted from Watershed Management Institute, Inc.)

Inspector Name \_\_\_\_\_ Project Location \_\_\_\_\_  
 Inspection Date \_\_\_\_\_  
 Watershed \_\_\_\_\_  
 As-built Plans available? \_\_\_\_\_

Inspection Items	Checked? Yes / No	Maintenance Needed? Yes / No	Inspection Frequency	Comments
1. Debris removal				
Facility and adjacent area clear of debris			M	
Inlets and outlets clear of debris			M	
Any dumping of yard wastes into facility			M	
Has litter (branches, etc.) been removed			M	
2. Vegetation				
Adjacent area stabilized			M	
Grass mowed			M	
Plant height not less than design water depth			M	
Fertilized per specifications			M	
Any evidence of erosion			M	
Is plant composition according to approved plans			M	
Any unauthorized or inappropriate plantings			M	
Any dead or diseased plants			M	
Any evidence of plant stress from inadequate watering			M	
Any evidence of deficient stakes or wires			M	
3. Oil and grease				
Any evidence of filter clogging			M	
4. Dewatering				
Facility dewaterers between storms			M	
5. Check dams/energy dissipators/sumps				
Any evidence of sedimentation buildup			A,S	
Are sumps greater than 50% full of sediment			A,S	
Any evidence of erosion at downstream toe of drop structures			A,S	

# PRE-ESTABLISHMENT PERIOD MAINTENANCE SCHEDULE

Appendix E

January 2006

Inspection Items	Checked? Yes / No	Maintenance Needed? Yes / No	Inspection Frequency	Comments
6. Sediment deposition				
Swale clean of sediments			A	
Sediments should not be > than 20% of swale design depth			A	
7. Outlets/overflow spillway				
Good condition (no need for repair)			A,S	
Any evidence of erosion			A,S	
Any evidence of blockages			A,S	
8. Integrity of facility				
Has facility been blocked or filled inappropriately			A	
9. Bioretention Planting Soil				
Any evidence of planting soil erosion			A	
10 Organic Layer				
Mulch covers entire area (NO voids) and to specified thickness			A	
Mulch is in good condition			A	

Inspection Frequency Key A=Annual, M=Monthly, S=After major storm

## Necessary Action:

If any of the items above where answered Yes for "Maintenance Needed", a time frame needs to be established for repair or correction.

No action necessary. Continue routine inspections.

Correct noted facility deficiencies by (date) \_\_\_\_\_

Facility repairs were previously indicated and completed. Site reinspection is necessary to verify corrections or improvements.

Site reinspection completed on (date) \_\_\_\_\_

Site reinspection was satisfactory.

Next routine inspection is scheduled for approximately (date): \_\_\_\_\_

\_\_\_\_\_  
Inspectors Signature

## **POST-ESTABLISHMENT MAINTENANCE SCHEDULE** **FOR STORM WATER CONTROLS**

**Following each storm event that exceeds 1-1/2 inches over a 24-hour period:**

All Storm Water Controls	Inspect and remove accumulated trash and debris.
Bioretention Areas	Replace mulch in bioretention areas when erosion is evident.
Water Quality Pond & Wetlands	Repair undercut or eroded areas in water quality pond and wetland areas.

### **Semi-monthly:**

Filter Strips	Mow grass in filter strips to maintain grass height of 2" to 4".
---------------	--

### **Monthly**

Bioretention Areas	Replace mulch in bioretention areas when erosion is evident.
Wetlands	Ensure that inlets and outlets to each submerged gravel wetland cell are free from debris and are not clogged.
Water Quality Pond & Wetlands	Clean and remove debris from inlet and outlet structures of water quality pond and wetland areas. Mow side slopes of water quality pond and wetland areas. Repair undercut or eroded areas in water quality pond and wetland areas. Check storm visually for illegal dumping or other pollutants.

### **Semi-annually:**

Bioretention Areas	Inspect flow points for clogging and remove any sediment. Mow side slopes of water quality pond and wetland areas. Inspect filter strip/grass channel for erosion or gullyng. Re-seed or sod as necessary. Inspect trees and shrubs to evaluate their health and remove any dead or diseased vegetation.
Water Quality Pond	Inspect for invasive vegetation in wetland components.
Enhanced Swale * As Needed **For First Year	For Dry swales, mow grass to maintain a height of 4 to 6 inches. Remove grass clippings.* Roto-till or cultivate the surface of the sand/soil bed of dry swales if the swale does not draw down within 48 hours* Remove sediment build-up within the bottom of the swale once it has accumulated to 25% of the original design volume* Inspect grass along side slopes for erosion and formation of rills or gullies and correct** Remove trash and debris accumulated in the inflow forebay Inspect and correct erosion problems in the sand/soil bed of dry swales** Based on inspection, plant an alternative grass species if the original grass cover has not been successfully established**



## **POST-ESTABLISHMENT MAINTENANCE SCHEDULE** **FOR STORM WATER CONTROLS (Cont'd)**

Wetlands	Monitor wetland vegetation and perform replacement planting.
----------	--

### **Annually:**

Bioretention Areas	The planting soils should be tested for pH to establish acidic levels. If the pH is below 5.2, limestone should be applied. If the pH is above 7.0 to 8.0, then iron sulfate can be added to reduce the pH.
Filter Strips	Inspect pea gravel diaphragm for clogging and remove built-up sediment. Inspect vegetation for rills and gullies and correct. Seed or sod bare areas. Inspect to ensure that grass has established. If not, replace with an alternative species.
Water Quality Pond	Inspect for damage, particularly at the control structures. Check for signs of eutrophic conditions. Note signs of hydrocarbon build-up and remove appropriately. Examine to ensure that the inlet and outlet control devices are free of debris and are operational. Check the flap and gate valves. Check downstream face of embankment for seepage and settling. If needed, perform wetland plant management & harvesting.
Wetlands	Examine stability of the original depth zones and microtopographical features. Inspect for invasive vegetation and remove where possible. Inspect for damage to the embankment and inlet/outlet structures. Repair as necessary. Note signs of hydrocarbon build-up and remove appropriately. Monitor sediment accumulation in the facility. Examine to ensure that the inlet and outlet devices are free of debris and operational. Harvest wetland plants that have been "choked out" by sediment build-up.

### **Every 2-3 years:**

Bioretention areas	Replace mulch over the entire area. Replace pea gravel diaphragm if warranted (or when the voids are obviously filled with sediment and water is no longer infiltrating).
--------------------	--

**POST-ESTABLISHMENT MAINTENANCE SCHEDULE**  
**FOR STORM WATER CONTROLS (Cont'd)**

**Every 5-7 years or after 50% reduction in forebay capacity:**

Water Quality Pond & Wetlands	Remove sediment from forebays.
-------------------------------	--------------------------------

**Every 10-20 years or after 25% reduction in pool/wetland volume:**

Water Quality Pond & Wetlands	Monitor sediment accumulations and remove sediment when the pool volume has become reduced significantly (as shown on markers), the wetland plants are "choked" with sediment, or the pool or wetland becomes eutrophic.
-------------------------------	--