

**PRIVATE DETENTION BASIN /  
STORMWATER QUALITY BEST MANAGEMENT PRACTICE  
MAINTENANCE AGREEMENT AND EASEMENT**

This PRIVATE DETENTION BASIN / STORMWATER QUALITY BEST MANAGEMENT PRACTICE MAINTENANCE AGREEMENT AND EASEMENT (Agreement) is made by and between EL PASO COUNTY by and through THE BOARD OF COUNTY COMMISSIONERS OF EL PASO COUNTY, COLORADO (“Board” or “County”), LORSON RANCH METROPOLITAN DISTRICT (“Metro District”), a quasi-municipal corporation and political subdivision of the State of Colorado, and Lorson LLC as nominee for Lorson Conservation Investment I, LLLP and Lorson LLC as nominee for Murray Fountain LLC, (collectively, “Developer” or “Owner”). The above may occasionally be referred to herein singularly as “Party” and collectively as “Parties.”

Recitals

A. WHEREAS, the Metro District provides various municipal services to certain real property in El Paso County, Colorado referred to as Lorson Ranch; and

B. WHEREAS, Developer is the owner of certain real estate (the Subdivision Property) in El Paso County, Colorado, which Subdivision Property is legally described in Exhibit A attached hereto and incorporated herein by this reference; and

C. WHEREAS, Developer desires to plat and develop on the Subdivision Property a subdivision to be known as Creekside South at Lorson Ranch Filing No.1; and

D. WHEREAS, the development of this Subdivision Property will substantially increase the volume of water runoff and will decrease the quality of the stormwater runoff from the Subdivision Property, and, therefore, it is in the best interest of public health, safety and welfare for the County to condition approval of this subdivision on Developer’s promise to construct adequate drainage, water runoff control facilities, and stormwater quality structural Best Management Practices (“BMPs”) for the subdivision; and

E. WHEREAS, Chapter 8, Section 8.4.5 of the El Paso County Land Development Code, as periodically amended, promulgated pursuant to Section 30-28-133(1), Colorado Revised Statutes (C.R.S.), requires the County to condition approval of all subdivisions on a developer’s promise to so construct adequate drainage, water runoff control facilities, and BMPs in subdivisions; and

F. WHEREAS, the Drainage Criteria Manual, Volume 2, as amended by Appendix I of the El Paso County Engineering Criteria Manual (ECM), as each may be periodically amended, promulgated pursuant to the County’s Colorado Discharge Permit System General Permit (MS4 Permit) as required by Phase II of the National Pollutant Discharge Elimination System (NPDES), which MS4 Permit requires that the County take measures to protect the quality of stormwater from sediment and other contaminants, requires subdividers, developers, landowners, and owners of facilities located in the County’s rights-of-way or easements to provide adequate permanent stormwater quality BMPs with new development or significant redevelopment; and

G. WHEREAS, Section 2.9 of the El Paso County Drainage Criteria Manual provides for a developer's promise to maintain a subdivision's drainage facilities in the event the County does not assume such responsibility; and

H. WHEREAS, developers in El Paso County have historically chosen water runoff detention basins as a means to provide adequate drainage and water runoff control in subdivisions, which basins, while effective, are less expensive for developers to construct than other methods of providing drainage and water runoff control; and

I. WHEREAS, Developer desires to construct for the subdivision two detention basin/stormwater quality BMP(s) ("Pond E2 & Pond J detention basins") as the means for providing adequate drainage and stormwater runoff control and to meet requirements of the County's MS4 Permit, and to provide for operating, cleaning, maintaining and repairing such detention basins; and

J. WHEREAS, Developer desires to construct the Pond E2 and Pond J detention basins on property that is or will be platted as Tracts B & E, Creekside South at Lorson Ranch Filing No. 1 as set forth on Exhibit B attached hereto; and

K. WHEREAS, Developer shall be charged with the duty of constructing the Pond E2 & Pond J detention basins, and the Metro District shall be charged with the duties of operating, maintaining and repairing the Pond E2 & Pond J detention basins on the property described in Exhibit B; and

L. WHEREAS, it is the County's experience that subdivision developers and property owners historically have not properly cleaned and otherwise not properly maintained and repaired these detention basins/BMPs, and that these detention basins/BMPs, when not so properly cleaned, maintained, and repaired, threaten the public health, safety and welfare; and

M. WHEREAS, the County, in order to protect the public health, safety and welfare, has historically expended valuable and limited public resources to so properly clean, maintain, and repair these detention basins/BMPs when developers and property owners have failed in their responsibilities, and therefore, the County desires the means to recover its costs incurred in the event the burden falls on the County to so clean, maintain and repair the detention basin/BMP(s) serving this subdivision due to the Developer's or the Metro District's failure to meet its obligations to do the same; and

N. WHEREAS, the County conditions approval of this subdivision on the Developer's promise to so construct the Pond E2 and Pond J detention basins, and further conditions approval on the Metro District's promise to reimburse the County in the event the burden falls upon the County to so clean, maintain and/or repair the Pond E2 and Pond J detention basins serving this subdivision; and

O. WHEREAS, the County could condition subdivision approval on the Developer's promise to construct a different and more expensive drainage, water runoff control system and BMPs than those proposed herein, which more expensive system would not create the possibility of the burden of cleaning, maintenance and repair expenses falling on the County; however, the County is willing to forego such right upon the performance of Developer's and the Metro District's promises contained herein; and

P. WHEREAS, the County, in order to secure performance of the promises contained herein, conditions approval of this subdivision upon the grant herein of a perpetual Easement over the property described in Exhibit B for the purpose of allowing the County to periodically access, inspect, and, when so necessary, to clean, maintain and/or repair the Pond E2 and Pond J detention basins; and

Q. WHEREAS, Pursuant to Colorado Constitution, Article XIV, Section 18(2) and Section 29-1-203, Colorado Revised Statutes, governmental entities may cooperate and contract with each other to provide any function, services, or facilities lawfully authorized to each.

### Agreement

NOW, THEREFORE, in consideration of the mutual Promises contained herein, the sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. Incorporation of Recitals: The Parties incorporate the Recitals above into this Agreement.

2. Covenants Running with the Land: Developer agrees that this entire Agreement and the performance thereof shall become a covenant running with the land, which land is legally described in Exhibit A attached hereto, and that this entire Agreement and the performance thereof shall be binding upon themselves and their respective successors and assigns.

3. Construction: Developer shall construct on the property described in Exhibit B attached hereto and incorporated herein by this reference the Pond E2 and Pond J detention basins. Developer shall not commence construction of the Pond E2 and Pond J detention basins until the El Paso County Planning and Community Development Department (PCD) has approved in writing the plans and specifications for the Pond E2 and Pond J detention basins and this Agreement has been signed by all Parties and returned to the PCD. Developer shall complete construction of the Pond E2 and Pond J detention basins in substantial compliance with the County-approved plans and specifications for the Pond E2 and Pond J detention basins. Failure to meet these requirements shall be a material breach of this Agreement, and shall entitle the County to pursue any remedies available to it at law or in equity to enforce the same. Construction of the Pond E2 and Pond J detention basins shall be substantially completed within one (1) year (defined as 365 days), which one-year period will commence to run on the date the approved plat of this subdivision is recorded in the records of the El Paso County Clerk and Recorder. Rough grading of the Pond E2 and Pond J detention basins must be completed and inspected by the El Paso County Planning and Community Development Department prior to commencing road construction.

In the event construction is not substantially completed within the one (1) year period, then the County may exercise its discretion to complete the project, and shall have the right to seek reimbursement from the Developer and its respective successors and assigns, for its actual costs and expenses incurred in the process of completing construction. The term actual costs and expenses shall be liberally construed in favor of the County, and shall include, but shall not be limited to, labor costs, tool and equipment costs, supply costs, and engineering and design costs, regardless of whether the County uses its own personnel, tools, equipment and supplies, etc. to correct the matter. In the event the County initiates any litigation or engages the services of legal counsel in order to enforce the provisions arising herein, the County shall be entitled to its damages and costs, including reasonable attorney fees,

regardless of whether the County contracts with outside legal counsel or utilizes in-house legal counsel for the same.

4. Maintenance: The Metro District agrees for itself and its successors and assigns, that it will regularly and routinely inspect, clean and maintain the Pond E2 and Pond J detention basins and otherwise keep the same in good repair, all at its own cost and expense. No trees or shrubs that will impair the structural integrity of the Pond E2 and Pond J detention basins shall be planted or allowed to grow on the Pond E2 and Pond J detention basins .

5. Creation of Easement: Owner hereby grants the County and the Metro District a non-exclusive perpetual easement upon and across the property described in Exhibit B. The purpose of the easement is to allow the County and the Metro District to access, inspect, clean, repair and maintain the Pond E2 and Pond J detention basins; however, the creation of the easement does not expressly or implicitly impose on the County a duty to so inspect, clean, repair or maintain the Pond E2 and Pond J detention basins.

6. County's Rights and Obligations: Any time the County determines, in the sole exercise of its discretion, that the Pond E2 and Pond J detention basins are not properly cleaned, maintained and/or otherwise kept in good repair, the County shall give reasonable notice to the Developer, the Metro District and their respective successors and assigns, that the Pond E2 and Pond J detention basins need to be cleaned, maintained and/or otherwise repaired. The notice shall provide a reasonable time to correct the problems. Should the responsible parties fail to correct the specified problems, the County may enter upon the property described in Exhibit B to so correct the specified problems. Notice shall be effective to the above by the County's deposit of the same into the regular United States mail, postage pre-paid. Notwithstanding the foregoing, this Agreement does not expressly or implicitly impose on the County a duty to so inspect, clean, repair or maintain the Pond E2 and Pond J detention basins.

7. Reimbursement of County's Costs: The Developer and the Metro District agree and covenant, for themselves, their respective successors and assigns, that they will reimburse the County for its actual costs and expenses incurred in the process of completing construction of, cleaning, maintaining, and/or repairing the Pond E2 and Pond J detention basins pursuant to the provisions of this Agreement.

The term "actual costs and expenses" shall be liberally construed in favor of the County, and shall include, but shall not be limited to, labor costs, tools and equipment costs, supply costs, and engineering and design costs, regardless of whether the County uses its own personnel, tools, equipment and supplies, etc. to correct the matter. In the event the County initiates any litigation or engages the services of legal counsel in order to enforce the provisions arising herein, the County shall be entitled to its damages and costs, including reasonable attorney's fees, regardless of whether the County contracts with outside legal counsel or utilizes in-house legal counsel for the same.

8. Contingencies of Subdivision Approval: Developer's and the Metro District's execution of this Agreement is a condition of subdivision approval. Additional conditions of this Agreement include, but are not limited to, the following:

- a. Conveyance of the property described in Exhibit B from the Owner to the Metro District (which will include a reservation of easement in favor of the County for purposes of

accessing, inspecting, cleaning, maintaining, and repairing the detention basins), and recording of the deed for the same; and

The County shall have the right, in the sole exercise of its discretion, to approve or disapprove any documentation submitted to it under the conditions of this Paragraph, including but not limited to, any separate agreement or amendment, if applicable, identifying any specific maintenance responsibilities not addressed herein. The County's rejection of any documentation submitted hereunder shall mean that the appropriate condition of this Agreement has not been fulfilled.

9. Agreement Monitored by El Paso County Planning and Community Development Department and/or El Paso County Department of Public Works: Any and all actions and decisions to be made hereunder by the County shall be made by the Director of the El Paso County Planning and Community Development Department and/or the Director of the El Paso County Department of Public Works. Accordingly, any and all documents, submissions, plan approvals, inspections, etc. shall be submitted to and shall be made by the Director of the Planning and Community Development Department and/or the Director of the El Paso County Department of Public Works.

10. Indemnification and Hold Harmless: To the extent authorized by law, Developer and the Metro District agree, for themselves, their respective successors and assigns, that they will indemnify, defend, and hold the County harmless from any and all loss, costs, damage, injury, liability, claim, lien, demand, action and causes of action whatsoever, whether at law or in equity, arising from or related to their respective intentional or negligent acts, errors or omissions or that of their agents, officers, servants, employees, invitees and licensees in the construction, operation, inspection, cleaning (including analyzing and disposing of any solid or hazardous wastes as defined by State and/or Federal environmental laws and regulations), maintenance, and repair of the Pond E2 and Pond J detention basins, and such obligation arising under this Paragraph shall be joint and several. Nothing in this Paragraph shall be deemed to waive or otherwise limit the defense available to the County pursuant to the Colorado Governmental Immunity Act, Sections 24-10-101, *et seq.* C.R.S., or as otherwise provided by law.

11. Severability: In the event any Court of competent jurisdiction declares any part of this Agreement to be unenforceable, such declaration shall not affect the enforceability of the remaining parts of this Agreement.

12. Third Parties: This Agreement does not and shall not be deemed to confer upon or grant to any third party any right to claim damages or to bring any lawsuit, action or other proceeding against the County, the Developer, the Owner, the Metro District, or their respective successors and assigns, because of any breach hereof or because of any terms, covenants, agreements or conditions contained herein.

13. Solid Waste or Hazardous Materials: Should any refuse from the Pond E2 and Pond J detention basins be suspected or identified as solid waste or petroleum products, hazardous substances or hazardous materials (collectively referred to herein as "hazardous materials"), the Developer, the Owner, and the Metro District shall take all necessary and proper steps to characterize the solid waste or hazardous materials and properly dispose of it in accordance with applicable State and/or Federal environmental laws and regulations, including, but not limited to, the following: Solid Wastes Disposal Sites and Facilities Acts, §§ 30-20-100.5 – 30-20-119, C.R.S., Colorado Regulations Pertaining to Solid Waste Disposal Sites and Facilities, 6 C.C.R. 1007-2, *et seq.*, Solid Waste Disposal Act, 42 U.S.C. §§

6901-6992k, and Federal Solid Waste Regulations 40 CFR Ch. I. The County shall not be responsible or liable for identifying, characterizing, cleaning up, or disposing of such solid waste or hazardous materials. Notwithstanding the previous sentence, should any refuse cleaned up and disposed of by the County be determined to be solid waste or hazardous materials, the Developer, the Owner, and the Metro District, but not the County, shall be responsible and liable as the owner, generator, and/or transporter of said solid waste or hazardous materials.

14. Applicable Law and Venue: The laws, rules, and regulations of the State of Colorado and El Paso County shall be applicable in the enforcement, interpretation, and execution of this Agreement, except that Federal law may be applicable regarding solid waste or hazardous materials. Venue shall be in the El Paso County District Court.

15. Limitation on Developer's Obligation and Liability: The obligation and liability of the Developer hereunder shall be joint and several but shall only continue until such time as the Final Plat as described in Paragraph Three (3) of the Recitals set forth above is recorded and the Developer completes the construction of the Pond E2 and Pond J detention basins and transfers all applicable maintenance and operation responsibilities to the Metro District. By execution of this agreement, the Metro District agrees to accept all responsibilities and to perform all duties assigned to it, including those of the Developer, as specified herein, upon transfer of the property described in Exhibit B to the Metro District.

IN WITNESS WHEREOF, the Parties affix their signatures below.

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by:

Lorson, LLC as nominee for Lorson Conservation Investment I, LLLP

By: \_\_\_\_\_  
Jeff Mark, Authorized signing Agent

Lorson LLC as nominee for Murray Fountain, LLC

By: \_\_\_\_\_  
Jeff Mark, Authorized signing Agent

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by Jeff Mark, Authorized signing Agent for Lorson, LLC as nominee for Lorson Conservation Investment I, LLLP, and Lorson, LLC as nominee for Murray Fountain, LLC

Witness my hand and official seal.

My commission expires: \_\_\_\_\_

\_\_\_\_\_  
Notary Public

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by:

LORSON RANCH METROPOLITAN DISTRICT

By: \_\_\_\_\_  
Jeff Mark, President

Attest:

By: \_\_\_\_\_

The foregoing instrument was acknowledged before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by Jeff Mark, President, LORSON RANCH METROPOLITAN DISTRICT, as attested by \_\_\_\_\_, as \_\_\_\_\_.

Witness my hand and official seal.

My commission expires: \_\_\_\_\_

\_\_\_\_\_  
Notary Public

Executed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by:

BOARD OF COUNTY COMMISSIONERS  
OF EL PASO COUNTY, COLORADO

By: \_\_\_\_\_  
Craig Dossey, Executive Director  
Planning and Community Development Department  
Authorized signatory pursuant to LDC

Approved as to Content and Form:

\_\_\_\_\_  
Assistant County Attorney

## Exhibit A –Land Description

### **CREEKSIDE SOUTH AT LORSON RANCH FILING NO. 1**

A PARCEL OF LAND IN THE NORTH HALF (N1/2) OF SECTION 23, T15S, R65W OF THE 6th P.M., EL PASO COUNTY, COLORADO MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BASIS OF BEARING:

THE EAST-WEST CENTERLINE OF SAID SECTION 23 BEING MONUMENTED AT THE WEST QUARTER CORNER OF SAID SECTION WITH A FOUND NO. 6 REBAR, FROM WHICH THE EAST QUARTER CORNER OF SAID SECTION 23 MONUMENTED WITH AN ALUMINUM CAP STAMPED "PLS NO. 31161", BEARS N89°41'54"E A DISTANCE OF 5319.46 FEET, TO WHICH LINE ALL BEARINGS IN THIS LEGAL DESCRIPTION ARE RELATIVE;

COMMENCING AT THE WEST QUARTER CORNER OF SAID SECTION 23;

THENCE N89°41'54"E ALONG THE CENTERLINE OF SAID SECTION 892.24 FEET TO THE SOUTHEAST CORNER OF "CREEKSIDE AT LORSON RANCH FILING NO. 1" AS RECORDED UNDER RECEPTION NO. 220714514 IN THE RECORDS OF EL PASO COUNTY, COLORADO;

THENCE ALONG THE SOUTHERLY AND EASTERLY LINES OF "CREEKSIDE AT LORSON RANCH FILING NO. 1" THE FOLLOWING TWENTY-TWO (22) COURSES;

- 1) THENCE N36°43'29"E A DISTANCE OF 311.41 FEET;
- 2) THENCE N28°55'26"E A DISTANCE OF 265.02 FEET;
- 3) THENCE S77°01'58"E A DISTANCE OF 350.83 FEET;
- 4) THENCE N83°30'09"E A DISTANCE OF 446.06 FEET;
- 5) THENCE N16°26'24"E A DISTANCE OF 116.82 FEET TO A POINT OF CURVE;
- 6) THENCE 281.40 FEET ALONG THE ARC OF A CURVE TO THE RIGHT, SAID CURVE HAVING A RADIUS OF 215.00 FEET, A CENTRAL ANGLE OF 74°59'26", THE CHORD OF 261.74 FEET BEARS N53°56'07"E TO A POINT OF TANGENT
- 7) THENCE S88°34'10"E A DISTANCE OF 160.16 FEET;
- 8) THENCE S44°43'03"E A DISTANCE OF 230.04 FEET;
- 9) THENCE S65°32'01"E A DISTANCE OF 188.46 FEET;
- 10) THENCE N85°20'33"E A DISTANCE OF 169.20 FEET;
- 11) THENCE N17°08'25"E A DISTANCE OF 123.42 FEET;
- 12) THENCE N60°55'25"E A DISTANCE OF 219.41 FEET;
- 13) THENCE N77°50'20"E A DISTANCE OF 405.01 FEET;
- 14) THENCE S82°16'06"E A DISTANCE OF 188.62 FEET;
- 15) THENCE N76°28'55"E A DISTANCE OF 247.86 FEET;
- 16) THENCE N31°05'09"E A DISTANCE OF 90.00 FEET;
- 17) THENCE N58°54'51"W A DISTANCE OF 4.71 FEET;
- 18) THENCE N31°55'05"E A DISTANCE OF 182.34 FEET;
- 19) THENCE N11°17'09"E A DISTANCE OF 285.14 FEET;
- 20) THENCE N00°29'43"E A DISTANCE OF 173.06 FEET;
- 21) THENCE N11°46'57"E A DISTANCE OF 127.69 FEET;
- 22) THENCE N21°18'01"E A DISTANCE OF 20.20 FEET TO THE SOUTHERLY RIGHT-OF-WAY LINE OF LORSON BOULEVARD AS SHOWN IN THE PLAT OF " LORSON RANCH EAST FILING NO. 1" AS RECORDED UNDER RECEPTION NO. 219714288 IN THE RECORDS OF EL PASO COUNTY, COLORADO;

THENCE ALONG SAID LINE THE FOLLOWING FOUR (4) COURSES:

- 1) THENCE S86°49'28"E A DISTANCE OF 128.25 FEET;

- 2) THENCE N89°35'58"EA DISTANCE OF 125.90 FEET;
- 3) THENCE S47°05'26"E A DISTANCE OF 38.26 FEET;
- 4) THENCE S00°24'02"E A DISTANCE OF 38.12 FEET TO A POINT ON THE WEST LINE OF THAT PARCEL DESCRIBED IN A WARRANTY DEED UNDER RECEPTION NO. 217154370 IN THE EL PASO COUNTY RECORDS;

THENCE ALONG THE WEST LINES OF SAID PARCEL THE FOLLOWING FOUR (4) COURSES;

- 1) THENCE S00°24'02"E A DISTANCE OF 429.71 FEET TO A POINT OF CURVE;
- 2) THENCE 538.03 FEET ALONG THE ARC OF A CURVE TO THE LEFT, SAID CURVE HAVING A RADIUS OF 595.00 FEET, A CENTRAL ANGLE OF 51°48'35", THE CHORD OF 519.88 FEET BEARS S26°18'20"E TO A POINT OF TANGENT;
- 3) THENCE S52°12'37"E A DISTANCE OF 365.17 FEET TO A POINT ON A TANGENT CURVE;
- 4) THENCE 160.11 FEET ALONG THE ARC OF A CURVE TO THE LEFT, SAID CURVE HAVING A RADIUS OF 780.00 FEET, A CENTRAL ANGLE OF 11°45'39", THE CHORD OF 159.83 FEET BEARS S58°05'27"E TO THE WEST LINE OF THAT EASEMENT DESCRIBED IN BOOK 2665 AT PAGE 715 OF THE EL PASO COUNTY RECORDS;

THENCE S38°22'41"W ALONG SAID EASEMENT LINE 250.28 FEET;

THENCE S00°19'53"E ALONG SAID EASEMENT LINE 168.87 FEET TO THE EAST-WEST CENTERLINE OF SECTION 23;

THENCE S89°41'54"W ALONG SAID CENTERLINE 4073.30 FEET TO THE POINT OF BEGINNING;

SAID PARCEL CONTAINS A CALCULATED AREA OF 2,799,015 Sq. Ft. (64.257 ACRES MORE OR LESS).

PREPARED BY:

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VERNON P. TAYLOR, COLORADO PLS NO. 25966                      DATE  
FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC

## Exhibit B – Pond Locations

### Pond Location:

Tract B & E, Creekside South at Lorson Ranch Filing No. 1

# Exhibit C – Pond Operations and Maintenance Manual

# **Lorson Ranch Metropolitan District Operations and Maintenance Manual Extended Detention Ponds**

Extended detention basins have low to moderate maintenance requirements. Routine and non-routine maintenance is necessary to assure performance, enhance aesthetics, and protect structural integrity. The dry basins can result in nuisance complaints if not properly designed or maintained. Bio-degradable pesticides may be required to limit insect problems. Frequent debris removal and grass-mowing can reduce aesthetic complaints. If a shallow wetland or marshy area is included, mosquito breeding and nuisance odors could occur if the water becomes stagnant.

## **1. Lorson Ranch Ponds maintained by Lorson Ranch Metropolitan District.**

There are multiple ponds within Lorson Ranch that the metro district owns and maintains. The following is a list of the ponds, type of pond, and the name of the subdivision within Lorson Ranch that built the pond. Attached to this manual is a location map of all the ponds owned/maintained by the Lorson Ranch Metropolitan District.

- a. Pond A1 – Extended Detention Basin with WQCV. Pond A1 was built in 2006 as part of the Fontaine Blvd/Old Glory street improvement project. The final drainage report for Fontaine Blvd/Old Glory covers the drainage calculations for this pond.
- b. Pond A2 – Extended Detention Basin (no WQCV). Pond A2 was built in 2006 as part of the Fontaine Blvd/Old Glory street improvement project. The final drainage report for Fontaine Blvd/Old Glory covers the drainage calculations for this pond.
- c. Pond A3 – Extended Detention Basin with WQCV. Pond A3 was originally built in 2006 as part of the Fontaine Blvd/Old Glory street improvement project and was expanded in September, 2020 and upgraded to full spectrum design volumes with a full spectrum outlet structure as part of Ponderosa at Lorson Ranch Filing No. 3. The final drainage report for Ponderosa at Lorson Ranch Filing No. 3 covers the drainage calculations for this pond.
- d. Pond A4 – Extended Detention Basin (no WQCV). Pond A4 was built in 2010 as part of the Pioneer Landing Filing No. 1 development. The final drainage report for Pioneer Landing Filing No. 1 covers the drainage calculations for this pond.
- e. Pond A5 - Extended Detention Basin with WQCV. Pond A5 was built in 2009-2010 as part of the Townhomes at Lorson Ranch Filing 1A development. The final drainage report covers the drainage calculations for this pond.
- f. Pond B1 – Extended Detention Basin with WQCV. Pond B1 was built in 2016 as part of the Pioneer Landing Filing No. 2 development. The final drainage report for Pioneer Landing Filing No. 2 covers the drainage calculations for this pond.
- g. Pond B2 – Extended Detention Basin with WQCV. Pond B2 was built in 2013 as part of the Meadows at Lorson Ranch Filing No. 3 development. The final

- drainage report for Meadows at Lorson Ranch Filing No. 3 covers the drainage calculations for this pond.
- h. Pond C1-R – Extended Detention Basin with WQCV. Pond C1 was built in 2011 as part of the Allegiant at Lorson Ranch development. The final drainage report for Allegiant at Lorson Ranch covers the drainage calculations for this pond. The outlet structure and pond calculations for Pond C1-R are updated in 2019 by Creekside at Lorson Ranch Filing 1 to include full spectrum detention and WQ.
  - i. Pond C3a– Extended Detention Basin with WQCV. Pond C3a was built in 2014 as part of the Meadows at Lorson Ranch Filing No. 4 development. The final drainage report for Meadows 4 at Lorson Ranch covers the drainage calculations for this pond.
  - j. Pond G1-G2 – Extended Detention Basin with WQCV. Full spectrum Pond G1-G2 was built in 2017 as part of the Carriage Meadows South development. The final drainage report for Carriage Meadows South covers the drainage calculations for this pond.
  - k. Pond G3 – Extended Detention Basin with WQCV. Full Spectrum Pond G3 was built in 2017 as part of the Carriage Meadows South development. The final drainage report for Carriage Meadows South covers the drainage calculations for this pond.
  - l. Pond C5 - Extended Detention Basin with WQCV. Full Spectrum Pond C5 was built in 2018 as part of the Lorson Ranch East development. The final drainage report for Lorson Ranch East Filing No. 1 covers the drainage calculations for this pond.
  - m. Pond D2 - Extended Detention Basin with WQCV. Full Spectrum Pond D2 was built in 2018 as part of the Lorson Ranch East development. The final drainage report for Lorson Ranch East Filing No. 1 covers the drainage calculations for this pond.
  - n. Pond CMN-1. Extended Detention Basin with WQCV. Full Spectrum Pond CMN-1 was built in 2018 as part of the Carriage Meadows North Filing No. 1 development. The final drainage report for Carriage Meadows North Filing No. 1 covers the drainage calculations for this pond.
  - o. Pond C3. Extended Detention Basin with WQCV. Pond C3 was built in 2018 as part of the Lorson Ranch East Filing No. 2 development and is expanded in 2020 as part of The Hills at Lorson Ranch Filing No. 1 including WQCV. The final drainage report for The Hills at Lorson Ranch Filing No. 1 covers the drainage calculations for this pond.
  - p. Pond CR2 - Extended Detention Basin with WQCV. Full Spectrum Pond CR2 will be built in 2019 as part of the Creekside at Lorson Ranch Filing No. 1 development. The final drainage report for Creekside at Lorson Ranch Filing No. 1 covers the drainage calculations for this pond.
  - q. Pond CR3 – Sand Filter Detention Basin with WQCV. Full Spectrum Pond CR2 will be built in 2019 as part of the Creekside at Lorson Ranch Filing No. 1 development. The final drainage report for Creekside at Lorson Ranch Filing No. 1 covers the drainage calculations for this pond. This pond is a sand filter basin.
  - r. Pond E1 – Extended Detention Basin with WQCV. Full Spectrum Pond E1 will be built in 2019 as part of the Lorson Ranch East Filing No. 4 development. The final drainage report for Lorson Ranch East Filing No. 4 covers the drainage

- calculations for this pond. This pond will consist of a pipe outlet until upstream development occurs
- s. Pond E2 – Extended Detention Basin with WQCV. Full Spectrum Pond E2 will be built in 2019 as part of the Lorson Ranch East Filing No. 4 development. The final drainage report for Lorson Ranch East Filing No. 4 covers the drainage calculations for this pond.
  - t. Pond C1 - Extended Detention Basin with WQCV. Full Spectrum Pond C1 will be built in 2020 as part of the The Hills at Lorson Ranch Filing No. 1 development. The final drainage report for The Hills at Lorson Ranch Filing No. 1 covers the drainage calculations for this pond.
  - u. Pond C2.1 - Interim Detention Basin (no WQCV). Pond C2.1 will be built in 2020 as part of the The Hills at Lorson Ranch development. The preliminary drainage report for The Hills at Lorson Ranch covers the interim drainage calculations for this pond. The interim pond is a detention basin with a forebay, low flow channel, and a pipe storm sewer draining the pond.
  - v. Pond C2.2 - Extended Detention Basin with WQCV. Full Spectrum Pond C2.2 will be built in 2020 as part of the The Hills at Lorson Ranch Filing No. 1 development. The final drainage report for The Hills at Lorson Ranch Filing No. 1 covers the drainage calculations for this pond.
  - w. Pond C2.3 - Extended Detention Basin with WQCV. Full Spectrum Pond C2.3 will be built in 2020 as part of the The Hills at Lorson Ranch Filing No. 1 development. The final drainage report for The Hills at Lorson Ranch Filing No. 1 covers the drainage calculations for this pond.
  - x. Pond C4 - Interim Detention Basin (no WQCV). Pond C4 will be built in 2020 as part of the The Hills at Lorson Ranch development. The preliminary drainage report for The Hills at Lorson Ranch covers the interim drainage calculations for this pond. The interim pond is a detention basin with a forebay, low flow channel, and a pipe storm sewer draining the pond.

## **1.1 Lorson Ranch Grass Buffer for Backyard Water Quality Treatment maintained by Lorson Ranch Metropolitan District.**

There are multiple areas that the backyards of houses drain directly to the East Tributary of Jimmy Camp Creek or the main channel of Jimmy Camp Creek. A grass buffer WQ CMP located in a separate tract of land will be used for these areas within Lorson Ranch and the metro district will own and maintain the buffer tracts. The following is a list of the grass buffer BMP's and the name of the subdivision within Lorson Ranch that built the BMP.

Attached to this manual is a location map of all the ponds and BMP's owned/maintained by the Lorson Ranch Metropolitan District. See Section 4.0 for maintenance of Grass Buffers.

- a.1. Carriage Meadows North at Lorson Ranch Filing No. 1 – Tract C – Grass Buffer BMP
- a.2. Lorson Ranch East Filing No. 1 – Tract D – Grass Buffer BMP
- a.3. Lorson Ranch East Filing No. 2 – Tract B – Grass Buffer BMP
- a.4. Creekside at Lorson Ranch Filing No. 1 – Tract A, C, E, K – Grass Buffer BMP

## **2. Pond Inspections**

### ***Inspection and Frequency***

- Annually inspect basins to insure that the basin continues to function as initially intended. The annual inspection should evaluate the forebay, pond side slopes, inflow storm sewer, the spillway condition, the depth of sediment in the forebay, outlet structure, trash rack, downstream storm sewer, and the condition of the downstream face of the pond. A site survey will be the best indication of excessive sediment buildup and degradation of the spillway. In addition, an inspection of the vegetation on the berm, inside the detention area and the downstream face of the spillway should be conducted. Any bare areas should be noted and repaired using native grasses. Any sloughing or erosion of the embankment should be noted and repaired. Items to record will include any items inspected and the mowing frequency of the vegetation on the facility.
- Just before annual storm seasons (that is, April and May) and following significant rainfall events, inspect for litter and debris that may plug outlets. Of notable importance, the inspections should also include the water quality orifice plate and trash rack to ensure plugging has not occurred.
- A baseline survey should be performed at the time of construction and comparison surveys conducted every ten to twenty years after to monitor overall performance of the pond. Results of inspections should be recorded and kept at a central location for review and recording by the district.

### ***Inspection Personnel***

A qualified engineer, surveyor, or certified storm water inspector should conduct inspections of the facility.

## **3.0 Operations**

No specific operating instructions are required.

## **4.0 Maintenance**

4.1 Maintenance of the Water Quality Ponds shall be in accordance with the guidelines included in Table EDB-1, attached.

4.2 Maintenance of Grass Buffers shall be in accordance with the guidelines included in the appendix

4.3 Maintenance of the Sand Filter Basins shall be in accordance with the guidelines included in Appendix A, attached.

## **Appendix A – Maintenance Requirements**

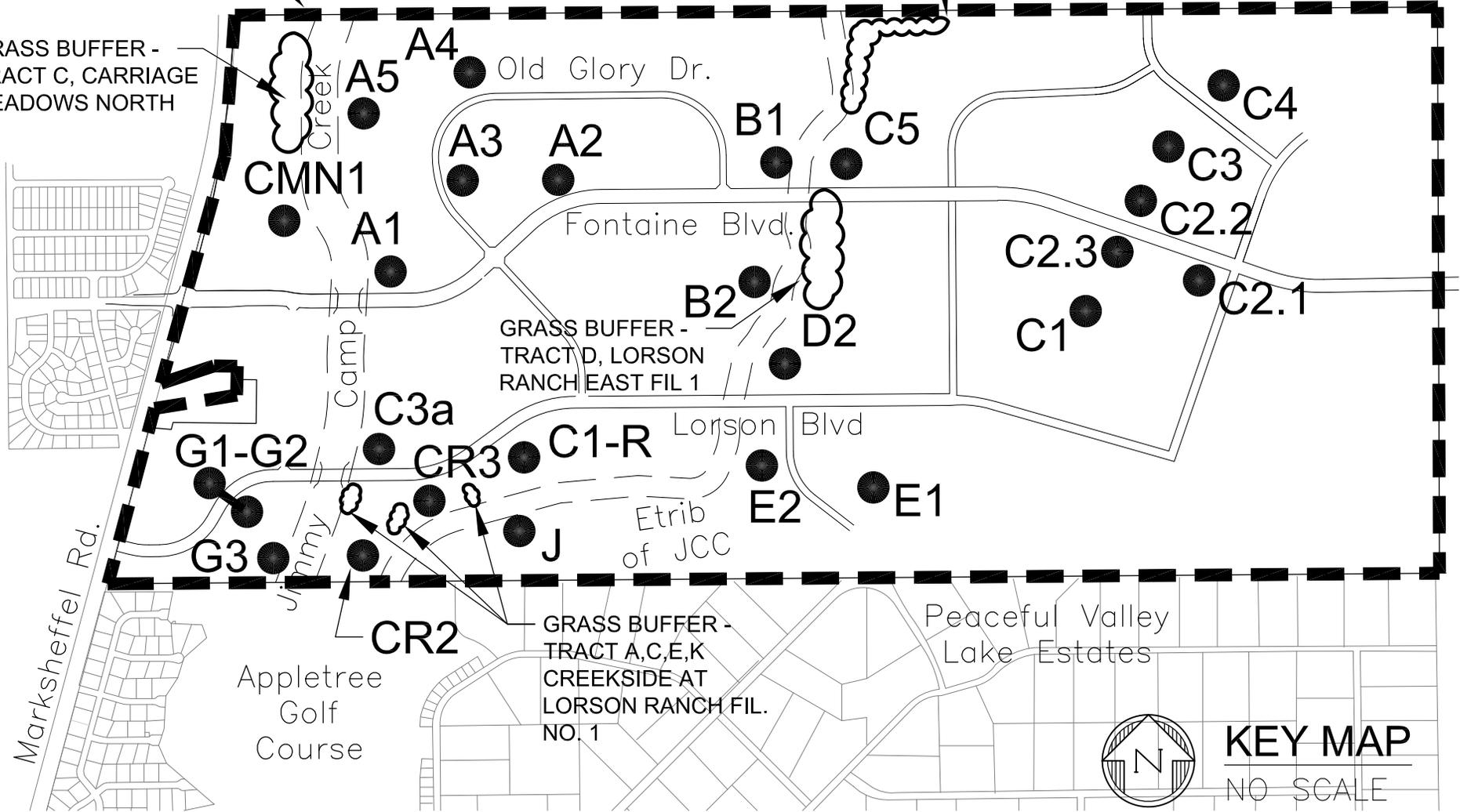
# LORSON RANCH

Banning Lewis Ranch

GRASS BUFFER - TRACT B, LORSON RANCH EAST FIL 2

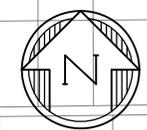
Rolling Hills Ranch

GRASS BUFFER - TRACT C, CARRIAGE MEADOWS NORTH



GRASS BUFFER - TRACT D, LORSON RANCH EAST FIL 1

GRASS BUFFER - TRACT A, C, E, K CREEKSIDE AT LORSON RANCH FIL. NO. 1



**KEY MAP**  
NO SCALE



**CORE**  
ENGINEERING GROUP

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## LORSON RANCH DETENTION POND and GRASS BUFFER LOCATION MAP

SCALE:  
NTS

DATE:  
OCTOBER, 2020

FIGURE NO.  
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**6.0 EXTENDED DETENTION BASINS (EDB)**



Extended detention basins have low to moderate maintenance requirements. Routine and nonroutine maintenance is necessary to assure performance, enhance aesthetics, and protect structural integrity. The dry basins can result in nuisance complaints if not properly designed or maintained. Bio-degradable pesticides may be required to limit insect problems. Frequent debris removal and grass-mowing can reduce aesthetic complaints. If a shallow wetland or marshy area is included, mosquito breeding and nuisance odors could occur if the water becomes stagnant. Access to critical elements of the pond (inlet, outlet, spillway, and sediment collection areas) must be provided. The basic elements of the maintenance requirements are presented in Table EDB-1.

**Table EDB-1—Extended Detention Basin Maintenance Considerations**

<b>Required Action</b>	<b>Maintenance Objective</b>	<b>Frequency of Action</b>
Lawn mowing and lawn care	Occasional mowing to limit unwanted vegetation. Maintain irrigated turf grass as 2 to 4 inches tall and nonirrigated native turf grasses at 4 to 6 inches.	Routine – Depending on aesthetic requirements.
Debris and litter removal	Remove debris and litter from the entire pond to minimize outlet clogging and improve aesthetics.	Routine – Including just before annual storm seasons (that is, April and May) and following significant rainfall events.
Erosion and sediment control	Repair and revegetate eroded areas in the basin and channels.	Nonroutine – Periodic and repair as necessary based on inspection.
Structural	Repair pond inlets, outlets, forebays, low flow channel liners, and energy dissipators whenever damage is discovered.	Nonroutine – Repair as needed based on regular inspections.

<b>Required Action</b>	<b>Maintenance Objective</b>	<b>Frequency of Action</b>
Inspections	Inspect basins to insure that the basin continues to function as initially intended. Examine the outlet for clogging, erosion, slumping, excessive sedimentation levels, overgrowth, embankment and spillway integrity, and damage to any structural element.	Routine – Annual inspection of hydraulic and structural facilities. Also check for obvious problems during routine maintenance visits, especially for plugging of outlets.
Nuisance control	Address odor, insects, and overgrowth issues associated with stagnant or standing water in the bottom zone.	Nonroutine – Handle as necessary per inspection or local complaints.
Sediment removal	Remove accumulated sediment from the forebay, micro-pool, and the bottom of the basin.	Nonroutine – Performed when sediment accumulation occupies 20 percent of the WQCV. This may vary considerably, but expect to do this every 10 to 20 years, as necessary per inspection if no construction activities take place in the tributary watershed. More often if they do. The forebay and the micro-pool will require more frequent cleanout than other areas of the basin, say every 1 or 2 years.

root systems are recommended. Plant selection is crucial on roofs with intense wind and light such as roofs of skyscrapers or roofs that receive reflected solar radiation from other structures. Additionally, certain portions of the roof may experience more intense sunlight and or reflected heat, requiring additional care or irrigation system adjustments.

Care of the plants on a green roof will require the most attention during the critical establishment phase. A horticultural professional should work with individuals caring for the new roof to organize schedules and routines for hand weeding, thinning, pruning, fertilizing, irrigation system scheduling and adjustments, and plant replacement. Watering and weeding are particularly important for the first two years of the green roof. For overall health of the green roof, weeds should be identified and removed early and often.

If the growing medium needs to be replaced, it should be replaced in accordance with the original design specifications, unless these specifications have been identified as a cause of poor plant growth or green roof performance. Any substitutions or adjustments to the original green roof media must be balanced carefully to meet loading limits, drainage requirements, and characteristics conducive to healthy plant growth.

When caring for plants or adjusting growing media, care should be taken to avoid use of materials likely to result in nutrient export from the green roof. For example, growing media and compost should have a low phosphorus index (P index). Appropriate plants with low fertilization requirements should be chosen. If used, fertilizer application should be minimized to levels necessary only for plant health.

### **6.3 Irrigation Scheduling and Maintenance**

Green roofs in Colorado should be equipped with irrigation systems, even if the ultimate goal is for the plants to rely primarily on natural precipitation. Irrigation schedules should be based on the evapotranspiration (ET) requirements of the plants, the type of irrigation system used (e.g., drip or spray), and changing ET over the growing season. Irrigation systems equipped with advanced irrigation controllers based on soil moisture can help facilitate watering according to the changing water needs of the plants. If advanced systems are not used, irrigation should be manually adjusted during the growing season to replace water lost through ET. During the first two years of plant establishment, regular irrigation will likely be needed. After plant establishment, it may be possible to reduce supplemental irrigation during non-drought conditions.

Completely drain the irrigation system before the first winter freeze each year. Upon reactivation of the irrigation system in the spring, inspect all components and replace damaged parts, as needed.

## **7.0 Extended Detention Basins (EDBs)**

EDBs have low to moderate maintenance requirements on a routine basis, but may require significant maintenance once every 15 to 25 years. Maintenance frequency depends on the amount of construction activity within the tributary watershed, the erosion control measures implemented, the size of the watershed, and the design of the facility.

### **7.1 Inspection**

Inspect the EDB at least twice annually, observing the amount of sediment in the forebay and checking for debris at the outlet structure.

## 7.2 Debris and Litter Removal

Remove debris and litter from the detention area as required to minimize clogging of the outlet.

## 7.3 Mowing and Plant Care

When starting from seed, mow native/drought tolerant grasses only when required to deter weeds during the first three years. Following this period, mowing of native/drought tolerant grass may stop or be reduced to maintain a height of no less than 6 inches (higher mowing heights are associated with deeper roots and greater drought tolerance). In general, mowing should be done as needed to maintain appropriate height and control weeds. Mowing of manicured grasses may vary from as frequently as weekly during the summer, to no mowing during the winter. See Section 4 of this chapter for additional recommendations from the CSU Extension.

## 7.4 Aeration

For EDBs with manicured grass, aeration will supply the soil and roots with air and increase infiltration. It reduces soil compaction and helps control thatch while helping water move into the root zone. Aeration is done by punching holes in the ground using an aerator with hollow punches that pull the soil cores or "plugs" from the ground. Holes should be at least 2 inches deep and no more than 4 inches apart.

Aeration should be performed at least once per year when the ground is not frozen. Water the turf thoroughly prior to aeration. Mark sprinkler heads and shallow utilities such as irrigation lines and cable TV lines to ensure those lines will not be damaged. Avoid aerating in extremely hot and dry conditions. Heavy traffic areas may require aeration more frequently.

## 7.5 Mosquito Control

Although the design provided in this manual implements practices specifically developed to deter mosquito breeding, some level of mosquito control may be necessary if the BMP is located in close proximity to outdoor amenities. The most effective mosquito control programs include weekly inspection for signs of mosquito breeding with treatment provided when breeding is found. These inspections can be performed by a mosquito control service and typically start in mid-May and extend to mid-September. Treatment should be targeted toward mosquito larvae. Mosquitoes are more difficult to control when they are adults. This typically requires neighborhood fogging with an insecticide.

The use of larvicidal briquettes or "dunks" may be appropriate. These are typically effective for about one month and perform best when the basin has a hard bottom (e.g., concrete lined micropool).

### Facts on Mosquito Breeding

Although mosquitoes prefer shallow, stagnant water, they can breed within the top 6 to 8 inches of deeper pools.

Mosquitoes need nutrients and prefer shelter from direct sunlight.

Mosquitoes can go from egg to adult within 72 hours.

The most common mosquitoes in Colorado include the *Aedes Vexans* and the *Culex Tarsalis*. Both have similar needs for breeding and development.

## **7.6 Irrigation Scheduling and Maintenance**

Adjust irrigation throughout the growing season to provide the proper irrigation application rate to maintain healthy vegetation. Less irrigation is typically needed in early summer and fall, with more irrigation needed during July and August. Native grass and other drought tolerant plantings should not require irrigation after establishment.

Check for broken sprinkler heads and repair them, as needed. Completely drain the irrigation system before the first winter freeze each year. Upon reactivation of the irrigation system in the spring, inspect all components and replace damaged parts, as needed.

## **7.7 Sediment Removal from the Forebay, Trickle Channel, and Micropool**

Remove sediment from the forebay and trickle channel annually. If portions of the watershed are not developed or if roadway or landscaping projects are taking place in the watershed, the required frequency of sediment removal in the forebay may be as often as after each storm event. The forebay should be maintained in such a way that it does not provide a significant source of resuspended sediment in the stormwater runoff.

Sediment removal from the micropool is required about once every one to four years, and should occur when the depth of the pool has been reduced to approximately 18 inches. Small micropools may be vacuumed and larger pools may need to be pumped in order to remove all sediment from the micropool bottom. Removing sediment from the micropool will benefit mosquito control. Ensure that the sediment is disposed of properly and not placed elsewhere in the basin.

## **7.8 Sediment Removal from the Basin Bottom**

Remove sediment from the bottom of the basin when accumulated sediment occupies about 20% of the water quality design volume or when sediment accumulation results in poor drainage within the basin. The required frequency may be every 15 to 25 years or more frequently in basins where construction activities are occurring.

## **7.9 Erosion and Structural Repairs**

Repair basin inlets, outlets, trickle channels, and all other structural components required for the basin to operate as intended. Repair and vegetate eroded areas as needed following inspection.

## **8.0 Sand Filters**

Sand filters have relatively low routine maintenance requirements. Maintenance frequency depends on pollutant loads in runoff, the amount of construction activity within the tributary watershed, the erosion control measures implemented, the size of the watershed, and the design of the facility.

### **8.1 Inspection**

Inspect the detention area once or twice annually following precipitation events to determine if the sand filter is providing acceptable infiltration. Also check for erosion and repair as necessary.

## **8.2 Debris and Litter Removal**

Remove debris and litter from detention area to minimize clogging of the media. Remove debris and litter from the overflow structure.

## **8.3 Filter Surface Maintenance**

Scarify the top 2 inches of sand on the surface of the filter. This may be required once every two to five years depending on observed drain times. After this has been done two or three times, replenish the top few inches of the filter with clean coarse sand (AASHTO C-33 or CDOT Class C filter material) to the original elevation. Maintain a minimum sand depth of 12 inches. Eventually, the entire sand layer may require replacement.

## **8.4 Erosion and Structural Repairs**

Repair basin inlets, outlets, and all other structural components required for the BMP to operate as intended. Repair and vegetate any eroded side slopes as needed following inspection.

# **9.0 Retention Ponds and Constructed Wetland Ponds**

## **9.1 Inspection**

Inspect the pond at least annually. Note the amount of sediment in the forebay and look for debris at the outlet structure.

## **9.2 Debris and Litter Removal**

Remove debris and litter from the pond as needed. This includes floating debris that could clog the outlet or overflow structure.

## **9.3 Aquatic Plant Harvesting**

Harvesting plants will permanently remove nutrients from the system, although removal of vegetation can also resuspend sediment and leave areas susceptible to erosion. Additionally, the plants growing on the safety wetland bench of a retention pond help prevent drowning accidents by demarking the pond boundary and creating a visual barrier. For this reason, UDFCD does not recommend harvesting vegetation completely as routine maintenance. However, aquatic plant harvesting can be performed if desired to maintain volume or eliminate nuisances related to overgrowth of vegetation. When this is the case, perform this activity during the dry season (November to February). This can be performed manually or with specialized machinery.

If a reduction in cattails is desired, harvest them annually, especially in areas of new growth. Cut them at the base of the plant just below the waterline, or slowly pull the shoot out from the base. Cattail removal should be done during late summer to deprive the roots of food and reduce their ability to survive winter.

## 4.0 Grass Buffers and Swales

Grass buffers and swales require maintenance of the turf cover and repair of rill or gully development. Healthy vegetation can often be maintained without using fertilizers because runoff from lawns and other areas contains the needed nutrients. Periodically inspecting the vegetation over the first few years will help to identify emerging problems and help to plan for long-term restorative maintenance needs. This section presents a summary of specific maintenance requirements and a suggested frequency of action.



**Photograph 6-2.** A lack of sediment removal in this grass swale has resulted in a grade change due to growth over the deposition and ponding upstream.

### 4.1 Inspection

Inspect vegetation at least twice annually for uniform cover and traffic impacts. Check for sediment accumulation and rill and gully development.

### 4.2 Debris and Litter Removal

Remove litter and debris to prevent rill and gully development from preferential flow paths around accumulated debris, enhance aesthetics, and prevent floatables from being washed offsite. This should be done as needed based on inspection, but no less than two times per year.

### 4.3 Aeration

Aerating manicured grass will supply the soil and roots with air. It reduces soil compaction and helps control thatch while helping water move into the root zone. Aeration is done by punching holes in the ground using an aerator with hollow punches that pull the soil cores or "plugs" from the ground. Holes should be at least 2 inches deep and no more than 4 inches apart.

Aeration should be performed at least once per year when the ground is not frozen. Water the turf thoroughly prior to aeration. Mark sprinkler heads and shallow utilities such as irrigation lines and cable TV lines to ensure those lines will not be damaged. Avoid aerating in extremely hot and dry conditions. Heavy traffic areas may require aeration more frequently.

### 4.4 Mowing

When starting from seed, mow native/drought-tolerant grasses only when required to deter weeds during the first three years. Following this period, mowing of native/drought tolerant grass may stop or be reduced to maintain a length of no less than six inches. Mowing of manicured grasses may vary from as frequently as weekly during the summer, to no mowing during the winter. See the inset for additional recommendations from the CSU Extension.

#### 4.5 Irrigation Scheduling and Maintenance

Adjust irrigation schedules throughout the growing season to provide the proper irrigation application rate to maintain healthy vegetation. Less irrigation is typically needed in early summer and fall, with more irrigation needed during July and August. Native grass should not require irrigation after establishment, except during prolonged dry periods when supplemental, temporary irrigation may aid in maintaining healthy vegetation cover. Check for broken sprinkler heads and repair them, as needed. Do not overwater. Signs of overwatering and/or broken sprinkler heads may include soggy areas and unevenly distributed areas of lush growth.

Completely drain and blowout the irrigation system before the first winter freeze each year. Upon reactivation of the irrigation system in the spring, inspect all components and replace damaged parts, as needed.

#### 4.6 Fertilizer, Herbicide, and Pesticide Application

Use the minimum amount of biodegradable nontoxic fertilizers and herbicides needed to establish and maintain dense vegetation cover that is reasonably free of weeds. Fertilizer application may be significantly reduced or eliminated by the use of mulch-mowers, as opposed to bagging and removing clippings. To keep clippings out of receiving waters, maintain a 25-foot buffer adjacent to open water areas where clippings are bagged. Hand-pull the weeds in areas with limited weed problems.

Frequency of fertilizer, herbicide, and pesticide application should be on an as-needed basis only and should decrease following establishment of vegetation. See BMP Fact Sheet S-8 in Chapter 5 for additional information. For additional information on managing vegetation in a manner that conserves water and protects water quality, see the 2008 *GreenCO Best Management Practices Manual* ([www.greenco.org](http://www.greenco.org)) for a series of Colorado-based BMP fact sheets on topics such as irrigation, plant care, and soil amendments.

#### CSU Extension Recommendations for Mowing Manicured Turf (Source: T. Koski and V. Skinner, 2003)

The two most important facets of mowing are mowing height and frequency. The minimum height for any lawn is 2 inches. The preferred mowing height for all Colorado species is 2.5 to 3 inches. Mowing to less than 2 inches can result in decreased drought and heat tolerance and higher incidence of insects, diseases and weeds. Mow the lawn at the same height all year. There is no reason to mow the turf shorter in late fall.

Mow the turf often enough so no more than 1/3 of the grass height is removed at any single mowing. If your mowing height is 2 inches, mow the grass when it is 3 inches tall. You may have to mow a bluegrass or fescue lawn every three to four days during the spring when it is actively growing but only once every seven to 10 days when growth is slowed by heat, drought or cold. Buffalograss lawns may require mowing once every 10 to 20 days, depending on how much they are watered.

If weather or another factor prevents mowing at the proper time, raise the height of the mower temporarily to avoid cutting too much at one time. Cut the grass again a few days later at the normal mowing height.

## 4.7 Sediment Removal

Remove sediment as needed based on inspection. Frequency depends on site-specific conditions. For planning purposes, it can be estimated that 3 to 10% of the swale length or buffer interface length will require sediment removal on an annual basis.

- **For Grass Buffers:** Using a shovel, remove sediment at the interface between the impervious area and buffer.
- **For Grass Swales:** Remove accumulated sediment near culverts and in channels to maintain flow capacity. Spot replace the grass areas as necessary.

Reseed and/or patch damaged areas in buffer, sideslopes, and/or channel to maintain healthy vegetative cover. This should be conducted as needed based on inspection. Over time, and depending on pollutant loads, a portion of the buffer or swale may need to be rehabilitated due to sediment deposition. Periodic sediment removal will reduce the frequency of revegetation required. Expect turf replacement for the buffer interface area every 10 to 20 years.

## 5.0 Bioretention (Rain Garden or Porous Landscape Detention)

The primary maintenance objective for bioretention, also known as porous landscape detention, is to keep vegetation healthy, remove sediment and trash, and ensure that the facility is draining properly. The growing medium may need to be replaced eventually to maintain performance. This section summarizes key maintenance considerations for bioretention.

### 5.1 Inspection

Inspect the infiltrating surface at least twice annually following precipitation events to determine if the bioretention area is providing acceptable infiltration. Bioretention facilities are designed with a maximum depth for the WQCV of one foot and soils that will typically drain the WQCV over approximately 12 hours. If standing water persists for more than 24 hours after runoff has ceased, clogging should be further investigated and remedied. Additionally, check for erosion and repair as necessary.

### 5.2 Debris and Litter Removal

Remove debris and litter from the infiltrating surface to minimize clogging of the media. Remove debris and litter from the overflow structure.

### 5.3 Mowing and Plant Care

- **All vegetation:** Maintain healthy, weed-free vegetation. Weeds should be removed before they flower. The frequency of weeding will depend on the planting scheme and cover. When the growing media is covered with mulch or densely vegetated, less frequent weeding will be required.
- **Grasses:** When started from seed, allow time for germination and establishment of grass prior to mowing. If mowing is required during this period for weed control, it should be accomplished with hand-held string trimmers to minimize disturbance to the seedbed. After established, mow as desired or as needed for weed control. Following this period, mowing of native/drought tolerant grasses may stop or be reduced to maintain a length of no less than 6 inches. Mowing of manicured grasses may vary from as frequently as weekly during the summer, to no mowing during the winter. See Section 4.4 for additional guidance on mowing.