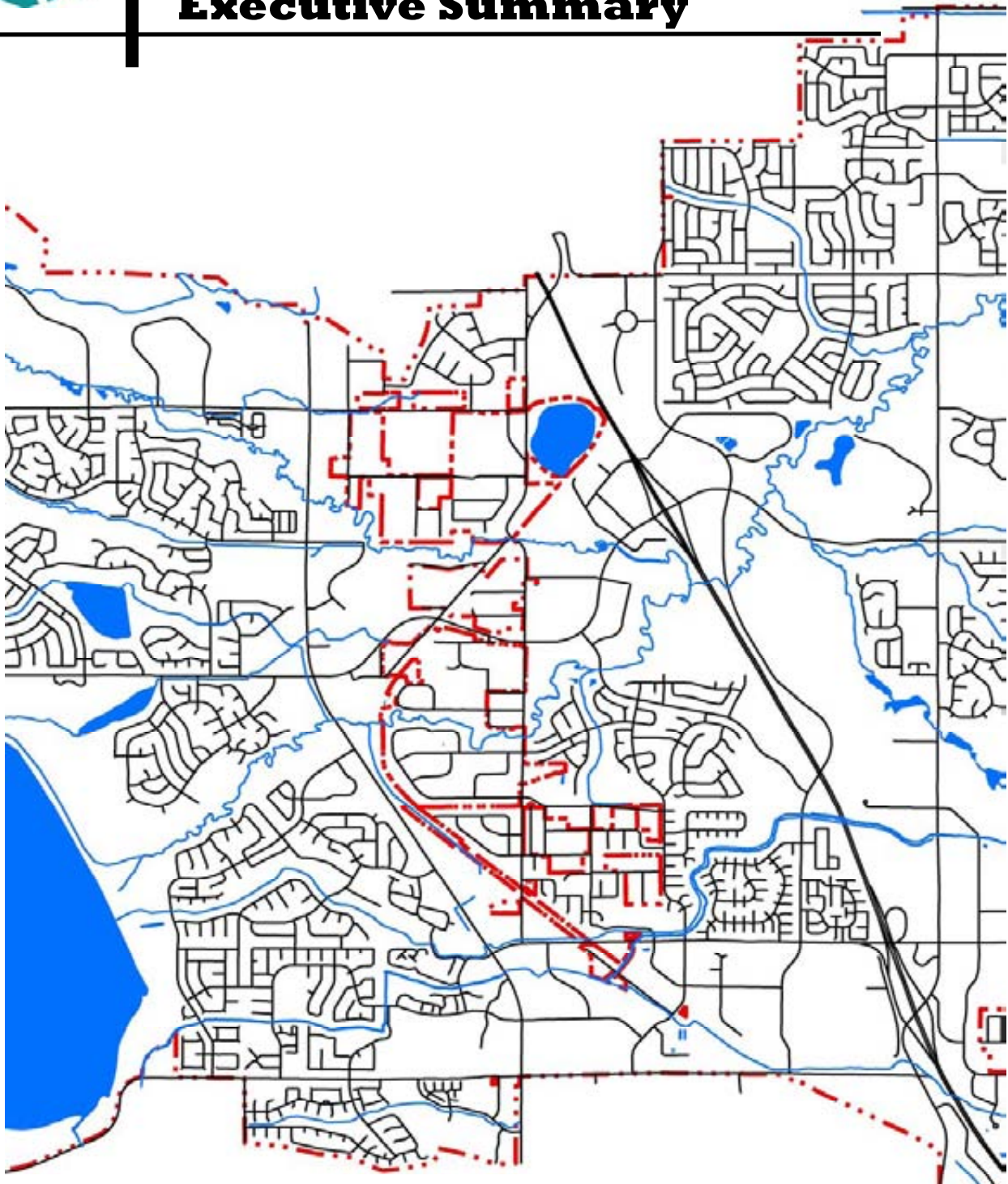




City of Westminster 2007 Storm Drainage Study Executive Summary



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Executive Summary

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The City of Westminster

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Introduction

As a condition of approving the 2008 budget and the increase in the stormwater fee from \$1.50 to \$3.00 per 3,100 square feet (SF) of impervious area, the City issued a request for proposal to engineering companies to evaluate the City’s storm drainage system. This Executive Summary is the culmination of that effort, and allows the City to prioritize projects that mitigate the greatest risk of flooding, determine the associated cost estimates, and develop a schedule to complete these projects.

Background Information

The stormwater utility fee was established in 2001 to address the City’s storm drainage system maintenance and improvements without relying on General Fund appropriations that compete with street improvement projects, parks and recreation projects, and other capital improvement projects. In addition to capital improvement needs and maintenance costs, the stormwater utility fee funds the requirements of the federal stormwater quality mandates of the National Pollutant Discharge Elimination System (NPDES) program.

Many local and regional based storm drainage construction projects have been completed, but there are still many projects and activities that need to be addressed to adequately provide for the health, safety, and welfare of the citizens. The City of Westminster currently charges the lowest single family residential stormwater specific fee at \$1.50 and the fourth lowest non-single family residential fee at \$0.48 per 1,000 square feet of impervious area compared to other Colorado municipalities that charge stormwater specific fees. The approved 2008 fee of \$3.00 for single family residential property and \$0.97 per 1,000 square feet of impervious area on non-single family property would still keep Westminster’s fees well below the average fees of other municipalities. The average fee charged by cities assuming a \$3.00 fee in Westminster would be \$5.29 for single family property and \$1.68 for non-single family property. The following tables sort the communities by descending fees:

Single Family Monthly Fee:	
Community	Single Family Monthly Fee
Ft. Collins	\$14.26
Loveland	\$10.00
Denver	\$7.62
Boulder	\$6.55
Aurora	\$5.18
Longmont	\$5.03
Parker	\$5.00
Arvada	\$4.40
Greeley	\$3.75
Golden	\$3.20
Federal Heights	\$3.15
2008 FEE	\$3.00
Northglenn	\$2.00
Littleton	\$2.00
Lakewood	\$1.98
Average Fee	\$5.29

Non-Single Family Monthly Fee: (\$/1,000 SF impervious area)	
Community	Non-Single Family Monthly Fee
Aurora	\$5.18
Ft. Collins	\$3.96
Denver	\$3.10
Federal Heights	\$1.62
Golden	\$1.60
Loveland	\$1.45
Arvada	\$1.41
Parker	\$1.34
Greeley	\$1.11
2008 FEE	\$0.97
Lakewood	\$0.88
Boulder	\$0.83
Northglenn	\$0.46
Littleton	\$0.36
Longmont	\$0.25
Average Fee	\$1.68



Purpose

The purpose of the 2007 City of Westminster Storm Drainage Study is to identify drainage improvement needs throughout the City of Westminster, to assess the relative priority of the projects, to estimate costs for construction and maintenance, and to relate the potential annual program costs to revenues from the City's stormwater utility fee. This Executive Summary communicates the results to the City Council, the public, and staff. The Executive Summary includes summaries of cost data, descriptions of the processes used in the study approach, summaries of the results, and a hard-copy fold-out map that documents the current channel conditions. An attached Appendix includes detailed information supporting the study's findings. In addition to the attached Appendix a more detailed technical Appendix resides with the City's Department of Community Development. This Appendix includes cost back up information and all of the study's findings.

The objective of the construction and maintenance cost estimates is to provide accurate cost data to support the drainage fee structure, and develop a projected build-out rate to complete the capital improvement program. The cost data is to be used by the City in conjunction with administrative costs, stormwater management program costs, and other costs to gauge the level of services provided by the current and proposed fee structure.

Results

The study results show that the Stormwater Program with the 2008 level of service and fee (\$3.00 per month per single family residence) will accomplish a capital improvement program build-out of approximately 36-years. For the purposes of this study, build-out is simply the total estimated capital needs identified in 2007 dollars divided by annual capital expenditures. Actual build-out conditions will depend of rates on inflation, actual project costs, the need for additional projects, and a variety of other factors. Funding stormwater-related maintenance operations performed by the Parks, Recreation and Libraries Department (Park Services Division) would require shifting funds out of the capital improvement program and increasing the build-out period to approximately 40-years. The current fee of \$1.50 based on the 2007 adopted program costs would result in a capital improvement program build-out of 52-years even without funding Park Services Division maintenance. A complete breakdown of the program costs, fees, and build-out period is shown on page 13 of this report.

Study Process

A wealth of data was assembled in the process of evaluating drainageways and drainage projects, creating cost information, prioritizing projects, and documenting maintenance responsibilities. In addition to the hard copies of this report and appendix are the Geographic Information Systems (GIS)-based mapping efforts that have been created as part of this study. Much of the data gathered will be made available in a database and linked interactively to the City's computer mapping. The GIS mapping will help the City efficiently monitor and maintain the various services provided by the Stormwater Program.

Task One Description – Develop and Prioritize Drainage Projects:

A major portion of the Westminster Storm Drainage Study consisted of stream inspections to observe and document the actual condition of the major drainageways within the City of Westminster. In order to accurately document the condition of the drainageways it was necessary to review and summarize the recommended improvements made by Master Plan studies for each



major drainageway within the City of Westminster. The costs of the recommended improvements given in these studies were summarized in the categories of drainageway improvements, culverts, regional detention facilities, utility relocation, land purchases, and contingencies for other miscellaneous costs such as engineering and administrative costs.

Some of the Master Plan studies date as far back as 1979, so the outdated improvement costs from the studies were adjusted to reflect the current 2007 construction costs using a construction cost index for the Denver Metro area published by McGraw–Hill. *Appendix A* provides a cost breakdown of the various Master Plan improvement categories adjusted forward to 2007 costs.

The complete package of improvements recommended in the Master Plans totals \$134.0M. Of this, a portion has already been constructed and other portions require reassessment to insure the Master Plan recommendations are appropriate for 2007 conditions. This re-evaluation of Master Plan recommendations was undertaken as part of this study. The re-evaluation steps are listed in the following paragraphs.

Muller Engineering Company staff walked every major drainageway within the City of Westminster. The actual condition of the 68 miles of drainageways was observed and noted in Stream Inspection Inventory forms. The inventory forms were used to document stream conditions such as flow rate, channel dimensions, vegetation, erosion severity, infrastructure damage, and water quality treatment. Pictures shown on pages 3 and 4 of this report demonstrate the levels of erosion and stream conditions cataloged during the stream inspections. A sample of actual Stream Inspection Inventory forms for Westminster channels observed to be experiencing severe, moderate, and minor erosion are included in *Appendix A*. The forms contain observations, comments, and associated pictures to clarify the overall intent of the inspection portion of this study. Inspection forms for all of the major



Severe Erosion – Little Dry Creek



Moderate Erosion – Little Dry Creek Tributary B



Minor Erosion – Standley Lake Trib. 4



Westminster drainageways will also be linked to the City’s GIS mapping to monitor the changing conditions of the drainage system throughout Westminster.

Master Plan recommendations were compared to the actual condition of the various stream reaches to identify areas that were in need of improvements. It was observed that approximately 39% of the major drainageways have been improved or constructed according to Master Plan recommendations and are functioning properly. It was also observed that approximately 22% of the Westminster drainageways are still in their natural condition and at the present time are stable and not in need of major improvements. The remaining 39% of drainageways are in need of some sort of improvements to prevent further erosion and protect existing utilities. The channels that are in need of some sort of rehabilitation were rated based on their level of erosion, ranging from minor to severe erosion. In some cases severe erosion was observed to have caused utility lines, such as sanitary sewer mains, to be exposed. Exposed utility lines were noted in the inspection forms, since the repair of these areas is of generally high priority and increased costs are often involved with relocating or protecting the utilities during rehabilitation construction projects.

The next step involved deriving a total present day cost to rehabilitate the eroded channels. Channels were grouped together in three different categories based on their respective basin size: primary channels having a contributing basin larger than 1 square mile (640 acres), secondary channels having a basin ranging in size from 1 square mile to 130 acres, and tertiary channels having a contributing basin smaller than 130 acres. A series of costs were then generated from past channel capital improvement project experience and cost data. These costs were broken down for each channel size based on the severity of erosion. Costs ranged from lowest (\$50/Linear Foot (LF) of channel rehabilitated) for tertiary channels with minor erosion problems to highest (\$400/LF of channel rehabilitated) for primary channels with severe erosion problems. In some cases the current natural active channel was observed to be functioning properly, however, future development will increase runoff rates. This increased runoff will necessitate channel improvements according to the Master Plan recommendations. Costs for these channel reaches were included in the total rehabilitation costs. The total stream rehabilitation costs based on the size of channel and the type of improvements needed was estimated to be approximately \$54.6M.



Naturally Stable Channel – Ranch Creek



Engineered (Constructed) Stable Channel – Middle Branch Hylands Creek



During the field studies it was noted that a number of culvert crossings and regional detention facilities had not been upgraded to meet the recommendations of the Master Plans. The construction costs for these culverts and regional detention facilities were also summarized. These costs were derived from the adjusted Master Plan costs. It was determined that upgrading culvert crossings to meet the Master Plan recommendations will amount to \$14.6M. The cost for implementing regional detention facility improvements comes to \$5.3M. In total, the costs for rehabilitating the drainageways, installing recommended culverts, and implementing regional detention facility improvements amounts to \$74.5M. It should be mentioned that a portion of the total costs associated with improving the drainageways according to the Master Plan recommendations can be shared with other governmental agencies such as Jefferson County, Adams County, and Urban Drainage and Flood Control District (UDFCD). A portion of the capital improvement costs may also be shared by developers for channels that currently pass through undeveloped properties. Please refer to *Appendix A* for the lists of costs associated with rehabilitating drainageways, constructing recommended culvert crossings, and constructing regional detention facilities according to Master Plan recommendations.

Eleven additional drainage projects were identified by the City as requiring improvements. Sixteen high maintenance areas were also defined. Each of these sites was visited to determine if the field conditions presented a solution. Costs were prepared for the areas where problems and solutions were obvious. Further study, consisting of calculating of 5-year and 100-year runoff rates, was completed for several of the sites to develop solutions and costs for those projects. A spreadsheet showing the locations of these areas, an identifier, and the solution with costs is included in *Appendix D* of this report. Including the identified costs of \$468,000 for these additional projects the total capital improvement costs amount to \$75.0M.

General Drainage Philosophy

For the purposes of this study, channels were observed, documented, and then classified based on the current conditions. These conditions can and will change overtime. A stable channel, whether engineered or not can destabilize and begin to erode. This erosion in an urban area can threaten infrastructure such as roadways, sanitary sewers, and other important utilities. The failure of these types of utilities can be detrimental to the health and welfare of the City's citizens. As in the past, the City of Westminster will continue to place high priority on drainage improvement projects which aim to protect threatened infrastructure.

While many of the drainageways are directed through urban areas, a large portion of the City's drainageways were found to be in open space. The majority of these open space channels are in their natural condition and experiencing erosion. As areas adjacent to the open space drainageways urbanize the natural flow characteristics of the drainageway change drastically. The peak flows in the channel are much higher due to the addition of impervious areas such as roads and parking lots. Though flooding damage caused by these higher flows may not be as significant of an issue in an open space environment there are still negative impacts. The increased flows cause streambed degradation, channel widening, and stream bank erosion. The increase in erosion causes bank instability and affects the stream water quality. The federal stormwater quality requirements of the NPDES program call for the use of best management practices to remove pollutants, suspended solids, and sediment from stormwater discharge points, such as storm sewers, however it should be mentioned that a greater quantity of sediment can be generated from an eroding channel than from urban runoff. This sediment can endanger



fish, wildlife, and other aquatic life. In an effort to meet and exceed the requirements of the NPDES program the City of Westminster is continuously evaluating the condition and stability of drainageways located in the City's open space corridors. Further study and assessment may be warranted to monitor and determine the stability of these channels. Through the use of the GIS mapping and stream inspections created as part of this study the City will continue to monitor these open space channels.

As mentioned the NPDES program calls for the use of best management practices to remove pollutants, suspended solids, and sediment from stormwater being discharged into drainageways. One of the most common best management practices used for the treatment of stormwater is a water quality pond. These ponds capture stormwater and hold it for an extended period of time allowing pollutants to settle out of the stormwater before the water is released into a drainageway. The City of Westminster and UDFCD have gone through great lengths to enforce requirements on new development calling for the use of best management practices to treat stormwater. The costs for implementing the best management practices in new development are commonly the responsibility of the developer. However sometimes it is in the best interests of the City to participate in the creation of a regional water quality pond which can be integrated into the community as a park or natural area.

The City is also going through efforts to improve water quality in areas that were developed prior to the water quality requirements of the NPDES program. For example, the Little Dry Creek drainage basin is nearly entirely developed with a large majority developed prior to water quality requirements. Therefore, any redevelopment that occurs should include water quality treatment measures. Frequently this water quality treatment, in both new development and redevelopment, can result in the creation of many smaller ponds that are often tucked into the corner of the development and are hard to maintain. When possible, the City of Westminster coordinates with developers to create regional water quality ponds. One such area the City has already identified is adjacent to the proposed Transit Oriented District south of 72nd Avenue between Federal Boulevard and Lowell Boulevard. A water quality pond located just upstream of Little Dry Creek could be very beneficial to stream quality as Little Dry Creek exits the City of Westminster.

Priority Ranking

The completed Stream Inspection Inventory forms and the general knowledge gained during the extensive drainageway inspection and inventory process was used to identify the relative priority of the various channel reaches. The purpose of this exercise was to determine individual projects or channel reaches currently most in need of work. The ranking exercise consisted of rating the channel reaches according to the categories of public health and safety, protection of infrastructure, severity of erosion, population served by a project, and availability of additional funding. Each of these categories was assigned a numerical rating between 1 and 4, with 4 indicating that a project has the highest of priority in that specific category, and 1 indicating that a project has the lowest priority. A priority multiplier was then used to place greater emphasis on categories that were deemed to have the most importance such as public health and safety. The addition of the scores from the various ranking categories were then added together to determine an overall priority ranking. The highest scores were used to determine the ranking for individual projects and determine the ten highest in priority.



The entire ranking spreadsheet and ranking criteria are given in *Appendix B*. The top ten projects are listed in the following table:

Priority	Stream ⁴	Stream Reach Abbreviation	Reach Boundaries
1	McKay Drainageway ***	MCD-3 & 4	Huron St. to I-25 (Lowes Pond)
2	Little Dry Creek ***	LDC-6	Lowell Blvd. to Federal Blvd
3	Airport Creek	APC-2	Eaton St. to Big Dry Creek Confluence
4	South Branch Hylands Creek	SBHC-2	Sheridan Blvd. to 104th Ave
5	Middle Branch Hylands Creek	MBHC-2	102nd Pl. to Confluence w/ S. Branch H.C.
6	Ranch Creek	RC-3	120th Ave to Confluence w/ Big Dry Creek
7	Big Dry Creek	BDC-6	128th Ave. to I-25
8	Big Dry Creek	BDC-5	120th Ave. to 128th Ave.
9	Big Dry Creek	BDC-4	Sheridan Blvd. to 120th Ave.
10	Tanglewood Creek ***	TC-3	128th Ave to I-25

⁴: *** Indicates channel reaches where channel improvement costs may be shared with other governmental agencies such as counties, cities, or area development (UDFCD involvement is implied or encouraged in all projects)

Note: The No. 2 priority stream reach on Little Dry Creek lies outside of the City limits of Westminster. The City limits end directly upstream at Lowell Blvd. However the City of Westminster is the major land owner in this area. Please refer to *Appendix A* to view the stream inspection form for this reach of stream. Also, please refer to the included foldout map which includes the location of the ten highest priority drainage projects.

- **McKay Drainageway – Huron St. to Big Dry Creek**

The drainageway from Huron St. to I-25 is currently undersized to handle the increased runoff flows from recent upstream developments. Also no channel currently exists to direct flow from I-25 to Big Dry Creek. Flows from the undersized channel enter Lowes Pond which is located on the north-west corner of the I-25 and 136th Ave interchange. Currently no outlet exists for Lowes Pond. Design plans call for a new channel to outlet east across I-25 directing flows to Big Dry Creek. The new channel from I-25 to Big Dry Creek is located in the City of Thornton however the City of Westminster is responsible for paying the construction costs of the channel. The City of Thornton will repay their portion of the construction costs at a later time. Channel improvements for this reach are estimated to cost \$10.3M.



- **Little Dry Creek – Lowell Blvd. to Federal Blvd.**
This reach of stream is experiencing severe erosion which has exposed utilities (A recent project was undertaken to protect the exposed utilities). The erosion is also encroaching upon private properties. Houses were observed to be in close proximity with 10 to 15-foot eroded channel banks. The existing culverts and bridges through this reach of stream are undersized and do not allow for the passage of the design storm flow rates. Channel improvements for this reach are estimated to cost \$5.7M.
- **Airport Creek – Eaton St. to Big Dry Creek**
Severe erosion is progressing upstream from Big Dry Creek. This erosion has exposed a large sanitary sewer main line. The channel upstream of the sanitary sewer line is in a stable natural condition. Channel improvements for this reach are estimated to cost \$280K.
- **South Branch Hylands Creek – Sheridan Blvd. to 104th Ave**
The reach of channel from below the open space ponds to 104th Ave. is experiencing moderate to severe erosion. Sanitary sewer mains were found to be in close proximity to the eroding channel. Channel improvements for this reach are estimated to be \$1.2M.
- **Middle Branch Hylands Creek – 102nd Pl. to Confluence with S. Branch Hylands Creek**
The channel from Sheridan Blvd. to approximately 1500 feet downstream of Sheridan recently underwent a channel rehabilitation project due to a 104th Ave and Sheridan intersection improvement project. The channels upstream and downstream of this project were observed to be experiencing severe erosion. Sanitary sewer mains were found to be in close proximity to the eroding channel. Channel improvements for this reach are estimated to be \$570K.
- **Ranch Creek – 120th Ave to Big Dry Creek**
The channel reach from 120th Ave to N. Federal Blvd. was observed to be experiencing moderate erosion. The 120th Ave culvert was found to be undersized according to Master Plan recommendations. The wing walls for this culvert are failing due to channel erosion. Channel improvements for this reach are estimated to be \$812K.
- **Big Dry Creek – 128th Ave (Bull Canal Diversion) to Upstream of Huron St.**
The channel downstream of the Bull Canal Diversion was observed to be experiencing severe erosion. Vertical eroded banks were observed to be 7 to 10-feet high. Master Plans recommend that 128th Ave be raised to eliminate overtopping during a flood event. Channel improvements for this reach are estimated to be \$4.1M.
- **Big Dry Creek – 120th Ave to 128th Ave (Lake Erie Tributary 6 Confluence)**
The channel from 120th Ave to the confluence with Lake Erie Tributary 6 was observed to be experiencing severe erosion. Vertical eroded banks were found to be on the order of 12-feet high. The Broomfield waste water treatment plant discharges flows into Big Dry Creek along this reach of channel. The City of Westminster also has two sanitary sewer main lines in close proximity to the eroding channel. Master Plans recommend that the



Zuni St. bridge be replaced to eliminate overtopping during a flood event. Channel improvements for this reach are estimated to be \$5.6M.

- **Big Dry Creek – Sheridan Blvd. to 120th Ave**

Two portions of this reach were observed to be experiencing severe erosion. The channel from Sheridan to just downstream of North Cotton Creek and from Cozy Corner Tributary 4 to 120th Ave was observed to be degrading. The vertical eroded banks in both areas were found to be on the order of 8 to 12-feet high. The erosion was most evident on the outside of sharp bends. Sanitary sewer mains are in close proximity to the eroding channel. Channel improvements for the two reaches are estimated to be \$5.0M.

- **Tanglewood Creek – 128th Ave to I-25**

The reach of Tanglewood Creek in the vicinity of I-25 was observed to be experiencing severe erosion. Topography constricts the channel near the interstate causing eroded banks on the order of 6 to 10-feet high. The channel currently passes under I-25 through an undersized 48-inch wide reinforced concrete pipe. Master Plans recommend that this pipe be abandoned and that a new drainageway be created to direct Tanglewood Creek flows north to Big Dry Creek along the west side of I-25. The 128th Ave culvert was also found to be undersized according to Master Plan recommendations. Channel improvements for this reach are estimated to cost \$1.3M.

Task Two Description – Drainageway Maintenance:

The stormwater program costs are made up of two main categories – capital costs for new construction projects and maintenance costs to insure that capital investments are protected. The maintenance costs were anticipated to be developed from estimates of similar programs, but Westminster has provided extensive records of maintenance activities and costs, thus the actual costs were used to develop the maintenance program. As part of this task, the maintenance responsibilities are separated into several entities – Public Works and Utilities (Streets Division), Parks, Recreation and Libraries (Park Services Division), City of Westminster Golf Courses, private entities, and Urban Drainage and Flood Control District (UDFCD). A detailed list of the maintenance responsibilities for each reach of drainageway can be found in *Appendix C*. A foldout map has also been included to graphically convey drainageway maintenance responsibility. The maintenance responsibilities are also linked to the GIS mapping system so that responsibilities including costs are easily accessible and modifiable.

The current 2007 adopted Stormwater Program budget provides \$100,000 to the Streets Division for maintenance of drainage facilities located in and around roadways. The majority of this funding is used to hire independent contractors for services such as storm sewer inlet and outfall cleaning. Streets Division personnel annually inspect one third of the over 1600 storm sewer inlets within the City of Westminster. The adopted 2008 budget with the increased stormwater utility fee provides the Streets Division with \$360,400. Much of this increase in budget can be attributed to the transfer of street sweeping services (\$240,000) into the Stormwater Program services.

A vital part of any drainage system is the underground network of storm sewer pipes that route stormwater from developments and roadways to drainageways. Over 157 miles of storm sewer lines exist within the City of Westminster and over time these pipe lines degrade and eventually



fail. As it currently stands the replacement or rehabilitation of these failing lines is the responsibility of the Streets Division. It is anticipated that as the storm sewer infrastructure ages, funding for the replacement of the lines will become more and more of a priority. It is foreseeable that capital improvement funds from the Stormwater Program could be directed towards the replacement of storm sewer lines after the drainageway capital improvements have been completed.

During the stream inspection portion of this study it was noted that a large portion of the drainageways and regional detention facilities within Westminster are in or near parks, green belts, and open space which the citizens regularly use. All of these areas require some level of regular maintenance to ensure that the facilities function as planned. Some of the maintenance responsibilities belong to Homeowners Associations (HOAs), commercial organizations, and management companies however the City of Westminster is responsible for maintaining the majority of the drainage facilities. Currently the 2007 and 2008 adopted budgets do not include any appropriations from the Stormwater Program for maintenance services provided by the Park Services Division. A detailed list of the services that the Park Services Division provides was generated for the study. This list totals \$549,500 annually in drainage related maintenance. A large portion of these costs are associated with general channel maintenance such as mowing and trash removal, and periodic major maintenance such as sediment removal from culverts or detention ponds. The list also included some minor costs for storm sewer outfall maintenance, detention pond maintenance, mosquito control for detention facilities located throughout the drainage system, and water quality pond maintenance. All of these costs are currently absorbed into the Park Services Division budget. According to the Park Services Division much of the current major maintenance operations are on the reactionary level. If appropriations from the Stormwater Program were to be made to the Park Services Division, crews would be able to provide more of a preventative maintenance for the drainage facilities. In the long run this would serve to reduce major rehabilitation costs and protect investments that the City has made in the drainage system. Please refer to *Appendix C* for a complete list of the Park Services Division drainage facility maintenance costs and also a list of the regional detention facilities, many of which the City is responsible for maintaining.

For the purposes of the stormwater utility fee analysis it was determined that the City wishes to consider the effects of funding a portion of the total maintenance activities that the Park Services Division provides. It was determined that this utility fee analysis should take into consideration the impact of allocating \$200,000 per year from the Stormwater Program to the Park Services Division for maintenance operations.

Urban Drainage and Flood Control District (UDFCD) Contributions

The UDFCD is an independent agency that is governed by a twenty-three member board of directors, with the goal of assisting local governments in the Denver metropolitan area with multi-jurisdictional drainage and flood control issues. UDFCD covers an area of 1608 square miles and includes Adams and Jefferson Counties as well as five other counties. UDFCD funds and operates four main programs: Master Planning; Design, Construction and Maintenance; Floodplain Management, and Information Services and Flood Warning. Funds for these programs come from four different property tax mill levies. The total mill levies cannot exceed one mill. In 2006, UDFCD levied a 0.608 mill for both Adams and Jefferson Counties.



The UDFCD contributions for Design, Construction, and Maintenance program were the main focus of this study. The first portion of this program deals specifically with the design and construction of master planned projects. All funding provided by UDFCD for the design and construction of a project was considered to be used as matching funds for the City of Westminster stormwater capital improvement program. In order for UDFCD to provide funds for the design and construction of a project the proposed improvements must be requested by the City, the proposed improvements must have been master planned, the UDFCD funds must be matched by the City, and the City must agree to own the completed facilities and accept primary responsibility for their maintenance.

The second portion of the UDFCD program deals with the maintenance of a stormwater facility. The maintenance program is divided into three types of activities: routine, restoration and rehabilitation. Routine maintenance consists of mowing native vegetation, trash and debris cleanup, including trash rack cleaning, weed control, and minor re-vegetation efforts. Restoration work is site-specific construction work to repair isolated drainageway problems. Types of restoration projects include detention pond mucking, tree thinning, local erosion repair, and local channel grading, shaping, and stabilization. Rehabilitation projects are major design and construction efforts that are intended to rebuild and reestablish existing drainage facilities that have been damaged or neglected such that structural problems have developed. Examples include reconstructing or replacing drop structures, building low flow or trickle channels, establishing maintenance access into drainageways, and providing protection for existing channel improvements. For the purposes of this study rehabilitation projects are considered to be capital improvement projects due to the severity and size of projects that are typically associated with rehabilitating a drainageway.

In reviewing the UDFCD proposed capital improvements program for 2006 to 2010 it was determined that the City of Westminster is to receive \$1.95M over this five year time frame. That averages to \$395,000 per year in funds directed towards the City of Westminster stormwater capital improvement program. In addition to this funding, the 2007 UDFCD maintenance program list approximately \$400,000 of rehabilitation work for channel and drop structure repair. On average UDFCD provides \$795,000 per year in funding for projects that are needed in the capital improvement program. It should be noted that while the study looks at the effects of an average yearly contribution from UDFCD the actual amount does vary from year to year.

The UDFCD routine and restoration maintenance work within the City of Westminster amounts to \$10,000 for 2007. These costs mainly consist of mowing and debris clearing. As the City progresses with implementing the Master Plan improvements, UDFCD funding will switch from the capital improvement program toward maintenance activities.

Program Summary

Two alternatives were developed to assess the impact of the Stormwater Program costs and services. These alternatives analyze the adopted 2008 budget, as well as a 2008 budget adjusted to provide maintenance funding for the Park Services Division. All of the alternatives analyzed include UDFCD contributions to the capital improvement program.



The existing fee of \$1.50 per single family residence would result in a 52-year build-out rate. This 52-year build-out rate is an unrealistic time period when one considers the lifecycle of the existing constructed drainageways. Over time the constructed channels will need to undergo major rehabilitation due to normal wear and tear that a drainageway experiences. As an example, it was observed that the drainage project along City Park Drainageway in the vicinity of Sheridan Blvd. and 120th Ave. is experiencing the effects of a drainageway lifecycle. The boulder retaining walls were found to be failing in a number of places.



Failing Boulder Retaining Wall – City Park Drainageway

Alternative 1 represents the adopted 2008 City of Westminster budget based on the approved \$3.00 per single family residence utility fee rate. As expected with an increase in funding, the capital improvement build-out rate is decreased to a time period of 36-years.

Alternative 2 is also based on the adopted 2008 budget however an appropriation of \$200,000 dollars is provided in this alternative for Park Services Division maintenance operations. These funds are taken out of the capital improvement program and result in an extended build-out rate of 40-years.

None of the Alternatives include future escalation of the fees for inflation. The cost figures also do not include an inflationary increase in cost based on construction occurring in future years. It will be necessary to re-evaluate the utility fee structure and consider increasing the fee to offset inflation and future construction costs. Alternatively the City may consider attaching a construction cost index adjustment factor to the stormwater utility fee. A construction cost index adjustment would enable the City to maintain the 2008 budget level of service while also meeting the capital improvement goals of the future. Please refer to the 2007 Westminster Storm Drainage Study Alternative Analysis Summary table on the following page for a breakdown of the various alternatives considered for this Executive Summary report.



2007 Westminster Storm Drainage Study - Alternative Analysis Summary

Item	Existing 2007 Program		Alternative 1		Alternative 2	
	Current 2007 Budget (Based on \$1.50/ Single Family)	Percentage of Westminster Program	Approved 2008 Budget (Based on \$3.00/ Single Family)	Percentage of Westminster Program	2008 Budget Including Parks Maintenance Costs (Based on \$3.00 / Single Family)	Percentage of Westminster Program
	Cost		Cost		Cost	
Environmental Services (Public Outreach/Spill Prevention)	\$100,000	11%	\$100,000	5%	\$100,000	5%
Engineering (Personnel)	\$76,100	8%	\$115,600	6%	\$115,600	6%
Street Div., (Maintenance/Street Sweeping)	\$100,000	11%	\$360,400	20%	\$360,400	20%
Park Services Div. (Maintenance)	\$0	0%	\$0	0%	\$200,000	11%
Capital Improvements (New Projects)	\$644,000	70%	\$1,264,000	69%	\$1,064,000	58%
Westminster Stormwater Program Budget	\$920,100	100%	\$1,840,000	100%	\$1,840,000	100%
UDFCD Capital Improvements (New Projects) Contribution	\$795,000		\$795,000		\$795,000	
UDFCD Maintenance Contribution	\$10,000		\$10,000		\$10,000	
Total Stormwater Program Budget	\$1,725,100		\$2,645,000		\$2,645,000	
<u>Summary of Capital Improvement Costs:</u>						
Channel Stabilization	\$54,631,457		\$54,631,457		\$54,631,457	
Road Crossings	\$14,591,631		\$14,591,631		\$14,591,631	
Detention Ponds	\$5,298,195		\$5,298,195		\$5,298,195	
Special Projects	\$468,000		\$468,000		\$468,000	
Total Capital Improvement Cost	\$74,989,283		\$74,989,283		\$74,989,283	
Number of Years to Complete Capital Improvement Projects (Based on 2007 Dollars)	52		36		40	
Utility Fee	\$1.50		\$3.00		\$3.00	



Summary

The stream inspection portion of this study helped to determine the current condition of the Westminster drainageways. Using the recommendations provided by Master Plan studies and cost data gathered from past experience with capital improvement projects, a total capital improvement cost of \$75.0M was determined. Knowledge gained during the stream inspection process also allowed for the ranking and prioritization of drainage projects. This ranking exercise will provide the City guidance on where capital improvement investments are most needed.

While a good portion of the Westminster drainageways are in a stable condition, improvements are needed to prevent the eroding channels from further deterioration. Experience has shown that investing in rehabilitating channels sooner rather than later results in a cost savings for the City. A Stormwater Program which aims to expedite the build-out of a capital improvement program will provide cost savings, while also providing for the health, safety, and welfare of its citizens.

A separate portion of this study includes the creation of a GIS mapping program, which interactively links much of the data collected during the study with the City's current mapping. Information such as erosion severity, stream inspection inventory forms, capital improvement costs, maintenance responsibilities, maintenance frequency, project priority, and maintenance costs will be linked to the GIS mapping. Having the ability to interactively view and update this information will allow the Stormwater Program and other City Departments to better monitor and assess the Westminster drainage system.

This Executive Summary demonstrates that the City is justified in increasing the stormwater utility fee to that of \$3.00 per single family residence for the adopted 2008 budget. The approved fee under the current adopted program funding will help to better serve the citizens of the City of Westminster while also working towards implementing and abiding by the regulations set for by the NPDES program. Additional funding for maintenance operations provided by the Park Services Division and Streets Division would better protect the investments that the City has placed in the capital improvements of the drainageways.



Appendix A

Westminster Master Plan & Outfall Systems Planning Summary

Master Plan	Plan Sheet	Reach I.D.	Drainageway Costs	Detention Costs	Road crossing Costs	Total Capital Costs	Utility Costs	Contingency Cost (35%)	Land Acquisition Costs	Total Capital Costs
Big Dry Creek Northern Tributaries (1)	L16	Shay 142+23 to 115+33	\$494,221	\$0	\$37,784	\$532,005	\$40,451	\$186,202	\$401,843	\$1,160,501
Big Dry Creek Northern Tributaries	L17	Shay 115+33 to 59+68	\$1,569,446	\$2,179,019	\$37,784	\$3,786,249	\$59,161	\$1,325,187	\$5,608,059	\$10,778,656
McKay Lake and Quail Creek (2)	3	MLT 119+40 to 104+00	\$0	\$0	\$129,253	\$129,253	\$6,463	\$45,239	\$53,878	\$234,833
McKay Lake and Quail Creek	4	MLT 100+00 to 76+00	\$606,686	\$1,978,998	\$63,081	\$2,648,765	\$132,469	\$927,068	\$150,899	\$3,859,200
McKay Lake and Quail Creek	5	MLT 76+00 to 51+00	\$781,209	\$0	\$81,015	\$862,225	\$43,167	\$301,779	\$193,942	\$1,401,112
McKay Lake and Quail Creek	6	MLT 51+00 to 28+00	\$622,147	\$0	\$1,042,066	\$1,664,213	\$80,743	\$582,475	\$183,057	\$2,510,488
McKay Lake and Quail Creek	7	MLT 28+00 to 0+00	\$1,110,712	\$0	\$185,531	\$1,296,243	\$24,985	\$453,685	\$145,456	\$1,920,370
McKay Lake and Quail Creek	8	SWT 43+00 to 25+00	\$456,159	\$0	\$43,291	\$499,450	\$24,985	\$174,807	\$145,456	\$844,698
McKay Lake and Quail Creek	9	SWT 25+00 to 0+00	\$671,622	\$0	\$0	\$671,622	\$33,643	\$235,068	\$220,906	\$1,161,239
McKay Lake and Quail Creek	10	PST 24+00 to 0+00	\$663,583	\$0	\$0	\$663,583	\$33,148	\$232,254	\$91,652	\$1,020,637
McKay Lake and Quail Creek	11	NET 12+80 to 0+00	\$206,805	\$0	\$14,842	\$221,648	\$11,132	\$77,577	\$53,878	\$364,235
McKay Lake and Quail Creek	12	NWT 33+31 to 25+00	\$195,055	\$0	\$0	\$195,055	\$9,771	\$68,269	\$32,282	\$305,378
McKay Lake and Quail Creek	13	NWT 25+00 to 0+00	\$647,627	\$0	\$14,842	\$662,469	\$33,148	\$231,864	\$96,971	\$1,024,453
McKay Lake and Quail Creek	20	QC 99+50 to 81+00	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
McKay Lake and Quail Creek	21	QC 81+00 to 53+00	\$0	\$0	\$114,411	\$114,411	\$5,690	\$40,044	\$0	\$160,144
McKay Lake and Quail Creek	24	QC 28+60.84 to 0+00	\$1,069,896	\$0	\$166,978	\$1,236,873	\$61,844	\$432,906	\$269,391	\$2,001,014
McKay Lake and Quail Creek	25	Trib. A 35+00 to 28+00	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
McKay Lake and Quail Creek	26	Trib. A 28+00 to 0+00	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Broomfield and Vicinity OSP (3)	Fig. 40	City Park Reach 4	\$2,265,284	\$0	\$1,268,997	\$3,534,281	\$176,715	\$1,236,998	\$942,885	\$5,890,880
Broomfield and Vicinity OSP	Fig. 40	3027 Reach 6	\$366,435	\$346,498	\$389,001	\$1,101,935	\$55,097	\$385,677	\$150,523	\$1,693,232
Major Drainageway Planning Little Dry Creek (4)	Not Shown See II-2	LDC Trib. B Garrison to Wadsworth	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Major Drainageway Planning Little Dry Creek	21	Shaw 0+00 to 20+00	\$116,863	\$0	\$0	\$116,863	\$29,268	\$40,902	\$0	\$187,033
Major Drainageway Planning Little Dry Creek	22	Shaw 20+00 to 47+00	\$347,852	\$0	\$367,645	\$715,496	\$63,169	\$250,424	\$61,064	\$1,090,152
Major Drainageway Planning Little Dry Creek	23	Shaw 47+00 to 81+00	\$290,578	\$157,923	\$324,268	\$772,770	\$76,435	\$270,469	\$3,580	\$1,123,253
Major Drainageway Planning Little Dry Creek	24	Shaw 81+00 to 106+00	\$0	\$0	\$439,657	\$439,657	\$21,899	\$622,595	\$7,159	\$622,595
Major Drainageway Planning Little Dry Creek	25	Shaw 106+00 to 116+00	\$0	\$250,992	\$46,113	\$297,106	\$6,317	\$103,987	\$42,113	\$449,522
Major Drainageway Planning Little Dry Creek	No Information	Shaw U/S sta 60+60 along C&S Railroad	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Major Drainageway Planning Little Dry Creek	16	LDC 53+00 to 74+00	\$648,326	\$0	\$834,465	\$1,482,791	\$204,458	\$518,977	\$453,976	\$2,660,201
Major Drainageway Planning Little Dry Creek	15	LDC 74+00 to 99+00	\$620,321	\$0	\$306,160	\$926,481	\$209,722	\$324,268	\$226,146	\$1,686,617
Major Drainageway Planning Little Dry Creek	14	LDC 99+00 to 126+00	\$890,054	\$0	\$824,779	\$1,714,832	\$217,513	\$600,191	\$48,640	\$2,581,177
Major Drainageway Planning Little Dry Creek	13	LDC 126+00 to 153+00	\$1,596,074	\$0	\$433,762	\$2,029,836	\$89,490	\$710,443	\$243,201	\$3,072,970
Major Drainageway Planning Little Dry Creek	12	LDC 153+00 to 190+00	\$120,443	\$0	\$110,757	\$231,199	\$3,369	\$80,920	\$37,270	\$352,758
Big Dry Creek and Tributaries (5)	35, 40, & 45	SLB Trib 1	\$933,141	\$559,853	\$0	\$1,492,994	\$47,512	\$522,548	\$981,287	\$3,044,340
Big Dry Creek and Tributaries	39 & 44	SLB Trib 2	\$518,676	\$0	\$0	\$518,676	\$0	\$181,536	\$464,828	\$1,165,040
Big Dry Creek and Tributaries	36, 43, & 44	SLB Trib 3	\$1,584	\$278,105	\$0	\$279,689	\$0	\$97,891	\$411,773	\$789,353
Big Dry Creek and Tributaries	33 & 38	SLB Trib 4	\$1,336,362	\$0	\$53,530	\$1,389,892	\$63,350	\$486,462	\$434,262	\$2,373,966
Big Dry Creek and Tributaries	33, 34, & 39	Ketner Trib.	\$489,060	\$158,374	\$0	\$647,434	\$0	\$226,602	\$467,204	\$1,341,239
Big Dry Creek and Tributaries	27, 33, & 34	Countryside Creek	\$1,005,993	\$0	\$256,249	\$1,262,242	\$0	\$441,785	\$437,905	\$2,141,932
Big Dry Creek and Tributaries	19, 26, 20, & 27	N. Branch Walnut Creek	\$175,795	\$0	\$126,066	\$301,861	\$0	\$105,651	\$86,156	\$493,668
Big Dry Creek and Tributaries	No Plan 19, 20, & 27	Upper Dry Creek Valley Ditch	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Big Dry Creek and Tributaries	15, 19, 20, 21, 28, & 34	N. Fork Walnut Creek	\$995,540	\$301,703	\$106,427	\$1,403,671	\$63,350	\$491,285	\$692,729	\$2,651,034
Big Dry Creek and Tributaries	26	Walnut Creek Trib. 2	\$17,421	\$523,902	\$0	\$541,323	\$0	\$189,463	\$942,326	\$1,673,113
Big Dry Creek and Tributaries	26, 27, 28, & 34	Walnut Creek	\$1,848,702	\$0	\$798,048	\$2,646,750	\$47,512	\$926,362	\$2,125,223	\$5,745,848
Big Dry Creek and Tributaries	28 & 34	Walnut Creek Trib. 1	\$1,160,408	\$0	\$200,977	\$1,361,385	\$142,537	\$476,485	\$688,136	\$2,668,542
Big Dry Creek and Tributaries	29 & 35	Lower Church Lake Trib.	\$482,566	\$19,797	\$0	\$502,363	\$31,675	\$175,827	\$722,186	\$1,432,051
Big Dry Creek and Tributaries	36 & 37	North Branch Hylands Creek	\$433,470	\$117,514	\$0	\$550,984	\$0	\$192,844	\$195,434	\$939,262
Big Dry Creek and Tributaries	35, 36, & 41	Middle Branch Hylands Creek	\$162,650	\$0	\$17,738	\$180,388	\$0	\$63,136	\$144,121	\$387,645
Big Dry Creek and Tributaries	29, 35, 36, 41, 42, & 46	South Branch Hylands Creek	\$3,373,370	\$853,003	\$0	\$4,226,374	\$332,586	\$1,479,231	\$485,734	\$6,523,924
Big Dry Creek and Tributaries	41	South Branch Hylands Creek Trib. 1	\$162,175	\$0	\$39,594	\$201,769	\$0	\$63,350	\$70,619	\$335,737
Big Dry Creek and Tributaries	41	South Branch Hylands Creek Trib. 2	\$0	\$707,616	\$0	\$707,616	\$0	\$247,666	\$633,497	\$1,588,778
Big Dry Creek and Tributaries	29 & 30	Hyland Hills Trib. 3	\$116,405	\$0	\$52,263	\$168,669	\$0	\$59,034	\$5,701	\$233,404
Big Dry Creek and Tributaries	29	Hyland Hills Trib. 4	\$1,107,669	\$0	\$1,107,669	\$1,107,669	\$0	\$387,684	\$490,960	\$1,986,313
Big Dry Creek and Tributaries	22, 29, & 30	Airport Creek	\$1,095,158	\$226,633	\$199,710	\$1,521,501	\$285,074	\$532,525	\$205,886	\$2,544,986
Big Dry Creek and Tributaries	30 & 31	Middle Cotton Creek	\$699,697	\$0	\$32,625	\$732,322	\$63,350	\$256,313	\$279,055	\$1,331,040
Big Dry Creek and Tributaries	23 & 30	North Cotton Creek	\$336,545	\$0	\$191,316	\$527,861	\$0	\$184,751	\$101,993	\$814,606
Big Dry Creek and Tributaries	16	Cozy Corner Trib. 1	\$110,862	\$0	\$0	\$110,862	\$0	\$38,802	\$38,010	\$187,673
Big Dry Creek and Tributaries	24	Cozy Corner Trib. 2	\$101,359	\$0	\$0	\$101,359	\$0	\$35,476	\$31,675	\$168,510
Big Dry Creek and Tributaries	24 & 31	Cozy Corner Trib. 3	\$1,896,531	\$1,078,687	\$175,003	\$3,150,221	\$126,699	\$1,102,577	\$2,136,151	\$6,515,649
Big Dry Creek and Tributaries	24	Cozy Corner Trib. 4	\$86,314	\$0	\$0	\$86,314	\$0	\$30,210	\$15,204	\$131,728
Big Dry Creek and Tributaries	23	Cozy Corner Trib. 5	\$550,825	\$0	\$220,457	\$771,282	\$47,512	\$269,949	\$261,951	\$1,350,694
Big Dry Creek and Tributaries	16, 24, 25, & 32	Ranch Creek	\$861,081	\$434,420	\$684,177	\$1,979,678	\$63,350	\$692,887	\$656,303	\$3,392,217
Big Dry Creek and Tributaries	25	Ranch Creek Trib. 1	\$893,864	\$0	\$67,784	\$961,648	\$95,025	\$336,577	\$515,666	\$1,908,916
Big Dry Creek and Tributaries	25	Ranch Creek Trib. 2	\$272,562	\$0	\$0	\$272,562	\$0	\$95,397	\$57,015	\$424,973
Big Dry Creek and Tributaries	9 & 13	Lake Erie Basin Trib. 5	\$454,851	\$0	\$38,010	\$492,861	\$79,187	\$172,501	\$282,698	\$1,027,247
Big Dry Creek and Tributaries	13 & 17	Lake Erie Basin Trib. 6	\$582,659	\$0	\$68,418	\$651,076	\$47,512	\$227,877	\$312,631	\$1,239,096
Big Dry Creek and Tributaries	13	Lake Erie Basin Trib. 6a	\$116,722	\$0	\$0	\$116,722	\$0	\$40,853	\$70,160	\$227,734
Big Dry Creek and Tributaries	10, 14, & 18	Tanglewood Creek	\$1,571,230	\$15,837	\$477,657	\$2,064,724	\$190,049	\$722,654	\$1,025,473	\$4,002,900
Big Dry Creek and Tributaries	14	Tanglewood Creek Trib. 1	\$31,358	\$0	\$0	\$31,358	\$0	\$10,975	\$6,335	\$48,668
Big Dry Creek and Tributaries	14	Tanglewood Creek Trib. 2	\$38,485	\$0	\$0	\$38,485	\$0	\$13,470	\$1,900	\$53,855
Big Dry Creek and Tributaries	10, 9, 13, 12, 16, 24, 23, 30, 29, 35, 40, 39, & 38	Big Dry Creek	\$5,662,511	\$0	\$7,949,039	\$13,611,550	\$190,049	\$4,764,042	\$2,391,134	\$20,956,775
Total Costs			\$46,041,001	\$10,188,875	\$19,031,570	\$75,261,445	\$3,670,578	\$26,341,506	\$28,726,277	\$133,999,806

(1) Outfall Systems Planning Update of Big Dry Creek Northern Tributaries - Conceptual Preliminary Design Report, Wright Water Engineers, Inc., March, 2007.
(2) McKay Lake and Quail Creek Outfall Systems Planning Study - Preliminary Design Report, Kiowa Engineering Corporation, October, 2001.
(3) Broomfield and Vicinity Outfall Systems Planning Study - Alternatives Development and Evaluation Report, Kiowa Engineering Corporation, September, 1999.
(4) Major Drainageway Planning Little Dry Creek (ADCO), Merrick and Company Engineers and Architects, April, 1979.
(5) Outfall Systems Planning Big Dry Creek (ADCO) and Tributaries, Muller Engineering Company, Inc., January, 1989.

Severe Erosion Example

City of Westminster

Stream Inspection Inventory Form

Observer: <u>Jim Watt</u>	Date: <u>4/27/2007</u>
Stream Name: <u>Little Dry Creek - Lowell Blvd. to Federal Blvd.</u>	
Segment ID No. <u>LDC-6</u>	Length, Mi <u>0.65</u>
Local Jurisdiction: <u>Westminster</u>	

General Precipitation Conditions	
Preceding Week:	<u>Rainy</u>
Preceding 3 months:	<u>Average Precipitation</u>
Preceding Year:	<u>Average Precipitation</u>

Baseflow Information	
Baseflow (yes or no)?	<u>Yes</u>
Moist conditions in channel bottom (yes or no)?	<u>Yes</u>
Visual Baseflow Rate (small<0.5 cfs or large>0.5 cfs)	<u>Large</u>
Avg. flow width, ft	<u>10</u>
Avg. flow depth, ft	<u>1.5</u>
Avg. flow velocity, fps	<u>0.83</u>
Calculated baseflow rate, cfs	<u>12.50</u>
Sediment wash load/turbidity (clear, cloudy, muddy)	<u>Clear</u>
Sediment bed load (low, medium, high)	<u>Low to Medium</u>

Channel Geometry Information	
Low Flow channel bottom width, ft	<u>10</u>
Top width, ft	<u>20</u>
Avg depth, ft	<u>4</u>
Primary (above low flow) channel bottom width, ft	_____
Top width, ft	_____
Avg depth, ft	_____
Floodplain (above primary) channel bottom width, ft	<u>20</u>
Top width, ft	<u>100-200</u>
Avg depth, ft	<u>3</u>

Channel Bottom	
Channel form (braided, meandering, straight)?	<u>Meandering</u>
Soil type	<u>Silty, Sandy Gravel</u>
Type of Vegetation in floodplain bottom:	_____
Upland (grasses, shrubs)?	<u>Upland Grasses & Shrubs</u>
Transitional (in between)?	_____
Wetland (cattails, willows, cottonwoods)?	<u>Cottonwoods</u>
Estimated Manning's n for Floodplain Bottom (opt)	<u>0.06</u>
Evidence of Bottom Erosion or Sedimentation?	<u>Erosion</u>
Approx. erosion or sedimentation depth, ft	<u>4</u>
Approx. erosion or sedimentation width, ft	<u>10</u>
Approx. erosion/sedimentation cross sect area, sf	<u>40</u>
Overall assessment of erosion or sedimentation (minor, moderate, or severe) ?	<u>Severe</u>

Points of Interest Description	Photo No.	GPS No.
1 Federal Blvd Crossing w/ Exposed Sanitary Sewer	P4270011	7
2 Exposed Sanitary Sewer	P4270012	8
3 Typ. Channel w/ Exposed Sanitary Sewer	P4270013	8
4 Low Flow Street Crossing	P4270014	8
5 Exposed Pedestrian Bridge Footer	P4270015	9
6 Low Flow Street Crossing - Irving St.	P4270016	10
7 Shed and Private Property on Edge of LDC	P4270017	11
8 House Close to 15' Bank Cut	P4270018	11
9 Private Property on Edge of LDC w/ Bank Protection	P4270019	12
10 House Close to 15' Bank Cut	P4270020	12
11 Erosion d/s From 69th Ave Crossing	P4270021	13
12 Typ. Channel u/s 69th Ave Crossing	P4270022	13
13 69th Ave Crossing	P4270023	13
14 _____	_____	_____
15 _____	_____	_____

Comments: This reach of stream is experiencing severe erosion. Erosion has exposed utilities and is encroaching on private property. The 69th Ave, Irving Blvd, access drive, and Federal Blvd street crossings are undersized. The channel is in need of major improvements.

Channel Banks	
Evidence of bank erosion?	<u>Yes</u>
Number of different bank erosion areas	<u>All of reach</u>
Approx. length of bank erosion, ft	<u>200 severe</u>
Approx. height of bank erosion, ft	<u>7 to 15</u>
Soil type	<u>Sandy Clay</u>
Overall assessment of bank erosion (minor, moderate, or severe) ?	<u>Severe</u>

Channel Erosion/Sedimentation Impacts on Existing Facilities/Structures	
Roads/Bridges:	<u>Undersized culverts causing erosion. (PTs 7, 8, 10, 13)</u>
Trails and Pedestrian Bridges:	<u>Bridge footer exposed (PT 9)</u>
Storm Sewer Outfalls:	_____
Utilities (water, sewer, etc.):	<u>Sanitary sewer lines exposed x2 (PTs 7 & 8)</u>
Private Properties:	<u>House close to large cut x2, shed directly on cut bank</u>
Other:	_____

Overall Water Quality Rating	
High Absorption (5)	_____
Moderate Absorption (4)	_____
Neutral (3)	_____
Slight Erosion (2)	_____
Severe Erosion (1)	<u>Severe Erosion Entire Reach</u>



P4270011—Undersized Federal Blvd. Crossing w/ Exposed Sanitary Sewer



P4270012—Exposed Sanitary Sewer



P4270013—Typ. Channel w/ Exposed Sanitary Sewer

Note: A recent project was completed to protect the exposed sanitary sewer lines shown in pictures P4270011-13. These pictures have been included as an example of the impacts that severe erosion can have on a channel and the surrounding infrastructure.



P4270014—Undersized Low Flow Street Crossing



P4270015—Exposed Pedestrian Bridge Footer



P4270016—Undersized Low Flow Street Crossing—Irving St.



P4270017—Shed and Private Property on Edge of LDC



P4270018—House Close to 15' Bank Cut



P4270019—Private Property on Edge of LDC
w/ Bank Protection



P4270020—House close to 15' Bank Cut



P4270021—Erosion d/s from 69th Ave Crossing



P4270022—Typ. Channel u/s of 69th Ave Crossing



P4270023—Undersized 69th Ave Crossing

Moderate Erosion Example

City of Westminster

Stream Inspection Inventory Form

Observer: <u>Jim Watt</u>	Date: <u>5/24/2007</u>
Stream Name: <u>Ranch Creek Tributary 1 - Pecos St. to Ranch Creek Confl.</u>	
Segment ID No. <u>RCT1-2</u>	Length, Mi <u>0.53</u>
Local Jurisdiction: <u>Westminster</u>	

General Precipitation Conditions	
Preceding Week:	<u>Rainy</u>
Preceding 3 months:	<u>Average Precipitation</u>
Preceding Year:	<u>Average Precipitation</u>

Baseflow Information	
Baseflow (yes or no)?	<u>Yes</u>
Moist conditions in channel bottom (yes or no)?	<u>Yes</u>
Visual Baseflow Rate (small<0.5 cfs or large>0.5 cfs)	<u>Large</u>
Avg. flow width, ft	<u>3</u>
Avg. flow depth, ft	<u>0.67</u>
Avg. flow velocity, fps	<u>0.71</u>
Calculated baseflow rate, cfs	<u>1.43</u>
Sediment wash load/turbidity (clear, cloudy, muddy)	<u>Cloudy towards Confluence</u>
Sediment bed load (low, medium, high)	<u>Medium towards Confluence</u>

Channel Geometry Information	
Low Flow channel bottom width, ft	<u>2</u>
Top width, ft	<u>3</u>
Avg depth, ft	<u>1</u>
Primary (above low flow) channel bottom width, ft	<u>3</u>
Top width, ft	<u>20</u>
Avg depth, ft	<u>1</u>
Floodplain (above primary) channel bottom width, ft	<u>20</u>
Top width, ft	<u>150</u>
Avg depth, ft	<u>6</u>

Channel Bottom	
Channel form (braided, meandering, straight)?	<u>Straight</u>
Soil type	<u>Sandy Clay</u>
Type of Vegetation in floodplain bottom:	
Upland (grasses, shrubs)?	<u>Upland Grass and Golf Course</u>
Transitional (in between)?	
Wetland (cattails, willows, cottonwoods)?	<u>Cattails</u>
Estimated Manning's n for Floodplain Bottom (opt)	<u>0.05</u>
Evidence of Bottom Erosion or Sedimentation?	<u>Erosion</u>
Approx. erosion or sedimentation depth, ft	<u>3</u>
Approx. erosion or sedimentation width, ft	<u>5</u>
Approx. erosion/sedimentation cross sect area, sf	<u>15</u>
Overall assessment of erosion or sedimentation (minor, moderate, or severe) ?	<u>Moderate</u>

Points of Interest Description	Photo No.	GPS No.
1 Pecos St. Crossing Outfall	P5240007	266
2 Typ. Wetland Channel	P5240008	267
3 Undersized (2) 6'x6' CBC Culvert at Quizas St.	P5240009	267
4 Minor Erosion d/s of Quizas St. Outfall	P5240010	268
5 Aesthetic Pond & Outlet	P5240011	269
6 Moderate Erosion	P5240012	270
7 Flared End Section Separating From Pipe	P5240013	271
8 Wetland Area at Jackson Lake Inlet	P5240014	272
9		
10		
11		
12		
13		
14		
15		

Comments: The Pecos St. and Quizas St. channel crossings are not sized according to Master Plans. The channel through the Golf Course is experiencing minor to moderate erosion. This erosion is transporting sediment into Jackson Lake. Some wetland area exists directly u/s of the golf course and also at the inlet to Jackson Lake.

Channel Banks	
Evidence of bank erosion?	<u>Yes</u>
Number of different bank erosion areas	<u>Much of reach</u>
Approx. length of bank erosion, ft	<u>200</u>
Approx. height of bank erosion, ft	<u>3-4</u>
Soil type	<u>Sandy Clay</u>
Overall assessment of bank erosion (minor, moderate, or severe) ?	<u>Moderate</u>

Channel Erosion/Sedimentation Impacts on Existing Facilities/Structures	
Roads/Bridges:	<u>Undersized Pecos St. (5) 42" Culverts (PT 266)</u> <u>Undersized (2) 6'x6' CBC @ Quizas St. (PT 267)</u>
Trails and Pedestrian Bridges:	_____
Storm Sewer Outfalls:	<u>Flared End Section separating from pipe (PT 271)</u>
Utilities (water, sewer, etc.):	_____
Private Properties:	_____
Other:	_____

Overall Water Quality Rating	
High Absorption (5)	_____
Moderate Absorption (4)	_____
Neutral (3)	_____
Slight Erosion (2)	<u>Moderate Erosion</u>
Severe Erosion (1)	_____



P5240007—Pecos St. Crossing Outfall



P5240008—Typ. Wetland Channel



P5240009—Undersized (2) 6'x6' CBC Culvert at Quizas St.



P5240010—Minor Erosion d/s of Quizas St. Outlet



P5240011—Aesthetic Pond & Outlet



P5240012—Moderate Erosion



P5240013—Flared End Section Separating from Pipe



P5240014—Wetland Area at Jackson Lake Inlet

Minor Erosion Example

City of Westminster

Stream Inspection Inventory Form

Observer: <u>Jim Watt</u>	Date: <u>5/3/2007</u>
Stream Name: <u>North Branch Walnut Creek - Simms St to Walnut Creek</u>	
Segment ID No. <u>NBWC</u>	Length, Mi <u>0.79</u>
Local Jurisdiction: <u>Westminster</u>	

General Precipitation Conditions	
Preceding Week:	<u>Rainy</u>
Preceding 3 months:	<u>Average Precipitation</u>
Preceding Year:	<u>Average Precipitation</u>

Baseflow Information	
Baseflow (yes or no)?	<u>Yes</u>
Moist conditions in channel bottom (yes or no)?	<u>Yes</u>
Visual Baseflow Rate (small<0.5 cfs or large>0.5 cfs)	<u>Small</u>
Avg. flow width, ft	<u>1</u>
Avg. flow depth, ft	<u>0.33</u>
Avg. flow velocity, fps	<u>0.40</u>
Calculated baseflow rate, cfs	<u>0.13</u>
Sediment wash load/turbidity (clear, cloudy, muddy)	<u>Clear</u>
Sediment bed load (low, medium, high)	<u>Low</u>

Channel Geometry Information	
Low Flow channel bottom width, ft	<u>1</u>
Top width, ft	<u>2</u>
Avg depth, ft	<u>0.50</u>
Primary (above low flow) channel bottom width, ft	<u>2</u>
Top width, ft	<u>30</u>
Avg depth, ft	<u>2</u>
Floodplain (above primary) channel bottom width, ft	<u>30</u>
Top width, ft	<u>200</u>
Avg depth, ft	<u>20</u>

Channel Bottom	
Channel form (braided, meandering, straight)?	<u>Meandering</u>
Soil type	<u>Silty Sandy Clay</u>
Type of Vegetation in floodplain bottom:	
Upland (grasses, shrubs)?	<u>Upland Grasses</u>
Transitional (in between)?	
Wetland (cattails, willows, cottonwoods)?	<u>Cattails</u>
Estimated Manning's n for Floodplain Bottom (opt)	<u>0.07</u>
Evidence of Bottom Erosion or Sedimentation?	<u>Erosion</u>
Approx. erosion or sedimentation depth, ft	<u>1</u>
Approx. erosion or sedimentation width, ft	<u>1</u>
Approx. erosion/sedimentation cross sect area, sf	<u>2</u>
Overall assessment of erosion or sedimentation (minor, moderate, or severe) ?	<u>Minor</u>

Points of Interest Description	Photo No.	GPS No.
1 <u>Typ. Wetland Channel @ Simms St.</u>	<u>P5030008</u>	<u>62</u>
2 <u>Typ. Wetland Channel</u>	<u>P5030009</u>	<u>63</u>
3 <u>Northern Tributary Outfall</u>	<u>P5030010</u>	<u>64</u>
4 <u>End Of Reach w/ Minor Erosion</u>	<u>P5030011</u>	<u>65</u>
5 _____	_____	_____
6 _____	_____	_____
7 _____	_____	_____
8 _____	_____	_____
9 _____	_____	_____
10 _____	_____	_____
11 _____	_____	_____
12 _____	_____	_____
13 _____	_____	_____
14 _____	_____	_____
15 _____	_____	_____

Comments: This reach of channel is in its natural condition. A broad shallow wetland channel provides good water quality. The Simms Street crossing has not been constructed per master plan recommendations. The existing outlet has been buried due to sedimentation. Minor erosion is developing near the confluence with Walnut Creek.

Channel Banks	
Evidence of bank erosion?	<u>Yes</u>
Number of different bank erosion areas	<u>1</u>
Approx. length of bank erosion, ft	<u>1000</u>
Approx. height of bank erosion, ft	<u>1</u>
Soil type	<u>Silty Sandy Clay</u>
Overall assessment of bank erosion (minor, moderate, or severe) ?	<u>Minor</u>

Channel Erosion/Sedimentation Impacts on Existing Facilities/Structures	
Roads/Bridges:	<u>Undersized Simms St. Culvert. The existing culvert is currently buried.</u>
Trails and Pedestrian Bridges:	_____
Storm Sewer Outfalls:	_____
Utilities (water, sewer, etc.):	_____
Private Properties:	_____
Other:	_____

Overall Water Quality Rating	
High Absorption (5)	<u>Thick Cattails</u>
Moderate Absorption (4)	_____
Neutral (3)	_____
Slight Erosion (2)	<u>Minor Erosion Near End</u>
Severe Erosion (1)	_____



P5030008—Typ. Wetland Channel @ Simms St.



P5030009—Typ. Wetland Channel



P5030010—Northern Tributary Outfall



P5030011—End of Reach w/ Minor Erosion

Westminster Stream Cost Estimate

Stream ^{4,5}	Stream Reach Abbreviation	Reach Boundaries	Reach Length		Overall Quality Rating ¹	Reach Size ²	Cost/ LF ³	Total Reach Cost
			ft	mi				
Airport Creek	APC-1	Main/Pierce St. to Eaton St.	5340	1.01	5	1	\$0	\$0
			10	0.00	2	1	\$275	\$2,750
			1300	0.25	4	1	\$0	\$0
Airport Creek	APC-2	Eaton St. to Big Dry Creek Confluence	700	0.13	1	1	\$400	\$280,000
			4116	0.78	2	1	\$275	\$1,131,845
Big Dry Creek	BDC-6	128th Ave. to I-25	4385	0.83	1	1	\$400	\$1,754,000
			3121	0.59	2	1	\$275	\$858,275
Big Dry Creek	BDC-5	120th Ave to 128th Ave.	9815	1.86	1	1	\$400	\$3,926,000
			4761	0.90	2	1	\$275	\$1,309,385
Big Dry Creek	BDC-4	Sheridan Blvd. to 120th Ave.	9125	1.73	1	1	\$400	\$3,650,000
			20460	3.88	4	1	\$0	\$0
Big Dry Creek	BDC-3	Wadsworth Blvd. to Sheridan Blvd.	3300	0.63	1	1	\$400	\$1,320,000
			5763	1.09	4	1	\$0	\$0
Big Dry Creek	BDC-1	Standley Lake to Railroad	1788	0.34	2	1	\$275	\$491,563
			1565	0.30	5	2	\$0	\$0
North Cotton Creek	NCC	Legacy Ridge Pkwy to Big Dry Creek	2395	0.45	4	2	\$0	\$0
			4855	0.92	5	2	\$0	\$0
Middle Cotton Creek	MCC	107th Ave. to Big Dry Creek	900	0.17	1	2	\$300	\$270,000
Countryside Creek	CC-1	N. Oak St. to Independence St.	3854	0.73	4	2	\$0	\$0
Countryside Creek	CC-2	Independence St. to Walnut Creek	3485	0.66	5	2	\$0	\$0
Cozy Corner Tributary 1	CCT1	118th Pl. to Big Dry Creek	1300	0.25	4	3	\$0	\$0
			975	0.18	5	3	\$0	\$0
Cozy Corner Tributary 2	CCT2	Newton Dr. to Big Dry Creek	125	0.02	1	3	\$200	\$25,000
Cozy Corner Tributary 3	CCT3-1	105th Pl. to Golf Course	1373	0.26	5	2	\$0	\$0
Cozy Corner Tributary 3	CCT3-2	Golf Course to 112th Ave	3485	0.66	5	2	\$0	\$0
Cozy Corner Tributary 3	CCT3-3	112th Ave to Big Dry Creek	5064	0.96	5	2	\$0	\$0
			850	0.16	3	2	\$100	\$85,000
			1960	0.37	5	2	\$0	\$0
			1800	0.34	4	2	\$0	\$0
Cozy Corner Tributary 4	CCT4	N. Grove St. to Big Dry Creek	200	0.04	3	2	\$100	\$20,000
Cozy Corner Tributary 5 ^{WV}	CCT5-1	Sheridan Blvd to City Park Overflow	2006	0.38	1	2	\$300	\$601,920
Cozy Corner Tributary 5	CCT5-2	City Park Overflow to Big Dry Creek	2640	0.50	4	2	\$0	\$0
Hyland Hills Tributary # 3	HHT3	Jay St. to Big Dry Creek	2300	0.44	5	3	\$0	\$0
Hyland Hills Tributary # 4	HHT4	Westminster Blvd. to Big Dry Creek	3350	0.63	5	3	\$0	\$0
			400	0.08	1	3	\$200	\$80,000
South Branch Hylands Creek	SBHC-3	104th Ave to Big Dry Creek	1178	0.22	4	1	\$0	\$0
			300	0.06	1	1	\$400	\$120,000
South Branch Hylands Creek	SBHC-2	Sheridan Blvd. to 104th Ave	2227	0.42	4	1	\$0	\$0
			3000	0.57	1	1	\$400	\$1,200,000
South Branch Hylands Creek ^{WV}	SBHC-1	Highland Pl. to Sheridan Blvd. (Note Costs Adj. For Storm Sewer Replacement)	4633	0.88	5	1	\$0	\$0
South Branch Hylands Creek ^{***}	SBHC-T1	Tributary 1	3550	0.67	1	2	\$1,197	\$4,250,000
South Branch Hylands Creek	SBHC-T2	Tributary 2	1003	0.19	4	3	\$0	\$0
Middle Branch Hylands Creek	MBHC-2	102nd Pl. to Confluence w/ S. Branch H. C.	3379	0.64	5	2	\$0	\$0
			1902	0.36	5	2	\$0	\$0
Middle Branch Hylands Creek	MBHC-1	Lowell Blvd. 102nd Pl.	1900	0.36	1	2	\$300	\$570,000
North Branch Hylands Creek	NBHC	104th Ave & Lowell Blvd. to M. Branch H.C.	5808	1.10	5	2	\$0	\$0
			6036	1.14	5	2	\$0	\$0
Ketner	K-1	N. Oak Street to Ketner Reservoir	300	0.06	3	2	\$100	\$30,000
Ketner	K-2	Ketner Reservoir to Big Dry Creek	3854	0.73	5	2	\$0	\$0
Lake Erie Basin Tributary 5	LET5	128th & Huron St. to Big Dry Creek	5280	1.00	5	2	\$0	\$0
			1690	0.32	5	3	\$0	\$0
			1107	0.21	5	2	\$0	\$0
Lake Erie Basin Tributary 6 ^{***WV}	LET6-1	120th Ave to Confluence Pond	1800	0.34	1	2	\$300	\$540,000
Lake Erie Basin Tributary 6	LET6-2	Confluence Pond to Big Dry Creek	1000	0.19	2	2	\$200	\$200,000
Lake Erie Basin Tributary 6A	LET6A	124th Ave. to Confluence Pond	1373	0.26	4	2	\$0	\$0
Little Dry Creek	LDC-6	Lowell Blvd. to Federal Blvd.	1300	0.25	4	3	\$0	\$0
Little Dry Creek	LDC-5	72nd Ave. to Lowell Blvd.	3432	0.65	1	1	\$400	\$1,372,800
Little Dry Creek	LDC-4	Winona Ct. to 72nd Ave	2323	0.44	5	1	\$0	\$0
Little Dry Creek	LDC-4	Winona Ct. to 72nd Ave	2429	0.46	5	1	\$0	\$0
Little Dry Creek	LDC-3	75th Ave to Winona Ct.	1426	0.27	5	1	\$0	\$0
Little Dry Creek	LDC-2	76th Ave to 75th Ave	792	0.15	5	1	\$0	\$0
Little Dry Creek	LDC-1	Tributary B Confluence to 76th Ave	2376	0.45	5	1	\$0	\$0
Little Dry Creek Tributary B	LDC-B1	N. Garrison St. to Trailside Park	2957	0.56	5	2	\$0	\$0
Little Dry Creek Tributary B	LDC-B2	Trailside Park to Wadsworth Blvd.	1482	0.28	4	2	\$0	\$0
			1000	0.19	2	2	\$200	\$200,000
McKay Drainageway	MCD-1	144th Ave to McKay Lake	1954	0.37	2	1	\$275	\$537,240
McKay Drainageway	MCD-2	McKay Lake to Huron St.	2693	0.51	5	1	\$0	\$0
McKay Drainageway ^{***WV}	MCD-3	Huron St. to I-25 (Lowes Pond)	3538	0.67	1	1	\$1,120	\$3,963,544
McKay Drainageway ^{WV}	MCD-4	I-25 to Washington Street	2800	0.53	1	1	\$1,073	\$3,004,280
Southwest Tributary to McKay Lake ^{***WV}	MCD-SW	Huron St. to Lowes Pond	1150	0.22	5	2	\$0	\$0
			1150	0.22	1	2	\$300	\$345,000
Quail Creek Tributary A	QC-A	Zuni St. to Quail Creek Confluence	3350	0.63	5	2	\$0	\$0
Quail Creek	QC-1	W 136th Ave. to Osage St.	2218	0.42	5	1	\$0	\$0
			5166	0.98	4	1	\$0	\$0
Quail Creek	QC-2	Osage St. to Bid Dry Creek Confluence	2534	0.48	1	1	\$847	\$2,145,545
Ranch Creek	RC-1	112th Ave to Upper Jackson Lake	1531	0.29	4	2	\$0	\$0
Ranch Creek	RC-2	Upper Jackson Lake to 120th Ave	5333	1.01	4	1	\$0	\$0
Ranch Creek	RC-3	120th Ave to Confluence w/ Big Dry Creek	1478	0.28	2	1	\$275	\$406,560
Ranch Creek Tributary 1	RCT1-1	Huron St. to Pecos St.	2698	0.51	4	2	\$0	\$0
			100	0.02	3	2	\$100	\$10,000
Ranch Creek Tributary 1	RCT1-2	Pecos St. to Ranch Creek Confluence.	2400	0.45	2	2	\$200	\$480,000
Ranch Creek Tributary 2	RCT2	Cedar Bridge Pond to Ranch Creek	823	0.16	5	3	\$0	\$0
			550	0.10	4	3	\$0	\$0
Shaw Heights Tributary	SHT-4	78th Ave to 76th Ave	962	0.18	5	1	\$0	\$0
Shaw Heights Tributary	SHT-3	80th Ave to 78th Ave	1150	0.22	2	1	\$275	\$316,250
Shaw Heights Tributary	SHT-2	Railroad to 80th Ave	1426	0.27	4	1	\$0	\$0
Shaw Heights West Tributary	SHT-1A	End of West Tributary to Railroad	2165	0.41	5	3	\$0	\$0
Shaw Heights Tributary ^{WV}	SHT-1	End of Main Stream to Railroad	2376	0.45	5	2	\$0	\$0
Shay Ditch ^{***WV}	SD-2	Huron St. to I-25	5122	0.97	1	2	\$300	\$1,536,480
Standley Lake Tributary 1	SLT1-1	92nd Ave to 96th Ave	2640	0.50	1	1	\$400	\$1,056,000
Standley Lake Tributary 1	SLT1-2	96th Ave to Big Dry Creek	7075	1.34	5	2	\$0	\$0
			3443	0.65	5	2	\$0	\$0
Standley Lake Tributary 2	SLT2	Lark Bunting Dr. to Big Dry Creek	200	0.04	3	2	\$100	\$20,000
Standley Lake Tributary 3	SLT3	Independence St. to Big Dry Creek	10085	1.91	5	2	\$0	\$0
Standley Lake Tributary 4	SLT4-1	100th Ave to Standley Spillway	3274	0.62	5	2	\$0	\$0
Standley Lake Tributary 4	SLT4-2	Standley Spillway to Big Dry Creek	2429	0.46	4	3	\$0	\$0
Tanglewood Creek	TC-1	120th Ave to 123rd Ave	4382	0.83	5	1	\$0	\$0
Tanglewood Creek ^{***}	TC-2	123rd Ave to 128th Ave	2693	0.51	5	2	\$0	\$0
			3196	0.61	4	2	\$0	\$0
Tanglewood Creek ^{***WV}	TC-3	128th Ave to I-25	500	0.09	2	2	\$200	\$100,000
Tanglewood Creek Tributary 1	TC-T1	I-25 to Tanglewood Creek	1070	0.20	4	1	\$0	\$0
Tanglewood Creek Tributary 2	TC-T2	I-25 to Tanglewood Creek	2200	0.42	1	1	\$400	\$880,000
Walnut Creek Tributary 2 ^{WV}	WC-T2	Simms St. Pond to Walnut Creek	528	0.10	4	3	\$0	\$0
			975	0.18	4	3	\$0	\$0
Walnut Creek	WC-1	Simms St. to 108th	2323	0.44	1	2	\$300	\$696,960
			7318	1.39	2	1	\$275	\$2,012,340
Walnut Creek	WC-2	108th to Wadsworth Pkwy	1500	0.28	1	1	\$400	\$600,000
			2066	0.39	4	1	\$0	\$0
Walnut Creek	WC-3	Wadsworth Pkwy to Big Dry Creek Confluence	2000	0.38	2	1	\$275	\$550,000
			3300	0.63	3	1	\$150	\$495,000
North Branch Walnut Creek	NBWC	Simms St to Walnut Creek	8738	1.66	1	1	\$400	\$3,495,360
			3171	0.60	4	1	\$0	\$0
Tributary to N. Branch Walnut Creek	NBWC-T1	Jeffco Airport to N. B. Walnut Creek	1000	0.19	3	1	\$150	\$150,000
Upper Dry Creek Valley Ditch	UDCVD	Simms St. to Ball Pond	2640	0.50	4	3	\$0	\$0
North Fork Walnut Creek ^{***WV}	NFWC	Ball Pond to Walnut Creek	7920	1.50	5	3	\$0	\$0
Walnut Creek Tributary 1 ^{***WV}	WC-T1	W. 108th Ave to Walnut Creek	5650	1.07	2	1	\$275	\$1,553,640
Lower Church Lake Tributary ^{WV}	LCL	Wadsworth Blvd. to Walnut Creek	3643	0.69	1	2	\$300	\$1,092,960
City Park Drainageway ^{WV}	CPD	Overflow to Big Dry Creek	5016	0.95	3	2	\$100	\$501,600
			5861	1.11	2	1	\$275	\$1,611,720
City Park Drainageway	CPD-O	Overflow to Cozy Corner Tributary 5	2554	0.48	1	1	\$822	\$2,100,000
3207 Drainageway ^{***}	3207	Lowell Blvd to Big Dry Creek Confluence	2851	0.54	5	1	\$0	\$0
Pomponio Branch	PB	72nd Ave. to Little Dry Creek	2482	0.47	2	1	\$275	\$682,440
TOTAL			2112	0.4	5	3	\$0	\$0
			361202	68			TOTAL COST	\$54,631,457

¹ Overall Quality Rating:

- (1) Severe Erosion
- (2) Moderate Erosion
- (3) Minor Erosion
- (4) Naturally Stable Channel
- (5) Engineered (Constructed) Stable Channel

² Reach Size:

- (1) Primary- Basin greater than 1 sq mi
- (2) Secondary- Basin between 130 acres and 1 sq mi
- (3) Tertiary- Basin smaller than 130 acres

³ Cost Estimates for each category (per LF)

Quality Rating	Primary	Secondary	Tertiary
1	\$400	\$300	\$200
2	\$275	\$200	\$125
3	\$150	\$100	\$50
4	\$0	\$0	\$0
5	\$0	\$0	\$0

⁴ *** Indicates channel reaches where channel improvement costs could be shared with other government agencies (Not Including UDFCD) or covered in full by area development.

⁵ ^{WV} Indicates that the "Overall Quality Rating" category has been changed to a lesser rating so that costs reflect that the channel reach is in need of major improvements to meet Master Plan recommendations. The quality rating may also reflect erosion problems for that reach.

Lengths and Reach Boundaries:

P:\07-021.01 2007 Westminster Drainage Study\Stream Inspection Forms

Quality Rating	Total Length		Percentage
	ft	mi	
1	83480	15.81	23.1%
2	46587.3	8.82	12.9%
3	10966	2.08	3.0%
4	80854.1	15.31	22.4%
5	139313.8	26.39	38.6%

Westminster Culvert Cost Estimate

Stream ⁴	Stream Reach Abbreviation	Reach Boundaries	Street Culvert " - " Indicates Separate Culvert Crossing along Stream Reach	Culvert Size " - " Indicates Separate Culvert Crossing Recommendation along Stream Reach	Total Culvert Cost Including Contingency	
					Contingency	35%
Airport Creek	APC-1	Main/Pierce St. to Eaton St.	Kendall St. - W.112th Ave	5'Hx8'W CBC - (2 Add.) 72" RCP		\$269,609
Airport Creek	APC-2	Eaton St. to Big Dry Creek Confluence				
Big Dry Creek	BDC-6	128th Ave. to I-25	128th Ave Road Raising	Road Raising		\$1,239,273
Big Dry Creek	BDC-5	120th Ave. to 128th Ave.	Zuni St.	110' Span Bridge		\$763,830
Big Dry Creek	BDC-4	Sheridan Blvd. to 120th Ave.				
Big Dry Creek	BDC-3	Wadsworth Blvd. to Sheridan Blvd.	Wadsworth Blvd	100' Span Bridge (Current Project No Cost to Utility)		
Big Dry Creek	BDC-1	Standley Lake to Railroad	Wadsworth Pkwy	Triple 8'Hx13'-16'-13'W CBC		\$957,717
North Cotton Creek	NCC	Legacy Ridge Pkwy to Big Dry Creek				
Middle Cotton Creek	MCC	107th Ave. to Big Dry Creek				
Countryside Creek	CC-1	N. Oak St. to Independence St.				
Countryside Creek	CC-2	Independence St. to Walnut Creek				
Cozy Corner Tributary 1	CCT1	118th Pl. to Big Dry Creek				
Cozy Corner Tributary 2	CCT2	Newton Dr. to Big Dry Creek				
Cozy Corner Tributary 3	CCT3-1	105th Pl. to Golf Course				
Cozy Corner Tributary 3	CCT3-2	Golf Course to 112th Ave				
Cozy Corner Tributary 3	CCT3-3	112th Ave to Big Dry Creek	W. 112th Ave. - Federal Blvd	(2) 4'Hx6'W CBC - 4'Hx6'W CBC		\$236,254
Cozy Corner Tributary 4	CCT4	N. Grove St. to Big Dry Creek				
Cozy Corner Tributary 5	CCT5-1	Sheridan to City Park Overflow	Sheridan Blvd	(2) 4'Hx12'W CBC		\$297,617
Cozy Corner Tributary 5	CCT5-2	City Park Overflow to Big Dry Creek				
Hyland Hills Tributary # 3	HHT3	Jay St. to Big Dry Creek	Harlan St.	(2 Add.) 36" RCP		\$70,555
Hyland Hills Tributary # 4	HHT4	Westminster Blvd. to Big Dry Creek				
South Branch Hylands Creek	SBHC-3	104th Ave to Big Dry Creek				
South Branch Hylands Creek	SBHC-2	Sheridan Blvd. to 104th Ave				
South Branch Hylands Creek	SBHC-1	Highland Pl. to Sheridan Blvd.				
South Branch Hylands Creek ***	SBHC-T1	Tributary 1	W. 98th Ave.	(2) 42" RCP		\$53,452
South Branch Hylands Creek	SBHC-T2	Tributary 2				
Middle Branch Hylands Creek	MBHC-2	102nd Pl. to Confluence w/ S. Branch H.C.				
Middle Branch Hylands Creek	MBHC-1	Lowell Blvd. to 102nd Pl.				
North Branch Hylands Creek	NBHC	104th Ave & Lowell Blvd. to M. Branch H.C.				
Ketner	K-1	N. Oak Street to Kettner Reservoir				
Ketner	K-2	Kettner Reservoir to Big Dry Creek				
Lake Erie Basin Tributary 5	LET5	128th & Huron St. to Big Dry Creek				
Lake Erie Basin Tributary 6 ***	LET6-1	120th Ave to Confluence Pond	W. 121st Ave	(2) 4'Hx8'W CBC		\$92,364
Lake Erie Basin Tributary 6	LET6-2	Confluence Pond to Big Dry Creek				
Lake Erie Basin Tributary 6A	LET6A	124th Ave to Confluence Pond				
Little Dry Creek ***	LDC-6	Lowell Blvd. to Federal Blvd	Federal Blvd. - Irving St. - 69th Ave.	(3) 8'wx10'H CBC - 2'Hx4'W CBC - 7'Hx 47' Bridge		\$1,374,517
Little Dry Creek	LDC-5	72nd Ave to Lowell Blvd.				
Little Dry Creek	LDC-4	Winona Ct. to 72nd Ave.				
Little Dry Creek	LDC-3	75th Ave to Winona Ct.				
Little Dry Creek	LDC-2	76th Ave to 75th Ave				
Little Dry Creek	LDC-1	Tributary B Confluence to 76th Ave.				
Little Dry Creek Tributary B	LDC-B1	N. Garrison St. to Trailside Park				
Little Dry Creek Tributary B	LDC-B2	Trailside Park to Wadsworth Blvd				
McKay Drainageway	MCD-1	144th Ave to McKay Lake	144th Ave.	(3) 5'Hx6'WX80"L CBC		\$174,492
McKay Drainageway	MCD-2	McKay Lake to Huron St.				
McKay Drainageway ***	MCD-3	Huron St. to I-25 (Lowses Pond)	I-25	(2) 10'x10'CBC		\$1,983,392
McKay Drainageway	MCD-4	I-25 to Washington Street	Washington St	(2) 8'x14'		\$460,086
Southwest tributary to McKay Lake	MCD-SW	Huron St. to Lowses Pond				
Quail Creek Tributary A	QC-A	Zuni St. to Quail Creek Confluence				
Quail Creek	QC-1	W 136th Ave. to Osage St.				
Quail Creek	QC-2	Osage St. to Bid Dry Creek	Osage St. - Kalamath St.	5'Hx16'Wx40'L CBC - 5'Hx16'Wx40'L CBC		\$154,455
Ranch Creek ***	RC-1	112th Ave to Upper Jackson Lake	112th Ave.	(2) 5'Hx10'W CBC 1/2 Cost		\$112,886
Ranch Creek	RC-2	Upper Jackson Lake to 120th Ave	Decatur (Bike Path) - 120th Ave.	(2) 8'Hx10'W CBC - (2) 8'Hx10'W CBC		\$810,749
Ranch Creek	RC-3	120th Ave to Confluence w/ Big Dry Creek				
Ranch Creek Tributary 1	RCT1-1	Huron St. to Pecos St.	Pecos St.	Add. 42" RCP		\$36,346
Ranch Creek Tributary 1	RCT1-2	Pecos St. to Ranch Creek Confluence.	Quivas Way	Add. 6'Hx6'W CBC		\$55,160
Ranch Creek Tributary 2	RCT2	Cedar Bridge Pond to Ranch Creek				
Shaw Heights Tributary	SHT-4	78th Ave to 76th Ave				
Shaw Heights Tributary	SHT-3	80th Ave to 78th Ave				
Shaw Heights Tributary	SHT-2	Railroad to 80th Ave				
Shaw Heights West Tributary	SHT-1A	End of West Tributary to Railroad				
Shaw Heights Tributary	SHT-1	End of Main Stream to Railroad	Rotary Pond to Railroad - Rotary Pond to Shaw/Lowell Blvd Pond	54"x1375' RCP - 54", 48", 36", 18"x3237l RCP		\$1,093,551
Shay Ditch	SD-2	Huron St. to I-25				
Standley Lake Tributary 1	SLT1-1	92nd Ave to 96th Ave				
Standley Lake Tributary 1	SLT1-2	96th Ave. to Big Dry Creek				
Standley Lake Tributary 2	SLT2	Lark Bunting Dr. to Big Dry Creek				
Standley Lake Tributary 3	SLT3	Independence Dr. to Big Dry Creek				
Standley Lake Tributary 4	SLT4-1	100th Ave to Standley Spillway	W. 100th Ave.	(2) 4'Hx6'W CBC		\$72,266
Standley Lake Tributary 4	SLT4-2	Standley Spillway to Big Dry Creek				
Tanglewood Creek	TC-1	120th Ave to 123rd Ave	W. 120th Ave. - W. 121st Ave.	5'Hx5'W CBC - (2) 5'Hx8'W CBC		\$242,876
Tanglewood Creek ***	TC-2	123rd Ave to 128th Ave	W. 128th Ave	8'Hx12'W CBC		\$401,944
Tanglewood Creek ***	TC-3	128th Ave to I-25				
Tanglewood Creek Tributary 1	TC-T1	I-25 to Tanglewood Creek				
Tanglewood Creek Tributary 2	TC-T2	I-25 to Tanglewood Creek				
Walnut Creek Tributary 2	WC-T2	Simms St. Pond to Walnut Creek				
Walnut Creek	WC-1	Simms St. to 108th Ave	Simms St. - 108th Ave.	(2)8'Hx10'W CBC - 8'Hx10'-12'-10'W CBC		\$668,338
Walnut Creek	WC-2	108th Ave to Wadsworth Pkwy	Wadsworth Pkwy	8'Hx11'-14'-11'W CBC		\$408,999
Walnut Creek	WC-3	Wadsworth Pkwy to Big Dry Creek Confl.				
North Branch Walnut Creek	NBWC	Simms St. to Walnut Creek	Simms St.	(2) 8'Hx9'W CBC		\$170,189
Tributary to N. Branch Walnut Creek	NBWC-T1	Jeffco Airport to N. B. Walnut Creek				
Upper Dry Creek Valley Ditch	UDCVD	Simms St. to Ball Pond				
North Fork Walnut Creek ***	NFWC	Ball Pond to Walnut Creek	W. 108th Ave.	4'Wx10'H CBC		\$143,676
Walnut Creek Tributary 1 ***	WC-T1	W. 108th Ave to Walnut Creek	W. 108th Ave. - W. 106th Ave.	6'Hx10'W CBC - (3) 4'Hx8'W CBC		\$271,319
Lower Church Lake Tributary	LCL	Wadsworth Blvd. to Walnut Creek				
City Park Drainageway	CPD	Reach 4 (Chase to Newton)	Sheridan Blvd	Add. (2) 84" & (1) 60" RCP		\$1,713,146
City Park Drainageway	CPD-O	Overflow to Cozy Corner Tributary 5				
3207 Drainageway ***	3207	Lowell Blvd to Big Dry Creek Confluence	Sheridan Blvd - Lowell Blvd.	(2) 84" & (1) 60" RCP - 6'Hx52'W Bridge 1/2 Cost		\$262,575
Pomponio Branch	PB	72nd Ave to Little Dry Creek				
Total Culvert Crossing Costs:						\$14,591,631

⁴*** Indicates locations where channel improvement costs could be shared with other government agencies (Not Including UDFCD) or covered in full by area development.

Westminster Regional Detention Facility Cost Estimate

Stream ⁴	Stream Reach Abbreviation	Reach Boundaries	Detention Pond	Pond Improvements	Total Detention Facility Cost Including Contingency		Facility Ownership
					Contingency	35%	
Airport Creek	APC-1	Main/Pierce St. to Eaton St.					
Airport Creek	APC-2	Eaton St. to Big Dry Creek Confluence					
Big Dry Creek	BDC-6	128th Ave. to I-25					
Big Dry Creek	BDC-5	120th Ave. to 128th Ave.					
Big Dry Creek	BDC-4	Sheridan Blvd. to 120th Ave.					
Big Dry Creek	BDC-3	Wadsworth Blvd. to Sheridan Blvd.					
Big Dry Creek	BDC-1	Standley Lake to Railroad					
North Cotton Creek	NCC	Legacy Ridge Pkwy to Big Dry Creek					
Middle Cotton Creek	MCC	107th Ave. to Big Dry Creek					
Countryside Creek	CC-1	N. Oak St. to Independence St.					
Countryside Creek	CC-2	Independence St. to Walnut Creek					
Cozy Corner Tributary 1	CCT1	118th Pl. to Big Dry Creek					
Cozy Corner Tributary 2	CCT2	Newton Dr. to Big Dry Creek					
Cozy Corner Tributary 3	CCT3-1	105th Pl. to Golf Course					
Cozy Corner Tributary 3	CCT3-2	Golf Course to 112th Ave					
Cozy Corner Tributary 3	CCT3-3	112th Ave to Big Dry Creek					
Cozy Corner Tributary 4	CCT4	N. Grove St. to Big Dry Creek					
Cozy Corner Tributary 5	CCT5-1	Sheridan to City Park Overflow					
Cozy Corner Tributary 5	CCT5-2	City Park Overflow to Big Dry Creek					
Hyland Hills Tributary # 3	HHT3	Jay St. to Big Dry Creek					
Hyland Hills Tributary # 4	HHT4	Westminster Blvd. to Big Dry Creek					
South Branch Hylands Creek	SBHC-3	104th Ave to Big Dry Creek					
South Branch Hylands Creek	SBHC-2	Sheridan Blvd. to 104th Ave					
South Branch Hylands Creek	SBHC-1	Highland Pl. to Sheridan Blvd.	Ice Arena Pond	Lowflow Outlet to D/S Ponds is Failing	\$27,000		Westminster
South Branch Hylands Creek	SBHC-T1	Tributary 1					
South Branch Hylands Creek	SBHC-T2	Tributary 2					
Middle Branch Hylands Creek	MBHC-2	102nd Pl. to Confluence w/ S. Branch H.C.					
Middle Branch Hylands Creek	MBHC-1	Lowell Blvd. to 102nd Pl.					
North Branch Hylands Creek	NBHC	104th Ave & Lowell Blvd. to M. Branch H.C.					
Ketner	K-1	N. Oak Street to Kettner Reservoir					
Ketner	K-2	Kettner Reservoir to Big Dry Creek					
Lake Erie Basin Tributary 5	LET5	128th & Huron St. to Big Dry Creek					
Lake Erie Basin Tributary 6	LET6-1	120th Ave to Confluence Pond					
Lake Erie Basin Tributary 6	LET6-2	Confluence Pond to Big Dry Creek					
Lake Erie Basin Tributary 6A	LET6A	124th Ave to Confluence Pond					
Little Dry Creek	LDC-6	Lowell Blvd. to Federal Blvd					
Little Dry Creek	LDC-5	72nd Ave to Lowell Blvd.					
Little Dry Creek	LDC-4	Winona Ct. to 72nd Ave.					
Little Dry Creek	LDC-3	75th Ave to Winona Ct.					
Little Dry Creek	LDC-2	76th Ave to 75th Ave					
Little Dry Creek	LDC-1	Tributary B Confluence to 76th Ave.					
Little Dry Creek Tributary B	LDC-B1	N. Garrison St. to Trailside Park					
Little Dry Creek Tributary B	LDC-B2	Trailside Park to Wadsworth Blvd					
McKay Drainageway	MCD-1	144th Ave to McKay Lake					
McKay Drainageway	MCD-2	McKay Lake to Huron St.					
McKay Drainageway	MCD-3	Huron St. to I-25 (Lowes Pond)					
McKay Drainageway	MCD-4	I-25 to Washington Street					
Southwest tributary to McKay Lake	MCD-SW	Huron St. to Lowes Pond					
Quail Creek Tributary A	QC-A	Zuni St. to Quail Creek Confluence					
Quail Creek	QC-1	W 136th Ave. to Osage St.					
Quail Creek	QC-2	Osage St. to Bid Dry Creek					
Ranch Creek	RC-1	112th Ave to Upper Jackson Lake	Upper Jackson Lake	Embankment Improvements, & (2) 5'Hx8'W CBC Outlet			The Ranch C.C.
Ranch Creek	RC-2	Upper Jackson Lake to 120th Ave	Jackson Lake	Embankment Improvements, & (4) 5'Hx10'W CBC Outlet			The Ranch C.C.
Ranch Creek	RC-3	120th Ave to Confluence w/ Big Dry Creek					
Ranch Creek Tributary 1	RCT1-1	Huron St. to Pecos St.					
Ranch Creek Tributary 1	RCT1-2	Pecos St. to Ranch Creek Confluence.					
Ranch Creek Tributary 2	RCT2	Cedar Bridge Pond to Ranch Creek					
Shaw Heights Tributary	SHT-4	78th Ave to 76th Ave					
Shaw Heights Tributary	SHT-3	80th Ave to 78th Ave					
Shaw Heights Tributary	SHT-2	Railroad to 80th Ave					
Shaw Heights West Tributary	SHT-1A	End of West Tributary to Railroad					
Shaw Heights Tributary ***	SHT-1	End of Main Stream to Railroad	Shaw & Lowell Blvd. Pond	No Pond Currently Exists	\$338,839		Westminster
Shay Ditch ***	SD-2	Huron St. to I-25	Shay & I-25 Pond	No Pond Currently Exists	\$2,941,797		Westminster
Standley Lake Tributary 1	SLT1-1	92nd Ave to 96th Ave	Niver Canal	Outlet to Drainageway, Grading to Outlet, & Highline Canal Overflow	\$256,500		Westminster
Standley Lake Tributary 1	SLT1-2	96th Ave. to Big Dry Creek					
Standley Lake Tributary 2	SLT2	Lark Bunting Dr. to Big Dry Creek					
Standley Lake Tributary 3	SLT3	Independence Dr. to Big Dry Creek					
Standley Lake Tributary 4	SLT4-1	100th Ave to Standley Spillway	Niver Canal & Bubble Up Pond	Outlet Structure to Bubble Up Pond, Niver Canal Dam, Bubble Up Improvements	\$243,000		Westminster
Standley Lake Tributary 4	SLT4-2	Standley Spillway to Big Dry Creek					
Tanglewood Creek	TC-1	120th Ave to 123rd Ave	Front Range Village Pond	Convert to Dry Facility & Spillway/Outlet Improvements	\$21,380		HOA
Tanglewood Creek ***	TC-2	123rd Ave to 128th Ave					
Tanglewood Creek ***	TC-3	128th Ave to I-25					
Tanglewood Creek Tributary 1	TC-T1	I-25 to Tanglewood Creek					
Tanglewood Creek Tributary 2	TC-T2	I-25 to Tanglewood Creek					
Walnut Creek Tributary 2	WC-T2	Simms St. Pond to Walnut Creek	Simms St. Pond	No pond Currently Exists	\$707,268		Westminster
Walnut Creek	WC-1	Simms St. to 108th Ave					
Walnut Creek	WC-2	108th Ave to Wadsworth Pkwy					
Walnut Creek	WC-3	Wadsworth Pkwy to Big Dry Creek Confl.					
North Branch Walnut Creek	NBWC	Simms St. to Walnut Creek					
Tributary to N. Branch Walnut Creek	NBWC-T1	Jeffco Airport to N. B. Walnut Creek					
Upper Dry Creek Valley Ditch	UDCVD	Simms St. to Ball Pond					
North Fork Walnut Creek ***	NFWC	Ball Pond to Walnut Creek	Ball Campus Pond	Outlet Structure, Pond Improvements, & Irrigation Canal Diversion Structure	\$501,799		Ball Corp
Walnut Creek Tributary 1	WC-T1	W. 108th Ave to Walnut Creek					
Lower Church Lake Tributary	LCL	Wadsworth Blvd. to Walnut Creek	Lower Church Lake	Lake Outlet Structure	\$26,726		Irrigation
City Park Drainageway	CPD	Reach 4 (Chase to Newton)					
City Park Drainageway	CPD-O	Overflow to Cozy Corner Tributary 5					
3207 Drainageway ***	3207	Lowell Blvd to Big Dry Creek Confluence	Metzger Park Ponds	Dam & Outlet Improvements (1/2 Costs)	\$233,886		Westminster & Broomfield
Pomponio Branch	PB	72nd Ave to Little Dry Creek					
Total Detention Facility Costs:						\$5,298,195	

⁴*** Indicates locations where channel improvement costs could be shared with other government agencies (Not Including UDFCD) or covered in full by area development.



Appendix B

**Westminster Drainageway Capital Improvement
Project Rankings**

Note: Higher Total Scores Represent Higher Priority

Priority	4	4	3	3	2	Total Score
	Public Health And Safety	Protection of Infrastructure	Erosion	Population Served by Project	Availability of Additional Funding	
Severity Of Condition	4	Project needed to alleviate existing health or safety hazard	Project is critical to protect structural integrity of existing facility	Severe erosion	Arterial Street/Road or at least 1000 homes affected	All or part of funding is provided by non-City revenues
	3	Project needed to alleviate potential health or safety hazard	Project will repair systems important to facility operation	Moderate erosion	Collector street/road or at least 100 homes affected	Non-City Revenues have been requested
	2	Project promotes or maintains health or safety	Project will improve facility appearance or deter future expenditure	Minor erosion	Local street/road or at least 35 homes affected	Potential for non-City revenues exists
	1	No health or safety benefit associated with project	No existing facility involved	No erosion evident	Cul-de-sac or less than 35 homes affected	No non-City revenues are available

Stream	Stream Reach Abbreviation	Reach Boundaries	4	4	3	3	2	Total Score
McKay Drainageway ***	MCD-3 & 4	Huron St. to I-25 (Lowes Pond)	16	16	12	12	8	64
Little Dry Creek ***	LDC-6	Lowell Blvd. to Federal Blvd	16	16	12	12	6	62
Airport Creek	APC-2	Eaton St. to Big Dry Creek Confluence	16	16	12	9	4	57
South Branch Hylands Creek	SBHC-2	Sheridan Blvd. to 104th Ave	12	12	12	9	4	49
Middle Branch Hylands Creek	MBHC-2	102nd Pl. to Confluence w/ S. Branch H.C.	12	12	12	9	4	49
Ranch Creek	RC-3	120th Ave to Confluence w/ Big Dry Creek	12	12	9	12	4	49
Big Dry Creek	BDC-6	128th Ave. to I-25	12	8	12	12	4	48
Big Dry Creek	BDC-5	120th Ave. to 128th Ave.	12	8	12	12	4	48
Big Dry Creek	BDC-4	Sheridan Blvd. to 120th Ave.	12	8	12	12	4	48
Tanglewood Creek ***	TC-3	128th Ave to I-25	12	8	12	12	4	48
Walnut Creek	WC-3	Wadsworth Pkwy to Big Dry Creek Confl.	8	12	12	12	4	48
Hyland Hills Tributary # 4	HHT4	Westminster Blvd. to Big Dry Creek	8	16	12	9	2	47
3207 Drainageway ***	3207	Lowell Blvd to Big Dry Creek Confluence	12	16	9	3	6	46
Big Dry Creek	BDC-3	Wadsworth Blvd. to Sheridan Blvd.	12	8	9	12	4	45
Middle Cotton Creek	MCC	107th Ave. to Big Dry Creek	8	12	12	9	4	45
Cozy Corner Tributary 5	CCT5-1	Sheridan to City Park Overflow	12	12	3	12	6	45
Lake Erie Basin Tributary 6 ***	LET6-1	120th Ave to Confluence Pond	8	12	9	12	4	45
Quail Creek	QC-2	Osage St. to Bid Dry Creek	12	12	3	9	6	42
Shaw Heights Tributary	SHT-4	78th Ave to 76th Ave	12	8	9	9	4	42
Walnut Creek Tributary 2	WC-T2	Simms St. Pond to Walnut Creek	12	8	6	12	4	42
Cozy Corner Tributary 2	CCT2	Newton Dr. to Big Dry Creek	8	16	12	3	2	41
South Branch Hylands Creek	SBHC-3	104th Ave to Big Dry Creek	8	8	12	9	4	41
Walnut Creek	WC-2	108th Ave to Wadsworth Pkwy	8	8	9	12	4	41
City Park Drainageway	CPD	Reach 4 (Chase to Newton)	8	8	9	12	4	41
Southwest tributary to McKay Lake	MCD-SW	Huron St. to Lowes Pond	12	12	3	9	4	40
Cozy Corner Tributary 5	CCT5-2	City Park Overflow to Big Dry Creek	8	12	6	9	4	39
Little Dry Creek Tributary B	LDC-B2	Trailside Park to Wadsworth Blvd	8	12	9	6	4	39
North Fork Walnut Creek ***	NFWC	Ball Pond to Walnut Creek	8	12	3	12	4	39
Big Dry Creek	BDC-1	Standley Lake to Railroad	8	8	6	12	4	38
Cozy Corner Tributary 3	CCT3-3	112th Ave to Big Dry Creek	8	8	6	12	4	38
South Branch Hylands Creek	SBHC-1	Highland Pl. to Sheridan Blvd.	8	12	6	9	2	37
Ranch Creek	RC-2	Upper Jackson Lake to 120th Ave	12	12	3	6	4	37
Ranch Creek Tributary 1	RCT1-2	Pecos St. to Ranch Creek Confluence.	8	8	9	6	4	35
North Branch Walnut Creek	NBWC	Simms St. to Walnut Creek	8	8	6	9	4	35
Shaw Heights Tributary	SHT-1	End of Main Stream to Railroad	8	8	3	12	2	33
Standley Lake Tributary 1	SLT1-1	92nd Ave to 96th Ave	8	12	3	6	4	33
Walnut Creek Tributary 1 ***	WC-T1	W. 108th Ave to Walnut Creek	8	12	3	6	4	33
Lower Church Lake Tributary	LCL	Wadsworth Blvd. to Walnut Creek	8	12	3	6	4	33
McKay Drainageway	MCD-1	144th Ave to McKay Lake	8	8	9	3	4	32
Ranch Creek ***	RC-1	112th Ave to Upper Jackson Lake	8	8	3	9	4	32
Standley Lake Tributary 2	SLT2	Lark Bunting Dr. to Big Dry Creek	4	8	6	12	2	32
Walnut Creek	WC-1	Simms St. to 108th Ave	4	8	12	3	4	31
Airport Creek	APC-1	Main/Pierce St. to Eaton St.	8	8	3	9	2	30
Hyland Hills Tributary # 3	HHT3	Jay St. to Big Dry Creek	8	8	3	9	2	30
Shay Ditch	SD-2	Huron St. to I-25	8	12	3	3	4	30
Upper Dry Creek Valley Ditch	UDCVD	Simms St. to Ball Pond	8	8	3	6	4	29
Tanglewood Creek ***	TC-2	123rd Ave to 128th Ave	4	8	6	6	4	28
Shaw Heights Tributary	SHT-2	Railroad to 80th Ave	8	8	3	6	2	27
Standley Lake Tributary 1	SLT1-2	96th Ave. to Big Dry Creek	4	4	6	9	4	27
Tanglewood Creek	TC-1	120th Ave to 123rd Ave	8	8	3	6	2	27
Countryside Creek	CC-1	N. Oak St. to Independence St.	8	8	3	3	4	26
South Branch Hylands Creek	SBHC-T2	Tributary 2	4	4	3	12	2	25
Standley Lake Tributary 4	SLT4-1	100th Ave to Standley Spillway	4	4	6	9	2	25
Tanglewood Creek Tributary 1	TC-T1	I-25 to Tanglewood Creek	4	4	3	12	2	25
Tanglewood Creek Tributary 2	TC-T2	I-25 to Tanglewood Creek	4	4	3	12	2	25
Lake Erie Basin Tributary 6	LET6-2	Confluence Pond to Big Dry Creek	4	4	6	6	4	24
Ranch Creek Tributary 1	RCT1-1	Huron St. to Pecos St.	4	4	6	6	4	24
Cozy Corner Tributary 4	CCT4	N. Grove St. to Big Dry Creek	4	8	6	3	2	23
South Branch Hylands Creek ***	SBHC-T1	Tributary 1	4	8	3	6	2	23
Standley Lake Tributary 3	SLT3	Independence Dr. to Big Dry Creek	4	8	3	6	2	23
North Cotton Creek	NCC	Legacy Ridge Pkwy to Big Dry Creek	4	4	3	9	2	22
Countryside Creek	CC-2	Independence St. to Walnut Creek	4	4	3	9	2	22
Cozy Corner Tributary 3	CCT3-2	Golf Course to 112th Ave	4	4	3	9	2	22
North Branch Hylands Creek	NBHC	104th Ave & Lowell Blvd. to M. Branch H.C.	4	4	3	9	2	22
Lake Erie Basin Tributary 5	LET5	128th & Huron St. to Big Dry Creek	4	4	3	9	2	22
Little Dry Creek	LDC-5	72nd Ave to Lowell Blvd.	4	4	3	9	2	22
Little Dry Creek	LDC-4	Winona Ct. to 72nd Ave.	4	4	3	9	2	22
Little Dry Creek	LDC-3	75th Ave to Winona Ct.	4	4	3	9	2	22
Little Dry Creek	LDC-2	76th Ave to 75th Ave	4	4	3	9	2	22
Little Dry Creek	LDC-1	Tributary B Confluence to 76th Ave.	4	4	3	9	2	22
Quail Creek	QC-1	W 136th Ave. to Osage St.	4	4	3	9	2	22
Ranch Creek Tributary 2	RCT2	Cedar Bridge Pond to Ranch Creek	4	4	3	9	2	22
Cozy Corner Tributary 3	CCT3-1	105th Pl. to Golf Course	4	4	3	6	2	19
Middle Branch Hylands Creek	MBHC-1	Lowell Blvd. to 102nd Pl.	4	4	3	6	2	19
Ketner	K-1	N. Oak Street to Kettner Reservoir	4	4	3	6	2	19
Ketner	K-2	Kettner Reservoir to Big Dry Creek	4	4	3	6	2	19
Lake Erie Basin Tributary 6A	LET6A	124th Ave to Confluence Pond	4	4	3	6	2	19
Little Dry Creek Tributary B	LDC-B1	N. Garrison St. to Trailside Park	4	4	3	6	2	19
McKay Drainageway	MCD-2	McKay Lake to Huron St.	4	4	3	6	2	19
Quail Creek Tributary A	QC-A	Zuni St. to Quail Creek Confluence	4	4	3	6	2	19
Shaw Heights West Tributary	SHT-1A	End of West Tributary to Railroad	4	4	3	6	2	19
Tributary to N. Branch Walnut Creek	NBWC-T1	Jeffco Airport to N. B. Walnut Creek	4	4	3	6	2	19
City Park Drainageway	CPD-O	Overflow to Cozy Corner Tributary 5	4	4	3	6	2	19
Pomponio Branch	PB	72nd Ave to Little Dry Creek	4	4	3	6	2	19
Cozy Corner Tributary 1	CCT1	118th Pl. to Big Dry Creek	4	4	3	3	2	16
Shaw Heights Tributary	SHT-3	80th Ave to 78th Ave	4	4	3	3	2	16
Standley Lake Tributary 4	SLT4-2	Standley Spillway to Big Dry Creek	4	4	3	3	2	16

4 *** Indicates channel reaches where channel improvement costs could be shared with other governmental agencies (Not Including UDFCD) or covered in full by area development.



Appendix C

Westminster Parks, Recreation and Libraries Department Drainageway Maintenance Costs

Stream	Channel General Maintenance	Periodic Stream Restoration	Mosquito Control	Storm Outfall Maintenance	Detention Pond Maintenance	Water Quality Pond Maintenance	Total Costs
Airport Creek	\$6,000	\$12,000			\$5,000		\$23,000
Big Dry Creek	\$65,000						\$65,000
North Cotton Creek	\$5,000						\$5,000
Middle Cotton Creek	\$8,000			\$2,000			\$10,000
Countryside Creek		\$10,000					\$10,000
Cozy Corner 1 & 2	\$2,000						\$2,000
Cozy Corner Tributary 3		\$15,000					\$15,000
Cozy Corner Tributary 4	\$5,000				\$2,000		\$7,000
Cozy Corner Tributary 5					\$3,000		\$3,000
Hyland Hills Tributary # 3	\$1,000	\$2,000					\$3,000
Hyland Hills Tributary # 4 linear buffer	\$10,000	\$5,000			\$2,000		\$17,000
South Branch Hylands Creek							\$0
Middle Branch Hylands Creek	\$3,000						\$3,000
North Branch Hylands Creek	\$5,000	\$15,000			\$3,000		\$23,000
Ketner		\$10,000					\$10,000
Lake Erie Basin Tributary 5							\$0
Lake Erie Basin Tributary 6	\$1,500						\$1,500
Lake Erie Basin Tributary 6A	\$2,000				\$2,000		\$4,000
Little Dry Creek	\$45,000						\$45,000
Little Dry Creek Tributary B		\$20,000					\$20,000
McKay Drainageway							\$0
Northwest tributary to McKay Lake							\$0
Southwest tributary to McKay Lake							\$0
Quail Creek Tributary A	\$20,000						\$20,000
Quail Creek	\$3,000	\$30,000					\$33,000
Ranch Creek	\$2,000						\$2,000
Ranch Creek Tributary 1		\$5,000				\$5,000	\$10,000
Ranch Creek Tributary 2	\$1,000	\$10,000					\$11,000
Shaw Heights Tributary	\$5,000						\$5,000
Shay Ditch							\$0
Standley Lake Tributary 1					\$2,000		\$2,000
Standley Lake Tributary 2					\$5,000		\$5,000
Standley Lake Tributary 3	\$5,000	\$2,000					\$7,000
Standley Lake Tributary 4							\$0
Tanglewood Creek	\$2,000	\$1,000					\$3,000
Tanglewood Creek Tributary 1		\$1,000					\$1,000
Tanglewood Creek Tributary 2		\$1,000					\$1,000
Walnut Creek Tributary 2		\$2,000					\$2,000
Walnut Creek	\$20,000					\$2,000	\$22,000
North Branch Walnut Creek	\$2,000						\$2,000
Tributary to N. Branch Walnut Creek							\$0
Upper Dry Creek Valley Ditch						\$2,000	\$2,000
North Fork Walnut Creek							\$0
Walnut Creek Tributary 1							\$0
Lower Church Lake Tributary							\$0
City Park Drainageway	\$5,000						\$5,000
3207 Drainageway - Metzger	\$10,000	\$20,000		\$10,000		\$4,000	\$44,000
Pomponio Branch							\$0
City Hall						\$5,000	\$5,000
Westfield Village Park							\$0
Vogel Pond		\$15,000					\$15,000
Westview Rec Center						\$2,000	\$2,000
Green Knolls Park						\$4,000	\$4,000
Chelsea Park	\$2,000						\$2,000
Farmers Highline Ditch	\$21,000						\$21,000
Countryside PLD						\$2,000	\$2,000
Cobblestone Park						\$5,000	\$5,000
Hidden Lake							\$0
Promenade Lake							\$0
City Park Lake							\$0
Ranch Pond							\$0
Margaret's Pond							\$0
Bull Canal Lakes							\$0
Campus Pond							\$0
Total Costs	\$256,500	\$176,000	\$50,000	\$12,000	\$24,000	\$31,000	\$549,500

Note: The Periodic Stream Restoration maintenance category represents costs for major maintenance operations performed on a specific site. These costs normally can be associated with activities such as clearing debris and sediment from culverts, major vegetation trimming, detention pond cleaning, and other major maintenance activities that are required every few years. It is anticipated that these costs are incurred for a specific site every 2-5 years. While this table shows costs incurred for only a specific site, it is anticipated that the same magnitude of funds will be distributed to other sites every year depending on maintenance needs.

Westminster Regional Detention Pond Summary

Sub-Basin	Facility	Storage Size (ac-ft)	Maintenance Area (ac)	Wet or Dry Facility	Water Quality Facility	Facility Ownership	Maintenance Responsibility
Little Dry Creek Basin	Westminster Mall (LDC Trib. B)	Not Given		Dry	No	Commercial	Commercial
	General Cable (LDC Trib. B)	Not Given		Dry	No	Westminster	Westminster
Standly Lake Basin	Niver Canal Storage (Trib. 1)	11	3.75	Dry	No	Westminster	Westminster
	West 92nd Avenue Pond (Trib. 1)	2.5	0.89	Wet	No	HOA	HOA
	East Niver Canal Storage (Trib. 2)	12	2.03	Dry	No	Westminster	Westminster
	East Pond (Trib. 2)	11.9	2.26	Dry	No	Westminster	Westminster
	Middle Pond (Trib. 2)	10.4	1.62	Dry	No	Westminster	Westminster
	West Pond (Trib. 2)	1.4	1.46	Dry	No	Westminster	Westminster
	Fred Schmid Pond (Trib. 2)	4.3	2.61	Dry	No	Commercial	Commercial
	West Niver Canal Storage (Trib. 3)	13	1.68	Dry	No	Westminster	Westminster
	Bubble Up Pond (Trib. 3)	Not Given	4.10	Dry	No	Westminster	Westminster
	Kettner Reservoir (Ketner)	44	32.72	Wet	No	Westminster	Westminster
	U.S. Homes Pond (Ketner)	13	5.97	Dry	No	Westminster	Westminster
Walnut Creek Basin	Walnut Creek Upstream of C&S Railroad (Walnut)	92	12.62	Wet	No	Westminster	Westminster
	Ball Campus Pond (North Fork)	25 (After Improvements)	4.56	Wet	No	Ball Corp.	Ball Corp.
	Simms Street Pond (Trib. 2)	31 (Not Constructed)	5.00	Not Constructed	No	Westminster	Westminster
	Lower Church Lake (Lower Church Lake)	43	35.72	Wet	No	Irrigation	Irrigation
Hyland Hills Basin	West Ponds (Trib. 2)	15	1.55	Dry	Yes	Commercial	Commercial
	East Pond (Trib. 2)	25	5.73	Dry	No	Westminster	Westminster
	Ice Arena Pond (South Branch)	Not Given	3.31	Wet	No	Westminster	Westminster
	S. B. Golf Course Ponds 1-5 (South Branch)	Not Given	12.4	Wet	No	Hyland Hills G.C.	Hyland Hills G.C.
	S. B. Ponds 6-7 (South Branch)	Not Given	6.1	Wet	No	Westminster	Westminster
	Lowell Blvd. & 99th Ave Pond (Middle Branch)	Not Given	4.65	Dry	No	Westminster	Westminster
	8th Green Pond (Middle Branch)	11	2.53	Wet	No	Hyland Hills G.C.	Hyland Hills G.C.
	104th Ave. & Lowell Blvd. Pond (North Branch)	Not Given	1.23	Dry	No	HOA	HOA
	104th Ave. & Legacy Ridge Pond (North Branch)	Not Given	4.99	Wet	No	Westminster	Westminster
	Hyland Hills Trib. 4 Pond (Trib. 4)	Not Given	2.46	Wet	No	Westminster	Westminster
Airport Creek Basin	Sheridan Green Skimming Pond (Airport Creek)	10	5.86	Dry	No	Westminster	Westminster
Cozy Corner Basin	107th Ave. Pond (Middle Cotton Creek)	Not Given	0.94	Dry	No	HOA	Westminster
	Legacy Ridge Pond (Middle Cotton Creek)	Not Given	1.80	Wet	No	Westminster	Westminster
	Tributary 2 Pond (C.C. Trib. 2)	Not Given	2.34	Wet	Yes	Westminster	Westminster
	Trib. 3 Golf Course Pond (C.C. Trib. 3)	Not Given	2.05	Wet	No	Westminster	Westminster
	South & North Mushroom Farm Pond (C.C. Trib. 3)	52	7.22	Wet	No	Westminster	Westminster
	Vogel Pond (C.C. Trib. 3)	Not Given	4.81	Wet	No	Westminster	Westminster
	Upper College Hills Pond (C.C. Trib. 3)	19	2.05	Wet	No	HOA	HOA
	College Hills Pond (C.C. Trib. 3)	3.5	1.18	Wet	No	HOA	HOA
	Trib. 4 Ponds 1-5 (C. C. Trib. 4)	Not Given	7.78	Wet	No	HOA	HOA
	Torrey Peaks Detention Ponds (C. C. Trib. 5)	Not Given	1.81	Dry	No	HOA	HOA
	Tributary 5 Pond (C. C. Trib. 5)	Not Given	1.33	Wet	No	Westminster	Westminster
	Upper Jackson Lake (Ranch Creek)	25	2.96	Wet	No	The Ranch C.C.	The Ranch C.C.
	Jackson Lake (Ranch Creek)	57	9.79	Wet	No	The Ranch C.C.	The Ranch C.C.
	N. Huron & 114th Ave Pond (Ranch Creek Trib. 1)	Not Given	1.44	Wet	No	Westminster	Westminster
	Golf Course Pond (Ranch Creek Trib. 1)	Not Given	0.63	Wet	No	The Ranch C.C.	The Ranch C.C.
Cedar Bridge Pond (Ranch Creek Trib. 2)	4	1.80	Dry	No	HOA	HOA	
3208 Drainageway	Metzger Open Space Ponds (3207 Drainageway)	Not Given	8.14	Wet	No	Westminster	Westminster
City Park Drainageway	City Park Overflow Pond (City Park to C.C. Trib 5)	Not Given	4.46	Wet	Yes	Westminster	Westminster
Lake Erie Basin	South Detention Pond (Lake Erie Trib. 6)	Not Given	1.59	Wet	Yes	Westminster	Westminster
	Confluence Pond (Lake Erie Trib. 6)	Not Given	4.44	Wet	Yes	Westminster	Westminster
	Huron St. & 128th Ave Detention Pond (Lake Erie Trib. 5)	Not Given	0.88	Dry	Yes	HOA	HOA
	Front Range Village Pond (Tanglewood Creek)	6	1.42	Wet	No	HOA	HOA
McKay Lake Watershed	McKay Lake (McKay Lake Drainageway)	97.2	74.17	Wet	No	Westminster	Westminster
	Lowes Pond (McKay Lake Drainageway)	Not Given	8.32	Wet	No	Commercial	Commercial
	Huron & 144th Ave Pond (Northeast Trib.)	Not Given	0.84	Dry	Yes	HOA	Westminster
	Huron & Lexington Pond (Southwest Trib.)	Not Given	1.61	Dry	No	HOA	HOA
Big Dry Creek	Big Dry Creek Upstream of I-36	200	26.66	Wet	No	Westminster	Westminster
	Big Dry Creek Upstream of C&S Railroad	89	10.23	Wet	No	Westminster	Westminster
Shaw Heights	Rotary Park Detention Pond (Shaw Heights)	33	4.19	Dry	No	ADCO	HOA / ADCO
	Shaw Blvd. & Lowell Blvd. Detention Pond (Shaw Heights)	17.7 (Not Constructed)	4.46	Not Constructed	No	Westminster	Westminster
Shay Ditch	Shay Ditch Pond @ I-25 (Shay Ditch)	138 (Not Constructed)	21.07	Not Constructed	No	Westminster	Westminster

Detention Pond Summary	
Detention Facilities Belonging to The City of Westminster	
Total Westminster Dry Detention Pond Area (ac)	40.05
Total Westminster Wet Detention Pond Area (ac)	200.05
Total Westminster Water Quality Detention Pond Area (ac)	13.67
Total Westminster Mater Plan Detention Ponds Not Constructed (ac)	30.53
Total Westminster Detention Pond Area (ac)	284.3
Total Number of Westminster Detention Facilities	37
Privately Owned Detention Facilities (HOA, Commercial, ECT.)	
Total Others Dry Detention Pond Area in Westminster (ac)	13.25
Total Others Wet Detention Pond Area in Westminster (ac)	90.23
Total Others Water Quality Detention Pond Area in Westminster (ac)	2.43
Total Other Detention Pond Area in Westminster (ac)	105.91
Total Number of Others Detention Facilities	22
Total Detention Pond Area within The City of Westminster (ac)	390.21
Total Number of Detention Facilities within The City of Westminster	59

Note: This summary of Regional Detention Ponds includes all major detention and retention facilities that are recommended in the various Master Plan studies. The list also includes drainage facilities and were not recommended for use as a major detention facility but were observed in the field to be inline, or directly connected to a major drainageway. The majority of these facilities are listed as "Not Given" in the Storage Size category. While these facilities were found to be connected to major drainageways they typically provide minimal to no detention benefits. They are listed here to convey ownership, maintenance responsibility, and maintenance area.

Westminster Drainage System Maintenance Responsibility Summary

Stream	Stream Reach Abbreviation	Reach Boundaries	Maintenance Responsibility	Location	Activity
Airport Creek	APC-1	Main/Pierce St. to Eaton St.	Streets Parks	Main St. to Kendall St. + Jay St. Sherwood Park & Sheridan Green Greenbelt	Storm Sewer Outlet Maintenance General Channel Maintenance and Mowing
Airport Creek	APC-2	Eaton St. to Big Dry Creek Confluence	Streets Parks	110th Ave. & Eaton St. Open Space D/S of Eaton St.	Culvert General Channel Maintenance and Mowing
Big Dry Creek	BDC-6	128th Ave. to I-25	Streets UDFCD Eligible	Entire Reach Huron St. + 128th Ave	General Channel Maintenance and Mowing Bridge Maintenance
Big Dry Creek	BDC-5	120th Ave. to 128th Ave.	UDFCD Eligible	I-25 Bridge Entire Reach	Major Maintenance Eligible General Channel Maintenance and Mowing
Big Dry Creek	BDC-4	Sheridan Blvd. to 120th Ave.	Streets UDFCD Eligible	120th Ave Bike Trail (1224+00 to 1217+00) Entire Reach	Major Maintenance Eligible General Channel Maintenance and Mowing
Big Dry Creek	BDC-3	Wadsworth Blvd. to Sheridan Blvd.	Streets UDFCD Eligible	112th Ave + Vrain Drive Storm Sewer 120th Ave Bike Trail (1224+00 to 1217+00)	Bridge and Storm Sewer Maintenance Major Maintenance Eligible
Big Dry Creek	BDC-2	Railroad Wadsworth Blvd.	Streets UDFCD Eligible	Entire Reach 104th Ave + Westcliff Pkwy 104th Ave/ US 36 (1497+00 to 1494+00) + Westcliff Pkwy (1565+00 to 1560+00)	General Channel Maintenance and Mowing Bridge Maintenance
Big Dry Creek	BDC-1	Standley Lake to Railroad	Other (Private and/or Jeff Co) Streets UDFCD Eligible	Entire Reach 96th Dr., 98th Pl., 98th Ave., Garrison Lane Storm Sewer Big Dry Creek Trail @ BNSF RR (1648+00 to 1638+00)	General Channel Maintenance and Mowing Storm Sewer Outlet Maintenance Major Maintenance Eligible
North Cotton Creek	NCC	Legacy Ridge Pkwy to Big Dry Creek	Streets Parks	Entire Reach Cotton Creek Park & Greenway Drainage Crossing of Legacy Ridge Pkwy	General Channel Maintenance and Mowing Storm Sewer Outlet Maintenance
Middle Cotton Creek	MCC	107th Ave. to Big Dry Creek	Streets Parks	In Vicinity of Fire Station 4 Windsor Park	Storm Sewer through Park, Storm Sewer Outlets, & Vrain St. Culvert Retention Pond
Countryside Creek	CC-1	N. Oak St. to Independence St.	Streets Parks	Legacy Ridge Golf Course Cotton Creek Greenbelt Golf Course D/S to Big Dry Creek	Legacy Ridge Pond & Culvert General Channel Maintenance and Mowing
Countryside Creek	CC-2	Independence St. to Walnut Creek	Streets UDFCD Eligible	Cotton Creek Greenbelt Chelsea Park + Countryside Ball fields + Mayfair Park	Storm Sewer Outlet Maintenance General Channel Maintenance and Mowing
Cozy Corner Tributary 1	CCT1	118th Pl. to Big Dry Creek	Streets Parks	106th Ave. + 105th Ave. Mayfair Greenbelt + Open Channel Adj. to School to Wadsworth Pkwy	Storm Sewer Outlet Maintenance General Channel Maintenance and Mowing
Cozy Corner Tributary 2	CCT2	Newton Dr. to Big Dry Creek	Streets Parks	Holland Way + Holland St + Dover St. Entire Reach of Improved Channel	Culvert Maintenance, & Storm Sewer Outlet Maintenance Major Maintenance Eligible
Cozy Corner Tributary 3	CCT3-1	105th Pl. to Golf Course	Others (HOA) Streets Parks	Wadsworth Pkwy to Dover St. Cozy Corner Trib. 1 in BDC Open Space Cozy Corner Trib. 2 in BDC Open Space	General Channel Maintenance and Mowing Retention Pond & General Channel Maintenance and Mowing Retention Pond & General Channel Maintenance and Mowing
Cozy Corner Tributary 3	CCT3-2	Golf Course to 112th Ave	Streets Parks	Meadowlark Park Bruchez Pkwy From Meadowlark Park to Golf Course	Culvert Maintenance, & Storm Sewer Outlet Maintenance General Channel Maintenance and Mowing
Cozy Corner Tributary 3	CCT3-3	112th Ave to Big Dry Creek	Streets Parks	Legacy Ridge Golf Course From Golf Course to outlet of N. Mushroom Farm Pond	Golf Course Pond & Culvert Detention Pond & General Channel Maintenance and Mowing
Cozy Corner Tributary 4	CCT4	N. Grove St. to Big Dry Creek	Streets Parks	111th Ave + 112th Ave + 112th & Clay Retention Pond Vogel Pond Park & Open Space	Trash Rack / Culvert Maint. & Storm Sewer Outlet Maintenance Detention Pond & General Channel Maintenance and Mowing
Cozy Corner Tributary 5	CCT5-1	Sheridan to City Park Overflow	Streets Parks	Culvert from Vogel Pond to Upper College Hills Pond - Culvert Upper College Hills Pond to College Hills Pond - Culvert College Hills Pond to BDC	Culvert Maintenance & Storm Sewer Outlet Maintenance No Maint. High flows have possibility of flooding golf course
Cozy Corner Tributary 5	CCT5-2	City Park Overflow to Big Dry Creek	Others (HOA) Streets Parks	Upper College Hills Pond and Open Space + College Hills Pond College Hills Pond to Big Dry Creek Open Space D/S of Pond 4	Detention Pond Maintenance Surface Maintenance Only - Streets Responsible for Culvert Detention Pond & General Channel Maintenance and Mowing
Hyland Hills Tributary # 3	HHT3	Jay St. to Big Dry Creek	Streets Parks	113th Ave & Stratford Lakes Dr. Ponds 1 through 4	Spillway, Grate, and Culvert Maintenance General Channel Maintenance and Mowing
Hyland Hills Tributary # 4	HHT4	Westminster Blvd To Big Dry Creek	Streets Parks	Torrey Peaks Retention Ponds Torrey Peaks Retention Ponds & Sheridan Culvert	General Channel Maintenance and Mowing Culvert Maintenance & Storm Sewer Outlet Maintenance
South Branch Hylands Creek	SBHC-3	104th Ave to Big Dry Creek	Streets UDFCD Eligible	104th Ave to Big Dry Creek 104th Ave	General Channel Maintenance and Mowing Culvert Maintenance
South Branch Hylands Creek	SBHC-2	Sheridan Blvd. to 104th Ave	Streets UDFCD Eligible	Channel in Vicinity of 104th Ave Culvert Entire Reach including Waverly Acres Park	Major Maintenance Eligible General Channel Maintenance and Mowing
South Branch Hylands Creek	SBHC-1	Highland Pl. to Sheridan Blvd.	Streets Parks	104th Ave. Culvert - Sheridan Culvert Channel in Vicinity of 104th Ave Culvert	Culvert Maintenance Major Maintenance Eligible
South Branch Hylands Creek	SBHC-T1	Tributary 1	Streets Parks	Hyland Hills Golf Course Carroll Butts Park incl. Ice Arena Pond	Pond 1 - 5 Maint. & General Channel Maintenance and Mowing Ice Arena Pond Maintenance
South Branch Hylands Creek	SBHC-T2	Tributary 2	Streets Parks	Storm Sewer from Highland Pl. to Ice Arena Pond From 98th Ave to the North	Storm Sewer Maintenance General Channel Maintenance and Mowing
Middle Branch Hylands Creek	MBHC-2	102nd Pl. to Confluence w/ S. Branch H.C.	Streets UDFCD Eligible	Storm Sewer from Retention Ponds to Sheridan Culvert East Pond	Storm Sewer Maintenance Water Quality Pond Maintenance And Mowing
Middle Branch Hylands Creek	MBHC-1	Lowell Blvd. to 102nd Pl.	Streets UDFCD Eligible	West Ponds Confluence w/ S. Branch to Sheridan Blvd. Confluence w/ S. Branch to Sheridan Blvd.	Retention Pond Maintenance (Hyland Hills G. C. Driving Range) General Channel Maintenance and Mowing Major Maintenance Eligible
Middle Branch Hylands Creek	MBHC-1	Lowell Blvd. to 102nd Pl.	Streets UDFCD Eligible	Sheridan Blvd. Sheridan Blvd. to 102nd Pl.	Culvert Maintenance General Channel Maintenance and Mowing
Middle Branch Hylands Creek	MBHC-1	Lowell Blvd. to 102nd Pl.	Streets UDFCD Eligible	102nd Pl. to Lowell Blvd. (excluding Hyland Hills G.C.) Storm Sewer Outfalls Entire Reach	General Channel Maintenance and Mowing Storm Sewer Maintenance
Middle Branch Hylands Creek	MBHC-1	Lowell Blvd. to 102nd Pl.	Streets UDFCD Eligible	Hyland Hills Golf Course Waverly Acres Park + Squires Park + Skyline Greenbelt	8th Green Pond and Culvert Maintenance Waverly Park Maintenance No Channel Maintenance + Retention Pond Maintenance + General Channel Maintenance and Mowing
Middle Branch Hylands Creek	MBHC-1	Lowell Blvd. to 102nd Pl.	Streets UDFCD Eligible	104th Ave & Lowell Blvd. 104th Ave & Lowell Blvd. + Legacy Ridge Pkwy + Sheridan Blvd. + 104th Ave E. of Sheridan	Retention Pond General Maintenance and Mowing Culvert Maintenance
Middle Branch Hylands Creek	MBHC-1	Lowell Blvd. to 102nd Pl.	Streets UDFCD Eligible	Legacy Ridge Golf Course 104th Ave to G.C. + D/S of G.C. to Confluence w/ M. Branch Hylands Creek	General Channel Maintenance and Mowing 104th & Legacy Pond + General Channel Maintenance and Mowing
Middle Branch Hylands Creek	MBHC-1	Lowell Blvd. to 102nd Pl.	Streets UDFCD Eligible	Sheridan Blvd. D/S to Confluence w/ M. Branch Countryside Greenbelt Kensington Park	Major Maintenance Eligible Open Space, Reservoir, & General Channel Maintenance and Mowing
Ketner	K-1	N. Oak Street to Kettner Reservoir	Streets Parks	Kettner Reservoir Kettner Reservoir	Maintenance For Storm Sewer Outlets and Ditches to Reservoir Debris Removal
Ketner	K-2	Kettner Reservoir to Big Dry Creek	Streets Parks	Kettner Reservoir to Garland St. incl. US Homes Pond US Homes Pond to Big Dry Creek	General Channel Maintenance and Mowing Maintenance For Storm Sewer Outlets into Pond and Storm Sewers from Pond to Big Dry Creek.
Lake Erie Basin Tributary 5	LET5	128th & Huron St. to Big Dry Creek	Streets Others (HOA)	128th & Huron Pond to Big Dry Creek 128th & Huron Pond	Storm Sewer Outlet to Retention Pond Maintenance & Culvert from pond to Big Dry Creek Retention Pond Maintenance And Mowing
Lake Erie Basin Tributary 6	LET6-1	120th Ave to Confluence Pond	Streets Parks	Wetland are near confluence w/ Big Dry Creek 122nd Ave to Confluence Pond	General Channel Maintenance and Mowing Detention Pond & General Channel Maintenance and Mowing
Lake Erie Basin Tributary 6	LET6-2	Confluence Pond to Big Dry Creek	Streets Parks	Entire Reach Entire Reach	Storm Sewer Outlet and Inlet Maintenance Detention Pond & General Channel Maintenance and Mowing
Lake Erie Basin Tributary 6A	LET6A	124th Ave to Confluence Pond	Streets Parks	Entire Reach W. 124th Ct. Storm Sewer	Detention Pond & General Channel Maintenance and Mowing Storm Sewer Outlet Maintenance
Little Dry Creek	LDC-6	Lowell Blvd to Federal Blvd	Streets Parks	Entire Reach Entire Reach incl. England Park	City is Major Land Owner In this area - General Channel Maintenance and Mowing General Channel Maintenance and Mowing
Little Dry Creek	LDC-5	72nd Ave to Lowell Blvd	Streets 2007 UDFCD Maintenance	Storm Sewers and Inlets in General Vicinity Entire Reach	Storm Sewer Outlet and Inlet Maintenance Mowing and Debris Removal
Little Dry Creek	LDC-4	Winona Ct. to 72nd Ave	Streets 2007 UDFCD Maintenance	Storm Sewers and Inlets in General Vicinity Entire Reach	General Channel Maintenance Storm Sewer Outlet and Inlet Maintenance
Little Dry Creek	LDC-3	75th Ave to Winona Ct.	Streets Parks	Storm Sewers and Inlets in General Vicinity Entire Reach	Storm Sewer Outlet and Inlet Maintenance General Channel Maintenance and Mowing
Little Dry Creek	LDC-2	76th Ave to 75th Ave	Streets 2007 UDFCD Maintenance	Storm Sewers and Inlets in General Vicinity Entire Reach	Storm Sewer Outlet and Inlet Maintenance Mowing and Debris Removal
Little Dry Creek	LDC-1	Tributary B Confluence to 76th Ave	Streets UDFCD Eligible	Entire Reach Sheridan Blvd. Culvert	General Channel Maintenance and Mowing Culvert Maintenance
Little Dry Creek Tributary B	LDC-B1	N. Garrison St. to Trailside Park	Streets 2007 UDFCD Maintenance	Entire Reach Trailside Park Dover Street	Major Maintenance Eligible Mowing and Debris Removal General Channel Maintenance and Mowing
Little Dry Creek Tributary B	LDC-B2	Trailside Park to Wadsworth Blvd	Streets Parks	Garrison St. to Dover St. Nottingham Park + Channel to 87th Ave	Debris Removal General Channel Maintenance and Mowing
McKay Drainageway	MCD-1	144th Ave to McKay Lake	Streets Parks	Nottingham Park Access to Wadsworth Pkwy 144th Ave to McKay Lake	Culvert and Storm Sewer Outlet Maintenance Lake and General Channel Maintenance and Mowing
McKay Drainageway	MCD-2	McKay Lake to Huron St.	Streets Parks	McKay Lake to Huron St. Cheyenne Ridge Park	General Channel Maintenance and Mowing General Retention Pond and Channel Maintenance and Mowing
McKay Drainageway	MCD-3	Huron St. to I-25 (Loves Pond)	Streets Others (Commercial Loves)	Cheyenne Ridge Park Detention Pond Entire Reach	Storm Sewer Outlet Maintenance General Channel Maintenance and Mowing
Southwest tributary to McKay Lake	MCD-SW	Huron to Loves Pond	Streets Others (Commercial Loves)	Lowes Pond Huron St. Culvert	Detention Pond Maintenance Culvert Maintenance When culvert is in operation
Quail Creek Tributary A	QC-A	Zuni St. to Quail Creek Confluence	Streets Parks	Drainage Channel adjacent to Loves Parking Lot Lexington Ave & Huron St. Retention Pond	General Channel Maintenance and Mowing Detention Pond Maintenance
Quail Creek	QC-1	W 136th Ave. to Osage St.	Streets Parks	Entire Reach (Amherst Drainage East) Entire Reach (Amherst Drainage East)	Amherst West Detention Pond Maintenance & General Channel Maintenance and Mowing Storm Sewer Outlet Maintenance & Channel Maintenance
Quail Creek	QC-2	Osage St. to Bid Dry Creek Confluence	Streets Parks	Entire Reach (Amherst Drainage North) 136th Ave	General Channel Maintenance and Mowing Culvert Maintenance
Ranch Creek	RC-1	112th Ave to Upper Jackson Lake	Streets Parks	Entire Reach Osage St. + Kalamath Ct. + Huron St.	General Channel Maintenance and Mowing Upper Jackson & Jackson Lake Maintenance & General Channel Maintenance and Mowing
Ranch Creek	RC-2	Upper Jackson Lake to 120th Ave	Streets Parks	The Ranch Country Club Country Club Loop Storm Sewers + 120th Ave	Storm Sewer Maintenance + Culvert Maintenance General Channel Maintenance and Mowing
Ranch Creek	RC-3	120th Ave to Confluence w/ Big Dry Creek	Streets Parks	Open Space D/S of G.C. 120th Ave + Federal Blvd.	Culvert Maintenance General Channel Maintenance and Mowing
Ranch Creek Tributary 1	RCT1-1	Huron St. to Pecos St.	Streets Parks	Open Space from 120th Ave to Big Dry Creek Entire Reach incl. Westminster T-Ball Complex and Park	General Channel Maintenance and Mowing General Channel Maintenance and Mowing
Ranch Creek Tributary 1	RCT1-2	Pecos St. to Ranch Creek Confluence.	Streets Parks	The Ranch Country Club Pecos St + Quivas Way	Detention Pond Maintenance & General Channel Maintenance and Mowing Culvert Maintenance
Ranch Creek Tributary 2	RCT2	Cedar Bridge Pond to Ranch Creek	Streets Others (HOA)	Open Channel 112th to Ranch Dr. 112th Ave + Ranch Dr.	General Channel Maintenance and Mowing 112th Ave Culvert Maintenance & Storm Sewer Maintenance From U/S Drainage to Ranch Creek
Ranch Creek Tributary 2	RCT2	Cedar Bridge Pond to Ranch Creek	Streets Others (HOA)	Cedar Bridge Detention Pond	Detention Pond Maintenance

Westminster Drainage System Maintenance Responsibility Summary

Stream	Stream Reach Abbreviation	Reach Boundaries	Maintenance Responsibility	Location	Activity
Shaw Heights Tributary	SHT-4	78th Ave to 76th Ave	Parks	Entire Reach incl. Wolff Run Park	General Channel Maintenance and Mowing
			Streets	Entire Reach	Storm Sewer Outlet Maintenance
			2007 UDFCD Maintenance	From Confluence with LDC to 1025 Feet U/S	Mowing and Debris Removal
Shaw Heights Tributary	SHT-3	80th Ave to 78th Ave	Streets	80th Ave + Drainage D/S to Wolff Run Park	Culvert Maintenance & General Channel Maintenance and Mowing
Shaw Heights Tributary	SHT-2	Railroad to 80th Ave	Streets	Entire Reach	Storm Sewer Maintenance
Shaw Heights West Tributary	SHT-1A	End of West Tributary to Railroad	Streets	Entire Reach	Storm Sewer Maintenance & General Channel Maintenance and Mowing
Shaw Heights Tributary	SHT-1	End of Main Stream to Railroad	Streets	Storm Sewer System	Storm Sewer Maintenance
			Others (ADCO or HOA?)	Rotary Park Detention Pond	Retention Pond Maintenance and Mowing
Shay Ditch	SD-2	Huron St. to I-25	Parks	Entire Reach	General Channel Maintenance and Mowing
			Streets	Huron St. Culvert	Culvert Maintenance
			Other (Cascade Apartments)	Cascade Apartment Pond	Detention Pond Maintenance
Standley Lake Tributary 1	SLT1-1	92nd Ave to 96th Ave	Parks	Niver Canal from 92nd Ave to Trendwood Park	General Channel / Retention Pond Maintenance and Mowing
			Streets	95th Ave Storm Sewer Outfalls	Storm Sewer Outlet Maintenance
			Other (HOA)	Drainage Channel from Trendwood Park D/S to Pierce St.	General Channel Maintenance and Mowing
			Parks	Drainage Channel from H.S. to 98th Ave	General Channel Maintenance and Mowing
Standley Lake Tributary 1	SLT1-2	96th Ave. to Big Dry Creek	Streets	Pierce St & High School Culvert + 98th Ave	Culvert Maintenance
			Others (HOA)	Drainage Channel from 98th Ave to Big Dry Creek	General Channel Maintenance and Mowing
Standley Lake Tributary 2	SLT2	Lark Bunting Dr. to Big Dry Creek	Parks	Niver Canal, Oakhurst Park 1 & 2, West Ponds, Middle Pond, & Drainage from Wadsworth Pkwy to Furniture Store	General Channel / Retention Pond Maintenance and Mowing
			Streets	Middle Pond + Fred Schmid Pond + Drainageway from Furniture Store d/s to Big Dry Creek	Storm Sewer Outlet Maintenance for Retention Ponds, Wadsworth Pkwy Culvert Maintenance, & General Channel Maintenance and Mowing
			Others (Commercial)	Fred Schmid Pond	Retention Pond Maintenance
Standley Lake Tributary 3	SLT3	Independence Dr. to Big Dry Creek	Parks	Niver Canal from Standley Lake to Standley Lake Trib 2 + Bubble Up Pond	General Channel / Retention Pond Maintenance and Mowing
			Streets	Storm Sewer from Bubble Up Pond to Big Dry Creek	Storm Sewer Maintenance
Standley Lake Tributary 4	SLT4-1	100th Ave to Standley Spillway	Parks	Entire Reach	General Channel Maintenance and Mowing
			Streets	100th Ave	Culvert and Storm Sewer Outlet Maintenance
Standley Lake Tributary 4	SLT4-2	Standley Spillway to Big Dry Creek	Others (Standley Lake)	Standley Lake Spillway	General Channel Maintenance and Mowing
			Parks	Standley Lake Spillway	Mowing and Debris Removal
Tanglewood Creek	TC-1	120th Ave to 123rd Ave	Others (RTD)	RTD Water Quality Pond	Retention Pond Maintenance and Mowing
			Streets	120th Ave + 121st Ave + 123rd Ave	Culvert Maintenance
			Others (Commercial)	Drainageway 120th to 121st	General Channel Maintenance and Mowing
			Others (Front Range Village HOA)	Drainageway 121st to 123rd incl. Front Range Village Pond	General Detention Pond & Channel Maintenance and Mowing
			2007 UDFCD Maintenance	From U/S to 200 feet D/S of 121st & Delaware	Mowing and Debris Removal
Tanglewood Creek	TC-2	123rd Ave to 128th Ave	UDFCD Eligible	Drainageway 121st Ave to 123rd Ave	Major Maintenance Eligible
			Streets	123rd Ave	
Tanglewood Creek	TC-3	128th Ave to I-25	Parks	Willowbrook Park	Park Maintenance
			Others (Private Owner)	Drainageway 123rd Ave to 128th Ave	General Channel Maintenance and Mowing
Tanglewood Creek Tributary 1	TC-T1	I-25 to Tanglewood Creek	Streets	128th Ave.	Culvert Maintenance
Tanglewood Creek Tributary 2	TC-T2	I-25 to Tanglewood Creek	Others (Private Owner)	Drainageway 128th Ave to I-25	General Channel Maintenance and Mowing
Tanglewood Creek Tributary 2	TC-T2	I-25 to Tanglewood Creek	Others (Private Owner)	I-25 to Tanglewood Creek	General Channel Maintenance and Mowing
Walnut Creek Tributary 2	WC-T2	Simms St. Pond to Walnut Creek	Not Constructed		
Walnut Creek	WC-1	Simms St. to 108th Ave	Parks	Entire Reach - Open Space and Golf Course Border Creek	General Channel Maintenance and Mowing
			Golf	The Heritage G.C. Simms to Westmoor - Open Space and Golf Course Border Creek	General Channel Maintenance and Mowing
			Streets	Simms St. + Westmoor Dr. + 108th Ave.	Culvert Maintenance
Walnut Creek	WC-2	108th Ave to Wadsworth Pkwy	Parks	Entire Reach incl. Walnut Grove Park	General Retention Pond & Channel Maintenance and Mowing
			Streets	Wadsworth Pkwy	Culvert Maintenance
Walnut Creek	WC-3	Wadsworth Pkwy to Big Dry Creek Confl.	Parks	Wadsworth Pkwy to Dover St. + Wadsworth Blvd. to Big Dry Creek	General Channel Maintenance and Mowing
			Streets	Wadsworth Blvd. + Church Ranch Blvd.	Culvert Maintenance
			Other (Privet Owners)	Dover St. to Wadsworth Blvd	General Channel Maintenance and Mowing
Walnut Creek	WC-3	Wadsworth Pkwy to Big Dry Creek Confl.	UDFCD Eligible	Big Dry Creek @ Confluence w/ Countryside Creek + Church Ranch Blvd D/S to Big Dry Creek Open Space (30+00 to 13+00)	Major Maintenance Eligible
			Parks	Entire Reach	General Channel Maintenance and Mowing
North Branch Walnut Creek	NBWC	Simms St. to Walnut Creek	Golf	The Heritage G.C. Drainageway in Vicinity of Confluence w/ Walnut Creek	General Channel Maintenance and Mowing
			Streets	Simms St.	Culvert Maintenance
Tributary to N. Branch Walnut Creek	NBWC-T1	Jeffco Airport to N. B. Walnut Creek	Golf	The Heritage G.C. Drainageway from Airport to Culvert	General Channel Maintenance and Mowing
			Streets	Drainageway Culvert under Westmoor Dr.	Culvert Maintenance
Upper Dry Creek Valley Ditch	UDCVD	Simms St. to Ball Pond	Streets	Simms St. and Overflow to N. Branch of Walnut Creek	Culvert Maintenance
			Golf	The Heritage G.C. Open Channel through Course	Mowing
			Other (Irrigation Co.)	Entire Reach	General Channel Maintenance and Mowing
North Fork Walnut Creek	NFWC	Ball Pond to Walnut Creek	Others (Ball Corp.)	Drainageway from Airport to 108th Ave	General Detention Pond & Channel Maintenance and Mowing
			Streets	108th Ave.	Culvert Maintenance
Walnut Creek Tributary 1	WC-T1	W. 108th Ave to Walnut Creek	Parks	Abandoned Drainageway from 108th Ave to Walnut Creek	General Channel Maintenance and Mowing
Lower Church Lake Tributary	LCL	Wadsworth Blvd. to Walnut Creek	Not Constructed		
			Parks	Open Space U/S of Lower Church Lake	General Maintenance
City Park Drainageway	CPD	Reach 4 (Chase to Newton)	Others (Irrigation Co.)	Lower Church Lake	General Lake Maintenance and Mowing
			Streets	Entire Reach	General Channel Maintenance and Mowing
City Park Drainageway	CPD-O	Overflow to Cozy Corner Tributary 5	UDFCD Eligible	Improvements U/S of Sheridan to Overflow Culvert (71+00 to 50+00)	Major Maintenance Eligible
			Other (HOA)	Drainageway from Overflow Culvert to Pond	General Channel Maintenance and Mowing
3207 Drainageway	3207	Lowell Blvd to Big Dry Creek Confluence	Streets	Storm Sewers Outlets to Pond	Storm Sewer Outlet Maintenance
			Parks	Overflow Pond	General Detention Pond Maintenance and Mowing
Pomponio Branch	PB	72nd Ave to Little Dry Creek	Parks	Entire Reach	General Detention Pond & Channel Maintenance and Mowing
Farmers Highline Canal			Streets	Entire Reach	General Channel Maintenance and Mowing
			Parks	Sommerset Park, Kings Mill Park, Dover Square Park	General Channel Maintenance and Mowing



Appendix D

Westminster 16 Maintenance Project & 11 Special Project Cost Estimate

Location - 16 Maint. Projects (Green) & 11 Special Projects (Red)	Location Abbreviation	Description	Total Reach Cost Including Contingency	
			Contingency	35%
Little Dry Creek - Depew St to Lowell Blvd	GREEN-1	Included in other maintenance costs	\$0	
W 80th Ave & Wolff St	GREEN-2	Completed project	\$0	
Pond south of 116th Ct & Wolff St	GREEN-3	Needs new trash rack less susceptible to clogging	\$10,000	
Approx. 8300 Sheridan Blvd-east side of Sandpiper Apts	GREEN-4	Large grate needs to be cleaned west of RR tracks, no imp. costs	\$0	
Approx. 8700 Turnpike Dr-west side of unemployment office	GREEN-5	Large grate needs to be cleaned east of RR tracks, no imp. costs	\$0	
Shaw Blvd & Circle Dr	GREEN-6	To be completed in 2007	\$0	
W 94th Ave between Raleigh & Quitman, south side	GREEN-7	Grate plugs with yard debris, install new trash rack	\$3,000	
W side of Eaton St, north of 108th Ave	GREEN-8	Grate plugs with yard debris, modify trash rack	\$20,000	
Behind 5649 W 109th Circle	GREEN-9	Grate needs to be cleaned after storms, no imp. costs	\$0	
Big Dry Creek at Huron St	GREEN-10	Completed project	\$0	
Pond east of Westin Hotel	GREEN-11	Needs new outlet structure and trash rack	\$30,000	
Zuni St north of 74th Ave at dead end	GREEN-12	Replace beehive grate with Type C inlet	\$5,000	
Zuni St & 86th Ave	GREEN-13	Small grate in sump needs Type D inlet and slope paving	\$15,000	
109th & Federal Blvd catch basin & manhole	GREEN-14	Pipe was repaired, no longer a problem	\$0	
84th Ave & Zuni St	GREEN-15	Safety problem exists, install 200 lf 18" rcp, mh & Type D inlet	\$35,000	
95th Ave & Old Wadsworth	GREEN-16	Grate needs cleaning after storms, undermining repaired with concrete debris	\$0	
94th & Lowell	RED-1	Construct regional storm sewer, see capital costs for S. Branch Hylands Creek, Highlands Pl. to Sheridan	\$0	
98th & Sheridan	RED-2	Add two street inlets & 200 lf of storm sewer	\$35,000	
107th & Sheridan	RED-3	Add larger street inlets on both sides of road, pipe size is okay	\$15,000	
109th & Federal Blvd catch basin & manhole	RED-4	Install asphalt terminal at end of c & g, create ditch to drain to east or north	\$5,000	
112th east of Westminster Blvd	RED-5	Problem unknown, pipe and inlets/street appear to be sized adequately	\$0	
7380 Newton	RED-6	Install trash rack at 75th & Newton, jet clean pipe	\$5,000	
128th & Pecos	RED-7	Raise 128th & install cross culvert, modify pipe connections from east	\$215,000	
116th Ave, southwest side, channel to Jackson Lake	RED-8	Reform 420 lf of riprap trapezoidal channel	\$40,000	
10428 Holland Pl cul-de-sac	RED-9	Create surface swale beneath fence, modify inlet	\$10,000	
112th & Alcott	RED-10	Problem indeterminate, could be pond outlet/irrigation crossing, other	\$25,000	
100th & Garland St	RED-11	Flow rates and visual inspection do not indicate a problem, no imp. costs	\$0	
			\$468,000	