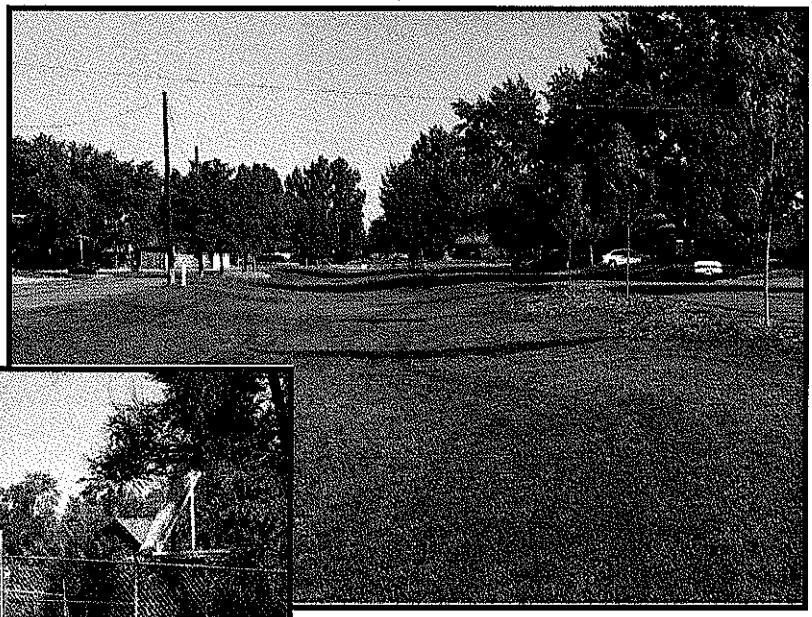
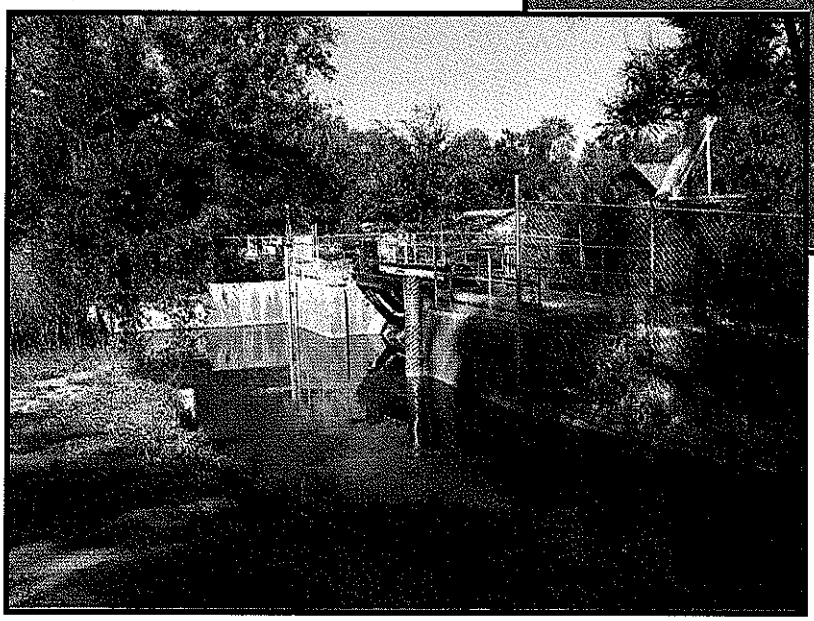
CITY OF GREELEY
COMPREHENSIVE DRAINAGE PLAN

28TH AVENUE BASIN
FINAL REPORT

Looking North Along 27th Avenue Median Channel at 13th Street





Clarkson Spill Structure on the Greeley No. 3 Ditch

MARCH 8, 2006

ANDERSON CONSULTING ENGINEERS, INC.

Civil • Water Resources • Environmental

City of Greeley

ANDERSON CONSULTING ENGINEERS, INC.
Civil • Water Resources • Environmental

March 8, 2006

Mr. Bert Leautaud
City of Greeley
Public Works Department
1001 Ninth Avenue
Greeley, CO 80631

RE: City of Greeley Comprehensive Drainage Plan – 28th Avenue Basin
(ACE Project No. COCOG05)

Dear Bert:

Anderson Consulting Engineers, Inc. (ACE) is pleased to inform you that we have completed the analyses, design, plan preparation and documentation associated with the update of the comprehensive drainage plan for the 28th Avenue Basin. In addition we have completed all revisions to the report and project notebook pursuant to City review comments and our final in-house review. Please find enclosed two copies of the Final Report and one copy of the Project Notebook for the 28th Avenue Basin Comprehensive Drainage Plan.

It has been our pleasure working with you in the completion of this study. If you have any questions or comments concerning any aspect of this project, please do not hesitate to contact us.

Sincerely,
ANDERSON CONSULTING ENGINEERS, INC.

Gregory J. Koch, P.E.
Vice President

Brian L. Van Zanten, P.E.
Project Engineer II

GJK/BLV/vla

Enclosures

772 Whalers Way, Suite 200 · Fort Collins, CO · 80525
Phone: (970) 226-0120 · Fax: (970) 226-0121 · www.acewater.com

CITY OF GREELEY
COMPREHENSIVE DRAINAGE PLAN

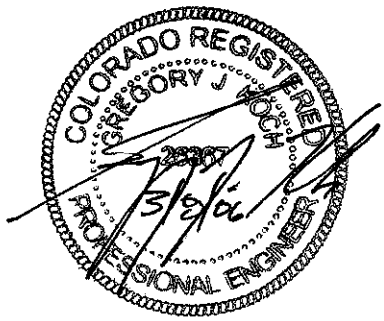
28TH AVENUE BASIN
FINAL REPORT

Prepared for:

City of Greeley
Public Works Department
1001 Ninth Avenue
Greeley, CO 80631

Prepared by:

Anderson Consulting Engineers, Inc.
772 Whalers Way, Suite 200
Fort Collins, CO 80525
(ACE Project No. COCOG05)



March 8, 2006

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I. INTRODUCTION

The City of Greeley is a rapidly growing community that previously recognized the need for adequate storm drainage facilities, as exemplified by the completion of the Comprehensive Drainage Plan in 1974. With the development that had occurred in and around Greeley in the 23 years following completion of the 1974 Comprehensive Drainage Plan, the Comp Plan was updated in 1997 for five of the City's major drainage basins, including the 28th Avenue Basin (Comprehensive Drainage Plan, City of Greeley, 28th Avenue Basin, Lidstone and Anderson, Inc., December 1996). The City of Greeley has continued to experience significant growth over the past eight years since completion of the 1997 Comp Plan.

It has become increasingly important that the 1997 Comp Plan be updated, including the following three primary factors: (a) considerable development has occurred within the 28th Avenue Basin south of 20th Street and west of 35th Avenue since completing the 1997 Comp Plan, thereby necessitating an update of the hydrologic model for the basin; (b) recent improvements to West Lake at Sanborn Park, as well as the Clarkson Spill Structure have also warranted a change to the hydrologic model; and (c) in relation to the first two items, proposed improvements as outlined in the 1997 Comp Plan were re-evaluated and updated as necessary.

In support of these needs, the City contracted with Anderson Consulting Engineers, Inc. (ACE) to update the Comp Plan for the 28th Avenue Basin, as well as the other basins that were the subject of the 1997 study. This report specifically identifies the results of the Comp Plan efforts associated with the 28th Avenue Basin.

1.1 Project Goals and Objectives

The goal of the 1997 Comprehensive Drainage Plan was to update the 1974 Comp Plan and develop a planning document to be utilized as a tool for making decisions related to stormwater management within the City of Greeley. Completion of the 1997 Comp Plan for the 28th Avenue Basin involved the development of a planning document that met the following objectives:

(a) identify long-term capital improvements and rehabilitation measures for the existing drainage system;

(b) provide a tool for implementation of future improvements associated with new developments within the urban growth boundary;

(c) provide a basis for prioritizing and scheduling required improvements (implementation plan);

(d) provide the flexibility to implement improvements that afford flood protection while being cost effective; and

(e) address environmental, water quality, and recreational and other open space and drainage corridor planning issues.

Sensitivity to these objectives was an important consideration during the preparation of the 1997 Comp Plan; however, the primary focus of the planning efforts was the reduction of both existing and potential future flood hazards within the City of Greeley.

The objectives of the current study are commensurate with those identified for the 1997 Comp Plan. The goals of the current study are to update the previous Comp Plan to reflect existing conditions based on recent improvements, and to re-evaluate the proposed improvements outlined in the 1997 Comp Plan that have not been built in context of the most recent hydrologic analyses, and update them if necessary. All objectives were important in the current Comp Plan update; however, the primary focus of the Comprehensive Drainage Plan remains the reduction of existing and potential future flood damages and hazards within the City of Greeley in the most economical manner.

1.2 Scope of Work

The scope of work associated with the current Comp Plan update included the following tasks:

1. Review of Existing Information and Field Reconnaissance. Existing information pertinent to the current study was reviewed and evaluated with respect to identifying data and parameters that were needed for completing the current analyses and modeling effort. This information included the following: (a) the 1997 Comp Plan for the 28th Avenue Basin, including all background data and modeling information; (b) all development that has occurred within the 28th Avenue Basin since the completion of the previous Comp Plan, including final 100-year discharge release rates for all pertinent on-site detention facilities; (c) design and as-built information regarding the improvements prepared for West Lake at Sanborn Park by the City of Greeley; (d) design information regarding the improvements prepared for the Clarkson Spill Structure; and (e) available GIS data within the basin including existing structures, topography, roads, railroads, water features, soils, zoning, storm sewers, and sanitary sewers.

   Field reconnaissance efforts included the following: (a) verification and determination of existing drainage facilities; (b) site visits to locations of recent improvements; and (c) field evaluation of potential water quality pond locations.

2. Update of Existing, Future, and Proposed Condition Hydrologic Models. The hydrologic models associated with the existing development/existing facilities, future development/existing facilities, and future development/Comp Plan facilities condition developed as part of the 1997 Comp Plan were updated to include drainage improvements in the basin that have been implemented since 1997. This included the following three items: (a) incorporation of all new detention facilities with either a combined pond volume or a single pond volume of approximately three acre-feet or greater, as well as the re-delineation of subbasins as they relate to the detention facilities; (b) incorporation of improvements related to West Lake at Sanborn Park; and (c) incorporation of improvements related to the Clarkson Spill Structure. A comparison of current existing condition discharges to those estimated from the 1997 Comp Plan was completed in order to evaluate discharge changes along the 28th Avenue Basin major drainageway.

3. Revisions to Drainage Improvement Plan. The drainage improvement plan considered potential revisions to the 1997 Comp Plan, based on revised discharges obtained from the updated hydrologic models. Specifically, the proposed culvert crossing at 35th Avenue was addressed. The plan also considered potential water quality improvements for the basin. Water quality facilities included a regional water quality pond located near the Poudre River at the downstream end of the Greeley No. 3 Ditch Wasteway.

4. Engineering Analyses of the Drainage Improvement Plan. Based on the selected level of protection determined from the 1997 Comp Plan, hydrologic and hydraulic design parameters for all proposed improvements were evaluated, with all components associated with all the previously proposed improvements modified to accommodate current hydraulic conditions. Specifically, consideration was given to the ability of the proposed 35th Avenue culvert to handle 10-year flows and eliminate overtopping of 35th Avenue during the 100-year event.

5. Preparation of the Plan of Storm Drainage Improvements. Hydraulic design parameters were finalized and final hydrologic modeling of the drainage improvement plan was completed. The revised plan of improvements for the 28th Avenue Basin was completed, including water quality facilities and revised estimates of capital improvement costs.

6. Final Report Documenting the Updated 28th Avenue Basin Comp Plan. The results of the Plan efforts are summarized in this report as well as in the accompanying Project Notebook.

1.3 Mapping and Surveying

The primary mapping utilized for the Comp Plan update was obtained from the City of Greeley GIS department. It is the same 2-foot contour mapping utilized for the 1997 Comp Plan. This mapping was previously digitized from 1987 and 1992 aerial flight line data. A triangulated

irregular network (TIN) was generated from a 50-foot point grid and break lines provided by Arnold Analytical Services. The North American Datum of 1927 (NAD27) was used for horizontal control, while the National Geodetic Vertical Datum of 1929 (NGVD29) was used for vertical control in preparing the mapping. A 2-foot contour map was specifically generated to facilitate completion of the Comp Plan for the 28th Avenue Basin. It should be noted that the contour mapping has recently been converted by the City of Greeley in an effort to keep up with the most current and accurate datum standards. The NAD27 horizontal datum has been converted to the North American Datum 1983 (NAD83) High Accuracy Reference Network (HARN) under the State Plane Coordination System Projection and the Colorado North Zone. The NGVD29 vertical datum has been converted to the geodetic North American Vertical Datum of 1988 (NAVD88). However, as this Comp Plan had largely been completed prior to the datum conversion, no datum adjustments were made and the original NAD27 and NGVD29 datums were maintained for this study.

No additional survey information was collected for the current Comp Plan Update. Field survey data collected by King Surveyors, Inc. of Windsor, Colorado for the 1997 Comp Plan is included in Section 1.1 of the Project Notebook.

1.4 Previous Studies

Previous studies related to stormwater management within the 28th Avenue Basin were collected and reviewed during the completion of the 1997 Comp Plan project. The 28th Avenue Basin was initially analyzed as part of the 1974 Comprehensive Drainage Plan (CDP). The CDP identified alternative drainage improvements and cost estimates for the major drainageway within the basin. Recommended improvements to the 26th/27th Avenue outfall channel and storm sewer system, cited in the CDP as improvements to mitigate flooding generated by the 50-year design storm, have been constructed in the northern half of the basin. Pertinent information associated with these drainage improvements was obtained from design plans and drawings (Hogan and Olhausen P.C., 1974). Detailed information collected and reviewed for the West Lake at Sanborn Park Pond included survey data of the outlet facilities, mapping of the pond area and stage-discharge rating curves for the pond (Norton, Underwood & Lamb Engineering Associates, Inc, 1990). Additional improvements to the West Lake at Sanborn Park Pond were proposed as part of the Greeley West Detention Pond Design (Muller Engineering Company, Inc., 1990). Pertinent design information related to the Greeley West Detention Pond and Greeley West Detention Pond Outfall Pipeline (City of Greeley, 1985) were also collected and reviewed. The information gathered from these reports, including the available design drawings

and specifications, was evaluated and utilized during the completion of the 1997 Comp Plan effort.

In addition to the 1997 Comp Plan and the documents referenced in that report, the current study utilized numerous drainage reports associated with previous and on-going developments, as well as specific design information related to the improvements recently implemented to West Lake at Sanborn Park and to the Clarkson Spill Structure. All drainage report information as it relates to the current study is provided in Section 7.2 of the accompanying Project Notebook.

II. BASIN CHARACTERISTICS

2.1 Location and Description

The 28th Avenue Basin is located in the central portion of the existing urbanized area within the City of Greeley. The basin limits are approximately defined by the Cache La Poudre River on the north, 23rd Avenue on the east, the Loveland and Greeley Canal on the south and 50th Avenue (at the extreme southwest corner of the basin) on the west. The drainage basin boundaries are delineated on the vicinity map in Figure 2.1.

The total drainage area encompassed within the 28th Avenue Drainage Basin is approximately 2,416 acres, of which roughly 320 acres are undeveloped; as a point of reference, almost 700 acres was undeveloped in 1996. Over 90 percent of the area south of the Greeley No. 3 Ditch, which crosses the northern portion of the basin near 4th Street, is developed, while over 60 percent of the area between the Greeley No. 3 Ditch and the Cache La Poudre River is developed. Of the 339 acres north of the Greeley No. 3 Ditch, approximately 173 acres are under Weld County jurisdiction and have not been annexed by the City of Greeley; however, the entire 28th Avenue Basin lies within the City of Greeley's Long Range Expected Growth Area (LREGA) limits, which represents the expected twenty-year growth area boundary.

Most of the development in the basin consists of medium to low density, single and multi-family residential housing. Development also includes a dense commercial area in the vicinity of west 10th Street, a large commercial development at the southeast corner of 35th Avenue and 20th Street, Greeley West High School, Sunset Memorial Cemetery, and several public park facilities. The majority of the development that has occurred in the basin since 1997 is located south of 20th Street, between 35th and 47th Avenues; the major development feature in this area is represented by the recently constructed Center Place Mall, located immediately northeast of the U.S. Highway 34 Bypass and 47th Avenue.

2.2 Drainage Features

In the southern half of the 28th Avenue Basin (specifically south of 20th Street), three detention facilities serve as major drainage features that are utilized to significantly reduce the peak discharges occurring along the major drainageway. Specifically, these facilities include: (1) Gateway Lakes Subdivision Ponds (formerly known as the Elks Club Golf Course Pond); (2) Greeley West Detention Pond; and (3) West Lake at Sanborn Park Detention Pond. The major drainageway in the northern portion of the 28th Avenue drainage area, unlike the upper basin that has developed more recently, contains no major detention facilities for attenuation of the storm runoff that is conveyed downstream.

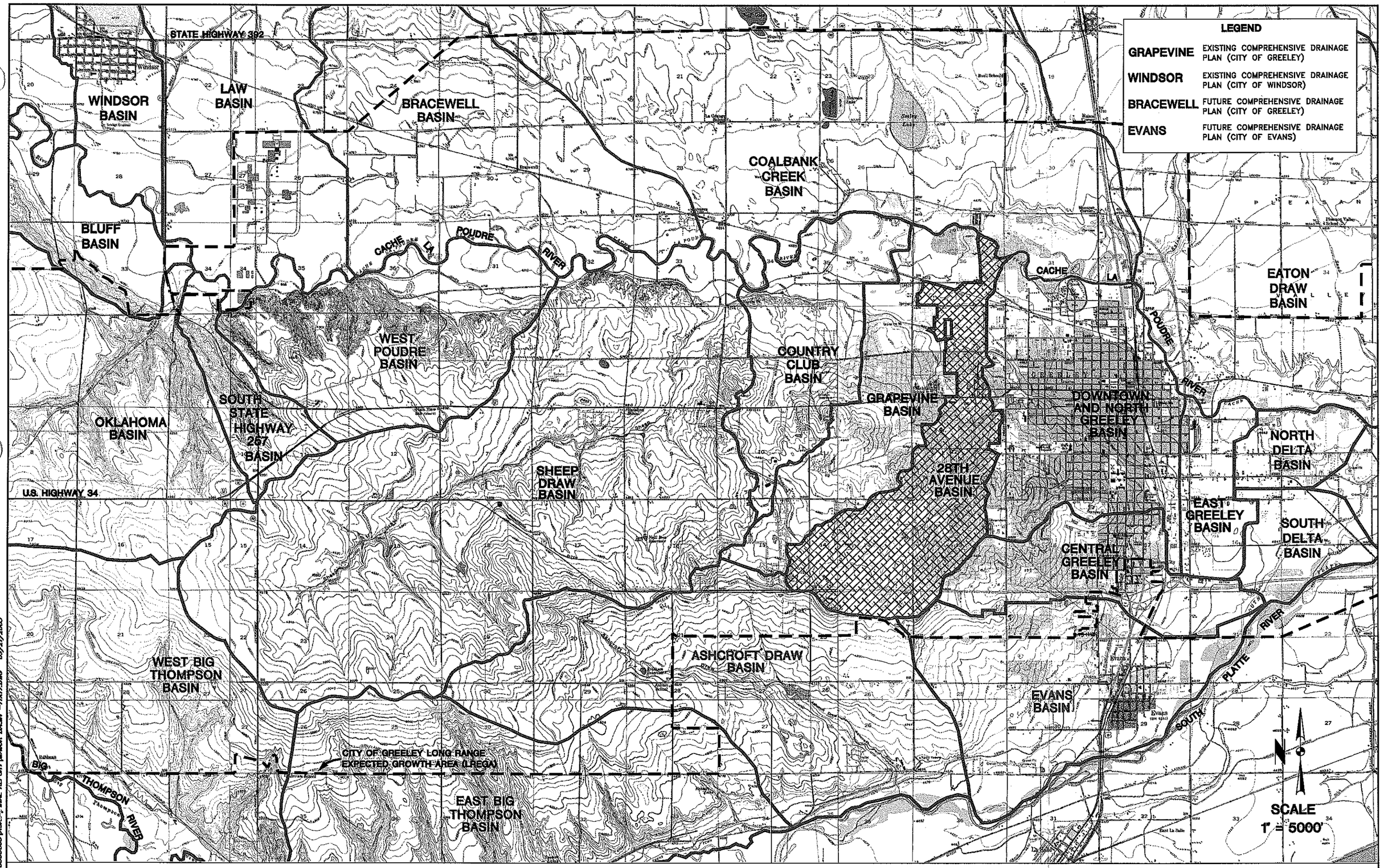

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Figure 2.1. Basin Vicinity Map

In addition to the major drainageway and outfall system, four irrigation ditches either border or traverse the 28th Avenue Basin. These include the Loveland and Greeley Canal, Grapevine Ditch, Greeley No. 3 Ditch, and the Greeley No. 3 Ditch Wasteway Channel. The Loveland and Greeley Canal serves as the southern boundary for the 28th Avenue Basin and does not contribute or remove flows from the basin. The Grapevine Ditch traverses the southwestern edge of the basin adjacent to 47th Avenue and conveys irrigation water and minor stormwater flows captured by the ditch; this ditch offers limited value as a drainage feature that will convey stormwater runoff out of the basin. Due to the magnitude of the stormwater flows during large storm events, these ditches and channels do not represent major drainage boundaries within the basin. The Greeley No. 3 Ditch conveys flow (irrigation and captured stormwater) in a southeasterly direction across the northern portion of the basin near 4th Street. Presently, the Greeley No. 3 Ditch intercepts the majority of the stormwater emanating from the southern portion of the basin. Stormwater runoff captured by the Greeley No. 3 Ditch is conveyed eastward to the recently improved Clarkson Spill Structure near 4th Street. At this location, stormwater is diverted to the Greeley No. 3 Ditch Wasteway Channel, which conveys the flow northward to the Cache La Poudre River. During more frequently occurring flood events (5-year return period and smaller), the Greeley No. 3 Ditch serves as a significant drainage boundary within the basin. Even during the 100-year event, the No. 3 Ditch collects a substantial portion of the storm runoff generated within the basin, conveying those flows to the Clarkson Spill Structure.

The Cache La Poudre River represents the northern boundary of the 28th Avenue Drainage Basin. The river receives all the stormwater runoff that is generated within the basin. The 100-year floodplain associated with the Cache La Poudre River (updated by the U.S. Army Corps of Engineers in 2003) encompasses approximately 42 percent (142 acres) of the basin drainage area between the Greeley No. 3 Ditch and the river.

The drainage features along with the 100-year floodplain are presented on the basin boundary map shown on Sheet B-1.

2.3 Description of Existing Drainage Paths

In general, stormwater runoff generated within the 28th Avenue Basin flows in a northerly direction toward the Cache La Poudre River. Runoff originates in the southwestern portion of the basin near the U.S. Highway 34 Bypass. South of the U.S. Highway 34 Bypass, stormwater runoff is significantly attenuated by the Gateway Lakes Subdivision Ponds. The remainder of the area south and west of Greeley West High School drains into the Greeley West Detention Pond. Areas that do not drain to the Greeley West Detention Pond immediately south of 20th

Street and west of 35th Avenue commingle with releases from the Greeley West Detention Pond at 35th Avenue and 22nd Street. These flows are conveyed eastward across 35th Avenue through the combined storm sewer system and channel into the West Lake at Sanborn Park Detention Pond, shown in Figure 2.2. The West Lake at Sanborn Park Detention Pond releases runoff directly into the West Lake at Sanborn Park Outfall Channel, where it is conveyed to the north to 19th Street. At 19th Street, a portion of the flow is intercepted by the storm sewer and conveyed to the 27th Avenue Channel at 16th Street. Runoff in excess of the storm sewer capacity at 19th Street is directed along the eastern edge of Woodbriar Park, dispersing between several homes onto 28th Avenue.

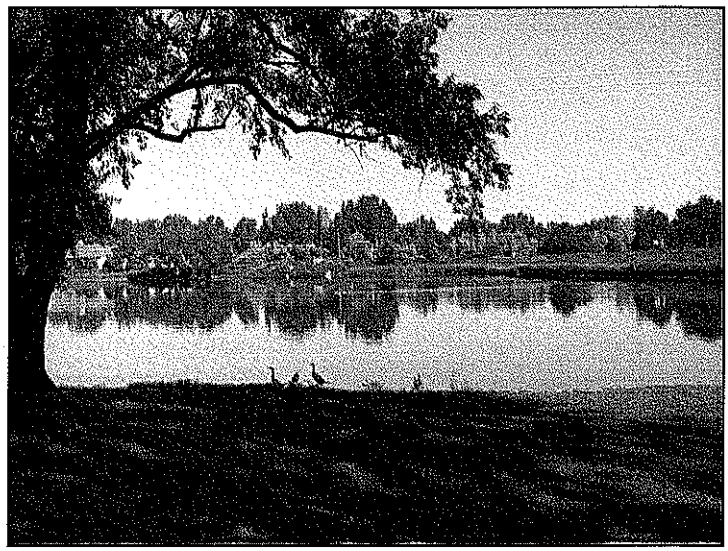


Figure 2.2 West Lake at Sanborn Park Detention Pond.

The runoff conveyed within the street section of 28th Avenue splits to the east to two sump areas located along 17th Street Road and 17th Street.

Runoff in excess of the storm sewer capacities at these sump areas is directed through the adjacent lots and onto 16th Street, where it eventually is conveyed into the 27th Avenue Storm Sewer and Outfall Channel, depicted in Figure 2.3. At 13th Street, the combined storm sewer system and channel transition to a large storm sewer under 26th Avenue that eventually discharges directly into the Greeley No. 3 Ditch, approximately 800 feet west of the Clarkson Spill Structure. Runoff in excess of the storm sewer system capacity between 13th Street and the No. 3 Ditch is conveyed northward within the street section of 26th Avenue. All upstream runoff is directed into the No. 3 Ditch and conveyed in an easterly direction

Figure 2.3 27th Avenue Storm Sewer and Outfall Channel.

to the recently improved Clarkson Spill Structure, shown in Figure 2.4. Due to the magnitude of main drainageway inflows to the No. 3 Ditch within the reach south of 4th Street, a significant portion of the 100-year runoff spills over the north ditch bank prior to reaching the Clarkson Spill Structure. The Greeley No. 3 Ditch Wasteway Channel conveys all ditch spills north toward the Cache La Poudre River.

The major drainageway and pertinent hydraulic structures are graphically portrayed on Sheet B-1.

Figure 2.4 Clarkson Spill Structure.

III. INVENTORY OF EXISTING FACILITIES

Substantial improvements had been made to the drainage facilities within the 28th Avenue Basin along the major drainageway at the time the 1997 Comp Plan was completed. Much of this work had been accomplished in response to development within the basin. Detention ponds, storm sewers, and conveyance channels comprise the network of drainage facilities that provide flood relief during the major storm events. As part of the 1997 Comp Plan, an inventory of the existing facilities along the major drainageway was conducted. The inventory and evaluation of each facility involved: (a) field reconnaissance to document location, condition and additional data requirements; (b) review of available design and as-built drawings; (c) collection of site-specific survey data; and (d) evaluation of the hydraulic capacity. Table 3.1 summarizes the results of the inventory and evaluation of existing facilities completed for the 1997 Comp Plan; information regarding the 38th Avenue Storm Sewer was obtained from drainage reports for this Comp Plan Update. Specific information related to these facilities is provided in the following paragraphs. More detailed data and photographic documentation associated with each facility are provided in Sections 1.2 and 5, respectively, of the Project Notebook.

In addition, a comprehensive inventory of storm drainage facilities constructed since the 1997 Comp Plan was conducted, primarily focusing on but not limited to the area south of 20th Street and west of 35th Avenue. These facilities are associated with recent development that has occurred in this area. As outlined in the 1997 Comp Plan, future developments tributary to the Greeley West Detention Pond are not required to provide detention as this facility is considered a regional detention pond; areas that are tributary to this facility are allowed to release 100-year developed condition peak discharges into the pond. However, based on an investigation of recent development plans conducted as part of this study, most developments chose to provide on-site detention rather than the construction of larger conveyance facilities to carry site runoff to the Greeley West Detention Pond. Developments not tributary to the Greeley West Detention Pond also generally provided on-site detention as recommended in the 1997 Comp Plan. Finally, further north and east along the major drainageway, improvements to the West Lake at Sanborn Park Detention Pond, as well as the Clarkson Spill Structure were also evaluated as part of the current study.

3.1 Detention Facilities

The following documentation of existing detention facilities was provided in the 1997 Comp Plan, with discharge, storage volume, and overtopping depth values updated for the current Comp Plan. The main detention facilities along the major drainageway are located in the

Table 3.1 Inventory of Existing Drainage Facilities.

Facility Name and/or Type	Location [EPA SWMM ID]	Condition	Maximum Storage Volume (acre-feet)	Maximum Discharge Capacity[1] (cfs)
Gateway Lakes Subdivision Ponds	South of U.S. Highway 34 Bypass, west of 35th Avenue [302]	Good	148.4	4.8[2]
U.S. Highway 34 Bypass Crossing	Sunset Memorial Gardens at the southeast corner of U.S. Highway 34 Bypass and 35th Avenue [N/A]	Good	N/A	40[3]
38th Avenue Storm Sewer	From 25th Street to 24th Street [207]	Good	N/A	115[3]
Greeley West Detention Pond	West of 35th Avenue and Greeley West High School [315]	Good - constructed in 1991	77.1[4] 143.0[5]	47[4] 4,051[5]
Greeley West Detention Pond Outfall Pipeline	From Greeley West Detention Pond to 35th Avenue [216]	Good	N/A	60[3]
35th Avenue Crossing	Intersection of 35th Avenue and 22nd Street [N/A]	Good	N/A	50[3]
22nd Street/West Lake at Sanborn Park Storm Sewer and Channel	From 35th Avenue to West Lake at Sanborn Park [220]	Good	N/A	24[3] 200[6]
West Lake at Sanborn Park	South of 20th Street/East of 35th Avenue [319]	Good – improvements made in 2005	84.3[4] 220.7[5]	106[4] 3,712[5]
West Lake at Sanborn Park Outfall Channel	From West Lake at Sanborn Park to 19th Street [222]	Good	N/A	490[6]
28th Avenue Storm Sewer	From 19th Street to 16th Street [224]	Good	N/A	58[3]
16th Street Crossing	Intersection of 16th Street and 27th Avenue [N/A]	Good	N/A	200[3]
27th/26th Avenue Storm Sewer	From 16th Street to 13th Street, Pipe [226], and Channel [526]	Good	N/A	40[3] 350[6]
	From 13th Street to 10th Street [227]	Good	N/A	379[3]
	From 10th Street to 9th Street [228]	Good	N/A	452[3]
	From 9th Street to 6th Street [228]	Good	N/A	465[3]
	From 6th Street to the No. 3 Ditch [229]	Good	N/A	448[3]
Greeley No. 3 Ditch	From 4th Street to Clarkson Spill Structure [N/A]	Good	N/A	680[6]
Clarkson Spill Structure	South of 4th Street near 23rd Avenue [N/A]	Good - reconstructed in 2003	N/A	1,210[7]
Greeley No. 3 Ditch Wasteway	From 4th Street to C Street [231]	Fair	N/A	1,360[9]
	From C Street to NW C Street [233]	Good	N/A	1,100[9]
	From NW C Street to the Cache La Poudre River [234]	Fair	N/A	1,160[9]
Greeley No. 3 Ditch Wasteway Crossings	4th Street	Fair	N/A	1,865[8]
	1st Street	Good	N/A	959[8]
	C Street	Good	N/A	677[8]
	Colorado and Southern Railroad	Fair	N/A	566[8]
	NW C Street	Fair	N/A	511[8]

[1] Assuming no obstructions.
[2] Maximum discharge of outlet pipe prior to overtopping.
[3] Pipe full flow capacity.
[4] At invert of spillway.
[5] Including spillway discharge and surcharged storage capacity.
[6] Maximum capacity of stormwater channel.
[7] Assuming a flow depth of 8.5 feet.
[8] Prior to flooding or street overtopping.
[9] Maximum capacity of stormwater channel averaged over reach.

following areas: (a) south of the U.S. Highway 34 Bypass and west of 35th Avenue and Home Depot; (b) the western end of the Greeley West High School campus; and (c) Sanborn Park. A minor detention facility in Cottonwood Park (located between 26th Avenue Court and 26th Avenue at 19th Street) serves a very limited drainage area and offers no significant reduction of peak flows along the major drainageway; consequently, it was not specifically evaluated during the 1997 Comp Plan effort. A summary of the location, condition, and capacity of each detention facility is included in Table 3.1.

Gateway Lakes Subdivision Ponds (formerly known as the Elks Club Golf Course Pond). The detention ponds are located in the southern portion of the basin immediately south of the U.S. Highway 34 Bypass (known as 28th Street within the Greeley City Limits). The existing ponds were previously used to irrigate the Elks Club Golf Course; the area has since been re-developed and the ponds are now used for irrigating the Gateway Lakes Nature Area, stormwater detention, and water quality purposes for the surrounding development, as well as for stormwater relief and/or wasteway flows from the Loveland and Greeley Canal. The ponds have a normal operating water surface area of approximately 9.6 acres. The roadway embankment associated with the U.S. Highway 34 Bypass is elevated approximately six feet above the normal water surface and serves to provide additional detention of stormwater runoff. An outlet box with a 5.5-inch diameter orifice plate controls flows out of the pond, with an 8-inch outflow pipe controlling flows out of the outlet box. As a result, the pond essentially operates as a retention pond, with only minimal releases from even a 100-year event. The detention volume provided by the pond before overtopping the highway is approximately 148.4 acre-feet, while the total volume of runoff tributary to the pond is estimated to be 24 acre-feet during a 100-year storm event for existing conditions. The routed 100-year existing condition runoff volume corresponds to a water surface elevation approximately 4.5 feet below the crown of the highway embankment.

Greeley West Detention Pond. The Greeley West Detention Pond is located between 22nd Street and 24th Street at the western end of the Greeley West High School campus. The pond serves as a regional detention facility for the southwestern portion of the 28th Avenue Basin. A small permanent pool within the detention pond is presently maintained as a source for irrigation water; the existing irrigation pond has a water surface area of less than two acres. Flows are released from the pond through an area inlet into a 36-inch RCP outlet pipe that is restricted by a 21-inch orifice plate. Prior to overtopping the emergency spillway, the maximum discharge capacity of the outlet pipe is estimated to be 47 cfs due to the restriction imposed by the 21-inch orifice plate. The maximum detention volume of the pond prior to overtopping the emergency spillway is estimated to be 77.1 acre-feet. During a 100-year storm event for existing conditions, the maximum discharge from the pond is estimated to be approximately 74 cfs, of which 47 cfs is conveyed through the outlet pipe.

West Lake at Sanborn Park. West Lake is situated southeast of 35th Avenue and 20th Street. West Lake serves two purposes in that it provides detention storage for stormwater runoff as well as maintaining a permanent pool for the neighborhood park. Recent improvements to West Lake include additional storage for stormwater detention and for park irrigation as well as improved outlet facilities. The primary outlet pipe, installed as part of the improvements, consists of a 36-inch RCP that ties into an existing 30-inch CMP (previously utilized to manually control water surface elevations in West Lake by means of a gated facility). The 36-inch RCP/30-inch CMP outlet pipe is the main device in controlling water surface elevations; it has a maximum discharge capacity of 49 cfs prior to overtopping the emergency spillway. The secondary outlet pipe, consisting of a 36-inch CMP that transitions to a 24-inch CMP, has a maximum discharge capacity of approximately 57 cfs, also prior to overtopping the emergency spillway. Discharges from the outlet pipes are released to the north under 20th Street to the West Lake at Sanborn Park Outfall Channel. Releases in excess of the combined pipe capacity of 106 cfs are conveyed by a grass-lined emergency spillway located at the eastern end of the pond embankment. Stormwater runoff released through the emergency spillway is conveyed overland to the north through the east end of the park, ultimately being directed toward both 28th Avenue and the West Lake at Sanborn Park Outfall Channel. The maximum available storage volume at the crest of the emergency spillway is approximately 84.3 acre-feet. The 100-year discharge from the pond for existing conditions is estimated to be 120 cfs.

3.2 Road/Railroad Crossings

There are four road crossings over the Greeley No. 3 Ditch Wasteway Channel (described in Section 3.4) and one railroad crossing. Three of the crossings (NW C Street, the Colorado and Southern Railroad, and 4th Street) are bridges, while the remaining two crossings (C Street and 1st Street) are reinforced concrete box culverts. The capacity of each crossing was calculated using the Federal Highway Administration's (FHWA) culvert analysis program HY-8. Table 3.1 includes a summary of the location, condition, and hydraulic capacity of each crossing structure. A brief description of each crossing is provided in the following paragraphs.

4th Street Bridge. This single span bridge has an opening that is approximately 18 feet wide and 9.2 feet high. The depth of flow in the wasteway channel at which roadway overtopping occurs is approximately 12.1 feet. The capacity of the bridge prior to overtopping the roadway was determined to be 1,865 cfs. The 100-year existing condition discharge in the wasteway channel at 4th Street is 2,362 cfs.

1st Street Culvert. This culvert incorporates an opening that is approximately 15 feet wide and 6.4 feet high. The depth of flow in the wasteway channel at which roadway

overtopping occurs is approximately 8.2 feet. The capacity of the culvert prior to overtopping the roadway was determined to be 959 cfs. The 100-year existing condition discharge in the wasteway channel at 1st Street is 2,362 cfs.

C Street Culvert. This culvert has an opening that is approximately 15 feet wide and 6.3 feet high. The depth of flow in the wasteway channel at which roadway overtopping occurs is approximately 8.2 feet. The capacity of the culvert prior to overtopping the roadway was determined to be 677 cfs. The 100-year existing condition discharge in the wasteway channel at C Street is 2,559 cfs.

Colorado and Southern Railroad Bridge. This crossing incorporates an opening that is approximately 12 feet wide and 4.6 feet high. The depth of flow in the wasteway channel at which the railroad overtops is approximately 7.1 feet. The capacity of the bridge prior to overtopping the railroad embankment was calculated to be 566 cfs. The 100-year existing condition discharge in the wasteway channel at the Colorado and Southern Railroad is 2,559 cfs.

NW C Street Bridge. This bridge incorporates an opening that is approximately 12 feet wide and 4.5 feet high. The depth of flow in the wasteway channel at which road overtopping occurs is approximately 7.1 feet. The capacity of the bridge prior to overtopping the roadway was calculated to be 511 cfs. The 100-year existing condition discharge in the wasteway channel at NW C Street is 2,673 cfs.

3.3 Storm Sewers

The 38th Avenue Storm Sewer was constructed along the major drainageway by several developments after the completion of the 1997 Comp Plan. In addition, the principal storm sewers as inventoried in the 1997 Comp Plan along the major drainageway of the 28th Avenue Basin include: (a) Greeley West Detention Pond Outfall Pipeline; (b) 22nd Street/West Lake at Sanborn Park Storm Sewer; (c) 28th Avenue Storm Sewer; and (d) 27th/26th Avenue Storm Sewer. Table 3.1 summarizes the location, condition, and hydraulic capacity of each storm sewer.

38th Avenue Storm Sewer. The 38th Avenue Storm Sewer consists of twin 29-inch by 45-inch HERCPs that extend from 25th Street to 24th Street. The pipes extend along 38th Avenue and collect off-site flows from the south as well as developed flows from a subdivision and two multi-family developments from the east. The pipes daylight immediately north of 24th Street into the Greeley West Detention Pond. According to one of the drainage reports associated with the construction of the culverts, the maximum combined capacity of the storm sewers is estimated to be 115 cfs.

Greeley West Detention Pond Outfall Pipeline. This 36-inch RCP storm sewer originates at the grated area inlet structure in the Greeley West Detention Pond and conveys low flows to

the intersection of 35th Avenue and 22nd Street. The upstream end of the pipe incorporates a 21-inch orifice plate to restrict outflows from the pond. Supplemental flows are collected downstream of the detention facility via several area inlets within the Greeley West High School Campus and through adjoining storm sewer lines servicing development to the north. The maximum capacity of the storm sewer is estimated to be 60 cfs. Immediately west of 35th Avenue, the 36-inch RCP storm sewer converges with smaller storm sewer laterals at a grated junction box. From the junction box, the 36-inch RCP crosses 35th Avenue with a capacity of approximately 50 cfs. Flows in excess of the storm sewer capacity overtop 35th Avenue and spill into the 22nd Street/West Lake at Sanborn Park Channel.

22nd Street/West Lake at Sanborn Park Storm Sewer. The 22nd Street/West Lake at Sanborn Park Storm Sewer, which connects directly to the 36-inch RCP crossing 35th Avenue, consists of a 42-inch CMP that ultimately conveys stormwater runoff into West Lake. The storm sewer has a minimal slope that limits its maximum capacity to 24 cfs. Area inlets located along the storm sewer permit low flows to drain into the system and allow surcharged flows to spill into the adjacent grass-lined channel.

28th Avenue Storm Sewer. At 19th Street, just west of 28th Avenue, the West Lake at Sanborn Park Outfall Channel conveys stormwater runoff into the 28th Avenue Storm Sewer. This storm sewer consists of a 36-inch RCP that continues from 19th Street through Woodbriar Park and ultimately terminates at the crossing of 16th Street. Between Woodbriar Park and 16th Street, the storm sewer is located adjacent to 28th Avenue, within drainage easements across several private properties. The maximum capacity of the 36-inch RCP was estimated to be 58 cfs. The 36-inch RCP transitions into twin 43-inch by 68-inch HERCPs at the 16th Street crossing. The twin culverts have a maximum combined pipe capacity of approximately 200 cfs.

27th/26th Avenue Storm Sewer. The 27th/26th Avenue Storm Sewer extends from 16th Street at 27th Avenue to the Greeley No. 3 Ditch, ranging in size from a 30-RCP to a 72-inch by 113-inch HERCP. The 30-inch RCP storm sewer extends from 16th Street to 13th Street beneath the 27th Avenue Median Channel, and has a maximum capacity of 40 cfs. At 13th Street the combined channel and pipe flows are directed into a 72-inch RCP located beneath 26th Avenue. From 13th Street to 10th Street, the maximum capacity of the 72-inch RCP is estimated to be 379 cfs, which increases to 452 cfs north of 10th Street due to an increase in slope as the storm sewer continues north toward 9th Street. Continuing north along 26th Avenue, the storm sewer increases initially to a 63-inch by 98-inch HERCP, with an approximate capacity of 465 cfs between 9th Street and 6th Street. The storm sewer ultimately transitions to a 72-inch by 113-inch HERCP between 6th Street and the Greeley No. 3 Ditch, with a maximum capacity of 448 cfs.

Storm Sewer Laterals. Several storm sewer laterals convey stormwater runoff to the structures comprising the major drainageway. These laterals converge on the major drainageway at several locations including, but not limited to 20th Street, 16th Street, 13th Street, and 10th Street.

The storm sewer laterals serve an important function in removing stormwater runoff from several business areas, public parks, and streets. Since these facilities are not considered to be part of the major drainageway, these laterals were not specifically evaluated during the 1997 Comp Plan effort.

3.4 Open Channels

Five open channel reaches are found along the major drainageway of the 28th Avenue Basin as inventoried for the 1997 Comp Plan. A description of each is presented below. In addition, the location, condition, and hydraulic capacity of each channel are summarized in Table 3.1.

22nd Street/West Lake at Sanborn Park Channel. This channel originates along the north side of 22nd Street at 35th Avenue and ultimately conveys stormwater runoff into West Lake. Near 35th Avenue, the grass-lined channel has a trapezoidal shape with a 7-foot bottom width, average depth of 3.5 feet, side slopes of 3H:1V, an average slope of 0.2 percent, and a bankfull capacity of 200 cfs. As the channel approaches West Lake at Sanborn Park, the capacity increases as it transitions to a broad swale.

West Lake at Sanborn Park Outfall Channel. Releases from the West Lake Detention Pond are conveyed beneath 20th Street into the West Lake at Sanborn Park Outfall Channel. This channel extends approximately 1,100 feet to the north to the 28th Avenue Storm Sewer at 19th Street near Woodbriar Park. The typical channel section can generally be described as trapezoidal having side slopes of 4H:1V, grass-lined banks and a rock-lined channel bed. The average bottom width, depth, and slope of the channel are 8 feet, 5 feet, and 0.2 percent, respectively. The bankfull capacity of the West Lake at Sanborn Park Outfall Channel was estimated at 490 cfs.

27th Avenue Median Channel. Downstream of 16th Street, 27th Avenue is divided by a large grass-lined median channel that extends from twin 43-inch by 68-inch HERCPs under 16th Street, to 13th Street (previously shown in Figure 2.3). The channel is approximately 1,300 feet in length and has a trapezoidal shape with a bottom width of 12 feet, depth of 2.5 feet, average side slopes of 8H:1V, average slope of 0.9 percent, and bankfull capacity of 350 cfs.

Greeley No. 3 Ditch. Near the northern portion of the 28th Avenue Basin, immediately south of 4th Street, stormwater conveyed by the major drainageway is intercepted by the Greeley No. 3 Ditch and is directed eastward approximately 800 feet to the Clarkson Spill Structure, recently improved in 2003. Flows carried in the 26th Avenue Storm Sewer discharge directly into the No. 3 Ditch, while street flows disperse between several homes along 25th Avenue Court and ultimately spill into the ditch. The configuration of the No. 3 Ditch in this reach can be

described as a trapezoidal channel with an average bottom width of 15 feet, side slopes of 2H:1V, an average depth of 6 feet, and a slope equal to 0.2 percent. The maximum capacity of the No. 3 Ditch in this area was estimated to be 680 cfs.

Greeley No. 3 Ditch Wasteway Channel. At the Clarkson Spill Structure, stormwater flows are diverted through an overshot gate into the Greeley No. 3 Ditch Wasteway Channel. The spill structure has been automated to control water surface elevations in the Greeley No. 3 Ditch and is calibrated to maintain a ditch discharge of 110 cfs, allowing all excess flows to spill north into the Greeley No. 3 Ditch Wasteway Channel. The spill structure can divert a maximum discharge of approximately 1,210 cfs out of the No. 3 Ditch. The wasteway channel originates at the Clarkson Spill Structure just south of 4th Street and extends northward to the Cache La Poudre River. The channel bottom width ranges from 12 to 18 feet with side slopes and average depths varying from 2H:1V to 1H:1V, and 4 to 7 feet, respectively. The channel slope transitions from 1.0 percent near 4th Street to 0.1 percent at the river. The average bankfull capacity along the channel reach is approximately 1,000 cfs; however, a number of constrictions and low bank sections limit the effective capacity to approximately 750 cfs north of 1st Street, and 120 cfs north of C Street.

IV. HYDROLOGIC ANALYSES AND MODELING

4.1 Formulation of the Hydrologic Model

The primary objectives of the current hydrologic analyses and modeling efforts were to: (a) update the hydrologic model for the 28th Avenue Basin to include development and drainage improvements that have been implemented since the completion of the 1997 Comp Plan; and (b) revise peak discharge and hydrograph data from the 1997 Comp Plan at various locations throughout the 28th Avenue Basin. This information, combined with the capacity of the existing drainage facilities, provided insight to existing and future flooding problems, comparison with discharges estimated as part of the 1997 Comp Plan, and potential revisions to previously proposed improvements. Hydrologic analyses were conducted for the 2-, 5-, 10-, 50-, and 100-year return periods, as well as the simulation of three modeling scenarios: (a) Existing Condition – existing development with existing facilities; (b) Future Condition – future development with existing facilities; and (c) Proposed Condition – future development with proposed improvements.

4.1.1 Model Description

The modeling approach chosen to simulate the runoff generated within and routed through the 28th Avenue Basin was similar to that used by the 1997 Comp Plan, involving the application of two computer models: the Colorado Urban Hydrograph Procedure (CUHP) and the EPA Stormwater Management Model (SWMM). The CUHP model is a hydrologic simulation program developed in 1982 (updated in May 2002) for the Urban Drainage and Flood Control District (UDFCD); it is used to generate storm runoff hydrographs for basin subcatchments. The program requires input of physical subbasin parameters such as area, slope, etc., as well as the 1-hour depth for the design storm associated with each return period, from which a 2-hour design storm distribution is computed for each storm event. The methodology used in developing the design storm is outlined in the Urban Storm Drainage Criteria Manual (USDCM, Volume I, 1978, updated 2001) and in the Storm Drainage Design Criteria (SDDC) and Construction Specifications Manual (City of Greeley, Colorado, Volume II, May 2002). Storm hydrographs were generated by the CUHP model for the 2-, 5-, 10-, 50-, and 100-year return periods; these hydrographs were in turn entered into the transport block of the EPA SWMM model. A description of the program written to convert the CUHP hydrographs into EPA SWMM inflow hydrographs as well as a copy of the program itself is provided in

Section 7.4 of the Project Notebook. Documentation describing the CUHP input parameters is provided in Section 2.2 of the Project Notebook.

The EPA SWMM model, originally developed in 1969 (updated in June 2003) by the Environmental Protection Agency, is a hydrologic model consisting of four computational blocks: the runoff block, transport block, extended transport block, and storage/treatment block. Each block can be used to route both stormwater flows and pollutants through a drainage basin to evaluate both quantity and quality issues. For purposes of this study, hydrologic analyses and modeling for the 28th Avenue Basin utilized the water quantity aspects of the transport block to develop routed flood hydrographs at various locations throughout the basin. The hydrographs generated from CUHP were routed through the drainage network simulated by the EPA SWMM model transport block, which in turn depicts the actual network of storm sewers, detention ponds, and open channels existing within the basin. Documentation describing the EPA SWMM input parameters is provided in Section 7.5 of the Project Notebook.

4.1.2 Network Development

The stormflow routing network incorporated into the EPA SWMM transport block is a numerical model of the basin drainage network, representing each of the drainage subbasins and facilities along the major drainageway. The first step in forming the network was to conceptualize and develop a schematic linking the drainage subbasins to the drainage facilities along the major drainageway. Identification of each drainage facility is based on information compiled from the following: (a) previous field reconnaissance and surveying efforts; (b) design and as-built plan sets; and (c) drainage reports from previously built or recently approved developments implemented since the 1997 Comp Plan. EPA SWMM refers to facilities incorporated into the modeling network as: conveyance elements (conduits and open channels), subcatchments (or subbasins), storage units (detention ponds, or features that provide significant flow attenuation), flow dividers (diversions), and manholes (nodes or design points). Subbasin delineations were accomplished through the use of the City's 2-foot contour topographic mapping and from drainage reports obtained from the City of Greeley (identified in Section 7.2 of the Project Notebook). Drainage network schematics were developed for the three scenarios previously discussed: (a) Existing Condition; (b) Future Condition; and (c) Proposed Condition.

A numbering scheme was developed for integration into the modeling network to facilitate identification of each type of drainage element; this numbering convention is presented below.

1 – 99	Subbasin runoff hydrographs (from CUHP) and inflow hydrographs (from HEC-RAS unsteady flow analyses)
200 – 299	Conveyance elements (streets, storm sewers and open channels)
300 – 399	Existing detention facilities
400 – 499	Nodes (flow combination or design points)
500 – 599	Overflow conveyance elements (used in conjunction with capacity-limited storm sewer conveyance elements; generally streets in most cases)
600 – 699	Flow diversions (typically used to separate surface and sub-surface discharges)
700 – 799	Nodes (used in conjunction with flow diversions)
800 – 899	Future development detention facilities
900 – 999	Nodes (used to create a hydrologic disconnect at the Greeley No. 3 Ditch due to HEC-RAS unsteady flow analyses)

It should be noted that the numbering scheme for existing detention facilities (300 – 399) releasing flows from fully-developed sites did not change when the Future or Proposed Conditions models were created; however, if a pond existed in the Existing Condition model and was reconfigured to a different release rate or did not exist in the Existing Condition model, a new numbering scheme (800 – 899) was utilized. This was applied to Pond 306 (which became Pond 806 in the Future and Proposed Condition models, due to a reduced release rate) and Pond 808 (which did not exist in the Existing Condition model), respectively for all Future and Proposed Condition models.

4.2 Rainfall Design Storms

The rainfall design storms used in the hydrologic analysis of the 28th Avenue Basin were prepared as part of the 1997 Comp Plan, based on information presented in the Precipitation Frequency Atlas of the Western United States, NOAA Atlas 2, Volume III, Colorado (1973). The one-hour rainfall values for the City of Greeley were obtained from the NOAA Atlas and used to develop a two-hour design storm. The two-hour storms developed for each return period are presented in the SDDC Manual. Further documentation and details regarding the

development of the design storms can also be found in the SDDC Manual and in Section 2.2 of the Project Notebook.

4.3 Hydrologic Subbasin Modeling Parameters

Hydrologic modeling of the 28th Avenue Basin involved the determination of several hydrologic parameters associated with each subbasin. These parameters are summarized in the following paragraphs.

4.3.1 Subbasin Delineation and Basin Characteristics

The 28th Avenue Basin was subdivided into smaller subbasins, ranging in size from approximately 23 acres to nearly 190 acres. The need for relatively detailed hydrologic information at specific points within the basin resulted in this wide range of subbasin drainage areas. The subbasins delineated for the 1997 Comp Plan were largely retained in areas where significant development had already occurred; this includes the majority of the area north of 20th Street and east of 35th Avenue, as well as areas in the extreme southwest portion of the basin. Subbasin delineation was based on several considerations, including the location of drainage facilities, road crossings, and potential flooding problems; however, the main reason for further subdivision of the basin was due to the development that has occurred over the past eight years in the basin since the completion of the 1997 Comp Plan.

The subbasin delineation for the 28th Avenue Basin is presented on Sheet A-1, provided in Appendix A of this report. The hydrologic model representation of the system of subbasins and conveyance elements is shown on Sheets A-2, A-3 and A-4; these are the schematic diagrams for the three hydrologic scenarios analyzed for this study. It is noted that the subbasin delineations are identical for all three scenarios. The 2-foot topographic mapping developed as part of the 1997 Comp Plan for the 28th Avenue Basin was used to determine geometric subbasin characteristics and hydrologic parameters. These parameters included subbasin area, basin length (distance from downstream design point along the flow path to the high point in the subbasin), distance to basin centroid, and basin slope.

4.3.2 Land Use

Land use in the 28th Avenue Basin has not changed significantly from that documented in the 1997 Comp Plan, due to over 90 percent of the basin south of the Greeley No. 3 Ditch already having been developed at the time of that study. The majority of land use in the 28th Avenue Basin consists of single- and multi-family residential developments, with commercial development located along the major thoroughfares such as 10th Street, 35th Avenue, and the U.S. Highway 34 Bypass.

GIS mapping, consisting of numerous layers of data, was provided by the City of Greeley for use during the current study. In part, this mapping displays existing development as well as miscellaneous pavement and road information. Additional developments (including those approved for construction as of May 20, 2004) were also provided by the City of Greeley. In addition, the City provided land use zoning mapping (as of October 2003), with designation classes indicating the type of land use within the basin. A land use map of the 28th Avenue Basin is provided on Sheet C-1, in Appendix C of this report.

Using a combination of the GIS data, zoning information, and development information, impervious percentages were calculated for both Existing and Future Conditions by: (a) assessing the GIS information within each subbasin; (b) assigning a zoning class most closely matching the land use; and (c) matching the zoning classes to land use and percent impervious values published in the USDCM (1978, Volume II, updated 2001). It should be noted that after investigation of percent impervious values for the Downtown and North Greeley Basin Comp Plan Update (Anderson Consulting Engineers, Inc., January 2005), it was determined that impervious percentages from the original USDCM (not the updated 2001 values) were more representative of land use conditions in the Greeley area. The updated values were found to be conservatively high for the City of Greeley; therefore, the original values were retained. Backup documentation for the calculation of existing and future percent impervious values is provided in Section 2.1 of the Project Notebook.

4.3.3 Soils, Infiltration, and Depression Storage

Soils information for the 28th Avenue Basin was obtained from GIS data provided by the City of Greeley; these data were based on the Soil Survey of Weld County, Southern Part, Colorado (1980), published by the Soil Conservation Service. The soil types specified in the associated GIS attribute tables include soil codes and names. This information was correlated to the Soil Survey of Weld County, where each soil code/name is classified into the four hydrologic soil groups. The four groups classify the soils according to infiltration rates, ranging from Type

A representing well-drained soils to Type D representing poorly-drained soils. The soil types represented within the 28th Avenue Basin are predominantly classified as relatively well-drained soils in the Type B hydrologic soils group. Soils mapping pertinent to the 28th Avenue Basin is provided on Sheet C-2, in Appendix C of this report. It is noted that in the 1997 Comp Plan, one area of soils near the north end of the basin was assumed to be part of hydrologic soils group A, when the actual classification is hydrologic soils group D; this situation was corrected in the current study.

The UDFCD analyzed rainfall/runoff data for each of the hydrologic soil groups and established recommended values for infiltration rates and decay coefficients for use with CUHP. The infiltration parameters recommended for each of the soil groups are summarized in Table 4.1. For subbasins containing more than one soil group classification, the coverage of each soil group was determined, measured, and an area-weighted average calculated.

Table 4.1 Infiltration Parameters for SCS Hydrologic Soil Groups.

SCS Hydrologic Soil Group	Infiltration (in/hr)		Horton's Decay Coefficient
	Initial	Final	
A	5.0	1.0	0.0007
B	4.5	0.6	0.0018
C	3.0	0.5	0.0018
D	3.0	0.5	0.0018

Surface depression storage losses and abstractions (rainfall intercepted by trees, bushes, and other vegetation) play an important role in the hydrologic cycle and the determination of rainfall available for runoff. The CUHP method requires estimation of these losses for both impervious and pervious areas to facilitate the calculation of the effective rainfall for each storm event. Values for surface depression storage and interception losses were selected in accordance with the values presented in the USDCM. Backup documentation related to the soil infiltration parameters and depression storage losses is provided in Section 2.1 of the Project Notebook.

4.3.4 Time of Concentration

The subbasin time of concentration represents the final hydrologic parameter needed to complete the CUHP model. The procedure for determining the time of concentration is outlined in the USDCM. Depending on subbasin area, this parameter is only required for subbasins less than 90 acres. Specifying the time of concentration for these smaller, urbanized subbasins allows the hydrograph peaks to be computed and displayed in the output using both the CUHP method

and the Rational Formula for comparison purposes only; however, the default subbasin peak discharge calculation uses the CUHP method. Documentation related to the calculation of subbasin time of concentration values may be found in the Project Notebook in Section 2.1.

4.4 Conveyance Modeling Parameters

Several hydraulic modeling parameters are required by the EPA SWMM model to simulate the routing of storm flows through storm sewers and open channels. The parameters required by the model to simulate the routing of stormwater through storm sewers are listed below:

1. Pipe diameter or maximum allowable depth prior to surcharging
2. Pipe length
3. Invert slope
4. Manning's *n*
5. Number of modeled elements

For the modeling of open channels, the hydraulic parameters required by the EPA SWMM model are as follows:

1. Maximum allowable channel depth prior to surcharging
2. Bottom width of channel or channel cross section bank width
3. Channel side slopes (x H:1V)
4. Invert slope
5. Channel length
6. Manning's *n*
7. Number of modeled elements

A summary of all conveyance element parameters defined in the hydrologic models is provided in Section 7.1 of the Project Notebook.

4.5 Special Modeling Features

In addition to the basic channel routing functions incorporated in the hydrologic model for the 28th Avenue Basin, special modeling functions were required in order to simulate

complicated drainage situations in specific areas of the basin. The EPA SWMM model includes the capability to simulate detention storage facilities, flow diversions, imported flows to a basin (also referred to as inflow hydrographs), and exported flows out of a basin. For the 28th Avenue Basin modeling efforts, detention storage facilities, flow diversions, and imported flows to a basin were utilized.

4.5.1 Detention Storage

The detention facilities simulated in the hydrologic models and evaluated in conjunction with this Comp Plan Update included the following: (a) the utilization of individual detention ponds, or multiple on-site ponds represented as a single pond, associated with commercial or residential development, totaling seven for the entire 28th Avenue Basin; and (b) the use of three existing on-line regional detention ponds, one each upstream of the U.S. Highway 34 Bypass, 35th Avenue, and 20th Street. Detailed information concerning the three regional ponds was previously provided in Section 3.1 of this report. Due to the large number of drainage facilities within the basin (mostly south of 20th Street and west of 35th Avenue), detention ponds linked to commercial or residential development located within the same subbasin and generally draining to the same location were often combined to reduce the total number of modeled elements. The detention facilities simulated in the hydrologic models were generally limited to those facilities that were effective in reducing peak runoff rates associated with, at a minimum, the 2-year storm event; extremely small, isolated detention ponds were generally not included in the overall basin models.

Storage-discharge relationships were derived for each of the seven development-based detention ponds included in the hydrologic models. All drainage development information was obtained from the City of Greeley. In each case, storage values that define the volume of stormwater detained in each pond were defined by manual iteration using the EPA SWMM model in order to accommodate either the combining of storage volumes from more than one pond, differences in hydrologic modeling techniques between the drainage studies and this Comp Plan analysis, or both. Discharge rates for the pond rating curves were set based on maximum release rates defined in the associated drainage reports. The three on-line detention ponds were largely retained in their entirety from the 1997 Comp Plan, with changes made to all three facilities due to updated development information, new design information, or corrections made from the 1997 Comp Plan.

Each of the seven detention ponds in the EPA SWMM model was delineated in such a way so as to fall into one of the three following release rate categories: (a) a single detention pond serving an entire subbasin as designated in the accompanying drainage report; (b) two or

more detention ponds consolidated into one pond, serving an entire subbasin, as designated by their respective drainage reports; or (c) two or more detention ponds consolidated into one pond, serving an entire subbasin, with tributary off-site flows from within the subbasin included in the overall subbasin release rate.

The seven detention facilities considered to be effective for more than just the most frequently occurring storms were incorporated into the hydrologic model based on the storage-discharge relationship developed for each detention pond. The hydrologic model utilized these pond characteristics to evaluate the ponds' response to a range of storm events, including determination of the maximum volume of stormwater detained in each pond and the corresponding peak discharge released from each pond for the subject storm events. Documentation of the storage-discharge rating curves developed for each of the seven development-based ponds as well as the three on-line regional detention ponds is included in Section 7.2 of the Project Notebook.

4.5.2 Diversions

Diversions, referred to as flow dividers by the EPA SWMM model, were used in the hydrologic model to accommodate the following split flow condition: a pipe with an overflow channel (i.e, when a pipe reaches its full flow capacity, the remaining flows in excess of this amount are diverted to a surface conveyance element). The maximum capacity of the pipe prior to diversion is required as input to the model. Flows are routed through the main conveyance element until its capacity is exceeded. Once exceeded, the excess flows are diverted to an overflow channel designated in the flow divider configuration. The storm sewer capacity must be calculated and input into the flow divider table. In order to more accurately define flow diversions in both the Existing and Future Condition hydrologic models, particularly for frequently occurring storms, six pipe with overflow channel diversions, all of which are located along the major drainageway, were included in the hydrologic models. Backup information concerning these diversions is provided in Section 7.3 of the Project Notebook.

4.5.3 Imported Flows to the Basin/Inflow Hydrographs

The Grapevine Basin, located immediately west of the 28th Avenue Basin, has also incorporated a significant number of improvements since completion of the 1997 Comp Plan for that basin. One of those improvements included the construction of a large regional detention pond, located immediately north of the Greeley No. 3 Ditch and 30th Avenue. The pond was

originally designed in the 1997 Comp Plan to attenuate the 100-year flows along the basin's secondary drainageway (proposed to pass over the ditch) and route them at a significantly lowered discharge back to the Grapevine Basin major drainageway (i.e., the 35th Avenue Outfall Channel). The pond (now known as the Northview Regional Detention Pond) was modified from the 1997 Comp Plan by construction of an underchute in order to route the Grapevine Basin secondary drainageway flows beneath the ditch. The pond design, in addition to the underchute, also incorporated the proposed side channel weir along the left bank of the ditch. The weir is intended to spill excess stormwater from the ditch into the pond. The outfall for the pond is a 30-inch diameter RCP, reduced to a 12-inch RCP via an orifice plate, that conveys pond releases to the Greeley No. 3 Ditch Wasteway Channel, rather than the 35th Avenue Outfall Channel, as planned.

The pond was simulated as part of the Grapevine Basin hydrologic model, combining the Grapevine Basin secondary drainageway flows and the Greeley No. 3 Ditch spills and routing them into the pond.. The resulting outflow hydrograph from the pond was input as an inflow hydrograph (No. 35) into the 28th Avenue Basin hydrologic model. The outflow hydrograph was combined with releases from on-site detention in Subbasin 30, located in the 28th Avenue Basin. The commingled flows were then directed to the east (immediately north of C Street) beneath the Colorado and Southern Railroad, where they were combined with flows from the Greeley No. 3 Ditch Wasteway Channel (previously described in Section 3.4).

In addition to the Northview Pond inflow hydrograph, the model simulated a second inflow hydrograph (No. 36), the result of spills from the Greeley No. 3 Ditch. The hydrologic model was disconnected at the ditch and broken into upper and lower basins, incorporating the second inflow hydrograph into the lower portion of the basin. Runoff hydrographs from the hydrologic model representing the upper basin were incorporated into the hydraulic model of the ditch as inflow hydrographs. The hydraulic (HEC-RAS) model for the ditch was executed in the unsteady flow mode using inflow hydrographs from all five basins for all return periods and scenarios analyzed for this study. Included in this model were lateral weirs that were defined along the entire left (downslope) bank of the canal. Specific to the 28th Avenue Basin, this included an internal rating curve at the recently improved Clarkson Spill Structure, intended to maintain a maximum ditch flow of 110 cfs, and spilling all remaining storm flows north into the Greeley No. 3 Ditch Wasteway Channel.

Lateral spill hydrographs from the weirs were defined based on the unsteady flow analyses. Due to the proximity of the spills to the Clarkson Spill Structure and local topography that generally slopes toward the Wasteway Channel, the hydrographs were incorporated into the hydrologic model as a single inflow hydrograph along the downslope side of the ditch. Documentation summarizing both inflow and outflow hydrographs as well as all unsteady hydraulic modeling of the Greeley No. 3 Ditch may be found in the "City of Greeley,

Comprehensive Drainage Plan, Greeley No. 3 Ditch Final Summary Hydraulics Report," Anderson Consulting Engineers, Inc., March 2006.

4.6 Hydraulic Modeling of the Greeley No. 3 Ditch

The determination of ditch spills was seen as an important part of the overall hydrologic modeling not only for the 28th Avenue Basin, but also for the Grapevine and Country Club Basins. At the request of the City of Greeley, the hydraulic (HEC-2) model for the Greeley No. 3 Ditch that was prepared for the 1997 Comp Plan was converted to HEC-RAS Version 3.1.2. The reach beginning at the downstream terminus of the original model (east of 1st Avenue) and continuing upstream nearly to the Clarkson Spill Structure (west of 23rd Avenue) was recently converted for the Downtown and North Greeley Basin HEC-RAS analyses (Anderson Consulting Engineers, Inc., January 2005). The remainder of the ditch (from the Clarkson Spill Structure up to the headgate at the Cache la Poudre River) was converted to HEC-RAS for analyses relating to the Country Club, Grapevine, and 28th Avenue Basins; these two reaches were then connected, producing a single hydraulic model for the entire ditch. For purposes of analyses related to all three basins, it was assumed that only normal irrigation flows (70 cfs) would enter the Greeley No. 3 Ditch from the Poudre River.

Modeling parameters for bridges and culverts were modified to accommodate improved modeling techniques available in HEC-RAS; however, these modifications were based on geometric information gathered for the 1997 Comp Plan. The ditch was not resurveyed as part of the current study; consequently, inherent in this analysis is the assumption that the previously defined cross sectional data for the ditch provides a reasonably accurate hydraulic representation of existing conditions. The exception to the use of previously defined geometric ditch data is the incorporation of the left (downslope) ditch bank spill structures constructed since completion of the 1997 Comp Plan. Ditch bank data were modified in the hydraulic model based on design drawings of the three spill structures.

Lateral weirs were defined along the entire length of the left (downslope) bank through the basin. These weirs included the controlled spill structures. Where bank improvements have not been implemented, lateral weirs were defined based on top of left bank elevations provided in the original HEC-2 model.

Uniform lateral inflow hydrographs and point inflow hydrographs, for all storm events and scenarios analyzed for this study, were defined as boundary conditions for the ditch based on the results of the hydrologic modeling of the upper portions of the five major basins.

The unsteady flow analyses were conducted and the resulting spill hydrographs defined and incorporated into the hydrologic models for the lower portion of the basin as inflow

hydrographs at the appropriate locations along the downslope side of the ditch. It is noted that the unsteady flow analyses were conducted, and inflow hydrographs to the basin due to ditch spills determined, only for the Existing and Proposed Conditions. The Future Condition described in Section 4.8 represents an intermediate step between Existing and Proposed Conditions that should never actually be represented by conditions in the field. Consequently, in order to simplify the modeling associated with this study, the Existing Condition inflow hydrographs to the basin north of the No. 3 Ditch (corresponding to spills from the ditch) were also used in the Future Condition hydrologic model.

4.7 Summary of the Existing Condition Hydrologic Analyses

4.7.1 Definition of the Existing Condition Scenario

The definition of the Existing Condition scenario includes all development that presently exists or was approved for construction prior to May 20, 2004. All basin development after this date is considered under the Future Condition analyses. Table 4.2 presents a summary of all subbasin hydrologic modeling parameters developed for the Existing Condition analyses. All hydrologic subbasin parameters, conveyance parameters, and special modeling features associated with the Existing Condition scenario are defined in Sections 4.3, 4.4, and 4.5, respectively, of this report. CUHP input files for each return period are provided in Section 2.2 of the Project Notebook; EPA SWMM input files for the 10- and 100-year return periods are included in Section 7.5 of the Project Notebook.

4.7.2 Storm Drainage Criteria

The drainage criteria prepared as part of the 1997 Comp Plan were utilized to identify potential problems along the major drainageway. In general, violations related to the criteria were specifically noted where road crossings were exceeded by maximum allowable overtopping depths or ponded water surface elevations within detention facilities overtopped pond embankments during specified storm events. A summary of existing drainage problems within the basin is provided in Section 4.7.4 of this report.

Table 4.2 Hydrologic Subbasin Parameters for the Existing Condition.

Subbasin No.	Basin Area (acres)	Basin Length (ft)	Distance to Basin Centroid (ft)	Average Basin Slope (ft/ft)	Time of Conc. (minutes)	Percent Imperv. (%)	Depression Storage (inches)		Infiltration Rates (in/hr)		Horton's Decay Rate
							Pervious	Imperv.	Initial	Final	
1	59.3	2,200	900	0.026	22	31.0	0.40	0.10	4.4	0.6	0.0018
2	89.4	1,600	770	0.011	19	56.5	0.40	0.10	4.5	0.6	0.0018
3	22.7	1,300	550	0.009	16	95.0	0.40	0.10	4.5	0.6	0.0018
4	38.3	1,600	600	0.025	19	10.7	0.40	0.10	4.5	0.6	0.0018
5	82.8	1,200	600	0.028	17	49.2	0.40	0.10	4.5	0.6	0.0018
6	105.5	3,160	1,530	0.010	N/A	61.2	0.40	0.10	4.5	0.6	0.0018
8	66.2	2,400	700	0.021	23	12.8	0.40	0.10	4.6	0.7	0.0016
9	57.7	4,400	2,500	0.002	34	69.5	0.40	0.10	4.5	0.6	0.0018
10	138.7	3,800	800	0.030	N/A	33.8	0.40	0.10	4.6	0.6	0.0018
11	159.3	2,800	900	0.031	N/A	42.3	0.40	0.10	4.6	0.6	0.0017
12	46.3	2,600	1,670	0.014	24	11.8	0.40	0.10	4.5	0.6	0.0018
13	75.8	2,700	800	0.010	25	23.9	0.40	0.10	4.5	0.6	0.0018
14	115.6	2,900	1,650	0.018	N/A	38.5	0.40	0.10	4.5	0.6	0.0018
15	40.3	1,300	500	0.038	17	6.9	0.40	0.10	4.5	0.6	0.0017
16	39.9	2,200	1,100	0.023	22	50.0	0.40	0.10	4.6	0.7	0.0017
17	47.2	2,500	1,100	0.020	24	45.3	0.40	0.10	4.5	0.6	0.0018
18	44.0	2,700	1,000	0.014	25	66.3	0.40	0.10	4.5	0.6	0.0018
19	52.0	1,200	600	0.028	17	58.1	0.40	0.10	4.5	0.6	0.0018
20	36.0	2,300	840	0.024	23	37.5	0.40	0.10	4.6	0.7	0.0016
21	30.8	2,400	1,600	0.011	23	10.0	0.40	0.10	4.5	0.6	0.0018
22	85.0	2,200	1,100	0.028	22	45.5	0.40	0.10	4.5	0.6	0.0018
23	71.1	2,000	1,300	0.018	21	45.1	0.40	0.10	4.5	0.6	0.0018
24	185.5	3,200	1,100	0.019	N/A	36.5	0.40	0.10	4.5	0.6	0.0017
25	67.5	2,400	1,500	0.019	23	37.0	0.40	0.10	4.5	0.6	0.0018
26	46.1	1,300	700	0.013	17	39.0	0.40	0.10	4.5	0.6	0.0018
27	140.5	1,800	300	0.050	N/A	62.9	0.40	0.10	4.5	0.6	0.0018
28	59.5	1,500	200	0.075	18	53.8	0.40	0.10	4.5	0.6	0.0018
29	74.0	1,200	600	0.003	17	35.2	0.40	0.10	4.5	0.6	0.0018
30	33.7	2,100	1,000	0.005	22	40.0	0.40	0.10	4.5	0.6	0.0018
31	117.1	2,800	1,600	0.004	N/A	28.2	0.40	0.10	4.5	0.6	0.0018
32	56.2	1,900	1,200	0.008	21	38.6	0.40	0.10	3.3	0.5	0.0018
33	51.3	1,900	900	0.005	21	5.0	0.40	0.10	3.1	0.5	0.0018
34	80.2	2,600	1,000	0.002	24	17.0	0.40	0.10	2.3	0.4	0.0012

4.7.3 Hydrologic Modeling Results for the Existing Condition

Based on the Existing Condition analyses of the 28th Avenue Basin, several facilities, structures or streets lack the capacity to safely convey flows arising from the 100-year design storm and, consequently, create potential flooding problems within the basin. The basin map and a schematic diagram of the hydrologic model representing the drainage network for the Existing Condition is provided on Sheet A-2 in Appendix A of this report. A summary of peak discharges resulting from the hydrologic modeling effort is provided in Table 4.3 for selected locations within the basin. A graphical representation of the discharge profiles along the major drainageway is also provided in Figure 4.1. Flood hydrographs at selected locations throughout the basin are presented in Appendix D of this report. Summary output from the EPA SWMM models of the Existing Condition analyses are also provided in Appendix D and in Section 7.6 of the Project Notebook; a description of the program written to summarize the EPA SWMM output as well as a copy of the program itself is provided in Section 7.4. All input and output files for both CUHP and EPA SWMM are provided electronically in Section 6 of the Project Notebook.

4.7.4 Summary of Existing Drainage Problems

Specific problem areas identified during the hydrologic modeling efforts associated with the 1997 Comp Plan were re-evaluated as part of the current study in order to re-define the magnitude of the flooding problems. Many flooding problems associated with existing facilities located along the major drainageway can be directly attributable to: (a) revisions in the rainfall-intensity-duration curves that were completed in conjunction with changes to the drainage criteria manual associated with the 1997 Comp Plan; and (b) previous facility design standards that are not compatible with current design standards (e.g., in accordance with the 1974 Comprehensive Drainage Plan, major drainageway facilities were designed for the 50-year or lesser storm events in the northern half of the basin). A brief summary of the major problem areas noted during the 1997 Comp Plan and the current study is presented in the following paragraphs. This summary is limited, however, to those locations along the major drainageway.

35th Avenue/22nd Street. The major drainageway collects flows from the southwestern portion of the 28th Avenue Basin and crosses 35th Avenue at 22nd Street. The existing crossing structure consists of a 36-inch RCP. Stormwater conveyed to the crossing consists of releases from the Greeley West Detention Pond and overland flows entering through a grated junction box at the northwest corner of 35th Avenue and 22nd Street. The 36-inch RCP has a maximum capacity of 50 cfs, which is exceeded by the 2-year peak discharge at this location of 65 cfs. The

pipe capacity is partially limited by tailwater conditions generated by the downstream 42-inch CMP storm sewer and channel. Flows in excess of the 2-year peak discharge overtop 35th Avenue and exceed street overtopping drainage criteria for the 10- and 100-year events. Analysis of the 35th Avenue and 22nd Street intersection indicates that the potential overtopping depths corresponding to the 10- and 100-year event discharges are 0.5 and 0.9 feet, respectively, with overtopping widths of approximately 160 and 270 feet, respectively.

Table 4.3 Summary of Selected Peak Discharges for the Existing Condition Scenario.

Location	EPA SWMM Element	Drainage Area (acres)	Distance above the Confluence with the Poudre River (1,000 feet)	Peak Discharge (cfs)				
				2-yr	5-yr	10-yr	50-yr	100-yr
Inflow to Gateway Lakes Subdivision Ponds	402	149	25.0	91	155	201	351	401
Outflow from Gateway Lakes Subdivision Ponds	302	149	24.4	0	1	1	2	2
24th Street	413	443	21.9	66	147	207	483	583
Inflow to Greeley West Detention Pond	414	681	21.5	181	398	540	1,146	1,358
Outflow from Greeley West Detention Pond	315	681	21.4	6	41	42	46	74
Intersection of 35th Avenue and 22nd Street (surface flows only)[a]	407	893	19.4	15	55	78	197	243
Flow from area south of 22nd Street/east of 35th Avenue	410	177	18.6	80	172	231	461	547
Inflow to West Lake at Sanborn Park	411	1,281	17.9	311	596	776	1,432	1,689
Outflow from West Lake at Sanborn Park	319	1,281	17.1	22	44	58	103	120
Inflow to West Lake at Sanborn Park Outfall Channel	422	1,348	17.0	25	57	81	180	214
Woodbriar Park (19th Street)	622	1,433	15.9	80	159	211	420	499
16th Street (surface flows only)[b]	423	1,689	13.5	12	201	336	927	1,145
13th Street (surface flows only)[c]	426	1,803	12.1	0	127	294	1,052	1,329
10th Street (surface flows only)	527	1,944	10.4	0	109	286	998	1,268
6th Street (surface flows only)	528	2,003	8.9	0	219	419	1,247	1,588
Greeley No. 3 Ditch	429	2,077	7.9	474	854	1,059	2,004	2,407
Northview Regional Detention Pond (Grapevine Basin)	35	209	N/A	7	9	10	74	146
Clarkson Spill Structure (4th Street)	36	2,077	7.2	396	675	890	1,949	2,362
C Street	431	2,194	4.3	416	727	959	2,097	2,559
NW C Street	433	2,488[d]	3.4	416	740	990	2,171	2,673
Cache La Poudre River	434	2,568[d]	0.0	376	723	978	2,232	2,739

[a] Total discharge values have been reduced by 50 cfs (capacity of existing 36-inch RCP).
[b] Total discharge values have been reduced by 200 cfs (capacity of existing twin 43-inch by 68-inch HERCPs).
[c] Total discharge values have been reduced by 379 cfs (capacity of existing 72-inch RCP).
[d] Drainage area includes 209 acres from Grapevine Basin (Subbasins 19, 21, 22, and 32).

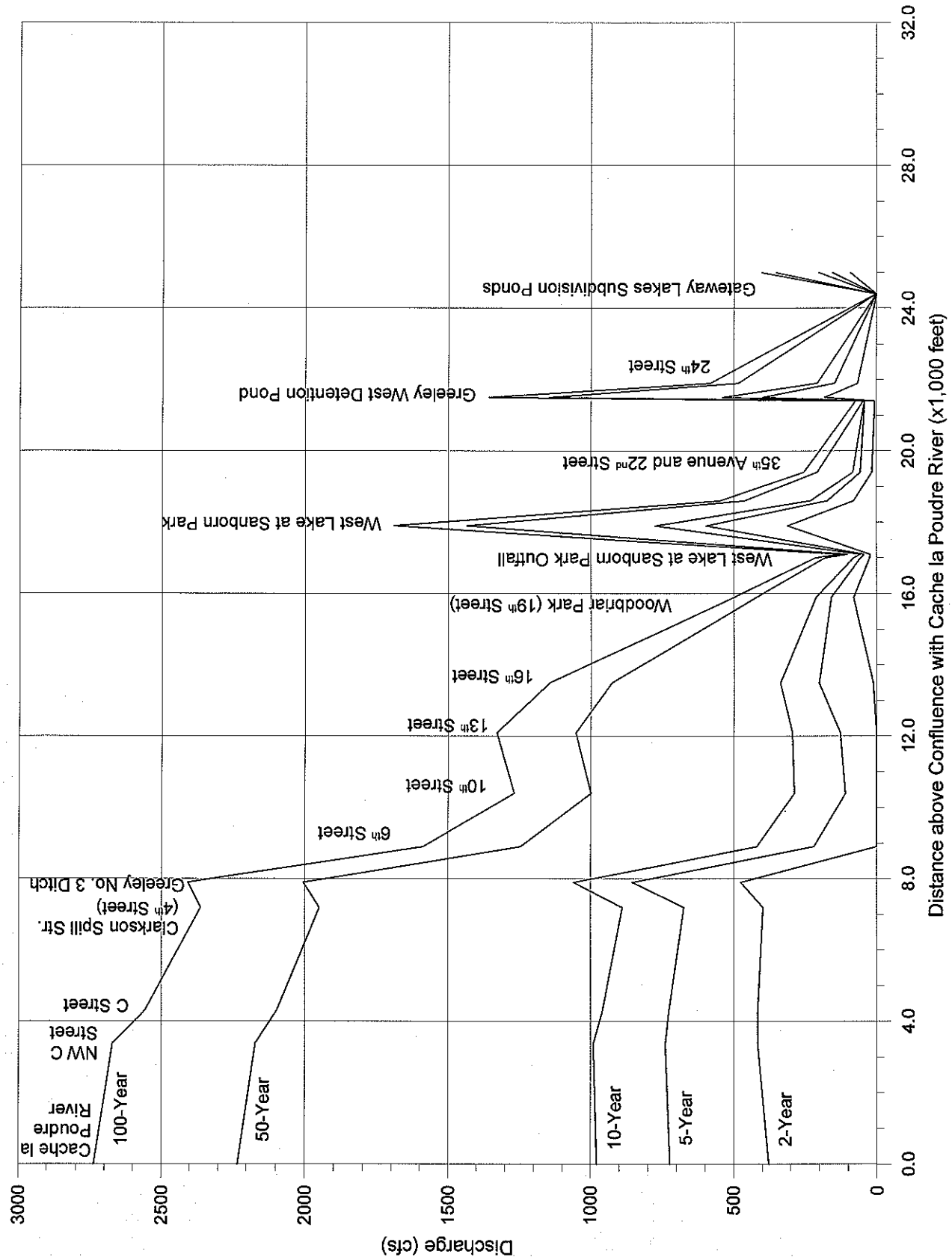


Figure 4.1 Discharge Profiles for the Existing Condition.

19th Street near Woodbriar Park. The major drainageway between 19th Street and 16th Street consists of a single 36-inch RCP. The inlet of the 36-inch RCP lies in a sump area on 19th Street along the southeastern edge of Woodbriar Park, and currently no conveyance facilities exist to evacuate runoff that exceeds the capacity of the storm sewer. Stormwater runoff resulting from a 2-year event and greater exceeds the existing storm sewer capacity and disperses between several homes onto 28th Avenue.

17th Street and 17th Street Road between 27th Avenue and 28th Avenue. Flows conveyed north along 28th Avenue are diverted eastward to two sump areas located along 17th Street Road and 17th Street. Both sump areas are currently serviced by the existing 28th Avenue Storm Sewer (36-inch RCP) with a maximum capacity of 58 cfs. Existing Condition discharges for this area during the 2-, 10-, and 100-year events are estimated to be 163, 421, and 1,091 cfs, respectively. Consequently, the capability of the sump areas to evacuate stormwater runoff is likely exceeded during storms less than the 2-year event. As flows exceed the capacity of the sump facilities, serious flooding potential exists for the homes that surround the two sump areas. It is likely that the excess flows will continue to pond in the vicinity of the sump facilities and will disperse between these homes ultimately onto 16th Street.

26th Avenue between 13th and 4th Streets. 26th Avenue and the underlying storm sewer serve as the major drainageway facilities for the lower 28th Avenue Basin. The capacity of the storm sewer is exceeded for events greater than the 2-year event. Given that the topography of the lower 28th Avenue Basin is relatively flat, the potential for widespread flooding along the entire drainage path from 13th Street to 4th Street is high.

Greeley No. 3 Ditch. Flows from the major drainageway along 26th Avenue discharge into the Greeley No. 3 Ditch immediately south of 4th Street. From 4th Street to the Clarkson Spill Structure, the bankfull capacity of the ditch is approximately 680 cfs. Storm flows discharging into the ditch during the 5-year and greater events exceed this bankfull capacity by over 170 cfs. Consequently, it is likely that properties north and south of the ditch will be susceptible to flooding during all events greater than or equal to the 5-year storm.

Greeley No. 3 Ditch Wasteway Channel. The Clarkson Spill Structure diverts storm flows from the Greeley No. 3 Ditch to the Cache La Poudre River through the Greeley No. 3 Ditch Wasteway Channel. The channel has a bankfull capacity of approximately 120 cfs (north of C Street) to nearly 2,100 cfs (north of the Colorado and Southern Railroad bridge). Flows greater than the 2-year event exceed the capacity and overtop both banks of the wasteway channel in certain locations creating a potential for widespread flooding of the surrounding residential developments.

Greeley No. 3 Ditch Wasteway Channel Crossings. The Greeley No. 3 Ditch Wasteway Channel crosses 4th Street, 1st Street, C Street, the Colorado and Southern Railroad, and NW C Street. The crossings at 4th Street and 1st Street have the capacity to convey the 10-year peak discharge of 890 cfs, but are overtopped for greater events. Similarly, the C Street, railroad, and

NW C Street crossings have the capacity to convey flows up to, but not exceeding the 2-year peak discharge of 416 cfs.

It should be noted that the potential for flooding could occur at almost any location throughout the basin. The previous discussion highlighted general locations along the major drainageway; it is not intended to be a comprehensive summary of basin-wide flooding problems. The aforementioned information should be used as a starting point along with more accurate data and analyses if the precise determination of flooding extents and damages is required throughout the basin.

4.8 Summary of the Future Condition Hydrologic Analyses

4.8.1 Definition of the Future Condition Scenario

The hydrologic model representing the Future Condition scenario was prepared by modifying the Existing Condition model to incorporate all potential future development, based on current zoning and land use for the 28th Avenue Basin. The model simulated all existing detention ponds utilized in the Existing Condition model. Future developments, according to City of Greeley drainage criteria, are generally required to provide on-site detention limiting releases to the 5-year Existing Condition runoff during the 100-year design storm. An exception to this criterion pertains to the areas tributary to the Greeley West Detention Pond. The Greeley West Detention Pond is considered a regional detention facility; consequently, storage within this facility is adequate to allow the release of the 100-year developed condition peak discharge from all tributary drainage areas. Based on development that has occurred since the completion of the 1997 Comp Plan, developments not tributary to the Greeley West Detention Pond have complied with providing 5-year on-site detention. Certain developments tributary to the Greeley West Detention Pond (i.e., Center Place Mall) have also opted to provide on-site detention with release rates generally ranging from flows greater than a 5-year Existing Condition event to flows less than a 100-year developed condition event. These on-site ponds were utilized rather than constructing larger conveyance facilities. For areas outside the existing city limits but within the City's Long Range Expected Growth Area (LREGA), future developments were required to provide on-site detention limiting releases to the 100-year Existing Condition runoff during the 100-year storm. This latter requirement specifically pertains to those areas north of the Greeley No. 3 Ditch and outside the city limits.

Modifications to the overland flow lengths, overland slope and time of concentration were made to reflect potential urbanization of the basin. Table 4.4 presents hydrologic modeling parameters defined for the Future Condition analyses. All hydrologic subbasin parameters, conveyance parameters, and special modeling features associated with the Future Condition

Table 4.4 Hydrologic Subbasin Parameters for the Future Condition.

Subbasin No.	Basin Area (acres)	Basin Length (ft)	Distance to Basin Centroid (ft)	Average Basin Slope (ft/ft)	Time of Conc. (minutes)	Percent Imperv. (%)	Depression Storage (inches)		Infiltration Rates (in/hr)		Horton's Decay Rate
							Pervious	Imperv.	Initial	Final	
1	59.3	2,200	900	0.026	22	31.0	0.40	0.10	4.4	0.6	0.0018
2	88.4	1,600	770	0.012	19	56.5	0.40	0.10	4.5	0.6	0.0018
3	22.7	1,300	550	0.009	16	95.0	0.40	0.10	4.5	0.6	0.0018
4	38.3	1,600	600	0.025	19	10.7	0.40	0.10	4.5	0.6	0.0018
5	82.8	1,200	600	0.028	17	54.0	0.40	0.10	4.5	0.6	0.0018
6	105.5	3,160	1,530	0.010	N/A	91.2	0.40	0.10	4.5	0.6	0.0018
8	66.2	2,400	700	0.021	23	79.3	0.40	0.10	4.6	0.7	0.0016
9	57.7	4,400	2,500	0.002	34	69.5	0.40	0.10	4.5	0.6	0.0018
10	138.7	3,800	800	0.030	N/A	33.8	0.40	0.10	4.6	0.6	0.0018
11	159.3	2,800	900	0.031	N/A	42.3	0.40	0.10	4.6	0.6	0.0017
12	46.3	2,600	1,670	0.014	24	80.8	0.40	0.10	4.5	0.6	0.0018
13	75.8	2,700	800	0.010	25	63.3	0.40	0.10	4.5	0.6	0.0018
14	115.6	2,900	1,650	0.018	N/A	40.9	0.40	0.10	4.5	0.6	0.0018
15	40.3	1,300	500	0.038	17	11.6	0.40	0.10	4.5	0.6	0.0017
16	39.9	2,200	1,100	0.023	22	50.0	0.40	0.10	4.6	0.7	0.0017
17	47.2	2,500	1,100	0.020	24	45.3	0.40	0.10	4.5	0.6	0.0018
18	44.0	2,700	1,000	0.014	25	66.3	0.40	0.10	4.5	0.6	0.0018
19	52.0	1,200	600	0.028	17	58.1	0.40	0.10	4.5	0.6	0.0018
20	36.0	2,300	840	0.024	23	37.5	0.40	0.10	4.6	0.7	0.0016
21	30.8	2,400	1,600	0.011	23	10.0	0.40	0.10	4.5	0.6	0.0018
22	85.0	2,200	1,100	0.028	22	45.5	0.40	0.10	4.5	0.6	0.0018
23	71.1	2,000	1,300	0.018	21	45.1	0.40	0.10	4.5	0.6	0.0018
24	185.5	3,200	1,100	0.019	N/A	36.5	0.40	0.10	4.5	0.6	0.0017
25	67.5	2,400	1,500	0.019	23	37.0	0.40	0.10	4.5	0.6	0.0018
26	46.1	1,300	700	0.013	17	39.0	0.40	0.10	4.5	0.6	0.0018
27	140.5	1,800	300	0.050	N/A	62.9	0.40	0.10	4.5	0.6	0.0018
28	59.5	1,500	200	0.075	18	53.8	0.40	0.10	4.5	0.6	0.0018
29	74.0	1,200	600	0.003	17	35.2	0.40	0.10	4.5	0.6	0.0018
30	33.7	2,100	1,000	0.005	22	40.0	0.40	0.10	4.5	0.6	0.0018
31	117.1	2,800	1,600	0.004	N/A	28.2	0.40	0.10	4.5	0.6	0.0018
32	56.2	1,900	1,200	0.008	21	38.6	0.40	0.10	3.3	0.5	0.0018
33	51.3	1,900	900	0.005	21	5.0	0.40	0.10	3.1	0.5	0.0018
34	80.2	2,600	1,000	0.002	24	17.0	0.40	0.10	2.3	0.4	0.0012

scenario are defined in Sections 4.3, 4.4, and 4.5, respectively, of this report. CUHP input files for each return period are provided in Section 2.2 of the Project Notebook; EPA SWMM input files for the 10- and 100-year return periods are included in Section 7.5.

Detention Pond No. 306 was re-named to Detention Pond No. 806 in order to accommodate a reduced release rate from Subbasin No. 6 due to completion of development associated with the Center Place Mall. Detention Pond No. 808 was added to the Future Condition hydrologic model to represent detention associated with the Center Place Mall in Subbasin No. 8.

As noted in Section 4.6, the inflow hydrographs to the basin (due to spills from the Greeley No. 3 Ditch) used in the Future Condition model were identical to those used in the Existing Condition model. It is recognized that assuming the Existing Condition inflow hydrographs are applicable to the Future Condition may result in slightly under-estimated peak discharges north of the No. 3 Ditch. However, City Staff concurred that this was an acceptable compromise in order to simplify the analyses for the Future Condition, since this condition represents an intermediate step between Existing and Proposed Conditions that will likely never be represented by conditions in the field.

4.8.2 Hydrologic Modeling Results for the Future Condition

Less than 20 percent of the upper 28th Avenue Basin (south of 20th Street) is undeveloped under the Existing Condition. As a result, the flows along the major drainageway in the upper basin area do not increase significantly from the Existing Condition to the Future Condition. Of the nineteen subbasins delineated in the upper basin, seven subbasins (5, 6, 8, 12, 13, 14, and 15) were revised to represent Future Conditions based on the proposed zoning. The basin map and a schematic diagram of the hydrologic model representing the drainage network for the Future Condition is provided on Sheet A-3 in Appendix A of this report. A summary of peak discharges resulting from the Future Condition hydrologic modeling effort is provided in Table 4.5 for selected locations within the basin. A graphical representation of the discharge profile along the major drainageway is also provided in Figure 4.2. Flood hydrographs at selected locations throughout the basin are presented in Appendix D of this report. Summary output from the EPA SWMM models representing the Future Condition analyses are also provided in Appendix D and in Section 7.6 of the Project Notebook; a description of the program written to summarize the EPA SWMM output as well as a copy of the program itself is provided in Section 7.4. All input and output files for both CUHP and EPA SWMM are provided electronically in Section 6 of the Project Notebook.

Table 4.5 Summary of Selected Peak Discharges for the Future Condition Scenario.

Location	EPA SWMM Element	Drainage Area (acres)	Distance above the Confluence with the Poudre River (1,000 feet)	Peak Discharge (cfs)				
				2-yr	5-yr	10-yr	50-yr	100-yr
Inflow to Gateway Lakes Subdivision Ponds	402	149	25.0	91	155	201	351	401
Outflow from Gateway Lakes Subdivision Ponds	302	149	24.4	0	1	1	2	2
24th Street	413	443	21.9	137	220	267	452	522
Inflow to Greeley West Detention Pond	414	681	21.5	285	511	645	1,175	1,375
Outflow from Greeley West Detention Pond	315	681	21.4	31	42	43	46	75
Intersection of 35th Avenue and 22nd Street (surface flows only)[a]	407	893	19.4	15	55	84	200	245
Inflow from area south of 22nd Street/east of 35th Avenue	410	177	18.6	80	172	231	461	547
Inflow to West Lake at Sanborn Park	411	1,281	17.9	311	597	775	1,432	1,689
Outflow from West Lake at Sanborn Park	319	1,281	17.1	29	46	59	103	120
Inflow to West Lake at Sanborn Park Outfall Channel	422	1,348	17.0	29	57	81	180	214
Woodbriar Park (19th Street)	622	1,433	15.9	80	159	211	420	499
16th Street (surface flows only)[b]	423	1,689	13.5	12	201	336	927	1,145
13th Street (surface flows only)[c]	426	1,803	12.1	0	127	294	1,052	1,329
10th Street (surface flows only)	527	1,944	10.4	0	109	286	998	1,268
6th Street (surface flows only)	528	2,003	8.9	0	219	419	1,247	1,588
eley No. 3 Ditch	429	2,077	7.9	474	854	1,059	2,004	2,407
orthview Regional Detention Pond (Grapevine Basin)	35	209	N/A	7	9	11	78	138
Clarkson Spill Structure (4th Street)	36	2,077	7.2	396	675	890	1,949	2,362
C Street	431	2,194	4.3	416	727	959	2,097	2,559
NW C Street	433	[d] 2,488	3.4	421	734	982	2,157	2,665
Cache La Poudre River	434	[d] 2,568	0.0	378	719	982	2,168	2,685

[a] Total discharge values have been reduced by 50 cfs (capacity of existing 36-inch RCP).
[b] Total discharge values have been reduced by 200 cfs (capacity of existing twin 43-inch by 68-inch HERCPs).
[c] Total discharge values have been reduced by 379 cfs (capacity of existing 72-inch RCP).
[d] Drainage area includes 209 acres from Grapevine Basin (Subbasins 19, 21, 22, and 32).

Despite the increase in runoff resulting from future development in the upper basin, the three major detention facilities located along the drainageway would remain effective in attenuating the peak discharge and reducing the flooding potential. Future Condition modeling results indicate that the Gateway Lakes Subdivision Ponds would continue to significantly detain the runoff resulting from the 100-year storm event, with an estimated maximum water surface elevation 4.5 feet below the crown of the U.S. Highway 34 Bypass.

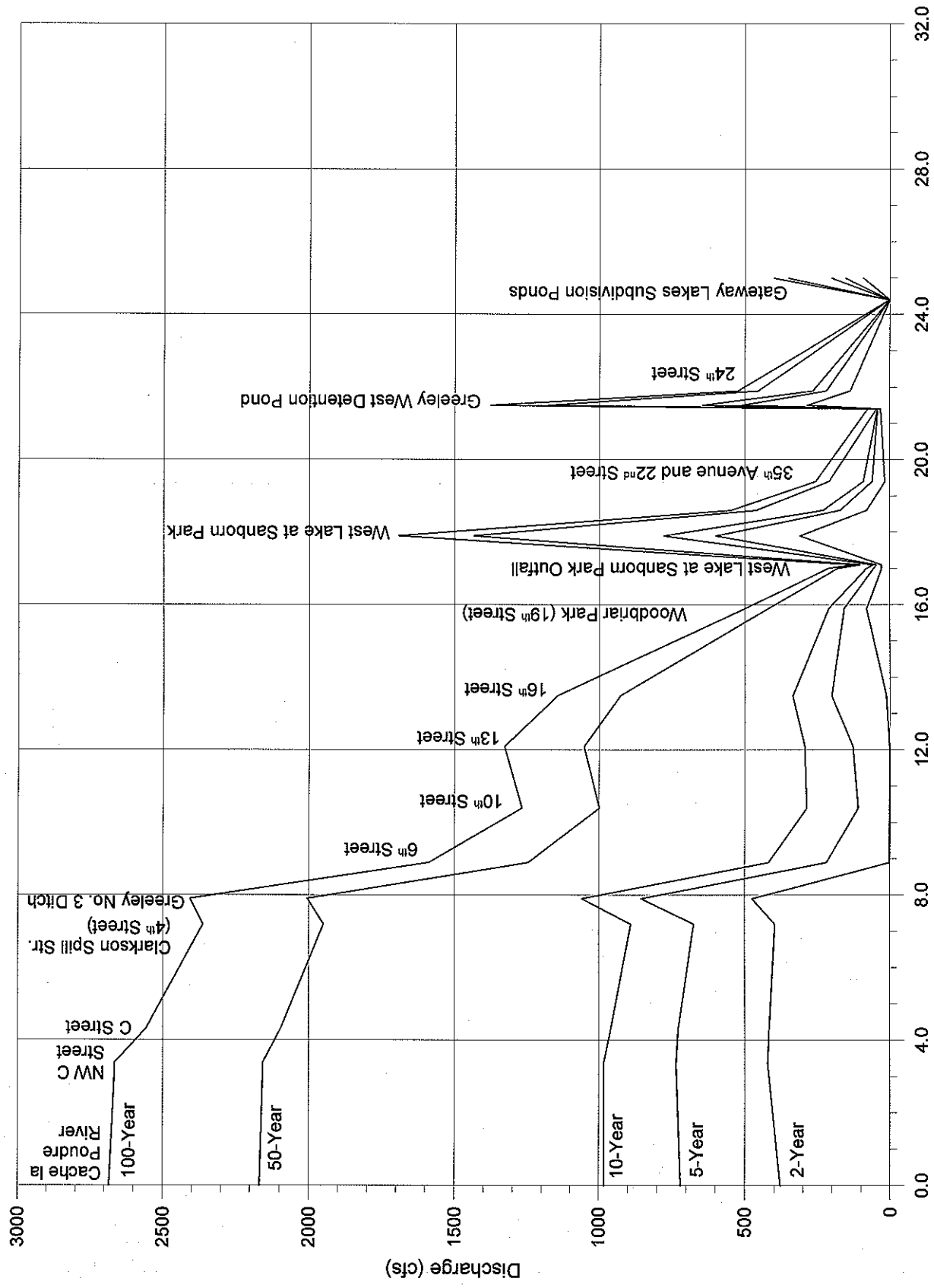


Figure 4.2 Discharge Profiles for the Future Condition.

Moderate increases in stormwater runoff along the major drainageway are indicated at the Greeley West Detention Pond, due to the fact that all remaining undeveloped areas were assumed to develop to applicable zoning designations without providing on-site detention. Exceptions to this are the remaining phases of the Center Place Mall, which are planning on providing on-site detention for all future development. However, the Greeley West Detention Pond was originally constructed as a regional detention facility, and was designed on the basis of rainfall intensity-duration-frequency data nearly equivalent to those cited in the drainage criteria manual. The maximum release from the Greeley West Detention Pond during the 100-year storm is estimated to be 75 cfs, which is only 1 cfs higher than the comparable 100-year release during the Existing Condition.

Due to the fact that most developments downstream of the Greeley West Detention Pond have already provided on-site detention as reflected in the Existing Condition model, peak discharges crossing 35th Avenue and entering West Lake at Sanborn Park are virtually unchanged for the Future Condition. Overtopping of 35th Avenue at 22nd Street will remain an issue for all events at a 10-year level and above.

Given that nearly the entire lower portion of the 28th Avenue Basin within the City is already developed as reflected in the Existing Condition model, the flows along the major drainageway downstream of 20th Street do not change as indicated by the Future Condition modeling results. Consequently, the Existing Condition flooding problems described in Section 4.7.4 will continue to persist. The magnitude of Future Condition flooding problems is generally the same as for Existing Conditions due to the similar peak discharges. It is noted that the discharges cited in Table 4.5 for areas north of the Greeley No. 3 Ditch may be slightly lower than the actual flows due to the use of Existing Condition inflow hydrographs from the No. 3 Ditch.

V. RECOMMENDED PLAN OF DRAINAGE IMPROVEMENTS

The 1997 Comp Plan included an alternative evaluation that considered a wide array of drainage improvements for the 28th Avenue Basin, including on-site detention, major storm sewer additions, Greeley No. 3 Ditch modifications, channel improvements, and the replacement of several channel-crossing structures. Of these recommendations, specific drainage-related improvements that have been implemented since 1997 include completion of on-site detention in areas both tributary and not tributary to the Greeley West Detention Pond, improvements to West Lake at Sanborn Park, and the automation of the Clarkson Spill Structure on the Greeley No. 3 Ditch at 4th Street. Although the City's subsequent implementation of these improvements have reduced flood hazards in several specific areas of the basin, basin-wide drainage conditions and the potential for flooding in the northern half (generally north of 20th Street) of the basin remain largely unchanged.

This study focused primarily on refining the previously recommended plan of improvements, including upgrading conceptual cost estimates. Water quality was also addressed as part of the overall recommended plan.

5.1 Formulation of the Drainage Improvement Plan

Modifying the drainage improvement plan for the 28th Avenue Basin was not included in the Scope of Work for the current study. However, in the context of the revised hydrologic and hydraulic modeling for the basin, as well as drainage improvements that have been implemented since completion of the previous Comp Plan, minor revisions to the drainage improvement plan are identified in this report. In addition, construction cost estimates associated with the proposed improvements have been updated to reflect the escalation of construction costs since 1997.

On-site detention that limits releases to the 5-year historic discharge will continue to be required in areas not tributary to the Greeley West Detention Pond. The use of the three on-line regional detention facilities in the upper portion of the basin will continue to be an important factor in reducing 100-year discharges along the major drainageway. Details associated with the overall drainage plan are provided in the following section.

5.2 Drainage Criteria

Where appropriate, preliminary design of the proposed drainage facilities was completed in accordance with the criteria presented in the City of Greeley Storm Drainage Criteria Manual (Greeley Public Works Department, May 2002). The City's drainage criteria manual reflects

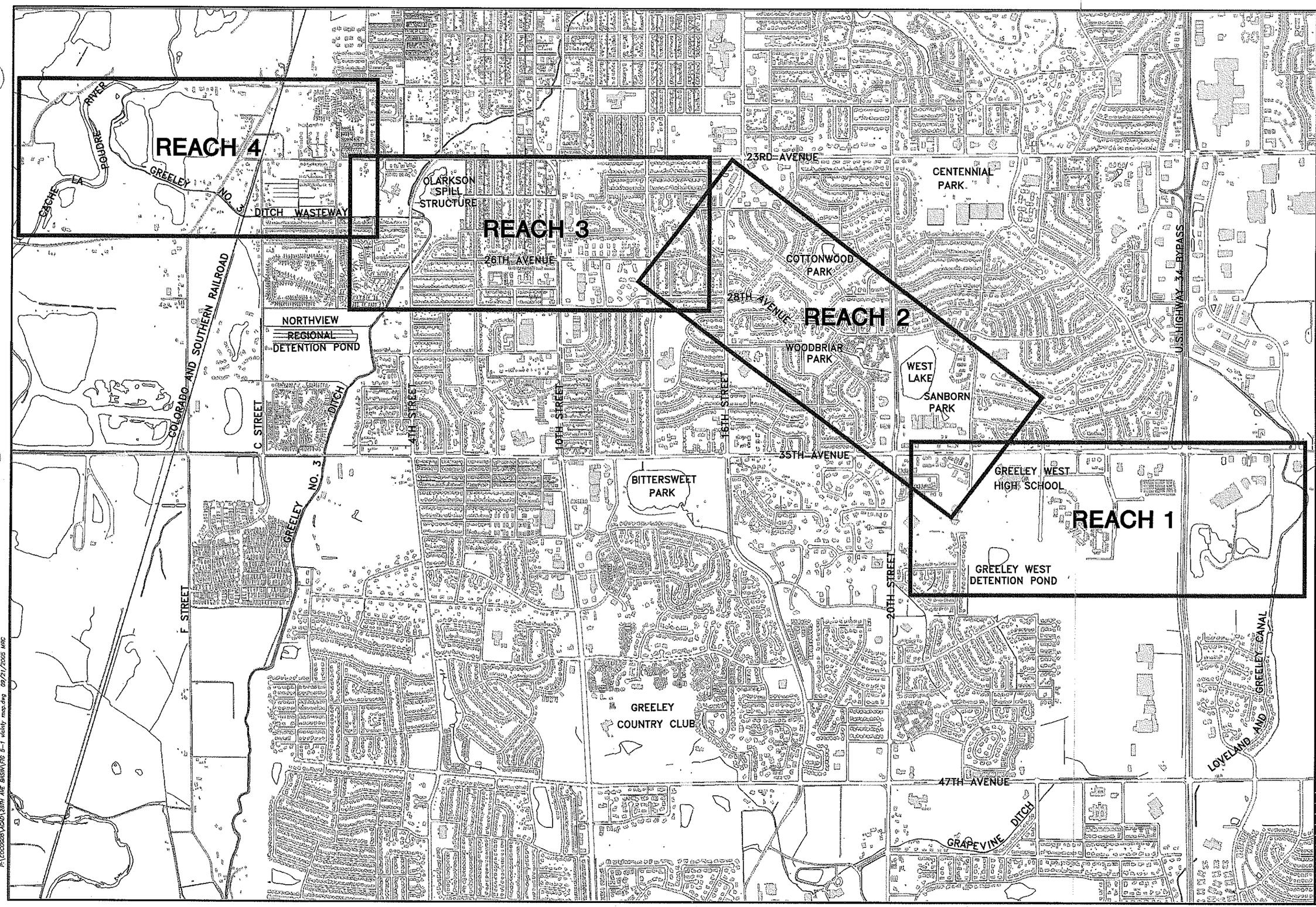
local standards and procedures and is consistent with the information presented in the Urban Storm Drainage Criteria Manual prepared by the Denver Regional Council of Governments.

5.3 Major Storm Drainage Improvements

The major storm drainage improvement plan for the 28th Avenue Basin, as adapted from the 1997 Comp Plan, consists of the following twelve components. Plan and profile drawings that provide detailed configuration information for the major storm drainage improvements are included in Figures 5.1 through 5.5. The improvements have been sized based on 10-year flows associated with the Proposed Condition scenario in the northern portion of the basin (north of 20th Street) and for 100-year flows in the southern portion of the basin (south of 20th Street), as defined in Section 5.6 of this report. Analyses related to all of the proposed improvements are provided in Section 3 of the Project Notebook.

1. ***Water Quality Pond.*** In order to improve the water quality aspects of the runoff from the 28th Avenue Basin, it is proposed that one the existing gravel ponds north of NW C Street near the Poudre River be utilized as a water quality pond. The pond, located at the confluence between the Greeley No. 3 Ditch Wasteway Channel and the Poudre River, has a surface area of approximately 11 acres and would be utilized as a Retention Pond (RP) according to the Urban Storm Drainage Criteria Manual (USDCM). Minor improvements are required to divert the Greeley No. 3 Ditch Wasteway Channel into the gravel pond. A stable outfall structure capable of discharging 10-year flows to the Poudre River is also required. Conceptual calculations indicated a design Water Quality Capture Volume (WQCV) of 14.6 ac-ft. The property associated with the gravel pond would need to be purchased and the minor improvements implemented.

2. ***NW C Street.*** The NW C Street crossing of the Greeley No. 3 Ditch Wasteway Channel currently has a capacity of approximately 510 cfs, which is less than a 5-year storm event. The 1997 Comp Plan called for replacement of the existing bridge with a 20-foot wide by 5-foot high, three-sided box culvert, or equivalent; based on revised discharges, the new size is a 20-foot wide by 6-foot high three-sided box culvert, or equivalent. The required structure size would need to be confirmed by a detailed analysis completed as part of final design of this crossing. Currently this crossing lies outside of the limits of the City of Greeley, and would be subject to Weld County drainage criteria. However, as shown it would meet the City of Greeley's storm drainage criteria, which does not allow roadway overtopping for a 10-year storm.



P:\COCO605\ACAD\28TH AVE BASIN\FIG 5-1 vicinity map.dwg 09/21/2005 MRC

City of Greeley

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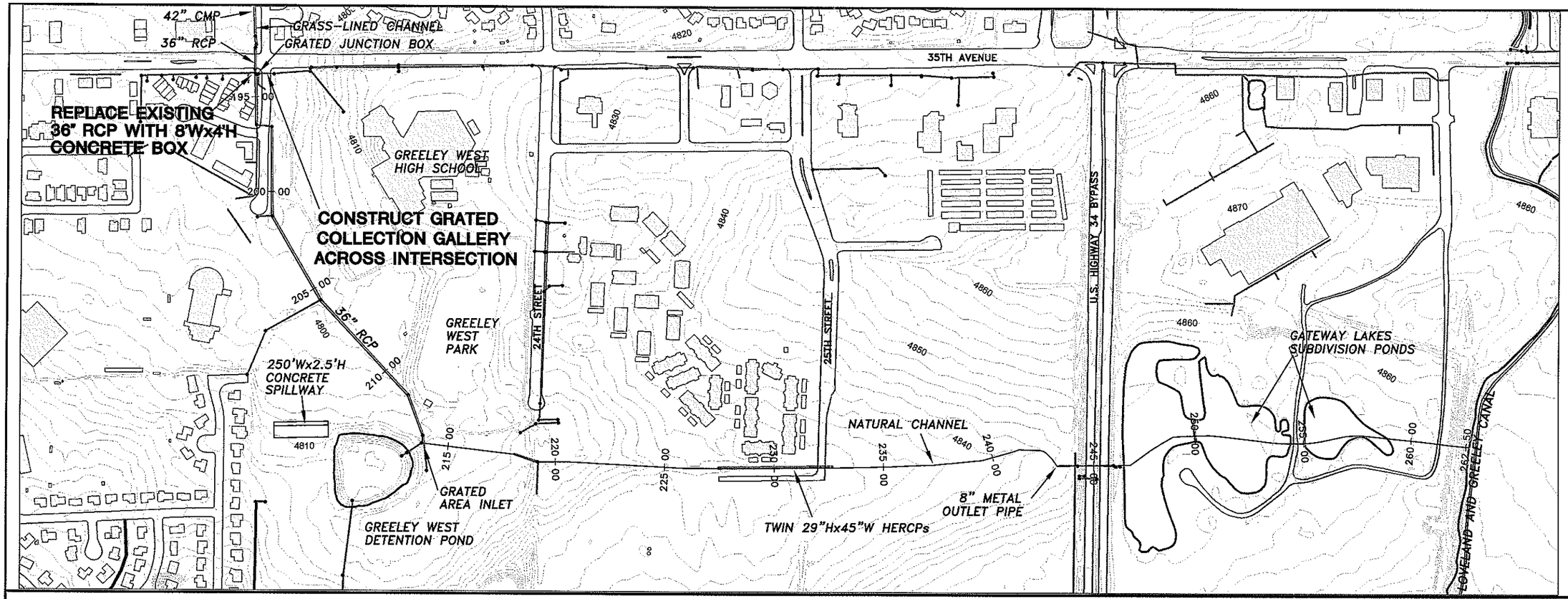
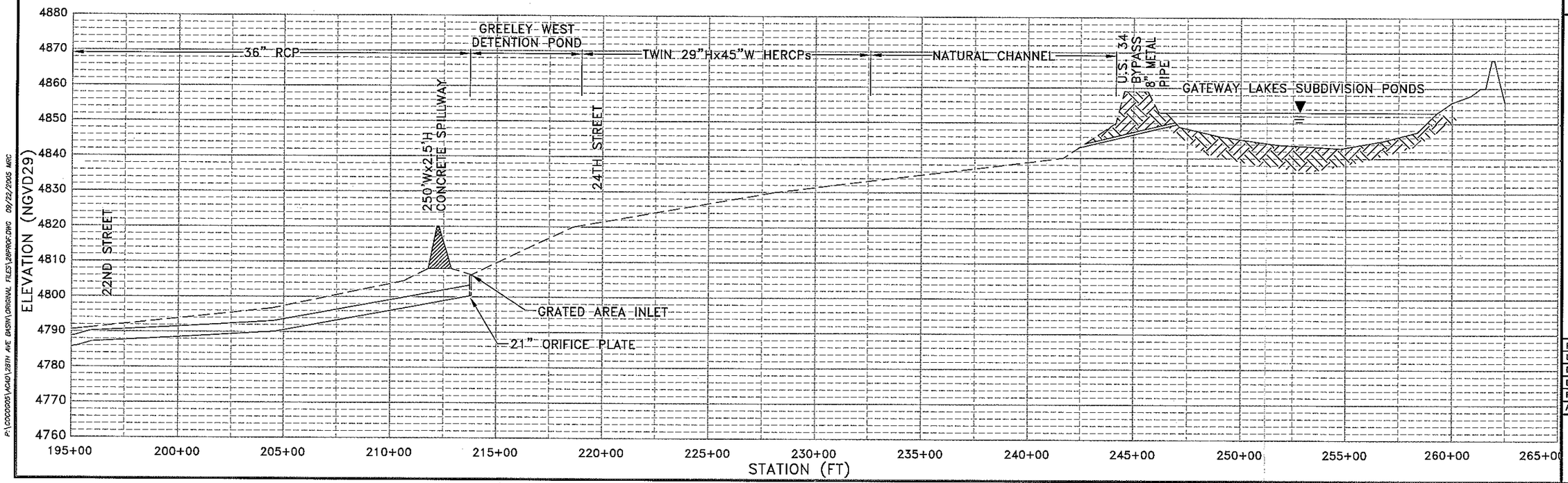
28TH AVENUE BASIN
PROPOSED DRAINAGE IMPROVEMENTS
INDEX SHEET

Anderson Consulting Engineers, Inc
Civil · Water Resources · Environmental
772 Whalers Way, Suite 200, Fort Collins, CO 80525
Phone (970) 226-0120 / Fax (970) 226-0121

Project No.	COCO605
Date:	08/19/2005
Design:	BLV
Drawn:	MRC
Revisions:	
ACADFILE:	fig5-1 vicinitymap

FIGURE 5.1





SCALE:
HORIZONTAL 1"=500'
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28TH AVENUE BASIN
PROPOSED DRAINAGE IMPROVEMENTS
REACH 1

ANDERSON CONSULTING ENGINEERS, INC
Civil · Water Resources · Environmental
772 Whalers Way, Suite 200, Fort Collins, CO 80525
Phone (970) 226-0120 Fax (970) 226-0121

Project No.	COCOG05
Date:	08/19/2005
Design:	BLV
Drawn:	MRC
Revisions:	
ACADFILE:	28PROF.DWG

FIGURE 5.2

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REPLACE EXISTING TWIN 43"Hx68"W CULVERTS WITH 2-8'Wx4'H CONCRETE BOX CULVERTS

REPLACE 36" RCP WITH 2-60" RCPs OR EQUIVALENT

CONSTRUCT GRATED COLLECTION GALLERY

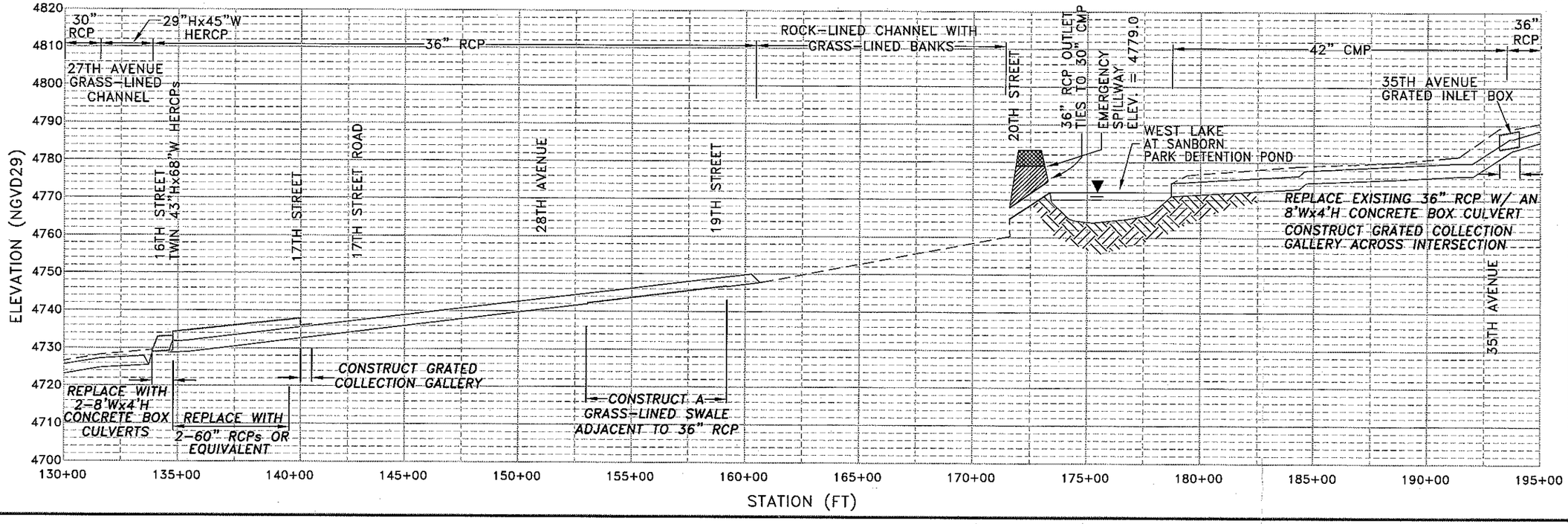
CONSTRUCT CROSSPAN AT INTERSECTION

CONSTRUCT GRASS-LINED SWALE ADJACENT TO 36" RCP

CONSTRUCT GRATED COLLECTION GALLERY ACROSS INTERSECTION

REPLACE EXISTING 36" RCP WITH 8'Wx4'H CONCRETE BOX

RED DENOTES IMPROVEMENTS MADE SINCE 1997 COMP PLAN



City of Greeley

SCALE:
HORIZONTAL 1"=500'
VERTICAL 1"=30'

28TH AVENUE BASIN
PROPOSED DRAINAGE IMPROVEMENTS
REACH 2

ANDERSON CONSULTING ENGINEERS, INC
Civil · Water Resources · Environmental
772 Whalers Way, Suite 200, Fort Collins, CO 80525
Phone (970) 226-0120 / Fax (970) 226-0121

Project No.	COCOG05
Date:	08/19/2005
Design:	BLV
Drawn:	MRC
Revisions:	
ACADFILE:	28PROF.DWG

FIGURE 5.3

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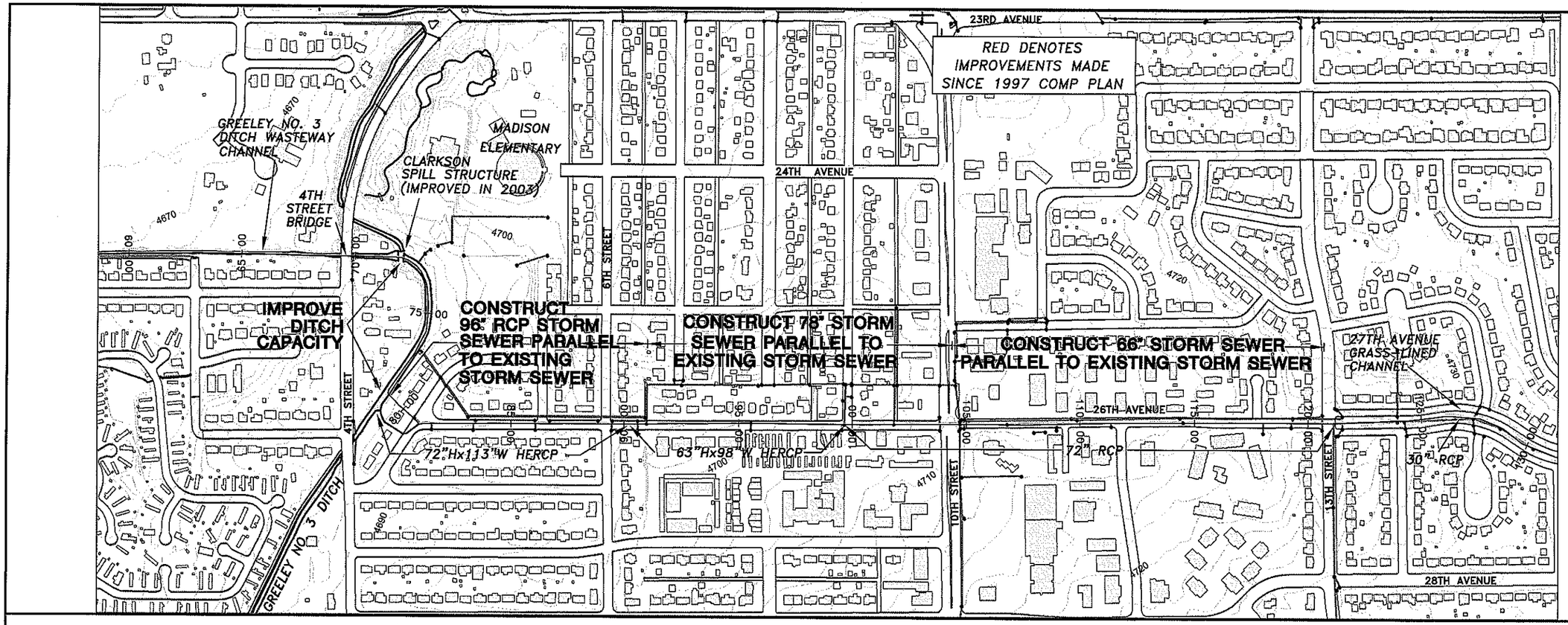

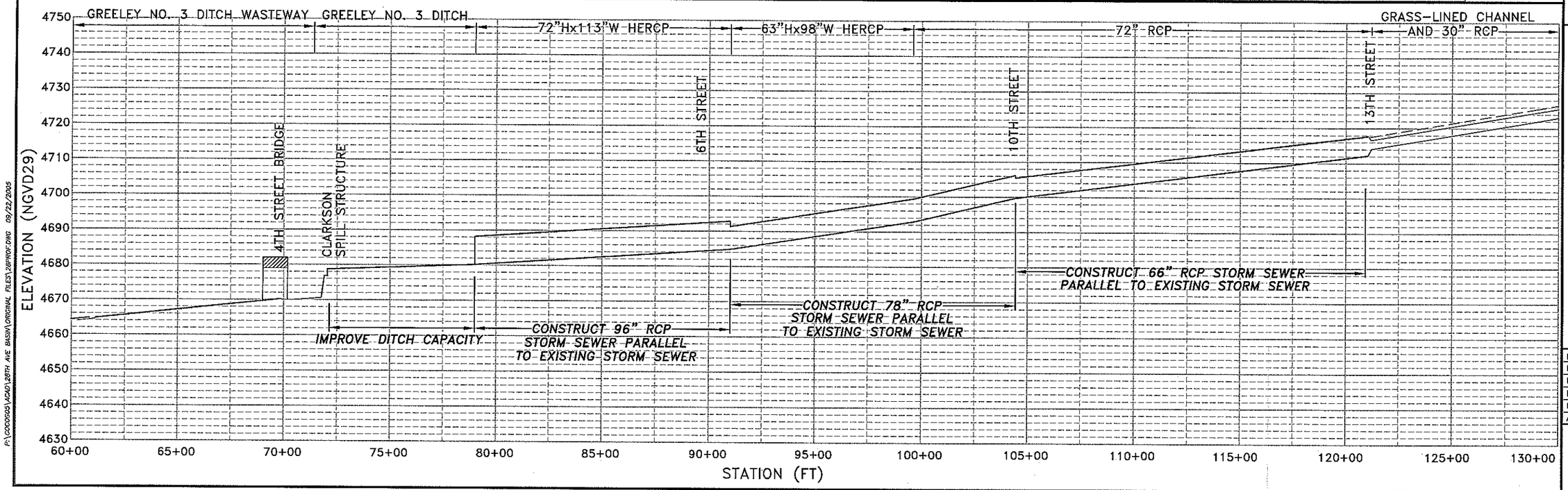

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City of Greeley

SCALE:
HORIZONTAL 1"=500'
VERTICAL 1"=30'

28TH AVENUE BASIN

PROPOSED DRAINAGE IMPROVEMENTS

REACH 3

Anderson Consulting Engineers, Inc
Civil · Water Resources · Environmental
772 Whalers Way, Suite 200, Fort Collins, CO 80525
Phone (970) 226-0120 / Fax (970) 226-0121

Project No.	COCOG05
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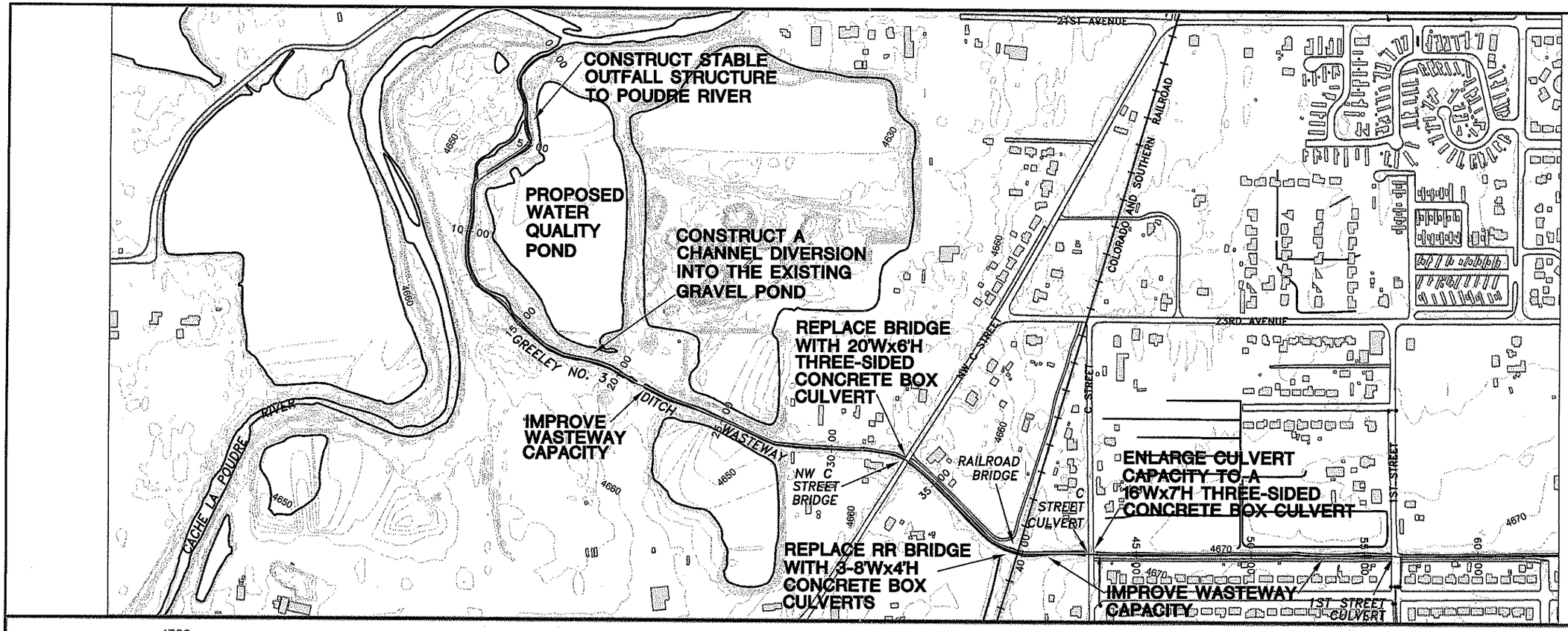
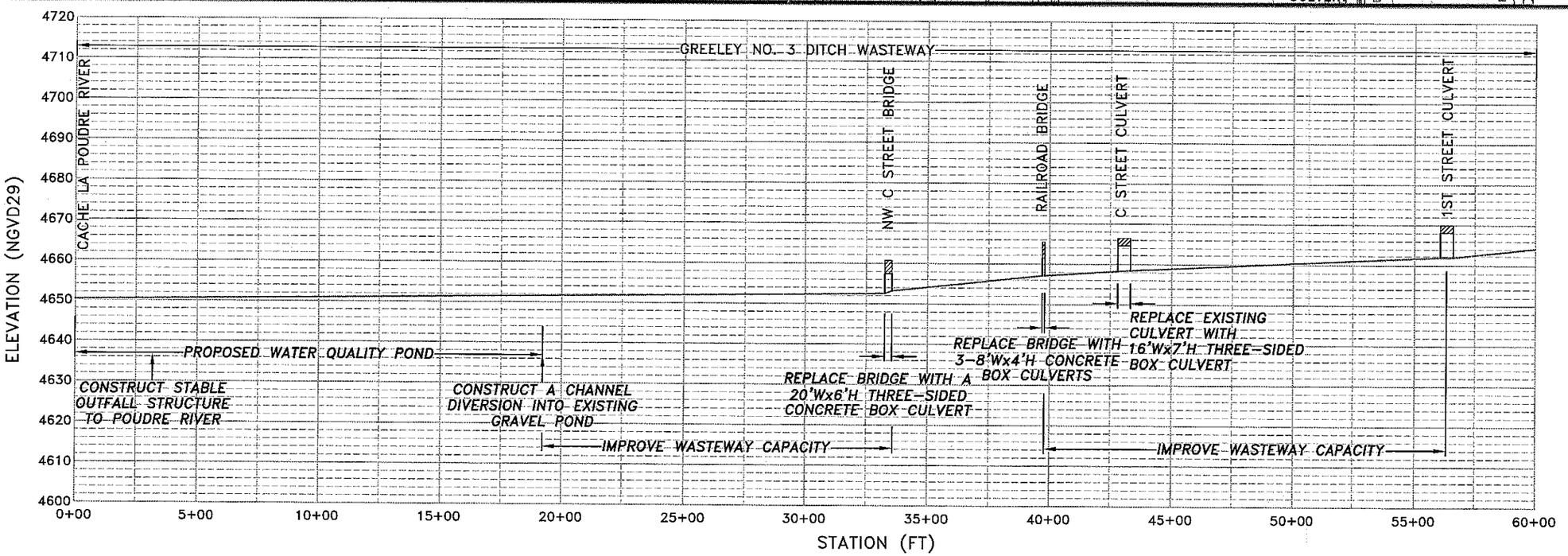
ACADFILE:	28PROF.DWG

FIGURE 5.4





City of Greeley

SCALE:
HORIZONTAL 1"=500'
VERTICAL 1"=30'

28TH AVENUE BASIN
PROPOSED DRAINAGE IMPROVEMENTS
REACH 4

ANDERSON CONSULTING ENGINEERS, INC
Civil • Water Resources • Environmental
772 Whalers Way, Suite 200, Fort Collins, CO 80525
Phone (970) 226-0120 / Fax (970) 226-0121

Project No.	COCOG05
Date:	08/19/2005
Design:	BLV
Drawn:	MRC
Revisions:	
ACADFILE:	28PROF.DWG

FIGURE 5.5

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3. ***Colorado and Southern Railroad.*** The Colorado and Southern Railroad crossing of the Greeley No. 3 Ditch Wasteway Channel currently has a capacity of approximately 570 cfs, which is less than a 5-year storm event. The 1997 Comp Plan called for replacement of the existing bridge with three 8-foot wide by 4-foot high concrete box culverts. The required structure sizes would need to be confirmed by a detailed analysis completed as part of final design of this crossing. This crossing would fall under the jurisdiction of the Colorado and Southern Railroad, and permission would have to be obtained prior to the replacement of the structure

4. ***C Street.*** The C Street crossing of the Greeley No. 3 Ditch Wasteway Channel currently has a capacity of approximately 680 cfs, which is less than a 5-year storm event. The 1997 Comp Plan called for replacement of the existing culvert with an 18-foot wide by 6-foot high three-sided box culvert or equivalent; due to reduced discharges along the major drainageway for the updated Comp Plan, the required culvert size has been reduced to a 16-foot wide by 7-foot high three-sided box culvert or equivalent. The required structure size would need to be confirmed by a detailed analysis completed as part of final design of this crossing. This crossing lies within the Greeley city limits. The structure would eliminate roadway overtopping for a 10-year storm, as required for a local street crossing by City of Greeley drainage criteria.

5. ***Greeley No. 3 Ditch Wasteway Channel Improvements.*** In order to contain and convey storm runoff during the 10-year event, improvements to the wasteway channel are necessary from 1st Street to the Cache la Poudre River (excluding the reach between the Colorado and Southern Railroad north to NW C Street, where the channel capacity is nearly 2,100 cfs). The improvements are needed to provide a minimum of 10-year capacity throughout the reach. The capacity of the existing channel in this reach ranges from approximately 120 cfs near C Street to 970 cfs north of NW C Street. Channel bed and bank improvements are required at several localized sections of the channel to increase the channel capacity to that of a 10-year event.

6. ***Greeley No. 3 Ditch Channel Improvements.*** The capacity of the existing Greeley No. 3 Ditch channel would be increased by increasing the bottom width from 15 to 35-feet while maintaining the current depth of approximately 6 feet and increasing the side slopes from 2H:1V to 1H:1V. This improvement would provide sufficient capacity to safely convey 10-year flows from 26th Avenue to the Clarkson Spill Structure. Permission would need to be obtained from the ditch company in order to implement the proposed improvements.

7. ***Storm Sewer along 26th Avenue from 13th Street to the Greeley No. 3 Ditch.*** The improvements between 13th Street and the Greeley No. 3 Ditch are intended to alleviate flooding problems during storm events less than or equal to the 10-year storm. Specifically, the improvements include the construction of a parallel storm sewer pipeline next to the existing storm sewer from 13th Street to the Greeley No.3 Ditch near 4th Street. The proposed storm sewer ranges in size from a 96-inch RCP or equivalent from the Greeley No. 3 Ditch to 6th Street, a 78-inch RCP or equivalent from 6th Street to 10th Street, and a 66-inch RCP from 10th Street to 13th Street. It is assumed that the storm sewer can largely be constructed within the existing street right-of-way with the possible relocation of existing utilities. At least one property or residence would need to be purchased and the existing structures removed to facilitate the placement of the proposed storm sewer from 25th Avenue Court to the Greeley No. 3 Ditch. The combined capacity of the existing and proposed storm sewers would be sufficient to convey stormwater runoff generated during the 10-year event, eliminating all surface flow with the exception of the reach between 6th Street and the Greeley No. 3 Ditch; the residual discharge in this reach of 26th Avenue would be 44 cfs during the 10-year event. Furthermore, roadway overtopping at several major intersections, including 13th Street and 10th Street, would be eliminated during the 10-year storm.

8. ***16th Street.*** Replace the existing twin 43-inch by 68-inch HERCP culvert crossing 16th Street at 27th Avenue with double 8-foot wide by 4-foot high concrete box culverts. This improvement would eliminate roadway overtopping during the 10-year event (peak discharge of approximately 540 cfs). This improvement is required in conjunction with the replacement of the 36-inch RCP section of the 28th Avenue Storm Sewer.

9. ***17th Street to 16th Street between 27th Avenue and 27th Avenue Court.*** From 17th Street to 16th Street, replace the existing 36-inch RCP section of storm sewer with double 60-inch RCPs or equivalent. In addition to the storm sewers, additional inlets would be required to reduce the potential ponding at 17th Street and evacuate the stormwater runoff efficiently from the sump area while eliminating roadway overtopping. These improvements are intended to limit flooding problems during the 10-year storm.

10. ***17th Street Road and 28th Avenue.*** Construct a crosspan along 28th Avenue crossing 17th Street Road along with minor street improvements to limit the flows conveyed within 28th Avenue from entering the sump along 17th Street Road.

11. ***Woodbriar Park to 28th Avenue.*** Construct a grass-lined swale from the 19th Street sump along the eastern side of Woodbriar Park and between the two lots at the northeast corner of the park. The dimensions of the swale include a bottom width of 20 feet through the park and between the lots, average depth of 1.5 feet, and typical side slopes of 4H:1V through the park and 2H:1V between the lots, and a capacity of approximately 150 cfs. The swale has been conceptually designed to City of Greeley drainage criteria for a grass-lined channel along a major drainageway. These proposed improvements would significantly relieve ponding in the vicinity of the sump along 19th Street and provide flood protection for homes adjacent to the park during storms less than or equal to the 10-year storm.

12. ***35th Avenue.*** Replace the existing 36-inch RCP crossing 35th Avenue at 22nd Street with an 8-foot wide by 4-foot high concrete box culvert. Construction of a grated collection gallery at the intersection is also required to reduce ponding at the intersection and meet the overtopping drainage criteria. Construction of these improvements would eliminate overtopping of 35th Avenue for all events including the 100-year storm (estimated to be a maximum of approximately 310 cfs). According to City of Greeley drainage criteria, the elimination of street overtopping at this crossing for the 100-year event was necessary as 35th Avenue is considered a major arterial, and no overtopping during the 100-year event is allowed. Minor modifications will be necessary at the transition to the existing 42-inch CMP downstream of 35th Avenue to allow adequate capacity for excess flows to be diverted into the 22nd Street/West Lake at Sanborn Park Channel. The grated collection gallery should be designed to remove approximately 250 cfs from the intersection in order to eliminate overtopping of the roadway.

5.4 Conceptual Construction Cost Estimates

Estimates of potential construction costs were prepared for all of the improvements proposed as part of the 1997 Comp Plan. These costs were updated for the current Comp Plan to reflect changes to the proposed facilities and escalation of construction and land acquisition costs since 1997. Where necessary for the current study, data used to develop unit costs were obtained from bid tabulations, quotations from various suppliers and manufacturers, and information supplied by local contractors and various municipal utility departments. Total estimated costs for the projects have been divided into the following categories: (a) actual construction of drainage improvements; (b) land acquisition; and (c) engineering and project management fees.

Actual construction costs are defined as those costs associated with the labor and materials needed to implement the drainage improvements. Considering that the facilities associated with the recommended plan of improvements have only been designed at a conceptual level as part of this study, a construction contingency of 35 percent was added to each project based on the initial cost estimate. Land acquisition costs include the cost to purchase land and associated structures in order to facilitate the construction and maintenance of the proposed improvements. The final cost category, engineering and project management fees, was based on the sum of the initial construction cost estimate and the construction contingency. For all projects, this cost was estimated using a factor of 20 percent. The sum of the three cost categories determined the total project cost. A summary of the estimated cost to construct each of the twelve proposed projects for the 28th Avenue Basin is provided in Table 5.1.

Table 5.1 Summary of Conceptual Construction Cost Estimates.

Description	Construction Cost [a]	Property Acquisition	Engineering and Project Management	Total Cost
Water Quality Pond	$64,000	$25,000	$13,000	$102,000
NW C Street Culvert	$183,000	$0[b]	$36,000	$219,000
Colorado and Southern Railroad Culverts	$103,000	$0[b]	$21,000	$124,000
C Street Culvert	$189,000	$0[b]	$37,000	$226,000
Greeley No. 3 Ditch Wasteway Channel Improvements	$116,000	$10,000	$23,000	$149,000
Greeley No. 3 Ditch Channel Improvements	$46,000	$11,000	$9,000	$86,000
26th Avenue Storm Sewer Additions	$4,013,000	$100,000	$803,000	$4,916,000
16th Street Culverts	$182,000	$0[b]	$36,000	$218,000
17th Street to 16th Street Culverts	$1,006,000	$0[b]	$201,000	$1,207,000
17th Street Road and 28th Avenue	$24,000	$0[b]	$5,000	$29,000
Woodbriar Park to 28th Avenue	$34,000	$15,000	$7,000	$56,000
35th Avenue Culvert	$464,000	$0[b]	$93,000	$557,000
Total Project Costs				**$7,889,000**

[a] Includes initial estimate and 35 percent contingency.

[b] It is assumed that existing easements are adequate for constructing this improvement.

For the proposed ***Water Quality Pond***, the 1997 cost estimate was converted from 1997 to 2004 dollars based on a cumulative increase of 27 percent in the Construction Cost Index (CCI) computed by the Engineering News Record (ENR). Detailed information used in the preparation of the construction cost estimates for this project and each of the remaining eleven projects is included in Section 4 of the Project Notebook. Estimated construction costs for the crossings at ***NW C Street, the Colorado and Southern Railroad, C Street, 16th Street, and 35th Avenue*** were based on current unit cost data for the major elements associated with the required culverts at each of these five locations. For drainage improvements associated with the ***Greeley No. 3 Ditch Wasteway Channel, the Greeley No. 3 Ditch, 17th Street Road and 28th Avenue, and Woodbriar Park to 28th Avenue***, the 1997 cost estimate was converted to 2004 dollars based on the cumulative increase in the CCI computed by the ENR. The remaining two projects, the storm sewers along ***26th Avenue from 13th Street to the Greeley No. 3 Ditch and from 17th Street to 16th Street***, had estimated construction costs based on current unit cost data for the major elements associated with the required culverts.

5.5 Implementation Plan

In order to promote the construction of the drainage improvements as funding becomes available, implementation priorities were established and an implementation plan developed during the completion of the 1997 Comp Plan. The implementation and phasing of the drainage improvements continue to be dependent on several factors. The following factors, originally established from the 1997 Comp Plan, were utilized to establish the priority of implementation for the improvements.

- Health and safety hazards to the public and vehicular traffic were considered the highest priority.
- Areas likely to incur the most flood damages were considered to be the next highest priority.
- Construction phasing of adjacent improvements was considered. For example, improving a culvert crossing may significantly reduce flood damage upstream of the crossing; however, the downstream channel must be improved in conjunction with the roadway crossing to prevent an increase in flood damages on the downstream property.

Recommended implementation priorities for projects in the 28th Avenue Basin have been prepared and are presented in Table 5.2. It is recommended that a proactive approach be taken to facilitate the administration of the implementation plan and the construction of the improvements. Obstacles that hinder the implementation of the plan are frequently encountered; in many instances these obstacles should be addressed or considered as early as conceivably possible in the planning process. Consequently, administration of the plan should provide immediate consideration of: (a) acquisition of the property, easements and rights-of-way necessary to construct the improvements; and (b) identification of potential utility conflicts that will require resolution prior to construction of the improvements.

Table 5.2 Implementation Plan.

Implementation Priority	Description	Total Cost
1	17th Street to 16th Street Culverts	$1,207,000
2	16th Street Culverts	$218,000
3	26th Avenue Storm Sewer Additions	$4,916,000
4	Greeley No. 3 Ditch Channel Improvements	$86,000
5	35th Avenue Culvert	$557,000
6	Woodbriar Park to 28th Avenue	$56,000
7	17th Street Road and 28th Avenue	$29,000
8	C Street Culvert	$226,000
9	NW C Street Culvert	$219,000
10	Colorado and Southern Railroad Culverts	$124,000
11	Greeley No. 3 Ditch Wasteway Channel Improvements	$149,000
12	Water Quality Pond	$102,000

5.6 Hydrologic Analysis of the Recommended Plan of Drainage Improvements

Hydrologic impacts of the recommended plan of drainage improvements were evaluated using a methodology similar to that used for the Existing Condition, as discussed in Chapter 4. Consistent with the terminology used in Chapter 4, the scenario associated with the recommended plan of improvements is identified as the Proposed Condition, which includes future development with the drainage improvements proposed in this report.

For the Proposed Condition, subbasin delineations and hydrologic parameters were not modified from those defined for the Future Condition analysis described in Section 4.3 of this report. As a result, the Future Condition CUHP analysis documented in Section 2.2 of the Project Notebook applies to the Proposed Condition. Hydraulic conveyance modeling parameters defined for the Existing Condition were modified to reflect the recommended plan of improvements. This included the addition of both pipe and street conveyance elements. A summary of all conveyance element parameters defined for the Proposed Condition is provided in Section 7.1 of the Project Notebook.

With respect to special modeling features, no detention storage elements were added beyond the eleven already included as part of the Future Condition. Conversely, existing pipe diversions were modified in the Proposed Condition model to reflect the upgraded system of proposed storm sewers. The basin map and a schematic diagram of the hydrologic model representing the drainage network for the Proposed Condition is provided on Sheet A-4 in Appendix A of this report.

A summary of peak discharges along the major drainageway resulting from the Proposed Condition hydrologic modeling effort is provided in Table 5.3. EPA SWMM input files for the 10- and 100-year return period events are included in Section 7.5 of the Project Notebook; summary output for all return periods are included in Appendix D of this report and Section 7.6 of the Project Notebook. A description of the program written to summarize the EPA SWMM output as well as a copy of the program itself is provided in Section 7.4. All input and output files for EPA SWMM are provided electronically in Section 6 of the Project Notebook. Figure 5.6 presents discharge profiles along the major drainageway that graphically portray the hydrologic results of the Proposed Condition modeling effort. In addition, selected flood hydrographs associated with the Proposed Condition are presented in Appendix D of this report.

The results of the proposed condition analysis indicate an elimination of surface flows for the 2-, 5-, and 10-year events generally from 16th Street north to 6th Street, with minor (less than 50 cfs) flows on the street from 6th Street to 25th Avenue Court. In addition, surface flows generated by both the 50-year and 100-year events would be significantly reduced in this area. The proposed crossing at the intersection of 35th Avenue and 22nd Street would eliminate all surface flows for all events. Regardless, structures that are not elevated above curb level and those with basements that have ingress and egress access at relatively low levels may continue to experience flooding on a relatively frequent basis. However, for the majority of structures, it appears that 10-year flood protection along the major drainageway would generally be provided north of 20th Street in the 28th Avenue Basin. Depending on the capacity of specific streets to carry storm flows, it is probable that many areas of the basin would be protected from flooding for up to the 25-year storm.

Table 5.3 Summary of Selected Peak Discharges for the Proposed Condition Scenario.

Location	EPA SWMM Element	Drainage Area (acres)	Distance above the Confluence with the Poudre River (1,000 feet)	Peak Discharge (cfs)				
				2-yr	5-yr	10-yr	50-yr	100-yr
Inflow to Gateway Lakes Subdivision Ponds	402	149	25.0	91	155	201	351	401
Outflow from Gateway Lakes Subdivision Ponds	302	149	24.4	0	1	1	2	2
24th Street	413	443	21.9	137	220	266	452	522
Inflow to Greeley West Detention Pond	414	681	21.5	285	511	644	1,175	1,375
Outflow from Greeley West Detention Pond	315	681	21.4	30	42	43	46	75
Intersection of 35th Avenue and 22nd Street (surface flows only)[a]	407	893	19.4	0	0	0	0	0
Inflow from area south of 22nd Street/east of 35th Avenue	410	177	18.6	80	172	231	461	547
Inflow to West Lake at Sanborn Park	411	1,281	17.9	311	597	775	1,432	1,689
Outflow from West Lake at Sanborn Park	319	1,281	17.1	29	46	58	103	120
Inflow to West Lake at Sanborn Park Outfall Channel	422	1,348	17.0	29	57	81	181	214
Woodbriar Park (19th Street)	622	1,433	15.9	80	159	211	420	499
16th Street (surface flows only)[b]	423	1,689	13.5	0	0	0	569	787
13th Street (surface flows only)[c]	426	1,803	12.1	0	0	0	752	1,029
10th Street (surface flows only)	527	1,944	10.4	0	0	0	721	963
6th Street (surface flows only)	528	2,003	8.9	0	0	0	778	1,115
Greeley No. 3 Ditch	429	2,077	7.9	473	855	1,117	2,014	2,420
Northview Regional Detention Pond (Grapevine Basin)	35	209	N/A	7	9	10	60	155
Clarkson Spill Structure (4th Street)	36	2,077	7.2	392	687	949	1,867	2,252
C Street	431	2,194	4.3	413	739	1,012	1,987	2,468
NW C Street	433	[d] 2,488	3.4	415	757	1,058	2,098	2,549
Cache La Poudre River	434	[d] 2,568	0.0	369	745	1,004	2,095	2,586

[a] Overtopping of 35th Avenue would be eliminated for all events by the installation of an 8-foot wide by 4-foot high RCB (maximum capacity of approximately 323 cfs).
[b] Total discharge values have been reduced by 558 cfs (capacity of proposed twin 8-foot wide by 4-foot high RCB).
[c] Total discharge values have been reduced by 679 cfs (capacity of existing 72-inch RCP and proposed 66-inch RCP).
[d] Drainage area includes 209 acres from Grapevine Basin (Subbasins 19, 21, 22, and 32).

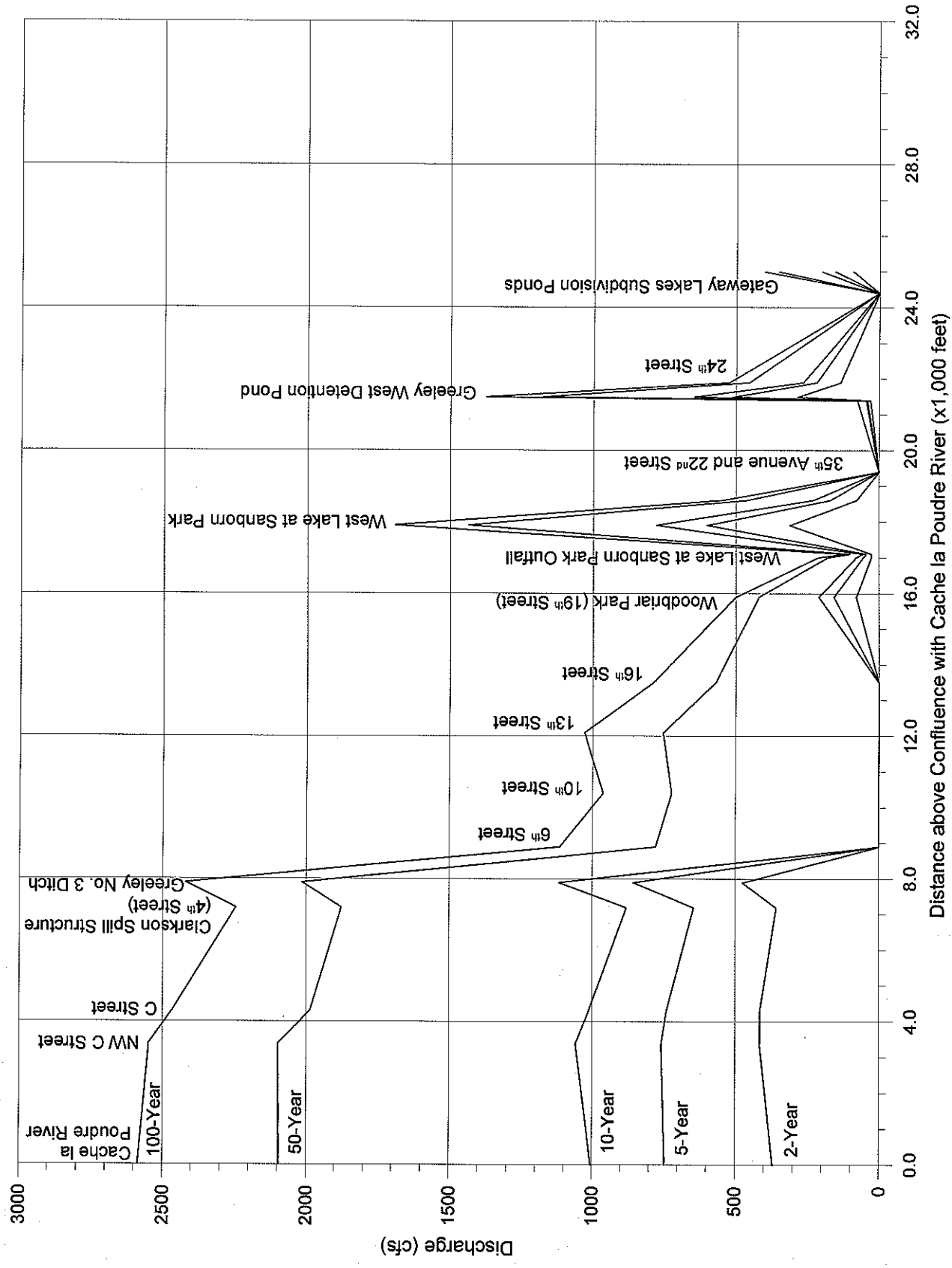

Figure 5.6 Discharge Profiles for the Proposed Condition.

VI. REFERENCES

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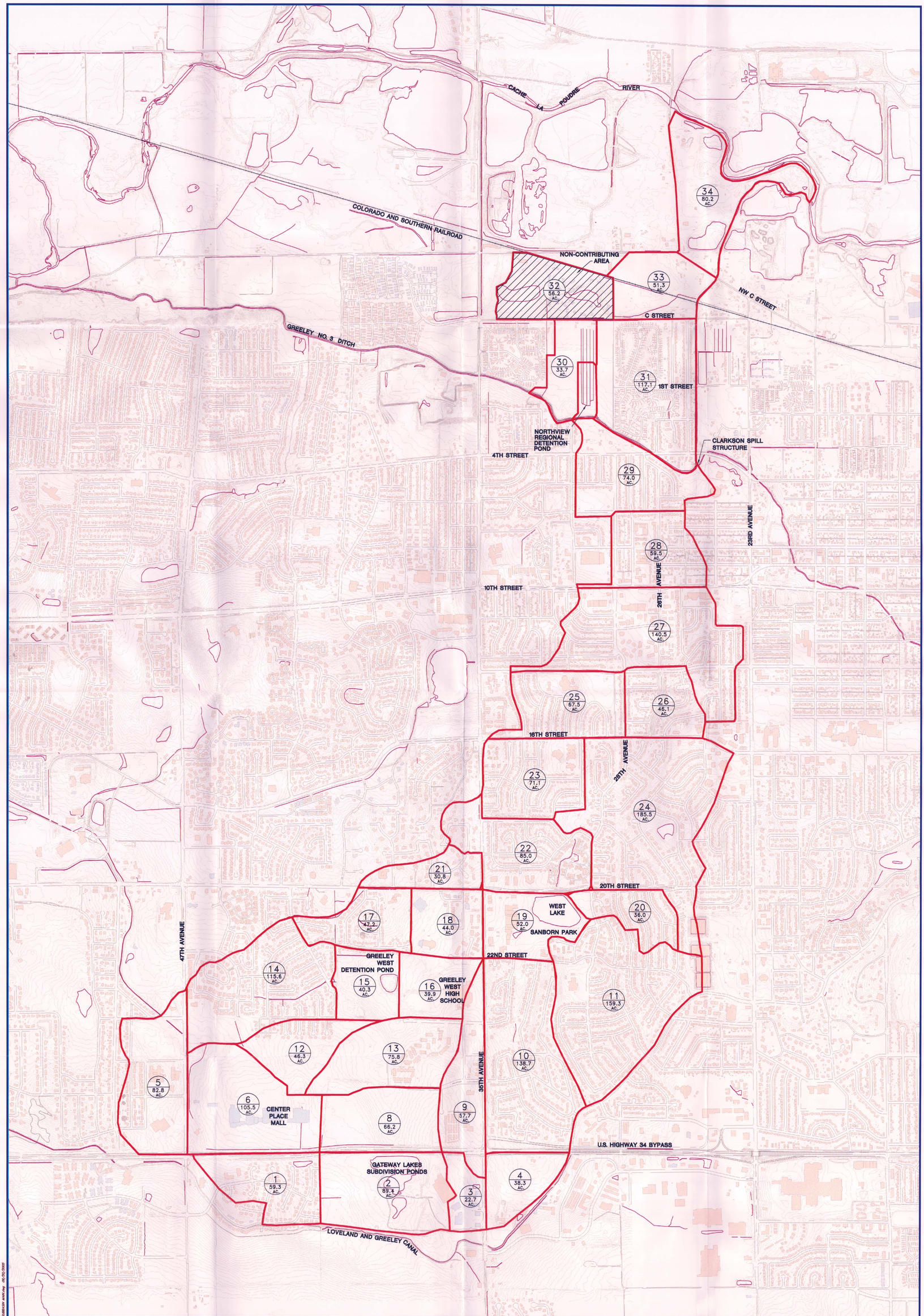
APPENDIX A

SUBBASIN MAP AND HYDROLOGIC MODEL SCHEMATICS



SHEET
A-1

CONTOUR INTERVAL
2-FOOT

ORIGINAL SCALE: 1"=800'
0 400 800 1600

City of Greeley

CITY OF GREELEY COMPREHENSIVE DRAINAGE PLAN
28TH AVENUE BASIN
SUBBASIN MAP

PROJECT NUMBER: COCOG05	DRAWN BY: MRC
ACAD FILE: SUBBASIN MAIN	DESIGNED BY: BLV
DATE: 08/19/2005	CHECKED BY: BLV

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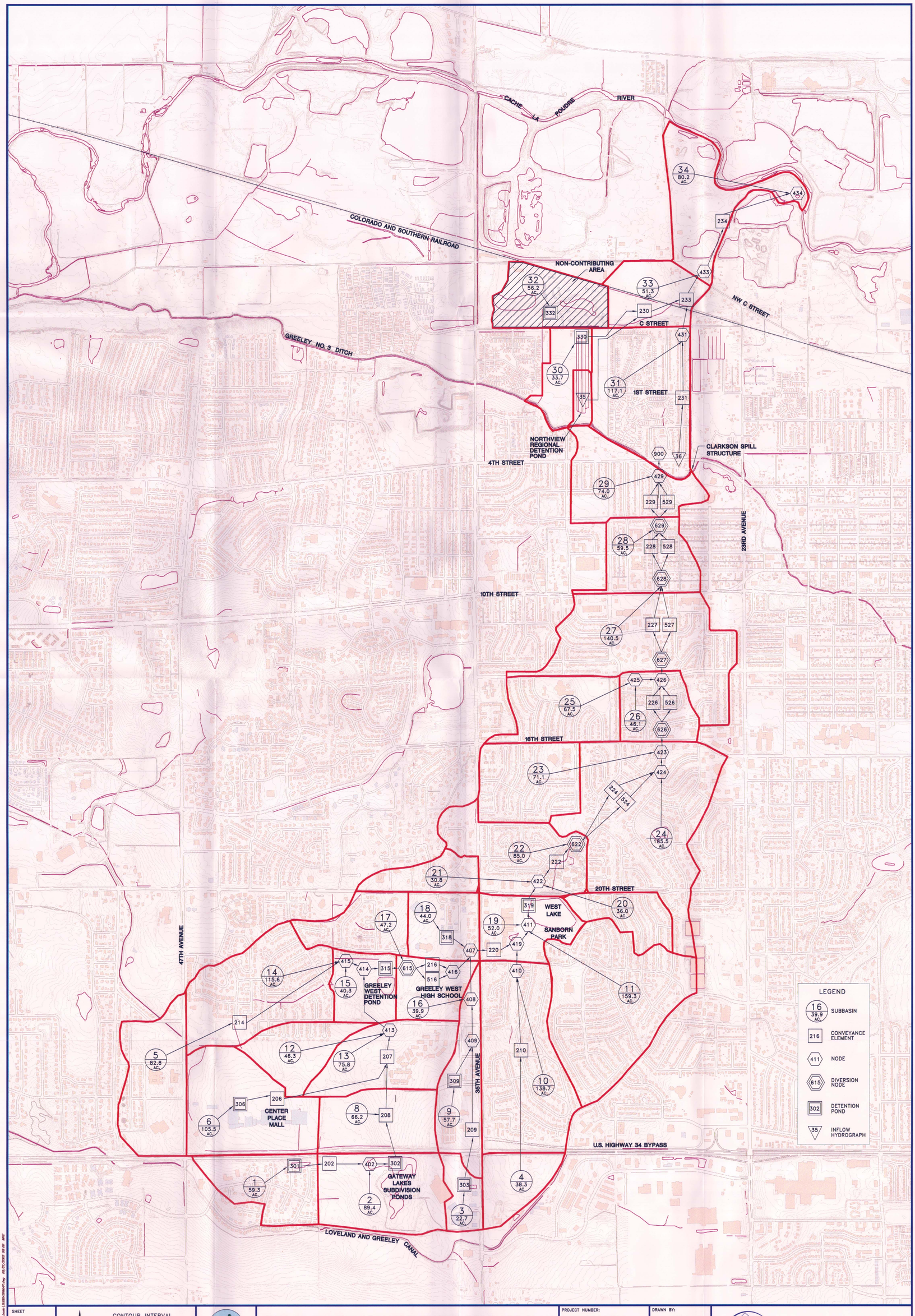
Civil · Water Resources · Environmental
772 Whalers Way, Suite 200, Fort Collins, CO 80525
Phone (970) 226-0120 / Fax (970) 226-0121



SHEET
A-2

CONTOUR INTERVAL
2-FOOT

ORIGINAL SCALE: 1"=800'
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City of Greeley

CITY OF GREELEY COMPREHENSIVE DRAINAGE PLAN
28TH AVENUE BASIN
EXISTING CONDITION SWMM SCHEMATIC

PROJECT NUMBER: COCOG05	DRAWN BY: MRC
ACAD FILE: SUBBASIN SWMM	DESIGNED BY: BLV
DATE: 08/19/2005	CHECKED BY: BLV

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SHEET					
A-3	CONTOUR INTERVAL 2-FOOT ORIGINAL SCALE: 1"=800' 0 400 800 1600	City of Greeley	**CITY OF GREELEY COMPREHENSIVE DRAINAGE PLAN 28TH AVENUE BASIN FUTURE CONDITION SWMM SCHEMATIC**	PROJECT NUMBER: COCOG05 ACAD FILE: PROPSCHEMATIC DATE: 08/19/2005	DRAWN BY: MRC DESIGNED BY: BLV CHECKED BY: BLV

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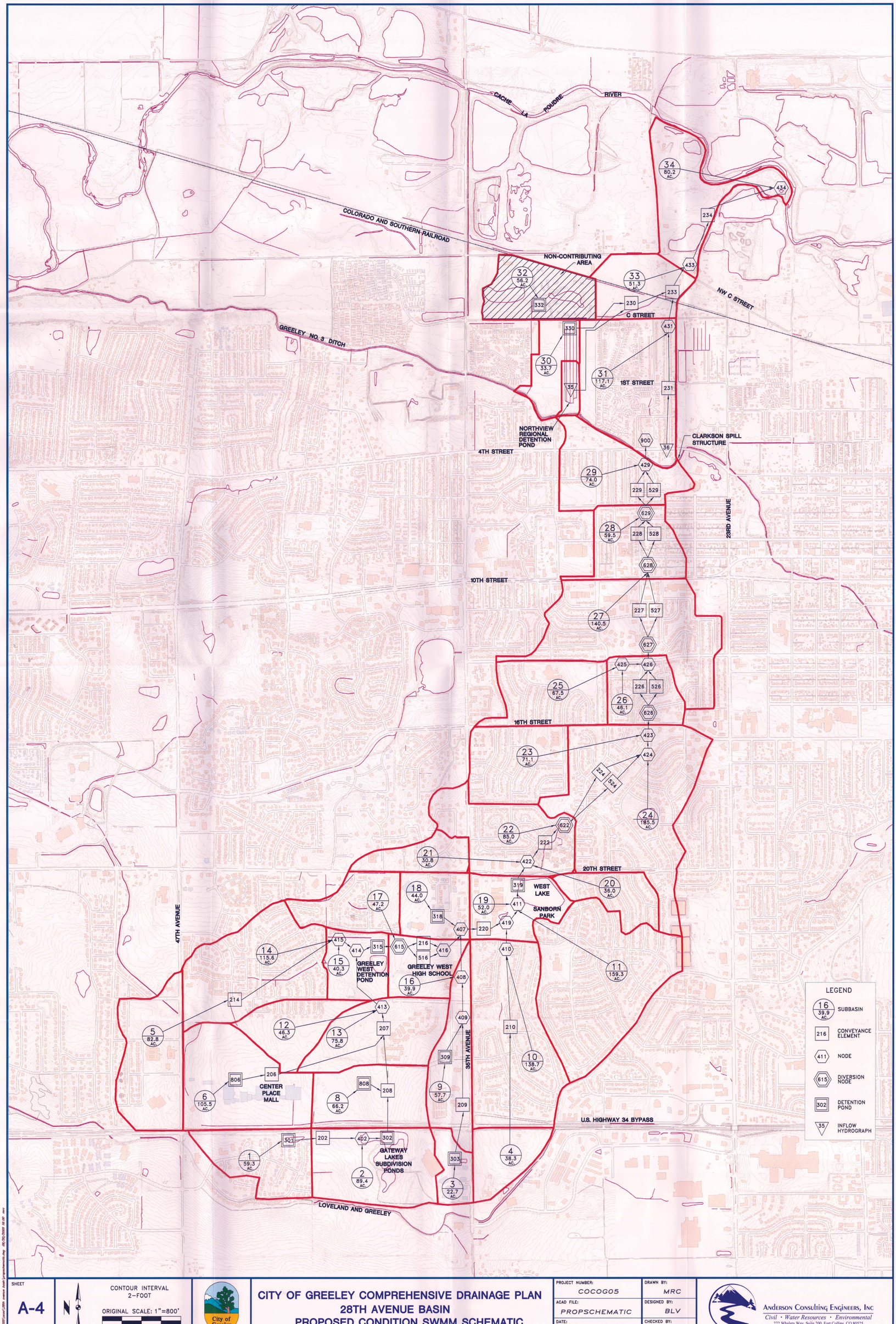

SHEET
A-4

CONTOUR INTERVAL
2-FOOT
ORIGINAL SCALE: 1"=800'
0 400 800 1600

City of Greeley

CITY OF GREELEY COMPREHENSIVE DRAINAGE PLAN
28TH AVENUE BASIN
PROPOSED CONDITION SWMM SCHEMATIC

PROJECT NUMBER: COCOG05	DRAWN BY: MRC
ACAD FILE: PROPSCHEMATIC	DESIGNED BY: BLV
DATE: 08/19/2005	CHECKED BY: BLV

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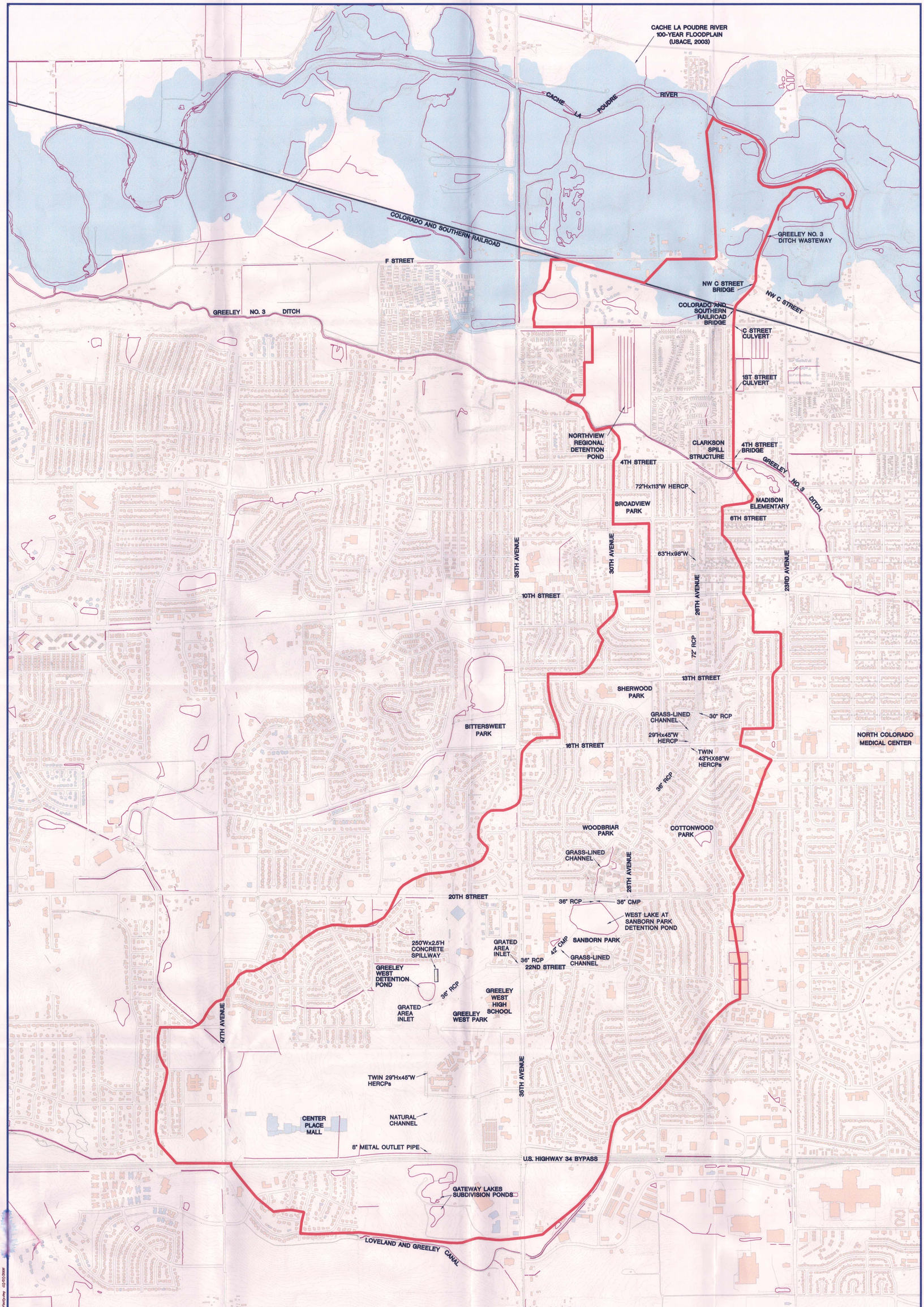
APPENDIX B

EXISTING FACILITIES MAPPING



SHEET
B-1

CONTOUR INTERVAL
2-FOOT

ORIGINAL SCALE: 1"=800'
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City of Greeley

CITY OF GREELEY COMPREHENSIVE DRAINAGE PLAN
28TH AVENUE BASIN
EXISTING DRAINAGE FACILITIES

PROJECT NUMBER: COCOG05	DRAWN BY: MRC
ACAD FILE: ExDrainFacity	DESIGNED BY: BLV
DATE: 08/19/2005	CHECKED BY: BLV

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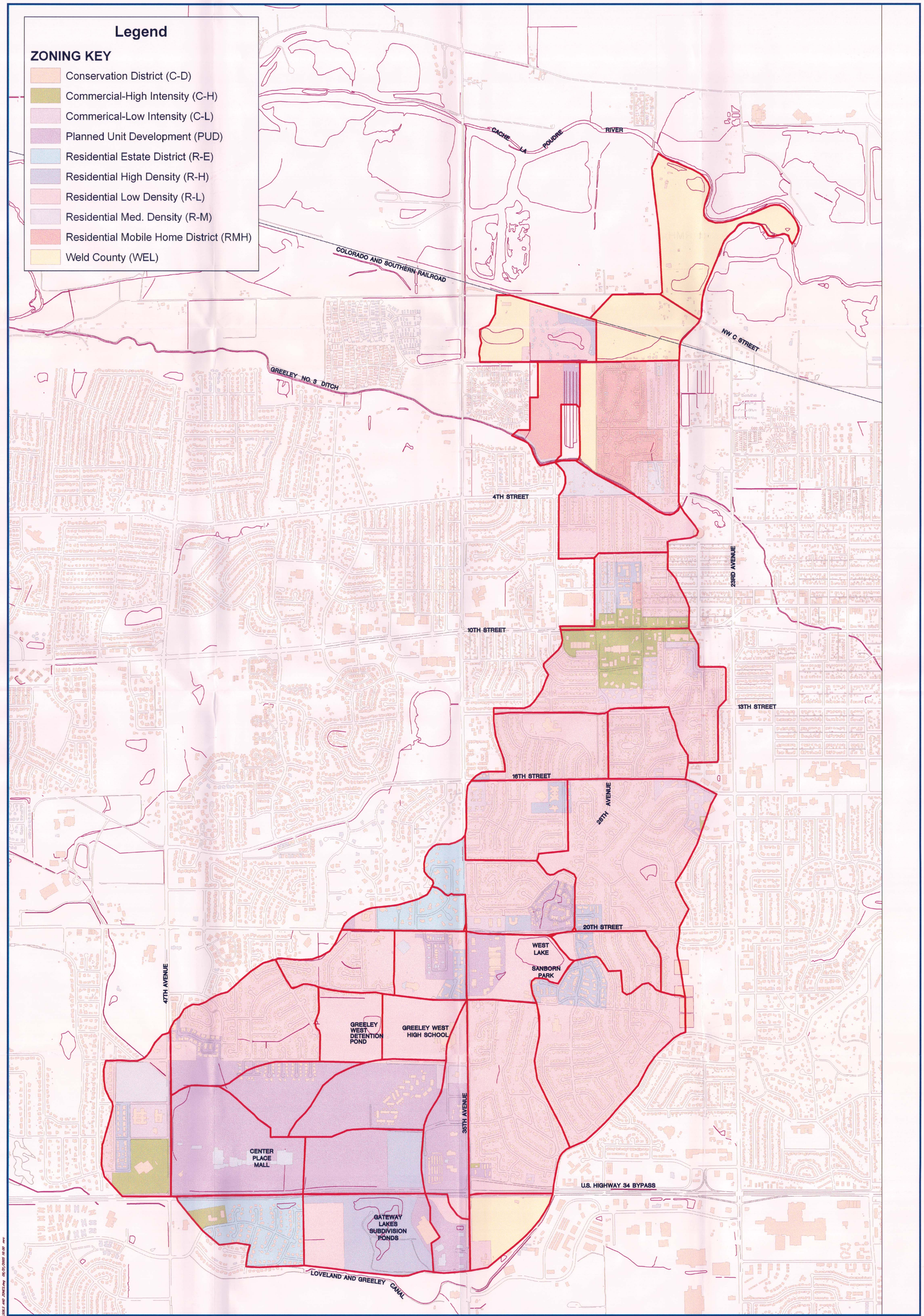
APPENDIX C

LAND USE AND SOILS MAPPING



SHEET C-1

ORIGINAL SCALE: 1"=800'
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City of Greeley

CITY OF GREELEY COMPREHENSIVE DRAINAGE PLAN
28TH AVENUE BASIN
LAND USE MAP

PROJECT NUMBER: COCOG05	DRAWN BY: MRC
ACAD FILE: SOILS AND ZONES	DESIGNED BY: BLV
DATE: 08/19/2005	CHECKED BY: BLV

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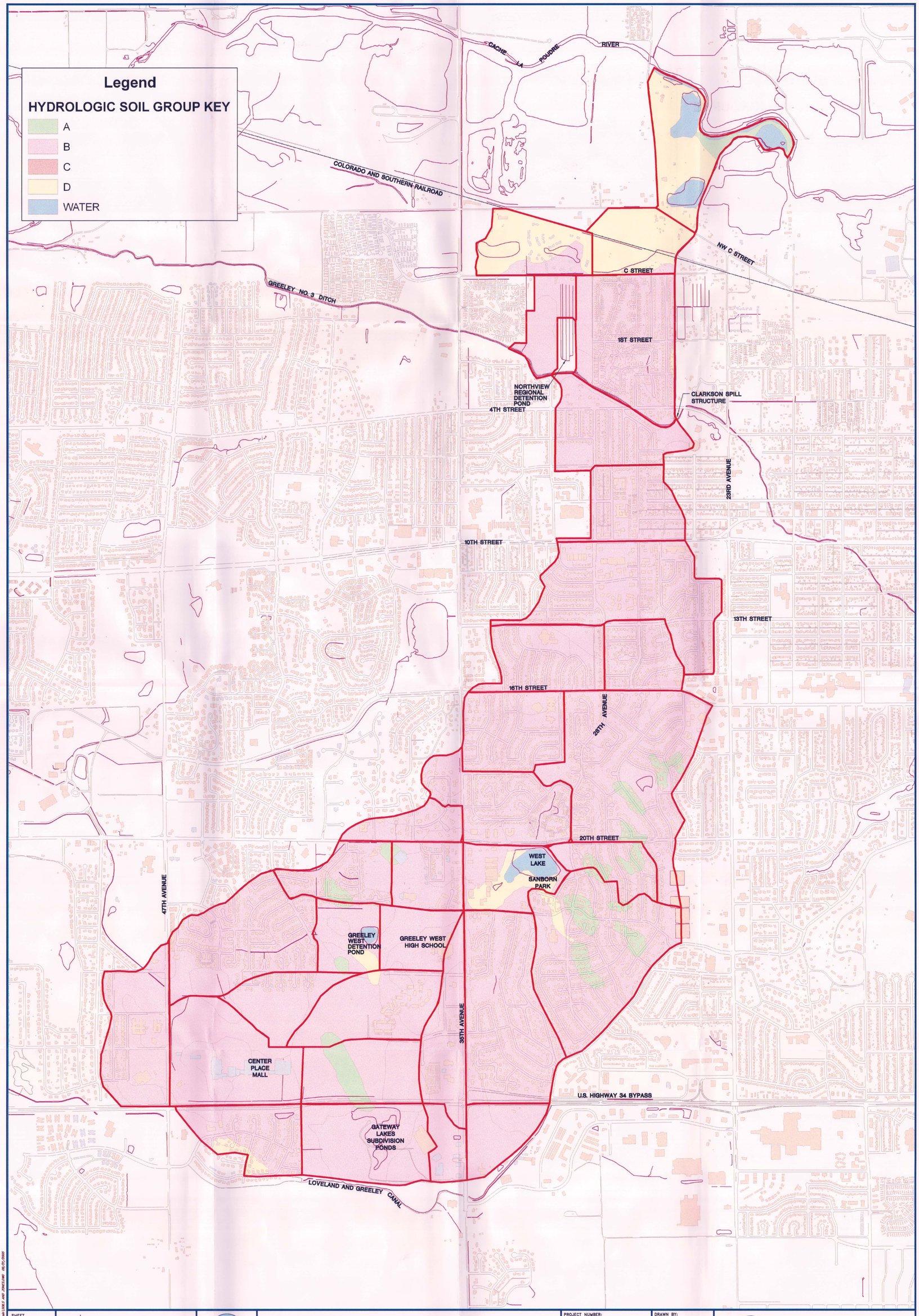

SHEET
C-2

ORIGINAL SCALE: 1"=800'
0 400 800 1600

City of Greeley

CITY OF GREELEY COMPREHENSIVE DRAINAGE PLAN
28TH AVENUE BASIN
HYDROLOGIC SOIL CLASSIFICATION

PROJECT NUMBER:	COCOG05
ACAD FILE:	SOILS AND ZONES
DATE:	08/19/2005
DRAWN BY:	MRC
DESIGNED BY:	BLV
CHECKED BY:	BLV

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Civil • Water Resources • Environmental
772 Whalers Way, Suite 200, Fort Collins, CO 80525
Phone (970) 226-0120 / Fax (970) 226-0121

APPENDIX D

HYDROLOGIC MODELING SUMMARIES

EXISTING CONDITION
(EXISTING DEVELOPMENT WITH EXISTING FACILITIES)

28th AVENUE BASIN
FILENAME: 28B002EC.SUM
EXISTING CONDITION WITH EXISTING FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
2-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Existing Conditions - 2-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	1.654	5.040	2.164	0.262	3.913	6.474	0.528	4.106	4.309	6.635
STANDARD DEVIATION OF FLOW.....	0.444	1.370	0.602	0.079	1.084	1.765	0.155	0.938	1.204	1.939
MAXIMUM FLOW.....	27.260	91.370	41.440	4.259	73.560	118.460	8.716	49.251	80.280	136.830
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	5.91E+04	1.80E+05	7.73E+04	9.36E+03	1.40E+05	2.31E+05	1.89E+04	1.47E+05	1.54E+05	2.37E+05

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	0.368	1.527	4.237	0.129	1.758	2.037	2.984	2.969	1.234	0.169
STANDARD DEVIATION OF FLOW.....	0.108	0.413	1.109	0.049	0.437	0.512	0.742	0.816	0.314	0.055
MAXIMUM FLOW.....	5.823	24.500	68.450	2.861	25.690	29.141	43.237	55.170	18.160	2.954
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.31E+04	5.45E+04	1.51E+05	4.60E+03	6.27E+04	7.27E+04	1.07E+05	1.06E+05	4.41E+04	6.03E+03

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	3.770	3.103	6.301	2.349	1.687	11.433	3.159	2.403	1.284	2.914
STANDARD DEVIATION OF FLOW.....	0.979	0.809	1.726	0.603	0.458	3.677	0.855	0.656	0.330	0.650
MAXIMUM FLOW.....	59.510	50.010	113.730	35.870	29.500	304.673	56.380	42.280	19.420	32.484
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.35E+05	1.11E+05	2.25E+05	8.39E+04	6.02E+04	4.08E+05	1.13E+05	8.58E+04	4.58E+04	1.04E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	2.149	0.203	1.269	5.733	37.134
STANDARD DEVIATION OF FLOW.....	0.568	0.068	0.325	0.189	7.218
MAXIMUM FLOW.....	35.190	3.877	17.960	7.090	394.884
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	7.67E+04	7.24E+03	4.53E+04	2.05E+05	1.33E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	306	413	415	414	315	615	716
AVERAGE FLOW.....	0.686	5.713	0.293	6.474	9.194	8.315	17.510	4.225	6.262	6.262
STANDARD DEVIATION OF FLOW.....	0.017	1.359	0.007	1.091	1.562	2.133	3.510	0.101	0.500	0.500
MAXIMUM FLOW.....	0.890	91.375	0.328	42.920	66.063	131.958	181.121	6.467	32.574	32.574
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.45E+04	2.04E+05	1.04E+04	2.31E+05	3.28E+05	2.97E+05	6.25E+05	1.51E+05	2.24E+05	2.24E+05

MO/DA/YR HR:MIN:SEC STEP	717	416	318	303	309	409	408	407	410	419
AVERAGE FLOW.....	0.000	6.216	2.635	2.130	4.089	6.214	7.971	16.822	4.690	21.452
STANDARD DEVIATION OF FLOW.....	0.000	0.495	0.140	0.187	0.428	0.613	0.848	1.367	1.227	2.329
MAXIMUM FLOW.....	0.000	32.562	5.231	6.023	13.944	19.948	30.161	64.622	80.280	126.687
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	8.58E-04	2.22E+05	9.41E+04	7.60E+04	1.46E+05	2.22E+05	2.85E+05	6.01E+05	1.67E+05	7.66E+05

MO/DA/YR HR:MIN:SEC STEP	411	319	422	622	723	724	424	423	626	727
AVERAGE FLOW.....	31.057	16.714	18.117	21.768	21.306	0.462	28.046	31.149	31.149	22.121
STANDARD DEVIATION OF FLOW.....	4.841	0.485	0.399	1.080	0.900	0.260	2.616	3.410	3.410	0.857
MAXIMUM FLOW.....	310.622	21.998	24.691	79.759	57.700	22.059	163.307	212.176	212.176	39.800
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.11E+06	5.97E+05	6.47E+05	7.77E+05	7.61E+05	1.65E+04	1.00E+06	1.11E+06	1.11E+06	7.90E+05

MO/DA/YR HR:MIN:SEC STEP	728	425	426	627	729	730	628	731	732	629
AVERAGE FLOW.....	9.028	4.036	35.133	35.133	35.133	0.000	46.469	46.469	0.000	49.552
STANDARD DEVIATION OF FLOW.....	2.858	1.059	4.308	4.308	4.308	0.000	6.884	6.884	0.000	7.694
MAXIMUM FLOW.....	172.376	65.370	262.745	262.745	262.745	0.000	386.379	386.379	0.000	451.713
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.22E+05	1.44E+05	1.25E+06	1.25E+06	1.25E+06	1.07E-02	1.66E+06	1.66E+06	5.44E-03	1.77E+06

MO/DA/YR HR:MIN:SEC STEP	733	734	429	900	431	330	332	433	434
AVERAGE FLOW.....	49.520	0.031	51.859	51.859	40.002	0.489	0.000	46.165	47.226
STANDARD DEVIATION OF FLOW.....	7.680	0.031	8.272	8.272	7.664	0.012	0.000	7.508	7.284
MAXIMUM FLOW.....	448.000	3.713	474.232	474.232	415.782	0.626	0.000	416.407	375.916
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.77E+06	1.11E+03	1.85E+06	1.85E+06	1.43E+06	1.74E+04	0.00E+00	1.65E+06	1.69E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....	0.404	0.352	1.424	1.466	0.824	1.571	0.007	0.671	1.234	0.284

MINIMUM DEPTH.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

1

MO/DA/YR HR:MIN:SEC STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....	0.652	2.375	0.459	2.112	1.818	3.616	0.000	4.363	0.000	6.188
MINIMUM DEPTH.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

1

MO/DA/YR HR:MIN:SEC STEP	529	231	230	233	234
MAXIMUM DEPTH.....	0.055	3.812	1.025	3.379	4.450
MINIMUM DEPTH.....	0.000	0.000	0.000	0.000	0.000

28TH AVENUE BASIN
FILENAME: 28B005EC.SUM
EXISTING CONDITIONS WITH EXISTING FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
5-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Existing Conditions - 5-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	3.512	8.436	3.216	1.185	6.845	10.597	1.742	6.500	8.707	12.007
STANDARD DEVIATION OF FLOW.....	0.964	2.317	0.871	0.334	1.927	2.903	0.490	1.485	2.508	3.602
MAXIMUM FLOW.....	59.990	155.180	59.460	18.786	132.760	195.500	28.911	77.918	171.960	266.760
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.25E+05	3.01E+05	1.15E+05	4.23E+04	2.44E+05	3.78E+05	6.22E+04	2.32E+05	3.11E+05	4.29E+05

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	1.514	3.714	8.072	1.006	2.600	3.679	4.789	4.928	2.248	0.900
STANDARD DEVIATION OF FLOW.....	0.421	1.018	2.177	0.299	0.629	0.942	1.190	1.366	0.581	0.253
MAXIMUM FLOW.....	23.853	60.770	134.030	17.640	37.070	55.217	69.914	93.390	34.110	13.814
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	5.40E+04	1.33E+05	2.88E+05	3.59E+04	9.28E+04	1.31E+05	1.71E+05	1.76E+05	8.02E+04	3.21E+04

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	6.762	5.568	12.147	4.572	3.204	18.563	5.381	4.789	2.417	6.487
STANDARD DEVIATION OF FLOW.....	1.792	1.487	3.427	1.206	0.893	5.978	1.471	1.344	0.636	1.466
MAXIMUM FLOW.....	109.747	91.740	227.730	71.810	58.900	502.249	97.680	88.380	37.620	74.827
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.41E+05	1.99E+05	4.34E+05	1.63E+05	1.14E+05	6.63E+05	1.92E+05	1.71E+05	8.63E+04	2.32E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	4.395	1.958	4.415	7.970	87.793
STANDARD DEVIATION OF FLOW.....	1.202	0.577	1.148	0.197	12.444
MAXIMUM FLOW.....	75.450	33.290	63.409	9.070	674.693
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.57E+05	6.99E+04	1.58E+05	2.85E+05	3.13E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	306	413	415	414	315	615	716
AVERAGE FLOW.....	1.457	9.871	0.500	10.597	18.052	15.983	34.035	19.120	22.799	22.799
STANDARD DEVIATION OF FLOW.....	0.036	2.293	0.011	1.800	3.297	4.267	7.289	1.286	1.472	1.472
MAXIMUM FLOW.....	1.883	155.199	0.567	70.667	146.964	271.396	398.420	41.002	58.890	58.890
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	5.20E+04	3.52E+05	1.78E+04	3.78E+05	6.44E+05	5.71E+05	1.22E+06	6.83E+05	8.14E+05	8.14E+05

MO/DA/YR HR:MIN:SEC STEP	717	416	318	303	309	409	408	407	410	419
AVERAGE FLOW.....	0.000	22.752	4.230	3.164	6.472	9.630	12.230	39.212	10.130	49.273
STANDARD DEVIATION OF FLOW.....	0.000	1.470	0.224	0.276	0.678	0.952	1.292	2.878	2.634	4.695
MAXIMUM FLOW.....	0.000	57.614	8.383	8.905	22.229	31.124	44.062	104.767	171.960	246.766
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.86E-04	8.12E+05	1.51E+05	1.13E+05	2.31E+05	3.44E+05	4.37E+05	1.40E+06	3.62E+05	1.76E+06

MO/DA/YR HR:MIN:SEC STEP	411	319	422	622	723	724	424	423	626	727
AVERAGE FLOW.....	66.208	37.118	40.265	46.724	42.437	4.287	58.721	64.289	64.289	38.195
STANDARD DEVIATION OF FLOW.....	9.037	0.925	0.760	2.024	0.858	1.497	4.878	6.329	6.329	0.508
MAXIMUM FLOW.....	596.421	44.151	56.628	159.242	57.700	101.542	310.857	401.327	401.327	39.800
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.36E+06	1.33E+06	1.44E+06	1.67E+06	1.51E+06	1.53E+05	2.10E+06	2.30E+06	2.30E+06	1.36E+06

MO/DA/YR HR:MIN:SEC STEP	728	425	426	627	729	730	628	731	732	629
AVERAGE FLOW.....	26.095	7.776	71.928	71.928	69.338	2.589	90.344	83.627	6.718	95.575
STANDARD DEVIATION OF FLOW.....	6.251	2.094	8.168	8.168	7.130	1.477	12.103	9.752	3.013	13.439
MAXIMUM FLOW.....	361.527	130.710	506.480	506.480	378.700	127.780	684.063	452.000	232.063	775.644
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	9.32E+05	2.78E+05	2.57E+06	2.57E+06	2.48E+06	9.24E+04	3.23E+06	2.99E+06	2.40E+05	3.41E+06

MO/DA/YR HR:MIN:SEC STEP	733	734	429	900	431	330	332	433	434
AVERAGE FLOW.....	85.726	9.849	100.203	100.203	93.601	0.920	0.000	103.956	107.545
STANDARD DEVIATION OF FLOW.....	10.067	4.274	14.617	14.617	13.713	0.022	0.000	14.021	14.304
MAXIMUM FLOW.....	448.000	327.644	854.029	854.029	727.287	1.173	0.000	739.611	722.896
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.06E+06	3.52E+05	3.58E+06	3.58E+06	3.34E+06	3.29E+04	0.00E+00	3.71E+06	3.84E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....	0.535	0.570	1.861	2.064	1.044	2.361	0.007	0.828	1.572	0.508

MINIMUM DEPTH.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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MO/DA/YR HR:MIN:SEC STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....	1.446	2.377	0.783	2.105	2.396	4.909	0.866	5.071	1.034	6.661
MINIMUM DEPTH.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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MO/DA/YR HR:MIN:SEC STEP	529	231	230	233	234
MAXIMUM DEPTH.....	1.353	4.903	1.152	4.351	5.847
MINIMUM DEPTH.....	0.000	0.000	0.000	0.000	0.000

28TH AVENUE BASIN
FILENAME: 28B010EC.SUM
EXISTING CONDITIONS WITH EXISTING FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
10-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Existing Conditions - 10-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	4.948	10.779	3.853	2.029	8.907	13.375	2.913	8.078	12.054	15.980
STANDARD DEVIATION OF FLOW.....	1.326	2.917	1.022	0.534	2.475	3.616	0.801	1.819	3.394	4.735
MAXIMUM FLOW.....	82.620	200.500	69.540	28.405	172.430	250.250	45.886	95.650	230.980	344.830
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.77E+05	3.85E+05	1.38E+05	7.24E+04	3.18E+05	4.77E+05	1.04E+05	2.88E+05	4.30E+05	5.70E+05

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	2.551	5.475	10.920	1.833	3.175	4.863	5.991	6.277	3.032	1.564
STANDARD DEVIATION OF FLOW.....	0.664	1.455	2.896	0.504	0.764	1.225	1.465	1.713	0.782	0.408
MAXIMUM FLOW.....	35.689	86.980	182.610	27.753	45.590	70.360	85.054	118.700	46.670	20.959
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	9.11E+04	1.95E+05	3.90E+05	6.54E+04	1.13E+05	1.74E+05	2.14E+05	2.24E+05	1.08E+05	5.59E+04

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	8.912	7.353	16.585	6.235	4.319	23.337	6.913	6.592	3.254	9.283
STANDARD DEVIATION OF FLOW.....	2.328	1.933	4.589	1.613	1.186	7.511	1.865	1.810	0.842	2.055
MAXIMUM FLOW.....	144.770	122.380	309.010	97.570	78.430	671.307	126.450	119.090	50.590	103.005
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.18E+05	2.63E+05	5.92E+05	2.23E+05	1.54E+05	8.33E+05	2.47E+05	2.35E+05	1.16E+05	3.31E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	5.907	3.231	6.536	9.108	120.301
STANDARD DEVIATION OF FLOW.....	1.564	0.875	1.625	0.222	16.234
MAXIMUM FLOW.....	98.820	47.603	87.920	10.410	889.821
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.11E+05	1.15E+05	2.33E+05	3.25E+05	4.29E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	306	413	415	414	315	615	716
AVERAGE FLOW.....	2.050	12.800	0.643	13.375	24.933	21.722	46.654	30.272	35.136	34.623
STANDARD DEVIATION OF FLOW.....	0.050	2.885	0.015	2.254	4.604	5.709	9.990	1.271	1.511	1.421
MAXIMUM FLOW.....	2.647	200.539	0.736	87.303	206.763	355.438	539.668	42.353	73.970	60.000
MINIMUM FLOW.....	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	7.32E+04	4.57E+05	2.30E+04	4.77E+05	8.90E+05	7.75E+05	1.67E+06	1.08E+06	1.25E+06	1.24E+06

MO/DA/YR HR:MIN:SEC STEP	717	416	318	303	309	409	408	407	410	419
AVERAGE FLOW.....	0.513	35.191	5.289	3.790	8.043	11.825	15.001	55.481	14.347	69.696
STANDARD DEVIATION OF FLOW.....	0.202	1.525	0.279	0.329	0.838	1.164	1.576	3.180	3.616	5.857
MAXIMUM FLOW.....	13.970	70.013	10.449	10.620	27.437	38.042	53.614	128.366	231.028	311.755
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001
FLOW VOLUME (CUBIC FEET).....	1.83E+04	1.26E+06	1.89E+05	1.35E+05	2.87E+05	4.22E+05	5.36E+05	1.98E+06	5.12E+05	2.49E+06

MO/DA/YR HR:MIN:SEC STEP	411	319	422	622	723	724	424	423	626	727
AVERAGE FLOW.....	91.953	48.946	53.542	62.041	53.278	8.763	78.469	85.822	85.822	39.027
STANDARD DEVIATION OF FLOW.....	11.608	1.205	1.022	2.728	0.835	2.466	6.561	8.450	8.450	0.483
MAXIMUM FLOW.....	775.285	57.663	81.059	210.561	57.700	152.861	421.387	535.540	535.540	39.800
MINIMUM FLOW.....	0.006	0.000	0.000	0.001	0.001	0.000	0.001	0.002	0.002	0.002
FLOW VOLUME (CUBIC FEET).....	3.28E+06	1.75E+06	1.91E+06	2.21E+06	1.90E+06	3.13E+05	2.80E+06	3.06E+06	3.06E+06	1.39E+06

MO/DA/YR HR:MIN:SEC STEP	728	425	426	627	729	730	628	731	732	629
AVERAGE FLOW.....	46.795	10.554	96.125	96.125	87.629	8.496	119.226	103.254	15.972	125.950
STANDARD DEVIATION OF FLOW.....	8.400	2.793	10.922	10.922	7.814	3.995	15.713	10.544	6.365	17.351
MAXIMUM FLOW.....	495.740	176.000	672.727	672.727	378.700	294.027	874.595	452.000	422.595	998.740
MINIMUM FLOW.....	0.000	0.000	0.001	0.001	0.001	0.000	0.013	0.013	0.000	0.001
FLOW VOLUME (CUBIC FEET).....	1.67E+06	3.77E+05	3.43E+06	3.43E+06	3.13E+06	3.03E+05	4.26E+06	3.69E+06	5.70E+05	4.50E+06

MO/DA/YR HR:MIN:SEC STEP	733	734	429	900	431	330	332	433	434
AVERAGE FLOW.....	105.192	20.757	132.336	132.336	128.683	1.238	0.000	141.644	146.910
STANDARD DEVIATION OF FLOW.....	10.808	7.912	18.936	18.936	18.056	0.030	0.000	18.619	19.212
MAXIMUM FLOW.....	448.000	550.740	1059.235	1059.235	959.177	1.576	0.000	989.821	978.442
MINIMUM FLOW.....	0.001	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.76E+06	7.41E+05	4.72E+06	4.72E+06	4.59E+06	4.42E+04	0.00E+00	5.06E+06	5.24E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....	0.608	0.696	2.095	2.441	1.154	2.476	0.409	0.914	1.738	0.607

MINIMUM DEPTH.....	0.007	0.003	0.001	0.000	0.000	0.004	0.000	0.001	0.000	0.000
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MO/DA/YR HR:MIN:SEC STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....	1.888	2.377	0.912	2.105	2.663	4.917	1.272	5.029	1.282	6.665
MINIMUM DEPTH.....	0.000	0.005	0.000	0.008	0.000	0.004	0.000	0.014	0.000	0.005
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MO/DA/YR HR:MIN:SEC STEP	529	231	230	233	234
MAXIMUM DEPTH.....	1.693	5.603	1.229	4.966	6.648
MINIMUM DEPTH.....	0.000	0.000	0.001	0.000	0.000

28th AVENUE BASIN
FILENAME: 28B050EC.SUM
EXISTING CONDITIONS WITH EXISTING FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
50-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Existing Conditions - 50-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	9.875	18.185	5.644	5.218	15.643	22.073	8.361	12.849	23.569	29.572
STANDARD DEVIATION OF FLOW.....	2.811	5.226	1.556	1.395	4.619	6.316	2.311	3.082	7.086	9.353
MAXIMUM FLOW.....	166.999	351.056	101.691	70.973	310.108	428.136	123.911	159.160	455.457	635.667
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.53E+05	6.49E+05	2.01E+05	1.86E+05	5.58E+05	7.88E+05	2.98E+05	4.59E+05	8.41E+05	1.06E+06

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	6.435	11.741	20.541	5.241	4.959	8.773	9.661	10.508	6.036	4.088
STANDARD DEVIATION OF FLOW.....	1.709	3.292	5.815	1.439	1.282	2.359	2.516	3.042	1.662	1.075
MAXIMUM FLOW.....	88.101	187.381	358.792	74.846	76.306	133.418	143.330	203.552	95.204	52.653
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.30E+05	4.19E+05	7.33E+05	1.87E+05	1.77E+05	3.13E+05	3.45E+05	3.75E+05	2.15E+05	1.46E+05

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	15.989	13.243	31.994	11.882	8.117	38.194	11.844	12.734	6.062	19.058
STANDARD DEVIATION OF FLOW.....	4.461	3.712	9.471	3.278	2.376	12.870	3.395	3.728	1.677	4.447
MAXIMUM FLOW.....	273.179	230.408	617.454	192.981	149.933	1193.330	224.033	233.847	97.799	217.722
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	5.71E+05	4.73E+05	1.14E+06	4.24E+05	2.90E+05	1.36E+06	4.23E+05	4.55E+05	2.16E+05	6.80E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	10.566	7.493	13.221	34.347	235.938
STANDARD DEVIATION OF FLOW.....	2.976	2.067	3.484	2.516	35.305
MAXIMUM FLOW.....	181.434	108.934	183.620	74.440	1949.380
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.77E+05	2.68E+05	4.72E+05	1.23E+06	8.42E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	306	413	415	414	315	615	716
AVERAGE FLOW.....	4.084	22.220	1.266	22.073	49.722	41.471	91.193	41.929	50.702	45.608
STANDARD DEVIATION OF FLOW.....	0.106	5.163	0.032	3.911	10.150	11.646	21.257	0.938	2.180	0.852
MAXIMUM FLOW.....	5.295	351.237	1.499	158.131	483.334	702.080	1145.767	45.633	156.809	60.000
MINIMUM FLOW.....	0.000	0.070	0.000	0.000	0.018	0.000	0.074	0.007	0.028	0.028
FLOW VOLUME (CUBIC FEET).....	1.46E+05	7.93E+05	4.52E+04	7.88E+05	1.78E+06	1.48E+06	3.26E+06	1.50E+06	1.81E+06	1.63E+06

MO/DA/YR HR:MIN:SEC STEP	717	416	318	303	309	409	408	407	410	419
AVERAGE FLOW.....	5.094	50.624	8.532	5.553	12.794	18.336	23.295	82.451	29.294	111.395
STANDARD DEVIATION OF FLOW.....	1.666	2.125	0.465	0.495	1.376	1.868	2.547	4.707	7.776	11.318
MAXIMUM FLOW.....	96.809	145.308	17.428	16.581	46.743	63.251	94.424	247.426	461.301	600.413
MINIMUM FLOW.....	0.000	0.000	0.000	0.001	0.000	0.000	0.021	0.022	0.074	0.083
FLOW VOLUME (CUBIC FEET).....	1.82E+05	1.81E+06	3.05E+05	1.98E+05	4.57E+05	6.55E+05	8.32E+05	2.94E+06	1.05E+06	3.98E+06

MO/DA/YR HR:MIN:SEC STEP	411	319	422	622	723	724	424	423	626	727
AVERAGE FLOW.....	151.475	86.742	96.866	112.204	56.126	56.078	143.407	156.649	156.649	39.085
STANDARD DEVIATION OF FLOW.....	22.708	2.214	2.535	6.072	0.810	5.891	14.171	17.802	17.802	0.457
MAXIMUM FLOW.....	1432.051	102.514	180.473	419.870	57.700	362.170	912.417	1127.019	1127.019	39.800
MINIMUM FLOW.....	0.350	0.001	0.018	0.044	0.044	0.000	0.103	0.142	0.142	0.142
FLOW VOLUME (CUBIC FEET).....	5.41E+06	3.10E+06	3.46E+06	4.01E+06	2.00E+06	2.00E+06	5.12E+06	5.59E+06	5.59E+06	1.40E+06

MO/DA/YR HR:MIN:SEC STEP	728	425	426	627	729	730	628	731	732	629
AVERAGE FLOW.....	117.564	19.998	176.023	176.023	130.546	45.476	213.880	146.944	66.936	225.452
STANDARD DEVIATION OF FLOW.....	17.755	5.639	22.960	22.960	8.303	16.289	30.995	10.866	22.216	34.006
MAXIMUM FLOW.....	1087.219	342.914	1430.804	1430.804	378.700	1052.104	1732.054	452.000	1280.054	1852.267
MINIMUM FLOW.....	0.000	0.000	0.063	0.063	0.063	0.000	0.819	0.819	0.000	0.049
FLOW VOLUME (CUBIC FEET).....	4.20E+06	7.14E+05	6.28E+06	6.28E+06	4.66E+06	1.62E+06	7.64E+06	5.25E+06	2.39E+06	8.05E+06

MO/DA/YR HR:MIN:SEC STEP	733	734	429	900	431	330	332	433	434
AVERAGE FLOW.....	147.954	77.498	237.889	237.889	253.544	2.305	0.000	296.743	307.744
STANDARD DEVIATION OF FLOW.....	10.964	25.274	37.327	37.327	39.292	0.059	0.000	40.230	41.789
MAXIMUM FLOW.....	448.000	1404.267	2005.416	2005.416	2097.170	2.941	0.000	2171.488	2231.500
MINIMUM FLOW.....	0.049	0.000	0.042	0.042	0.013	0.000	0.000	0.004	0.008
FLOW VOLUME (CUBIC FEET).....	5.28E+06	2.77E+06	8.49E+06	8.49E+06	9.05E+06	8.23E+04	0.00E+00	1.06E+07	1.10E+07

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....	0.789	1.044	3.042	4.188	1.506	2.476	0.991	1.196	2.362	0.899
MINIMUM DEPTH.....	0.008	0.005	0.004	0.000	0.000	0.026	0.000	0.005	0.001	0.009

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MO/DA/YR HR:MIN:SEC	STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....		2.654	2.377	1.298	2.105	3.269	4.918	2.289	5.094	2.185	6.706
MINIMUM DEPTH.....		0.000	0.031	0.000	0.055	0.000	0.031	0.000	0.096	0.000	0.033

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MO/DA/YR HR:MIN:SEC	STEP	529	231	230	233	234
MAXIMUM DEPTH.....		2.830	8.939	1.946	7.263	9.881
MINIMUM DEPTH.....		0.000	0.000	0.001	0.000	0.000

28TH AVENUE BASIN
FILENAME: 28B100EC.SUM
EXISTING CONDITIONS WITH EXISTING FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
100-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Existing Conditions - 100-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	11.881	21.070	6.299	6.574	18.286	25.417	10.730	14.682	28.249	34.981
STANDARD DEVIATION OF FLOW.....	3.396	6.139	1.769	1.740	5.461	7.386	2.926	3.591	8.510	11.128
MAXIMUM FLOW.....	197.088	400.918	115.452	85.618	360.419	485.780	151.704	184.420	539.619	760.052
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	4.24E+05	7.52E+05	2.25E+05	2.35E+05	6.53E+05	9.07E+05	3.83E+05	5.24E+05	1.01E+06	1.25E+06

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	8.082	14.337	24.416	6.688	5.891	10.314	11.074	12.153	7.275	5.162
STANDARD DEVIATION OF FLOW.....	2.127	4.015	6.969	1.812	1.589	2.813	2.937	3.567	2.019	1.343
MAXIMUM FLOW.....	106.153	222.658	416.669	91.134	93.704	155.632	166.151	234.609	112.464	63.645
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.89E+05	5.12E+05	8.72E+05	2.39E+05	2.10E+05	3.68E+05	3.95E+05	4.34E+05	2.60E+05	1.84E+05

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	18.803	15.571	38.202	14.161	9.642	43.909	13.770	15.220	7.193	23.076
STANDARD DEVIATION OF FLOW.....	5.307	4.418	11.381	3.939	2.843	14.845	3.999	4.476	2.010	5.416
MAXIMUM FLOW.....	313.889	265.592	725.043	225.012	176.166	1326.240	257.333	275.395	113.849	257.223
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	6.71E+05	5.56E+05	1.36E+06	5.06E+05	3.44E+05	1.57E+06	4.92E+05	5.43E+05	2.57E+05	8.24E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	12.430	9.312	15.796	48.562	274.024
STANDARD DEVIATION OF FLOW.....	3.540	2.549	4.230	3.654	43.499
MAXIMUM FLOW.....	210.727	130.746	218.419	146.438	2361.800
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	4.44E+05	3.32E+05	5.64E+05	1.73E+06	9.78E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	306	413	415	414	315	615	716
AVERAGE FLOW.....	4.916	25.930	1.542	25.417	59.856	49.443	109.300	44.841	55.155	47.537
STANDARD DEVIATION OF FLOW.....	0.128	6.064	0.039	4.579	12.424	13.994	25.793	1.144	2.688	0.911
MAXIMUM FLOW.....	6.398	401.139	1.821	184.196	582.949	831.163	1358.278	73.969	190.819	60.000
MINIMUM FLOW.....	0.000	0.038	0.000	0.000	0.010	0.000	0.040	0.004	0.015	0.015
FLOW VOLUME (CUBIC FEET).....	1.76E+05	9.26E+05	5.51E+04	9.07E+05	2.14E+06	1.77E+06	3.90E+06	1.60E+06	1.97E+06	1.70E+06

MO/DA/YR HR:MIN:SEC STEP	717	416	318	303	309	409	408	407	410	419
AVERAGE FLOW.....	7.618	55.096	9.784	6.199	14.620	20.806	26.697	91.578	35.363	126.581
STANDARD DEVIATION OF FLOW.....	2.184	2.600	0.539	0.559	1.589	2.144	2.989	5.702	9.412	13.780
MAXIMUM FLOW.....	130.819	170.917	20.398	19.199	54.898	73.945	116.575	292.992	546.510	713.705
MINIMUM FLOW.....	0.000	0.000	0.000	0.001	0.000	0.000	0.012	0.012	0.046	0.046
FLOW VOLUME (CUBIC FEET).....	2.72E+05	1.97E+06	3.49E+05	2.21E+05	5.22E+05	7.43E+05	9.53E+05	3.27E+06	1.26E+06	4.52E+06

MO/DA/YR HR:MIN:SEC STEP	411	319	422	622	723	724	424	423	626	727
AVERAGE FLOW.....	173.716	97.394	109.832	127.867	56.120	71.747	164.925	180.496	180.496	39.048
STANDARD DEVIATION OF FLOW.....	27.302	2.334	3.060	7.462	0.816	7.285	17.384	21.715	21.715	0.470
MAXIMUM FLOW.....	1688.937	120.030	213.804	499.264	57.700	441.564	1090.570	1344.718	1344.718	39.800
MINIMUM FLOW.....	0.191	0.001	0.010	0.024	0.024	0.000	0.056	0.078	0.078	0.078
FLOW VOLUME (CUBIC FEET).....	6.20E+06	3.48E+06	3.92E+06	4.56E+06	2.00E+06	2.56E+06	5.89E+06	6.44E+06	6.44E+06	1.39E+06

MO/DA/YR HR:MIN:SEC STEP	728	425	426	627	729	730	628	731	732	629
AVERAGE FLOW.....	141.447	23.803	203.502	203.502	140.116	63.385	247.013	156.337	90.676	260.461
STANDARD DEVIATION OF FLOW.....	21.668	6.765	27.969	27.969	8.144	21.388	37.435	10.673	28.796	41.049
MAXIMUM FLOW.....	1304.918	401.177	1707.854	1707.854	378.700	1329.154	2052.514	452.000	1600.514	2223.193
MINIMUM FLOW.....	0.000	0.000	0.034	0.034	0.034	0.000	0.447	0.447	0.000	0.027
FLOW VOLUME (CUBIC FEET).....	5.05E+06	8.50E+05	7.27E+06	7.27E+06	5.00E+06	2.26E+06	8.82E+06	5.58E+06	3.24E+06	9.30E+06

MO/DA/YR HR:MIN:SEC STEP	733	734	429	900	431	330	332	433	434
AVERAGE FLOW.....	157.152	103.309	275.334	275.334	295.606	2.736	0.000	352.142	365.683
STANDARD DEVIATION OF FLOW.....	10.761	32.491	45.082	45.082	48.286	0.070	0.000	49.841	51.830
MAXIMUM FLOW.....	448.000	1775.193	2409.108	2409.108	2558.563	3.495	0.000	2672.582	2739.112
MINIMUM FLOW.....	0.027	0.000	0.023	0.023	0.007	0.000	0.000	0.002	0.004
FLOW VOLUME (CUBIC FEET).....	5.61E+06	3.69E+06	9.83E+06	9.83E+06	1.06E+07	9.77E+04	0.00E+00	1.26E+07	1.31E+07

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....	0.847	1.136	3.454	3.667	1.618	2.476	1.093	1.319	2.551	0.975
MINIMUM DEPTH.....	0.007	0.004	0.005	0.000	0.000	0.019	0.000	0.004	0.000	0.009

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MO/DA/YR HR:MIN:SEC	STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....		2.836	2.377	1.412	2.105	3.418	4.918	2.570	5.072	2.472	6.705
MINIMUM DEPTH.....		0.000	0.024	0.000	0.042	0.000	0.024	0.000	0.072	0.000	0.025

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MO/DA/YR HR:MIN:SEC	STEP	529	231	230	233	234
MAXIMUM DEPTH.....		3.177	9.486	1.909	7.892	10.690
MINIMUM DEPTH.....		0.000	0.000	0.001	0.000	0.000

FUTURE CONDITION
(FUTURE DEVELOPMENT WITH EXISTING FACILITIES)

28TH AVENUE BASIN
FILENAME: 28B002FC.SUM
FUTURE CONDITIONS WITH EXISTING FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
2-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Future Conditions - 2-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	1.654	5.040	2.164	0.262	4.262	9.849	5.621	4.106	4.309	6.635
STANDARD DEVIATION OF FLOW.....	0.444	1.370	0.602	0.079	1.190	2.738	1.450	0.938	1.204	1.939
MAXIMUM FLOW.....	27.260	91.370	41.440	4.259	81.780	196.650	91.380	49.251	80.280	136.830
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	5.91E+04	1.80E+05	7.73E+04	9.36E+03	1.52E+05	3.52E+05	2.01E+05	1.47E+05	1.54E+05	2.37E+05

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	3.974	4.819	4.575	0.296	1.758	2.037	2.984	2.969	1.234	0.169
STANDARD DEVIATION OF FLOW.....	1.007	1.218	1.208	0.089	0.437	0.512	0.742	0.816	0.314	0.055
MAXIMUM FLOW.....	60.350	72.653	75.900	4.807	25.690	29.141	43.237	55.170	18.160	2.954
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.42E+05	1.72E+05	1.63E+05	1.06E+04	6.27E+04	7.27E+04	1.07E+05	1.06E+05	4.41E+04	6.03E+03

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	3.770	3.103	6.301	2.349	1.687	11.433	3.159	2.403	1.284	2.914
STANDARD DEVIATION OF FLOW.....	0.979	0.809	1.726	0.603	0.458	3.677	0.855	0.656	0.330	0.650
MAXIMUM FLOW.....	59.510	50.010	113.730	35.870	29.500	304.673	56.380	42.280	19.420	32.484
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.35E+05	1.11E+05	2.25E+05	8.39E+04	6.02E+04	4.08E+05	1.13E+05	8.58E+04	4.58E+04	1.04E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	2.149	0.203	1.269	5.733	37.134
STANDARD DEVIATION OF FLOW.....	0.568	0.068	0.325	0.189	7.218
MAXIMUM FLOW.....	35.190	3.877	17.960	7.090	394.884
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	7.67E+04	7.24E+03	4.53E+04	2.05E+05	1.33E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	808	806	413	415	414	315	615
AVERAGE FLOW.....	0.686	5.713	0.293	5.620	8.574	23.231	9.170	32.401	16.496	18.533
STANDARD DEVIATION OF FLOW.....	0.017	1.359	0.007	0.843	0.432	2.767	2.369	5.010	0.793	0.742
MAXIMUM FLOW.....	0.890	91.375	0.328	30.226	16.490	137.069	147.938	285.007	30.246	32.762
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.45E+04	2.04E+05	1.04E+04	2.01E+05	3.06E+05	8.29E+05	3.27E+05	1.16E+06	5.89E+05	6.62E+05

MO/DA/YR HR:MIN:SEC STEP	716	717	416	318	303	309	409	408	407	410
AVERAGE FLOW.....	18.533	0.000	18.460	2.635	2.130	4.089	6.214	7.971	29.066	4.690
STANDARD DEVIATION OF FLOW.....	0.742	0.000	0.748	0.140	0.187	0.428	0.613	0.848	1.533	1.227
MAXIMUM FLOW.....	32.762	0.000	32.709	5.231	6.023	13.944	19.948	30.161	64.769	80.280
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	6.62E+05	1.29E-03	6.59E+05	9.41E+04	7.60E+04	1.46E+05	2.22E+05	2.85E+05	1.04E+06	1.67E+05

MO/DA/YR HR:MIN:SEC STEP	419	411	319	422	622	723	724	424	423	626
AVERAGE FLOW.....	33.653	43.258	23.335	24.738	28.304	27.842	0.462	34.521	37.624	37.624
STANDARD DEVIATION OF FLOW.....	2.269	4.638	0.678	0.477	0.918	0.735	0.260	2.417	3.208	3.208
MAXIMUM FLOW.....	126.807	310.768	28.517	28.517	79.761	57.700	22.061	163.307	212.176	212.176
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.20E+06	1.54E+06	8.33E+05	8.83E+05	1.01E+06	9.94E+05	1.65E+04	1.23E+06	1.34E+06	1.34E+06

MO/DA/YR HR:MIN:SEC STEP	727	728	425	426	627	729	730	628	731	732
AVERAGE FLOW.....	28.568	9.056	4.036	41.574	41.574	41.574	0.000	52.866	52.866	0.000
STANDARD DEVIATION OF FLOW.....	0.623	2.858	1.059	4.099	4.099	4.099	0.000	6.664	6.664	0.000
MAXIMUM FLOW.....	39.800	172.376	65.370	262.745	262.745	262.745	0.000	386.379	386.379	0.000
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.02E+06	3.23E+05	1.44E+05	1.48E+06	1.48E+06	1.48E+06	1.16E-02	1.89E+06	1.89E+06	1.09E-02

MO/DA/YR HR:MIN:SEC STEP	629	733	734	429	431	330	332	433	434	900
AVERAGE FLOW.....	55.911	55.880	0.031	58.179	40.002	0.489	0.000	46.142	47.182	58.179
STANDARD DEVIATION OF FLOW.....	7.477	7.463	0.031	8.061	7.664	0.012	0.000	7.510	7.286	8.061
MAXIMUM FLOW.....	451.713	448.000	3.713	474.232	415.782	0.626	0.000	420.918	378.453	474.232
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.00E+06	1.99E+06	1.11E+03	2.08E+06	1.43E+06	1.74E+04	0.00E+00	1.65E+06	1.68E+06	2.08E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....	0.404	0.622	0.880	1.393	0.856	1.576	0.007	0.671	1.236	0.284

MINIMUM DEPTH.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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MO/DA/YR HR:MIN:SEC STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....	0.791	2.375	0.459	2.112	1.818	3.616	0.000	4.363	0.000	6.188
MINIMUM DEPTH.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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MO/DA/YR HR:MIN:SEC STEP	529	231	230	233	234					
MAXIMUM DEPTH.....	0.055	3.812	1.025	3.385	4.446					
MINIMUM DEPTH.....	0.000	0.000	0.000	0.000	0.000					

28TH AVENUE BASIN
FILENAME: 28B005FC.SUM
FUTURE CONDITIONS WITH EXISTING FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
5-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Future Conditions - 5-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	3.512	8.436	3.216	1.185	7.244	14.664	8.444	6.500	8.707	12.007
STANDARD DEVIATION OF FLOW.....	0.964	2.317	0.871	0.334	2.044	3.987	2.147	1.485	2.508	3.602
MAXIMUM FLOW.....	59.990	155.180	59.460	18.786	142.200	284.340	134.030	77.918	171.960	266.760
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.25E+05	3.01E+05	1.15E+05	4.23E+04	2.59E+05	5.23E+05	3.01E+05	2.32E+05	3.11E+05	4.29E+05

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	6.035	7.820	8.492	1.223	2.600	3.679	4.789	4.928	2.248	0.900
STANDARD DEVIATION OF FLOW.....	1.508	1.982	2.308	0.344	0.629	0.942	1.190	1.366	0.581	0.253
MAXIMUM FLOW.....	89.540	119.569	144.770	19.422	37.070	55.217	69.914	93.390	34.110	13.814
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.15E+05	2.79E+05	3.03E+05	4.37E+04	9.28E+04	1.31E+05	1.71E+05	1.76E+05	8.02E+04	3.21E+04

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	6.762	5.568	12.147	4.572	3.204	18.563	5.381	4.789	2.417	6.487
STANDARD DEVIATION OF FLOW.....	1.792	1.487	3.427	1.206	0.893	5.978	1.471	1.344	0.636	1.466
MAXIMUM FLOW.....	109.747	91.740	227.730	71.810	58.900	502.249	97.680	88.380	37.620	74.827
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.41E+05	1.99E+05	4.34E+05	1.63E+05	1.14E+05	6.63E+05	1.92E+05	1.71E+05	8.63E+04	2.32E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	4.395	1.958	4.415	7.970	87.790
STANDARD DEVIATION OF FLOW.....	1.202	0.577	1.148	0.197	12.444
MAXIMUM FLOW.....	75.450	33.290	63.409	9.070	674.693
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.57E+05	6.99E+04	1.58E+05	2.85E+05	3.13E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	808	806	413	415	414	315	615
AVERAGE FLOW.....	1.457	9.871	0.500	8.444	12.767	35.482	17.018	52.499	34.001	37.680
STANDARD DEVIATION OF FLOW.....	0.036	2.293	0.011	1.265	0.642	4.325	4.549	8.651	1.081	1.031
MAXIMUM FLOW.....	1.883	155.199	0.567	44.945	24.473	219.460	291.272	510.732	42.085	59.015
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	5.20E+04	3.52E+05	1.78E+04	3.01E+05	4.56E+05	1.27E+06	6.08E+05	1.87E+06	1.21E+06	1.35E+06

MO/DA/YR HR:MIN:SEC STEP	716	717	416	318	303	309	409	408	407	410
AVERAGE FLOW.....	37.680	0.000	37.540	4.230	3.164	6.472	9.630	12.230	54.000	10.130
STANDARD DEVIATION OF FLOW.....	1.031	0.000	1.055	0.224	0.276	0.678	0.952	1.292	2.316	2.634
MAXIMUM FLOW.....	59.015	0.000	57.750	8.383	8.905	22.229	31.124	44.062	104.902	171.960
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.35E+06	0.00E+00	1.34E+06	1.51E+05	1.13E+05	2.31E+05	3.44E+05	4.37E+05	1.93E+06	3.62E+05

MO/DA/YR HR:MIN:SEC STEP	419	411	319	422	622	723	724	424	423	626
AVERAGE FLOW.....	63.946	80.881	40.742	43.889	50.260	45.945	4.314	62.199	67.767	67.767
STANDARD DEVIATION OF FLOW.....	4.167	8.577	1.013	0.750	1.929	0.780	1.498	4.768	6.219	6.219
MAXIMUM FLOW.....	246.905	596.645	46.361	56.642	159.248	57.700	101.548	310.859	401.329	401.329
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.28E+06	2.89E+06	1.45E+06	1.57E+06	1.79E+06	1.64E+06	1.54E+05	2.22E+06	2.42E+06	2.42E+06

MO/DA/YR HR:MIN:SEC STEP	727	728	425	426	627	729	730	628	731	732
AVERAGE FLOW.....	38.978	28.790	7.776	75.328	75.328	72.738	2.589	93.706	86.988	6.718
STANDARD DEVIATION OF FLOW.....	0.496	6.167	2.094	8.059	8.059	7.016	1.477	11.987	9.628	3.013
MAXIMUM FLOW.....	39.800	361.529	130.710	506.482	506.482	378.700	127.782	684.063	452.000	232.063
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.39E+06	1.03E+06	2.78E+05	2.69E+06	2.69E+06	2.60E+06	9.24E+04	3.35E+06	3.11E+06	2.40E+05

MO/DA/YR HR:MIN:SEC STEP	629	733	734	429	431	330	332	433	434	900
AVERAGE FLOW.....	98.908	89.059	9.849	103.500	93.598	0.920	0.000	103.913	107.303	103.500
STANDARD DEVIATION OF FLOW.....	13.325	9.943	4.274	14.505	13.713	0.022	0.000	14.027	14.319	14.505
MAXIMUM FLOW.....	775.644	448.000	327.644	854.029	727.287	1.173	0.000	733.650	719.381	854.029
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.53E+06	3.18E+06	3.52E+05	3.69E+06	3.34E+06	3.29E+04	0.00E+00	3.71E+06	3.83E+06	3.69E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....	0.535	0.726	1.072	1.719	1.072	2.366	0.000	0.828	1.575	0.508
MINIMUM DEPTH.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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MO/DA/YR HR:MIN:SEC STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....	1.446	2.377	0.783	2.105	2.396	4.909	0.866	5.071	1.034	6.661
MINIMUM DEPTH.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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MO/DA/YR HR:MIN:SEC STEP	529	231	230	233	234
MAXIMUM DEPTH.....	1.353	4.903	1.152	4.365	5.866
MINIMUM DEPTH.....	0.000	0.000	0.000	0.000	0.000

28TH AVENUE BASIN
FILENAME: 28B010FC.SUM
FUTURE CONDITIONS WITH EXISTING FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
10-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Future Conditions - 10-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	4.948	10.779	3.853	2.029	9.302	17.646	10.256	8.078	12.054	15.980
STANDARD DEVIATION OF FLOW.....	1.326	2.917	1.022	0.534	2.591	4.706	2.573	1.819	3.394	4.735
MAXIMUM FLOW.....	82.620	200.500	69.540	28.405	182.820	337.550	162.970	95.650	230.980	344.830
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.77E+05	3.85E+05	1.38E+05	7.24E+04	3.32E+05	6.30E+05	3.66E+05	2.88E+05	4.30E+05	5.70E+05

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	7.353	9.821	11.369	2.101	3.175	4.863	5.991	6.277	3.032	1.564
STANDARD DEVIATION OF FLOW.....	1.806	2.456	3.045	0.548	0.764	1.225	1.465	1.713	0.782	0.408
MAXIMUM FLOW.....	108.750	146.252	196.340	29.279	45.590	70.360	85.054	118.700	46.670	20.959
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.63E+05	3.51E+05	4.06E+05	7.50E+04	1.13E+05	1.74E+05	2.14E+05	2.24E+05	1.08E+05	5.59E+04

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	8.912	7.353	16.585	6.235	4.319	23.337	6.913	6.592	3.254	9.283
STANDARD DEVIATION OF FLOW.....	2.328	1.933	4.589	1.613	1.186	7.511	1.865	1.810	0.842	2.055
MAXIMUM FLOW.....	144.770	122.380	309.010	97.570	78.430	671.307	126.450	119.090	50.590	103.005
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.18E+05	2.63E+05	5.92E+05	2.23E+05	1.54E+05	8.33E+05	2.47E+05	2.35E+05	1.16E+05	3.31E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	5.907	3.231	6.536	9.209	120.301
STANDARD DEVIATION OF FLOW.....	1.564	0.875	1.625	0.224	16.234
MAXIMUM FLOW.....	98.820	47.603	87.920	10.530	889.821
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.11E+05	1.15E+05	2.33E+05	3.29E+05	4.29E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	808	806	413	415	414	315	615
AVERAGE FLOW.....	2.050	12.800	0.643	10.256	15.355	43.326	22.835	66.161	39.614	44.477
STANDARD DEVIATION OF FLOW.....	0.050	2.885	0.015	1.524	0.768	5.288	6.006	11.025	0.917	1.005
MAXIMUM FLOW.....	2.647	200.539	0.736	53.644	29.437	266.032	377.707	643.738	43.129	77.764
MINIMUM FLOW.....	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.002	0.000	0.001
FLOW VOLUME (CUBIC FEET).....	7.32E+04	4.57E+05	2.30E+04	3.66E+05	5.48E+05	1.55E+06	8.15E+05	2.36E+06	1.41E+06	1.59E+06

MO/DA/YR HR:MIN:SEC STEP	716	717	416	318	303	309	409	408	407	410
AVERAGE FLOW.....	43.610	0.867	44.360	5.289	3.790	8.043	11.825	15.001	64.651	14.347
STANDARD DEVIATION OF FLOW.....	0.822	0.301	1.052	0.279	0.329	0.838	1.164	1.576	2.609	3.616
MAXIMUM FLOW.....	60.000	17.764	75.123	10.449	10.620	27.437	38.042	53.614	133.756	231.028
MINIMUM FLOW.....	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
FLOW VOLUME (CUBIC FEET).....	1.56E+06	3.10E+04	1.58E+06	1.89E+05	1.35E+05	2.87E+05	4.22E+05	5.36E+05	2.31E+06	5.12E+05

MO/DA/YR HR:MIN:SEC STEP	419	411	319	422	622	723	724	424	423	626
AVERAGE FLOW.....	78.668	100.925	50.846	55.443	63.879	54.976	8.903	80.267	87.620	87.620
STANDARD DEVIATION OF FLOW.....	5.421	11.266	1.238	0.992	2.671	0.805	2.464	6.501	8.390	8.390
MAXIMUM FLOW.....	311.879	775.409	58.363	81.074	210.569	57.700	152.869	421.391	535.544	535.544
MINIMUM FLOW.....	0.001	0.006	0.000	0.000	0.001	0.001	0.000	0.001	0.002	0.002
FLOW VOLUME (CUBIC FEET).....	2.81E+06	3.60E+06	1.82E+06	1.98E+06	2.28E+06	1.96E+06	3.18E+05	2.87E+06	3.13E+06	3.13E+06

MO/DA/YR HR:MIN:SEC STEP	727	728	425	426	627	729	730	628	731	732
AVERAGE FLOW.....	39.027	48.593	10.554	97.823	97.823	89.327	8.496	120.899	104.927	15.972
STANDARD DEVIATION OF FLOW.....	0.483	8.338	2.793	10.865	10.865	7.750	3.995	15.653	10.477	6.365
MAXIMUM FLOW.....	39.800	495.744	176.000	672.729	672.729	378.700	294.029	874.595	452.000	422.595
MINIMUM FLOW.....	0.002	0.000	0.000	0.001	0.001	0.001	0.000	0.013	0.013	0.000
FLOW VOLUME (CUBIC FEET).....	1.39E+06	1.73E+06	3.77E+05	3.49E+06	3.49E+06	3.19E+06	3.03E+05	4.32E+06	3.75E+06	5.70E+05

MO/DA/YR HR:MIN:SEC STEP	629	733	734	429	431	330	332	433	434	900
AVERAGE FLOW.....	127.604	106.846	20.758	133.969	128.683	1.238	0.000	141.726	146.900	133.969
STANDARD DEVIATION OF FLOW.....	17.292	10.741	7.913	18.879	18.056	0.030	0.000	18.622	19.229	18.879
MAXIMUM FLOW.....	998.740	448.000	550.740	1059.235	959.177	1.576	0.000	982.317	981.724	1059.235
MINIMUM FLOW.....	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001
FLOW VOLUME (CUBIC FEET).....	4.56E+06	3.81E+06	7.41E+05	4.78E+06	4.59E+06	4.42E+04	0.00E+00	5.06E+06	5.24E+06	4.78E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....	0.608	0.778	1.176	1.890	1.179	2.476	0.510	0.914	1.771	0.607
MINIMUM DEPTH.....	0.007	0.003	0.001	0.000	0.000	0.004	0.000	0.001	0.000	0.000

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MO/DA/YR HR:MIN:SEC	STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....		1.888	2.377	0.912	2.105	2.663	4.917	1.272	5.029	1.282	6.665
MINIMUM DEPTH.....		0.000	0.005	0.000	0.008	0.000	0.004	0.000	0.014	0.000	0.005

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MO/DA/YR HR:MIN:SEC	STEP	529	231	230	233	234
MAXIMUM DEPTH.....		1.693	5.603	1.235	4.977	6.660
MINIMUM DEPTH.....		0.000	0.000	0.001	0.000	0.000

28TH AVENUE BASIN
FILENAME: 28B050FC.SUM
FUTURE CONDITIONS WITH EXISTING FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
50-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Future Conditions - 50-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	9.875	18.185	5.644	5.218	15.896	26.114	15.823	12.849	23.569	29.572
STANDARD DEVIATION OF FLOW.....	2.811	5.226	1.556	1.395	4.698	7.234	4.202	3.082	7.086	9.353
MAXIMUM FLOW.....	166.999	351.056	101.691	70.973	320.369	501.433	261.334	159.160	455.457	635.667
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.53E+05	6.49E+05	2.01E+05	1.86E+05	5.67E+05	9.32E+05	5.65E+05	4.59E+05	8.41E+05	1.06E+06

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	11.223	16.065	21.020	5.462	4.959	8.773	9.661	10.508	6.036	4.088
STANDARD DEVIATION OF FLOW.....	2.918	4.271	6.011	1.461	1.282	2.359	2.516	3.042	1.662	1.075
MAXIMUM FLOW.....	172.763	248.702	379.587	74.733	76.306	133.418	143.330	203.552	95.204	52.653
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	4.01E+05	5.74E+05	7.50E+05	1.95E+05	1.77E+05	3.13E+05	3.45E+05	3.75E+05	2.15E+05	1.46E+05

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	15.989	13.243	31.994	11.882	8.117	38.194	11.844	12.734	6.062	19.058
STANDARD DEVIATION OF FLOW.....	4.461	3.712	9.471	3.278	2.376	12.870	3.395	3.728	1.677	4.447
MAXIMUM FLOW.....	273.179	230.408	617.454	192.981	149.933	1193.330	224.033	233.847	97.799	217.722
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	5.71E+05	4.73E+05	1.14E+06	4.24E+05	2.90E+05	1.36E+06	4.23E+05	4.55E+05	2.16E+05	6.80E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	10.566	7.493	13.221	34.899	236.005
STANDARD DEVIATION OF FLOW.....	2.976	2.067	3.484	2.622	35.303
MAXIMUM FLOW.....	181.434	108.934	183.620	78.028	1949.380
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.77E+05	2.68E+05	4.72E+05	1.25E+06	8.43E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	808	806	413	415	414	315	615
AVERAGE FLOW.....	4.084	22.220	1.266	15.823	22.734	66.951	42.424	109.375	42.717	51.490
STANDARD DEVIATION OF FLOW.....	0.106	5.163	0.032	2.458	1.172	8.847	11.925	20.353	0.937	2.203
MAXIMUM FLOW.....	5.295	351.237	1.499	91.835	44.145	452.426	722.214	1174.640	45.916	166.007
MINIMUM FLOW.....	0.000	0.070	0.000	0.002	0.001	0.064	0.000	0.127	0.012	0.033
FLOW VOLUME (CUBIC FEET).....	1.46E+05	7.93E+05	4.52E+04	5.65E+05	8.12E+05	2.39E+06	1.51E+06	3.90E+06	1.53E+06	1.84E+06

MO/DA/YR HR:MIN:SEC STEP	716	717	416	318	303	309	409	408	407	410
AVERAGE FLOW.....	46.301	5.189	51.405	8.532	5.553	12.794	18.336	23.295	83.232	29.294
STANDARD DEVIATION OF FLOW.....	0.839	1.713	2.140	0.465	0.495	1.376	1.868	2.547	4.703	7.776
MAXIMUM FLOW.....	60.000	106.007	148.371	17.428	16.581	46.743	63.251	94.424	250.489	461.301
MINIMUM FLOW.....	0.033	0.000	0.000	0.000	0.001	0.000	0.000	0.021	0.022	0.074
FLOW VOLUME (CUBIC FEET).....	1.65E+06	1.85E+05	1.84E+06	3.05E+05	1.98E+05	4.57E+05	6.55E+05	8.32E+05	2.97E+06	1.05E+06

MO/DA/YR HR:MIN:SEC STEP	419	411	319	422	622	723	724	424	423	626
AVERAGE FLOW.....	112.169	152.250	87.037	97.160	112.494	56.126	56.368	143.679	156.922	156.922
STANDARD DEVIATION OF FLOW.....	11.321	22.711	2.214	2.527	6.064	0.810	5.882	14.164	17.794	17.794
MAXIMUM FLOW.....	600.177	1432.123	102.534	180.485	419.887	57.700	362.187	912.432	1127.034	1127.034
MINIMUM FLOW.....	0.083	0.350	0.001	0.018	0.044	0.044	0.000	0.103	0.142	0.142
FLOW VOLUME (CUBIC FEET).....	4.00E+06	5.44E+06	3.11E+06	3.47E+06	4.02E+06	2.00E+06	2.01E+06	5.13E+06	5.60E+06	5.60E+06

MO/DA/YR HR:MIN:SEC STEP	727	728	425	426	627	729	730	628	731	732
AVERAGE FLOW.....	39.085	117.837	19.998	176.289	176.289	130.807	45.482	214.144	147.202	66.942
STANDARD DEVIATION OF FLOW.....	0.457	17.748	5.639	22.953	22.953	8.292	16.290	30.987	10.855	22.217
MAXIMUM FLOW.....	39.800	1087.234	342.914	1430.817	1430.817	378.700	1052.117	1732.064	452.000	1280.064
MINIMUM FLOW.....	0.142	0.000	0.000	0.063	0.063	0.063	0.000	0.819	0.819	0.000
FLOW VOLUME (CUBIC FEET).....	1.40E+06	4.21E+06	7.14E+05	6.29E+06	6.29E+06	4.67E+06	1.62E+06	7.64E+06	5.26E+06	2.39E+06

MO/DA/YR HR:MIN:SEC STEP	629	733	734	429	431	330	332	433	434	900
AVERAGE FLOW.....	225.715	148.210	77.504	238.151	253.611	2.305	0.000	297.412	308.471	238.151
STANDARD DEVIATION OF FLOW.....	33.999	10.953	25.274	37.319	39.290	0.059	0.000	40.215	41.601	37.319
MAXIMUM FLOW.....	1852.273	448.000	1404.273	2005.421	2097.170	2.941	0.000	2157.155	2167.971	2005.421
MINIMUM FLOW.....	0.049	0.049	0.000	0.042	0.013	0.000	0.000	0.002	0.008	0.042
FLOW VOLUME (CUBIC FEET).....	8.06E+06	5.29E+06	2.77E+06	8.50E+06	9.05E+06	8.23E+04	0.00E+00	1.06E+07	1.10E+07	8.50E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....	0.789	0.959	1.449	2.565	1.523	2.476	1.001	1.196	2.370	0.899
MINIMUM DEPTH.....	0.008	0.004	0.005	0.000	0.000	0.028	0.000	0.005	0.001	0.009

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MO/DA/YR HR:MIN:SEC STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....	2.654	2.377	1.298	2.105	3.269	4.918	2.289	5.094	2.185	6.706
MINIMUM DEPTH.....	0.000	0.031	0.000	0.055	0.000	0.031	0.000	0.096	0.000	0.033

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MO/DA/YR HR:MIN:SEC STEP	529	231	230	233	234
MAXIMUM DEPTH.....	2.830	8.939	1.988	7.262	10.102
MINIMUM DEPTH.....	0.000	0.000	0.001	0.000	0.000

28TH AVENUE BASIN
FILENAME: 28B100FC.SUM
FUTURE CONDITIONS WITH EXISTING FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
100-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Future Conditions - 100-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	11.881	21.070	6.299	6.574	18.477	29.225	17.931	14.682	28.249	34.981
STANDARD DEVIATION OF FLOW.....	3.396	6.139	1.769	1.740	5.526	8.248	4.854	3.591	8.510	11.128
MAXIMUM FLOW.....	197.088	400.918	115.452	85.618	370.346	562.637	292.171	184.420	539.619	760.052
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	4.24E+05	7.52E+05	2.25E+05	2.35E+05	6.60E+05	1.04E+06	6.40E+05	5.24E+05	1.01E+06	1.25E+06

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	12.676	18.463	24.889	6.886	5.891	10.314	11.074	12.153	7.275	5.162
STANDARD DEVIATION OF FLOW.....	3.362	4.997	7.182	1.827	1.589	2.813	2.937	3.567	2.019	1.343
MAXIMUM FLOW.....	193.832	289.324	439.520	90.399	93.704	155.632	166.151	234.609	112.464	63.645
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	4.53E+05	6.59E+05	8.89E+05	2.46E+05	2.10E+05	3.68E+05	3.95E+05	4.34E+05	2.60E+05	1.84E+05

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	18.803	15.571	38.202	14.161	9.642	43.909	13.770	15.220	7.193	23.076
STANDARD DEVIATION OF FLOW.....	5.307	4.418	11.381	3.939	2.843	14.845	3.999	4.476	2.010	5.416
MAXIMUM FLOW.....	313.889	265.592	725.043	225.012	176.166	1326.240	257.333	275.395	113.849	257.223
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	6.71E+05	5.56E+05	1.36E+06	5.06E+05	3.44E+05	1.57E+06	4.92E+05	5.43E+05	2.57E+05	8.24E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	12.430	9.312	15.796	49.644	274.287
STANDARD DEVIATION OF FLOW.....	3.540	2.549	4.230	3.734	43.490
MAXIMUM FLOW.....	210.727	130.746	218.419	138.040	2361.800
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	4.44E+05	3.32E+05	5.64E+05	1.77E+06	9.79E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	808	806	413	415	414	315	615
AVERAGE FLOW.....	4.916	25.930	1.542	17.930	25.455	75.888	50.304	126.193	47.123	57.437
STANDARD DEVIATION OF FLOW.....	0.128	6.064	0.039	2.829	1.327	10.269	14.264	24.065	1.286	2.689
MAXIMUM FLOW.....	6.398	401.139	1.821	106.494	50.499	521.987	852.843	1374.830	75.360	196.260
MINIMUM FLOW.....	0.000	0.038	0.000	0.001	0.001	0.035	0.000	0.070	0.007	0.018
FLOW VOLUME (CUBIC FEET).....	1.76E+05	9.26E+05	5.51E+04	6.40E+05	9.09E+05	2.71E+06	1.80E+06	4.51E+06	1.68E+06	2.05E+06

MO/DA/YR HR:MIN:SEC STEP	716	717	416	318	303	309	409	408	407	410
AVERAGE FLOW.....	49.273	8.164	57.405	9.784	6.199	14.620	20.806	26.697	93.886	35.363
STANDARD DEVIATION OF FLOW.....	0.940	2.202	2.599	0.539	0.559	1.589	2.144	2.989	5.679	9.412
MAXIMUM FLOW.....	60.000	136.260	172.437	20.398	19.199	54.898	73.945	116.575	294.512	546.510
MINIMUM FLOW.....	0.018	0.000	0.000	0.000	0.001	0.000	0.000	0.012	0.012	0.046
FLOW VOLUME (CUBIC FEET).....	1.76E+06	2.91E+05	2.05E+06	3.49E+05	2.21E+05	5.22E+05	7.43E+05	9.53E+05	3.35E+06	1.26E+06

MO/DA/YR HR:MIN:SEC STEP	419	411	319	422	622	723	724	424	423	626
AVERAGE FLOW.....	128.884	176.018	98.239	110.676	128.697	56.120	72.578	165.717	181.288	181.288
STANDARD DEVIATION OF FLOW.....	13.729	27.250	2.361	3.054	7.443	0.816	7.264	17.362	21.693	21.693
MAXIMUM FLOW.....	713.663	1689.003	119.604	213.814	499.276	57.700	441.576	1090.588	1344.736	1344.736
MINIMUM FLOW.....	0.046	0.191	0.001	0.010	0.024	0.024	0.000	0.056	0.078	0.078
FLOW VOLUME (CUBIC FEET).....	4.60E+06	6.28E+06	3.51E+06	3.95E+06	4.59E+06	2.00E+06	2.59E+06	5.92E+06	6.47E+06	6.47E+06

MO/DA/YR HR:MIN:SEC STEP	727	728	425	426	627	729	730	628	731	732
AVERAGE FLOW.....	39.048	142.239	23.803	204.273	204.273	140.884	63.389	247.777	157.098	90.679
STANDARD DEVIATION OF FLOW.....	0.470	21.646	6.765	27.947	27.947	8.118	21.389	37.411	10.644	28.796
MAXIMUM FLOW.....	39.800	1304.936	401.177	1707.871	1707.871	378.700	1329.171	2052.528	452.000	1600.528
MINIMUM FLOW.....	0.078	0.000	0.000	0.034	0.034	0.034	0.000	0.447	0.447	0.000
FLOW VOLUME (CUBIC FEET).....	1.39E+06	5.08E+06	8.50E+05	7.29E+06	7.29E+06	5.03E+06	2.26E+06	8.85E+06	5.61E+06	3.24E+06

MO/DA/YR HR:MIN:SEC STEP	629	733	734	429	431	330	332	433	434	900
AVERAGE FLOW.....	261.219	157.907	103.312	276.086	295.869	2.736	0.000	356.766	370.341	276.086
STANDARD DEVIATION OF FLOW.....	41.026	10.731	32.491	45.059	48.277	0.070	0.000	49.627	51.349	45.059
MAXIMUM FLOW.....	2223.209	448.000	1775.209	2409.124	2558.563	3.495	0.000	2664.617	2685.321	2409.124
MINIMUM FLOW.....	0.027	0.027	0.000	0.023	0.007	0.000	0.000	0.002	0.004	0.023
FLOW VOLUME (CUBIC FEET).....	9.33E+06	5.64E+06	3.69E+06	9.86E+06	1.06E+07	9.77E+04	0.00E+00	1.27E+07	1.32E+07	9.86E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....	0.847	1.017	1.554	2.837	1.635	2.476	1.101	1.319	2.560	0.975
MINIMUM DEPTH.....	0.007	0.004	0.004	0.000	0.000	0.021	0.000	0.004	0.000	0.009

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MO/DA/YR HR:MIN:SEC STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....	2.836	2.377	1.412	2.105	3.418	4.918	2.570	5.072	2.472	6.705
MINIMUM DEPTH.....	0.000	0.024	0.000	0.042	0.000	0.024	0.000	0.072	0.000	0.025

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MO/DA/YR HR:MIN:SEC STEP	529	231	230	233	234
MAXIMUM DEPTH.....	3.177	9.486	1.982	8.219	10.875
MINIMUM DEPTH.....	0.000	0.000	0.001	0.000	0.000

PROPOSED CONDITION
(FUTURE DEVELOPMENT WITH PROPOSED FACILITIES)

28TH AVENUE BASIN
FILENAME: 28B002PC.SUM
FUTURE CONDITIONS WITH PROPOSED FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
2-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Proposed Conditions - 2-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	1.654	5.040	2.164	0.262	4.262	9.849	5.621	4.106	4.309	6.635
STANDARD DEVIATION OF FLOW.....	0.444	1.370	0.602	0.079	1.190	2.738	1.450	0.938	1.204	1.939
MAXIMUM FLOW.....	27.260	91.370	41.440	4.259	81.780	196.650	91.380	49.251	80.280	136.830
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	5.91E+04	1.80E+05	7.73E+04	9.36E+03	1.52E+05	3.52E+05	2.01E+05	1.47E+05	1.54E+05	2.37E+05

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	3.974	4.819	4.575	0.296	1.758	2.037	2.984	2.969	1.234	0.169
STANDARD DEVIATION OF FLOW.....	1.007	1.218	1.208	0.089	0.437	0.512	0.742	0.816	0.314	0.055
MAXIMUM FLOW.....	60.350	72.653	75.900	4.807	25.690	29.141	43.237	55.170	18.160	2.954
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.42E+05	1.72E+05	1.63E+05	1.06E+04	6.27E+04	7.27E+04	1.07E+05	1.06E+05	4.41E+04	6.03E+03

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	3.770	3.103	6.301	2.349	1.687	11.433	3.159	2.403	1.284	2.914
STANDARD DEVIATION OF FLOW.....	0.979	0.809	1.726	0.603	0.458	3.677	0.855	0.656	0.330	0.650
MAXIMUM FLOW.....	59.510	50.010	113.730	35.870	29.500	304.673	56.380	42.280	19.420	32.484
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.35E+05	1.11E+05	2.25E+05	8.39E+04	6.02E+04	4.08E+05	1.13E+05	8.58E+04	4.58E+04	1.04E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	2.149	0.203	1.269	6.436	42.329
STANDARD DEVIATION OF FLOW.....	0.568	0.068	0.325	0.154	6.948
MAXIMUM FLOW.....	35.190	3.877	17.960	7.170	392.213
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	7.67E+04	7.24E+03	4.53E+04	2.30E+05	1.51E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	808	806	413	415	414	315	615
AVERAGE FLOW.....	0.686	5.713	0.293	5.620	8.574	23.231	9.170	32.401	16.496	18.533
STANDARD DEVIATION OF FLOW.....	0.017	1.359	0.007	0.843	0.432	2.767	2.369	5.010	0.793	0.742
MAXIMUM FLOW.....	0.890	91.375	0.328	30.226	16.490	137.069	147.938	285.007	30.246	32.762
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.45E+04	2.04E+05	1.04E+04	2.01E+05	3.06E+05	8.29E+05	3.27E+05	1.16E+06	5.89E+05	6.62E+05

MO/DA/YR HR:MIN:SEC STEP	716	717	416	318	303	309	409	408	407	410
AVERAGE FLOW.....	18.533	0.000	18.460	2.635	2.130	4.089	6.214	7.971	29.066	4.690
STANDARD DEVIATION OF FLOW.....	0.742	0.000	0.748	0.140	0.187	0.428	0.613	0.848	1.533	1.227
MAXIMUM FLOW.....	32.762	0.000	32.709	5.231	6.023	13.944	19.948	30.161	64.769	80.280
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	6.62E+05	1.29E-03	6.59E+05	9.41E+04	7.60E+04	1.46E+05	2.22E+05	2.85E+05	1.04E+06	1.67E+05

MO/DA/YR HR:MIN:SEC STEP	419	411	319	422	622	723	724	424	423	626
AVERAGE FLOW.....	33.653	43.258	23.335	24.738	28.304	27.842	0.462	34.521	37.624	37.624
STANDARD DEVIATION OF FLOW.....	2.269	4.638	0.678	0.477	0.918	0.735	0.260	2.417	3.208	3.208
MAXIMUM FLOW.....	126.807	310.768	28.517	28.517	79.761	57.700	22.061	163.307	212.176	212.176
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.20E+06	1.54E+06	8.33E+05	8.83E+05	1.01E+06	9.94E+05	1.65E+04	1.23E+06	1.34E+06	1.34E+06

MO/DA/YR HR:MIN:SEC STEP	727	728	425	426	627	729	730	628	731	732
AVERAGE FLOW.....	28.568	9.056	4.036	41.574	41.574	41.574	0.000	52.832	52.832	0.000
STANDARD DEVIATION OF FLOW.....	0.623	2.858	1.059	4.099	4.099	4.099	0.000	6.622	6.622	0.000
MAXIMUM FLOW.....	39.800	172.376	65.370	262.745	262.745	262.745	0.000	380.267	380.267	0.000
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.02E+06	3.23E+05	1.44E+05	1.48E+06	1.48E+06	1.48E+06	4.58E-03	1.89E+06	1.89E+06	0.00E+00

MO/DA/YR HR:MIN:SEC STEP	629	733	734	429	431	330	332	433	434	900
AVERAGE FLOW.....	55.855	55.855	0.000	58.106	44.960	0.489	0.000	51.760	52.576	58.106
STANDARD DEVIATION OF FLOW.....	7.430	7.430	0.000	8.017	7.349	0.012	0.000	7.249	7.034	8.017
MAXIMUM FLOW.....	447.287	447.287	0.000	473.371	412.982	0.626	0.000	415.039	368.671	473.371
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.99E+06	1.99E+06	0.00E+00	2.07E+06	1.61E+06	1.74E+04	0.00E+00	1.85E+06	1.88E+06	2.07E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC	STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....		0.404	0.622	0.880	1.393	0.856	1.576	0.007	0.671	1.236	0.284
MINIMUM DEPTH.....		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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MO/DA/YR HR:MIN:SEC	STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....		0.791	2.375	0.459	2.112	1.818	2.406	0.000	2.654	0.000	3.676
MINIMUM DEPTH.....		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
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MO/DA/YR HR:MIN:SEC	STEP	529	231	230	233	234
MAXIMUM DEPTH.....		0.000	3.772	1.035	3.360	4.435
MINIMUM DEPTH.....		0.000	0.000	0.000	0.000	0.000

28TH AVENUE BASIN
FILENAME: 28B005PC.SUM
FUTURE CONDITIONS WITH PROPOSED FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
5-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Proposed Conditions - 5-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	3.512	8.436	3.216	1.185	7.244	14.664	8.444	6.500	8.707	12.007
STANDARD DEVIATION OF FLOW.....	0.964	2.317	0.871	0.334	2.044	3.987	2.147	1.485	2.508	3.602
MAXIMUM FLOW.....	59.990	155.180	59.460	18.786	142.200	284.340	134.030	77.918	171.960	266.760
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.25E+05	3.01E+05	1.15E+05	4.23E+04	2.59E+05	5.23E+05	3.01E+05	2.32E+05	3.11E+05	4.29E+05

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	6.035	7.820	8.492	1.223	2.600	3.679	4.789	4.928	2.248	0.900
STANDARD DEVIATION OF FLOW.....	1.508	1.982	2.308	0.344	0.629	0.942	1.190	1.366	0.581	0.253
MAXIMUM FLOW.....	89.540	119.569	144.770	19.422	37.070	55.217	69.914	93.390	34.110	13.814
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.15E+05	2.79E+05	3.03E+05	4.37E+04	9.28E+04	1.31E+05	1.71E+05	1.76E+05	8.02E+04	3.21E+04

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	6.762	5.568	12.147	4.572	3.204	18.563	5.381	4.789	2.417	6.487
STANDARD DEVIATION OF FLOW.....	1.792	1.487	3.427	1.206	0.893	5.978	1.471	1.344	0.636	1.466
MAXIMUM FLOW.....	109.747	91.740	227.730	71.810	58.900	502.249	97.680	88.380	37.620	74.827
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.41E+05	1.99E+05	4.34E+05	1.63E+05	1.14E+05	6.63E+05	1.92E+05	1.71E+05	8.63E+04	2.32E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	4.395	1.958	4.415	8.490	88.609
STANDARD DEVIATION OF FLOW.....	1.202	0.577	1.148	0.189	12.256
MAXIMUM FLOW.....	75.450	33.290	63.409	9.360	686.733
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.57E+05	6.99E+04	1.58E+05	3.03E+05	3.16E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	808	806	413	415	414	315	615
AVERAGE FLOW.....	1.457	9.871	0.500	8.444	12.767	35.482	17.018	52.499	34.001	37.680
STANDARD DEVIATION OF FLOW.....	0.036	2.293	0.011	1.265	0.642	4.325	4.549	8.651	1.081	1.031
MAXIMUM FLOW.....	1.883	155.199	0.567	44.945	24.473	219.460	291.272	510.732	42.085	59.015
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	5.20E+04	3.52E+05	1.78E+04	3.01E+05	4.56E+05	1.27E+06	6.08E+05	1.87E+06	1.21E+06	1.35E+06

MO/DA/YR HR:MIN:SEC STEP	716	717	416	318	303	309	409	408	407	410
AVERAGE FLOW.....	37.680	0.000	37.540	4.230	3.164	6.472	9.630	12.230	54.000	10.130
STANDARD DEVIATION OF FLOW.....	1.031	0.000	1.055	0.224	0.276	0.678	0.952	1.292	2.316	2.634
MAXIMUM FLOW.....	59.015	0.000	57.750	8.383	8.905	22.229	31.124	44.062	104.902	171.960
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.35E+06	0.00E+00	1.34E+06	1.51E+05	1.13E+05	2.31E+05	3.44E+05	4.37E+05	1.93E+06	3.62E+05

MO/DA/YR HR:MIN:SEC STEP	419	411	319	422	622	723	724	424	423	626
AVERAGE FLOW.....	63.946	80.881	40.742	43.889	50.260	45.945	4.314	62.199	67.767	67.767
STANDARD DEVIATION OF FLOW.....	4.167	8.577	1.013	0.750	1.929	0.780	1.498	4.768	6.219	6.219
MAXIMUM FLOW.....	246.905	596.645	46.361	56.642	159.248	57.700	101.548	310.859	401.329	401.329
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.28E+06	2.89E+06	1.45E+06	1.57E+06	1.79E+06	1.64E+06	1.54E+05	2.22E+06	2.42E+06	2.42E+06

MO/DA/YR HR:MIN:SEC STEP	727	728	425	426	627	729	730	628	731	732
AVERAGE FLOW.....	38.978	28.790	7.776	75.328	75.328	75.328	0.000	93.614	93.614	0.000
STANDARD DEVIATION OF FLOW.....	0.496	6.167	2.094	8.059	8.059	8.059	0.000	12.034	12.034	0.000
MAXIMUM FLOW.....	39.800	361.529	130.710	506.482	506.482	506.482	0.000	694.008	694.008	0.000
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.39E+06	1.03E+06	2.78E+05	2.69E+06	2.69E+06	2.69E+06	2.40E-02	3.34E+06	3.34E+06	3.43E-03

MO/DA/YR HR:MIN:SEC STEP	629	733	734	429	431	330	332	433	434	900
AVERAGE FLOW.....	98.770	98.770	0.000	103.316	94.397	0.920	0.000	105.219	108.554	103.316
STANDARD DEVIATION OF FLOW.....	13.431	13.431	0.000	14.672	13.506	0.022	0.000	13.841	14.084	14.672
MAXIMUM FLOW.....	804.411	804.411	0.000	855.380	739.144	1.173	0.000	757.250	745.309	855.380
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.53E+06	3.53E+06	3.43E-03	3.69E+06	3.37E+06	3.29E+04	0.00E+00	3.76E+06	3.88E+06	3.69E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC	STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....		0.535	0.726	1.072	1.719	1.072	2.366	0.000	0.828	1.575	0.508
MINIMUM DEPTH.....		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1											

MO/DA/YR HR:MIN:SEC	STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....		1.446	2.377	0.783	2.105	2.396	3.529	0.000	3.770	0.000	5.181
MINIMUM DEPTH.....		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1											

MO/DA/YR HR:MIN:SEC	STEP	529	231	230	233	234
MAXIMUM DEPTH.....		0.000	4.946	1.167	4.420	5.877
MINIMUM DEPTH.....		0.000	0.000	0.000	0.000	0.000

28TH AVENUE BASIN
FILENAME: 28B010PC.SUM
FUTURE CONDITIONS WITH PROPOSED FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
10-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Proposed Conditions - 10-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	4.948	10.779	3.853	2.029	9.302	17.646	10.256	8.078	12.054	15.980
STANDARD DEVIATION OF FLOW.....	1.326	2.917	1.022	0.534	2.591	4.706	2.573	1.819	3.394	4.735
MAXIMUM FLOW.....	82.620	200.500	69.540	28.405	182.820	337.550	162.970	95.650	230.980	344.830
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	1.77E+05	3.85E+05	1.38E+05	7.24E+04	3.32E+05	6.30E+05	3.66E+05	2.88E+05	4.30E+05	5.70E+05

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	7.353	9.821	11.369	2.101	3.175	4.863	5.991	6.277	3.032	1.564
STANDARD DEVIATION OF FLOW.....	1.806	2.456	3.045	0.548	0.764	1.225	1.465	1.713	0.782	0.408
MAXIMUM FLOW.....	108.750	146.252	196.340	29.279	45.590	70.360	85.054	118.700	46.670	20.959
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.63E+05	3.51E+05	4.06E+05	7.50E+04	1.13E+05	1.74E+05	2.14E+05	2.24E+05	1.08E+05	5.59E+04

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	8.912	7.353	16.585	6.235	4.319	23.337	6.913	6.592	3.254	9.283
STANDARD DEVIATION OF FLOW.....	2.328	1.933	4.589	1.613	1.186	7.511	1.865	1.810	0.842	2.055
MAXIMUM FLOW.....	144.770	122.380	309.010	97.570	78.430	671.307	126.450	119.090	50.590	103.005
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.18E+05	2.63E+05	5.92E+05	2.23E+05	1.54E+05	8.33E+05	2.47E+05	2.35E+05	1.16E+05	3.31E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	5.907	3.231	6.536	9.517	119.530
STANDARD DEVIATION OF FLOW.....	1.564	0.875	1.625	0.210	16.314
MAXIMUM FLOW.....	98.820	47.603	87.920	10.550	948.887
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	2.11E+05	1.15E+05	2.33E+05	3.40E+05	4.27E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	808	806	413	415	414	315	615
AVERAGE FLOW.....	2.050	12.800	0.643	10.256	15.355	43.326	22.835	66.161	39.614	44.477
STANDARD DEVIATION OF FLOW.....	0.050	2.885	0.015	1.524	0.768	5.288	6.006	11.025	0.917	1.005
MAXIMUM FLOW.....	2.647	200.539	0.736	53.644	29.437	266.032	377.707	643.738	43.129	77.764
MINIMUM FLOW.....	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.002	0.000	0.001
FLOW VOLUME (CUBIC FEET).....	7.32E+04	4.57E+05	2.30E+04	3.66E+05	5.48E+05	1.55E+06	8.15E+05	2.36E+06	1.41E+06	1.59E+06

MO/DA/YR HR:MIN:SEC STEP	716	717	416	318	303	309	409	408	407	410
AVERAGE FLOW.....	43.610	0.867	44.360	5.289	3.790	8.043	11.825	15.001	64.651	14.347
STANDARD DEVIATION OF FLOW.....	0.822	0.301	1.052	0.279	0.329	0.838	1.164	1.576	2.609	3.616
MAXIMUM FLOW.....	60.000	17.764	75.123	10.449	10.620	27.437	38.042	53.614	133.756	231.028
MINIMUM FLOW.....	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
FLOW VOLUME (CUBIC FEET).....	1.56E+06	3.10E+04	1.58E+06	1.89E+05	1.35E+05	2.87E+05	4.22E+05	5.36E+05	2.31E+06	5.12E+05

MO/DA/YR HR:MIN:SEC STEP	419	411	319	422	622	723	724	424	423	626
AVERAGE FLOW.....	78.668	100.925	50.846	55.443	63.879	54.976	8.903	80.267	87.620	87.620
STANDARD DEVIATION OF FLOW.....	5.421	11.266	1.238	0.992	2.671	0.805	2.464	6.501	8.390	8.390
MAXIMUM FLOW.....	311.879	775.409	58.363	81.074	210.569	57.700	152.869	421.391	535.544	535.544
MINIMUM FLOW.....	0.001	0.006	0.000	0.000	0.001	0.001	0.000	0.001	0.002	0.002
FLOW VOLUME (CUBIC FEET).....	2.81E+06	3.60E+06	1.82E+06	1.98E+06	2.28E+06	1.96E+06	3.18E+05	2.87E+06	3.13E+06	3.13E+06

MO/DA/YR HR:MIN:SEC STEP	727	728	425	426	627	729	730	628	731	732
AVERAGE FLOW.....	39.027	48.593	10.554	97.823	97.823	97.823	0.000	120.841	120.841	0.000
STANDARD DEVIATION OF FLOW.....	0.483	8.338	2.793	10.865	10.865	10.865	0.000	15.831	15.831	0.000
MAXIMUM FLOW.....	39.800	495.744	176.000	672.729	672.729	672.729	0.000	882.513	882.513	0.000
MINIMUM FLOW.....	0.002	0.000	0.000	0.001	0.001	0.001	0.000	0.013	0.013	0.000
FLOW VOLUME (CUBIC FEET).....	1.39E+06	1.73E+06	3.77E+05	3.49E+06	3.49E+06	3.49E+06	2.06E-02	4.31E+06	4.31E+06	5.72E-03

MO/DA/YR HR:MIN:SEC STEP	629	733	734	229	529	429	431	330	332	433
AVERAGE FLOW.....	127.498	126.908	0.590	126.627	0.590	133.809	127.900	1.238	0.000	141.253
STANDARD DEVIATION OF FLOW.....	17.584	17.327	0.593	17.243	0.423	19.247	18.081	0.030	0.000	18.666
MAXIMUM FLOW.....	1050.212	980.000	70.212	965.626	48.413	1116.952	1012.395	1.576	0.000	1057.533
MINIMUM FLOW.....	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	4.55E+06	4.53E+06	2.11E+04	4.52E+06	2.11E+04	4.78E+06	4.57E+06	4.42E+04	0.00E+00	5.04E+06

MO/DA/YR HR:MIN:SEC STEP	434	900
AVERAGE FLOW.....	146.416	133.809
STANDARD DEVIATION OF FLOW.....	19.167	19.247
MAXIMUM FLOW.....	1003.990	1116.952
MINIMUM FLOW.....	0.000	0.001
FLOW VOLUME (CUBIC FEET).....	5.23E+06	4.78E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC	STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....		0.608	0.778	1.176	1.890	1.179	2.476	0.510	0.914	1.771	0.607
MINIMUM DEPTH.....		0.007	0.003	0.001	0.000	0.000	0.004	0.000	0.001	0.000	0.000
1											

MO/DA/YR HR:MIN:SEC	STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....		1.888	2.377	0.912	2.105	2.663	4.286	0.000	4.486	0.000	6.139
MINIMUM DEPTH.....		0.000	0.005	0.000	0.008	0.000	0.003	0.000	0.010	0.000	0.003
1											

MO/DA/YR HR:MIN:SEC	STEP	529	231	230	233	234
MAXIMUM DEPTH.....		0.541	5.881	1.236	5.137	6.823
MINIMUM DEPTH.....		0.000	0.000	0.001	0.000	0.000

28TH AVENUE BASIN
FILENAME: 28B050PC.SUM
FUTURE CONDITIONS WITH PROPOSED FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
50-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Proposed Conditions - 50-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	9.875	18.185	5.644	5.218	15.896	26.114	15.823	12.849	23.569	29.572
STANDARD DEVIATION OF FLOW.....	2.811	5.226	1.556	1.395	4.698	7.234	4.202	3.082	7.086	9.353
MAXIMUM FLOW.....	166.999	351.056	101.691	70.973	320.369	501.433	261.334	159.160	455.457	635.667
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.53E+05	6.49E+05	2.01E+05	1.86E+05	5.67E+05	9.32E+05	5.65E+05	4.59E+05	8.41E+05	1.06E+06

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	11.223	16.065	21.020	5.462	4.959	8.773	9.661	10.508	6.036	4.088
STANDARD DEVIATION OF FLOW.....	2.918	4.271	6.011	1.461	1.282	2.359	2.516	3.042	1.662	1.075
MAXIMUM FLOW.....	172.763	248.702	379.587	74.733	76.306	133.418	143.330	203.552	95.204	52.653
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	4.01E+05	5.74E+05	7.50E+05	1.95E+05	1.77E+05	3.13E+05	3.45E+05	3.75E+05	2.15E+05	1.46E+05

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	15.989	13.243	31.994	11.882	8.117	38.194	11.844	12.734	6.062	19.058
STANDARD DEVIATION OF FLOW.....	4.461	3.712	9.471	3.278	2.376	12.870	3.395	3.728	1.677	4.447
MAXIMUM FLOW.....	273.179	230.408	617.454	192.981	149.933	1193.330	224.033	233.847	97.799	217.722
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	5.71E+05	4.73E+05	1.14E+06	4.24E+05	2.90E+05	1.36E+06	4.23E+05	4.55E+05	2.16E+05	6.80E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	10.566	7.493	13.221	28.514	230.273
STANDARD DEVIATION OF FLOW.....	2.976	2.067	3.484	1.946	34.190
MAXIMUM FLOW.....	181.434	108.934	183.620	63.570	1867.277
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	3.77E+05	2.68E+05	4.72E+05	1.02E+06	8.22E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	808	806	413	415	414	315	615
AVERAGE FLOW.....	4.084	22.220	1.266	15.823	22.734	66.951	42.424	109.375	42.717	51.490
STANDARD DEVIATION OF FLOW.....	0.106	5.163	0.032	2.458	1.172	8.847	11.925	20.353	0.937	2.203
MAXIMUM FLOW.....	5.295	351.237	1.499	91.835	44.145	452.426	722.214	1174.640	45.916	166.007
MINIMUM FLOW.....	0.000	0.070	0.000	0.002	0.001	0.064	0.000	0.127	0.012	0.033
FLOW VOLUME (CUBIC FEET).....	1.46E+05	7.93E+05	4.52E+04	5.65E+05	8.12E+05	2.39E+06	1.51E+06	3.90E+06	1.53E+06	1.84E+06

MO/DA/YR HR:MIN:SEC STEP	716	717	416	318	303	309	409	408	407	410
AVERAGE FLOW.....	46.301	5.189	51.405	8.532	5.553	12.794	18.336	23.295	83.232	29.294
STANDARD DEVIATION OF FLOW.....	0.839	1.713	2.140	0.465	0.495	1.376	1.868	2.547	4.703	7.776
MAXIMUM FLOW.....	60.000	106.007	148.371	17.428	16.581	46.743	63.251	94.424	250.489	461.301
MINIMUM FLOW.....	0.033	0.000	0.000	0.000	0.001	0.000	0.000	0.021	0.022	0.074
FLOW VOLUME (CUBIC FEET).....	1.65E+06	1.85E+05	1.84E+06	3.05E+05	1.98E+05	4.57E+05	6.55E+05	8.32E+05	2.97E+06	1.05E+06

MO/DA/YR HR:MIN:SEC STEP	419	411	319	422	622	723	724	424	423	626
AVERAGE FLOW.....	112.169	152.250	87.037	97.160	112.494	56.126	56.368	143.679	156.922	156.922
STANDARD DEVIATION OF FLOW.....	11.321	22.711	2.214	2.527	6.064	0.810	5.882	14.164	17.794	17.794
MAXIMUM FLOW.....	600.177	1432.123	102.534	180.485	419.887	57.700	362.187	912.432	1127.034	1127.034
MINIMUM FLOW.....	0.083	0.350	0.001	0.018	0.044	0.044	0.000	0.103	0.142	0.142
FLOW VOLUME (CUBIC FEET).....	4.00E+06	5.44E+06	3.11E+06	3.47E+06	4.02E+06	2.00E+06	2.01E+06	5.13E+06	5.60E+06	5.60E+06

MO/DA/YR HR:MIN:SEC STEP	727	728	425	426	627	729	730	628	731	732
AVERAGE FLOW.....	39.085	117.837	19.998	176.289	176.289	153.035	23.253	214.067	182.978	31.089
STANDARD DEVIATION OF FLOW.....	0.457	17.748	5.639	22.953	22.953	14.525	10.335	31.213	20.621	12.607
MAXIMUM FLOW.....	39.800	1087.234	342.914	1430.817	1430.817	679.000	751.817	1689.339	917.000	772.339
MINIMUM FLOW.....	0.142	0.000	0.000	0.063	0.063	0.063	0.000	0.819	0.819	0.000
FLOW VOLUME (CUBIC FEET).....	1.40E+06	4.21E+06	7.14E+05	6.29E+06	6.29E+06	5.46E+06	8.30E+05	7.64E+06	6.53E+06	1.11E+06

MO/DA/YR HR:MIN:SEC STEP	629	733	734	429	431	330	332	433	434	900
AVERAGE FLOW.....	225.572	190.367	35.206	237.948	247.891	2.305	0.000	285.233	296.281	237.948
STANDARD DEVIATION OF FLOW.....	34.216	22.339	14.019	37.576	38.198	0.059	0.000	39.361	40.826	37.576
MAXIMUM FLOW.....	1871.721	980.000	891.721	2013.783	1986.731	2.941	0.000	2098.324	2094.593	2013.783
MINIMUM FLOW.....	0.049	0.049	0.000	0.042	0.013	0.000	0.000	0.002	0.008	0.042
FLOW VOLUME (CUBIC FEET).....	8.05E+06	6.80E+06	1.26E+06	8.49E+06	8.85E+06	8.23E+04	0.00E+00	1.02E+07	1.06E+07	8.49E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC	STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....		0.789	0.959	1.449	2.565	1.523	2.476	1.001	1.196	2.370	0.899
MINIMUM DEPTH.....		0.008	0.004	0.005	0.000	0.000	0.028	0.000	0.005	0.001	0.009
1											

MO/DA/YR HR:MIN:SEC	STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....		2.654	2.377	1.298	2.105	3.269	4.437	1.923	4.543	1.752	6.407
MINIMUM DEPTH.....		0.000	0.031	0.000	0.055	0.000	0.023	0.000	0.068	0.000	0.024
1											

MO/DA/YR HR:MIN:SEC	STEP	529	231	230	233	234
MAXIMUM DEPTH.....		2.196	8.817	1.921	7.080	9.970
MINIMUM DEPTH.....		0.000	0.000	0.001	0.000	0.000

28TH AVENUE BASIN
FILENAME: 28B100PC.SUM
FUTURE CONDITIONS WITH PROPOSED FACILITIES
EPA SWMM SUMMARY OUTPUT FILE
100-YEAR EVENT

SUMMARY OF EPA SWMM ANALYSIS
(See detailed output for more information)

City of Greeley Comprehensive Drainage Plan Update - ACE Inc.
28th Ave. Basin - Proposed Conditions - 100-Year Storm

SUB-BASIN INFLOWS

MO/DA/YR HR:MIN:SEC STEP	1	2	3	4	5	6	8	9	10	11
AVERAGE FLOW.....	11.881	21.070	6.299	6.574	18.477	29.225	17.931	14.682	28.249	34.981
STANDARD DEVIATION OF FLOW.....	3.396	6.139	1.769	1.740	5.526	8.248	4.854	3.591	8.510	11.128
MAXIMUM FLOW.....	197.088	400.918	115.452	85.618	370.346	562.637	292.171	184.420	539.619	760.052
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	4.24E+05	7.52E+05	2.25E+05	2.35E+05	6.60E+05	1.04E+06	6.40E+05	5.24E+05	1.01E+06	1.25E+06

MO/DA/YR HR:MIN:SEC STEP	12	13	14	15	16	17	18	19	20	21
AVERAGE FLOW.....	12.676	18.463	24.889	6.886	5.891	10.314	11.074	12.153	7.275	5.162
STANDARD DEVIATION OF FLOW.....	3.362	4.997	7.182	1.827	1.589	2.813	2.937	3.567	2.019	1.343
MAXIMUM FLOW.....	193.832	289.324	439.520	90.399	93.704	155.632	166.151	234.609	112.464	63.645
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	4.53E+05	6.59E+05	8.89E+05	2.46E+05	2.10E+05	3.68E+05	3.95E+05	4.34E+05	2.60E+05	1.84E+05

MO/DA/YR HR:MIN:SEC STEP	22	23	24	25	26	27	28	29	30	31
AVERAGE FLOW.....	18.803	15.571	38.202	14.161	9.642	43.909	13.770	15.220	7.193	23.076
STANDARD DEVIATION OF FLOW.....	5.307	4.418	11.381	3.939	2.843	14.845	3.999	4.476	2.010	5.416
MAXIMUM FLOW.....	313.889	265.592	725.043	225.012	176.166	1326.240	257.333	275.395	113.849	257.223
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	6.71E+05	5.56E+05	1.36E+06	5.06E+05	3.44E+05	1.57E+06	4.92E+05	5.43E+05	2.57E+05	8.24E+05

MO/DA/YR HR:MIN:SEC STEP	32	33	34	35	36
AVERAGE FLOW.....	12.430	9.312	15.796	39.985	262.430
STANDARD DEVIATION OF FLOW.....	3.540	2.549	4.230	3.599	42.067
MAXIMUM FLOW.....	210.727	130.746	218.419	157.173	2251.795
MINIMUM FLOW.....	0.000	0.000	0.000	0.000	0.000
FLOW VOLUME (CUBIC FEET).....	4.44E+05	3.32E+05	5.64E+05	1.43E+06	9.37E+06

CONVEYANCE ELEMENT OUTFLOWS

MO/DA/YR HR:MIN:SEC STEP	301	402	302	808	806	413	415	414	315	615
AVERAGE FLOW.....	4.916	25.930	1.542	17.930	25.455	75.888	50.304	126.193	47.123	57.437
STANDARD DEVIATION OF FLOW.....	0.128	6.064	0.039	2.829	1.327	10.269	14.264	24.065	1.286	2.689
MAXIMUM FLOW.....	6.398	401.139	1.821	106.494	50.499	521.987	852.843	1374.830	75.360	196.260
MINIMUM FLOW.....	0.000	0.038	0.000	0.001	0.001	0.035	0.000	0.070	0.007	0.018
FLOW VOLUME (CUBIC FEET).....	1.76E+05	9.26E+05	5.51E+04	6.40E+05	9.09E+05	2.71E+06	1.80E+06	4.51E+06	1.68E+06	2.05E+06

MO/DA/YR HR:MIN:SEC STEP	716	717	416	318	303	309	409	408	407	410
AVERAGE FLOW.....	49.273	8.164	57.405	9.784	6.199	14.620	20.806	26.697	93.886	35.363
STANDARD DEVIATION OF FLOW.....	0.940	2.202	2.599	0.539	0.559	1.589	2.144	2.989	5.679	9.412
MAXIMUM FLOW.....	60.000	136.260	172.437	20.398	19.199	54.898	73.945	116.575	294.512	546.510
MINIMUM FLOW.....	0.018	0.000	0.000	0.000	0.001	0.000	0.000	0.012	0.012	0.046
FLOW VOLUME (CUBIC FEET).....	1.76E+06	2.91E+05	2.05E+06	3.49E+05	2.21E+05	5.22E+05	7.43E+05	9.53E+05	3.35E+06	1.26E+06

MO/DA/YR HR:MIN:SEC STEP	419	411	319	422	622	723	724	424	423	626
AVERAGE FLOW.....	128.884	176.018	98.239	110.676	128.697	56.120	72.578	165.717	181.288	181.288
STANDARD DEVIATION OF FLOW.....	13.729	27.250	2.361	3.054	7.443	0.816	7.264	17.362	21.693	21.693
MAXIMUM FLOW.....	713.663	1689.003	119.604	213.814	499.276	57.700	441.576	1090.588	1344.736	1344.736
MINIMUM FLOW.....	0.046	0.191	0.001	0.010	0.024	0.024	0.000	0.056	0.078	0.078
FLOW VOLUME (CUBIC FEET).....	4.60E+06	6.28E+06	3.51E+06	3.95E+06	4.59E+06	2.00E+06	2.59E+06	5.92E+06	6.47E+06	6.47E+06

MO/DA/YR HR:MIN:SEC STEP	727	728	425	426	627	729	730	628	731	732
AVERAGE FLOW.....	39.048	142.239	23.803	204.273	204.273	166.824	37.449	247.731	198.012	49.719
STANDARD DEVIATION OF FLOW.....	0.470	21.646	6.765	27.947	27.947	15.140	14.966	37.609	21.427	18.555
MAXIMUM FLOW.....	39.800	1304.936	401.177	1707.871	1707.871	679.000	1028.871	2021.147	917.000	1104.147
MINIMUM FLOW.....	0.078	0.000	0.000	0.034	0.034	0.034	0.000	0.447	0.447	0.000
FLOW VOLUME (CUBIC FEET).....	1.39E+06	5.08E+06	8.50E+05	7.29E+06	7.29E+06	5.96E+06	1.34E+06	8.84E+06	7.07E+06	1.77E+06

MO/DA/YR HR:MIN:SEC STEP	629	733	734	429	431	330	332	433	434	900
AVERAGE FLOW.....	261.098	205.357	55.741	275.885	284.047	2.736	0.000	334.291	347.888	275.885
STANDARD DEVIATION OF FLOW.....	41.200	23.148	20.580	45.268	46.895	0.070	0.000	48.523	50.340	45.268
MAXIMUM FLOW.....	2217.722	980.000	1237.722	2420.283	2468.329	3.495	0.000	2548.709	2585.921	2420.283
MINIMUM FLOW.....	0.027	0.027	0.000	0.023	0.007	0.000	0.000	0.002	0.004	0.023
FLOW VOLUME (CUBIC FEET).....	9.32E+06	7.33E+06	1.99E+06	9.85E+06	1.01E+07	9.77E+04	0.00E+00	1.19E+07	1.24E+07	9.85E+06

CONVEYANCE ELEMENT FLOW DEPTHS (IN FEET)

MO/DA/YR HR:MIN:SEC	STEP	202	208	206	207	214	216	516	209	220	210
MAXIMUM DEPTH.....		0.847	1.017	1.554	2.837	1.635	2.476	1.101	1.319	2.560	0.975
MINIMUM DEPTH.....		0.007	0.004	0.004	0.000	0.000	0.021	0.000	0.004	0.000	0.009
1											

MO/DA/YR HR:MIN:SEC	STEP	222	224	524	226	526	227	527	228	528	229
MAXIMUM DEPTH.....		2.836	2.377	1.412	2.105	3.418	4.438	2.248	4.541	2.087	6.416
MINIMUM DEPTH.....		0.000	0.024	0.000	0.042	0.000	0.017	0.000	0.051	0.000	0.018
1											

MO/DA/YR HR:MIN:SEC	STEP	529	231	230	233	234
MAXIMUM DEPTH.....		2.621	9.346	1.936	7.997	10.736
MINIMUM DEPTH.....		0.000	0.000	0.001	0.000	0.000

FLOOD HYDROGRAPHS

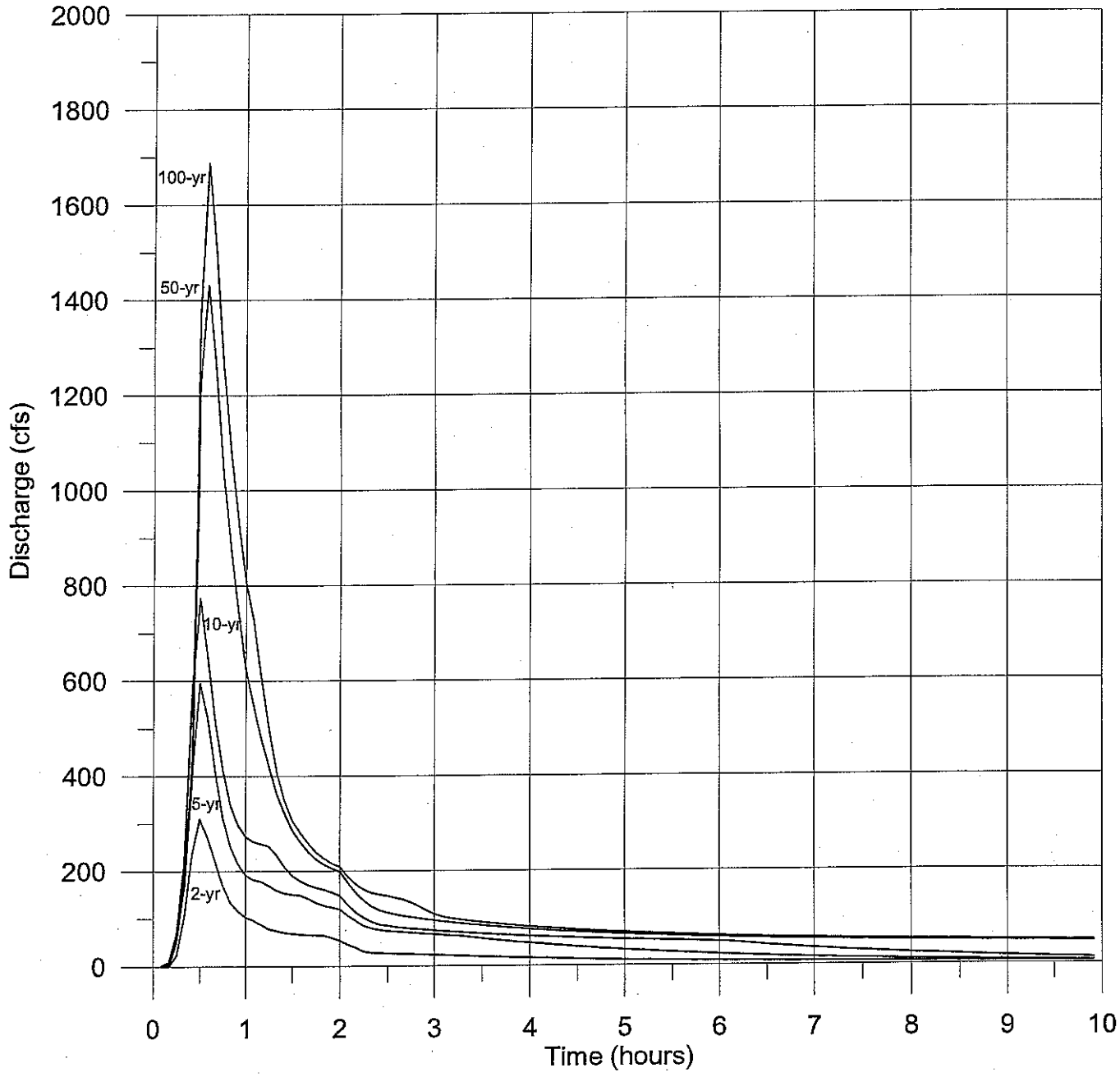

Figure D.1 Flood Hydrographs, Inflows to West Lake at Sanborn Park
Existing Condition (EPA SWMM Node 411)

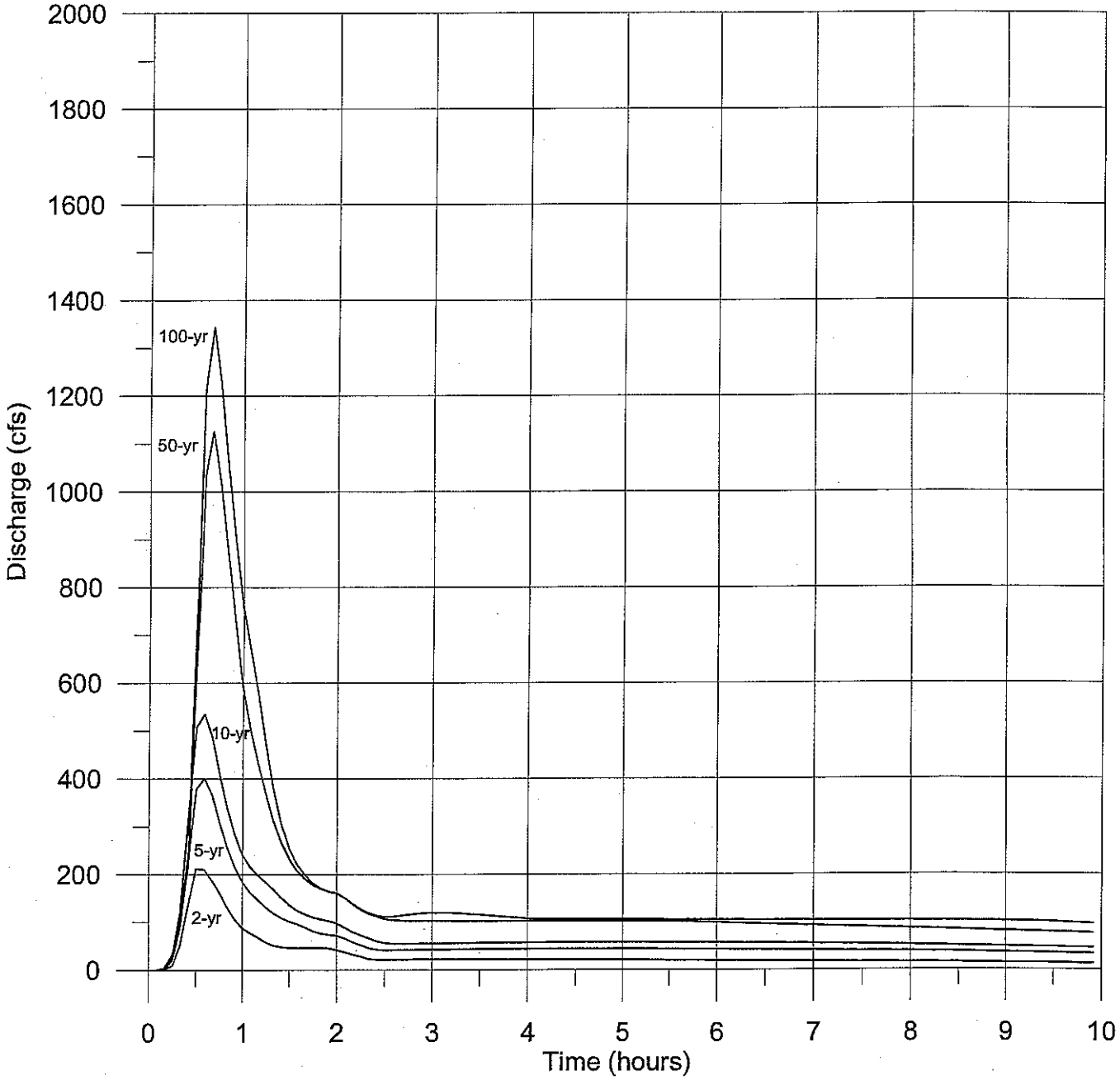

Figure D.2 Flood Hydrographs, 16th Street and 27th Avenue
Existing Condition (EPA SWMM Node 423)

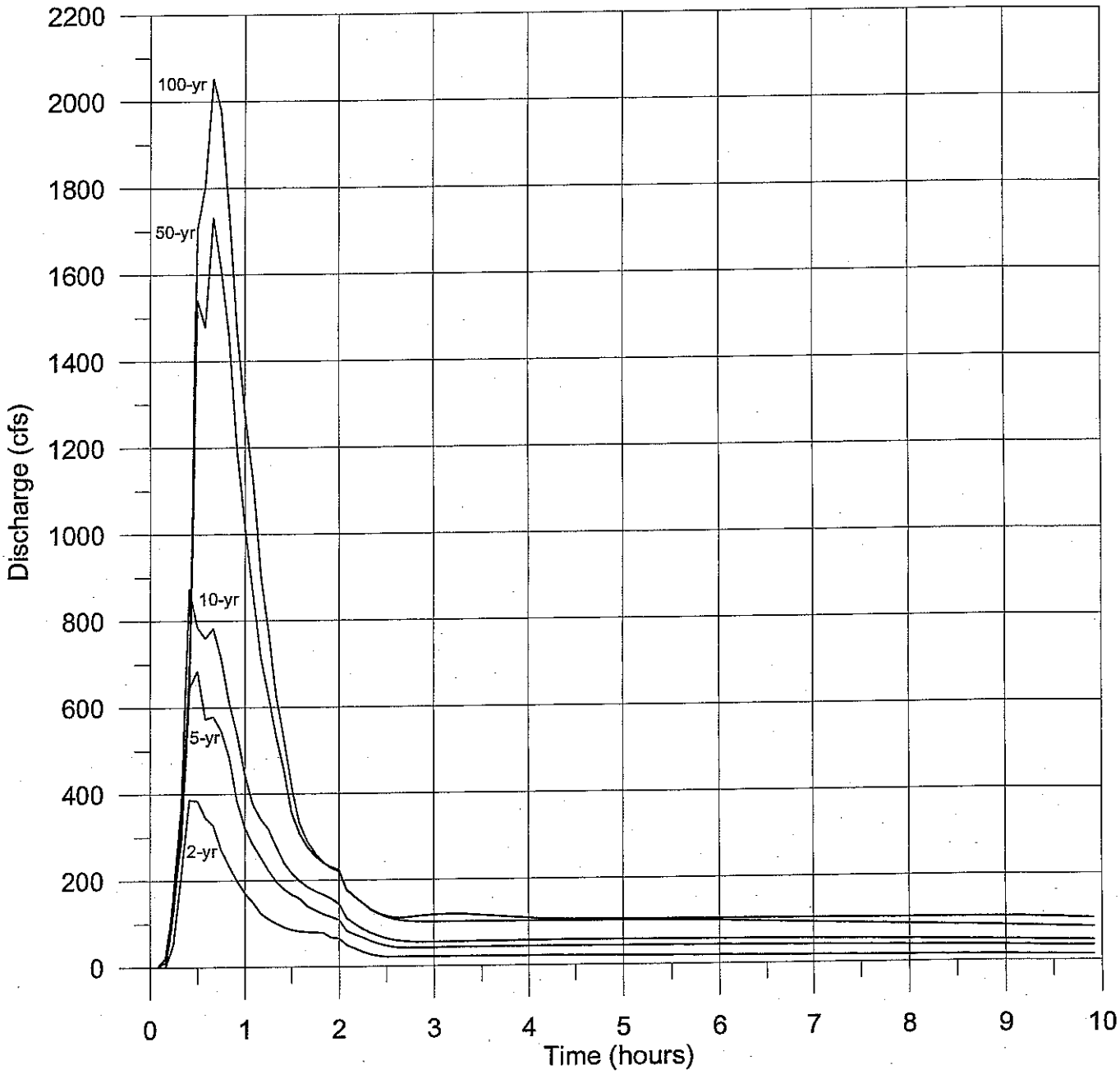

Figure D.3 Flood Hydrographs, 10th Street and 26th Avenue
Existing Condition (EPA SWMM Node 628)

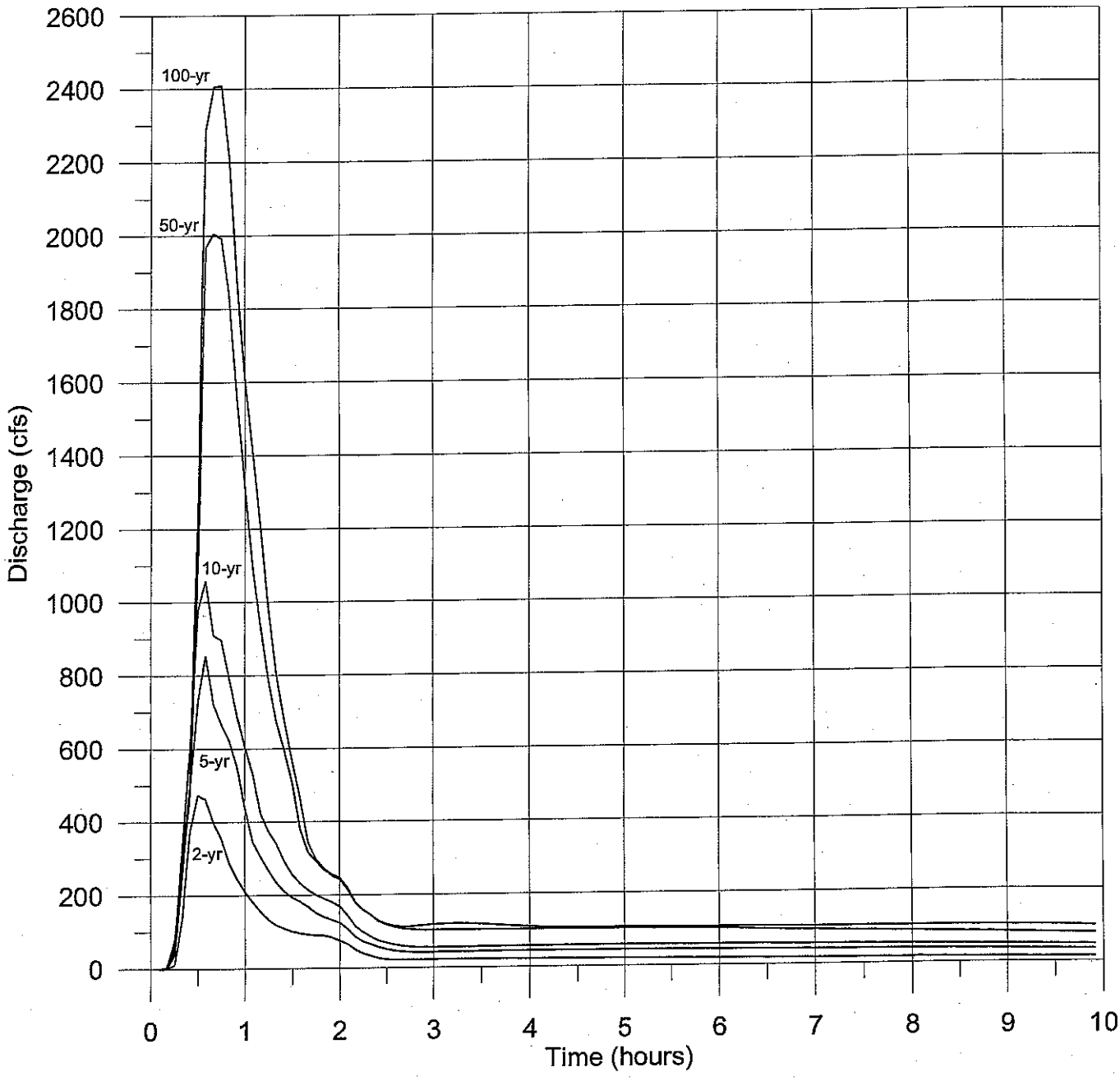

Figure D.4 Flood Hydrographs, Greeley No. 3 Ditch and 26th Avenue
Existing Condition (EPA SWMM Node 429)

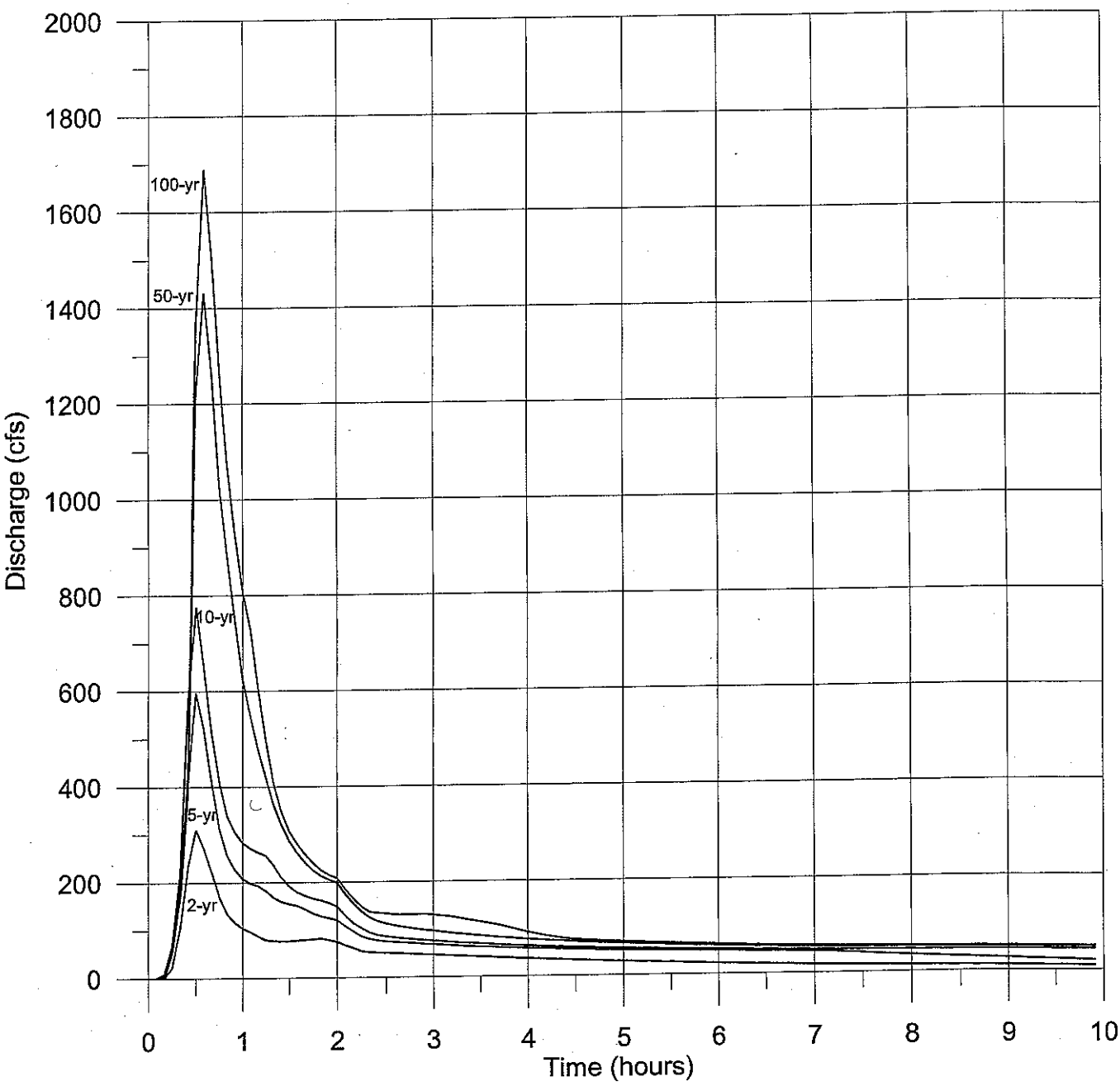

Figure D.5 Flood Hydrographs, Inflows to West Lake at Sanborn Park
Future Condition (EPA SWMM Node 411)

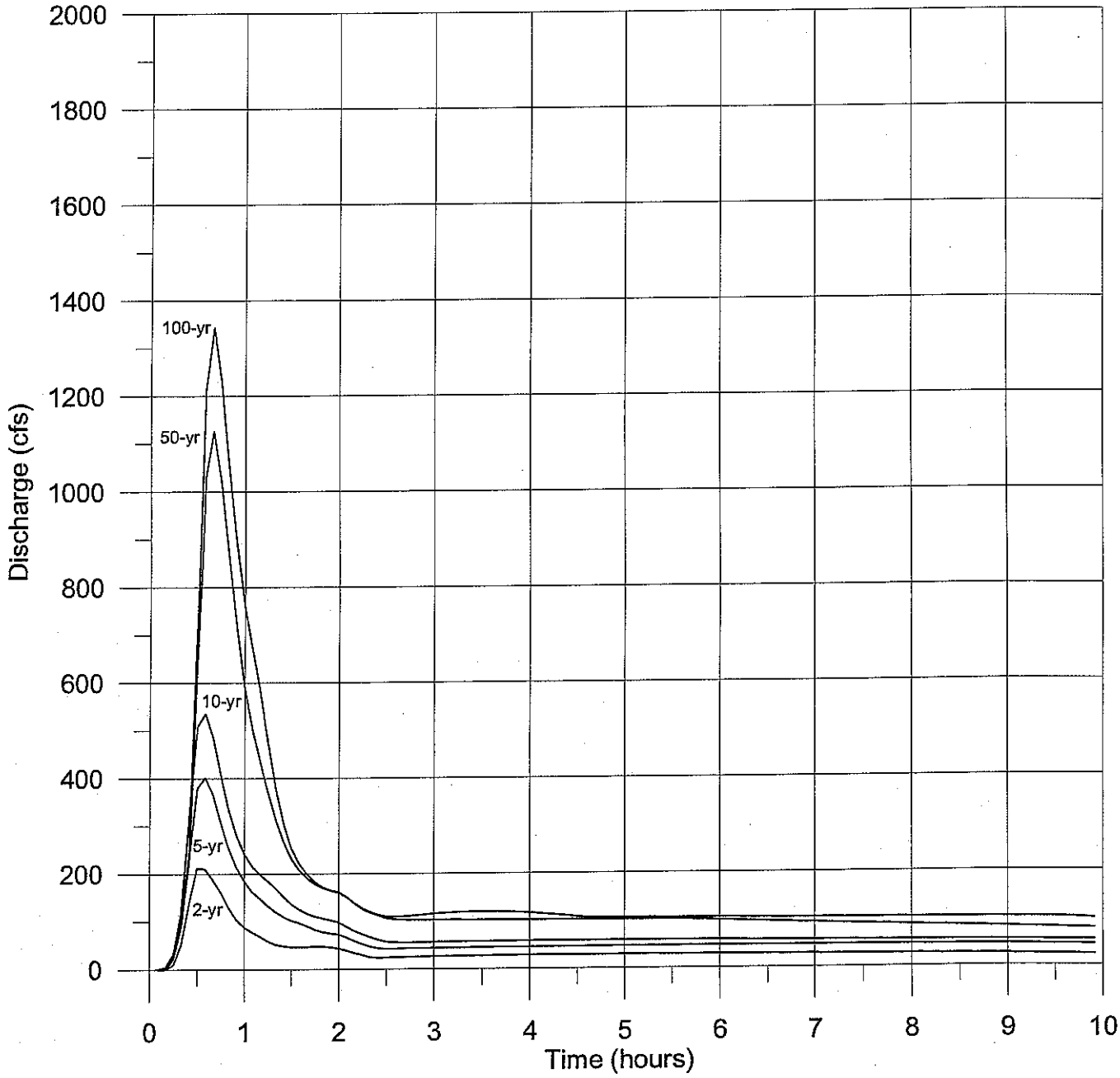

Figure D.6 Flood Hydrographs, 16th Street and 27th Avenue
Future Condition (EPA SWMM Node 423)

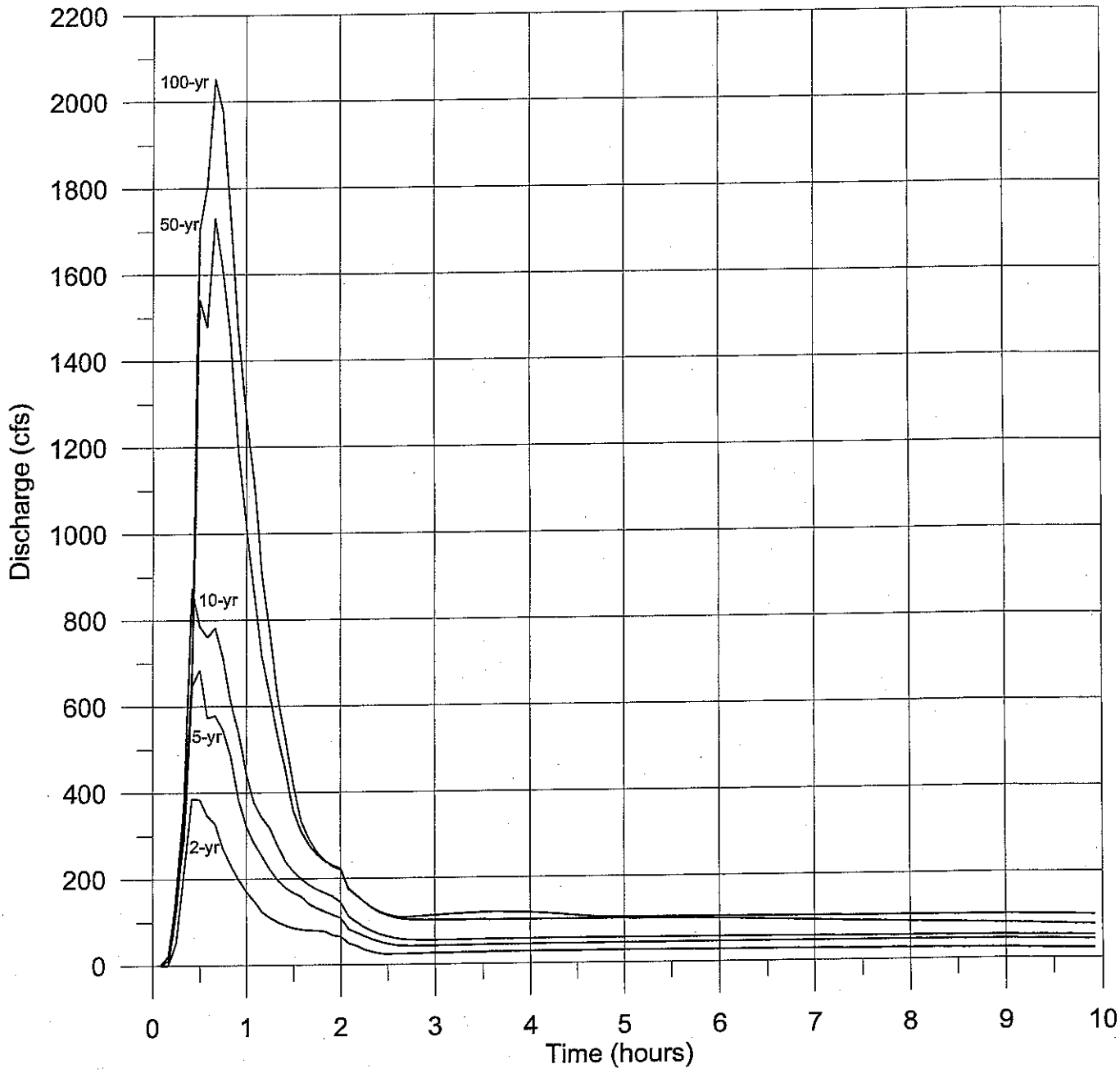

Figure D.7 Flood Hydrographs, 10th Street and 26th Avenue
Future Condition (EPA SWMM Node 628)

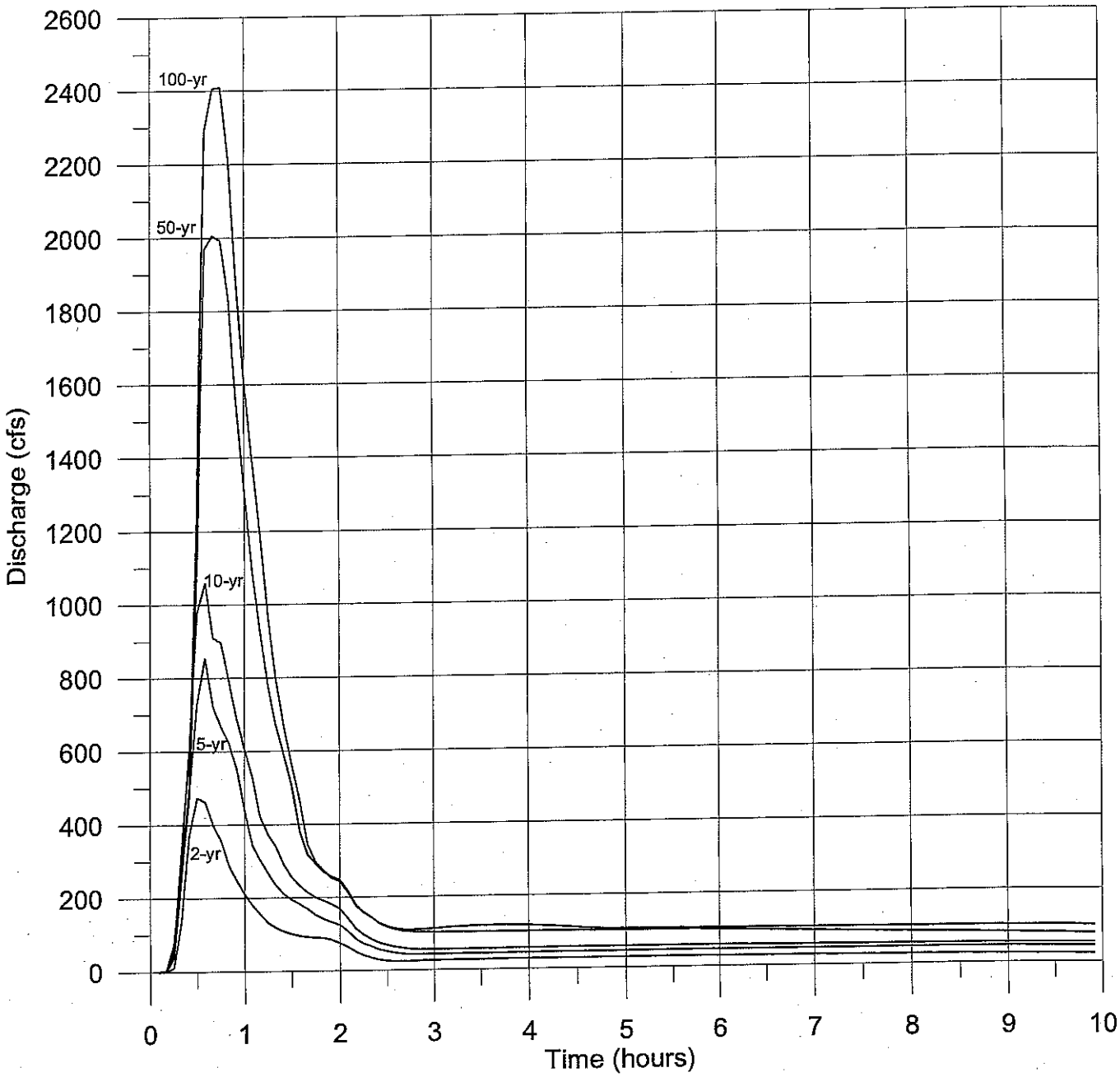

Figure D.8 Flood Hydrographs, Greeley No. 3 Ditch and 26th Avenue Future Condition (EPA SWMM Node 429)

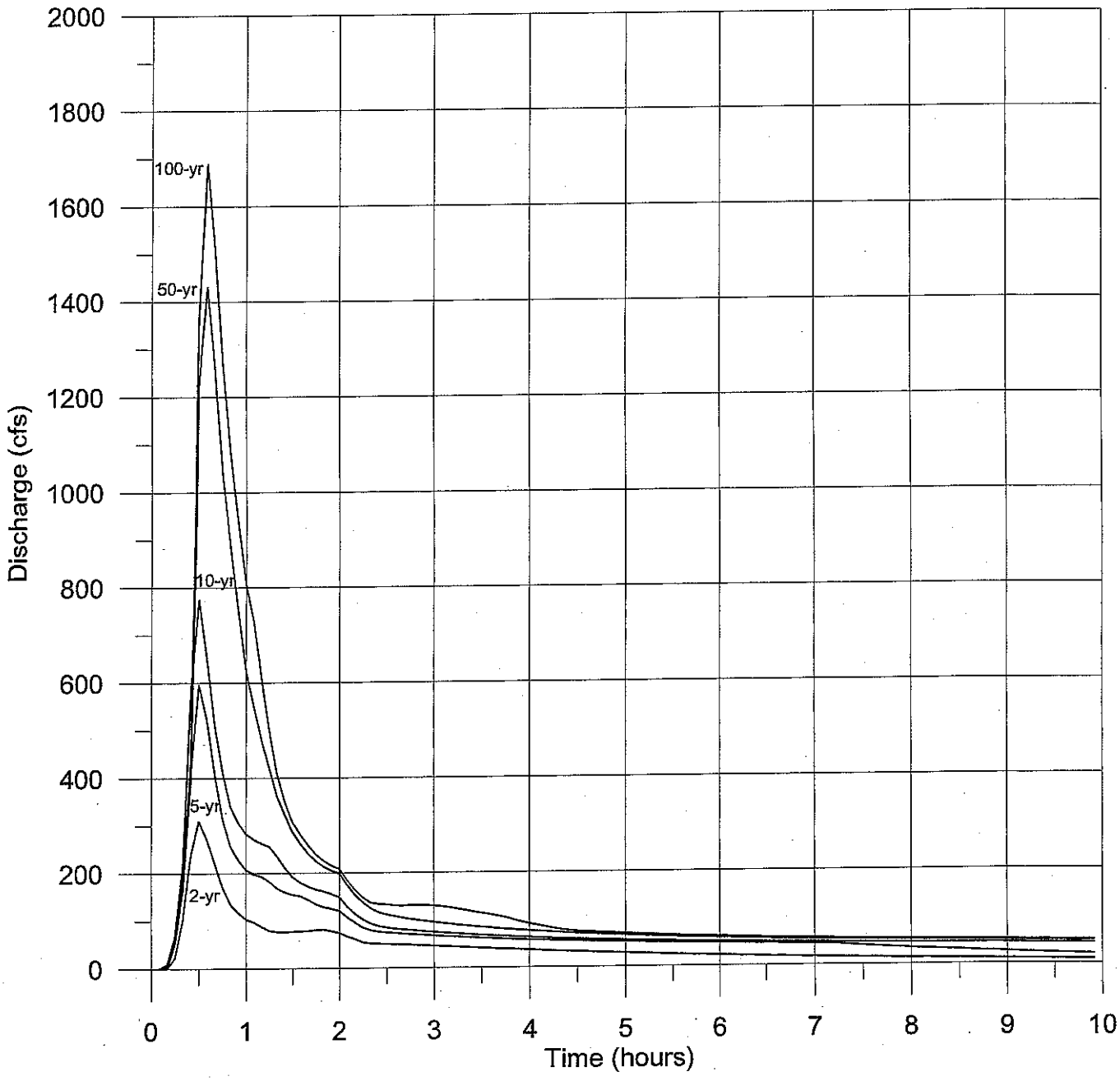

Figure D.9 Flood Hydrographs, Inflows to West Lake at Sanborn Park
Proposed Condition (EPA SWMM Node 411)

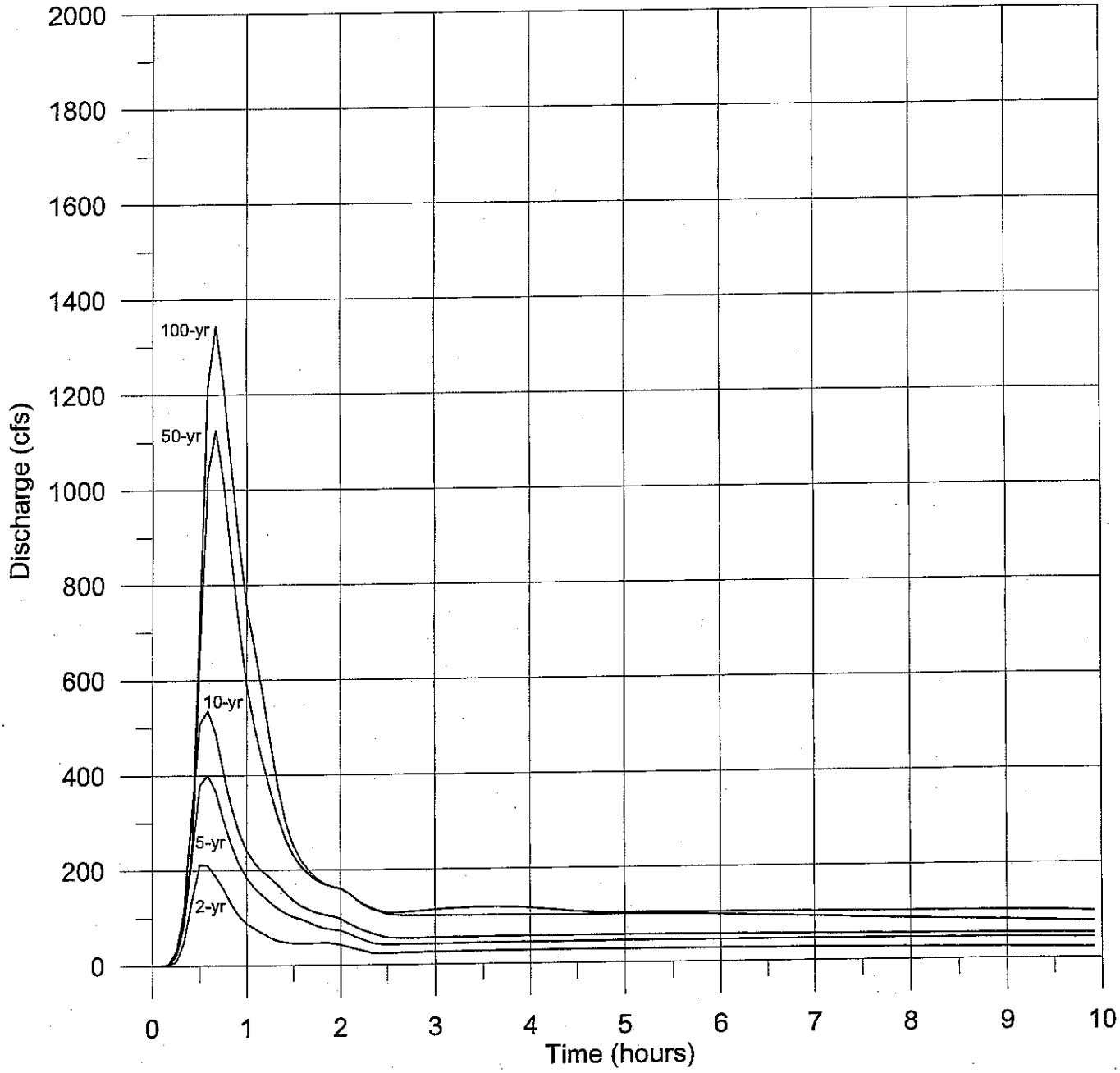

Figure D.10 Flood Hydrographs, 16th Street and 27th Avenue
Proposed Condition (EPA SWMM Node 423)

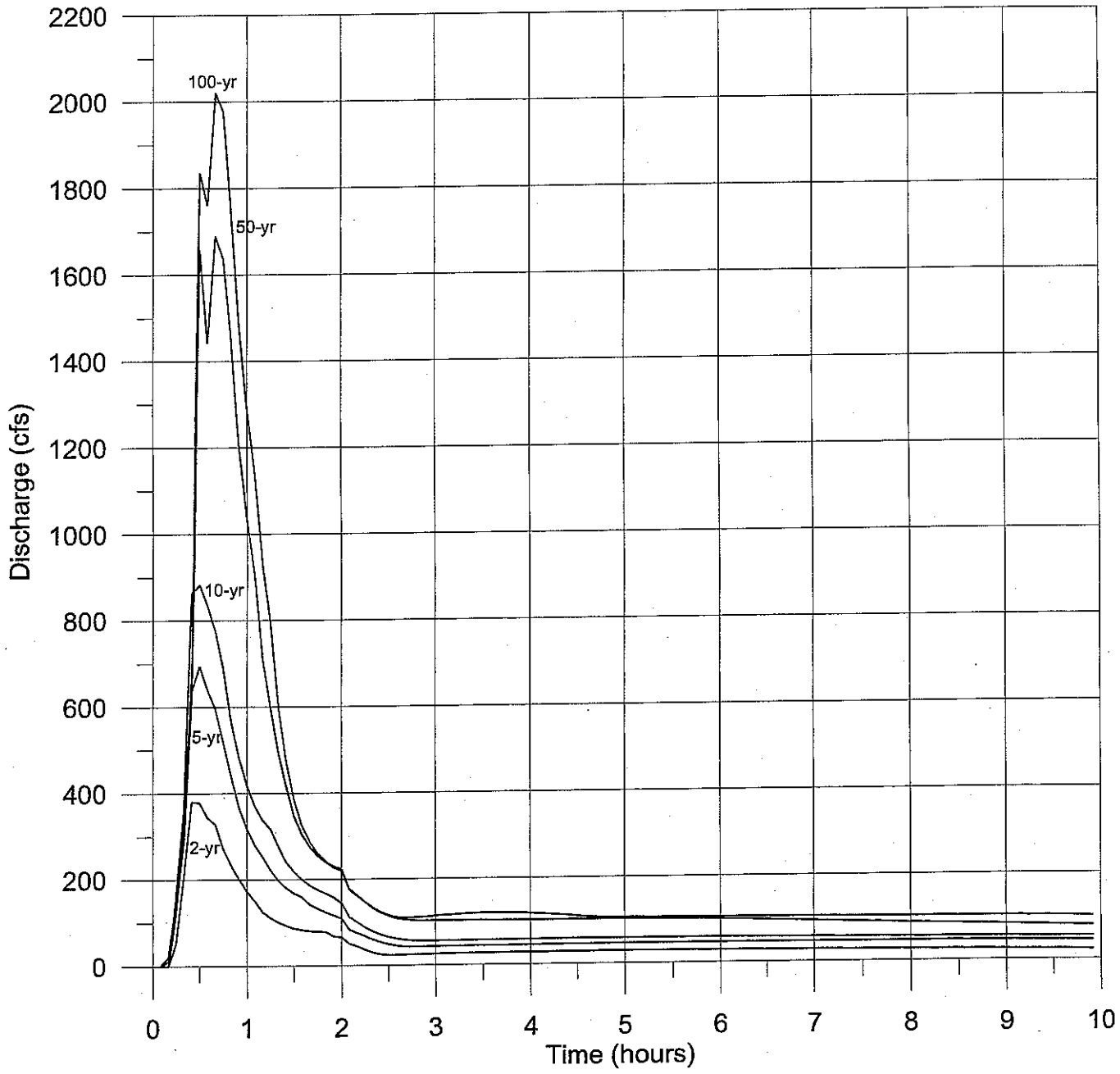

Figure D.11 Flood Hydrographs, 10th Street and 26th Avenue
Proposed Condition (EPA SWMM Node 628)

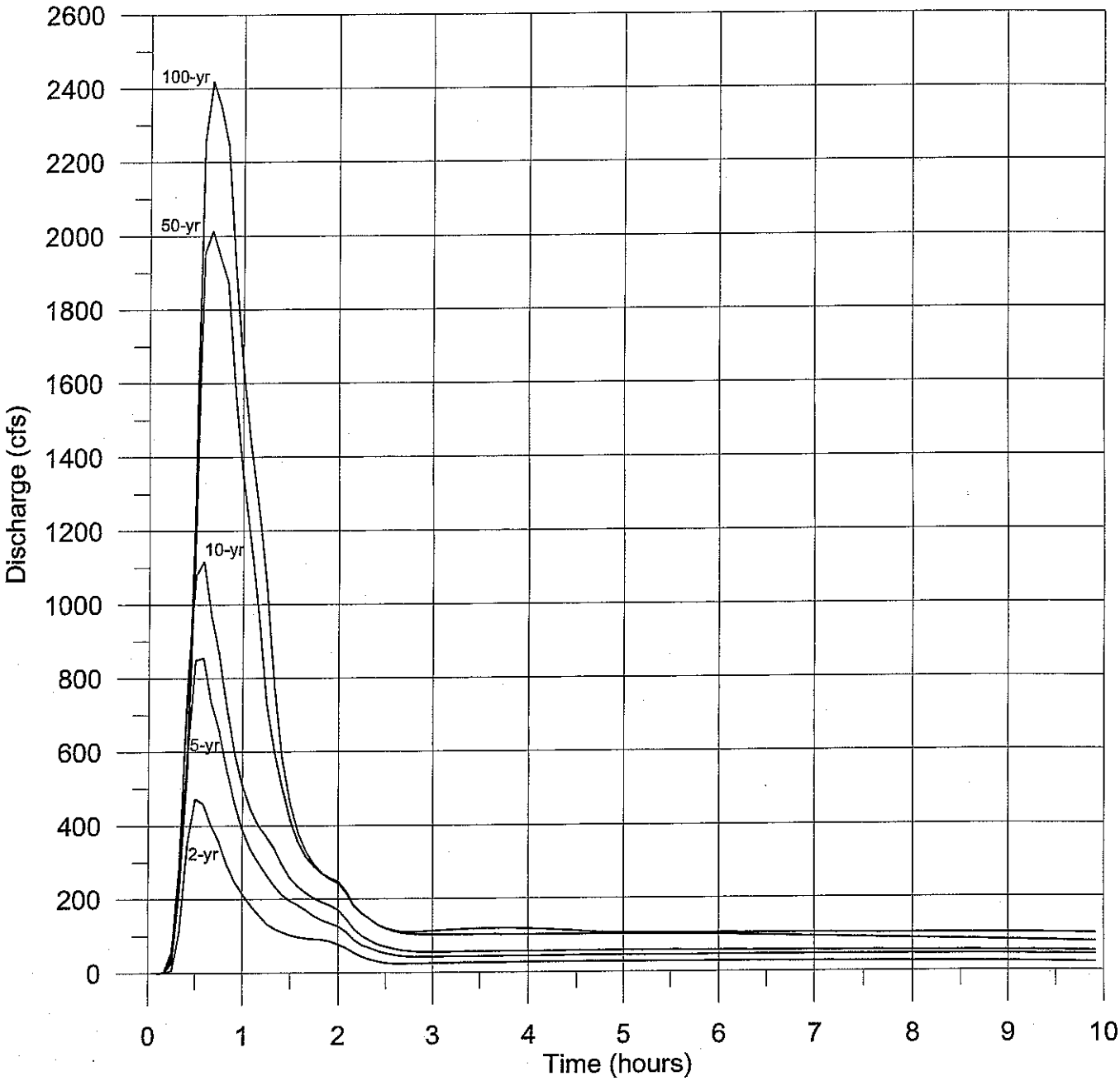

Figure D.12 Flood Hydrographs, Greeley No. 3 Ditch and 26th Avenue
Proposed Condition (EPA SWMM Node 429)