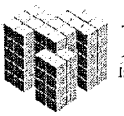
MASTER DEVELOPMENT DRAINAGE PLAN FOR THE GOLD HILL MESA

Prepared for:
City of Colorado Springs
Department of Public Works
Engineering Division

On Behalf of:
Gold Hill Mesa Township

Prepared by:



Matrix Design Group, Inc.
Integrated Design Solutions
Infrastructure Engineering
Community Development
Program Management

2925 Professional Place, #200
Colorado Springs, Colorado 80904
(719) 575-0100
fax (719) 575-0208

July 2004

ENGINEER'S STATEMENT:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City / County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Jonathan Moore, P.E. #34944

DEVELOPER'S STATEMENT:

I, the developer, have read and will comply with all of the requirements specified in this report and plan.

Business Name

By: _____

Title: GHMT Co Spr. Mgr

Address: 1040 South 8th St, Suite 101
Co Spg, CO 80906

Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

_____ For: _____ 8/10/04
City Engineer **Date**

Conditions:

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Appendix

A. INTRODUCTION

The following Master Development Drainage Plan (MDDP) has been prepared for Gold Hill Mesa Township to evaluate existing drainage conditions and conceptually size stormwater management facilities serving the 210-acre site situated within the City of Colorado Springs. The Gold Hill Mesa development is located along and south of Fountain Creek at the southeast corner of 21st Street and Highway 24, approximately 0.25 miles west of Interstate Highway 25 (See Figure 1 – Existing Topography / Drainage Basins). Gold Hill Mesa currently has residential development immediately to the south (Crown Hill Subdivision) and east (Portland Heights Subdivision). Villa de Mesa subdivision is accessed through 21st Street and is surrounded by the Gold Hill Mesa property. At the northwest corner of the site are existing retail buildings in the K&J, Golden Cycle, and Moore's Subdivisions.

The current Gold Hill Mesa development plan looks to transform the highly visible property to a range of mixed uses including commercial, residential, and open space. The redevelopment of Gold Hill Mesa is planned to have 1,699 residential dwelling units, 458,000 square feet of commercial buildings, and 107,000 square feet of office and government buildings (See Figure 4 - Gold Hill Mesa Development Plan).

Soil Conditions

Soils within the Gold Hill Mesa property consist primarily of the soil group "Badland" which originated from gold ore tailings. These tailings were deposited during the operation of the Golden Cycle Mill from 1905-1949. The hillside has severe slopes and is prone to very rapid runoff and has a high potential for erosion. A small percentage of the site consists of the soil group Chaseville-Midway complex. The permeability of this soil group is rapid, but because of the steep slopes of the area, the surface runoff is medium and the erosion potential is moderate to high. The Razor-Midway complex has gently to moderate sloping soils with moderate hazard of erosion. The Ustic Torrifluvents soil group is located adjacent to Fountain Creek and has a moderate to high hazard of erosion.

The soil groups located within the Gold Hill Mesa property are summarized below in Table 1. The information was taken from the El Paso County Soil Survey prepared by the National Resource Conservation Service.

Table 1
Current Hydrologic Soil Groups
(Source: NCRS Soil Survey for El Paso County)

Map Symbol	Name	Hydrologic Soil Group
4	Badland, 0 to 100% slopes	D
18	Chaseville-Midway complex, 5% to 50% slopes	A/D
75	Razor-Midway complex, gently sloping to moderately steep	C/D
101	Ustic Torrifluvents, loamy, 0% to 3% slopes	B

An excerpt of the soil survey map is provided in the appendices and shows the presence of D soil across 90% of the site and C soils across the remainder.

Topography

The topography of the Gold Hill Mesa property is dominated by the deposition of the gold tailings on the site between 1905 and 1949. Large channels have been formed through the erosion of the hillside toward Fountain Creek. The site drains from the southwest to the northeast with elevations varying from 6000 to 6250 feet above sea level. The top of the hill is relatively flat with slopes varying from 0.5% to 5.0%. The hill slopes steeply towards Fountain Creek at slopes varying from 10.0% to 25.0%. Approximately 85% of the property outfalls directly to Fountain Creek through several drainage basins. The majority of the remainder of the site on the southeast corner drains off the property through a natural channel to Fountain Creek downstream of the Gold Hill Mesa property. A fraction of the southwest corner of the site is part of the Bear Creek Drainage Basin.

As described above, the development will be phased and consist of a mix between commercial, residential, and open space. A Voluntary Cleanup Application (VCUP) was made on June 6, 2000 and appended on June 12, 2002. This document describes the actions that will be taken to reduce the impact of development in the area. The VCUP has been approved by the State of Colorado on December 20, 2002, and this approval letter is included in the appendix.

A ***Preliminary Geological Hazards Evaluation and Preliminary Geotechnical Investigation*** dated October 9, 2002, was generated by CTL/Thompson. This drainage report agrees with its basic assessment with regard to drainage. It is the intent of this development to convey stormwater to Fountain Creek via underground conduits and to minimize ponding areas and as a result, limit infiltration.

The steep slopes and soil properties have contributed to a large amount of erosion on the face of the hill. Deep cuts into the hillside are readily visible from Highway 24 and will be addressed as part of the development. The material management program will be established by others and is outside the scope of this report. However, it is our understanding that non-paved areas will be topped with 2.5 feet of clean fill to allow for vegetation and help to mitigate the erosion problems. Any detention ponds will be located outside the limits of the gold tailings. Detailed grading plans will be provided for the hillside development at a later stage.

B. HISTORIC DRAINAGE

The site has historically drained to Fountain Creek, either directly or indirectly across an adjacent property. A small section (2.6 acres) of the property is within the Bear Creek Drainage Basin and drains to the south into 21st Street into an existing storm sewer. The remainder of the site is broken into several drainage basins that outfall into Fountain Creek. The existing drainage basins are delineated on Figure 1 – Gold Hill Mesa: Existing Topography / Drainage Basins.

The Villa de Mesa Subdivision drains to the northeast corner of the property and outfalls onto the Gold Hill Mesa Property. The only drainage report available at the City of Colorado Springs for this area is the **Drainage Report: Villa de Mesa** prepared by R. Keith Hook & Assoc. on December 29, 1966. This report covers 328 acres including Gold Hill Mesa and Crown Hill Mesa Subdivision. Currently, the development encompasses 9.6 acres. Because of lack of information on the flows for the developed area, the contributing flows were calculated using the same criteria as the proposed area.

The majority of the site is not located within a 100-year floodplain as delineated by the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map Panel Number 08041C0728 F,

dated March 17, 1997. Because of the property's location adjacent to Fountain Creek, the area along the creek is located within the floodplain. The floodplain is shown on Figure 2 – Gold Hill Mesa: 100 / 500 - Yr Floodplain Delineated.

Improvements to Fountain Creek are currently under construction immediately downstream of the Gold Hill Mesa property. The improvements include the acquisition of property along the south side of Fountain Creek and are planned to alleviate the historical flooding problems in the Portland Heights Subdivision. Our understanding of City policy, is that no improvements will be required of Fountain Creek with the development of Gold Hill Mesa. However, improvements to Fountain Creek will be done to protect structures such as homes or commercial buildings built as part of the development. Any development along Fountain Creek within Gold Hill Mesa will be done outside the 100-Yr floodplain and floodway and any alteration of the floodplain will require consulting the City's Flood Plain Administrator and following the appropriate procedures for revising the FEMA map.

Table 2
Existing Basin Hydrology: 100-Year Storm Event (Rational Method)

Basin	Imperviousness (%)	C 10	C 100	Area (Ac)	Q_{100} (cfs)
101	0	0.30	0.45	17.60	49.10
102	0	0.30	0.45	6.80	27.54
103	0	0.30	0.45	27.70	56.09
104	0	0.30	0.45	84.80	137.38
105	0	0.30	0.45	49.80	84.04
106	0	0.30	0.45	27.20	47.74
107	0	0.30	0.45	2.06	6.49
E1	95	0.90	0.95	9.90	66.00
Totals	---				---

C. DESIGN CRITERIA

The City of Colorado Springs recommends the use of the Rational Formula for basins smaller than 100 acres. This methodology was used to analyze the hydrology on the Gold Hill Mesa property. The rainfall data and other design information were taken from the City of Colorado Springs Drainage Criteria Manual. The following tables / figures are included in the Appendix:

1. Intensity-Duration-Frequency Curves
2. Recommended Average Runoff Coefficients and Percent Impervious
3. Overland Flow Curves
4. Estimate of Average Flow Velocity for Use with the Rational Formula

For existing conditions, the runoff coefficient was taken from Table 5-1 of the Colorado Springs Drainage Criteria Manual for "Undeveloped Area-Greenbelts, Agricultural" and soil group C&D. As shown in Table 2, the coefficients used for the 5-year and 100-year event were 0.30 and 0.45. Times of concentrations were based on tables from the City of Colorado Springs for Overland Flow Curves for a maximum of 1000 foot run. The remainder of the time of concentration was calculated using a defined waterway.

The runoff coefficients were determined based on the proposed land uses. While there are large concentrations of open space on the high end of the site, a composite coefficient of 0.80 and 0.70 was used for the 100-year and 5-year storm, respectively. A percent impervious of 80% was used for the commercial / office areas and 70% for the residential areas.

The report analyzes the hydrological impacts of the development to determine the effects of the 5-year (Minor) and the 100-year (Major) storm events and the infrastructure required to convey the storm runoff.

Table 3
5-Year & 100-Year Storm Runoff (Proposed)

Basin	Area (Ac)	C_5	C_{100}	Tc (min)	I_5	I_{100}	Q_5	Q_{100}
A	162.92	0.73	0.80	15.42	3.5	6.1	416.3	795.1
B	55.68	0.70	0.76	12.5	3.7	6.7	144.2	283.5

D. DRAINAGE PLAN

The drainage plan for Gold Hill Mesa addresses the current erosion problems that exist at the proposed site. As mentioned earlier, the VCUP discusses to some degree the material management program that includes the placement of a "viable barrier between residual tailings and the end user of the site." This plan will help to reduce the amount of surface runoff by directing runoff on surface streets and underground conveyance systems. Fountain Creek will be protected from further erosion caused by runoff from Gold Hill Mesa by using several locations to outfall the developed flows. Structures will be designed so as to dissipate the high velocities of runoff prior to entering Fountain Creek. The proposed hydrology including basins, outfall locations, and trunk storm sewer size and locations are shown on Figure 3. Details of outfalls and energy dissipaters will be done as the design of the development progresses.

Basin A consists of 162.92 acres along the western side of the over-all development. This basin includes flows from Villa de Mesa Subdivision and the future commercial area. Based on this basin information, the Water Quality Pond (WQP) #1 needs to be 1.07 acres, see appendix for calculation. A diversion box will be placed outside the WQP to limit the amount of storm water that enters the pond to the 5-Year storm event threshold. All remaining storm water will be routed around the pond and will discharge into Fountain Creek.

Basin B consists of 55.68 acres along the eastern side of the over-all development. This basin will only include flows from this site. Based on this basin information, the Water Quality Pond (WQP) #2 needs to be 0.31 acres, see appendix for calculation. A diversion box will be placed out side the WQP to limit the amount of storm water that enters the pond to the 5-Year storm event threshold. All remaining storm water will be routed around the pond and will discharge into Fountain Creek.

E. STORMWATER MANAGEMENT

The two goals at the Gold Hill Mesa development are to provide safe conveyance of runoff and to protect the water quality. The first item is accomplished by properly sizing the conveyance elements to protect the existing and proposed development. The second goal is generally accomplished through a multi-level, multi element approach of what is termed best management practices (BMPs).

Traditionally, BMP's include detention ponds, elements of detention ponds such as the outlet works systems, smaller storage ponds known as water quality ponds, and grass swales. These elements and others will be incorporated into the Gold Hill Mesa drainage plan. A recent concept will also be employed to the extent practicable: Minimization of Directly Connected Impervious Areas (DCIA). This is a simple concept, which is to direct runoff through vegetated areas in order to provide for natural filtering and treatment of containments in the runoff. Implementation of DCIA has only a negligible affect on major storm runoff peaks, but can provide significant improvements of water quality from urban areas.

The majority of the Gold Hill Mesa development does not lend itself to the most common type of BMP. The presence of gold tailings prevents the use of water quality and detention ponds to provide treatment of water prior to outfall. In areas where the gold tailings are present, the Stormceptor product that treats water by separating the stormwater from oil, sediment, and other pollutants from urban runoff will be widely used on this development. Where possible, typical water quality ponds will be constructed to treat the runoff prior to outfall to Fountain Creek.

F. CONCLUSION

In summary, the Gold Hill Mesa development will convey the 100-yr flows within proposed roadways and underground drainage facilities on the southern, high end of the development. Due to steep slopes and erosion potential, the 100-yr flows will be conveyed down the steep slopes completely underground. Several outfall structures will release directly to Fountain Creek with a total flow of 1081 cfs. This concept will have to be examined further to determine possible impacts to the existing subdivision. All outfall structures will also serve as energy dissipaters so as to reduce to the erosion problems within Fountain Creek. As further refinement of the grading and development plan take place, the method of conveyance may be adjusted to provide more surface drainage.

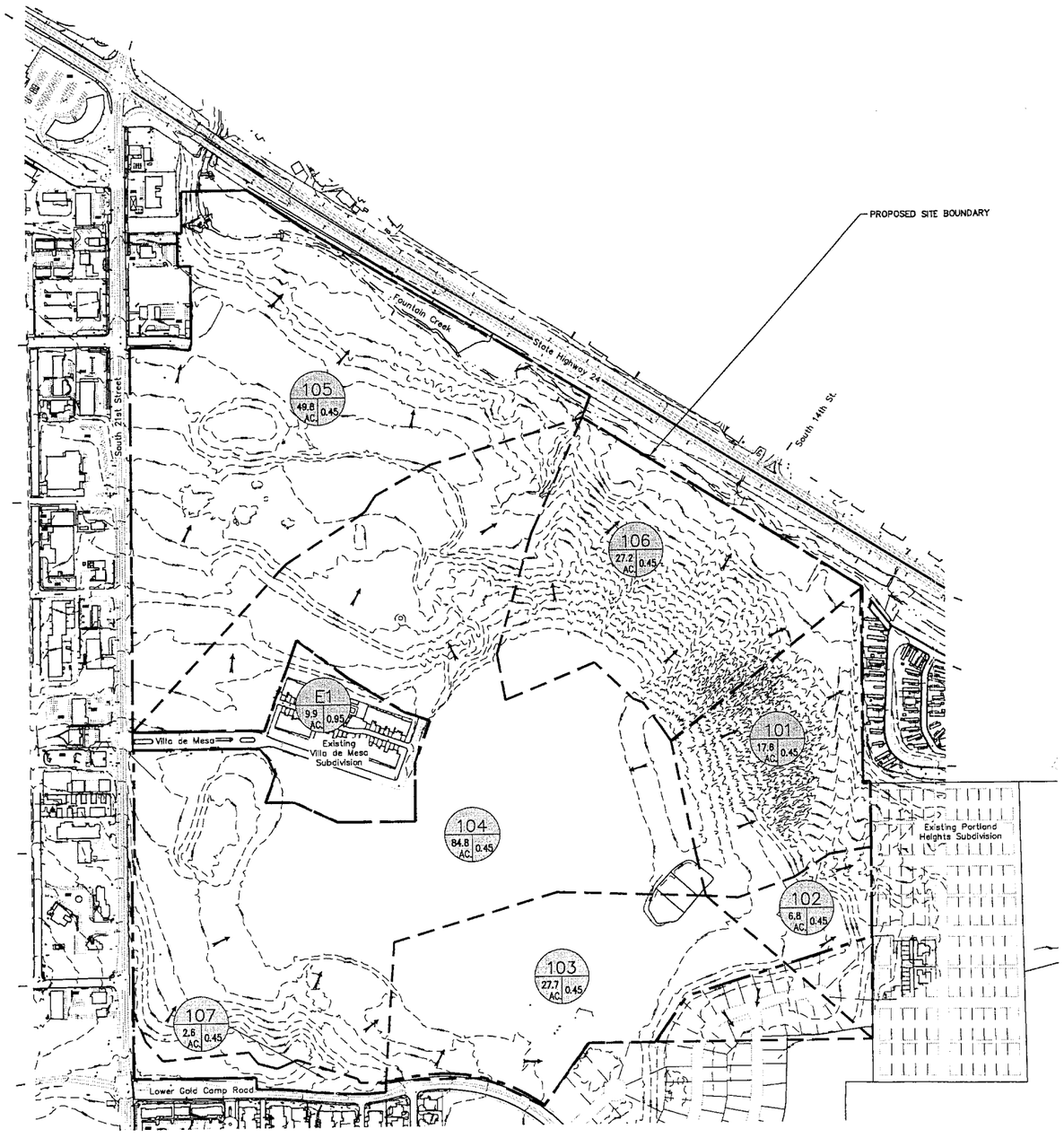
The Extended Detention Basin Pond #1 will be built with the first Filing and no development will occur in Basin B until the Extended Detention Basin Pond #2 is built. No development in the vicinity of Fountain Creek will be allowed until improvements or prudent line/build to line has been established.

This report attempts to address comments made to the MDDP dated April 2004. It represents the ongoing effort in the redevelopment of the Gold Hill Mesa property. We welcome any additional comments the City of Colorado Springs may have with regards to the drainage issues of this area.

G. REFERENCES

1. **Soil Survey of El Paso County Area, Colorado**, United States Department of Agriculture Soil Conservation Service, June 1981.
2. **Master Development Drainage Plan for Crown Hill Mesa Subdivision**, Associated Design Professionals, Inc., November 15, 1995.
3. **Voluntary Cleanup Application (VCUP)**, Spectrum Services, June 6, 2000, and June 12, 2002.
4. **Villa de Mesa: Preliminary Drainage Report**, R. Keith Hook & Assoc., December 29, 1966.
5. **Fountain Creek Drainage Basin Planning Study**, Volume 1, Muller Engineering Company, Inc., July 1994.
6. **Drainage Study of the Bear Creek Basin**, Lincoln DeVore Engineers, December 1980.
7. **Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map Panel Number 08041C0728 F**, dated March 17, 1997

H. APPENDIX



N

GRAPHIC SCALE

300 0 150 300 600

(IN FEET)
1 inch = 300 ft.

LEGEND

- EXISITING BASIN BOUNDARY
- PROPOSED PROPERTY LINE
- EXISTING FLOW DIRECTION ARROW
- BASIN DESIGNATION
- "C" COEFFICIENT (100 YR)
- BASIN AREA (ACRES)

XX – X
X.XX AC X.XX

REFERENCE DRAWINGS

X-EX-TOPO
X-TITLE
X-EX-FEAT

NO.	DATE	DESCRIPTION	BY

REVISIONS

NAME: S:\03.028.007(Phase1)\dwg\DEVELOP\STRM\MODP\EXTP1.dwg
PCP: Matrix.ctb
PLOT DATE: Wed Apr 28, 2004 11:34am

BENCHMARK DATA(ELEV.)
(DATUM)
(DESCRIPTION/LOCATION)

FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

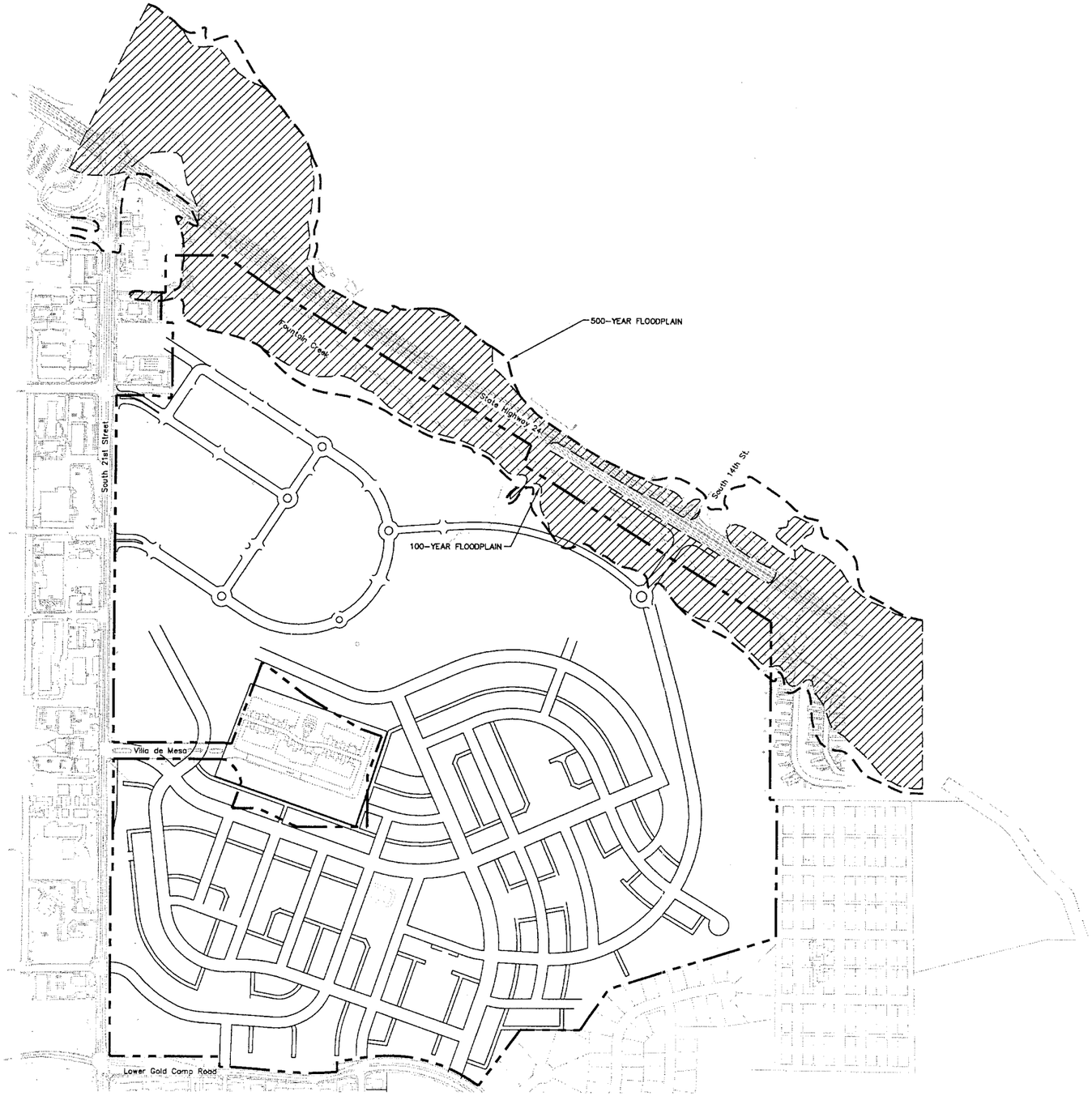
Matrix Design Group, Inc.
Integrated Design Solutions
2925 Professional Place, Suite 202
Colorado Springs, CO 80904
Phone 719-575-0100
Fax 719-575-0208

GOLD HILL MESA

FIGURE 1

EXISTING TOPOGRAPHY/ DRAINAGE BASINS

DESIGNED BY: JCM	SCALE	DATE ISSUED: APRIL, 2004	
DRAWN BY: JLB	HORIZ: 1"=300'		
CHECKED BY: JCM	VERT: N/A	SHEET NO. OF SHEETS	1



N

GRAPHIC SCALE

300 0 150 300 600

(IN FEET)
1 inch = 300 ft.

LEGEND

- 500-YEAR FLOODPLAIN
- 100-YEAR FLOODPLAIN
- PROJECT LIMITS

* FLOODPLAINS AREA AS DELINEATED ON FLOOD INSURANCE RATE MAP FOR EL PASO COUNTY, COLORADO AND INCORPORATED AREAS, MAP NUMBER 08041C0728F, DATED MARCH 17, 1997.

REFERENCE DRAWINGS

X-TITLE
X-EX-FEAT
X-BASE

NO.	DATE	DESCRIPTION	BY

REVISIONS

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PCP: Matrix.ctb
PLOT DATE: Wed Apr 28, 2004 11:35am

BENCHMARK DATA(ELEV.)
(DATUM)
(DESCRIPTION/LOCATION)

FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

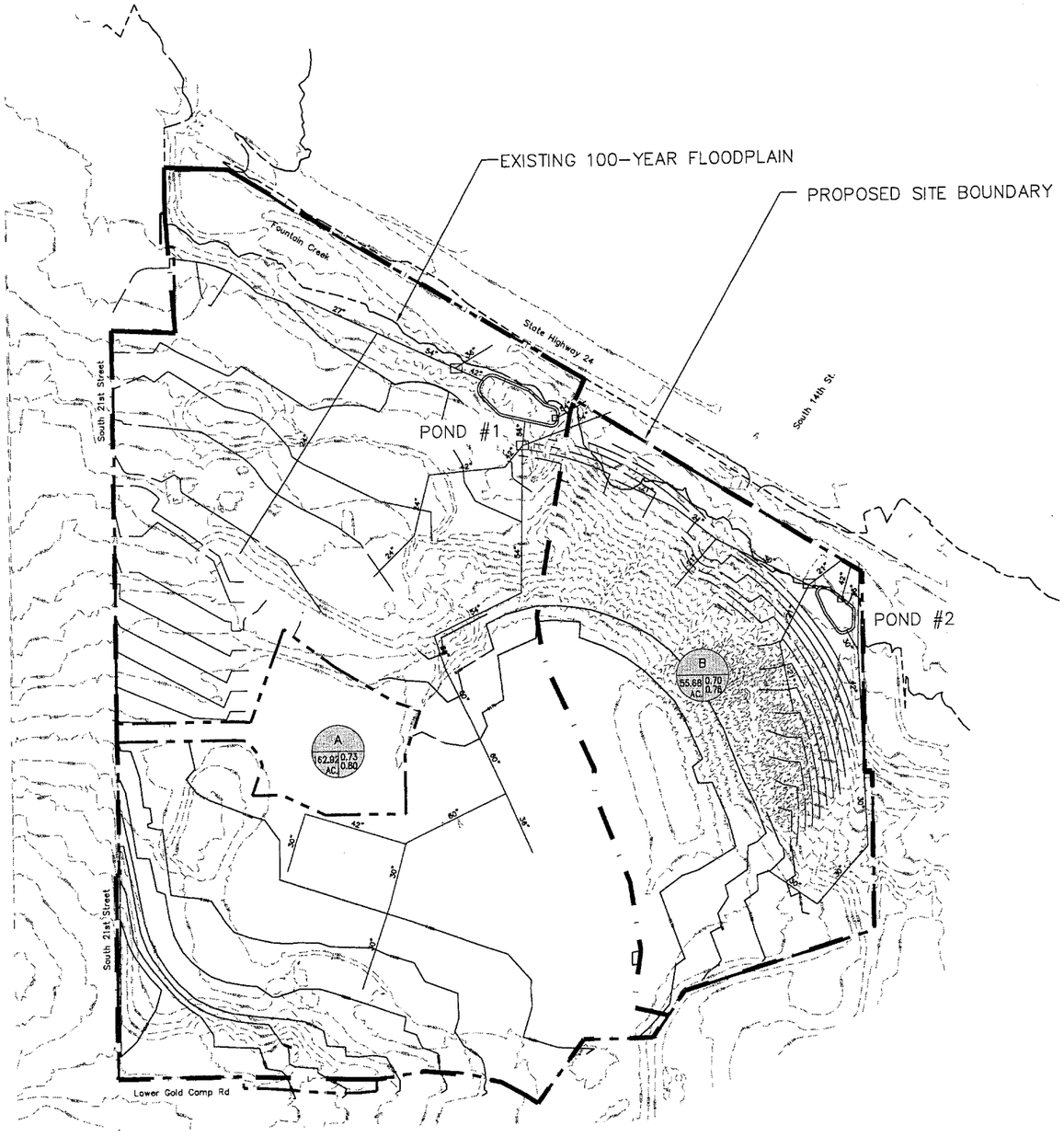
Matrix Design Group, Inc.
Integrated Design Solutions
2925 Professional Place, Suite 202
Colorado Springs, CO 80904
Phone 719-575-0100
Fax 719-575-0208

GOLD HILL MESA

FIGURE 2

100-YR/ 500-YR FLOODPLAIN DELINEATED

DESIGNED BY: JCM	SCALE	DATE ISSUED: APRIL, 2004	
DRAWN BY: JLB	HORIZ: 1"=300'		
CHECKED BY: JCM	VERT: N/A	SHEET NO. OF SHEETS	2



N

GRAPHIC SCALE

300 0 150 300 600

(IN FEET)
1 inch = 300 ft.

LEGEND

- PROPOSED BASIN BOUNDARY
- PROPOSED PROPERTY LINE
- PROPOSED WATER QUALITY POND
- 42" PROPOSED STORM PIPE
- 6250 PROPOSED 20' CONTOUR
- BASIN DESIGNATION
- "C" COEFFICIENT (100 YR)
- BASIN AREA (ACRES)

REFERENCE DRAWINGS
X-EX-TOPO
X-TITLE
X-EX-FEAT
X-BASE
X-PP-TOPO

NO.	DATE	DESCRIPTION	BY

REVISIONS

NAME: S:\03.028.007(Phase1)\dwg\DEVELOP\STRM\MDDP\PB01.dwg
PCP: Matrix.ctb
PLOT DATE: Mon Jul 12, 2004 10:31am

BENCHMARK DATA(ELEV.)
(DATUM)
(DESCRIPTION/LOCATION)

FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

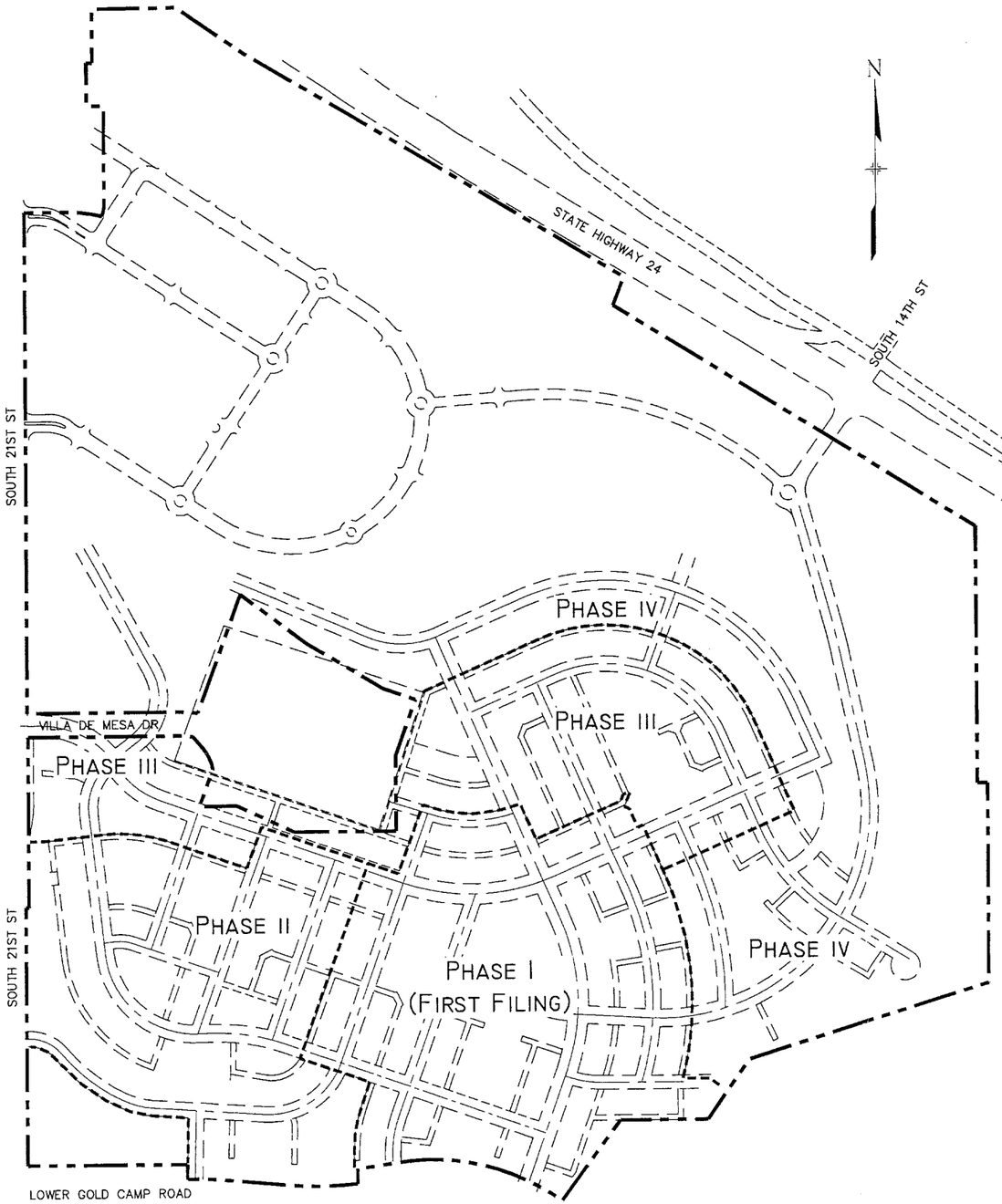
Matrix Design Group, Inc.
Integrated Design Solutions
2925 Professional Place, Suite 202
Colorado Springs, CO 80904
Phone 719-575-0100
Fax 719-575-0208

GOLD HILL MESA

FIGURE 3

PROPOSED BASINS

DESIGNED BY:	JCM	SCALE		DATE ISSUED: APRIL, 2004	3
DRAWN BY:	JLB	HORIZ:	1"=300'		
CHECKED BY:	JCM	VERT:	N/A	SHEET NO. OF SHEETS	



LEGEND

- PROJECT LIMITS
- PHASE LIMITS
- ROW LIMITS

REFERENCE DRAWINGS	NO	DATE	DESCRIPTION	BY
X-BASE X-TITLE				

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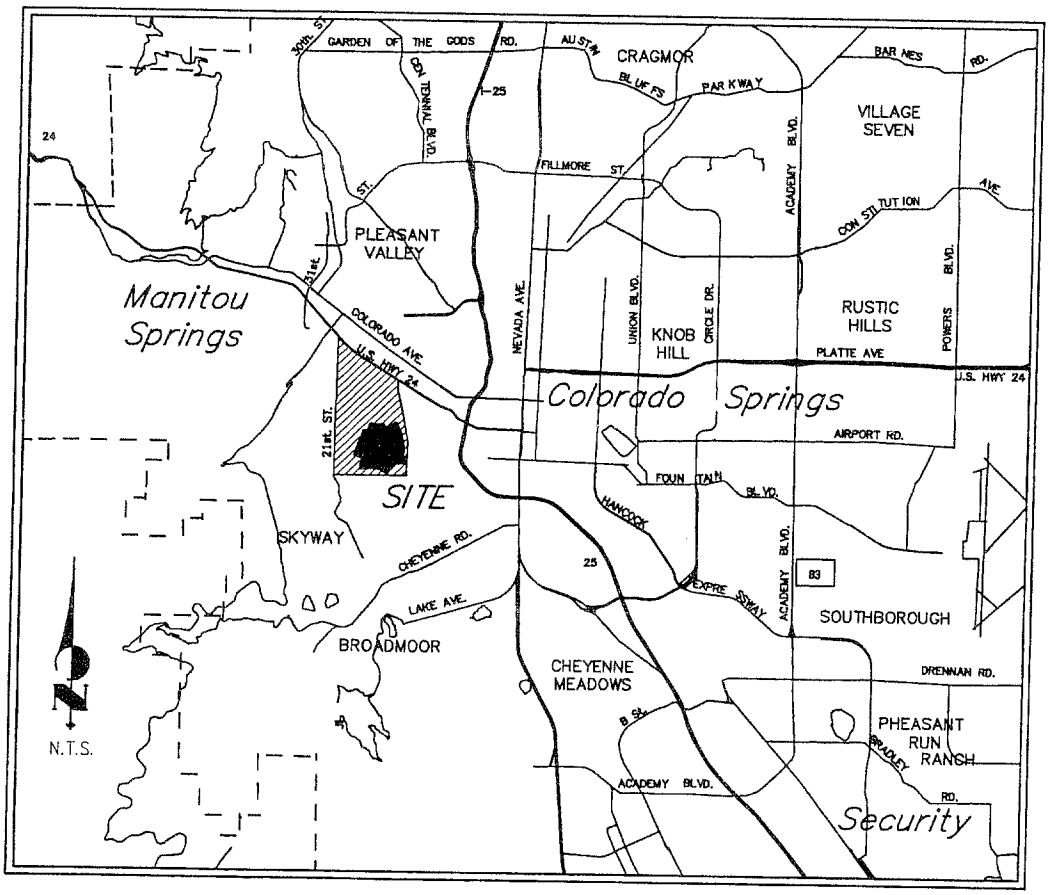
GOLD HILL MESA

FIGURE 4

DEVELOPMENT PLAN


JOINS PANEL 0726
ZONE X
ZONE AE
AVENUE
S 22ND STREET
11
6049
EX
EW
EV
EU
ET
ES
ER
EQ
EP
EO
S 20TH ST
WEST PIKES PEAK AVENUE
S 19TH ST
WEST COLORADO AVENUE
S 18TH ST
WEST CUCHARRAS AVENUE
S 17TH ST
SOUTH 17TH STREET
SOUTH 16TH STREET
SOUTH 15TH STREET
KIOWA STREET
BIJOU STREET
VERMIJO AVENUE
HAYES STREET
DENVER & RIO GRANDE WESTERN
MIDLAND EXPRESSWAY
BALTIMORE CIRCLE
BOSTON TERRACE
ARCH STREET
CALVERT AVENUE
PINE STREET
PECAN STREET
SOUTH 21ST STREET
OF COLORADO SPRINGS
080060
SOUTH BLVD
14
VILLA DE MESA DRIVE
CALLE DE SEVILLE
CALLE DE ORO
SKYVIEW LANE
FOUNTAIN BLVD
WEST RIO GRANDE STREET
WEST MORENO
6028
6026
6024
6022
6018
6016
6011
6008
6004
5999
6216
6210
6205
6200
6195
6190
6185
6180
6175
6172
6168
6163
6158
6152
6148
6134
6100
6080
6035
6031
6010
6005
Bottom Site
Top Site

GOLD HILL MESA
VICINITY MAP



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Colorado Springs, CO 80904
Phone 719-575-0100
Fax 719-575-0208

STATE OF COLORADO

Bill Owens, Governor
Douglas H. Benevento, Acting Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
TDD Line (303) 691-7700
Located in Glendale, Colorado

http://www.cdphe.state.co.us

Laboratory and Radiation Services Division
8100 Lowry Blvd.
Denver, Colorado 80230-6928
(303) 692-3090

Colorado Department
of Public Health
and Environment

December 20, 2002

Mr. Robert Willard
ERSH, L.L.C.
1040 S 8th ST Suite 101
Colorado Springs, CO 80906

Re: Voluntary Cleanup Plan Approval, Gold Hill Tailing Pile, 21st ST and Highway 24, Colorado Springs, Colorado.

Dear Mr. Willard:

The Colorado Department of Public Health and Environment (the "Department") has reviewed the voluntary cleanup plan submitted on behalf of ERSH, L.L.C. (the Applicant) concerning the property identified in the application and known as the Gold Hill Tailing Pile, 21st ST and Highway 24, Colorado Springs, Colorado (the site). This review was limited to the materials submitted by the Applicant, as well as those materials required by 25-16-304(2) C.R.S.

Based on this review the Department has concluded that, if fully and properly implemented, the plan will attain a degree of cleanup and control of hazardous substances and petroleum products, such that the property does not present an unacceptable risk to human health or the environment based on the property's proposed future use which is mixed use, substantially similar to Figure 2 of the application (Conceptual Master Plan I).

In accordance with the Voluntary Cleanup and Redevelopment Act 25-16-301 to 311, C.R.S., the Department hereby approves the voluntary cleanup plan submitted by the Applicant for the property identified in the application and located near 21st ST and Highway 24 in Colorado Springs, Colorado. It is the opinion of the Colorado Department of Public Health and Environment that upon completion of the voluntary cleanup plan no further action is required to assure that this property, when used for the purposes identified in the voluntary cleanup plan (mixed use, substantially similar to Figure 2 of the application [Conceptual Master Plan I]), is protective of existing and proposed uses and does not pose an unacceptable risk to human health or the environment at the site.

The approval of the voluntary cleanup plan by the Department, and the Department's conclusions and opinions relating thereto, apply only to conditions on the property and state standards that exist at the time of submission of, and which were addressed in the voluntary cleanup plan application. The submission of any materially misleading information by the Applicant in the context of a voluntary cleanup plan shall render the Department's approval of the plan void. Also, failure of the Applicant to materially comply with the voluntary cleanup plan shall render the Department's approval of the plan void.

Further, if the voluntary cleanup plan is not initiated within twelve months after approval by the Department, or completed within twenty-four months after approval or within a Department approved extension for completion of the voluntary cleanup plan, the approval shall lapse, and reapplication and Department approval pursuant to 25-16-306(4), C.R.S. is required prior to implementation of the lapsed voluntary cleanup plan.

Within forty-five days after completion of the voluntary cleanup described in the plan approved by the Department, the Applicant shall provide to the Department a certification from a qualified environmental professional that the voluntary cleanup plan has been fully implemented. Any person who fails after initiation of an approved voluntary cleanup plan, to fully and properly implement the plan, may be required by the Department to take further action, provided such action is authorized or required under applicable state laws and regulations.

The Applicant shall comply with all applicable federal, state, and local laws or regulations and shall obtain all necessary approvals or permits to conduct the activities required by the voluntary cleanup plan. The Department makes no representation with respect to approvals or permits required by federal or local laws or regulations or state laws or regulations other than the Voluntary Cleanup and Redevelopment Act.

Further, the Department shall not be liable for any injuries or damages to persons or property resulting from acts or omissions of the Applicant or those acting for or on behalf of the Applicant, including its officers, employees, agents, successors, representatives, contractors, or consultants in carrying out the activities required by the voluntary cleanup plan. Nothing in the Department's approval of the voluntary cleanup plan, or the Department's conclusions or opinions relating thereto, shall constitute an express or implied waiver of sovereign immunity otherwise applicable to the Department, its employees, agents, or representatives.

Nothing in this letter shall be construed to limit the Department's authority, and the Department reserves all rights and authorities to bring any action pursuant to applicable state laws or regulations.

If you have any questions, please call me at (303) 692-3449.

Sincerely,

Mark E Walker

Mark E. Walker
Voluntary Cleanup Program

cc: RV020614'1
Sandy Friedman, El Paso County Health Dept.
James Mayerl, City of Colorado Springs Planning Dept.

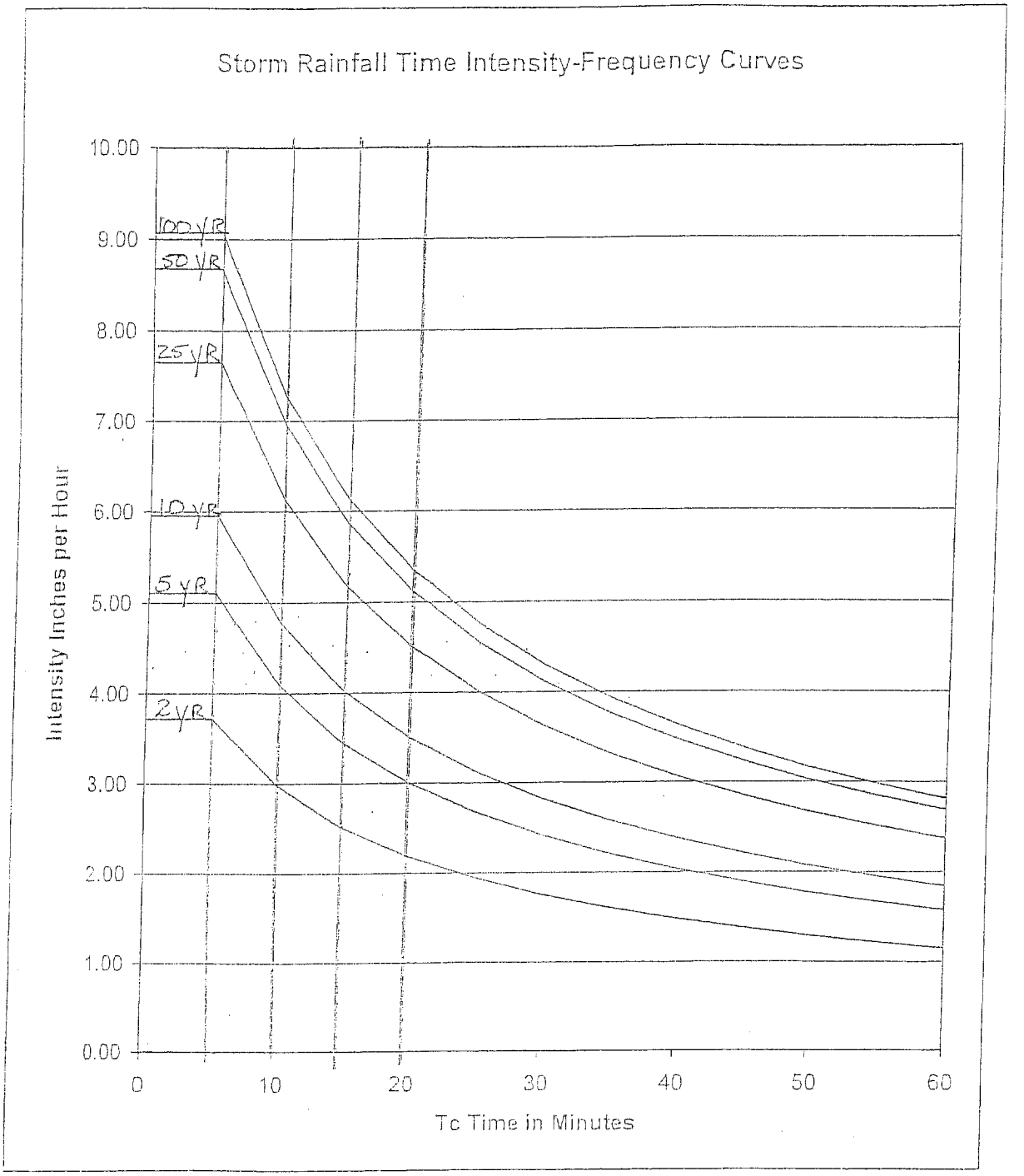
TABLE 5-1

RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY 10 A&B*	10 C&D*	100 A&B*	100 C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.60	0.70	0.70	0.80
1/4 Acre	40	0.50	0.60	0.60	0.70
1/3 Acre	30	0.40	0.50	0.55	0.60
1/2 Acre	25	0.35	0.45	0.45	0.55
1 Acre	20	0.30	0.40	0.40	0.50
Industrial					
Light Areas	80	0.70	0.70	0.80	0.80
Heavy Areas	90	0.80	0.80	0.90	0.90
Parks and Cemeteries	7	0.30	0.35	0.55	0.60
Playgrounds	13	0.30	0.35	0.60	0.65
Railroad Yard Areas	40	0.50	0.55	0.60	0.65
Undeveloped Areas					
Historic Flow Analysis- Greenbelts, Agricultural	2	0.15	0.25	0.20	0.30
Pasture/Meadow	0	0.25	0.30	0.35	0.45
Forest	0	0.10	0.15	0.15	0.20
Exposed Rock	100	0.90	0.90	0.95	0.95
Offsite Flow Analysis (when land use not defined)	45	0.55	0.60	0.65	0.70
Streets					
Paved	100	0.90	0.90	0.95	0.95
Gravel	80	0.80	0.80	0.85	0.85
Drive and Walks	100	0.90	0.90	0.95	0.95
Roofs	90	0.90	0.90	0.95	0.95
Lawns	0	0.25	0.30	0.35	0.45

* Hydrologic Soil Group

9/30/90



Rainfall Depth - Duration - Frequency Table derived from Rainfall Atlas III for Colorado
Resource: Guo, James C.Y., (2001) "Urban Storm Water Modeling", Chapter 5: Runoff Prediction for Small Catchment, published by Auraria Campus Book Company, University of Colorado at Denver, Denver, Colorado.

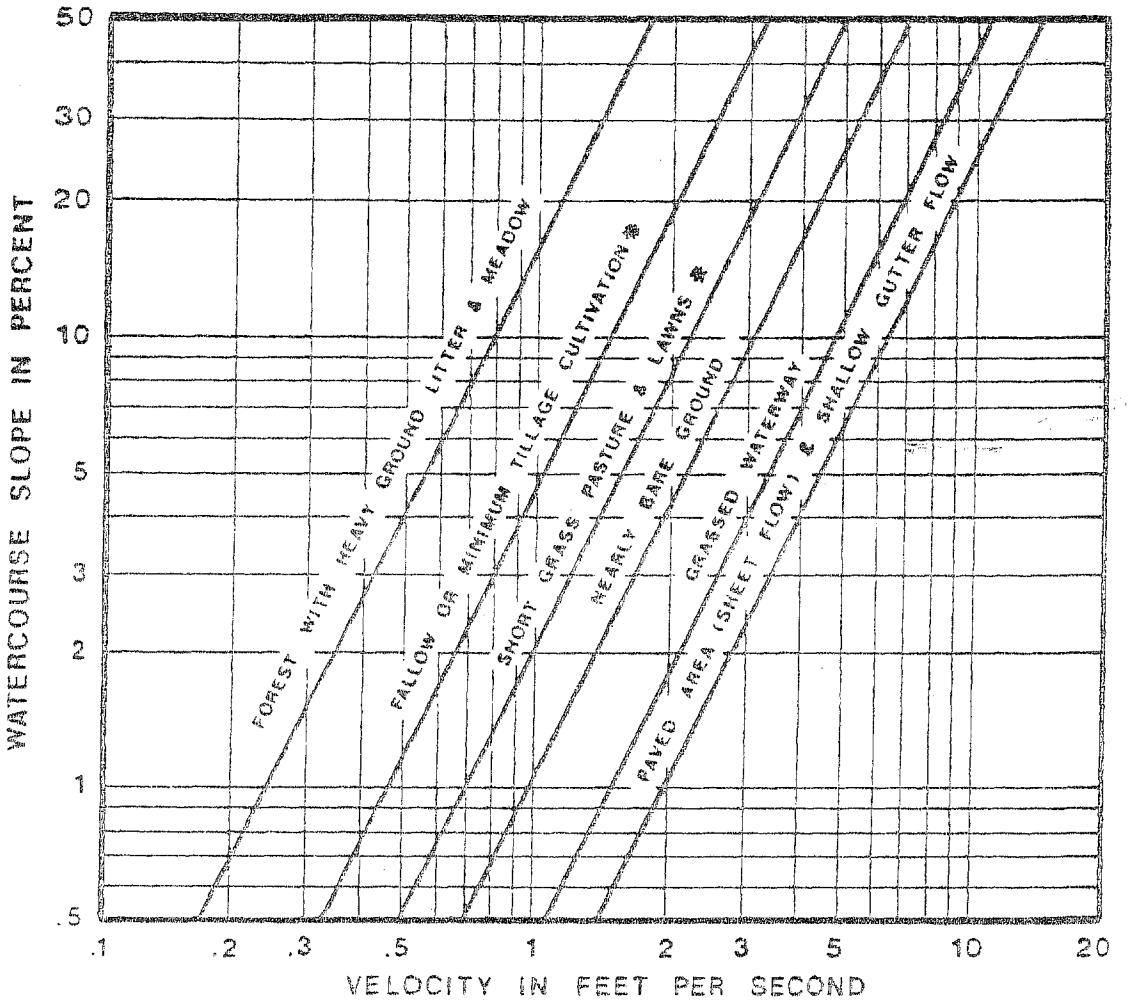
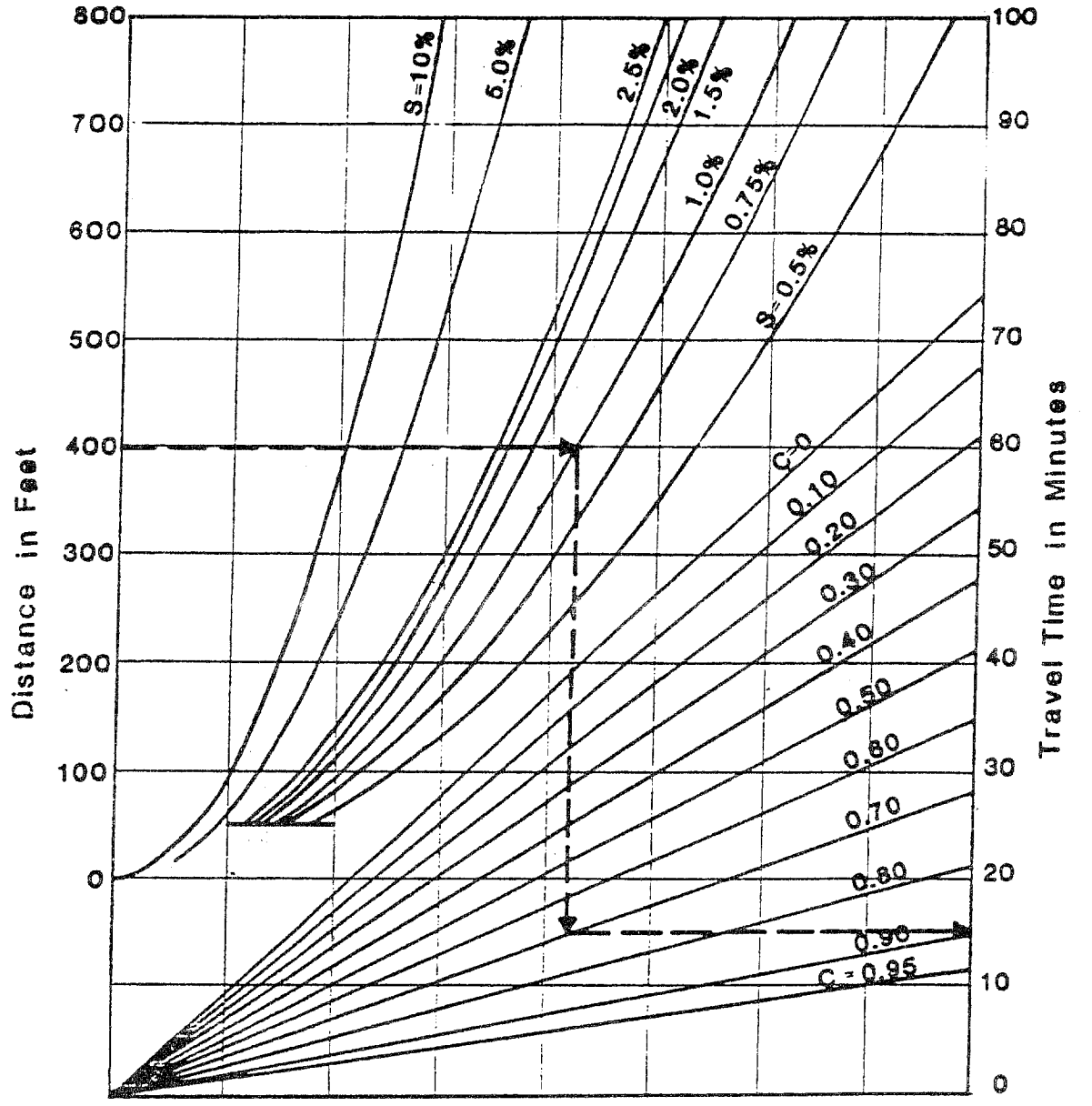


FIGURE RO-1

Estimate of Average Overland Flow Velocity for Use With the Rational Formula



REFERENCE : Wright - McLaughlin Engineers, Urban Storm Drainage Criteria Manual, Vol. 1, Denver Regional Council of Governments, Denver, Co. 1977

HDR Infrastructure, Inc.
A Centerra Company

The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Overland Flow Curves

Date: OCT. 1987

Figure: 5-2

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 728 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

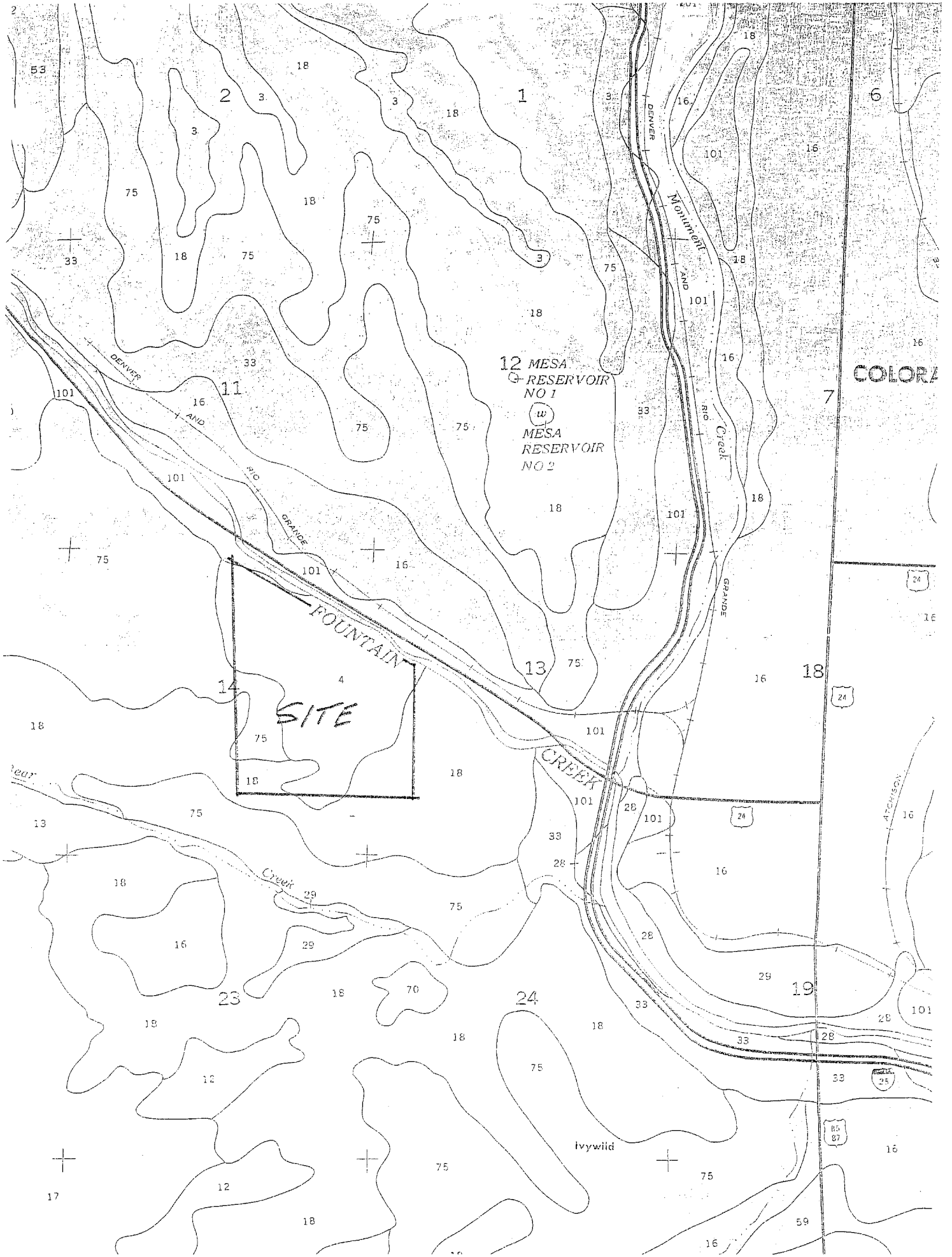
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0728	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0728	F

MAP NUMBER
08041C0728 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency


MESA
RESERVOIR
NO 1
MESA
RESERVOIR
NO 2
FOUNTAIN
CREEK
SITE
DENVER
AND
RIO
GRANDE
Monument
Creek
Ivywild
COLORA

Matrix Design Group, Inc.
Integrated Design Solutions
Infrastructure Engineering
Community Development
Program Management

BASIN A

Water Quality Volume - Extended Detention Basin (EDB)

Total Imperv. Ratio (I)	0.80	
WQCV (inches)	0.33	WQCV = 1.0*(0.91*I^3-1.19*I^2+0.78*I)
Site Area (Acres)	162.92	(40-hour Drain Time)
Vwq (Ac-Ft)	**5.35**	Vwq=WQCV*Acres*1.2
Dwq (feet)	5.0	
Dbs (feet)	6.5	
Dmp (feet)	2.5	
15% Bottom Stage (Ac-Ft)	0.80	
Bottom Stage Area (Ac)	0.09	
Total WQP Area (Ac)	**1.07**	

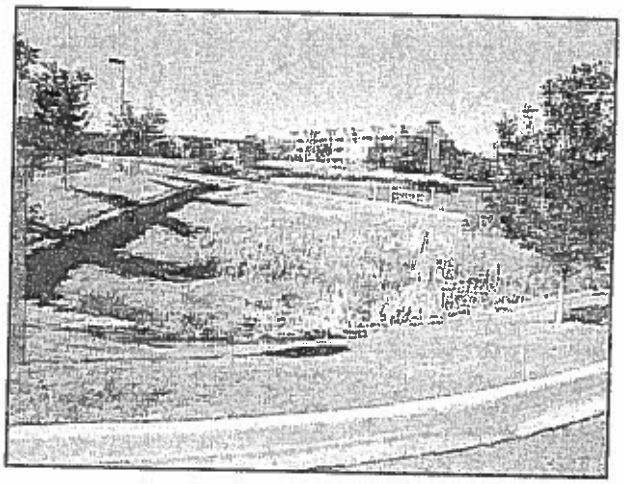
BASIN B

Water Quality Volume - Extended Detention Basin (EDB)

Total Imperv. Ratio	0.70	
WQCV (inches)	0.28	WQCV = 1.0*(0.91*I^3-1.19*I^2+0.78*I)
Site Area (Acres)	55.68	(40-hour Drain Time)
Vwq (Ac-Ft)	**1.53**	Vwq=WQCV*Acres*1.2
Dwq (feet)	5.0	
Dbs (feet)	6.5	
Dmp (feet)	2.5	
15% Bottom Stage (Ac-Ft)	0.23	
Bottom Stage Area (Ac)	0.03	
WQP Area (Ac)	**0.31**	

S:\03.028.007(Phase1)\Drainage Study\MDDP\[WQP's.xls]Sheet1
By: Jonathan Moore
7/6/2004 14:57
Project: Gold Hill Mesa

Extended Detention Basin (EDB)—Sedimentation Facility



Description

An extended detention basin (EDB) is a sedimentation basin designed to totally drain dry sometime after stormwater runoff ends. It is an adaptation of a detention basin used for flood control. The primary difference is in the outlet design. The EDB uses a much smaller outlet that extends the emptying time of the more frequently occurring runoff events to facilitate pollutant removal. The EDB's drain time for the brim-full water quality capture volume (i.e., time to fully evacuate the design capture volume) of 40 hours is recommended to remove a significant portion of fine particulate pollutants found in urban stormwater runoff. Soluble pollutant removal can be somewhat enhanced by providing a small wetland marsh or ponding area in the basin's bottom to promote biological uptake. The basins are considered to be "dry" because they are designed not to have a significant permanent pool of water remaining between storm runoff events. However, EDB may develop wetland vegetation and sometimes shallow pools in the bottom portions of the facilities.

General Application

An EDB can be used to enhance stormwater runoff quality and reduce peak stormwater runoff rates. If these basins are constructed early in the development cycle, they can also be used to trap sediment from construction activities within the tributary drainage area. The accumulated sediment, however, will need to be removed after upstream land disturbances cease and before the basin is placed into final long-term use. Also, an EDB can sometimes be retrofitted into existing flood control detention basins.

EDBs can be used to improve the quality of urban runoff from roads, parking lots, residential neighborhoods, commercial areas, and industrial sites and are generally used for regional or

follow-up treatment. They can also be used as an onsite BMP and work well in conjunction with other BMPs, such as upstream onsite source controls and downstream infiltration/filtration basins or wetland channels. If desired, a flood routing detention volume can be provided above the water quality capture volume (WQCV) of the basin.

Advantages/Disadvantages

General

An EDB can be designed to provide other benefits such as recreation and open space opportunities in addition to reducing peak runoff rates and improving water quality. They are effective in removing particulate matter and the associated heavy metals and other pollutants. As with other BMPs, safety issues need to be addressed through proper design.

Physical Site Suitability

Normally, the land required for an EDB is approximately 0.5 to 2.0 percent of the total tributary development area. In high groundwater areas, consider the use of retention ponds (RP) instead in order to avoid many of the problems that can occur when the EDB's bottom is located below the seasonal high water table. Soil maps should be consulted, and soil borings may be needed to establish design geotechnical parameters.

Pollutant Removal

The pollutant removal range of an EDB was presented in section 4.1, Table ND-2. Removal of suspended solids and metals can be moderate to high, and removal of nutrients is low to moderate. The removal of nutrients can be improved when a small shallow pool or wetland is included as part of the basin's bottom or the basin is followed by BMPs more efficient at removing soluble pollutants, such as a filtration system, constructed wetlands or wetland channels.

The major factor controlling the degree of pollutant removal is the emptying time provided by the outlet. The rate and degree of removal will also depend on influent particle sizes. Metals, oil and grease, and some nutrients have a close affinity for suspended sediment and will be removed partially through sedimentation.

Aesthetics and Multiple Uses

Since an EDB is designed to drain very slowly, its bottom and lower portions will be inundated frequently for extended periods of time. Grasses in this frequently inundated zone will tend to die off, with only the species that can survive the specific environment at each site eventually prevailing. In addition, the bottom will be the depository of all the sediment that settles out in the basin. As a result, the bottom can be muddy and may have an undesirable appearance to some. To reduce this problem and to improve the basin's availability for other uses (such as open space, habitat or passive recreation), it is suggested that the designer provide a lower-stage basin as suggested in the Two Stage Design procedure. As an alternative, a retention pond (RP) could be used, in which the settling occurs primarily within the permanent pool.

Design Considerations

Whenever desirable and feasible, incorporate the EDB within a larger flood control basin. Also, whenever possible try to provide within the basin for other urban uses such as passive recreation, and wildlife habitat. If multiple uses are being contemplated, consider the multiple-stage detention basin to limit inundation of passive recreational areas to one or two occurrences a year. Generally, the area within the WQCV is not well suited for active recreation facilities such as ballparks, playing fields, and picnic areas. These are best located above the WQCV pool level.

Figure EDB-1 shows a representative layout of an EDB. Although flood control storage can be accomplished by providing a storage volume above the water quality storage, how best to accomplish this is not included in this discussion. Whether or not flood storage is provided, all embankments should be protected from catastrophic failure when runoff exceeds the design event. The State Engineer's regulatory requirements for larger dam embankments and storage volumes must be followed whenever regulatory height and/or volume thresholds are exceeded. Below those thresholds, the engineer should design the embankment-spillway-outlet system so that catastrophic failure will not occur.

Perforated outlet and trash rack configurations are illustrated in section 4.3, *Typical Structural Details*. Figure EDB-3 equates the WQCV that needs to be emptied over 40 hours, to the total required area of perforations per row for the standard configurations shown in that section. The chart is based on the rows being equally spaced vertically at 4-inch centers. This total area of perforations per row is then used to determine the number of uniformly sized holes per row (see detail in the *Structural Details* section). One or more perforated columns on a perforated orifice plate integrated into the front of the outlet can be used. Other types of outlets may also be used, provided they control the release of the WQCV in a manner consistent with the drain time requirements and are approved in advance.

Although the soil types beneath the pond seldom prevent the use of this BMP, they should be considered during design. Any potential exfiltration capacity should be considered a short-term characteristic and ignored in the design of the WQCV because exfiltration will decrease over time as the soils clog with fine sediment and as the groundwater beneath the basin develops a mound that surfaces into the basin.

High groundwater should not preclude the use of an EDB. Groundwater, however, should be considered during design and construction, and the outlet design must account for any upstream base flows that enter the basin or that may result from groundwater surfacing within the basin itself.

Stable, all weather access to critical elements of the pond, such as the inlet, outlet, spillway, and sediment collection areas must be provided for maintenance purposes.

Design Procedure and Criteria

The following steps outline the design procedure and criteria for an EDB.

1. Basin Storage Volume

Provide a storage volume equal to 120 percent of the WQCV based on a 40-hour drain time, above the lowest outlet (i.e., perforation) in the basin. The additional 20 percent of storage volume provides for sediment accumulation and the resultant loss in storage volume.

A. Determine the WQCV tributary catchment's percent imperviousness. Account for the effects of DCIA, if any, on Effective Imperviousness. Using Figure ND-1, determine the reduction in impervious area to use with WQCV calculations.

B. Find the required storage volume (watershed inches of runoff):

Determine the required WQCV (watershed inches of runoff) using Figure EDB-2, based on the EDB's 40-hour drain time.

Calculate the Design Volume in acre-feet as follows:

$$Design\ Volume = \left(\frac{WQCV}{12}\right) * Area * 1.2$$

In which:

Area = The watershed area tributary to the extended detention pond.

1.2 factor = Multiplier of 1.2 to account for the additional 20 percent of required storage for sediment accumulation.

2. Outlet Works

The Outlet Works are to be designed to release the WQCV (i.e., not the "Design Volume") over a 40-hour period, with no more than 50 percent of the WQCV being released in 12 hours. Refer to the *Structural Details* section for schematics pertaining to structure geometry; grates, trash racks, and screens; outlet type: orifice plate or perforated riser pipe; cutoff collar size and location; and all other necessary components.

For a perforated outlet, use Figure EDB-3 to calculate the required area per row based on WQCV and the depth of perforations at the outlet. See the *Structural Details* section to determine the appropriate perforation geometry and number of rows. (The lowest perforations should be set at the water surface elevation of the outlet micropool.) The total outlet area can then be calculated by multiplying the area per row by the number of rows.

3. Trash Rack

Provide a trash rack of sufficient size to prevent clogging of the primary water quality outlet. Size the rack so as not to interfere with the hydraulic capacity of the outlet. Using the total outlet area and the selected perforation diameter (or height), Figures 6, 6a or 7 in the *Structural Details* section will help to determine the minimum open area required for the trash rack. If a perforated vertical plate or riser is used as suggested in this manual, use one-half of the total outlet area to calculate the trash rack's size. This accounts for the variable inundation of the outlet orifices. Figures 6 and 6a were developed as suggested standardized outlet designs for smaller sites.

4. Basin Shape

Shape the pond whenever possible with a gradual expansion from the inlet and a gradual contraction toward the outlet, thereby minimizing short circuiting. The basin length to width ratio between the inlet and the outlet should be between 2:1 to 3:1, with the larger being preferred. It may be necessary to modify the inlet and outlet points through the use of pipes, swales, or channels to accomplish this.

5. Two-Stage Design

A two-stage design with a pool that fills often with frequently occurring runoff minimizes standing water and sediment deposition in the remainder of the basin. The two stages are as follows:

A. Top Stage: The top stage should be 2 or more feet deep with its bottom sloped at 2 percent toward the low flow channel.

B. Bottom Stage: The active storage basin of the bottom stage should be 1.5 to 3 feet deeper than the top stage and store 5 to 15 percent of the WQCV. Provide a micro-pool below the bottom active storage volume of the lower stage at the outlet point. The pool should be ½ the depth of the upper WQCV depth or 2.5 feet, whichever is the larger.

6. Low-Flow Channel

Conveys low flows from the forebay to the bottom stage. Erosion protection should be provided where the low-flow channel enters bottom stage. Lining the low flow channel with concrete is recommended. Otherwise line its sides with VL Type riprap and bottom with concrete. Make it at least 9 inches deep; at a minimum provide capacity equal to twice the release capacity at the upstream forebay outlet.

7. Basin Side Slopes

Basin side slopes should be stable and gentle to facilitate maintenance and access. Side slopes should be no steeper than 3:1, the flatter, the better and safer.

8. Dam Embankment	The embankment should be designed not to fail during a 100-year and larger storms. Embankment slopes should be no steeper than 3:1, preferably 4:1 or flatter, and planted with turf forming grasses. Poorly compacted native soils should be excavated and replaced. Embankment soils should be compacted to at least 95 percent of their maximum density according to ASTM D 698-70 (Modified Proctor). Spillway structures and overflows should be designed in accordance with the City of Colorado Springs and El Paso County Drainage Criteria Manual and should consider UDFCD drop-structure design guidelines.
9. Vegetation	Bottom vegetation provides erosion control and sediment entrapment. Pond bottom, berms, and side sloping areas may be planted with native grasses or with irrigated turf, depending on the local setting.
10. Access	All weather stable access to the bottom, forebay, and outlet works area shall be provided for maintenance vehicles. Maximum grades should be 10 percent with a solid driving surface of gravel, rock, or concrete.
11. Inlet	Dissipate flow energy at pond's inflow point(s) to limit erosion and promote particle sedimentation. Inlets should be designed in accordance with the City of Colorado Springs and El Paso County Drainage Criteria Manual's drop structure criteria or another type of energy dissipating structure.
12. Forebay Design	Provide the opportunity for larger particles to settle out in the inlet in an area that has a solid surface bottom to facilitate mechanical sediment removal. A rock berm should be constructed between the forebay and the main EDB. The forebay volume of the permanent pool should be 5 to 10 percent of the design water quality capture volume. A pipe throughout the berm to convey water the EDB should be offset from the inflow streamline to prevent short circuiting and should be sized to drain the forebay volume in 5 minutes.
13. Flood Storage	Combining the water quality facility with a flood control facility is recommended. The 10-year, 100-year, or other floods may be detained above the WQCV. See the *New Development Planning* section of this chapter for further guidance.
14. Multiple Uses	Whenever desirable and feasible, incorporate the EDB within a larger flood control basin. Also, whenever possible try to provide for other urban uses such as active or passive recreation, and wildlife habitat. If multiple uses are being contemplated, use the multiple-stage detention basin to limit inundation of passive recreational areas to one or two occurrences a year. Generally, the

area within the WQCV is not well suited for active recreation facilities such as ballparks, playing fields, and picnic areas. These are best located above the EDB level.

Design Example

Design forms that provide a means of documenting the design procedure are included in the *Design Forms* section. A completed form follows as a design example.

Maintenance Recommendations

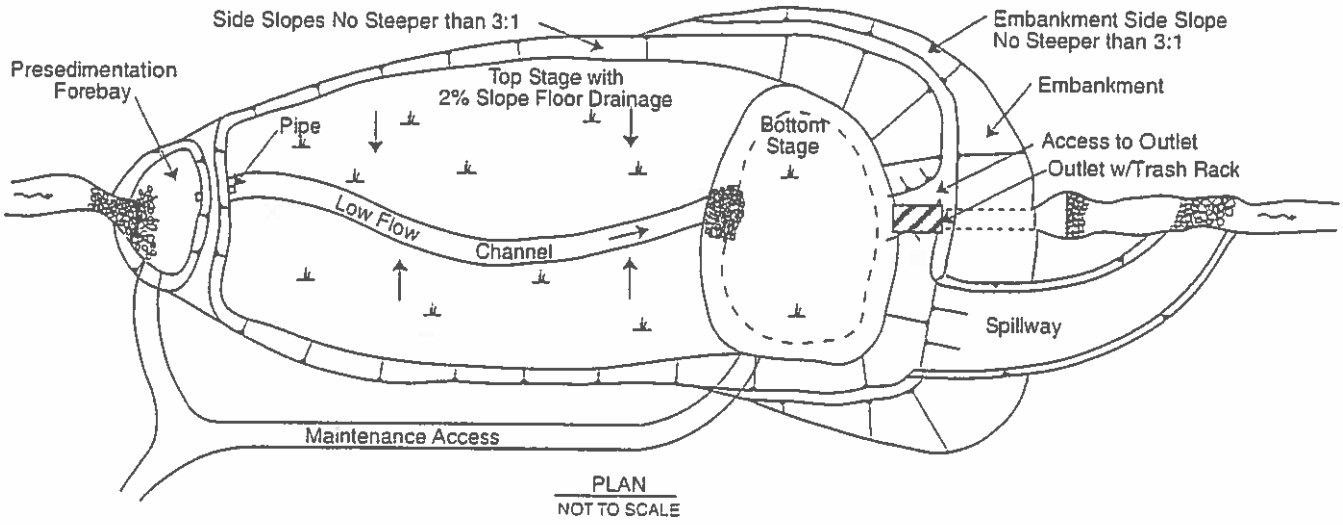
Extended detention basins have low to moderate maintenance requirements. Routine and nonroutine maintenance is necessary to assure performance, enhance aesthetics, and protect structural integrity. The dry basins can result in nuisance complaints if not properly designed or maintained. Bio-degradable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

TABLE EDB-1
Extended Detention Basin Maintenance Considerations

Required Action	Maintenance Objective	Frequency of Action
Lawn mowing and lawn care	Occasional mowing to limit unwanted vegetation. Maintain irrigated turf grass as 2 to 4 inches tall and nonirrigated native turf grasses at 4 to 6 inches.	Routine – Depending on aesthetic requirements.
Debris and litter removal	Remove debris and litter from the entire pond to minimize outlet clogging and improve aesthetics.	Routine – Including just before annual storm seasons (that is, April and May) and following significant rainfall events.
Erosion and sediment control	Repair and revegetate eroded areas in the basin and channels.	Nonroutine – Periodic and repair as necessary based on inspection.
Structural	Repair pond inlets, outlets, forebays, low flow channel liners, and energy dissipators whenever damage is discovered.	Nonroutine – Repair as needed based on regular inspections.
Inspections	Inspect basins to insure that the basin continues to function as initially intended. Examine the outlet for clogging, erosion, slumping, excessive sedimentation levels, overgrowth, embankment and spillway integrity, and damage to any structural element.	Routine – Annual inspection of hydraulic and structural facilities. Also check for obvious problems during routine maintenance visits, especially for plugging of outlets.
Nuisance control	Address odor, insects, and overgrowth issues associated with stagnant or standing water in the bottom zone.	Nonroutine – Handle as necessary per inspection or local complaints.

TABLE EDB-1
Extended Detention Basin Maintenance Considerations

Required Action	Maintenance Objective	Frequency of Action
Sediment removal	Remove accumulated sediment from the forebay, micro-pool, and the bottom of the basin.	Nonroutine – Performed when sediment accumulation occupies 20 percent of the WQCV. This may vary considerably, but expect to do this every 10 to 20 years, as necessary per inspection if no construction activities take place in the tributary watershed. More often if they do. The forebay and the micro-pool will require more frequent cleanout than other areas of the basin, say every 1 or 2 years.



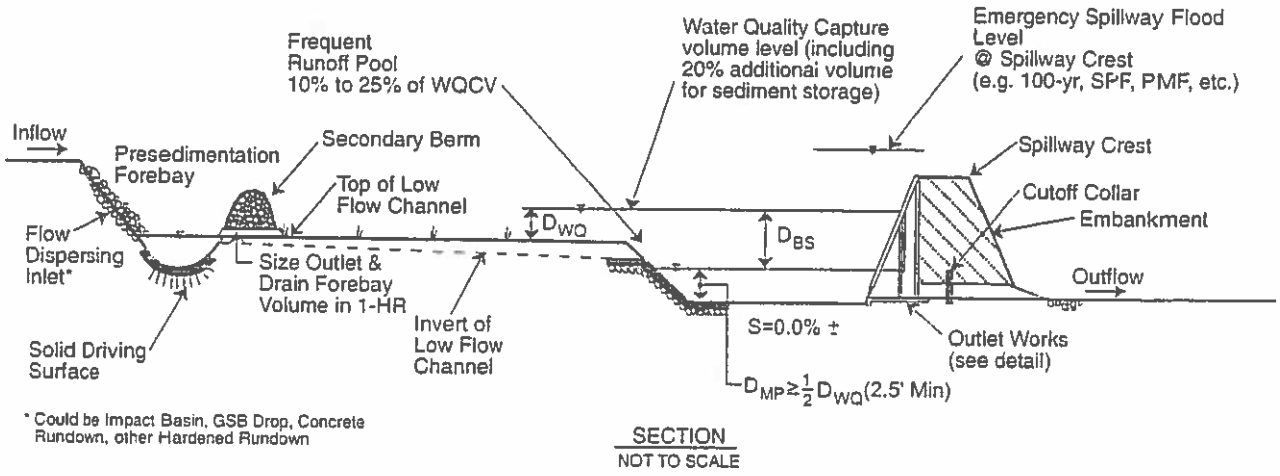


FIGURE EDB-1
Plan and Section of an Extended Detention Basin Sedimentation Facility

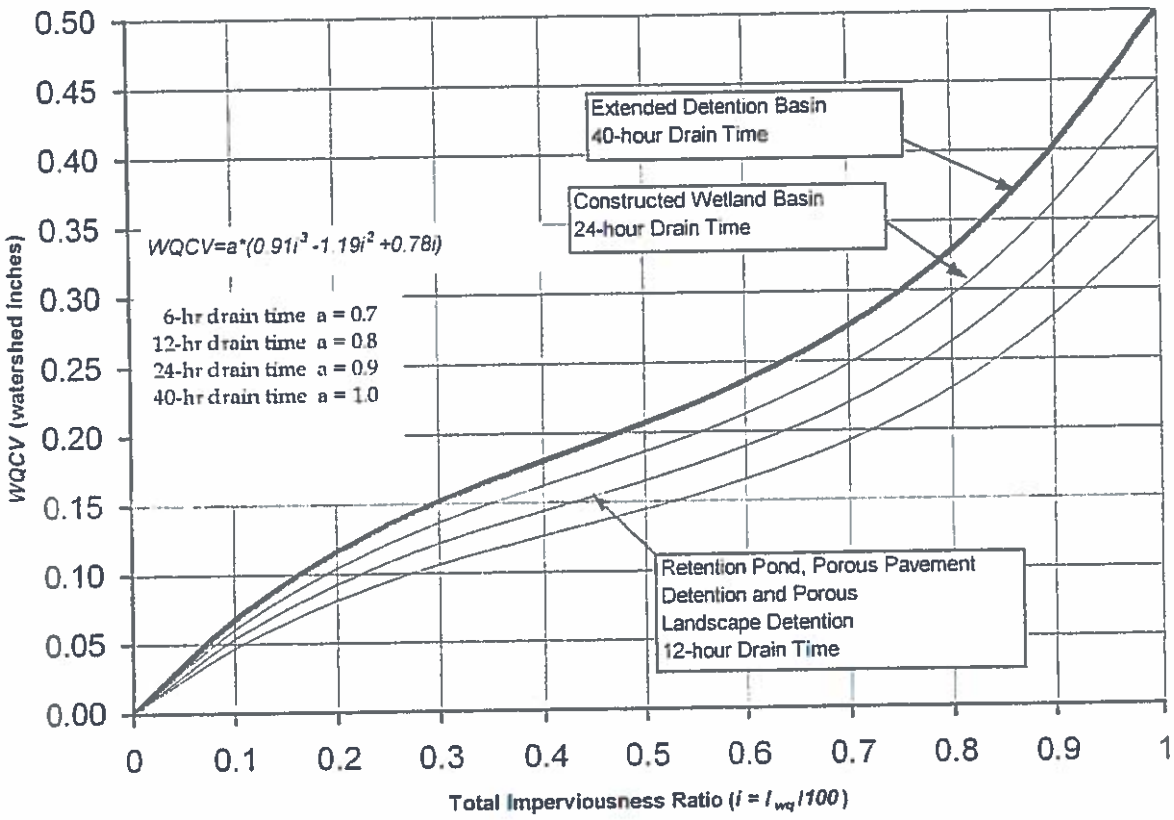
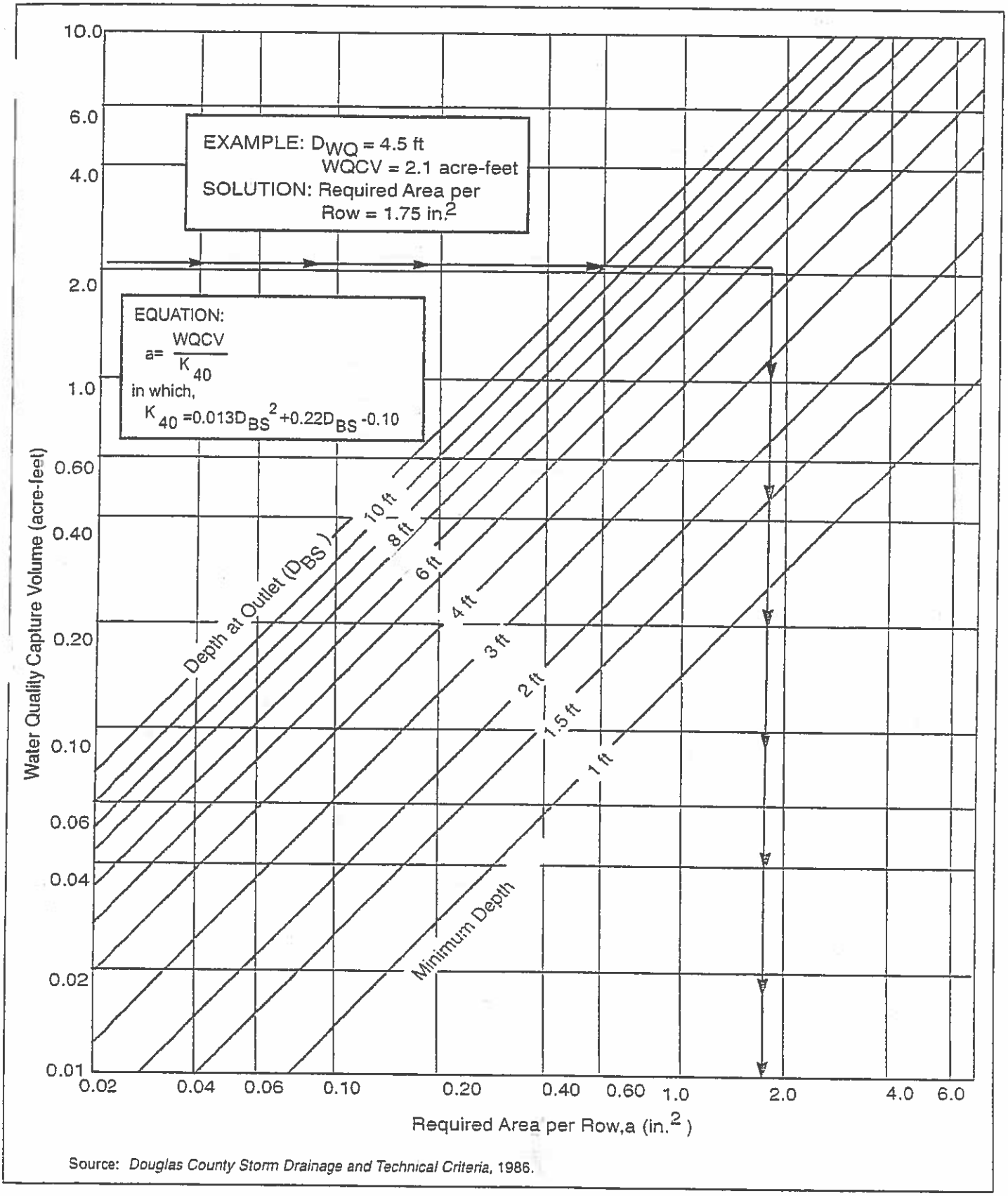


FIGURE EDB-2
Water Quality Capture Volume (WQCV), 80th Percentile Runoff Event



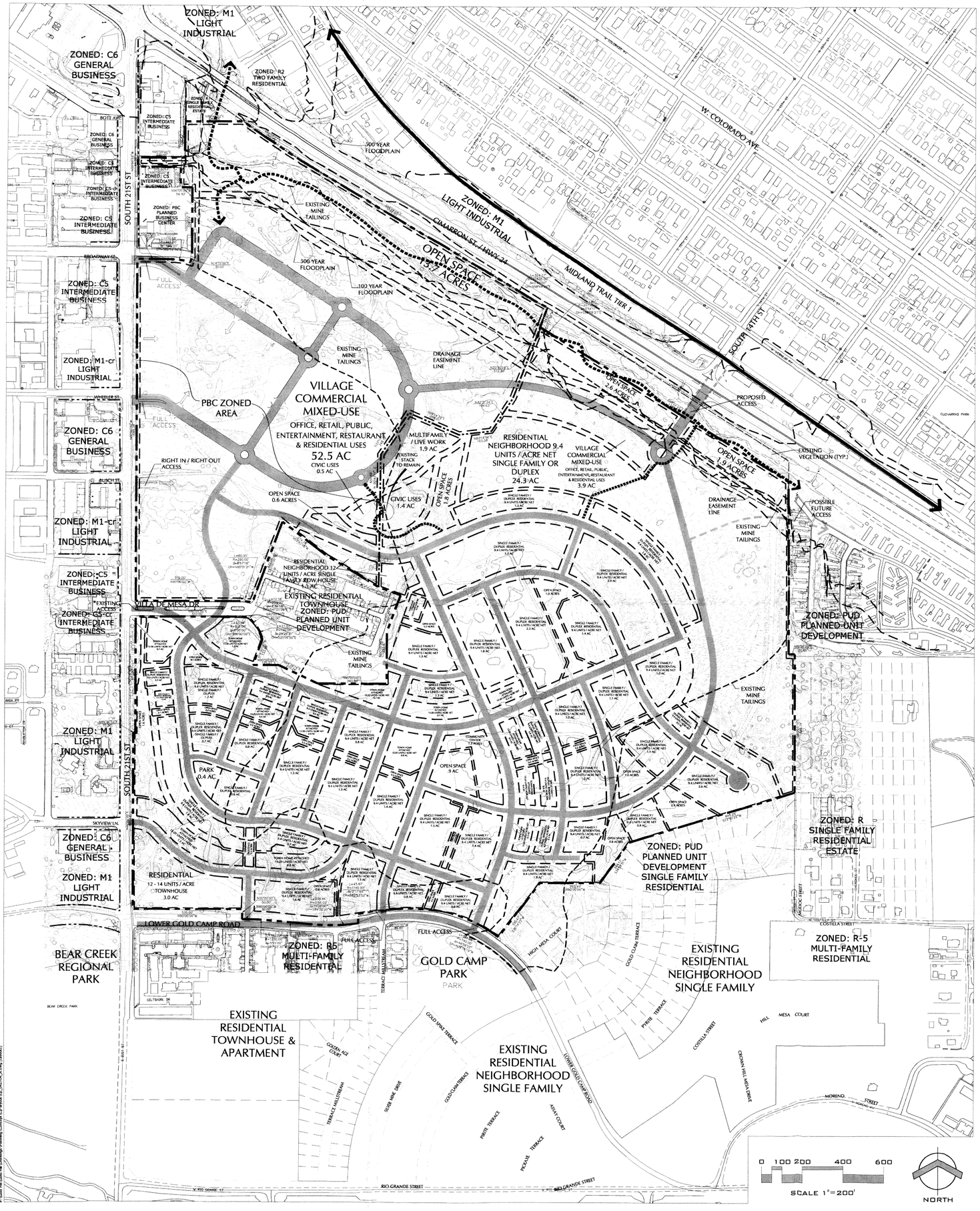
Source: *Douglas County Storm Drainage and Technical Criteria*, 1986.

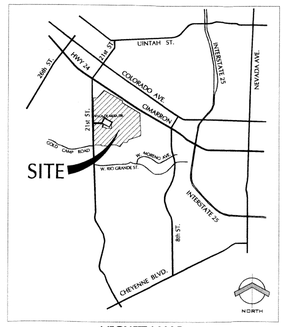
FIGURE EDB-3
Water Quality Outlet Sizing: Dry Extended Detention Basin with a 40-Hour Drain Time of the Capture Volume

Design Procedure Form: Extended Detention Basin (EDB) - Sedimentation Facility

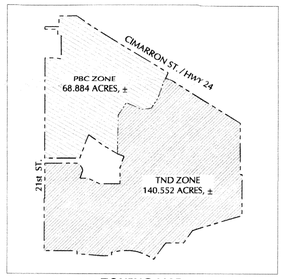
Designer: _____
Company: _____
Date: September 22, 1999
Project: _____
Location: _____

1. Basin Storage Volume	
A) Tributary Area's Imperviousness Ratio ($i = I_a / 100$)	I_a = 50.00 % i = 0.50
B) Contributing Watershed Area (Area)	Area = 100.00 acres
C) Water Quality Capture Volume (WQCV) (WQCV =1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i))	WQCV = 0.21 watershed inches
D) Design Volume: Vol = (WQCV / 12) * Area * 1.2	Vol = 2.063 acre-feet
2. Outlet Works	
A) Outlet Type (Check One)	X Orifice Plate _____ Perforated Riser Pipe _____ Other: _____
B) Depth at Outlet Above Lowest Perforation (H)	H = 4.00 feet
C) Required Maximum Outlet Area per Row, (A_o)	A_o = 1.74 square inches
D) Perforation Dimensions (enter one only): i) Circular Perforation Diameter OR ii) 2" Height Rectangular Perforation Width	D = 1.5000 inches, OR W = _____ inches
E) Number of Columns (nc, See Table 6a-1 For Maximum)	nc = 1 number
F) Actual Design Outlet Area per Row (A_o)	A_o = 1.77 square inches
G) Number of Rows (nr)	nr = 12 number
H) Total Outlet Area (A_{ot})	A_{ot} = 21.21 square inches
3. Trash Rack	
A) Needed Open Area: A_t = 0.5 * (Figure 7 Value) * A_{ot}	A_t = 678 square inches
B) Type of Outlet Opening (Check One)	X < 2" Diameter Round _____ 2" High Rectangular _____ Other: _____
C) For 2", or Smaller, Round Opening (Ref.: Figure 6a): i) Width of Trash Rack and Concrete Opening (W_{conc}) from Table 6a-1	W_{conc} = 18 inches
ii) Height of Trash Rack Screen (H_{TR})	H_{TR} = 72 inches





VICINITY MAP
N.T.S.



ZONING MAP
1'=1000'

TND LEGAL DESCRIPTION

That certain parcel of land situated in the East One-Half of Section 14 and the West One-Half of the West One-Half of Section 13, both of Township 14 South, Range 67 West of the 6th P.M., City of Colorado Springs, County of El Paso, State of Colorado, more particularly described as follows:

Commencing at the Northwest Corner of the Northeast One-Quarter said Section 14, (all bearings used in this description area relative to the West line of the Northeast One-Quarter of said Section 14, which was assumed to be South 00°00'00" East); thence North 89°42'59" East along the Northerly Line of said Northeast One-Quarter, 30.23 feet; thence South 79°00'00" East, 181.31 feet, said point also being the Northwest Corner of Lot 1, Block 2, GOLDEN CYCLE SUBDIVISION NO. 1 as recorded in Plat Book A-2 at Page 54 of the records of said El Paso County; thence North 90°00'00" East along the North line of said Lot 1, 230.00 feet to a point on the East line of said GOLDEN CYCLE SUBDIVISION NO. 1; thence North 00°00'00" East along said East line, 180.94 feet; thence North 89°40'22" East, 284.95 feet to a point on the Southwesterly right-of-way line of that tract of land conveyed to the Colorado Department of Highways in Book 1961 at Page 983 of the records of said El Paso County; thence Southerly and Easterly along said Southwesterly right-of-way line for the following three (3) courses; (1) thence South 55°22'27" East, 281.72 feet; (2) thence South 59°09'04" East, 1146.85 feet; (3) thence on the arc of a curve to the right having a central angle of 00°48'50", a radius of 22,835.00 feet and an arc length of 324.37 feet to a point on the Westerly line of that tract of land as described in Book 2974 at Page 688 of the records of said El Paso County; thence South 29°31'59" West along the Westerly of said tract on a non-tangent line to the last mentioned curve, 101.92 feet to the POINT OF BEGINNING;

Thence Easterly along the Northerly line of said tract the following two (2) courses; (1) thence on the arc of a curve to the right whose chord bears South 58°09'28" East, having a central angle of 00°14'17", a radius of 22,735.00 feet and an arc length of 93.80 feet; (2) thence South 58°02'22" East on the forward tangent to the last mentioned curve, 1339.21 feet to a point on the Westerly line of that tract of land described in Book 2889 at page 547 of the records of said El Paso County; thence South 00°00'24" East along said Westerly line, 853.50 feet to the Southerly line thereof; thence N89°56'50"E along said Southerly line, 30.86 feet to a point on the Westerly line of PORTLAND HEIGHTS as recorded in Plat Book 1 at Page 55 of the records of said El Paso County; thence South 00°03'10" East along said Westerly line, 680.79 feet to the Northwesterly Corner of that tract of land described in Reception No. 201135455 of the records of said El Paso County; thence South 34°58'31" West, 244.13 feet to the North line of Parcel A as described in Reception No. 97035459 of the records of said El Paso County; thence Westerly and Southwesterly along the Northerly and Northwesterly lines of said tract for the following two (2) courses; (1) thence North 90°00'00" West, 292.45 feet; (2) thence South 36°14'22" West, 335.47 feet to the Northerly right-of-way line of Lower Gold Camp Road as shown on CROWN HILL MESA SUBDIVISION FILING NO. 3 as recorded at Reception No. 200156380 of the records of said El Paso County; thence Northwesterly, Westerly and Southerly along the Northerly right-of-way line of said Lower Gold Camp Road for the following four (4) courses; (1) thence on the arc of a curve to the left whose chord bears North 26°15'19" West, having a central angle of 44°59'22", a radius of 240.00 feet and an arc length of 581.06 feet; (2) thence South 81°15'00" West on the forward tangent to the last mentioned curve, 94.85 feet; (3) thence on the arc of a curve to the right whose chord bears South 82°23'52" West, having a central angle of 02°17'44", a radius of 1145.00 feet and an arc length of 45.87 feet; (4) thence South 00°00'00" East, 49.94 feet to the Northerly line of that tract of land described in Book 2786 at Page 137 of the records of said El Paso County; thence Westerly along the Northerly line of said tract for the following five (5) courses; (1) thence on the arc of a curve to the right whose chord bears South 89°32'00" West having a central angle of 11°26'00", a radius of 1195.00 feet and an arc length of 238.46 feet; (2) thence North 84°45'00" West on the forward tangent to the last mentioned curve, 188.00 feet; (3) thence on the arc of a curve to the left having a central angle of 9°15'00", a radius of 1230.00 feet and an arc length of 112.70 feet; (4) thence North 90°00'00" West on the forward tangent and an arc length of 112.70 feet; (5) thence North 90°00'00" West on the forward tangent to the last mentioned curve, 30.00 feet to a point on the Easterly line of GOLD HILL PLAZA FILING NO. 1 as recorded in Plat Book 3-3 at Page 69 of the records of said El Paso County; thence along the Easterly and Northerly lines of said GOLD HILL PLAZA FILING NO. 1 for the following two (2) courses; (1) thence North 00°00'00" East, 50.00 feet; (2) thence North 90°00'00" West, 535.00 feet to a point on the Easterly right-of-way line of said South 21st Street; thence Northerly along said Easterly right-of-way line for the following three (3) courses; (1) thence North 00°00'00" East, 871.13 feet; (2) thence North 89°36'52" East, 10.00 feet; (3) thence North 00°00'00" East, 573.09 feet to the Northwest corner of Common Area C as platted in VILLA DEMESA FILING NO.1 as recorded in Plat Book K-2 at Page 6 of the records of said El Paso County; thence along the North line of said Common Area C for the following (2) courses; (1) thence North 90°00'00" East, 510.00 feet; (2) thence on the arc of a curve to the right having a central angle of 9°00'00", a radius of 310.00 feet and an arc length of 43.28 feet; thence on the arc of a curve to the right whose chord bears South 41°21'09" East, having a central angle of 2°42'18", a radius of 258.00 feet and an arc length of 12.18 feet; thence South 40°00'00" East on the forward tangent of the last mentioned curve, 40.00 feet; thence on the arc of a curve to the right having a central angle of 29°26'21", a radius of 150.00 feet and an arc length of 77.08 feet; thence South 19°30'00" West on a non-tangent line to the last mentioned curve, 133.88 feet to a point on the South line of said VILLA DEMESA FILING NO.1; thence Easterly, Northerly and Westerly along the Southerly, Easterly and Northerly lines of said VILLA DEMESA FILING NO. 1 for the following six (6) courses; (1) thence North 90°00'00" East, 125.21 feet; (2) thence South 64°59'14" East, 210.24 feet; (3) thence North 90°00'00" East, 340.00 feet; (4) thence North 00°00'00" East, 253.97 feet; (5) thence North 19°30'00" East, 199.16 feet; (6) thence North 70°30'00" West, 114.51 feet to the Southerly Corner of the tract of land described in Book 1902 at Page 179 of the records of said El Paso County; thence North 00°43'11" East along the Easterly line of said tract, 651.59 feet to a point on the Northwesterly boundary line of a tract of land conveyed in Book 2033 at Page 614 of the records of said El Paso County; thence Northeasterly and Southeasterly along the Northerly boundary line of said conveyed tract for the following courses; (1) thence North 33°11'57" East, 248.10 feet; (2) thence South 64°14'39" East, 268.91 feet; (3) thence North 83°14'56" East, 160.08 feet; (4) thence North 32°31'34" East, 194.63 feet; (5) thence North 20°31'09" East, 372.38 feet to the POINT OF BEGINNING.

Area = 140.552 Acres. More or Less.

TND LAND USE CHART

GROSS ACRES	140.552 ACRES TND	
LAND USE	REQUIRED	PROVIDED
-SINGLE FAMILY ATTACHED OR DETACHED HOUSING, TWO FAMILY DWELLING UNITS AND TOWNHOUSES	30% / 42 ACRES	87% / 122.56 ACRES
-MULTI-FAMILY HOUSING	15% / 21 ACRES	1% / 1.9 ACRES
-OPEN SPACE / PARKS	15% / 21 ACRES	10% / 14.8 ACRES
-COMMERCIAL (RETAIL, PARKING, OFFICE, INDUSTRIAL)	5% / 7 ACRES	0% / 0 ACRES
-CIVIC USE (COMMUNITY CENTER AND SPECIAL USE AREAS)	5% / 7 ACRES	1% / 1.2 ACRES
-PLAZA / SQUARE / COURTYARD (PUBLIC OR PRIVATE)	5% / 7 ACRES	1% / .09 ACRES
(ALL PERCENTAGES ARE EXPRESSED AS GROSS ACREAGE)		

TND SITE DATA

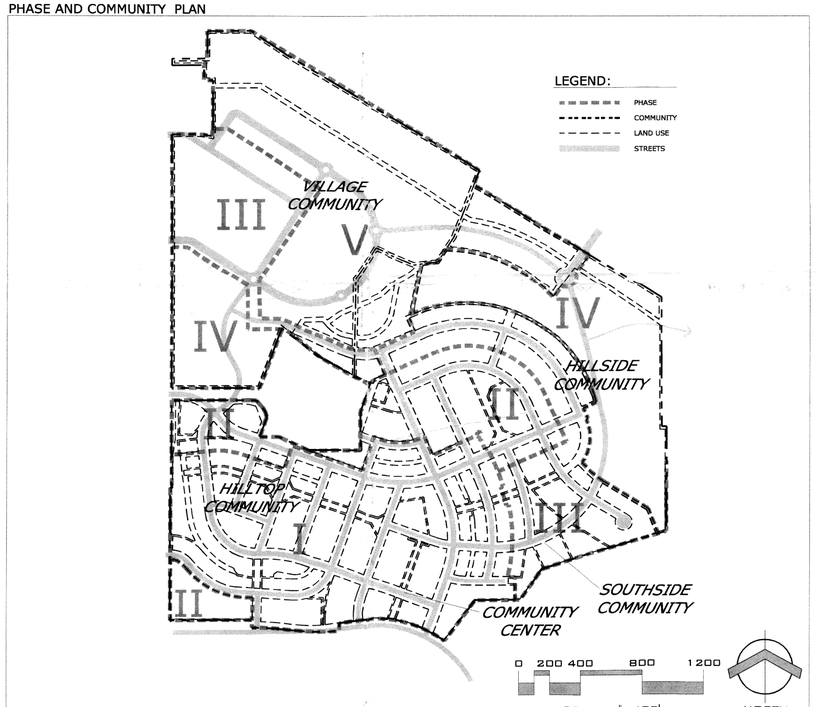
SITE ACREAGE: 140.552
EXISTING ZONING: TND

OWNER: GOLD HILL MESA TOWNSHIP, LLC
1040 S. 8th ST.
SUITE 101
COLORADO SPRINGS, CO 80906

GENERAL NOTES:

1. THIS PROPERTY IS SUBJECT TO THE FINDINGS SUMMARY AND CONCLUSIONS OF A GEOLOGICAL HAZARD REPORT PREPARED BY CTL/THOMPSON, INC. DATED OCTOBER 9, 2002. A COPY OF SAID REPORT HAS BEEN PLACED WITHIN FILE CPC ZC 02-232 AND CPC CP 02-231 OF THE CITY OF COLORADO SPRINGS, DEVELOPMENT SERVICE DIVISION. CONTACT DEVELOPMENT SERVICES 30 SOUTH NEVADA AVENUE, SUITE 301, COLORADO SPRINGS, CO, IF YOU WOULD LIKE TO REVIEW SAID REPORT.
2. THIS PROPERTY IS SUBJECT TO THE FINDINGS SUMMARY AND CONCLUSIONS OF THE VOLUNTARY CLEANUP PLAN (VCUP) PREPARED BY SPECTRUM SERVICES. A COPY OF SAID REPORT AND THE COLORADO DEPARTMENT OF PUBLIC HEALTH & ENVIRONMENT APPROVAL LETTER DATES DECEMBER 20, 2002 HAS BEEN PLACED WITHIN FILE CPC ZP 02-232 AND CPC CP 02-231 OF THE CITY OF COLORADO SPRINGS, DEVELOPMENT SERVICE DIVISION. CONTACT DEVELOPMENT SERVICES 30 SOUTH NEVADA AVENUE, SUITE 301, COLORADO SPRINGS, CO, IF YOU WOULD LIKE TO REVIEW SAID REPORT. THE MATERIALS MANAGEMENT PLAN IS CONTAINED WITHIN THE VCUP. REVIEW AS DISCUSSED IN THE VCUP.
3. THE GOLD HILL MESA PROPERTY WILL UTILIZE THE SEVEN PRINCIPALS OF XERISCAPE WHEN DESIGNING LANDSCAPE AREAS FOR THE PROJECT. THIS EFFORT WILL ALSO BE COORDINATED WITH ESTABLISHED ENVIRONMENTAL
4. ALL PARKS WITHIN THE GOLD HILL MESA AREA SHALL BE PRIVATELY OWNED AND MAINTAINED.
5. ACCESS TO U.S. HIGHWAY 24 AS ILLUSTRATED ON THIS PLAN IS NOT APPROVED WITH THIS PLAN. AN ACCESS PERMIT/APPROVAL IS REQUIRED BY THE COLORADO DEPARTMENT OF TRANSPORTATION (CDOT).
6. IF ACCESS TO U.S. HIGHWAY 24 IS NOT GRANTED, MODIFICATIONS TO INTERNAL CIRCULATION WILL BE NEEDED IN ORDER TO SERVE THE COMMERCIAL AREA.
7. A MIX OF HOUSING DENSITIES AND TYPES WILL BE PROVIDED IN THE RESIDENTIAL NEIGHBORHOOD.
8. A LIGHTING AND SIGNAGE PLAN WILL BE PROVIDED WITH EACH DEVELOPMENT PLAN.
9. A TRANSIT STOP WILL BE PROVIDED AT A LOCATION MUTUALLY AGREEABLE WITH THE SPRINGS TRANSIT.
10. WHEN GOLD HILL MESA IS DEVELOPED, CIVIC USE, COMMERCIAL USE, AND THE SPECIAL USE AREA WILL BE DESIGNED TO PROVIDE APPROPRIATE PUBLIC OR PRIVATE PLAZAS, COURTYARDS, AND OR SQUARES.
11. GRADING FOR THE HILLSIDE RESIDENTIAL AREA (PHASE II) SHALL BE DONE IN CONJUNCTION WITH OR BEFORE THE VILLAGE/COMMERCIAL MIXED USE AREA (PHASE III).
12. A SIDEWALK SHALL BE PROVIDED ALONG THE EAST SIDE OF 21ST STREET WHEN THE STREET IS IMPROVED.
13. A HOMEOWNERS ASSOCIATION OR OTHER ENTITY SHALL BE ESTABLISHED TO MAINTAIN COMMON AREAS/PARKS AND POSSIBLY PRIVATE LANDSCAPE AREAS AS WELL.
14. A PASSIVE-VENTINTING RADON SYSTEM SHALL BE INSTALLED FOR EACH STRUCTURE CONSTRUCTED IN THE SITE.
15. TRAFFIC CALMING TECHNIQUES WILL BE USED FOR THE MAIN STREET ALONG THE EAST SIDE OF THE SITE.
16. RIGHT-OF-WAY ADJACENT TO THE SITE WILL BE DEDICATED AS REQUIRED PER CITY STANDARDS.
17. PRIOR TO OR IN CONJUNCTION WITH THE FIRST DEVELOPMENT PLAN, THE WALL LOCATION AND DESIGN ADJACENT TO THE VILLA DE MESA HOA SHALL BE SUBMITTED.
18. FULL IMPROVEMENTS TO LOWER GOLD CAMP ROAD SHALL BE COMPLETED IN CONJUNCTION WITH THE FIRST DEVELOPMENT PLAN.
19. A PEDESTRIAN CONNECTION WILL BE PROVIDED WITH THE DEVELOPMENT OF THE SMOKESTACK AREA (PHASE V) TO THE RESIDENTIAL AREA ON THE UPPER MESA.
20. THE FIRST DEVELOPMENT PLAN FOR THIS SITE SHALL BE REVIEWED AND APPROVED BY CITY COUNCIL.
21. IN CONJUNCTION WITH THE FIRST DEVELOPMENT PLAN A PHASED PUBLIC IMPROVEMENTS PLAN AND / OR FUNDING FOR PUBLIC IMPROVEMENTS SHALL BE APPROVED.
22. THIS PROPERTY IS SUBJECT TO THE CITY'S STREAMSIDE ORDINANCE. CITY PLANNING RECOGNIZES THAT THIS PROPERTY IS SUBJECT TO TO A VCUP AS REGULATED BY THE STATE (CDPHE).

PHASE AND COMMUNITY PLAN



URBAN DESIGN
LAND PLANNING
& LANDSCAPE
ARCHITECTURE
509 South Tejon Street
Colorado Springs, CO 80903
Ph 719.471.0930
Fax 719.471.0267

NES

MITHŪN
Architects+Designers+Planners
Pier 56, 1201 Alaskan Way, Ste. 200
Seattle, WA 98101
TEL 206 623-3344 FAX 206 623-7005

Matrix Design Group, Inc.
Integrated Design Solutions
2925 Professional Place, Suite 202
Colorado Springs, CO 80904
Phone 719-575-0100
Fax 719-575-0208

GOLD HILL MESA
CONCEPT PLAN

DRAWN: ADT	DATE:	BY:	COMMENTS:	DATE: 4/29/04
APPROVED: TWS	DATE:	BY:	COMMENTS:	

SHEET NO.
1

CPC CP 04-127
PLANNER: MAYERL