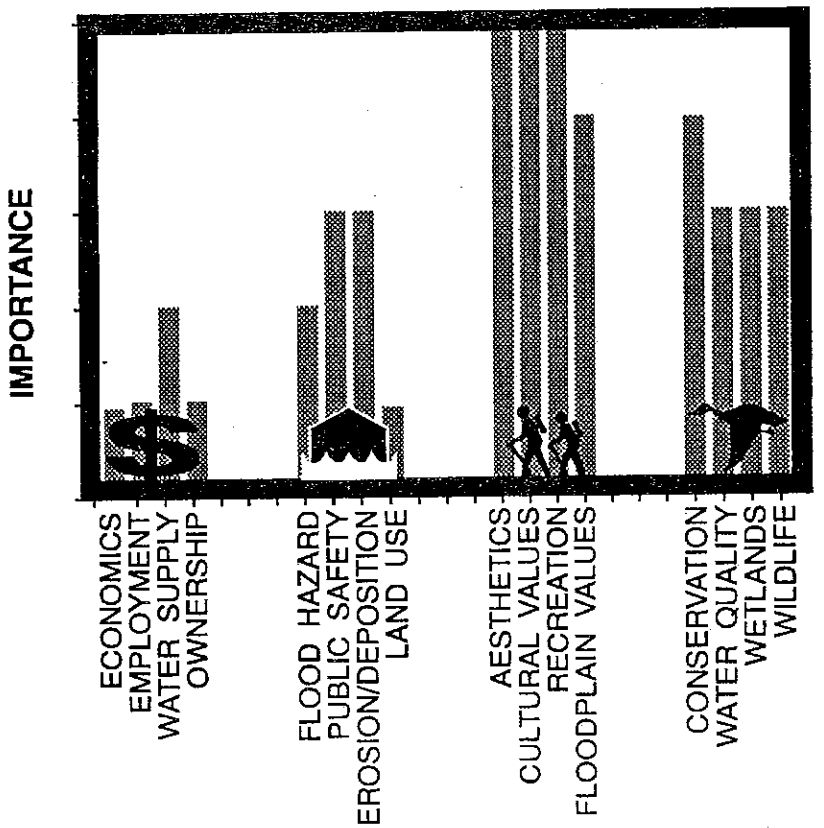
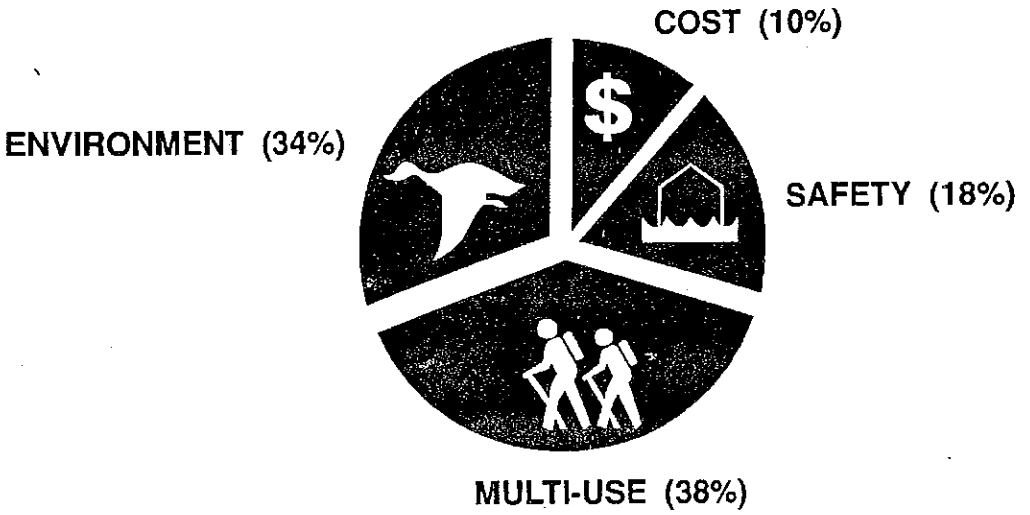
SPRING CREEK DBPS

COMMUNITY VALUES

WAGNER PARK DETENTION POND

FIGURE 38





ENVIRONMENTAL EVALUATION

FIGURE 39 - WAGNER PARK DETENTION SITE

INVENTORY OF CURRENT ENVIRONMENT CONDITIONS

	ACRES	PERCENT		ACRES	PERCENT
1. Structural or Upland	4	80	4. Riparian Grassland	1	20
2. Open Water	0	0	5. Herbaceous Wetland	0	0
3. Mature Riparian Forest	0	0	6. Emergent Wetland	0	0

TREATMENT	IMPACT		MITIGATION OPPORTUNITIES
	DISTURB	LOSS	
Detention Pond	0.6 Acres of Riparian Grassland	No net loss. Will reduce upstream soil loss.	On site replacement of vegetation lost during construction.
No Action	None- All vegetation left undisturbed.	Moderate- Natural erosion upstream will widen and incise channel causing loss of most vegetation.	Not applicable.

10. REACH 4-3 FROM BIJOU ST. TO PLATTE AVE.

a. Description of Existing Characteristics

The existing channel in this area is concrete lined with a concrete box culvert at Bijou Street and an underground pipe system at Platte Ave. and above. The Bijou Street crossing is a triple 8 foot by 5 foot concrete box culvert. The Platte Ave. crossing is a single 10 foot by 8 foot concrete box culvert. The existing trapezoidal concrete lined channel has a 15 foot bottom width, a 5 foot depth, and 1.5:1 side slopes. The existing soils consist of coarse grained alluvial deposits and manmade fills. Since the channel is fully lined there is no vegetation in the channel. The area is fully built out with commercial land uses adjacent to the channel. No maintenance road was provided adjacent to the channel. Access for maintenance would be through the existing parking lots on the commercial development only by permission of the adjacent property owners.

b. Constraints

The existing Bijou Street crossing and channel upstream are inadequate to pass the 100-year design storm. However, the channel does have additional height available above the concrete lining that will provide the capacity needed to pass the 100-year design storm. The crossing does need to be upgraded (by providing a larger crossing) to avoid having a backwater effect created at Bijou Street. The channel immediately downstream of the Bijou Street crossing is severely eroded.

c. Community Values

The community values determined for this reach are presented on Figure 40. The most important community value factors for this location were determined to be the cost and safety. With considerably lower rankings were multi-use and the environment. Since this channel is already fully lined with dense development right up to the channel, cost and safety are very important.

d. Alternatives Considered

The alternatives were selected based on the existing constraints. The alternatives include the following:

Expand capacity of the existing fully lined open channel by increasing lining height
Replace this segment with a concrete box culvert

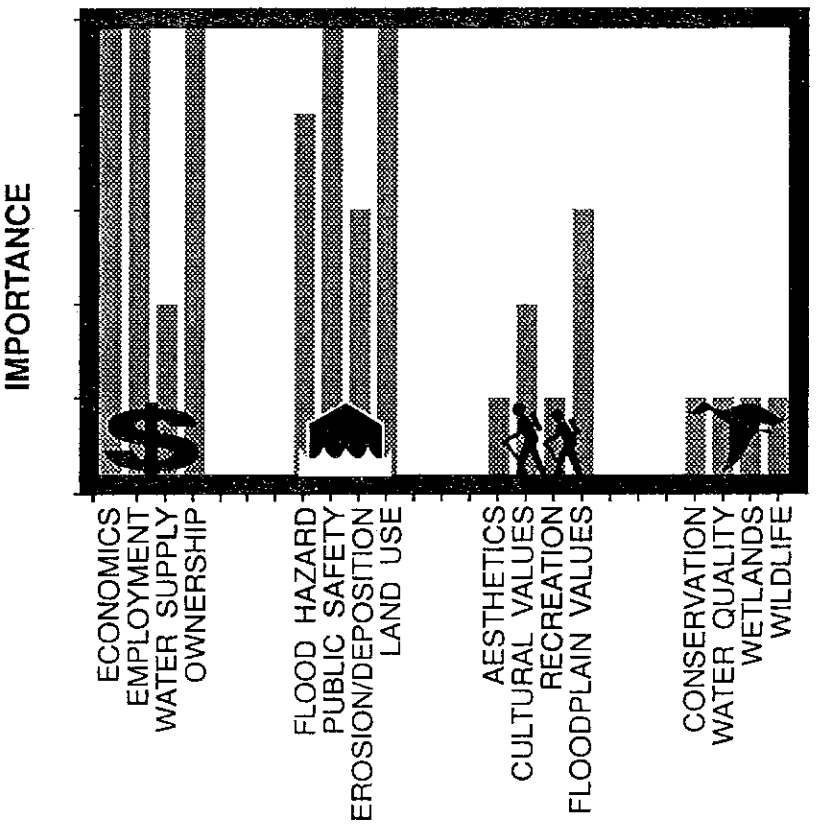
An evaluation of the environmental disturbance, losses, and mitigation required for each alternative is shown on Figure 41.

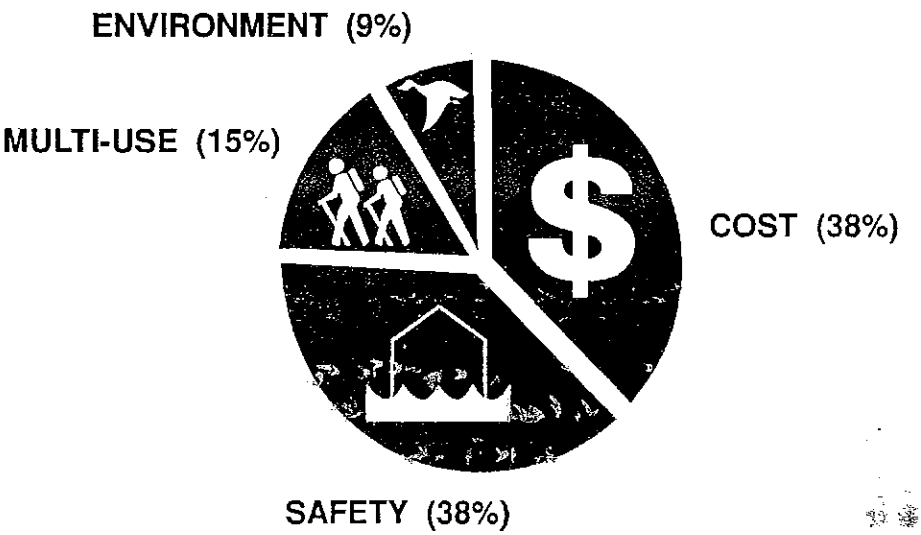
SPRING CREEK DBPS

COMMUNITY VALUES

BIJOU ST. TO PLATTE AVE. (US 24)

FIGURE 40





ENVIRONMENTAL EVALUATION

FIGURE 41 - BIJOU STREET TO PLATTE AVE. (U.S. 24)

INVENTORY OF CURRENT ENVIRONMENT CONDITIONS		ACRES	PERCENT		ACRES	PERCENT
	1. Structural or Upland	0.7	100	4. Riparian Grassland	0	0
	2. Open Water	0	0	5. Herbaceous Wetland	0	0
	3. Mature Riparian Forest	0	0	6. Emergent Wetland	0	0

TREATMENT	IMPACT		MITIGATION OPPORTUNITIES
	DISTURB	LOSS	
No Action	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable. No opportunities available to create wetlands or habitat due to space limitations.
Expand Capacity - Hard Lined Sides and Bottom	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable. No opportunities available to create wetlands or habitat due to space limitations.
Replace with Concrete Box Culvert	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable. No opportunities available to create wetlands or habitat due to space limitations.

C. MAJOR TRIBUTARIES

1. REACH 14A TO NORTH ALONG UNION BLVD. - NORTH TRIB.

a. Description of Existing Characteristics

This reach generally lies along the Union Blvd. alignment between the U.S. 24 Bypass project (by CDOT) and Fountain Blvd. The existing channel is natural with highly eroded banks and bottom. The area upstream of this channel is fully developed and drains from the north and west into inlets at the intersection of Union Blvd. and Fountain Blvd. These inlets are then collected into a 30 inch pipe which discharges directly into this channel segment. The channel segment generally has a bottom width of 20 feet, is approximately 10 feet deep and has steep banks. The channel has an overall slope of 2.9%.

The existing soils are sandy resulting from alluvial deposits and are highly erodible. The vegetation consists of riparian grasslands which are made up of grasses and shrubs and mature riparian forest. The area is mostly undeveloped ground and future land uses are projected to be commercial with the Evergreen Cemetery just west of the channel as well as the public right-of-way on the east for Union Blvd.

b. Constraints

The existing channel has the capacity to carry the 100-year design storm, however, the velocities are extremely high as evidenced by the significant downcutting that has occurred in the channel. This channel is also directly along the route of Union Blvd. from the U.S. 24 Bypass to Fountain Blvd. This is an important major arterial transportation link for this area of Colorado Springs and there is not much flexibility in locating Union Blvd. since the location of the two ends are already set. This may necessitate some filling of the channel. Concerns were expressed in the coordination meetings on flooding that has occurred at the intersection of Union Blvd. and Fountain Blvd.

c. Community Values

The community values determined for this reach are presented on Figure 42. The most important community value factors for this reach were determined to be cost and safety due to the location of Union Blvd. Multi-use is somewhat important and the environment ranked last.

d. Alternatives Considered

The alternatives were selected from a wide range of possible alternatives. From this range of possible alternatives, the list was narrowed down to the following alternatives:

Underground Pipe	-	Some underground pipe is required due to the location of Union Blvd. over the channel on each end
Soft Bank Lining	-	Use vegetation to protect banks
Soft Bottom Lining	-	Use vegetation to protect bottom of channel
Hard Bank Lining	-	Use buried riprap to protect banks
Grade Control	-	Use drop structures or cutoff walls to reduce channel slopes and velocities

An evaluation of the environmental disturbance, losses, and mitigation required for each alternative is shown on Figure 43. The following alternatives were not considered for the reasons noted below:

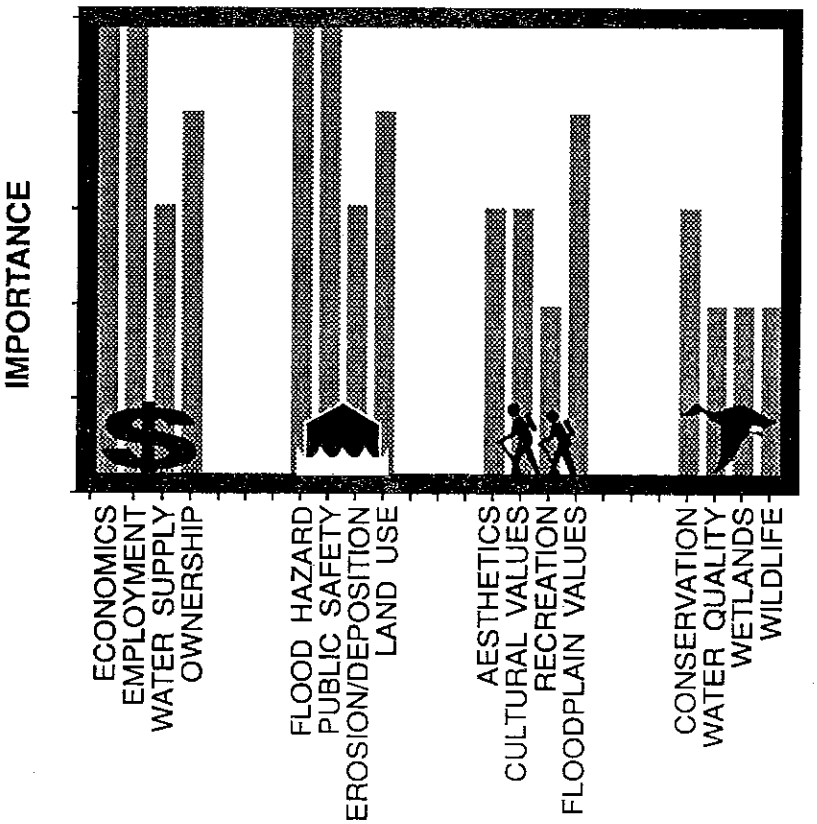
No Bank Lining	-	It is not practical to leave the fill for Union Blvd. extension in jeopardy due to channel erosion and create a hazard to the public when using the roadway
No Bottom Lining	-	It is not practical to leave the fill for Union Blvd. extension in jeopardy due to channel erosion and create a hazard to the public when using the roadway
Bank Reshaping	-	The extreme depth of the channel makes any major bank reshaping impractical
Detention Upstream	-	There is no practical location for detention upstream of this reach since all of the area upstream is fully built out with very limited ROW available.

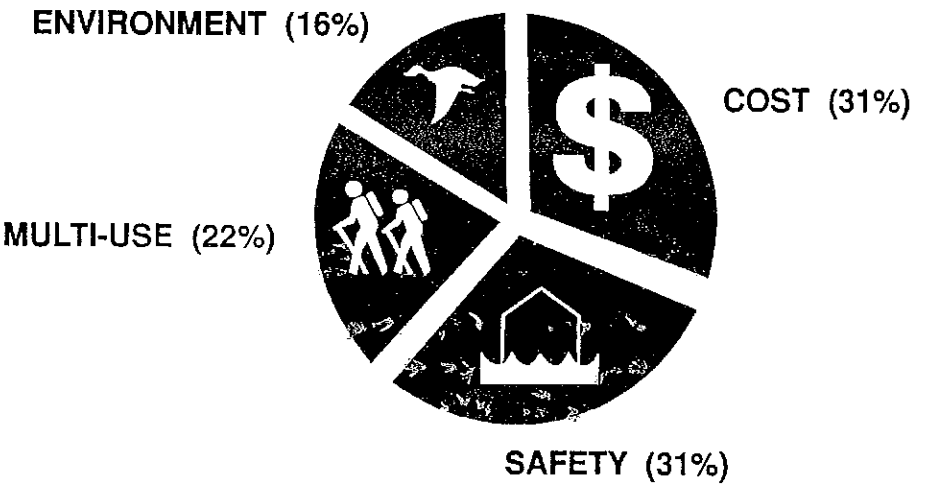
SPRING CREEK DBPS

COMMUNITY VALUES

ALONG UNION BLVD. - NORTH TRIB.

FIGURE 42





ENVIRONMENTAL EVALUATION

FIGURE 43 - ALONG UNION BLVD. - NORTH TRIBUTARY

INVENTORY OF CURRENT ENVIRONMENT CONDITIONS

	ACRES	PERCENT
1. Structural or Upland	0.4	8
2. Open Water	0	0
3. Mature Riparian Forest	3.3	72
4. Riparian Grassland	.9	20
5. Herbaceous Wetland	0	0
6. Emergent Wetland	0	0

TREATMENT	IMPACT		MITIGATION OPPORTUNITIES
	DISTURB	LOSS	
Underground System (Union Blvd. Fill)	1.6 Acres of Mature Riparian Forest 0.9 Acres of Riparian Grassland	1.6 Acres of Mature Riparian Forest 0.9 Acres of Riparian Grassland	Due to slopes of site and adjacent land, on site mitigation unfeasible. Off site mitigation required.
Underground System	1.7 Acres of Mature Riparian Forest	1.7 Acres of Mature Riparian Forest	Due to slopes of site and adjacent land, on site mitigation unfeasible. Off site mitigation required.
Soft Bank Lining	0.3 Acres of Mature Riparian Forest	No net loss	On site replacement of wetland vegetation and/or riparian habitat lost during construction using native plant materials.
Soft Bottom Lining	0.1 Acres of Mature Riparian Forest	No net loss	On site replacement of wetland vegetation and/or riparian habitat lost during construction using native plant materials.
Hard Bank Lining	1.4 Acres of Mature Riparian Forest	1.4 Acres of Mature Riparian Forest	Due to slopes of site and adjacent land, on site mitigation unfeasible. Off site mitigation required.
No Action	None	Natural erosion will cause loss of some vegetation.	Not applicable
Grade Control	0.2 Acres of Mature Riparian Forest	.1 Acre of Mature Riparin Forest.	Areas lost to drop structure mitigated through enhanced wetlands behind drop structures.

2. REACH 13A TO NORTH US 24 BYPASS TO FOUNTAIN BLVD.

a. Description of Existing Characteristics

This reach generally lies along an extension south of the concrete lined channel between Doniphan Drive and Hutchinson Drive towards the main channel of Spring Creek. It lies between the U.S. 24 Bypass project (by CDOT) and Fountain Blvd. The existing channel is natural with highly eroded banks and bottom. The area upstream of this channel is fully developed and drains from the north in a concrete lined channel which crosses Fountain Blvd between Doniphan Drive and Hutchinson Drive. This channel crosses Fountain Blvd. in a 60 inch pipe which discharges directly into this channel segment. The channel segment generally has a bottom width of 10 feet, is approximately 15 feet deep and has steep banks. The channel has an overall slope of 4.0%.

The existing soils are sandy resulting from alluvial deposits and are highly erodible. The vegetation consists of riparian grasslands which are made up of grasses and shrubs and mature riparian forest. The area is mostly undeveloped ground and future land uses are projected to be commercial adjacent to the channel.

b. Constraints

The existing channel has the capacity to carry the 100-year design storm, however, the velocities are extremely high as evidenced by the significant downcutting that has occurred in the channel. This channel extends from upstream of the U.S. 24 Bypass to Fountain Blvd. The channel will outfall into the proposed Spring Creek box culvert under the bypass.

c. Community Values

The community values determined for this reach are presented on Figure 44. The most important community value factor for this reach was determined to be cost with the remaining factors also having significant ratings.

d. Alternatives Considered

Due to the extreme slope of the existing channel, the alternatives were fairly limited. The alternatives include the following:

Underground System - Carry the flow in an underground pipe system
Fully Lined Channel - Carry the flow in an fully hard lined system

Even though the environment and multi-use are considered to be important for this

reach, it was not considered practical to leave the reach alone. It was considered more practical and desirable to relocate the habitat to a higher elevation above the proposed alternative. An evaluation of the environmental disturbance, losses, and mitigation required for each alternative is shown on Figure 45. The following alternatives were not considered for the reasons noted below:

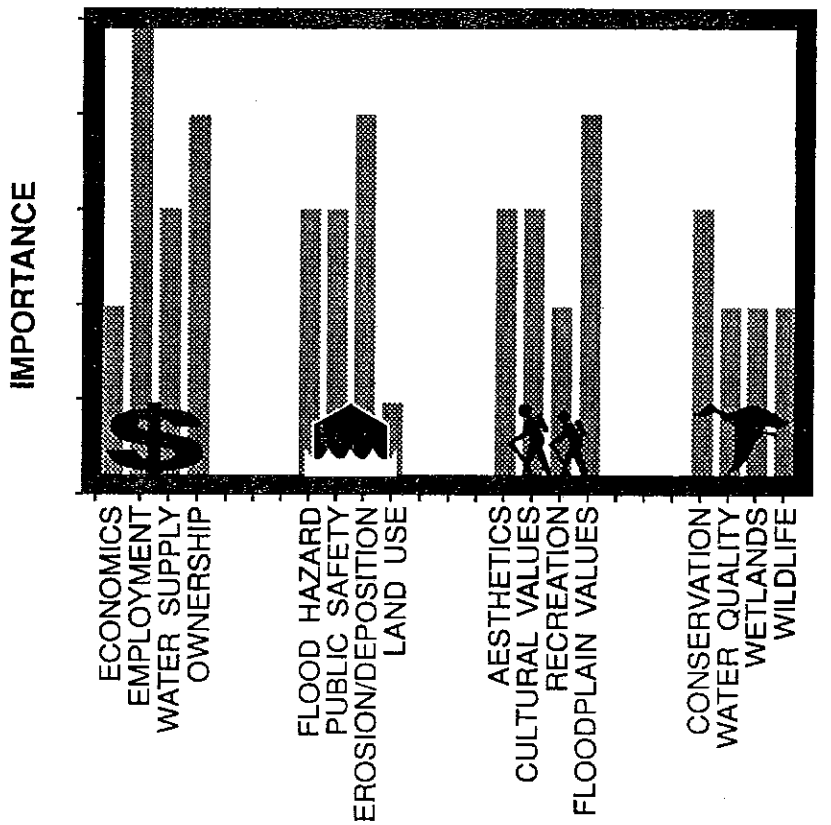
Detention Upstream	-	There is no practical location for detention upstream of this reach since all of the area upstream is fully built out with very limited ROW available.
Grade Control	-	It is not practical to build grade control on this reach since the existing grade is too steep. This would require a continuous series of drop structures which would practically result in a fully hard lined alternative.

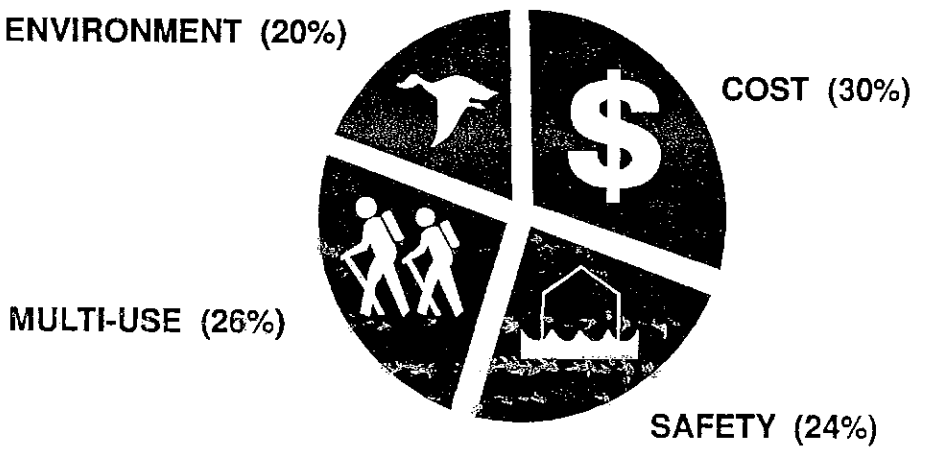
SPRING CREEK DBPS

COMMUNITY VALUES

U.S. 24 BYPASS TO FOUNTAIN BLVD. - NORTH TRIB.

FIGURE 44





ENVIRONMENTAL EVALUATION

FIGURE 45 - U.S. 24 BYPASS TO FOUNTAIN BLVD. - NORTH TRIBUTARY

INVENTORY OF CURRENT ENVIRONMENT CONDITIONS

	ACRES	PERCENT
1. Structural or Upland	0	0
2. Open Water	0	0
3. Mature Riparian Forest	0.3	50
4. Riparian Grassland	0.3	50
5. Herbaceous Wetland	0	0
6. Emergent Wetland	0	0

TREATMENT	IMPACT		MITIGATION OPPORTUNITIES
	DISTURB	LOSS	
Underground System	0.3 Acres Mature Riparian Forest 0.3 Riparian Grassland	0.3 Acres Mature Riparian Forest 0.3 Riparian Grassland	Fill channel and create new swale at higher elevation; divert trickle flows and Fountain Boulevard runoff to create new wetland/habitat; remaining stormwater to be carried in underground system.
Fully Lined Channel	0.3 Acres Mature Riparian Forest 0.3 Riparian Grassland	0.3 Acres Mature Riparian Forest 0.3 Riparian Grassland	No on-site mitigation. Off-site mitigation opportunities limited.
No Action	None- All vegetation left undisturbed.	Major- Natural erosion will widen and incise channel causing loss of most vegetation.	Not applicable.

3. REACH 10C - 10B VALLEY HI GOLF COURSE TO NW

a. Description of Existing Characteristics

This reach is located on the Valley Hi Golf Course and extends from Valley High Lake to Airport Road. The existing channel has a natural bottom and riprap side slopes. The channel is located on the Valley High golf course and carries drainage from Airport Road in a southeasterly direction to Valley Hi Lake. The channel segment generally has a bottom width of 10 feet and is approximately 4 feet deep. The channel has an overall slope of 1.1%. There are several cart paths which bridge over the channel to allow golfers to cross it. The last 475 feet near the lake changes to a 42 inch corrugated steel pipe instead of the channel.

The existing soils are sandy resulting from alluvial or eolian deposits and are highly erodible. Presently, however, the channel is not eroding except at the outlet of the 42" CSP. The channel does not have very much vegetation and the area above the channel consists of upland grasses. The area is currently developed as a golf course. The crossing of Airport Road is at least half silted in. Overflows from north of airport road are not fully picked up by this channel. These overflows, for major and minor storms, have proceeded south past the three golf course lakes and adversely impacted the existing apartment buildings along Circle Drive.

b. Constraints

The existing channel does not have the capacity to carry the 100-year design storm and the velocities are moderate (6 to 8 feet per second). This channel needs to fit into the recreational uses on the golf course. There is some constraints on widening the channel due to the location of tee boxes and greens on the golf course.

c. Community Values

The community values determined for this reach are presented on Figure 46. The most important community value factor for this reach was determined to be multi-use with the remaining factors having significantly lower ratings.

d. Alternatives Considered

The alternatives were selected from a wide range of possible alternatives. From this range of possible alternatives, the list was narrowed down to the following alternatives:

Expand capacity of the existing bank lined open channel with a hard lined bottom
Expand capacity of the existing bank lined open channel with a soft lined bottom
Expand capacity of the existing bank lined open channel with a bare bottom

An evaluation of the environmental disturbance, losses, and mitigation required for each alternative are shown on Figure 47. The following alternatives were not considered for the reasons noted below:

Detention Upstream - There is no practical location for detention upstream of this reach since all of the area immediately upstream is fully built out with very limited ROW available. The nearest area that is undeveloped upstream is also too far upstream to reduce the peak flows to any significant extent.

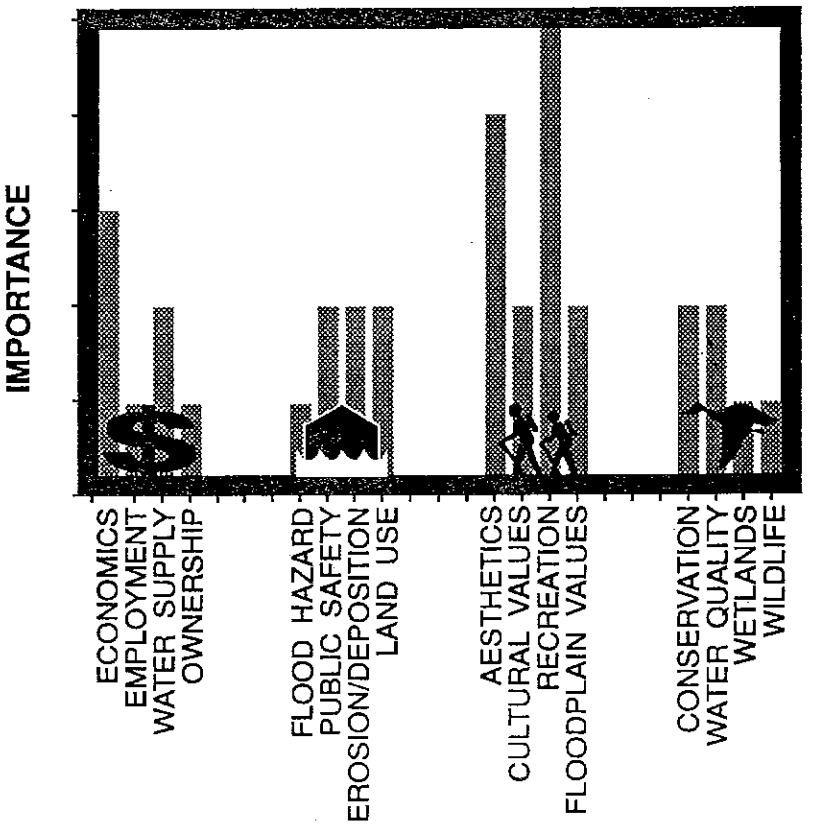
Grade Control - Using grade control on this reach would cause significant flooding on the golf course. Not only is this not a desirable situation, it could also cause additional flooding by existing buildings near Circle Drive due to the overflow patterns on the golf course.

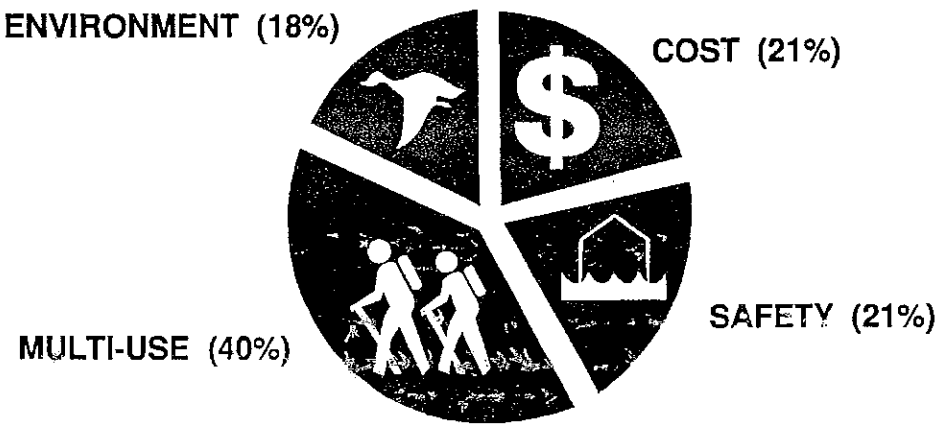
SPRING CREEK DBPS

COMMUNITY VALUES

VALLEY GOLF COURSE - NORTHWEST TRIB.

FIGURE 46





ENVIRONMENTAL EVALUATION

FIGURE 47 - VALLEY HI GOLF COURSE - NORTHWEST TRIBUTARY

INVENTORY OF CURRENT ENVIRONMENT CONDITIONS		ACRES	PERCENT		ACRES	PERCENT
	1. Structural or Upland	1.0	100	4. Riparian Grassland	0	0
	2. Open Water	0	0	5. Herbaceous Wetland	0	0
	3. Mature Riparian Forest	0	0	6. Emergent Wetland	0	0

TREATMENT	IMPACT		MITIGATION OPPORTUNITIES
	DISTURB	LOSS	
No Action	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable.
Expand Capacity - Hard Lined Sides and Bottom	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable.
Expand Capacity - Hard Lined Sides with Soft Bottom Lining	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Potential opportunity to enhance the bottom with wetlands vegetation to mitigate for another site.
Expand Capacity - Hard Lined Sides with No Bottom Lining	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable.

4. REACH 10A TO CHELTON DRIVE VALLEY HI GOLF COURSE TO NE

a. Description of Existing Characteristics

This reach is located on the Valley Hi Golf Course and extends from Valley High Lake to Chelton Drive in a northeasterly direction. This reach crosses Chelton Drive north of the Spring Creek main channel crossing described previously when dealing with the main channel. The 8' culvert crossing beneath Chelton conveys the surface runoff and overflow from the golf course east of Chelton (sub-basin I-1) and surface flows to Valley Hi Lake. The culvert also doubles as a golf cart crossing beneath Chelton. The existing channel has a fully concrete lined section. The channel is located on the Valley High golf course and carries drainage from Chelton Drive in a southwesterly direction to the main channel of Spring Creek. The channel segment generally has a bottom width of 28 feet and is approximately 4 feet deep. The channel has an overall slope of 0.5%. There are several cart paths which bridge over the channel to allow golfers to cross it. The top of the channel is slightly higher than the surrounding ground preventing local runoff from entering the channel from the sides. The storm drain system along Chelton and north to airport Rd. discharges into this channel.

The existing soils are silty to clayey resulting from alluvial deposits and are not very erodible. The channel does not have very much vegetation and the area above the channel consists of upland grasses. The area is currently developed as a golf course.

b. Constraints

The existing channel has the capacity to carry the 100-year design storm with slightly less than the required freeboard. The channel velocities are moderate (7 to 9 feet per second). This channel needs to fit into the recreational uses on the golf course.

c. Community Values

The community values determined for this reach are presented on Figure 48. The most important community value factor for this reach was determined to be multi-use.

d. Alternatives Considered

The alternatives were selected from a wide range of possible alternatives. From this range of possible alternatives, the list was narrowed down to the following alternatives:

Expand capacity of the existing fully concrete lined open channel with a hard lined channel to satisfy freeboard requirements.

Improve adjoining surface drainage by modifying of the existing fully concrete lined open channel with a soft lined bottom & low flow pipe.

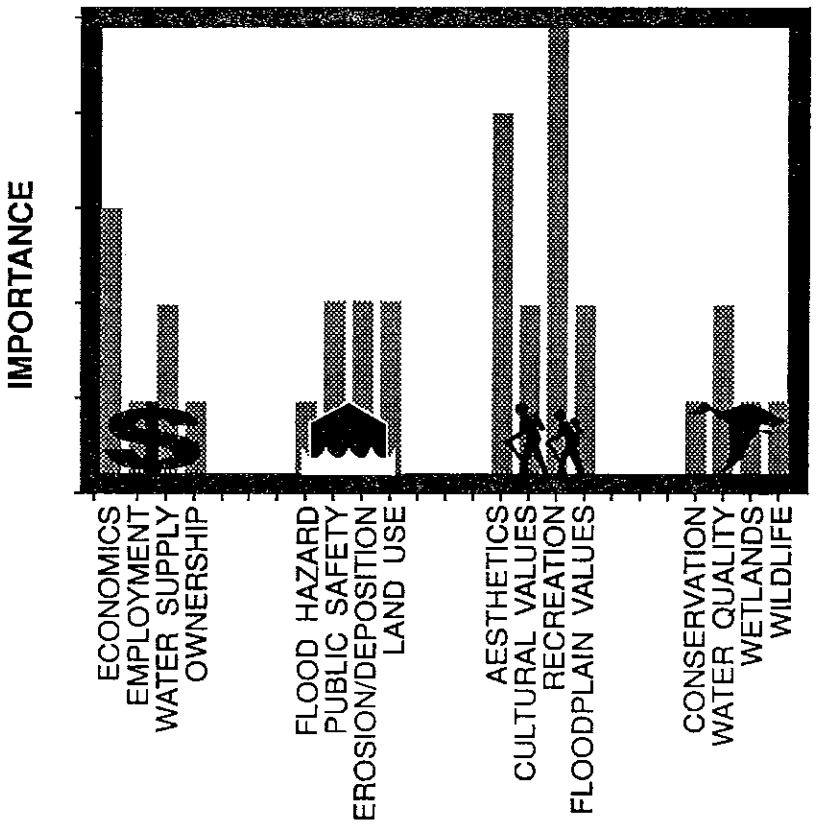
An evaluation of the environmental disturbance, losses, and mitigation required for each alternative is shown on Figure 49. Replacing this section of channel with a more natural section such as a soft bottom was not considered practical since it would actually create a bigger flooding problem due to the higher roughness of the channel. There is also not a suitable detention site on the channel or upstream so this was also not considered. Some detention might be possible on the golf course east of Chelton but the cost/benefit would not be advantageous.

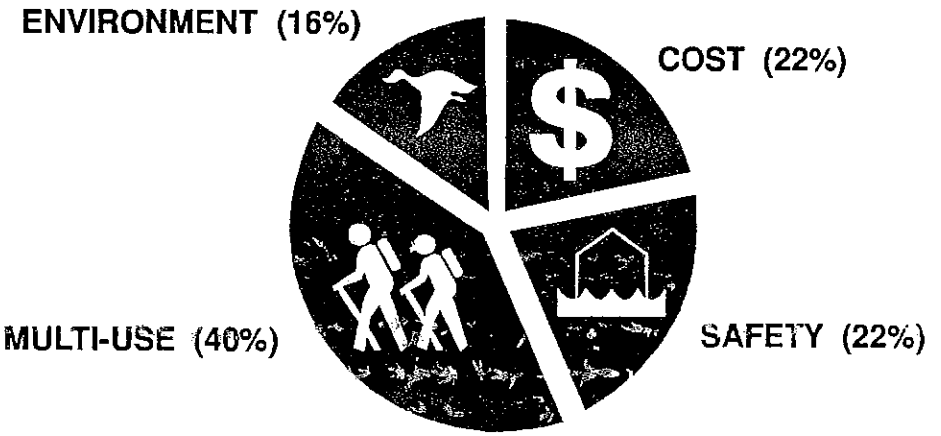
SPRING CREEK DBPS

COMMUNITY VALUES

VALLEY GOLF COURSE - NORTHEAST TRIB.

FIGURE 48





ENVIRONMENTAL EVALUATION

FIGURE 49 - VALLEY HI GOLF COURSE - NORTHEAST TRIBUTARY

INVENTORY OF CURRENT ENVIRONMENT CONDITIONS		ACRES	PERCENT		ACRES	PERCENT
	1. Structural or Upland	0.7	100	4. Riparian Grassland	0	0
	2. Open Water	0	0	5. Herbaceous Wetland	0	0
	3. Mature Riparian Forest	0	0	6. Emergent Wetland	0	0

TREATMENT	IMPACT		MITIGATION OPPORTUNITIES
	DISTURB	LOSS	
No Action	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable.
Expand Capacity - Hard Lined Sides and Bottom	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable.
Expand Capacity - Hard Lined Sides with Soft Bottom Lining	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Potential opportunity to enhance the bottom with wetlands vegetation to mitigate for another site.

5. REACH 6A - 6B ACADEMY BLVD. TO PIKES PEAK AVE.

a. Description of Existing Characteristics

The existing channel is fully lined with concrete. The channel is located east of Academy Blvd. between Pikes Peak Ave. and Bijou street. The channel reach generally has a bottom width of 12 feet and is approximately 4 feet deep. The channel has an overall slope of 3.3%. The channel does not have any vegetation and the area above the channel consists of upland grasses. The area is currently developed as with commercial or multifamily land uses adjacent to the channel.

West of Academy Blvd. to the main channel is a section of natural channel that has been highly eroded. A stilling basin has recently been added to the outfall across Academy by CDOT that should help reduce the erosion west of Academy. However, the soils for this area are still highly erodible and some treatment is still required. That section was considered in the treatment of the Red Wing detention site since its characteristics more closely matched those for the pond rather than this current section of channel.

b. Constraints

The existing channel does not have the capacity to carry the 100-year design storm with adequate freeboard. If no freeboard is assumed the channel will carry the 100-year design storm. The channel velocities are very high, even for the concrete lining. This channel is constrained by existing development.

c. Community Values

The community values determined for this reach are presented on Figure 50. The most important community value factors for this reach were determined to be cost and safety by a wide margin.

d. Alternatives Considered

The alternatives were selected considering what is feasible within the existing constraints. This list includes the following alternatives:

Expand capacity of the existing fully lined open channel
Replace this segment with a concrete box culvert

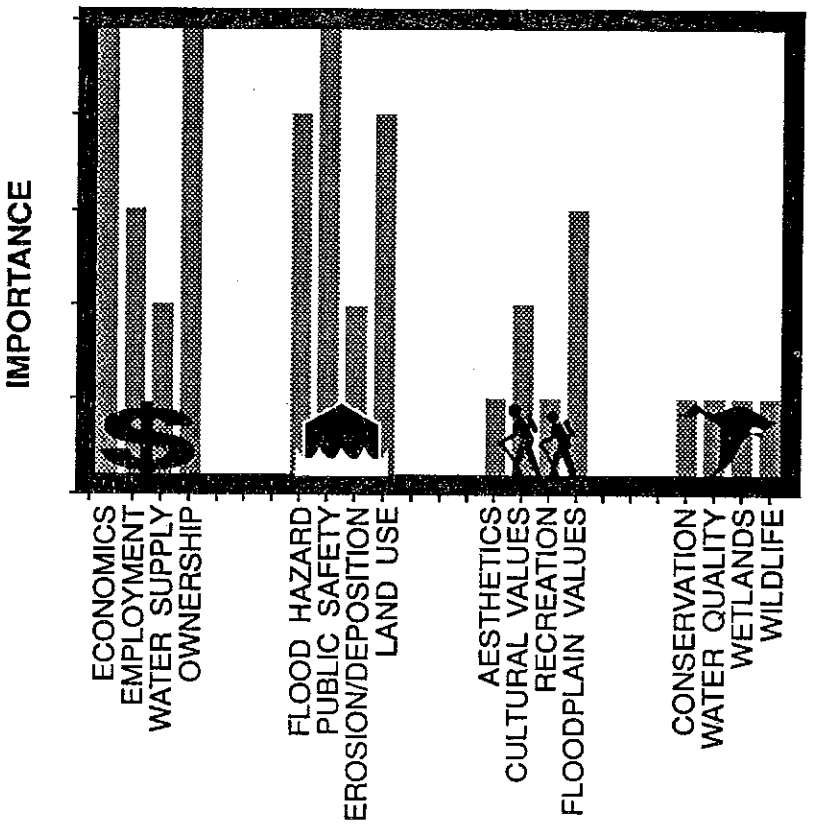
An evaluation of the environmental disturbance, losses, and mitigation required for each alternative is shown on Figure 51.

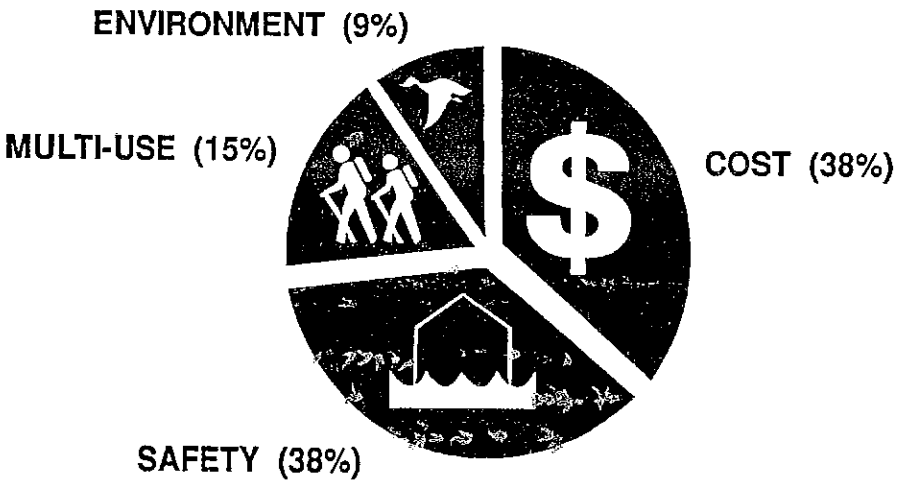
SPRING CREEK DBPS

COMMUNITY VALUES

ACADEMY BLVD. TO BIJOU ST. (EAST TRIB.)

FIGURE 50





ENVIRONMENTAL EVALUATION

FIGURE 51 - ACADEMY BLVD. TO BIJOU ST. (EAST TRIBUTARY)

INVENTORY OF CURRENT ENVIRONMENT CONDITIONS		ACRES	PERCENT		ACRES	PERCENT
	1. Structural or Upland	0.7	100	4. Riparian Grassland	0	0
	2. Open Water	0	0	5. Herbaceous Wetland	0	0
	3. Mature Riparian Forest	0	0	6. Emergent Wetland	0	0

TREATMENT	IMPACT		MITIGATION OPPORTUNITIES
	DISTURB	LOSS	
No Action	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable. No opportunities available to create wetlands or habitat due to space limitations.
Expand Capacity - Hard Lined Sides and Bottom	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable. No opportunities available to create wetlands or habitat due to space limitations.
Replace with Concrete Box Culvert	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable. No opportunities available to create wetlands or habitat due to space limitations.

6. REACH 6B - 6C BIJOU STREET TO PLATTE AVE.

a. Description of Existing Characteristics

The existing channel is fully lined with concrete. The channel is located east of Academy Blvd. between Bijou Street and Platte Ave. (U.S. Highway 24). The channel segment generally has a bottom width of 8 feet and is approximately 4 feet deep. The channel has an overall slope of 1.0%. Portions of this reach are built as an underground pipe instead of an open channel.

The channel does not have any vegetation and the area above the channel consists of upland grasses. The area is currently developed as with commercial land uses adjacent to the channel.

b. Constraints

The existing channel does not have the capacity to carry the 100-year design storm with adequate freeboard. If no freeboard is assumed the channel is questionable on carrying the 100-year design storm. The channel velocities are high. This channel is constrained by existing development.

c. Community Values

The community values determined for this reach are presented on Figure 52. The most important community value factors for this reach were determined to be cost and safety by a wide margin.

d. Alternatives Considered

The alternatives were selected considering what is feasible within the existing constraints. This list includes the following alternatives:

Expand capacity of the existing fully lined open channel
Replace this segment with a concrete box culvert

No additional modifications to channel - facilities to operate slightly under capacity.

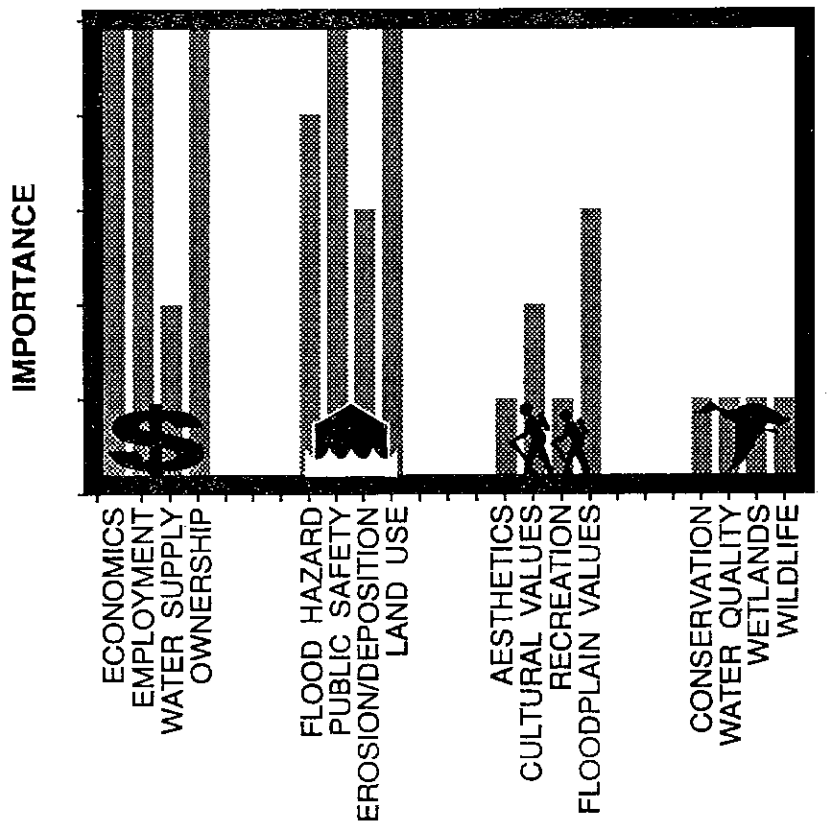
An evaluation of the environmental disturbance, losses, and mitigation required for each alternative is shown on Figure 53.

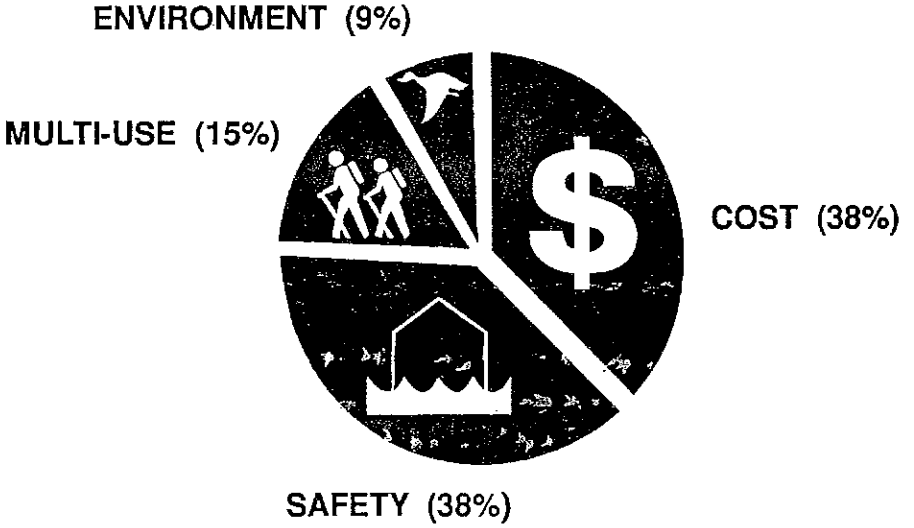
SPRING CREEK DBPS

COMMUNITY VALUES

BIJOU ST. TO PLATTE AVE. (US 24) (EAST TRIB.)

FIGURE 52





ENVIRONMENTAL EVALUATION

FIGURE 53 - BIJOU ST. TO PLATTE AVE. (U.S. 24) - (EAST TRIBUTARY)

INVENTORY OF CURRENT ENVIRONMENT CONDITIONS

	ACRES	PERCENT
1. Structural or Upland	0.4	100
2. Open Water	0	0
3. Mature Riparian Forest	0	0
4. Riparian Grassland	0	0
5. Herbaceous Wetland	0	0
6. Emergent Wetland	0	0

TREATMENT	IMPACT		MITIGATION OPPORTUNITIES
	DISTURB	LOSS	
No Action	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable. No opportunities available to create wetlands or habitat due to space limitations.
Expand Capacity - Hard Lined Sides and Bottom	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable. No opportunities available to create wetlands or habitat due to space limitations.
Replace with Concrete Box Culvert	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable. No opportunities available to create wetlands or habitat due to space limitations.

7. REACH 13A - M4 FOUNTAIN BLVD. TO WINNIPEG

a. Description of Existing Characteristics

The existing channel is fully lined with concrete. The channel is located north of Fountain Blvd. between Doniphan Drive and Hutchinson Drive. The channel segment generally has a V-ditch approximately 6.8 feet deep. The channel has an overall slope of 3.0%. The upper portion of this reach is in a pipe of inadequate size to carry the design flow.

The channel does not have any vegetation and the area above the channel consists of upland grasses. The area is currently developed with residential land uses adjacent to the channel.

b. Constraints

The existing channel does not have the capacity to carry the 100-year design storm with adequate freeboard. If no freeboard is assumed the channel will carry the 100-year design storm under current design criteria. However, the crossing of Fountain Blvd. is marginally adequate to pass the design storm if the crossing is maintained. It currently is debris filled and would not function well in a large storm. The channel velocities are high. This channel is constrained by existing development. No maintenance access was provided when the channel was built.

c. Community Values

The community values determined for this reach are presented on Figure 54. The most important community value factors for this reach were determined to be cost and safety by a wide margin.

d. Alternatives Considered

The alternatives were selected considering what is feasible within the existing constraints. This list includes the following alternatives:

Expand capacity of the existing fully lined open channel
Replace this segment with a concrete box culvert

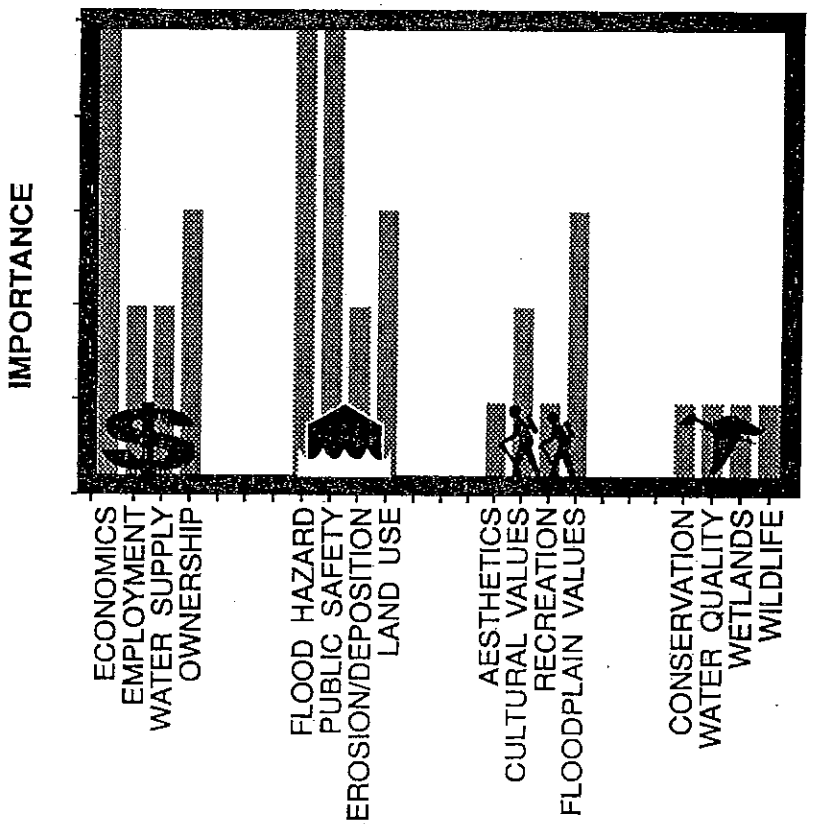
An evaluation of the environmental disturbance, losses, and mitigation required for each alternative is shown on Figure 55.

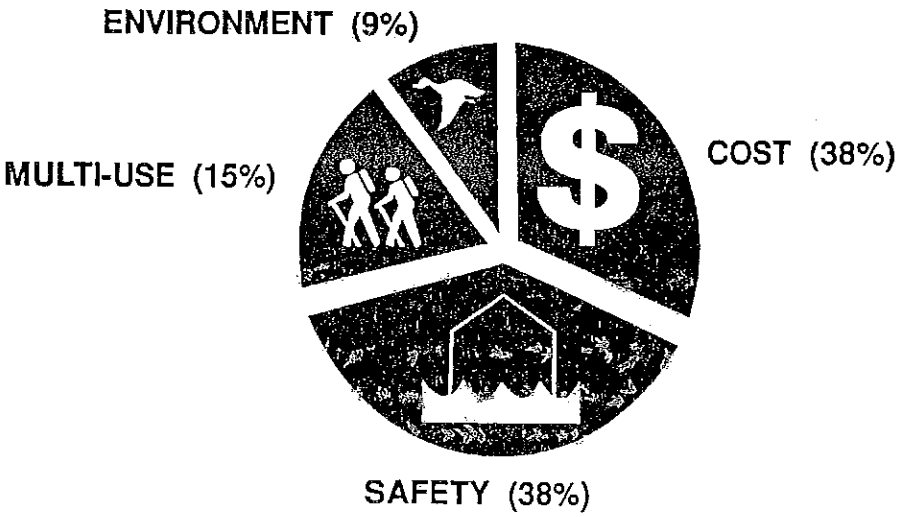
SPRING CREEK DBPS

COMMUNITY VALUES

FOUNTAIN BLVD. TO WINNIPEG ST.

FIGURE 54





ENVIRONMENTAL EVALUATION

FIGURE 55 - FOUNTAIN BLVD. TO WINNIPEG ST.

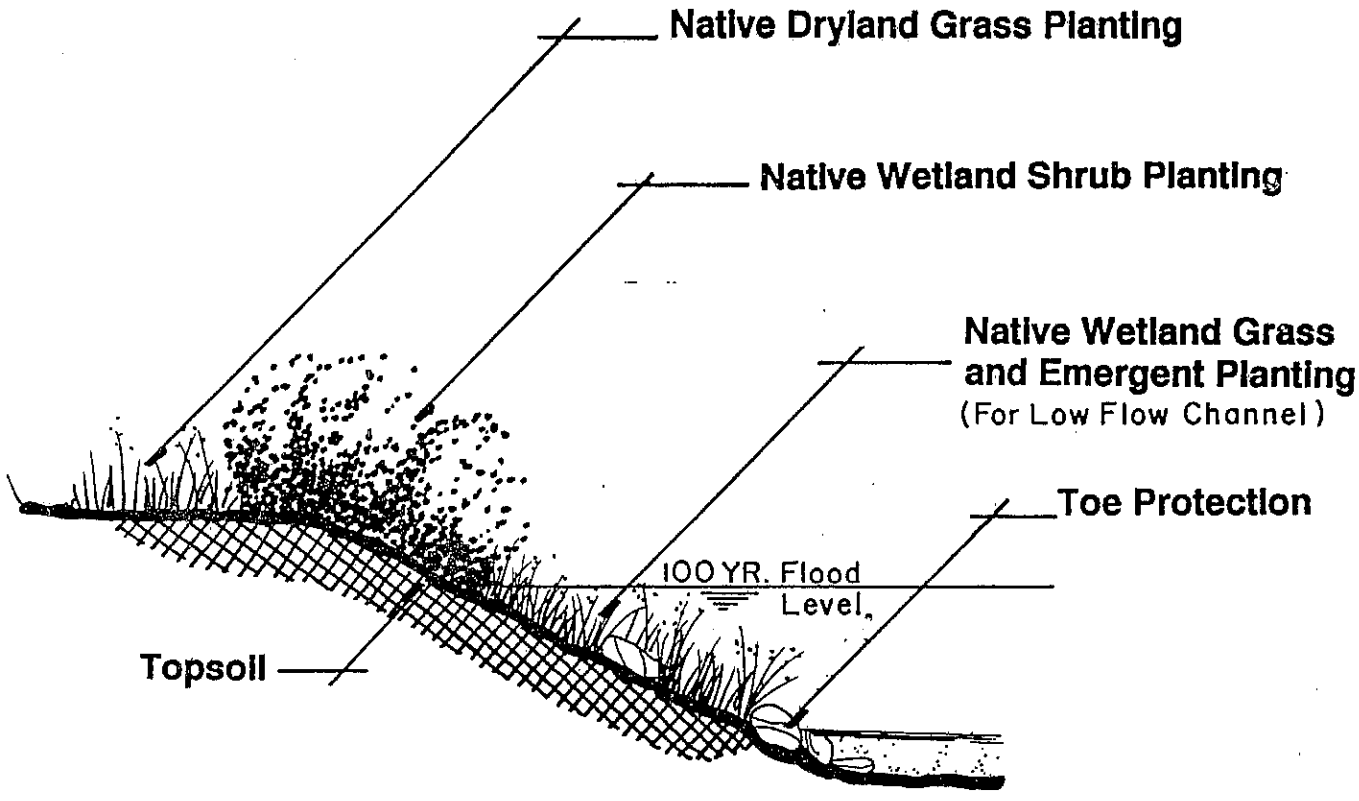
INVENTORY OF CURRENT ENVIRONMENT CONDITIONS		ACRES	PERCENT		ACRES	PERCENT
	1. Structural or Upland	0.5	100	4. Riparian Grassland	0	0
	2. Open Water	0	0	5. Herbaceous Wetland	0	0
	3. Mature Riparian Forest	0	0	6. Emergent Wetland	0	0

TREATMENT	IMPACT		MITIGATION OPPORTUNITIES
	DISTURB	LOSS	
No Action	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable. No opportunities available to create wetlands or habitat due to space limitations.
Expand Capacity - Hard Lined Sides and Bottom	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable. No opportunities available to create wetlands or habitat due to space limitations.
Replace with Concrete Box Culvert	None- No significant wetlands or habitat present.	None- No significant wetlands or habitat present.	Not applicable. No opportunities available to create wetlands or habitat due to space limitations.

D. EXISTING UNDERGROUND SYSTEMS

There are many locations where flooding complaints have been received by the City staff due to inadequate storm sewer systems within the Spring Creek basin. Since these are all in locations where full development has already occurred, there are a limited number of alternatives available to reduce the potential for flooding. The only practical alternative is to add underground pipes and inlets along the existing roadways. Therefore, it did not make sense to present alternative considerations for these areas to as was done previously in this section. The facilities proposed to upgrade the existing underground systems are included in the recommendations in the next section.

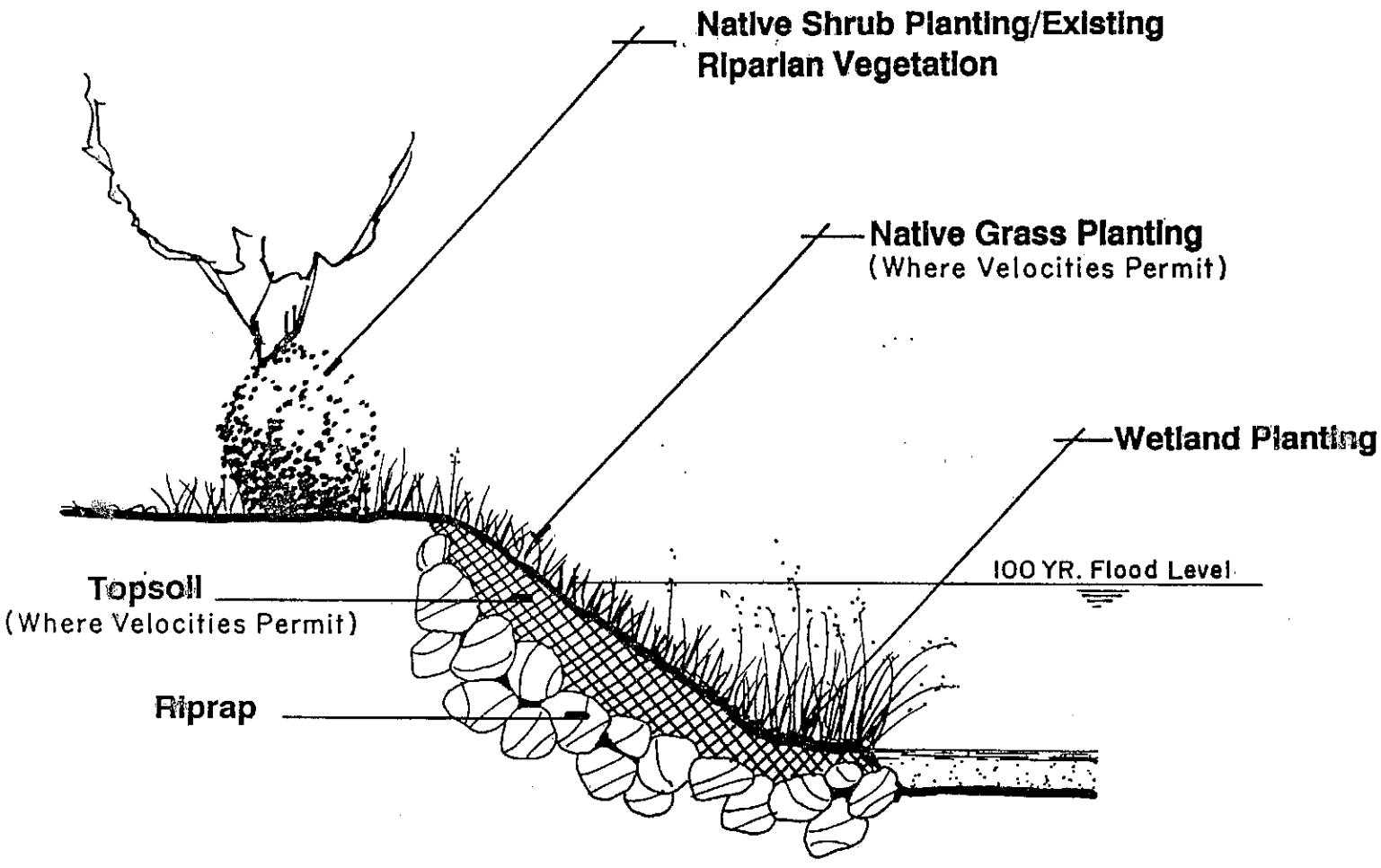
There is a small detention pond in subbasin G2-1 that is part of the initial drainage system. This pond is fairly small and is not adequate to handle the area upstream of the pond without overtopping the dam since there is not an overflow spillway. It was designed under the previous drainage criteria.



SPRING CREEK DBPS

FIGURE 56
CHANNEL TREATMENT - SOFT BANK LINING

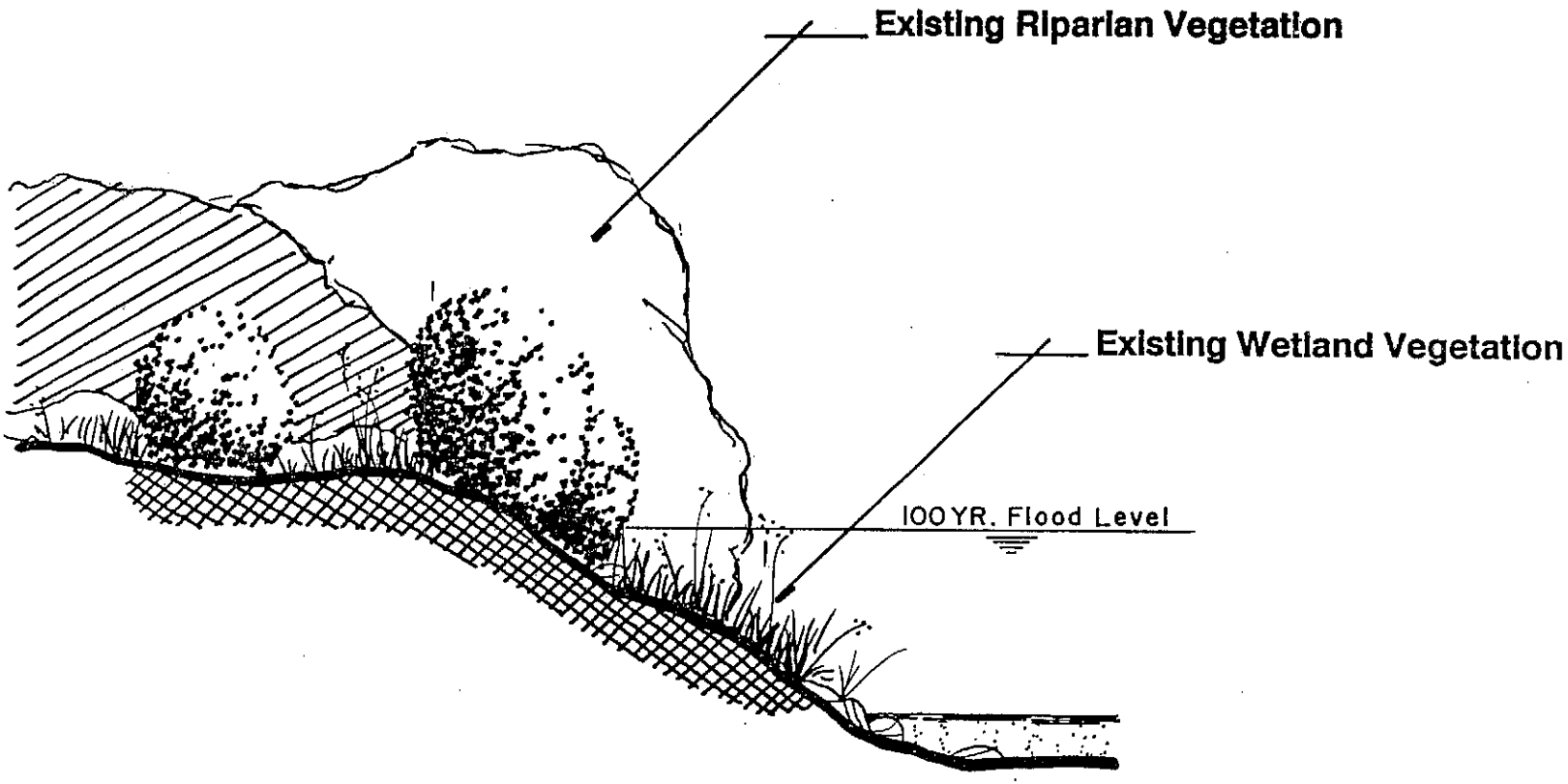
(SHRUB-GRASS)



SPRING CREEK DBPS

FIGURE 57
CHANNEL TREATMENT - HARD BANK LINING

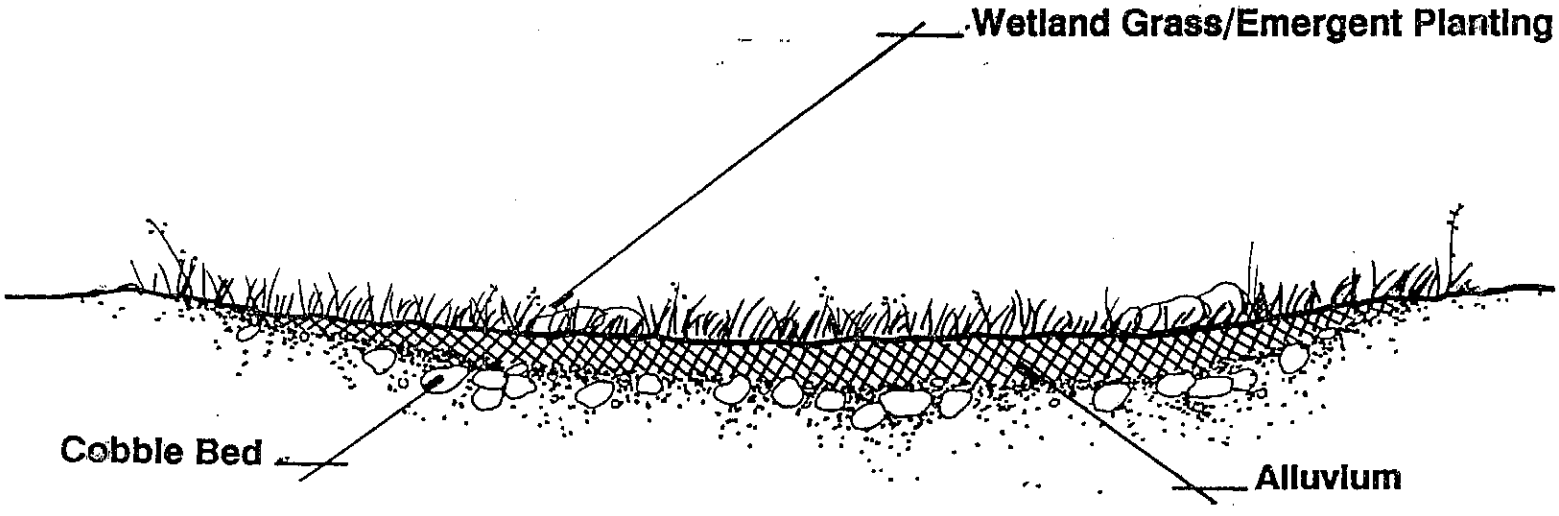
(BURIED RIPRAP)



SPRING CREEK DBPS

FIGURE 58
CHANNEL TREATMENT - NO BANK LINING

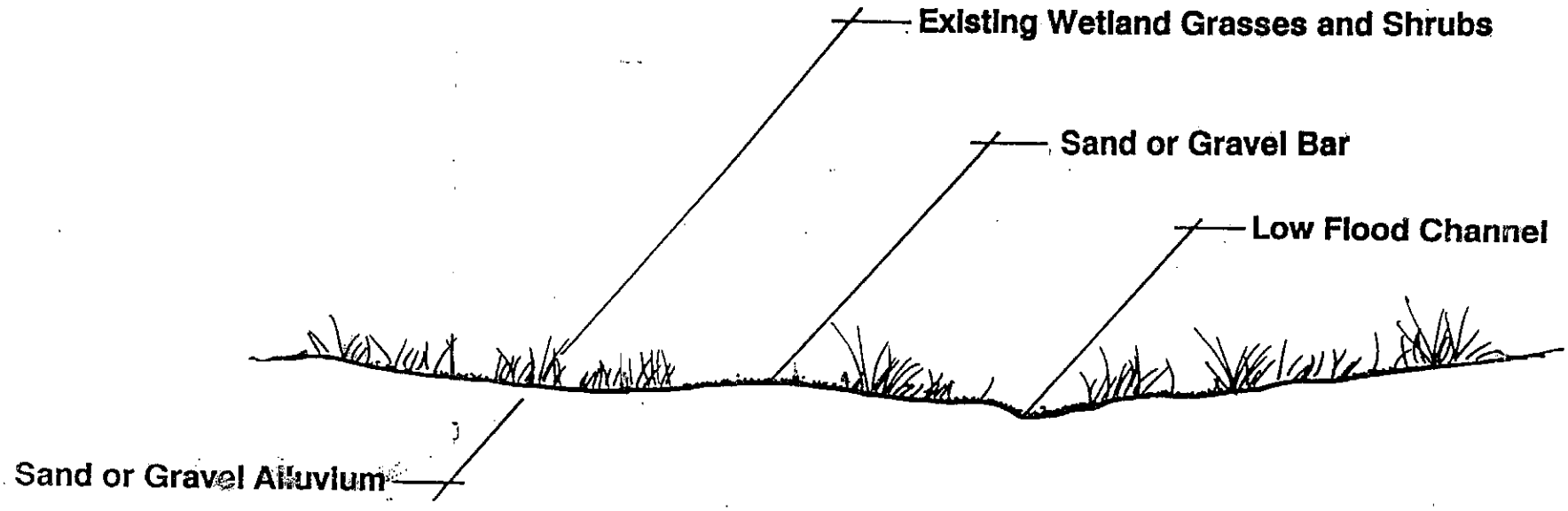
(NATURAL CHANNEL)



SPRING CREEK DBPS

FIGURE 59
CHANNEL TREATMENT - SOFT BOTTOM LINING

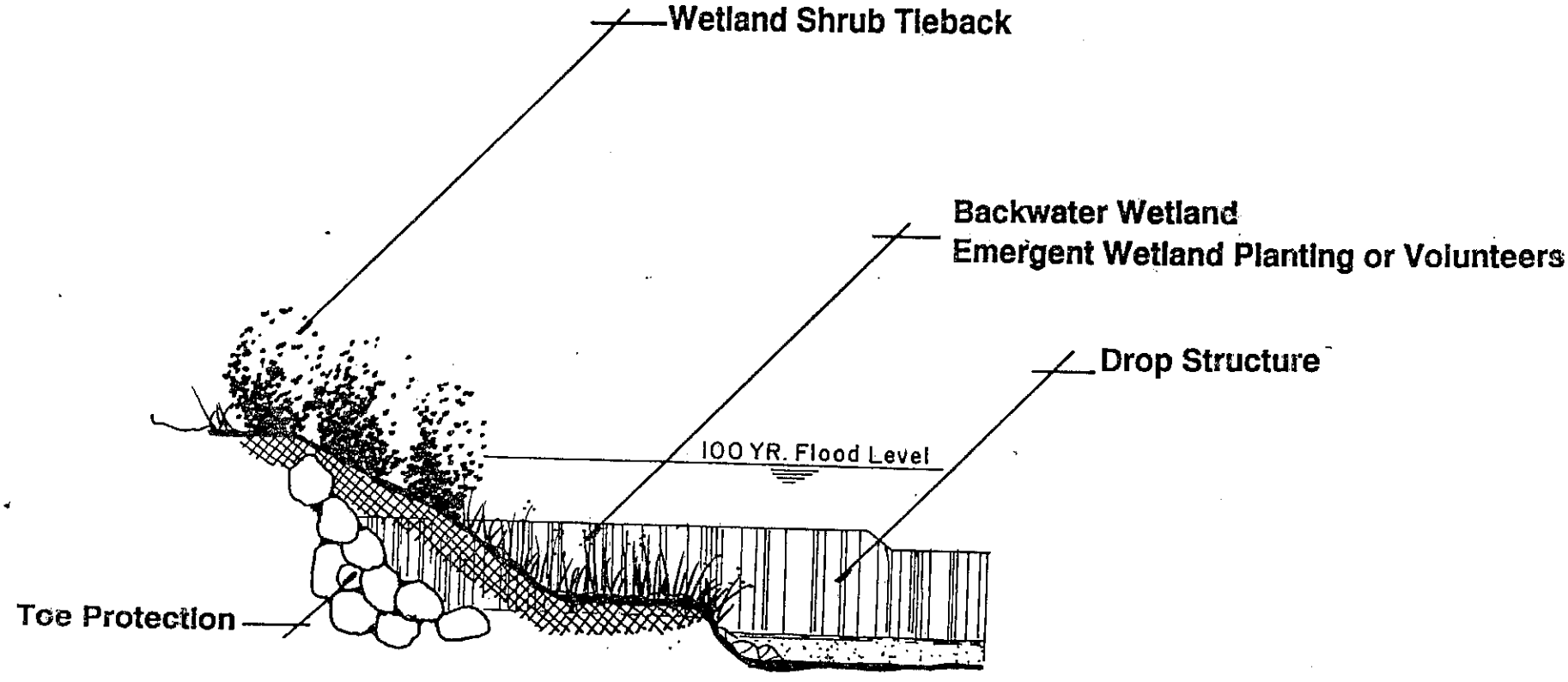
(GRASSES)



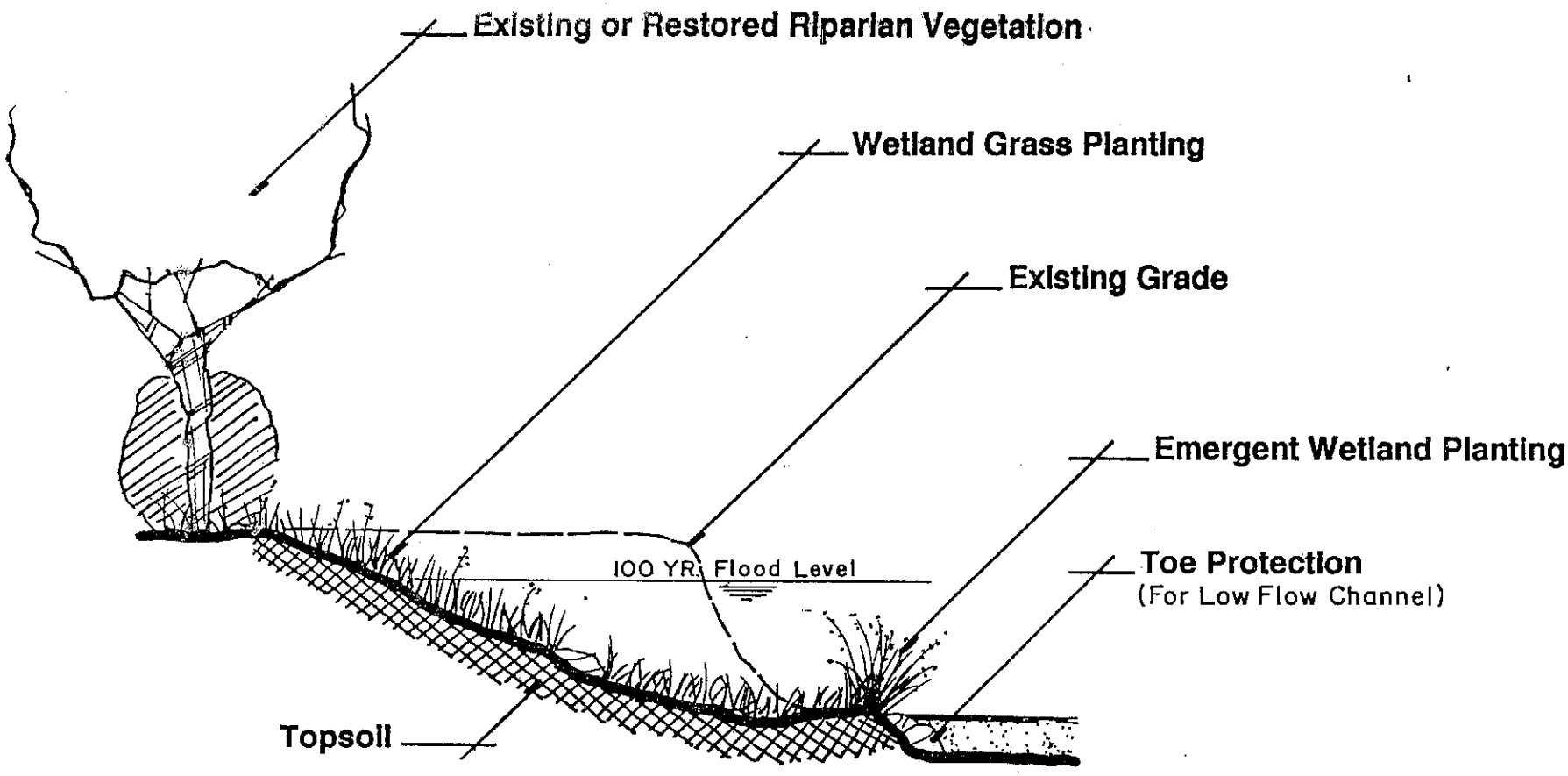
SPRING CREEK DBPS

FIGURE 60
CHANNEL TREATMENT - NO BOTTOM LINING

(NATURAL CHANNEL)



SPRING CREEK DBPS
FIGURE 61
CHANNEL TREATMENT - GRADE CONTROL

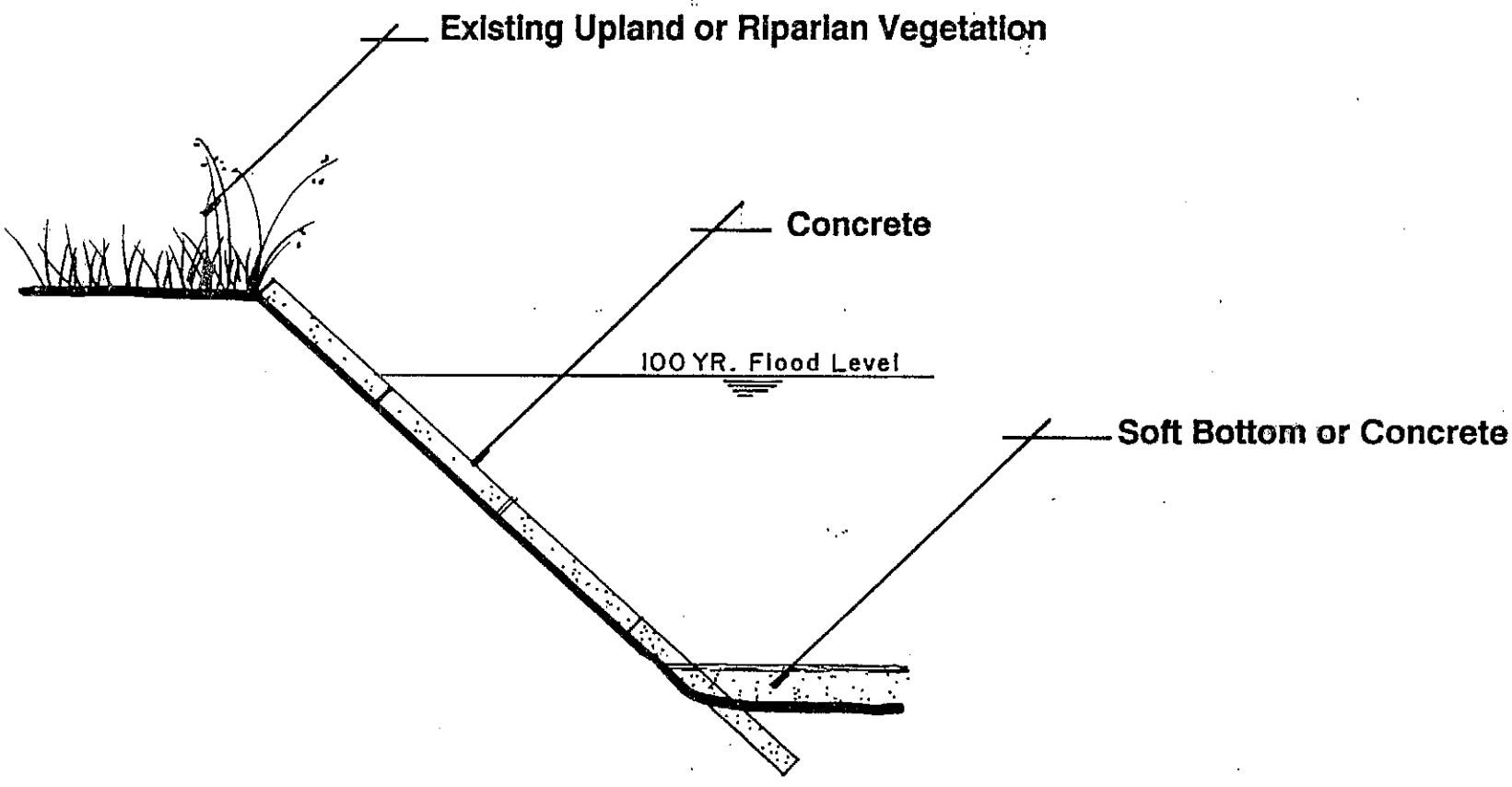


Bank Reshaping To Provide
Stable Slope

SPRING CREEK DBPS

FIGURE 62
CHANNEL TREATMENT - BANK RESHAPING

(3:1 SLOPES)



SPRING CREEK DBPS

FIGURE 63
CHANNEL TREATMENT - EXPAND CAPACITY

(CONCRETE LINED)

Recommended Plan

V. RECOMMENDED PLAN

A. ALTERNATIVE SELECTION CRITERIA

The selection of alternatives for each reach of the basin was done by weighing all of the alternative evaluation parameters equally. There are basic contradictions throughout the alternative selection process from the differing regulations that govern drainage. These conflicts can not be resolved without some compromises. The steep terrain and erodible soils result in some type of channel protection for the majority of this basin in order to avoid having significant changes in the channel cross section or hazards to life and property. On the other hand, it is desirable to leave this basin as close to natural as possible to minimize the impact to vegetation and wildlife. This basin plan needed to consider all of these facts and make decisions on what is the plan for the Spring Creek basin. Specific recommendations for facilities are described in the sections that follow and tabulated in Tables 9, 10, 11, and 12 immediately following this section. The recommended plan is a result of much effort and discussion with appropriate government agencies and interested citizens. We would like to thank the following agencies for their previous and continued participation in this study:

Federal Agencies

Corps of Engineers
Environmental Protection Agency
U.S. Fish and Wildlife Service
Federal Emergency Management Agency

State Agencies

Colorado Division of Wildlife
Colorado Department of Transportation
Colorado Water Conservation Board

Local Agencies

El Paso County Department of Public Works
El Paso County Land Use Department
El Paso County Parks Department
City/County Drainage Board
City Planning Division
City Parks and Recreation

The following specific concerns were raised through the series of meetings held:

1. Valley Hi Lake

The Valley Hi Lake is of interest in terms of habitat for birds and small mammals. This point was raised by members of the Audubon Society and the Colorado Division of Wildlife. This area is used by bird watchers and a list of species observed on different occasions is available and was forwarded to Dr. Olgeirson, the Environmental Consultant for this study. The lake volume and depth has been significantly reduced in the last several years due to sediment buildup in the lake. The significant flooding problems adjacent to the lake were also discussed. The question of whether or not the lake should be dredged to increase the depth and volume was raised by URS. The City and the Corps expressed concern over both the cost and benefit of dredging, as well as the effect on wildlife and wetlands. The desired depth of the lake was a point of contention with some favoring the lake in its present depth and some favoring the depth before it was filled in with sediment. The Division of Wildlife indicated that the wildlife options focused on whether catfish or similar deep water species were a priority over emergent wetland species. The question remains on whether or not we can halt the sedimentation process in the lake or not. Cleaning the existing sediment basins, located between the lake and Chelton Road, was identified as one partial remedy. If the sediment sources can't be reduced to an acceptable level then it would not be feasible to dredge the lake. This location was pointed out as a potential site for detention in the basin. Serious flooding has occurred downstream of the pond due to the lack of capacity of the outfall structure and overtopping of the embankment.

2. Red Wing Sanctuary

A concern about the degradation and the drying out of the Red Wing Sanctuary area was raised. The land was donated as an anonymous gift to the Aiken Audubon Society around 1982. The upstream property was mostly built out by this time with underground piping systems emptying into the sanctuary from the north and east. The process that is changing this area started before 1982. It has accelerated in recent years as can be seen from photographs obtained from the Audubon Society. The sanctuary area was originally an emergent wetland before the changes started occurring. This can be seen on the 1947 air photographs of the area. It has now dried out to the point where it is more of a riparian grassland than an emergent wetland. This process has come about through the concentration of flows due to development and roadway construction adjacent to the area. The development also contributed to cutting off the groundwater springs and the increase in velocities through the site. The groundwater has not appeared in the sanitary sewer system so it was unclear where the natural springs and seeps are outfalling now. The question of trying to back up water on the sanctuary using a detention pond at the downstream end was discussed. A number of letters and reports were obtained for the sanctuary area.

3. U.S. 24 Bypass

The U.S. 24 Bypass route through the basin was described to the group. This project is the most significant transportation project in recent years for the Colorado Springs area. It provides the first freeway type east/west route available for travelers through Colorado Springs. The remainder of the work on the Spring Creek section of the bypass will be completed in the summer of 1993. The section of Spring Creek from Union Blvd. to Circle Drive will be in a concrete box culvert under U.S. 24 for the majority of the reach. The hydrology for the basin study has resulted in a higher design flow than the Colorado Department of Transportation used for the drainage systems for the bypass. A mitigation area is under construction on the northeast side of the Union Blvd. interchange with the Bypass. This reach has an Individual Section 404 Permit for the changes to the channel and the mitigation area is required to replace the vegetation and habitat disturbed by the Bypass project.

4. Other Concerns Raised

Several people expressed an interest in incorporating standards for preserving natural systems and enhancing natural systems through current landscaping standards. This trend has been formalized by the current regulations of such agencies as the Corps of Engineers and the Environmental Protection Agency. Due to the fact that the existing drainage system is already lined or in pipes for a significant portion of the basin, it was felt that we should focus on the opportunities for enhancing the natural system left in the basin. Interest in protecting the existing utilities in the basin was also expressed. The majority of the utilities are not in the channel itself which minimizes these type of problems. However, there are existing and future sanitary sewer lines that run parallel with Spring Creek. These facilities need to be protected from erosion. Flooding problems do occur in the basin, especially around Circle Drive and Fountain Blvd. Interest in finding out the financial feasibility for both construction and maintenance of drainage facilities was expressed. The current records on maintenance present a difficulty in actually being able to accomplish this. Maintenance records are not kept by type of system maintained, so a separation of cost is difficult. For the most part, system maintenance is performed by the City Street Department and is on a need basis, not on a routine or scheduled basis.

B. MAIN CHANNEL RECOMMENDATIONS

1. Overview

Recommendations for the main channel of Spring Creek varied according to the existing conditions/constraints, comments received during the meetings, alternative evaluation parameters, and engineering judgement. For more discussion of each of the parameters considered and alternatives analyzed, refer back to Section IV. Overall, mitigation for any of the main channel reaches or design point is recommended to be accomplished on site. In addition, the enhancement of wetlands and habitat of certain main channel segments is being recommended. This section is organized from the downstream end of the Spring Creek Basin where it discharges into Fountain Creek and proceeds upstream to Platte Ave. (U.S. Highway 24) along the main channel of Spring Creek.

2. REACH 16-14 FROM FOUNTAIN CREEK TO UNION BLVD.

This is the reach from the confluence with Fountain Creek to the proposed Union Blvd./U.S. 24 Bypass Interchange. This reach is generally natural with little or no development. The floodplain for Fountain Creek contains much of the Spring Creek channel area downstream of the Las Vegas Street bridge making it practically undevelopable. Considerable dumping of materials has occurred from Las Vegas Street to Hancock Expressway creating an undesirable area through the dumping of rubble, trash, and waste floor coverings. This would need to be cleaned up for any alternative being recommended. As discussed in the alternative section, preserving the existing wetlands and habitat is the most important community value for this reach. An opportunity exists north of the Hancock Expressway crossing on the east side where open space or park is master planned. The most difficult part of selecting the desired treatment is that the high velocities skew the selection towards protecting the banks and bottom while the community values skew the selection towards no action. This study recommends to compromise towards the side of no treatment. We recommend that grade control be provided for the entire reach. In the reach from Fountain Creek to Las Vegas Street, high velocities are a problem because of the narrow, deep channel. The grade control recommended in this reach is intended to raise the invert of the existing channel thereby carrying more flow in the overbank areas. This decreases the velocity in the main channel to a point where the more natural alternative is feasible. In addition, we recommend bank reshaping with soft lining in a few limited locations where the habitat can be enhanced through the vegetation associated with the soft lining. This does not eliminate all of the potential erosion that could occur and building setbacks from the channel bank need to be addressed during the subdivision drainage report stage of design. It is desired to reclaim the channel between Las Vegas Street and Hancock Expressway for a trail corridor/multi-use area. This is the only portion of the reach where hard bank lining is recommended due to the proximity of the bridges in this area. The remainder of the reach is to have minimal changes to the banks or alignment of the channel.

We feel that grade control is absolutely necessary to reduce velocities throughout the reach. There are some existing drop structures in place that are in poor condition. It is recommended that these be removed and replaced with new ones in the same general location if feasible. In the locations shown, it is proposed that the banks be laid back on a 3:1 or flatter slope and revegetated so that they help enhance the overall reach, while providing a more stable situation. Erosion protection may need to be provided at other locations if erosion is found to be a significant problem. This protection was assumed to be buried riprap bank lining for the 10-year flow channel in locations banks are unstable or eroding due to side channels or storm sewer pipes entering the main channel. Within this reach there are crossings at Hancock Expressway, the railroad bridge, and Las Vegas Street. Based on the HEC-2 water surface profile model contained in Appendix B, all bridges have adequate capacity to pass the detained 100 year flow although the Las Vegas St. bridge is a major constriction to flow. The Las Vegas St. bridge is not recommended for replacement at this time. This is considered a future bridge replacement by El Paso County if and when they deem it necessary. Some of the existing drop structures mentioned above are located in the vicinity of the bridges. It is recommended that proper erosion protection be maintained at all three bridges to ensure their stability. Proposed locations for specific channel improvements are shown on Figures 12 and 15.

3. REACH 14-12 FROM UNION BLVD. TO CIRCLE DRIVE

This is the channel reach from the proposed Union Blvd./U.S. 24 Bypass Interchange to Circle Drive. This section has been designed by the Colorado Department of Transportation as part of the U.S. Highway 24 Bypass, Phase I, and should be completed in the summer of 1993. The proposed facilities replace the inadequate culvert at Circle Drive and the eroded channel downstream of Circle Dr. Figure 12 shows the locations of these facilities. West of Circle Drive, the final design calls for continuation of the double 12' x 12' CBC under the U.S. Highway 24 Bypass embankment. After passing under U.S. Highway 24, the box culvert discharges into a stilling basin to spread the flow. The area from the stilling basin to proposed Union Blvd. was chosen as a wetland mitigation area. This area is to be regraded and planted to enhance the formation of wetlands and take advantage of existing underground springs. This mitigation area is required as part of the Individual Section 404 Permit for the bypass and is intended to mitigate the disturbance as outlined in the environmental evaluation for this reach. A low flow channel was proposed to handle smaller discharges. A 13' X 10' CBC was proposed at Union Blvd., which will restrict the design flow and create a detention effect during higher flows. This will limit the flow downstream to an acceptable level and help maintain the newly created wetlands. A concrete apron with riprap protection was proposed at the outlet to minimize the potential for erosion downstream. This reach is entirely within CDOT right-of-way for the U.S. 24 Bypass project. All improvements are being built as part of the Bypass and will be maintained by CDOT.

4. REACH 12-10 FROM CIRCLE DRIVE TO VALLEY HI LAKE

This is the channel reach from Circle Drive to the spillway at Valley Hi Lake. The existing trapezoidal channel, between Circle Drive and Fountain Blvd., is concrete lined and constrained by the existing shopping center parking lot. North of Fountain Blvd., a rectangular concrete channel is also constrained by the existing radio tower on the north and the U.S. Highway 24 Bypass alignment on the south between Fountain Blvd. and Valley Hi Lake. Due to these constraints, it would be extremely difficult and costly to do anything other than use the same type of improvement and alignment that already exists for this location.

The existing 22' x 10' channel from Valley Hi Lake to Fountain Blvd. is not adequate to carry the proposed release from the lake. We recommend that the existing 22' x 10' channel from the spillway to Fountain Blvd. be replaced with a 31' x 10' CBC. It is proposed that the present bridge invert at Fountain Blvd. be lowered 2 feet to provide additional fall and increase the capacity of the outlet system. This will have to be further analyzed in the final design of this reach since we are assuming that the existing structure does not have to be replaced to accomplish this. The section between Fountain Blvd. and Circle Drive has been designed by Colorado Department of Transportation as part of Phase II of the U.S. Highway 24 Bypass. The CDOT design proposes a 31' wide open rectangular channel downstream of Fountain Blvd. and then a double 12' x 12' CBC crossing under Circle Drive. The CDOT design also used an invert downstream of Fountain Blvd. that is 2 feet lower than that which exists now. Figure 13 shows the locations of these facilities.

5. DESIGN POINT 10 VALLEY HI LAKE

This is the permanent lake within Valley Hi Golf Course, which will also be utilized as a detention site using additional existing volume above the permanent water surface elevation. The environment, safety, and multi-use were all determined to be important community values for this location. The potential for major flooding damages due to overtopping of the dam pointed out that the "No Action" alternative was not a good solution. In addition, significant raising of the dam embankment is not realistic since this would cause additional flooding of properties between the main channel and Fountain Blvd. We were then left with the option of improving the spillway or the option of lowering the spillway crest elevation while increasing its capacity as well as the storage capacity. The spillway elevation presently controls the water level of the lake. The recommendation is to construct a new side channel spillway with increased capacity and designed to maintain the current permanent water surface elevation. Lowering of the spillway crest elevation was generally opposed due to environmental concerns. Some minor raising of the dam embankment is desirable on the downstream side of the dam to provide more freeboard during the 100-year storm, if possible. The surface area and depth of the lake is decreasing due to accumulation of sediment generated from upstream

erosion within the basin. Dredging has been ruled out due to disposal problems of the dredged material.

It was very difficult to achieve the desired discharge, because of the relatively small elevation difference between the existing spillway crest elevation and buildings along Fountain Blvd. as well as freeboard at the dam. It is recommended that the existing spillway be replaced with a side channel spillway as outlined in the "Design of Small Dams" by the Bureau of Reclamation. A 200' weir length was used in the analysis. As a minimum, the bottom of the bridge at Fountain Blvd. may have to be lowered two feet vertically and final design may require additional lowering. This resulted in a 12% decrease in the peak flow, while allowing an outflow of 5522 cfs. The maximum estimated water surface elevation was 5949.9 with an estimated volume of 75.6 acre-feet. These elevations are for planning purposes only. Actual elevations and volumes are to be determined during final design. Some flood protection in the form of berms may still be required along the south side of the lake when the water surface reaches the maximum elevation. This outflow combined with the flows from Verde Drive east of Circle Drive equate to a flow of 6,250 cfs, which is consistent with the CDOT design flow of 6,300 cfs for the crossing at Circle Drive.

With the elevation difference between Valley High Lake and the Fountain Blvd. crossing, it is possible to get the flow into a 31 foot wide rectangular section. However, it would not be possible to fit it into the existing 22 foot wide channel which must be replaced anyway due to its deteriorating condition. An additional drop in elevation is available under Circle Drive to help reduce the section downstream of Fountain Blvd. to CDOT's double 14' by 10' box culvert. The improved spillway also aids in speeding up the water in the concrete channel since additional energy is provided by the water backed up behind the dam. Currently, the upstream end of the concrete channel will not accelerate the flow properly. The re-establishment of a low flow channel is recommended along the south bank of the lake to maintain sufficient velocity to prevent sediment deposition in the lake. Figure 13 shows the locations of these facilities. Other spillway design alternatives will be analyzed during final design.

6. REACH 10-7 FROM VALLEY HI LAKE TO AIRPORT ROAD

This is the channel reach from Valley Hi Lake to Airport Road generally divided into two sections, Valley Hi Lake to Chelton Road, and Chelton Road to Airport Road. Multi-use was considered the most important community value and there are no significant wetlands or wildlife habitat present except when you approach Valley Hi Lake.

The upstream section will be discussed first. The 100-year detained flow would just be contained in the banks of the channel on the golf course side. The golf course side is lower than the other side and any small overflows will pass safely through the golf

course and cross Chelton Road near the CMP culvert and golf cart crossing. It is recommended that two drop structures be provided on the main channel near Chelton Road to lower the invert of the channel and ensure adequate depth for a new structure crossing Chelton Drive. Additional buried riprap lining is proposed for the east and south banks of the channel, adjacent to existing developments, most of which are already built out. The west and north sides of the channel are adjacent to Valley Hi Golf Course and very little room is available for widening or improvements because of the close proximity of tee boxes and greens. It is proposed that additional vegetation be planted to stabilize the banks and enhance the potential for wildlife habitat. There is minimal risk to buildings or structures on the golf course, therefore soft or vegetated bank lining alternatives were preferred adjacent to it.

The existing box culvert crossing at Chelton Road is inadequate for passing the 100 year runoff at this location. It is proposed that this crossing be entirely replaced with an 70' x 8' bridge and the invert lowered approximately 5 feet below the existing invert. This fits in with the concept just described upstream of this location and also helps to reduce velocities downstream of this location. The reach from Chelton Road to Valley Hi Lake is a smaller channel section than upstream and needs to be significantly enlarged. Buried riprap lining is proposed along the south bank where development has occurred right to the top of the bank. The bottom of the channel will have to be widened to approximately 70' with the proposed bridge improvement at Chelton Drive. The north side and bottom of this channel are proposed to be enhanced and used as an offsite mitigation site for the basin. The channel bottom needs to be planted with native wetland plants. A depth of 4 feet is proposed along the north bank with an additional 40' overbank area being used for creation of wildlife habitat before sloping back up to existing ground. The north bank is again adjacent to Valley Hi Golf Course, however, in this location more area was available so that the creation of an overbank area was possible. This will provide a good area for mitigation and will also enhance the golf course. Figures 13 and 14 show the locations of these facilities.

7. REACH 7-6 FROM AIRPORT ROAD TO RED WING BIRD SANCTUARY

This is the channel reach from Airport Road to the south side of the Redwing Bird Sanctuary. The existing channel has concrete lined banks and constrained by the existing buildings/parking lot on the east side and driving range on the west side. Cost and safety were determined to be the community values for this reach. There are no significant wetlands or wildlife habitats present for this reach.

The channel has adequate capacity to carry the 100-year detained flow but does not meet the criteria for freeboard. Some effort has been made to increase the depth of lining by placing grouted riprap above the concrete lining in some locations. No different type of improvement is recommended for the reach in general. The existing concrete lining ends prior to Airport Road on the west channel bank. It is recommended that this lining be

constructed in conjunction with a concrete transition to the Airport Road box culvert crossing. An additional 10' x 5' CBC is recommended to upgrade the crossing of Airport Road. It currently does not have adequate capacity. A drop structure is recommended downstream of the crossing to limit erosion and reduce velocities downstream. Figure 11 shows the locations of these facilities.

8. DESIGN POINT 6 DOWNSTREAM SIDE OF RED WING SANCTUARY

This location was studied as a potential detention site in order to partially reduce downstream flows, the downcutting of the upstream channel, and to properly direct the flow into the downstream channel. The wetlands and wildlife habitat, along with the passive recreational uses upstream of this location are the most important community values. The large lateral migration of the channel bank has provided a natural detention storage area. Building a small dam at the downstream side of the sanctuary should help in reducing the upstream erosion during major rainstorms. Much of the silt impacting downstream areas is contributed by this site. The desire to maintain these natural habitats made this a good site for detention to attenuate the downstream peak flows. The proposed outlet is 2 - 24" RCP's in conjunction with a 35' overflow spillway 3 feet above the channel invert. This results in a 4% decrease in peak flow with a storage volume of 23 acre-feet. The maximum water surface elevation was 5998.5, assuming an invert of 5986. While the majority of the peak reduction is accomplished at the Wagner Park detention site, the value of this pond, along with selective channel protection measures is to reduce the erosion in the Red Wing Sanctuary upstream. The channel protection will help reduce erosion during smaller rainstorms and the detention pond will help reduce the erosion during larger rainstorms.

It is also recommended that grade control be established on the main channel and on the northeast tributary within the sanctuary to provide protection from downcutting during lower channel flows. Some spot riprap protection is required to stop bank erosion and where the trees are in danger of falling into the channel. This needs to be provided by flattening the channel banks through filling in steep areas and providing better protection on the outside of channel bends. The outlet of the northeast tributary into the sanctuary is in poor condition and has a large drop near the outfall under Academy Blvd. The Colorado Department of Transportation has recently rebuilt this outfall with the goal being to dissipate this energy, thus helping to ensure the stability of the downstream channel. The overall goal is to stabilize and enhance this area so that the natural habitat will stabilize and be protected from further degradation. Figure 11 shows the location of the detention facilities.

9. REACH 6-4 FROM RED WING BIRD SANCTUARY TO BIJOU ST.

This is the channel reach from the Red Wing Bird Sanctuary to Bijou Street, crossing Pikes Peak Avenue. The majority of this reach is classified as riparian grassland or

mature riparian forest. At one time, this area was more similar to an emergent wetland, but the downcutting of the channel caused by upstream development and increased concentrated runoff has lowered the available water table. The channel is very deep and has enough capacity to contain the 100 year runoff so that no channel enlargement is necessary. It would be very difficult and costly to restore this area to its original type of environment without having a significant amount of disturbance through construction activities.

A serious problem in the reach through both the Red Wing Sanctuary and Wagner Park is the erosion of and collapse of the banks in some areas. This erosion has also contributed to the sediment buildup in Valley Hi Lake by transferring sediment downstream to that location. It is recommended that grade control be provided to reduce velocities and buried riprap lining protection be provided for the low flows to stabilize the banks. The channel section downstream of Pikes Peak to the Redwing Bird Sanctuary is also natural and eroding. It is proposed that the channel side slopes be reduced to a 3:1 slope or flatter in this area along with stabilizing the slopes with buried riprap bank lining or erosion resistant vegetation. The buried riprap would be placed on the outside of horizontal channel bends and the erosion resistant vegetation should be placed for the remainder of the banks in the sanctuary. Grade control and energy dissipation is required to stabilize this location. Figure 11 shows the locations of these facilities.

The crossing at Pikes Peak Avenue is inadequate for passing the 100 year runoff if detention is not considered. Included in this reach is a recommended detention pond at design point 5 that will avoid having to replace this crossing. This site is located on the south end of Wagner Park near Pikes Peak Avenue. Detention at this location will benefit the entire downstream system as well as providing an additional recreation area in Wagner Park. The area east of Spring Creek and north of Pikes Peak Avenue should be graded out at a fairly flat slope from the Spring Creek low flow channel to create a benched area for recreation and for additional detention volume. The proposed maximum ponding elevation is 6030 +/-. A new headwall and wingwalls will be required to allow berming around the inlet to the existing box that will prevent the detained water from flowing over Pikes Peak Ave. The top of this berm should be at elevation 6034 +/-. Banks protection is proposed for the 10-year low flow channel through the pond. In many areas the existing vegetation is well established and stable. This should be maintained as bank lining for the low flow channel except in unstable areas. In unstable areas and along the west bank, buried riprap lining is proposed for the channel. The slopes along the west bank can be laid back to 3:1 or flatter slopes, or benched areas can be created in some areas without encroaching into the existing park and fence. This would help stabilize the channel. Grade control is also recommended for this reach. The locations of these protection measures are shown on Figure 10.

One of the other important issues considered for this reach is that the culvert crossing of Pikes Peak Avenue is undersized for the 100-year runoff in its present configuration. The culvert can be utilized at it's present capacity as the outlet for the detention facility. There has been a significant amount of erosion downstream of this crossing. This reach would have a significantly greater amount of disturbance in order to replace the crossing at Pikes Peak Avenue at a lower elevation in order to match the downstream channel bottom elevation. Therefore, adding the detention pond at Pikes Peak Ave. (which increases the hydraulic head available to force the water through the existing culvert) and an energy dissipator on the downstream side (which reduces the velocities into the sanctuary) is the best solution.

10. REACH 4-3 FROM BIJOU ST. TO PLATTE AVE.

This is the channel reach from Bijou Street to Platte Avenue. It is constrained by the existing buildings and parking lots on either side of the channel. Due to these constraints, it would be extremely difficult and costly to do anything other than use a similar type of improvement to what already exists.

It is recommended that the height of the existing concrete lining be increased approximately 2.5 feet to provide additional capacity, allowing the 100 year runoff to flow within the channel and meet the criteria for freeboard. The natural ground adjacent to the channel appears to be higher than the existing lining throughout the reach, which would allow the lining to be extended upward. The adjacent properties are fully developed with industrial and commercial uses so there is minimal width available for proposed improvements. The crossing at Bijou Street is inadequate for passing the 100 year runoff. It is recommended that an additional 10' x 5' Concrete Box Culvert be placed parallel to the existing crossing to increase the capacity. This will require rebuilding a portion of the upstream channel and the transition to the box culverts. Consideration must also be given to an energy dissipator at the outfall and downstream channel to ensure protection against additional erosion. Figure 10 shows the locations of these facilities.

C. MAJOR TRIBUTARIES RECOMMENDATIONS

Recommendations for the tributary channels of Spring Creek varied according to the existing conditions/constraints, comments received during the meetings, alternative evaluation parameters, and engineering judgement. For more discussion of each of the parameters considered and alternatives analyzed, refer back to Section IV. Overall, the majority of the tributary channels are already fully lined. For those that are now natural, mitigation is recommended to be accomplished either on site or off site. The enhancement of wetlands and habitat of the main channel segment between Valley Hi Lake and Chelton Drive or on the main channel between Fountain Creek and Union Blvd. is being used as the recommended off site mitigation sites. This section is organized from the downstream end of the Spring Creek Basin where tributaries discharge into the main channel of Spring Creek and proceeds upstream to Platte Ave. (U.S. Highway 24) along the main channel of Spring Creek.

1. REACH 14A TO NORTH ALONG UNION BLVD. - NORTH TRIB.

This reach runs along the west side of the proposed Union Blvd. from the main channel at the proposed Union Blvd./U.S. 24 Bypass Interchange to Fountain Blvd. The most important community values were determined to be cost and safety due to the importance of the Union Blvd. transportation link to the bypass. Approximately one half of the existing channel will be filled in as a result of the grading for Union Blvd. Due to the depth and steepness of the channel banks in this area, it is very difficult to mitigate the wetland and habitat losses on site. Therefore, this reach is the one reach in this basin which will require off site mitigation. This off site mitigation is proposed along the main channel of Spring Creek between Valley Hi Lake and Chelton Road or on the main channel between Fountain Creek and Union Blvd. The offsite mitigation site chosen needs to be fully addressed along with any detailed designs of this reach. Two alternative sites noted above are proposed since the exact timing of improvements and/or legal/ownership complications are not known at this time.

The lower (southerly) section of this channel reach is recommended to remain as a channel. This is a deep, highly eroded natural channel with adequate capacity to carry the design flow. It is, however, unstable and the channel will continue to cut deeper and erode further. It is recommended that grade control be applied to reduce the velocities and erosion protection be provided in problem areas to stabilize the channel. Due to the depth of the channel it is not feasible to flatten the banks substantially. However, it is desirable to stabilize the banks as much as possible with erosion resistant vegetation. A portion of this improvement will be constructed with the State Highway 24 Bypass project. The upper end of this reach will require an underground system (54" RCP) in Union Blvd., because of the encroachment of the proposed Union Blvd. embankment into the existing channel. Figure 12 shows the locations of these facilities.

2. REACH 13A TO NORTH — US 24 BYPASS TO FOUNTAIN BLVD.

This reach runs north of the main channel from the proposed U.S. 24 Bypass to Fountain Blvd. between Doniphan Drive and Hutchinson Drive. The community values for this reach were determined to include the full range of values. The existing channel is very deep with steep longitudinal and side slopes. Due to the depth and steepness of the channel in this area, it is very difficult to create a stable channel system.

This study recommends that the major storm water flows be carried in an underground system (72" RCP). In addition, creation of a shallow swale over the top of the pipe is required to provide on site mitigation of the channel disturbances. Figure 12 shows the locations of these facilities.

3. REACH 10C - 10B — VALLEY HI GOLF COURSE TO NW

This is a tributary channel reach from Valley Hi Lake running to the northwest and eventually crossing Airport Blvd. Multi-use was considered the most important community value and there are no significant wetlands or wildlife habitat present except when you approach Valley Hi Lake. The banks of this channel are already lined with riprap.

It is recommended that the depth of this channel and the bottom width both be increased to greatly improve the capacity and eliminate flooding of the downstream apartments on Circle Drive. Riprap lining on the sides of the channel is proposed with the bottom being enhanced with vegetation. In addition, the crossing of Airport Road needs to be cleaned out and a better transition created into the channel. As this tributary approaches the lake, an 96" RCP is proposed to replace the existing 42" CSP and carry the flow to the lake beneath the #1 and #9 fairways. Various golf cart crossings will need to be replaced during the final design and construction of this channel. An energy dissipator is recommended at the lake to remedy the existing erosion problem.

4. REACH 10A TO CHELTON DRIVE — VALLEY HI GOLF COURSE TO NE

This is a tributary channel reach from Valley Hi Lake running to the northeast and eventually extending across Chelton Drive. Multi-use was considered the most important community value due to its location on the golf course and there are no significant wetlands or wildlife habitat present except when you approach Valley Hi Lake. This channel is fully lined with concrete.

It is recommended that no improvement be made to this channel. This channel does not fully satisfy the criteria for freeboard, however, it runs through the golf course and no structures or buildings would be at risk from any overflow. Due to the high flowline

elevations of the channel the local runoff does not readily enter the channel. The area south of this channel should be filled and graded to surface drain to the channel.

5. REACH 6A - 6B ACADEMY BLVD. TO PIKES PEAK AVE.

This is a segment of the east tributary of Spring Creek which outfalls across Academy Blvd. to the Red Wing Bird Sanctuary. This is an underground section from Academy Blvd., at the Redwing Blackbird Sanctuary, running northeast to Pikes Peak Avenue. It is constrained by the existing buildings and parking lots on either side of the channel. Due to these constraints, it would be extremely difficult and costly to replace the section with a more natural type of improvement.

It is recommended that a 60" RCP be located along Academy Blvd. and then along Pikes Peak Avenue east to the existing crossing. There is not adequate easement width for this pipe to be placed in along the existing route between these points. It would start in parallel (bored construction) with the existing double 10' x 4' CBC crossing Academy and the existing 12' x 6' CBC running towards Ruskin Drive. The crossing at Pikes Peak Avenue is adequate, therefore no improvement is proposed. The reach from Pikes Peak Avenue to Bijou Street is a concrete lined channel capable of carrying the design flow, but does not meet the criteria established for freeboard. It is recommended that no improvement be made. The improvement would be very costly just to add additional freeboard. No improvement is proposed for the crossing at Bijou Street.

6. REACH 6B - 6C BIJOU ST. TO PLATTE AVE.

This reach is just upstream of the previous reach on the east tributary of Spring Creek. It is constrained by the existing buildings and parking lots on either side of the channel. Due to these constraints, it would be extremely difficult and costly to replace the section with a more natural type of improvement.

The reach from Bijou Street to near Platte Avenue is a concrete lined channel capable of carrying the design flow, but does not meet the criteria established for freeboard. It is recommended that no improvement be made. The portion of the reach just south of Platte Ave. is a corrugated steel pipe that does not have adequate capacity to carry the 100-year flow. It is recommended that the existing pipe be replaced with a 72' RCP. No improvements are proposed for the crossings at Platte Avenue.

7. REACH 13A - M4 FOUNTAIN BLVD. TO WINNIPEG

This reach is just upstream of the reach on the north tributary of Spring Creek between Doniphan Drive and Hutchinson Drive. It is constrained by the existing residential development on either side of the channel. Due to these constraints, it would be

extremely difficult and costly to replace this section with a more natural type of improvement.

This section of channel is adequate for the design flow and it would be very costly to improve this channel just to add additional freeboard. No improvement is proposed for this reach. No improvement is proposed for the crossing at Fountain Blvd.

D. UNDERGROUND SYSTEMS

1. Investigation of Flooding Areas

Thirteen problem areas have been identified by the City for investigation of flooding problems. For the purpose of a drainage basin planning study, a sufficient level of detail is required to determine costs associated with proposed system upgrades. This requires the use of a general analysis that gives reasonable results. After much thought, a method was created to simplify the analysis, keeping in mind that there are many factors which influence storm sewer design.

All of the sub basins in the Spring Creek Drainage Basin were analyzed using the Rational Method to determine a 10-year peak flow for each subbasin. A runoff factor was then developed for each sub basin in CFS/ACRE, to be used when calculating runoff for smaller areas within the sub basins. Arterial and 36' Residential street capacities were developed for the 10-year and 100-year storms based on allowable flow spreads of 14' (arterial street) and 18' (residential street) for the 10-year storm and a water depth of 8" at the curb for the 100-year storm. These two street classifications represent most of the streets in the problem areas, therefore, the above criteria for street capacities is a reasonable representation. At this point we were able to quantify the problem based on the runoff factor, area tributary to a flooding area, existing outfall pipe size, and the capacity of the street. The next step was to propose additional facilities to pick up excess runoff at flooding locations. The average slope of a basin has a great impact on the capacities of pipes and the ability of inlets to intercept runoff, therefore, proposed facilities were based on the average slope of the tributary areas. Inlet pickup and pipe capacities were calculated for slopes ranging from 1% to 6% with a 12' inlet being used as the basis for inlet calculations, and the depth at the inlet being based on the allowable street capacities. These capacities are summarized in the tables included in Appendix B.

It is not realistic to provide facilities based solely on the 10-year storm, because the 10-year and 100-year systems can't be separated. With street capacities being limited, the 100-year flow becomes a factor in the middle to lower reaches of most systems and must be considered to attain accurate results. In the past, the minor systems were designed with little or no consideration being given to 100-year flow and many flooding problems can be attributed to this fact. The upgrades proposed in these areas were based on 10-year flows using only 75% of a pipe's capacity when sizing pipes to allow for the

differences in carrying the 100-year storm. This will provide additional capacity for system losses and for a portion of the 100-year flow to be carried in the system. The inlets will generally pick up additional runoff during the 100-year storm, because of the increased depth at the curb as long as the additional capacity is available in the system. An adequate facility must be provided to convey the additional overflows, up to the 100-year rates, to the main discharge point or main channel. Overall this approach will lead to a better representation of upgrade costs. The remainder of this section deals with the specific areas where flooding has occurred.

2. Platte Avenue (S.H. 24) and Murray Blvd.

There are two subbasins tributary to this intersection. Basin F7 from the west is contained in an underground system. Any deficiency in the storm sewer system from subbasin F7 would probably not impact this intersection, because of the 60" outfall system constructed under Academy Blvd. A large portion of subbasin F1 is tributary to Murray on the north side of Platte Avenue. There is no system running up Murray and it is assumed that this is one main cause of flooding. For analysis in subbasin F1, a runoff of 2.8 cfs per acre was used for the 10 year storm and an the overall basin slope used was 3%. There is an area of approximately 20 acres directly entering Murray. This equates to a flow of 56 cfs. An upstream system containing 8 inlets and a 36" RCP outfall pipe is required to pick up this flow prior to Platte Avenue. The other area tributary to this area enters Murray from Edison Avenue to the east. Approximately 32 acres, including King Soopers and Hugh M. Woods parking lots drain to Edison Avenue and then east to Murray. This equates to a flow of 90 cfs. The existing outfall pipe for this area is a 36" RCP at approximately 0.7% slope. Assuming that this pipe flows 75% full, it has a capacity of approximately 56 cfs. A new parallel system with 4 inlets and a 30" RCP outfall pipe is required to pick up the remaining 44 cfs.

3. Fountain Blvd and Union Blvd. Intersection

This intersection is at the lower end of subbasin M2. For analysis in subbasin M2, a runoff of 2.6 cfs per acre was used for the 10 year storm and the overall basin slope used was 3%. There is an area of approximately 20 acres directly entering Fountain Blvd. This equates to a flow of 52 cfs. There are three existing inlets in Fountain as you approach Union Blvd. It is assumed that they have a total capacity of 15 cfs and the street capacity near the intersection is approximately 14 cfs. An upstream system in Fountain Blvd. with 3 inlets and a 24" RCP outfall pipe is required to pick up the remaining 23 cfs. There is an area of approximately 53 acres directly entering Union Blvd. This equates to a flow of 139 cfs. There are two existing inlets in Union Blvd. as you approach Fountain. It is assumed that they have a total capacity of 24 cfs and the street capacity near the intersection is 0 cfs because Fountain is at capacity. An upstream system with 14 inlets and a 36" RCP outfall pipe is required to pick up the remaining

115 cfs. The additional 100-year overflow is routed to the low point in the Hwy. 24 interchange or east in Fountain Blvd.

4. Fountain Blvd. and Hutchinson Drive

This intersection is at the lower end of subbasin M3. For analysis in subbasin M3, a runoff of 2.2 cfs per acre was used for the 10 year storm and the overall basin slope used was 3%. There is an area of approximately 65 acres directly entering Fountain Blvd., most of which enters Fountain via Boggs Place. This equates to a flow of 143 cfs. The existing outfall for this area is a 36" RCP, which has a capacity of approximately 70 cfs. Fountain Blvd. has no additional street capacity at this location because of the carry over from the intersection with Union Blvd. An upstream system with 6 inlets and a 36" RCP outfall pipe is required to pick up the remaining 73 cfs. The other area tributary to this location flows down Doniphan Dr. to Fountain. This is an area of 8 acres and equates to a flow of 18 cfs. An upstream system with 2 inlets and a 24" RCP outfall pipe is required to pick up the 18 cfs. A 42" RCP would be required after the confluence of these two systems to run south to proposed Union Blvd. Just west of Hutchinson there is a 60" RCP crossing under Fountain Blvd. which is tributary to the concrete channel upstream. The inlet to this pipe is clogged with debris, including a shopping cart, which may cause a backwater effect that would contribute to further flooding in this area. It is recommended that this inlet be entirely cleaned out.

5. Verde Drive East of Circle Drive

There are two subbasins tributary to the lower portion of Verde Drive. Subbasin L1 is tributary to Verde Drive and subbasin L2 is tributary to Capulin Drive, which intersects Verde Dr. at the lower end of the basins. For analysis in subbasin L1, a runoff of 2.5 cfs per acre was used for the 10 year storm and the overall basin slope used was 2%. There is an area of approximately 89 acres directly entering Verde Drive. This equates to a flow of 223 cfs. It was assumed that the curb chases at the lower end of Verde Dr. have a capacity of approximately 20 cfs. An upstream system with 18 inlets and a 54" RCP outfall pipe is required to pick up the remaining 203 cfs. For analysis in subbasin L2, a runoff of 2.3 cfs per acre was used for the 10 year storm and the overall basin slope used was 2%. There is an area of approximately 143 acres directly entering Capulin Dr. This equates to a flow of 329 cfs. It was assumed that the curb chases to the channel at the lower end of Capulin Dr. have a capacity of approximately 20 cfs. An upstream system with 28 inlets and a 72" RCP outfall pipe is required to pick up the remaining 309 cfs. This system will outfall into an existing concrete channel at the lower end of Capulin Drive. The channel does not have adequate capacity and a 7' x 6' CBC is recommended to replace the channel. The crossing of Verde Drive and upstream space limitations make this more feasible than enlarging the channel. The crossing at Verde Drive, which runs to the main Spring Creek channel near Circle Drive, is also not adequate. From the sump in Verde to the main channel requires a 100-year system.

There is no adequate overflow route so all runoff must be picked up here. The existing outfall to spring Creek is 3-54" CMP's. It is recommended that the 3-54" CMP's be replaced with a 9' x 6' CBC. The 9' x 6' CBC should be extended to Spring Creek. Any remaining flows from Verde Drive can be picked up at the existing sump and piped into the 9' x 6' CBC.

6. Fountain Blvd. and Chelton Road

Fountain Blvd. has a low point at the intersection with Chelton Drive and receives runoff from three directions. The tributary areas are within the limits of subbasin I3. For analysis in subbasin I3, a runoff of 2.5 cfs per acre was used for the 10 year storm and the overall basin slope used was 3%. There is an area of approximately 43 acres that enters Fountain from the south via Chelton. This equates to a flow of 108 cfs. There is no existing system in Chelton to the south and Fountain has no available capacity. An upstream system with 13 inlets and a 42" RCP outfall pipe is required to pick up this flow. An area of 9 acres is tributary to Fountain from the west. This equates to a flow of 23 cfs. A system with 3 inlets and a 30" RCP outfall pipe is required for this area. There is an area of 27 acres that enters Fountain Blvd. from the east. This equates to a flow of 68 cfs. There is no existing system in Fountain. It is assumed that Fountain Blvd. has a street capacity of approximately 7 cfs. An upstream system with 7 inlets and a 36" RCP outfall pipe is required to pick up the remaining 61 cfs.

7. Airport Road and Chelton Drive

Airport Road has a low point at Chelton and high points 800-900 feet east and west of Chelton. Therefore, there is very little tributary area to the east or west and the flooding problem exists because of the large tributary area to the north. The three tributary subbasins to the north are J1-1, J1-2, and J2. For analysis in these subbasins, runoff values of 2.3, 1.8, and 1.5 cfs per acre were used for the 10 year storm and the overall basin slope used for each subbasin was 3%. The respective areas are 82, 80, and 64 acres. The quantity of runoff calculated at this intersection was 429 cfs. The existing outfall pipe at this location is a 60" RCP at 1.80%. Assuming that 75% of the capacity is utilized, it has a capacity of approximately 260 cfs. An upstream system with 22 inlets and an additional parallel 48" RCP outfall pipe is required to pick up the remaining 169 cfs.

8. Chelton Drive at Spring Creek Main Channel

Chelton Drive has a low point at Spring Creek and has large tributary areas to the north and south. The areas north of Airport Road and south of Fountain Blvd. have been analyzed previously and the facilities proposed for those areas will greatly reduce flooding at this location. This analysis focuses on the area tributary to Chelton between Airport Road and Fountain Blvd. The tributary area to the north is part of subbasin J2

and encompasses approximately 16 acres. For analysis in subbasin J2, a runoff of 1.5 cfs per acre was used for the 10 year storm and the overall basin slope used was 3%. This equates to a flow of 24 cfs. It is assumed that the existing inlets between Airport Road and Spring Creek have a total capacity of 15 cfs. The remaining 9 cfs is within the capacity of Chelton Road. It is recommended that rolled asphalt curb, found in some locations along Chelton, be replaced with concrete vertical curb and gutter. The tributary area to the south is part of subbasin I3 and measures approximately 34 acres. This equates to a flow of 85 cfs. It is assumed that Chelton Road can carry 14 cfs as it approaches Spring Creek. An upstream system with 9 inlets is required to pick up the remaining 71 cfs. These additional inlets will be connected to the proposed storm sewer system running north from Fountain Blvd.

9. Pikes Peak Ave. East of Academy Blvd.

The investigation of flooding in this area revealed some obvious problems. There is an area of approximately 128 acres that is tributary to Pikes Peak Avenue near it's intersections with Ruskin Dr. and Academy Blvd. Pikes Peak Avenue is on a very flat grade from Ruskin Drive west to Academy Blvd. The upstream area is part of subbasin F3. For analysis in sub-basin F3, a runoff of 2.1 cfs per acre was used for the 10 year storm and the overall basin slope used was 3%. This equates to a flow of 269 cfs. A small storm sewer system from the mobile home park, in the upper part of the subbasin, carries approximately 25 cfs to the north and away from Pikes Peak Avenue. It is assumed that Pikes Peak Avenue near Ruskin has a capacity of 13 cfs. A storm sewer system with 29 inlets and a 60" RCP outfall pipe is required to handle the remaining 231 cfs. The 60" outfall will have to run west in Pikes Peak Ave. to the east side of Academy Blvd. and then south to the Academy crossing (see reach 6A-6B described previously). The only apparent drainage concept for this area was to get the runoff to Pikes Peak Avenue and this has led to the current flooding problems.

10. Airport Road and Circle Drive

Circle Drive has a low point just north of the intersection with Airport Road which has a fairly large tributary area. Subbasin K2-1 to the north outfalls down Circle Drive and subbasin K1 outfalls from the northeast behind K-Mart. The respective areas for subbasins K2-1 and K-1 are 134.9 and 153.9 acres. For analysis in subbasin K2-1, a runoff of 1.9 cfs per acre was used for the 10 year storm and the overall basin slope used was 3%. For analysis in subbasin K1, a runoff of 2.7 cfs per acre was used for the 10 year storm and the overall basin slope used was 3%. This equates to a flow of 256 cfs for subbasin K2-1. The existing outfall in Circle Drive is a 48" RCP at 1.70%. Assuming that 75% of it's capacity is now utilized, it has a capacity of 140 cfs. Circle Drive at the lower end has a capacity of 10 cfs. A storm sewer system with 12 inlets and a 42" RCP outfall pipe is required to handle the remaining 106 cfs. A flow of 416 cfs was calculated for subbasin K1. The existing outfall is a concrete V-ditch and it does

not have adequate capacity or meet the freeboard requirements. The existing outfall crossing Circle Drive is a 72" RCP at 1%. Assuming that 75% of it's capacity is now utilized, it has a capacity of 318 cfs. A storm sewer system with 12 inlets and a 42" RCP outfall pipe is required to pick up an additional 98 cfs upstream of K-Mart. A 72" RCP is proposed as an outfall for the existing system and to replace the open channel. The 72" RCP should extend across Circle Drive. There is also a sump in Airport Road to the east of Circle Drive that may experience flooding. The subbasin tributary to this sump is K2-2 and it encompasses 39.1 acres. For analysis in subbasin K2-2, a runoff of 2.2 cfs per acre was used for the 10 year storm and the overall basin slope used was 3%. This equates to a flow of 86 cfs. Assuming that Airport Road can carry 10 cfs, a storm sewer system with 7 inlets and a 36" RCP outfall pipe is required to handle the remaining 76 cfs. The existing outfall from Circle Drive towards Airport Road is an 84" CMP. It only has 40% of the required capacity. It is recommended that it be replaced with a 12' x 6' CBC in the same location. The sump in Airport Road discharges the 100-year overflow into the golf course channel.

11. Airport Road and Academy Blvd.

The first area tributary to this intersection is to the south and east including the Memorial Gardens Cemetery. It is assumed that the small amount of runoff generated on the cemetery is handled with the existing inlet on the property near the intersection. An area of approximately 5.6 acres contributes runoff from the east, between Murray and Academy. A flow of 24 cfs was calculated for this area. An upstream system with 3 inlets is required along the south side of Airport to pick up this runoff prior to the intersection with Academy Blvd. A tributary area of 1.7 acres flows down Academy Blvd., from the south, to the intersection with Airport Road. One inlet is recommended at the intersection to pick up this flow. A commercial area to the northeast and a residential area to the east along Airport are the other major areas contributing runoff to the intersection. The total area is 21 acres and is part of subbasin G3. For analysis in subbasin G-3, a runoff of 3.0 cfs per acre was used for the 10 year storm and the overall basin slope used was 3%. This equates to a flow of 63 cfs. Assuming that the existing system along the north side of Airport Rd. and the 30 " RCP to the north have a combined capacity of 35 cfs, a storm sewer system with 5 inlets and a 30" RCP outfall pipe is required to handle the remaining 35 cfs. The inlet on the northwest corner of the intersection appears to have capacity to handle the small flow coming down the west side of Academy Blvd. The 100-year overflow is routed west in Airport to the Spring Creek channel.

12. Airport Road at Spring Creek Main Channel

The area tributary to Airport Road at Spring Creek is part of subbasin G1. A portion of G1 drains directly to the main channel and never reaches Airport Road. For analysis in subbasin G1, a runoff of 2.7 cfs per acre was used for the 10 year storm and overall

basin slopes of 4% and 2% were used for the west and east areas, respectively. The area contributing to Airport from the west contains 42 acres. This equates to a flow of 113 cfs. A storm sewer system with 11 inlets and a 42" RCP outfall pipe is required to pick up this flow prior to the sump in Airport Road. A commercial area of approximately 15 acres is tributary from the east. This equates to a flow of 41 cfs. The existing outfall for this area is a 24" RCP at 0.3% slope. Assuming that 75% of it's capacity is currently utilized, it has a capacity of 9 cfs. A storm sewer system with 4 inlets and a 30" RCP outfall pipe is required to pick up the remaining flow prior to the sump in Airport Road. The main channel crossing at this location is not adequate to pass larger flows and some flooding here may be attributed to the backwater effect created by the constriction. Improvements are proposed for this crossing.

13. Chelton Road near Dale Street

Chelton Road and Dale Street do not actually intersect, however, Chelton has a low point just east of the end of Dale Street. There are two subbasins that are directly tributary to the Sump in Chelton. Subbasin B3 flows down Chelton from the north and contains approximately 65 acres. For analysis in subbasin B3, a runoff of 1.8 cfs per acre was used for the 10 year storm and the overall basin slope used was 3%. This equates to a flow of 117 cfs. The existing outfall for this area is a 48" RCP at 1.5%. Assuming that 75% of total capacity is utilized, it has a capacity of 130 cfs. It would appear that this system will adequately handle the 10 year flow from the north. The other area tributary to the sump in Chelton is subbasin B4 from the west, an area of almost 75 acres. For analysis in subbasin B4, a runoff of 2.9 cfs per acre was used for the 10 year storm and the overall basin slope used was 3%. This equates to a flow of 217 cfs. There are only two inlets for this area and it is assumed that they have a combined capacity of 10 cfs. A storm sewer system with 16 inlets and a 54" RCP outfall pipe is required to pick up the remaining 207 cfs prior to the sump in Chelton Road. There is a low point at the end of Dale Street in Querida, which is just west of a confluence of two concrete channels. If this system did not function properly during a large storm, it is possible that additional "overflow runoff" could reach the sump in Chelton and further compound the problem.

14. Fountain Blvd. and Circle Drive

Circle Drive has a low point near the intersection with Fountain Blvd. The largest area tributary to this intersection is subbasin L4, to the north and west, and encompassing 79 acres. For analysis in subbasin L4, a runoff of 2.2 cfs per acre was used for the 10 year storm and the overall basin slope used was 3%. This equates to a flow of 175 cfs. It is assumed that Circle Drive has a capacity of approximately 15 cfs. A storm sewer system with 18 inlets and a 54" RCP outfall pipe is required to pick up the remaining 160 cfs prior to the intersection with Fountain. Subbasin K4 on Valley Hi Golf Course is indirectly tributary to the intersection. The City of Colorado Springs has performed

a preliminary analysis on this subbasin and recommended facilities to handle the flow prior to Circle Drive. Subbasin K5, an area of approximately 43 acres, is tributary to the intersection via Fountain Blvd. from the east. This area has been studied as part of the S.H. 24 Bypass, Phase II, and storm sewer facilities have been proposed to pick up runoff from this area. The remaining subbasin tributary to this intersection is L3, which flows from the south along Circle Drive. Most runoff is taken off Circle Drive prior to reaching Fountain Blvd., because Circle Drive does not have curb and gutter for the entire length. It is assumed that the existing roadside ditches adequately handle this runoff and this area does not contribute to flooding at the intersection. The 100-year overflow will be routed to the sump in Circle Drive at Spring Creek. Another factor that may contribute to flooding is overflow to Circle Drive from the sump in Verde Drive, approximately 700' south of Fountain Blvd. The upgrade to the system in Verde Drive east of Circle Drive was discussed previously.

15. Galley Road at Academy Blvd. (East of Academy)

A flooding problem exists at the northeast corner of Galley and Academy. This is the outfall for sub-basin C1 and has a tributary area of 115.2 acres. For analysis in subbasin C1, a runoff of 2.8 cfs per acre was used for the 10-year storm. An area of approximately 13.5 acres drains to this intersection from the northeast via Academy Blvd. This equates to a flow of 37.8 cfs and a basin slope of 3% was used. The street capacity for one side of Academy is 10.2 cfs. There is no storm sewer system in Academy Blvd. A storm sewer system with 4 inlets and a 24" RCP outfall pipe is required to pick 27.6 cfs prior to the intersection. The remaining 101.7 acres of subbasin cap is tributary to Galley Road. For this large area, a percentage of the 10-year HEC-1 flow for subbasin C1 based on area was used instead of the 2.8 cfs per acre. This gave a 10-year flow of 200 cfs. The outfall is a 54" RCP @ 1.3% with an approximate capacity of 225 cfs. There are only 9 existing inlets upstream. It was assumed that they could pick up 12 cfs each, using an average basin slope of 2%, or a total of 108 cfs. Thirteen additional inlets are required to pick up 92 cfs prior to the intersection with Academy Blvd. Additional 100-year overflow would route to the south in Academy Blvd.

E. LETTER OF PERMISSION PROCEDURE

DEFINITION OF LETTER OF PERMISSION
(From Corps of Engineers Handout)

(33 CFR 325.2(e)(l))

Letter of Permission. Letters of permission are a type of permit issued through an abbreviated processing procedures which includes coordination with Federal and state fish and wildlife agencies, as required by the Fish and Wildlife Coordination Act, and a public interest evaluation, but without the publishing of an individual public notice.

Letters of permission may be used:

(ii) In those cases subject to section 404 of the Clean Water Act after:

(A) The district engineer, through consultation with Federal and state fish and wildlife agencies, the Regional Administrator, Environmental Protection Agency, and the state water quality certifying agency develops a list of categories of activities proposed for authorization under LOP procedures;

(B) The district engineer issues a public notice advertising the proposed list and the LOP procedures, requesting comments and offering an opportunity for public hearing; and

(C) A 401 certification has been issued or waived or presumed either on a generic or individual basis.

BASIC CONCEPT

There are several things that need to be clearly pointed out about the LOP procedures. An individual permit application to the Corps of Engineers is still required for all jurisdictional areas. The individual permit application has the same level of detail requirements as if the LOP did not exist. An individual public notice may still be required if the type of activity or impact is significantly different from the LOP or it is requested by one of the resource agencies or the public. Normally, the processing time is significantly reduced for the individual permit applications unless the Corps determines differently. This is why the LOP process was to be incorporated into all current Drainage Basin Planning Studies within the City. Including the resource agencies in the DBPS provides an opportunity to incorporate the various agency guidelines into the study for future application. Further information on the LOP procedures is available from the Corps of Engineers, Albuquerque District.

F. LIST OF CATEGORIES OF ACTIVITIES

The final LOP includes a List of Categories of Activities that cover all of the proposed types of construction for the DBPS. This list of activities also needs to include temporary construction activity and maintenance activities that are required for the improvements and covered under the LOP permit. The basic concept behind this list of categories of activities is to ensure that best management practices be used for construction in the basin and that the activities have corresponding mitigation measures for the type of environment that is currently present for this basin. The LOP would be applicable to all waters of the United States located within the boundaries of this basin study. Final approval of the LOP is subject to the approval of an initial Environmental Assessment to be prepared by the Corps of Engineers for this study area.

The final List of Categories of Activities will be prepared by the Corps of Engineers and included in the final LOP. The following is a preliminary list of what has been included in this study:

1. Channel features as described in the DBPS. These include riprap lined low flow channels, resloping of floodway banks, drop structures, energy dissipator structures, riprap bank protection, concrete bank protection, concrete bottom lining, resloping of channel banks, and channel enlargement.

2. Roadway features crossing the Waters of the U.S. as described in the DBPS. this includes roadway fills, bridges, box culverts, headwalls/toewalls, wingwalls, and energy dissipators.

3. Detention pond features as described in the DBPS. This includes bank reshaping, dams, spillways/outlet works, sediment traps, and sediment removal.

4. Trail features/maintenance roads as described in the DBPS. These include gravel or paved paths.

5. Storm sewer features as described in the DBPS. These include pipeline construction, outfall structures, and energy dissipators at outfalls.

6. Wetland construction, replacement, or restoration features as described in the DBPS or as needed to meet the goal of no net loss of wetland functions and values within the basin. These include restoration of wetlands disturbed by construction activities and design of drop structures to encourage formation of new wetland areas.

7. Riparian habitat construction, replacement, or restoration as described in the DBPS or as needed to meet the goal of no net loss of riparian functions or values within the basin. This includes the restoration of trees and shrubs disturbed by construction activities.

8. The placement of dredged or fill material for mitigation measures needed to meet other environmental or mitigation conditions as described in the DBPS. This includes revegetation of eroded overbanks and areas disturbed by construction activities.

9. Temporary fills needed for construction of activities described in the DBPS. These include the placement of dredged or fill material for construction of temporary road crossings, access roads, construction pads, construction ramps, and cofferdams. The structure or fill must be culverted or otherwise designed to not restrict low stream flows, to allow passage of ordinary high water, and to not restrict flows into or out of wetlands to be preserved. Temporary fills will be removed as soon

as practical, the original streambed contours restored or post-project contours completed, and revegetated with the original type of vegetation.

10. Maintain protection of existing and future utility and transportation facilities.

G. PERMITTING AND MITIGATION GUIDELINES

The mitigation concept for this basin study is for any mitigation required by the 404 permit to be done on site (wherever possible) for the proposed improvements in this basin. That is, revegetation and restoration of disturbed areas will be done at the project location in which the disturbance occurs. In addition, the following sections describe guidelines for what needs to be included in the site specific plan.

1. Environmental Inventory Requirements

A site specific inventory of a defined area where alterations in streambank conditions are proposed must be undertaken to define existing vegetation. Inventories must be conducted by a qualified wetlands biologist using the methods detailed in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (U.S. Fish and Wildlife Service et al., 1989). The provision of this type of information is a requirement of Section 404 of the Clean Water Act and collateral supporting legislation where wetlands or waterways of the United States are concerned. The appropriate level of field investigation for a given action is described in the before-mentioned manual. Basic requirements are outlined for reference, as follows:

a. A map of the area at a scale $\leq 1" = 200'$ showing the boundaries of existing vegetation classified by specific type of wetland, riparian or upland vegetation.

b. A description of vegetation types including plant species present, indicating wetland indicator status and dominance, to determine if the criteria for hydrophytic vegetation are met:

- **obligate wetland plants** are those that occur almost always in wetlands under natural conditions ($\geq 99\%$ probability)
- **facultative wetland plants** are those that usually occur in wetlands (67-99% probability), but occasionally are found in nonwetlands
- **facultative plants** are those that are equally likely to occur in wetlands or nonwetlands (34-66% probability)
- **facultative upland plants** are those that usually occur in nonwetlands (67-99% probability), but occasionally are found in wetlands (1-33% probability)
- **upland plants** are those that almost always occur in nonwetlands under natural conditions ($\geq 99\%$ probability)

c. A description of soil characteristics on the site to determine if the criteria for hydric soils are met including examination for the following:

- o histic soil characteristics
- o aquic soil characteristics
- o soils that are ponded for long duration during the growing season
- o soils that are frequently flooded for long duration during the growing season

d. A description of hydrologic conditions on the site to determine if the criteria for wetland hydrology are met including evaluation of the following:

- o in somewhat poorly drained mineral soils saturation of soils to the surface occurs when the water table is 0.5 feet from the surface for seven days or more during the growing season
- o in poorly drained mineral soils saturation of soils to the surface occurs when the water table is less than 1.5 feet from the surface for approximately seven or more days during the growing season
- o in variably permeable mineral soils saturation of soils to the surface occurs when the water table is less than 1 foot from the surface for seven days or more during the growing season
- o in poorly drained organic soils saturation of soils to the surface occurs when the water table is at a depth where saturation occurs more than rarely (i.e., the water table is managed, such as by irrigation)
- o inundation or saturation occurs by flooding or ponding for seven days or more during the growing season

e. A tabulation of the areal extent of wetland and riparian vegetation existing in the area and to be disturbed by the proposed action.

f. A tabulation of the areal extent of wetland and riparian vegetation to be mitigated and a description of the mitigation area and category, i.e., restoration, enhancement or replacement [Note: The purpose of the regulations surrounding the Clean Water Act, and subsequent refinements created by the recent Memorandum of Understanding between the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency is principally directed at no net loss of wetlands.]

2. Analysis Of Alternatives

a. Project Purpose

This is a discussion of the reasons requiring construction of the project. Examples include stabilization of eroding streambanks, road crossings, access roads,

hike/bike trail systems, building construction and park development.

b. Project Actions and Practicable Alternatives

The applicant must develop dialogue that clearly illustrates that the proposed construction cannot be accomplished in an upland area. The discussion must follow the 404 (b)(1) guidelines, as summarized below. These guidelines require that any action resulting in the disturbance of wetlands be demonstrated as the most practicable alternative in terms of logistics, technology and economics.

Section 230.10(a)(1) and (2) provide, in pertinent part:

Except as provided under Section 404(b)(2)[pertaining to navigation], no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem so long as the alternative does not have other significant adverse environmental consequences.

An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology and logistics in light of overall project purposes. If it is otherwise a practicable alternative, an area not presently owned by the applicant which could reasonably be obtained, utilized, expanded or managed in order to fulfill the basic purpose of the proposed activity may be considered*.

* Section 230.10(a)(2) embodies the definition of "practicable" which is found in Section 230.3(q). This definition reads: The term practicable means available and capable of being done after taking into consideration cost, existing technology, and logistics in the light of overall project purposes.

In practice, the application of Section 230.10 of the Section 404(b)(1) Guidelines requires[sic] an assessment of alternatives to a proposed activity and the identification of practicable alternatives, if they exist. Then there must be an assessment of otherwise adverse environmental impacts to determine if they are significant.

If an activity is not water dependent, there is a presumption that less damaging alternatives exist unless clearly demonstrated otherwise by the applicant {Section 230.10(a)(3)}.

The application of the **alternatives test** requires an interpretation or understanding of the terms used. The following criteria provide direction in assisting alternatives to proposed projects pursuant to the Section 404(b)(1) Guidelines.

- To be considered practicable, an alternative to a proposed discharge must be both available and capable of being done after taking into consideration cost, existing technology and logistics in light of overall project purposes; **i.e., an alternative must be available and feasible.**

- The assessment of practicability requires an interpretation of the basic project purpose of a proposal. Under the Guidelines, **an alternative must be capable of satisfying the basic or overall project purpose of the proposed project (taking into consideration cost, technology and logistics).** An applicant's proposal is a starting point for identifying the basic project purpose. The Guidelines do not demand an acceptance of every aspect of a developer's characterization of his project purpose. The preamble to the Section 404(b)(1) Guidelines provides the following example:

  ...fill to create a restaurant site is not water dependent, since restaurants do not need to be in wetlands to fulfill their basic purpose of feeding people.

- The presumption that other practicable alternatives exist for non-water dependent projects serves to direct developments away from sensitive aquatic resources and it **preserves such sites which truly require access to water. The presumption correctly and logically recognizes that non-water dependent projects can usually be located someplace other than special aquatic sites.**

- **An applicant's submission of information clearly within its expertise is normally accepted by the reviewing agency. Where the information seems in conflict with other available information, independent judgement must be used to determine the matter at issue. Although providing important insight, issues raised by an applicant to justify rejection of an alternative cannot be automatically considered adequate or sufficient to satisfy the rebuttal of alternatives in the Section 404(b)(1) Guidelines. The Section 404(b)(1) Guidelines require an alternative to be only feasible, not that it is equal or better than the proposed site.** Since the applicant usually selects the site which is best from his perspective, alternatives are often, by definition, less desirable to the applicant. **Alternatives which are located in non-water dependent areas may not be eliminated from consideration solely on their being less desirable to the applicant.**

- One element of feasibility is a consideration of cost of an alternative. For an alternative to be dismissed due solely to cost, the applicant must clearly demonstrate that the alternative is not economically feasible.

c. Requirement of Access to Water

The applicant must address that construction of the proposed action is water-related. Examples of action that are water related are bridges, road crossings, grade controls and streambank stabilization.

H. MITIGATION DESIGN PROCESS

The focus of wetland mitigation should be to produce a diverse and self-sustaining combination of aquatic, wetland and riparian habitats. The components of a detailed wetland mitigation design are:

- o resource requirements for plant materials, soils and hydrology, as determined by the characteristics of the existing area to be disturbed
- o proposed location that meets the above requirements
- o mitigation planning and documents including construction drawings, specifications and construction supervision
- o monitoring of mitigation success and maintenance of site

1. Plant Materials

The applicant must provide a list of plant materials suitable for use in mitigation. The basis for this list are those species occurring in the existing site to be disturbed and can be augmented with nursery stock. The applicant should indicate the source of the plant materials to be established in the mitigation site, for example transplant source areas and nursery stock sources.

2. Planting Plan

A detailed planting plan must be provided showing the location, sizes and quantities of plant materials to be established in the mitigation site. Species to be seeded must also be shown. The plan should also indicate grading and earthwork for the mitigation site showing contours at one foot intervals. Specifications must be provided in sufficient detail to show the method(s) of setting and establishing plant materials, and seeding methods. The scale of this drawing should be $\geq 1"=50'$.

3. Soil Preparation

Specifications for site preparation, topsoiling, fertilizer application and other soil amendments must be provided in sufficient detail to assure that proper soil characteristics are established on the mitigation site.

4. Hydrologic Maintenance

The mitigation plan drawings must also indicate sources of water that will maintain the

hydrologic character of the wetland mitigation site. Average annual flow into the mitigation site should also be determined.

5. Impact Mitigation

Details of protection of existing natural vegetation and flowing water must be given. This can take the form of a site plan that indicates access routes, traffic patterns, no-traffic areas and erosion control measures and locations. The purpose of this plan is to assure protection of existing water quality and protection of existing wetlands.

6. Monitoring Program

A monitoring program must be developed that details the period during which the mitigation plan will be evaluated for successful establishment. The recommended period is three growing seasons following construction. The monitoring plan must also details methods of evaluation and success standards. Annual findings of the monitoring evaluation must be documented in a submittal to the appropriate agencies.

7. Maintenance

A plan for maintenance of the mitigation area must be formulated that integrates the findings of the monitoring program with required repairs or plant material replacements. The maintenance period should be the same as the monitoring period. Financial assurances for maintenance should be provided in amounts that are sufficient to guarantee meeting the success standards established for mitigation.

SPRING CREEK DBPS – TABLE 9
DETENTION POND RECOMMENDATIONS

PROPOSED DETENTION LOCATION	DESIGN POINT	PEAK INFLOW (CFS)	PEAK OUTFLOW (CFS)	VOLUME (AC-FT)	MAXIMUM* ELEVATION	PROPOSED OUTLET
WAGNER PARK	5	3022	2171	35.2	6030.1	EXIST. DBL 12' x 6' CBC, NEW HEADWALL,WINGWALLS
REDWING BIRD SANCTUARY	6	3317	3177	31.2	5998.5	2 – 24" RCP WITH 35' WEIR
VALLEY HI LAKE	10	6304	5522	75.6	5949.9	NEW SIDE CHANNEL SPILLWAY AT CURRENT OVERFLOW ELEVATION
PROPOSED UNION BLVD.	14	7026	5276	138.4	5900.4	DOUBLE – 13'X 10' CBC (CDOH DESIGN)

NOTE: PROPOSED POND ELEVATIONS ARE FOR PLANNING PURPOSES ONLY. EXACT WATER SURFACE ELEVATIONS WILL BE DETERMINED DURING FINAL DESIGN.

SPRING CREEK DBPS – PROPOSED CHANNEL\MAJOR PIPE CAPACITIES
TABLE 10 – SHEET 1 OF 2

DESIGN POINTS	MAIN CHANNEL REACH	SLOPE (%)	MANNINGS n–VALUE	B (FT)	DEPTH (FT)	SIDES (x:1)	CAPACITY (CFS)	VELOCITY (FPS)	COMMENT
16 TO 15	FOUNTAIN CR. TO LAS VEGAS ST.	SEE HEC–2 ANALYSIS IN APPENDIX B							GRADE CONTROL, SPOT EROSION PROTECTION
16 TO 15	LAS VEGAS ST. TO HANCOCK EXP.	SEE HEC–2 ANALYSIS IN APPENDIX B							BURIED RIP RAP BANK PROTECTION
15 TO 14	HANCOCK EXP. TO UNION BLVD.	SEE HEC–2 ANALYSIS IN APPENDIX B							GRADE CONTROL, SPOT EROSION PROTECTION
15 TO 14	HANCOCK EXP. TO UNION BLVD.	SEE HEC–2 ANALYSIS IN APPENDIX B							GRADE CONTROL, SPOT EROSION PROTECTION
14 TO 12	UNION BLVD. TO CIRCLE DR.	1.00	0.015	24	12.0	0.0	5,640	23.8	NEW IMPROVED CHANNEL/CBC (CDOT)
12 TO 11	CIRCLE DR. TO FOUNTAIN BLVD.	1.50	0.015	36	10.0	1.5	11,118	36.1	NEW CBC (CDOT)
11 TO 10	FOUNTAIN TO VALLEY HI LAKE	0.80	0.015	31	10.0	0.0	5,763	23.1	REPLACE EXIST. CHANNEL W/31x10 CBC
10 TO 9	VALLEY HIGH LAKE TO CHELTON DR.	0.50	0.035	70	7.0	2.0	5,000	11.1	USE D=4' N. SIDE W/40' OVERBANK
9 TO 7	CHELTON DR. TO AIRPORT RD.–LWR.	0.50	0.035	30	12.0	1.5	6,837	11.9	WO/FB,VEG. LINING N.,HARD LINING S.,LWR. INV. 2'
9 TO 7	CHELTON DR. TO AIRPORT RD.–UPP.	0.50	0.035	40	10.0	1.5	6,175	11.2	WO/FB,VEG. LINING W.,HARD LINING E.,LWR. INV. 2'
7 TO 6	AIRPORT RD. TO RED WING SANC.	0.70	0.025	50	7.8	1.5	5,160	14.5	INCREASED DEPTH OF LINING
6 TO 5	RED WING SANC. TO PIKES PEAK AVE	0.50	0.035	40	7.0	2.0	2,314	8.1	BURIED RIP RAP BANK LINING, GRADE CONTROL
5 TO 4	PIKE PEAK AVE. TO BIJOU ST.	0.50	0.035	40	4.0	2.0	1,282	6.7	LOW FLOW CHANNEL THROUGH POND – WO/FRBRD.
4 TO 3	BIJOU ST. TO PLATTE AVE.	1.00	0.015	15	7.5	1.5	2,762	23.0	INCREASED DEPTH OF LINING

DESIGN POINTS	MAIN STORM SEWER REACH	SLOPE (%)	CAPACITY (CFS)	COMMENT
3 TO 2	PLATTE AVE. TO CHELTON DR.	1.20	1,000	NO IMPROVEMENT PROPOSED
3 TO 1	PLATTE AVE. TO GALLEY RD.	1.20	368	NO IMPROVEMENT PROPOSED– OVERFLOW TO 96" SYSTEM
3 TO C1	PLATTE AVE. TO ACADEMY BLVD.	4.30	878	NO IMPROVEMENT PROPOSED

SPRING CREEK DBPS – PROPOSED CHANNEL\MAJOR PIPE CAPACITIES
TABLE 10 – SHEET 2 OF 2

DESIGN POINTS	TRIBUTARY CHANNEL REACH	SLOPE (%)	MANNINGS n–VALUE	B (FT)	DEPTH (FT)	SIDES (x:1)	CAPACITY (CFS)	VELOCITY (FPS)	COMMENT
14A TO N.	UNION BLVD. TO FOUNTAIN BLVD.	0.50	0.035	20	10	2	2,899	9.3	GRADE CONTROL, SPOT EROSION PROTECTION
13 TO 13A	U.S. 24 BYPASS TO FOUNTAIN BLVD.	4.00	N/A	N/A	N/A	N/A	850	N/A	72" RCP (60" RCP–CDOH DESIGN)
10C TO 10B	VALLEY HI GOLF COURSE TO NW	1.10	0.035	16	6	2	1,084	9.5	INCREASED DEPTH, WIDENED CHANNEL
10A TO E.	VALLEY HI GOLF COURSE TO NE	0.50	0.025	28	4.0	1.5	628	7.3	NO IMPROVEMENT PROPOSED
6A TO 6B	BIJOU ST. TO PIKES PEAK	3.25	0.015	12	4.0	1.5	2,509	34.8	NO IMPROVEMENT PROPOSED – WO/FULL FRBRD.
6B TO 6C	PLATTE AVE. TO BIJOU ST.	1.00	0.015	8	4.0	1.5	1,021	18.2	NO IMPROVEMENT PROPOSED – WO/FULL FRBRD.
M4 TO 13A	FOUNTAIN BLVD. TO WINNEPEG	3.00	0.015	0	6.8	1	461	23.2	NO IMPROVEMENT PROPOSED

DESIGN POINTS	TRIBUTARY STORM SEWER REACH	SLOPE (%)	CAPACITY (CFS)	COMMENT
12A	CIRCLE DR. TO VERDE DR.	1.40	850	REPLACE EXIST. PIPES W/ 9' X 6' CBC
6A TO 6B	ACADEMY BLVD. TO PIKES PEAK	1.50	1,390	PROPOSED 60" RCP PARALLEL
6B TO 6C	PLATTE AVE. TO BIJOU ST.	2.00	590	REPLACE EXIST. PIPE W/ 72" RCP
10C TO 10B	VALLEY HI GOLF COURSE TO NW	4.00	1,275	REPLACE EXIST. PIPE W/ 84" RCP, IMP. INLET, ENERGY DISSIPATOR

SPRING CREEK DBPS – PROPOSED CROSSING CAPACITIES
TABLE 11

DESIGN POINT	MAIN CHANNEL CROSSING	EXISTING IMPROVEMENT	PROPOSED IMPROVEMENT	CAPACITY (CFS)	REMARKS
15/16	LAS VEGAS STREET	BRIDGE–30' SPAN, 15' D	NO IMPROVEMENT PROPOSED	5,677	SEE HEC–2 NO FREEBOARD BUT PASSES THRU
15/16	RAILROAD	BRIDGE–61' SPAN, 13' D	NO IMPROVEMENT PROPOSED	7,850	ENSURE EROSION PROTECTION
15	HANCOCK EXPRESSWAY	BRIDGE–75' SPAN, 19' D	NO IMPROVEMENT PROPOSED	7,140	ENSURE EROSION PROTECTION
14	UNION BLVD (CDOH)	DOUBLE–13'X 10' CBC	NO IMPROVEMENT PROPOSED	5,530	CDOH DESIGN W/S.H. 24 BYPASS
12	CIRCLE DRIVE	DOUBLE–10'X 6' CBC	NEW DOUBLE– 12'x 12' CBC	6,300	CDOH DESIGN W/S.H. 24 BYPASS
11	FOUNTAIN BLVD.	BRIDGE–31' SPAN, 10' D	LOWER INVERT 2'	6,200	ADEQUATE CAPACITY
10	VALLEY HI LAKE SPILLWAY	109' WIDE CONC. SPILLWAY	NEW 220' WIDE SPILLWAY	5,720	DOWNSTREAM THROAT CONTROLS
9	CHELTON ROAD	QUADRUPLE–8'X 6' CBC	7–10'x 8' CBC OR BRIDGE	4,550	LOWER INVERT AT CHELTON
7	AIRPORT ROAD	2–13'X 5',1–18'X 5' CBC	ADDITIONAL 10'x 5' CBC	4,100	BUILD CONC.TRANSITION FROM CHANNEL
5	PIKES PEAK AVENUE	DOUBLE–12'X 6' CBC	NO IMPROVEMENT PROPOSED	2,170	DETENTION OUTLET – WAGNER PARK
4	BIJOU STREET	TRIPLE–8'X 5' CBC	ADDITIONAL 10'x 5' CBC	2,800	IN PARALLEL
3	PLATTE AVENUE (S.H. 24)	10'X 8' CBC	NO IMPROVEMENT PROPOSED	2,610	ADEQUATE CAPACITY

DESIGN POINT	TRIBUTARY CHANNEL CROSSING	EXISTING IMPROVEMENT	PROPOSED IMPROVEMENT	CAPACITY (CFS)	REMARKS
6B	BIJOU STREET	DOUBLE–8'X 5' CBC	NO IMPROVEMENT PROPOSED	1,315	ADEQUATE CAPACITY
6A/6B	PIKES PEAK AVENUE	DOUBLE–8'X 4' CBC	NO IMPROVEMENT PROPOSED	1,190	ADEQUATE CAPACITY
6C	PLATTE AVENUE	2– 8'x 3' CBC	NO IMPROVEMENT PROPOSED	650	ADEQUATE CAPACITY
6A	ACADEMY BLVD.	DOUBLE–10'x 4' CBC	ADDITIONAL 60" RCP	1,303	IN PARALLEL
10B	AIRPORT ROAD	14'–4"x 4'–4" CSP ARCH	NEW 9'x 6' CBC	1,120	NEW ALIGNMENT AT CROSSING
12A	VERDE DRIVE	TRIPLE–54" CMP	NEW 10'x 6' CBC	850	IMPROVE UPSTREAM SYSTEM
13A	FOUNTAIN BLVD.	60" RCP	NO IMPROVEMENT PROPOSED	450	ADEQUATE CAPACITY

Preliminary Cost Estimates

VI. PRELIMINARY COST ESTIMATES

A. DRAINAGE FEES

New public drainage facilities identified in this basinwide study, in public easements or ROW, are shared equally by all of the developers within the drainage basin through the application of a drainage fee. The drainage fee is applied at the time that land within the basin is platted. Also accompanying the plat is a subdivision drainage report which delineates all of the drainage facilities to be built to current City/County criteria as part of that development. The subdivision report then compares the cost of facilities to the amount of fee that is required for the platted acreage. If the fee is in excess of the drainage facilities, the developer is required to build the facilities in the report and pay a cash fee equal to the difference between the full drainage fee and the cost of facilities built. The cash fee then goes into a revolving fund for the basin. If the cost of drainage facilities exceed the amount of fee required, the developer is required to build the facilities and is eligible for a reimbursement for the amount in excess of the fees from the revolving fund for the basin. This policy is in effect for both the City of Colorado Springs and El Paso County.

This study area encompasses a total drainage area of 4,502 acres. Excluding existing ROW for roads and presently platted acreage within the basin, there is approximately 548 acres of unplatted developable acreage within the basin. Table 12 summarizes the drainage fees for this study and the components that make up the fees. The drainage fees are composed of capital improvement costs and land costs. Total drainage costs are then divided by the acreage remaining in the basin at the time the fee was established. Fees are then charged as the remaining acreage is platted relative to the acreage of the plat. Current policy allows the reimbursement of land only for detention facilities. See the current drainage criteria for reimbursement guidelines.

B. BRIDGE FEES

Bridges are considered a separate fee structure from the rest of the drainage improvements for the basin. A bridge over a drainageway shall be defined as a roadway structure having a passageway for carrying traffic or other moving loads and having a drainageway clear opening, measured along the centerline of the roadway, of more than 20 feet per Section 2.3.1 of the Drainage Criteria Manual. The City of Colorado Springs has an arterial bridge reimbursement policy for bridges under arterial roadways . The policy is that the amount of the arterial bridge over 68 feet in length perpendicular to the centerline of the arterial roadway is paid for by the City through the general fund. El Paso County does not have this policy. Therefore, the remainder of the bridge costs are shared equally by all of the developers within the drainage basin through the application of a bridge fee. The bridge fee is applied at the time that land within the basin is platted. Also accompanying the plat is a subdivision drainage report which delineates all of the bridges to be built as part of that development. The subdivision report then compares the cost of facilities to the amount of fee that is required for the platted acreage. If the fee is in excess of the bridge costs, the developer is required to build any bridges in the report and pay a cash fee equal to the difference between the full bridge fee and the cost of facilities built. The cash fee then goes into a revolving fund for the basin that is separate from the drainage fee fund. If the cost of bridges exceed the amount of fee required, the developer is required to build the facilities and is eligible for a reimbursement from the revolving fund for the basin. Reimbursement for the City's portion of arterial bridges is made based on the City Council's decision on when they are able to provide funds to the bridge fund.

There is no proposed bridge fee for the Spring Creek basin. Since all of the proposed bridge upgrades were subjected to an upgrade cost share by the City and developer and included in the drainage fee calculations.

SPRING CREEK DBPS – SUMMARY OF DRAINAGE FEES

07-Sep-93

TABLE 12 – SHEET 1 OF 9

DESIGN POINTS	IMPROVEMENT REACH	QUANTITY	UNIT	UNIT COST	TOTAL	IMPROVEMENT TOTAL COST	CAPITAL IMPR. COST ALLOC.	REIMBURSABLE COST ALLOC.	CDOT COST ALLOC.
16 TO 15	FOUNTAIN CR. TO LAS VEGAS ST.					$165,970	$0	$165,970	$0
	Vegetated Lining (one side)	900	LF	$32	$28,800				
	Riprap Lining (one side)	800	LF	$48	$38,400				
	Drop Structure	2	EA	$36,960	$73,920				
	Earthwork (Lay Back for Veg. Lining)	5,000	CY	$2	$10,000				
	Land Cost	0.5	AC	$14,700	$7,350				
	Mitigation / Wetland Restoration	0.5	AC	$15,000	$7,500				
16 TO 15	LAS VEGAS ST. TO HANCOCK EXP.					$181,920	$0	$0	$181,920
	Riprap Lining (both sides)	700	LF	$90	$63,000				
	Remove Existing Rubble	1	LS	$30,000	$30,000				
	Drop Structure	2	EA	$36,960	$73,920				
	Earthwork	7,500	CY	$2	$15,000				
15 TO 14	HANCOCK EXP. TO UNION BLVD.					$168,070	$0	$168,070	$0
	Riprap Lining (one side),d=10'@ Hancock	200	LF	$88	$17,600				
	Vegetated Lining (one side)	900	LF	$32	$28,800				
	Riprap Lining (one side)	800	LF	$48	$38,400				
	Remove Existing Drop	1	LS	$7,500	$7,500				
	Drop Structure	1	EA	$28,160	$28,160				
	Earthwork (Lay Back for Veg. Lining)	7,500	CY	$2	$15,000				
	Land Cost	1.3	AC	$14,700	$19,110				
	Mitigation / Wetland Restoration	0.9	AC	$15,000	$13,500				
11 TO 10	FOUNTAIN TO VALLEY HI LAKE					$795,200	$698,186	$97,014	$0
	Remove Existing Concrete Channel	800	LF	$125	$100,000				
	31' x 10' Concrete Box Culvert	800	LF	$790	$632,000				
	Misc. for Box Culvert	1	LS	$63,200	$63,200				
10	VALLEY HI LAKE DETENTION POND					$1,136,750	$998,067	$138,684	$0
	Remove Existing Spillway & 150' of Channel	350	CY	$125	$43,750				
	Dewatering	1	LS	$50,000	$50,000				
	Earthwork,Backfill,Compaction	1	LS	$61,000	$61,000				
	Concrete Spillway & Transition	1	LS	$800,000	$800,000				
	Miscellaneous	1	LS	$96,000	$96,000				
	Berm Construction	1	LS	$50,000	$50,000				
	Wetland Restoration (Emergent)	0.9	AC	$40,000	$36,000				

SPRING CREEK DBPS – SUMMARY OF DRAINAGE FEES

07-Sep-93

TABLE 12 – SHEET 2 OF 9

DESIGN POINTS	IMPROVEMENT REACH	QUANTITY	UNIT	UNIT COST	TOTAL	IMPROVEMENT TOTAL COST	CAPITAL IMPR. COST ALLOC.	REIMBURSABLE COST ALLOC.	CDOT COST ALLOC.
10 TO 9	VALLEY HIGH LAKE TO CHELTON DR.					$157,100	$137,934	$19,166	$0
	Riprap Lining (south side)	1,600	LF	$64	$102,400				
	Vegetated Lining (north side)	700	LF	$21	$14,700				
	Riprap Lining (north side)	1,000	LF	$40	$40,000				
9 TO 7	CHELTON DR. TO AIRPORT RD.					$420,640	$369,322	$51,318	$0
	Riprap Lining (east side,S. of Airport)	1,100	LF	$104	$114,400				
	Riprap Lining (south side, E. of Chelton)	2,400	LF	$88	$211,200				
	Drop Structure (Near Chelton)	2	EA	$29,920	$59,840				
	Drop Structure (Airport crossing)	1	EA	$35,200	$35,200				
7 TO 6	AIRPORT RD. CROSSING TO REDWING BIRD SANCTUARY					$105,540	$92,664	$12,876	$0
	Remove Existing Transition	1	LS	$3,000	$3,000				
	Build New Transition	1	LS	$37,940	$37,940				
	Additional 10' x 5' Concrete Box Culvert	80	LF	$245	$19,600				
	Misc. for Box Culvert	1	LS	$30,000	$30,000				
	Dewatering	1	LS	$15,000	$15,000				
6 TO 5	REDWING BIRD SANCTUARY TO PIKES PEAK AVE.					$344,788	$302,724	$42,064	$0
	Riprap Lining (10-year,both sides)	1,800	LF	$48	$86,400				
	Earthwork (Lay Back for Lining)	8,800	CY	$2	$17,600				
	Drop Structure	1	EA	$25,520	$25,520				
	Drop Structure (DP 6A to Academy)	2	EA	$22,240	$44,480				
	Earthwork (for dam)	4,000	CY	$2.00	$8,000				
	Low Flow Pipe (2 – 24" RCP)	160	LF	$40.80	$6,528				
	Build Spillway	1	LS	$12,500	$12,500				
	Riprap Lining (both sides)	525	LF	$128	$67,200				
	Drop Structures, Energy Dissipator	3	EA	$25,520	$76,560				
5	WAGNER PARK DETENTION POND					$199,040	$174,757	$24,283	$0
	Remove Existing Headwall & Wingwalls	1	LS	$5,940	$5,940				
	Earthwork (excavating pond)	55,000	CY	$2.00	$110,000				
	Revegetation	15,000	SY	$1.80	$27,000				
	Build New Transition to Outlet	1	LS	$56,100	$56,100				

SPRING CREEK DBPS – SUMMARY OF DRAINAGE FEES

07-Sep-93

TABLE 12 – SHEET 3 OF 9

DESIGN POINTS	IMPROVEMENT REACH	QUANTITY	UNIT	UNIT COST	TOTAL	IMPROVEMENT TOTAL COST	CAPITAL IMPR. COST ALLOC.	REIMBURSABLE COST ALLOC.	CDOT COST ALLOC.
5 TO 4	PIKE PEAK AVE. TO BIJOU ST.					$186,160	$163,448	$22,712	$0
	Riprap Lining (West and N. 400' on east)	1,700	LF	$56	$95,200				
	Riprap Lining (Remaining east side)	800	LF	$40	$32,000				
	Drop Structure	2	EA	$29,480	$58,960				
4	BIJOU STREET CROSSING					$69,660	$61,161	$8,499	$0
	Additional 10' x 5' Concrete Box Culvert	100	LF	$245	$24,500				
	Misc. for Box Culvert	1	LS	$17,000	$17,000				
	Energy Dissipator Downstream	1	EA	$28,160	$28,160				
4 TO 3	BIJOU ST. TO PLATTE AVE.					$85,380	$85,380	$0	$0
	Remove Concrete Channel (100 LF)	1	LS	$9,140	$9,140				
	Additional Concrete Lining (both sides)	1,800	LF	$30	$54,000				
	Build New Transition (N. of Bijou)	1	EA	$22,240	$22,240				
14A TO N.	ALONG UNION BLVD. – NORTH TRIBUTARY TO FOUNTAIN BLVD.					$198,440	$0	$198,440	$0
	54" RCP	1,200	LF	$114.70	$137,640				
	Energy Dissipator Downstream	1	EA	$35,200	$35,200				
	18" RCP	420	LF	$30.00	$12,600				
	12' INLETS	4	EA	$3,250.00	$13,000				
14A TO N.	ALONG UNION BLVD. – NORTH TRIBUTARY ABOVE FOUNTAIN BLVD.					$270,632	$270,632	$0	$0
	(INCLUDING FOUNTAIN BLVD. TO THE WEST & SOUTH)								
	36" RCP	1,775	LF	$54.00	$95,850				
	30" RCP	160	LF	$48.00	$7,680				
	24" RCP	2,190	LF	$40.80	$89,352				
	18" RCP	750	LF	$30.00	$22,500				
	12' INLETS	17	EA	$3,250.00	$55,250				
13A TO N.	U.S. 24 BYPASS TO FOUNTAIN BLVD. – NORTH TRIBUTARY					$97,400	$0	$97,400	$0
	72" RCP	500	LF	$194.80	$97,400				
13A TO N.	FOUNTAIN BLVD. AND HUTCHINSON DR. – NORTH TRIBUTARY					$180,452	$180,452	$0	$0
	42" RCP	230	LF	$72.00	$16,560				
	36" RCP	955	LF	$54.00	$51,570				
	30" RCP	740	LF	$48.00	$35,520				
	24" RCP	1,065	LF	$40.80	$43,452				
	18" RCP	245	LF	$30.00	$7,350				
	12' INLETS	8	EA	$3,250.00	$26,000				

SPRING CREEK DBPS – SUMMARY OF DRAINAGE FEES

07-Sep-93

TABLE 12 – SHEET 4 OF 9

DESIGN POINTS	IMPROVEMENT REACH	QUANTITY	UNIT	UNIT COST	TOTAL	IMPROVEMENT TOTAL COST	CAPITAL IMPR. COST ALLOC.	REIMBURSABLE COST ALLOC.	CDOT COST ALLOC.
14A TO S.	SOUTH TRIBUTARY TO SPRING CREEK DEVELOPMENT					$333,254	$0	$333,254	$0
	72" RCP (FROM POND TO ROW)	100	LF	$194.80	$19,480				
	GRATED INLET (FOR 100-YR. OVERFLOW)	1	EA	$5,000.00	$5,000				
	54" RCP	300	LF	$114.70	$34,410				
	42" RCP	1,400	LF	$72.00	$100,800				
	36" RCP	140	LF	$54.00	$7,560				
	30" RCP	435	LF	$48.00	$20,880				
	24" RCP	2,030	LF	$40.80	$82,824				
	18" RCP	560	LF	$30.00	$16,800				
	12' INLETS	14	EA	$3,250.00	$45,500				
12A	FROM MAIN CHANNEL – SOUTH TRIBUTARY EAST OF CIRCLE DR.					$1,090,626	$1,090,626	$0	$0
	(FROM MAIN CHANNEL TO VERDE DR. & UPSTREAM – EAST OF CIRCLE DR./SOUTH OF VERDE DR.)								
	9' x 6' Concrete Box Culvert	450	LF	$317	$142,650				
	Misc. for Box Culvert	1	LS	$14,265	$14,265				
	Transition for Box Culverts	25	LF	$280.00	$7,000				
	7' x 6' Concrete Box Culv (across Verde Dr.)	50	LF	$238.00	$11,900				
	Misc. for Box Culvert	1	LS	$1,190	$1,190				
	7' x 6' Concrete Box Culv (south of Verde Dr.)	500	LF	$238	$119,000				
	Misc. for Box Culvert	1	LS	$11,900	$11,900				
	72" RCP	420	LF	$194.80	$81,816				
	60" RCP	320	LF	$133.20	$42,624				
	54" RCP	1,485	LF	$114.70	$170,330				
	48" RCP	1,240	LF	$96.84	$120,082				
	42" RCP	1,090	LF	$72.00	$78,480				
	36" RCP	305	LF	$54.00	$16,470				
	30" RCP	745	LF	$48.00	$35,760				
	24" RCP	700	LF	$40.80	$28,560				
	18" RCP	1,320	LF	$30.00	$39,600				
	12' INLETS	52	EA	$3,250.00	$169,000				

SPRING CREEK DBPS – SUMMARY OF DRAINAGE FEES

07-Sep-93

TABLE 12 – SHEET 5 OF 9

DESIGN POINTS	IMPROVEMENT REACH	QUANTITY	UNIT	UNIT COST	TOTAL	IMPROVEMENT TOTAL COST	CAPITAL IMPR. COST ALLOC.	REIMBURSABLE COST ALLOC.	CDOT COST ALLOC.
ABOVE 12	NORTH TRIBUTARY – FOUNTAIN BLVD. AND CIRCLE DR.					$228,038	$0	$0	$228,038
	54" RCP	205	LF	$114.70	$23,514				
	48" RCP	100	LF	$96.84	$9,684				
	42" RCP	930	LF	$72.00	$66,960				
	36" RCP	1,010	LF	$54.00	$54,540				
	30" RCP	270	LF	$48.00	$12,960				
	24" RCP	600	LF	$40.80	$24,480				
	18" RCP	330	LF	$30.00	$9,900				
	12' INLETS	8	EA	$3,250.00	$26,000				
ABOVE 12	NORTH TRIBUTARY – FOUNTAIN BLVD. AND CIRCLE DR. (SIDE STREETS)					$81,280	$81,280	$0	$0
	30" RCP	100	LF	$48.00	$4,800				
	24" RCP	600	LF	$40.80	$24,480				
	18" RCP	650	LF	$30.00	$19,500				
	12' INLETS	10	EA	$3,250.00	$32,500				
ABOVE 11	NORTH TRIBUTARY – IN VALLEY HI GOLF COURSE					$100,454	$100,454	$0	$0
	48" RCP	290	LF	$96.84	$28,084				
	42" RCP	960	LF	$72.00	$69,120				
	12' INLETS	1	EA	$3,250.00	$3,250				
10C TO 10B	VALLEY HI GOLF COURSE TO NW					$745,100	$654,198	$90,902	$0
	96" RCP	786	LF	$370.00	$290,820				
	Build New Transition	2	EA	$40,000	$80,000				
	Riprap Lining (both sides w/earthwork)	1,050	LF	$180	$189,000				
	Utilities & Miscellaneous	1	LS	$110,280	$110,280				
	Energy Dissipator Downstream	1	EA	$75,000	$75,000				
10B	AIRPORT ROAD (EAST OF CIRCLE)					$279,224	$198,137	$27,532	$53,556
	16' x 6' Concrete Box Culvert (CDOT)	120	LF	$446	$53,556				
	12' x 6' Concrete Box Culvert	370	LF	$446	$165,131				
	Misc. for Box Culverts	1	LS	$43,737	$43,737				
	New Junction Box/Inlet	1	LS	$5,000	$5,000				
	Remove CMP	490	LF	$20	$9,800				
	Remove Existing Junction Box	1	LS	$2,000	$2,000				

SPRING CREEK DBPS – SUMMARY OF DRAINAGE FEES

07-Sep-93

TABLE 12 – SHEET 6 OF 9

DESIGN POINTS	IMPROVEMENT REACH	QUANTITY	UNIT	UNIT COST	TOTAL	IMPROVEMENT TOTAL COST	CAPITAL IMPR. COST ALLOC.	REIMBURSABLE COST ALLOC.	CDOT COST ALLOC.
ABOVE 10B	AIRPORT RD. AND CIRCLE DR. (NORTH & EAST)					$378,200	$378,200	$0	$0
	42" RCP	580	LF	$72.00	$41,760				
	36" RCP	1,770	LF	$54.00	$95,580				
	30" RCP	1,660	LF	$48.00	$79,680				
	24" RCP	1,350	LF	$40.80	$55,080				
	18" RCP	1,370	LF	$30.00	$41,100				
	12' INLETS	20	EA	$3,250.00	$65,000				
ABOVE 10B	AIRPORT RD. AND CIRCLE DR. (NORTHWEST – PRINTERS PARK)					$283,860	$122,102	$161,758	$0
	72" RCP	300	LF	$194.80	$58,440				
	42" RCP	80	LF	$72.00	$5,760				
	36" RCP	1,380	LF	$54.00	$74,520				
	30" RCP	520	LF	$48.00	$24,960				
	24" RCP	850	LF	$40.80	$34,680				
	18" RCP	1,550	LF	$30.00	$46,500				
	12' INLETS	12	EA	$3,250.00	$39,000				
ABOVE 9	SOUTH TRIBUTARY CHELTON ROAD NORTH OF FOUNTAIN BLVD.					$243,157	$82,887	$0	$160,270
	60" RCP	920	LF	$133.20	$122,544				
	54" RCP	290	LF	$114.70	$33,263				
	48" RCP	445	LF	$96.84	$43,094				
	24" RCP	195	LF	$40.80	$7,956				
	18" RCP	235	LF	$30.00	$7,050				
	12' INLETS	9	EA	$3,250.00	$29,250				
ABOVE 9	SOUTH TRIBUTARY – FOUNTAIN BLVD. EAST & WEST OF CHELTON ROAD					$131,364	$0	$0	$131,364
	48" RCP	95	LF	$96.84	$9,200				
	36" RCP	150	LF	$54.00	$8,100				
	30" RCP	460	LF	$48.00	$22,080				
	24" RCP	980	LF	$40.80	$39,984				
	18" RCP	650	LF	$30.00	$19,500				
	12' INLETS	10	EA	$3,250.00	$32,500				

SPRING CREEK DBPS – SUMMARY OF DRAINAGE FEES

07-Sep-93

TABLE 12 – SHEET 7 OF 9

DESIGN POINTS	IMPROVEMENT REACH	QUANTITY	UNIT	UNIT COST	TOTAL	IMPROVEMENT TOTAL COST	CAPITAL IMPR. COST ALLOC.	REIMBURSABLE COST ALLOC.	CDOT COST ALLOC.
ABOVE 9	SOUTH TRIBUTARY – CHELTON RD. SOUTH OF FOUNTAIN BLVD.					$130,780	$55,019	$75,761	$0
	42" RCP	390	LF	$72.00	$28,080				
	36" RCP	270	LF	$54.00	$14,580				
	30" RCP	190	LF	$48.00	$9,120				
	24" RCP	875	LF	$40.80	$35,700				
	18" RCP	360	LF	$30.00	$10,800				
	12' INLETS	10	EA	$3,250.00	$32,500				
ABOVE 9	NORTH TRIBUTARY – IN CHELTON RD. TO AIRPORT RD.					$575,357	$575,357	$0	$0
	48" RCP	1,830	LF	$96.84	$177,217				
	42" RCP	1,000	LF	$72.00	$72,000				
	36" RCP	1,655	LF	$54.00	$89,370				
	30" RCP	540	LF	$48.00	$25,920				
	24" RCP	2,375	LF	$40.80	$96,900				
	18" RCP	1,415	LF	$30.00	$42,450				
	12' INLETS	22	EA	$3,250.00	$71,500				
ABOVE 7	AIRPORT RD. AT MAIN CHANNEL (WEST OF CHANNEL)					$110,486	$110,486	$0	$0
	42" RCP	60	LF	$72.00	$4,320				
	36" RCP	770	LF	$54.00	$41,580				
	30" RCP	100	LF	$48.00	$4,800				
	24" RCP	420	LF	$40.80	$17,136				
	18" RCP	230	LF	$30.00	$6,900				
	12' INLETS	11	EA	$3,250.00	$35,750				
ABOVE 7	AIRPORT RD. AT MAIN CHANNEL (EAST OF CHANNEL)					$50,980	$0	$0	$50,980
	30" RCP	290	LF	$48.00	$13,920				
	24" RCP	450	LF	$40.80	$18,360				
	18" RCP	190	LF	$30.00	$5,700				
	12' INLETS	4	EA	$3,250.00	$13,000				
ABOVE 7	AIRPORT RD. AND ACADEMY BLVD. (WEST & NORTH)					$88,126	$0	$0	$88,126
	36" RCP	840	LF	$54.00	$45,360				
	24" RCP	520	LF	$40.80	$21,216				
	18" RCP	285	LF	$30.00	$8,550				
	12' INLETS	4	EA	$3,250.00	$13,000				

SPRING CREEK DBPS – SUMMARY OF DRAINAGE FEES

07-Sep-93

TABLE 12 – SHEET 8 OF 9

DESIGN POINTS	IMPROVEMENT REACH	QUANTITY	UNIT	UNIT COST	TOTAL	IMPROVEMENT TOTAL COST	CAPITAL IMPR. COST ALLOC.	REIMBURSABLE COST ALLOC.	CDOT COST ALLOC.
ABOVE 7	AIRPORT RD. AND ACADEMY BLVD. (EAST)					$78,830	$78,830	$0	$0
	30" RCP	200	LF	$48.00	$9,600				
	24" RCP	600	LF	$40.80	$24,480				
	18" RCP	950	LF	$30.00	$28,500				
	12' INLETS	5	EA	$3,250.00	$16,250				
ABOVE 6A	ACROSS ACADEMY BOULEVARD					$75,000	$75,000	$0	$0
	60" RCP (BORED)	125	LF	$500.00	$62,500				
	MISC. FOR 60" RCP	1	LS	$12,500.00	$12,500				
6A TO 6B	ACADEMY BLVD. TO PIKES PEAK AVE.					$54,612	$54,612	$0	$0
	60" RCP	410	LF	$133.20	$54,612				
6B TO 6C	BIJOU ST. TO PLATTE AVE.					$128,880	$128,880	$0	$0
	72" RCP	600	LF	$194.80	$116,880				
	REMOVE 66" CMP	600	LF	$20.00	$12,000				
ABOVE 6C	PLATTE AVE. (S.H. 24) AND MURRAY BLVD.					$144,708	$144,708	$0	$0
	36" RCP	265	LF	$54.00	$14,310				
	30" RCP	855	LF	$48.00	$41,040				
	24" RCP	885	LF	$40.80	$36,108				
	18" RCP	475	LF	$30.00	$14,250				
	12' INLETS	12	EA	$3,250.00	$39,000				
ABOVE 6A	PIKES PEAK AVE. EAST OF CONCRETE CHANNEL					$688,390	$688,390	$0	$0
	60" RCP	1,050	LF	$133.20	$139,860				
	JUNCTION BOX	1	EA	$5,000.00	$5,000				
	54" RCP	1,260	LF	$114.70	$144,522				
	48" RCP	890	LF	$96.84	$86,188				
	42" RCP	860	LF	$72.00	$61,920				
	36" RCP	670	LF	$54.00	$36,180				
	30" RCP	320	LF	$48.00	$15,360				
	24" RCP	1,450	LF	$40.80	$59,160				
	18" RCP	1,315	LF	$30.00	$39,450				
	12' INLETS	31	EA	$3,250.00	$100,750				

SPRING CREEK DBPS – SUMMARY OF DRAINAGE FEES

07-Sep-93

TABLE 12 – SHEET 9 OF 9

DESIGN POINTS	IMPROVEMENT REACH	QUANTITY	UNIT	UNIT COST	TOTAL	IMPROVEMENT TOTAL COST	CAPITAL IMPR. COST ALLOC.	REIMBURSABLE COST ALLOC.	CDOT COST ALLOC.
ABOVE 4	CHELTON RD. NORTH OF BIJOU ST.					$56,596	$56,596	$0	$0
	36" RCP	810	LF	$54.00	$43,740				
	24" RCP	70	LF	$40.80	$2,856				
	30' INLETS	2	EA	$5,000.00	$10,000				
ABOVE 3	GALLEY ROAD AT ACADEMY BLVD.					$85,294	$85,294	$0	$0
	24" RCP	680	LF	$40.80	$27,744				
	18" RCP	510	LF	$30.00	$15,300				
	12' INLETS	13	EA	$3,250.00	$42,250				
ABOVE 2	CHELTON RD. WEST TO DALE ST.					$297,739	$297,739	$0	$0
	54" RCP	55	LF	$114.70	$6,309				
	48" RCP	650	LF	$96.84	$62,946				
	42" RCP	520	LF	$72.00	$37,440				
	30" RCP	1,285	LF	$48.00	$61,680				
	24" RCP	1,330	LF	$40.80	$54,264				
	18" RCP	770	LF	$30.00	$23,100				
	12' INLETS	16	EA	$3,250.00	$52,000				
					SUBTOTAL	$11,223,476	$8,593,520	$1,735,702	$1,168,008
					CONTINGENCY (5%)	$561,174	$429,676	$86,785	$58,400
					ENGINEERING (10%)	$1,122,348	$859,352	$173,570	$116,801
					COST OF RESTUDY	$138,351		$138,351	
					CITY FUND BALANCE (DEFICIT)	$1,060,105		$1,060,105	
					COUNTY FUND BALANCE	$0		$0	
					DRAINAGE BASIN COSTS	$14,105,453	$9,882,548	$3,194,513	$1,343,209
					DRAINAGE BASIN FEE			$5,832	

NOTES:

(1) UNPLATTED ACREAGE AT TIME OF THIS STUDY = 548 ACRES

(2) LAND PORTION OF FEE BASED ON $14,700 PER ACRE

(3) MANHOLE COSTS INCLUDED IN STORM DRAIN PIPING

Additional Information

VII. ADDITIONAL INFORMATION

A. COMMENTS/CORRESPONDENCE RECEIVED

See the following pages for copies of comments received in response to the various public meetings and draft submittals.

MEETING NOTES
SPRING CREEK AGENCY CITIZEN MEETING
JUNE 27, 1991

URS Consultants presented recommendations for community values and alternative channel selections for the Spring Creek Drainage Basin Planning Study. This was presented by reach as summarized below:

Fountain Creek to Union Boulevard

URS proposed some bank reshaping, flattening of the slope or over bank reshaping to provide additional capacity on a bench above the lower flow channel. Future development flows will cause capacity problems. The State questioned this finding because the US 24 Bypass included a detention pond to handle future flows. Based on the URS analysis, additional capacity is required.

A question was also raised regarding the amount of detail that would be shown in a study related to where the banks would be reshaped versus the existing riparian habitat. These items will be further considered as the study progresses.

Drop structures that were at grade control were included in the section from Fountain Creek to Union Blvd.

Union Boulevard to Circle Drive

It was discussed that this reach was part of the US 24 bypass project currently being built by the Stated Department of Highways. The community values were presented based on the current condition of the channel which is under construction. A detention area and wetlands replacement area is being provided as part of that individual 404 permit on the northeast side of Union Blvd. and the US 24 bypass. The remainder of this section is being built as a double celled, concrete box culvert underneath the bypass. A question was raised if the study will address flooding problems at Union and Fountain Blvd. It was stated that the study will address these in the final report.

Circle Drive to Valley Hi Lake

This section of channel is currently concrete lined and it was recommended that it remain so with some upgrading to the facilities to increase the capacities.

Valley Lake Detention Pond

This location was discussed at great length in regard to what was proposed and what the concerns were. Preliminary findings of the analysis of the lake indicate that the spillway has inadequate capacity to pass the 100 year storm and alternative configurations of the spillway and dam were presented. These alternatives included leaving the spillway overflow at the same elevation and raising the height of the dam, lowering the spillway and raising the dam in combination with lowering the spillway two feet or three feet.

Questions were raised on why anything needed to be done on this existing lake and detention facility. Concerns were also expressed about whether lowering a spillway, would eliminate the standing water or causing channel cutting upstream. The question was also raised on why dredging the lake was not considered a feasible option. It was pointed out that there are considerable flooding problems in businesses on the south side of this location even during smaller rainstorms. It also was discussed how to dispose of the dredge material and what kind of odor problems they would create dredging it from the bottom of the existing pool. This location would require considerable more analysis and consideration of possibly different alternatives to minimize the impact on the vegetation and wild life in the pond area. Several participants did not believe that anything needed to be done to the dam or spillway for Valley Hi Lake. The technical justification needs to be presented in a clearer manner to explain what the problem is.

It was pointed out that Valley Hi Lake is also called Mallard Lake. It was discussed whether dredge material from Valley Hi Lake could be placed in a channel upstream to cover the riprap.

Valley Hi Lake to Airport Road

This is an area that goes through the golf course. It was proposed that the bank protection already in this location be buried to provide a more aesthetic appearance and that bank protection may be required in addition to protect residences on the south side of the channel are. A flooding problem was also pointed out at a Chelton Drive nursing home. Questions were also raised if something could be done to create a wider floodplain area by using some of the golf course during higher flows. It was discussed that the golf course needs to be considered as an active recreation facility mainly for the use of golfers who pay for the maintenance of this area.

Airport Road to Redwing Bird Sanctuary

This section of the basin is currently in concrete lined channel and it was pointed out that it would remain so with some upgrade for capacity.

Detention Site at Redwing Bird Sanctuary

A sketch was discussed showing the proposed detention with a dam or dike being five or six feet high both in the existing channel and in the higher elevation area on the south side of this area. The question was asked whether some of the water could be held back on a permanent basis to recharge the upstream underground aquifer.

Redwing Bird Sanctuary to Bijou Street

Concerns ware expressed about the banks ability and the current erosion problems that have created near vertical banks. It was discussed that treatment of the banks would have to be done in five locations to protect what is currently there along with grade control to stope vertical degradation of the channel. Wagner Park was discussed in that laying the banks back is difficult to do and still maintain the area of the park for recreational use.

Bijou Street to Platte Avenue

This location was discussed as currently being fully lined with concrete and it would remain that way with some upgrades for capacity.

These are additional comments and thoughts that need to be incorporated into the above headings.

- The community values were presented but not discussed in any great detail by the participants. No formal process was initiated to gather values from the community.
- Additional discussion needs to occur with the EPA regarding how much detail will be provided in the final study.
- Written comments were requested within a three week period in order to keep proceeding with the study.
- The following sections were generally agreed to as to the recommendation made: Union Boulevard to Circle Drive, Circle Drive to Valley Hi Lake, Valley Hi Lake to Airport Road, Airport Road to Redwing Bird Sanctuary, Bijou Street to Platte.
- The following sections need to be analyzed in greater detail due to discussions about the recommendations made: Fountain Creek to Union Blvd., Valley Hi Lake detention site, Redwing Bird Sanctuary detention site, Redwing Bird Sanctuary to Bijou Street.

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STATE OF COLORADO
Roy Romer, Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
AN EQUAL OPPORTUNITY EMPLOYER
Perry D. Olson, Director
6060 Broadway
Denver, Colorado 80216
Telephone: (303) 297-1192

Southeast Regional Office
2126 North Weber Street
Colorado Springs, Colorado 80907
Telephone: (719) 473-2945

REFER TO

For Wildlife–
For People

July 12, 1991

Mr. Chuck Donnely
URS Consultants
1040 South 8th Street
Colorado Springs, CO 80906

RE: Spring Creek Drainage Basin Planning Study

Dear Chuck,

I am providing Colorado Division of Wildlife (CDOW) comments regarding Spring Creek drainage basin based on past field visits and consultation with other CDOW personnel.

Consistent with CDOW recommendations for other drainage basin studies in the Colorado Springs area, CDOW would like to see Spring Creek treated to maximize multiple uses, but with an emphasis on environmental values. Accordingly, CDOW supports the goal to provide an effective and safe stormwater drainage system, but a system which reflects the least damaging of channel treatment alternatives. This system should also be designed and treated to maximize a state of long term equilibrium, by reach and throughout.

To achieve the forgoing, CDOW offers the following recommendations by reach:

1. Fountain Creek to Union Blvd.

   This stream segment is in a fairly natural state and should be maintained this way. Flows from above should be maintained at historic levels for all but major storm events to preclude degredation of this section requiring eventual hard lining.

2. Union Blvd. to Circle Drive

   Channel treatments for this section of Spring Creek have been designed as a part of the Highway 24 bypass project. Detention facilities, high water overflow channels and an emphasis on vegetated channel banks are meant to maintain flow and habitat values existing before the project.

-continued-

3. Valley Hi Lake to Airport Road

CDOW recommends two major departures from current thinking on this stream segment. First, Valley Hi Lake should be dredged to restore the detention function this lake once provided. Spoils should be used elsewhere in the Spring Creek drainage or for projects such as mountain scars reclamation. Secondly, the stark channel segment through Valley Hi golf course should be modified to provide more natural, aesthetically pleasing values. At the same time, channel modifications should be made to slow sediment deposition in Valley Hi Lake, e.g. grade control structures.

4. Airport Drive to Red Wing Bird Sanctuary

The existing treatment of this channel segment is such that few modification options, short of a total reworking, are feasible. However, some thought to replacing the concrete channel should be given as repairs are needed. Until then, an emphasis should be placed on transitioning between upper and lower stream segments to reduce the negative effects of this sluiceway.

5. Red Wing Bird Sanctuary Detention Site

In coordination with the detention facility, effort should be directed toward reclaiming the main and tributary channels. The main channel should be narrowed, and stabilized with vegetation to avoid continued eratic and erosive flow patterns.

6. Redwing Bird Sanctuary Detention Site to Bijou Street

This channel segment should be modified to raise the channel invert and to flatten the channel slopes. Grade control structures and resloping of the upper banks may achieve the desired channel design and function. Existing vegetation should be preserved, and additional plantings should be placed to stabilize banks and/or benches.

7. Bijou Street to Platte Avenue

Because the stretch is a concrete channel, little can be done to improve the channel short of a total reworking. Once again, a reworking of the channel may be an option when major repairs become necessary. Until then, a stable transition of flows from this channel to the lower, natural segment should be achieved.

-continued-

Finally, CDOW recommends that a more quantitative comparison of alternatives be made to allow a realistic weighing of alternative costs, including those related to mitigation. To further assist you in considering channel treatment options, I have enclosed a memo from Ruth Carlson whose comments may augment these. Please call me at 473-2945 if you have any questions.

Sincerely,

Bruce Goforth
Senior Wildlife Biologist

RPD/BG/jc

xc: Anita Culp, COE
Bill Noonan, USFWS
Sarah Fowler, EPA
Gary Haynes, CS

TO: Bruce Goforth
FROM: Ruth Lewis Carlson
RE: Spring Creek Drainage Re-study

July 12,1991

I attended the third Spring Creek Drainage Re-study public meeting held on June 27, 1991. The meeting brought to light some interesting channel treatments.

Conceptually I would like to see three things develop from this re-study. One, to see Valley High Golf Course Lake provide wildlife habitat and flood control; two, to see Spring Creek through the golf course re-designed which would include meanders and riparian vegetation; and three, the Red wing sanctuary to become a stable riparian/wetland environment. I believe that we can accomplish all three with individual and community effort.

According to this last meeting URS proposed two scenarios to deepen golf course lake. One included lowering the spillway. My concern with this is the impact to downstream water quality from the increase in sediment which will come from the lake. If the lake bottom is left at the current height, and the spillway lowered, the next few surges of water will cut a channel through the silt. I do understand the concept of providing greater storage capacity with this scenario. Because of the past water flows and siltation action the open deep water has been replaced by sandbars and a more wetland type habitat. Wildlife that previously used the lake include waterfowl and shorebirds. To some people the integrity and value of the lake has been lost. To others the evolution of the wetland/marsh habitat is more desirable. Hence human values want to dictate the outcome of the habitat. The Aiken Audubon Society took ownership of the named Red Wing Sanctuary because they recognized the opportunity to observe fragile wildlife species in a fragile environment. If the spillway is lowered, the water table will effectively be lowered and wetland wildlife habitat will be destroyed.

Increasing the dam height of course is a viable alternative. I have wondered if the current dam is stable enough to handle the proposed construction. Raising the dam height will provide additional flood storage without disrupting the wetland vegetation. Along with this proposal is the potential to dredge part of the lake to increase storage. What do we do with the dredged material? I know that a Division of Wildlife property in the Denver area worked with a company who dredged out a lake and used the silt for reclamation. A second idea that I heard at the meeting was to put the dredged material back in the Red Wing Sanctuary. I believe this would be an alternative only on the east fork tributary. The main channel has become much to big. The east fork is still relatively narrow but deep. This idea would foster the potential to re-create the original wetland on this property. Dredging has the potential to

impact the wetland environment just as lowering the spillway does. However, with dredging we have the ability to determine where the excavation will take place and can predict how the shoreline will look. Trees and other necessary vegetation could be protected, overland flows during storm events could be directed to the wetland area. If the dredged material is placed back in the RW sanctuary we could potentially mitigate the loss of wetland at VH lake. The City Park Department has never indicated that they would like to have irrigation water supply from the lake. If they do, dredging is potentially the only way to deepen the lake.

The next reach of Spring creek passes through the golf course. The channel is straight and steep sided. The water has no where to go except down the channel. Hence, there is no flood plain. Historically the golf course area was sub-irrigated because of the springs and overland flow. Public use of this land has dictated a more manicured situation. However, in the public safety concern, floodplains are a natural way to reduce flow velocities and erosive forces. I strongly recommend that the channel be reshaped to allow for overflow and velocity reduction, and that a riparian ribbon be established simultaneously to re-establish what was lost with the highway 24 bypass project. I would like to see the channel curved, with side slopes of at least 5:1. Channel bank stabilization and grade control measures which will slow the water flow, deposit silt and increase percolation should be incorporated into the design. I am not a golfer, however, I would guess that even novice golfers enjoy vegetated golf courses. A golf course with an interesting creek and vegetation would not only make a course more challenging, but also nicer to look at. The alternative treatment options for this section identify hard lining as the preferred alternative because of the residential area to the east. If the channel is relocated and re-shaped this alternative would be minimized. Under recreation enhancement the plan states that trails would conflict with the golf course. I would point out that the golf course does not exist on the south east side of the channel between Chelton and Airport. I would think that a trail could be worked through here, as part of the whole project of bank reshaping.

The next section (reach 7-6) is concrete lined. The treatment options do not provide for grade control, re-construction or maintenance at the head of the concrete channel, and do not provide for trails.Because of the lower resistance of the concrete, water velocity is faster than in the channel above or below this section. Grade control structures along with velocity dissipaters could be used to add the resistance to protect the downstream projects. Potentially flows will be reduced by the proposed detention dam at the boundary with the Red Wing Sanctuary. But in a storm event or normal low flows that bypass the detention facility there should be another measure to prevent the erosive velocities. Concerning the trail potential, there is a walkway over the channel to access the west side of the channel. Currently a golf driving range is on the west side of the channel. I believe that there is a ROW between their property and the channel that could accommodate a trail.

Point 6 of the alternative options is a detention facility at the Red Wing Sanctuary. This has been used as an option for both reaches 10-7 and 7-6. This alternative is viable as a key in the drainage plan. However, this detention facility will only help the downstream situation. Plans need to be developed that will curb the continued erosion within the RW sanctuary. Grade controls and bank stabilization structures must also be incorporated. The treatment options listed mention sediment traps in the bottom of the pond, this is misleading, since there should not be a "pond" formed. I am under the impression that the detention dam will allow the normal low flow to pass through, and that only storm events will be detained. If water will be retained then the surface acreage and pond depth must be identified. The State Division of Water Resources may require filing if more than 2 acres of water is impounded. As for habitat enhancement I don't believe this is necessary or practical. The evolution of this property through the drying up of the wetlands has developed meadows, mature cottonwood, Russian Olive and willow trees. The main stem of the creek is establishing a young riparian ecosystem with minor wetland edges. If the water is slowed and the grade protected the habitat will develop itself. A major impoundment will destroy the developing riparian community in the main stem.

An alternative previously mentioned was to place dredged material from Valley High in the east fork of Spring Creek. This would help re-establish a wet condition in the original wetland area. Because of the recent construction by the Colorado Department of Highways at Academy Blvd. plans will need to be developed that will re-direct the water flow up into the soil strata and not at the current grade. Habitat enhancement could be developed along with this to accelerate wetland re-vegetation.

Reach 6-4 will be difficult to work with. The channel is narrow, steep and deep. The only control feature is the culvert under Pikes Peak Ave. which acts as a grade control and detention dam. Property to the east of the channel has wetlands that over the years have been filled but struggle to exist. Part of this project should be to clean up and re-establish these wetlands. The options for this reach identify that the banks should be re-shaped. At the meeting this was explained as benching to act as a floodplain area. These benches would be re-vegetated. I think it would be wise to see if benching to the east would expose the aquifer and cause harm to any springs which surface at the RW sanctuary.

To summarize, I am concerned with the potential loss of the evolving wetland at the Valley High Golf Course should lowering of the spillway cause the saturated soils to dry. I do see dredging as a viable option to increase the water depth at the lake without critically damaging the wetlands. I would like to see the channel reshaped through the golf course between Chelton and Airport Rd.. I believe this will provide additional storm detention and improve the aesthetics in this area. Wildlife habitat can be enhanced and replaced from the loss which occurred from the Highway 24 bypass project. The RW sanctuary can act as a major facility for water

detention in major storms. The potential to re-establish the wetland condition on the eastern side of the property is a situation Aiken Audubon would like to see accomplished. Grade control and friendly bank stabilization structures should be included for both the main stem and the east fork of Spring Creek at a minimum. The final natural channel adjacent to Wagner Park should be stabilized. Bank re-shaping should be used to provide for flood water expansion. The wetlands east of the channel should be cleaned and enhanced.

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
SOUTHERN COLORADO PROJECT OFFICE
P.O. BOX 294, PUEBLO, COLORADO 81002

REPLY TO
ATTENTION OF:

September 25, 1992

Construction-Operations Division
Regulatory Branch

Mr. Robert Adamczyk
City Engineering Division
City of Colorado Springs
P.O. Box 1575 (m.c. 435)
Colorado Springs, Colorado 80901-1575

Dear Mr. Adamczyk:

Enclosed is a copy of the meeting record for the August 26, 1992 public meeting for the proposed List of Categories of Activities and Letter of Permission procedures, Action No. CO-OYT-0638, for the Spring Creek Drainage Basin Planning Study, Colorado Springs, El Paso County, Colorado.

Sincerely,

Anita E. Culp
Senior Project Manager

Enclosure

CESWA-CO-R-SC (1145b) 31 August 1992

MEMORANDUM THRU

Chief, Southern Colorado Regulatory Office

Chief, Regulatory Branch

FOR Regulatory Branch File

SUBJECT: Public Meeting, Section 404 Action No. CO-OYT-0638

1. The public meeting for the proposed Section 404 Letter of Permission (LOP) List of Categories of Activities, Application No. CO-OYT-0638 for the Spring Creek Drainage Basin Planning Study (DBPS) was held on August 26, 1992. The meeting began at 7:15 p.m. in the City Council Chambers, City Administration Building, 30 South Nevada Avenue, Colorado Springs, Colorado.

2. The meeting was attended by 10 people. An attendance list is enclosed.

3. The entire meeting was audio recorded. The comment/statement section of the meeting had been first transcribed verbatim from the tape and is given in paragraph 4 of this report. The order of speakers and subjects for the public meeting were:

a. Introduction and purpose of meeting - Bruce Thorson, City Engineering Division.

b. Introduction of Drainage Basin Planning Study and Reading of Colorado Water Quality Control Division Statement - Bob Adamczyk, City Engineering Division.

b. Explanation of proposed List of Categories of Activities and Letter of Permission Procedures - Anita Culp, Corps of Engineers.

c. Questions and answers for 3b - Ruth Carlson from the audience and Anita Culp and Bruce Thorson.

d. Introduction of DBPS alternatives presentation - Bob Adamczyk.

e. Presentation of DBPS methods and alternatives - Clyde Pikkaraine, URS Consultants.

f. Questions and answers for 3e - Phil Weinert, Ruth Lewis Carlson, Gary Conover, and Allan Morrice from the audience and Clyde Pikkaraine, Bruce Thorson, Bob Adamczyk, and Anita Culp.

g. Statement - Ruth Lewis Carlson, Colorado Division of Wildlife. Statements were mixed in with questions so those comments which were judged to be statements are transcribed below.

h. Statement - Phil Weinert. Statements were mixed in with questions so those comments which were judged to be statements are transcribed below.

i. Statement - Alan Morrice, El Paso County.

j. Statement - Gary Conover, Aiken Audubon Society.

k. Adjournment of public meeting - Bruce Thorson.

4. The verbatim transcript follows.

a. Paragraph 3g, Ruth Lewis Carlson: "First of all, I have to commend URS for the good study. It was a lot of work and, after we got the charts figured out, we like what we've seen. That was great. You will be, Anita, receiving written comments from us. But as far as everybody else's behalf tonight, I think something we want to stress is, I've already stated once was, not just a piece-meal effect, but really looking at how this last little bit of the natural drainage that's basically available from Bijou Street down to Valley Hi Golf Course is really tied together for the best end result. In particular, I guess in some other comments that we've made, it seems like a year or so ago, I think we were trying to stress that Valley Hi Golf Course Lake does have a lot of wildlife value to it. As we pointed out in the study, there's debate as to should that be a deep water habitat-should it be a marshy habitat, depending on the public that you talk to. But I'm really concerned with the potential for dropping that spillway. My main concern stems from the fact that you drop that spillway and that is going to headcut up through that wetland. I don't personally believe that that's going to retain a saturated wetland site that we've got now. It would be in effect, to me it would be a natural dredging effect. You drop the head of that spillway and it's going to happen the same thing that Red Wing Sanctuary did. It's going to swoosh through there and you're going to loose all that silt. We might end up with some detention in a big, big flood, but the environmental effect I think is going to be great. Maybe you could address that. Maybe I'm off the wall, but I really do think that that's going to happen. I don't know. Something that did catch my eye tonight: the buildings I know have always had the potential of getting flooded right there by the Valley Hi Golf Course Lake. In fact, I've been there in some pretty high water time myself. I got to wondering if there's a potential of