VI. IMPROVEMENT ALTERNATIVE ANALYSIS

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Public Information and Involvement Program

Throughout the course of this DBPS, a public information and involvement program was utilized to disseminate information generated during the study and to receive input regarding the study. The program included mailings of information packets at various stages of the study and follow-up study meetings to answer questions, to clarify, and to receive input about the information. The program resulted in input to help establish the goals for the study, to identify potential improvement alternatives for the main channel, to evaluate the improvement alternatives relative to the goals for the study, and to select the recommended improvement alternative.

Existing Channel Description.

The main channel of Shooks Run was divided into reaches for the purpose of evaluation of proposed improvement alternatives. These reaches were established through consideration of existing channel conditions (cross-section, slope, channel stability, and vegetation type and density), existing hydraulic conditions (flow depths and velocities), and existing potential flooding issues relative to adjacent land use. The following seven reaches were identified for the evaluation of proposed improvement alternatives.

A. Reach 1 - Fountain Creek to the Abandoned Railroad Crossing

This reach of the drainageway is largely within an area of commercial/industrial property and development. There is a mobile home park along the west side between Fountain Creek and just south of Las Vegas Street. The crossings in this reach include Las Vegas Street and two railroads. The crossing of the abandoned railroad is a double 20-foot span stone arch culvert constructed in 1887. The concrete encasement of a 60-inch sanitary sewer is exposed in the channel bottom just upstream of Fountain Creek.

Both banks of the channel are lined with a dense growth of native trees and bushes between Fountain Creek and Las Vegas Street, and between the two railroad crossings. There are large quantities of concrete rubble and timber debris scattered along the entire reach. There is a deteriorated timber retaining wall along a portion of the mobile home park, and a deteriorated large concrete block retaining wall along the east bank upstream of the A.T.S.F. and D.R.G.W. Railroad. Both banks between the two railroads are high (25 to 30 feet), steep, and unstable, with active erosion. Between Fountain Creek and Las Vegas Street, the banks are also steep and unstable, with active erosion, although not so high (10 to 15 feet). There are numerous existing buildings immediately adjacent to these unstable banks at various locations.

The existing 100-year floodplain inundates the mobile home park, as well as an area east of the channel just upstream of Fountain Creek. The floodplain is contained in the channel between the two railroad crossings. The 100-year peak discharge overtops the Las Vegas Street crossing, but not the two railroad crossings. Flow depths range from 10 to 16 feet, with high velocities of 13 to 15 feet per second.

There is no maintenance or recreational access along this reach.

B. Reach 2 - The Abandoned Railroad Crossing to Costilla Street

This reach of the drainageway is within, or adjacent to, a public park. An abandoned railroad yard lies to the west between Fountain Boulevard and Costilla Street. The crossings in this reach include Fountain Boulevard, Costilla Street, and a low flow pedestrian bridge (downstream of Fountain Boulevard). Degradation of the earth bottom, about 1 foot deep, is evident at the Costilla Street crossing. The concrete encasement of an 18-inch sanitary sewer is exposed in the channel bottom just upstream of the pedestrian bridge.

Both banks of the channel are lined with a dense growth of native trees and bushes along most of the reach. The channel bottom and lower channel banks have been lined with rock riprap placed around the vegetation as part of an earlier improvement project. There are also large quantities of concrete rubble and timber debris scattered along the entire reach. The channel banks have been lined with thin gunite that is deteriorated for a short distance downstream of Costilla Street. The west bank between Fountain Boulevard and Costilla Street is high (30 to 40 feet), steep, and unstable with active erosion. There are some areas of claystone outcropping visible along this bank.

Most of the existing 100-year floodplain is contained in the channel or overbank areas within the public park. The 100-year peak discharge overtops all of the crossings. The backwater of Fountain Boulevard inundates a portion of one residential apartment property. Flow depths range from 13 to 22 feet, with high velocities of seven to 13 feet per second.

There is a paved path along most of the reach through the public park that provides recreational and limited maintenance access. Actual maintenance access to the channel is restricted by the dense vegetation.

C. Reach 3 - Costilla Street to Boulder Street

This reach of the drainageway is within an area of dense commercial/industrial and residential development. The area between Costilla Street and just north of Pikes Peak Avenue is mostly commercial/industrial development and property. The remaining area is largely old residential properties with some small commercial uses interspersed. There is a small public park along the westerly side of the channel between Kiowa Street and Platte Avenue. The drainageway has been completely filled in and replaced with conduit between Pikes Peak Avenue and El Paso Street (north of Pikes Peak Avenue), and under the public school athletic field between Platte Avenue and Boulder Street. The crossings in this reach include El Paso Street (south of Pikes Peak Avenue), Pikes Peak Avenue/El Paso Street (north of Pikes Peak Avenue), Kiowa Street, Bijou Street, Platte Avenue/athletic field, and Boulder Street. Degradation of the earth bottom, about one to three feet deep, is evident at each of these crossings. There are two aerial sanitary sewer crossings (an 18-inch and an 8-inch) between Costilla Street and El Paso Street (south of Pikes Peak Avenue). There are also existing utility lines suspended in the culverts of some of the crossings.

Both banks of the channel are lined with a dense growth of native trees and bushes along most of the reach. There are large quantities of concrete rubble and timber debris scattered along the entire reach. A few small, isolated areas of the channel banks and bottom have been lined with rock riprap. There is a deteriorated concrete retaining wall along the west bank at the commercial property just upstream of Costilla Street, deteriorated retaining walls of salvaged railroad construction materials along both banks just downstream of Pikes Peak Avenue, and a deteriorated timber and concrete retaining wall along the east bank between Kiowa Street and Bijou Street. Both banks between Costilla Street and Pikes Peak Avenue are high (15 to 35 feet), steep, and unstable, with active erosion. There are some areas of claystone outcropping visible along the west bank between Costilla Street and El Paso Street (south of Pikes Peak Avenue). Between Kiowa Street and Platte Avenue, the banks are also steep and unstable, with active erosion, although not so high (15 to 20 feet). There are numerous existing buildings immediately adjacent to these unstable banks at various locations.

The existing 100-year floodplain inundates extensive development adjacent to the drainageway throughout this reach. Large areas of the commercial/industrial properties and a residence between Costilla Street and Pikes Peak Avenue, two commercial properties and six residences between Kiowa Street and Bijou Street, 14 residences between Bijou Street and Platte Avenue, and five residences and the athletic field between Platte Avenue and Boulder Street are within the floodplain. The 100-year peak discharge overtops all the crossings in this reach. The overtopping of Platte Avenue causes the depression of the roadway under the old railroad crossing (to the east) to flood to a depth between five and ten feet. Flow depths in the channel range from 14 to 24 feet, with high velocities of eight to 13 feet per second.

The only access for maintenance and recreation in this reach is the gravel path and concrete sidewalk through the public park between Kiowa Street and Platte Avenue. Actual maintenance access to the channel is restricted by the dense vegetation along much of the gravel path.

D. **Reach 4 - Boulder Street to Cache La Poudre Street**

This reach of the drainageway is bounded on the east side by a public park and on the west side by old residential properties. The crossings in this reach include St. Vrain Street, Willamette Street, Cache La Poudre Street, and a low flow pedestrian bridge (upstream of Willamette Street). Degradation of the earth bottom, about one to two feet deep, is evident at most of these crossings. A ten-inch sanitary sewer crossing is encased in the concrete crestwall of a low vertical drop structure just upstream of Boulder Street. There are also utility lines suspended, or exposed in the earth bottom of some of the crossings.

Both banks of the channel are lined with a dense growth of native trees and bushes along most of the reach. There are large quantities of concrete rubble and timber debris scattered along the entire reach. The lower portions of the banks and the bottom of the channel have been lined with rock riprap along some of the reach, placed around the vegetation as part of an earlier improvement project. There are several low (one to two feet high) vertical concrete drop structures at random locations. Both banks along most of this reach are high (ten to 20 feet), steep, and unstable with active erosion. There are a few existing buildings immediately adjacent to these unstable banks in various locations.

Most of the existing 100-year floodplain is contained in the channel or overbank areas along the public park; however, some residential properties adjacent to the crossings are in the floodplain. There are 15 residences between Boulder Street and St. Vrain Street, a residence between St. Vrain Street and Willamette Street, and two residences between Willamette Street and Cache La Poudre Street within the floodplain. The 100-year peak discharge overtops all the crossings in this reach. Flow depths in the channel range from 12 to 24 feet, with high velocities of six to 12 feet per second.

There is a paved path along much of the reach through the public park that provides recreational and limited maintenance access. Actual maintenance access to the channel is restricted by the dense vegetation.

E. **Reach 5 - Cache La Poudre Street to Patty Jewett Golf Course**

This reach of the drainageway is mainly within an area of old residential properties. There is commercial property on the west side of the channel between Cache La Poudre Street and San Rafael Street, and an elementary school on the west side of the channel just downstream of Patty Jewett Golf Course. The crossings in this reach include Uintah Street, San Miguel Street, and a pedestrian bridge (at the elementary school). Degradation of the earth bottom, about one to two feet deep, is evident at these crossings.

Both banks of the channel are lined with a dense growth of native trees and bushes along most of the reach. There are large quantities of concrete rubble and timber debris scattered along the entire reach. A few small, isolated areas of the channel banks and bottom have been lined with rock riprap. There is a timber retaining wall along the residential property on the west side of the channel immediately upstream of Uintah Street. Both banks of the channel along most of the reach are high (20 to 25 feet), steep, and unstable, with active erosion. There are a few areas of claystone outcropping visible along both banks at isolated locations in the reach. There are numerous existing buildings immediately adjacent to these unstable banks at various locations.

The 100-year floodplain is contained within the channel along most of the reach; however, some residential properties adjacent to the crossings are in the floodplain. There are two residences between Cache La Poudre Street and Uintah Street, four residences between Uintah Street and San Miguel Street, and two residences between San Miguel Street and Patty Jewett Golf Course within the floodplain. The 100-year peak discharge overtops the Uintah Street and San Miguel Street crossings, but not the pedestrian bridge. Flow depths in the channel range from ten to 24 feet, with high velocities of five to 13 feet per second.

There is no maintenance or recreational access along this reach.

F. **Reach 6 - Patty Jewett Golf Course**

This reach of the drainageway is entirely within Patty Jewett Golf Course. The crossings in this reach include Española Street (the golf course access drive) and 10 golf cart bridges.

The extreme downstream portion of this reach has not been developed as golf course, and both banks are lined with a dense growth of native trees and bushes. Between this undeveloped portion and Española Street, both banks are lined with tall native grass, with isolated areas of dense growth native trees and bushes. There are large quantities of concrete rubble (including a deteriorated drop structure) and timber debris scattered along the channel downstream of Española Street. Both banks of the channel downstream of Española Street are high (ten to 30 feet), steep, and unstable with active erosion. There is an area of claystone outcropping visible along the east bank at the upstream end of the undeveloped area. The channel between Española Street and confluence with the major tributary from the east is lined with concrete that is deteriorated. At the upstream end of the concrete lining is a small area where both banks are lined with a dense growth of native trees and bushes. These banks are also steep and unstable. In the remainder of this reach to the upstream end of the golf course, the channel is shallow (three to four feet), grass-lined, and maintained as a rough area of the course. This upper portion of the reach shows no evidence of recent flow, since the Van Buren channel (further upstream) diverts all but the infrequent higher peak discharges.

The existing 100-year floodplain is contained in the channel or the overbank areas of the golf course. The 100-year peak discharge overtops all the crossings except the two golf cart bridges furthest downstream of Española Street. Flow depths in the channel range from four to 12 feet, with high velocities of eight to 13 feet per second.

Maintenance access to the channel is from the golf course play areas and is restricted in some areas by the dense vegetation. Recreational access to the channel is limited to golf course play only.

G. **Reach 7 - Patty Jewett Golf Course to the Van Buren Channel Diversion**

This reach of the drainageway is mainly within an area of residential development. There is commercial property on the west side of the channel between Jefferson Street and Madison Street. The drainageway has been completely filled in and replaced with conduit under the church property between Jackson Street and LaSalle Street. The crossings in this reach include Paseo Road, Jefferson Street, Madison Street, Monroe Street, Jackson Street/church property/LaSalle Street, a pedestrian path crossing, and a railroad crossing.

There are many large trees and some native bushes along both banks of the channel in this reach. There are some quantities of concrete rubble and timber debris scattered along the entire reach. A few small isolated areas of the channel banks have been lined with rock riprap. This entire reach shows no evidence of recent flow, since the Van Buren channel (further upstream) diverts all but the infrequent higher peak discharges.

The existing 100-year floodplain is not contained in the channel anywhere along this reach and will spread through the surrounding residential neighborhood as shallow flow (generally less than one foot deep). The commercial property, the church property, and 22 residential properties that are immediately adjacent to the channel along this reach are within the floodplain. Other residential properties not immediately adjacent to the channel are probably also in the shallow flow portion of the floodplain. The 100-year peak discharge overtops all the crossings in this reach. Flow depths in the channel range from four to ten feet, with high velocities of seven to nine feet per second.

There is no maintenance or recreational access along this reach.

As discussed previously in the Hydraulic Analysis section of this report, most of the existing roadways, railroads and paths that cross the main channel are overtopped by the 100-year discharge. The improvement alternatives included replacing the structures at these crossings to provide adequate capacity. Many of these undersized culvert crossings are very old, with construction dating back to the late 1800's and early 1900's. Replacement of these culvert crossings should also be considered due to the potential existing structural inadequacies. Although a structural evaluation of the existing facilities was not included in the scope of this study, the following structural concerns were observed at many of the culvert crossings during field observations.

A. Cracking and spalling of concrete wall surfaces inside the culverts, and on headwalls and wingwalls.

B. Groundwater seepage through these cracks and construction joints, and pavement settlement of roadways over the culverts (indicating the probability of voids in the backfill zone due to piping).

C. Undercutting and voids beneath the footings of the culverts.

D. Erosion at the entrances, outfalls and along the dirt floors of the culverts.

E. Steep, unstable and unprotected roadway embankment slopes and channel side slopes immediately adjacent to the culverts.

F. Displacement of headwalls and wingwalls.

G. Sagging of unprotected, suspended utilities through the culverts and exposure of utilities along the dirt floors of the culverts.

Main Channel Improvement Alternatives

A number of public study meetings were held to discuss possible improvement alternative concepts for the main channel. The following seven improvement alternatives were originally developed for evaluation for each individual reach of Shooks Run.

A. **Alternative 1 - Reactive Maintenance Only**

This alternative provides for maintenance of serious or threatening problems only on an as-needed basis. This reactive maintenance would include work such as removal of large trees that fall and block the channel, repairs to culverts when roadway damage occurs, and stabilization of channel banks that fail and threaten existing adjacent buildings. The existing condition remains generally unchanged.

B. **Alternative 2 - Proactive Maintenance Program**

This alternative provides for a general cleanup of the drainageway, repairs and protection of existing public facilities, access for long-term maintenance and recreation, and only minimal consideration of public safety and welfare. The following improvements are included in this alternative.

1. Removal of debris; such as broken concrete, remnants of abandoned structures and trash.
2. Removal of dead, dying, fallen or high-risk trees and bushes.
3. Repair of existing culverts and channel lining; such as patching of cracks and holes, filling voids in backfill zones, invert lining, and adequate guardrails.
4. Slope protection for existing crossing embankments and abutments for anticipated overflows.
5. Erosion protection at isolated, unstable areas along the channel.
6. Erosion protection, stabilization or reconstruction of existing utility crossings.
7. Construction of a paved maintenance/recreation path in all reaches where none currently exists, including acquisition of easements or right-of-way as needed.
8. Mitigate loss of trees, bushes and grass caused by the maintenance activities, with new landscaping, to create a linear park along the entire drainageway.
9. Identify stormwater pollution sources, and provide for control and cleanup through coordination with adjacent private property owners.
10. Design and implement an early warning program, and a street closing and evacuation plan to be used when flooding is possible for all areas along the drainageway.

This alternative does not include any drainageway capacity or floodplain improvements. Nor does it address any unstable side-slope issues. While overall impacts on existing vegetation will be minor, loss of existing vegetation at the locations where the maintenance work is needed will be extensive. This loss of vegetation is mitigated by soft-lining at these areas. This soft-lining will not blend into the existing vegetation for some time. This maintenance program provides no permanent improvements for Shooks Run; and due to the existing conditions along the drainageway, substantial future maintenance should be anticipated on a regular basis. These maintenance improvements require acquisition of only a narrow corridor and no buildings.

C. **Alternative 3 - Soft-Lined Full Improvement**

This alternative provides for full improvement of the drainageway to prevent flooding of private properties and overtopping of crossings during a 100-year peak discharge; protects other existing public utilities; and eliminates steep, unstable, adjacent side-slope conditions. The drainageway improvements are based on a grass-lined and other landscape-lined channel with low height rock stepped walls for the steep side-slopes, and gently-sloped benches between the walls. Access for long-term maintenance and recreation will also be provided. The following improvements are included in this alternative.

1. Removal of debris; such as broken concrete, remnants of abandoned structures and trash.
2. Removal of all but select trees and bushes in the areas of construction.
3. Construct adequately-sized, grass- and landscape-lined channels with all appropriate appurtenances (drops and cutoff walls).
4. Replace all crossings that are currently overtopped with adequately-sized culverts or bridges with all appropriate appurtenances (headwalls and wingwalls).
5. Flatten or replace with low height rock stepped walls and gently-sloped benches between the walls, all steep, unstable side-slopes adjacent to the drainageway.
6. Erosion protection, stabilization or reconstruction of existing utility crossings.
7. Construction of a paved maintenance/recreation path in all reaches where none currently exists.
8. Mitigate loss of trees, bushes and grass caused by the construction activities with grass and landscape lining of the channel bottom and benches between the walls to create a linear park along the entire drainageway.
9. Identify stormwater pollution sources and provide control and cleanup through coordination with adjacent private property owners.

This alternative provides 100-year channel and crossing improvements and contains the floodplain within these improvements. The unstable side-slopes are eliminated. Removal of existing wetland vegetation and significant existing riparian vegetation is required as part of the improvement. The loss of wetland vegetation is mitigated by the soft-lining of the channel bottom, and the loss of riparian vegetation is mitigated by the soft-lining of the benches of the channel banks. Although the loss of vegetation is mitigated, the overall appearance of the drainageway is more urban and manicured. These improvements are permanent and would require only routine periodic maintenance in the future. These improvements require acquisition of a wide corridor, including many residences and commercial/industrial buildings.

D. **Alternative 4 - Structural Full Improvement**

This alternative is similar to Alternative 3 - Soft-Lined Full Improvement, except it is based on a grass-lined and other landscape-lined channel with moderate height concrete stepped walls for the steep side-slopes and gently-sloped soft-lined benches between the walls. Access for long-term maintenance and recreation will also be provided. The following improvements are included in this alternative.

1. Removal of debris; such as broken concrete, remnants of abandoned structures and trash.
2. Removal of all but select trees and bushes in areas of construction.
3. Construct adequately-sized, grass- and landscaped-lined channels with buried rock riprap erosion protection along the bottom channel.

4. Replace all crossings that are currently overtopped with adequately-sized culverts or bridges with all appropriate appurtenances (headwalls and wingwalls).
5. Replace with moderate height concrete stepped walls and gently-sloped benches between the walls, all steep, unstable side-slopes adjacent to the drainageway.
6. Erosion protection, stabilization or reconstruction of existing utility crossings.
7. Construction of a paved maintenance/recreation path in all reaches where none currently exists.
8. Mitigate loss of trees, bushes and grass caused by the construction activities with grass and landscape lining of the channel bottom and benches between the walls to create a linear park along the entire drainageway.
9. Identify stormwater pollution sources and provide control and cleanup through coordination with adjacent private property owners.

This alternative provides 100-year channel and crossing improvements and contains the floodplain within those improvements. The unstable side-slopes are eliminated. Removal of existing wetland vegetation and significant existing riparian vegetation is required as part of the improvement. The loss of wetland vegetation is mitigated by the soft-lining of the channel bottom, and the loss of riparian vegetation is mitigated by the soft-lining of the benches of the channel banks. Although the loss of vegetation is mitigated, the overall appearance of the drainageway is more urban and manicured. These improvements are permanent and would require only routine periodic maintenance in the future. These improvements require acquisition of a moderate width corridor, including some residences and commercial/industrial buildings.

E. Alternative 5 - Soft-Lined Full Improvement with Complete Shooks Run Diversion at the Van Buren Channel

This alternative is similar to Alternative 3 - Soft-Lined Full Improvement, except it includes diversion of all flow in Shooks Run at the Van Buren channel to reduce required improvement capacity further downstream. It includes improvement of the Van Buren channel between Templeton Gap Road and Monument Creek to provide capacity for the additional flow diverted from Shooks Run. In addition to the improvements included in Alternative 3, the following improvements are included in this alternative.

1. Replace the existing concrete-lined Van Buren channel with an adequately-sized, concrete-lined channel between Templeton Gap Road and Monument Creek.
2. Replace all crossings of the Van Buren channel that would be overtopped by the diversion of all the Shooks Run flow with adequately-sized culverts or bridges with all appropriate appurtenances (headwalls and wingwalls).
3. Erosion protection, stabilization, or reconstruction of existing utility crossings of the Van Buren channel between Templeton Gap Road and Monument Creek.

The results and impacts of this alternative are similar to those for Alternative 3 except; 1) the areas of the riparian vegetation removal and mitigation, and the width of the acquisition corridor and number of buildings acquired are slightly less; and 2) only routine maintenance is required for Reach 7 - Patty Jewett Golf Course to the Van Buren Channel.

F. Alternative 6 - Soft-Lined Full Improvement With Detention Ponding Along the Channel

This alternative is similar to Alternative 3 - Soft-Lined Full Improvement, except it includes detention ponds along the channel to reduce required improvement capacity further downstream. In addition to the improvements included in Alternative 3, the following improvements are included in this alternative.

1. Construction of a detention pond/local neighborhood park along the channel in the area generally bounded by Platte Avenue, Kiowa Street, El Paso Street and Corona Street.
2. Construction of a detention pond along the channel in Patty Jewett Golf Course south of Española Street.

The results and impacts of this alternative are similar to those for Alternative 3 except; 1) the areas of riparian vegetation removal and mitigation, and the width of the acquisition corridor and number of buildings acquired are slightly less; 2) some of the existing crossings replaced in Alternative 3 are adequately-sized for this alternative; 3) the detention pond between Platte Avenue and Kiowa Street requires acquisition of more residences and commercial buildings; and 4) the detention pond in Patty Jewett Golf Course requires reconstruction of most of the 9-hole course south of Española Street.

G. Alternative 7 - Soft-Lined Channel Side-Slopes Only Improvement With Crossing Maintenance

This alternative provides for elimination of steep, unstable, adjacent side-slopes; a cleanup of the drainageway; repairs and protection of existing public facilities; access for long-term maintenance; and limited consideration of public safety and welfare. The following improvements are included in this alternative.

1. Removal of debris; such as broken concrete, remnants of abandoned structures and trash.
2. Removal of all but select trees and bushes in the areas of construction.
3. Flatten or replace with low height rock stepped walls and gently-sloped benches between the walls, all steep, unstable side-slopes adjacent to the drainageway.
4. Repair of existing culverts and channel lining; such as patching of cracks and holes, filling voids in backfill zones, invert lining and adequate guardrails.
5. Side-slope protection for existing embankments and abutments for anticipated overflows.
6. Erosion protection, stabilization or reconstruction of existing utility crossings.
7. Construction of a paved maintenance/recreation path in all reaches where none currently exists.
8. Mitigate loss of trees, bushes and grass caused by the construction activities with grass and landscape lining of the channel bottom and benches between the walls to create a linear park along the entire drainageway.
9. Identify stormwater pollution sources and provide control and cleanup through coordination with adjacent private property owners.

This alternative provides limited channel capacity increase through existing vegetation removal and adjacent side-slope improvement. The unstable side-slopes are eliminated. Removal of existing wetland vegetation and significant riparian vegetation (though not as extensive as for Alternative 3 -Soft-Lined Full Improvement) is required as part of the improvement. The loss of wetland vegetation is mitigated by the soft-lining of the channel bottom, and the loss of riparian vegetation is mitigated by the soft-lining of the upper benches of the channel banks. Although the loss of vegetation is mitigated, the overall appearance of the drainageway is more urban and manicured. The side-slope improvements are permanent; however, significant maintenance should be anticipated since the drainageway will not have full improvement. These improvements require acquisition of a moderate width corridor, including some residences and commercial/industrial buildings.

Improved channel sections for the various alternatives were sized using normal-depth flow calculations and improved culvert crossings for the various alternatives were sized using simple inlet control calculations, both in consideration of the water surface profile developed for the channel during the existing floodplain delineation. All improvements were based on the future development condition peak discharges. The hydrologic analysis included separate TR-20 models for the diversion and detention improvement alternatives to estimate peak discharges for those conditions. A summary of the peak discharges used for the various improvement alternatives is illustrated on Figure 27. Typical cross-sections that schematically illustrate these improvement alternatives for each reach are included on Figures 28-34.

Alternative Evaluation

The public study meetings confirmed the following community goals for all drainage basin planning studies, previously adopted by the City for use in the Shooks Run DBPS:

A. Protect public safety and welfare

1. Minimizes flood damage to private property
2. Minimizes flood damage to public property
3. Minimizes bank erosion and bank sloughing
4. Minimizes injury and loss of life
5. Minimizes safety hazard/water contact

B. Maintain and enhance aesthetics

1. Utilizes quality and compatible materials
2. Provides beautification
3. Provides passive recreation
4. Establishes buffer zones

C. Enhance and provide social and recreational benefits

1. Provides multi-use trail
2. Provides active recreation area
3. Provides education/interpretive opportunities
4. Provides access to corridor

D. Implement and design solutions in a cost effective manner

1. Minimizes capital cost
2. Minimizes operations and maintenance cost.

E. Control stormwater pollutants

F. Protect and enhance wetlands, riparian areas and wildlife habitat

1. Stabilizes channel
2. Preserves aquatic habitat
3. Preserves riparian habitat
4. Preserves upland habitat
5. Protects groundwater level
6. Minimizes construction and maintenance impacts

The public study meetings also established the following additional goals for the Shooks Run DBPS:

A. General drainageway cleanup

B. Protect existing infrastructure

C. Land Use compatibility

1. Preserves/enhances historic and cultural features
2. Promotes community pride and stewardship
3. Preserves/enhances neighborhoods
4. Minimizes acquisition of private property
5. Preserves/enhances property value

These goals were used as the basis for the evaluation of the improvement alternatives for the main channel. Each of the improvement alternatives was evaluated on a reach-by-reach basis for the entire main channel. The goals and considerations of public safety and welfare (channel width required), cost (including construction, property acquisition, engineering and administration), land use (number of structures removed), and right-of-way acquisition (width required) were evaluated somewhat quantitatively. The unit costs used in the estimates of probable construction cost are included in Table 10. All the other goals and considerations were evaluated qualitatively only. The results of this evaluation are illustrated in the Alternative Evaluation Matrix on Figures 35-41 and the Alternative Evaluation Summary on Figures 42-48.

Recommended Improvement Alternative Selection

There was extensive review of the alternative analysis by the City and the consultant team. This review included lengthy, detailed discussion about the advantages and disadvantages of each improvement alternative for each individual reach of the drainageway. During this review, the City requested that Alternative 1 - Reactive Maintenance Only, Alternative 2 - Proactive Maintenance Program, and Alternative 7 - Soft-Lined Channel Side-Slopes Only Improvement

with Crossing Maintenance be modified to include replacement of all roadway crossings with adequately-sized culverts or bridges with all appropriate appurtenances (headwalls and wingwalls) as in Alternatives 3 through 6 (the full improvement alternatives). The City also requested the goal of the DBPS to protect wetlands, riparian areas and wildlife habitats be modified to relate to preservation only and not enhancement.

The *Alternative Analysis Summary* was completed during this review. There were widely varying opinions about how the different improvement alternatives should be rated relative to the goals for the DBPS. Throughout the alternative analysis, the City directed there should be no weighting of the goals for the DBPS. All goals were to be considered of equal value. The *Alternative Analysis Summary* was intended to provide an objective rating of the improvement alternatives. However, the final consensus of the improvement alternative recommended for each reach was also based on subjective considerations.

The main issue identified during the alternative evaluation and selection process is that the goals of protection of public safety, welfare and the existing infrastructure in a cost effective manner cannot be met; if the goals related to aesthetics, existing habitats and land use are met. Different improvement alternatives were recommended for the various reaches in order to meet as many of the goals as possible. The following describes the alternatives initially recommended for each reach of the main channel and how they were selected.

A. **Reach 1 - Fountain Creek to the Abandoned Railroad Crossing**

Alternative 2 - Proactive Maintenance was recommended for Reach 1. This alternative was recommended because it provides an enlarged roadway crossing for Las Vegas Street, a multi-use trail along the channel, and maintenance of the channel at a moderate cost, and partially meets the goals related to aesthetics, existing habitats and land use. This alternative does not improve existing flooding problems at the mobile home park and the area east of the channel just upstream of Fountain Creek or the steep, unstable channel side-slope problems. The enlarged roadway crossing will be somewhat susceptible to potential plugging by the extensive amount of existing vegetation that will remain.

B. **Reach 2 - The Abandoned Railroad Crossing to Costilla Street**

Alternative 1 - Reactive Maintenance Only was recommended for Reach 2. This alternative was recommended because it provides enlarged roadway crossings for Fountain Boulevard and Costilla Street and the 100-year floodplain is contained within the existing channel for most of the reach, and most of the reach is through a public park that includes an existing multi-use trail where it was concluded that major maintenance or improvement is not desirable in consideration of aesthetics, existing habitat and land use. The multi-use trail will be extended and upgraded as necessary. The enlarged roadway crossing for Fountain Boulevard will solve the potential flooding problem for the only private property along the reach that is within the existing 100-year floodplain. This alternative does not solve the problem of the steep, unstable side-slopes of the channel. This was considered acceptable since the lower portions of the side-slopes already have existing riprap lining. The enlargement of the Fountain Boulevard roadway crossing will increase velocities and erosion potential in the upstream channel. The enlarged roadway crossings, and those further downstream, will be somewhat susceptible to potential plugging by the extensive amount of existing vegetation that will remain.

C. **Reach 3 - Costilla Street to Boulder Street**

Alternative 4 - Structural Full Improvement was recommended for Reach 3. This alternative was recommended because it contains the 100-year floodplain within the channel through this densely developed commercial/industrial and residential area, stabilizes the steep, unstable side-slopes of the existing channel and provides a multi-use trail along the channel most cost effectively. This alternative does not meet the aesthetic, existing habitats and land use goals; however, mitigation is included with the proposed improvements.

D. **Reach 4 - Boulder Street to Cache La Poudre Street**

Alternative 2 - Proactive Maintenance Program was recommended for Reach 4. This alternative was recommended because it provides enlarged roadway crossings at St. Vrain Street, Willamette Street, and Cache La Poudre Street, a multi-use trail along the channel, and maintenance of the channel, and partially meets the goals related to aesthetics, existing habitats and land use. The 100-year floodplain will be contained within the existing channel following enlargement of the roadway crossings but at flow velocities higher than desirable. This alternative does not solve the problem of the steep, unstable side-slopes of the channel. This was considered acceptable since some of the lower portions of the side-slopes already have existing riprap lining, and the channel is within a public park in this reach. The enlargement of the roadway crossings will increase velocities and erosion potential in the upstream channels. The enlarged roadway crossings, and those further downstream, will be somewhat susceptible to potential plugging by the extensive amount of existing vegetation that will remain.

E. **Reach 5 - Cache La Poudre Street to Patty Jewett Golf Course**

Alternative 7 - Soft-Lined Channel Side-Slopes Only Improvement was recommended for Reach 5. This alternative was recommended because it provides enlarged roadway crossings at Uintah Street and San Miguel Street, a multi-use trail along the channel, stabilizes the steep, unstable side-slopes of the existing channel, and is the most appropriate major improvement alternative for the surrounding residential neighborhood. The 100-year floodplain will be contained within the existing channel following enlargement of the roadway crossings, but at flow velocities higher than desirable.

F. **Reach 6 - Patty Jewett Golf Course**

Alternative 2 - Proactive Maintenance Program was recommended for Reach 6. This alternative was recommended because it provides an enlarged roadway crossing at Española Street and partially meets the goals related to aesthetics, existing habitats and land use. This alternative does not solve the existing flooding problems or the steep, unstable side-slope problems. This was considered acceptable since this reach is through a public golf course. The enlargement of the Española Street roadway crossing will increase velocities and erosion potential in the upstream channel. The enlarged roadway crossing, and those further downstream, will be somewhat susceptible to potential plugging by the extensive amount of existing vegetation that will remain. There will be no multi-use trail along this channel reach since it is through a public golf course.

G. **Reach 7 - Patty Jewett Golf Course to the Van Buren Channel Diversion**

Alternative 4 - Structural Full Improvement was recommended for Reach 7. This alternative was recommended because it contains the 100-year floodplain within the channel through this densely developed commercial and residential area, stabilizes the steep, unstable side-slopes of the existing channel, and provides a multi-use trail along the channel most cost effectively. This alternative does not meet the aesthetic, existing habitats and land use goals; however, mitigation is included within the proposed improvements.

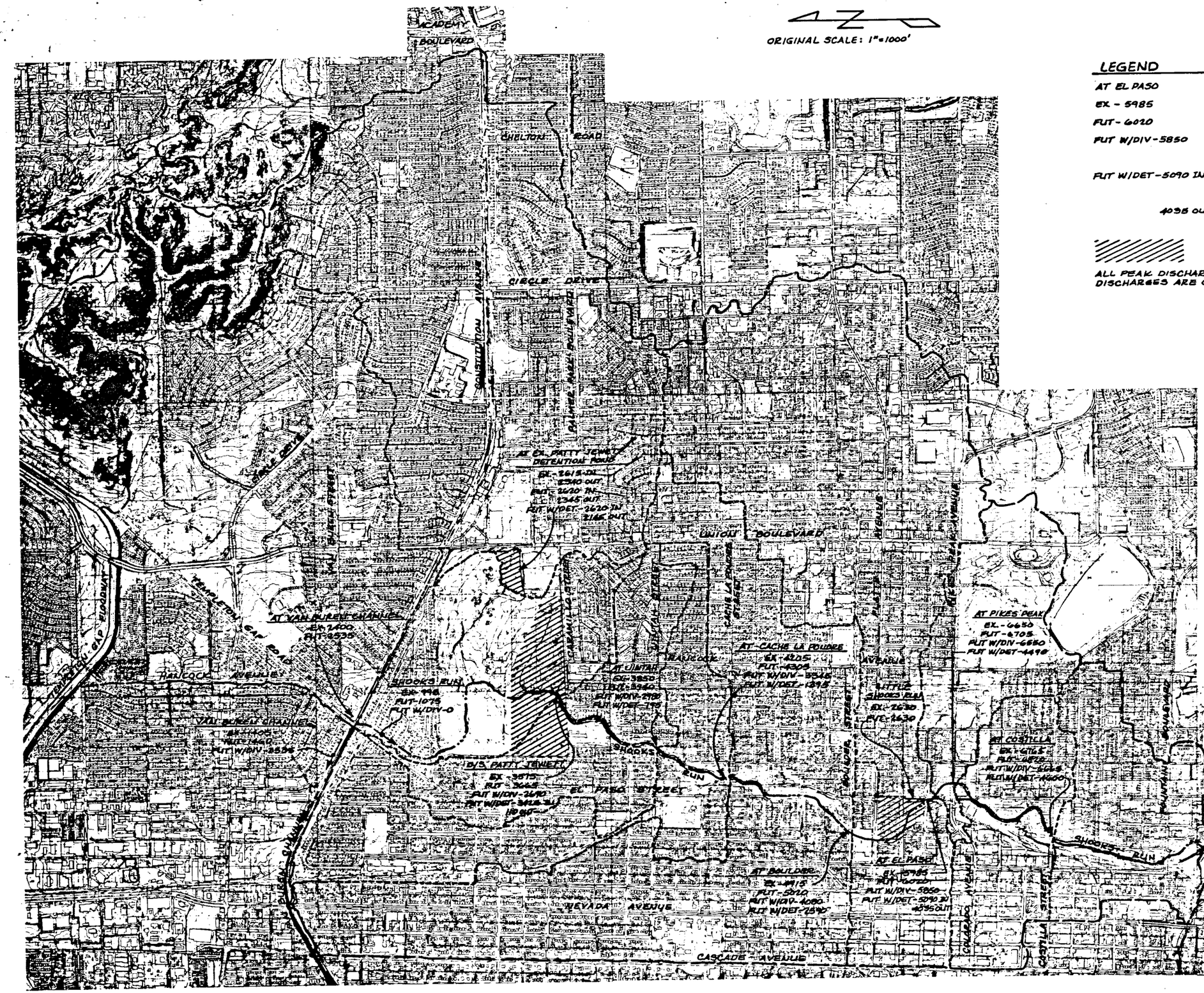
Since the recommended alternatives for some of the channel reaches do not include major channel improvements in the reaches, channel transitions are necessary at the enlarged roadway crossings and locations where major channel improvements for other reaches end. These channel transitions were considered as the Preliminary Design Plans for the recommended alternative were developed.

During preparation of the Preliminary Design Plans, it became apparent that in Reach 4, Boulder Street to Cache La Poudre Street (where Improvement Alternative 2, Proactive Maintenance was selected), there were two areas where the open channels that remained between the channel transitions for the enlarged roadway crossings were relatively short. The remaining open channel between the Boulder Street and St. Vrain Street improvements was only about 225 feet long, and between the St. Vrain Street and Willamette Street improvements was only about 85 feet long. These open channels were too short to make the Proactive Maintenance alternative a reasonable approach. Alternative 4, Structural Full Improvement used in Reach 3 was therefore extended for use between Boulder Street and Willamette Street. The Proactive Maintenance alternative was used for the remainder of Reach 4 between Willamette Street and Cache La Poudre Street.

Also during preparation of the Preliminary Design Plans, it was suggested that Alternative 4, Structural Full Improvement be used for Reach 5, Cache La Poudre Street to Patty Jewett Golf Course because it requires less property acquisition and is more cost effective than Alternative 7, Soft-Lined Channel Side-Slopes Only Improvement, which was originally selected for the reach. It was decided to use the originally selected alternative for this reach since it fit best with the residential character of the neighborhood, while providing improvement of the steep, unstable side-slopes.

The recommended alternative is illustrated and discussed in more detail in the Recommended Improvements section of this report.

ORIGINAL SCALE: 1"=1000'



LEGEND

AT EL PASO	- DESIGN LOCATION
EX - 5985	- EXISTING CONDITION PEAK DISCHARGE
FUT - 6020	- FUTURE CONDITION PEAK DISCHARGE
FUT W/DIV - 5850	- FUTURE CONDITION PEAK DISCHARGE W/TOTAL DIVERSION AT VAN BUREN CHANNEL
FUT W/DET - 5090 IN	- FUTURE CONDITION PEAK DISCHARGE W/MAX. DETENTION FEASIBLE (DISCHARGE INTO POND)
4035 OUT	- FUTURE CONDITION PEAK DISCHARGE W/MAX. DETENTION FEASIBLE (DISCHARGE OUT OF POND)
	- NEW DETENTION POND OR EXISTING DETENTION POND.

ALL PEAK DISCHARGES ARE 100-YEAR. ALL PEAK DISCHARGES ARE CUBIC FEET PER SECOND.

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SHOOKS RUN
DRAINAGE BASIN PLANNING STUDY
HYDROLOGY ALTERNATIVES

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DATE	11/3/92
FILE NO.	90-809
SHEET NO.	FIGURE 27

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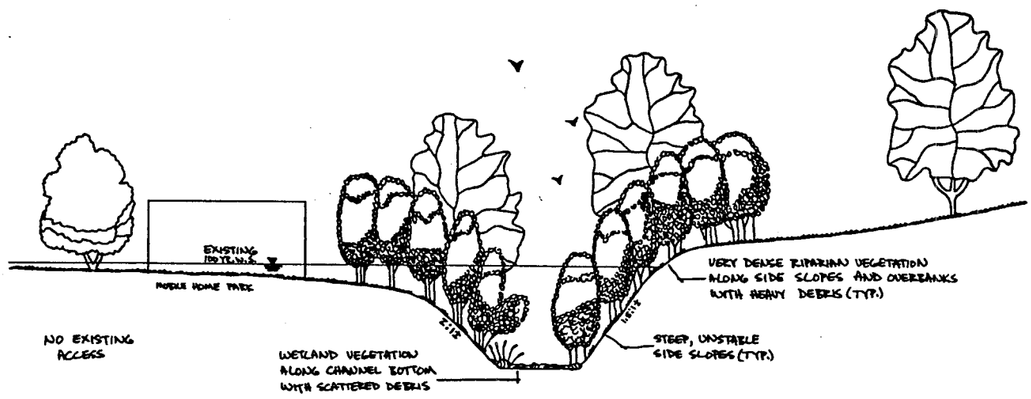
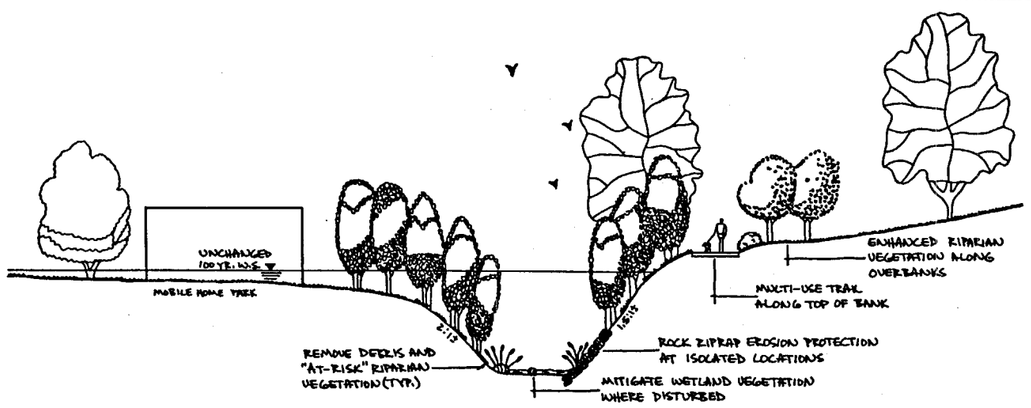
REACH 1 - FOUNTAIN CREEK TO ABANDONED RAILROAD CROSSING

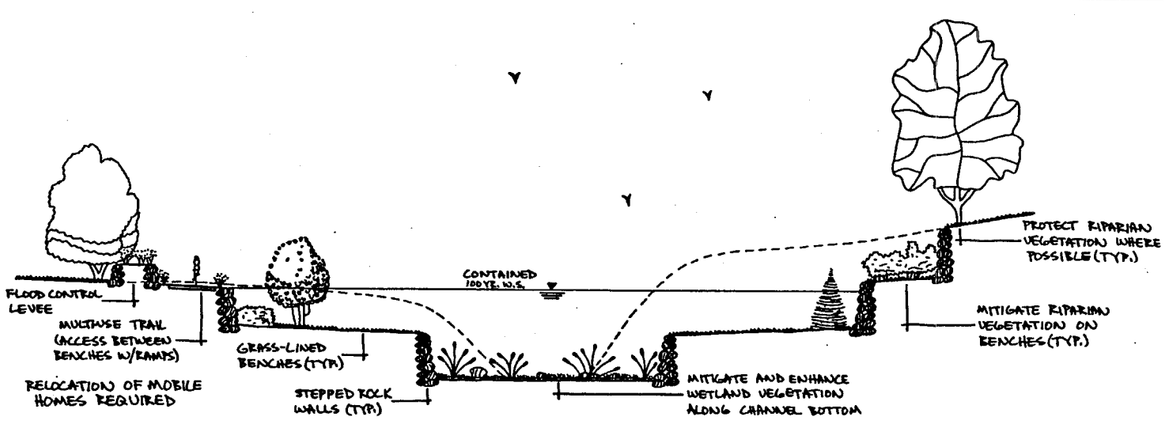
EXISTING CONDITION/ ALTERNATIVE 1- REACTIVE MAINTENANCE ONLY



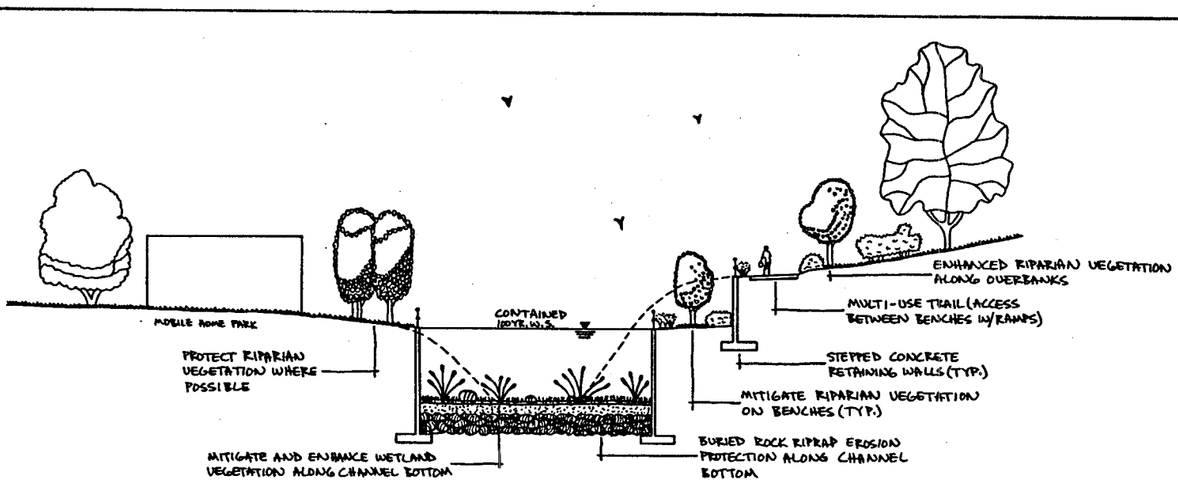
ALTERNATIVE 2- PROACTIVE MAINTENANCE PROGRAM



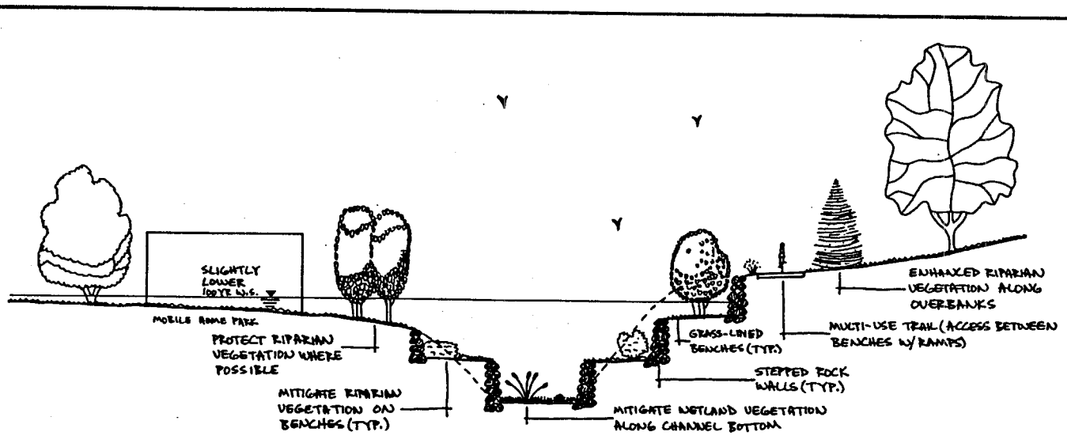
ALTERNATIVES 3, 5, & 6- SOFT-LINED FULL IMPROVEMENT



ALTERNATIVE 4- STRUCTURAL FULL IMPROVEMENT



ALTERNATIVE 7 - SOFT-LINED SIDE SLOPES ONLY IMPROVEMENT WITH CROSSING MAINTENANCE



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DESIGN
DRAWN
DATE
FILE NO. 90-809
SHEET NO. FIGURE 28

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DRAINAGE BASIN PLANNING STUDY
TYPICAL SECTIONS OF ALTERNATIVES

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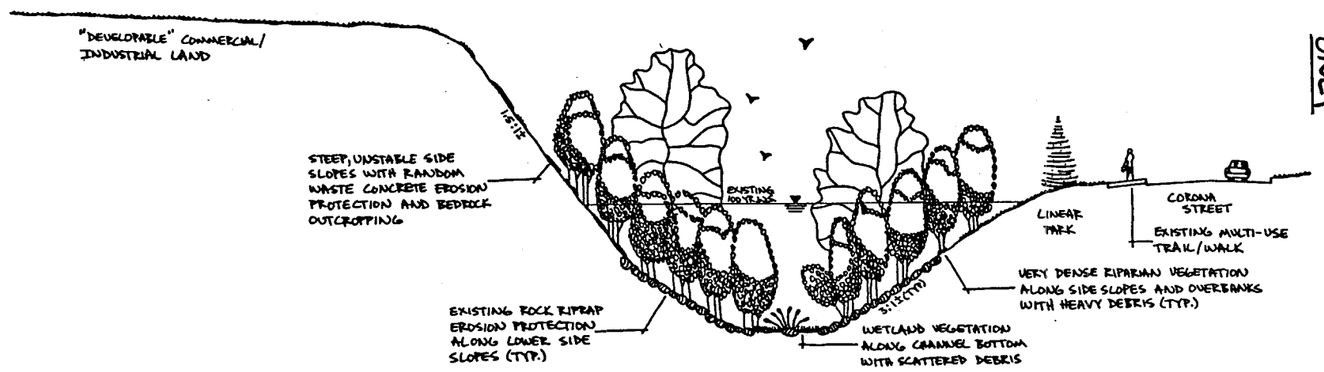
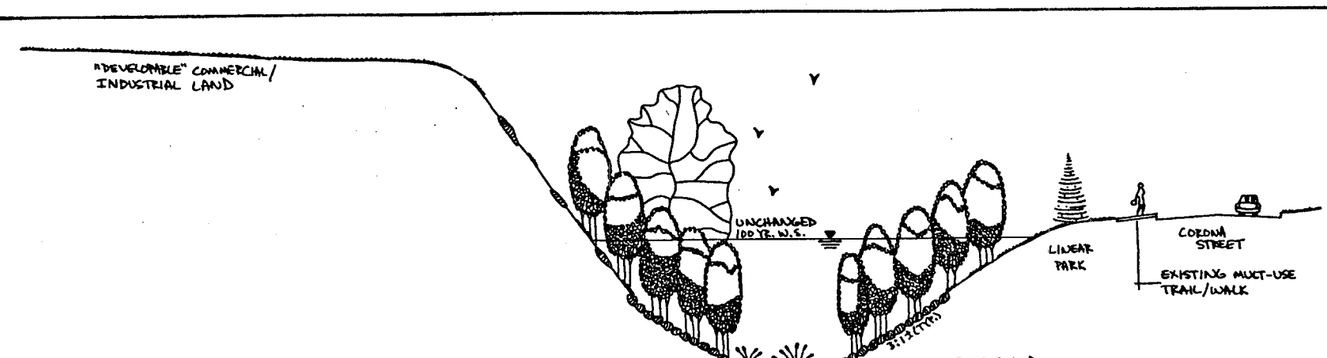
REACH 2 - ABANDONED RAILROAD CROSSING TO COSTILLA STREET

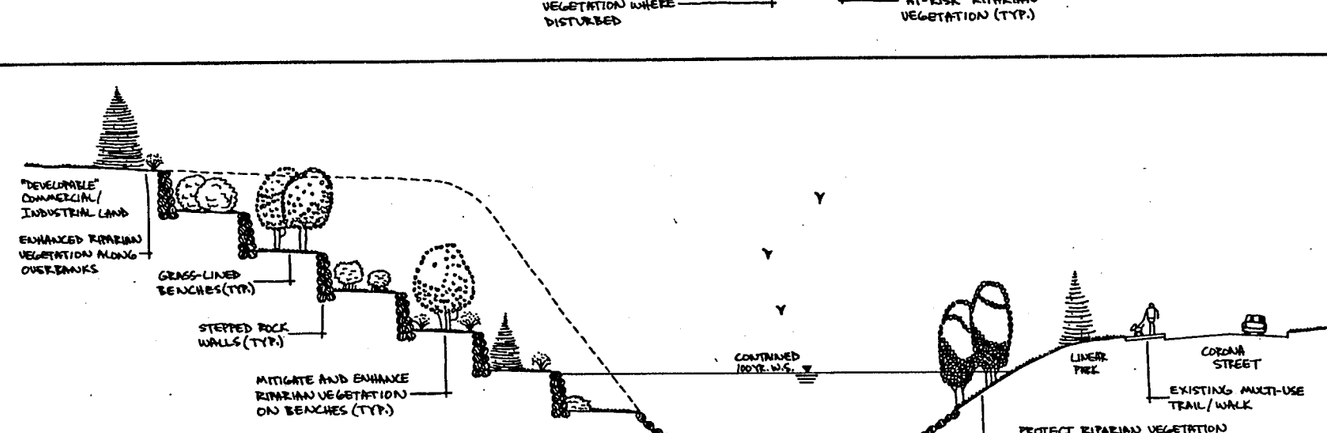
EXISTING CONDITION/ ALTERNATIVE 1 - REACTIVE MAINTENANCE ONLY



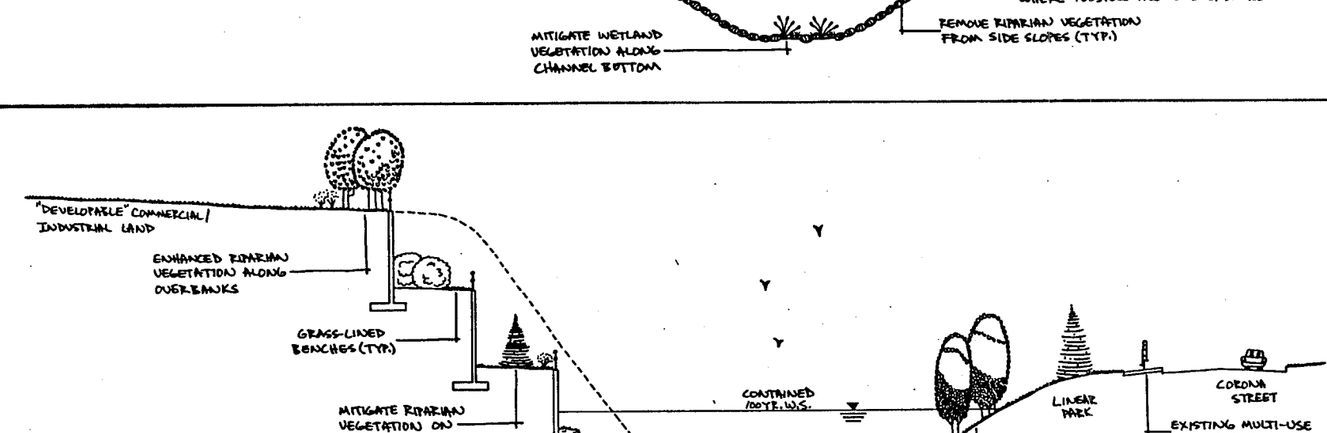
ALTERNATIVE 2 - PROACTIVE MAINTENANCE PROGRAM



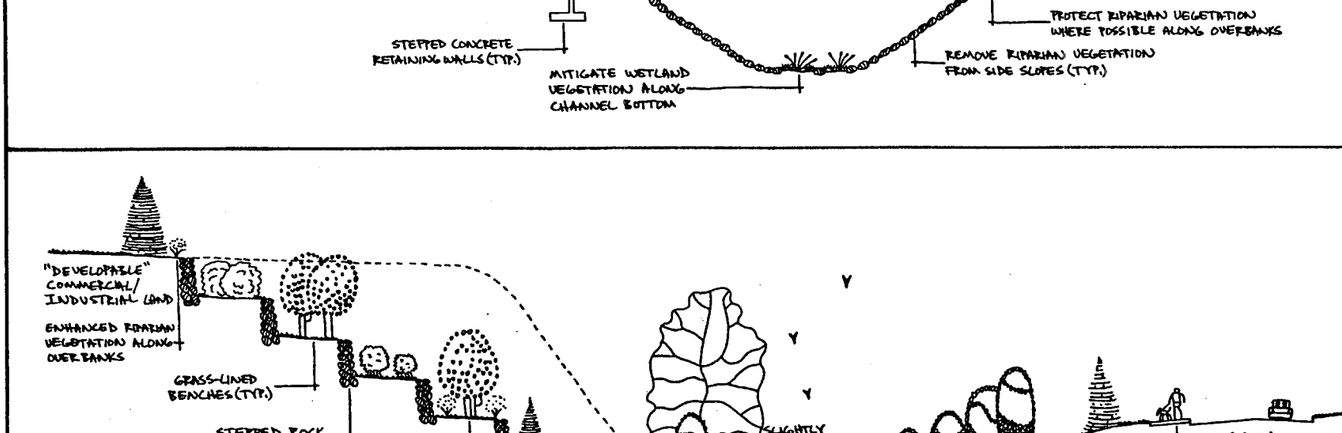
ALTERNATIVES 3, 5, & 6 - SOFT-LINED FULL IMPROVEMENT



ALTERNATIVE 4 - STRUCTURAL FULL IMPROVEMENT



ALTERNATIVE 7 - SOFT-LINED SIDE SLOPES ONLY IMPROVEMENT WITH CROSSING MAINTENANCE



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SHEET NO. FIGURE 24
FILE NO. 90-809
DATE
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DRAINAGE BASIN PLANNING STUDY
TYPICAL SECTIONS OF ALTERNATIVES

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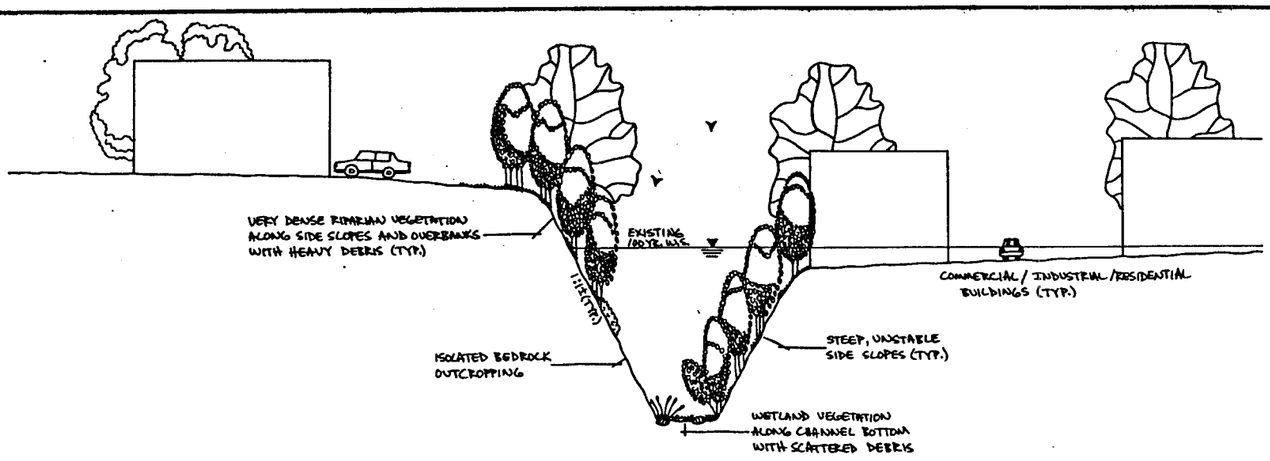
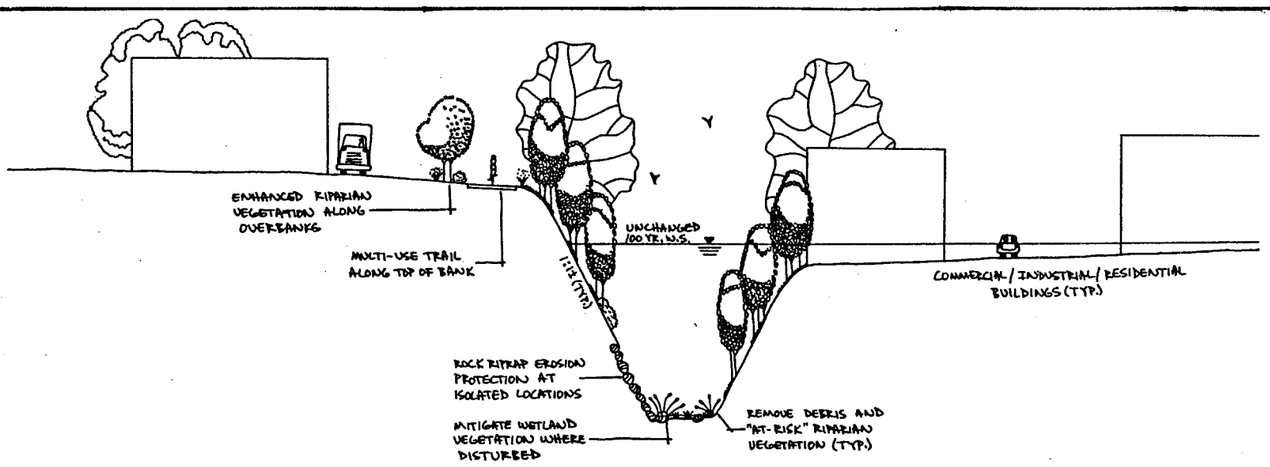
REACH 3- COSTILLA STREET TO BOULDER STREET

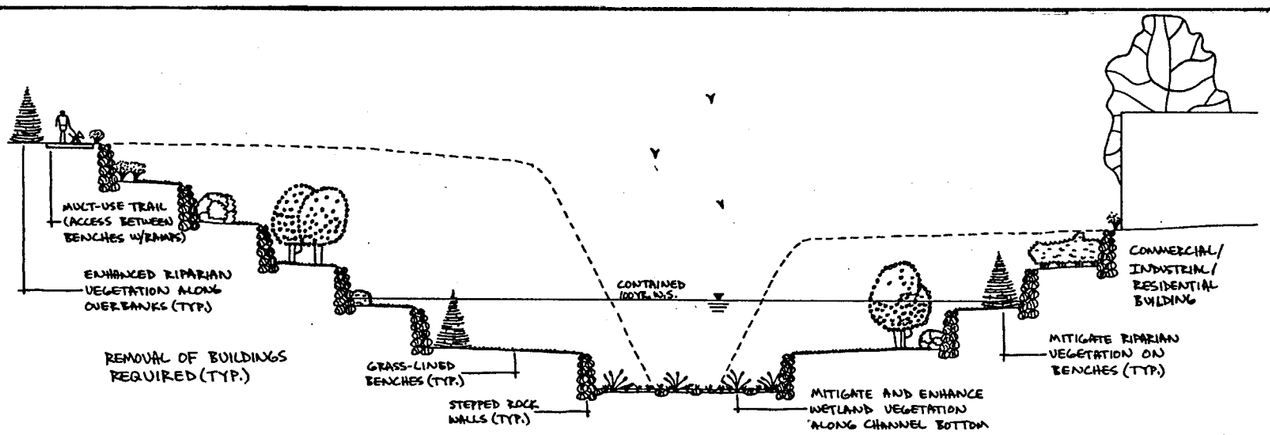
EXISTING CONDITION/ ALTERNATIVE 1- REACTIVE MAINTENANCE ONLY



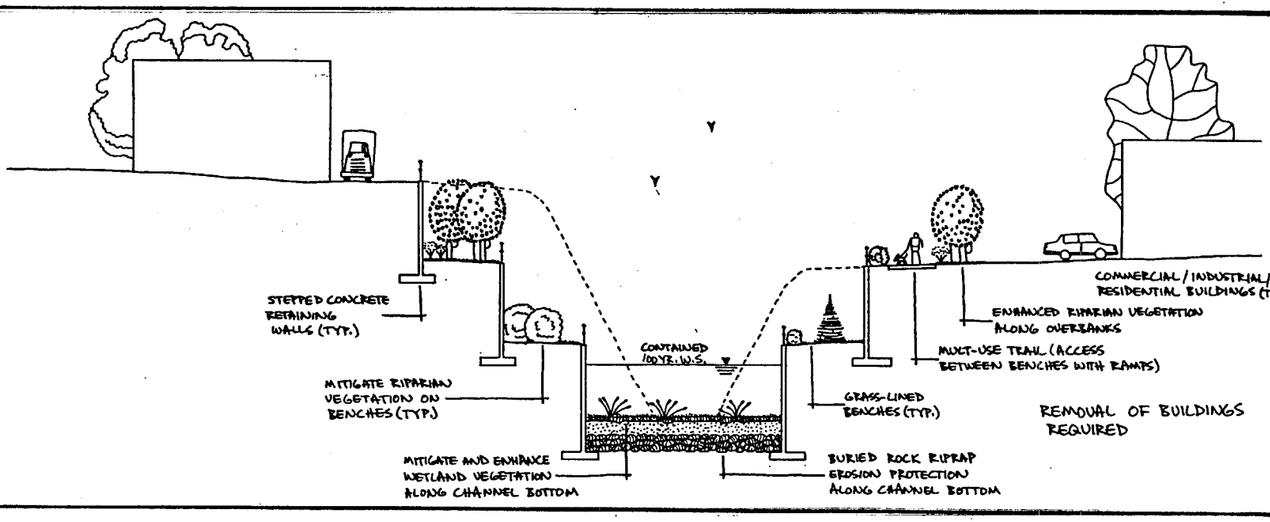
ALTERNATIVE 2-PROACTIVE MAINTENANCE PROGRAM



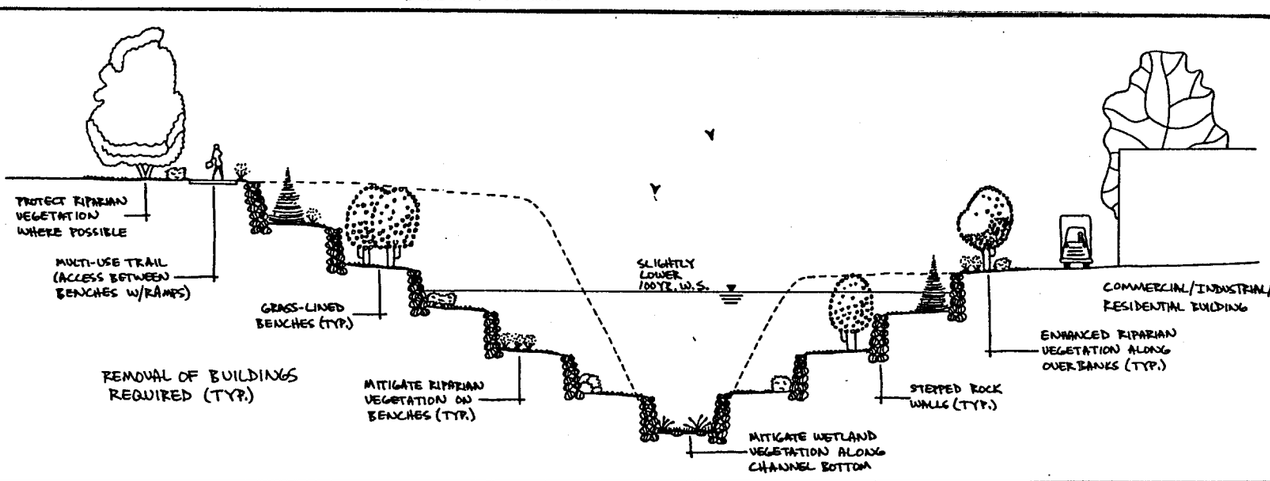
ALTERNATIVES 3, 5, & 6- SOFT-LINED FULL IMPROVEMENT



ALTERNATIVE 4- STRUCTURAL FULL IMPROVEMENT



ALTERNATIVE 7-SOFT-LINED SIDE SLOPES ONLY IMPROVEMENT WITH CROSSING MAINTENANCE



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DESIGN
DRAWN
DATE
FILE NO. 20-809
SHEET NO. FIGURE 30

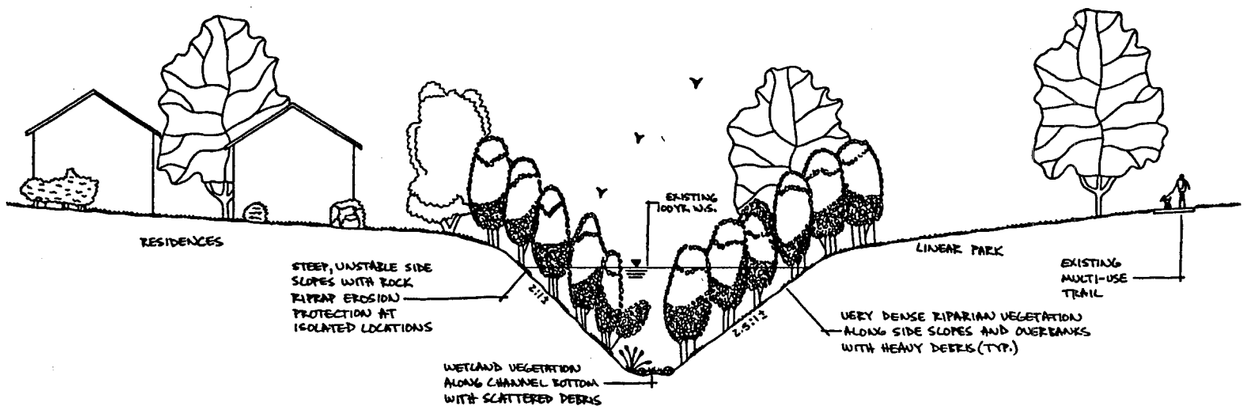
SHOOKS RUN
DRAINAGE BASIN PLANNING STUDY
TYPICAL SECTIONS OF ALTERNATIVES

WILSON & COMPANY

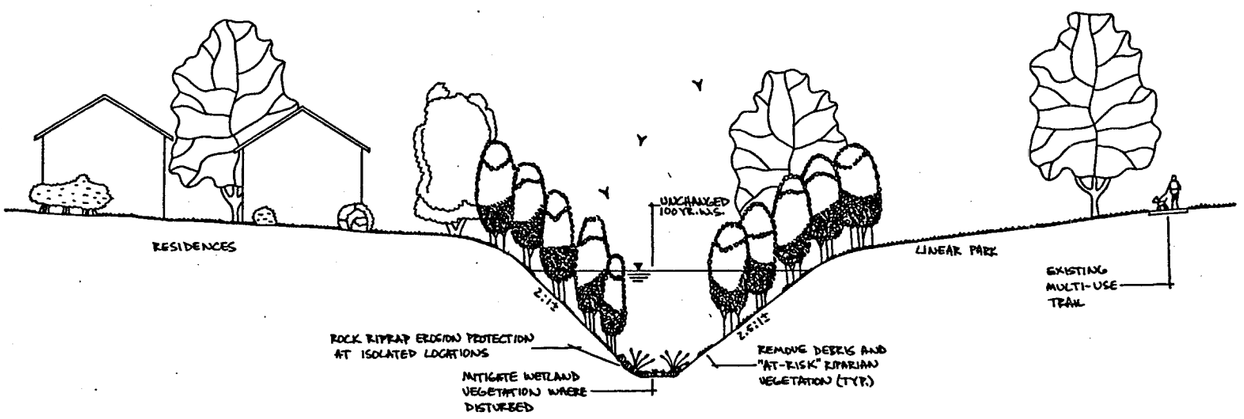
REVISION	DATE	BY

REACH 4 - BOULDER STREET TO CACHE LA POUDRE STREET

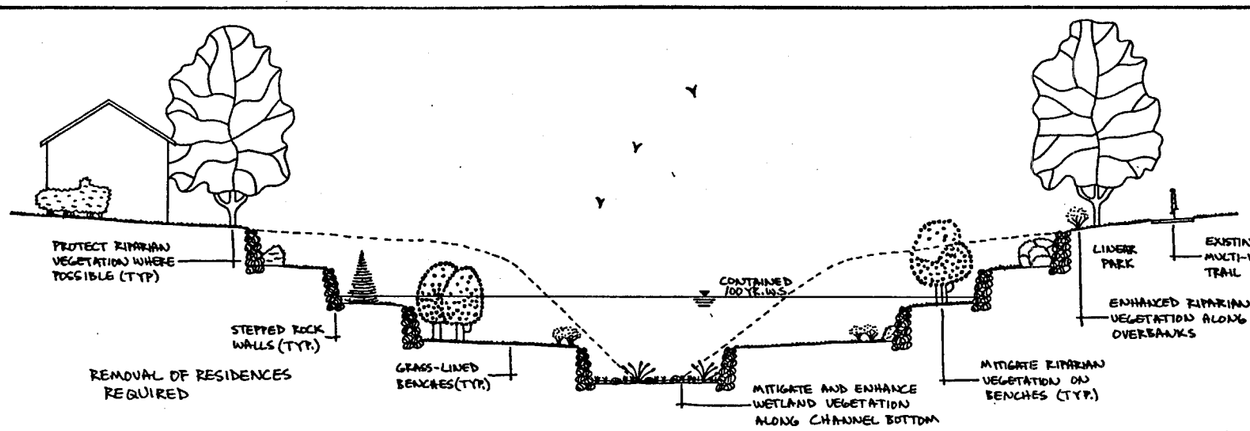
EXISTING CONDITION / ALTERNATIVE 1 - REACTIVE MAINTENANCE ONLY



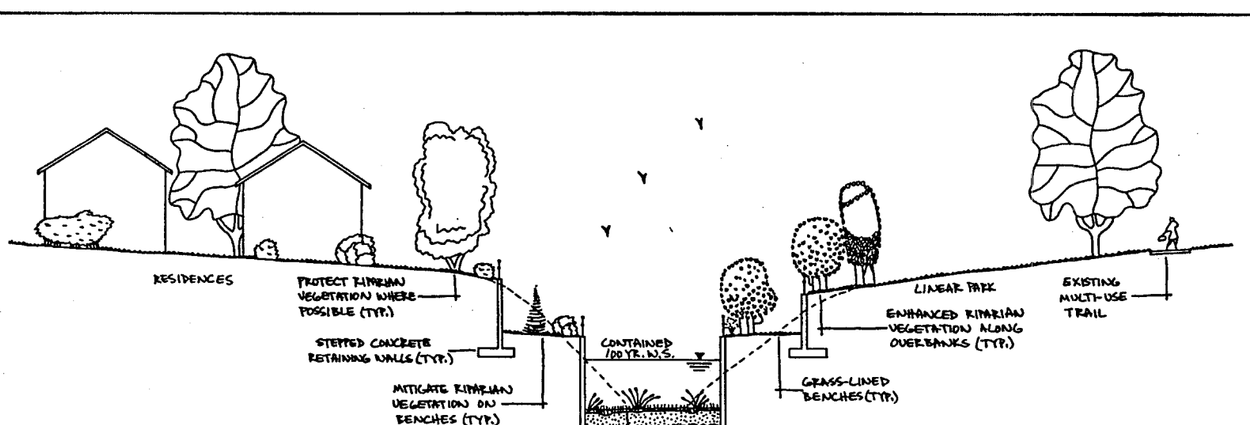
ALTERNATIVE 2 - PROACTIVE MAINTENANCE PROGRAM



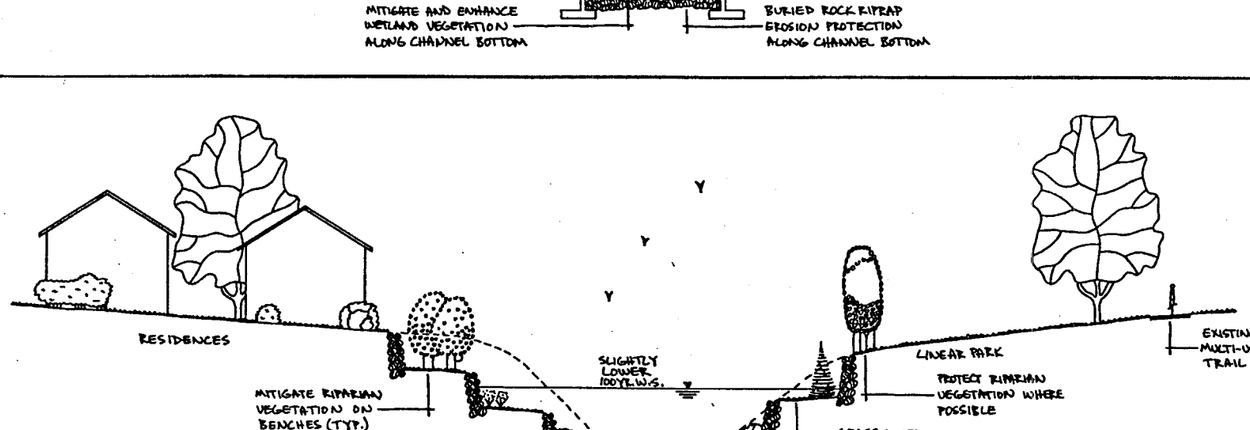
ALTERNATIVES 3, 5, & 6 - SOFT-LINED FULL IMPROVEMENT



ALTERNATIVE 4 - STRUCTURAL FULL IMPROVEMENT



ALTERNATIVE 7 - SOFT-LINED SIDE SLOPES ONLY IMPROVEMENT WITH CROSSING MAINTENANCE



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SHEET NO. FIGURE 31
FILE NO. 90-809
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SHOOKS RUN
DRAINAGE BASIN PLANNING STUDY
TYPICAL SECTIONS OF ALTERNATIVES

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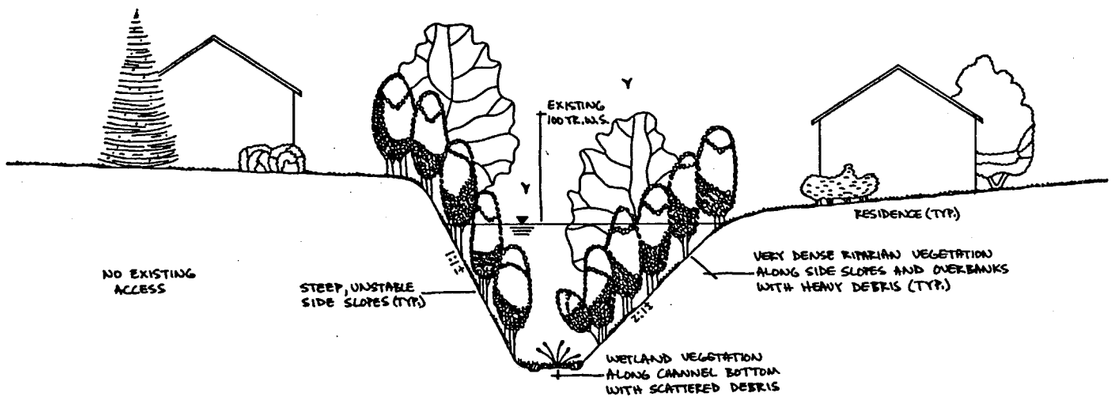
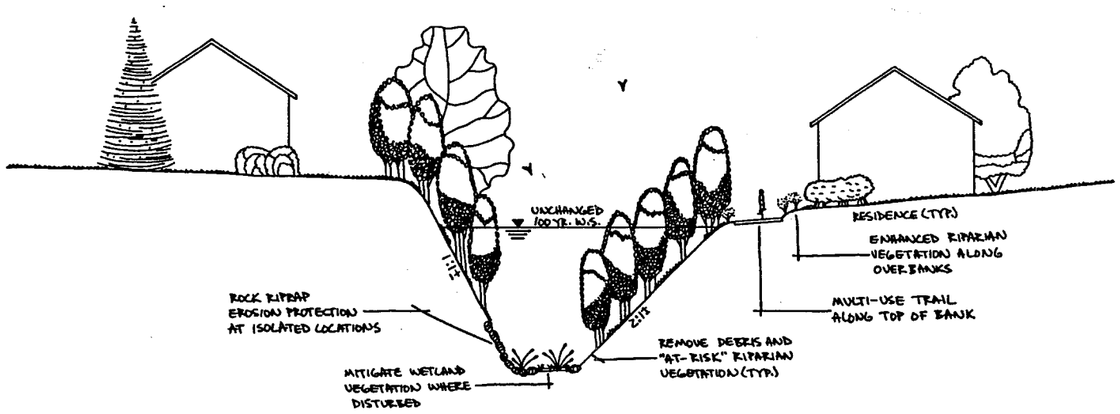
REACH 5 - CACHE LA POUDRE STREET TO PATTY JEWETT GOLF COURSE

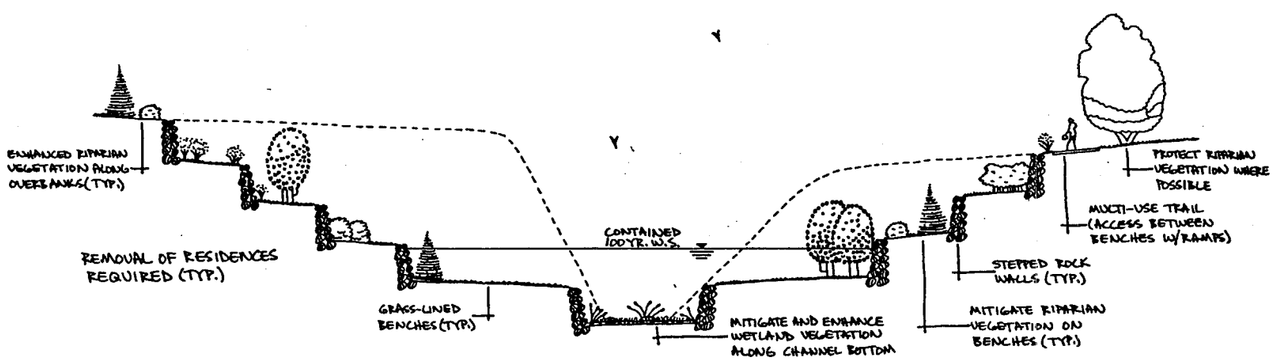
EXISTING CONDITION/ ALTERNATIVE 1- REACTIVE MAINTENANCE DUTY



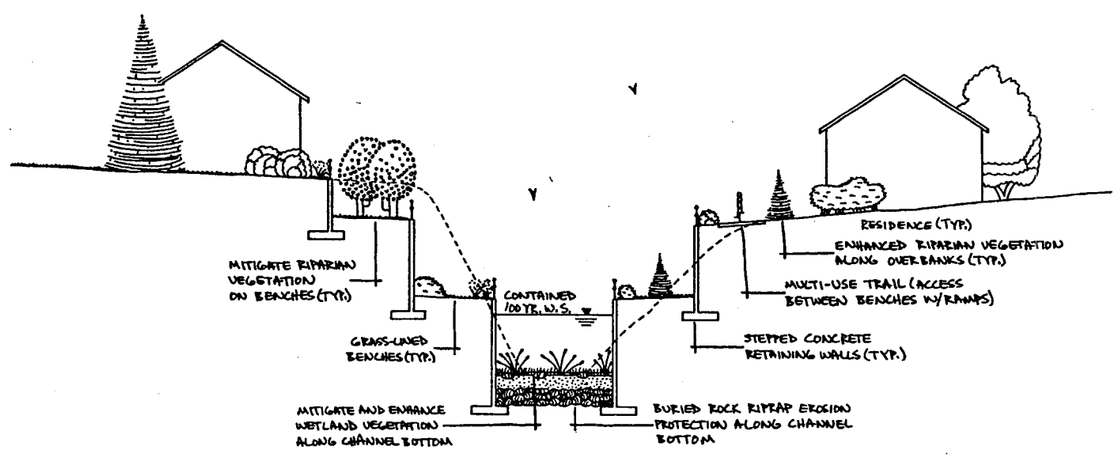
ALTERNATIVE 2- PROACTIVE MAINTENANCE PROGRAM



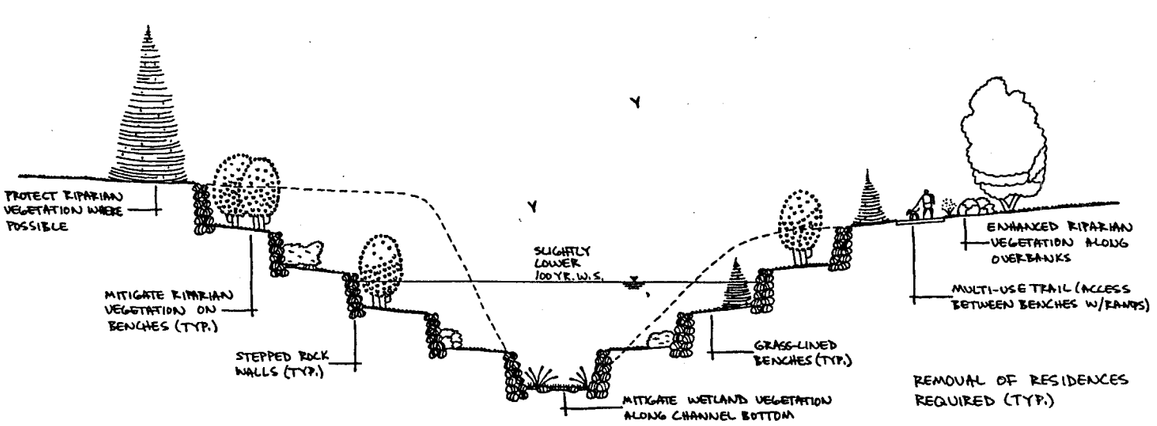
ALTERNATIVES 3, 5, & 6- SOFT-LINE FULL IMPROVEMENT



ALTERNATIVE 4- STRUCTURAL FULL IMPROVEMENT



ALTERNATIVE 7- SOFT-LINED SIDESLOPES ONLY IMPROVEMENT WITH CROSSING MAINTENANCE



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SHEET NO. FIGURE 32

FILE NO. 90-809

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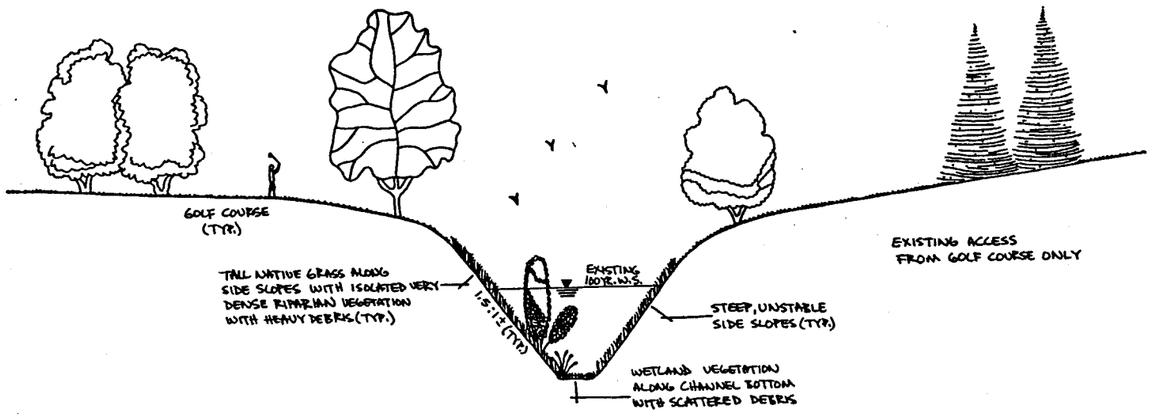
DRAINAGE BASIN PLANNING STUDY
TYPICAL SECTIONS OF ALTERNATIVES

WILSON & COMPANY

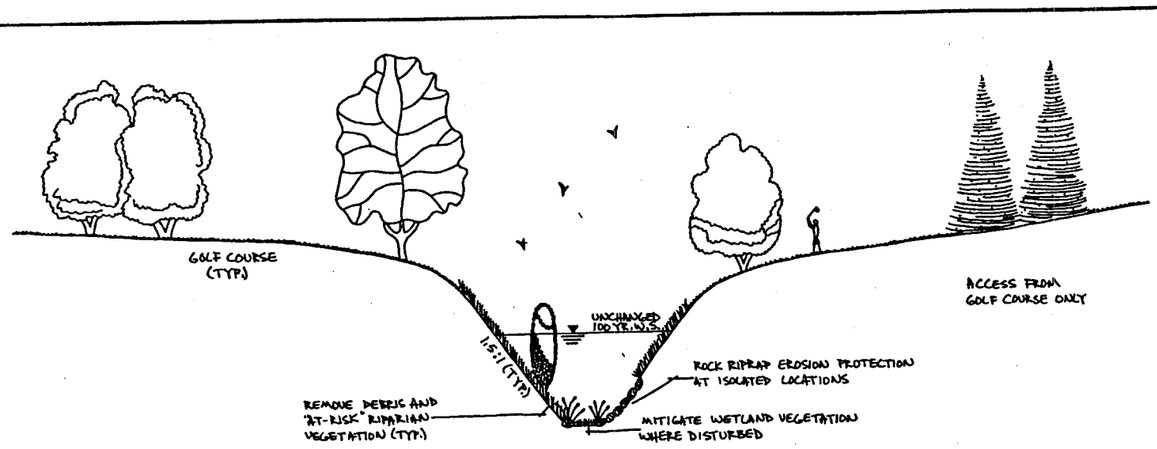
REVISION	DATE	BY

REACH 6- PATTY JEWETT GOLF COURSE

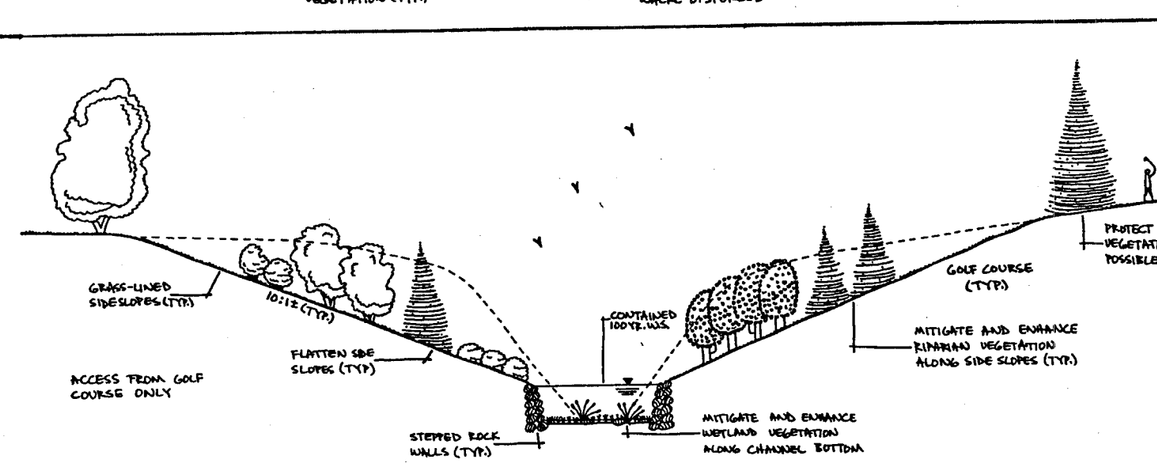
EXISTING CONDITION/ ALTERNATIVE 1- REACTIVE MAINTENANCE ONLY



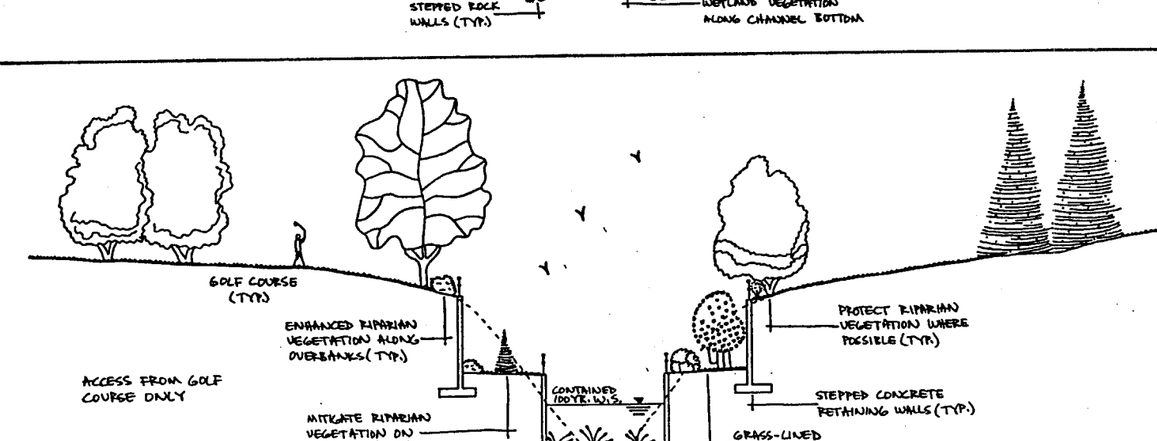
ALTERNATIVE 2- PROACTIVE MAINTENANCE PROGRAM



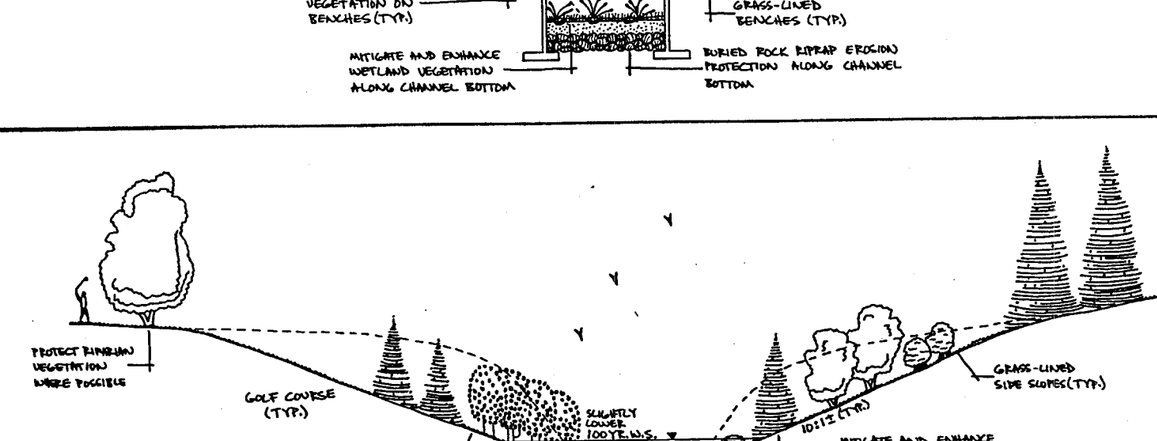
ALTERNATIVES 3, 5, & 6- SOFT-LINED FULL IMPROVEMENT



ALTERNATIVE 4- STRUCTURAL FULL IMPROVEMENT



ALTERNATIVE 7- SOFT-LINED SIDE SLOPES ONLY IMPROVEMENT WITH CROSSING MAINTENANCE



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SHEET NO. FIGURE 33

SHOOKS RUN
DRAINAGE BASIN PLANNING STUDY
TYPICAL SECTIONS OF ALTERNATIVES

WILSON & COMPANY

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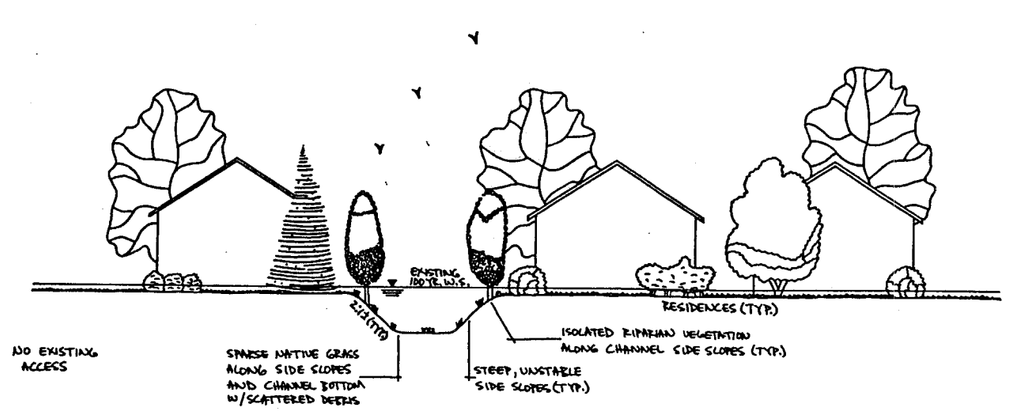
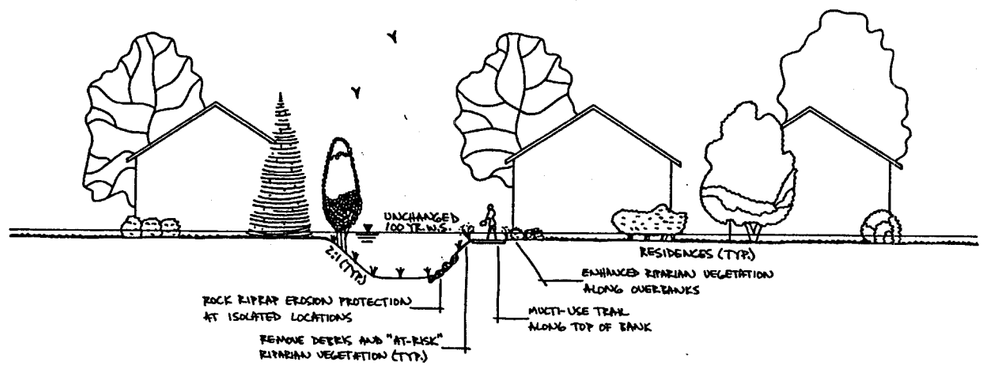
REACH 7 - PATTY JEWETT GOLF COURSE TO VAN BUREN CHANNEL DIVERSION

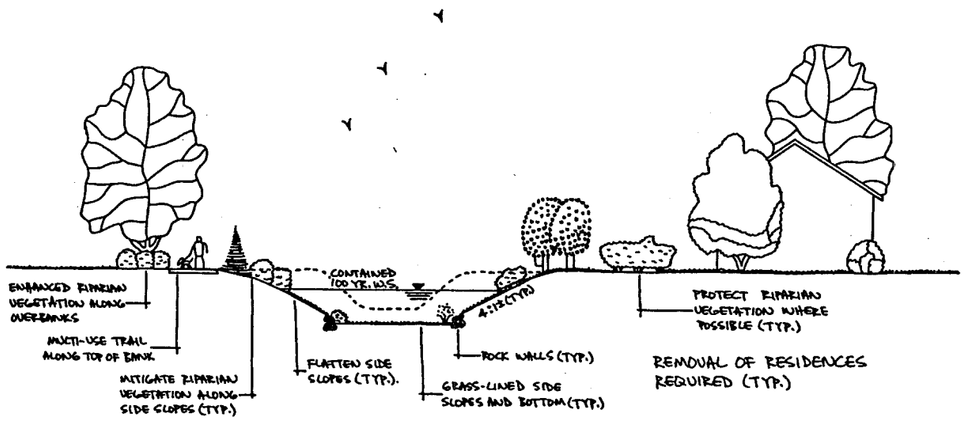
EXISTING CONDITION/ ALTERNATIVE 1- REACTIVE MAINTENANCE ONLY



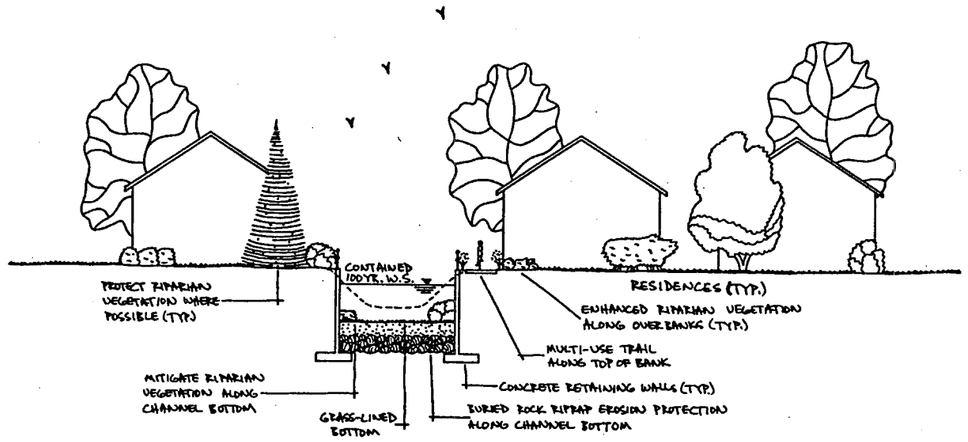
ALTERNATIVE 2- PROACTIVE MAINTENANCE PROGRAM



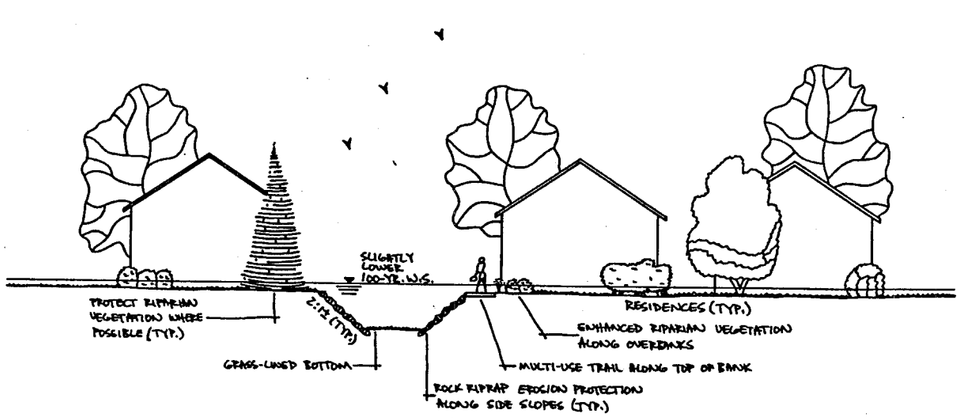
ALTERNATIVES 3, 5, & 6- SOFT-LINED FULL IMPROVEMENT



ALTERNATIVE 4- STRUCTURAL FULL IMPROVEMENT



ALTERNATIVE 7- SOFT-LINED SIDE SLOPES ONLY IMPROVEMENT WITH CROSSING MAINTENANCE



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COLORADO SPRINGS, COLORADO

FILE NO. 90-809
FIGURE 34

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DATE

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DRAINAGE BASIN PLANNING STUDY
TYPICAL SECTIONS OF ALTERNATIVES

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TABLE 10
Unit Costs for Estimates of Probable Construction Costs
(Winter 1992-1993)

Item Description	Unit	Unit Cost
Selective Vegetation Clearing and Debris Removal	Acre	$5,000
Complete Vegetation Clearing and Debris Removal	Acre	$20,000
Culvert or Bridge Crossing Cleaning	Lump Sum	$500 to $5,000
Culvert or Bridge Crossing Removal	Lump Sum	$5,000 to $150,000
Remove Retaining Wall	Square Foot	$5
Remove Concrete Pavement	Square Yard	$10
Remove Single-Family Residence	Each	$10,000
Remove Apartment Building	Each	$50,000
Remove Commercial/Industrial Building	Each	$20,000 to $50,000
Relocate Mobile Home	Each	$2,000
Reset Steel Pedestrian/Golf Cart Bridge (including abutments and piers)	Each	$10,000
Earthwork	Cubic Yard	$4
Embankment	Cubic Yard	$4
Structure Excavation	Cubic Yard	$6
Structure Backfill	Cubic Yard	$7
Granular Bedding	Cubic Yard	$15
Selective Landscaping	Acre	$10,000
Complete Landscaping	Acre	$35,000
4" Thick Asphalt Pavement	Square Yard	$6
8" Thick Asphalt Pavement	Square Yard	$12
8" Thick Concrete Pavement	Square Yard	$40
Double Tennis Court	Lump Sum	$75,000
Riprap	Cubic Yard	$40
Selective Riprap	Cubic Yard	$50
Low Rock Wall	Face Foot	$20
Low Riprap Drop Structure	Each	$10,000 to $25,000
Pedestrian/Golf Cart Bridge (including abutments and piers)	Square Foot	$60 to $80
Structural Concrete (including reinforcing steel)	Cubic Yard	$275
Concrete Retaining Wall	Face Foot	$20
Concrete Channel Lining Repair	Cubic Yard	$375
Steel Guardrail	Linear Foot	$50
Fence	Linear Foot	$5
Concrete Curb and Gutter	Linear Foot	$8
Concrete Sidewalk	Square Yard	$17
Reconstruct Aerial Sanitary Sewer Crossing	Linear Foot	$150 to $300
Reconstruct Railroad Track	Linear Foot	$100

TABLE 10
Unit Costs for Estimates of Probable Construction Costs
(Winter 1992-1993)

Item Description	Unit	Unit Cost
Acquire Partial Single-Family Residential Lot	Each	$5,000
Acquire Single-Family Residence	Each	$75,000
Acquire Apartment Building and Property	Each	$150,000 to $300,000
Acquire Commercial/Industrial/School Property (within floodplain)	Acre	$25,000
Acquire Commercial/Industrial/School Property (outside floodplain)	Acre	$50,000
Acquire Commercial/Industrial Building	Square Foot	$35
Engineering, Administration, and Contingencies	—	20% of Other Costs

Note: These unit costs are based on 1991 Colorado Department of Transportation construction bid tabulations, and other recent construction bid tabulations and cost information for the Front-Range area of Colorado.

FIGURE 35

SHOOKS RUN
ALTERNATIVE EVALUATION MATRIX

REACH 1 - FOUNTAIN CREEK TO ABANDONED RAILROAD CROSSING

COMMUNITY AND D.B.P.S. GOALS

	PUBLIC SAFETY AND WELFARE	AESTHETICS	RECREATION	CAPITAL COST	POLLUTANT CONTROL	ENVIRONMENTAL	DRAINAGEWAY CLEAN-UP	INFRASTRUCTURE PROTECTION	LANDUSE
ALTERNATIVE 1 Reactive Maintenance Only	Correct serious or threatening problems on as-needed basis.	No change.	No change.	$0	No change	No change.	No change.	No change.	Acquire R.O.W. on as-needed basis.
ALTERNATIVE 2 Proactive Maintenance Program	Remove high-risk vegetation only. Spot erosion protection. Provide adequate inverts, embankments and guardrails at crossings. Early warning and evacuation plan. 70' ave. channel. Little hydraulic change.	Buried spot erosion protection in channel and at crossing embankments.	Provide continuous multi-use trail along channel.	$300,000	Identify for clean-up by property owner.	Mitigate areas disturbed by maintenance.	Remove large debris and trash only.	Repairs and erosion protection at crossings. Erosion protection of utilities.	Acquire 100' ave. corridor through residential and commercial/industrial.
ALTERNATIVE 3 Soft-Lined Full Improvement	Provide 100-year crossings and 215' ave. channel. Low velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Provide continuous multi-use trail along channel.	$2,800,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	Relocate 8 mobile homes. Acquire 240' ave. corridor through residential and commercial/industrial.
ALTERNATIVE 4 Structural Full Improvement	Provide 100-year crossings and 85' ave. channel. High velocities. Stepped walls for steep slopes.	Vertical walled, concrete lined channel with soft-lining between moderate concrete walls on overbanks.	Provide continuous multi-use trail along channel.	$2,600,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate overbank areas disturbed with soft-lining between stepped walls.	Clean-up as part of construction.	Erosion protection of utilities.	Acquire 115' ave. corridor through residential and commercial/industrial.
ALTERNATIVE 5 Soft-Lined Full Improvement with Diversion	Provide 100-year crossings and 205' ave. channel. Low velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Provide continuous multi-use trail along channel.	$2,800,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	Relocate 8 mobile homes. Acquire 240' ave. corridor through residential and commercial/industrial.
ALTERNATIVE 6 Soft-Lined Full Improvement with Detention	Provide 100-year crossings and 175' ave. channel. Low velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Provide continuous multi-use trail along channel.	$2,200,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	Relocate 8 mobile homes. Acquire 210' ave. corridor through residential and commercial/industrial.
ALTERNATIVE 7 Soft-Lined Side Slopes Only Improvement With Crossing Maintenance	Limited increased channel capacity, crossings not increased. 120' ave. channel. Moderate velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Provide continuous multi-use trail along channel.	$1,600,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection for utilities.	Relocate 8 mobile homes. Acquire 150' ave. corridor through residential and commercial/industrial.

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FIGURE 36

SHOOKS RUN
ALTERNATIVE EVALUATION MATRIX

REACH 2 - ABANDONED RAILROAD CROSSING TO COSTILLA STREET

COMMUNITY AND D.B.P.S. GOALS

	PUBLIC SAFETY AND WELFARE	AESTHETICS	RECREATION	CAPITAL COST	POLLUTANT CONTROL	ENVIRONMENTAL	DRAINAGEWAY CLEAN-UP	INFRASTRUCTURE PROTECTION	LANDUSE
ALTERNATIVE 1 Reactive Maintenance Only	Correct serious or threatening problems on an as-needed basis.	No change.	No change.	$0	No change.	No change.	No change.	No change.	Acquire R.O.W. on as-needed basis.
ALTERNATIVE 2 Proactive Maintenance Program	Remove high-risk vegetation only. Spot erosion protection. Provide adequate inverts, embankments and guardrails at crossings. Early warning and evacuation plan. 150' ave. channel. Little hydraulic change.	Buried spot erosion protection in channel and at crossing embankments.	Complete continuous multi-use trail along channel through existing park.	$500,000	Identify for clean-up by property owner.	Mitigate areas disturbed by maintenance.	Remove large debris and trash only.	Repairs and erosion protection at crossings. Erosion protection of utilities.	Acquire 50' ave. corridor through commercial/ industrial. Access along existing public corridor through park.
ALTERNATIVE 3 Soft-Lined Full Improvement	Provide 100-year crossings and 225' ave. channel. Low velocities. Stepped walls for steep slopes.	Existing riprap-lined channel with soft-lining between low rock walls on steep overbanks.	Complete continuous multi-use trail along channel through existing park.	$4,700,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate overbank areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	Remove 1 commercial building. Acquire 175' ave. corridor through commercial/ industrial. Access along existing public corridor through park.
ALTERNATIVE 4 Structural Full Improvement	Provide 100-year crossings and 170' ave. channel. High velocities. Stepped walls for steep slopes.	Existing riprap-lined channel with soft-lining between moderate concrete walls on steep overbanks.	Complete continuous multi-use trail along channel through existing park.	$4,200,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate overbank areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	Remove 1 commercial building Acquire 120' ave. corridor through commercial/ industrial. Access along existing public corridor through park.
ALTERNATIVE 5 Soft-Lined Full Improvement with Diversion	Provide 100-year crossings and 225' ave. channel. Low velocities. Stepped walls for steep slopes.	Existing riprap-lined channel with soft-lining between low rock walls on steep overbanks.	Complete continuous multi-use trail along channel through existing park.	$4,700,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate overbank areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	Remove 1 commercial building. Acquire 175' ave. corridor through commercial/ industrial. Access along existing public corridor through park.
ALTERNATIVE 6 Soft-Lined Full Improvement with Detention	Provide 100-year crossings and 225' ave. channel. Low velocities. Stepped walls for steep slopes.	Existing riprap-lined channel with soft-lining between low rock walls on steep overbanks.	Complete continuous multi-use trail along channel through existing park.	$4,200,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate overbank areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	Remove 1 commercial building. Acquire 175' ave. corridor through commercial/ industrial. Access along existing public corridor through park.
ALTERNATIVE 7 Soft-Lined Side Slopes Only Improvement With Crossing Maintenance	Limited increased channel capacity, crossings not increased. 225' ave. channel. Moderate velocities. Stepped walls for steep slopes.	Existing riprap-lined channel with soft-lining between low rock walls on steep overbanks.	Complete continuous multi-use trail along channel through existing park.	$3,700,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate overbank areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection for utilities.	Acquire 175' ave. corridor through commercial/ industrial. Access along existing public corridor through park.

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FIGURE 37

SHOOKS RUN
ALTERNATIVE EVALUATION MATRIX

REACH 3 - COSTILLA STREET TO BOULDER STREET

COMMUNITY AND D.B.P.S. GOALS

	PUBLIC SAFETY AND WELFARE	AESTHETICS	RECREATION	CAPITAL COST	POLLUTANT CONTROL	ENVIRONMENTAL	DRAINAGEWAY CLEAN-UP	INFRASTRUCTURE PROTECTION	LANDUSE
ALTERNATIVE 1 Reactive Maintenance Only	Correct serious or threatening problems on an as-needed basis.	No change.	No change.	$0	No change.	No change.	No change.	No change.	Acquire R.O.W. on as-needed basis.
ALTERNATIVE 2 Proactive Maintenance Program	Remove high-risk vegetation only. Spot erosion protection. Provide adequate inverts, embankments and guardrails at crossings. Early warning and evacuation plan. 65' ave. channel. Little hydraulic change.	Buried spot erosion protection in channel and at crossing embankments.	Complete continuous multi-use trail along channel.	$1,400,000	Identify for clean-up by property owner.	Mitigate areas disturbed by maintenance.	Remove large debris and trash only.	Repairs and erosion protection at crossings. Erosion protection and reconstruction of utilities.	Acquire 75' ave. corridor through residential and commercial/industrial. Limited existing public corridor through park.
ALTERNATIVE 3 Soft-Lined Full Improvement	Provide 100-year crossings and 235' ave. channel. Low velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Complete continuous multi-use trail along channel.	$21,500,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 17 residences and 17 commercial/industrial buildings. Acquire 265' ave. corridor through residential, commercial/industrial and school.
ALTERNATIVE 4 Structural Full Improvement	Provide 100-year crossings and 105' ave. channel. High velocities. Stepped walls for steep slopes.	Vertical walled, concrete lined channel with soft-lining between moderate concrete walls on overbanks.	Complete continuous multi-use trail along channel.	$17,100,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate overbank areas disturbed with soft-lining between stepped walls.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 6 residences and 8 commercial/industrial buildings. Acquire 135' ave. corridor through residential, commercial/industrial and school.
ALTERNATIVE 5 Soft-Lined Full Improvement with Diversion	Provide 100-year crossings and 205' ave. channel. Low velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Complete continuous multi-use trail along channel.	$19,700,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 13 residences and 16 commercial/industrial buildings. Acquire 235' ave. corridor through residential, commercial/industrial and school.
ALTERNATIVE 6 Soft-Lined Full Improvement with Detention	Provide 100-year crossings and 210' ave. channel. Low velocities. Stepped walls for steep slopes. 54 AF detention pond Kiowa to Platte.	Soft-lined channel with low rock walls.	Neighborhood park in detention pond. Complete continuous multi-use trail along channel and through pond.	$19,600,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining. Additional areas of soft-lining in detention pond.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 35 residences and 16 commercial/industrial buildings. Acquire 240' ave. corridor through residential, commercial/industrial and school.
ALTERNATIVE 7 Soft-Lined Side Slopes Only Improvement With Crossing Maintenance	Limited increased channel capacity, crossings not increased. 135' ave. channel. Moderate velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Complete continuous multi-use trail along channel.	$9,000,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 5 residences and 10 commercial/industrial buildings. Acquire 165' ave. corridor through residential and commercial/ industrial.

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FIGURE 38

SHOOKS RUN
ALTERNATIVE EVALUATION MATRIX

REACH 4 - BOULDER STREET TO CACHE LA POUDRE STREET

COMMUNITY AND D.B.P.S. GOALS

	PUBLIC SAFETY AND WELFARE	AESTHETICS	RECREATION	CAPITAL COST	POLLUTANT CONTROL	ENVIRONMENTAL	DRAINAGEWAY CLEAN-UP	INFRASTRUCTURE PROTECTION	LANDUSE
ALTERNATIVE 1 Reactive Maintenance Only	Correct serious or threatening problems on as-needed basis.	No change.	No change.	$0	No change.	No change.	No change.	No change.	Acquire R.O.W. on as-needed basis.
ALTERNATIVE 2 Proactive Maintenance Program	Remove high-risk vegetation only. Spot erosion protection. Provide adequate inverts, embankments and guardrails at crossings. Early warning and evacuation plan. 90′ ave. channel. Little hydraulic change.	Buried spot erosion protection in channel and at crossing embankments.	Complete continuous multi-use trail along channel through existing park.	$500,000	Identify for clean-up by property owner.	Mitigate areas disturbed by maintenance.	Remove large debris and trash only.	Repairs and erosion protection at crossings. Erosion protection and reconstruction of utilities.	No change. Existing public corridor through park.
ALTERNATIVE 3 Soft-Lined Full Improvement	Provide 100-year crossings and 220′ ave. channel. Low velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Complete continuous multi-use trail along channel through existing park.	$6,600,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 16 residences. Acquire parcels of residential adjacent to existing public corridor. 250′ ave. total width.
ALTERNATIVE 4 Structural Full Improvement	Provide 100-year crossings and 75′ ave. channel. High velocities. Stepped walls for steep slopes.	Vertical walled, concrete lined channel with soft-lining between moderate concrete walls on overbanks.	Complete continuous multi-use trail along channel through existing park.	$4,900,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate overbank areas disturbed with soft-lining between stepped walls.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Acquire parcels of residential adjacent to existing public corridor. 105′ ave. total width.
ALTERNATIVE 5 Soft-Lined Full Improvement with Diversion	Provide 100-year crossings and 170′ ave. channel. Low velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Complete continuous multi-use trail along channel through existing park.	$5,600,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 11 residences. Acquire parcels of residential adjacent to existing public corridor. 200′ ave. total width.
ALTERNATIVE 6 Soft-Lined Full Improvement with Detention	Provide 100-year crossings and 140′ ave. channel. Low velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Complete continuous multi-use trail along channel through existing park.	$4,000,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 4 residences. Acquire parcels of residential adjacent to existing public corridor. 170′ ave. total width
ALTERNATIVE 7 Soft-Lined Side Slopes Only Improvement With Crossing Maintenance	Limited increased channel capacity, crossings not increased. 105′ ave. channel. Moderate velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Complete continuous multi-use trail along channel through existing park.	$3,100,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 1 residence. Acquire parcels of residential adjacent to existing public corridor. 135′ ave. total width.

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FIGURE 39

SHOOKS RUN
ALTERNATIVE EVALUATION MATRIX

REACH 5 - CACHE LA POUDRE STREET TO PATTY JEWETT GOLF COURSE

COMMUNITY AND D.B.P.S. GOALS

	PUBLIC SAFETY AND WELFARE	AESTHETICS	RECREATION	CAPITAL COST	POLLUTANT CONTROL	ENVIRONMENTAL	DRAINAGEWAY CLEAN-UP	INFRASTRUCTURE PROTECTION	LANDUSE
ALTERNATIVE 1 Reactive Maintenance Only	No change.	No change.	No change.	$0	No change.	No change.	No change.	No change.	Acquire R.O.W. on as-needed basis.
ALTERNATIVE 2 Proactive Maintenance Program	Remove high-risk vegetation only. Spot erosion protection. Provide adequate inverts, embankments and guardrails at crossings. Early warning and evacuation plan. 85' ave. channel. Little hydraulic change.	Buried spot erosion protection in channel and at crossing embankments.	Provide continuous multi-use trail along channel.	$800,000	Identify for clean-up by property owner.	Mitigate areas disturbed by maintenance.	Remove large debris and trash only.	Repairs and erosion protection at crossings. Erosion protection of utilities.	Acquire 75' ave. corridor through residential, commercial/industrial and school.
ALTERNATIVE 3 Soft-Lined Full Improvement	Provide 100-year crossings and 245' ave. channel. Low velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Provide continuous multi-use trail along channel.	$12,700,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 30 residences and 4 apartment buildings. Acquire 275' ave. corridor through residential, commercial/industrial and school.
ALTERNATIVE 4 Structural Full Improvement	Provide 100-year crossings and 100' ave. channel. High velocities. Stepped walls for steep slopes.	Vertical walled, concrete lined channel with soft-lining between moderate concrete walls on overbanks.	Provide continuous multi-use trail along channel.	$8,300,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate overbank areas disturbed with soft-lining between stepped walls.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 4 residences. Acquire 130' ave. corridor through residential, commercial/industrial and school.
ALTERNATIVE 5 Soft-Lined Full Improvement with Diversion	Provide 100-year crossings and 205' ave. channel. Low velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Provide continuous multi-use trail along channel.	$10,900,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 21 residences and 4 apartment buildings. Acquire 235' ave. corridor through residential, commercial/industrial and school.
ALTERNATIVE 6 Soft-Lined Full Improvement with Detention	Provide 100-year crossings and 170' ave. channel. Low velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Provide continuous multi-use trail along channel.	$9,300,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 15 residences and 4 apartment buildings. Acquire 200' ave. corridor through residential, commercial/industrial and school.
ALTERNATIVE 7 Soft-Lined Side Slopes Only Improvement With Crossing Maintenance	Limited increased channel capacity, crossings not increased. 165' ave. channel. Moderate velocities. Stepped walls for steep slopes.	Soft-lined channel with low rock walls.	Provide continuous multi-use trail along channel.	$9,200,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection and reconstruction of utilities.	Remove 17 residences and 3 apartment buildings. Acquire 195' ave. corridor through residential, commercial/industrial and school.

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FIGURE 40

SHOOKS RUN
ALTERNATIVE EVALUATION MATRIX

REACH 6 - PATTY JEWETT GOLF COURSE

COMMUNITY AND D.B.P.S. GOALS

	PUBLIC SAFETY AND WELFARE	AESTHETICS	RECREATION	CAPITAL COST	POLLUTANT CONTROL	ENVIRONMENTAL	DRAINAGEWAY CLEAN-UP	INFRASTRUCTURE PROTECTION	LANDUSE
ALTERNATIVE 1 Reactive Maintenance Only	No change.	No change.	No change.	$0	No change.	No change.	No change.	No change.	No change. Existing public area.
ALTERNATIVE 2 Proactive Maintenance Program	Remove high-risk vegetation only. Spot erosion protection. Provide adequate embankments and guardrails at crossings. Repair existing concrete lining. Early warning and evacuation plan. 50′ ave. channel. Little hydraulic change.	Buried spot erosion protection in channel and at crossing embankments.	Existing golf course.	$200,000	Identify for clean-up by property owner.	Mitigate areas disturbed by maintenance.	Remove large debris and trash only.	Repairs and erosion protection at crossings. Repairs to channel lining. Erosion protection of utilities.	No change. Existing public area.
ALTERNATIVE 3 Soft-Lined Full Improvement	Provide 100-year crossings and 245′ ave. channel. Low velocities. Flatten steep slopes.	Soft-lined channel with low rock walls for low flow channel.	Regrading of golf course along channel improvements.	$2,800,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	No change. Existing public area.
ALTERNATIVE 4 Structural Full Improvement	Provide 100-year crossings and 60′ ave. channel. High velocities. Stepped walls for steep slopes.	Vertical walled and trapezoidal concrete-lined channel with soft-lining between moderate concrete walls on overbanks.	Regrading of golf course along channel improvements.	$4,600,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate overbank areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	No change. Existing public area.
ALTERNATIVE 5 Soft-Lined Full Improvement with Diversion	Provide 100-year crossings and 235′ ave. channel. Low velocities. Flatten steep slopes.	Soft-lined channel with low rock walls for low flow channel, and existing grass-lined channel.	Regrading of golf course along channel improvements.	$2,200,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	No change. Existing public area.
ALTERNATIVE 6 Soft-Lined Full Improvement with Detention	Provide 100-year crossings and 200′ ave. channel. Low velocities. 363 AF detention pond in south golf course. Flatten steep slopes	Soft-lined channel with low rock walls for low flow channel. Detention pond.	Reconstruction of portion of golf course in detention pond bottom.	$7,600,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining. Additional areas of soft-lining in detention pond.	Clean-up as part of construction.	Erosion protection of utilities.	No change. Existing public area.
ALTERNATIVE 7 Soft-Lined Side Slopes Only Improvement With Crossing Maintenance	Limited increased channel capacity, crossings not increased. 315′ ave. channel. Moderate velocities. Flatten steep slopes.	Soft-lined channel with low rock walls for low flow channel, existing concrete-lined channel and existing grass-lined channel.	Regrading of golf course along channel improvements.	$1,400,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	No change. Existing public area.

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FIGURE 41

SHOOKS RUN
ALTERNATIVE EVALUATION MATRIX

REACH 7 - PATTY JEWETT GOLF COURSE TO VAN BUREN CHANNEL DIVERSION

COMMUNITY AND D.B.P.S. GOALS

	PUBLIC SAFETY AND WELFARE	AESTHETICS	RECREATION	CAPITAL COST	POLLUTANT CONTROL	ENVIRONMENTAL	DRAINAGEWAY CLEAN-UP	INFRASTRUCTURE PROTECTION	LANDUSE
ALTERNATIVE 1 Reactive Maintenance Only	No change.	No change.	No change.	$0	No change.	No change.	No change.	No change.	Acquire R.O.W. on as-needed basis.
ALTERNATIVE 2 Proactive Maintenance Program	Remove high-risk vegetation only. Spot erosion protection. Provide adequate embankments and guardrails at crossings. Early warning and evacuation plan. 35′ ave. channel. Little hydraulic change.	Buried spot erosion protection in channel and at crossing embankments.	Provide continuous multi-use trail along top of bank.	$400,000	Identify for clean-up by property owner.	Mitigate areas disturbed by maintenance.	Remove large debris and trash only.	Repairs and erosion protection at crossings. Erosion protection of utilities.	Acquire parcels of residential and commercial adjacent to existing public corridor. 50′ ave. total width.
ALTERNATIVE 3 Soft-Lined Full Improvement	Provide 100-year crossings and 80′ ave. channel. Low velocities.	Soft-lined channel with low rock walls for low flow channel.	Provide continuous multi-use trail along channel.	$4,800,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	Remove 15 residences and 2 commercial buildings. Acquire parcels of residential, commercial & church adjacent to existing public corridor. 110′ ave total width.
ALTERNATIVE 4 Structural Full Improvement	Provide 100-year crossings and 35′ ave. channel. High velocities.	Vertical walled, concrete lined channel.	Provide continuous multi-use trail along channel.	$3,700,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate overbank areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	Remove 11 residences. Acquire parcels of residential, commercial & church adjacent to existing public corridor. 65′ ave. total width.
ALTERNATIVE 5 Soft-Lined Full Improvement with Diversion	Routine maintenance for Shooks Run. 35′ ave channel. Low velocities. Hard-lined 25′ ave. channel for Van Buren channel. High velocities.	Trapezoidal grass-lined channel for Shooks Run. Trapezoidal & vertical walled, concrete-lined channel for Van Buren channel.	No change.	$5,500,000	Identify for clean-up by property owner.	No change.	Clean-up as part of construction.	Erosion protection of utilities.	No change.
ALTERNATIVE 6 Soft-Lined Full Improvement with Detention	Provide 100-year crossings and 80′ ave. channel. Low velocities.	Soft-lined channel with low rock walls for low flow channel.	Provide continuous multi-use trail along channel.	$4,800,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	Remove 15 residences and 2 commercial buildings. Acquire parcels of residential, commercial & church adjacent to existing public corridor. 110′ ave. total width.
ALTERNATIVE 7 Soft-Lined Side Slopes Only Improvement With Crossing Maintenance	Limited increased channel capacity, crossings not increased. 35′ ave. channel. Moderate velocities. Riprap for steep slopes.	Soft-lined channel (over riprap slopes).	Provide continuous multi-use trail along channel.	$1,600,000	Identify for clean-up by property owner.	Remove all but select vegetation. Mitigate areas disturbed with soft-lining.	Clean-up as part of construction.	Erosion protection of utilities.	Remove 11 residences. Acquire parcels of residential and commercial adjacent to existing public corridor. 50′ ave. total width.

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FIGURE 42
SHOOKS RUN - ALTERNATIVE EVALUATION SUMMARY
REACH 1 - FOUNTAIN CREEK TO ABANDONED RAILROAD CROSSING

	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7
PUBLIC SAFETY AND WELFARE							
Minimizes Flood Damage to Private Property	○	◒	●	●	●	●	◒
Minimizes Flood Damage to Public Property	○	◒	●	●	●	●	◒
Minimizes Bank Erosion & Bank Sloughing	○	◒	●	●	●	●	●
Minimizes Injury & Loss of Life	○	○	●	●	●	●	◒
Minimizes Safety Hazard - Water Contact	○	○	●	●	●	●	◒
AESTHETICS							
Utilizes Quality & Compatible Materials	○	◒	●	◒	●	●	●
Provides Beautification	◒	◒	●	◒	●	●	●
Provides Passive Recreation	◒	○	●	◒	●	●	●
Establishes Buffer Zones	○	◒	●	●	●	●	●
SOCIAL AND RECREATIONAL							
Provides Multi-Use Trail	◒	●	●	●	●	●	●
Provides Active Recreation Area	◒	●	●	●	●	●	●
Provides Education/Interpretive Opportunities	○	●	●	●	●	●	●
Provides Access to Corridor	◒	●	●	●	●	●	●
COST							
Minimizes Capital Cost	$0.0M	$0.3M	$2.8M	$2.6M	$2.8M	$2.2M	$1.6M
Minimizes Operations & Maintenance Cost	○	◒	●	●	●	●	●
STORMWATER POLLUTION							
Controls Stormwater Pollutants	○	◒	◒	◒	◒	◒	◒
WETLANDS, RIPARIAN AREAS AND WILDLIFE							
Stabilizes Channel	○	◒	●	●	●	●	●
Preserves Aquatic Habitat	●	◒	○	○	○	○	○
Preserves Riparian Habitat	●	◒	○	○	○	○	○
Preserves Upland Habitat	●	◒	○	○	○	○	◒
Protects Groundwater Level	○	○	●	●	●	●	●
Minimizes Construction & Maintenance Impacts	●	◒	○	◒	○	○	◒
DRAINAGEWAY CLEAN-UP							
Provides General Drainageway Clean-Up	○	●	●	●	●	●	●
INFRASTRUCTURE							
Protects Existing Infrastructure	○	◒	●	●	●	●	◒
LANDUSE							
Preserves/Enhances Historic/Cultural Features	●	●	○	○	○	○	○
Promotes Community Pride & Stewardship	○	◒	◒	◒	◒	◒	◒
Preserves/ Enhances Neighborhoods	●	●	◒	◒	◒	◒	◒
Minimizes Acquisition of Private Property	●	◒	○	◒	○	○	◒
Preserves/Enhances Property Value	◒	◒	●	◒	●	●	◒

RECOMMENDATION - ALTERNATIVE 2

FIGURE 43
SHOOKS RUN - ALTERNATIVE EVALUATION SUMMARY
REACH 2 - ABANDONED RAILROAD CROSSING TO COSTILLA STREET

	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7
PUBLIC SAFETY AND WELFARE							
Minimizes Flood Damage to Private Property	◒	◒	●	●	●	●	◒
Minimizes Flood Damage to Public Property	◒	◒	●	●	●	●	◒
Minimizes Bank Erosion & Bank Sloughing	○	◒	●	●	●	●	●
Minimizes Injury & Loss of Life	◒	◒	●	●	●	●	◒
Minimizes Safety Hazard - Water Contact	◒	◒	●	●	●	●	◒
AESTHETICS							
Utilizes Quality & Compatible Materials	○	◒	●	◒	●	●	●
Provides Beautification	◒	◒	●	◒	●	●	●
Provides Passive Recreation	◒	○	●	◒	●	●	●
Establishes Buffer Zones	○	◒	●	●	●	●	●
SOCIAL AND RECREATIONAL							
Provides Multi-Use Trail	●	●	●	●	●	●	●
Provides Active Recreation Area	●	●	●	●	●	●	●
Provides Education/Interpretive Opportunities	●	●	●	●	●	●	●
Provides Access to Corridor	●	●	●	●	●	●	●
COST							
Minimizes Capital Cost	$0.0M	$0.5M	$4.7M	$4.2M	$4.7M	$4.2M	$3.7M
Minimizes Operations & Maintenance Cost	○	◒	●	●	●	●	●
STORMWATER POLLUTION							
Controls Stormwater Pollutants	○	◒	◒	◒	◒	◒	◒
WETLANDS, RIPARIAN AREAS AND WILDLIFE							
Stabilizes Channel	○	◒	●	●	●	●	●
Preserves Aquatic Habitat	●	◒	○	○	○	○	○
Preserves Riparian Habitat	●	◒	○	○	○	○	○
Preserves Upland Habitat	●	◒	○	○	○	○	◒
Protects Groundwater Level	○	○	●	●	●	●	●
Minimizes Construction & Maintenance Impacts	●	◒	○	◒	○	○	◒
DRAINAGEWAY CLEAN-UP							
Provides General Drainageway Clean-Up	○	●	●	●	●	●	●
INFRASTRUCTURE							
Protects Existing Infrastructure	○	◒	●	●	●	●	◒
LANDUSE							
Preserves/Enhances Historic/Cultural Features	●	●	○	○	○	○	○
Promotes Community Pride & Stewardship	●	◒	◒	◒	◒	◒	◒
Preserves/ Enhances Neighborhoods	●	●	◒	◒	◒	◒	◒
Minimizes Acquisition of Private Property	●	◒	○	◒	○	○	◒
Preserves/Enhances Property Value	◒	◒	●	◒	●	●	◒

RECOMMENDATION - ALTERNATIVE 1

FIGURE 44
SHOOKS RUN - ALTERNATIVE EVALUATION SUMMARY
REACH 3 - COSTILLA STREET TO BOULDER STREET

	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7
PUBLIC SAFETY AND WELFARE							
Minimizes Flood Damage to Private Property	○	◒	●	●	●	●	◒
Minimizes Flood Damage to Public Property	○	◒	●	●	●	●	◒
Minimizes Bank Erosion & Bank Sloughing	○	◒	●	●	●	●	●
Minimizes Injury & Loss of Life	○	○	●	●	●	●	◒
Minimizes Safety Hazard - Water Contact	○	○	●	●	●	●	◒
AESTHETICS							
Utilizes Quality & Compatible Materials	○	◒	●	◒	●	●	●
Provides Beautification	◒	◒	●	◒	●	●	●
Provides Passive Recreation	◒	○	●	◒	●	●	●
Establishes Buffer Zones	○	◒	●	●	●	●	●
SOCIAL AND RECREATIONAL							
Provides Multi-Use Trail	◒	●	●	●	●	●	●
Provides Active Recreation Area	○	●	●	●	●	●	●
Provides Education/Interpretive Opportunities	◒	●	●	●	●	●	●
Provides Access to Corridor	◒	●	●	●	●	●	●
COST							
Minimizes Capital Cost	$0.0M	$1.4M	$21.5M	$17.1M	$19.7M	$19.6M	$9.0M
Minimizes Operations & Maintenance Cost	○	◒	●	●	●	●	●
STORMWATER POLLUTION							
Controls Stormwater Pollutants	○	◒	◒	◒	◒	◒	◒
WETLANDS, RIPARIAN AREAS AND WILDLIFE							
Stabilizes Channel	○	◒	●	●	●	●	●
Preserves Aquatic Habitat	●	◒	○	○	○	○	○
Preserves Riparian Habitat	●	◒	○	○	○	○	○
Preserves Upland Habitat	●	◒	○	○	○	○	◒
Protects Groundwater Level	○	○	●	●	●	●	●
Minimizes Construction & Maintenance	●	◒	○	◒	○	○	◒
DRAINAGEWAY CLEAN-UP							
Provides General Drainageway Clean-Up	○	●	●	●	●	●	●
INFRASTRUCTURE							
Protects Existing Infrastructure	○	◒	●	●	●	●	◒
LANDUSE							
Preserves/Enhances Historic/Cultural Features	●	●	○	○	○	○	○
Promotes Community Pride & Stewardship	○	◒	◒	◒	◒	◒	◒
Preserves/ Enhances Neighborhoods	●	●	◒	◒	◒	◒	◒
Minimizes Acquisition of Private Property	●	◒	○	◒	○	○	◒
Preserves/Enhances Property Value	◒	◒	●	●	●	●	◒

RECOMMENDATION – ALTERNATIVE 4

FIGURE 45
SHOOKS RUN - ALTERNATIVE EVALUATION SUMMARY
REACH 4 - BOULDER STREET TO CACHE LA POUDRE STREET

	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7
PUBLIC SAFETY AND WELFARE							
Minimizes Flood Damage to Private Property	●	●	●	●	●	●	◒
Minimizes Flood Damage to Public Property	○	◒	●	●	●	●	◒
Minimizes Bank Erosion & Bank Sloughing	○	◒	●	●	●	●	●
Minimizes Injury & Loss of Life	○	◒	●	●	●	●	◒
Minimizes Safety Hazard - Water Contact	●	●	●	●	●	●	◒
AESTHETICS							
Utilizes Quality & Compatible Materials	●	●	●	◒	●	●	●
Provides Beautification	●	●	●	◒	●	●	●
Provides Passive Recreation	●	●	●	◒	●	●	●
Establishes Buffer Zones	●	●	●	●	●	●	●
SOCIAL AND RECREATIONAL							
Provides Multi-Use Trail	●	●	●	●	●	●	●
Provides Active Recreation Area	●	●	●	●	●	●	●
Provides Education/Interpretive Opportunities	●	●	●	●	●	●	●
Provides Access to Corridor	●	●	●	●	●	●	●
COST							
Minimizes Capital Cost	$0.0M	$0.5M	$6.6M	$4.9M	$5.6M	$4.0M	$3.1M
Minimizes Operations & Maintenance Cost	○	◒	●	●	●	●	●
STORMWATER POLLUTION							
Controls Stormwater Pollutants	○	◒	◒	◒	◒	◒	◒
WETLANDS, RIPARIAN AREAS AND WILDLIFE							
Stabilizes Channel	○	◒	●	●	●	●	●
Preserves Aquatic Habitat	●	◒	○	○	○	○	○
Preserves Riparian Habitat	●	◒	○	○	○	○	○
Preserves Upland Habitat	●	◒	○	○	○	○	◒
Protects Groundwater Level	○	○	●	●	●	●	●
Minimizes Construction & Maintenance Impacts	●	◒	○	◒	○	○	◒
DRAINAGEWAY CLEAN-UP							
Provides General Drainageway Clean-Up	○	●	●	●	●	●	●
INFRASTRUCTURE							
Protects Existing Infrastructure	○	◒	●	●	●	●	◒
LANDUSE							
Preserves/Enhances Historic/Cultural Features	●	●	○	○	○	○	○
Promotes Community Pride & Stewardship	○	◒	◒	◒	◒	◒	◒
Preserves/ Enhances Neighborhoods	●	●	◒	◒	◒	◒	◒
Minimizes Acquisition of Private Property	●	◒	○	◒	○	○	◒
Preserves/Enhances Property Value	◒	◒	●	◒	●	●	◒

RECOMMENDATION – ALTERNATIVE 2

FIGURE 46
SHOOKS RUN - ALTERNATIVE EVALUATION SUMMARY
REACH 5 - CACHE LA POUDRE STREET TO PATTY JEWETT GOLF COURSE

	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7
PUBLIC SAFETY AND WELFARE							
Minimizes Flood Damage to Private Property	○	◒	●	●	●	●	◒
Minimizes Flood Damage to Public Property	○	◒	●	●	●	●	◒
Minimizes Bank Erosion & Bank Sloughing	○	◒	●	●	●	●	●
Minimizes Injury & Loss of Life	○	○	●	●	●	●	◒
Minimizes Safety Hazard - Water Contact	○	○	●	●	●	●	◒
AESTHETICS							
Utilizes Quality & Compatible Materials	○	◒	●	◒	●	●	●
Provides Beautification	◒	○	●	◒	●	●	●
Provides Passive Recreation	◒	◒	●	◒	●	●	●
Establishes Buffer Zones	○	◒	●	●	●	●	●
SOCIAL AND RECREATIONAL							
Provides Multi-Use Trail	◒	●	●	●	●	●	●
Provides Active Recreation Area	○	●	●	●	●	●	●
Provides Education/Interpretive Opportunities	◒	●	●	●	●	●	●
Provides Access to Corridor	◒	●	●	●	●	●	●
COST							
Minimizes Capital Cost	$0.0M	$0.8M	$12.7M	$8.3M	$10.9M	$9.3M	$9.2M
Minimizes Operations & Maintenance Cost	○	◒	●	●	●	●	●
STORMWATER POLLUTION							
Controls Stormwater Pollutants	○	◒	◒	◒	◒	◒	◒
WETLANDS, RIPARIAN AREAS AND WILDLIFE							
Stabilizes Channel	○	◒	●	●	●	●	●
Preserves Aquatic Habitat	●	◒	○	○	○	○	○
Preserves Riparian Habitat	●	◒	○	○	○	○	○
Preserves Upland Habitat	●	◒	○	○	○	○	◒
Protects Groundwater Level	○	○	●	●	●	●	●
Minimizes Construction & Maintenance Impacts	●	◒	○	◒	○	○	○
DRAINAGEWAY CLEAN-UP							
Provides General Drainageway Clean-Up	○	●	●	●	●	●	●
INFRASTRUCTURE							
Protects Existing Infrastructure	○	◒	●	●	●	●	◒
LANDUSE							
Preserves/Enhances Historic/Cultural Features	●	●	○	○	○	○	○
Promotes Community Pride & Stewardship	○	◒	◒	◒	◒	◒	◒
Preserves/ Enhances Neighborhoods	●	●	◒	◒	◒	◒	◒
Minimizes Acquisition of Private Property	●	◒	○	◒	○	○	○
Preserves/Enhances Property Value	◒	◒	●	◒	●	●	◒

RECOMMENDATION - ALTERNATIVE 7

FIGURE 47
SHOOKS RUN - ALTERNATIVE EVALUATION SUMMARY
REACH 6 - PATTY JEWETT GOLF COURSE

	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7
PUBLIC SAFETY AND WELFARE							
Minimizes Flood Damage to Private Property	○	○	○	○	○	○	○
Minimizes Flood Damage to Public Property	○	◒	●	●	●	●	◒
Minimizes Bank Erosion & Bank Sloughing	○	◒	●	●	●	●	●
Minimizes Injury & Loss of Life	○	○	●	●	●	●	◒
Minimizes Safety Hazard - Water Contact	○	○	●	●	●	●	◒
AESTHETICS							
Utilizes Quality & Compatible Materials	○	◒	●	◒	●	●	●
Provides Beautification	◒	◒	●	◒	●	●	●
Provides Passive Recreation	◒	○	●	◒	●	●	●
Establishes Buffer Zones	○	○	○	○	○	○	○
SOCIAL AND RECREATIONAL							
Provides Multi-Use Trail	○	○	○	○	○	○	○
Provides Active Recreation Area	●	●	●	●	●	●	●
Provides Education/Interpretive Opportunities	○	○	○	○	○	○	○
Provides Access to Corridor	○	○	○	○	○	○	○
COST							
Minimizes Capital Cost	$0.0M	$0.2M	$2.8M	$4.6M	$2.2M	$7.6M	$1.4M
Minimizes Operations & Maintenance Cost	○	◒	●	●	●	●	●
STORMWATER POLLUTION							
Controls Stormwater Pollutants	○	◒	◒	◒	◒	◒	◒
WETLANDS, RIPARIAN AREAS AND WILDLIFE							
Stabilizes Channel	○	◒	●	●	●	●	●
Preserves Aquatic Habitat	●	◒	○	○	○	○	○
Preserves Riparian Habitat	●	◒	○	○	○	○	○
Preserves Upland Habitat	●	◒	○	○	○	○	◒
Protects Groundwater Level	○	○	●	●	●	●	●
Minimizes Construction & Maintenance Impacts	●	◒	○	◒	○	○	○
DRAINAGEWAY CLEAN-UP							
Provides General Drainageway Clean-Up	○	◒	●	●	●	●	●
INFRASTRUCTURE							
Protects Existing Infrastructure	○	◒	●	●	●	●	◒
LANDUSE							
Preserves/Enhances Historic/Cultural Features	○	○	○	○	○	○	○
Promotes Community Pride & Stewardship	○	○	○	○	○	○	○
Preserves/ Enhances Neighborhoods	○	○	○	○	○	○	○
Minimizes Acquisition of Private Property	○	○	○	○	○	○	○
Preserves/Enhances Property Value	○	◒	●	●	●	●	◒

RECOMMENDATION - ALTERNATIVE 2

FIGURE 48
SHOOKS RUN - ALTERNATIVE EVALUATION SUMMARY
REACH 7 - PATTY JEWETT GOLF COURSE TO VAN BUREN CHANNEL DIVERSION

	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6	ALT 7
PUBLIC SAFETY AND WELFARE							
Minimizes Flood Damage to Private Property	○	◒	●	●	●	●	◒
Minimizes Flood Damage to Public Property	○	◒	●	●	●	●	◒
Minimizes Bank Erosion & Bank Sloughing	○	◒	●	●	●	●	●
Minimizes Injury & Loss of Life	○	○	●	●	●	●	◒
Minimizes Safety Hazard - Water Contact	○	○	●	●	●	●	◒
AESTHETICS							
Utilizes Quality & Compatible Materials	○	◒	●	◒	○	●	●
Provides Beautification	◒	◒	●	◒	○	●	●
Provides Passive Recreation	◒	○	●	◒	○	●	●
Establishes Buffer Zones	○	◒	●	●	○	●	●
SOCIAL AND RECREATIONAL							
Provides Multi-Use Trail	◒	●	●	●	○	●	●
Provides Active Recreation Area	○	●	●	●	○	●	●
Provides Education/Interpretive Opportunities	◒	●	●	●	○	●	●
Provides Access to Corridor	◒	●	●	●	○	●	●
COST							
Minimizes Capital Cost	$0.0M	$0.4M	$4.8M	$3.7M	$5.5M	$4.8M	$1.6M
Minimizes Operations & Maintenance Cost	○	◒	●	●	●	●	●
STORMWATER POLLUTION							
Controls Stormwater Pollutants	○	◒	◒	◒	◒	◒	◒
WETLANDS, RIPARIAN AREAS AND WILDLIFE							
Stabilizes Channel	○	◒	●	●	○	●	●
Preserves Aquatic Habitat	●	◒	○	○	●	○	○
Preserves Riparian Habitat	●	◒	○	○	●	○	○
Preserves Upland Habitat	●	◒	○	○	●	○	◒
Protects Groundwater Level	○	○	●	●	●	◒	●
Minimizes Construction & Maintenance Impacts	●	◒	○	◒	●	○	◒
DRAINAGEWAY CLEAN-UP							
Provides General Drainageway Clean-Up	○	●	●	●	○	●	●
INFRASTRUCTURE							
Protects Existing Infrastructure	○	◒	●	●	●	●	◒
LANDUSE							
Preserves/Enhances Historic/Cultural Features	●	●	○	○	●	○	○
Promotes Community Pride & Stewardship	○	◒	◒	◒	◒	◒	◒
Preserves/ Enhances Neighborhoods	○	●	◒	◒	◒	◒	◒
Minimizes Acquisition of Private Property	●	◒	○	◒	●	○	◒
Preserves/Enhances Property Value	○	◒	●	◒	●	●	◒

RECOMMENDATION - ALTERNATIVE 4

VII. RECOMMENDED IMPROVEMENTS

VII. RECOMMENDED IMPROVEMENTS

Preliminary Design Plans

The Preliminary Design Plans (Figures 49-56) illustrate the recommended improvements for Shooks Run. The drawings represent preliminary and conceptual engineering that is subject to change, and are not suitable for construction purposes. The existing condition 100-year floodplain and the future fully developed condition 100-year floodplain with the recommended improvements are shown on the drawings.

Recommended Improvements Description

A. **Reach 1 - Fountain Creek to Abandoned Railroad Crossing (Figure 49)**

Proactive maintenance will be done along the channel in this reach. This maintenance will include removal of all dead, dying, fallen, and high-risk vegetation and all debris, riprap erosion protection of the existing 60-inch sanitary sewer crossing just upstream of Fountain Creek, and erosion protection of all isolated, unstable areas. The existing bridge at Las Vegas Street will be replaced with a five-barrel, twelve-foot by ten-foot reinforced concrete box culvert. The existing energy dissipator downstream of the Las Vegas Street bridge will be replaced to fit the new Las Vegas Street culvert. Riprap erosion protection will be provided downstream of the new energy dissipator. The existing concrete transition channel, between Las Vegas Street and the A.T.S.F. & D.R.G.W. Railroad will also be replaced to fit the new Las Vegas Street culvert. A multi-use trail will be constructed along this entire channel reach. All areas disturbed by the maintenance and construction activities will be mitigated with new landscaping.

B. **Reach 2 - Abandoned Railroad Crossing to Costilla Street (Figures 49 & 50)**

Reactive maintenance will be done along the channel in this reach. This maintenance will include removal of large trees that fall and block the channel and stabilization of channel banks that fail and threaten existing adjacent buildings or infrastructure. Riprap erosion protection will be provided at the existing pedestrian bridge between the abandoned railroad and Fountain Boulevard and at the existing 18-inch sanitary sewer crossing upstream of the existing pedestrian bridge. The existing culverts at Fountain Boulevard will be replaced with a four-barrel, twelve-foot by ten-foot, reinforced concrete box culvert. The existing culvert at Costilla Street will be replaced with a four-barrel, fourteen-foot by ten-foot reinforced concrete box culvert. Riprap erosion protection will be provided downstream of both of these new culverts. Transitions to the existing channel will also be constructed downstream of both of these new culverts and upstream of the new Fountain Boulevard culvert. The existing multi-use trail along the channel will be extended downstream of Fountain Boulevard to the abandoned railroad. All areas disturbed by the maintenance and construction activities will be mitigated with new landscaping.

C. **Reach 3 - Costilla Street to Boulder Street (Figures 50-52)**

Structural full improvements will be constructed for the channel along this reach. The channel cross-section will include an earth bottom 50 to 70 feet wide over buried riprap and stepped concrete retaining walls with 20 feet wide benches between the walls. The walls will be about ten feet high. The number of walls on each side of the channel will vary as needed to retain the steep existing side-slopes. Four low drop structures (about three feet high) will be constructed along the channel bottom between Costilla Street and El Paso Street (south of Pikes Peak Avenue) to provide peak discharge flow velocities at acceptable levels. The existing aerial 18-inch sanitary sewer crossing and the existing aerial eight-inch sanitary sewer crossing between Costilla Street and El Paso Street (south of Pikes Peak Avenue) will be reconstructed across the new structural channel. The existing culvert at El Paso Street (south of Pikes Peak Avenue) will be replaced with a five-barrel, fourteen-foot by ten-foot reinforced concrete box culvert. The existing culvert at Pikes Peak Avenue/El Paso Street (north of Pikes Peak Avenue) will be replaced with a continuous five-barrel, twelve-foot by ten-foot reinforced concrete box culvert. The existing culvert at Kiowa Street will be replaced with a four-barrel, twelve-foot by ten-foot reinforced concrete box culvert. One low drop structure (about three feet high) will also be constructed along the channel bottom between Kiowa Street and Bijou Street. The existing culvert at Bijou Street will be replaced with a four-barrel, twelve-foot by ten-foot reinforced concrete box culvert. The existing culvert at Platte Avenue/the athletic field and the existing bridge at Boulder Street will also be replaced with a continuous four-barrel, twelve-foot by ten-foot reinforced concrete box culvert. Riprap erosion protection will be provided downstream of all the new culverts. A multi-use trail will be constructed along this entire channel reach. All areas disturbed by the construction activities will be mitigated with new landscaping.

D. **Reach 4 - Boulder Street to Cache La Poudre Street (Figures 52 & 53)**

Structural full improvements will be constructed for the channel between Boulder Street and Willamette Street. The channel cross-section will include an earth bottom 45 to 50 feet wide over buried riprap, and stepped concrete retaining walls with 20 feet wide benches between the walls. The walls will be about ten feet high. The number of walls on each side of the channel will vary as needed to retain the steep existing side-slopes. One low drop structure (about three feet high) will be constructed along the channel bottom between Boulder Street and St. Vrain Street to provide peak discharge flow velocities at acceptable levels. The existing culvert at St. Vrain Street will be replaced with a four-barrel, ten-foot by ten-foot reinforced concrete box culvert. One low drop structure (about three feet high) will also be constructed along the channel bottom between St. Vrain Street and Willamette Street. The existing culvert at Willamette Street will be replaced with a three-barrel, ten-foot by ten-foot reinforced concrete box culvert.

Proactive maintenance will be done along the channel between Willamette Street and Cache La Poudre Street. This maintenance will include removal of all dead, dying, fallen, and high-risk vegetation and all debris, riprap erosion protection of the existing pedestrian bridge, and erosion protection of all isolated, unstable areas. The existing culvert at Cache La Poudre Street will be replaced with a three-barrel, twelve-foot by ten-foot reinforced concrete box culvert. Riprap erosion protection will be provided downstream of all the new culverts. Transitions to the existing channel will be provided upstream of the new Willamette Street culvert and downstream of the new Cache La Poudre culvert. A multi-use trail will be constructed along the channel between Boulder Street and Willamette Street. All areas disturbed by the construction and maintenance activities will be mitigated with new landscaping.

E. **Reach 5 - Cache La Poudre Street to Patty Jewett Golf Course (Figures 53 & 54)**

Soft-lined side-slope only improvements will be constructed for the channel along this reach. The channel cross-section will include an earth bottom matching the existing width of ten to twenty feet and stepped rock retaining walls with 20 feet wide benches between the walls. The walls will be about five feet high. The number of walls on each side of the channel will vary as needed to retain the steep existing side slopes. Three low drop structures (about three feet high) will be constructed along the channel bottom between Cache La Poudre Street and Uintah Street to provide peak discharge flow velocities at acceptable levels. The existing culvert at Uintah Street will be replaced with a two-barrel, fourteen-foot by ten-foot reinforced concrete box culvert. One low drop structure (about three feet high) will also be constructed along the channel bottom between Uintah Street and San Miguel Street. The existing culvert at San Miguel Street will be replaced with a two-barrel, fourteen-foot by ten-foot reinforced concrete box culvert. Three low drop structures (about three feet high) will also be constructed along the channel bottom between San Miguel Street and the Patty Jewett Golf Course. The existing pedestrian bridge between San Miguel Street and the Patty Jewett Golf Course will be replaced to span the new improved channel. Riprap erosion protection will be provided downstream of all the new culverts. A transition to the existing channel will be provided at the south boundary of the Patty Jewett Golf Course. A multi-use trail will be constructed along this channel reach. All areas disturbed by the construction activities will be mitigated with new landscaping.

F. **Reach 6 - Patty Jewett Golf Course (Figures 54 & 55)**

Proactive maintenance will be done along the channel in this reach. This maintenance will include removal of all dead, dying, fallen, and high-risk vegetation and all debris, riprap erosion protection at all the existing golf cart bridges downstream of Española Street and upstream of the existing concrete channel lining, erosion protection of all isolated, unstable areas, and repair of the existing concrete channel lining upstream of Española Street. The existing drop structure downstream of Española Street will be reconstructed. The existing culvert at Española Street will be replaced with a three-barrel, ten-foot by ten-foot reinforced concrete box culvert. Riprap erosion protection and a transition to the existing channel will be constructed downstream, and a structural concrete channel transition to the existing concrete channel lining will be constructed upstream of this new culvert. The existing golf cart bridge upstream of Española Street will be replaced to span the new concrete channel transition. A transition to the existing channel will be provided downstream of the new Paseo Road culvert at the north boundary of the golf course. All areas disturbed by the maintenance and construction activities will be mitigated with new landscaping.

G. **Reach 7 - Patty Jewett Golf Course to the Van Buren Channel Diversion (Figures 55 & 56)**

Structural full improvements will be constructed for the channel along this reach. The channel cross-section will include an earth bottom 30 feet wide over buried riprap, and seven feet high concrete retaining walls on each side. The existing culverts at Paseo Road, Jefferson Street, Madison Street, Monroe Street, Jackson Street/church property/LaSalle Street, and the pedestrian path will each be replaced with three-barrel, ten-foot by five-foot reinforced concrete box culverts. A structural concrete channel transition will be constructed between the pedestrian path and the C.R.I.P. Railroad. The existing culverts at the C.R.I.P. Railroad will be replaced with a two-barrel, ten-foot by five-foot reinforced concrete box culvert. Riprap erosion protection will be provided downstream of these new culverts. The existing culvert for the Van Buren channel at Templeton Gap Road will be replaced with a two-barrel, eleven-foot by six-foot reinforced concrete box culvert. A multi-use trail will be constructed along this entire channel reach. All areas disturbed by the construction activities will be mitigated with new landscaping.

Estimate of Probable Construction Costs for Recommended Improvements

The estimates of probable construction costs developed for the various improvement alternatives during the Improvement Alternative Analysis were revised and combined into an estimate of probable construction costs for the recommended improvements included on the Preliminary Design Plans. The following is a summary of the estimate of probable construction costs for the recommended alternatives.

A. Reach 1 - Fountain Creek to the Abandoned Railroad (Proactive Maintenance) - $800,000

B. Reach 2 - Abandoned Railroad to Costilla Street (Reactive Maintenance Only) - $1,400,000

C. Reach 3 - Costilla Street to Boulder Street (Structural Full Improvement) - $17,100,000

D. Reach 4 - Boulder Street to Cache La Poudre Street (Structural Full Improvement/Proactive Maintenance) - $2,900,000

E. Reach 5 - Cache La Poudre Street to Patty Jewett Golf Course (Soft-Lined Side-Slopes Only Improvement) - $9,500,000

F. Reach 6 - Patty Jewett Golf Course (Proactive Maintenance) - $900,000

G. Reach 7 - Paseo Road to Van Buren Channel Diversion (Structural Full Improvement) - $3,700,000

RECOMMENDED ALTERNATIVE TOTAL - $36,300,000

Prioritization of Recommended Improvements

While the City has made no commitment to construct any of the recommended improvements, these improvements for the Shooks Run main channel were prioritized for possible inclusion in the City's Capital Improvement Plan budget process in the future. The recommended improvements were placed in priority groups considering public safety and welfare, damage potential of flooding and slope failure, relative importance of the location or area of the improvement, and relative impact of the improvement. The City may select individual improvements from these priority groups, as needed, for the Capital Improvement Plan in the future. Funding for these improvements may also be through local improvement districts, developers, adjacent property owners, or private parties. The results of this prioritization are included in Table 11.

INUNDATES TRAILER PARK TO 950'± WEST OF CHANNEL

PROACTIVE MAINTENANCE FOUNTAIN CREEK TO LAS VEGAS STREET (INCLUDES MULTI-USE TRAIL)

EROSION PROTECTION DOWNSTREAM OF ENERGY DISSIPATOR

PROACTIVE MAINTENANCE A.T.S.F. & D.R.G.W. RAILROAD TO ABANDONED RAILROAD (INCLUDES MULTI-USE TRAIL)

ORIGINAL SCALE - H. 1"=100' V. 1"=10'

REPLACE EXIST. CULVERTS WITH 4-12'x10' RCB W/HEADWALLS AND WINGWALLS

WAHSATCH AVENUE

REACTIVE MAINTENANCE FOUNTAIN BOULEVARD TO COSTILLA STREET

EROSION PROTECTION DOWNSTREAM OF CULVERT

100-YEAR FLOODPLAIN (WITH IMPROVEMENTS) IS WITHIN CONCRETE TRANSITION CHANNEL

ABANDONED RAILROAD

EROSION PROTECTION AT 18" SANITARY SEWER CROSSING

100-YEAR FLOODPLAIN (WITH IMPROVEMENTS)

MATCHLINE

EROSION PROTECTION AT 60" SANITARY SEWER CROSSING

REPLACE EXIST. CONC. ENERGY DISSIPATOR

REPLACE EXIST. BRIDGE WITH 5-12'x10' RCB W/HEADWALLS AND D/S WINGWALLS

SHOOKS RUN

FOUNTAIN CREEK

GILLETTE STREET

HUGO STREET

MINOR FLOW SPLIT (EXIST)

MINOR FLOW SPLIT

L.A.S. VEGAS ST. & A.T.S.F. & D.R.G.W. RAILROAD

EROSION PROTECTION AT EXISTING PEDESTRIAN BRIDGE

100-YR FLOODPLAIN (EXIST)

CORONA STREET

FOUNTAIN BOULEVARD

REACTIVE MAINTENANCE ABANDONED RAILROAD TO FOUNTAIN BOULEVARD (INCLUDES MULTI-USE TRAIL)

REPLACE EXIST. CONC. TRANSITION CHANNEL

ROYER STREET

ROSEWORTH STREET

SANTA FE STREET

100-YR W.S. (WITH IMPROVEMENTS)

EXIST. Q10 = 3100 cfs
Q100 = 4880 cfs
FUT. Q10 = 4285 cfs
Q100 = 6940 cfs

100-YEAR W.S. (EXIST.)

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EXIST. Q10 = 3050 cfs
Q100 = 4840 cfs
FUT. Q10 = 4250 cfs
Q100 = 6910 cfs

FOUNTAIN CREEK

PROACTIVE MAINTENANCE FOUNTAIN CREEK TO L.A.S. VEGAS STREET (INCLUDES MULTI-USE TRAIL)

EROSION PROTECTION AT 18" SANITARY SEWER CROSSING

100 YR. W.S. (WITH IMPROVEMENTS)

L.A.S. VEGAS ST. & A.T.S.F. & D.R.G.W. RAILROAD

100 YEAR W.S. (EXIST.)

0.3%

END CHANNEL TRANSITION

EXIST. DOUBLE 20'x16.5' CONC. ARCH $Q_{100\ CULV.}$ = 6840 cfs

18%

EXIST. 44'x10' BRIDGE $Q_{100\ BRID.}$ = 5830 cfs $Q_{100\ OVER}$ = 1010 cfs

END DISSIPATOR

REPLACE EXIST. BRIDGE WITH 5-12'x10' RCB @ 0.7%

PROACTIVE MAINTENANCE A.T.S.F. & D.R.G.W. RAILROAD TO ABANDONED RAILROAD (INCLUDES MULTI-USE TRAIL)

ABANDONED RAILROAD

EXIST. DOUBLE 20'x17.9' STONE MASONRY ARCH $Q_{100\ CULV.}$ = 6840 cfs

EROSION PROTECTION AT EXIST. PEDESTRIAN BRIDGE

REACTIVE MAINTENANCE ABANDONED RAILROAD TO FOUNTAIN BOULEVARD (INCLUDES MULTI-USE TRAIL)

EROSION PROTECTION AT 18" SANITARY SEWER CROSSING

EXIST. Q10 = 3015 cfs
Q100 = 4860 cfs
FUT. Q10 = 4195 cfs
Q100 = 6825 cfs

0.4%

25'-00

EXIST. 20'x9.5' CONC. ARCH & 22'x11' CMP. ARCH $Q_{100\ CULV.}$ = 5600 cfs $Q_{100\ OVER}$ = 1280 cfs

END CHANNEL TRANSITION

0.8%

REPLACE EXIST. CULVERTS WITH 4-12'x10' RCB @ 0.7%

REACTIVE MAINTENANCE FOUNTAIN BOULEVARD TO COSTILLA STREET

MATCHLINE

0+00 5+00 10+00 15+00 20+00

5930 5920 5910 5900 5890 5880

NO.	REVISION	DATE	BY

WILSON & COMPANY

SHOOKS RUN
DRAINAGE BASIN PLANNING STUDY
PRELIMINARY DESIGN PLAN

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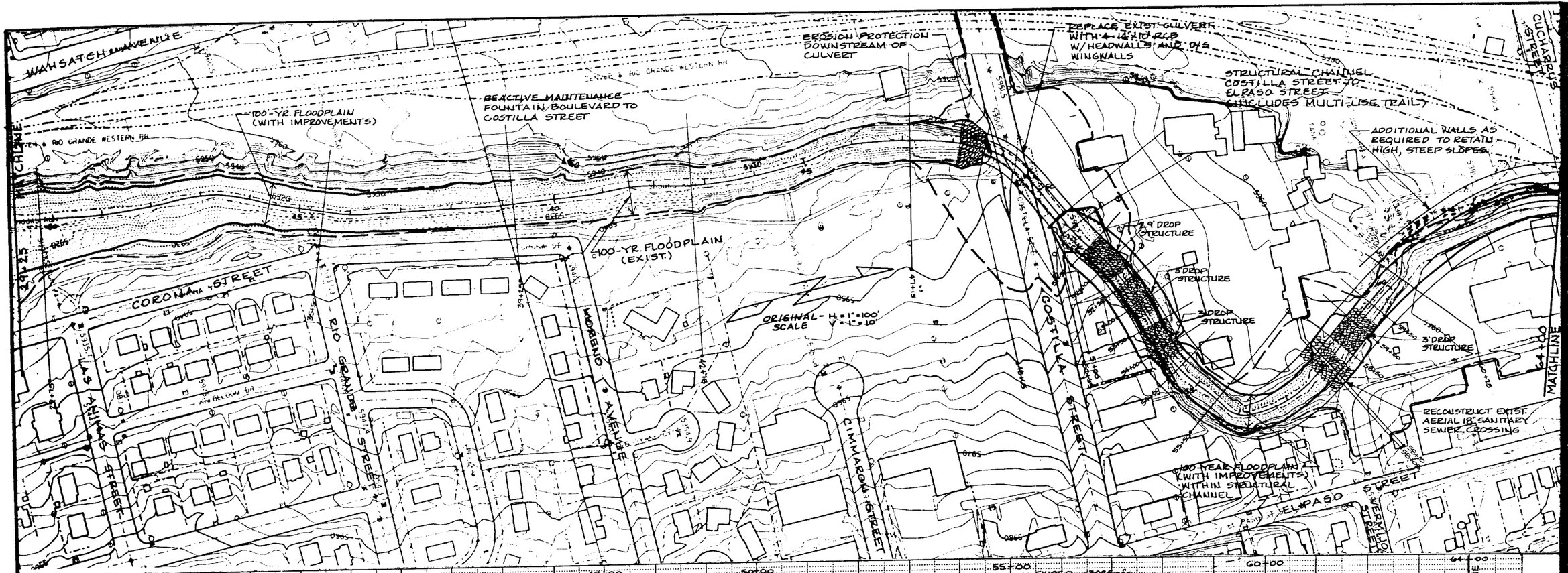
DRAWN	R.H.
DATE	7-93
FILE NO.	90-809
SHEET NO.	FIGURE 49

WILSON & COMPANY
COLORADO SPRINGS, COLORADO



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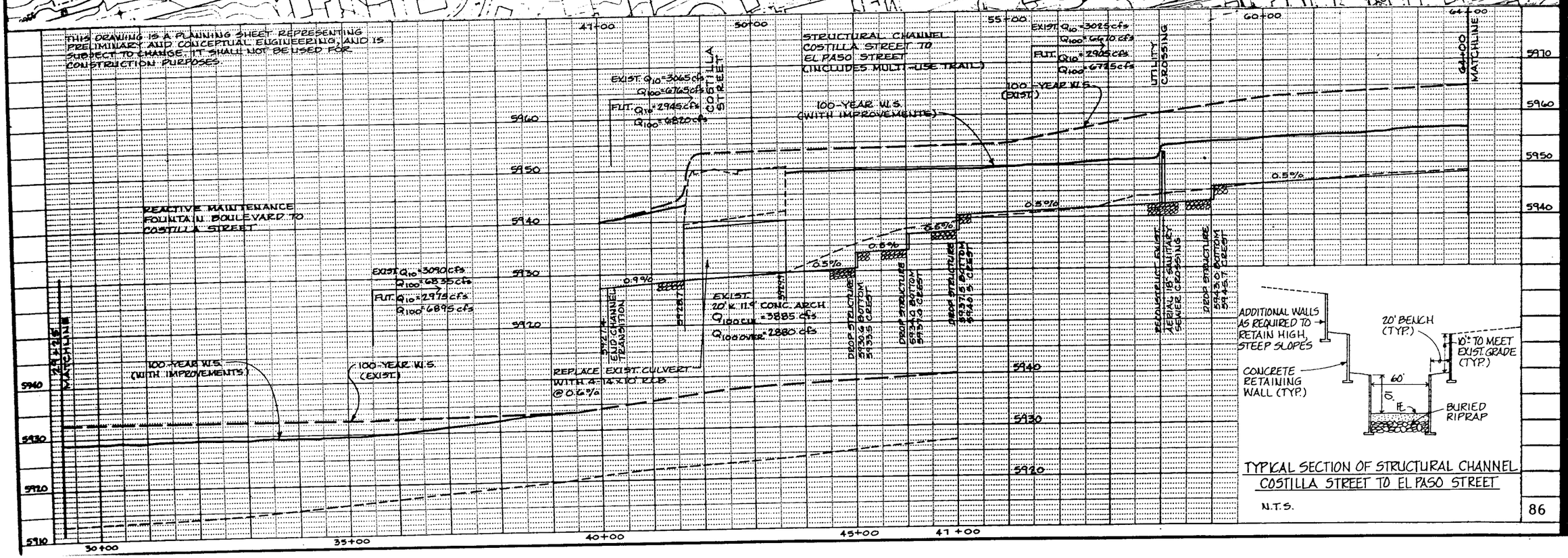

TYPICAL SECTION OF STRUCTURAL CHANNEL COSTILLA STREET TO EL PASO STREET

N.T.S.

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DRAINAGE BASIN PLANNING STUDY

PRELIMINARY DESIGN PLAN

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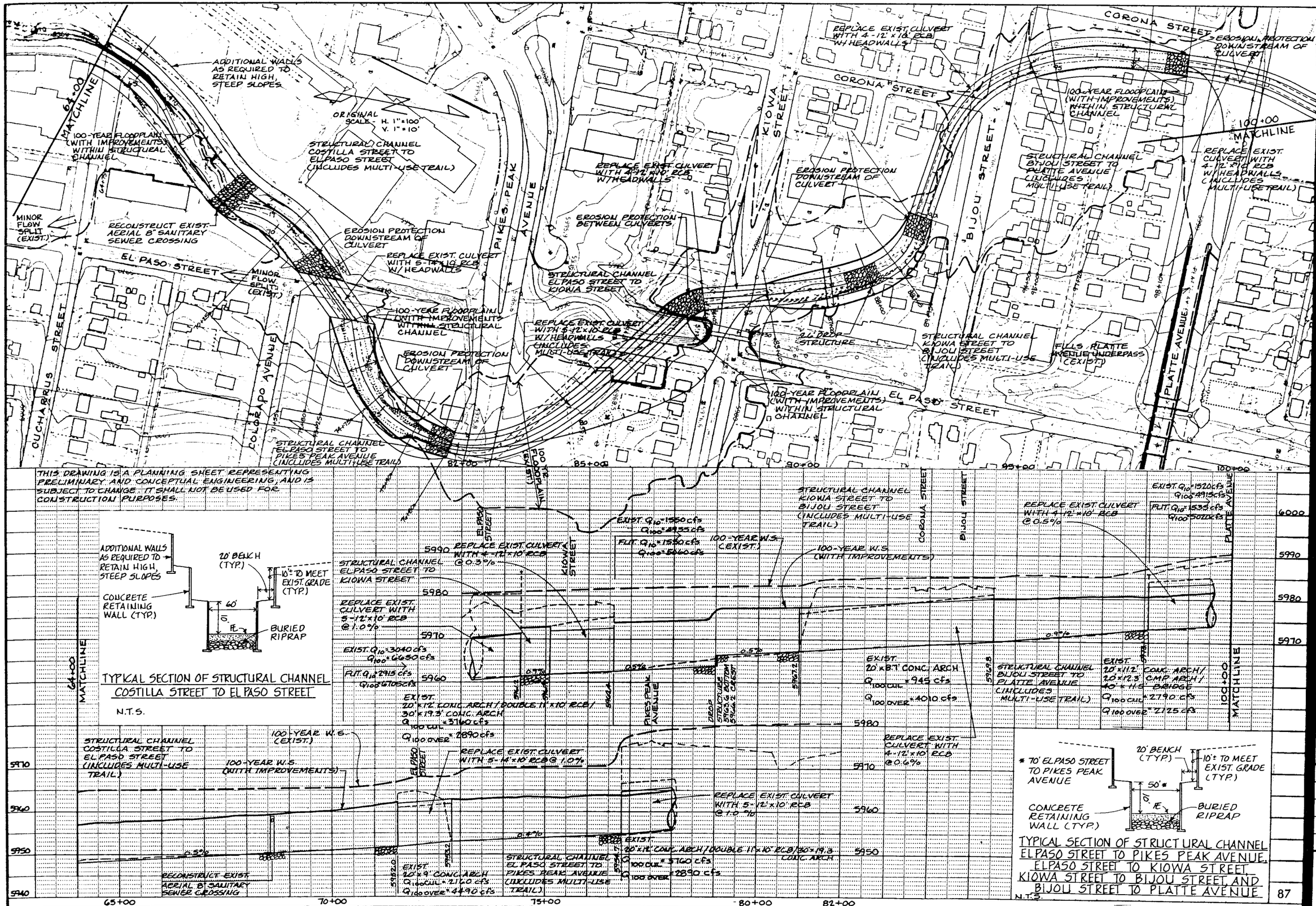
SHEET NO.	FIGURE 50

WILSON & COMPANY
COLORADO SPRINGS, COLORADO



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TYPICAL SECTION OF STRUCTURAL CHANNEL
COSTILLA STREET TO EL PASO STREET

N.T.S.

TYPICAL SECTION OF STRUCTURAL CHANNEL
EL PASO STREET TO PIKES PEAK AVENUE,
EL PASO STREET TO KIOWA STREET,
KIOWA STREET TO BIJOU STREET AND
BIJOU STREET TO PLATTE AVENUE

N.T.S.

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DRAINAGE BASIN PLANNING STUDY

PRELIMINARY DESIGN PLAN

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DATE	7-93
FILE NO.	90-809
SHEET NO.	FIGURE 51

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COLORADO SPRINGS, COLORADO

REPLACE EXIST. CULVERT WITH 4-12'x10' RCB W/HEADWALLS (INCLUDES MULTI-USE TRAIL)

CORONA STREET

3' DROP STRUCTURE

FARR'S COURT

ROYER STREET

100-YEAR FLOODPLAIN (WITH IMPROVEMENTS) WITHIN STRUCTURAL CHANNEL

ORIGINAL - H. 1"=100' V. 1"=10'

WILLAMETTE STREET

MONUMENT STREET

MAPLE STREET

DALE STREET

EL PASO STREET

100-YEAR FLOODPLAIN (WITH IMPROVEMENTS)

100.00 MATCHLINE

REPLACE EXIST. CULVERT WITH 4-10'x10' RCB W/HEADWALLS

ST. VRAIN STREET

100-YEAR FLOODPLAIN (WITH IMPROVEMENTS) WITHIN STRUCTURAL CHANNEL

REPLACE EXIST. CULVERT WITH 3-10'x10' RCB W/HEADWALLS AND U/S WING WALLS

EROSION PROTECTION AT EXIST. PEDESTRIAN BRIDGE

EROSION PROTECTION DOWNSTREAM OF CULVERT

BOULDER STREET

100-YR FLOODPLAIN (EXIST.)

STRUCTURAL CHANNEL BOULDER STREET TO ST. VRAIN STREET (INCLUDES MULTI-USE TRAIL)

FRANKLIN STREET

PROACTIVE MAINTENANCE WILLIAMETTE STREET TO CACHE LA POUDRE STREET

132+50 MATCHLINE

3' DROP STRUCTURE

EROSION PROTECTION DOWNSTREAM OF CULVERT.

PLATTE AVENUE

FILLS PLATTE AVENUE UNDERPASS (EXIST.)

EL PASO STREET

STRUCTURAL CHANNEL ST. VRAIN STREET TO WILLAMETTE STREET (INCLUDES MULTI-USE TRAIL)

PROSPECT STREET

DALE STREET

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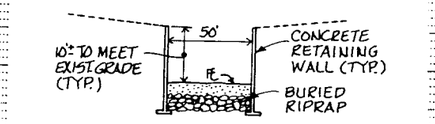

TYPICAL SECTION OF STRUCTURAL CHANNEL BOULDER STREET TO ST. VRAIN STREET

N.T.S.

TYPICAL SECTION OF STRUCTURAL CHANNEL ST. VRAIN STREET TO WILLAMETTE STREET

N.T.S.

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DRAINAGE BASIN PLANNING STUDY

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SHEET NO. FIGURE 52

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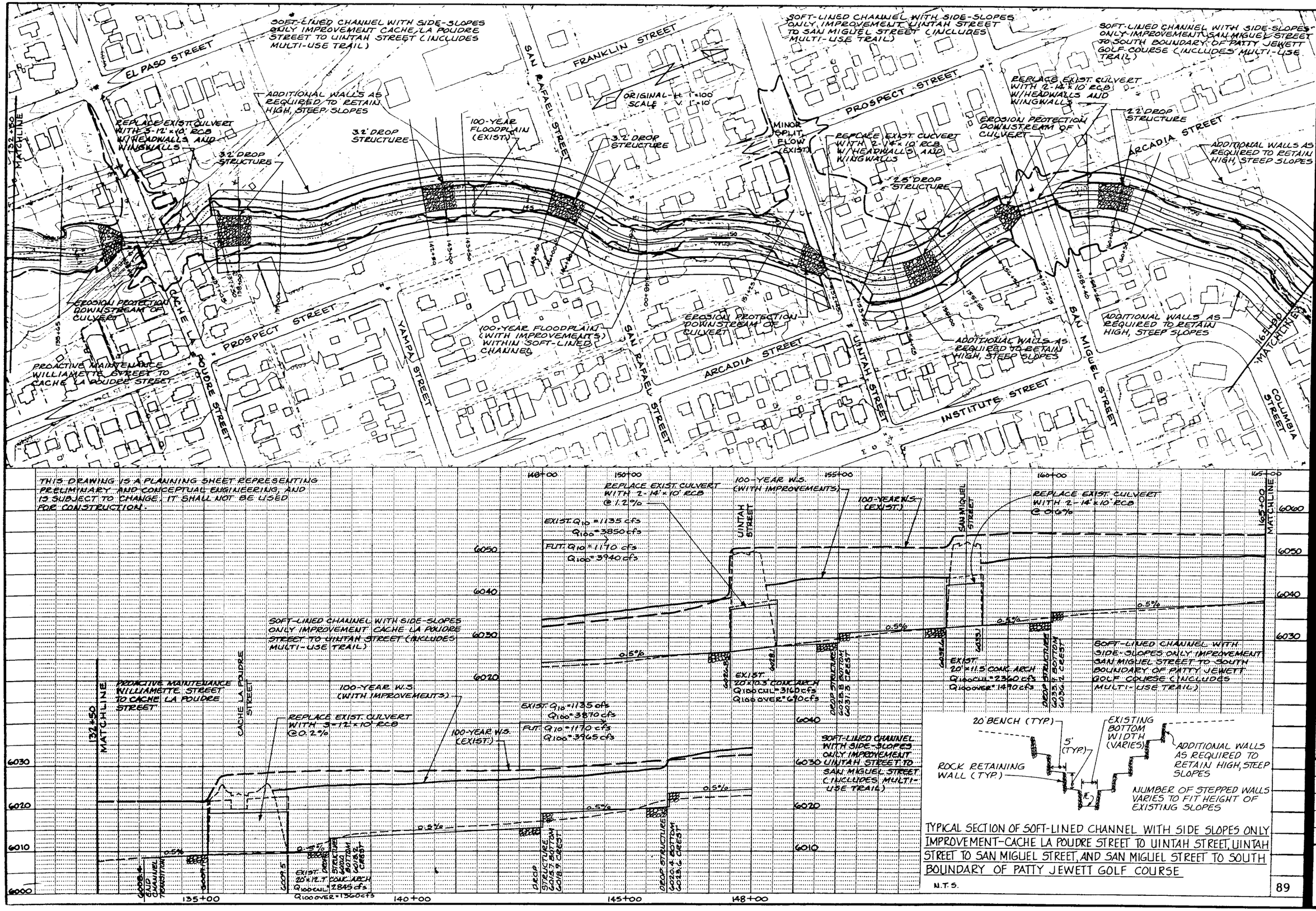
COLORADO SPRINGS, COLORADO



TYPICAL SECTION OF SOFT-LINED CHANNEL WITH SIDE SLOPES ONLY IMPROVEMENT-CACHE LA POUDRE STREET TO UINTAH STREET, UINTAH STREET TO SAN MIGUEL STREET, AND SAN MIGUEL STREET TO SOUTH BOUNDARY OF PATTY JEWETT GOLF COURSE

N.T.S.

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WILSON & COMPANY

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DRAINAGE BASIN PLANNING STUDY

PRELIMINARY DESIGN PLAN

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SHEET NO.	FIGURE 53

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COLORADO SPRINGS, COLORADO

ORIGINAL- H. 1"=100
SCALE V. 1"=10'

COLUMBIA STREET
ARCADIA STREET
BUENA VISTA STREET
SOFT-LINED CHANNEL WITH SIDE-SLOPES ONLY IMPROVEMENT SAN MIGUEL STREET TO SOUTH BOUNDARY OF PATTY JEWETT GOLF COURSE (INCLUDES MULTI-USE TRAIL)
ADDITIONAL WALLS AS REQUIRED TO RETAIN HIGH, STEEP SLOPES
3.6' DROP STRUCTURE
100-YEAR FLOODPLAIN (EXIST.)
REPLACE EXIST. PEDESTRIAN BRIDGE
165+00 MATCHLINE
100-YEAR FLOODPLAIN (WITH IMPROVEMENTS) WITHIN SOFT-LINED CHANNEL
2.2' DROP STRUCTURE
CUSTER AVENUE
ADDITIONAL WALLS AS REQUIRED TO RETAIN HIGH, STEEP SLOPES
CASANILLO STREET
PATTY JEWETT GOLF COURSE
PROACTIVE MAINTENANCE SOUTH BOUNDARY OF PATTY JEWETT GOLF COURSE TO ESPANOLA STREET
EROSION PROTECTION AT EXIST. GOLF CART BRIDGE
RECONSTRUCT EXIST. DROP STRUCTURE
EROSION PROTECTION AT EXIST. GOLF CART BRIDGE
EROSION PROTECTION AT EXIST. GOLF CART BRIDGE
REPLACE EXIST. CULVERT WITH 3-10'x10' RCB
EROSION PROTECTION AT EXIST. GOLF CART BRIDGE
REPLACE EXIST. CULVERT WITH 4-5'-10'x10' RCB @ 13%
EROSION PROTECTION DOWNSTREAM OF CULVERT
100-YEAR FLOODPLAIN (WITH IMPROVEMENTS)
ESPANOLA STREET
EXIST. DROP IN CHANNEL LINING
PROACTIVE MAINTENANCE ESPANOLA STREET TO PASEO ROAD
STRUCTURAL CHANNEL TRANSITION
REPLACE EXIST. GOLF CART BRIDGE
MINOR FLOW SPLIT
EROSION PROTECTION DOWNSTREAM OF EXIST. GOLF CART PATH CULVERT
200+00 MATCHLINE
EXIST. GOLF CART BRIDGE
EXIST. GOLF CART BRIDGE
EXIST. GOLF CART BRIDGE
END EXIST. CHANNEL LINING
REPAIR EXIST. CONCRETE CHANNEL LINING
100-YEAR W.S. (WITH IMPROVEMENTS)
EXIST Q_{10}=215 cfs
Q_{100}=1035 cfs
FUT. Q_{10}=250 cfs
Q_{100}=1110 cfs
EXIST Q_{10}=1080 cfs
Q_{100}=3375 cfs
FUT. Q_{10}=1050 cfs
Q_{100}=3460 cfs

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EXIST Q_{10}=1070 cfs
Q_{100}=3575 cfs
FUT. Q_{10}=1105 cfs
Q_{100}=3665 cfs
100-YEAR W.S. (WITH IMPROVEMENTS)
100-YEAR W.S. (EXIST.)
REPLACE EXIST. PEDESTRIAN BRIDGE
DROP STRUCTURE LAST BOTTOM EL 6041.3 CREST
DROP STRUCTURE LAST BOTTOM EL 6047.4 CREST
SOUTH BOUNDARY PATTY JEWETT GOLF COURSE (APP.)
EXIST Q_{10}=1045 cfs
Q_{100}=3470 cfs
FUT. Q_{10}=1080 cfs
Q_{100}=3555 cfs
100-YEAR W.S. (EXIST.)
EROSION PROTECTION AT EXIST. GOLF CART BRIDGE
EROSION PROTECTION AT EXIST. GOLF CART BRIDGE
RECONSTRUCT EXIST. DROP STRUCTURE
END CHANNEL TRANSITION
EXIST. 12'x8' RCB
Q_{100CAP}=1400 cfs
$Q_{100OVER}$=1010 cfs
REPLACE EXIST. GOLF CART BRIDGE
ESPANOLA STREET
DROP IN EXIST. CHANNEL LINING
EXIST. GOLF CART BRIDGE
EXIST. GOLF CART BRIDGE
END EXIST. CHANNEL LINING
6078.6 END STRUCTURAL CHANNEL TRANSITION
PROACTIVE MAINTENANCE ESPANOLA STREET TO PASEO ROAD
EROSION PROTECTION DOWNSTREAM OF EXIST. GOLF CART PATH CULVERT
200+00 MATCHLINE
PROACTIVE MAINTENANCE SOUTH BOUNDARY OF PATTY JEWETT GOLF COURSE TO ESPANOLA STREET
0.5%
0.5%
0.5%
2.0%
2.0%

20' BENCH (TYP.)
EXISTING BOTTOM WIDTH (VARIES)
5' (TYP.)
ADDITIONAL WALLS AS REQUIRED TO RETAIN HIGH, STEEP SLOPES
ROCK RETAINING WALL (TYP.)
NUMBER OF STEPPED WALLS VARIES TO FIT HEIGHT OF EXISTING SLOPES

TYPICAL SECTION OF SOFT-LINED CHANNEL WITH SIDE-SLOPES ONLY IMPROVEMENT SAN MIGUEL STREET TO SOUTH BOUNDARY OF PATTY JEWETT GOLF COURSE

N.T.S.

BY	DATE	REVISION

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SHOOKS RUN
DRAINAGE BASIN PLANNING STUDY
PRELIMINARY DESIGN PLAN

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DATE 7/93
FILE NO. 90-809
SHEET NO. FIGURE 54

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COLORADO SPRINGS, COLORADO

PATTY JEWETT GOLF COURSE

MINOR FLOW SPLIT

EROSION PROTECTION DOWNSTREAM OF EXIST. GOLF CART PATH CULVERT

EROSION PROTECTION AT EXIST. GOLF CART BRIDGE

100-YEAR FLOODPLAIN (EXIST.)

PROACTIVE MAINTENANCE ESPANOLA STREET TO PASEO ROAD

ORIGINAL SCALE H. 1"=100' V. 1"=10'

200+00 MATCHLINE

EROSION PROTECTION DOWNSTREAM OF CULVERT

REPLACE EXIST. CULVERTS WITH 3-10'x5' RCB W/HEADWALLS AND DIS WILLSHWALLS

PROSPECTUS STREET

PASEO ROAD

FRANKLIN STREET

STRUCTURAL CHANNEL PASEO ROAD TO JEFFERSON STREET (INCLUDES MULTI-USE TRAIL)

MINOR FLOW SPLITS (EXIST.)

REPLACE EXIST. CULVERTS WITH 3-10'x5' RCB W/HEADWALLS

MINOR FLOW SPLIT (EXIST.)

JEFFERSON STREET

TEMPLETON GAP ROAD

STRUCTURAL CHANNEL JEFFERSON STREET TO MADISON STREET (INCLUDES MULTI-USE TRAIL)

221+00 MATCHLINE

100-YEAR FLOODPLAIN (WITH IMPROVEMENTS) WITHIN STRUCTURAL CHANNEL

MADISON STREET

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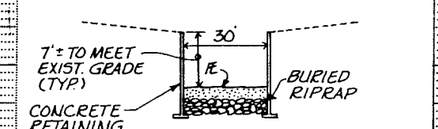

TYPICAL SECTION OF STRUCTURAL CHANNEL
PASEO ROAD TO JEFFERSON STREET
JEFFERSON STREET TO MADISON STREET
N.T.S.

BY	DATE	REVISION

WILSON & COMPANY

SHOOKS RUN
DRAINAGE BASIN PLANNING STUDY
PRELIMINARY DESIGN PLAN

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DATE	7-93
FILE NO.	90-809
SHEET NO.	FIGURE 55

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COLORADO SPRINGS, COLORADO

REPLACE EXIST. CULVERTS WITH 3-10'x5' RCB W/HEADWALLS

100-YEAR FLOODPLAIN (WITH IMPROVEMENTS) WITHIN STRUCTURAL CHANNEL

ARTERIAL H: 1"=100' V: 1"=10'

EROSION PROTECTION DOWNSTREAM OF CULVERT

REPLACE EXIST. CULVERTS WITH 3-10'x5' RCB W/HEADWALLS

PEDESTRIAN PATH

REPLACE EXIST. CULVERT WITH 2-11'x6' RCB W/HEADWALLS

TEMPLETON GAP ROAD

EROSION PROTECTION DOWNSTREAM OF CULVERT

MATCHLINE 221+00

REPLACE EXIST. CULVERTS WITH 3-10'x5' RCB W/HEADWALLS

EROSION PROTECTION DOWNSTREAM OF CULVERT

REPLACE EXIST. CULVERTS WITH 3-10'x5' RCB W/HEADWALLS

REPLACE EXIST. CULVERTS WITH 2-10'x5' RCB W/HEADWALLS

EROSION PROTECTION DOWNSTREAM OF CULVERT

100-YEAR FLOODPLAIN (WITH IMPROVEMENTS) WITHIN VAN BUREN CHANNEL

STRUCTURAL TRANSITION CHANNEL PEDESTRIAN PATH TO C.R.I.P. RAILROAD

100 YR. FLOODPLAIN (EXIST.)

MINOR SPLIT FLOWS (EXIST. TYPICAL AS SHOWN)

STRUCTURAL CHANNEL JEFFERSON STREET TO MADISON STREET (INCLUDING MULTI-USE TRAIL)

EROSION PROTECTION DOWNSTREAM OF CULVERT

STRUCTURAL CHANNEL MONROE STREET TO JACKSON STREET (INCLUDING MULTI-USE TRAIL)

STRUCTURAL CHANNEL MADISON STREET TO MONROE STREET (INCLUDING MULTI-USE TRAIL)

STRUCTURAL CHANNEL LA SALLE STREET TO PEDESTRIAN PATH (INCLUDING MULTI-USE TRAIL)

HORACE MANN JR HIGH SCHOOL

MADISON STREET

MONROE STREET

JACKSON STREET

LA SALLE STREET

PASEO ROAD

C.R.I.P. RAILROAD

VAN BUREN CHANNEL

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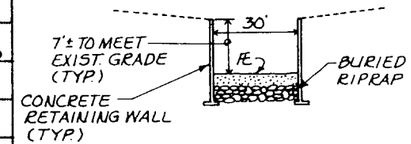
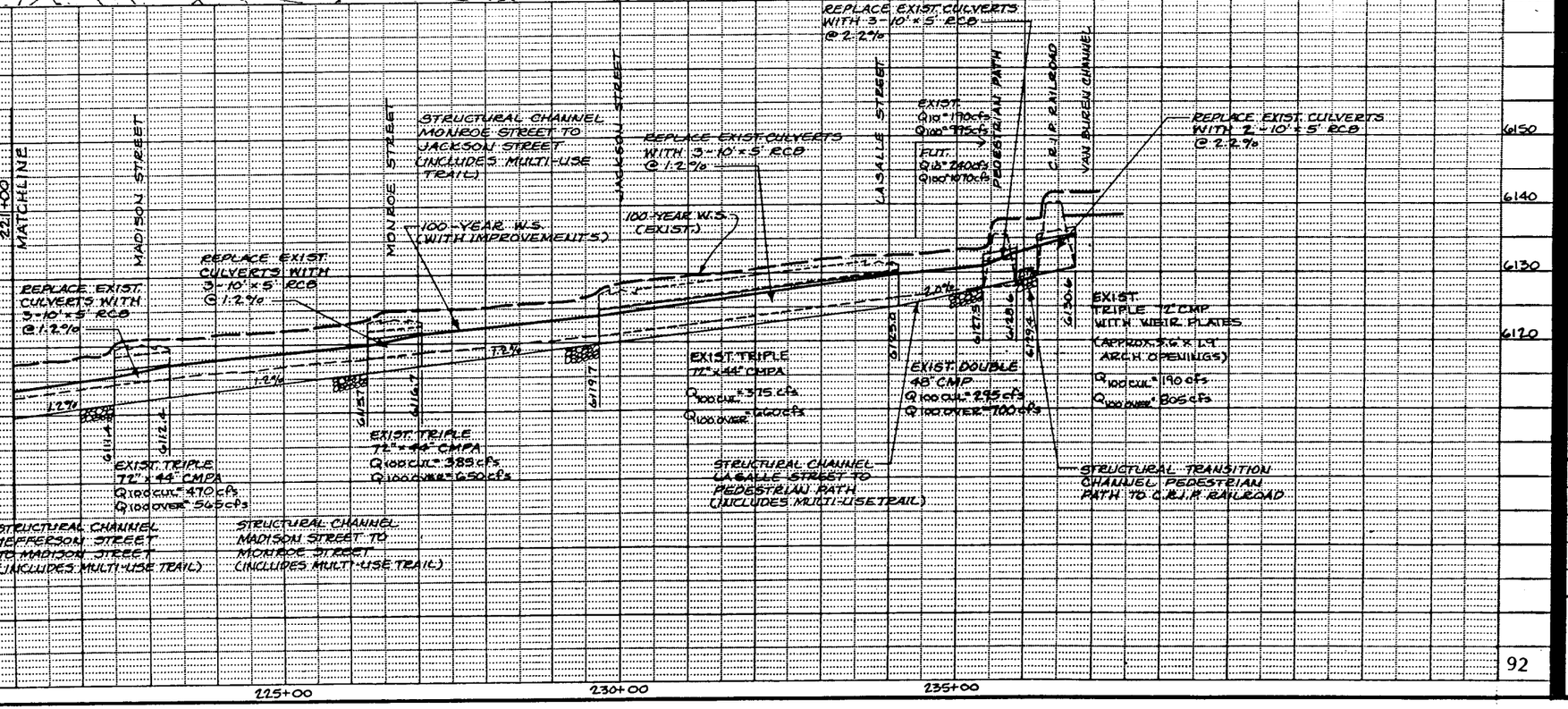


TYPICAL SECTION OF STRUCTURAL CHANNEL
JEFFERSON STREET TO MADISON STREET
MADISON STREET TO MONROE STREET
MONROE STREET TO JACKSON STREET
LA SALLE STREET TO PEDESTRIAN PATH
N.T.S.



NO.	REVISION	DATE	BY

WILSON & COMPANY

SHOOKS RUN
DRAINAGE BASIN PLANNING STUDY
PRELIMINARY DESIGN PLAN

DESIGN	W.D.
DRAWN	E.H.
DATE	7-93
FILE NO.	90-809
SHEET NO.	FIGURE 56

WILSON & COMPANY
COLORADO SPRINGS, COLORADO

TABLE 11
Prioritization of Recommended Improvements

Priority Group	Recommended Improvement	Estimate of Probable Construction Cost for the Recommended Alternative
A	Pikes Peak Avenue/El Paso Street Culvert	$2,880,000
	Platte Avenue/Athletic Field/ Boulder Street Culvert	$2,170,000
		$5,050,000
B	Costilla Street Culvert	$690,000
	El Paso Street Culvert	$480,000
	Kiowa Street Culvert	$520,000
	Bijou Street Culvert	$1,530,000
		$3,220,000
C	Costilla Street to Platte Avenue Channel Improvements	
		$9,490,000
D	Las Vegas Street Culvert	$500,000
	Fountain Boulevard Culvert	$760,000
	Willamette Street Culvert	$560,000
	Cache La Poudre Street Culvert	$610,000
	Uintah Street Culvert	$290,000
		$2,720,000
E	Paseo Road to Van Buren Channel Culvert and Channel Improvements	
		$3,840,000
F	St. Vrain Street Culvert	$280,000
	San Miguel Street Culvert	$170,000
		$450,000

TABLE 11
Prioritization of Recommended Improvements

Priority Group	Recommended Improvement	Estimate of Probable Construction Cost for the Recommended Alternative
G	Boulder Street to Willamette Street Channel Improvements	$1,350,000
	Cache La Poudre Street to Patty Jewett Golf Course Channel Improvements	$9,010,000
		$10,360,000
H	Fountain Creek to Abandoned Railroad Proactive Maintenance	$240,000
I	Willamette Street to Cache La Poudre Street Proactive Maintenance	$120,000
	Patty Jewett Golf Course Proactive Maintenance	$790,000
		$910,000
		$36,280,000