Appendix D – Stormwater Project Descriptions and Cost Estimates

Previous stormwater master plans included general descriptions of each project. Projects that were not constructed or were superseded by other construction are eliminated in this master plan update. The remaining projects are included in this plan update by reference. Table 14.1 includes the project identification references previously used in those plans for the projects that still a part of this master plan update. The project descriptions for those projects are not repeated in this master plan update. Projects proposed specifically for this plan update are included in this appendix.

PLANNED FACILITIES

All recommended CIPs were sized to convey runoff from the 100 year storm by approximate USGS regression methods. The noted sizes of channels and culverts are approximate only and could change once a more detailed hydrologic analysis is performed for the particular study area.

Water Course #18 Alum Creek – TMSA: Truckee Meadows

CIP #B19-3

Reasons/Purpose – During the 2005 event, flow was observed crossing through Roy Gomm Elementary school grounds, north across Mayberry Dr, and into the Edgewater subdivision. This water appears to have come from the Last Chance Ditch which is located just south of the elementary school. At this time the location of the breach/overtopping and how the water entered into the irrigation ditch are unclear. As with any irrigation ditch, the Last Chance Ditch embankment in the Roy Gomm vicinity is penetrated with culverts allowing the release of water into fields.

Description - This CIP is to 1ine the irrigation ditch from the Alum Creek crossing to 1,100' upstream with concrete so that the risk of water breaching the embankment is reduced.

Assumptions – That the water came from a ditch breach, and that Alum Creek stayed contained in its' channel.

Cost – $360,000

Associated CIPs - none

Water Course #23 Evans Creek (Block N Watershed) – TMSA: Truckee Meadows

CIP #B18-1

Reasons/Purpose – As early as January 1970, the United States Department of Agriculture – Natural Resource Conservation Service proposed a detention basin on Evans Creek north of what is now North McCarran Blvd. Some of the justification and reasons presented were:

a. The largest recorded flow in the watershed was during a 1914 event where flows estimated to be in excess of 1,000 cfs created water 2 feet deep in what is now the University of Nevada Reno (UNR) Business Quad.

b. In 1970 the construction cost of the dam was estimated at under $2 million dollars while the damage to UNR property alone was almost $9 million dollars.

c. And "…the freeway (I-80) will be depressed in this area (south of UNR), and poses the problem of how to prevent inundation by overland floodwaters."

During the 2005 event, which was estimated at a 20-25 year reoccurrence, floodwaters were 3' deep over Sierra Street, and 6" deep on the Evans Avenue bridge over I-80, thereby indicating that the issues originally posed are still very applicable.

7 years ago, "existing conditions" flows at Sierra St were estimated between 1422 cfs (WRC Nevada, August 2000) and 880 cfs (Nimbus, July 1999) for the 100 year storm. Proposed conditions flows at the same location were estimated to be over 2,000 cfs (WRC Nevada, August 2000). In those studies, the estimated storm drain capacity at Sierra St was approximately 245 cfs.

Including the 1970 project, there have been 2 proposed locations for the dam, the most recent of which was rejected by the public in 2002-2003 over concerns of impact to the recreation trails and wildlife in the canyon. Prior to this, a series of alternatives was evaluated. In summary they were:

- 8,000' long concrete channel to convey flow from Sierra St to the Truckee River
- Enlarge existing storm drain pipe network
- Detention dam sites in Rancho San Rafael Park on both sides of McCarran Blvd.
- Store floodwaters on UNR farms west of Wells Ave.
- Divert floodwaters across N. Virginia and into Dandini Wash of S. McCarran

All of these alternatives were rejected based on feasibility, cost, or inferiority to other alternatives.

Description - This CIP is to construct an earthen or concrete dam near elevation 4860' and associated culverts/piping which will detain runoff in a basin and release it slowly over time. Additionally to construct adjacent facilities necessary to gain public acceptance of the project (trails, parks, playgrounds, etc)

The site is under the telephone utility line which runs west and east about 750' due north of Cambrian Way. The site is fairly isolated and would not disturb many people, impacts no wetlands, is not visible from McCarran Blvd or N Virginia St, is only partially visible to a few houses on Cambrian Way, and would still control 79% of the Evans Creek Watershed above Sierra St.

Assumptions – That the impoundment would be sized so that discharge plus contributing flow from area runoff below Sierra St would not exceed 200+ cfs.

Cost – $7,840,000

Associated CIPs - none

Water Course #24 Dandini Wash – TMSA: Truckee Meadows

CIP #C18-1

Reasons/Purpose – Currently, flows in the Dandini Wash East of Valley Road cross the Orr Ditch via an eroded channel under the concrete structure which conveys ditch water. This structure appears to have been constructed in the flow path of the wash and will significantly impede flow under all but low flow events. At the present time, there are no notches to allow wash flow into or out of the ditch.

Description - This CIP is to construct a structure which will both allow flow in the wash to cross the ditch unimpeded, and to allow excess water in the ditch to return to the wash.

Assumptions – That the downstream storm drain system is able to handle the rate of flow out of the UNR detention pond.

Cost – $170,000

Associated CIPs - none

Water Course #27 Rosewood Wash - TMSA: Truckee Meadows

CIP #B19-5

Reasons/Purpose – During the 2005 event, full ditch flows were observed in the Last Chance Ditch in the vicinity of Rosewood Wash. Currently a structure exists at Cory Dr and Rainna Ct to convey one branch of Rosewood Wash over the ditch. However, other branches still contribute flow directly to the ditch.

Description - This CIP is to either modify the structure at Cory Dr to allow excess ditch water to discharge back into the wash or to construct an entirely new structure.

Assumptions – That the facilities downstream will be constructed in conjunction with this CIP, otherwise the system will not be able to handle the increased volume once the ditches are prevented from intercepting flow.

That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Rosewood Wash in addition to the other elevated flows that the system would experience.

Cost – $90,000

Associated CIPs – CIP #C19-9, CIP #C19-8, CIP #C19-7, CIP #C19-6, CIP #C19-5, CIP #C19-4, CIP #C19-3, CIP #C19-2, and CIP #C19-1.

CIP #B19-4 –

Reasons/Purpose – During the 2005 event, full ditch flows were observed in the Last Chance Ditch in the vicinity of Rosewood Wash. One of the more significant contributors to this was the northern most branch of Rosewood Wash. This branch crosses the Last Chance Ditch between Belford Rd. and Barnes Cir. Currently, the configuration of the intersection is such that all low flows in the wash are initially intercepted by the ditch.

Description - This CIP is to construct a low profile reinforced concrete structure at this intersection that would both keep the wash and ditch flows separate and allow excess ditch flows to discharge back into the wash.

Assumptions – That the facilities downstream will be constructed in conjunction with this CIP, otherwise the system will not be able to handle the increased volume once the ditches are prevented from intercepting flow.

That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Rosewood Wash in addition to the other elevated flows that the system would experience.

Cost – $170,000

Associated CIPs – CIP #C19-9, CIP #C19-8, CIP #C19-7, CIP #C19-6, CIP #C19-5, CIP #C19-4, CIP #C19-3, CIP #C19-2, and CIP #C19-1.

CIP #19-9 –

Reasons/Purpose – Historically, as the branches of Rosewood Wash cross the Last Chance and Lake Ditches, much of the water is intercepted and conveyed away from the vicinity by the ditches. This has allowed the Rosewood Wash conveyance system between Arlington Ave and Virginia Lake to function moderately well even though it is extremely undersized. However, as was shown during the 2005 event, having such large volumes of runoff being captured by irrigation ditches elicits flooding problems and ditch breaches. Additionally, even the reduced volume of water flowing down the wash was more than the channel could handle and flow broke out and flooded neighborhood streets. Once CIPs #C18-1 & #B19-5 are constructed, ditch interception will be reduced and flows in the wash increased substantially. These facts necessitate the up-sizing of the rest of the system down to Virginia Lake.

Description - This CIP is to replace the existing culvert under Plumb Ln. with 2-10'x 5' reinforced concrete box culverts.

Assumptions – That the facilities downstream will be constructed in conjunction with this CIP, otherwise the system will not be able to handle the increased volume once the ditches are prevented from intercepting flow.

That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Rosewood Wash in addition to the other elevated flows that the system would experience.

Cost – $820,000

Associated CIPs – CIP #C19-8, CIP #C19-7, CIP #C19-6, CIP #C19-5, CIP #C19-4, CIP #C19-3, CIP # C19-2, and CIP # C19-1.

CIP #C19-8 –

Reasons/Purpose – Historically, as the branches of Rosewood Wash cross the Last Chance and Lake Ditches, much of the water is intercepted and conveyed away from the vicinity by the ditches. This has allowed the Rosewood Wash conveyance system between Arlington Ave and Virginia Lake to function moderately well even though it is extremely undersized. However, as was shown during the 2005 event, having such large volumes of runoff being captured by irrigation ditches elicits flooding problems and ditch breaches. Additionally, even the reduced volume of water flowing down the wash was more than the channel could handle and flow broke out and flooded neighborhood streets. Once CIPs #C18-1 & #B19-5 are constructed, ditch interception will be reduced and flows in the wash increased substantially. These facts necessitate the up-sizing of the rest of the system down to Virginia Lake.

Description - This CIP is to replace/modify the existing channel between Plumb Ln. and Plumas St. The proposed channel will have minimal vegetation and be concrete. The approximate dimensions are 4.5'deep with a 6' wide bottom and 3:1 side slopes.

Assumptions – That the facilities downstream will be constructed in conjunction with this CIP, otherwise the system will not be able to handle the increased volume once the ditches are prevented from intercepting flow.

That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Rosewood Wash in addition to the other elevated flows that the system would experience.

Cost – $2,030,000

Associated CIPs – CIP #C19-9, CIP #C19-7, CIP #C19-6, CIP #C19-5, CIP # C19-4, CIP # C19-3, CIP # C19-2, and CIP # C19-1.

CIP #19-7 –

Reasons/Purpose – Historically, as the branches of Rosewood Wash cross the Last Chance and Lake Ditches, much of the water is intercepted and conveyed away from the vicinity by the ditches. This has allowed the Rosewood Wash conveyance system between Arlington Ave and Virginia Lake to function moderately well even though it is extremely undersized. However, as was shown during the 2005 event, having such large volumes of runoff being captured by irrigation ditches elicits flooding problems and ditch breaches. Additionally, even the reduced volume of water flowing down the wash was more than the channel could handle and flow broke out and flooded neighborhood streets. Once CIPs #C18-1 & #B19-5 are constructed, ditch interception will be reduced and flows in the wash increased substantially. These facts necessitate the up-sizing of the rest of the system down to Virginia Lake.

Description - This CIP is to replace the existing 1-10' x 3' box culvert under Plumas St. with 2-12'x 4' box culverts.

Assumptions – That the facilities downstream will be constructed in conjunction with this CIP, otherwise the system will not be able to handle the increased volume once the ditches are prevented from intercepting flow.

That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Rosewood Wash in addition to the other elevated flows that the system would experience.

Cost – $610,000

Associated CIPs – CIP #C19-9, CIP #C19-8, CIP #C19-6, CIP #C19-5, CIP # C19-4, CIP # C19-3, CIP # C19-2, and CIP # C19-1.

CIP #C19-6 –

Reasons/Purpose – Historically, as the branches of Rosewood Wash cross the Last Chance and Lake Ditches, much of the water is intercepted and conveyed away from the vicinity by the ditches. This has allowed the Rosewood Wash conveyance system between Arlington Ave and Virginia Lake to function moderately well even though it is extremely undersized. However, as was shown during the 2005 event, having such large volumes of runoff being captured by irrigation ditches elicits flooding problems and breaches. Additionally, even the reduced volume of water flowing down the wash was more than the channel could handle and flow broke out and flooded neighborhood streets. Once CIPs #C18-1 & #B19-5 are constructed, ditch interception will be reduced and flows in the wash increased substantially. These facts necessitate the up-sizing of the rest of the system down to Virginia Lake.

Description - This CIP is to replace/modify the existing channel between Plumas St. and Watt St. The proposed channel will have minimal vegetation and be concrete. The approximate dimensions are 4.5'deep with a 4.5' wide bottom and 3:1 side slopes.

Assumptions – That the facilities downstream will be constructed in conjunction with this CIP, otherwise the system will not be able to handle the increased volume once the ditches are prevented from intercepting flow.

That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Rosewood Wash in addition to the other elevated flows that the system would experience.

Cost – $3,910,000

Associated CIPs – CIP #C19-9, CIP #C19-8, CIP #C19-7, CIP #C19-5, CIP # C19-4, CIP # C19-3, CIP # C19-2, and CIP # C19-1.

CIP #C19-5 –

Reasons/Purpose – Historically, as the branches of Rosewood Wash cross the Last Chance and Lake Ditches, much of the water is intercepted and conveyed away from the vicinity by the ditches. This has allowed the Rosewood Wash conveyance system between Arlington Ave and Virginia Lake to function moderately well even though it is extremely undersized. However, as was shown during the 2005 event, having such large volumes of runoff being captured by irrigation ditches elicits flooding problems and breaches. Additionally, even the reduced volume of water flowing down the wash was more than the channel could handle and flow broke out and flooded neighborhood streets. Once CIPs #C18-1 & #B19-5 are constructed, ditch interception will be reduced and flows in the wash increased substantially. These facts necessitate the up-sizing of the rest of the system down to Virginia Lake.

Description - This CIP is to replace the existing 10'x 3' box culvert under Plumb Ln. and Watt St. with 2-12'x4' reinforced concrete box culverts.

Assumptions – That the facilities downstream will be constructed in conjunction with this CIP, otherwise the system will not be able to handle the increased volume once the ditches are prevented from intercepting flow.

That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Rosewood Wash in addition to the other elevated flows that the system would experience.

Cost – $640,000

Associated CIPs – CIP #C19-9, CIP #C19-8, CIP #C19-7, CIP #C19-6, CIP # C19-4, CIP # C19-3, CIP # C19-2, and CIP # C19-1.

CIP #C19-4 –

Reasons/Purpose – Historically, as the branches of Rosewood Wash cross the Last Chance and Lake Ditches, much of the water is intercepted and conveyed away from the vicinity by the ditches. This has allowed the Rosewood Wash conveyance system between Arlington Ave and Virginia Lake to function moderately well even though it is extremely undersized. However, as was shown during the 2005 event, having such large volumes of runoff being captured by irrigation ditches elicits flooding problems and breaches. Additionally, even the reduced volume of water flowing down the wash was more than the channel could handle and flow broke out and flooded neighborhood streets. Once CIPs #C18-1 & #B19-5 are constructed, ditch interception will be reduced and flows in the wash increased substantially. These facts necessitate the up-sizing of the rest of the system down to Virginia Lake.

Description - This CIP is to replace/modify the existing channel between Plumb Ln. and Hillcrest Dr. The proposed channel will have minimal vegetation and be concrete. The approximate dimensions are 4.5'deep with a 3.5' wide bottom and 3:1 side slopes.

Assumptions – That the facilities downstream will be constructed in conjunction with this CIP, otherwise the system will not be able to handle the increased volume once the ditches are prevented from intercepting flow.

That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Rosewood Wash in addition to the other elevated flows that the system would experience.

Cost – $3,460,000

Associated CIPs – CIP #C19-9, CIP #C19-8, CIP #C19-7, CIP #C19-6, CIP # C19-5, CIP # C19-3, CIP # C19-2, and CIP # C19-1.

CIP #C19-3 –

Reasons/Purpose – Historically, as the branches of Rosewood Wash cross the Last Chance and Lake Ditches, much of the water is intercepted and conveyed away from the vicinity by the ditches. This has allowed the Rosewood Wash conveyance system between Arlington Ave and Virginia Lake to function moderately well even though it is extremely undersized. However, as was shown during the 2005 event, having such large volumes of runoff being captured by irrigation ditches elicits flooding problems and breaches. Additionally, even the reduced volume of water flowing down the wash was more than the channel could handle and flow broke out and flooded neighborhood streets. Once CIPs #C18-1 & #B19-5 are constructed, ditch interception will be reduced and flows in the wash increased substantially. These facts necessitate the up-sizing of the rest of the system down to Virginia Lake.

Description - This CIP is to replace the existing 10'x3' box culvert under Hillcrest Dr. with 3-10'x 4' reinforced concrete box culverts.

Assumptions – That the facilities downstream will be constructed in conjunction with this CIP, otherwise the system will not be able to handle the increased volume once the ditches are prevented from intercepting flow.

That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Rosewood Wash in addition to the other elevated flows that the system would experience.

Cost – $290,000

Associated CIPs – CIP #C19-9, CIP #C19-8, CIP #C19-7, CIP #C19-6, CIP # C19-5, CIP # C19-4, CIP # C19-2, and CIP # C19-1.

CIP #C19-2 –

Reasons/Purpose – Historically, as the branches of Rosewood Wash cross the Last Chance and Lake Ditches, much of the water is intercepted and conveyed away from the vicinity by the ditches. This has allowed the Rosewood Wash conveyance system between Arlington Ave and Virginia Lake to function moderately well even though it is extremely undersized. However, as was shown during the 2005 event, having such large volumes of runoff being captured by irrigation ditches elicits flooding problems and breaches. Additionally, even the reduced volume of water flowing down the wash was more than the channel could handle and flow broke out and flooded neighborhood streets. Once CIPs #C18-1 & #B19-5 are constructed, ditch interception will be reduced and flows in the wash increased substantially. These facts necessitate the up-sizing of the rest of the system down to Virginia Lake.

Description - This CIP is to replace/modify the existing channel between Hillcrest Dr. and Lakeside Dr. The proposed channel will have minimal vegetation and be concrete. The approximate dimensions are 5'deep with a 6.5' wide bottom and 3:1 side slopes.

Assumptions – That the facilities downstream will be constructed in conjunction with this CIP, otherwise the system will not be able to handle the increased volume once the ditches are prevented from intercepting flow.

That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Rosewood Wash in addition to the other elevated flows that the system would experience.

Cost – $2,240,000

Associated CIPs – CIP #C19-9, CIP #C19-8, CIP #C19-7, CIP #C19-6, CIP # C19-5, CIP # C19-4, CIP # C19-3, and CIP # C19-1.

C19-1 –

Reasons/Purpose – Historically, as the branches of Rosewood Wash cross the Last Chance and Lake Ditches, much of the water is intercepted and conveyed away from the vicinity by the ditches. This has allowed the Rosewood Wash conveyance system between Arlington Ave and Virginia Lake to function moderately well even though it is extremely undersized. However, as was shown during the 2005 event, having such large volumes of runoff being captured by irrigation ditches elicits flooding problems and breaches. Additionally, even the reduced volume of water flowing down the wash was more than the channel could handle and flow broke out and flooded neighborhood streets. Once CIPs #C18-1 & #B19-5 are constructed, ditch interception will be reduced and flows in the wash increased substantially. These facts necessitate the up-sizing of the rest of the system down to Virginia Lake.

Description - This CIP is to replace the existing 2-6'x2.5' box culverts under Lakeside Dr. with 3-10'x3' reinforced concrete box culverts.

Assumptions – That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Rosewood Wash in addition to the other elevated flows that the system would experience.

Cost – $370,000

Associated CIPs – CIP #C19-9, CIP #C19-8, CIP #C19-7, CIP #C19-6, CIP # C19-5, CIP # C19-4, CIP # C19-3, and CIP # C19-2.

Water Course #28 Dant Wash – TMSA: Truckee Meadows

CIP #19-20 –

Reasons/Purpose – During the 2005 event, full ditch flows were observed in the Lake Ditch. When the capacity of the ditch was exceeded, streets and residences near the ditch were flooded. For example, large quantities of flow were observed proceeding east on Manzanita Ln across Lakeside Dr. It is doubtful that such volumes as were observed were a result of localized runoff only, and were likely increased by water from the Last Chance Ditch. Just channel of the Manzanita Ln crossing of the Last Chance Ditch is Dant Wash, which intersects the Last Chance Ditch between Honeywood Ct and Pioneer Dr. Currently, the configuration of the intersection is such that all flows in the wash are intercepted by the ditch. Once the capacity of the ditch is exceeded, water will overtop the ditch and continue down channel.

Description – This CIP is to construct a structure at the Dant Wash – Last Chance Ditch intersection, that would both keep the wash and ditch flows separate and allow excess ditch flows to discharge back into the wash.

Assumptions –

Cost – $170,000

Associated CIPs – CIP #C19-19, CIP #C19-16, CIP #C19-17, CIP #C19-14 CIP #C19-13, and CIP #C19-12.

Water Course #28 Dant Wash – TMSA: Truckee Meadows

CIP #C19-19 –

Reasons/Purpose – Downstream of the Dant Blvd Dam, the channel is in variable condition. In some places it's wide and almost indefinable, in other locations small earthen berms have been constructed to direct low flows various directions, and in yet other areas the channel is forced into narrow strips by residential structure encroachment. During the 2005 event, discharge from the Dant Blvd Detention Basin was initially intercepted by the Last Chance Ditch. When the ditch became overwhelmed, flow continued down the natural channel where it partially flooded three residences. This CIP is to better protect the residential structures against flooding from low flows, and to improve conditions of the wash in this stretch.

In addition to this channel improvement, design is currently being conducted for a structure at the intersection of the Dant Wash and the Last Chance Ditch. Once this structure is constructed, the ditch will not be able to intercept flows thereby causing higher than experienced volumes to continue down the wash further creating the need for downstream channel improvements.

Description – This CIP is to construct a channel in the wash between Dant Blvd. and Pheasant Ln. to convey discharge from the Dant Blvd Detention Basin. The proposed channel will be concrete and have approximate dimensions of 3' deep with a 6' wide bottom and 2:1 side slopes.

Assumptions – That the structure currently under design for the Dant Wash – Last Chance Ditch intersection, will be constructed.

Cost – $2,990,000

Associated CIPs – CIP #C19-20, CIP #C19-16, CIP #C19-17 CIP #C19-14, CIP #C19-13, and CIP #C19-12.

CIP #C19-16 –

Reasons/Purpose – Downstream of Pheasant Ln, the channel is in variable condition. In some places it has been planted over with pasture grass, in another it is extremely choked with trees and plants as it intersects the Lake Ditch, and finally it's partially dammed by a driveway just upstream from Moana Ln. During the 2005 event, discharge from the Dant Blvd Detention Basin was initially intercepted by the Last Chance Ditch, and later the Lake Ditch. When the ditches became overwhelmed, flow continued down channel where floodwaters broke out onto Moana Ln and Plumas St.

In addition to this channel improvement, design is currently being conducted for a structure at the intersection of the Dant Wash and the Last Chance Ditch. Once this structure is constructed, the ditch will not be able to intercept flows thereby causing higher than experienced volumes to continue down the wash further creating the need for downstream channel improvements.

Description – This CIP is to improve conditions of the wash in the stretch between Pheasant Ln and Moana Ln. The proposed channel will be concrete and have approximate dimensions of 3' deep with an 8' wide bottom and 2:1 side slopes.

Assumptions – That the structure currently under design for the Dant Wash – Last Chance Ditch intersection will be constructed.

Cost – $2,020,000

Associated CIPs – CIP #C19-20, CIP #C19-19, CIP #C19-17, CIP #C19-14, CIP #C19-13, and CIP #C19-12.

CIP #C19-17 –

Reasons/Purpose – During the 2005 event, full ditch flows were observed in the Lake Ditch. When the capacity of the ditch was exceeded, streets and residences near the ditch were flooded. For example, large quantities of flow were observed proceeding east on Manzanita Ln across Lakeside Dr. It is doubtful that such volumes as were observed were a result of localized runoff only, and were likely increased by water from the Lake Ditch. Just up channel of the Manzanita Ln crossing of the Lake Ditch is Dant Wash, which intersects the Lake Ditch between Moana Ln and Pheasant Ln. Currently, the configuration of the intersection is such that all flows in the wash are intercepted by the ditch. Once the capacity of the ditch is exceeded, water will overtop the ditch and continue down channel.

Description – This CIP is to construct a structure at the Dant Wash – Lake Ditch intersection, that would both keep the wash and ditch flows separate and allow excess ditch flows to discharge back into the wash.

Assumptions –

Cost – $170,000

Associated CIPs – CIP #C19-20, CIP #C19-19, CIP #C19-16, CIP #C19-14, CIP #C19-13, and CIP #C19-12.

CIP #C19-14 –

Reasons/Purpose – Historically, as the branches of Dant Wash cross the Last Chance and Lake Ditches, much of the water is intercepted and conveyed away from the vicinity by the ditches. This has allowed the Dant Wash system (conveyance through underground city storm drain) between Moana Ln. and Virginia Lake to function moderately well even though it is extremely undersized. However, as was shown during the 2005 event, having such large volumes of runoff being captured by irrigation ditches elicits flooding problems and ditch breaches. Additionally, even the reduced volume of water flowing down the wash was more than the channel could handle and flow broke out and flooded neighborhood streets off of Moana Ln and Plumas St. With the completion of the Dant Wash-Last Chance Ditch flow separating structure (currently under design), and completion of the Dant Wash – Lake Ditch flow separating structure (CIP #C19-19), ditch interception will be minimized and flows in the wash increased substantially. This necessitates the up-sizing of the rest of the system down to Virginia Lake.

Description – This CIP is to upgrade a 3400+ ft section of storm drain that conveys wash flows from west of Plumas St, east along Glenda Wy, north along Lakeside Dr., and east along Brinkby Ave., until the system returns to open channel 300+ ft east of Lakeside Dr. on Brinkby Ave.

Assumptions – That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Dant Wash in addition to the other elevated flows that the system would experience.

Cost – $4,990,000

Associated CIPs – CIP #C19-20, CIP #C19-19, CIP #C19-16, CIP #C19-17, CIP #C19-13, and CIP #C19-12.

CIP #C19-13 –

Reasons/Purpose – Historically, as the branches of Dant Wash cross the Last Chance and Lake Ditches, much of the water is intercepted and conveyed away from the vicinity by the ditches. This has allowed the Dant Wash system (conveyance through underground city storm drain) between Moana Ln. and Virginia Lake to function moderately well even though it is extremely undersized. However, as was shown during the 2005 event, having such large volumes of runoff being captured by irrigation ditches elicits flooding problems and ditch breaches. Additionally, even the reduced volume of water flowing down the wash was more than the channel could handle and flow broke out and flooded neighborhood streets off of Moana Ln and Plumas St. With the completion of the Dant Wash-Last Chance Ditch flow separating structure (currently under design), and completion of the Dant Wash – Lake Ditch flow separating structure (CIP #C19-19), ditch interception will be minimized and flows in the wash increased substantially. This necessitates the up-sizing of the rest of the system down to Virginia Lake.

Description – This CIP is to upgrade to a 730 ft section of open channel storm drain which conveys wash flows north from Brinkby Ave to Eastshore Dr.

Assumptions – That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Dant Wash in addition to the other elevated flows that the system would experience.

Cost – $2,890,000

Associated CIPs – CIP #C19-20, CIP #C19-19, CIP #C19-16, CIP #C19-17, CIP #C19-14, and CIP #C19-12.

CIP #C19-12 –

Reasons/Purpose – Historically, as the branches of Dant Wash cross the Last Chance and Lake Ditches, much of the water is intercepted and conveyed away from the vicinity by the ditches. This has allowed the Dant Wash system (conveyance through underground city storm drain) between Moana Ln. and Virginia Lake to function moderately well even though it is extremely undersized. However, as was shown during the 2005 event, having such large volumes of runoff being captured by irrigation ditches elicits flooding problems and ditch breaches. Additionally, even the reduced volume of water flowing down the wash was more than the channel could handle and flow broke out and flooded neighborhood streets off of Moana Ln and Plumas St. With the completion of the Dant Wash-Last Chance Ditch flow separating structure (currently under design), and completion of the previously mentioned Dant Wash – Lake Ditch flow separating structure, ditch interception will be minimized and flows in the wash increased substantially. This necessitates the up-sizing of the rest of the system down to Virginia Lake.

Description – This CIP is to upgrade/replace the existing 10'x 4' box culvert which empties into Virginia Lake under Eastshore Dr, to be 3-10'x 4' box culverts.

Assumptions – That the conveyance system between Virginia Lake and Boyonton Slough is large enough to handle 100 year flows from Dant Wash in addition to the other elevated flows that the system would experience.

Cost – $390,000

Associated CIPs – CIP #C19-20, CIP #C19-19, CIP #C19-16, CIP #C19-17, CIP #C19-14, and CIP #C19-13.

Water Course #29 Manzanita Park Wash – TMSA: Truckee Meadows

CIP #C19-21 –

Reasons/Purpose – During the 2005 event, water was observed flowing through the high-water spillway after storage had exceeded existing detention capacity in Manzanita Park. Once water exited through the spillway, it proceeded overland where it flooded apartments and inundated the storm drain system. The extents of what flooding occurred are unknown.

Currently all flows that exit the park enter the subterranean city storm drain system, the capacity of which is unknown. However, any flows that pass through the current spillway will cause urban flooding due to the lack of a downstream inlet structure and possible deficient system capacity.

Description – This CIP is to enlarge the existing Manzanita Park detention basin to provide better downstream protection for the 100 year storm. The detention basin will need to be sized so that the maximum discharge will not inundate the downstream storm drain conveyance system.

Assumptions – That the conveyance system between Baker Ln and Boyonton Slough is NOT large enough to handle 100 year flows from Manzanita Park Wash in addition to the other elevated flows that the system would experience.

Cost – $1,900,000

Associated CIPs – none

Water Course #31 Evans Creek – TMSA: Truckee Meadows

CIP #19-28 –

Reasons/Purpose – As Evans Creek approaches Lakeside Dr, and for most of its course afterward, it encounters structures and channels which do not allow for 100 year storm runoff conveyance. During the 2005 event water from Evans Creek was observed entering and exceeding the Last Chance Ditch and flooding residential streets and businesses in the Lakeside Dr. area. A detention basin has been proposed on Evans Creek above the Lakeridge community since 1990. Should this facility be constructed, it would benefit the downstream channel substantially. However, with or without said facility, there still exist areas which cause localized flooding that need addressing.

As Evans Creek crosses the Steamboat Ditch by Range View Ln., the creek passes under a structure conveying ditch water. The structure also has a flashboard opening directed downstream to allow any flows which have entered the ditch to exit back into the creek. Such a structure does not exist where Evans Creek crosses the Last Chance Ditch and water from the creek intersects the ditch directly.

Description – This CIP is to construct a reinforced concrete structure at the Evans Creek – Last Chance Ditch crossing. This structure would keep ditch flow and creek flow separate, and also provide a means for the ditch to discharge back into the creek. The structure would be similar to the one which currently exists at the Evans Creek - Steamboat Ditch crossing.

Assumptions – That the detention pond on the Balardini Ranch property will be constructed

Cost – $210,000

Associated CIPs – none

CIP #C19-27 –

Reasons/Purpose – As Evans Creek approaches Lakeside Dr, and for most of its course afterward, it encounters structures and channels which do not allow for 100 year storm runoff conveyance. During the 2005 event water from Evans Creek was observed entering and exceeding the Last Chance Ditch and flooding residential streets and businesses in the Lakeside Dr. area. A detention basin has been proposed on Evans Creek above the Lakeridge community since 1990. Should this facility be constructed, it would benefit the downstream channel substantially. Additionally, the long box conveying Evans Creek under 395 and Neil Road is only capable of flowing approximately 1000 cfs. Even so, there are still areas which cause localized flooding that need addressing.

Between South Virginia and the Cochran Ditch crossing, the creek passes through an unimproved and dilapidated 270 ft stretch. This stretch has unstable banks with exposed tree roots. Additionally, the current reinforced concrete Cochran Ditch crossing poses a significant flow impediment.

Description – CIP is to replace/modify the existing channel in this reach, and to remove the now-defunct concrete Cochran Ditch crossing. The proposed channel will have minimal vegetation and be concrete. The approximate dimensions are 5.5'deep with a 15.5' wide bottom and 3:1 side slopes.

Assumptions – That the detention pond on the Balardini Ranch property will be constructed.

Cost – $1,250,000

Associated CIPs – CIP #C19-26

CIP #C19-26 –

Reasons/Purpose – As Evans Creek approaches Lakeside Dr, and for most of its course afterward, it encounters structures and channels which do not allow for 100 year storm runoff conveyance. During the 2005 event water from Evans Creek was observed entering and exceeding the Last Chance Ditch and flooding residential streets and businesses in the Lakeside Dr. area. A detention basin has been proposed on Evans Creek above the Lakeridge community since 1990. Should this facility be constructed, it would benefit the downstream channel substantially. However, with or without said facility, there still exist areas which cause localized flooding that need addressing.

Sierra Pacific Power Company (SPPCo) owns water rights on Evans Creek, and utilizes a pair of metal headgates S of Delucchi Ln and 300' east of S Virginia St to impound and remove water from the creek for irrigation of their nearby campus. The configuration of these headgates poses a flow impediment, which will be accentuated with the construction of CIP #2200.

Description – This CIP is to reconstruct the SPPCo headgates so that the impediment to the flow is reduced and the channel is made capable of passing 1000 cfs.

Assumptions – That the detention pond on the Balardini Ranch property, SW of S McCarran, will be constructed.

Cost – $190,000

Associated CIPs – CIP #C19-27

Water Course #34 Boyonton Slough – TMSA: Truckee Meadows

CIP #C19-25 –

Reasons/Purpose – By the time the Boyonton Slough reaches Peckham Lane, it contains runoff from an area of approximately 29 square miles. Flow is contributed mainly from Dry Creek, and Evans Creek. During the 2005 event, water was observed overtopping the road at Peckham Ln. This was mostly due to the extremely restrictive culvert configuration at this crossing. Whereas upstream at the S McCarran crossing, Boyonton Slough passes through 3-14'x8' box culverts (flow area = approximately 336 sq ft), the Peckham Ln crossing consists of only 2-60" and 2-84" RCP culverts (flow area = approximately 116 sq ft).

Description – This CIP is to replace the existing 2-60" and 2-84" RCP culverts under Peckham Ln, with 4-12'x10' reinforced concrete box culverts.

Assumptions –

Cost – $900,000

Associated CIPs – CIP #C19-24, CIP #C19-23, and CIP #C19-22.

CIP #C19-24 –

Reasons/Purpose – By the time the Boyonton Slough reaches Runway 34R, it contains runoff from an area of approximately 32 square miles. Flow is contributed from Dry Creek, Evans Creek, and the entire city storm drain network between Dry Creek and Peckham Ln. Due to airport access restrictions, a culvert assessment was not possible for this structure. However, hydraulic studies indicate that the structure consists of 3-12'x10' (estimated) box culverts. These culverts are insufficient to pass the currently anticipated flow.

Description – This CIP is to modify the existing 3-12'x10' (estimated) box culverts under Reno Tahoe Airport Runway 34R to be 5-12'x10' reinforced concrete box culverts.

Assumptions – That the detention basins for Dry Creek, and Evans Creek will NOT be constructed. If they are, then the flow quantities may not require an increase in culvert capacity.

Cost – $2,190,000

Associated CIPs – CIP #C19-25, CIP #C19-23, and CIP #C19-22.

CIP #C19-23 –

Reasons/Purpose – By the time the Boyonton Slough reaches Longley Lane, it contains runoff from an area of approximately 38 square miles. Flow is contributed from Dry Creek, Evans Creek, Dant Wash, Rosewood Wash, and the entire city storm drain network bracketed by those drainages. During the 2005 event, water was observed overtopping the road at Longley Ln. This was manily due to the occlusions associated with the Longley Ln bridge. The bridge consists of asphalt paving, on top of a corrugated metal deck, supported by an entirely wooden substructure. The bridge has over 80 posts extending into the channel underneath for support. These posts provide many locations to snag debris. Once conglomerated, this debris chokes the flow area. In addition to bridge configuration, basic hydraulic analyses indicate that the bridge does not provide sufficient flow area to pass the anticipated volumes.

Description – This CIP is to replace the existing wooden bridge conveying Longley Ln over Boynton Slough. The proposed structure is 7 – 12' x 10' reinforced concrete box culverts.

Assumptions – That the detention basins for Dry Creek, and Evans Creek will NOT be constructed.

Cost – $3,320,000

Associated CIPs – CIP #C19-25, CIP #C19-24, and CIP #C19-22.

CIP #C19-22 –

Reasons/Purpose – By the time the Boyonton Slough reaches Longley Lane, it contains runoff from an area of approximately 38 square miles. Flow is contributed from Dry Creek, Evans Creek, Dant Wash, Rosewood Wash, and the entire city storm drain network bracketed by those drainages. Hydraulic analyses indicate that these culverts are insufficient to pass the currently anticipated flow.

Description – This CIP is to modify the existing 5-12'x10' box culverts under E. McCarran Blvd to be 7-12'x10' reinforced concrete box culverts.

Assumptions – That the detention basins for Dry Creek, and Evans Creek will NOT be constructed.

Cost – $2,260,000

Associated CIPs – CIP #C19-25, CIP #C19-24, and CIP #C19-23.

Water Course #35 Thomas Creek – TMSA: South Truckee Meadows

CIP #C20-7–

Reasons/Purpose – After the split in Thomas Creek, the capacities and issues associated with each branch appear to vary substantially. Whereas the South (or East) Branch has larger conveyance structures, larger channels, and more detention facilities, the North (or West) Branch is much narrower, enters and inundates the city storm drain system, and has a long list of areas that cause flooding. A detention basin has been proposed near Arrowcreek south of Ventana Wy since 1990. Should this facility be constructed, it would benefit both downstream channels substantially. Construction of said detention facility may reduce the size and cost of this CIP.

Description – This CIP is to construct a small detention/debris basin, and a reinforced concrete flow splitting structure at the location where Thomas Creek splits into two branches east of the Dixon Ln and Passa Tempo Drive intersection. Such a structure would enable the directing of more flow to the branch capable of handling it, most probably the East Branch.

Assumptions –

Cost – $2,620,000

Associated CIPs – CIP #C20-6 and CIP #C20-3

Water Course #36 Thomas Creek West Split – TMSA: South Truckee Meadows

Discussion – The West (North) Split of Thomas Creek has numerous flooding issues along its entire length. During the 2005 event water: flowed overland ½' – 1'deep through the Casazza Ranch neighborhood, overtopped S Virginia St by Allison Mitsubishi, overtopped the north bound 395 off and on ramps at the 395 - S Virginia Interchange by the pink Scolaris, contributed to the flooding of the Huffaker Hills neighborhood (specifically along Autumn Hills Dr), ponded ½' - 1'deep at the McCarran Blvd - Longley Ln intersection, and finally ponded 1'-2' deep in the Rio Poco – Creekside Circle area.

Some of the issues with the creek in this area are:

- A concrete structure associated with the Lake Ditch was constructed so that it blocks the creek flow (Casazza Ranch area).

- Whereas 3 culverts exist to capture flow SW of the S Virginia – 395 interchange, the discharge from only 1 of those 3 culverts was able to be located. Conversations with City of Reno, NDOT, and other civil engineering firms have not revealed the discharge location of the other 2 culverts. It's entirely likely that they discharge to the Huffaker Hills storm drain system (which the 1 culvert which was located eventually does), but there is a possibility that flow is re-directed around the south end of Huffaker Hills to the Gateway Dr – Prototype Dr area.

- At least one 30" culvert, and possibly 2-30" and 1-24", contributes flow directly to the storm drain system of the Huffaker Hills subdivision. As stormdrains are typically sized to handle onlyurban runoff from medium sized storms, adding elevated creek flows to a system already near capacity will inevitably result in water breaking out and flooding streets and residences.

- In a few locations, the stream has been channelized into ditches or narrow water ways which configurations do not allow elevated flows to stay contained within the banks.

CIP #C20-2 –

Reasons/Purpose – During the 2005 event, water was observed flowing through the Casazza Ranch neighborhood. This water appears to have come from a configuration conflict at the Lake Ditch and Thomas Creek West Branch crossing. Currently, flows in the Thomas Creek West Split cross the Lake Ditch east of Dixon Ct. via an eroded channel under the concrete structure which conveys ditch water over the creek. This structure appears to have been constructed in the flow path of the stream and will significantly impede flow under all but low flow events. At the present time, a notch does exist to let water out of the ditch and downstream, but due to elevation differences if the flash boards are removed water will actually enter instead of exit the ditch. Construction of the previously mentioned detention facility near Arrowcreek, and or CIP #C19-23 may reduce the size and cost of this CIP.

Description – This CIP, located at Lake Ditch and Thomas Creek crossing, E of Dixon Ct., is to construct a reinforced concrete structure which will both allow flow in the creek to cross the ditch unimpeded, and allow excess water in the ditch to return to the stream.

Assumptions –

Cost – $260,000

Associated CIPs –

Water Course #37 Thomas Creek East Split – TMSA: South Truckee Meadows

CIP #C20-6 –

Reasons/Purpose – Once the reinforced concrete flow splitting structure mentioned previously is constructed, additional flow will be directed down the East Split of Thomas Creek. This necessitates performing downstream channel improvements to increase capacity.

Description –This CIP is to replace/modify the existing channel between the split near Dixon Ln and Sierra Manor Dr (modification of the stretch between Sierra Manor Dr and S Virginia St has been proposed in previous reports). The proposed channel will have minimal vegetation and be concrete. Dimensions are unable to be approximated at this time due to the associated variability of potential discharge flows from the proposed detention basin.

Assumptions – That system capacity between S Virginia and Steamboat Creek has sufficient capacity to handle the flow, which will be comprised of the portion of discharge from the Thomas Creek detention basin which is NOT directed to the North (West) branch, and any area runoff which is collected in the reach downstream of the proposed detention basin.

Cost – $5,340,000

Associated CIPs – CIP #C20-7 and CIP #C20-3

Water Course #37 Thomas Creek East Split – TMSA: South Truckee Meadows

CIP #C20-3 –

Reasons/Purpose – Once the reinforced concrete flow splitting structure mentioned previously is constructed, additional flow will be directed down the East Split of Thomas Creek. This necessitates performing downstream culvert improvements to increase capacity.

Description – This CIP is to replace/modify the existing 11'x3.5' reinforced concrete box culverts under S Virginia St in front of Winco Foods. Dimensions are unable to be approximated at this time due to the associated variability of potential discharge flows from the proposed detention basin.

Assumptions – That system capacity between S Virginia and Steamboat Creek has sufficient capacity to handle the flow, which will be comprised of the portion of discharge from the Thomas Creek detention basin which is NOT directed to the North (West) branch, and any area runoff which is collected in the reach downstream of the proposed detention basin.

Cost – $2,880,000

Associated CIPs – CIP #C20-7 and CIP #C20-6

Water Course #43 Galena Wash – TMSA: South Truckee Meadows

CIP #C21-3 -

Reasons/Purpose – Behind Galena High school, the wash is conveyed through an improved channel. Once the wash departs from school property though, the channel is unimproved, undersized, and susceptible to breakout.

Description – This CIP is to construct a 1420 ft channel with minimal vegetation and be concrete. The approximate dimensions are 4.5'deep with a 4' wide bottom and 3:1 side slopes.

Assumptions –

Cost – $1,650,000

Associated CIPs – CIP #C21-2

CIP #C21-2 –

Reasons/Purpose – East of where Galena Wash crosses Wedge Parkway, a pair of drop inlets and a 36" CMP culvert carry flow across the Mt Rose Highway and into Branch 4 of Whites Creek. Currently the unimproved channel between Wedge Parkway and these intakes is unimproved, undersized, and susceptible to breakout.

Description – This CIP is to construct an 1800 ft channel with minimal vegetation and be concrete. The approximate dimensions are 4'deep with a 3' wide bottom and 3:1 side slopes.

Assumptions –

Cost – $1,570,000

Associated CIPs – CIP #C21-3

Water Course # Steamboat Creek South of Hwy 341 (Geiger Grade) – TMSA: South Truckee Meadows

CIP #C21-5 –

Reasons/Purpose – During the 2005 event, water overtopped the Rhodes Rd bridge over Steamboat Creek to a depth of approximately 3'. One vehicle was washed off the bridge and the structure received some damage when floating trees impacted the upstream side. Historical USGS Stream gauge records show that Steamboat Creek at Geiger Grade peaked at a flow rate just over 3000 cubic feet per second during the morning of December 31, 2005.

Description – This CIP is to replace the existing wooden Rhodes Road Bridge (possessing an open area of approximately 13'x8') with 6-20'x8' reinforced concrete box culverts.

Assumptions –

Cost – $3,100,000

Associated CIPs – none

Water Course # Steamboat Creek South of Hwy 341 (Geiger Grade) – TMSA: South Truckee Meadows

CIP #C21-4 –

Reasons/Purpose – During the 2005 event, water overtopped Towne Dr to a depth of approximately 3'. For a period of time the only access into or out of the Steamboat Subdivision was impassable. Additionally, some damage occurred to the commercial/professional structure at the corner of Hwy 395 and Towne Dr. Historical USGS Stream gauge records show that Steamboat Creek at Geiger Grade peaked at a flow rate just over 3000 cubic feet per second during the morning of December 31, 2005.

Description – This CIP is to modify/replace the existing 3-6'x5' box culverts under Towne Dr to be 10-20'x6' reinforced concrete box culverts.

Assumptions –

Cost – $3,100,000

Associated CIPs – none

Water Course # Miscellaneous – TMSA: Truckee Meadows

CIP #B19-1 –

Reasons/Purpose – During the 2005 event, the Edgewater Subdivision west of West McCarran was inundated with water, some of which came across Mayberry Dr (see CIP #B19-3) and some of which was conveyed from the Truckee River to the community via the Lake Ditch. As river levels rose, the Lake Ditch intake structure near Aspen Glen Dr and White Fir St was inundated and water entered the ditch in large quantities. It is likely that although the ditch was at full capacity, it didn't overtop its banks until flow from Roy Gomm Elementary school was added. Since the ditch was already full there was no freeboard to allow the additional flow from the Last Chance Ditch to be taken away from the vicinity and thus water overtopped the ditch, flooded homes along Willowsprings Dr, and entered the neighborhood.

Description – This CIP is to construct a new structure, or modify the existing one, at the Lake Ditch intake near Aspen Glen Dr and White Fir St. The modified structure would prevent the ditch from accepting large quantities of water during Truckee River high flow events. An alternative to this would be to construct a discharge back to the river near Ambrose Dr (Ambrose Park) to allow high flows in the ditch to discharge back into the river even when the river is experiencing elevated flows.

Assumptions –

Cost – $260,000

Associated CIPs – none