City of South Jordan
Storm Drainage Master Plan
Capital Facility Plan
Impact Fee Analysis

January 2011

Prepared For:

The City of South Jordan

SOUTH JORDAN
UTAH

Prepared By:

FRANSON Civil Engineers

FRANSON
CIVIL ENGINEERS

CITY OF SOUTH JORDAN
STORM DRAINAGE MASTER PLAN UPDATE

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EXECUTIVE SUMMARY
STORM DRAIN MASTER PLAN

General

During the spring of 2006, the City of South Jordan determined that the rapid pace of development within the City boundary required that the 2002 Storm Drain Master Plan (SDMP), prepared by Forsgren Associates, be updated. FRANSON Civil Engineers was retained by the City to update the SDMP. The City also determined that the Capital Facility Plan (CFP), prepared in 2004 by FRANSON Civil Engineers, formerly Franson Noble Engineering, also needed to be updated. This Executive Summary provides a brief synopsis of the SDMP and CFP update results.

Statement of Purpose

The purpose of the updated SDMP for the City of South Jordan is to identify and evaluate the adequacy of the existing storm water drainage and flood control facilities for both current and future conditions within the City boundaries. Once adopted, this document will be the guide for placement and construction of future storm drain facilities. The CFP, located in Chapter 7, sets forth improvements to be implemented and the costs associated with those improvements.

It should be noted that Kennecott Master Subdivision Development, commonly referred to as Daybreak, is assumed to not introduce any storm drain runoff into the City's storm drain system. As Kennecott Master Subdivision's storm drain system is totally self contained by utilizing open ditches and large retention basins that allow for infiltration. This Master Plan does not incorporate this development into the analysis of the City's storm drainage system.

The specific objectives of this SDMP include:

- Identify existing deficiencies in the storm drain system
- Analyze undeveloped areas of the City and their impact on the existing system
- Identify specific storm drain improvements
- Update the Capital Facility Plan
- Update the Cost Estimate for needed improvements
- Update cost to replace existing storm drain facilities

Existing Conditions

South Jordan City's storm drainage system includes existing piping, detention basins, and retention basins throughout the City.

Although adjacent municipalities' storm drainage does not appear to directly impact the City's storm drain system, adjacent municipality storm drainage does flow into Salt Lake County Flood Control facilities that traverse through the City. Salt Lake County Flood Control Facilities within the City include the: Jordan River, Midas Creek, Bingham Creek, Willow Creek, Utah Lake Distributing Canal, Utah and Salt Lake Canal, and South Jordan Canal. In addition to Salt

Lake County Flood Control Facilities, the City also uses the Welby-Jacob Canal and UDOT storm drain facilities. UDOT storm drain facilities used by the City include:

- Pipeline along Bangerter Highway, which collects and carries flows to a detention basin. The basin has an outfall into the city system at 3400 West.
- Pipeline facility in Redwood Road between 9400 South and 10600 South.
- Redwood Road from 10600 South to the southern city limits of South Jordan.
- Pipeline in South Jordan Parkway from Bangerter Highway to the Jordan River.
- Detention Basin located adjacent to Jordan River at 10600 South.

The City storm drainage system also receives storm drainage from UDOT facilities. Storm drainage from within City boundaries flow to one of the above mentioned facilities or is contained on-site. Storm drainage basins were determined based on which storm drainage facility the area drained to. The major points of discharge have been identified as: Bingham Creek, Bangerter Highway, Midas Creek, and the Jordan River. All basins drain to one of these four discharge points with the exception of the 10600 South Basin which discharges partially to the Utah and Salt Lake Canal with the balance draining to UDOT's system at Redwood Road. In other instances storm water drains directly to canals.

FRANSON Civil Engineers has produced a schematic map of the existing storm drain system (Figure ES-1). This map shows existing facilities such as; pipeline locations and sizes, detention facility locations, and Salt Lake County flood control facilities. The map also shows proposed facilities. The map was completed using the existing City storm drain maps, field verification and the City's GIS data.

Existing Policy and Design Standards

South Jordan City requires new developments to comply with current City Storm Drain Design Standards. The City's storm drainage conveyance and detention policy utilizes widely accepted engineering industry standards. Piped systems must have sufficient capacity to convey the 10-year storm event. Detention and retention facilities must be designed for a 100-year storm event. The City also employs a restrictive discharge policy for commercial developments. Storm water runoff must be released at a maximum rate of 0.2 cfs per acre with the excess runoff detained on-site. The City also requires storm drain pipes have a minimum diameter of 18-inches to allow for large debris and flushing.

9000 S.
9400 S.
9800 S.
10600 S.
11000 S.
11800 S.
6000 W.
5600 W.
4800 W.
4400 W.
4000 W.
3600 W.
3200 W.
2700 W.
2200 W.
1700 W.
1300 W.
1000 W.
600 W.
300 W.

TO BINGHAM CREEK
98th A
4.0 AC-FT
6 CFS
98th D
16.4 AC-FT
1 CFS
UTAH S.L. CANAL
JORDAN & SALT LAKE CANAL
JORDAN CANAL
BINGHAM CREEK
S-A
S-B
S-C
B-A
BANG-A
BANG-B
BANG-C
BANG-D
BANG-E
BANG-F
BANG-G
BANG-H
BANG-I
BANG-J
BANG-K
BANG-C
38 AC-FT
0 CFS
98TH-A
98TH-B
98TH-C
98TH-D
98TH-D SUMP DRAIN
98TH-C2
106TH-A
106TH-B
M-A
M-B
M-C
M-D
M-E
M-F
M-G
M-B 1
9.0 AC-FT
20 CFS
M-B 2
2.0 AC-FT
0 CFS
M-B 3
2 AC-FT
8.5 CFS
M-B 4
3.0 AC-FT
17 CFS
M-E
4.3 AC-FT
1 CFS
Bang-H
5.0 AC-FT
2 CFS
J-E
0.9 AC-FT
1 CFS
R-A
R-B
J-A
J-B
J-C
J-D
J-E
J-F
J-G
J-H
J-I
J-J
J-K
JACOB WELBY CANAL
BANGERTER HIGHWAY
UTAH LAKE DISTRIBUTING CANAL
SOUTH JORDAN CANAL
UTAH & SALT LAKE CANAL
JORDAN RIVER
DRY CREEK
REMNANT GALENA CANAL
WINWARD DITCH
NATURAL SPRING
LITTLE WILLOW CREEK
MIDAS CREEK
DAYBREAK DEVELOPMENT
FUTURE UDOT PROJECT

SOUTH JORDAN
U T A H

LEGEND

PROPOSED DETENTION BASIN INFORMATION
BASIN
AREA
100-YR OUTFALL
PROPOSED PIPE SIZE
DESIGNED PIPE SIZE

STUDY BOUNDARY/CITY LIMITS
EXISTING DRAINAGE
SUB BASIN DELINEATION
EXISTING DETENTION BASINS
TEMPORARY DETENTION BASINS
PROPOSED DETENTION BASINS
PROPOSED PUMP STATION

EXISTING PROJECT STORM DRAIN PIPE
EXISTING SYSTEM STORM DRAIN PIPE
DESIGNED SYSTEM STORM DRAIN PIPE (AWAITING CONSTRUCTION)
PROPOSED STORM DRAIN PIPE
SHEET FLOWS DISSIPATER (EXISTING/PROPOSED)
PROPOSED SUMP DRAIN
PROPOSED RETENTION BASIN

N
0
2500 FT.

FRANSON CIVIL ENGINEERS

SOUTH JORDAN CITY
2008 STORM DRAIN
MASTER PLAN UPDATE

DATE: FEBRUARY 13, 2008
SCALE: -
SD Basins-2006.dwg
CLIENT\3-SL\SO. JORDAN\STORM DRAINAGE\SDMP 2006\DRAWINGS\
LAYOUT: Figure ES-1

FIGURE ES-1
PROPOSED STORM DRAINAGE CAPITAL FACILITIES

Recommendations

The recommended storm drainage improvements are shown on Figure ES-1. The recommended improvements include piped conveyance along major corridors with regional detention located in public areas to reduce peak flows and minimize pipe sizes. The use of regional detention rather than individual site detention allows for easier maintenance and better attenuation of flows from the basin area. Regional detention can be coupled with recreational use as water will only pond in these areas during severe storm events. The improvements shown utilize piped conveyance in keeping with the general practice in urbanized areas of Salt Lake Valley.

The City is nearing buildout conditions in the majority of areas east of Bangerter Highway. Infrastructure will need to be constructed as the remaining rural/farming areas are developed. Although regional detention may be preferable, the increase in the cost of raw land and new construction make that option less feasible. Thus, it is recommended that new developments detain storm water where possible. Also, the placement of detention within the new developments will allow for the majority of the storm drain system to function without the need of improvements.

Another recommendation is that during the review of new developments a 100-year flood path should be designed. This flood path delineation would illustrate how flooding would affect a development should piping not be able to contain the storm water. Caution should be taken during the review process to ensure that flooding, be conveyed away from existing homes and structures to lessen the City's liability.

CAPITAL FACILITY PLAN

General

In order to implement the recommendations of the Storm Drain Master Plan Update, the City intends to review the Impact Fee relating to storm drainage infrastructure. A key element of the impact fee evaluation process is the development of a Capital Facility Plan (CFP) to document the proposed improvements and differentiate distribution of costs between current City residents and future development.

Cost Estimates

Estimated capital improvement construction costs were prepared for all identified projects. The total cost estimate for these projects is **$22,995,000 in 2006 dollars and $24,294,000 in 2008 dollars**. Project costs were initially estimated based on 2006 unit costs. The 2006 costs have

been escalated to 2008 using the Construction Cost Index published by the American City and County Magazine. It should be noted that construction prices are extremely variable and as such the costs presented should be regarded as conceptual and only appropriate for planning purposes.

Also an important part of the impact fee analysis is the cost of replacing the existing system facilities. It was assumed that a design life of 50-years for the piped conveyance systems was appropriate. The cost to replace the existing system facilities was estimated to be approximately $43,000,000 in 2006 dollars and $45,400,000 in 2008 dollars.

Another important facet of the CFP is the project cost allocation between existing storm drainage deficiencies (minimum level of service) and improvements required to support future development. The allocation of costs enables the City to determine the portion of the projects cost eligible for Impact Fee collection. Only those costs associated with future growth may be distributed to future developments through Impact Fees.

An analysis of existing development versus future development was performed. This analysis provided the appropriate fraction of costs that may be included within Impact Fees for new development. Table ES-1 summarizes the total proportionate costs between current deficiencies and future growth improvements for all of the proposed capital facilities

TABLE ES-1
COST ALLOCATION SUMMARY

Year	Cost to Address Existing Deficiencies	Cost to Address Future Development	Total Capital Facility Cost
2006	$14,058,000	$8,937,000	$22,995,000
2008	$14,852,000	$9,442,000	$24,294,000

Capital Improvement Projects

As a part of this SDMP specific projects have been identified. The projects identified and the costs associated with the projects can be seen on Table ES-2. Project costs were initially estimated based on 2006 unit costs. The project costs have been escalated to 2008 using the Construction Cost Index published by American City and County Magazine. Both the 2006 and 2008 cost estimates are presented in Table ES-2. The construction of these projects will be built as funding allows and/or opportunities to combine projects and thereby reduce costs present themselves. The order in which projects are presented in Table ES-2 does not indicate a priority for construction.

The City's UPDES Municipal Permit stipulates that storm water quality must be improved. The costs identified in Table ES-1 include the cost of installing storm water treatment structures. A time frame for installation of these treatment structures has not been identified. Specific costs

for storm water treatment projects are not given in Table ES-2 but are provided in Tables ES-3 and ES-4 with greater detail available in Appendix E of the Storm Drain Master Plan.

UPDES Compliance

The City has obtained a UPDES Municipal Permit jointly with Salt Lake County to discharge storm water to natural waterways. The UPDES permit stipulates that the City implement measures to improve the water quality of its storm water discharge. The UPDES Municipal Permit was initially issued in March of 2003 then renewed in 2007. A study to identify what treatment structures are needed has been conducted. This study identifies where treatment is needed and estimates the cost of providing that treatment. The results of the study are presented in Appendix E. A summary of the costs associated with storm water treatment can be found in Tables ES-3 for 2006 costs and ES-4 for 2008 costs.

TABLE ES-2
PROPOSED PROJECTS

Project Name	Project Designation	2006 Cost	2008 Cost
Bingham Pipeline 1	4000 W. Pipeline	$751,932	$794,417
98th-A Pipeline 1	West 98th Pipeline Project	$2,372,884	$2,506,952
Bang-H Pipeline	Country Crossing Pipeline	$527,930	$557,758
98th-A Pipeline 2	102nd S. Pipeline	$744,237	$786,286
98th-A Proposed Detention Basin	102nd S. Detention Basin (4.0 Ac-ft)	$94,783	$100,138
98th-C Pipeline	East 98th Pipeline Project	$279,175	$294,948
98th-D Pipeline	94th Pipeline Project	$1,814,064	$1,916,558
98th-D Proposed Detention Basin	94th Detention Basin (16.4 Ac-ft)	$1,793,623	$1,894,963
Redwood Pipeline 3	13th W. 24" Pipeline	$102,934	$108,750
106th-A Pipeline 1	104th S. Pipeline	$2,033,216	$2,148,093
M-B Pipeline 5	Midas Creek North Pipeline	$665,057	$702,633
M-B Proposed Detention Basin 3	Jones Meadow Detention Basin (2 Ac-ft)	$235,892	$249,219
Bang-C Retention Basin	Oquirrh Park Retention Basin	$195,403	$206,443
M-B Pipeline 7	Ivory Crossing Pipeline Upsize	$262,594	$277,431
M-B Proposed Retension Basin 4	Ivory Park Retension Basin (3 Ac-ft)	$53,157	$56,160
J-A Pipeline 1	10th W./Witherspoon Estates Pipeline	$322,784	$341,021
Bingham Pipeline 2	4800 W. Pipeline	$390,039	$412,076
Bang-H Proposed Detention	118th South 40th West Detention Basin (3 Ac-ft)	$344,625	$364,096
98th-D Sump Drain	Sump Drain	$6,500	$6,867
Public Works Facility	Public Works Facility	$544,089	$574,830
M-B Proposed Retention Basin 2	36th Retention Basin (2 Ac-ft)	$235,892	$249,219
Bang-C Pipeline	102nd S. Pipeline	$150,397	$158,894
Redwood Pipeline 1	Beckstead Lane 18" Pipeline	$166,400	$175,802
Redwood Pipeline 2	11150 S. Pipeline	$169,585	$179,167
106th-A Pipeline 2	32nd W. Pipeline	$79,560	$84,055
106th-A Pipeline 3	Wheadon Estates Pipeline	$127,985	$135,216
106th-A Pipeline 6	Temple View Pipeline	$126,880	$134,049
M-B Pipeline 1	27th W. Pipeline	$1,233,583	$1,303,280
M-B Pipeline 2	Majestic Heights 18" Pipeline	$303,030	$320,151
M-B Pipeline 4	2865 W. Pipeline	$288,015	$304,288
M-B Pipeline 6	Midas Creek South Pipeline	$512,688	$541,654
M-B Proposed Detention Basin 1	27th Detention Basin (9 Ac-ft)	$1,661,277	$1,755,139
M-C Pipeline	114th S./Charter Pointe Pipeline	$323,798	$342,092
M-E Pipeline 1	Jordan Hills #1 Pipeline	$590,265	$623,615
M-E Pipeline 2	Jordan Hills #2 Pipeline	$138,450	$146,272
M-E Proposed Detention Basin	Jordan Hills Detention Basin (4.3 Ac-ft)	$493,727	$521,623
J-B Pipeline 1	Temple Cove/Meadow Moor Pipeline	$268,288	$283,446
J-B Pipeline 2	Wilshire/Spring Hill Pipeline	$185,153	$195,614
J-D Pipeline	Clover Ridge 18" Pipeline	$156,260	$165,089
J-E Pipeline 1	114th S. 18" Pipeline	$199,680	$210,962
J-E Pipeline 2	445 W. 18" Pipeline	$117,910	$124,572
J-E Proposed Detention Basin	114th Detention Basin (0.9 Ac-ft)	$144,053	$152,192
J-F Pipeline	Sterling Village #3 18" Pipeline	$89,700	$94,768
J-G Sheet Flow	105th S. Sheet Flow	$97,500	$103,009
Bang-D Pipeline	104th - West of Bangerter Pipeline	$127,036	$134,214
106th-A Pipeline 4	Sycamoor Pipeline	$136,013	$143,697
106th-A Pipeline 5	Burkhart Estates Pipeline	$97,695	$103,215
M-B Pipeline 3	Lucas Dell Pipeline	$210,340	$222,224
M-F Pipeline	Creek Ridge Dr. 18" Pipeline	$209,625	$221,469
J-A Pipeline 2	Temple View Estates 21" Pipeline	$300,983	$317,988
J-A Pipeline 3	101st S. 18" Pipeline	$343,785	$363,209
J-C Pipeline	River Front Parkway 24" Pipeline	$174,941	$184,825
	Total Cost	**$22,995,000**	**$24,295,000**

TABLE ES-3
SUMMARY OF 2006 STORM WATER TREATMENT COSTS

Creek/River	Cost	Fractional Cost Analysis	
		Developed	Undeveloped
Bingham Creek	$1,213,615	$1,179,634	$33,981
Midas Creek	$1,861,210	$1,330,765	$530,445
Jordan River	$1,447,680	$909,143	$538,537
Little Willow Creek	$294,710	$185,078	$109,632
TOTALS	**$4,817,215**	**$3,604,620**	**$1,212,595**

TABLE ES-4
SUMMARY OF 2008 STORM WATER TREATMENT COSTS

Creek/River	Cost	Fractional Cost Analysis	
		Developed	Undeveloped
Bingham Creek	$1,282,184	$1,246,283	$35,901
Midas Creek	$1,966,368	$1,405,953	$560,415
Jordan River	$1,529,474	$960,510	$568,964
Little Willow Creek	$311,361	$195,535	$115,826
TOTALS	**$5,089,388**	**$3,808,281**	**$1,281,107**

SECTION 1 – PROJECT OVERVIEW

1.1 Project Background

South Jordan City experienced the second highest annual average growth rate in the State of Utah from 1990 to 1999. Because of this remarkable growth, South Jordan is one of the largest cities in Utah with a current population of approximately 57,067. As with any growing city, it is imperative that the infrastructure keep pace with development and that the city properly plan for the future. As residential, commercial and industrial developments are being established at a rapid rate, South Jordan City has recognized the need to re-evaluate their storm drainage policies and master planning efforts.

It is anticipated that South Jordan will reach its ultimate (buildout) population projection by 2030. As this once largely agricultural community gives way to urbanized developments, the amount of impervious area increases, thereby increasing storm water runoff. The increase in storm water runoff requires storm drain facility improvements to manage the conveyance, detention and discharge of runoff to major drainage systems.

Historically and within recent years, the majority of storm drainage within the City has been conveyed through irrigation ditches at the road's edge and through the irrigation canal systems. Presently, with the Utah Pollutant Discharge Elimination System (UPDES) requirements for newly constructed developments and moratoriums on discharge of storm water flows into irrigation canals it is necessary to collect, convey and detain storm water flows within South Jordan City facilities.

In May 2002, Forsgren Associates prepared a Storm Drainage Master Plan (SDMP) for South Jordan as a result of the City's planning strategies. During the Spring of 2006 the City determined it necessary to update the SDMP to include improvements that have been constructed over the past four years. This 2008 SDMP updates the 2002 Master Plan. This Master Plan will utilize the 2002 Master Plan where possible to facilitate the City's planning and development efforts.

The City also determined that the Capital Facility Plan (CFP) would need to be updated to correctly identify proposed improvements and update costs to include the dramatic cost increase of construction and land acquisition. Therefore the CFP prepared by FRANSON Civil Engineers, formerly Franson Noble Engineering, in 2004 will serve as a supplemental component for this inclusive Master and Capital Facility Plan. The CFP was requested by the City in order to reassess storm drain impact fees to new developments.

1.2 Statement of Purpose

The purpose of the Storm Drainage Master Plan for the City of South Jordan is to identify and evaluate the adequacy of the existing storm water drainage and flood control facilities for both current and future conditions within the City boundaries. Once adopted, this document will be the guide for placement and construction of future storm drain facilities. The CFP, located in Chapter 7, sets forth short-term and long-term improvements to be implemented.

It should be noted that Kennecott Master Subdivision Development, commonly referred to as Daybreak located on the western region of South Jordan is assumed to not introduce any storm drain runoff into the City's system as their storm drain system is totally self contained by utilizing open ditches and large retention basins that allow for infiltration. This Master Plan will not incorporate Daybreak into the analysis of the City's storm drainage system.

The specific objectives of this SDMP include:

- Identify existing deficiencies in the storm drain system
- Analyze undeveloped areas of the City and their impact on the existing system
- Identify specific storm drain improvements
- Update the Capital Facility Plan
- Update the Cost Estimates needed for the impact fee analysis

1.3 Master Plan Development Activities

Over the past several years, a number of master planning documents have been prepared for South Jordan City, with the most recent being in 2002. These documents are outdated due to the rapid development within the City and the zoning and land use changes. The following is a summary of tasks performed to produce the current Master Plan:

1.3.1 Collect Existing Planning and System Information

FRANSON Civil Engineers staff collected information related to the existing storm drain system and future land use conditions. The following illustrates specific data obtained:

- Zoning Map adopted on July 3, 2006.
- Master Land Use Map adopted on July 3, 2006
- 2002 Storm Drain Master Plan and accompanying 2004 Capital Facility Plan
- Existing storm drain system GIS maps supplied by the City, facility age data, and record drawings of important facilities
- Salt Lake County Southwest Creek & Canal Study - 2002

1.3.2 Existing Storm Drain System Map

FRANSON Civil Engineers has produced a schematic map of the existing storm drain system. This map shows the pipeline locations and sizes, detention facility locations, and Salt Lake County flood control facilities. The map was completed using the existing City storm drain maps, and the City's GIS data. It was utilized in the evaluation of the existing system.

1.3.3 Hydraulic Model Development

FRANSON Civil Engineers prepared a hydraulic model for the areas that will be impacted by new development or for areas that have changed land use from the previous Master Plan.

1.3.4 Future System Development

Future system needs were examined by using the system model. Future flows were added at all existing undeveloped areas. The hydraulic model was used to size pipelines and detention ponds.

1.3.5 Capital Facility Update

FRANSON Civil Engineers updated the Capital Facility list with those improvements that have been constructed over the past several years. The 2006 and 2008 construction and land price costs are included in this report.

1.3.6 Staff Involvement

FRANSON Civil Engineers worked with City Staff including Brad Klavano, and Shane Greenwood to coordinate activities and recommendations associated with this plan.

SECTION 2 – EXISTING CONDITIONS

South Jordan City's storm drainage system includes the existing piping, detention basins and retention basins throughout the City.

The existing storm drain system is impacted by conditions associated with the physical environment, such as topography, land use, major roadway segments, natural drainages and irrigation canals. Another factor that will impact the overall storm drainage system capacity is the future development of historical pervious areas to impervious areas.

2.1 Existing Policy, Design Standards and Level of Service

South Jordan City requires new developments to comply with current City Storm Drain Design Standards. The City's storm drainage conveyance and detention policy utilizes widely accepted engineering industry standards. Piped systems must have sufficient capacity to convey the 10-year storm event. Detention and retention facilities must be designed for a 100-year storm event. The City also employs a restrictive discharge policy for commercial developments. Storm water runoff must be released at a maximum rate of 0.2 cfs per acre with the excess runoff detained on-site. The City also requires storm drain pipes have a minimum diameter of 18-inches to allow for large debris and flushing.

2.2 Other Municipalities and Agencies

Other urbanized municipalities surround South Jordan. Due to topography and previous planning it does not appear that other municipality storm water runoff will impact City drainage facilities. However, these municipalities do utilize Salt Lake County Flood Control Facilities that traverse through the City such as the irrigation canals and Midas Creek which is also used by Riverton City. For this plan it was assumed that the City's proposed infrastructure would not receive runoff from surrounding municipalities. However, South Jordan City has coordinated with Salt Lake County Flood Control and UDOT to handle storm water from within city limits. Details regarding the coordination with Salt Lake County and UDOT are discussed below.

2.2.1 Salt Lake County

The Southwest Canal and Creek Study, prepared for Salt Lake County in 2002, included the City of South Jordan. This study provides recommendations for improvements to natural drainages and irrigation canals to accommodate storm drainage from the 100-year event. During the preparation of the South Jordan SDMP discussions and approvals were received from SLCo to ensure that the County Flood Control Facilities, namely Midas Creek and the Utah Lake Distributing Canal, had sufficient planned capacity for South Jordan's storm water runoff. These major conveyances are detailed in section 2.11.

2.2.2 Utah Department of Transportation

The Utah Department of Transportation (UDOT) controls a number of transportation corridors within city limits. These transportation corridors include:

- Redwood Road (SR-68)
- 10400/10600 South from I-15 to Bangerter Highway
- Bangerter Highway through its entire length within city limits
- 11400 South from I-15 to Bangerter Highway

UDOT has several existing storm drainage facilities within the City. Some of the facilities receive storm drainage flows from South Jordan City while the city storm drain system receives storm drainage from UDOT facilities in other areas. The following is a list of UDOT storm drain facilities:

- Pipeline along Bangerter Highway, which collects and carries flows to a detention basin. The basin has an outfall into the city system at 3400 West.
- Pipeline facility installed in Redwood Road between 9400 South and 11800 South.
- Pipeline in 10600 South from Bangerter Highway to the Jordan River was installed during a previous roadway improvement projects.
- Detention Basin located adjacent to Jordan River at 10600 South.
- Detention Basins located at 10760 South Beckstead Lane.

In conversations with UDOT's Region Two hydraulic engineer, future discharge into Bangerter Highway may not be allowed as the Highway's storm drain system was not designed to convey the City's storm water runoff. If discharge is allowed by UDOT it will be at a very restrictive rate. Future development will need to be made aware of this UDOT policy and plan accordingly.

2.3 Floodplain Mapping

FEMA Flood Insurance Rate Maps have been prepared to cover nearly all of the natural drainages within the city. As part of the FEMA mapping process, Salt Lake County has worked with FEMA and its consulting engineers to update FEMA studies for the Jordan River and Midas Creek. In this effort the county provided input, reviewed and concurred with FEMA studies for all streams within Salt Lake County. As a result FEMA has delineated a 100-year floodplain and designated floodway for each of the following streams that traverse though South Jordan:

- Jordan River
- Midas Creek
- Willow Creek
- Dry Creek
- Bingham Creek

2.4 System Versus Project Facilities

It was determined, while preparing the Master Plan, the importance of distinguishing between System facilities (major) and Project facilities (minor). For this Master Plan, System facilities are defined as major systems that service more than one development. Project facilities are

defined as minor systems that service a single development internally such as a subdivision storm drain collection system. For the purpose of this Master Plan it is assumed that project facilities are funded and constructed by a specific development and are typically not funded by Impact Fees. To the extent possible only the system facilities have been modeled as part of this Master Plan (see Figure 2-1 for the existing storm drainage system). However, a project facility that has been included in the modeling effort is the Jones Meadows subdivision since some problems have been identified in this area.

2.5 Existing Detention Basins

South Jordan City has typically utilized detention and retention facilities to reduce and manage peak storm water flows from newly developed impervious areas. Detention facilities allow for storm water runoff to be collected and dissipated at moderate release rates thus allowing for smaller pipe sizes below the detention facilities. Locations of the City's existing detention basins are depicted in Figure 2-1.

Since the 2002 Master Plan, the City has eliminated where possible, redundant storm water detention facilities. Therefore, the City has been actively upgrading a number of existing detention basins in order to meet storm water detention needs, including the reconstructed Dunsinane Detention Basin, Country Crossing Basin and the newly constructed 9800 South / Shields Lane Basin and the Jordan Ridge Park Basin.

2.6 Existing Roadside Ditches

Historically the City has utilized roadside irrigation ditches to convey storm water runoff from rural streets. Currently there are a number of roadside ditches that still accept storm water runoff from these unimproved roadways. These ditches are not City facilities and their use as storm drain conveyance will be eliminated as new storm drain pipelines are installed.

2.7 Topography

Most of South Jordan City is located west of the Jordan River and generally slopes east to the river. Topography throughout this area is mild with average slopes of approximately 2 percent grade from west to east. Slopes from the bench areas down to the Jordan River floodplain generally increase to approximately 5 percent. The area to the east of the Jordan River slopes westerly toward the river valley with mild slopes on bench areas and steeper slopes dropping to

9000 S.
9400 S.
9800 S.
10600 S.
11000 S.
11800 S.
6000 W.
5600 W.
4800 W.
4400 W.
4000 W.
3600 W.
3200 W.
2700 W.
2200 W.
1700 W.
1300 W.
1000 W.
600 W.
300 W.
TO BINGHAM CREEK
BINGHAM CREEK
S-A
S-B
S-C
B-A
BANG-A
BANG-B
BANG-C
BANG-D
BANG-E
BANG-F
BANG-G
BANG-H
BANG-I
BANG-J
BANG-K
WELBY JACOB CANAL
BANGERTER HIGHWAY
98TH-A
98TH-B
98TH-C
98TH-D
106TH-A
UTAH S.L. CANAL
UTAH LAKE DISTRIBUTING CANAL
UTAH LAKE
M-A
M-B
M-BI
M-C
M-D
M-E
M-F
M-G
MIDAS CREEK
R-A
R-B
SOUTH JORDAN CANAL
UTAH-SALT LAKE CANAL
98TH-C2
JORDAN RIVER
J-A
J-B
J-C
J-D
J-E
J-F
J-G
J-H
J-I
J-J
J-K
DRY CREEK
REMNANT GALENA CANAL
WINWARD DITCH
NATURAL SPRING
LITTLE WILLOW CREEK
JORDAN & SALT LAKE CANAL
JORDAN CANAL

LEGEND

- STUDY BOUNDARY/CITY LIMITS
- EXISTING DRAINAGE
- SUB BASIN DELINEATION
- EXISTING DETENTION BASINS
- TEMPORARY DETENTION BASINS
- EXISTING PROJECT STORM DRAIN PIPE
- EXISTING SYSTEM STORM DRAIN PIPE
- EXISTING SHEET FLOWS DISSIPATER

N

0 2500 FT.

SOUTH JORDAN
UTAH

FRANSON
CIVIL ENGINEERS

SOUTH JORDAN CITY
2008 STORM DRAIN
MASTER PLAN UPDATE

DATE: JULY 7, 2006
SCALE: -
SD Basins-2006.dwg
CLIENT\3-SL\SO. JORDAN\STORM DRAINAGE\
SDMP 2006\DRAWINGS\
LAYOUT: EXISTING

FIGURE 2-I
EXISTING STORM DRAINAGE
CAPITAL FACILITIES

the floodplain area. The slopes from south to north are very flat in most areas. Several natural drainage channels also exist, which affect the areas immediately adjacent to these natural drainages. These channels include the Midas Creek channel, which causes adjacent areas to slope to the south and the Bingham Creek, which causes adjacent areas to slope to the north.

2.8 Soils

Soils throughout the study area are identified as well drained or moderately well drained by the soil survey prepared by the Soil Conservation Service in 1974. Soils within the city boundary can generally be divided into three soil groups: Bingham-Parleys, Bluffdale-Taylorsville-Hillfield-Bramwell, and Chipman-Magna-Ironton association. Infiltration rates of 0.05 to 0.30 inches/hour have been assumed based on previous studies.

2.9 Land Use / Zoning

In 1997, existing land use in South Jordan was designated as 45% agricultural. Over the past 10 years or so, this percentage has sharply decreased due to development of these agricultural lands. Residential, commercial and industrial developments have taken the place of many agricultural lands. This increases the amount of storm runoff that results from a precipitation event. Recently constructed and proposed developments include a number of commercial parks along the Bangerter Highway including the District and the area around the former Albertsons, Redwood Road, Jordan Parkway, and areas immediately adjacent to the Jordan River floodplain. The remainder of the City's future development will be predominately residential with low to medium density designations as well as a number of high density housing developments.

South Jordan's zoning map, see Figure 2-2, was used as the basis for determining storm runoff parameters utilized for modeling existing developments. The City's Future Land Use Map, see Figure 2-3, was used as the basis for determining the storm runoff characteristics for undeveloped areas and to determine future developable areas. The storm water runoff modeling is based on full buildout conditions.

2.10 Major Roadway Segments

Major roadways throughout the City affect the overall planning of the storm water drainage system. Not only do these larger roadways generate large amounts of runoff, but they also act as boundaries for adjacent storm drainage basins. The major north-south corridors include Redwood Road and the Bangerter Highway. To a lesser extent, 1300 West, 2200 West and 2700 West also provide north-south routes. The major east-west connectors are the South Jordan Parkway at 10400 to 10600 South, 11800 South and Shields Lane (9800 South). Some of these corridors, including Redwood Road, Bangerter Highway, 11400 South and the South Jordan Parkway, are State Highways and are under the jurisdiction of The Utah Department of Transportation (UDOT).

OFFICIAL ZONING MAP

UPDATED ON JULY 3, 2006

LEGEND

R-3	R-2.5	R-1.8	R-M
C-N	C-C	C-I	C-F
I-F	A-1	A-5	O-S
M-U	M-U	M-U	PC

N

5200 W. 4800 W. 4400 W. 4000 W. 3600 W. 3200 W. 2700 W. 2200 W. 1700 W. 1300 W. 1000 W. 600 W. 300 W.

9400 S.

9800 S.

10600 S.

11000 S.

11800 S.

WEST JORDAN

SANDY

DAYBREAK DEVELOPMENT

PC

RIVERTON

CITY LIMITS

DRAPER

FRANSON CIVIL ENGINEERS

SOUTH JORDAN CITY
2008 STORM DRAIN
MASTER PLAN UPDATE

DATE: OCTOBER 2006
SCALE: -

Zoning.dwg
CLIENT\3-SL\SO. JORDAN\STORM DRAINAGE\SDMP 2006\DRAWINGS\
LAYOUT: Zoning

FIGURE 2-2
ZONING MAP

FUTURE LAND USE PLAN MAP

UPDATED ON JULY 3, 2006

N

LEGEND

- COMMERCIAL
- OFFICE SPACE
- INDUSTRIAL PARKWAY
- PUBLIC
- RECREATION/ OPEN SPACE
- RURAL RESIDENTIAL
- LOW DENSITY RESIDENTIAL
- MEDIUM DENSITY RESIDENTIAL
- HIGH DENSITY RESIDENTIAL
- HISTORICAL AREA
- LARGE-SCALE MASTER PLANNED COMMUNITY
- HIGHWAY CORRIDOR MIXED USE
- C Church

SOUTH JORDAN
UTAH

5200 W. 4800 W. 4400 W. 4000 W. 3600 W. 3200 W. 2700 W. 2200 W. 1700 W. 1300 W. 1000 W. 600 W. 300 W.

9400 S.

9800 S.

10600 S.

11000 S.

11800 S.

WEST JORDAN

SANDY

DAYBREAK DEVELOPMENT

CITY LIMITS

RIVERTON

DRAPER

FRANSON CIVIL ENGINEERS

SOUTH JORDAN CITY
2008 STORM DRAIN MASTER PLAN UPDATE

DATE: OCTOBER 2006
SCALE: -

Future Land Use.dwg
CLIENT\3-SL\SO. JORDAN\STORM DRAINAGE\SDMP 2006\DRAWINGS\
LAYOUT: Future Land Use

FIGURE 2-3
FUTURE LAND USE MAP

2.11 Natural Drainages and Irrigation Canals

The natural drainages and irrigation canals within South Jordan City are shown on Figure 2-1. The natural drainages and the canals, except the Welby-Jacob Canal, are under the jurisdiction of Salt Lake County Flood Control. Coordination and review with Salt Lake County was included with this Master Plan as proposed storm drainage outfalls will impact these County facilities. The irrigation canals which are detailed below all mainly run in a south to north direction throughout the City. Although a considerable amount of runoff currently drains into the canals, the canal companies and County generally discourage the practice of using the irrigation canals for storm drainage runoff for new development as the existing capacity of the canals has been reached. It is assumed that the existing storm water runoff which drains to these canals will continue to do so; however minimal future discharges are planned. The following is a brief summary of the natural drainages and irrigation canals used for storm drainage in South Jordan City.

2.11.1 Jordan River

The Jordan River meanders from south to north through the easterly part of South Jordan City and is the major conveyance of natural drainage (surface and groundwater) and irrigation water for the entire Salt Lake County. The river is also utilized by communities for storm water discharge from urban areas. Currently South Jordan City utilizes the Jordan River to discharge a number of existing storm drainage outfalls.

2.11.2 Midas Creek

Midas Creek originates in the Oquirrh Mountains west of South Jordan City and runs east to the Jordan River. Manmade irrigation canals interrupt the path of the natural drainage. Where these canals cross the channel in an elevated earthen berm they effectively dam the natural drainage from the west. In recent years, previous canal restrictions and other deficiencies have been improved restoring the channel's ability to convey considerable storm water flows. Midas Creek serves as one of the main facilites in meeting storm runoff needs for the southern and eastern areas of the City. The County is actively restoring portions of Midas Creek to convey the future 100-year storm event. The City has assisted with the improvement of Midas Creek from 11800 South to 2700 West to allow for an increase of storm water from the District and surrounding areas.

2.11.3 Bingham Creek

Bingham Creek is located in the northwestern corner of the City and runs from southwest to northeast. Bingham Creek has been impacted by farming and urban encroachments, and portions of the natural channel have been almost obliterated in places. Although not as significant as Midas Creek, Bingham Creek is utilized for storm drainage runoff in the northwestern corner of the City.

2.11.4 Willow Creek

Willow Creek is located east of the Jordan River and serves as a minor drainage channel. While Willow Creek plays a significant role in conveying runoff from Sandy and Draper, its role in meeting South Jordan's storm drainage needs is relatively minor. This channel

provides drainage for storm water from the sub-basins east of the Jordan River. The boundary for the areas within South Jordan served by Willow Creek consist of I-15 on the east, the Jordan River on the west, 11400 South on the south and approximately 11000 South on the north.

2.11.5 Welby Jacob Canal

This irrigation canal is located between Bangerter Highway and approximately 4400 West. The Welby Jacob Canal is not part of the Salt Lake Flood Control Facilities. Approval to discharge storm water runoff to the Canal must come from the Canal Company. Presently the canal is not accepting storm water discharge.

2.11.6 Utah Lake Distributing Canal

The Utah Lake Distributing Canal is generally located between 3400 West and 2700 West. Although there are a few outfalls directly into the canal from urbanized developments, most of the runoff into the Utah Lake Distributing Canal comes from undeveloped areas west of the canal. In recent discussions with Salt Lake County this canal is close to its capacity. The County has agreed that only an additional five cfs from new development may be allowed. An option to increase the capacity is to improve the canal by raising the banks.

2.11.7 Utah and Salt Lake Canal

The Utah and Salt Lake Canal runs between 2400 West and 1700 West and currently accepts several storm drainage discharge points. These points include the outlet from Jordan Ridge Park which acts as a large detention pond located at approximately 9500 South and 2400 West, discharge points along 2200 West including a 42" line near 10800 South and a 24" line near 9559 South, and discharge lines at approximately 10100 South and 1800 West, 10950 South and 2200 West, and 11400 South and 2200 West.

2.11.8 South Jordan Canal

The South Jordan Canal is generally located between 1700 West and 1200 West. While most of the runoff comes from more rural areas, there are a few discharge points into the canal including one at 11400 South and 1500 West.

SECTION 3 – BASIN DELINEATION

The major drainage basins, for the most part, were delineated based on their discharge point. The points of discharge for the major basins have been identified as: Bingham Creek, Bangerter Highway, Midas Creek, and the Jordan River. All basins drain to one of these four discharge points with the exception of the 10600 South Basin which discharges partially to the Utah and Salt Lake Canal with the balance draining to UDOT's system at Redwood Road. In other instances storm water drains to canals. The major drainage basins are illustrated on Figure 3-1.

3.1 Drainage Basins

The major drainage basins are described as follows:

3.1.1 Skye Park Basin

The Skye Park Basin includes the areas in the northwest corner of the city bordered by the city boundary and Bingham Creek. The basin consists of mostly medium density residential development. The Skye Park Basin discharges into Bingham Creek.

3.1.2 Bingham Basin

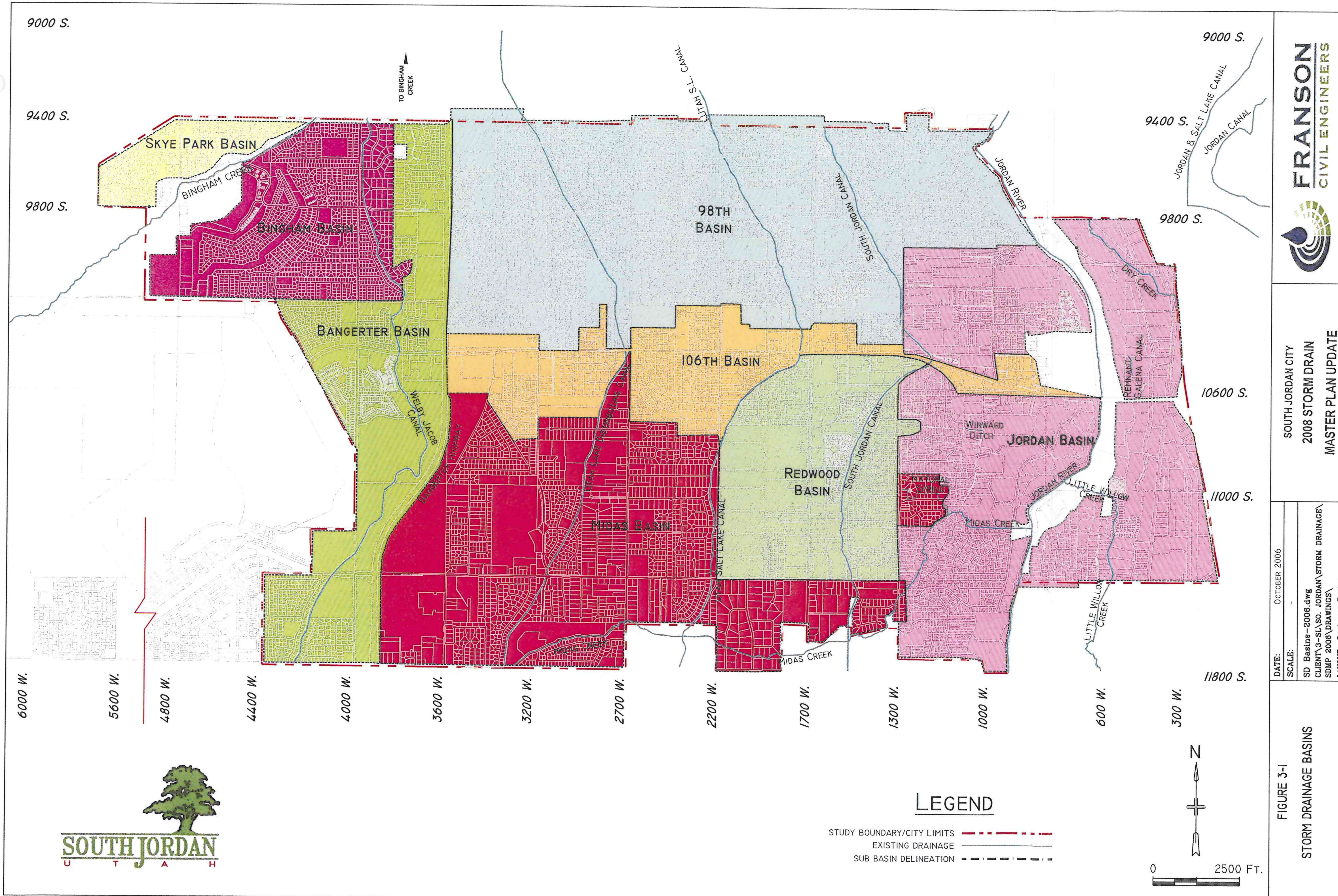
The Bingham Basin included the areas between 9470 South and 10200 South and between Dunsinane Drive (3845 West) and 4800 West. The basin consists mostly of medium density residential development as well as recreation/open space land. This basin discharges to Bingham Creek.

3.1.3 Bangerter Basin

The Bangerter Basin includes the areas on the west side of the city that are bound by the Bangerter Highway. The basin extends from the eastern boundary of the Daybreak development to Bangerter Highway and from 9400 South to 11800 South. The land use is and has been designated for low density and high density residential as well as commercial, office space, and recreation/open space. Portions of this basin have been previously allowed to drain into the Bangerter Highway System or the Welby Jacob Canal. Future development will likely need to retain storm drain water on site or receive special approval by the Canal Company or UDOT to discharge a minimal amount. The areas that have not been developed are in areas with a very high infiltration rate that would allow for retention/sump areas.

3.1.4 9800 South Basin

The 9800 South Basin includes the areas that are serviced by major lines on 9400 South and 9800 South that ultimately drain to the Jordan River and the Utah and Salt Lake Canal. The basin extends from Bangerter Highway to the Jordan River and from the northern city boundary to approximately 10200 South. The basin consists of mostly low density housing with minor areas of public/semi-public, recreational, and commercial areas. This basin is nearing buildout conditions.



9000 S.
9400 S.
9800 S.
10600 S.
11000 S.
11800 S.
TO BINGHAM CREEK
SKYE PARK BASIN
BINGHAM CREEK
BINGHAM BASIN
BANGERTER BASIN
98TH BASIN
106TH BASIN
MIDAS BASIN
REDWOOD BASIN
JORDAN BASIN
UTAH S.L. CANAL
SOUTH JORDAN CANAL
JORDAN RIVER
JORDAN & SALT LAKE CANAL
JORDAN CANAL
DRY CREEK
REMNANT GALENA CANAL
WINWARD DITCH
NATURAL SPRING
LITTLE WILLOW CREEK
MIDAS CREEK
WELBY JACOB CANAL
BANGERTER HIGHWAY
UTAH SALT LAKE CANAL
6000 W.
5600 W.
4800 W.
4400 W.
4000 W.
3600 W.
3200 W.
2700 W.
2200 W.
1700 W.
1300 W.
1000 W.
600 W.
300 W.
SOUTH JORDAN
U T A H
LEGEND
STUDY BOUNDARY/CITY LIMITS
EXISTING DRAINAGE
SUB BASIN DELINEATION
N
0 2500 FT.
FRANSON CIVIL ENGINEERS
SOUTH JORDAN CITY
2008 STORM DRAIN
MASTER PLAN UPDATE
DATE: OCTOBER 2006
SCALE: -
SD Basins-2006.dwg
CLIENT\3-SL\SO. JORDAN\STORM DRAINAGE\
SDMP 2006\DRAWINGS\
LAYOUT: Drainage Basins
FIGURE 3-1
STORM DRAINAGE BASINS

3.1.5 Redwood Basin

The Redwood Basin includes the south central part of the city that ultimately drains to Midas Creek. The basin extends from 10400 South to 11400 South and from 2200 West to 1300 West. The land use of the basin is and will be low density residential, commercial, office space, recreational, and some high density residential areas.

3.1.6 10600 South Basin

The 10600 South Basin consists of areas that drain onto 10600 South. The basin extends from Bangerter Highway on the west to the Jordan River on the east and from 10800 South to 10200 South. The basin is divided into two sub basins. Sub basin 10600 South A ultimately drains to the Utah and Salt Lake Canal while Sub Basin 10600 B flows into the existing UDOT system east of Redwood Road. The basin is designated for mostly low density residential but also commercial, office space and public/semi-public areas.

3.1.7 Midas Basin

The Midas Basin includes the areas that discharge to Midas Creek. The Midas Basin extends from Bangerter Highway on the west to nearly the Jordan River on the east. The southern city boundary forms the south boundary while the northern boundary varies between 10400 South to 11400 South. The basin consists of land designated for future use as rural residential, low density residential, commercial, office space, and some public/semi-public areas.

3.1.8 Jordan Basin

The Jordan Basin includes the areas of the city that discharge directly into the Jordan River. The basin extends roughly from the west side of I-15 to 1300 West and from the northern city limits to the southern city limits. The land is designated for use as low density residential, rural residential, office space, commercial, industrial, recreational, and some preservation areas.

3.2 Sub-Basin delineation

The major basins identified above have been broken down further into sub-basins. These sub-basins can be viewed within the individual sub-basin figures found in Appendix F The sub-basin boundaries were determined based on:

- Topography
- Future road development
- Future land use
- Existing collection pipes
- Proposed collection pipes
- Current outfalls

The sub-basins were used as the basis for the storm drain analysis and planning. Each sub-basin's hydrologic characteristics were used in determining storm water runoff. Also these sub-basins were the smallest area that was used in the modeling effort.

SECTION 4 – FUTURE CONDITIONS/LAND USE

4.1 Population Projections and Future Growth

A key factor in the preparation of a Capital Facility Plan or Master Plan is the consideration of future growth. As South Jordan City continues to grow, both in terms of population and in the amount of developed area, the conveyance and storage of storm water runoff to alleviate flooding will be crucial. The following section discusses current population projections, future land use, and existing zoning as they affect the proposed City storm drain capital facility improvements.

4.1.1 Population Projections

According to the City's General Plan, at full build-out the City could reach 35,785 housing units including Kennecott Master Subdivision. This equates to a population of 133,836 based on most recent census information for average household size. Currently, the City has a population of approximately 57,067. Future growth will occur in undeveloped areas throughout the City until buildout has occurred.

4.1.2 Future Land Use

The City provided a future land use map, see Figure 2-2, which was used to determine future buildout zoning conditions. The future land use map does not always reflect current zoning but instead the City's intentions for use at city buildout. The future land use map is a dynamic document utilized for planning purposes. The land use map has been revised since the preparation of the 2002 SDMP. Thus requiring some alterations to the previously proposed storm drain improvements.

Based on the population projections, by the year 2030 the City will be considered to be in a full build-out condition with no vacant land remaining for future development. Areas previously designated as agricultural lands are now changing to residential, commercial, and industrial particularly in the western half of the City. Proposed developments include a number of commercial parks along the Bangerter Highway, Redwood Road, Jordan Parkway, and areas immediately adjacent to the Jordan River floodplain. Additionally, industrial parks are proposed north of 10200 South, west of 4800 West, and immediately adjacent to the Jordan River floodplain in the northeastern part of the City. The remainder of the City's future development will be predominately residential with low to medium density designations. A few high density housing developments will also be included in the city's future development.

A figure was produced with input from the City that details those areas that may be still developed. The figure also identifies areas in the City that may be redeveloped sometime in the future. This figure is provided in Appendix D. The figure and its purpose is detailed further in Section 7.3.1.

4.2 Kennecott Master Subdivision Development (Daybreak)

Kennecott Land Company (KLC) is in the process of developing 4,127 contiguous acres of land over the next 20 years. Kennecott Master Subdivision, typically referred to as Daybreak, is located on the furthest west side of the City. The mixed-use community of residential, retail, industrial, and office developments has been designed to be self-sustained. Approximately 25 percent of the 4,127 acres will be open space and parks.

A Storm Water Management Plan for the Kennecott Land Company's Daybreak Development was prepared in February of 2003. The storm water objective is to attain 100 percent retention of storm water with on-site infiltration by building a low impact development. This results in no contribution of storm flows from Daybreak to other City storm drainage facilities during a 100-year storm event. The storm water collection and conveyance systems within Daybreak will be designed to meet South Jordan City requirements.

The new facilities required by development of the Kennecott Daybreak Development are not addressed in this document as the Daybreak Development will finance and construct all storm drainage facilities required for the Master Planned Community. After construction of Daybreak, storm water facilities will be transferred to the City for operation and maintenance

SECTION 5 – MODELING ANALYSIS

The modeling effort utilized the Rational Method to develop runoff rates for the study area. The use of the Rational Method is useful in urbanized areas. Modeling software was used to estimate hydrographs and peak flows from the 10-year and 100-year storms for sub-basins and at key design points along the main collection system. The input parameters are discussed below.

5.1 Routing Method

The model allows the user to define the method for routing flows to downstream reaches. Generally, the Muskingham-Cunge Method is the preferred technique for master planning purposes. This technique allows the user to define either a channel or conduit cross-section along with a Manning 'n' value. The routing is utilized to account for hydrograph attenuation due to travel time and the inflowing hydrograph.

5.2 Design Storm

A 10-year storm was utilized to calculate peak runoff flows for system conveyance facilities. A 100-year storm was utilized to calculate volumes for detention and retention facilities.

5.3 Precipitation

Precipitation data for the South Jordan area was obtained from the TRC North American Weather Consultants report for Salt Lake County, 1999. Typically, higher elevations to the west of South Jordan City will experience higher rainfall. However, due to the size of the City, little variance was observed from east to west so no elevation adjustment is proposed. The intensity duration curve for the City is provided in Appendix A.

5.4 Runoff Coefficient

The runoff coefficient was developed for each land type within the city. It was assumed for commercial and industrial land types that the runoff coefficient would reflect the City's allowable runoff requirement of 0.2 cfs per acre. A "weighted" runoff coefficient was used for basins with mixed land use. Typical coefficients are listed below:

- Commercial, Industrial, High Density Residential and Office Parks – 0.15 (reflecting the 0.2cfs/acre)
- Residential – 0.4
- Open Space / Parks – 0.2
- Public (Church, Schools, City Buildings and etc) – Coefficient will be computed using aerial photography and amount of impervious area.

5.5 Time of Concentration

Modeling offers several methods to estimate time of concentration for each drainage basin. A flow path is mapped from the most hydraulically remote part of the sub-basin to the design point

and a travel time is estimated for each segment of the flow path based on slope and land cover. The sum of the travel time components is adjusted based on basin size to give a lag time. For this study a minimum of 20 minutes was used for the time of concentration for each sub-basin.

5.6 Detention

The model allows input of parameters to define a detention area and routes the inflow hydrograph through the low level outlet and spillway. A "level-pool" reservoir routing is performed to compute reservoir volume. For estimation of future detention storage, an approximated outflow hydrograph is subtracted from the inflow hydrograph. It was understood that the City prefers regional detention ponds (major) versus individual development ponds (minor) for residential development. It was also assumed that the allowable outflow from detention ponds was 0.2 cfs per acre of total drainage area.

5.7 Modeling Assumptions

Some assumptions were made during the development of the model for the sub-basins in the study area. The hydrologic procedures and major assumptions are summarized below:

- The sub-basins were modeled assuming the hydrologic process can be represented by parameters which reflect average conditions within each sub-basin.
- For existing conditions runoff in excess of existing capacities was assumed to be surface flow to the next down-gradient sub-basin, with no street detention. Storm flows were calculated assuming no street detention to check against existing system capacity. Due to the urban nature of some of the sub-basins, street detention facilities are not feasible. Actual peak flows for existing conditions may be smaller due to current street flooding acting as detention.

SECTION 6 – RECOMMENDATIONS

6.1 Recommendations

The recommended storm drainage improvements are shown on Figure 6-1. The recommended improvements include piped conveyance along major corridors with detention located in public areas to reduce peak flows and minimize pipe sizes. When possible the use of regional detention rather than individual site detention allows for easier maintenance and better attenuation of flows from the basin area. The improvements shown utilize piped conveyance in keeping with the general practice in urbanized areas of Salt Lake Valley. Each improvement is detailed within Appendix F with additional information and assumptions.

6.1.1 General City Wide Recommendations

As expressed previously in this report, the City is nearing buildout conditions in the majority of areas east of Bangerter Highway. Infrastructure will need to be constructed as the remaining rural/farming areas are developed. Also as seen in the past several years, because of a substantial increase in raw land and construction prices it is recommended that new developments detain storm water where possible. The placement of detention within the new developments will allow for the majority of the storm drain system to function without the need of improvements.

Another recommendation is that during the review of new developments a 100-year flood path should be designed. This flood path delineation would illustrate how flooding would affect a development should piping not be able to contain the storm water. Caution should be taken during the review process to ensure that flooding, be conveyed away from existing homes and structures to lessen the City's liability.

6.1.2 Bangerter Basin Recommendations

It is recommended that for the Bangerter Basins located to the west of Bangerter Highway that new developments provide for their off-site storm drain system. It has been determined after discussions and meetings with UDOT Region Two Hydraulics Engineer that the Bangerter piped system may not be used to convey South Jordan storm water. Therefore those new developments would have the following options:

- negotiate and receive approval from UDOT to discharge into their system
- negotiate and receive approval from the Welby Jacob Canal to discharge into the canal
- retain storm water on-site with the consideration of utilizing deep sumps similar to Daybreak

SOUTH JORDAN CITY
2008 STORM DRAIN MASTER PLAN UPDATE

FRANSON CIVIL ENGINEERS

9000 S.
9400 S.
9800 S.
10600 S.
11000 S.
11800 S.

6000 W. 5600 W. 4800 W. 4400 W. 4000 W. 3600 W. 3200 W. 2700 W. 2200 W. 1700 W. 1300 W. 1000 W. 600 W. 300 W.

BINGHAM CREEK
TO BINGHAM CREEK
UTAH S.L. CANAL
JORDAN & SALT LAKE CANAL
JORDAN CANAL
JORDAN RIVER
SOUTH JORDAN CANAL
DRY CREEK
REMNANT GALENA CANAL
WELBY JACOB CANAL
BANGERTER HIGHWAY
UTAH LAKE DISTRIBUTING CANAL
WINWARD DITCH
NATURAL SPRING
MIDAS CREEK
LITTLE WILLOW CREEK
FUTURE UDOT PROJECT

S-A, S-B, S-C, B-A, BANG-A, BANG-B, BANG-C, BANG-D, BANG-E, BANG-F, BANG-G, BANG-H, BANG-I, BANG-J, 98TH-A, 98TH-B, 98TH-C, 98TH-D, 98TH-C2, 106TH-A, 106TH-B, M-A, M-B, M-C, M-D, M-E, M-F, M-G, R-A, R-B, J-A, J-B, J-C, J-D, J-E, J-F, J-G, J-H, J-I, J-J, J-K

98TH-D SUMP DRAIN

BANG-C 38 AC-FT 0 CFS
BANG-H 3.0 AC-FT 3 CFS
M-B 1 9.0 AC-FT 20 CFS
M-B 2 2.0 AC-FT 0 CFS
M-B 3 2 AC-FT 2.5 CFS
M-B 4 3.0 AC-FT 17 CFS
M-E 1 4.3 AC-FT 1 CFS
M-E 2 0.6 AC-FT 1 CFS
98th A 4.0 AC-FT 8 CFS
98th B 15.4 AC-Ft 1 CFS

SUNSTONE DEVELOPMENT

SUNSTONE

LEGEND

- STUDY BOUNDARY/CITY LIMITS
- EXISTING DRAINAGE
- SUB BASIN DELINEATION
- EXISTING DETENTION BASINS
- TEMPORARY DETENTION BASINS
- PROPOSED DETENTION BASINS
- PROPOSED PUMP STATION
- PROPOSED DETENTION BASIN INFORMATION (BASIN / AREA / 100-YR OUTFALL)
- PROPOSED PIPE SIZE & FLOW
- DESIGNED PIPE SIZE & FLOW
- EXISTING PROJECT STORM DRAIN PIPE
- EXISTING SYSTEM STORM DRAIN PIPE
- DESIGNED SYSTEM STORM DRAIN PIPE (AWAITING CONSTRUCTION)
- PROPOSED STORM DRAIN PIPE
- SHEET FLOWS DISSIPATER (EXISTING/PROPOSED)
- PROPOSED SUMP DRAIN
- PROPOSED RETENTION BASIN

N

0 2500 FT.

SOUTH JORDAN UTAH

DATE: OCTOBER 2006
SCALE: AS SHOWN
SD Basins-2006_Sizes and Flows.dwg
CLIENT\3-SL\SO. JORDAN\STORM DRAINAGE\SDMP 2006\DRAWINGS\
LAYOUT: Proposed_large

FIGURE 6-I
PROPOSED STORM DRAINAGE CAPITAL FACILITIES

6.1.3 Water Quality

This storm drain plan does not specifically address water quality concerns relating to storm water discharge with the exception of a planning level storm water treatment study in Appendix E. South Jordan City has received a UPDES Municipal Permit to discharge storm water. As the City of South Jordan implements the improvements described in this report, structural improvements should be designed to include appropriate water quality controls that meet the Permit Requirements. Such controls may include:

- Extended catch basins to trap sediment
- Hooded outlets on catch basins to trap oil and floatables
- Oil/water separators (hydrodynamic separators) for large paved areas to trap oils, sediments and floatables
- Detention design to consider holding of the "first flush" to allow for settlement of suspended solids
- Use of vegetation to trap sediments and absorb nutrients
- Protection of storm water inlets and conveyances during construction activities

New and innovative storm water quality controls are being used throughout the nation as the National Pollutant Discharge Elimination System (NPDES) Program matures. Through contact with Salt Lake County and other municipalities, South Jordan City may keep current regarding new controls that may better suit the specific application.

6.2 New Conveyance Pipelines

Storm drain pipe alignments were based on topography, available corridors (major roadways), and outfall locations. The hydrographs calculated for each sub-basin were then routed through the conveyance system in the storm water model and combined at key design locations to give a peak design flow for the pipe (10 year design event). The pipe sizes were then estimated using the Manning equation for open channel flow assuming gravity flow conditions with the pipe slope similar to the slope of the existing land. The gravity design size gives the City an added factor of safety over minimizing pipe sizes by designing with a pressure head. The required pipe sizes to convey the peak flow for the 10 year event are shown on the individual basin figures in Appendix F. These pipe sizes are based on reduction of peak flows by on-line detention and restrictive discharge as shown in the figures. During the design process caution should be taken to evaluate the flow capacity of the pipe and not just the size.

6.3 New Detention Facilities

Detention ponds are utilized to reduce peak flows from the design storm event by detaining the excess water and releasing at a restricted rate over a longer period of time. The use of detention ponds reduces the required pipe sizes and resultant corridor needed for pipe construction. The detention areas may be utilized for open space and recreational needs and may also offer an opportunity to trap sediment and debris from storm water runoff. The detention shown in the individual basin figures in Appendix F is based on a release rate as shown in the figure. For

reference purposes Salt Lake County normally requires a restricted discharge of 0.2 cfs/acre which is approximately predevelopment flow rates. Detention is shown for the 100 year design storm events. The 10 year event will be conveyed to the detention area by the piped improvements shown on the figures. The 100 year event is assumed to reach the detention area both through the piped conveyance under surcharged conditions and by overland flow. The detention area sizing estimated in the storm water modeling should be reviewed during the design phase when actual physical design parameters are available.