Enoch City

STORMWATER IMPACT FEE FACILITIES PLAN & IMPACT FEE ANALYSIS

June 2017

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1 EXECUTIVE SUMMARY

1.1 Introduction

Enoch City commissioned Sunrise Engineering to create an Impact Fee Facilities Plan and Impact Fee Analysis for the stormwater utility. This plan evaluates the existing system and recommends improvements for a 6-year planning horizon and a 20-year planning horizon. The stormwater utility was established in fiscal year 2015 and received a grant to construct a major storm drain trunk line to convey stormwater through the City.

1.2 System User Analysis

Enoch City's projected growth rate is expected to increase gradually over the next several years. Supporting data is available in Appendix B.

- Growth Rate of 1.5% to 5%
    - 2015 Census estimated population was 6,265
    - 2017 estimated population is 6,454
    - 6-year planning horizon estimated population is 7,595
    - 20-year planning horizon estimated population is 14,750
- Commercial Connections are defined as 4.11 Equivalent Residential Units
    - 2017 estimated total ERUs is 2,234
    - 6-year planning horizon estimated total ERUs is 2,628
    - 20-year planning horizon estimated total ERUs is 5,105

1.3 Existing Facilities

Several different types of facilities contribute to stormwater control and conveyance.

- 26.1 miles of curb and gutter
- 2.7 miles of storm drain pipe
    - 26 storm drain manholes
    - 24 storm drain inlet structures
- 7 detention basins
- 2.4 miles of road side ditches
- 214 culverts (included driveway crossings)
- 141 cross gutters

1.4 Hydrologic and Hydraulic Analysis

Sunrise Engineering collected field data for the storm drain system to provide required data for the hydraulic system model. Watershed basins were delineated with publically available LIDAR data and topographical map data. Soil type data was collected from the Soil Conservation Survey (SCS) database. Land use data was collected from a national database and local zoning designations. Curve numbers representing the runoff potential of a basin were calculated from a

table relating soil type and land use to curve numbers (CN). The design storm for the stormwater runoff analysis was the 100-year, 6-hour storm.

- Mountain Region Rainfall Depth – 2.73 inches
- City Region Rainfall Depth – 2.30 inches

The mountain region model results are presented in Appendix A (Map 7). The City region model results are shown in Appendix A (Map 8). Supporting information is included in Appendix C.

The City has several thousand feet of storm drain pipe, mostly from one storm drain line in Stagecoach Lane from a detention basin near Enoch Road. The critical or limiting pipe capacity for the main storm drain line is approximately 35.8 cfs because of its mild slope. Hydraulic model input and results are included in Appendix D.

1.5 Recommended Improvements

- Construct various improvements to correct existing issues.
    - Regrade the roadside swale on Spanish Trails Drive.
    - Install curb and gutter along the west side of Veterans Memorial Drive.
    - Install curb and gutter along both sides of Enoch Road between Sunset Road and Jones Road.
- Construct Detention Basins 14 and 15.
- Ensure City Code requires that post-development flows do not exceed pre-development flows.
- Require new development to perform a drainage study.
- Construct Detention Basin 13.
- Construct the Storm Drain Phase II Project.
- Construct Detention Basin 12.
- Define Drainage Paths.
- Construct Detention Basin 11.
- Construct Detention Basin 10.
- Update this IFFPA. A plan update should occur every five years to maintain current impact fees and update impact fee facilities plan or as growth dictates.

1.6 System Financials

An Engineer's Opinion of Probable Cost shows that construction related costs could total $5,899,700 in 2017 dollars, with another $160,000 for Impact Fee Facilities Plan updates.

A city utility must be able to sustain itself financially through user rates and impact fees. User rates cover operations and maintenance and includes existing debt not covered by impact fees. Impact fees pay for improvements that are needed because of growth.

A user rate based on 2016 audit numbers and engineering judgment was calculated. Engineer's Opinion of Probable Cost values are reflected in the maximum allowable impact fee.

- Existing Impact Fee - $0.00 per ERU
- Existing User Rate - $2.00 per month per ERU
- Maximum Allowable Impact Fee - **$1,593.14** per ERU
- Proposed User Rate 100% Bonds- **$7.76** per month per ERU
- Proposed User Rate 50% Bonds, 50% Grants- **$5.52** per month per ERU

Cash flows for both user rate scenarios show the system's financial viability for the next 20 years are available in Appendix E.

2 INTRODUCTION

2.1 Purpose and Scope

Enoch City commissioned Sunrise Engineering, Inc. to create a Stormwater Impact Fee Facilities Plan. Also included in the plan is an Impact Fee Analysis, establishment of a system model, and a User Rate Analysis. The purpose of the study is to provide an Impact Fee Facilities Plan and Analysis (IFFPA) that can be used as a valuable tool by the City for the following:

1. Provide an updated understanding of the key elements of the system including existing watersheds, gravity network attributes, scope, and collection points.
2. Provide a digital system map for planning and maintenance.
3. Define stormwater basins.
4. Develop and quantify peak stormwater flow rates for existing conditions, 6-year planning horizon, 20-year planning horizon, and buildout conditions.
5. Create a model of the existing Storm Drain Project Phase I collection system to evaluate capacity and conveyance.
6. Develop an infrastructure plan for recommended improvements.
7. Provide an Engineer's Opinion of Probable Cost for recommended improvements in the 20-year planning horizon.
8. Provide an impact fee analysis and maximum allowable impact fee for new improvements that are needed to accommodate growth regarding the stormwater utility systems.
9. Provide a user rate analysis and cash flow analysis for financial operations and management of the stormwater system.

The items to be discussed in this master plan will focus on the existing system in 2017 followed by a 6-year (2023) and 20-year (2037) planning horizon. Project costs and impact fee calculations will be based on the 20-year planning horizon. Public input was sought during an open house regarding this project in April 2017, and input was taken from City staff and public comments. The public comment cards and copies of overview maps are included at the end of Appendix B.

2.2 Background Information

Enoch City is a growing rural community in Iron County, just north of Cedar City. Its current and future economic status benefits heavily from I-15 bordering the City to the east. Enoch City embraces its foundation and pioneer heritage from the 1800's as evident from the City's seal. Growth has been steady for the past few decades, the latest Census estimate from 2015 shows a population of 6,265. This IFFPA equates the 2015 population to 2,168 equivalent residential units (ERUs). Population growth is projected to increase in the coming years, resulting in a population projection in 2037 to be 14,750 residents and 5,105 ERUs.

Stormwater generally flows from the east into the City then changes direction to the north. The mountains to the east of Enoch serve as a collection area for stormwater measuring approximately 12 square-miles. The topology of the City changes slope from the mountains in the east to the valley floor to the west.

The stormwater utility was establish for fical year 2015. In that year, Enoch received a grant of over $1M to design and construct a storm drain trunk line. The trunk line is fed by a detention basin that reduces stormwater flow into the City and conveys that flow through the middle of the City to a field north of the City boundary.

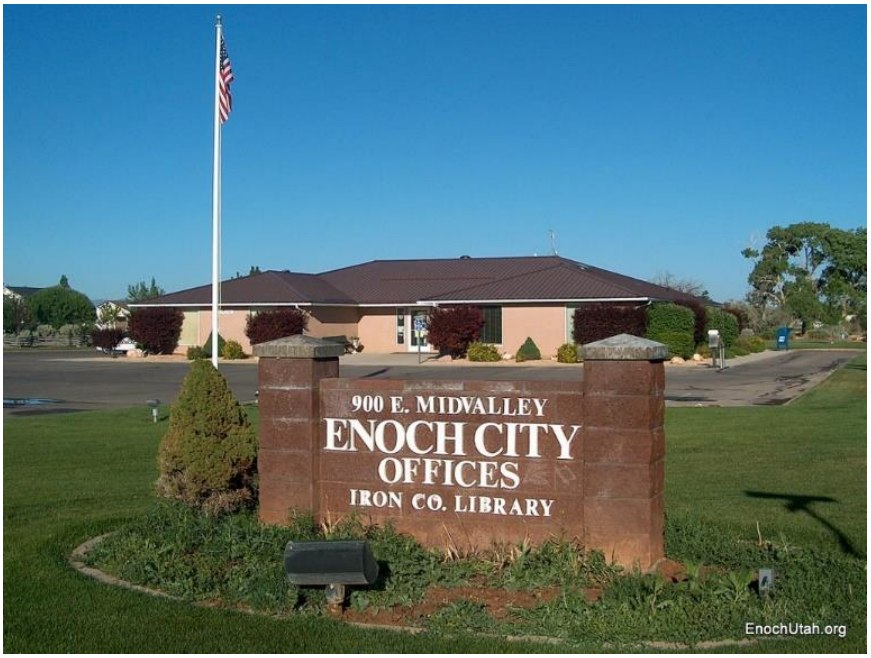


Figure 2-1: Enoch City Offices

3 SYSTEM USER ANALYSIS

3.1 Planning Horizon

The agreement between Sunrise Engineering and Enoch City identified two planning horizons where the model results would dictate recommended improvements. A 6-year planning horizon was established to identify immediate needs for the stormwater system that could be paid for by impact fees per Utah State Code within 6 years of receipt. A longer planning horizon of 20-years was established to identify long term needs for the stormwater system.

3.2 Projected Growth Rate

Table 3-1: Enoch City Historic Growth

Data Type	Year	Population	Annual Growth Rate
Census Est.	2015	6,265	1.5%
Census	2010	5,803	5.3%
Census	2000	3,467	5.9%
Census	1990	1,947	11.1%
Census	1980	678	-

An essential element in the development of a facilities plan is the projection of the City's population growth rate. Projecting the number of future connections with any degree of accuracy can be a very subjective process. This plan uses several resources including Census figures and sewer connection data from the City's billing summaries to evaluate the growth trends and to provide a projection of how growth will occur in the future. Table 3-1 shows historic growth rates based on census counts from 1980 through 2010 and a census estimate from 2015.

It is expected that the number of new connections per year will increase at a moderate rate for the duration of the planning horizons. For this IFFPA and to prepare for the future stormwater requirements it is assumed that 1.5%-5% growth will occur for the next 20 years. If the number of system connections is reached earlier or later than projected, then future improvements to support growth may either come earlier or later as needed. Impact fee revenue is directly related to the assumed growth rates. Table 3-2 shows the projected ERUs, connections, and population growth.

Future population estimates are calculated using the compound interest formula and inserting the

Table 3-2: Population and ERU Growth Projections

Year	Est. Growth Rate	*Estimated Residential ERU's	*Estimated Commercial ERU's	*Estimated Total ERU's	**Estimated Population
2015	-	2,119	49	2,168	6,265
2016	1.5%	2,151	50	2,201	6,359
2017	1.5%	2,183	51	2,234	6,454
2018	1.5%	2,216	52	2,267	6,551
2019	3.0%	2,282	53	2,335	6,748
2020	3.0%	2,351	55	2,405	6,950
2021	3.0%	2,421	56	2,478	7,159
2022	3.0%	2,494	58	2,552	7,373
2023	3.0%	2,569	60	2,628	7,595
2024	3.0%	2,646	62	2,707	7,822
2025	5.0%	2,778	65	2,843	8,214
2026	5.0%	2,917	68	2,985	8,624
2027	5.0%	3,063	71	3,134	9,055
2028	5.0%	3,216	75	3,291	9,508
2029	5.0%	3,377	79	3,455	9,984
2030	5.0%	3,546	83	3,628	10,483
2031	5.0%	3,723	87	3,810	11,007
2032	5.0%	3,909	91	4,000	11,557
2033	5.0%	4,104	96	4,200	12,135
2034	5.0%	4,310	100	4,410	12,742
2035	5.0%	4,525	105	4,630	13,379
2036	5.0%	4,751	111	4,862	14,048
2037	5.0%	4,989	116	5,105	14,750

* Estimated ERU's and Connections are based on City billing data.

** Estimated Population is based on the 2015 census data and the projected growth rates.

existing population value, projected growth rate, and the number of years of each planning horizon. Figure 3-1 shows how quickly the population may increase.

$$F = P(1+i)^n$$

F = Future Value
P = Present Value
i = Growth Rate
n = Years

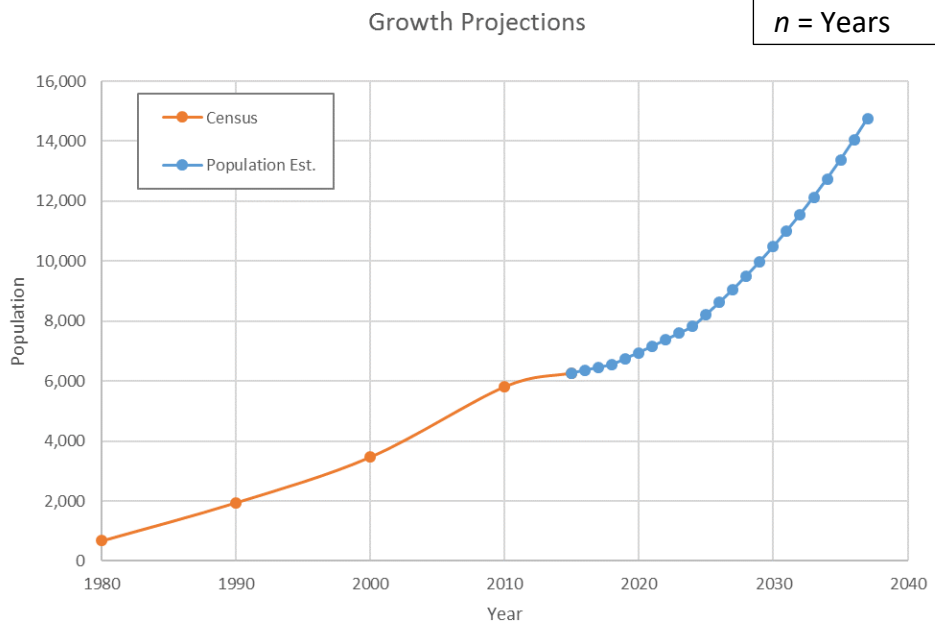


Figure 3-1: Growth Projections

3.3 Equivalent Residential Units

Each residential unit is defined as 1 ERU. Each commercial unit is defined as 4.11 ERUs. This number was calculated in the previous Water Capital Facilities Plan. The data required to recalculate this value was not provided. This means that the average commercial user produces more stormwater runoff than the average residential user.

The total number of ERUs for 2017 and each planning horizon is summarized in Table 3-3.

Table 3-3: Planning Horizon ERU Calculation Summary

Planning Horizon	Year	Estimated Residential ERU's	Estimated Commercial ERU's	Estimated Total ERU's
-	2017	2,183	51	2,234
6-Year	2023	2,569	60	2,628
20-Year	2037	4,989	116	5,105

4 EXISTING FACILITIES

4.1 Roadway Conveyance

Roadway conveyance is the ability to carry stormwater within the street right-of-way. Typically curb and gutter can increase the volume of stormwater a roadway can convey. In areas lacking curb and gutter, flooding can occur from relatively minor storm events.

Enoch City has approximately 26.1 linear miles of curb and gutter. Some streets in the City have sloped sides to create a natural road-side swale. Curb and gutter locations in Enoch City are shown in Figure 3-1.

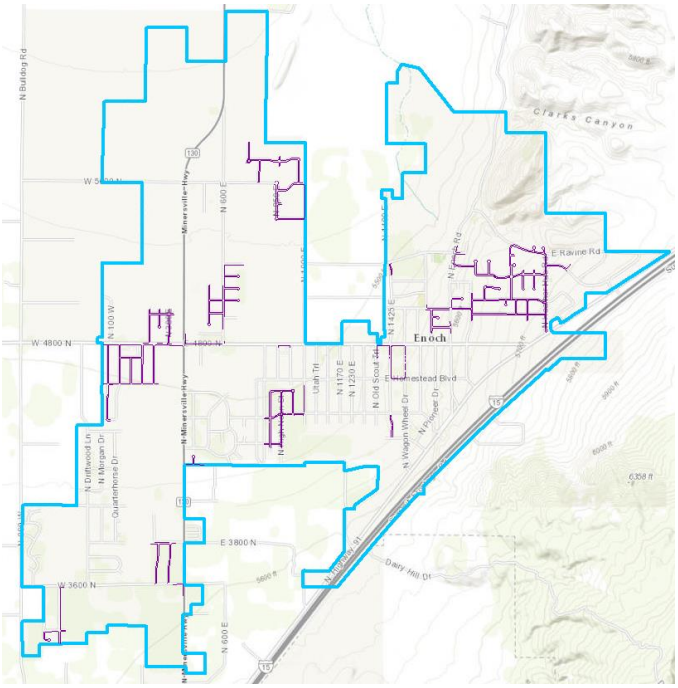


Figure 3-1: Curb & Gutter in Enoch

4.2 Storm Drain System

Storm drain pipes are an underground pipe network that collects stormwater through surface catch basins and conveys the stormwater underground. While storm drain systems can be efficient in conveying stormwater, it is necessary to properly maintain the system to convey stormwater. For example, during or after a storm event, it may be necessary to clear debris and sediment from catch basins and pipes to maximize the efficiency of the storm drain system.

Enoch City has a major storm drain trunk line that was recently installed under Stagecoach Lane and Half Mile Road and several smaller networks to convey surface water away from developed areas of the City. There is approximately 2.7 linear miles of storm drain pipe, 26 storm drain manholes, and 24 storm drain inlet structures. Figure 4-2 shows the storm drain network in Enoch.

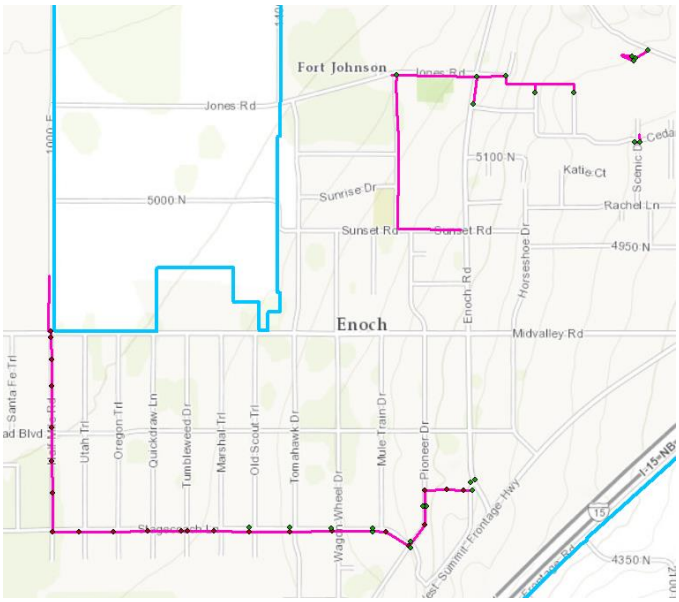


Figure 4-2: Storm Drain Networks in Enoch

4.3 Detention Basins

Detention and retention facilities are used to decrease or eliminate the downstream flow to the stormwater conveyance facilities, thus reducing or eliminating the burden of stormwater runoff. Several

small detention basins exist in Enoch, primarily near new development because post-development flows should not exceed pre-development flows for an area.

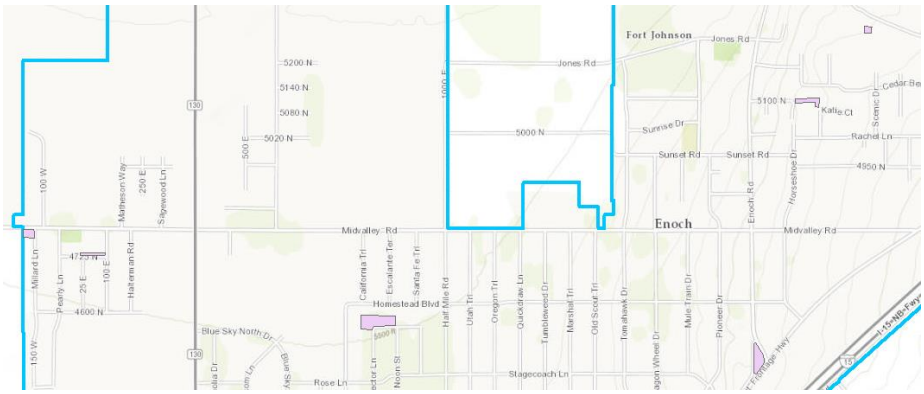


Figure 4-3: Detention Basins in Enoch

Enoch has seven identified detention basins throughout the City. Most of the detention basins were constructed near recent development to reduce stormwater runoff flow.

4.4 Drainage Channels

A drainage channel is a natural or man-made waterway. For major drainages, these natural channels are the flow line of the basin. Not only do natural open channels typically provide greater capacity for conveying stormwater, but they also provide for pleasing aesthetics and provide opportunities for alternate uses. These alternate uses can include linear parks, trails, etc. Additional benefits of natural drainage channels also include slow flow characteristics, are wide and shallow, and they function and appear natural.

Enoch has roadside swales or shallow ditches to convey stormwater where there is no curb and gutter. There is approximately 2.4 linear miles of road side ditches. Constructed channels are shown in Figure 4-4.

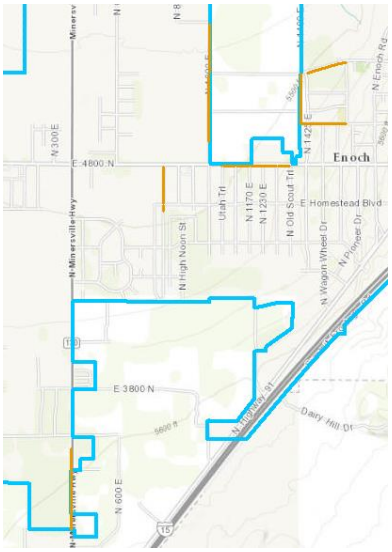


Figure 4-4: Drainage Channels in Enoch

4.5 Drainage Crossings

A drainage crossing is a structure that conveys stormwater under, through and otherwise across a barrier, usually a roadway. Examples of drainage crossings are a culvert and a cross gutter.

Enoch has numerous culvert crossings for both minor and major drainage channels. There are approximately 214 culverts, included driveway crossings, and 141 cross gutters have been identified in Enoch. There are also several major concrete box culverts to convey stormwater under I-15. Culverts must be properly maintained and cleared of brush or debris blocking the inlet or outlet to function as intended.

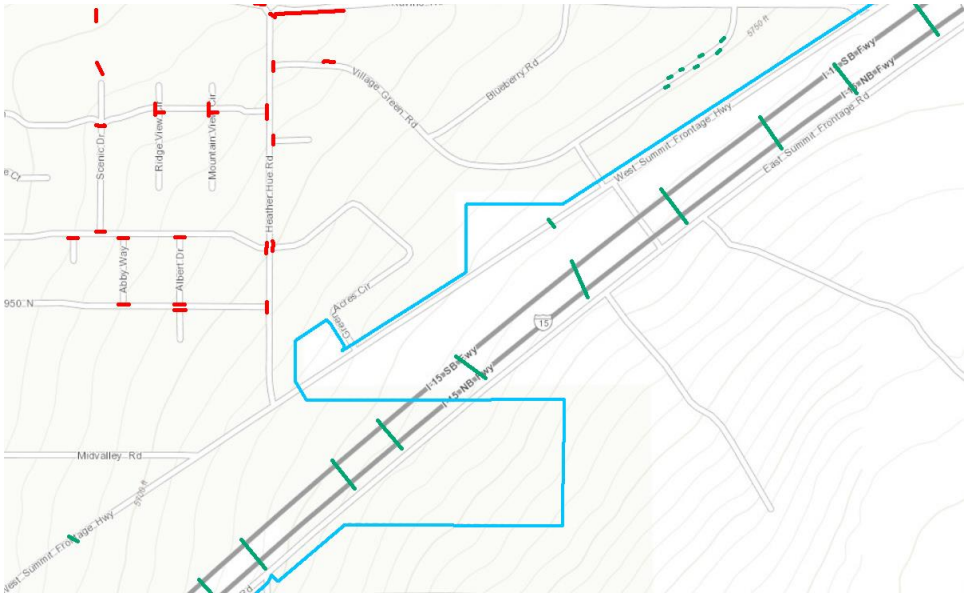


Figure 4-5: Culverts under I-15 and Cross Gutters in Enoch

A summary of existing facilities, their locations and size are shown in Appendix A (Map 9 & 9a) and can be found on the City's Cloud SMART GIS portal.

5 HYDROLOGIC & HYDRAULIC ANALYSIS

5.1 Field Collection and Site Visits

To accurately model the storm drain system, field measurements were collected for each manhole and pipe. Each manhole rim elevation was recorded with survey grade GPS equipment. Then the depth to the flow, or invert elevation was measured. The diameter of the pipe was verified at the same time as the invert elevation measurement. These critical parameter values were included in the GIS data of the stormwater system. This field collected data was critical for the creation and accurate function of the model.

Other site visits were completed to verify intersection flow paths and to document cross gutters and culverts in Enoch City.

5.2 Basin Delineation & Flow Patterns

A drainage basin is a portion of a greater watershed area that has specific, well-defined boundaries and produces runoff at a downstream point location. A sub-basin is an area within a drainage basin that is characterized by similar drainage features and homogeneous land use. Dividing larger watershed areas into individual drainage basins and sub-basins allows more detailed and accurate analyses of the individual areas. These individual analyses can then be combined to generate data for the large basins and the watershed.

Basins contributing runoff through and within the service area needed to be identified along with the flow paths these basins use to discharge their stormwater runoff. These defined flow paths allow for conveyance facilities to be near each basin to properly detain, route and convey runoff downstream. In several cases, these existing natural flow path drainages will be incorporated into the future drainage system infrastructure.

A digital elevation model (DEM) was obtained from the U.S. Geological Survey (USGS) website at contour intervals of 10 meters. The DEM was imported into Watershed Modeling System (WMS©) and was used to perform the basin delineation. WMS© is a watershed modeling software used to calculate watershed information, analyze it, and output basin characteristics required by HEC-HMS as input. Such basin characteristics include basin areas, flow path lengths, and flow path slopes. Basin boundaries and

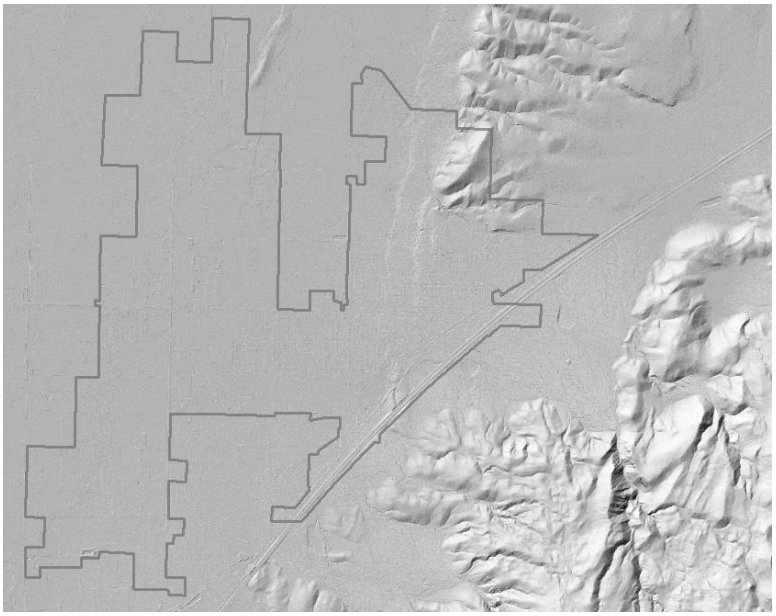


Figure 5-1: LIDAR Elevation Data

flow paths were verified with LIDAR data as shown in Figure 5-1.

Enoch and the surrounding areas are divided into several drainage basins as shown in Appendix A (Map 2). This map contains the name and area for each basin. The service area for this plan contains 11 basins varying in shape and size. The numbering of the basins and outlets for the mountainous region was done by Sunrise Engineering and serves only for reference between HEC-HMS and WMS©. The numbering for the areas within the City were also done by Sunrise and serve only as a reference. Watershed basin 24B does not flow into Enoch City, but was delineated to help distinguish the boundary between watershed basins.

5.3 Soil Type

The soil type within a watershed area has a significant impact on how much excess stormwater is available for runoff because the soil type determines the precipitation infiltration rate. This infiltration rate is the rate which water moves from the ground surface into subsurface soil layers. If the infiltration rate is very high, stormwater runoff generated by precipitation events is lower because a greater volume of moisture is absorbed by the soil. Conversely, if the infiltration rate is low, higher volumes of runoff are generated because minimal absorption occurs in the subsurface soil layers. The Soil Conservation Service (SCS) has studied soil types throughout the United States and has grouped soils according to their type and infiltration rates. These groups are described in the list below:

- Group A: These soils have a high infiltration rate. They are chiefly deep, well drained sands or gravel, deep loess, or aggregated silts. They have low runoff potential.
- Group B: These soils have a moderate infiltration rate when thoroughly wet. They are moderately deep and well drained and of moderately fine to moderately coarse texture. Examples are shallow loess and sandy loam.
- Group C: These soils have a slow infiltration rate when wet. They are soils with a layer that impedes downward movement of water and typically have moderately fine to fine texture. Examples are clay loams or shallow sandy loams. These soils are typically low in organic content and high in clay content.
- Group D: These soils have a very slow infiltration rate. They are chiefly clay soils with high swelling potential. A high water table is often permanent. Clay pan is often found at or near the surface. A shallow layer of soil may cover a nearly impervious material. Examples include heavy plastic clays and certain saline soils. They have high runoff potential.

The SCS has performed a study of the soils in Enoch City and the surrounding area. This study reveals that the soil types are primarily of groups B and D. Soil type maps area is given in Appendix A (Map 3).

5.4 Land Use

The type of land use in each watershed area is a factor that significantly affects the magnitude of stormwater flow and runoff volume generated by precipitation events over the watershed area. Land uses that have relatively higher percentages of impervious surfaces such as parking lots, shopping areas, storage yards and high density residential housing tracts generate more stormwater runoff than areas with lower percentages of impervious surfaces such as parks and grasslands. Examination of current aerial photographs and field investigations allowed land use trends within the City to be identified for the purposes of this study. The City has a variety of land uses that include:

- Commercial and Services: Includes shops, restaurants, and other businesses.
- Communications and Utilities: Includes areas that facilitate public and private utilities.
- Cropland and Pasture: Includes agricultural land and livestock feeding areas.
- Deciduous Forest Land - Oak and Aspen (80%): Includes forest land with Oak and Aspen.
- Evergreen Forest Land: Includes evergreen covered forests.
- Future Development: Includes designated areas nearing development.
- Industrial and Commercial Complexes: Includes planned developments of industrial and commercial areas.
- Mixed Forest Land: Includes forested areas not sorted into other land uses.
- Mixed Rangeland: Includes mixed-use agricultural land.
- Residential: Includes suburban and urban residential areas.
- Rural Residential (2.5 ac lots): Includes residential areas having 2.5 acre average lots.
- Rural Residential (5 ac lots): Includes residential areas having 5 acre average lots.
- Shrub and Grass Rangeland: Undisturbed land used for range.

Most of the existing land use is designated as desert shrubs and pinyon/juniper with residential and commercial/services isolated in Enoch as shown in Appendix A (Map 4). A new land use named “Future Development” was used in the model for future land use conditions shown in Appendix A (Map 5). The future development land use is assumed to be a hybrid of residential and commercial; an average of possible urban development.

5.5 Curve Numbers

After the land use characteristics for the area were determined, SCS Runoff Curve Numbers (CN) were determined. The SCS, based on experiments and experience, has related soil groups and other drainage characteristics to CN values. This relationship between land use, soil type, and CN figures is presented in Appendix A (Map 7 and Map 8). The calculations of all curve numbers are shown in Appendix C (Exhibit B and C).

5.6 Design Storm & Precipitation

The design storm is specified by the frequency of the storm event (years), the duration of the event (hours), and the temporal distribution of the event. Since this IFFPA is for major conveyance facilities, the 100-year frequency was used. A graph showing the storm distribution is in Figure 5-2. The duration that was used was 6 hours because of typical severe storm durations in the area. The design storm temporal distribution shows that about 50% of the rainfall occurs in about 30 minutes.

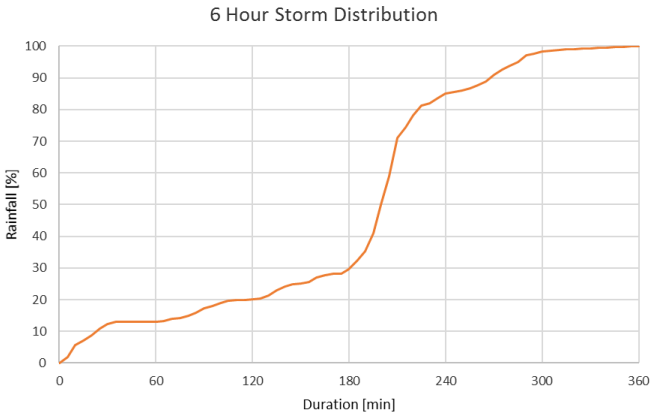


Figure 5-2: Design Storm Distribution

5.7 Precipitation Data

Rainfall data needed for input into the computer model was taken from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 precipitation frequency data server. Precipitation frequency is used to measure the intensity of a rainfall event over a certain time. This data is presented in Appendix B. Precipitation data presented is given in depth for a storm duration and storm recurrence period for a certain storm event. This depth is used to create a temporal distribution, or the relationship between percentages of rainfall over time. A summary of the precipitation data used in this IFFPA can be found in Table 5-1.

Table 5-1: Precipitation Data Summary

Region	Design Storm	Rain Fall [in]
Mountains	100-yr 6-hr	2.73
City	100-yr 6-hr	2.30

5.8 City Stormwater Flow Calculations

The method and model used for the mountain region, as explained in the previous subsections, was not used to model the stormwater flow through the City because of the shallow slopes within the City boundaries. Stormwater flow in Enoch was calculated with a tabular curve number method. Enoch was divided into four basins where stormwater is collected. The land use and soil characteristics as shown in Appendix A (Map 3, 4, and 5) were evaluated in each basin to calculate a composite curve number (CCN). The CCN is used in the maximum storage equation.

$$S = \left(\frac{1000}{CCN}\right) - 10$$

Rainfall excess (or stormwater flow) is then calculated in inches from the NRCS Curve Number method using precipitation depth and maximum storage when Q_{in} is greater than S.

$$Q_{in} = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

The flow in inches is converted to a volume in acre-feet and to an average flow in cubic-feet per second. The tabular analysis and results are found in Appendix C, with results from the existing condition scenario in Appendix A (Map 8).

5.9 Model Results

All of the previously mentioned data was obtained and used in the model to get the hydrologic results. The City region analysis was done for four different time periods: existing conditions, 6-year planning horizon, 20-year planning horizon, and buildout. In the case of the mountain region, the only change in input parameters was for buildout conditions. Only the existing and buildout conditions were evaluated because detention basin recommendations should be sized for existing condition flow results with future development infrastructure being designed to locally detain the increase in flow evident from the buildout conditions.

A basin map can be found in Appendix A (Map 2). Results of the hydrologic modeling are found in the following formats:

- Overview Mapped Result – includes basin name and CN in Appendix A (Map 7 & 8)
- Tabulated Result – includes basin name, drainage area, peak discharge, time of peak discharge, and volume in Appendix C

5.10 Hydraulic Model & Analysis

The major storm drain trunk line in Stagecoach Lane and Half Mile Road was modeled to verify the maximum capacity of each pipe segment. H2OMAP Sewer® by Innovyze was the modeling program used to evaluate the gravity pipe systems. The inputs for the model are the manholes and pipe network information and flow demands. Figure 5-3 shows the model inputs and alignment of the storm drain.

This particular storm drain is fed by a detention basin near I-15 and has some street side inlets along Pioneer Drive. The limiting pipe is on Stagecoach Lane between Pioneer Drive and Mule Train Drive. This pipe (ID A01CA01D) has a maximum capacity of approximately 35.8 cfs. Appendix D contains the model input data and the model results.

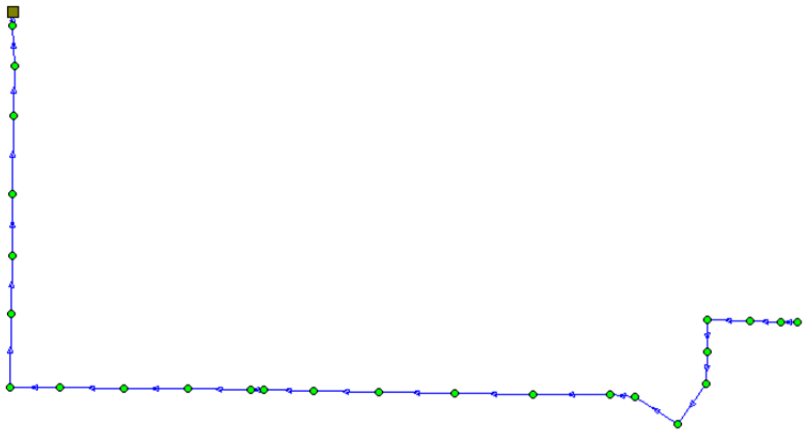


Figure 5-3: Modeled Storm Drain Alignment

6 RECOMMENDED IMPROVEMENTS

6.1 Assumptions

Planning for the drainage facilities within the service area requires a general understanding of the overall land use planning, natural drainages, and other issues associated with the watershed.

It is the intent of this IFFPA to make drainage planning an integral part of the overall utility planning. Maintenance is a vital part of drainage planning. Current infrastructure and control systems including sedimentation basins, detentions basins, culverts, etc. need to be maintained so they function as designed and not impact downstream systems. Runoff from precipitation occurs no matter how well or poorly, drainage planning is done. Therefore, the following recommended infrastructure seeks to provide an effective and cost efficient drainage plan for the service area.

To provide recommendations for proposed improvements, it was necessary to assume the following parameters for the different improvements:

- Curb and Gutter
  - Type A curb and gutter as shown in Appendix F (Figure IV-A)
  - 2.5’ curb and gutter width
  - 6” curb height
- Trapezoidal Channels
  - 1% slope
  - Manning’s n of 0.025
  - Clean natural lined channel
- V-Ditches or Swales
  - 1% slope
  - Manning’s n of 0.025
  - Smooth natural lined channel
- Storm Drain System
  - 2/3 filled capacity on pipes
  - Clean pipes and catch basins
  - Catch basin capacity of 10 cfs
  - Manning’s n of 0.013 for pipes

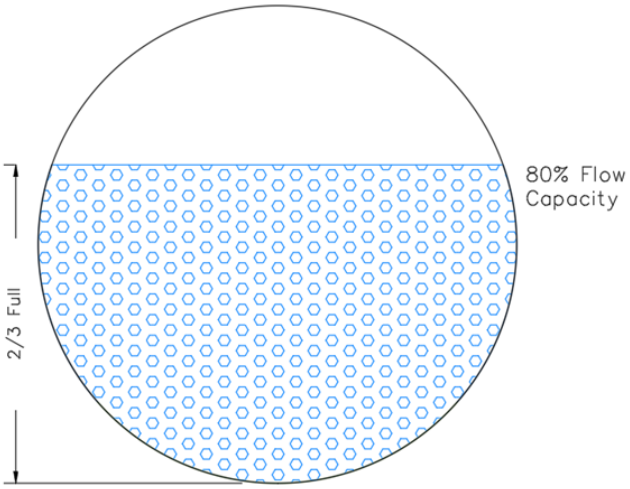


Figure 6-1: Flow Depth vs. Flow Capacity Representation

As part of this IFFPA, most recommendations are made as to the capacities, location of infrastructure, available land for facilities, and historical problem areas. It shall be noted that the shown location of each line or facility is conceptual and general only. Actual development and real site conditions may require improvements to be constructed in alternate locations.

6.2 0-6 Year Recommended Improvements

The modeling work completed during this IFFPA has identified deficiencies that should be remedied. Recommendations to address these deficiencies are summarized below. A map of these improvements is included in Appendix A (Map 9 & 9a).

- Construct various improvements to correct existing issues.
    - Regrade the roadside swale on Spanish Trails Drive between Driftwood Lane and Arabian Way to reduce a flat section as much as possible.
    - Install curb and gutter along the west side of Veterans Memorial Drive between Sunset Road and Jones Road. The purpose of this improvement is to create a break in flow and convey stormwater to the north to Jones Road. This should reduce flooding to the west of the proposed improvement.
    - Install curb and gutter along both sides of Enoch Road between Sunset Road and Jones Road. The purpose of this improvement is to create a break in flow and convey stormwater to the north to Jones Road. This should reduce flooding on the west side of the road.
- Construct Detention Basins 14 and 15. This is needed to detain flow from Watershed Basin 21B. The volume of stormwater from this watershed is so much that it is not feasible to construct one detention basin. These two basins will work in series as one detention basin. Construct a channel between the proposed basins and the existing detention basin to the west of the freeway. A drainage swale from the detention basin to the water tank to the east is also assumed to convey stormwater to the basins.
- Ensure City Code requires that post-development flows do not exceed pre-development flows. This is usually done through detention basins. Detention basin outlets should release water to established drainage paths, be they natural or manmade.
- Require new development to perform a drainage study. This is to validate the previous improvement design. Storm drain pipes and inlets should be designed to convey the 10-year, 6-hour storm with the pipes being two-thirds (2/3) full. Detention basins and streets should be designed to convey the 100-year, 6-hour storm.
- Update this IFFPA. A plan update should occur every five years to maintain current impact fees and update impact fee facilities plan or as growth dictates.

6.3 6-20 Year Recommended Improvements

Modeling work for the 20-year planning horizon has identified deficiencies that should be planned for according to future development at buildout. Recommendations to address these deficiencies are summarized below.

- Construct Detention Basin 13. This is needed to reduce flow from Watershed Basin 20B. Construct a channel between the proposed basins and the existing detention basin to the west of the freeway.
- Construct the Storm Drain Phase II Project. This project was initially designed by NRCS with Phase I. We recommend adjusting the design so the full length of the alignment is

storm drain pipe. The outlet of Phase II is currently designed to be tied into the existing storm drain line in Stagecoach Lane at the manhole near Tumbleweed Drive.

- Construct Detention Basin 12. This is needed to detain flow from Watershed Basin 19B. Construct a channel to the culvert under the freeway. Storm Drain Phase II Project is needed before this to convey the flow in a storm drain pipe.
- Define Drainage Paths. Near the intersections of West Summit Frontage Hwy with 940 E and Meadow Lark Lane, downstream drainage paths (via a ditch, a channel or pipeline) need to be established when overland flow through fields are no longer available. This drainage path should extend past the developed sections of the City.
- Construct Detention Basin 11. This is needed to detain flow from Watershed Basin 18B. Construct a channel to the culvert under the freeway. A downstream drainage path (via a ditch, a channel or pipeline) needs to be established when overland flow through fields are no longer available. This drainage path should extend past the developed sections of the City.
- Construct Detention Basin 10. This is needed to detain flow from Watershed Basin 17B. Construct a channel to the culvert under the freeway. A downstream drainage path (via a ditch, a channel or pipeline) needs to be established when overland flow through fields are no longer available. This drainage path should extend past the developed sections of the City.
- Update this IFFPA. A plan update should occur every five years to maintain current impact fees and update impact fee facilities plan or as growth dictates.

Enoch is a rural residential community, and therefore most of the roadways are not developed with curb, gutter, storm drains, and sidewalk. While a roadway with curb and gutter is able to convey and contain the most amount of stormwater, it is more expensive and may take away the rural character of the City. As the City sees fit, reconstructing roadways and intersections may prove necessary to resolve issues that arise in the future, especially with smaller stormwater flows that create nuisance water within the City.

Appendix F contains several general construction details for curb, gutter, and intersection reconstruction. It is assumed that intersections are four-way intersections with pedestrian ramps, storm water transition structures, valley gutters, and new driving surfaces. Two options exist for the City block sections for improvements. The more complete Option #1 includes adding more driving surface, curb and gutter, and sidewalk. Option #2 adds swales or ditches to the sides of the road for stormwater conveyance with no additional driving surface, curb and gutter, and sidewalk.

Roadway and intersection reconstruction generally should not be covered by impact fees unless a change in flow volume or flow path is directly related to new development. User fees and other non-impact fee funds may be used for these optional improvements.

6.4 Further Considerations

Stormwater facilities include a wide assortment of constructed practices designed to manage and control the stormwater runoff from a certain area of land. The best stormwater management facility design cannot preclude the need for long term maintenance and repair of these facilities to keep the facility functioning as originally designed. The lack of proper operation and maintenance is often cited as the number one reason for failure of facilities or damage to property from flooding events.

Routine maintenance addresses the expected activities required to keep the stormwater facilities in proper condition. Routine maintenance may include mowing, vegetation maintenance, and removal of accumulated debris and sediment.

The party responsible for the stormwater facilities shall keep accurate and complete records. Typical records include a log of all inspections, repairs and maintenance performed at the site, copies of inspection reports, invoices for work performed, photographs of the facilities, etc. These records, along with establishing an ongoing operation maintenance program is the key to successful stormwater maintenance.

The stormwater utility fund was established in 2015. The fund should provide for costs associated with routine maintenance, property management, inspections and record keeping, as well as providing for remedial maintenance that can be anticipated over the life of the stormwater facilities. User rates should be adopted that cover these costs.

It is also recommended that Enoch require that a Storm Water Management Plan (SWMP) be prepared for each project that includes construction activities within a drainage basin. It is recommended that the developer be required to manage stormwater in accordance with this plan. This does not relieve the developer from obtaining other required County, State, and Federal permits.

7 FINANCIAL VIABILITY

7.1 Project Phasing

Recommended improvements were given a time frame in which the projects are expected to be constructed. Table 7-1 shows the recommended improvement projects with the estimated year of construction.

Table 7-1: Project Construction Phasing

Contributing Project	Year
Detention Basin 15	2021
Detention Basin 14	2025
Detention Basin 13	2023
Detention Basin 12	2029
Detention Basin 11	2032
Detention Basin 10	2035
Storm Drain Phase 2 & Detention Routing	2022
City Improvements	2027
IFFP Updates	2022, 2027, 2032, 2037

In all cases, the improvements are planned to support continuing growth within the next twenty years and are planned for implementation at times when the growing population base can theoretically generate enough revenue to fund the projects. It should be noted that growth in the study area may occur at a rate faster or slower than that predicted in the cash flow analysis. If growth occurs at a faster rate, more funds will be available to construct the projects at an earlier schedule than that specified by the phasing projections. On the other hand, if growth slows more than expected, implementation of the projects should be delayed until the population base can fund the improvements.

The City may also choose to bond these projects. This would allow the City to construct a majority of the costly projects recommended to mitigate flooding to Enoch City with a more aggressive schedule. A bond would allow the projects to be constructed earlier, but it should only be considered if there will be enough user rates and impact fees to cover bond payments.

7.2 Opinions of Probable Cost

Two Engineer's Opinions of Probable Cost (EOPC) are included as part of the IFFPA. The first EOPC organizes and itemizes project related items to recommended improvements and includes anticipated construction and material costs, a contingency budget, and miscellaneous incidental costs. The second EOPC includes possible roadway reconstruction projects such as a typical intersection, City blocks with curb, gutter and sidewalk, and City blocks with ditches. The second EOPC is presented for informational purposes only and is not part if the impact fee analysis.

Table 7-2: EOPC Summary

Projects	EOPC (in 2017 $)
Recommended Improvements	$ 5,899,800
Reconstructed Intersection	$ 81,200
Option #1 Street Block Reconstruciton	$ 359,195
Option #2 Street Block Reconstruciton	$ 22,500

Both EOPCs are included in Appendix F. Table 7-2 shows a summary of EOPC values. The street blocks are assumed to be 1,200 feet in length. Option #1 includes street block reconstruction with curb and gutter, sidewalk, and expanded driving surface for both sides of the road. Option #2 includes street block reconstruction with natural road-side swales. Option #1 calculates to an EOPC of approximately $300 per foot of roadway. Option #2 calculates to an EOPC of approximately $19 per foot of roadway.

7.3 Impact Fee Analysis

Enoch City currently charges a stormwater system impact fee of $0 per ERU. Enoch has no debt for the stormwater system.

A proposed impact fee was calculated based on the EOPC, estimated construction year, inflation, and impact fee eligibility. Because the improvements benefit the whole City, and with no clear way to isolate the projects as solely growth related, most of the projects are partially impact fee eligible. Table 7-3 shows a summary of the impact fee eligibility calculation.

Table 7-3: Impact Fee Eligibility Calculations

Date	ERUs
2017	2,234
2037	5,105
% IF Eligible	56.2%

The new ERUs that are projected to be added to the City in the 20-year planning horizon (2,871 ERUs) should pay for their portion of the improvements. The number of ERUs added to the City in the 20-year planning horizon is divided by the total of ERUs projected to be in the City at the end of the 20-year planning horizon is 56.2%. The new ERUs should pay 56.2% of the improvements through impact fees.

The opinion of probable cost for each proposed project is shown before and after inflation. Inflation is calculated for the number of years between 2017 and the estimated year of the construction of the project. Impact fee calculations are presented in Table 7-4.

Table 7-4: Impact Fee Calculation

Contributing Project	Probable Project Cost	Year	Inflated Costs (3.0%)	% Impact Fee Eligible	Impact Fee Eligible Costs
Detention Basin 15	$ 981,263	2021	$ 1,104,421	56%	$ 621,157
Detention Basin 14	$ 901,000	2025	$ 1,141,359	56%	$ 641,932
Detention Basin 13	$ 276,277	2023	$ 329,889	56%	$ 185,539
Detention Basin 12	$ 432,109	2029	$ 616,084	56%	$ 346,503
Detention Basin 11	$ 619,566	2032	$ 965,263	56%	$ 542,891
Detention Basin 10	$ 690,722	2035	$ 1,175,909	56%	$ 661,364
Storm Drain Phase 2 & Detention Routing	$ 1,646,530	2022	$ 1,908,780	56%	$ 1,073,551
City Improvements	$ 352,270	2027	$ 473,421	56%	$ 266,265
IFFP Updates	$ 160,000	2022, 2027, 2032, 2037	$ 234,691	100%	$ 234,691
				Total Impact Fee Eligible	$ 4,573,893
				New ERUs	2,871
				Impact Fee Amount	**$ 1,593.14**

The maximum allowable impact fee for the stormwater system is **$1,593.14**. This is a new impact fee to be charged to new development. This was calculated by multiplying the inflated probable costs by the impact fee eligible percentage and then dividing that total impact fee eligible cost by the number of new ERUs to the system in the 20-year planning horizon.

7.4 User Rate Analysis

Enoch City requested that two scenarios be investigated for user rates and cash flow projections.

- Use 100% bonds to pay for detention basin and storm drain and routing projects
- Use 50% bonds and 50% grants to pay for detention basin and storm drain and routing projects

The City Improvements Project or IFFPA updates are assumed to be paid for with impact fees. The new user rates were calculated by summing annual operating expenses to the system and existing debt service then dividing the total expenses amount by the number of ERUs currently serviced by the system. Values from the 2016 City audit were used with engineering judgment to achieve final values for salaries, materials, and capital expenses shown in the User Rate Analysis. Table 7-5 and Table 7-6 show the two different user rate scenarios.

Table 7-5: User Rate Based on 100% Bonds

OPERATING EXPENSES		
Salaries, Wages, and Benefits	$	35,000
Materials, Supplies, and Services	$	1,887
Capital Expenses	$	50,000
Total	**$**	**86,887**
EXISTING DEBT SERVICE		
N/A	$	-
Estimated Percentage Not Impact Fee Eligible		0%
	$	**-**
NEW DEBT SERVICE - 100% BONDS		
Bond A: $5,750,000, 1.5%, 30 years	$	245,059
Reserve for Bond A	$	24,506
Estimated Percentage Not Impact Fee Eligible		43.8%
	$	**117,954**
GRAND TOTAL EXPENSES	**$**	**204,841**
ANNUAL INCOME		
Total Number of ERUs (2017)		**2,201**
Average Monthly Stormwater User Rate/ERU	**$**	**7.76**

Table 7-6: User Rate Based on 50% Bonds

OPERATING EXPENSES		
Salaries, Wages, and Benefits	$	35,000
Materials, Supplies, and Services	$	1,887
Capital Expenses	$	50,000
Total	**$**	**86,887**
EXISTING DEBT SERVICE		
N/A	$	-
Estimated Percentage Not Impact Fee Eligible		0%
	$	**-**
NEW DEBT SERVICE - 50% BOND, 50% GRANT		
Bond A: $2,900,000, 1.5%, 30 years	$	122,530
Reserve for Bond A	$	12,253
Estimated Percentage Not Impact Fee Eligible		43.8%
	$	**58,977**
GRAND TOTAL EXPENSES	**$**	**145,864**
ANNUAL INCOME		
Total Number of ERUs (2017)		**2,201**
Average Monthly Stormwater User Rate/ERU	**$**	**5.52**

Dividing the total expenses for the 100% bond scenario by the number of ERUs currently in the City results in an average monthly stormwater user rate of **$7.76**. Dividing the total expenses for the 50% bond scenario by the number of ERUs currently in the City results in an average monthly stormwater user rate of **$5.52**.

It is recommended that Enoch seek grants to fund the projects and reduce the financial burden upon the City. The ability to obtain a grant would also allow projects to start design and construction as soon as the funds are available. Funding opportunities are listed below:

- Permanent Community Impact Fund Board (CIB)
- USDA Rural Development (RD)-Will require enterprise fund to be set up by community as a mechanism for payback of bond portion (revenue bond)
- Corps of Engineers US Economic Development Administration (EDA)-If it is tied to sustaining or creating economic development and business
- Utah Community Development Block Grant (CDBG)
- Utah State Municipal Storm Water Loans
- EPA Clean Water State Revolving Fund (CWSRF)
- Interfund loans

7.5 Cash Flow Analysis

Two stormwater utility cash flow analysis for a 20-year planning horizon were completed to show how the 20-year planning horizon improvement projects could be implemented, to analyze the continued viability of proposed user rates, and to show possible trends in impact fee and cash fund balances. Initial data for the cash flow analysis was taken from fiscal year 2015-2016 Enoch City audits. Values projected through the analysis are based on growth, interest, and inflation trends determined during the process of the study. It should be noted that the analysis is a general forecast only and will vary with the speed and pattern of development in the City. The entire cash flow analysis printout is given in Appendix E.

The upper section of the cash flow printout, entitled “Stormwater System Data”, contains the basic data upon which many of the values in the cash flow spreadsheet are generated. Of note are the projected population growth trends, the assumed inflation rates, user rates, impact fees and inspection fees, and the projected ERU quantities for the coming fiscal years. Most of the revenue and expense increases in later parts of the cash flow spreadsheet are generated from the impact fees, rates, and ERU values based on the assumed growth and inflation rates.

The next section of the cash flow spreadsheet is the utilities revenues section. This section seeks to quantify all revenues generated by the utility, whether through impact fees, user rate assessments, interest earned on deposited funds, etc.

The following section is the utility expenses section which seeks to quantify all the expenses incurred by the stormwater utility. Included in the expenses section are the operation and maintenance costs, existing debt service costs and new debt service costs. The difference between the total revenues and total expenses is the net cash flow for the utility.

Total revenues and total expenses are then broken down into impact fee and cash fund categories. This was done to help show adequate funds over the course of the projection period.

Included at the end of the cash flow analysis is a system improvement implementation schedule for the next twenty years which shows how the IFFPA improvement projects were incorporated into the cash flow analysis.

7.6 Impact Fee Related Items

In general, it is beneficial to update this impact fee facilities plan and analysis at least every five years, or more frequently if drastic growth or changes affect the assumptions and data in this plan. It is assumed that this plan will be updated as recommended.

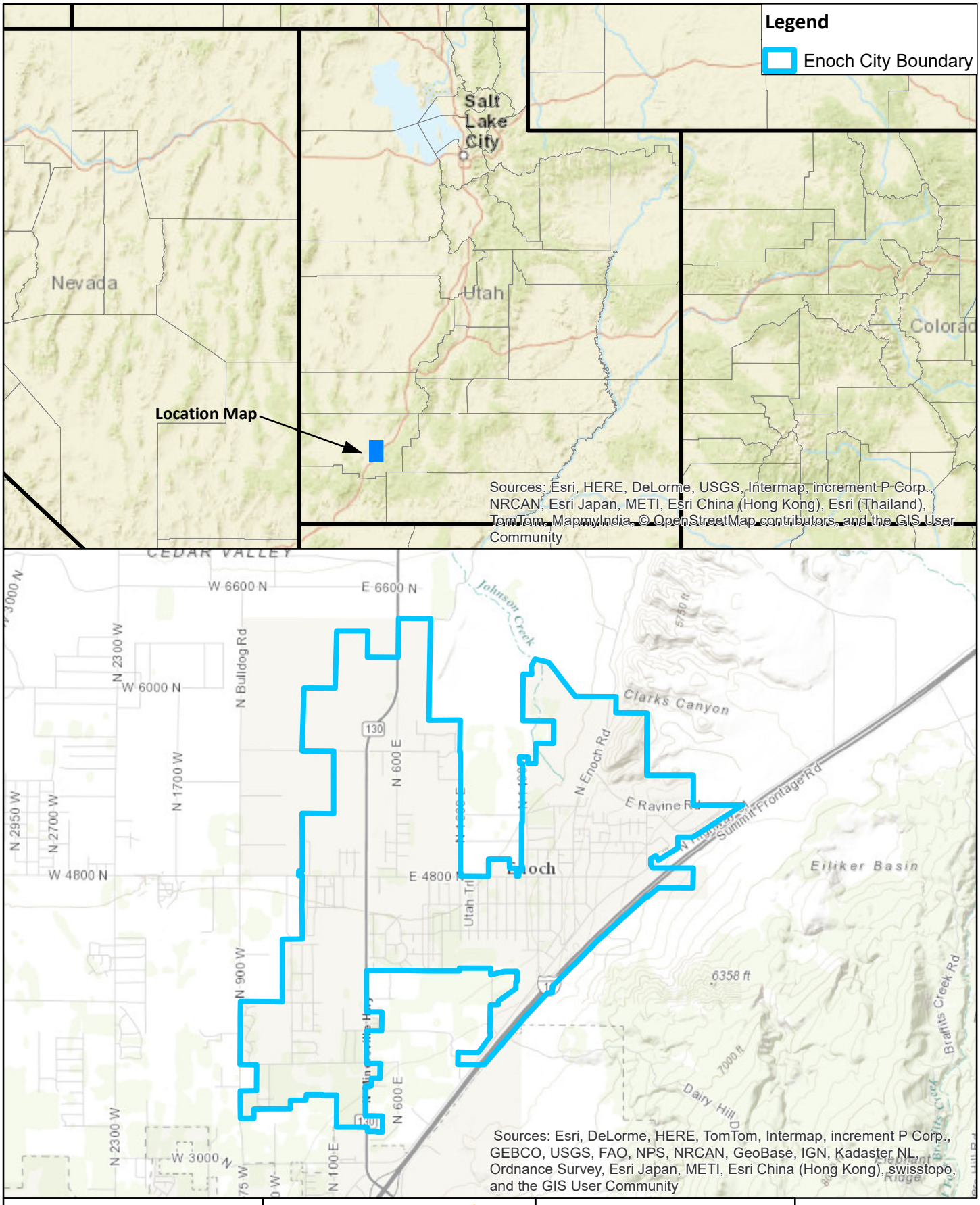
There are a few items relating to impact fees that Enoch City must consider when planning for, collecting, and expending impact fees in accordance with Utah Code 11-36a-101.

City staff must understand that impact fees can only be expended for a system improvement that is identified in the Impact Fee Facilities Plan and that is for the specific facility type for which the fee was collected. Impact fees must be expended or encumbered for a permissible use within six years of their receipt unless 11-36a-602(2)(b) applies. Also, impact fees must have a proper accounting (track each fee in and out) in accordance with Utah Code 11-36a-601

In accordance with Utah Code 11-36a-306 a certification of impact fee analysis is located in Appendix G.

APPENDIX A

Maps


Legend
Enoch City Boundary
Salt Lake City
Nevada
Utah
Colorad
Location Map
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
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Johnson Creek
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W 6000 N
N 1700 W
N 2950 W
N 2700 W
W 4800 N
E 4800 N
Enoch
N 600 E
N Enoch Rd
Clarks Canyon
E Ravine Rd
Summit Frontage Rd
Eiliker Basin
6358 ft
7000 ft
Dairy Hill
Bradfords Creek Rd
N 900 W
N 100 E
W 3000 N
N 2300 W
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Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
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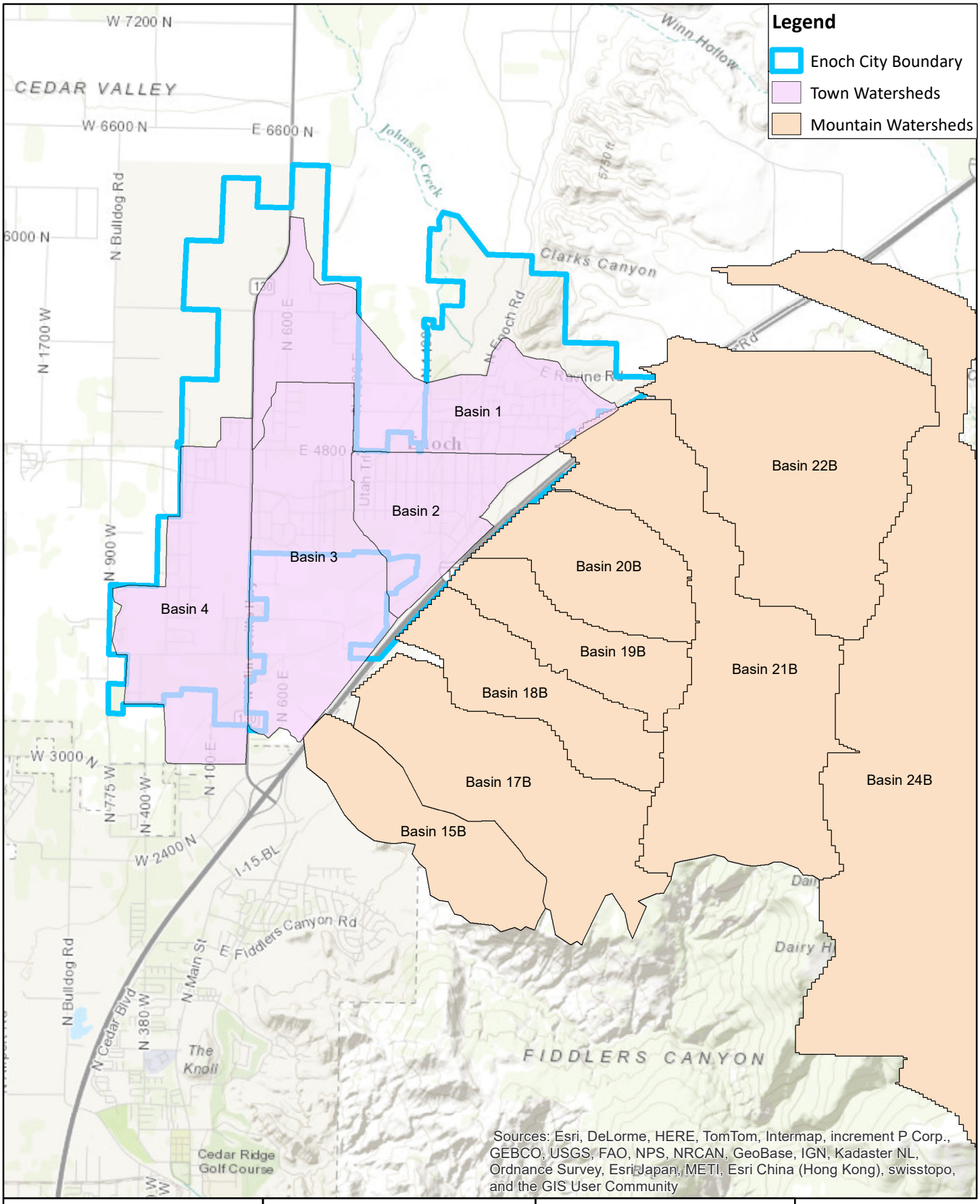
ENOCH CITY
SUNRISE ENGINEERING
STORMWATER IMPACT FEE FACILITIES PLAN
AREA MAP
Map 1



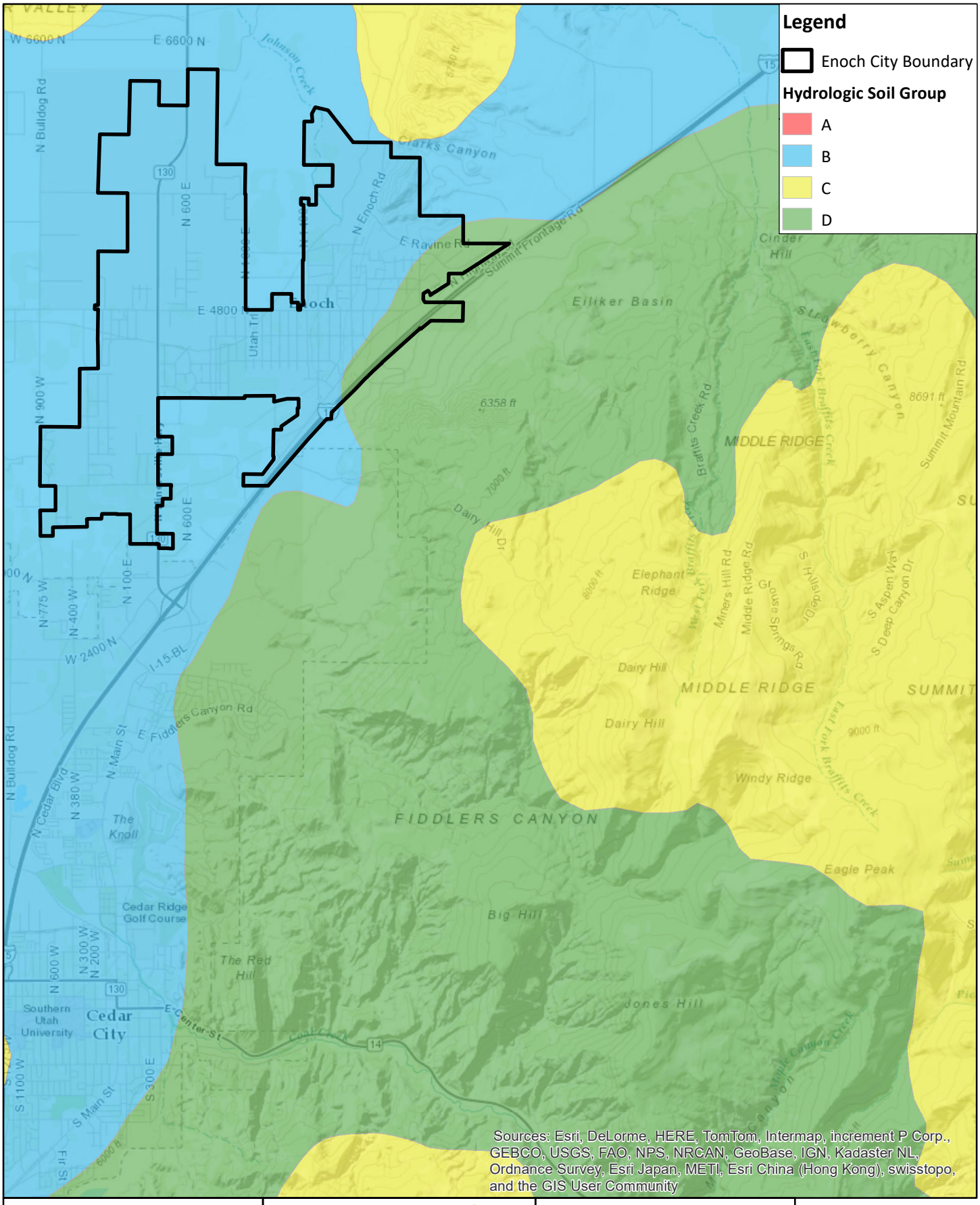
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

WATERSHED BASINS

Map 2



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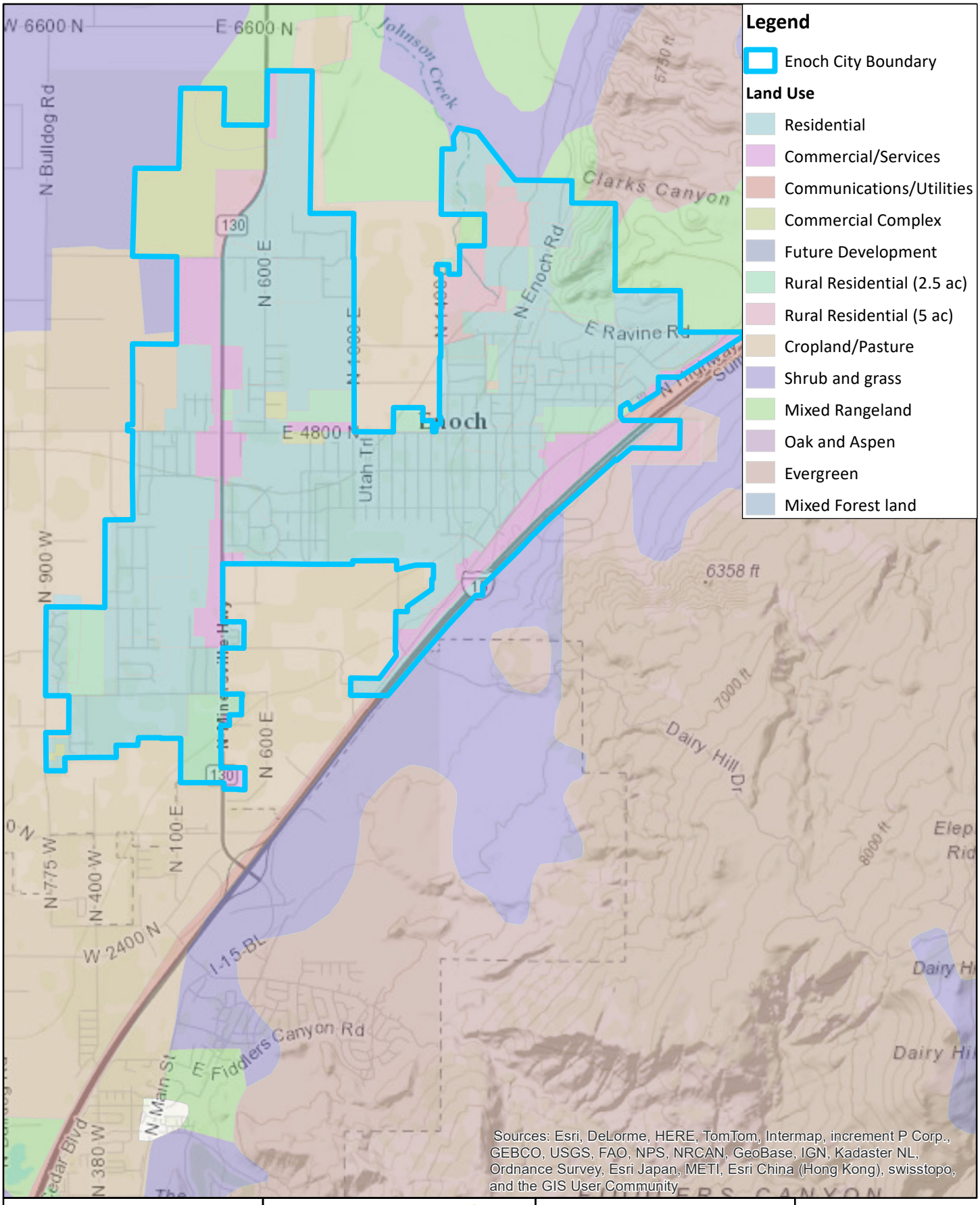
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

HYDROLOGIC SOIL TYPE

Map 3



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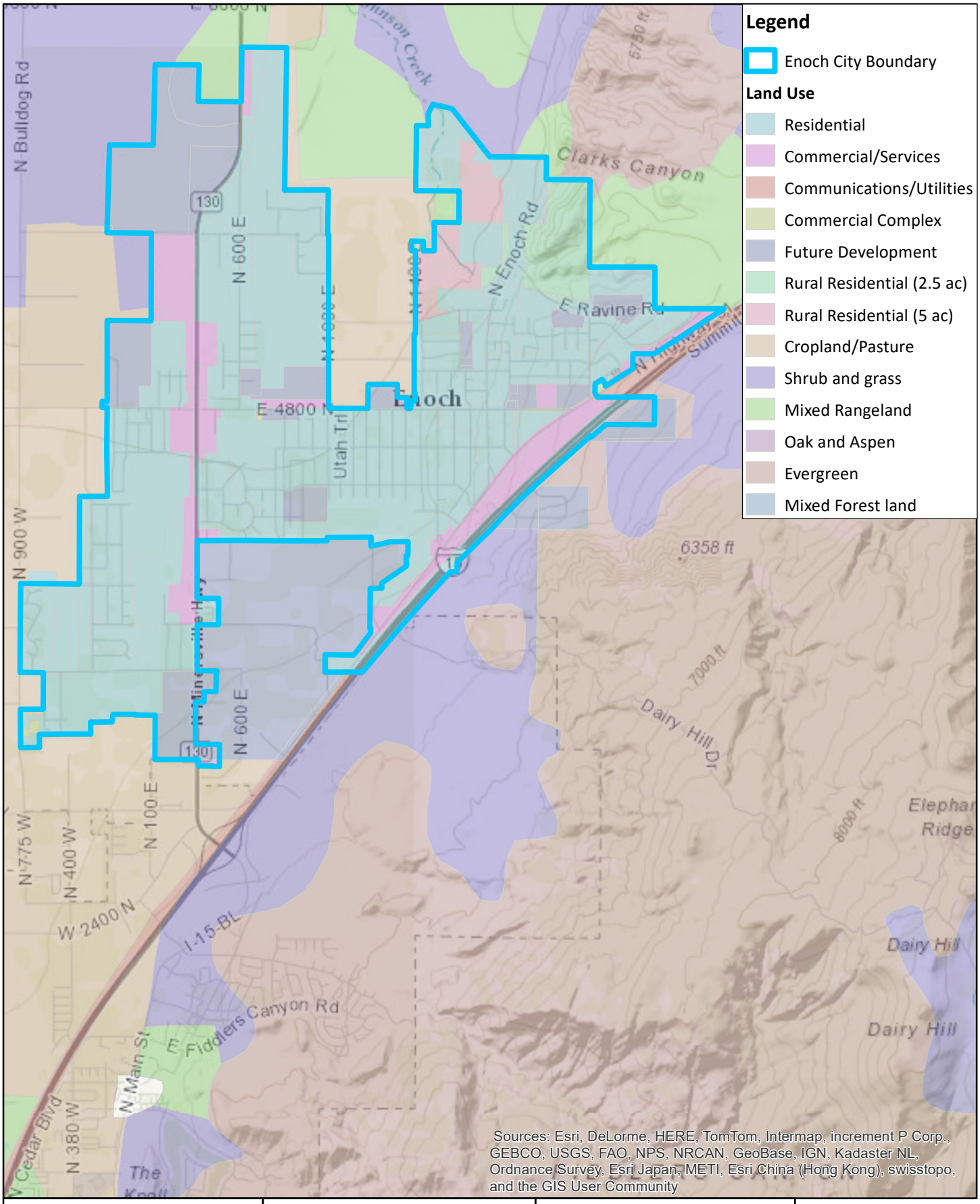
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

EXISTING LAND USE

Map 4



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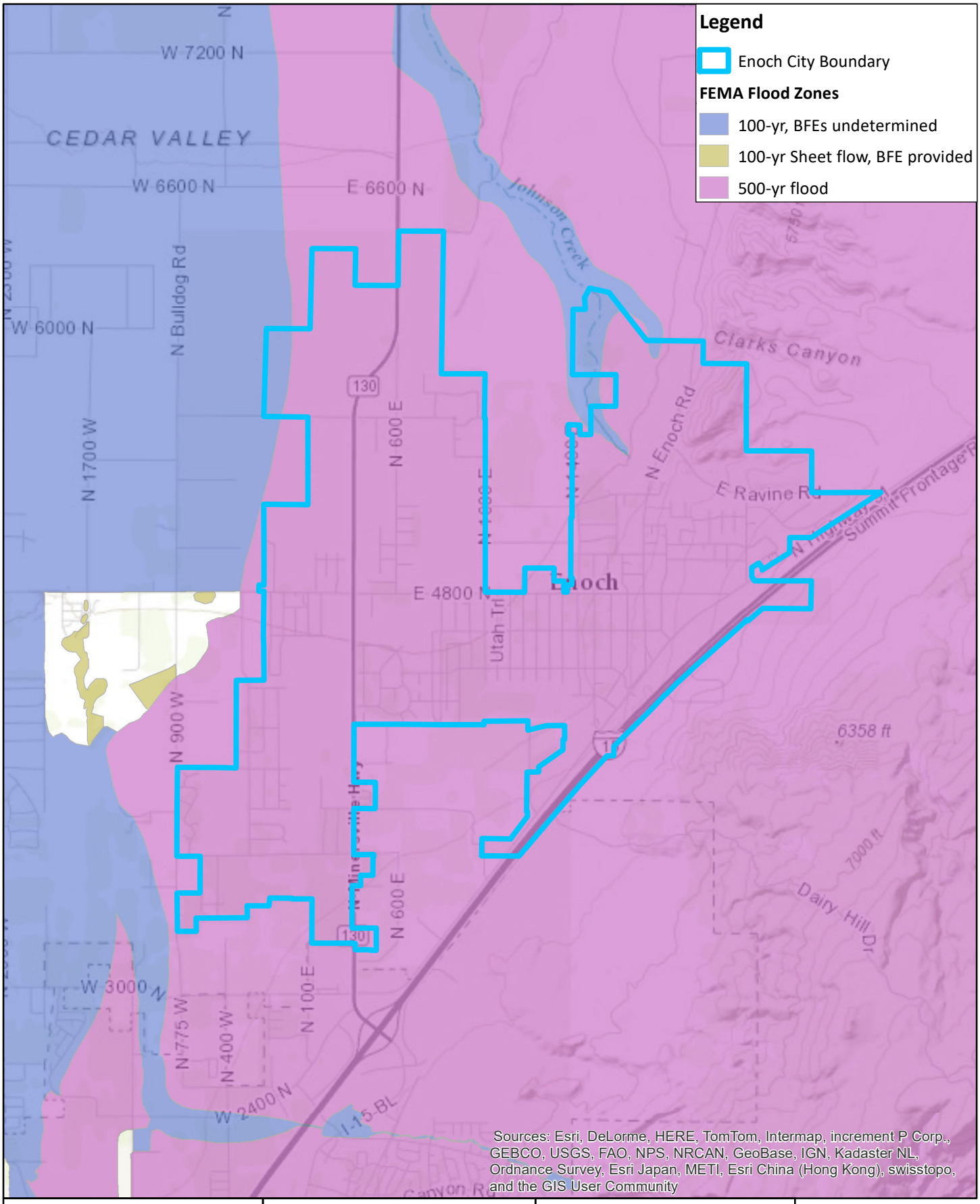
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

FUTURE LAND USE

Map 5



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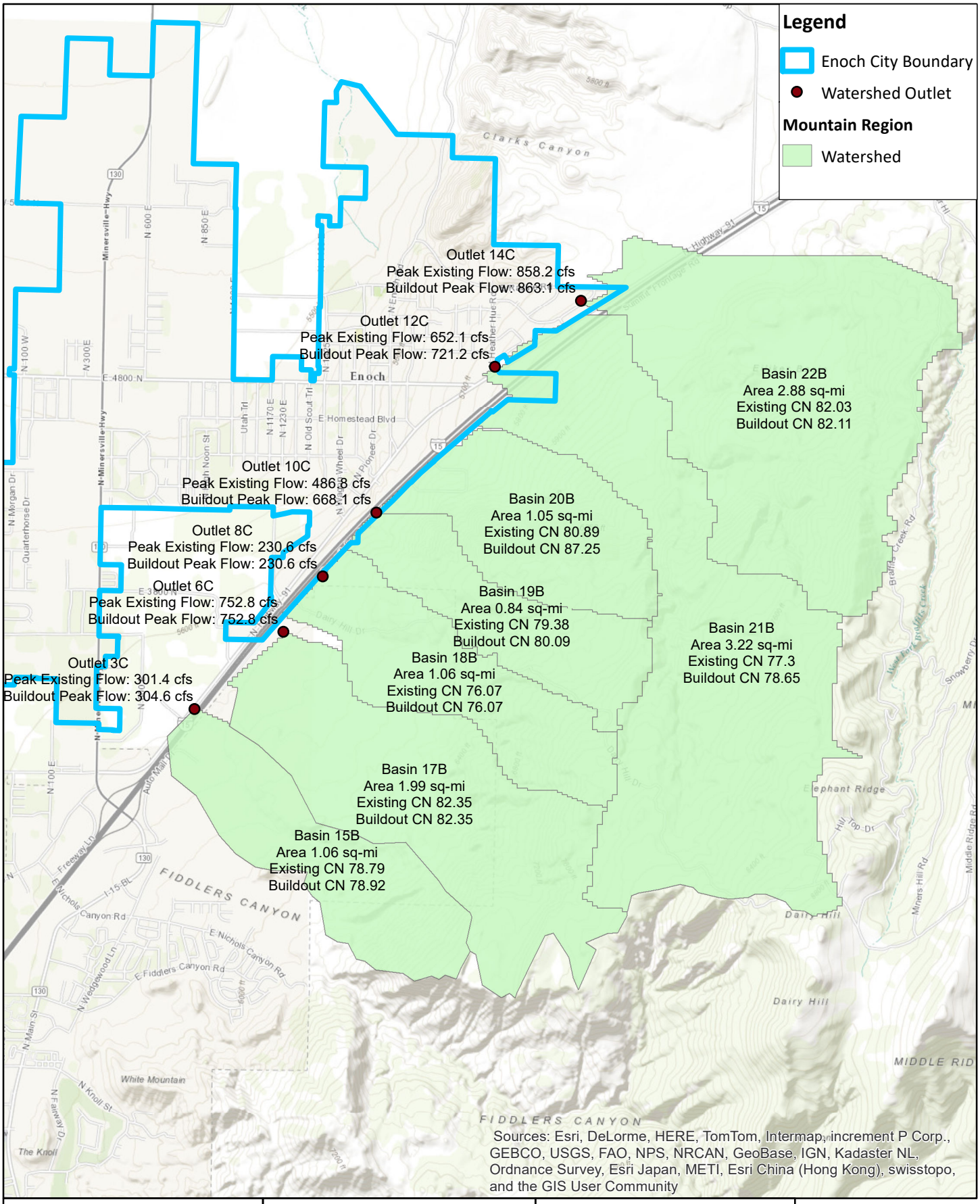
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

FEMA FLOOD HAZARD MAP

Map 6



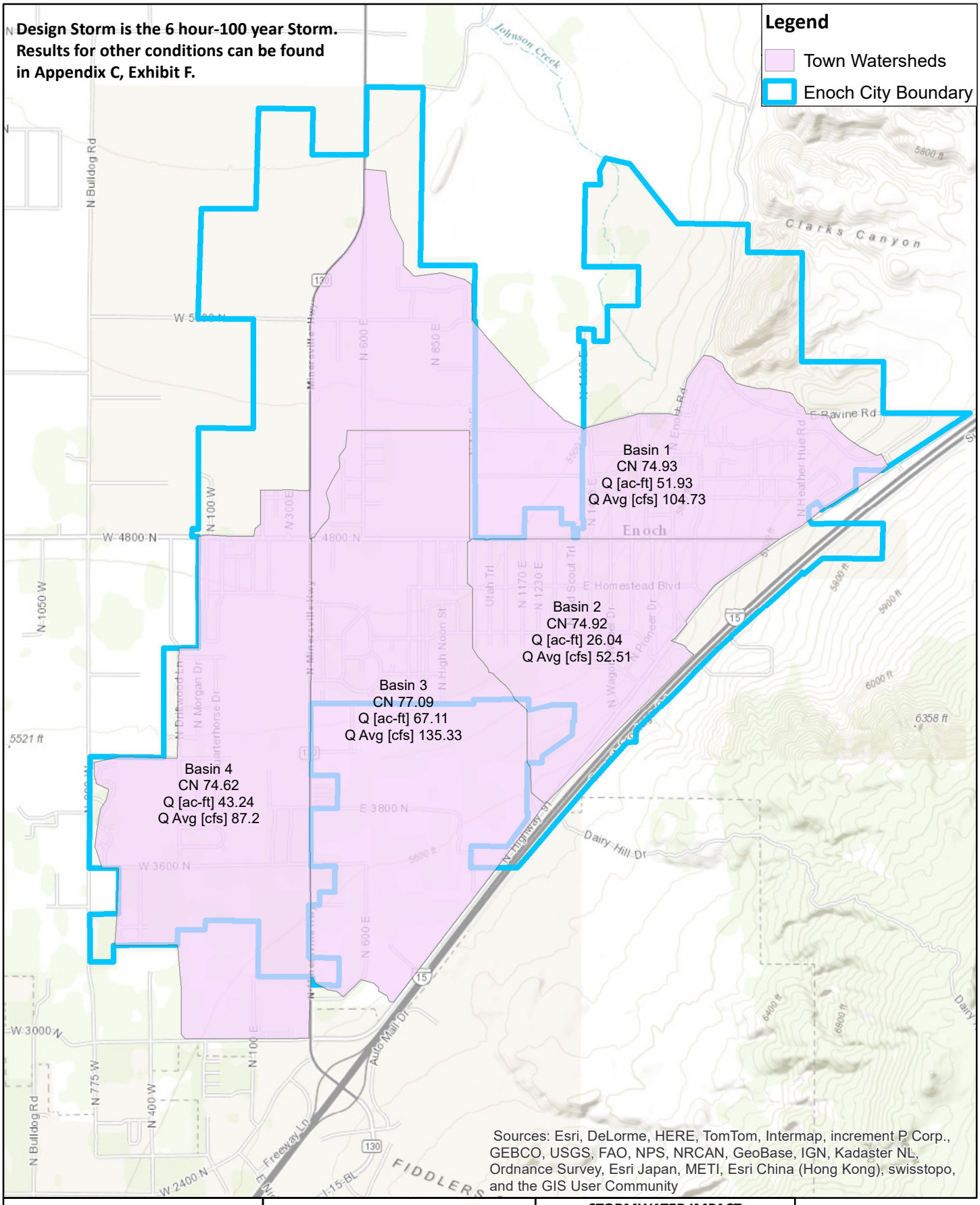
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

WATERSHED MODEL RESULTS

Map 7



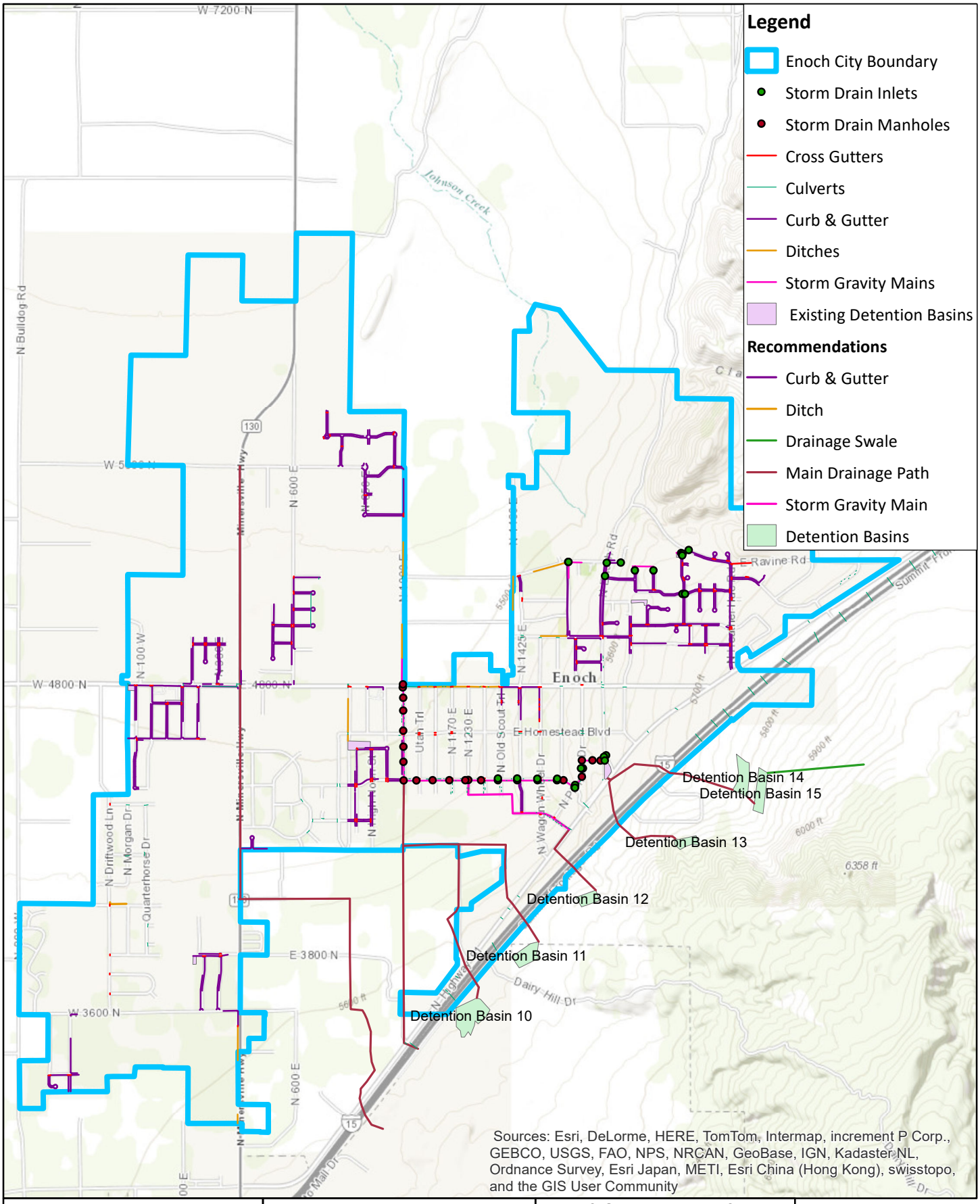
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

TOWN WATERSHED EXISTING CONDITIONS ANALYSIS RESULTS

Map 8



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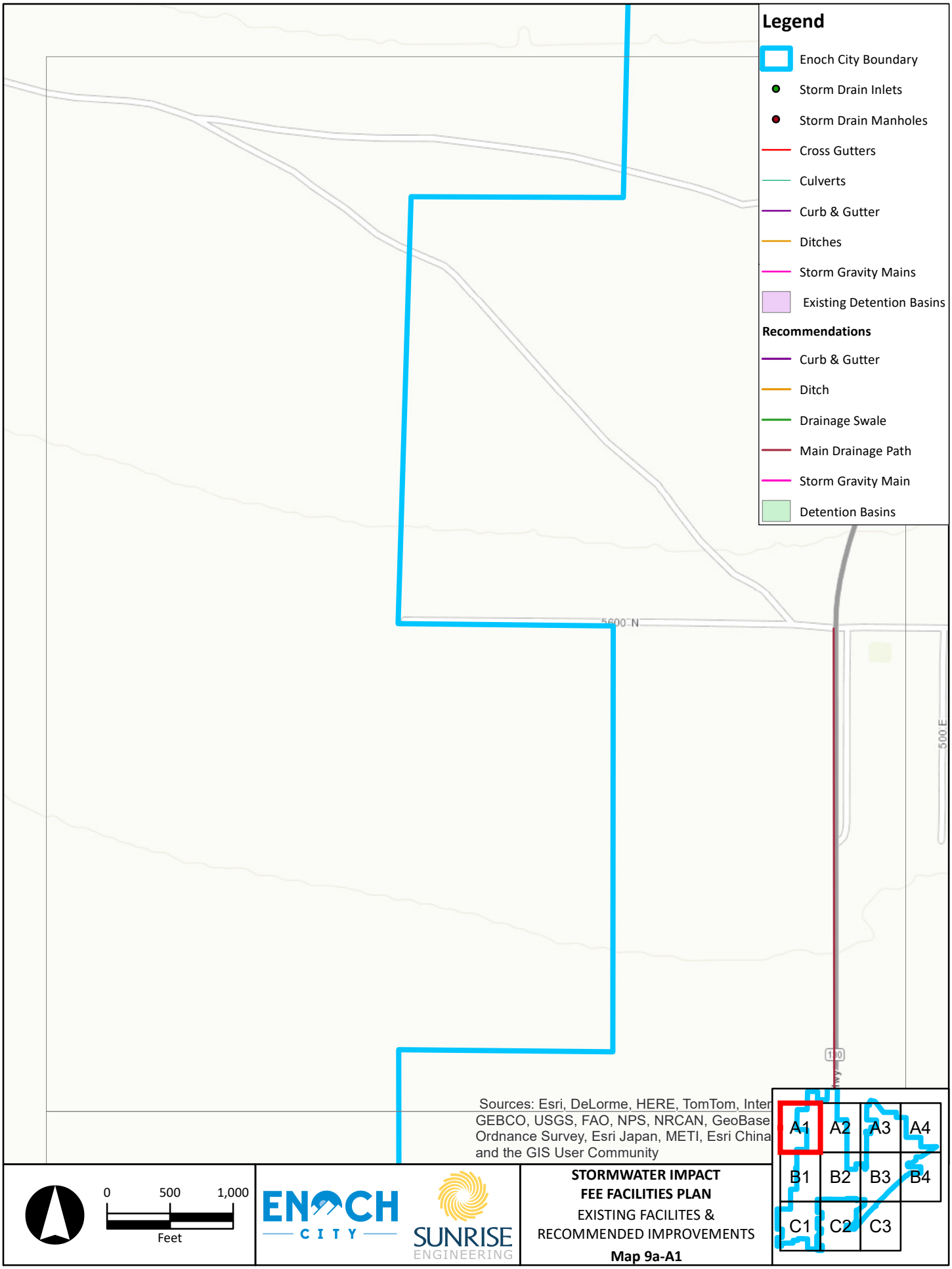
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

OVERVIEW OF EXISTING FACILITES & RECOMMENDED IMPROVEMENTS

Map 9


Legend
Enoch City Boundary
Storm Drain Inlets
Storm Drain Manholes
Cross Gutters
Culverts
Curb & Gutter
Ditches
Storm Gravity Mains
Existing Detention Basins
Recommendations
Curb & Gutter
Ditch
Drainage Swale
Main Drainage Path
Storm Gravity Main
Detention Basins
5600 N
500 E
Sources: Esri, DeLorme, HERE, TomTom, Inter
GEBCO, USGS, FAO, NPS, NRCAN, GeoBase
Ordnance Survey, Esri Japan, METI, Esri China
and the GIS User Community
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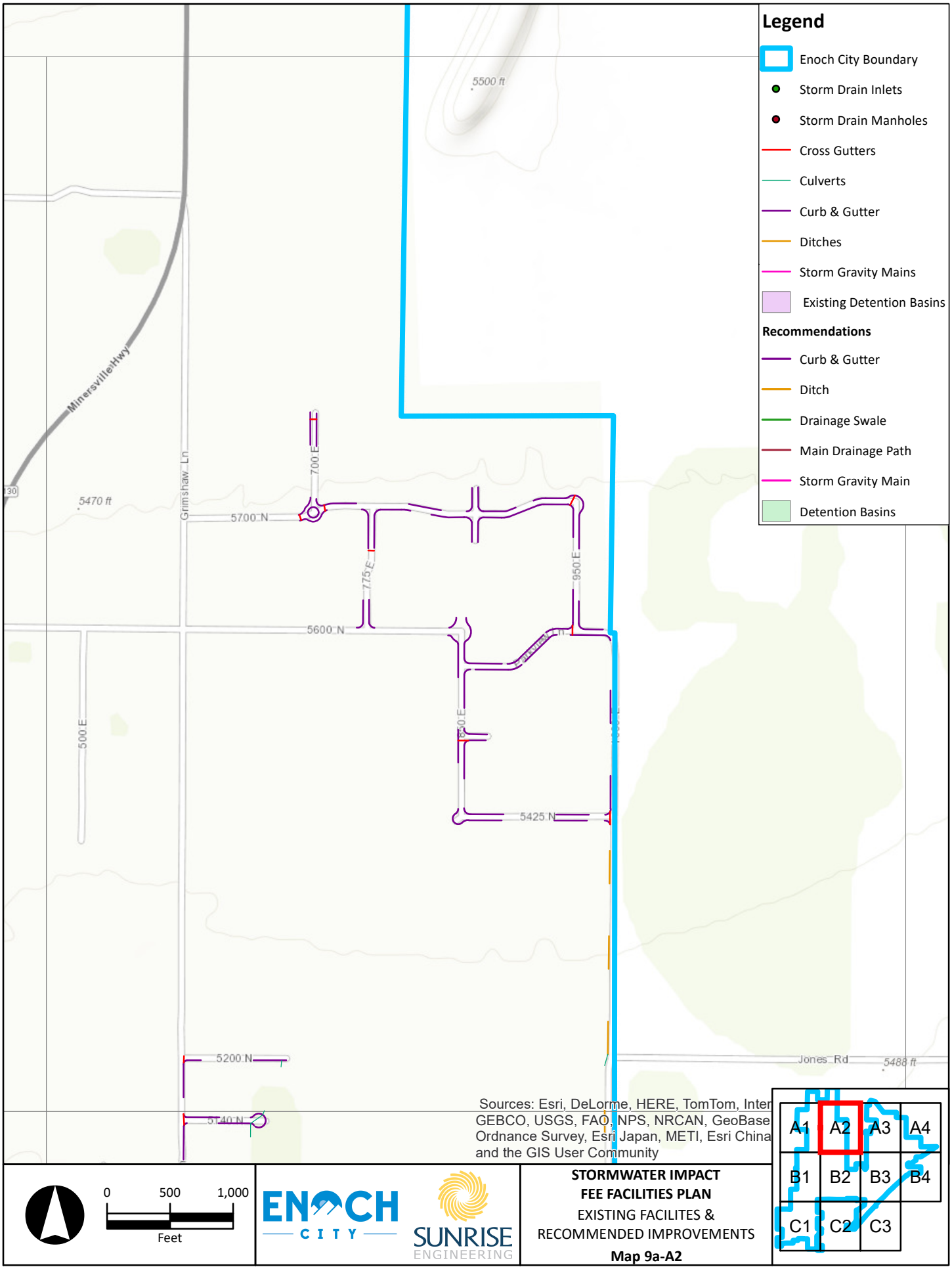
ENOCH CITY
SUNRISE ENGINEERING
STORMWATER IMPACT FEE FACILITIES PLAN
EXISTING FACILITES & RECOMMENDED IMPROVEMENTS
Map 9a-A1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Storm Drain Manholes
Cross Gutters
Culverts
Curb & Gutter
Ditches
Storm Gravity Mains
Existing Detention Basins
Recommendations
Curb & Gutter
Ditch
Drainage Swale
Main Drainage Path
Storm Gravity Main
Detention Basins
Minersville Hwy
Grimshaw Ln
700 E
775 E
950 E
500 E
5700 N
5600 N
5425 N
5200 N
5140 N
Jones Rd
5500 ft
5470 ft
5488 ft
Sources: Esri, DeLorme, HERE, TomTom, Inter
GEBCO, USGS, FAO, NPS, NRCAN, GeoBase
Ordnance Survey, Esri Japan, METI, Esri China
and the GIS User Community
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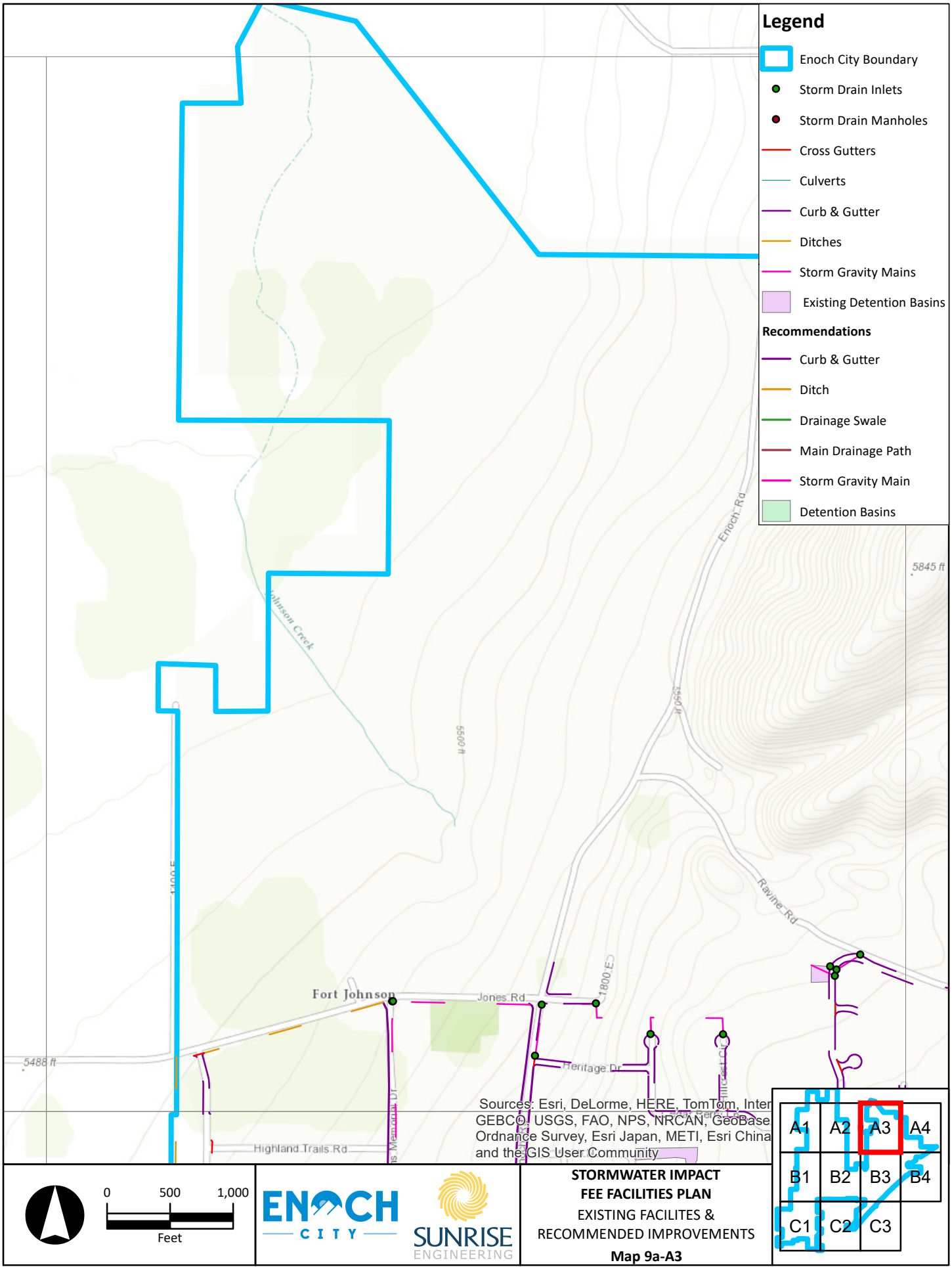
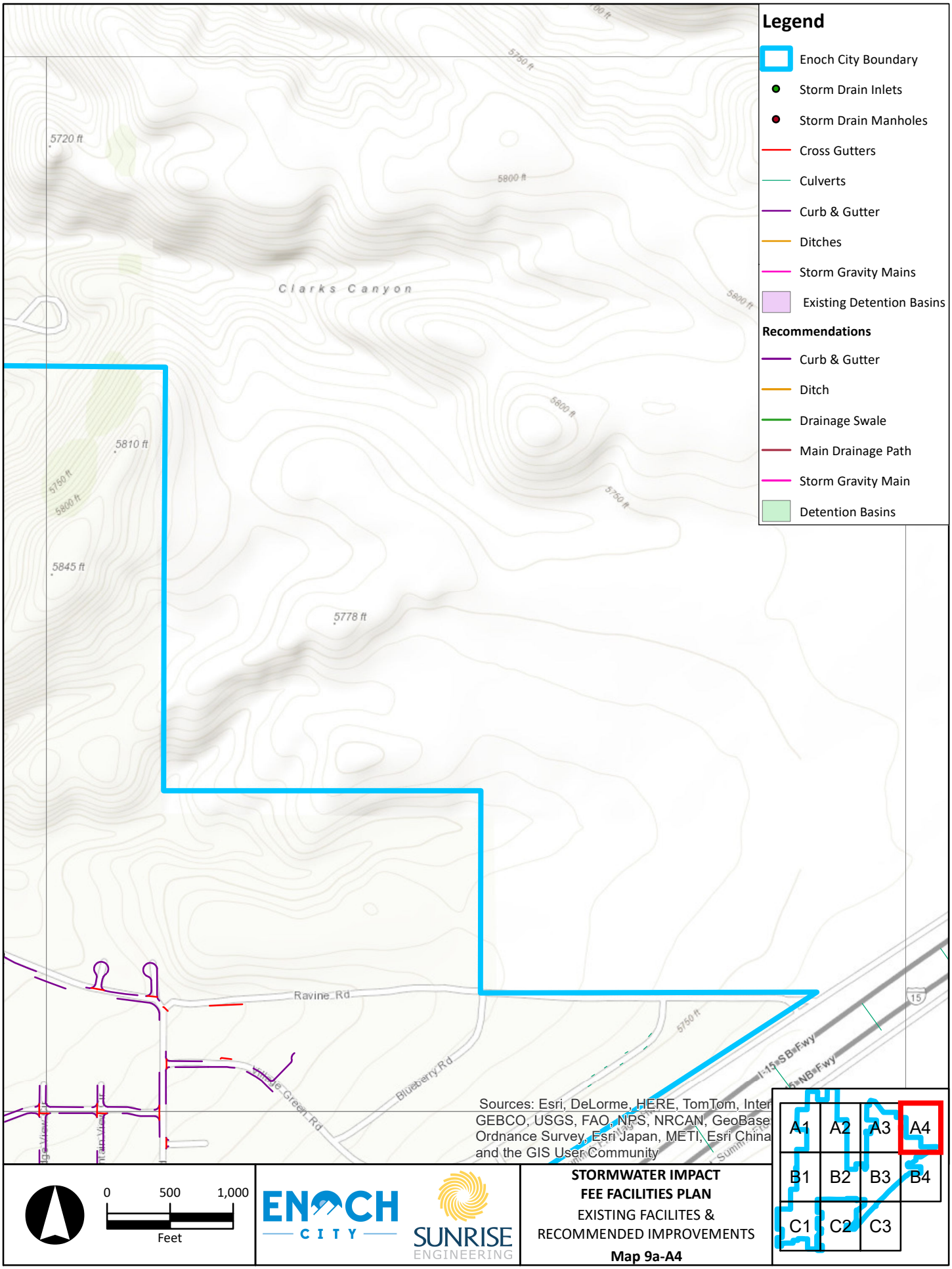
ENOCH CITY
SUNRISE ENGINEERING
STORMWATER IMPACT FEE FACILITIES PLAN
EXISTING FACILITES & RECOMMENDED IMPROVEMENTS
Map 9a-A2


Legend
Enoch City Boundary
Storm Drain Inlets
Storm Drain Manholes
Cross Gutters
Culverts
Curb & Gutter
Ditches
Storm Gravity Mains
Existing Detention Basins
Recommendations
Curb & Gutter
Ditch
Drainage Swale
Main Drainage Path
Storm Gravity Main
Detention Basins
Enoch Rd
Johnson Creek
5845 ft
5550 ft
5500 ft
5488 ft
1400 E
1800 E
Fort Johnson
Jones Rd
Heritage Dr
Ravine Rd
Highland Trails Rd
Sources: Esri, DeLorme, HERE, TomTom, Inter
GEBCO, USGS, FAO, NPS, NRCAN, GeoBase
Ordnance Survey, Esri Japan, METI, Esri China
and the GIS User Community
A1
A2
A3
A4
B1
B2
B3
B4
C1
C2
C3
0
500
1,000
Feet
ENOCH CITY
SUNRISE ENGINEERING
STORMWATER IMPACT FEE FACILITIES PLAN
EXISTING FACILITES & RECOMMENDED IMPROVEMENTS
Map 9a-A3



Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, and the GIS User Community

0 500 1,000
Feet

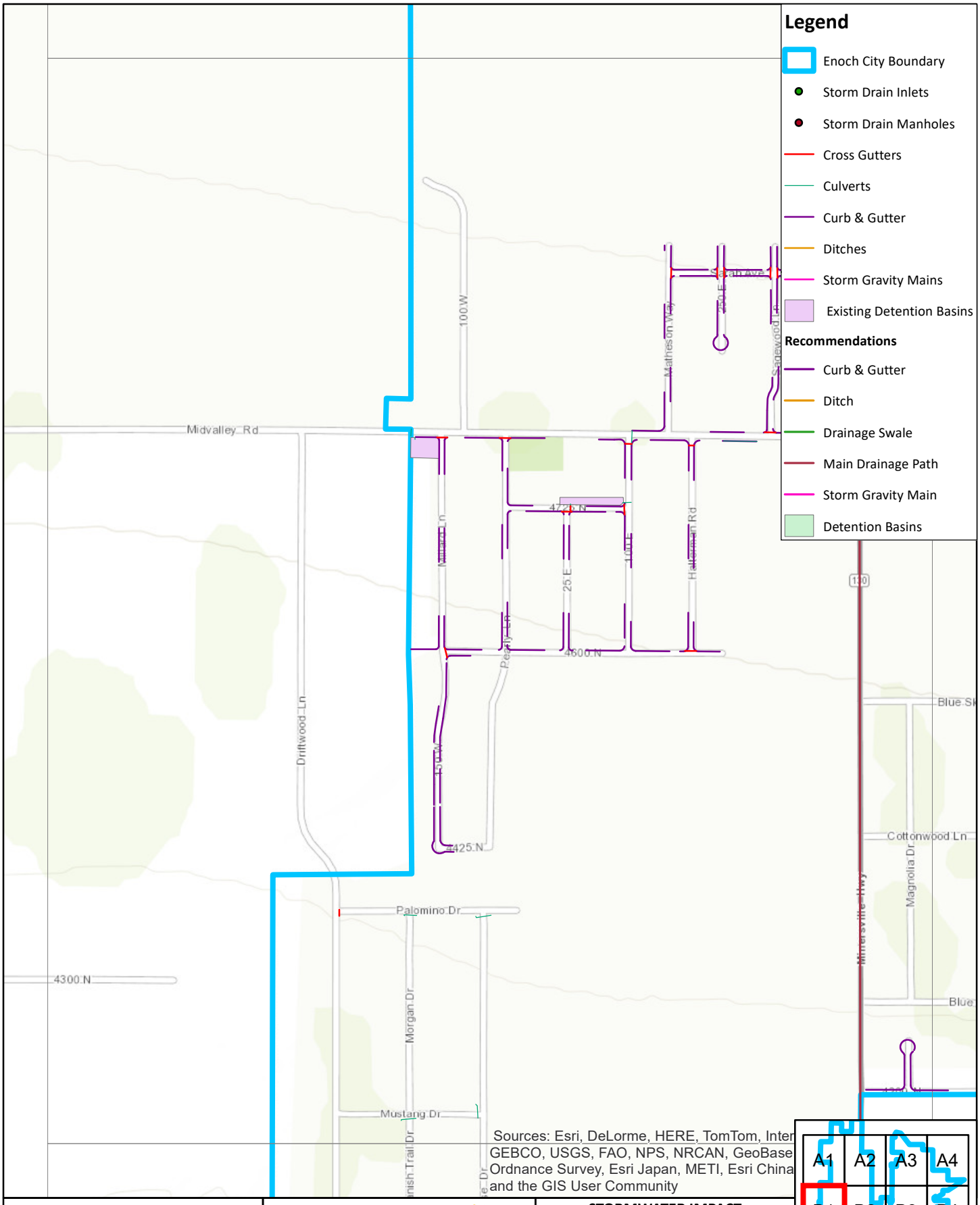
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

EXISTING FACILITES & RECOMMENDED IMPROVEMENTS

Map 9a-A4



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Feet

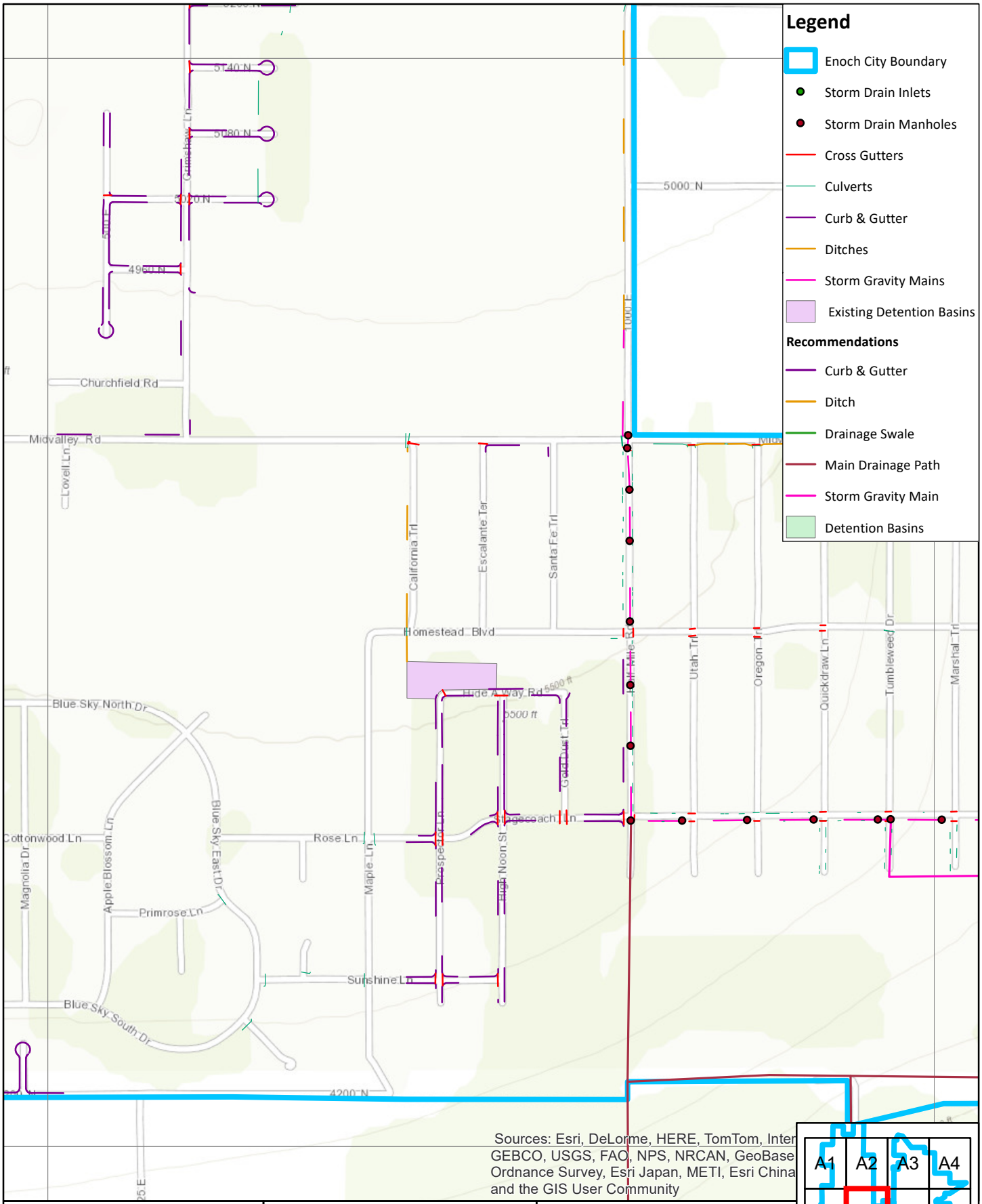
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

EXISTING FACILITES & RECOMMENDED IMPROVEMENTS

Map 9a-B1



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Feet

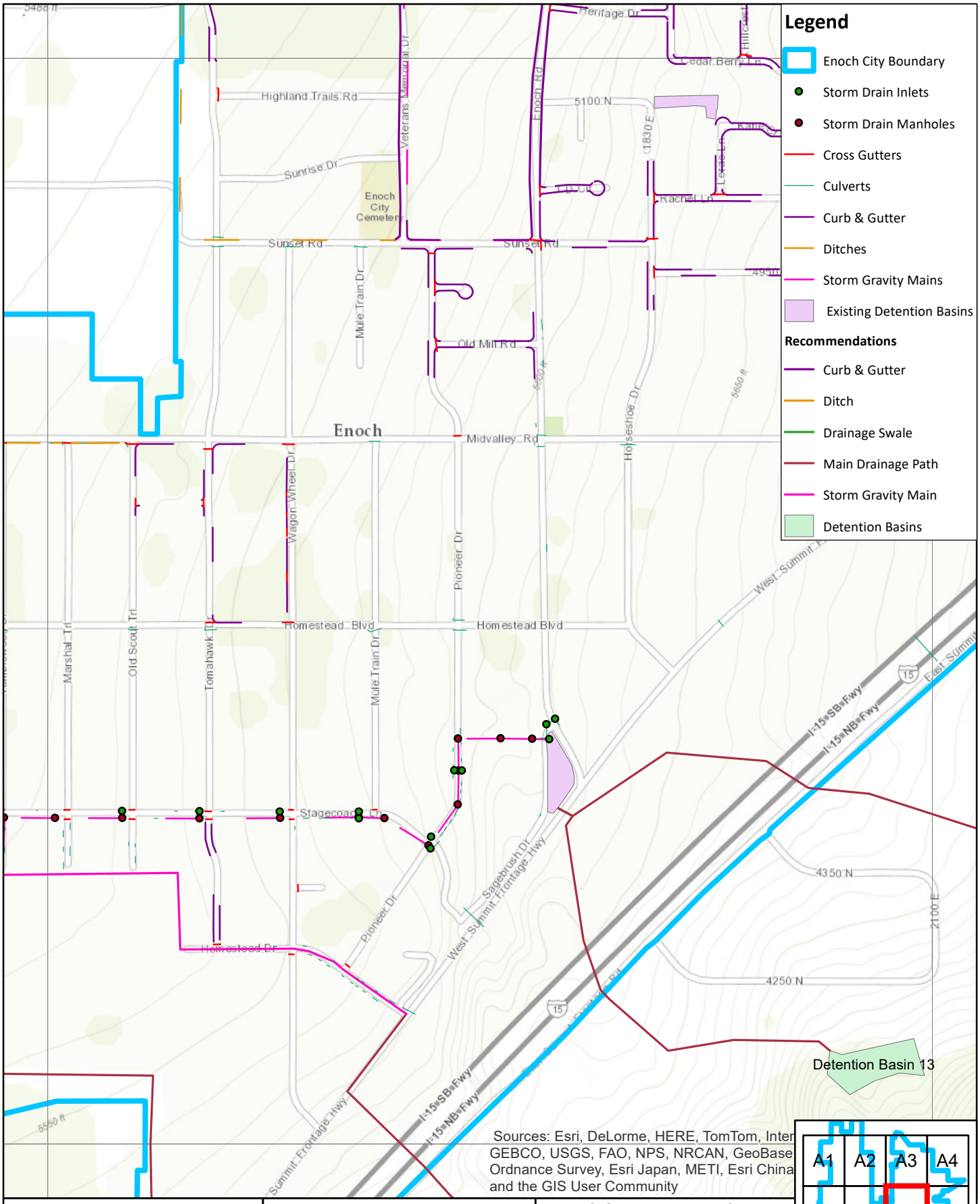
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

EXISTING FACILITES & RECOMMENDED IMPROVEMENTS

Map 9a-B2



0 500 1,000
Feet

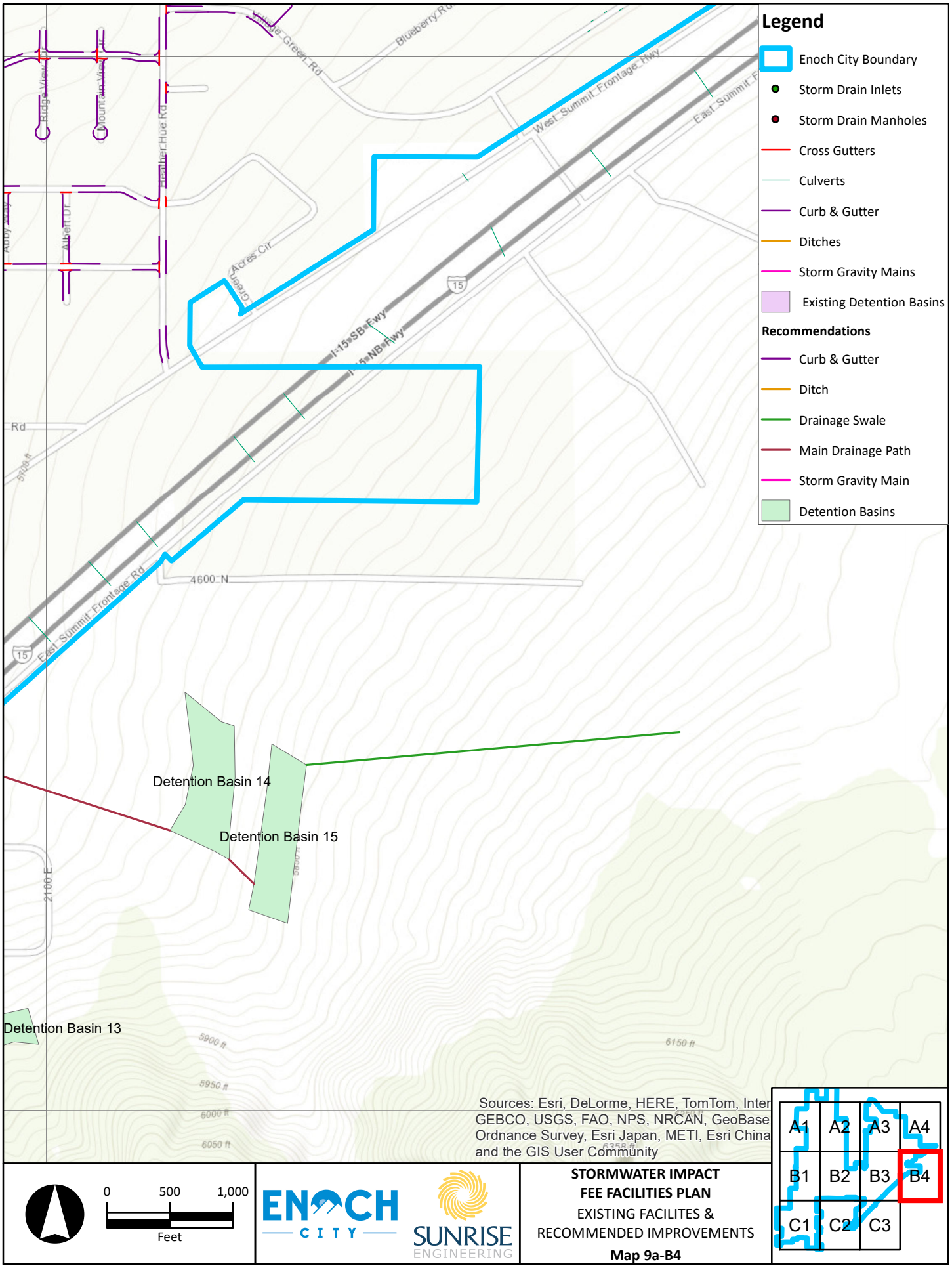
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

EXISTING FACILITES & RECOMMENDED IMPROVEMENTS

Map 9a-B3



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Feet

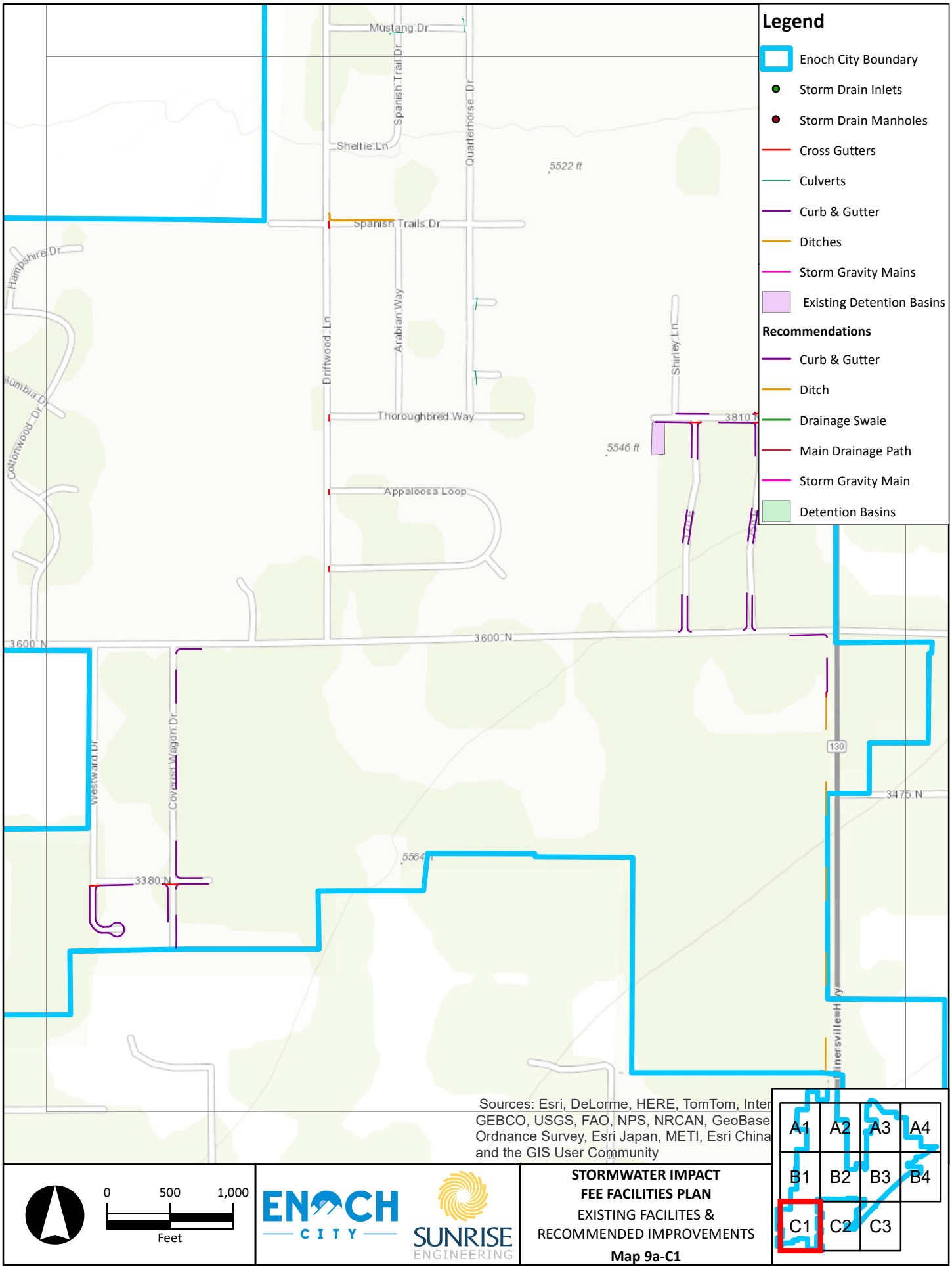
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

EXISTING FACILITES & RECOMMENDED IMPROVEMENTS

Map 9a-B4


Legend
Enoch City Boundary
Storm Drain Inlets
Storm Drain Manholes
Cross Gutters
Culverts
Curb & Gutter
Ditches
Storm Gravity Mains
Existing Detention Basins
Recommendations
Curb & Gutter
Ditch
Drainage Swale
Main Drainage Path
Storm Gravity Main
Detention Basins
Mustang Dr
Spanish Trail Dr
Quarterhorse Dr
Sheltie Ln
5522 ft
Spanish Trails Dr
Hampshire Dr
Arabian Way
Driftwood Ln
Shirley Ln
Thoroughbred Way
3810 N
5546 ft
Appaloosa Loop
3600 N
Westward Dr
Covered Wagon Dr
130
3475 N
5564
3380 N
Sources: Esri, DeLorme, HERE, TomTom, Inter
GEBCO, USGS, FAO, NPS, NRCAN, GeoBase
Ordnance Survey, Esri Japan, METI, Esri China
and the GIS User Community
A1
A2
A3
A4
B1
B2
B3
B4
C1
C2
C3
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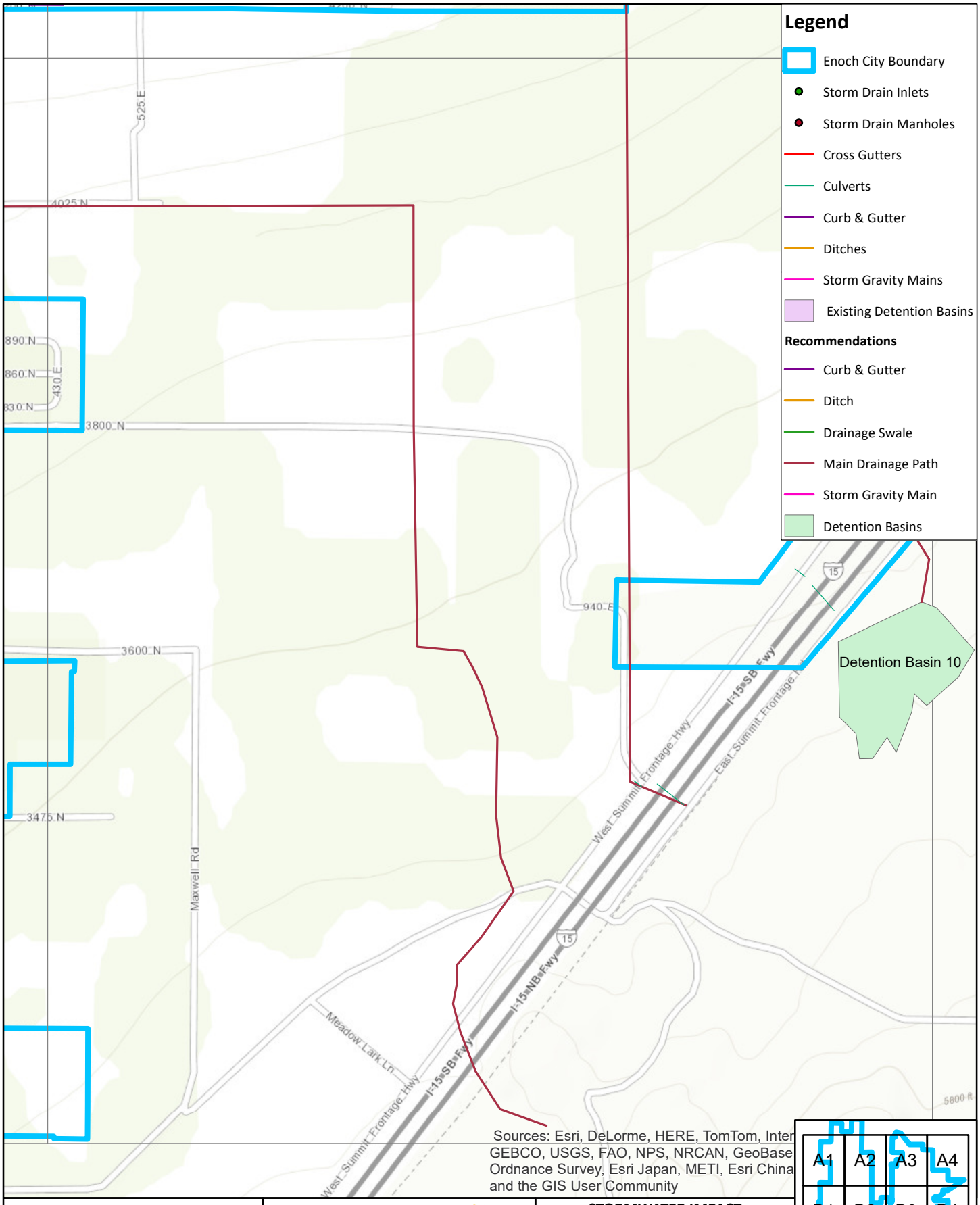
Feet
ENOCH CITY
SUNRISE ENGINEERING
STORMWATER IMPACT FEE FACILITIES PLAN
EXISTING FACILITES & RECOMMENDED IMPROVEMENTS
Map 9a-C1



0 500 1,000
Feet

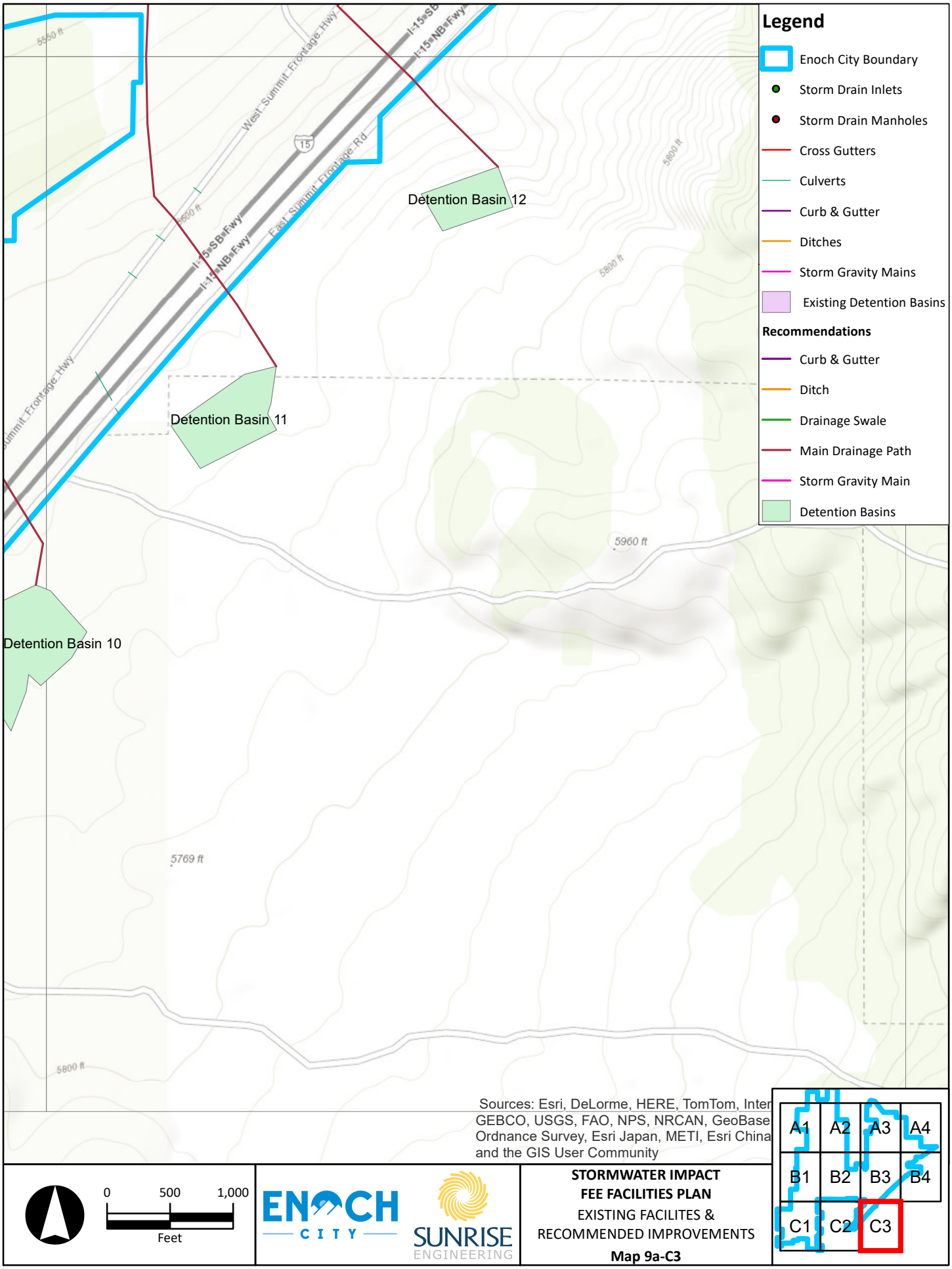
ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

EXISTING FACILITES & RECOMMENDED IMPROVEMENTS

Map 9a-C2



ENOCH CITY

SUNRISE ENGINEERING

STORMWATER IMPACT FEE FACILITIES PLAN

EXISTING FACILITES & RECOMMENDED IMPROVEMENTS

Map 9a-C3

APPENDIX B
Tables & Figures

NOAA Atlas 14 Precipitation Estimates for Mountain Areas

NOAA Atlas 14 Precipitation Estimates for Enoch City

Census Population Data

Growth Projections Table

Growth Projections Chart

6-hour Storm Distribution

Rain Fall Summary

Public Feedback Comment Cards

Scanned Maps from Open House

Scanned Maps from Field Observations

NOAA Atlas 14 Precipitation Estimates for Mountain Areas

NOAA Atlas 14, Volume 1, Version 5

Location name: Cedar City, Utah, USA*

Latitude: 37.7274°, Longitude: -112.9933°

Elevation: 7800.02 ft**

* source: ESRI Maps

** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.175** (0.154-0.201)	**0.227** (0.199-0.261)	**0.313** (0.273-0.359)	**0.389** (0.336-0.444)	**0.502** (0.428-0.576)	**0.602** (0.504-0.690)	**0.715** (0.586-0.829)	**0.848** (0.677-0.992)	**1.05** (0.810-1.26)	**1.24** (0.919-1.50)
10-min	**0.266** (0.234-0.305)	**0.345** (0.304-0.397)	**0.477** (0.416-0.547)	**0.592** (0.512-0.676)	**0.764** (0.651-0.877)	**0.916** (0.767-1.05)	**1.09** (0.892-1.26)	**1.29** (1.03-1.51)	**1.61** (1.23-1.91)	**1.89** (1.40-2.29)
15-min	**0.330** (0.290-0.379)	**0.428** (0.376-0.493)	**0.592** (0.516-0.678)	**0.734** (0.635-0.838)	**0.948** (0.807-1.09)	**1.14** (0.951-1.30)	**1.35** (1.10-1.56)	**1.60** (1.28-1.87)	**1.99** (1.53-2.37)	**2.35** (1.73-2.83)
30-min	**0.444** (0.391-0.510)	**0.576** (0.507-0.663)	**0.797** (0.695-0.913)	**0.989** (0.855-1.13)	**1.28** (1.09-1.46)	**1.53** (1.28-1.75)	**1.82** (1.49-2.10)	**2.15** (1.72-2.52)	**2.68** (2.06-3.19)	**3.16** (2.33-3.82)
60-min	**0.550** (0.484-0.631)	**0.713** (0.627-0.821)	**0.986** (0.860-1.13)	**1.22** (1.06-1.40)	**1.58** (1.34-1.81)	**1.89** (1.58-2.17)	**2.25** (1.84-2.60)	**2.67** (2.13-3.12)	**3.32** (2.55-3.95)	**3.91** (2.89-4.72)
2-hr	**0.657** (0.581-0.738)	**0.835** (0.738-0.937)	**1.11** (0.980-1.25)	**1.36** (1.19-1.52)	**1.74** (1.50-1.94)	**2.07** (1.75-2.33)	**2.46** (2.05-2.80)	**2.91** (2.36-3.34)	**3.62** (2.82-4.22)	**4.26** (3.21-5.04)
3-hr	**0.723** (0.658-0.806)	**0.917** (0.831-1.02)	**1.18** (1.07-1.31)	**1.42** (1.27-1.57)	**1.76** (1.57-1.96)	**2.09** (1.83-2.35)	**2.48** (2.13-2.83)	**2.92** (2.45-3.38)	**3.65** (2.93-4.26)	**4.30** (3.35-5.09)
6-hr	**0.959** (0.874-1.05)	**1.20** (1.09-1.31)	**1.49** (1.36-1.63)	**1.74** (1.58-1.91)	**2.10** (1.89-2.31)	**2.40** (2.14-2.65)	**2.73** (2.40-3.03)	**3.11** (2.69-3.49)	**3.82** (3.23-4.35)	**4.46** (3.69-5.15)
12-hr	**1.24** (1.12-1.38)	**1.53** (1.38-1.71)	**1.88** (1.69-2.10)	**2.18** (1.95-2.43)	**2.59** (2.30-2.90)	**2.92** (2.57-3.27)	**3.26** (2.84-3.67)	**3.63** (3.14-4.10)	**4.17** (3.54-4.77)	**4.82** (4.03-5.56)
24-hr	**1.29** (1.18-1.41)	**1.59** (1.46-1.75)	**1.96** (1.80-2.15)	**2.27** (2.07-2.48)	**2.68** (2.44-2.94)	**3.02** (2.73-3.30)	**3.36** (3.03-3.68)	**3.71** (3.33-4.14)	**4.20** (3.73-4.81)	**4.86** (4.06-5.62)
2-day	**1.46** (1.33-1.59)	**1.80** (1.65-1.98)	**2.22** (2.03-2.43)	**2.57** (2.35-2.81)	**3.07** (2.79-3.35)	**3.46** (3.13-3.78)	**3.87** (3.48-4.24)	**4.31** (3.85-4.72)	**4.91** (4.34-5.41)	**5.39** (4.72-5.96)
3-day	**1.59** (1.45-1.75)	**1.97** (1.79-2.17)	**2.42** (2.21-2.68)	**2.81** (2.56-3.10)	**3.36** (3.04-3.71)	**3.80** (3.42-4.20)	**4.27** (3.81-4.72)	**4.76** (4.22-5.28)	**5.45** (4.77-6.07)	**6.00** (5.20-6.72)
4-day	**1.72** (1.56-1.91)	**2.13** (1.93-2.37)	**2.63** (2.38-2.93)	**3.05** (2.76-3.40)	**3.65** (3.29-4.07)	**4.14** (3.70-4.62)	**4.66** (4.14-5.21)	**5.21** (4.59-5.84)	**5.98** (5.20-6.73)	**6.60** (5.67-7.48)
7-day	**2.05** (1.86-2.26)	**2.55** (2.32-2.81)	**3.15** (2.86-3.47)	**3.63** (3.30-4.01)	**4.31** (3.89-4.74)	**4.84** (4.35-5.33)	**5.38** (4.81-5.94)	**5.94** (5.27-6.58)	**6.71** (5.90-7.48)	**7.32** (6.38-8.20)
10-day	**2.31** (2.10-2.54)	**2.87** (2.62-3.17)	**3.55** (3.23-3.91)	**4.09** (3.72-4.50)	**4.83** (4.36-5.32)	**5.40** (4.86-5.96)	**5.99** (5.36-6.62)	**6.59** (5.87-7.31)	**7.40** (6.52-8.25)	**8.05** (7.04-9.02)
20-day	**3.03** (2.78-3.30)	**3.76** (3.45-4.09)	**4.58** (4.20-4.99)	**5.22** (4.77-5.68)	**6.06** (5.52-6.59)	**6.68** (6.07-7.27)	**7.30** (6.61-7.96)	**7.91** (7.13-8.66)	**8.71** (7.80-9.57)	**9.30** (8.28-10.3)
30-day	**3.70** (3.42-4.01)	**4.60** (4.25-4.99)	**5.60** (5.17-6.07)	**6.37** (5.87-6.90)	**7.36** (6.75-7.98)	**8.09** (7.41-8.78)	**8.81** (8.04-9.59)	**9.52** (8.65-10.4)	**10.4** (9.41-11.4)	**11.1** (9.96-12.2)
45-day	**4.53**	**5.64**	**6.87**	**7.81**	**9.03**	**9.93**	**10.8**	**11.7**	**12.9**	**13.7**

	(4.16-4.92)	(5.18-6.13)	(6.29-7.47)	(7.14-8.50)	(8.23-9.85)	(9.03-10.8)	(9.81-11.8)	(10.6-12.9)	(11.5-14.2)	(12.2-15.2)
60-day	**5.32** (4.87-5.82)	**6.64** (6.08-7.26)	**8.11** (7.41-8.87)	**9.20** (8.40-10.1)	**10.6** (9.67-11.6)	**11.6** (10.6-12.8)	**12.7** (11.4-13.9)	**13.6** (12.3-15.0)	**14.9** (13.3-16.5)	**15.9** (14.1-17.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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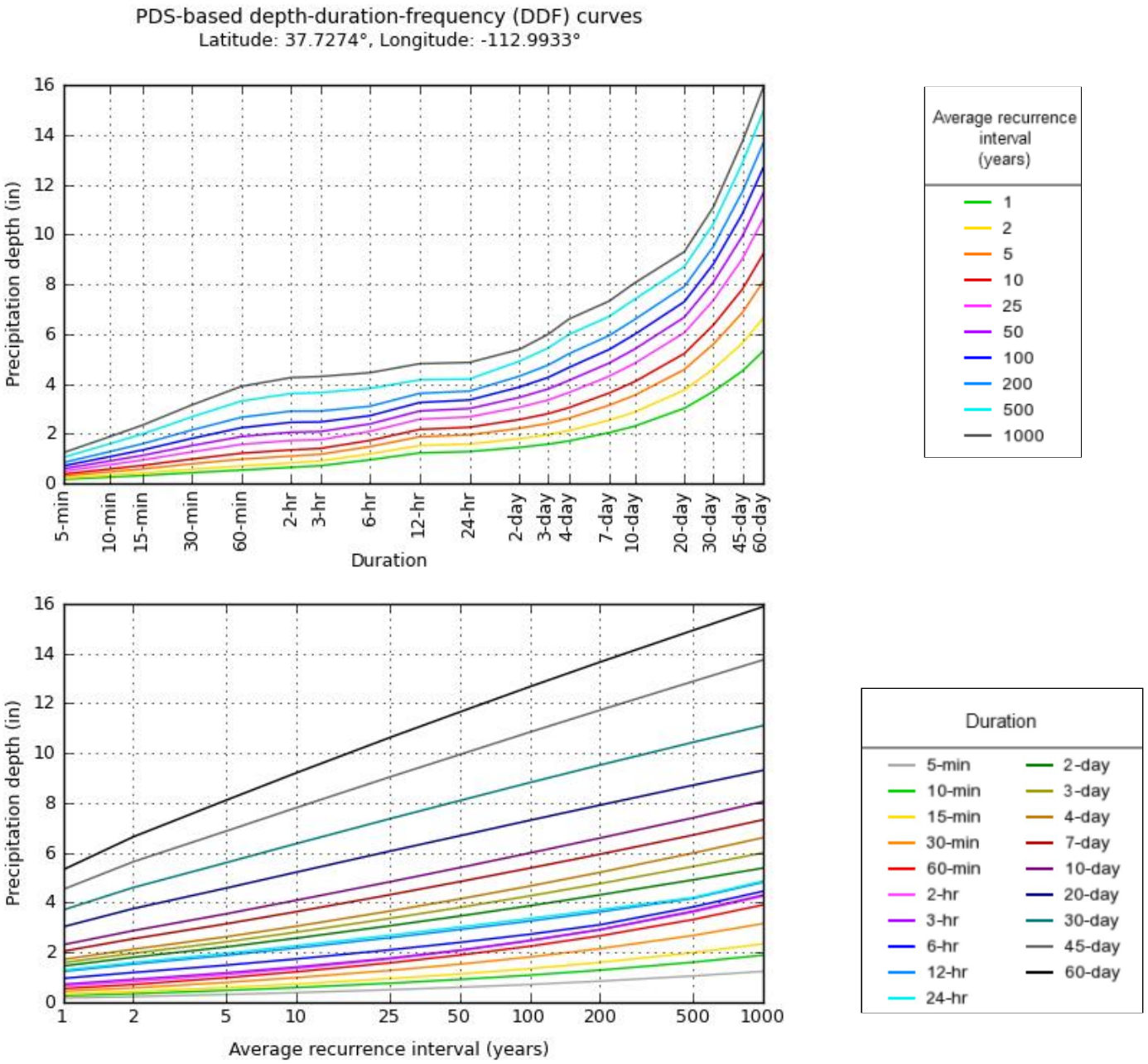
PF graphical



NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Fri Feb 17 22:22:30 2017

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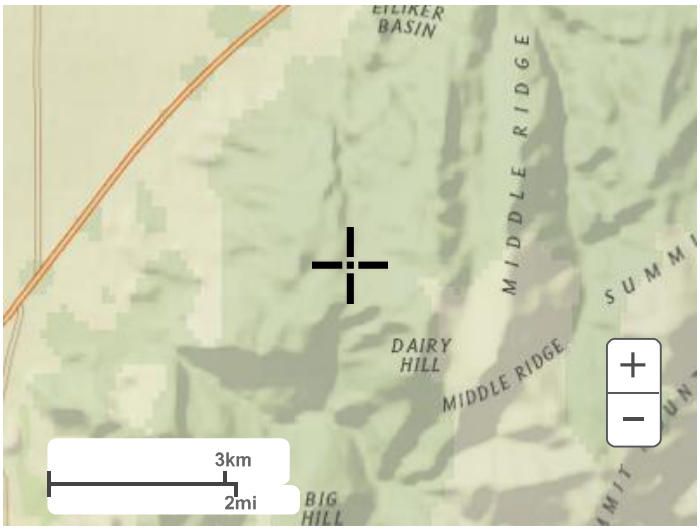
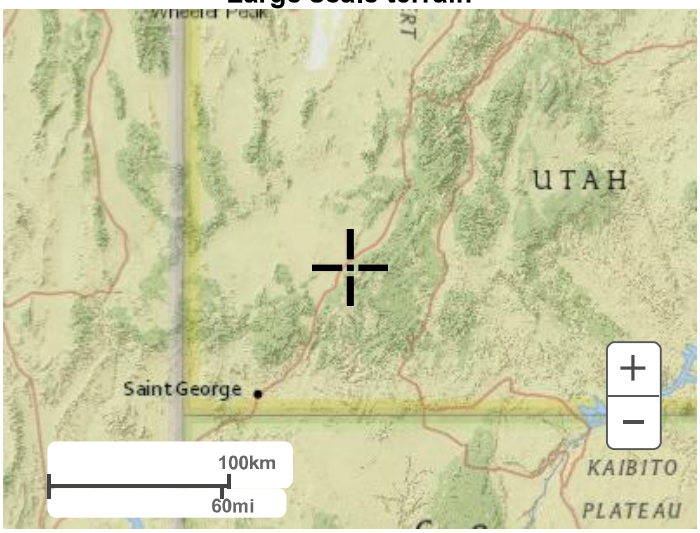
Maps & aerials

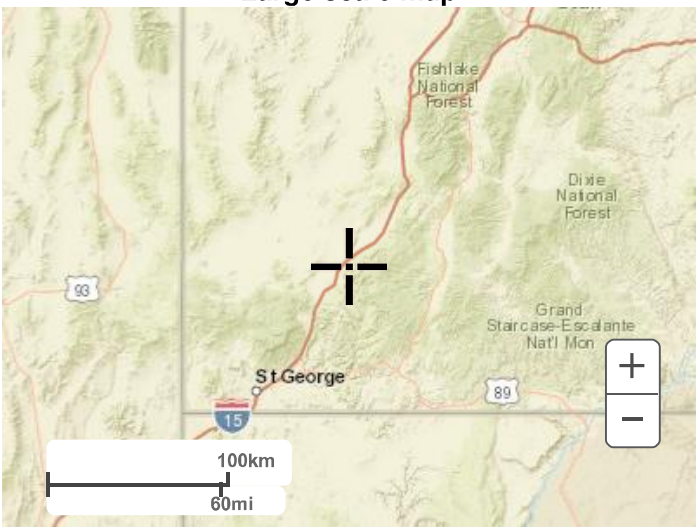
Small scale terrain



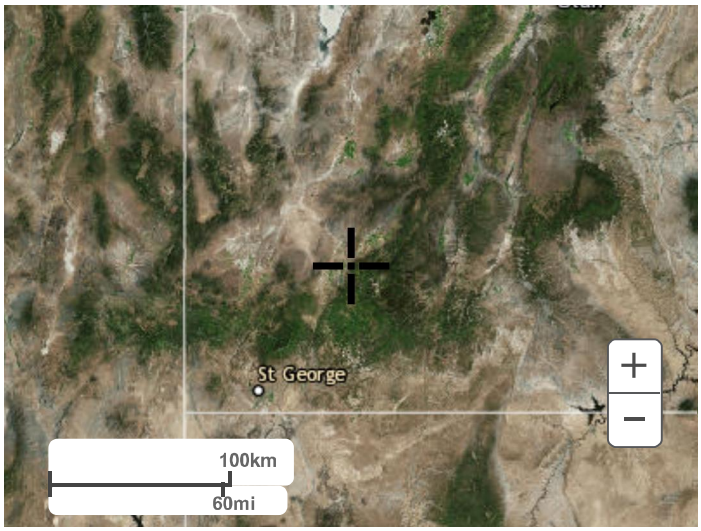
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14 Precipitation Estimates for Enoch City

NOAA Atlas 14, Volume 1, Version 5

Location name: Enoch, Utah, USA*

Latitude: 37.7733°, Longitude: -113.0244°

Elevation: 5551.36 ft**

* source: ESRI Maps

** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.143** (0.125-0.166)	**0.186** (0.162-0.216)	**0.258** (0.224-0.299)	**0.322** (0.277-0.373)	**0.421** (0.356-0.488)	**0.509** (0.422-0.590)	**0.609** (0.494-0.713)	**0.726** (0.574-0.859)	**0.909** (0.689-1.09)	**1.07** (0.785-1.31)
10-min	**0.218** (0.191-0.253)	**0.283** (0.247-0.329)	**0.393** (0.341-0.456)	**0.490** (0.422-0.567)	**0.640** (0.541-0.743)	**0.774** (0.642-0.898)	**0.927** (0.752-1.08)	**1.11** (0.873-1.31)	**1.38** (1.05-1.66)	**1.63** (1.20-1.99)
15-min	**0.271** (0.236-0.314)	**0.350** (0.306-0.408)	**0.487** (0.423-0.565)	**0.608** (0.523-0.703)	**0.794** (0.670-0.921)	**0.959** (0.795-1.11)	**1.15** (0.932-1.34)	**1.37** (1.08-1.62)	**1.72** (1.30-2.06)	**2.02** (1.48-2.46)
30-min	**0.364** (0.318-0.423)	**0.472** (0.412-0.549)	**0.656** (0.569-0.761)	**0.819** (0.705-0.947)	**1.07** (0.903-1.24)	**1.29** (1.07-1.50)	**1.55** (1.25-1.81)	**1.85** (1.46-2.18)	**2.31** (1.75-2.78)	**2.73** (2.00-3.32)
60-min	**0.451** (0.394-0.523)	**0.584** (0.509-0.679)	**0.812** (0.704-0.941)	**1.01** (0.872-1.17)	**1.32** (1.12-1.53)	**1.60** (1.33-1.85)	**1.91** (1.55-2.24)	**2.29** (1.80-2.70)	**2.86** (2.17-3.44)	**3.37** (2.47-4.11)
2-hr	**0.546** (0.482-0.619)	**0.694** (0.610-0.785)	**0.927** (0.814-1.05)	**1.14** (0.990-1.28)	**1.46** (1.25-1.65)	**1.75** (1.47-1.98)	**2.09** (1.73-2.39)	**2.48** (1.99-2.87)	**3.10** (2.39-3.64)	**3.65** (2.72-4.35)
3-hr	**0.605** (0.547-0.680)	**0.767** (0.691-0.858)	**0.995** (0.896-1.11)	**1.20** (1.07-1.33)	**1.50** (1.32-1.67)	**1.78** (1.54-1.99)	**2.11** (1.79-2.42)	**2.49** (2.07-2.90)	**3.13** (2.48-3.67)	**3.69** (2.84-4.39)
6-hr	**0.786** (0.714-0.870)	**0.980** (0.892-1.08)	**1.23** (1.12-1.36)	**1.45** (1.31-1.60)	**1.75** (1.57-1.94)	**2.01** (1.78-2.23)	**2.30** (2.01-2.57)	**2.63** (2.26-2.98)	**3.25** (2.72-3.73)	**3.80** (3.11-4.42)
12-hr	**1.00** (0.906-1.11)	**1.24** (1.12-1.38)	**1.54** (1.38-1.71)	**1.78** (1.60-1.98)	**2.12** (1.89-2.36)	**2.39** (2.11-2.67)	**2.67** (2.33-3.00)	**2.98** (2.58-3.36)	**3.44** (2.92-3.94)	**3.98** (3.33-4.60)
24-hr	**1.11** (1.02-1.21)	**1.37** (1.26-1.50)	**1.68** (1.55-1.83)	**1.93** (1.78-2.10)	**2.28** (2.09-2.48)	**2.56** (2.34-2.78)	**2.84** (2.58-3.10)	**3.13** (2.83-3.42)	**3.53** (3.16-3.98)	**4.02** (3.42-4.64)
2-day	**1.21** (1.12-1.31)	**1.50** (1.38-1.62)	**1.82** (1.68-1.98)	**2.10** (1.94-2.27)	**2.48** (2.28-2.69)	**2.78** (2.55-3.01)	**3.09** (2.82-3.36)	**3.42** (3.10-3.72)	**3.86** (3.46-4.21)	**4.21** (3.74-4.69)
3-day	**1.30** (1.20-1.42)	**1.60** (1.47-1.75)	**1.95** (1.79-2.13)	**2.25** (2.07-2.45)	**2.66** (2.44-2.90)	**2.99** (2.72-3.26)	**3.33** (3.02-3.64)	**3.69** (3.32-4.04)	**4.18** (3.72-4.60)	**4.57** (4.03-5.10)
4-day	**1.39** (1.27-1.52)	**1.71** (1.57-1.88)	**2.08** (1.91-2.28)	**2.39** (2.19-2.62)	**2.84** (2.59-3.11)	**3.19** (2.90-3.50)	**3.57** (3.22-3.92)	**3.96** (3.54-4.37)	**4.50** (3.98-4.99)	**4.93** (4.32-5.50)
7-day	**1.61** (1.48-1.75)	**1.99** (1.83-2.17)	**2.42** (2.23-2.64)	**2.77** (2.55-3.01)	**3.24** (2.97-3.51)	**3.60** (3.30-3.91)	**3.97** (3.61-4.31)	**4.33** (3.92-4.72)	**4.82** (4.33-5.28)	**5.20** (4.64-5.72)
10-day	**1.77** (1.64-1.94)	**2.20** (2.02-2.39)	**2.68** (2.47-2.91)	**3.06** (2.82-3.32)	**3.56** (3.27-3.87)	**3.95** (3.62-4.29)	**4.34** (3.96-4.72)	**4.72** (4.29-5.16)	**5.23** (4.71-5.73)	**5.63** (5.03-6.19)
20-day	**2.28** (2.11-2.46)	**2.81** (2.60-3.04)	**3.40** (3.15-3.66)	**3.85** (3.56-4.14)	**4.42** (4.09-4.75)	**4.84** (4.46-5.21)	**5.25** (4.84-5.66)	**5.64** (5.18-6.10)	**6.13** (5.60-6.66)	**6.48** (5.90-7.06)
30-day	**2.73** (2.54-2.93)	**3.38** (3.14-3.63)	**4.07** (3.78-4.36)	**4.58** (4.27-4.91)	**5.24** (4.87-5.61)	**5.71** (5.30-6.12)	**6.17** (5.71-6.62)	**6.60** (6.09-7.10)	**7.13** (6.55-7.70)	**7.51** (6.88-8.12)
45-day	**3.33** (3.08-3.58)	**4.12** (3.81-4.44)	**4.96** (4.59-5.34)	**5.59** (5.17-6.01)	**6.38** (5.90-6.86)	**6.95** (6.42-7.46)	**7.49** (6.91-8.04)	**7.98** (7.35-8.60)	**8.57** (7.87-9.26)	**8.98** (8.22-9.71)

60-day	**3.83** (3.55-4.15)	**4.75** (4.40-5.15)	**5.74** (5.31-6.21)	**6.47** (5.98-6.98)	**7.38** (6.83-7.97)	**8.03** (7.41-8.66)	**8.65** (7.96-9.34)	**9.22** (8.47-9.97)	**9.90** (9.07-10.7)	**10.4** (9.47-11.3)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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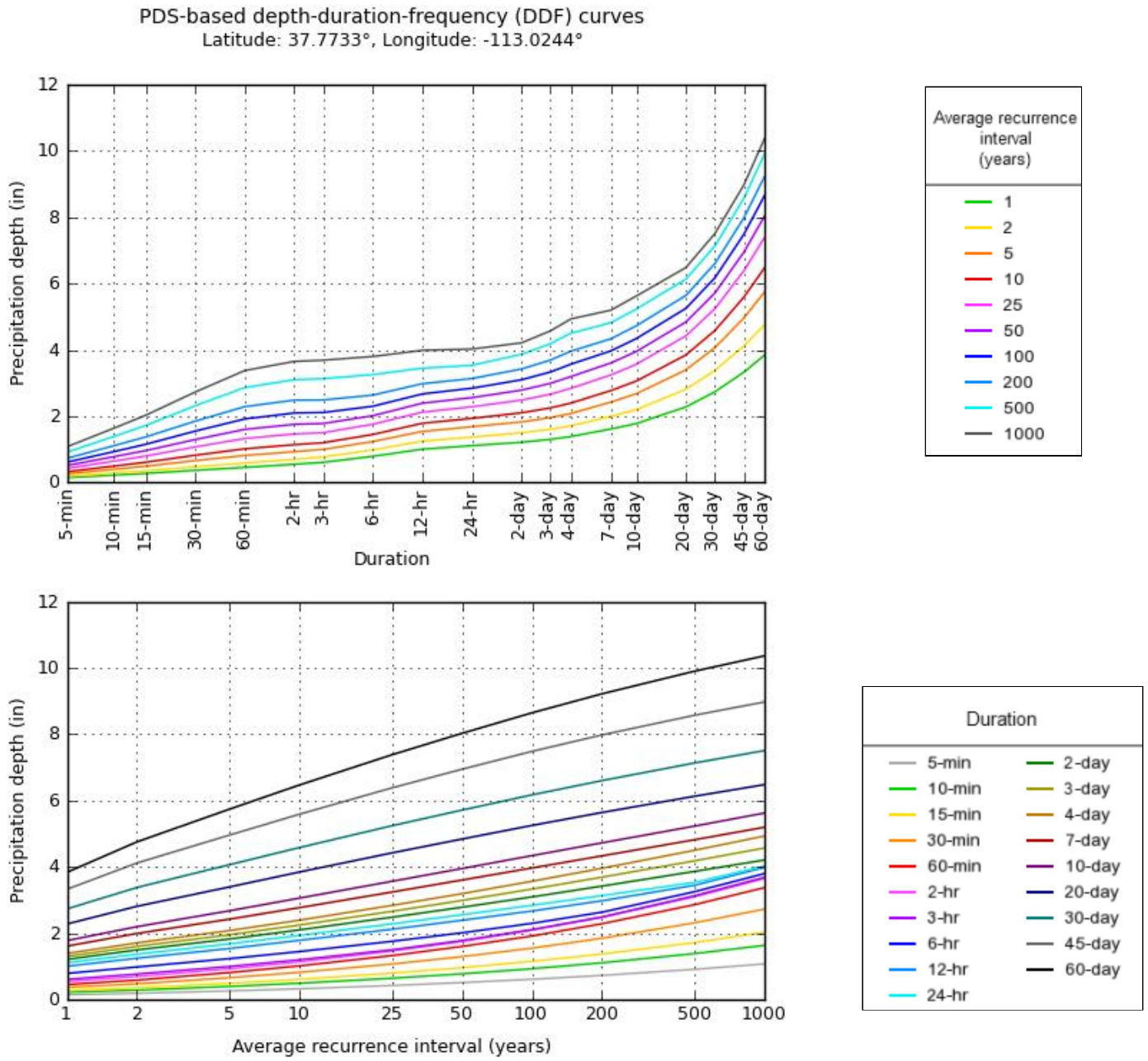
PF graphical



NOAA Atlas 14, Volume 1, Version 5

Created (GMT): Fri Feb 17 22:24:59 2017

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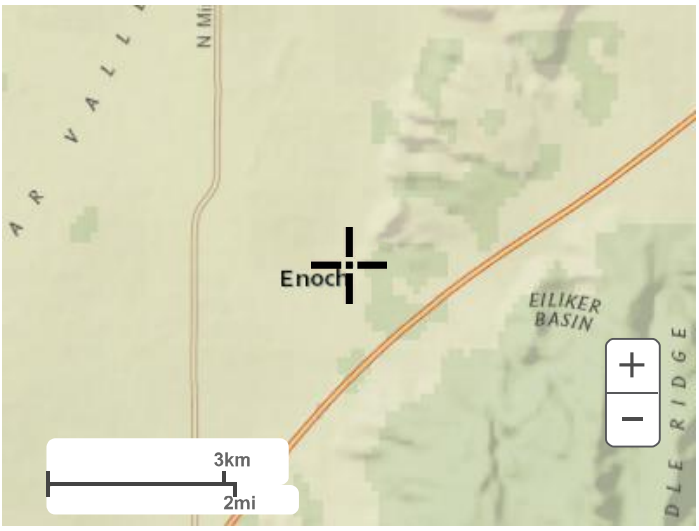
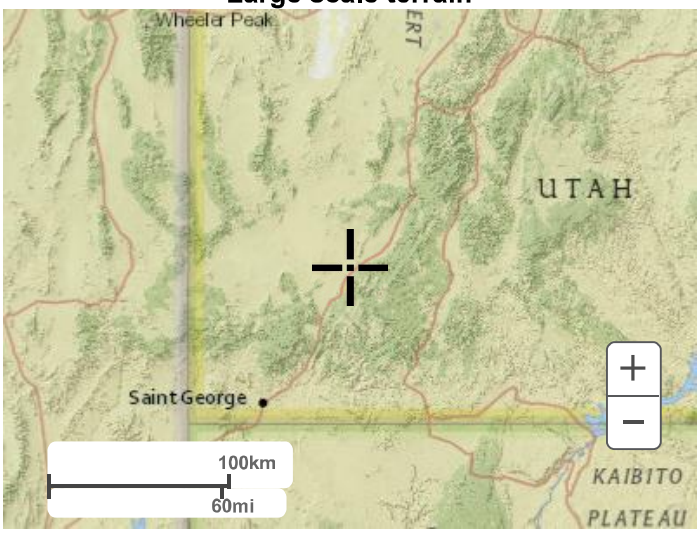
Maps & aerials

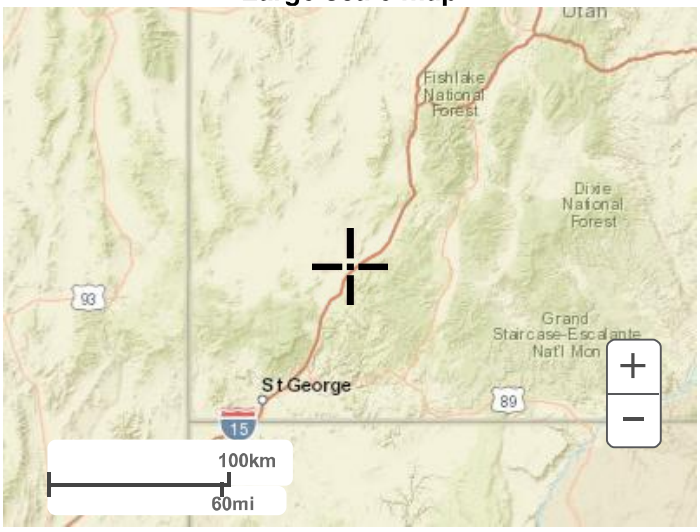
Small scale terrain



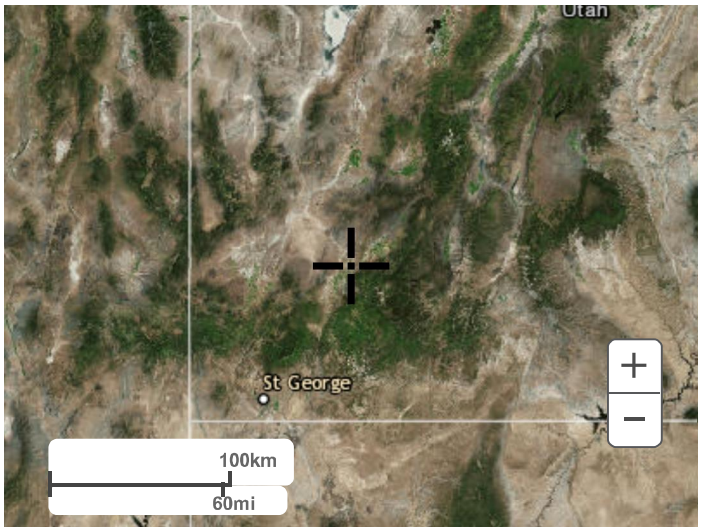
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Census Population Data

Data Type	Year	Population	Annual Growth Rate
Census Est.	2015	6,265	1.5%
Census	2010	5,803	5.3%
Census	2000	3,467	5.9%
Census	1990	1,947	11.1%
Census	1980	678	-

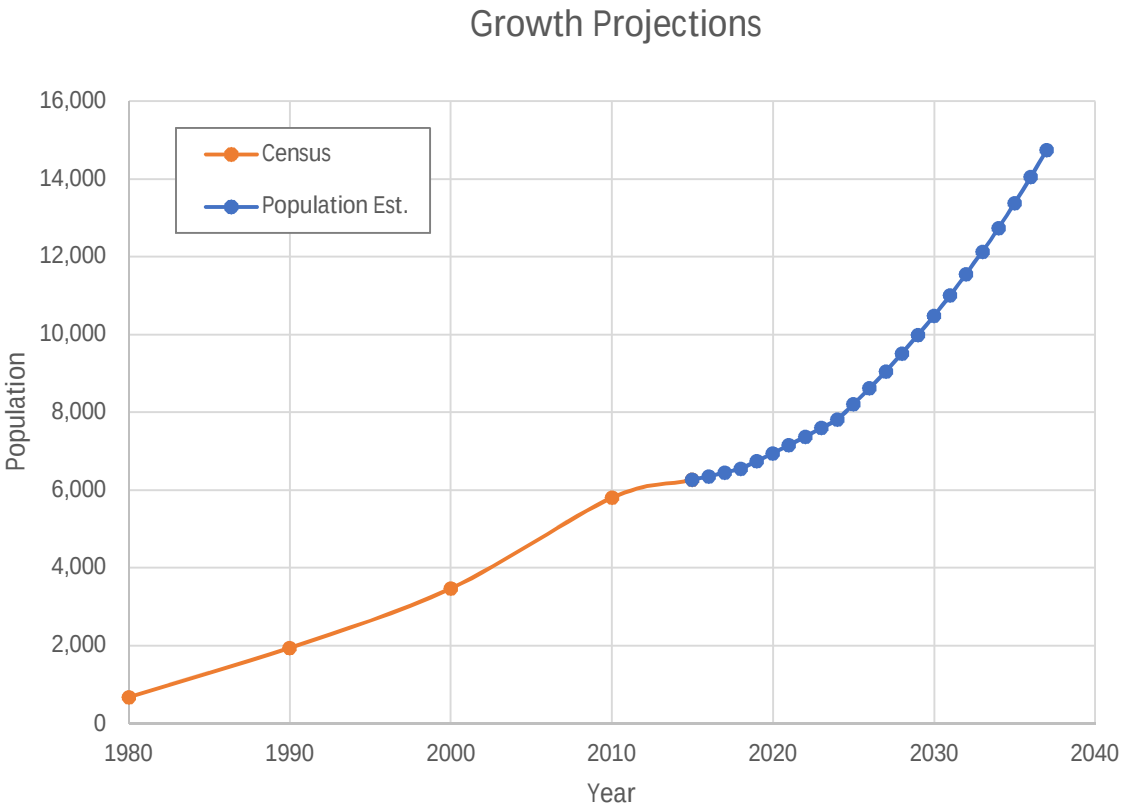
Growth Projections Table

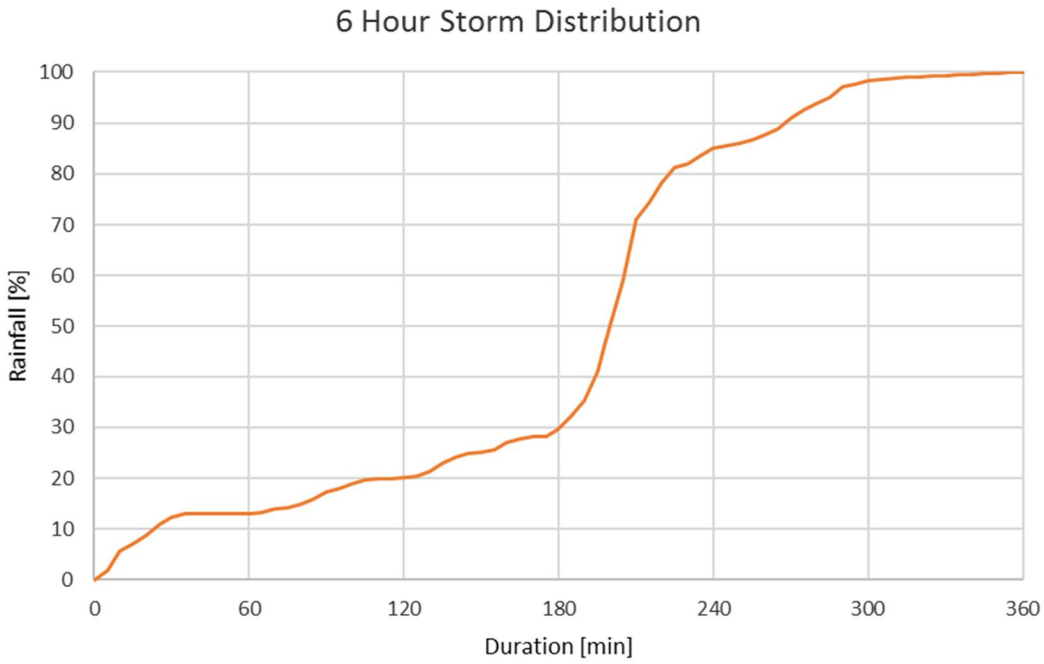
Year	Est. Growth Rate	*Estimated Residential ERU's	*Estimated Commercial ERU's	*Estimated Total ERU's	**Estimated Population
2015	-	2,119	49	2,168	6,265
2016	1.5%	2,151	50	2,201	6,359
2017	1.5%	2,183	51	2,234	6,454
2018	1.5%	2,216	52	2,267	6,551
2019	3.0%	2,282	53	2,335	6,748
2020	3.0%	2,351	55	2,405	6,950
2021	3.0%	2,421	56	2,478	7,159
2022	3.0%	2,494	58	2,552	7,373
2023	3.0%	2,569	60	2,628	7,595
2024	3.0%	2,646	62	2,707	7,822
2025	5.0%	2,778	65	2,843	8,214
2026	5.0%	2,917	68	2,985	8,624
2027	5.0%	3,063	71	3,134	9,055
2028	5.0%	3,216	75	3,291	9,508
2029	5.0%	3,377	79	3,455	9,984
2030	5.0%	3,546	83	3,628	10,483
2031	5.0%	3,723	87	3,810	11,007
2032	5.0%	3,909	91	4,000	11,557
2033	5.0%	4,104	96	4,200	12,135
2034	5.0%	4,310	100	4,410	12,742
2035	5.0%	4,525	105	4,630	13,379
2036	5.0%	4,751	111	4,862	14,048
2037	5.0%	4,989	116	5,105	14,750

* Estimated ERU's and Connections are based on City billing data.

** Estimated Population is based on the 2015 census data and the projected growth rates.

Growth Projections Chart





Rain Fall Summary

Region	Design Storm	Rain Fall [in]
Mountains	100-yr 6-hr	2.73
City	100-yr 6-hr	2.30

ENOCH CITY

Stormwater & Wastewater Master Plans

Name: Sharon Yanez

Address:

Telephone:

Email:

Comments:

Communicate the importance of barrow pit maintenance for all residence

ENOCH CITY

Stormwater & Wastewater Master Plans

Name: Tom Hansen

Address: 5227 N 1600 E

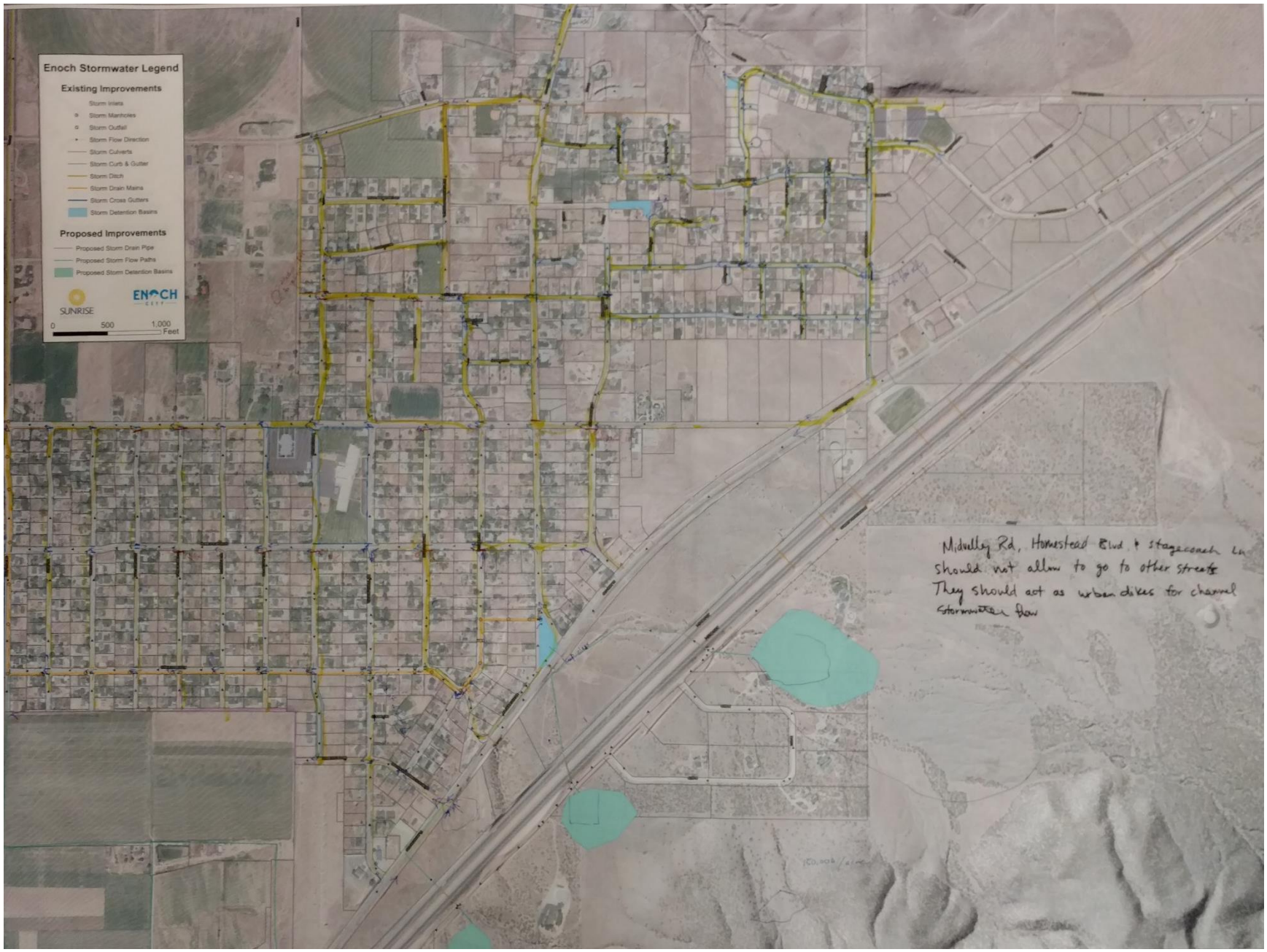
Telephone: 586-8297

Email: hansent@scinternet.net

Comments:

Please send engineer to see us so we can explain drainage issues. Surprised engineer not aware of problem.

Scanned Maps from Open House


Enoch Stormwater Legend
Existing Improvements
Storm Inlets
Storm Manholes
Storm Outfall
Storm Flow Direction
Storm Culverts
Storm Curb & Gutter
Storm Ditch
Storm Drain Mains
Storm Cross Gutters
Storm Detention Basins
Proposed Improvements
Proposed Storm Drain Pipe
Proposed Storm Flow Paths
Proposed Storm Detention Basins
SUNRISE
ENOCH
0
500
1,000
Feet
Midvalley Rd., Homestead Blvd. & Stagecoach Ln should not allow to go to other streets
They should act as urban dikes for channel
stormwater flow

Scanned Maps from Field Observations


Enoch Stormwater Legend
Existing Improvements
Storm Inlets
Storm Manholes
Storm Outfall
Storm Flow Direction
Storm Culverts
Storm Curb & Gutter
Storm Ditch
Storm Drain Mains
Storm Cross Gutters
Storm Detention Basins
Proposed Improvements
Proposed Storm Drain Pipe
Proposed Storm Flow Paths
Proposed Storm Detention Basins
SUNRISE
ENOCH
0
500
1,000
Feet

APPENDIX C
Hydrologic Model Output Results

Watershed Basin Schematic

Existing Conditions CN Calculations

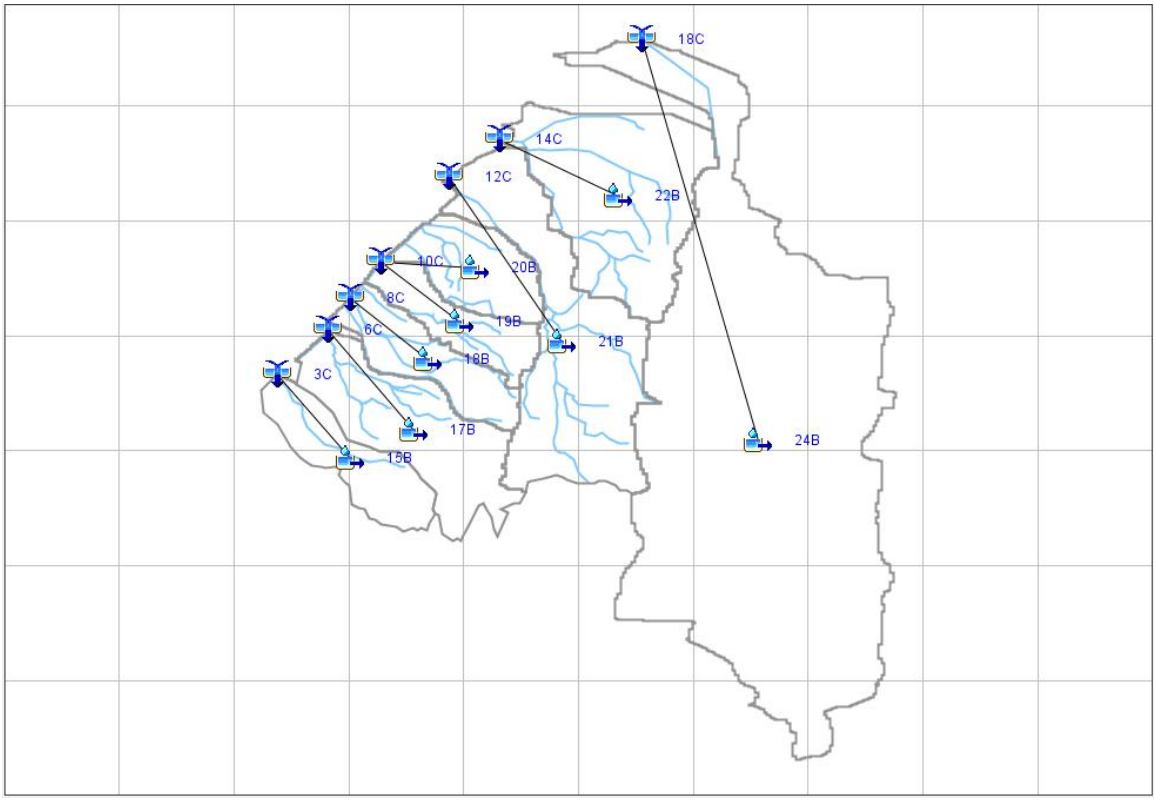
Buildout Conditions CN Calculations

HEC-HMS Model Results for Existing Conditions

HEC-HMS Model Results for Buildout Conditions

City NRCS Runoff Analysis

Exhibit A: HEC-HMS Basin Schematic



Runoff Curve Number Report
(Generated by WMS)

Fri May 19 11:38:30 2017

Runoff Curve Number Report for Basin 15B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
B	Transportation, Communications, and Utilities	89	0.008	0.746
B	Shrub and Grass Rangeland	66	0.109	7.190
D	Shrub and Grass Rangeland	90	0.101	9.050
D	Evergreen Forest Land	79	0.842	66.529

CN (Weighted) = Total Product \ Total Area

78.7866

Runoff Curve Number Report for Basin 17B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
B	Shrub and Grass Rangeland	66	0.037	2.467
D	Shrub and Grass Rangeland	90	0.714	64.304
D	Evergreen Forest Land	79	1.113	87.948
C	Evergreen Forest Land	73	0.120	8.794

CN (Weighted) = Total Product \ Total Area

82.3494

Runoff Curve Number Report for Basin 18B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
B	Shrub and Grass Rangeland	66	0.236	15.550
D	Shrub and Grass Rangeland	90	0.181	16.282
B	Evergreen Forest Land	60	0.055	3.282
D	Evergreen Forest Land	79	0.421	33.237
C	Evergreen Forest Land	73	0.164	11.978

CN (Weighted) = Total Product \ Total Area

76.0677

Runoff Curve Number Report for Basin 19B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
B	Residential	75	0.004	0.329
B	Shrub and Grass Rangeland	66	0.044	2.894
D	Shrub and Grass Rangeland	90	0.114	10.262
B	Evergreen Forest Land	60	0.004	0.263
D	Evergreen Forest Land	79	0.627	49.541
C	Evergreen Forest Land	73	0.044	3.201

CN (Weighted) = Total Product \ Total Area

79.3822

Runoff Curve Number Report for Basin 20B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
D	Shrub and Grass Rangeland	90	0.174	15.676
D	Transportation, Communications, and Utilities	93	0.004	0.395
D	Evergreen Forest Land	79	0.867	68.467

CN (Weighted) = Total Product \ Total Area

80.8902

Runoff Curve Number Report for Basin 21B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
D	Evergreen Forest Land	79	0.847	66.882
D	Commercial and Services	95	0.008	0.792
D	Rural Residential (5 ac lots)	79	0.100	7.907
D	Transportation, Communications, and Utilities	93	0.067	6.206
D	Shrub and Grass Rangeland	90	0.359	32.279
C	Evergreen Forest Land	73	1.797	131.215
C	Shrub and Grass Rangeland	86	0.042	3.587

CN (Weighted) = Total Product \ Total Area

77.2979

Runoff Curve Number Report for Basin 22B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
D	Residential	87	0.004	0.359
D	Mixed Rangeland	92	0.186	17.072
D	Shrub and Grass Rangeland	90	0.524	47.134
D	Transportation, Communications, and Utilities	93	0.041	3.835
B	Mixed Rangeland	79	0.016	1.303
D	Evergreen Forest Land	79	2.103	166.146
C	Evergreen Forest Land	73	0.008	0.602

CN (Weighted) = Total Product \ Total Area

82.03

Runoff Curve Number Report for Basin 24B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
B	Cropland and Pasture	75	0.120	9.019
B	Shrub and Grass Rangeland	66	0.046	3.010
C	Evergreen Forest Land	73	4.512	329.344
D	Evergreen Forest Land	79	1.733	136.931
B	Transportation, Communications, and Utilities	89	0.017	1.476
D	Shrub and Grass Rangeland	90	0.493	44.411
D	Transportation, Communications, and Utilities	93	0.012	1.157
C	Shrub and Grass Rangeland	86	1.737	149.420
D	Deciduous Forest Land – Oak and Aspen (80)	52	0.141	7.331
C	Deciduous Forest Land – Oak and Aspen (80)	42	2.281	95.788
C	Mixed Forest Land	73	0.792	57.817

CN (Weighted) = Total Product \ Total Area

70.32

Runoff Curve Number Report
(Generated by WMS)

Thu Mar 09 13:34:51 2017

Runoff Curve Number Report for Basin 15B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
B	Transportation, Communications, and Utilities	89	0.004	0.373
B	Future Development	85	0.013	1.068
B	Shrub and Grass Rangeland	66	0.101	6.637
D	Shrub and Grass Rangeland	90	0.101	9.050
D	Evergreen Forest Land	79	0.842	66.529

CN (Weighted) = Total Product \ Total Area

78.9209

Runoff Curve Number Report for Basin 17B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
B	Shrub and Grass Rangeland	66	0.037	2.467
D	Shrub and Grass Rangeland	90	0.714	64.304
D	Evergreen Forest Land	79	1.113	87.948
C	Evergreen Forest Land	73	0.120	8.794

CN (Weighted) = Total Product \ Total Area

82.3494

Runoff Curve Number Report for Basin 18B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
B	Shrub and Grass Rangeland	66	0.236	15.550
D	Shrub and Grass Rangeland	90	0.181	16.282
B	Evergreen Forest Land	60	0.055	3.282
D	Evergreen Forest Land	79	0.421	33.237
C	Evergreen Forest Land	73	0.164	11.978

CN (Weighted) = Total Product \ Total Area

==========
76.0677

Runoff Curve Number Report for Basin 19B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
B	Residential	75	0.004	0.329
B	Shrub and Grass Rangeland	66	0.026	1.737
B	Future Development	85	0.018	1.491
D	Future Development	92	0.057	5.245
D	Shrub and Grass Rangeland	90	0.070	6.315
B	Evergreen Forest Land	60	0.004	0.263
D	Evergreen Forest Land	79	0.614	48.502
C	Evergreen Forest Land	73	0.044	3.201

CN (Weighted) = Total Product \ Total Area
==========
80.089

Runoff Curve Number Report for Basin 20B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
D	Future Development	92	0.658	60.582
D	Transportation, Communications, and Utilities	93	0.004	0.395
D	Evergreen Forest Land	79	0.382	30.206

CN (Weighted) = Total Product \ Total Area
==========
87.248

Runoff Curve Number Report for Basin 21B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
D	Future Development	92	0.613	56.401
D	Commercial and Services	95	0.008	0.792
D	Transportation, Communications, and Utilities	93	0.067	6.206
C	Evergreen Forest Land	73	1.797	131.215
D	Evergreen Forest Land	79	0.663	52.385
D	Shrub and Grass Rangeland	90	0.029	2.627
C	Shrub and Grass Rangeland	86	0.042	3.587

CN (Weighted) = Total Product \ Total Area
==========
78.6477

Runoff Curve Number Report for Basin 22B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
D	Residential	87	0.004	0.359
D	Future Development	92	0.132	12.140
D	Transportation, Communications, and Utilities	93	0.041	3.835
B	Future Development	85	0.012	1.052
B	Mixed Rangeland	79	0.004	0.326
D	Mixed Rangeland	92	0.132	12.140
D	Shrub and Grass Rangeland	90	0.445	40.083
D	Evergreen Forest Land	79	2.103	166.146
C	Evergreen Forest Land	73	0.008	0.602

CN (Weighted) = Total Product \ Total Area

82.1102

Runoff Curve Number Report for Basin 24B

HSG	Land Use Description	CN	Area mi^2	Product CN x A
B	Cropland and Pasture	75	0.120	9.019
B	Shrub and Grass Rangeland	66	0.046	3.010
C	Evergreen Forest Land	73	4.512	329.344
D	Evergreen Forest Land	79	1.733	136.931
B	Transportation, Communications, and Utilities	89	0.017	1.476
D	Shrub and Grass Rangeland	90	0.493	44.411
D	Transportation, Communications, and Utilities	93	0.012	1.157
C	Shrub and Grass Rangeland	86	1.737	149.420
D	Deciduous Forest Land – Oak and Aspen (80)	52	0.141	7.331
C	Deciduous Forest Land – Oak and Aspen (80)	42	2.281	95.788
C	Mixed Forest Land	73	0.792	57.817

CN (Weighted) = Total Product \ Total Area

70.32

Exhibit D: HEC-HMS Model Results Existing Conditions					
Name	Drainage Area [mi^2]	Peak Discharge [cfs]	Time of Peak*	Volume [in]	Volume [acft]
24B	11.88	941.8	10Feb2017, 19:15	0.58	369.1
22B	2.88	858.2	10Feb2017, 17:00	1.17	180.1
21B	3.22	652.1	10Feb2017, 17:30	0.90	155.2
20B	1.05	265.9	10Feb2017, 17:20	1.10	61.5
19B	0.84	239.5	10Feb2017, 16:45	1.02	45.4
18B	1.06	230.6	10Feb2017, 17:00	0.84	47.4
17B	1.99	752.8	10Feb2017, 16:30	1.19	126.2
15B	1.06	301.4	10Feb2017, 16:40	0.98	55.6
18C	11.88	941.8	10Feb2017, 19:15	0.58	369.1
14C	2.88	858.2	10Feb2017, 17:00	1.17	180.1
12C	3.22	652.1	10Feb2017, 17:30	0.90	155.2
10C	1.88	486.8	10Feb2017, 17:00	1.06	106.9
8C	1.06	230.6	10Feb2017, 17:00	0.84	47.4
6C	1.99	752.8	10Feb2017, 16:30	1.19	126.2
3C	1.06	301.4	10Feb2017, 16:40	0.98	55.6

**Storm simulation ran for two days starting on 10Feb2017, 00:00*

Exhibit E: HEC-HMS Model Results Buildout Conditions					
Name	Drainage Area [mi^2]	Peak Discharge [cfs]	Time of Peak*	Volume [in]	Volume [acft]
24B	11.88	941.8	10Feb2017, 19:15	0.58	369.1
22B	2.88	863.1	10Feb2017, 17:00	1.18	180.9
21B	3.22	721.2	10Feb2017, 17:25	0.98	167.6
20B	1.05	417.1	10Feb2017, 16:50	1.52	85.0
19B	0.84	252.4	10Feb2017, 16:45	1.06	47.2
18B	1.06	230.6	10Feb2017, 17:00	0.84	47.4
17B	1.99	752.8	10Feb2017, 16:30	1.19	126.2
15B	1.06	304.6	10Feb2017, 16:40	0.99	56.0
18C	11.88	941.8	10Feb2017, 19:15	0.58	369.1
14C	2.88	863.1	10Feb2017, 17:00	1.18	180.9
12C	3.22	721.2	10Feb2017, 17:25	0.98	167.6
10C	1.88	668.1	10Feb2017, 16:45	1.32	132.1
8C	1.06	230.6	10Feb2017, 17:00	0.84	47.4
6C	1.99	752.8	10Feb2017, 16:30	1.19	126.2
3C	1.06	304.6	10Feb2017, 16:40	0.99	56.0

**Storm simulation ran for two days starting on 10Feb2017, 00:00*

Exhibit F: City Area NRCS Curve Number Runoff Analysis							
Rain Fall [in]	2.3	Storm duration		6	hr - 100 yr		
	Watershed name	CCN	Area [ac]	S [in]	Q [in]	Q [acft]	Qavg [cfs]
Existing	1	74.93	1165.76	3.35	0.53	51.93	104.73
	2	74.92	585.09	3.35	0.53	26.04	52.51
	3	77.09	1294.64	2.97	0.62	67.11	135.33
	4	74.62	992.87	3.40	0.52	43.24	87.20
Future 6-yr	1	75.16	1165.76	3.31	0.54	52.77	106.42
	2	74.94	585.09	3.34	0.53	26.08	52.59
	3	77.68	1294.64	2.87	0.65	69.81	140.79
	4	74.63	992.87	3.40	0.52	43.26	87.24
Future 20-yr	1	75.49	1165.76	3.25	0.56	54.03	108.97
	2	74.94	585.09	3.34	0.53	26.08	52.59
	3	77.68	1294.64	2.87	0.65	69.81	140.79
	4	74.63	992.87	3.40	0.52	43.26	87.24
Future Buildout	1	77.42	1165.76	2.92	0.64	61.80	124.63
	2	75.16	585.09	3.30	0.54	26.49	53.43
	3	80.55	1294.64	2.41	0.78	84.17	169.75
	4	76.75	992.87	3.03	0.61	50.29	101.42

APPENDIX D
Hydraulic Model Output Results

Storm Drain Model Input

Model Schematic

Model Results

Model Results (Sorted by “Full Flow”)

Graphed Model Results

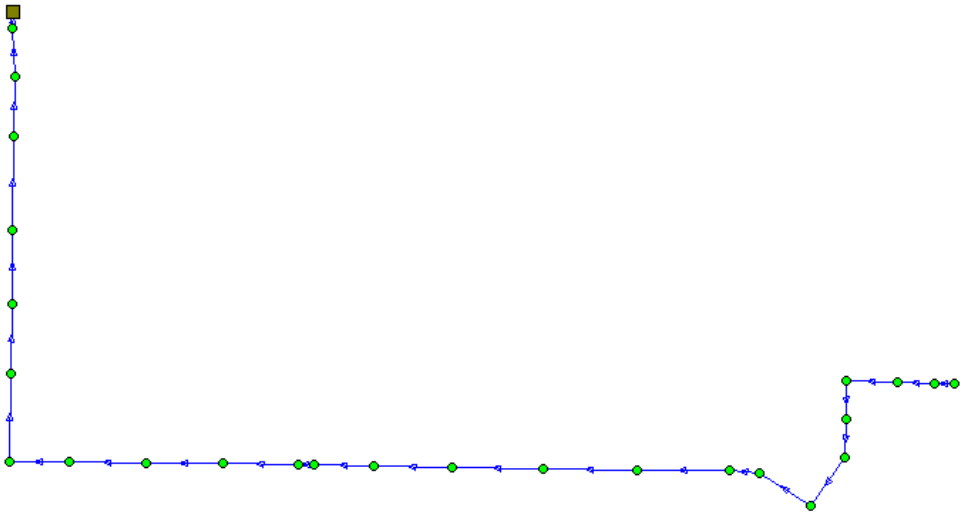
Manning’s Equation Calculation for Circular Pipe

Manning’s Equation Calculation for Trapezoidal Channel

Manning’s Equation Calculation for V-Ditch

Storm Drain H2OMap Model Input

ID (Char)	FROM_INV (Num)	TO_INV (Num)	LENGTH (Num)	DIAMETER (Num)	COEFF (Num)
A01BA01C	5,584.81	5,571.42	305.445	36	0.013
A018A00B	5,614.57	5,607.99	104.442	36	0.013
A00BA007	5,607.90	5,602.27	192.146	36	0.013
A007A019	5,602.17	5,591.90	260.51	36	0.013
A019A01A	5,591.80	5,590.23	193.577	36	0.013
A06CA0A0	5,480.89	5,480.44	77.344	36	0.013
A06BA06C	5,485.33	5,481.02	252.461	48	0.013
A06AA06B	5,486.80	5,485.43	309.763	36	0.013
A069A06A	5,489.19	5,486.90	489.089	36	0.013
A068A069	5,491.38	5,489.29	384.524	36	0.013
A054A068	5,493.74	5,491.48	368.406	36	0.013
A053A054	5,495.61	5,493.84	453.292	48	0.013
A052A053	5,497.11	5,495.71	312.091	36	0.013
A051A052	5,499.23	5,497.21	396.344	36	0.013
A03DA051	5,504.58	5,499.33	404.638	36	0.013
A03CA03D	5,508.69	5,504.68	390.224	36	0.013
A03BA03C	5,509.90	5,508.79	77.797	36	0.013
A03AA03B	5,511.83	5,510.00	311.793	36	0.013
A039A03A	5,519.57	5,511.93	410.788	36	0.013
A02CA039	5,531.74	5,519.67	470.793	36	0.013
A01FA02C	5,547.14	5,531.84	491.302	36	0.013
A01EA01F	5,566.08	5,547.24	479.534	36	0.013
A01DA01E	5,570.31	5,566.18	156.541	36	0.013
A01CA01D	5,571.32	5,570.41	316.829	36	0.013
A01AA01B	5,590.13	5,584.91	206.679	36	0.013



Storm Drain H2OMap Model Results Table

ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (cfs)	Unpeakable Flow (cfs)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude Number	Full Flow (cfs)	Backwater Adjustment	Adjusted Depth (ft)	Adjusted Velocity (ft/s)
A007A019	A007	A019	36	260.51	0.039	3	3	Free Surface	7.717	0.104	0.023	0.311	0.539	2.951	132.795	Yes	0.334	6.976
A00BA007	A00B	A007	36	192.146	0.029	3	3	Free Surface	6.958	0.111	0.026	0.334	0.539	2.566	114.51	No	0.334	6.958
A018A00B	A018	A00B	36	104.442	0.063	3	3	Free Surface	9.091	0.093	0.018	0.279	0.539	3.681	167.889	No	0.279	9.091
A019A01A	A019	A01A	36	193.577	0.008	3	3	Free Surface	4.427	0.152	0.05	0.456	0.539	1.391	60.075	No	0.456	4.427
A01AA01B	A01A	A01B	36	206.679	0.025	5	5	Free Surface	7.697	0.148	0.047	0.443	0.7	2.455	106.316	No	0.443	7.697
A01BA01C	A01B	A01C	36	305.445	0.044	5	5	Free Surface	9.337	0.129	0.036	0.388	0.7	3.19	140.03	Yes	0.594	5.046
A01CA01D	A01C	A01D	36	316.829	0.003	7	7	Free Surface	3.929	0.3	0.196	0.899	0.832	0.86	35.794	No	0.899	3.929
A01DA01E	A01D	A01E	36	156.541	0.026	7	7	Free Surface	8.636	0.172	0.064	0.516	0.832	2.544	108.635	No	0.516	8.636
A01EA01F	A01E	A01F	36	479.534	0.039	9	9	Free Surface	10.7	0.176	0.068	0.529	0.947	3.11	132.546	No	0.529	10.7
A01FA02C	A01F	A02C	36	491.302	0.031	10	10	Free Surface	10.172	0.197	0.085	0.59	1	2.792	118.048	No	0.59	10.172
A02CA039	A02C	A039	36	470.793	0.026	11	11	Free Surface	9.762	0.216	0.103	0.649	1.051	2.547	107.063	No	0.649	9.762
A039A03A	A039	A03A	36	410.788	0.019	12	12	Free Surface	8.936	0.245	0.132	0.735	1.1	2.183	91.209	Yes	0.811	7.773
A03AA03B	A03A	A03B	36	311.793	0.006	12	12	Free Surface	5.915	0.329	0.234	0.988	1.1	1.229	51.216	No	0.988	5.915
A03BA03C	A03B	A03C	36	77.797	0.014	12	12	Free Surface	8.131	0.262	0.15	0.786	1.1	1.916	79.862	No	0.786	8.131
A03CA03D	A03C	A03D	36	390.224	0.01	12	12	Free Surface	7.235	0.285	0.177	0.854	1.1	1.629	67.82	No	0.854	7.235
A03DA051	A03D	A051	36	404.638	0.013	12	12	Free Surface	7.861	0.268	0.158	0.805	1.1	1.828	76.171	Yes	0.865	7.11
A051A052	A051	A052	36	396.344	0.005	12	12	Free Surface	5.625	0.342	0.251	1.025	1.1	1.145	47.77	No	1.025	5.625
A052A053	A052	A053	36	312.091	0.004	12	12	Free Surface	5.371	0.353	0.268	1.06	1.1	1.073	44.815	No	1.06	5.371
A053A054	A053	A054	48	453.292	0.004	12	12	Free Surface	4.978	0.247	0.133	0.987	1.011	1.049	89.989	No	0.987	4.978
A054A068	A054	A068	36	368.406	0.006	12	12	Free Surface	6.006	0.326	0.229	0.977	1.1	1.256	52.312	No	0.977	6.006
A068A069	A068	A069	36	384.524	0.005	12	12	Free Surface	5.756	0.336	0.243	1.008	1.1	1.183	49.317	No	1.008	5.756
A069A06A	A069	A06A	36	489.089	0.005	12	12	Free Surface	5.458	0.349	0.262	1.048	1.1	1.097	45.816	No	1.048	5.458
A06AA06B	A06A	A06B	36	309.763	0.004	12	12	Free Surface	5.333	0.355	0.27	1.066	1.1	1.062	44.367	No	1.066	5.333
A06BA06C	A06B	A06C	48	252.461	0.017	12	12	Free Surface	8.391	0.171	0.064	0.685	1.011	2.146	188.256	Yes	0.772	7.054
A06CA0A0	A06C	A0A0	36	77.344	0.006	12	12	Free Surface	5.898	0.33	0.235	0.99	1.1	1.224	51.012	No	0.99	5.898

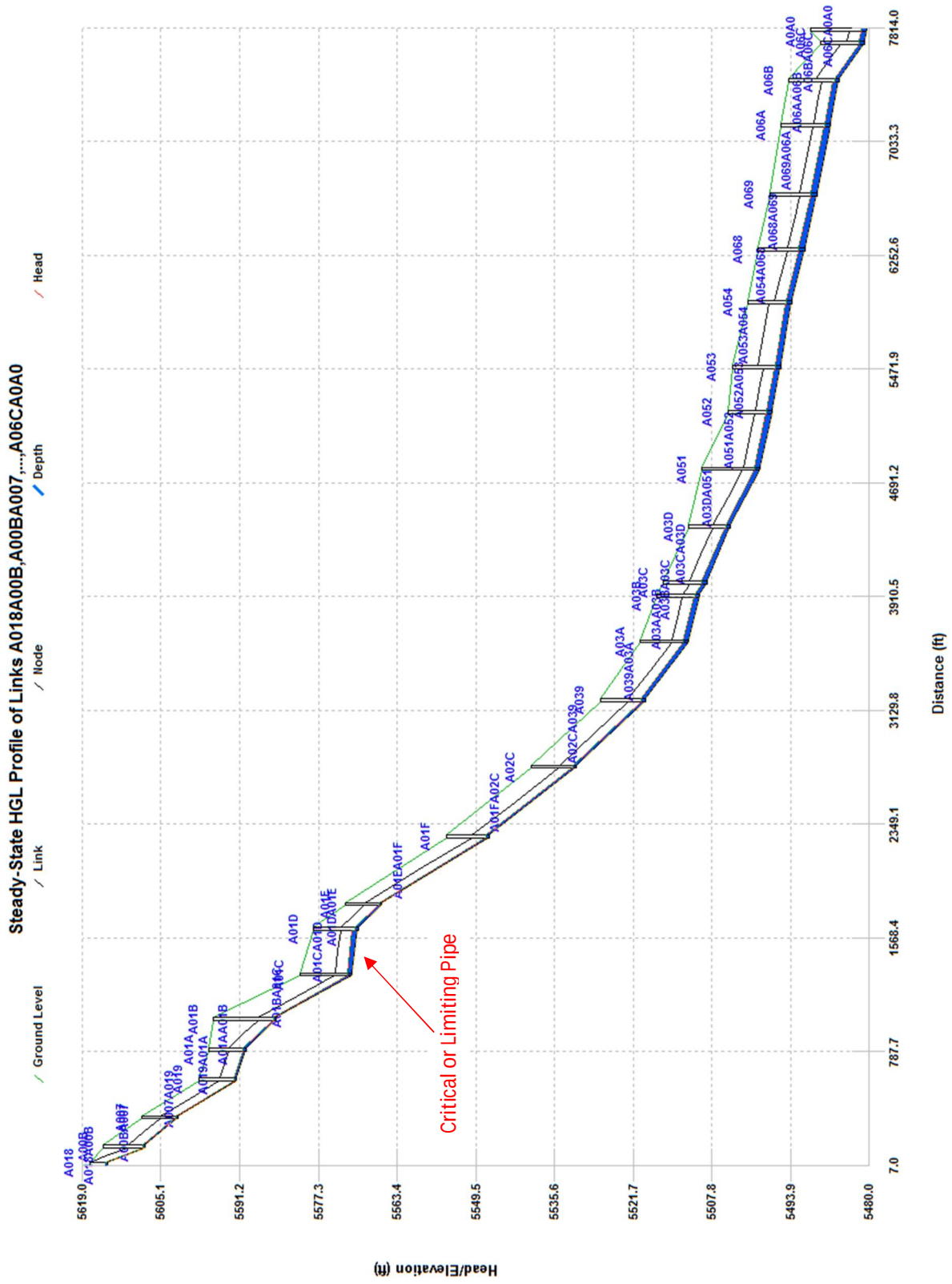
**Model results ordered by direction of flow and the network.*

Storm Drain H2OMap Model Results Table (Sorted)

ID	From ID	To ID	Diameter (in)	Length (ft)	Slope	Total Flow (cfs)	Unpeakable Flow (cfs)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude Number	Full Flow (cfs)*	Backwater Adjustment	Adjusted Depth (ft)	Adjusted Velocity (ft/s)
A01CA01D	A01C	A01D	36	316.829	0.003	7	7	Free Surface	3.929	0.3	0.196	0.899	0.832	0.86	35.794	No	0.899	3.929
A06AA06B	A06A	A06B	36	309.763	0.004	12	12	Free Surface	5.333	0.355	0.27	1.066	1.1	1.062	44.367	No	1.066	5.333
A052A053	A052	A053	36	312.091	0.004	12	12	Free Surface	5.371	0.353	0.268	1.06	1.1	1.073	44.815	No	1.06	5.371
A069A06A	A069	A06A	36	489.089	0.005	12	12	Free Surface	5.458	0.349	0.262	1.048	1.1	1.097	45.816	No	1.048	5.458
A051A052	A051	A052	36	396.344	0.005	12	12	Free Surface	5.625	0.342	0.251	1.025	1.1	1.145	47.77	No	1.025	5.625
A068A069	A068	A069	36	384.524	0.005	12	12	Free Surface	5.756	0.336	0.243	1.008	1.1	1.183	49.317	No	1.008	5.756
A06CA0A0	A06C	A0A0	36	77.344	0.006	12	12	Free Surface	5.898	0.33	0.235	0.99	1.1	1.224	51.012	No	0.99	5.898
A03AA03B	A03A	A03B	36	311.793	0.006	12	12	Free Surface	5.915	0.329	0.234	0.988	1.1	1.229	51.216	No	0.988	5.915
A054A068	A054	A068	36	368.406	0.006	12	12	Free Surface	6.006	0.326	0.229	0.977	1.1	1.256	52.312	No	0.977	6.006
A019A01A	A019	A01A	36	193.577	0.008	3	3	Free Surface	4.427	0.152	0.05	0.456	0.539	1.391	60.075	No	0.456	4.427
A03CA03D	A03C	A03D	36	390.224	0.01	12	12	Free Surface	7.235	0.285	0.177	0.854	1.1	1.629	67.82	No	0.854	7.235
A03DA051	A03D	A051	36	404.638	0.013	12	12	Free Surface	7.861	0.268	0.158	0.805	1.1	1.828	76.171	Yes	0.865	7.11
A03BA03C	A03B	A03C	36	77.797	0.014	12	12	Free Surface	8.131	0.262	0.15	0.786	1.1	1.916	79.862	No	0.786	8.131
A053A054	A053	A054	48	453.292	0.004	12	12	Free Surface	4.978	0.247	0.133	0.987	1.011	1.049	89.989	No	0.987	4.978
A039A03A	A039	A03A	36	410.788	0.019	12	12	Free Surface	8.936	0.245	0.132	0.735	1.1	2.183	91.209	Yes	0.811	7.773
A01AA01B	A01A	A01B	36	206.679	0.025	5	5	Free Surface	7.697	0.148	0.047	0.443	0.7	2.455	106.316	No	0.443	7.697
A02CA039	A02C	A039	36	470.793	0.026	11	11	Free Surface	9.762	0.216	0.103	0.649	1.051	2.547	107.063	No	0.649	9.762
A01DA01E	A01D	A01E	36	156.541	0.026	7	7	Free Surface	8.636	0.172	0.064	0.516	0.832	2.544	108.635	No	0.516	8.636
A00BA007	A00B	A007	36	192.146	0.029	3	3	Free Surface	6.958	0.111	0.026	0.334	0.539	2.566	114.51	No	0.334	6.958
A01FA02C	A01F	A02C	36	491.302	0.031	10	10	Free Surface	10.172	0.197	0.085	0.59	1	2.792	118.048	No	0.59	10.172
A01EA01F	A01E	A01F	36	479.534	0.039	9	9	Free Surface	10.7	0.176	0.068	0.529	0.947	3.11	132.546	No	0.529	10.7
A007A019	A007	A019	36	260.51	0.039	3	3	Free Surface	7.717	0.104	0.023	0.311	0.539	2.951	132.795	Yes	0.334	6.976
A01BA01C	A01B	A01C	36	305.445	0.044	5	5	Free Surface	9.337	0.129	0.036	0.388	0.7	3.19	140.03	Yes	0.594	5.046
A018A00B	A018	A00B	36	104.442	0.063	3	3	Free Surface	9.091	0.093	0.018	0.279	0.539	3.681	167.889	No	0.279	9.091
A06BA06C	A06B	A06C	48	252.461	0.017	12	12	Free Surface	8.391	0.171	0.064	0.685	1.011	2.146	188.256	Yes	0.772	7.054

**Model results sorted by "Full Flow" value from smallest to largest to show critcal pipe.*

Storm Drain H2OMap Model Results Graph



Circular Pipe Manning's Equation Calculation

INPUT DATA	
Manning roughness coefficient, n	0.013
pipe segment slope, S_o (ft/ft)	0.010
pipe diameter, D (in)	36.00
pipe diameter, D (ft)	3.00
fluid depth, y (in)	33.48
fluid depth, y (ft)	2.79
OUTPUT DATA	
fill angle, θ (deg)	149.3
fill angle, θ (rad)	2.6
flow area, A (in^2)	986.6
flow area, A (ft^2)	6.9
wetted perimiter, P (in)	93.8
wetted perimiter, P (ft)	7.8
hydraulic radius, R_h (in)	10.5
hydraulic radius, R_h (ft)	0.9
pipe flow rate, Q (cfs)	**71.71**
pipe flow rate, Q (gpm)	32187.2
flow velocity, V (fps)	10.47

Trapezoidal Channel Manning's Equation Calculation

Channel Base, b (ft)	1.50
Flow Depth, d (ft)	2.60
Side Slope Ratio	1 :1
Side Slope Angle (rad)	0.785
Top Width, t (ft)	6.70
Manning's Roughness,	0.025
Hydraulic Radius, R (ft)	1.20
Channel Slope, S (ft/ft)	0.010
Channel Area, A (ft^2)	10.7
Flow Velocity, V (fps)	6.7
Flow Rate, Q (cfs)	71.9

V-Ditch Manning's Equation Calculation

Channel Base, b (ft)	0.00
Flow Depth, d (ft)	3.30
Side Slope Ratio	1 :1
Side Slope Angle (rad)	0.785
Top Width, t (ft)	6.60
Manning's Roughness,	0.025
Hydraulic Radius, R (ft)	1.17
Channel Slope, S (ft/ft)	0.010
Channel Area, A (ft^2)	10.9
Flow Velocity, V (fps)	6.6
Flow Rate, Q (cfs)	71.9

APPENDIX E
Financial Analysis

Engineer's Opinion of Probable Cost

EOPC for Typical Optional Road Improvements

Cash Flow (100% Bonds)

Cash Flow (50% Bonds, 50% Grants)

SUNRISE ENGINEERING
11 North 300 West, Washington, Utah 84780
TEL 435.652.8450 | FAX 435.652.8416 | sunrise-eng.com

ENGINEER'S OPINION OF PROBABLE COST

Stormwater Master Plan Recommended Improvements

April 12, 2017
KCS/CCH

NO.	DESCRIPTION	EST QTY	UNIT	UNIT PRICE	AMOUNT
I-15 East Detention Basin 15					
1	NRCS Total Cost	1	LS	$ 728,559.03	$ 728,559.03
I-15 East Detention Basin 14					
2	NRCS Total Cost	1	LS	$ 668,965.61	$ 668,965.61
I-15 East Detention Basin 13					
3	NRCS Total Cost	1	LS	$ 205,127.65	$ 205,127.65
I-15 East Detention Basin 12					
4	NRCS Total Cost	1	LS	$ 320,828.19	$ 320,828.19
I-15 East Detention Basin 11					
5	NRCS Total Cost	1	LS	$ 460,009.23	$ 460,009.23
I-15 East Detention Basin 10					
6	NRCS Total Cost	1	LS	$ 512,840.96	$ 512,840.96
7				Subtotal	$ 2,896,330.67
Storm Drain Phase 2 & Detention Routing					
1	Mobilization	1	LS	$ 58,200.00	$ 58,200.00
2	Project Sign	1	EA	$ 1,000.00	$ 1,000.00
3	Pre-Construction DVD	1	EA	$ 500.00	$ 500.00
4	Subsurface Investigation	12	HR	$ 250.00	$ 3,000.00
5	Materials Sampling & Testing	1	LS	$ 4,000.00	$ 4,000.00
6	Dust Control & Watering	1	LS	$ 1,200.00	$ 1,200.00
7	Construction Staking	1	LS	$ 4,000.00	$ 4,000.00
8	Erosion Control Compliance	1	LS	$ 1,500.00	$ 1,500.00
9	24-inch HDPE Pipe	2,720	LF	$ 42.00	$ 114,240.00
10	36-inch HDPE Pipe	700	LF	$ 72.00	$ 50,400.00
11	60-inch Reinforced Concrete Manhole	6	EA	$ 4,000.00	$ 24,000.00
12	Storm Drain Inlet	8	EA	$ 800.00	$ 6,400.00
13	Imported Pipe Bedding	320	CY	$ 18.00	$ 5,760.00
14	Imported Trench Backfill	900	CY	$ 12.00	$ 10,800.00
15	8" Untreated Base Course	28,500	SF	$ 0.75	$ 21,375.00
16	8" Granular Borrow	28,500	SF	$ 0.55	$ 15,675.00
17	Bituminous Surface Course (2-1/2")	28,500	SF	$ 1.40	$ 39,900.00
18	Detention Dike	2,400	LF	$ 10.00	$ 24,000.00
19	Detention Routing V-Ditch	37,680	LF	$ 15.00	$ 565,200.00
20	Detention Routing Trapezoidal Channel	6,030	LF	$ 45.00	$ 271,350.00
21				Subtotal	$ 1,222,500.00
Misc. City Improvements					
1	Mobilization	1	LS	$ 12,500.00	$ 12,500.00
2	Construction General Activities	1	LS	$ 8,000.00	$ 8,000.00
3	Drainage Ditch	1,200	LF	$ 25.00	$ 30,000.00
4	Culvert	730	LF	$ 35.00	$ 25,550.00
5	Curb & Gutter	5,300	LF	$ 35.00	$ 185,500.00
6				Subtotal	$ 261,550.00
				Grand Subtotal	$ 4,380,380.67
			15%	Contingency	$ 657,057.11
				General Construction Total	$ 5,037,500.00
Professional Services & Incidentals					
1	Funding & Administrative Services		EST	$ 10,000.00	$ 10,000.00
2	Topographical Survey		EST	$ 10,000.00	$ 10,000.00
3	Engineering Design		EST	$ 339,500.00	$ 339,500.00
4	Bidding & Negotiating		EST	$ 40,000.00	$ 40,000.00
5	Construction Administration Services		EST	$ 262,800.00	$ 262,800.00
6	Permit Acquisition		EST	$ 10,000.00	$ 10,000.00
7	Preliminary Engineering Report (PER)		EST	$ 20,000.00	$ 20,000.00

8	Wastewater Facilities Plan		EST		$	-
9	Water Conservation Plan		EST		$	-
10	Operation and Maintenance Manual		EST		$	-
11	Plan of Operations		EST		$	-
12	Ground Water Discharge / UPDES /Reuse		EST		$	-
13	SWPPP (Storm Water Pollution Protection Plan)		EST	$ 5,000.00	$	5,000.00
14	Environmental Report (EIS,EA, CATEX, ...)		EST		$	-
15	Archeology (Survey/monitor)		EST		$	-
16	Biological (Survey/monitor)		EST		$	-
17	Building and Safety Plan Review		EST		$	-
18	Geotechnical Report		EST	$ 5,000.00	$	5,000.00
19	Geotechnical and Materials Testing		EST		$	-
20	SCADA Design		EST		$	-
21	SCADA Improvements		EST		$	-
22	Controls Integration		EST		$	-
23	Cathodic Protection Design		EST		$	-
24	Cathodic Protection Installation		EST		$	-
25	Construction Staking		EST		$	-
26	Property Surveys		EST	$ 15,000.00	$	15,000.00
27	Land & RoW Acquisition		EST		$	-
28	Land & RoW Negotiation		EST	$ 25,000.00	$	25,000.00
29	GIS Mapping		EST	$ 10,000.00	$	10,000.00
30	GPS points during construction for GIS system		EST		$	-
31	CRD conversion to GIS		EST		$	-
32	GIS PanoView		EST		$	-
33	Community Viz Modeling		EST		$	-
34	Aerial Photography		EST		$	-
35	Aerial Photography Survey Control		EST		$	-
36	Water Rights Research and POD Applications		EST		$	-
37	Well Siting Study		EST		$	-
38	Well PER		EST		$	-
39	Well/Spring Source Protection Plan		EST		$	-
40	Loan Origination Fee		EST	$ 50,000.00	$	50,000.00
41	Bond Attorney		EST	$ 60,000.00	$	60,000.00
42	Interim Financing Costs		EST		$	-
43	Miscellaneous Engineering Services		EST		$	-
44	Radio Read Meters/Equipment/Software - Materials, no Install		EST		$	-
				Subtotal	$	862,300.00
				TOTAL PROJECT COST	$	5,899,800.00

In providing opinions of probable construction cost, the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as to the accuracy of such opinions compared to bid or actual costs.

SUNRISE ENGINEERING, INC.
11 North 300 West, Washington, Utah 84780
Tel: (435) 652-8450 Fax: (435) 652-8416

Engineer's Opinion of Probable Cost* for Typical Optional Road Improvements

ENOCH STORMWATER IFFPA — 18-Apr-17
Enoch City — KCS/CCH

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
Typical Completed Intersection in Enoch					
1	Mobilization	5%	LS	$ 3,100.00	$ 3,100.00
2	Traffic Control & Site Security	1	LS	$ 1,500.00	$ 1,500.00
3	Construction Staking	1	LS	$ 2,500.00	$ 2,500.00
4	Earthwork & Grading	1	LS	$ 7,500.00	$ 7,500.00
5	Waterway Transition Structure w/ Base	4	EA	$ 2,500.00	$ 10,000.00
6	Pedestrian Access Ramp	4	EA	$ 2,000.00	$ 8,000.00
7	8' Waterway w/ Base	82	LF	$ 80.00	$ 6,560.00
8	Remove Asphalt / Chip Seal	6000	SF	$ 0.30	$ 1,800.00
9	3" Asphalt with 6" Base Course	8000	SF	$ 2.50	$ 20,000.00
10	Adjust Utilities to Final Grade	1	LS	$ 2,500.00	$ 2,500.00
11	Remove & Relocate Site Features	1	LS	$ 1,500.00	$ 1,500.00
			CONTINGENCY	10%	$ 6,496.00
			PROFESSIONAL SERVICES AND INCIDENTALS	15%	$ 9,744.00
			SUBTOTAL		$ 81,200.00
Typical 1,200' Street Block with including Curb & Gutter and Sidewalk					
1	Mobilization	5%	LS	$ 13,700.00	$ 13,700.00
2	Traffic Control & Site Security	1	LS	$ 1,500.00	$ 1,500.00
3	Construction Staking	1	LS	$ 3,000.00	$ 3,000.00
4	Earthwork & Grading	1	LS	$ 9,000.00	$ 9,000.00
5	4" Concrete Sidewalk w/ Base	11600	SF	$ 7.00	$ 81,200.00
6	2' Curb & Gutter w/ Base	2320	LF	$ 30.00	$ 69,600.00
7	4' Waterway w/ Base	100	LF	$ 50.00	$ 5,000.00
8	Driveway Approach	20	EA	$ 1,500.00	$ 30,000.00
9	Remove Asphalt / Chip Seal	2000	SF	$ 0.30	$ 600.00
10	3" Asphalt with 6" Base Course	26700	SF	$ 2.50	$ 66,750.00
11	Remove and Dispose of Site Features	1	LS	$ 1,500.00	$ 1,500.00
12	Adjust Utilities to Final Grade	1	LS	$ 3,500.00	$ 3,500.00
13	Remove & Relocate Site Features	1	LS	$ 2,000.00	$ 2,000.00
			CONTINGENCY	10%	$ 28,735.00
			PROFESSIONAL SERVICES AND INCIDENTALS	15%	$ 43,110.00
			SUBTOTAL		$ 359,195.00
Typical Street Block with Ditches					
1	Mobilization	5%	LS	$ 900.00	$ 900.00
2	Traffic Control & Site Security	1	LS	$ 1,500.00	$ 1,500.00
3	Construction Staking	1	LS	$ 2,500.00	$ 2,500.00
4	Earthwork & Grading	1	LS	$ 10,000.00	$ 10,000.00
5	Adjust Utilities to Final Grade	1	LS	$ 1,500.00	$ 1,500.00
6	Remove & Relocate Site Features	1	LS	$ 1,000.00	$ 1,000.00
7	Remove Asphalt / Chip Seal	2000	SF	$ 0.30	$ 600.00
			CONTINGENCY	10%	$ 1,800.00
			PROFESSIONAL SERVICES AND INCIDENTALS	15%	$ 2,700.00
			SUBTOTAL		$ 22,500.00

**In providing opinions of probable construction cost, the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as to the accuracy of such opinions compared to bid or actual costs.*

100% Bond for Improvements/Fiscal Year	2015	2016	2017	2018
STORMWATER SYSTEM DATA				
Annual Population Growth Rate	-	1.5%	1.5%	1.5%
Annual Inflation	3.0%	3.0%	3.0%	3.0%
Average User Rate / ERU / Month	$ 2.00	$ 2.00	$ 7.83	$ 7.83
Average Impact Fee / ERU	$ -	$ -	$ 1,593.14	$ 1,593.14
Total ERU's at Year End	2,147	2,179	2,211	2,245
New ERU's per Year	31	32	33	33
STORMWATER SYSTEM REVENUES				
OPERATING				
Charges for Services	$ 35,816.00	$ 44,067.00	$ 103,120.21	$ 209,357.27
Connection Fees	$ -	$ -	$ -	$ -
Accounts Receivable	$ (3,805.00)	$ -	$ -	$ -
NON-OPERATING				
Federal Capital Grant	$ 1,015,599.00	$ -	$ -	$ -
Impact Fees	$ -	$ -	$ 26,286.74	$ 52,573.48
TOTAL OPERATING REVENUES:	$ 1,047,610.00	$ 44,067.00	$ 103,120.21	$ 209,357.27
STORMWATER SYSTEM OPERATING EXPENSES				
Salaries, Wages, and Benefits	$ -	$ -	$ 35,000.00	$ 36,312.50
Materials, Supplies, and Services	$ 1,887.00	$ 144.00	$ 2,000.00	$ 2,075.00
Capital Expenses	$ 1,015,599.00	$ 25,050.00	$ 50,000.00	$ 51,875.00
TOTAL OPERATING EXPENSES:	$ 1,017,486.00	$ 25,194.00	$ 87,000.00	$ 90,262.50
STORMWATER SYSTEM EXISTING DEBT SERVICE				
N/A	$ -	$ -	$ -	$ -
TOTAL EXISTING DEBT SERVICE:	$ -	$ -	$ -	$ -
STORMWATER SYSTEM NEW DEBT SERVICE				
Bond A: $5,750,000, 1.5%, 30 years				$ 245,059.47
Reserve for Bond A: 10 years				$ 24,505.95
TOTAL NEW DEBT SERVICE:	$ -	$ -	$ -	$ 269,565.42
STORMWATER SYSTEM EXPENSES SUMMARY				
STORMWATER System O&M Expenses	$ 1,017,486.00	$ 25,194.00	$ 87,000.00	$ 90,262.50
STORMWATER System Existing Debt Service	$ -	$ -	$ -	$ -
STORMWATER System New Debt Service	$ -	$ -	$ -	$ 117,954.33
TOTAL EXPENSES:	$ 1,017,486.00	$ 25,194.00	$ 87,000.00	$ 208,216.83
STORMWATER SYSTEM CASH FLOW				
NET CASH FLOW:	$ 30,124.00	$ 18,873.00	$ 16,120.21	$ 1,140.44
STORMWATER SYSTEM IMPACT FEE FUND				
Total Impact Fee Revenue	$ -	$ -	$ 26,286.74	$ 52,573.48
Impact Fee Account Interest	$ -	$ -	$ 4,205.88	$ 8,411.76
Impact Fees Covering Bond A	$ -	$ -	$ -	$ (137,828.26)
Impact Fees Spent for Single Payment Projects or Self Help	$ -	$ -	$ -	$ -
Bond Reserve Payments	$ -	$ -	$ -	$ (13,782.83)
IMPACT FEE FUND TOTAL:	$ -	$ -	$ 30,492.62	$ (60,133.24)
STORMWATER SYSTEM CASH FUND				
Total Cash Revenue	$ 1,047,610.00	$ 44,067.00	$ 103,120.21	$ 209,357.27
Total Cash Expenses	$ (1,017,486.00)	$ (25,194.00)	$ (87,000.00)	$ (208,216.83)
Cash Spent for Single Payment Projects or Self Help			$ (33,000.00)	$ -
CASH FUND TOTAL:	$ 30,124.00	$ 48,997.00	$ 32,117.21	$ 33,257.65
SYSTEM IMPROVEMENT SCHEDULE				
Detention Basin 15	Projects to be Bonded			$ 981,263.40
Detention Basin 14				
Detention Basin 13				
Detention Basin 12				
Detention Basin 11				
Detention Basin 10				
Storm Drain Phase 2 & Detention Routing				$ 1,646,530.28
City Improvements				
IFFP Updates			$ 33,000.00	
City Capital Improvements				

100% Bond for Improvements/Fiscal Year	2019	2020	2021	2022
STORMWATER SYSTEM DATA				
Annual Population Growth Rate	3.0%	3.0%	3.0%	3.0%
Annual Inflation	3.0%	3.0%	3.0%	3.0%
Average User Rate / ERU / Month	$ 7.83	$ 7.83	$ 7.83	$ 7.83
Average Impact Fee / ERU	$ 1,593.14	$ 1,593.14	$ 1,593.14	$ 1,593.14
Total ERU's at Year End	2,312	2,381	2,453	2,526
New ERU's per Year	67	69	71	74
STORMWATER SYSTEM REVENUES				
OPERATING				
Charges for Services	$ 214,087.18	$ 220,510.27	$ 227,128.87	$ 233,901.86
Connection Fees	$ -	$ -	$ -	$ -
Accounts Receivable	$ -	$ -	$ -	$ -
NON-OPERATING				
Federal Capital Grant	$ -	$ -	$ -	$ -
Impact Fees	$ 106,740.09	$ 109,926.36	$ 113,112.63	$ 117,892.04
TOTAL OPERATING REVENUES:	$ 214,087.18	$ 220,510.27	$ 227,128.87	$ 233,901.86
STORMWATER SYSTEM OPERATING EXPENSES				
Salaries, Wages, and Benefits	$ 37,946.56	$ 39,654.16	$ 41,438.59	$ 43,303.33
Materials, Supplies, and Services	$ 2,168.38	$ 2,265.95	$ 2,367.92	$ 2,474.48
Capital Expenses	$ 54,209.38	$ 56,648.80	$ 59,197.99	$ 61,861.90
TOTAL OPERATING EXPENSES:	$ 94,324.31	$ 98,568.91	$ 103,004.51	$ 107,639.71
STORMWATER SYSTEM EXISTING DEBT SERVICE				
N/A	$ -	$ -	$ -	$ -
TOTAL EXISTING DEBT SERVICE:	$ -	$ -	$ -	$ -
STORMWATER SYSTEM NEW DEBT SERVICE				
Bond A: $5,750,000, 1.5%, 30 years	$ 245,059.47	$ 245,059.47	$ 245,059.47	$ 245,059.47
Reserve for Bond A: 10 years	$ 24,505.95	$ 24,505.95	$ 24,505.95	$ 24,505.95
TOTAL NEW DEBT SERVICE:	$ 269,565.42	$ 269,565.42	$ 269,565.42	$ 269,565.42
STORMWATER SYSTEM EXPENSES SUMMARY				
STORMWATER System O&M Expenses	$ 94,324.31	$ 98,568.91	$ 103,004.51	$ 107,639.71
STORMWATER System Existing Debt Service	$ -	$ -	$ -	$ -
STORMWATER System New Debt Service	$ 117,954.33	$ 117,954.33	$ 117,954.33	$ 117,954.33
TOTAL EXPENSES:	$ 212,278.65	$ 216,523.24	$ 220,958.84	$ 225,594.04
STORMWATER SYSTEM CASH FLOW				
NET CASH FLOW:	$ 1,808.54	$ 3,987.03	$ 6,170.02	$ 8,307.81
STORMWATER SYSTEM IMPACT FEE FUND				
Total Impact Fee Revenue	$ 106,740.09	$ 109,926.36	$ 113,112.63	$ 117,892.04
Impact Fee Account Interest	$ 17,078.41	$ 17,588.22	$ 18,098.02	$ 18,862.73
Impact Fees Covering Bond A	$ (137,828.26)	$ (137,828.26)	$ (137,828.26)	$ (137,828.26)
Impact Fees Spent for Single Payment Projects or Self Help	$ -	$ -	$ -	$ (46,370.96)
Bond Reserve Payments	$ (13,782.83)	$ (13,782.83)	$ (13,782.83)	$ (13,782.83)
IMPACT FEE FUND TOTAL:	$ (87,925.82)	$ (112,022.32)	$ (132,422.75)	$ (193,650.03)
STORMWATER SYSTEM CASH FUND				
Total Cash Revenue	$ 214,087.18	$ 220,510.27	$ 227,128.87	$ 233,901.86
Total Cash Expenses	$ (212,278.65)	$ (216,523.24)	$ (220,958.84)	$ (225,594.04)
Cash Spent for Single Payment Projects or Self Help	$ -	$ -	$ -	$ -
CASH FUND TOTAL:	$ 35,066.18	$ 39,053.21	$ 45,223.23	$ 53,531.05
SYSTEM IMPROVEMENT SCHEDULE				
Detention Basin 15				
Detention Basin 14	$ 900,999.70			
Detention Basin 13	$ 276,277.21			
Detention Basin 12		$ 432,109.06		
Detention Basin 11		$ 619,565.75		
Detention Basin 10			$ 690,722.43	
Storm Drain Phase 2 & Detention Routing				
City Improvements				
IFFP Updates				$ 46,370.96
City Capital Improvements				

100% Bond for Improvements/Fiscal Year	2023	2024	2025	2026
STORMWATER SYSTEM DATA				
Annual Population Growth Rate	3.0%	3.0%	5.0%	5.0%
Annual Inflation	3.0%	3.0%	3.0%	3.0%
Average User Rate / ERU / Month	$ 7.83	$ 7.83	$ 7.83	$ 7.83
Average Impact Fee / ERU	$ 1,593.14	$ 1,593.14	$ 1,593.14	$ 1,593.14
Total ERU's at Year End	2,602	2,680	2,814	2,955
New ERU's per Year	76	78	134	141
STORMWATER SYSTEM REVENUES				
OPERATING				
Charges for Services	$ 240,929.25	$ 248,170.28	$ 258,131.14	$ 271,023.60
Connection Fees	$ -	$ -	$ -	$ -
Accounts Receivable	$ -	$ -	$ -	$ -
NON-OPERATING				
Federal Capital Grant	$ -	$ -	$ -	$ -
Impact Fees	$ 121,078.31	$ 124,264.58	$ 213,480.18	$ 224,632.13
TOTAL OPERATING REVENUES:	$ 240,929.25	$ 248,170.28	$ 258,131.14	$ 271,023.60
STORMWATER SYSTEM OPERATING EXPENSES				
Salaries, Wages, and Benefits	$ 45,251.98	$ 47,288.32	$ 49,889.18	$ 52,633.08
Materials, Supplies, and Services	$ 2,585.83	$ 2,702.19	$ 2,850.81	$ 3,007.60
Capital Expenses	$ 64,645.69	$ 67,554.74	$ 71,270.25	$ 75,190.12
TOTAL OPERATING EXPENSES:	$ 112,483.50	$ 117,545.25	$ 124,010.24	$ 130,830.81
STORMWATER SYSTEM EXISTING DEBT SERVICE				
N/A	$ -	$ -	$ -	$ -
TOTAL EXISTING DEBT SERVICE:	$ -	$ -	$ -	$ -
STORMWATER SYSTEM NEW DEBT SERVICE				
Bond A: $5,750,000, 1.5%, 30 years	$ 245,059.47	$ 245,059.47	$ 245,059.47	$ 245,059.47
Reserve for Bond A: 10 years	$ 24,505.95	$ 24,505.95	$ 24,505.95	$ 24,505.95
TOTAL NEW DEBT SERVICE:	$ 269,565.42	$ 269,565.42	$ 269,565.42	$ 269,565.42
STORMWATER SYSTEM EXPENSES SUMMARY				
STORMWATER System O&M Expenses	$ 112,483.50	$ 117,545.25	$ 124,010.24	$ 130,830.81
STORMWATER System Existing Debt Service	$ -	$ -	$ -	$ -
STORMWATER System New Debt Service	$ 117,954.33	$ 117,954.33	$ 117,954.33	$ 117,954.33
TOTAL EXPENSES:	$ 230,437.83	$ 235,499.59	$ 241,964.58	$ 248,785.14
STORMWATER SYSTEM CASH FLOW				
NET CASH FLOW:	$ 10,491.42	$ 12,670.69	$ 16,166.56	$ 22,238.46
STORMWATER SYSTEM IMPACT FEE FUND				
Total Impact Fee Revenue	$ 121,078.31	$ 124,264.58	$ 213,480.18	$ 224,632.13
Impact Fee Account Interest	$ 19,372.53	$ 19,882.33	$ 34,156.83	$ 35,941.14
Impact Fees Covering Bond A	$ (137,828.26)	$ (137,828.26)	$ (137,828.26)	$ (137,828.26)
Impact Fees Spent for Single Payment Projects or Self Help	$ -	$ -	$ -	$ -
Bond Reserve Payments	$ (13,782.83)	$ (13,782.83)	$ (13,782.83)	$ (13,782.83)
IMPACT FEE FUND TOTAL:	$ (204,810.28)	$ (212,274.45)	$ (116,248.52)	$ (7,286.33)
STORMWATER SYSTEM CASH FUND				
Total Cash Revenue	$ 240,929.25	$ 248,170.28	$ 258,131.14	$ 271,023.60
Total Cash Expenses	$ (230,437.83)	$ (235,499.59)	$ (241,964.58)	$ (248,785.14)
Cash Spent for Single Payment Projects or Self Help	$ -	$ -	$ -	$ -
CASH FUND TOTAL:	$ 64,022.47	$ 76,693.16	$ 92,859.72	$ 115,098.18
SYSTEM IMPROVEMENT SCHEDULE				
Detention Basin 15				
Detention Basin 14				
Detention Basin 13				
Detention Basin 12				
Detention Basin 11				
Detention Basin 10				
Storm Drain Phase 2 & Detention Routing				
City Improvements				
IFFP Updates				
City Capital Improvements				

100% Bond for Improvements/Fiscal Year	2027	2028	2029	2030
STORMWATER SYSTEM DATA				
Annual Population Growth Rate	5.0%	5.0%	5.0%	5.0%
Annual Inflation	3.0%	3.0%	3.0%	3.0%
Average User Rate / ERU / Month	$ 7.83	$ 7.83	$ 7.83	$ 7.83
Average Impact Fee / ERU	$ 1,593.14	$ 1,593.14	$ 1,593.14	$ 1,593.14
Total ERU's at Year End	3,103	3,258	3,421	3,592
New ERU's per Year	148	155	163	171
STORMWATER SYSTEM REVENUES				
OPERATING				
Charges for Services	$ 284,577.13	$ 298,824.78	$ 313,754.27	$ 329,449.03
Connection Fees	$ -	$ -	$ -	$ -
Accounts Receivable	$ -	$ -	$ -	$ -
NON-OPERATING				
Federal Capital Grant	$ -	$ -	$ -	$ -
Impact Fees	$ 235,784.08	$ 246,936.03	$ 259,681.12	$ 272,426.20
TOTAL OPERATING REVENUES:	$ 284,577.13	$ 298,824.78	$ 313,754.27	$ 329,449.03
STORMWATER SYSTEM OPERATING EXPENSES				
Salaries, Wages, and Benefits	$ 55,527.90	$ 58,581.94	$ 61,803.94	$ 65,203.16
Materials, Supplies, and Services	$ 3,173.02	$ 3,347.54	$ 3,531.65	$ 3,725.89
Capital Expenses	$ 79,325.58	$ 83,688.48	$ 88,291.35	$ 93,147.37
TOTAL OPERATING EXPENSES:	$ 138,026.50	$ 145,617.96	$ 153,626.95	$ 162,076.43
STORMWATER SYSTEM EXISTING DEBT SERVICE				
N/A	$ -	$ -	$ -	$ -
TOTAL EXISTING DEBT SERVICE:	$ -	$ -	$ -	$ -
STORMWATER SYSTEM NEW DEBT SERVICE				
Bond A: $5,750,000, 1.5%, 30 years	$ 245,059.47	$ 245,059.47	$ 245,059.47	$ 245,059.47
Reserve for Bond A: 10 years	$ 24,505.95			
TOTAL NEW DEBT SERVICE:	$ 269,565.42	$ 245,059.47	$ 245,059.47	$ 245,059.47
STORMWATER SYSTEM EXPENSES SUMMARY				
STORMWATER System O&M Expenses	$ 138,026.50	$ 145,617.96	$ 153,626.95	$ 162,076.43
STORMWATER System Existing Debt Service	$ -	$ -	$ -	$ -
STORMWATER System New Debt Service	$ 117,954.33	$ 107,231.21	$ 107,231.21	$ 107,231.21
TOTAL EXPENSES:	$ 255,980.84	$ 252,849.17	$ 260,858.16	$ 269,307.64
STORMWATER SYSTEM CASH FLOW				
NET CASH FLOW:	$ 28,596.29	$ 45,975.61	$ 52,896.11	$ 60,141.39
STORMWATER SYSTEM IMPACT FEE FUND				
Total Impact Fee Revenue	$ 235,784.08	$ 246,936.03	$ 259,681.12	$ 272,426.20
Impact Fee Account Interest	$ 37,725.45	$ 39,509.77	$ 41,548.98	$ 43,588.19
Impact Fees Covering Bond A	$ (137,828.26)	$ (137,828.26)	$ (137,828.26)	$ (137,828.26)
Impact Fees Spent for Single Payment Projects or Self Help	$ (320,021.98)	$ -	$ -	$ -
Bond Reserve Payments	$ (13,782.83)	$ -	$ -	$ -
IMPACT FEE FUND TOTAL:	$ (205,409.86)	$ (56,792.32)	$ 106,609.52	$ 284,795.65
STORMWATER SYSTEM CASH FUND				
Total Cash Revenue	$ 284,577.13	$ 298,824.78	$ 313,754.27	$ 329,449.03
Total Cash Expenses	$ (255,980.84)	$ (252,849.17)	$ (260,858.16)	$ (269,307.64)
Cash Spent for Single Payment Projects or Self Help	$ (153,399.36)	$ -	$ -	$ (90,000.00)
CASH FUND TOTAL:	$ (9,704.89)	$ 36,270.72	$ 89,166.83	$ 59,308.22
SYSTEM IMPROVEMENT SCHEDULE				
Detention Basin 15				
Detention Basin 14				
Detention Basin 13				
Detention Basin 12				
Detention Basin 11				
Detention Basin 10				
Storm Drain Phase 2 & Detention Routing				
City Improvements	$ 473,421.34			
IFFP Updates	$ 53,756.66			
City Capital Improvements				$ 90,000.00

100% Bond for Improvements/Fiscal Year	2031	2032	2033	2034
STORMWATER SYSTEM DATA				
Annual Population Growth Rate	5.0%	5.0%	5.0%	5.0%
Annual Inflation	3.0%	3.0%	3.0%	3.0%
Average User Rate / ERU / Month	$ 7.83	$ 7.83	$ 7.83	$ 7.83
Average Impact Fee / ERU	$ 1,593.14	$ 1,593.14	$ 1,593.14	$ 1,593.14
Total ERU's at Year End	3,771	3,960	4,158	4,366
New ERU's per Year	180	189	198	208
STORMWATER SYSTEM REVENUES				
OPERATING				
Charges for Services	$ 345,900.34	$ 363,195.36	$ 381,376.27	$ 400,440.38
Connection Fees	$ -	$ -	$ -	$ -
Accounts Receivable	$ -	$ -	$ -	$ -
NON-OPERATING				
Federal Capital Grant	$ -	$ -	$ -	$ -
Impact Fees	$ 286,764.43	$ 301,102.65	$ 315,440.87	$ 331,372.23
TOTAL OPERATING REVENUES:	$ 345,900.34	$ 363,195.36	$ 381,376.27	$ 400,440.38
STORMWATER SYSTEM OPERATING EXPENSES				
Salaries, Wages, and Benefits	$ 68,789.33	$ 72,572.75	$ 76,564.25	$ 80,775.28
Materials, Supplies, and Services	$ 3,930.82	$ 4,147.01	$ 4,375.10	$ 4,615.73
Capital Expenses	$ 98,270.48	$ 103,675.35	$ 109,377.50	$ 115,393.26
TOTAL OPERATING EXPENSES:	$ 170,990.63	$ 180,395.12	$ 190,316.85	$ 200,784.28
STORMWATER SYSTEM EXISTING DEBT SERVICE				
N/A	$ -	$ -	$ -	$ -
TOTAL EXISTING DEBT SERVICE:	$ -	$ -	$ -	$ -
STORMWATER SYSTEM NEW DEBT SERVICE				
Bond A: $5,750,000, 1.5%, 30 years	$ 245,059.47	$ 245,059.47	$ 245,059.47	$ 245,059.47
Reserve for Bond A: 10 years				
TOTAL NEW DEBT SERVICE:	$ 245,059.47	$ 245,059.47	$ 245,059.47	$ 245,059.47
STORMWATER SYSTEM EXPENSES SUMMARY				
STORMWATER System O&M Expenses	$ 170,990.63	$ 180,395.12	$ 190,316.85	$ 200,784.28
STORMWATER System Existing Debt Service	$ -	$ -	$ -	$ -
STORMWATER System New Debt Service	$ 107,231.21	$ 107,231.21	$ 107,231.21	$ 107,231.21
TOTAL EXPENSES:	$ 278,221.85	$ 287,626.33	$ 297,548.06	$ 308,015.49
STORMWATER SYSTEM CASH FLOW				
NET CASH FLOW:	$ 67,678.50	$ 75,569.03	$ 83,828.21	$ 92,424.90
STORMWATER SYSTEM IMPACT FEE FUND				
Total Impact Fee Revenue	$ 286,764.43	$ 301,102.65	$ 315,440.87	$ 331,372.23
Impact Fee Account Interest	$ 45,882.31	$ 48,176.42	$ 50,470.54	$ 53,019.56
Impact Fees Covering Bond A	$ (137,828.26)	$ (137,828.26)	$ (137,828.26)	$ (137,828.26)
Impact Fees Spent for Single Payment Projects or Self Help	$ -	$ (62,318.70)	$ -	$ -
Bond Reserve Payments	$ -	$ -	$ -	$ -
IMPACT FEE FUND TOTAL:	$ 479,614.13	$ 628,746.24	$ 856,829.39	$ 1,103,392.91
STORMWATER SYSTEM CASH FUND				
Total Cash Revenue	$ 345,900.34	$ 363,195.36	$ 381,376.27	$ 400,440.38
Total Cash Expenses	$ (278,221.85)	$ (287,626.33)	$ (297,548.06)	$ (308,015.49)
Cash Spent for Single Payment Projects or Self Help	$ (81,200.00)	$ -	$ -	$ (243,600.00)
CASH FUND TOTAL:	$ 45,786.72	$ 121,355.75	$ 205,183.96	$ 54,008.86
SYSTEM IMPROVEMENT SCHEDULE				
Detention Basin 15				
Detention Basin 14				
Detention Basin 13				
Detention Basin 12				
Detention Basin 11				
Detention Basin 10				
Storm Drain Phase 2 & Detention Routing				
City Improvements				
IFFP Updates		$ 62,318.70		
City Capital Improvements	$ 81,200.00			$ 243,600.00

100% Bond for Improvements/Fiscal Year	2035	2036	2037
STORMWATER SYSTEM DATA			
Annual Population Growth Rate	5.0%	5.0%	5.0%
Annual Inflation	3.0%	3.0%	3.0%
Average User Rate / ERU / Month	$ 7.83	$ 7.83	$ 7.83
Average Impact Fee / ERU	$ 1,593.14	$ 1,593.14	$ 1,593.14
Total ERU's at Year End	4,584	4,813	5,054
New ERU's per Year	218	229	241
STORMWATER SYSTEM REVENUES			
OPERATING			
Charges for Services	$ 420,481.20	$ 441,500.56	$ 463,549.75
Connection Fees	$ -	$ -	$ -
Accounts Receivable	$ -	$ -	$ -
NON-OPERATING			
Federal Capital Grant	$ -	$ -	$ -
Impact Fees	$ 347,303.58	$ 364,828.08	$ 383,945.70
TOTAL OPERATING REVENUES:	$ 420,481.20	$ 441,500.56	$ 463,549.75
STORMWATER SYSTEM OPERATING EXPENSES			
Salaries, Wages, and Benefits	$ 85,217.92	$ 89,904.91	$ 94,849.68
Materials, Supplies, and Services	$ 4,869.60	$ 5,137.42	$ 5,419.98
Capital Expenses	$ 121,739.89	$ 128,435.58	$ 135,499.54
TOTAL OPERATING EXPENSES:	$ 211,827.41	$ 223,477.92	$ 235,769.20
STORMWATER SYSTEM EXISTING DEBT SERVICE			
N/A	$ -	$ -	$ -
TOTAL EXISTING DEBT SERVICE:	$ -	$ -	$ -
STORMWATER SYSTEM NEW DEBT SERVICE			
Bond A: $5,750,000, 1.5%, 30 years	$ 245,059.47	$ 245,059.47	$ 245,059.47
Reserve for Bond A: 10 years			
TOTAL NEW DEBT SERVICE:	$ 245,059.47	$ 245,059.47	$ 245,059.47
STORMWATER SYSTEM EXPENSES SUMMARY			
STORMWATER System O&M Expenses	$ 211,827.41	$ 223,477.92	$ 235,769.20
STORMWATER System Existing Debt Service	$ -	$ -	$ -
STORMWATER System New Debt Service	$ 107,231.21	$ 107,231.21	$ 107,231.21
TOTAL EXPENSES:	$ 319,058.62	$ 330,709.13	$ 343,000.42
STORMWATER SYSTEM CASH FLOW			
NET CASH FLOW:	$ 101,422.57	$ 110,791.43	$ 120,549.33
STORMWATER SYSTEM IMPACT FEE FUND			
Total Impact Fee Revenue	$ 347,303.58	$ 364,828.08	$ 383,945.70
Impact Fee Account Interest	$ 55,568.57	$ 58,372.49	$ 61,431.31
Impact Fees Covering Bond A	$ (137,828.26)	$ (137,828.26)	$ (137,828.26)
Impact Fees Spent for Single Payment Projects or Self Help	$ -	$ -	$ (72,244.45)
Bond Reserve Payments	$ -	$ -	$ -
IMPACT FEE FUND TOTAL:	$ 1,368,436.80	$ 1,653,809.11	$ 1,889,113.42
STORMWATER SYSTEM CASH FUND			
Total Cash Revenue	$ 420,481.20	$ 441,500.56	$ 463,549.75
Total Cash Expenses	$ (319,058.62)	$ (330,709.13)	$ (343,000.42)
Cash Spent for Single Payment Projects or Self Help	$ -	$ -	$ -
CASH FUND TOTAL:	$ 155,431.43	$ 266,222.86	$ 386,772.19
SYSTEM IMPROVEMENT SCHEDULE			
Detention Basin 15			
Detention Basin 14			
Detention Basin 13			
Detention Basin 12			
Detention Basin 11			
Detention Basin 10			
Storm Drain Phase 2 & Detention Routing			
City Improvements			
IFFP Updates			$ 72,244.45
City Capital Improvements			

50% Bond for Improvements/Fiscal Year	2015	2016	2017	2018
STORMWATER SYSTEM DATA				
Annual Population Growth Rate	-	1.5%	1.5%	1.5%
Annual Inflation	3.0%	3.0%	3.0%	3.0%
Average User Rate / ERU / Month	$ 2.00	$ 2.00	$ 5.58	$ 5.58
Average Impact Fee / ERU	$ -	$ -	$ 1,593.14	$ 1,593.14
Total ERU's at Year End	2,147	2,179	2,211	2,245
New ERU's per Year	31	32	33	33
STORMWATER SYSTEM REVENUES				
OPERATING				
Charges for Services	$ 35,816.00	$ 44,067.00	$ 73,487.96	$ 149,197.14
Connection Fees	$ -	$ -	$ -	$ -
Accounts Receivable	$ (3,805.00)	$ -	$ -	$ -
NON-OPERATING				
Federal Capital Grant	$ 1,015,599.00	$ -	$ -	$ 2,942,654.31
Impact Fees	$ -	$ -	$ 26,286.74	$ 52,573.48
TOTAL OPERATING REVENUES:	$ 1,047,610.00	$ 44,067.00	$ 73,487.96	$ 3,091,851.45
STORMWATER SYSTEM OPERATING EXPENSES				
Salaries, Wages, and Benefits	$ -	$ -	$ 35,000.00	$ 36,312.50
Materials, Supplies, and Services	$ 1,887.00	$ 144.00	$ 2,000.00	$ 2,075.00
Capital Expenses	$ 1,015,599.00	$ 25,050.00	$ 50,000.00	$ 2,994,529.31
TOTAL OPERATING EXPENSES:	$ 1,017,486.00	$ 25,194.00	$ 87,000.00	$ 3,032,916.81
STORMWATER SYSTEM EXISTING DEBT SERVICE				
N/A	$ -	$ -	$ -	$ -
TOTAL EXISTING DEBT SERVICE:	$ -	$ -	$ -	$ -
STORMWATER SYSTEM NEW DEBT SERVICE				
Bond A: $2,900,000, 1.5%, 30 years				$ 122,529.74
Reserve for Bond A: 10 years				$ 12,252.97
TOTAL NEW DEBT SERVICE:	$ -	$ -	$ -	$ 134,782.71
STORMWATER SYSTEM EXPENSES SUMMARY				
STORMWATER System O&M Expenses	$ 1,017,486.00	$ 25,194.00	$ 87,000.00	$ 3,032,916.81
STORMWATER System Existing Debt Service	$ -	$ -	$ -	$ -
STORMWATER System New Debt Service	$ -	$ -	$ -	$ 58,977.17
TOTAL EXPENSES:	$ 1,017,486.00	$ 25,194.00	$ 87,000.00	$ 3,091,893.98
STORMWATER SYSTEM CASH FLOW				
NET CASH FLOW:	$ 30,124.00	$ 18,873.00	$ (13,512.04)	$ (42.53)
STORMWATER SYSTEM IMPACT FEE FUND				
Total Impact Fee Revenue	$ -	$ -	$ 26,286.74	$ 52,573.48
Impact Fee Account Interest	$ -	$ -	$ 4,205.88	$ 8,411.76
Impact Fees Covering Bond A	$ -	$ -	$ -	$ (68,914.13)
Impact Fees Spent for Single Payment Projects or Self Help	$ -	$ -	$ -	$ -
Bond Reserve Payments	$ -	$ -	$ -	$ (6,891.41)
IMPACT FEE FUND TOTAL:	$ -	$ -	$ 30,492.62	$ 15,672.31
STORMWATER SYSTEM CASH FUND				
Total Cash Revenue	$ 1,047,610.00	$ 44,067.00	$ 73,487.96	$ 3,091,851.45
Total Cash Expenses	$ (1,017,486.00)	$ (25,194.00)	$ (87,000.00)	$ (3,091,893.98)
Cash Spent for Single Payment Projects or Self Help			$ (33,000.00)	$ -
CASH FUND TOTAL:	$ 30,124.00	$ 48,997.00	$ 2,484.96	$ 2,442.43
SYSTEM IMPROVEMENT SCHEDULE				
Detention Basin 15	Projects to be Bonded			$ 981,263.40
Detention Basin 14				
Detention Basin 13				
Detention Basin 12				
Detention Basin 11				
Detention Basin 10				
Storm Drain Phase 2 & Detention Routing				$ 1,646,530.28
City Improvements				
IFFP Updates			$ 33,000.00	
City Capital Improvements				

50% Bond for Improvements/Fiscal Year	2019	2020	2021	2022
STORMWATER SYSTEM DATA				
Annual Population Growth Rate	3.0%	3.0%	3.0%	3.0%
Annual Inflation	3.0%	3.0%	3.0%	3.0%
Average User Rate / ERU / Month	$ 5.58	$ 5.58	$ 5.58	$ 5.58
Average Impact Fee / ERU	$ 1,593.14	$ 1,593.14	$ 1,593.14	$ 1,593.14
Total ERU's at Year End	2,312	2,381	2,453	2,526
New ERU's per Year	67	69	71	74
STORMWATER SYSTEM REVENUES				
OPERATING				
Charges for Services	$ 152,567.88	$ 157,145.25	$ 161,861.95	$ 166,688.68
Connection Fees	$ -	$ -	$ -	$ -
Accounts Receivable	$ -	$ -	$ -	$ -
NON-OPERATING				
Federal Capital Grant	$ -	$ -	$ -	$ -
Impact Fees	$ 106,740.09	$ 109,926.36	$ 113,112.63	$ 117,892.04
TOTAL OPERATING REVENUES:	$ 152,567.88	$ 157,145.25	$ 161,861.95	$ 166,688.68
STORMWATER SYSTEM OPERATING EXPENSES				
Salaries, Wages, and Benefits	$ 37,946.56	$ 39,654.16	$ 41,438.59	$ 43,303.33
Materials, Supplies, and Services	$ 2,168.38	$ 2,265.95	$ 2,367.92	$ 2,474.48
Capital Expenses	$ 54,209.38	$ 56,648.80	$ 59,197.99	$ 61,861.90
TOTAL OPERATING EXPENSES:	$ 94,324.31	$ 98,568.91	$ 103,004.51	$ 107,639.71
STORMWATER SYSTEM EXISTING DEBT SERVICE				
N/A	$ -	$ -	$ -	$ -
TOTAL EXISTING DEBT SERVICE:	$ -	$ -	$ -	$ -
STORMWATER SYSTEM NEW DEBT SERVICE				
Bond A: $2,900,000, 1.5%, 30 years	$ 122,529.74	$ 122,529.74	$ 122,529.74	$ 122,529.74
Reserve for Bond A: 10 years	$ 12,252.97	$ 12,252.97	$ 12,252.97	$ 12,252.97
TOTAL NEW DEBT SERVICE:	$ 134,782.71	$ 134,782.71	$ 134,782.71	$ 134,782.71
STORMWATER SYSTEM EXPENSES SUMMARY				
STORMWATER System O&M Expenses	$ 94,324.31	$ 98,568.91	$ 103,004.51	$ 107,639.71
STORMWATER System Existing Debt Service	$ -	$ -	$ -	$ -
STORMWATER System New Debt Service	$ 58,977.17	$ 58,977.17	$ 58,977.17	$ 58,977.17
TOTAL EXPENSES:	$ 153,301.48	$ 157,546.07	$ 161,981.67	$ 166,616.88
STORMWATER SYSTEM CASH FLOW				
NET CASH FLOW:	$ (733.60)	$ (400.82)	$ (119.72)	$ 71.80
STORMWATER SYSTEM IMPACT FEE FUND				
Total Impact Fee Revenue	$ 106,740.09	$ 109,926.36	$ 113,112.63	$ 117,892.04
Impact Fee Account Interest	$ 17,078.41	$ 17,588.22	$ 18,098.02	$ 18,862.73
Impact Fees Covering Bond A	$ (68,914.13)	$ (68,914.13)	$ (68,914.13)	$ (68,914.13)
Impact Fees Spent for Single Payment Projects or Self Help	$ -	$ -	$ -	$ (46,370.96)
Bond Reserve Payments	$ (6,891.41)	$ (6,891.41)	$ (6,891.41)	$ (6,891.41)
IMPACT FEE FUND TOTAL:	$ 63,685.27	$ 115,394.31	$ 170,799.42	$ 185,377.68
STORMWATER SYSTEM CASH FUND				
Total Cash Revenue	$ 152,567.88	$ 157,145.25	$ 161,861.95	$ 166,688.68
Total Cash Expenses	$ (153,301.48)	$ (157,546.07)	$ (161,981.67)	$ (166,616.88)
Cash Spent for Single Payment Projects or Self Help	$ -	$ -	$ -	$ -
CASH FUND TOTAL:	$ 1,708.83	$ 1,308.01	$ 1,188.28	$ 1,260.09
SYSTEM IMPROVEMENT SCHEDULE				
Detention Basin 15				
Detention Basin 14	$ 900,999.70			
Detention Basin 13	$ 276,277.21			
Detention Basin 12		$ 432,109.06		
Detention Basin 11		$ 619,565.75		
Detention Basin 10			$ 690,722.43	
Storm Drain Phase 2 & Detention Routing				
City Improvements				
IFFP Updates				$ 46,370.96
City Capital Improvements				

50% Bond for Improvements/Fiscal Year	2023	2024	2025	2026
STORMWATER SYSTEM DATA				
Annual Population Growth Rate	3.0%	3.0%	5.0%	5.0%
Annual Inflation	3.0%	3.0%	3.0%	3.0%
Average User Rate / ERU / Month	$ 5.58	$ 5.58	$ 5.58	$ 5.58
Average Impact Fee / ERU	$ 1,593.14	$ 1,593.14	$ 1,593.14	$ 1,593.14
Total ERU's at Year End	2,602	2,680	2,814	2,955
New ERU's per Year	76	78	134	141
STORMWATER SYSTEM REVENUES				
OPERATING				
Charges for Services	$ 171,696.71	$ 176,856.98	$ 183,955.52	$ 193,143.26
Connection Fees	$ -	$ -	$ -	$ -
Accounts Receivable	$ -	$ -	$ -	$ -
NON-OPERATING				
Federal Capital Grant	$ -	$ -	$ -	$ -
Impact Fees	$ 121,078.31	$ 124,264.58	$ 213,480.18	$ 224,632.13
TOTAL OPERATING REVENUES:	$ 171,696.71	$ 176,856.98	$ 183,955.52	$ 193,143.26
STORMWATER SYSTEM OPERATING EXPENSES				
Salaries, Wages, and Benefits	$ 45,251.98	$ 47,288.32	$ 49,889.18	$ 52,633.08
Materials, Supplies, and Services	$ 2,585.83	$ 2,702.19	$ 2,850.81	$ 3,007.60
Capital Expenses	$ 64,645.69	$ 67,554.74	$ 71,270.25	$ 75,190.12
TOTAL OPERATING EXPENSES:	$ 112,483.50	$ 117,545.25	$ 124,010.24	$ 130,830.81
STORMWATER SYSTEM EXISTING DEBT SERVICE				
N/A	$ -	$ -	$ -	$ -
TOTAL EXISTING DEBT SERVICE:	$ -	$ -	$ -	$ -
STORMWATER SYSTEM NEW DEBT SERVICE				
Bond A: $2,900,000, 1.5%, 30 years	$ 122,529.74	$ 122,529.74	$ 122,529.74	$ 122,529.74
Reserve for Bond A: 10 years	$ 12,252.97	$ 12,252.97	$ 12,252.97	$ 12,252.97
TOTAL NEW DEBT SERVICE:	$ 134,782.71	$ 134,782.71	$ 134,782.71	$ 134,782.71
STORMWATER SYSTEM EXPENSES SUMMARY				
STORMWATER System O&M Expenses	$ 112,483.50	$ 117,545.25	$ 124,010.24	$ 130,830.81
STORMWATER System Existing Debt Service	$ -	$ -	$ -	$ -
STORMWATER System New Debt Service	$ 58,977.17	$ 58,977.17	$ 58,977.17	$ 58,977.17
TOTAL EXPENSES:	$ 171,460.66	$ 176,522.42	$ 182,987.41	$ 189,807.97
STORMWATER SYSTEM CASH FLOW				
NET CASH FLOW:	$ 236.04	$ 334.56	$ 968.11	$ 3,335.28
STORMWATER SYSTEM IMPACT FEE FUND				
Total Impact Fee Revenue	$ 121,078.31	$ 124,264.58	$ 213,480.18	$ 224,632.13
Impact Fee Account Interest	$ 19,372.53	$ 19,882.33	$ 34,156.83	$ 35,941.14
Impact Fees Covering Bond A	$ (68,914.13)	$ (68,914.13)	$ (68,914.13)	$ (68,914.13)
Impact Fees Spent for Single Payment Projects or Self Help	$ -	$ -	$ -	$ -
Bond Reserve Payments	$ (6,891.41)	$ (6,891.41)	$ (6,891.41)	$ (6,891.41)
IMPACT FEE FUND TOTAL:	$ 250,022.98	$ 318,364.36	$ 490,195.83	$ 674,963.56
STORMWATER SYSTEM CASH FUND				
Total Cash Revenue	$ 171,696.71	$ 176,856.98	$ 183,955.52	$ 193,143.26
Total Cash Expenses	$ (171,460.66)	$ (176,522.42)	$ (182,987.41)	$ (189,807.97)
Cash Spent for Single Payment Projects or Self Help	$ -	$ -	$ -	$ -
CASH FUND TOTAL:	$ 1,496.13	$ 1,830.69	$ 2,798.80	$ 6,134.08
SYSTEM IMPROVEMENT SCHEDULE				
Detention Basin 15				
Detention Basin 14				
Detention Basin 13				
Detention Basin 12				
Detention Basin 11				
Detention Basin 10				
Storm Drain Phase 2 & Detention Routing				
City Improvements				
IFFP Updates				
City Capital Improvements				

50% Bond for Improvements/Fiscal Year	2027	2028	2029	2030
STORMWATER SYSTEM DATA				
Annual Population Growth Rate	5.0%	5.0%	5.0%	5.0%
Annual Inflation	3.0%	3.0%	3.0%	3.0%
Average User Rate / ERU / Month	$ 5.58	$ 5.58	$ 5.58	$ 5.58
Average Impact Fee / ERU	$ 1,593.14	$ 1,593.14	$ 1,593.14	$ 1,593.14
Total ERU's at Year End	3,103	3,258	3,421	3,592
New ERU's per Year	148	155	163	171
STORMWATER SYSTEM REVENUES				
OPERATING				
Charges for Services	$ 202,802.09	$ 212,955.59	$ 223,595.00	$ 234,779.77
Connection Fees	$ -	$ -	$ -	$ -
Accounts Receivable	$ -	$ -	$ -	$ -
NON-OPERATING				
Federal Capital Grant	$ -	$ -	$ -	$ -
Impact Fees	$ 235,784.08	$ 246,936.03	$ 259,681.12	$ 272,426.20
TOTAL OPERATING REVENUES:	$ 202,802.09	$ 212,955.59	$ 223,595.00	$ 234,779.77
STORMWATER SYSTEM OPERATING EXPENSES				
Salaries, Wages, and Benefits	$ 55,527.90	$ 58,581.94	$ 61,803.94	$ 65,203.16
Materials, Supplies, and Services	$ 3,173.02	$ 3,347.54	$ 3,531.65	$ 3,725.89
Capital Expenses	$ 79,325.58	$ 83,688.48	$ 88,291.35	$ 93,147.37
TOTAL OPERATING EXPENSES:	$ 138,026.50	$ 145,617.96	$ 153,626.95	$ 162,076.43
STORMWATER SYSTEM EXISTING DEBT SERVICE				
N/A	$ -	$ -	$ -	$ -
TOTAL EXISTING DEBT SERVICE:	$ -	$ -	$ -	$ -
STORMWATER SYSTEM NEW DEBT SERVICE				
Bond A: $2,900,000, 1.5%, 30 years	$ 122,529.74	$ 122,529.74	$ 122,529.74	$ 122,529.74
Reserve for Bond A: 10 years	$ 12,252.97			
TOTAL NEW DEBT SERVICE:	$ 134,782.71	$ 122,529.74	$ 122,529.74	$ 122,529.74
STORMWATER SYSTEM EXPENSES SUMMARY				
STORMWATER System O&M Expenses	$ 138,026.50	$ 145,617.96	$ 153,626.95	$ 162,076.43
STORMWATER System Existing Debt Service	$ -	$ -	$ -	$ -
STORMWATER System New Debt Service	$ 58,977.17	$ 53,615.61	$ 53,615.61	$ 53,615.61
TOTAL EXPENSES:	$ 197,003.67	$ 199,233.57	$ 207,242.55	$ 215,692.04
STORMWATER SYSTEM CASH FLOW				
NET CASH FLOW:	$ 5,798.42	$ 13,722.02	$ 16,352.45	$ 19,087.74
STORMWATER SYSTEM IMPACT FEE FUND				
Total Impact Fee Revenue	$ 235,784.08	$ 246,936.03	$ 259,681.12	$ 272,426.20
Impact Fee Account Interest	$ 37,725.45	$ 39,509.77	$ 41,548.98	$ 43,588.19
Impact Fees Covering Bond A	$ (68,914.13)	$ (68,914.13)	$ (68,914.13)	$ (68,914.13)
Impact Fees Spent for Single Payment Projects or Self Help	$ (320,021.98)	$ -	$ -	$ -
Bond Reserve Payments	$ (6,891.41)	$ -	$ -	$ -
IMPACT FEE FUND TOTAL:	$ 552,645.58	$ 770,177.25	$ 1,002,493.21	$ 1,249,593.48
STORMWATER SYSTEM CASH FUND				
Total Cash Revenue	$ 202,802.09	$ 212,955.59	$ 223,595.00	$ 234,779.77
Total Cash Expenses	$ (197,003.67)	$ (199,233.57)	$ (207,242.55)	$ (215,692.04)
Cash Spent for Single Payment Projects or Self Help	$ (153,399.36)	$ -	$ -	$ -
CASH FUND TOTAL:	$ (141,466.85)	$ (127,744.83)	$ (111,392.38)	$ (92,304.65)
SYSTEM IMPROVEMENT SCHEDULE				
Detention Basin 15				
Detention Basin 14				
Detention Basin 13				
Detention Basin 12				
Detention Basin 11				
Detention Basin 10				
Storm Drain Phase 2 & Detention Routing				
City Improvements	$ 473,421.34			
IFFP Updates	$ 53,756.66			
City Capital Improvements				

50% Bond for Improvements/Fiscal Year	2031	2032	2033	2034
STORMWATER SYSTEM DATA				
Annual Population Growth Rate	5.0%	5.0%	5.0%	5.0%
Annual Inflation	3.0%	3.0%	3.0%	3.0%
Average User Rate / ERU / Month	$ 5.58	$ 5.58	$ 5.58	$ 5.58
Average Impact Fee / ERU	$ 1,593.14	$ 1,593.14	$ 1,593.14	$ 1,593.14
Total ERU's at Year End	3,771	3,960	4,158	4,366
New ERU's per Year	180	189	198	208
STORMWATER SYSTEM REVENUES				
OPERATING				
Charges for Services	$ 246,503.69	$ 258,828.88	$ 271,785.39	$ 285,371.31
Connection Fees	$ -	$ -	$ -	$ -
Accounts Receivable	$ -	$ -	$ -	$ -
NON-OPERATING				
Federal Capital Grant	$ -	$ -	$ -	$ -
Impact Fees	$ 286,764.43	$ 301,102.65	$ 315,440.87	$ 331,372.23
TOTAL OPERATING REVENUES:	$ 246,503.69	$ 258,828.88	$ 271,785.39	$ 285,371.31
STORMWATER SYSTEM OPERATING EXPENSES				
Salaries, Wages, and Benefits	$ 68,789.33	$ 72,572.75	$ 76,564.25	$ 80,775.28
Materials, Supplies, and Services	$ 3,930.82	$ 4,147.01	$ 4,375.10	$ 4,615.73
Capital Expenses	$ 98,270.48	$ 103,675.35	$ 109,377.50	$ 115,393.26
TOTAL OPERATING EXPENSES:	$ 170,990.63	$ 180,395.12	$ 190,316.85	$ 200,784.28
STORMWATER SYSTEM EXISTING DEBT SERVICE				
N/A	$ -	$ -	$ -	$ -
TOTAL EXISTING DEBT SERVICE:	$ -	$ -	$ -	$ -
STORMWATER SYSTEM NEW DEBT SERVICE				
Bond A: $2,900,000, 1.5%, 30 years	$ 122,529.74	$ 122,529.74	$ 122,529.74	$ 122,529.74
Reserve for Bond A: 10 years				
TOTAL NEW DEBT SERVICE:	$ 122,529.74	$ 122,529.74	$ 122,529.74	$ 122,529.74
STORMWATER SYSTEM EXPENSES SUMMARY				
STORMWATER System O&M Expenses	$ 170,990.63	$ 180,395.12	$ 190,316.85	$ 200,784.28
STORMWATER System Existing Debt Service	$ -	$ -	$ -	$ -
STORMWATER System New Debt Service	$ 53,615.61	$ 53,615.61	$ 53,615.61	$ 53,615.61
TOTAL EXPENSES:	$ 224,606.24	$ 234,010.72	$ 243,932.45	$ 254,399.88
STORMWATER SYSTEM CASH FLOW				
NET CASH FLOW:	$ 21,897.45	$ 24,818.15	$ 27,852.93	$ 30,971.43
STORMWATER SYSTEM IMPACT FEE FUND				
Total Impact Fee Revenue	$ 286,764.43	$ 301,102.65	$ 315,440.87	$ 331,372.23
Impact Fee Account Interest	$ 45,882.31	$ 48,176.42	$ 50,470.54	$ 53,019.56
Impact Fees Covering Bond A	$ (68,914.13)	$ (68,914.13)	$ (68,914.13)	$ (68,914.13)
Impact Fees Spent for Single Payment Projects or Self Help	$ -	$ (62,318.70)	$ -	$ -
Bond Reserve Payments	$ -	$ -	$ -	$ -
IMPACT FEE FUND TOTAL:	$ 1,513,326.09	$ 1,731,372.33	$ 2,028,369.61	$ 2,343,847.26
STORMWATER SYSTEM CASH FUND				
Total Cash Revenue	$ 246,503.69	$ 258,828.88	$ 271,785.39	$ 285,371.31
Total Cash Expenses	$ (224,606.24)	$ (234,010.72)	$ (243,932.45)	$ (254,399.88)
Cash Spent for Single Payment Projects or Self Help	$ -	$ -	$ -	$ -
CASH FUND TOTAL:	$ (70,407.19)	$ (45,589.04)	$ (17,736.11)	$ 13,235.32
SYSTEM IMPROVEMENT SCHEDULE				
Detention Basin 15				
Detention Basin 14				
Detention Basin 13				
Detention Basin 12				
Detention Basin 11				
Detention Basin 10				
Storm Drain Phase 2 & Detention Routing				
City Improvements				
IFFP Updates		$ 62,318.70		
City Capital Improvements				

50% Bond for Improvements/Fiscal Year	2035	2036	2037
STORMWATER SYSTEM DATA			
Annual Population Growth Rate	5.0%	5.0%	5.0%
Annual Inflation	3.0%	3.0%	3.0%
Average User Rate / ERU / Month	$ 5.58	$ 5.58	$ 5.58
Average Impact Fee / ERU	$ 1,593.14	$ 1,593.14	$ 1,593.14
Total ERU's at Year End	4,584	4,813	5,054
New ERU's per Year	218	229	241
STORMWATER SYSTEM REVENUES			
OPERATING			
Charges for Services	$ 299,653.27	$ 314,632.58	$ 330,345.80
Connection Fees	$ -	$ -	$ -
Accounts Receivable	$ -	$ -	$ -
NON-OPERATING			
Federal Capital Grant	$ -	$ -	$ -
Impact Fees	$ 347,303.58	$ 364,828.08	$ 383,945.70
TOTAL OPERATING REVENUES:	$ 299,653.27	$ 314,632.58	$ 330,345.80
STORMWATER SYSTEM OPERATING EXPENSES			
Salaries, Wages, and Benefits	$ 85,217.92	$ 89,904.91	$ 94,849.68
Materials, Supplies, and Services	$ 4,869.60	$ 5,137.42	$ 5,419.98
Capital Expenses	$ 121,739.89	$ 128,435.58	$ 135,499.54
TOTAL OPERATING EXPENSES:	$ 211,827.41	$ 223,477.92	$ 235,769.20
STORMWATER SYSTEM EXISTING DEBT SERVICE			
N/A	$ -	$ -	$ -
TOTAL EXISTING DEBT SERVICE:	$ -	$ -	$ -
STORMWATER SYSTEM NEW DEBT SERVICE			
Bond A: $2,900,000, 1.5%, 30 years	$ 122,529.74	$ 122,529.74	$ 122,529.74
Reserve for Bond A: 10 years			
TOTAL NEW DEBT SERVICE:	$ 122,529.74	$ 122,529.74	$ 122,529.74
STORMWATER SYSTEM EXPENSES SUMMARY			
STORMWATER System O&M Expenses	$ 211,827.41	$ 223,477.92	$ 235,769.20
STORMWATER System Existing Debt Service	$ -	$ -	$ -
STORMWATER System New Debt Service	$ 53,615.61	$ 53,615.61	$ 53,615.61
TOTAL EXPENSES:	$ 265,443.02	$ 277,093.52	$ 289,384.81
STORMWATER SYSTEM CASH FLOW			
NET CASH FLOW:	$ 34,210.25	$ 37,539.06	$ 40,960.99
STORMWATER SYSTEM IMPACT FEE FUND			
Total Impact Fee Revenue	$ 347,303.58	$ 364,828.08	$ 383,945.70
Impact Fee Account Interest	$ 55,568.57	$ 58,372.49	$ 61,431.31
Impact Fees Covering Bond A	$ (68,914.13)	$ (68,914.13)	$ (68,914.13)
Impact Fees Spent for Single Payment Projects or Self Help	$ -	$ -	$ (72,244.45)
Bond Reserve Payments	$ -	$ -	$ -
IMPACT FEE FUND TOTAL:	$ 2,677,805.28	$ 3,032,091.72	$ 3,336,310.16
STORMWATER SYSTEM CASH FUND			
Total Cash Revenue	$ 299,653.27	$ 314,632.58	$ 330,345.80
Total Cash Expenses	$ (265,443.02)	$ (277,093.52)	$ (289,384.81)
Cash Spent for Single Payment Projects or Self Help	$ -	$ -	$ -
CASH FUND TOTAL:	$ 47,445.57	$ 84,984.63	$ 125,945.61
SYSTEM IMPROVEMENT SCHEDULE			
Detention Basin 15			
Detention Basin 14			
Detention Basin 13			
Detention Basin 12			
Detention Basin 11			
Detention Basin 10			
Storm Drain Phase 2 & Detention Routing			
City Improvements			
IFFP Updates			$ 72,244.45
City Capital Improvements			

APPENDIX F
Drawing Details

Curb & Gutter Detail

Street Cross Sections

Intersection Detail

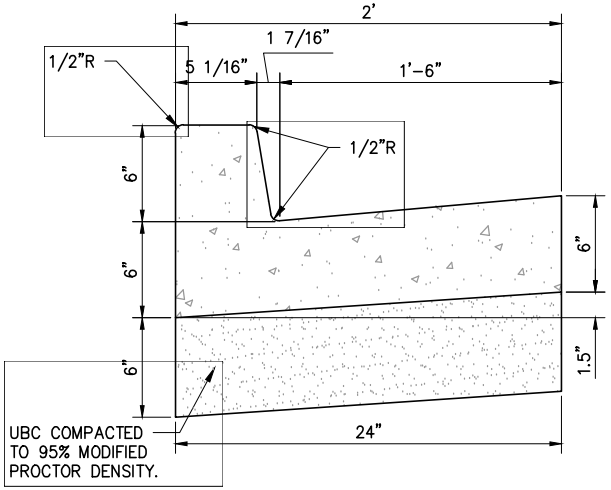
Natural Lined Ditch Detail

Natural Lined V-Ditch Detail

Natural Lined Trapezoidal Channel Detail

36” Pipe Capacity Detail

FIGURE IV-A
CURB & GUTTER DETAIL



D ~ DETAIL - 2' CURB & GUTTER W/ BASE

2' CURB & GUTTER NOTES:

1. CONCRETE SHALL BE CLASS 3500 PER PROJECT SPECIFICATIONS.
2. PROVIDE 1/2" RADIUS ON CONCRETE EDGES EXPOSED TO WEATHER UNLESS SHOWN OTHERWISE.
3. CONTRACTION JOINTS SHALL BE VERTICAL, AT LEAST 1/8" WIDE, 2" DEEP, AND NO GREATER THAN 10' APART.
4. EXPANSION JOINTS SHALL BE SPACED NO GREATER THAN 60' APART AND SHALL BE FILLED TO FULL DEPTH WITH APPROVED JOINT FILLER MATERIAL.

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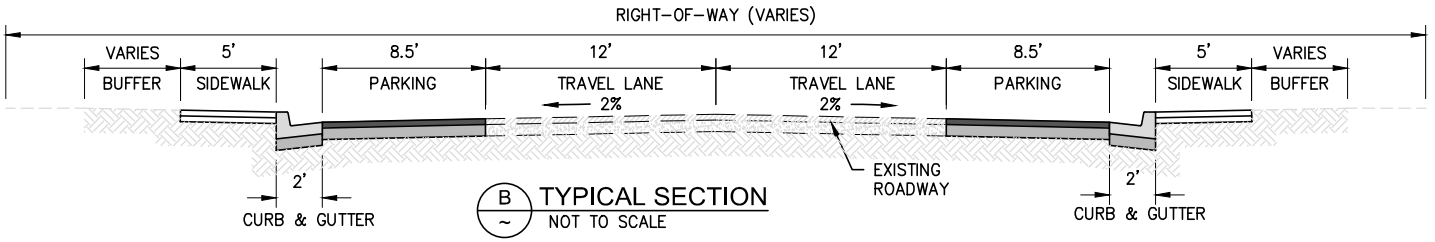
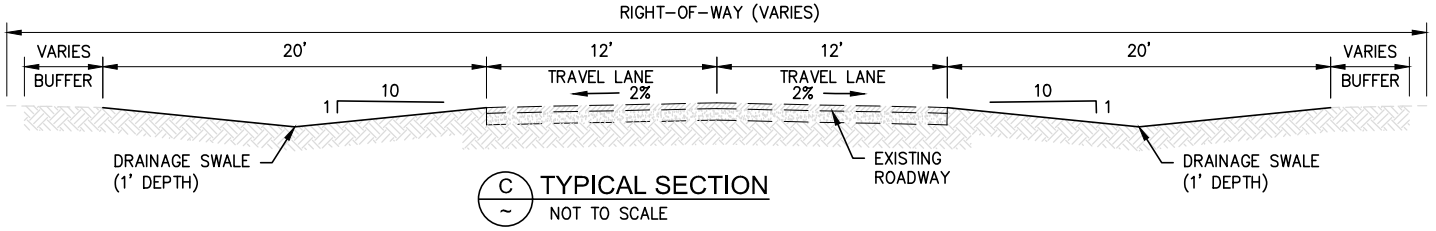
FIGURE IV-B
TYPICAL STREET SECTIONS



B ~ TYPICAL SECTION
NOT TO SCALE



C ~ TYPICAL SECTION
NOT TO SCALE

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FIGURE IV-C
INTERSECTION DETAIL

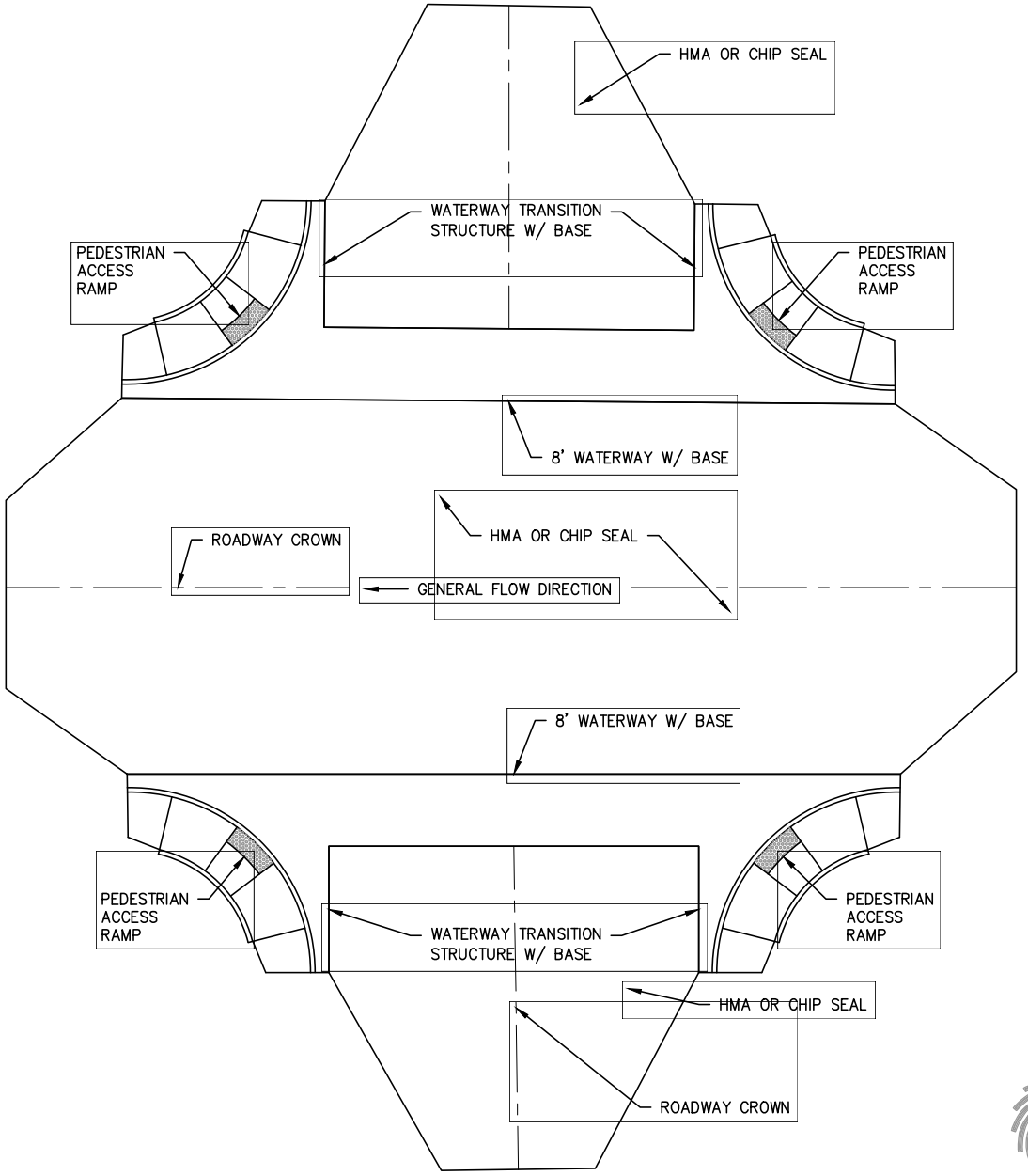

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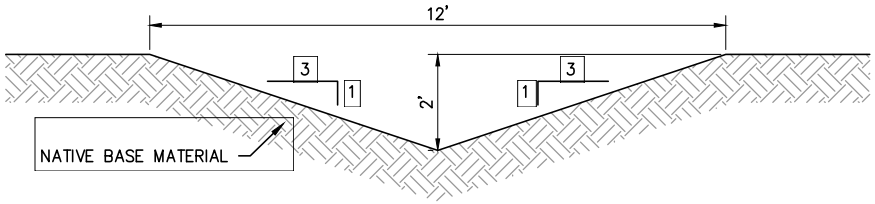
FIGURE IV-D
NATURAL LINED DITCH DETAIL



NOTES:

1. ASSUMED PARAMETERS:
   MANNING'S ROUGHNESS VALUE N=0.027
   SLOPE = 1.0%
2. CALCULATED FLOW CAPACITY IS 63.76 CFS
3. CHANNEL SHALL BE MAINTAINED AND CLEAR FROM GRASSES, WEEDS, AND DEBRIS.

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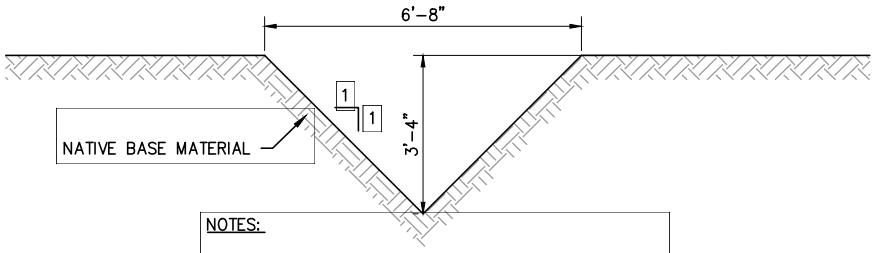
FIGURE IV-E
NATURAL LINED V-DITCH DETAIL



NOTES:

1. ASSUMED PARAMETERS:
   MANNING'S ROUGHNESS VALUE N=0.025
   SLOPE = 1.0%
2. CALCULATED FLOW CAPACITY IS 71.9 CFS
3. CHANNEL SHALL BE MAINTAINED AND CLEAR FROM GRASSES, WEEDS, AND DEBRIS.

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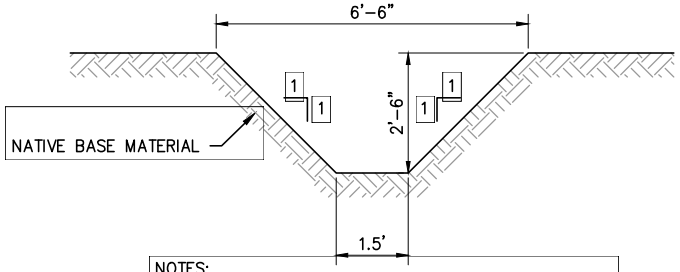
FIGURE IV-F
NATURAL LINED TRAPEZOIDAL CHANNEL DETAIL



NOTES:

1. ASSUMED PARAMETERS:
   MANNING'S ROUGHNESS VALUE N=0.025
   SLOPE = 1.0%
2. CALCULATED FLOW CAPACITY IS 71.9 CFS
3. CHANNEL SHALL BE MAINTAINED AND CLEAR FROM GRASSES, WEEDS, AND DEBRIS.

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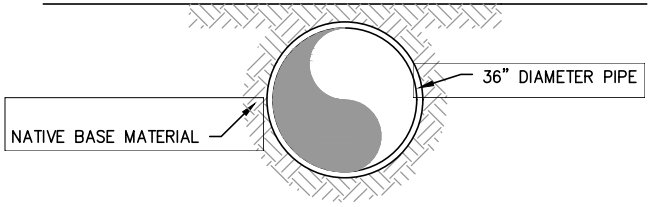
FIGURE IV-G
36" PIPE CAPACITY DETAIL



NOTES:

1. ASSUMED PARAMETERS:
   MANNING'S ROUGHNESS VALUE N=0.013
   SLOPE = 1.0%
2. CALCULATED FLOW CAPACITY IS 71.71 CFS
3. PIPE SHALL BE MAINTAINED AND CLEAR FROM GRASSES, WEEDS, AND DEBRIS.

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APPENDIX G
Impact Fee Certification

Impact Fee Certification

CERTIFICATION OF IMPACT FEE ANALYSIS BY CONSULTANT

In accordance with Utah Code Annotated, § 11-36a-306 Kelvin C. Smith, P.E., on behalf of Sunrise Engineering, Inc., make the following certification:

I certify that the attached impact fee facilities plan and impact fee analysis:

1. Includes only the costs for qualifying public facilities that are:
    a. Allowed under the Impact Fees Act; and
    b. Actually incurred; or
    c. Projected to be incurred or encumbered within six years after each impact fee is paid;
2. Does not include:
    a. costs of operation and maintenance of public facilities;
    b. costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents;
    c. an expense for overhead, unless the expense is calculated pursuant to a methodology that is consistent with generally accepted cost accounting practices and that methodological standards set forth by the federal Office of Management and Budget for federal grant reimbursement; and
3. Offsets costs with grants or other alternate sources of payment (if grants or other sources of payment have been applied for and received and such information was made available when the Impact Fee Analysis was prepared); and
4. Complies in each and every relevant respect with the Impact Fees Act.

Kelvin C. Smith, P.E. makes this certification with the following qualifications:

1. All of the recommendations for implementations of the Impact Fee Facilities Plan ("IFFP") made in the IFFP documents or in the Impact Fee Analysis documents are followed in their entirety by Enoch City, Utah staff and elected officials.

2. If all or a portion of the IFFP's or Impact Fee Analyses are modified or amended, this certification is no longer valid.

3. All information provided to Sunrise Engineering, Inc., its contractors or suppliers is assumed to be correct, complete and accurate. This includes information provided by Enoch City, Utah, and outside sources.

4. The undersigned is trained and licensed as a professional engineer and has not been trained or licensed as a lawyer. Nothing in the foregoing certification shall be deemed an opinion of law or an opinion of compliance with law which under applicable professional licensing laws or regulations or other laws or regulations must be rendered by a lawyer licensed in the State of Utah.

5. The foregoing Certification is an expression of professional opinion based on the undersigned's best knowledge, information and belief and shall not be construed as a warranty or guaranty of any fact or circumstance.

6. The foregoing certification is made only to Enoch City, Utah and may not be used or relied upon by any other person or entity without the expressed written authorization of the undersigned.

Sunrise Engineering, Inc.

By: _____

Dated: 6.23.2017