WaterSMART:
Drought Response Program: Drought Resiliency Project Grants for FY 2018

Response to FOA No. BOR-DO-18-F008

Ephraim City Drought Resiliency Project

Ephraim, Utah

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February 13, 2018

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TECHNICAL PROPOSAL AND EVALUATION CRITERIA

Executive Summary

Date: Application due date is February 13, 2018

Applicant: Ephraim City, Sanpete County, Utah

Project Title: Ephraim City Drought Resiliency Project

Project Summary:

The overall concept of the Ephraim City Drought Resiliency Project entails the construction of a new well and a short connection pipeline from the new well location to tie into the City's potable water system.

The major objective of this project is to improve Ephraim City's drought resiliency and increase the overall quantity and quality of water in Ephraim. Ephraim City's water supply is currently supplied 100% by spring water from the mountains east of the City. The existing springs are limited in capacity and are highly susceptible to drought conditions with flows that drop off dramatically during extended periods of drought. Additionally, the pipelines which bring the water to the City are located on steep mountain terrain prone to landslides. The City has a single backup well to use in emergencies, but the well can no longer supply water to the entire City due to fluctuating arsenic levels, lack of capacity, and not being able to serve all the different pressures zones within the City. The fluctuating levels of arsenic stem from naturally occurring geologic formations and sometimes levels exceed the allowable EPA standards for drinking water. The backup well easily met drinking water standards for arsenic when it was drilled, but since the standard dropped the well has had periods where the well no longer meets the standard. The combination of drought affected springs that are piped across landslide prone mountains, along with a single backup well that cannot meet the demands of the City by itself creates an especially precarious position for Ephraim City's water system.

The Ephraim City Drought Resiliency Project entails installing a new well in an area that has better quality water and constructing a connection pipeline to Ephraim City's potable system. Improvements to the overall water management will include: monitoring and measurement of aquifer water levels, planning for an Aquifer Storage and Recovery program (ASR) which will include infiltration basins and/or injection wells for groundwater recharge when water supplies exceed the demand. Ephraim City is confident that this project will increase potable water supplies during extended drought periods as they have seen these last few years.

WaterSMART funds will be used to assist with the installation of the well, a connection pipeline to the existing potable system, and the preliminary design and permitting of an ASR program.

Approximate Length: Estimated project length is two and a half years

Completion Date: September 2020

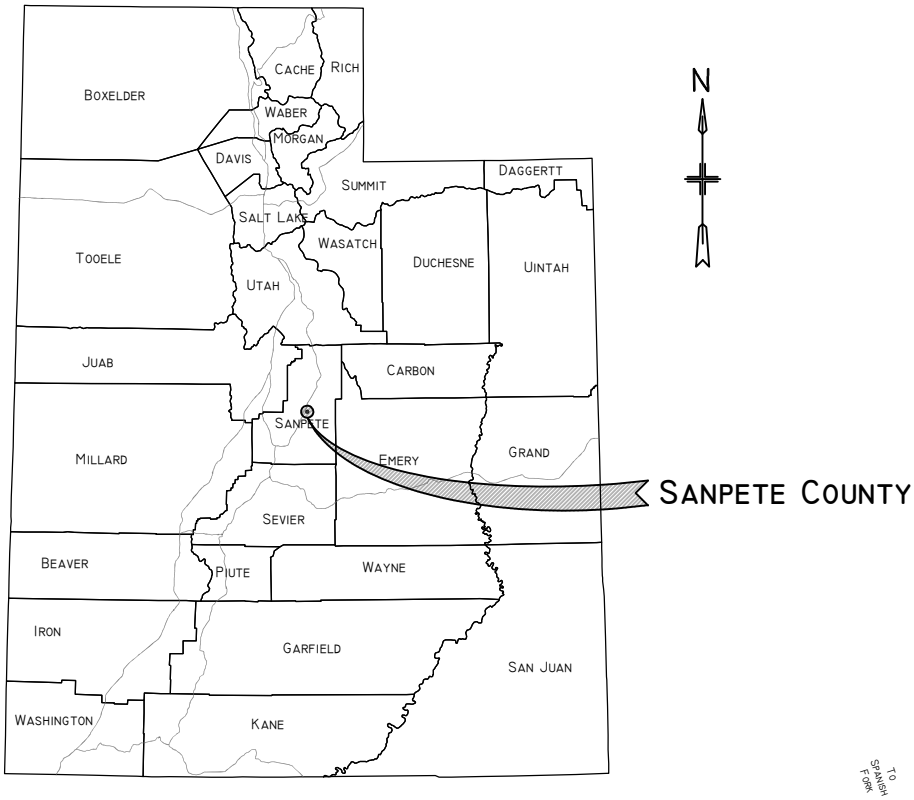
Federal Facility: The project is not located on a Federal facility.

Background Data

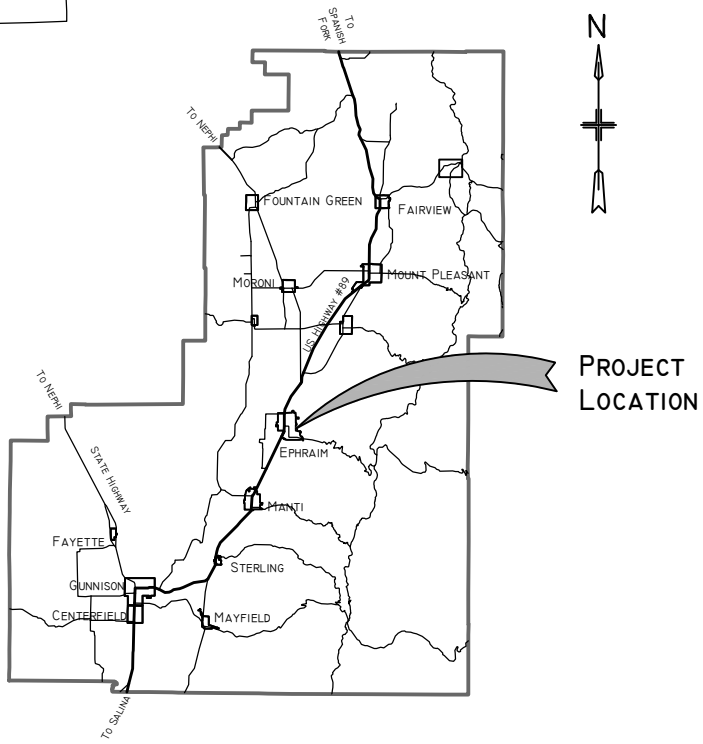
Project Location

The Ephraim City Drought Resiliency Project is located in Sanpete County in Utah. See Figure 1. The city of Manti is located 7 miles to the south-southwest of Ephraim and Salt Lake City is approximately 98 miles to the north.

The Ephraim City Drought and Resiliency Project well is located at 39°20’55.71” N; 111°35’41.95” W; approximately 0.96 miles southwest of Ephraim City Center, just on the outskirts of town. The planned infiltration basin will be located one mile southeast of Ephraim City (39°21'1.53"N, 111°33'58.41"W) near two of the City’s water tanks. Figure 2 shows Ephraim’s existing potable water system with the location of the planned well and the proposed ASR basin location.

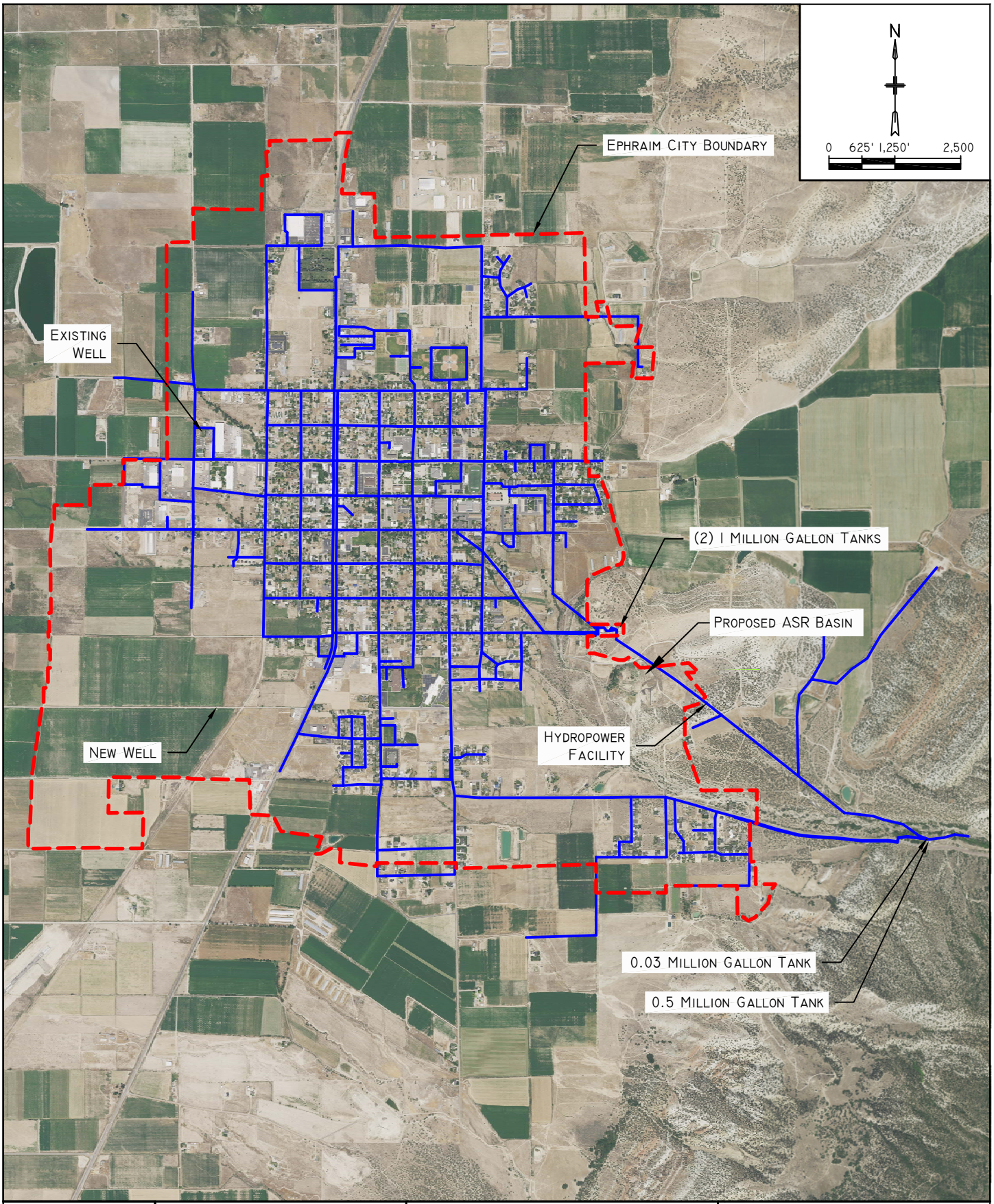


State of Utah



SANPETE COUNTY

FRANSON CIVIL ENGINEERS	DATE: FEBRUARY 12, 2018 SCALE: 1" = 2,500' Watersmart Figures.dwg P:\UT\Central\Ephraim Well Study and Funding Support\Drawings	EPHRAIM CITY WATERSMART APPLICATION	FIGURE 1 LOCATION MAPS



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EPHRAIM CITY

WATERSMART APPLICATION

FIGURE 2

EXISTING FACILITIES

Water Supply

Ephraim City receives potable water from two sources, mountain springs and an existing city owned well. The principal source of potable water comes from springs fed by seasonal runoff from the Wasatch Plateau Mountains to the east of Ephraim. These springs supply 100% of Ephraim's potable water needs and is heavily dependent on the annual snowpack and rain in the mountains. A well (400 West Well), owned by Ephraim City, is used in emergencies during times of drought. This well is located near the west edge of Ephraim City Limits at 39°21'46.94" N, 111°35'46.67" W.

As of 2007 Ephraim City had obtained the rights to nearly 2,763 acre-feet of potable water. This water is supplied by an existing municipal well and from springs in the Wasatch Plateau Mountains. The amount of water produced by the mountain springs greatly varies depending on the mountain snowpack which is currently at 22% of normal, the lowest it has been since 1981 according to the NRCS (Natural Conservation Resources Service). Historical yield rates from all of Ephraim's water sources is shown in Table 1 and is taken from Ephraim's Water System Master Plan (2007).

Table 1. Ephraim City's Water Sources Summary
(Source: Utah Division of Water Rights)

	Average Yield (ac-ft/yr)	***Historic Minimum Yield (ac-ft/yr)***	***Historic Maximum Yield (ac-ft/yr)***
Beck Spring	55.0	43.2	63.1
Big Springs	518.4	124	2271.1
Birch-Maple Springs	431.2	39.8	1325.8
Black Stump	615.9	49.2	2209.7
Experimental Spring Station	46.3	51.8	64.7
Curley Hill Springs	59.2	36.3	58.3
Left Hand Fork Spring	348.9	55	1078.7
Little Springs	40.9	31	55.2
North Little Spring	57.1	36.3	80.8
Parry Spring	44.6	41.7	46.7
Riddley Spring	327.8	83.1	1212.3
Sawmill Springs	321.9	78	1200
Well	17.7	1.2	28.4
Twin Spring	215.3	52.5	583.1
Totals	3100.2	723.1	10277.9

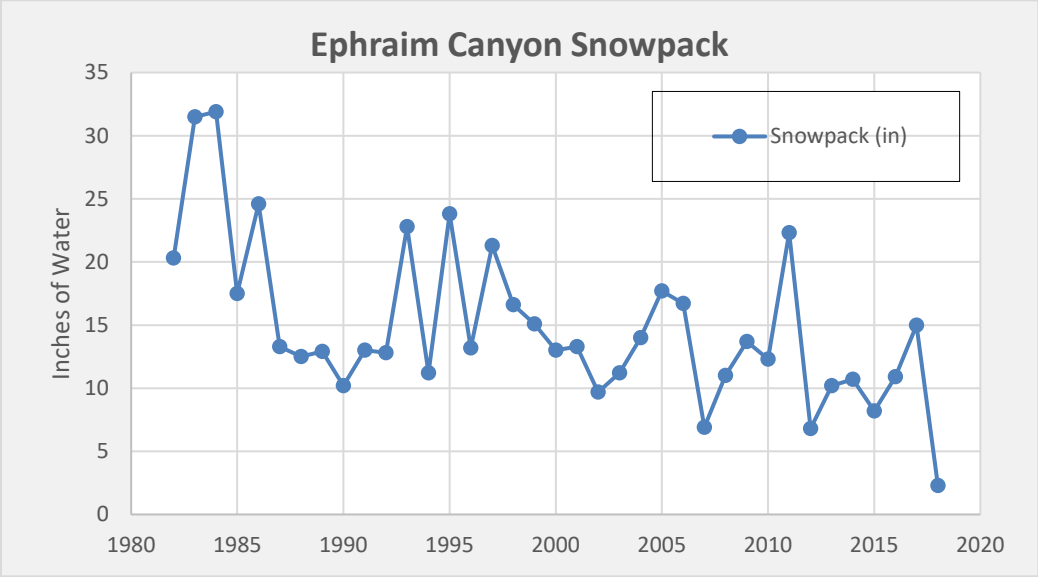


Figure 3. Ephraim Canyon Snowpack

The mountain springs are extremely susceptible to snowpack, rain, earthquakes, landslides, and fires. Mountain snowpack, as mentioned earlier, is the lowest it has been since 1981. The last six years have been drought years and the well has been used to supplement the mountain springs. Even last year when the snowpack was good, the spring production did not recover due the extended period of drought prior to 2017. Ephraim has at times had to run the existing city well for extended periods of time during the months of July through October due to reduced production from the springs. In 2017 the springs and well (pumped continuously) barely met the demand in late summer.

Nearly 847 acre-feet of the City's potable water is available from both the City's existing well and the mountain springs. Water Rights owned by Ephraim are summarized in Table 11 from the Ephraim City Water System Master Plan in Appendix H. Ephraim City has additionally purchased nearly 328 acre-feet of ground water for the Ephraim City Drought Resiliency Project's new well location. The majority of this additional water has been purchased and is in the process of being finalized. This water comprises change application a38517, which involves Water Rights 65-918, 65-1077, 65-3471, and 65-3875.

The City's existing well was constructed in the early 1990's and has been providing backup water to Ephraim City for nearly 30 years. This single backup well is used in emergencies, but the well cannot supply water to the entire City due to both lack of capacity, as well as not being able to serve all the different pressures zones within the City. Additionally, the backup well has fluctuating levels of arsenic from naturally occurring geologic formations that sometimes exceeds the allowable EPA standards for drinking water. Observations have found that the arsenic levels in this well increase the more the well is pumped. The combination of drought affected springs piped across landslide prone mountains, along with a single backup well that cannot meet the demands of the City by itself creates an especially precarious position for Ephraim City's water system.

Ephraim City supplies nearly 1,100 acre-feet of potable water to over 1,500 customers on an annual basis. Water from the system is not used for agricultural purposes; system water is only used for municipal, residential and commercial purposes. The City does not currently distinguish between

municipal, residential, and commercial water use. Ephraim's potable water use is projected to increase to 1,856 acre-feet in the year 2050.

Ephraim City has experienced drought six of the last seven years. With less than average snowpack and poor water production from the mountain springs Ephraim City has had to enact more drastic water conservation management practices and strategies.

Water Delivery System

The Ephraim water system provides approximately 7,100 residents and two schools with potable water. The water system is heavily influenced by a local junior college of nearly 5,000 enrolled students.

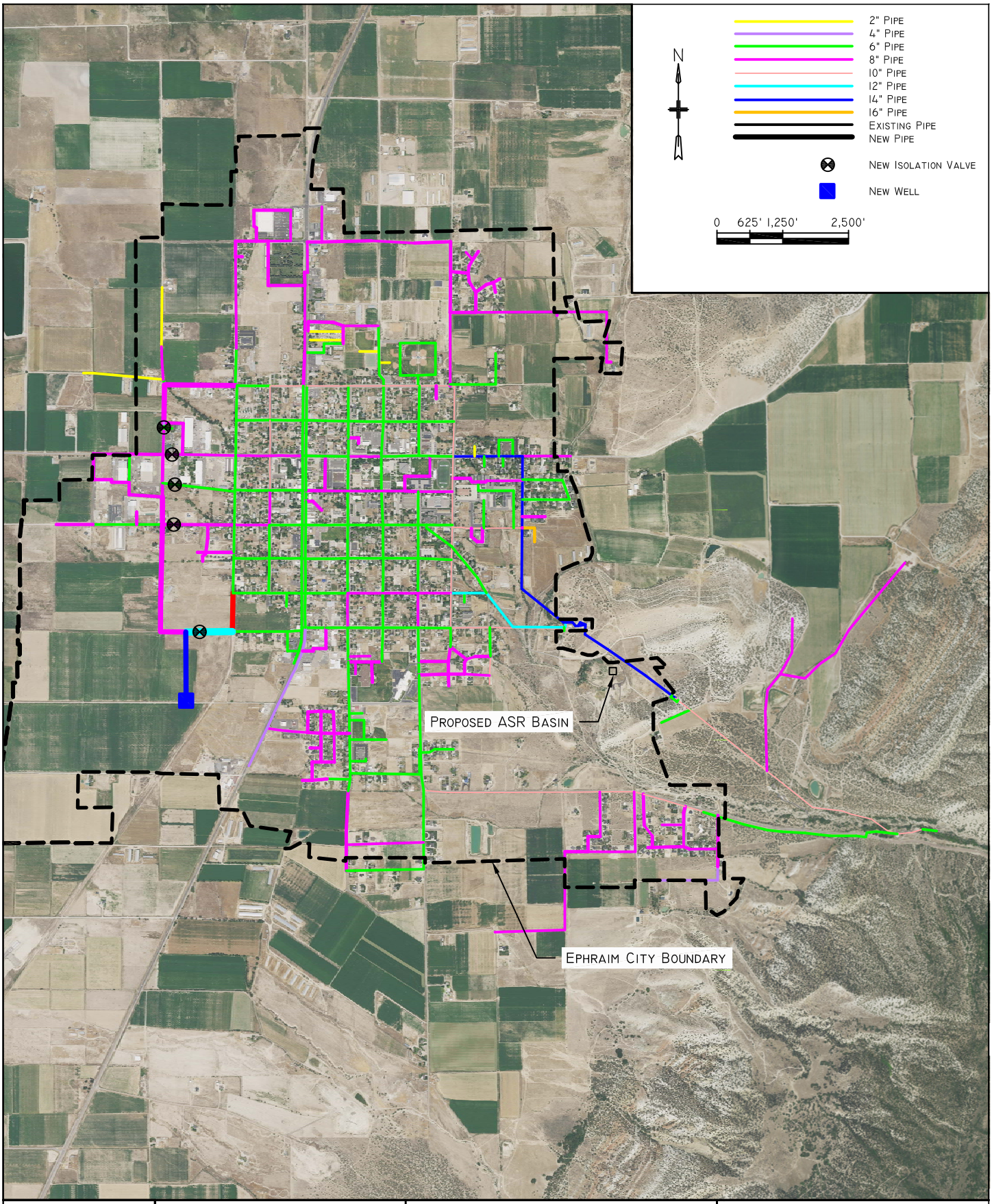
The Ephraim potable water system contains spring collection systems with sections of steel, ductile iron, concrete, PVC, and HDPE pipes that will typically carry the water several miles from the springs in the mountains to the city water tanks. The water is treated just above the city before reaching the tanks.

The Ephraim City potable water system contains approximately 56 miles of pipes ranging from 4 inches to 14 inches in diameter. Newer sections of the system and system upgrades are constructed using PVC and HDPE pipe. There is very little of the old ductile iron pipe or wooden pipe remaining in the system. See Figure 4. Ephraim has six water tanks for storage between 30,000 gallons and 1,500,000 gallons. The total water storage volume in these tanks is 5.28 million gallons or 16.2 acre-feet.

Ephraim City is divided into two pressure zones. The upper pressure zone consists of the southern developments along the south edge of Ephraim City limits and some of the east edge of town. The central zone consists of the remaining parts of Ephraim City and those near the extents of the city boundary.

Relationships with Reclamation

Much of Ephraim City's potable water is piped through a 7,100 foot long tunnel that is owned by Reclamation in the mountains above Ephraim City. Reclamation built the tunnel in the 1930's. In 2016, Ephraim City teamed up with Ephraim Irrigation Company and Reclamation to rehabilitate the deteriorating tunnel. The total project cost was just under $4 million. Reclamation is supporting the rehabilitation of the tunnel through a WaterSMART Grant, as well as providing engineering and construction observation support. The project is ongoing and expected to be completed by the end of 2018.



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LAYOUT: Layout1

Ephraim City

Figure 4

Ephraim City Drought Resiliency Project

Technical Project Description

The Ephraim City Drought Resiliency Project involves the design and drilling of a new well capable of producing 1,500 gallons per minute on a piece of property that the City has recently purchased near the southwest edge of town. There is an existing well on this property that will have the water rights transferred into the new well. Permits will be acquired from the City of Ephraim, Sanpete County, and the Utah State Engineers Office. The existing well at this location will be abandoned. Construction of the new well will be subcontracted to a qualified and licensed water well driller.

A new connection pipeline will be designed to connect this new well into the existing potable water system. Multiple connections to the existing system will be required to meet modern design standards, provide system redundancy, improve water quality, and provide flexibility during times of drought. Permitting and easements will be obtained prior to the installation of the new pipeline. Construction of the pipeline will be subcontracted.

Water meters will be installed on the downstream side of the southern water tanks. This work will be designed as part of the well and pipeline design. This work is expected to be subcontracted. These meters will be incorporated into the existing SCADA system Ephraim City is currently using.

The Aquifer Storage and Recovery system will be preliminarily designed and permitted. A ground water flow model of the Ephraim area has been developed by the Utah Geological Survey (UGS) and may be used to help model the effectiveness of the ASR system, and aid in permitting. Existing aquifer conditions will be established, and a basin performance monitoring plan will be created. The potential aquifer recharge basin location will be evaluated to determine performance estimates. The preliminary design of the infiltration basin and/or injection well will be completed. An abbreviated Environmental Assessment will be completed. Permit acquisition for the ASR will be obtained from the Utah State Engineers Office, Sanpete County, and Ephraim City. It is anticipated that public support will be obtained during the permitting process as this project will improve aquifer conditions in the area. The construction of the ASR site is not part of this funding plan and will be completed when permitting is completed.

Performance Measures

Performance of the Ephraim Drought and Resiliency Project will be measured and evaluated to determine the project's effectiveness and beneficial impact on the system and community. The measurement of this project will be completed by measuring the following effects:

The primary indicator of the Ephraim City Drought Resiliency Project will be whether the water system can adequately supply the needs of the water system without requiring emergency water restrictions. This will be determined by the system's ability to adequately provide safe water to the City should the springs become unproductive due to prolonged drought conditions.

The new well will be evaluated based on two indicators. First will be the well's ability to supply safe quality water to the system. This will be determined by regularly testing the quality of the water that the well produces and verifying that it meets all applicable environmental water requirements. This will be completed as part of the City's regular testing and monitoring procedures.

The second measure of the new well's performance will be the well's ability to provide an adequate quantity of water for the Ephraim water system. The well should be able to produce enough water to help ensure all system demands are met during prolonged drought conditions. Water should be readily available for typical use and the system should not suffer performance impacts at any time during prolonged drought conditions. The City is planning to rely on the new well water to help supplement and dilute the water provided by the City's existing well. Since the existing well only periodically exceeds drinking water standards, the existing well can remain in service if water from the existing well is blended with water from the new well. Valves and a short section of pipe will be installed to use as much of the existing system as possible to facilitate the blending of water.

The connection pipeline performance will be measured by how well the new well water provides water to the existing system. The pipeline will be designed with sufficient flow capacity to meet flow and pressure demands of the system. Monitoring at points throughout the system through the City's monitoring system will help provide measures of this performance.

The performance of the planned ASR basin will be based on aquifer level measurements taken during the planning and design stage. Water meters will be used at the inlet of the basin/injection well and monitoring wells to properly track and measure the performance of the infiltration basin/injection well and monitor the quantity and quality of the water recharging the aquifer. The amount of water that Ephraim can recover from the aquifer will also be used to measure ASR system performance.

In summary, the primary performance indicator of the Ephraim City Drought Resiliency Project will be whether the water system can adequately supply the needs of the water system without requiring emergency water restrictions.

Evaluation Criteria

Evaluation Criterion A – Project Benefits

- *How will the project build long-term resilience to drought? How many years will the project continue to provide benefits?*

The Ephraim City Drought and Resiliency Project will build long term resilience to drought by allowing access to additional potable quality water any time during the year. A newly constructed well at the Larson Lane location will allow existing and newly acquired water rights to be used at this location, as well as provide the ability for the City to inject surplus water directly into the aquifer during non-drought periods.

There is an existing irrigation well near the Larson Lane well site that was constructed in the 1930's and has performed reliably for its owners during that time. This project is similarly expected to provide drought resiliency to Ephraim City for 50-75 years.

- *Will the project make additional water supplies available? If so, what is the estimated quantity of additional supply the project will provide and how was this calculated? What percentage of the total water supply does the additional water supply represent? How was*

this estimate calculated? Provide a brief qualitative description of the degree/significance of the benefits associated with the additional water supplies.

This project will make all of the city's groundwater rights available for use in an emergency situation by providing the capacity to deliver all of the city's water demand from the two wells. The city's water rights allow water to be provided from the springs on the mountain or from the existing well. With the production of the new well and the ability to address the arsenic problem in the existing well by blending, 100% of the city's water supply can be supplied as a result of this project, even with complete loss of water from the mountain springs due to drought or other natural disaster that damages the transmission pipeline from the mountain.

$$Exisiting\ Water\ Capacity\ from\ Springs = New\ Project\ Water$$

$$\frac{New\ Water}{Existing\ Water} * 100 = 100\%\ of\ potable\ water\ supply$$

The additional water will be a tremendous benefit to Ephraim City. The additional water when combined with the City's existing well will be able to provide a total of nearly 1,175 acre-feet of water. This will provide the city with 100% system redundancy during extended periods of drought or during emergencies should the mountain springs become compromised.

- *Will the project improve the management of water supplies? If so, how will the project increase efficiency or operational flexibility? What is the estimated quantity of water that will be better managed as a result of the project and how was this estimate calculated? Provide a brief qualitative description of the degree/significance of anticipated water management benefits. Will the project make new information available to water managers? If so, what is that information and how will it improve water management?*

The Ephraim City Drought Resiliency Project will greatly improve the amount of manageable water. Nearly all of the city's potential water from the springs will be better managed because it can be replaced by the wells if necessary.

The project will improve the system's flexibility by allowing the use of groundwater to supplement spring water use, or allowing the City to completely use groundwater should the need arise. The new well can also be used as a potential aquifer injection location for any surplus water the system receives from the high spring flows from the mountain springs. Otherwise, this water is spilled or wasted in the water tank overflows. This injected water can also be recovered at a future time from the new well location. The city's existing well was not a viable candidate for aquifer injection due to the potential for arsenic contamination.

The Ephraim City Drought Resiliency Project will provide new and more complete information to water managers. The City will be able to measure aquifer storage and determine how much water is being used from the City's storage tanks. This information will be used to show current and projected future water use allowing the City to better plan for its future storage and water needs.

The City's water management efficiency is expected to increase as the new project is incorporated into the existing system and the City's existing SCADA system. Water typically wasted from tank

overflows can now be captured and stored for future use. The existing well remains usable with the ability to blend water from the new well.

Ephraim City has received requests for water from homeowners outside of city boundaries that have failing wells. With a more secure water supply, Ephraim City has the ability to consider allowing these homes to connect to the city's water system. Without securing the supply, Ephraim City would not be able to contract to provide water beyond city limits. Water marketing activities are possible due to the project.

If the proposed project includes any of the following components, please provide the applicable additional information:

- ***Wells**.—What is the estimated capacity of the new well(s), and how was the estimate calculated? How much water do you plan to extract through the well(s)? Will the well be used as a primary supply or supplemental supply when there is a lack of surface supplies? Please provide information documenting that proposed well(s) will not adversely impact the aquifer it/they are pumping from (overdraft or land subsidence). At a minimum, this should include aquifer description, information on existing or planned aquifer recharge facilities, a map of the well location and other nearby surface water supplies, and physical descriptions of the proposed well(s) (depth, diameter, casing description, etc.). If available, information should be provided on nearby wells (sizes, capacities, yields, etc.), aquifer test results, and if the area is currently experiencing aquifer overdraft or land subsidence. Please describe the groundwater monitoring plan that will be undertaken and the associated monitoring triggers for mitigation actions. Describe how the mitigation actions will respond to or help avoid any significant adverse impacts to third parties that occur due to groundwater pumping.*

The new City well on Larson Lane is estimated to produce nearly 1,500 gallons per minute (gpm). This estimate is derived from production rates of other similar wells in the surrounding area. It is reasonable to believe that with the increased size of the new well the desired production can be obtained through proper planning and design efforts. This well will ultimately be responsible for delivering a total of 328 acre-feet of water once the well is completed. Additional water rights owned by Ephraim City can be transferred to the well so that all of the city's demand can be provided from the two wells.

This well will be used as a secondary water production source. This well is expected to run during the night to fill the city' storage tanks at the base of Ephraim Canyon during the late summer when the demand is highest. At times during heavy water usage (summer) there may came a time when this well will become the primary source of water and be required to provide water to Ephraim at all times of the day should surface water levels become insufficient as they have in the past.

The new well is not expected to have any negative effects on ground water levels in the aquifer. The existing irrigation well at this location has typically provided a large volume of water during the irrigation season since its construction in the 1930's. The water previously drawn by the existing irrigation well will now be drawn from the new potable water well near the same location. The existing irrigation well would typically run during the irrigation season from April through the end of October. The new potable water well is expected to similarly run for only part of the year, during

the driest times of the year, July through October, or during emergencies. Unless it is an emergency situation, the water being drawn from the culinary wells would have been pumped for agricultural use since the water rights were initially agricultural wells.

- ***New Water Marketing Tool or Program***.—*How does the new tool or program increase the flexibility of acquiring water on the open market? What is the scope of water users and uses that will benefit? Are there any legal issues pertaining to water marketing that could hinder project implementation?*

This project will now allow Ephraim City the ability to purchase underground water rights and transfer those rights to a well that does not have arsenic contamination issues. This water will be used to benefit nearly 12,000 individuals who receive water from the Ephraim City potable water system. Utah state law prevents any city from selling water rights once obtained so Ephraim City cannot sell water rights after they have been obtained even if quality issues make them unusable.

- *Metering/Water Measurement Projects.— To what extent are the methods tested/proven? To what degree will the project improve the ability to predict the onset of drought earlier and/or with more certainty? To what degree will the project improve the ability to anticipate the severity and magnitude of drought? To what degree will the project improve the likelihood/timing of detecting mitigation action triggers? Explain why this is a necessary sub-component of another eligible Drought Resiliency Project as described in Tasks A-C.*

The meters to be installed on the new well, and the southern water tanks to measure the overflow will provide the City with a more accurate description of the City's consumptive use and allow the city to be better informed in its future planning. Water meters on potable water systems is a widely used and accepted practice with well-defined benefits and reputable results. The information gleaned from the water meters at these locations along with other system sources will allow Ephraim city to accurately determine how long the stored tank water will last and allow the city adequate time to determine when to increase the water supply again.

- *Environmental/Wildlife Projects*
  - *What are the types and quantities of environmental benefits provided, such as the type of species and their numbers benefited, acreage of habitat improved, restored or protected, or the amount of flow provided? How was this estimate calculated?*
  - *What is the status of the species of interest? How has the drought impacted the species?*

Not applicable to this project.

Evaluation Criteria B – Drought Planning and Preparedness

Ephraim City has been working to build drought resiliency for a while now. Ephraim has maintained a Water Master Plan, source protections plans for the springs and well, Water Management and Conservations Plans, and recently completed an Aquifer Storage and Recovery (ASR) Assessment in cooperation with the Utah Geological Survey. This study identified locations that would be ideal for recharge and recovery. The study also identified where the best water quality could be found.

- *Attach a copy of the applicable drought plan, or sections of the plan, as an appendix to your application.*

Select pages of the Ephraim City Water Utility: Water Management and Conservation Plan, 2015 have been attached as Appendix F. Select pages from the ASR Assessment have also been included in Appendix I.

- *Explain how the applicable plan addresses drought.*

This plan addresses drought by discussing current water usage and potential water shortages in the near future. The Plan details historical water use and discusses the methods used thus far to increase water use efficiency and the resulting effects of these conservation methods. The City' current potable water system vulnerabilities are discussed and mitigation methods are proposed. This plan also provides recommendations to further increase water use efficiency by improvements to the City's system facilities, operational and management programs, and additional facilities.

- *Describe how your proposed drought resiliency project is supported by an existing drought plan.*

The Water Management and Conversation Plan specifically suggests implementing an Aquifer Storage Recovery (ASR) system to store water underground in the aquifer during periods of abundant water and withdraw that water later during periods of drought. The water saved will be used for recharging the aquifers, agriculture (surface irrigation), as well as maintaining stream and river flows and related habitats from the surface overflow which eventually ends up in the Sanpitch River west of town.

The Plan further identifies the need for an additional well to supply water to Ephraim City. With the Springs susceptible to varying production rates and potential failure due to fires or landslides, Ephraim has listed the need for an additional well as a high priority need to be completed within three years from the time of the report (2015). The City's existing well was mentioned as a polluted source and was not considered to be a viable option for safe potable water.

The ASR Assessment was completed to determine the feasibility of an ASR basin. The Assessment proposed a location for both a new well and a potential site for an ASR basin. These proposed locations are the locations planned for the new well and ASR basin.

- *Does the proposed project implement a goal or need identified in the drought plan?*

Yes, this project is classified by Ephraim City as a high priority need. This project will allow the City to supply much needed water immediately to its users, fortify the City's resiliency to drought through storing water during times of abundance, and benefit from current water savings efforts allowing the City to rely upon those reserves in future times of need.

- *Describe how the proposed project is prioritized in the referenced drought plan.*

This project is classified by Ephraim City as a high priority need. The new well in particular was discussed as a "high priority need" and should be constructed at the soonest possible time.

Evaluation Criterion C – Severity of Actual or Potential Drought Impacts

- *What are the ongoing or potential drought impacts to specific sectors in the project area if no action is taken (e.g., impacts to agriculture, environment, hydropower, recreation and tourism, forestry), and how severe are those impacts? Impacts should be quantified and documented to the extent possible.*

Should no action be taken, the City is expected to suffer severe drought conditions, water restrictions, and be forced to rely on the existing well with arsenic contamination to meet peak demands. Drought conditions would be brought on by the City's existing well water quality problems and the mountain springs yielding insufficient water supplies. The U.S. Drought Monitor has recently classified the Ephraim area to be in a severe drought. See U.S. Drought Monitor Utah dated February 6, 2018 in Appendix G. Historically, the mountain springs water production has coincided with the mountain snowpack of the winter before. The NRCS has recorded snowpack levels in the mountains near Ephraim since 1981 and these records have shown that snowpack levels have been steadily decreasing over the years. So far, 2018 is seeing the lowest snowpack levels, currently 22%, in the last 40 years. See Figure 3. Ephraim City is expecting 2018 to be an exceptionally dry summer.

For the last several years, Ephraim has resorted to using the City's existing well to help supplement spring water supplies. Water quality needs to be monitored to ensure that the water's arsenic levels do not exceed drinking water standards. During heavy times of use in the past, Ephraim has had to apply for temporary exemptions to the drinking water standards due to arsenic levels in the existing well. Should the arsenic levels in the well exceed the limits of the temporary exemption, the City would begin to instigate watering restrictions to residents limiting water use to indoor use only, schools would be required to stop watering fields, and the city would be required to stop watering parks, baseball and soccer fields, and the city cemetery. This would be done to help reduce the volume of arsenic contaminated water added to the system and help any stored tank water to sustain the City for as long as possible.

When Ephraim has issued water restrictions in the past the residents have been generally understanding of the situation. Watering restrictions have been issued by the City through social media (Facebook) and word of mouth. Watering restrictions have typically lasted only a few days at a time when some of the springs transmission lines are taken out of service after a land slide. However, water restrictions have become increasingly longer over the last several years as drought conditions have become more severe.

Ephraim is structured to only receive payment for water delivered to customers. During times of drought and watering restrictions the City typically delivers less water, thus reducing revenue. Revenue is further reduced by the additional costs associated with pumping the well.

Evaluation Criterion D – Project Implementation

- *Describe the implementation plan of the proposed project. Please include an estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates.*

A. Sign grant contract: September 2018
B. Begin design and permitting: October 2018
C. Complete NEPA: February 2019 (assumes a simplified EA will be necessary)
D. Complete design work: March 2019
E. Bid well and pipeline construction: March 2019
F. Begin construction: April 2019
G. Complete construction: August 2019
H. Begin ASR preliminary design and permitting: October 2019
I. Complete ASR permitting: September 2020

- *Describe any permits that will be required, along with the process for obtaining such permits.*

Please see the section labeled "Required Permits or Approvals" for this response.

- *Identify and describe any engineering or design work performed specifically in support of the proposed project.*

Significant engineering and study has been done to identify feasible locations for ASR, which also identified a preferred location for a new well that has good water quality. Preliminary design has been done to identify project costs including hydraulic modeling of the Ephraim water system to determine the best way to connect the new well to the existing system.

- *Describe how the environmental compliance estimate was developed. Have the compliance costs been discussed with the local Reclamation office?*

Environmental costs are expected to be minimal, so the recommended value of two percent was used as a cost estimate. We anticipate a subcontractor to do cultural clearance work and the subcontracted engineer to perform NEPA compliance work. The engineer has experience complying with NEPA requirements and has provided the cost estimate. The NEPA compliance cost estimate for this particular project has not been discussed with Reclamation. However, the engineer has prepared numerous EA documents for WaterSMART funded water projects.

Evaluation Criterion E – Nexus to Reclamation

- *How is the proposed project connected to a Reclamation project or activity?*

Reclamation is currently involved in the *Gobblefield Ditch Piping and Ephraim Tunnel Improvements* project. This project currently benefits Ephraim Irrigation Company and Ephraim City. It is expected to be a great benefit to the area. Ephraim City benefits from the improvements to the tunnel, as well as the improved potable water line that is being installed within the Ephraim Tunnel. This project will greatly improve the reliability of the water delivery system that supplies Ephraim City's potable water.

The Ephraim City Drought Resiliency Project is dependent on the Gobblefield *Ditch Piping and Ephraim Tunnel Improvements* project. As mentioned before, the City receives nearly 65% of its potable water through the Ephraim Tunnel that is being rehabilitated as result of this project.

- *Will the project benefit any tribes?*

No, local tribes will not benefit from this project.

- *Does the applicant receive Reclamation project water?*

No.

- *Is the project in the same basin as a Reclamation project or activity?*

Yes, the Ephraim City Drought Resiliency Project is located in the same basin as two other Reclamation projects. The first is the *Moroni Irrigation Company Improvements* project completed in 2012 near Moroni, Utah. The second is the *Gobblefield Ditch Piping and Ephraim Tunnel Improvements* project located northeast of Ephraim, Utah. The Ephraim Tunnel was built by Reclamation.

- *Will the proposed work contribute water to a basin where a Reclamation project is located?*

Yes, this project will continue to contribute water to a basin where a Reclamation project is located.

PROJECT BUDGET

Funding Plan and Letters of Commitment

Describe how the non-Federal share of project costs will be obtained. Reclamation will use this information in making a determination of financial capability.

The non-Federal share of project costs will be obtained through a Utah Division of Drinking Water (DDW) Loan. This type of project is the kind of project that DDW typically funds. A letter of support from DDW for the Ephraim City Drought Resiliency Project can be seen in Appendix B. A funding application to DDW is currently submitted and is pending approval. Ephraim City will also use reserve accounts, tax revenue, and revenue from utility assessments to make loan payments.

Project funding provided by a source other than the applicant shall be supported with letters of commitment from these additional sources.

A letter of funding commitment from DDW has not been issued at the time of this application submission. However, Ephraim City will be seeking funding approval before the DDW board on March 1, 2018. A letter can be provided after this meeting.

Commitment letters from third party funding sources should be submitted with your application. If commitment letters are not available at the time of the application submission, please provide a timeline for submission of all commitment letters.

It is anticipated that DDW will approve funding for the Ephraim City Drought Resiliency Project on March 1, 2018. A letter of funding will then be provided to Ephraim City and the City will submit said letter to Reclamation as required.

How will you make your contribution to the cost-share requirement, such as monetary and/or in-kind contributions and source funds contributed by the applicant (e.g. reserve account, tax revenue, and/or assessments).

Ephraim City will provide the designated cost-share funds from DDW loans, reserve accounts, tax revenue, and through utility assessments. Ephraim City has been saving money for this project and will provide 10% of the project costs from this account.

Describe any donations or in-kind costs incurred before the anticipated Project start date that you seek to include as project costs.

Ephraim City does not wish to include any donations or in-kind costs incurred before the anticipated project start date as project costs.

Describe any funding requested or received from other Federal partners.

Ephraim City has requested a $645,255 loan from DDW. Ephraim has also applied multiple times, without success, for funding under Section 595 from the U.S. Army Corps of Engineers. Lack of success in receiving Section 595 funds has caused Ephraim City to seek other funding sources due to the critical nature of this project.

Describe any pending funding requests that have not yet been approved and explain how the project will be affected if such funding is denied.

A loan application to DDW is currently submitted and is pending approval. Should this funding not be approved, Ephraim City will then request emergency funding from the DDW. Ephraim City will seek funding through other state agencies if funding is not obtained from DDW.

Please include the following chart to summarize all funding sources. Denote in-kind contributions with an asterisk (*).

Table: Summary of Non-Federal and Federal Funding Sources

Funding Sources	Funding Amount
Non-Federal Entities	
1. Participant (Cash)	$143,900.00
2. Participant (Loan)	$645,255.00
Non-Federal Subtotal	$788,645.00
Other Federal Entities	$0.00
Requested Reclamation Funding	$645,255.00
Total Project Funding	**$1,433,900.00**

Budget Proposal

Table: Funding Sources

Funding Sources	Quantity Type	Total Cost
Recipient Funding	55%	$788,645.00
Reclamation Funding	45%	$645,255.00
Other Federal Funding	0%	$0.00
Totals	**100%**	**$1,433,900.00**

Funding Group II Request			
Year	Year 1 (FY 2019)	Year 2 (FY2020)	Year 3 (FY 2021)
Funding Requested	$575,255.00	$50,000.00	$20,000.00

Table: Budget Proposal

Budget Item Description	Computation		Quantity Type (hours/days)	Total Cost
	$/Unit	Quantity		
Salaries And Wages				
Monthly Project Group Meetings	$0.00	0	N/A	$0.00
Data Collection	$0.00	0	N/A	$0.00
Fringe Benefits	$0.00	0	N/A	$0.00
Travel	$0.00	0	N/A	$0.00
Equipment	$0.00	0	N/A	$0.00
Supplies/Materials	$0.00	0	N/A	$0.00
Contractual/Construction [1]				
Contractor - Construction	See Appendix D		Varies	$1,125,400.00
WaterSMART Coordination	See Appendix C		Varies	$10,000.00
Design Engineering	See Appendix C		Varies	$139,800.00
Construction Review	See Appendix C		Varies	$39,900.00
ASR Design and Permitting	See Appendix C		Varies	$50,000.00
Environmental and Regulatory Compliance - USBR (2%)	$27,400.00	1	Lump Sum	$27,400.00
Other – Legal and Admin (3%)	$41,400.00	1	Lump Sum	$41,400.00
Total Direct Costs				**$1,433,900.00**
Total Project Costs				**$1,433,900.00**

[1] See Appendices C and D for additional information on budget costs.

[1] Contracts should be broken out into specific line items. You may attach a separate, detailed budget for each contract to adequately address all contractor budget items.

Budget Narrative

Salaries and Wages

Please see the estimated project costs in Appendix C. Indirect costs will be absorbed by the Ephraim City budget and will not be submitted for payment from the grant.

Salary and wage information for engineering is outlined in the "Contractual" section below. Salary and wage information for the contractor is unknown since the project has not been bid.

Fringe Benefits

No fringe benefits are included in the project.

Travel

Any travel expenses for engineering work are included under the "Contractual" section.

Equipment

No equipment costs are included. Construction equipment will be provided by the selected contractor.

Materials and Supplies

The only materials and supplies are those included for the engineer under the "Contractual" section.

Budget Form

Forms SF-424C and SF-424D are enclosed with the application for federal assistance SF-424.

Contractual

Two portions of the project will use consultants and contractors. First, an engineering firm will be retained to provide engineering and permitting services, which includes: WaterSMART coordination, design engineering, permitting and construction review. Second, a contractor will be solicited to provide construction services. Detailed cost estimates for engineering (Manpower Estimate) and construction services (Engineer's Estimate of Probable Costs) are shown in Appendices C and D, respectively.

The billing rates for Franson Civil Engineers are shown on the following table.

Table: Billing Rate for Franson Civil Engineers
Effective January 1, 2018

Personnel Classification	Fee Schedule ($/hour)
Program Manager	$169
Senior Manager	$149
Senior Engineer	$129
Senior Field Manager	$120
Staff Engineer	$110
Senior Designer	$99
Engineer I	$90
Designer	$79
Engineering Assistant	$85
Engineering Intern	$65
Office Assistant	$60
Clerk	$50

No fringe costs are included. The basis of the billing rate computation is as follows:

Table: Billing Rate Computation

Wage Percent	30%
Benefits	15%
Overhead	40%
Profit	15%

Cost for materials and supplies are shown in the "Other Direct Costs" column of the Engineering Manpower Estimate enclosed in Appendix C. These costs are for printing and copying construction drawings, specifications, reports, letters, permits and other documents related to the project. The cost for printing is as follows:

Copy/print – 8.5x11	$0.04/copy or print
Copies – 11x17	$0.08/copy or print
Color Copy/Print	$0.25/copy or print
Oversize copies/prints	$1.00/sq. ft.

No information is available for the contractor at this time since the project has not been bid or awarded. Contractor costs are based on the Engineer's Estimate of Probable Construction Costs (see Appendix D).

Environmental and Regulatory Compliance Costs

Environmental costs are expected to be minimal, so the recommended value of two percent was used as a cost estimate. We anticipate a subcontractor to do cultural clearance work and the engineering consultant to perform NEPA compliance work.

Other Expenses

Legal and administration costs were added to the project based on resolution of legal issues related to permitting, water rights, land transfer, right-of-way, etc. that will occur during design and construction of the project. Because of the unknown nature of these costs, an estimate of three percent was used, based on past project experience.

A total of $10,000 was budgeted for coordination with Reclamation for the WaterSMART grant. This amount would include the costs to complete a grant contract with Reclamation, provide semi-annual reports, and create a final construction report and finalize repayment agreements, progress performance reports, and to coordinate requests for reimbursement. This amount is included in the "Contractual" cost item under engineering.

Indirect Costs

Not applicable to this project.

Total Costs

The total cost of the proposed project is $1,433,900.

Environmental and Cultural Resources Compliance

- *Will the proposed project impact the surrounding environment (e.g., soil [dust], air, water [quality and quantity], animal habitat)? Please briefly describe all earth-disturbing work and any work that will affect the air, water, or animal habitat in the project area. Please also explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.*

The Ephraim City Drought Resiliency Project is not expected to have an adverse impact on the environment. The well and pipeline are planned to follow existing ditches, city streets, and currently cultivated agricultural lands. The new well construction will minimally disturb the surface as all work will be done to meet best management practices to minimize environmental impacts. The pipeline installation work will be completed using best management practices and any disturbed areas will be restored back to their existing state or better.

- *Are you aware of any species listed or proposed to be listed as a Federal threatened or endangered species, or designated critical habitat in the project area? If so, would they be affected by any activities associated with the proposed project?*

Ephraim City is not aware of any species listed or proposed to be listed as a Federal threatened or endangered species or designated critical habitat in the project area. The following table identifies threatened or endangered species for the State of Utah.

Table: Federal Threatened or Endangered Species

Type	Name	Status	Location
Bird	Greater Sage-Grouse	Candidate	State of Utah
Bird	Yellow-Billed Cuckoo	Candidate	State of Utah
Fish	Least Chub	Candidate	Large Portion of Utah
Fish	June Sucker	Endangered	Large Portion of Utah
Flowering Plant	Ute Ladies'-Tresses	Threatened	Large Portion of Utah
Mammal	Canada Lynx	Threatened	Large Portion of Utah

There are four federally recognized endangered species in Sanpete County, Utah; the Humpback Chub, Colorado Pikeminnow, Bonytail Chub, and the Razerback Sucker. These species are normally associated with the Colorado River Basin. According to the Utah State Water Plan - Sevier River Basin, the Least Chub is listed as an endangered species. The Least Chub is only found in the Bonneville Basin, particularly in the Salt Lake, Utah Lake, and Sevier Lake drainage areas. The project area drains to Sevier Lake. The Spotted Frog is listed as a federal-candidate species. The Spotted Frog population exists near riparian areas in the San Pitch drainage basin. Cottonwood Creek drains to the San Pitch River.

- *Are there wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as "Waters of the United States?" If so, please describe and estimate any impacts the proposed project may have.*

There are no wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as "Waters of the United States" according to CWA resources.

- *When was the water delivery system constructed?*

Ephraim City was established in 1854 and the water system is believed to have been initially constructed sometime around the late 1800's. Improvements and replacements have been occurring since the original system was installed. The system has been in service for well over 100 years.

- *Will the proposed project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.*

Irrigation facilities are not expected to be impacted by this project.

- *Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the Nation Register of Historic Places? A cultural resources specialist at your local Reclamation office or the State Historic Preservation Office can assist in answering this question.*

The Ephraim City Drought Resiliency Project will not impact any historic places near the project's proposed location.

- *Are there any known archeological sites in the proposed project area?*

There are no known archeological sites within the proposed project area.

- *Will the project have a disproportionately high and adverse effect on low income or minority populations?*

No, the project is not expected to have a disproportionately high and adverse effect on low income or minority populations.

- *Will the project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands?*

The project is not expected to limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands.

- *Will the project contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area?*

No, the project is not expected to contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area. Project documents and specifications will be prepared to ensure that noxious weeds are controlled and non-native species are not introduced during the project.

REQUIRED PERMITS OR APPROVALS

The Ephraim City Drought Resiliency Project will require the following permits. Plans to obtain these permits are also described.

Permit or Approval	Plan to Obtain
Ephraim City Project Approval	Letters of Support from the Ephraim City Mayor and the City Council will be obtained during this application process.
Public Support	The City of Ephraim will hold public meetings to inform the public of the projects benefits and garner the public's support.
Utah State Engineer	A Change Application is required. This application has been submitted and is expected to be approved. Approval and permits to construct the ASR basin will be submitted with the supporting studies and information required for approval.
City and County Construction Permits	Construction Permits for the proposed well, connection pipeline, and the planned ASR site will be prepared and obtained from Ephraim City and Sanpete County. Storm Water Pollution Prevention Plans (SWPPP) and any other typical construction permits will be completed as part of the construction process by contractors once the project has been designed and awarded for construction.
Division of Drinking Water Funding Approval	A funding application is being prepared. A Letter of Support from DDW has been submitted as part of this application. DDW also needs to approve any changes to the culinary water system.
Pipeline Easements	Some of the easements for the planned connection pipeline have already been obtained. Continued efforts are being made to finalize any remaining easements needed for the project.
Sanpete County Water Conservancy District Approval	A Letter of Support for the Ephraim City Drought Resiliency Project has been obtained as part of this application.
Ground Water Recharge and Recovery Permits	These permits will be obtained as part of the Design and Permitting process for the ASR recharge basin. The concept of the design will be discussed with the Utah Division of Water Rights prior to application.

EXISTING DROUGHT CONTINGENCY PLAN

Please see Appendix F for Ephraim City's Drought Contingency Plan (Ephraim City Water Utility and Conservation Plan).

LETTERS OF SUPPORT

Please see Appendix B for Letters of Support for the Ephraim City Drought Resiliency Project.

OFFICIAL RESOLUTION

An official resolution by the Ephraim City Council will be submitted at a later time.

Appendix A

Official Resolution
(to be submitted later)

Appendix B

Utah Board of Water Resources Letter

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF DRINKING WATER
Marie E. Owens, P.E.
Director

February 8, 2018

Bureau of Reclamation
Attn: Mr. Kevin Connolly
Denver Federal Center
Bldg. 56, Rm. 1000
6th Avenue and Kipling Street
Denver, CO 80225

Re: Ephraim City Drought Resiliency Project

Dear Mr. Connolly:

The Utah Division of Drinking Water (Division) supports Ephraim City's efforts to seek funding through the USBR's WaterSMART Grant program. The new well and connecting pipeline will greatly benefit Ephraim City by ensuring residents an adequate supply of quality drinking water from a more reliable source, especially during drought conditions.

The Division also supports the City's investigation into aquifer storage and recovery as another tool to combat the effects of prolonged drought on its drinking water sources.

Regards,

Michael J. Grange, P.E.
Construction Assistance Section Manager
Utah Division of Drinking Water

cc: Chad Parry, Public Works Director, Ephraim City, chad.parry@ephraimcity.org
Lauren Ploeger, P.E., Franson Civil Engineers, lploeger@fransoncivil.com

Appendix C

Engineering Manpower Estimate

Ephraim City Culinary Well Master Plan

Probable Cost Opinion for Engineering Services

(Rate Table Attached)

Task Description	Hours By Personnel Category						Total Hours	Total Fee
	1	3	7	6	9	11		
	Principal Engineer	Senior Engineer	Engineer I	Senior Designer	Engineering Assistant	Office Assistant		
Phase 1 - Test Well/Existing Well Rehab.								
Task 1. General Project Management Tasks	8	1				2	11	$1,601
Task 2. Water Rights	3	40					43	$5,667
Task 3. Change Application (if applicable)	2	20	2			4	28	$3,338
Task 4. Water Management and Conservation Plan		4	8			4	16	$1,476
Task 5. Design Critera Memo	1	4				2	7	$805
Task 6. Test Well Approval and PER	1	20	8		4	2	35	$3,929
Task 7. Well Design - Well Plan Sheets	1	8	3	12	2	2	28	$2,949
Task 8. Well Specifications	2	4	12		8	2	28	$2,734
Task 9. Bidding and Part Time Construction Management	20	20	80		8	2	130	$13,960
Task 10. City Coordination Meetings	8	8	40			1	57	$6,044
Task 11. Existing Well Rehabilitation	8	20	32			1	61	$6,872
Task 12. Close Out	1	4				3	8	$865
Expenses								$2,000
SUBTOTAL	**55**	**153**	**185**	**12**	**22**	**25**	**452**	**$52,240**
Phase 2 - Culinary Well Design								
Task 1. General Project Management Tasks	4	2				3	9	$1,114
Task 2. Design Critera Memo (Evaluate Test Well Data)	4	6	0			1	11	$1,510
Task 3. Well Design - Well Plan Sheets	2	8	1	8			19	$2,252
Task 4. Well Specifications	2	8	4		4	2	20	$2,190
Task 5. Well Application and Approval Process	1	16	8			3	28	$3,133
Task 6. Bidding and Part Time Construction Management	10	24	32		2	1	69	$7,896
Task 7. Close Out and Check List for DEQ	1	8	4			2	15	$1,681
Task 8. Source Protection Plan	8	30	30	16	5	1	90	$9,991
Expenses							0	$3,000
SUBTOTAL	32	102	79	24	11	13	261	$32,767
Phase 3 - Well House Design								
Task 1. General Project Management Tasks	8	3					11	$1,739
Task 2. Design Critera Memo	2	4	2			1	9	$1,094
Task 3. Wellhouse Design - Plan Sheets	4	20	40	40	8	1	113	$11,556
Task 4. Wellhouse Specifications	2	10	8		8	3	31	$3,208
Task 5. Wellhouse Application and Approval Process	2	10	4			1	17	$2,048
Task 6. Bidding and Part Time Construction Management	4	32	60		8	5	109	$11,184
Task 7. Close Out	1	2	6			4	13	$1,207

Ephraim City Culinary Well Master Plan

Probable Cost Opinion for Engineering Services

(Rate Table Attached)

Task Description	Hours By Personnel Category						Total Hours	Total Fee
	1	3	7	6	9	11		
	Principal Engineer	Senior Engineer	Engineer I	Senior Designer	Engineering Assistant	Office Assistant		
Expenses							0	$3,000
SUBTOTAL	**23**	**81**	**120**	**40**	**24**	**15**	**303**	**$35,036**
Phase 4 - Connection Pipeline/Booseter Station Design								
Task 1. General Project Management Tasks	10	8					18	$2,722
Task 2. Design Critera Memo	2	8	4			1	15	$1,790
Task 3. Pipeline Design (survey, hydraulic model, etc.)	8	40	80	60	10	1	199	$20,562
Task 4. Pipeline Specifications	3	8	16		8	3	38	$3,839
Task 5. Drinking Water Approval Process	4	16	16	20	4	1	61	$6,560
Task 6. Bidding and Part Time Construction Management	8	40	120		4	5	177	$17,952
Task 7. Close Out	1	2	6			4	13	$1,207
Expenses							0	$5,000
SUBTOTAL	**36**	**122**	**242**	**80**	**26**	**15**	**521**	**$59,632**
Project Totals	**146**	**458**	**626**	**156**	**83**	**68**	**1537**	**$179,675**

ASR for WaterSMART

Task Description	Hours By Personnel Category						Total Hours	Total Fee
	1	3	7	6	9	11		
	Principal Engineer	Senior Engineer	Engineer I	Senior Designer	Engineering Assistant	Office Assistant		
Phase 5 - ASR Permitting and Preliminary Design								
Task 1. General Project Management Tasks	8	1				2	11	$1,601
Task 2. Water Rights	3	20					23	$3,087
Task 3. Preliminary Design	8	40	60	12		3	123	$13,280
Task 4. Recharge Permit	3	60	8	10		4	85	$10,197
Task 5. Recovery Permit	8	80	48	8		2	146	$16,904
Task 6. City Coordination Meetings	8	4	2			0	14	$2,048
Task 7. Close Out	1	4				3	8	$865
Expenses								$2,000
SUBTOTAL	**39**	**209**	**118**	**30**	**0**	**14**	**410**	**$49,982**

Ephraim City Culinary Well Master Plan

Probable Cost Opinion for Engineering Services

(Rate Table Attached)

Permitting for WaterSMART

Task Description	Hours By Personnel Category						Total Hours	Total Fee
	1	3	7	6	9	11		
	Principal Engineer	Senior Engineer	Engineer I	Senior Designer	Engineering Assistant	Office Assistant		
Environmental Compliance								
Task 1. General Project Management Tasks	4	8				2	14	$1,828
Task 2. Coordination With Reclamation	1	8					9	$1,201
Task 3. Cultural Resource Study Coordination	2	8				2	12	$1,490
Task 4. Cultural Resource Subconsultant							0	$4,000
Task 5. Prepare Simplified EA Document	8	80		20	10	2	120	$14,622
Task 6. Public Comment Meeting	8	12				0	20	$2,900
Task 7. Close Out	1	4				3	8	$865
Expenses								$500
SUBTOTAL	**24**	**120**	**0**	**20**	**10**	**9**	**183**	**$27,406**

Appendix D

Engineer's Estimate of Probable Construction Costs

Ephraim Well and Connection Pipeline

COST ESTIMATE

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
WELL				
Mobilization	1	LS	$ 35,000.00	$ 35,000
Test Well Drilling	300	LF	$ 150.00	$ 45,000
Test Well Pump Testing	40	HR	$ 350.00	$ 14,000
Abandon (Existing and Test Well)	2	EA	$ 7,500.00	$ 15,000
Furnish & Install 26" Carrier Casing	100	LF	$ 400.00	$ 40,000
Grout Surface Seal	100	LF	$ 95.00	$ 9,500
Drilling 24" Diameter Borehole	300	LF	$ 185.00	$ 55,500
Furnish & Install 18" Diameter Well Casing	100	LF	$ 90.00	$ 9,000
Furnish & Install 18" Well Screen	200	LF	$ 250.00	$ 50,000
Furnish & Install 1500 gpm (12" Diameter) Pump	1	LS	$ 100,000.00	$ 100,000
Furnish & Install Telemetry Tube	300	LF	$ 7.50	$ 2,250
Furnish & Install Piezometer Tube	300	LF	$ 7.50	$ 2,250
Furnish & Install Gravel Pack	30	TON	$ 450.00	$ 13,500
Provide Geophysical Log of Well	1	LS	$ 12,500.00	$ 12,500
Well Plumbness Test	1	LS	$ 4,500.00	$ 4,500
Video Well Log	1	LS	$ 3,500.00	$ 3,500
Develop Well	48	HR	$ 525.00	$ 25,200
Test Pump Equipment	1	LS	$ 29,500.00	$ 29,500
Pump Testing	36	HR	$ 350.00	$ 12,600
Disinfect Well	1	LS	$ 2,000.00	$ 2,000
SUBTOTAL				**$ 480,800**
WELL HOUSE				
Mobilization	1	LS	$ 20,000.00	$ 20,000
Concrete Foundation & Floor	30	CY	$ 450.00	$ 13,500
Decorative Concrete Block (Wall)	1,975	EA	$ 5.80	$ 11,455
Roof Truss	18	EA	$ 420.00	$ 7,560
Insulated Steel Door	1	LS	$ 500.00	$ 500
Roll Up Steel Door	1	LS	$ 2,000.00	$ 2,000
Roof Hatch (for Pump)	1	LS	$ 6,000.00	$ 6,000
Electrical Supply and Control Panels	1	LS	$ 30,000.00	$ 30,000
Interior Plumbing	1	LS	$ 8,000.00	$ 8,000
Chlorinator	1	LS	$ 15,000.00	$ 15,000

CONTINUED

Ephraim Well and Connection Pipeline

COST ESTIMATE (CONTINUED)

ITEM	QUANTITY	UNIT	UNIT COST	TOTAL COST
WELL HOUSE (CONTINUED)				
Plywood	1,200	SF	$ 1.90	$ 2,280
Roofing Materials	1,200	SF	$ 2.90	$ 3,480
Trim and Finishing	1	LS	$ 3,500.00	$ 3,500
Interior Insulation	3,300	SF	$ 1.25	$ 4,125
Interior Paneling & Ceiling	3,100	SF	$ 1.80	$ 5,580
HVAC	1	LS	$ 5,000.00	$ 5,000
SUBTOTAL				**$ 137,980**
CONNECTION PIPELINES				
14" C905 PVC Pipe	1,350	LF	$ 50.00	$ 67,500
12" C900 PVC Pipe	900	LF	$ 40.00	$ 36,000
10" C900 PVC Pipe	800	LF	$ 30.00	$ 24,000
8" C900 PVC Pipe	5,200	LF	$ 20.00	$ 104,000
Well Connection Piping, Valves, Meters, etc	1	LS	$ 15,000.00	$ 15,000
Valves	6	EA	$ 4,000.00	$ 24,000
Easements	1	LS	$ 20,000.00	$ 20,000
Road Repairs	6,900	LF	$ 18.00	$ 124,200
SUBTOTAL				**$ 414,700**
EXISTING WELL REHABILITATION				
Well Redevelopment	48	HR	$ 525.00	$ 25,200
Grout and Bedrock Seal	25	LF	$ 425.00	$ 10,625
Blending System (Valves, Meters, Piping)	1	LS	$ 25,000.00	$ 25,000
SUBTOTAL				**$ 60,825**
EMERGENCY SUPPLY PIPING				
14" Steel Piping	50	LF	$ 200.00	$ 10,000
Valves	3	EA	$ 7,000.00	$ 21,000
SUBTOTAL				**$ 31,000**
TOTAL CONSTRUCTION COSTS				
GRAND TOTAL				**$ 1,125,305**

COST ESTIMATE JUSTIFICATION

1.0 WELL

1.1 **Mobilization:** Rocky Ridge. Assumed to be roughly equal given distance and size of well.

1.2 **Test Well Drilling:** Verbal communication with Grimshaw Drilling. We are assuming that most of the casing will be unrecoverable.

1.3 **Test Well Pump Testing:** Multiple bids from Rocky Ridge as well as the Grimshaw bid. Testing times were taken as an average of different locations.

1.4 **Abandon Well:** Cost of bentonite grout from RSMeans (03 62 13). Volumes are variable and intended to be a rough estimate.

1.5 **Carrier Casing:** Grimshaw Estimate. 100 feet deep as required by DEQ Standards.

1.6 **Grout Surface Seal:** Ibid.

1.7 **24" Borehole:** Grimshaw Estimate. The depth is our best estimate given gravimetric surveys and the well logs of wells taken in the area.

1.8 **18" Well Casing:** Grimshaw Estimate. 100 feet for the surface seal per DEQ standards.

1.9 **18" Well Screen:** Grimshaw Estimate. 200 feet for the remainder of the 300-foot total depth.

1.10 **1500 gpm Pump:** Rhino Pumps Email. Carl Haehl from Rhino Pumps provided a preliminary design assuming the likely depth of the pump and pressures of 120 psi in the system.

1.11 **Telemetry Tube:** Grimshaw Estimate.

1.12 **Piezometer Tube:** Ibid. (A second tube for Piezometer Readings).

1.13 **Gravel Pack:** Grimshaw Drilling. The volume will be similar given size of well.

1.14 **Geophysical Log:** Rocky Ridge Estimate.

1.15 **Well Plumbness:** Rocky Ridge Estimate.

1.16 **Video Well Log:** Rocky Ridge Estimate.

1.17 **Develop Well:** Rocky Ridge and Grimshaw Estimates. Rates from multiple bidders.

1.18 **Test Pump Equipment:** Rocky Ridge Estimates.

1.19 **Pump Testing:** Rocky Ridge and Grimshaw Estimates. Rates from multiple bidders.

1.20 **Disinfect Well:** Rocky Ridge and Grimshaw Estimates.

2.0 WELL HOUSE

2.1 **Mobilization:** Assumed to be roughly 10% of construction costs.

2.2 **Concrete:** RSMeans (03 30 53), Averaged for footings, foundation, and floor.

2.3 **Concrete Blocks (Wall):** RSMeans (04 22 10). Assumed 20 ft x 15 ft well house.

2.4 **Roof Truss:** Professional Judgement.

2.5 **Insulated Steel Door:** Professional Judgement.

2.6 **Roll Up Steel Door:** Professional Judgement.

2.7 **Roof Hatch:** Professional Judgement. Used to raise and lower the pump during maintenance.

2.8 **Electrical Supply and Control Panels:** Professional Judgement.

2.9 **Interior Plumbing:** Professional Judgement.

2.10 **Chlorinator:** Waterford Systems. The model used in pricing was the Accutab Power Pro 3150.

2.11 **Plywood (Roof):** Professional Judgement.

2.12 **Roofing Materials:** Professional Judgement.

2.13 **Trim and Finish**: Professional Judgement.

2.14 **Interior Insulation**: Professional Judgement.

2.15 **Interior Paneling and Ceiling**: Professional Judgement.

2.16 **HVAC**: Professional Judgement.

3.0 CONNECTION PIPELINES

3.1 **14" C905 PVC:** RSMeans (33 11 13). The price includes excavation, installation, and backfill. Pavement covered in 3.8. Also shown in recent bids from FCE projects.

3.2 **12" C900 PVC:** Ibid.

3.3 **10" C900 PVC:** Ibid.

3.4 **8" C900 PVC:** Ibid.

3.5 **Well Connection Piping, Valves, Meters:** Rocky Mountain Valve. Email and Phone Calls.

3.6 **Valves:** Ibid.

3.7 **Easements:** Professional judgement, property values may vary.

3.8 **Road Repairs:** RSMeans (32 12 16). 2" of Pavement, 6" Roadbase, 6 feet wide. Some dirt roads not counted.

4.0 EXISTING WELL REHABILITATION

4.1 **Well Redevelopment:** Same cost as development (1.17), repeated.

4.2 **Grout and Seal:** Grimshaw Drilling. Conversation with Aaron, the cost is pressure grouting the lower portion of the well to seal off the bedrock zone.

4.3 **Blending System:** Rocky Mountain Valve. Cost for one flow meter, one controller, one actuated butterfly valve (to control flow of existing well for mixing).

5.0 EMERGENCY SUPPLY PIPING

5.1 **14" Steel Piping:** RSMeans (33 11 13). Length estimated.

5.2 **Valves:** Rocky Mountain Valve. Easier installation costs because of location.

6.0 INFORMATION DOCUMENTATION

Grimshaw Drilling Estimate. "300' Well" Feb 6, 2018.

Rocky Ridge Bid Opening. (Grimshaw Drilling, Boart Longyear Co., Stewart Brothers Drilling), "Rocky Ridge Culinary Well" August 16, 2017.

Rhino Pumps. Email, February 9, 2018.

RSMeans Heavy Construction Cost Data 2015 (29th Edition).

Appendix E

Letters of Support

Ephraim City Corporation

Richard Squire, Mayor
5 South Main, Ephraim, Utah 84627

Ephraim
Rich in Heritage. Invested in the Future.

February 5, 2018

Bureau of Reclamation
Attn: Mr. Kevin Connolly
Denver Federal Center
Bldg. 56, Rm. 1000
6th Avenue and Kipling Street
Denver, CO 80225

Re: Ephraim City Drought Resiliency Project

Dear Mr. Connolly:

The Ephraim City Council has voted to fully support the efforts of Ephraim City Staff in seeking funding through the USBR's WaterSMART Grant program. The construction of a new well and connection pipeline will greatly benefit Ephraim City by providing residents with quality culinary water from a dependable source. The aquifer storage and recovery preparation efforts will allow the City to further improve the quantity and quality of water in the future. Ephraim City has been saving money for the drilling of a new well. In addition to the funds saved for the new well, Ephraim City will obtain additional funding from the Utah Division of Drinking Water.

Sincerely,

Richard Squire
Mayor, Ephraim City

Sanpete County Courthouse
160 North Main
Manti, Utah 84642

Commissioners: Scott Bartholomew (Chair), Claudia Jarrett, Steven J. Lund

Assessor:	Kenneth Bench
Attorney:	Brody L. Keisel
Auditor:	Ilene B. Roth
Clerk:	Sandy Neill
Recorder:	Reed D. Hatch
Sheriff:	Brian Nielson
Treasurer:	Amy Willden

February 5, 2018

Bureau of Reclamation
Attn: Mr. Kevin Connolly
Denver Federal Center
Bldg. 56, Rm. 1000
6th Avenue and Kipling Street
Denver, CO 80225

Re: Ephraim City Drought Resiliency Project

Dear Mr. Connolly:

It is our intent to fully support the efforts of Ephraim City as they seek funding through the USBR's WaterSMART Grant program. The construction of the new well and connection pipeline will greatly benefit Ephraim City by providing residents with quality culinary water from a dependable source. The planning and preparation that Ephraim City has conducted thus far has been a good example of what is needed to manage the effects of drought. The aquifer storage and recovery preparation efforts will be a great example of drought resiliency planning to other communities that face similar issues in our county.

Sincerely,

Scott Bartholomew
Sanpete County Commissioners

Claudia Jarrett

Steven J. Lund

EPHRAIM IRRIGATION COMPANY
PO Box 692
358 E 300 S
Ephraim, Utah 84627

February 5, 2018

Bureau of Reclamation
Attn: Mr. Kevin Connolly
Denver Federal Center
Bldg. 56, Rm. 1000
6th Avenue and Kipling Street
Denver, CO 80225

Re: Ephraim City Drought Resiliency Project

Dear Mr. Connolly:

It is our intent to fully support the efforts of Ephraim City as they seek funding through the USBR's WaterSMART Grant program. The construction of the new well and connection pipeline will greatly benefit Ephraim City by providing residents with quality culinary water from a dependable source. The aquifer storage and recovery preparation efforts are also fully supported by the Ephraim Irrigation Company. Ephraim Irrigation Company is also moving forward with drought resiliency plans and exploring the possibility of storing water in the aquifer. Both entities have cooperated on projects in the past and we look forward to continuing this in the future.

Sincerely,

Michael D. Larson
President
Ephraim Irrigation Company

Appendix F

Ephraim City Water Utility and Conservation Plan

(Select Pages)

Ephraim City Water Utility and Conservation Plan Update

May 2015

A conservation report, updating the previous water utility conservation report of Ephraim City, in compliance with the Utah Water Conservation Plan Act (73-10-32, UCA). This report was updated and compiled by City Engineer Bryan Kimball, and Public Works Director Chad Parry.

Section 1: Background Information

1.1 History

Ephraim City has been supplying culinary drinking water for over 100 years. When the city was founded water was supplied by Cottonwood Creek which runs through the community. As time went on springs were developed in the nearby mountains east of town and wood staved pipe was used to carry the water to the community. The springs and delivery systems have been updated over the years. A map of the overall water system and the distribution system within the City is attached in Appendix A and Appendix B, respectively.

1.2 Population

The 2013 Census listed Ephraim as having 6,431people. The projected population for 2050 is estimated as 8,996. (*Source: Utah Governor's Office of Planning and Budget)*

1.3 Goals and Objectives

The primary goal of the Ephraim Water Utility Service is to provide, safe, adequate water so that the culinary water needs of the City continue to be met.

Specific objectives include the following:

- To make sure the springs comply with all State and Federal health and safety standards
- To make sure the culinary well meets all State and Federal health and safety standards
- To provide all fire suppression water storage as required by State and Federal health and safety standards
- To ensure adequate spacing of fire hydrants throughout the City, and ensure that each hydrant maintains proper fire flow
- To ensure that Water Department employees have the required State water certification
- To have all water mains at least 8 inches or larger

1.4 Recent accomplishments for water management and development

- Operator certification
- Water sources meet all Federal and State requirements
- 2000-2015: Upgraded existing water lines and installed new water lines to provide better fire flows throughout the town
- 2001-2015: Repaired damaged and dilapidated culinary spring collection systems
- 2007: Completed the Water Master Plan, rate study, impact fee study, and capital facilities plan
- 2008: Installed additional pressure reducing stations to improve water service to south pressure zone in the City
- 2010: Constructed a new 1.5 MG tank to provide emergency storage and provide for future growth
- 2012: Purchased additional water rights from an existing well, enough for approximately 300 new homes.

- 2015: Secured loan funding to rehabilitate and improve the existing aging and deteriorating tunnel, which provides up to 65% of the city's culinary water supply.

Section 2: Existing Resources

2.1 Water Sources

Ephraim City has one existing well and a number of existing springs which provide water for Ephraim City. (see Appendix A for a system map) During normal water years, the springs, which are east of Ephraim in the mountains, are currently able to provide 100% of the indoor and outdoor water demand for the City. The well is currently used only sparingly to supplement the springs during extended periods of drought and/or low flows from the springs. The sources for Ephraim City are summarized as follows:

- South Little Spring
- North Little Spring
- Big Spring
- Curley Hill Spring
- Black Stump Spring
- Sawmill Spring (1-5)
- Beck Spring
- Parry Spring
- Birch Spring
- Twin Spring
- Riddley Spring
- Maple Sparing
- Left Hand Fork Spring
- GABEEC Spring
- Ephraim Culinary Well

The Ephraim Water Master Plan (2007) acknowledged the large fluctuations of the spring flows, and identified the need for additional sources to provide redundancy should the existing springs become damaged due to landslide or unable to provide adequate flows for any other reason. To meet this need, Ephraim has listed the need for a new well with at least 1,000 gpm capacity located preferably near the mouth of the Canyon, as a high priority need to be completed within the 0-3 year time period.

2.2 Water Storage

The following represents a summary of the existing water storage serving Ephraim City:

• Mill Hill Steel Tank	1 MG
• Mill Hill Concrete Tank	1 MG
• Lower Canyon Concrete Tank 1	0.75 MG
• Lower Canyon Concrete Tank 2	0.03 MG
• Lake Hill Concrete Tank	1 MG
• Ropes Course Concrete Tank	1.5 MG
Total Storage	**5.28 MG**

Section 3: Current and Future Water Use and Effects of Conservation

3.1 Current Water Use

There are currently 1,543 metered connections in Ephraim's culinary water system. The Census estimates the 2013 population of Ephraim to be 6,431. The recent metered usage for Ephraim City is shown below in Figure 2. (See Appendix C for additional metered water usage data broken down by type of use). Average use per capita per day is shown in Figure 3.

Figure 2: Total Metered Water Use for Ephraim

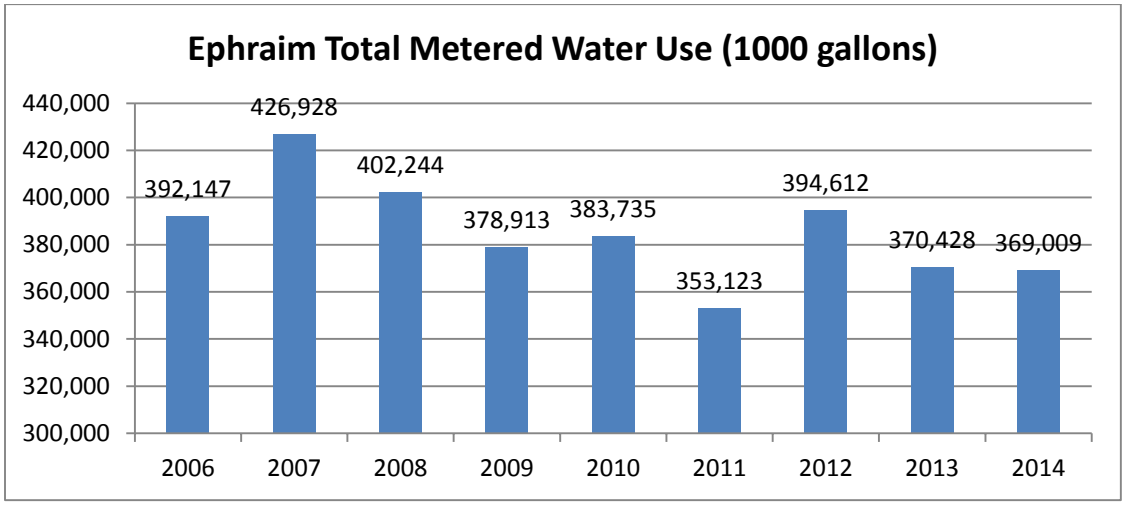
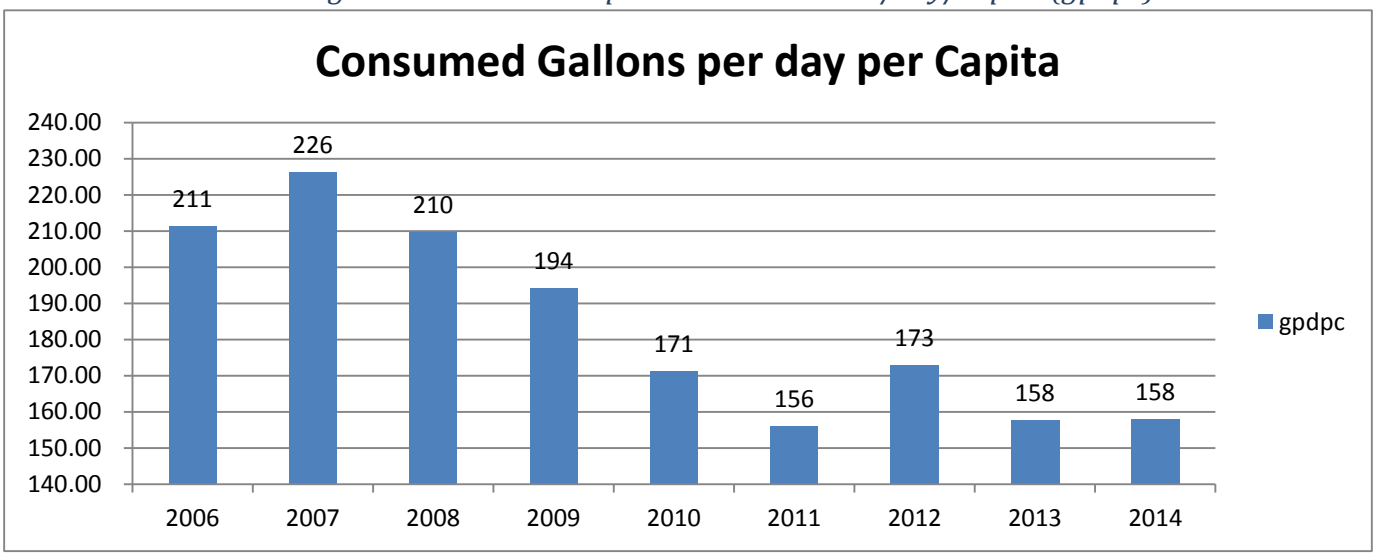


Figure 3: Estimated Population and Gallons/day/capita (gpdpc)



It should be noted that the above figures represent actual metered water use for Ephraim City, and does not include unmetered water used for outdoor irrigation for the City Parks and Cemetery.

3.2: Projected Water Use

Using the projected population data from the Governor's Office of Planning and Budget and an average gpdpc figure since 2006, the projected water use in Ephraim City in 2050 is as follows:

Projected Use based on average per capita usage since 2007:

Ave. daily water use per capita, 2006-2014	= 185 gpdpc
Projected Ephraim City 2050 Population	= 8,996 people
Projected Ephraim City Water use, 2050	**= 604,703,700 gallons per year**

This represents an increase of approximately 64% above the current water use (369,000,000 gallons) from 2014. While the existing water rights will enable over 900M gallons/year, the existing springs do not provide enough capacity to consistently meet that projected water use, according to historical spring flow records. It is clear that additional water sources, likely in the form of additional culinary wells, will be needed to accommodate that future projected 2050 population. The growth of the College will likely be the driving factor for the timing of developing those future additional water sources. It is also likely that additional system upgrades such as additional storage and upsizing of pipelines will also be required to accommodate that future growth. The attached Water Master Plan identifies the most pressing system upgrades (see Appendix E)

3.3 Current Water Conservation Strategies and Current Assessment

Ephraim City has implemented the following strategies to encourage water conservation:

- Installing automatic sprinkler systems on all City properties so the watering is done in off-peak hours
- Encouraging citizens to water lawns and gardens in the early morning or evening hours to reduce evaporation rates and therefore water use
- Education – encourage citizens to turn water off when not needed
- Updating a graduated rate schedule with costs that increase with water use to encourage conservation
- Coordinating with Snow College and City parks/cemeteries (which represent the largest water users) to provide watering of lawns during off-peak hours
- Retrofitting of City properties to install new water wise landscaping
- Repairing/replacing old lines to reduce leaks

Since 2007, the data shows that the current the over**all consumption has been *reduced* by 57,919,000 gallons/year (or 13.6%)** while the **population has actually *increased* by 1260 people (or 24%)** during that same time period (see figure 2 above). **This equates to a reduction in per capita water use of 30% since 2007.** Based on this data, it appears that the existing strategies have been effective in reducing water consumption during that time.

3.4 Water Conservation Goals and Future Possible Strategies

The State of Utah has listed a goal of reducing water consumption by 25% by 2050. Because Ephraim City has no secondary watering system, all outdoor watering must be done with culinary water. Using monthly metering data, it was determined that winter time (indoor) usage was dramatically lower than summer time (indoor plus outdoor) use. It is clear that outdoor watering provides the greatest opportunity to conserve. Some possible concepts that can reduce outdoor watering are listed as follows:

- Review City landscaping requirements for new development to encourage/required more water wise landscaping.
- Ensure that all City properties (parks, cemeteries, soccer fields, etc) are not being overwatered and are using efficient water systems. Consider alternate types of sod and landscaping which are more water wise.
- Work with other entities, including schools, the college, and others to ensure grass areas are not being overwatered and are using efficient water systems.
- Review the current rate structure and use pricing to encourage conservation. Consider alternative rate structures such as summer rates vs. winter months.
- Consider options to reuse existing waste water for land application irrigation to both decrease the culinary water needed for outdoor watering and extend the life of our waste treatment system.
- Public outreach/education to promote proper outdoor watering techniques and methods to avoid excess watering of lawns and gardens.
- Consider rebate programs which help convert existing landscaping to water wise landscaping.

It is the opinion of Ephraim City Staff that it is a reasonable goal to continue to pursue reducing total water consumption by 8-10% every 15 years. This will be measured by comparing actual metered consumption on a yearly basis during that time frame, in additional to City water balancing, and annual consumption reporting. If the goal of conserving 10% every 15 years is met, this is estimated to conserve approximately 162 million gallons per year, using the figures for gallons per day per capita from the year 2007 and a future 2050 estimated population of 8,996.

As discussed previously, Ephraim City has already **reduced its consumption approximately 30% per capita since 2007**, showing that there has been success in the existing strategies implemented by the City. Care should be taken, however, to ensure that as conservation strategies take hold and gain momentum with the public that the rate structure be reevaluated on an ongoing basis to ensure that revenues will remain adequate to ensure that operation and maintenance expenses can still be met for the water system.

The following items have been specifically identified as additional strategies of the City, in addition to those strategies already being implemented, to further reduce water consumption and better manage the existing water system:

- Encourage water efficient fixtures and appliances
- Install additional master meters, including on the tank overflow, to better understand the availability and usage patterns of the water available
- Maintain good practices for operation and maintenance, including repairing/replacing of old leaky lines and meters

- Ongoing education of the public in water conservation techniques, in the form of city web page and social media, newsletters, and local radio and media public announcements
- Maintain sound outdoor watering practices on City property to avoid excess watering of lawns
- Pursue secondary water and/or waste water reuse for watering the parks and cemetery and other appropriate areas
- Require pressure reducers on each new house to reduce flows in houses, in accordance with standard plumbing codes
- Consider implementing an aquifer storage and recovery systems to store water underground in the aquifer during periods of abundant water, and withdraw that water later during periods of drought.

It is anticipated that Water saved will be used for recharging the aquifers, agriculture (surface irrigation), as well as maintaining stream and river flows and related habitats from the surface overflow which eventually ends up in the Sanpitch River west of town.

The city's current utility ordinance currently prohibits the waste of water, and the council has implemented mandates from time to time to conserve more aggressively during drought years. This is expected to continue in the foreseeable future. As noted by the 30% reduction in gpdpc figure above, the current measures appear to be working.

Section 3.5 Alternatives to Meet Future Needs

In order to meet future needs, there will need to be upgrades to the system in the form of new/larger pipes, additional storage, and new sources. Most pressing is the need for a new well, which will likely be pursued in 2016. Other Specific improvements are listed in the attached Water Master Plan of 2007, (See Appendix E)

Section 3.6 Evaluation Period

The Water Management and Conservation Plan will be updated every 5 years as required by State law, or sooner as needed due to significant growth or other pressing circumstances.

Section 3.7 Associated Plans – Emergency Response Plan

Events that will activate the Emergency Response Plan include earthquakes, drought, mud slides which take out the main water feeders, contamination and terrorists. In such an event, the Emergency Response Plan will be activated and implemented.

Section 3.8 City Water Conservation Coordinator

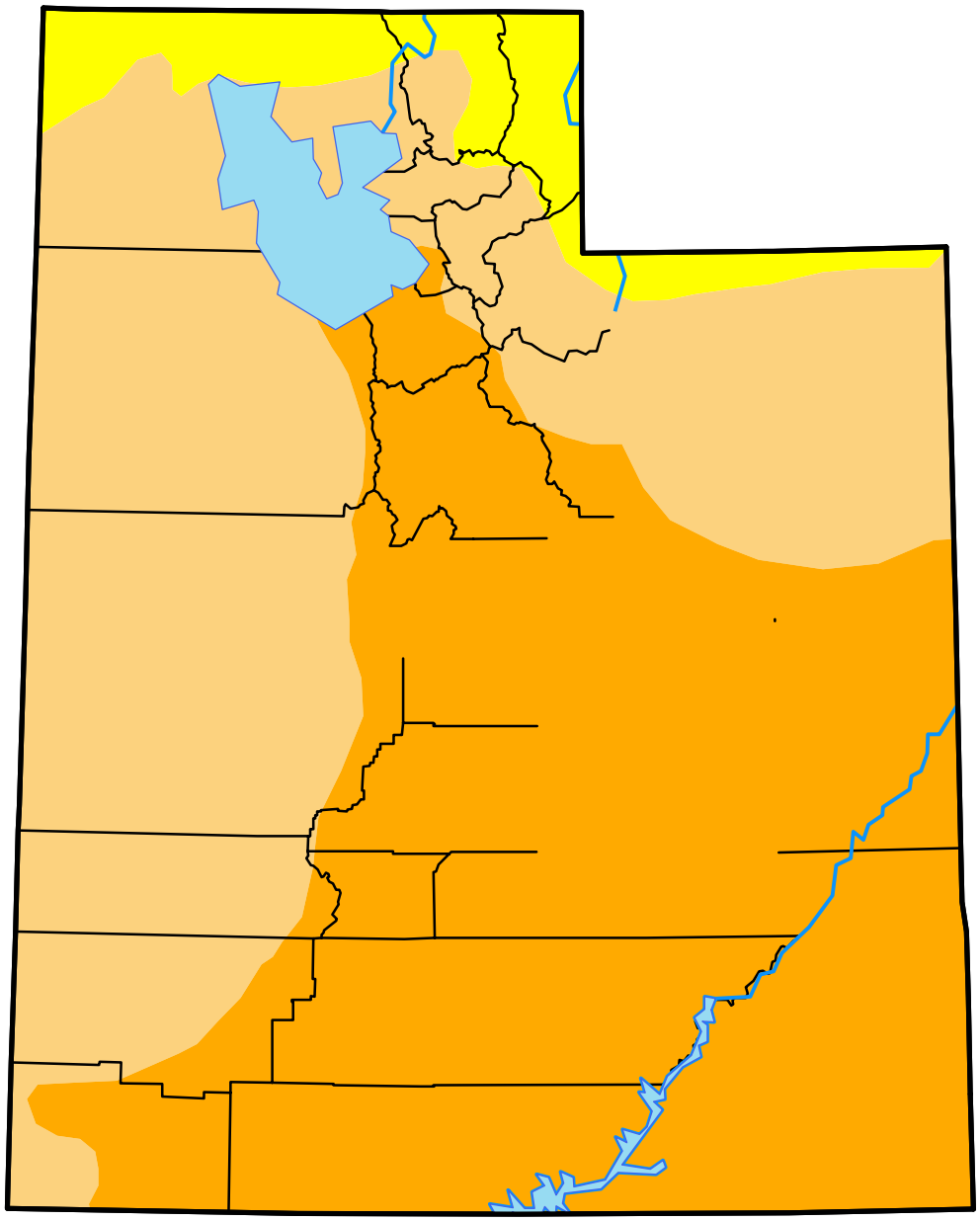
Name	Phone	Email
Public Works Director Chad Parry	(435) 283-4631	chadp@ephraimcity.org
City Engineer Bryan Kimball	(435) 283-4631	bryan.kimball@ephraimcity.org

Appendix G

U.S. Drought Monitor Data

U.S. Drought Monitor

Utah



February 6, 2018

(Released Thursday, Feb. 8, 2018)

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	93.93	50.94	0.00	0.00
Last Week *01-30-2018*	0.00	100.00	93.99	47.53	0.00	0.00
3 Months Ago *11-07-2017*	30.31	69.69	12.48	0.00	0.00	0.00
Start of Calendar Year *01-02-2018*	9.73	90.27	61.37	19.64	0.00	0.00
Start of Water Year *09-26-2017*	50.04	49.96	7.82	0.00	0.00	0.00
One Year Ago *02-07-2017*	86.80	13.20	0.00	0.00	0.00	0.00

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Eric Luebehusen

U.S. Department of Agriculture

http://droughtmonitor.unl.edu/

Appendix H

Ephraim City Water Master Plan

(Select Pages)

Ephraim City

WATER SYSTEM MASTER PLAN

Project Engineer

Prepared by:

NOLTE ASSOCIATES, INC.

Salt Lake Office
53RD Park Plaza
5217 South State St. Suite #300
Murray, Utah 84107
(801) 743-1300

Executive Summary

Nolte was hired by Ephraim City to prepare a water system master planning study. We gathered and compiled all available existing data pertaining to Ephraim City's supply, storage and distribution. The data was used to create a computer model that would analyze the hydraulic performance of the current water system. The data collection provided a method to create mapping of the current water distribution system. The map data was converted to a GIS (Geographic Information Systems) database to enable the City to create more efficient future models. Once the data collection and mapping were completed, the creation of the model began. The model assisted in the decision making process in determining what elements of the system should be upgraded and updating the current system to meet current and future State regulations. Since population is forecasted to increase for Ephraim City, the model was adjusted to simulate a future growth scenario. This scenario was determined by evaluating the City zoning maps, land availability, and population forecasts. By modeling the effects of future growth, a plan was developed to meet the demand for future water.

The water rights currently owned by the City were investigated and reviewed as part of this master planning study. As the City continues to grow, the need to assure the sufficiency of the water rights will become an issue. For this study we developed a strategy to preserve current water rights and strategies to acquire additional water rights in the future.

From the analyses and modeling, a Capital Improvements Plan has been developed to schedule and pay for the recommended water system improvements. The economics of these projects have been evaluated and total costs for construction were broken down. The projects were organized on the basis of urgency and cost. Further analysis provided recommended adjustments in the water user rates in order to provide sufficient revenue for the needed system improvement projects. These rates have also been compared to previous rates and with those of other cities with similar populations. Impact fees were also evaluated in a similar manner.

This study concludes that the overall distribution system is in relatively good shape. In completing the storage analysis according to Utah State Code R309 it was determined that the City lacks approximately 0.6 million gallons of recommended storage. It is therefore recommended to construct an additional 1 million gallon tank in the future. Upon completion of the source analysis it has been determined that a 10-year low flow from the springs alone would result in a water shortage. This led to a recommendation of a new well for the city based on the economics of treating the existing well. Included in this study are recommendations for adjustments of the water rates and impact fees for the City.

Table 11. Water Rights Summary

NAME	BASE WR #	WR/APP#	SUPP GRP	DIVERSION TYPE	WR TYPE	TYPE	STATUS	APPLICATION NO.	FLOW (cfs)	ACFT	PRIORITY DATE
Birch and Maple Springs	65-2255	65-2255	429570	Surface	Municipal Water Right	DEC	CERT		0.84	201.6	7/31/1980
Birch and Maple Springs	65-2255	a11403			Change Application		CERT		0.84		7/31/1980
Big Spring and Underground Water	65-2282	65-2282		Surface/Well	Municipal Water Right	APPL	CERT		1.17	847.056	12/18/1917
Big Spring and Underground Water	65-2282	a16178	429570		Change Application		CERT		1.17		5/22/1991
Big Spring and Underground Water	65-2282	t91-65-10			Temporary Application		EXP		1.17		5/22/1991
3 Spring Areas - Riddlers Ridge, Sawmill, Twin	93-3403	a23754			Change Application		APP		2.50		9/23/1999
Cottonwood Creek	93-3403	93-3403	429570	Surface	Municipal Water Right	APPL	CERT	A12497	2.50	1714.29	2/14/1983
Cottonwood Creek	93-3403	93-3403	617249	Surface	Power	APPL	CERT	A12498	2.50	100.70	2/14/1983
Riddlers Ridge, Sawmill, Twin Springs	93-3403	a12705			Change Application		CERT		2.50		2/14/1983
3 Spring Areas - Riddlers Ridge, Sawmill, Twin	93-3403	t23750			Temporary Application		LAP		2.50		9/23/1999
Big, Ltl, Lf Hand Fk, Curly Hill Sp.	65-29	65-29	430265	Surface	Power	DEC	CERT	A10270 1725	3.00	2171.94	1/28/1928
Underground Water Well	65-1733	65-1733	429570	Surface	Power/Municipal	APPL	REJ	A41889	5.00		9/30/1972
Ephraim Hydro #1 Discharge	65-2412	65-2412	429735	Surface	Power	APPL	CERT	A63842	6.99	5060.62	4/3/1989
Cottonwood Creek & New Canyon Creek	65-22	a11066			Ammendatory Change		AMEN		7.53		11/26/1979
Cottonwood Creek & New Canyon Creek	65-22	65-22	429510	Surface	Power	DEC	CERT	A4102	7.53	5451.57	7/8/1911
Cottonwood Creek & New Canyon Creek	65-22	a16700			Change Application		CERT		7.53		4/24/1992
Seeley Creek	93-1174	93-1174	616864	Surface	Power	APPL	UNAP	A49080	40.00	28959.20	5/29/1977
Cottonwood & New Canyon Creek	65-2160	65-2160	429469	Surface	Power	APPL	CERT	A56061	44.97	32557.38	4/2/1981
Cottonwood Creek & New Canyon Creek	65-2160	a16699			Change Application		CERT		44.97		4/24/1992

Appendix I

Aquifer Storage and Recovery Assessment: Phase 1 for The City of Ephraim, Utah

(Select Pages)

AQUIFER STORAGE AND RECOVERY ASSESSMENT: PHASE 1 FOR THE CITY OF EPHRAIM, UTAH

2017

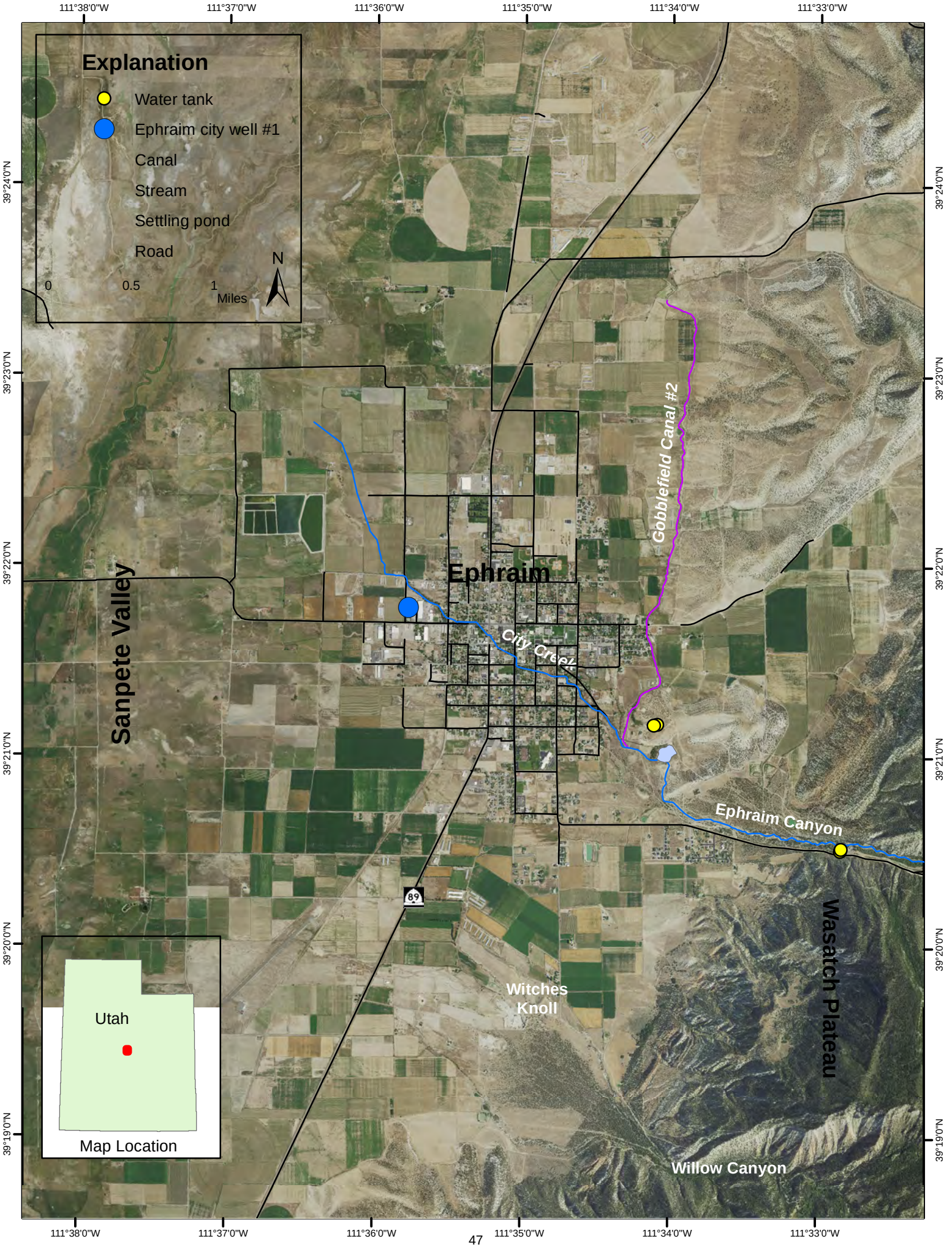
Contract deliverable to the City of Ephraim by the Utah Geological Survey
by Janae Wallace, Christian Hardwick, Rebekah Stimpson, and Paul Inkenbrandt

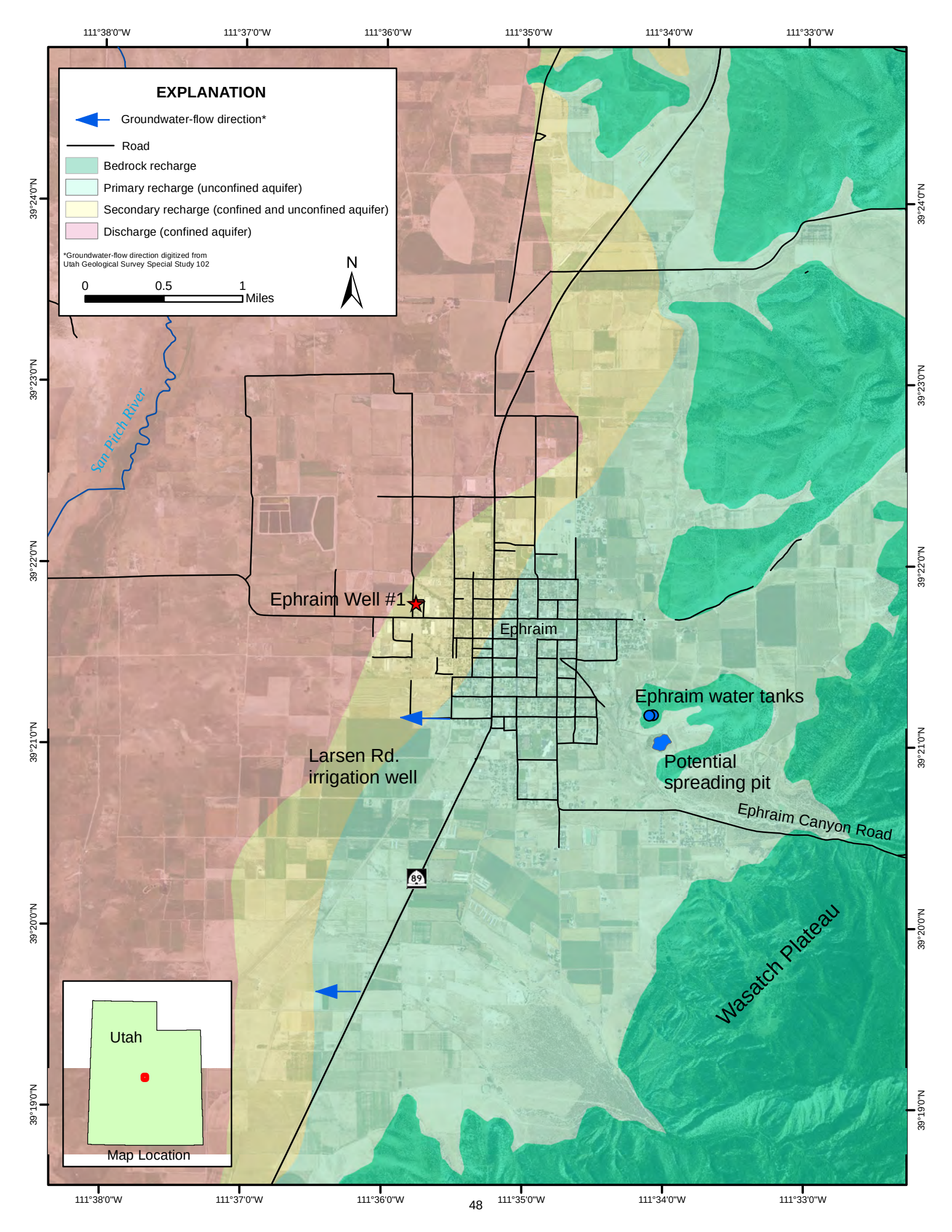
EXECUTIVE SUMMARY

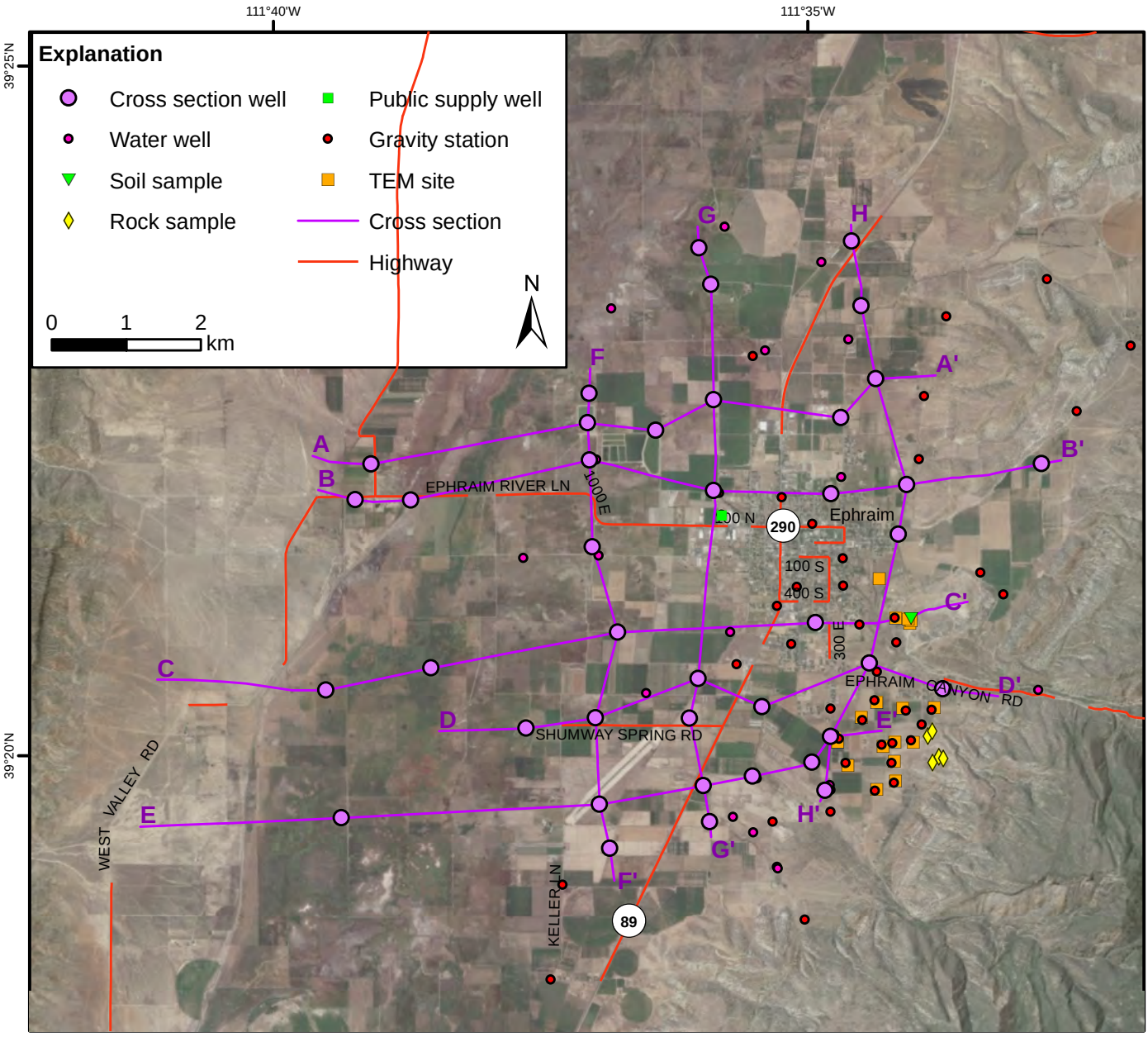
The purpose of this study is to assess the feasibility of aquifer storage and recovery (ASR) in the principal valley-fill aquifer in Sanpete Valley, focusing on the area near the City of Ephraim. The Utah Geological Survey (UGS) investigated the possibility of recharging the principal aquifer via surface water spreading and/or injecting excess public supply water to wells at or near the foot of the mountains of the Wasatch Plateau, which will, in turn, provide water to existing extraction wells downgradient in the valley. We determined that ASR is feasible in Sanpete Valley, and we identified potential pilot sites and provided recommendations for conducting a future pilot project. Thus, this study is the first phase of a potentially ongoing project. Our evaluations were based on prior ASR project experiences in Utah. In addition to citing suitable locations for ASR, we provided the City of Ephraim recommendations to drill a new public supply well to augment and/or replace their current Ephraim city well #1 should future water quality conditions (high arsenic concentrations) deem the well unsuitable to serve as a public supply source or if the spring complex located in the canyons east of town become compromised due to potential geologic hazards (slope failure).

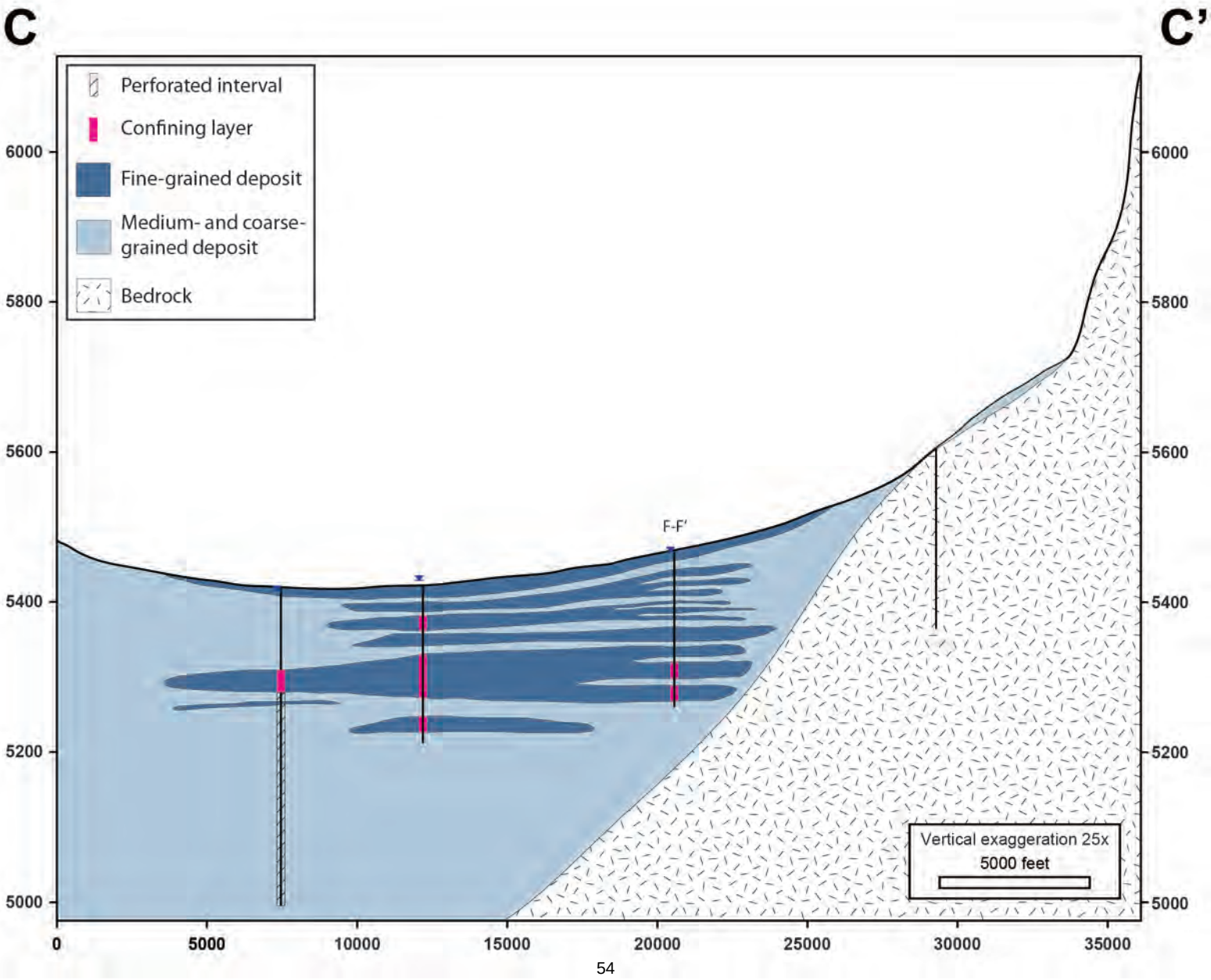
INTRODUCTION

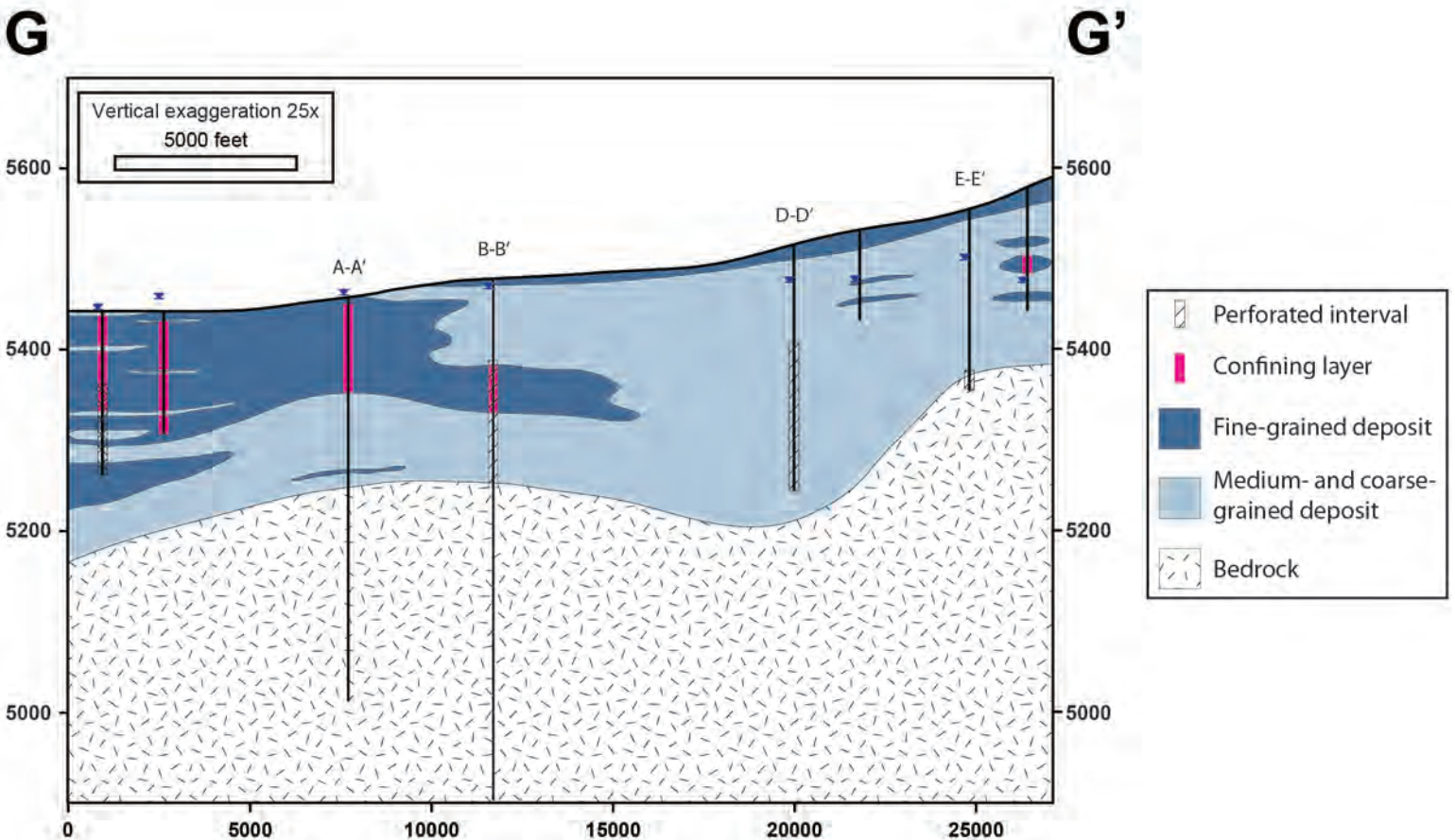
The City of Ephraim is in Sanpete Valley, Sanpete County, a rural area in central Utah (figure 1) that is experiencing moderate population growth accompanied by an increase in urbanization and groundwater use. Groundwater, derived mostly from the valley-fill aquifer, provides almost all the drinking-water supply in Sanpete Valley, including a small percentage of Ephraim's drinking water which relies mainly on groundwater from springs; Ephraim owns a 463-foot-deep well that penetrates valley-fill material and is completed in 25 feet of bedrock

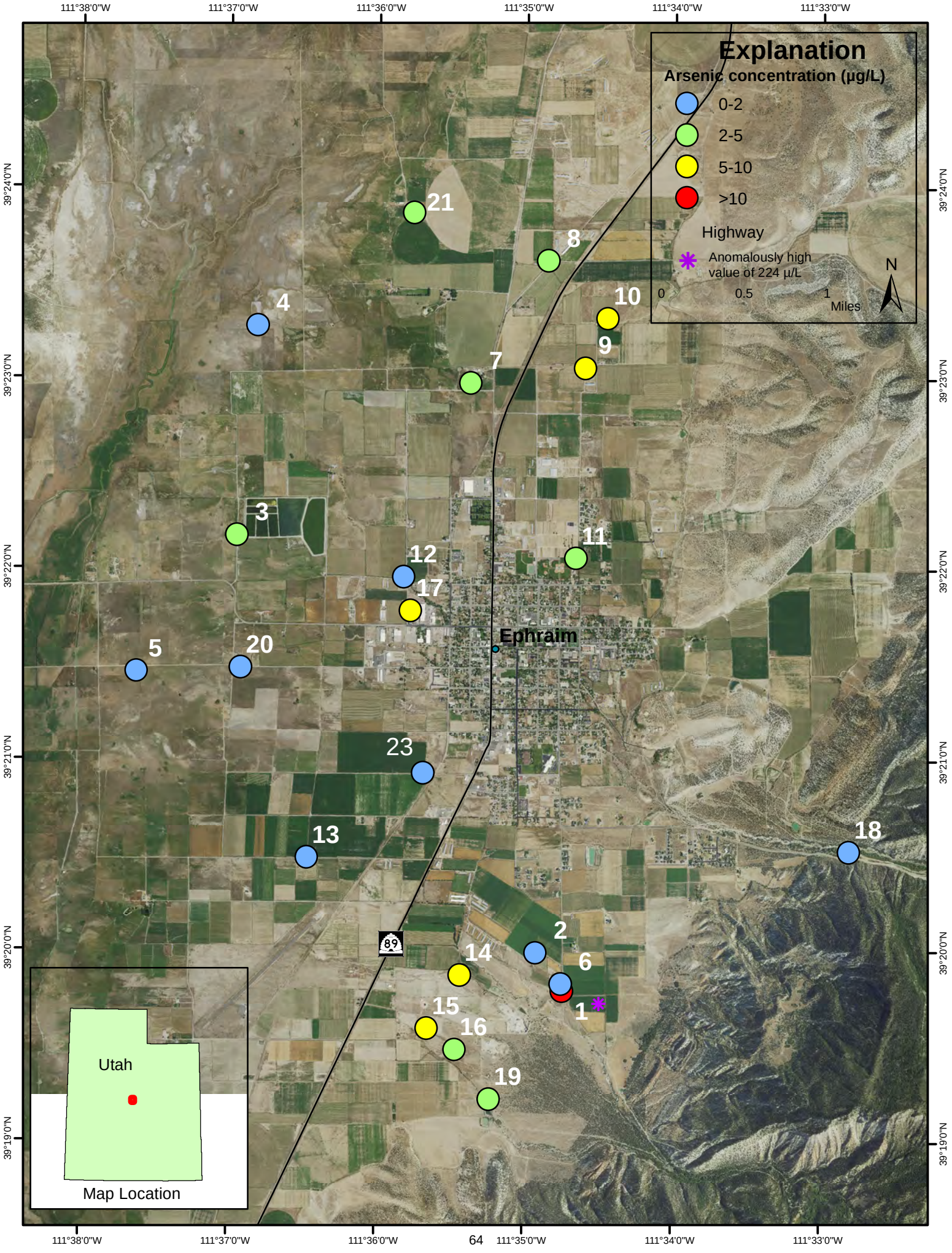

Explanation
Water tank
Ephraim city well #1
Canal
Stream
Settling pond
Road
0
0.5
1
Miles
N
Sanpete Valley
Ephraim
Gobblefield Canal #2
City Creek
Ephraim Canyon
Wasatch Plateau
Witches Knoll
Willow Canyon
89
Utah
Map Location
111°38'0"W
111°37'0"W
111°36'0"W
111°35'0"W
111°34'0"W
111°33'0"W
39°24'0"N
39°23'0"N
39°22'0"N
39°21'0"N
39°20'0"N
39°19'0"N

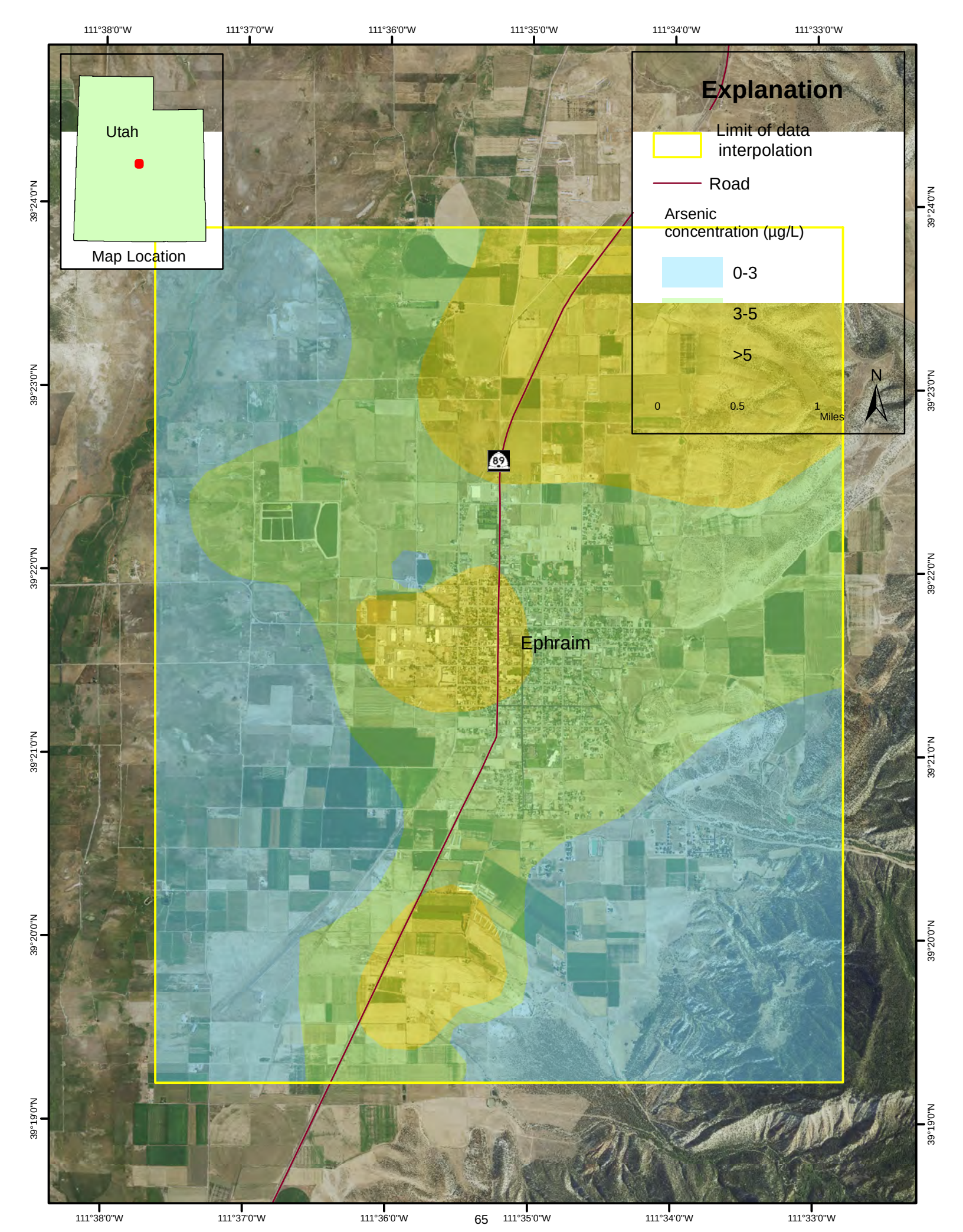

111°38'0"W
111°37'0"W
111°36'0"W
111°35'0"W
111°34'0"W
111°33'0"W
39°24'0"N
39°23'0"N
39°22'0"N
39°21'0"N
39°20'0"N
39°19'0"N
EXPLANATION
Groundwater-flow direction*
Road
Bedrock recharge
Primary recharge (unconfined aquifer)
Secondary recharge (confined and unconfined aquifer)
Discharge (confined aquifer)
*Groundwater-flow direction digitized from Utah Geological Survey Special Study 102
0
0.5
1
Miles
N
San Pitch River
Ephraim Well #1
Ephraim
Ephraim water tanks
Potential spreading pit
Larsen Rd. irrigation well
Ephraim Canyon Road
89
Wasatch Plateau
Utah
Map Location

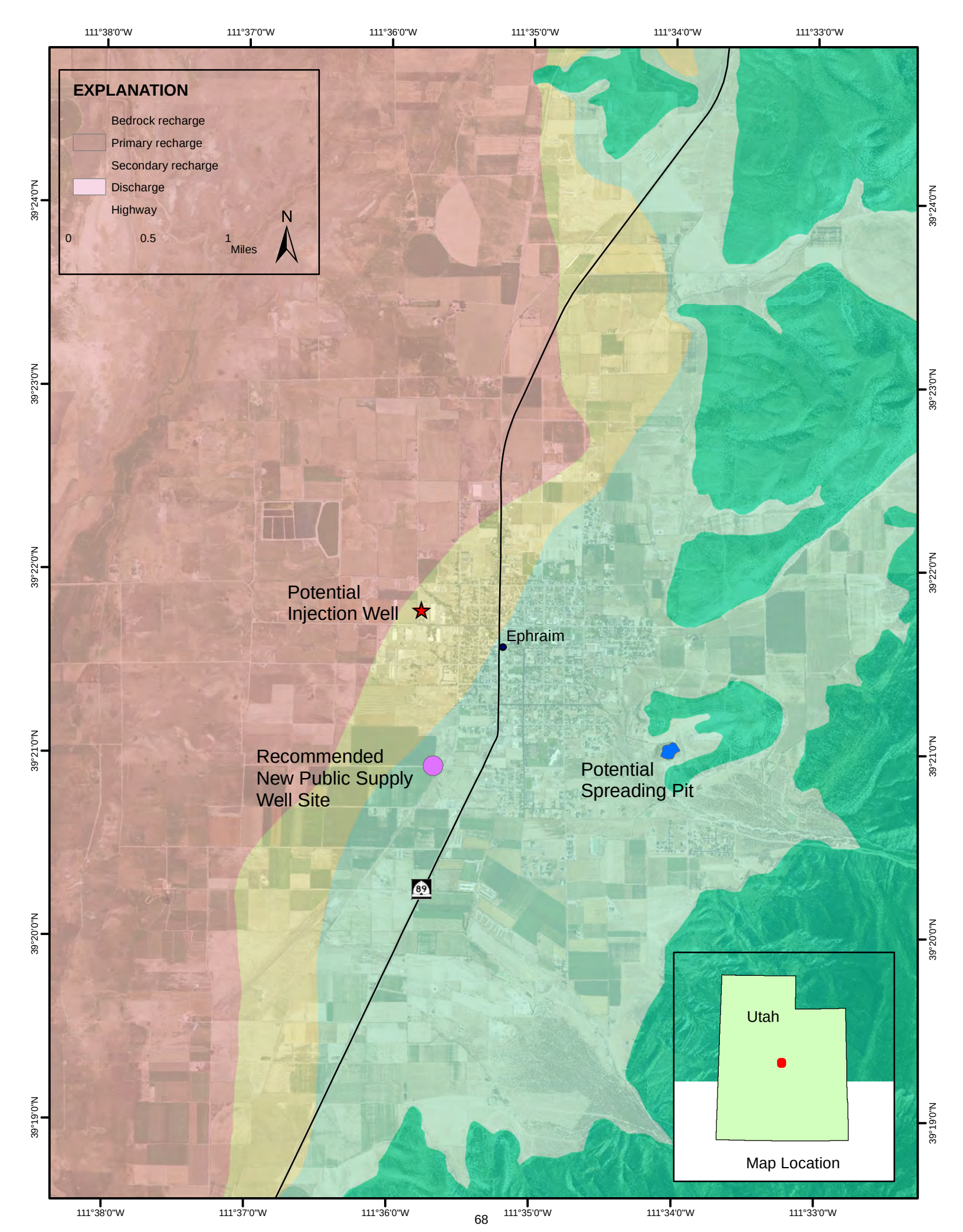

111°40'W
111°35'W
39°25'N
39°20'N
Explanation
Cross section well
Water well
Soil sample
Rock sample
Public supply well
Gravity station
TEM site
Cross section
Highway
0 1 2 km
N
A
A'
B
B'
C
C'
D
D'
E
E'
F
F'
G
G'
H
H'
EPHRAIM RIVER LN
1000 E
100 N
290
Ephraim
100 S
400 S
300 E
EPHRAIM CANYON RD
SHUMWAY SPRING RD
WEST VALLEY RD
KELLER LN
89


C
C'
Perforated interval
Confining layer
Fine-grained deposit
Medium- and coarse-grained deposit
Bedrock
F-F'
Vertical exaggeration 25x
5000 feet
6000
5800
5600
5400
5200
5000
0
5000
10000
15000
20000
25000
30000
35000


G
G'
Vertical exaggeration 25x
5000 feet
5600
5400
5200
5000
A-A'
B-B'
D-D'
E-E'
0
5000
10000
15000
20000
25000
Perforated interval
Confining layer
Fine-grained deposit
Medium- and coarse-grained deposit
Bedrock


111°38'0"W
111°37'0"W
111°36'0"W
111°35'0"W
111°34'0"W
111°33'0"W
39°24'0"N
39°23'0"N
39°22'0"N
39°21'0"N
39°20'0"N
39°19'0"N
Explanation
Arsenic concentration (µg/L)
0-2
2-5
5-10
>10
Highway
Anomalously high value of 224 µ/L
0
0.5
1
Miles
N
Ephraim
89
Utah
Map Location
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
23


111°38'0"W
111°37'0"W
111°36'0"W
111°35'0"W
111°34'0"W
111°33'0"W
39°24'0"N
39°23'0"N
39°22'0"N
39°21'0"N
39°20'0"N
39°19'0"N
Utah
Map Location
Explanation
Limit of data interpolation
Road
Arsenic concentration (µg/L)
0-3
3-5
>5
0
0.5
1
Miles
N
89
Ephraim


111°38'0"W
111°37'0"W
111°36'0"W
111°35'0"W
111°34'0"W
111°33'0"W
39°24'0"N
39°23'0"N
39°22'0"N
39°21'0"N
39°20'0"N
39°19'0"N
EXPLANATION
Bedrock recharge
Primary recharge
Secondary recharge
Discharge
Highway
0
0.5
1
Miles
N
Potential
Injection Well
Ephraim
Recommended
New Public Supply
Well Site
Potential
Spreading Pit
89
Utah
Map Location