AMERICAN FORK CITY
PLANNING COMMISSION REGULAR SESSION
JANUARY 8, 2020

Notice is hereby given that the American Fork City Planning Commission will meet in regular session on January 8, 2020 at the American Fork City Hall, 31 North Church Street, commencing at 7:00 p.m. The agenda shall be as follows:

1. Pledge of Allegiance

2. Review and action on an agreement for the Axley-Way Annexation consisting of 19.304 acres, located at approximately 900 South 500 East.

3. Hearing, review and action on amendments to the General Plan by adopting the updated Master Plans of the pressurized irrigation, sanitary sewer and culinary water elements of the General Plan.

4. Hearing, review and action on amendments to the General Plan by adopting the updated Master Plan of the transportation element of the General Plan.

5. Other Business

6. Site Plan Committee Report

7. Review and action on the minutes of the December 4, 2019 Planning Commission Regular Session

8. Adjournment

John H. Woffinden, P.G.
Planning Commission Chairman

The order of agenda items may change to accommodate the needs of the commission, city staff and the public

Review and action on an agreement for the Axley Way Annexation, consisting of 19.3 acres, located in the area of 900 South 500 East

The Axley Way annexation closes an island of unincorporated land in the vicinity of 900 South 500 East. The area consists of 19.3 acres. Auto Mall Drive divides the property roughly in half. North of Auto Mall Drive, the GC-2 (Planned Commercial) zone is proposed. South of Auto mall Drive, the PI-1 (Planned Industrial) zone is proposed.

Potential Motions:

APPROVAL

Mr. Chairman, I move that we recommend approval of the Axley Way Annexation Agreement.

DENIAL

Mr. Chairman, I move that we recommend denial of the Axley Way Annexation Agreement.

TABLE

Mr. Chairman, I move that we table action on the Axley Way Annexation Agreement.

ANNEXATION AGREEMENT
(*Axley-Way Annexation*)

This Agreement, made and entered into this _____ day of_____, 20__, by and between The City of American Fork, Utah, a Utah Municipal Corporation (hereafter referred to as "City") and D&D AF Properties, 500 East At Automall, LLC, and R&J Christensen Properties, LLC, (hereafter referred to as "Applicants"), is based on the following:

RECITALS

WHEREAS, Applicants are the owners of parcels of privately-owned real property constituting the entirety of the *Axley Way Annexation*, which annexation is located within the unincorporated territory of Utah County and contiguous to the corporate boundary of the City. A "Request to Initiate Annexation of Land Within an Island or Peninsula" (Attachment 1), together with an Annexation Area map (Attachment 2) prepared by the Applicants showing the real property proposed for annexation (hereafter referred to as "Annexation Area").

WHEREAS, the Annexation Area constitutes a portion of an existing island, as defined by Utah State law; and

WHEREAS, in accordance with the provisions of UCA 10-2-418, the American Fork City Council has heretofore adopted Resolution No. 2019-11-45R indicating its intent to annex the entire Annexation Area. Further, notice of hearing regarding the proposed annexation has been published and the public hearing thereon held.

WHEREAS, the City Council has determined that annexation of the Annexation Area is in the best interest of the City and has indicated an intent to: (1) execute this Agreement and enact an ordinance of annexation relating thereto, and (2) authorize the recording of the annexation plat at the office of the Utah County Recorder, subject to the terms and conditions of this Agreement and any other conditions required prior to annexation.

TERMS AND CONDITIONS

NOW THEREFORE, based on the above recitals and in consideration of the annexation of the Annexation Area to the City, the parties covenant and agree as follows:

SECTION 1 - Applicability of Agreement: The real property to which the terms of this Agreement apply shall be the parcels of private property within the Annexation Area, identified on Attachment 2. Attachment 2 is hereby made part of this Agreement.

SECTION 2 - Annexation a benefit to Applicants: Applicants and City acknowledge that the City is not required to approve the annexation and that the terms and conditions of annexation, as set forth herein, are reasonable and entered into freely and voluntarily. Further, Applicants hereby acknowledge and agree that the benefit received from annexation of the property is equal to or greater than the requirements and conditions of annexation as set forth in this Agreement and the conditions of the development as set forth under the terms of the City's Development Code and Impact Fee Ordinance and does not constitute a taking as defined pursuant to the terms of UCA 10-9a-103(6), 1953, as amended.

SECTION 3 - Authority of Applicants: Applicants hereby affirm that they are the current owners of at least 75% of the Annexation Area and have complete authority to enter into this Agreement and bind the Annexation Area hereto.

SECTION 4 - Compatibility with Land Use Plan and Initial Zone Classification: The Land Use Element of the General Plan shows the Annexation Area classified as Design Industrial and Design Commercial. Therefore, the zone classifications attached to the parcels shall be PI-1 (Planned Industrial) south of Auto Mall Drive, and GC-2 (Planned Commercial) north of Auto Mall Drive. A map illustrating the zone classifications has been prepared by the City and is made part of this agreement (Attachment 3).

SECTION 5 - Right-of-way to be Conveyed. The City's Transportation Element and Bicycle and Pedestrian Plan of the General Plan provides for the development of Auto Mall Drive as a Major Collector with a bike lane and 500 East as an Arterial and a Major Collector with a buffered bike lane. As a condition of annexation, Applicants hereby agree to convey to the City any right-of-way necessary for Auto Mall Drive and 500 East in the location shown on the plat prepared by the Applicants and approved by the City (Attachment 4). Applicants shall have no obligation to construct any right-of-way improvements unless and until any improvement or development occurs on the parcel adjacent to the right-of-way, or as otherwise required by City Code, subject to the provisions as outlined in the American Fork City Development Code Section 17.5.126 (Minimum Level of Improvements Required).

SECTION 6 - Conveyance of Water Right: Applicants acknowledge that the dedication of water rights is required pursuant to City Code Section 17.1.400—Conveyance of Water. City acknowledges that Applicants have sufficient basis to delay the time of conveyance of water rights until the time of development in accordance with City Code Section 17.1.400(C). A Water Delay Agreement is hereby entered into by the parties and is incorporated into this Agreement as Attachment 5.

SECTION 7 - Open Ditches to be Piped: Applicants acknowledge that it is their burden in full to pipe any and all gravity irrigation conveyances (ditches), to the standards of the City and to the standards of the applicable irrigation company or private ditch easement holders, as part of any forthcoming development project. Such piping shall be completed prior to or in

concurrence with the development of the parcel and in compliance with City Code Section 17.8.303 – Plan to identify and accommodate natural constraints to development.

SECTION 8 - Property Taxes and Rollback Taxes to be Paid on any Right-of-Way Dedicated to City: Applicants agree to pay any outstanding property taxes on the Annexation Area including any and all rollback taxes if the subject area is classified as "Greenbelt" with the Utah County Tax Assessor, for any areas identified as right-of-way to be dedicated to City. Proof of payment of these taxes shall be required prior to recording of this Agreement.

SECTION 9 - Impact Fees: No impact fees are required as a condition of annexation. However, nothing in this Agreement constitutes a waiver of any obligation that Applicants or any successor may have for the payment of impact fees required as a condition of development of the Annexation Area or any portion thereof. Applicants acknowledge that no development approval or building permit shall be issued until all applicable fees required by City ordinance have been paid at the amount then in effect.

SECTION 10 - Default: Should any of the parties default in the performance of any of the terms of this Agreement, the parties shall first seek mediation to resolve any defaulting performance. The defaulting party shall pay all costs and expenses, including mediation fees and/or reasonable attorney's fees, which may arise from enforcing this Agreement, whether such remedy is pursued by mediation and/or filing suit or otherwise.

SECTION 11 - Notice: Any notice to be given hereunder shall be given by certified mail, return receipt requested, addressed as follows:

a. If to the City, to the City of American Fork, 51 East Main Street, American Fork Utah, 84003
b. If to Applicants, to _____.

SECTION 12 - Counterparts and Severability: In the event that any provision of this Agreement shall be held invalid and unenforceable, such provision shall be severable from, and such invalidity and unenforceability shall not be construed to have any effect on, the remaining provisions of this Agreement. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which shall constitute one and the same instrument.

SECTION 13 - Entire Agreement: This Agreement constitutes the entire agreement between the parties and may be changed only in writing signed by all parties, and this agreement shall bind the heirs, assigns, and successors in interest of the respective parties. If any party shall breach this Agreement, the other party shall be entitled to recover their attorney fees and court costs in addition to other lawful damages resulting therefrom.

_____ _____

IN WITNESS WHEREOF, the parties have signed this agreement on the date first mentioned above.

Applicant names

Applicant signature

MAYOR

ATTEST:

City Recorder

LIST OF ATTACHMENTS

Attachment 1 Request to Initiate Annexation of Land of Within an Island or Peninsula

Attachment 2 Annexation Area Map

Attachment 3 Zone Classification Map

Attachment 4 Annexation Plat

Attachment 5 Water Delay Agreement

Attachment 1

Exhibit 'A'

REQUEST TO INITIATE ANNEXATION
OF LAND WITHIN AN ISLAND OR PENINSULA

DATE: July 23, 2019

We the undersigned, by virtue of our signatures affixed hereto, do hereby request the City of American Fork, Utah, to annex the parcel(s) identified on the attached map, in accordance with the procedures for "Annexation Without Petition" as set forth under Section 10-2-418(1)(a)(ii) of the Utah State Code.

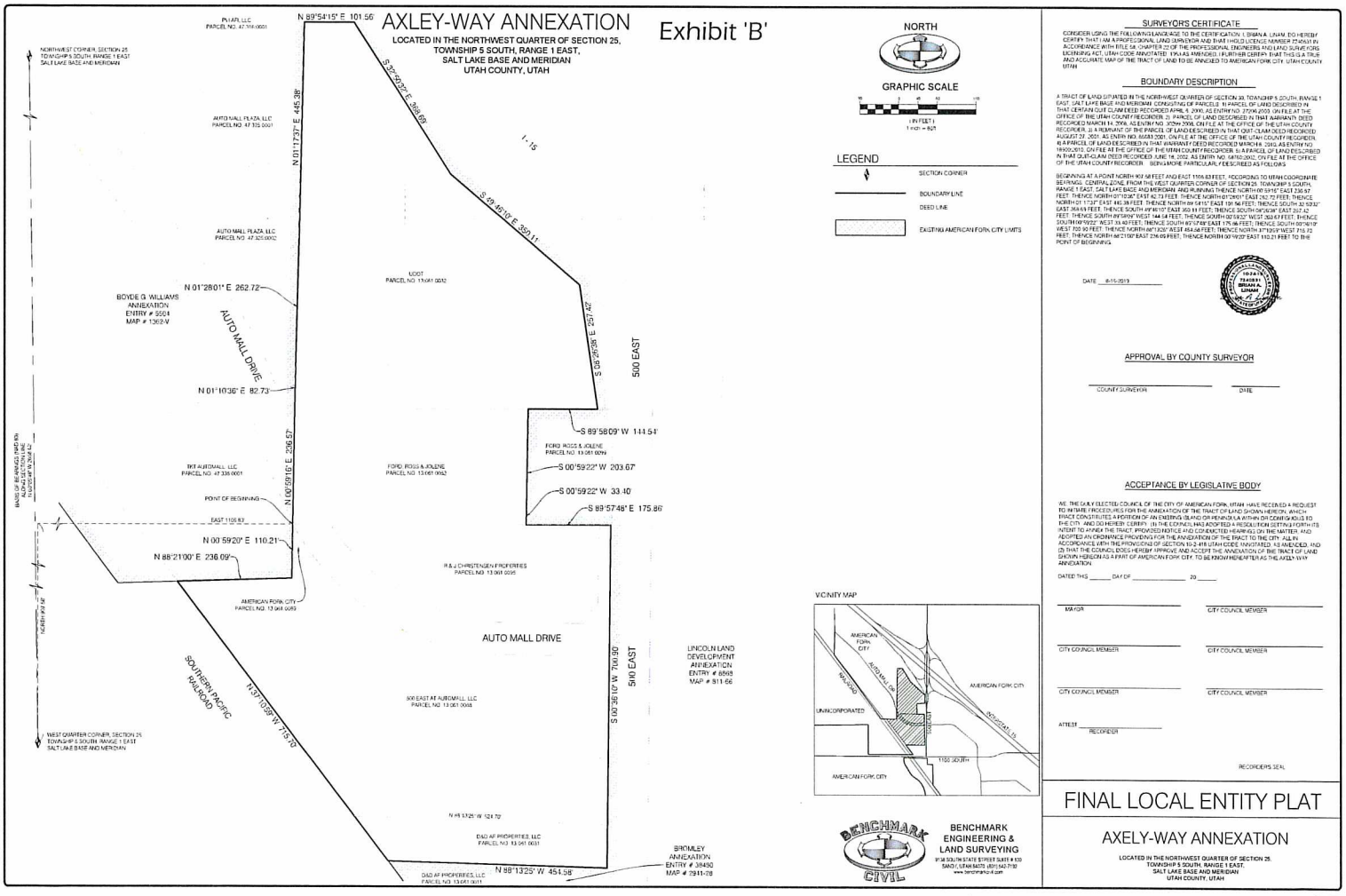
We hereby further acknowledge and affirm as follows:

A. The area to be annexed is contiguous to the municipality and has fewer than 800 residents, and
B. The municipality has provided one or more municipal type services to the area for at least one year.

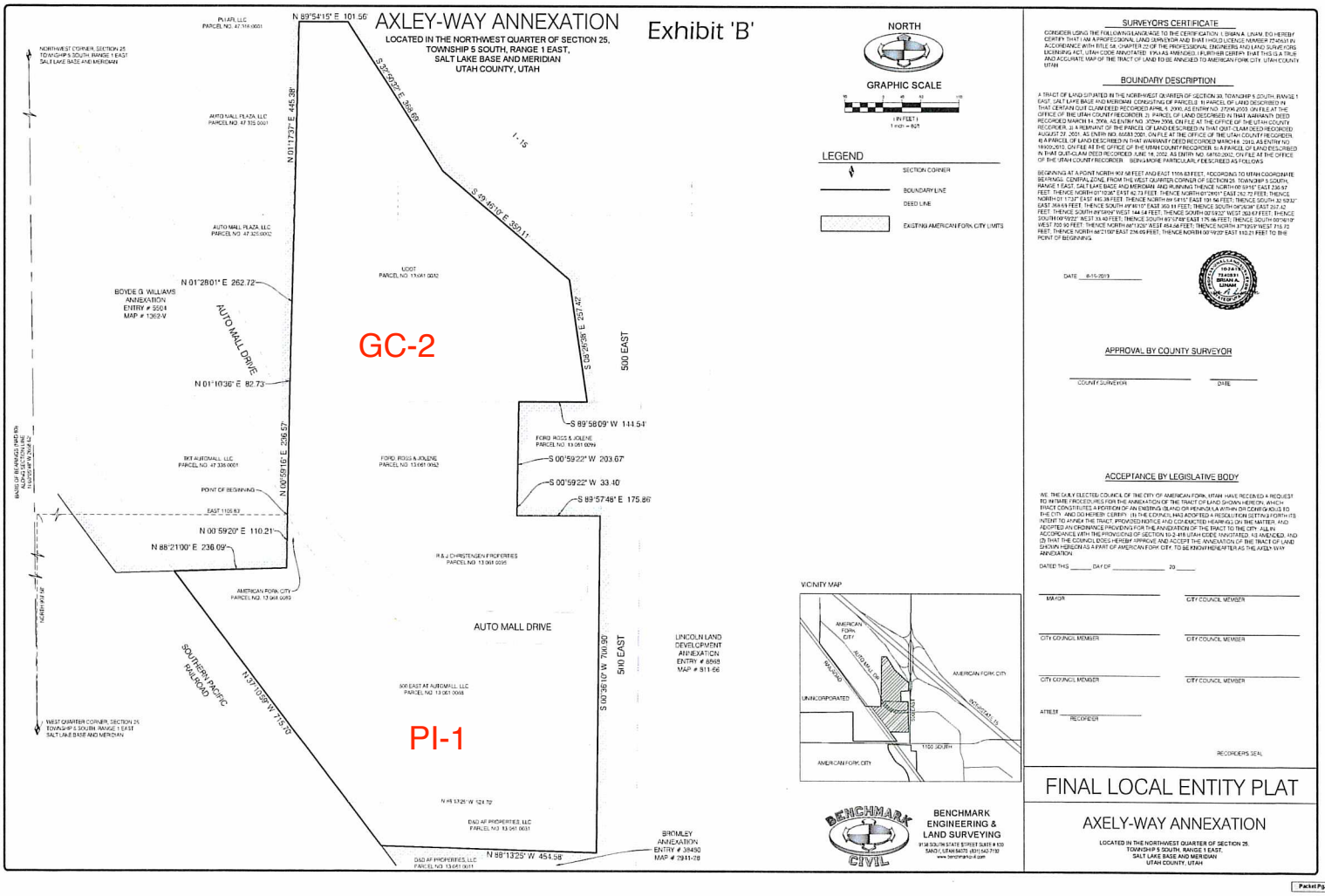
Tax I.D. No.	Name(s) of Owner	Signature of Owner(s)
13:061:0089	R & J Christensen Properties, LLC	
13:061:0095	R & J Christensen Properties, LLC	
13:061:0088	500 East at Automall, LLC	
13:061:0031	D & D AF Properties, LLC	

Attachment: NOI Resolution (Axley-Way Annexation NOI)

Attachment 2



Attachment 3



AUTO MALL DRIVE & 500 EAST STREET DEDICATION PLAT

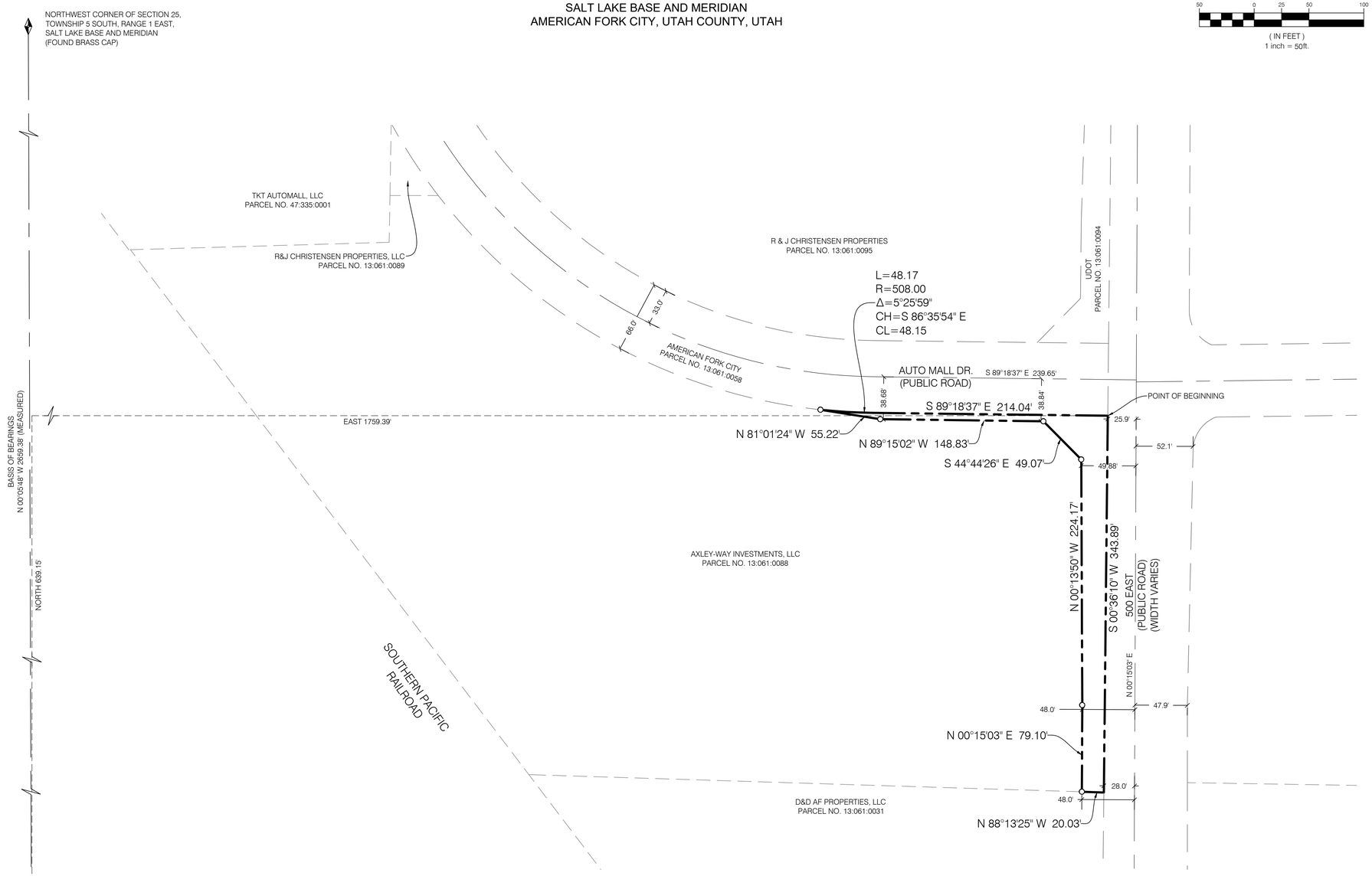
LOCATED IN THE NORTHWEST QUARTER OF SECTION 25,
TOWNSHIP 5 SOUTH, RANGE 1 EAST,
SALT LAKE BASE AND MERIDIAN
AMERICAN FORK CITY, UTAH COUNTY, UTAH

NORTH

GRAPHIC SCALE

50 0 25 50 100

(IN FEET)
1 inch = 50ft.



LEGEND

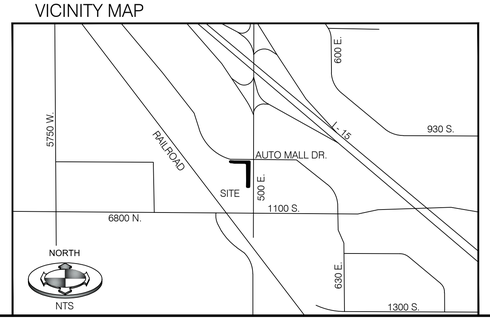
- UTAH COUNTY SECTION CORNER
- BOUNDARY CORNER (SET ⅝ REBAR AND CAP OR NAIL AND WASHER STAMPED "BENCHMARK ENG.")
- SECTION LINE
- BOUNDARY LINE
- ADJACENT PROPERTY
- STREET CENTERLINE EXISTING
- EXISTING RIGHT OF WAY

WEST QUARTER CORNER OF SECTION 25, TOWNSHIP 5 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN (FOUND BRASS CAP)

S 00°04'25" E 38.96' (MEASURED)
S 00°05'12" E 39.00' (RECORD)

WITNESS CORNER FOR THE WEST QUARTER CORNER OF SECTION 25, TOWNSHIP 5 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN (FOUND BRASS CAP)

VICINITY MAP



DEVELOPER:
DAVIES DESIGN BUILD
JONATHAN JENSEN
240 N. 1200 E. #201
LEHI, UT 84043
801-583-6044

FLOOD ZONE DESIGNATION

SUBJECT PROPERTY HAS NO DATA DELINEATED BY F.E.M.A. FLOOD INSURANCE RATE MAP, COMMUNITY PANEL MAP NO. 4955170120B, EFFECTIVE JULY 17, 2002.

SURVEYOR'S CERTIFICATE

I, BRIAN A. LINAM, DO HEREBY CERTIFY THAT I AM A PROFESSIONAL LAND SURVEYOR, AND THAT I HOLD A LICENSE IN ACCORDANCE WITH TITLE 58, CHAPTER 22, PROFESSIONAL ENGINEERS AND LAND SURVEYORS LICENSING ACT, UTAH CODE ANNOTATED, 1953 AS AMENDED CERTIFICATE NUMBER 7240531. I FURTHER CERTIFY THAT BY AUTHORITY OF THE OWNERS, I HAVE MADE A SURVEY OF THE TRACT OF LAND SHOWN ON THIS PLAT AND DESCRIBED BELOW, AND HAVE SUBDIVIDED SAID TRACT OF LAND INTO STREETS, HEREAFTER TO BE KNOWN AS AUTO MALL DRIVE & 500 EAST STREET ROAD DEDICATION PLAT, AND THAT THE SAME HAS BEEN CORRECTLY SURVEYED AS SHOWN ON THIS PLAT.

DEDICATION DESCRIPTION

BEGINNING AT THE NORTHEAST CORNER OF GRANTOR'S PROPERTY, SAID POINT BEING NORTH 639.15 FEET AND EAST 1759.39 FEET FROM THE WEST QUARTER CORNER OF SECTION 25, TOWNSHIP 5 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN(BASIS OF BEARINGS BEING NORTH 00°05'48" WEST FROM SAID WEST QUARTER CORNER TO THE NORTHWEST CORNER OF SAID SECTION 25); AND RUNNING THENCE SOUTH 00°36'10" WEST 343.89 FEET TO THE SOUTHEAST CORNER OF GRANTOR'S PROPERTY; THENCE NORTH 88°13'25" WEST 20.03 FEET ALONG THE SOUTHERLY LINE OF GRANTORS PROPERTY; THENCE NORTH 00°15'03" EAST 79.10 FEET, THENCE NORTH 00°13'50" WEST 224.17 FEET; THENCE NORTH 44°44'26" WEST 49.07 FEET; THENCE NORTH 89°15'02" WEST 148.83 FEET; THENCE NORTH 81°01'24" WEST 55.22 FEET TO A POINT ON THE NORTHERLY LINE OF GRANTOR'S PROPERTY; THENCE ALONG SAID NORTHERLY PROPERTY LINE THE FOLLOWING TWO (2) COURSES: 1) SOUTHEASTERLY 48.17 FEET ALONG THE ARC OF A 508.00 FOOT RADIUS NON TANGENT CURVE TO THE LEFT, CHORD BEARS SOUTH 86°35'54" EAST 48.15 FEET; 2) SOUTH 89°18'37" EAST 214.04 FEET TO THE POINT OF BEGINNING.

CONTAINS 9,318 SQ FT OR 0.214 ACRES, MORE OR LESS

DATE: 1/2020 BRIAN A. LINAM, PLS
LICENSE NO: 7240531

OWNER'S DEDICATION

KNOWN ALL MEN BY THESE PRESENTS THAT I / WE, THE UNDERSIGNED OWNER(S) OF THE ABOVE DESCRIBED TRACT OF LAND, HAVING CAUSED SAME TO BE SUBDIVIDED, HEREAFTER KNOWN AS THE

AUTO MALL DRIVE & 500 EAST STREET
ROAD DEDICATION PLAT

DO HEREBY DEDICATE THE STREETS, EASEMENTS AND OTHER PUBLIC AREAS AS INDICATED HEREON FOR THE PERPETUAL USE OF THE PUBLIC.
IN WITNESS WHEREOF I / WE HAVE HEREUNTO SET OUR HAND (S) THIS ___ DAY OF _____ A.D., 20___.

BY: _____
ITS: _____

ACKNOWLEDGMENT

STATE OF UTAH
County of Salt Lake } S.S.

ON THIS ___DAY OF _____, IN THE YEAR 20___, BEFORE ME _____, A NOTARY PUBLIC, PERSONALLY APPEARED _____THE MANAGING MEMBER OF AXLEY-WAY INVESTEMNTS, LLC PROVED ON THE BASIS OF SATISFACTORY EVIDENCE TO BE THE PERSON(S) WHOSE NAME(S) IS/ARE SUBSCRIBED TO IN THE FOREGOING OWNER'S DEDICATION AND CONSENT REGARDING AUTO MALL DRIVE & 500 EAST STREET ROAD DEDICATION PLAT AND WAS SIGNED BY HIM/HER ON BEHALF OF SAID AXLEY-WAY INVESTEMNTS, LLC AND ACKNOWLEDGED THAT HE/SHE/THEY EXECUTED THE SAME.

MY COMMISSION EXPIRES: _____ (DATE) COMMISSION NUMBER:_____

_____ PRINT NAME

_____ (SIGNED) A NOTARY PUBLIC COMMISSIONED IN UTAH

ACCEPTANCE BY LEGISLATIVE BODY

THE CITY COUNCIL OF THE CITY OF AMERICAN FORK, COUNTY OF UTAH, APPROVES THIS DEDICATION PLAT, AND HEREBY ACCEPTS THE DEDICATION OF ALL STREETS, EASEMENTS AND OTHER PARCELS OF LAND INTENDED FOR THE PUBLIC PURPOSE OF THE PERPETUAL USE OF SAID PUBLIC.
THIS _____ DAY OF _____, A.D. _____.

_____ CITY MAYOR

_____ CITY COUNCIL MEMBER

_____ CITY COUNCIL MEMBER

_____ CITY COUNCIL MEMBER

_____ CITY COUNCIL MEMBER

_____ CITY COUNCIL MEMBER

_____ CITY COUNCIL MEMBER

_____ CITY ENGINEER

ATTEST: _____ CLERK-RECORDER (SEE SEAL BELOW)

PLANNING COMMISSION APPROVAL

APPROVED THIS _____ DAY OF _____ A.D. 20____, BY THE AMERICAN FORK CITY PLANNING COMMISSION.

_____ PLANNER

_____ PLANNING COMMISSION CHAIR

AUTO MALL DRIVE & 500 EAST STREET
ROAD DEDICATION PLAT

LOCATED IN THE NORTHWEST QUARTER
OF SECTION 25, TOWNSHIP 5 SOUTH, RANGE 1 EAST,
SALT LAKE BASE AND MERIDIAN
AMERICAN FORK CITY, UTAH COUNTY, UTAH

BENCHMARK CIVIL
BENCHMARK ENGINEERING & LAND SURVEYING
9138 SOUTH STATE STREET SUITE # 100
SANDY, UTAH 84070 (801) 542-7192
www.benchmarkcivil.com

SURVEYOR'S SEAL



NOTARY PUBLIC SEAL

CLERK - RECORDER SEAL

WATER DELAY AGREEMENT FOR ANNEXATION

This Water Delay Agreement for Annexation ("**Agreement**") is entered into as of the _____ day of _____, 20___ ("**Effective Date**"), by and between 500 East at Aub Mall, LLC ("**Owner**"), and AMERICAN FORK CITY, a municipal corporation and political subdivision of the State of Utah ("**City**").

RECITALS

WHEREAS Owner is the owner of Parcel Nos. 13:061:0088 ("**Property**"), which are located outside of the City's current municipal boundaries; and

WHEREAS Owner has filed with the City a request to have the Property annexed into the City ("**Annexation Request**"); and

WHEREAS Section 17.1.400(C) of the City Code requires the conveyance of title to water rights concurrently with final action by the City Council on an annexation, except under pursuant to certain findings, terms, and conditions; and

WHEREAS City and Owner desire to enter into this Agreement as part of the findings, terms, and conditions required under Section 17.1.400(C) of the City Code.

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants hereafter set forth, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Owner and City, incorporating the recitals set forth above, agree as follows:

AGREEMENT

1. Determination of City Council. The City Council, with the recommendation of the City Planning Commission, has determined that there is good and sufficient reason to delay the time of conveyance of water rights and/or water shares beyond the time of the City Council's final action on the Annexation Request. This determination was made in the City Council meeting held on _____, 20___. The basis and reasoning for the City Council's determination are included within the recording, minutes, and other documentation from said City Council meeting.

2. Water Rights/Shares. The specific water rights and/or water shares that may be conveyed to the City, and that pursuant to the terms and conditions of this Agreement are hereby committed to the City, which commitment is irrevocable by Owner and may be released by the City only as provided in this Agreement ("**Committed Water**"), are identified in Exhibit A of this Agreement.

3. Conveyance of Committed Water. Prior to the City's approval of any development on the Property that will require the delivery of water, the City will determine the amount of water rights/shares required for dedication and conveyance to the City in order to meet the water requirements of the development. Owner will convey clear title to the required amount of the Committed Water to the City. If the amount of water necessary for the development is less than the

total amount of the Committed Water, the City will release the commitment (provided in paragraph 2 above) as to the unnecessary portion of the Committed Water. If the amount of water necessary for the development is more than the total amount of the Committed Water, Owner shall convey additional acceptable water rights/shares to the City to meet the dedication requirements. If the Committed Water consists of any water rights, the conveyance shall be by Warranty Deed and an accompanying Water Rights Deed Addendum. If the Committed Water consists of any water shares, the conveyance shall be by assignment, endorsement, and delivery of the appropriate share certificates. Owner acknowledges that under the Article XI, Section 6 of the Utah Constitution, City is prohibited from returning to Owner any portion of the Committed Water once it has been conveyed to the City.

4. Change Application. If any of the Committed Water consists of water rights, an express prerequisite for conveyance shall be the filing and approval of an Application for Permanent Change of Water ("**Change Application**") with the Utah Division of Water Rights ("**Division**") to convert the water rights to municipal use to be diverted from the City's wells. Prior to the filing of the Change Application, the water rights shall be reviewed by the City's water attorneys to ensure that the water rights are suitable for dedication. The City's water attorneys shall also prepare and prosecute the Change Application, with the full assistance and support of Owner. The water rights will be deemed acceptable for conveyance to the City under this paragraph upon the issuance of an Order approving the Change Application that is acceptable to the City and upon expiration of all applicable deadlines for requests for reconsideration and/or appeal of the Order. Owner shall be responsible for all costs associated with the Change Application, including but not limited to the City's attorney fees, application filing fees, and document fees.

5. Title to Committed Water. Owner shall convey unencumbered title to the Committed Water to the City. If the Committed Water consists of water rights, the City will obtain a water rights title insurance policy for the water rights. Owner shall be responsible for all costs associated with the water rights title insurance, including but not limited to the policy premium and recording fees. Owner shall be responsible for satisfying the requirements and conditions of the Title Commitment in order for the title company to issue a title insurance policy that is acceptable to the City. A water rights title insurance policy that is agreeable to the City is an express condition to the acceptability of the water rights for dedication and conveyance to the City. If the Committed Water consists of water shares, the City will obtain written confirmation of share ownership and current payment of all assessments from the respective water company/companies. Owner shall be responsible for all costs associated with obtaining the written confirmation. From the date of this Agreement until the Committed Water is conveyed to the City, Owner shall not sell or otherwise dispose of the Committed Water, nor shall Owner allow any liens or encumbrances upon the Committed Water that would prevent Owner from conveying unencumbered title to the Committed Water to the City.

6. Cessation of Owner's Use. Upon conveyance of the Committed Water to the City, Owner shall immediately cease any and all use of the Committed Water.

7. Successors and Assigns. Pursuant to the terms of this Agreement, Owner shall have the right to assign its rights, duties, and obligations. The parties acknowledge that the rights, duties, and obligations of Owner will also apply to any successor or assign of Owner, and that the use of the term "Owner" in this contract includes Owner's successors or assigns.

8. Ownership of Water Facilities. Nothing in this Agreement shall alter the ownership of any wells or other water facilities of Owner or City.

9. Entire Agreement. This Agreement represents the entire agreement between the parties and supersedes all prior agreements and understandings concerning the commitment and conveyance of water rights for the Property. This Agreement shall not be amended, modified, or terminated except by written instrument signed by all parties.

10. Construction and Enforcement. This Agreement shall be construed in accordance with and governed by the laws of the State of Utah. This Agreement may be specifically enforced.

11. Third Party Beneficiaries. This Agreement is not intended to and shall not create any rights in any person or entity not a party to this Agreement.

12. Attorney Fees. In any action arising out of this Agreement, the prevailing party shall be entitled to costs and reasonable attorney fees.

13. Further Assurances. After the execution of this Agreement, the parties agree to execute and deliver such documents, and to take or cause to be taken all such other actions, as either party may reasonably deem necessary or appropriate in order to carry out the intents and purposes of this Agreement.

14. Severability. If any term, covenant, or condition of this Agreement shall be determined by a court of competent jurisdiction to be invalid or unenforceable, the remainder of this Agreement shall not be affected thereby, and the remainder of the Agreement shall remain in full force and effect.

15. Authority of Parties. The persons signing this Agreement represent and warrant that they have full authority to do so and that their corporation or entity has undertaken and obtained whatever formalities and approvals are necessary to enter into this Agreement.

16. Counterparts. This Agreement may be executed in multiple counterparts, all of which taken together shall comprise one agreement.

Approved as to form by City's attorney 7/11/2018

IN WITNESS WHEREOF, the parties have executed this Agreement as of the Effective Date.

AMERICAN FORK CITY

_____ Attest: _____

Bradley J. Frost, Mayor Terilyn Lurker, City Recorder

STATE OF UTAH)
:ss
COUNTY OF _____)

On the _____ day of _____, 20___, personally appeared before me Bradley J. Frost and Terilyn Lurker, known to me to be the Mayor and City Recorder, respectively, of American Fork City, who acknowledged to me that they executed the within Water Delay Agreement pursuant to the approval and authorization of the City Council at a regular meeting at which a quorum was in attendance.

_____
NOTARY PUBLIC

[OWNER]

Steve Davies

STATE OF UTAH Utah)
:ss
COUNTY OF _____)

On the 4th day of December, 2019 Steve Davies personally appeared before me and duly acknowledged that he/she executed this Water Delay Agreement for the purposes stated therein.

TAMARA DAVIES
NOTARY PUBLIC -STATE OF UTAH
My Comm. Exp 09/18/2022
Commission # 702362

Tamara Davies
NOTARY PUBLIC

Approved as to form by City's attorney 7/11/2018

Exhibit A

Description of Water Rights and/or Water Shares Committed to the City

To Whom It May Concern:

Our company, Central Utah Water Specialists Services, LLC, is a water broker dealing with purchasing and selling water shares for most of the water companies in Utah County.

Currently we have had discussions with 500 East at Auto Mall, LLC represented by Steve Davies, its Manager, and have committed to deliver them the required American Fork Irrigation or Provo Reservoir water shares required to annex the property on the corner of 500 East and Auto Mall Drive, American Fork, Utah. We have the shares in our inventory and could deliver them upon request.

Sincerely,

Jay W. Garlick
Dec. 5, 2019

Jay Garlick
Manager
Central Utah Water Specialist Services, LLC
1016 North Fort Canyon Road
Alpine, Utah 84004

AMERICAN FORK CITY ENGINEERING DIVISION
STAFF REPORT

Planning Commission Meeting Date: 1/8/2020

This report is a summary of the American Fork City Engineering Division plan review comments regarding the subject plan as submitted by the applicant for American Fork City Land Use Authority approval:

Project Name: Axley-Way Annexation

Project Address: 500 East Auto Mall Drive

Developer / Applicant's Name: Davies Design Build

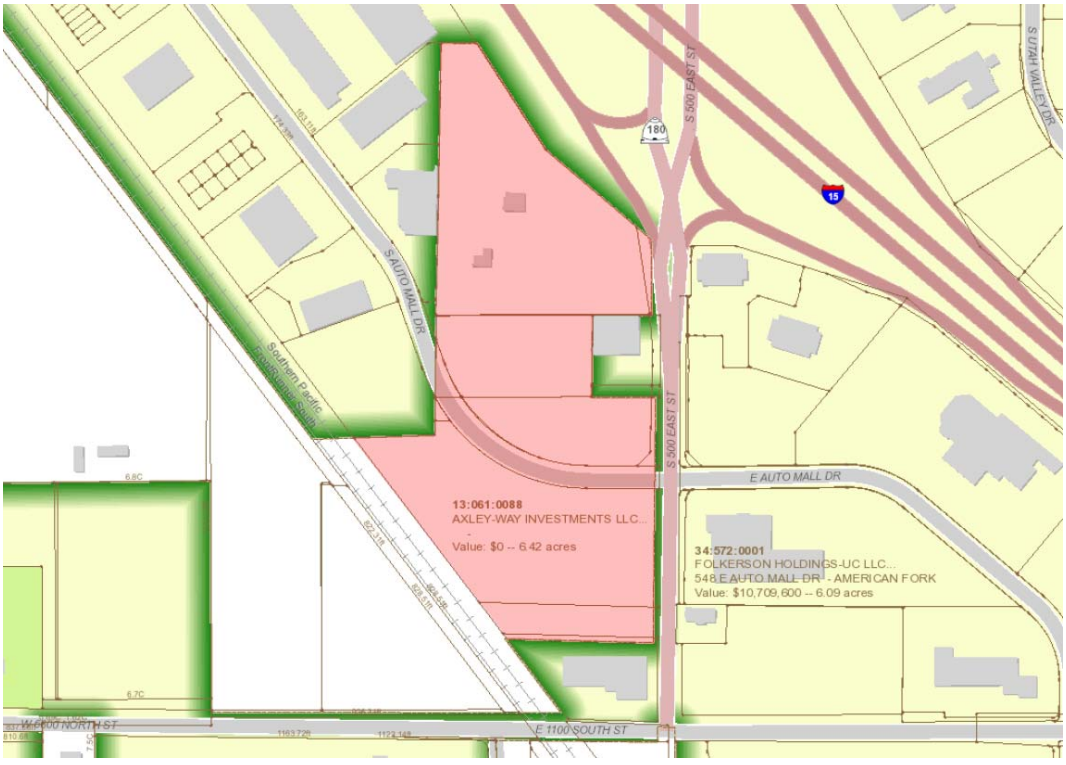
Type of Application:

- ☐ Subdivision Final Plat
- ☐ Subdivision Preliminary Plan
- ☒ Annexation
- ☐ Code Text Amendment
- ☐ General Plan Amendment
- ☐ Zone Change
- ☐ Commercial Site Plan
- ☐ Residential Accessory Structure Site Plan

Engineering Division Recommendation: The Engineering Division recommends APPROVAL of the proposed development subject to the following findings and conditions:

1. All Standard Conditions of Approval and items denoted as "Plan Modification(s) Required" in the 1/8/2020 Engineering Division Staff Report for the City Land Use Authority shall be addressed on all final project documents.

Project Map:



STANDARD CONDITIONS OF APPROVAL

Standard Conditions of Approval:

APPLICANT is responsible and shall submit/post/obtain all necessary documentation and evidence to comply with these Standard Conditions of Approval prior to any platting, permitting, or any other form of authorization by the City including plat recording or other property conveyance to the City and prior to scheduling a pre-construction meeting. All recording shall take place at the Utah County Recorder's Office.

1. **Title Report:** Submit an updated Title Report not older than 30 days or other type of appropriate verification that shows all dedications to the City are free and clear of encumbrances, taxes, or other assessments.
2. **Property Taxes and Liens:** Submit evidence that all the property taxes, for the current and/or previous years, liens, and agricultural land use roll over fees have been paid in full.
3. **Water Rights:** Submit evidence that all the required water rights have been conveyed to American Fork City.
4. **Performance Guarantee:** Post a performance guarantee for all required public and essential common improvements.
5. **Easements and Agreements:** Submit/record a long-term Storm Water Pollution Prevention Maintenance Agreement signed and dated by the property owner and any required easement documentation.
6. **Land Disturbance Permit:** Obtain a Land Disturbance Permit.
7. **Compliance with the Engineering Division Plan Review Comments:** All plans and documents shall comply with all the Technical Review Committee comments and the City Engineer's final review.
8. **Commercial Structure:** Record an Owner Acknowledgment and Utility Liability Indemnification if the proposed building is a multi-unit commercial structure served by a single utility service.
9. **Sensitive Lands:** Record all applicable documents required for compliance with the City's Sensitive Lands Ordinance.
10. **Utility Notification Form:** Submit a Subdivision Utility Notification Form.
11. **Professional Verification:** Submit final stamped construction documentation by all appropriate professionals.
12. **Fees:** Payment of all development, inspection, recording, street light, and other project related fees.
13. **Mylar:** Submit a Mylar. All plats will receive final verification of all formats, notes, conveyances, and other items contained on the plat by City staff (recorder, legal, engineer, GIS, planning).

Plan Modifications Required:

1.

Review and action on General Plan Amendments relating to the culinary water system master plan, pressurized irrigation system master plan, and sanitary sewer system master plan.

Proposed general plan amendments for the public facilities and service elements, including the culinary water system master plan, pressurized irrigation system master plan, and sanitary sewer system master plan.

Potential Motions:

APPROVAL

Mr. Chairman, I move that we recommend approval of the General Plan Amendments.

DENIAL

Mr. Chairman, I move that we recommend denial of the General Plan Amendments.

TABLE

Mr. Chairman, I move that we table action on the General Plan Amendments.

AMERICAN FORK CITY ENGINEERING DIVISION
STAFF REPORT

Planning Commission Meeting Date: 1/8/2020

This report is a summary of the American Fork City Engineering Division plan review comments regarding the subject plan as submitted by the applicant for American Fork City Land Use Authority approval:

Project Name: General Plan Amendments

Project Address: N/A

Developer / Applicant's Name: American Fork City

Type of Application:

- ☐ Subdivision Final Plat
- ☐ Subdivision Preliminary Plan
- ☐ Annexation
- ☐ Code Text Amendment
- ☒ General Plan Amendment
- ☐ Zone Change
- ☐ Commercial Site Plan
- ☐ Residential Accessory Structure Site Plan

Engineering Division Recommendation: The Engineering Division recommends APPROVAL of the proposed general plan amendments for the public facilities and service elements, including the culinary water system master plan, pressurized irrigation system master plan and sanitary sewer system master plan. These updates reflect current development needs related to public infrastructure. These updates are consistent with the long-term planning and engineering goals for the City and are not detrimental to the general health, safety and welfare of its citizens.

AMERICAN FORK CITY
GENERAL PLAN



Public Facilities and Services Element

2019 Culinary Water System Master Plan
&
Impact Fee Facility Plan

Prepared by

HORROCKS
ENGINEERS

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Abbreviations

AAPR	Annual Percentage Growth Rate
CCI	Construction Cost Index
ERC	Equivalent Residential Connection
DDW	Division of Drinking Water
fps	Feet per Second
gpd	Gallons per Day
gpdpc	Gallons per Day per Capita
gpm	Gallons per Minute
IFA	Impact Fee Analysis
IFFP	Impact Fee Facility Plan
sf	Square Foot

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Chapter 1 - Summary and Recommendations

Introduction

American Fork City has been experiencing significant population growth over the past several years, with many new subdivisions having been built and large blocks of land having been annexed into the City. The City continues to prepare for additional population growth, especially in areas south of Interstate 15 such as the proposed Transit Oriented Development (TOD) area. Due to these factors, it is necessary to review and update the American Fork City culinary water system component of the General Plan to help the City prepare for growth and to correct water system deficiencies.

Horrocks Engineers prepared the American Fork City Water Systems component of the General Plan in 1993, which was subsequently updated in 1998. An additional section was added to the water systems component of the General Plan in 2003, which was then updated in both 2007 and 2010 to include the proposed secondary water system, hereafter referred to as the pressurized irrigation system. Since completion of construction of the pressurized irrigation system in 2010, demands on the culinary water system have been significantly reduced and overall water service to City residents has improved. The pressurized irrigation and culinary water systems generally operate independent of each other. As such, the American Fork City Water Systems component of the General Plan was separated into the Culinary Water and Pressurized Irrigation System master plans in 2016. An additional update was completed in 2018.

Most of the recommendations in the previous components have been completed. This 2019 Culinary Water System master plan update addresses the changes since 2016. This study was performed assuming the city-wide pressurized irrigation system will supply the majority of outdoor water demand.

American Fork City's current and future conditions are discussed in this study, including the existing land use and zoning, projected population, number of connections, developable areas, and projected demand. Using the projected population, design requirements, and historical demand, required system capacity is projected through the planning period.

To develop an impact fee, a minimum level of service must be established. The following are the minimum level of service (LOS) to be provided by the culinary water system.

- Provide 40 psi at all locations in the distribution system during peak day demands
- Provide 30 psi at all locations in the distribution system during peak hour demands
- Provide 20 psi at all locations in the distribution system during a fire flow event.

- Maintain a maximum of 15 psi pressure differential between peak day and peak hour.
- Provide minimum 1,750 gpm of fire flow for 2 hours (adequate for 4,800 sf home).
- Maintain a maximum 8 fps water velocity during peak hour demands
- Maintain a maximum 5 fps water velocity during peak day demands unless pressures are not compromised.
- Maintain a minimum of 400 gallons of storage per ERC
- Maintain a minimum of 0.45 ac-ft of water right per ERC
- Maintain a minimum of 0.56 gpm of water source per ERC

The International Fire Code (UFC) requires that a minimum fire flow of 1,750 gpm at 20 psi residual pressure be available for homes greater than 3,600 square feet. For homes less than 3,600 square feet, the required fire flow is 1,000 gpm. Homes that are 4,800 square feet and larger require increasingly larger fire flows. It is recommended that homes greater than 4,800 square feet should be analyzed individually to determine if adequate fire flows are available and what improvements are necessary to obtain adequate fire protection.

A computer program was used to analyze the existing water systems to determine if the LOS pressures and fire flows could be met. The capital improvements required to bring the existing water system up to the minimum LOS were also determined. In addition, recommendations for improvements were made to meet future demand.

The feasibility of the recommended improvements depends on the available funding. Recommendations are made to provide the funding needed to implement the recommended capital improvements.

Projected Population

American Fork City's population as of 2019 was approximately 36,303 people. However, the City's population is projected to increase by 128 percent to 82,694 people at build out conditions by the year 2060. This growth will add an additional 24,233 equivalent residential units (ERCs) to the system.

Projected Water Demand

Calculations in this report assume that the culinary water system is used for most indoor water use and the pressurized irrigation system is used for most outdoor water use. It is also assumed that all residents connected to the pressurized irrigation system use the system for their outdoor watering needs. Indoor water use records were analyzed to determine average water usage by a residential home for this study.

The State of Utah Division of Drinking Water has minimum **peak day** source requirements of 800 gallons per day (gpd) per connection for indoor use. Actual water use data from 2014 individual user meter readings shows an **average usage day** of 208 gpd per residential connection was used. Peak day individual meter usage is typically twice the average. This data was utilized to determine ERC values for all non-residential uses. In order to calibrate the model the total system peak usage day was estimated from monthly totals delivered to the system from the City's culinary water source master meters. The average flow in the peak month was

multiplied by a peaking factor of 1.2 to come up with the peak day. American Fork City does not track water sources on a daily basis but daily measurements in an adjoining community suggest a peaking factor between 1.11 and 1.3. Based on the above assumptions, peak daily culinary demand per ERC is 718 gallons per day (gpd). The difference between the individual metered usage and master metered supply is due to leakage and loss. The amount of leakage and loss is more than anticipated and it is recommended the City attempt to determine the reasons and take steps to reduce. For modeling and planning purposes the DDW standard of 800 gpd (0.56 gpm) is utilized because that is required by State Code. This becomes the Level of Service (LOS) for both existing and future users.

Recommended Culinary Water System Improvements

These recommendations were determined by using a computer model of American Fork City's culinary water system and input from city staff.

Existing Deficiency Improvement Plan

Table 1 shows the deficiencies in the existing culinary water system. These improvements are shown in Figure 2 in the appendix. A portion of the improvements listed will serve future as well as existing connections and the proportion associated with each are shown.

Table 1 Existing Deficiencies

Item	Description	Cost	Existing	Growth
1	New 8 Inch Connections	$57,741	$21,333	$36,407.22
2	8 Inch Upsizing	$1,075,061	$397,203	$677,858.73
3	4 Inch Waterline Replacement	$14,249,884	$14,249,884	$0.00
4	Hospital Well Generator Replacement	$120,000	$120,000	$0.00
	Grand Total	**$15,502,686**	**$14,788,421**	**$714,266**

September 2019 CCI = 11311

Buildout Improvement Plan

Table 2 shows the projected improvements in the buildout culinary water system. These improvements are shown in Figure 3 in the appendix.

Table 2 Buildout Improvements

Item	Description	Cost
1	Buildout Distribution Piping	$26,296,953
2	Buildout Transmission Piping	$30,711,727
3	Southwest Well and Generator	$4,702,615
4	North East Well and Generator	$3,889,292
5	Low Zone Tank	$2,940,765
	Grand Total	**$68,541,352**
	September 2019 CCI = 11311	

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Chapter 2 - Current and Future Conditions

Future conditions in American Fork City will affect the culinary water demands and the improvements needed to meet these demands. As factors change, the projected future conditions made in this study could be affected. To help minimize the effect of the changing future conditions, the recommendations made in this study have been based upon the number of people served by American Fork City's culinary water system rather than time periods.

This chapter discusses American Fork City's population projections through the planning and ultimate build-out periods. The projected number of culinary water connections has been determined based upon the projected population. In addition, using the potential areas of development, historical water demands, and State design requirements, the culinary water demands projected through the planning and ultimate build-out periods are discussed.

Projected Population

Population projections have been determined for American Fork City by Mountainland Association of Governments (MAG) in ten (10) year increments until total build-out is reached near the year 2060. However, the MAG population projections do not take into account the Transit Oriented Development (TOD) area located south of Interstate 15. Additional “high density” population projections have been determined by InterPlan in ten (10) year increments that take the TOD development into account. Intermediate numbers for both the MAG and InterPlan population projections were calculated by interpolation and are shown in Table 3. American Fork City's projected population is also shown on Figure 1. The projected average annual percentage growth rate (AAPR) from 2019 to 2060 is approximately 2.03 percent. Figures 5 and 6 in the appendix show the current zoning and anticipated land use within American Fork City.

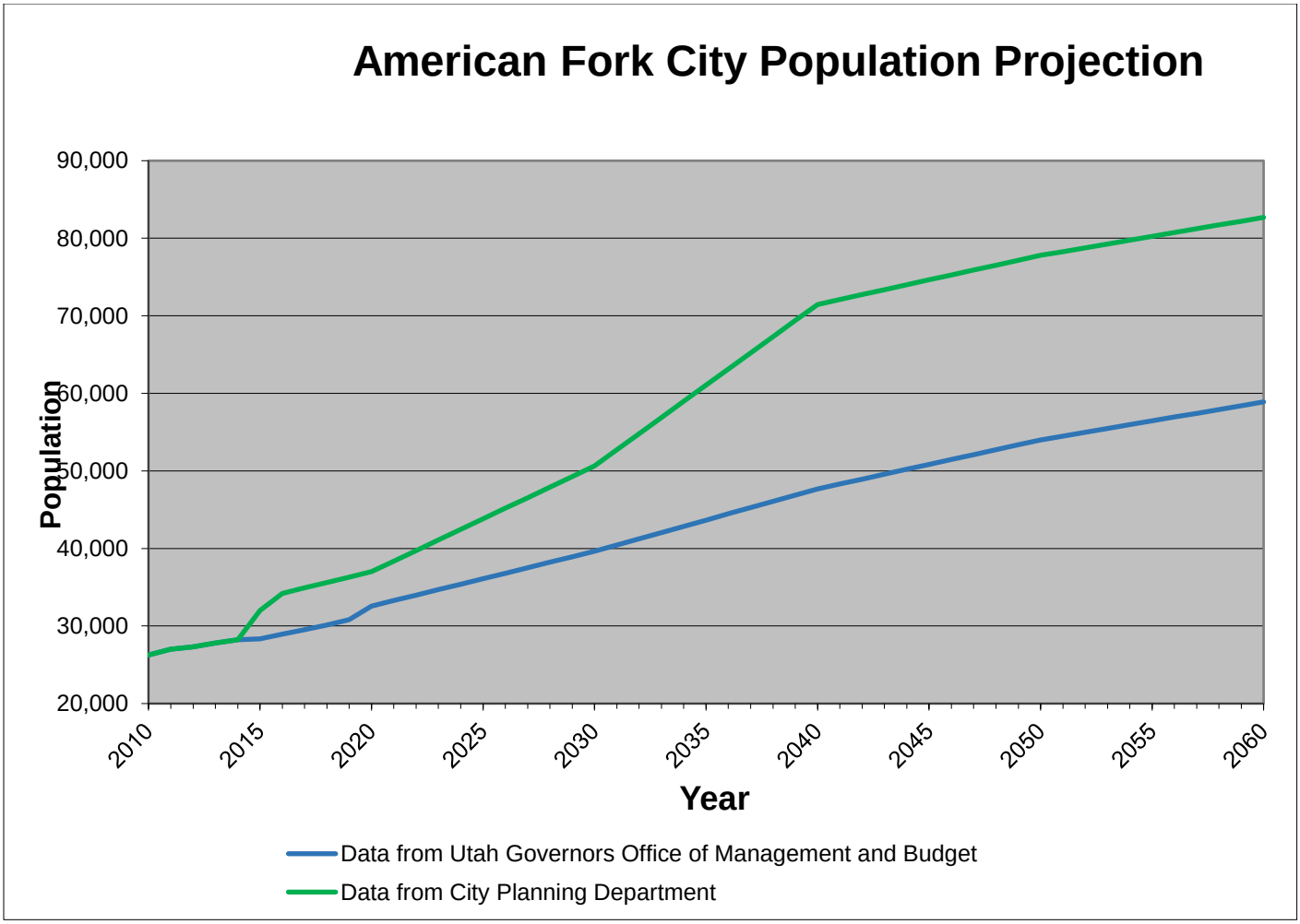


Figure 1 Population Projections

Equivalent Residential Connection (ERC)

Culinary water demands are generated from residential, commercial, industrial, and institutional sources and it is advantageous to relate these sources in a quantifiable manner. It was determined in the culinary water master plan that an average residential home in American Fork City required 208 gallons of culinary water per day. The average residential home is defined as an ERC. Other sources such as churches, schools, and commercial businesses are compared to the average residential home to determine its ERC value. For example a commercial business who requires 624 gallons of culinary water per day is assigned an ERC value of 3.0 because it requires three times the culinary water of an average home.

ERC's are anticipated to grow at the same rate as population. Table 3 also shows the projected ERC Growth.

Table 3 Population and ERC Projections

Year	Population	Growth Rate	ERC's
2016	34,213	6.92%	12,032
2017	34,910	2.04%	12,967
2018	35,607	2.00%	13,901
2019	36,303	1.96%	14,200
2020	37,000	1.92%	14,534
2021	38,364	3.69%	15,132
2022	39,727	3.55%	15,735
2023	41,091	3.43%	16,342
2024	42,454	3.32%	16,955
2025	43,818	3.21%	17,572
2026	45,181	3.11%	18,195
2027	46,545	3.02%	18,822
2028	47,908	2.93%	19,454
2029	49,272	2.85%	20,092
2030	50,635	2.77%	20,734
2031	52,719	4.12%	21,676
2032	54,802	3.95%	22,626
2033	56,886	3.80%	23,584
2034	58,970	3.66%	24,549
2035	61,054	3.53%	25,522
2036	63,137	3.41%	26,503
2037	65,221	3.30%	27,492
2038	67,305	3.19%	28,488
2039	69,388	3.10%	29,493
2040	71,472	3.00%	30,505
2041	72,104	0.88%	30,906
2042	72,736	0.88%	31,310
2043	73,369	0.87%	31,717
2044	74,001	0.86%	32,126
2045	74,633	0.85%	32,539
2046	75,265	0.85%	32,955
2047	75,897	0.84%	33,373
2048	76,530	0.83%	33,795
2049	77,162	0.83%	34,219
2050	77,794	0.82%	34,647
2051	78,284	0.63%	35,014
2052	78,774	0.63%	35,383
2053	79,264	0.62%	35,756

2054	79,754	0.62%	36,131
2055	80,244	0.61%	36,508
2056	80,734	0.61%	36,888
2057	81,224	0.61%	37,270
2058	81,714	0.60%	37,655
2059	82,204	0.60%	38,043
2060	82,694	0.60%	38,433

Existing Culinary Water System

The existing American Fork City culinary water system includes sources, storage, water rights, and distribution piping. The following sections describe the existing culinary water system components. The tables are a summary of the system as a whole rather than a zone-specific analysis. A zone-specific analysis has been performed with results shown in the Appendix. If there is a zone-specific deficiency it is noted in the appropriate section.

Culinary Water Sources

Table 4 shows the City existing culinary water sources and their capacity. Table 5 shows the current need versus supply. American Fork City currently has excess culinary water sources. Actual water usage in the City is significantly less than state standards and therefore these sources may not be physically necessary for the culinary water system to operate. The Division of Drinking Water is currently evaluating system specific requirements for American Fork City. When these requirements are published then the master plan requirements can be revisited as well.

Table 4 Existing Culinary Water Source Capacity

Water Source	Flowrate Capacity (gpm)	Pressure Zone
Boley Well	2,668	Upper Zone
Country Club Well	2,588	Upper Zone
Golf Course Well	2,660	Lower Zone
Hospital Well	1,400	Lower Zone
Race Track Well	3,200	Upper Zone
AF Canyon Springs	2,000	Upper Zone
Totals	**14,016**	

Table 5 Existing Culinary Source Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit) State Standards
Current	7,952	14,501	6,564

Culinary Water Storage

Table 6 shows the City's existing culinary water storage facilities and their capacity. Table 7 shows the current need versus supply. American Fork City currently has excess culinary water storage.

Table 6 Existing Culinary Water Storage Capacity

Tank	Capacity (gallons)	Zone*
AF Canyon Tank #1	5,000,000	Upper Zone
AF Canyon Tank #2	5,000,000	Upper Zone
Tank Farm (1 Tank)	4,500,000	Lower Zone
AF Canyon Springs Equivalent *	240,000	Upper Zone
Hospital Well Equivalent *	168,000	Lower Zone
Total	14,908,000	

*Free flowing springs or wells with backup power can be considered storage over the two hour fire flow period.

Table 7 Existing Culinary Storage Need Versus Supply

	Projected Need (gallons)	Capacity (gallons)	Excess/(Deficit)
Current	6,100,000	14,908,000	8,808,000

Culinary Water Rights

Table 8 shows the City's existing water rights. Table 9 shows the current need versus supply. American Fork City currently has adequate water right capacity. See City 40-Year water rights plan for details on water rights.

Table 8 Existing Water Right Capacity

Water Source	Water Right Capacity (ac-ft)	Pressure Zone
	Adequate	
Totals	**Adequate**	

Table 9 Existing Water Right Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit) State Standards
Current	6,390	Adequate	Adequate

Culinary Distribution Piping

Figure 6 in the appendix shows the City's existing distribution system including piping, sources, storage, etc. Figure 7 shows the pressure zones within the culinary water system.

Projected Culinary Water System Requirements

The projected population and LOS requirements were used to project the culinary water needs through the planning period. Using the projected ERCs, Table 10 shows the projected source, storage, and water right needs through the planning period. The tables are a summary of the system as a whole rather than a zone-specific analysis. A zone-specific analysis has been performed with results shown in the Appendix. If there is a zone-specific deficiency it is noted in the appropriate section.

Table 10 Projected Culinary Water Needs

Year	ERC's	Flow Required (gpm)	Storage Volume Required (gallons)	Water Rights Required (ac-ft)
2019	14,200	7,952	6,100,000	6,390
2020	14,534	8,139	6,233,437	6,540
2021	15,132	8,474	6,472,668	6,809
2025	17,572	9,840	7,448,894	7,908
2030	20,734	11,611	8,713,588	9,330
2035	25,522	14,292	10,628,878	11,485
2040	30,505	17,083	12,622,035	13,727
2045	32,539	18,222	13,435,607	14,643
2050	34,647	19,402	14,278,625	15,591
2055	36,508	20,444	15,023,146	16,429
Buildout	38,433	21,523	15,793,382	17,295

Buildout Culinary Water Sources

Table 11 shows the buildout need versus supply. It is projected that American Fork City will have inadequate culinary water sources at buildout. This is a change from earlier master plans in that proposed high density development have increased the potential needs significantly. It is recommended that two new wells be constructed one each in the Lower and Upper Zones. The City should also closely monitor the status of the aquifer to see if it maintains the necessary levels to supply the water necessary at buildout. Existing wells may need to be deepened or re-drilled as aquifer water levels continue to decrease. If aquifer water levels decrease too much then other sources of drinking water may need to be obtained such as treating surface water to drinking water quality.

Table 11 Buildout Source Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit) State Standards
Buildout	21,523	16,016	(5,507)

Buildout Culinary Water Storage

Table 12 shows the buildout need versus supply. It is projected that American Fork City will have inadequate culinary water storage at buildout. It is also recommended to have a 20 percent excess reserve if possible.

Table 12 Buildout Storage Need Versus Supply

	Projected Need (gallons)	Capacity (gallons)	Excess/(Deficit)
Buildout	15,793,382	14,908,000	(885,382)

Buildout Culinary Water Rights

Table 13 shows the buildout need versus supply. It is projected that American Fork City will have inadequate culinary water rights at buildout. It is recommended that the City continue to require water rights to be turned in to the City as a condition of development. Water rights that the City accepts should have a priority date of 1950 or earlier. This is based on the area water rights being over allocated. See City 40-Year water rights plan for details on water rights.

Table 13 Buildout Water Right Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit) State Standards
Buildout	17,295	Inadequate	Inadequate

Zone by Zone Analysis

A zone by zone analysis of culinary water system needs is given in the appendix. It shows the source, storage, and water right needs for each pressure zone in the culinary water system both for existing and buildout. It also shows the existing ERC's and projected buildout ERC's in each zone. Figure 7 in the appendix shows the culinary water pressure zones for American Fork City.

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Chapter 3 – Culinary Water System Analysis

American Fork City's culinary water system was analyzed to find the capacity of the current system and to determine the improvements needed to meet the demands of the projected population. In this chapter, a description of the existing culinary water system is given along with a discussion of the concerns and recommended improvements. State and American Fork City standard requirements were used as criteria to analyze the culinary water system. Information obtained from a computer model of American Fork's culinary water system is presented with the recommended improvements needed to meet the projected population culinary water demand.

American Fork City currently has approximately 162 miles of culinary water pipelines that transmit and distribute culinary water throughout the City. Figure 6 in the appendix shows the existing culinary water system. Pipelines in the City range from 2 inches to 36 inches.

State Design Requirements

The Utah DDW provides regulations for culinary water system design. It is recommended that American Fork City adopt the following criteria as the minimum level of service for the culinary water system:

To develop an impact fee, a minimum level of service must be established. The following are the minimum level of service to be provided by the culinary water system.

- Provide 40 psi at all locations in the distribution system during peak day demands
- Provide 30 psi at all locations in the distribution system during peak hour demands
- Provide 20 psi at all locations in the distribution system during a fire flow event.
- Provide minimum 1,750 gpm of fire flow for 2 hours (adequate for a 4,800 sf home).
- Maintain a maximum 8 fps water velocity during peak hour demands
- Maintain a maximum 5 fps water velocity during peak day demands unless pressures are not compromised.
- Maintain a minimum of 400 gallons of storage per ERC
- Maintain a minimum of 0.45 ac-ft of water right per ERC
- Maintain a minimum of 0.56 gpm of water source per ERC

The Uniform Fire Code (UFC) requires that a minimum fire flow of 1,750 gpm at 20 psi residual pressure be available for homes greater than 3,600 square feet. For homes less than 3,600 square feet, the required fire flow is 1,000 gpm. Homes that are 4,800 square feet and larger require increasingly larger fire flows. It is

recommended that homes greater than 4,800 square feet should be analyzed individually to determine if adequate fire flows are available and what improvements are necessary to obtain adequate fire protection.

Computer Model of Culinary Water System

A computer program called *WaterGEMS* (Connect Edition Update 2) was used to model American Fork City's culinary water system. The program uses the flows demanded at each node to calculate the pressures, flows, and velocity of flow for each node and pipe. Output of the model includes, pipe velocity, node demands, pressures, and available fire flow. Information for the existing culinary water system includes the pipe diameters, lengths, tanks, sources, pumps, PRV stations, etc.

The number of ERCs was estimated based on build-out conditions with the 2019 zoning and assuming 20 percent of the area was used in the development of roadways, sidewalks, parks, etc. The flows generated by the number of ERCs achieved at build-out were entered into *WaterGEMS*. *WaterGEMS* was run to determine upgrades needed for demands on the existing culinary water system and demands to be placed on the system during buildout.

Division of Drinking Water Hydraulic Modeling Rule

The hydraulic modeling was performed in conformance with the State of Utah Administrative Code R309-511. Hydraulic Modeling Requirements and utilized the minimum flow requirements of R309-510 and the minimum pressure requirements of R309-105-9. All recommendations within this plan are to ensure that both the existing and buildout system meet the standards noted above. The hydraulic model was calibrated with field measurements and observations including fire flow testing in each of the separate pressure zones. The majority of the fire flow tests were within 5 percent of the modeled results. It was determined that the areas that showed greater than 5 percent discrepancy were caused by closed valves. As these locations are noted the City identifies and opens the valves.

Existing Deficiency Improvement Plan

Table 14 shows the deficiencies in the existing culinary water system. These improvements are shown in Figure 2 in the appendix. A portion of the improvements listed will serve future as well as existing connections and the proportion associated with each are shown. Figures 8 and 9 in the appendix show the existing peak day pressure and velocity respectively. Figure 10 in the appendix shows the current available fire flow.

Table 14 Existing Deficiencies

Item	Description	Cost	Existing	Growth
1	New 8 Inch Connections	$57,741	$21,333	$36,407.22
2	8 Inch Upsizing	$1,075,061	$397,203	$677,858.73
3	4 Inch Waterline Replacement	$14,249,884	$14,249,884	$0.00
4	Hospital Well Generator Replacement	$120,000	$120,000	$0.00
	Grand Total	**$15,502,686**	**$14,788,421**	**$714,266**

September 2019 CCI = 11311
Costs are in 2019 dollars

Buildout Improvement Plan

Table 15 shows the improvements necessary to provide capacity for future growth. These improvements are shown in Figure 4 in the appendix. Figure 11 in the appendix shows the proposed buildout water system. Figures 12 and 13 in the appendix show the projected peak day pressure and velocity respectively at buildout. Figure 14 in the appendix shows the projected available fire flow at Buildout.

Table 15 Buildout Improvements

Item	Description	Cost
1	Buildout Distribution Piping	$26,296,953
2	Buildout Transmission Piping	$30,711,727
3	Southwest Well and Generator	$4,702,615
4	North East Well and Generator	$3,889,292
5	Low Zone Tank	$2,940,765
	Grand Total	**$68,541,352**

September 2019 CCI = 11311

A summary of the recommended improvements, scheduling, and estimated costs is shown in Table 16. Figures 2 and 3 in the appendix shows the recommended improvements. With contingencies, engineering, legal, and administrative fees, the total estimated cost is $184,829,213.

Table 16 Full Improvement Schedule

Fiscal Year	Description	Cost	% Benefit to Existing	Impact Expense	Operating Expense
2019-20	Annual Master Plan Review	$5,500	36.95%	$3,468	$2,032
	New 8 Inch Connections	$57,741	36.95%	$36,407	$21,333
	8 Inch Upsizing	$107,506	36.95%	$67,786	$39,720
	4 Inch Waterline Replacement	$1,424,988	100.00%	$0	$1,424,988
	System Replacement	$1,329,383	100.00%	$0	$1,329,383
	Southwest Well and Generator	$1,551,863	0.00%	$1,551,863	$0
	Buildout Distribution Piping	$1,314,848	0.00%	$1,314,848	$0
2020-21	Annual Master Plan Review	$5,500	36.95%	$3,468	$2,032
	8 Inch Upsizing	$107,506	36.95%	$67,786	$39,720
	4 Inch Waterline Replacement	$1,424,988	100.00%	$0	$1,424,988
	System Replacement	$1,329,383	100.00%	$0	$1,329,383
	Southwest Well and Generator	$1,551,863	0.00%	$1,551,863	$0
	Buildout Distribution Piping	$1,314,848	0.00%	$1,314,848	$0
2021-22	Annual Master Plan Review	$5,500	36.95%	$3,468	$2,032
	8 Inch Upsizing	$107,506	36.95%	$67,786	$39,720
	4 Inch Waterline Replacement	$1,424,988	100.00%	$0	$1,424,988
	System Replacement	$1,329,383	100.00%	$0	$1,329,383
	Southwest Well and Generator	$1,598,889	0.00%	$1,598,889	$0
	Buildout Distribution Piping	$1,314,848	0.00%	$1,314,848	$0
2022-23	5 Year Master Plan Update	$55,000	36.95%	$34,679	$20,321
	8 Inch Upsizing	$107,506	36.95%	$67,786	$39,720
	4 Inch Waterline Replacement	$1,424,988	100.00%	$0	$1,424,988
	Hospital Well Generator Replacement	$120,000	100.00%	$0	$120,000
	System Replacement	$1,329,383	100.00%	$0	$1,329,383
	Buildout Distribution Piping	$859,708	0.00%	$859,708	$0
	Buildout Transmission Piping	$1,181,220	0.00%	$1,181,220	$0
2023-24	Annual Master Plan Review	$5,500	36.95%	$3,468	$2,032
	8 Inch Upsizing	$107,506	36.95%	$67,786	$39,720
	4 Inch Waterline Replacement	$1,424,988	100.00%	$0	$1,424,988
	System Replacement	$1,329,383	100.00%	$0	$1,329,383
	Buildout Distribution Piping	$859,708	0.00%	$859,708	$0
	Buildout Transmission Piping	$1,181,220	0.00%	$1,181,220	$0
2024-25	Annual Master Plan Review	$5,500	36.95%	$3,468	$2,032
	8 Inch Upsizing	$107,506	36.95%	$67,786	$39,720
	4 Inch Waterline Replacement	$1,424,988	100.00%	$0	$1,424,988
	System Replacement	$1,329,383	100.00%	$0	$1,329,383
	Buildout Distribution Piping	$859,708	0.00%	$859,708	$0

	Buildout Transmission Piping	$1,181,220	0.00%	$1,181,220	$0
2025-26	Annual Master Plan Review	$5,500	36.95%	$3,468	$2,032
	8 Inch Upsizing	$107,506	36.95%	$67,786	$39,720
	4 Inch Waterline Replacement	$1,424,988	100.00%	$0	$1,424,988
	System Replacement	$1,329,383	100.00%	$0	$1,329,383
	Buildout Distribution Piping	$859,708	0.00%	$859,708	$0
	Buildout Transmission Piping	$1,181,220	0.00%	$1,181,220	$0
2026-27	Annual Master Plan Review	$5,500	36.95%	$3,468	$2,032
	8 Inch Upsizing	$107,506	36.95%	$67,786	$39,720
	4 Inch Waterline Replacement	$1,424,988	100.00%	$0	$1,424,988
	System Replacement	$1,329,383	100.00%	$0	$1,329,383
	Buildout Distribution Piping	$859,708	0.00%	$859,708	$0
	Buildout Transmission Piping	$1,181,220	0.00%	$1,181,220	$0
2027-28	5 Year Master Plan Update	$55,000	36.95%	$34,679	$20,321
	8 Inch Upsizing	$107,506	36.95%	$67,786	$39,720
	4 Inch Waterline Replacement	$1,424,988	100.00%	$0	$1,424,988
	System Replacement	$1,329,383	100.00%	$0	$1,329,383
	Buildout Distribution Piping	$859,708	0.00%	$859,708	$0
	Buildout Transmission Piping	$1,181,220	0.00%	$1,181,220	$0
2028-29	Annual Master Plan Review	$5,500	36.95%	$3,468	$2,032
	8 Inch Upsizing	$107,506	36.95%	$67,786	$39,720
	4 Inch Waterline Replacement	$1,424,988	100.00%	$0	$1,424,988
	System Replacement	$1,329,383	100.00%	$0	$1,329,383
	Low Zone Tank	$1,470,382	0.00%	$1,470,382	$0
	Buildout Distribution Piping	$859,708	0.00%	$859,708	$0
	Buildout Transmission Piping	$1,181,220	0.00%	$1,181,220	$0
2029-30	Annual Master Plan Review	$5,500	36.95%	$3,468	$2,032
	System Replacement	$2,861,878	100.00%	$0	$2,861,878
	Low Zone Tank	$1,470,382	0.00%	$1,470,382	$0
2030-35	Annual Master Plan Review	$77,000	36.95%	$48,551	$28,449
	System Replacement	$14,309,388	100.00%	$0	$14,309,388
	Buildout Distribution Piping	$4,298,540	0.00%	$4,298,540	$0
	Buildout Transmission Piping	$5,906,101	0.00%	$5,906,101	$0
2035-40	Annual Master Plan Review	$77,000	36.95%	$48,551	$28,449
	System Replacement	$14,309,388	100.00%	$0	$14,309,388
	Buildout Distribution Piping	$4,298,540	0.00%	$4,298,540	$0
	Buildout Transmission Piping	$5,906,101	0.00%	$5,906,101	$0
2040-45	Annual Master Plan Review	$77,000	36.95%	$48,551	$28,449
	System Replacement	$14,309,388	100.00%	$0	$14,309,388
	Buildout Distribution Piping	$4,298,540	0.00%	$4,298,540	$0
	Buildout Transmission Piping	$5,906,101	0.00%	$5,906,101	$0
2045-50	Annual Master Plan Review	$77,000	36.95%	$48,551	$28,449
	System Replacement	$14,309,388	100.00%	$0	$14,309,388

	Buildout Distribution Piping	$4,298,540	0.00%	$4,298,540	$0
	Buildout Transmission Piping	$5,906,101	0.00%	$5,906,101	$0
2050-55	Annual Master Plan Review	$77,000	0.00%	$77,000	$0
	System Replacement	$14,309,388	100.00%	$0	$14,309,388
2055-60	Annual Master Plan Review	$77,000	36.95%	$48,551	$28,449
	System Replacement	$14,309,388	100.00%	$0	$14,309,388
	Total Expenditures	**$184,829,213**		**$67,827,577**	**$117,001,636**

Utah State Training School

The State of Utah owns and operates the Training School in the northeast portion of the City. The waterlines serving the training school are included in the map and modeling of this master plan but are owned and maintained by the State. They are undersized and need to be updated to meet the current fire flow requirements. They are older and likely leaking as well. An analysis a few years ago noted a significant difference between the water metered into the Training School versus the amount of flow leaving in the sanitary sewer. It is recommended that the City notify the Training School of the inadequacy of the waterlines serving their facility.

Ground Water Aquifer

The City obtains a majority of its culinary water from wells that tap the ground water aquifer in North Utah County. This percentage will increase as the City builds out. Previous master planning has estimated that the ground water aquifer would meet the needs of the buildout City especially with the construction of the City-wide pressurized irrigation system in 2008-2010. Since that time there has been increased pressure for high density development and hence increased culinary water demand. There has also been increased pressure on the aquifer from growth throughout North Utah County. In recent years the State Engineer has determined that the water rights in North Utah County have been over allocated meaning there are more water rights issued to water users than the aquifer can support. The last five years have been significant drought years as well and aquifer water levels are dropping significantly. All of these issues lead us to be cautious in projecting that all future culinary water needs will be met by tapping the ground water aquifer. Meeting the culinary needs of the future for the City will likely require a combination of efforts.

The City should actively pursue and participate in aquifer storage and recovery (ASR) efforts. ASR is the active encouragement of ground water infiltration during times of excess surface water flows. This water can be pumped out of the aquifer later in times of need. It is recommended that the City continue to be active in the North Utah County Aquifer Association and budget the necessary funds to implement its recommendations regarding ASR.

The City should also continue to implement water conservation measures. Over the past 30 years improvements in plumbing and water conservation education have decreased per capita culinary water use significantly. These efforts should continue and be enhanced where possible.

The proposed annual water system replacement program whereby old failing culinary water infrastructure is replaced will help conserve water lost to leaks and breakages. The City should continue its leak detention program as well.

At some point in the future it is entirely possible that the ground water aquifer will not fully meet the City culinary water needs despite all the City's and others best efforts to conserve, protect and enhance the aquifer. It may be necessary to treat surface water sources to culinary standards to meet the future needs of the City. The likely sources of water for treatment are American Fork River water and Provo River water delivered through aqueducts near the north east corner of the City. With this in mind the recommended buildout improvements shown in this master plan include a large transmission line from the northeast corner of the City to South of I-15 near the Front Runner station and the proposed high density development there. This large transmission serves equally well if the aquifer can meet the City's future culinary needs or if water treatment becomes necessary.

Culinary Water System Replacement

American Fork City's culinary water system was constructed over the past 80 years or so and some areas are reaching their design life and/or may be failing. It is recommended that American Fork City begin to budget for system replacement every year so as facilities fail and need to be replaced there will be sufficient funds to do so. Current budgeting includes depreciation on existing infrastructure and these funds could be utilized to replace failing infrastructure. Table 15 shows the existing culinary water system total replacement costs. If the City were to replace the whole system over an 80-year period the yearly costs would be approximately $2,861,878.

Table 17 Existing Culinary System Replacement Cost

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$8,322,436
2	4, 6, & 8 inch	608,321	LF	$64.99	$39,533,001
3	10 inch	48,053	LF	$70.40	$3,383,059
4	12 inch	102,513	LF	$81.23	$8,327,525
5	14 inch	3,774	LF	$97.48	$367,892
6	16 inch	19,241	LF	$119.14	$2,292,430
7	18 inch	34,132	LF	$151.64	$5,175,657
8	20 inch	6,232	LF	$194.96	$1,214,998
9	22 inch	1,057	LF	$227.45	$240,420
10	24 inch	9,234	LF	$259.95	$2,400,363
12	Fire Hydrants	1,850	EA	$6,105.35	$11,294,906
13	Service Connections	10,400	EA	$1,727.27	$17,963,639
13	PRV Stations	7	EA	$74,877.18	$524,140
13	Water Supply Wells	6	EA	$2,491,171.12	$14,947,027
13	Spring Collection System	2	EA	$433,247.15	$866,494
13	Chlorine Injection Station	1	EA	$270,779.47	$270,779
13	Storage Tanks	15	MG	$1,007,974.88	$15,119,623
17	Class "A" Road Repair	4,896,204	SF	$4.03	$19,729,634
19	Imported Backfill	244,810	TON	$17.28	$4,231,207
21	Valves and Fittings	1	LS	$15,733,836.04	$15,733,836
22	Traffic Control	1	LS	$1,258,706.88	$1,258,707
23	Utility Relocation	1	LS	$1,573,383.60	$1,573,384
	Sub Total (Construction)				$174,771,156
	Contingencies	15%			$26,215,673
	Total (Construction)				$200,986,830
	Design and Construction Engineering	15%			$26,215,673
	Administration, Legal, and Bond Counsel	1%			$1,747,712
	Total (Professional Services)				$27,963,385
	Grand Total				**$228,950,215**
	September 2019 CCI = 11311				
	Data From Water Model Data Base				
	Costs are in 2019 dollars				
	Replacement Costs Per Year (80 Years)				**$2,861,878**

APPENDIX

American Fork City

WATER SYSTEM ANALYSIS

High Zone Culinary

System User Analysis	
Existing ERC	2,533.0
Existing Irrigation ERC	0.0
Projected ERC	3,661.0
Projected Irrigation ERC	0.0
Existing System Capacities	
Water Right (gpm)	0
Water Source (gpm)	10,456
Water Storage (gallons)	10,240,000

Water Right	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (ac-ft)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	2,533.0		400	gal/day/conn	1135.01		
Existing Outdoor Need		0	1.66	ac-ft/irr ac	0.00		
Existing Total WR Need					1135.01	0.00	(1135.01)
Projected Indoor Need	3,661.0		400	gal/day/conn	1640.45		
Projected Outdoor Need		0	1.66	ac-ft/season	0.00		
Projected Total WR Need					1640.45	0.00	(1640.45)

Water Source	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (gpm)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	2,533.0		800	gal/day/conn	1407.00		
Existing Outdoor Need		0	8.8	gpm/irr-acre	0.00		
Existing Total WS Need					1407.00	10,456.00	9,049.00
Projected Indoor Need	3,661.0		800	gal/day/conn	2034.00		
Projected Outdoor Need		0	8.8	gpm/irr-acre	0.00		
Projected Total WS Need					2034.00	12,456.00	10,422.00

Race Track Well	3,200.00
Boley Well	2,668.00
Country Club Well	2,588.00
AF Cannyon Springs	2,000.00
Total	**10,456.00**
Total From Existing	10,456.00
Warnick Well	2,000.00
Total	**12,456.00**

Water Storage	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (gal)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	2,533.0		400	gal/conn	1,013,200		
Existing Outdoor Need		0	3168	gal/irr-acre	-		
Fire Protection			1,500	gpm*120min	180,000		
Existing Total Storage Need					1,193,200	10,240,000	9,046,800
Projected Indoor Need	3,661.0		400	gal/conn	1,464,400		
Projected Outdoor Need		0	3168	gal/irr-acre	-		
20% Emergency Storage			20%		292,880		
Fire Protection			1750	gpm*120min	210,000		
Projected Total Storage Need					1,967,280	10,240,000	8,272,720

AF Canyon Srpings Equiv	240,000.00
Upper Tanks	10,000,000.00
Total	**10,240,000.00**
AF Canyon Srpings Equiv	240,000.00
Upper Tanks	10,000,000.00
Total	**10,240,000.00**

Legend

American Fork
Parcels
Roads

Zoning

CC-1
CC-2
GC-1
GC-2
I-1
M-1
PC
PF
PI-1
PO-1
PR-2.0
PR-2.3
PR-3.0
R1-12000
R1-15000
R1-20000
R1-7500
R1-9000
R2-7500
R3-7500
R4-7500
RA-1
RA-5
S-1
SC-1
SP
TOD

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HORROCKS ENGINEERS

2162 West Grove Parkway
Suite 400
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(801) 763-5100

Culinary Water System Master Plan

Existing Zoning

DATE 11/25/2019
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Figure 4

Legend

- American Fork
- Parcels
- Roads
- Professional office
- Design Commercial
- Design Industrial
- General Commercial
- Institutional Lands, Schools and Public Facilities
- Residential Low Density
- Major Transportation Facilities
- Neighborhood Commercial
- Planned Community
- Professional Office
- Public Parks & Open Space
- Residential High Density
- Residential Medium Density
- Residential Very- Low Density
- Resort
- Shoreline Protection
- Transit Oriented Development

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Culinary Water System Master Plan

General Plan Anticipated Land Use

DATE 12/3/2019
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Figure 5

Legend

pipes

Pipe Diameter

- 2-inch
- 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 14-inch
- 16-inch
- 18-inch
- 20
- 22-inch
- 24-inch
- 30

- Spring

Pump

- Well - Boley
- Well - Country Club
- Well - Golf Course
- Well - Hospital
- Well - JC Park
- Well - Race Track

Tank

- Tank - AF Canyon
- Tank - Tank Farm
- PRV
- Junctions
- American Fork
- Parcels
- Roads

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Culinary Water System Master Plan

Existing Culinary Water System

DATE 12/4/2019

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Figure 6

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Legend

- American Fork
- lower
- upper
- Roads

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Culinary Water System Master Plan

Existing Culinary Water Pressure Zones

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Figure 7

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Legend

pipes

pipes

Junctions

Pressure

- 0 - 20 psi
- 20 - 30 psi
- 30 - 40 psi
- 40 - 100 psi
- 100 - 150 psi

American Fork

Parcels

Roads

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Culinary Water System Master Plan

Existing Peak Day Pressures

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Pleasant Grove, UT 84062
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Figure 8

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Legend

pipes

Velocity

- 0 - 2 fps
- 2 - 5 fps
- 5 - 8 fps
- 8 - 10 fps

Junctions

- Junctions
- American Fork
- Parcels
- Roads

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Culinary Water System Master Plan

Existing Peak Day Velocity

DATE 12/4/2019

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Figure 9

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Legend

pipes

pipes

fire flow

Avalable Fire Flow

- 0-1000 gpm
- 1000-1750 gpm
- 1750-2000 gpm
- 2000-3000 gpm
- 3000-7500 gpm

American Fork

Parcels

Roads

1:24,000

Culinary Water System Master Plan

Existing Fire Flow Avaliable

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DATE 12/4/2019

DRAWN JES

Figure 10

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Legend

pipes

Pipe Diameter

- 2-inch
- 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 14-inch
- 16-inch
- 18-inch
- 20
- 22-inch
- 24-inch
- 30
- 36
- 42

Pump

- Spring
- Well - South
- Well - Warnick
- Well - Boley
- Well - Country Club
- Well - Golf Course
- Well - Hospital
- Well - JC Park
- Well - Race Track

Tank

- Tank - AF Canyon
- Tank - Tank Farm
- PRV
- Junctions
- American Fork
- Parcels
- Roads

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HORROCKS ENGINEERS

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Culinary Water System Master Plan

Buildout Culinary Water System

DATE 11/16/2019

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Figure 11

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Legend

pipes

pipes

Junctions

Pressure

- 0 - 20 psi
- 20 - 30 psi
- 30 - 40 psi
- 40 - 100 psi
- 100 - 150 psi

American Fork

Parcels

Roads

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Culinary Water System Master Plan

Buildout Peak Day Pressures

DATE 11/16/2019

DRAWN JES

Figure 12

Legend

pipes

Velocity

- 0 - 2 fps
- 2 - 5 fps
- 5 - 8 fps
- 8 - 10 fps

Junctions

- Junctions
- American Fork
- Parcels
- Roads

1:24,000

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Culinary Water System Master Plan

Buildout Peak Day Velocity

DATE 11/16/2019
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Figure 13

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Legend

pipes

pipes

fire flow

Avalable Fire Flow

- 0-1000 gpm
- 1000-1750 gpm
- 1750-2000 gpm
- 2000-3000 gpm
- 3000-7500 gpm

American Fork

Parcels

Roads

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(801) 763-5100

Culinary Water System Master Plan

Buildout Fire Flow Avaliable

DATE 11/16/2019

DRAWN JES

Figure 14

Table 33 Detailed Cost Estimates

New 8 Inch Connections

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$2,099
2	4 inch	0	LF	$64.99	$0
3	6 inch	0	LF	$64.99	$0
4	8 inch	316	LF	$64.99	$20,536
5	10 inch	0	LF	$70.40	$0
6	12 inch	0	LF	$81.23	$0
7	14 inch	0	LF	$97.48	$0
8	16 inch	0	LF	$119.14	$0
9	18 inch	0	LF	$151.64	$0
10	20 inch	0	LF	$194.96	$0
12	Fire Hydrants	1	EA	$6,105.35	$6,105
13	Service Connections	0	EA	$1,727.27	$0
13	PRV Stations	0	EA	$74,877.18	$0
13	Water Supply Wells	0	EA	$2,650,000.00	$0
13	Spring Collection System	0	EA	$433,247.15	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$1,007,974.88	$0
17	Class "A" Road Repair	1,896	SF	$4.03	$7,640
19	Imported Backfill	95	TON	$17.28	$1,638
21	Valves and Fittings	1	LS	$5,133.98	$5,134
22	Traffic Control	1	LS	$410.72	$411
23	Utility Relocation	1	LS	$513.40	$513
	Sub Total (Construction)				$44,077
	Contingencies	15%			$6,612
	Total (Construction)				$50,688
	Design and Construction Engineering	15%			$6,612
	Administration, Legal, and Bond Counsel	1%			$441
	Total (Professional Services)				$7,052
	Grand Total				**$57,741**
	September 2019 CCI = 11311				
	Costs are in 2019 dollars				
	Cost to Existing Users	36.95%			$21,333.42
	Cost to Future Users	63.05%			$36,407.22

Project is needed to fix existing deficiency but will be utilized by future growth as well.

8 Inch Upsizing

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$39,079
2	4 inch	0	LF	$64.99	$0
3	6 inch	0	LF	$64.99	$0
4	8 inch	4,825	LF	$64.99	$313,563
5	10 inch	0	LF	$70.40	$0
6	12 inch	0	LF	$81.23	$0
7	14 inch	0	LF	$97.48	$0
8	16 inch	0	LF	$119.14	$0
9	18 inch	0	LF	$151.64	$0
10	20 inch	0	LF	$194.96	$0
12	Fire Hydrants	11	EA	$6,105.35	$67,159
13	Service Connections	97	EA	$1,727.27	$166,682
13	PRV Stations	0	EA	$74,877.18	$0
13	Water Supply Wells	0	EA	$2,650,000.00	$0
13	Spring Collection System	0	EA	$433,247.15	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$1,007,974.88	$0
17	Class "A" Road Repair	28,950	SF	$4.03	$116,656
19	Imported Backfill	1,448	TON	$17.28	$25,018
21	Valves and Fittings	1	LS	$78,390.66	$78,391
22	Traffic Control	1	LS	$6,271.25	$6,271
23	Utility Relocation	1	LS	$7,839.07	$7,839
	Sub Total (Construction)				$820,658
	Contingencies	15%			$123,099
	Total (Construction)				$943,756
	Design and Construction Engineering	15%			$123,099
	Administration, Legal, and Bond Counsel	1%			$8,207
	Total (Professional Services)				$131,305
	Grand Total				**$1,075,061**
	September 2019 CCI = 11311				
	Costs are in 2019 dollars				
	Cost to Existing Users	36.95%			$397,202.71
	Cost to Future Users	63.05%			$677,858.73

Project is needed to fix existing deficiency but will be utilized by future growth as well.

4 Inch Waterline Replacement

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$517,989
2	4 inch	0	LF	$64.99	$0
3	6 inch	0	LF	$64.99	$0
4	8 inch	64,112	LF	$64.99	$4,166,451
5	10 inch	0	LF	$70.40	$0
6	12 inch	0	LF	$81.23	$0
7	14 inch	0	LF	$97.48	$0
8	16 inch	0	LF	$119.14	$0
9	18 inch	0	LF	$151.64	$0
10	20 inch	0	LF	$194.96	$0
12	Fire Hydrants	142	EA	$6,105.35	$866,960
13	Service Connections	1,282	EA	$1,727.27	$2,214,779
13	PRV Stations	0	EA	$74,877.18	$0
13	Water Supply Wells	0	EA	$2,650,000.00	$0
13	Spring Collection System	0	EA	$433,247.15	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$1,007,974.88	$0
17	Class "A" Road Repair	384,672	SF	$4.03	$1,550,066
19	Imported Backfill	19,234	TON	$17.28	$332,426
21	Valves and Fittings	1	LS	$1,041,612.80	$1,041,613
22	Traffic Control	1	LS	$83,329.02	$83,329
23	Utility Relocation	1	LS	$104,161.28	$104,161
	Sub Total (Construction)				$10,877,774
	Contingencies	15%			$1,631,666
	Total (Construction)				$12,509,441
	Design and Construction Engineering	15%			$1,631,666
	Administration, Legal, and Bond Counsel	1%			$108,778
	Total (Professional Services)				$1,740,444
	Grand Total				**$14,249,884**

September 2019 CCI = 11311
Costs are in 2019 dollars

Buildout Distribution Piping

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$955,905
2	4 inch	1,484	LF	$64.99	$96,441
3	6 inch	4,874	LF	$70.40	$343,143
4	8 inch	68,641	LF	$81.23	$5,575,972
5	10 inch	0	LF	$97.48	$0
6	12 inch	14,005	LF	$119.14	$1,668,597
7	14 inch	8,300	LF	$151.64	$1,258,583
8	16 inch	0	LF	$194.96	$0
9	18 inch	0	LF	$259.95	$0
10	20 inch	0	LF	$298.94	$0
12	Fire Hydrants	216	EA	$6,105.35	$1,318,757
13	Service Connections	1,946	EA	$1,727.27	$3,361,411
13	PRV Stations	0	EA	$74,877.18	$0
13	Water Supply Wells	0	EA	$2,650,000.00	$0
13	Spring Collection System	0	EA	$433,247.15	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$1,007,974.88	$0
17	Class "A" Road Repair	583,824	SF	$4.03	$2,352,564
19	Imported Backfill	29,191	TON	$17.28	$504,530
21	Valves and Fittings	1	LS	$2,235,683.92	$2,235,684
22	Traffic Control	1	LS	$178,854.71	$178,855
23	Utility Relocation	1	LS	$223,568.39	$223,568
	Sub Total (Construction)				$20,074,010
	Contingencies	15%			$3,011,101
	Total (Construction)				$23,085,111
	Design and Construction Engineering	15%			$3,011,101
	Administration, Legal, and Bond Counsel	1%			$200,740
	Total (Professional Services)				$3,211,842
	Grand Total				**$26,296,953**

September 2019 CCI = 11311

Costs are in 2019 dollars

Buildout Transmission Piping

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$1,116,384
2	4 inch	0	LF	$64.99	$0
3	6 inch	0	LF	$70.40	$0
4	8 inch	0	LF	$81.23	$0
5	10 inch	0	LF	$194.96	$0
6	12 inch	0	LF	$227.45	$0
7	14 inch	10,421	LF	$259.95	$2,708,921
8	16 inch	8,333	LF	$298.94	$2,491,071
9	18 inch	13,794	LF	$358.73	$4,948,303
10	20 inch	8,514	LF	$448.41	$3,817,770
12	Fire Hydrants	91	EA	$6,105.35	$555,587
13	Service Connections	821	EA	$1,727.27	$1,418,506
13	42 inch Boring (railroads)	400	LF	$1,000.00	$400,000
13	Water Supply Wells	0	EA	$2,650,000.00	$0
13	Spring Collection System	0	EA	$433,247.15	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$1,007,974.88	$0
17	Class "A" Road Repair	410,620	SF	$4.03	$1,654,625
19	Imported Backfill	12,319	TON	$17.28	$212,910
21	Valves and Fittings	1	LS	$3,491,516.26	$3,491,516
22	Traffic Control	1	LS	$279,321.30	$279,321
23	Utility Relocation	1	LS	$349,151.63	$349,152
	Sub Total (Construction)				$23,444,066
	Contingencies	15%			$3,516,610
	Total (Construction)				$26,960,676
	Design and Construction Engineering	15%			$3,516,610
	Administration, Legal, and Bond Counsel	1%			$234,441
	Total (Professional Services)				$3,751,051
	Grand Total				**$30,711,727**

September 2019 CCI = 11311

Costs are in 2019 dollars

Southwest Well and Generator

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$170,942
2	4 inch	0	LF	$64.99	$0
3	6 inch	0	LF	$64.99	$0
4	8 inch	0	LF	$64.99	$0
5	10 inch	0	LF	$70.40	$0
6	12 inch	0	LF	$81.23	$0
7	14 inch	0	LF	$97.48	$0
8	16 inch	0	LF	$119.14	$0
9	18 inch	0	LF	$151.64	$0
10	20 inch	400	LF	$194.96	$77,984
12	Fire Hydrants	1	EA	$6,105.35	$6,105
13	Service Connections	0	EA	$1,727.27	$0
13	PRV Stations	0	EA	$74,877.18	$0
13	Water Supply Wells	1	EA	$3,300,000.00	$3,300,000
13	Spring Collection System	0	EA	$433,247.15	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$1,007,974.88	$0
17	Class "A" Road Repair	2,400	SF	$4.03	$9,671
19	Imported Backfill	120	TON	$17.28	$2,074
21	Valves and Fittings	1	LS	$19,496.12	$19,496
22	Traffic Control	1	LS	$1,559.69	$1,560
23	Utility Relocation	1	LS	$1,949.61	$1,950
	Sub Total (Construction)				$3,589,782
	Contingencies	15%			$538,467
	Total (Construction)				$4,128,250
	Design and Construction Engineering	15%			$538,467
	Administration, Legal, and Bond Counsel	1%			$35,898
	Total (Professional Services)				$574,365
	Grand Total				**$4,702,615**

September 2019 CCI = 11311

Costs are in 2019 dollars

North East Well and Generator

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$141,377
2	4 inch	0	LF	$64.99	$0
3	6 inch	0	LF	$64.99	$0
4	8 inch	0	LF	$64.99	$0
5	10 inch	0	LF	$70.40	$0
6	12 inch	0	LF	$81.23	$0
7	14 inch	0	LF	$97.48	$0
8	16 inch	150	LF	$119.14	$17,871
9	18 inch	0	LF	$151.64	$0
10	20 inch	0	LF	$194.96	$0
12	Fire Hydrants	0	EA	$6,105.35	$0
13	Service Connections	0	EA	$1,727.27	$0
13	PRV Stations	0	EA	$74,877.18	$0
13	Water Supply Wells	1	EA	$2,800,000.00	$2,800,000
13	Spring Collection System	0	EA	$433,247.15	$0
13	Booster Pump Station	0	EA	$500,000.00	$0
13	Storage Tanks	0	MG	$1,007,974.88	$0
17	Class "A" Road Repair	900	SF	$4.03	$3,627
19	Imported Backfill	45	TON	$17.28	$778
21	Valves and Fittings	1	LS	$4,467.86	$4,468
22	Traffic Control	1	LS	$357.43	$357
23	Utility Relocation	1	LS	$446.79	$447
	Sub Total (Construction)				$2,968,925
	Contingencies	15%			$445,339
	Total (Construction)				$3,414,264
	Design and Construction Engineering	15%			$445,339
	Administration, Legal, and Bond Counsel	1%			$29,689
	Total (Professional Services)				$475,028
	Grand Total				**$3,889,292**

September 2019 CCI = 11311

Costs are in 2019 dollars

Table 34 Zone By Zone Needs Analysis

American Fork City

WATER SYSTEM ANALYSIS

High Zone Culinary

System User Analysis	
Existing ERC	2,533.0
Existing Irrigation ERC	0.0
Projected ERC	3,661.0
Projected Irrigation ERC	0.0
Existing System Capacities	
Water Right (gpm)	0
Water Source (gpm)	10,456
Water Storage (gallons)	10,240,000

Water Right	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (ac-ft)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	2,533.0		400	gal/day/conn	1135.01		
Existing Outdoor Need		0	1.66	ac-ft/irr ac	0.00		
Existing Total WR Need					1135.01	0.00	(1135.01)
Projected Indoor Need	3,661.0		400	gal/day/conn	1640.45		
Projected Outdoor Need		0	1.66	ac-ft/season	0.00		
Projected Total WR Need					1640.45	0.00	(1640.45)

Water Source	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (gpm)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	2,533.0		800	gal/day/conn	1407.00		
Existing Outdoor Need		0	8.8	gpm/irr-acre	0.00		
Existing Total WS Need					1407.00	10,456.00	9,049.00
Projected Indoor Need	3,661.0		800	gal/day/conn	2034.00		
Projected Outdoor Need		0	8.8	gpm/irr-acre	0.00		
Projected Total WS Need					2034.00	12,456.00	10,422.00

Race Track Well	3,200.00
Boley Well	2,668.00
Country Club Well	2,588.00
AF Cannyon Springs	2,000.00
Total	**10,456.00**
Total From Existing	10,456.00
Warnick Well	2,000.00
Total	**12,456.00**

Water Storage	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (gal)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	2,533.0		400	gal/conn	1,013,200		
Existing Outdoor Need		0	3168	gal/irr-acre	-		
Fire Protection			1,500	gpm*120min	180,000		
Existing Total Storage Need					1,193,200	10,240,000	9,046,800
Projected Indoor Need	3,661.0		400	gal/conn	1,464,400		
Projected Outdoor Need		0	3168	gal/irr-acre	-		
20% Emergency Storage			20%		292,880		
Fire Protection			1750	gpm*120min	210,000		
Projected Total Storage Need					1,967,280	10,240,000	8,272,720

AF Canyon Srpings Equiv	240,000.00
Upper Tanks	10,000,000.00
Total	**10,240,000.00**
AF Canyon Srpings Equiv	240,000.00
Upper Tanks	10,000,000.00
Total	**10,240,000.00**

System User Analysis	
Existing ERC	11,666.0
Existing Irrigation ERC	0.0
Projected ERC	34,380.0
Projected Irrigation ERC	0.0
Existing System Capacities	
Water Right (gpm)	0.0
Water Source (gpm)	14,609
Water Storage (gallons)	13,546,800

American Fork City

WATER SYSTEM ANALYSIS

Low Zone Culinary

.

Water Right	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (ac-ft)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	11,666.0		400	gal/day/conn	5227.40		
Existing Outdoor Need		0	1.66	ac-ft/irr ac	0.00		
Existing Total WR Need					5227.40	(1,135.01)	(6362.40)
Projected Indoor Need	34,380.0		400	gal/day/conn	15405.27		
Projected Outdoor Need		0	1.66	ac-ft/season	0.00		
Projected Total WR Need					15405.27	(1,640.45)	(17045.72)

Water Source	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (gpm)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	11,666.0		800	gal/day/conn	6481.00		
Existing Outdoor Need		0	8.8	gpm/irr-acre	0.00		
Existing Total WS Need					6481.00	14,609.00	8,128.00
Projected Indoor Need	34,380.0		800	gal/day/conn	19100.00		
Projected Outdoor Need		0	8.8	gpm/irr-acre	0.00		
Projected Total WS Need					19100.00	18,982.00	(118.00)

Water Storage	Number of Connections	Acres Irrigated	DDW Factor	Unit	Total Need (gal)	Existing Capacity	Surplus (Deficit)
Existing Indoor Need	11,666.0		400	gal/conn	4,666,400		
Existing Outdoor Need		0	3168	gal/irr-acre	-		
Fire Protection			1,750	gpm*120min	210,000		
Existing Total Storage Need					4,876,400	13,546,800	8,670,400
Projected Indoor Need	34,380.0		400	gal/conn	13,752,000		
Projected Outdoor Need		0	3168	gal/irr-acre	-		
20% Emergency Storage			20%		-		
Fire Protection			1750	gpm*120min	210,000		
Projected Total Storage Need					13,962,000	12,940,720	(1,021,280)

JC Park Well	1,500.00
Hospital Well	1,400.00
Golf Course Well	2,660.00
Upstream Extra Capacity	9,049.00
Total	**14,609.00**
Total From Existing	5,560.00
Patriot Well	3,000.00
Upstream Extra Capacity	10,422.00
Total	**18,982.00**
Lower Tanks	4,500,000.00
Upstream Extra Capacity	9,046,800.00
Total	**13,546,800.00**
Patriot Tank	-
Hospital Well Equivalent	168,000.00
Lower Tanks	4,500,000.00
Upstream Extra Capacity	8,272,720.00
Total	**12,940,720.00**

AMERICAN FORK CITY
GENERAL PLAN



Public Facilities and Services Element

2019 Pressurized Irrigation System Master Plan
&
Impact Fee Facility Plan

Prepared by

HORROCKS
ENGINEERS

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Abbreviations

AAPR	Annual Percentage Growth Rate
CCI	Construction Cost Index
ERC	Equivalent Residential Connection
DDW	Division of Drinking Water
fps	Feet per Second
gpd	Gallons per Day
gpdpc	Gallons per Day per Capita
gpm	Gallons per Minute
IFA	Impact Fee Analysis
IFFP	Impact Fee Facility Plan
sf	Square Foot

S E C T I O N

1

Chapter 1 - Summary and Recommendations

Introduction

American Fork City has been experiencing significant population growth over the past several years, with many new subdivisions having been built and large blocks of land having been annexed into the City. The City continues to prepare for additional population growth, especially in areas south of Interstate 15 such as the proposed Transit Oriented Development (TOD) area. Due to these factors, it is necessary to review and update the American Fork City pressurized irrigation system component of the General Plan to help the City prepare for growth and to correct water system deficiencies.

Horrocks Engineers prepared the American Fork City Water Systems component of the General Plan in 1993, which was subsequently updated in 1998. An additional section was added to the water systems component of the General Plan in 2003, which was then updated in both 2007 and 2010 to include the proposed secondary water system, hereafter referred to as the pressurized irrigation system. Since completion of construction of the pressurized irrigation system in 2010, demands on the culinary water system have been significantly reduced and overall water service to City residents has improved. The pressurized irrigation and culinary water systems generally operate independent of each other. As such, the American Fork City Water Systems component of the General Plan was separated into the Culinary Water and Pressurized Irrigation System master plans in 2016.

Most of the recommendations in the previous components have been completed. This 2019 Pressurized Irrigation System master plan update addresses the changes since 2018. This study was performed assuming the city-wide pressurized irrigation system will supply the majority of outdoor water demand.

American Fork City's current and future conditions are discussed in this study, including the existing land use and zoning, projected population, number of connections, developable areas, and projected demand. Using the projected population, design requirements, and historical demand, required system capacity is projected through the planning period.

To develop an impact fee, a minimum level of service must be established. The following are the minimum level of service (LOS) to be provided by the Pressurized Irrigation system.

- Provide 40 psi at all locations in the distribution system during peak day demands
- Provide 30 psi at all locations in the distribution system during peak hour demands
- Maintain a maximum 8 fps water velocity during peak hour demands

- Maintain a maximum 5 fps water velocity during peak day demands unless pressures are not compromised.
- Maintain a minimum of 2,254 gallons of storage per acre
- Maintain a minimum of 4.0 ac-ft of water right per acre
- Maintain a minimum of 7.05 gpm of water source per acre

A computer program was used to analyze the existing water systems to determine if the LOS minimum could be met. The capital improvements required to bring the existing water system up to the minimum LOS were also determined. In addition, recommendations for improvements were made to meet future demand.

The feasibility of the recommended improvements depends on the available funding. Recommendations are made to provide the funding needed to implement the recommended capital improvements.

Projected Population

American Fork City's population as of 2019 was approximately 36,300 people. However, the City's population is projected to increase by 128 percent to 82,694 people at build out conditions by the year 2060. This growth will add an additional 1,254 irrigated acres to the system.

Projected Water Demand

Calculations in this report assume that the culinary water system is used most for indoor water use and the pressurized irrigation system is used for most outdoor water use. It is also assumed that all residents connected to the secondary irrigation system use the system for their outdoor watering needs.

The State of Utah Division of Drinking Water requires a culinary public water system to provide 3.39 gpm per irrigated acre in this part of the State. American Fork's pressurized irrigation system was originally designed to handle 7.05 gpm per irrigated acre. All modeling and planning for future construction is based on this minimum level of service. Conservation measures will need to be implemented to meet this target both now and in the future to ensure that American Fork's pressurized irrigation system can handle the current usage rates without having compromising service in some areas.

Recommended Pressurized Irrigation System Improvements

These recommendations were determined by using a computer model of American Fork City's pressurized Irrigation system and input from city staff.

Existing Deficiency Improvement Plan

American Fork City's current pressurized irrigation system delivers pressurized irrigation water throughout the City. The pressurized irrigation system is performing as planned since completion of construction in 2010, overall water service to City residents has improved, and no existing deficiencies have been noted. As such, no improvements are required for the existing pressurized irrigation system. Table 1 shows the improvements to the existing system.

Table 1 Existing Improvements

Item	Description	Cost	Existing	Growth
1	Pressurized Irrigation Meter Installation	$7,078,658	$4,296,838.38	$2,781,819.34
	Grand Total	**$7,078,658**	**$4,296,838**	**$2,781,819**

September 2019 CCI = 11311
Costs are in 2019 dollars

Buildout Improvement Plan

Table 2 shows the improvements necessary to provide capacity for future growth. These improvements are shown in Figure 2 in the appendix.

Table 2 Buildout Improvements

Item	Description	Cost
1	900 West Distribution Line	$468,094
2	740 East and 600 South Distribution Lines	$200,821
3	State Street and 860 East Distribution Lines	$213,919
4	Southern Slough Booster #1 Connection to PI System	$514,395
5	860 East Northern Distribution Line	$85,358
6	860 East Southern Distribution Line	$241,114
7	500 West Distribution Line	$363,795
8	200 South Distribution Line	$370,161
9	Spring Creek Connection to PI System	$498,893
10	1500 South Distribution Line	$1,268,436
11	Combined Distribution Line Projects	$11,483,805
12	Mitchell Hollow Connection to PI System	$490,603
13	Mill Lane Connection to PI System	$1,037,085
14	6th East Well Connection to PI System	$2,412,585
15	Southern Slough Booster #2 Connection to PI System	$517,975
16	TSSD Re-use Water Connection to PI	$8,592,940
	Grand Total	**$28,759,980**

September 2019 CCI = 11311
Costs are in 2019 dollars

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Chapter 2 - Current and Future Conditions

Future conditions in American Fork City will affect the pressurized irrigation demands and the improvements needed to meet these demands. As factors change, the projected future conditions made in this study could be affected. To help minimize the effect of the changing future conditions, the recommendations made in this study have been based upon the acres irrigated by American Fork City's pressurized irrigation system rather than time periods.

This chapter discusses American Fork City's population projections through the planning and ultimate build-out periods. The projected number of irrigated acres has been determined based upon the projected population. In addition, using the potential areas of development, historical water demands, and selected LOS, the pressurized irrigation demands projected through the planning and ultimate build-out periods are discussed.

Projected Population

Population projections have been determined for American Fork City by Mountainland Association of Governments (MAG) in ten (10) year increments until total build-out is reached near the year 2060. However, the MAG population projections do not take into account the Transit Oriented Development (TOD) area located south of Interstate 15. Additional "high density" population projections have been determined by InterPlan in ten (10) year increments that take the TOD development into account. Intermediate numbers for both the MAG and InterPlan population projections were calculated by interpolation and are shown in Table 4. American Fork City's projected population is also shown on Figure 1. The projected annual percentage growth rate (AAPR) from 2019 to 2060 is approximately 2.03 percent. Figures 3 and 4 in the appendix show the current zoning and land use within American Fork City.

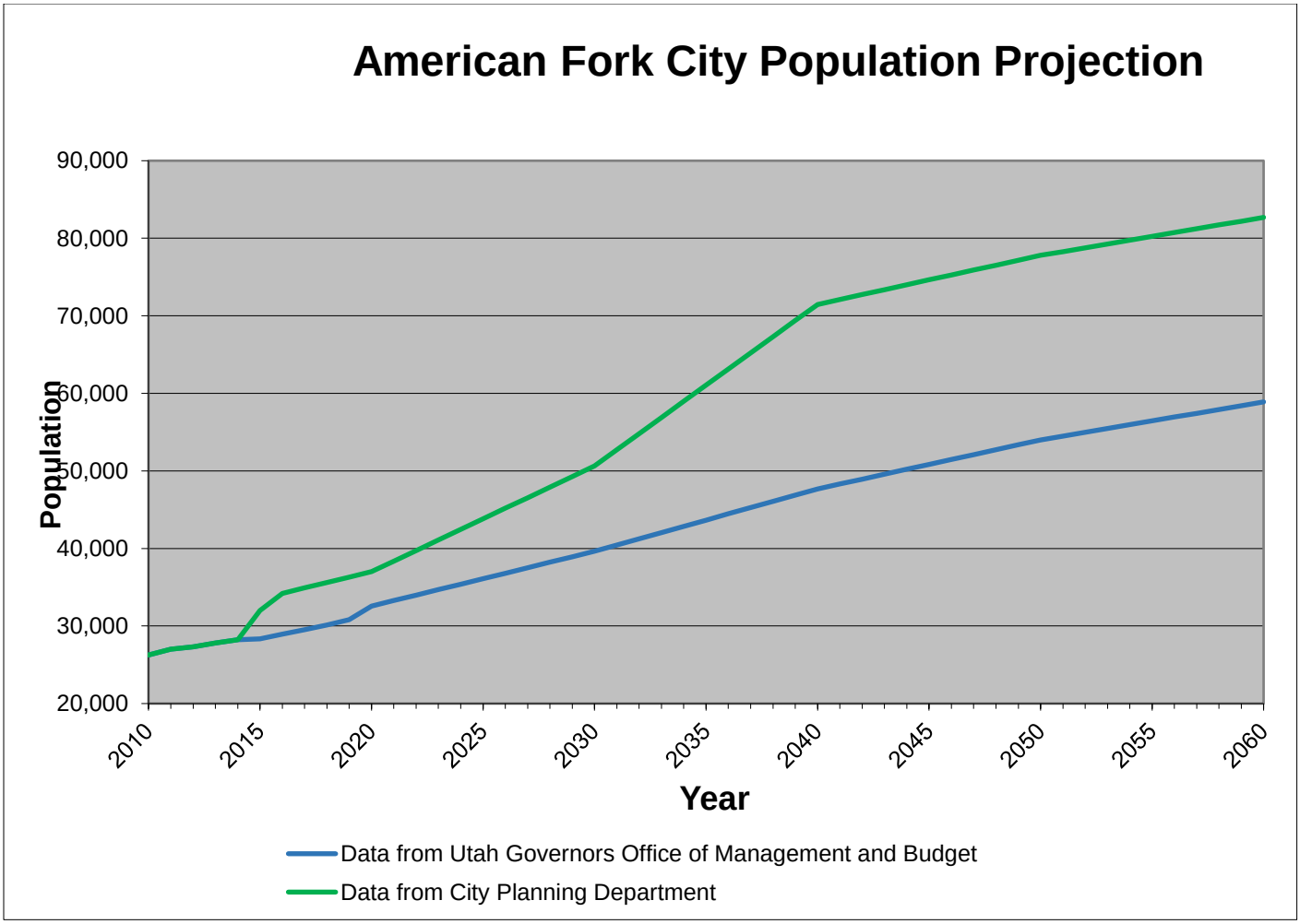


Figure 1 Population Projections

Irrigated Acreage

Pressurized irrigation demands are generated from land use within the City. Residential irrigation demand is based on the zoning while commercial, industrial, and institutional are based on a typical average. Table 3 below shows the percentage of each parcel that is assumed irrigated for modeling and planning purposes. Values were determined by measuring a representative sample of each land use and typical values seen in surrounding communities.

Table 3 Irrigated Acreage by Land Use

Zoning or Land Use	Percent of Lot Irrigated	Typical Irrigated Acres
Design Commercial	17-24%	Site Specific
Design Industrial	11.00%	Site Specific
General Commercial	17.00%	Site Specific
Neighborhood Commercial	17.00%	Site Specific
Planned Community	32.00%	Site Specific
Professional Office	17.00%	Site Specific
Resort	56.00%	Site Specific
Shoreline Protection	56.00%	Site Specific
TOD	11-24%	Site Specific
Residential High Density	52.00%	0.24
Residential Low Density	63.00%	0.22
Residential Medium Density	56.00%	0.15
Residential Very Low Density	66.00%	0.15
Parks	95.00%	Site Specific
Schools	50.00%	Site Specific
Churches	30.00%	Site Specific

Irrigated acreage is anticipated to grow at the same rate as population. Table 4 also shows the projected growth in irrigated acreage.

Table 4 Population and Irrigated Acreage Projections

Year	Population	Growth Rate	Acres
2018	35,607	2.05%	2,089
2019	36,303	2.27%	1,939
2020	37,000	5.62%	1,961
2025	43,818	2.00%	2,174
2030	50,635	1.82%	2,373
2035	61,054	1.88%	2,658
2040	71,472	1.72%	2,925
2045	74,633	1.26%	3,002
2050	77,794	1.18%	3,079
2055	80,244	0.88%	3,137
2060	82,694	0.84%	3,194

Existing Pressurized Irrigation System

The existing American Fork City pressurized irrigation system includes sources, storage, water rights, and distribution piping. The following sections describe the existing pressurized irrigation system components.

Pressurized Irrigation Sources

Table 5 shows the City existing pressurized irrigation sources and their capacity. Table 6 shows the current need versus supply. American Fork City currently has excess pressurized irrigation sources.

Table 5 Existing Pressurized Irrigation Sources

Water Source	Drought Year Flowrate Capacity (gpm)	Pressure Zone
Alpine Aqueduct	7,800	Upper Zone
American Fork River	1,651	Upper Zone
Culinary System Surplus	3,000	Upper Zone
Kelly Pasture Springs	535	Lower Zone
Murdock Canal	2,300	Lower Zone
Totals	**15,286**	

Table 6 Pressurized Irrigation Source Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit)
Current	13,651	15,286	1,635

Pressurized Irrigation Storage

Table 7 shows the City's existing pressurized irrigation storage facilities and their capacity. Table 8 shows the current need versus supply. American Fork City currently has excess pressurized irrigation storage.

Table 7 Existing Pressurized Irrigation Storage

Tank	Capacity (gallons)	Zone
Upper Reservoir	4,887,432	Upper Zone
Lower Reservoir	8,145,720	Lower Zone
Total	13,033,152	

Table 8 Pressurized Irrigation Storage Need Versus Supply

	Projected Need (gallons)	Potential Supply (gallons)	Excess/(Deficit)
Current	4,369,730	13,033,152	8,663,422

Pressurized Irrigation Rights

Table 9 shows the City's existing pressurized irrigation water rights and or irrigation company shares and their drought year capacity. Table 10 shows the current need versus supply. American Fork City currently has adequate pressurized irrigation water rights.

Table 9 Existing Water Rights

Water Source	Drought Year Capacity (ac-ft)	Pressure Zone
American Fork Irrigation Company Shares	3,955	Upper Zone
Central Utah Project Water	2,095	Upper Zone
Highland Conservancy District Shares	473	Lower Zone
Provo River Water Users Association Shares	500	Lower Zone
Provo Reservoir Water Users Company	643	Lower Zone
American Fork City Misc Water Rights	200	Multiple
American Fork City Culinary Overflow Water Rights	2,000	Multiple
Totals	**9,866**	

Table 10 Pressurized Irrigation Water Right Need Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit)
Current	7,756	9,866	2,110

Pressurized Irrigation Distribution Piping

Figure 5 in the appendix shows the City's existing distribution system including piping, sources, storage, etc. Figure 6 shows the pressure zones within the pressurized irrigation system.

Projected Pressurized Irrigation System Requirements

The projected population and LOS requirements were used to project the pressurized irrigation needs through the planning period. Using the projected ERCs, Table 11 shows the projected source, storage, and water right needs through the planning period.

Table 11 Projected Pressurized Irrigation Needs

Year	Acres	Flow Required (gpm)	Storage Volume Required (gallons)	Water Rights Required (ac-ft)
2019	1,939	13,651	4,369,730	7,756
2020	1,961	13,809	4,420,302	7,846
2021	2,005	14,115	4,518,527	8,020
2025	2,174	15,301	4,898,206	8,694
2030	2,373	16,704	5,347,179	9,491
2035	2,658	18,715	5,990,850	10,633
2040	2,925	20,592	6,591,844	11,700
2045	3,002	21,138	6,766,433	12,010
2050	3,079	21,674	6,938,104	12,315
2055	3,137	22,083	7,069,213	12,547
Buildout	3,194	22,488	7,198,741	12,777

Buildout Pressurized Irrigation Sources

Table 12 shows the anticipated sources at buildout. Table 13 shows the buildout need versus supply. It is projected that American Fork City will have adequate pressurized irrigation sources at buildout.

Table 12 Anticipated Sources at Buildout

Water Source	Drought Year Flowrate Capacity (gpm)	Pressure Zone
Alpine Aqueduct	7,800	Upper Zone
American Fork River	2,840	Upper Zone
Culinary System Surplus	0	Upper Zone
Kelly Pasture Springs	535	Lower Zone
Murdock Canal	2,300	Lower Zone
Mitchell Hollow	450	Lower Zone
Mill Lane Well	2,500	Lower Zone
TSSD Re-Use	8,000	Lower Zone
6th East Well	2,150	Lower Zone
Southern Sloughs (3)	2,700	Lower Zone
Totals	**29,275**	

Table 13 Buildout Source Needs Versus Supply

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit)
Buildout	22,488	29,275	6,787

Buildout Pressurized Irrigation Storage

Table 14 shows the anticipated storage facilities at buildout. Table 15 shows the buildout need versus supply. It is projected that American Fork City will have adequate pressurized irrigation storage at buildout.

Table 14 Anticipated Storage at Buildout

Tank	Capacity (gallons)	Zone
Upper Reservoir	4,887,432	Upper Zone
Lower Reservoir	8,145,720	Lower Zone
Total	13,033,152	

Table 15 Buildout Storage Needs Versus Supply

	Projected Need (gallons)	Potential Supply (gallons)	Excess/(Deficit)
Buildout	7,198,741	13,033,152	5,834,411

Buildout Pressurized Irrigation Rights

Table 16 shows the anticipated water rights at buildout. Table 17 shows the buildout need versus supply. It is projected that American Fork City will have adequate pressurized irrigation water rights at buildout as developers are required to dedicate water rights to the City as a condition of development.

Table 16 Anticipated Water Rights at Buildout

Water Source	Drought Year Capacity (ac-ft)	Pressure Zone
American Fork Irrigation Company Shares	6,805	Upper Zone
Central Utah Project Water	2,095	Upper Zone
Highland Conservancy District Shares	600	Lower Zone
Provo River Water Users Association Shares	270	Lower Zone
Provo Reservoir Water Users Company	643	Lower Zone
American Fork City Water Rights	1,500	Multiple
American Fork City Culinary Overflow Water Rights	0	Multiple
Future Wells	7,500	Mill Ditch
TSSD Recycled Water	5,000	Aqueduct Low
Totals	**24,413**	

Table 17 Buildout Water Right Need Versus Supply

Table x-x Projected Secondary Water Rights

	Projected Need (gpm)	Potential Supply (gpm)	Excess/(Deficit)

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Chapter 3 – Pressurized Irrigation System Analysis

American Fork City's pressurized irrigation system was analyzed to find the capacity of the current system and to determine the improvements needed to meet the demands of the projected population. In this chapter, a description of the existing pressurized irrigation system is given along with a discussion of the concerns and recommended improvements. State and American Fork City standard requirements were used as criteria to analyze the pressurized irrigation system. Information obtained from a computer model of American Fork's pressurized irrigation system is presented with the recommended improvements needed to meet the projected pressurized irrigation demand.

American Fork City currently has approximately 127 miles of pressurized irrigation pipelines that transmit and distribute pressurized irrigation throughout the City. Figure 5 in the appendix shows the existing pressurized irrigation system. Pipelines in the City range from 2 inches to 42 inches.

Design Standards

The State of Utah does not provide regulations for pressurized irrigation system design. It is recommended that American Fork City adopt the following criteria as the minimum level of service for the pressurized irrigation system:

To develop an impact fee, a minimum level of service must be established. The following are the minimum level of service to be provided by the pressurized irrigation system.

- Provide 40 psi at all locations in the distribution system during peak day demands
- Provide 30 psi at all locations in the distribution system during peak hour demands
- Maintain a maximum 8 fps water velocity during peak hour demands
- Maintain a maximum 5 fps water velocity during peak day demands unless pressures are not compromised.
- Maintain a minimum of 2,254 gallons of storage per acre
- Maintain a minimum of 4.0 ac-ft of water right per acre
- Maintain a minimum of 7.05 gpm of water source per acre

In addition to the minimum level of service criteria listed above the City has noted several operational concerns that should be addressed in the modeling planning for improvements. They are listed below.

1. Supply American Fork Canyon Water to the Lower Reservoir through the historical main ditch during high water periods.
2. Use this same ditch to provide water to Six Gates turnout into Highland during high water periods.
3. Provide water to the Developmental Center through the traditional ditch during high water rather than the piped turnout.
4. Encourage flood irrigators to switch to pressurized service.
5. Encourage Six Gates users to connect to Highland pressurized irrigation system.
6. Encourage Mitchell Hollow users to connect to other pressurized irrigation systems.
7. Collect City owned Mitchell Hollow water shares into the pressurized irrigation system via booster pump.
8. Utilize Provo Reservoir Water Users Company flow rights throughout the irrigation season.
9. Rent Developmental Center water.
10. Schedule flood irrigation turns to limit the number of flood ditches operating at the same time or during times of high pressurized system usage.
11. Decrease water available to flood irrigators as American Fork Canyon water decreases.
12. Reserve storage water for late season use or bank for future years (CUP, Deer Creek).
13. Charge system in spring with wells to minimize contamination.
14. Meeting regularly with the irrigation company to schedule irrigation turns and other coordination.
15. Only allow flood irrigation for those who requested it at the start of the system and limit the ability to go back to flood service if they discontinue service for a period of time.
16. Do not allow dual flood irrigation and pressurized irrigation service on an individual property.
17. Eventually install water meters and charge based on usage.
18. Institute odd/even watering schedules as necessary for conservation.
19. Limit culinary well usage as much as possible.
20. Evaluate piping of Main Ditch from the mouth of American Fork Canyon to the lower reservoir.
21. Participate in the reconstruction of the main irrigation diversion at the mouth of American Fork Canyon.
22. Install telemetry at splitter structure and upper reservoir screening structure to monitor flows remotely.
23. Actively participate in aquifer storage and recovery projects.

Computer Model of Pressurized Irrigation System

A computer program called *WaterGEMS* (Connect Edition Update 2) was used to model American Fork City's pressurized irrigation system. The program uses the flows demanded at each node to calculate the pressures, flows, and velocity of flow for each node and pipe. Output of the model includes, pipe velocity, node demands, pressures, and available fire flow. Information for the existing pressurized irrigation system includes the pipe diameters, lengths, tanks, sources, pumps, PRV stations, etc.

Several different scenarios were modeled to determine the necessary improvements. First both peak day and peak hour modeling are performed to ensure the minimum levels of service are met. Second both wet year and dry year conditions were modeled. Wet year modeling utilized local high surface water flows first prior to utilizing other sources while dry year modeling utilizes TSSD re-use water with the minimum expected

surface water flows. There could be any number of wet year/dry year conditions in any given year. Peak day/peak hour and wet year/dry year conditions were analyzed in both the current conditions and projected buildout conditions. In addition an extended period simulation was set up in both the wet year and dry year conditions where demands varied during the day. This analysis was performed to determine if sources and storage were balanced over an extended period.

Water usage and supply conditions are very seldom the same from day to day or from year to year and it is not possible to model the complete range of conditions that may apply. The intent of this analysis is to provide the City with recommendations that, if implemented, will provide flexibility in operation to meet the myriad of operational conditions that will exist.

The number of irrigated acreage was estimated based on build-out conditions with the 2019 zoning and assuming 20 percent of the area was used in the development of roadways, sidewalks, parks, etc. The flows generated by the number of irrigated acreage achieved at build-out were entered into *WaterGEMS*. *WaterGEMS* was run to determine upgrades needed for demands on the existing pressurized irrigation system and demands to be placed on the system during buildout.

Existing Deficiency Improvement Plan

American Fork City's current pressurized irrigation system delivers pressurized irrigation water throughout the City. The pressurized irrigation system is performing as planned since completion of construction in 2010, overall water service to City residents has improved, and no existing deficiencies have been noted. As such, no improvements are required for the existing pressurized irrigation system. Figures 7 and 8 in the appendix show the existing peak day pressure and velocity respectively. Table 18 shows the improvements to the existing system.

Table 18 Existing Improvements

Item	Description	Cost	Existing	Growth
1	Pressurized Irrigation Meter Installation	$7,078,658	$4,296,838.38	$2,781,819.34
	Grand Total	**$7,078,658**	**$4,296,838**	**$2,781,819**

September 2019 CCI = 11311
Costs are in 2019 dollars

Buildout Improvement Plan

Table 19 shows the improvements necessary to provide capacity for future growth. These improvements are shown in Figure 3 in the appendix. Figure 9 in the appendix shows the proposed buildout water system. Figures 10 and 11 in the appendix show the projected peak hour pressure and velocity respectively at buildout.

Table 19 Buildout Improvements

Item	Description	Cost
1	900 West Distribution Line	$468,094
2	740 East and 600 South Distribution Lines	$200,821
3	State Street and 860 East Distribution Lines	$213,919
4	Southern Slough Booster #1 Connection to PI System	$514,395
5	860 East Northern Distribution Line	$85,358
6	860 East Southern Distribution Line	$241,114
7	500 West Distribution Line	$363,795
8	200 South Distribution Line	$370,161
9	Spring Creek Connection to PI System	$498,893
10	1500 South Distribution Line	$1,268,436
11	Combined Distribution Line Projects	$11,483,805
12	Mitchell Hollow Connection to PI System	$490,603
13	Mill Lane Connection to PI System	$1,037,085
14	6th East Well Connection to PI System	$2,412,585
15	Southern Slough Booster #2 Connection to PI System	$517,975
16	TSSD Re-use Water Connection to PI	$8,592,940
	Grand Total	**$28,759,980**

September 2019 CCI = 11311
Costs are in 2019 dollars

A summary of the recommended improvements, scheduling, and estimated costs is shown in Table 20. Figure 3 in the appendix shows the recommended improvements. With contingencies, engineering, legal, and administrative fees, the total estimated cost is $28,748,230.

Table 20 Full Improvement Schedule

Fiscal Year	Description	Cost	% Benefit to Existing	Impact Expense	Operating Expense
2019-20	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	900 West Distribution Line	$468,094	0.00%	$468,094	$0
	860 East Southern Distribution Line	$241,114	0.00%	$241,114	$0
2020-21	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	860 East Northern Distribution Line	$85,358	0.00%	$85,358	$0
2021-22	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339

	740 East and 600 South Distribution Lines	$200,821	0.00%	$200,821	$0
2022-23	5 Year Master Plan Update	$55,000	60.70%	$21,614	$33,386
	State Street and 860 East Distribution Lines	$213,919	0.00%	$213,919	$0
2023-24	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Southern Slough Booster #1 Connection to PI System	$514,395	0.00%	$514,395	$0
2024-25	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Pressurized Irrigation Meter Installation	$7,078,658	60.70%	$2,781,819	$4,296,838
2025-26	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	500 West Distribution Line	$363,795	0.00%	$363,795	$0
2026-27	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	200 South Distribution Line	$370,161	0.00%	$370,161	$0
2027-28	5 Year Master Plan Update	$55,000	60.70%	$21,614	$33,386
	Spring Creek Connection to PI System	$498,893	0.00%	$498,893	$0
2028-29	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	1500 South Distribution Line	$1,268,436	0.00%	$1,268,436	$0
2029-30	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2030-31	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2031-32	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2032-33	5 Year Master Plan Update	$55,000	60.70%	$21,614	$33,386
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2033-34	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Mitchell Hollow Connection to PI System	$490,603	0.00%	$490,603	$0
2034-35	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2035-36	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2036-37	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2037-38	5 Year Master Plan Update	$55,000	60.70%	$21,614	$33,386

	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2038-39	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Mill Lane Connection to PI System	$1,037,085	0.00%	$1,037,085	$0
2039-40	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2040-41	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2041-42	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2042-43	5 Year Master Plan Update	$55,000	60.70%	$21,614	$33,386
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2043-44	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	6th East Well Connection to PI System	$2,412,585	0.00%	$2,412,585	$0
2044-45	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2045-46	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2046-47	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2047-48	5 Year Master Plan Update	$55,000	60.70%	$21,614	$33,386
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2048-49	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Southern Slough Booster #2 Connection to PI System	$517,975	0.00%	$517,975	$0
2049-50	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2050-51	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2051-52	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2052-53	5 Year Master Plan Update	$55,000	60.70%	$21,614	$33,386
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2053-54	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339

	TSSD Re-use Water Connection to PI	$8,592,940	0.00%	$8,592,940	$0
2054-55	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2055-56	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2056-57	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2057-58	5 Year Master Plan Update	$55,000	60.70%	$21,614	$33,386
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2058-59	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
2059-60	Annual Master Plan Review	$5,500	60.70%	$2,161	$3,339
	Combined Distribution Line Projects	$441,685	0.00%	$441,685	$0
	Total Expenditures	**$36,460,138**		**$31,786,041**	**$4,674,097**

APPENDIX

Legend

Pump

- PMP-6th East Well
- PMP-Mill Well
- PMP-Mitchell Springs
- PMP-South Slough 1
- PMP-South Slough 2
- PMP-Spring Creek
- PMP-TSSD

pipes

- pipes
- 6 Inch New
- 8 Inch New
- 10 Inch New
- 12 Inch New
- 14 Inch New
- 18 Inch New
- 24 Inch New
- 30 Inch New

- American Fork
- Parcels
- Roads

1:24,000

HORROCKS ENGINEERS

2162 West Grove Parkway
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Pleasant Grove, UT 84062
(801) 763-5100

Pressurized Irrigation System Master Plan

Buildout Pressure Irrigation System Improvements

DATE 12/5/2019

DRAWN JES

Figure 2

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Legend

American Fork

Parcels

Roads

Zoning

- CC-1
- CC-2
- GC-1
- GC-2
- I-1
- M-1
- PC
- PF
- PI-1
- PO-1
- PR-2.0
- PR-2.3
- PR-3.0
- R1-12000
- R1-15000
- R1-20000
- R1-7500
- R1-9000
- R2-7500
- R3-7500
- R4-7500
- RA-1
- RA-5
- S-1
- SC-1
- SP
- TOD

1:24,000

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Pressurized Irrigation System Master Plan

Existing Zoning

DATE 11/25/2019

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Figure 3

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Legend

- American Fork
- Parcels
- Roads
- Professional office
- Design Commercial
- Design Industrial
- General Commercial
- Institutional Lands, Schools and Public Facilities
- Residential Low Density
- Major Transportation Facilities
- Neighborhood Commercial
- Planned Community
- Professional Office
- Public Parks & Open Space
- Residential High Density
- Residential Medium Density
- Residential Very- Low Density
- Resort
- Shoreline Protection
- Transit Oriented Development

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Pressurized Irrigation System Master Plan

General Plan Anticipated Land Use

DATE 12/3/2019

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Figure 4

Legend

Kelly Pasture Springs

Reservoir

Upper Reservoir

Lower Reservoir

PRV

Junctions

American Fork

Parcels

Roads

Pipes

2-inch
4-inch
6-inch
8-inch
10-inch
12-inch
14-inch
16-inch
18-inch
22-inch
24-inch
30-inch
36-inch
39-inch
42-inch

1:30,000

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Pressurized Irrigation System Master Plan

Existing Pressurized Irrigations System

DATE 11/25/2019

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Figure 5

Legend

- American Fork
- lower
- upper
- Roads

1:24,000

Pressurized Irrigation System Master Plan

Existing Pressurized Irrigation Pressure Zones

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Figure 6

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Legend

pipes

pipes

Junctions

Pressure

- 0 - 20 psi
- 20 - 30 psi
- 30 - 40 psi
- 40 - 100 psi
- 100 - 150 psi

American Fork

Parcels

Roads

1:24,000

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Pressurized Irrigation System Master Plan

Existing Pressurized Irrigation Peak Hour Pressures

DATE 11/25/2019

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Figure 7

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Legend

pipes

Velocity

- 0 - 2 fps
- 2 - 5 fps
- 5 - 8 fps
- 8 - 10 fps

Junctions

- Junctions
- American Fork
- Parcels
- Roads

1:24,000

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Pressurized Irrigation System Master Plan

Existing Peak Hour Velocity

DATE 11/25/2019

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Figure 8

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Legend

Reservoir

- Upper Reservoir
- Lower Reservoir
- PRV
- Junctions
- American Fork
- Parcels
- Roads

- PMP-6th East Well
- PMP-Kelly Pasture
- PMP-Mill Well
- PMP-Mitchell Springs
- PMP-South Slough 1
- PMP-South Slough 2
- PMP-Spring Creek
- PMP-TSSD

Pipes

- 2-inch
- 4-inch
- 6-inch
- 8-inch
- 10-inch
- 12-inch
- 14-inch
- 16-inch
- 18-inch
- 22-inch
- 24-inch
- 30-inch
- 36-inch
- 39-inch
- 42-inch

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Pressurized Irrigation System Master Plan

Buildout Pressurized Irrigations System

DATE 12/5/2019

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Figure 9

Legend

pipes

pipes

Junctions

Pressure

- 0 - 20 psi
- 20 - 30 psi
- 30 - 40 psi
- 40 - 100 psi
- 100 - 150 psi

American Fork

Parcels

Roads

1:24,000

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Pressurized Irrigation System Master Plan

Buildout Pressurized Irrigation Peak Hour Pressures

DATE 12/5/2019

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Figure 10

Legend

pipes

Velocity

- 0 - 2 fps
- 2 - 5 fps
- 5 - 8 fps
- 8 - 10 fps

Junctions

- Junctions
- American Fork
- Parcels
- Roads

1:24,000

Pressurized Irrigation System Master Plan

Buildout Peak Hour Velocity

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Figure 11

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Table 35 Detailed Cost Estimates

Pressurized Irrigation Meter Installation

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$276,294.21
2	Meters	9400	Each	$334.17	$3,141,156.85
3	Installation	9400	Each	$253.16	$2,379,664.28
4	Radio Read System	1	Each	$5,063.12	$5,063.12
	Sub Total (Construction)				$5,802,178.46
	Contingencies	15%			$870,326.77
	Land	-	SF	$4.00	$0.00
	Right of Way	-	SF	$2.00	$0.00
	Total (Construction)				$6,672,505.22
	Design and Construction Engineering	6%			$348,130.71
	Administration, Legal, and Bond Counsel	1%			$58,021.78
	Total (Professional Services)				$406,152.49
	Grand Total				**$7,078,657.72**
	September 2019 CCI = 11311				

900 West Distribution Line

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$17,015
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	5,100	LF	$28.85	$147,144
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	0	LF	$42.70	$0
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	0	LF	$83.09	$0
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	0	EA	$350,000.00	$0
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	30,600	SF	$4.03	$123,318
25	Imported Backfill	1,530	TON	$17.28	$26,438
26	Valves and Fittings	1	LS	$36,786.01	$36,786
27	Traffic Control	1	LS	$2,942.88	$2,943
28	Utility Relocation	1	LS	$3,678.60	$3,679
	Sub Total (Construction)				$357,323
	Contingencies	15%			$53,599
	Total (Construction)				$410,922
	Design and Construction Engineering	15%			$53,599
	Administration, Legal, and Bond Counsel	1%			$3,573
	Total (Professional Services)				$57,172
	Grand Total				**$468,094**

September 2019 CCI = 11311

Costs are in 2019 dollars

740 East and 600 South Distribution Lines

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	0	LS	----	$7,300
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	2,188	LF	$28.85	$63,128
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	0	LF	$42.70	$0
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	0	LF	$83.09	$0
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	0	EA	$350,000.00	$0
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	13,128	SF	$4.03	$52,906
25	Imported Backfill	656	TON	$17.28	$11,343
26	Valves and Fittings	1	LS	$15,781.92	$15,782
27	Traffic Control	1	LS	$1,262.55	$1,263
28	Utility Relocation	1	LS	$1,578.19	$1,578
	Sub Total (Construction)				$153,299
	Contingencies	15%			$22,995
	Total (Construction)				$176,294
	Design and Construction Engineering	15%			$22,995
	Administration, Legal, and Bond Counsel	1%			$1,533
	Total (Professional Services)				$24,528
	Grand Total				**$200,821**
	September 2019 CCI = 11311				
	Costs are in 2019 dollars				

State Street and 860 East Distribution Lines

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	0	LS	----	$7,776
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	2,440	LF	$26.54	$64,766
5	8 inch Pipe	0	LF	$28.85	$0
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	0	LF	$42.70	$0
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	0	LF	$83.09	$0
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	0	EA	$350,000.00	$0
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	14,640	SF	$4.03	$58,999
25	Imported Backfill	732	TON	$17.28	$12,649
26	Valves and Fittings	1	LS	$16,191.62	$16,192
27	Traffic Control	1	LS	$1,295.33	$1,295
28	Utility Relocation	1	LS	$1,619.16	$1,619
	Sub Total (Construction)				$163,297
	Contingencies	15%			$24,495
	Total (Construction)				$187,791
	Design and Construction Engineering	15%			$24,495
	Administration, Legal, and Bond Counsel	1%			$1,633
	Total (Professional Services)				$26,127
	Grand Total				**$213,919**
	September 2019 CCI = 11311				
	Costs are in 2019 dollars				

Southern Slough Booster #1 Connection to PI System

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	0	LS	----	$18,698
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	0	LF	$28.85	$0
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	0	LF	$42.70	$0
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	175	LF	$83.09	$14,541
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	1	EA	$350,000.00	$350,000
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
22	Lower Filter Station	0	EA	$496,968.37	$0
24	Class "A" Road Repair	1,050	SF	$4.03	$4,232
25	Imported Backfill	53	TON	$17.28	$907
26	Valves and Fittings	1	LS	$3,635.32	$3,635
27	Traffic Control	1	LS	$290.83	$291
28	Utility Relocation	1	LS	$363.53	$364
	Sub Total (Construction)				$392,668
	Contingencies	15%			$58,900
	Total (Construction)				$451,568
	Design and Construction Engineering	15%			$58,900
	Administration, Legal, and Bond Counsel	1%			$3,927
	Total (Professional Services)				$62,827
	Grand Total				**$514,395**

September 2019 CCI = 11311

Costs are in 2019 dollars

860 East Southern Distribution Line

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	0	LS	----	$8,765
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	2,627	LF	$28.85	$75,794
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	0	LF	$42.70	$0
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	0	LF	$83.09	$0
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	0	EA	$350,000.00	$0
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	15,762	SF	$4.03	$63,521
25	Imported Backfill	788	TON	$17.28	$13,618
26	Valves and Fittings	1	LS	$18,948.40	$18,948
27	Traffic Control	1	LS	$1,515.87	$1,516
28	Utility Relocation	1	LS	$1,894.84	$1,895
	Sub Total (Construction)				$184,057
	Contingencies	15%			$27,608
	Total (Construction)				$211,665
	Design and Construction Engineering	15%			$27,608
	Administration, Legal, and Bond Counsel	1%			$1,841
	Total (Professional Services)				$29,449
	Grand Total				**$241,114**

September 2019 CCI = 11311

Costs are in 2019 dollars

500 West Distribution Line

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	0	LS	----	$13,224
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	0	LF	$28.85	$0
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	3,124	LF	$42.70	$133,397
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	0	LF	$83.09	$0
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	0	EA	$350,000.00	$0
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	18,744	SF	$4.03	$75,538
25	Imported Backfill	937	TON	$17.28	$16,195
26	Valves and Fittings	1	LS	$33,349.19	$33,349
27	Traffic Control	1	LS	$2,667.94	$2,668
28	Utility Relocation	1	LS	$3,334.92	$3,335
	Sub Total (Construction)				$277,706
	Contingencies	15%			$41,656
	Total (Construction)				$319,362
	Design and Construction Engineering	15%			$41,656
	Administration, Legal, and Bond Counsel	1%			$2,777
	Total (Professional Services)				$44,433
	Grand Total				**$363,795**

September 2019 CCI = 11311

Costs are in 2019 dollars

200 South Distribution Line

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	0	LS	----	$13,456
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	4,033	LF	$28.85	$116,359
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	0	LF	$42.70	$0
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	0	LF	$83.09	$0
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	0	EA	$350,000.00	$0
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	24,198	SF	$4.03	$97,518
25	Imported Backfill	1,210	TON	$17.28	$20,907
26	Valves and Fittings	1	LS	$29,089.80	$29,090
27	Traffic Control	1	LS	$2,327.18	$2,327
28	Utility Relocation	1	LS	$2,908.98	$2,909
	Sub Total (Construction)				$282,566
	Contingencies	15%			$42,385
	Total (Construction)				$324,951
	Design and Construction Engineering	15%			$42,385
	Administration, Legal, and Bond Counsel	1%			$2,826
	Total (Professional Services)				$45,211
	Grand Total				**$370,161**

September 2019 CCI = 11311

Costs are in 2019 dollars

Spring Creek Connection to PI System

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	0	LS	----	$18,135
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	0	LF	$28.85	$0
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	150	LF	$42.70	$6,405
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	0	LF	$83.09	$0
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	1	EA	$350,000.00	$350,000
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	900	SF	$4.03	$3,627
25	Imported Backfill	45	TON	$17.28	$778
26	Valves and Fittings	1	LS	$1,601.27	$1,601
27	Traffic Control	1	LS	$128.10	$128
28	Utility Relocation	1	LS	$160.13	$160
	Sub Total (Construction)				$380,834
	Contingencies	15%			$57,125
	Total (Construction)				$437,959
	Design and Construction Engineering	15%			$57,125
	Administration, Legal, and Bond Counsel	1%			$3,808
	Total (Professional Services)				$60,933
	Grand Total				**$498,893**

September 2019 CCI = 11311

Costs are in 2019 dollars

1500 South Distribution Line

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	0	LS	----	$46,108
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	0	LF	$28.85	$0
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	4,780	LF	$42.70	$204,109
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	0	LF	$83.09	$0
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	2,772	LF	$121.48	$336,746
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	0	EA	$350,000.00	$0
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	45,312	SF	$4.03	$182,607
25	Imported Backfill	2,266	TON	$17.28	$39,150
26	Valves and Fittings	1	LS	$135,213.69	$135,214
27	Traffic Control	1	LS	$10,817.10	$10,817
28	Utility Relocation	1	LS	$13,521.37	$13,521
	Sub Total (Construction)				$968,272
	Contingencies	15%			$145,241
	Total (Construction)				$1,113,513
	Design and Construction Engineering	15%			$145,241
	Administration, Legal, and Bond Counsel	1%			$9,683
	Total (Professional Services)				$154,924
	Grand Total				**$1,268,436**

September 2019 CCI = 11311

Costs are in 2019 dollars

Combined Distribution Line Projects

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$417,441
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	487	LF	$21.93	$10,679
4	6 inch Pipe	30,731	LF	$26.54	$815,712
5	8 inch Pipe	57,689	LF	$28.85	$1,664,430
6	10 inch Pipe	892	LF	$32.31	$28,824
7	12 inch Pipe	12,175	LF	$42.70	$519,880
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	23	LF	$83.09	$1,911
10	18 inch Pipe	818	LF	$95.79	$78,354
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	4,830	LF	$121.48	$586,754
13	30 inch Pipe	1,626	LF	$161.57	$262,713
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	0	EA	$350,000.00	$0
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	655,626	SF	$4.03	$2,642,173
25	Imported Backfill	32,781	TON	$17.28	$566,461
26	Valves and Fittings	1	LS	$992,314.39	$992,314
27	Traffic Control	1	LS	$79,385.15	$79,385
28	Utility Relocation	1	LS	$99,231.44	$99,231
	Sub Total (Construction)				$8,766,263
	Contingencies	15%			$1,314,939
	Total (Construction)				$10,081,203
	Design and Construction Engineering	15%			$1,314,939
	Administration, Legal, and Bond Counsel	1%			$87,663
	Total (Professional Services)				$1,402,602
	Grand Total				**$11,483,805**

September 2019 CCI = 11311

Costs are in 2019 dollars

Mitchell Hollow Connection to PI System

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$17,834
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	100	LF	$28.85	$2,885
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	0	LF	$42.70	$0
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	0	LF	$83.09	$0
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	1	EA	$350,000.00	$350,000
19	Southern Slough Boosters	0	EA	$350,000.00	$0
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	600	SF	$4.03	$2,418
25	Imported Backfill	30	TON	$17.28	$518
26	Valves and Fittings	1	LS	$721.29	$721
27	Traffic Control	1	LS	$57.70	$58
28	Utility Relocation	1	LS	$72.13	$72
	Sub Total (Construction)				$374,506
	Contingencies	15%			$56,176
	Total (Construction)				$430,682
	Design and Construction Engineering	15%			$56,176
	Administration, Legal, and Bond Counsel	1%			$3,745
	Total (Professional Services)				$59,921
	Grand Total				**$490,603**

September 2019 CCI = 11311

Costs are in 2019 dollars

Mill Lane Connection to PI System

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$37,698
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	0	LF	$28.85	$0
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	0	LF	$42.70	$0
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	175	LF	$83.09	$14,541
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	0	EA	$350,000.00	$0
20	Mill Lane Well	1	EA	$730,000.00	$730,000
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	1,050	SF	$4.03	$4,232
25	Imported Backfill	53	TON	$17.28	$907
26	Valves and Fittings	1	LS	$3,635.32	$3,635
27	Traffic Control	1	LS	$290.83	$291
28	Utility Relocation	1	LS	$363.53	$364
	Sub Total (Construction)				$791,668
	Contingencies	15%			$118,750
	Total (Construction)				$910,418
	Design and Construction Engineering	15%			$118,750
	Administration, Legal, and Bond Counsel	1%			$7,917
	Total (Professional Services)				$126,667
	Grand Total				**$1,037,085**

September 2019 CCI = 11311

Costs are in 2019 dollars

6th East Well Connection to PI System

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$87,698
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	0	LF	$28.85	$0
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	0	LF	$42.70	$0
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	175	LF	$83.09	$14,541
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	0	EA	$350,000.00	$0
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	1	EA	$1,730,000.00	$1,730,000
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	1,050	SF	$4.03	$4,232
25	Imported Backfill	53	TON	$17.28	$907
26	Valves and Fittings	1	LS	$3,635.32	$3,635
27	Traffic Control	1	LS	$290.83	$291
28	Utility Relocation	1	LS	$363.53	$364
	Sub Total (Construction)				$1,841,668
	Contingencies	15%			$276,250
	Total (Construction)				$2,117,918
	Design and Construction Engineering	15%			$276,250
	Administration, Legal, and Bond Counsel	1%			$18,417
	Total (Professional Services)				$294,667
	Grand Total				**$2,412,585**

September 2019 CCI = 11311
Costs are in 2019 dollars

Southern Slough Booster #2 Connection to PI System

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$18,829
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	0	LF	$28.85	$0
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	0	LF	$42.70	$0
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	194	LF	$83.09	$16,120
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	0	LF	$161.57	$0
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	1	EA	$350,000.00	$350,000
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	0	EA	$4,500,000.00	$0
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	1,164	SF	$4.03	$4,691
25	Imported Backfill	58	TON	$17.28	$1,006
26	Valves and Fittings	1	LS	$4,030.02	$4,030
27	Traffic Control	1	LS	$322.40	$322
28	Utility Relocation	1	LS	$403.00	$403
	Sub Total (Construction)				$395,401
	Contingencies	15%			$59,310
	Total (Construction)				$454,711
	Design and Construction Engineering	15%			$59,310
	Administration, Legal, and Bond Counsel	1%			$3,954
	Total (Professional Services)				$63,264
	Grand Total				**$517,975**

September 2019 CCI = 11311

Costs are in 2019 dollars

TSSD Re-use Water Connection to PI

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$236,930
2	2 inch Pipe	0	LF	$18.77	$0
3	4 inch Pipe	0	LF	$21.93	$0
4	6 inch Pipe	0	LF	$26.54	$0
5	8 inch Pipe	0	LF	$28.85	$0
6	10 inch Pipe	0	LF	$32.31	$0
7	12 inch Pipe	0	LF	$42.70	$0
8	14 inch Pipe	0	LF	$77.32	$0
9	16 inch Pipe	0	LF	$83.09	$0
10	18 inch Pipe	0	LF	$95.79	$0
11	22 inch Pipe	0	LF	$107.12	$0
12	24 inch Pipe	0	LF	$121.48	$0
13	30 inch Pipe	1,000	LF	$161.57	$161,570
14	36 inch Pipe	0	LF	$194.37	$0
15	39 inch Pipe	0	LF	$265.05	$0
16	42 inch Pipe	0	LF	$298.18	$0
17	Service Connections	0	EA	$1,038.11	$0
18	Mitchell Hollow	0	EA	$350,000.00	$0
19	Southern Slough Boosters	0	EA	$350,000.00	$0
20	Mill Lane Well	0	EA	$730,000.00	$0
21	6th East Well	0	EA	$1,730,000.00	$0
22	TSSD Re-use Booster	1	EA	$4,500,000.00	$4,500,000
23	Upper Filter Station Replacement	0	EA	$828,280.61	$0
24	Class "A" Road Repair	6,000	SF	$4.03	$24,180
25	Imported Backfill	300	TON	$17.28	$5,184
26	Valves and Fittings	1	LS	$40,392.48	$40,392
27	Traffic Control	1	LS	$3,231.40	$3,231
28	Utility Relocation	1	LS	$4,039.25	$4,039
	Sub Total (Construction)				$4,975,527
	Contingencies	15%			$746,329
	Total (Construction)				$5,721,856
	Design and Construction Engineering	15%			$746,329
	Land	8.30	ACRE	$250,000.00	$2,075,000
	Administration, Legal, and Bond Counsel	1%			$49,755
	Total (Professional Services)				$2,871,084
	Grand Total				**$8,592,940**

September 2019 CCI = 11311

Costs are in 2019 dollars

AMERICAN FORK CITY
GENERAL PLAN

Public Facilities and Services Element

2019 Sanitary Sewer System Master Plan & Impact Fee Facility Plan

Prepared by

HORROCKS ENGINEERS

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Abbreviations

AAPR	Annual Percentage Growth Rate
CCI	Construction Cost Index
ERC	Equivalent Residential Connection (culinary water)
ERU	Equivalent Residential Unit (sanitary sewer)
DEQ	Division of Environmental Quality
fps	Feet per Second

gpd	Gallons per Day
gpdpc	Gallons per Day per Capita
IFFP	Impact Fee Facility Plan
MG	Million Gallons
MGD	Million Gallons per Day
PF	Peaking Factor
TSSD	Timpanogos Special Service District

S E C T I O N

1

Chapter 1 - Summary and Recommendations

Introduction

Horrocks Engineers developed sanitary sewer system master plan updates for American Fork City in 1998 2008, 2010, 2016, & 2017 and made recommendations to provide for the capacity needed at build-out. The major reason for this current master plan update is to stay current with the needs of the City's sanitary sewer system and to stay current on impact fees. This update is not a full revision of the plan but an update changed information for the previous year.

In this study, American Fork City's future conditions are identified including the projected population, number of connections, developable areas, and wastewater flows. Using the projected population, design requirements, and historical wastewater flows, the flows are projected through the planning period.

A computer model was used to analyze the existing sanitary sewer system and determine its capacity. Then using the potential areas of development and the projected wastewater flows, improvements were identified to meet the needed capacities at buildout.

Measured flows from Timpanogos Special Service District (TSSD) were used to calibrate the computer model as were selected measurement sites within the City's collection system (2016).

Residents of several neighboring communities are included in the City wastewater flow modeling because they discharge directly into the American Fork City boundary. Cedar Hills City discharges directly into the American Fork City sanitary sewer system while Lehi, Alpine, and Highland discharge into TSSD trunk lines that run through American Fork City boundaries. These projected flows have also been added to determine the long-range pipe sizing requirements.

Projected Population

American Fork City currently has a population of approximately 36,300 people. However, the City's population is projected to increase by 128 percent to 86,694 people by the year 2060. This growth will add an additional 21,888 equivalent residential units (ERUs) to the system.

Projected Sewer Flow

The peak monthly flow from American Fork in 2016 was 238 gallons per day/ERU which includes 198 gallons per day sewer generated and 40 gpd infiltration and inflow. Modeling for existing and future improvements is based on 198 gpd sewer generated per ERU and a unit infiltration and inflow rate based on the length and size

of pipe. This allows future growth needs to be separated from base infiltration and inflow. Future growth will contribute some infiltration and inflow but that will be based on the length and size of pipe versus the number of ERUs. The peak monthly flow is projected to increase from 112.65 million gallons (MG) to 286.32 MG. The peak daily flow is projected to be 2 times the peak monthly flow. This increase in flow has the potential to exceed 75% of the capacity of many of the TSSD outfall lines during peak flows. This increase will also cause a few of the existing collection lines in the City to exceed their design capacity as well.

Recommended Sanitary Sewer System Improvements

These recommendations were determined by using a computer model of American Fork City's sanitary sewer system and input from city staff. A detailed listing of the recommended improvements is given in the following paragraphs.

Existing Deficiency Improvement Plan

Table 1 shows improvements that are necessary to provide capacity for existing users. These improvements are shown in Figure 3 in the appendix.

Table 1 Improvements needed on Existing System

Item	Description	Cost
1	450 West Upsizing	$465,225
2		
	Grand Total	**$465,225**

September 2019 CCI = 11311
Costs are in 2019 dollars

Buildout Improvement Plan

Table 2 shows improvements that are necessary to provide capacity for future growth. These improvements are shown in Figure 4 in the appendix.

Table 2 Improvements Needed on Buildout System

Item	Description	Cost
1	400 West Upsizing	$486,514
2	200 South Upsizing	$210,774
3	400 South Upsizing	$142,156
4	300 East Upsizing and Diversion	$151,261
5	860 East Area New	$373,112
6	Southside Buildout Improvements	$14,807,629
7	Cedar Hills Buildout Needs *	$922,451
	Grand Total	**$17,093,899**

September 2019 CCI = 11311
Costs are in 2019 dollars

Cedar Hills Buildout Needs are for information only and not for the calculations of impact fees for American Fork City users. The upsize and new capacity needed is for the benefit of Cedar Hills only (see Detailed cost estimates in the Appendix).

S E C T I O N

2

Chapter 2 - Current and Future Conditions

Future conditions in American Fork City will affect the sanitary sewer flows and the improvements needed to handle these flows. As factors change, the projected future conditions made in this study could be affected. To help minimize the effect of the changing future conditions, the recommendations made in this study have been based upon the number of people served by American Fork City's sanitary sewer system rather than time periods.

This chapter discusses American Fork City's population projections through the planning and ultimate build-out periods. The projected number of sanitary sewer connections has been determined based upon the projected population. In addition, using the potential areas of development, historical water demands, and State design requirements, the sanitary sewer flows projected through the planning and ultimate build-out periods are discussed.

Projected Population

Population projections have been determined for American Fork City by Mountainland Association of Governments (MAG) in ten (10) year increments until total build-out is reached near the year 2060. However, the MAG population projections do not take into account the Transit Oriented Development (TOD) area located south of Interstate 15. Additional "high density" population projections have been determined by InterPlan in ten (10) year increments that take the TOD development into account. Intermediate numbers for both the MAG and InterPlan population projections were calculated by interpolation and are shown in Table 3. American Fork City's projected population is also shown on Figure 1. The projected average annual percentage growth rate (AAPR) from 2019 to 2060 is approximately 2.03 percent. Figures 5 and 6 in the appendix show the current zoning and anticipated land use within American Fork City.

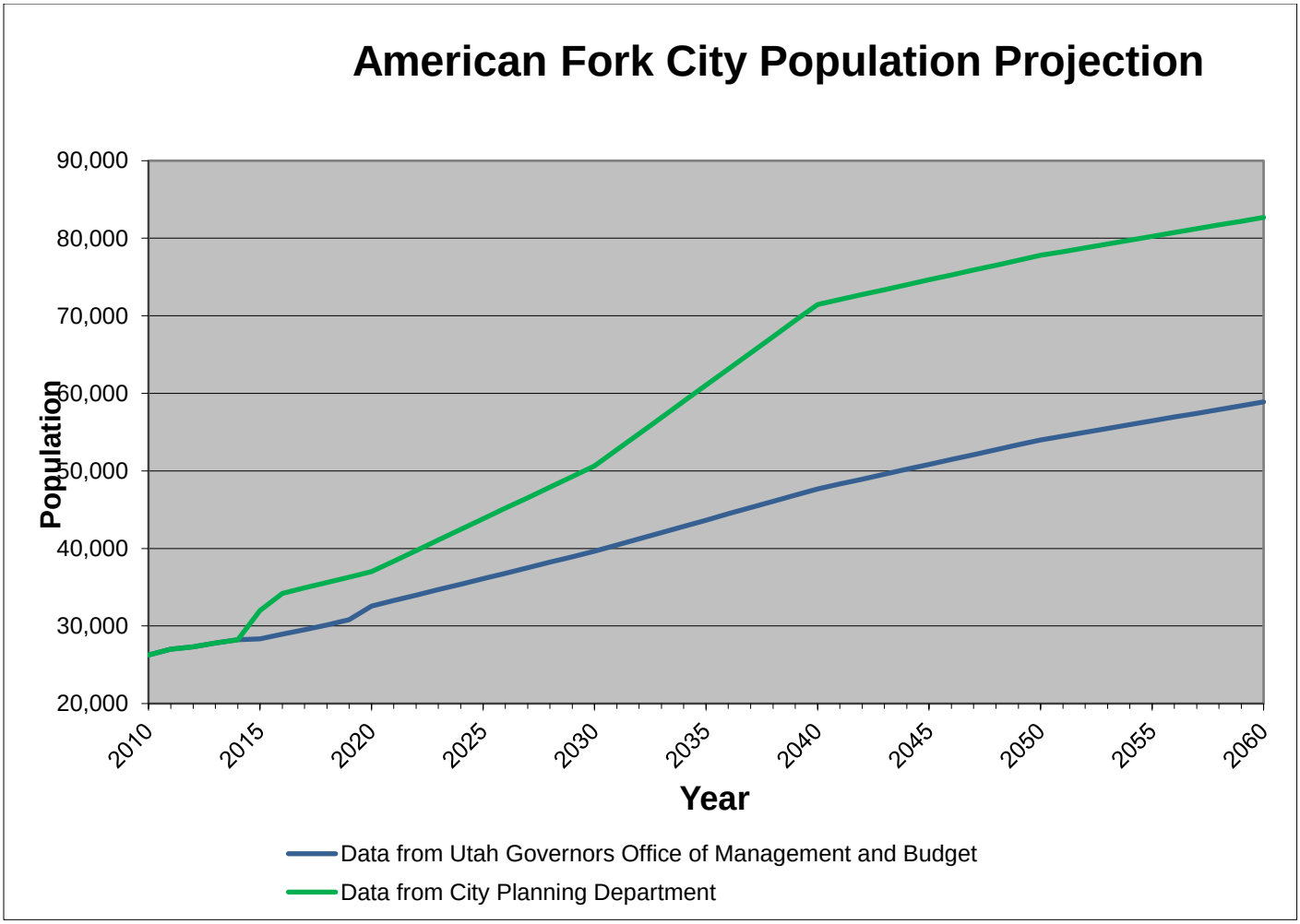


Figure 1 Population Projections

Equivalent Residential Unit (ERU)

Sanitary sewer flows are generated from residential, commercial, industrial, and institutional sources and it is advantageous to relate these sources in a quantifiable manner. It was determined in the culinary water master plan that an average residential home in American Fork City utilizes 205 gallons of culinary water per day most of which is discharged into the sewer. The average residential home is defined as an ERU for sanitary sewer purposes. For the purposes of this report an ERU is equivalent to an Equivalent Residential Connection (ERC) in the culinary water system. The ERU for some non-residential users was adjusted downward because they do not discharge most of their culinary usage into the sanitary sewer. Other sources such as churches, schools, and commercial businesses are compared to the average residential home to determine its ERU value. For example a commercial business who utilizes 615 gallons of culinary water and discharges most to the sanitary sewer system is assigned an ERU value of 3.0 because it generates three times the sanitary waste of an average home.

ERU's are anticipated to grow at the same rate as population. Table 1 also shows the projected ERU Growth.

Table 3 ERU Projections

Year	Population	Growth Rate	ERC's
2016	34,213	6.92%	11,932
2017	34,910	2.04%	12,917
2018	35,607	2.00%	13,901
2019	36,303	1.96%	14,198
2020	37,000	1.92%	14,509
2021	38,364	3.69%	15,084
2022	39,727	3.55%	15,661
2023	41,091	3.43%	16,241
2024	42,454	3.32%	16,824
2025	43,818	3.21%	17,411
2026	45,181	3.11%	18,000
2027	46,545	3.02%	18,592
2028	47,908	2.93%	19,188
2029	49,272	2.85%	19,786
2030	50,635	2.77%	20,388
2031	52,719	4.12%	21,282
2032	54,802	3.95%	22,182
2033	56,886	3.80%	23,086
2034	58,970	3.66%	23,994
2035	61,054	3.53%	24,908
2036	63,137	3.41%	25,826
2037	65,221	3.30%	26,748
2038	67,305	3.19%	27,676
2039	69,388	3.10%	28,608
2040	71,472	3.00%	29,546
2041	72,104	0.88%	29,888
2042	72,736	0.88%	30,231
2043	73,369	0.87%	30,577
2044	74,001	0.86%	30,924
2045	74,633	0.85%	31,272
2046	75,265	0.85%	31,622
2047	75,897	0.84%	31,974
2048	76,530	0.83%	32,328
2049	77,162	0.83%	32,683
2050	77,794	0.82%	33,040
2051	78,284	0.63%	33,339
2052	78,774	0.63%	33,638
2053	79,264	0.62%	33,939

2054	79,754	0.62%	34,242
2055	80,244	0.61%	34,546
2056	80,734	0.61%	34,851
2057	81,224	0.61%	35,158
2058	81,714	0.60%	35,466
2059	82,204	0.60%	35,775
2060	82,694	0.60%	36,086

Historical Sewer Flows

Sewer flows vary depending upon the amount of culinary water used and the amount of infiltration and inflow within the system. Figure 2 shows the historical sewer generated per month for American Fork City. The 2016 average annual flow is 967 MG based on TSSD meter data. The 2016 peak month was 86.33 MG. The current trend in flows generated per ERU is downward. This can be seen in figure 2 where total sanitary sewer flows have decreased over the past 8 years despite a growing population. This is a factor of both decreased culinary water usage and a concerted effort by City staff to identify and limit infiltration.

The peak monthly flow from American Fork in 2016 was 238 gallons per day/ERU which includes 198 gallons per day sewer generated and 40 gpd infiltration and inflow. Modeling for existing and future improvements is based on 198 gpd sewer generated per ERU and a unit infiltration and inflow rate based on the length and size of pipe. This allows future growth needs to be separated from base infiltration and inflow. Future growth will contribute some infiltration and inflow but that will be based on the length and size of pipe versus the number of ERUs. The unit infiltration and inflow rate used to model both current and future needs is the amount necessary to match 2016 flow plus nearly 60 percent to account for years of above normal groundwater and precipitation. This is in line with historical measured waste water flows.

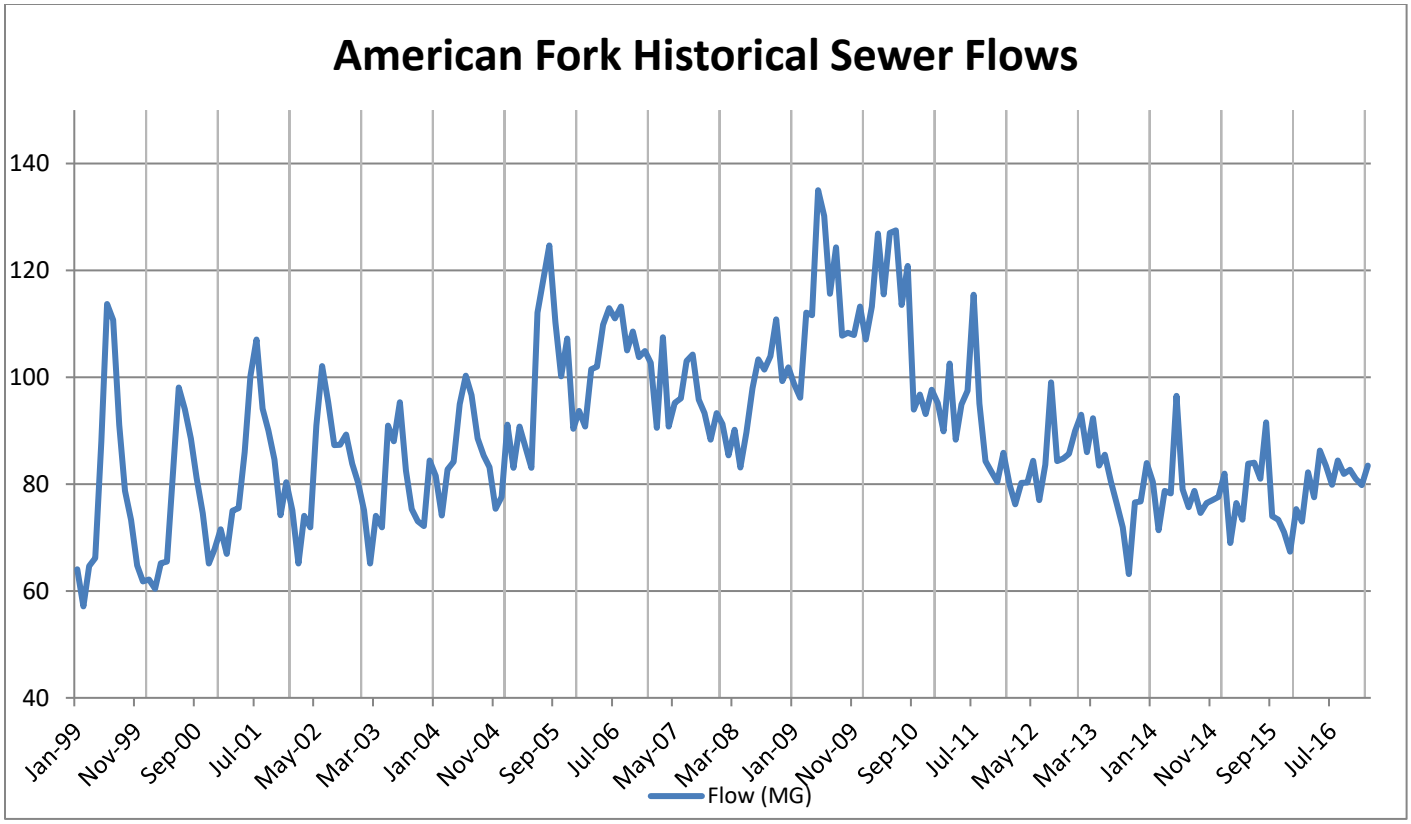


Figure 2 American Fork Historic Sewer Generation

Projected Sewer Flows

The projected population, historical sewer flows, and typical design criteria were used to project the sewer flows through the planning period. Projected sewer flows were entered into a computer program called *SewerGEMS* (Connect Edition Update 2) creating a model of American Fork City's existing sanitary sewer system.

Sewer lines are required to provide capacities for peak hourly and maximum daily flows. This variation of flows is due to the hydrograph or peak that is created by the wastewater as it enters the pipes and is collected from different areas. The farther the wastewater travels in the system, the smaller the peaks become. The "peak" in the flow or hydrograph is referred to as the peaking factor (PF) and is higher for collector lines (12" and smaller) than for trunk lines (larger than 12") because the peak is reduced as the wastewater flows downstream.

PFs for the American Fork City sewer model are based upon the historical wastewater flows, and typical design requirements. The model uses a variable PF of between 2.0 and 3.0 depending on how close the flow is to where it was generated. The PF's match closely with TSSD data at the meter leaving the City and individual meter locations. A typical PF for small municipal sanitary sewer system is 2.5. The State of Utah DEQ recommends a PF of 2.5 for over 12 inch lines and 4.0 for 12 inch and under lines for design purposes in the absence of measured flow data.

Using the projected ERCs and the peak daily flow, Table 4 shows the projected average yearly, average daily, peak monthly and peak daily flows through the planning period.

In summary, the number of ERCs is projected to increase by 21,888 ERU's by the year 2060. The average yearly flow is projected to increase from 1,150 MG to 2,924 MG. The States design standard is 100 gpd per person or approximately 370 gpd/ERU.

The recommendations in this capital facilities plan are based on 198 gpd/ERU plus a unit rate for infiltration and inflow. We believe this is high enough to provide a factor of safety while not being overly conservative given the ongoing efforts to limit infiltration and trend of decreasing culinary water demand. Using the State's design standards of 100 gpd per person would require significant improvements beyond what is actually needed.

Table 4 Projected Sewer Generation

Year	ERC's	Average Yearly (MG)	Peak Monthly (MG)	Average Daily (MGD)	Peak Daily (MGD)
2019	14,198	1,150	112.65	3.15	7.41
2020	14,509	1,176	115.12	3.22	7.57
2021	15,084	1,222	119.68	3.35	7.87
2025	17,411	1,411	138.14	3.87	9.09
2030	20,388	1,652	161.76	4.53	10.64
2035	24,908	2,018	197.63	5.53	13.00
2040	29,546	2,394	234.43	6.56	15.42
2045	31,272	2,534	248.13	6.94	16.32
2050	33,040	2,677	262.16	7.33	17.25
2055	34,546	2,799	274.10	7.67	18.03
Buildout	36,086	2,924	286.32	8.01	18.84

S E C T I O N

3

Chapter 3 – Sanitary Sewer System Analysis

American Fork City's sanitary sewer system was analyzed to find the capacity of the current system and to determine the improvements needed to meet the flows of the projected population. In this chapter, a description of the existing sanitary sewer system is given along with a discussion of the concerns and recommended improvements. State and American Fork City standard requirements were used as criteria to analyze the sanitary sewer system. Information obtained from a computer model of American Fork's sanitary sewer system is presented with the recommended improvements needed to meet the projected population wastewater flows.

American Fork City currently has approximately 130 miles of sewer lines that collect the wastewater and convey it to TSSD outfall lines at the various locations. Figure 7 in the appendix shows the layout of the existing system. Collection lines in the City range from 8 inches to 36 inches and carry an average yearly flow of 1,150 MG of wastewater.

State Design Requirements

The Utah DEQ provides guidelines and regulations for new sanitary sewer system design. These guidelines are useful in new construction, but measured flows have shown that these guidelines are considerably higher than actual flows and would be unnecessary for the City to fully implement. Design guidelines from other sewer districts were reviewed to help develop local standards. It is recommended that American Fork City adopt the following criteria as the minimum level of service for the sanitary sewer system:

- New collector lines must be capable of carrying a minimum peak flow of 3 times the average flow.
- New interceptors and outfall lines must be capable of carrying a minimum peak flow of 2 times the average flow.
- The minimum size of a collection line is 8 inches.
- The minimum velocity of a line flowing full is two feet per second (2 fps).
- 8-inch thru 12-inch sewer lines are not to exceed 50 percent capacity (by depth) at peak flow.
- 15-inch and greater sewer lines are not to exceed 75 percent capacity (by depth) at peak flow.
- An ERU is equal to 198 gallons per day (gpd) average flow. This is based on each culinary ERC using 208 gallons per day, 95 percent of this flow going into the sanitary sewer, plus a unit rate for infiltration and inflow.

The sewer model uses a flow of 198 gpd/ERU plus a unit rate for infiltration and inflow. These numbers compare favorably with recently measured flows (2016) from both the TSSD flow meter and individual portable meter verification. The sewer model also used a variable PF of 2.0 to 3.0.

The population capacity of different sewer line sizes is shown in Table 3. The capacities are calculated as shown. PFs are used to show maximum daily peaking flows with respect to whether the pipe is a collector or trunk line. As discussed in the previous chapter, trunk lines experience smaller peaks than collector lines.

Table 5 Pipe Design Standards

Size (in)	Percent Full	Minimum Slopes @ 2 fps (ft/ft)	Capacity @ Minimum Slope (MGD)	Peaking Factor	ERC Capacity @ 195 gpd
8	50	0.00334	0.24	3.00	410.26
10	50	0.00248	0.38	3.00	649.57
12	50	0.00194	0.55	3.00	940.17
15	75	0.00144	1.56	2.00	4000.00
18	75	0.00113	2.25	2.00	5769.23
21	75	0.00092	3.07	2.00	7871.79
24	75	0.00077	4.01	2.00	10282.05
27	75	0.00066	5.49	2.00	14076.92
30	75	0.00057	7.27	2.00	18641.03
36	75	0.00045	11.82	2.00	30307.69

Computer Model of Sanitary Sewer System

A computer program called *SewerGEMS (Connect Edition Update 2)* was used to model American Fork City's sanitary sewer system. The program uses the flows generated at each sewer connection to calculate the full flow, maximum flow, and velocity of flow for each pipe. From the output of the model, the amount of wastewater flowing in each line can be determined. Information for the existing sanitary sewer system including the pipe diameters, lengths, manhole locations, and invert elevations, were obtained from the 2016 model. Additional sections of the model were added from the developments since the last update in 2016.

The number of ERUs was estimated based on build-out conditions with the 2018 zoning and assuming 20 percent of the area was used in the development of roadways, sidewalks, parks, etc. The flows generated by the number of ERUs achieved at build-out were entered into SewerGEMS allowing the flows to be routed into existing lines. SewerGEMS was run to determine upgrades needed for demands on the existing sanitary sewer system and demands to be placed on the system during buildout.

The existing sanitary sewer system was modeled using PFs for both the present and future conditions. Each line that was flowing over either 50 percent of capacity for lines 12 inches and smaller or 75 percent of capacity for lines greater than 12 inches was then re-evaluated and recommendations made to provide lines with adequate capacities for the future conditions.

Existing Deficiency Improvement Plan

Table 6 shows improvements that are necessary to provide capacity for existing users. These improvements are shown in Figure 3 in the appendix.

Table 6 Improvements Needed on Existing System

Item	Description	Cost
1	450 West Upsizing	$465,225
2		
	Grand Total	**$465,225**

September 2019 CCI = 11311
Costs are in 2019 dollars

Buildout Improvement Plan

Table 7 shows improvements that are necessary to provide capacity for future growth. These improvements are shown in Figure 4 in the appendix.

Table 7 Improvements Needed on Buildout System

Item	Description	Cost
1	400 West Upsizing	$486,514
2	200 South Upsizing	$210,774
3	400 South Upsizing	$142,156
4	300 East Upsizing and Diversion	$151,261
5	860 East Area New	$373,112
6	Southside Buildout Improvements	$14,807,629
7	Cedar Hills Buildout Needs *	$922,451
	Grand Total	**$17,093,899**

September 2019 CCI = 11311
Costs are in 2019 dollars

Cedar Hills Buildout needs are for information only and not for the calculations of impact fees for American Fork City users. The upsize and new capacity needed is for the benefit of Cedar Hills only (see Detailed cost estimates in the Appendix).

A summary of the recommended improvements, scheduling, and estimated costs is shown in Table 8. Figures 3 and 4 in the appendix shows the recommended improvements. Figure 8 in the appendix shows the proposed buildout sanitary sewer system. Figure 9 in the appendix shows the anticipated capacity utilized at buildout. With contingencies, engineering, legal, and administrative fees, the total estimated cost is $136,919,237.

Table 8 Full Improvement Schedule

Fiscal Year	Description	Cost	% Benefit to Existing	Impact Expense	Operating Expense
2019-20	Annual Master Plan Review	$5,500	39.34%	$3,336	$2,164
	System Replacement	$2,944,145	100.00%	$0	$2,944,145
	Southside Buildout Improvements	$361,162	0.00%	$361,162	$0
	450 West Upsizing	$465,225	39.34%	$282,184	$183,042
	400 West Upsizing	$486,514	0.00%	$486,514	$0
2020-21	Annual Master Plan Review	$5,500	39.34%	$3,336	$2,164
	System Replacement	$2,944,145	100.00%	$0	$2,944,145
	Southside Buildout Improvements	$361,162	0.00%	$361,162	$0
	200 South Upsizing	$210,774	0.00%	$210,774	$0
2021-22	Annual Master Plan Review	$5,500	39.34%	$3,336	$2,164
	System Replacement	$2,944,145	100.00%	$0	$2,944,145
	Southside Buildout Improvements	$361,162	0.00%	$361,162	$0
	860 East Area New	$373,112	0.00%	$373,112	$0
2022-23	5 Year Master Plan Update	$55,000	39.34%	$33,360	$21,640
	System Replacement	$2,944,145	100.00%	$0	$2,944,145
	Southside Buildout Improvements	$361,162	0.00%	$361,162	$0
2023-24	Annual Master Plan Review	$5,500	39.34%	$3,336	$2,164
	System Replacement	$2,944,145	100.00%	$0	$2,944,145
	Southside Buildout Improvements	$361,162	0.00%	$361,162	$0
2024-25	Annual Master Plan Review	$5,500	39.34%	$3,336	$2,164
	System Replacement	$2,944,145	100.00%	$0	$2,944,145
	Southside Buildout Improvements	$361,162	0.00%	$361,162	$0
2025-26	Annual Master Plan Review	$5,500	39.34%	$3,336	$2,164
	System Replacement	$2,944,145	100.00%	$0	$2,944,145
	Southside Buildout Improvements	$361,162	0.00%	$361,162	$0
	400 South Upsizing	$142,156	0.00%	$142,156	$0
2026-27	Annual Master Plan Review	$5,500	39.34%	$3,336	$2,164
	System Replacement	$2,944,145	100.00%	$0	$2,944,145
	Southside Buildout Improvements	$361,162	0.00%	$361,162	$0
	300 East Upsizing and Diversion	$151,261	0.00%	$151,261	$0
2027-28	5 Year Master Plan Update	$55,000	39.34%	$33,360	$21,640
	System Replacement	$2,944,145	100.00%	$0	$2,944,145

	Southside Buildout Improvements	$361,162	0.00%	$361,162	$0
	860 East Area New	$186,556	0.00%	$186,556	$0
2028-29	Annual Master Plan Review	$5,500	39.34%	$3,336	$2,164
	System Replacement	$2,944,145	100.00%	$0	$2,944,145
	Southside Buildout Improvements	$361,162	0.00%	$361,162	$0
2029-30	Annual Master Plan Review	$5,500	39.34%	$3,336	$2,164
	System Replacement	$2,944,145	100.00%	$0	$2,944,145
	Southside Buildout Improvements	$361,162	0.00%	$361,162	$0
2030-35	Annual Master Plan Review	$77,000	39.34%	$46,705	$30,295
	System Replacement	$14,720,725	100.00%	$0	$14,720,725
	Southside Buildout Improvements	$1,805,808	0.00%	$1,805,808	$0
2035-40	Annual Master Plan Review	$77,000	39.34%	$46,705	$30,295
	System Replacement	$14,720,725	100.00%	$0	$14,720,725
	Southside Buildout Improvements	$1,805,808	0.00%	$1,805,808	$0
2040-45	Annual Master Plan Review	$77,000	39.34%	$46,705	$30,295
	System Replacement	$14,720,725	100.00%	$0	$14,720,725
	Southside Buildout Improvements	$1,805,808	0.00%	$1,805,808	$0
2045-50	Annual Master Plan Review	$77,000	39.34%	$46,705	$30,295
	System Replacement	$14,720,725	100.00%	$0	$14,720,725
	Southside Buildout Improvements	$1,805,808	0.00%	$1,805,808	$0
2050-55	Annual Master Plan Review	$77,000	0.00%	$77,000	$0
	System Replacement	$14,720,725	100.00%	$0	$14,720,725
	Southside Buildout Improvements	$1,805,808	0.00%	$1,805,808	$0
2055-60	Annual Master Plan Review	$77,000	39.34%	$46,705	$30,295
	System Replacement	$14,720,725	100.00%	$0	$14,720,725
	Southside Buildout Improvements	$1,805,808	0.00%	$1,805,808	$0
	Total Expenditures	**$138,154,676**		**$17,047,455**	**$121,107,220**

TSSD Connection Requirements

TSSD owns and operates several outfall lines in and through American Fork City. TSSD requires the City to obtain the necessary permissions prior to connecting to these lines and the City often requires developments to obtain the permissions on the City's behalf. They have design and construction standards necessary to construct a proposed connection.

On any outfall line where American Fork City has a TSSD meter at the downstream end of the outfall line a connection can be made at any manhole that is within a City street for access purposes. The flowline shall be at or above the point where the 75 percent depth level matches in the discharging and receiving pipe. For pipes 12 inch and smaller it is recommended the 50 percent full level in the smaller pipe be matched to the 75 percent full level in the larger pipe.

On any outfall line where American Fork City does not have a TSSD meter at the downstream end a connection can only be made with a TSSD approved meter. The connection must have a minimum of 200

homes, preferably more, connected at buildout. The flowline shall be as required by TSSD. A general rule for connecting different sized pipes is for the flowline to be at or above the point where the 75 percent depth level matches in the discharging and receiving pipe. For pipes 12 inch and smaller it is recommended the 50 percent full level in the smaller pipe be matched to the 75 percent full level in the larger pipe. Additional fall through the metering device shall be incorporated in the design. The meter must be installed at any location that is within or adjacent to a City street for access purposes.

APPENDIX

Legend

- WTP — TSSD
- M — Existing Meter
- Manhole

Improvements

- UPSIZE 12
- American Fork
- Parcels
- Roads

1:24,000

Sanitary Sewer System Master Plan

Existing Sanitary Sewer System Improvements

HORROCKS ENGINEERS

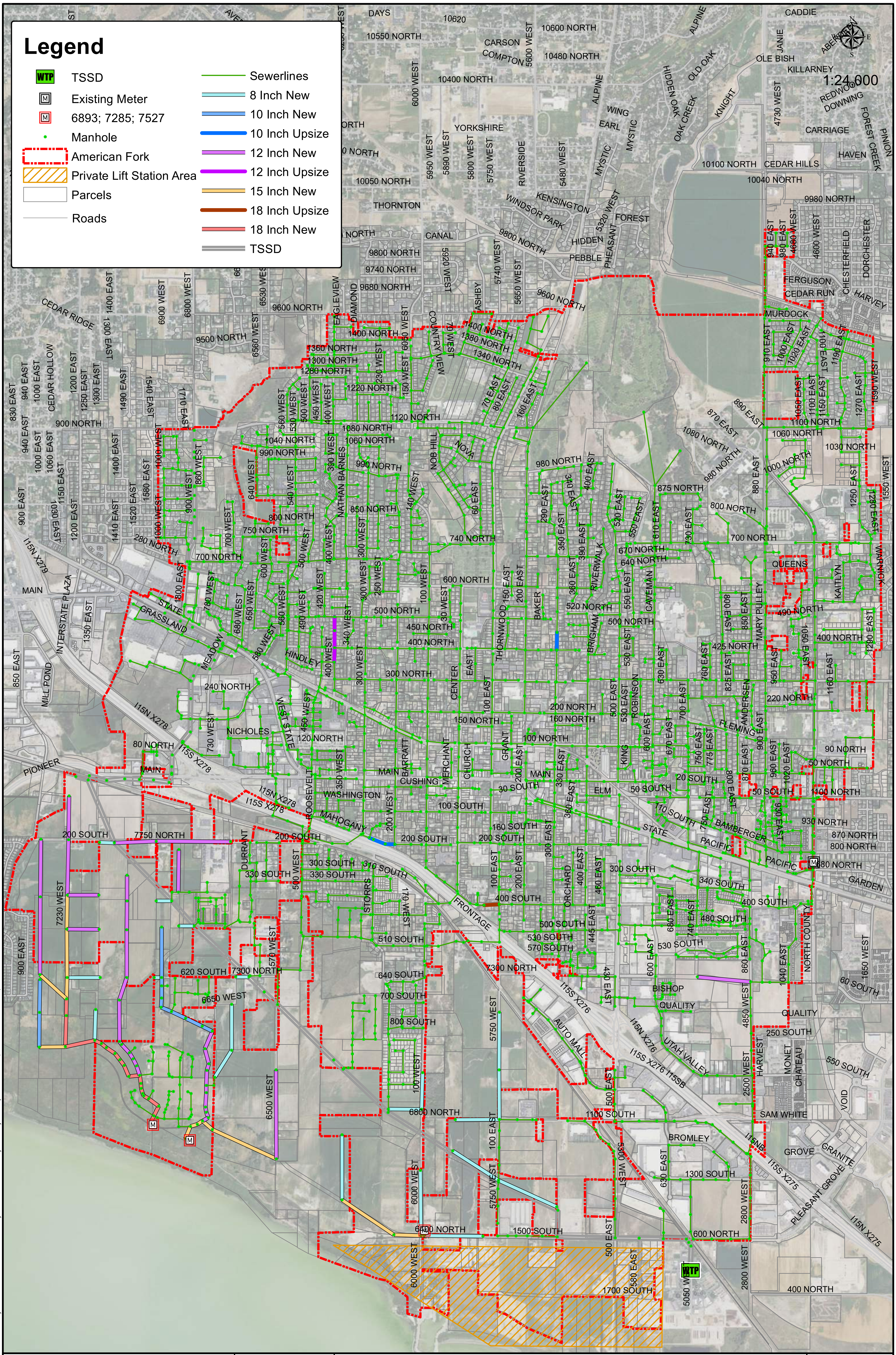
2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

DATE 11/25/2019

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Figure 3

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Pleasant Grove, UT 84062
(801) 763-5100

Sanitary Sewer System Master Plan

Buildout Sanitary Sewer System Improvements

DATE 11/25/2019

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Figure 4

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Legend

American Fork
Parcels
Roads

Zoning

CC-1, CC-2, GC-1, GC-2, I-1, M-1, PC, PF, PI-1, PO-1, PR-2.0, PR-2.3, PR-3.0, R1-12000, R1-15000, R1-20000, R1-7500, R1-9000, R2-7500, R3-7500, R4-7500, RA-1, RA-5, S-1, SC-1, SP, TOD

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Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

Sanitary Sewer System Master Plan

Existing Zoning

DATE 11/25/2019
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Figure 5

Legend

- American Fork
- Parcels
- Roads
- professional office
- Design Commercial
- Design Industrial
- General Commercial
- Institutional Lands, Schools and Public Facilities
- Low Density Residential
- Major Transportation Facilities
- Neighborhood Commercial
- Planned Community
- Professional Office
- Public Parks & Open Space
- Residential High Density
- Residential Low Density
- Residential Medium Density
- Residential Very- Low Density
- Resort
- Shoreline Protection
- Transit Oriented Development

1:24,000

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Pleasant Grove, UT 84062
(801) 763-5100

Sanitary Sewer System Master Plan

General Plan Anticipated Land Use

DATE 11/25/2019

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Figure 6

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Legend

- Manhole

Sewerline (Dia)

- 8
- 9.4
- 10
- 11.2
- 12
- 12.3
- 14.1
- 15
- 15.8
- 18
- 21
- 24
- 30
- 36
- 42
- American Fork
- Parcels
- Roads

1:24,000

Sanitary Sewer System Master Plan

Existing Sanitary Sewer System

HORROCKS ENGINEERS

2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

DATE 11/25/2019

DRAWN JES

Figure 7

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Legend

- Manhole

Sewerline (Dia)

- 8
- 9.4
- 10
- 11.2
- 12
- 12.3
- 14.1
- 15
- 15.8
- 18
- 21
- 24
- 30
- 36
- 42
- American Fork
- Parcels
- Roads

1:24,000

HORROCKS ENGINEERS

2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

Sanitary Sewer System Master Plan

Buildout Sanitary Sewer System

DATE 11/25/2019
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Figure 8

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Legend

DN/D

- 0-12.5%
- 12.5-25%
- 25-50%
- 50-75%
- 75-100%
- American Fork
- Parcels
- Roads

1:24,000

HORROCKS ENGINEERS

2162 West Grove Parkway
Suite 400
Pleasant Grove, UT 84062
(801) 763-5100

Sanitary Sewer System Master Plan

Buildout Sanitary Sewer Used Capacity

DATE 11/25/2019

DRAWN JES

Figure 9

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Table 12 Outflow Data Provided by Cedar Hills

Existing ERUs	2,596
Existing Ave day, peak month (gallons/day)	732,000
Flow/ERU (gallons/day)	282
Peak Hour Peaking Factor	2.5

@ 282 gpd/ERU	Cedar Hills			Others					
Outfall	Existing ERUs	Future Residential ERUs	Future Commercial ERUs	Pleasant Grove ERUs	Highland ERUs	Lone Peak High School	Total ERUs	Future Peak Month, Ave. Day (gals/day)	Future Peak Hour (gals/day)
I - 4600 West	1,206	155	90				1,451	409,142	1,022,854
II - 4500 West	953	155		200			1,308	368,820	922,049
III - 4800 West	437	150	190		80	111	968	272,900	682,251
Total	2,596	460	280		80	111	3,727	1,050,862	2,627,154

@ 355 gpd/ERU	Cedar Hills			Others					
Outfall	Existing ERUs	Future Residential ERUs	Future Commercial ERUs	Pleasant Grove ERUs	Highland ERUs	Lone Peak High School	Total ERUs	Future Peak Month, Ave. Day (gals/day)	Future Peak Hour (gals/day)
I - 4600 West	1,206	155	90				1,451	515,105	1,287,763
II - 4500 West	953	155		200			1,308	464,340	1,160,850
III - 4800 West	437	150	190		80	88	945	335,485	838,713
Total	2,596	460	280		80	88	3,704	1,314,930	3,287,325

Table 13 Detailed Cost Estimates

450 West Upsizing

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$16,911
2	8 inch PVC		LF	$84.83	$0
3	10 inch PVC		LF	$90.13	$0
4	12 inch PVC	979	LF	$98.61	$96,544
5	15 inch PVC		LF	$111.34	$0
6	18 inch PVC		LF	$127.24	$0
7	21 inch PVC		LF	$143.15	$0
8	24 inch PVC		LF	$169.66	$0
9	30 inch PVC		LF	$201.47	$0
10	36 inch RCP		LF	$233.28	$0
12	5 foot manholes	8	EA	$3,711.31	$29,690
13	6 foot manholes		EA	$4,771.68	$0
14	8 foot manholes		EA	$6,362.24	$0
15	Service Connections	50	EA	$1,961.69	$98,085
16	TSSD Meter Station		EA	$132,546.64	$0
17	Class "A" Road Repair (10 ft/lin ft)	9,790	SF	$4.03	$39,456
18	Imported Backfill (60 cf/lin ft)	3,916	TON	$17.29	$67,690
19	Traffic Control	1	LS	$1,930.88	$1,931
20	Bypass Pumping	1	LS	$4,827.19	$4,827
	Sub Total (Construction)				$355,134
	Contingencies	15%			$53,270
	Total (Construction)				$408,404
	Design and Construction Engineering	15%			$53,270
	Administration, Legal, and Bond Counsel	1%			$3,551
	Total (Professional Services)				$56,821
	Grand Total				**$465,225**

September 2019 CCI = 11311
Data From Sewer Model Data Base
Costs are in 2019 dollars

400 West Upsizing

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$17,685
2	8 inch PVC		LF	$84.83	$0
3	10 inch PVC		LF	$90.13	$0
4	12 inch PVC	1,051	LF	$98.61	$103,644
5	15 inch PVC		LF	$111.34	$0
6	18 inch PVC		LF	$127.24	$0
7	21 inch PVC		LF	$143.15	$0
8	24 inch PVC		LF	$169.66	$0
9	30 inch PVC		LF	$201.47	$0
10	36 inch RCP		LF	$233.28	$0
12	5 foot manholes	8	EA	$3,711.31	$29,690
13	6 foot manholes		EA	$4,771.68	$0
14	8 foot manholes		EA	$6,362.24	$0
15	Service Connections	50	EA	$1,961.69	$98,085
16	TSSD Meter Station		EA	$132,546.64	$0
17	Class "A" Road Repair (10 ft/lin ft)	10,510	SF	$4.03	$42,358
18	Imported Backfill (60 cf/lin ft)	4,204	TON	$17.29	$72,668
19	Traffic Control	1	LS	$2,072.88	$2,073
20	Bypass Pumping	1	LS	$5,182.20	$5,182
	Sub Total (Construction)				$371,385
	Contingencies	15%			$55,708
	Total (Construction)				$427,093
	Design and Construction Engineering	15%			$55,708
	Administration, Legal, and Bond Counsel	1%			$3,714
	Total (Professional Services)				$59,422
	Grand Total				**$486,514**

September 2019 CCI = 11311
Data From Sewer Model Data Base
Costs are in 2019 dollars

200 South Upsizing

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$7,662
2	8 inch PVC		LF	$84.83	$0
3	10 inch PVC	615	LF	$90.13	$55,431
4	12 inch PVC		LF	$98.61	$0
5	15 inch PVC		LF	$111.34	$0
6	18 inch PVC		LF	$127.24	$0
7	21 inch PVC		LF	$143.15	$0
8	24 inch PVC		LF	$169.66	$0
9	30 inch PVC		LF	$201.47	$0
10	36 inch RCP		LF	$233.28	$0
12	5 foot manholes	4	EA	$3,711.31	$14,845
13	6 foot manholes		EA	$4,771.68	$0
14	8 foot manholes		EA	$6,362.24	$0
15	Service Connections	6	EA	$1,961.69	$11,770
16	TSSD Meter Station		EA	$132,546.64	$0
17	Class "A" Road Repair (10 ft/lin ft)	6,150	SF	$4.03	$24,786
18	Imported Backfill (60 cf/lin ft)	2,460	TON	$17.29	$42,522
19	Traffic Control	1	LS	$1,108.62	$1,109
20	Bypass Pumping	1	LS	$2,771.55	$2,772
	Sub Total (Construction)				$160,897
	Contingencies	15%			$24,134
	Total (Construction)				$185,031
	Design and Construction Engineering	15%			$24,134
	Administration, Legal, and Bond Counsel	1%			$1,609
	Total (Professional Services)				$25,743
	Grand Total				**$210,774**

September 2019 CCI = 11311
Data From Sewer Model Data Base
Costs are in 2019 dollars

400 South Upsizing

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$5,167
2	8 inch PVC		LF	$84.83	$0
3	10 inch PVC		LF	$90.13	$0
4	12 inch PVC		LF	$98.61	$0
5	15 inch PVC		LF	$111.34	$0
6	18 inch PVC	350	LF	$127.24	$44,536
7	21 inch PVC		LF	$143.15	$0
8	24 inch PVC		LF	$169.66	$0
9	30 inch PVC		LF	$201.47	$0
10	36 inch RCP		LF	$233.28	$0
12	5 foot manholes		EA	$3,711.31	$0
13	6 foot manholes	2	EA	$4,771.68	$9,543
14	8 foot manholes		EA	$6,362.24	$0
15	Service Connections	4	EA	$1,961.69	$7,847
16	TSSD Meter Station		EA	$132,546.64	$0
17	Class "A" Road Repair (10 ft/lin ft)	3,500	SF	$4.03	$14,106
18	Imported Backfill (60 cf/lin ft)	1,400	TON	$17.29	$24,200
19	Traffic Control	1	LS	$890.71	$891
20	Bypass Pumping	1	LS	$2,226.78	$2,227
	Sub Total (Construction)				$108,516
	Contingencies	15%			$16,277
	Total (Construction)				$124,794
	Design and Construction Engineering	15%			$16,277
	Administration, Legal, and Bond Counsel	1%			$1,085
	Total (Professional Services)				$17,363
	Grand Total				**$142,156**

September 2019 CCI = 11311
Data From Sewer Model Data Base
Costs are in 2019 dollars

300 East Upsizing and Diversion

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$5,498
2	8 inch PVC		LF	$84.83	$0
3	10 inch PVC	410	LF	$90.13	$36,954
4	12 inch PVC		LF	$98.61	$0
5	15 inch PVC		LF	$111.34	$0
6	18 inch PVC		LF	$127.24	$0
7	21 inch PVC		LF	$143.15	$0
8	24 inch PVC		LF	$169.66	$0
9	30 inch PVC		LF	$201.47	$0
10	36 inch RCP		LF	$233.28	$0
12	5 foot manholes	2	EA	$3,711.31	$7,423
13	6 foot manholes		EA	$4,771.68	$0
14	400 North 300 East Diversion (15% W 85% S)	1	EA	$6,362.24	$6,362
15	Service Connections	6	EA	$1,961.69	$11,770
16	TSSD Meter Station		EA	$132,546.64	$0
17	Class "A" Road Repair (10 ft/lin ft)	4,100	SF	$4.03	$16,524
18	Imported Backfill (60 cf/lin ft)	1,640	TON	$17.29	$28,348
19	Traffic Control	1	LS	$739.08	$739
20	Bypass Pumping	1	LS	$1,847.70	$1,848
	Sub Total (Construction)				$115,466
	Contingencies	15%			$17,320
	Total (Construction)				$132,786
	Design and Construction Engineering	15%			$17,320
	Administration, Legal, and Bond Counsel	1%			$1,155
	Total (Professional Services)				$18,475
	Grand Total				**$151,261**

September 2019 CCI = 11311
Data From Sewer Model Data Base
Costs are in 2019 dollars

860 East Area New

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$13,563
2	8 inch PVC		LF	$84.83	$0
3	10 inch PVC		LF	$90.13	$0
4	12 inch PVC	1,240	LF	$98.61	$122,282
5	15 inch PVC		LF	$111.34	$0
6	18 inch PVC		LF	$127.24	$0
7	21 inch PVC		LF	$143.15	$0
8	24 inch PVC		LF	$169.66	$0
9	30 inch PVC		LF	$201.47	$0
10	36 inch RCP		LF	$233.28	$0
12	5 foot manholes	8	EA	$3,711.31	$29,690
13	6 foot manholes		EA	$4,771.68	$0
14	8 foot manholes		EA	$6,362.24	$0
15	Service Connections		EA	$1,961.69	$0
16	TSSD Meter Station		EA	$132,546.64	$0
17	Class "A" Road Repair (10 ft/lin ft)	6,200	SF	$4.03	$24,987
18	Imported Backfill (60 cf/lin ft)	4,960	TON	$17.29	$85,736
19	Traffic Control	1	LS	$2,445.64	$2,446
20	Bypass Pumping	1	LS	$6,114.11	$6,114
	Sub Total (Construction)				$284,819
	Contingencies	15%			$42,723
	Total (Construction)				$327,541
	Design and Construction Engineering	15%			$42,723
	Administration, Legal, and Bond Counsel	1%			$2,848
	Total (Professional Services)				$45,571
	Grand Total				**$373,112**

September 2019 CCI = 11311
Data From Sewer Model Data Base
Costs are in 2019 dollars

Southside Buildout Improvements

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$538,264
2	8 inch PVC *	21,552	LF	$84.83	$1,828,253
3	10 inch PVC	4,106	LF	$90.13	$370,081
4	12 inch PVC	19,653	LF	$98.61	$1,938,075
5	15 inch PVC	8,654	LF	$111.34	$963,529
6	18 inch PVC	4,228	LF	$127.24	$537,991
7	21 inch PVC		LF	$143.15	$0
8	24 inch PVC		LF	$169.66	$0
9	30 inch PVC		LF	$201.47	$0
10	36 inch RCP		LF	$233.28	$0
12	5 foot manholes	50	EA	$3,711.31	$185,565
13	6 foot manholes	25	EA	$4,771.68	$119,292
14	8 foot manholes		EA	$6,362.24	$0
15	Lift Station	1	EA	$301,937.24	$301,937
16	TSSD Meter Station	3	EA	$132,546.64	$397,640
17	Class "A" Road Repair (10 ft/lin ft)	366,410	SF	$4.03	$1,476,720
18	Imported Backfill (60 cf/lin ft)	146,564	TON	$17.29	$2,533,429
19	Traffic Control	1	LS	$112,758.57	$112,759
20	Bypass Pumping	0	LS	$281,896.43	$0
	Sub Total (Construction)				$11,303,534
	Contingencies	15%			$1,695,530
	Total (Construction)				$12,999,064
	Design and Construction Engineering	15%			$1,695,530
	Administration, Legal, and Bond Counsel	1%			$113,035
	Total (Professional Services)				$1,808,565
	Grand Total				**$14,807,629**

September 2019 CCI = 11311

Data From Sewer Model Data Base

Costs are in 2019 dollars

* Assumed that all 8 inch lines are installed by developers and not funded by impact fees.

Cedar Hills Buildout Needs *

Item	Description	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	----	$33,531
2	8 inch PVC		LF	$84.83	$0
3	10 inch PVC		LF	$90.13	$0
4	12 inch PVC		LF	$98.61	$0
5	15 inch PVC (Upsize Existing)	2,700	LF	$111.34	$300,616
7	21 inch PVC		LF	$143.15	$0
8	24 inch PVC		LF	$169.66	$0
9	30 inch PVC		LF	$201.47	$0
10	36 inch RCP		LF	$233.28	$0
12	5 foot manholes		EA	$3,711.31	$0
13	6 foot manholes	15	EA	$4,771.68	$71,575
14	8 foot manholes		EA	$6,362.24	$0
15	Service Connections	45	EA	$1,961.69	$88,276
16	TSSD Meter Station		EA	$132,546.64	$0
17	Class "A" Road Repair (10 ft/lin ft)	17,280	SF	$4.03	$69,643
18	Imported Backfill (60 cf/lin ft)	6,912	TON	$17.29	$119,477
19	Traffic Control	1	LS	$6,012.32	$6,012
20	Bypass Pumping	1	LS	$15,030.79	$15,031
	Sub Total (Construction)				$704,161
	Contingencies	15%			$105,624
	Total (Construction)				$809,786
	Design and Construction Engineering	15%			$105,624
	Administration, Legal, and Bond Counsel	1%			$7,042
	Total (Professional Services)				$112,666
	Grand Total				**$922,451**

September 2019 CCI = 11311
Data From Sewer Model Data Base
Costs are in 2019 dollars

Data Provided by Cedar Hills

Existing ERUs	2,596
Existing Ave day, peak month (gallons/day)	732,000
Flow/ERU (gallons/day)	282
Peak Hour Peaking Factor	2.5

@ 282 gpd/ERU	Cedar Hills			Others					
Outfall	Existing ERUs	Future Residential ERUs	Future Commercial ERUs	Pleasant Grove ERUs	Highland ERUs	Lone Peak High School	Total ERUs	Future Peak Month, Ave. Day (gals/day)	Future Peak Hour (gals/day)
I - 4600 West	1,206	155	90				1,451	409,142	1,022,854
II - 4500 West	953	155		200			1,308	368,820	922,049
III - 4800 West	437	150	190		80	111	968	272,900	682,251
Total	2,596	460	280		80	111	3,727	1,050,862	2,627,154

@ 355 gpd/ERU	Cedar Hills			Others					
Outfall	Existing ERUs	Future Residential ERUs	Future Commercial ERUs	Pleasant Grove ERUs	Highland ERUs	Lone Peak High School	Total ERUs	Future Peak Month, Ave. Day (gals/day)	Future Peak Hour (gals/day)
I - 4600 West	1,206	155	90				1,451	515,105	1,287,763
II - 4500 West	953	155		200			1,308	464,340	1,160,850
III - 4800 West	437	150	190		80	88	945	335,485	838,713
Total	2,596	460	280		80	88	3,704	1,314,930	3,287,325

AMERICAN FORK CITY
PLANNING COMMISSION MINUTES
DECEMBER 4, 2019

The American Fork City Planning Commission met in a regular session on December 4, 2019 at the American Fork City Hall, 31 North Church Street, commencing at 7:00 p.m.

Present:	John Woffinden Chris Christiansen Geoff Dupaix Harold Dudley Rod Brocious Ryan Hunter
Absent:	Christine Anderson Rebecca Staten
Staff Present:	Scott Sensanbaugher, City Engineer Adam Olsen, City Planner Wendelin Knobloch, Planner Ben Hunter, Engineer Lisa Halversen, Administrative Assistant
Also Present:	Niel Christensen, David Christensen, Allen Christensen, Wayne Christensen, Cindy Christensen, Kathleen Christensen, Mandy Winters, Kristi Townsend, Terry Townsend, Veha Souphom, Tresa Chadwick, Samantha Carson, Norman Chadwick, Wayne Christensen, Carolyn Lloyd, Andrea McAllister, Rio Honaker, James Honaker, Ken Berg, Ginger Romriell, and 10 others

1. Pledge of Allegiance

Chairman Woffinden welcomed everyone and those present recited the Pledge of Allegiance.

2. Hearing, review and action on the preliminary plan for the AF 10 Combined Project located in the area of 780 West 620 South in the PR-3.0 Residential zone

Mr. Olsen stated that AF 10 Subdivision proposes a combination of both a Conservation Subdivision PUD and Low Density Attached Housing PUD. 47 lots/units are proposed; two lots having existing homes. Overall density for subdivision is 3.9 du/ac. Access is provided off 620 South, and an access connection to 900 West (currently under construction). An open space area

exists at the southern portion of the subdivision. Additional open space areas are proposed at the northeastern portion of the subdivision, surrounding the townhome area.

The subdivision proposes a transfer of unused, allowed, units (density) from the Dixie Farms Subdivision, located directly west and south. As the two subdivisions are under one developer, the developer wishes to place unused units from the Dixie Farms area, into the AF 10 Subdivision. This creates an overall density which is slightly higher, at 3.9 du/ac. However, if the combined number of units within Dixie Farms, AF PD South, and AF 10 are accounted for, the overall density for all three projects falls within the 3 du/ac; as allowed in the zone.

Conservation subdivisions within the PR-3.0 zone require 25% open space. The subdivision meets this requirement.

As with other development options in the PR-3.0 zone, the Code allows the Planning Commission flexibility to require changes in the plan. Changes may include, but are not limited to, "adjustments in the density or number of structures, relocation of project elements, redesign of the road system, increase in the amount of open space and provisions for the disposal of surface water drainage" (17.7.503.D).

Mr. Hunter indicated that this is the same developer that owns the property where 900 West is being constructed, they will be providing required utilities and primary access to 900 West. Engineering Division has no other concerns and recommends approval.

Mr. Ken Berg, civil engineer representing applicant, said that this is a somewhat complicated proposal. Lots 201 and 202 are one-acre lots, there is required open space, and there are 2 different developments being proposed that are somewhat combined. 620 South will be widened to the collector road specification.

Chairman Woffinden asked if there would a no-basement requirement.

Mr. Berg stated that notes on the final plat would indicate that no basements can be built. He disclosed that on east side of the property there is no road stubbing in because that is a UDOT parcel for future UDOT plans. There are reasons why there is not a road on the east, it's not an oversight.

Chairman Woffinden asked about the liquefaction issue, the state says it's a high-liquefaction area but the geotechnical report doesn't acknowledge this.

Mr. Berg acknowledges that it is a high-liquefaction area and said that they are planning to abide by the sensitive lands ordinance to meet liquefaction standards and criteria. Developer will have plans to counterbalance liquefaction potential.

Chairman Woffinden asked for specificity regarding mitigations, Mr. Berg replied that mitigations will be part of a peer-reviewed report.

Mr. Dudley asks if there are to be no basements through the entire development or just parts of it.

Mr. Berg replied that no basements will be anywhere in the development, this will be noted on the final plat.

Public Hearing Opened

Mr. Rio Honaker said that he has been talking to the contractor about concerns regarding the development. They indicated to him that sewer lines will be 14 ½ ft deep going to 21 ft in that area. He is concerned about what the contingencies are for sewer problems, they can't dig that deep to diagnose problems.

Mr. Berg said that's not the correct sewer depth, but the sewer lines will likely be in groundwater. Sewer pipes will be 18", bedded in gravel with clay dikes, and built to city standards to maintain integrity of the lines. They will be working with TSSD to meet all of their requirements as well.

Mr. Niel Christensen, resident, is a 5th generation farmer in the area. He said that the city moved north instead of spreading out around the farmland because of the groundwater problem. The main problem with high groundwater is that it compromises the integrity of the sewer system. Rough roads will also be a problem; the road base will be difficult to maintain.

Ms. Andrea McAllister indicated that Red Pine Construction has pulled out because they are not being paid, she is concerned about partial work not being finished that the city will be left holding the bag for. She is very concerned about safety in the area, she almost hit a bicyclist on the road tonight. It's not safe and the city keeps bringing subdivisions and more people into the area. Emergency vehicles can't get to some areas in a timely fashion when they have to wait for trains. She asked commissioners to please use their power to plan the area's growth in a way that provides the necessary infrastructure before more people are put in unsafe situations, and asked them to be considerate of residents already living in the area.

Mr. Allen Christensen is concerned about water movement through the soil, the sewer lines act as an underground dam that creates puddles on upside and droughts on lower side. There is lots of groundwater in that area that can cause problems with gas lines. Potential issues and problems need to be taken more seriously. Water appears to be collecting around Storrs Avenue from unused water rights, he urges commissioners to protect the water that will be necessary for future needs.

Mr. Wayne Christensen, said that the scar from the Timpanogos sewer line is still visible after 30 years. Inadequate drains don't put the water where it can be used. Road base acts as a dam, it disrupts the water flow. Major work needs to be done on the drains to keep the water usable for those who have water rights. There are five generations in this area, their family will be staying there. The city has no authority to take their land for roads, as it is agriculturally protected. The city council wants to put in a fiber system that is going to be a lot of money. If the city has money for that, they can buy land someplace else to build roads, not on his agricultural land. The city has property 120 ft south of him that they could use for a road.

Mr. Brocious asked him whether the subdivision is impacting the flow of water or if water is no longer available at all.

Mr. Christensen replied that there has been a reduction by about 50% in water available to use. There are 4 main water sloughs in the area, and when you dig into them the water moves someplace else. This affects his access to the water. It's not an easy case with easy solutions.

Mr. Rio Honaker has experience with developments such as gas and sewer lines in the area around the Salt Lake City airport. Some problems can be resolved, but they need to be thought out first.

Ms. Carolyn Lloyd resides on lot 201, a one-acre lot in the proposed development. She knows that development is coming, but she is concerned about having duplexes around her home. City code says that development has to be compatible with the general plan for the area, she wants to see more of a transition, not duplexes right next to her home. The geotech report says that groundwater is 5 ft down in her area, it is really more like 2 ft. The liquefaction map shows the area as a high-liquefaction area. She has a sump pump that runs 24/7until May. The geotech report was done at end of 2018, one of the driest years on record. She suggested that another geotech report be done. After the wet winter last year, she had a lot more water at her house, there are a lot of fluctuations. Her house was built 25 years ago, and within 3 years there were a lot of cracks in her ceilings from movement.

Ms. Andrea McAllister says that water is definitely an issue in the area, the farmers that water have had to build structures to get enough water. She has noticed a big decrease in water pressure in her house.

Ms. Tresa Chadwick lives on lot 202, the other one-acre lot. Her home was built in 1979, her walls have shifted and moved, liquefaction is a factor. They are on an artesian well, the water has slowed significantly in the last couple of years. She thinks they could have a problem getting the amount of water needed to the new residences. She knows that development and growth will come, but she wants more of a buffer between her and the 4-plexes. Larger lot sizes would indicate more care in planning.

Chairman Woffinden asked Mr. Berg about the planned open space, if it's on buildable land.

Mr. Berg said that the planned amount of open space is part of the requirements for development in the area, there is also a spring there that is being protected.

Mr. Niel Christensen asked who will maintain the open space. Will it be like a city park? Or will it become a thicket of russian olives that people can't get in and out of? His wells have also dried up and they are having to pump. He fears that mud will eventually cover the spring and clog it.

Mr. Honaker said that he has been keeping the area cut while decisions are in the process.

Mr. Dupaix wanted to hear from Scott Sensanbaugher about the residents' water concerns, he has walked the properties with residents. What is the Engineering Division doing to make sure the residents water rights and pressures aren't affected?

Mr. Sensanbaugher replied that if residents have a claim about water rights and access, they would have to work it out with the developer. The development complies with city code.

Mr. Brocious said that the potential impacts to the spring and water access make him concerned. Has the city done measurements to determine if flows have been reduced?

Mr. Sensanbaugher stated that such water concerns are not a city function, residents should contact state engineers.

Mr. Brocious replied that this is not the case if a development in the city is creating an impact on the springs.

Mr. Sensanbaugher said that there's a state process to follow for damages to water rights. He's not making a judgement call about water rights, it's a state issue. His only role is to say if the development meets code or not.

Mr. Brocious said that as a civil engineer, he recognizes that there could be a direct correlation between development and changes in water amounts and flows. There are many other factors that affect groundwater. He is concerned that the city is not truly filling its role in oversight and monitoring, the residents have legitimate concerns. At what point are 200 South and other roads going to be looked at for greater capacity? The city continues to approve developments, what will trigger the necessary road improvements?

Mr. Sensanbaugher gave an update on 200 South. He said that the city council at their meeting two weeks ago approved a purchase order to complete the rest of the design of 200 South. Council is moving full speed ahead with the design for full complete widening from Millpond Road to the frontage road next to the freeway. The plans would upgrade a large water line, add pedestrian and bicycle facilities, and widen to two lanes in each direction. The full section will be built for just a portion of the length, in a core area, then down to some widening on both ends. There would be full pedestrian and bicycle lanes for the whole length. Design is resuming, they anticipate finishing in April –May of 2020. City council in January will consider creating a financing mechanism to build this project. The project would hopefully go to bid next summer, and begin construction in maybe a year from now. This is conditional on a funding mechanism being approved, please speak your mind to the council. When 200 South is improved it will be much safer than it is now. Road design is moving forward regardless of approval or disapproval of this proposal tonight.

Mr. Dupaix expressed concerns about getting good bids in the summer when contractors are maxed out.

Mr. Sensanbaugher stated that this has needed to go forward, but it will be council's decision when to bid it out.

Mr. Dupaix said that no one on the commission is against development, but they take seriously the long term prospects. He wants to make sure they come in with their eyes wide open, maybe the city should take more time to evaluate things to make them better for the future of the area and current residents.

Mr. Dudley pointed out that he relies on city staff to review engineering, water rights, etc. He hears from staff that developments meet city requirements. He hears the residents' concerns as

well, but relies on staff for information. He points out that residents of lots 201 and 202 will have to sign the final plats, they have a lot of power to get it to final plat.

Mr. Hunter asked if city code has a requirement for the geotech report to be recent? He suggested that perhaps the code needs to be revised to specify time limits for such reports. If digging a trench impacts the groundwater by creating a dam or ditch, does our code need to consider this?

Mr. Hunter stated that the sensitive lands ordinance identifies hazardous conditions, steep slopes and high-liquefaction areas. Geotech reports indicate where groundwater is, but the sensitive land ordinance allows the city to require ongoing monitoring of groundwater levels. The city plans on implementing this. Code does not specify a time frame for a geotech report, but the building department accepts reports from the last 3-5 years as adequate.

Chairman Woffinden said that when the developer comes back with a final plat these can be addressed further. He asked the developer what modifications would be done for liquefaction problems. He pointed out that their geotech report doesn't address it at all, but this whole area is a high-liquefaction area.

Mr. Chad M., with EarthTek Engineering, the developer's geotechnical advisor, stated that clay soil is in area, it doesn't have the same liquefaction problem that sandy soil has.

Chairman Woffinden asked how they reconcile the state's calling it a high liquefaction area?

The geotech advisor said that because groundwater is high, the state probably assumes it will have a liquefaction problem.

Chairman Woffinden replied that he believes the problem is that the reports are done in a dry year and in the fall. Their results and conclusions might be completely different in the spring and in a wet year.

The geotech advisor replied that this is why they have different depth requirements.

Chairman Woffinden asked how you would mitigate problems.

The geotech advisor says piers are an option. He says he will get the Chairman data from 40-50 ft if the current 20-30 ft isn't good enough for him.

Mrs. Samantha Carson has two concerns – 1. City ordinances shouldn't allow 4-plexes in the middle of single-family homes. There are already houses built in the area that have water problems. They live down there and know these problems are there, even though the homes were built to code, and 2. Code isn't adequate in the area.

Chairman Woffindendon said they can't make a developer do more than the code requires.

Mr. Olsen stated that this type of development is allowed under the PUD code, as long as the total density meets requirements, regardless of housing type. The overall density is not higher and meets code. 3 units per acre is the total requirement in this area.

Mr. Dupaix said that PUD's are allowed in other areas of the city.

Mr. Allen Christensen referenced the discussion on water rights being a state issue. His issue is that he feels the city is negligent in allowing development that affects water rights, and he feels it opens the city up to litigation.

Mr. Dupaix said that Mr. Dudley makes a good point in reminding us that lots 201 and 202 have to sign off on this, that gives the homeowners other protections in the future. With that understanding, he is willing to approve.

Public Hearing Closed

Mr. Dupaix moved to recommend approval of the preliminary plan for the AF 10 Subdivision, with the finding listed in the staff report and subject to any findings, conditions, and modifications listed in the Engineering report.

Mr. Hunter seconded the motion. Voting was as follows:

Chairman Woffinden	**Nay**
Chris Christiansen	**Aye**
Geoff Dupaix	**Aye**
Harold Dudley	**Aye**
Rod Brocious	**Aye**
Ryan Hunter	**Aye**

The motion carried.

3. Hearing, review and action on the preliminary plan for the AF PD South Low Density Attached Housing Project located in the area of 620 South 900 West in the PR-3.0 Residential zone

Mr. Olsen stated that AF PD South Subdivision is proposed as a Low Density Attached Housing PUD (Planned Unit Development). 24 units are proposed in a townhome arrangement. Overall density for the subdivision is 3.8 du/ac. Access is provided off of 900 West. An open space area exists at the southeastern portion of the subdivision. Additional open space areas are proposed surrounding the townhome areas.

The subdivision proposes a transfer of unused, allowed, units (density) from the Dixie Farms Subdivision, located directly east and south. As the two subdivisions are under one developer, the developer wishes to place unused units from the Dixie Farms area, into the AF PD South Subdivision. This creates an overall density which is slightly higher, at 3.8 du/ac. However, if the combined number of units within Dixie Farms, AF PD South, and AF 10 are accounted for, the overall density for all three projects falls within the 3 du/ac as allowed in the zone.

Townhome structures are allowed within the PUD type (Low Density Attached Housing); with a maximum number of dwelling units per structure capped at 6. The subdivision proposes 3, 4, and 5-unit townhome structures; within the allowed unit count per structure.

As with other development options in the PR-3.0 zone, the Code allows the Planning Commission flexibility to require changes in the plan. Changes may include, but are not limited to, "adjustments in the density or number of structures, relocation of project elements, redesign of the road system, increase in the amount of open space and provisions for the disposal of surface water drainage" (17.7.504.D).

Mr. Hunter said that the Engineering Division's comments are similar to the previous item, utilities and roads will be provided and it meets code requirements.

Mr. Dupaix asked if right-of-way lines match up to what we have for 900 West?

Mr. Hunter affirmed, says that 620 South may differ a little bit from the north to the south

Mr. Berg said that this is a unique and challenging piece, bordered by 620 South and 900 West, they don't want driveways backing onto these roads. The proposal is to do low-density attached housing so driveways and access are in the rear, not facing the main streets. They have the same 25% open space requirement.

Mr. Dudley asked about the long piece of property that's not part of Dixie Farms or the other properties. Mr. Berg said that it is a tax sale property, and has no access, it is landlocked.

Mr. Olsen said that if the property were ever to be for sale, Dixie Farms would add lots on it.

Mr. Dudley says this plat locks it in without any access. He asks Mr. Olsen if he's ok with that. Mr. Olsen said that sometimes remnant parcels are landlocked into developments, there's a few around.

Mr. Brocious asked when Mr. Berg anticipates final plat and construction. Mr. Berg replied that this development is in the middle of the total project. 900 West is bringing water and irrigation to site, and the sewer is being finalized with TSSD. Sewer /storm water construction will start at the lake and come up, they want to get that started. They are ready to begin construction on plat A, and also complete 900 West. They can't really start the subdivision until utilities, road and plat A are done, he thinks maybe fall of 2020 at the earliest. Mr. Brocious said that he was asking because he's trying to see if the 200 South safety issues can be resolved before this phase of construction would begin. Mr. Berg indicated that they are optimistically a year away from occupancy.

Public Hearing Opened

Mr. Allen Christensen congratulated Chairman Woffinden for recognizing the seriousness of the liquefaction issue that hasn't been addressed. They need to be taking more measurements than in the driest season of the driest year. Earthquake safety is a concern to him as well.

Ms. Lloyd said that there is standing water at this section, there are huge ditches that go through there. The report says that groundwater is 2 1/2 ft down. It doesn't seem wise to be putting

duplexes there. All these roads go out onto 200 South. A slow train backs up traffic by 30 cars frequently, developments will bring more people and more needs. This is a case of putting the cart before the horse, developments are coming before necessary infrastructure is in place.

Chairman Woffinden indicated that there are plans for a fire station in the area.

Mr. Niel Christensen pointed out that city water comes from wells. Will this development need to have well water? He advises to not disregard the flowing water. It is not easily detected, you can put in a fence for 50 feet and be dry, then go uphill and find water in a posthole. It is not an easy problem to solve, city code won't be adequate. The Christensen family is tired of being brushed off, he asked the commission to please solve the problems up front. As he sat on the Board of Adjustment for 30 years, he solved problems that should have been handled in planning commission.

Mr. Jim Honaker says that he knows development is coming, but the roads are a critical issue for him.

Public Hearing Closed

Mr. Christiansen moved to recommend approval of the preliminary plan for the AF PD South Subdivision, with the finding listed in the staff report and subject to any findings, conditions, and modifications listed in the Engineering report.

Mr. Brocious seconded the motion. Voting was as follows:

Chairman Woffinden	**Nay**
Chris Christiansen	**Aye**
Geoff Dupaix	**Aye**
Harold Dudley	**Aye**
Rod Brocious	**Aye**
Ryan Hunter	**Aye**

The motion carried.

4. Other Business

Mr. Olsen handed out the calendar for Planning Commission meetings for 2020. He informed commissioners that all fitness center memberships have been updated.

Chairman Woffinden informed commissioners that there will be no meeting on December 18.

5. Site Plan Committee Report

Mr. Knobloch had no upcoming Planning Commission items to review. The next meeting will be held on January 8, 2020.

6. Review and action on the minutes of the November 20, 2019 Planning Commission Regular Session

Mr. Dupaix moved to approve the minutes of the November 20, 2019 Planning Commission Regular Session.

Mr. Christiansen seconded the motion. Voting was as follows:

Chairman Woffinden	**Aye**
Chris Christiansen	**Aye**
Geoff Dupaix	**Aye**
Harold Dudley	**Aye**
Rod Brocious	**Aye**
Ryan Hunter	**Aye**

The motion carried.

7. Adjournment

Mr. Dupaix moved to adjourn.
Mr. Brocious seconded the motion. All concurred.

Meeting adjourned at 8:50 pm.

Lisa Halversen, Administrative Assistant