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Papers Concerning Logan Water Works; Specifications

Dean F. Peterson
Utah State University

Alvin A. Bishop
Utah State University

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SPECIFICATIONS

GENERAL CONDITIONS

1. Location of Work - The Logan City water supply main is located in Logan Canyon due east of Logan, Utah. The existing pipe line diverts water from DeWitt Spring at a point about six miles above the mouth of Logan Canyon and conveys it to the distribution reservoir located on the bench immediately east of the golf course in the mouth of Logan Canyon. From the spring the pipe line runs in a southerly direction and crosses the Logan River about 1,000 feet from the spring. It then follows the general river alignment to the mouth of the canyon. U. S. Highway 89 follows the same canyon but generally on the opposite side of the river from the pipe line.

2. Description of the Work - The principal construction features include trenching and backfilling together with furnishing and laying a new water supply pipe from DeWitt Spring to the Davis Camp, a distance of 16,322 feet, together with spring development and other appurtenant works as follows:

(a) An addition will be made to the existing spring house to serve as a combination pipe-inlet structure and a measuring, recording and control room. Addition, improvement and enlargement of the existing structure shall also be made.

(b) From the spring to a point near the "City Dam," distance of 5,900 feet, the pipe line will consist of 36-inch diameter cast iron, centrifugal concrete, steel or asbestos cement pipe as the owner may select.

(c) From the "City Dam" to the Davis Camp, a distance of 10,422 feet, the pipe line will consist of 24-inch or 30-inch cast iron, centrifugal concrete, steel or asbestos cement pipe as the owner may select.

(d) The necessary valves and protective structures as shown on the plans shall be provided to make the pipe line a complete and operable unit.

3. Definitions and Abbreviations - Whenever the words "contractor," "owner," or "engineer" occur in these specifications they shall have the meaning here given:

Contractor shall mean the party or parties entering into the contract for the performance of the work covered by these specifications.

Owner shall mean the corporation of the City of Logan, Utah.

Engineer shall mean the person or persons appointed by Logan City to the position of engineer for the work under these specifications or his properly authorized agents, such agents acting within the scope of the particular duties assigned to them.

Where the following abbreviations are used, they shall have the following meanings:

AWWA - Means the "American Water Works Association."

AWS - Means the "American Welding Society."

ASTM - Means the "American Society for Testing Materials."

4. Disputes - All disputes concerning questions of fact arising under this contract shall be decided by the engineer, whose decision shall be final and binding upon both parties to this contract. Any doubt as to the meaning of these specifications shall be explained by the engineer.

5. Bonds - The contractor shall furnish a performance bond for the protection of the owner with a surety or sureties satisfactory to the owner in an amount not less than 50 per cent of the amount of the contract. In addition to the performance bond, the contractor shall furnish a payment bond with a surety or sureties satisfactory to the owner, for the protection of all persons supplying labor and materials under the contract, in an amount not less than 50 per cent of the amount of the contract. Bonds shall be furnished by the contractor within ten days after the award of the contract.

6. Evaluation of Bids - In comparing proposals presented for different materials, the various proposals shall be evaluated by determining the annual cost to the City. This annual cost shall be determined by computing the annual amount, using the sinking fund method, necessary to replace the system at the end of its economic life based on the price stated in the proposal, and by computing an annual interest charge on this same stated price. The sum of these two amounts, sinking fund and interest, will be assumed to be the annual cost. The interest rate for the basis of this comparison is assumed to be four per cent and the estimated life of the different materials is assumed to be as follows:

<u>Material</u>	<u>Life in Years</u>
Cast iron pipe	100
Centrifugal concrete	100
Asbestos cement	100
Steel	50

7. Rights of Way - The necessary rights of way, Forest Service Special Use Permits, etc. required for the proper installation of the pipe line and appurtenant works as well as access roads and equipment and pipe storage areas will be furnished by the owner.

8. Staking Out Work - The work to be done shall be staked out by the engineer for the contractor. Bench marks and survey stakes shall be preserved by the contractor, and in case of their destruction or removal by him or by his employees, they shall be replaced by the engineer, at the contractor's expense and his sureties shall be liable therefor.

9. Verification of Data - The material to be removed in the trenching operation is believed to consist principally of unconsolidated

alluvium with small amounts of solid rock being encountered at points noted on the plans. The notations on the plans regarding material to be removed is based on surface examinations and surface evidence only, no test pits or borings having been made. For this reason it is expected that bidders will examine the work to decide for themselves the character of the work to be done and make their bids accordingly as the owner does not guarantee the accuracy of the descriptions.

10. Climate Conditions - The engineer may order the contractor to suspend operations on any feature of the work that may be subject to damage by climatic conditions.

11. Patents and Royalties - The contractor shall pay all royalties and license fees and shall defend all suits or claims whatsoever for infringement of any patent rights which may arise on this work and shall save the owner harmless from loss on account thereof.

12. Liability - The contractor shall maintain such insurance, as required by Utah State Law, as will protect him from claims under Workman's Compensation Acts, and from any other claims for damages for personal injury, including death, which may arise from operations under this contract. Certificates of such insurance shall be filed with the owner.

13. Accident Prevention - The contractor shall at all times exercise reasonable precautions for the safety of employees on the work and shall comply with all applicable provisions of Federal, State and Municipal safety laws. ^{adjacent to a U.S. Highway and} Since the area of the work is within a popular recreational area, the contractor shall erect barricades and maintain such flares and signals which may be necessary to warn and safeguard the public. The contractor shall also indemnify and save harmless the owner against all suits, claims and actions of every name and description brought against them, and all costs and damages to which the owner may be put on account or by reason of any injury or alleged injury to the person or property of another, resulting from negligence or carelessness in the performance of the work, or in guarding the work, or from any improper materials used, or by or on account of any act or omission of the contractor or his agents or employees.

14. Protection of the Work - The contractor shall protect the work and materials including the existing pipe line from damage because of the nature of the work and carelessness on the part of his workmen or others, or from any other cause whatsoever, until the certificate of completion has been issued and final payment made. In case damage to the work should occur, it shall be repaired by the contractor at his own expense to the satisfaction of the engineer.

15. Unnoticed Defects - Any defective work or material that may be discovered by the engineer before the final acceptance of the work or before final payment has been made shall be removed and replaced by work and material which shall conform to the true intent of the specifications; failure or neglect on the part of the engineer to condemn or reject inferior work or materials shall not be construed to imply acceptance of such work or materials and any defects previously unnoticed shall be corrected by the contractor whenever, previous to the issuance of the final

certificate, they shall be called to his attention by the engineer.

16. Rejected Materials - Any materials condemned or rejected by the engineer as not conforming to these specifications shall be plainly marked, and shall, on demand by the engineer, be removed from the vicinity of the work.

17. Cleaning Up - Upon completion of the work the contractor shall remove from the vicinity of the work all plant, buildings, rubbish, unused materials, concrete forms and other like material belonging to him or used under his direction during construction. All brush and trees removed from the site in the process of construction shall be burned or disposed of in a manner satisfactory to the U. S. Forest Ranger of the Cache National Forest. Grounds and facilities in picnic and summer home areas shall be restored to a condition as near to their original state as possible and to the satisfaction of the engineer and Forest Ranger.) In the event of failure on the part of the contractor to enforce the provisions of this paragraph, the owner may order the necessary work done at the contractor's expense and his surety or sureties may be liable therefor.

18. Planting - If, in the opinion of the U. S. Forest Ranger, it appears necessary to restore vegetation in the form of range grasses to the areas denuded by the work specified in order to protect the lands from accelerated erosion and damage, such plantings shall be made by the contractor at his expense under the supervision of the U. S. Forest Service.

19. Sanitation - Sanitary facilities available in the park or picnic areas in the forest will be available for use by the contractor and his workmen. If additional facilities are required, they shall be provided by the contractor and constructed to the specification of the U. S. Forest Service. The engineer may establish sanitary rule and regulation for all forces employed under this contract and if the contractor fails to enforce these rules they may be enforced by the engineer at the expense of the contractor.

20. Quantities and Unit Price - The quantities noted in the schedule are approximations for comparison of bids, and no claim shall be made against the owner for excess or deficiency therein, actual or relative. Payment at the prices agreed upon will be in full for the completed work and will cover materials, supplies, labor, tools, machinery and all other expenditures incident to satisfactory compliance with the contract, unless otherwise specifically provided.

21. Payment - Partial payment based on estimates made and approved by the engineer will be made to the contractor each month, at the unit prices per linear foot bid therefor in the schedule, which cost shall include the cost of furnishing all materials, trenching, laying, jointing, and testing the pipe as described in these specifications.

In making such partial payments there shall be retained 15 per cent of the estimated amount until final completion and acceptance. Such work covered by partial payments made shall become the property of the owner, but this provision shall not be construed as relieving the contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made, or the restoration of any damaged work. In preparing the monthly estimates of quantities

upon which payments will be made, the engineer shall include only those materials incorporated into the project. No credit will be given for materials delivered on the site which have not been incorporated into the work and preparatory work done will not be taken into consideration.

22. Extras - The contractor shall, when ordered in writing by the engineer, perform extra work and furnish extra material, not covered by the specifications but forming an inseparable part of the work contracted for. Extra work and material will ordinarily be paid for at a lump sum or unit price agreed upon by the contractor and engineer and stated in the order. Whenever in the judgment of the engineer, it is impractical to fix the price in the order, the extra work and material shall be paid for at actual cost as determined by the engineer, plus 10 per cent for superintendence, general expense and profit. The actual necessary cost will include all expenditures for material, labor (including compensation insurance and social security taxes), and supplies furnished by the contractor, and a reasonable allowance for the use of his plant and equipment, where required, to be agreed upon in writing before the work is begun.

23. Failure to Complete Punctually - Because the damages that may result to the owner from any delay in completion of the work on or before the time agreed upon will be difficult, it not impossible to ascertain, the sum of \$50.00 per day for each day that any work shall remain incomplete beyond the time specified in the contract for its completion shall be deducted from amounts due the contractor not as a penalty, but as just and liquidated damages.

24. Abandonment - Should the contractor neglect or abandon the work or if at any time the engineer is convinced that the work is unreasonably delayed, or that the conditions of the contract are being willfully violated or executed carelessly or in bad faith, he may notify the contractor in writing, and if his notification be without effect within twenty-four hour after the delivery thereof, then and in that case the contractor shall discontinue all work under the contract, and the engineer shall have full authority and power immediately to purchase and hire materials, tools, labor and machinery for the completion of the contract at the expense of the contractor or his sureties or both; or said contract may be declared null and void, and the performance bond and retained percentage and the material built into the work and the materials delivered shall then become the property of the owner.

25. Time of Completion - Time of completion is important and the contractor shall so schedule his operations that the entire work shall be completed and the pipe line placed in service in a period of 180 calendar days. Saturdays, Sundays and holidays shall be included in the time period, but extensions of time shall be granted for time lost during periods that the contractor is prohibited from working because of climatic or other reasons. The contractor shall state in the proposal the delivery date of pipe and specify the beginning date.

SPECIFICATIONS

SPECIAL CONDITIONS

1. Requirement - It is required that there be constructed and completed in accordance with these specifications and attached drawings a pipe line from De Witt Spring to Station 163+22° opposite Davis Camp along with appurtenant works and structures necessary to make a complete and operable system. The necessary plant, equipment, labor, tools, drainage, pumping, timbering and other items necessary to complete the work herein described together with testing and chlorination of the completed system shall be provided by the contractor.

Since the pipe line will be essentially a replacement of the existing woodstave pipe from which Logan City now obtains its water supply it will be necessary to safeguard the operation of the existing system. In many places the work covered by these specifications will closely parallel the pipe line now in operation and it is imperative that the existing pipe line be kept in operation in order that the water service to Logan City will not be interrupted. For this reason, the order of executing the work shall be subject to the approval of the engineer and the contractor shall obtain approval for his proposed plan of operation from the engineer before beginning construction in order that the interest of the owner in maintaining uninterrupted water service might be carefully safeguarded.

The major part of the installation can be constructed without interruption of service. Where destruction of the existing pipe is necessary, such portion of the work shall be delayed until all other work has been completed. At that time the contractor shall make all installation requiring destruction of the existing pipe and shall complete such construction as soon as possible.

24 2. Clearing - The right of way, where, in the judgment of the engineer, clearing is necessary, shall be cleared of all grass, brush, rubbish and other objectionable material and the cleared materials shall be burned or otherwise disposed of as approved by the U. S. Forest Service.

25 3. Grubbing - Sections of the pipe line as shown in the accompanying drawings will be supported by embankments and in order to provide a stable foundation supporting the pipe the surface to receive such embankments shall be cleared of all stumps, roots, and vegetable material of every kind before the embankment is placed. Material used in such embankment shall be taken from excavated materials along the right of way. These materials shall be subject to the approval of the engineer and shall not contain any roots, stumps or vegetable material of any kind.

26 4. Blasting - Blasting will be permitted only when proper precautions are taken for the protection of persons, work, ~~(including the pipe line not in service,)~~ ^{including the pipe line not in service} and private property. Any damage done by blasting shall be repaired by the contractor at his expense. Caps or other exploders or fuses shall in no case be stored, or transported, or kept in the same place as dynamites are stored, transported or kept. The location and design of powder magazines, method of transporting explosives, and in general, the

precautions taken to prevent accidents, shall be subject to the approval of the engineer, but the contractor shall be liable for all injuries to or death of persons or damage to property caused by blasts or explosives.

② 5. Trenching - Trenching shall be made to the lines and grades as staked by the engineer and shown on the accompanying drawings. The trenches shall be of sufficient depth to give a minimum cover of three feet over all pipe. Typical pipe trench sections are shown on the drawings. The pipe trench shall in all cases be excavated to a width of not less than two feet greater than the diameter of the pipe to be installed. The contractor will not be required to excavate the trench with vertical sides, but regardless of the side slope and the width of the trench as actually excavated payment will be made on the basis of the price per foot bid for the completed work.

The bottom of the trench ^{to receive} ~~for~~ the pipe shall be finished accurately by hand to the dimensions and grades shown on the drawings. If the material in the bottom of the trench is not suitable, as determined by the engineer, for a foundation for the pipe, it shall be removed and replaced with selected materials compacted to the satisfaction of the engineer. The bottom of the trench to receive the pipe shall be placed in such a manner that the pipe shall have a bearing for its entire length. Where rock is encountered, there shall be prepared a cushion not less than six inches thick compacted to the satisfaction of the engineer. In no case shall the material forming the bed of the pipe or the backfill contain rocks in excess of two inches in diameter within six inches of the pipe.

6. Excavation for Spring House Improvement - Excavation for the intake structure and spring-house improvement shall be made to the lines and grades staked out by the engineer. Most of the earth work for this structure can be excavated economically by the use of the excavating equipment used for the pipe trench and the work shall be coordinated so as to permit the use of such equipment to the fullest extent. It is expected that considerable water will be encountered in this excavation and the contractor shall provide the necessary pumps, sheet piling and other materials or equipment required to handle the water encountered or developed.

7. Disposal of Materials - All suitable materials for required excavation, or as much thereof as may be needed, shall be used for the construction of compacted embankment or for backfill of the pipe or for other required jobs as directed by the engineer. The materials removed in excavation and not suitable or required for the above-described purpose shall be wasted on the right of way owned by Logan City at such points as may be approved by the engineer. In the vicinity of the city reservoir in the area between the bridge to the Girl's Camp and the "City Dam," no material shall be wasted into the reservoir area but shall be excavated and wasted at points shown on the plans and designated by the engineer.

③ 8. Backfill - Only selected materials free from rocks shall be used for the initial backfill. The selected materials shall be well compacted around the pipe up to at least its horizontal diameter. Backfilling shall be made in 8-inch layers, each layer being well compacted

before the next layer is placed. After the backfilling has been completed to a depth of at least 16 inches over the pipe, the remaining backfill may be made by any method selected by the contractor and special compacting will not be required. Any material left over shall be windrowed over the trench except in ~~the camp, picnic areas and private home areas~~ where the ground surface shall be left in as near its original condition as possible.

Cast Iron Pipe

9. General Description - Cast iron pipe shall conform to ~~Manufacturers~~ Specifications for the diameter and class shown on the plans.

10. Laying - Laying of cast iron pipe shall be made in accordance with AWWA Standard Specification No. 7D.1-1933. Sections 1 to 11 inclusive and Sections 14 to 18 inclusive of this Standard Specification will be applicable. Lead joints shall be used.

11. Testing - Testing of cast iron pipe shall comply with Section 15 - Hydrostatic Tests of AWWA Standard Specification 7D.1-1933.

(NOTE: Copies of the above listed Standard Specification are on file in the office of the Logan City Engineer.)

Centrifugal Concrete Pipe

12. General Description - The centrifugal concrete pipe shall conform to AWWA Standard Specification 7B-T, Section 2 and Section 5 for the heads shown on the plans.

13. Angles - An attempt has been made to plan the layout so that a minimum number of sections of bevel-end pipe will be required. The gradual curvature required on most of the line shall be accomplished at the joint. Bevel pipe shall be used in all places as scheduled on the plans.

⑤ 14. Jointing and Laying - Bell holes shall be excavated to provide ample room to properly make the joints. ~~in~~ The pipe sections shall be laid with the spigot in the direction of the flow. The sections shall be tightly fitted together and care shall be exercised to secure true alignment and grade. ~~The~~ The trench shall be backfilled to the top of the pipe before the joint is poured. The joint shall consist either of the collar type or the double rubber gasket type perfected by the American Pipe and Construction Company of Los Angeles, as shown on the plans or as required by the engineer.

The open end of the pipe shall be securely closed by canvas or otherwise at the end of each day's work. The inside joints shall be carefully finished by troweling off smooth with the inside of the pipe. These shall not be filled until the trench has been backfilled and any settlement of the line taken place, except where conditions make this impractical.

Careful inspection shall be made of every joint to insure a smooth interior surface. The interior of the pipe shall be thoroughly cleaned and any obstruction removed that may reduce its carrying capacity

⑤ 15. Testing - After laying and before any backfill is placed around the joint, the pipe shall be tested by closing valves, when available, or by placing temporary bulkheads in the pipe and filling the line slowly with water. Care shall be used to see that all air vents are open during the filling. After the line has been completely filled, it shall be allowed to stand under a slight pressure for several hours to allow the concrete to absorb what water it will and to allow the escape of air from any slight air pockets. During this period, the bulkheads, valves, manholes, and connections shall be examined for leaks. If any are found, these shall be stopped or, in the case of valves in the main line or bulkheads, provision shall be made for measuring the leakage during the test. The test shall consist of holding a pressure equal to 125 per cent of the specified working head on the line for a period of four hours. The water necessary to maintain this pressure shall be measured through a meter or by other means satisfactory to the engineer. The leakage shall be considered the amount of water entering the pipe line during the test, less the measured leakage through valves or bulkheads. This leakage shall not exceed 100 gallons per inch of diameter per mile per 24 hours. Any noticeable leaks shall be stopped and any defective pipe shall be replaced with new sections. Bulkheads, test gage, test pump, water meter, fittings and valves and all other materials necessary for making the test shall be supplied by the contractor.

16. Backfilling Trenches - After the pipe has been laid, the earth shall be tamped, using tampers approved by the engineer, in compact layers not exceeding 3 inches in thickness around the sides of the pipe up to the horizontal diameter. This backfilling and tamping is to be carried on simultaneously on each side of the pipe, care being taken to secure a uniform bed. The contractor shall furnish sufficient careful men for this work.

The balance of the backfill may be placed in the trench by any method desired by the contractor, provided care is taken that such methods do not disturb or injure the pipe line. The backfill shall then be thoroughly settled by flooding with water, when available. Where the backfill on pipe exceeds a 5-foot depth, the flooding shall be done after two feet of backfill has been placed over the pipe.

17. Guarantee - The contractor shall guarantee the pipe line against leaks and breaks due to defective material or workmanship for a period of one year from the date of completion of the contract. Damage or leaks due to acts of God, or from sabotage and/or vandalism are specifically excepted from this guarantee.

The owner of the contractor who has contracted with the owner for the trench excavation and backfill, shall be responsible under this guarantee for defective workmanship and lack of observance of the specifications in preparing the sub-grade for the pipe line. Side slippage of trenches and/or subsidence of trenches (not due to leakage) are specifically excepted from this guarantee.

When defective material and workmanship are discovered, requiring repairs to be made under this guarantee, all such repair work shall be done by the contractor at his own expense within five days after written notice of any leaks or breaks has been given him by the owner; provided, however, that if it is necessary to immediately repair such leaks or breaks, the owner shall have the right to repair the same and charge the contractor with the actual cost of all labor and material required. Should the contractor fail to repair such leaks within five days thereafter, the owner may make the necessary repairs and charge the contractor with the actual cost of all labor and material required.

The contractor shall arrange to have his faithful performance bond run for a period of one year after the date of the completion of the contract to cover his guarantee as above set forth.

Steel Pipe

18. General Description - The steel pipe required shall consist of U. S. Standard Gage No. 3 electric fusion welded pipe conforming to AWWA Standard Specification for Electric Fusion Welded Steel Water Pipe (No. 7A.3-1940 and No. 7A.4-1941-TR) of the diameters shown on the drawings

19. Steel Plates - Steel plates shall conform to the requirements of Section 4-2 AWWA Standard Specification 7A.4-1941-TR or Section 3-2 AWWA Standard Specification 7A.3-1940 or the following grades of steel, but no fabrication shall use more than one grade:

ASTM	-	Designation	A-139	Grade A
ASTM	-	Designation	A-139	Grade B
ASTM	-	Designation	A-245	Grade A

20. Fabrication - Fabrication shall be in accordance with Section 4-3 of AWWA Standard Specification No. 7A.4-1941-TR, or Section 3-3 of Specification 7A.3-1940. Straight seamed pipe or spiral seamed pipe may be used. Where the straight seam method is used, the pipe shall be made in courses of not less than 10 feet. Not more than one longitudinal seam will be permitted in each course. The longitudinal seams in adjacent courses shall be staggered on the opposite side of the vertical center line and shall be parallel to the axis of the pipe. Pipe shall be furnished in shipping lengths of not less than 40 feet and not more than 50 feet.

21. Preparation of Ends of Section - The steel pipe ends shall be bevelled for field butt welds in accordance with Section 4-3.9.3 of the AWWA Standard Specification 7A.4-1941-TR. Bends shall be made by field cutting the pipe to the proper bevel.

22. Protective Coating - The protective coating for steel pipe shall be in accordance with AWWA Standard Specification 7A.6-1940 for coal tar enamel protective covers for steel water pipe. The cover coat shall be kraft paper as specified in Section 6-2.6 of the above referred to specifications.

23. Field Procedure and Enameling - Transporting, handling and field enameling, along with the other items covered in Section 6-4 of AWWA Standard Specification 7A.6-1940, shall be strictly followed.

24. Welding - Welding of steel water pipe joints shall be in strict accordance with AWWA Standard Specification 7A.3-T and AWS Standard Specification D7.0-46T. All sections of this specification shall apply.

25. Testing - After the steel pipe line is installed, and before the joints are covered, the pipe shall be tested under pressure to check the tightness of field joints. Dished test heads, test pump, test gage and water meter shall be supplied by the contractor. The pipe shall be tested under a pressure of 150 pounds per square inch maintained for a period of four hours and no leakage will be permitted in welded joints. Any defective joints discovered by the test shall be repaired and made tight and the line retested before final backfill is made. The permissible leakage in the steel line shall not exceed $3/4$ gallon per 24 hours per linear foot of coupled joint. Before the test is made, thrust blocks shall be provided to prevent the line from pulling apart at coupled joints.

26. Expansion Joints - In order to provide for expansion and contraction of the steel pipe line during its installation, a "Dresser Coupling" Style 40 shall be installed in the line at intervals not to exceed 400 feet. The contractor may, with the approval of the engineer, provide for temperature stresses during construction by following the procedure outlined in Section A 3-1 AWWA Standard Specification 7A.3-T.

Asbestos Cement Pipe

27. General Description - Asbestos cement pipe shall be Johns-Manville Transite Pressure Pipe of the class specified on the drawings, or equivalent.

28. Laying - Laying and jointing of asbestos cement pipe shall conform to the manufacturer's specifications and couplings designed for use with this type of pipe shall be used.

29. Testing - After the asbestos cement pipe is installed and before joints are backfilled, it shall be tested in the same manner as specified for cast iron pipe. The permissible leakage shall not exceed that specified for cast iron pipe.

Structural Concrete For Manholes

30. Composition - All concrete shall be composed of cement, sand and broken rock or clean gravel, well mixed with the proper amount of water, and brought to a proper consistency by adjusting the aggregate-cement ratio. The water-cement ratio shall be 6.0, i.e. 6 U. S. gallons of water, including the water held in the aggregate, shall be used in the mix per each sack of cement (94 lb. net weight). The consistency, as measured by the slump test, shall be such as to give a slump of 4 inches. The aggregate-cement ratio shall be varied to produce the proper consistency. The water-cement ratio shall be held constant. The maximum

size of aggregate shall be one inch for reinforced concrete and one and one-half inches for bulk concrete. The proportions of the mix shall be 1: 2: 3, but if the consistency of the mix is not that specified, the aggregate-cement ratio may be varied to obtain the proper consistency.

31. Cement - The cement used shall be Portland cement and shall conform to the Standard Specification and Tests for Type 1 Portland Cement (serial designation C150-46 of the American Society for Testing Materials

32. Sand - Sand for concrete may be obtained from natural deposits may be made by crushing suitable rock. The sand particles shall be hard, dense, durable uncoated, non-organic rock fragments that will pass a 1/4-inch square or a 5/16-inch round opening. It must be free from injurious amounts of dust, lumps, soft or flaky particles, shale, alkali, organic matter, loam, or other deleterious substances. The sand, as it is used in the concrete, must be so graded that, in the opinion of the engineer, concrete of the required workability, density, and strength can be made without the use of an excess of water or cement.

33. Broken Rock or Gravel - The broken rock or gravel for concrete must be hard, dense, durable, uncoated rock fragments free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali, organic or other deleterious matter. The broken rock or gravel shall have maximum particles of the size specified for reinforced or plain concrete, and shall all be retained on a 1/4-inch square or 5/16-inch round opening sieve. It shall be so graded that, in the opinion of the engineer, concrete of the required workability, density, and strength, can be made without the use of an excess of sand, water or cement.

34. Reinforcing Steel - Steel used for concrete reinforcement shall conform to Standard Specification for billet steel bars for concrete reinforcement ASTM Designation A15-39 for deformed bars of structural grade

All steel used shall be new steel of the size and dimensions shown on the drawings. Before the reinforcement bars are placed, the surfaces of the bars and the surfaces of any metal supports for reinforcement bars shall be cleaned of objectionable rust, scale, dirt, grease, or other foreign substances, and, after being placed, the reinforcement bars shall be maintained in a clean condition until they are completely embedded in the concrete. All bars shall be accurately placed and securely fastened to position as shown on the plans and tied with wire at all intersections in such a manner that the steel will not displace during the depositing and ramming of concrete. Where bars are spliced, they shall have a lap of at least forty bar diameters. Where bars are bent as shown on the drawings, they shall be bent cold around a pin having a diameter not less than six times the minimum thickness of the bar.

~~The bid prices for concrete shall include reinforcing steel as shown in the plans~~

35. Mixing - The concrete shall be mixed until there is a uniform distribution of the materials and the mass is uniform in color and homogeneous. The mixer used shall be of such a type as to insure maintenance of the correct proportions of the ingredients. The mixing shall continue for at least one minute after all the ingredients are in the mixer. The batch shall not exceed manufacturer's rating for mixer.

12 ✓ 36. Formwork - Forms shall conform to the shape, lines and dimensions of the member as called for on the plans. They shall be of sufficient strength and tied and braced to maintain position and shape and sufficient tight to prevent leakage of mortar. All walls shall be formed on both sides except for pipe anchorages in trenches where the sides of the trench may serve as a form. Forms and shoring shall be removed in such a manner as to insure complete safety. In no instance shall forms be removed prior to 24 hours after placing the concrete. The contractor will be responsible for any damage resulting from removal of forms and, if in the opinion of the engineer, such damage impairs the value of the structure the contractor shall remove the damaged portion and replace with new concrete.

13 37. Placing - Concrete shall be placed in the work before the cement takes its initial set. All foundation surfaces upon or against which concrete is to be placed must be made free from mud and debris. When placing of concrete is to be interrupted long enough for the concrete to take its final set, the working face shall be given a shape by the use of forms that will secure a proper union with subsequent work. All concrete surfaces on or against which concrete is to be placed shall be roughened, and all laitance shall be removed by thorough scrubbing, brushing, and chipping before placing concrete or mortar upon or against them. Only methods of transportation and placing which will deliver concrete of the proper consistency into the forms without segregation of aggregates will be permitted. All concrete shall be placed in horizontal layers, and thoroughly worked and tamped with suitable tools until all voids in the mass are worked out, and until it completely fills the forms, closes snugly against all surfaces, and is in perfect and complete contact with all steel used for reinforcement. Concrete shall not be deposited under water, except as authorized by the engineer, and the method of depositing shall be subject to his approval.

14 38. Temperature of Concrete - Concrete, when deposited, shall have a temperature of not less than 40° F., nor more than 120° F. In freezing weather, suitable means shall be provided for maintaining the concrete at a temperature of at least 50° F. for not less than 72 hours after placing or until the concrete has thoroughly hardened. No admixture shall be used to prevent freezing.

15 39. Finishing - The surface of concrete placed against forms must be smooth, free from projections, and thoroughly filled with mortar. Immediately upon the removal of forms, all voids shall be neatly filled with cement mortar of the same consistency as the mortar in the concrete, provided that such voids do not render the concrete defective and unsuitable for its intended use.

16 40. Curing and Protection - The contractor shall protect all concrete from injury until final acceptance by the City. Exposed surfaces of concrete shall be protected from the direct rays of the sun for at least three days. All concrete shall be kept continuously moist for at least two weeks after being placed. The method of keeping concrete moist shall be by continuous or continual sprinkling or spraying with water, as may be necessary to keep the concrete from drying, or by other methods approved by the engineer.

Attendants Cabin

41. Attendants Cabin - Since the attendants cabin at the third da is approximately on line, it will be necessary to move it to one side or the other to allow the pipe line to be installed. The responsibility for moving the cabin and restoring it to its original location after the pipe is installed shall be the responsibility of the contractor. Any damage done to the cabin in the moving operations shall be repaired by the contractor.

Power Poles

17 42. Power Poles - It is expected that several power poles may have to be moved. The price for removing and replacing these utility poles shall be included in the unit price bid for the pipe line. Replacement shall be of a quality equal to the existing installation and to the satisfaction of the engineer.

Appurtenances

43. Measuring Device - The measuring device to be installed in the recording and control room shall consist of a "Simplex Standard Venturi Type MO Meter" size 36" x 22", or equal, equipped with flanged ends and tapped for direct reading piezometers and automatic recording instruments. The total head on the Venturi tube will be less than 5 feet measured at the axis of the tube. For use with the Venturi tube, there shall be furnished one indicating, recording and totalizing meter register, designed for floor stand mounting and arranged for low head operation.

The instrument shall indicate the instantaneous flow through the line at all times on a uniformly-graduated, direct-reading, flow scale; shall record the flow on a uniformly-graduated, direct-reading, rectangular chart, designed for weekly removal; and shall totalize the flow on a direct-reading, five-dial totalizer whose fast-reading dial is at least 4 inches in diameter to provide for accurate checking at any time.

The indicating, recording and totalizing features shall be separate and distinct.

The instrument shall be of the mercury float operated, purely mechanical type, utilizing a shaped float at least 6 inches in diameter. No equipment employing the use of any electrical steps other than chart drive clock movement shall be given consideration.

The meter register and its accompanying Venturi tube shall be made by one and the same manufacturer.

There shall be included with the meter register a year's supply of charts, pens, ink, tools, mercury, and a water manometer testing device for checking the accuracy of the instrument at any time.

The equipment offered shall be capable of measuring from a maximum of 22,500,000 g.p.d. to a minimum of 2,500,000 m.g.d. with an average error over the entire range not exceeding 2 per cent.

The Venturi metering equipment described shall be installed in complete accordance with manufacturer's recommendations and proof shall be given by the manufacturer that similar equipment of his make has been in satisfactory operation under comparable conditions for a period of at least five years.

Upon the shipment of any instrument, there shall be supplied by the manufacturer certified test notes indicating that the instrument has maintained the accuracy required by these specifications.

44. Main Control Valve - The main control valve to be installed in the recording and control room shall consist of a 36-inch iron body, bronze mounted, gate valve equipped with flanged ends and non-rising stem designed for a working pressure of 50 pounds per square inch.

45. Air Inlet Valves - Air inlet valves shall be furnished at each of the points indicated on the drawings. The valves shall consist of a 6-inch standard type VAC unit manufactured by the Simplex Valve and Meter Company, or equal.

46. Air Release Valves - Air release valves shall be furnished at each of the points indicated on the drawings. The valves shall consist of 2-inch standard Simplex Air Release Valves, or equal, designed for a working pressure of 150 pounds per square inch.

47. Gate Valves - At each of the points on the line where an air inlet valve is to be installed, there shall also be furnished a 6-inch iron body, bronze mounted, double gate valve designed for working pressure of 150 pounds per square inch. Valves shall be furnished with flanged end for connecting to air inlet valves and to the main water line. Valves shall be Pacific States Gate Valves, or equivalent.

At each of the points on the line designated to receive air release valves, a 2-inch gate valve shall be furnished having characteristics as specified above.

48. Valve Boxes - At each of the points designated to receive air inlet valves, a suitable box for housing the valve assembly shall be constructed in accordance with the attached drawings. Where air release valves are installed, valve boxes having a suitable cover shall be provided by Logan City and installed by the contractor.

49. Anchorage Concrete anchorages shall be constructed according to the schedule indicated on the drawings. Concrete for anchorages shall conform to the specifications for bulk concrete. (See paragraph 30.)

50. Service Outlets - Service outlets shall be installed in the line at points designated by the engineer. Corporation stops with lead goose necks attached, valves, valve boxes, meters and meter boxes shall be supplied by Logan City and installed by the contractor. Eight 3/4-inch, two 1-inch and one 1-1/4-inch service outlets will be required.

51. Installation of Valve in Existing Line - The owner will furnish a 24-inch flanged gate valve to be installed at a by-pass located at a point in the existing steel line several hundred feet below the end of the new pipe. The work will consist of uncovering the pipe, removing a short flanged section, installing the gate valve and providing and installing a 6-inch air inlet valve and manhole in accordance with the drawings for "Air Inlet and Manhole," sheet 7.

52. Flush Valves - The contractor shall install a 2-inch flush valve in the 35-inch pipe line in the control and measuring vault as shown on the plans. A second flush valve consisting of a 6-inch gate valve shall be installed in the line at station 102+50. Flush valves shall conform to specifications for gate valves (see paragraph 47). Valve box and cover for the 6-inch flush valve shall be furnished by Logan City and installed by the contractor.

53. Connection of Existing 24-inch Steel Line - The pipe line covered by these specifications shall be connected to the existing 24-inch steel line near station 163+22. The necessary fitting, designed for a working head of 200 feet, to make the connection shall be furnished and installed by the contractor. The connection shall not be made until it is necessary to discontinue delivery through the existing woodstave pipe.

54. Reducers - Reducers conforming to AWWA Standard Specifications for long-pattern reducers of the appropriate pressure class shall be supplied and properly installed where required. At station 59+00, a 36-inch by 30-inch or a 36-inch by 24-inch reducer will be required. At station 163+22+, a 30-inch by 24-inch reducer will be required only if the lower portion of the line consists of 30-inch pipe. The price bid for the reducer shall include the cost of anchorages as shown on the plans.

55. Removal of Existing Pipe at Dam - The existing pipe line running through the south abutment of the "City Dam," will present a definite hazard to the safety of the Dam when abandoned. For this reason, it will be necessary to remove the section of the existing woodstave pipe in the abutment of the Dam and backfill the abutment with suitable materials. Materials used for the backfill, except for the clay, may be obtained from required excavation as provided in paragraph 7. Clay will be hauled from a location west of Logan, probably from the vicinity of the Logan-Cache Airport, from a barrow pit provided by the owner.

Since this section of the existing line closely parallels the proposed new line, extreme care must be exercised to protect the new line if it is placed prior to the time the old line is removed. For this reason, work on this portion of the new line should probably be scheduled for completion during the period of discontinued service in the existing pipe. After the old pipe has been removed, the foundation to receive the backfill shall be prepared by removing all debris, roots and vegetable material of every kind and the section prepared as shown on the accompanying drawings. Clay and selected backfill shall then be placed in 6-inch layers and thoroughly compacted by rolling with a tamping roller having staggered, uniformly-spaced knobs, or by using pneumatic tampers, or other tamping machines approved by the engineer. Each layer

shall have the optimum practicable moisture content required for compaction purposes as directed by the engineer. If the moisture content of the material is greater than the optimum for compaction, the tamping shall be delayed until such time as the material has dried until it contains only optimum moisture. The degree of compaction shall be equivalent to that obtained by using a pneumatic tamper operating at an air pressure of not less than 100 pounds per square inch, having a total weight, in pounds, including the weight of the tamping foot, of not less than two and one half times the area, in square inches of the tamping foot and operating uniformly over an area of one square yard for a period of not less than three minutes, provided that the area of the tamping foot shall not be less than 40 square inches. Compacted backfill shall be continued up to the elevation of the top of the dam as shown on the plans.

The existing woodstave pipe shall be cut off and removed and the space left in the concrete cut-off wall of the dam shall be thoroughly cleaned and a keyway prepared as shown on the plans. The entire volume shall then be filled with concrete of the quality specified for reinforced concrete. Care shall be exercised to insure complete and perfect contact of new concrete with the existing concrete by ramming and tamping in order to prevent any possible leakage through the plug thus prepared.

Inlet Works

56. Recording and Control House - This unit consists of a reinforced concrete vault for housing the measuring device and the control valve. Construction of the unit can be undertaken at any time desired, however the unit, including installation of equipment, must be completed so that it may be put in service as soon as the pipe line is complete. The work includes all excavation, unwatering, formwork, concrete in place, backfill, cast iron manhole cover, rounded entrance for pipe inlet, removable concrete cover, supports for the Venturi meter and any other work or materials necessary to complete the structure as shown on the plans. Bolts for anchoring the instrument panels and flow-registering recorder shall be provided as indicated by the engineer. Rounding of the pipe entrance shall be accomplished by forming the concrete to the required radius or by forming to rectangular lines and removing the green concrete. If the latter method is elected, the inlet shall be accurately finished to shape by honing. The short section of inlet pipe shall be fabricated as shown on the plans and cast in place in the concrete.

57. Inlet Pipe - Inlet pipe as shown on the plans shall be placed in the concrete forms and the concrete poured around the pipe and rammed or vibrated in such a manner that the concrete is in complete contact with the entire surface of the pipe embedded. Inlet pipe, if consisting of steel, shall be prepared by welding two 3/8-inch round deformed reinforcing rods spaced 2 inches on centers around the section of steel pipe to be embedded. A continuous fillet, welding the rod to the pipe, shall be used. Cast iron inlet pipe shall have the bell end embedded in the concrete.

Inlet pipe shall be furnished with a flanged end for connecting to the Venturi tube or gate valve as the case may be, and the cost of this pipe shall be included in the unit cost per foot bid for the line.

58. Recording and Control Vault Drain - A drain shall be installed in the recording and control vault as shown on the plans. The drain line shall consist of 2-inch galvanized iron pipe between the vault and the river. The inlet shall be fitted with a brass screen, and a screen shall be provided at the river outlet. The pipe, at the river, shall be turned in such a manner that the drain discharge is parallel with the direction of river flow. The drain tile may be installed parallel to and in the same trench as the 36-inch pipe, but shall be laid to the grade shown on the drawings.

59. Collection Vault - A collection vault which collects the flow from drainage tiles tapping spring areas northeast of the spring house is located east of the existing spring house. This structure is approximately 21 feet long and varies from 6 to 9 feet in width and is presently covered with a wooden cover. The work includes draining of water, excavation, foundation walls and footings, backfill, construction of frame cover, painting, and any other necessary work shown on the plans. Excavation, concrete work and backfill shall be in accordance with the specifications for structures.

60. Spring Development, Division 1 and Division 2 - In order that the water available to the pipe may be increased, it is planned to extend the spring house 26 feet south. The work includes unwatering, excavation, concrete footings and foundation walls, backfill, timber superstructure, painting and sluice gates as shown on the plans. It is planned that the foundation walls will serve also as a cut-off to prevent excess leakage of water from the production area. All work shall be in accordance with the appropriate paragraph under these specifications.

61. Excavation and Backfill for Structures - Excavation for structures shall be made to the lines and grades shown on the plans, or as staked in the field by the engineer. Where concrete is to be placed on the ground, the excavation shall be finished accurately by hand to the proper lines and grades. If the material is excavated beyond the neat lines required to receive the structure, the excess excavation shall be filled with selected materials in layers not more than 6 inches and thoroughly compacted in a manner satisfactory to the engineer.

Backfill for structures, except pipe lines and anchorages, shall consist of selected material compacted in 6-inch layers in a manner satisfactory to the engineer. Backfill for anchorages shall meet the specifications for backfill for pipe lines.

It is anticipated that unwatering of structures in the spring area may be difficult. All costs for pumping, timbering and sheetpiling that may be necessary shall be included in the unit price bid for the structure.

62. Carpentry - All lumber incorporated into permanent structures shall be new and shall be clearly stamped with the inspector's stamp showing the grade and grading association under which graded. All structural lumber shall be Douglas fir conforming to the West Coast Lumberman's Association specifications for No. 1 Framing, Joists, Plank and Small Timbers or No. 1 Studding, Blocking and Small Posts or equal. Sheathing shall be No. 2 or better Douglas fir, hemlock, pine or spruce. Rustic siding shall be "B and Better" Douglas fir, spruce, hemlock, pine

or cedar Standard Pattern No. 105 West Coast Lumberman's Association. Shingles shall be No. 1 5/2 cedar exposed 4-1/2 inches to weather.

63. Painting - Surfaces shall be cleaned of all dust and dirt. Knots and resin deposits shall be treated with one coat of shellac before paint is applied. Prime coat shall consist of white lead paint with raw-linseed oil vehicle and turpentine thinner and drier. Second and third coats for the siding shall be white lead paint in raw linseed oil vehicle proportioned as approved by the engineer or a commercial mixed paint approved by the engineer. Paint shall be applied to the siding with a brush. Paint shall not be applied when the temperature is lower than 50° F. or during wet or dusty weather. Shingles shall be given two coats of shingle stain. Stain shall be of commercial grade acceptable to the engineer.

64. Slide Head Gates - Slide head gates shall be installed in the spring house to provide for diverting the spring flow to the river. Gates shall consist of Hardesty Model No. 15-00 sluice gates, size 36-inch by 36-inch, together with a suitable metal frame, and fitted with bronze seats and equipped with Hardesty Hand-wheel Lift, 30-inch, Type "D". Gates shall be installed at the locations shown on the plans.

65. Plugging Existing Pipe at Spring - After use of the existing pipe line has been discontinued, the spring intake for the abandoned line shall be bulkheaded and plugged with concrete as shown on the plans. Surfaces to receive the concrete shall be thoroughly roughened and cleaned in order that complete bond and a tight water seal might be obtained. No concrete shall be placed until preparations are thoroughly made and approval of the engineer has been obtained.

SPECIFICATIONS FOR
WATER PRESSURE SYSTEM
UTAH STATE UNIVERSITY
LOGAN, UTAH

APPROVED

Robert F. Potts
Glen R. Swanson

COLLEGE OF ENGINEERING
UTAH STATE UNIVERSITY
Dean F. Peterson, F ASCE
A. Alvin Bishop, F ASCE
Willis Tingey
ENGINEERS

CONTRACT DOCUMENTS FOR
WATER PRESSURE SYSTEM
UTAH STATE UNIVERSITY
LOGAN, UTAH

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INFORMATION FOR BIDDERS

The project consists of construction of a water pressure system consisting of approximately 5,900 feet of 14" cast iron pipe line; 1,000,000-gallon buried storage reservoir; pumping station and appurtenant works and approximately 2120' of 8" and 10" distribution main, for Utah State University, Logan, Utah.

Plans and specifications may be examined, without charge, at the Office of the Utah State Building Board, State Capitol Building, Salt Lake City, Utah; the Office of the Business Manager, Utah State University or the Associated General Contractors, 430 South Main Street, Salt Lake City, Utah.

Such plans and specifications may be obtained by intending bidders from the Office of the Utah State Building Board, State Capitol Building, Salt Lake City, Utah, upon payment of the sum of \$15.00 which sum will be refunded on return of the plans in good condition within ten days after the date set for the opening of bids.

Bids must be made on the form provided, and must be enclosed in a sealed envelope plainly marked as follows:

"Bid for Water Pressure System for Utah State University."

To Be Opened: 2 P.M., February 19, 1960

Bids may be delivered in person or may be mailed. If mailed, the sealed envelope referred to above shall be placed in a second envelope addressed to:

Director
Utah State Building Board
State Capitol Building
Salt Lake City, Utah

Bids received prior to the time set for opening shall be securely kept, unopened. The officer whose duty it is to open them will decide when the specified time has arrived and no bid received thereafter will be considered. It is the sole responsibility of the bidder to see that the bid is received by the proper time. No responsibility will attach to an

officer for the premature opening of a bid not properly addressed and identified. Unless specifically authorized, telegraphic bids will not be considered, but modifications by telegraph of bids already submitted will be considered if received prior to the hour set for opening. Bids may be withdrawn on written or telegraphic request received from the bidders prior to the time of opening.

Before a bid is considered for award, the bidder may be requested by the Engineer to submit a statement of facts in detail as to his previous experience in performing similar or comparable work, and of his business and technical organization and financial resources and plant available and to be used in performing the contemplated work.

Each bidder must submit with his proposal, certified or cashier's check or a satisfactory proposal guaranty bond made payable to the order of the Utah State Building Board in an amount not less than five (5) percent of the aggregate sum of the bid as a guarantee that the bidder will enter into the proposed contract if it is awarded to him. No bid will be considered unless it is accompanied by such check or bond. The check or bond accompanying the bid and the proceeds thereof will be forfeited to the Utah State Building Board if the bidder fails or refuses to execute the required contract within ten days after being notified that the contract is awarded to him. Any check or bond accompanying the successful bid will be returned upon the execution of the contract. Any checks or bonds accompanying the rejected bids will be returned. The bidder to whom the award is made will be required to execute a written contract with the Utah State Building Board and to furnish performance and payment bonds as specified within ten days after notice of award of said contract is delivered to him. The amount of the bond to be given to secure faithful performance of the contract for said work shall be one-hundred percent of the contract price computed as hereinafter provided. The amount of the bond to be given to secure payment for labor, materials, equipment and supplies furnished for the performance of the work to be done under the contract and for any work or labor of any kind done in connection therewith shall be equal to one-hundred percent of the contract price for the work. The contract price shall be computed from quantities given in the Bid Schedule herein and prices bid in the proposal.

The form of bonds required shall be such that the Utah State Building Board may proceed against the contractor and his sureties on the bonds immediately upon any default in the performance of the contract, or in payments for labor, material and supplies without waiting for the completion of the work and accumulation of damages.

The following documents are essential parts of the complete contract: Information for Bidders, Bid Schedule, Specifications, Plans, Contract and Bonds.

Bidders must carefully examine plans and specifications and forms of contract documents in advance of submitting a bid and shall visit the site and examine and judge for themselves the location and surroundings of the proposed work, the nature of the excavations to be made and the work to be done and shall make their own estimates of the facilities and of the difficulties attending the execution of the contract.

The bidder must state in words and figures the unit prices or specific sums or both, as the case may be, for which he proposes to supply all the materials and perform the work required by the plans and specifications. Failure to examine plans, drawings, specifications, schedules, and instructions pertaining to the work will not relieve the contractor of any work to be performed.

The bidder shall fill in, in words, the number of calendar days when he will begin work after he is notified of award of contract and the number of calendar days he will require for completion of the work. He shall state the names of subcontractors and manufacturers and type of equipment to be furnished as stated in the specifications and as indicated on the bid form.

If more than one bid is offered by any one party in the name of his or their clerk, partner, or other person, all such bids may be rejected. A party who has quoted prices on materials to one bidder is not disqualified from quoting prices to other bidders or from submitting a bid directly for the work.

All blank spaces in the bid form must be properly filled in and the phraseology must not be changed. Any unauthorized conditions, limitations or provisions attached to a bid may render it informal and may cause its rejection. Alterations by erasure or interlineation must be noted in the bid over the signature of the bidder. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened.

Bidders are invited to be present at the opening of bids, for at this time their contents will be made public for the information of bidders and others properly interested.

The contract will be awarded to the lowest responsible bidder complying with the necessary conditions provided his bid is reasonable and it is to the interest of the Utah State Building Board to accept it. The bidder to whom the award is made will be notified at the earliest possible date. The Utah State Building Board, however, reserves the right to reject any and all bids and to waive any informality in bids received.

If the bid is made by an individual, it must be signed with the full name of the bidder whose address must be given; if it is made by a firm, it must be signed with the co-partnership name by a member of the firm, and the name and full address of each member must be given; and if it is made by a corporation, it must be signed by a properly authorized officer in the corporate name and the corporate seal must be attached to such signature.

The bidder shall affix to the bid the number of his Utah Contractors License. All bidders will be held to have on file with the State Prequalification Board an approved prequalification rating.

The form of the agreement shall be the standard form used by the Utah State Building Board.

All drawings showing the work to be accomplished under the contract are listed below;

TITLE

- M 1 - Location Plan
- M 2 - Plan and Profile
- M 3 - Plan and Profile
- M 4 - Plan and Profile
- M 5 - Trench Sections and Manhole
- M 6 - Plot Plan
- St 1 - Reservoir Foundation and Piping
- St 2 - Concrete Details for Reservoir
- St 3 - Pumping Station
- St 1A Preload Reservoir (alternate)
- St 1B Preload Reservoir (alternate)

BID

Date _____

In compliance with the above invitation for bids and subject to all the conditions thereof, the undersigned offers and agrees to furnish all labor and materials and perform all work required for the construction of the water pressure system including storage reservoir, pipe lines, and appurtenances on the property and in the location as shown on the drawings, in strict accordance with the plans, specifications and bid schedule, for the consideration of unit and lump sum prices as shown in the bid schedule, provided this bid is accepted within thirty (30) calendar days from date of opening of bids.

The undersigned further agrees that the work will begin within _____
_____ calendar days after receipt of notice
(write in)
to proceed and will be completed within _____
_____ (write in)
calendar days from that date, subject to such extensions as may be authorized by paragraph 24 of the "General Conditions."

Bidder _____

Address _____

By _____
(Signature of person authorized to sign this bid)

Title _____

BID SCHEDULE

Item	Work, Quantity, and Unit Price	Amount
	LINE 1	
1	Trenching, laying and backfilling 14" cast iron pipe, Line 1 5931 feet at _____ (words) \$ _____ per foot.	
2	Install 14" x 14" x 14" tee at Sta 54 + 25; one each at _____ (words) \$ _____ each.	
3	Install 14" x 14" x 8" tee. One each at _____ _____ (words) \$ _____ each.	
4	Install 14" x 14" x 6" tee. Five each at _____ _____ (words) \$ _____ each.	
5	Install 6" gate valves. Five each at _____ _____ (words) \$ _____ each.	
6	Install 8" gate valve. One each at _____ _____ (words) \$ _____ each.	
7	Install 14" gate valves. Three each at _____ _____ (words) \$ _____ each.	

8	Install 6" cast iron pipe service, 60 feet at _____ _____ \$ _____ per foot (words)	
PUMPING STATION AND APPURTENANCES		
9	Pumping station, complete. _____ _____ (words) \$ _____ lump sum.	
10	Wash water system, complete _____ _____ (words) \$ _____ lump sum.	
RESERVOIR		
11	<u>Alternate A</u> 1,000,000 gallon reinforced concrete storage reservoir and appurtenances, complete _____ _____ (words) \$ _____ lump sum. ----- <u>Alternate B</u> 1,000,000 gallon post-tensioned (prestressed) concrete storage reservoir and appurtenances, complete _____ _____ (words) \$ _____ lump sum.	
12	Trenching, laying and backfilling 10" cast iron reservoir inlet pipe, 270 feet at _____ _____ (words) \$ _____ per foot.	

13	10" unreinforced concrete sewer pipe, in place, 225 feet at _____ (words) \$ _____ per foot.	
14	12" unreinforced concrete sewer pipe, in place, 160 feet at _____ (words) \$ _____ per foot.	
15	Drainage manhole near pumping station, one each at _____ (words) \$ _____ each.	
ALTERNATES		
16	Trenching, laying and backfilling 10" cast iron distribution pipe line 2, 10 ⁵⁶ feet, at _____ _____ (words) \$ _____ per foot.	
17	Trenching, laying and backfilling 8" cast iron distribution pipe line, 10 ⁶⁵ feet, at _____ _____ (words) \$ _____ per foot.	
18	Install fire hydrants, two each at _____ _____ \$ _____ each (words)	

SUBCONTRACTORS

1. Item 11 B Post-tensioned Concrete Reservoir (Alternate)
(Bidders fill in if bidding on Alternate 11 B)

The name and address of subcontractor responsible for design and construction of the post-tensioned concrete tank is

2. Other subcontractors

(Bidders list name and address of any other subcontractors proposed)

Item of Work

Name and Address of Subcontractor

PUMPING STATION EQUIPMENT

1. Primary Pumps

a. Manufacturers Name and Address:

b. Pump is _____; Model Number or
(vertical turbine or horizontal centrifugal)
type _____

c. Motor Manufacturer is _____
Motor Number or Type _____

d. Starter and Overload Switch shall be _____

(Manufacturer and description)

2. Water Level Control Apparatus

a. _____
(Manufacturer and Type)

b. _____
(description)

3. Wash Water Pump

a. Pump _____
(Manufacturer and type)

b. Motor _____
(Manufacturer and type)

c. Starter and Switch _____
(Manufacturer and Type)

SPECIFICATIONS

GENERAL CONDITIONS

1. Location of Work - The reservoir site is located approximately one and one-half miles east of the main campus of Utah State University, Logan, Utah, on a site located in the SE 1/4 Sec. 25, Twp. 11, N., R.I.E., Salt Lake Base and Meridian, approximately 200 feet east of the present Logan City Reservoir. The pumping plant will be located adjacent to the existing Logan City Reservoir and the route of the supply main will be west-southwesterly through the Logan Golf Course to a point in the right-of-way for U. S. Highway 89 approximately 500 feet east of SW corner Sec. 25 and thence westerly along Seventh North Street to connect to the campus distribution system approximately 925 feet west of Twelfth East Street. The distribution lines will be located on the campus of Utah State University.

2. Description of the Work - The work consists of excavation for and construction of, a reinforced concrete or post-tensioned concrete water tank, together with appurtenances; construction of a pumping plant having a capacity of 2,000 g.p.m. against a static head of approximately 100 feet; approximately 270 feet of ten inch cast iron reservoir supply line; approximately 5,930 feet of fourteen inch cast iron pipe supply main; approximately 225 feet of ten inch and 160 feet of twelve inch concrete pipe drain, together with all necessary appurtenances and approximately 2,120 feet of eight inch and ten inch cast iron distribution lines as an alternate. It is intended that water shall be pumped from the present Logan City supply line in Logan Canyon into the reservoir thus delivering water from the reservoir under an increased pressure of approximately 70 p.s.i. to the Utah State University campus. It is intended that the project shall result in a complete, operable unit and the contractor shall do all things necessary within the scope of the plans and specifications to provide such an installation.

3. Definitions and Abbreviations - Whenever the words "contractor," "owner," "board," "University," "subcontractor" or "engineer" occur in these specifications, they shall have the meaning here given:

Contractor shall mean the party or parties entering into the contract for the performance of the work covered by these specifications.

Owner shall mean the Utah State Building Board.

Board shall mean the Utah State Building Board.

University shall mean the Utah State University.

Subcontractor shall mean those having a direct contract with the contractor for completing a portion of the work covered by these plans and specifications,

including material worked to a special design of such plans and specifications but does not include one who merely furnished material not so worked.

Engineer and/or inspector shall mean the person or persons appointed by the Utah State Building Board to the positions of engineer or inspector for the work under these specifications or his properly authorized agents, such agents acting within the scope of the particular duties assigned to them.

Where the following abbreviations are used, they shall have the following meanings:

AWWA - Means the "American Water Works Association."

ASTM - Means the "American Society for Testing Materials."

ASA - Means the "American Standards Association."

Contract document means Information for Bidders, Bid Schedule, Specifications, Plans, Contract and Bonds, all of which are essential parts of the complete agreement.

4. Disputes - All disputes concerning questions of fact arising under this contract shall be decided by the engineer, whose decision shall be final and binding upon both parties to this contract. Any doubt as to the meaning of these specifications shall be explained by the engineer.

5. Bonds - The successful bidder, simultaneously with the execution of the agreement, will be required to furnish a bond or bonds guaranteeing the faithful performance of the contract in an amount equal to one hundred (100) percent of the contract price, and a bond or bonds guaranteeing the payment of all obligations arising thereunder in an amount equal to one hundred (100) percent of the contract price; said bonds shall be secured from a surety company satisfactory to the Board.

6. Right-of-Way - The University will provide or arrange for the rights-of-way or the site for permanent works or installations and rights-of-way for access thereto. The contractor will be permitted to use such land for construction purposes, but any additional right-of-way or land desired by the contractor for construction purposes shall be provided by the contractor without expense to the owner.

7. Line and Grade - The engineer will establish lines and grades required for proper execution of work.

The contractor shall, without additional costs to the owner, provide such assistance and such forms, spikes, nails, etc. as may be required by the engineer in establishing lines and grades.

8. Bench Marks and Survey Stakes - Bench marks and survey stakes shall be established by the engineer and shall be preserved by the contractor, and in case of their destruction or removal by him or by his employees they shall be replaced by the engineer at the contractor's expense and his sureties shall be liable therefore.

9. Verification of Data - Based on surface observations and two test pits the existing natural earth material to be excavated for the reservoir is believed to be unconsolidated earth, including topsoil and other material ranging from clay to coarse gravel and cobbles, with the likelihood of some ledge rock in the vicinity of the reservoir. A test pit dug to a depth of eighteen feet at the reservoir site did not encounter ledge rock, however.

Based on general geological information and upon experiences in excavation in the area the earth material in which the main pipe lines and other appurtenances, other than the reservoir, will be installed, is believed to be unconsolidated alluvium, generally ranging from topsoil and fine sand to coarse gravel and cobbles.

The owner does not guarantee the accuracy of any descriptions or notations relative to existing earth or rock material. For these reasons it is expected that bidders will examine the site and decide for themselves, the character of the work to be done and make their bids accordingly.

The location of existing water lines is shown on the drawings, but exact distances of such existing works are not guaranteed.

10. Climatic Conditions - The engineer may order the contractor to suspend operations on any feature of the work that may be subject to damage by climatic conditions.

11. Patents and Royalties - The contractor shall pay all royalties and license fees and shall defend all suits or claims whatsoever for infringement on any patent rights which may arise on this work and shall save the owner harmless from loss on account thereof.

12. Liability - The contractor shall maintain such insurance, as required by Utah State Law, as will protect him from claims under Workman's Compensation Acts, and from any other claims for damage for personal injury, including death, which may arise from operations under this contract. Certificates of such insurance shall be filed with the owner.

13. Accident Prevention - The contractor shall at all times exercise reasonable precautions for the safety of employees on the work and shall comply with all applicable provisions of Federal, State and Municipal safety laws. The excavation shall be properly timbered whenever timbering is

necessary to prevent the sides from caving in, or to protect the work, or the installation. The contractor shall also indemnify and save harmless the owner against all suits, claims, and actions of every name and description brought against him, and all costs and damages to which the owner may be put on account or by reason of any injury or alleged injury to the person or property of another, resulting from negligence or carelessness in the performance of the work, or in guarding the work, or from any improper materials used, or by or on account of any act or omission of the contractor or his agents or employees. The costs of all work required by this paragraph shall be included in the unit price bid in the schedule for other items of the construction work.

14. Protection of the Work - The contractor shall protect the work and materials from damage resulting from the nature of the work or carelessness on the part of his workmen or others, or from any other cause whatsoever, until the certificate of completion has been issued and final payment made. In case damage to the work should occur, it shall be repaired by the contractor at his own expense to the satisfaction of the engineer.

15. Inspection - All materials and workmanship shall be subject to inspection, examination, and test by the engineer at any and all times during manufacture and/or construction and at any and all places where such manufacture and/or construction are carried on. The engineer shall have the right to reject defective material and workmanship or require its correction. Rejected workmanship shall be satisfactorily corrected and rejected material shall be satisfactorily replaced with proper material without charge therefore, and the contractor shall promptly segregate and remove the rejected material from the premises.

16. Unnoticed Defects - Any defective work or material that may be discovered by the engineer before the final acceptance of the work or before final payment has been made shall be removed and replaced by work and material which shall conform to the true intent of the specifications failure or neglect on the part of the engineer to condemn or reject inferior work or materials shall not be construed to imply acceptance of such work or materials and any defects previously unnoticed shall be corrected by the contractor whenever, previous to the issuance of the final certificate, they shall be called to his attention by the engineer.

17. Cleaning Up - Upon completion of the work the contractor shall remove from the vicinity of the work all plant, buildings, rubbish, unused materials, concrete forms and other like material belonging to him or used under his direction during construction. In the event of failure on the part of the contractor to enforce the provisions of this paragraph, the owner may order the necessary work done at the contractor's expense and his surety or sureties may be liable therefore.

18. Sanitation - The engineer may establish sanitary and police rules and regulations for all forces employed under this contract, and if the contractor fails to enforce these rules, the engineer may enforce them at the expense of the contractor.

19. Quantities and Unit Price - The quantities noted in the schedule are approximations for comparison of bids, and no claim shall be made against the

owner for excess or deficiency therein, actual or relative. Payment at the prices agreed upon will be in full for the completed work and will cover materials, supplies, labor, tools, machinery and all other expenditures incident to satisfactory compliance with the contract, unless otherwise specifically provided.

20. Payment - Partial payment based on estimates made and approved by the engineer will be made to the contractor each month. The contractor shall submit an application for each payment based on the value of the work in place relative to the total bid price and shall submit, if required by the engineer, receipts or vouchers supporting his payments for materials, labor and other costs of the work. This application shall be submitted at least ten days before payment is due. The engineer will inspect the progress of the work and shall, if necessary, amend the contractor's estimate of the value of the work to agree with the engineer's findings. The decision of the engineer shall be binding. Upon certification of the engineer, the owner shall make such payments to the contractor as may be due.

In making such partial payments there shall be retained ten percent of the estimated amount until final completion and acceptance. Such work covered by partial payments made shall become the property of the owner, but this provision shall not be construed as relieving the contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made, or the restoration of any damaged work. In preparing the monthly estimates of quantities upon which payments will be made, the engineer shall include only those materials incorporated into the project. No credit will be given for materials delivered on the site which have not been incorporated into the work and preparatory work done will not be taken into consideration.

21. Extras - The contractor shall, when ordered in writing by the engineer and the owner, perform extra work and furnish extra material, not covered by the specifications but forming an inseparable part of the work contracted for. Extra work and material will ordinarily be paid for at a lump sum or unit price agreed upon by the contractor and engineer and stated in the order. Whenever, in the judgment of the engineer, it is impractical to fix the price in the order, the extra work and material shall be paid for at actual cost as determined by the engineer, plus ten and five percent for superintendence, general expense and profit. The actual necessary cost will include all expenditures for material, labor (including compensation insurance and social security taxes), and supplies furnished by the contractor, and a reasonable allowance for the use of his plant and equipment, where required; to be agreed upon in writing before the work is begun.

22. Failure to Complete Punctually - Because the damages that may result to the owner from any delay in completion of the work on or before the time agreed upon will be difficult, if not impossible to ascertain, the sum of \$75.00 per day for each day that any work shall remain incomplete beyond the time specified in the contract for its completion shall be deducted from amounts due the contractor not as a penalty, but as just and liquidated damages.

23. Abandonment - Should the contractor neglect or abandon the work or if at any time the engineer and owner are convinced that the work is unreasonably delayed, or that the conditions of the contract are being willfully violated or executed carelessly or in bad faith they may notify the contractor in writing, and if such notification be without effect within twenty-four hours after the delivery thereof, then and in that case the contractor shall discontinue all work under the contract, and the engineer and owner shall have full authority and power immediately to purchase and hire materials, tools, labor and machinery for the completion of the contract at the expense of the contractor or his sureties, or both; and said contract may be declared null and void, and the performance bond and retained percentage and the material built into the work and the materials delivered shall then become the property of the owner.

24. Time of Completion - Time of completion is important and the contractor shall so schedule his operations that the entire work shall be completed and the reservoir placed in service within the time specified in the contract. Saturdays, Sundays, and holidays shall be included in the time period, but extensions of time shall be granted for time lost during periods that the contractor is prohibited from working because of climatic conditions or other reasons as ordered or approved by the engineer.

25. Materials and Workmanship - All materials and articles incorporated in the work covered by this contract are to be new and of the most suitable grade of their respective kinds for the purpose and all workmanship shall be first class. Where equipment, materials, or articles are referred to as "equal to" any particular standard, the engineer shall decide the question of equality. When required by the specifications or when called for by the engineer, the contractor shall furnish the engineer for approval full information concerning the materials or articles which he contemplates incorporating in the work. Samples of materials shall be submitted for approval when so directed. Materials or articles installed or used without such approval shall be at the risk of subsequent rejection.

The contractor shall replace or correct, without cost to the owner, any defects which occur within a period of one year due to faulty materials or poor workmanship.

26. Responsibilities for the Work, etc. - The contractor shall be responsible for all damages to all persons or property that occur as a result of his fault or negligence in connection with the prosecution of the work. He shall, also, be responsible for all materials delivered and work performed until completion and final acceptance.

27. Superintendence by the Contractor - The contractor shall give his personal superintendence to the work or have a competent foreman or superintendent with authority to act for him and satisfactory to the engineer on the work at all times during progress.

28. Subcontracts - The contractor shall notify the owner, in writing of the names and addresses of any subcontractors proposed as soon as practical after the execution of the agreement and shall not employ any that the engineer and owner may, within fourteen days after such notification, object to as incompetent or unfit. Insofar as possible, bidders should submit names of proposed subcontractors with their bids on the form included herewith.

If the bidder proposes the "post-tensioned" alternate for the tank, he must submit the name of the proposed subcontractor responsible for the post-tensioning operation with his proposal; such subcontractor must be satisfactory to the engineer and the owner. The contractor may informally discuss the qualifications of a proposed subcontractor with the engineer prior to submitting his proposal but such informal discussion shall in no way constitute a commitment to approve any subcontractor.

The contractor shall be fully responsible to the owner for the work of the subcontractor under these plans and specifications and for the compliance by the subcontractor with all the terms and conditions of the agreement. The subcontractor shall be bound to the contractor by the terms of the Plans, Specifications and Agreement and assume toward him all of the responsibilities that he, by these documents, assumes to the owner. The contractor shall make all payments when due the subcontractor and shall assume toward the subcontractor all the obligations and responsibilities that the owner assumes toward him under this contract document.

SPECIFICATIONS

SPECIAL CONDITIONS

1. Requirement - It is required that there be constructed and completed in accordance with these specifications and attached drawings, a culinary water pressure system for Utah State University. This system includes a supply line from the present main supply of Logan City, with pumping station to a 1,000,000 gallon concrete reservoir and distribution main to the campus of the University, complete with all appurtenances connected in satisfactory operable condition with the University campus distribution system. All labor, materials, and equipment necessary to complete the work shall be furnished by the contractor and the lump sum or unit price bid in the bid schedule shall be for the completed work including excavation, backfilling, concrete work, mechanical work, finish grading and clean up necessary to provide a complete installation as shown on the plans.
2. Clearing - Very little clearing will be necessary; however, where brush exists on the right-of-way it shall be cut and burned.
3. Maintenance of Right-of-way - Since much of the pipe line will be located in the Logan City, or University campus, streets, or in the golf course or campus, every effort shall be made to keep the right-of-way in an orderly condition and to reduce interference with the normal use of the right-of-way to a minimum. After the construction is completed, the contractor will restore the right-of-way to the original condition, as nearly as possible, especially in the University campus, in the streets, and on the golf course.
4. Information on Character of Excavation - Bidders shall visit the site and judge for themselves the character of the natural material to be excavated. Notes and drawings referring to the character of natural material are indicative only and are not guaranteed as to accuracy and the owner assumes no responsibility for any inferences or interpretations which bidders may draw from such notes and drawings. Two test pits were dug at the location and to the depths shown on the plans. Bidders are invited to inspect these pits.
5. Excavation - The contractor shall make such excavation as may be necessary to construct the work to the lines and grades required. Where floors or other structures are to be placed on natural earth, the contractor shall not over-excavate. In the event over-excavation occurs, the contractor shall replace such over-excavation with selected earth material designated by the engineer and compacted as directed by the engineer/inspector or with concrete or compacted gravel if the engineer/inspector so designates.

Prior to backfill all trash, etc., shall be removed from the site of the excavation. No trash shall be incorporated with the backfill materials.

Backfill around structures will be carefully placed in eight inch layers and thoroughly compacted by mechanical tamping or rolling. Such backfill material shall be placed as nearly as practical at optimum moisture content. The contractor shall not operate heavy backfilling equipment in such proximity to structures that there can be any possibility of damage.

Excess materials in the reservoir area may be disposed of locally as designated on the plans or by the engineer/inspector. In the streets, on the University campus, or in the golf course, the contractor shall haul excess material, if any, from the site and shall be responsible for its disposal.

The contractor shall exercise special care so that the reservoir tank is not damaged by the operation of construction machinery or equipment. The top of the tank is not designed to support machinery or to resist impact and shall not be loaded by machinery or by dropping objects.

6. Trenching and Backfilling for Pipe Lines - The contractor shall perform all trench excavation of whatever description and of whatever substance encountered to the lines and grades staked by the engineer and shown on the drawings. The trenches shall be of sufficient depth to provide a minimum cover of three feet over all pipe. The pipe trench shall not be less than twelve inches wider than the outside diameter of the pipe to be installed. Sides of the trench shall be as nearly vertical as possible, but regardless of side slope and width of the trench as actually excavated and of the substance encountered, payment will be made on the basis of the price bid per foot of completed work.

In earth, mechanical excavation shall be held to at least two inches above final invert grade and the remainder of the trench shaped by manual excavation in such a manner that the lower ninety-degree arc of the pipe barrel shall be in firm contact with the undisturbed earth. Bell holes shall be excavated to insure the pipe resting for its entire length on the bottom of the trench. Where natural earth is not suitable, because of boulders or cobbles, or for other reasons, it shall be removed and replaced with compacted earth or sand as directed by the engineer/inspector. Such replacement material shall be prepared and shaped as specified above to receive the pipe. In rock, the trench shall be excavated to a depth of not less than six inches below the pipe invert, backfilled and the foundation prepared as specified above.

After pipes and joints have been inspected and tested, selected backfill, free from rocks, shall be carefully placed and tamped under the haunches of the pipe at least to the elevation of the horizontal diameter to insure uniform bearing surface and prevent lateral movement. In no case shall backfill material, or the material forming the bed of the pipe, contain rocks in excess of two inches in diameter within six inches of the pipe. Backfilling shall be made in eight inch layers, each layer being thoroughly compacted before the next layer is placed. Except in the streets, where the full compaction is required, after backfilling has been completed to a depth of sixteen inches over the pipe, special compaction will not be required. Excess material shall be disposed of as indicated in Article 5.

7. Access Road - Location and construction of the access road for construction of the reservoir will be the responsibility of the contractor; however, the location shall be as approved by the engineer. The excavation for the access road shall not include side-hill cuts immediately down slope from the reservoir within 100 feet of the reservoir since this may reduce the competence of the foundation for the reservoir. Cost of the access road shall be included in the lump sum price bid for construction of the reservoir and appurtenant works. Access road shall be left for the use of the owner after construction is finished.

CAST IRON PIPE LINES

8. Cast Iron Pipe Line - The unit price bid per foot (Items 1, 2, 16, 17) shall be the entire cost for excavating, furnishing and installing pipe and all such fittings, air inlet valve, drain line and valve, and connections as are not otherwise listed separately in the bid schedule; testing, backfilling, sterilization, final grading, clean up and replacement of asphalt paving where damaged or removed, together with all necessary connections and all other items of work necessary to provide an operable unit ready for service. For the distribution lines (Lines 2, 3 and 4) on the campus (Items 16 and 17) such unit price per foot shall include in addition to the foregoing all valves and fittings necessary for connections to existing lines, connecting all existing services for replacement lines as shown on the plans, and replacing lawn where removed by the construction. Such unit price per foot shall constitute payment for the entire cost of the pipe lines.

9. Cast Iron Pipe and Fittings - Cast iron pipe shall be Class 150, tar coated, centrifugally cast to conform to specification ASA A21.6. Unless otherwise indicated on the plans, joints shall be of a type employing a single gasket to effect the joint seal, Pacific States "Tyton" or equal,

or mechanical joints conforming to ASA 21.11. Fittings shall be AWWA C100-08 Class C and/or ASA B16.1, Class 125. Gaskets and joint material and installation thereof of "Tyton" shall conform fully to manufacturer's specifications.

10. Laying and Testing - Laying and testing of cast iron pipe shall be in accordance with AWWA 7D 1-1938 and AWWA C600-49T. Prior to backfilling, the contractor shall test all pipe lines at 140 p. s. i. pressure to the satisfaction of the engineer. Contractor shall supply dished test heads, test pump, test gauge and displacement meter and the test pressure shall be maintained for not less than thirty minutes. Make up water shall be carefully measured and leakage shall not exceed seventy gallons per twenty-four hours per inch of diameter per mile for twelve foot lengths or in inverse proportion thereof for other laying lengths. Contractor shall be responsible for providing any necessary anchorages required to prevent movement of the pipe line during testing prior to backfill. After pipe has held water for twelve hours, Building Board Project inspector will test all joints before backfilling.

11. Gate Valves - Unless otherwise specified or indicated on the plans, gate valves twelve inches in diameter and under shall be "O" ring type, left hand open, non-rising stem with standard two inch operating nut, iron body, bronze mounted, parallel seat, double gate type, 175 p. s. i. working water pressure Pacific States List 4 or equal. Valves fourteen inch and larger, unless otherwise indicated, will be left hand open, non-rising stem, with standard two inch operating nut, iron body, bronze mounted, double disc, parallel seat, 175 p. s. i. working pressure, AWWA specification C500 for waterworks use, Ludlow or equal.

12. Connection to Existing Lines - The connection to the University system will be made by cutting the existing twelve inch line serving the campus and installing a 12"x12"x14" tee. This connection will be made under the sidewalk immediately north of the existing metering and control station. Contractor shall install the tee and a fourteen inch forty-five degree ell, ready to receive the fourteen inch main. He may use Dresser couplings to complete the installation. He shall replace the sidewalk equal to the existing condition. For the campus distribution lines, the contractor shall furnish and install all fittings necessary to make the connections and remake service connections as indicated on the plans. The unit price per foot bid for cast iron pipe in place shall include the entire cost of such fittings and couplings installed, excavation and backfilling, and sidewalk replacement as required.

13. Tees - The unit cost bid price for tees shown on the Bid Schedule (Items 2, 3 and 4) shall include the additional cost, over and above the cost bid per foot, of installing 14"x14"x14", 14"x14"x8", or 14"x14"x6" service tees at the points shown in the fourteen inch supply main, Line 1. The University or Logan City will be responsible for making connections from these tees to existing facilities. Cost of tees required in Lines 2, 3 and 4 shall be included in the bid price per foot of pipe, Items 16 and 17.

14. 6" and 8" Gate Valves - Where indicated on the plans for Line 1 the contractor shall install stubs and gate valves in connection with service tees, (Items 5 and 6). The valves shall comply with Article 11 of the Special Conditions and shall be installed in a cast iron valve box. Valve box shall be slip type, suitable for the size valve indicated, with "Water" cover, Pacific States Fig. 237, or equal. Unit price indicated in the Bid Schedule shall constitute payment in full for the entire cost of installing the stub, valve and valve box complete. Prices for valves at the pumping station at the drain line or for Lines 2, 3 and 4 are not included under this item, but shall be included in the lump sum or unit price per foot bid for these items.

15. 14" Gate Valves - Three 14" gate valves are required in the supply main and services. These valves shall comply with Article 11 of Special Conditions and shall be installed in cast iron valve boxes. Atlas Foundry and Machine Company with 18" Top Pattern 6150 or equal. The unit price indicated in the Bid Schedule (Item 7), shall constitute the full payment for the cost over and above the cost per foot bid for the 14" line, of furnishing and installing such valve stub if required and valve box complete. Valves at the pumping station are not included under this item.

16. Drain Line and Valve - This work shall include tapping a 4" cast iron line into the bottom of the main at the indicated station, installing a 4" valve in a cast iron valve box and installing approximately 60 feet of 4" cast iron pipe leading to the drainage ditch along the north side of U. S. Highway 97. Riprapping to prevent erosion will be installed at the pipe outlet. Valve and valve box shall be in accordance with Articles 11 and 14, Special Conditions. The cost of the drain line and valve shall be included in the price bid per foot for 14" cast iron pipe, Line 1, (Item 1).

17. Air Release Valve - An air release and inlet valve is required at Station 44 + 50. This shall be capable of (1) releasing air accumulations, (2) admitting air to break vacuum, and (3) venting air when pipe is filled. This valve shall be Simplex Type AV combination air release and air

inlet valve or equal. Cost of this item shall include the entire cost of furnishing and installing the air release valve complete and shall be included in the price bid per foot for 14" cast iron pipe, Line 1, (Item 1).

18. Repair and Replacement of Street Surfaces, Sidewalks, etc. - All paving, sidewalks, curbs, gutters and structures removed or damaged by the work shall be repaired or replaced. The materials used for the replacement and the workmanship shall be such that the completed surface or structure will be restored to its original usefulness and condition. The cost of restoring surfaces and structure shall be included in the unit price per foot bid for the completed water line, or lump sum price for other item.

19. Guarantee - The contractor shall guarantee the pipe line against leaks and breaks due to defective material or workmanship for a period of one year from the date of completion of the contract. Damage or leaks due to Acts of God, or from sabotage and/or vandalism are specifically excepted from this guarantee.

The contractor shall be responsible under this guarantee for defective workmanship and lack of observance of the specifications in preparing the subgrade for the pipe line. Side slippage of trenches and/or subsidence of trenches (not due to leakage) are specifically excepted from this guarantee.

PUMPING STATION

20. Pumping Station - The lump sum amount for this item (Item 9), shall include construction of the reinforced concrete pumphouse, including excavation and backfill; service lighting, ventilation, heating and floor drainage connected to the drain manhole as indicated in the plans. It shall include the primary pumps including all necessary electrical switching and conduits within the building and auxiliary piping valves, water meter, and the water level controller. It shall include making the connection to the existing Logan City main line and all necessary piping to deliver the water through the pumps to the reservoir supply line including the reservoir supply line to a point six feet outside of the pumphouse. It shall not include the wash water system which is to be bid as a separate item. The transformers necessary to supply the 220/440 volt current to the pumps will be mounted outside and will be furnished by others. The pumping station is to be delivered to the owner as a complete and operable unit. Bidders shall submit complete sketches and equipment specifications for the pumping plant with their bids.

21. Primary Pumps - Two identical primary pumps are required. They shall be of standard manufacture, electric-motor driven, horizontal split-case centrifugal type Fairbanks Morse No. 5812 or equal; or vertical turbine type Peerless close-coupled pumps, or equal. They shall operate under manufacturer's warranty under conditions described below. The minimum elevation head in the Logan City line will be 4860 mean sea level datum. The maximum water level in the new reservoir will be 4960, or a maximum static head of 100 feet. The pumps shall each deliver 1,000 g.p.m. against such total dynamic head as may be required. They shall be directly connected to the suction line from the Logan City main and shall be fully capable of providing sufficient suction head, at the elevation of the pump setting, to move the required discharge through the suction line under full operating conditions. The characteristics of the pumps shall be such that overload damage to the equipment will not occur under reduced discharge pressure and the vendor shall warrant that the maximum pump power requirement shall not exceed the drive motor horsepower under any variation of discharge head. Bidders shall furnish operating characteristic curves to the engineer together with manufacturer's warranty and such performance and warranty shall be satisfactory to the engineer. Pump and motor shall be warranted against faulty manufacture or installation for a period of one year.

22. Motor and Switching - Motors for pumps shall be 440-volt, three-phase AC of standard manufacture having the capacity and operating characteristics specified by the pump manufacturer. Starter shall be magnetic combination with fused disconnect switch and three-leg overcurrent protection, as specified by the pump and motor manufacturer. Bidders shall specify with their proposals, name of manufacturer, capacity and operating characteristics and catalog number of the equipment proposed to be furnished.

23. Pipes and Fittings - Pipes and fittings for the pumping station shall be of cast iron and shall comply with specification ASA A21.6 for class 150 pipe and with AWWA C100-08, Class C and A21.11 for fittings and mechanical joints and with ASA B16.1 Class 125 for flanged fittings. Constructor may use flange joints; mechanical joints or Dresser couplings as indicated on the plans to effect connections in the pumping plant. He shall furnish all valves, check valves and Dresser couplings indicated on the plans or the functional equivalent thereof. The pumping plant design may be modified if desired to suit the pumping equipment furnished and with the advance approval of the engineer, provided fittings and piping are of equal quality to those shown on the plans and that the entire function of the installation, as approved by the engineer, is maintained.

Pipes and fittings shall be painted with two coats of asphalt base aluminum paint.

24. Connection to City Main - The contractor must make arrangements with the City of Logan regarding the connection to be made to the existing 20" Logan City pipe line. It is highly desirable that this connection be made without shutting down the 20" supply line. The contractor shall furnish a 12" flange plain end special welding nipple shaped to fit to be welded onto the 20" pipe, together with a suitable tapping valve Mueller H667 or equal.

25. Water Meter - Water meter shall be Sparling Type CF-115, 10" size, with high velocity propeller, suitable for measurements up to 2200 g.p.m.

26. Water Level Controller - Water level controller shall be two-pump Healy-Ruff Roto-Trol Type A with alternator or equal. One pump shall operate at minus 1' -6" from full reservoir; both at minus 2' -6". Both pumps shall stop at minus 3 inches. Automatic alternator shall reverse sequence of operation after each cycle.

Bidder may propose as an alternate, water level controller operating from remote reservoir float which shall include conductors, freeze protection, weather cover and all necessary components. Components shall be of standard manufacture and bidder shall submit, with his proposal, description and specifications for equipment proposed.

Whether pressure or float operated, controller shall actuate pump within an error of not to exceed 2 inches in the prescribed reservoir water level, regardless of differences from static head due to friction under either one- or two-pump operation.

Controller shall be fully installed, complete, in operable condition and contractor shall warrant against failure or faulty operation due to faulty manufacture or installation for a period of one year.

27. Pumphouse - Pumphouse shall be of reinforced concrete. Two designs are shown on the plans for two types of pumping equipment. These may be modified if necessary, to accommodate the particular equipment to be furnished. Such modification shall be of equal construction quality to that shown on the plans and plans for such modification shall be approved in advance by the engineer.

28. Building Construction - Reinforced concrete and steel reinforcing shall comply with Article 42 to 54, Special Conditions. Structural steel shall conform to "Steel for Buildings" ASTM Designation A7-46. After removal of forms contractor shall remove projecting fins, etc., from concrete surfaces and patch any irregularities on exposed surfaces and shall finish such exterior surfaces to a smooth condition. The floor and roof shall have steel trowel finish.

All electrical circuits shall be placed in conduit and shall be installed in accordance with Logan City code. Excavation and backfilling shall be in accordance with Logan City code. Excavation and backfilling shall be in accordance with Article 5. Floor drains shall be 6 inches diameter cast iron carried to drainage manhole with 4" cast iron soil pipe or concrete sewer pipe.

Glass block shall be Libbey-Owens-Ford #80, 8" size installed according to manufacturers directions.

Screens for glass block windows shall be constructed of 1/2 inch No. 19 gauge hardware cloth mounted on 3/4 x 3/4 welded angle frame.

Heater shall be 3,000 watt wall mount, Model CHE, 230 volt, 10,236 B.T.U. Output, Chromolox fan heater combination thermostat controlled within 60 to 80 degrees Fahrenheit with safety cover.

Metal double doors shall be wooster commercial line #PR. FP2, 1 3/4" thickness with insert louver 3' wide. Frames shall fit 6'0" by 7' 0" opening. Locks shall be commercial heavy duty schlage, 6 pin, F keyway and aluminum finish. One door shall be equipped with top and bottom heavy duty flush bolts. Doors shall have three hinges (1 1/2 pair per door). Doors will be provided with inverted channel in top for weather sealing. Doors and frames shall be thoroughly cleaned, free from oil, dirt and dust before painting; immersed in high temperature degreasing and paint preparation chemical, and immersed into an extra high density non-porous salt spray resisting, air dry, rust inhibiting primer.

Exposed metalwork shall be cleaned and painted with two coats of aluminum paint.

29. Roofing - Roofing shall be three-ply asphalt felt, 15 year bond with 400 pounds of gravel or 300 pounds of slag per 100 square feet complying with specification 152A, the Rubberoid Company or equivalent.

WASH WATER SYSTEM

30. Wash Water System - This item, (item 10), shall include tapping the supply line in the pumphouse, furnishing necessary pumps, motors and electrical starting and switching equipment, valves, pipes and fittings, pipe line to the reservoir, and hose valve as indicated on the plans, installed completely as a fully operating unit.

31. Pump and Motor - Pump shall provide 50 g.p.m. at 200 feet total dynamic head. It shall be of horizontal centrifugal type of standard manufacture Fairbanks-Morse 5592 or equal. Pump shall be driven by 440V, 3 phase electric motor as specified by the pump manufacturer. Starting switch and overload protection shall be as specified by the motor manufacturer, completely installed and connected to the power supply serving the pumping station. Bidders shall specify manufacturer and type of pump and motor and switching equipment to be furnished with the bid together with operating characteristics of same. Pump, motor and switching shall be warranted against failure due to faulty manufacture or installation for a period of one year.

STORAGE RESERVOIR

32. One-Million Gallon Storage Reinforced Concrete Reservoir and Appurtenances - This item (item 11A) shall include the access road (Article 7, Special Conditions), all excavation, concrete work, mechanical work and backfill necessary to construct a one-million gallon reinforced concrete storage reservoir as shown on the drawings. It shall include overflow pipe and drain to the manhole and the drainage manhole complete with cover. It shall include the inlet and outlet piping to a point six feet outside the limits of the foundation; ladder, and vent all as shown on the plans and the lump sum price bid shall cover the entire cost of the above items complete as an operable unit. All piping and fittings, concrete work, reinforcing steel, excavation, backfill, trenching, manhole covers and frames, and other materials and construction, shall comply with the pertinent articles of these specifications. Tank shall be warranted against leaks and defective workmanship for a period of one year after acceptance by the owner.

33. One-Million Gallon Post-tensioned Concrete Reservoir and Appurtenances (alternate) - Bidders may propose to furnish a concrete tank reservoir designed and constructed using "prestressing" and/or "post-tensioning" instead of the reinforced concrete tank shown in the drawings. Such tank shall have the same diameter and height as well as general configuration as the reinforced concrete tank shown on the drawings and the lump sum price bid for such tank (item 11B) shall include the complete cost of the tank and all appurtenances as included under the item described in Article 32 of the Special Conditions. The tank shall be designed and constructed in accordance with accepted practice and the prestressing or post-tensioning shall be done by a qualified constructor acceptable to the engineer. Such a tank shall be as furnished by the Prescon Corporation of Englewood, Colorado or by the Preload Company, Inc. of Dallas, Texas, or equal. Bidders shall submit with their bids, plans for such alternate tank together with copies of

specifications covering design and construction and shall make copies of design computations available to the engineer for review, if requested. Constructor of the tank shall warrant the tank against leaks and defective workmanship for a period of one year after acceptance by the owner.

34. Testing of Tank - Prior to backfilling but not earlier than fourteen days after placing the last concrete, the contractor shall fill the reservoir to the level of the overflow and the engineer shall inspect the construction for leaks. Such leaks shall be repaired to the satisfaction of the engineer without cost to the owner.

35. Mastic - Mastic joint filler shall comply with ASTM Standard Specification D491 and shall be installed in compliance with such specification.

DRAINAGE LINE

36. Concrete Drainage Lines - These items (items 13 and 14) shall include trenching, furnishing and installing concrete pipe, and backfilling for the drainage lines at the location and grades shown on the drawings. The unit price bid per foot shall include the entire cost of such pipe lines fully complete and ready for service.

37. Concrete Pipe - Concrete pipe shall conform to latest ASTM specifications C14 for unreinforced sewer pipe. Pipe shall be laid with the bell end upstream. Bell and spigot end of pipes must be cleaned, using a steel brush if necessary. After the spigot end is matched uniformly into the bell, the annular space shall be filled with Portland Cement mortar consisting of three parts sand and one part Portland Cement mixed to a stiff consistency. Preparation of trench, laying and backfilling shall be as provided in Article 6 of Special Conditions. Minimum cover shall be two feet. If the contractor desires, "Rubber Gasket Sewer Pipe" may be used. In addition to ASTM specification C14, such pipe "Rubber Gasket Sewer Pipe" shall comply with Articles 38 and 39, Special Conditions.

38. Joints for Rubber Gasket Sewer Pipe - The joints shall be of the bell and spigot type, details of which shall be furnished with the bid. The joint shall be so designed as to provide for self-centering and, when assembled, to compress the gasket to form a water-tight seal. The gasket shall be confined in a groove of the spigot, so that movement of the pipe or hydrostatic pressure cannot displace the gasket. In order to assure water-tightness the clearances between the inner surface of the bell and the outer surface of the spigot as well as the dimensional tolerances of this annular space, shall be such that the gasket residual diametric deformation is neither less than 20 percent nor more than 45 percent when the outer surface of the spigot contacts the inner surface of the bell.

39. Rubber Ring Gaskets for Concrete Pipe Joints - The rubber ring gaskets for use on concrete pipe with rubber gasket joints shall be molded or extruded and cured in such a manner that any cross section will be dense, homogeneous, and free from porosity and other imperfections. The gaskets shall be extruded or molded to the specified size within a tolerance of plus or minus 1/32 of an inch for any diameter measure at any cross section. The gaskets shall be fabricated from a high-grade tread-type compound. The basic polymer shall be natural rubber, or a copolymer of butadienestyrene synthetic. The compound shall contain no factice and shall have the following characteristics:

Tensile strength, pounds per square inch, minimum	2, 300
Elongation at break, percent, minimum	425
Shore durometer (type A)	40 to 65
Absorption of water, by weight, 2 days at 70° C, percent maximum	5
Compression set (constant deflection), percent of original deflection, maximum	20
Tensile strength after oxygen bomb aging (48 hours, 158° F, 300 pounds per square inch), percent of tensile strength before aging, minimum	80
Maximum increase over original Shore durometer	8
Acetone, extract, percent, maximum	15
Absorption of water, by weight, 2 days at 70° C, percent, maximum	5
Compression set (constant deflection), percent of original deflection, maximum	20
Tensile strength after oxygen bomb aging (48 hours, 158° F, 300 pounds per square inch), per cent of tensile strength before aging, minimum	80
Increase in Shore durometer hardness after oxygen bomb aging. Maximum increase over original Shore durometer	8
Acetone, extract, percent, maximum	15

The physical properties of the rubber compound shall be determined by tests performed in accordance with appropriate sections of Federal Specification ZZ-R601a, except for Shore durometer and compression set. All tests for compression set shall be made in accordance with method B, ASTM Designation: D 395 for compression set of vulcanized rubber under constant deflection. Tests for Shore durometer shall be made in accordance with ASTM designation: D676. The contractor shall furnish certified copies of test reports as evidence of the rubber compound used in all rubber gaskets before any gaskets are used to join pipes. All rubber shall be stored in as cool a place as practicable, preferably, at 70° or less, and in no case shall the rubber for joints be stored where they will be exposed to the direct rays of the sun. All rubber gaskets shall be stored so as to permit free circulation of air about the rubber.

40. Laying Pipe - All concrete drainage pipe shall be installed according to recommended practices as set forth in ASTM Designation C12-58T. Unless otherwise authorized, the contractor shall erect grade boards at 50 foot intervals above the trench over which a string or wire may be tightly stretched along the center line of the pipe a uniform distance above the grade elevation indicated. Each pipe shall be accurately placed on grade and checked for elevation by measuring down from the string or wire.

Testing of alignment after backfill shall be by lights, mirrors or other methods approved by the engineer/inspector.

41. Drainage Manhole at Pumping Station - Drainage Manhole shall include excavation, concrete work, ladder, manhole, ring and cover and backfill installed complete to the lines and grades shown on the plans. Manhole at the pumping station may be cast in place according to drawings attached hereto or a precast manhole approved by the engineer may be used. Manhole ring and cover shall be 400 pounds, 24" diameter furnished according to Logan City specifications.

CONCRETE WORK

42. Materials - All materials shall be so delivered, stored and handled in a manner such that inclusion of foreign materials and damage in any way will not occur. Packaged materials shall be delivered and stored in their original packages until ready for use. Damaged materials, including cement that is lumpy or which has partially set, shall be rejected.

43. Composition - Concrete shall be composed of cement, sand and broken rock or clean gravel, well mixed with the proper amount of water and cement and brought to a proper consistency by adjusting the water-cement ratio. The water-cement ratio shall be such as to provide the required crushing strength shown on the drawings, or as indicated on the drawings and is defined as the number of U. S. gallons of water, including the water held in the aggregate, per sack of cement (94 pounds net weight). The consistency as measured by the slump test shall be such as to provide a slump of four inches. The aggregate-cement ratio shall be varied to obtain the desired consistency, however, the water-cement ratio shall not be changed. The maximum size of aggregate shall be as shown on the drawings. The proportion of sand to gravel shall be such as to provide a plastic mix satisfactory to the engineer. The concrete shall have a 28-day crushing strength as shown on the drawings. An air entraining admixture of a manufacture satisfactory to the engineer shall be used according to the manufacturer's instructions to provide between 3 per cent and 5 per cent by volume total air entrainment by direct measurement or as determined by ASTM Designation C-138-44.

44. Cement - The cement used shall be Portland cement and shall conform to the Standard Specification and Tests for Type I Portland Cement ASTM Designation C-150-56.

45. Sand - Sand for concrete may be obtained from natural deposits or may be made by crushing suitable rock. The sand particles shall be hard, dense, durable, uncoated, non-organic rock fragments that will pass a 3/16-inch square (#4) or a 5/16-inch round opening standard sieve. Sand must be free from injurious amounts of dust, clay, lumps, soft or flaky particles, shale, alkali, organic matter, loam, or other deleterious substances. The sand, as it is used in the concrete, must be so graded that, in the opinion of the engineer, concrete of the required workability, density and strength can be made without the use of an excess of water or cement.

46. Broken Rock or Gravel - The broken rock or gravel for concrete must be hard, dense, durable, uncoated rock fragments free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali, organic or other deleterious matter. Maximum size of particles shall be as specified on the drawings, and shall all be retained on a 3/16-inch square (#4) or 5/16-inch round opening sieve. It shall be so graded that, in the opinion of the engineer, concrete of the required workability, density, and strength can be made without the use of an excess of sand, water, or cement.

47. Reinforcing Steel - Steel used for concrete reinforcement shall conform to Tentative Specification for billet steel bars for concrete reinforcement ASTM Designation A15-58T for deformed bars of structural grade.

All steel used shall be new steel of the size and dimensions shown on the drawings. Before the reinforcement bars are placed, the surfaces of the bars and the surfaces of any metal supports for reinforcement bars shall be cleaned of objectionable rust, scale, dirt, grease, or other foreign substances, and, after being placed, the reinforcement bars shall be maintained in a clean condition until they are completely embedded in the concrete. All bars shall be accurately placed and securely fastened to position as shown on the plans and tied with wire at all intersections in such a manner that the steel will not displace during the depositing and ramming of concrete. Where bars are spliced, they shall have a lap of at least forty bar diameters. Where bars are bent as shown on the drawings, they shall be bent cold around a pin having a diameter not less than six times the minimum thickness of the bar.

48. Mixing - The contractor shall provide an accurate means for measuring the water and shall pay particular attention to the water content of the mix. The concrete shall be mixed until there is a uniform distribution of the materials and the mass is uniform in color and homogeneous. The mixer used shall be of such a type as to insure maintenance of the correct proportions of the ingredients. The mixing shall continue for at least 1 1/2

minutes after all the ingredients are in the mixer. The batch shall not exceed manufacturers rating for mixer. When the temperature is below 40 degrees F., adequate equipment shall be provided for heating the concrete materials.

49. Testing - Standard concrete test cylinders will be made as designated by the engineer/inspector and tested by an acceptable commercial laboratory. The contractor will pay the cost of testing.

50. Formwork - Forms shall conform to the shape, lines and dimensions of the member as called for on the plans. They shall be of sufficient strength and tied and braced to maintain position and shape and sufficiently tight to prevent leakage of mortar. All walls shall be formed on both sides. Forms and shoring shall be removed in such a manner as to insure complete safety. In no instance shall forms be removed prior to twenty-four hours after placing the concrete. The contractor will be responsible for any damage resulting from removal of forms and, if in the opinion of the engineer, such damage impairs the value of the structure, the contractor shall remove the damaged portion and replace with new concrete.

51. Placing - Concrete shall be placed in the work before the cement takes its initial set. No additional water shall be added to the mix to increase slump lost during delay in placing. All foundation surfaces upon or against which concrete is to be placed must be made free from mud and debris. When placing of concrete is to be interrupted long enough for the concrete to take its final set, the working face shall be given a shape by the use of forms that will secure a proper union with subsequent work. All concrete surfaces on or against which concrete is to be placed shall be roughened, and all laitance shall be removed by thorough scrubbing, brushing, and shipping before placing concrete or mortar upon or against them. Only methods of transportation and placing which will deliver concrete of the proper consistency into the forms without segregation of aggregates will be permitted. All concrete shall be placed in horizontal layers, and thoroughly worked and vibrated with a mechanical vibrator approved by the engineer until all voids in the mass are worked out, and until it completely fills the forms and the mass closes snugly against all surfaces, and is in perfect and complete contact with all steel used for reinforcement. Concrete shall not be deposited under water, except as authorized by the engineer, and the method of depositing shall be subject to his approval.

Special care shall be given to placing the concrete in the reinforced concrete tank, for the reservoir, especially in the walls in order to avoid leakage. There may be a horizontal construction joint between the footing and the wall. If possible, the contractor shall place the entire wall of the tank in one continuous operation; however, if this is impractical he may place it in separate runs of a height approved by the engineer. In this latter event, he shall bring the first run to a uniform elevation and shall prepare the construction joint as specified below.

Concrete shall be placed in the tank walls in vertical lifts not exceeding 2 feet in height and shall be deposited at frequent intervals around the periphery of the tank. The time interval between lifts shall not exceed 45 minutes and the contractor shall employ 2 placement crews or reduce the height of the lift if necessary to comply with this time limitation. The contractor shall insure against complete stoppage of concrete placement by having two mixers available or by some means satisfactory to the engineer.

In making a construction joint in the tank, the contractor shall clean the joint surface with a pressure water jet just prior to initial set (about six hours after placing). He shall then cover the joint and keep it continuously wet until the succeeding run is placed. Immediately before placing the next lift, he shall flush the joint surface with a mortar consisting of one part Portland Cement to two parts of sand. The new concrete shall be vibrated against the joint face. A rubber water stop shall be properly installed in the intermediate horizontal joints. The succeeding run shall be placed as soon as practical and in no case more than fourteen days following placement of the initial run.

The joint between the floor and the wall of the tank shall be made as follows: The inside top surface of the footing shall be trowelled smooth. Prior to placing the floor, this surface shall be coated with an approved water-proofing mastic. After the floor has hardened (not less than seven days) the vertical joint between the wall and floor shall be tightly caulked with an oakum caulking material and sealed with mastic placed according to manufacturers specifications.

Each sector of the floor of the tank shall be placed in a single continuous operation.

52. Temperature of Concrete - Concrete, when deposited, shall have a temperature of not less than 40 degrees F., nor more than 120 degrees F. In freezing weather, suitable means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F. for not less than 72 hours after placing or until the concrete has thoroughly hardened. No admixture shall be used to prevent freezing.

53. Finishing - The surface of concrete placed against forms must be smooth, free from projections, and thoroughly filled with mortar. Immediately upon the removal of forms, all voids shall be neatly filled with cement mortar of the same consistency as the mortar in the concrete, provided, in the opinion of the engineer, such voids do not render the concrete defective and unsuitable for its intended use.

The surface of the floor of the tank and of the pumphouse shall be carefully screeded to grade and floated. It shall be finished with a steel trowel to a dense, smooth, hard surface. The surface of the roof slab of the tank shall be float finished.

54. Curing and Protection - The contractor shall protect all concrete from injury until final acceptance by the owner. Exposed surfaces of concrete shall be protected from the direct rays of the sun for at least three days. Curing is of primary importance, especially for the walls of the tank. All concrete shall be kept continuously wet for at least two weeks after being placed. The method of keeping concrete moist shall be by continuous sprinkling or spraying with water, or by covering with burlap kept wet, or by other methods approved by the engineer.

STEEL PIPE AND FITTINGS

55. General - Steel pipe shall conform to AWWA specifications for Electric Fusion Welded Steel Water Pipe 7A. 3-1940 and 7A. 4-1941-TR.

56. Steel Plates - Steel plates shall conform to Section 4-2 AWWA specification 7A. 4-1941TR or Section 3-2 AWWA 7A. 3-1940 or the following grades of steel ASTM A139 Grades A or B or ASTM A245 Grade A.

MISCELLANEOUS

57. Fire Hydrants - Location shall be as shown on the drawings. Hydrants shall be Pacific States Class 175 or equal flanged with mechanical joint, 5" valve opening with three nozzles; two hose and one streamer, 6" connection with shut-off valve, together with necessary piping and connection to main. Lump sum price bid shall be for the complete installation.

58. Protection of Existing Utilities - The contractor shall protect existing installations such as power lines, water mains and services, gas mains and services, irrigation canals and ditches, and telephone lines which may be encountered in the construction. All water pipes, gas pipes, and other pipes encountered in excavating the trench shall be adequately supported and protected from injury until the backfill is complete. Power poles or electric facilities, except as otherwise specifically noted, shall be protected against damage.

Since natural gas service was recently installed in Logan City the location of gas mains and services is generally apparent from surface indications; however, the Mountain Fuel Supply Company shall be notified when the trench crosses existing gas facilities and any special precautions required by the Mountain Fuel Supply Company must be complied with.

The general location of water mains as recorded by Logan City is shown on the attached drawings. The Logan City water superintendent shall be advised when the trench crosses any water mains and repair of any breaks in service connections or laterals shall meet the standards of Logan City Water Department.

Irrigation canal crossings shall be made in the shortest possible time in order that service to users can be maintained. Contractor shall make arrangements with the canal company to shut the canal down to allow the lines to be cut through.

Cost of all repairs due to moving, damage or breakage of utilities whether necessary for the work or inadvertent shall be born by the contractor.

59. Sterilization - Prior to placing the reservoir and connecting pipelines in service, the contractor shall disinfect the new pipe and the tank by filling them with water to which an acceptable disinfectant providing the equivalent of 50 parts per million available chlorine has been added. Following sterilization, the contractor shall thoroughly flush the tank and pipe until the replacement water shall have the same chemical quality as the water regularly supplied to the Logan City.

60. Interruption of Water Service - The contractor shall avoid insofar as possible, interrupting the present water supply to Logan City and the University. In the event this service is interrupted by necessity or by accident, the contractor shall place the system in operable condition as rapidly as possible. He shall notify the City Engineer of Logan City and/or the Business Manager of Utah State University at least 72 hours in advance of any interruption required by the progress of the work.

D. F. Peterson
Engineers Copy

S P E C I F I C A T I O N S

AND

CONTRACT DOCUMENTS

FOR

EXPLORATORY DRILLING

AND

WATER SUPPLY WELLS

LOGAN, UTAH

APRIL, 1961

RAY C. HUGIE

CITY ENGINEER

BISHOP AND PETERSON

PROFESSIONAL ENGINEERS

LOGAN, UTAH

INVITATION

Sealed proposals will be received by Logan City Recorder at Logan City Offices, Logan, Utah until 10:30 A.M. June 1, 1961
_____ 1961 for the construction of up to four 16- inch water supply wells from 200 to 800 feet deep, located in Logan City. Test holes will be drilled for two or more of the wells.

Specifications are on file in the office of Logan City Engineering Dept., Logan, Utah. Copies may be obtained from the City Engineer by prospective bidders who are licensed well drillers upon presentation of their Utah well drillers license number.

Each bidder must submit a letter from an approved surety company guaranteeing to furnish said bidder with required performance bond.

Bid guaranty in the amount of five percent of the bid price must be submitted with the proposal. Any additional information may be secured at the office of the City Recorder, Logan, Utah.

The right is reserved, as the interest of Logan City may require, to reject any and all bids, to waive any informality in bids received and to accept or reject any items of any bid unless such bid is qualified by specific limitation.

Dated this _____ day of _____ 1961

City Recorder

INFORMATION FOR BIDDERS

The project consists of construction of four water supply wells, 16 inches in diameter and from 200 to 800 feet deep for Logan City Corporation. Test holes will be drilled for two or more of the wells. Specifications may be examined, without charge, at the office of the Logan City Recorder, Logan, Utah.

Specifications may be obtained by intending bidders who are Utah licensed drillers, from the Logan City Recorder, Logan City Offices, Logan, Utah.

Bids must be made on the form provided, and must be enclosed in a sealed envelope plainly marked as follows:

"Bid for Water Supply Wells, Logan, City, Utah

To Be Opened: 10:30 A.M. Thurs June 1, 1961.

Bids may be delivered in person or may be mailed. If mailed, the sealed envelope referred to above shall be placed in a second envelope addressed to:

Logan City Recorder
City Offices
Logan, Utah

Bids received prior to the time set for opening shall be securely kept, unopened. The officer whose duty it is to open them will decide when the specified time has arrived and no bid received thereafter will be considered. It is the sole responsibility of the bidder to see that the bid is received by the proper time.

BID BOND

Each bidder must submit with his proposal, certified or cashier's check or a satisfactory proposal guaranty bond made payable to the order of Logan City Corporation in an amount not less than five (5) percent of the aggregate sum of the bid as security that, if awarded the contract, the bidder will execute the contract and furnish bond as required. Any check or bond accompanying the successful bid will be returned upon the execution of the contract. Any checks or bonds accompanying the rejected bids will be returned. The bidder to whom the award is made will be required to execute a written contract with Logan City Corporation and to furnish performance and payment bonds as specified within ten days after notice of award of said contract is delivered to him.

The amount of the bond to be given to secure faithful performance of the contract shall be fifty percent of the contract price computed as hereinafter provided.

GENERAL INFORMATION

The following documents are essential parts of the complete contract: Advertisement, Information for Bidders, Bid Schedule, Specifications, Contract and Bonds.

Bidders must carefully examine specifications and forms of contract documents in advance of submitting a bid and shall visit the site and examine and judge for themselves the location and surroundings of the proposed work and shall make their own estimates of the difficulties attending the execution of the contract. Bidders are encouraged to examine logs of wells in the vicinity which are on file in the office of the Utah State Engineer.

The bidder must state in words and figures the unit prices or specific sums or both, as the case may be, for which he proposes to supply all the materials and perform the work required by the specifications. Failure to examine specifications, schedules, and instructions pertaining to the work will not relieve the contractor of any work to be performed.

Bidders are invited to be present at the opening of bids, for at this time their contents will be made public for the information of bidders and others properly interested.

If the bid is made by an individual, it must be signed with the full name of the bidder whose address must be given; if it is made by a firm, it must be signed with the co-partnership name by a member of the firm, and the name and full address of each member must be given; and if it is made by a corporation, it must be signed by a properly authorized officer in the corporate name and the corporate seal must be attached to such signature.

The bidder shall affix to the bid the number of his current Utah well drillers License. He must be bonded and have a current permit from the Utah State Engineer.

The quantities listed in the bid are approximate only and are not guaranteed to be correct. They are the quantities, however, which will be used for the purpose of comparing bids. Bidders must carefully review the specifications in order that they may fully understand the intentions of the contract in regard to quantities.

Applications have been filed with the State Engineer for the necessary drilling permits. At the time of advertisement these had not yet been acted upon, however, it is expected that they will be granted by the time of the bid opening, nevertheless awarding of the contract must be contingent upon receipt of such permits from the State Engineer.

The contract will be awarded to the lowest responsible bidder complying with the necessary conditions provided his bid is reasonable and it is to the interest of the City to accept it. The bidder to whom the award is made will be notified at the earliest possible date. The City however, reserves the right to reject any and all bids and to waive any informality in bids received.

BID

Date _____

In compliance with the above invitation for bids and subject to all the conditions thereof, the undersigned offers and agrees to furnish all labor and materials and perform all work required for the construction of exploratory wells and water supply wells on the property and in the location as shown on the drawings, in strict accordance with the plans, specifications and bid schedule, for the consideration of unit and lump sum prices as shown in the bid schedule, provided this bid is accepted within ten (10) calendar days from date of opening of bids.

Bidder _____

Address _____

By _____ Title _____
(Signature of person authorized to sign this bid)

Information to be furnished by bidders.

Exploratory Wells

Will well be drilled using rotary or cable tool methods? _____
(State Which)

Description of equipment to be used _____

Production Wells

Will well be drilled using rotary or cable tool methods? _____
(State Which)

Description of equipment to be used _____

A C C E P T A N C E

Date _____

Accepted as to Bid Schedule items numbered _____

LOGAN CITY CORPORATION

By

CONSTRUCTION CONTRACT

THIS CONTRACT made this _____ day of _____, 1961

by Logan City, a municipal corporation of Utah, hereinafter called the "City" and _____ hereinafter called the "Contractor" whose address is _____

witnesseth that the parties hereto agree as follows:

The Contractor shall furnish all of the materials and perform all of the work required for _____

on the property in Logan City described as follows:

- 1 - Approximately 2000' S., 325' E., NW Cor. Sec. 35, Twp. 12 N., R. 1 E., Salt Lake Base and Meridian (Canyon Road and Crockett Ave.)
- 2 - Approximately 820' N., 1220' E., SW Cor Sec 34, Twp. 12 N., R. 1 E. Salt Lake Base and Meridian (Center, St. and 2nd E).
- 3 - Approximately 1,460' W., 350' N., SE Cor. Sec. 34, Twp. 12 N., R. 1 E. Salt Lake Base and Meridian (7th No. and 6th E.).
- 4 - Approximately 3,660' W., 2,220' N., SE Cor. Sec. 27, Twp. 12 N., R. 1 E. Salt Lake Base and Meridian (10th No. and 3rd E.).

The work shall be commenced _____

and shall be completed _____

IN WITNESS WHEREOF, the parties hereto have executed this contract as of the date first above written.

LOGAN CITY CORPORATION

Approved by the Board of Commissioners

By _____
Mayor

Attest _____
City Recorder

Countersigned:

City Recorder

Contractor

BID SCHEDULE

ITEM	WORK, QUANTITY AND UNIT PRICE	TOTAL AMOUNT
	<u>EXPLORATORY HOLES</u>	
-	Drilling exploratory holes up to 400 feet deep, 800 feet at _____ per foot (_____ per ft.) (Write In)	_____
-	Drilling exploratory holes from 400 to 1000 feet deep, 400 ft. at _____ per foot (_____ per ft.) (Write In)	_____
-	Casing exploratory holes up to 400 feet deep, 800 feet at _____ per foot (_____ per ft.) (Write In)	_____
-	Casing exploratory holes from 400 to 1000 feet deep, 400 ft. at _____ per foot (_____ per ft.) (Write In)	_____
-	Perforating exploratory holes, 100 feet at _____ per ft. (_____ per ft.) (Write In)	_____
-	Testing and Experimental work on exploratory holes. 50 hours at _____ per hour (_____ per hour.) (Write In)	_____
-	Plugging exploratory holes, 5 plugs at _____ per plug (_____ per plug) (Write In)	_____

PRODUCTION WELLS

WORK, QUANTITY AND UNIT PRICE

TOTAL AMOUNT

Drilling production wells up to 400 feet deep.
1400 ft. at

_____ per ft. (_____ Per ft.) _____
(Write in)

Drilling production wells 400 to 700 feet depth. 300' @

_____ per ft. (_____ per ft.) _____
(Write in)

Drilling production wells 700 to 1000 feet depth.
100 feet at

_____ per ft. (_____ per ft.) _____
(Write in)

Casing production wells up to 400 feet depth.
1400 feet at

_____ per ft. (_____ per ft.) _____
(Write in)

Casing production wells 400 to 1000 feet depth.
400 feet at

_____ per ft. (_____ per ft.) _____
(Write in)

Perforating production wells.
300 feet at

_____ per ft. (_____ per ft.) _____
(Write in)

Testing production wells.
150 hours at

_____ per hour (_____ per hour) _____
(Write in)

Total _____

SPECIFICATIONS

GENERAL CONDITIONS

1. Location of Work - The desired wells are to be located at approximately the following points in Logan, City.

- No. 1 2000' S., 325' E., NW Cor. Sec. 35 Twp 12 N., R. 1E
Salt Lake Base and Meridian.
(Canyon Road and Crockett Ave.)
- No. 2 820' n., 1220' E., SW Cor. Sec. 34, Twp 12 N., R. 1E.,
Salt Lake Base and Meridian
(Center St. and 2nd E.)
- No. 3 1460' W., 350' N., SE Cor. Sec. 27, Twp 12 N., R. 1 E
Salt Lake Base and Meridian.
(7th North and 6th E.)
- No. 4 3660' W., 2220' N., SE Cor. Sec. 27, Twp 12 N., R. 1 E
Salt Lake Base and Meridian
(10th No. and 3rd E.)

2. Description - The work consists of drilling up to four 16" wells for water. It is planned to drill a test hole in advance on at least the first two locations, and, at the other two if deemed necessary by the Engineer. After completion of the test well, if the results are favorable, the driller will proceed with construction of the production well at each location. The holes may be drilled using either cable tool or rotary drilling methods. It is planned to use aquifers at depths between 250 and 400 feet although greater depths up to 1,000 feet may be drilled if necessary. Work will include drilling, installation of casing and/or screen, perforations and testing. The owner reserves the right to omit any or all of the work on production wells if, in the opinion of the Engineer, the test wells are unfavorable.

3. Definitions -

Owner - Logan City Corporation

Contractor - Party or parties entering into this contract to perform the work herein.

Engineer - Person or persons appointed by the owners to be Engineer or such agents as he designates acting within the scope of the particular duties assigned to them.

4. Bonds - The successful bidder shall furnish a performance bond with sureties satisfactory to the owner in the amount of 50 percent of the bid price.

5. Rights of Way - The necessary rights-of-way and permits required for proper construction of the well will be furnished by the owner.

6. Visits to Sites, Verification of Data- The bidder shall satisfy himself regarding the sites and is encouraged to study logs of existing wells in the office of the Utah State Engineer. No allowance will be made after the bid has been accepted for errors made in this connection.

7. Liability- The contractor shall maintain such insurance, as required by Utah State Law, as will protect the owners and himself from claims under the Workmen's Compensation Acts and for any other claims for damages for personal liability, including death, and for property.

8. Safety - The contractor shall at all times exercise reasonable precautions for the safety of employees and the public. The work shall be protected with barricades in such a manner that the public shall be excluded from dangerous areas. The contractor shall cover or otherwise exclude persons from accidental entry to open holes and maintain such signals and flares as may be necessary to warn the public from any danger. The contractor shall indemnify and save harmless the owner against all suits, claims, and actions of every name and description brought against them, and all costs and damages to which the owner may be put on account or by reason of any injury or alleged injury to the person or property of another, resulting from negligence or carelessness in the performance of the work, or in guarding the work, or from any improper materials used, or by or on account of any act or omission of the contractor or his agent or employees.

9. Care of Property and Cleaning Up - The contractor shall at all times conduct the work in such a way as to prevent undue damage to the property. He shall dispose of all mud, drill cuttings, and other refuse in a workmanlike manner. He shall assume the responsibility for damage to existing installations from operations under this contract. He shall at his expense remove all his equipment and clear the well sites to the satisfaction of the engineer. The contractor shall maintain the well in good condition until accepted by the owner.

10. Superintendence - The contractor shall personally superintend the work or shall have a competent well drilling foreman or superintendent with authority to act for him, satisfactory to the engineer on the work at all times during progress thereof.

11. Notice to Proceed and Completion of Contract - Work shall commence within 15 days after notice to proceed and shall continue diligently thereafter until completion of the contract.

12. Drilling Permits - The owner has applied for the appropriations from the State Engineer. At the date of advertisement, these had not been approved. It is anticipated that these will be cleared by the time set for awarding the contract; nevertheless, execution of the contract shall be contingent upon the granting of the necessary permits by the State Engineer and the owner reserves the right to reject all bids in the event such permits are not granted by the State Engineer within the necessary time specified for executing the contract.

13 - Quantities and Unit Prices - Quantities noted on the schedule are approximations for comparison of bids and no claim shall be made for excess or deficiency therein. Payment at the prices agreed upon shall be full compensation for completed work and will cover materials, supplies, labor, tools, machinery and all other expenditures incident to satisfactory compliance with the contract, unless otherwise specifically provided. It is desired to develop 4 wells producing not less than 3 c.f.s. each and quantities will be adjusted to most economically achieve this result, if practical, based on the information obtained from exploratory drilling, the recommendations of the contractor and the judgement of the engineer. The owner reserves the right to cancel or omit any and/or all items of the contract except drilling and casing the exploratory holes, Items 1 and 3, if, in the opinion of the engineer, based on the exploratory results, proceeding with such items would be unpromising or unnecessary.

14 - Minimum Amount of Work - The minimum value of the work required by this contract would be a value equivalent to drilling and casing 4 test holes 400 feet deep. This would be the case in the event the test holes at all four locations proved unfavorable. In this event the owner may wish to drill an exploratory hole to a greater depth, but reserves the right to decide this on the basis of conditions found by the previous exploratory program.

15 - Payment - Partial payments will be made based on the amount of work completed during each calendar month and accepted by the Engineer and will be due not later than the 10th of the succeeding month. Payment for holes will be based on the depth measured from the ground surface to the bottom of the hole. Ten percent of partial payments shall be withheld until final completion and acceptance of all the work covered by this contract.

16 - License Regulations - The contractor shall be licensed and bonded to drill water wells in Utah in compliance with the regulations of the State Engineer.

17 - Test Discharges - Discharges of the wells during pumping tests will be discharged into nearby irrigation canals. The contractor shall furnish and install adequate pipe to convey such discharges to the appropriate canal without extra cost to the owner. He shall discharge the water into the canal in such a manner that there shall be no erosion damage and shall repair any such damage. Permission to discharge into canals will be obtained by the owner.

SPECIAL CONDITIONS

Exploratory Wells

1. Drilling Methods - Test holes shall be approximately 6" diameter as necessary to continue hole to desired length and may be drilled with a rotary rig or by using cable tools. Holes shall be cased with steel casing meeting the specifications set forth in Article 4. It is intended that casing will not be removed. Contractor shall furnish rig and shall equip himself with all necessary tools, pumping equipment, supplies, power and lighting and all other materials necessary for the efficient execution of the work.

2. Logs and Samples - A log of drilling conditions shall be carefully kept by the contractor for each hole. Samples shall be taken whenever a change in the formation or of the character of the materials occurs. Samples shall be obtained with a sample bucket or bailer if cable tools are used. If rotary drilling, the cuttings from the formations shall be allowed to accumulate in the trough and there collected. Samples shall be placed in containers furnished by the owner.

3. Drilling - The bid price per foot items 1, 2, for drilling the exploratory holes shall include all the costs therefore except casing and perforating including moving equipment in, furnishing all supplies and power, drilling the hole, and providing logs and samples in accordance with these specifications. The depth of the exploratory holes shall be determined by the engineer, but shall not exceed 1000 feet.

4. Casing - The bid price per foot, items 3, 4, for casing shall include the entire cost of the casing and all labor materials and supplies necessary to install same as required by this article. It is intended that the exploratory holes shall generally be cased for their entire length, however, this shall be as ordered by the engineer. Under artesian conditions, casing must be sealed in the hole to prevent extraneous flow and capped with a water tight screw cap fitted with a 1½ inch nipple or coupling. Alignment and plumbness shall be adequate to permit installation of test pump. Casing for exploratory wells shall be steel or wrought iron. May be new or used. If used, casing shall be straight, clean, and free from kinks, pitting and excessive rust and shall be of adequate strength and thickness for the purpose conforming to standard and accepted practice for cased wells of the diameter and depth specified.

5. Perforations - Perforations shall be made with a Mills knife or equivalent at elevations recommended by the contractor, but agreed upon and as directed by the engineer. The bid price for perforating item 5 per foot shall be the entire cost of making such perforations including crew and rig.

6. Plugging - It is likely that artesian conditions will be encountered. The contractor shall be equipped to place concrete plugs in the holes if necessary and if so ordered by the engineer. The depths at which such plugs may be necessary shall be determined by the engineer. The plugs shall totally shut off the flow and/or prevent waters from mixing in different aquifers. The bid price, item 7 shall include furnishing of packers, cement, and other materials necessary to accomplish total plugging. Plugs shall be 5 feet long.

7. Hourly Charge for Drill Unit for Experimental Work and Testing

The bid price per hour, Item 6 shall include entire price for drill rig and crew with basic supplies of fuel, lubricant and drilling mud, etc. Hourly charge for this service must be ordered in writing by the engineer. This service will include test pumping the exploratory hole and the driller shall provide himself with all necessary pump, tools, and devices for measuring discharge and drawdown.

Production Wells

8. Drilling - Hole shall be 16 to 24 inch overall with 16- inch casing. Hole may be drilled using cable tools or rotary rig. If overall size of hole is larger than the size of casing, the engineer shall specify the grade of gravel and sealing material to be used in filling the annular space and the depth at which the annular space shall be sealed. Centering devices or casing stirrups shall be attached at reasonable intervals as directed by the engineer. At depths exceeding 400 feet, hole may be reduced to 12 to 20 inches and casing to 12 inches. Bid price per foot of hole, items 8, 9, 10 shall include entire cost of drilling including moving in, labor, materials, equipment and drilling supplies and developing. Contractor shall furnish rig and shall equip himself with all necessary tools, pumping equipment, supplies and other materials necessary for the efficient execution of the work.

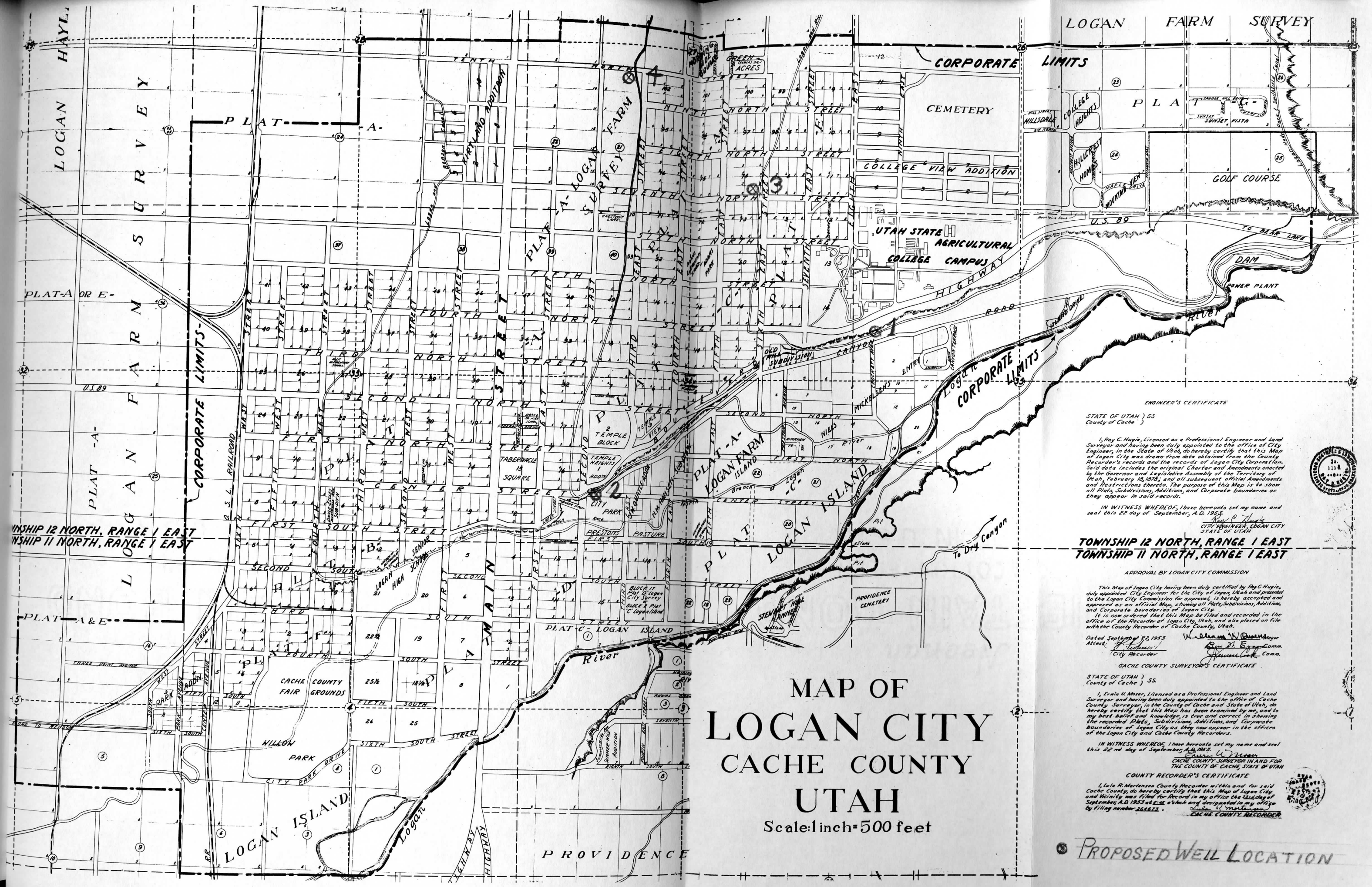
9. Casing - The bid price per foot for casing, items 11, 12 shall include all costs of furnishing and installing casing in the well in accordance with this article. Casing for production wells shall conform to the size and minimum weight specified in the tabulation at the end of this article. It shall be new pipe and installed in the hole straight and plumb. It shall be tested for plumbness and alignment by passing a 40 foot dummy into the casing or by other methods approved by the engineer. The dummy shall have an outside diameter $\frac{1}{2}$ inch smaller than the inside of the casing and shall move freely throughout the length of the casing to the deepest anticipated setting of pump - estimated to be 250 feet. The exact depth of well and length of casing shall be determined by the engineer on the basis of the drilling records and such other measurements as he shall require the contractor to make. Where a reduction in size of casing is required, an adequate overlap shall be made and a watertight seal provided. The inside casing at this point shall be cut off and removed.

<u>Diameter</u>	<u>Weight Per Foot</u> <u>Cable - Tool Well</u>	<u>Rotary</u> <u>Drilled Well</u>
12"	43.	33.0
14"	45.	37.0
16"	52.	42.0

10. Perforations - Perforations for the production well may be made with a Mills knife or equivalent. The size and number per foot and the depths will be based on recommendations of the driller, but will be as specified by the engineer. Bid price per foot, item 13, shall include the entire cost of perforating casing already installed. The engineer shall be present during the perforating process. Together with the contractor he will measure the depth to the knife at the beginning and end of the perforating process.

11. Developing - After the casing is installed, the contractor shall develop the well by bailing or surging as required by the engineer. Costs of developing are considered part of drilling costs.

12. Testing - Contractor shall provide test pump, discharge lines, power supply, devices for measuring discharge and drawdown and all other equipment and supplies necessary to perform a drawdown test of the production well when so ordered in writing by the engineer. Payment for testing shall be at the hourly rate bid therefore on the bid schedule, item 14.



CORPORATE LIMITS

CEMETERY

COLLEGE VIEW ADDITION

UTAH STATE AGRICULTURAL COLLEGE CAMPUS

HIGHWAY

CORPORATE LIMITS

ENGINEER'S CERTIFICATE

STATE OF UTAH) SS
County of Cache)

I, Ray C. Huggie, Licensed as a Professional Engineer and Land Surveyor and having been duly appointed to the office of City Engineer, in the State of Utah, do hereby certify that this Map of Logan City was drawn from data obtained from the County Recorder's records and the records of Logan City Corporation. Said data includes the original Charter and Amendments enacted by the Governor and Legislative Assembly of the Territory of Utah, February 18, 1873, and all subsequent official Amendments and Resolutions thereof. The purpose of this Map is to show all Plats, Subdivisions, Additions, and Corporate boundaries as they appear in said records.

IN WITNESS WHEREOF, I have hereunto set my name and seal this 22 day of September, A.D. 1953.

Ray C. Huggie
CITY ENGINEER, LOGAN CITY
STATE OF UTAH

TOWNSHIP 12 NORTH, RANGE 1 EAST
TOWNSHIP 11 NORTH, RANGE 1 EAST

APPROVAL BY LOGAN CITY COMMISSION

This Map of Logan City having been duly certified by Ray C. Huggie, duly appointed City Engineer for the City of Logan, Utah, and presented to the Logan City Commission for approval, is hereby accepted and approved as an official Map, showing all Plats, Subdivisions, Additions, and Corporate boundaries of Logan City. It is now ordered that this Map be filed and recorded in the office of the Recorder of Logan City, Utah, and also placed on file with the County Recorder of Cache County, Utah.

Dated September 22, 1953
Attest: [Signature]
City Recorder

[Signature]
Mayor
[Signature]
Comm.

CACHE COUNTY SURVEYOR'S CERTIFICATE

STATE OF UTAH) SS
County of Cache)

I, Erwin U. Meier, Licensed as a Professional Engineer and Land Surveyor and having been duly appointed to the office of Cache County Surveyor, in the County of Cache and State of Utah, do hereby certify that this Map has been examined by me, and to my best belief and knowledge, is true and correct in showing the recorded Plats, Subdivisions, Additions, and Corporate boundaries of Logan City as they now appear in the offices of the Logan City and Cache County Recorders.

IN WITNESS WHEREOF, I have hereunto set my name and seal this 22nd day of September, A.D. 1953.

[Signature]
CACHE COUNTY SURVEYOR IN AND FOR
THE COUNTY OF CACHE, STATE OF UTAH

COUNTY RECORDER'S CERTIFICATE

I, Lula R. Martensen County Recorder within and for said Cache County, do hereby certify that this Map of Logan City and vicinity was filed for record in my office the 22nd day of September, A.D. 1953 and is a correct and true copy of the original as filed in my office by filing number 266822.

[Signature]
CACHE COUNTY RECORDER

MAP OF
LOGAN CITY
CACHE COUNTY
UTAH

Scale: 1 inch = 500 feet

PROPOSED WELL LOCATION

Official Copy

S P E C I F I C A T I O N S

AND

CONTRACT DOCUMENTS

FOR

EXPLORATORY DRILLING

AND

WATER SUPPLY WELLS

LOGAN, UTAH

APRIL, 1961

RAY C. HUGIE

CITY ENGINEER

BISHOP AND PETERSON

PROFESSIONAL ENGINEERS

LOGAN, UTAH

INVITATION

Sealed proposals will be received by Logan City Recorder at Logan City Offices, Logan, Utah until 10:30 A.M. June 1, 1961 1961 for the construction of up to four 16- inch water supply wells from 200 to 800 feet deep, located in Logan City. Test holes will be drilled for two or more of the wells.

Specifications are on file in the office of Logan City Engineering Dept., Logan, Utah. Copies may be obtained from the City Engineer by prospective bidders who are licensed well drillers upon presentation of their Utah well drillers license number.

Each bidder must submit a letter from an approved surety company guaranteeing to furnish said bidder with required performance bond.

Bid guaranty in the amount of five percent of the bid price must be submitted with the proposal. Any additional information may be secured at the office of the City Recorder, Logan, Utah.

The right is reserved, as the interest of Logan City may require, to reject any and all bids, to waive any informality in bids received and to accept or reject any items of any bid unless such bid is qualified by specific limitation.

Dated this _____ day of _____ 1961

City Recorder

INFORMATION FOR BIDDERS

The project consists of construction of four water supply wells, 16 inches in diameter and from 200 to 800 feet deep for Logan City Corporation. Test holes will be drilled for two or more of the wells. Specifications may be examined, without charge, at the office of the Logan City Recorder, Logan, Utah.

Specifications may be obtained by intending bidders who are Utah licensed drillers, from the Logan City Recorder, Logan City Offices, Logan, Utah.

Bids must be made on the form provided, and must be enclosed in a sealed envelope plainly marked as follows:

"Bid for Water Supply Wells, Logan, City, Utah

To Be Opened: 10:30 A.M. Thurs June 1, 1961.

Bids may be delivered in person or may be mailed. If mailed, the sealed envelope referred to above shall be placed in a second envelope addressed to:

Logan City Recorder
City Offices
Logan, Utah

Bids received prior to the time set for opening shall be securely kept, unopened. The officer whose duty it is to open them will decide when the specified time has arrived and no bid received thereafter will be considered. It is the sole responsibility of the bidder to see that the bid is received by the proper time.

BID BOND

Each bidder must submit with his proposal, certified or cashier's check or a satisfactory proposal guaranty bond made payable to the order of Logan City Corporation in an amount not less than five (5) percent of the aggregate sum of the bid as security that, if awarded the contract, the bidder will execute the contract and furnish bond as required. Any check or bond accompanying the successful bid will be returned upon the execution of the contract. Any checks or bonds accompanying the rejected bids will be returned. The bidder to whom the award is made will be required to execute a written contract with Logan City Corporation and to furnish performance and payment bonds as specified within ten days after notice of award of said contract is delivered to him.

The amount of the bond to be given to secure faithful performance of the contract shall be fifty percent of the contract price computed as hereinafter provided.

GENERAL INFORMATION

The following documents are essential parts of the complete contract: Advertisement, Information for Bidders, Bid Schedule, Specifications, Contract and Bonds.

Bidders must carefully examine specifications and forms of contract documents in advance of submitting a bid and shall visit the site and examine and judge for themselves the location and surroundings of the proposed work and shall make their own estimates of the difficulties attending the execution of the contract. Bidders are encouraged to examine logs of wells in the vicinity which are on file in the office of the Utah State Engineer.

The bidder must state in words and figures the unit prices or specific sums or both, as the case may be, for which he proposes to supply all the materials and perform the work required by the specifications. Failure to examine specifications, schedules, and instructions pertaining to the work will not relieve the contractor of any work to be performed.

Bidders are invited to be present at the opening of bids, for at this time their contents will be made public for the information of bidders and others properly interested.

If the bid is made by an individual, it must be signed with the full name of the bidder whose address must be given; if it is made by a firm, it must be signed with the co-partnership name by a member of the firm, and the name and full address of each member must be given; and if it is made by a corporation, it must be signed by a properly authorized officer in the corporate name and the corporate seal must be attached to such signature.

The bidder shall affix to the bid the number of his current Utah well drillers License. He must be bonded and have a current permit from the Utah State Engineer.

The quantities listed in the bid are approximate only and are not guaranteed to be correct. They are the quantities, however, which will be used for the purpose of comparing bids. Bidders must carefully review the specifications in order that they may fully understand the intentions of the contract in regard to quantities.

Applications have been filed with the State Engineer for the necessary drilling permits. At the time of advertisement these had not yet been acted upon, however, it is expected that they will be granted by the time of the bid opening, nevertheless awarding of the contract must be contingent upon receipt of such permits from the State Engineer.

The contract will be awarded to the lowest responsible bidder complying with the necessary conditions provided his bid is reasonable and it is to the interest of the City to accept it. The bidder to whom the award is made will be notified at the earliest possible date. The City however, reserves the right to reject any and all bids and to waive any informality in bids received.

BID

Date _____

In compliance with the above invitation for bids and subject to all the conditions thereof, the undersigned offers and agrees to furnish all labor and materials and perform all work required for the construction of exploratory wells and water supply wells on the property and in the location as shown on the drawings, in strict accordance with the plans, specifications and bid schedule, for the consideration of unit and lump sum prices as shown in the bid schedule, provided this bid is accepted within ten (10) calendar days from date of opening of bids.

Bidder Harvey Osborne, (in charge) Mr. Denton & Mr. Alexander
Tech. Services Ralph C. Denton

Address 292 W - C. Provo Murrah, Idaho

By _____ Title _____
(Signature of person authorized to sign this bid)

Information to be furnished by bidders.

Exploratory Wells

Will well be drilled using rotary or cable tool methods? either
Cable
(State Which)

Description of equipment to be used _____

Production Wells

Will well be drilled using rotary or cable tool methods? Cable tool
Cable
(State Which)

Description of equipment to be used _____

A C C E P T A N C E

Date _____

Accepted as to Bid Schedule items numbered _____

LOGAN CITY CORPORATION

By _____

CONSTRUCTION CONTRACT

THIS CONTRACT made this _____ day of _____, 1961

by Logan City, a municipal corporation of Utah, hereinafter called the

"City" and _____ hereinafter called the

"Contractor" whose address is _____

witnesseth that the parties hereto agree as follows:

The Contractor shall furnish all of the materials and perform all
of the work required for _____

on the property in Logan City described as follows:

- 1 - Approximately 2000' S., 325' E., NW Cor. Sec. 35, Twp. 12 N.,
R. 1 E., Salt Lake Base and Meridian (Canyon Road and Crockett Ave.)
- 2 - Approximately 820' N., 1220' E., SW Cor Sec 34, Twp. 12 N., R. 1 E.
Salt Lake Base and Meridian (Center St. and 2nd E).
- 3 - Approximately 1,460' W., 350' N., SE Cor. Sec. 34, Twp. 12 N., R. 1 E.
Salt Lake Base and Meridian (7th No. and 6th E.).
- 4 - Approximately 3,660' W., 2,220' N., SE Cor. Sec. 27, Twp. 12 N., R. 1 E.
Salt Lake Base and Meridian (10th No. and 3rd E.).

The work shall be commenced _____

and shall be completed _____

IN WITNESS WHEREOF, the parties hereto have executed this contract as
of the date first above written.

LOGAN CITY CORPORATION

Approved by the Board of Commissioners

By _____
Mayor

Attest

City Recorder

Countersigned:

City Recorder

Contractor

PRODUCTION WELLS

ITEM	WORK, QUANTITY AND UNIT PRICE	TOTAL AMOUNT
8 -	Drilling production wells up to 400 feet deep. 1400 ft. at	22,400. ⁰⁰
	_____ per ft. (<u>13.50</u> Per ft.)	<u>18,900.⁰⁰</u>
	(Write in)	
9 -	Drilling production wells 400 to 700 feet depth. 300' @	4,800. ⁰⁰
	_____ per ft. (<u>16.25</u> per ft.)	<u>4,875.⁰⁰</u>
	(Write in)	
10 -	Drilling production wells 700 to 1000 feet depth. 100 feet at	2,000. ⁰⁰
	_____ per ft. (<u>19.00</u> per ft.)	<u>1,900.⁰⁰</u>
	(Write in)	
11 -	Casing production wells up to 400 feet depth. 1400 feet at	9,800. ⁰⁰
	_____ per ft. (<u>5.50</u> per ft.)	<u>7,700.⁰⁰</u>
	(Write in)	
12 -	Casing production wells 400 to 1000 feet depth. 400 feet at	2,800. ⁰⁰
	_____ per ft. (<u>5.50</u> per ft.)	<u>2,200.⁰⁰</u>
	(Write in)	
13 -	Perforating production wells. 300 feet at	300. ⁰⁰
	_____ per ft. (<u>1.⁰⁰</u> per ft.)	<u>300.⁰⁰</u>
	(Write in)	
14 -	Testing production wells. 150 hours at	2,250
	_____ per hour (<u>22.⁰⁰</u> per hour)	<u>3,300</u>
	(Write in)	
	Total	<u>54,375.⁰⁰</u>
		<u>60,600.⁰⁰</u>

add 550.⁰⁰ for each move

SPECIFICATIONS

GENERAL CONDITIONS

1. Location of Work - The desired wells are to be located at approximately the following points in Logan, City.

- No. 1 2000' S., 325' E., NW Cor. Sec. 35 Twp 12 N., R. 1E
Salt Lake Base and Meridian.
(Canyon Road and Crockett Ave.)
- No. 2 820' n., 1220' E., SW Cor. Sec. 34, Twp 12 N., R. 1E.,
Salt Lake Base and Meridian
(Center St. and 2nd E.)
- No. 3 1460' W., 350' N., SE Cor. Sec. 27, Twp 12 N., R. 1 E
Salt Lake Base and Meridian.
(7th North and 6th E.)
- No. 4 3660' W., 2220' N., SE Cor. Sec. 27, Twp 12 N., R. 1 E
Salt Lake Base and Meridian
(10th No. and 3rd E.)

2. Description - The work consists of drilling up to four 16" wells for water. It is planned to drill a test hole in advance on at least the first two locations, and, at the other two if deemed necessary by the Engineer. After completion of the test well, if the results are favorable, the driller will proceed with construction of the production well at each location. The holes may be drilled using either cable tool or rotary drilling methods. It is planned to use aquifers at depths between 250 and 400 feet although greater depths up to 1,000 feet may be drilled if necessary. Work will include drilling, installation of casing and/or screen, perforations and testing. The owner reserves the right to omit any or all of the work on production wells if, in the opinion of the Engineer, the test wells are unfavorable.

3. Definitions -

Owner - Logan City Corporation

Contractor - Party or parties entering into this contract to perform the work herein.

Engineer - Person or persons appointed by the owners to be Engineer or such agents as he designates acting within the scope of the particular duties assigned to them.

4. Bonds - The successful bidder shall furnish a performance bond with sureties satisfactory to the owner in the amount of 50 percent of the bid price.

5. Rights of Way - The necessary rights-of-way and permits required for proper construction of the well will be furnished by the owner.

6. Visits to Sites, Verification of Data- The bidder shall satisfy himself regarding the sites and is encouraged to study logs of existing wells in the office of the Utah State Engineer. No allowance will be made after the bid has been accepted for errors made in this connection.

7. Liability- The contractor shall maintain such insurance, as required by Utah State Law, as will protect the owners and himself from claims under the Workmen's Compensation Acts and for any other claims for damages for personal liability, including death, and for property.

8. Safety - The contractor shall at all times exercise reasonable precautions for the safety of employees and the public. The work shall be protected with barricades in such a manner that the public shall be excluded from dangerous areas. The contractor shall cover or otherwise exclude persons from accidental entry to open holes and maintain such signals and flares as may be necessary to warn the public from any danger. The contractor shall indemnify and save harmless the owner against all suits, claims, and actions of every name and description brought against them, and all costs and damages to which the owner may be put on account or by reason of any injury or alleged injury to the person or property of another, resulting from negligence or carelessness in the performance of the work, or in guarding the work, or from any improper materials used, or by or on account of any act or omission of the contractor or his agent or employees.

9. Care of Property and Cleaning Up - The contractor shall at all times conduct the work in such a way as to prevent undue damage to the property. He shall dispose of all mud, drill cuttings, and other refuse in a workmanlike manner. He shall assume the responsibility for damage to existing installations from operations under this contract. He shall at his expense remove all his equipment and clear the well sites to the satisfaction of the engineer. The contractor shall maintain the well in good condition until accepted by the owner.

10. Superintendence - The contractor shall personally superintend the work or shall have a competent well drilling foreman or superintendent with authority to act for him, satisfactory to the engineer on the work at all times during progress thereof.

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12. Drilling Permits - The owner has applied for the appropriations from the State Engineer. At the date of advertisement, these had not been approved. It is anticipated that these will be cleared by the time set for awarding the contract; nevertheless, execution of the contract shall be contingent upon the granting of the necessary permits by the State Engineer and the owner reserves the right to reject all bids in the event such permits are not granted by the State Engineer within the necessary time specified for executing the contract.

13 - Quantities and Unit Prices - Quantities noted on the schedule are approximations for comparison of bids and no claim shall be made for excess or deficiency therein. Payment at the prices agreed upon shall be full compensation for completed work and will cover materials, supplies, labor, tools, machinery and all other expenditures incident to satisfactory compliance with the contract, unless otherwise specifically provided. It is desired to develop 4 wells producing not less than 3 c.f.s. each and quantities will be adjusted to most economically achieve this result, if practical, based on the information obtained from exploratory drilling, the recommendations of the contractor and the judgement of the engineer. The owner reserves the right to cancel or omit any and/or all items of the contract except drilling and casing the exploratory holes, Items 1 and 3, if, in the opinion of the engineer, based on the exploratory results, proceeding with such items would be unpromising or unnecessary.

14 - Minimum Amount of Work - The minimum value of the work required by this contract would be a value equivalent to drilling and casing 4 test holes 400 feet deep. This would be the case in the event the test holes at all four locations proved unfavorable. In this event the owner may wish to drill an exploratory hole to a greater depth, but reserves the right to decide this on the basis of conditions found by the previous exploratory program.

15 - Payment - Partial payments will be made based on the amount of work completed during each calendar month and accepted by the Engineer and will be due not later than the 10th of the succeeding month. Payment for holes will be based on the depth measured from the ground surface to the bottom of the hole. Ten percent of partial payments shall be withheld until final completion and acceptance of all the work covered by this contract.

16 - License Regulations - The contractor shall be licensed and bonded to drill water wells in Utah in compliance with the regulations of the State Engineer.

17 - Test Discharges - Discharges of the wells during pumping tests will be discharged into nearby irrigation canals. The contractor shall furnish and install adequate pipe to convey such discharges to the appropriate canal without extra cost to the owner. He shall discharge the water into the canal in such a manner that there shall be no erosion damage and shall repair any such damage. Permission to discharge into canals will be obtained by the owner.

SPECIAL CONDITIONS

Exploratory Wells

1. Drilling Methods - Test holes shall be approximately 6" diameter as necessary to continue hole to desired length and may be drilled with a rotary rig or by using cable tools. Holes shall be cased with steel casing meeting the specifications set forth in Article 4. It is intended that casing will not be removed. Contractor shall furnish rig and shall equip himself with all necessary tools, pumping equipment, supplies, power and lighting and all other materials necessary for the efficient execution of the work.

2. Logs and Samples - A log of drilling conditions shall be carefully kept by the contractor for each hole. Samples shall be taken whenever a change in the formation or of the character of the materials occurs. Samples shall be obtained with a sample bucket or bailer if cable tools are used. If rotary drilling, the cuttings from the formations shall be allowed to accumulate in the trough and there collected. Samples shall be placed in containers furnished by the owner.

3. Drilling - The bid price per foot items 1, 2, for drilling the exploratory holes shall include all the costs therefore except casing and perforating including moving equipment in, furnishing all supplies and power, drilling the hole, and providing logs and samples in accordance with these specifications. The depth of the exploratory holes shall be determined by the engineer, but shall not exceed 1000 feet.

4. Casing - The bid price per foot, items 3, 4, for casing shall include the entire cost of the casing and all labor materials and supplies necessary to install same as required by this article. It is intended that the exploratory holes shall generally be cased for their entire length, however, this shall be as ordered by the engineer. Under artesian conditions, casing must be sealed in the hole to prevent extraneous flow and capped with a water tight screw cap fitted with a 1½ inch nipple or coupling. Alignment and plumbness shall be adequate to permit installation of test pump. Casing for exploratory wells shall be steel or wrought iron. May be new or used. If used, casing shall be straight, clean, and free from kinks, pitting and excessive rust and shall be of adequate strength and thickness for the purpose conforming to standard and accepted practice for cased wells of the diameter and depth specified.

5. Perforations - Perforations shall be made with a Mills knife or equivalent at elevations recommended by the contractor, but agreed upon and as directed by the engineer. The bid price for perforating item 5 per foot shall be the entire cost of making such perforations including crew and rig.

6. Plugging - It is likely that artesian conditions will be encountered. The contractor shall be equipped to place concrete plugs in the holes if necessary and if so ordered by the engineer. The depths at which such plugs may be necessary shall be determined by the engineer. The plugs shall totally shut off the flow and/or prevent waters from mixing in different aquifers. The bid price, item 7 shall include furnishing of packers, cement, and other materials necessary to accomplish total plugging. Plugs shall be 5 feet long.

7. Hourly Charge for Drill Unit for Experimental Work and Testing

The bid price per hour, Item 6 shall include entire price for drill rig and crew with basic supplies of fuel, lubricant and drilling mud, etc. Hourly charge for this service must be ordered in writing by the engineer. This service will include test pumping the exploratory hole and the driller shall provide himself with all necessary pump, tools, and devices for measuring discharge and drawdown.

Production Wells

8. Drilling - Hole shall be 16 to 24 inch overall with 16- inch casing. Hole may be drilled using cable tools or rotary rig. If overall size of hole is larger than the size of casing, the engineer shall specify the grade of gravel and sealing material to be used in filling the annular space and the depth at which the annular space shall be sealed. Centering devices or casing stirrups shall be attached at reasonable intervals as directed by the engineer. At depths exceeding 400 feet, hole may be reduced to 12 to 20 inches and casing to 12 inches. Bid price per foot of hole, items 8, 9, 10 shall include entire cost of drilling including moving in, labor, materials, equipment and drilling supplies and developing. Contractor shall furnish rig and shall equip himself with all necessary tools, pumping equipment, supplies and other materials necessary for the efficient execution of the work.

9. Casing - The bid price per foot for casing, items 11, 12 shall include all costs of furnishing and installing casing in the well in accordance with this article. Casing for production wells shall conform to the size and minimum weight specified in the tabulation at the end of this article. It shall be new pipe and installed in the hole straight and plumb. It shall be tested for plumbness and alignment by passing a 40 foot dummy into the casing or by other methods approved by the engineer. The dummy shall have an outside diameter $\frac{1}{2}$ inch smaller than the inside of the casing and shall move freely throughout the length of the casing to the deepest anticipated setting of pump - estimated to be 250 feet. The exact depth of well and length of casing shall be determined by the engineer on the basis of the drilling records and such other measurements as he shall require the contractor to make. Where a reduction in size of casing is required, an adequate overlap shall be made and a watertight seal provided. The inside casing at this point shall be cut off and removed.

<u>Diameter</u>	<u>Weight Per Foot</u> <u>Cable - Tool Well</u>	<u>Rotary</u> <u>Drilled Well</u>
12"	43.	33.0
14"	45.	37.0
16"	52.	42.0

10. Perforations - Perforations for the production well may be made with a Mills knife or equivalent. The size and number per foot and the depths will be based on recommendations of the driller, but will be as specified by the engineer. Bid price per foot, item 13, shall include the entire cost of perforating casing already installed. The engineer shall be present during the perforating process. Together with the contractor he will measure the depth to the knife at the beginning and end of the perforating process.

11. Developing - After the casing is installed, the contractor shall develop the well by bailing or surging as required by the engineer. Costs of developing are considered part of drilling costs.

12. Testing - Contractor shall provide test pump, discharge lines, power supply, devices for measuring discharge and drawdown and all other equipment and supplies necessary to perform a drawdown test of the production well when so ordered in writing by the engineer. Payment for testing shall be at the hourly rate bid therefore on the bid schedule, item 14.

LOGAN CITY WELLS

<u>Well No.</u>	<u>Ground Elevation</u>	<u>Static Water Level</u>	<u>Draw Down</u>	<u>Pumping Level 10 cfs</u>	<u>Pump to Elevation*</u>	<u>Pumping Head</u>
1	4,590	4,487	15'	4,472	4,742	270'
2	4,542	4,487	35'	4,452	4,742	290'
3	<u>4,632</u>	<u>4,487</u>	<u>25'</u>	<u>4,462</u>	<u>4,742</u>	<u>280'</u>
Average	4,588	4,487	25'	4,462	4,742	280'

*Based on pressure zone at elevation 4,626 with 116' head on low side of regulator

Pumping cost one acre foot with power cost of 1¢ Kw/h, 62% efficiency wire to water, 1676 per 100' of 11ft = \$1.65. \$1.65 x 2.80 = \$4.62 per acre foot power cost. (See page 1676 Merriman & Wiggen - 5th Edition)

Well # 1 - Canyon Road & Crockett Avenue	978' - 20" to 12"	\$24,808
Well # 2 - 2nd East & Center	1000' - 20" to 16"	27,930
Well # 3 - 7th North & 6th East	467' - 20" to 12"	<u>13,683</u>
Average Cost, drill, case, perforate & test		\$22,140
Pump Cost		7,600
Motor & Controls		7,600
Pumphouse & Miscellaneous		<u>2,660</u>
Total Cost - One Well Equipped for 10 cfs - 280' Head		\$40,000

June 13, 1963

LOGAN WELL
ANNUAL DEPRECIATION
STRAIGHT LINE

Well - 50 years	\$22,140	\$ 443.00
Motor - 25 years	7,600	304.00
Pump - 15 years	7,600	507.00
Pumphouse - 50 years	2,660	<u>53.00</u>
Total Annual Depreciation		\$1,307.00
M & O - 5 months without power - 3/4 of \$40,000 at 2%/year		<u>600.00</u>
	Annual Cost	\$1,907.00

Use of Water - 1961 = 1905 a.f., 1962 = 1624 a.f.
Average one dry year and one wet year = 1765 a.f.
Would anticipate approximately 65 acre feet a year increase
In 20 years usage of 3065 a.f.
Average depreciation period 30.6 years
Average first 20 years = $(1765 + 3065) \div 2 = 2415$ a.f.
 $((2415 \times 20) + (3065 \times 10.6)) \div 30.6 = 2640$ a.f./year average
 $1907 \div 2640 = \$0.72/\text{a.f.}$
 $4.62 + 0.72 = \$5.34/\text{a.f.}$

ANNUAL DEPRECIATION
ANNUITY BASIS 3½%

Well - 50 years	\$22,140 at 0.0076	\$ 168.00
Pumphouse - 50 years	2,660 at 0.0076	20.00
Motor & Controls - 25 years	7,600 at 0.026	198.00
Pump - 15 years	7,600 at 0.052	<u>395.00</u>
Total Annual Depreciation		\$ 781.00
M & O - 5 months; take 3/4 of annual - 40,000 at 2%		<u>600.00</u>
Total M & O (without power) & depreciation		\$1,381.00

$1381 \div 2640 = \$0.52/\text{a.f.}$ for depreciation & power
4.62/a.f. for power
\$5.14/a.f. - Total Cost

(Ref. Merriman & Wiggins, 5th Edition - Pages 57, 58 & 2112)

installment required, paid at the end of each year of the period. Then $I = S i / (1 + i)^n - 1$. The following table gives annual installments required to create a fund of one dollar (equal to I/S) in various periods at various interest rates. Thus the annual installment necessary to accumulate \$22 000 in 25 years, at 4%, is $22\ 000 \times \$0.02401$, or \$528.22; the interest earning is $22\ 000 - (25 \times 528.22)$, or \$8794.50.

Annual Annuity Required to Accumulate \$1 (Installments plus Interest Earnings)

No. of Years	Rates of compound interest						
	2%	2 1/2%	3%	3-1/2%	4%	4-1/2%	5%
1	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
2	0.49505	0.49382	0.49261	0.49140	0.49020	0.48900	0.48780
3	0.32675	0.32514	0.32353	0.32193	0.32035	0.31877	0.31721
4	0.24262	0.24082	0.23902	0.23725	0.23550	0.23374	0.23201
5	0.19218	0.19025	0.18835	0.18648	0.18463	0.18279	0.18098
10	0.09133	0.08926	0.08723	0.08524	0.08329	0.08138	0.07950
15	0.05782	0.05577	0.05380	0.05183	0.04994	0.04811	0.04634
20	0.04116	0.03915	0.03722	0.03536	0.03356	0.03187	0.03024
25	0.03122	0.02928	0.02743	0.02567	0.02401	0.02244	0.02095
30	0.02465	0.02278	0.02102	0.01937	0.01783	0.01639	0.01505
35	0.02000	0.01821	0.01654	0.01499	0.01358	0.01227	0.01107
40	0.01655	0.01484	0.01326	0.01183	0.01052	0.00934	0.00828
45	0.01391	0.01226	0.01080	0.00945	0.00826	0.00720	0.00626
50	0.01182	0.01026	0.00886	0.00763	0.00655	0.00560	0.00478

The Present Worth of a given sum due at a future time is such a sum which if now placed at interest, would amount to the given sum at that time. Let p = present worth, a = given sum due in n years from now, and i = interest rate; then on simple interest basis $p = a / (1 + in)$, and on annual compound $p = a / (1 + i)^n$. The following table gives present worths, computed at various rates of compound interest, of \$1 due in various periods. For example, an addition to plant necessary 5 years hence will then entail a cost of \$8000; how much can one afford to pay for such addition now, it being without use or expense for 5 years? As much as the present worth of \$8000 due in 5 years at the current rate of interest, that is, if the rate is 5%, $8000 \times \$0.78353$, or \$6268.24.

Present Worth of \$1 Due at a Future Date

No. of Years	Rates of compound interest						
	2%	2 1/2%	3%	3 1/2%	4%	4 1/2%	5%
1	0.98039	0.97561	0.97087	0.96618	0.96154	0.95694	0.95238
2	0.96117	0.95181	0.94260	0.93351	0.92456	0.91573	0.90703
3	0.94232	0.92860	0.91514	0.90194	0.88900	0.87630	0.86304
4	0.92385	0.90595	0.88849	0.87144	0.85480	0.83856	0.82270
5	0.90573	0.88385	0.86261	0.84197	0.82193	0.80245	0.78352
6	0.82035	0.78120	0.74409	0.70892	0.67556	0.64393	0.61391
7	0.74301	0.69147	0.64186	0.59689	0.55526	0.51672	0.48122
8	0.67297	0.61027	0.55368	0.50257	0.45639	0.41464	0.37689
9	0.60953	0.53939	0.47761	0.42315	0.37512	0.33273	0.29530
10	0.55207	0.47674	0.41199	0.35628	0.30832	0.26700	0.23138
15	0.50003	0.42137	0.35538	0.29998	0.25342	0.21425	0.18129
20	0.45289	0.37243	0.30656	0.25257	0.20829	0.17193	0.14205
25	0.41020	0.32917	0.26444	0.21266	0.17120	0.13796	0.11130
30	0.37153	0.29094	0.22811	0.17905	0.14071	0.11071	0.08720

The present Worth of an Annuity is the sum which now placed at compound interest will reach the same amount as will be reached by the annuity. Let $V =$ the present value of an annuity I ; then $V = \frac{I [1 - (1+i)^{-n}]}{i}$. The following table gives values of an annuity of \$1 for various periods and various rates. Thus, the present worth of an annuity of \$1 for 20 years at 4% is \$13.59.

Present Value of an Annuity of \$1

No. of Years	Rates of compound interest						
	2%	2-1/2%	3%	3-1/2%	4%	4-1/2%	5%
1	0.98039	0.97561	0.97087	0.96618	0.96154	0.95694	0.95238
2	1.94156	1.92742	1.91347	1.89969	1.88609	1.87267	1.85941
3	2.88383	2.85602	2.82861	2.80164	2.77509	2.74896	2.72325
4	3.80773	3.76197	3.71710	3.67308	3.62989	3.58753	3.54595
5	4.71346	4.64582	4.57971	4.51505	4.45182	4.38998	4.32948
10	8.98258	8.75206	8.53020	8.31660	8.11090	7.91272	7.72173
15	12.84926	12.38138	11.93793	11.51741	11.11839	10.73955	10.37966
20	16.35143	15.58916	14.87747	14.21240	13.59033	13.00794	12.46221
25	19.52346	18.42438	17.41315	16.48151	15.62208	14.82821	14.09394
30	22.39646	20.93029	19.60044	18.39204	17.29203	16.28889	15.37245
35	24.93622	23.14516	21.48722	20.00066	18.66461	17.46101	16.37419
40	27.35548	25.10277	23.11477	21.35507	19.79277	18.40158	17.15909
45	29.69016	26.83302	24.51871	22.49545	20.73004	19.15635	17.77407
50	31.82361	28.36231	25.72976	23.45562	21.48218	19.76291	18.25592

Annual Depreciation of a property is the necessary annual installment of the annuity which will amount to the first cost of that property at the expiration of its useful life; annual depreciation is also expressed in percentage of first cost. Thus, if the first cost of a part of a plant is \$10 000 and its life is estimated at 40 years, then if money is worth 3%, the annual depreciation is $10\ 000 \times 0.01326$, or \$132.60, and the rate of depreciation is 1.326%.

Capitalization of a plant is the sum of the first cost C and the capital necessary to earn annually (a) the annual cost of operation O and (b) the annual depreciation D ; that is, if i is the interest rate, capitalization equals $C + (O + D)/i$. Thus, if in the preceding illustration $O = \$500$, the capitalization equals $\$10\ 000 + (\$500 + \$132.06)/0.03 = \$31\ 068$.

Annual Annuity for Various Periods which \$1 will Purchase

No. of Years	Rates of compound interest						
	2%	2-1/2%	3%	3-1/2%	4%	4-1/2%	5%
1	1.02000	1.02500	1.03000	1.03500	1.04000	1.04500	1.05000
2	0.51505	0.51883	0.52261	0.52640	0.53020	0.53400	0.53780
3	0.34675	0.35014	0.35353	0.35693	0.36035	0.36377	0.36721
4	0.26282	0.26582	0.26903	0.27225	0.27549	0.27874	0.28201
5	0.21216	0.21525	0.21835	0.22148	0.22463	0.22778	0.23097
10	0.11133	0.11426	0.11723	0.12024	0.12329	0.12638	0.12950
15	0.07783	0.08077	0.08377	0.08683	0.08994	0.09311	0.09634
20	0.06116	0.06415	0.06722	0.07036	0.07358	0.07686	0.08024
25	0.05122	0.05428	0.05743	0.06067	0.06401	0.06744	0.07095
30	0.04465	0.04778	0.05102	0.05437	0.05783	0.06139	0.06505
35	0.04000	0.04321	0.04654	0.05000	0.05358	0.05727	0.06107
40	0.03656	0.03984	0.04326	0.04683	0.05052	0.05434	0.05828
45	0.03391	0.03727	0.04079	0.04445	0.04826	0.05220	0.05626
50	0.03182	0.03526	0.03887	0.04263	0.04655	0.05060	0.05478

The formula for this table is $i/(1 + i)^{-n}$.

ADVANCED MATHEMATICS

8. Differential Calculus

Definitions and Symbols. In a discussion of quantities regarded as having the same value throughout, and quantities to take different values. When several variables are interdependent, each is a function of the others; thus, the sides of a triangle of constant altitude being definitely related, are functions of each other. Also any expression containing a quantity is a function of that quantity; thus $ax^2 + bx + c$ and $ay^2 + by$ is a function of x and y . The following abbreviations: $f(x)$, $F(x)$, $\phi(x)$, etc., for functions of x ; $f(x, y)$, $F(x, y)$, $\phi(x, y)$, etc., for functions of x and y . The letters f , F , ϕ , etc., are functional notations of x and y , etc. The letters f , F , ϕ , etc., are functional notations of x and y , etc. The letters f , F , ϕ , etc., are functional notations of x and y , etc. Thus if $f(x)$ denotes $x^3 + 6x - 7$, then $f(y)$ denotes $y^3 + 6y - 7$. Thus if $f(x)$ as $y = x^2 + 4x$, the equation being solved for y explicit function of x ; but in $F(x, y) = 0$, as $xy + 4x^2 - y^2$ not being solved for y , then y is an implicit function of x and for each value of x there is only one value of y , then y is a function of x ; if for each value of x there is more than one value of y is a multiple-valued function.

If two variables x and y are related and x is regarded as taking on any value x_1 and x_2 then y its corresponding values, x is the independent and y the dependent. When any variable x changes from a value x_1 to a value x_2 , the difference increment of x ; any increment of x is denoted by Δx , also dx . An increment be positive or negative; when negative, the numerical value of the increment is a decrement. A variable regarded as taking on equal increments is an equal variable. If in $y = f(x)$ all equal changes in x produce equal changes in y , the form variable with respect to x , and the graph of $y = f(x)$ is straight. with respect to x , or the x -rate of y , is the change in y per unit change in x (Fig. 20), is any change in x , and $y_2 - y_1$, or Δy , is the corresponding change in y . Then the x -rate of y is $(y_2 - y_1)/(x_2 - x_1) = \Delta y/\Delta x$. If in $y = f(x)$ all in x do not produce equal changes in y , then y varies non-uniformly with respect to x , or at a variable rate; the graph of $y = f(x)$ is a curve. The average rate of y with respect to x , or average x -rate of y , for any change in x , is that constant rate which would give the actual change in y due to the change in x . For the change $x_2 - x_1$ in x (Fig. 21) this constant rate is $(y_2 - y_1)/(x_2 - x_1)$, or $\Delta y/\Delta x$, and is represented by the slope of the chord AB . The actual x -rate of y when $x = x_1$, say, is the value which the average rate $\Delta y/(x_2 - x_1)$ approaches as x_2 is taken nearer and nearer to x_1 ; this limiting average rate, or actual rate, is represented by the tangent line at A . As $y = f(x)$, the x -rate of y is also the x -rate of $f(x)$.

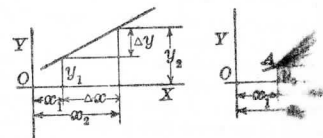
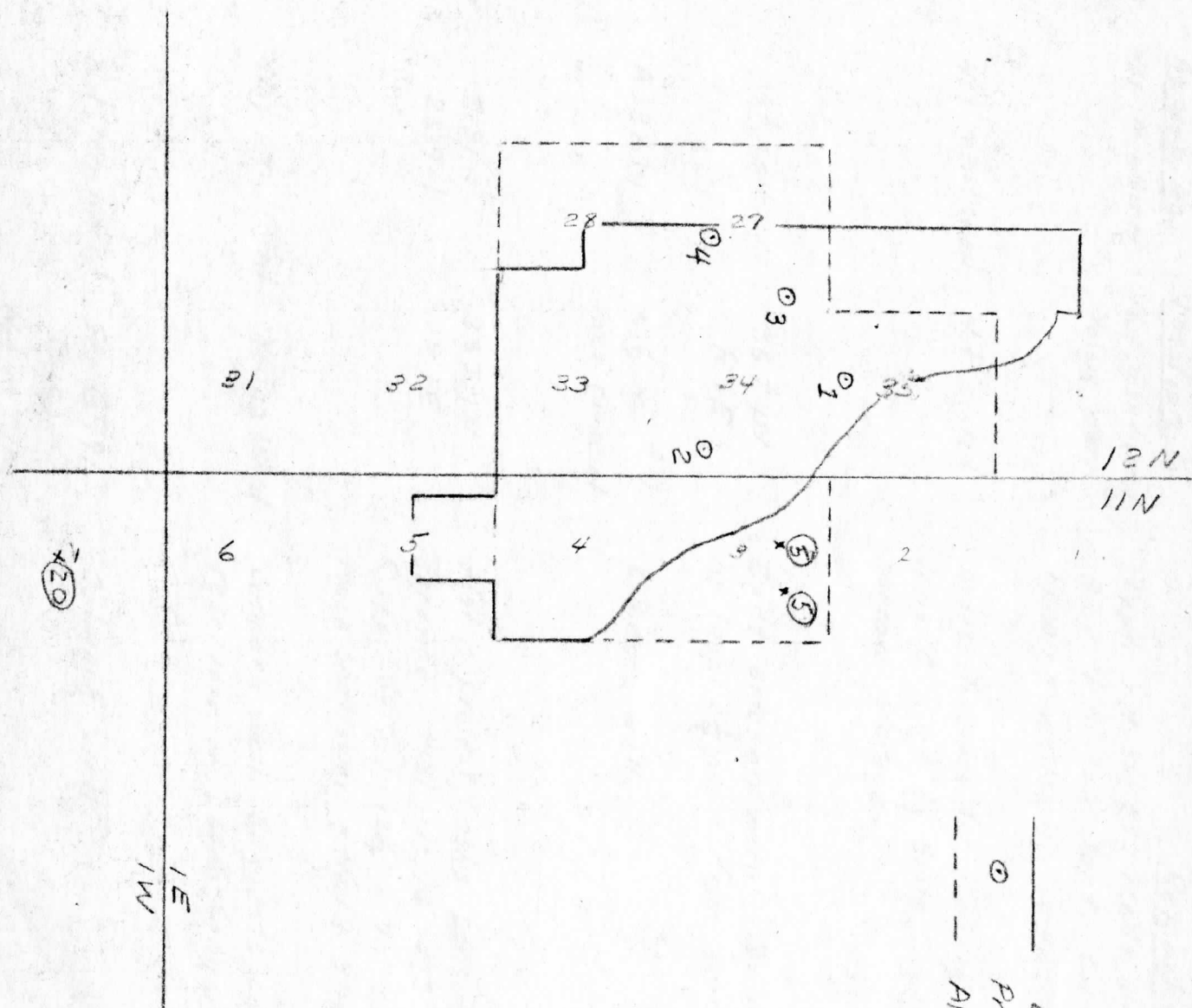


Fig. 20

The Derivative, the differential coefficient, and the differential of $f(x)$, y being equal to $f(x)$, with respect to x are expressed by $\frac{dy}{dx}$, the x -rate of y or of $f(x)$; the first is the most common standard notations for this quantity: thus, $D_x y$ or $D_x f(x)$ (the subscript is generally omitted), and dy/dx or $d/dx f(x)$ (the subscript is generally omitted) and have the advantage of being obtained in the first instance. If the curve in Fig. 21 is such that $\frac{dy}{dx} = \tan \alpha$ (where $\alpha = \alpha_1$), α being the slope angle at A .



——— LOGAN CITY LIMITS
 ○ Proposed wells.
 - - - Area canvassed.

<u>Protestant</u>	<u>Approp No</u>	<u>Location</u>	<u>Remarks</u>
① Floyd V. Israelsen Rte 1, Box 184 Logan, Utah	Not mentioned	Not mentioned Young Ward	Depth not stated. Wells already drying up. Must be 3 or 4 miles distant. Culinary and animal use of flowing wells.
② Lorn Coburn (Logan & Blacksmith Fork Irrig Co) RFD # 1, Logan.	Not mentioned	Not stated	Artesian wells for culinary purposes. Cites closure of Irrig Co well by State Engineers. Suggests city develop surface storage.
③ Willard K Hill RFD # 1, Logan	Not mentioned	SG T11N R1E	Eight artesian wells. Six irrigation, 2 culinary. At least $2\frac{1}{4}$ miles from nearest proposed well.
④ Norman J. Olsen RFD # 1 Logan, Utah	A23877	Not in area canvassed	Culinary well.
⑤ Heber Olsen, mayor River Heights Town. River Heights, UT	8131 2317-1	S3T11N R1E	Not a protest, asks consideration of possible interference. 8131 12/14"-192' on bench immed. so of River. 2317-1 12 1/2"-140' so of but near Logan River. Much shallower strata than proposed wells.
⑥ Frederick N. Lloyd RFD # 1 Logan, Utah	Not mentioned	Young Ward	Culinary well. Suggests combined fish and storage Reservoir in Logan Canyon.
⑦ Russell Williams RFD # 1 Logan, Utah	Not mentioned	Sec G491 (S1E) Not in area canvassed	Culinary well.

<u>Protestant</u>	<u>Approp No</u>	<u>Location</u>	<u>Remarks</u>
⑧ Orson W. Wilson Rte 1, Logan	31820	Not in area canvassed	Culinary well.
⑨ Dimworth Young Rte 1, Logan	A 29306		Culinary well. Suggests City store in Logan Canyon and provide booting facilities.
⑩ Ray E. Jensen RFD 1, Logan	1070 694 695 696	699 811-1-14 prec 1	4 1/2 miles from nearest proposed well. Culinary and stock watering wells.
⑪ David L. Olsen RFD Box 209 Logan	Not Mentioned	Bottom of Caché Valley	Culinary and stock well. Feels other sources available to Logan City
⑫ Geo F Olsen RFD 1 Logan.	816 817	Not in area canvassed.	"Many good dam sides up Logan Canyon..." No specific info re his wells
⑬ W. Neil Jensen RFD #1 Logan	A30204	Not in area canvassed.	Culinary and stock well.
⑭ Bert W Olsen (No address given)	1152-5	Not in area canvassed.	Culinary and stock wells. 4 well. Inow dry. 1 other almost dry.
⑮ Willard Leo Herzog (No address given)	Not given		Does he have a well? ↓ "..... many areas in Logan Canyon" which could be used for water storage... He does not say

	<u>Protestant</u>	<u>Approp No'</u>	<u>Location</u>	<u>Remarks</u>
(16)	Mrs Melvin Nelson Logan, Utah	1476 1477	Not in area conversed	Culinary use. "Most of wells are down this year"
(17)	Bp. Chas. E Schenk RFD # 1 Logan, Utah	None given		Culinary water from flowing well. Logan should "-- Procure and process the abundant surface water --"
(18)	Verla S. Carson Melrose A Carson 649 So 8th West Logan, Utah	None given	Cannot find a claim under this name in Sec 5 which includes this address.	No specific information about well given. "we are sure it would tap our source of water." This is 1 1/2 miles from nearest proposed well. What is depth?
(19)	Rulon S. Olsen RFD 1 Logan, Utah	None given	Not stated	Feels will have harmful effect on wells must rely on for water. Logan City has other sources.
(20)	Kenneth Septh (No address given)	22269	52498' E 620' N 1/4, S 1, T 11 N R 1 W.	2" dia. Depth not stated. "Logan has other ways to get water" 4 miles from proposed well.
(21)	Courtney A. Jensen RFD # 1 Logan, Utah	None given	"Just west of Logan"	Culinary wells "-- places in Logan Canyon that could be developed for water storage --"
(22)	Evan L Olsen RFD # 1 Box 200 Logan, Utah (Young Ward)	None given	Presumably Young Ward.	Does he own a well? He doesn't say. "neighbor just 2 1/2 miles away who has to pump every day for his cows." "... Logan City has overlooked the possibility of storing water in Logan Canyon"

<u>Protestant</u>	<u>Approp No</u>	<u>Location</u>	<u>Remarks</u>
(23) Van E. Jensen RFD No. 1 Logan, Utah	A 23999	Young Ward	Culinary well. Present time our wells are threatened by trawls
(24) Frank E. Harris RFD # 1 Logan, Utah		S 2 T 11 N R 1 W	Culinary well. Five miles away.
(25) Marden A. Turner Verma, O. Turner Logan, Utah	Not given	Young Ward 5 miles south. west of Logan	Culinary and garden irrigation.
(26) Earl B. Jensen (No address given)	1070 694 695 696	697 698 699 700	These are the same wells protested by Ray E. Jensen. See (10).
(27) A.D. Olsen RFD No. 1 Logan, Utah.	A 17432	Presumably Young Ward	
(28) John Baer RFD # 1 Logan, Utah		Presumably Young Ward	Claims artesian wells for culinary water.
(29) Danie / J. Olsen RFD # 1 Box 211	Not stated	Presumably Young Ward.	No information given except implies dependence for irrigation and culinary use.
(30) E. Floyd Olsen Rte 1, Logan	10033 10034	Presumably Young Ward	Culinary use.

<u>Protestant</u>	<u>Approp No.</u>	<u>Location</u>	<u>Remarks</u>
(31) Robert Thaiman RFD # 1 Logan, Utah	10399	SITTI RIV?	Four miles away. Culinary supply. 2", 86 GPM.
(32) Craig Pinder, Secy Logan River and Blocksmith Fork Irrigation Co. RFD # 1, Logan			Protest on grounds dry up Logan River and springs between mouth of canyon and their diversion
(33) Merle Isaacson RFD # 1 Logan, Utah	Not stated	College Ward	Location not definite. College Ward is 5-6 miles from nearest well.
(34) Ronald DeJend? College Ward	Not stated	College Ward.	Well 125' deep. Uses pump all the time Opposed to lowering water table.
(35) Ross D. Olsen Logan	Not stated	5 miles west of Logan	Water supply for home. "Storage areas can be developed in Logan Canyon"