Exhibit A

STATE OF MISSOURI

Matt Blunt
Secretary of State

CORPORATION DIVISION

CERTIFICATE OF GOOD STANDING

I, MATT BLUNT, Secretary of the State of Missouri, do hereby certify that the records in my office and in my care and custody reveal that

CALVEY BROOK WATER INC.
00520624

was created under the laws of this State on the 29th day of April, 2003, and is in good standing, having fully complied with all requirements of this office.

IN TESTIMONY WHEREOF, I have set my hand an imprinted the GREAT SEAL of the State of Missouri, on this, the 22nd day of August, 2003

Matt Blunt
Secretary of State

Certification Number: 6037888-1 Page 1 of 1 Reference:
Verify this certificate online at http://www.sos.state.mo.us/businessentity/verification

SOS #30 (1-01)

No. 00520624

STATE OF MISSOURI

Matt Blunt
Secretary of State

CORPORATION DIVISION

CERTIFICATE OF INCORPORATION

WHEREAS, duplicate originals of Articles of Incorporation of

CALVEY BROOK WATER INC.

have been received and filed in the office of the Secretary of State, which Articles, in all respects, comply with the requirements of General and Business Corporation Law;

NOW, THEREFORE, I, MATT BLUNT, Secretary of State of the State of Missouri, by virtue of the authority vested in me by law, do hereby certify and declare this entity a body corporate, duly organized this date and that it is entitled to all rights and privileges granted corporations organized under the General and Business Corporation Law.

IN TESTIMONY WHEREOF, I have set my hand and imprinted the GREAT SEAL of the State of Missouri, on this, the 29th day of APRIL, 2003.

Matt Blunt
Secretary of State

$58.00

SOS #30 (1-01)

State of Missouri

Matt Blunt, Secretary of State

Corporations Division
P.O. Box 778, Jefferson City, MO 65102

James C. Kirkpatrick State Information Center
600 W. Main Street, Rm 322, Jefferson City, MO 65101

Articles of Incorporation

(To be submitted in duplicate by an attorney or an incorporator)

The undersigned natural person(s) of the age of eighteen years or more for the purpose of forming a corporation under the General and Business Corporation Law of Missouri adopts the following Articles of Incorporation:

Article One

The name of the corporation is CALVAY BROOK WATER INC.

Article Two

The address, including street and number, if any, of the corporation's initial registered office in this state is

2801 W. OSage (Street Address (P.O. Box may only be used in conjunction with a physical street address)) Pacific (City) MO (State) 63072 (Zip)

and the name of its initial agent at such address is Jeff Snider

Article Three

The aggregate number, class and par value, if any, of shares which the corporation shall have authority to issue shall be:

1,000 Shares @ 1.00 Per Share

The preferences, qualifications, limitations, restrictions, and the special or relative rights, including convertible rights, if any, in respect to the shares of each class are as follows:

Article Four

The extent, if any, to which the preemptive right of a shareholder to acquire additional shares is limited or denied.

FILED

APR 29 2003

Matt Blunt
SECRETARY OF STATE

AUG-12-2003 16:49 SEC. OF STATE INC. 573 522 6525 P.02/08

Article Five

The name and place of residence of each incorporator is as follows:

Name	Street	City/State/Zip
JEFF SNIDER	4616 ~~PO Box 107~~	ROBERTSVILLE MO 63072
ROGER GULLET	2135 Young Rd.	PACIFIC MO. 63069

Article Six
(Designate which and complete the applicable paragraph.)

? The number of directors to constitute the first board of directors is 2. Thereafter the number of directors shall be fixed by, or in the manner provided by the bylaws. Any changes in the number will be reported to the Secretary of State within thirty calendar days of such change. **(NOTE: If the number of directors is to be one or two, do not check this box.)**

OR

? The number of directors to constitute the board of directors is _____. (The number of directors to constitute the board of directors must be stated herein if there are to be less than three directors. The person to constitute the first board of directors may, but not need, be named.)

Article Seven

The duration of the corporation is perpetual.
(indicate either perpetual or the date the corporation expires)

Article Eight

The corporation is formed for the following purposes:
Utility Company

IN WITNESS WHEREOF, these Articles of Incorporation have been signed on April 29 2003.
month/day/year

Signature	Printed Name
[signature]	JEFF SNIDER
[signature]	ROGER GULLET

AUG-12-2003 16:50 SEC. OF STATE INC. 573 522 6525 P.03/08

State of Missouri

County of St Louis City } ss

I, Jacqueline A. Green, A Notary Public, do hereby certify that on 4-29-03 (month/day/year)

personally appeared before me Jeff Snyder Roger Gullet, and being duly sworn by me, acknowledged that he/she signed as his/her own free act and deed the foregoing document in the capacity therein set forth and declared that the statements therein contained are true.

IN WITNESS WHEREOF, I have hereunto set my hand and seal the day and year before written.

(Notarial Seal or Stamp)

Jacqueline A Green
Notary Public

JACQUELINE A GREEN
Notary Public - Notary Seal
STATE OF MISSOURI
ST. LOUIS COUNTY
My Commission Exp. Mar. 22, 2004

My commission expires _____

My County of Commission _____

Corp. #41 (03/01)

Exhibit B

AFFIDAVIT

State of Missouri)
) ss
County of Franklin)

I, Jeff Snider, of lawful age, being first duly sworn upon my oath, state that I am the Vice-President of Calvey Brook Water Inc. and that the facts set forth in the foregoing Application are true to the best of my knowledge and belief.

Jeff Snider

Subscribed and sworn before me this 7th day of January, 2004.

Notary Public

My commission expires:

STEVEN L. KAMIENSKI
Notary Public - Notary Seal
State of Missouri
St. Charles County
My Commission Expires June 20, 2006

Exhibit C

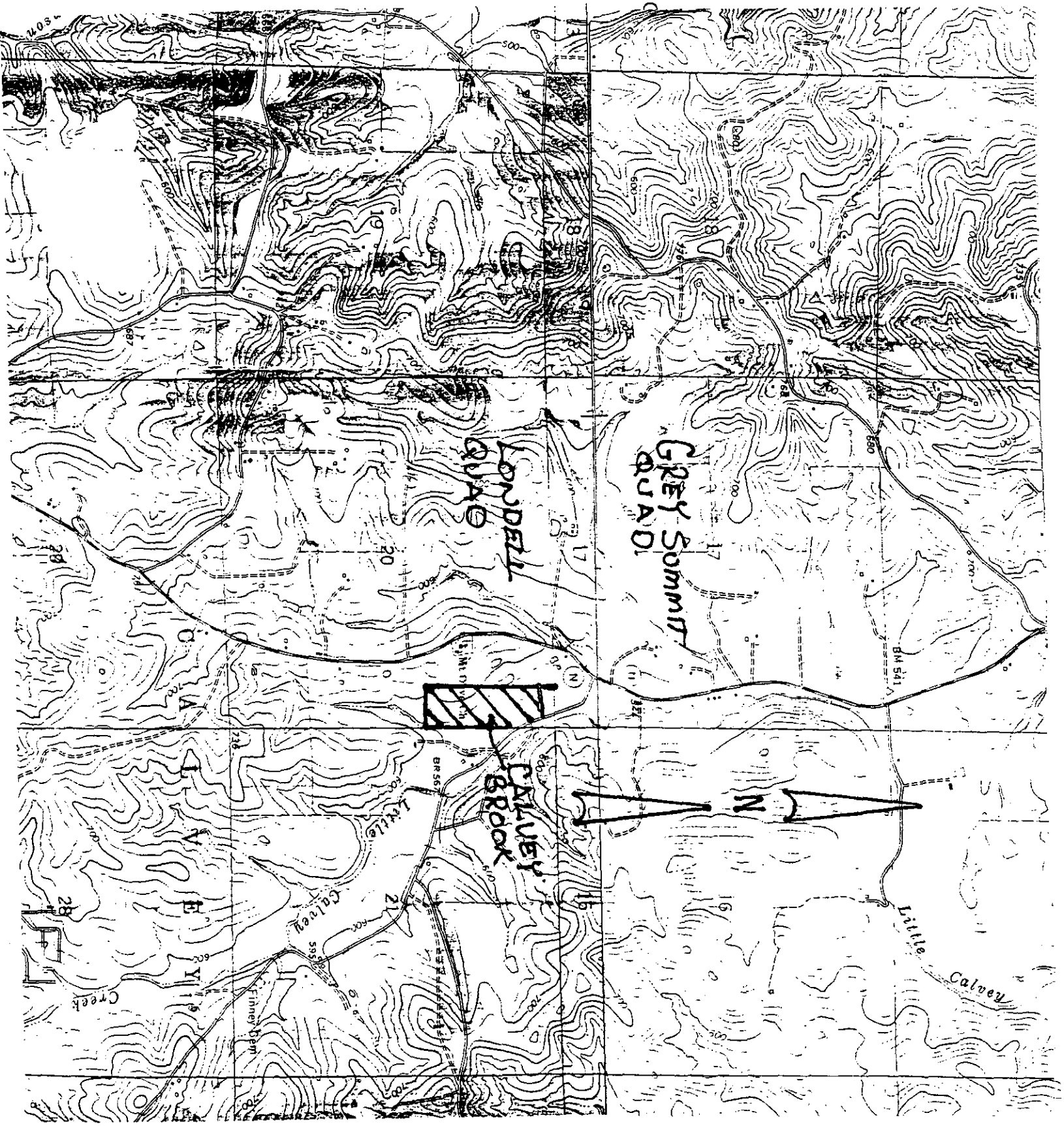
LONDELL QUAD
GREY SUMMIT QUAD
CALVEY BROOK
Little Calvey
Calvey
Creek
Finney Dam
BM 541
N

EXHIBIT D

LEGAL DESCRIPTION

A tract of land being part of the Northeast quarter of Section 20, Township 42 North, Range 2 East of the 5th P.M., Franklin County, Missouri, being more fully described as follows: Beginning at the intersection of the Southwest right-of-way of Finney Road with the section line located South 02 degrees 07 minutes 43 seconds West 663.52 feet from a stone at the Northeast corner of said Section 20; thence South 02 degrees 07 minutes 44 seconds West on the section line 1356.97 feet to the centerline of a creek; thence on the centerline of said creek as follows: North 49 degrees ' 51 minutes 29 seconds West 59.03 feet; South 69 degrees 07 minutes 51 seconds West 157.81 feet; North 57 degrees 12 minutes 25 seconds West 65.14 feet; South 68 degrees 42 minutes 54 seconds West 126.36 feet; South 84 degrees 15 minutes 33 seconds West 102.41 feet; North 86 degrees 45 minutes 35 seconds West 121.86 feet; and North 60 degrees 44 minutes 05 seconds West 68.30 feet; thence leaving said creek North 0 degrees 36 minutes 35 seconds East on the property line 699.29 feet to an iron rod; thence North 01 degree 54 minutes 47 seconds East on the East line of Finney Lake Estates for 939.81 feet; thence North 73 degrees 19 minutes 45 seconds East 517.78 feet to the West right-of-way of Finney Road; thence on the West right-of-way of Finney Road as follows: South 17 degrees 16 minutes 41 seconds East 173.84 feet; South 18 degrees 45 minutes 34 seconds East 118.50 feet; South 23 degrees 00 minutes 47 seconds East 127.03 feet; and South 33 degrees 15 minutes 56 seconds East 44.47 feet to the point of beginning,

EXHIBIT E

Feasibility Study

1. Description of company, its objectives, and area proposed to be served.

Calvey Brook Water Inc. (hereinafter "Applicant") was incorporated on April 29, 2003 with the purpose of operating and/or supervising a water system for the Calvey Brook Estates Subdivision. The area proposed to be served is limited to the Calvey Brook Estates Subdivision, a 36 lot subdivision located in an unincorporated portion of Franklin County, Missouri (part of the NE 1/4, Sec. 20, Township 42N, Range 2E, of the 5th P.M.). See Exhibit C for a map of the proposed service area, Exhibit D for a legal description of the Calvey Brook Estates Subdivision and the Report and Specifications for Calvey Brook Estates prepared by Wunderlich Surveying & Engineering, Inc. attached hereto as **Item 1**.

2. Plan or Plat showing total proposed system and detailed estimate of costs.

A Site Improvement Plan for Calvey Brook Estates Subdivision is attached hereto as **Item 2**. Said plan sets forth the proposed system, specifically the proposed site of the well and well house on the western most area of the subdivision, contiguous with lots 20 and 21, the water line(s) throughout the subdivision and all other water line appurtenances.

The entire cost of the feasibility study, the engineering and construction of the proposed water system will be paid by the subdivision developer, G&S Development, Inc., borrowing Six Hundred Thousand Dollars ($600,000) from Bank of Washington, 200 West Main Street, Washington, Missouri 63090, and lending the necessary funds for the water system to the Applicant at the same rate as charged on the Bank of Washington loan. An estimate of costs is as follows:

3416 ft. Water Main	$58,000.00
2300 ft. Service Line	13,800.00
36 Corp Stops	16,200.00
36 Saddles and Taps	9,000.00
Well House	22,000.00
Water System	75,000.00
	$194,000.00

3. Description of existing facilities (if any) and detailed costs.

There are currently no existing facilities.

4. Description of proposed facilities to be constructed immediately and estimate of costs.

The proposed system will consist of a 12,500 gallon ground water storage tank, a 5hp booster pump, and a 1,000 gallon preasure tank operating through the 40/60 psi pressure range. The distribution piping will consist of approximately 2,700 lineal feet of 4-inch SDR 21 class 200 pvc pipe. This system is not intended to provide fire flow, therefore only flush hydrants will be provided at the end of the lines and at high points in the system to allow flushing of the lines when required.

Ground Water Well:

A request was made to the Missouri Department of Natural Resources, Division of Geology and Land Survey, concerning a casing depth letter for a community well. A copy of this letter has been included with this report.

DNR-DGLS estimated the casing depth to be 350-feet below the existing ground elevation. It was recommend that a pilot hole be constructed to the total depth of the well. DNR-DGLS requires the well driller to send samples of the cuttings to their office to determine the exact casing depth for the proposed well.

At the total drill depth of 600 feet, the well should yield 70+ gallons per minute (gpm) of water. The proposed yield from the well will be 38 gallons per minute. In the future a larger well pump can be added to increase the capacity of the well if required. The difference between the maximum hour demand and the proposed pumping rate can be absorbed by the ground water storage tank.

After consulting a local well driller, it was decided to use a 6-inch well, with a 5-hp pump set at approximately 360-feet. Final depth of the well pump will be determined after the well shaft is drilled and a draw down test has been preformed.

The discharge for the pump will be 2-inch in diameter. The discharge piping will have two inline check valves. The first valve will be spaced approximately 25-feet above the pump, and the second will be placed approximately 175-feet above the pump. The well discharge will connect to the well house piping just above the sanitary split ring seal, and it will terminate with a 2-inch tee connection. The run of the tee shall be plugged. The 1-inch diameter screened vent pipe and the electrical connection for the submersible motor can enter through the side of the well casing or through the top of the sanitary split ring seal. The sanitary split ring seal will require a depth gauge.

Well House:

The well will discharge into a 12,500-gallon surface storage tank. This tank was sized assuming 36 homes with 3.5 persons per home at average daily flow of 100 gallons per person per day. Assuming a total flow of 1-gallon per minute per home, the peak hourly flow for Calvey Brook Estates would be 76 gallons per minute. The estimated yield for the well pump is $\pm$ 64 gpm. The maximum hour was calculated at 6 times the average daily flow and the calculation yielded a max. hour flow of 52.5 gallons per minute.

The surface ground storage tank will be 10-foot in diameter and a total of 22-feet tall. The tank will be equipped with both exterior and interior ladders for access. The ground storage tank will have 2-24-inch diameter man accesses. A 4-inch diameter overflow pipe shall be attached to the tank and be equipped with a flap valve on the end of the screened pipe. A screened 4-inch vent shall be supplied on the top of the tank, and a 4-inch drain plug shall be located at the bottom of the tank. A 2-inch inlet line shall be run into the tank as shown on the plans. A 3-inch outlet pipe will discharge from the tank as shown on die plans. The elevation of the water in the tank will be controlled with an Ametk black/white level controller. The controller will cycle the well through the on/off cycles. The tank will be provided with 2-feet of draw down under normal conditions. The ground storage tank will have a total of 3.48-feet during the maximum hour event. It will take the well pump 1.17 hours to fill the ground storage tank.

A 5-hp booster pump will be connected to the 3-inch discharge line from the ground storage tank. The booster pump shall be capable of providing 81 gallons per minute of flow at 60 psi. This flow is greater than the max. hour demand which is 52.55 gallons per minute. The flow from the booster pump will discharge into the pressure tank. The control for the booster pump will be a Square D pressure switch set for the 40/60 psi range.

The pressure tank was sized assuming two minutes of flow from the largest supplying pump. In this case the booster pump at 81 gallons per minute will require 162 gallons of available storage. Using the charts provided in the draft guidelines provided by Missouri DNR, a 1,000 gallon pressure tank will be required. The supplied chart yielded the usable volume of the tank at 178.5 gallons, the water seal at 333.3 gallons and the air cushion at 488.2 gallons.

An oil-less air compressor will control the air cushion. This compressor is designed for use on hydro-pneumatic pressure tanks. This air compressor will provide the make up air that will be absorbed in

the water of the pressure tank. The pressure tank will be equipped with a 70 psi pressure release valve. The pressure vessel shall meet ASME boiler codes, NSF Standard 61, and AWWA D 100 guidelines.

The well house will be standard wood frame construction. The interior of the well house will be sheeted with 1/2-inch treated plywood. The plywood shall be painted to owner choice of color. 4-inch floor drains will be provided incase of a leak. A 4-kw wall mounted heater will be provided for heat during the winter months. Chlorine disinfection is not intended at this time. A room will be constructed to house the chlorine equipment if it becomes necessary to disinfect in the future.

Distribution System:

The distribution system shall consist of 2,700 feet of 4-inch SDR 35 Class 200 PVC pipe. Because the pressure tank will be operating through the 40-60 psi pressure range, the distribution system should not be below 35 psi at any part of the proposed system. At the lowest point in the proposed distribution system the high pressure will be approximately 87 psi. The homes built in these areas will require a pressure-reducing valve located inside the home. The lowest pressure in the system will be 41 psi at the building sites closest to the well house.

The distribution system was analyzed using the equation $Q=12N^{0.515}$ where N is the number of connections drawing on the line. A tabulation sheet has been included showing the calculated flows, pipe head losses, and node pressures for the system at the 40, 50, and 60 psi pressure ranges.

According to the Design Guide for Community Public Water Supplies, the distribution system cannot have fire hydrants. Flushing hydrants will be attached to the system. No fire flow was intended with this design.

An estimate of costs is as follows:

3416 ft. Water Main	$58,000.00
2300 ft. Service Line	13,800.00
36 Corp Stops	16,200.00
36 Saddles and Taps	9,000.00
Well House	22,000.00
Water System	75,000.00
	$194,000.00

5. Description of additional facilities proposed to be constructed in each of the next three years and estimate of costs.

Following the initial construction, the proposed water system will have the necessary facilities and infrastructure to provide sufficient capacity for at least the initial three years of operation.

6. Type of existing dwelling units, population, and actual water used, if applicable.

There are currently no existing dwelling units in the subdivision.

7. Type of dwelling units, population estimated to be added in each of the next three years and estimates of water usage.

The proposed water system will primarily serve the Calvey Brook Estates Subdivision, a 36 lot residential subdivision that will consist of single-family homes constructed one per lot. Obviously the size of each family will vary greatly among the residents of the subdivision but a conservative range based on 3 to 6 members in a family would result in a population range of 108 to 216. Best estimates for build-out of the subdivision is as follows:

2003 – Year One	5 Homes
2004 – Year Two	18 Homes
2005 – Year Three	32 Homes
2006 – Year Four	36 Homes

The estimated usage is between 6000 and 7000 gallons of water per month per household.

8. Proposed rates, connection fees, and other charges (also existing rates and charges if any).

$27.50 per month minimum for 2,500 gallons of water
$2.00 per 1,000 gallons after minimum

$1,200 water connection fee per meter.

$75.00 deposit will be required prior to connection. This deposit will be refunded when the system is disconnected minus any outstanding water debts owed to the district.

$50.00 reconnection charge

There are no current customers therefore there are currently no existing rates or charges.

9. Statement of current income from existing facilities.

There are no existing facilities therefore there is no current statement of income.

10. Detailed estimate for operating expenses for each of the next three years.

See **Item 3** - Missouri Public Water System Financial Capacity Worksheets attached hereto as **Item 3**.

11. Statement of operating expenses in connection with existing facilities, if any.

There are no existing facilities therefore there is no current statement of operating expenses.

12. Detailed estimate of operating expenses for each of the next three years.

See **Item 3** - Missouri Public Water System Financial Capacity Worksheets attached hereto as **Item 3**.

13. Plans for financing and proposed capital structure of the company.

The entire cost of the feasibility study, the engineering and construction of the proposed water system will be paid by the subdivision developer, G&S Development, Inc., borrowing Six Hundred Thousand Dollars ($600,000) from Bank of Washington, 200 West Main Street, Washington, Missouri 63090, and lending the necessary funds for the water system to the Applicant at the same rate as charged on the Bank of Washington loan.

14. Plans for the protection of the financial integrity of the utility during the development years.

Roger Gullet and Jeff Snider, owners of G & S Development, Inc. (the subdivision developer) and owners of Applicant, understand the proposed water system will probably not be profitable during the development years and have personally guaranteed the loan with Bank of Washington.

15. Name of professional operator and his/her qualifications, or operation-management firm to be responsible for operation and maintenance of the facilities.

    Mr. Bob Wideman
    Wideman Well Drilling
    Highway 47 N
    St. Clair, Missouri 63077
    (636) 629-2881

16. Name of person or management firm to be responsible for managing the utility's business activities, and contact person for customer inquiries.

    Mr. Jeff Snider
    2801 West Osage, Suite 5
    Pacific, Missouri 63069
    (636) 271-5792

17. Copy of Proposed Management Contracts.

There are currently no proposed management contracts.

ITEM 1

Report and Specifications

For

"CALVEY BROOK ESTATES"

Date
March 12, 2003

Revised June 4, 2003

Owner
G&S DEVELOPMENT
2801 West Osage Suite 5
Pacific, Missouri 63069

Prepared By

Wunderlich Surveying & Engineering, Inc
20 South Church Street
Union, Missouri 63084

3.13.03
Norbert Wunderlich, P.E.

Table of Contents

INTROCTION:

"Calvey Brook Estates" is part of the northeast quarter of section 20, township 42 north, range 2 east of the 5th P.M. in Franklin County Missouri. G&S development LLC are the developers for this proposed 36 lot residential subdivision.

Franklin County Planning & Zoning now requires central water and central sewer on a development of this nature. Calvey Brook Estates is located within Franklin County Public Water Supply District Number 2. However, PWSD No. 2 is currently a non functioning district according to Franklin County Planning & Zoning Department. Approval cannot be obtained from PWSD No.2 and there are no available facilities for connection from the water supply district.

A proposed packed media bed treatment system will be employed to treat the sanitary sewage from Calvey Brook Estates. This system is in the preliminary design phase and it will be submitted to the Missouri Department of Natural Resources for approval later this month or early next month.

G&S Development is proposing a centralized water distribution system to serve Calvey Brook Estates.

DESIGN & CALCULATIONS:

Proposed System:

The proposed system will consist of a 12,500 gallon ground water storage tank, a 5hp booster pump, and a 1,000 gallon pressure tank operating through the 40/60 psi pressure range. The distribution piping will consist of approximately 2,700 lineal feet of 4-inch SDR 21 class 200 pvc pipe. **This system is not intended to provided fire flow**, therefore only flush hydrants will be provided at the end of the lines and at high points in the system to allow flushing of the lines when required.

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According to the Design Guide for Community Public Water Supplies, the distribution system cannot have fire hydrants. Flushing hydrants will be attached to the system. ***No fire flow was intended with this design.***

References:

Design Guide for Community Public Water Supplies, Draft Version, MO-DNR

Masterspec, by_ Arcom,, specification program

Special Thanks to

Schroepfer Well Drilling.

Masterspec, by arcom, specification writing program (AIA)

RECEIVED NOV 1 4 2002

STATE OF MISSOURI
Bob Holden, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES

P.O. Box 250 111 Fairgrounds Rd. Rolla, MO 65402-0250
(573) 368-2100
FAX (573) 368-2111

November 12, 2002

Mr. Jeff Snider
The Realty Office
2801 West Osage Ste 1
Pacific, MO 63069

Franklin County
SE NE NE Sec. 20, T42N, R2W
Capital Hills Farms Subdivision
community well

Dear Mr. Snider:

This letter is regarding a request for information from Wunderlich Surveying and Engineering on your behalf concerning a community (public) well at the above location in Franklin County on the Lonedell quadrangle.

Since this well is to be a public water supply well, construction of the well must conform to the standards of the Department of Natural Resources' Water Protection and Soil Conservation Division, as outlined in their publication Design Guide for Community Public Water Supplies 10 CSR 60-3, 10 CSR 60-10.

One requirement of the Department of Natural Resources' Water Protection and Soil Conservation Division is that the engineer's plans and specifications for water works projects be submitted to them for their review and approval before the start of construction. If the completed project does not conform to the published standards, a Permit of Approval cannot be issued as provided for in Part VI, Book V of the Sanitary Code, a part of the Regulations developed under Section 640.115 - 10 CSR 60 - 10.010, Revised Statutes of Missouri.

Copies of the Regulations and Design Standards are available upon request from Water Protection and Soil Conservation Division, Public Drinking Water Program, Missouri Department of Natural Resources, P.O. Box 176, Jefferson City, MO 65102.

One other requirement for such a water supply is that this office determines the well casing depth. The required casing depth for a well at this location is estimated to be 360 feet and into the Upper Gasconade Dolomite. This is based on a surface elevation of 580 feet above sea level. To help in establishing a final approved casing depth, rock cuttings must be submitted to the total depth of the well. In this instance it could be to your advantage to have a "pilot hole" drilled to total depth before casing is set and grouted. In this way, the casing depth could be approved with good data and you would be assured that no surprises would occur below the final casing depth. The casing (19 pound or equivalent weight per

foot for a 6 inch hole, for example) must be placed into a drill hole that is a nominal four (4) inches larger in diameter, and then pressure grouted (Haliburton method or equivalent). Once the grouting is complete, operations must be suspended for a minimum period of seventy-two (72) hours. Pressure grouting of the casing is to be witnessed by the department's Regional Office personnel in St. Louis at 314/ 416-2970 (please give 48 hours notice of intent to grout).

A total drilled depth of 600 feet into the Eminence Dolomite should furnish you with approximately 60 to 70 gallons of water per minute.

Persons in Missouri with a well or wells capable of producing at least 100,000 gallons per day (70 gallons per minute) are required to register as major water users. Should the proposed well be capable of producing that amount, it will be necessary for the well owner to file a form each year showing water use for the preceding year. Should you have any questions concerning major water use or the purpose of identification of high-yield wells, please feel free to contact Jeanette Barnett at (573) 368-2188 or at this letterhead address.

Since passage of the Water Well Drillers Act (RSMo 256.600, effective October 1, 1986) it is a legal requirement that all water wells be drilled and pumps installed by persons permitted by the Department of Natural Resources' Geological Survey and Resource Assessment Division. It is in your best interests to contract with a permitted water well driller/pump installer to complete your well installation. The law also requires that all new wells (or old wells that need major reconstruction) must be registered and a Water Well Record completed on each well. A $35.00 fee, which is to be paid by the well owner, must accompany the completed form. The well driller and well owner must sign the form, and a copy returned to this office by the well driller. You will receive a tag and a card with a registration number upon our receipt of the form and fee.

When I may be of further assistance, please do not hesitate to contact me.

Sincerely,

GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION

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Water Resources Program
Groundwater Geology Section
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November 12, 2002

JCJ/sh

c: Jerry Lane, WPSCD/PDWP
Department of Natural Resources/St. Louis Regional Office
Kirby Scheer, Wunderlich Surveying and Engineering, PO Box 536, Union, MO 63084

Project: Calvey Brook Estates
Project No:3797

A.) Design Water Demand

1.) Population to be served. Homes to be served $home := 36$

Persons per home $capita := 3.5$

Total estimated population to be served. $dd := capita \cdot home$ $dd = 126$ People

2.) Average Daily Demand per person $ADD := 100 \cdot \frac{gal}{day}$

Design flow $Df := ADD \cdot dd$ $Df = 12600 \frac{gal}{day}$ or $Df = 8.75 \frac{gal}{min}$

Peak Hourly Flow $Q := 12 \cdot home^{0.515}$ $Q = 75.98$ gallons per minute

3.) Maximum hourly demand $Mh := 6 \cdot Df$ $Mh = 52.5 \frac{gal}{min}$

proposed pump yields 64 gpm

B.) Proposed Well Capacity

The preliminary casing letter was received from Mo~Dnr. This letter stated that the estimated casing depth was 360 feet based on a surface elevation of 580 feet. The estimated total drill depth for the well is 600 feet, and the approximate well yield will be 60 to 70 gallons per minute. This should be greater than the maximum hourly demand. The assumed elevation of the pump will be 360 feet.

C.) Above Ground Storage

Public Water Supply Serving less than 50 connections shall supply a storage capacity equal to or greater than one days average demand. A hydro-pneumatic tank will provide pressure to the system.

Average Daily Demand will equal the design flow $Df = 12600 \frac{gal}{day}$

Ground Storage Tank Volume $GST := Df \cdot day$

Assume Circular tank

Assumed height of tank $Ht := 21 \cdot ft$

Calculated area of tank $At := \frac{GST}{Ht}$ $At = 80.21\ ft^2$

Calculated Diameter of the Tank $Dia := \sqrt{\frac{At \cdot 4}{\pi}}$ $Dia = 10.11$ ft

D.) Hydro-Pneumatic Tank

A proposed 1000 gallons pressure vessel will be used to provide the pressure for the distribution system.

Calculated usable volume at the 40/60 psi range. Calculations based on table provided in the Mo~DNR Draft Guidelines.

Pressure Vessel Gross Volume $Gv := 1000 \cdot gal$

Usable Volume	$UV := 17.85 \cdot \% \cdot Gv$	$UV = 178.5\,gal$
Water Seal	$Ws := 33.33 \cdot \% \cdot Gv$	$Ws = 333.3\,gal$
Air Cushion	$AC := 48.82 \cdot \% \cdot Gv$	$AC = 488.2\,gal$

Assuming the Booster Pump will provided a flow of 81 gpm at 138.5 feet (60 psi) of total head the pressure tank is required to have two minutes of discharge at the 81 gpm pumping rate.

Required Usable Volume	$RUV := 2 \cdot min \cdot 81 \cdot \frac{gal}{min}$	$RUV = 162\,gal$
Usable Volume Supplied	$UVS := UV$	$UV = 178.5\,gal$

E.) *Ground Storage Tank Flow Levels at Average Daily Flow*

Diameter of Tank $D := 10 \cdot ft$

Area of Tank $AT := \frac{\pi}{4} \cdot D^2$

Volume of the tank per foot of Depth $VT := AT \cdot 1 \cdot ft$ $VT = 587.52\,gal$

Allowing the tank to have a 2 foot draw down yields a flow to the subdivision as follows

Distance between pump on and pump off probes $H := 2 \cdot ft$

Volume of water to subdivision before pump starts $VW := AT \cdot H$ $VW = 1175.04\,gal$

Time between pump starts at average daily demand flow $Addps := \frac{VW}{Df}$ $Addps = 2.24\,hr$

Assumed flow from the well pump $WPR := 64 \cdot \frac{gal}{min}$

Time required to fill the tank between pump on and pump off $TF := \frac{VW}{WPR - Df}$ $TF = 21.27\,min$

F.) Ground Storage Tank Levels at Max.Hour Demand

Max. Hour Demand $Mh = 52.5\,\frac{gal}{min}$

Time to turn pumps on if tank is full. $TPO := \frac{VW}{Mh}$ $TPO = 22.38\,min$

Time Remaining in Max Hour Flow. $Tr := 1 \cdot hr - TPO$ $Tr = 37.62\,min$

Fill rate for the remaining time after the well pump has started $Dr := Mh - WPR$

if the value is negative then the tank is being filled. $Dr = -11.5\,\frac{gal}{min}$

Drawdown Depth for the remainder of the max hour. $DD := \frac{Dr \cdot Tr}{AT}$ $DD = -0.74\,ft$

if the value is negative then the tank is being filled.

Total Drawdown in the tank if max hour occurs when tank is full $TDD := DD + H$

$TDD = 1.26\,ft$

Assuming the max hour occurs when the well pump turns on

Total Drawdown Depth $Tdd := \left(\frac{Dr \cdot 1 \cdot hr}{AT}\right) + H$ $Tdd = 0.83\,ft$

Time Required to fill the Tank from this level $TF := \frac{Tdd \cdot AT + H \cdot AT}{(WPR - Df)}$ $TF = 30.05\,min$

Therefore if the well pump is ready to engage when the maximum hour flow occurs the ground storage tank will see a total 0.83 foot drop in the water level of the tank and it will take 10 minutes to fill the tank to shut off level assuming average daily demand on the system while filling.

Hydraulic Analysis

Elev. Bottom of tank to finish floor of well house 2 ft

Well House Elevation 612.00 ft

Pressure Tank Elevation @ 40/60 psi 40.00 psi Average Pressure

Total Water Column 706.38

Constant C 140.00

Flow in pipe based on equation Q = 12xN^0.515
Where N is number of connections drawing on the line.

Head loss in pipes is based on Hazen-Williams Equation.

Node Number	Node Elevation ft	Pipe Run node to node	Pipe Length ft	Pipe Size in	Pipe Area sq ft	No. House Connections	Flow in Pipe gpm	Head loss in pipe ft/100ft	Head loss in pipe ft	Pipe Velocity ft/sec	Delta Elevation ft	Total Elevation ft	Pressure @ node psi
1	611.5											94.88	41.08
		1-2	458	4	0.087	36	75.98	0.397	1.816	1.94	38	131.06	
2	573.5												56.75
2	573.5												
		1-3	365	4	0.087	11	41.26	0.128	0.468	1.05	-10	122.41	
3	583.5												53.00
3	583.5												
		3-5	416	4	0.087	11	41.26	0.128	0.533	1.05	-25.5	96.85	
5	609												41.93
2	573.5												
		2-6	420	4	0.087	15	48.40	0.172	0.723	1.24	12.5	144.66	
6	561												62.64
6	561												
		6-7	263	4	0.087	14	46.71	0.161	0.424	1.19	-11	133.95	
7	572												58.00
7	572												
		7-9	534	4	0.087	10	39.28	0.117	0.625	1.00	10	143.75	
9	562												62.25

Hydraulic Analysis

Elev. Bottom of tank to finish floor of well house 2 ft

Well House Elevation 612.00 ft

Pressure Tank Elevation 50.00 psi Average Pressure
@ 40/60 psi

Total Water Column 729.47

Flow in pipe based on equation Q = 12xN^0.515
Where N is number of connections drawing on the line.

Constant C 140.00

Head loss in pipes is based on Hazen-Williams Equation.

Node Number	Node Elevation ft	Pipe Run node to node	Pipe Length ft	Pipe Size in	Pipe Area sq ft	No. House Connections	Flow in Pipe gpm	Head loss in pipe ft/100ft	Head loss in pipe ft	Pipe Velocity ft/sec	Delta Elevation ft	Total Elevation ft	Pressure @ node psi
1	611.5											117.97	51.08
		1-2	458	4	0.087	36	75.98	0.397	1.816	1.94	38	154.16	
2	573.5												66.75
2	573.5												
		1-3	365	4	0.087	11	41.26	0.128	0.468	1.05	-10	145.51	
3	583.5												63.00
3	583.5												
		3-5	416	4	0.087	11	41.26	0.128	0.533	1.05	-25.5	119.94	
5	609												51.93
2	573.5												
		2-6	420	4	0.087	15	48.40	0.172	0.723	1.24	12.5	167.75	
6	561												72.64
6	561												
		6-7	263	4	0.087	14	46.71	0.161	0.424	1.19	-11	157.05	
7	572												68.00
7	572												
		7-9	534	4	0.087	10	39.28	0.117	0.625	1.00	10	166.85	
9	562												72.25

Hydraulic Analysis

Elev. Bottom of tank to finish floor of well house 2 ft

Well House Elevation 612.00 ft

Pressure Tank Elevation @ 40/60 psi 60.00 psi Average Pressure

Total Water Column 752.57

Constant C 140.00

Flow in pipe based on equation Q = 12xN^0.515
Where N is number of connections drawing on the line.

Head loss in pipes is based on Hazen-Williams Equation.

Node Number	Node Elevation ft	Pipe Run node to node	Pipe Length ft	Pipe Size in	Pipe Area sq ft	No. House Connections	Flow in Pipe gpm	Head loss in pipe ft/100ft	Head loss in pipe ft	Pipe Velocity ft/sec	Delta Elevation ft	Total Elevation ft	Pressure @ node psi
1	611.5											141.07	61.08
		1-2	458	4	0.087	36	75.98	0.397	1.816	1.94	38	177.25	
2	573.5												76.75
2	573.5												
		1-3	365	4	0.087	11	41.26	0.128	0.468	1.05	-10	168.60	
3	583.5												73.00
3	583.5												
		3-5	416	4	0.087	11	41.26	0.128	0.533	1.05	-25.5	143.04	
5	609												61.93
2	573.5												
		2-6	420	4	0.087	15	48.40	0.172	0.723	1.24	12.5	190.84	
6	561												82.64
6	561												
		6-7	263	4	0.087	14	46.71	0.161	0.424	1.19	-11	180.14	
7	572												78.00
7	572												
		7-9	534	4	0.087	10	39.28	0.117	0.625	1.00	10	189.94	
9	562												82.25

SECTION 2511 - MUNICIPAL WATER DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Water Service Mains
   2. Water Main Appurtenances
   3. Fire and Flush hydrants

B. Related Sections include the following:
   1. Division 1 Specifications

C. Alternates: Refer to Division 1 Section "Alternates" for description of Work in this Section affected by alternates.

1.3 UNIT PRICES

A. Bid Unit Prices shall be used for final payment based on installed field measurements.

1.4 DEFINITIONS

A. AWWA; American Water Works Association
B. Continuing Authority; City, Municipality, or Home Owners Association where the work is being performed. Are responsible to Mo~DNR for the Ownership of the System.
C. Mo~DNR; Missouri Department of Natural Resources

1.5 DELIVERY, STORAGE, AND HANDLING

A. Contractor is responsible for the delivery, storage, and handling of all materials. Any expense incurred due to materials being damaged, lost, or stolen shall be the responsibility of the contractor.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing weather conditions permit trench excavation to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Indicate measurements on Shop Drawings. When required by the Continuing Authority AS-Built drawings shall be provided at the expense of the owner.

1.7 COORDINATION

A. Contractor shall coordinate his/her work with the schedule prepared by the owner. The Contractor shall not perform work prior to its scheduled start date.

1.8 WARRANTY

A. Special Warranty: The contractor agrees to repair or replace components of the water distribution system that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failed hydrostatic pressure testing.
      b. Burst pipe
      c. Faulty appurtenances

B. Warranty Period: 1 year from date of Substantial Completion.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below.
   1. All equipment necessary to perform the required hydrostatic pressure test according to AWWA & Mo~DNR guidelines.
   2. All equipment necessary to disinfect the water line according to AWWA & Mo~DNR guidlines.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Pipe
   1. PVC
      a. Class 200 PVC water mains shall conform to ASTM D2241 and shall be pressure rated at 200 psi at 73° F with a standard dimension ratio of SDR 21. PVC pipe must be certified by the National Sanitation Foundation. Joints shall be integral bell push on joints with a single rubber gasket, making a pressure tight seal
      b. C900 PVC water mains shall conform to ANSI/AWWA C-900 DR-18 Class 150 requirements. PVC pipe must be certified by the National Sanitation Foundation. Joints shall be integral bell push n joints with a single rubber gasket, makng a pressure tight seal.

c. Fittings for PVC Mains , flanged and/or mechanical joint , shall be cast iron fittings for PVC pipe and shall meet the latest revisions of ANSIA21.11/AWWA C111. Fittings shall include all appropriate transition gaskets .All mechanical joints shall be restrained with "Mega Lug" restraining glands as manufactured by EBBA Iron Company or approved substitute.

2. Ductile Iron
   a. Ductile Iron Pipe used for water mains shall be cement lined super bell-tite push on joint. The pipe shall meet the requirements of the latest revision of ANSI A21.51/AWWA C151 for Class 50 ductile iron pipe. The pipe shall have a working pressure of 350 psi.
3. Valves
   a. Valves for PVC water lines shall be Mueller Model A-2360-20 gate valve, non-rising stem, resilient wedge, gate valve or approved substitute. Each valve shll include all appropriate transition gaskets. All mechanical joints shall be restrained with "Mega Lug" restraining glands as manufactured by EBBA Iron or approved substitute. All valves shall be sized according to approved drawings and shall meet AWWA C-509.
   b. Valves for Ductile Iron water lines shall be Mueller Model A-2360-20 gate valves, non-rising stem, resilient wedge gate valve. All valves shall have the required joint accessories. All valves shall be sized according to approved drawings and shall meet AWWA C509
4. Gate Boxes
   a. Valve boxes shall be Mueller Model H-10360 with lid as manufactured by Mueller Company or approved substitute.
5. Tees & Bends
   a. All tees and bends shall meet AWWA C153/A21.53 and ANSI/AWWA C111/A21.11 requirements. All tees and bends shall be cement lined according to ANSI/AWWA C104/A21.4. Fitting size and joint type to match drawings. If joint type is not noted contact the Continuing Authority for preferred type of joint. If mechanical joints are used, all joints shall be restrained with a restraining gland. Mega Lug as manufactured by EBBA Iron or approved substitute.
6. Tapping Sleeve
   a. Tapping Sleeves for PVC water lines shall be Mueller Model H304, stainless steel with flanged outlet as manufactured by Mueller Company or approved substitute.
   b. Tapping valve shall be Mueller Model T-2360-16, gate valve non-rising stem, resilient wedge seat meeting AWWA C-509. All tapping valves shall include the required transition glands and shall be sized as shown on the drawings. All mechanical joints shall be restrained with "Mega Lug" restraining glands as manufactured by EBBA Iron or approved substitute.
7. Detectable Locator Tape
   a. Detectable locator tape shall be 3-inches wide, bonded layer plastic with magnetic foil core. Tape shall be labeled as follows " Caution: Water Main Buried Below"
8. Water Main Locator Wire
   a. Water main locator wire shall be # 12 copper wire, solid or stranded, insulated for 600 volts with splice points in valve boxes only

C. Fire & Flush Hydrants
   1. Three-way Fire Hydrants
      a. Three-way Fire hydrants shall comply with American Water Works Association specifications C502. Hydrants shall have: post type dry barrel design, two-piece standpipe; compression type main valve; five and one-forth (5 ¼) inch valve

opening; two (2) two and one-half (2 ½) inch hose nozzles; one (1) four and one-half (4 ½) inch pumper nozzle; mechanical joint inlet with cast iron retainer glands; 7/8 inch square operating nut to open counter clockwise. Cast iron fitting shall be cement mortar lines with bituminous seal coat inside and out. Inlet connection shall be 6-inch mechanical joint. Fire hydrants shall be Model 423 as manufactured by the Mueller Company, or approved equal. Said hydrants shall be equipped with auxiliary gate valve and valve box and Mueller transition gland. Hydrants shall be properly restrained with tie rods or duc-lugs, size and quantity per manufactures recommendations for the hydrants pressure.

2. Two-way Fire Hydrant
   a. Two-way Fire hydrants shall comply with American Water Works Association specifications C502. Hydrants shall have: post type dry barrel design, two-piece standpipe; compression type main valve; five and one-forth (5 ¼) inch valve opening; two (2) two and one-half (2 ½) inch hose nozzles; mechanical joint inlet with cast iron retainer glands; 7/8 inch square operating nut to open counter clockwise. Cast iron fitting shall be cement mortar lines with bituminous seal coat inside and out. Inlet connection shall be 6-inch mechanical joint. Fire hydrants shall be Model 423 as manufactured by the Mueller Company, or approved equal. Said hydrants shall be equipped with auxiliary gate valve and valve box and Mueller transition gland. Hydrants shall be properly restrained with tie rods or duc-lugs, size and quantity per manufactures recommendations for the hydrants pressure.
3. Flush Hydrant
   a. One-way Flush hydrants shall comply with American Water Works Association specifications C502. Hydrants shall have: post type dry barrel design, two-piece standpipe; compression type main valve; 2 1/8-inch valve opening; one 2 ½ inch hose nozzles; mechanical joint inlet with cast iron retainer glands; 7/8 inch square operating nut to open counter clockwise. Cast iron fitting shall be cement mortar lines with bituminous seal coat inside and out. Inlet connection shall be 6-inch mechanical joint. Fire hydrants shall be Model 85 as manufactured by the Kupferle Foundry or approved substitute. Said hydrants shall be equipped with auxiliary gate valve and valve box and Mueller transition gland. Hydrants shall be properly restrained with tie rods or duc-lugs, size and quantity per manufactures recommendations for the hydrants pressure.

D. Water Service Connections
   1. Service Saddles
      a. Service saddles for water lines shall be Mueller Bronxe H-1300 Series or approved Substitute by the Continuing Authority. Saddles shall have a tapped outlet and shall be sized as specified by the Continuing Authority
   2. Corporation Stops
      a. Corporation stops shall be Mueller B-25008 or approved substitute by the Continuing Authority. Corporation stops shall be sized by the Continuing Authority.
   3. Curb Valves and Valve Boxes
      a. Curb Valves for service connections shall be Mueller H-15209 or approved substitute by the Continuing Authority. Curb Valves shall be sized by the Continuing Authority.
      b. Curb Boxes shall be Mueller H-15209 with compression connections on both ends. Curb boxes shall be extended to grade and clearly marked. Curb boxes shall be sized by the Continuing Authority.

4. Service Piping
   a. Type K copper tubing sized by the Continuing authority shall be buried with a minimum of 36-inches of cover. Service lines must be inspected by the Continuing Authority prior to backfilling.
   b. PVC service lines are permitted **only on approval** of the Continuing Authority.
5. Water Meters
   a. Water meters shall be sized by the Continuing Authority. All meters must be proceeded immediately by a ball valve. Meters shall be equipped with an approved dual check valve. Meters are to be installed according to the manufactures recomendations
   b. Outdoor installation of water meters shall be inspected by the Continuing Authority prior to use. Contact the Continuing Authority of approved materials for outdoor installation.

PART 3 - EXECUTION

3.1 EXCAVATION CLASSIFICATIONS

A. Class A Excavation
   1. Class A excavation shall consist of all other materials not mentioned in Class B excavation. The decision of the Continuing Authority shall be final on the determination of the proper classification.

B. Class B Excavation
   1. Any material which cannot be excavated by any other process other than drilling and blasting or drilling and wedging shall be determined to be Class B excavation. Class B excavation shall be defined as solid rock. All Class B excavation shall be stripped clear to allow for measurement prior to payment.

   2. Explosives shall only be used when permitted by the Continuing Authority. Only a insured State licensed blaster shall be permitted to perform the work. The blaster shall use all OSHA Safety Guidelines when working. Any and all damages incurred as a result of the blasting shall be the responsibility of the contractor and the blaster.

   3. Measurement of the Class B excavated material shall be determined as in-place cubic yardage. Pay limits are established as the required trench width as defined below. Any over-excavation required to install the water line will be at the contractors expense.

3.2 TRENCH LOCATION

A. Horizontal & Vertical Separation with Sewers
   1. Horizontal Separation: Water mains shall maintain a minimum of 10 feet horizontal separation form sanitary sewer lines, storm sewer lines, and/or manholes. The horizontal separation shall be measured from the nearest edge of the water main to the closet edge of the sewer main.
   2. Vertical Separation: Water mains shall maintain a minimum of 18-inches cover over the sewer main. The separation distance shall be measured from the bottom of the water main to the top of the sewer main.

3. Unusual Conditions: When minimum separations distances cannot be met and the water or sewer line cannot be relocated, minimum separation distances may be reduced by the following methods
   a. Approval of the Continuing Authority must be obtained.
   b. The water main shall be laid with a full-length cast iron pipe. The pipe shall be located such that the pipe joints will be located as far as possible for the crossing. (ie. center of pipe at center or crossing) concrete encasement shall be placed 10-feet from the crossing point in both directions. The sewer line and the water line must be encased. Contact the Division of Health for alternate methods.

B. Location in Easements
   1. The water line shall be constructed in the plated easements as shown on the drawing. The contractor is responsible any and all work performed outside of the established easements. The contractor is responsible for any and all damages incurred due to work outside the easements.

3.3 EXCAVATION OF TRENCHES

C. Trenches
   1. Trench Depth
      a. Trenches shall have a minimum of 42" of cover over the top of the water line. Holes for the pipe bells shall be excavated to allow full and continuous support along the length of the pipe. The bottom of the trench shall be free of rocks, roots, or any other material that may damage the pipe. When trench bottom is unsuitable for laying the pipe directly on the bottom of the trench, 6-inchs of 1-inch minus material shall be used for bedding.
   2. Trench Width & Pay Line
      a. No excavation shall be wider than one and four tenths (1.4) times the pipe diameter in inches plus 12-inches (W=1.4(D")+12). Two feet shall be the minimum trench width. Pay limits will be established using the following equation. Contractor is responsible for all excavation beyond the pay limits.
   3. Trench Excavation
      a. The Contractor shall control the grading to prevent surface ground water from running into the excavated areas. Any water or other liquid wastes, which accumulated in the excavations, shall be removed promptly.

      b. The Contractor shall perform all excavation work necessary for and incidental to the proper construction of the water lines as shown on the approved plans or directed by the Continuing Authority. Excavation shall include the removal of trees, shrubs, and undesirable material. Excavation shall be done along the lines indicated on the approved plans and shall be continuous and straight. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner a sufficient distance from the banks of the trenches to avoid overloading. All excavated material not suitable for backfill shall be removed by the Contractor and disposed of in a manner approved by the owner. The Contractor shall provide all barricades, lights, temporary crossings, warning signs, etc. that may be necessary to properly protect the public and the work from injury or damage

3.4 PIPE LAYING

D. Installation

1. Laying Pipe
   a. Laying of the pipe shall be commenced immediately after the excavation is started. The Contractor shall keep laying pipe closely behind the trenching operation. The Continuing Authority may stop the trenching when, in its opinion, the trench is opened too far in advance of the pipe laying operation. The Contractor shall lay the pipe in accordance with the manufacturer's instructions and recommendations, and in a manner that will not damage the pipe.
   b. When construction ends, the end of the pipe shall be securely plugged to prevent the entrance of debris or other contaminants from entering the pipe.
   c. In the event that the trench becomes inundated with water. The contractor shall excavate a pit adjacent to the main trench line and install a trash pump or similar device capable of removing the accumulated water from the trench. All water within the trench shall be removed from the trench prior to resuming construction of the water line.
2. Thrust Blocking
   a. Lines shall be thrust blocked at bends, tees, and hydrants to prevent movement of lines under pressure. The concrete blocking shall be placed between solid ground and the fitting to be anchored in such a manner that the pipe and fitting joints will be accessible for repairs. Thrust blocks shall be constructed in accordance with the table shown on the detail drawing
   b. Restraining Glands shall be used on all mechanical joint connections. Mega Lug manufactured by EBBA Iron or approved substitute shall be used
   c. Duc Lugs or Tie Rods shall be used. Contractor shall consult manufactures specifications for size and quantity of rods required for the rated pressure
3. Damaged pipe will not be allowed. All damaged pipe shall be replaced at the contractors expense, and shall under no circumstances shall damaged pipe be installed.

3.5 TRENCH BACFILL

E. Backfill
   1. Backfill
      a. When the pipe is laid, the Contractor shall backfill under and around the pipe until the pipe is covered with sufficient material to hold the pipe in position when firmly tamped. The remainder of the trench shall then be carefully backfilled simultaneously on both sides of the pipe. Broken concrete or pavement, blasted rock and large boulders shall not be used as backfill materials. Any trenches improperly backfilled, or where settlement occurs shall be repaired as directed by the Continuing Authority. The ground shall be graded to a reasonable uniformity and the required amount of mounding over the trenches left in a uniform and neat condition. Before final acceptance is made, the Contractor shall travel the line with the Continuing Authority to locate any places requiring repair. It is the intent of these Specifications to secure a condition where no further settlement of trenches will occur after backfilling is completed
   2. Backfill Under Paved Areas
      a. In areas of existing or proposed pavement or rock surfaces, the entire backfill shall consist of well-graded one (1) inch minus crushed limestone. The backfill material shall be compacted by an acceptable method to insure that no settlement of the completed backfill will occur. All areas of existing pavement damaged during construction shall be repaved to the specifications of the Appropriate Governing Authority. Edges of the existing pavement shall be neatly cut in a straight line, removing all damaged pavement, prior to repaving.

3. Backfill Settlement
   a. The Contractor shall be responsible for the satisfactory compaction of backfill material described. If any trenches or other excavation are found to have settled, they shall be immediately reworked by the Contractor and restored to the specified grades. In addition, the Contractor shall be responsible for all damage or damages which might result from settlement of backfill made by him of the fulfillment of his contract within and during the period of one (1) year from and after the date of final acceptance

3.6 WATER LINE TESTING

F. Hydrostatic Testing
1. All newly laid lines shall be tested before being placed in service. Trenches may be backfilled as the pipe is laid; or where practicable, trenches or bell holes may be left open for visual inspection during tests. Prior to making tests, all air shall be expelled from the pip. If hydrants or blow-offs are not available at high points of the lines, suitable taps shall be provided at such points
2. A two-hour hydrostatic test conforming to AWWA C600 shall be made on the pipeline between valves or temporary plugs at a test pressure of at least fifty (50) percent in excess or normal operating pressure. Any open trench or bell holes may over dry joints and may be backfilled following this test. Where trenches have been backfilled prior to making the test, any leaks evident at the surface shall be remade and retested. All pipes, fittings, valves, hydrants, and other materials found defective under this test should be removed and replaced.
3. After hydrostatic tests have been satisfactorily completed, a two (2) hour leakage test shall be made on the pipeline valves or temporary plugs at a constant test pressure of seventy-five (75) pounds per square inch. Leakage in the test system shall be measured through a meter or approved measuring device. The allowable leakage shall not be greater than seventy (70) gallons per 24-hour day per mile of pipe per inch nominal diameter of pipe. Should tests disclose leakage greater than the allowable amount, locate and repair defective joint(s) until the leakage is within the specified allowance.
4. All water line testing shall be performed in the presence of a representative of the Continuing Authority.

WATER LINE DISINFECTION

G. Preparation
1. The interior of all pipe, fittings, and other accessories shall be kept free as possible from dirt and foreign matter at all times. Every precaution shall be used to protect the pipe against the entrance of foreign material before the pipe is placed in the new line. At the close of the day's work or whenever the workmen are absent from the job, the end of the last laid section of pipe shall be plugged, capped or otherwise tightly closed to prevent the entry of foreign material of any nature. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into it, the Continuing Authority may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end, and left there until the connection is to be made to the adjacent pipe.
2. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug. Joints of pipe in the trench shall be made before the work is stopped. The provision shall apply during the noon hour as well as overnight.

H. Flushing & Sterlizing

1. Sterilizing of the completed line shall be done in a manner approved and recommended by the Missouri Division of Health. Prior to chlorination, the main shall be flushed as thoroughly as possible with the water pressure and outlets available. Flushing shall be done after the pressure tests are made. It must be understood that such flushing removes only the lighter solids and cannot be relied upon to remove heavy material allowed to get into the main during laying, Unless extreme care and thorough inspection is practiced during the laying of water mains, small stones, pieces of concrete, particles of metal, or other foreign material may gain access to mains newly laid. If it is believed that such foreign material may be in the main, it shall be thoroughly flushed and valves carefully inspected after flushing to see that the entire valve operating mechanism is in good condition.
2. Subsequent to flushing, the following procedure shall be followed in disinfecting the water mains.

   a. Close off section of distribution system that is to be disinfected.
   b. Prepare one (1) percent chlorine solution as shown in the following table:

Product	Amount of Compound	Quantity of Water to Add to make 1% Solution
High Test Calcium Hypo-Chlorite (65-70% Chlorine, HTH Parachloron, etc.)	1 lb.	7.5 gal.
Chlorinated Lime (32-35% Chlorine)	2 lbs.	7.5 gal.
Liquid Laundry Bleach (Purex or Chlorox	1 gal.	4.25 gal.

   c. The amount of chlorine required per one hundred (100) feet length of various pipe sizes is as shown in the following table:

Pipe Size (in)	Pipe Size (gal)	Volumeof 100 ft. Length 100% Chlorine (lb.)	Amount Required to Give 25 ppm Chlorine 1% Chlorine/Water (gal.)
2	16.4	0.0034	1/24
4	65.3	0.0135	1/6
6	146.5	0.0305	3/8
8	261.0	0.054	2/3
10	408.0	0.085	1
12	588.7	0.123	1 ½

   d. Introduce the chlorine solution with a positive displacement type pump at the same point where the water will be introduced into the section to be disinfected.

e. Fill the pipe slowly and be sure not to trap any air in the pipe. Close the section off that is to be disinfected when the pipe is full and under slight pressure. The solution should be allowed to remain in the pipe for twenty-four (24) hours.

NOTE: The detention time may be cut to three (3) hours, provided a one-hundred (100) ppm chlorine solution is used in place of the 25 ppm chlorine solution.

f. All valves or other appurtenances in the line being disinfected should be operated while the system is being filled with the chlorine solution.

3. Following sterilizing, all treated water shall be thoroughly flushed from the newly laid pipeline at its extremities until the replacement water throughout its length shall, upon test, be proved comparable to the quality of water approved by the Public Health Authority having jurisdiction. The Contractor or his Representative shall arrange for any bacteriological testing of water samples that may be required. This quality of water delivered by the new main should continue for a period of at least two (2) full days, as demonstrated by laboratory examination of samples taken from a tap located and installed in such a way as to prevent outside contamination. Samples should never be taken from an unsterilized hose or from a hydrant, because such samples seldom meet current bacteriological standards.
4. Should the initial treatment fail to result in the condition specified in the preceding paragraph, the sterilization procedure shall be repeated until such results are obtained.

3.7 FINISH GRADDING

I. Finish Gradding
   1. During the progress of the work, the Contractor shall remove and properly dispose of all debris and waste material. Upon completion and acceptance of the work, remove from the property of the Owner all equipment and facilities and unused materials provided by the contractor in connection with the work and leave the grounds in a clean and orderly condition. Any and all areas that are disturbed as a result of construction shall be restored to an "as good or better" condition as existed prior to being disturbed.

3.8 SAFTEY

J. The contractor shall follow all current OSHA guidelines at all times during construction.

END OF SECTION 2511

SECTION 02525 - WATER SUPPLY WELLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Submersible-type pumps for water supply wells.
   2. Associated specialties.

B. See Division 2 Section "Water Distribution" for water-service, fire-service-main, and combined water-service and fire-service-main piping.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Tested Water Supply Well Performance Capacity: 64 gpm. Final capacity will be determined by the required pump test.

B. Well driller must be certified by The State of Missouri to drill this type of well.

C. The well driller is required to contact Missouri Department of Natural Resources, State Geologist prior to drilling the well. The driller shall perform the required samples as described by state requirements. These samples will determine the final properties of the well.

1.3 UNIT PRICES

A. Unit-Price Amounts: As stipulated in the Form of Agreement.

B. Measurement and Payment Procedures:
   1. Measurement of the well shall be made from the existing ground surface to the bottom of the well. Measurement of the well casing shall be measured from the top of the casing to the bottom of the casing. Measurement of the surface casing shall be measured from the top of the casing to the bottom of the casing.
   2. Unit Prices as determined by the agreement shall be used for final payment based on final measurments.

C. Measurement Units for Water Supply Wells, Casings, and Grout: Per linear foot of well depth.

1.4 SUBMITTALS

A. Product Data: Submit certified performance curves and rated capacities of selected well pumps and furnished specialties for each type and size of well pump indicated.

B. Shop Drawings: Show layout and connections for well pumps.

   1. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control reports.

D. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AWWA Compliance: Comply with AWWA A100 for water supply wells.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 WELL CASINGS

A. Surface Casing
1. Well Casing shall be sized in according to MO~DNR 10 CSR 23-3 Steel Casing Table and shall be sized as shown on the drawings

B. Well Casing
1. Well Casing shall be sized in according to MO~DNR 10 CSR 23-3 Steel Casing Table and shall be sized as shown on the drawings."

C. Discharge Piping
1. Steel Pipe shall meet AWWA C200, single ply, steel pipe with threaded ends and threaded couplings for threaded joints
2. Two inline check valves shall be installed in the discharge piping. The first inline check valve shall be placed approximately 25-feet above the well pump. The second valve shall be placed approximately 175-feet above the pump. Inline check valves shall be Flowmatic or Technocheck sized for the discharge column as shown on the drawings

D. Well Sanitary Seals: Casing cap, with holes for piping and cables, that fits into the casing and is removable, waterproof, and vermin proof.

2.3 WATER WELL SCREENS

A. Screen Material: Fabricated of ASTM A 666, Type 304 stainless-steel tube; with slotted or perforated surface and designed for well-screen applications.

1. Screen Couplings: Butt-type, stainless-steel, coupling rings.
2. Screen Fittings: Screen, with necessary fittings, closes bottom and makes tight seal between top of screen and well casing.
3. Maximum Entering Velocity: 0.1 fps.

2.4 SUBMERSIBLE-TYPE WELL PUMPS

A. Manufacturers:
1. Grundfos.
2. Jacuzzi, Inc.; Jacuzzi Brothers.
3. Pentair Pump Group; F. E. Myers
4. Submaster Pumps.

B. Description: Submersible-type, vertical-turbine well pump complying with HI 2.1-2.5 or AWWA E101, with the following features:

1. Impeller Material: Stainless steel.
2. Motor: Capable of continuous operation under water, with protected submersible power cable.
3. Column Pipe: ASTM A 53, Schedule 40, galvanized steel pipe with threaded ends and cast-iron or steel threaded couplings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Pilot-Hole Data: Pilot hole is not required but is recommended. Boring samples from the pilot hole shall be taken in accordance with Mo-DNR guidelines and they shall be submitted to the State Geologist for review. The State Geologist will use these samples to determine the final casing depth and total depth of the well. A copy of this report shall be furnished to Owner.

3.2 INSTALLATION

A. Construct well using air driven rotary or rotary percussion method.

B. Enlarge pilot hole and install permanent casing, screen, and grout. Install first section of casing with hardened steel driving shoe of an OD slightly larger than casing couplings if threaded couplings are used.

C. Set casing and liners round, plumb, and true to line.

D. Join casing pipe as follows:

1. Ream ends of pipe and remove burrs.
2. Remove scale, slag, dirt, and debris from inside and outside casing before installation.
3. Cut bevel in ends of casing pipe and make threaded joints.
4. Clean and make solvent-cement joints.

E. Provide permanent casing with temporary well cap. Install with top of casing 24 inches above finished grade.

F. Develop wells to maximum yield per foot of drawdown.

1. Extract maximum practical quantity of sand, drill fluid, and other fine materials from water-bearing formation.
2. Avoid settlement and disturbance of strata above water-bearing formation.
3. Do not disturb sealing around well casings.
4. Continue developing wells until water contains no more than 2 ppm of sand by weight when pumped at maximum testing rate.

G. Install submersible-type well pumps according to HI 2.1-2.5 and provide access for periodic maintenance.

1. Before lowering permanent pump into well, lower a dummy pump that is slightly longer and wider than permanent pump to determine that permanent pump can be installed. Correct alignment problems.
2. Before lowering permanent pump into well, start pump to verify correct motor rotation.
3. Securely tighten discharge piping joints.
4. Connect motor to submersible pump and locate as determined by Mo~DNR near well bottom.

    a. Connect power cable while connection points are dry and undamaged.
    b. Do not damage power cable during installation; use cable clamps that do not have sharp edges.
    c. Install water-sealed surface plate that will support pump and piping.

H. See Division 2 Section "Utility Materials" for basic piping joint construction.

3.3 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

1. Connect piping between well pump and water piping.
2. Connect building water distribution to well pipe inside well house.

B. Electrical wiring, connections, and pump controllers are specified..

C. Ground equipment according to NEC Electrical Codes.

3.4 WELL ABANDONMENT

A. Follow well-abandonment procedures of Missouri Department of Natural Resources. Restore ground surface to finished grade.

3.5 FIELD QUALITY CONTROL

A. Plumbness and Alignment Testing: Comply with AWWA A100, Section 8.

B. Water Samples, Records, and Reports: Take samples of substrata formation at Mo~DNR pre determined intervals and at changes in formation throughout entire depth of each water supply well. Carefully preserve samples on-site in glass jars properly labeled for identification.

1. Furnish samples of water-bearing formation to testing laboratory and well-screen manufacturer for mechanical sieve analysis.
2. Prepare reports on static level of ground water, level of water for various pumping rates, and depth to water-bearing strata.

C. Performance Testing: Conduct final pumping tests after wells have been constructed, cleaned, and tested for plumbness and alignment.

1. Provide discharge piping to conduct water to locations where disposal will not create a nuisance or endanger adjacent property. Comply with requirements of Mo~DNR.
2. Measure elevation to water level in wells.
3. Perform two bailer or air-ejection tests to determine expected yield. Test at depths with sufficient quantity of water to satisfy desired yields.
4. Test Pump: Variable capacity test pump with capacity equal to maximum expected yields at pressure equal to drawdown in wells, plus losses in pump columns and discharge pipes.
5. Start and adjust test pumps and equipment to required pumping rates.
6. Record readings of water levels in wells and pumping rates at Mo~DNR or AWWA required required rates.
7. Record maximum yields when drawdown..
8. Operate pumping units continuously as required after maximum drawdown is reached.
9. Record returning water levels in wells and plot curves of well recovery rates.
10. Remove sand, stones, and other foreign materials that may become deposited in wells after completing final tests.

D. Water Analysis Testing: Make bacteriological, physical, and chemical analyses of water from each finished well and report the results. Make analyses according to requirements of authorities having jurisdiction.

E. Start well pump and adjust controls and pressure setting. Replace damaged and malfunctioning controls and equipment.

3.6 CLEANING

A. Disinfect water supply wells according to AWWA A100 and AWWA C654 before testing well pumps.

B. Follow water supply well disinfection procedures required by Mo~DNR.

3.7 PROTECTION

A. Water Quality Protection: Prevent well contamination, including undesirable physical and chemical characteristics.

B. Ensure that mud pit will not leak or overflow into streams or wetlands. When well is accepted, remove mud and solids in mud pit from Project site and restore site to finished grade.

C. Provide casings, seals, sterilizing agents, and other materials to eliminate contamination; shut off contaminated water.

D. Exercise care to prevent breakdown or collapse of strata overlaying that from which water is to be drawn.

E. Protect water supply wells to prevent tampering and introducing foreign matter. Retain temporary well cap until installation is complete.

END OF SECTION 02525

Water Temperature and Flow

Franklin Electric submersible motors are designed to operate with loading up to maximum service factor horsepower in water up to 86 degrees F (30°C) with a water flow past the motor of 0.25 ft/sec for 4" High Thrust motors and 0.5 ft/sec for 6 & 8 inch motors. Table 5 shows minimum flow rates, in GPM, for various well diameters and motor sizes.

If the motors are operated in water over 86 degrees F (30°C), water flow past the motor and/or the motor horsepower must be increased to maintain safe motor operating temperatures as shown in HOT WATER APPLICATIONS on page 6.

Table 5 Required Cooling Flow

Minimum GPM required for motor cooling in water up to 86°F (30°C).

Inches *Casing or* Sleeve I.D.	4" High Thrust Motor .25 ft/sec GPM	6" Motor .5 ft/sec GPM	8" Motor .5 ft/sec GPM
4	1.2	—	—
5	7	—	—
6	13	9	—
7	20	25	—
8	30	45	10
10	50	90	55
12	80	140	110
14	110	200	170
16	150	280	245

.25 ft/sec = 7.62 cm/sec
.50 ft/sec = 15.24 cm/sec
1 inch = 2.54 cm

Head Loss From Flow Past Motor

The following lists the approximate feet of head loss from flow between an average length motor and smooth casing or flow inducer sleeve.

Table 6 Head Loss Past Motor

Motor (Nominal)		4"	4"	4"	6"	6"	6"	8"	8"
Casing I.D. Inches		4.026"	5"	6"	6"	7"	8"	8.1"	10"
GPM	25	0.3							
	50	1.2							
	100	4.7	0.3		1.7				
	150	10.2	0.6	0.2	3.7				
	200		1.1	0.4	6.3	0.5		6.8	
	250		1.8	0.7	9.6	0.8		10.4	
	300		2.5	1.0	13.6	1.2	0.2	14.6	
	400				23.7	2.0	0.4	24.6	
	500					3.1	0.7	37.3	0.6
	600					4.4	1.0	52.2	0.8
	800								1.5
	1000								2.4

Flow Inducer Sleeve

If the flow rate is less than specified or coming from above the pump, then a flow inducer sleeve must be added for motor cooling. A flow sleeve is always required in an open body of water. FIG 1. shows a typical flow inducer sleeve construction.

Example: A six-inch motor and pump that delivers 60 GPM will be installed in a 10" well, 90 GPM past the motor is required in a 10" I.D. well. An 8" or smaller sleeve must be added to the pump to provide a cooling flow of water past the motor.

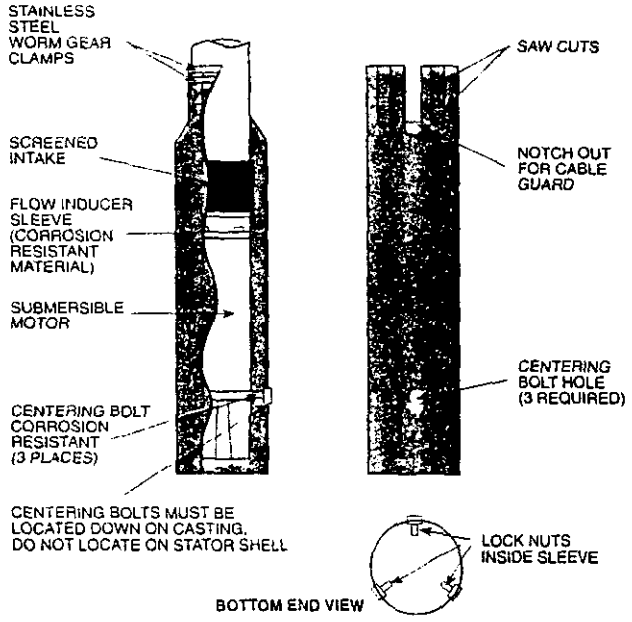


FIG 1

Table 8 Single Phase Motor Specifications (60 Hertz) 3450 RPM

Type	Motor Model Prefix					Rated Input		Maximum (S.F. Load)		(1) Line to Line	Efficiency %			Power Factor %			Locked Rotor	KVA	Circuit Breaker or Fuse AMPS	
		HP	Volts	HZ	S.F.	(2) Amps	Watts	(2) Amps	Watts	Res. M = Main S = Start	S.F.	F.L.	3/4	S.F.	F.L.	3/4	Amps	Code	Std.	Delay
4 Inch Two Wire	244502	1/3	115	60	1.75	8.0	480	9.2	720	1.4-1.8	60.0	51.0	44.8	71.0	53.5	46.5	48.4	S	25	10
	244503	1/3	230	60	1.75	4.0	480	4.6	720	6.0-7.4	60.0	51.0	44.8	71.0	53.5	46.5	24.2	S	15	5
	244504	1/2	115	60	1.60	10.0	680	12.0	970	1.0-1.3	61.5	55.0	48.8	72.5	57.5	49.7	64.4	R	30	15
	244505	1/2	230	60	1.60	5.0	680	6.0	970	4.2-5.2	61.5	55.0	48.8	72.5	57.5	49.7	32.2	R	15	7
	244507	3/4	230	60	1.50	6.8	950	8.0	1325	3.0-3.6	63.5	59.0	53.2	74.0	61.5	53.2	40.7	N	20	9
	244508	1	230	60	1.40	8.2	1200	9.8	1600	2.2-2.7	65.0	62.2	57.4	74.0	62.5	53.5	48.7	M	25	12
	244309	1 1/2	230	60	1.30	10.6	1780	13.1	2250	1.5-1.9	65.0	62.8	59.4	79.7	74.2	66.1	56.8	L	35	15
4 Inch Three Wire	214502	1/3	115	60	1.75	Y8.0 B8.0 R0	480	Y9.2 B9.2 R0	720	1.4-1.8M 6.5-7.9S	60.0	51.0	44.8	71.0	53.5	46.5	34.8	N	25	10
	214503	1/3	230	60	1.75	Y4.0 B4.0 R0	480	Y4.6 B4.6 R0	720	6.0-7.4M 26.1-32S	60.0	51.0	44.8	71.0	53.5	46.5	17.2	N	15	5
	214504	1/2	115	60	1.60	Y10.0 B10.0 R0	680	Y12.0 B12.0 R0	970	1.0-1.3M 4.1-5.1S	61.5	55.0	48.8	72.5	57.5	49.7	50.5	M	30	15
	214505	1/2	230	60	1.60	Y5.0 B5.0 R0	680	Y6.0 B6.0 R0	970	4.2-5.2M 16.7-20.5S	61.5	55.0	48.8	72.5	57.5	49.7	23.0	M	15	7
	214507	3/4	230	60	1.50	Y6.8 B6.8 R0	950	Y8.0 B8.0 R0	1325	3.0-3.6M 11.0-13.4S	63.5	59.0	53.2	74.0	61.5	53.2	34.2	M	20	9
	214508	1	230	60	1.40	Y8.2 B8.2 R0	1200	Y9.8 B9.8 R0	1600	2.2-2.7M 10.1-12.3S	65.0	62.2	57.4	74.0	62.5	53.5	41.8	L	25	12
4 Inch 3 Wire W-Run Cap	224300	1 1/2	230	60	1.30	Y10.0 B9.9 R1.3	1700	Y11.5 B11.0 R1.3	2150	1.5-2.3M 6.2-12.0S	67.9	66.0	62.0	81.4	74.4	66.1	52.0	J	30	15
	224301	2	230	60	1.25	Y10.0 B9.3 R2.6	2100	Y13.2 B11.9 R 2.6	2650	1.6-2.3M 5.2-7.15S	70.0	71.0	68.8	93.1	90.5	86.7	51.0	G	30	15
	224302	3	230	60	1.15	Y14.0 B12.2 R4.7	3150	Y17.0 B14.5 R4.5	3650	.9-1.5M 3.0-4.9S	70.9	71.8	69.6	98.0	97.5	96.0	82.0	G	45	20
	224303	5	230	60	1.15	Y23.0 B19.1 R8.0	5100	Y27.5 B23.2 R7.8	5900	.68-1.0M 2.1-2.8S	71.1	71.9	70.0	97.5	96.4	94.0	121.0	F	70	30
6 Inch	226110	5	230	60	1.15	Y23.0 B18.2 R8.0	5000	Y27.5 B23.2 R7.8	5700	.55-.68M 1.3-1.6S	75.8	75.0	72.2	98.0	98.3	98.5	99.0	E	70	30
	226111	7 1/2	230	60	1.15	Y36.5 B34.4 R5.5	7300	Y42.1 B40.5 R5.4	8800	.36-.50M .92-1.2S	73.4	74.4	74.2	91.0	90.4	87.2	165.0	F	100	45
	226112	10	230	60	1.15	Y44.0 B39.5 R9.3	9800	Y51.0 B47.5 R8.9	11300	.27-.33M .80-.99S	76.2	76.8	76.3	95.8	95.8	95.3	204.0	E	150	60
	226113	15	230	60	1.15	Y62.0 B52.0 R17.5	13900	Y75.0 B62.5 R16.9	16200	.17-.22M .68-.93S	79.4	80.3	79.7	97.3	97.9	98.2	303.0	E	200	80

(1) Main winding - black to yellow
Start winding - red to yellow

(2) Y = Yellow lead, line amps
B = Black lead, main winding amps
R = Red lead, start or auxiliary winding amps

Auxiliary Running Capacitors for Noisy Installations

The addition of auxiliary running capacitors as a method of reducing noise in submersible installations is not reliable in all cases, but in some installations does reduce the noise to an acceptable level. In some cases, there is space in the control box to add an additional running capacitor or capacitors. In others, there is not room and the additional capacitor(s) should be mounted in an auxiliary box and used in conjunction with the regular control box.

Added capacitors must be connected across "Red" and "Black" control box terminals, in parallel with any existing running capacitors. Given below are the values of additional running capacitors most likely to reduce noise in cases where it may be a problem. The tabulation also gives the running capacitors originally supplied in each rating control box and the S.F. amps normally in each lead with the added capacitor.

Table 9 Auxiliary Capacitor Sizing

Motor Rating		Normal Running Capacitor(s) Mfd.	Auxiliary Running Capacitors For Noise Reduction			S.F. Amps (with Run Cap)		
HP	Volts		Mfd.	Min. Volts	Franklin Part	Yellow	Black	Red
1/3	115	0	45(1)	370	One 155327109	6.3	5.3	2.9
1/2		0	60(1)	240	Two 155328108	8.4	7.0	4.0
1/3	230	0	10(1)	370	One 155328102	3.3	3.1	1.2
1/2		0	15(1)	370	One 155328101	4.2	3.5	2.0
3/4		0	20(1)	370	One 155328103	5.8	5.0	2.5
1		0	25(1)	370	One ea. 155328101 155328102	7.1	5.6	3.4
1 1/2		10	20	370	One 155328103	9.3	7.5	4.4
2		20	10	370	One 155328102	11.2	9.2	3.8
3		35	10	370	One 155328102	16.1	13.0	5.9
5		60	None			27.5	23.2	7.8
7 1/2		45	45	370	One ea. 155327101 155328101	37	32	11.3
10		70	30	370	One 155327101	49	42	13
15		135	None			75	62.5	16.9

(1) ***Do not*** *add running capacitors to standard production 1/3 through 1 HP control boxes which use current relays, solid* state starting switches or QD relays! Adding capacitors will cause switch failure. If the control box is converted to use a voltage relay, the specified running capacitance can be added.

Buck-Boost Transformers

When the available power supply voltage is not within the proper range for a standard or available motor, a buck-boost transformer is often used to adjust voltage to match the motor. While tables to give a wide range of voltage boost or buck are published by transformer manufacturers, the following table shows Franklin recommendations for the most common usage on submersible motors, boosting a 208 volt supply to use a standard 230 volt single phase submersible motor and control. The table, based on boosting the voltage 10%, shows the minimum rated transformer KVA needed to supply the 10% boost, and the common standard transformer KVA.

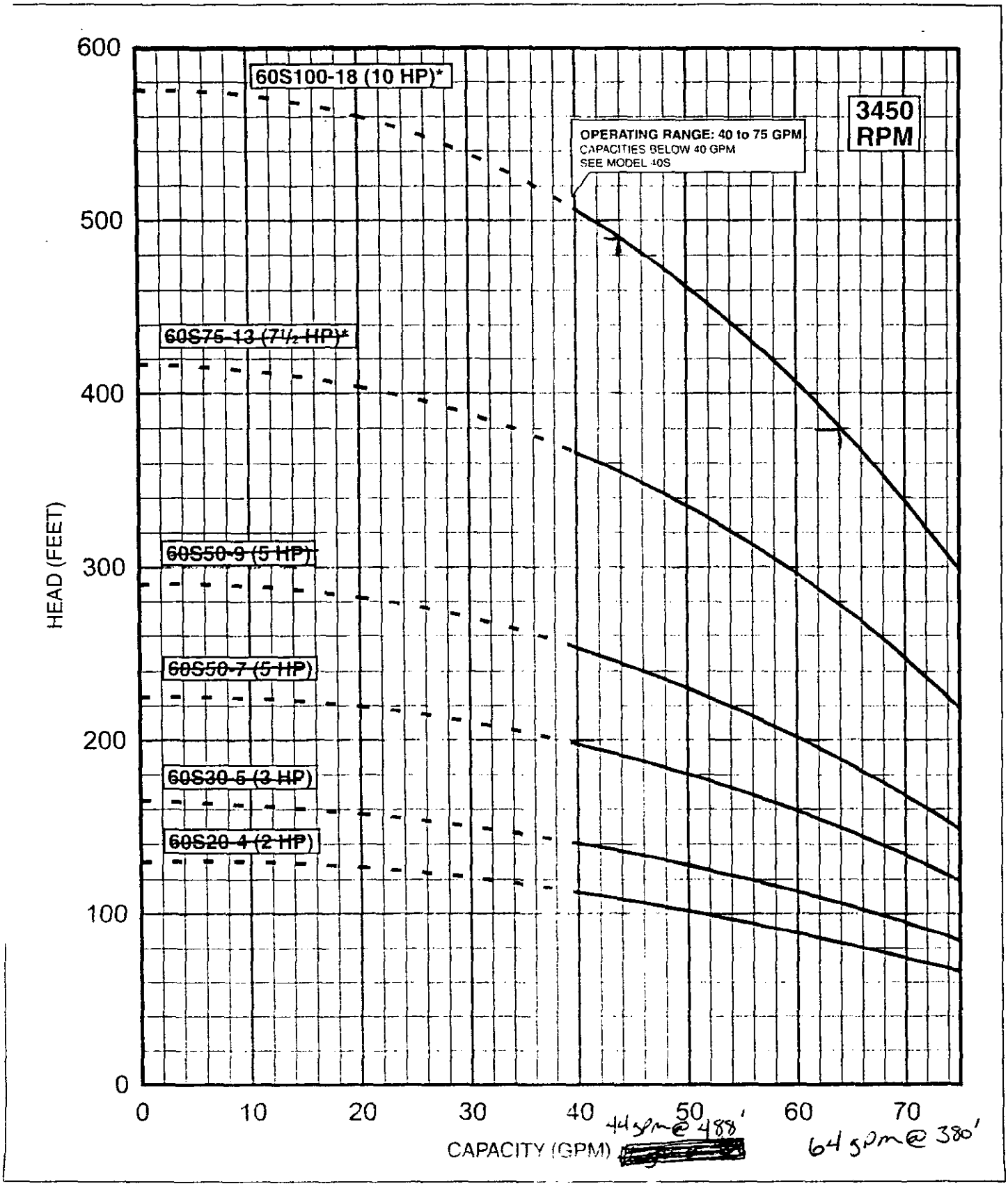
Table 10 Buck-Boost Transformer Sizing

Motor HP	1/3	1/2	3/4	1	1 1/2	2	3	5	7 1/2	10	15
Load KVA	1.02	1.36	1.84	2.21	2.65	3.04	3.91	6.33	9.66	11.7	16.6
MIN XFMR KVA	.11	.14	.19	.22	.27	.31	.40	.64	.97	1.2	1.7
STD XFMR KVA	.25	.25	.25	.25	.50	.50	50	.75	1.0	1.5	2.0

Buck-Boost transformers are power transformers, not control transformers. They may also be used to lower voltage when the available power supply voltage is too high.

Performance Curves 60 GPM Model 60S

LOW RANGE: 40 -75 GPM **OUTLET SIZE: 2 " NPT** **NOMINAL DIA. 4"**



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.
4" MOTOR STANDARD, 3450 RPM.
* Also available with 6" motor.

Performance conforms to ISO 9906 Annex A
@ 5 ft. min. submergence.

DIMENSIONS AND WEIGHTS

MODEL NO.	FIG.	HP	MOTOR SIZE	DISCH. SIZE	DIMENSIONS IN INCHES					APPROX. SHIP WT.
					A	B	C	D	E	
60S20-4	A	2	4"	2" NPT	32.6	15.1	17.5	3.8	3.9	39
60S30-5	A	3	4"	2" NPT	40.7	20.6	20.1	3.8	3.9	64
60S50-7	A	5	4"	2" NPT	48.8	23.6	25.2	3.8	3.9	75
60S50-9	A	5	4"	2" NPT	53.9	23.6	30.3	3.8	3.9	80
60S75-13*	A	7 1/2	4"	2" NPT	70.1	29.6	40.5	3.8	3.9	105
60S100-18*	A	10	4"	2" NPT	97.3	43.9	53.4	3.8	3.9	160

NOTES: All models suitable for use in 4" wells, unless otherwise noted.
Weights include pump end with motor in lbs..
* Also available with 6" motor.

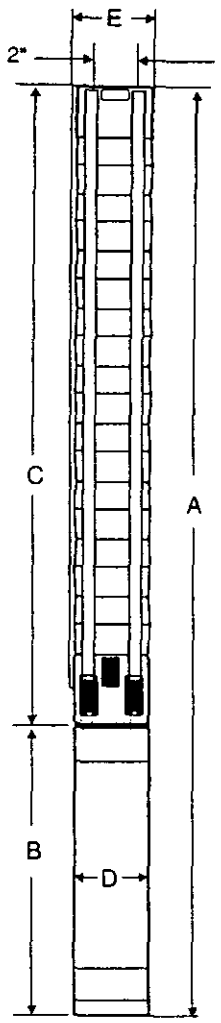


Fig. A

MATERIALS OF CONSTRUCTION

COMPONENT	CYLINDRICAL SHAFT (4-18 Stgs.)
Check Valve Housing	304 Stainless Steel
Check Valve	304 Stainless Steel
Diffuser Chamber	304 Stainless Steel
Impeller	304 Stainless Steel
Suction Interconnector	304 Stainless Steel
Inlet Screen	304 Stainless Steel
Pump Shaft	431 Stainless Steel
Straps	304 Stainless Steel
Cable Guard	304 Stainless Steel
Priming Inducer	304 Stainless Steel
Coupling	316/431 Stainless Steel**
Check Valve Seat	NBR/316 Stainless Steel
Top Bearing	NBR/316 Stainless Steel
Impeller Seal Ring	NBR/316 Stainless Steel
Intermediate Bearings	NBR/316 Stainless Steel
Shaft Washer	LCP (Vectra®)
Split Cone	304 Stainless Steel
Split Cone Nut	304 Stainless Steel
Coupling Key	Not Required**

NOTES: Specifications are subject to change without notice.
Vectra® is a registered trademark of Hoechast Celanese Corporation.
** *If using 6" non-standard motors, refer to 416 Stainless Steel for coupling* and 302/304 for the coupling key.

SECTION 2526 — WELL GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the allowable methods for grouting the well casing.

1.2 QUALITY ASSURANCE

A. Installer Qualifications: it is the responsibility of the well installation contractor to ensure that the annular space is sealed and that the casing does not leak. This obligation and responsibility ends three years after the date of certification unless it can be shown that the well seal has been damaged by other persons.

B. Grouting of the well shall be in compliance with 10-CSR-23-3 (3) grouting.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials used to grout well casing shall be in accordance with MO DNR Guidlines:
   1. Cement
   2. Bentonite slurry

2.2 MIXES

A. Mixes shall be in accordance with MO~DNR Guidelines. It shall be the responsibility of the contractor to verify the allowable mixture type and quantity. The contractor shall confirm mixture with MO~DNR prior to installing the grout.

PART 3 - EXECUTION

3.1 GROUTING METHODS

1. The contractor shall contact MO~DNR to confirm the appropriate method of placing the grout around the well.
2. One of the following methods shall be used.
   a. Tremie method
   b. Pressure grouting through tremie method
   c. Pressure grouting through the casing method

d. Positive displacement method

3.2 INSTALLATION

A. Tremie Method
1. The grout is placed in the annular space by gravity through a tremie or grout pipe suspended in the annular space. The tremie pipe is placed into the annulus and extends to within five feet from the bottom of the interval to be grouted. The grout is added into the tremie pipe, which should remain submerged in the grouting material during the entire time the grout is being placed. The tremie pipe is gradually withdrawn as the grouting material is placed or may be removed after the annular space is full and before the grout sets.

B. Pressure Grouting Through Tremie Method
1. For this method the same procedure is followed as described in the tremie method, except the grout is pumped into the tremie pipe instead of placed by gravity flow.

C. Pressure Grouting Through the Casing Method.
1. A grout pump is attached to the top of the casing and grout is pumped through the casing and allowed to fill the annular space from the bottom. Pumping continues until grout reaches the surface of the annular space. The grout shall be allowed to set for 72 hours before drilling continues.

D. Positive Displacement Method
1. Casing is set into the borehole to a point about five feet above the casing point. Grout is poured into the well casing followed by a drillable plug. This is designed to push all grout to the bottom of the well. If there is water in the borehole and bentonite or cement slurry is used it must be emplaced by means of a tremie to the bottom of the borehole. A plug is pushed to the bottom of the casing forcing the grout down the inside of the casing and up the annular space. The casing is then set into the bottom of the drill hole.

END OF SECTION

SECTION 5509 - GROUND WATER STORAGE TANK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. *This Section includes the requirements for construction of the ground water storage tank:*

1.3 DEFINITIONS

A. Missouri Department of Natural Resources ; Mo~DNR

B. American Water Works Association; AWWA

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide a ground water storage tank capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:

a. Uniform pressure of 20 lbf/sq. ft., acting inward or outward.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Data: *For the following:*

1. Ground Water Storage Tank

C. Product Data: Include rated capacities; shipping, weight.

D. Shop Drawings: Show fabrication and installation details for ground water storage tank.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall be responsible for delivery, storage and handling.

1.7 WARRANTY

A. Special Warranty: manufacturer in which manufacturer agrees to repair or replace components of Ground Water Storage Tank that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of piping or venting equipment.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

B. Warranty Period: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GROUND WATER STORAGE TANK

A. Tank Requirements
1. 10-foot inner diameter
2. 22-feet tall
3. Roof shall have a minimum of 3-inches of rise
4. Tank shall be constructed in accordance with AWWA D100

2.2 MATERIALS, GENERAL

A. Ground Storage Tank
1. The Ground Water Storage Tank shall be constructed from carbon steel.
2. The tank shall be continuously welded at all joints.
3. Tank shall be constructed in accordance with AWWA D100

B. Over Flow Pipe
1. A 4-inch over flow pipe shall be attached to the tank at the elevation shown on the drawings.
2. the overflow pipe shall be securely attached to the side of the tank and terminate 2-feet from the bottom of the tank.
3. A screened stainless steel #24 mesh shall be attached to the end of the over flow pipe
4. A 4-inch flap valve shall be attached to the end of the overflow pipe.

C. Inlet Pipe
1. 2-inch NPT fitting shall be extended through the tank for piping connection.
2. A 2-inch elbow shall be used to extend an inner 2-inch pipe 16-feet above the bottom of the tank. The inner 2-inch pipe shall be supported at 8-foot intervals and be securely fastened to the side of the tank..

D. Outlet Pipe
1. 3-inch NPT fitting shall be extended through the tank for piping connection.

2. A 3-inch elbow shall be used to extend the inner 3-inch discharge pipe 1-foot above the finish floor of the tank. The 3-inch pipe shall be securely fastened to the side of the tank.

E. Exterior Ladder
1. A ladder with side rails shall be mounted to the exterior of the tank. The ladder shall be extended to the top man access as shown on the plans.
2. The exterior ladder shall terminate 8-feet above the bottom of the tank.

F. Interior Ladder
1. A ladder with side rails shall be mounted to the interior of the tank..
2. The interior ladder shall terminate 1-foot above the bottom of the tank.

G. Roof Man Access
1. Roof access shall have a minimum inner opening of 24-inches.
2. Access shall be hinged and provide a water tight seal.
3. Access shall be located as shown on the plans.

H. Lower Man Access
1. Access shall be located as shown on the drawing.
2. Access shall provide a water tight seal.
3. Access shall be a minimum of 24-inches inside diameter.

I. Vent
1. A 4-inch pipe connect to a tee shall be provided as a vent. Both ends of the vent shall be screened with # 24 stainless steel mesh.
2. Alternate Mushroom Vent
   a. A mushroom vent shall be provided and located near the center of the roof.
   b. The vent shall provide a minimum of 100 square inches of open area and shall be screened with # 24 stainless steel mesh.

J. Drain Plug
1. A 4-inch NPT drain plug shall be provided as shown on the plans. The plug shall be included with the tank.

K. Probe Connection
1. A 2-inch NPT fitting shall be attached at the center of the tank to provide a connection for the well pump control probes.

L. Lift Rings
1. Lift Rings securely fastened to the tank shall be provided.
2. Lift Rings shall be suitable to load, unload, and erect the tank at the job site.

PART 3 - EXECUTION

3.1 Welding

A. Ground Water Storage Tank
1. Tank shall be welded in accordance with ASME Section IX requirements.
2. Only ASME certified welders will be allowed to weld on the tank

3. Manufacture shall test the tank for leaks prior to shipping the tank.

3.2 Assembly

A. The tank shall be completely assembled at the shop and shipped to the job site.

B. Exterior components that can be attached to pre welded brackets may be made removable for shipping purposes.

3.3 Offloading and Erection

A. The contractor shall supply equipment capable of lifting the tank for the purpose of off loading and placing the tank on the foundation.

3.4 Painting

A. Interior of the tank shall be painted by the manufacture to meet AWWA D100 and NSF standard 61 requirment.

B. Exterior
1. Tank shall be primed by the manufacture with Oxide Primer to prevent rusting.
2. Contractor shall paint the Exterior of the tank after erection with a Tenemic Brand paint owner select color.

3.5 STERILIZATION

A. The contractor shall sterilize the tank in accordance with AWWA C652 and the requirements of Mo~Dnr.

B. Procedure
1. Tank shall be slowly filled to the overflow pipe.
2. Contractor shall introduce enough chlorine to create a concentration of 25 ppm.
3. After 24 hours the water shall be tested by a certified lab and shall have a concentration of 10ppm residual.
4. If test fails contractor shall repeat AWWA C652 until adequate results have been obtained.

3.6 Mo~DNR Notification

A. Prior to placing the tank into service the Mo~DNR shall be contacted for permission to distribute water.

END OF SECTION 5509

SECTION 5510 - HYDROPNEUMATIC STORAGE TANK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1.3 ASSEMBLY DESCRIPTION

A. Hydropneumatic Tank shall be constructed as drawn and tested prior to shipping to the site. The tank shall meet all required codes.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide Hydropneumatic Tank capable of withstanding the effects of gravity loads and meeting all requirements of the ASME Boiler Codes, AWWA D100 Standard for "the following loads and stresses within limits and under conditions indicated:

1.5 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for the Hydropneumatic Tank.

1.6 DELIVERY, STORAGE, AND HANDLING

A. The hydropneumatic tank shall be delivered to the site. Upon delivery the contractor shall store the tank according to the manufactures guidelines and recommendations

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of Hydropneumatic Tank that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failure under normal operating conditions.
   b. Any leaks due to poor workmanship.

B. Special Warranty: Contractor agrees to repair or replace components of Hydropneumatic Tank that fail in within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failure due to improper storage.
b. Structural failure due to improper handling..

C. Warranty Period: 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Qick Tanks Inc.;

2. Continental Tanks

3. Hydropneumatic Tank:

B. The hydropneumatic tank shall meet the following requirements
1) ASME Boiler & Pressure Vessel Code
2) AWWA D100 Standard for Welded Steel Tanks.
3) ANSI/NSF Standard 61

2.2 Hydropneumatic Tank

A. Tank Dimensions and Required Pressure
1. Tank shall have a gross capacity of 1,000 gallons
2. Tank shall be approximately 4-foot diameter
3. Tank shall be approximately 12 1/2-feet in length.

B. Inlet and Outlet
1. Tank inlet shall be sized and located as shown on the drawing.
2. Tank outlet shall be sized and located as shown on the drawing.
3. 2- 2-inch threaded openings shall be installed on the top of the tank.
4. The tank shall be provided with a site glass as shown on the drawings
5. 2 1-inch threaded connections shall be mounted on the tank as shown on the drawings

C. Man Access
1. A 12"x16" man entrance shall be provided. Entrance shall meet all codes

D. Support Saddle
1. 12-inch wide metal saddles shall be provided on the tank as shown on the drawings.

2. Saddles shall provide a minimum of 24-inches of clearance below the bottom of the tank.

E. Coatings
1. Interior of the tank shall be coated according to ANSI/NSF Standard 61
2. Exterior of the tank shall be primed with an Oxide Primer to prevent rust.
3. Exterior of the tank shall be field coated by the contractor with Tenemic Brand Paint.

F. Tank shall be labeled with the following information:
1. Name of manufacturer
2. Maximum allowable pressure of the tank as determined by the ASME Boiler Code.

2.3 MATERIALS, GENERAL

A. Steel
1. All material shall meet the requirements of the ASME Boiler Codes. The Pressure Vessel shall be design for 100 psi working pressure. The outer shell shall be sized using the ASME Boiler Codes to meet the required working pressure and the required factor of safety as defined by the ASME Boiler Codes.

PART 3 - EXECUTION

3.1 Assembly

A. Hydropneumatic tank shall be sand blasted to a white metal finish in the areas of the weld. The tank shall be completely assembled prior to testing.

3.2 Testing

A. Testing of the tank shall comply with the requirements of the ASME Boiler Codes. The tank shall be tested for any and all leaks.

3.3 Coating

A. Factor Coating
1. The interior of the tank shall be coated according to ANSI/NSF Standard 61
2. Exterior of the tank shall be primed with an Oxide Primer to prevent rust

B. Field Coating
1. Exterior of the tank shall be field coated by the contractor with Tenemic Brand Paint for metal exterior quality. Color shall be white.

3.4 Shipping & Handling

A. The tank shall be shipped to the site by the manufacturer.

B. The contactor shall be responsible for handling and storage of the tank upon arrival. The contract is responsible for inspection of the tank for any damages during shipping.

3.5 Installation

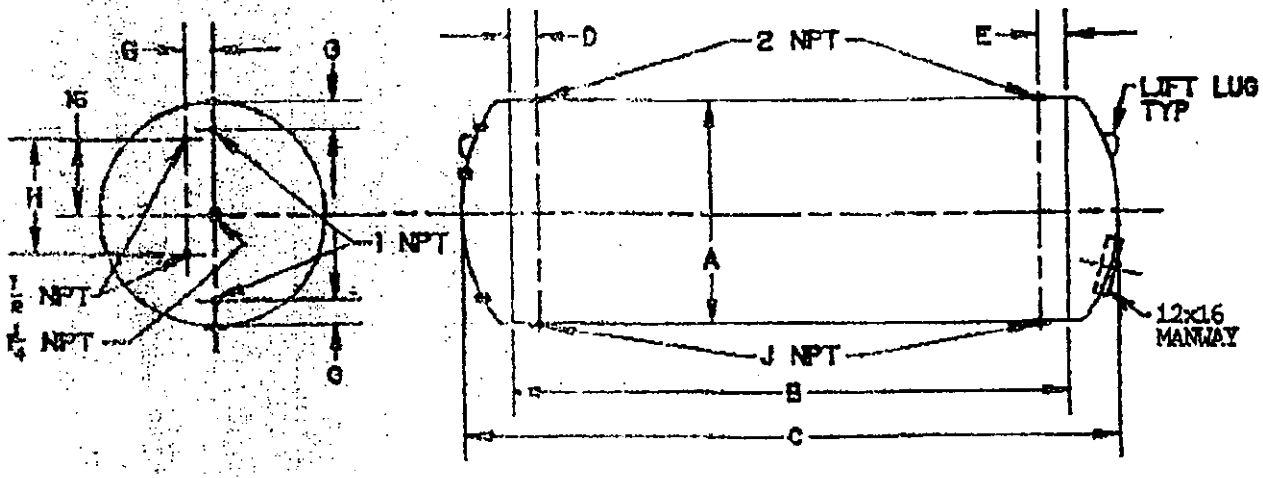
A. Hydropneumatic tank shall be installed as shown on the drawings.

B. Contactor is responsible for all piping connections to the hydropneumatic tank.

END OF SECTION 5510

QUICK TANKS, Inc.

QHTC ASME CODE -- QUICK HORIZONTAL TANKS
ANSI/NSF STANDARD 61 CERTIFIED LINING
100 PSI WORKING PRESSURE



BELOW ARE DIMENSIONS FOR STANDARD TANK CAPACITIES.
OTHER CONFIGURATIONS ARE AVAILABLE UPON REQUEST.

CRADLE DIMENSIONS VARY WITH TANK DIAMETER,
BUT ALL CRADLES RAISE TANK 8 INCHES ABOVE MOUNTING SURFACE.
NOTE: CRADLES ARE OPTIONAL - NOT INCLUDED IN TANK PRICE

QHT - QUICK HORIZONTAL TANKS
100 PSI WORKING PRESSURE
LINED WITH ANSI/NSF STANDARD 61 CERTIFIED EPOXY - PRIMED EXTERIOR

MODEL NUMBER	GALLONS ACTUAL	----NOMINAL DIMENSIONS--INCHES--- A	B	C	D	E	F	G	H	J	WT-#
QHT1000	1009	48	120	130	6	6	16	6	24	3	1744#
QHT1600	1472	48	180	210	6	6	16	6	24	3	2387#
QHT2000	2027	48	252	282	6	6	16	6	24	4	3164#
QHT2500	2477	60	192	227	6	6	20	6	24	4	3397#
QHT3000	3057	60	240	275	6	6	20	6	24	4	4106#
QHT3500	3492	60	276	311	6	6	20	6	24	4	4547#
QHT4000	4021	72	216	257	6	6	24	6	24	4	5666#
QHT4500	4440	72	240	281	6	6	24	6	24	4	6148#
QHT5000	5064	72	276	317	6	6	24	6	24	4	6870#
QHT6000	6112	84	240	287	6	6	28	6	24	4	7387#
QHT7000	6964	84	276	323	6	6	28	6	24	4	8225#
QHT8000	8068	96	240	293	6	6	32	6	84	6	10651#
QHT9000	8812	96	264	317	6	6	32	6	24	6	11426#
QHT10000	10300	96	312	365	6	6	32	6	24	6	12957#

SECTION 15150 - FLOW METER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Detail Specification of the Master Well Flow Meter

1.3 DEFINITIONS

A. Missouri Department of Natural Resources: Mo~DNR

B. American Water Works Association: AWWA

1.4 SYSTEM DESCRIPTION

A. Flow meter shall be a propeller driven meter, measuring flow in gallons.

1.5 PERFORMANCE REQUIREMENTS

A. The meter shall meet the requirements of AWWA D150 and AWWA Standard C-702

1.6 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of the flow meter that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Faulty operation of inaccurate meter readings or no readings.
   b. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period: 1 year from date of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Sensus Flow Meters
   2. Master Meter Inc.
   3. ISTEC Flow Measurement & Control

B. Flow meter shall be sized to agree with piping size and expected flow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine flow meter for any apparent factory or shipping defects prior to installation.

3.2 FLOW METER INSTALLATION

A. Install flow meter according to manufactures guidelines.

END OF SECTION 15150

SECTION 15444 - BOOSTER PUMP

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes constant-speed, duplex, booster pumps.

1.3 SUBMITTALS

A. Product Data: For each booster pump specified. Include certified performance curves with operating points plotted on curves; and rated capacities of selected models, furnished specialties, and accessories.

B. Shop Drawings: For booster pumps and accessories. Include plans, elevations, sections, details, and attachments to other work.

1. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Operation and Maintenance Data: For each booster pump to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of packaged booster pumps and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. ASME Compliance: Comply with ASME B31.9 for piping.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with pump manufacturer's written rigging instructions for handling.

D. One spare pump shall be kept in storage on site incase of pump failure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 CONSTANT-SPEED, DUPLEX BOOSTER PUMPS

A. Available Manufacturers:

   1. STA-RITE.
   2. F.E Myers.

B. Description: Factory-assembled and -tested, booster pump with pump, piping, valves, sensors, hydropneumatic tank, and controls mounted on skids or base.

C. System Working-Pressure Rating: 60 psig minimum.

D. Pump: Overhung impeller, close coupled, single stage, end suction, centrifugal. Comply with UL 778 and with HI 1.1-1.2 and HI 1.3.

   1. Pump Construction: Bronze fitted.

      a. Casing: Radially split, cast iron.
      b. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, closed, and keyed to shaft.
      c. Shaft and Shaft Sleeve: Steel shaft, with copper-alloy shaft sleeve.
      d. Seal: Mechanical.

E. Motor: Single speed, with oil-lubricated bearings, unless otherwise indicated; and directly mounted to pump casing. Select motor that will not overload through full range of pump performance curve.

F. Control Valve: Adjustable, automatic, direct-acting pressure regulator on pump discharge.

G. Relief Valve: Adjustable, pressure relief type on pump discharge.

H. Piping: ASTM A 53/A 53M, Schedule 40, galvanized-steel pipe with threaded, cast-iron fittings and threaded joints.

I. Valves: Include shutoff valve at each pump suction, and shutoff valve and check valve at each pump discharge.

1. Shutoff Valves: MSS SP-80, Class 125, bronze, rising-stem gate valve or MSS SP-110, 600-psig minimum CWP, bronze ball valve with ends matching piping.
2. Check Valves: Spring- or lever-loaded, MSS SP-80, Class 125, bronze, swing check valve.

J. Sensors: Pressure and flow switches.

K. Dielectric Fittings: Factory-fabricated union assembly; with insulating material isolating joined dissimilar metals to prevent galvanic action and to stop corrosion; rated for 250-psig minimum working pressure at 180 deg F.

L. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembling and testing. Protect flanges, pipe openings, and pump nozzles.

M. Capacity and Characteristics:
1. Discharge Pressure: 60 psig.
2. Shutoff Pressure: 60 psig.
3. Inlet Size: 2 ½-inch NPS.

a. Outlet Size: 2 inch NPS.

b. A pressure gauge shall be located on the discharge piping as shown on the plans.

4. Pump:

a. Capacity: 81 gpm.
b. Total Dynamic Head: 138.5 feet
c. Shutoff Pressure: 60 psig
d. Speed: 3450 rpm.

5. Motor Horsepower: 5 hp
6. Electrical Characteristics:

a. Volts: 240
b. Phases: Single.
c. Hertz: 60.
d. Full-Load Amperes: 28
e. Minimum Circuit Ampacity: 40

2.3 BOOSTER PUMP CONTROL PANEL

A. A NEMA 3R control panel shall be furnished for the operation of the booster pumps with the following equipment
1. Elapsed time meters for each pump to record the run time of the pump.
2. Event counter to record the total pump starts.
3. Alternator to switch between pumps.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for booster pumps to verify actual locations of connections before booster pump installation.

3.2 BOOSTER PUMP INSTALLATION

A. Install booster pumps level on concrete floor with access for periodic maintenance including removal of pumps, motors, impellers, couplings, and accessories.

1. Do not dismantle packaged booster pumps or remove individual components.

B. Support connected water piping so weight of piping is not supported by packaged booster pumps.

3.3 CONTROL PANEL INSTALLATION

A. Install booster pump control panel in accordance with the manufactures recommendations. Wiring for the panel shall meet all local and state electrical codes.

3.4 CONNECTIONS

A. Connect water piping to booster pumps. Install suction and discharge pipe equal to or greater than size of unit suction and discharge piping.

1. Install shutoff valves on piping connections to each booster pump suction and discharge piping. Install gate valves same size as suction and discharge piping
2. Install union or flanged connections on pump suction and discharge piping at connection to domestic water piping.
3. Install piping adjacent to packaged booster pumps to allow service and maintenance.

B. Ground equipment according to NEC codes."

C. Connect wiring according to NEC codes."

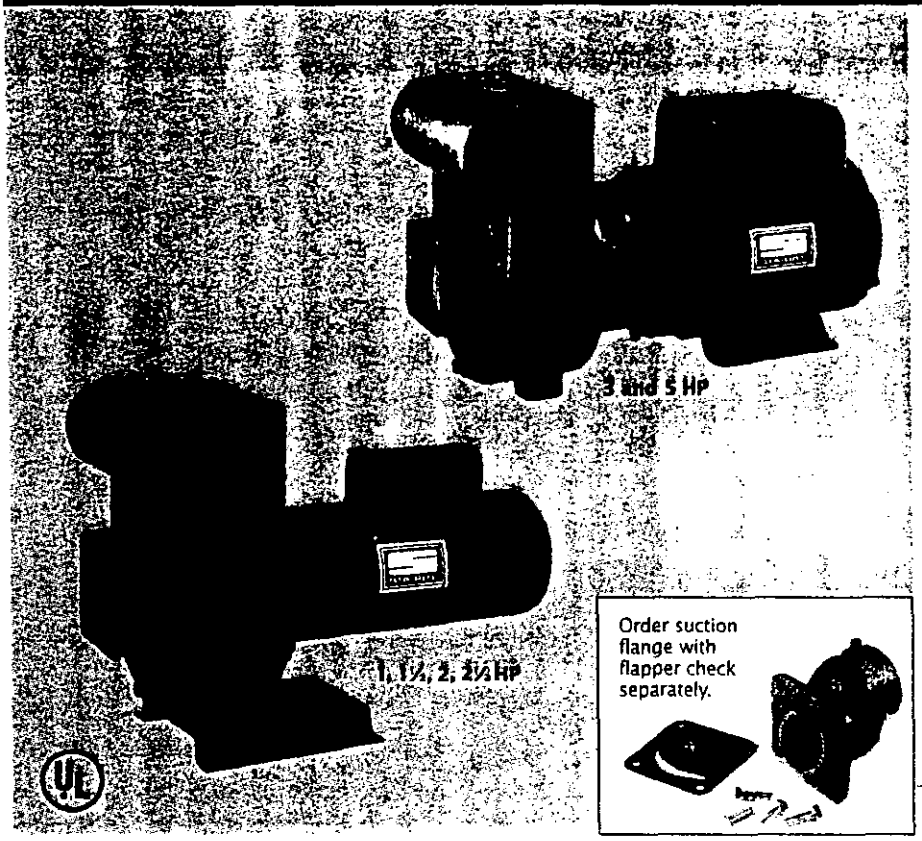
3.5 LABELING AND IDENTIFICATION

A. Install identifying equipment markers and equipment signs on booster pumps.

END OF SECTION 15444

STA-RITE

self-priming centrifugal pumps



This product is Listed to UL Standards for Safety by Underwriters Laboratories Inc. (UL). (1, 1½, 2, 2½ HP)

Some of the fastest priming pumps on the market. Available in high head or medium head series. Feature leak-proof mechanical seals, easy service design, heavy-duty motors, rugged construction. Available in 1 through 5 HP.

Optional 6" and 8" Trap Packages are available.

APPLICATIONS

- **Lawn Sprinkling**... operate from 1 to 30 or more heads. Can be safely operated by timer or other automatic device.
- **Contractors**... for dewatering excavation, jetting, water transfer and supply operations.
- **Agriculture**... seed bed and plot irrigation, stock watering, fire protection.
- **Industrial**... sump drainage, fire protection, marine pumping, liquid transfer and supply operations.

D SERIES

SPECIFICATIONS

Body and Base – Close-grained cast iron

Impeller – Noryl® on 1 through 2-1/2 HP, bronze on 3 and 5 HP

Diffuser – Cast iron

Shaft – *1 through 2-1/2 HP:* 416 stainless steel; *3 and 5 HP:* Carbon steel inside removable shaft sleeve of stainless steel.

FEATURES

1 through 5 HP – Both high head and medium head models offer heavy-duty motors, easy service design, and air volume control tapping.

Drain Port – Provided for easy winterizing.

Medium Head Models – Deliver up to 115' of head with capacities to 159 GPM.

High Head Models – Deliver up to 138' of head with capacities to 162 GPM.

Easy Serviceability – Normal wearing parts are easily accessible for service and replacement, without disturbing piping or mounting.

Heavy-duty Motors – Designed for continuous operation. Capacitor start, will not cause electrical interference with TV or other appliances. Nationally known motors have ball bearing, stainless steel shaft. For single- and three-phase operation, 3450 RPM.

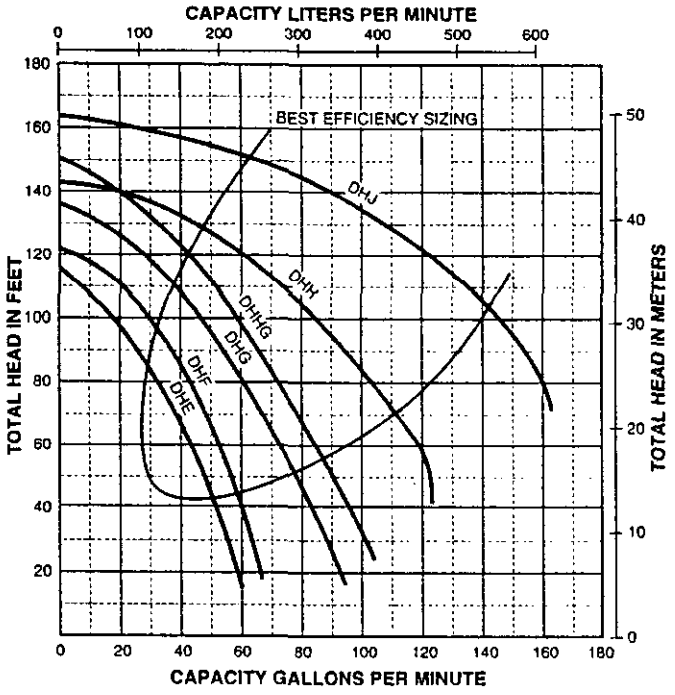
Noryl® is a registered trademark of General Electric Co.

In order to provide the best products possible, specifications are subject to change.

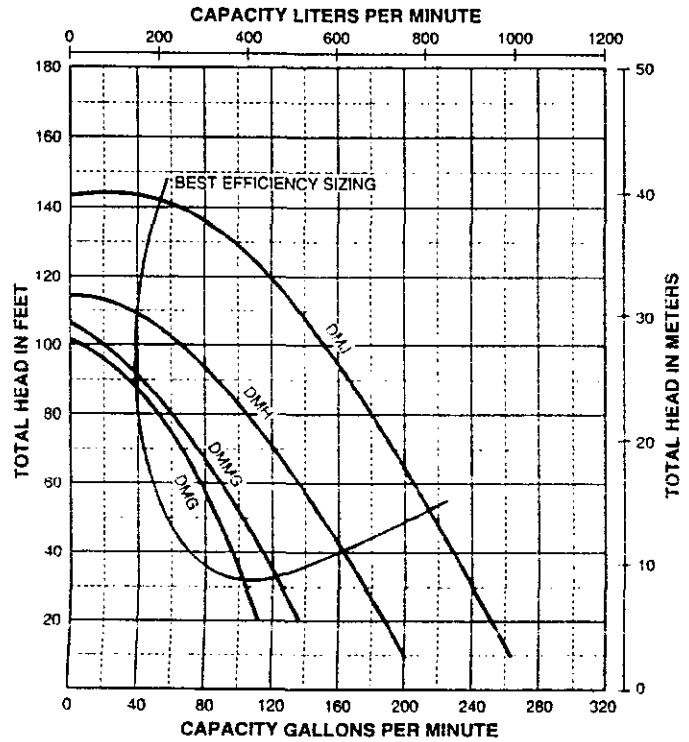
STA-RITE

self-priming centrifugal pumps

PUMP PERFORMANCE – HIGH HEAD



PUMP PERFORMANCE – MEDIUM HEAD



PUMP PERFORMANCE *(Capacity in Gallons Per Minute)*

HIGH HEAD

Cat. No.	HP	Discharge PSI	Discharge Feet Head	Suction Lift in Feet 5'	10'	15'	20'	25'
DHE	1	20	46.2	46	43	41	40	38
		30	69.3	35	32	29	25	21
		40	92.4	19	15	–	–	–
		50	115.5	–	–	–	–	–
		60	138.6	–	–	–	–	–
DHF	1-1/2	20	46.2	55	53	51	49	48
		30	69.3	45	42	39	36	32
		40	92.4	31	27	22	15	–
		50	115.5	–	–	–	–	–
		60	138.6	–	–	–	–	–
DHG	2	20	46.2	77	74	71	68	65
		30	69.3	63	60	56	53	49
		40	92.4	48	44	40	36	30
		50	115.5	30	20	13	–	–
		60	138.6	–	–	–	–	–
DHHG	2-1/2	20	46.2	89	85	82	80	76
		30	69.3	75	72	68	64	60
		40	92.4	60	57	51	49	42
		50	115.5	42	37	31	25	20
		60	138.6	14	–	–	–	–
DHH	3	20	46.2	–	–	–	113	109
		30	69.3	109	103	98	92	89
		40	92.4	90	75	74	69	62
		50	115.5	62	51	42	32	20
DHJ	5	20	46.2	–	–	–	–	–
		30	69.3	–	–	–	–	–
		40	92.4	146	141	136	130	122
		50	115.5	122	114	105	95	85
		60	138.6	81	70	50	30	–

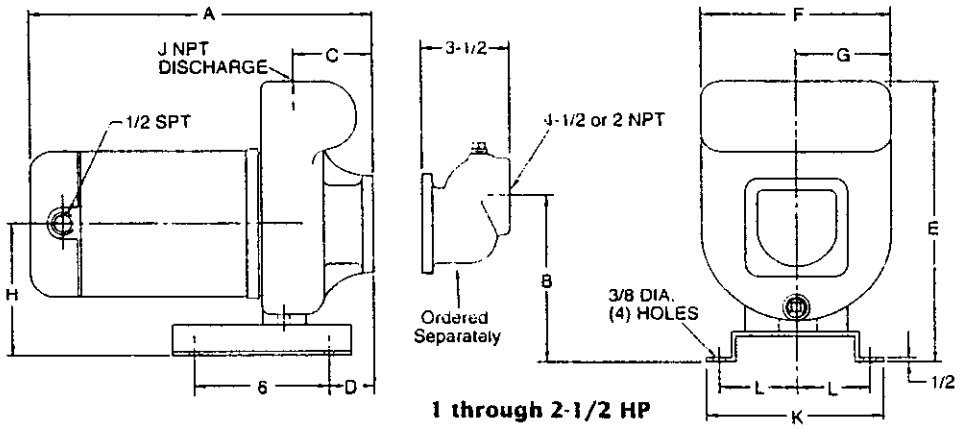
MEDIUM HEAD

Cat. No.	HP	Discharge PSI	Discharge Feet Head	Suction Lift in Feet 5'	10'	15'	20'	25'
DMG	2	20	46.2	84	79	74	69	63
		30	69.3	60	53	46	35	20
		40	92.4	22	–	–	–	–
		50	115.5	–	–	–	–	–
DMMG	2-1/2	20	46.2	103	96	90	80	70
		30	69.3	70	60	50	46	30
		40	92.4	30	18	5	–	–
		50	115.5	–	–	–	–	–
DMH	3	20	46.2	149	140	136	124	119
		30	69.3	116	108	99	85	76
		40	92.4	75	65	51	26	–
DMJ	5	20	46.2	214	209	202	194	182
		30	69.3	185	179	172	165	158
		40	92.4	153	146	139	130	120
		50	115.5	119	107	95	80	50

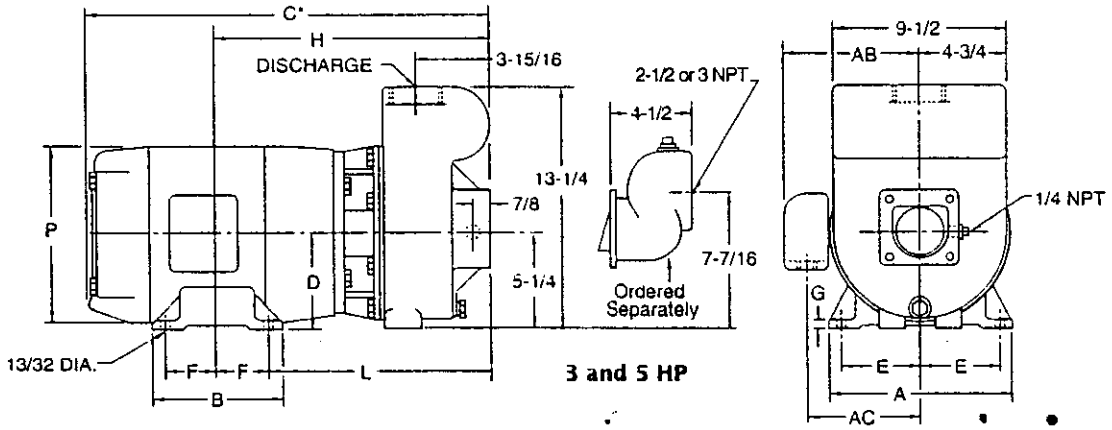
STA-RITE

self-priming centrifugal pumps

OUTLINE DIMENSIONS



1 through 2-1/2 HP



3 and 5 HP

Dimensions (in inches) are for estimating purposes only.

DIMENSIONS IN INCHES – 1 THROUGH 2-1/2 HP

Catalog Number	HP	A	B	C	D	E	F	G	H	J	K	L
DHE	1	15-13/16	7-1/16	3-1/2	4	11-7/8	7-7/8	3-15/16	5-13/16	1-1/2	7-1/2	3-3/8
DHF	1-1/2	16-11/16	7-1/16	3-1/2	4	11-7/8	7-7/8	3-15/16	5-13/16	1-1/2	7-1/2	3-3/8
DHG	2	18-11/16	7-13/16	3-15/16	3-13/16	14-3/8	9-1/2	4-3/4	6-9/16	2	7-1/2	3-3/8
DHHG	2-1/2	19-11/16	7-13/16	3-15/16	3-13/16	14-3/8	9-1/2	4-3/4	6-9/16	2	7-1/2	3-3/8
DMG	2	17-15/16	7-1/16	3-1/2	4	11-7/8	7-7/8	3-15/16	5-13/16	1-1/2	7-1/2	3-3/8
DMMG	2-1/2	18-15/16	7-1/16	3-1/2	4	11-7/8	7-7/8	3-15/16	5-13/16	2	7-1/2	3-3/8

DIMENSIONS IN INCHES – 3 AND 5 HP

Catalog Number	HP	A	B	C*	D	E	F	G	H	L	P	AB	AC
DHH	3	9	6	20-3/4	4-1/2	3-3/4	2-1/4	1/2	15	12-3/4	9-3/4	8-1/8	6-1/2
DHJ	5	9	7	21-3/4	4-1/2	3-3/4	2-3/4	1/2	15-1/2	12-3/4	9-3/4	9	7
DMH	3	9	6	20-3/4	4-1/2	3-3/4	2-1/4	1/2	15	12-3/4	9-3/4	8-1/8	6-1/2
DMJ	5	9	7	21-3/4	4-1/2	3-3/4	2-3/4	1/2	15-1/2	12-3/4	9-3/4	9	7

*Overall length (C) is shown for single-phase motors. Three-phase motors are slightly smaller. Dimensions are for estimating purposes only.

SECTION 15862 - OIL-LESS AIR COMPRESSOR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Oil-Less Air Compressor

1.3 DEFINITIONS

A. Missouri Department of Natural Resources: Mo~DNR

B. American Water Works Association: AWWA

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Oil-Less Air Compressor:

a. Thomas Ultra Air-Pac Compressor

b. Charge Air, Pacific Hydro Proucts

2.2 COMPRESSOR REQUIREMENTS

A. Compressor Requirements
1. Motor
   a. 1 hp or larger
   b. 120 volt single phase
   c. UL listed
2. Compressor and Air Tank
   a. Compressor shall deliver 2.85 cfm @ 90 psi
   b. Tank shall be a minimum of 4 gallons

c. Tank shall meet all ASME Pressure Vessel Codes:
d. Tank Shall be Equipped with a 140 psi ASME rated safety valve.

B. Charge Air
1. Self Contained Oil-less Compressor
a. 115-volt single phase
b. Internally controlled

PART 3 - EXECUTION

3.1 COMPRESSOR INSTALLATION

A. The compressor shall be mounted as shown on the drawings. Compressor may be mounted on a bench or a shelf capable of supporting the weight of the compressor.

B. The Charge Air system shall be mounted to the tank according to manufactures recommendations.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Air Solenoid Valve shall meet the requirements of the controller and be installed in the air line to the Hydropneumatic Tank

END OF SECTION 15862

CHARGE AIR

CHARGE AIR
Pacific Hydro Products

Universal Aircharging System for Hydropneumatic Tanks

- Dual Voltage System (120–240 VAC)
- Auto Ranging Solid State Liquid Level Control
- Oil-less Long Life Compressor
- Adjustable Pressure Switch (40–120 PSI)
- One Year Warranty

CHARGE AIR Standard Features...

Charge *Air* is an entirely self-contained dual voltage air charging system. All components are mounted on a corrosion resistant gold zinc plated base using stainless steel fasteners and enclosed within a heavy gauge high density polyethylene, weatherproof outer shell. The protected components include a long life oil-less compressor, auto ranging solid state liquid level control with isolated electrode circuit and time delay and an adjustable 40 to 120 P.S.I. pressure switch.

CHARGE AIR Operation...

Charge *Air* utilizes three primary components: a liquid level switch, a pressure switch, and an air compressor. Through an electrode suspended into the tank from the Charge Air system the liquid level control continuously monitors the water level of the tank. Simultaneously the pressure switch monitors the air pressure in the tank. When the water level is above the electrode and the air pressure in the tank drops below its setting the compressor will start and continue to run until the proper air pressure is reached or the water level drops below the electrode. This constant monitoring guarantees that the optimum air charge is maintained.

CHARGE AIR MFG by Pacific Hydro Products, Grass Valley, CA • (888)747-3257 • Fax (888)865-7325

CHARGE AIR

CHARGE AIR
Pacific Hydro Products

Installation Instructions

Charge Air Model CA2000 Air Volume Control

1. Attaching The Water Level Probe—The bottom of the probe should hang half way from the top of the tank and tank and the center of the outlet pipe at the bottom. Measure this distance, divide by two, and add 4 inches. Cut the white probe wire to this length, and strip $^1/_2$" of insulation from the end of the wire. Twist the wire strands into a tight bundle, and connect the probe wire to brass connector inside the coupling on the ***Charge Air*** base by sliding the stranded bundle into the side of the brass connector and securing it with the stainless steel screw provided. Use caution not to over tighten the screw as it might cut the wire strands. Gently pull on the wire to confirm a sound attachment.

2. Mounting Charge Air to The Tank—***Charge Air*** should be located near the end of the tank if possible for ease of installation and servicing, but not over the water inlet pipe where waves might disturb the probe readings. Attach ***Charge Air*** using a 2" steel pipe nipple 3" long. Use a good thread sealing compound or Teflon tape to assure an air tight seal. The vibration damper rod must be adjusted so it is snug against the tank, and line up with the tank centerline if on a horizontal tank.

3. Connecting the Electrical Power—The ***Charge Air*** operates on either 115,208, or 230 volts. The motor is factory wired for 115 volts, so if higher voltage is used the jumpers in the back of the motor must be moved according to the motor name plate diagram. The water level control electronic module is auto ranging, which means it will operate on either 115, 208, or 230 volts without any adjustment. Power to the ***Charge Air*** should be a separately fused 15 amp circuit. Because ***Charge Air*** circuitry is surge protected, it can be powered from the pump control panel. Since it operates independently of the pump, it should be connected between the disconnect and the pump contractor.

4. Adjusting the Pressure Switch—***Charge Air*** pressure switch cut-out must be set 5 PSI below the pump pressure switch cutout setting. For instance, if the pump pressure switch is set at 40-60, the Charge Air pressure switch must be set at 55 PSIG. The ***Charge Air*** switch is factory set at 45 PSIG, making it suitable, as shipped, for a pump pressure switch setting of 30-50. Any other pump pressure setting requires an adjustment of the ***Charge Air*** Pressure Switch. ***(Note—The minimum set point on the Charge Air pressure switch is 40 PSI, so the minimum system pressure for which Charge Air is suitable is 25-45.)*** The Charge Air pressure switch has a thumb wheel which is used to adjust it's pressure setting. The indicator on the front to the pressure switch gives only a ball park indication of the cutout pressure, so a pressure gauge must be used to make the final adjustments. Before adjusting the setting, drain enough water out of the tank to make the pump cycle. Watch the pressure gauge and note the exact pressure reading when the pump shuts off at the end of the pumping cycle. Adjust the ***Charge Air*** pressure switch to turn the compressor off 5 PSIG below this Pump cutoff reading. To increase the compressor cutout setting, turn the thumb wheel until the compressor turns on and slowly increase the setting until the desired cutout pressure is achieved. When adjusting the setting, make sure there is enough water in the tank to contact the probe so the compressor will run. Some means of bleeding air out of the tank without changing the water level makes setting the compressor cutout pressure much quicker and more accurate. ***(Note—Should the compressor not start as expected, remember the 15 second on-delay timer built into the water level control circuitry to prevent the it from short cycling due to waves in the tank.)***

Pacific Hydro Products, Inc. Box 1697, Grass Valley, CA 95945 • Phone 888 747-3257 • FAX 888 865-7325

SECTION 15867 - ELECTRIC HEATER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Wall Mount Electric Heater

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Electric Wall Heater

a. Qmark

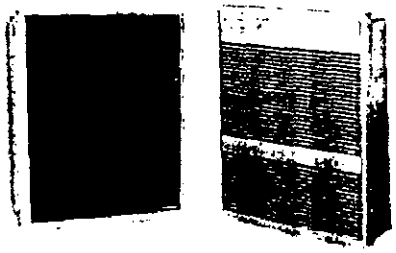
B. Heater Requirement
1. 3600/4800 watts; 240 volt
2. wall mounted minimum 36-inches above the finish floor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Wall Heater shall be mounted according to the manufactures requirements. Wiring to the heater shall meet all NEC codes and local building codes.

END OF SECTION 15867



No. 5E176 [A] No. 5E177

[A] TAMPER-RESISTANT HEATERS

Tamper-resistant, commercial-grade construction features are ideal for small entryways, lobbies, corridors, stairwells, rest rooms, churches, schools, offices, stores and other public buildings where supplementary heat is required. Integral thermostat is tamper-resistant and adjustable only by inserting narrow blade screwdriver through front bar grille of heater. Permanently lubricated totally enclosed fan motor provides long life and low maintenance; gently distributes 100 CFM warm air throughout room area. Contemporary heavy-duty 16-gauge steel bar grille available in bronze brown baked enamel finish and satin finished aluminum frame or Navajo white unit and frame. Recess mounts in standard 2" x 4" stud walls. Housing measures 14¾"W x 18⅝"H x 3"D. Use No. 5E188 (Bronze Brown) or No. 5E189 (Northern White) frames for surface mounting applications.

SURFACE MOUNTING FRAMES FOR TAMPER-RESISTANT HEATERS

For surface installation on brick, concrete block, wood, and plaster walls. Frame extends 3⅜". Screws and mounting hardware included.

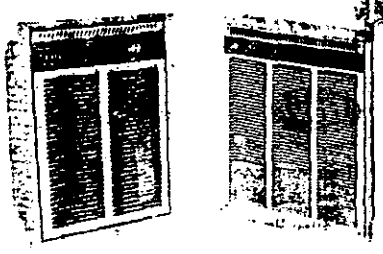
No. 5E188. Bronze brown frame. QMark brand (AWH-SM). Shpg. wt. 4.0 lbs. List $58.48. Each **$48.55**

No. 5E189. Navajo white frame. QMark brand (FRA-SM). Shpg. wt. 4.0 lbs. List $58.18. Each **$48.55**

QMARK

BUILT-IN ELECTRIC WALL HEATERS FEATURE:

- Heavy-duty steel finned metal sheath heating element
- Built-in fan delay switch energizes fan motor only after elements are heated
- Integral thermostat for quick installation
- Motors are totally enclosed, impedance protected with permanently lubricated bearings
- For use in applications where energy management is critical



No. 3UF58 [B] No. 3UF60

Repair Parts Available
1-800-323-0620

[B] ARCHITECTURAL / COMMERCIAL GRADE HEATERS

Highly styled design is ideal for supplementary heating of offices, reception rooms, game rooms, family rooms and similar light-duty commercial and residential applications. Rugged stamped steel front covers attractively finished in Northern White baked enamel with a brushed gold and silver trimmed face plate. Hole plugs provided for tamper-resistant installations. Separate tamper resistant front cover, in Northern White finish available for Nos. 3UF59 thru 3UF63. Nos. 3UF59 thru 3UF63 have a built-in fan only switch. Nos. 3UF60, 3UF61, 3UF59, 3UF62, and 3UF63 grille dimensions are 19¾H x 15¾W x 1⅛"D; Openings are 18⅛H x 14¾W x 3⅜"D. No. 3UF58 grille dimensions are 14⅞H x 11⅞W x 1⅛"D; Opening is 12⅛H x 9¼W x 3⅜"D. QMark.

SURFACE MOUNTING FRAMES

No. 4TM74. Surface Mounting Frame. QMark brand (CWHSMI) used with No. 3UF58 only. Shpg. wt. 2.0 lbs. List $59.66. Each **$46.40**

No. 4TM75. Surface Mounting Frame. QMark brand (FZSM) used with Nos. 3UG12, 3UG13 and 3UG14 on page 3458. Shpg. wt. 2.0 lbs. List $44.89. Each **$34.90**

No. 3UF66. Surface Mounting Frame. Use with Nos. 3UF59, 3UF60, 3UF61, 3UF62 and 3UF63. Frame extends 3⅝". QMark brand (CWH 3-SM). Shpg. wt. 2.0 lbs. List $57.66. Each **$46.20**

No. 3UF64. Surface Mounting Frame. 1" Deep surface mounting sleeve for semi-recessed installation. QMark brand (CWH3S-1). Shpg. wt. 2.0 lbs. List $57.66. Each **$46.20**

No. 3UF65. Surface Mounting Frame. 2" Deep Surface mounting sleeve for semi-recessed installation. QMark brand (CWH3S-2). Shpg. wt. 2.0 lbs. List $57.66. Each **$46.20**

No. 3UG58. Security Front Cover. For Nos. 3UF59 through 3UF63 and 3UG55 through 3UG57 (sold on page 3458). 14-Gauge steel, Northern White finish. QMark brand (LFKSFC). Shpg. wt. 6.0 lbs. List $88.64. Each **$59.90**

Key	Heater Description	Watts	Btu/H	Volts/Hertz	Amps	Enamel Finish	Q Mark Model	Stock No.	List	Each	Shpg. Wt.
A	Tamper-Resistant	1500	5120	277	5.5	Brown	AWH-4157	5E176	$450.16	$342.25	25.0
		1500	5120	277	5.5	White	AWH-4157MG	5E177	450.16	342.25	25.0
		2000	6842	208	10.0	Brown	AWH-4208	5E178	450.16	342.25	25.0
		2000	6842	208	10.0	White	AWH-4208MG	5E179	450.16	342.25	25.0
		2000	6842	240	8.5	Brown	AWH-4204	5E180	450.16	342.25	25.0
		2000	6842	240	8.5	White	AWH-4204MG	5E181	450.16	342.25	25.0
		4000	13,650	208	19.5	Brown	AWH-4408	5E182	515.53	391.75	25.0
		4000	13,650	208	19.5	White	AWH-4408MG	5E183	515.53	391.75	25.0
		4000	13,650	240	16.7	Brown	AWH-4404	5E184	515.53	391.75	25.0
		4000	13,650	240	16.7	White	AWH-4404MG	5E185	515.53	391.75	25.0
		4000	13,650	277	14.5	Brown	AWH-4407	5E186	515.53	391.75	25.0
		4000	13,650	277	14.5	White	AWH-4407MG	5E187	515.53	391.75	25.0
B	Architectural/ Commercial Grade	1500/750/2000/1000	5120/2560/6826/3413	208/240	7.2/6.3/9.6/4.2	White	CWH2202	3UF58	191.66	136.10	12.0
		3000/4000	10,239/13,652	208/240	14.5/16.7	White	CWH3404	3UF60	379.00	269.75	22.0
		3000/4000	10,239/13,652	240/277	12.5/14.5	White	CWH3407	3UF61	379.00	269.75	22.0
		3000	10,239	277	10.8	White	CWH3307	3UF59	379.00	269.75	22.0
		3600/4800	10,287/16,382	208/240	17.3/20.0	White	CWH3504	3UF62	379.00	269.75	22.0
		3600/4800	12,287/16,382	240/277	15.0/17.3	White	CWH3507	3UF63	379.00	269.75	22.0

SECTION 15911 – Well SYSTEM CONTROLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Ground Storage Tank Water Level Controller
2. Booster Pump Controller
3. Hydropneumatic Pressure Tank Air Controller

1.3 DEFINITIONS

A. Missouri Department of Natural Resources: Mo~DNR

1.4 SUBMITTALS

A. Product Data: For the following:

1. Ground Storage Tank Water Level Controller
2. Booster Pump Controller
3. Hydromaster Pressure Tank air Controller

B. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

C. Shop Drawings: Installation details for the controller.

D. Shop Drawings: Diagram power, signal, and control wiring.

E. Operation and Maintenance Data: For all listed Controllers to include in emergency, operation, and maintenance manuals.

1.5 ALTERNATE CONTROLER

A. Master Level Controls
   1. Single Panel Controler
      a. H-172

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of Controller that fail in materials or workmanship within specified warranty period.

   1. Warranty Period: 1 year from date of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Ground Storage Tank Water Level controller
      a. Ametek: B/W Controls
   2. Booster Pump Controler
      a. Square "D": Pressure Switch Controller
   3. Hydropneumatic Pressure Tank Air Controler
      a. Charge Air "Oil-Less" Air Controller, Model CA2000.

2.2 CONTROLS and FEATURES

A. Ground Storage Tank Water Level Controller features:
   1. Pump Start Electrode
   2. Pump Stop Electrode
   3. Booster Pump low Level Stop Electrode
   4. Contact for Well Pump Motor Starter

B. Booster Pump Control Requirements
   1. Square "D" 40/60 Pressure Switch or Approved substitute.
   2. Contact for Booster Pump Motor Starter

C. Hydropneumatic Pressure Tank Air Controller
   1. Charge Air Model CA2000
   2. 2-inch NPT attachment
   3. 115-volts
   4. Adjustable pressure swithch

D. Alternate Master Level Controls H-172
   1. Ground Storage Tank Water Level Controls
      a. Well pump on/off
   2. Booster Pump Controls with low water pump off control.

a. Booster pump on/off, ground storage tank low water off
3. Hydropneumatic Add air control

PART 3 - EXECUTION

3.1 EXAMINATION

A. Contractor shall examine the products upon arrival for any defects or damage during shipping.

3.2 INSTALLATION

A. All Controls shall be installed according to the manufactures guidelines

3.3 CONNECTIONS

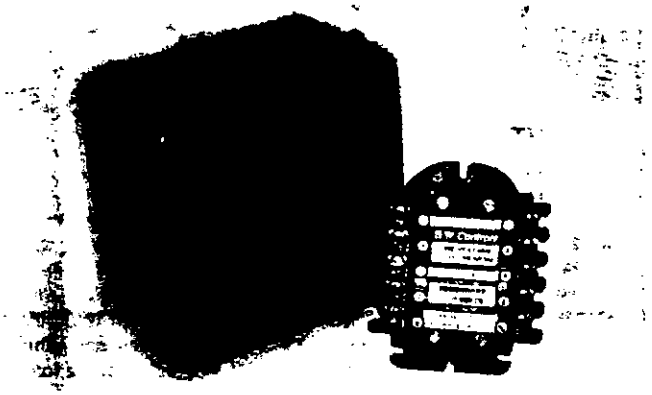
A. Connect wiring according to manufactures shop drawings.

END OF SECTION 15910

AMETEK®

Series 1500 B/W Controls

Induction Control Relays



PRINCIPLE OF OPERATION

A B/W floatless liquid level control system consists of a relay of the proper type, a holder designed to support one or more electrodes or probes in the liquid container, and the corrosion resistant electrodes themselves. In as much as all B/W induction relays are quite similar -- differing only in contact arrangement, the following description of how a 1500-C Relay functions on a pump down control application will serve to explain the design, construction, and operating principles for the entire line.

As shown in diagrams below, the laminated core of the relay is **A** shaped. The primary coil is assembled to the upper bar of the core, and the secondary coil for the electrode is placed on the lower bar. An armature located below the legs of the **A** core is connected to an insulated arm carrying the movable contacts. When the armature is raised, these contacts close or open the motor and electrode circuits, depending upon whether the contacts are normally open or closed. (Contacts shown normally open in this example).

When a source of alternating current is connected to the primary coil at terminals 3 and 4, the primary coil sets up a magnetic flux which -- following the lines of least resistance -- circulates through the shortest path. As shown in Figure 1, this is through the lower bar of the laminated core on which the secondary coil is mounted. This magnetic flux induces a voltage in the secondary or electrode circuit coil. No current can flow in this coil, however, until the circuit is completed between the electrodes. **Thus, the electrode circuit voltage being generated within the relay has no connection with the power line.**

The B/W 1500 induction relay utilizes the liquid as an electrical conductor to complete the secondary circuit between the upper and lower electrodes. Thus, when the liquid contacts the upper electrode, the resulting flow of current in this circuit sets up a bucking action in the lower bar of the core. This action tends to divert lines of magnetic force to the core legs and sets up an attraction that pulls the armature in to contact with the legs, as shown in Figure 2. This armature movement closes the electrode and load contacts.

The lower contacts on 1500-C Relays (terminals 9 and 10) connect the secondary circuit to ground when liquid contacts the upper electrode and act as a holding circuit to maintain the relay in its closed position until the liquid falls below the lower electrode. This holding circuit provides control of the relay over any desired range in the liquid level, depending on the distance between the upper and lower electrodes.

The flow of current through the low energy secondary circuit is very small and varies with the voltage of the secondary coil. The secondary coil is selected to operate over the resistance of the liquid being controlled. Accordingly, since there is a wide range of secondary coils from which to choose, it is important that complete information regarding the nature of the liquid be furnished when ordering B/W induction relays.

1500-C RELAY USED FOR PUMP DOWN CONTROL

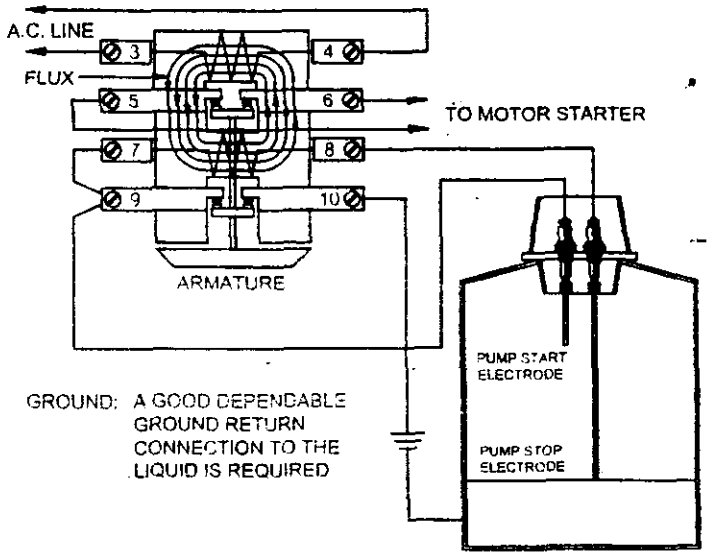


Figure 1 - Secondary coil circuit open; armature down.

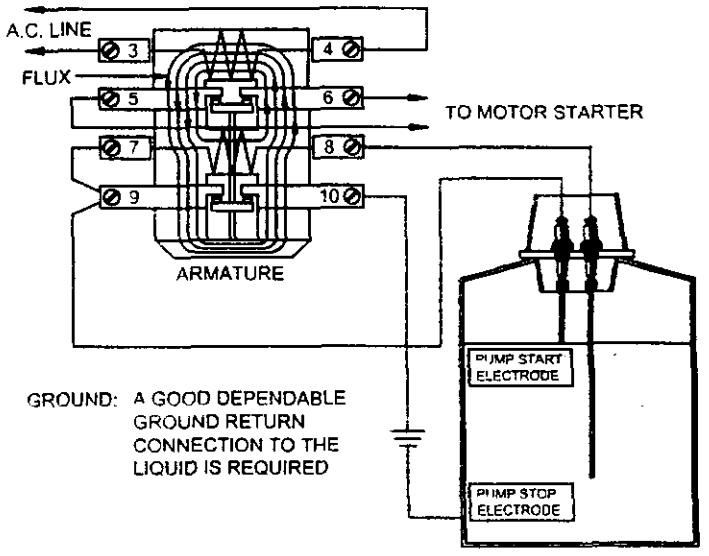


Figure 2 - Secondary coil circuit closed; armature up.

CHARGE AIR

CHARGE AIR
Pacific Hydro Products

Installation Instructions

Charge Air Model CA2000 Air Volume Control

1. Attaching The Water Level Probe—The bottom of the probe should hang half way from the top of the tank and tank and the center of the outlet pipe at the bottom. Measure this distance, divide by two, and add 4 inches. Cut the white probe wire to this length, and strip 1/2" of insulation from the end of the wire. Twist the wire strands into a tight bundle, and connect the probe wire to brass connector inside the coupling on the ***Charge Air*** base by sliding the stranded bundle into the side of the brass connector and securing it with the stainless steel screw provided. Use caution not to over tighten the screw as it might cut the wire strands. Gently pull on the wire to confirm a sound attachment.

2. Mounting Charge Air to The Tank—***Charge Air*** should be located near the end of the tank if possible for ease of installation and servicing, but not over the water inlet pipe where waves might disturb the probe readings. Attach ***Charge Air*** using a 2" steel pipe nipple 3" long. Use a good thread sealing compound or Teflon tape to assure an air tight seal. The vibration damper rod must be adjusted so it is snug against the tank, and line up with the tank centerline if on a horizontal tank.

3. Connecting the Electrical Power—The ***Charge Air*** operates on either 115,208, or 230 volts. The motor is factory wired for 115 volts, so if higher voltage is used the jumpers in the back of the motor must be moved according to the motor name plate diagram. The water level control electronic module is auto ranging, which means it will operate on either 115, 208, or 230 volts without any adjustment. Power to the ***Charge Air*** should be a separately fused 15 amp circuit. Because ***Charge Air*** circuitry is surge protected, it can be powered from the pump control panel. Since it operates independently of the pump, it should be connected between the disconnect and the pump contractor.

4. Adjusting the Pressure Switch—***Charge Air*** pressure switch cut-out must be set 5 PSI below the pump pressure switch cutout setting. For instance, if the pump pressure switch is set at 40-60, the Charge Air pressure switch must be set at 55 PSIG. The ***Charge Air*** switch is factory set at 45 PSIG, making it suitable, as shipped, for a pump pressure switch setting of 30-50. Any other pump pressure setting requires an adjustment of the ***Charge Air*** Pressure Switch. ***(Note—The minimum set point on the Charge Air pressure switch is 40 PSI, so the minimum system pressure for which Charge Air is suitable is 25-45.)*** The Charge Air pressure switch has a thumb wheel which is used to adjust it's pressure setting. The indicator on the front to the pressure switch gives only a ball park indication of the cutout pressure, so a pressure gauge must be used to make the final adjustments. Before adjusting the setting, drain enough water out of the tank to make the pump cycle. Watch the pressure gauge and note the exact pressure reading when the pump shuts off at the end of the pumping cycle. Adjust the ***Charge Air*** pressure switch to turn the compressor off 5 PSIG below this Pump cutoff reading. To increase the compressor cutout setting, turn the thumb wheel until the compressor turns on and slowly increase the setting until the desired cutout pressure is achieved. When adjusting the setting, make sure there is enough water in the tank to contact the probe so the compressor will run. Some means of bleeding air out of the tank without changing the water level makes setting the compressor cutout pressure much quicker and more accurate. ***(Note—Should the compressor not start as expected, remember the 15 second on-delay timer built into the water level control circuitry to prevent the it from short cycling due to waves in the tank.)***

Pacific Hydro Products, Inc. Box 1697, Grass Valley, CA 95945 • Phone 888 747-3257 • FAX 888 865-7325

CHARGE AIR

CHARGE AIR
Pacific Hydro Products

Universal Aircharging System for Hydropneumatic Tanks

- Dual Voltage System (120–240 VAC)
- Auto Ranging Solid State Liquid Level Control
- Oil-less Long Life Compressor
- Adjustable Pressure Switch (40–120 PSI)
- One Year Warranty

CHARGE AIR Standard Features...

Charge *Air* is an entirely self-contained dual voltage air charging system. All components are mounted on a corrosion resistant gold zinc plated base using stainless steel fasteners and enclosed within a heavy gauge high density polyethylene, weatherproof outer shell. The protected components include a long life oil-less compressor, auto ranging solid state liquid level control with isolated electrode circuit and time delay and an adjustable 40 to 120 P.S.I. pressure switch.

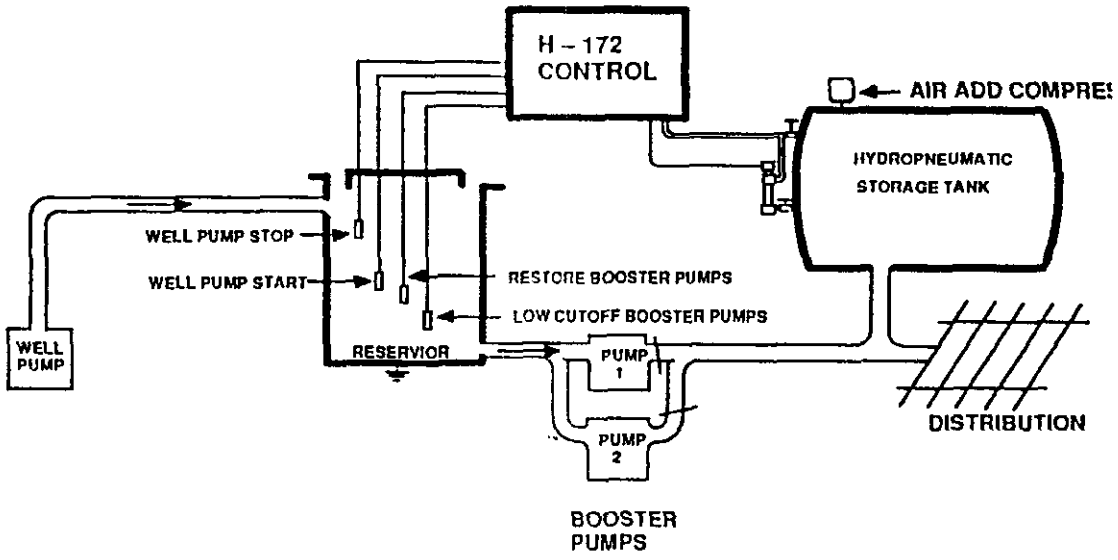
CHARGE AIR Operation...

Charge *Air* utilizes three primary components: a liquid level switch, a pressure switch, and an air compressor. Through an electrode suspended into the tank from the Charge Air system the liquid level control continuously monitors the water level of the tank. Simultaneously the pressure switch monitors the air pressure in the tank. When the water level is above the electrode and the air pressure in the tank drops below its setting the compressor will start and continue to run until the proper air pressure is reached or the water level drops below the electrode. This constant monitoring guarantees that the optimum air charge is maintained.

MASTER LEVEL CONTROLS

ALTERNATE CONTROLLER

Typical Water System



H– 172 CONTROL

CONTROLS

Well Pump (S)	–	Filling Reservoir
Booster Pumps	–	Supplying System And Storage Tank
Booster Pumps	–	Alternating Sequence
Low Cutoff Of Booster Pumps	–	Prevents Pumping A Dry Reservoir
Air Compressor	–	Supplying Air To Storage Tank

MASTER LEVEL CONTROLS JAN 19

OMASTER CONTROL

e Panels With Motor Control Are Available
robe Assembly Is Furnished With Each Controller

SEPARATE CONTR
PRICE LIST

R		PRESSURE RANGE 5-100PSI			NEM
EL	NUMBER OF PUMPS	CONTROL VOLTAGE	YOUR STARTER COIL CIRCUIT MAX. VOLTS	SPECIAL FORM A	STAND/ FOR
- 1	1	120	240	$ 715.00	$ 66
- 2	1	208/230	240	725.00	69
- 3	1	120	460	765.00	72
- 4	1	460	460	800.00	76
- 1	2	120	240	1060.00	10
- 2	2	208/230	240	1080.00	10
4 - 1	2*	120	240	1210.00	11
4 - 2	2*	208/230	240	1230.00	12
- 1	3	120	240		13
5 - 1	3**	120	240		16

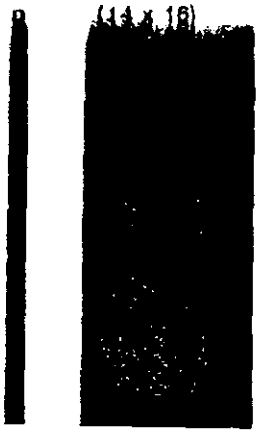
NT		PRESSURE RANGE 5-100PSI		
5 - 1	1	120	240	$ 7
5 - 2	1	208/230	240	7
5 - 1	2	120	240	10
5 - 2	2	208/230	240	10
230 - 1	2*	120	240	12
230 - 2	2*	208/230	240	12

)D & AIR VENT		PRESSURE RANGE 5-100PSI		
36 - 1	1	120	240	$ 9
36 - 2	1	208/230	240	9
46 - 1	2	120	240	12
46 - 2	2	208/230	240	13
239 - 1	2*	120	240	14
239 - 2	2*	208/230	240	14

: PUMP ALTERNATOR **3 PUMP ALTERNATOR

SSORIES MOST USED - MANY OTHERS AVAILABLE P

f ntrol test
(14 x 16)



Project: Calvey Brook Estates
Review No. 61866-03
PWS ID# MO6031385

The following comments are in response to the checklist for construction authorization and permit to dispense water to the public.

Item 1 Two copies of the engineering report have been submitted for review.
Item 2 Two copies of the detailed plans and specifications have been submitted for review.
Item 3 *An Application for Construction Authorization has been submitted*

Required Items for Technical Capacity Demonstration

Item 1 Calvey Brook Water Company will higher a state certified operator.
The Water Company will provide the operator with all required equipment for the operator to perform the job. Mr. Bob Wideman will be the certified operator.
Item 2 The continuing authority will maintain as built plans for distribution system plans. The plans will be required to be updated after any new construction has occurred prior to final acceptance of the line by the continuing authority.

A.) Interim enhanced Surface Water Treatment Rule is not applicable
B.) LT-1 enhanced surface Water Treatment Rule is not applicable
C.) Ground Water Rule impacts were considered
D.) Disinfectants/disinfection By-Products Rule,
A separate room has been provided incase of possible chlorination requirements.
E.) Radon Rule can be meet with minor modifications.
F.) Filter Backwash Rule is not applicable

Additional space in the well house has been provided for future regulations of the system.

Design Guide Standards

Item 1 This system is intended to serve Calvey Brook Estates which is a tract of land located in the northeast corner of section 20 township 42 north range 2 east of the 5th P.M. in Franklin county Missouri. Calvey Brook Estates is a 36 lot residential subdivision on approximately 25 acres. This area has no centralized water service available. The only method of water is private wells.

Item 2 This area is part of Public Water District No. 2. However, according to the Franklin County Planning & Zoning Department the above-mentioned water district exists on paper only and it has no active members. A letter waving the preferential status cannot be obtained.

Item 3 Calvey Brook Estates will be the only area served by this water system. The boundaries will be the limits of the subdivision as it is recorded in the Franklin County Recorders Office.

Item 4 Franklin County Zoning Regulations require a dense subdivision to provide central water

Project: Calvey Brook Estates
Review No. 61866-03
PWS ID# MO6031385

and central sanitary sewer. One alternative would be individual wells or multiple wells serving several homes. The chosen central water system will provided the best system.

Item 5 The source of water will be a deep well capable of delivering approximately 38 gallons per minute of flow. The quality of water is expected to meet the required MCL.

Item 6 No treatment of the ground water is expected.

Item 7 The well location is at the highest point of the subdivision. There are no current known sources of pollution for the well. Other houses are located in the vicinity of the well.

Item 8 The estimated water use was assumed at 370 gallons per home. This system will not provided fire protection. A dry hydrant in a pond will be provided for the fire department for fire flow.

Item 9 No future extension of the system is anticipated.

Item 10 Flow requirements were supplied with the engineering report. No fire flow will occur on this system.

Item 11 Wunderlich Surveying & Engineering will provide inspection of the water system and will supply a certification to the department.

Required Items for Managerial Capacity Demonstration

Item 1 The owners intend to develop a company that will be responsible for the operation and maintenance of the water and sewer systems. They are currently in the process of forming this company. A copy of the recorded paper work will be forwarded to your office as soon as it is received.

Item 2 A Written Rate Structure and Service Fee will be publicly displayed.

Item 3 The proposed company will hold public meetings for rate structure changes. All customers will be notified of such meeting prior to the meeting and before the rate changes take affect.

Item 4 Managerial Capacity for future regulation impacts have been considered.

Item 5 An organizational chart for Calvey Brook Water Co. is as follows:

President	Vice President	Treasurer	Secretary
Jeff Snider	Roger Gullet	Jeff Snider	Roger Gullet

Jeff Snider
2801 West Osage Suite
Pacific, Missouri 63069.
Phone 636 271-5792

Roger Gullet
2488 hwy N
Pacific, Missouri 63069
Phone 636 271 2327

Item 6 The designated customer complaint person will be Jeff Snider president of Calvey Brook Water Company. See above for address and phone number. Office hours will be from 8 am to 5 pm Monday through Friday.

Project: Calvey Brook Estates
Review No. 61866-03
PWS ID# MO6031385

Item 7 The written customer complaint procedure will be as follows
a.) The received complaints will be recorded in a record book upon arrival
b.) The system operator will respond to the complaint.
c.) The system operator will try to solve the problem.
d.) Disputes that cannot be resolved will be forwarded to the continuing authority for further review.
e.) Complaint procedures will be publicly published with the rate structure.

Item 8 Mr.Bob Wideman shall be contacted as the compliance contact person.
Wideman Well Drilling
Phone 636 629-2881

Item 9 An Operation Management Plan has been included.

Item 10 An Emergency Operation Plan has been included.

Item 11 The water will be tested for MCL and brought into compliance prior to distributing water.

Required Items for Financial Capacity Demonstration

Item 1 Standard Accounting Principles and Practices will be used.

Item 2 Legal action, disconnection, and late fees will be used in the event of non payment to the governing authority. The actions by the governing authority for non-payment will be publicly published with the rate structure.

Item 3 The governing authority will perform an annual budget of revenue and expenditures with an annual comparison to the planned budget.

Item 4 Written rate structure and service fee will be published publicly

Item 5 See Attachment.

Item 6 An operating reserve of 1/10 of annual operations and maintenance has been established.

Item 7 Emergency equipment replacement reserve equal to the most expensive mechanical equipment over 10 years has been established.

Item 8 Not Applicable

Item 9 See the Technical Capacity Section.

Calvey Brook Estates
PWS ID No. Mo6031385
Review No. 61866-03

Operational and Management Plan

1.) Follow standard operating procedures as outlined in the Water Operator Guide for Potable Water System and the Drinking Water System Management Handbook as published by the EPA.
2.) The well system shall be checked on a weekly basis for proper operation of the sytem.
3.) The master meter shall be read weekly and recorded in a log book.
4.) Water samples shall be taken in accordance with Mo~ DNR sampling guidelines and procedures
5.) If disinfect ion is required, the chlorine system shall be monitored on a weekly basis. Residual chlorine levels shall be determined on a monthly basis.
6.) This system has been designed for hands free operation only monitoring of the system is required.
7.) The water meter at each house shall be read once a month and compared to the total usage on the master meter for indications of leaks in the system.
8.) The operator shall be familiar with all current Mo~DNR regulations.
9.) A monthly report of the systems operation shall be prepared and submitted to the governing authority. This report should include total water usage, total billable water used, amount of chlorine used (if Required), and any obvious problems with the water system. The report should also contain the water quality findings from the previous month.
10.) Provide a Yearly Performance summary of the system. This report should include the major items mentioned in item 9 and any other items requested by the governing authority.
11.)The Operational and Management Plan should be reviewed every six months and as deemed necessary by the continuing authiority.

May 6, 2003

Calvey Brook Water Company Inc.
PWS ID Mo603185
Review No. 61866-03

Emergency Operation Plan

1.) The designated coordinator to be called under emergency conditions shall be the president of Calvey Brook Water Company.
2.) In the event of an emergency, the designated coordinator shall be authorized to expend funds to meet the existing emergency.
3.) A list of telephone numbers for the coordinator and key personnel are listed as follows:
    a. Coordinator: Jeff Snider 636 271-5792
    b. Certified Operator: Bob Wideman 636 629-2881
    c. Calvey Brook Water Company Maintenance Roger Gullet 636 271-2327.

    This list shall be updated quarterly or immediately after a position change has occurred.

4.) In the event the water system becomes incapacitated, Tank Trucks can be utilized to provided water to the system. The closest municipal water system would be The City of Pacific. Hayfield Water Company is a private system that could also provided water.
5.) The connection of the tank truck could be made through the pump to waste line. This connection will require the booster pump to be to re piped to provide service to the hydro-pneumatic tank. In the event the hydro-pneumatic tank fails, a pressure tank will need to be obtained as soon as possible. Until a pressure tank is obtained the system will be out of service.
6.) The connection to pipe the booster pump shall be provided. Access to the booster pump within 24 hours should be provided. 24 hour access to the control equipment should also be provided.
7.) Written emergency procedures should be obtained from the department of natural resources for tank truck disinfection and emergency chlorination of the system. These procedures should be obtained prior to distributing water and they should be attached to this document.

May 12, 2003

Water Connection Charges and Water Rates.

This letter is to inform you that as of January 1, 2003, each water costumer that connects to the Calvey Brook Water Company will be subject to the following fees for the water provided by Calvey Brook Water Company to the customer. Water meters will be read monthly and the customer will be billed according to use at the following rates.

Water Connection Fee per Meter $1,200

The water meter and all appurtenances must be purchased through the Calvey Creek Water Company. No exceptions will be made.

Monthly Minimum Rate. $27.50 (for first 2,500 gallons used)

Commodity Rate: $2.00 per Thousand (1,000) gallons used above the Minimum Monthly Rate.

A $75.00 deposit will be required prior to connection. This deposit will be refunded when the system is disconnected minus any outstanding water debts owed to the district.

If the water meter is disconnected for any reason a $50.00 reconnection fee will apply.

Calvey Brook Water Company will review and adjust billing rates on a yearly basis. Rate changes will occur in January of each year Calvey Brook Water Company reserves the right to grant leak adjustments at its own discretion. Leak Adjustments will be addressed at the regular meetings of the Calvey Brook Water Company. Meeting dates and times will be published prior to the meeting.

Calvey Brook Water Company Inc.
Office Hours Monday through Friday 8 am to 5 pm
For Questions Contact Mr. Jeff Snider at 636 271-5792

MISSOURI PUBLIC WATER SYSTEM FINANCIAL CAPACITY WORKSHEETS

Financial Capacity Approved 6/07/03

PAGE 1: CUSTOMERS, REVENUES AND EXPENDITURES WORKSHEET

Name: Calvey Brook Estates

Proposed Customers, Revenues and Expenses

Line No	DESCRIPTION		Year 2002	Inflation Factor (%)	Year 2 2004	Year 3 2005	Year 4 2006	Year 5 2007
1	PROJECTED CUSTOMERS		5		18	32	36	36
2	Annual increase in customers (#)				220.00	100.80	12.50	0.00
3	ANNUAL MEDIAN HOUSEHOLD INCOME (AMHI)		35000	2.0	35700	36414	37142	37885
4	REVENUES AND EXPENSES							
5	AVAILABLE OPENING CASH BALANCE		0		0	0	0	0
6	REVENUES RECEIVED							
7		Water Rates (calculation based on new customers**)	2100		6720	13440	15120	15120
8		Fees and Service Charges						
9		Hookup Charges Average Charge/connection = 1200	6000		15200	19200	4800	0
10		Other Revenues						
11	TOTAL REVENUES AVAILABLE (Lines 6 through 10)		8100	0	19920	32640	19920	15120
12	OPERATING & MAINTENANCE EXPENSES							
13	Operating Expenses							
14		Salaries and Benefits	0	0.0	0	0	0	0
15		Power and other utility*	1200		1200	1200	1200	1200
16		Chemicals and Treatment*	0	2.0	0	0	0	0
17		Monitoring/Sample Collection	1200	2.0	1224	1248	1273	1299
18		Materials, Supplies, and Parts	306	2.0	306	312	318	325
19		Transportation*		0.0	0	0	0	0
20		Purchase Water*	0	0.0	0	0	0	0
21		Equipment Rents	0	0.0	0	0	0	0
22		Miscellaneous*	200	0.0	200	200	200	200
23	Total Operating Expenses (Lines 14 through 22)		2900		2930	2961	2992	3024
24	General and Administrative							
25		Salaries and Benefits	0	0.0	0	0	0	0
26		Office Supplies and Postage*	200	2.0	204	208	212	216
27		Real Property/Office Equipment Rents	0	0.0	0	0	0	0
28		Insurance-Vehicles, liability, workers compensation	0	0.0	0	0	0	0
29		Legal and accounting	1000	2.0	1020	1040	1061	1082
30		Contractor Services/Professional services	600	0.0	600	600	600	600
31		Fees	200	0.0	200	200	200	200 Lab Fee/Primacy Fee
32		Advertising	0	0.0	0	0	0	0
33		Miscellaneous*	300	0.0	300	300	300	300
34	Total General and Administrative (Lines 25 through 33)		2300		2324	2348	2373	2398
35	Other Expenses							
36		Other Deductions, Fees and Expenses	0		0	0	0	0
37		Income Taxes	0		0	0	0	0
38		Other Taxes	0	0.0	0	0	0	0
39	Total Other Expenses (Lines 36 through 38)		0		0	0	0	0
40	TOTAL O&M EXPENSES (Lines 23, 34, and 39)		5200		5254	5309	5365	5422
41	Operating Reserve							
	Minimum operating reserve must equal 10% of Line 40 over 10 yrs		55		55	55	55	55
		Annual O&M Reserve Needed	52		53	53	53	53
41a			52		105	158	211	264
41b		Cumulative Operating Reserve Needed						
42	TOTAL EXPENSES including Operating Reserve (Lines 40 + 41)		5255		5309	5364	5420	5478
43	NET REVENUES FOR CIP & RESERVES (Line 11 - Line 42)		2845		14611	27276	14500	9642

Please Go to Page 2

* This expense item is forecasted using both the inflation factor and increase in number of customers.

Note:
Didn't include available opening cash balance since it is the developer's cash and this will be the financial budget applicable to the HOA

Post-it® Fax Note 7671 | Date 5-7-03 | # of pages ▶ 2

To Kicky Schaal	From Donna Cash
Co./Dept.	Co. PDWP
Phone #	Phone # 573 751-4988
Fax # 636 583 1810	Fax # 751-3110

MISSOURI PUBLIC WATER SYSTEM FINANCIAL CAPACITY WORKSHEETS

Financial Capacity Approved 5/07/03

PAGE 2: CAPITAL INVESTMENT / RESERVES WORKSHEET Name: Calvey Brook Estates

Capital Revenues and Reserves

Line No	DESCRIPTION	Year 2003	Year 2 2004	Year 3 2005	Year 4 2006	Year 5 2007
44	**REVENUES AVAILABLE FOR CAPITAL IMPROVEMENTS AND RESERVES** (Line 43 from Page 1)	2945	14611	27275	14500	9542
45	**OTHER FUNDS/RESOURCES AVAILABLE**					
46	Depreciation Reserves					
47	Capital Contribution from Owner/stockholder (own source)					
48	Contribution/Advance from Customer/Others					
49	Grants					
50	DWSRF Loan (if applicable)					
51	Business loans	0				
52	Withdrawal from capital or other reserves					
53	Other Fund Sources					
54	**TOTAL SOURCE OF FUNDS** [Lines 46 through 53]	2945	14611	27275	14500	9542
55	**CAPITAL/RESERVE USE OF FUNDS** (in excess of operational expenses)					
56	***Capital Improvement Plan Expenditures***					
57	New Capital Facilities					
58	Renewal and Replacement Facilities	0	0	0	0	0
59	Safe Drinking Water Act Facilities					
60	Non-facility Costs					
61	Other Use of Funds					
62	**Total CIP Expenditures** [Lines 57 through 61]	0	0	0	0	0
63	***Debt Obligations*** (principal and interest expenses)					
64	Repayment to Customer/others					
65	Repayment of Business Loans					
66	Repayment of SRF Loan					
67	Other Use of Funds					
68	**Total Debt Obligations** [Lines 64 through 67]	0	0	0	0	0
69	***Depreciation Expense*** (Funded)	0	0	0	0	0
	(Funded depreciation in excess of all other P&I payments)			0		
70	***Addition to Reserves***					
71	Debt Service Reserve	0	0	0	0	0
72	Emergency Reserve **Reserve Needed =** $4,800.00	400	400	400	400	400
72a	Cumulative Emergency Reserve Needed	400	800	1200	1600	2000
73	**TOTAL CAPITAL/RESERVE EXPENSES** [Lines 62, 68, 69, 71, 72]	400	400	400	400	400
74	**END OF YEAR SURPLUS OR DEFICIT** [Line 54 - Line 73]	2545	14211	26875	14100	9242
	Surplus or deficit is calculated after including reserves and capital investments					
75	**PROJECTED MONTHLY RESIDENTIAL BILL**	35	35	35	35	35
	Current and expected monthly water rate divided by number of residential customers [Line 7/12/Line 1]					
76	**AFFORDABILITY INDEX** [Annual Projection of Line 75 / Line 3]	1.2%	1.2%	1.2%	1.1%	1.1%
	Percent of monthly household income dedicated to water utility services (Rates Paid should not exceed 1.5 to 2.0%)					

Note:
Didn't consider the project funding costs and payback of loans since the developer will recover cost of construction through the sell of lots

positive, therefore approved

MISSOURI PUBLIC WATER SYSTEM FINANCIAL CAPACITY WORKSHEETS

Financial Capacity Approved 6/07/03

PAGE 1: CUSTOMERS, REVENUES AND EXPENDITURES WORKSHEET

Name: Calvey Brook Estates

Proposed Customers, Revenues and Expenses

Line No	DESCRIPTION		Year 2003	Inflation Factor (%)	Year 2 2004	Year 3 2005	Year 4 2006	Year 5 2007
1	PROJECTED CUSTOMERS		8		16	32	36	36
2	*Annual increase in customers (#)*				220.00	100.00	12.50	0.00
3	ANNUAL MEDIAN HOUSEHOLD INCOME (AMHI)		35000	2.0	35700	36414	37142	37885
4	REVENUES AND EXPENSES							
5	*AVAILABLE OPENING CASH BALANCE*		0		0	0	0	0
6	REVENUES RECEIVED		2100		6720	13440	15120	15120
7	Water Rates (calculation based on new customers**)							
8	Fees and Service Charges							
9	Hookup Charges Average Charge/connection =	1200	6000		13200	19200	4800	0
10	Other Revenues							
11	TOTAL REVENUES AVAILABLE (Lines 6 through 10)		8100	0	19920	32640	19920	15120
12	OPERATING & MAINTENANCE EXPENSES							
13	Operating Expenses		0	0.0	0	0	0	0
14	Salaries and Benefits		1200		1200	1200	1200	1200
15	Power and other utility*		0	2.0	0	0	0	0
16	Chemicals and Treatment*		1200	2.0	1224	1248	1273	1299
17	Monitoring/Sample Collection*		306	2.0	306	312	318	324
18	Materials, Supplies, and Parts			0.0	0	0	0	0
19	Transportation		0	0.0	0	0	0	0
20	Purchase Water*		0	0.0	0	0	0	0
21	Equipment Rents		200	0.0	200	200	200	200
22	Miscellaneous*		2906		2930	2951	2991	3024
23	Total Operating Expenses (Lines 14 through 22)							
24	General and Administrative		0	0.0	0	0	0	0
25	Salaries and Benefits		200	2.0	204	208	212	216
26	Office Supplies and Postage*		0	0.0	0	0	0	0
27	Real Property/Office Equipment Rents		0	0.0	0	0	0	0
28	Insurance-Vehicles, liability, workers compensation		1000	2.0	1020	1040	1061	1082
29	Legal and accounting		600	0.0	600	600	600	600
30	Contractor Services/Professional services		200	0.0	200	200	200	200
31	Fees		0	0.0	0	0	0	0
32	Advertising		300	0.0	300	300	300	300
33	Miscellaneous*		2300		2324	2348	2373	2398
34	Total General and Administrative (Lines 25 through 33)							
35	Other Expenses		0		0	0	0	0
36	Other Deductions, Fees and Expenses		0		0	0	0	0
37	Income Taxes		0	0.0	0	0	0	0
38	Other Taxes		0		0	0	0	0
39	Total Other Expenses (Lines 36 through 38)							
40	TOTAL O&M EXPENSES (Lines 23, 34, and 39)		8200		8254	8309	8345	8423
41	Operating Reserve		55		55	55	55	55
	Minimum operating reserve must equal 10% of Line 40 over 10 yrs							
	Annual O&M Reserve Needed		52		105	158	211	271
41a	Cumulative Operating Reserve Needed							
41b								
42	TOTAL EXPENSES including Operating Reserve (Lines 40 + 41)		8255		8309	8364	8420	8478
43	NET REVENUES FOR CIP & RESERVES (Line 11 - Line 42)		-2648		11611	27276	11500	6642

Please Go to Page 2

* This expense item is forecasted using both the inflation factor and increase in number of customers.

Note:
Didn't include available opening cash balance since it is the developer's cash and this will be the financial budget applicable to the HOA

Lab Fee/Primacy Fee

ITEM 3

Post-it® Fax Note 7671 | Date 5-7-03 | # of pages ▶ 2

To Kirby School | From Deana Cash

Co./Dept. | Co. PDWP

Phone # | Phone # 573 751-4988

Fax # 636 583 1810 | Fax # 751-3110

MISSOURI PUBLIC WATER SYSTEM FINANCIAL CAPACITY WORKSHEETS

Financial Capacity Approved 5/07/03 QC

PAGE 2: CAPITAL INVESTMENT / RESERVES WORKSHEET Name: Calvey Brook Estates

Capital Expenses and Reserves

Line No	DESCRIPTION	Year 2003	Year 2 2004	Year 3 2005	Year 4 2006	Year 5 2007
44	**REVENUES AVAILABLE FOR CAPITAL IMPROVEMENTS AND RESERVES** (Line 43 from Page 1)	2845	14611	27276	14500	9642
45	**OTHER FUNDS/RESOURCES AVAILABLE**					
46	Depreciation Reserves					
47	Capital Contribution from Owner/stockholder (own source)					
48	Contribution/Advance from Customer/Others					
49	Grants					
50	DWSRF Loan (if applicable)					
51	Business loans	0				
52	Withdrawal from capital or other reserves					
53	Other Fund Sources					
54	**TOTAL SOURCE OF FUNDS** [Lines 46 through 53]	2845	14611	27276	14500	9642
55	**CAPITAL/RESERVE USE OF FUNDS** [in excess of operational expenses]					
56	*Capital Improvement Plan Expenditures*					
57	New Capital Facilities					
58	Renewal and Replacement Facilities	0	0	0	0	0
59	Safe Drinking Water Act Facilities					
60	Non-facility Costs					
61	Other Use of Funds					
62	**Total CIP Expenditures** [Lines 57 through 61]	0	0	0	0	0
63	*Debt Obligations* (principal and interest expenses)					
64	Repayment to Customers/others					
65	Repayment of Business Loans					
66	Repayment of SRF Loan					
67	Other Use of Funds					
68	**Total Debt Obligations** [Lines 64 through 67]	0	0	0	0	0
69	*Depreciation Expense* (Funded)	0	0	0	0	0
	[Funded depreciation in excess of all other P&I payments]			0		
70	*Addition to Reserves*					
71	Debt ServiceReserve	0	0	0	0	0
72	Emergency Reserve **Reserve Needed =** $4,000.00	400	400	400	400	400
72a	Cumulative Emergency Reserve Needed	400	800	1200	1600	2000
73	**TOTAL CAPITAL/RESERVE EXPENSES** [Lines 62, 68, 69, 71, 72]	400	800	400	400	400
74	**END OF YEAR SURPLUS OR DEFICIT** [Line 54 - Line 73]	2445	14211	26876	14100	9242
	Surplus or deficit is calculated after including reserves and capital investments					
75	**PROJECTED MONTHLY RESIDENTIAL BILL**	35	35	35	35	35
	Current and expected monthly water rate divided by number of residential customers [Line 7/12/Line 1]					
76	**AFFORDABILITY INDEX** [Annual Projection of Line 75 / Line 3]	1.2%	1.2%	1.2%	1.1%	1.1%
	Percent of monthly household income dedicated to water utility services (Rates Paid should not exceed 1.5 to 2.0%]					

Note:
Didn't consider the project funding costs and payback of loans since the developer will recover cost of construction through the sell of lots

positive, therefore approved

Project: Calvey Brook Estates
Review No. 61866-03
PWS ID# MO6031385

The following comments are in response to the checklist for construction authorization and permit to dispense water to the public.

Item 1 Two copies of the engineering report have been submitted for review.
Item 2 Two copies of the detailed plans and specifications have been submitted for review.
Item 3 An Application for Construction Authorization has been submitted

Required Items for Technical Capacity Demonstration

Item 1 Calvey Brook Water Company will higher a state certified operator.
The Water Company will provide the operator with all required equipment for the operator to perform the job. Mr. Bob Wideman will be the certified operator.
Item 2 The continuing authority will maintain as built plans for distribution system plans. The plans will be required to be updated after any new construction has occurred prior to final acceptance of the line by the continuing authority.

A.) Interim enhanced Surface Water Treatment Rule is not applicable
B.) LT-1 enhanced surface Water Treatment Rule is not applicable
C.) Ground Water Rule impacts were considered
D.) Disinfectants/disinfection By-Products Rule,
A separate room has been provided incase of possible chlorination requirements.
E.) Radon Rule can be meet with minor modifications.
F.) Filter Backwash Rule is not applicable
Additional space in the well house has been provided for future regulations of the system.

Design Guide Standards

Item 1 This system is intended to serve Calvey Brook Estates which is a tract of land located in the northeast corner of section 20 township 42 north range 2 east of the 5th P.M. in Franklin county Missouri. Calvey Brook Estates is a 36 lot residential subdivision on approximately 25 acres. This area has no centralized water service available. The only method of water is private wells.

Item 2 This area is part of Public Water District No. 2. However, according to the Franklin County Planning & Zoning Department the above mentioned water district exists on paper only and it has no active members. A letter waving the preferential status cannot be obtained.

Item 3 Calvey Brook Estates will be the only area served by this water system. The boundaries will be the limits of the subdivision as it is recorded in the Franklin County Recorders Office.

Item 4 Franklin County Zoning Regulations require a dense subdivision to provide central water

Project: Calvey Brook Estates
Review No. 61866-03
PWS ID# MO6031385

and central sanitary sewer. One alternative would be individual wells or multiple wells serving several homes. The chosen central water system will provided the best system.

Item 5 The source of water will be a deep well capable of delivering approximately 38 gallons per minute of flow. The quality of water is expected to meet the required MCL.

Item 6 No treatment of the ground water is expected.

Item 7 The well location is at the highest point of the subdivis[illegible]re no current known sources of pollution for the well. Other h[illegible] of the well.

Item 8 The estimated water use was assumed at [illegible]er home provided fire protection. A dry hydrant [illegible]l be provide[illegible] for fire flow.

Item 9 No future extension of the system is anticipate[illegible]

Item 10 Flow requirements were supplied with the engineering report. No fire flow will occur on this system.

Item 11 Wunderlich Surveying & Engineering will provide inspection of the water system and will supply a certification to the department.

Required Items for Managerial Capacity Demonstration

Item 1 The owners intend to develop a company that will be responsible for the operation and maintenance of the water and sewer systems. They are currently in the process of forming this company. A copy of the recorded paper work will be forwarded to your office as soon as it is received.

Item 2 A Written Rate Structure and Service Fee will be publicly displayed.

Item 3 The proposed company will hold public meetings for rate structure changes. All customers will be notified of such meeting prior to the meeting and before the rate changes take affect.

Item 4 Managerial Capacity for future regulation impacts have been considered.

Item 5 An organizational chart for Calvey Brook Water Co. is as follows:

President	Vice President	Treasurer	Secretary
Jeff Snider	Roger Gullet	Jeff Snider	Roger Gullet

Jeff Snider
2801 West Osage Suite
Pacific, Missouri 63069.
Phone 636 271-5792

Roger Gullet
2488 hwy N
Pacific, Missouri 63069
Phone 636 271 2327

Item 6 The designated customer complaint person will be Jeff Snider president of Calvey Brook Water Company. See above for address and phone number. Office hours will be from 8 am to 5 pm Monday through Friday.

Project: Calvey Brook Estates
Review No. 61866-03
PWS ID# MO6031385

Item 7 The written customer complaint procedure will be as follows
- a.) The received complaints will be recorded in a record book upon arrival
- b.) The system operator will respond to the complaint.
- c.) The system operator will try to solve the problem.
- d.) Disputes that cannot be resolved will be forwarded to the continuing authority for further review.
- e.) Complaint procedures will be publicly published

Item 8 Mr.Bob Wideman shall be contacted as the compliance
Wideman Well Drilling
Phone 636 629-2881

Item 9 An Operation Management Plan has been included.

Item 10 An Emergency Operation Plan has been included.

Item 11 The water will be tested for MCL and brought into compliance prior to distributing water.

Required Items for Financial Capacity Demonstration

Item 1 Standard Accounting Principles and Practices will be used.

Item 2 Legal action, disconnection, and late fees will be used in the event of non payment to the governing authority. The actions by the governing authority for non-payment will be publicly published with the rate structure.

Item 3 The governing authority will perform an annual budget of revenue and expenditures with an annual comparison to the planned budget.

Item 4 Written rate structure and service fee will be published publicly

Item 5 See Attachment.

Item 6 An operating reserve of 1/10 of annual operations and maintenance has been established.

Item 7 Emergency equipment replacement reserve equal to the most expensive mechanical equipment over 10 years has been established.

Item 8 Not Applicable

Item 9 See the Technical Capacity Section.

Calvey Brook Estates
PWS ID No. Mo6031385
Review No. 61866-03

Operational and Management Plan

1.) Follow standard operating procedures as outlined in the Water Operator Guide for Potable Water System and the Drinking Water System Management Handbook as published by the EPA.
2.) The well system shall be checked on a weekly basis for proper operation of the sytem.
3.) The master meter shall be read weekly and recorded in a log book.
4.) Water samples shall be taken in accordance with Mo~ DNR sampling guidelines and procedures
5.) If disinfect ion is required, the chlorine system shall be monitored on a weekly basis. Residual chlorine levels shall be determined on a monthly basis.
6.) This system has been designed for hands free operation only monitoring of the system is required.
7.) The water meter at each house shall be read once a month and compared to the total usage on the master meter for indications of leaks in the system.
8.) The operator shall be familiar with all current Mo~DNR regulations.
9.) A monthly report of the systems operation shall be prepared and submitted to the governing authority. This report should include total water usage, total billable water used, amount of chlorine used (if Required), and any obvious problems with the water system. The report should also contain the water quality findings from the previous month.
10.) Provide a Yearly Performance summary of the system. This report should include the major items mentioned in item 9 and any other items requested by the governing authority.
11.)The Operational and Management Plan should be reviewed every six months and as deemed necessary by the continuing authiority.

May 6, 2003

Calvey Brook Water Company Inc.
PWS ID Mo603185
Review No. 61866-03

Emergency Operation Plan

1.) The designated coordinator to be called under emergency conditions shall be the president of Calvey Brook Water Company.
2.) In the event of an emergency, the designated coordinator shall be authorized to expend funds to meet the existing emergency.
3.) A list of telephone numbers for the coordinator and key personnel are listed as follows:
    a. Coordinator: Jeff Snider 636 271-5792
    b. Certified Operator: Bob Wideman 636 629-2881
    c. Calvey Brook Water Company Maintenance Roger Gullet 636 271-2327.

    This list shall be updated quarterly or immediately after a position change has occurred.

4.) In the event the water system becomes incapacitated, Tank Trucks can be utilized to provided water to the system. The closest municipal water system would be The City of Pacific. Hayfield Water Company is a private system that could also provided water.
5.) The connection of the tank truck could be made through the pump to waste line. This connection will require the booster pump to be to re piped to provide service to the hydro-pneumatic tank. In the event the hydro-pneumatic tank fails, a pressure tank will need to be obtained as soon as possible. Until a pressure tank is obtained the system will be out of service.
6.) The connection to pipe the booster pump shall be provided. Access to the booster pump within 24 hours should be provided. 24 hour access to the control equipment should also be provided.
7.) Written emergency procedures should be obtained from the department of natural resources for tank truck disinfection and emergency chlorination of the system. These procedures should be obtained prior to distributing water and they should be attached to this document.

May 12, 2003

Water Connection Charges and Water Rates.

This letter is to inform you that as of January 1, 2003, each water costumer that connects to the Calvey Brook Water Company will be subject to the following fees for the water provided by Calvey Brook Water Company to the customer. Water meters will be read monthly and the customer will be billed according to use at the following rates.

Water Connection Fee per Meter $1,200

The water meter and all appurtenances must be purchased through the Calvey Creek Water Company. No exceptions will be made.

Monthly Minimum Rate. $27.50 (for first 2,500 gallons used)

Commodity Rate: $2.00 per Thousand (1,000) gallons used above the Minimum Monthly Rate.

A $75.00 deposit will be required prior to connection. This deposit will be refunded when the system is disconnected minus any outstanding water debts owed to the district.

If the water meter is disconnected for any reason a $50.00 reconnection fee will apply.

Calvey Brook Water Company will review and adjust billing rates on a yearly basis. Rate changes will occur in January of each year Calvey Brook Water Company reserves the right to grant leak adjustments at its own discretion. Leak Adjustments will be addressed at the regular meetings of the Calvey Brook Water Company. Meeting dates and times will be published prior to the meeting.

Calvey Brook Water Company Inc.
Office Hours Monday through Friday 8 am to 5 pm
For Questions Contact Mr. Jeff Snider at 636 271-5792

Exhibit F

RECEIVED MAR 3 1 2003

STATE OF MISSOURI Bob Holden, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES

www.dnr.state.mo.us
P.O. Box 176, Jefferson City, MO 65102
573/751-5331

AR
Calvey Brook Estates
Review No. 61866-03
PWS ID # MO6031385

March 21, 2003

Mr. Jeff Snider, Owner/Developer
Calvey Brook Estates
G&S Development
2801 W. Osage, Suite 5
Pacific, MO 63069

Dear Mr. Snider:

We are advising that detailed plans, specifications and an engineering report for a new water system for Calvey Brook Estates, Franklin County, Missouri, were submitted by Wunderlich Surveying & Engineering, consulting engineer, Union, Missouri, on March 18, 2003. Please make reference to Review Number 61866-03 when submitting documents pertinent to this proposal.

A field survey and review of the documents will be made as rapidly as possible. Approximately forty-five days are required by our staff to review the preliminary plans, and process and discuss possible changes with your engineers. You will be advised in writing of our approval of the proposals set forth in the documents.

A copy of the regulations regarding submission of plans and approval of water works is enclosed. Please note that regulations provide that our approval of the project must be secured in writing before construction work is started. This approval is your assurance that the proposed work complies with requirements of this Division.

You will receive copies of our report and approval of the documents for the proposed work, and this report will serve as your authorization to award contracts and begin construction.

Please be aware of the regulations that affect new public water systems commencing operation after October 1, 1999. All new community and non-transient non-community public water systems **commencing operation after October 1,** 1999 must show, as part of their application for a "Construction Authorization and Permit to Dispense Water to the Public" that the proposed water system has the technical, managerial, and financial (TMF) capability to operate in compliance with drinking water regulations, and that a permanent organization exists which will serve as the continuing operating authority of the management, operation, replacement, maintenance and modernization of the facility. If your proposed facility is within the legal boundaries of an existing higher preference continuing operating authority, you must provide documentation that water service is not available from the existing higher preference continuing operating authority, or a statement from each existing higher preference continuing operating

authority waiving its preferential status. Enclosed is y of the final rules 10 CSR 60-3.020 and 10 CSR 60-3.030 for your reference.

The minimum TMF Capacity of this proposed public r system will be assessed during the engineering review process for the Construction Aut ation. Enclosed is a Checklist for the TMF Capacity Requirements. Please complete the C list and address all items that have not been provided. You will also need to sign and return enclosed form entitled "Owner's Acknowledgement of requirements to Obtain a Perm Dispense."

When construction of your public water system is co te and you are ready to place it into operation, you must notify this office. At that time, y will need to provide a copy of your engineer's certification that all of your public water sy n facilities have been constructed in accordance with approved plans and specifications. Y will also need to provide the necessary documentation to demonstrate that all TMF Capacity quirements have been met.

Note that all of the requirements for TMF Capacity, s ted on the enclosed Checklist, will be assessed prior to our issuance of a Permit to Dispens ter to the Public for this facility. If you have any questions regarding the TMF Capacity, plea eel free to contact Ms. Deana Cash of this Program at (573) 751-4988.

Please be advised, this facility may be required to ob other permits from the Water Pollution Control Program. It is your responsibility to insure th any and all necessary permits for this facility have been obtained. You should apply direct o that program for any necessary permits.

Sincerely,

PUBLIC DRINKING WATER PROGRAM

Breck E. Summerford, P.E , Chief
Permits Section

BES:mw

c: Wunderlich Surveying & Engineering
St. Louis Regional Office
Deana Cash, PDWP
Larry Dusenberg, PDWP
Stephen Jones, PDWP
GSRAD
PSC

OWNER'S ACKNOWLEDGEMENTOF REQUIREMENTS TO OBTAIN A PERMIT TO DISPENSE WATER

The following items are requirements, in accordance with 10 CSR 60-3.010, 10 CSR 60-3.020 and 10 CSR 60-3.030, that must be met prior to issuance of a Permit to Dispense Water to the Public (Operating Permit):

REQUIRED ITEMS FOR TECHNICAL CAPACITY DEMONSTRATION

- Notify the DNR Regional Office upon completion of construction;
- The Professional Engineer shall provide certification to the Regional Office that construction was in accordance with the approved Plans & Specifications;
- Designation of properly certified operator(s) having all equipment needed including safety equipment to perform job duties;
- An updated distribution map shall be maintained and available to the department upon request;
- If the proposed system is within the legal boundaries of an existing higher preference Continuing Operating Authority (10 CSR 60-3.020(A)), either obtain a statement from the existing COA waiving its preferential status, or show the existing system is not feasibly available as defined in 10 CSR 60-3.020(6)(B).

REQUIRED ITEMS FOR MANAGERIAL CAPACITY DEMONSTRATION

- A Continuing Operating Authority exists in accordance with 10 CSRE 60-3.020.
- Written Rate Structure and Service Fees shall be publicly displayed;
- A public meeting shall be held for changes in rate structure or service fees with advanced notice to customers, and records of customers notice and summary of public meetings will be kept for 5 years;
- An updated Organizational Chart with the name, position, business address and phone number of all positions that provide drinking water functions, including elected officials, shall be publicly displayed and made available to the department;
- A customer complaint designated person with the name, title, business address, business telephone number, and office hours shall be publicly displayed;
- Written Customer Complaint Procedures for receiving, investigating, resolving, and recording customer complaints shall be publicly displayed;
- Designation of the compliance person to be contact for regulatory issues and compliance actions;
- An Operational Management Plan which describes operating procedures for reliable water system operation, consistent with type of treatment and degree of automatic control, including the process to be used to identify and implement changes to current procedures and ensure that changes in responsible personnel are reported and implemented;
- A completed Emergency Operation Plan in accordance with 10 CSR 60-12.010;
- Present evidence of the ability to produce water meeting applicable MCLs*;

*A Permit to Dispense Water may be issued temporarily until the information is provided.

REQUIRED ITEMS FOR FINANCIAL CAP/ :Y DEMONSTRATION

- Present evidence of a system for water f· ·llection including measures to obtain payment for non-payment (i.e., disconne ·rvice, late fee charge, etc.);
- An annual budget of revenues vs. expen· es and an annual comparison of planned budge: to actual budget must be ·ilable during inspections. Note: all revenue shall cover drinking water costs
- A five year budget and capital improven plan must be developed and updated annually, including at a minimum, annu· venue income, annual estimated cost of operation including salary of operato perating Reserve, Emergency Equipment Replacement Reserve, Debt S vice Reserve, and proposed methods to finance both capital charges and operati g expenses;
- An Operating Reserve = 1/10 of annual o· ·tions and maintenance expenses shall be established over a ten year perio· t least equal payments. EX: O&M expenses $8,000, Operating Reserve = $80 by year 10, not including inflation, therefore $80 + inflation per year is mini· reserve;
- An Emergency Equipment Replacement P· ·ve equal to or greater than the most expensive mechanical equipment item shall · established in at least equal annual payments over ten (10) years (i.e., if most · ·ensive equipment is $10,000, the minimum yearly reserve must be $1,000/y + inflation);
- A Debt Service Reserve shall be equal to o· xceed that required in bonding agreement;

I have read and understand the above requirement· d acknowledge the specified information must be provided prior to obtaining a P· mit to Dispense Water to the Public (Operating Permit).

Owner/Official Custod an Signature:_____ _____ Date:_____
PUBLIC WATER SYSTEM NAME: _____ _____
PWS ID #: MO_____ (if not know· may be completed by the PDWP)

Please sign and return this form to the: Missouri Department of Natural Resources
Public Drinking Water Program
P.O. Box 176
Jefferson City, MO 65102

STATE OF MISSOURI
Bob Holden, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.state.mo.us
101 Adams St., P.O. Box 176, Jefferson City, MO 65102
573/751-5331

CI
Calvey Brook Estates
Review No. 61866-03
PWS ID # MO 6031385

June 17, 2003

Mr. Jeff Snider, Owner/Developer
Calvey Brook Estates
2801 W. Osage, Ste. 5
Pacific, Missouri 63069

Dear Mr. Snider:

Enclosed is a Report on an Engineering Report, Plans and Specifications for a new water system for Calvey Brook Estates, Franklin County, Missouri, which I believe is self-explanatory.

Please be advised, this facility may be required to obtain other permits from the Water Pollution Control Program. It is your responsibility to insure that any and all necessary permits for this facility have been obtained. You should apply directly to that program for any necessary permits.

Please be aware of the regulations that affect new public water systems commencing operation after October 1, 1999. All new community and non-transient non-community public water systems **commencing operation after October 1, 1999** must show, as part of their application for a "Construction Authorization and Permit to Dispense Water to the Public" that the proposed water system has the technical, managerial, and financial (TMF) capability to operate in compliance with drinking water regulations, and that a permanent organization exists which will serve as the continuing operating authority of the management, operation, replacement, maintenance and modernization of the facility. If your proposed facility is within the legal boundaries of an existing higher preference continuing operating authority, you must provide documentation that water service is not available from the existing higher preference continuing operating authority, or a statement from each existing higher preference continuing operating authority waiving its preferential status. Enclosed is a copy of the final rules 10 CSR 60-3.020 and 10 CSR 60-3.030 for your reference.

When construction of your public water system is complete and you are ready to place it into operation, you must notify this office. At that time, you will need to provide a copy of your engineer's certification that all of your public water system facilities have been constructed in accordance with approved plans and specifications. You will also need to provide the necessary documentation to demonstrate that all TMF Capacity requirements have been met.

Note that all of the requirements for TMF Capacity, as listed on the enclosed Checklist, will be assessed prior to our issuance of a Permit to Dispense Water to the Public for this facility. If you have any questions regarding the TMF Capacity, please feel free to contact Ms. Deana Cash of this Program at (573) 751-4988.

Sincerely,

PUBLIC DRINKING WATER PROGRAM

Breck E. Summerford, P.E., Chief
Permits Section

BES:wsb

Enclosures

c: PSC
GSRAD
Deana Cash, PDWP
Larry Dusenberg, PDWP
Steve Jones, PDWP
Don Scott, PDWP
St. Louis Regional Office
Wunderlich Surveying & Engineering

DEPARTMENT OF NATURAL RESOURCES
OF MISSOURI

REPORT ON ENGINEERING REPORT, PLANS AND SPECIFICATIONS FOR NEW WATER SYSTEM FOR CALVEY BROOK ESTATES

FRANKLIN COUNTY, MISSOURI

June 17, 2003

Review Number 61866-03

INTRODUCTION:

An engineering report, plans and specifications for a new water system to serve Calvey Brook Estates in Franklin County, Missouri were submitted for review and approval by Wunderlich Surveying & Engineering, Inc., Union, Missouri.

BRIEF DESCRIPTION:

In general, these plans and specifications provide for the installation of one 64 gallon per minute (gpm) well, well house, one 12,500 gallon steel ground level storage tank, one 1,000 gallon steel hydro pneumatic tank, two 81 gpm booster pumps, and approximately 2,700 lineal feet of 4 inch SDR 21 Class 200 PVC water main and the necessary appurtenances and fittings to make a complete and usable water system to serve Calvey Brook Estates in Franklin County, Missouri.

The well will be located in the NE1/4, NE1/4, Section 20, Township 42 North, Range 2 East, Franklin County, Missouri. The well will be drilled to a depth of approximately 600 feet and consist of 350 feet of 6 inch diameter steel casing and 80 feet of 10 inch surface casing. The annular space between the drill hole and the casing will be filled with neat cement grout under pressure, from the bottom upward in one continuous operation. A 64 gallon per minute submersible pump will be installed at approximately 350 feet below ground surface. The well will discharge through a sealed well head and a 2 inch galvanized iron pipe outfitted with the necessary fittings and appurtenances as shown on the approved plans and specifications. The well will be disinfected and samples collected for bacteriological and chemical analyses prior to being placed into service.

William H. Scheperle, E.I.T.
Environmental Engineer II
Public Drinking Water Program

APPROVAL TO CONSTRUCT

The engineering plans and specifications described above were examined as to sanitary features of design which may affect the operation of the sanitary works, including size, capacities of the units, and factors which may affect the efficiency and ease of operation. Approval as regards these points is hereby given.

Approval is given with the understanding that final inspection and approval of the completed works hall be made by the Department of Natural Resources before same is accepted and placed in operation. If construction is not commenced two (2) years after the date of issue or there is a halt in construction of more than two years, the approval to construct will be void unless an extension of time has been granted by the department.

In the examination of plans and specifications, the Department of Natural Resources, Public Drinking Water Program does not examine the structural features of design or efficiency of mechanical equipment. This approval does not include approval of these features.

The Department of Natural Resources, Public Drinking Water Program reserves the right to withdraw the approval of plans and specifications at any time it is found that additional treatment or alterations are necessary to assure reasonable operating efficiency and to afford adequate protection to public health.

Calvey Brook Estates

MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
PUBLIC DRINKING WATER PROGRAM

CHECKLIST FOR CONSTRUCTION AUTHORIZATION AND PERMIT TO DISPENSE WATER TO THE PUBLIC – applicable to Non-Transient Non-Community water systems commencing operation after October 1, 1999 and do not charge rates (e.g., schools, businesses with 25+ employees, institutions, etc.)

rovided	
√	
√	Engineering Report – 2 copies with Professional Engineer's seal, certified in the state of Missouri;
√	Detailed Plans and Specifications – 2 copies with Professional Engineer's seal on all copies;
√	Application for Construction Authorization – one application completed and signed by Owner/President/Official Custodian.

ovided	NA	
√	√	***REQUIRED ITEMS FOR TECHNICAL CAPACITY DEMONSTRATION***
√		Discussion of, and designation of, properly certified operator(s) if known, including acknowledgment of the adequate number of operators having all equipment needed including safety equipment to perform job duties (note: designation of the properly certified operator(s) is required prior to issuance of Permit to Dispense);
√		Acknowledgement of the requirement for the system to maintain an updated distribution map;
		Acknowledgement there was planning and consideration for the technical capacity impacts of future regulations. The upcoming regulations known as of October 1999 are:
	√	Interim Enhanced Surface Water Treatment Rule (IESWTR),
	√	LT-1 Enhanced Surface Water Treatment Rule,
√		Ground Water Rule,
	√	Disinfectants/Disinfection By-Products Rule,
	√	Radon Rule, and
	√	Filter Backwash Rule;

Design Guide Standards

		A description of the proposed new system's service area, a description of service area(s) of nearby system(s);
√		Extent of the water works system including nature and extent of area to be served, maps of legal boundaries, provisions for extending the water works system to additional areas, and appraisal of future service requirements (note: if proposed system is within the legal boundaries of existing available water system, either obtain a waiver, or show the existing system is not feasibly available as defined in 10 CSR 60-3.020(6)(B));
		An assessment of alternatives including feasibility and practicability, financial considerations including estimated cost of integral parts of the system and comparisons of operator requirements for operation of each alternative;
√		A description of the proposed source(s) quality, capacity, protection, and production.
√		A description of the treatment process proposal, waste disposal, and automation;
		A description of the project site, including various considerations, potential pollution sources, location with respect to other establishments, houses, etc ;
√		Water Use Data, including population trends and projections, present water consumption, water losses, projected demands, fire flow demand, present and future source yields, etc.
√		Consideration of future extensions for needs;
√		Flow requirements, including hydraulic analyses based on flow demands and pressures and fire flows;
√		A statement that the Engineer will provide certification to the department that construction was

'rovided NA

√ √ *REQUIRED ITEMS FOR MANAGERIAL CAPACITY DEMONSTRATION*

Confirmation that a permanent organization exists as the continuing operating authority for the management, operation, maintenance, replacement, and modernization of the facility. Designation of the Continuing Operating Authority is required. (If a developer has a plan for a home owner's association, there should be acknowledgement of the following:

- the incorporated association owns the facility and has authority to lay all necessary water lines,
- an adopted covenant covering the land of each owner, which assures connection to the system if available,
- the bylaws of the association provide for the proper operation, maintenance, and modernization of the facility to include at minimum: the power to regulate the use of the facility, the power to levy assessments on members and enforce them on each owner, and the power to convey the facility to a higher COA, as listed in 10 CSR 60-3.020(6)(A).);

√ Acknowledgment the Written Rate Structure and Service Fees will be publicly displayed when in operation;

√ Acknowledgement that a public meeting will be held for changes in rate structure or service fees with advanced notice to customers;

√ Acknowledgement there was planning and consideration for the managerial capacity impacts of future regulations. The upcoming regulations are the same as listed under the Technical Capacity Section;

√ Organizational chart with the name, position, business address and phone number of all positions that provide drinking water functions, including elected officials*;

√ Customer complaint designated person, acknowledging that the name, title, business address*, business telephone number, and office hours will be publicly displayed*;

√ Written Customer Complaint Procedures for receiving, investigating, resolving, and recording customer complaints with the acknowledgement that the Procedure will be publicly displayed*;

√ Designated compliance person to be contact for regulatory issues and compliance actions*;

√ An Operational Management Plan which describes operating procedures for reliable water system operation, consistent with type of treatment and degree of automatic control, including the process to be used to identify and implement changes to current procedures and ensure that changes in responsible personnel are reported and implemented*;

√ Complete an Emergency Operation Plan in accordance with 10 CSR 60-12.010*;

√ Present evidence of the ability to produce water meeting applicable MCLs*.

* **This information is required to be provided prior to issuance of the Permit to Dispense, but is encouraged to ›e provided during the construction authorization process.**

ovided NA

√ *REQUIRED ITEMS FOR FINANCIAL CAPACITY DEMONSTRATION*

A statement that Standard Accounting Principles and Practices were used in accordance with either the Generally Accepted Accounting Principals & Practices or the NARUC Uniform Systems of Accounts;

A system for water fee collection including measures to obtain payment for non-payment (i.e., disconnect service, late fee charge, etc.);

Acknowledgement of an annual budget of revenues and expenditures with an annual comparison of planned budget to actual budget**;

Written rate structure and service fees;

Annual revenues cover public water system costs;

A five year budget and capital improvement plan to be updated annually, including at a minimum, annual revenue income, annual estimated cost of operation including salary of operator, Operating Reserve, Emergency Equipment Replacement Reserve, Debt Service Reserve, and proposed methods to finance both capital charges and operating expenses**. The following is a list of typical revenues and expenses for possible consideration in the budget and capital improvement plan:

Revenues: Water Rates; Fees and Service Charges; Hookup Charges; Other Revenues as Drinking Water Revenues; etc.,

Other Funds/Resources Available: Depreciation Reserves; Capital Contribution from Owner/Stockholder (own source); Contribution/Advance from Customer/Others; Grants; DWSRF Loan; Business loans; Withdrawal from Capital or Other Reserves

Operating & Maintenance Expenses includes Operating Expenses and General & Administrative Expenses:

Operating Expenses: Salaries and Benefits; Power and Other Utility; Chemicals and Treatment; Monitoring; Materials, Supplies, and Parts; Transportation; etc.

General & Administrative Expenses: Salaries and Benefits; Office Supplies and Postage; Insurance-vehicles, liability, workers compensation; Legal and Accounting; Contractor/ Professional Services; Fees; Other Deductions, Income Taxes, Other Taxes, etc.,

Reserve Expenses: Operating Reserve; Emergency Equipment Replacement Reserve; and Debt Service Reserve,

Capital Improvement Plan Expenses: New Capital Facilities; Renewal and Replacement Facilities; Safe Drinking Water Act Facilities; Non-facility Costs; Other Use of Funds; etc ,

Debt Obligation Expenses [principal and interest expenses]: Repayment to Customers/others; Repayment of Business Loans; Repayment of SRF Loan; Other Use of Funds; etc., and

Funded Depreciation Expenses in excess of all other P&I payments;

Discussion of establishing an Operating Reserve (must = 1/10 of annual operations and maintenance expenses and established over a ten year period in at least equal payments).

EX: O&M expenses $8,000, Operating Reserve = $800 by year 10, not including inflation, therefore $80 + inflation per year is minimum reserve;

Acknowledgement of an Emergency Equipment Replacement Reserve equal to or greater than the most expensive mechanical equipment item and established in at least equal annual payments over ten (10) years (i.e., if most expensive equipment is $10,000, the minimum yearly reserve must be $1,000/year + inflation);

Specify and acknowledge the Debt Service Reserve will equal or exceed the required in bonding agreement;

Acknowledgement there was planning and consideration for the financial capacity impacts of future regulations. The upcoming regulations are the same as listed under the Technical Capacity Section.

* **The PDWP has a financial assessment tool which may be utilized upon request to analyze system nancial needs based on a five (5) year budget and capital plan. It is optional and may be used simply as a ool for information in preparing a budget and capital improvements plan.**

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STATE OF MISSOURI
Bob Holden, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES

P.O. Box 250 111 Fairgrounds Rd. Rolla, MO 65402-0250
(573) 368-2100
FAX (573) 368-2111

November 12, 2002

Mr. Jeff Snider
The Realty Office
2801 West Osage Ste 1
Pacific, MO 63069

Franklin County
SE NE NE Sec. 20, T42N, R2W
Capital Hills Farms Subdivision
community well

Dear Mr. Snider:

This letter is regarding a request for information from Wunderlich Surveying and Engineering on your behalf concerning a community (public) well at the above location in Franklin County on the Lonedell quadrangle.

Since this well is to be a public water supply well, construction of the well must conform to the standards of the Department of Natural Resources' Water Protection and Soil Conservation Division, as outlined in their publication Design Guide for Community Public Water Supplies 10 CSR 60-3, 10 CSR 60-10.

One requirement of the Department of Natural Resources' Water Protection and Soil Conservation Division is that the engineer's plans and specifications for water works projects be submitted to them for their review and approval before the start of construction. If the completed project does not conform to the published standards, a Permit of Approval cannot be issued as provided for in Part VI, Book V of the Sanitary Code, a part of the Regulations developed under Section 640.115 - 10 CSR 60 - 10.010, Revised Statutes of Missouri.

Copies of the Regulations and Design Standards are available upon request from Water Protection and Soil Conservation Division, Public Drinking Water Program, Missouri Department of Natural Resources, P.O. Box 176, Jefferson City, MO 65102.

One other requirement for such a water supply is that this office determines the well casing depth. The required casing depth for a well at this location is estimated to be 360 feet and into the Upper Gasconade Dolomite. This is based on a surface elevation of 580 feet above sea level. To help in establishing a final approved casing depth, rock cuttings must be submitted to the total depth of the well. *In this instance it could be to your advantage to have a "pilot hole" drilled to total depth before casing is set* and grouted. In this way, the casing depth could be approved with good data and you would be assured that no surprises would occur below the final casing depth. The casing (19 pound or equivalent weight per

foot for a 6 inch hole, for example) must be placed into a drill hole that is a nominal four (4) inches larger in diameter, and then pressure grouted (Haliburton method or equivalent). Once the grouting is complete, operations must be suspended for a minimum period of seventy-two (72) hours. Pressure grouting of the casing is to be witnessed by the department's Regional Office personnel in St. Louis at 314/ 416-2970 (please give 48 hours notice of intent to grout).

A total drilled depth of 600 feet into the Eminence Dolomite should furnish you with approximately 60 to 70 gallons of water per minute.

Persons in Missouri with a well or wells capable of producing at least 100,000 gallons per day (70 gallons per minute) are required to register as major water users. Should the proposed well be capable of producing that amount, it will be necessary for the well owner to file a form each year showing water use for the preceding year. Should you have any questions concerning major water use or the purpose of identification of high-yield wells, please feel free to contact Jeanette Barnett at (573) 368-2188 or at this letterhead address.

Since passage of the Water Well Drillers Act (RSMo 256.600, effective October 1, 1986) it is a legal requirement that all water wells be drilled and pumps installed by persons permitted by the Department of Natural Resources' Geological Survey and Resource Assessment Division. It is in your best interests to contract with a permitted water well driller/pump installer to complete your well installation. The law also requires that all new wells (or old wells that need major reconstruction) must be registered and a Water Well Record completed on each well. A $35.00 fee, which is to be paid by the well owner, must accompany the completed form. The well driller and well owner must sign the form, and a copy returned to this office by the well driller. You will receive a tag and a card with a registration number upon our receipt of the form and fee.

When I may be of further assistance, please do not hesitate to contact me.

Sincerely,

GEOLOGICAL SURVEY AND RESOURCE ASSESSMENT DIVISION

Jeffrey C. Jaquess
Hydrologist
Water Resources Program
Groundwater Geology Section
(573) 368-2190

November 12, 2002

JCJ/sh

c: Jerry Lane, WPSCD/PDWP
Department of Natural Resources/St. Louis Regional Office
Kirby Scheer, Wunderlich Surveying and Engineering. PO Box 536, Union, MO 63084

WUNDERLICH SURVEYING & ENGINEERING, INC.
20 S. CHURCH STREET • P.O. BOX 536 • UNION, MO 63084 • (636) 583-8400 Fax: (636) 583-1810

June 3, 2003

William H. Scheperle, E.I.T.
State of Missouri Department of Natural Resources
Public Drinking Water Program
Permits Section
P.O. Box 176
Jefferson City, Missouri 65102

RE: Calvey Brook Estates; Response to review letter.
Review No. 61866-03
PWS ID# MO 6031385

Dear Mr. Scheperle:

Transmitted here with are the revised plans and specifications for Calvey Brook Estates. These plans and specifications were revised per your comment letter dated May 27 of this year and are being resubmitted for your review with the following comments.

Item 1.) Done
Item 2.) The well pump has been sized to provided 64 gpm at 380' of total dynamic head. Our site is limited by single phase electric and this flow is close to the calculated design flow for 36 residential lots.
Item 3.) The well pump will be capable of providing water to the system when the booster pump and storage tank are out of service. However the peak flow rate will drop to 44 gpm at 488 feet of total head.
Item 4.) Two booster pumps capable of providing peak hourly flow have been provided.
Item 5.) Pump Curves have been provided.
Item 6.) Pressure Gauge has been shown on the plans.
Item 7.) Grout Specifications have been included.
Item 8.) Noted on the plans
Item 9.) A Spare pump has been specified instead.
Item 10.) Done
Item 11.) A fence will not be provided at this time. All buildings can be locked and access to the ground storage tank will require a ladder.
Item 12.) Overhang noted on the plans.
Item 13.) The original request from DGLS was for a well yielding 76gpm of flow. The response letter from DGLS showed that the flow at the specified depth would range between 60-70 gpm. A copy of this letter has been included with the engineering report.

Item 14.) Done
Item 15.) Done
Item 16.) Done
Item 17.) Done

If you have any further questions or comments, please contact our office at your convenience.

Sincerely

Kirby Scheer

Kirby Scheer P.E.

Cc file

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STATE OF MISSOURI
Bob Holden, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.state.mo.us

R1
Calvey Brook Estates
Review No. 61866-03
PWS ID #MO 6031385

May 27, 2003

Mr. Jeff Snider, Owner/Developer
Calvey Brook Estates
G&S Development
2801 W. Osage, Suite 5
Pacific, MO 63069

Dear Mr. Snider:

We are reviewing the detailed plans, specifications, and engineering report for a new water system for Calvey Brook Estates, Franklin County Missouri. In order for us to complete our review of the project, please consult with your engineer and respond to the following comments within 30 calendar days from your receipt of this letter.

1. The Peak hourly flow shall be determined using the equation Q = 12N^0.515, where N is the number of connections. The peak hourly flow for the proposed subdivision should be near 76 gallons per minute (gpm).

2. The well pump shall be sized to meet or exceed the design peak hourly flow. The well pump should be sized at 76 gpm or greater.

3. Please show that the well pump can overcome the total dynamic head for the system when the booster pump and ground level storage tank are taken out of service.

4. Two booster pumps are required for redundancy. Please provide a second booster pump capable of providing peak hourly flow rates.

5. Please provide all pump curves and system curves used for sizing the well pump and the booster pumps.

6. A pressure gage shall be installed on the discharge piping for each booster pump.

7. Please include specifications for grout and pressure grouting procedures.

8. The well house floor shall slope to the floor drain at a rate of three inches for every 10 feet.

9. Specify that repair and replacement parts for the booster pumps will be kept on site.

10. The booster pumps should have a totalizer mete

11. It is recommended that a fence be constructed a: ınd the well site to prevent unauthorized access.

12. Specify that the access hatch shall be sealed and ave a two-inch overhang to prevent the entrance of contaminants.

13. Please contact the Geological Survey and Resou ce Assessment Division to determine if the proposed well depth and diameter will suppl a minimum of 76 gpm.

14. Specify that the open end of water main being c nstructed will be plugged to prevent the entrance of small animals, debris, and other con minants while work is not in progress.

15. Specify dewatering procedures for trenching an pipe installation.

16. Hydrostatic testing shall be conducted in accor nce with AWWA C600. The test must last for 2 hours.

17. The well profile drawing should be modified to epresent the proposed casing depth and pump depth. The pump depth and the casing de th are both specified to be set at approximately 350 feet but the pump appears to e set much deeper than 350 feet.

If it is not possible for you to respond, you may request an extension by letter to Mr. Breck E. Summerford, P.E., Chief, Permits Section, Public Drinl ng Water Program, P.O. Box 176, Jefferson City, MO 65102. The request for extension r ust identify the reasons why the applicant cannot respond within the established time fr ne and must include a proposed timetable or deadline for response. Extension will only e granted when the request is received within 30 calendar days from your receipt of this letter.

Sincerely,

PUBLIC DRINKING WATER PROGRAM

William H. Scheperle, E.I.T.
Environmental Engineer II
Permits Section

WHS:be

Certified Mail 7001 2510 0006 2079 1351

c: Wunderlich Surveying & Engineering
St. Louis Regional Office
Deana Cash, PDWP
Larry Dusenberg, PDWP
Stephen Jones, PDWP
GSRAD
PSC

Missouri Department Of Natural Resources
Water Protection and Soil Conservation Division
Public Drinking Water Program

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REPORT OF FIELD SURVEY

Project:
CALVEY BROOK ESTATES. WATER SYSETM

PWS Name:
CALVEY BROOK ESTATES

Review No.	PWS ID#	County
61866-03	6031385	FRANKLIN

Location: 1/4 NE 1/4 NE 1/4 Sec. 20 T 42 N. R 2 E

North 38.36928 ° Lat., West 90.81858 ° Long. FOM: 11.2 FT

Location Description:

Scope of Project:
NEW WELL, STORAGE AND DISTRIBUTION SYSTEM

Reason for Project:
Water system for new subdivision

Owner: Jeff Snider, G&S Development Co.
2801 West Osage, Suite 5, Pacific MO 63069

Address: G&S Development Co.
2801 West Osage, Suite 5, Pacific MO 63069

Flood Frequency:	Level (max)	Levee Protection?
N/A		

Distance to Sewers:
NONE, NEW SEWER SYSTEM TO BE BUILT

Down Street use:

Total Acres	Useable Acres	Room for expansion
25 TOTAL DEVELOPMENT	1/2 ACRE FOR WELL SITE	NO

Does site include entire Water shed?	If Not, Watershed Acreage
N/A	

Field Evaluation:

a) Nearby buildings and developments:
NONE, AGRICULTURAL

b) Is site usable? Yes Limitations:

c) Recommendations:
SITE APPEARS SUITABLE

By _____ -/St. Louis Regional Office Date April 10, 2003