

1. Considered: _____, 19____ Water Right No. 4974-3
2. Name of Applicant PineLake Hills Homeowners Assoc
3. Post Office Address 7101 Pine Lake Drive, Sioux Falls, S.D. 57103
4. Amount of Water Claimed 0.5 - 224 GPM maximum acre feet _____
5. Source of Water Supply 2 existing wells 126' & 140' deep and one proposed 140' deep
6. Water to be used for SHD acres to be irrigated _____
7. County Minnehaha about 1 1/2 miles east of Sioux Falls
8. PROOF OF PUBLICATION: Received 12-30-83 ~~Not~~ Received _____
 APPLICATION: Approved _____ Subject to _____
 Not Approved _____ Action Deferred _____

PRIORITY 8/24/83 Dated Received 8/24/83 Application complete-yes no _____ FEE 275.00
 Remarks need fee, signed drillers statement on formations

Corrected Application received _____ Period of Annual Use 1/1 to 12/31

WATER QUALITY Received yes _____ no _____ APPROVED/CONDITIONAL (Circle one)
 WI-1 Description same as application-yes _____ no _____ Remarks _____
not applicable
 Disapproved _____ Returned _____

					xx
				18	

Diversion Point _____
SE 1/4 NE 1/4, Section 18-T101N-R48W

 Land to be irrigated _____

WELL LOG for the two existing wells drilled in 1975 & 1976 unknown
 Driller _____ Licensed - yes _____ no _____
 Depth 126' & 140' proposed 140'

Remarks records not kept, non profit homeowners assoc took over in 1980
EStimate of log from Dave Putzke, Drilling and pump company SD licensed

MAP Map No. 4974-3 Map located in Water Right xx Map file _____
 Type of Map drawn Prepared by DeWild, Grant Reckert and Assoc-

+++++

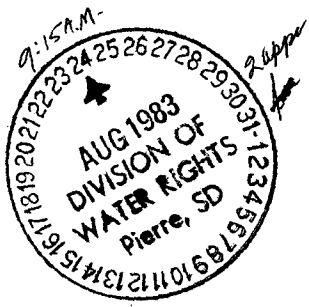
REVIEWED This Application was received within 30 days of the date received, accepted as complete, Number assigned and written up for advertisement before the Board on:
9/2/83

 (Signed)

+++++

PROTESTS Letters/Petitions in File - yes _____ no _____ Remarks _____

REMARKS Date
 F.F. & C. Final Decision, including F.F. & C. of Law were adopted _____
 OF LAW, Date
 FINAL Final Decision mailed to parties and/or parties notified that Final Decision was
 DECISIONS adopted _____
 ETC. Remarks _____



No. 4974-3

Map No. 4974-3 Water Division No. 3 BIG SIOUX RIVER District

Above for Office Use 10170203

APPLICATION FOR PERMIT To Appropriate Water within the State of South Dakota

Check one of the following:

New Vested Right _____ Future Use _____

Change in Diversion _____ Additional Diversion _____

Change in Acreage _____ Additional Acreage _____

1. Name of Applicant Pine Lake Hills Homeowners Assoc. Phone No. 338-0901
 Post Office Address 7101 Pine Lake Drive, Sioux Falls State South Dakota 57103
(Street, RR, or Box) (Town) (Zip Code)
 If a corporation show date and place of incorporation 1980 Minnehaha County, S. Dakota

2. Method of accomplishing work (contract, employment of others, or by direct labor) work completed

3. Name of diversion work as above

4. Amount of water claimed (cubic feet per second) 0.5 cfs - (224 gal/min.)

5. Source of water supply groundwater 2 existing; 1 new

6. Location of point of diversion Tract 4 in. N.E. corner of S1/2 of NE1/4 of section 18,
T101N, R48W, Minnehaha County, South Dakota SENE

County Minnehaha

7. Annual period or periods during which water is to be used Continuously

8. Use to be made of water, (irrigation, industrial, municipal, commercial, recreation, etc.) Housing Development

9. For irrigation use, Total number of acres to be irrigated _____

List below each forty acre subdivision, or lot, or fraction thereof and show number of acres to be irrigated in each.

Land Description	No. Acres Irr.

Land Description	No. Acres Irr.

Attach sheet if more space is needed

10. Time required to complete construction of water supply system 5 years. Additional time required to complete application of water to the proposed beneficial use 4 years.

11. Choice of county newspaper for publication of Notice of Intent to Appropriate Water Brandon Valley Reporter

12. Principal Features of the Proposed Water Supply System.

A. Works proposed to divert water from its natural source.

Well pumps and motors

B. Works proposed to transport water to place of use.

2" - 3" plastic pipe

C. Works proposed to apply water to beneficial use.

To provide water for consumption by Homeowners of Pine Lake Hills. Presently, approximately 360 people served from 91 connections.

Estimated Total Cost \$ Unknown

Attachments: Attach Form 2A if diversion from a well or dugout, or if storage of water, is proposed. Attach map. (see instructions concerning preparation.)

STATE OF SOUTH DAKOTA)
)ss.
 County of Minnehaha)

I, JAMES M. ADW the applicant, certify that I have read the foregoing application and have examined the attached map and that the matters therein stated are true and that I intend, and am able to complete the necessary construction.

Signed James M. Adw

Subscribed and sworn to before me this 22 day of August, 1983

Theresa Hennings
 Notary Public (or other qualified officer)

WATER RIGHT APPLICATION APPROVAL

The Water Management Board hereby approves Water Right Application No. 4974-3

Pine Lake Hills Homeowners Assoc 7601 Pine Lake Dr. Sioux Falls
(Applicant) (Post Office Address)
South Dakota
(State)

With the following qualifications.

The wells approved under this Permit will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner, under this Permit shall control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.

Date of first receipt of application August 24, 1983
Date of return to applicant for correction, amendments or changes required _____, 19____
Date of receipt of corrected application _____, 19____
Approved February 15, 1984, Recorded in Book _____ Page _____

WATER RIGHT PERMIT NO. 4974-3

The Water Management Board hereby grants and issues this Water Right Permit No. 4974-3 authorizing the construction of the water use system and the putting of water to beneficial use as stated in the Application and as qualified in the Water Right Application approval, subject, however, to the following limitations and conditions:

1. The date from which applicant may claim right is August 24, 1983.
2. The equivalent of at least one-fifth of the work above specified is to be completed on or before August 15, 1986.
3. The whole of said work is to be completed on or before February 15, 1989.
4. The limit of time from proof of beneficial use of water appropriated in accordance herewith is February 15, 1993.
5. The water appropriated shall be used for the purpose of suburban housing

6. The prior right of all persons who, by compliance with the laws of the State of South Dakota, have acquired a right to the use of water must not be injuriously affected by this appropriation.

7. The amount of the appropriation herein granted shall not exceed 0.5 cubic feet per second; neither shall it exceed the capacity of the above described water supply system, nor shall it exceed the amount of water needed for beneficial uses served, and ~~if for irrigation purposes said appropriation must be limited to not more than 2 acre foot per acre per year and be limited to not more than one seventieth (1/70) of one cubic foot of water per second of time for each acre of land to which water is actually and beneficially applied~~

~~for irrigation~~ on or before February 15, 1993; said water to be used during the following described annual period: CONTINUOUS

Witness my hand this 15TH day of March, 1984

THE WATER MANAGEMENT BOARD

By: John Hatch
Chief Engineer, Water Rights

Certificate of Construction Issued _____, 19____
Water License Issued _____, 19____

D. Well Information Well # 1 (1973)

- (1) Drill Hole, Diameter 10 in., Depth 126 ft.
- (2) Casing, Type Steel, Diameter 6 in., Thickness 1/4 "
(wood, concrete, steel, etc)
- (3) Screen, Type Unknown, Diameter _____, Length _____
- (4) Gravel Pack, Thickness 4 in., Length of gravel pack 15 ft.

E. Dugout Information or Estimates

- (1) Surface dimensions, _____, Depth _____

F. Fill out for Either a Well or a Dugout.

(1) Water Bearing Materials. (Attach a copy of test well log)

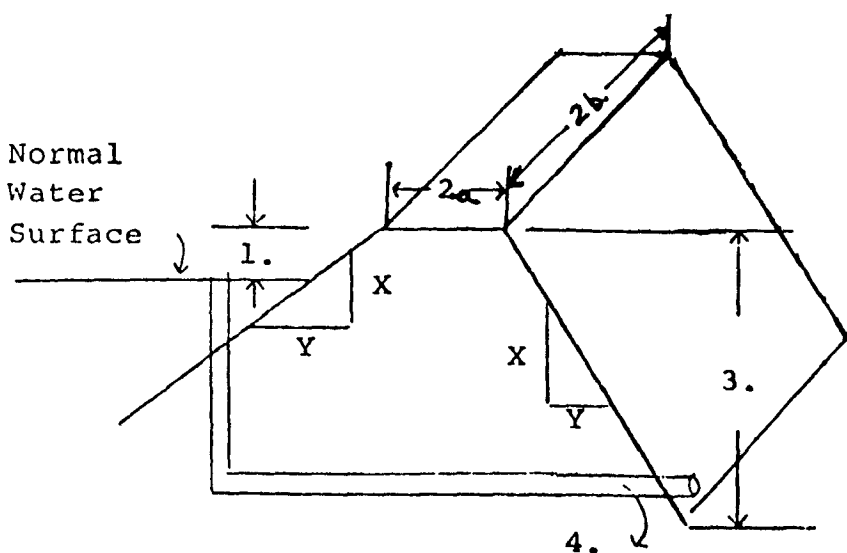
- Depth to top of water bearing material _____
- Depth to bottom of water bearing material _____
- Depth to water (ground surface to water level) _____

(2) Distance to nearest existing household or livestock watering well.

- On same owner's property None rds.
- On property owned by others 20 rds.

G. Water Storage Dams

If the proposed water use system contains one or more water storage dams, please show in the space below, the height, length, maximum water depth, surface area, drainage area, storage capacity, dam slope, dimensions, location and size of outlet works, of each storage dam. The location of each water storage dam should be shown on the water right map.



1. Freeboard _____
- 2a Crest width _____ b. length _____
3. Height of Dam _____
4. Outlet dimensions:
 Pipe diameter _____
 Spillway width _____
- X & Y slope:
 Upstream _____
 Downstream _____
- Surface area of impoundment _____
- Drainage area above dam _____

James M. Cull

 Signature of Applicant

D. Well Information Well # 2

- (1) Drill Hole, Diameter 5 inches, Depth 140 feet
 (2) Casing, Type plastic, Diameter 5 inches, Thickness 1/4 "
(wood, concrete, steel, etc.)
 (3) Screen, Type PVC, Diameter 5 inches, Length 10 feet
 (4) Gravel Pack, Thickness 4 inches, Length of gravel pack 15 feet

E. Dugout Information or Estimates

- (1) Surface dimensions, _____, Depth _____

F. Fill out for Either a Well or a Dugout.

(1) Water Bearing Materials. (Attach a copy of test well log)

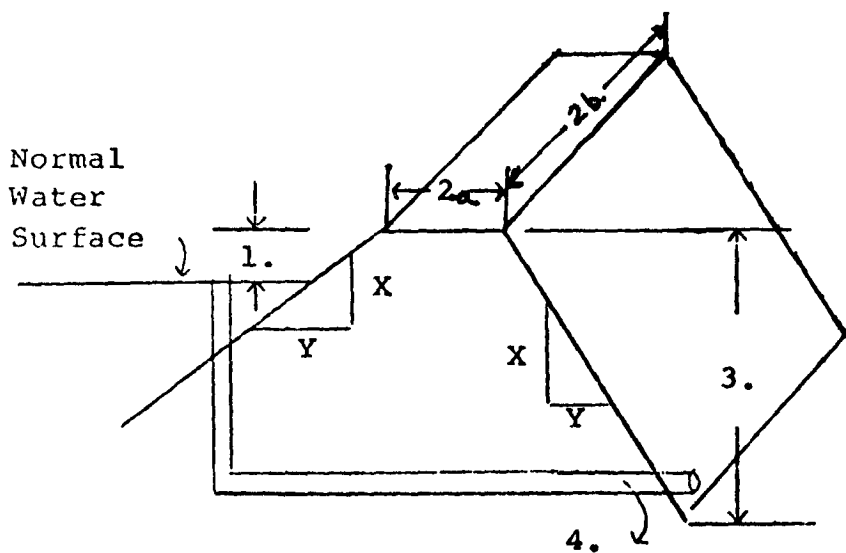
- Depth to top of water bearing material _____
 Depth to bottom of water bearing material _____
 Depth to water (ground surface to water level) _____

(2) Distance to nearest existing household or livestock watering well.

- On same owner's property None rds.
 On property owned by others 20 rds.

G. Water Storage Dams

If the proposed water use system contains one or more water storage dams, please show in the space below, the height, length, maximum water depth, surface area, drainage area, storage capacity, dam slope, dimensions, location and size of outlet works, of each storage dam. The location of each water storage dam should be shown on the water right map.



1. Freeboard _____
 2a Crest width _____ b. length _____
 3. Height of Dam _____
 4. Outlet dimensions:
 Pipe diameter _____
 Spillway width _____
 X & Y slope:
 Upstream _____
 Downstream _____
 Surface area of impoundment _____
 Drainage area above dam _____

Developed in 1975 & 1976. Not all records kept.
 Non-profit Homeowners Association took over in 1980.

James M. Carl

 Signature of Applicant

D. Well Information Future Well

- (1) Drill Hole, Diameter 10 in., Depth 140 ft.
- (2) Casing, Type PVC, Diameter 8 in., Thickness _____
(wood, concrete, steel, etc.)
- (3) Screen, Type PVC, Diameter 8 in., Length 15 - 20 ft.
- (4) Gravel Pack, Thickness 4 inches, Length of gravel pack 15 - 20 ft.

E. Dugout Information or Estimates

- (1) Surface dimensions, _____, Depth _____

F. Fill out for Either a Well or a Dugout.

(1) Water Bearing Materials. (Attach a copy of test well log)

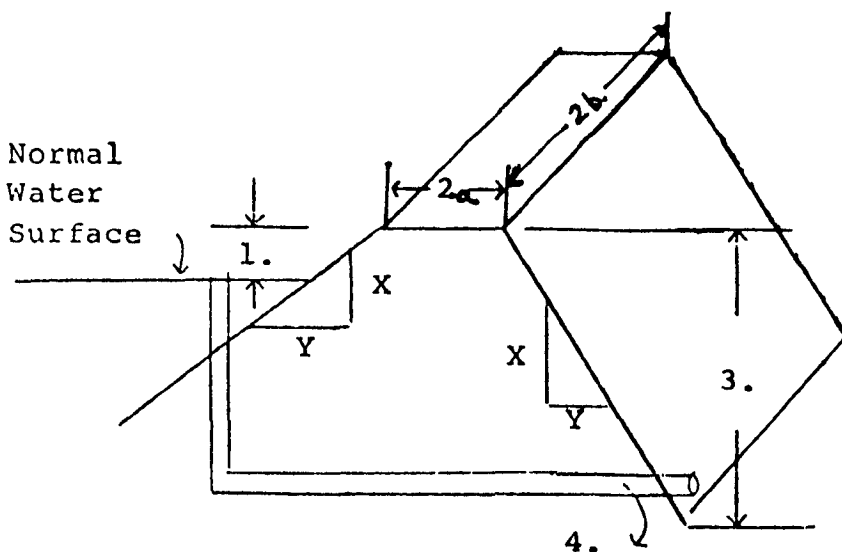
- Depth to top of water bearing material _____
- Depth to bottom of water bearing material _____
- Depth to water (ground surface to water level) _____

(2) Distance to nearest existing household or livestock watering well.

- On same owner's property None rds.
- On property owned by others 20 rds.

G. Water Storage Dams

If the proposed water use system contains one or more water storage dams, please show in the space below, the height, length, maximum water depth, surface area, drainage area, storage capacity, dam slope, dimensions, location and size of outlet works, of each storage dam. The location of each water storage dam should be shown on the water right map.



1. Freeboard _____
- 2a Crest width _____ b. length _____
3. Height of Dam _____
4. Outlet dimensions:
 Pipe diameter _____
 Spillway width _____
- X & Y slope:
 Upstream _____
 Downstream _____
- Surface area of impoundment _____
- Drainage area above dam _____

James M. Carter

 Signature of Applicant

Information on wells in Pine Lake Hills Homeowners Association
Housing Development

0 - 2' Top Soil
2' - 60' Yellow Clay
60' - 110' Blue Clay
110' - 125' Fine Sand & Clay
125' - 140' Fine Brown Sand
140' - 160' Medium - Course Sand & Gravel



Soil at wells.

Information from Dave Putzke, Drilling and Pump Co., Sioux Falls.

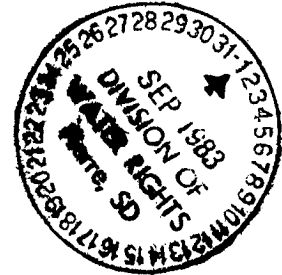
John M. [Signature]

Dave Putzke well [Signature]
Dave Putzke

L. 439

Information on wells in Pine Lake Hills Homeowners Association
Housing Development

0 - 2' Top Soil
2' - 60' Yellow Clay
60' - 110' Blue Clay
110' - 125' Fine Sand & Clay
125' - 140' Fine Brown Sand
140' - 160' Medium - Course Sand & Gravel



Soil at wells.

Information from Dave Putzke, Drilling and Pump Co., Sioux Falls.

James M. Carter

*Dave Putzke well Driller
Dave Putzke*

L. 1139

RECEIPT

Division of Water Rights

No 4 9328

South Dakota Department of Water and Natural Resources

Pierre, September 1, 1983

RECEIVED OF Pine Lake Hills Homeowners Assoc., 7101 Pine Lake Drive, Bioux Falls, SD
the following amount in fees for services rendered as provided for by law: 57101

Fee for Application for Permit No. <u>4974-3</u> to Appropriate Water, to construct works and to put water to beneficial use _____	275	00
Fee for Application for Permit No. _____ to Appropriate Water for Future Use _____		
Fee to retain Future Use Permit No. _____ after period of seven years.		
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. _____		
Fee for Filing Transfer Form _____		
Fee for Filing Extension Request _____		
Fee for Certified Copy of _____		
Fee for Print Copy of Map _____		
Fee for Certifying _____		
Fee for _____		
(Any Other Work Provided by Law)	Total	275 00

By John Hatch
Chief Engineer JOHN HATCH ms

ANALYSIS OF EXISTING WATER SUPPLY FACILITIES
AND
RECOMMENDED IMPROVEMENTS

PREPARED FOR
PINE LAKE HILLS WATER ASSOCIATION - 5.2
SIOUX FALLS, SOUTH DAKOTA

PROJECT NO. 30173

DeWild Grant Reckert & Associates Co.
Consulting Engineers

PINE LAKE HILLS WATER ASSOCIATION
ANALYSIS OF EXISTING WATER SUPPLY FACILITIES
AND
RECOMMENDED IMPROVEMENTS

August 1980

I hereby certify that this report was prepared by me or under my direct personal supervision and that I am a Registered Professional Engineer in the State of South Dakota.

By Leonard C. Neugebauer
Leonard C. Neugebauer,
South Dakota Reg. No. 2461

Date Sept. 10, 1980

DEWILD GRANT RECKERT & ASSOCIATES COMPANY
ARCHITECTURE - ENGINEERING - PLANNING
ROCK RAPIDS, IOWA
SIOUX CITY, IOWA
SIOUX FALLS, SOUTH DAKOTA



Pine Lake Hills Water Association
Mr. Ron Roddel, President
700 Lakeview Road
Sioux Falls, South Dakota 57101

Re: Analysis of Existing Water Supply Facilities
and Recommended Improvements

Dear Mr. Roddel:

Pursuant of our Engineering Service Agreement, dated May 14, 1979, we are pleased to herein transmit the final "Analysis of Existing Water Supply Facilities and Recommended Improvements."

Section 1.0 presents a brief introduction as well as states the objectives of the study. Section 2.0 includes an analysis of the existing and future water demands and compares these demands to typical residential subdivisions. Section 3.0 reviews the water quality analysis and compares the results to recommended and mandatory maximum contaminant levels established by the Federal Environmental Protection Agency. Section 4.0 presents the actual evaluation of the existing water supply facilities as well as recommended improvements on an item by item basis. Sections 5.0 and 6.0 summarize the recommendations and establish a suggested priority for system improvements. Section 5.0 also contains an estimate of the cost for each recommended improvement.

After the Association has had the opportunity to review this report, we would be pleased to attend a meeting of the Association and discuss it further with you. Meanwhile, if you have any questions or if we can assist you further in any way, please let us know.

Respectfully submitted,

DEWILD GRANT RECKERT
& ASSOCIATES COMPANY

Leonard C. Neugebauer, P.E.
Project Manager

JCN:dae

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ANALYSIS OF EXISTING WATER SUPPLY FACILITIES
AND
RECOMMENDED IMPROVEMENTS

1.0 INTRODUCTION

1.1 General: This report contains the findings and recommendations of an engineering evaluation made on the existing water supply system presently serving the Pine Lake subdivision located east of Sioux Falls, South Dakota.

The objectives of this study were as follows:

1. To evaluate and improve the existing system to meet the immediate water requirements of the existing 60 residences.
2. To evaluate the existing system and make recommendations for meeting the future water requirements of the future maximum of 90 residences.
3. To provide rough cost estimates of system improvements as well as an implementation schedule.

1.2 Analysis Criteria: In order to evaluate the water supply system used by the Pine Lake Hills Water Association, it is appropriate that standard design criteria be reviewed and used as the basis for the evaluation. The accepted design criteria used in the State of South Dakota and throughout most of the country is the Recommended Standards for Water Works, published by the Great Lakes-Upper Mississippi River Board of State Sanitary Engineers⁽¹⁾. In addition the State of South Dakota has recently developed a supplement to the Recommended Standards for Water Works, entitled "Criteria for Design of Public Water Supply Facilities in South Dakota"⁽²⁾. Both of these publications will be used as a basis for the evaluation of the existing water supply system and subsequent recommendations. When available, tests and data collected from the actual water system are used and compared to the standards previously mentioned.

2.0 WATER DEMAND

The best and most reliable method for determining the existing and future water requirements of a community is by reference to the water supply records kept by that particular community. When those records are non-existent or inadequate, then estimates of water demand must be made from typical water consumption values. In this case, Pine Lake Hills has only limited water supply records. From June 3 to July 9, 1979, daily meter readings were taken at the water treatment plant, which indicated the following for this time period:

1. The average daily water consumption was 59,300 gallons or 282 gallons per capita per day (gpcd) based on an estimated population of 210 people (60 households at 3.5 persons per household).
2. The maximum daily water consumption was 124,070 gallons or 591 gpcd based on an estimated population of 210 people.

Typical water consumption for subdivision dwellings on a public water supply system range from 150 gallons per bedroom for a metered supply to 200 gallons per bedroom for an unmetered water supply⁽³⁾. Assuming three bedrooms per household and 60 households, these typical consumption values translate into a range of 27,000 to 36,000 gallons per day or 128.6 to 171.4 gpcd for the expected average daily water consumption for the Pine Lake Hills community. At first glance, the actual value of 282 gpcd compared to the typical range of 128.6 to 171.4 gpcd seems extremely high. However, it must be noted that the records were taken during June and July, which are two of the warmest months of the year and occur during a time when lawn watering would be a significant demand especially for a developing subdivision. Therefore the average daily consumption for the year would be substantially lower than the June/July values and would likely fall into the range of 128.6 to 171.4 gpcd or approximately at the mean of 150 gpcd. It should also be noted that water systems must also be capable of meeting the maximum daily demand. The maximum daily consumption typically occurs during June or July and the value of 591 gpcd would likely be the best indication of the future maximum daily demand.

Based on the above analysis, the estimates of the existing and future water demand for the Pine Lake Hills development were developed and are presented in Table A.

TABLE A

ESTIMATED EXISTING AND FUTURE WATER DEMAND
FOR PINE LAKE HILLS

<u>Condition</u>	<u>Estimated Population</u>	<u>Average Daily Water Demand</u>			<u>Maximum Daily Water Demand</u>		
		<u>gpcd</u>	<u>gpd</u>	<u>gpm</u>	<u>gpcd</u>	<u>gpd</u>	<u>gpm</u>
Existing							
60 Households	210	150	31,500	21.9	600	126,000	87.5
Future							
90 Households	315	150	47,250	32.8	600	189,000	131.3

The peak instantaneous demand for small water systems is typically 9 times the average daily flow. Therefore the instantaneous demand values for Pine Lake Hills system would be:

1. Existing:

$$31,500 \text{ gpd} \times 9 = 293,500 \text{ gpd or } 196 \text{ gpm}$$

2. Future:

$$47,250 \text{ gpd} \times 9 = 425,250 \text{ gpd or } 295 \text{ gpm}$$

3.0 WATER QUALITY

During June 1980, samples were collected from both the east and west wells and from the treated water to determine the quality of the raw and treated water being consumed. Table B shows the results of the analysis as well as the recommended and/or required Maximum Contaminant Levels (MCL) for community water supply systems as set forth by the U.S. Environmental Protection Agency. Immediately following Table B is an explanation of some of the suggested limits.

As brought out in Table B, several chemical parameters exceed their suggested limits. Those exceeding their limits include iron (raw water only), manganese, and total dissolved solids. Additionally the hardness of the water is quite high at 530 mg/l or about 31 grains per gallon (gpg). It should be noted that the water is typical of groundwater supplies in South Dakota and that the water is safe for domestic consumption; however, the high manganese, total dissolved solids, and hardness may cause minor inconveniences at times as described in the "Explanation of Chemical Analysis" section of Appendix A. The positive Langalier Index indicates that the water as it leaves the plant is not corrosive; however, with home softening and heating the Index does change and the water might become slightly corrosive.

TABLE B

WATER ANALYSIS - PINE LAKE HILLS

Parameter	Unit	Maximum Limit	Suggested Limit	West Well			East Well	
				Raw	Raw	Treated*		
Arsenic	mg/l	0.05						
Barium	mg/l	1.0						
Cadmium	mg/l	0.010						
Chromium	mg/l	0.05						
Lead	mg/l	0.05						
Mercury	mg/l	0.002						
Selenium	mg/l	0.01						
Silver	mg/l	0.05						
Fluoride	mg/l	2.4		0.36	0.38	0.39		
Nitrate (as N)	mg/l	10.0		0.1	0.1	0.1		
Gross Alpha	pCi/l	15.0						
Radium 226-228	pCi/l	5.0						
Turbidity	NTU	1.0						
Bacteriological								Safe
Chloride (CR)	mg/l		250	1.3	1.5	1.3		
Copper (Cu)	mg/l		1	.006	.006	0.012		
Iron (Fe)	mg/l		0.3	1.36	1.24	0.19		
Manganese (Mn)	mg/l		0.05	0.62	0.70	0.62		
Sulfate (SO ₄)	mg/l		250	180	198	190		
Zinc (Zn)	mg/l		5	0.168	0.018	0.019		
Total Dissolved Solids (TDS)	mg/l		500	674	754	780		
pH			6.5-8.5	7.58	7.13	7.49		
Alkalinity (m) (CaCO ₃)	mg/l			331	347	346		
Alkalinity (p) (CaCO ₃)	mg/l			404	423	422		
Carbonate (CO ₂)	mg/l			0	0	0		
Spec. Cond. @ ²⁵ degrees C.	mhos/cm			926	1040	1019		
Calcium (Ca)	mg/l			143	156	155		
Magnesium (Mg)	mg/l			32.3	34.8	34.5		
Hardness (CaCO ₃)	mg/l			490	533	529		
Langelier In- dex @ 50 degrees F.				+0.42	+0.02	+0.38		
Sodium (Na)	mg/l			12.2	12.7	12.7		
Potassium (K)	mg/l			3.6	4.0	4.0		
Nitrite (NO ₂) (as N)	mg/l			0.01	0.01	0.01		

*Note: At the time the treated water sample was collected by the State, a valve was unknowingly closed to the west well and therefore only water from the east well was treated and sampled contrary to what was reported by the State.

In regards to further treatment of the water to bring these chemical parameters below their suggested limits, the only feasible method for reduction of the high manganese is filtration with a special manganese greensand media along with the addition of potassium permanganate to increase the efficiency of manganese removal. The best methodology would be an automatic valve-less filter, since a full-time operator would not be required. An alternate would be a pressure filtration system, which would require daily manual backwashing of the filter as well as a more complicated valving system. In either case, an investment of between \$30,000 to \$40,000 would be necessary to install filtration.

4.0 EVALUATION OF EXISTING FACILITIES

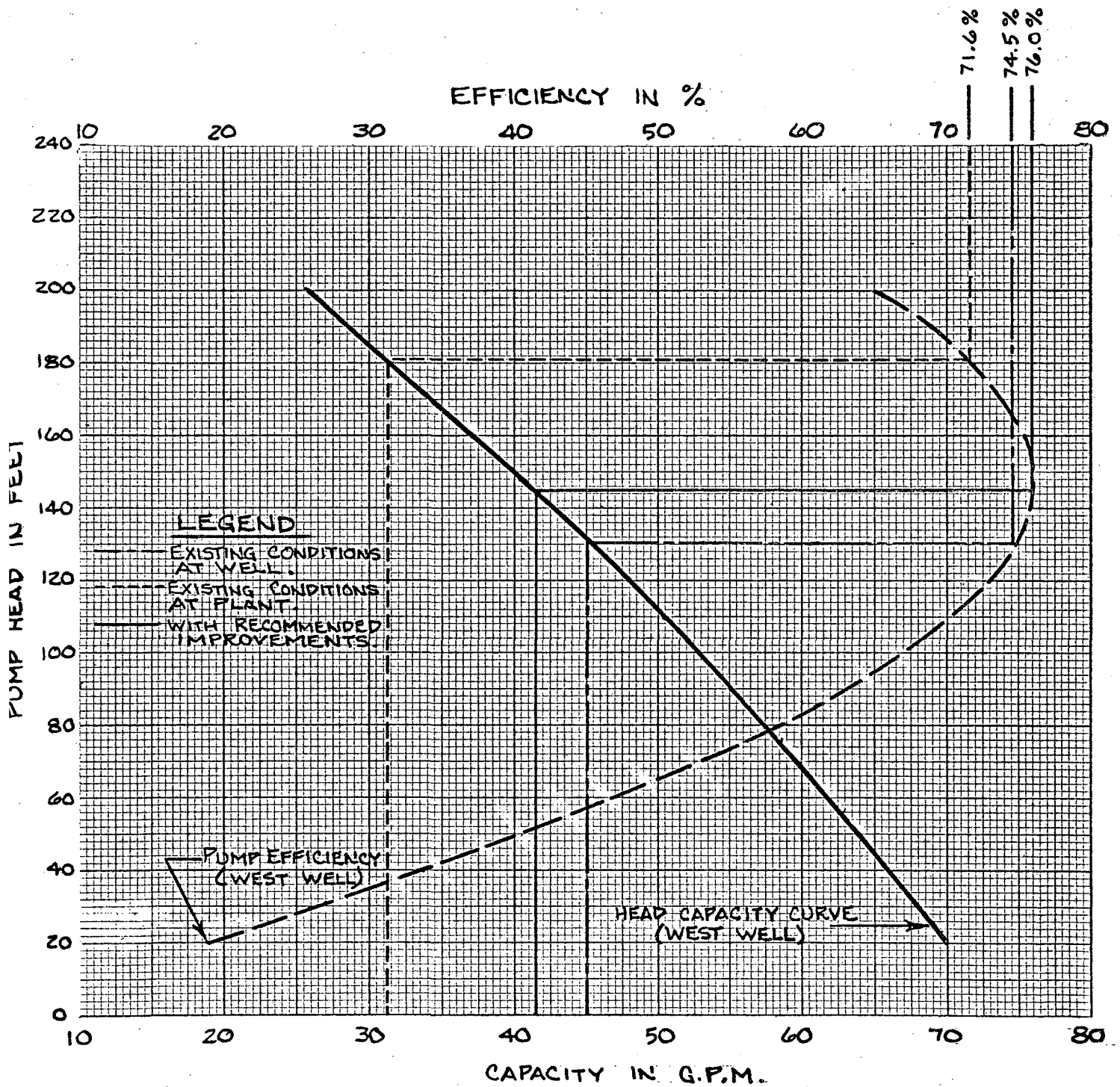
4.1 Raw Water System: During June 1980 tests were conducted on both wells to determine their present capacity and efficiency both at the well and at the plant. In addition a test was conducted at the plant to determine the total output of the wells pumping together. Table C contains the results of the well tests.

TABLE C

WELL CAPACITY TESTS

<u>Location</u>	<u>East Well (gpm)</u>	<u>West Well (gpm)</u>	<u>Both Wells Together (gpm)</u>
At Well	45	45	N/A
At Plant	41.1 65	30.2 42	71.2 107
Manufacturer's Rated Capacity	60	45	105

As illustrated in the preceding table the actual capacity at the east well is substantially lower than the manufacturer's rated capacity indicating that substantial head losses are occurring in the raw water piping system. In the case of the 60 gpm east well, it was determined by hydraulic calculations that most of the head loss occurs in the 1½ inch diameter steel riser resulting in a 15 gpm reduction in capacity. In talking with local well drillers the source of the head loss for the



RAW WATER SYSTEM ANALYSIS - WEST WELL



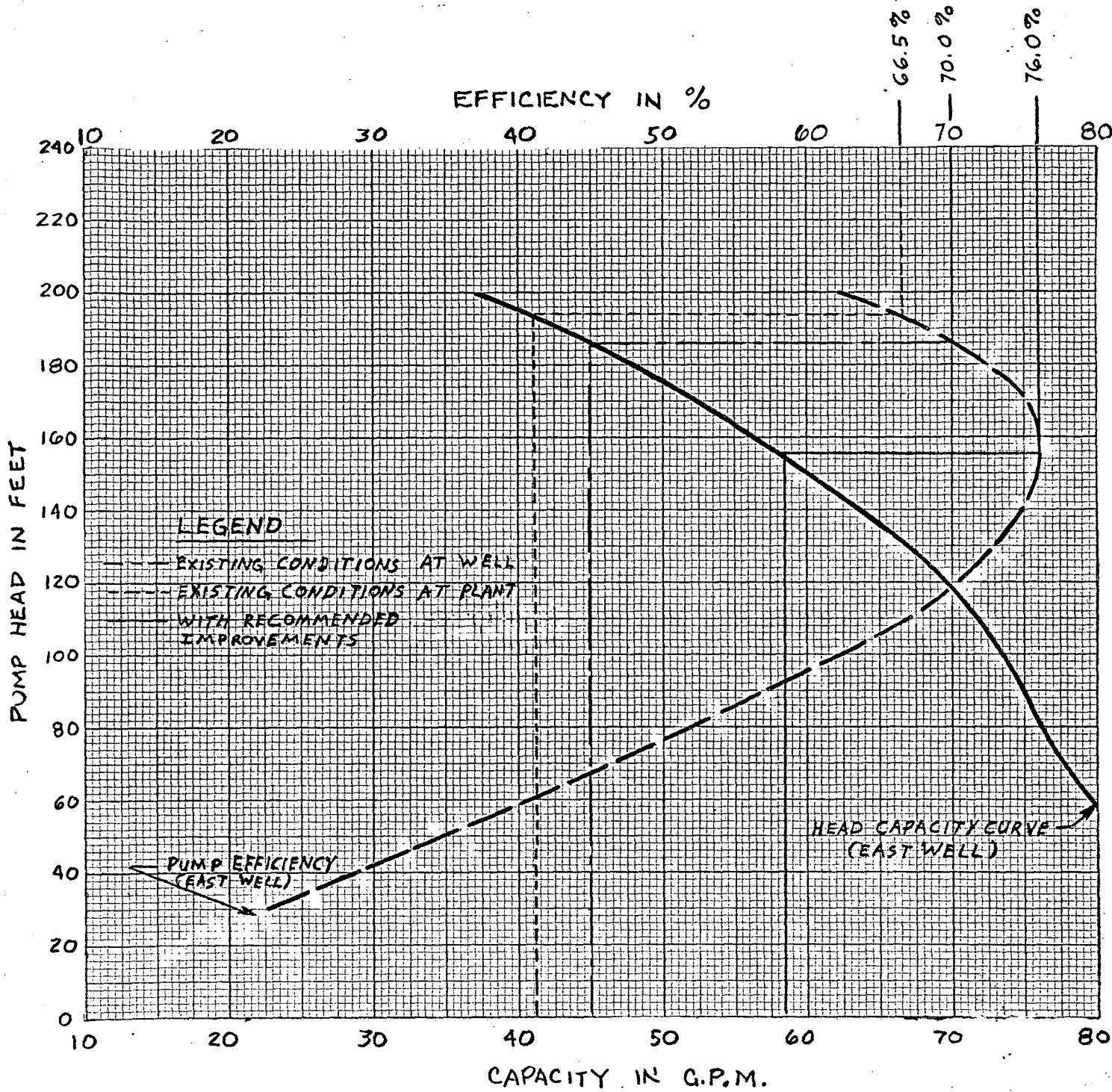
DeWild Grant Recker & Associates Co.
Architecture Engineering Planning

Rock Rapids, Iowa
Sioux City, Iowa
Sioux Falls, South Dakota

Date 07-28-80
Drawn By DAVE O.
Approved TWD
Revised

PINE LAKE HILLS WATER SYSTEM

FIGURE 1



RAW WATER SYSTEM ANALYSIS - EAST WELL



DeWild Grant Recker & Associates Co.
Architecture Engineering Planning
Rock Rapids, Iowa
Sioux City, Iowa
Sioux Falls, South Dakota

Date 07-28-80
Drawn By DAVE O.
Approved TWD
Revised

PINE LAKE HILLS WATER SYSTEM

FIGURE 2

TABLE D

RESULTS OF UPGRADING RAW WATER SYSTEM

	<u>Pump Capacity</u>	<u>Pump Efficiency</u>	<u>*Annual Pumping Cost</u>
East Well			
Existing	41.1 gpm	66.5%	\$103.52
Improved	58.0 gpm	76.0%	<u>64.80</u>
Net Change	+16.9 gpm	+ 9.5%	-\$ 38.72
West Well			
Existing	30.2 gpm	71.6%	\$ 64.20
Improved	41.5 gpm	76.0%	<u>43.20</u>
Net Change	+11.3 gpm	+ 4.4%	-\$ 21.00
Combined			
Existing	71.2 gpm	68.4%	\$167.72
Improved	99.5 gpm	76.0%	<u>108.00</u>
Net Change	+28.3 gpm	+ 7.6%	-\$ 59.72

*Based on 60 households, 3.5 persons/household and an average daily water consumption of 150 gpcd.

west well appears to be a very restrictive, odd-ball "pitless adapter" with a 1-inch diameter discharge at the well. This restriction along with friction losses in the raw water line to the plant, result in a reduction in pump capacity of 14 gpm.

Based upon the well tests and upon standard line loss coefficients, the existing hydraulic conditions of the raw water system were calculated and applied to pump curves as shown in Figures 1 and 2. Assuming that the system was upgraded using all 2 inch diameter lines, along with a standard pitless adapter in the west well, the improved system conditions were calculated and again applied to the pump curves as shown in Figures 1 and 2. This resulted in a theoretical increase in both pump capacity and efficiency as well as a substantial savings in electrical pumping costs as summarized in Table D. Assuming that Pine Lake Hills is fully developed in five years, the estimated savings in electrical costs over a typical 20 year design life is \$1,732 and over a 50 year actual life of the system would be \$4,420.

The estimated costs for these improvements is between \$1,500 and \$3,000 depending on how much 1½ inch diameter line is in the existing system and needs to be replaced with 2 inch or larger line.

A new well may eventually be necessary, since the well improvements will only increase the present well capacity to about 100 gpm and the future maximum daily demand is estimated at 131 gpm. However, the cost of an additional well will depend on the exact location of the well from the treatment plant. For example, if the new well were to be placed near the lake, a considerable amount of raw water line would be needed to connect it to the existing treatment plant. Some of this cost could be reduced if a 3 inch diameter line was installed to the west well, from which a future line could be extended to the new well. The estimated cost for a new well would vary between \$5,000 and \$10,000 or more depending on the location of the well. It should be pointed out that should one of the wells break down and be temporarily out of service, then the east well would produce 47 percent of the maximum daily demand (MDD) or 66 percent if piping improvements were made, whereas the west well would produce 34

percent of the MDD or 48 percent if piping improvements were made. Therefore, the Association may desire to add a third well now to avoid potential water shortage problem during the summer in the event a well should break down.

- 4.2 Aeration: As the water enters the plant it flows through a forced draft aerator, which aids in the removal of hydrogen sulfide as well as in the removal of iron and manganese present in the supply. The forced draft aerator is rated at 50 gpm and effectively reduces the iron content below the 0.3 mg/l suggested limit (1.24 mg/l to 0.19 mg/l) in the water from the east well. Also a slight reduction in the manganese occurs from 0.70 mg/l to 0.62 mg/l; however, the suggested limit of 0.05 mg/l is still greatly exceeded in the treated water. Additionally since the treated water sample was obtained when only the east well was operating, it is unknown as to whether or not these same levels of removal can be applied to the combined flow from both wells. Furthermore, if the well capacity is expanded to 100 gpm or more it is recommended that additional aeration be provided.
- 4.3 Chlorination: After the water flows through the aerator, chlorine is added for disinfection and to further aid in the removal of iron and manganese. A hypo-chlorinator, Model Number 9701-11 manufactured by Precision Control Products, has been installed in the treatment plant and has the capacity to meet both the present and future needs of the development provided it is operated properly. Therefore, an operation and maintenance pamphlet from the manufacturer is contained in Appendix B along with example calculations to determine the theoretical setting and dosage requirements to provide for a chlorine residual of 0.3 mg/l in the distribution system. It should be noted that chlorine will aid in the removal of iron and manganese and the actual chlorine requirements will be slightly higher than the theoretical. Therefore, a Hach chlorine test kit is provided at the treatment plant and should be used to adjust the actual dosage to maintain a chlorine residual of 0.3 mg/l in the distribution system, which is necessary to provide continuous disinfection and protect the health and safety of the water consumer.

Furthermore, the theoretical run time for the chlorine storage tank is 16 days under average conditions of 150 gpcd and would be substantially

shorter under maximum demand. Therefore, a conscientious effort must be made to keep the storage tank filled and the chlorinator operating properly.

- 4.4 Sedimentation and Storage: A clearwell storage basin is provided after aeration and chlorination to provide contact time for the chlorine and to allow time for the oxidized iron and manganese particles to settle out. Additionally, any sand and grit accidentally sucked into the wells will also settle in the storage basin. However, the primary function of water storage is to provide equalization water to meet peak instantaneous water demands which often exceed average daily demands by a factor of nine. Therefore, the minimum effective water storage capacity should be equal to at least one-half the maximum daily demand and the recommended effective storage capacity is equal to the maximum daily demand.

The existing storage is approximately 60,000 gallons or not quite one-half of the present maximum daily demand of 124,000 gallons. With full development of all 90 lots the future maximum daily demand would be 189,000 gallons, requiring an additional 35,000 to 100,000 gallons of storage. Furthermore, this additional storage capacity would help alleviate the distribution pressure problems, if it was placed on the high ground across the valley to the southwest. This will be addressed later in the report under Subsection 4.7, Distribution System.

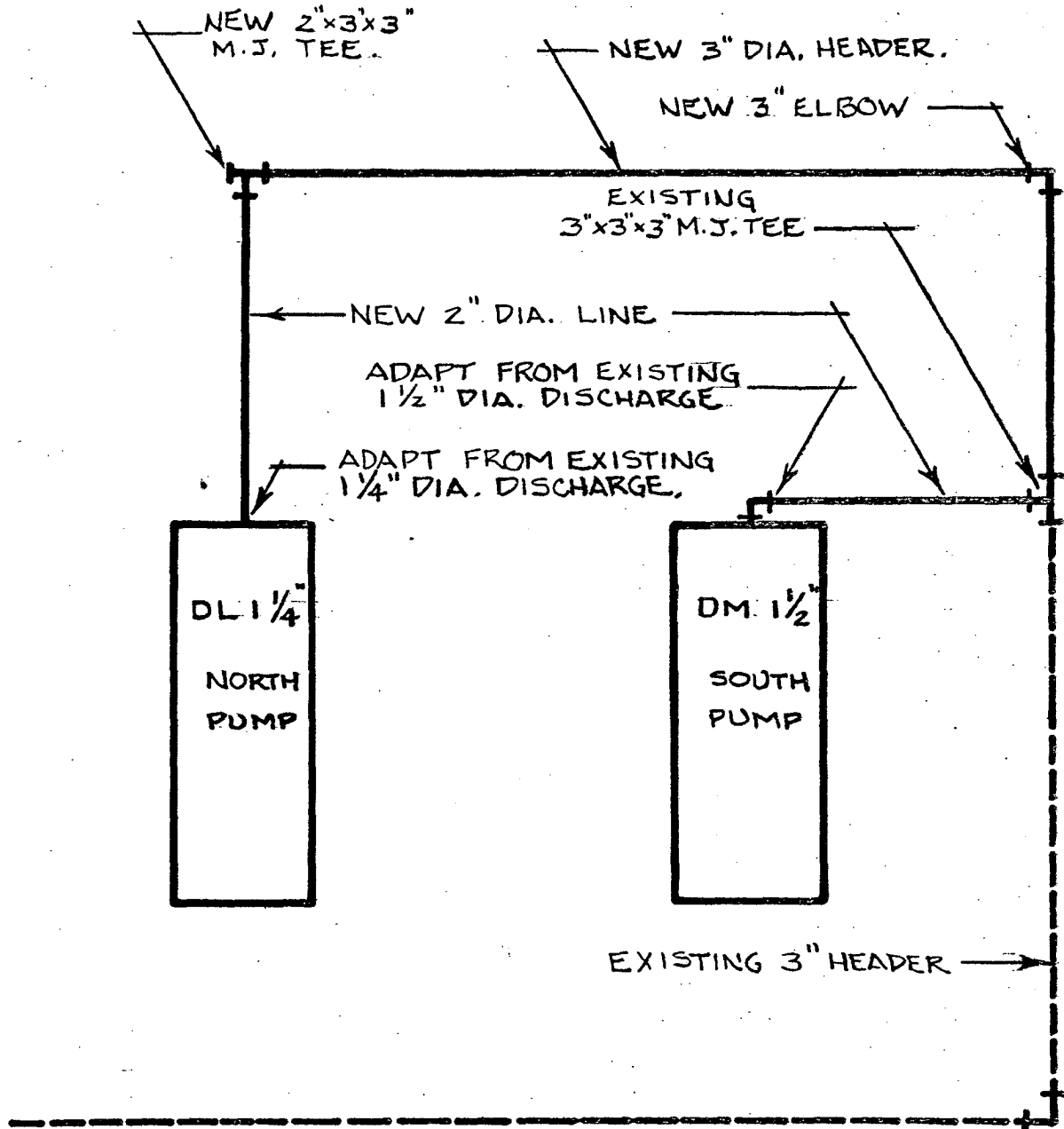
It should be pointed out that water storage has a significant economy in size. For example, an aquastore system of 50,000 gallons would cost approximately \$30,000 or about \$0.60 per gallon whereas an aquastore system at 100,000 gallons would cost approximately \$40,000 or about \$0.40 per gallon. This means that the additional 50,000 gallons of storage could be obtained for less than one-third the original 50,000 gallons. This economy of size should be considered when storage is added to the water system.

- 4.5 High Service Pumps and Discharge Piping: Two high service centrifugal pumps are used to pump the treated water from the ground storage facilities into the distribution system. These pumps along with the hydro-pneumatic tank are used in pressurizing the distribution system. An analysis of the pumping system including the plant discharge

TABLE E

SUMMARY OF HIGH SERVICE PUMP AND PLANT PIPING ANALYSIS

Pump Combination	Discharge Pressure (psi)	Pump Capacity		Pump Efficiency			
		Existing (gpm)	Improved (gpm)	Existing (%)	Improved (%)	Change (%)	
North Pump (DL 1½)	40	102	136	33.3	58.5	55.5	-5.1
	50	91	127	39.6	56.0	58.5	4.5
	60	78	115	47.4	52.5	60.0	14.3
South Pump (DM 1½)	40	129	150	16.3	70.5	67.0	-5.0
	50	109	127	16.5	68.5	10.5	2.9
	60	82	97	18.3	61.0	66.0	8.2
Both Pumps	20	225	289	28.4	64.7	61.0	-5.7
	30	204	267	30.8	63.4	63.9	0.8
	40	180	241	33.9	60.1	64.6	7.5
	50	151	209	38.4	54.5	62.5	14.7
60	117	164	40.2	44.3	53.5	20.8	



SCHMATIC OF DISCHARGE PLUMBING IMPROVEMENTS

NO SCALE



DeWild Grant Recker & Associates Co.
Architecture Engineering Planning

Rock Rapids, Iowa
Sioux City, Iowa
Sioux Falls, South Dakota

Date 07-29-80
Drawn By DAVE O.
Approved
Revised

PINE LAKE HILLS WATER SYSTEM
FIGURE 3

pipng, disclosed that the discharge piping is very restrictive and reduces the combined discharge capacity by up to 40 percent and the combined efficiency by up to 21 percent depending on the exact discharge pressure of the distribution system. Table E summarizes the results of the analysis assuming both existing conditions and an improved condition based on improvements to the pump discharge lines so that both the north and south pumps discharge into separate 2-inch diameter lines that are then connected to a common 3-inch diameter header as shown in Figure 3.

Based on the assumption of a three-way split of the total annual water consumption between the three combinations of pumps (i.e., one-third - north pump alone; one-third - south pump alone; one-third - north and south together) and based on an average discharge pressure of 50 psi to the distribution system, the expected annual energy savings would be \$71.00 for existing conditions and \$106.50 for full development of the subdivision. Assuming full subdivision development in five years, the expected return on the improvements for a typical design life of 20 years is \$2,060 and for actual system life of 50 years is \$5,255.

The expected cost for these improvements is \$200 to \$500 dollars. Therefore a substantial return both in terms of pumping costs and in increased capacity can be realized. Since the combined pump capacity is increased to 268 gpm at a discharge pressure at 30 psi, the future peak instantaneous demand of 295 gpm cannot be met and an additional high service pump may be required; also, it is a generally accepted practice to be able to meet peak demand with the largest pump out of operation. Therefore, it is recommended that a third high service pump of similar capacity be installed along with 4-inch diameter or larger header pipe to reduce inplant head losses.

- 4.6 Hydro-Pneumatic Tank: According to standard design procedures (1), the gross volume of the hydro-pneumatic tank in gallons, should be at least ten times the largest pump capacity, rated in gallons per minute (gpm). For Pine Lake Hills, this would be 10 x 289 or 2,890 gallons, which is considerably less than the actual 3,800 gallon tank. Therefore, it appears that the existing tank is adequate for both the existing conditions as well as the full development of the subdivision.

4.7 Distribution System: The existing distribution system is composed of looped 4-inch diameter PVC pipe, which is adequate for small domestic water systems not intended for fire protection. Since this system was not designed for fire protection, it also was not designed for frequent flushing of the water mains. Uncontrolled flushing of the water mains tends to create more problems than it eliminates for small water systems with substantial topographic relief. Therefore, the flushing of the water mains should be practiced only under extreme emergencies and then only under controlled discharge, so negative pressures are not imposed on the portion of the system located at the higher elevations.

A computerized Hardy Cross distribution analysis was performed to model both the existing and future dispersements of flow within the Pine Lake Hills subdivision. This analysis showed that existing maximum instantaneous demands can be supplied by the system without imposing negative pressures in the high elevations; however, fire flows or line flushing would result in negative pressure conditions and therefore should be avoided. The analysis of future instantaneous demands revealed that an additional high service pump would be required.

An alternative to the addition of another high service pump would be to provide additional equalization storage at the extreme southwest corner of the system. This would prevent negative pressures in the system and would sustain the water supply needs in the event of pump failure as well as provide increased fire protection. The cost of the storage would be substantial, however, ranging from about \$40,000 for a ground storage reservoir to \$100,000 for an elevated tank.

4.8 Evaluation Summary: In summary, problems exist throughout the water supply system presently serving the Pine Lake Hills Community. Some of these problems can be readily and inexpensively be remedied, such as replumbing the discharge from the high service pumps; others such as improvements in the raw water system need to be corrected by a reliable Contractor one portion at a time. Others such as manganese removal require substantial capital investment in treatment equipment. However, with the exception of the future treatment and increase in storage, all the problems can be solved with only minor capital expenditures,

proper operation and maintenance, and daily record keeping.

5.0 RECOMMENDATIONS

5.1 Operator: The very first and probably most important recommendation is to retain a knowledgeable operator to oversee daily or at least the weekly operation of the total water supply system. The operator should be available to supervise the installation of the various recommended system improvements and to observe, operate and maintain the treatment plant. In addition the operator should be in charge of daily, monthly and yearly water supply records as well as reading the household water meters and preparing the monthly water billings. In short the operator should be in complete charge of the water system.

5.2 Water Supply Records: It is essential that daily, monthly and yearly water supply records be kept starting as soon as possible. Items to be included in these records should be:

1. Daily water consumption and chlorine residual in the distribution system.
2. Monthly chemical and electrical usage.
3. Monthly water sales.
4. Monthly sampling of water from distribution system and submittal to State Department of Health Laboratory in Pierre.
5. A log of all operation and maintenance activities including recording the time, cost and name of Contractor who makes the improvements to the system.
6. A log of the chlorine usage should be kept with dates noted when the chlorine tank is filled including the amount of hypo chloride diluted and the amount of water used.
7. Annual totals of water sales, chemicals, power consumption and system improvements should be kept along with records of gross receipts and expenditures.

- 5.3 Water Rights: Since it appears that Pine Lake Hills has not secured its water rights as per South Dakota State Law, it is imperative that an application be made immediately to protect the rights to this source.

An application form is included in Appendix D. Additional information and forms may be obtained from:

Water Rights Division
Department of Water and Natural Resources
Foss Building
Pierre, South Dakota 57501
Telephone 605/773-3352

5.4 Recommended System Improvements and Cost Estimates:

5.4.1 Existing Raw Water System Improvements:

Replacement of well riser pipe with 2 inch diameter PVC pipe, 260 ft. at \$2.00/ft.	\$ 520
Pitless adapter for west well, lump sum	330
Set-up of well drilling rig, lump sum	25
Miscellaneous fittings	50
Labor, 10 hrs. at \$20/hr.	200
*3 inch water line to west well, 250 ft. at \$4.50/ft.	1,125
*2 inch water line to east well, 200 ft. at \$4.00/ft.	<u>800</u>
Total Cost	\$ 3,050

*Note: It probably would not be necessary to construct these lines the full length, depending on what diameters of lines are already in.

5.4.2 New Well:

Construction of new 60 gpm well, lump sum	\$ 5,000
Raw water line, 1,250 ft. of 2 inch diameter PVC line at \$4.00/ft.	<u>5,000</u>
Total Cost	\$10,000

5.4.3 High Service Pumping:

Replumbing high service discharge lines \$300-\$500

New high service pump installed \$ 2,000

5.4.4 Filtration:

Valveless gravity filter with manganese green sand medium and potassium permanganate feeder, lump sum \$40,000

5.4.5 Aeration:

Additional aerator, lump sum \$10,000

5.4.6 Storage:

Alternative ground storage reservoir (100,000 gallons), lump sum \$40,000

5.5 State Recommendations: The report "Routine Sanitary Survey of Pine Lake Hills" performed by the South Dakota Department of Water and Natural Resources is reprinted in its entirety in Appendix A of this report. In it are several recommendations for correcting several "unsanitary" features noted by J. C. Andersen, the Sioux Falls Regional Office Supervisor. It is recommended here that all these recommendations by the State be implemented and that a good working relationship be maintained both with the State and with the United States Environmental Protection Agency.

6.0 IMPLEMENTATION PRIORITY

The very first priority for the Pine Lake Hills Water Association is to retain a knowledgeable operator to oversee the operation and record keeping of the system. This should be done immediately so that better records are available to plan for future expansion, rather than to use sketchy information or to react to a water crisis.

However, it is apparent from the analysis that several improvements should be made immediately such as improved plant discharge piping and an improved raw water collection system. Both of these improvements have been shown to be both cost effective as well as productive in terms of increasing the system's overall capacity. In regards to improving the raw water collection system, it is recommended that at least

two phases of construction occur, the first phase would consist of replacing the restrictive "odd-ball" pitless adapter in the west well with a standard adapter. Also, in the first phase it is recommended that the 1½-inch diameter riser pipes be replaced with 2-inch diameter riser pipe as was the original recommended minimum by the pump manufacturer. Between the first and second phase, it is recommended that the individual and combined well capacities be measured at the wells and at the plant. The second phase would then consist of increasing the diameter of the raw water lines to the plant, depending upon the line losses calculated from the well tests. During the first phase, the Contractor should replace any small diameter raw water lines encountered near the wells that appear overly restrictive, particularly near the west well.

The Water Association will need to establish the priority for improving the treatment facilities to remove manganese depending on both the finances and desires of the association.

Water storage, new well construction, and additional high service pumps will depend on the future demands of the system as determined by future water demand records.

References:

1. Recommended Standards for Water Works, Great Lakes-Upper Mississippi River Board of State Sanitary Engineers, Health Education Service, Inc.; Albany, New York 1976 ed.
2. Criteria for Design of Public Water Supply Facilities in South Dakota, A Supplement to the Recommended Standards for Water Works' Office of Drinking Water, South Dakota Department of Water and Natural Resources, July 1, 1979.
3. Salvato, Joseph A., The Design of Small Water Systems, Division of Sanitary Engineering, New York State Department of Health, Health Education Service, Inc., Albany, New York.

APPENDIX A

"ROUTINE SANITARY SURVEY OF THE PINE LAKE HILLS"
SOUTH DAKOTA DEPARTMENT OF WATER AND NATURAL RESOURCES

DGR RECEIVED

ROUTE TO

JKJ BT BM

JUL 3 1980

ABD MB DB LN
 JW JD GF LDJ
 GM TC TD JR
 File

July 2, 1980

Re: 5.4 Pine Lake Hills

Jim Christensen, President
Pine Lake Hills Owners Association
7504 Pine Lake Drive
Sioux Falls, South Dakota 57105

Dear Mr. Christensen:

Attached is a report entitled, "Routine Sanitary Survey of the Pine Lake Hills". This report has been prepared on the basis of a routine sanitary survey by the Department of Water and Natural Resources and is submitted for correction of the unsanitary features noted. Hopefully, these recommendations will be complied with at your earliest convenience.

We respectfully urge you or your representative to attend annual meetings and training short courses sponsored by the South Dakota Municipal League and the South Dakota Water and Wastewater Association. The next annual South Dakota Water and Wastewater Conference will be held September 10, 11, & 12, 1980, at the Sheraton Motor Inn in Aberdeen.

Please acknowledge receipt of this report together with action contemplated on the recommendations included in the report within 30 days. If we can be of any assistance, please let us know.

Very truly yours,

Mark E. Steichen

Mark E. Steichen
Office Administrator
Office of Drinking Water
Phone: (605) 773-3754

cc: Vonnie Klippert
Tom Drake ✓
Casey Andersen, Sioux Falls Regional Office

C7130S74

Department of Environmental Protection
Office of Water Hygiene

Inspection and Operation Survey of the Pine Lake Hills Public Water Supply System

Contacted Tom Drake, DeWild Grant Reckert & Assoc. Co. Date 6 / 2 / 80

Facilities Consist of 2 Wells - Forced Air Aeration - Chlorination 60,000 gal. concrete reservoir
high lift pump - 3,800 gal pressure tank and the distribution system.

REVIEW ITEMS

1. Chlorination

- a. Is chlorination provided?
- b. If yes, make, model and type of chlorinator: Precision
model; 9701-11 Hypo
- c. Rated capacity: _____ indicated setting: _____
- d. Anti-siphon valve installed on hypochlorinator feed pump?
- e. Safety features for gas chlorination:
 - 1. Separate room?
 - 2. Positive mechanical ventilation?
 - 3. Restraints to secure chlorine cylinders?
 - 4. Gas mask?
- f. Type of chemical used: 12½% Sodium Hypochlorite

Yes	No	N/A
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Not being operated.

<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

2. Fluoridation

- a. Is fluoridation required?
 - 1. Why: Not 500 people
- b. Is fluoridation provided?
- c. If yes, make and model: _____
- d. Rated capacity: _____ indicated setting: _____
- e. Anti-siphon valve on feed pump?
- f. Type of saturator: _____
- g. Type of cross connection control for makeup water: _____
- h. Type of chemical used: _____
- i. Is the proper 10" min. bed of fluoride maintained?
- j. Does a softener and meter accompany the installation?
- k. Do the records show consistent acceptable fluoride levels?
 - 1. If not, describe problems and any steps taken to correct problems: _____

<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

3. Test Equipment

- a. If treatment is provided, are the appropriate test kits available?
 - 1. If yes, state brand name and type of test kit(s): Hach Model CN-66

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-------------------------------------	--------------------------	--------------------------

4. Field Tests

- a. Were tests performed during the survey?
 - 1. If yes, give values: Less than 0.1 mg/l
- b. Are tests performed by the operator?
 - 1. If yes, type and frequency: _____

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
-------------------------------------	--------------------------	--------------------------

<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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Reservoir(s)

Yes No N/A

- a. State size and type: 60,000 underground concrete reservoir
3800 gal. steel pressure tank
- b. Service frequency: _____
1. Type of lining: _____
- c. Are the following present:
1. Overlapping cover on manhole?
2. Overflow & vents screened?
- d. Comments on general condition: _____

		X
		X

Distribution System

- a. Indicate main sizes: All 4" plastic
1. Are there fire hydrants on less than 6" diameter mains?
- b. Is there a main flushing program?
1. If yes, state frequency: Occasionally
- c. Are there complaints of water quality from consumers?
1. If so, describe: Low volume

X		
X		

X		
---	--	--

Sanitation

- a. Does the general appearance of the facilities indicate routine maintenance and good housekeeping practices? Need shelving for meters and paint
- b. Is any equipment located in a pit? No Clean out paper boxes and junk
1. If yes, detail: _____

	X	
	X	

Records

- a. Are adequate records of operation maintained?
- b. State what records are kept: None

	X	
--	---	--

Cross Connection(s)

- a. Were any cross connections observed?
1. If yes, describe: _____

	X	
--	---	--

Filtration

- a. Is filtration provided?
1. If yes, what type: _____
2. Filter area: _____ filtration rate: _____
3. Backwash frequency: _____
a. How determined: _____
4. Do the records show adequate filtration is being accomplished?

	X	
--	---	--

		X
--	--	---

Aeration

- a. Is aeration provided?
1. Type: Forced Air

X		
---	--	--

Chemical Treatment

- a. Are chemicals other than chlorine or fluoride used to treat the water?
1. If yes, detail what is being used and at what feed rate:

	X	
--	---	--

13. Bacteriological Sample(s)

Yes No N/A

- a. How many samples were collected: 1
 1. # safe: 1 (June 2, 1980) # unsafe: _____
- b. Have unsafe bacteriological samples been collected recently?
 1. If yes, describe what has been done to eliminate the source of contaminants: _____
- c. Are bacteriological samples being submitted as required?

	X	
	X	

14. Chemical Sample(s)

- a. # of samples collected and type: 1 Chemical
- b. Has the water supply violated the nitrate level in the past?
 1. If yes, when was the last time consumers were informed: _____

	X	
--	---	--

15. Certification

- a. Is a certified operator required? _____
- b. Is the operator certified? _____
- c. Does the operator desire training, PLP and/or certification?
Need designated operator

	X	
	X	
		X

16. Water Rights

- a. Have water rights been obtained?
 1. License or permit #(s): _____

	X	
--	---	--

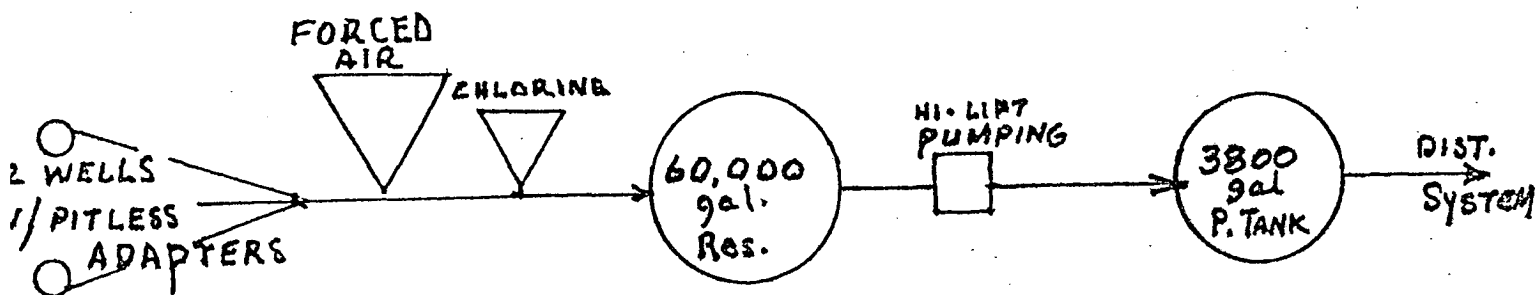
17. Improvements

- a. Have improvements planned to the water system?
 1. If yes, describe: DeWild Grant Reckert & Assoc. presently are studying system.

X		
---	--	--

18. General Comments: _____

19. Flow Diagram of Facility:



RECOMMENDATIONS: See Attached Sheet(s)

RECOMMENDATIONS

1. That the chlorinator be adjusted and operated so that a free chlorine residual in the entire distribution system is maintained at a minimum of 0.30 mg/l. It is possible for contamination to enter the water supply at the source, treatment facilities, or the distribution system through faulty plumbing. Continuous disinfection of the water through the use of chlorine is essential for destruction of disease-producing organisms.
2. All openings into the concrete reservoir around the drop or suction pipes from the chlorinator and the high lift pumping equipment, etc., should be sealed to prevent entrance of contaminating material into the reservoir.
3. It is recommended that the chlorine residual be tested at least once a day in the distribution system through use of the test kit which is available in the pump house. A record should be maintained of the chlorine residual readings.
4. That the paper boxes and miscellaneous junk be removed from the pump building and that shelving be constructed to hold waterworks equipment up off the wet floor. Paint and other miscellaneous equipment not related to waterworks operation or treatment should be removed from the pump room.
5. Waterworks records of water consumption, daily pumpage, power usage, draw-down levels, and maintenance activities should be collected to effectively plan future waterworks improvements and to detect equipment malfunctions before they become a major problem. For example, a record of pumpage rates compared with power usage could forewarn impending pump or well failure.
6. Both wells contain high levels of iron and manganese. Most of the iron is oxidized by the forced draft aeration system and settles in the bottom of the concrete reservoir which necessitates periodic emptying, cleaning, and disinfection before being replaced into use. If the iron and manganese content exceeds 0.3 mg/l and 0.5 mg/l respectively, they cause deposits in water distribution mains and service lines and leave stains on plumbing fixtures and light-colored clothes. Iron causes red or reddish-brown deposits and stains. Manganese stains and deposits are black or gray.
7. Information available to this department indicates that Pine Lake Hills has not secured its water rights as per South Dakota State Law. It is recommended that an application be made to protect your supply source. Application forms and additional information may be obtained from the Water Rights Division of the Department of Water & Natural Resources in Pierre.
8. Although Pine Lake Hills is not required to have a certified waterworks operator, we would like to encourage you to give your operator the opportunity to attend some of the various training courses that are available and become certified. For more information as to class dates, location, etc., please contact Mr. Bill Aisenbrey, Department of Water and Natural Resources, Pierre, South Dakota, 57501.
9. Because Pine Lake Hills' water system has more than fifteen connections and serves more than twenty-five customers on a full time basis, you are subject to the Federal Safe Drinking Water Act and the National Interim Primary Drinking Water Regulations. By copy of this report, we are requesting EPA Offices in Denver to send you detailed information on the requirements of this program.

Bacteriological Sampling & Analysis

The State Department of Water and Natural Resources requires that all public water supplies submit water samples on a routine basis to the State Department of Health Laboratory in Pierre. (Pine Lake Hills must submit one sample during each calendar month of the year). Bacteriological samples should be collected from different points in the distribution system so that the water sampling record will provide an indication of the water quality within the entire distribution system.

Your water analysis record for 1980 is as follows:

Samples required 1/month Safe samples 1

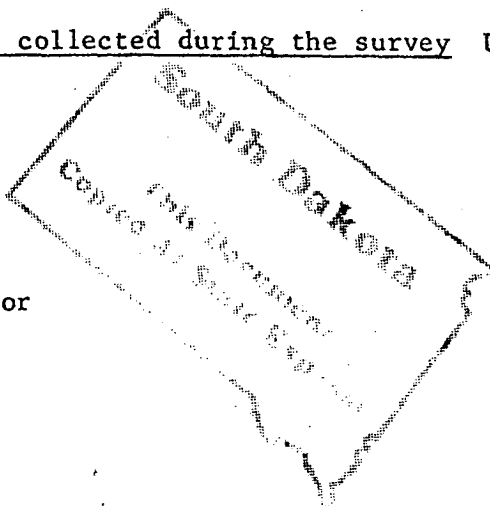
Samples submitted 1 collected during the survey Unsafe samples 0

Respectfully yours,



J.C. Andersen
Regional Office Supervisor

JCA:dr



SOUTH DAKOTA DEPARTMENT OF WATER AND NATURAL RESOURCES

OFFICE OF DRINKING WATER

CHEMICAL ANALYTICAL DATA

Water Supply: PINE LAKE HILLS
 Town, County: SIOUX FALLS, MINN. Co
 Source of Supply: EAST WELL #2
 Sampling Point: Pumphouse
 Sample: Raw X Treated _____ Composite _____
 Treatment Process: Aeration-Chlorination

Date Collected: JUNE 9 1980
 Collected By: ANDERSEN-DRAKE
 Mail Report To: VONNIE KLINGERT 705 PINE LAKE HILLS R.R. S. Falls 57101
W. TOM DRAKE 113 E 14TH ST. S. Falls 57104
J.C. ANDERSEN
 Comments: _____

Received By Lab: 6-10-80 DB
 Report Sent By Lab: 6-20-80

Parameter	Maximum Limit	Results	Parameter	Suggested Limit	Results
Arsenic	50 ug/l		Chloride (Cl)	250 mg/l	1.5
Barium	1000 ug/l		Copper (Cu)	1 mg/l	0.006
Cadmium	10 ug/l		Iron (Fe)	0.3 mg/l	1.24
Chromium	50 ug/l		Manganese (Mn)	0.05 mg/l	0.70
Lead	50 ug/l		Sulfate (SO4)	250 mg/l	198
Mercury	2 ug/l		Zinc (Zn)	5 mg/l	0.018
Nitrate (as N)	10 mg/l	0.1	Tot. Diss. Solids (TDS)	500 mg/l	254
Selenium	10 ug/l		pH	6.5-8.5	7.13
Silver	50 ug/l		Alkalinity(m) (CaCO3)	mg/l	347
Fluoride	2.4 mg/l	0.38	Alkalinity(p) (CaCO3)	mg/l	
Gross alpha	15 pCi/l		Bicarbonate (HCO3)	mg/l	423
Radium 226-228	5 pCi/l		Carbonate (CO3)	mg/l	
Turbidity	1 NTU		Spec. Cond. @ 25°C	umhos/cm	1040
OTHER PARAMETERS			Calcium (Ca)	mg/l	156
			Magnesium (Mg)	mg/l	34.8
			Hardness (CaCO3)	mg/l	533
			Langlier Index @ 50°F		+0.02
			Sodium (Na)	mg/l	12.7
			Potassium (K)	mg/l	4.0
			Nitrite (NO2)(as N)	mg/l	<0.01

LAB COMMENTS: _____

* Certificate of A. guidelines - Values may not be valid.

Percentage of Error: 0.89/3.4

WNR - 606 - 10/79

mg/l = milligrams/liter = parts/million (ppm)

ug/l = micrograms/liter = parts/billion (ppb)

LAB. NO.

802730

Posted 6-24-80

SOUTH DAKOTA DEPARTMENT OF WATER AND NATURAL RESOURCES

OFFICE OF DRINKING WATER

CHEMICAL ANALYTICAL DATA

Supply: PINE LAKE HILLS
 County: SIoux FALLS, MINN. Co.
 Type of Supply: X WELLS EAST ONLY
 Sampling Point: PUMP HOUSE TAP
 Sample: Raw _____ Treated X Composite X
 Treatment Process: _____
Chlorine

Date Collected: JUNE 2, 1980
 Collected By: HANSEN-ANDERSEN
 Mail Report To: _____
VENNIE KLINVERT 705 PINE LAKE HILLS
R.R. SIOUX FALLS 57101
 cc: TOM DRAKE 113 E 14th ST S. FALLS 57104
 cc: J.C. ANDERSEN
 Comments: _____

Received By Lab: 6-10-80 DB
 Report Sent By Lab: 6-20-80 DB

Parameter	Maximum Limit	Results	Parameter	Suggested Limit	Results
Arsenic	50 ug/l		Chloride (Cl)	250 mg/l	1.3
Barium	1000 ug/l		Copper (Cu)	1 mg/l	0.012
Cadmium	10 ug/l		Iron (Fe)	0.3 mg/l	0.19
Chromium	50 ug/l		Manganese (Mn)	0.05 mg/l	0.62
Lead	50 ug/l		Sulfate (SO4)	250 mg/l	190
Mercury	2 ug/l		Zinc (Zn)	5 mg/l	0.019
Nitrate (as N)	10 mg/l	0.1	Tot. Diss. Solids (TDS)	500 mg/l	780
Selenium	10 ug/l		pH	6.5-8.5	7.49
Silver	50 ug/l		Alkalinity(m) (CaCO3)	mg/l	346
Fluoride	2.4 mg/l	0.39	Alkalinity(p) (CaCO3)	mg/l	
Gross alpha	15 pCi/l		Bicarbonate (HCO3)	mg/l	422
Radium 226-228	5 pCi/l		Carbonate (CO3)	mg/l	
Turbidity	1 NTU		Spec. Cond. @ 25 °C	umhos/cm	1019
OTHER PARAMETERS			Calcium (Ca)	mg/l	155
			Magnesium (Mg)	mg/l	34.5
			Hardness (CaCO3)	30.9 gpg mg/l	529
			Langelier Index @ 50 °F		+0.38
			Sodium (Na)	mg/l	12.7
			Potassium (K)	mg/l	4.0
			Nitrite (NO2)(as N)	mg/l	40.01

COMMENTS:

mg/l = milligrams/liter = parts/million (ppm)
 ug/l = micrograms/liter = parts/billion (ppb)

Percentage of Error: 1.4/3.3
 - 606 - 10/79

802733

LAB. NO.

dated 6-24-80

SOUTH DAKOTA DEPARTMENT OF WATER AND NATURAL RESOURCES

OFFICE OF DRINKING WATER

CHEMICAL ANALYTICAL DATA

Water Supply: PINE LAKE HILLS
 Town, County: SIOUX FALLS, MINNEHAHA CO
 Source of Supply: WEST WELL # 1
 Sampling Point: PUMP HOUSE WELL
 Sample: Raw X Treated _____ Composite _____
 Treatment Process: _____
AERATION
Chlorine

Date Collected: JUNE 11, 1980
 Collected By: TOM DRAKE
 Mail Report To: _____
VONNIE KLINNERT - 705 PINE LAKE AVE
R.R. SIOUX FALLS - 57101
CC: TOM DRAKE - 113 E 14th St S. Falls 57101
CC: J.C. ANDERSEN
 Comments: _____

Received By Lab: 6/13/80
 Report Sent By Lab: 6/24/80

Parameter	Maximum Limit	Results	Parameter	Suggested Limit	Results
Arsenic	50 ug/l		Chloride (Cl)	250 mg/l	1.3
Barium	1000 ug/l		Copper (Cu)	1 mg/l	0.006
Cadmium	10 ug/l		Iron (Fe)	0.3 mg/l	1.36
Chromium	50 ug/l		Manganese (Mn)	0.05 mg/l	0.62
Lead	50 ug/l		Sulfate (SO4)	250 mg/l	180
Mercury	2 ug/l		Zinc (Zn)	5 mg/l	0.168
Nitrate (as N)	10 mg/l	< 0.1	Tot. Diss. Solids (TDS)	500 mg/l	674
Selenium	10 ug/l		pH	6.5-8.5	7.58
Silver	50 ug/l		Alkalinity(m) (CaCO3)	mg/l	331
Fluoride	2.4 mg/l	0.36	Alkalinity(p) (CaCO3)	mg/l	
Gross alpha	15 pCi/l		Bicarbonate (HCO3)	mg/l	404
Radium 226-228	5 pCi/l		Carbonate (CO3)	mg/l	
Turbidity	1 NTU		Spec. Cond. @ 25 °C	umhos/cm	926
OTHER PARAMETERS			Calcium (Ca)	mg/l	143
			Magnesium (Mg)	mg/l	32.3
			Hardness (CaCO3) 28.7 gpg	mg/l	490
			Langelier Index @ 50 °F		+0.42
			Sodium (Na)	mg/l	12.2
			Potassium (K)	mg/l	3.6
			Nitrite (NO2)(as N)	mg/l	0.01

LAB COMMENTS: _____

 Percentage of Error: 0.04/3.5
 WNR - 606 - 10/79

mg/l = milligrams/liter = parts/million (ppm)
 ug/l = micrograms/liter = parts/billion (ppb)
 LAB. NO. ~~802830~~ **802830**

Posted 6-24-80

Explanation of Chemical Analyses

The following list of chemicals corresponds to the chemical analysis of your drinking water. The recommended limits were provided by the United States Public Health Service, Drinking Water Standards revised in 1962. The numbers in parenthesis following the element on the lab form prescribes the maximum contaminant levels as set forth by the Federal Drinking Water Standards placed into effect June 24, 1977.

SODIUM - Sodium may be of health significant to persons on a low-salt diet for medical reasons. The sodium content is increased when water is passed through a softener.

IRON AND MANGANESE - Iron and manganese are nuisance chemicals which cause troublesome stains and deposits on light colored clothes, on plumbing fixtures and in pipes. Iron causes yellow, red, or reddish-brown stains and deposits while manganese causes gray or black stains. Both can be removed in a zeolite softener equipped with a special resin or by small treatment systems involving aeration, filtration, and chlorination. Manganese in excess of 0.2 mg/l will more than likely cause problems. Iron problems arise with levels greater than 0.3 mg/l. A combination of iron and manganese in excess of 0.3 mg/l can also cause discoloration and may contribute to odor problems.

NITRATE - Nitrate in excess of 10 mg/l (as N) is of major health significance to infants of six months age or less. High nitrate water should not be used for infant feeding or formulas. Nitrates cannot be removed or reduced by boiling (in fact nitrate content is increased by boiling) and cannot be completely removed by any presently-known public water supply treatment device.

SULFATE - Sulfate content should not exceed 250 mg/l. Water with a sulfate content in excess of 500 to 700 mg/l may have a bitter taste, and have a laxative effect on persons not adapted to the water. Sulfates may also contribute to odor problems.

CONDUCTIVITY - This measures the ability of water to conduct electric current, and is related to the type and amount of dissolved chemicals in the water. In general waters having a conductivity of less than 1000 micromhos may have slight hardness as well as taste and odor problems. Dependent upon the particular chemicals dissolved in the water, these problems may become more pronounced with increasing conductivity to the extent that levels greater than 3000 micromhos may make the water objectionable for human use.

HARDNESS - Hardness is the soap-consuming capacity of water, that is, the more soap required to produce a lather, the harder the water. Hard water also causes greasy rings on bathtubs and sinks, chemical deposits in pipes and faucets, greasy films on dishes or on hair after washing and poor laundry results.

The hardness of South Dakota waters may be rated as follows:

0.3 gpg	Soft water
4-10 gpg	Reasonably soft
11-25 gpg	Fairly hard, less than average for SD
26-50 gpg	Average hardness for SD
51-75 gpg	Very hard
Over 75 gpg	Extremely hard

ALKALINITY - Alkalinity is not considered to be detrimental to humans, but it is generally associated with hardness, high pH values and excessive dissolved solids, all of which may be undesirable. No recommended standard set by the U.S.P.H.S.

BICARBONATES - Excessive bicarbonates add to the salinity and total solids content of water, and at high temperature tends to form scale deposits on faucets. No recommended standard has been set for bicarbonates by the U.S.P.H.S.

CALCIUM - Calcium content is not a health hazard, but is disadvantageous for household uses, such as washing, bathing, and laundering, and because it tends to cause incrustations on cooking utensils and water heaters. No recommended standard for calcium has been set by U.S.P.H.S.

CHLORIDES - Chlorides in drinking water are generally not harmful to human beings until high concentrations are reached, although chlorides may be injurious to some people suffering from diseases of heart or kidneys. Restrictions on chloride concentrations in drinking water are generally based on taste requirements rather than on health. The source of chlorides may be a more important factor than the quantity of chloride, in that any sudden increase in the chloride content should be suspected as a possible indication of pollution and should be investigated further. Chlorides should not exceed 250 mg/l.

MAGNESIUM - Magnesium is considered relatively non-toxic to man, and not a public health hazard because before toxic concentrations are reached in water, the taste becomes quite unpleasant. At high concentrations, magnesium salts have a laxative effect, particularly upon new users, although the human body can develop a tolerance to magnesium over a period of time. Recommended limit is 125 mg/l.

pH - The pH indicates the acidity of your drinking water. The pH scale is from 0 to 14 units with a value of 7 being neutral (equal amounts of acid and base) 0-6 being acid and 8-14 being basic. No recommended limits have been set for pH, although drinking water usually is between 7.0 -7.8.

POTASSIUM - In public drinking water supplies, potassium is an essential nutritional element, but in excessive quantities it acts as a laxative, and 1000 mg/l to 2000 mg/l is regarded as the extreme limit of potassium permissible in drinking water.

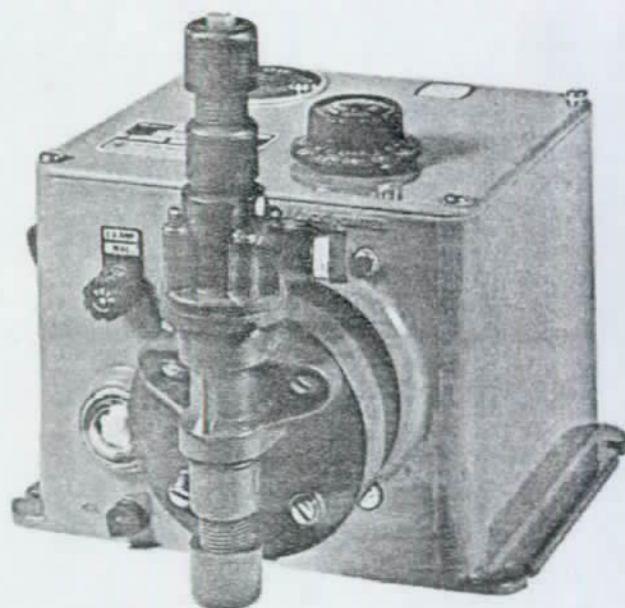
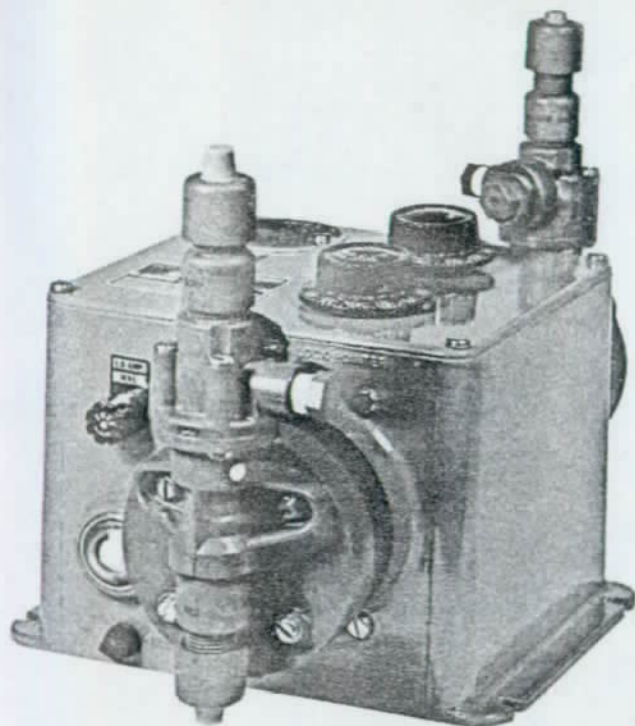
CARBONATE - Called temporary hardness because heating will remove it. When the water is heated, bicarbonates break down into carbonates that form solid particles which stick to the inside of pipes or a heated surface.

LANGELIER INDEX - This value indicates whether your water tends to be corrosive (-) or deposit (+) forming.

TURBIDITY - This value indicates the presence of suspended material such as clay, silt, and other material preventing the clear quality of water. Turbidity in excess of 5 units are usually detectable in a glass of water, and often objectionable.

SOLIDS (TOTAL) - This refers to the amount of total solid matter suspended and dissolved in water. Water with a high solids count generally are of poor drinking water quality. A limit of 500 mg/l for drinking water is recommended with 4000 mg/l as a maximum.

4701-6
11/78
Cancels
4701-6
8177



AMF
Cuno

Precision Control Products 9000 Series Instructions

Pump Model 9701-11

INSTRUCTIONS FOR 9000 SERIES

INSTALLATION

A. Unpacking

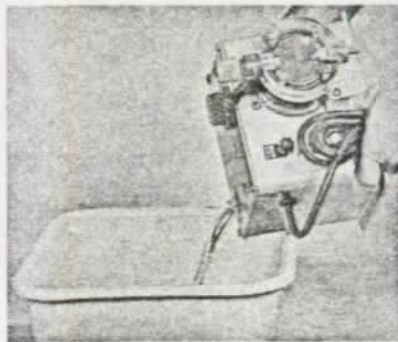


1. Tubing
2. Oil
3. Valve Assemblies
4. Chemical Pump

1. The chemical pump, Valve Assemblies, tubing and Oil are shipped in one box. Inspect carton. If there are signs of rough handling, check Pump and Parts carefully. Notify delivering carrier immediately if there is any damage.

2. MAKE SURE ALL ITEMS HAVE BEEN REMOVED FROM SHIPPING CARTON BEFORE THROWING CARTON AWAY.

B. Lubrication



1. To lubricate the pump remove the 224 oil cover plate located on top of the pump and pour contents of the oil can into the pump housing (Photo 2). THIS OIL SHOULD BE CHANGED ONCE EVERY SIX MONTHS, OR 2000 OPERATING HOURS.
2. The oil may be drained by removing the 1/4" NPT Drain Plug, Part No. 909 located at the front of pump. If the pump is easily removed after installation, it is easier to drain the oil by removing the 224 oil cover plate and pouring the oil out. If the pump is bolted or screwed in place, install a short length of 1/4" pipe and a petcock to make it easier to drain the oil.
3. 9000 Series pumps require one quart of lubricating oil, Precision Part No. 205. Substitutes are Shell Tellus 21 or Mobile Velocite No. 10.

C. Location

The chemical pump should be located in an area that allows convenient connections to both chemical tank and chemical injection point. Avoid locations that may be subjected to high temperatures (over 110°F, 43°C), high humidity, direct sunlight, rain, snow, etc. Do not place in an area which may be sprayed with water or chemical.

D. Mounting the Chemical Pump



1. On Molded Fiberglas cover No. 1350:

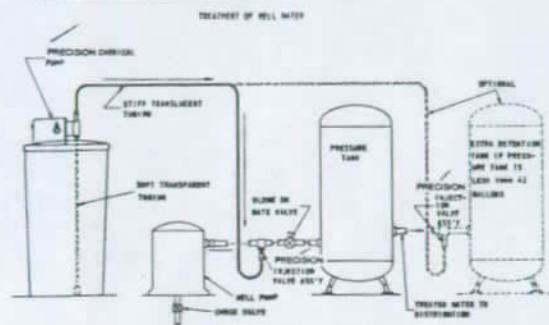
Install Chemical pump as shown in photo at left. Insert suction tubing through center hole and cut tubing so foot valve hangs about one inch (25mm) above bottom of tank. It is not necessary to bolt down chemical pump because it cannot slide away from tank cover.



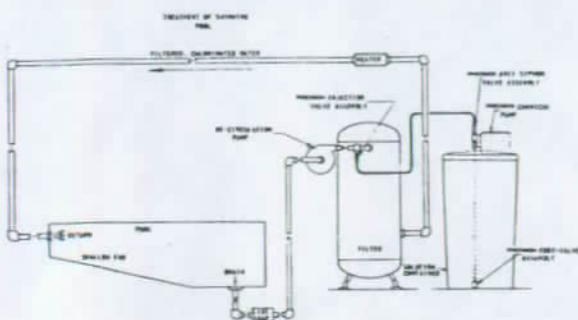
2. On a shelf or Mounting Bracket above Chemical Tank:

Install a shelf or Precision Control Products' Universal Mounting Bracket (can be ordered as No. 260 028) above the chemical tank. Mount Chemical pump as shown in photo of Mounting Bracket instruction booklet. Connect suction tubing to suction valve of Chemical Pump. Suction Valve is the lower valve. Tubing should be long enough so that the foot valve hangs about one inch (25mm) above bottom of chemical tank. To keep chemical from contamination, the tank should have a cover.

E. Point of Injection

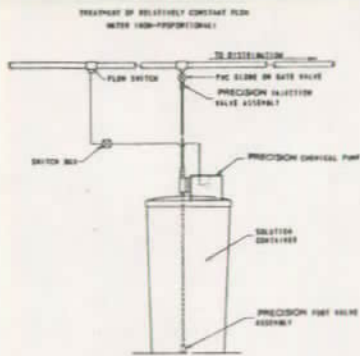


1. Treatment of Well Water
For Chlorination, the point of injection should be between the water pump and pressure tank (see Diagram 1).



2. Treatment of Swimming Pools and Cooling Towers

For swimming pools, the point of injection should be between the circulating pump and the filter (See Diagram 2). For Cooling Towers, the point of injection should be between the circulating pump and the discharge to the tower. See Supplement "Liquid Handling Connections" for installation details regarding point of injection.

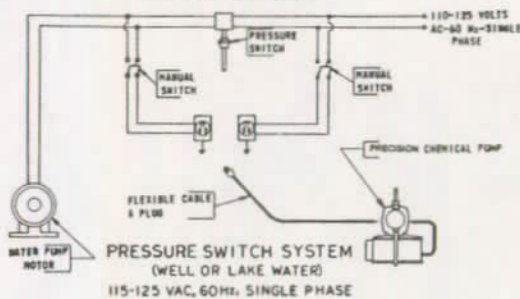


3. Treatment of Relatively Constant Flow Water (non-proportional).

For treatment of relatively constant flow water (non-proportional) the point of injection should be between the flow switch and the point of distribution (Diagram 3).

F. Electrical

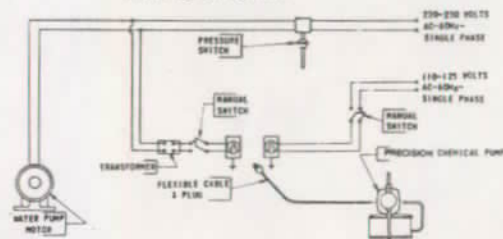
WIRING DIAGRAM



1. The unit should be wired to an electrical source which has specifications conforming to those marked on the pump serial number name plate.

2. Do not defeat the purpose of the ground wire by cutting off the ground prong.

WIRING DIAGRAM



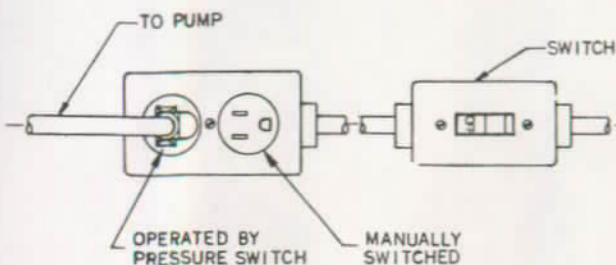
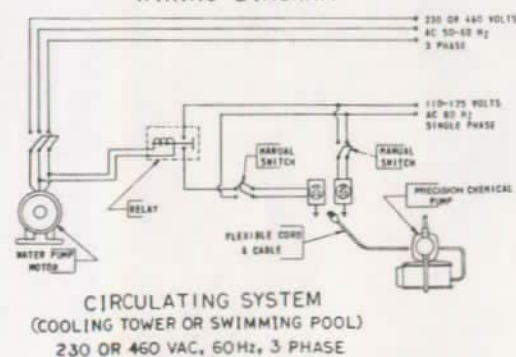
3. Fuse is:

1. 115 VAC: 1.0 amp. Type MDL or 1.0 amp 3AG Slo-Blo. Part No. 1589
2. 230 VAC: 0.5 amp. Type MDL or 0.5 amp 3AG Slo-Blo. Part No. 1699

4. Peak Power Consumption is approximately 90 watts at 115 volts.

5. The way in which the chemical pump is wired depends upon the system in which the pump is installed. Below are a few common wiring diagrams.

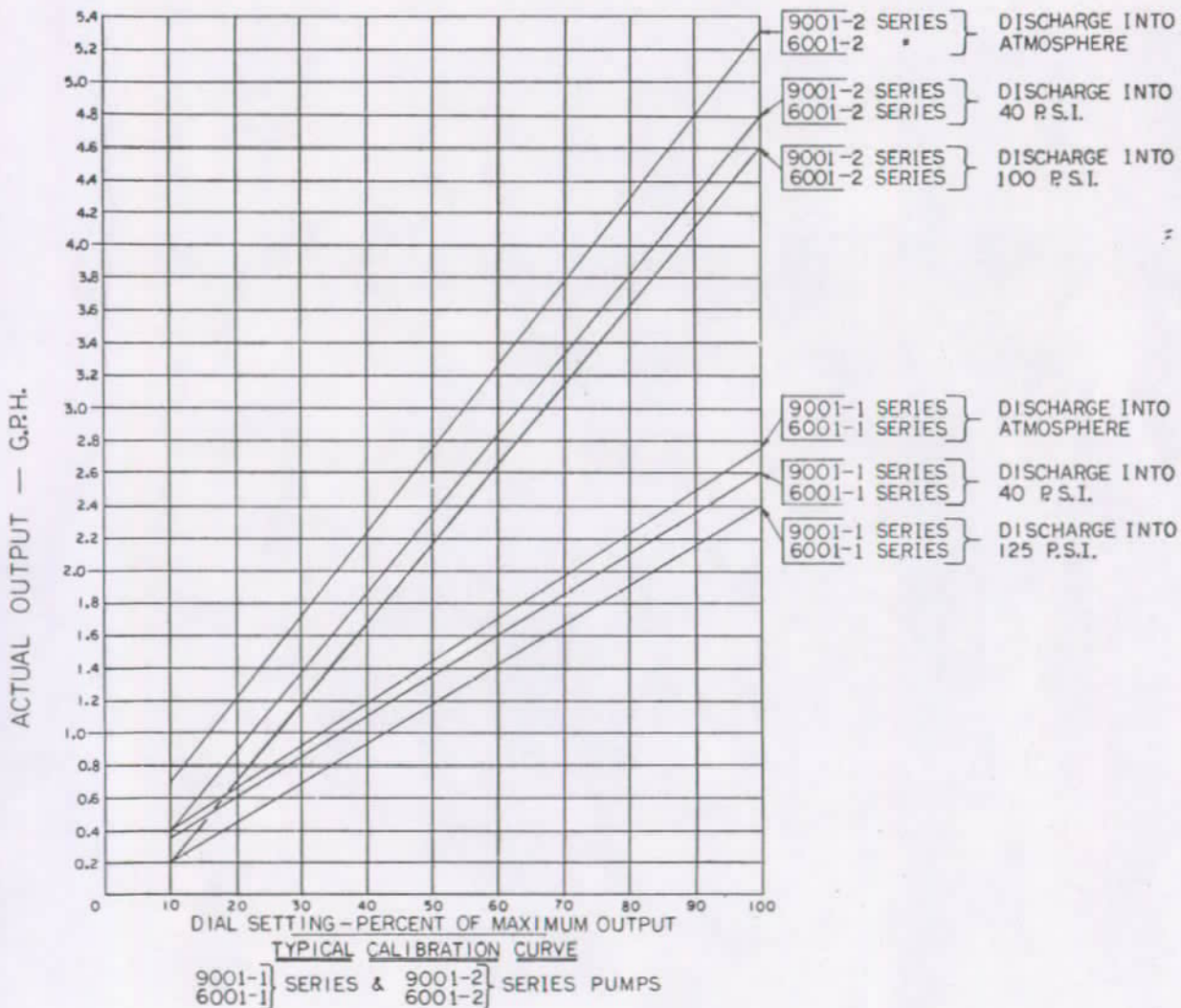
WIRING DIAGRAM



If the pump is installed to treat water from a lake or well water system, it should be wired to the pressure switch which operates the water pump. Install a duplex U-ground receptacle, one side switched on by the pressured switch that operates the water pump. The other side may be continuously live or may be manually switched. This will permit you to operate the chemical pump for cleaning or checking without operating the water pump.

9000 Series Output Adjustment

- A. The output dial is calibrated approximately in terms of percent maximum output (Dial indicated settings of 10-100 percent). Setting of 50 on a 9000 Series pump whose maximum output is 2.5 GPH means pump will pump approximately 1.25 GPH. The maximum output rating of the pump in G.P.D. (gallons per 24 hours) is indicated on the pump.
- B. Output Adjustment Graph:



Note: When pumping into Vacuum (pressures less than atmosphere), an anti-syphon valve must be used or serious syphoning will occur. Use a curve halfway between atmosphere and 40 psi when anti-syphon valve is used and discharging to vacuum.

C. To calibrate exact amount of chemical pumped:

1. Determine pressure at injection point.
2. From output graph set dial knob corresponding to approximate output desired.
3. Fill a large graduate (1 liter or 1000cc) or measuring cup (32 oz.) with chemical being pumped.
4. Place suction tubing in graduate or cup and start pump.
5. Determine amount of chemical pumped out of graduate or cup for 3 minutes.
6. Divide 3 minutes into 60.
7. Multiply result by amount of chemical pumped in three minutes. The result is amount of chemical pumped per hour.

Example:

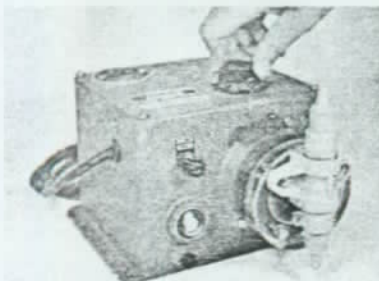
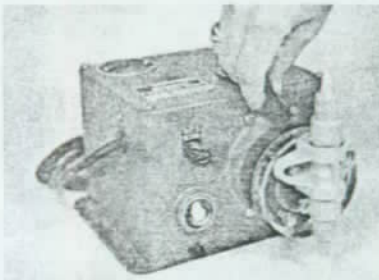
- (a) Amount of chemical pumped
in 3 minutes = 10.3 oz.
 $10.3 \times 20 = 206 \text{ oz/hr or } 1.6 \text{ GPH}$
- (b) Amount of chemical pumped
in 3 minutes = 300cc (or ml.)
 $300 \times 20 = 6000 \text{ cc/hr or } 1.585 \text{ GPH}$

Conversion Factors

1 Gallon = 128 oz.

1 Gallon = 3785cc or ml.

D. Output Adjustment



1. Unlock the output adjustment knob by turning the locking level 1/4 turn to the left.
2. The locking lever is located behind the discharge valve.
3. Turn on pump.
4. Adjust output knob to desired setting.
 - a. Calibration on the dial are from 10 to 100. This means approximately 10 to 100 percent of maximum output.
 - b. 9XX1-1X Models have a maximum output of 2.5 GPH or 60 GPD.
 - c. 9XX1-2X Models have a maximum output of 5.0 GPH or 120 GPD.
 - d. Minimum output settings should be no lower than 10 (i.e., 10 percent of maximum output).

MAINTENANCE

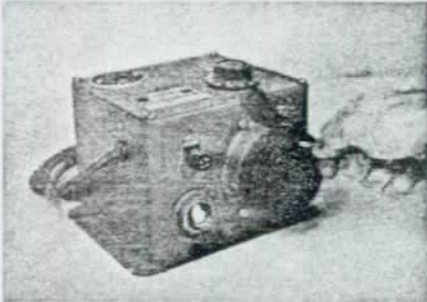
A. Running Temperature

When running constantly, the unit will heat up to nearly 70°F above room temperature. IT WILL BE VERY HOT TO TOUCH. This hot running temperature is normal.

B. Changing Lubricating Oil

The oil should be changed every six months or every 2000 operating hours. Refer to Installation Section for Precision Part Number and acceptable oil substitutes.

C. Changing the Diaton



1. Switch pump OFF. Release pressure in pumping line. Disconnect suction and discharge tubing from cartridge valve.
2. Unscrew the four head screws and remove head and cartridge valve assembly.
3. With the pump running, set output adjustment knob at 50 (i.e. 50%) and remove old Diaton by turning it counter clockwise.
4. With pump running be sure output adjustment knob is locked at 50% setting.
5. Install the spacer (E) with the drain hole facing down and with the 1388 seal (F) between the spacer and the boss of the pump housing (G). Make certain that the slots of the 1388 seal (F) are aligned with holes in the spacer (E) and the tapped holes in the boss of the pump housing (G).
6. Turn on the pump and screw in the new Diaton (C) until the back side of the Diaton just touches the recess (A) of the spacer (E).
7. Unscrew the Diaton counterclockwise 1/4 to 1/2 full turn until the four holes in the Diaton (C) are aligned with the four holes in the spacer (E). This places the Diaton in an optimum position for long lift and best accuracy.
8. Re-install pump head and cartridge valve assembly, tightening the four head mounting screws in a criss-cross pattern.
9. Retighten these four head mounting screws after two days to take care of Diaton Set.

CAUTION

When pumping any dangerous chemical make certain that all tubing and/or pipe is securely attached to the fittings, and that no lines are closed or blocked. It is recommended that tubing or pipe lines be shielded to prevent possible injury in case of rupture or accidental damage. Always wear protective clothing when working on or near the pump.

CODE 70

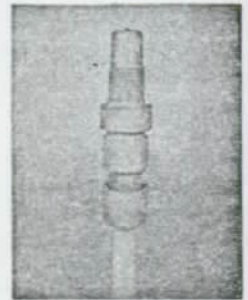
LIQUID HANDLING CONNECTIONS

8000, 9000, 11000, 12000 and 13000 SERIES PUMPS

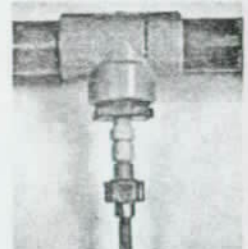
MATERIALS: ACRYLIC HEAD, PVC FITTINGS. HYPALON O-RING SEATS & DIATON. SUCTION CONNECTION - 1/2" OD VINYL TUBING. DISCHARGE CONNECTION - 1/2" OD POLY-ETHYLENE TUBING.

A. INSTALLING INJECTION CHECK VALVE

1. Location of the injection point is extremely important. Refer to installation diagram which best illustrates your system:
 - (a) If the water line at the injection point has a positive pressure, the injection point may be above or below the solution level in the chemical supply tank.
 - (b) If the pressure at the injection point is negative or atmospheric pressure, then the entry point into the line must be above the solution level in the tank or an anti-syphon valve must be used.
Order anti-syphon valve No. 300 483-P.



2. Install injection check valve in the line into which chemical is injected. This prevents backflow from *treated line* into pump discharge line.
On systems with small treated lines such as small plant water supplies:
 - (a) Install pipe tee with 1/2" NPT outlet. Tee should be schedule 120 PVC material if chemical solution being pumped is corrosive to metals.
 - (b) To insure correct seating of valves, injection check valve should be installed upward in direction of arrows on valve.

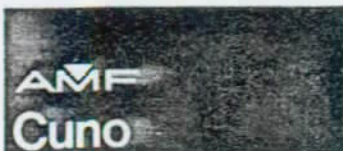


On systems with larger pipe lines, such as cooling towers or water mains, it is recommended that No. 992, 3/4" NPT Corporation Stop or No. 362, 1" NPT Corporation Stop be used. This injects solution into stream from an extended PVC tube. The Corporation Stop makes it possible to withdraw the entire injection assembly for cleaning or inspection while line is under pressure.

3. Procedure for Drilling & Tapping (when required):
 - (a) Drill main line with 23/32" drill.
 - (b) Tap hole with 1/2" NPT
 - (c) Screw injection check valve into tapped hole. To seat correctly, valve should point upward in direction of arrows on valve.



*NOTE: For 992 Corporation Stop, use 29/32" (23mm) drill and 3/4" NPT tap.
For 362, use 19/64" (29mm) drill and 1" NPT tap.*



PRECISION CONTROL PRODUCTS
906 JONATHON DRIVE
MADISON, WISCONSIN 53713
(608) 231-2981

B. ATTACHING DISCHARGE TUBING (The stiff translucent polyethylene tubing 10 ft. [3 meters] long.):

1. Cut discharge tubing to required length and route from injection check valve to chemical pump. Do not let tubing touch hot surfaces or bend sharply. If more tubing is needed, order Part No. 242 in length desired.

Pump Model Series	Maximum Vertical Rise*
8000	183 Ft. (56m)
9000	229 Ft. (70m)
11000	82 Ft. (25m)
12000	146 Ft. (45m)
13000	229 Ft. (70m)

*Based on pumping chemicals weighing approximately 10.5 lbs. per gallon (1.25 gm/cc), and discharge into pressure not greater than atmospheric.

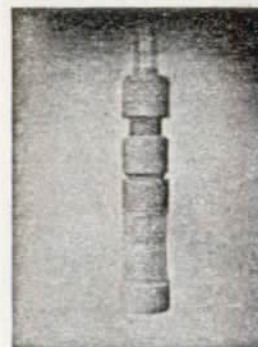
2. Slide coupling nut onto tubing.
3. Gently push discharge tubing over tapered end of discharge valve assembly so that it flares out. (If tubing is stiff from cold, dip end in hot water).
4. Make sure tubing is forced on to fitting cone (tapered end) all the way to shoulder of the threads.
5. Push down on coupling nut and turn until threads are engaged. Tighten by hand until tubing is held securely in place. *Caution: Undue force will fracture the plastic fittings. DO NOT USE PIPE WRENCH.*
6. Following same procedure, connect discharge tubing to injection check valve.

C. ATTACHING SUCTION TUBING (The soft transparent vinyl tubing 6 ft. [1.8 meters] long.):

1. Cut suction tubing to length required. Foot valve should hang approximately 2" (5cm) to 3" (7.6cm) above bottom of chemical tank. Maximum recommended vertical suction lift is 5 ft. (1.5 meters).
2. Following same procedure as discharge tubing (See B) connect suction tubing to suction valve.
3. Connect other end of suction tubing to foot valve. Drop foot valve into chemical tank. Foot valve has a self-contained weight and strainer assembly.

D. PRIMING:

1. The unit is pre-primed with water for your convenience. If the chemical you are going to pump cannot be mixed with water, loosen the four head mounting screws and drain the water out. Retighten the screws afterwards.
2. Temporarily disconnect the discharge tubing from the point of injection (from the injection check valve) and start the pump. Set output adjustment to maximum and keep the unit operating until the suction tubing is filled.
3. Reconnect the discharge tubing to the injection check valve. The unit is now ready for operation.



— CHLORINATION CHART —

APPROXIMATE CHEMICAL SOLUTION REQUIRED FOR CHLORINATION BASED ON USING BLEACH (5.25% SODIUM HYPOCHLORITE) AT 1 PPM DOSAGE

Water Flow			Bleach (Sodium Hypochlorite) Required		
GPM	GPH	m ³ /h	cc per min.	Liters/Hr.	GPD (gals. per 24-hr. day)
20	1200	4.542	1.51	.090	.57
30	1800	6.813	2.27	.136	.86
40	2400	9.084	3.02	.181	1.15
50	3000	11.355	3.78	.227	1.44
60	3600	13.626	4.54	.272	1.73
70	4200	15.897	5.30	.318	2.01
80	4800	18.168	6.06	.364	2.30
90	5400	20.439	6.81	.409	2.60
100	6000	22.710	7.57	.454	2.88
150	9000	34.065	11.36	.682	4.32
200	12000	45.420	15.14	.908	5.76
300	18000	68.130	22.71	1.363	8.64
400	24000	90.840	30.28	1.817	11.52
500	30000	113.550	37.85	2.271	14.40
750	45000	170.33	56.77	3.41	21.60
1000	60000	227.10	75.71	4.54	28.80

E. CHLORINATION WITH SODIUM HYPOCHLORITE

1. For chlorinating drinking water, the easiest chlorine source to use is a standard laundry bleach, which may be purchased at a local grocery.
2. Determine water flow in terms of gallons per minute (GPM) or gallons per hour (GPH). This figure is usually written on specification plate of water pump.
3. Using chlorination chart page 2, determine the gallons per day (GPD) sodium hypochlorite (bleach) required, and set output of chemical pump accordingly (See "Output Adjustment" section of instruction booklet). When necessary to dilute sodium hypochlorite (bleach) because of low water flow, use soft water, distilled water, or demineralized water. This prevents precipitation of calcium carbonate, reduces scaling of valves and Diaton, and helps keep chemical pump clean.
4. An alternative to use of softened or demineralized water is to mix a compatible "softening" chemical such as "Hypo-Clean" in the solution.
5. In order to finally arrive at proper chemical pump output, a trial and error method must be used. Do this by setting chemical pump to within 30% of calculated output rate. Operate water system long enough to thoroughly mix chlorine and water. Take sample of water and make a residual test, using a chlorine test kit (Precision Part No. 1096 or 1097). If no residual shows, increase chemical pump output setting and repeat procedure. Continue to increase chemical pump output until a residual shows. Then make final adjustment of pump to get desired residual (for drinking water, approximately .2 ppm).

NOTE: If chlorinator is installed on a water system which has been in use, initial dosage may have to be much higher than continuing dosage rate in order to react with all oxidizable material which may have accumulated in an old system. In effect, the build-up of oxidizable material (iron, etc.) will have to be "burned out".

F. SODA ASH FEEDING FOR pH CONTROL

1. With pH test kit (precision No. 1099) determine pH reading. If on acid side, add sodium hydroxide (Caustic soda) or sodium carbonate (soda ash).
2. Prepare a stock solution by dissolving one part by weight of sodium hydroxide in 100 parts of water. Prepare a test solution by dissolving one part by weight of stock solution in 1000 parts of water. Take a one-quart sample of the water to be treated. Add a suitable pH indicator and then add test solution until the pH has been adjusted to the desired value.

Record the volume of test solution used. That same volume of stock solution will then treat 250 gallons of water in the system.

EXAMPLE: If 1.3 Fl. Oz. of test solution were required to adjust the pH of the one quart sample, then 1.3 Fl. Oz. of stock solution will treat 250 gallons of water. Since $1.3 \text{ Fl. Oz.} \div 128 = .010$ we see that 1 gallon of stock solution will treat $250 \div .010$ or 25,000 gallons of water. If the flow rate of the water system is 500 GPM then the chemical pump should be set to deliver $500 \div 25,000 = .020$ GPM or $.020 \times 60 = 1.2$ GPH, or 14.4 GPD.

Indicators	pH Range	Color Changes
Bromphenol Blue	3.0 - 4.6	Yellow - Blue
Bromcresol Green	3.8 - 5.4	Yellow - Blue
Methyl Red	4.4 - 6.0	Red - Yellow
Chlorphenol Red	5.2 - 6.8	Yellow - Red
Bromthymol Blue	6.0 - 7.6	Yellow - Blue
Phenol Red	6.8 - 8.4	Yellow - Red
Cresol Red	7.2 - 8.8	Yellow - Red
Meta Cresol Purple	7.6 - 9.2	Yellow - Purple
Thymol Blue	8.0 - 9.6	Yellow - Blue
Phthalein Red	8.6 - 10.2	Yellow - Red
Tolyl Red	10.0 - 11.6	Red - Yellow

G. CLEANING OF HEAD AND VALVES (Refer to exploded view on next page.)

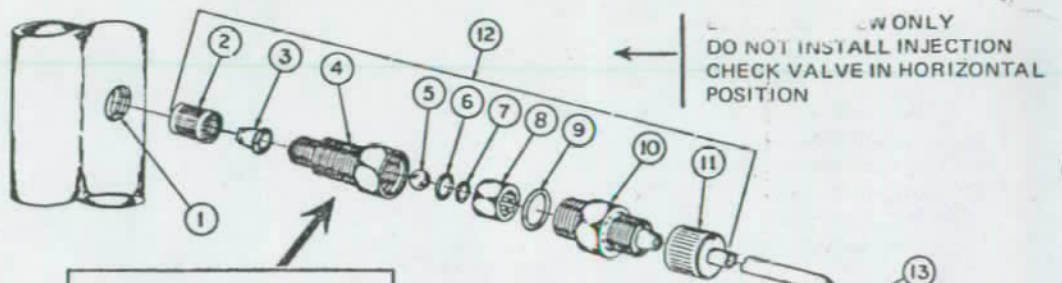
NOTE: IF VALVES ARE DIRTY OR NOT ASSEMBLED EXACTLY AS SHOWN IN EXPLODED VIEW, THE PUMP WILL NOT OPERATE.

For some water treatment and swimming pool chemicals which tend to be alkaline and scale forming, the following cleaning procedure should be repeated regularly:

1. Switch off chemical pump. Lift foot valve out of solution tank. Put it in small container of clear water. Set chemical pump for maximum output. Let it pump for about two minutes to flush head and lines.

NOTE: Chemical pump should be switched off when moving foot valve from one container to another in order to prevent air from entering pump head and possibly causing loss of prime.

2. Again switch off chemical pump. Lift foot valve out of water container. Set it in a container of dilute (approx. 5%) muriatic (hydrochloric) acid. Switch on chemical pump and let pump approximately five minutes or until scale is dissolved. Switch off chemical pump. Transfer foot valve to the clear water container. Switch on pump long enough to flush acid from head and tubing. Then switch it off and re-immerses foot valve in treatment solution container.
3. Switch on chemical pump. Let pump for about one minute at full output. Then return output pointer to its normal setting.
4. If solution being pumped forms a deposit which cannot be cleaned in place with muriatic acid or other cleaning solution, head cartridge and valves should be disassembled and cleaned as frequently as experience indicates is necessary.
 - (a) Remove pump head mounting screws and unscrew valves from cartridge housing. Disassemble valves.
 - (b) Clean all valve balls, O-rings, valve seats and head with detergent or soap solution.
 - (c) Inspect all O-rings, balls, and valve seats for pits or imperfections. O-rings and balls must be perfectly smooth. If they are not, they must be replaced with spare parts kit 500-70.
 - (d) Assemble valves and head exactly as shown in exploded view.



WARNING:
Use teflon tape or pipe dope only at this point. O-Ring gaskets seal all other joints.

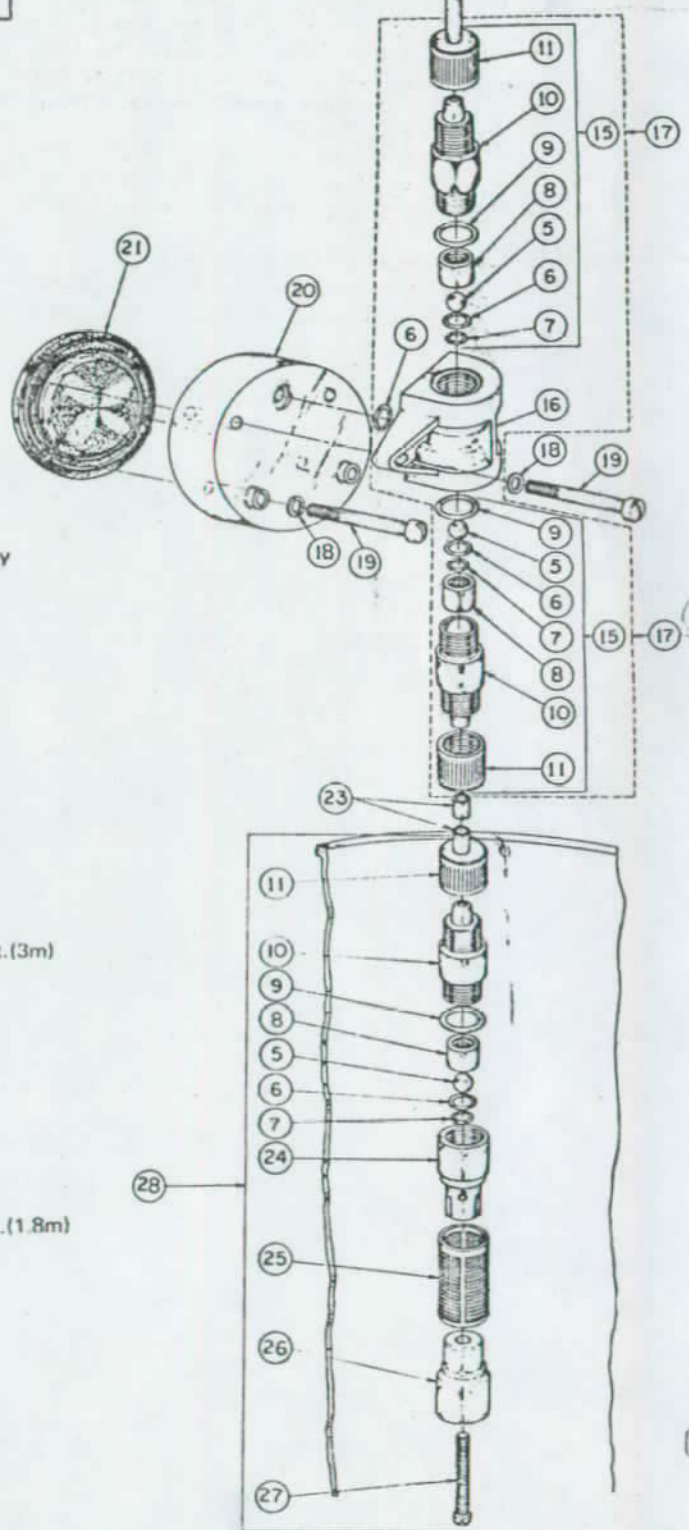
ONLY
DO NOT INSTALL INJECTION CHECK VALVE IN HORIZONTAL POSITION

CODE 70
Liquid Handling Connection

Material:

Fittings	PVC
Valve Seat O-Rings	Hypalon
Seal Rings	Viton
Balls	Ceramic
Head	Plexiglas, Acrylic
Diaton	Hypalon

For Spare Parts Use Kit No. 500-70



Key No.	Part No.	Description	Quantity
1		1/2" Pipe Thread	1
2	2399	Coupling Nut	1
3	3329*	Flapper	1
4	535 944-P	Injector Fitting	1
5	1058*	Valve Ball	4
6	1061*	O-Ring	5
7	1060*	O-Ring	4
8	3177-P	O-Ring Seat	4
9	3388*	O-Ring	4
10	532 882-P	Housing, Valve, Single	4
11	211-P	Coupling Nut	4
12	290 250-P	Injection Check Valve Assembly	1
13	242	Tubing, Polyethylene	10 ft. (3m)
15	292 711-P	Discharge & Suction Valve Assembly	2
16	3312-P	Cartridge Valve Housing	1
17	300 467-P	Cartridge Valve Assembly	1
18	118	Washer	4
19	1835	Screw	6
20	552 736	Head	1
21	2A	Diaton	1
23	241	Tubing, Vinyl	6 ft. (1.8m)
24	2471-2P	Valve Seat	1
25	2472	Screen, Filter	1
26	2473	Retainer, Screen	1
27	2474*	Screw, 12-24 x 1-1/2 Polypropylene	1
28	297 729-P	Foot Valve Assembly	1

*Parts Included in Spare Parts Kit 500-70

PINE LAKE HILLS WATER SYSTEM

COMPUTATIONS TO EVALUATE CHLORINATION SYSTEM

1. Determine capacity of existing chlorine storage tank.

Given: 22 inches high, 21 inches in diameter, and minimum of 8 inches for intake clearance.

$$\begin{aligned} \text{Net Volume} &= (22"-8") \times \frac{1}{4} \pi \times (21)^2 = 4,849 \text{ in.}^3 \\ &\quad \div 12^3 = 2.81 \text{ ft.}^3 \\ &\quad \times 7.48 = 21.0 \text{ gallons} \end{aligned}$$

2. Determine how many gallons of 11.9 percent sodium hypochlorite solution are required to prepare 21.0 gallons of 1 percent solution.

$$21.0 \text{ gallons} \times 1\%/11.9\% = 1.76 \text{ gallons}$$

3. How many gallons of 1 percent solution are needed to treat 71 gpm or 4,260 gph to maintain a residual of 0.3 mg/l.

$$\text{Gallons of Solution Required} = \frac{.3 \text{ mg/l} \times 4,260 \text{ gph}}{1\% \times 10,000} = 0.128 \text{ gal./hr.}$$

or 3.07 gal./day

4. How many gallons of 1 percent solution are needed to treat 100 gpm or 6,000 gph to maintain a residual of 0.3 mg/l.

$$\text{Gallons of Solution Required} = \frac{.3 \text{ mg/l} \times 6,000 \text{ gph}}{1\% \times 10,000} = 0.18 \text{ gal./hr.}$$

= 4.32 gal./day

5. Lowest Pump Setting = 10 or 0.25 gallons per hour.

6. Determine how long the 21 gallons of 1% solution will last at an average daily demand of 31,500 gpd.

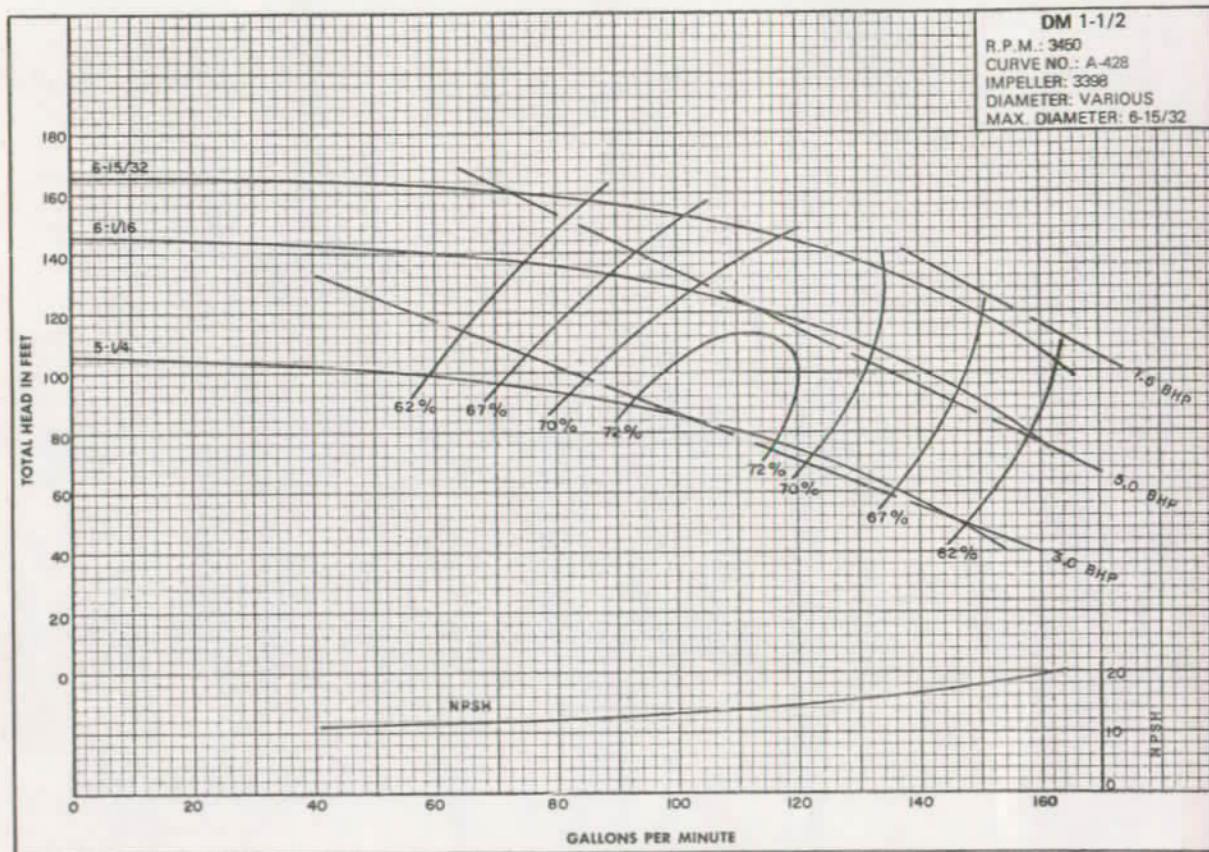
$$31,500 \text{ gpd}/6,000 \text{ gph} = 5.25 \text{ hr./day}$$

$$21 \text{ gal.}/(5.25 \text{ hr./day} \times 0.25 \text{ gal./hr.}) = 16.0 \text{ days}$$

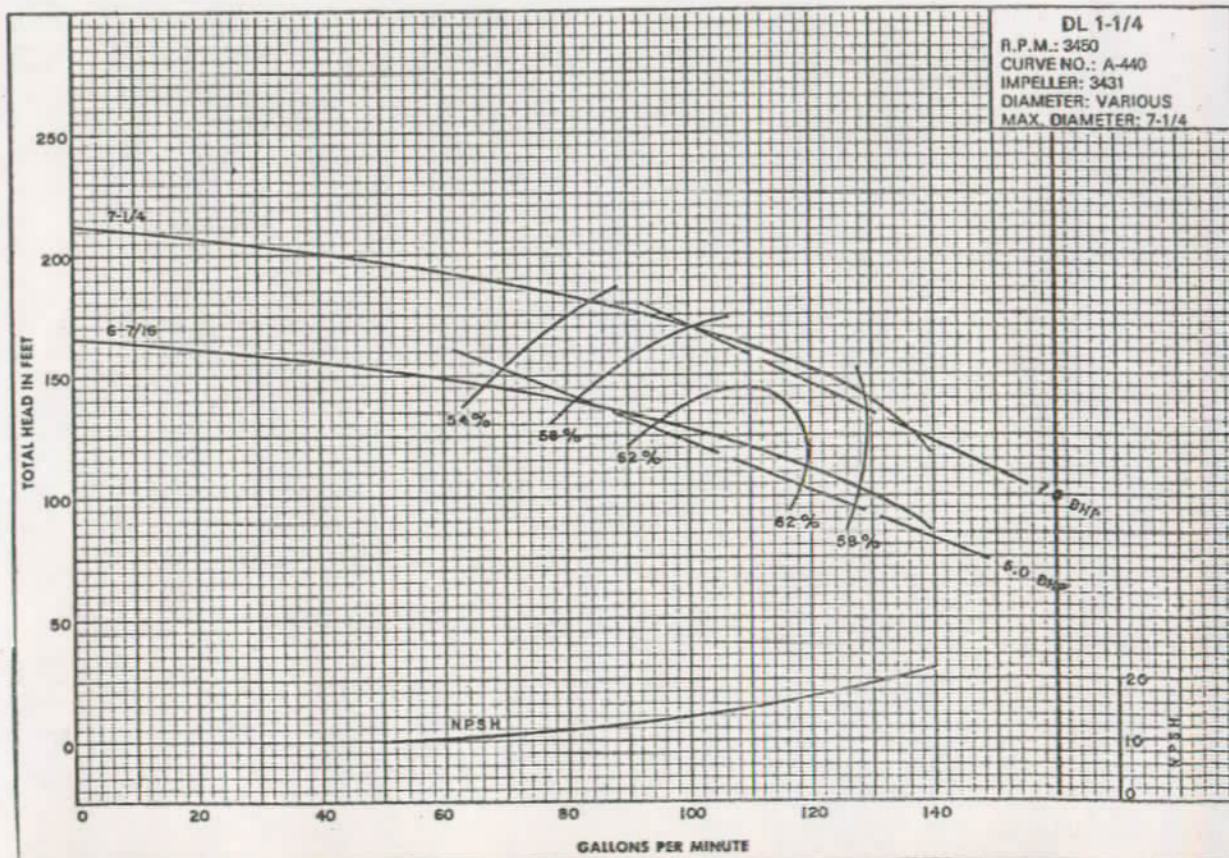
APPENDIX C

HIGH SERVICE AND WELL PUMP
DATA - JACUZZI PUMPS

6-11-72
Model DM1½ - SOUTH
SINGLE-STAGE CENTRIFUGAL PUMPS

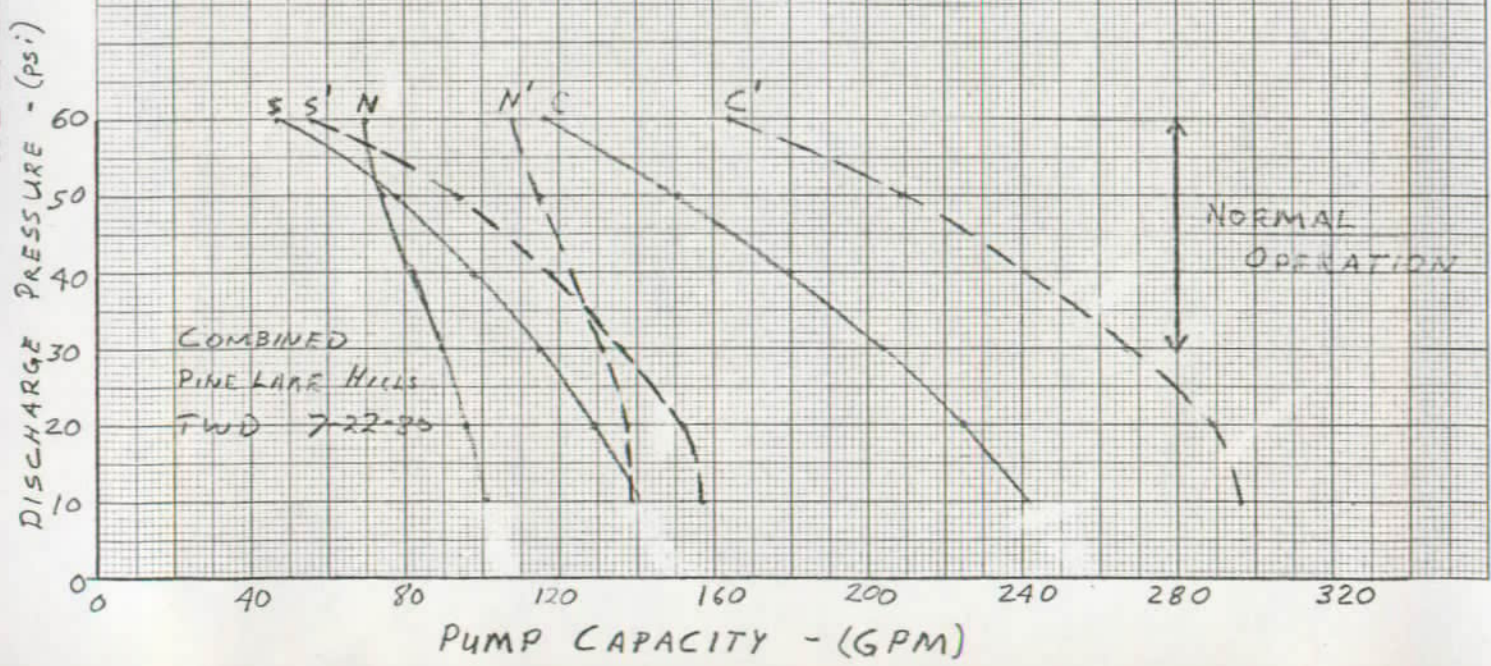
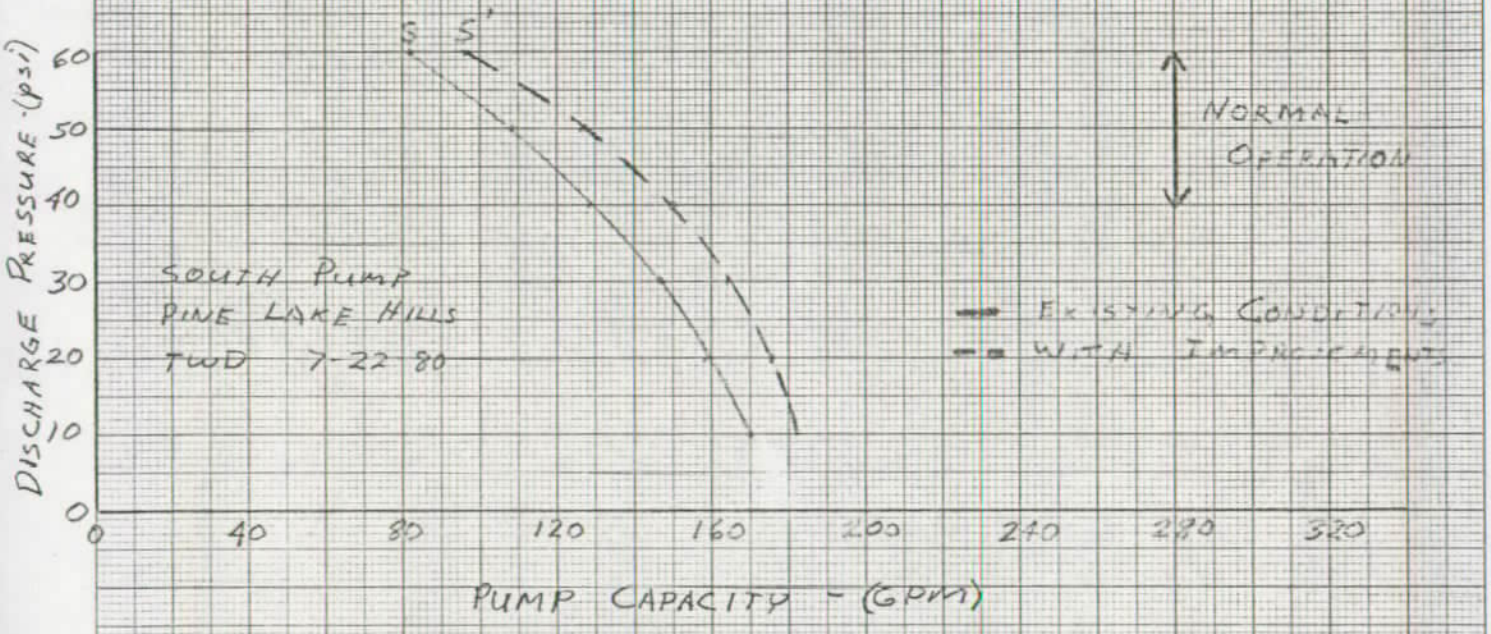
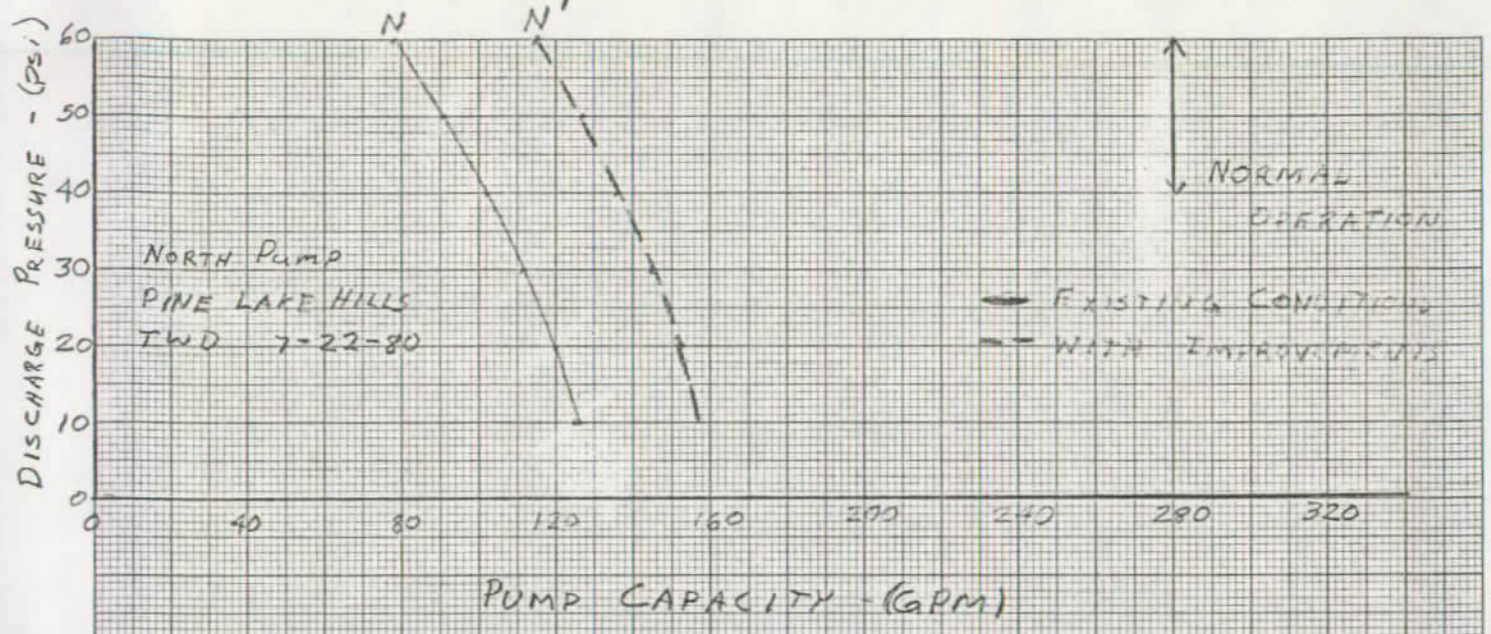


6-11-72
Model DL1¼ - NORTH
SINGLE-STAGE CENTRIFUGAL PUMPS



461510

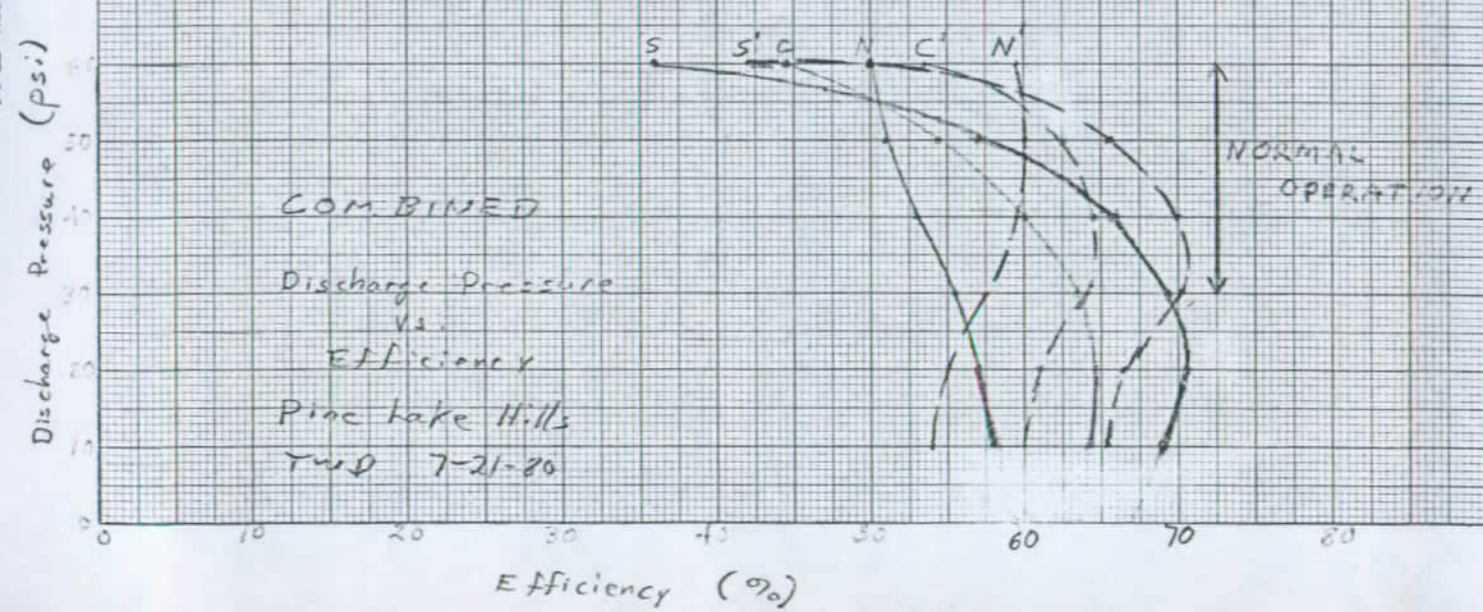
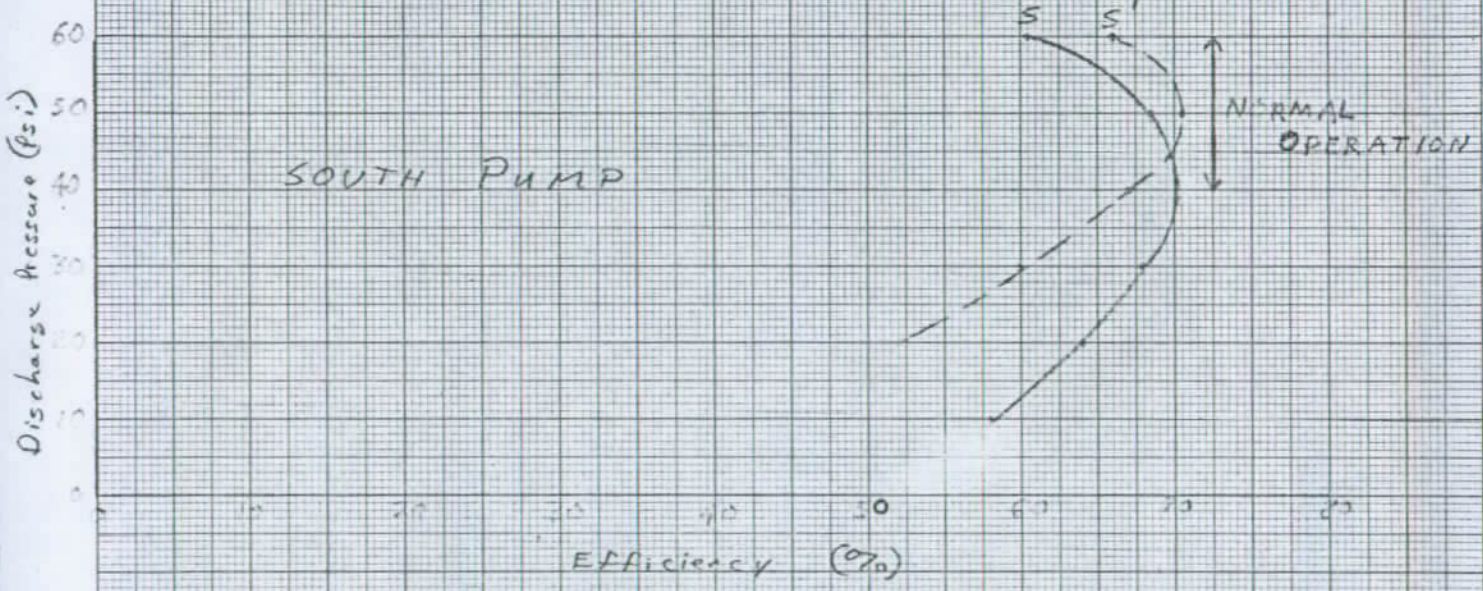
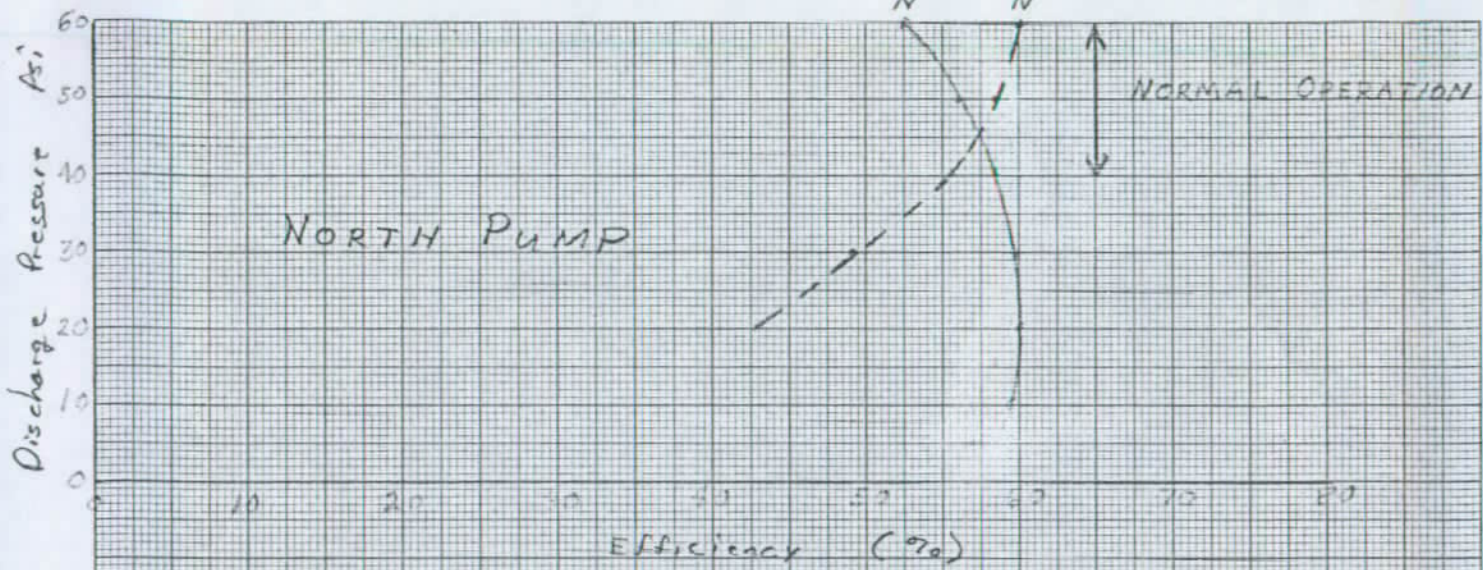
10 X 10 TO THE CENTIMETER KEUFFEL & ESSER CO. MADE IN U.S.A.



461510

10 X 10 TO THE CENTIMETER
KEUFFEL & ESSER CO. MADE IN U.S.A.

K&E



Discharge Pressure vs. Efficiency
Pine Lake Hills
Twp 7-21-20

Series S4YP - EAST WELL

60 GPM 4" SUBMERSIBLE PUMPS
(Minimum Well Diameter 4" I.D.) - 3450 RPM - 60 Cycle

Cast iron discharge and bracket - Turbine type impellers and stages of fiberglass reinforced thermoplastic

Depth to Water in Feet	2S4YP8						
	2 HP - 6 Stages						
	DISCHARGE PRESSURE						
	0	10	20	30	40	50	60
	CAPACITIES IN GPH						
20		4815	4470	4050	3380	2630	1780
30	5060	4660	4310	3800	3010	2290	1610
40	4865	4515	4120	3490	2720	1860	
50	4705	4350	3885	3125	2415	1690	
60	4560	4185	3600	2810	1995	1215	
70	4410	3960	3240	2515	1740		
80	4245	3695	2900	2125	1435		
90	4035	3350	2610	1775			
100	3780	2990	2260	1580			
110	3465	2700	1835				
120	3100	2390	1675				

Depth to Water in Feet	3S4YP8						
	3 HP - 8 Stages						
	DISCHARGE PRESSURE						
	0	10	20	30	40	50	60
	CAPACITIES IN GPH						
20		5025	4705	4505	4290	3890	3415
30	5305	4865	4615	4425	4150	3680	3200
40	5085	4740	4530	4325	3955	3480	2930
50	4910	4640	4450	4205	3745	3270	2595
60	4775	4555	4380	4015	3540	3025	2270
70	4670	4475	4245	3810	3340	2700	1975
80	4580	4390	4060	3600	3105	2365	1780
90	4500	4285	3875	3405	2805	2065	1670
100	4415	4135	3665	3180	2465	1795	1290
110	4320	3940	3465	2905	2155	1725	
120	4195	3730	3255	2570	1870	1450	
130	4005	3525	3005	2250	1755		
140	3800	3325	2675	1955	1570		
150	3585	3090	2345	1775			
160	3390	2780	2045	1655			
170	3165	2445	1795	1245			
180	2885	2135					

Depth to Water in Feet	5S4YP13										
	5 HP - 13 Stages										
	DISCHARGE PRESSURE										
	0	10	20	30	40	50	60	70	80	90	100
	CAPACITIES IN GPH										
20		5235	5050	4875	4705	4525	4330	4110	3850	3570	3285
40	5260	5075	4900	4730	4550	4360	4140	3890	3610	3305	2965
60	5100	4920	4750	4575	4385	4175	3925	3645	3350	3015	2625
80	4945	4775	4600	4415	4205	3960	3685	3390	3060	2685	2225
100	4795	4625	4440	4235	3995	3725	3430	3110	2735	2295	1790
120	4645	4465	4265	4030	3760	3470	3155	2790	2360	1855	1525
140	4490	4290	4060	3800	3510	3200	2840	2425	1920	1565	
160	4320	4095	3835	3550	3245	2895	2485	1985	1605	1245	
180	4125	3870	3590	3290	2945	2545	2055	1645	1305		
200	3910	3630	3330	2990	2600	2125	1685	1360			
220	3670	3370	3040	2660	2195	1730	1410				
240	3415	3090	2715	2260	1770	1460					
260	3135	2765	2330	1825	1505						
280	2820	2400	1890	1545							
300	2460	1955	1590	1215							
320	2025	1630	1280								
340	1670	1335									
360	1390										

1. Discharge pressure is in pounds per square inch at well head.
2. Note that NO allowance has been made in the performance tables for friction losses in the riser pipe, which vary with flow rate, and size, type, and length of pipe. Deduct these losses from the discharge pressure at the well head.
3. Install these pumps only in wells with INSIDE diameters of 4 inches or larger.
4. Unit does not include check valve.

Pump discharge tapping and minimum riser pipe size 2".

Series S4XP - WEST WELL

45 GPM SUBMERSIBLE PUMPS

(Minimum Well Diameter 4" I.D.) • 3450 RPM • 60 Cycle

Cast iron discharge and bracket — Turbine type impellers and stages of fiberglass reinforced thermoplastic

Depth to Water in Feet	15S4XP6						
	1½ HP - 6 Stages						
	DISCHARGE PRESSURE						
	0	10	20	30	40	50	60
	CAPACITIES IN GPH						
20	4170	3815	3410	2960	2475	1990	1400
30	4025	3645	3220	2750	2265	1755	1000
40	3870	3465	3020	2540	2055	1495	530
50	3700	3280	2815	2330	1825	1145	110
60	3525	3085	2605	2125	1580	675	
70	3340	2880	2390	1900	1270	230	
80	3145	2670	2190	1665	820		
90	2945	2460	1970	1375	360		
100	2735	2255	1740	965			
110	2525	2040	1475	495			
120	2315	1810	1110	90			

Depth to Water in Feet	2S4XP8							
	2 HP - 8 Stages							
	DISCHARGE PRESSURE							
	0	10	20	30	40	50	60	
	CAPACITIES IN GPH							
20	4180	3915	3625	3320	2990	2640	2265	
30	4065	3795	3495	3180	2840	2480	2095	
40	3950	3665	3360	3035	2690	2320	1915	
50	3830	3535	3225	2890	2530	2150	1745	
60	3705	3405	3080	2735	2370	1970	1575	
70	3580	3265	2935	2580	2200	1790	1360	
80	3445	3125	2785	2420	2025	1630	1055	
90	3310	2980	2630	2255	1845	1435	675	
100	3170	2830	2470	2080	1685	1170	330	
110	3025	2680	2305	1905	1500	790	75	
120	2880	2520	2135	1735	1265	430		
130	2725	2360	1950	1565	910	140		
140	2570	2190	1780	1345	535			
150	2410	2015	1620	1025	220			
160	2240	1835	1420	650	15			
170	2070	1675	1140	310				
180	1890	1485	765	60				
190	1720	1245	405					
200	1550	885	125					

1. Discharge pressure is in pounds per square inch at well head.
2. Note that NO allowance has been made in the performance tables for friction losses in the riser pipe, which vary with flow rate, and size, type, and length of pipe. Deduct these losses from the discharge pressure at the well head.
3. Install these pumps only in wells with INSIDE diameters of .4 inches or larger.
4. Unit does not include check valve.

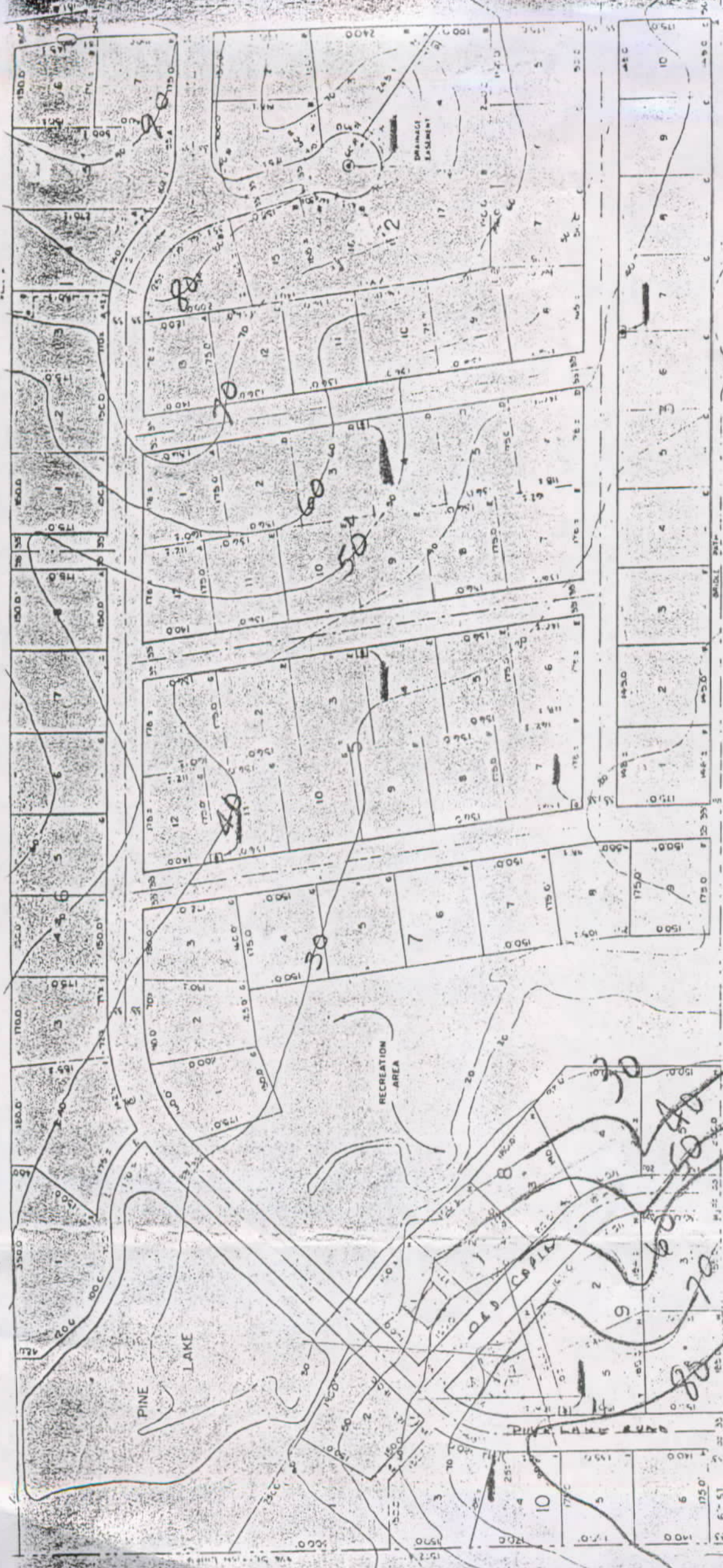
Pump discharge tapping and minimum riser pipe size 2".

APPENDIX D

DISTRIBUTION SYSTEM MAP
PINE LAKE HILLS WATER SYSTEM

CONTOUR MAP
PINE LAKE HILLS SUBDIVISION

SOUTH DAKOTA WATER RIGHTS APPLICATION FORM



PROPERTY SUBJECT MATTER:
 The South Half of the Northeast Quarter (55 1/2 AC.) of
 Section 24, Township 101 North, Range 48 East of the 4th
 Principal Meridian, Minnehaha County, South Dakota.
 Sheets 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

PRELIMINARY SUBDIVISION PLAN
 OF
 PINE LAKE HILLS
 A CITY ADDITION IN
 SECTION 24 OF TOWNSHIP 101 NORTH, RANGE 48 EAST
 MINNEHAHA COUNTY, SOUTH DAKOTA

CITY PLANNING COMMISSION APPROVAL
 Approved by the Sioux Falls City Planning Commission on
 this _____ day of _____ A.D. 1975

MINNEHAHA COUNTY PLANNING COMMISSION APPROVAL
 Approved by the Minnehaha County Planning Commission on
 this _____ day of _____ A.D. 1975.

10000

Conversation or File Documentation

NAME OF PERSON OR FILE: Jim Arlt - Pine Lake HillsADDRESS: Liony Falls? COUNTY _____DATE: 8/18/83 TELEPHONE _____RE: Casey Anderson called to check on requiredCOMMENTS: farms etc to submit a SHD application
Pine Lake Hills (SHD)

Will be sending appl. for .50 cfs for SHD
 when appl is received will check our files for
 logs & wells (2) drilled 1975-76 - 1, ^{wells} proposed
 next year. Have 91 ^{service} connections at present
 plan more within a year ~~are~~ requesting total
 amount. Are sending map showing all connections
 in SHD, contacted driller sending formations
 encountered as separate information in case we
 don't have logs. Another party had control until
 all the lots were sold. Mr Arlt now has control
 and discovered an application had not been submitted
 in 1976. Casey is sending the Engr report & would
 like the copy returned I told him we could make
 copies of information we needed & return to him.
 Also told them if additional information or if
 our office had any questions we would contact
 them after we received the application.

$$224 \div 449 = .49 \times 2 = .99 \times 365 = 364.18 = 275.00 \text{ filing fee}$$

File in Permit or other file as necessary. Use to document conversations and what the other party was told; why action or decision was made.

NAME: Doty Westlund

Water Rights Division
605 773-3352

August 26, 1983

James Arlt *1501 Palomares Rd.*
Pine Lake Hills Homeowners Assoc.
Sioux Falls SD 57103

Dear Mr. Arlt:

We are returning the information on the wells by Dave Putzke with the request the well driller sign and return. Since our office only needs two copies of the application, enclosed are the extra copies for your files.

The filing fee required for this application will be \$275.00.

Upon receipt of the above further processing will proceed.

Sincerely,

BETTY WESTLUND
Water Rights Specialist

BW:ks

enclosure

Report on Application No. 4974-3
Pine Lake Hills Homeowners Association
September 27, 1983

Water permit application No. 4974-3 requests 0.5 cfs from 3 wells (two existing) for suburban housing purposes two miles east of Sioux Falls in Minnehaha County. The project is located in the NE 1/4 Sec. 18, T101N, R48W. The two existing wells, drilled in 1973 and 1976, are currently supplying water to 360 people in the Pine Lake development. Expansion of the development has made a third well necessary. A permit has not been issued for the two existing wells.

Discussion

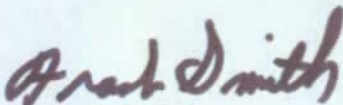
The two existing wells are 126 and 140 feet deep. One of the wells pumps 65 gpm and the other 42 gpm. They are finished in an aquifer which has not been named by SDGS. Areal coverage and recoverable storage of the aquifer have not been determined. Division of Water Rights observation well No. MA-80BA is located approximately 1 mile northwest of this application. The log of MA-80BA is similar to the logs of the two existing Pine Lake Hills wells, and may be in the same water bearing formation. Water level records of MA-80BA do not indicate a water shortage in this aquifer.

One water permit, No. 686-3, authorizes the diversion of 0.11 cfs for use by the Cactus Hills Country Club from a formation which may be connected to the Pine Lake Hills wells. Water permit application No. 4964-3, Children's Home Society, proposes to divert 0.07 cfs for geothermal heating purposes from a formation which also may be connected to the Pine Lake Hills wells. The Division of Water Rights staff has recommended approval of this application, which will be considered by the Water Management Board on October 5, 1983.

Considering the low pumping rates of existing permits and proposed wells in this area, it is unlikely that additional pumping by Pine Lake Hills Homeowner's Association will cause interference problems.

Conclusions

1. Unappropriated water is available for water permit application No. 4974-3.
2. Additional pumping proposed by Pine Lake Hills Homeowner's Association will not interfere with any existing water rights or domestic use of water.
3. Application No. 4974-3 is a beneficial use of water and is in the public interest.



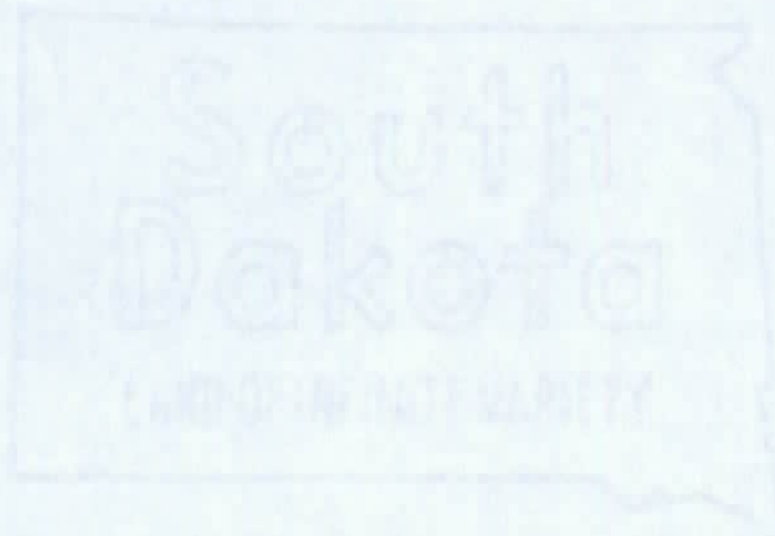
Frank Smith
Natural Resources Engineer

References

1. Water Rights Files, SD Dept of Water and Natural Resources, Div. of Water Rights, Pierre, SD 1983.

2. Observation well files, Div. of Water Rights, Pierre, SD, 1983.
3. Hedges, Burch, Isles, Barari and Schoon, "Evaluation of Ground Water Resources Eastern South Dakota and Upper Big Sioux River, South Dakota and Iowa", Dept. of Water and Natural Resources, Office of Geological Survey, Vermillion, SD, 1982.
4. Smith, Frank, "Report on Water Permit Application No. 4974-3, Children's Home Society", SD Dept. of Water and Natural Resources, Div. of Water Rights, Pierre, SD, 1983.

C92902fs.wr



Hydrograph MA-80 BA

180

190

200

Static Water Level, FT.

J F M A M J J A S O N D J J A S O N D J J A S O N D J J A S O N D
1980 1981 1982 1983



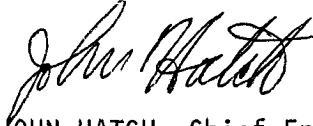
RECOMMENDATION OF CHIEF ENGINEER FOR WATER PERMIT
APPLICATION NO. 4947-3, Pine Lake Hills Homeowners Association

Pursuant to SDCL 46-2A-2, the following is the recommendation of the Chief Engineer, Water Rights Division, Department of Water and Natural Resources concerning Water Permit Application No. 4947-3, Pine Lake Hills Homeowners Assn., 7101 Pine Lake Drive, Sioux Falls, South Dakota.

The Chief Engineer is recommending APPROVAL of Application No. 4947-3 because 1) there is reasonable probability that there is unappropriated water available for the applicant's proposed use, 2) the proposed diversion can be developed without unlawful impairment of existing rights, 3) the proposed use is a beneficial use and 4) in the public interest with the following qualifications:

The wells approved under this Permit will be located near domestic wells and other wells which may obtain water from the same aquifer. The well owner, under this Permit shall control his withdrawals so there is not a reduction of needed water supplies in adequate domestic wells or in adequate wells having prior water rights.

The attached report is a part of this recommendation.


JOHN HATCH, Chief Engineer
October 11, 1983



No. 4974-3

Department of Water & Natural Resources

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501

WATER RIGHTS DIVISION
(605) 773-3352

October 12, 1983

NOTE: TO BE SURE OF PUBLICATION ON THE CORRECT DATES, CONTACT THE NEWSPAPER RIGHT AWAY.

James M Arlt
Pine Lake Hills Homeowners Assn.
7101 Pine Lake Drive
Sioux Falls SD 57103

Dear Mr. Arlt:

You are hereby notified that your Application No. 4947-3 for a permit to appropriate water for suburban housing use, has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice of your intent to appropriate water has been sent to the Publisher of the

ARGUS LEADER printed at Sioux Falls,

South Dakota. For your information, a copy of this notice and the recommendation of the Chief Engineer is enclosed. Please review and contact this office, if you have any questions.

Be sure to contact the above newspaper to authorize publication of your notice of intent to appropriate water and to arrange for payment. Early contact with the paper can eliminate delays. The publisher has been instructed to publish your notice once each week for two consecutive weeks with the last publication to occur at least thirty days before the board meeting. We must receive Proof of Publication before the application can be considered by the Water Management Board.

Very truly yours,

KEVIN C LARSON
Water Resources Engineer

Encl. Forms 6&7

Instruction to Newspaper - Publish first publication of the following Notice on or before October 17, 1983 with 2nd publication 1 week later. The applicant is responsible for payment.

NOTICE OF HEARING on Application No. 4974-3 to Appropriate Water
~~and/or to Amend Water Permit or Water Rights No. _____~~

Notice is hereby given that Pine Lake Homeowners Assoc. whose mailing address is 7101 Pine Lake Dr., Sioux Falls, South Dakota has made an application for a permit

to appropriate 0.50 cubic feet per second from groundwater (2 existing wells 126' and 140' deep and 1 proposed 140' deep wells) the points of diversion to be located in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ of Section 18, T101N, R48W. Said water to be used for the purpose of providing water supplies for the Pine Lake Hills Homeowners Assn. suburban housing development.

Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Division recommends APPROVAL of Application No. 4947-3 because 1) unappropriated water is available, 2) will be no unlawful impairment of existing rights, 3) is beneficial use of water and 4) is in the public interest.

This application will be considered by the Water Management Board at Room 216, Joe Foss Building, 523 East Capitol, Pierre SD on November 30 19 83 at 10:00 am.

The recommendation of the Chief Engineer is not final or binding upon the Board and the Board is authorized to make a determination on this application after it reaches a conclusion based upon facts presented at the public hearing. Any interested person who may be affected by a Board decision and who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, must file a written petition with BOTH the Applicant and the Chief Engineer by November 18, 1983. The petition may be informal, but it must include a statement describing the petitioner's interest in the application, the reason for the petitioner's opposition to or support of the application, and the signature and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The applicant need not file a petition.

This application is made pursuant to the provisions of SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-15; 46-2-3.1, 46-2-9, 46-2-11, 46-2-13, 46-2-17, 46-5-1 thru 46-5-16, 46-5-24, 46-5-25, 46-5-30.2, 46-5-31; 46-2A-1 thru 46-2A-10, 46-2A-12; ~~(ground) 46-6-3, 46-6-3.1, 46-6-6.1, 46-6-10, 46-6-13, 46-6-14; (future use) 46-5-38 thru 46-5-40; (transfer lands) 46-5-30.4, 46-5-33 thru 46-5-35; (10,000 AFA) 46-5-20.1, 46-5-0.1; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15; (future use) 74:02:01:24 thru 74:02:01:25; (10,000 AFA) 74:02:01:15:02 thru 74:02:01:15:05.~~

This hearing is an adversary proceeding. The applicant or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and the State Supreme Court as provided by law.

Any person wishing a copy of the Chief Engineer's recommendation, further information on this application or to assure access to the hearing by the handicapped can contact the Water Rights Division, DWRN, Joe Foss Bldg, Pierre SD (605 773-3352) for assistance prior to the hearing date. The time of the hearing will be automatically extended for at least twenty days upon written request of the applicant or any person who has filed a petition to oppose or support the application. The request for extension must be filed with the Chief Engineer by November 18, 1983



Department of Water & Natural Resources

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501

Water Rights Division
605 773-3352

December 16, 1983

4974-3

James M Arlt
Pine Lake Homeowners Association
7101 Pine Lake Drive
Sioux Falls SD 57103

Mr. Arlt:

Enclosed please find notice to readvertise your Permit Application No. 4974-3. The Legal advertising dept. of the Argus Leader advised us that they did not hear from you concerning this application, therefore it was not advertised. Please contact the paper upon receipt of this letter to assure proper publication of this notice. If you have any questions please contact this office.

Thank you,

KEVIN C LARSON
Water Resources Engineer

KCL:ks

cc: James C Andersen
Water Quality
Sioux Falls SD

Instruction to Newspaper - Publish first publication of the following Notice on or before **Dec. 23, 1983** with 2nd publication 1 week later. The applicant is responsible for payment.

NOTICE OF HEARING on Application No. 4974-3 to Appropriate Water and/or to Amend Water Permit or Water Rights No. _____

Notice is hereby given that Pine Lake Homeowners Association whose mailing address is 7101 Pine Lake Drive, Sioux Falls, , South Dakota has made an application for a permit

to appropriate 0.50 cubic feet per second from Groundwater (2 existing wells 126' and 140' deep and 1 proposed 140' deep well), the point of diversion to be located in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ of Section 18, Twp. 101N, Range 48W. Said water to be used for the purpose of providing water supplies for the Pine Lake Hills Homeowners Association Suburban Housing Development.

Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Division recommends APPROVAL of Application No. 4974-3 because 1) unappropriated water is available, 2) will be no unlawful impairment of existing rights, 3) is beneficial use of water and 4) is in the public interest.

This application will be considered by the Water Management Board at the Civil Defense Room, Capitol Building, Pierre, SD on February 15 1984 at 10:00 am.

The recommendation of the Chief Engineer is not final or binding upon the Board and the Board is authorized to make a determination on this application after it reaches a conclusion based upon facts presented at the public hearing. Any interested person who may be affected by a Board decision and who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, must file a written petition with BOTH the Applicant and the Chief Engineer by February 3, 1984. The petition may be informal, but it must include a statement describing the petitioners interest in the application, the reason for the petitioner's opposition to or support of the application, and the signature and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The applicant need not file a petition.

This application is made pursuant to the provisions of SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-15; 46-2-3.1, 46-2-9, 46-2-11, 46-2-13, 46-2-17, 46-5-1 thru 46-5-16, 46-5-24, 46-5-25, 46-5-30.2, 46-5-31; 46-2A-1 thru 46-2A-10, 46-2A-12; (~~ground~~) 46-6-3, 46-6-3.1, 46-6-6.1, 46-6-10, 46-6-13, 46-6-14; (~~future use~~) ~~46-5-38 thru 46-5-40~~; (~~transfer lands~~) ~~46-5-30.4, 46-5-33 thru 46-5-35~~; (10,000 AFA) ~~46-5-20.1, 46-5-8.1~~; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15; (~~future use~~) ~~74:02:01:24 thru 74:02:01:25~~; (10,000 AFA) ~~74:02:01:15:02 thru 74:02:01:15:05~~.

This hearing is an adversary proceeding. The applicant or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and the State Supreme Court as provided by law.

Any person wishing a copy of the Chief Engineer's recommendation, further information on this application or to assure access to the hearing by the handicapped can contact the Water Rights Division, DWRN, Joe Foss Bldg, Pierre SD (605 773-3352) for assistance prior to the hearing date. The time of the hearing will be automatically extended for at least twenty days upon written request of the applicant or any person who has filed a petition to oppose or support the application. The request for extension must be filed with the Chief Engineer by February 3, 1984.

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
County Minnehaha) ss.

Roxy Deutscher
certify that the annexed printed copy of Notice of Intent
Water was taken from the Argus Leader

A newspaper which during the whole time of publication
herein after stated, has been and is printed and published
City of Sioux Falls

County of Minnehaha and State of S
that the said notice was published in said newspaper on
two dates:
Thursday, Dec. 22, 1983
Thursday, Dec. 29, 1983

NOTICE OF HEARING ON APPLICATION NO. 4974-3 TO APPROPRIATE WATER

Notice is hereby given that Pine Lakes Homeowners Association whose mailing address is 7101 Pine Lake Drive, Sioux Falls, South Dakota has made an application for a permit to appropriate 0.50 cubic feet per second from Groundwater (2 existing wells 126' and 140' deep and 1 proposed 140' deep well), the point of diversion to be located in the SE 1/4 NE 1/4 of Section 18, Twp. 101N, Range 48W. Said water to be used for the purpose of providing water supplies for the Pine Lake Hills Homeowners Association Suburban Housing Development.

Pursuant to SDCL 46-2A-2 the Chief Engineer of the Water Rights Division recommends APPROVAL of Application No. 4974-3 because 1) unappropriated water is available, 2) will be no unlawful impairment of existing rights, 3) is beneficial use of water and 4) is in the public interest.

This application will be considered by the Water Management Board at the Civil Defense Room, Capitol Building, Pierre, SD on February 15, 1984 at 10:00 a.m.

The recommendation of the Chief Engineer is not final or binding upon the Board and the Board is authorized to make a determination on this application after it reaches a conclusion

based upon facts presented at the public hearing. Any interested persons who may be affected by a Board decision and who intends to participate in the hearing before the Board and present evidence or cross-examine witnesses according to SDCL 1-26, must file a written petition with BOTH the Applicant and the Chief Engineer by February 3, 1984. The petition may be informal, but it must include a statement describing the petitioner's interest in the application, the reason for the petitioner's opposition to or support of the application, and the signature and mailing address of the petitioner or his legal counsel if legal counsel is obtained. The applicant need not file a petition.

This application is made pursuant to the provisions of SDCL 46-1-1 thru 46-1-9, 46-1-12 thru 46-1-15; 46-2-3.1, 46-2-9, 46-2-11, 46-2-13, 46-2-17, 46-5-1 thru 46-5-16, 46-5-24, 46-5-25, 46-5-30.2, 46-5-31; 46-2A-1 thru 46-2A-10, 46-2A-12; 46-6-3, 46-6-3.1, 46-6-6.1, 46-6-10, 46-6-13, 46-6-14; and Board Rules ARSD 74:02:01:01 thru 74:02:01:15.

This hearing is an adversary proceeding. The applicant or any person, after filing a petition, has the right to be present or to be represented by a lawyer. These and other due process rights will be forfeited if they are not exercised. Decisions of the Board may be appealed to the Circuit Court and the State Supreme Court as provided by law. Any person wishing a copy of

the Chief Engineer's recommendation, further information on this application or to assure access to the hearing by the handicapped can contact the Water Rights Division, DWNR, Joe Foss Bldg., Pierre, SD (605/773-3352) for assistance prior to the hearing date. The time of the hearing will be automatically extended for at least twenty days upon written request of the applicant or any person who has filed a petition to oppose or support the application. The request for extension must be filed with the Chief Engineer by February 3, 1984.

431 Dec. 22 & 29, 1983

Roxy Deutscher
(Signature)

Controller
(Title)

December 29, 1983
(Date Signed)

Cost of Printing: 16 3/4" @ \$4.08=
\$68.34.





DEPARTMENT OF WATER & NATURAL RESOURCES

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

DBB 2/4/91
4974-3
4909-3

December 27, 1990

Dave Putzke
Dave Putzke Well Drilling
816 N Kiwanis Ave
Sioux Falls, SD 57107

Dear Mr. Putzke:

The Division of Water Rights is in the process of issuing a Water License for suburban housing development use under Water Permit No. 4974-3 held by the Pine Lake Homeowners Association, Minnehaha South Dakota.

In order to complete our file and before a Water License can be issued to the Pine Lake Homeowners Association, an "as constructed" well log is needed for three wells located in the SE1/4 NE1/4 Section 18, T101N R48W, Minnehaha County, South Dakota. The wells were drilled in approximately 1973, 1976, and 1983.

If you still have a copy of the "as constructed" well log for the three wells, please forward a copy of the log to our office. The Water License cannot be issued until this information is obtained.

If you have any information on the pumps that were installed, please forward that to us also.

Your prompt attention in this matter will be appreciated. If you have any questions, please contact me.

Sincerely,

David S. Brown
Natural Resources Engineer II
DWRN, Water Rights Division
(605) 773-3352

cc: Pine Lake Hills Homeowners Association, 7101 Pine Lake Drive,
Sioux Falls, SD 57103

South Dakota

GREAT FACES. GREAT PLACES.

DEPARTMENT OF WATER & NATURAL RESOURCES

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

February 11, 1991

4974-3

Pine Lake Hills Homeowners Assoc
7101 Pine Lake Drive
Sioux Falls, SD 57103

Dear Sirs:

The inspection of your water use system and the inspection of the extent of application of water to beneficial use, as developed under Water Permit No. 4974-3, has been completed. Your final water right document, the Water License, can now be issued.

Statutes require that we charge a \$50.00 fee for the inspection and issuance of the Water License. Upon receipt of the \$50.00 fee from you, we will begin processing your Water License.

South Dakota Water Law 46-5-30.1 requires that a permit holder may not divert water until the \$50.00 license fee has been paid. Please contact us if you have any questions.

Sincerely,

Genny McMath

Genny McMath
Natural Resources Analyst
(605) 773-3352

NOTE: On check or money order, please specify your permit number. This will insure proper handling of the fee.



DEPARTMENT OF WATER & NATURAL RESOURCES

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

COPY

March 18, 1991

Pine Lake Hills Homeowners Association
7101 Pine Lake Drive
Sioux Falls, SD 57103

Dear Sir:

I am writing regarding Water Permit No. 4974-3 held by the Association which appropriates 0.5 cubic feet of water per second from three wells. During review of the permit prior to licensing it came to our attention that well no. 3 constructed back in 1983 is not in accordance with the original water permit.

Well No. 3 as approved by Permit No. 4974-3 was to be constructed into an unnamed aquifer at a depth of 140 feet. The well completion report and an inspection of your permit by David Brown indicates that the well was constructed into the Split Rock Creek Aquifer to a depth of 260 feet. Since this well was obviously constructed in a different water source it is not authorized by Permit No. 4974-3. A new water permit will need to be obtained for the water used from this well in order to be in compliance with state statutes. I have enclosed the necessary application forms to be completed. We currently have the well completion report and map so it will not be necessary to submit this information with your application.

If you have any questions, please feel free to contact me.

Sincerely,

Eric Gronlund
Eric Gronlund
Water Rights Division
605 773-3352

enclosure



GREAT FACES. GREAT PLACES.

April 25, 1991

DEPARTMENT OF WATER & NATURAL RESOURCES

Joe Foss Building
523 East Capitol
Pierre, South Dakota 57501-3181

Pine Lake Hills
Joe Swenson
705 Pine Lake Ridge
Sioux Falls SD 57103

Dear Mr. Swenson:

Regarding your phone conversation with Eric Gronlund, enclosed is your \$50 check submitted with the application. Enclosed for your records are copies of Water Permit Nos. 4974-3 and 4974A-3 for Pine Lake Hills. We have received the \$50 fee for inspection and issuance of the Water License. You will be receiving the Water License when it is completed which should be a few weeks.

We are sorry for any inconvenience we may have caused. If you have questions, please contact us.

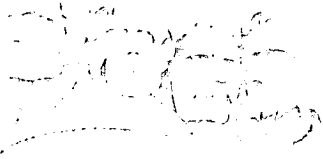
Sincerely,

Karen Schlaak

Karen Schlaak
Natural Resources Analyst
605 773-3352

enclosures

South Dakota



GREAT FACES. GREAT PLACES.

**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE SOUTH DAKOTA 57501-3181

SEP 17 1991

4974A-3

Pine Lake Hills Homeowners Association
7101 Pine Lake Drive
Sioux Falls, SD 57103

Dear Sirs:

Enclosed is Water License No. 4974A-3. This is the final water right document completing your process of obtaining a Water Right. Enclosed is Receipt No. 412587 in the amount of \$50.00 which you paid for the inspection and issuance of the Water License.

For your information SDCL 46-6-27 requires that if the owner of an existing well, such as the well authorized by Water Right No. 4974A-3, constructs a replacement well and does not plan to use the old well, the old well is considered abandoned and must be plugged. Also, any well that is being used or is not considered abandoned must be valved and controlled, if flowing, or sealed and capped so that no leaking occurs either underground or at the surface.

As long as you use the water beneficially, as stated in the Water License, the State Water Laws provide that you have a continuing right to use the water. If you have any questions, please contact our office.

Very truly yours,

JOHN HATCH, Chief Engineer
Water Rights Division
(605) 773-3352

enclosures

NOTE: The applicable portions of Water Permit No. 4974-3 have been incorporated into Water License No. 4974A-3.