



## CITY OF WASILLA

290 E. HERNING AVE.  
WASILLA, ALASKA 99687  
PHONE: (907) 373-9050  
FAX: (907) 373-0788

INFORMATION MEMORANDUM NO. 91-15

TO: Council  
FROM: Deputy Administrator  
DATE: August 28, 1991  
RE: Water System Expansion

During Council deliberations concerning the purchase of the third water tank site, it became apparent that some Council members are not aware of the long-range water system master planning that has taken place. Accordingly, some the the associated correspondence and plan excerpts are provided for your information.

You may note that to-date the need-based expansion of the water system has closely followed the 10 year old master plan. The City has an excellent system that serves the public very well. While there is no present need to further expand the system, the next logical... and foreseeable... requirement will be for tank site number 3. Therefore, Administration believes it is prudent planning to purchase the next tank site before it is lost to development and may become very expensive.

Robert E. Harris  
Deputy Administrator



ENGINEERS  
GEOLOGISTS  
PLANNERS  
SCIENTISTS

November 11, 1982

NOV 15 1982

R&M No. 251147

City of Wasilla  
P.O. Box 430  
Wasilla, Alaska 99687

Attention: Mr. Bob Harris

Re: Wasilla Water System Extension to Spirit Ridge Subdivision.

Dear Mr. Harris:

It was a pleasure talking with you on October 27, 1982, regarding future city water service to the area north of Snow Hill Road. As you know R&M has been retained by Mr. Eugene F. Fisher, P.E., to determine the best way to serve water to Spirit Ridge Subdivision that is compatible with the existing city system and fire insurance ratings. Unfortunately the Insurance Services Office in San Francisco will not respond to telephone requests for rating information thus an exchange of written information would be required to establish the precise fire insurance rating for any combination of development and water service.

Wasilla has three main options for providing service to the area north of Snow Hill Road. Each option's practicality depends on the extent of growth and development in this area.

OPTION I - Modify Existing Pumphouse

The cheapest option would be a modification of the existing pumphouse to serve the higher elevations found in Spirit Ridge Subdivision and to accommodate the expected eventual increase in domestic use. We have contacted the booster station manufacturer and determined that it appears possible to change out the three existing pumps without major modification of the booster station piping. The three new pumps will require about 150% of the horsepower of the existing pumps, providing a 50 psi pressure boost vs. the current 25 psi boost. The new pumps would provide additional domestic output to handle the anticipated peak domestic use which might occur under the present development plan.

Currently there are 70 single family lots in GVC Subdivision. Spirit Ridge Subdivision would add 63 single family lots and 16 each 4 plex lots for a total of 197 dwelling units. Using 60 GPCD and four persons per dwelling unit gives an average use of 33 GPM and anticipated peak domestic use of 200 GPM. Thus the jockey pump would be sized around 33 GPM @ 50 psi

boost, the lead pump around 200 GPM @ 50 psi boost, and the lag or fire pump at about 750 GPM @ 50 psi boost. An elevation of about 465 feet M.S.L. has been used herein as a basis for sizing pipes and pumps to serve this development, based on information given to R&M by the developer's engineer, Mr. Eugene F. Fisher, P.E. Pressures may have to adjusted somewhat when more precise survey data becomes available. The friction loss in the long run of 8" pipe to the top of the new development necessarily limits the fire flow available to between 750 and 850 GPM @ 20 psi min. line pressure at the top of the development. The lower end of GVC II Subdivision would be pressurized to nearly 90 psi under this scheme and might require pressure regulator valves on some of the residential services to reduce service pressures.

Hydronix estimated current cost for the upgrade at \$3,100 for pumps, \$1,500 for electrical controls and \$3,000 for installation work in the pump station. R&M estimates this change would cost a total of \$8,000 to \$15,000.

#### OPTION II - New Pumphouse and Parallel Main

Another way to serve Spirit Ridge Subdivision would be to run the 12" main from Bogard Road up Peck Street to Snow Hill Drive, install a new pump station and run a 12" main to the top of the subdivision where the 4 plex or townhouse development will be built. This scheme could provide the 2000 GPM required to obtain the best fire rating for the townhouse development, and would be capable of supplying the adjacent land as development proceeds. The Pump station in this scheme would cost about \$34,000 F.O.B. Seattle, with an additional \$3,400 to ship to Wasilla. R&M estimates installed cost at \$50,000 to \$75,000 for this pump station.

#### OPTION III - New Main from Tank Site

A third option would be to install a booster station at the tank site and run an 8" to 12" line to the new development routing it in the most advantageous way for serving other anticipated development in this area. This could allow an increase in the water service area beyond the subdivision presently considered. Further work on this option would require R.O.W. and easement planning with the City of Wasilla.

Each option has advantages and disadvantages as summarized below:

#### BENEFITS

#### PROBLEMS

##### Option 1

- ° Lowest Capital Cost
- ° Lowest Maintenance Cost

- ° Elevation difference may cause overpressure at lower lots of GVC.

- Fire insurance rating at upper 4 plex lots may be below that of general city rating.
- Will interrupt service to existing pressure zone during modification.
- Highest Capital Cost.
- Additional O&M Costs.

#### Option 2

- Will not affect existing pressure zone or interrupt existing services during construction.
- Will provide best possible fire protection.
- Has the capacity to serve adjacent areas that may develop in the near future.

#### Option 3

- May be more cost effective way to serve new development than Option 2.
- Could provide another system loop to guarantee continuous service during system maintenance.
- May require additional R.O.W. and easements.
- High Capital Cost.
- Additional O&M Costs.

Wasilla has recently been evaluated and given a revised rating by the Insurance Services Office within the water service district. The local I.S.O. representative, Jane Werber, indicates that this rating will not be reevaluated for about ten years. The reported rating is between 5 and 6 representing about a 40% decrease from the 9 rating that was in effect prior to construction of the water system. To the best of our current knowledge upgrading the existing pump station at GVC to include Spirit Ridge Subdivision appears to be the most desirable method of serving the new development. We do wish to point out that this upgrade would not provide sufficient water service to eventually serve potential adjacent developments. The upgrade would be near the maximum fire flow pressure and capacity that could physically be pumped within the confines of the pump station and the 8" main. A second pressure zone and 10" or 12" main would be desirable to serve the generally higher area north to the city limits and including Spirit Ridge Subdivision.

Assuming service is provided to Spirit Ridge Subdivision by upgrading the GVC pump station, the main up Peck Street to Snonomish and then along Snonomish and the dead end off Snonomish up Chattarory Court should all be 8" lines. Other lines looping through the subdivision should be 6" diameter. The fire hydrant and valve layouts shown in Mr. Fisher's preliminary plans dated October 3, 1982, are consistent with the adjacent system in GVC II subdivision.

If you have any questions please do not hesitate to contact us.

Very truly yours,

R&M CONSULTANTS, INC.

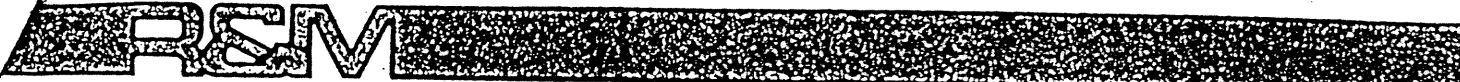
*Richard S. Giessel*

Richard S. Giessel, P.E.  
Senior Engineer

RSG/jms

xc: Eugene F. Fisher  
P.O. Box 888  
Wasilla, Alaska 99687

George



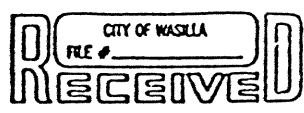
R&M CONSULTANTS, INC. 5024 CORDOVA • BOX 6087 • ANCHORAGE ALASKA 99502 • PH. 907-279-0483 • TLX 090-25280

ENGINEERS  
GEOLOGISTS  
PLANNERS  
SURVEYORS

April 25, 1983

R&M No. 351020

City of Wasilla  
P.O. Box 430  
Wasilla, Alaska 99687



Attention: Mayor Harold S. Newcomb

APR 25 1983

Re: Wasilla Water System Extensions

Dear Mayor Newcomb:

It has been our pleasure to prepare this water system extension report for the City of Wasilla. Per our telephonic communication of April 4, 1983, and our meeting with you of April 15, 1983, we have greatly enlarged the original study area. All of the analysis outside the original study area is necessarily based on 1979, USGS contour maps with an interval of 5 meters. Thus node elevations in the added area may be expected to be much less accurate than in the original study area which has mapping at 1 inch = 50 feet scale with two feet contour intervals.

We have analysed north and south side tank sites, (both outside the original study area) and provided tank recommendations herein. The distribution main extensions encompass much of the area first proposed for water service in our October, 1977, Water Facilities Plan for the City of Wasilla.

Elevations used in this report are estimated from topographic maps and they should be used with caution. Ground based survey is recommended to establish important node elevations when preliminary engineering begins. A complete set of the data we analysed is included in the enclosed computer run and key map.

The key map locates the 67 nodes analyzed for this solution. Pipelines are identified by beginning and end nodes and pressure zones. Type "L" indicates a normal pipeline with length, diameter and friction coefficient listed. Type "R" indicates a line including a pressure reducing valve and also lists the set point of the valve. Type "NH" nodes are reservoirs and "NQ" NODES are simply pipe junctions. Pressure zone "B" is set at 560' above sea level and zone "A" is set at 460' above sea level.

A second pressure zone (Zone "B") can be provided for the higher areas of the city to the north and east of the existing system. From the USGS topographic maps lots 1,2, and 3 of Wasilla Woods Subdivision all appear to provide a good tank or standpipe site for a second zone. A seventy foot standpipe could provide a gravity head of 560 feet above sea level if the

existing tank (node 1) during an emergency. The three PRV's in the Lakeside Terrace area will provide a 43 psi. increase in the line pressure at the upper half of this development. The last PRV, near Cottonwood Creek on the north site of the Parks Highway, completes the separation of Zones A & B and again allows flow from "B" to "A" during emergencies in Zone "A". For this analyses the PRV's were set such that they would pass flow into Zone "A" only during a 4000 GPM or greater use rate in Zone "A".

The 10" main down Crusey Street (node 40 to 22) should be added when pressure zone "B" and the PRV's are added to prevent reduction of fire flow to the south side of town. The PRV's will block the existing loop through Lakeside Terrace.

The 6" dead end line at Boundary Street and Swanson Avenue should be looped. The direction of development in this area may determine where to connect this dead end. The cheapest alternative appears to be running about 350' of 6" pipe to the east connecting to the 6" line at Yenlo Street and Swanson Avenue.

The south side of the Parks Highway can be served from the existing Zone "A" network. 4000 GPM fire flows can be delivered to nodes 30 through 36 from the existing tank. It appears that a 70 feet tall standpipe would be required in the area near node 39 to equal the domestic pressure available from the existing tank. Such a tank at node 39 would improve the fire flow to the south side, especially to the west end of Lake Lucille but nearly the same pressure improvement could be provided by adding a third 12" pipe across the Parks Highway at the west end of the Airport Mall (node 10). The only good reason for a south side tank would be to provide additional storage capacity.

The long transmission mains to nodes 39, 41, 43, 62, 63, 64, 65, 66, and 67 should be 12 inch diameter as indicated in the computer program. Pipe should be either cement mortar lined ductile iron or Driscopipe 8600 polyethylene, to maintain a low friction factor in these long lines and provide reliable long term service.

A one million gallon, 70' standpipe is estimated to cost between \$.45 and \$.80 per gallon. The per gallon cost of a 500,000 gallon, 70' standpipe is estimated at between \$.65 and \$1.10 per gallon. Estimates are in 1983 dollars and represent the range obtained from a wood tank supplier, a steel tank supplier, and a steel tank contractor.

Node 41, at the west end of Lake Lucille can be supplied with over 2500 GPM fire flow using 12" pipes crossing the Parks highway at Crusey and Main Streets. Adding a third crossing at the west end of Airport Mall would allow 3500 GPM flow to node 41.

Looping improvements to be completed with the addition of pressure Zone "B" include a 12" line from node 51 to 52, and 8" lines from nodes 51 to 50, 48 to 49, 57 to 58, 58 to 59, and 59 to 45 (most of which is in as a dead end). These looping connections are all in the GVC, Spirit Ridge,

April 25, 1983  
Mayor Harold S. Newcomb  
Page 4

Indian Hills area. Additional future connections are shown in Figure 2 and would be 12" lines from nodes 10 to 71, 67 to 68, and 69 to 70.

If you have any questions regarding this report, please contact us at your convenience.

Very truly yours,

R&M CONSULTANTS, INC.

*Richard S. Giessel*

Richard S. Giessel, P.E.  
Senior Engineer

RSG/rma

Enclosures: Topographic Prints  
Computer Output with Node and Element Map (Figure 1)  
Figure 2



EXISTING SYSTEM	---
FUTURE SYSTEM	---

NODES ○

FIGURE 1

100% CONSULTANT'S INCH

WASTEWATER FACILITIES STUDY

PROPOSED  
STORM  
WATER  
PLANT

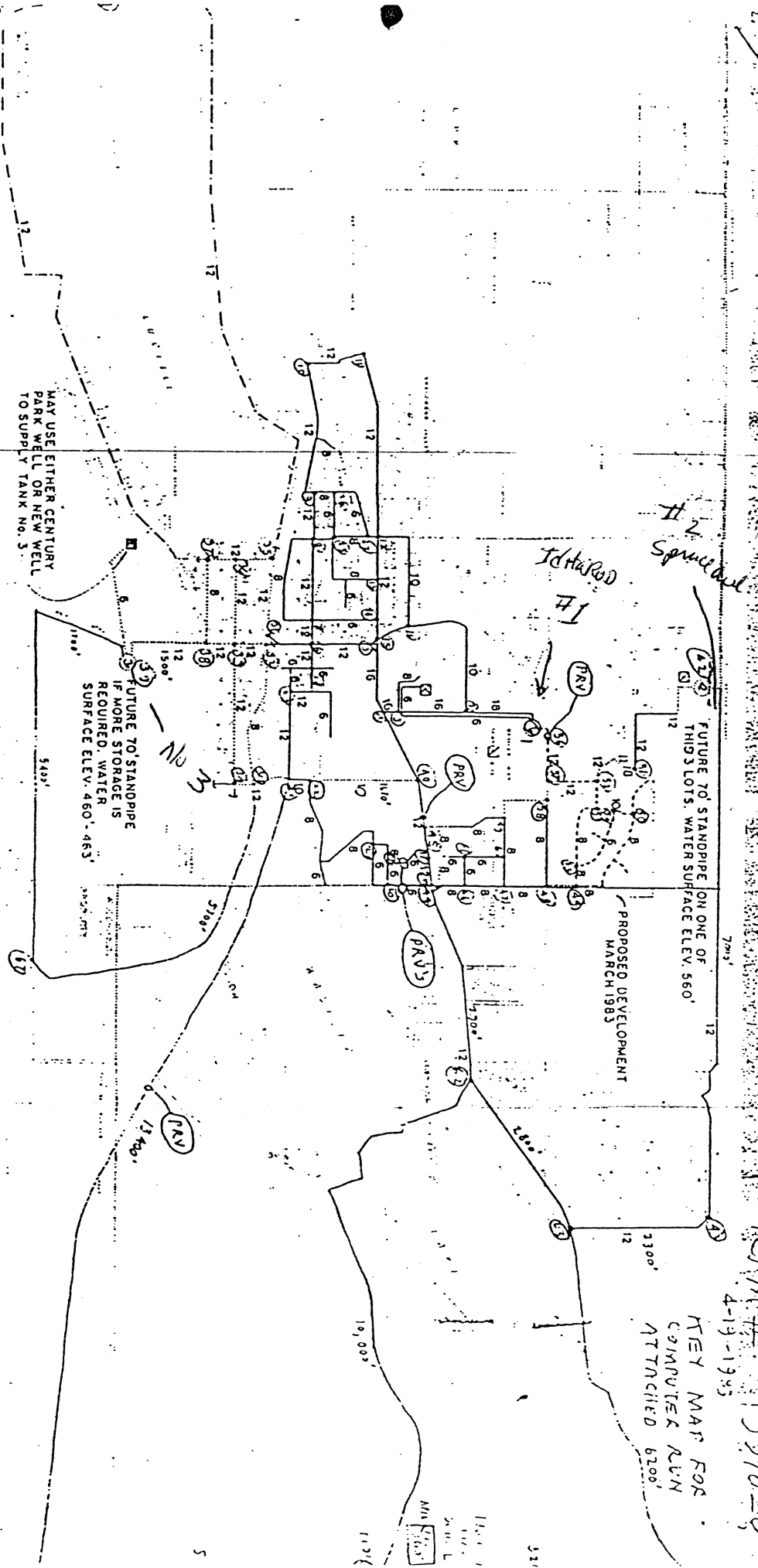
MAY USE EITHER CENTURY  
PARK WELL OR NEW WELL  
TO SUPPLY TANK NO. 3

FUTURE TO STANDPIPE  
IF MORE STORAGE IS  
REQUIRED. WATER  
SURFACE ELEV. 460' - 463'

PROPOSED DEVELOPMENT  
MARCH 1983

KEY MAP FOR  
COMPUTER ALM  
ATTACHED 6200'

4-19-1985  
351020



ENGINEERS  
GEOLOGISTS  
PLANNERS  
SURVEYORS

May 14, 1984

R&M No. 451072

City of Wasilla  
P.O. Box 870430  
Wasilla, Alaska 99687

Attention: Bob Harris, City Administrator

Re: Wasilla Water System Additions Analysis

Dear Mr. Harris,

It has been our pleasure to prepare this report for you in conjunction with information supplied to R&M Consultants by Gilfilian Engineering, Alaska Land Development Services and Tryck, Nyman & Hayes.

Water main layout for the service area south of the Park highway is in general conformance with the master plan we prepared for this area in April 1983. Dead end lines on Knik, Willow and Lake Streets present problems with both water quality and fire flow and should be looped as indicated in our April, 1983 Master Plan as soon as it is economically possible to do so. Communications with George Strother of Alaska Land Development Services indicate future completion of looping to eliminate the currently planned dead ends. Computer analysis of the planned south side improvements indicate reduced fire flow capacity with the dead end system. Node 36 at Lake street and Susitna Avenue exhibits a flow capacity reduction from 4000 gpm at 37.5 psi down to 2500 gpm at 38.6 psi. Maximum capacity at 20.5 psi is 3500 gpm which should be adequate for the existing development. Eight inch dead end lines will be limited to a delivery of about 1500 gpm versus 3000 gpm for the looped system. Flow data assumes completion of the ten-inch (10") main up Crusey Street to Bogard Road.

Extension of water main west to Saddler's Mall, Node 79, should be made with sixteen-inch (16") diameter pipe since it is expected to be an

unlooped major transmission line. Connection to the two twelve-inch (12") mains at Node 10 should be made with a 16" x 12" x 12" reducing Tee fitting replacing the existing 12" x 12" x 12" Tee. Water delivery of 4000 gpm was calculated through this 1200 foot extension at a residual pressure of 16.5 psi using a fully aged pipe friction factor for the entire system.

Flow required to Cottonwood Mall was based on Insurance Services Office (ISO) requirements assuming the building to fall within their safest category, Fire-Resistive Construction. According to the ISO requirements for Phase I, the Cottonwood Mall would require a base fire flow of 4500 gpm. Addition of Phase II would increase the Mall to about 277,000 square feet (over 6-1/3 acre) and require a base fire flow of 5750 gpm. From these base figures ISO allows reductions for sprinklered buildings that can be very substantial. Such reductions are normally figured by the ISO expert when a system is evaluated. Dan Crevensten of Tryck, Nyman & Hayes indicated that the National Fire Protection Association (NFPA) Chapter 13 requirements for the Mall would be 3500 gpm for fire flow. Dick Kersop of Marsh and McClelland Technical Consultants offered even small fire flows based on their sprinkler system design. We believe that applying some reduction to the Phase I ISO base number is reasonable and that a 4000 gpm flow is consistent with design parameters used city wide. We caution that the impact of serving such a large development should be checked with the ISO to ensure that there is no negative impact to the city wide rating. Future development of the higher reservoir and eventual looping of another main from the north into the proposed main to Cottonwood Mall using a pressure reducing valve would provide additional flow capability to this site on the order of the Phase II ISO base flow requirements, assuming development approximating that shown in our April 1983 report. We believe the development of this higher zone and second main from the north is five (5) or more years away and is at best an uncertain future possibility that should not be relied upon for the currently proposed Mall.

With this basis, easterly extensions of water main to the proposed Cottonwood Mall, Node 78, should be made with sixteen-inch (16") pipe. A fire flow of 4000 gpm was calculated through the 4500 feet of pipe with a

residual pressure of 14 psi using fully aged pipe friction factors (Hazen-Williams C=110). Using the new pipe friction factor for the sixteen-inch (16") main (C=140) residual pressure at Node 78 was 24 psi with 4000 gpm flow. Reduction of this line to twelve-inch (12") diameter would require a 73 psi booster pump to maintain a 20 psi residual pressure at node 28 with 4000 gpm flow and fully aged pipe friction factor. This would require a booster pump on the order of 200 to 250 horsepower. We strongly advise against the use of such a booster pump when a larger line and gravity can be used with much more reliability and less maintenance. Analysis of this line was done assuming completion of proposed south side improvements and completion of the ten-inch (10") main up Crusey street to tie into the twelve-inch (12") main at Bogard Road.

Review of preliminary plans for the Cottonwood Mall water service from Tryck, Nyman & Hayes stamped April 17, 1984, has resulted in the following suggestions besides increasing the main size to sixteen-inch (16") diameter. Blow offs should be placed at stations 21+50 and 48+00 of the Park's Highway, and an air release should be located at station 47+00 On the main at the Palmer/Wasilla Highway an air release should be located at station 14+00. The sixteen-inch (16") main should run at least to station 17+27.66 of the Palmer/Wasilla Highway where the second service line tees off to the proposed Mall. A twelve-inch (12") service loop around the building would be better than a ten-inch (10").

We believe it is appropriate to include with this report our general design goals for the City of Wasilla Water System which should be kept in mind whenever system changes are being considered. System design is for delivering 4000 to 4500 gpm for four hours within the commercial core of the city. Residential and outlying area requirements are generally less than the commercial core. There is a practical and economical limit to system expansion and political and economic decisions have to be made with each addition. Obviously with enough money one could add lines, pumps, wells and reservoirs to serve virtually any size project, but the operations and maintenance considerations might not make economic sense. Our goal

has been to provide a gravity system that is simple to operate and maintain. Pump stations have been used only to supply residential developments with relatively small domestic and fire demands. Recommended development of the Wasilla Woods tank site will eliminate the existing pump stations and provide gravity service to the north and east extensions of the system envisioned in our April 1983 report. The only pumping required when the higher zone tank comes on line will be from the well supplies into the reservoirs. As the City grows and consumption increases additional wells can be floated on line with simple pressure controls.

*Done  
1986*

Wells at Paulson Avenue, Lakeside Terrace, Carrs and the Wasilla High School are possible sources for additional water production. When bringing another well on line it would be wise to perform a pump test to determine well capacity and size equipment accordingly, checking the existing well screen and soils data to insure long term sediment free operation.

Reservoir cathodic protection systems should be given regular checks to insure function.

Hydrant flow test data supplied to R&M was not sufficiently accurate to use for refining the computer model of the water system. We recommend the following procedure be used in future tests determining system capacity.

Use discharge equation  $Q = 29.8 C d^2 (p)^{\frac{1}{2}}$  for discharge from hydrant nozzles.

Where Q = discharge, gallons per minute.

C = coefficient, normally 0.90

d = diameter of outlet, inches

p = pitot gage reading, pounds per square inch (psi)

An outlet cap on one hydrant is replaced with a pressure gage. This is the hydrant of interest referred to as the residual pressure indicating hydrant. After exhausting the air, the residual hydrant valve is left open

to obtain initial pressure and then pressures at flows from adjacent hydrants that are calculated from pitot gage readings by the above formula. To get good flow information enough water should be extracted from adjacent hydrants to produce at least a ten (10) psi pressure drop in the residual hydrant. On ten-inch (10") and larger mains, this may require opening three or four adjacent hydrants. The flow from each open hydrant is calculated by the discharge equation and the total flow from the open hydrants is designated  $Q_F$  and used in the following equation to determine the flow capacity,  $Q_R$ , of the pipe at some residual pressure (usually 20 psi).

$$Q_R = Q_F \left( \frac{H_R}{H_F} \right)^{.54}$$

- Where:  $Q_R$  = computed discharge at specified residual pressure, gpm  
 $Q_F$  = total discharge during test, gpm  
 $H_R$  = drop in pressure from original value to specified residual, psi  
 $H_F$  = pressure drop during test, psi

We believe this procedure will provide data that can be used to adjust the computer model in the future.

In conclusion, we strongly urge that the ten-inch (10") main up Crusey Street be completed to Bogard Road and tied into that twelve-inch (12") main. We looked at increasing this main down Crusey to twelve-inch (12") and found a small (2 psi) system improvement under south and east side maximum fire flows that may not be justified by the economics. If the City of Wasilla desires to plan for developments on Crusey Street which might require more than 4000 gpm fire flows then it may be justified to upgrade this main to twelve-inch (12"). The connection of the sixteen-inch (16") main down the Parks Highway to serve Cottonwood Mall is best made at Node 28 by replacing the existing 12" x 12" x 10" Tee with a 12" x 16" x

*Done  
1984*

*Done  
1984*

10" Tee such that no reduction in flow area occurs. The twelve-inch (12") loop through the south side of town should be completed before the Cottonwood Mall goes on line to help supply water to the east with minimum system pressure loss. Flow computations included this loop.

Thank you for this opportunity to be of service to the City of Wasilla. If you have any questions or if we can be of further service to you, please do not hesitate to contact us.

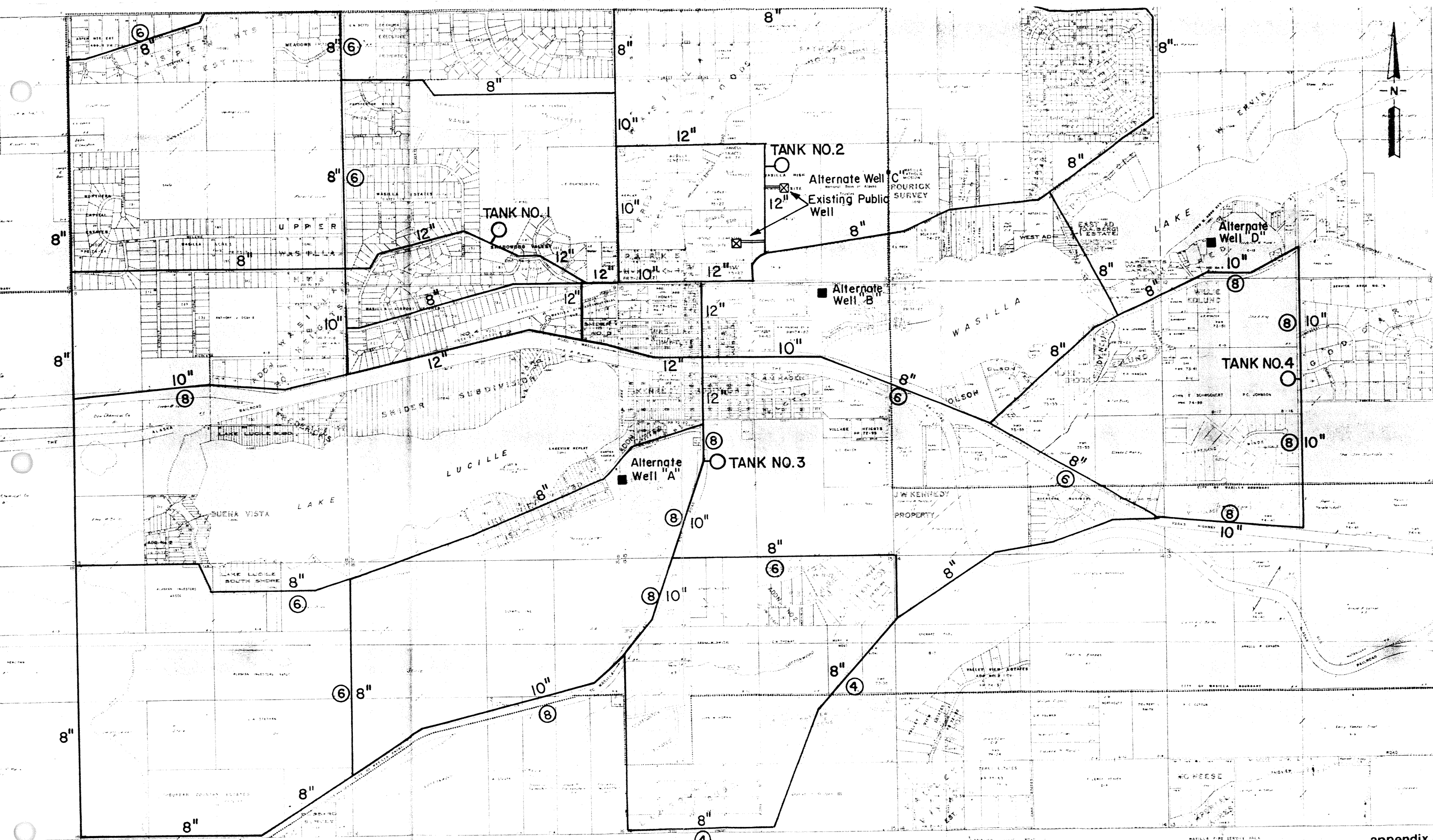
Very truly yours,

R&M CONSULTANTS, INC.

*Richard S. Giessel*

Richard S. Giessel, P.E.  
Senior Civil Engineer

RSG:mbr23/p




**LEGEND**

- 8" AREA WIDE FIRE-FLOW. WATER DISTRIBUTION SYSTEM. —
- Ⓢ AREA DOMESTIC FLOW. WATER STORAGE TANKS. ○

1 MILE

**MASTER PLAN**

  
**R&M CONSULTANTS, INC.**  
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS  
 OCT 1977

**WASILLA WATER FACILITIES STUDY**  
 WASILLA, ALASKA

appendix