CITY OF PARK RAPIDS
CITY COUNCIL WORKSHOP
MARCH 27, 2012, 6:00 PM
Park Rapids Public Library-Lower Level
Park Rapids, Minnesota

1. CALL TO ORDER: Mayor Nancy Carroll called the City Council Workshop for March 13th, 2012, to order at 6:00 p.m.

2. ROLL CALL: Present: Mayor Nancy Carroll, Councilmembers Dave Konshok, Pat Mikesh, Sue Tomte, and Paul Utke. Absent: None. Staff Present: Public Works Superintendent Scott Burlingame, Public Works Employees Tim Little and Dean Christofferson, and Clerk Margie Vik. Others Present: Ulteig Engineers Jon Olson and Bala Vairavan, Mike Strodtman, Rod Nordberg, Todd Johnson, and Anna Erickson from the Enterprise.

3. DISCUSSION:

3.1. Water Study by Ulteig Engineers: Jon Olson introduced himself and Bala Vairavan from Ulteig Engineers. He stated Vairavan will present the technical aspects of the report and assist with any questions you may have. The study is in draft form. If there are any comments received tonight, we wanted to get them incorporated into the final report. We will finalize, sign it, and complete the study after this evening.

Olson stated over the last five to fifteen years our nitrates in the shallow aquifer have been a large topic. Well four and seven have exceeded the MCL in 2010, and therefore have been removed from production. In 2010, a twofold project was put in place. The existing wellhouses were beyond their useful life and in need of repair. A wellhouse was constructed and a new well was installed and is named well eight. That's drilled into the deeper aquifer, and at that time the water quality within that well looked appropriate for bringing up and blending with wells five and six. We blended because the iron within that well was slightly elevated. Our primary source for water is still wells five and six, with an occasional usage of well eight, when needed.

Olson stated the reason for that is the iron concentration. Recommended concentration for iron content is less than .3 MP/L. When we tested the test well in 2009 we had a concentration of approximately double that. At that time, the thought was this appears to be an appropriate method to give a try. By blending it, it would reduce the iron concentration to a more reasonable level, and by doing so we'll also knock down the nitrate levels. Since 2009, under heavy pumping conditions we have noticed a pretty aggressive change in the iron concentrations in that well. Our most current reading was just above 2. MP/L in 2011.

Olson stated the city has been working very aggressively to find other water sources throughout the community and the surrounding area. We found a spot near well seven that appeared to be usable. It has very similar water quality to the water in test well eight that we found in 2009 and 2010. In July of 2011 a study was authorized to review the

feasibility, long term viability, of continued blending in a second location. The goal of the study was to look at the water system in its entirety, long term, current water demands, available water sources, evaluate continued blending approach at a new site, look at other alternatives that may be suitable, provide planning level costs, and then make a recommendation that we feel is most appropriate for the city to move forward within their water system.

Olson stated we have two sites. Location two has well seven, which has been removed from production because of nitrates. That's the location where a deeper well was drilled. The driving force for the study was to see if it was feasible to blend at that location. Our primary site right now is near the school. We have the water tower, our new wellhouse, and wells five, six, and eight. That is the primary source for supplying water to the city right now.

Olson stated our average daily demand is approximately 430 gpm. Currently, with wells five and six running we're meeting that need. Our maximum daily demand is approximately 860 gpm. That's noticed during the heaviest pumping times, dry summer days. Currently, we're falling short of that maximum demand. We're still meeting the demand with the storage that we have. We have two elevated storage facilities, therefore we're able to meet those peak days at this time. We're getting into a situation where well eight is running continuously. We have noticed some complaints and concerns with elevated iron concentrations in the system.

Olson stated the existing water qualities of well five and six are very similar in quality. We have hard water, iron concentrations are nearly zero, manganese and ammonia are low. The main issue with the shallow wells is the nitrate levels. Well eight, the deeper well, in the deepest aquifer, has fairly hard water. The iron concentration is well above the recommended level, at 2.3 MCL. Ammonia is an odd contamination to have in a confined water source, and it is elevated in that well. However, the nitrate levels are very low. The nitrates in well five are trending upward at a gradual and steady rate. Well six has had some fairly rapid increases. Our current level is 9.2 MCL, and approaching the 10. MCL, which is the maximum level that we can have in the system. We do not have data on well eight because it has not been in production very long. The iron concentrates have increased under pumping conditions from 2009 to 2010.

Olson stated the desired option to resolve these issues is to install a deep well at the well seven location, which would increase the capacity of system dramatically. The desired improvement is a blended approach very similar to what we're currently doing up near the school site. This alternative would satisfy the capacity needs both now and in the long term. First thing we looked at was the water quality within the test well to verify the feasibility of putting this on line without treatment. This water quality is very similar to what we've experience in the well eight aquifer with exception of the ammonia. It's at a level that wouldn't necessarily require treatment. It does however have elevated iron concentration that brings some concern, especially because of what we've noticed with the production of well eight. Looking at the blending of the water quality analysis, for the major contaminates, the iron and the nitrates, the two primary contaminates that we're faced with at this time. In wells five, six, and eight, if running continuously, we have a production of approximately 726 gpm. Our iron concentration when blended is quite high at nearly one, which would be three times the recommended limit, which would be a very detectable concentration. The nitrates would be below five. Well seven and the new test well, if we put a production well there, we would anticipate getting about 631 gpm from the site, the iron

concentration would be 0.533 based on the observations that we've seen, the nitrates would be 5.05. If running all five wells together, we'd be exceeding the design year of 2030, at 1,357 gpm, 0.763 of iron, and 4.693 of nitrates. The findings for the alternative of the new well to the existing wellhouse at well seven, has an estimated cost of $410,000.00. This is a viable option from the health based regulations and requirements. However with the iron concentrations, and the issues we've experienced with well eight, perhaps not the best option for the city to pursue at this time. This is viable at this time. However, if the nitrate levels in that shallow aquifer continue to increase, they're currently at around ten, if they get up to the twenty mark, this option would no longer be viable. We wouldn't be able to blend the water to reduce it to a point where it's below the MCL.

Bala Vairavan stated we expanded the study to include some other alternatives. Aesthetic concerns with iron include the staining that you see in your faucets, sinks, and laundry. There is also staining due to bacteria growth, which is basically a slime layer growing on the porcelain. The chemistry behind it is iron gets in the ground water, and once it gets to the concentrations above the .3's, in the ground water you don't have oxygen, so it's in a ferrous state, and that's a dissolved state, as soon as it hits your sink, when it comes in contact with the oxygen, it oxidizes to a ferrous hydroxide, and that's the particles that you see on your sinks. We'll look at different options that we evaluated to address iron issues.

Vairavan stated option one involves selecting a different route. The goal behind it is finding an ideal route that you don't have iron, manganese, and nitrate issues. The city has been going through a rigorous sampling program to look at many wells over a period of years, and have collected all that data. The samples are from twenty-five private test wells over a period of time. Some samples in shallow aquifers contain nitrates. The deep aquifers have iron and manganese. The nitrate is elevated due to farming activities, such as fertilizers. The reason it's elevated in the shallow aquifer is because they are not confined. You don't have a clay confining layer, so anything you put on your surface, it will percolate through the sand, and it's going to get into your water body. The nitrogen was lower in the northwest region of the city, however it was not consistent everywhere. We're seeing an average of 1.39 to 3.59, but right next to it we'll see a 17.42 in MCL values. With that, there is no guarantee that we can pump a whole year and find the ideal water aquifer. The water quality here indicates the direct effort of all of the farming right next to the test well site and the elevated nitrate levels. With this option the additional assumption would be that there are no future agricultural operations. When they add more fields, it will have a direct increase in nitrate levels. This is not the most ideal option.

Vairavan stated the next option is removing agricultural lands from production. This targets nitrate at the source. By taking out agricultural lands, you take out the nitrate. There is about 960 acres that are suspected to affect the existing shallow wells. If we went through the process of eliminating those, the approximate cost is $2.4 to $8.1 million to purchase those lands outright from the farmer. $2,500 per acre is from the Hubbard County website. The $8,500 by acre is from the farmer. There is no guarantee that in the future you're not going to see any farm fields. If they are any, you will see an affect. You will not see an immediate affect once you take those farm fields out. It takes years for the nitrates to travel from the top to the aquifer. If you stop right now, the nitrogen that is in the ground is still going to travel downwards. It will take years before you see an effect. It's not the cheapest option and there is no guarantee.

Vairavan stated option three is blending as Olson just discussed extensively. If the nitrate levels keep on increasing this may not be a feasible option. The iron concentrations are not a health based concern, but it's about the color of the water that we discussed.

Vairavan stated next we get into the treatment options, four through eight. The goal of treatment is to make sure that all the chemistry happens within your plant so you take out the iron and manganese before it gets to your distribution center. That's the goal of a treatment plant. Option four involves pressure filtration at two locations. It works by having an inflow drain coming through there. The whole system is pressurized. You have the filtered water going through underneath, and then it goes into a distribution system. The particles are filtered out of the water. You have to use chemicals on the water to oxidize it to initiate the process, then you stop the oxidation process. After a week or so, your filters will get clogged with particles. You then backwash with clear water from the storage tank. Then you backwash the pipes, through the media, it expands and dislodges the particles, then they travel and are collected in a different chamber. That's the process itself. Under this option we'd have two different locations. The advantage is this is the least expensive option for iron, manganese treatment. The disadvantage is we're dealing with two different locations and two treatment plants. We are still going to leave the shallow wells in production under this operation, and if the nitrate keeps increasing, at some point you'll have to talk about additional wells for treatment for nitrates. The other disadvantage is the chemical cost. Every year the approximate cost is $60,000.

Vairavan stated option 4A is a modification of option 4. We'd use the pressure filtration at one location. We'd drill additional deep wells to get away from the shallow ones and abandon them. We'd primarily deal with iron and manganese. With a water treatment plant it's beneficial to limit the treatment perimeters to as minimum as possible. Instead of treating iron, manganese, and nitrates, we'd eliminate nitrates and concentrate on iron and manganese. The advantages would be one facility to maintain and operate, eliminate the nitrate concerns, and it's the second least costly treatment option. The chemical cost would be similar to option four, because the chemicals are the same based on the amount of water you run through it, at $60,000.

Vairavan stated options five and six are variations of ultra-filtration. It's a different kind of plant. The chemistry is basically the same. You oxidize iron and manganese and then filter out the particles. You just do it with different technologies. With an ultra-filtration package plant you have ozone, which is a molecule that does the same oxidation, then it creates the particles, then you filter it through a membrane process. The advantage is the chemistry is a little easier with this process because ozone is a fairly strong oxidizing agent. It's probably the strongest oxidizing agent, better than chlorine. The chemistry of it is you're not fighting day by day. The other is an iron/manganese plant, it works fairly well in other communities. It's just a little easier with this process. The operational cost is estimated at $30,000 a year. Approximately half of the other option we talked about. The disadvantage is the upfront cost, which would be the highest cost.

Vairavan stated option seven is called a conventional plant. We try to achieve the same chemistry but with different technologies. You go through aeration to oxidize and then we add some chemicals, you have a detention tank, where you try to capture some of the particles beforehand and go through a filtration media and then through clear water and it goes into this distribution system. Under this option you'd dig two to four new deep wells, abandon the shallow wells, and construct an iron/manganese plant. This option

eliminates the nitrate concerns, and you'd have one facility to maintain and operate. The disadvantage is the chemical costs would be about the same at $60,000.

Vairavan stated option eight involves the surface water source and treatment. We'd construct a raw water intake from the river, and then construct a new surface water plant. There are no clear advantages in comparison to the other options. You might get away from iron and manganese, and nitrate treatment, but you'll be dealing with other pollutants from the river. The disadvantage is it has the highest upfront cost and highest operational cost, and you're getting away from your existing well system.

Vairavan stated option nine is a nitrate removal plant. Under this option, we'd stay with the shallow wells and construct one to two additional shallow wells. We'd construct a nitrate removal plant. The advantage would be eliminating the nitrate health concern. You won't have to deal with the deep well iron and manganese. The disadvantage would be the upfront cost and higher operational costs. With the increasing trend in nitrates, it's a moving target, as the nitrate concentration increases, the treatment cost is going to go up. That's a big disadvantage. We don't think this is a feasible option.

Vairavan stated the primary objective was to determine if blending could be achieved with a second new deep well, and blending without any treatment. Obviously that's the least expensive of all the options. However we have aesthetic issues so it's really not desirable to go with that option. We looked at other options for source and treatment. We have provided the options and the capital costs, the advantages and disadvantages, and the operational involvement. Option four and 4A are the pressure filters and they're fairly similar as far as cost goes. Option two is the cheapest. It's a blending but we have issues with iron. With the other options, the cost tends to increase. The surface water treatment plant is the highest. We didn't put a cost together for nitrate because it's a moving target and over a period of time you're going to deal with additional shallow wells therefore increasing the capacity of the nitrate plant to deal those increase. To move from the blending system to go to a treatment plant, the operator license has to be upgraded from a class C to a class B. A surface water treatment plant would need a class B license at a minimum. The reason being it's more complicated.

Olson stated for the conventional treatment plant, you can probably get by with a class C. Currently the city employees are sufficiently licensed. Burlingame stated he has a class C license. Olson stated it's based on a point system for the type of treatment facility. We can likely get by with the current licensure, but there is a possibility of having to go to that next step. Carroll questioned does moving to that next license level involve education and testing? Burlingame stated we have to be class D for the system we have in place. I took my class C testing a long time ago. Unless the criteria has changed, we added it up and it came to a class C.

Vairavan stated the nitrates in the shallow aquifer are too much of a variable. We would not go with a blending approach because iron concentrations exceed the recommended secondary standards and user's expectations. You don't want staining and coloring issues. One option is to construct new deep wells and remove iron and manganese with a new plant. Construction of one plant is better than constructing and operating two plants. Option 4A is the most economical option, which eliminates the reliance on the shallow aquifer and removes the iron and manganese from the water.

Olson stated this study was a very high level look at the water supply system. The next step would be to do a preliminary engineering report on a specific improvement. In that report we would evaluate that treatment process in great detail, conduct a pilot study

that would help and assist with the sizing, at which point we could get a much better handle on the upfront capital costs and the operational and maintenance costs of that facility. This is a large improvement so we would recommend that we do look at getting the water system improvements on the Project Priority List. That's a fairly easy application and it's the first place for any outside funding, if there is any available.

Tomte questioned what urgency is there to do something? Is it three to five years, ten to fifteen years? Olson stated currently the system is operating at its peak capacity. Burlingame stated when it gets hot and dry, I'll be back in again to ask the Council for a water ban. If we turn well eight on everything turns yellow. Olson stated the main downfall is that iron concentration in well eight. The complaints are frequent. Burlingame stated even bigger than that is the ammonia concentration in well eight takes away all of our chlorine concentration. We have no residual in the system if we turn well eight on. Then we're basically going back to when we had the ecoli potential. In our opinion there is a sense of urgency with the system. We've been very fortunate to prolong treatment. Burlingame stated we've closed down wells because of nitrates. Well six is at 9.2.

Carroll stated having lived in a community that had only deep wells, we were expected to have a water softener. All homes had water softeners. I assume that was for the high iron. Vairavan stated that's for hardness. Carroll questioned so it doesn't affect iron? Vairavan stated that's for softening. You see the well concentration for hardness was really high, around 180 minimum. That's a very hard water. You want to be closer to 35. The problem with hardness is no foaming when you use soap. Carroll questioned are you aware of anything that a homeowner can do to eliminate those elements, iron and manganese. Vairavan stated it's probably not economical to treat it everywhere. Todd Johnson stated a softener will help out a little bit, but it won't take out any manganese. But nothing like what you have. Carroll stated so we need this to be treated when it comes right out of the ground. Burlingame stated if we don't treat it, and we drill more deep wells, our system is going to get full of iron. It will take a lot more maintenance to keep the system clean. We'll get that iron and bacteria in them. Vairavan stated you'll be flushing the pipes and hydrants more frequently.

Carroll questioned thinking about the urgency and nitrates to the west, we've had a number of meetings with the farmers who are making some adjustments with what they are planting, and trying to lower the use of fertilizers, so we don't have time to wait to see if that's going to have an impact. Vairavan stated it takes several years to see the impact. It depends on the length of travel. Around here it's ten years before you actually see the affect. With the urgency as it is, you probably won't see the effect immediately. The increasing trends that we have been seeing in all these wells is a problem too. It's helping but it's not there yet. You can't rely on just that because nitrate being a health based concern, it's not an aesthetic concern. Burlingame stated RDO and the Beckers have been good to work with. RDO put sorghum on two of the fields. Beckers put wheat as part of that process, but they also put nitrate on it. They're following the recommended Minnesota standards. Tomte stated even those changes aren't necessarily guaranteeing that there is going to be less nitrates leeching into our system. Burlingame stated you won't have a guarantee even if all those fields come out of production because that shallow aquifer comes from the Ponsford Prairie. You have irrigators one right after the other. You may get enough clean water, but you're not going to know that. You could spend millions of dollars to buy that out, with no effect.

Carroll questioned our wellhead protection area doesn't go all the way up the aquifer? It's just right nearby? Burlingame stated it goes out for a ten year time of travel, which is about five miles.

Mikesh stated the system we just bought was supposed to be the way to go when we put it in. If you've been around water, the deeper you go the harder it gets. Why are we going deep again to try and get away from everyone, because you're not going to. Why can't we concentrate on nitrates? We have wells that produce water. Why not set up a system just to treat what we have? Instead of wasting money to drill four more wells and finding it's the same problem. Build this whole elaborate facility and we're back to where we started. Vairavan stated the issue with that would be the nitrates are a moving target. If you don't have a fixed value of what you're going to treat, and it's dependent on what's going on on the surface from the farmer operations. You might start with a low nitrate value, with the increasing trend you're going to get to a point that you're going to need treatment, and that target is moving all the time. With the increasing chemicals, you're going to have to spend more on treatment costs too. It's not impossible. But with iron and manganese, even though it's a deeper aquifer, it doesn't increase to that extent or that fast, just because you're dealing with pockets that's below ground and it's not being feed by an above ground source basically like your shallow wells. It's just being feed with a contaminated source constantly by the farm operation. That is the challenge.

Utke stated the treatment plant for the nitrates is more expensive than working with the iron and manganese. Vairavan stated the initial capital cost is about the same, but the operation cost per year is going to keep on increasing because of the increasing nitrate trend. The other thing to keep in mind is you'll have to talk new wells because your nitrate is so high that the treatment plant is not able to handle it, so you're talking about additional nitrate wells, additional piping to the treatment plant. That is a big challenge staying with that option. Burlingame stated it's an unconfined aquifer so eventually any spill you're going to have to deal with because it will meet that thirty foot aquifer eventually. If you go into a confined aquifer, what's happening on the surface, you don't have to worry about it.

Konshok stated on option nine, you say high up front cost, but you don't have a cost listed. Vairavan stated it would be very similar to the ultra-filtration plant we looked at with options five and six in the $4 million range. Olson stated the primary reason for going to an iron and manganese is the operational efforts and cost. Konshok questioned can you get us those figures? Olson answered absolutely.

Vairavan stated the biggest thing is it's unconfined. You don't have control over what's going on and a spill could potentially get to you. Going into a deeper aquifer you have more protection on top of you.

Tomte questioned what do neighboring communities do for water treatment? Olson stated Detroit Lakes does deep wells with a conventional style plant. Burlingame stated the water has a pressure filter similar what you're talking about. Todd Johnson stated Akeley is gravity, Nevis doesn't treat, Menahga has a gravity filter, Walker pressure filter, and Bemidji doesn't treat.

Carroll questioned would the Fish Hook River even have the volume we would need? Todd Johnson stated we wouldn't let you do that. There's no need to even look at that.

Carroll questioned if all of these technologies have been around for a while? Vairavan stated they have been around for a while. They are just a different way of doing it. Ultra-filtration is a relatively newer technology.

Konshok questioned if we do go to deep wells, are you addressing the ammonia? Vairavan stated the ammonia would basically go away, once you add chlorine. That's one form of disinfecting. The other would be going to a chloramine system, so you're basically adding ammonia to help you to get into that system. Chloramine is better for the system, because it generally lasts longer. Konshok questioned you're including that in your costs? We know it's an issue with that one deep well. Burlingame stated we'd probably look at the one hundred to two hundred foot aquifer, instead of the three hundred foot where well eight is. The test well in the two hundred foot range didn't show ammonia. Olson stated the actual source of the deep water would be identified in the preliminary report, what is going to be the cheapest source for treatment. Is it the second, or third aquifer? That chemistry would be reviewed in that pilot study. The costs that are included in this report are planning level to give you an idea of what these options run. Konshok stated I don't want to be surprised. We're focusing on iron treatment, and possibly forgot to count the cost of ammonia treatment.

Konshok questioned the medium depth aquifer is the one we haven't tested yet? Olson stated we had a well in the 50's and it was very high in iron. We would want to again test that for other contaminants. We're confident it's free and clear. That was a test going into that aquifer. There was very little information available because there were very few wells in that aquifer. Burlingame stated Elsner was the only one who never it was there. Olson stated we'll take a look at that and it would be incorporated in that pilot study.

Konshok questioned on option four, you're talking one deep well at well seven location, and then two to four wells at the five, six, eight location? Olson stated it was a challenge to put this report together. We're trying to come up with as many options as possible. In option four we would have the capacity with going with just one deep well, however we would have the capacity to meet the city's needs. The unfortunate part is we'd still be dealing with shallow unconfined aquifer that does have nitrates, and the other risks with surface contaminations. Our other options we purposed straight up deep aquifer to eliminate the shallow nitrate concentrations. We could have put in another option with a conventional plant with a shallow well and a deep well, and done that number. However our recommendation is to avoid the shallow aquifer at all costs. It's to get into a confined aquifer where we know the water quality, and can rely on consistent water quality.

Konshok questioned at this point you don't know how many deep wells you're talking about at the well tower site? Burlingame stated the problem is you put in a production well and you might get three hundred GPM, or you might get one thousand. We won't know that until you put in a test well and test it long term. Konshok stated that's true at either the well seven location or at the water tower site. Olson stated we do have a test well at seven, so we have an idea of what we may get from a production well in that aquifer. We did include four wells in our cost estimates to be conservative. If we do all the wells and a treatment plant, we included four wells. There's a very likely possibility with some of the rates that we're seeing from the agricultural community those irrigators are pumping very, very high volumes of water, and there's a possibility that we could get by with two.

Carroll questioned what aquifer are they using? Olson stated they are likely in the middle aquifer. Burlingame stated one hundred and forty to one hundred and ninety feet. Carroll questioned how much water is down there, if we're in competition with the irrigators? Christofferson stated in talking with the DNR, it seems like there's quite a bit. We have priority over any irrigator. It's human consumption over agricultural. Carroll

questioned does the DNR issue permits on an annual basis. Christofferson answered they do. The DNR will require some monitoring on everything we've talked about.

Olson stated in the last few weeks they've really been active. They've learned we're looking at things, and we're definitely going to lean on some of their research, and they want to participate. They are focusing on the interconnection of all these aquifers. That's really why they want to be involved. They want a handle on how they impact each other. They've done a lot of research in this area.

Mikesh questioned what's the next step? Olson stated we would recommend looking at getting a report together on a treatment process. A pressurized filter plant looks to be the best option. Todd Johnson stated it seems like a good path to go. You guys have avoided any catastrophe for the past fourteen years. Things are ratcheting up now. We've looked at a lot of options over the years, going east of the river, going deep, going shallow. A treatment plant can guarantee quality water and not have issues. Then you can keep your shallow wells and blend. Burlingame stated we wouldn't be getting rid of them because DNR will use them.

Carroll stated this is a huge expense. It's a major move for the city. We need to make sure we have safe drinking water for all our residents and visitors. Strodtman stated we will help you search for funding.

Rod Nordberg questioned in your cost analysis, did you get a breakdown of cost per user over the years? Olson stated we did a really high level. Vairavan stated we would do that once we get into the preliminary engineering report. At that time we'll do a net resident worth analysis. You have a capital cost and a operation cost per year. Then we come up with a dollar value that's representing all your improvements over twenty to thirty years, and then compare apples to apples. Then we can put in a cost per user. That will be in the next step. We'll basically have one number for each option. We consider the operational costs, maintenance costs, capital costs, the inflation, value depreciation for different options, and then you come up with that number that will give you the most economical option.

A motion was made by Mikesh, seconded by Utke, and unanimously carried to authorize Ulteig Engineers to create a Preliminary Engineering Report for further analysis and cost estimates for a comprehensive water study.

4. ADJOURNMENT: **A motion was made by Utke, seconded by Mikesh, and unanimously carried to adjourn the workshop at 7:00 p.m.**

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Mayor Nancy J. Carroll

ATTEST:

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Margie M. Vik
City Clerk