Village of Tuluksak, Alaska

WATER TREATMENT STUDY

Clear water after a successful jar test. Sludge in bottom of jars contains iron, manganese, arsenic, and removed color compounds.

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WATER TREATMENT STUDY
TULUKSAK, ALASKA

I. EXECUTIVE SUMMARY

As part of the ongoing effort of bringing piped water and sewer to the Lower Kuskokwim River community of Tuluksak, Alaska (2005 population of 466), CE2 Engineers, Inc. (CE2) examined alternative treatment methods to remove iron, manganese, color, and arsenic from the ground water source of the two new wells drilled in 2005. The objective of the examination was to find a practical method to treat the water to meet current and anticipated U.S. Environmental Protection Agency (EPA) water quality standards. Findings from this analysis will be used to design a new water treatment process.

Study Approach and Procedures:

- Analyze existing water quality data from the well field;
- Collect water samples from the well field and perform basic water quality screening tests and bench-scale laboratory tests (jar tests) to identify potential water treatment processes;
- Perform an on-site water treatment pilot study to verify and optimize the treatment process indicated by the jar tests.
- Determine the potential for disinfection byproducts formation due to the addition of chlorine disinfectant.
- Size and specify the type of water treatment equipment, filter loading rates and chemical application rates for the proposed water treatment process.
- Determine how much sludge is generated in the process and what the expected concentration of arsenic would be in the sludge to determine if the sludge must be treated as hazardous waste.

Study Findings:

- Raw water quality varied slightly between wells. Wells had moderate color, high levels of iron and manganese, and moderate levels of arsenic.

- New wells drilled in 2005 appear to be true groundwater, as the aquifers were in fine sands over a hundred feet below the ground surface, though no microscopic examination was made to verify true groundwater. See the attached map located in Appendix F.
- A significant amount of the iron (7-8 ppm) was dissolved in the water, as an open container of clear well water turned reddish brown after an hour of being exposed to the air.
- Jar tests were successful in finding a process to treat the water using chemical oxidation with chlorine, adding coagulants, flocculation, and settling. Iron, manganese, arsenic, and color were removed to levels below those required by water quality regulations.
- Pilot tests indicated use of a conventional plant. A series of pressure vessels using chemical oxidation, coagulation through coarse media and filtration in multimedia arrangement was not successful. A batch process was successful, but longer residence times in the batch process indicated problems with leaching of manganese in the sludge back into the treated water.
- The recommended water treatment process for the community will sequentially utilize the following operations at 60 gpm maximum:
  1. Process water preheat.
  2. Oxidation of iron, manganese, and arsenic by injection of chlorine in a pressure vessel, with 40 minutes of reaction time.
  3. Injection of a coagulant blend to form floc to remove colloidal iron, manganese, arsenic, and color.
  4. Use of a conventional open-top treatment vessel with flocculation, clarification, and multimedia filter sections.
  5. pH and alkalinity adjustment downstream of the treatment vessels, if required for minimizing lead and copper leaching into the water from piping and plumbing fixtures.
- Disinfection byproducts (DBP) – Trihalomethanes (THM) and Haloacetic acids (HAA) should be well below the maximum allowable limits under federal Stage Two rules (effective December 2003). No special treatment for reducing disinfection byproducts is anticipated. However, adequate floor space should be provided for additional DBP removal, if future regulations require additional reductions in contaminant levels of DBP.

- After the system has been in production for a while, finished water should be tested for corrosivity, and if required the water chemistry changed to modify the pH, achieve a neutral Langlier Index and address any lead and copper issues.

  Note: Water quality data for well water is typically: Ca 36.1 mg/l as Ca^{+2}, Hardness 106 mg/l as CaCO3, Alkalinity as CaCO3 108 mg/l, TDS 176 mg/l, pH 7.06. This gives a calculated Langalier Index (LI) using the AWWA calculator of –0.76 at 45°F, which would be the temperature of a typical water distribution loop. This water would be slightly corrosive and could cause lead and copper issues in older building plumbing. Raising the pH to 7.7 and maintaining the same alkalinity level would produce a LI of –0.23. To do this would require addition of soda ash to raise pH, and possibly some sodium bicarbonate to restore alkalinity. The actual amounts of chemical added for pH and alkalinity adjustment would be fine-tuned after the wells have been in production for a while.

- Sludge from the process is less than 1 ppm of arsenic, so it is not considered hazardous waste.

II. INTRODUCTION

CE2 was tasked with the development of a water treatment process to cost-effectively produce safe, aesthetically pleasing drinking water for consumers in the community. Completed tasks were as follows:

- Physical characteristics of the community water source and its chemistry were examined and the existing water treatment system evaluated.
- Regulatory requirements of the EPA and the State of Alaska were researched to understand what the proposed Tuluksak water treatment system must accomplish to stay in compliance with water regulations and standards for the present and the foreseeable future.
- Various treatment technologies were evaluated, preferred processes were proposed, and the processes bench tested (commonly called "jar tests"). Pilot tests followed to verify the efficacy of the final proposed treatment processes. After the pilot tests were completed, the results were examined and the best process was recommended.
- Recommendations were made for the actual process and related equipment, including suggested chemical feed rates and treatment vessel loading rates.

The following sections discuss the above tasks in detail.

III. EXISTING COMMUNITY WATER SOURCE, NEW WELLS AND TREATMENT SYSTEM

A. Existing Community Water Source

The Village of Tuluksak draws its water for the existing water treatment plant from a 6-in cased well located just outside the water treatment/Washeteria building. The well, about 56-ft deep, has supplied the needs of residents using the Washeteria and watering point for about 20 years. Water is high in iron, moderate in manganese and color. The school uses treated water from the existing water treatment plant.

B. Existing Water Treatment System

Water treatment in the existing water treatment plant consists of the following process:

1. Raw water is pumped out of the old well adjacent to the water treatment plant.
2. The incoming raw water is preheated to 55F.
3. Potassium permanganate is injected into the heated raw water line.
4. The raw water line flows into a 10,000-gallon galvanized steel bolted-and-gasketed settling tank inside the water treatment building.
5. The oxidized iron in the water forms pin floc, which settles overnight at the bottom of the settling tank.
6. The next day, water is transferred from the settling tank, through a multimedia filter, and into a 10,000-gallon water storage tank, where a pressure pump draws water off the bottom and supplies water to the watering point, Washeteria, and the school building.

C. New Water Source

In 2005, two new 6-inch wells were drilled near the power plant approximately 1,350 linear feet southeast from the existing well and water treatment plant. The wells were through numerous layers of very dense sand. Water bearing layers were found from 135 to 159 feet in Well 05-1, and from 172 to 191 feet from the ground surface in Well 05-2. At the time they were drilled, both wells were developed and test pumped at 75 GPM for a 24-hour period with a 20-foot

drawdown from static water level. The static water surface in both wells was within 20 feet of the land surface. The community is currently applying for water rights.

The aquifer serving the two above wells consists of fine sands with some pea gravel. The aquifer lies underneath layers of silts, and fine and coarse sands (see well logs in Appendix B). The wells were drilled in September 2005, using 6-in steel casing.

CE2 has collected well water data for each new well. A full laboratory analysis is presented in Appendix A, and summarized in Table 1 below. Raw water was collected from wells on July 31, 2006, with each well running at 18 gpm after a 2 to 3-week period of pumping to stabilize water quality.

TABLE 1 – Raw Water Parameters

Water Parameter	Well W05-1	Well W05-2	MCL
Total Organic Carbon, dissolved	44.8 mg/l	45.7 mg/l	See note at end of table
Total Organic Carbon	47.1 mg/l	48.0 mg/l	
UV254	0.0540 cm^{-1}	0.0900 cm^{-1}	
Total Dissolved Solids	176 mg/l	185 mg/l	500 mg/l
Turbidity	0.85 NTU	1.99 NTU	0.5 NTU
True Color	65 PCU	55 PCU	15 PCU
Total Alkalinity as $CaCO_3$	108 mg/l	108 mg/l	
OH Alkalinity	ND	ND	
Hardness as $CaCO_3$	106 mg/l	104 mg/l	
pH	7.06	6.98	6.5 to 8.5
Aluminum	ND	ND	0.05 to 0.2 mg/l
Calcium	36.1 mg/l	29.9 mg/l	
Magnesium	3.85 mg/l	5.08 mg/l	
Silver	ND	ND	0.1 mg/l
Nitrate-N (measured as nitrogen)	ND	ND	10.0 mg/l
Nitrite-N (measured as nitrogen)	ND	ND	1.0 mg/l
Bromide	ND	ND	0.1 mg/l
Antimony	ND	ND	6 µg/l
Arsenic	36.3 µg/l	49.9 µg/l	10 µg/l
Barium	146 µg/l	184 µg/l	2000 µg/l
Beryllium	ND	ND	4 µg/l
Cadmium	ND	ND	5 µg/l
Chromium	ND	ND	100 µg/l
Copper	ND	ND	1000 µg/l
Cyanide	ND	ND	0.2 µg/l

Water Parameter	Well W05-1	Well W05-2	MCL
Fluoride	ND	ND	2 mg/l
Mercury by Cold Vapor	ND	ND	0.2 µg/l
Nickel	ND	ND	100 µg/l
Selenium	ND	ND	50 µg/l
Thallium	ND	ND	2 µg/l
Chloride	3.09 mg/l	1.96 mg/l	250 mg/l
Langlier Index @40F	-1.15	-1.28	
Langlier Index @140F	-0.07	-0.20	
Iron	6.99 mg/l	8.41 mg/l	0.3 mg/l
Odor (TON)	ND	ND	3 TON
Manganese	0.331 mg/l	0.326 mg/l	0.05 mg/l
Sodium	2.65 mg/l	2.47 mg/l	250 mg/l
Sulfate	2.18 mg/l	ND	250 mg/l
Zinc	ND	ND	500 mg/l
Total Potential Trihalomethane	69.7 µg/l	140 µg/l	80 µg/l
Total Potential HAA5	60.1 µg/l	147 µg/l	60 µg/l
Ammonia (as nitrogen)	0.36 mg/l	0.96 mg/l	Tested onsite
Dissolved oxygen	5.7 mg/l	5.8 mg/l	
Hydrogen sulfide	0.04 mg/l	0.02 mg/l	
Carbon dioxide	45 mg/l	60 mg/l	

Note: Organic carbon values from the laboratory for raw water were very high (over 40 mg/l), making their values suspect. Organic Carbon values for 2005, when the wells were drilled were 2.1 mg/l for TOC and 1.7 mg/l for DOC.

IV. REGULATORY REQUIREMENTS

A. Surface Water Treatment Rule Requirements

The new wells may be considered a true groundwater source, as the aquifer is located well over 100-ft below the surface, with multiple layers of fine sands that would act as a natural filter. However, with the proposed water treatment process, using conventional treatment, followed by multimedia filtration, chlorination and residence time, the necessary 3-log removal/inactivation of *giardia* cysts by multimedia filtration and chlorination, and the 4-log inactivation of viruses by chlorination will meet the SWTR anyway. Therefore, the issue of the well field being a true groundwater source, or groundwater under the influence of surface water (GWUISW) is moot.

B. State of Alaska Water Quality Requirements

The Alaska Department of Environmental Conservation (ADEC) is the primary agency in Alaska responsible for enforcement of water treatment regulations, through agreements with the United States Environmental Protection Agency. Potable water distributed to the public in Tuluksak must therefore meet all EPA and ADEC requirements. Those water quality parameters of particular concern for the system are listed in Table 2. There are many more on the EPA list of primary contaminants, however most of them are volatile organic compounds that have not shown up in any of the well water tested in Tuluksak.

TABLE 2 – EPA National Primary Drinking Water Standards Highlights

Contaminant	MCL
Antimony	0.006 mg/l
Arsenic	0.010 mg/l as of 1/23/06
Barium	2 mg/l
Beryllium	0.004 mg/l
Bromate	0.10 mg/l
Cadmium	0.005 mg/l
Chromium (total)	0.1 mg/l
Copper (action level)	1.3 mg/l
Cyanide (as free cyanide)	0.2 mg/l
Fluoride	4.0 mg/l
Haloacetic Acids	0.060 mg/l
Lead (action level)	0.015 mg/l
Mercury (inorganic)	0.002 mg/l
Nitrate (measured as nitrogen)	10.0 mg/l
Nitrite (measured as nitrogen)	1.0 mg/l
Selenium	0.05 mg/l
Total Trihalomethanes (TTHM)	0.080 mg/l
Turbidity	0.5 NTU

TABLE 3– EPA National Secondary Drinking Water Standards

Contaminant	MCL
Aluminum	0.05 to 0.2 mg/l
Chloride	250 mg/l
Color	15 PCU
Copper	1.0 mg/l
Corrosivity	Noncorrosive
Fluoride	2.0 mg/l
Foaming Agents	0.5 mg/l
Iron	0.3 mg/l
Manganese	0.05 mg/l
Odor	3 T.O.N.
pH	6.5 to 8.5
Silver	0.1 mg/l
Sulfate	250 mg/l
Total Dissolved Solids (TDS)	500 mg/l
Zinc	5 mg/l

C. Disinfectant and Disinfectant Byproducts Requirements

Disinfection of drinking water is required to kill or inactivate organisms that have not been removed in the treatment process. Disinfectants can react with natural organic matter (NOM), however, to produce disinfection byproducts that have been associated with increased cancer risks. At Tuluksak, disinfection is presently accomplished with hypochlorite solutions such as chlorine bleach or a solution of calcium hypochlorite. Trihalomethanes (THM), consisting of chloroform, bromodichloromethane, dibromochloromethane, and bromoform, are one category of byproduct that may be produced through disinfection using chlorine.

Total Trihalomethanes (TTHM) typically constitute only 15-25 percent of the total organic halide concentrations in chlorinated drinking water. Haloacetic acids (HAA) are also produced as a byproduct of disinfection through chlorination of NOM. Five of these haloacetic acids (HAA5) that have been investigated include monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid.

The EPA recognized that THM and HAA5 might cause serious health problems, such as cancer, if the concentration and length of dose were above certain levels. To minimize this risk to the public, regulations limit the amounts disinfectant byproducts (DBP) in drinking water. The EPA first regulated TTHM in finished drinking water in 1979, with the maximum contaminant level set at 100 micrograms per liter based on running annual average quarterly samples. Systems serving more than 10,000 persons were required to comply with these regulations. Enforcement for systems serving fewer than 10,000 had been left to the discretion of the individual states.

TTHM and HAA5 concentrations are further regulated under the new Disinfectants/Disinfection Byproducts Rule (D/DBPR), which was promulgated in two stages. Stage One Maximum Contaminant Levels (MCL) were set TTHM to 80 micrograms per liter and HAA5 to 60 micrograms per liter (so-called "80/60" rule), as of December 2003 for systems serving fewer than 10,000 people in Alaska. Stage Two will change some of the testing requirements for DBP and introduced LRAA (Locational Running Annual Averages) to the requirements. Monitoring programs for drinking water systems not having a very small system exception will have to have

their monitoring plans in place by April 1, 2007, and be collecting samples by April 1, 2008. Water systems keeping their MCL for THHM below 40 µg/l and HAA5 below 30 µg/l, and are certified for same, are exempted from the additional monitoring and study requirements. EPA summary sheets for the Disinfectant Byproducts Rule are found in Appendix C.

D. Lead and Copper Rule Requirements

On June 7, 1991, the EPA adopted the National Primary Drinking Water Regulations for Lead and Copper. Lead and copper typically enter drinking water through the corrosion of copper piping, solder joints, and brass plumbing fixtures, and are monitored because of the possible detrimental health affects associated with their consumption. Studies of lead in children indicate a slowing of physical and mental development. Adults may experience kidney damage, higher blood pressure, and other adverse effects. Heath effects due to the consumption of copper are not long term; however, they may include nausea and diarrhea. The 90^{th} percentile action level for lead is 15 ppb and for copper it is 1.3 ppm.

E. How Water Quality Regulatory Requirements Apply to Tuluksak

If the well field water source is classified as a true ground water, the EPA's SWTR should not apply here.

The D/DBPR limits the amount of disinfectant byproducts present in the treated water. Proper filtration techniques will minimize the amount of NOM and other compounds that could potentially react with chlorine to produce disinfection byproducts. The final determination of the system to stay below Stage 1 D/DBPR values of 80/60 will still have to await production and process fine-tuning, as the characteristics of the water source will change after production level pumping of 60 gpm (30 gpm from each well or 60 gpm from one well) for sustained periods. Stage 2 D/DBPR values of 40/30 will also have to await production and process fine-tuning. If, after treatment has been optimized and the chlorine residual minimized into the distribution system, the values of disinfectant byproducts could be above the MCL. Provision for a granulated activated carbon (GAC) filter vessel or other DPM removal scheme could be made to lower DBP to acceptable levels.

The Lead and Copper Rule regulates the maximum contaminant level (MCL) allowed in potable water. Prevention of lead and copper contamination involves interrupting or slowing the corrosion process in copper and brass piping and plumbing fixtures. After production treatment is in place, the water can be analyzed and its Langlier index calculated. This will be an indication if pH and/or alkalinity adjustment will be needed to prevent leaching of lead and copper in the drinking water of consumers.

V. PROPOSED WATER TREATMENT PROCESSES

The main contaminants found in the water at Tuluksak were:

- Iron
- Manganese
- Arsenic
- Color

It was found from testing that much of the iron and manganese was dissolved in the water, so removal of these contaminants would require oxidation to convert it to a form that would settle out. With the combination of the above four contaminants, treatment became complicated, and much jar and pilot testing was performed to come up with a straightforward process. Because of the significant amount of color in the water, removing iron and manganese by a catalytic process (pyrolusite) or manganese greensand was not practical. So several three-step pilot processes were proposed that involved:

1. Oxidation;
2. Coagulation;
3. Clarification;
4. Multimedia filtration.

A. Chemical Oxidation, Coagulation, and Multimedia Filtration in Pressure Vessels

This process involves the following steps (see Figure 1 on next page):

1. Raw water from the wells is preheated to 50°F for more effective treatment.
2. Potassium permanganate is injected into the process stream to oxidize the iron and manganese.
3. Water and oxidizer flow through a detention tank for 40 minutes to fully oxidize the iron and manganese.
4. A blend of inorganic coagulant and polymer is injected into the process stream after detention to form a floc of the oxidized iron and color for removal. Detention time in this step is also 30 minutes.
5. The floc-laden process water flows through a multimedia filter at 1 to 2 gpm per square foot of filter area, removing the contaminants.

The advantage of this process is that it is a simple flow-through system with the minimum of pumps and auxiliary equipment, with only the well pump to supply and transfer water, and a backwash pump to clean the multimedia filter.

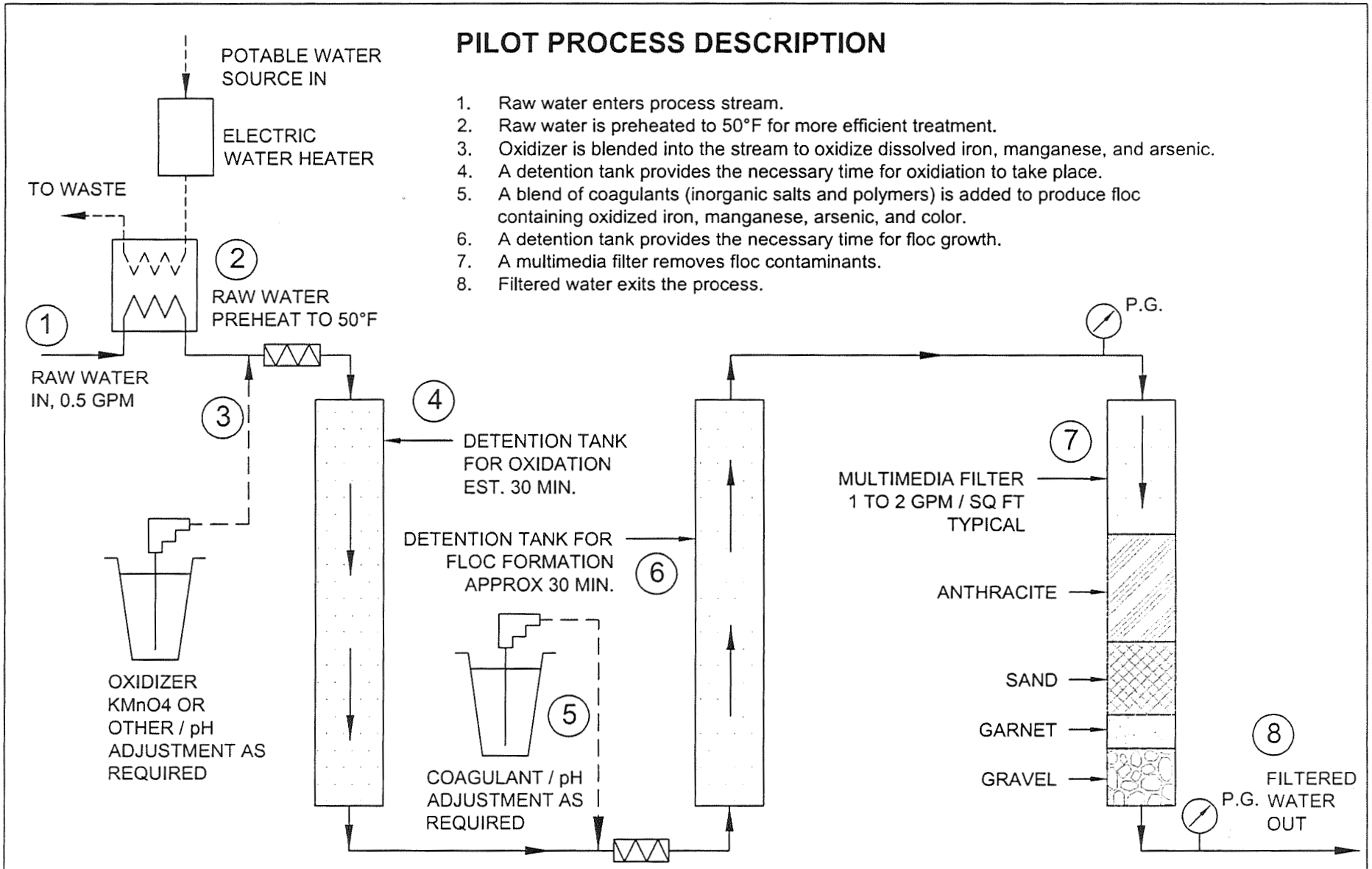

FIGURE 1 - OXIDATION, COAGULATION, AND MULTIMEDIA FILTRATION IN PRESSURE VESSELS

B. Chemical Oxidation, Coagulation, Coarse Filtration, and Multimedia Filtration in Pressure Vessels

If the level of contaminants is significant, the process as shown in Figure 1 can be problematic. Contaminants could load up or blind the multimedia filter, requiring frequent backwashes. This could lower the efficiency of the process by backwash water demand increasing to 25% or more of the filtered water. The process could be modified by adding a layer of coarse anthracite in the second detention tank. This layer is designed to form floc and provide slight agitation through the detention tank. Constructed versions of this system have been found to capture 70% of the floc in this stage, extending run time in the multimedia filter significantly. A schematic of this system is shown in Figure 2 below.

PILOT PROCESS DESCRIPTION

1. Raw water enters process stream.
2. Raw water is preheated to 50°F for more efficient and effective treatment.
3. Oxidizer is blended into the stream to oxidize dissolved iron, manganese, and arsenic.
4. A detention tank provides the necessary time for oxidation to take place.
5. A blend of coagulants (inorganic salts and polymers) is added to produce floc containing oxidized iron, manganese, arsenic, and color.
6. A filter column consisting of 3-ft of coarse anthracite acts as a contactor and a coarse filter where floc is formed and trapped. This column should take 70 % of the contaminants, which would extend the filter run of the multimedia filter downstream.
7. Some water is wasted as required to match filter loadings as they would exist in a full-sized plant. The pilot columns for the filter/contactor and the multimedia filter would be the same size. Filter loading for the filter/contactor would be twice that of the multimedial filter, hence the wasting of half the water from the filter/contactor would match actual multimedia filter hydraulic loading.
8. A multimedia filter removes floc contaminants.
9. Filtered water exits the process.

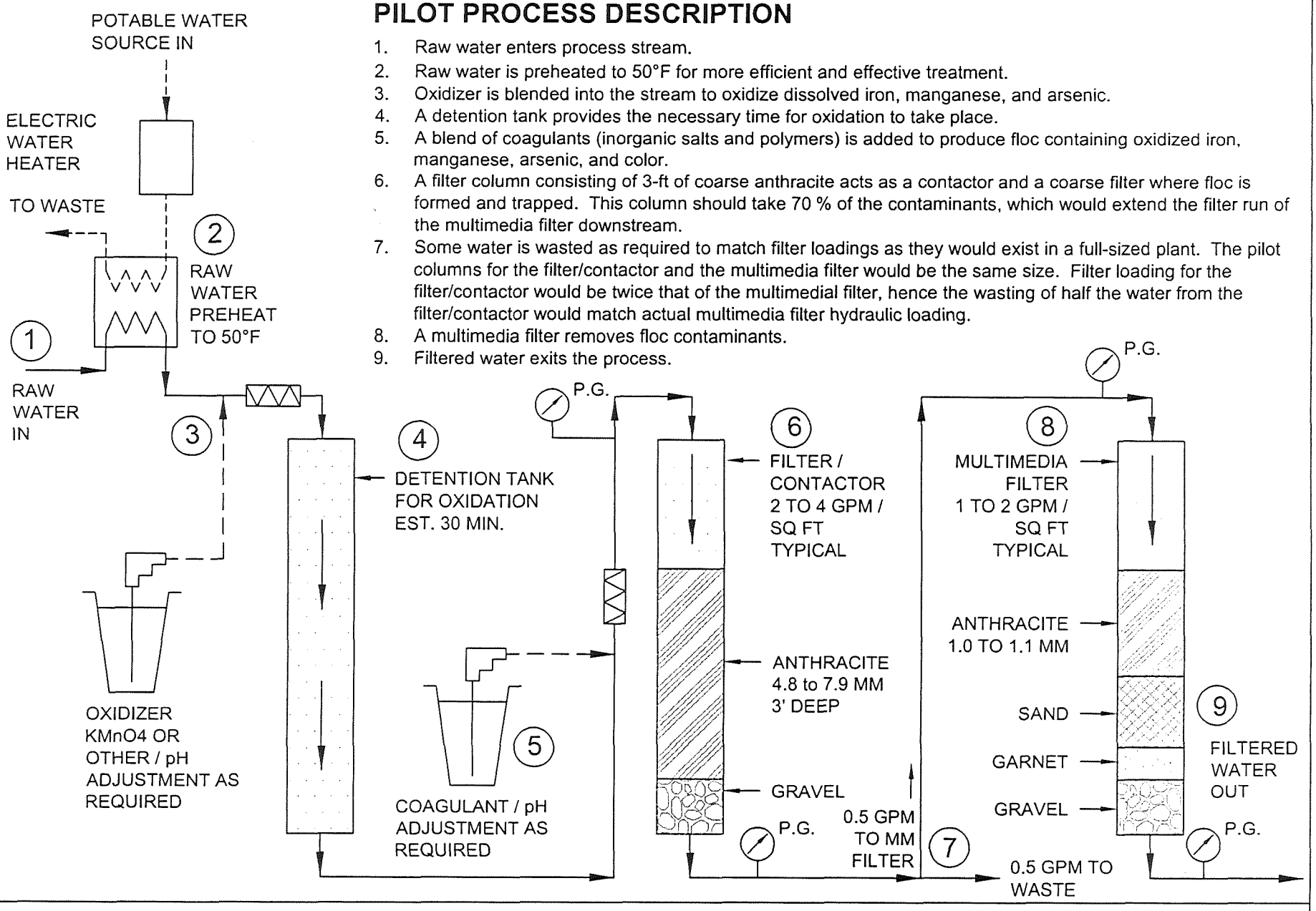

FIGURE 2 - OXIDATION, COAGULATION, COARSE FILTRATION, AND MULTIMEDIA FILTRATION IN PRESSURE VESSELS

C. Oxidation by Air, Coagulation, Settling, and Multimedia Filtration in Open Tank

This process, as seen in Figure 3 on the next page, uses inducted air to oxidize the iron in the system.

1. The aerated well water flows into an open top tank, where oxidation takes place for approximately 30 minutes.
2. After this time, a coagulant blend is added into the tank while the water is stirred at high speed for 5 minutes.
3. Then the water in the tank is mixed at slow speed for about 30 minutes to build floc.
4. After slow mixing, the coagulant is allowed to settle to the bottom for about 4 hours.
5. Clarified water from the open tank is pumped through a multimedia filter at 1-to 2-gpm/sq ft.
6. Sludge laden water is pumped to waste.

PILOT PROCESS DESCRIPTION

1. Raw water enters process stream.
2. Raw water is preheated to 50°F for more efficient and effective treatment.
3. The raw water is run through a three-stage venturi-type air inductor that supersaturates the raw water with oxygen. Iron is oxidized, with the arsenic attaching to the oxidized iron. Experimentation will determine if the manganese will be oxidized at this stage.
4. The oxygen-saturated water flows into the open reactor vessel for completion of the oxidation process (about 30 minutes).

4a. The motorized mixer with adjustable speed drive is run at high speed to receive a batch quantity of coagulant blends (step 4b). When the coagulants and water in the vessel are thoroughly mixed (approximately 10 minutes), the motorized mixer is run at very low speed about 30 minutes to aid in floc formation. After slow mixing, the floc is allowed to build and settle for about 4 hours.

4b. A blend of coagulants (inorganic salts and polymers) is added to produce floc containing oxidized iron, manganese, arsenic, and color.

4c. After settlement and consolidation of the floc, the clarified water is transferred out of the reactor vessel to the multimedia filter.

4d. Sludge is pumped to waste. A sample of the sludge is analyzed for arsenic concentration in a TCLP (Toxic Characteristic Leaching Procedure for 8 metals, including arsenic).

5. A multimedia filter removes remaining floc contaminants. Filter loading is 1 to 3 gpm/sq ft. Filter loading will be optimized to produce the greatest amount of filtered water with the minimum amount of backwash.
6. Filtered water exits the process.

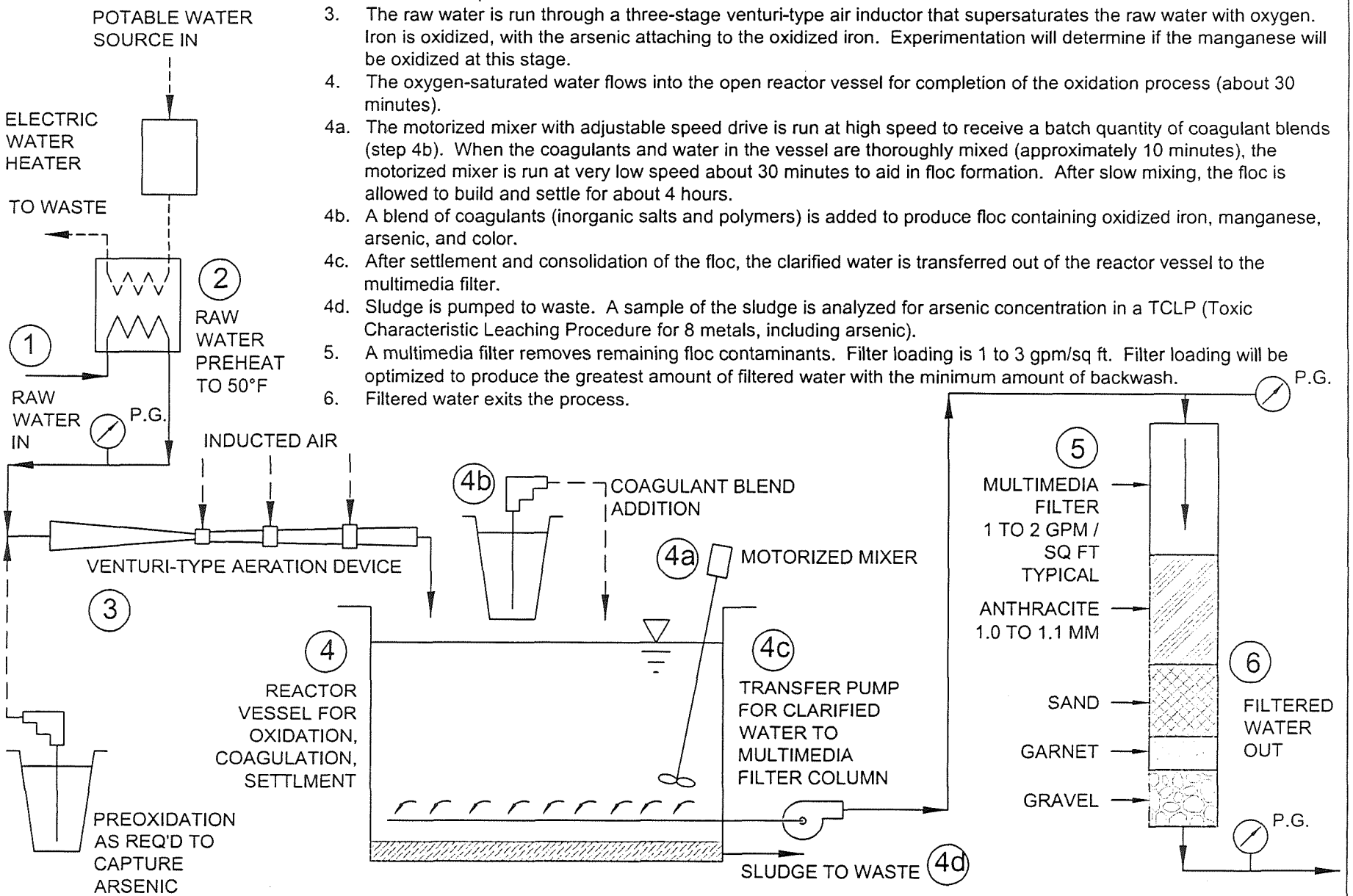

FIGURE 3 - AIR OXIDATION, COAGULATION, SETTLEMENT, AND MULTIMEDIA FILTRATION

D. Chemical Oxidation, Coagulation, Settling, and Multimedia Filtration in Open Tank

This process, as seen in Figure 4 on the next page, is similar to the process used in Figure 3, but uses potassium permanganate or chlorine to oxidize the iron in the system.

1. The well water with potassium permanganate addition flows into an open top tank, where oxidation takes place for approximately 30 to 40 minutes.
2. After this time, a coagulant blend is added into the tank while the water is stirred at high speed for 5 minutes.
3. Then the water in the tank is mixed at slow speed for about 30 minutes to build floc.
4. After slow mixing, the coagulant is allowed to settle to the bottom for about 4 hours.
5. Clarified water from the open tank is pumped through a multimedia filter at 1-to 2-gpm/sq ft.
6. Sludge laden water is pumped to waste.

PILOT PROCESS DESCRIPTION

1. Raw water enters process stream.
2. Raw water is preheated to 50°F for more efficient and effective treatment.
3. An oxidant, such as KMnO4 or chlorine is injected into the raw water stream to oxidize iron, arsenic, and manganese.
4. The raw water and oxidant flows into the open reactor vessel for completion of the oxidation process (about 30 minutes).

4a. A blend of coagulants (inorganic salts and polymers) is added to produce floc containing oxidized iron, manganese, arsenic, and color.

4b. The motorized mixer with adjustable speed drive is run at high speed to receive a batch quantity of coagulant blends (step 4b). When the coagulants and water in the vessel are thoroughly mixed (approximately 10 minutes), the motorized mixer is run at very low speed about 30 minutes to aid in floc formation. After slow mixing, the floc is allowed to build and settle for about 4 hours.

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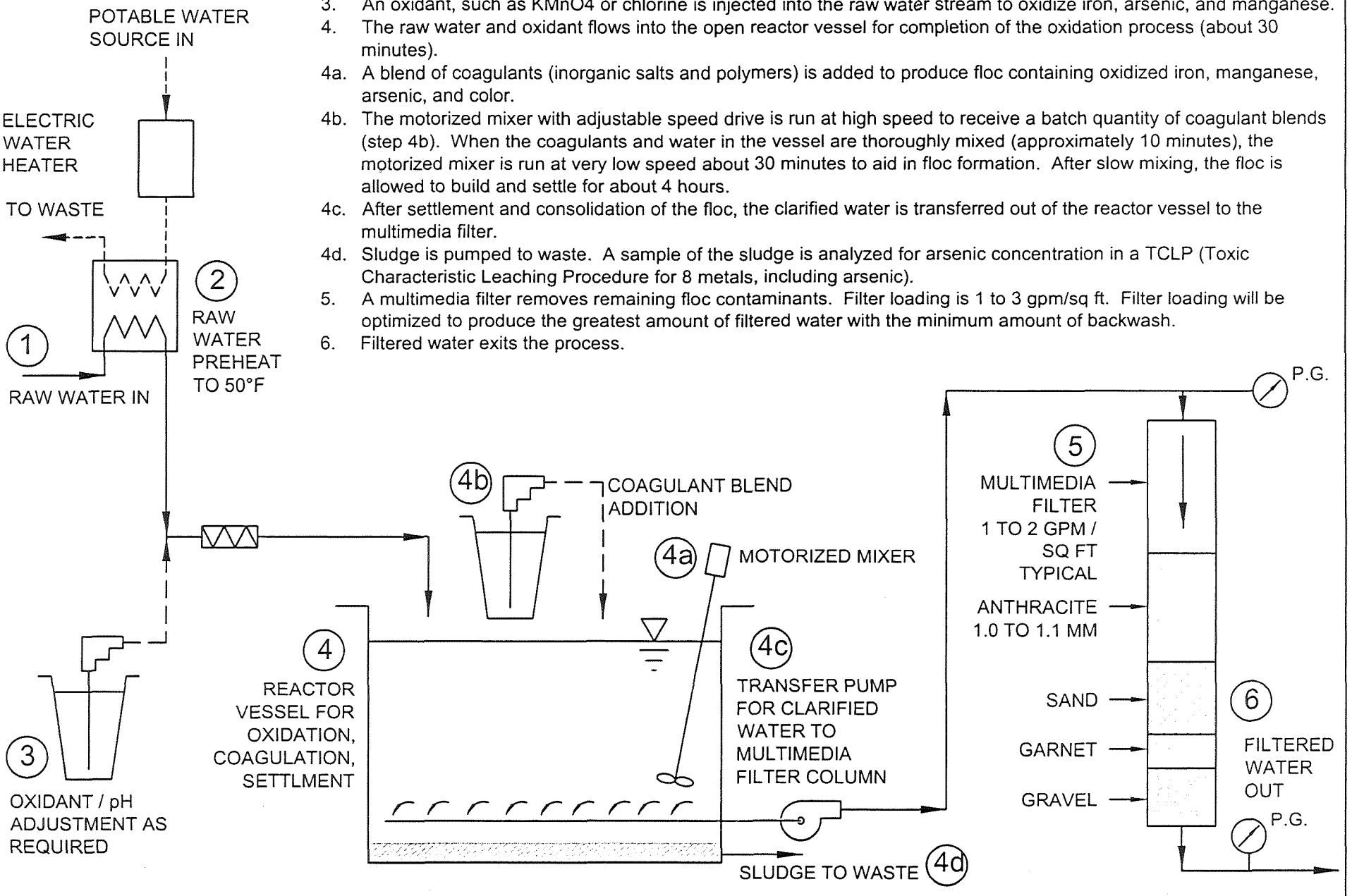

FIGURE 4 - CHEMICAL OXIDATION, COAGULATION, SETTLEMENT, AND MULTIMEDIA FILTRATION

VI. BENCH TESTING AND PILOT STUDIES FOR BEST TREATMENT STRATEGY

A. Bench Testing Strategy

Bench testing was performed to find the best method to oxidize the iron and manganese and to find the best coagulants for flocculation and filtration. The most promising results would be used for subsequent pilot testing to find the best treatment process to remove contaminants from the well water sources.

Bench testing was conducted at the Tuluksak Water and Sewer Project camp building hallway using a six-place gang mixer, six one-liter beakers, a HACH 2100P Turbidimeter, a HACH CEL/890 Advanced Portable Laboratory and syringe filtration testing equipment. An Industrial Test Systems (ISI) arsenic test kit was used to estimate arsenic levels down to 5 µg/l. Syringe filters were used to simulate multimedia filters. A Pall 32 mm dia 1.2-micron cartridge filter was stacked on top of a Pall 32 mm dia 5-micron cartridge filter. Water samples were drawn through this stack for turbidity, iron, manganese, and arsenic readings. For true color readings, an additional 0.45-micron syringe filter was added.

UV254 measurement was performed using a Real Tech Real UVT portable meter.

Mixing and flocculation of the samples included a rapid mix of 315 revolutions per minute (rpm) for about 4 minutes and flocculation at 10 RPM for 30 minutes. The mean velocity gradient G (a measure of the energy of mixing) was greater than 300 sec^{-1} during flash mixing to simulate a static mixer and approximately 28 sec^{-1} during flocculation to simulate gentle agitation while the floc travels through the piping and through the flocculation chambers.

Raw water was obtained for bench testing and pilot studies by hauling well water from each well. Water quality values are shown in Table 4 below.

TABLE 4– Water Characteristics from Water Wells

Contaminant	Well W05-1 Concentration (mg/l) Or Other Value	Well W05-2 Concentration (mg/l) Or Other Value
Turbidity	0.58 NTU	1.71 NTU
Apparent Color	41 PCU	38 PCU
Iron	8.1 mg/l	9.24 mg/l
Manganese	0.376 mg/l	0.343 mg/l
Arsenic	15 µg/l	35 µg/l
Total Dissolved Solids (TDS)	96 mg/l	84 mg/l
pH	7.33	7.40

B. Bench Testing Process

A water sample in a 1-liter beaker was taken and was exposed to the air for one hour. The clear water changed color to orange, but little sediment was observed at the bottom of the beaker. This experiment showed that a significant portion of the iron in the water was dissolved and existed as Fe^{+2}, as exposure to the air oxidized it to Fe^{+3} and formed the orange color in the beaker.

It was decided to also oxidize the iron and manganese chemically, so jar tests were set up, using potassium permanganate ($KMnO_4$) as an oxidant. The use of chlorine solutions was avoided to prevent the formation of disinfectant byproducts, such as THHM and HAA5. Results are shown in Table 5 below.

TABLE 5– Jar Test for Optimum Dose of $KMnO_4$ for water from Well W05-1

Jar No.	Dose mg/l	PH	Turbidity Filtered NTU	Color Filtered PCU	Fe mg/l	Mn mg/l	Remarks
1	2	7.33	0.08	2	0.05	O/L	Mn over limit low range test
2	4	7.33	0.08	10	0.04	0.22	Good settling
3	6	7.33	0.30	8	0.02	0.11	Good settling
4	8	7.33	0.19		0.06	0.68	Light pink (overdose)
5	10	7.33					Overdose
6	12	7.33					Overdose

Small pin floc was seen in Jars 2, 3, and 4 (jars are numbered from left to right). From this jar test, it was determined that the optimum dose would be between 5 and 6 mg/l of $KMnO_4$. Figure 5 below shows the jar testing for the optimum $KMnO_4$ dose.

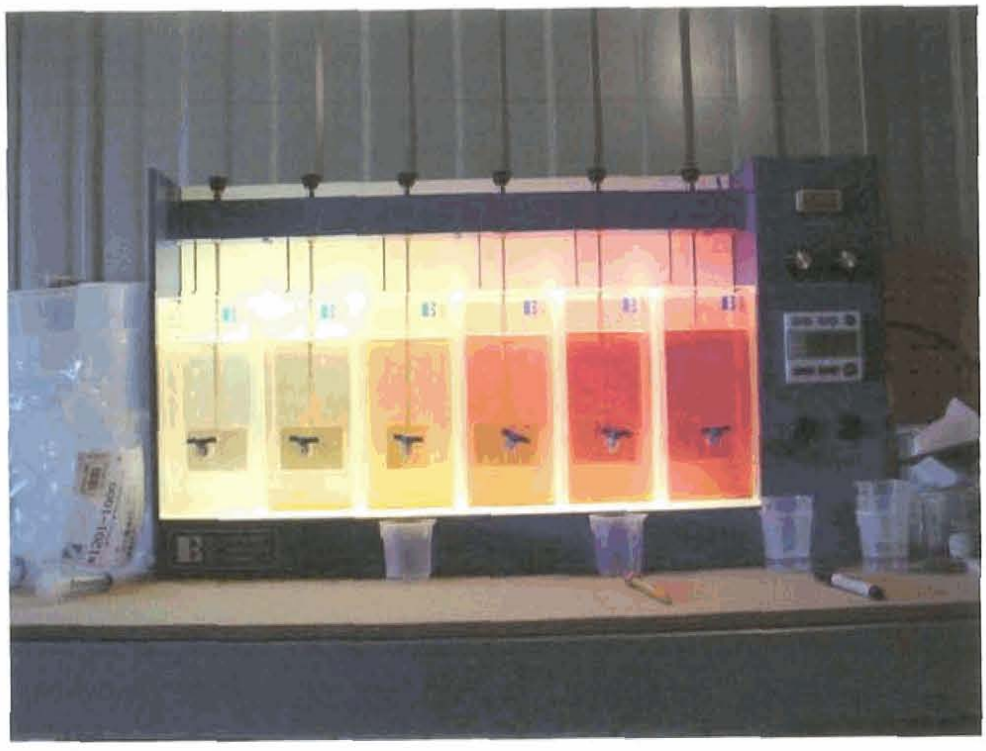

Figure 5 – Jar tests for optimum $KMnO_4$ dose

The next step was to perform a further jar test with the optimum dose of $KMnO_4$, followed by a range of doses of a coagulant blend of 80% SternPAC inorganic coagulant plus 20% Arctic Floc 12100 polymer. The procedure was as follows.

1. Inject the $KMnO_4$ in jars with water preheated to 55°F, mix at 320 rpm for 2 minutes, and then mix at 30 rpm for 30 to 40 minutes for oxidation detention time.
2. Inject the 80/20 coagulant blend in the jars, mix at 320 rpm for 2 minutes, then down to 10 rpm for coagulation, then 30 minutes with the mixer stopped for settling.

TABLE 6– Jar test for optimum dose of coagulant blend for water from Well W05-1, using $KMnO_4$ as an oxidant, and 80% SternPac/20% AF 12100 as a coagulant

Jar No.	$KMnO_4$ Dose mg/l	80/20 Coagulant dose µl	PH	Turbidity Filtered NTU	Color Filtered PCU	Fe mg/l	Mn mg/l	Remarks
1	5	5	7.33	0.06	0	0.02	0	
2	5	10	7.33	0.06	0	0.01	0	Arsenic test showed no color on the strip (0µg/l)
3	5	15	7.33	0.07	3	0.04	0.04	
4	5	20	7.33	0.06	0	0.01	0.03	
5	5	25	7.33	0.07	0	0.07	0.05	
6	5	30	7.33	0.07	9	0.03	0.08	

This jar test produced excellent results with almost complete removal of all contaminants for a process using chemical oxidation, followed by coagulation and filtration. Oxidation of the iron also enabled excellent arsenic removal. Figure 6 below shows the results of the jar tests. Jars are numbered 1 through 6, left to right.

Figure 6 – Jar test with KMnO4, followed by 80/20 blend of SternPAC and Arctic Floc 12100

A similar jar test to that shown in Table 6 was performed, but air injection was substituted for chemical oxidation. Results are shown in Table 7 below.

TABLE 7 – Jar test for optimum dose of coagulant blend for water from Well W05-2, using oxidation by air injection, and 80% SternPac / 20% AF 12100 as a coagulant

Jar No.	80/20 Coagulant dose µl	PH	Turbidity Filtered NTU	Color Filtered PCU	Fe mg/l	Mn mg/l	Remarks
1	8	7.40	0.14	0	0.02	0.225	Medium Floc
2	11	7.40	0.06	0	0.02	0.119	Medium Floc
3	14	7.40	0.07	0	0.10	0.243	Medium Floc
4	17	7.40	0.20	12	0.02	0.174	Medium Floc
5	20	7.40	0.07	11	0.03	0.184	Small Floc
6	25	7.40	0.11	D/R	D/R	D/R	Cloudy, plugged filter

This jar test produced good iron and color removal, and filtered turbidity values were similar to the jar test in Table 6. Manganese removal, however, was poor.

A jar test, using air for oxidation, followed by an 80/20 mix of ferric sulfate and Arctic Floc 12100 was also performed on water from Well W05-1. The water turned a dark red-brown and cloudy, with no floc formation, so the jar tests were discontinued.

Another set of jar tests was performed to examine the relationship between the ratio of SternPAC and Arctic Floc 12100, using $KMnO_4$ as an oxidant. The SternPAC/Arctic Floc 12100 ratio was changed to 90/10. Samples were tested from both wells (W05-1 and W05-2). The results are shown in Table 8 below.

TABLE 8– Jar test for optimum dose of coagulant blend for waters from Well W05-1 and W05-2, using oxidation by $KMnO_4$, and 90% SternPac / 10% AF 12100 as a coagulant

Jar No.	$KMnO_4$ Dose mg/l	90/10 Coagulant dose µl	PH	Turbidity Filtered NTU	Color Filtered PCU	Fe mg/l	Mn mg/l	UV254	Remarks
1	5	5	7.33	0.06	0	0.11	0.42	0.0247	Well W05-1
2	5	10	7.33	0.06	0	0.04	0	0.0173	Well W05-1
3	5	15	7.33	0.07	3	0.04	0	0.0179	Well W05-1
4	5	5	7.40	0.06	0	0.02	0.125	0.0204	Well W05-2
5	5	10	7.40	0.06	1	0.02	0.265	0.0250	Well W05-2
6	5	15	7.40	0.05	0	0.18	0.267	0.0260	Well W05-2

The UV254 value for raw water from Well W05-1 was 0.0389, indicating a TOC removal of 56%, assuming UV254 values correlated with TOC. The UV254 value for raw water from Well W05-2 was 0.0607, indicating a TOC removal of 66%. Iron removal was good for both wells, with an 80/20 coagulant blend working best for iron removal (0.01 mg/l level for 80/20 vs 0.04 mg/l for 90/10), and manganese removal was good as for the 80/20 coagulant blend.

Another set of jar tests was performed to further examine the relationship between the ratio of SternPAC and Arctic Floc 12100, using $KMnO_4$ as an oxidant. The SternPAC/Arctic Floc 12100 ratio was changed to 70/30. Samples were tested from both wells (W05-1 and W05-2). The results are shown in Table 9 below.

TABLE 9– Jar test for optimum dose of coagulant blend for waters from Well W05-1 and W05-2, using oxidation by $KMnO_4$, and 70% SternPac / 30% AF 12100 as a coagulant

Jar No.	$KMnO_4$ Dose mg/l	70/30 Coagulant dose µl	PH	Turbidity Filtered NTU	Color Filtered PCU	Fe mg/l	Mn mg/l	UV254	Remarks
1	5	5	7.33	0.07	0	0.02	0.375	0.0060	Well W05-1
2	5	10	7.33	0.11	5	0.07	0.164	0.0072	Well W05-1
3	5	15	7.33	0.11	5	0.04	0.155	0.0054	Well W05-1
4	5	5	7.40	0.06	13	0.05	0.638	0.0089	Well W05-2
5	5	10	7.40	0.18	9	0.04	0.448	0.0085	Well W05-2
6	5	15	7.40	0.07	12	0.07	0.485	0.0066	Well W05-2

Iron removal was fairly good, but not as good as using the 80/20 blend of coagulants. Manganese removal was poor, and color removal, though satisfactory, was not nearly as good as in the use of the 80/20 coagulant blend. UV254 values of the filtered water indicated TOC removals in the order of 60% for W05-1 and 78% for W05-2.

A set of jar tests was performed to examine the relationship between the ratio of inorganic coagulant ACH (Aluminum chlorohydrate) and Arctic Floc 12100, using $KMnO_4$ as an oxidant. An initial ratio of 80/20 was used. Samples were tested from both wells (W05-1 and W05-2). The results are shown in Table 10 below.

TABLE 10 – Jar test for optimum dose of coagulant blend for waters from Well W05-1 and W05-2, using oxidation by $KMnO_4$, and 80% ACH / 20% AF 12100 as a coagulant

Jar No.	$KMnO_4$ Dose mg/l	80/20 Coagulant dose µl	PH	Turbidity Filtered NTU	Color Filtered PCU	Fe mg/l	Mn mg/l	UV254	Remarks
1	5	10	7.33	0.07	2	0.01	0	0.0142	Well W05-1
2	5	15	7.33	0.09	20	0.02	0	0.0141	Well W05-1
3	5	20	7.33	0.10	0	0.00	0	0.0122	Well W05-1
4	5	10	7.40	0.06	16	0	0	0.0099	Well W05-2
5	5	15	7.40	0.06	6	0	0	0.0142	Well W05-2
6	5	20	7.40	0.05	19	0.04	0	0.0120	Well W05-2

For well W05-1, filtered water turbidity was fair to good, with good color removal values. Iron and manganese removal were excellent. For raw water UV254 reading of 0.0235, TOC removal was estimated at 40%. Well W05-2 results were also good, though at different dosages than that of W05-1.

Another set of jar tests was performed to further examine the relationship between the ratio of ACH (Aluminum chlorohydrate) and Arctic Floc 12100, using $KMnO_4$ as an oxidant. A ratio of 90/10 was used. Samples were tested from well W05-1. The results are shown in Table 11 below.

TABLE 11 – Jar test for optimum dose of coagulant blend for waters from Well W05-1, using oxidation by $KMnO_4$, and 80% ACH / 20% AF 12100 as a coagulant

Jar No.	$KMnO_4$ Dose mg/l	90/10 Coagulant dose µl	PH	Turbidity Filtered NTU	Color Filtered PCU	Fe mg/l	Mn mg/l	UV254	Remarks
1	5	5	7.57	0.07	16	0.03	0.188	0.0149	
2	5	10	7.65	0.06	0	0.01	0.073	0.0129	
3	5	15	7.65	0.07	7	0.03	0.073	0.0161	
4	5	20	7.65	0.05	0	0.04	0.085	0.0134	
5	5	25	7.61	0.05	8	0.02	0.073	0.0099	
6	5	30	7.62	0.06	0	0	0.086	0.0111	

The UV254 value for raw water from Well W05-1 was 0.0201, indicating a TOC removal of 56%. The UV254 value for raw water from Well W05-2 was 0.0607, indicating a TOC removal of 66%, assuming a direct correlation between TOC and UV254. Iron removal was good for both wells, but manganese removal was not consistent and not as good for the two wells as for the 80/20 coagulant blend.

An additional jar test using a 70-30 ratio of ACH to Arctic Floc 12100 was performed, but floc stayed suspended and settled very slowly. Performance was poor.

A jar test using a 90/10 blend of PAX XL-9 inorganic coagulant and Arctic Floc 12100 produced decent results, but the floc had a lot of floating particles, which would be detrimental to the treatment process. Other ratios produced cloudy settled particles on the bottom of the beakers. Syringe filters plugged up fairly quickly.

Another set of jar tests were performed to examine the relationship between various doses of Nalco 8185, using $KMnO_4$ as an oxidant. Nalco is basically a blend of 50%ACH and a polyamine (Nalco 8105, or Arctic Floc 12100). Samples were tested from well W05-2. The results are shown in Table 12 below.

TABLE 12 – Jar test for optimum dose of coagulant blend for waters from Well W05-2, using oxidation by $KMnO_4$, and Nalco 8185 coagulant

Jar No.	$KMnO_4$ Dose mg/l	8185 Coagulant dose µl	PH	Turbidity Filtered NTU	Color Filtered PCU	Fe mg/l	Mn mg/l	UV254	Remarks
1	7	5	D/R	0.07	0	0.05	0.077	0.0356	Medium sized floc
2	7	10	D/R	0.07	0	0.06	0.070	0.0133	Medium sized floc
3	7	15	D/R	0.09	0	0.02	0.024	0.0087	Medium sized floc
4	7	20	D/R	0.10	0	0.04	0	0.0191	Medium sized floc
5	7	25	D/R	0.10	0	0.04	0	0.0057	Medium sized floc
6	7	30	D/R	0.15	0	0.09	0.054	0.0333	Medium sized floc

Note: Problems with pH meters prevented reading of pH, until a new pH probe was obtained. PH values in subsequent tests ranged from 7.2 to 7.7.

The UV254 value for raw water from Well W05-2 was 0.069, indicating a TOC removal of 87%. Iron and manganese removal were very good, with the optimum dose of Nalco 8185 about 17 mg/l. Nalco 8185 results were very good, with good turbidity and excellent color values. Iron and manganese removal was good. Overall, the 80/20 SternPac-Arctic Floc 12100 blend performed slightly better than Nalco 8185. Turbidity was slightly lower with the 80/20 blend, and iron and manganese levels were lowered to non detectable levels. UV 254 absorption levels were close to each other in the filtered water from the jars.

C. Bench Testing Conclusions

Raw water quality varied somewhat, due to the low rate of pumping out of the wells. Chemical oxidation worked well to oxidize the iron and manganese, but air oxidation did not oxidize the manganese. Blends of inorganic coagulants and polymers, such as Nalco 8185, SternPAC/Arctic Floc 12100 or ACH/Arctic Floc 12100 did well in blends in the order of an 80/20 ratio. Too much polymer in the blend formed floc that did not settle well and caused problems with filtering through a syringe filter.

In the pilot testing section of the study it was decided not to perform any pilot studies using the air oxidation technique (as shown in Figure 3), as it was not as effective as chemical oxidation using potassium permanganate.

D. Pilot Studies

1. Chemical Oxidation, Coagulation, Settling in Open Tank, with Pressure Multimedia Filtration

It was decided that the pilot test as shown in Figure 4 would be performed first to understand how much energy will be required in flocculation, and would expose possible problems in scaling up the process from jar tests. The process vessel was a 300-gal vertical HDPE tank with a ½-hp Neptune mixer mounted on top, with a propeller set about 4-ft below the top of the tank, as shown in Figure 7 below.

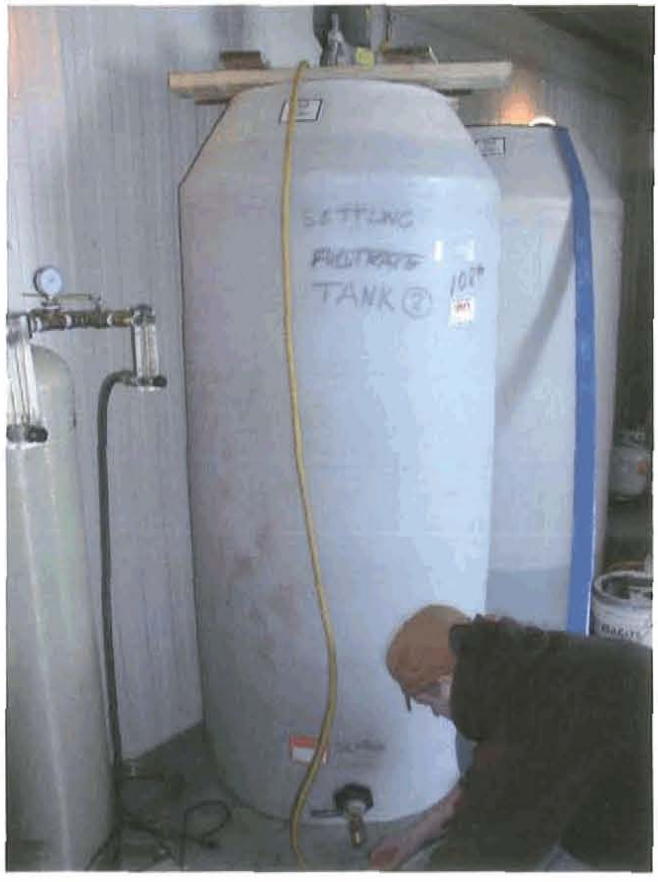

Figure 7 – 300-gal tank and mixer for oxidation, coagulation, and settling.

Multimedia filtration was accomplished by use of a manifold and a clear 8-in dia PVC multimedia pressure filter column. This apparatus is shown in Figure 8 below.

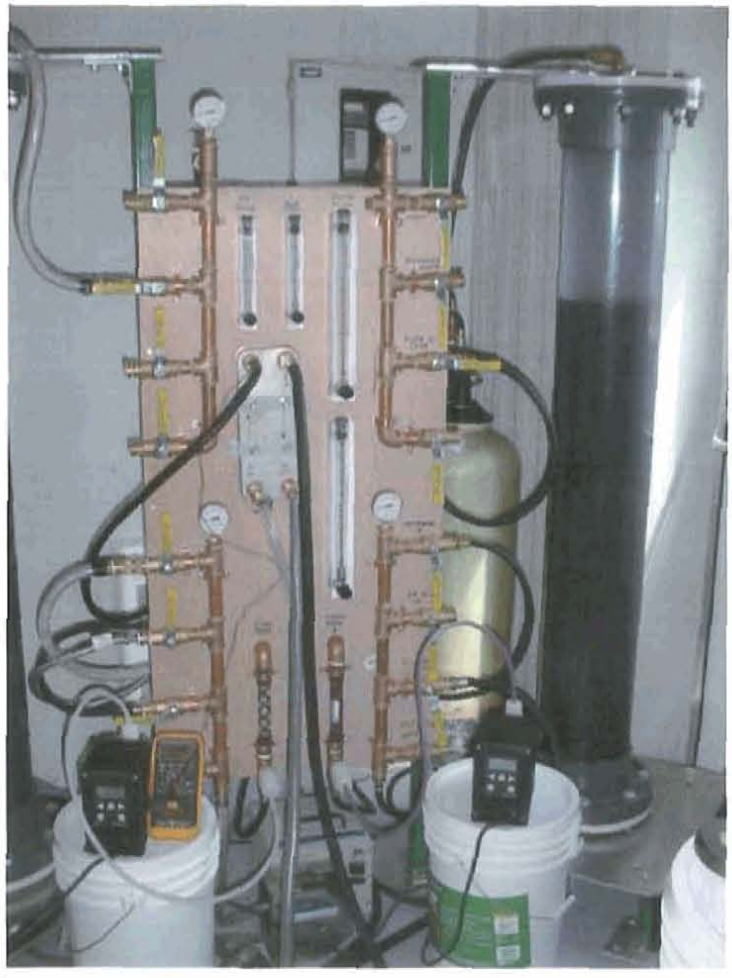

Figure 8 – Test manifold and 8-in dia clear PVC multimedia pressure filter column. Four brass pipe manifolds direct the flow of water or air any way desired. Two static mixers allow for mixing of injected chemicals. Four rotameters provide for process water, backwash water, or air scour flow measurement. A flat plate heat exchanger allows raw water preheat. All the flow connections are made with washing machine hoses in accordance with the needs of the pilot test desired.

After performing jar tests, a test run was initially made with 4.22 mg/l of potassium permanganate rapid mixed in the tank for five minutes, then slow mixed for 30 to 40 minutes for oxidation. 11 mg/l of an 80/20 blend of ACH and Arctic Floc 12100 was added to the tank, rapid mixed for 5 minutes, slow mixed for 35 minutes, then allowed to floc and settle. There were problems in the mixing system of the tank, as the floc formation performance of the system was poor, though the jar tests indicated that it should work. The mixer motor and shaft were realigned to be centered along the longitudinal axis of the tank. After considerable experimentation, an additional paddle was added to the mixer shaft and better rapid and slow mixing occurred. This was an important discovery, as it was found that the mixing energy was

critical to good floc formation. Another fresh batch of water for the pilot process was added, the process was started in late afternoon, and settlement occurred overnight. Flocculation and settling were successful, and the sludge level in the 300-gallon tank after settlement indicated about 1% sludge in the process.

After settlement, clarified liquid from the tank was pumped through the 8-in dia x 60-in high multimedia filter at 0.5 gpm to simulate a filter loading of 1.5 gpm/sq ft. The filter run duration was 8-hours. Filtrate turbidities ranged from 0.12 NTU initially to 0.06 to 0.07 for most of the run. Iron started out at 0.02 mg/l at the start of the run to 0 for the end of the run. True color varied between 0 and 3 PCU. Manganese ranged from 0.4 mg/l to 0.1 mg/l. After some examination, it was found that the tap water at the camp was still high in manganese, which affected our ability to initially clean and condition the multimedia filter. The media retained a significant amount of residual manganese for quite a few batches. The pH of the water remained relatively constant throughout the process at 7.6. UV254 measurements of raw water and filtrate indicated a 68% removal of TOC. However, because of TOC measurement problems, A UV254 correlation with TOC was not conclusively made. Arsenic readings throughout the filter run indicated 3 µg/l, well below the required MCL of 10 µg/l.

A total of six batches were made, with similar results to the above reported batch. Each batch created about 260 gallons of clear water. Total filter run time was about 48 hours. Filter loading was calculated to be: 260 gal/batch x 6 batches /0.349 sq ft = 4470 gal/sq ft filter area.

Backwash of the filter took about 10 minutes and 52 gallons of water, and filter conditioning took about 10 gallons, so backwashing and conditioning used:

62 gal/4470 gal x 100 = 1.5% of filtered water.

Add about 4% waste from the settlement tank, and the whole system consumed about 5.5% of the filtered water in sludge wasting and filter backwash and conditioning.

Process efficiency: = 100% - 5.5% = 94.5%

It was noted that in the batch process, manganese would start leaching back into the clear water if the processed water stayed too long in the 300-gallon tank. This was noted by the pilot process operator, but was not recorded, due to operational problems with the system at the time.

The treatment process appeared to remove a significant amount of the total organic carbon (TOC) in the raw water. However laboratory data was suspect on the raw water TOC values. Table 13 below shows the contaminant levels during the pilot test (data from Appendix E).

TABLE 13 – Contaminant levels for raw and treated water from Water Treatment Process 1 - Chemical Oxidation, Coagulation, Settling in Open Tank, with Pressure Multimedia Filtration

Note: Raw water TOC values from the analytical laboratory are suspect, as they are so high. 2005 TOC values from the wells were around 2.7 mg/l.

Water Sample Location	TOC Value (mg/l)	UV254 Absorption cm^{-1}	Percent TOC removal	Iron (mg/l)	Mang-anese (µg/l)	Arsenic (µg/l)	True Color (PCU)	THHM Potential (mg/l)	HAA5 Potential (mg/l)
Raw Water	48.0 see note below	0.0900		8.41	326	49.9	55	140	147
Effluent from Multimedia Filter	1.94	0.0340	96% see note below	ND	193	ND	0	55.7 (<80 MCL)	37.1 (<60 MCL)

2. Chemical Oxidation, Coagulation, Coarse Filtration, and Multimedia Filtration in Pressure Vessels

The first pilot test series with a batch type steps of oxidation, coagulation, settlement and filtration was successful, and so a second type of pilot test was run with essentially the same system, but continuously, as shown in Figure 2. The pilot testing apparatus shown in Figure 8 was replumbed to include another 8-in dia x 60-in high clear PVC vessel containing a bed of coarse anthracite. The pilot run lasted about 8 hours before the coarse anthracite and multimedia filters were loaded with contaminants. From observations in the areas of the clear filter columns above the filter media, it was noted that floc formation was small. Backwash of both filter columns was required after an 8-hour run. The efficiency of the filter run was as follows:

Filter throughput: 8hr x 60min/hr x 0.7 gal/min = 336 gallons in 8 hours

Backwash: 2 filters x 52 gal/filter = 104 gallons

Filter Conditioning: 10 gallons:

Water treatment process backwash water use = $\frac{(104 \text{ gal} + 10 \text{ gal})}{336 \text{ gal}} \times 100 = 33.9\%$

Process efficiency: = 100% - 33.9% = 66.1%

Contaminant removal values for this process were good, except for manganese removal. However, backwash and filter conditioning required one-third of the treated water, which is excessive. Because of excessive backwash water requirements, the pilot run was discontinued.

It was apparent that successful coagulation of the oxidized iron and color into usable floc depends upon an adequate amount of energy imparted to the water during flocculation, and that natural flow through coarse anthracite will not work on this water.

Because of the poor backwash efficiency results in the above pilot test, it was decided that a pilot test involving the process as shown in Figure 1 (oxidation, coagulation, multimedia filtration in pressure vessels), that is, the same process as completed above without the coarse anthracite column, would not yield any better results.

It was noted that in the batch process, manganese would start leaching back into the clear water if the processed water stayed too long (over two hours) in the 300-gallon tank.

The treatment process removed a significant amount of the total organic carbon (TOC) in the raw water. Table 14 below shows the contaminant levels during the pilot test (data from Appendix E).

TABLE 14 – Contaminant levels for raw and treated water from Water Treatment Process 2 - Chemical Oxidation, Coagulation, Coarse Filtration, and Multimedia Filtration in Pressure Vessels

Water Sample Location	TOC Value (mg/l)	UV254 Absorption cm^{-1}	Percent TOC removal	Iron (mg/l)	Man-ganese (µg/l)	Arsenic (µg/l)	True Color (PCU)	THHM Potential (mg/l)	HAA5 Potential (mg/l)
Raw Water	48.0	0.0900		8.41	326	49.9	55	140	147
Effluent from Multimedia Filter	1.82	0.0260	96%	ND	252	ND	0	53.4 (<80 MCL)	40.4 (<60 MCL)

VII. CONCLUSIONS

A. Raw water quality from the two wells varied throughout the pilot runs, and were slightly different from each other. However, they were similar enough to each other to enable the same type of water treatment process. The wells had high levels of iron and manganese, low turbidity, moderate arsenic, and moderate to high color. Samples of water, when exposed to air, turned reddish brown, indicating that a significant portion of the iron in the water was Fe^{+2} that oxidized to Fe^{+3}.

B. The iron and manganese appeared to be readily oxidized by potassium permanganate ($KMnO_4$) without a pH change.

C. Color and colloidal iron and manganese were readily removed by the use of a blend of inorganic and polymer coagulants. The ratio of inorganic and polymer coagulant components could be optimized for best overall performance in removal of turbidity, iron, manganese, arsenic, and true color. Filtered water UV254 values indicated lower TOC removal than actually occurred during the process. UV254 values did not correlate in a linear fashion with actual TOC values, though their directional trend did agree with decreases in TOC. However, raw water quality changed during the testing, indicating that sustained pumping during production would have to be done to stabilize the raw water parameters.

D. Arsenic was readily removed down to levels well below 10 µg/l (new level under the Arsenic Rule). Arsenic in all successful jar and pilot tests removed arsenic down to non-detectable levels.

E. Flocculation and settlement were easily accomplished in the jars, but took some work in the pilot process (1000:1 scaling up) to accomplish the same result. Reconfiguring the mixer geometry and paddle shape resulted in successful flocculation in the pilot process. This indicated that the energy of flocculation was critical to the success of the process.

F. Sludge production was in the order of 1 to 1.5 percent of the water used in the process. Arsenic in the sludge was below 1 ppm, so that the sludge would not be considered hazardous material, and could be disposed of without special precautions.

G. The floc would settle out at a rate of 4 ft/hr or 0.07 ft/minute.

H. Sludge remaining in the clarified water too long (about 2-hours) would result in manganese leaching into the clarified water, which would raise manganese values in the finished water.

I. Multimedia filtration of the clarified water was excellent, resulting in turbidities of less than 0.1 NTU consistently, color between 0 and 5 PCU, and filter runs of up to 48 hours.

J. Final determination of the level of disinfectant byproducts (DPB, specifically THHM and HAA5) due to finished water being disinfected by chlorine will have to await production, as the level of TOC in raw water will change (and probably go down) as the wells are pumped at production level rates. However, with present well water quality, the process will have THHM and HAA5 well below present Stage 1 levels of 80 µg/l and 60 µg/l, respectively. Under the Standard Methods for the Examination of Water and Wastewater Method No. 5710, DPB potential is found by adding chlorine disinfectant five to ten times the amount that process water disinfection uses. In normal practice at a future treatment plant in Tuluksak, chlorine disinfectant would be added in the order of 1 mg/l. Even with rechlorination of the water storage tank one time, the DPB levels should be well below the MCL.

K. The same situation as in I above applies to the finished water's effect on lead and copper. Once the treatment system runs on a production basis, and the wells are pumped at 50 to 60 gpm continuously, a slight change in pH and/or alkalinity may have to be made to keep the water from being corrosive to lead and copper.

Note: Water quality data for well water is typically: Ca 36.1 mg/l as Ca^{+2}, Hardness 106 mg/l as CaCO3, Alkalinity as CaCO3 108 mg/l, TDS 176 mg/l, pH 7.06. This gives a

calculated Langalier Index (LI) using the AWWA calculator of –0.76 at 45°F, which would be the temperature of a typical water distribution loop. This water would be slightly corrosive and could cause lead and copper issues in older building plumbing. Raising the pH to 7.7 and maintaining the same alkalinity level would produce a LI of –0.23. To do this would require addition of soda ash to raise pH, and possibly some sodium bicarbonate to restore alkalinity. The actual amounts of chemical added for pH and alkalinity adjustment would be fine-tuned after the wells have been in production for a while.

VIII. RECOMMENDATIONS

A. The water is readily treatable using a conventional process. This process would consist of the following steps:

1. Preheat incoming well water to 50°F for more effective treatment.
2. Inject a potassium permanganate or chlorine solution into the process stream at about 5 mg/l. For economic and operational considerations, oxidation with ozone was not considered, but should remain a possibility down the line.
3. The process stream would enter a pressure vessel with near plug flow characteristics for 40 minutes of detention time. For Tuluksak, this would be about 2,500-gallons at 60 gpm maximum process flow rate. Having oxidation take place inside the pressure vessel would prevent the water from being in contact with air, which would oxidize some of the iron in the water, and possibly cause a potassium permanganate or chlorine overdose. To have control over this step in the treatment process, a closed vessel would be the best choice.
4. The process stream would enter into the flocculation chamber of the conventional plant. Residence time in the flocculation chamber would be 30 to 40 minutes at rated flow. Flocculation should occur in two stages, and flocculator paddle rotational speed controls should have adequate dynamic range. In normal practice in flocculation, velocity gradients (G) will vary from 20 to 75 sec^{-1} (ft/sec/ft). It is recommended that each of the two flocculator paddles and drives be configured to vary G from 15 to 100 sec^{-1}.
5. The clarifier (floc settling section) should have inclined tubes with a steep bottom hopper to collect sludge. Sludge should be wasted in short pumping cycles every 15 to 20 minutes to remove accumulated sludge and prevent leaching of manganese back into the water. The clarifier should be sized conservatively to prevent floc from being drawn into the filter section of the plant.
6. Water flowing out of the clarifier would enter a multimedia filter section. This section should be sized for a filter loading of 2.0 gpm/sq ft maximum for long filter

runs. The multimedia filter should be equipped with an air scour system capable of 2-cfm/sq ft.

B. A blend of 80% SternPAC inorganic coagulant and 20% Arctic Floc 12100 polymer is recommended for flocculation. These chemicals are readily available, and when used with the oxidized iron, manganese, and color, forms medium floc with good settling characteristics, and no floaters. Starting dose would be 10 mg/l. Other blends, such as Nalco 8185, or ACH / Nalco 8156 or Arctic Floc 12100 could also be used. After the wells have been pumped at a 30-60 gpm production rate for some weeks, a few jar tests will verify the blend, and it can be adjusted as required.

C. Based upon pilot testing, disinfectant byproducts (DPB) levels for THHM and HAA5 will be well below Stage 1 MCLs (80 µg/l and 60 µg/l, respectively), and no additional treatment will be needed for DBP removal. If, in the future, additional DBP reduction is required, provision should be made for the addition of a granulated activated carbon (GAC) pressure vessel or other process for further removal of disinfectant byproducts if the treatment train itself cannot meet future D/DBP standards for THHM and HAA5. However, a GAC removal step could be expensive to operate, with the additional cost burden of periodically replacing GAC media or having to regenerate it.

D. Chlorination for disinfection should be kept at the minimum level (0.2 – 0.35 mg/L), in order to minimize disinfectant byproducts.

E. After water production is established and run for a while, filtered water should be analyzed and a Langlier Index (LI) calculated for 40°F and for 140°F. If the Langlier Index is less than –0.5, the pH, calcium hardness, and/or alkalinity can be adjusted using soda ash and sodium bicarbonate, as required, to make the water non-corrosive. The 140°F value of the LI should also be examined, so the water does not form deposits in or corrode water heaters.

F. Because of issues with the pilot testing system as it related to flocculation and sludge removal, manganese levels were higher in the pilot test, even though the jar tests

indicated excellent manganese reduction with several coagulant blends. To minimize uncertainties about the recommended process, the following is recommended:

1. Pump the wells at 30-60 gpm for two weeks (depending upon whether both or one well is used as a water source, which is a conservative rate, based upon test pumping at 75 gpm, when the wells were drilled.
2. Construct a conventional treatment system pilot apparatus, approximately 2-ft wide x 2-ft high x 6-ft long from available materials to test the conventional treatment process. This apparatus could test different configurations of the clarifier to determine the optimum setting to minimize leaching of manganese back into the water from process sludge.
3. Try using a hypochlorite solution for an oxidizer to compare the efficacy of the treatment process with that of potassium permanganate for manganese and DPM precursor removal.
4. Utilize the VSW on-site TOC analyzer to accurately determine process TOC removal without the problems related to sample logistics, laboratory schedules and limited sample hold times.

Appendix A

Laboratory Analysis Report

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301
Web: http://www.us.sgs.com

Paul Weisner
Chuck Eggener Consulting Engr.
P.O. Box 232946
Anchorage, AK 99523

Work Order:	1063346
	Tuluksak VSW W-05-1
Client:	Chuck Eggener Consulting Engr.
Report Date:	July 31, 2006

Released by:
Forest Taylor
2006.07.31
17:09:02 -
08'00'

Enclosed are the analytical results associated with the above workorder.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintained by SGS. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request.

The laboratory certification numbers are AK971-05 (DW), UST-005 (CS) and AK00971 (Micro) for ADEC and 001543 for NELAP.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP, the National Environmental Laboratory Accreditation Program and, when applicable, other regulatory authorities.

If you have any questions regarding this report or if we can be of any other assistance, please contact your SGS Project Manager at 907-562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

PQL	Practical Quantitation Limit (reporting limit).
U	Indicates the analyte was analyzed for but not detected.
F	Indicates value that is greater than or equal to the MDL.
J	The quantitation is an estimation.
ND	Indicates the analyte is not detected.
B	Indicates the analyte is found in a blank associated with the sample.
*	The analyte has exceeded allowable regulatory or control limits.
GT	Greater Than
D	The analyte concentration is the result of a dilution.
LT	Less Than
!	Surrogate out of control limits.
Q	QC parameter out of acceptance range.
M	A matrix effect was present.
JL	The analyte was positively identified, but the quantitation is a low estimation.
E	The analyte result is above the calibrated range.

Note: Soil samples are reported on a dry weight basis unless otherwise specified.

SGS

SGS Ref.#	1063346001	**All Dates/Times are Alaska Standard Time**	
Client Name	Chuck Eggener Consulting Engr.	**Printed Date/Time**	07/31/2006 13:48
Project Name/#	Tuluksak VSW W-05-1	**Collected Date/Time**	06/20/2006 16:15
Client Sample ID	W-05-1RW	**Received Date/Time**	06/22/2006 13:06
Matrix	Drinking Water	**Technical Director**	**Stephen C. Ede**

Sample Remarks:

SM 5910 - %T = 88.0

HAA Formation Potential was analyzed by Montgomery Watson Harza of Monrovia, CA.

TTHM Formation Potential was analyzed by Montgomery Watson Harza of Monrovia, CA.

Parameter	Results		PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Calcium	36.1		0.100	mg/L	SM20 2340B	K		06/28/06	07/12/06	TK
Hardness as CaCO3	106		5.00	mg/L	SM20 2340B	K		06/28/06	07/12/06	TK
Magnesium	3.84		0.100	mg/L	SM20 2340B	K		06/28/06	07/12/06	TK
Metals by ICP/MS										
Aluminum	ND		20.0	ug/L	EP200.8	K		06/28/06	06/30/06	MH
Calcium	32400		500	ug/L	EP200.8	K		06/28/06	06/30/06	MH
Magnesium	3850		50.0	ug/L	EP200.8	K		06/28/06	06/30/06	MH
Silver	ND		1.00	ug/L	EP200.8	K		06/28/06	06/30/06	MH
Waters Department										
Nitrite-N	ND		0.100	mg/L	EPA 353.2	A			06/22/06	ALR
Nitrate-N	ND		0.100	mg/L	EPA 353.2	A			06/22/06	ALR
Bromide	ND		0.100	mg/L	EPA 300.0	A		06/26/06	06/26/06	DSH
Total Organic Carbon	47.1		0.500	mg/L	EPA 415.1	H			06/29/06	TSN
Total Organic Carbon,Dissolved	44.8		0.500	mg/L	EPA 415.1	I			06/30/06	TSN
UV-254	0.0540		0.0200	cm-1	SM20 5910B	C			06/22/06	CAW
Inorganic Contaminants										
Antimony	ND		1.00	ug/L	EP200.8	K	(<6)	06/28/06	06/30/06	MH
Arsenic	36.3	*	5.00	ug/L	EP200.8	K	(<10)	06/28/06	06/30/06	MH
Barium	146		3.00	ug/L	EP200.8	K	(<2000)	06/28/06	06/30/06	MH
Beryllium	ND		0.400	ug/L	EP200.8	K	(<4)	06/28/06	06/30/06	MH
Cadmium	ND		0.500	ug/L	EP200.8	K	(<5)	06/28/06	06/30/06	MH
Chromium	ND		1.00	ug/L	EP200.8	K	(<100)	06/28/06	06/30/06	MH
Cyanide	ND		0.0050	mg/L	SM20 4500-CN C,E	J	(<0.2)	06/26/06	06/27/06	KP

SGS

SGS Ref.#	1063346001	**All Dates/Times are Alaska Standard Time**	
Client Name	Chuck Eggener Consulting Engr.	**Printed Date/Time**	07/31/2006 13:48
Project Name/#	Tuluksak VSW W-05-1	**Collected Date/Time**	06/20/2006 16:15
Client Sample ID	W-05-1RW	**Received Date/Time**	06/22/2006 13:06
Matrix	Drinking Water	**Technical Director**	**Stephen C. Ede**

Parameter	Results		PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Inorganic Contaminants										
Fluoride	ND		0.100	mg/L	EPA 300.0	A	(<2)	06/26/06	06/26/06	DSH
Mercury by Cold Vapor	ND		0.200	ug/L	EP245.1	K	(<0.2)	07/03/06	07/05/06	HKG
Nickel	ND		2.00	ug/L	EP200.8	K	(<100)	06/28/06	06/30/06	MH
Selenium	ND		5.00	ug/L	EP200.8	K	(<50)	06/28/06	06/30/06	MH
Thallium	ND		1.00	ug/L	EP200.8	K	(<2)	06/28/06	06/30/06	MH
Secondary Contaminants										
Calcium	36.1		2.00	mg/L	EP200.7	K		06/28/06	07/12/06	TK
Chloride	3.09		0.100	mg/L	EPA 300.0	A	(<250)	06/26/06	06/26/06	DSH
Color	65.0	*	5.00	PCU	SM20 2120B	D	(<15)		06/22/06	CRY
Copper	ND		1.00	ug/L	EP200.8	K	(<1000)	06/28/06	06/30/06	MH
Fluoride	ND		0.100	mg/L	EPA 300.0	A	(<2)	06/26/06	06/26/06	DSH
Langlier Index @ 40 degree F	-1.15				SM2330B	A			07/13/06	PLW
Alkalinity	108		40.0	mg/L	SM20 2320B	D			06/27/06	PLW
Langlier Index @ 140 degree F	-0.07				SM2330B	A			07/13/06	PLW
CO3 Alkalinity	ND		40.0	mg/L	SM20 2320B	D			06/27/06	PLW
Iron	6.99	*	0.0400	mg/L	EP200.7	K	(<0.3)	06/28/06	07/12/06	TK
HCO3 Alkalinity	108		40.0	mg/L	SM20 2320B	D			06/27/06	PLW
OH Alkalinity	ND		40.0	mg/L	SM20 2320B	D			06/27/06	PLW
Manganese	331	*	1.00	ug/L	EP200.8	K	(<50)	06/28/06	06/30/06	MH
Odor (TON)	ND		1.00	T.O.N.	SM20 2150B	E	(<3)		06/22/06	CRY
pH	7.06		0.100	pH units	EPA 150.1	D	(6.5-8.5)		06/22/06	CRY
Magnesium	3.84		0.200	mg/L	EP200.7	K		06/28/06	07/12/06	TK
Sodium	2.65		2.00	mg/L	EP200.7	K	(<250)	06/28/06	07/12/06	TK
Sulfate	2.18		0.100	mg/L	EPA 300.0	A	(<250)	06/26/06	06/26/06	DSH
Total Dissolved Solids	176		10.0	mg/L	SM20 2540C	D	(<500)		06/27/06	KP
Zinc	ND		5.00	ug/L	EP200.8	K	(<5000)	06/28/06	06/30/06	MH

MWH Laboratories
A Division of MWH Americas, Inc.

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel 626 386 1100
Fax 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory Report

for

SGS Environmental Services Inc.
200 W. Potter Drive

Anchorage , AK 99518

Attention: Forest Taylor
Fax: (907) 561-5301

DATE OF ISSUE
JUL 27 2006
MWH LABORATORIES

YOM Yolanda Martin
Project Manager

ACCREDITED IN ACCORDANCE WITH nelac 01114CA

Report#: 177353
DRINKING

Laboratory certifies that the test results meet all **NELAC** requirements unless noted in the Comments section or the Case Narrative. Following the cover page are QC Report,QC Summary,Data Report,Hits Report, totaling 5 page[s].

MWH Laboratories
A Division of MWH Americas, Inc.

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
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Laboratory
Hits Report
#177353

SGS Environmental Services Inc.
Forest Taylor
200 W. Potter Drive
Anchorage , AK 99518

Samples Received
24-jun-2006 09:18:43

Analyzed	Sample#	Sample ID	Result	Federal MCL	UNITS	MRL
	2606240164	W-05-1 RW 1063346001				
07/19/06	Bromochloroacetic acid		2.97		ug/l	1.0
07/19/06	Bromodichloroacetic acid		4.24		ug/l	1.0
07/07/06	Chlorine Dose		10		mg/l	1.0
07/14/06	Chlorine Residual		2.2		mg/l	0.1
07/19/06	D/DBP Haloacetic Acids (HAA5)		60.1	60	ug/l	1.0
07/19/06	Dichloroacetic acid		27.5		ug/l	1.0
07/19/06	Trichloroacetic acid		32.6		ug/l	1.0
07/08/06	Bromodichloromethane		5.03		ug/l	0.5
06/26/06	Chlorine Dose		10		mg/l	1.0
07/03/06	Chlorine Residual		2.1		mg/l	0.1
07/08/06	Chloroform		64.0		ug/l	0.5
07/08/06	Dibromochloromethane		0.637		ug/l	0.5
07/08/06	Total Potential Trihalomethane		69.7		ug/l	0.5

SUMMARY OF POSITIVE DATA ONLY.

MWH Laboratories
A Division of MWH Americas, Inc.

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
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Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory
Data Report
#177353

SGS Environmental Services Inc.
Forest Taylor
200 W. Potter Drive
Anchorage , AK 99518

Samples Received
06/24/06

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
W-05-1 RW 1063346001 (2606240164) Sampled on 06/20/06 16:15								
				Tot Pot Trihalomethanes 5710B				
07/07/06	07/08/06 00:00	324842	(ML/EPA 551.1)	Bromoform	ND	ug/l	0.5	1
07/07/06	07/08/06 00:00	324842	(ML/EPA 551.1)	Chloroform	64.0	ug/l	0.5	1
07/07/06	06/26/06 00:00	324842	(SM2350)	Chlorine Dose	10	mg/l	1.0	1
07/07/06	07/03/06 00:00	324842	(ML/S 4500CL-G)	Chlorine Residual	2.1	mg/l	0.1	1
07/07/06	07/08/06 00:00	324842	(ML/EPA 551.1)	Dibromochloromethane	0.637	ug/l	0.5	1
07/07/06	07/08/06 00:00	324842	(ML/EPA 551.1)	Bromodichloromethane	5.03	ug/l	0.5	1
07/07/06	07/08/06 00:00	324842	(ML/EPA 551.1)	Total Potential Trihalomethane	69.7	ug/l	0.5	1
			(ML/SM 5710)	1,2-Dibromopropane(70-130)	100	% Rec		
				Total Potential Haloacetic				
07/18/06	07/07/06 00:00	326271	(ML/SM 5710B)	Chlorine Dose	10	mg/l	1.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Bromochloroacetic acid	2.97	ug/l	1.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Bromodichloroacetic acid	4.24	ug/l	1.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Chlorodibromomacetic acid	ND	ug/l	2.0	1
07/18/06	07/14/06 00:00	326271	(ML/SM 5710B)	Chlorine Residual	2.2	mg/l	0.1	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Dibromoacetic acid	ND	ug/l	1.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Dichloroacetic acid	27.5	ug/l	1.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Monobromoacetic acid	ND	ug/l	1.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Monochloroacetic acid	ND	ug/l	2.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Tribromoacetic acid	NA	ug/l	4.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Trichloroacetic acid	32.6	ug/l	1.0	1
07/18/06	07/19/06 00:00	326271	(ML/S6251B)	D/DBP Haloacetic Acids (HAA5)	60.1	ug/l	1.0	1
			(SM5710 6251B)	1,2,3-TCP(80-120)	104	% Rec		
			(SM5710 6251B)	2,3-Dibrom Acid(70-130)	94	% Rec		

SGS

CHAIN OF CUSTODY RECORD
SGS Environmental Services Inc.

1063346

rolina
51101

CLIENT: CE2 Tuluksak VSW	SGS Reference:
CONTACT: CE2 Engineers PHONE NO: (907) 349-1010	PAGE 1 OF 1
PROJECT: Tuluksak VSW SITE/PWSID#: W-05-1	
REPORTS TO: Paul Weisner FAX NO.: (907) 349-1015	
INVOICE TO: CE2 Engineers QUOTE # P.O. NUMBER	

Preservatives Used: $Na_2S_2O_3$, HNO_3, NaOH, HCl, HCl, HCl

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE (C= COMP, G= GRAB)	TC	METALS 1° & 2° (hard) + Ag, Al, Mg, Ca	CN	Fl, Cl, SO4, Br, NO2, NO3	TDS, Alk, pH, Color	ODOR	TOC	MBAS	DOC	UV 254	TURB	Chlorine Demand	HAAS Form Pot	TTHM Form Pot	VOC 524.2	REMARKS
① A-S ~~W-05-1~~	~~Raw Water~~ W-05-1 RW W-05-1RW	06/20/06	4:15	W	18	G	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
② A-C																						

HOLDING

Collected/Relinquished By:(1)	Date	Time	Received By:
[signature]			
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 6/22/06	Time 1306	Received By: [signature]

Shipping Carrier:

Shipping Ticket No:

Samples Received Cold? (Circle) YES NO

Temperature °C: TB=2.6 ; C=2.0

Special Deliverable Requirements:

Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

Requested Turnaround Time and Special Instructions:

1063346

SGS

SAMPLE RECEIPT FORM

SGS WO#:

Yes	No	NA		
✓			Are samples **RUSH**, priority, or *w/n 72 hrs.* of **hold time**?	**Due Date:** 7-7-06
called			If yes have you done *e-mail notification*?	**Received Date:** 6-22-06
✓			Are samples *within 24 hrs.* of **hold time** or **due date**?	**Received Time:** 1306
		✓	If yes, have you *spoken with* Supervisor?	Is **date/time conversion** necessary? N
		✓	Archiving bottles – if req., are they properly marked?	# of hours to AK Local Time:
* ✓			Are there any **problems**? PM Notified?	**Thermometer ID:** 7D
✓			Were samples preserved correctly and pH verified?	
			* Bubbles in VOAs (DRTS) > 1cm	
?			If this is for PWS, provide **PWSID.**	
	✓		Will courier charges apply?	
			Method of payment?	
	✓		Data package required? (Level: 1 / 2 / 3 / 4)	
			Notes:	
	✓		Is this a DoD project? (USACE, Navy, AFCEE)	

Cooler ID	Temp Blank	Cooler Temp
1	2-6 °C	2.0 °C
	°C	°C
	°C	°C
	°C	°C
	°C	°C

*Temperature readings include thermometer correction factors

Delivery method (circle all that apply): Client / Alert Courier / UPS / FedEx / USPS / AA Goldstreak / NAC / ERA / PenAir / Carlile Lynden / SGS / Other:

Airbill # 1138 1462

Additional Sample Remarks: *(√ if applicable)*

- ____ Extra Sample Volume?
- ____ Limited Sample Volume?
- ____ Field preserved for volatiles?
- ____ Field-filtered for dissolved? ____
- ____ Lab-filtered for dissolved? ____
- ✓ Ref Lab required? ~~2 MBAS 5 TTLw HAAS 13~~ chloride, TOC 524.2 25 6-22-06
- ____ Foreign Soil?

This section must be filled out for DoD projects (USACE, Navy, AFCEE)

Yes	No		
____	____	Is received temperature 4 ± 2°C?	
		Exceptions:	Samples/Analyses Affected:
____	____	Rad Screen performed? Result:	
____	____	Was there an airbill? *(Note # above in the right hand column)*	
____	____	Was cooler sealed with custody seals?	
		# / where:	
____	____	Were seal(s) intact upon arrival?	
____	____	Was there a COC with cooler?	
____	____	Was COC sealed in plastic bag & taped inside lid of cooler?	
____	____	Was the COC filled out properly?	
____	____	Did the COC indicate COE / AFCEE / Navy project?	
____	____	Did the COC and samples correspond?	
____	____	Were all sample packed to prevent breakage?	
		Packing material:	
____	____	Were all samples unbroken and clearly labeled?	
____	____	Were all samples sealed in separate plastic bags?	
____	____	Were all VOCs free of headspace and/or MeOH preserved?	
____	____	Were correct container / sample sizes submitted?	
____	____	Is sample-condition good?	
____	____	Was copy of CoC, SRF, and custody seals given to PM to fax?	

This section must be filled if problems are found.

Yes	No	
✓	____	Was client notified of problems?

Individual contacted: LLOYD

Via: Phone / Fax / Email *(circle one)*

Date/Time: 6/22/06 1325

Reason for contact: TC & CHLORINE DEMAND ARE PAST HT. MBAS IS CLOSE AND WILL BE 2X COST. CLIENT SAYS CANCEL MBAS, TC, & CHLORINE DEMAND. CANCEL VOC.

Change Order Required? No

SGS Contact: FAT

Notes: CANCEL TC, CHLORINE DEMAND, & MBAS

CANCEL VOC DUE TO AIR BUBBLES

Completed by (sign): _____ (print): Jamie Johnson

Login proof (check one): waived ____ required ____ performed by: _____

SGS

1063346

SAMPLE RECEIPT FORM (page 2)

SGS WO#:

#	Container ID	Matrix	Test	QC	TB	Container Volume: 1 L	500 mL	250 mL	125 mL	60 mL	40 mL	8oz (250 mL)	4oz (125 mL)	Other	Container Type: AG	CG	HDPE	Nalgene	Cubie	Coli	Septa	Other	Preservative: None	HCl	HNO_3	H_2SO_4	MeOH	$Na_2S_2O_3$	NaOH	Other
1	A	O	~~NO_3, NO_2~~ F, Cl, SO_4, Br							1								X					X							
	B		~~TOC~~ TOC 2204						1											X								X			
	C		UV254						1						X								X							
	D		TDS, Alk, pH, Color, Turb			1											X						X							
	E		Odor			1									X								X							
	F		~~HAA5~~ 524.2				1								X								X							
	G		~~Chlorine Demand~~			1									X								X							
	H		TOC					1							X									X						
	I		DOC					1							X									X						FF
	J		CN					1									X							X					X	
	K		Metals					1									X								X					
	L-M		TTHM FP			2									X								X							
	N-O		HAA5 FP			2									X								X							
	P		extra							1								X					X							
	Q-S		~~524.2~~								3				X						X			X						
2	A-C	1	~~524.2~~ TOC Chloride	X							3				X						X			X						

Bottle Totals	7	1	4	2	2	6			

Completed by: _____ Date: 6-22-06

1063346

SGS Environmental **CUSTODY SEAL**

Signature: Danny H Bentley CEZ ENGINEERS Date/Time: 6/20/06 5:20pm

SGS Environmental **CUSTODY SEAL**

Signature: Danny H Bentley CEZ Date/Time: 6/20/06 5:20pm

Alert Expeditors Inc.
DBA/Petroleum Courier Service
Citywide Delivery
272-0349 • 440-3351
8421 Flamingo Drive • Anchorage, Alaska 99502

173686

Date: 6/23
From: Hageland Aviation
To: SCS Bethel Aviation

Collect ☐ | Prepay ☐ Account ☐ | Advance Charges ☐

Job # | PO#

Shipped Signature

Received By

Total Charge 136

Gold Streak
Alaska Airlines

www.ALASKACARGO.com
1-800-225-2752

P.O. Box 68900
Seattle, WA 98168

Airline	Origin	AIR WAYBILL Number
027-	Bet	1138 1462

Shipper: Hageland Aviation

FROM

Phone:

Bethel State: AK Zip Code:

this shipment does not contain any unauthorized explosives, destructive devices or hazardous materials.

Signature — PRINTED NAME: Michael Wolf Date: 6/21/06

Domestic ☒ International ☐

Value Declared Value For Customs

Departure | First Carrier | Airport of Destination

Nature and Quantity of Goods: Water Samples

Information:

Consignee: (Complete Consignee information required on package) F2 Engineer

TO

Phone: 349-1040

City State: AK Zip Code:

Consignee's Printed Name Signature (Received in Good Order Except as Noted) | Time: 8:20 a.m. p.m. | Date

Total Pieces: 2
Total Weight: 47/50

MULTIPLE PIECES FOR AS FLIGHTS ONLY
Please ✓ If Live Animal ☐

Form of Payment
☐ Cash ☐ Check ☐ GBL—Attach GBL
☒ AS Account Number: 274421247751
☐ Credit Card Number

Validata Approval: 214236
(Required for all except cash and GBL)

CHECK ONE ONLY
☒ AIRPORT TO AIRPORT SERVICE
PICKUP ONLY ☐ DELIVERY ONLY ☐ DOOR TO DOOR ☐

Executed By: Date/Time: 6/21/06 1135 a.m. p.m.

Carrier	Flight	Destination	E.T.A.
AS	44	ANC	

Remarks

PCS.	WT. RANGE	RATE.	CHARGE
	GSX LETTER		
	1-15		
2	16-50		100 —
	51-70		
	71-100		

Subtotal Charges
AS COURIER CHARGES
Other Charges
1st Carrier
2nd Carrier
3rd Carrier
Tax (Offline only)
Pickup (NON AS COURIER)
Delivery (NON AS COURIER)
Special Service
Insurance
TOTAL 100 —

Service: (800) 634-7113

2. Consignee Memo

1063346

Airline	Origin	AIR WAYBILL Number
027-		1138 1462

Gold Streak
Alaska Airlines

Laboratory Analysis Report

200 W. Potter Drive
Anchorage, AK 99518-1605
Tel: (907) 562-2343
Fax: (907) 561-5301
Web: http://www.us.sgs.com

Paul Weisner
Chuck Eggener Consulting Engr.
P.O. Box 232946
Anchorage, AK 99523

Work Order:	1063345
	Tuluksak VSW W-05-2
Client:	Chuck Eggener Consulting Engr.
Report Date:	August 02, 2006

Released by:
Forest Taylor
2006.08.03
13:44:40 -
08'00'

Enclosed are the analytical results associated with the above workorder.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintained by SGS. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request.

The laboratory certification numbers are AK971-05 (DW), UST-005 (CS) and AK00971 (Micro) for ADEC and 001543 for NELAP.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP, the National Environmental Laboratory Accreditation Program and, when applicable, other regulatory authorities.

If you have any questions regarding this report or if we can be of any other assistance, please contact your SGS Project Manager at 907-562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

PQL	Practical Quantitation Limit (reporting limit).
U	Indicates the analyte was analyzed for but not detected.
F	Indicates value that is greater than or equal to the MDL.
J	The quantitation is an estimation.
ND	Indicates the analyte is not detected.
B	Indicates the analyte is found in a blank associated with the sample.
*	The analyte has exceeded allowable regulatory or control limits.
GT	Greater Than
D	The analyte concentration is the result of a dilution.
LT	Less Than
!	Surrogate out of control limits.
Q	QC parameter out of acceptance range.
M	A matrix effect was present.
JL	The analyte was positively identified, but the quantitation is a low estimation.
E	The analyte result is above the calibrated range.

Note: Soil samples are reported on a dry weight basis unless otherwise specified.

SGS

SGS Ref.#	1063345001	**All Dates/Times are Alaska Standard Time**	
Client Name	Chuck Eggener Consulting Engr.	**Printed Date/Time**	08/02/2006 8:40
Project Name/#	Tuluksak VSW W-05-2	**Collected Date/Time**	06/20/2006 16:05
Client Sample ID	W-05-2RW	**Received Date/Time**	06/22/2006 13:06
Matrix	Drinking Water	**Technical Director**	**Stephen C. Ede**
PWSID	0		

Sample Remarks:

SM 5910 - %T = 81.2

HAA Formation Potential was analyzed by Montgomery Watson Harza of Monrovia, CA.

TTHM Formation Potential was analyzed by Montgomery Watson Harza of Monrovia, CA.

Parameter	Results		PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Calcium	34.3		0.100	mg/L	SM20 2340B	K		06/27/06	07/07/06	TK
Hardness as CaCO3	104		5.00	mg/L	SM20 2340B	K		06/27/06	07/07/06	TK
Magnesium	4.54		0.100	mg/L	SM20 2340B	K		06/27/06	07/07/06	TK
Metals by ICP/MS										
Aluminum	ND		20.0	ug/L	EP200.8	K		06/27/06	06/30/06	MH
Calcium	29900		500	ug/L	EP200.8	K		06/27/06	06/30/06	MH
Magnesium	5080		50.0	ug/L	EP200.8	K		06/27/06	06/30/06	MH
Silver	ND		1.00	ug/L	EP200.8	K		06/27/06	06/30/06	MH
Waters Department										
Nitrite-N	ND		0.100	mg/L	EPA 353.2	A			06/22/06	ALR
Nitrate-N	ND		0.100	mg/L	EPA 353.2	A			06/22/06	ALR
Bromide	ND		0.100	mg/L	EPA 300.0	A		06/23/06	06/23/06	DSH
Total Organic Carbon	48.0		0.500	mg/L	EPA 415.1	H			06/29/06	TSN
Total Organic Carbon,Dissolved	45.7		0.500	mg/L	EPA 415.1	I			06/29/06	TSN
UV-254	0.0900		0.0200	cm-1	SM20 5910B	C			06/22/06	CAW
Inorganic Contaminants										
Antimony	ND		1.00	ug/L	EP200.8	K	(<6)	06/27/06	06/30/06	MH
Arsenic	49.9	*	5.00	ug/L	EP200.8	K	(<10)	06/27/06	06/30/06	MH
Barium	184		3.00	ug/L	EP200.8	K	(<2000)	06/27/06	06/30/06	MH
Beryllium	ND		0.400	ug/L	EP200.8	K	(<4)	06/27/06	06/30/06	MH
Cadmium	ND		0.500	ug/L	EP200.8	K	(<5)	06/27/06	06/30/06	MH
Chromium	ND		1.00	ug/L	EP200.8	K	(<100)	06/27/06	06/30/06	MH
Cyanide	ND		0.0050	mg/L	SM20 4500-CN C,E	J	(<0.2)	06/26/06	06/27/06	KP

SGS

SGS Ref.#	1063345001	**All Dates/Times are Alaska Standard Time**	
Client Name	Chuck Eggener Consulting Engr.	**Printed Date/Time**	08/02/2006 8:40
Project Name/#	Tuluksak VSW W-05-2	**Collected Date/Time**	06/20/2006 16:05
Client Sample ID	W-05-2RW	**Received Date/Time**	06/22/2006 13:06
Matrix	Drinking Water	**Technical Director**	**Stephen C. Ede**
PWSID	0		

Parameter	Results		PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Inorganic Contaminants										
Fluoride	ND		0.100	mg/L	EPA 300.0	A	(<2)	06/23/06	06/23/06	DSH
Mercury by Cold Vapor	ND		0.200	ug/L	EP245.1	K	(<0.2)	07/03/06	07/05/06	HKG
Nickel	ND		2.00	ug/L	EP200.8	K	(<100)	06/27/06	06/30/06	MH
Selenium	ND		5.00	ug/L	EP200.8	K	(<50)	06/27/06	06/30/06	MH
Thallium	ND		1.00	ug/L	EP200.8	K	(<2)	06/27/06	06/30/06	MH
Secondary Contaminants										
Calcium	34.3		0.200	mg/L	EP200.7	K		06/27/06	07/07/06	TK
Chloride	1.96		0.100	mg/L	EPA 300.0	A	(<250)	06/23/06	06/23/06	DSH
Color	55.0	*	5.00	PCU	SM20 2120B	D	(<15)		06/22/06	CRY
Copper	ND		1.00	ug/L	EP200.8	K	(<1000)	06/27/06	06/30/06	MH
Fluoride	ND		0.100	mg/L	EPA 300.0	A	(<2)	06/23/06	06/23/06	DSH
Langlier Index @ 40 degree F	-1.2797				SM2330B	A			07/10/06	PLW
Alkalinity	108		40.0	mg/L	SM20 2320B	D			06/27/06	PLW
Langlier Index @ 140 degree F	-0.1997				SM2330B	A			07/10/06	PLW
CO3 Alkalinity	ND		40.0	mg/L	SM20 2320B	D			06/27/06	PLW
Iron	8.41	*	0.0400	mg/L	EP200.7	K	(<0.3)	06/27/06	07/07/06	TK
HCO3 Alkalinity	108		40.0	mg/L	SM20 2320B	D			06/27/06	PLW
OH Alkalinity	ND		40.0	mg/L	SM20 2320B	D			06/27/06	PLW
Manganese	326	*	1.00	ug/L	EP200.8	K	(<50)	06/27/06	06/30/06	MH
Odor (TON)	2.00		1.00	T.O.N.	SM20 2150B	E	(<3)		06/22/06	CRY
pH	6.98		0.100	pH units	EPA 150.1	D	(6.5-8.5)		06/22/06	CRY
Magnesium	4.54		0.200	mg/L	EP200.7	K		06/27/06	07/07/06	TK
Sodium	2.47		2.00	mg/L	EP200.7	K	(<250)	06/27/06	07/07/06	TK
Sulfate	ND		0.100	mg/L	EPA 300.0	A	(<250)	06/23/06	06/23/06	DSH
Total Dissolved Solids	185		10.0	mg/L	SM20 2540C	D	(<500)		06/27/06	KP
Zinc	ND		5.00	ug/L	EP200.8	K	(<5000)	06/27/06	06/30/06	MH

MWH Laboratories
A Division of MWH Americas, Inc.

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory Report

for

REVISED
7/31/06

SGS Environmental Services Inc.
200 W. Potter Drive

Anchorage , AK 99518

Attention: Forest Taylor
Fax: (907) 561-5301

D/DBP Haloacetic acids (HAA5) changed from ND to 147ug/L

DATE OF ISSUE
JUL 3 1 2006
MWH LABORATORIES

YOM Yolanda Martin
Project Manager

ACCREDITED IN ACCORDANCE WITH nelac
01114CA

Report#: 177352
DRINKING

Laboratory certifies that the test results meet all **NELAC** requirements unless noted in the Comments section or the Case Narrative. Following the cover page are QC Report,QC Summary,Data Report,Hits Report, totaling 5 page[s].

MWH Laboratories
A Division of MWH Americas, Inc.

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory
Hits Report
#177352

SGS Environmental Services Inc.
Forest Taylor
200 W. Potter Drive
Anchorage , AK 99518

Samples Received
24-jun-2006 09:16:05

Analyzed	Sample#	Sample ID	Result	Federal MCL	UNITS	MRL
	2606240163	W-05-2 RW 1063345001				
07/19/06	Bromochloroacetic acid		3.55		ug/l	1.0
07/19/06	Bromodichloroacetic acid		5.19		ug/l	1.0
07/07/06	Chlorine Dose		20		mg/l	1.0
07/14/06	Chlorine Residual		4.6		mg/l	0.1
07/19/06	Chlorodibromomacetic acid		2.13		ug/l	2.0
07/19/06	D/DBP Haloacetic Acids (HAA5)		147	60	ug/l	1.0
07/19/06	Dichloroacetic acid		65.3		ug/l	5.0
07/19/06	Tribromoacetic acid		147		ug/l	4.0
07/19/06	Trichloroacetic acid		82.1		ug/l	5.0
07/08/06	Bromodichloromethane		4.57		ug/l	0.5
06/26/06	Chlorine Dose		20		mg/l	1.0
07/03/06	Chlorine Residual		5.0		mg/l	0.1
07/10/06	Chloroform		135		ug/l	2.5
07/10/06	Total Potential Trihalomethane		140		ug/l	0.5

SUMMARY OF POSITIVE DATA ONLY.

MWH Laboratories
A Division of MWH Americas, Inc.

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel. 626 386 1100
Fax. 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory
Data Report
#177352

SGS Environmental Services Inc.
Forest Taylor
200 W. Potter Drive
Anchorage , AK 99518

Samples Received
06/24/06

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
W-05-2 RW 1063345001 (2606240163) Sampled on 06/20/06 16:05								
				Tot Pot Trihalomethanes 5710B				
07/07/06	07/08/06 00:00	324842	(ML/EPA 551.1)	Bromoform	ND	ug/l	0.5	1
07/07/06	07/10/06 00:00	324842	(ML/EPA 551.1)	Chloroform	135	ug/l	2.5	5
07/07/06	06/26/06 00:00	324642	(SM2350)	Chlorine Dose	20	mg/l	1.0	1
07/07/06	07/03/06 00:00	324842	(ML/S 4500CL-G)	Chlorine Residual	5.0	mg/l	0.1	1
07/07/06	07/08/06 00:00	324842	(ML/EPA 551.1)	Dibromochloromethane	ND	ug/l	0.5	1
07/07/06	07/08/06 00:00	324842	(ML/EPA 551.1)	Bromodichloromethane	4.57	ug/l	0.5	1
07/07/06	07/10/06 00:00	324842	(ML/EPA 551.1)	Total Potential Trihalomethane	140	ug/l	0.5	1
			(ML/SM 5710)	1,2-Dibromopropane(70-130)	96	% Rec		
				Total Potential Haloacetic				
07/18/06	07/07/06 00:00	326271	(ML/SM 5710B)	Chlorine Dose	20	mg/l	1.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Bromochloroacetic acid	3.55	ug/l	1.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Bromodichloroacetic acid	5.19	ug/l	1.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Chlorodibromoacetic acid	2.13	ug/l	2.0	1
07/18/06	07/14/06 00:00	326271	(ML/SM 5710B)	Chlorine Residual	4.6	mg/l	0.1	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Dibromoacetic acid	ND	ug/l	1.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Dichloroacetic acid	65.3	ug/l	5.0	5
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Monobromoacetic acid	ND	ug/l	1.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Monochloroacetic acid	ND	ug/l	2.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Tribromoacetic acid	147	ug/l	4.0	1
07/18/06	07/19/06 00:00	326271	(ML/SM 6251B)	Trichloroacetic acid	82.1	ug/l	5.0	5
07/18/06	07/19/06 00:00	326271	(ML/S6251B)	D/DBP Haloacetic Acids (HAA5)	147	ug/l	1.0	1
			(SM5710 6251B)	1,2,3-TCP(80-120)	107	% Rec		
			(SM5710 6251B)	2,3-Dibrom Acid(70-130)	99	% Rec		

SGS

CHAIN OF CUSTODY RECORD
SGS Environmental Services Inc.

1063345

waii
yland
th Carolina
051099

(1)
CLIENT: Tuluksak VSW
CONTACT: CE2 Engineers PHONE NO:(907) 349-1010
PROJECT: Tuluksak VSW SITE/PWSID#: W-05-2
REPORTS TO:
Paul Weisner FAX NO.:(907) 349-1015
INVOICE TO: QUOTE #
CE2 Engineers P.O. NUMBER

SGS Reference:

PAGE 1 OF 1

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE (C=COMP G=GRAB)	Preservatives Used	Na2S2O3	HNO3	NaOH				HCl	HCl			HCl	Analysis Required (3)	REMARKS
																			TColi	
																			metals: 10&20 inorg (Ag, Al, mg, Ca)	
																			CN	
																			fl, SO_4, Br, NO_2, NO_3	
																			TDS, Alk, pH, Color	
																			Odor	
																			TBAS	
																			TOC	
																			DOC (Field Filtered)	
																			UV 254	
																			TuCb	
																			Chlorine Demand	
																			HAA5 Form Pct	
																			THM Form Pct	
																			VOC 524.2	
(1) A-S	W-05-2 RW	6/20/06	405 PM	W	18	G		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
(2) A-C																				

(5)

Collected/Relinquished By:(1)	Date	Time	Received By:
Gary A Bowers			
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 6/22/06	Time 1306	Received By:

(4)

Shipping Carrier:	Samples Received Cold? (Circle) YES NO
Shipping Ticket No:	Temperature IC: TB=2.5 °, C=3.3
Special Deliverable Requirements:	Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT
Requested Turnaround Time and Special Instructions:	

☐ 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
☐ 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557
☐ 1258 Greenbrier Street Charleston, WV 25311 Tel: (304) 346-0725 Fax: (304) 346-0761

White - Retained by Lab
Yellow - Returned with Report
Pink - Retained by Sampler

1063345

SGS

SAMPLE RECEIPT FORM

SGS WO#: _____

Yes	No	NA		
✓			Are samples **RUSH**, priority, or *w/n 72 hrs.* of hold time?	**Due Date:** 7-7-06
	called		If yes have you done *e-mail notification*?	**Received Date:** 6-22-06
✓			Are samples *within 24 hrs.* of hold time or due date?	**Received Time:** 1306
		✓	If yes, have you *spoken with* Supervisor?	Is **date/time conversion** necessary? N
		✓	Archiving bottles – if req., are they properly marked?	# of hours to AK Local Time:
* ✓			Are there any **problems**? PM Notified? _____	**Thermometer ID:** 5D
✓			Were samples preserved correctly and pH verified?	
			* Bubbles in VOAs (1) R=6mm 5>1cm	
?			If this is for PWS, provide **PWSID.**	
✓			Will courier charges apply?	
			Method of payment?	
	✓		Data package required? (Level: 1 / 2 / 3 / 4)	
			Notes:	
	✓		Is this a DoD project? (USACE, Navy, AFCEE)	

Cooler ID	Temp Blank	Cooler Temp
1	2.5 °C	3.3 °C
	°C	°C
	°C	°C
	°C	°C
	°C	°C

*Temperature readings include thermometer correction factors

Delivery method (circle all that apply): Client / (Alert Courier) / UPS / FedEx / USPS / (AA Goldstreak) / NAC / ERA / PenAir / Carlile / Lynden / SGS / Other: _____

Airbill # 1138 1462

Additional Sample Remarks: *(✓ if applicable)*

- ✓ Extra Sample Volume?
- _____ Limited Sample Volume?
- _____ Field preserved for volatiles?
- _____ Field-filtered for dissolved? _____
- _____ Lab-filtered for dissolved? _____
- ✓ Ref Lab required? MBAS chlorine
- _____ Foreign Soil? TTHM/HAA5 Form Poison

This section must be filled out for DoD projects (USACE, Navy, AFCEE)

Yes	No		
		Is received temperature 4 ± 2°C?	
		Exceptions:	Samples/Analyses Affected:
		Rad Screen performed? Result:	
		Was there an airbill? *(Note # above in the right hand column)*	
		Was cooler sealed with custody seals?	
		# / where:	
		Were seal(s) intact upon arrival?	
		Was there a COC with cooler?	
		Was COC sealed in plastic bag & taped inside lid of cooler?	
		Was the COC filled out properly?	
		Did the COC indicate COE / AFCEE / Navy project?	
		Did the COC and samples correspond?	
		Were all sample packed to prevent breakage?	
		Packing material:	
		Were all samples unbroken and clearly labeled?	
		Were all samples sealed in separate plastic bags?	
		Were all VOCs free of headspace and/or MeOH preserved?	
		Were correct container / sample sizes submitted?	
		Is sample-condition good?	
		Was copy of CoC, SRF, and custody seals given to PM to fax?	

This section must be filled if problems are found.

Yes / No: ✓ / ___ Was client notified of problems?

Individual contacted: _____

Via: (Phone) / Fax / Email *(circle one)*

Date/Time: 6/22/06 1325

Reason for contact: MBAS is short hold and client would need to pay 2x price. Cancel MBAS. TC and Chlorine demand are past ht. Cancel

Change Order Required? No

SGS Contact: FAT

Notes: Cancel TC, Chlorine Demand, & MBAS. FAT 6/22/06

Cancel VOC due to bubbles.

Completed by (sign): _____ **(print):** Jamey Johnson

Login proof (check one): waived ✓ required ___ performed by: _____

1063345

SGS

SAMPLE RECEIPT FORM (page 2)

SGS WO#.

#	Container ID	Matrix	Test	QC	TB	Container Volume: 1 L	500 mL	250 mL	125 mL	60 mL	40 mL	8oz (250 mL)	4oz (125 mL)	Other	Container Type: AG	CG	HDPE	Nalgene	Cubie	Coli	Septa	Other	Preservative: None	HCl	HNO_3	H_2SO_4	MeOH	$Na_2S_2O_3$	NaOH	Other
1	A	O	NO2, NO3, F, Cl, SO4, Br							1								X					X							
	B		~~TC~~ SJS 6-22-06						1											X								X		
	C		UV254						1						X								X							
	D		TDS, Alk, Ph, Color, turb			1											X						X							
	E		Odor			1									X								X							
	F		~~HAA5~~ SJS 6-22-06				1								X								X							
	G		~~Chlorine Demand~~			1									X								X							
	H		TOC					1							X									X						
	I		DOC					1							X									X						FF
	J		CN					1									X												X	
	K		Metals					1									X								X					
	L-M		TTHM FP			2									X								X							
	N-O		HAA5 FP			2									X								X							
	P		extra							1								X					X							
	Q-S		524.2								3				X						X			X						
2	A-C	1	524.2		X						3				X						X			X						

Bottle Totals	7	1	4	2	2	6			

Completed by: [signature] Date: 6-22-06

1063345

SGS Environmental

CUSTODY SEAL

Signature: Jeremy A Lawley CRL Date/Time: 6/20/06 5:00pm

SGS Environmental

CUSTODY SEAL

Signature: Jeremy A Lawley CRL Date/Time: 6/20/06 5:20pm

Gold Streak
Alaska Airlines

www.ALASKACARGO.com
1-800-225-2752

P.O. Box 68900
Seattle, WA 98168

Airline	Origin	AIR WAYBILL Number
027-	Bet	1138 1462

From Shipper: Hageland Aviation

Address: FROM

Phone:

City: Bethel State: AK Zip Code:

I certify that this shipment does not contain any unauthorized explosives, destructive devices or hazardous materials.

Shipper's Signature — PRINTED NAME: X [signature] Michael Underwood Date: 6/2/06

Domestic [X] International [ ]

Insured Value: Declared Value For Customs:

Airport of Departure	First Carrier	Airport of Destination

Nature and Quantity of Goods: Water Samples

Handling Information:

To Consignee: (Complete Consignee information required on package)
CE2 Engineer

Address: Phone: 349-1040

City: ANCH State: AK Zip Code:

Consignee's Printed Name/Signature (Received in Good Order Except as Noted): [signature]

Time: 2:0 a.m. p.m.

Date:

Airline	Origin	AIR WAYBILL Number
027-		1138 1462

Gold Streak Alaska Airlines

This is a non-negotiable AIR WAYBILL subject to the terms and conditions set forth on the reverse of shippers copy.

Total Pieces: 2

Total Weight: 47/50

MULTIPLE PIECES FOR AS FLIGHTS ONLY
Please ✓ If Live Animal ☐

Form of Payment
☐ Cash ☐ Check ☐ GBL—Attach GBL
☒ AS Account Number 27443124751
☐ Credit Card Number

Validata Approval: 21472 (Required for all except cash and GBL)

CHECK ONE ONLY
☒ AIRPORT TO AIRPORT SERVICE

PICK-UP ONLY ☐ DELIVERY ONLY ☐ DOOR TO DOOR ☐

Executed By: Date/Time: 6/2/06 1135 a.m. p.m.

Carrier	Flight	Destination	E.T.A.
AS	44	ANC	

1063345

Remarks:

PCS.	WT. RANGE	RATE	CHARGE
	GSX LETTER		
	1-15		
2	16-50		110
	51-70		
	71-100		

Subtotal Charges

AS COURIER CHARGES

Other Charges

1st Carrier	
2nd Carrier	
3rd Carrier	
Tax (Offline only)	
Pickup (NON AS COURIER)	
Delivery (NON AS COURIER)	
Special Service	
Insurance	
TOTAL	110 —

Shipper: To complete all shaded areas

Appendix B

CE2 ENGINEERS, INC.
DRILLING LOG

#1 WELL

Well Owner Community of Tuluksak, Alaska Use of Well Public Water Supply

Location (address of: Township, Range, Section, if known)

GPS Coordinates

Size of casing 6" Depth of Hole 159 feet Cased to 135 feet

Static water level 12 ft. (above) (below) land surface.

Finish of well (check one): Open End ( ) Screen (X) Perforated( )

Describe screen or perforation 15', .010 SLOT 10', .016 SLOT TOT 25'

Well pumping test at 75 gallons per (Hour) (Minute) for 24 hours with 20 ft. of drawdown from static level.

Date of completion 9-18

DRILLER
By Longbottom
MY LAST
(8 AM 83)

WELL LOG

Depth in feet from ground surface	Give details of formations penetrated, size of material, color and hardness.
0 TO 19	FINE SAND
19 TO 41	FINE MUCKY SAND & WATER
41 TO 66	GRAY SAND & WATER 66' PEA GRAVEL
66 TO 72	COARS SAND & WATER SOME PEA GRAVEL
72 TO 135	PACK SAND VERY LITTLE WATER
135 TO 158	LITTEE STRIPS OF WATER IN THE
TO	PACKAAN SOM PEA GRAVEL MOSLEY
TO	FINE SAND
159 TO 161	HARD PACK SAND NO WATER
TO	
TO	
TO	
TO	
TO	

PUMPING TEST RECORD

ODNR-Division of Water
Water Resources Section

Page No. 1

#1 WELL

Owner TULUKSAK Address

County Township

Date 9-17-05 (Test Started) (Test Ended) ODNR Log# Other Well ID

Company Conducting Test R L DRILLING Individual Making Measurements

Type of Test Distance From Pumping Well

Measuring Equipment Used DEPTH METER

Static Water Level (S_0) 12' 8" Measuring Point TOP CASING Elevation Above Ground 3'

Date	Clock Time (Use Military Time)	Time Since Pumping Started (In Minutes)	Depth to Water (S)	Change in Water Level ($S - S_0$)	Discharge Rate (GPM)	Comments (Include Weather Conditions)
9-17-05	8:10	0	12' 8"		75	
	8:15	1 5	32' 8"			
	8:20	2 5	32 9.5			
	8:25	3 5	32 10			
	8:30	4 5	32 10			
	8:40	5 5	32 10			
	8:45	6 5	32 10.6			
	8:55	7 10	32 10			
	9:05	8 10	32 10.6			
	9:10	9 10	32 10			
	9:20	10 10	32 11			
	9:30	11 10	32 11.6			
	9:40	12 10	32 10.6			
	10:40	13 60	32 9.6			
	11:40	14 60	32 9			
	12:40	15 60	32 11			
	13:40	20 60	32 11			
	14:40	25 60	32 10.5			
	15:40	30 60	32 11			
	16:40	35 60	33 1			
	17:40	40 60	33			
	18:40	45 60	33 1			
	19:40	50 60	33			
	20:40	55 60	33			
	21:40	60 (1hr) 60	33 1.5			
	22:40	90 60	33 1.6			
	23:40	120 (2hr) 60	33 2			
	24:40	150 60	33 3			
		180 (3hr)				
		240 (4hr)				

DNR 7811.93

PUMPING TEST RECORD

Observation Wells
ODNR-Division of Water
Water Resources Section

#1 WELL

Page No. 1

Owner TULUKSAK Address

Location of well on property

County Twnty/Rg

Date 9-18-05 (Test Started / Test Ended) ODNR Log Other Well ID

Company Conducting Test R L DRILLING Individual Making Measurements

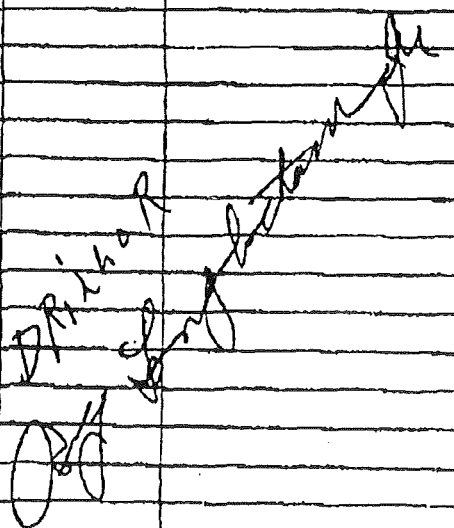
Type of Test DROWDOWN Distance From Pumping Well

Measuring Equipment Used DEPTH METER

Static Water Level (B_0) 12 ft Measuring Point TOP CASING Elevation Above Ground 31

Pumping Water Level (ft.) 33' Depth of Pump (ft.) 40

Date	Clock Time (Use Military Time)	Time Since Pumping Started (In Minutes)	Depth to Water (B)	Change in Water Level ($B - B_0$)	Discharge Rate (GPM)	Comments (Include Weather Conditions)
9-18-05	1:40	60	33 3/8		75	
	2:40	60	33 1/4			
	3:40	60	33 1/8			
	4:40	60	33 1/8			
	5:40	60	33 1/8			
	6:40	60	33 1/8			
	7:40	60	33 1/8			
	8:40	60	33 1/8			
	END OF DROWDOWN TEST					
	8:45	5	12 6/8			
	8:50	5	12 6/8			
	8:55	5	12 6/8			
	9:00	5	12 6/8			
	9:10	10	12 5/8			
	9:20	10	12 5/8			
	9:30	10	12 6/8			
	9:40	10	12 6/8			



CE2 ENGINEERS, INC.
DRILLING LOG

Well Owner Community of Tuluksak, Alaska #2 WELL Use of Well Public Water Supply

Location (address of: Township, Range, Section, if known) _____

GPS Coordinates _____

Size of casing 6" Depth of Hole 191 feet Cased to 172 feet

Static water level 13 4 ft. (above) (below) land surface.

Finish of well (check one): Open End ( ) Screen (X) Perforated( )

Describe screen or perforation 21'10" TOTAL, .010 - .010 - .016 - .030

Well pumping test at 76 gallons per (Hour) (Minute) for 24 hours with 20'11" ft. of drawdown from static level.

Date of completion 9-7-05

WELL LOG DRILLER Roy Longbrake Jr

Depth in feet from ground surface	Give details of formations penetrated, size of material, color and hardness.
0 TO 4	TOP SOIL
4 TO 10	BROWN SAND
10 TO 16	FROZEN SILT,
16 TO 24	FINE SAND
24 TO 50	FINE SAND & WATER
50 TO 51 6	COARSE SAND & PEA GRAVEL
51 6 TO 61 6	FINE SAND & WATER
61 6 TO 82 10	PACK SAND NO WATER
82 10 TO 83	FINE SAND & WATER
83 TO 107	PACK SAND
107 TO 108	SAND & PEA GRAVEL & WATER WATER TESTED FOR IRON
108 TO 125	PACK SAND
125 TO 167	PACK SAND & LITTLE STREAKS OF WATER.
167 TO 191	COARSE SAND PEA GRAVEL WATER. HAS STREAKS OF PACK SAND IN BETWEEN LAYERS OF SAND & WATER.

DNR 7011.03

PUMPING TEST RECORD
Observation Wells
ODNR-Division of Water
Water Resources Section

Page No. 1

Owner _____ Address _____

Location of well on property _____

County _____ Township _____

Date 9-7-05 (Test started) / (Test ended) ODNR Log# _____ Other Well ID _____

Company Conducting Test R.L. DRILLING Individual Making Measurements KINGSTHAM

Type of Test DRAWDOWN Distance From Pumping Well _____

Measuring Equipment Used DEPTH MEATOR

Static Water Level (S_0) 13'4" Measuring Point TOP-CASING Elevation Above Ground 3'

Pumping Water Level (ft.) _____ Depth of Pump (ft.) 40

Date	Clock Time (Use Military Time)	Time Since Pumping Started (In Minutes)	Depth to Water (S)	Change in Water Level ($S - S_0$)	Discharge Rate (GPM)	Comments (Include Weather Conditions)
9-7-05	11:15	5	13'4"	33' 3"	7.5	
	11:20	5		33 1		
	11:30	5		31 1		
	11:35	5		33 2		
	11:40	5		33 2.5		
	11:45	5		33 3		
	11:55	10		33 3		
	12:05	10		33 4		
	12:15	10		33 4		
	12:35	10		33 4.0		
	12:45	20		33 5		
	12:55	10		33 5		
	13:05	10		33 5		
	13:35	30		33 6.0		
	14:05	30		33 7.0		
	14:35	30		33 8		
	15:05	30		33 9		
	16:05	60		33 10.0		
	17:05	60		33 8.5		
	19:05	60		33 8.0		
	19:05	60		33 9.5		
	20:05	60		33 11.5		
	21:05	60		34 .5		
	22:05	60		34 .5		
	23:05	60		34 15		
	24:05	60		34 3		
9-8-05	1:05	60		34 5		
	2:05	60		34 4		
	3:05	60		34 4.5		

Ray Longfellow Jr.

DNR 7811.03

PUMPING TEST RECORD

Observation Wells

ODNR-Division of Water
Water Resources Section

Page No. 3

Owner _____ Address _____

Location of well on property _____

County _____ Township _____

Date 9-8-05 (Test Started) / (Test Ended) ODNR Log# _____ Other Well ID _____

Company Conducting Test R.H. DRILLING Individual Making Measurements LONG-BOTHAM

Type of Test DROWDOWN Distance From Pumping Well _____

Measuring Equipment Used DEPTH METER

Static Water Level (S_0) 13' 4" Measuring Point TOP CASING Elevation Above Ground 3'

Pumping Water Level (ft.) _____ Depth of Pump (ft.) 40

Date	Clock Time (Use Military Time)	Time Since Pumping Started (In Minutes)	Depth to Water (S)	Change in Water Level ($S - S_0$)	Discharge Rate (GPM)	Comments (Include Weather Conditions)
9-8-05	4:05	60		34 5	75	
	5:05	60		34 5.5		
	6:05	60		34 6		
	7:05	60		34 6.0		
	8:05	60		34 7.0		
	9:05	60		34 6.5		
	10:05	60		34 7		
	11:05	60		34 7		
	12:05	60		34 7.5		
	END OF PUMP TEST					
9-9-05	12:10	5		14 3		
	12:15	5		14 3		
	12:20	5		14 3		
	12:25	5		14 3		
	12:35	10		14 3		
	12:45	10		14 3		
	12:55	10		14 3		
	13:05	10		14 3		
	13:15	10		14 0		
	13:30	45		13.45		

TULUKSAK # 2
9-7-05
By Englebrecht

TIME #	TO	MIN	DRAWDOWN 13 4	STAT. L. 13 4	G P M. 5 H.P. PUMP.
1 15	1120	5	33		75
1 20	1125	5	33 1		
1 25	1130	5	33 1		
1 30	1135	5	33 2		
1 35	11:40	5	33 2.5		
1 40	1145	5	33 3		
1 45	1155	10	33 3		
1 55	12.05	10	33 4		
2 05	12:15	10	33 4		
2 15	12:25	10	33 4.5		
2:25	1245	20	33 5		
2 45	1255	10	33 5		
2 55	1:05	10	33 5		
1 05	135	30	33 6.5		
1 35	205	30	33 6.5		
2 05	235	30	33 8		
2 35	305	30	33 9		
3 05	405	60	33 10.5		
4 05	505	60	33 8.0		
5 05	605	60	33 8.5		
6 05	705	60	33 9.5		
7 05	805	60	33 11.5		
8 05	905	60	34 .5		
9 05	10:05	60	34 .5		
10 05	11:05	60	34 1.5		
11 05	1205	60	34 2		

TULUKSAK #2
9-7-05
Avg Typhoon

TIME FROM	TO	MIN	DRAWDOWN	STAT. L. 13.5	GPM. 5HP PUMP
12:05	1:05	60	34:05		75
1:05	2:05	60	34.4		
2:05	3:05	60	34.45		
3:05	4:05	60	34.52		
4:05	5:05	60	34.55		
5:05	6:05	60	346		
6:05	7:05	60	346.05		
7:05	8:05	60	346.0		
8:05	9:05	60	346.0		
9:05	10:05	60	347		
10:05	11:05	60	347		
11:05	12:05	60	347.0		
		END OF PUMP TEST. PUMP CUT OFF 12:05			
12:05	12:10	5	14 3/8		
12:10	12:15	5	14 3/8		
12:15	12:20	5	14 3/8		
12:20	12:25	5	14 3/8		
12:25	12:35	10	14 3/8		
12:35	12:45	10	14 3/8		
12:45	12:55	10	14 3/8		
12:55	1:05	10	14 3/8		
1:05	1:10	10	14 0		
1:10	1:50	40	13.4 1/2		

Appendix C

EPA
United States
Environmental Protection
Agency

Stage 1 Disinfectants and Disinfection Byproducts Rule: A Quick Reference Guide

Overview of the Rule

Title	Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) 63 FR 69390 - 69476, December 16, 1998, Vol. 63, No. 241 Revisions to the Interim Enhanced Surface Water Treatment Rule (IESWTR), the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR), and Revisions to State Primacy Requirements to Implement the Safe Drinking Water Act (SDWA) Amendments 66 FR 3770, January 16, 2001, Vol 66, No. 29
Purpose	Improve public health protection by reducing exposure to disinfection byproducts. Some disinfectants and disinfection byproducts (DBPs) have been shown to cause cancer and reproductive effects in lab animals and suggested bladder cancer and reproductive effects in humans.
General Description	The Stage 1 DBPR is the first of a staged set of rules that will reduce the allowable levels of DBPs in drinking water. The new rule establishes seven new standards and a treatment technique of enhanced coagulation or enhanced softening to further reduce DBP exposure. The rule is designed to limit capital investments and avoid major shifts in disinfection technologies until additional information is available on the occurrence and health effects of DBPs.
Utilities Covered	The Stage 1 DBPR applies to all sizes of community water systems and nontransient noncommunity water systems that add a disinfectant to the drinking water during any part of the treatment process and transient noncommunity water systems that use chlorine dioxide.

Public Health Benefits

Implementation of the Stage 1 DBPR will result in . . .	▸ As many as 140 million people receiving increased protection from DBPs. ▸ 24 percent average reduction nationally in trihalomethane levels. ▸ Reduction in exposure to the major DBPs from use of ozone (DBP = bromate) and chlorine dioxide (DBP = chlorite).
Estimated impacts of the Stage 1 DBPR include . . .	▸ National capital costs: $2.3 billion ▸ National total annualized costs to utilities: $684 million ▸ 95 percent of households will incur an increase of less than $1 per month. ▸ 4 percent of households will incur an increase of $1-10 per month. ▸ <1 percent of households will incur an increase of $10-33 per month.

Critical Deadlines and Requirements

For Drinking Water Systems

January 1, 2002	Surface water systems and ground water systems under the direct influence of surface water serving ≥ 10,000 people must comply with the Stage 1 DBPR requirements.
January 1, 2004	Surface water systems and ground water systems under the direct influence of surface water serving < 10,000, and all ground water systems must comply with the Stage 1 DBPR requirements.

For States

December 16, 2000	States submit Stage 1 DBPR primacy revision applications to EPA (triggers interim primacy).
December 16, 2002	Primacy extension deadline - all states with an extension must submit primacy revision applications to EPA.

For additional information on the Stage 1 DBPR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/safewater; or contact your State drinking water representative.

Additional material is available at www.epa.gov/safewater/dbp/implement.html.

Regulated Contaminants/Disinfectants

Regulated Contaminants	MCL (mg/L)	MCLG (mg/L)	Regulated Disinfectants	MRDL* (mg/L)	MRDLG* (mg/l)
Total Trihalomethanes (TTHM)	0.080		Chlorine	4.0 as Cl_2	4
Chloroform		-			
Bromodichloromethane		zero			
Dibromochloromethane		0.06			
Bromoform		zero			
Five Haloacetic Acids (HAA5)	0.060		Chloramines	4.0 as Cl_2	4
Monochloroacetic acid		-	Chlorine dioxide	0.8	0.8
Dichloroacetic acid		zero			
Trichloroacetic acid		0.3			
Bromoacetic acid		-			
Dibromoacetic acid		-			
Bromate (plants that use ozone)	0.010	zero	*Stage 1 DBPR includes maximum residual disinfectant levels (MRDLs) and maximum residual disinfectant level goals (MRDLGs) which are similar to MCLs and MCLGs, but for disinfectants.		
Chlorite (plants that use chlorine dioxide)	1.0	0.8			

Treatment Technique

Enhanced coagulation/enhanced softening to improve removal of DBP precursors (See Step 1 TOC Table) for systems using conventional filtration treatment.

Step 1 TOC Table - Required % Removal of TOC

Source Water TOC (mg/L)	Source Water Alkalinity, mg/L as $CaCO_3$		
	0-60	> 60-120	> 120
> 2.0 to 4.0	35.0%	25.0%	15.0%
> 4.0 to 8.0	45.0%	35.0%	25.0%
> 8.0	50.0%	40.0%	30.0%

[1] Systems meeting at least one of the alternative compliance criteria in the rule are not required to meet the removals in this table.

[2] Systems practicing softening must meet the TOC removal requirements in the last column to the right

Routine Monitoring Requirements

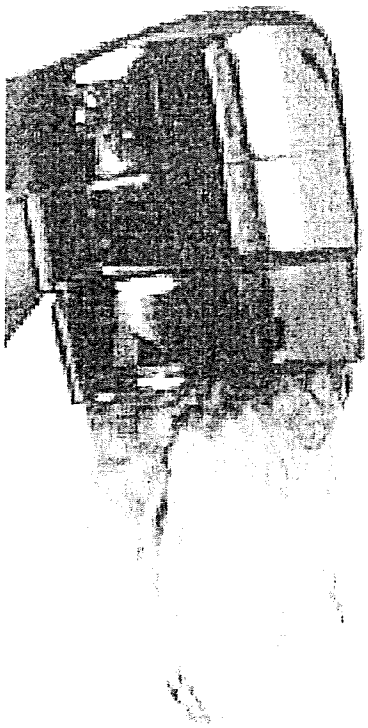
	Coverage	Monitoring Frequency	Compliance
TTHM/HAA5	Surface and ground water under the direct influence of surface water serving ≥ 10,000	4/plant/quarter	Running annual average
	Surface and ground water under the direct influence of surface water serving 500 - 9,999	1/plant/quarter	Running annual average
	Surface and ground water under the direct influence of surface water serving < 500	1/plant/year in month of warmest water temperature**	Running annual average of increased monitoring
	Ground water serving ≥ 10,000	1/plant/quarter	Running annual average
	Ground water serving < 10,000	1/plant/year in month of warmest water temperature**	Running annual average of increased monitoring
Bromate	Ozone plants	Monthly	Running annual average
Chlorite	Chlorine dioxide plants	Daily at entrance to distribution system; monthly in distribution system	Daily/follow-up monitoring
Chlorine dioxide	Chlorine dioxide plants	Daily at entrance to distribution system	Daily/follow-up monitoring
Chlorine/Chloramines	All systems	Same location and frequency as TCR sampling	Running annual average
DBP precursors	Conventional filtration	Monthly for total organic carbon and alkalinity	Running annual average

** System must increase monitoring to 1 sample per plant per quarter if an MCL is exceeded.

Office of Water (4606) EPA 816-F-01-010 www.epa.gov/safewater May 2001

EPA
United States
Environmental Protection
Agency

Stage 2 Disinfectants and Disinfection Byproducts Rule: A Quick Reference Guide For Schedule 2 Systems



Overview of the Rule

Title	Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) 71 FR 388, January 4, 2006, Vol. 71, No. 2
Purpose	To increase public health protection by reducing the potential risk of adverse health effects associated with disinfection byproducts (DBPs) throughout the distribution system. Builds on the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) by focusing on monitoring for and reducing concentrations of two classes of DBPs - TTHM and HAA5 - in drinking water.
General Description	Stage 2 DBPR requires systems to complete an Initial Distribution System Evaluation (IDSE) to characterize DBP levels in their distribution systems and identify locations to monitor DBPs for Stage 2 DBPR compliance. The Stage 2 DBPR bases TTHM and HAA5 compliance on a locational running annual average (LRAA) calculated at each monitoring location.
Utilities Covered	▸ All community water systems (CWSs) and nontransient noncommunity water systems (NTNCWSs) that either add a primary or residual disinfectant other than ultraviolet light, or deliver water that has been treated with a primary or residual disinfectant other than ultraviolet light. ▸ Schedule 2 includes CWSs and NTNCWSs serving 50,000 to 99,999 people OR CWSs and NTNCWSs that are part of a combined distribution system in which the largest system serves 50,000 to 99,999 people.

Stage 2 DBPR Regulated Contaminants

Regulated Contaminants	MCLG (mg/L)	MCL (mg/L)
Total Trihalomethanes (TTHM)		0.080 LRAA
Chloroform	0.07	
Bromodichloromethane	zero	
Dibromochloromethane	0.06	
Bromoform	zero	
Five Haloacetic Acids (HAA5)		0.060 LRAA
Monochloroacetic acid	0.07	
Dichloroacetic acid	zero	
Trichloroacetic acid	0.02	
Bromoacetic acid	-	
Dibromoacetic acid	-	

IDSE Requirements*

IDSE Option	Description
Standard Monitoring	Standard monitoring is one year of increased monitoring for TTHM and HAA5 in addition to the data being collected under Stage 1 DBPR. These data will be used with Stage 1 DBPR data to select Stage 2 DBPR monitoring locations for DBP compliance monitoring. Any system may conduct standard monitoring to meet the IDSE requirements of the Stage 2 DBPR.
System Specific Study (SSS)	Systems that have extensive DBP data (including Stage 1 DBPR compliance data) or technical expertise to prepare a hydraulic model may choose to conduct a system specific study to select Stage 2 DBPR compliance monitoring locations.
40/30 Certification†	The term "40/30" refers to a system that during a specific time period has all individual Stage 1 DBPR compliance samples less than or equal to 0.040 mg/L for TTHM and 0.030 mg/L for HAA5 and has no monitoring violations during the same time period. These systems have no IDSE monitoring requirements, but will still need to conduct Stage 2 DBPR compliance monitoring.
Very Small System (VSS) Waiver†	Systems that serve fewer than 500 people and have DBP data can qualify for a VSS Waiver and would not be required to conduct IDSE monitoring. These systems have no IDSE monitoring requirements, but will still need to conduct Stage 2 DBPR compliance monitoring.
EPA has developed several tools to assist systems with complying with the Stage 2 DBPR IDSE requirements. These materials can be downloaded at www.epa.gov/safewater/disinfection/stage2.	

* NTNCWS serving < 10,000 people do not need to complete any of the IDSE options.
† Unless notified by EPA or the state that they must complete standard monitoring or system specific study.

For additional information on the Stage 2 DBPR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/safewater; or contact your State drinking water representative.

Additional material is available at www.epa.gov/safewater/disinfection/stage2.

Compliance with Stage 2 DBPR MCLs (Routine Monitoring)

Source Water Type	Population Size Category	Monitoring Frequency [1]	Total Distribution System Monitoring Locations Per Monitoring Period [2]
Subpart H	<500	per year	2
	500-3,300	per quarter	2
	3,301-9,999	per quarter	2
	10,000-49,999		4
	50,000-249,999		8
	250,000-999,999		12
	1,000,000-4,999,999		16
	≥5,000,000		20
Ground Water	<500	per year	2
	500-9,999		2
	10,000-99,999	per quarter	4
	100,000-499,999		6
	≥500,000		8
Operational Evaluation			
Systems must begin complying with rule requirements to determine compliance with the operational evaluation levels for TTHMs and HAA5s.			

[1] All systems must monitor during month of highest DBP concentrations.

[2] Systems on quarterly monitoring must take dual sample sets every 90 days at each monitoring location, except for subpart H systems serving 500-3,300. Systems on annual monitoring and subpart H systems serving 500-3,300 are required to take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentrations, respectively. If monitoring annually, only one location with a dual sample set per monitoring period is needed if highest TTHM and HAA5 concentrations occur at the same location, and month.

Critical Deadlines and Requirements

For Drinking Water Systems (Schedule 2)	
January 4, 2006	Systems serving fewer than 500 people that have TTHM and HAA5 compliance data qualify for a VSS Waiver from conducting an IDSE, unless informed otherwise by U.S. EPA or state primacy agency.
April 1, 2007	Systems that do not receive a VSS Waiver must submit to the U.S EPA or state primacy agency either a: ‣ Standard monitoring plan, ‣ System specific study plan, or ‣ 40/30 certification.
April 1, 2008	Systems conducting standard monitoring or SSS begin collecting samples in accordance with their approved plan.
March 31, 2009	No later than this date, systems conducting standard monitoring or a SSS complete their monitoring or study.
July 1, 2009	No later than this date, systems conducting standard monitoring or a SSS must submit their IDSE report.
April 1, 2009	Consecutive systems must begin monitoring for chlorine or chloramines as specified under the Stage 1 DBPR.
October 1, 2012	No later than this date, systems must: ‣ Complete their Stage 2 DBPR Compliance Monitoring Plan (Systems serving more than 3,300 people must submit their Monitoring Plan to the state.)* ‣ Begin complying with monitoring requirements of the Stage 2 DBPR.†
July 2013	Systems must begin complying with rule requirements to determine compliance with the operational evaluation levels for TTHMs and HAA5s.
For States	
January - June 2006	States are encouraged to inform systems serving fewer than 500 people and do not qualify for a VSS Waiver from the IDSE requirements should begin complying with standard monitoring requirements.
March 31, 2008	States must approve the system's standard monitoring plan, 40/30 certification, or system specific study plan or notify the system that the state has not completed its review.
October 4, 2007	States are encouraged to submit final primacy applications or extension requests to EPA.
January 4, 2008	Final primacy applications must be submitted to EPA, unless granted an extension.
September 30, 2009	States must approve the system's IDSE report or notify the system that the state has not completed its review of the IDSE report.
January 4, 2010	Final primacy revision applications from states with approved 2-year extensions agreements must be submitted to EPA.

* A monitoring plan is not required if the IDSE report includes all information required in the monitoring plan.
† States may allow up to an additional 24 months for compliance with MCLs for systems requiring capital improvements.

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Lead and Copper Rule: A Quick Reference Guide

Overview of the Rule

Title	Lead and Copper Rule (LCR)[1], 56 FR 26460 - 26564, June 7, 1991
Purpose	Protect public health by minimizing lead (Pb) and copper (Cu) levels in drinking water, primarily by reducing water corrosivity. Pb and Cu enter drinking water mainly from corrosion of Pb and Cu containing plumbing materials.
General Description	Establishes action level (AL) of 0.015 mg/L for Pb and 1.3 mg/L for Cu based on 90th percentile level of tap water samples. An AL exceedance is not a violation but can trigger other requirements that include water quality parameter (WQP) monitoring, corrosion control treatment (CCT), source water monitoring/treatment, public education, and lead service line replacement (LSLR).
Utilities Covered	All community water systems (CWSs) and non-transient, non-community water systems (NTNCWSs) are subject to the LCR requirements.

Public Health Benefits

Implementation of the LCR has resulted in . . .	▸ Reduction in risk of exposure to Pb that can cause damage to brain, red blood cells, and kidneys, especially for young children and pregnant women. ▸ Reduction in risk of exposure to Cu that can cause stomach and intestinal distress, liver or kidney damage, and complications of Wilson's disease in genetically predisposed people.

Lead and Copper Tap Sampling Requirements

- First draw samples must be collected by all CWSs & NTNCWSs at cold water taps in homes/buildings that are at high risk of Pb/Cu contamination as identified in 40 CFR 141.86(a).
- Number of sample sites is based on system size (see Table 1).
- Systems must conduct monitoring every 6 months unless they qualify for reduced monitoring (see Table 2).

Table 1: Pb and Cu Tap and WQP Tap Monitoring

Size Category	System Size	Number of Pb/Cu Tap Sample Sites		Number of WQP Tap Sampling Sites	
		Standard	Reduced	Standard	Reduced
Large	> 100K	100	50	25	10
	50,001-100K	60	30	10	7
Medium	10,001 - 50K	60	30	10	7
	3,301 - 10K	40	20	3	3
Small	501 - 3,300	20	10	2	2
	101 - 500	10	5	1	1
	≤ 100	5	5	1	1

Table 2: Criteria for Reduced Pb/Cu Tap Monitoring

Can Monitor . . .	*If the System . . .*
Annually	1. Serves ≤ 50,000 and is ≤ both ALs for 2 consecutive 6-month monitoring periods; *or*
	2. Meets Optimal Water Quality Parameter (OWQP) specifications for 2 consecutive 6-month monitoring periods.
Triennially	1. Serves ≤ 50,000 and is ≤ both ALs for 3 consecutive years of monitoring; *or*
	2. Meets OWQP specifications for 3 consecutive years of monitoring; *or*
	3. Has 90th percentile Pb levels ≤ 0.005 mg/L & 90th percentile Cu level ≤ 0.65 mg/L for 2 consecutive 6-month periods (*i.e.*, accelerated reduced Pb/Cu tap monitoring), *or*
	4. Meets the 40 CFR 141.81(b)(3) criteria.
Once every 9 years	Serves ≤ 3,300 and meets monitoring waiver criteria found at 40 CFR 141.86(g).

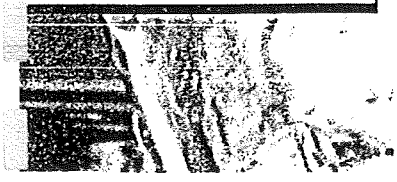
[a] Samples are collected at reduced number of sites (see Table 1 above).

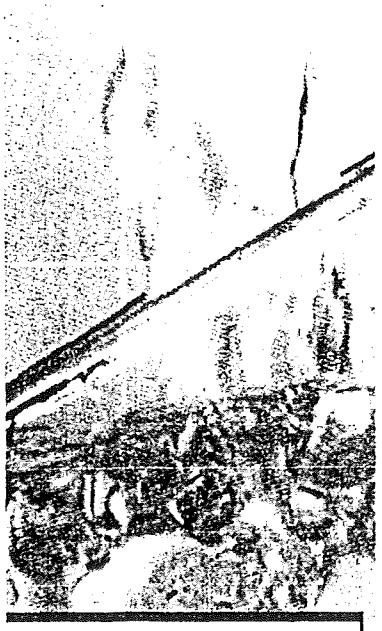
Treatment Technique and Sampling Requirements

CORROSION CONTROL TREATMENT INSTALLATION: All large systems (except systems that meet the requirements of 40 CFR 141.81(b)(2) or (3)) must install CCT. Medium and small systems that exceed either AL must install CCT.

WATER QUALITY PARAMETER MONITORING: All large systems are required to do WQP monitoring. Medium and small systems that exceed either AL are required to do WQP monitoring.

[1]The June 1991 LCR was revised with the following Technical Amendments: 56 FR 32112, July 15, 1991; 57 FR 28785, June 29, 1992; 59 FR 33860, June 30, 1994; and the LCR Minor Revisions 65 FR 1950, January 12, 2000.





For additional information on the LCR, call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/safewater/lcrmr/implement.html; or contact your State drinking water representative.

Treatment Technique and Sampling Requirements if the AL is Exceeded

❶ Water Quality Parameter (WQP) Monitoring

- All systems serving > 50,000 people, and those systems serving ≤ 50,000 people if 90th percentile tap level > either AL, must take WQP samples during the same monitoring periods as Pb/Cu tap samples.
- Used to determine water corrosivity, and if needed, to help identify type of CCT to be installed and how CCT should be operated (*i.e.*, establishes OWQP levels).
- WQPs include: pH, alkalinity, calcium, conductivity (initial WQP monitoring only), orthophosphate (if phosphate-based inhibitor is used); silica (if silicate-based inhibitor is used), and temperature (initial WQP monitoring only).
- Samples are collected within distribution system (*i.e.*, WQP tap samples), with number of sites based on system size (see Table 1), and at each entry point to distribution system (EPTDS).
- Systems installing CCT, must conduct follow-up monitoring for 2 consecutive 6-month periods – WQP tap monitoring is conducted semi-annually; EPTDS monitoring increases to every two weeks.
- After follow-up monitoring, State sets ranges of values for the OWQPs.
- Reduced WQP tap monitoring is available for systems in compliance with OWQPs; *Reduced monitoring does not apply to EPTDS monitoring.*
- For systems ≤ 50,000, WQP monitoring is not required whenever 90th percentile tap levels are ≤ both ALs.

❷ Public Education (PE)

- Only required if Pb AL is exceeded *(no public education is required if only Cu AL exceeded).*
- Informs Public Water System's (PWS) customers about health effects, sources, and what can be done to reduce exposure.
- Includes billing inserts sent directly to customers, pamphlets or brochures distributed to hospitals & other locations that provide services to pregnant woman & children, and for some CWSs, newspaper notices and public service announcements (PSAs) submitted to TV/radio stations.
- System must begin delivering materials within 60 days of Pb AL exceedance and continue every 6 months for PSAs and annually for all other forms of delivery for as long as it exceeds Pb AL.
- Different delivery methods and mandatory language for CWSs & NTNCWSs.
- Can discontinue delivery whenever ≤ Pb AL; but must recommence if Pb AL subsequently exceeded.
- PE requirements are in addition to the Public Notification required in 40 CFR Subpart Q.

❸ Source Water Monitoring and Treatment

- All systems that exceed Pb or Cu AL must collect source water samples to determine contribution from source water to total tap water Pb/Cu levels and make a source water treatment (SOWT) recommendation within 6 months of the exceedance.
- One set of samples at each EPTDS is due within 6 months of first AL exceedance.
- If State requires SOWT; system has 24 months to install SOWT.
- After follow-up Pb/Cu tap and EPTDS monitoring, State sets maximum permissible levels for Pb & Cu in source.

❹ Corrosion Control Treatment

- Required for all large systems (except systems that meet the requirements of 40 CFR 141.81(b)(2) or (b)(3)) and medium/small systems that exceed either AL. The system shall recommend optimal CCT within 6 months.
- Corrosion control study required for large systems.
- If State requires study for medium or small systems, it must be completed within 18 months.
- Once State determines type of CCT to be installed, PWS has 24 months to install CCT.
- Systems installing CCT must conduct 2 consecutive 6-months of follow-up monitoring.
- After follow-up Pb/Cu tap & WQP monitoring, State sets OWQPs.
- Small & medium systems can stop CCT steps if ≤ both ALs for 2 consecutive 6-month monitoring periods.

If the system continues to exceed the AL after installing CCT and/or SOWT...

❺ Lead Service Line (LSL) Monitoring

- Two types of sampling associated with LSL replacement (LSLR):
  - *Optional* - Monitoring from LSL to determine need to replace line. If all Pb samples from line ≤ 0.015 mg/L then LSL does not need to be replaced and counts as replaced line.
  - *Required* - Monitoring if entire LSL is ***not*** replaced to determine impact from "partial" LSLR. Sample is collected that is representative of water in service line that is partially replaced.
- Monitoring only applies to system subject to LSLR.

❻ Lead Service Line Replacement

- System must replace LSLs that contribute more than 0.015 mg/L to tap water levels.
- Must replace 7% of LSL per year; State can require accelerated schedule.
- If only a portion of a LSL is replaced, PWS must:
  - Notify customers at least 45 days prior to replacement about the potential for increased Pb levels;
  - Collect sample within 72 hours of replacement and mail/post results within 3 days of receipt of results.
- Systems can discontinue LSLR whenever ≤ Pb AL in tap water for 2 consecutive monitoring periods.

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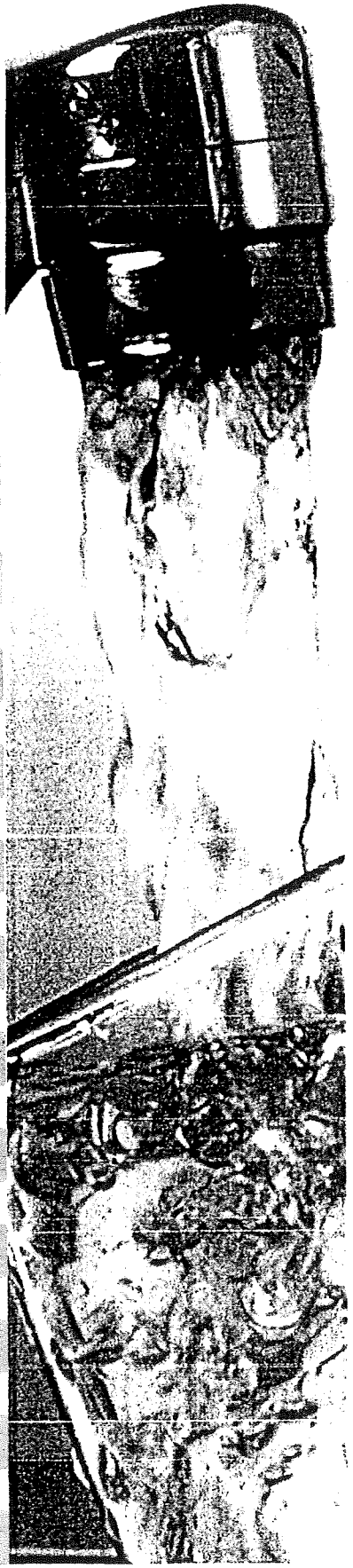
Arsenic and Clarifications to Compliance and New Source Monitoring Rule: A Quick Reference Guide



Overview of the Rule

Title	Arsenic and Clarifications to Compliance and New Source Monitoring Rule 66 FR 6976 (January 22, 2001)
Purpose	To improve public health by reducing exposure to arsenic in drinking water.
General Description	Changes the arsenic MCL from 50 µg/L to 10 µg/L; Sets arsenic MCLG at 0; Requires new systems and new drinking water sources to demonstrate compliance as specified by the State; Clarifies the procedures for determining compliance with the MCLs for IOCs, SOCs, and VOCs.
Utilities Covered	All community water systems (CWSs) and nontransient, noncommunity water systems (NTNCWSs) must comply with the arsenic requirements. EPA estimates that 3,024 CWSs and 1,080 NTNCWSs will have to install treatment to comply with the revised MCL.

Public Health Benefits

Implementation of the Arsenic Rule will result in . . .	• Avoidance of 16 to 26 non-fatal bladder and lung cancers per year. • Avoidance of 21 to 30 fatal bladder and lung cancers per year. • Reduction in the frequency of non-carcinogenic diseases.

Critical Deadlines & Requirements

Consumer Confidence Report Requirements*

Report Due	*Report Requirements*
July 1, 2002 and beyond	For reports covering calendar years 2001 and beyond, systems that detect arsenic between 5 µg/L and 10 µg/L must include an educational statement in the CCRs.
July 1, 2002 - July 1, 2006	For reports covering calendar years 2001 to 2005, systems that detect arsenic between 10 µg/L and 50 µg/L must include a health effects statement in their CCRs.
July 1, 2007 and beyond	For reports covering calendar year 2006 and beyond, systems that are in violation of the arsenic MLC (10 µg/L) must include a health effects statement in their CCRs.

For Drinking Water Systems

Jan. 22, 2004	All *NEW* systems/sources must collect initial monitoring samples for all IOCs, SOCs, and VOCs within a period and frequency determined by the State.
Jan. 1, 2005	When allowed by the State, systems may grandfather data collected after this date.
Jan. 23, 2006	The new arsenic MCL of 10 µg/L becomes effective. All systems must begin monitoring or when allowed by the State, submit data that meets grandfathering requirements.
Dec. 31, 2006	Surface water systems must complete initial monitoring or have a State approved waiver.
Dec. 31, 2007	Ground water systems must complete initial monitoring or have a State approved waiver.

For States

Spring 2002	EPA meets and works with States to explain new rule and requirements and to support adoption and implementation activities.
Jan. 22, 2003	State primacy revision applications due.
Jan. 22, 2005	State primacy revision applications due from States that received 2-year extensions.

* For required educational and health effect statements, please see 40 CFR 141.154.

Compliance Determination (IOCs, VOCs, and SOCs)

1. Calculate compliance based on a running annual average at each sampling point.
2. Systems will not be in violation until 1 year of quarterly samples have been collected (unless fewer samples would cause the running annual average to be exceeded.)
3. If a system does not collect all required samples, compliance will be based on the running annual average of the samples collected.

Monitoring Requirements for Total Arsenic[1]

Monitoring

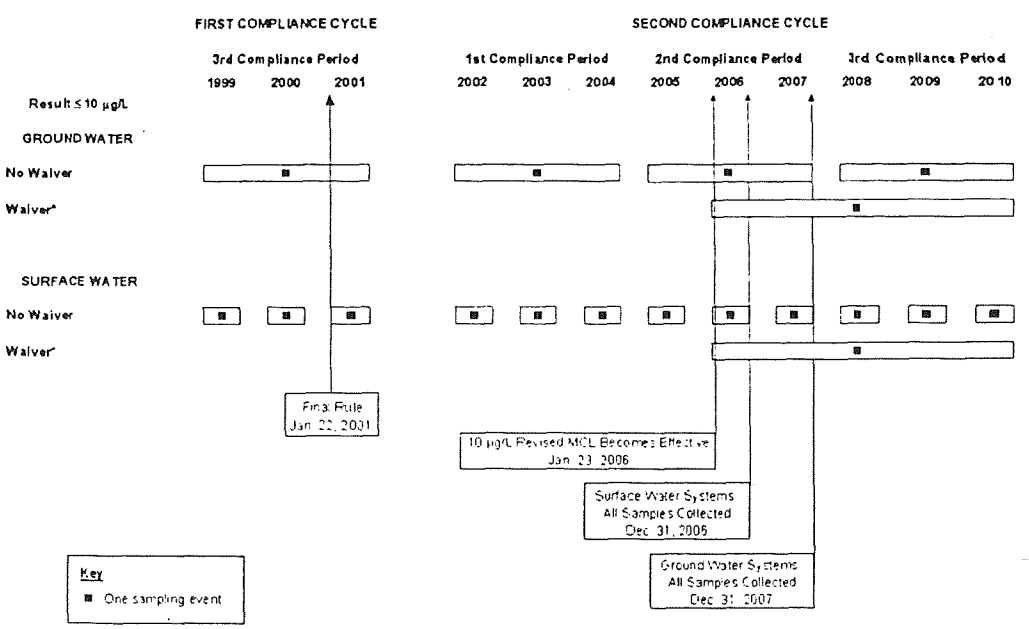
One sample after the effective date of the MCL (January 23, 2006). Surface water systems must take annual samples. Ground water systems must take one sample during the 2005-2007 compliance period. If the monitoring result is less than the MCL ground water systems must collect one sample every 3 years and surface water systems must continue to collect annual samples.

Increased Monitoring

A system with a sampling point result above the MCL must collect quarterly samples at that sampling point, until the system is reliably and consistently below the MCL.

[1] All samples must be collected at each entry point to the distribution system, unless otherwise specified by the State.

Applicability of Standardized Monitoring Framework to Arsenic

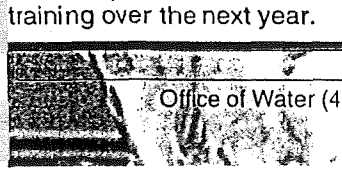


*States may issue 9 year monitoring waivers under the January 22, 2001 final arsenic rule. Waivers are not permitted under the current arsenic requirements. To be eligible for a waiver, surface water systems must have monitored annually for at least 3 years. Ground water systems must conduct a minimum of 3 rounds of monitoring with detections limits below 10 µg/L.

For additional information on the Arsenic Rule

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA Web site at www.epa.gov/safewater; or contact your State drinking water representative.

EPA will provide arsenic training over the next year.



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Interim Enhanced Surface Water Treatment Rule: A Quick Reference Guide

Overview of the Rule

Title	Interim Enhanced Surface Water Treatment Rule (IESWTR) 63 FR 69478 - 69521, December 16, 1998, Vol. 63, No. 241 Revisions to the Interim Enhanced Surface Water Treatment Rule (IESWTR), the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR), and Revisions to State Primacy Requirements to Implement the Safe Drinking Water Act (SDWA) Amendments 66 FR 3770, January 16, 2001, Vol 66, No. 29
Purpose	Improve public health control of microbial contaminants, particularly *Cryptosporidium*. Prevent significant increases in microbial risk that might otherwise occur when systems implement the Stage 1 Disinfectants and Disinfection Byproducts Rule.
General Description	Builds upon treatment technique approach and requirements of the 1989 Surface Water Treatment Rule. Relies on existing technologies currently in use at water treatment plants.
Utilities Covered	Sanitary survey requirements apply to all public water systems using surface water or ground water under the direct influence of surface water, regardless of size. All remaining requirements apply to public water systems that use surface water or ground water under the direct influence of surface water and serve 10,000 or more people.

Major Provisions

Regulated Contaminants

Cryptosporidium	▸ Maximum contaminant level goal (MCLG) of zero. ▸ 99 percent (2-log) physical removal for systems that filter. ▸ Include in watershed control program for unfiltered systems.
Turbidity Performance Standards	Conventional and direct filtration combined filter effluent: ▸ ≤ 0.3 nephelometric turbidity units (NTU) in at least 95 percent of measurements taken each month. ▸ Maximum level of 1 NTU.

Turbidity Monitoring Requirements (Conventional and Direct Filtration)

Combined Filter Effluent	▸ Performed every 4 hours to ensure compliance with turbidity performance standards.
Individual Filter Effluent	▸ Performed continuously (every 15 minutes) to assist treatment plant operators in understanding and assessing filter performance.

Additional Requirements

- Disinfection profiling and benchmarking.
- Construction of new uncovered finished water storage facilities prohibited.
- Sanitary surveys, conducted by the state, for all surface water and ground water under the direct influence of surface water systems regardless of size (every 3 years for community water systems and every 5 years for noncommunity water systems).

Profiling and Benchmarking

Public water systems must evaluate impacts on microbial risk before changing disinfection practices to ensure adequate protection is maintained. The three major steps are:

- Determine if a public water system needs to profile based on TTHM and HAA5 levels (applicability monitoring)
- Develop a disinfection profile that reflects daily *Giardia lamblia* inactivation for at least a year (systems using ozone or chloramines must also calculate inactivation of viruses)
- Calculate a disinfection benchmark (lowest monthly inactivation) based on the profile and consult with the state prior to making a significant change to disinfection practices

Critical Deadlines and Requirements

For Drinking Water Systems

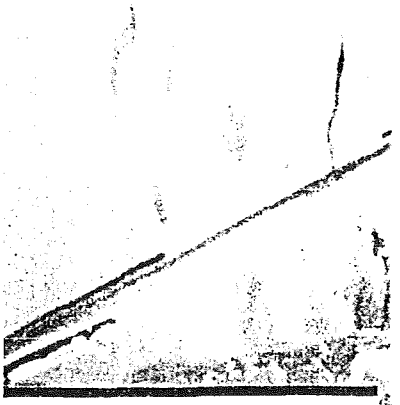
February 16, 1999	Construction of uncovered finished water reservoirs is prohibited.
March 1999	Public water systems lacking ICR or other occurrence data begin 4 quarters of applicability monitoring for TTHM and HAA5 to determine if disinfection profiling is necessary.
April 16, 1999	Systems that have 4 consecutive quarters of HAA5 occurrence data that meet the TTHM monitoring requirements must submit data to the state to determine if disinfection profiling is necessary.
December 31, 1999	Public water systems with ICR data must submit it to states to determine if disinfection profiling is necessary.
April 1, 2000	Public water systems must begin developing a disinfection profile if their annual average (based on 4 quarters of data) for TTHM is greater than or equal to 0.064 mg/L or HAA5 is greater than or equal to 0.048 mg/L.
March 31, 2001	Disinfection profile must be complete.
January 1, 2002	Surface water systems or ground water under the direct influence of surface water systems serving 10,000 or more people must comply with all IESWTR provisions (e.g., turbidity standards, individual filter monitoring).

For States

December 16, 2000	States submit IESWTR primacy revision applications to EPA (triggers interim primacy).
January 2002	States begin first round of sanitary surveys.
December 16, 2002	Primacy extension deadline - all states with an extension must submit primacy revision applications to EPA.
December 2004	States must complete first round of sanitary surveys for community water systems.
December 2006	States must complete first round of sanitary surveys for noncommunity water systems.

Public Health Benefits

Implementation of the IESWTR will result in . . .	▸ Increased protection against gastrointestinal illnesses from *Cryptosporidium* and other pathogens through improvements in filtration. ▸ Reduced likelihood of endemic illness from *Cryptosporidium* by 110,000 to 463,000 cases annually. ▸ Reduced likelihood of outbreaks of cryptosporidiosis.
Estimated impacts of the IESWTR include . . .	▸ National total annualized cost: $307 million ▸ 92 percent of households will incur an increase of less than $1 per month. ▸ Less than 1 percent of households will incur an increase of more than $5 per month (about $8 per month).



For additional information on the IESWTR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/safewater; or contact your State drinking water representative.

Additional material is available at www.epa.gov/safewater/mdbp/implement.html.

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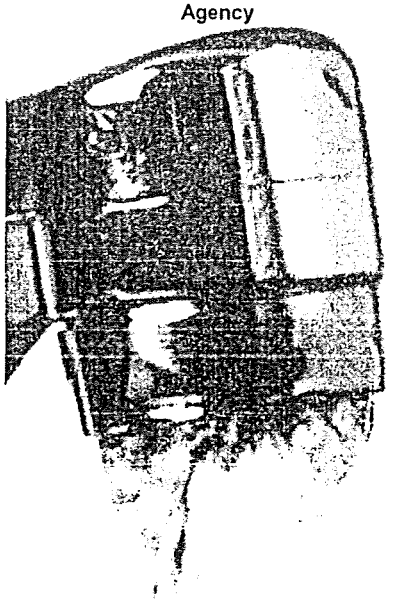
Long Term 1 Enhanced Surface Water Treatment Rule: A Quick Reference Guide

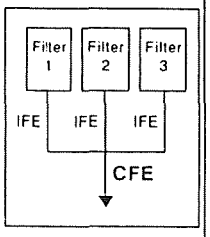


Overview of the Rule

Title	Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) 67 FR 1812, January 14, 2002, Vol. 67, No. 9
Purpose	Improve public health protection through the control of microbial contaminants, particularly *Cryptosporidium*. Prevent significant increases in microbial risk that might otherwise occur when systems implement the Stage 1 Disinfectants and Disinfection Byproducts Rule.
General Description	Builds upon the requirements of the 1989 Surface Water Treatment Rule (SWTR). Smaller system counterpart of the Interim Enhanced Surface Water Treatment Rule (IESWTR).
Utilities Covered	Public water systems that use surface water or ground water under the direct influence of surface water (GWUDI) and serve fewer than 10,000 people.

Major Provisions

Control of *Cryptosporidium*	▸ The maximum contaminant level goal (MCLG) is set at zero. ▸ Filtered systems must physically remove 99% (2-log) of *Cryptosporidium*. ▸ Unfiltered systems must update their watershed control programs to minimize the potential for contamination by *Cryptosporidium* oocysts. ▸ *Cryptosporidium* is included as an indicator of GWUDI.
Combined Filter Effluent (CFE) Turbidity Performance Standards	*Specific CFE turbidity requirements depend on the type of filtration used by the system.* <u>Conventional and direct filtration:</u> ▸ ≤ 0.3 nephelometric turbidity units (NTU) in at least 95% of measurements taken each month. ▸ Maximum level of turbidity: 1 NTU. <u>Slow sand and diatomaceous earth (DE) filtration:</u> ▸ Continue to meet CFE turbidity limits specified in the SWTR: • 1 NTU in at least 95% of measurements taken each month. • Maximum level of turbidity: 5 NTU. <u>Alternative technologies (other than conventional, direct, slow sand, or DE):</u> ▸ Turbidity levels are established by the State based on filter demonstration data submitted by the system. • State-set limits must not exceed 1 NTU (in at least 95% of measurements) or 5 NTU (maximum).



Turbidity Monitoring Requirements

Combined Filter Effluent	▸ Performed at least every 4 hours to ensure compliance with CFE turbidity performance standards.[1]
Individual Filter Effluent (IFE) (for systems using conventional and direct filtration only)	*Since the CFE may meet regulatory requirements even though one filter is producing high turbidity water, the IFE is measured to assist conventional and direct filtration treatment plant operators in understanding and assessing individual filter performance.* ▸ Performed continuously (recorded at least every 15 minutes). ▸ Systems with two or fewer filters may conduct continuous monitoring of CFE turbidity in place of individual filter effluent turbidity monitoring. ▸ Certain follow-up actions are required if the IFE turbidity (or CFE for systems with two filters) exceeds 1.0 NTU in 2 consecutive readings or more (i.e., additional reporting, filter self-assessments, and/or comprehensive performance evaluations (CPEs)).

For additional information on the LT1ESWTR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/safewater/mdbp/lt1eswtr.html; or contact your State drinking water representative.

[1] This frequency may be reduced by the State to once per day for systems using slow sand/alternative filtration or for systems serving 500 persons or fewer regardless of the type of filtration used.

Disinfection Profiling and Benchmarking Requirements

Community and non-transient non-community public water systems must evaluate impacts on microbial risk before changing disinfection practices to ensure adequate microbial protection is maintained. This is accomplished through a process called disinfection profiling and benchmarking.

What are the disinfection profiling and benchmarking requirements?

- Systems must develop a disinfection profile, which is a graphical compilation of weekly inactivation of *Giardia lamblia*, taken on the same calendar day each week over 12 consecutive months. (Systems using chloramines, ozone, or chlorine dioxide for primary disinfection must also calculate inactivation of viruses). Results must be available for review by the State during sanitary surveys.
- A State may deem a profile unnecessary if the system has sample data collected after January 1, 1998–during the month of warmest water temperature and at maximum residence time in the distribution system–indicating TTHM levels are below 0.064 mg/L and HAA5 levels are below 0.048 mg/L.
- Prior to making a significant change to disinfection practices, systems required to develop a profile must calculate a disinfection benchmark and consult with the State. The benchmark is the calculation of the lowest monthly average of inactivation based on the disinfection profile.

Additional Requirements

- Construction of new uncovered finished water reservoirs is prohibited.

Critical Deadlines and Requirements

For Drinking Water Systems

March 15, 2002	Construction of uncovered finished reservoirs is prohibited.
July 1, 2003	No later than this date, systems serving between 500-9,999 persons must report to the State: • Results of optional monitoring which show levels of TTHM < 0.064 mg/L and HAA5 < 0.048 mg/L, OR • System has started profiling.
January 1, 2004	No later than this date, systems serving fewer than 500 persons must report to the State: • Results of optional monitoring which show levels of TTHM < 0.064 mg/L and HAA5 < 0.048 mg/L, OR • System has started profiling.
June 30, 2004	Systems serving between 500 and 9,999 persons must complete their disinfection profile unless the State has determined it is unnecessary.
December 31, 2004	Systems serving fewer than 500 persons must complete their disinfection profile unless the State has determined it is unnecessary.
January 14, 2005	Surface water systems or GWUDI systems serving fewer than 10,000 people must comply with the applicable LT1ESWTR provisions (e.g., turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).

For States

January 2002	As per the IESWTR, States begin first round of sanitary surveys (at least every 3 years for community water systems and every 5 years for non-community water systems).
October 14, 2003	States are encouraged to submit final primacy applications to EPA.
January 14, 2004	Final primacy applications must be submitted to EPA unless granted an extension.
December 2004	States must complete first round of sanitary surveys for community water systems (as per the IESWTR).
January 14, 2006	Final primacy revision applications from States with approved 2-year extension agreements must be submitted to EPA.
December 2006	States must complete first round of sanitary surveys for non-community water systems (as per the IESWTR).

Public Health Benefits

Implementation of the LT1ESWTR will result in . . .	• Increased protection against gastrointestinal illnesses from *Cryptosporidium* and other pathogens through improvements in filtration. • Reduced likelihood of endemic illness from *Cryptosporidium* by an estimated 12,000 to 41,000 cases annually. • Reduced likelihood of outbreaks of cryptosporidiosis.
Estimated Impacts of the LT1ESWTR include . . .	• National total annualized cost: $39.5 million. • 90% of affected households will incur an increase of less than $1.25 per month. • One percent of affected households are likely to incur an increase of more than $10 per month.

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Total Coliform Rule: A Quick Reference Guide

Overview of the Rule

Title	Total Coliform Rule (TCR) 54 FR 27544-27568, June 29, 1989, Vol. 54, No. 124[1]
Purpose	Improve public health protection by reducing fecal pathogens to minimal levels through control of total coliform bacteria, including fecal coliforms and *Escherichia coli (E. coli).*
General Description	Establishes a maximum contaminant level (MCL) based on the presence or absence of total coliforms, modifies monitoring requirements including testing for fecal coliforms or *E. coli,* requires use of a sample siting plan, and also requires sanitary surveys for systems collecting fewer than five samples per month.
Utilities Covered	The TCR applies to all public water systems.

Public Health Benefits

Implementation of the TCR has resulted in . . .	▸ Reduction in risk of illness from disease causing organisms associated with sewage or animal wastes. Disease symptoms may include diarrhea, cramps, nausea, and possibly jaundice, and associated headaches and fatigue.

What are the Major Provisions?

ROUTINE Sampling Requirements

- Total coliform samples must be collected at sites which are representative of water quality throughout the distribution system according to a written sample siting plan subject to state review and revision.
- Samples must be collected at regular time intervals throughout the month except groundwater systems serving 4,900 persons or fewer may collect them on the same day.
- Monthly sampling requirements are based on population served (see table on next page for the minimum sampling frequency).
- A reduced monitoring frequency may be available for systems serving 1,000 persons or fewer and using only ground water if a sanitary survey within the past 5 years shows the system is free of sanitary defects (the frequency may be no less than 1 sample/quarter for community and 1 sample/year for non-community systems).
- Each total coliform-positive routine sample must be tested for the presence of fecal coliforms or *E. coli.*
- If any routine sample is total coliform-positive, repeat samples are required.

REPEAT Sampling Requirements

- Within 24 hours of learning of a total coliform-positive ROUTINE sample result, at least 3 REPEAT samples must be collected and analyzed for total coliforms:
  - One REPEAT sample must be collected from the same tap as the original sample.
  - One REPEAT sample must be collected within five service connections upstream.
  - One REPEAT sample must be collected within five service connections downstream.
  - Systems that collect 1 ROUTINE sample per month or fewer must collect a 4th REPEAT sample.
- If any REPEAT sample is total coliform-positive:
  - The system must analyze that total coliform-positive culture for fecal coliforms or *E. coli.*
  - The system must collect another set of REPEAT samples, as before, unless the MCL has been violated and the system has notified the state.

Additional ROUTINE Sample Requirements

- A positive ROUTINE or REPEAT total coliform result requires a minimum of five ROUTINE samples be collected the following month the system provides water to the public unless waived by the state.

[1] The June 1989 Rule was revised as follows: Corrections and Technical Amendments, 6/19/90 and Partial Stay of Certain Provisions (Variance Criteria) 56 FR 1556-1557, Vol 56, No 10.

Note: The TCR is currently undergoing the 6 year review process and may be subject to change.

For additional information on the TCR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/safewater/mdbp/mdbp.html; or contact your state drinking water representative.

[2] The revised Public Notification Rule will extend the period allowed for public notice of monthly violations to 30 days and shorten the period for acute violations to 24 hours. These revisions are effective for all systems by May 6, 2002 and are detailed in 40 CFR Subpart Q.

Public Water System ROUTINE Monitoring Frequencies

Population	Minimum Samples/ Month	Population	Minimum Samples/ Month	Population	Minimum Samples/ Month
25-1,000*	1	21,501-25,000	25	450,001-600,000	210
1,001-2,500	2	25,001-33,000	30	600,001-780,000	240
2,501-3,300	3	33,001-41,000	40	780,001-970,000	270
3,301-4,100	4	41,001-50,000	50	970,001-1,230,000	300
4,101-4,900	5	50,001-59,000	60	1,230,001-1,520,000	330
4,901-5,800	6	59,001-70,000	70	1,520,001-1,850,000	360
5,801-6,700	7	70,001-83,000	80	1,850,001-2,270,000	390
6,701-7,600	8	83,001-96,000	90	2,270,001-3,020,000	420
7,601-8,500	9	96,001-130,000	100	3,020,001-3,960,000	450
8,501-12,900	10	130,001-220,000	120	≥ 3,960,001	480
12,901-17,200	15	220,001-320,000	150		
17,201-21,500	20	320,001-450,000	180		

*Includes PWSs which have at least 15 service connections, but serve <25 people.

What are the Other Provisions?

Systems collecting fewer than 5 ROUTINE samples per month . . .	Must have a sanitary survey every 5 years (or every 10 years if it is a non-community water system using protected and disinfected ground water).**
Systems using surface water or ground water under the direct influence of surface water (GWUDI) and meeting filtration avoidance criteria . . .	Must collect and have analyzed one coliform sample each day the turbidity of the source water exceeds 1 NTU. This sample must be collected from a tap near the first service connection.

** As per the IESWTR, states must conduct sanitary surveys for community surface water and GWUDI systems in this category every 3 years (unless reduced by the state based on outstanding performance).

How is Compliance Determined?

- Compliance is based on the presence or absence of total coliforms.
- Compliance is determined each calendar month the system serves water to the public (or each calendar month that sampling occurs for systems on reduced monitoring).
- The results of ROUTINE and REPEAT samples are used to calculate compliance.

A Monthly MCL Violation is Triggered if:

A system collecting fewer than 40 samples per month . . .	Has greater than 1 ROUTINE/REPEAT sample per month which is total coliform-positive.
A system collecting at least 40 samples per month . . .	Has greater than 5.0 percent of the ROUTINE/REPEAT samples in a month total coliform-positive.

An Acute MCL Violation is Triggered if:

Any public water system . . .	Has any fecal coliform- or *E. coli*-positive REPEAT sample *or* has a fecal coliform- or *E. coli*-positive ROUTINE sample followed by a total coliform-positive REPEAT sample.

What are the Public Notification and Reporting Requirements?

For a Monthly MCL Violation	▸ The violation must be reported to the state no later than the end of the next business day after the system learns of the violation. ▸ The public must be notified within 14 days.[2]
For an Acute MCL Violation	▸ The violation must be reported to the state no later than the end of the next business day after the system learns of the violation. ▸ The public must be notified within 72 hours.[2]
Systems with ROUTINE or REPEAT samples that are fecal coliform- or *E. coli*-positive . . .	Must notify the state by the end of the day they are notified of the result or by the end of the next business day if the state office is already closed.

Office of Water (4606) EPA 816-F-01-035 www.epa.gov/safewater November 2001

Appendix D

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/13/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.85				Primary Coagulant			Mixing		
Color PCU	69				Coagulant Aid			Flocculation		
pH	7.33				Filter Aid			Settling		
Alkalinity mg/l					Pre pH Adjustment			Remarks		
Hardness mg/l					Post pH Adjustment					
Temp F	36.5°				Other					
Fe mg/l	7.92									
Mn mg/l	0.297									
As mg/l	15									
TDS mg/l	79									

Comments & Notes After about one hour with the water setting in a one leter beaker it starts to oxidize and change color but has no settling

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	Color Settled	Floc Size	Water Quality mg/l					Other
									Fe	Mn	As	Alk	Hard	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/13/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	1.99				Primary Coagulant			Mixing		
Color PCU	74				Coagulant Aid			Flocculation		
pH	7.2				Filter Aid			Settling		
Alkalinity mg/l					Pre pH Adjustment			Remarks		
Hardness mg/l					Post pH Adjustment					
Temp F	35°				Other					
Fe mg/l	7.98									
Mn mg/l	0.331									
As mg/l	35									
TDS mg/l	68									

Comments & Notes After water sets in a 1 liter beaker for about one and one half hour it starts to oxidize and change color but has no noticable settling in it.

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	Color Settled	Floc Size	Water Quality mg/l					Other
									Fe	Mn	As	Alk	Hard	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/14/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.85				Primary Coagulant			Mixing	330	2min
Color PCU	69				Coagulant Aid			Flocculation	30	2min
pH	7.33				Filter Aid			Settling	0	1hr
Alkalinity mg/l					Pre pH Adjustment			Remarks	After 5min small pin Floc	
Hardness mg/l					Post pH Adjustment			in beakers #2,3,&4 Jars 5&6 Overdose		
Temp F	36.5°				Other			and maybe 4 still a little pink		
Fe mg/l	7.92									
Mn mg/l	0.297									
As mg/l	15									
TDS mg/l	79									

Comments & Notes *After about one hour with the water setting in a one liter beaker it starts to oxidize and change color but has no settling*
Looks like 5 mg/l is going to be optimum dose for KmNO4 See pictures 1,2&3

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	Color Filtered	Floc Size	Water Quality mg/l					Other
									Fe	Mn	As	Alk	Hard	
KmNO4	1	2			2.55	0.08	2	small pin	0.05	over				Mn Over limit low range test
	2	4			0.97	0.08	10	small pin	0.04	0.22				Good settling
	3	6			1.09	0.3	8	small pin	0.02	0.11				Good settling
	4	8				0.19		small pin	0.06	0.68				Stil A little pink overdose
	5	10						small pin						Overdose KmNO4
	6	12						small pin						Overdose KmNO4

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/15/2006	Tuluksak W-05-1	Garry Bowley	Pilot

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	0.88				Primary Coagulant		
Color PCU	72				Coagulant Aid		
pH	7.4				Filter Aid		
Alkalinity mg/l					Pre pH Adjustment		
Hardness mg/l					Post pH Adjustment		
Temp F	36°				Other		
Fe mg/l	7.96						
Mn mg/l	0.302						
As mg/l	15						
TDS mg/l	80						

Jar Testing Procedure	RPM	Time
Mixing	320	2min
Flocculation	30	30min
Settling	0	30min

Remarks: Started with 5 mg/l KMnO4 in all jars 330 rpm for 2min then turned down to 30 rpm for 30 min then back up to 330 rpm and added 80/20 Stern Pac Arctic Floc 12100 let run on high 2 min then down to 30 rpm for 2 min then down to 10 rpm for 20 min let settle 30min

Comments & Notes About 5 min after adding KMnO4 and turning rpm down to 30 had small pin floc present and it continued to build in all jars Then after adding Stern Pac +Arctic Floc and turning rpm down to 10 started seeing floc formation and settling after 5min it looks a little heaver in 2,3&4 will see after readings are done.

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	Color Filtered	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	Other
KMnO4 Dose mg/l	1	5	5		0.32	0.06	0	Medium	0.02	0				
	2	5	10		0.28	0.06	0	Medium	0.01	0	0	90	2.79	As no noticeable color change
Stern Pac 80% +	3	5	15		0.42	0.07	3	Medium	0.04	0.04				
Arctic Floc12100 20%	4	5	20		0.46	0.06	0	Medium	0.01	0.03				
Dose µl	5	5	25		0.69	0.07	0	Medium	0.07	0.05				
	6	5	30		0.66	0.07	9	Medium	0.03	0.08				

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/16/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist
Turbidity NTU	4.06			
Color PCU	88			
pH	7.1			
Alkalinity mg/l	74			
Hardness mg/l	3.05			
Temp F	37			
Fe mg/l	7.9			
Mn mg/l	0.336			
As mg/l	35			
TDS mg/l	68			

Chemical Usage	Product	Dose mg/l
Primary Coagulant		
Coagulant Aid		
Filter Aid		
Pre pH Adjustment		
Post pH Adjustment		
Other		

Jar Testing Procedure	RPM	Time
Mixing	330	2min
Flocculation	30	2min
Settling	0	1hr

Remarks Added KMnO4 and SP+AF 80/20 blend at the same time ran on high for 2 min down to 30 rpm 2min then down to 10rpm 25minlet settle for 1hr good pin floc in all jars heaver in lower dose jars 1,2&3 after settling jars 5&6 left suspended floc and pluged gelman filter

Comments & Notes I got greedy and added Stern Pac + Arctic Floc at the same time and it didn't remove the Mn it didn't have time to oxidize

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	Color Filtered	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	Other
KMnO4 = mg/l dose	1	5	8		0.66	0.06	0	medium	0.02	0.28	d/r			
	2	5	10		1.1	0.05	0	medium	0.21	0.23	d/r			
	3	5	12		0.57	0.05	13	medium	0	0.48	d/r			
Stern Pac + Arctic	4	5	14		0.77	0.06	16	medium	0	0.58	d/r			
Floc 12100 = µl	5	5	16		0.67	0.05	15	medium	0.02	0.73	d/r			
	6	5	18		1.37	0.07	5	medium	0	0.6	d/r			

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/17/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist
Turbidity NTU	0.86			
Color PCU	70			
pH	7.33			
Alkalinity mg/l				
Hardness mg/l				
Temp F	37			
Fe mg/l	7.95			
Mn mg/l	0.31			
As mg/l	15			
TDS mg/l	80			
UV254 (A)	D/R			

Chemical Usage	Product	Dose mg/l
Primary Coagulant		
Coagulant Aid		
Filter Aid		
Pre pH Adjustment		
Post pH Adjustment		
Other		

Jar Testing Procedure	RPM	Time
Mixing	330	5min
Flocculation	30	5min
Flocculation	10	25min
Settling	0	1hr

Remarks: Mixed a blend of ferric sulfate and arctic floc 12100 80/20 24 grams Ferric Sulfate to 6 grams Arctic floc12100 and started jar test with oxygen oxidized water for oxidization I used air compressor and 3/8 copper tube with multiple 1/6" holes drilled in it let run for 1 hr in 5gal bucket

Comments & Notes All this did was turn the water a little darker red brown and cloudy didn't read any of the jars because their wasn't any floc formation it didn't work at all

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
Ferric Sulfate Plus	1		6		D/R	D/R	D/R	None	D/R	D/R	D/R	D/R	D/R	D/R	
Arctic Floc 12100	2		9												
80/20 blend	3		12												
	4		15												
	5		18												
	6		21												

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/17/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	5.21				Primary Coagulant			Mixing	330	2min
Color PCU					Coagulant Aid			Oxidization With Air		1hr
pH	7.4				Filter Aid			Flocculation	30	2min
Alkalinity mg/l					Pre pH Adjustment			Flocculation	10	25min
Hardness mg/l					Post pH Adjustment			Settling	0	30min
Temp F	65°				Other			Remarks: Took the water left in 5 gal.		
Fe mg/l	9.42							bucket from yesterday and injected air used		
Mn mg/l	0.331							3/8 copper tube with multiple 1/16" holes		
As mg/l	35							drilled in it let run for 1hr and transferred		
TDS mg/l	70							into jars started test using Stem Pac plus		
UV254 (A)	0.0168							Arctic Floc 12100 80/20 blend		

Comments & Notes Have good floc formation in lower doses but it appears to be light in in color and airy the higher dose jars appear to be overdose 20,25 µl Will see after settling 30 min see pictures 6 & 7

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
Stem Pac Plus	1		8		1.15	0.14	0	medium	0.02	0.225	D/R	D/R	D/R	0.014	
Arctic Floc 12100	2		11		2.27	0.06	0	medium	0.02	0.119	D/R	D/R	D/R	0.012	
80/20 Blend	3		14		4.6	0.07	0	medium	0.1	0.243	D/R	D/R	D/R	0.022	
	4		17		8.32	0.2	12	medium	0.02	0.174	D/R	D/R	D/R	D/R	
	5		20		11.3	0.07	11	small	0.03	0.184	D/R	D/R	D/R	D/R	
	6		25		22.2	0.11	D/R	cloudy	D/R	D/R	D/R	D/R	D/R	D/R	Plugged 5µl filter for 15 ml
															Turbidity sample

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/18/2006	Tuluksak W-05-1		

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	0.55				Primary Coagulant		
Color PCU	40		29		Coagulant Aid		
pH	7.2				Filter Aid		
Alkalinity mg/l					Pre pH Adjustment		
Hardness mg/l					Post pH Adjustment		
Temp F	37				Other		
Fe mg/l	7.98						
Mn mg/l	0.375						
As mg/l	35						
TDS mg/l	97						
UV254 (A)	0.0389						

Jar Testing Procedure	RPM	Time
Mixing	330	2min
Oxidization	30	30min
Flocculation	30	2min
Flocculation	10	30
Settling	0	1hr

Remarks: Started off with 5mg/l KMnO4 mixed on high 2min turned down to 30rpm for 30min to oxidize Fe and Mn turned rpm up and added Stem Pac plus Arctic Floc 12100 90/10 blend then down to 30rpm for2min down to 10rpm for 30min let settle

Comments & Notes I decided to do three jars for each well KMnO4 at 5mg/l in all jars 5,10,15 µl for each well of SP+AF12100 90/10 blend. As soon as I added KMnO4 to the three jars for well 2 I noticed a difference in the color between wells see pictures (8,9,10,11) also had better floc formation and oxidization in the three jars for well 1 before adding coagulant blend

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 is mg/l dose	1	5	5		0.27	0.11	0	medium	0.11	0.42				0.0247	
	2	5	10		0.34	0.08	0	medium	0.04	0				0.0173	
Stem Pac plus Arctic	3	5	15		0.37	0.06	0	medium	0.04	0				0.0179	
Floc is µl dose	4	5	5												See sheet W-05-2
	5	5	10												See sheet W-05-2
	6	5	15												See sheet W-05-2

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CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/18/2006	Tuluksak W-05-2		

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.58				Primary Coagulant			Mixing	330	2min
Color PCU	43		31		Coagulant Aid			Oxidization	30	30min
pH	7.11				Filter Aid			Flocculation	30	2min
Alkalinity mg/l					Pre pH Adjustment			Flocculation	10	30
Hardness mg/l					Post pH Adjustment			Settling	0	1hr
Temp F	37				Other			Remarks: Started off with 5mg/l KMnO4		
Fe mg/l	8.43							mixed on high 2min turned down to 30rpm		
Mn mg/l	0.328							for 30min to oxidize Fe and Mn turned rpm		
As mg/l	35							up and added Stem Pac plus Arctic Floc		
TDS mg/l	84							12100 90/10 blend then down to 30rpm		
UV254 (A)	0.0607							for2min down to 10rpm for 30min let settle		

Comments & Notes I decided to do three jars for each well KMnO4 at 5mg/l in all jars 5,10,15 µl for each well of SP+AF12100 90/10 blend. As soon as I added KMnO4 to the three jars for well 2 I noticed a difference in the color between wells see pictures (8,9,10,11) also had better floc formation and oxidization in the three jars for well 1 before adding coagulant blend

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 is mg/l dose	1	5	5												See sheet for W-05-1
	2	5	10												See sheet for W-05-1
Stem Pac plus Arctic	3	5	15												See sheet for W-05-1
Floc is µl dose	4	5	5		0.21	0.06	0	medium	0.02	0.125				0.0204	
	5	5	10		0.24	0.06	1	medium	0.02	0.265				0.025	
	6	5	15		0.69	0.05	0	medium	0.18	0.267				0.026	
Products Tested	Jar	Dose	Dose	pH	Turbidity	Turbidity	True	Floc Size	Water Quality mg/l						Other

Garry Bowley 907-695-6095

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/18/2006	Tuluksak W-05-2		

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	0.58				Primary Coagulant		
Color PCU	43		31		Coagulant Aid		
pH	7.11				Filter Aid		
Alkalinity mg/l					Pre pH Adjustment		
Hardness mg/l					Post pH Adjustment		
Temp F	37				Other		
Fe mg/l	8.43						
Mn mg/l	0.328						
As mg/l	35						
TDS mg/l	84						
UV254 (A)	0.0607						

Jar Testing Procedure	RPM	Time
Mixing	330	2min
Oxidization	30	30min
Flocculation	30	2min
Flocculation	10	30
Settling	0	1hr

Remarks: Started off with 5mg/l KMnO4 mixed on high 2min turned down to 30rpm for 30min to oxidize Fe and Mn turned rpm up and added Stern Pac plus Arctic Floc 12100 90/10 blend then down to 30rpm for2min down to 10rpm for 30min let settle

Comments & Notes I decided to do three jars for each well KMnO4 at 5mg/l in all jars 5,10,15 µl for each well of SP+AF12100 90/10 blend. As soon as I added KMnO4 to the three jars for well 2 I noticed a difference in the color between wells see pictures (8,9,10,11) also had better floc formation and oxidization in the three jars for well 1 before adding coagulant blend

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 is mg/l dose	1	5	5												See sheet for W-05-1
	2	5	10												See sheet for W-05-1
Stern Pac plus Arctic	3	5	15												See sheet for W-05-1
Floc is µl dose	4	5	5		0.21	0.06	0	medium	0.02	0.125				0.0204	
	5	5	10		0.24	0.06	1	medium	0.02	0.265				0.025	
	6	5	15		0.69	0.05	0	medium	0.18	0.267				0.026	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/19/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.58				Primary Coagulant			Mixing	330	2min
Color PCU	41				Coagulant Aid			Oxidization	18	30min
pH	7.15				Filter Aid			Flocculation	30	2min
Alkalinity mg/l					Pre pH Adjustment			Flocculation	10	15min
Hardness mg/l					Post pH Adjustment			Settling	0	1hr
Temp F	37°				Other			Remarks: Started with KMnO4 5 mg/l		
Fe mg/l	8.1							all jars mixed SP + AF12100 70/30 blend		
Mn mg/l	0.376							and did three jars for each well		
As mg/l	15									
TDS mg/l	96									
UV254 (A)	0.0182									

Comments & Notes Had good floc in all three jars for each well 2 floc smaller than well 1

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMn04 dose mg/l	1	5	5		0.39	0.07	0	medium	0.02	0.375	d/r	d/r	d/r	0.006	
	2	5	10		0.58	0.11	5	medium	0.07	0.164	d/r	d/r	d/r	0.0072	
	3	5	15		0.8	0.11	5	medium	0.04	0.155	d/r	d/r	d/r	0.0054	
Stern Pac plus Arctic															
Floc12100 dose µl															

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/19/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist
Turbidity NTU	0.6			
Color PCU	43			
pH	7.1			
Alkalinity mg/l				
Hardness mg/l				
Temp F	37			
Fe mg/l	8.43			
Mn mg/l	0.328			
As mg/l	35			
TDS mg/l	84			
UV254 (A)	0.0399			

Chemical Usage	Product	Dose mg/l
Primary Coagulant		
Coagulant Aid		
Filter Aid		
Pre pH Adjustment		
Post pH Adjustment		
Other		

Jar Testing Procedure	RPM	Time
Mixing	330	2min
Oxidization	18	30min
Flocculation	30	2min
Flocculation	10	15min
Settling	0	1hr

Remarks: Started with KMnO4 5 mg/l
all jars mixed SP + AF12100 70/30 blend
and did three jars for each well

Comments & Notes Had good floc in all three jars for each well 2 floc smaller than well 1

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMn04 dose mg/l	4	5	5		0.4	0.06	13	small	0.05	0.638	d/r	d/r	d/r	0.0089	
	5	5	10		0.57	0.18	9	small	0.04	0.448	d/r	d/r	d/r	0.0085	
	6	5	15		0.73	0.07	12	small	0.07	0.485	d/r	d/r	d/r	0.0086	
Stern Pac plus Arctic															
Floc12100 dose µl															
70/30 blend															

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/19/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.58				Primary Coagulant			Mixing	330	2min
Color PCU	41				Coagulant Aid			Oxidization	18	30min
pH	7.15				Filter Aid			Flocculation	30	2min
Alkalinity mg/l					Pre pH Adjustment			Flocculation	10	15min
Hardness mg/l					Post pH Adjustment			Settling	0	1hr
Temp F	37°				Other			Remarks: Started with KMnO4 5 mg/l		
Fe mg/l	8.1							all jars mixed A C H + AF12100 80/20		
Mn mg/l	0.376							blend and did jar test to find optimum dose		
As mg/l	15							for well 1		
TDS mg/l	96									
UV254 (A)	0.0182									

Comments & Notes As soon as I added the KMnO4 to the jars the water turned pink as if it was an over dose I used the same water from this mornings test but decided to run test anyway had good floc with KMnO4 water stayed a little bit pink until I added A C H blend will retest tomorrow

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 dose mg/l	1	5	5		0.53	0.15	32	medium	0.01	0.012	d/r	d/r	d/r	d/r	
	2	5	10		0.28	0.07	31	medium	0.03	0	d/r	d/r	d/r	-0.005	
	3	5	15		0.16	0.07	26	medium	0.05	0	d/r	d/r	d/r	-0.004	
A C H plus Arctic	4	5	20		0.2	0.1	5	medium	0.02	0	d/r	d/r	d/r	d/r	
Floc12100 dose µl	5	5	25		0.12	0.1	10	medium	0.01	0	d/r	d/r	d/r	d/r	
80/20 blend	6	5	30		0.12	0.06	15	medium	0.01	0	d/r	d/r	d/r	d/r	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/20/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.6				Primary Coagulant			Mixing	330	2min
Color PCU	42				Coagulant Aid			Oxidization	15	30min
pH	7.21				Filter Aid			Mixing	330	2min
Alkalinity mg/l	D/R				Pre pH Adjustment			Flocculation	12	20min
Hardness mg/l	D/R				Post pH Adjustment			Settling	0	30min
Temp F	37°				Other			Remarks: Started with cold water in		
Fe mg/l	8.1							jars added KMnO4 had small pin floc but		
Mn mg/l	0.378							it didn't oxidize as well as when it is heated		
As mg/l	15							to 50° then added ACH plus Arctic Floc		
TDS mg/l	94							12100 80/20 blend		
UV254 (A)	0.0135	0.0235								

Comments & Notes

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMn04 mg/l dose	1	5	10		0.78	0.07	2	small	0.01	0	d/r	d/r	d/r	0.0166	will read UV254 again after
	2	5	15		0.53	0.09	20	small	0.02	0	d/r	d/r	d/r	0.0185	setting in jars over night
	3	5	20		0.48	0.1	3	small	0	0	d/r	d/r	d/r	0.0124	
ACH plus AF12100															
80/20 blend µl dose															
	1													0.0142	
	2													0.0141	
	3													0.0122	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/20/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	0.6				Primary Coagulant		
Color PCU	42				Coagulant Aid		
pH	7.21				Filter Aid		
Alkalinity mg/l	D/R				Pre pH Adjustment		
Hardness mg/l	D/R				Post pH Adjustment		
Temp F	37°				Other		
Fe mg/l	8.44						
Mn mg/l	0.341						
As mg/l	15						
TDS mg/l	84						
UV254 (A)	0.0269						

Jar Testing Procedure	RPM	Time
Mixing	330	2min
Oxidization	15	30min
Mixing	330	2min
Flocculation	12	20min
Settling	0	30min

Remarks: Started with cold water in jars added KMnO4 had small pin floc but it didn't oxidize as well as when it is heated to 50° then added ACH plus Arctic Floc 12100 80/20 blend

Comments & Notes

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 mg/l Dose	4	5	10		0.57	0.11	16	small	0	0	D/R	D/R	D/R	0.0108	Will read UV254 again after
	5	5	15		0.76	0.13	6	small	0	0	D/R	D/R	D/R	0.0151	setting in jars over night
ACH Plus AF12100	6	5	20		0.9	0.07	19	small	0.04	0	D/R	D/R	D/R	0.0123	
80/20 blend µl Dose															
	4													0.0099	
	5													0.0142	
	6													0.012	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/21/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	1.27				Primary Coagulant		
Color PCU	35				Coagulant Aid		
pH	7.2/7.5	cold/warm			Filter Aid		
Alkalinity mg/l	D/R				Pre pH Adjustment	None	
Hardness mg/l	D/R				Post pH Adjustment	None	
Temp F	37				Other		
Fe mg/l	9.09						
Mn mg/l	0.361						
As mg/l	D/R(15)						
TDS mg/l	101						
UV254 (A)	0.0201						

Jar Testing Procedure		RPM	Time
Mixing	KmnO4	330	2min
Oxidization		15	30min
Mixing	ACH+AF12100	330	2min
Flocculation		12	15min
Settling		0	30min

Remarks: Started with KMnO4 mixed it then let it oxidize and then added ACH plus Arctic Floc 12100 90/10 blend

Comments & Notes: Builds good floc and settles fairly fast

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	5	5	7.57	0.3	0.07	16	medium	0.03	0.188	D/R	D/R	D/R	0.0149	
	2	5	10	7.65	0.31	0.05	0	medium	0.01	0.073	D/R	D/R	D/R	0.0129	
ACH plus Arctic Floc	3	5	15	7.65	0.32	0.07	7	medium	0.03	0.073	D/R	D/R	D/R	0.0161	
12100 Dose µl	4	5	20	7.65	0.19	0.05	0	medium	0.04	0.085	D/R	D/R	D/R	0.0134	
90/10 blend	5	5	25	7.61	0.36	0.05	8	medium	0.02	0.073	D/R	D/R	D/R	0.0099	
	6	5	30	7.62	0.3	0.06	0	medium	0	0.086	D/R	D/R	D/R	0.0111	

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POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/21/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	1.71				Primary Coagulant		
Color PCU	38				Coagulant Aid		
pH	7.4				Filter Aid		
Alkalinity mg/l	D/R				Pre pH Adjustment		
Hardness mg/l	D/R				Post pH Adjustment		
Temp F	37°				Other		
Fe mg/l	9.24						
Mn mg/l	0.0343						
As mg/l	D/R(35)						
TDS mg/l	84						
UV254 (A)	0.0375						

Jar Testing Procedure		RPM	Time
Mixing	KMnO4	312	2min
Oxidization		15	30min
Mixing	ACH+AF12100	312	2min
Flocculation		15	15min
Settling		0	30min

Remarks: Started with KMnO4 mixed let it oxidize then added ACH plus Arctic Floc 12100 90/10 blend

Comments & Notes With the KMnO4 after 10 min. it was starting to build small pin floc but it is light in color well W-05-1 has same size floc but is red in color I increased KMnO4 dose for this well

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	7.5	5	7.66	0.71	0.05	17	large	0.01	0.041	D/R	D/R	D/R	0.0212	
	2	7.5	10	7.62	0.41	0.1	4	large	0.01	0.046	D/R	D/R	D/R	0.0422	
ACH plus Arctic Floc	3	7.5	15	7.57	0.58	0.04	4	large	0	0.002	D/R	D/R	D/R	0.0212	
12100 Dose µl	4	10	20	7.59	0.34	0.08	14	large	0	0	D/R	D/R	D/R	0.024	Over dose KMnO4
	5	7.5	25	7.6	0.33	0.06	4	large	0	0	D/R	D/R	D/R	0.0199	
	6	7.5	30	7.61	0.34	0.06	0	large	0	0	D/R	D/R	D/R	0.013	

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POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/22/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	1.02				Primary Coagulant		
Color PCU	37				Coagulant Aid		
pH	7.4				Filter Aid		
Alkalinity mg/l	D/R				Pre pH Adjustment		
Hardness mg/l	D/R				Post pH Adjustment		
Temp F	37°				Other		
Fe mg/l	9.03						
Mn mg/l	0.372						
As mg/l	D/R(15)						
TDS mg/l	99						
UV254 (A)	0.0203						

Jar Testing Procedure		RPM	Time
Mixing	KMnO4	330	2min
Oxidization		15	30min
Mixing	ACH+AF 70/30	330	2min
Flocculation		15	20min
Settling		0	30min

Remarks: Started with KMnO4 had good size floc in all jars addad ACH plus Arctic floc 12100 turned speed up to mix then down but it didn't build floc as big as it was with just the KMnO4 floc goes from small to large with increased dose

Comments & Notes Looks like two much Arctic Floc12100 the floc appears to be coated and stays suspended has very slow settling in the lighter doses

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	5	5	D/R	0.65	0.1	11	small	0.02	0.04	D/R	D/R	D/R	0.0151	
	2	5	10	D/R	0.53	0.06	0		0.02	0.064	D/R	D/R	D/R	0.0154	
	3	5	15	D/R	0.63	0.07	0		0	0.102	D/R	D/R	D/R	0.0185	
ACH plus Arctic Floc	4	5	20	D/R	0.54	0.08	2		0.02	0.095	D/R	D/R	D/R	0.0136	
12100 70/30 blend	5	5	25	D/R	0.49	0.1	0		0.01	0.112	D/R	D/R	D/R	0.0168	
Dose µl	6	5	30	D/R	0.31	0.11	1	large	0.01	0.111	D/R	D/R	D/R	0.0205	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/22/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	1.51				Primary Coagulant			Mixing KMnO4	312	2min
Color PCU	39				Coagulant Aid			Oxidization	15	30min
pH	7.4				Filter Aid			Mixing ACH+AF 70/30	312	2min
Alkalinity mg/l	D/R				Pre pH Adjustment			Flocculation	15	20min
Hardness mg/l	D/R				Post pH Adjustment			Settling	0	30min
Temp F	37°				Other			Remarks: Started with KMnO4 had		
Fe mg/l	9.21							good size floc in all jars addad ACH plus		
Mn mg/l	0.0344							Arctic floc 12100 turned speed up to mix		
As mg/l	D/R							then down but it didn't build floc as big as		
TDS mg/l	86							it was with just the KMnO4		
UV254 (A)	0.0373									

Comments & Notes Looks like two much Arctic Floc12100 the floc appears to be coated and stays suspended has very slow settling in all jars

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	7	5	D/R	0.87	0.1	21	Small	0.01	0.081	D/R	D/R	D/R	0.016	
	2	7	10	D/R	0.41	0.09	0	Small	0.01	0.093	D/R	D/R	D/R	0.0169	
	3	7	15	D/R	0.42	0.08	0	Small	0.02	0.137	D/R	D/R	D/R	0.0121	
ACH plus Arctic Floc	4	7	20	D/R	0.84	0.08	0	Small	0.02	0.07	D/R	D/R	D/R	0.0137	
12100 70/30 blend	5	7	25	D/R	1.16	0.1	0	Small	0.14	0.089	D/R	D/R	D/R	0.0198	
Dose µl	6	7	30	D/R	0.52	0.1	0	Small	0.03	0.101	D/R	D/R	D/R	0.0304	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/23/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist
Turbidity NTU				
Color PCU	40			
pH	7.4			
Alkalinity mg/l				
Hardness mg/l				
Temp F	37°			
Fe mg/l	6.39			
Mn mg/l				
As mg/l				
TDS mg/l				
UV254 (A)	0.0265			

Chemical Usage	Product	Dose mg/l
Primary Coagulant		
Coagulant Aid		
Filter Aid		
Pre pH Adjustment		
Post pH Adjustment		
Other		

Jar Testing Procedure		RPM	Time
Mixing	KMnO4	330	2min
Oxidization		15	30min
Mixing	Pax XL-9 +AF	330	3min
Flocculation		14	20min
Settling		0	30min

Remarks: Noticed color in the first three jars was a little two pink when I injected the KMnO4 into them so I redued jars 4,5,6 to 4 mg/l and checked raw water iron also noticed slight odor in it.continued jar test with Pax XL-9 plus Arctic Floc 90/10 blend

Comments & Notes Had a lot of pin floc with the KMnO4 in all jars put the first three stayed a little bit pink until after I added the Pax XL-9 plus arctic floc 12100 and reduced speed had large floc after 10min on slow speed has settlin during flocculation and is clear between floc

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KmnO4 dose mg/l	1	5	5		0.54	0.07	0	medium	0.06	0.03				0.0233	
	2	5	10		1.6	0.08	15	medium	0.04	0.101				0.0215	Overdose KMnO4
	3	5	15		0.8	0.08	15	medium	0.03	0.364				0.0237	Overdose KMnO4
PAX XL-9 plus Arctic	4	4	20		0.42	0.07	0	large	0.01	0.168				0.0187	
Floc 12100 dose µl	5	4	25		0.6	0.09	0	large	0.03	0.352				0.0199	
90/10 blend	6	4	30		0.5	0.07	0	large	0.01	0.093				0.0194	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/23/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU					Primary Coagulant			Mixing KMnO4	310	2min
Color PCU					Coagulant Aid			Oxidization	15	30min
pH					Filter Aid			Mixing Pax XL-9+AF 90/10	310	2min
Alkalinity mg/l					Pre pH Adjustment			Flocculation	15	20min
Hardness mg/l					Post pH Adjustment			Settling	0	45min
Temp F					Other			Remarks:		
Fe mg/l	8.34									
Mn mg/l										
As mg/l										
TDS mg/l										
UV254 (A)	0.0347									

Comments & Notes Has good oxidization and pin floc with KMnO4 10min after adding the Pax XL-9 plus AF12100 and mixing it has good floc formation smaller in lower doses but large in higher dose has settling during mixing and is clear between floc but it also looks like this is going to have some floaters (see picture)

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 dose mg/l	1	7	5		0.57	0.05	7	small	0.02	0.07				0.0292	
	2	7	10		0.5	0.07	0	small	0.01	0.302				0.0286	
	3	7	15		0.71	0.16	0	medium	0.02	0.138				0.0264	
Pax XL-9 plus Arctic	4	7	20		0.44	0.07	0	medium	0	0				0.0385	
Floc 12100 dose µl	5	7	25		0.87	0.06	0	large	0.04	0.016				0.0274	
90/10 blend	6	7	30		0.68	0.07	0	large	0.03	0				0.0211	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/24/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Filtered	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.62				Ammonia (as Nitrogen) mg/l	0.36		Mixing KMnO4	330	3min
Color PCU	40				Dissolved Oxygen mg/l	5.7		Oxidization	14	30min
pH	7.35	mV -13.2			Hydrogen Sulfide mg/l	0.04		Mixing Pax XL-9+AF12100 70/30	330	3min
Alkalinity mg/l	90				Carbon Dioxoid mg/l	45		Flocculation	14	20min
Hardness mg/l	2.78							Settling	0	35min
Temp F	37°							Remarks:		
Fe mg/l	5.01	Ferrous mg/l 2.05								
Mn mg/l	0.334									
As mg/l	15									
TDS mg/l	82 Cond 178.0 µs Sal 0.1‰									
UV254 (A)	0.0271									

Comments & Notes Checked raw water quality this morning and noted change in total iron and adjusted KMnO4 dose for jar test

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	4	5	7.15	0.62	0.11	5	Small	0	0	D/R	D/R	D/R	0.0218	
	2	4	10	7.18	0.64	0.11	11	Small	0	0	D/R	D/R	D/R	0.0157	
Pax XL-9 Plus Arctic	3	4	15	7.23	1.19	0.12	15	Small	0	0	D/R	D/R	D/R	0.0168	
Floc 12100 70/30	4	4	20	7.3	1.33	0.12	4	Small	0.04	0.001	D/R	D/R	D/R	0.0162	
blend Dose µl	5	4	25	7.31	1.91	0.21	15	Small	0	0	D/R	D/R	D/R	0.0141	
	6	4	30	7.29	2.62	0.25	17	Small	0.04	0.001	D/R	D/R	D/R	0.0162	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/24/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Filtered	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.69				Ammonia (as Nitrogen)	mg/l 0.96		Mixing KMnO4	312	3min
Color PCU	45				Dissolved Oxygen mg/l	5.8		Oxidization	14	30min
pH	7.31	mV -12.9			Hydrogen Sulfide mg/l	0.02		Mixing Pax XL-9+AF12100 70/30	312	3min
Alkalinity mg/l	75				Carbon Dioxoid mg/l	60		Flocculation	14	20min
Hardness mg/l	3.05							Settling	0	35min
Temp F	37°							Remarks:		
Fe mg/l	9.63	Ferrous mg/l 2.87								
Mn mg/l	0.279									
As mg/l	15									
TDS mg/l	83 Cond 179.8 µs Sal 0.1‰									
UV254 (A)	0.0279									

Comments & Notes Checked raw water quality this morning and started jar test with Pax XL-9 plus Arctic Floc 12100 70/30 blend it had small floc and the settling was a little slow and a little cloudy on the bottom.

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	7	5	7.56	0.6	0.14	20	Small	0	0	D/R	D/R	D/R	0.0247	
	2	7	10	7.7	0.48	0.09	13	Small	0	0	D/R	D/R	D/R	0.0283	
Pax XL-9 Plus Arctic	3	7	15	7.77	0.52	0.09	9	Small	0	0	D/R	D/R	D/R	0.035	
Floc 12100 70/30	4	7	20	7.78	0.96	0.09	14	Small	0	0	D/R	D/R	D/R	0.0272	
blend Dose µl	5	7	25	7.76	1.16	0.09	0	Small	0	0	D/R	D/R	D/R	0.0202	
	6	7	30	7.78	1.06	0.1	12	Small	0.01	0	D/R	D/R	D/R	0.0173	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/25/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.17				Ammonia (as Nitrogen)	mg/l		Mixing KMnO4	330	3min
Color PCU	35				Dissolved Oxygen mg/l			Oxidization	14	30min
pH	7.35	mV -13.1			Hydrogen Sulfide mg/l			Mixing Pax XL-9+AF12100 80/20	330	3min
Alkalinity mg/l	90				Carbon Dioxoid mg/l			Flocculation	14	25min
Hardness mg/l	2.79							Settling	0	40min
Temp F	35°							Remarks:		
Fe mg/l	8.64	Ferrous mg/l D/R								
Mn mg/l	0.325									
As mg/l	15									
TDS mg/l	80 Cond. 198.5µs Sal .0 1‰									
UV254 (A)	0.0281									

Comments & Notes Checked raw water quality this morning the iron is back up to 8.63 mg/l and temp is down 2° NTU is as low as I have seen it on raw water in this well. Continued jar test adjusted KMnO4 Dose for higher iron and used Pax XL-9 plus Arctic Floc 12100 80/20 blend built pretty good floc kind of small but was clear between it settling rate is a little slow but condenses in the bottom of jars.

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	5	5	7.38	0.31	0.08	0	Small	0.02	0.022	D/R	D/R	D/R	0.0178	
	2	5	10	7.38	0.46	0.07	0	Small	0.01	0.026	D/R	D/R	D/R	0.0165	
Pax XL-9 Plus Arctic	3	5	15	7.36	0.44	0.09	0	Small	0	0.026	D/R	D/R	D/R	0.0169	
Floc 12100 80/20	4	5	20	7.35	0.51	0.07	0	Small	0.02	0.029	D/R	D/R	D/R	0.015	
Blend Dose µl	5	5	25	7.35	0.7	0.09	0	Small	0.04	0.05	D/R	D/R	D/R	0.0161	
	6	5	30	7.3	0.89	0.11	0	Small	0.02	0.089	D/R	D/R	D/R	0.0135	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/25/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.19				Ammonia (as Nitrogen)	mg/l		Mixing KMnO4	312	3min
Color PCU	37				Dissolved Oxygen mg/l			Oxidization	14	30min
pH	7.29	mV -11.6			Hydrogen Sulfide mg/l			Mixing Pax XL-9+AF12100 80/20	312	3min
Alkalinity mg/l	75				Carbon Dioxoid mg/l			Flocculation	14	25min
Hardness mg/l	3.05							Settling	0	35min
Temp F	35°							Remarks:		
Fe mg/l	9.8	Ferrous mg/l								
Mn mg/l	0.277									
As mg/l	35									
TDS mg/l	82	Cond. 185.5µs	Sal .0 1‰							
UV254 (A)	0.0529									

Comments & Notes checked raw water quality this morning the only difference was the temp down 2° continued jar test using Pax XL-9 plus Arctic Floc 12100 80'20 blend it built nice floc and settled out good

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	7	5	7.56	0.34	0.08	0	Medium	0.02	0.022	D/R	D/R	D/R	0.0297	
	2	7	10	7.69	0.43	0.07	0	Medium	0.04	0.013	D/R	D/R	D/R	0.0287	
Pax XL-9 plus Arctic	3	7	15	7.7	0.56	0.08	0	Medium	0.03	0	D/R	D/R	D/R	0.0195	
Floc 12100 80/20	4	7	20	7.73	0.68	0.08	0	Medium	0.02	0.039	D/R	D/R	D/R	0.019	
blend Dose µl	5	7	25	7.73	0.69	0.07	0	Medium	0.03	0.018	D/R	D/R	D/R	0.0173	
	6	7	30	7.75	0.75	0.06	0	Medium	0	0.051	D/R	D/R	D/R	0.0331	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/26/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated
Turbidity NTU	0.28				Ammonia (as Nitrogen)	mg/l	
Color PCU	34				Dissolved Oxygen mg/l		
pH	7.44	mV -19.8			Hydrogen Sulfide mg/l		
Alkalinity mg/l					Carbon Dioxoid mg/l		
Hardness mg/l							
Temp F	34.7°						
Fe mg/l	8.88	Ferrous mg/l					
Mn mg/l	0.36						
As mg/l							
TDS mg/l	81 Cond 185.0 µs Sal 0.1‰						
UV254 (A)	0.0311						

Jar Testing Procedure	RPM	Time
Mixing KMnO4	330	3min
Oxidization	14	30min
Mixing Nalco 8165	330	3min
Flocculation	14	25min
Settling	0	45min

Remarks: Started jar test after checking raw water this morning the KMnO4 oxidizes and forms lots of pin floc with the dose of 5mg/l in this well the iron is back up and the temp is down .3° I fet flocculation run 5min longer because this is slow reacting kind of cloudy

Comments & Notes Settling rate is a little slow floc is small and you won't have a very long filter run it plugged up the 5µl syringe filter about half way through the sampling

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	5	5	D/R	1.17	0.08	0	Small	0.03	0.143	D/R	D/R	D/R	0.0218	
	2	5	10	D/R	0.7	0.08	0	Small	0.02	0.165	D/R	D/R	D/R	0.011	
Nalco 8185 Dose µl	3	5	15	D/R	0.42	0.07	0	Small	0	0.05	D/R	D/R	D/R	0.0091	
	4	5	20	D/R	0.69	0.09	0	Small	0.04	0.085	D/R	D/R	D/R	0.0281	
	5	5	25	D/R	0.57	0.1	0	Small	0.06	0.065	D/R	D/R	D/R	0.0228	
	6	5	30	D/R	0.72	0.15	0	Small	0.07	0.432	D/R	D/R	D/R	0.0246	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/26/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.17				Ammonia (as Nitrogen)	mg/l		Mixing KMnO4	310	3min
Color PCU	50				Dissolved Oxygen mg/l			Oxidization	14	30min
pH	7.36	mV -15.3			Hydrogen Sulfide mg/l			Mixing Nalco 8185	310	3min
Alkalinity mg/l					Carbon Dioxoid mg/l			Flocculation	14	20min
Hardness mg/l								Settling	0	40min
Temp F	35.4°							Remarks: Checked raw water this morning it		
Fe mg/l	9.84	Ferrous mg/l						is about the same as yesterday temp is .4° higher		
Mn mg/l	0.351							This well builds better looking floc faster than well		
As mg/l								05-1 with 8185 in all jars with different doses		
TDS mg/l	83 Cond 189.1 µs Sal 0.1‰									
UV254 (A)	0.069									

Comments & Notes Settling rate is a little slow but the water looks clear floc stayed suspended and then settled down this well will have about twice the filter run time with nalco 8185 than W-05-1

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	7	5	D/R	0.44	0.07	0	Medum	0.05	0.077	D/R	D/R	D/R	0.0356	
	2	7	10	D/R	0.32	0.07	0	Medum	0.06	0.07	D/R	D/R	D/R	0.0133	
Nalco 8185 Dose µl	3	7	15	D/R	0.53	0.09	0	Medum	0.02	0.024	D/R	D/R	D/R	0.0087	
	4	7	20	D/R	0.97	0.1	0	Medum	0.04	0	D/R	D/R	D/R	0.0191	
	5	7	25	D/R	0.55	0.1	0	Medum	0.04	0	D/R	D/R	D/R	0.0057	
	6	7	30	D/R	0.56	0.15	0	Medum	0.09	0.054	D/R	D/R	D/R	0.0333	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/27/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.9				Ammonia (as Nitrogen) mg/l			Mixing KMnO4	330	2min
Color PCU	41				Dissolved Oxygen mg/l			Oxidization	15	30min
pH	7.25	mV			Hydrogen Sulfide mg/l			Mixing Stem Pac Plus Arctic Floc	330	2min
Alkalinity mg/l					Carbon Dioxoid mg/l			Flocculation	14	30min
Hardness mg/l								Settling	0	1hr
Temp F	35°							Remarks: I didn't like what was happening in		
Fe mg/l	11.44	Ferrous mg/l						the 300 gal tank after adding chemicals so I did		
Mn mg/l	0.404							this jar test.		
As mg/l										
TDS mg/l	Cond µs	Sal ‰								
UV254 (A)										

Comments & Notes After taking readings it would appear that the KMn04 dose in the 300 gal tank is a little bit of an overdose looking at turbidity and apparent color for both the 300gal tank and the jar with 6mg/l KMnO4 have close to the same turbidity (see pictures for today)

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	5	10		0.41	0.08	0	small							
	2	6	10		2.99	0.25	0	small							
SP + AF 80/20 µl	3	7	10												OVERDOSE KMnO4
Out of 300 gal tank	4		10		2.65	0.08	0	small	0	0.09					

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Location	Water Source	Personnel
6/27/2006	Tuluksak W-05-01	Raw Water	Garry Bowley

Raw Water Quality		Chemicals Used	Dose mg/l	Treatment Vessel Information	
Turbidity NTU	0.9	KMnO4	5 mg/l	Flow Rate GPM	
Color PCU	41			Vessel Description	GPM/sq ft
pH	7.25	Stern Pac Plus	11 mg/l		
Alkalinity mg/l		Arctic Floc 12100			
Hardness mg/l		80/20 Blend			
Temp F	35°				
Fe mg/l	11.44			Other Notes I didn't like what was happening with the water in the 300 gal tank and did quick jar test to determine what was going on with the water in the 300gal tank	
Mn mg/l	0.404				
As mg/l					
TDS mg/l					
UV254 (A)					

Treatment Process Objective

Treatment Process Description Hauled water in and preheated to 64° added 5 grams KMnO4 to it mixed on high for 5min then turned down and let oxidize for 30min turned speed up and added 11 ml of Stern Pac plus Arctic Floc 12100 80/20/ blend to it took one minute to add 11 ml mixed on high for 5min then down to about 14 rpm for 25min and turned mixer off water stayed turning for 30min started taking readings at ports on tank

Sketch of Test Setup

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments
6/27/2006	3:00pm		45min after stopping mixer took turbidity readings on the three taps on tank
		Top	NTU 9.67 through 1.2µl filter 0.10
			Ptco 307 through .45µl filter 15
		Middle	NTU 9.67 through 1.2µl filter 0.10
			Ptco 382 through .45µl filter 17
		Bottom	NTU 9.67 through 1.2µl filter 0.10
			Ptco 387 through .45µl filter 34
	5:00pm		
		Top	NTU 4.96 through 1.2µl filter 0.28
			Ptco 107 through .45µl filter 10
		Middle	NTU 8.85 through 1.2µl filter 0.40
			Ptco 200 through .45µl filter 15
		Bottom	NTU 10.9 through 1.2µl filter 0.62
			Ptco 285 through .45µl filter 22
	10:00pm		
		Top	NTU 3.10 through 1.2µl filter 0.10
		Middle	NTU 4.32 through 1.2µl filter 0.11
		Bottom	NTU 5.09 through 1.2µl filter 0.07
			Fe 0.02

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Location	Water Source	Personnel
6/28/2006	Tuluksak	W-05-1	Garry Bowley

Raw Water Quality		Chemicals Used	Dose mg/l	Treatment Vessel Information	
Turbidity NTU	0.9			Flow Rate GPM	0.5
Color PCU	41			Vessel Description	GPM/sq ft
pH	7.25			8" X 60" Clear PVC Multi Media 1.5	GPM/sq ft
Alkalinity mg/l					
Hardness mg/l					
Temp F	35°				
Fe mg/l	11.44			Other Notes	
Mn mg/l	0.404				
As mg/l	35				
TDS mg/l	82				
UV254 (A)	0.0269				

Treatment Process Objective To remove Iron,Manganese,Arsenic and Color

Treatment Process Description Raw Water hauled and batch treated in 300gal tank (see figure 4- Chemical Oxidation, Coagulation, Settlement, And Multimedia Filtration)

Sketch of Test Setup

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments
6/28/2006	9:00am		Water readings in the 300 gal tank before starting through filter at the three taps
		Top	NTU settled 1.94 through 1.2µl filter 0.09
			Fe 0.03
			Ptco 0
			Mn 0.454
			PH 7.26
		Middle	NTU settled 2.65 through 1.2µl filter 0.13
			Fe 0.03
			Ptco 0
			Mn 0.454
			PH 7.16
		Bottom	NTU settled 2.69 through 1.2µl filter 0.12
			Fe 0.03
			Ptco 0
			Mn 0.454
			PH 7.26
	10:30am		Started water through filter ran it filter to waste for 15min and took readings
	11:00am		NTU 0.29
			Fe 0.00
			Ptco 0
			Mn Over limit low range
			PH 7.26
	11:15am		Checked tap water quality because of Mn being high
			NTU 0.35
			Fe 0.02
			Ptco 31
			Mn Over limit low range high range 3.4mg/l
			PH 6.80
	11:30am		NTU 0.19
			Fe 0.00
			Ptco 2
			Mn High range 2.1mg/l
			PH 7.24

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments		
6/28/2006	11:00am		Raw Water quality check	Time	
			UV254 0.0269	1:45pm	Out of center tap on tank pushed
			NTU 1.02		through 1.2µl filter
			Fe 9.24		NTU 0.09
			Ptco 41		Mn 0.052
			Mn 0.612		Fe 0.00
			PH 7.35		Ptco 0
	12:00pm		NTU 0.08	2:00pm	NTU 0.07
			Fe 0.01		Fe 0.00
			Ptco 0		Ptco 0
			Mn 1.2		Mn 0.4
			PH 7.21		PH 7.25
			UV254 0.0179		UV254 D/R
	12:30pm		NTU 0.07	2:30pm	NTU 0.07
			Fe 0.00		Fe 0.00
			Ptco 0		Ptco 0
			Mn 0.9		Mn 0.3
			PH 7.26		PH 7.30
			UV254 D/R		UV254 D/R
	1:00pm		NTU 0.07	3:00pm	NTU 0.07
			Fe 0.00		Fe 0.00
			Ptco 0		Ptco 2
			Mn 0.8		Mn D/R
			PH 7.16		PH 7.28
			UV254 D/R		UV254 D/R
	1:30pm		NTU 0.07	3:30pm	NTU 0.07
			Fe 0.00		Fe 0.00
			Ptco 0		Ptco 0
			Mn 0.6		Mn 0.4 High range
			PH 7.16		PH D/R
			UV254 D/R		UV254 D/R

CE2 Engineers, Inc. **PILOT TESTING LOG**

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments		
6/28/2006				Time	
	4:00pm		NTU 0.07	6:15pm	Stopped filter process Air scour
			Fe 0.00		and backwash to try and reduce
			Ptco 0		the high Mn level the filter cleaned
			Mn D/R		in 2min but ran the treated water
			PH 7.28		through for 8min then started filter
			UV254 D/R		to waste took readings after 10min
	4:30pm		NTU 0.07	6:30pm	NTU 0.07
			Fe 0.00		Fe 0.00
			Ptco 0		Ptco 0
			Mn D/R		Mn 0.561
			PH 7.26		PH 7.25
		>	As 3ppb		UV254 D/R
	5:00pm		NTU 0.07	7:00pm	NTU 0.07
			Fe 0.00		Fe 0.00
			Ptco 1		Ptco 0
			Mn 0.4		Mn 0.519
			PH 7.26		PH 7.30
			UV254 D/R		UV254 D/R
	5:30pm		NTU 0.07	7:30pm	NTU 0.07
			Fe 0.00		Fe 0.00
			Ptco 0		Ptco 1
			Mn 0.8		Mn 0.507
			PH D/R		PH 7.28
			UV254 D/R		UV254 D/R
	6:00pm		NTU 0.07	7:40pm	Shut down process
			Fe 0.00		
			Ptco 0		
			Mn 0.6		
			PH D/R		
			UV254 D/R		

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/29/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated
Turbidity NTU	0.38				Ammonia (as Nitrogen)	mg/l	
Color PCU	14				Dissolved Oxygen mg/l		
pH	7.64	mV			Hydrogen Sulfide mg/l		
Alkalinity mg/l					Carbon Dioxoid mg/l		
Hardness mg/l							
Temp F	34.6						
Fe mg/l	9.88						
Mn mg/l	0.8						
As mg/l	35						
TDS mg/l	82						
UV254 (A)	0.0369						

Jar Testing Procedure	RPM	Time
Mixing KMnO4	330	3min
Oxidization	14	35min
Mixing Coagulant Blend	330	3min
Flocculation	14	30min
Settling	0	1hr
Remarks:		

Comments & Notes: Did jar test to determine dose for next batch that is more effective on the higher raw water manganese

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	4	10	7.61	1.52			small							
SP+AF 80/20	2	4.5	10	7.55	0.65	0.07	12	small	0.07	0.223					
KMnO4	4	4	10	7.82	0.24	0.09	0	small	0.02	0.05					
ACH+ AF 80/20	5	5			Overdose	KMnO4									
	6	4.5	10	7.52	0.5	0.08	0	medium	0.02	0.022					looks like this will work for
															the batch treatment

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Location	Water Source	Personnel
6/29/2006	Tuluksak	W-05-1	Garry Bowley

Raw Water Quality		Chemicals Used	Dose mg/l	Treatment Vessel Information	
Turbidity NTU	0.38	KMnO4	4.22	Flow Rate GPM	0.5
Color PCU	14			Vessel Description	GPM/sq ft
pH	7.64			8" X 60" clear PVC Multimedia	1.5
Alkalinity mg/l		ACH plus Arctic Floc	11		
Hardness mg/l		12100 80/20 blend			
Temp F	34.6				
Fe mg/l	9.66			Other Notes Heated water to 48.5' added the	
Mn mg/l	0.8			KMnO4 rapid mixed 6min turned down slow let it	
As mg/l	35			oxidize for 35min then added 11ml of ACH + AF	
TDS mg/l	81			80/20 blend rapid mix 5min slow 35min let settle	
UV254 (A)	0.0369			overnight	

Treatment Process Objective To Remove Iron,Manganese,Arsenic and Color to below the MCL

Treatment Process Description Raw Water hauled,heated and batch treated in 300gal tank (See Figure 4 - Chemical Oxidation,Coagulation, Settlement, And Multimedia Filtration

Sketch of Test Setup

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/30/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated
Turbidity NTU	0.67				Ammonia (as Nitrogen)	mg/l	
Color PCU	30				Dissolved Oxygen mg/l		
pH	7.45				Hydrogen Sulfide mg/l		
Alkalinity mg/l	D/R				Carbon Dioxoid mg/l		
Hardness mg/l	D/R						
Temp F	35.4						
Fe mg/l	9.6						
Mn mg/l	0.8						
As mg/l	35						
TDS mg/l	80						
UV254 (A)	0.0298						

Jar Testing Procedure		RPM	Time
Mixing	KMnO4	330	3min
Oxidization		14	35min
Mixing	Pax XL-9 plus Arctic Floc	330	3min
Flocculation	70/30 blend	14	30min
Settling		0	45min

Remarks: Did jar test to determine dose for next batch treatment referred to my notes for best manganese reduction

Comments & Notes The KMnO4 dose seams to be critical in this water.

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	4.5	9	7.51	1.05	0.17	2	small	0	0.024	D/R	D/R	D/R	D/R	
	2	4.5	12	7.5	0.66	0.06	0	small	0	0	D/R	D/R	D/R	D/R	This looks good will use this
Pax XL-9 plus Arctic	3	4.5	15	7.49	0.89	0.1	0	small	0	0	D/R	D/R	D/R	D/R	Dose
Floc 12100 70/30															
Blend Dose µl															

CE2 Engineers, Inc. **PILOT TESTING LOG**

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments			
6/30/2006				Time		
	4:30pm	NTU	0.07	7:00pm		
		Fe	0	Shut Down cleaned tank hauled water and		
		Ptco	3	and started another batch used XL-9 plus		
		Mn	0.12	Arctic Floc 12100 70/30 blend		
		PH	7.62			
		UV254	D/R			
		As	3			
	5:00pm	NTU	0.07		NTU	
		Fe	0		Fe	
		Ptco	6		Ptco	
		Mn	D/R		Mn	
		PH	7.65		PH	
		UV254	0.0108		UV254	
		As	3		As	
	5:30pm	NTU	0.07		NTU	
		Fe	0		Fe	
		Ptco	5		Ptco	
		Mn	D/R		Mn	
		PH	7.65		PH	
		UV254	D/R		UV254	
		As	3		As	
	6:00pm	NTU	0.06		NTU	
		Fe	0		Fe	
		Ptco	0		Ptco	
		Mn	0.092		Mn	
		PH	7.62		PH	
		UV254	D/R		UV254	
		As	3		As	
	6:30pm	NTU	0.06		NTU	
		Fe	0		Fe	
		Ptco	0		Ptco	
		Mn	D/R		Mn	
		PH	7.62		PH	
		UV254	0.0108		UV254	
		As	3		As	

CE2 Engineers, Inc. **PILOT TESTING LOG**

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments			
6/30/2006		After filter	to waste for 15min	Time		
	10:15am	NTU	0.12	1:15pm	NTU	0.06
		Fe	0.02		Fe	0
		Ptco	0		Ptco	0
		Mn	0.482		Mn	D/R
		PH	7.66 Temp: 56.5°		PH	7.62
		UV254	0.0118		UV254	D/R
		As	3		As	D/R
	10:20am	Started water into 165 gal holding tank				
	10:45am	NTU	0.09	2:20pm	NTU	0.07
		Fe	0.01		Fe	0
		Ptco	10		Ptco	0
		Mn	0.41		Mn	0.185
		PH	7.65		PH	7.6
		UV254	0.0108		UV254	D/R
		As	3		As	D/R
	11:30am	NTU	0.07	3:00pm	NTU	0.07
		Fe	0		Fe	0
		Ptco	10		Ptco	3
		Mn	0.254		Mn	0.149
		PH	7.65		PH	7.63
		UV254	D/R		UV254	D/R
		As	3		As	D/R
	12:00pm	NTU	0.07	3:30pm	NTU	0.06
		Fe	0.01		Fe	0
		Ptco	1		Ptco	6
		Mn	0.21		Mn	D/R
		PH	7.62		PH	7.6
		UV254	D/R		UV254	D/R
		As	3		As	D/R
	12:30pm	NTU	0.06	4:00pm	NTU	0.07
		Fe	0		Fe	0
		Ptco	0		Ptco	3
		Mn	0.208		Mn	D/R
		PH	7.62		PH	7.6
		UV254	0.0108		UV254	D/R
		As	3		As	D/R

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Location	Water Source	Personnel
6/30/2006	Tuluksak W-05-1		Garry Bowley

Raw Water Quality		Chemicals Used	Dose mg/l	Treatment Vessel Information	
Turbidity NTU	0.38	KMnO4	4.22	Flow Rate GPM	0.5
Color PCU	14			Vessel Description	GPM/sq ft
pH	7.64			8" X 60" clear PVC Multimedia	1.5
Alkalinity mg/l		ACH plus Arctic Floc	11		
Hardness mg/l		12100 80/20 blend			
Temp F	34.6				
Fe mg/l	9.66			Other Notes Heated water to 48.5° added the	
Mn mg/l	0.8			KMnO4 rapid mixed 5min turned down slow let it	
As mg/l	35			oxidize for 35min then added 11ml of ACH + AF	
TDS mg/l	81			80/20 blend rapid mix 6min slow 35min let settle	
UV254 (A)	0.0369			overnight	

Treatment Process Objective To Remove Iron,Manganese,Arsenic and Color to below the MCL

Treatment Process Description Raw Water hauled,heated and batch treated in 300gal tank (See Figure 4 - Chemical Oxidation,Coagulation, Settlement, And Multimedia Filtration

(Note: this batch was started late yestersay afternoon)

Sketch of Test Setup

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
7/1/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated
Turbidity NTU	0.65				Ammonia (as Nitrogen)	mg/l	
Color PCU	37				Dissolved Oxygen mg/l		
pH	7.5	mV			Hydrogen Sulfide mg/l		
Alkalinity mg/l	D/R				Carbon Dioxoid mg/l		
Hardness mg/l	D/R						
Temp F	35.4						
Fe mg/l	9.66	Ferrous mg/l					
Mn mg/l	0.8						
As mg/l	35						
TDS mg/l	82 Cond µs Sal ‰						
UV254 (A)	0.0267						

Jar Testing Procedure	RPM	Time
Mixing KMnO4	330	3min
Oxidization	15	35min
Mixing XL-9 plus AF 12100	330	3min
Flocculation 70/30 blend	14	35min
Settling	0	45min
Remarks:		

Comments & Notes Dumped what was mixed late yesterday did jar test hauled water and heated it to 54°. This water starts to oxidize after about 1 and 1/2 to 2 HR of setting and reduces the dose rate of the amount of Potassium Permanganate in order to oxidize it by about 1 mg/l. Also the mixing of the coagulant blend in the large vessel is very important to the water quality

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	5			0.68	0.22		medium			D/R	D/R	D/R	D/R	KMnO4 Only
Af 12100 dose µl	2	5	2		0.47	0.25	13	small	0.03		D/R	D/R	D/R	D/R	
Kemiron Pax XL-9	3	5	12		0.31	0.07	0	small	0	0	D/R	D/R	D/R	D/R	
Plus Arctic Floc12100	4	5	12		1.05	0.07	2	small	0	0	D/R	D/R	D/R	D/R	One liter out of 300gal tank
70/30 blend Dose µl															after KMnO4 dose

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
7/3/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated
Turbidity NTU	0.36				Ammonia (as Nitrogen)	mg/l	
Color PCU	51				Dissolved Oxygen mg/l		
pH	7.62	mV			Hydrogen Sulfide mg/l		
Alkalinity mg/l	D/R				Carbon Dioxoid mg/l		
Hardness mg/l	D/R						
Temp F	35.2°						
Fe mg/l	6.97	Ferrous mg/l					
Mn mg/l	0.7						
As mg/l	35						
TDS mg/l	80 Cond µs	Sal ‰					
UV254 (A)							

Jar Testing Procedure	RPM	Time
Mixing KMnO4	330	3min
Oxidization	14	35min
Mixing XL-9 Plus AF 75/25 blend	330	3min
Flocculation	14	25min
Settling	0	40min

Remarks: Dumped the 300 gal tank that was batch treated Saturday afternoon because it was cloudy high trubidity and the Mn level was 0.108 like it just didn't bulid good floc.Checked raw water quality both wells and a quick jar test

Comments & Notes

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	5.5	10		0.89	0.12	6	small	0.12	0.043	D/R	D/R	D/R		
	2	5.5	15		0.9	0.07	0	medium	0.01	0.034	D/R	D/R	D/R		
Kemiron Pax XL-9	3	5.5	20		0.94	0.07	0	medium	0	0.045	D/R	D/R	D/R		
Plus Arctic Floc															
12100 Dose µl															

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
7/3/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.51				Ammonia (as Nitrogen)	mg/l		Mixing KMnO4	330	3min
Color PCU	58				Dissolved Oxygen mg/l			Oxidization	14	35min
pH	7.6	mV			Hydrogen Sulfide mg/l			Mixing XL-9 Plus AF 75/25 blend	330	3min
Alkalinity mg/l	D/R				Carbon Dioxoid mg/l			Flocculation	14	25min
Hardness mg/l	D/R							Settling	0	40min
Temp F	35.2°							Remarks: Dumped the 300 gal tank that was		
Fe mg/l	8.12	Ferrous mg/l						batch treated Saturday afternoon because it was		
Mn mg/l	0.8							cloudy high trubidity and the Mn level was 0.108		
As mg/l	35							like it just didn't build good floc.Checked raw		
TDS mg/l	82 Cond	µs	Sal ‰					water quality both wells and a quick jar test		
UV254 (A)										

Comments & Notes

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	4	6.2	10		0.48	0.07	1	medium	0	0.206	D/R	D/R	D/R		
	5	6.2	15		0.76	0.06	0	medium	0	0.387	D/R	D/R	D/R		
Kemiron Pax XL-9	6	6.2	20		1.13	0.09	0	medium	0	0.323	D/R	D/R	D/R		
Plus Arctic Floc															
12100 Dose µl															

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments			
7/4/2006				Time		
	8:30am					
				5:00pm		
	Top	NTU	1.67 Settled overnight	Bottom	NTU	3.48 Settled 1hr
		NTU	0.1 Through 1.2µl filter		NTU	0.1 Through 1.2µl filter
		Fe	0.02		Fe	0
		Mn	0.127		Mn	0.11
		Ptco	8 Through .45µl		Ptco	0 Through .45µl
	Middle	NTU	2.8 Settled overnight			
		NTU	0.06 Through 1.2µl filter			
		Fe	0			
		Mn	0.11			
		Ptco	7 Through .45µl			
	Bottom	NTU	5.20 Settled Overnight			
		NTU	0.06 Through 1.2µl filter			
		Fe	0			
		Mn	0.04			
		Ptco	3 Through .45µl			
	Changed the mixer motor mount and ran it on slow speed for 40min it built mueium size floc and					
	dropped out in one hour the water is clearer than it's been and the speed that floc dropped is good.					
	5:00pm					
	Top	NTU	2.84 Settled 1hr			
		NTU	0.1 Through 1.2µl filter			
		Fe	0			
		Mn	D/R			
		Ptco	0 Through .45µl			
	Middle	NTU	1.44 Settled 1hr			
		NTU	0.08 Through 1.2µl filter			
		Fe	0			
		Mn	D/R			
		Ptco	0 Through .45µl			

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/13/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.85				Primary Coagulant			Mixing		
Color PCU	69				Coagulant Aid			Flocculation		
pH	7.33				Filter Aid			Settling		
Alkalinity mg/l					Pre pH Adjustment			Remarks		
Hardness mg/l					Post pH Adjustment					
Temp F	36.5°				Other					
Fe mg/l	7.92									
Mn mg/l	0.297									
As mg/l	15									
TDS mg/l	79									

Comments & Notes After about one hour with the water setting in a one leter beaker it starts to oxidize and change color but has no settling

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	Color Settled	Floc Size	Water Quality mg/l					Other
									Fe	Mn	As	Alk	Hard	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/13/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	1.99				Primary Coagulant			Mixing		
Color PCU	74				Coagulant Aid			Flocculation		
pH	7.2				Filter Aid			Settling		
Alkalinity mg/l					Pre pH Adjustment			Remarks		
Hardness mg/l					Post pH Adjustment					
Temp F	35°				Other					
Fe mg/l	7.98									
Mn mg/l	0.331									
As mg/l	35									
TDS mg/l	68									

Comments & Notes After water sets in a 1 liter beaker for about one and one half hour it starts to oxidize and change color but has no noticable settling in it.

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	Color Settled	Floc Size	Water Quality mg/l					Other
									Fe	Mn	As	Alk	Hard	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/14/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chomical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.85				Primary Coagulant			Mixing	330	2min
Color PCU	69				Coagulant Aid			Flocculation	30	2min
pH	7.33				Filter Aid			Settling	0	1hr
Alkalinity mg/l					Pre pH Adjustment			Remarks	After 5min small pin Floc	
Hardness mg/l					Post pH Adjustment			in beakers #2,3,&4 Jars 5&6 Overdose		
Temp F	36.5°				Other			and maybe 4 still a little pink		
Fe mg/l	7.92									
Mn mg/l	0.297									
As mg/l	15									
TDS mg/l	79									

Comments & Notes After about one hour with the water setting in a one liter beaker it starts to oxidize and change color but has no settling
Looks like 5 mg/l is going to be optimum dose for KmNO4 See pictures 1,2&3

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	Color Filtered	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	Other
KmNO4	1	2			2.55	0.08	2	small pin	0.05	over				Mn Over limit low range test
	2	4			0.97	0.08	10	small pin	0.04	0.22				Good settling
	3	6			1.09	0.3	8	small pin	0.02	0.11				Good settling
	4	8				0.19		small pin	0.06	0.68				Stil A little pink overdose
	5	10						small pin						Overdose KmNO4
	6	12						small pin						Overdose KmNO4

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/15/2006	Tuluksak W-05-1	Garry Bowley	Pilot

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	0.88				Primary Coagulant		
Color PCU	72				Coagulant Aid		
pH	7.4				Filter Aid		
Alkalinity mg/l					Pre pH Adjustment		
Hardness mg/l					Post pH Adjustment		
Temp F	36°				Other		
Fe mg/l	7.96						
Mn mg/l	0.302						
As mg/l	15						
TDS mg/l	80						

Jar Testing Procedure	RPM	Time
Mixing	320	2min
Flocculation	30	30min
Settling	0	30min

Remarks: Started with 5 mg/l KMnO4 in all jars 330 rpm for 2min then turned down to 30 rpm for 30 min then back up to 330 rpm and added 80/20 Stern Pac Arctic Floc 12100 let run on high 2 min then down to 30 rpm for 2 min then down to 10 rpm for 20 min let settle 30min

Comments & Notes About 5 min after adding KMnO4 and turning rpm down to 30 had small pin floc present and it continued to build in all jars Then after adding Stern Pac +Arctic Floc and turning rpm down to 10 started seeing floc formation and settling after 5min it looks a little heaver in 2,3&4 will see after readings are done.

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	Color Filtered	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	Other
KMnO4 Dose mg/l	1	5	5		0.32	0.06	0	Medium	0.02	0				
	2	5	10		0.28	0.06	0	Medium	0.01	0	0	90	2.79	As no noticeable color change
Stern Pac 80% +	3	5	15		0.42	0.07	3	Medium	0.04	0.04				
Arctic Floc12100 20%	4	5	20		0.46	0.06	0	Medium	0.01	0.03				
Dose µl	5	5	25		0.69	0.07	0	Medium	0.07	0.05				
	6	5	30		0.66	0.07	9	Medium	0.03	0.08				

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/16/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist
Turbidity NTU	4.08			
Color PCU	88			
pH	7.1			
Alkalinity mg/l	74			
Hardness mg/l	3.05			
Temp F	37			
Fe mg/l	7.9			
Mn mg/l	0.336			
As mg/l	35			
TDS mg/l	68			

Chemical Usage	Product	Dose mg/l
Primary Coagulant		
Coagulant Aid		
Filter Aid		
Pre pH Adjustment		
Post pH Adjustment		
Other		

Jar Testing Procedure	RPM	Time
Mixing	330	2min
Flocculation	30	2min
Settling	0	1hr

Remarks: Added KMnO4 and SP+AF 80/20 blend at the same time ran on high for 2 min down to 30 rpm 2min then down to 10rpm 25minlet settle for 1hr good pin floc in all jars heaver in lower dose jars 1,2&3 after settling jars 5&6 left suspended floc and pluged gelman filter

Comments & Notes I got greedy and added Stern Pac + Arctic Floc at the same time and it didn't remove the Mn it didn't have time to oxidize

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	Color Filtered	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	Other
KMnO4 = mg/l dose	1	5	8		0.66	0.06	0	medium	0.02	0.28	d/r			
	2	5	10		1.1	0.05	0	medium	0.21	0.23	d/r			
	3	5	12		0.57	0.05	13	medium	0	0.48	d/r			
Stern Pac + Arctic	4	5	14		0.77	0.06	16	medium	0	0.58	d/r			
Floc 12100 = µl	5	5	16		0.67	0.05	15	medium	0.02	0.73	d/r			
	6	5	18		1.37	0.07	5	medium	0	0.6	d/r			

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/17/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist
Turbidity NTU	0.86			
Color PCU	70			
pH	7.33			
Alkalinity mg/l				
Hardness mg/l				
Temp F	37°			
Fe mg/l	7.95			
Mn mg/l	0.31			
As mg/l	15			
TDS mg/l	80			
UV254 (A)	D/R			

Chemical Usage	Product	Dose mg/l
Primary Coagulant		
Coagulant Aid		
Filter Aid		
Pre pH Adjustment		
Post pH Adjustment		
Other		

Jar Testing Procedure	RPM	Time
Mixing	330	5min
Flocculation	30	5min
Flocculation	10	25min
Settling	0	1hr

Remarks: Mixed a blend of ferric sulfate and arctic floc 12100 80/20 24 grams Ferric Sulfate to 6 grams Arctic floc12100 and started jar test with oxygen oxidized water for oxidization I used air compressor and 3/8 copper tube with multiple 1/6" holes drilled in it let run for 1 hr in 5gal bucket

Comments & Notes All this did was turn the water a little darker red brown and cloudy didn't read any of the jars because their wasn't any floc formation it didn't work at all

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
Ferric Sulfate Plus	1		6		D/R	D/R	D/R	None	D/R	D/R	D/R	D/R	D/R	D/R	
Arctic Floc 12100	2		9												
80/20 blend	3		12												
	4		15												
	5		18												
	6		21												

Tuluksak W-05-1 6-17-06
Jar Test Sheet

Page _____

Printed 6/17/2006

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/17/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	5.21				Primary Coagulant			Mixing	330	2min
Color PCU					Coagulant Aid			Oxidization With Air		1hr
pH	7.4				Filter Aid			Flocculation	30	2min
Alkalinity mg/l					Pre pH Adjustment			Flocculation	10	25min
Hardness mg/l					Post pH Adjustment			Settling	0	30min
Temp F	65°				Other			Remarks: Took the water left in 5 gal.		
Fe mg/l	9.42							bucket from yesterday and injected air used		
Mn mg/l	0.331							3/8 copper tube with multiple 1/16" holes		
As mg/l	35							drilled in it let run for 1hr and transferred		
TDS mg/l	70							into jars started test using Stern Pac plus		
UV254 (A)	0.0168							Arctic Floc 12100 80/20 blend		

Comments & Notes Have good floc formation in lower doses but it appears to be light in in color and airy the higher dose jars appear to be overdose 20,25 µl
Will see after settling 30 min see pictures 6 & 7

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
Stern Pac Plus	1		8		1.15	0.14	0	medium	0.02	0.225	D/R	D/R	D/R	0.014	
Arctic Floc 12100	2		11		2.27	0.06	0	medium	0.02	0.119	D/R	D/R	D/R	0.012	
80/20 Blend	3		14		4.6	0.07	0	medium	0.1	0.243	D/R	D/R	D/R	0.022	
	4		17		8.32	0.2	12	medium	0.02	0.174	D/R	D/R	D/R	D/R	
	5		20		11.3	0.07	11	small	0.03	0.184	D/R	D/R	D/R	D/R	
	6		25		22.2	0.11	D/R	cloudy	D/R	D/R	D/R	D/R	D/R	D/R	Plugged 5µl filter for 15 ml
															Turbidity sample

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/18/2006	Tuluksak W-05-1		

Water Quality	Raw	Settled	Filtered	Dist
Turbidity NTU	0.55			
Color PCU	40		29	
pH	7.2			
Alkalinity mg/l				
Hardness mg/l				
Temp F	37			
Fe mg/l	7.98			
Mn mg/l	0.375			
As mg/l	35			
TDS mg/l	97			
UV254 (A)	0.0389			

Chemical Usage	Product	Dose mg/l
Primary Coagulant		
Coagulant Aid		
Filter Aid		
Pre pH Adjustment		
Post pH Adjustment		
Other		

Jar Testing Procedure	RPM	Time
Mixing	330	2min
Oxidization	30	30min
Flocculation	30	2min
Flocculation	10	30
Settling	0	1hr

Remarks: Started off with 5mg/l KMnO4 mixed on high 2min turned down to 30rpm for 30min to oxidize Fe and Mn turned rpm up and added Stem Pac plus Arctic Floc 12100 90/10 blend then down to 30rpm for2min down to 10rpm for 30min let settle

Comments & Notes I decided to do three jars for each well KMnO4 at 5mg/l in all jars 5,10,15 µl for each well of SP+AF12100 90/10 blend. As soon as I added KMnO4 to the three jars for well 2 I noticed a difference in the color between wells see pictures (8,9,10,11) also had better floc formation and oxidization in the three jars for well 1 before adding coagulant blend

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 is mg/l dose	1	5	5		0.27	0.11	0	medium	0.11	0.42				0.0247	
	2	5	10		0.34	0.08	0	medium	0.04	0				0.0173	
Stem Pac plus Arctic	3	5	15		0.37	0.06	0	medium	0.04	0				0.0179	
Floc is µl dose	4	5	5												See sheet W-05-2
	5	5	10												See sheet W-05-2
	6	5	15												See sheet W-05-2

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/18/2006	Tuluksak W-05-2		

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.58				Primary Coagulant			Mixing	330	2min
Color PCU	43		31		Coagulant Aid			Oxidization	30	30min
pH	7.11				Filter Aid			Flocculation	30	2min
Alkalinity mg/l					Pre pH Adjustment			Flocculation	10	30
Hardness mg/l					Post pH Adjustment			Settling	0	1hr
Temp F	37				Other			Remarks: Started off with 5mg/l KMnO4		
Fe mg/l	8.43							mixed on high 2min turned down to 30rpm		
Mn mg/l	0.328							for 30min to oxidize Fe and Mn turned rpm		
As mg/l	35							up and added Stem Pac plus Arctic Floc		
TDS mg/l	84							12100 90/10 blend then down to 30rpm		
UV254 (A)	0.0607							for2min down to 10rpm for 30min let settle		

Comments & Notes I decided to do three jars for each well KMnO4 at 5mg/l in all jars 5,10,15 µl for each well of SP+AF12100 90/10 blend. As soon as I added KMnO4 to the three jars for well 2 I noticed a difference in the color between wells see pictures (8,9,10,11) also had better floc formation and oxidization in the three jars for well 1 before adding coagulant blend

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 is mg/l dose	1	5	5												See sheet for W-05-1
	2	5	10												See sheet for W-05-1
Stem Pac plus Arctic	3	5	15												See sheet for W-05-1
Floc is µl dose	4	5	5		0.21	0.06	0	medium	0.02	0.125				0.0204	
	5	5	10		0.24	0.06	1	medium	0.02	0.265				0.025	
	6	5	15		0.69	0.05	0	medium	0.18	0.267				0.026	
Products Tested	Jar	Dose	Dose	pH	Turbidity	Turbidity	True	Floc Size	Water Quality mg/l						Other

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/18/2006	Tuluksak W-05-2		

Water Quality	Raw	Settled	Filtered	Dist
Turbidity NTU	0.58			
Color PCU	43		31	
pH	7.11			
Alkalinity mg/l				
Hardness mg/l				
Temp F	37			
Fe mg/l	8.43			
Mn mg/l	0.328			
As mg/l	35			
TDS mg/l	84			
UV254 (A)	0.0607			

Chemical Usage	Product	Dose mg/l
Primary Coagulant		
Coagulant Aid		
Filter Aid		
Pre pH Adjustment		
Post pH Adjustment		
Other		

Jar Testing Procedure	RPM	Time
Mixing	330	2min
Oxidization	30	30min
Flocculation	30	2min
Flocculation	10	30
Settling	0	1hr

Remarks: Started off with 5mg/l KMnO4 mixed on high 2min turned down to 30rpm for 30min to oxidize Fe and Mn turned rpm up and added Stern Pac plus Arctic Floc 12100 90/10 blend then down to 30rpm for2min down to 10rpm for 30min let settle

Comments & Notes I decided to do three jars for each well KMnO4 at 5mg/l in all jars 5,10,15 µl for each well of SP+AF12100 90/10 blend. As soon as I added KMnO4 to the three jars for well 2 I noticed a difference in the color between wells see pictures (8,9,10,11) also had better floc formation and oxidization in the three jars for well 1 before adding coagulant blend

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 is mg/l dose	1	5	5												See sheet for W-05-1
	2	5	10												See sheet for W-05-1
Stern Pac plus Arctic	3	5	15												See sheet for W-05-1
Floc is µl dose	4	5	5		0.21	0.06	0	medium	0.02	0.125				0.0204	
	5	5	10		0.24	0.06	1	medium	0.02	0.285				0.025	
	6	5	15		0.69	0.05	0	medium	0.18	0.267				0.026	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/19/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.58				Primary Coagulant			Mixing	330	2min
Color PCU	41				Coagulant Aid			Oxidization	18	30min
pH	7.15				Filter Aid			Flocculation	30	2min
Alkalinity mg/l					Pre pH Adjustment			Flocculation	10	15min
Hardness mg/l					Post pH Adjustment			Settling	0	1hr
Temp F	37°				Other			Remarks: Started with KMnO4 5 mg/l		
Fe mg/l	8.1							all jars mixed SP + AF12100 70/30 blend		
Mn mg/l	0.376							and did three jars for each well		
As mg/l	15									
TDS mg/l	96									
UV254 (A)	0.0182									

Comments & Notes Had good floc in all three jars for each well 2 floc smaller than well 1

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMn04 dose mg/l	1	5	5		0.39	0.07	0	medium	0.02	0.375	d/r	d/r	d/r	0.006	
	2	5	10		0.58	0.11	5	medium	0.07	0.164	d/r	d/r	d/r	0.0072	
	3	5	15		0.8	0.11	5	medium	0.04	0.155	d/r	d/r	d/r	0.0054	
Stern Pac plus Arctic															
Floc12100 dose µl															

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/19/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.6				Primary Coagulant			Mixing	330	2min
Color PCU	43				Coagulant Aid			Oxidization	18	30min
pH	7.1				Filter Aid			Flocculation	30	2min
Alkalinity mg/l					Pre pH Adjustment			Flocculation	10	15min
Hardness mg/l					Post pH Adjustment			Settling	0	1hr
Temp F	37				Other			Remarks: Started with KMnO4 5 mg/l		
Fe mg/l	8.43							all jars mixed SP + AF12100 70/30 blend		
Mn mg/l	0.328							and did three jars for each well		
As mg/l	35									
TDS mg/l	84									
UV254 (A)	0.0399									

Comments & Notes Had good floc in all three jars for each well 2 floc smaller than well 1

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMn04 dose mg/l	4	5	5		0.4	0.06	13	small	0.05	0.638	d/r	d/r	d/r	0.0089	
	5	5	10		0.57	0.18	9	small	0.04	0.448	d/r	d/r	d/r	0.0085	
	6	5	15		0.73	0.07	12	small	0.07	0.485	d/r	d/r	d/r	0.0086	
Stern Pac plus Arctic															
Floc12100 dose µl															
70/30 blend															

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/19/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist
Turbidity NTU	0.58			
Color PCU	41			
pH	7.15			
Alkalinity mg/l				
Hardness mg/l				
Temp F	37°			
Fe mg/l	8.1			
Mn mg/l	0.376			
As mg/l	15			
TDS mg/l	96			
UV254 (A)	0.0182			

Chemical Usage	Product	Dose mg/l
Primary Coagulant		
Coagulant Aid		
Filter Aid		
Pre pH Adjustment		
Post pH Adjustment		
Other		

Jar Testing Procedure	RPM	Time
Mixing	330	2min
Oxidization	18	30min
Flocculation	30	2min
Flocculation	10	15min
Settling	0	1hr

Remarks: Started with KMnO4 5 mg/l
all jars mixed A C H + AF12100 80/20
blend and did jar test to find optimum dose
for well 1

Comments & Notes As soon as I added the KMnO4 to the jars the water turned pink as if it was an over dose I used the same water from this mornings test but decided to run test anyway had good floc with KMnO4 water stayed a little bit pink until I added A C H blend will retest tomorrow

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 dose mg/l	1	5	5		0.53	0.15	32	medium	0.01	0.012	d/r	d/r	d/r	d/r	
	2	5	10		0.28	0.07	31	medium	0.03	0	d/r	d/r	d/r	-0.005	
	3	5	15		0.16	0.07	26	medium	0.05	0	d/r	d/r	d/r	-0.004	
A C H plus Arctic	4	5	20		0.2	0.1	5	medium	0.02	0	d/r	d/r	d/r	d/r	
Floc12100 dose µl	5	5	25		0.12	0.1	10	medium	0.01	0	d/r	d/r	d/r	d/r	
80/20 blend	6	5	30		0.12	0.06	15	medium	0.01	0	d/r	d/r	d/r	d/r	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/20/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	0.6				Primary Coagulant		
Color PCU	42				Coagulant Aid		
pH	7.21				Filter Aid		
Alkalinity mg/l	D/R				Pre pH Adjustment		
Hardness mg/l	D/R				Post pH Adjustment		
Temp F	37°				Other		
Fe mg/l	8.1						
Mn mg/l	0.378						
As mg/l	15						
TDS mg/l	94						
UV254 (A)	0.0135	0.025					

Jar Testing Procedure	RPM	Time
Mixing	330	2min
Oxidization	15	30min
Mixing	330	2min
Flocculation	12	20min
Settling	0	30min

Remarks: Started with cold water in jars added KMnO4 had small pin floc but it didn't oxidize as well as when it is heated to 50° then added ACH plus Arctic Floc 12100 80/20 blend

Comments & Notes

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 mg/l dose	1	5	10		0.78	0.07	2	small	0.01	0	d/r	d/r	d/r	0.0166	will read UV254 again after
	2	5	15		0.53	0.09	20	small	0.02	0	d/r	d/r	d/r	0.0185	setting in jars over night
	3	5	20		0.48	0.1	3	small	0	0	d/r	d/r	d/r	0.0124	
ACH plus AF12100															
80/20 blend µl dose															
	1													0.0142	
	2													0.0141	
	3													0.0122	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/20/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	0.6				Primary Coagulant		
Color PCU	42				Coagulant Aid		
pH	7.21				Filter Aid		
Alkalinity mg/l	D/R				Pre pH Adjustment		
Hardness mg/l	D/R				Post pH Adjustment		
Temp F	37°				Other		
Fe mg/l	8.44						
Mn mg/l	0.341						
As mg/l	15						
TDS mg/l	84						
UV254 (A)	0.0269						

Jar Testing Procedure	RPM	Time
Mixing	330	2min
Oxidization	15	30min
Mixing	330	2min
Flocculation	12	20min
Settling	0	30min

Remarks: Started with cold water in jars added KMnO4 had small pin floc but it didn't oxidize as well as when it is heated to 50° then added ACH plus Arctic Floc 12100 80/20 blend

Comments & Notes

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 mg/l Dose	4	5	10		0.57	0.11	16	small	0	0	D/R	D/R	D/R	0.0108	Will read UV254 again after
	5	5	15		0.76	0.13	6	small	0	0	D/R	D/R	D/R	0.0151	setting in jars over night
ACH Plus AF12100	6	5	20		0.9	0.07	19	small	0.04	0	D/R	D/R	D/R	0.0123	
80/20 blend µl Dose															
	4													0.0099	
	5													0.0142	
	6													0.012	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/21/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	1.27				Primary Coagulant		
Color PCU	35				Coagulant Aid		
pH	7.2/7.5	cold/warm			Filter Aid		
Alkalinity mg/l	D/R				Pre pH Adjustment	None	
Hardness mg/l	D/R				Post pH Adjustment	None	
Temp F	37				Other		
Fe mg/l	9.09						
Mn mg/l	0.361						
As mg/l	D/R(15)						
TDS mg/l	101						
UV254 (A)	0.0201						

Jar Testing Procedure		RPM	Time
Mixing	KmnO4	330	2min
Oxidization		15	30min
Mixing	ACH+AF12100	330	2min
Flocculation		12	15min
Settling		0	30min

Remarks: Started with KMnO4 mixed it then let it oxidize and then added ACH plus Arctic Floc 12100 90/10 blend

Comments & Notes Builds good floc and settles fairly fast

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	5	5	7.57	0.3	0.07	16	medium	0.03	0.188	D/R	D/R	D/R	0.0149	
	2	5	10	7.65	0.31	0.05	0	medium	0.01	0.073	D/R	D/R	D/R	0.0129	
ACH plus Arctic Floc	3	5	15	7.65	0.32	0.07	7	medium	0.03	0.073	D/R	D/R	D/R	0.0161	
12100 Dose µl	4	5	20	7.65	0.19	0.05	0	medium	0.04	0.085	D/R	D/R	D/R	0.0134	
90/10 blend	5	5	25	7.61	0.36	0.05	8	medium	0.02	0.073	D/R	D/R	D/R	0.0099	
	6	5	30	7.62	0.3	0.06	0	medium	0	0.086	D/R	D/R	D/R	0.0111	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/21/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	1.71				Primary Coagulant		
Color PCU	38				Coagulant Aid		
pH	7.4				Filter Aid		
Alkalinity mg/l	D/R				Pre pH Adjustment		
Hardness mg/l	D/R				Post pH Adjustment		
Temp F	37°				Other		
Fe mg/l	9.24						
Mn mg/l	0.0343						
As mg/l	D/R(35)						
TDS mg/l	84						
UV254 (A)	0.0375						

Jar Testing Procedure		RPM	Time
Mixing	KMnO4	312	2min
Oxidization		15	30min
Mixing	ACH+AF12100	312	2min
Flocculation		15	15min
Settling		0	30min

Remarks: Started with KMnO4 mixed let it oxidize then added ACH plus Arctic Floc 12100 90/10 blend

Comments & Notes With the KMnO4 after 10 min. it was starting to build small pin floc but it is light in color well W-05-1 has same size floc but is red in color I increased KMnO4 dose for this well

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	7.5	5	7.66	0.71	0.05	17	large	0.01	0.041	D/R	D/R	D/R	0.0212	
	2	7.5	10	7.62	0.41	0.1	4	large	0.01	0.046	D/R	D/R	D/R	0.0422	
ACH plus Arctic Floc	3	7.5	15	7.57	0.58	0.04	4	large	0	0.002	D/R	D/R	D/R	0.0212	
12100 Dose µl	4	10	20	7.59	0.34	0.08	14	large	0	0	D/R	D/R	D/R	0.024	Over dose KMnO4
	5	7.5	25	7.6	0.33	0.06	4	large	0	0	D/R	D/R	D/R	0.0199	
	6	7.5	30	7.61	0.34	0.06	0	large	0	0	D/R	D/R	D/R	0.013	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/22/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	1.02				Primary Coagulant		
Color PCU	37				Coagulant Aid		
pH	7.4				Filter Aid		
Alkalinity mg/l	D/R				Pre pH Adjustment		
Hardness mg/l	D/R				Post pH Adjustment		
Temp F	37"				Other		
Fe mg/l	9.03						
Mn mg/l	0.372						
As mg/l	D/R(15)						
TDS mg/l	99						
UV254 (A)	0.0203						

Jar Testing Procedure		RPM	Time
Mixing	KMnO4	330	2min
Oxidization		15	30min
Mixing	ACH+AF 70/30	330	2min
Flocculation		15	20min
Settling		0	30min

Remarks: Started with KMnO4 had good size floc in all jars addad ACH plus Arctic floc 12100 turned speed up to mix then down but it didn't build floc as big as it was with just the KMnO4 floc goes from small to large with increased dose

Comments & Notes Looks like two much Arctic Floc12100 the floc appears to be coated and stays suspended has very slow settling in the lighter doses

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	5	5	D/R	0.65	0.1	11	small	0.02	0.04	D/R	D/R	D/R	0.0151	
	2	5	10	D/R	0.53	0.06	0		0.02	0.064	D/R	D/R	D/R	0.0154	
	3	5	15	D/R	0.63	0.07	0		0	0.102	D/R	D/R	D/R	0.0185	
ACH plus Arctic Floc	4	5	20	D/R	0.54	0.08	2		0.02	0.095	D/R	D/R	D/R	0.0136	
12100 70/30 blend	5	5	25	D/R	0.49	0.1	0		0.01	0.112	D/R	D/R	D/R	0.0168	
Dose µl	6	5	30	D/R	0.31	0.11	1	large	0.01	0.111	D/R	D/R	D/R	0.0205	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/22/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU	1.51				Primary Coagulant		
Color PCU	39				Coagulant Aid		
pH	7.4				Filter Aid		
Alkalinity mg/l	D/R				Pre pH Adjustment		
Hardness mg/l	D/R				Post pH Adjustment		
Temp F	37°				Other		
Fe mg/l	9.21						
Mn mg/l	0.0344						
As mg/l	D/R						
TDS mg/l	86						
UV254 (A)	0.0373						

Jar Testing Procedure		RPM	Time
Mixing	KMnO4	312	2min
Oxidization		15	30min
Mixing	ACH+AF 70/30	312	2min
Flocculation		15	20min
Settling		0	30min

Remarks: Started with KMnO4 had good size floc in all jars addad ACH plus Arctic floc 12100 turned speed up to mix then down but it didn't build floc as big as it was with just the KMnO4

Comments & Notes Looks like two much Arctic Floc12100 the floc appears to be coated and stays suspended has very slow settling in all jars

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	7	5	D/R	0.87	0.1	21	Small	0.01	0.081	D/R	D/R	D/R	0.016	
	2	7	10	D/R	0.41	0.09	0	Small	0.01	0.093	D/R	D/R	D/R	0.0169	
	3	7	15	D/R	0.42	0.08	0	Small	0.02	0.137	D/R	D/R	D/R	0.0121	
ACH plus Arctic Floc	4	7	20	D/R	0.84	0.08	0	Small	0.02	0.07	D/R	D/R	D/R	0.0137	
12100 70/30 blend	5	7	25	D/R	1.16	0.1	0	Small	0.14	0.089	D/R	D/R	D/R	0.0198	
Dose µl	6	7	30	D/R	0.52	0.1	0	Small	0.03	0.101	D/R	D/R	D/R	0.0304	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/23/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU					Primary Coagulant		
Color PCU	40				Coagulant Aid		
pH	7.4				Filter Aid		
Alkalinity mg/l					Pre pH Adjustment		
Hardness mg/l					Post pH Adjustment		
Temp F	37°				Other		
Fe mg/l	6.39						
Mn mg/l							
As mg/l							
TDS mg/l							
UV254 (A)	0.0265						

Jar Testing Procedure		RPM	Time
Mixing	KMnO4	330	2min
Oxidization		15	30min
Mixing	Pax XL-9 +AF	330	3min
Flocculation		14	20min
Settling		0	30min

Remarks: Noticed color in the first three jars was a little two pink when I injected the KMnO4 into them so I redued jars 4,5,6 to 4 mg/l and checked raw water iron also noticed slight odor in it continued jar test with Pax XL-9 plus Arctic Floc 90/10 blend

Comments & Notes Had a lot of pin floc with the KMnO4 in all jars put the first three stayed a little bit pink until after I added the Pax XL-9 plus arctic floc 12100 and reduced speed had large floc after 10min on slow speed has settlin during flocculation and is clear between floc

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KmnO4 dose mg/l	1	5	5		0.54	0.07	0	medium	0.06	0.03				0.0233	
	2	5	10		1.6	0.08	15	medium	0.04	0.101				0.0215	Overdose KMnO4
	3	5	15		0.8	0.08	15	medium	0.03	0.364				0.0237	Overdose KMnO4
PAX XL-9 plus Arctic	4	4	20		0.42	0.07	0	large	0.01	0.168				0.0187	
Floc 12100 dose µl	5	4	25		0.6	0.09	0	large	0.03	0.352				0.0199	
90/10 blend	6	4	30		0.5	0.07	0	large	0.01	0.093				0.0194	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/23/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Chemical Usage	Product	Dose mg/l
Turbidity NTU					Primary Coagulant		
Color PCU					Coagulant Aid		
pH					Filter Aid		
Alkalinity mg/l					Pre pH Adjustment		
Hardness mg/l					Post pH Adjustment		
Temp F					Other		
Fe mg/l	8.34						
Mn mg/l							
As mg/l							
TDS mg/l							
UV254 (A)	0.0347						

Jar Testing Procedure		RPM	Time
Mixing	KMnO4	310	2min
Oxidization		15	30min
Mixing	Pax XL-9+AF 90/10	310	2min
Flocculation		15	20min
Settling		0	45min
Remarks:			

Comments & Notes Has good oxidization and pin floc with KMnO4 10min after adding the Pax XL-9 plus AF12100 and mixing it has good floc formation smaller in lower doses but large in higher dose has settling during mixing and is clear between floc but it also looks like this is going to have some floaters (see picture)

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 dose mg/l	1	7	5		0.57	0.05	7	small	0.02	0.07				0.0292	
	2	7	10		0.5	0.07	0	small	0.01	0.302				0.0286	
	3	7	15		0.71	0.16	0	medium	0.02	0.138				0.0284	
Pax XL-9 plus Arctic	4	7	20		0.44	0.07	0	medium	0	0				0.0385	
Floc 12100 dose µl	5	7	25		0.87	0.06	0	large	0.04	0.016				0.0274	
90/10 blend	6	7	30		0.68	0.07	0	large	0.03	0				0.0211	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/24/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Filtered	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.62				Ammonia (as Nitrogen)	mg/l 0.36		Mixing KMnO4	330	3min
Color PCU	40				Dissolved Oxygen mg/l	5.7		Oxidization	14	30min
pH	7.35	mV -13.2			Hydrogen Sulfide mg/l	0.04		Mixing Pax XL-9+AF12100 70/30	330	3min
Alkalinity mg/l	90				Carbon Dioxoid mg/l	45		Flocculation	14	20min
Hardness mg/l	2.79							Settling	0	35min
Temp F	37°							Remarks:		
Fe mg/l	5.01	Ferrous mg/l 2.05								
Mn mg/l	0.334									
As mg/l	15									
TDS mg/l	82 Cond 178.0 µs Sal 0.1‰									
UV254 (A)	0.0271									

Comments & Notes Checked raw water quality this morning and noted change in total iron and adjusted KMnO4 dose for jar test

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	4	5	7.15	0.62	0.11	5	Small	0	0	D/R	D/R	D/R	0.0218	
	2	4	10	7.18	0.64	0.11	11	Small	0	0	D/R	D/R	D/R	0.0157	
Pax XL-9 Plus Arctic	3	4	15	7.23	1.19	0.12	15	Small	0	0	D/R	D/R	D/R	0.0168	
Floc 12100 70/30	4	4	20	7.3	1.33	0.12	4	Small	0.04	0.001	D/R	D/R	D/R	0.0162	
blend Dose µl	5	4	25	7.31	1.91	0.21	15	Small	0	0	D/R	D/R	D/R	0.0141	
	6	4	30	7.29	2.62	0.25	17	Small	0.04	0.001	D/R	D/R	D/R	0.0162	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/24/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Filtered	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.69				Ammonia (as Nitrogen) mg/l	0.96		Mixing KMnO4	312	3min
Color PCU	45				Dissolved Oxygen mg/l	5.8		Oxidization	14	30min
pH	7.31	mV -12.9			Hydrogen Sulfide mg/l	0.02		Mixing Pax XL-9+AF12100 70/30	312	3min
Alkalinity mg/l	75				Carbon Dioxoid mg/l	60		Flocculation	14	20min
Hardness mg/l	3.05							Settling	0	35min
Temp F	37°							Remarks:		
Fe mg/l	9.63	Ferrous mg/l 2.87								
Mn mg/l	0.279									
As mg/l	15									
TDS mg/l	83 Cond 179.8 µs Sal 0.1‰									
UV254 (A)	0.0279									

Comments & Notes Checked raw water quality this morning and started jar test with Pax XL-9 plus Arctic Floc 12100 70/30 blend it had small floc and the settling was a little slow and a little cloudy on the bottom.

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	7	5	7.56	0.6	0.14	20	Small	0	0	D/R	D/R	D/R	0.0247	
	2	7	10	7.7	0.48	0.09	13	Small	0	0	D/R	D/R	D/R	0.0283	
Pax XL-9 Plus Arctic	3	7	15	7.77	0.52	0.09	9	Small	0	0	D/R	D/R	D/R	0.035	
Floc 12100 70/30	4	7	20	7.78	0.96	0.09	14	Small	0	0	D/R	D/R	D/R	0.0272	
blend Dose µl	5	7	25	7.76	1.16	0.09	0	Small	0	0	D/R	D/R	D/R	0.0252	
	6	7	30	7.78	1.06	0.1	12	Small	0.01	0	D/R	D/R	D/R	0.0173	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/25/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.17				Ammonia (as Nitrogen)	mg/l		Mixing KMnO4	330	3min
Color PCU	35				Dissolved Oxygen mg/l			Oxidization	14	30min
pH	7.35	mV -13.1			Hydrogen Sulfide mg/l			Mixing Pax XL-9+AF12100 80/20	330	3min
Alkalinity mg/l	90				Carbon Dioxoid mg/l			Flocculation	14	25min
Hardness mg/l	2.79							Settling	0	40min
Temp F	35°							Remarks:		
Fe mg/l	8.64	Ferrous mg/l D/R								
Mn mg/l	0.325									
As mg/l	15									
TDS mg/l	80 Cond. 198.5µs Sal .0 1‰									
UV254 (A)	0.0281									

Comments & Notes Checked raw water quality this morning the iron is back up to 8.63 mg/l and temp is down 2° NTU is as low as I have seen it on raw water in this well. Continued jar test adjusted KMnO4 Dose for higher iron and used Pax XL-9 plus Arctic Floc 12100 80/20 blend built pretty good floc kind of small but was clear between it settling rate is a little slow but condenses in the bottom of jars.

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	5	5	7.38	0.31	0.08	0	Small	0.02	0.022	D/R	D/R	D/R	0.0178	
	2	5	10	7.38	0.46	0.07	0	Small	0.01	0.026	D/R	D/R	D/R	0.0165	
Pax XL-9 Plus Arctic	3	5	15	7.36	0.44	0.09	0	Small	0	0.026	D/R	D/R	D/R	0.0169	
Floc 12100 80/20	4	5	20	7.35	0.51	0.07	0	Small	0.02	0.029	D/R	D/R	D/R	0.015	
Blend Dose µl	5	5	25	7.35	0.7	0.09	0	Small	0.04	0.05	D/R	D/R	D/R	0.0161	
	6	5	30	7.3	0.89	0.11	0	Small	0.02	0.089	D/R	D/R	D/R	0.0135	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/25/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.19				Ammonia (as Nitrogen)	mg/l		Mixing KMnO4	312	3min
Color PCU	37				Dissolved Oxygen mg/l			Oxidization	14	30min
pH	7.29	mV -11.6			Hydrogen Sulfide mg/l			Mixing Pax XL-9+AF12100 80/20	312	3min
Alkalinity mg/l	75				Carbon Dioxoid mg/l			Flocculation	14	25min
Hardness mg/l	3.05							Settling	0	35min
Temp F	35°							Remarks:		
Fe mg/l	9.8	Ferrous mg/l								
Mn mg/l	0.277									
As mg/l	35									
TDS mg/l	82 Cond. 185.5µs Sal .0 1‰									
UV254 (A)	0.0529									

Comments & Notes checked raw water quality this morning the only difference was the temp down 2° continued jar test using Pax XL-9 plus Arctic Floc 12100 80'20 blend it built nice floc and settled out good

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	7	5	7.56	0.34	0.08	0	Medium	0.02	0.022	D/R	D/R	D/R	0.0297	
	2	7	10	7.69	0.43	0.07	0	Medium	0.04	0.013	D/R	D/R	D/R	0.0287	
Pax XL-9 plus Arctic	3	7	15	7.7	0.56	0.08	0	Medium	0.03	0	D/R	D/R	D/R	0.0195	
Floc 12100 80/20	4	7	20	7.73	0.68	0.08	0	Medium	0.02	0.039	D/R	D/R	D/R	0.019	
blend Dose µl	5	7	25	7.73	0.69	0.07	0	Medium	0.03	0.018	D/R	D/R	D/R	0.0173	
	6	7	30	7.75	0.75	0.06	0	Medium	0	0.051	D/R	D/R	D/R	0.0331	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/26/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.28				Ammonia (as Nitrogen) mg/l			Mixing KMnO4	330	3min
Color PCU	34				Dissolved Oxygen mg/l			Oxidization	14	30min
pH	7.44	mV -19.8			Hydrogen Sulfide mg/l			Mixing Nalco 8185	330	3min
Alkalinity mg/l					Carbon Dioxoid mg/l			Flocculation	14	25min
Hardness mg/l								Settling	0	45min
Temp F	34.7°							Remarks: Started jar test after checking raw		
Fe mg/l	8.88	Ferrous mg/l						water this morning the KMnO4 oxidizes and forms		
Mn mg/l	0.36							lots of pin floc with the dose of 5mg/l in this well		
As mg/l								the iron is back up and the temp is down .3° I let		
TDS mg/l	81 Cond 185.0 µs Sal 0.1‰							flocculation run 5min longer because this is slow		
UV254 (A)	0.0311							reacting kind of cloudy		

Comments & Notes Settling rate is a little slow floc is small and you won't have a very long filter run it plugged up the 5µl syringe filter about half way through the sampling

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	5	5	D/R	1.17	0.08	0	Small	0.03	0.143	D/R	D/R	D/R	0.0218	
	2	5	10	D/R	0.7	0.08	0	Small	0.02	0.165	D/R	D/R	D/R	0.011	
Nalco 8185 Dose µl	3	5	15	D/R	0.42	0.07	0	Small	0	0.05	D/R	D/R	D/R	0.0091	
	4	5	20	D/R	0.69	0.09	0	Small	0.04	0.085	D/R	D/R	D/R	0.0281	
	5	5	25	D/R	0.57	0.1	0	Small	0.06	0.065	D/R	D/R	D/R	0.0228	
	6	5	30	D/R	0.72	0.15	0	Small	0.07	0.432	D/R	D/R	D/R	0.0246	

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/26/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.17				Ammonia (as Nitrogen)	mg/l		Mixing KMnO4	310	3min
Color PCU	50				Dissolved Oxygen mg/l			Oxidization	14	30min
pH	7.36	mV -15.3			Hydrogen Sulfide mg/l			Mixing Nalco 8185	310	3min
Alkalinity mg/l					Carbon Dioxoid mg/l			Flocculation	14	20min
Hardness mg/l								Settling	0	40min
Temp F	35.4°							Remarks: Checked raw water this morning it		
Fe mg/l	9.84	Ferrous mg/l						is about the same as yesterday temp is .4° higher		
Mn mg/l	0.351							This well builds better looking floc faster than well		
As mg/l								05-1 with 8185 in all jars with different doses		
TDS mg/l	83 Cond 189.1 µs Sal 0.1‰									
UV254 (A)	0.069									

Comments & Notes Settling rate is a little slow but the water looks clear floc stayed suspended and then settled down this well will have about twice the filter run time with nalco 8185 than W-05-1

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	7	5	D/R	0.44	0.07	0	Medum	0.05	0.077	D/R	D/R	D/R	0.0356	
	2	7	10	D/R	0.32	0.07	0	Medum	0.06	0.07	D/R	D/R	D/R	0.0133	
Nalco 8185 Dose µl	3	7	15	D/R	0.53	0.09	0	Medum	0.02	0.024	D/R	D/R	D/R	0.0087	
	4	7	20	D/R	0.97	0.1	0	Medum	0.04	0	D/R	D/R	D/R	0.0191	
	5	7	25	D/R	0.55	0.1	0	Medum	0.04	0	D/R	D/R	D/R	0.0057	
	6	7	30	D/R	0.56	0.15	0	Medum	0.09	0.054	D/R	D/R	D/R	0.0333	

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CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/27/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.9				Ammonia (as Nitrogen)	mg/l		Mixing KMnO4	330	2min
Color PCU	41				Dissolved Oxygen mg/l			Oxidization	15	30min
pH	7.25	mV			Hydrogen Sulfide mg/l			Mixing Stem Pac Plus Arctic Floc	330	2min
Alkalinity mg/l					Carbon Dioxoid mg/l			Flocculation	14	30min
Hardness mg/l								Settling	0	1hr
Temp F	35°							Remarks: I didn't like what was happening in		
Fe mg/l	11.44	Ferrous mg/l						the 300 gal tank after adding chemicals so I did		
Mn mg/l	0.404							this jar test.		
As mg/l										
TDS mg/l	Cond µs	Sal ‰								
UV254 (A)										

Comments & Notes After taking readings it would appear that the KMnO4 dose in the 300 gal tank is a little bit of an overdose looking at turbidity and apparent color for both the 300gal tank and the jar with 6mg/l KMnO4 have close to the same turbidity (see pictures for today)

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	5	10		0.41	0.08	0	small							
	2	6	10		2.99	0.25	0	small							
SP + AF 80/20 µl	3	7	10												OVERDOSE KMnO4
Out of 300 gal tank	4		10		2.65	0.08	0	small	0	0.09					

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Location	Water Source	Personnel
6/27/2006	Tuluksak W-05-01	Raw Water	Garry Bowley

Raw Water Quality		Chemicals Used	Dose mg/l	Treatment Vessel Information	
Turbidity NTU	0.9	KMnO4	5 mg/l	Flow Rate GPM	
Color PCU	41			Vessel Description	GPM/sq ft
pH	7.25	Stern Pac Plus	11 mg/l		
Alkalinity mg/l		Arctic Floc 12100			
Hardness mg/l		80/20 Blend			
Temp F	35°				
Fe mg/l	11.44			Other Notes I didn't like what was happening with the water in the 300 gal tank and did quick jar test to determine what was going on with the water in the 300gal tank	
Mn mg/l	0.404				
As mg/l					
TDS mg/l					
UV254 (A)					

Treatment Process Objective

Treatment Process Description Hauled water in and preheated to 64° added 5 grams KMnO4 to it mixed on high for 5min then turned down and let oxidize for 30min turned speed up and added 11 ml of Stern Pac plus Arctic Floc 12100 80/20/ blend to it took one minute to add 11 ml mixed on high for 5min then down to about 14 rpm for 25min and turned mixer off water stayed turning for 30min started taking readings at ports on tank

Sketch of Test Setup

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments
6/27/2006	3:00pm		45min after stopping mixer took turbidity readings on the three taps on tank
		Top	NTU 9.67 through 1.2µl filter 0.10
			Ptco 307 through .45µl filter 15
		Middle	NTU 9.67 through 1.2µl filter 0.10
			Ptco 382 through .45µl filter 17
		Bottom	NTU 9.67 through 1.2µl filter 0.10
			Ptco 387 through .45µl filter 34
	5:00pm		
		Top	NTU 4.95 through 1.2µl filter 0.28
			Ptco 107 through .45µl filter 10
		Middle	NTU 8.85 through 1.2µl filter 0.40
			Ptco 200 through .45µl filter 15
		Bottom	NTU 10.9 through 1.2µl filter 0.62
			Ptco 285 through .45µl filter 22
	10:00pm		
		Top	NTU 3.10 through 1.2µl filter 0.10
		Middle	NTU 4.32 through 1.2µl filter 0.11
		Bottom	NTU 5.09 through 1.2µl filter 0.07
			Fe 0.02

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Location	Water Source	Personnel
6/28/2006	Tuluksak	W-05-1	Garry Bowley

Raw Water Quality		Chemicals Used	Dose mg/l
Turbidity NTU	0.9		
Color PCU	41		
pH	7.25		
Alkalinity mg/l			
Hardness mg/l			
Temp F	35*		
Fe mg/l	11.44		
Mn mg/l	0.404		
As mg/l	35		
TDS mg/l	82		
UV254 (A)	0.0269		

Treatment Vessel Information	
Flow Rate GPM	0.5
Vessel Description	GPM/sq ft
8" X 60" Clear PVC Multi Media 1.5	GPM/sq ft
Other Notes	

Treatment Process Objective To remove Iron,Manganese,Arsenic and Color

Treatment Process Description Raw Water hauled and batch treated in 300gal tank (see figure 4- Chemical Oxidation, Coagulation, Settlement, And Multimedia Filtration)

Sketch of Test Setup

CE2 Engineers, Inc. **PILOT TESTING LOG**

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments
6/28/2006	9:00am		Water readings in the 300 gal tank before starting through filter at the three taps
		Top	NTU settled 1.94 through 1.2µl filter 0.09
			Fe 0.03
			Ptco 0
			Mn 0.454
			PH 7.26
		Middle	NTU settled 2.65 through 1.2µl filter 0.13
			Fe 0.03
			Ptco 0
			Mn 0.454
			PH 7.16
		Bottom	NTU settled 2.69 through 1.2µl filter 0.12
			Fe 0.03
			Ptco 0
			Mn 0.454
			PH 7.28
	10:30am		Started water through filter ran it filter to waste for 15min and took readings
	11:00am		NTU 0.29
			Fe 0.00
			Ptco 0
			Mn Over limit low range
			PH 7.26
	11:15am		Checked tap water quality because of Mn being high
			NTU 0.35
			Fe 0.02
			Ptco 31
			Mn Over limit low range high range 3.4mg/l
			PH 6.80
	11:30am		NTU 0.19
			Fe 0.00
			Ptco 2
			Mn High range 2.1mg/l
			PH 7.24

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments		
6/28/2006	11:00am		Raw Water quality check	Time	
			UV254 0.0269	1:45pm	Out of center tap on tank pushed
			NTU 1.02		through 1.2µl filter
			Fe 9.24		NTU 0.09
			Ptco 41		Mn 0.052
			Mn 0.812		Fe 0.00
			PH 7.35		Ptco 0
	12:00pm		NTU 0.08	2:00pm	NTU 0.07
			Fe 0.01		Fe 0.00
			Ptco 0		Ptco 0
			Mn 1.2		Mn 0.4
			PH 7.21		PH 7.25
			UV254 0.0179		UV254 D/R
	12:30pm		NTU 0.07	2:30pm	NTU 0.07
			Fe 0.00		Fe 0.00
			Ptco 0		Ptco 0
			Mn 0.9		Mn 0.3
			PH 7.26		PH 7.30
			UV254 D/R		UV254 D/R
	1:00pm		NTU 0.07	3:00pm	NTU 0.07
			Fe 0.00		Fe 0.00
			Ptco 0		Ptco 2
			Mn 0.8		Mn D/R
			PH 7.16		PH 7.28
			UV254 D/R		UV254 D/R
	1:30pm		NTU 0.07	3:30pm	NTU 0.07
			Fe 0.00		Fe 0.00
			Ptco 0		Ptco 0
			Mn 0.6		Mn 0.4 High range
			PH 7.16		PH D/R
			UV254 D/R		UV254 D/R

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments		
6/28/2006				Time	
	4:00pm		NTU 0.07	6:15pm	Stopped filter process Air scour
			Fe 0.00		and backwash to try and reduce
			Ptco 0		the high Mn level the filter cleaned
			Mn D/R		in 2min but ran the treated water
			PH 7.28		through for 8min then started filter
			UV254 D/R		to waste took readings after 10min
	4:30pm		NTU 0.07	6:30pm	NTU 0.07
			Fe 0.00		Fe 0.00
			Ptco 0		Ptco 0
			Mn D/R		Mn 0.561
			PH 7.26		PH 7.25
		>	As 3ppb		UV254 D/R
	5:00pm		NTU 0.07	7:00pm	NTU 0.07
			Fe 0.00		Fe 0.00
			Ptco 1		Ptco 0
			Mn 0.4		Mn 0.519
			PH 7.28		PH 7.30
			UV254 D/R		UV254 D/R
	5:30pm		NTU 0.07	7:30pm	NTU 0.07
			Fe 0.00		Fe 0.00
			Ptco 0		Ptco 1
			Mn 0.8		Mn 0.507
			PH D/R		PH 7.28
			UV254 D/R		UV254 D/R
	6:00pm		NTU 0.07	7:40pm	Shut down process
			Fe 0.00		
			Ptco 0		
			Mn 0.6		
			PH D/R		
			UV254 D/R		

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/29/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.38				Ammonia (as Nitrogen)	mg/l		Mixing KMnO4	330	3min
Color PCU	14				Dissolved Oxygen mg/l			Oxidization	14	35min
pH	7.64	mV			Hydrogen Sulfide mg/l			Mixing Coagulant Blend	330	3min
Alkalinity mg/l					Carbon Dioxoid mg/l			Flocculation	14	30min
Hardness mg/l								Settling	0	1hr
Temp F	34.6							Remarks:		
Fe mg/l	9.88									
Mn mg/l	0.8									
As mg/l	35									
TDS mg/l	82									
UV254 (A)	0.0369									

Comments & Notes Did jar test to determine dose for next batch that is more effective on the higher raw water manganese

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	4	10	7.61	1.52			small							
SP+AF 80/20	2	4.5	10	7.55	0.65	0.07	12	small	0.07	0.223					
KMnO4	4	4	10	7.62	0.24	0.09	0	small	0.02	0.05					
ACH+ AF 80/20	5	5			Overdose	KMnO4									
	6	4.5	10	7.52	0.5	0.08	0	medium	0.02	0.022					looks like this will work for
															the batch treatment

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Location	Water Source	Personnel
6/29/2006	Tuluksak	W-05-1	Garry Bowley

Raw Water Quality		Chemicals Used	Dose mg/l	Treatment Vessel Information	
Turbidity NTU	0.38	KMnO4	4.22	Flow Rate GPM	0.5
Color PCU	14			Vessel Description	GPM/sq ft
pH	7.64			8" X 60" clear PVC Multimedia	1.5
Alkalinity mg/l		ACH plus Arctic Floc	11		
Hardness mg/l		12100 80/20 blend			
Temp F	34.6				
Fe mg/l	9.66			Other Notes Heated water to 48.6' added the	
Mn mg/l	0.8			KMnO4 rapid mixed 5min turned down slow let it	
As mg/l	35			oxidize for 35min then added 11ml of ACH + AF	
TDS mg/l	81			80/20 blend rapid mix 5min slow 35min let settle	
UV254 (A)	0.0369			overnight	

Treatment Process Objective To Remove Iron,Manganese,Arsenic and Color to below the MCL

Treatment Process Description Raw Water hauled,heated and batch treated in 300gal tank (See Figure 4 - Chemical Oxidation,Coagulation, Settlement, And Multimedia Filtration

Sketch of Test Setup

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
6/30/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist
Turbidity NTU	0.67			
Color PCU	30			
pH	7.45			
Alkalinity mg/l	D/R			
Hardness mg/l	D/R			
Temp F	35.4			
Fe mg/l	9.6			
Mn mg/l	0.8			
As mg/l	35			
TDS mg/l	80			
UV254 (A)	0.0298			

Water Quality	Raw	Treated
Ammonia (as Nitrogen)	mg/l	
Dissolved Oxygen mg/l		
Hydrogen Sulfide mg/l		
Carbon Dioxoid mg/l		

Jar Testing Procedure		RPM	Time
Mixing	KMnO4	330	3min
Oxidization		14	35min
Mixing	Pax XL-9 plus Arctic Floc	330	3min
Flocculation	70/30 blend	14	30min
Settling		0	45min

Remarks: Did jar test to determine dose for next batch treatment referred to my notes for best manganese reduction

Comments & Notes The KMnO4 dose seems to be critical in this water.

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	4.5	9	7.51	1.05	0.17	2	small	0	0.024	D/R	D/R	D/R	D/R	
	2	4.5	12	7.5	0.66	0.06	0	small	0	0	D/R	D/R	D/R	D/R	This looks good will use this
Pax XL-9 plus Arctic	3	4.5	15	7.49	0.89	0.1	0	small	0	0	D/R	D/R	D/R	D/R	Dose
Floc 12100 70/30															
Blend Dose µl															

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments			
6/30/2006				Time		
	4:30pm	NTU	0.07	7:00pm		
		Fe	0	Shut Down cleaned tank hauled water and		
		Ptco	3	and started another batch used XL-9 plus		
		Mn	0.12	Arctic Floc 12100 70/30 blend		
		PH	7.62			
		UV254	D/R			
		As	3			
	5:00pm	NTU	0.07		NTU	
		Fe	0		Fe	
		Ptco	8		Ptco	
		Mn	D/R		Mn	
		PH	7.65		PH	
		UV254	0.0108		UV254	
		As	3		As	
	5:30pm	NTU	0.07		NTU	
		Fe	0		Fe	
		Ptco	5		Ptco	
		Mn	D/R		Mn	
		PH	7.65		PH	
		UV254	D/R		UV254	
		As	3		As	
	6:00pm	NTU	0.06		NTU	
		Fe	0		Fe	
		Ptco	0		Ptco	
		Mn	0.092		Mn	
		PH	7.62		PH	
		UV254	D/R		UV254	
		As	3		As	
	6:30pm	NTU	0.06		NTU	
		Fe	0		Fe	
		Ptco	0		Ptco	
		Mn	D/R		Mn	
		PH	7.62		PH	
		UV254	0.0108		UV254	
		As	3		As	

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments			
6/30/2006		After filter	to waste for 15min	Time		
	10:15am	NTU	0.12	1:15pm	NTU	0.06
		Fe	0.02		Fe	0
		Ptco	0		Ptco	0
		Mn	0.482		Mn	D/R
		PH	7.66 Temp: 56.5°		PH	7.62
		UV254	0.0118		UV254	D/R
		As	3		As	D/R
	10:20am	Started water into 165 gal holding tank				
	10:45am	NTU	0.09	2:20pm	NTU	0.07
		Fe	0.01		Fe	0
		Ptco	10		Ptco	0
		Mn	0.41		Mn	0.185
		PH	7.65		PH	7.6
		UV254	0.0108		UV254	D/R
		As	3		As	D/R
	11:30am	NTU	0.07	3:00pm	NTU	0.07
		Fe	0		Fe	0
		Ptco	10		Ptco	3
		Mn	0.254		Mn	0.149
		PH	7.65		PH	7.63
		UV254	D/R		UV254	D/R
		As	3		As	D/R
	12:00pm	NTU	0.07	3:30pm	NTU	0.06
		Fe	0.01		Fe	0
		Ptco	1		Ptco	6
		Mn	0.21		Mn	D/R
		PH	7.62		PH	7.6
		UV254	D/R		UV254	D/R
		As	3		As	D/R
	12:30pm	NTU	0.06	4:00pm	NTU	0.07
		Fe	0		Fe	0
		Ptco	0		Ptco	3
		Mn	0.208		Mn	D/R
		PH	7.62		PH	7.6
		UV254	0.0108		UV254	D/R
		As	3		As	D/R

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Location	Water Source	Personnel
6/30/2006	Tuluksak W-05-1		Garry Bowley

Raw Water Quality		Chemicals Used	Dose mg/l	Treatment Vessel Information	
Turbidity NTU	0.38	KMnO4	4.22	Flow Rate GPM	0.5
Color PCU	14			Vessel Description	GPM/sq ft
pH	7.64			8" X 60" clear PVC Multimedia	1.5
Alkalinity mg/l		ACH plus Arctic Floc	11		
Hardness mg/l		12100 80/20 blend			
Temp F	34.6				
Fe mg/l	9.66			Other Notes Heated water to 48.6° added the	
Mn mg/l	0.8			KMnO4 rapid mixed 5min turned down slow let it	
As mg/l	35			oxidize for 35min then added 11ml of ACH + AF	
TDS mg/l	81			80/20 blend rapid mix 5min slow 35min let settle	
UV254 (A)	0.0369			overnight	

Treatment Process Objective To Remove Iron,Manganese,Arsenic and Color to below the MCL

Treatment Process Description Raw Water hauled,heated and batch treated in 300gal tank (See Figure 4 - Chemical Oxidation,Coagulation, Settlement, And Multimedia Filtration

(Note: this batch was started late yesterday afternoon)

Sketch of Test Setup

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
7/1/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.65				Ammonia (as Nitrogen) mg/l			Mixing KMnO4	330	3min
Color PCU	37				Dissolved Oxygen mg/l			Oxidization	15	35min
pH	7.5	mV			Hydrogen Sulfide mg/l			Mixing XL-9 plus AF 12100	330	3min
Alkalinity mg/l	D/R				Carbon Dioxoid mg/l			Flocculation 70/30 blend	14	35min
Hardness mg/l	D/R							Settling	0	45min
Temp F	35.4							Remarks:		
Fe mg/l	9.66	Ferrous mg/l								
Mn mg/l	0.8									
As mg/l	35									
TDS mg/l	82 Cond µs Sal ‰									
UV254 (A)	0.0267									

Comments & Notes Dumped what was mixed late yesterday did jar test hauled water and heated it to 54°. This water starts to oxidize after about 1 and 1/2 to 2 HR of setting and reduces the dose rate of the amount of Potassium Permanganate in order to oxidize it by about 1 mg/L. Also the mixing of the coagulant blend in the large vessel is very important to the water quality

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l						Other
									Fe	Mn	As	Alk	Hard	UV254	
KMnO4 Dose mg/l	1	5			0.68	0.22		medium			D/R	D/R	D/R	D/R	KMnO4 Only
Af 12100 dose µl	2	5	2		0.47	0.25	13	small	0.03		D/R	D/R	D/R	D/R	
Kemiron Pax XL-9	3	5	12		0.31	0.07	0	small	0	0	D/R	D/R	D/R	D/R	
Plus Arctic Floc12100	4	5	12		1.05	0.07	2	small	0	0	D/R	D/R	D/R	D/R	One liter out of 300gal tank
70/30 blend Dose µl															after KMnO4 dose

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
7/3/2006	Tuluksak W-05-1	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated
Turbidity NTU	0.36				Ammonia (as Nitrogen)	mg/l	
Color PCU	51				Dissolved Oxygen mg/l		
pH	7.62	mV			Hydrogen Sulfide mg/l		
Alkalinity mg/l	D/R				Carbon Dioxoid mg/l		
Hardness mg/l	D/R						
Temp F	35.2°						
Fe mg/l	6.97	Ferrous mg/l					
Mn mg/l	0.7						
As mg/l	35						
TDS mg/l	80 Cond	µs Sal	‰				
UV254 (A)							

Jar Testing Procedure	RPM	Time
Mixing KMnO4	330	3min
Oxidization	14	35min
Mixing XL-9 Plus AF 75/25 blend	330	3min
Flocculation	14	25min
Settling	0	40min

Remarks: Dumped the 300 gal tank that was batch treated Saturday afternoon because it was cloudy high trubidity and the Mn level was 0.108 like it just didn't bulid good floc.Checked raw water quality both wells and a quick jar test

Comments & Notes

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	1	5.5	10		0.89	0.12	6	small	0.12	0.043	D/R	D/R	D/R		
	2	5.5	15		0.9	0.07	0	medium	0.01	0.034	D/R	D/R	D/R		
Kemiron Pax XL-9	3	5.5	20		0.94	0.07	0	medium	0	0.045	D/R	D/R	D/R		
Plus Arctic Floc															
12100 Dose µl															

CE2 Engineers, Inc.

POTABLE WATER JAR TEST EVALUATION FORM

Date	Location	Personnel	Plant Size and Flow
7/3/2006	Tuluksak W-05-2	Garry Bowley	

Water Quality	Raw	Settled	Filtered	Dist	Water Quality	Raw	Treated	Jar Testing Procedure	RPM	Time
Turbidity NTU	0.51				Ammonia (as Nitrogen)	mg/l		Mixing KMnO4	330	3min
Color PCU	58				Dissolved Oxygen mg/l			Oxidization	14	35min
pH	7.6	mV			Hydrogen Sulfide mg/l			Mixing XL-9 Plus AF 75/25 blend	330	3min
Alkalinity mg/l	D/R				Carbon Dioxoid mg/l			Flocculation	14	25min
Hardness mg/l	D/R							Settling	0	40min
Temp F	35.2°							Remarks: Dumped the 300 gal tank that was		
Fe mg/l	8.12	Ferrous mg/l						batch treated Saturday afternoon because it was		
Mn mg/l	0.8							cloudy high trubidity and the Mn level was 0.108		
As mg/l	35							like it just didn't bulid good floc.Checked raw		
TDS mg/l	82 Cond µs	Sal ‰						water quality both wells and a quick jar test		
UV254 (A)										

Comments & Notes

Products Tested	Jar No.	Dose mg/l	Dose µl	pH	Turbidity Settled	Turbidity Filtered	True Color	Floc Size	Water Quality mg/l Fe	Mn	As	Alk	Hard	UV254	Other
KMnO4 Dose mg/l	4	6.2	10		0.48	0.07	1	medium	0	0.206	D/R	D/R	D/R		
	5	6.2	15		0.76	0.06	0	medium	0	0.387	D/R	D/R	D/R		
Kemiron Pax XL-9	6	6.2	20		1.13	0.09	0	medium	0	0.323	D/R	D/R	D/R		
Plus Arctic Floc															
12100 Dose µl															

CE2 Engineers, Inc.

PILOT TESTING LOG

Date	Time	(S)tart (M)iddle (E)nd	Description of Process Step, Test Results, Adjustments			
7/4/2006				Time		
	8:30am					
				5:00pm		
	Top	NTU	1.67 Settled overnight	Bottom	NTU	3.46 Settled 1hr
		NTU	0.1 Through 1.2µl filter		NTU	0.1 Through 1.2µl filter
		Fe	0.02		Fe	0
		Mn	0.127		Mn	0.11
		Ptco	8 Through .45µl		Ptco	0 Through .45µl
	Middle	NTU	2.8 Settled overnight			
		NTU	0.06 Through 1.2µl filter			
		Fe	0			
		Mn	0.11			
		Ptco	7 Through .45µl			
	Bottom	NTU	5.20 Settled Overnight			
		NTU	0.06 Through 1.2µl filter			
		Fe	0			
		Mn	0.04			
		Ptco	3 Through .45µl			
	Changed the mixer motor mount and ran it on slow speed for 40min it built mueium size floc and					
	dropped out in one hour the water is clearer than it's been and the speed that floc dropped is good.					
	5:00pm					
	Top	NTU	2.84 Settled 1hr			
		NTU	0.1 Through 1.2µl filter			
		Fe	0			
		Mn	D/R			
		Ptco	0 Through .45µl			
	Middle	NTU	1.44 Settled 1hr			
		NTU	0.06 Through 1.2µl filter			
		Fe	0			
		Mn	D/R			
		Ptco	0 Through .45µl			

Appendix E

Laboratory Analysis Report

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P.O. Box 232946
Anchorage, AK 99523

Work Order:	1063863
	Tuluksak
Client:	A D E C-Village Safewater
Report Date:	August 10, 2006

Released by:
Forest Taylor
2006.08.10
18:32:35 -
08'00'

Enclosed are the analytical results associated with the above workorder.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintained by SGS. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request.

The laboratory certification numbers are AK971-05 (DW), UST-005 (CS) and AK00971 (Micro) for ADEC and 001543 for NELAP.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP, the National Environmental Laboratory Accreditation Program and, when applicable, other regulatory authorities.

If you have any questions regarding this report or if we can be of any other assistance, please contact your SGS Project Manager at 907-562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

PQL	Practical Quantitation Limit (reporting limit).
U	Indicates the analyte was analyzed for but not detected.
F	Indicates value that is greater than or equal to the MDL.
J	The quantitation is an estimation.
ND	Indicates the analyte is not detected.
B	Indicates the analyte is found in a blank associated with the sample.
*	The analyte has exceeded allowable regulatory or control limits.
GT	Greater Than
D	The analyte concentration is the result of a dilution.
LT	Less Than
!	Surrogate out of control limits.
Q	QC parameter out of acceptance range.
M	A matrix effect was present.
JL	The analyte was positively identified, but the quantitation is a low estimation.
E	The analyte result is above the calibrated range.

Note: Soil samples are reported on a dry weight basis unless otherwise specified.

SGS

SGS Ref.#	1063863003
Client Name	A D E C-Village Safewater
Project Name/#	Tuluksak
Client Sample ID	Treated Water Process 1
Matrix	Water (Surface, Eff., Ground)

All Dates/Times are Alaska Standard Time

Printed Date/Time	08/10/2006 11:20
Collected Date/Time	07/11/2006 23:00
Received Date/Time	07/13/2006 10:05
Technical Director	**Stephen C. Ede**

Sample Remarks:

SM 5910B - %T = 92.4

TTHM Formation Potential was analyzed by Montgomery Watson Harza in Monrovia, CA.

HAA5 Formation Potential was analyzed by Montgomery Watson Harza in Monrovia, CA.

MBAS (Surfactants) by SM5440C was analyzed by Analytica International of Anchorage, AK.

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Nitrate-N	1.17	0.100	mg/L	EPA 353.2	C			07/13/06	ALR
Nitrite-N	ND	0.100	mg/L	EPA 353.2	C			07/13/06	ALR
Calcium	34.3	0.100	mg/L	EP200.7	A		07/20/06	07/25/06	TK
Magnesium	3.54	0.100	mg/L	EP200.7	A		07/20/06	07/25/06	TK
Calcium	68.5	0.0500	mg/L	SM20 2340B	A		07/20/06	07/25/06	TK
Hardness as CaCO3	100	2.50	mg/L	SM20 2340B	A		07/20/06	07/25/06	TK
Magnesium	7.09	0.0500	mg/L	SM20 2340B	A		07/20/06	07/25/06	TK
Metals by ICP/MS									
Aluminum	ND	20.0	ug/L	EP200.8	A		07/20/06	07/25/06	MH
Calcium	35800	500	ug/L	EP200.8	A		07/20/06	07/25/06	MH
Magnesium	3490	50.0	ug/L	EP200.8	A		07/20/06	07/25/06	MH
Silver	ND	1.00	ug/L	EP200.8	A		07/20/06	07/25/06	MH
Waters Department									
Bromide	ND	0.100	mg/L	EPA 300.0	C		07/14/06	07/14/06	DSH
Total Residual Chlorine	ND	0.200	mg/L	SM20 4500-Cl G	G			07/13/06	DPT
Total Organic Carbon	1.94	0.500	mg/L	EPA 415.1	H			07/17/06	TSN
Total Organic Carbon,Dissolved	1.80	0.500	mg/L	EPA 415.1	O			07/17/06	TSN
UV-254	0.0340	0.0200	cm-1	SM20 5910B	N			07/13/06	CAW
Inorganic Contaminants									
Antimony	ND	1.00	ug/L	EP200.8	A	(<6)	07/20/06	07/25/06	MH
Arsenic	ND	5.00	ug/L	EP200.8	A	(<50)	07/20/06	07/25/06	MH
Barium	42.8	3.00	ug/L	EP200.8	A	(<2000)	07/20/06	07/25/06	MH

SGS

SGS Ref.#	1063863003
Client Name	A D E C-Village Safewater
Project Name/#	Tuluksak
Client Sample ID	Treated Water Process 1
Matrix	Water (Surface, Eff., Ground)

All Dates/Times are Alaska Standard Time

Printed Date/Time	08/10/2006 11:20
Collected Date/Time	07/11/2006 23:00
Received Date/Time	07/13/2006 10:05
Technical Director	Stephen C. Ede

Parameter	Results		PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Inorganic Contaminants										
Beryllium	ND		0.400	ug/L	EP200.8	A	(<4)	07/20/06	07/25/06	MH
Cadmium	ND		0.500	ug/L	EP200.8	A	(<5)	07/20/06	07/25/06	MH
Chromium	2.44		1.00	ug/L	EP200.8	A	(<100)	07/20/06	07/25/06	MH
Cyanide	ND		0.0050	mg/L	SM20 4500-CN C.E	B	(<0.2)	07/17/06	07/19/06	XZ
Fluoride	ND		0.100	mg/L	EPA 300.0	C	(<2)	07/14/06	07/14/06	DSH
Mercury by Cold Vapor	ND		0.200	ug/L	EP245.1	A	(<0.2)	07/20/06	07/20/06	HKG
Nickel	2.37		2.00	ug/L	EP200.8	A	(<100)	07/20/06	07/25/06	MH
Selenium	ND		5.00	ug/L	EP200.8	A	(<50)	07/20/06	07/25/06	MH
Thallium	ND		1.00	ug/L	EP200.8	A	(<2)	07/20/06	07/25/06	MH
Secondary Contaminants										
Chloride	4.42		0.100	mg/L	EPA 300.0	C	(<250)	07/14/06	07/14/06	DSH
Color	ND		5.00	PCU	SM20 2120B	D	(<15)		07/13/06	CRY
Copper	5.41		1.00	ug/L	EP200.8	A	(<1300)	07/20/06	07/25/06	MH
Fluoride	ND		0.100	mg/L	EPA 300.0	C	(<2)	07/14/06	07/14/06	DSH
Langlier Index @ 40 degree F	-1.162				SM2330B	D			07/28/06	PLW
Alkalinity	98.0		20.0	mg/L	SM20 2320B	D			07/14/06	PLW
Langlier Index @ 140 degree F	-0.082				SM2330B	D			07/28/06	PLW
CO3 Alkalinity	ND		20.0	mg/L	SM20 2320B	D			07/14/06	PLW
Iron	ND		0.0200	mg/L	EP200.7	A		07/20/06	07/25/06	TK
HCO3 Alkalinity	98.0		20.0	mg/L	SM20 2320B	D			07/14/06	PLW
OH Alkalinity	ND		20.0	mg/L	SM20 2320B	D			07/14/06	PLW
Manganese	193	*	1.00	ug/L	EP200.8	A	(<50)	07/20/06	07/25/06	MH
Odor (TON)	ND		1.00	T.O.N.	SM20 2150B	E	(<3)		07/13/06	CRY
pH	7.14		0.100	pH units	EPA 150.1	D	(6.5-8.5)		07/13/06	CRY
Sodium	2.90		1.00	mg/L	EP200.7	A		07/20/06	07/25/06	TK
Sulfate	2.68		0.100	mg/L	EPA 300.0	C	(<250)	07/14/06	07/14/06	DSH
Total Dissolved Solids	133		10.0	mg/L	SM20 2540C	D	(<500)		07/14/06	KP
Zinc	91.6		5.00	ug/L	EP200.8	A	(<5000)	07/20/06	07/25/06	MH

SGS

SGS Ref.#	1063863003
Client Name	A D E C-Village Safewater
Project Name/#	Tuluksak
Client Sample ID	Treated Water Process 1
Matrix	Water (Surface, Eff., Ground)

All Dates/Times are Alaska Standard Time

Printed Date/Time	08/10/2006 11:20
Collected Date/Time	07/11/2006 23:00
Received Date/Time	07/13/2006 10:05
Technical Director	**Stephen C. Ede**

SGS

SGS Ref.#	1063863004
Client Name	A D E C-Village Safewater
Project Name/#	Tuluksak
Client Sample ID	Treatment Process 2
Matrix	Water (Surface, Eff., Ground)

All Dates/Times are Alaska Standard Time

Printed Date/Time	08/10/2006 11:20
Collected Date/Time	07/11/2006 22:00
Received Date/Time	07/13/2006 7:55
Technical Director	Stephen C. Ede

Sample Remarks:

SM 5910B - %T = 94.2

TTHM Formation Potential was analyzed by Montgomery Watson Harza in Monrovia, CA.

HAA5 Formation Potential was analyzed by Montgomery Watson Harza in Monrovia, CA.

MBAS (Surfactants) by SM5440C was analyzed by Analytica International of Anchorage, AK.

Parameter	Results	PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Nitrate-N	0.205	0.100	mg/L	EPA 353.2	A			07/13/06	ALR
Nitrite-N	ND	0.100	mg/L	EPA 353.2	A			07/13/06	ALR
Calcium	34.6	0.100	mg/L	EP200.7	A		07/20/06	07/25/06	TK
Magnesium	3.55	0.100	mg/L	EP200.7	A		07/20/06	07/25/06	TK
Calcium	69.2	0.0500	mg/L	SM20 2340B	A		07/20/06	07/25/06	TK
Hardness as CaCO3	101	2.50	mg/L	SM20 2340B	A		07/20/06	07/25/06	TK
Magnesium	7.10	0.0500	mg/L	SM20 2340B	A		07/20/06	07/25/06	TK
Metals by ICP/MS									
Aluminum	ND	20.0	ug/L	EP200.8	A		07/20/06	07/25/06	MH
Calcium	35200	500	ug/L	EP200.8	A		07/20/06	07/25/06	MH
Magnesium	3480	50.0	ug/L	EP200.8	A		07/20/06	07/25/06	MH
Silver	ND	1.00	ug/L	EP200.8	A		07/20/06	07/25/06	MH
Waters Department									
Bromide	ND	0.100	mg/L	EPA 300.0	C		07/17/06	07/17/06	DSH
Total Residual Chlorine	ND	0.200	mg/L	SM20 4500-Cl G	G			07/13/06	DPT
Total Organic Carbon,Dissolved	1.82	0.500	mg/L	EPA 415.1	O			07/17/06	TSN
UV-254	0.0260	0.0200	cm-1	SM20 5910B	N			07/13/06	CAW
Inorganic Contaminants									
Antimony	ND	1.00	ug/L	EP200.8	A	(<6)	07/20/06	07/25/06	MH
Arsenic	ND	5.00	ug/L	EP200.8	A	(<50)	07/20/06	07/25/06	MH
Barium	71.0	3.00	ug/L	EP200.8	A	(<2000)	07/20/06	07/25/06	MH
Beryllium	ND	0.400	ug/L	EP200.8	A	(<4)	07/20/06	07/25/06	MH

SGS

SGS Ref.#	1063863004
Client Name	A D E C-Village Safewater
Project Name/#	Tuluksak
Client Sample ID	Treatment Process 2
Matrix	Water (Surface, Eff., Ground)

All Dates/Times are Alaska Standard Time

Printed Date/Time	08/10/2006 11:20
Collected Date/Time	07/11/2006 22:00
Received Date/Time	07/13/2006 7:55
Technical Director	**Stephen C. Ede**

Parameter	Results		PQL	Units	Method	Container ID	Allowable Limits	Prep Date	Analysis Date	Init
Inorganic Contaminants										
Cadmium	ND		0.500	ug/L	EP200.8	A	(<5)	07/20/06	07/25/06	MH
Chromium	2.29		1.00	ug/L	EP200.8	A	(<100)	07/20/06	07/25/06	MH
Cyanide	ND		0.0050	mg/L	SM20 4500-CN C,E		(<0.2)	07/17/06	07/19/06	XZ
Fluoride	ND		0.100	mg/L	EPA 300.0	C	(<2)	07/17/06	07/17/06	DSH
Mercury by Cold Vapor	ND		0.200	ug/L	EP245.1	A	(<0.2)	07/20/06	07/20/06	HKG
Nickel	2.02		2.00	ug/L	EP200.8	A	(<100)	07/20/06	07/25/06	MH
Selenium	ND		5.00	ug/L	EP200.8	A	(<50)	07/20/06	07/25/06	MH
Thallium	ND		1.00	ug/L	EP200.8	A	(<2)	07/20/06	07/25/06	MH
Secondary Contaminants										
Chloride	3.51		0.100	mg/L	EPA 300.0	A	(<250)	07/17/06	07/17/06	DSH
Color	ND		5.00	PCU	SM20 2120B	D	(<15)		07/13/06	CRY
Copper	4.21		1.00	ug/L	EP200.8	A	(<1300)	07/20/06	07/25/06	MH
Fluoride	ND		0.100	mg/L	EPA 300.0	A	(<2)	07/17/06	07/17/06	DSH
Langlier Index @ 40 degree F	-1.171				SM2330B	D			07/28/06	PLW
Alkalinity	96.0		20.0	mg/L	SM20 2320B	D			07/14/06	PLW
Iron	ND		0.0200	mg/L	EP200.7	A		07/20/06	07/25/06	TK
Langlier Index @ 140 degree F	-0.091				SM2330B	D			07/28/06	PLW
CO3 Alkalinity	ND		20.0	mg/L	SM20 2320B	D			07/14/06	PLW
HCO3 Alkalinity	96.0		20.0	mg/L	SM20 2320B	D			07/14/06	PLW
OH Alkalinity	ND		20.0	mg/L	SM20 2320B	D			07/14/06	PLW
Manganese	252	*	1.00	ug/L	EP200.8	A	(<50)	07/20/06	07/25/06	MH
Odor (TON)	ND		1.00	T.O.N.	SM20 2150B	E	(<3)		07/13/06	CRY
pH	7.14		0.100	pH units	EPA 150.1	D	(6.5-8.5)		07/13/06	CRY
Sodium	2.59		1.00	mg/L	EP200.7	A		07/20/06	07/25/06	TK
Sulfate	2.81		0.100	mg/L	EPA 300.0	A	(<250)	07/17/06	07/17/06	DSH
Zinc	34.9		5.00	ug/L	EP200.8	A	(<5000)	07/20/06	07/25/06	MH
Total Dissolved Solids	129		10.0	mg/L	SM20 2540C	D	(<500)		07/14/06	KP

ANALYTICA GROUP

Analytica International, Inc.
5761 Silverado Way, Unit N
Anchorage, AK 99518
Phone: 907-258-2155
Fax: 907-258-6634

SGS Environmental Services
Attn: Mr. Forest Taylor

200 W Potter Drive
Anchorage, AK 99518
907 562-2343
Fax: 907-561-5301

Report Date: 7/31/2006
Receipt Date: 7/13/2006
Sample Date: 7/12/2006
Sample Time: 7:00:00PM
Collected By: FT

Client Sample ID: **Raw Water W-05-1**
Client Project: Tuluksak
Location:
Sample Matrix: Aqueous
COC #: 051996
PWS#:
Residual Chlorine:
Comments:

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D = Lost to Dilution
** = RL higher than MCL; target not detected

Lab#: A0607165-01A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Prep Method	Prep Date	Analysis Date	Analyst
5540C (Aqueous) - Surfactants as MBAS						*Test was conducted by: Analytica - Anchorage*			
MBAS Foaming Agents	<MRL	mg/L		0.10			7/13/2006	7/13/2006	AJ

K. Plett

Reported by: Krissy Plett,
Laboratory Project Manager

Analytica International, Inc.
5761 Silverado Way, Unit N
Anchorage, AK 99518
Phone: 907-258-2155
Fax: 907-258-6634

SGS Environmental Services
Attn: Mr. Forest Taylor

200 W Potter Drive
Anchorage, AK 99518
907 562-2343
Fax: 907-561-5301

Report Date: 7/31/2006
Receipt Date: 7/13/2006
Sample Date: 7/12/2006
Sample Time: 7:20:00PM
Collected By: FT

Client Sample ID: **Raw Water W-05-2**
Client Project: Tuluksak
Location:
Sample Matrix: Aqueous
COC #: 051996
PWS#:
Residual Chlorine:
Comments:

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D = Lost to Dilution
** = RL higher than MCL; target not detected

Lab#: A0607165-02A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Prep Method	Prep Date	Analysis Date	Analyst
5540C (Aqueous) - Surfactants as MBAS					*Test was conducted by: Analytica - Anchorage*				
MBAS Foaming Agents	<MRL	mg/L		0.10			7/13/2006	7/13/2006	AJ

K. Plett

Reported by: Krissy Plett,
Laboratory Project Manager

ANALYTICA GROUP

Analytica International, Inc.
5761 Silverado Way, Unit N
Anchorage, AK 99518
Phone: 907-258-2155
Fax: 907-258-6634

SGS Environmental Services
Attn: Mr. Forest Taylor

200 W Potter Drive
Anchorage, AK 99518
907 562-2343
Fax: 907-561-5301

Report Date: 7/31/2006
Receipt Date: 7/13/2006
Sample Date: 7/11/2006
Sample Time: 11:00:00PM
Collected By: FT

Client Sample ID: **Treated Water #1**
Client Project: Tuluksak
Location:
Sample Matrix: Aqueous
COC #: 051996
PWS#:
Residual Chlorine:
Comments:

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D = Lost to Dilution
** = RL higher than MCL; target not detected

Lab#: A0607165-03A

Analysis Method Parameter	Result	Units	Flags	MRL	MCL	Prep Method	Prep Date	Analysis Date	Analyst
5540C (Aqueous) - Surfactants as MBAS					*Test was conducted by: Analytica - Anchorage*				
MBAS Foaming Agents	<MRL	mg/L		0.10			7/13/2006	7/13/2006	AJ

K. Plett

Reported by: Krissy Plett,
Laboratory Project Manager

ANALYTICA GROUP

Analytica International, Inc.
5761 Silverado Way, Unit N
Anchorage, AK 99518
Phone: 907-258-2155
Fax: 907-258-6634

SGS Environmental Services
Attn: Mr. Forest Taylor

200 W Potter Drive
Anchorage, AK 99518
907 562-2343
Fax: 907-561-5301

Report Date: 7/31/2006
Receipt Date: 7/13/2006
Sample Date: 7/11/2006
Sample Time: 10:00:00PM
Collected By: FT

Client Sample ID: **Treatment Process 2**
Client Project: Tuluksak
Location:
Sample Matrix: Aqueous
COC #: 051996
PWS#:
Residual Chlorine:
Comments:

Flag Definitions:
MRL = Method Reporting Limit
MCL = Maximum Contaminant Limit
B = Present also in Method Blank
H = Exceeds Regulatory Limit
M = Matrix Interference
J = Estimated Value
D = Lost to Dilution
** = RL higher than MCL; target not detected

Lab#: A0607165-04A

Analysis Method / Parameter	Result	Units	Flags	MRL	MCL	Prep Method	Prep Date	Analysis Date	Analyst
5540C (Aqueous) - Surfactants as MBAS					*Test was conducted by: Analytica - Anchorage*				
MBAS Foaming Agents	<MRL	mg/L		0.10			7/13/2006	7/13/2006	AJ

K. Plett

Reported by: Krissy Plett,
Laboratory Project Manager

MWH Laboratories
A Division of MWH Americas, Inc.

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory Report

for

SGS Environmental Services Inc.
200 W. Potter Drive

Anchorage , AK 99518

Attention: Forest Taylor
Fax: (907) 561-5301

DATE OF ISSUE
AUG 07 2006
MWH LABORATORIES

YOM Yolanda Martin
Project Manager

ACCREDITED IN ACCORDANCE WITH nelac 01114CA

Report#: 179019
DRINKING

Laboratory certifies that the test results meet all **NELAC** requirements unless noted in the Comments section or the Case Narrative. Following the cover page are Comments,QC Report,QC Summary,Data Report,Hits Report, totaling 32 page[s].

MWH Laboratories
A Division of MWH Americas, Inc.

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: 626 386 1100
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1 800 566 LABS (1 800 566 5227)

Laboratory
Hits Report
#179019

SGS Environmental Services Inc.
Forest Taylor
200 W. Potter Drive
Anchorage , AK 99518

Samples Received
15-jul-2006 09:29:06

Analyzed	Sample#	Sample ID	Result	Federal MCL	UNITS	MRL
	2607150003	1063863001 RAW WATER W-05-1				
	2607150004	1063863002 RAW WATER W-05-2				
	2607150005	1063863003 TREATMENT PROCESS 1				
08/01/06	Bromochloroacetic acid		3.86		ug/l	1.0
08/01/06	Bromodichloroacetic acid		3.82		ug/l	1.0
07/17/06	Chlorine Dose		10		mg/l	1.0
07/24/06	Chlorine Residual		2.2		mg/l	0.1
08/01/06	D/DBP Haloacetic Acids (HAA5)		37.1	60	ug/l	1.0
08/01/06	Dichloroacetic acid		19.6		ug/l	1.0
08/01/06	Trichloroacetic acid		17.5		ug/l	1.0
07/31/06	Bromodichloromethane		7.52		ug/l	0.5
07/17/06	Chlorine Dose		10		mg/l	1.0
07/24/06	Chlorine Residual		2.2		mg/l	0.1
07/31/06	Chloroform		46.7		ug/l	0.5
07/31/06	Dibromochloromethane		1.52		ug/l	0.5
07/31/06	Total Potential Trihalomethane		55.7	<80	ug/l	0.5
	2607150006	1063863004 TREATMENT PROCESS 2				
08/01/06	Bromochloroacetic acid		3.17		ug/l	1.0
08/01/06	Bromodichloroacetic acid		3.64		ug/l	1.0
07/17/06	Chlorine Dose		10		mg/l	1.0
07/24/06	Chlorine Residual		2.7		mg/l	0.1
08/01/06	D/DBP Haloacetic Acids (HAA5)		40.4	60	ug/l	1.0
08/01/06	Dichloroacetic acid		19.4		ug/l	1.0
08/01/06	Monochloroacetic acid		2.19		ug/l	2.0
08/01/06	Trichloroacetic acid		18.8		ug/l	1.0

SUMMARY OF POSITIVE DATA ONLY.

MWH Laboratories
A Division of MWH Americas, Inc.

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
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Laboratory
Hits Report
#179019

SGS Environmental Services Inc.
Forest Taylor
200 W. Potter Drive
Anchorage , AK 99518

Samples Received
15-jul-2006 09:29:06

Analyzed	Sample#	Sample ID	Result	Federal MCL	UNITS	MRL
	2607150006	1063863004 TREATMENT PROCESS 2				
07/31/06	Bromodichloromethane		5.96		ug/l	0.5
07/17/06	Chlorine Dose		10		mg/l	1.0
07/24/06	Chlorine Residual		2.7		mg/l	0.1
07/31/06	Chloroform		46.4		ug/l	0.5
07/31/06	Dibromochloromethane		0.998		ug/l	0.5
07/31/06	Total Potential Trihalomethane		53.4	< 60	ug/l	0.5
	2607150007	1063863005 TRIP BLANK				
07/20/06	Dichloromethane		0.75	5	ug/l	0.5

SUMMARY OF POSITIVE DATA ONLY.

MWH Laboratories
A Division of MWH Americas, Inc.

750 Royal Oaks Drive, Suite 100
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Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory
Data Report
#179019

SGS Environmental Services Inc.
Forest Taylor
200 W. Potter Drive
Anchorage , AK 99518

Samples Received
07/15/06

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
1063863001 RAW WATER W-05-1 (2607150003) Sampled on 07/12/06 19:00								
				Regulated VOCs plus Lists 1&3				
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,1,1,2-Tetrachloroethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,1,1-Trichloroethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,1,2,2-Tetrachloroethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,1,2-Trichloroethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,1-Dichloroethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,1-Dichloroethylene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,1-Dichloropropene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,2,3-Trichlorobenzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,2,3-Trichloropropane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,2,4-Trichlorobenzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,2,4-Trimethylbenzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,2-Dichloroethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,2-Dichloropropane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,3,5-Trimethylbenzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	1,3-Dichloropropane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	p-Dichlorobenzene (1,4-DCB)	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	2,2-Dichloropropane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	2-Butanone (MEK)	ND	ug/l	5.0	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	o-Chlorotoluene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	p-Chlorotoluene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	4-Methyl-2-Pentanone (MIBK)	ND	ug/l	5.0	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Benzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Bromobenzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Bromomethane (Methyl Bromide)	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Bromoethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	cis-1,2-Dichloroethylene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Chlorobenzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Carbon Tetrachloride	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	cis-1,3-Dichloropropene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Bromoform	ND	ug/l	0.5	1

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Laboratory
Data Report
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SGS Environmental Services Inc.
(continued)

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
1063863001 RAW WATER W-05-1 (2607150003) (continued)						Sampled on		07/12/0
	07/20/06 05:39	326177	(ML/EPA 524.2)	Chloroform (Trichloromethane)	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Bromochloromethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Chloroethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Chloromethane(Methyl Chloride)	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Chlorodibromomethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Dibromomethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Bromodichloromethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Dichloromethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Di-isopropyl ether	ND	ug/l	3.0	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Ethyl benzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Dichlorodifluoromethane	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Fluorotrichloromethane-Freon11	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Hexachlorobutadiene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Isopropylbenzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	m-Dichlorobenzene (1,3-DCB)	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	m,p-Xylenes	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Methyl Tert-butyl ether (MTBE)	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Naphthalene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	n-Butylbenzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	n-Propylbenzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	o-Xylene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	o-Dichlorobenzene (1,2-DCB)	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Tetrachloroethylene (PCE)	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	p-Isopropyltoluene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	sec-Butylbenzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Styrene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	trans-1,2-Dichloroethylene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	tert-amyl Methyl Ether	ND	ug/l	3.0	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	tert-Butyl Ethyl Ether	ND	ug/l	3.0	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	tert-Butylbenzene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Trichloroethylene (TCE)	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Trichlorotrifluoroethane(Freon	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	trans-1,3-Dichloropropene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Toluene	ND	ug/l	0.5	1

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Laboratory
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SGS Environmental Services Inc.
(continued)

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
1063863001 RAW WATER W-05-1 (2607150003) (continued)						Sampled on		07/12/0
	07/20/06 05:39	326177	(ML/EPA 524.2)	Total 1,3-Dichloropropene	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Total THM	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Total xylenes	ND	ug/l	0.5	1
	07/20/06 05:39	326177	(ML/EPA 524.2)	Vinyl chloride (VC)	ND	ug/l	0.3	1
			(EPA 524.2)	Toluene-d8(70-130)	97	% Rec		
			(EPA 524.2)	4-Bromofluorobenzene(70-130)	99	% Rec		
			(EPA 524.2)	1,2-Dichloroethane-d4(70-130)	105	% Rec		

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SGS Environmental Services Inc.
(continued)

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution

1063863002 RAW WATER W-05-2 (2607150004) Sampled on 07/12/06 19:20

Regulated VOCs plus Lists 1&3

07/20/06 06:00	326177	(ML/EPA 524.2)	1,1,1,2-Tetrachloroethane	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,1,1-Trichloroethane	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,1,2,2-Tetrachloroethane	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,1,2-Trichloroethane	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,1-Dichloroethane	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,1-Dichloroethylene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,1-Dichloropropene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,2,3-Trichlorobenzene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,2,3-Trichloropropane	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,2,4-Trichlorobenzene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,2,4-Trimethylbenzene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,2-Dichloroethane	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,2-Dichloropropane	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,3,5-Trimethylbenzene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	1,3-Dichloropropane	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	p-Dichlorobenzene (1,4-DCB)	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	2,2-Dichloropropane	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	2-Butanone (MEK)	ND	ug/l	5.0	1
07/20/06 06:00	326177	(ML/EPA 524.2)	o-Chlorotoluene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	p-Chlorotoluene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	4-Methyl-2-Pentanone (MIBK)	ND	ug/l	5.0	1
07/20/06 06:00	326177	(ML/EPA 524.2)	Benzene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	Bromobenzene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	Bromomethane (Methyl Bromide)	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	Bromoethane	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	cis-1,2-Dichloroethylene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	Chlorobenzene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	Carbon Tetrachloride	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	cis-1,3-Dichloropropene	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	Bromoform	ND	ug/l	0.5	1
07/20/06 06:00	326177	(ML/EPA 524.2)	Chloroform (Trichloromethane)	ND	ug/l	0.5	1

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SGS Environmental Services Inc.
(continued)

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
1063863002 RAW WATER W-05-2 (2607150004) (continued)						Sampled on		07/12/0
	07/20/06 06:00	326177	(ML/EPA 524.2)	Bromochloromethane	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Chloroethane	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Chloromethane(Methyl Chloride)	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Chlorodibromomethane	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Dibromomethane	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Bromodichloromethane	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Dichloromethane	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Di-isopropyl ether	ND	ug/l	3.0	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Ethyl benzene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Dichlorodifluoromethane	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Fluorotrichloromethane-Freon11	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Hexachlorobutadiene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Isopropylbenzene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	m-Dichlorobenzene (1,3-DCB)	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	m,p-Xylenes	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Methyl Tert-butyl ether (MTBE)	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Naphthalene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	n-Butylbenzene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	n-Propylbenzene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	o-Xylene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	o-Dichlorobenzene (1,2-DCB)	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Tetrachloroethylene (PCE)	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	p-Isopropyltoluene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	sec-Butylbenzene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Styrene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	trans-1,2-Dichloroethylene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	tert-amyl Methyl Ether	ND	ug/l	3.0	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	tert-Butyl Ethyl Ether	ND	ug/l	3.0	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	tert-Butylbenzene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Trichloroethylene (TCE)	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Trichlorotrifluoroethane(Freon	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	trans-1,3-Dichloropropene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Toluene	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Total 1,3-Dichloropropene	ND	ug/l	0.5	1

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SGS Environmental Services Inc.
(continued)

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
1063863002 RAW WATER W-05-2 (2607150004) (continued)						Sampled on		07/12/0
	07/20/06 06:00	326177	(ML/EPA 524.2)	Total THM	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Total xylenes	ND	ug/l	0.5	1
	07/20/06 06:00	326177	(ML/EPA 524.2)	Vinyl chloride (VC)	ND	ug/l	0.3	1
			(EPA 524.2)	1.2-Dichloroethane-d4(70-130)	99	% Rec		
			(EPA 524.2)	4-Bromofluorobenzene(70-130)	104	% Rec		
			(EPA 524.2)	Toluene-d8(70-130)	97	% Rec		

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SGS Environmental Services Inc.
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Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
1063863003 TREATMENT PROCESS 1 (2607150005) Sampled on 07/11/06 23:00								
				Tot Pot Trihalomethanes 5710B				
07/28/06	07/31/06 00:00	327662	(ML/EPA 551.1)	Bromoform	ND	ug/l	0.5	1
07/28/06	07/31/06 00:00	327662	(ML/EPA 551.1)	Chloroform	46.7	ug/l	0.5	1
07/28/06	07/17/06 00:00	327662	(SM2350)	Chlorine Dose	10	mg/l	1.0	1
07/28/06	07/24/06 00:00	327662	(ML/S 4500CL-G)	Chlorine Residual	2.2	mg/l	0.1	1
07/28/06	07/31/06 00:00	327662	(ML/EPA 551.1)	Dibromochloromethane	1.52	ug/l	0.5	1
07/28/06	07/31/06 00:00	327662	(ML/EPA 551.1)	Bromodichloromethane	7.52	ug/l	0.5	1
07/28/06	07/31/06 00:00	327662	(ML/EPA 551.1)	Total Potential Trihalomethane	55.7	ug/l	0.5	1
			(ML/SM 5710)	1,2-Dibromopropane(70-130)	115	% Rec		
				Total Potential Haloacetic				
07/28/06	07/17/06 00:00	327929	(ML/SM 5710B)	Chlorine Dose	10	mg/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Bromochloroacetic acid	3.86	ug/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Bromodichloroacetic acid	3.82	ug/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Chlorodibromoacetic acid	ND	ug/l	2.0	1
07/28/06	07/24/06 00:00	327929	(ML/SM 5710B)	Chlorine Residual	2.2	mg/l	0.1	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Dibromoacetic acid	ND	ug/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Dichloroacetic acid	19.6	ug/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Monobromoacetic acid	ND	ug/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Monochloroacetic acid	ND	ug/l	2.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Tribromoacetic acid	ND	ug/l	4.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Trichloroacetic acid	17.5	ug/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/S6251B)	D/DBP Haloacetic Acids (HAA5)	37.1	ug/l	1.0	1
			(SM5710 6251B)	2,3-Dibrom Acid(70-130)	106	% Rec		
			(SM5710 6251B)	1,2,3-TCP(80-120)	102	% Rec		

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Laboratory
Data Report
#179019

SGS Environmental Services Inc.
(continued)

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
1063863004 TREATMENT PROCESS 2 (2607150006) Sampled on 07/11/06 22:00								
				Tot Pot Trihalomethanes 5710B				
07/28/06	07/31/06 00:00	327662	(ML/EPA 551.1)	Bromoform	ND	ug/l	0.5	1
07/28/06	07/31/06 00:00	327662	(ML/EPA 551.1)	Chloroform	46.4	ug/l	0.5	1
07/28/06	07/17/06 00:00	327662	(SM2350)	Chlorine Dose	10	mg/l	1.0	1
07/28/06	07/24/06 00:00	327662	(ML/S 4500CL-G)	Chlorine Residual	2.7	mg/l	0.1	1
07/28/06	07/31/06 00:00	327662	(ML/EPA 551.1)	Dibromochloromethane	0.998	ug/l	0.5	1
07/28/06	07/31/06 00:00	327662	(ML/EPA 551.1)	Bromodichloromethane	5.96	ug/l	0.5	1
07/28/06	07/31/06 00:00	327662	(ML/EPA 551.1)	Total Potential Trihalomethane	53.4	ug/l	0.5	1
			(ML/SM 5710)	1,2-Dibromopropane(70-130)	117	% Rec		
				Total Potential Haloacetic				
07/28/06	07/17/06 00:00	327929	(ML/SM 5710B)	Chlorine Dose	10	mg/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Bromochloroacetic acid	3.17	ug/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Bromodichloroacetic acid	3.64	ug/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Chlorodibromoacetic acid	ND	ug/l	2.0	1
07/28/06	07/24/06 00:00	327929	(ML/SM 5710B)	Chlorine Residual	2.7	mg/l	0.1	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Dibromoacetic acid	ND	ug/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Dichloroacetic acid	19.4	ug/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Monobromoacetic acid	ND	ug/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Monochloroacetic acid	2.19	ug/l	2.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Tribromoacetic acid	ND	ug/l	4.0	1
07/28/06	08/01/06 00:00	327929	(ML/SM 6251B)	Trichloroacetic acid	18.8	ug/l	1.0	1
07/28/06	08/01/06 00:00	327929	(ML/S6251B)	D/DBP Haloacetic Acids (HAA5)	40.4	ug/l	1.0	1
			(SM5710 6251B)	2,3-Dibrom Acid(70-130)	107	% Rec		
			(SM5710 6251B)	1,2,3-TCP(80-120)	101	% Rec		

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Laboratory
Data Report
#179019

SGS Environmental Services Inc.
(continued)

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
1063863005 TRIP BLANK (2607150007) Sampled on 07/12/06 19:00								
				Regulated VOCs plus Lists 1&3				
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,1,1,2-Tetrachloroethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,1,1-Trichloroethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,1,2,2-Tetrachloroethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,1,2-Trichloroethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,1-Dichloroethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,1-Dichloroethylene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,1-Dichloropropene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,2,3-Trichlorobenzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,2,3-Trichloropropane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,2,4-Trichlorobenzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,2,4-Trimethylbenzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,2-Dichloroethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,2-Dichloropropane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,3,5-Trimethylbenzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	1,3-Dichloropropane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	p-Dichlorobenzene (1,4-DCB)	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	2,2-Dichloropropane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	2-Butanone (MEK)	ND	ug/l	5.0	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	o-Chlorotoluene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	p-Chlorotoluene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	4-Methyl-2-Pentanone (MIBK)	ND	ug/l	5.0	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Benzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Bromobenzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Bromomethane (Methyl Bromide)	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Bromoethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	cis-1,2-Dichloroethylene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Chlorobenzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Carbon Tetrachloride	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	cis-1,3-Dichloropropene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Bromoform	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Chloroform (Trichloromethane)	ND	ug/l	0.5	1

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Laboratory
Data Report
#179019

SGS Environmental Services Inc.
(continued)

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
1063863005 TRIP BLANK (2607150007) (continued) Sampled on 07/12/06 19:0								
	07/20/06 03:41	326175	(ML/EPA 524.2)	Bromochloromethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Chloroethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Chloromethane(Methyl Chloride)	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Chlorodibromomethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Dibromomethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Bromodichloromethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Dichloromethane	0.75	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Di-isopropyl ether	ND	ug/l	3.0	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Ethyl benzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Dichlorodifluoromethane	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Fluorotrichloromethane-Freon11	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Hexachlorobutadiene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Isopropylbenzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	m-Dichlorobenzene (1,3-DCB)	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	m,p-Xylenes	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Methyl Tert-butyl ether (MTBE)	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Naphthalene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	n-Butylbenzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	n-Propylbenzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	o-Xylene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	o-Dichlorobenzene (1,2-DCB)	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Tetrachloroethylene (PCE)	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	p-Isopropyltoluene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	sec-Butylbenzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Styrene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	trans-1,2-Dichloroethylene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	tert-amyl Methyl Ether	ND	ug/l	3.0	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	tert-Butyl Ethyl Ether	ND	ug/l	3.0	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	tert-Butylbenzene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Trichloroethylene (TCE)	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Trichlorotrifluoroethane(Freon	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	trans-1,3-Dichloropropene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Toluene	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Total 1,3-Dichloropropene	ND	ug/l	0.5	1

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Laboratory
Data Report
#179019

SGS Environmental Services Inc.
(continued)

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
1063863005 TRIP BLANK (2607150007) (continued) Sampled on 07/12/06 19:0								
	07/20/06 03:41	326175	(ML/EPA 524.2)	Total THM	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Total xylenes	ND	ug/l	0.5	1
	07/20/06 03:41	326175	(ML/EPA 524.2)	Vinyl chloride (VC)	ND	ug/l	0.3	1
			(EPA 524.2)	Toluene-d8(70-130)	104	% Rec		
			(EPA 524.2)	1,2-Dichloroethane-d4(70-130)	118	% Rec		
			(EPA 524.2)	4-Bromofluorobenzene(70-130)	109	% Rec		

SGS

CHAIN OF CUSTOI
SGS Environmental

1063863

Locations Nationwide
- Alaska
- Hawaii
- Louisiana
- Maryland
- New Jersey
- North Carolina
- West Virginia

www.us.sgs.com

051194

(1)

CLIENT: CRZ ENGINEERS

CONTACT: PAUL WEISNER PHONE NO:(907) 349-1010

PROJECT: TULUKSAK SITE/PWSID#:

REPORTS TO: CRZ ENGINEERS

PAUL WEISNER FAX NO.:(907) 349-1015

INVOICE TO: QUOTE #

P.O. NUMBER

SGS Reference:

PAGE 1 OF 1

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE (C= COMP G= GRAB)	Preservatives Used: HCl	Analysis Required (3): VOC 524.2	Chlorine Demand	MBAS	REMARKS
(1) A-E	RAW WATER W-05-1	7-12	7:00 AM	O	5			3	1	1	
(2) A-E	RAW WATER W-05-2	7-12	7:20 AM	O	5			3	1	1	

(5)

Collected/Relinquished By:(1)	Date	Time	Received By:
Gary M Bonney	7-12		
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 7/13/06	Time 1005	Received By:

(4)

Shipping Carrier:

Shipping Ticket No:

Special Deliverable Requirements:

Samples Received Cold? (Circle) (YES) NO

Temperature IC: C=4.4 I TB=2.3

Chain of Custody Seal: (Circle)

(INTACT) x2 BROKEN ABSENT

Requested Turnaround Time and Special Instructions:

200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557
1258 Greenbrier Street Charleston, WV 25311 Tel: (304) 346-0725 Fax: (304) 346-0781

White - Retained by Lab
Yellow - Returned with Report
Pink - Retained by Sampler

SGS

CHAIN OF CUSTODY RECORD
SGS Environmental Services Inc.

1063863

...nwide
- Hawaii
- Maryland
- North Carolina

...com 051102

(1)

CLIENT: CRZ TULUKSAK I/S W

CONTACT: CRZ ENGINEERS PHONE NO:(907) 349-1010

PROJECT: TULUKSAK VSW SITE/PWSID#: TREATED PROCESS 2

REPORTS TO:

PAUL WEISNER FAX NO.:(907) 349-1015

INVOICE TO: QUOTE #

CRZ ENGINEERS P.O. NUMBER TULUKSAK

SGS Reference:

PAGE _____ OF _____

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE (C=COMP, G=GRAB)	Preservatives Used	Analysis Required (3)												REMARKS
								METALS	E.W	FLASH PT	WHITES	DOOR	MBAS	T/R Chlorine	TOC	DOC	TTHM	HAAS	UV254	
(4) A-N	TREATMENT PROCESS 2	7-11-06	10:00 AM	D	14	G		1	1	1	1	1	1	1	1	1	2	2	1	
EHL 7/13/06																				

(5)

Collected/Relinquished By:(1)	Date	Time	Received By:
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 7/13/06	Time 0755	Received By:

(4)

Shipping Carrier:

Shipping Ticket No:

Samples Received Cold? (Circle) YES NO

Temperature IC: C=2.2 °C TB=1.9 °C

Special Deliverable Requirements:

Chain of Custody Seal: (Circle)

INTACT x2 BROKEN ABSENT

Requested Turnaround Time and Special Instructions:

200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557
1258 Greenbrier Street Charleston, WV 25311 Tel: (304) 348-0725 Fax: (304) 348-0761

White - Retained by Lab
Yellow - Returned with Report
Pink - Retained by Sampler

SGS

CHAIN OF CUSTODY RECORD
SGS Environmental Services Inc.

1063863

de
Hawaii
Maryland
North Carolina

051100

CLIENT: CE2 TULUKSAK VSW	
CONTACT: CE2 ENGINEERS	PHONE NO: (907) 349-1010
PROJECT: TULUKSAK VSW	SITE/PWSID#: TREATED PROCESS 1
REPORTS TO: PAUL WEISNER	FAX NO.: (907) 349-1015
INVOICE TO: CE2 ENGINEERS	QUOTE #
	P.O. NUMBER TULUKSAK

SGS Reference:

PAGE____OF____

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE C= COMP G= GRAB	METALS (HNO_3)	CN ($NaOH$)	ALK/K, BR	WATERS	ODOR	MBAS	T/B COLIFORM	TOC (HCl)	DOC	TTHM	HAAS	UV254	REMARKS
3 A-N	TREATED WATER PROCESS #1	7-11-06	11:00 am	0	14	G	1	1	1	1	1	1	1	1	1	2	2	1	

SW 7/13/06

Collected/Relinquished By: (1)	Date	Time	Received By:
[signature]	7-12		
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date 7/13/06	Time 0755	Received By: [signature]

Shipping Carrier:

Shipping Ticket No:

Special Deliverable Requirements:

Samples Received Cold? (Circle) (YES) NO

Temperature °C: C=3.8 , TB=2.2

Chain of Custody Seal: (Circle) (INTACT) x2 BROKEN ABSENT

Requested Turnaround Time and Special Instructions:

☐ 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
☐ 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557
☐ 1258 Greenbrier Street Charleston, WV 25311 Tel: (304) 346-0725 Fax: (304) 346-0761

White - Retained by Lab
Yellow - Returned with Report
Pink - Retained by Sampler

SGS Environmental Services Inc.
200 W. Potter Dr., Anchorage, AK 99518 P: 907-562-2343, F: 907-561-5301
3180 Peger Rd., Fairbanks, AK 99701 P: 907-474-8656, F: 907-474-9685
255 Sand Island Rd. Unit1B, Honolulu, HI 96819 P: 808-224-6217, F: 808-845-2287

Sample Kit Request

Client Name: CE2 ENG
Ordered By:
Phone/Fax:
Project Name:

Deliver To:
ATTN:

☒ Client pickup on: 7/6/06
☐ Deliver to client:
☐ Shipment Method:
Date to ship by:
Notes:

Taken by: EAT Date: 7/6/06
Prepared by: Date:
Checked by: Date:
Shipped by: Date:

No. of Samples	Matrix	Analysis	Bottle Type	Bottle Lot#	Preservative	Preservative Lot#	Hold Time	#QC Bottles	Total # Bottles
2	O	1°/2° INORG							
		METALS + Ag, Al, Ca, Mg	250 HDPE		HNO_3		6 MOS		2
		CN	250 HDPE		NaOH		14 DAYS		2
		ALKALINITY, TBR	60 NALGENE		—		48 HRS		2
		NITRATE	250 HDPE		—		48 HRS		2
		ODOR	250 AMBER		—		48 HRS		2
		VOAS	500 AMBER		—		48 HRS		2
		T/R CHLORINE	60 NALGENE		—		48 HRS		2
		TOC	250 AMBER		HCl		14 DAYS		2
		DOC	250 AMBER		—		48 HRS		2
		THM FP	2 x 250 AMBER		—		7 DAYS		4
		HAA5 FP	2 x 250 AMBER		—		7 DAYS		4
		UV 254	125 AMBER		—		14 DAYS		2

☐ Department of Defense (DOD) project (AFCEE, Navy, USACE)?
☐ Foreign Soils?
☐ Total # Containers includes extra bottles for QC
☐ Total # Containers includes bottles for Percent Solids

Est. Sample Return Date:
Notes:

☒ Temperature Blank: 125 mL / 500 mL (circle one)
☒ ~~Trip~~ Blank (circle matrix): soil / water
ID:

☐ Chlorinated DW: Ascorbic Acid Req'd? ____ yes ____ no
☒ Blue Ice ☒ CT&E COCs X2
☒ Labels ☒ Custody Seals
☒ Bubble Wrap ☒ Coolers
Other:

Sampling Instructions:
1. Do not rinse container before filling and be aware of any acid preservative in container.
2. Fill container to top, but do not overfill (except volatiles which should be headspace free).
3. Label the container with your sample/site ID, as well as the date & time of collection.
4. Fill in the Chain of Custody.
5. Add frozen gel packs or ice to your cooler & pack to prevent breakage.

If you have any questions concerning this sample kit, please contact your Project Manager for assistance. *Thank you.*

SGS

1063863

SAMPLE RECEIPT FORM

SGS WO#:

Yes	No	NA		
✓			Are samples **RUSH**, priority, or *w/n 72 hrs.* of hold time?	**Due Date:** 7/26/06
✓			If yes have you done *e-mail notification*?	**Received Date:** 7/13/06
✓			Are samples *within 24 hrs.* of **hold time** or due date?	**Received Time:** ~~EE~~ EM 1005
✓			If yes, have you *spoken with* Supervisor?	**Is date/time conversion necessary?** NA
		✓	Archiving bottles – if req., are they properly marked?	# of hours to AK Local Time:
	✓		Are there any **problems**? PM Notified?	**Thermometer ID:** 7D
✓			Were samples preserved correctly and pH verified?	
		✓	If this is for PWS, provide **PWSID.**	
	✓		Will courier charges apply?	
			Method of payment?	
	✓		Data package required? (Level: 1 / 2 / 3 / 4)	
			Notes:	
	✓		Is this a DoD project? (USACE, Navy, AFCEE)	

Cooler ID	Temp Blank	Cooler Temp
1	2.3 °C	4.4 °C
2	2.2 °C	3.8 °C
3	1.9 °C	2.2 °C
	°C	°C
	°C	°C

*Temperature readings include thermometer correction factors

Delivery method (circle all that apply): Client / Alert Courier / UPS / FedEx / USPS / ~~AA Goldstreak~~ / NAC / ERA / PenAir / Carlile Lynden / SGS / Other:

Airbill # 1138 3982

Additional Sample Remarks: *(✓ if applicable)*

- Extra Sample Volume?
- Limited Sample Volume?
- Field preserved for volatiles?
- Field-filtered for dissolved?
- ✓ Lab-filtered for dissolved? DOC (3)
- ✓ Ref Lab required? MEAS 1524
- Foreign Soil? (1),(2)

This section must be filled out for DoD projects (USACE, Navy, AFCEE)

Yes	No		
		Is received temperature 4 ± 2°C?	
		Exceptions:	Samples/Analyses Affected:
		Rad Screen performed? Result:	
		Was there an airbill? *(Note # above in the right hand column)*	
		Was cooler sealed with custody seals? # / where:	
		Were seal(s) intact upon arrival?	
		Was there a COC with cooler?	
		Was COC sealed in plastic bag & taped inside lid of cooler?	
		Was the COC filled out properly?	
		Did the COC indicate COE / AFCEE / Navy project?	
		Did the COC and samples correspond?	
		Were all sample packed to prevent breakage? Packing material:	
		Were all samples unbroken and clearly labeled?	
		Were all samples sealed in separate plastic bags?	
		Were all VOCs free of headspace and/or MeOH preserved?	
		Were correct container / sample sizes submitted?	
		Is sample condition good?	
		Was copy of CoC, SRF, and custody seals given to PM to fax?	

This section must be filled if problems are found.

Yes	No	
✓		Was client notified of problems?

Individual ~~contacted~~: Paul

Via: Phone / Fax / Email *(circle one)*

Date/Time: 7/13/06 1200

Reason for contact: COC INDICATES CHLORINE DEMAND. CLIENT WANTS FREE CHLORINE 7/18/06 1415

Change Order Required? No

SGS Contact: KAT

Notes: (1) ~~CHLORINE DEMAND AS FREE CHLORINE~~

(2) #3 & #4: ADD Ag, Al, Ca, Mg TO METALS AND ADD BROMIDE TO ANIONS.

(3) bubble > 6mm in vial (DC, trip blank not on COC

(4) #3 & #4, TTHM & HAAS ARE FORMATION POTENTIAL (5) #1 & #2: CANCEL CHLORINE DEMA

Completed by (sign): Erin Lee (print): Erin Lee

Login proof (check one): waived ____ required ____ performed by: ____

1063863

SGS

SAMPLE RECEIPT FORM (page 2)

SGS WO#:

#	Container ID	Matrix	Test	QC	TB	Container Volume: 1L	500 mL	250 mL	125 mL	60 mL	40 mL	8oz (250 mL)	4oz (125 mL)	Other	Container Type: AG	CG	HDPE	Nalgene	Cubie	Coli	Septa	Other	Preservative: None	HCl	HNO_3	H_2SO_4	MeOH	$Na_2S_2O_3$	NaOH	Other
1-2	A-C	1	VOC 524.2					~~6~~			6				X						X			X						
	D		MBAS				2	~~2~~ 1 7/11/06							X								X								
	E		Free Cl			2									X								X								
3-4	A	1	1° & 2° metals (+As, N, Cu, Mo)					2									X								X						
	B		CN					2									X												X		
	C		Cl, F, SO_4, NO_3, NO_2, Br							2								X					X								
	D		TDS, Alk, pH; Color, Corrosivity (Lang.)			2											X						X								
	E		ODOR			2									X								X								
	F		MBAS				2								X								X								
	G		T/R Cl							2								X					X								
	H		TOC					2							X									X							
	I		Filter					2							X								X								
	J-K		TTHM F/P			2									X								X								
	L-M		HAA5 F/P			2									X								X								
	N		UV254						2						X								X								
	O		DOC											2x?								X?		X						L.F.	
	~~P~~		~~PHC~~																												
	~~Q~~		~~BOD~~																												
	EW 7/13/06		EW																												
5	A-C	1	VOC 524.2		X					3					X						X			X							
Bottle Totals						14	4	8	2	4	~~6~~ 9 EW 7/13/06			2x?																	

Completed by: Erin Lee Date: 7/13/06

Form # F004-14 : 05/17/04

SGS Environmental CUSTODY SEAL

Signature: _____ Date/Time: _____

SGS Environmental CUSTODY SEAL

Signature: _____ Date/Time: _____

SGS Environmental CUSTODY SEAL

Signature: _____ Date/Time: _____

SGS Environmental CUSTODY SEAL

Signature: _____ Date/Time: _____

SGS Environmental CUSTODY SEAL

Signature: _____ Date/Time: _____

SGS Environmental CUSTODY SEAL

Signature: _____ Date/Time: _____

Appendix F

EXISTING WATER TREATMENT PLANT AND WELL

EXISTING LAGOON

EXISTING WASHETERIA

PROPOSED "CENTRAL" WATER LOOP

USS 4435 LOT 2

PROPOSED "EAST" WATER LOOP

EXISTING LAGOON

EXISTING COMMUNITY DUMP SITE

USS 3797 LOT 1

PROPOSED WATER TREATMENT PLANT AND STORAGE TANK

EXISTING HONEY BUCKET LAGOON

W05-1

W05-2

NEW 2005 WELLS

PROPOSED 60' EASEMENT

PROPOSED WASTEWATER LAGOON AND LANDFILL SITE

FUTURE ACCESS ROAD

LANDFILL

CELL #1

CELL #2

NORTH

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)

G:\CE2 Data Files\Tul

CE2 ENGINEERS, INC.

Scale: SEE GRAPHICAL

Date: AUG 2007

Drawn: LAW / CM

VICINITY MAP

TULUKSAK, ALASKA

Appendix F