

SANITATION MASTER PLAN AMENDMENT

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TAKOTNA, ALASKA

MARCH 25, 2010

LCMF Project 09-055

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I. INTRODUCTION

A Sanitation Facilities Feasibility Study was last prepared for the community of Takotna in 2001 by LCMF LLC. Over the past 9 years, some of the proposed facility improvements have been completed, while others have been started and unfinished. This Amendment is intended to update the 2001 Study to reflect the current conditions. ²⁰¹⁰ } The 2010 study was not formally approved by the Dept.

²⁰¹⁰ The findings of the 2001 study are still supported by the community; therefore, only information which has significantly changed, or needed to be verified for the design assumptions, are included in this report. *Community leadership changed*

This Amendment is developed using existing information provided in previous reports and studies, with some current information provided by the community. No field inspections were conducted.

The following reports are referenced in this Amendment:

- Community Water, Sewer, and Solid Waste Upgrade Feasibility Study, October 2001
- Engineering Pre-Design Specifications – Takotna Water Treatment Plant Improvements and Septic System Pre-Design Services, May 16, 2008 (Appendix A)

II. CONCLUSIONS AND RECOMMENDATIONS

This Amendment identifies and recommends the following upgrades to the Takotna Water Treatment Plant and the Waste Water Disposal systems:

- Increasing water treatment system Water Rights (\$200 application fee) *+ paperwork.*
- ~~Conduct Lead & Copper Rule Desktop Study/ Corrosion Control Program (\$63,892).~~ *NOT REQ'D*
- ~~Develop Water Treatment Plant Operation and Maintenance Manual (\$6,071).~~ *Not a capital upgrade*
- Install LT1 (Cryptosporidium) Filtration (\$58,324).
- Increase water storage tank CT Capacity (\$36,693).?
- Install new on-site septic systems for 23 buildings (\$1,192,329).?
- Construct Septage Monofill and procure Septage Hauler (\$71,390).

The total estimated cost for these projects in 2010 dollars is \$1,428,899.

Phasing Plan with Costs and Requirements. The schedule for completion of the upgrades identified in this Amendment should be completed as soon as practical in order to meet current regulations and to provide sanitary conditions to the community in terms of water treatment and waste water disposal.

~~Currently funded projects were identified from the Capital Projects Database as listed on the State of Alaska, Division of Community and Regional Affairs web-site:~~

- ~~• Airport Relocation (\$10.5 million). Relocation of airport roughly 1 mile east of the community.~~

V. EXISTING WATER, SEWER AND SOLID WASTE AND ASSOCIATED FACILITIES

A. History of Sanitation Improvements

Following the completion of the 2001 Study, the water treatment system was modified to remove the PCE contamination source, meet ADEC requirements and provide pumps/controls for a Water Line to the School. The source of the contamination was determined to be in the roughing filters, which were subsequently replaced with new filters. A Giardia Filter was also added to meet ADEC requirements, along with disconnection of a boiler glycol system from the potable water system and upgrading the water tank float controls. The pumping system for the School water line was added to supply a new water line constructed by the School District. The upgrades were completed in 2004.

The water plant is in compliance with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2). In accordance with the LT2 regulations, a source water monitoring plan was implemented in October of 2008 and monitoring was performed through September of 2009 in accordance with the requirements. The results found less than 1 E. Coli/100 mL, which has resulted in a Bin Classification Number of 1. This Bin Number does not require additional action at this time. Monitoring will again be required in 2017.

The Iditarod School District installed a water distribution system to service the School and School related buildings in 2002. ~~The new circulating potable water supply was constructed using materials purchased in 2001, prior to the development of the Sanitation Master Plan. The circulating system is constructed with a 1-1/2-inch supply line and a 1-inch return line. The system does not provide for Fire Flow (hydrant or sprinkler). The design does include provisions for a future Health Clinic, which was designed by LCMF for ANTHC.~~

Sized to

Health Clinic bu

B. Evaluation of Existing Sanitation Facilities and Conditions

Water Source, Treatment, Storage and Distribution:

Water Source. The infiltration gallery at Gold Run Creek continues to be the community's water source. No significant modifications have been made to the infiltration gallery since 2001.

The production capacity of the infiltration gallery was identified as 37-gpm, or 53,280-gpd, in 2001. The production rate was noted to be 32-gpm in the As-Built drawings prepared for the Water Treatment Plant upgrades, in 2004, resulting in a daily yield of 46,080-gpd. This yield is dependent upon the flow rate of Gold Run Creek entering the perforated basin.

The existing Water Rights withdrawal volume for the infiltration gallery is 803-gpd. The water demand was determined to be 1,577-gpd in 2004 and estimated to be 1,667-gpd in 2009. The current demand is roughly double the volume of the Water Rights.

Water Treatment Plant. The Water Treatment Plant currently meets the typical community's water demand. Limited consumption data is available; however, the current water demand is estimated to be roughly 50,000 gallons per month. Using a 30-day month, this equates to an average daily flow of 1,667-gpd. This estimate is larger than the 2001 demand estimate of 950-gpd; however, it appears to be reasonable, given the increased availability of water due to the School's water supply pipeline. ~~This increased water demand estimate is further supported by the Design Criteria presented in the As-Built Water Plant Equipment and Piping Plant drawings prepared by LCMF and GV Jones & Associates in January of 2004, which show a "current" average daily demand of 1,577-gpd.~~

? demand for?

In the 2001 Study, GV Jones & Associates identified the Chlorine Contact Time to be the limiting water treatment process in the Water Plant. In their analysis, the Chlorine Contact tank was capable of providing an average daily water flow of up to 1,800-gpd. This capacity exceeds the estimated current typical demand of 1,667-gpd.

gallon

Takotna experiences a brief period of population influx during the Iditarod Dog Sled Race. It is unknown what the water demand raises to during this event; however, it is anticipated that it exceeds the Chlorine Contact Time. ~~without an T in~~ chlorine does.

Wala

The proposed new Health Clinic would increase the water demand slightly over the existing clinic demand. For the purposes of this report, an increase in demand is anticipated to be roughly 30-gpd, raising the total typical system demand to around 1,700-gpm. Actual demand should be measured upon the completion of the new Clinic to confirm actual demand.

? done

Previous reports indicated that the Water Treatment Plant did not have an Operations and Maintenance Plan. Subsequent correspondence indicated that a copy of the O&M Manual was available from the Tanana Chiefs Conference and efforts were underway to get a copy.

The Water Treatment Plant is currently out of compliance with the following regulatory requirements:

Please Ductlet work

Due to funding and construction season limitations, the work will likely have to be sequenced over at least two construction seasons as follows:

Seasons I: Drain field at WTP, Crypto Filter.

- Season 1 (summer 2010): • Complete design and construction for nine (9) facility on-site septic systems previously investigated in the Engineering Pre-Design Specifications report, • design and construct LTI filtration improvements and conduct field investigations for the remaining eleven (11) facility on-site septic systems. Estimated Cost = \$636,853.

WTP drain field

Winter 2010/2011: ~~Develop Water Treatment Plant O&M Manual, design tank CT Capacity increase (baffles and level control modifications), conduct Corrosion Control Desktop study and design Septage Monofill at landfill.~~ Estimated Cost = \$21,671.

Season 2 (summer 2011): *ON RECEIPT OF FUNDS* Construction on-site septic systems for remaining eleven (11) facilities, construct tank CT capacity upgrades, ~~install Corrosion Control System,~~ and construct Septage Monofill and procure Septage Hauler. Estimated Cost = \$770,175.

III. PROJECT PLANNING AREA

The State of Alaska Department of Labor population data for 2009 indicates that the population of the Yukon-Koyukuk Census Area dropped by roughly 14% since 2001 (Appendix B). Takotna's population estimates between 2000 and 2006 fluctuate between 40 and 61 people with the most recent data in 2006 showing 53 people.

2012

IV. GROWTH AND FUTURE PROJECTS

A. Population Forecasting

The population of Takotna appears to be relatively stable with no significant changes anticipated in the foreseeable future. The forecast maximum year-round population is projected to be 60 people.

B. Growth Areas

With a steady population, no expansion is anticipated.

C. Future Projects

No significant infrastructure projects are currently planned, or funded, for the community that will change either the population of the community, or change water/wastewater usage.

Need landfill for septage

1. Lead and Copper Rule Compliance. Water samples taken in 1999 found lead and copper levels higher than allowable limits of 0.015 mg/l for lead and 1.3 mg/l for copper). The Study identified the need to conduct a desktop study to evaluate treatment alternatives. There is no record that this study has been performed.

2. Long Term 1 Enhanced Surface Water Treatment Rule (LT1) Compliance. The LT1 regulations require a surface water system to provide Log-2 removal of microbial contaminants, especially Cryptosporidium. The existing filters do not meet this requirement. One solution to meeting this requirement would be to install additional filters, downstream of the existing filters, which are designed for the removal of Cryptosporidium. Compliance with LT1 was required by ~~December 31, 2006.~~ *7 cartridge filter pressure sand were not*

can since
Water Storage Tank. The water storage tank is located inside the Water Treatment Plant. It has a nominal capacity of 11,000 gallons and it does not have internal baffles. The tank appears to be adequate for the current typical average water demand; however, the annual Iditarod Dog Sled Race causes a spike in demand in March. It is unknown what the demand increases to at this time; however, it most likely exceeds the CT capacity of the existing tank. *11,000 gal*

Watering Point. Water is still sold at the watering point located at the Water Plant/Washeteria. No deficiencies have been identified at this time. *which would increase ability to disinfect*

School Water Line. The School water line *can only?* (has limited capacity) to provide roughly 35-gpm. This capacity was determined to be adequate to serve the buildings it is currently connected to and a future Health Clinic; however, it is not expandable to other buildings. Due to the limited flow rates and minimal water storage capacity of the water tank, this system is not suitable to provide fire protection flows for sprinkler systems or fire hydrants. *no operational adjustments are made, # days*

C. Wastewater Collection, Treatment and Disposal

Previous household surveys identified 18 residences, 7 seasonal use cabins and 18 commercial/public buildings in the community (see Appendix A – Village Safe Water Plumbing Assessment in the Engineering Pre-Design Specifications Report). Of these, 23 appear to have plumbing of some kind which drains to cribs, or other means of rudimentary disposal. Only one home, the Fox residence, has a standard septic tank and leach field design. *what is it? Fire flow is not funded by VSW - managed sanitation grants*

Of the 24 buildings with plumbing, 8 are connected to the School water distribution system. The other building Owners/Users haul water from the watering point.

The condition of the non-septic tank/leach field systems that serve the 23 buildings is unknown. The septic tank/leach field system at the Fox residence appeared to be functioning when inspected by LCMF personnel in 2006. Since there are no septage

haulers or a septage receiving pit, it is unlikely that any of the septic tanks or cribs have been pumped. This condition shortens the life of these systems. Several systems were anecdotally identified as having failed. Most notable is the School system which is reported to have effluent day-lighting along the river bank. *still?*

The Water Treatment Plant and Washeteria leach field is reported to be failing, requiring the construction of a new leach field.

The status of other leach fields and cesspools around the community are unknown, but are considered to be out of compliance with ADEC on-site septic system requirements.

A septage monofill has not been created, nor has a septage hauler been purchased; therefore, there currently is no means to dispose of septage waste pumped out of septic tanks or other cribs and pits. *even leach fields?*

D. Evaluation of Associated Facilities and Infrastructure

General

still planned? { The construction of a new airport has been funded and is scheduled for completion by 2014. The new airport will replace the existing landing strip on the hillside above the community. No services are planned for the new airport, so no impact is anticipated on the community.

Power Generation and Fuel Storage

The community power plant and fuel storage facility were upgraded in approximately 2005 by the Alaska Energy Authority. The new power generation equipment was sized to provide for future expansion, with 185 kW capacity.

Heavy Equipment

The following equipment is owned by the Takotna Community Service Association and located in the community:

- *any?* To Be Determined

Community Buildings, School, Health Clinic

There are no significant changes to Community Buildings, the School or Health Clinic since the 2001 Study. There are plans for a new Health Clinic as mentioned previously in this report.

Commercial Facilities

There are no new commercial facilities in the community, nor are there plans for any.

Homeowner Surveys

No updated Homeowner Surveys have been conducted.

VI. COMMUNITY AND FINANCIAL CAPACITY

An Updated Business Plan is to be developed separate from this Amendment.

VII. SANITATION FACILITY ALTERNATIVES

In keeping with the findings of the 2001 Study, the community of Takotna does not want to increase the burden on local residents by incurring O&M costs associated with expanding the water and sewer collection systems beyond the minimum required for sanitary operations. (For this reason, there are no significant changes in the findings of the 2001 Study.) The following alternatives are presented with this in mind. *→ which were?*

The cost for most improvements were determined in either the original 2001 Study or in the 2008 Engineering Pre-Design Specification report. Existing costs were used, with an escalation factor, for pricing the current capital, design and O&M costs. Escalation factors were determined by comparing Consumer Price Index values from the original cost estimate year to the value for 2009 (the most current year provided). The Consumer Price Index (CPI) values were taken from the State of Alaska, Department of Labor & Workforce Development web site for Anchorage, Alaska (see Appendix C). A summary of the costs and calculations is included in Appendix D.

A. Water Source

The Water Rights for the system are not adequate to meet the current demand. The community should request an increase in its Water Rights to at least 1,800-gpd to meet the current water demand. A capacity of 2,400-gpd would provide for future increases not foreseen at this time.

The cost for upgrading the State of Alaska Water Rights application is estimated to be a \$200 application fee if prepared and submitted by the community. *LABOR.*

B. Water Treatment Plant

The Water Treatment Plant is currently out of compliance with the several regulatory requirements. The following actions must be taken as soon as possible:

~~Lead and Copper Rule Compliance.~~ A desktop study to evaluate treatment alternatives must be performed as soon as possible. The findings of this desktop study may require the installation of a corrosion control system. *complies*

The cost for the Desk Top Study and anticipated Corrosion Control System is estimated to be \$63,892 (Capital and Design Cost) and \$16,562/yr (O&M Cost).

Water Treatment Plant O&M Manual. If an existing Operations and Maintenance Manual cannot be located, a new manual should be developed.

The cost for the development of a new O&M Manual is estimated to be \$6,071 (Design Cost) with no annual O&M Cost. TCC

Long Term 1 Enhanced Surface Water Treatment Rule (LT1) Compliance. The LT1 regulations require installation of either a Cryptosporidium filter, ~~or a direct filter system,~~ to remove microbial contaminants.

Recommend
At least one Cryptosporidium filter is available that would work in series with the existing filters to meet the required regulatory requirements. Strainrite manufactures an approved Cryptosporidium filter that has a flow rate of 20-30 gpm. Two filters, installed in parallel, would be required to meet the maximum infiltration yield.

Converting to a direct filter system would require the use chemicals to meet the regulation requirements. This conversion would require the installation of equipment to inject the chemicals, additional water sampling to determine injection rates and increased water plant operator training and certification. The result would be an increase in water production cost which is not desired by the community. shorten.

The cost for the installation of a Cryptosporidium filter is estimated to be \$58,324 (Capital and Design Cost) and \$5,060/yr (O&M Cost) \$2000/yr more

the
Water Storage Tank. The existing water tank appears to provide adequate Chlorine Contact Time capacity to meet the typical average peak daily demand, including the proposed Health Clinic; however, these average flows may be exceeded during peak season use, such as during the Iditarod dog sled race. While no data is available for this period, it is assumed that the water demand exceeds the CT capacity of the tank; therefore, the tank should be modified to increase CT by installing baffles and modifying the level float controls, in addition to changing tank filling procedures. These modifications were identified in the Engineering Pre-Design Specification report.

The cost for the upgrades to the Water Storage Tank is estimated to be \$36,693 (Capital and Design Cost) with no impact on monthly O&M costs.

VALVE REPAIR OR METER REPLACEMENT +
C. Community Water Distribution System

The existing School water distribution system cannot provide adequate flow rates to meet fire flow conditions. In addition, the existing distribution system does not have the capacity to handle increased flow required to expand the distribution system. It is

Fire flow
not
Endure
and not
a rect.
They should
look at other
fire prevention

understood that the School District and the community does not want to upgrade this system to provide Fire Water flow at this time.) *move to front of section.*

D. Upgrade On-Site Septic Systems

OK { Of the 23 buildings identified in the 2006 VSW Surveys as having plumbing and inadequate on-site waste water disposal systems, 20 buildings (12 houses and 8 commercial/public buildings) meet the criteria for consideration of receiving upgrades to their on-site waste water disposal systems. See Appendix E for Housing Assessment/Condition Summary.

In 2006, LCMF conducted soils investigations and percolation tests at 10 sites which were identified by the Takotna Tribal Council. Twelve test pits were dug at these sites in order to develop an Engineering Pre-Design Specifications report as required by the USDA Rural Development for project funding. The investigation included 9 houses and the Takotna Tribal Council Office. Through the course of the investigation, it was determined that one house (Bennett house) did not meet the VSW criteria for upgrades. The final report addressed preliminary design information for 8 houses and the Takotna Tribal Council Office.

In addition to the 10 sites evaluated in 2006, eleven (11) buildings (4 residences and 7 commercial/public facilities) have not been investigated for preliminary design of new waste water treatment systems. Of these, four (4) are connected to the School water distribution system (Blue Teachers house, Dormitory, School and School Kitchen) and one, the Water Plant/Washeteria, handles significant loading from the Washeteria use and water treatment system backwashing.

Not eligible for USDA funds

The cost for upgrading these additional eleven (11) waste water disposal systems is estimated based on the School and School Kitchen systems being similar design to the Takotna Traditional Council Office, the Water Plant/Washeteria being a large capacity traditional septic system with a system to dampen the backwash water disposal rates, the Dormitory being a larger traditional septic system and the others being small traditional septic systems. Pricing was derived from the original 2006 estimates developed for the Engineering Pre-Design Specifications.

The cost for the ten (10) septic systems identified in 2006 is \$517,129 (Capital and Design Cost), while the cost for the eleven (11) additional systems estimated to be \$675,200 (Capital and Design Cost). The total combined Septic System estimated cost is \$1,192,329 (Capital and Design Cost).

E. Septage Monofill and Septage Hauler

In order to properly maintain the on-site septic systems, a means for pumping the septic tanks and disposal of the septage will be required. Previous investigations identified a new Septage Monofill to be constructed at the landfill for disposal, along with the

purchase of a trailer mounted tank and pumping system. It is understood that an agreement can be put together with the Takotna Community Service Association to provide personnel and equipment to operate the septage hauler.

The cost for the Septage Monofill and purchase of a Septage trailer is estimated to be \$71,390 (Capital and Design Cost), with a monthly O&M cost of \$32/mo for residential and \$64/mo. for commercial facilities.

↑ what does that include.

VIII. DESIGN CRITERIA AND DESIGN ASSUMPTIONS

Water Rights. Water Rights are managed by the State of Alaska, Division of Mining, Land and Water. The increase in Water Rights will require the submittal of an application for the additional capacity.

Lead and Copper Rule. The Lead and Copper Rule federal drinking water regulation requires a desk top study be completed to identify mitigation measures for aggressive water. A corrective action plan is developed from the findings of the study.

LT1 Filtration. The Cryptosporidium filtration shall meet the criteria defined in the Long Term 1 Enhanced Surface Water Treatment Rule by the EPA.

Preliminary investigation identified ^{that the Strainrite} ~~one~~ filter that met the criteria established by LT1. ~~This filter is produced by Strainrite.~~ The flow capacity is listed as 20-30 gpm per filter. In order to meet the production capacity of the infiltration gallery pumps, two units will need to be installed in parallel.

CT Capacity Increase. Baffle installation and level control modifications shall be designed to increase the CT capacity in the existing 11,000 gallon tank. The design shall be in compliance with the Disinfectants and Disinfection Byproducts Rule federal drinking water regulation.

Sizing requirements for the increased CT Capacity shall be based on information gathered through a review of the Water Treatment Plant water production records for the recent Iditarod race timeframe.

Septic Systems. The Design Criteria and design assumptions for the On-site Septic System design is outlined in the Engineering Pre-Design Specifications report.

Septage Monofill and Trailer. The septage Monofill design shall be in accordance with State of Alaska Department of Environmental Conservation requirements, including guidance information provided in the EPA's Domestic Septage Regulatory Guidance document (EPA 832-B-92-005). Septage pumping from the on-site septic tanks is anticipated to occur bi-annually.

IX. RECOMMENDATIONS FOR IMPROVEMENTS

Repeat. What projects

Sanitation Facility Improvements. This amendment identifies priority projects that were initially identified in the 2001 Sanitation Master Plan and additional regulatory required upgrades. All of the projects identified as Sanitation Facility Alternatives projects should be implemented.

Associated Facilities Improvements. No improvements for Associated Facilities have been identified.

Construction Phasing Plan with Costs and Requirements. The sequencing/scheduling of the projects identified in this report are recommended to be accomplished as follows, depending on the availability of funds.

2010 Construction Season: *now First Year (dependent on funding)*

1. On-site Septic Systems (9 Facilities). The site investigation has been completed for eight residences and the Takotna Tribal Council Office septic systems. This work should be completed during the summer. The work will require the importation of materials and equipment, potentially requiring barge access which would limit the work season to the late summer/fall.
2. LT1 Filtration Installation. *designed and* ~~The Water Treatment System is out of compliance with the LT1 regulations and~~ the filters should be installed as soon as possible. Timing of the installation will ~~be dependent~~ upon the delivery schedule for the filters *(and it should really?)* consider seasonal demand to minimize the impact on the community.
3. Field Investigation for Remaining Septic System Designs. Field investigations for the eleven (11) remaining facilities requiring on-site septic systems should be completed in *first year* ~~2010~~. The work would include the identification of soils and perc rated data for each site. The data collected during this investigation will be used for planning the work for the balance of facilities to be provided with compliant septic systems. *by a PE*

Winter 2010/2011:

Eqpt required

1. ~~Lead and Copper Rule Desktop Study. The Desktop study should be completed by December of 2010 in order to establish funding requirements for system upgrades. Implementation of the Corrosion Control system would be dependent on funding.~~
2. ~~O&M Manual Development. If a copy of the existing O&M Manual cannot be found, the replacement manual should be developed in the Fall and winter of 2010/2011. Information for the Manual could be gathered during on-site work on the other improvements.~~

3. CT Capacity Increase Design. The design for the baffling and level control modifications should be completed ~~during the winter in order to perform construction during the summer construction season.~~

restrictive. not a big design, could install in winter.

~~2011~~ Construction Season: *Second Year*

1. Septage Monofill and Septage Hauler Procurement The construction of the Septage Monofill should be conducted while equipment is available in the community for the installation of the on-site septic systems. / This work would fit well with the second season, allowing time for design and permitting in the winter/spring of 2011, along with the procurement of the septage hauler. *pull out as a task.*
2. On-site Septic Systems (11 Facilities). This work would complete the on-site septic system upgrades. It is anticipated that the construction schedule would be developed around the barge schedule in order to economically bring in materials and equipment.
3. CT Capacity Increase. The design of the baffling and level controls modifications should be completed during the summer, dependent upon seasonal demand in order to minimize the impact to the community. *Construction?*
4. ~~Installation of Corrosion Control System. Based on the findings of the Desktop Study, the corrosion control system should be installed in conjunction with the CT Capacity increase work.~~

The funding schedule for this sequence of work is summarized as follows:

Title?

Item	Summer 2010	Winter 2010/2011	Summer 2011
Design of Septic Systems Design (9 Fac)	47,000		
Construction of Septic Systems (9 Fac)	470,129		
Design Remaining Septic Systems (11 Fac)	61,400		
Construction Remaining Septic Systems (11 Fac)			613,800
Design of LT1 Filtration	5,300		
Construction of LT1 Filtration	53,024		
G&M Manual			
Design of Tank CT Capacity Increase		3,300	
Construction of Tank CT Capacity Increase			33,393
Corrosion Control Program			
Corrosion Control Program			
Design of Septage Monofill and Trailer		6,500	
Construction /Procurement of Septage Monofill and Trailer			64,890
Totals	636,853	21,671	770,175