# MEMORANDUM

CITY/BOROUGH OF JUNEAU
155 South Seward Street, Juneau, Alaska 99801

**DATE:** November 13, 2014

**TO:** Planning Commission

**FROM:** Beth McKibben, Planner
Community Development Department

**FILE NO.:** CSP2014 0022

**PROPOSAL:** CBJ Biosolids Treatment and Disposal Evaluation - Phase II Final Report

## ATTACHMENTS

A- Non-monetary criteria used in Alternatives Evaluation
B- Table 1 Advantages/Disadvantages of Biosolids Facility Location

## BACKGROUND

In response to concern over the long -term stability of shipping biosolids to Oregon, the CBJ has performed an evaluation of viable treatment and disposal alternatives for biosolids. Biosolids are the semi-solid organic materials resulting from the treatment of sewage sludge. From 1992 to 2010, an incinerator located at the Juneau Douglas Wastewater Treatment Plant (JDWWTP) effectively combusted our biosolids to produce an inert ash that was disposed of on site.

In 2010, the incinerator was decommissioned due primarily to corrosion issues after performing for its expected lifespan of 20 years. The cost of repair, estimated at $2 Million, was considered too expensive to pay to extend the service life. Instead, the CBJ worked with Waste Management (WM) to handle our biosolids. WM first disposed of the biosolids at the local landfill but discontinued this after a few months due to complaints of a significant increase of odors by the public. WM management also found the material was difficult to handle because of the high moisture content. WM then began shipping the biosolids to Oregon for disposal in another WM owned- landfill while other alternatives were considered by the CBJ. The cost per wet ton to the CBJ for biosolid disposal at the local landfill in 2010 was $88. The cost to ship the biosolids to Oregon in 2013 was $140/wet ton. The current cost to ship the biosolids under the contract with WM to Oregon is $215/wet ton.

Since the incinerator was decommissioned, rising fuel costs, uncertainty over environmental regulations in Oregon, and issues with odors and leaking containers that threatened the CBJ/ WM contract, have become real and immediate threats to the long term viability of this disposal

strategy. If the contract is terminated, the CBJ would be in an emergency situation with no method for disposal of the biosolids, posing a significant health hazard for the community.

In the Phase I study, CBJ worked with Tetra Tech to provide a general overview of 10 treatment processes and 3 disposal strategies. The goal was to understand the spectrum of treatment and disposal options that may be viable for Juneau. During the process of research and evaluation, the following two governing principles were established for further analysis and decision making:

- **Produce a Class A biosolid.** This refers to the United States Environmental Protection Agency (USEPA) classification for biosolids pathogen characteristics. A Class A product meets the most stringent pathogen standards, is considered safe for public use, and has the least disposal restrictions; for example, it can be used as topsoil in residential gardens.
- **Reduce the volume of the biosolids.** Disposing of biosolids costs money. The more biosolids we have to dispose, the more expensive it is. Juneau has very little land that is of suitable size (multiple acres), flat, uplands, and in areas with compatible uses.

As scoping for the 2014 Phase II study began, the following governing principles were added to further define requirements of the long-term biosolids solution:

- **Allow for multiple end uses enabling ease of disposal.** Available disposal options include landfilling, monofilling, land applying (as a soil amendment), or burning (as a fuel source). Unfortunately, ground appropriate for a monofill or land application is limited, the landfill is nearing its capacity (within 20 years), and the market demand for a soil amendment product is uncertain.
- **Is classified as an established or innovative technology as defined by USEPA for system reliability.** An established technology is used at more than 25 facilities in the United States. An innovative technology may be established overseas but has some degree of initial, full-scale tested use in the United States.

The CBJ Land Use Code section CBJ 49.10.170(c) on City and Borough Land Acquisitions, Disposals and Projects, states:

"The commission shall review and make recommendations to the Assembly on land acquisitions and disposals as prescribed by Title 53, or capital improvement projects by any City and Borough Agency. The report and recommendation of the commission shall be based upon the provisions of this title and the comprehensive plan, and the capital improvement program."

Therefore, Staff has reviewed the proposed alternatives and locations evaluated in the study and provided the following evaluation of the project in accordance with adopted plans and the CBJ Land Use Code. There will be another review when a specific project, in a specific location is being planned.

**ANALYSIS**

The final report, Biosolids Treatment and Disposal Evaluation, Phase II considers four alternatives. The alternatives for biosolids management selected by the CBJ for detailed evaluation in Phase II are:

1. Continuation of the current practice of shipping dewatered biosolids from the JDWWTP and the MWWTP by barge, rail, and road to Oregon for landfill disposal (also known as the "status quo" or "base case" alternative).
2. Thermal drying of biosolids at a central facility with local disposal or marketing of the dried, Class A biosolids product.
3. Thermal drying of biosolids followed by combustion of the biosolids in a furnace to recover heat that is then recirculated to the biosolids drying process, thus reducing the amount of purchased fuel.
4. Thermal combustion (incineration) of the biosolids in a new fluidized-bed incinerator that recovers heat from the combusted biosolids to aid in evaporation and reduce the amount of purchased fuel.

In Phase II, the four alternatives were compared based on Capital and Operational Costs and the Non- Monetary Criteria listed below (attachment A):

- Public Health and Safety Considerations
- Risk of New Technology
- Implementation Timeline
- End Product Disposal Options
- Energy Sourcing and Consumption
- Operational Complexity
- Environmental and Permitting Issues
- Logistics of Transport
- Carbon Footprint
- Location of the Technology

The recommended alternative is Alternative 3, a thermal belt dryer that circulates hot air to dry the sludge and produces pellets. The pellets would be combusted in a furnace; the heat generated from this process would return to the belt dryer to dry the biosolids. Some supplemental fuel in the form of oil or wood pellets would be required for the process. The dried pellets from the thermal dryer could alternatively be used as a soil amendment. The cost estimate provided uses wood pellets as supplementary fuel.

The Phase II report considers two potential sites for a biosolids drying facility. One is the MWWTP and the other is JDWWTP. The MWWTP produces almost 80% of the biosolids. Table 1 (attachment B) articulates the advantages and disadvantages of the two sites. Prior to

construction of a new treatment facility there will be a second CSP review and a Conditional Use permit review. However, considering, in a general way, the three standards the Commission evaluates when reviewing a Conditional Use permit; public health and safety, neighborhood harmony, and conformity with adopted plans; is prudent in this broader review.

MWWTP is located off Radcliff Road near the airport. The site is 3.2 acres and is zoned Industrial. It is immediately adjacent to D5 zoning on the north and a mix of D15 and General Commercial zoning to the east. To the west is Mendenhall River and to the south the airport as well as the airport dike trail and public parking.

JDWWTP uses approximately 10 acres of a 105 acre site. It is accessed from Thane Road and is also zoned Industrial. There is a narrow area of Waterfront Industrial (WI) zoned land between the JDWWT and the channel to the west. The site is adjacent to industrially zoned and used land to the north. To the east, across Thane Road is zoned Rural Reserve. To the south is again a narrow strip of WI and the channel.

The use of MWWTP requires trucks and other traffic traveling to the plant drive through residential and general commercial neighborhoods. The Phase II report notes there have been complaints about odors over the years. The use is not harmonious with the surrounding neighborhood; there are no similar uses in the area. As noted in the report, this site is within the non-attainment area for air emissions, which will like cause challenges to receiving an air emissions permit.

Use of the JDWWTP will require more trips to haul waste material from the MWWTP to the JDWWTP for disposal. The site is less constrained and surrounded by primarily Industrial zoned land, including Waterfront Industrial, and industrial uses. It is in harmony with the surrounding neighborhood. However, there are impacts to the Radcliff Road neighborhood because of the number of trucks that would be hauling material from the MWWTP to the JDWWTP.

Because there will be trucking from one site to the other, either site will create truck traffic through residential and general commercial neighborhoods near the MWWTP and through downtown to reach or leave the JDWWTP.

Both sites are zoned appropriately for this type of use. However, the JDWWTP is more harmonious with the surrounding neighborhood in both use and zoning and is not in the non-attainment area for air emissions.

## CONFORMITY WITH ADOPTED PLANS

Staff reviewed the 2013 Comprehensive Plan, the 2011 Juneau Climate Action plan (JCAP) and the 2004 Long Range Waterfront Plan. Below is a summary of the plan sections that staff found

to be most relevant when evaluating the four alternatives for biosolids management selected by the CBJ in Phase II.

**2013 Comprehensive Plan**

CHAPTER 2, SUSTAINABILITY

Policy 2.2 To model sustainability through its operations, practices, and projects.

2.2 IA2 Identify opportunities throughout the CBJ government to conserve energy, use alternative fuels and renewable energy sources, and reduce the CBJ's carbon footprint.

CHAPTER 6, ENERGY

Policy 6.5 To incorporate technologies and operating practices that will promote clean, efficient, and cost effective energy use into all of its own new and existing buildings and energy-using projects.

6.5.IA6 When designing new facilities or major renovation of CBJ facilities, analyze life-cycle costs of energy applications with consideration of using renewable energy sources given high priority.

Policy 6.6 To maximize the ratio of local, renewable-source energy to imported fossil-source energy in Juneau's internal energy economy.

Policy 6.8. Include the indirect, or external, costs of energy use in its economic analyses.

6.8-SOP1 Use quantifiable external and indirect costs in establishing the cost of energy when conducting life-cycle cost analysis of CBJ owned facilities, projects and operations.

CHAPTER 10, LAND USE

Policy 10.4 To minimize conflicts between residential areas and nearby recreational, commercial or industrial uses that would generate adverse impacts to existing residential areas thorough appropriate land use decisions and regulatory measures.

**2011 Juneau Climate Action Plan**

The JCAP speaks to wastewater treatment energy use as follows:

CBJ has three wastewater treatment facilities, Mendenhall, Juneau-Douglas and Auke Bay (ABTP). This system consumes both electricity and fuel oil. In 2010, Mendenhall treatment facility alone used over 3 million kwhs of electricity. Additional electricity was used by the JDWWTP, ABTP, and the 45 lift stations. In addition, wastewater processing in 2010 required almost 155,500 gallons of fuel. The CBJ wastewater system consumes both building energy (lights, ventilation, and heat) and process energy. These energy usages are not separately metered. Staff notes this summary is before CBJ began barging waste out of Juneau.

3.1.3 Cost of implementation

Implementing the actions in this plan will have costs to all levels of governments and to the general public. In many cases, though, making changes that reduce energy use will be more expensive up front and will result in lower energy costs in the future.

Goal B-1: Reduce energy consumption in, and Green House Gas (GHG) emission produced by, borough government buildings. (Estimate: 30% emission reduction for CBJ buildings).

Action Item: Set energy efficiency standards for all new local government buildings. Use specific standards that exceed the minimum baselines of such standards as the American Society of Heating, Refrigeration and Air-conditioning Engineers energy efficiency standard (ASHRAE 90.1 or 90.2), for example, the 10 BTUS per square foot of heated floor area standard. New buildings should aim to achieve a 50% reduction in energy use per square foot compared to existing buildings. GHG emissions abatement and energy efficiency need to be incorporated into the early stages of building design.

Action Item: Establish a policy that requires equipment purchased or leased by local government to meet specified energy efficiency standards, such as energy star.

Action Item: Adopt a policy requiring that all new CBJ government buildings undergo a life cycle analysis and that this information be used to make decisions about energy efficiency and alternative systems.

Goal U-1 – Reduce energy consumption and GHG emissions from wastewater treatment (Estimate: 25% reduction in emissions from wastewater plant).

Wastewater is pumped through pump stations to the MWWTP, JDWWTP, or ABTP. At the main treatment facilities (MWWTP and JDTP), wastewater is processed and the solid phase is separated from the liquid. The liquid phase (treated water) is further disinfected with UV light before discharging to the Gastineau Channel or Mendenhall River. At both facilities, the remaining solid phase/sludge is dewatered. At the time the JCAP was written the biosolids were being disposed of at the land-fill. The JCAP states that while it was in operation, the incinerator at JDWWTP emitted a large portion area-wide GHG reported in the 2010 GHG emissions

inventory. In reviewing appendix VII it appears that wastewater accounted for 13% of the CBJ total emissions.

**2004 Long Range Waterfront Plan**

The JDWWTP is located within the planning area of the 2004 Long Range Waterfront Plan. The JDWWTP is in subarea E. The Plan states that with the high level of investment in industrial, public works and marine facilities this area is envisioned to remain similar to present levels of activity and character. Page 58 of the Plan states that the Plan encourages the strengthening of land regulations in this subarea primarily to allow only industrial and non-cruise related maritime activities. The Plan also calls for continued utilization of a part of this area for the operation of the CBJ waste water treatment facility. The Plan further recommends buffering this use through plant materials or other means to improve the possibility of development eastward should be explored.

The Phase II report includes both a life-cycle cost analysis and a GHG emissions analysis for the four proposals considered. Both analyses are recommended for CBJ projects in the 2013 Comprehensive Plan and JCAP. These analyses allow for considering factors beyond the initial construction cost. The report also weighs other non-monetary factors, which are summarized above and also in attachment A). This is helpful for reviewing the alternatives for consistency with our plans.

**FINDINGS**

The recommended alternative, Alternative 3, a thermal belt dryer that circulates hot air to dry the sludge and produces ash is most consistent with the 2013 Comprehensive Plan and the 2011 JCAP.

The JDWWTP location is most consistent with the 2013 Comprehensive Plan. The JDWWTP is also consistent with the 2004 Waterfront Plan.

**RECOMMENDATION**

Staff recommends that the Planning Commission recommend to the Assembly that they initiate the design and construction of the thermal belt dryer and energy recovery furnace at the JDWWTP.

# DEVELOPMENT PERMIT APPLICATION

| Project Number CSP20140022 | CITY and BOROUGH of JUNEAU | Date Received: 10/29/14 |
|---|---|---|
| Project Name (City Staff to Assign Name) | | |

## PROJECT / APPLICANT INFORMATION

**Project Description**
CBJ has completed two planning level studies on the evaluation and recommendation of a biosolids treatment plan. Staff recommends a heat dryer with an energy recovery furnace. With a Planning Commission recommendation and Assembly approval, design and construction could be completed by early 2017 with a start up in the 2nd quarter of 2017. The location would be at the Mendenhall or Juneau Douglas Wastewater Treatment Plant.

### PROPERTY LOCATION

| Street Address | City/Zip |
|---|---|
| Mendenhall or Juneau Douglas Wastewater Treatment Plant | Juneau 99801 |

**Legal Description(s) of Parcel(s) (Subdivision, Survey, Block, Tract, Lot)**
MWWTP - Utility Park BL A JDWWTP - ATS 556 Tract A

**Assessor's Parcel Number(s)**
MWWTP - 5B1601220010 JDWWTP -1C110K000040

### LANDOWNER/ LESSEE

| Property Owner's Name | Contact Person: | Work Phone: |
|---|---|---|
| CBJ | Michele Elfers | 586-0931 |
| **Mailing Address** | **Home Phone:** | **Fax Number:** |
| 155 S. Seward Street, Juneau, AK 99801 | | 463-2606 |
| **E-mail Address** | **Other Contact Phone Number(s):** | |
| Michele.Elfers@juneau.org | | |

### LANDOWNER/ LESSEE CONSENT

****Required for Planning Permits, not needed on Building/ Engineering Permits****

I am (we are) the owner(s)or lessee(s) of the property subject to this application and I (we) consent as follows:

A. This application for a land use or activity review for development on my (our) property is made with my complete understanding and permission.
B. I (we) grant permission for officials and employees of the City and Borough of Juneau to inspect my property as needed for purposes of this application.

X _____ Landowner/Lessee Signature _____ Date

X _____ Landowner/Lessee Signature _____ Date

NOTICE: The City and Borough of Juneau staff may need access to the subject property during regular business hours and will attempt to contact the landowner in addition to the formal consent given above. Further, members of the Planning Commission may visit the property before the scheduled public hearing date.

### APPLICANT

If the same as OWNER, write "SAME" and sign and date at X below

| Applicant's Name | Contact Person: | Work Phone: |
|---|---|---|
| Same | | |
| **Mailing Address** | **Home Phone:** | **Fax Number:** |
| | | |
| **E-mail Address** | **Other Contact Phone Number(s):** | |
| | | |

X Michele Elfers Applicant's Signature 10/29/14 Date of Application

---OFFICE USE ONLY BELOW THIS LINE---

## STAFF APPROVALS

| ✔ | Permit Type | ***SIGN | Date Received | Application Number(s) |
|---|---|---|---|---|
| | Building/Grading Permit | ■ | | |
| X | City/State Project Review and City Land Action | ■ | 10/29/14 | CSP20140022 |
| | Inquiry Case (Fee In Lieu, Letter of ZC, Use Not Listed) | ■ | | |
| | Mining Case (Small, Large, Rural, Extraction, Exploration) | | | |
| | Sign Approval (If more than one, fill in all applicable permit #'s) | ■ | | |
| | Subdivision (Minor, Major, PUD, St. Vacation, St. Name Change) | | | |
| | Use Approval (Allowable, Conditional, Cottage Housing, Mobile Home Parks, Accessory Apartment) | | | |
| | Variance Case (De Minimis and all other Variance case types) | ■ | | |
| | Wetlands Permits | | | |
| | Zone Change Application | | | |
| | Other (Describe) _____ | | | |

***Public Notice Sign Form filled out and in the file.

Comments:

Permit Intake Initials: HJ

NOTE: DEVELOPMENT PERMIT APPLICATION FORMS MUST ACCOMPANY ALL OTHER COMMUNITY DEVELOPMENT DEPARTMENT APPLICATIONS

# CITY/STATE PROJECT AND LAND ACTION REVIEW APPLICATION

| Project Number | Project Name (15 characters) | Case Number | Date Received |
|---|---|---|---|
| | | CSP20140022 | 10/29/14 |

## TYPE OF PROJECT REVIEW:

☑ City Project Review ☐ City Land Acquisition /Disposal ☐ State Project Review

## DESCRIPTION OF PROJECT

CBJ has completed two planning level studies on the evaluation and recommendation of a biosolids treatment plan. Staff recommends a heat dryer with an energy recovery furnace. With a Planning Commission recommendation and Assembly approval, design and construction could be completed in early 2017 and startup could occur in the 2nd quarter of 2017.

The location of the equipment would be at the Mendenhall or Juneau Douglas Wastewater Treatment Plant.

**Please attach a cover letter to fully explain the project if there is not adequate space on this form.**

## CURRENT USE OF LAND OR BUILDING(S):

Both sites are currently used as wastewater treatment facilities.

## PROPOSED USE OF LAND OR BUILDING(S):

Most likely at either site a new building would be constructed to house the biosolids treatment equipment. At the JDWWTP, the incinerator building may be renovated.

## PROJECT NUMBERS ASSOCIATED WITH PROPOSAL:

**Is this project associated with any other Land Use Permits?** ☑ No ☐ Yes **Case No.:** _____

**Capital Improvement Program # (CIP)** U76-012

**Local Improvement District # (LID)** _____

**State Project #** _____

## ESTIMATED PROJECT COST: $ $28.7M

For more information regarding the permitting process and the submittals required for a complete application, please see the reverse side.

If you need any assistance filling out this form, please contact the Permit Center at 586-0770.

**CITY/STATE PROJECT FEES**

| | Fees | Check No. | Receipt | Date |
|---|---|---|---|---|
| Application Fees | $ | | | |
| Total Fee | $ | | | |

***NOTE: MUST BE ACCOMPANIED BY* DEVELOPMENT PERMIT APPLICATION *FORM***

***&***

***EVEN IF THE PROPOSED PROJECT IS ASSOCIATE WITH OTHER LAND USE PERMITS, THIS APPLICATION MUST BE FILLED OUT***

TO BE COMPLETED BY THE APPLICANT

TABLE 4
**Results of Developing and Weighting Non-Monetary Criteria Used in Alternatives Evaluation**

| Criteria No. | Evaluation Criteria | Criteria Weights | Criteria Description |
|---|---|---|---|
| 1 | Ease of operation | 9.1 | Relative ease of operating the technologies involved in each alternative, compared to existing operations. Technologies considered easier to operate receive higher score. |
| 2 | Carbon footprint | 3.6 | An estimate of the amount of greenhouse gas (GHG) emissions that would be emitted as a result of implementing each of the alternatives. Lower GHG emissions receive higher score. |
| 3 | Timeline for implementation | 14.5 | Estimated time required to implement each alternative, relative to other alternatives. Alternatives with faster timeline receive higher score. |
| 4 | Location of the technology | 1.8 | Flexibility to locate the facilities involved in each alternative at any one of three possible locations (JDWWTP, MWWTP, and Capitol Landfill) relative to other alternatives. Alternatives with greater location flexibility receive higher score. |
| 5 | Logistics of transport | 7.3 | Ease or difficulty in which end product from each alternative (dewatered cake, dried solids, or ash) can be transported, relative to other alternatives. Alternatives with end products considered easier to transport receive higher score. |
| 6 | Public health & safety issues | 18.2 | Possibility of each alternative to create public health or safety issues relative to the other alternatives. Greater possibility of creating issues results in lower score. |
| 7 | Environmental & permitting issues | 7.3 | Likelihood of each alternative to encounter environmental or permitting problems, relative to the other alternatives. Higher likelihood of problems results in lower score. |
| 8 | Risk | 16.4 | The amount of risk associated with implementing each alternative, from the perspectives of new technology, process complexity, and possibility of failure during operations, relative to the other alternatives. Alternatives with higher risk receive lower score. |
| 9 | End product disposal method | 10.9 | Likelihood of each alternative to experience ease or difficulty with end product disposal. Greater anticipated difficulty results in lower score. |
| 10 | Energy consumption & sourcing | 10.9 | Estimated amount of energy and source of energy required by each alternative compared with the other alternatives. Higher score to alternatives with lower energy requirements and higher scores to alternatives that can create energy or use local energy sources. |
| | **Total Weight** | **100.0** | |

### 4.1.2 Carbon Footprint Estimates and Comparisons between Alternatives

"Carbon Footprint" is the term used to express and compare a facility's estimated contribution to global warming via its estimated emissions of greenhouse gases (GHG's) to the atmosphere. A number of GHG's have been identified as contributors to global warming, but the only GHG's of consequence in wastewater treatment and biosolids management are the following three gases:

1. **Carbon dioxide ($CO_2$):** The most common GHG; all other GHG's are converted to carbon-dioxide equivalents ($CO_2e$) when estimating total GHG emissions.
2. **Methane ($CH_4$):** The next most common GHG found in wastewater and biosolids after carbon dioxide, methane is the primary gas product of anaerobic respiration, and is 23 times more potent than carbon dioxide as a GHG. Therefore one unit of methane = 23 units of $CO_2e$.
3. **Nitrous oxide ($N_2O$):** The least common of the three GHG's associated with wastewater and biosolids, nitrous oxide is a by-product of nitrification and denitrification reactions. Even though nitrous oxide is



Attachment A

typically emitted in smaller amounts than carbon dioxide and methane, it is 300 times more potent than carbon dioxide as a GHG. One unit of nitrous oxide = 300 units of $CO_2e$.

The summation of these three GHG's, when all are converted to $CO_2e$, represents the total estimated Carbon Footprint of an alternative. The Total Carbon Footprint consists of direct and indirect emissions of CO2e, which are categorized in the following three groups for purposes of estimating total GHG emissions:

1. **Scope 1 GHG emissions** – These are the direct emissions of GHG's arising from a process or activity. However, $CO_2$ emitted as a result of natural biological activity, known as "biogenic $CO_2$ emissions" are not typically counted as part of the total carbon footprint. $CO_2$ emissions resulting from combustion of fossil fuels, known as "anthropogenic $CO_2$ emission," are typically counted in the total carbon footprint. All of the carbon dioxide emitted from fossil-fuel based engines or processes is included in Scope 1 GHG emissions. In addition, all methane and nitrous oxide emissions from these processes are counted as Scope 1 GHG emissions, whether or not the methane or nitrous oxide is emitted from biogenic or anthropogenic sources in the processes.
2. **Scope 2 GHG Emissions** – These are indirect emissions of GHG's resulting mostly from combustion of fossil fuels used to produce electrical power, heat, or steam that is delivered to an activity or process. Since the primary electrical power in Juneau is produced by hydro-powered turbines, the fossil fuel use in power production is negligible, and Scope 2 emissions are therefore negligible for purposes of this comparison.
3. **Scope 3 GHG Emissions** – These are indirect emissions of GHG's resulting from the production of purchased chemicals and materials, and the uses of end products produced by an alternative. Scope 3 emissions tend to be remote from the source of an activity or process. Scope 3 GHG emissions are not considered in the following estimates of GHG emissions, or Carbon Footprint, associated with the four alternatives being evaluated.

Based on the explanations given above, only Scope 1 (Direct) GHG emissions were considered when comparing the Carbon Footprint of each alternative being evaluated. Results of the Carbon Footprint estimates are shown in Table 5.

TABLE 5
**Estimated Annual Greenhouse Gas (GHG) Emissions (Carbon Footprint) of Each Alternative**

| Alternative | Estimated GHG Emissions ($CO_2e$) in metric tons per year (Mg/year), based on Scope 1 (Direct) GHG Emissions |
|---|---|
| 1- Status Quo | 2,700 |
| 2- Thermal Dryer Fueled No. 2 Heating Oil | 1,900 |
| 3- Thermal Dryer + Combustion for Energy Recovery | 980 |
| 4- Direct Combustion via Fluidized-Bed Incinerator (FBI) | 1,200 |

As shown in Table 5, Alternative 3 – Thermal Dryer with Energy Recovery System, is estimated to have the lowest Scope 1 emissions of GHG's, i.e., the smallest Carbon Footprint, of the four alternatives. The primary reason for Alternative 3 having the smallest Carbon Footprint is because it uses dried biosolids for combustion and heat recovery to help fuel the biosolids dryer, thereby substantially reducing the amount of fossil fuel (No. 2 heating oil) needed to dry or combust biosolids, when compared with Alternatives 2 and 4, respectively. Alternative 1 – Status Quo, has the highest Carbon Footprint primarily because landfilling of

biosolids results in anaerobic activity and high emissions of methane from the landfill. Additionally, fossil fuels are used to transport biosolids from the MWWTP and JDWWTP first by truck, barge, and rail, prior to being landfilled in the State of Oregon, thereby contributing to the large Carbon Footprint of Alternative 1.

### 4.1.3 Non-Monetary Comparison of Alternatives

Each of the four alternatives non-monetary criteria were ranked by CBJ and CH2M HILL staff. The results of these rankings are shown in Table 6 and Figure 6. A score of "5" indicates the highest possible score, in that the alternative shown would rank highest in being able to meet the criterion described. Conversely, a score of "1" indicates the lowest possible score for an alternative to satisfy that criterion.

TABLE 6
**Results of Developing and Weighting Non-Monetary Criteria Used in Alternatives Evaluation**

| Criteria Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Total Score |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Criteria Name | Ease of Operation | Carbon Footprint | Timeline | Location | Transport | Public Health | Permitting | Risk | Disposal | Energy | |
| **Weight** | ***9.1*** | ***3.6*** | ***14.5*** | ***1.8*** | ***7.3*** | ***18.2*** | ***7.3*** | ***16.4*** | ***10.9*** | ***10.9*** | |
| 1: Maintain Status Quo | 2 | 1 | 5 | 1 | 1 | 1 | 1 | 4 | 1 | 2 | 20.7 |
| 2: Thermal Drying | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 26.3 |
| 3: Thermal Drying with Heat-Recovery Furnace | 2 | 4 | 2 | 2 | 4 | 4 | 2 | 2 | 4 | 4 | 27.4 |
| 4: Thermal Oxidation (Incineration) | 2 | 4 | 2 | 2 | 4 | 4 | 1 | 3 | 4 | 2 | 26.3 |

A graphical depiction of the alternative rankings with respect to non-monetary criteria is shown in Figure 6.

As shown, Alternative 3 (Dryer and Heat-Recovery Furnace), ranked highest in non-monetary terms, Alternative 2 (Thermal Drying), followed by Alternative 4 (Incineration) ranked next highest, and finally, ranked last, is Alternative 1 (Continued Status Quo of Landfill Disposal). The non-monetary criteria rankings shown in Table 6 and Figure 6 apply to either the MWWTP or JDWWTP facility location.

The cost estimates for each alternative change slightly depending on whether the biosolids treatment facility is located at the MWWTP or JDWWTP, as described in the next section of this TM.

### 4.1.4 Methodology for Cost Estimation

Cost estimates including capital costs, annual operation and maintenance (O&M) costs, and net present value, also were developed. All costs were derived using the same level of estimating accuracy and are therefore comparable. Actual construction costs may differ from the estimates presented, depending on specific design requirements and the economic climate at the time a project is bid. The American Association of Cost Engineers (AACE) has developed levels of accuracy for various stages of construction cost estimation. The estimates produced for the current comparison are Class 5, with a corresponding project definition level of 0-2% and expected level of accuracy of 20-50% below and 30-100% above the cost given.

Basic cost assumptions are shown in Table 7.

The advantages and disadvantages of locating new facilities at the MWWTP or the JDWWTP are summarized below in Table 1:

TABLE 1
**Advantages/Disadvantages of Biosolids Facility Location**

| Comparison Criteria | Mendenhall WWTP | Juneau-Douglas WWTP |
|---|---|---|
| Sludge Transported Annually | 1710 wet tons | 5413 wet tons |
| Distance to Landfill (Disposal Site) | 4 miles | 7 miles |
| Air Emissions/Permitting Issues | Complex (close neighbors, Mendenhall Valley non-attainment) | Not as complex (industrial district, had prior air emissions permit) |
| Infrastructure Needs | Need new building, must demolish existing building, constrained site | May be able to reuse part of Incineration/Dewatering Building, more space available |
| Construction Timeline | Likely longer due to restricted site access and more complex permitting | Likely shorter due to easier site access and less complex permitting |
| Resident/Neighbor Impacts | Nearby commercial and residential neighbors on all sides | Industrial area, no nearby residences, near cruise ship docks and 1 mile from downtown Juneau |
| NPV of Capital Costs | $26.6 million | $27.9 million |
| NPV of O&M Costs | $9.4 million | $10.7 million |

Locating a new biosolids drying facility at the MWWTP appears to be less costly than locating a biosolids drying facility at the JDWWTP at this point, because nearly 80% of CBJ's biosolids are produced at the MWWTP. Therefore, the JDWWTP facility capital cost includes larger bins for storing imported solids, and its O&M costs reflect higher volumes of dewatered solids that have to be transported from MWWTP to JDWWTP.

The JDWWTP facility location has several non-monetary advantages over the MWWTP location, however. It does not have neighbors in close proximity like the MWWTP does. The MWWTP neighbors have periodically filed complaints related to odors from the MWWTP. It is believed that the JDWWTP would be less subject to odor and nuisance complaints than the MWWTP, due to its location in an industrial zone next to a shipping dock and more land available for a buffer zone. Also it is believed that air emissions permitting may be less complex at the JDWWTP because a permitted incinerator previously operated on the site, and the MWWTP is in a non-attainment area for air particulates, potentially making an air emissions permit at MWWTP more stringent and difficult to obtain.

Figure 7 indicates where a new thermal drying facility with energy-recovery furnace could be located on the JDWWTP site. The system's space requirements are approximately 95 feet long by 75 feet wide. It is advantageous to locate the drying facility as close as possible to the dewatering equipment. The existing dewatering equipment at JDWWTP, which would remain in place, is represented by the small rectangle in the bottom left corner of the existing incinerator building. The new thermal drying facility is located just to the right of the existing dewatering equipment in Figure 7. The portion of the existing building that houses the de-commissioned incinerator would likely have to be demolished, and the new thermal drying facility installed inside a new building in its place, as shown in Figure 7.