MATANUSKA-SUSITNA (MAT-SU) BOROUGH

Central Landfill - Leachate Treatment Plant

April 1, 2020

CLARK ENGINEERING

HDL ENGINEERING CONSULTANTS

CLARK TECHNOLOGY

PRESENTED BY:

Dr. Kazem Oskoui
Vice President/Chief Technology Officer
Clark

Mr. Vlad Scheglowski, PE
COO/Executive Vice President
Clark

Mr. Chris Bowman, PE
Project Manager, HDL Engineering Consultants

Dr. Abi Assadi, PE
Principal/Client Executive
Clark

OVERVIEW

- In a Public Meeting Heard Public Testimony and Approved Landfill Leachate Treatment Plant Overview:
  - Summer 2018 MSB Assembly approved a contract to design and construct a Landfill Leachate Treatment Plant at the Central Landfill based on the recommendations provided by the Wastewater Septage Advisory Board and conclusions of a Preliminary Engineering Report (PER) prepared on behalf of the Borough.
  - PER evaluated in detail a variety of leachate treatment options considered by Borough over a 20-year time period. Borough considered technical and financial alternatives for each option identified in the PER and determined one as a go-ahead treatment option.
  - Final option: Design at the Central Landfill a Landfill Leachate Treatment Plant that will treat for current, new, and emerging contaminants of concern for future and possibly more stringent discharge limits for years to come.

PRESENTATION

- Project Background and Location
- Leachate Treatment Path Summary
- Recommended System for Leachate Treatment
- Clean Water Effluent Discharge from Leachate Treatment Plant
- Leachate Treatment Project Overview
- Summary of Project Costs
- Technology, Experience and Performance Results
- Leachate Treatment System Summary

PROJECT BACKGROUND AND LOCATION

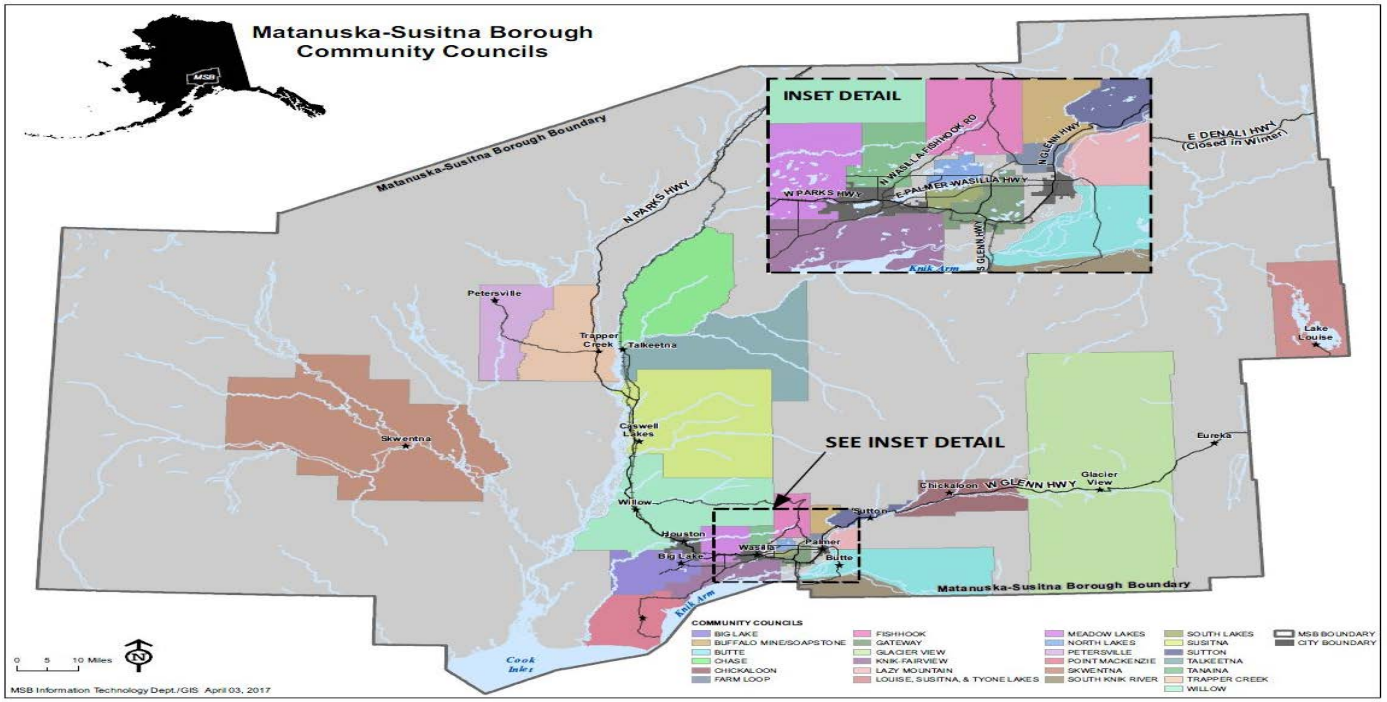
- MSB's Central Landfill, regulated by ADEC, produces a liquid wastewater called landfill leachate.

- Central Landfill produces approximately 3.15 million gallons of leachate per year, with an average leachate production of 4.6 to 5.7 million gallons/year over the next 20 years (based on Borough's escalation factor and PER data).

- Current Practice: Leachate, along with all its contaminants, is collected into two leachate collection ponds, pumped from the ponds, and hauled to the Turpin Septage Receiving Station in Anchorage for disposal into the Cook Inlet (with only primary treatment).

PROJECT BACKGROUND AND LOCATION

Mat-Su Borough Central Landfill, near the city of Palmer, Alaska



CLARK ENGINEERING

HDL ENGINEERING CONSULTANTS

CLARK TECHNOLOGY

MSB Landfill Leachate Treatment Facility

LEACHATE TREATMENT ALTERNATIVES

As part of the PER, Borough evaluated numerous alternatives for treatment of leachate. Of these alternatives, all were studied in detail. Below are three examples:

- Status Quo – Continue hauling septage and leachate to Anchorage

- Build a treatment facility to treat leachate using aerated lagoon system

- Build a treatment facility to treat leachate using membrane bio reactor (MBR)

CLARK ENGINEERING HDL ENGINEERING CONSULTANTS CLARK TECHNOLOGY

RECOMMENDED SYSTEM FOR LEACHATE TREATMENT

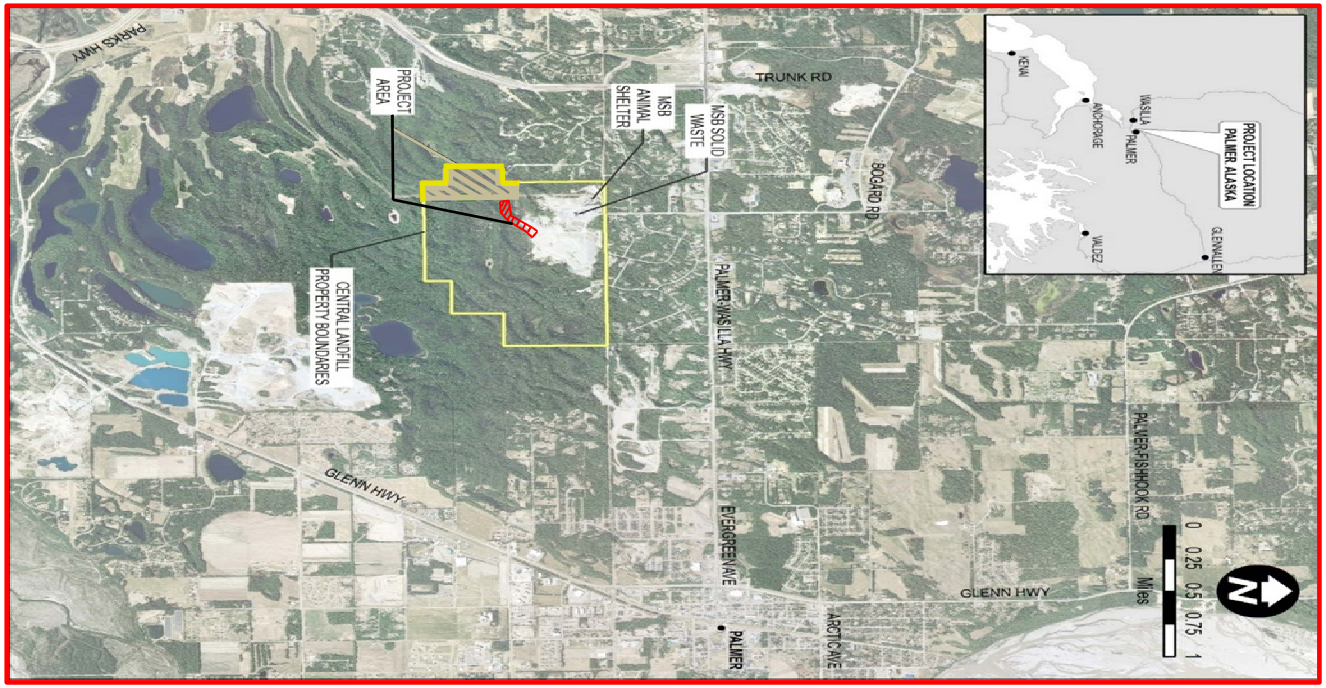
- As part of the PER Clark reviewed all the various leachate treatment alternatives and evaluated and analyzed each one.
- Temporal Dynamics Analysis (TDA) was employed to determine the treatment capacity (demand) requirements.
- Per discussions with MSB Staff - Mitigated Risk Temporal Dynamic Analysis (MRTDA) was also employed.
- 25, 50, 75 and 99(100) percentile risk levels were evaluated.
- Also 50% MRTDA was evaluated.
- Borough selected the best fit alternative to construct an on-site Leachate Treatment Plant and to contain contaminants in the landfill.

RECOMMENDED SYSTEM

- Final option: Design at the Central Landfill a Landfill Leachate Treatment Plant that will treat for current, new, and emerging contaminants of concern for future and possibly more stringent discharge limits for years to come.
- Discharge clean water effluent from leachate treatment plant into a low - lying area between moraines on landfill property.
- Return leachate contaminants to the landfill.
- A final risk level was decided upon with MSB staff, the 75 % level for landfill leachate treatment with a processing capacity of 20,000 gallons per day.

LEACHATE TREATMENT PROJECT LOCATION

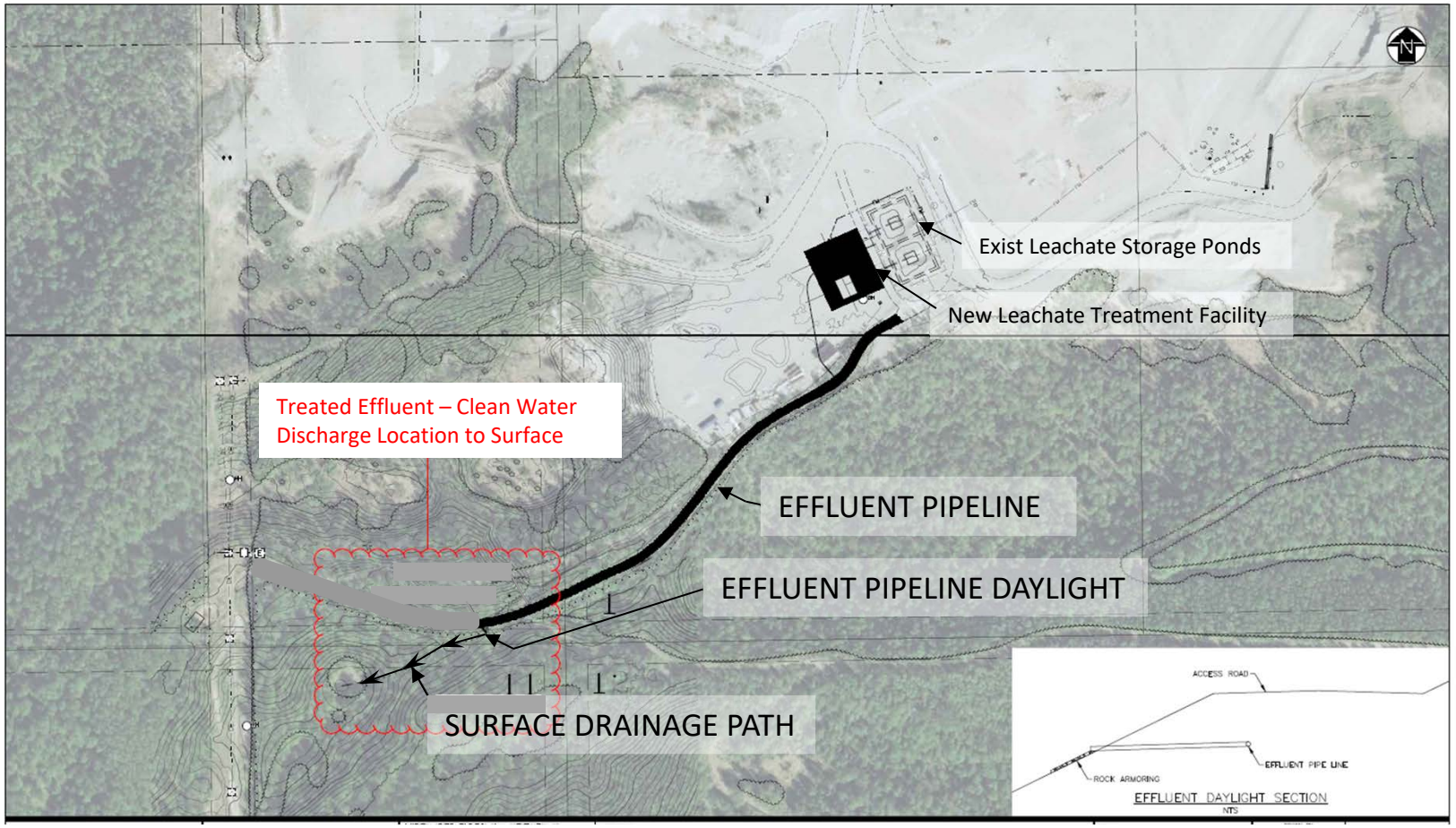
Mat-Su Borough Leachate Treatment Plant Project Limits – red hashed area below



MSB Landfill Leachate Treatment Facility

LEACHATE TREATMENT PLANT -

CLEANED WATER EFFLUENT DISCHARGE LOCATION



CLARK ENGINEERING | HDL ENGINEERING CONSULTANTS | CLARK TECHNOLOGY

MSB Landfill Leachate Treatment Facility

LEACHATE TREATMENT PROJECT OVERVIEW

Mat-Su Borough Leachate treatment plant has the following design parameters:

Waste Stream	Landfill Leachate
System Design Capacity (in GPY)	4,654,000 (Up to 20,000 gpd)*
System Expandable to (GPY)	9,000,000
Treated Leachate Discharge	Surface Discharge into Low Spot between Moraines within Landfill Site
Concentrated Leachate	Dispersed within the open Landfill cell(s) (1,000 to 4,000 gpd)**

*Note 1: Based on Borough's operating risk level of 75% capacity, where plant operates 85% of the time over 365 days/yr. (20,000gpd x 365 days x 85% x 75%)

**Note 2: Achieves goal of contaminant confinement vs. untreated dispersion to surface and ground waters.

CLARK ENGINEERING HDL ENGINEERING CONSULTANTS CLARK TECHNOLOGY

PROJECT COSTS

Estimated Breakdown of current disposal cost for Mat-Su Haulers

Cost Item	Estimated Cost/3,000 gal
Fuel	$48.00
Labor	$62.50
Truck maintenance & Insurance	$36.80
AWWU discharge cost*	$75.58
Total	$222.88

*AWWU is currently conducting a rate study for a proposed rate increase in 2017, to be approved by the RCA.

Above data is from CH2M's Financial Analysis for MSB Septage and Leachate Treatment Facility, dated Dec. 11, 2015. Accounting for inflationary increases since 2015, as stated per year by the State of Alaska's Department of Labor and Work Force Development on the first three cost items (fuel, labor, and cost of trucking) and accounting for increases in the AWWU discharge costs approved by RCA thru March, 2020, the current leachate disposal cost is estimated at $245.30 per 3,000 gal tanker or $0.082/gal.

PROJECT COSTS

Total Leachate Treatment System Cost

Percentile Risk Level Treatment System will not need to Process more than System Cap. in gpd of leachate	75%
System Processing Capacity in GPD	20,000
Annual Debt Service/Gallon	$0.037
Annual O&M/Gallon	$0.035
Avg. Probable Gallons Processed/Year	4,653,750
20 Yr. Equivalent Uniform Annual Cost (EAUC)/Gallon	$0.072
EUAC/1000 Gallons	$71.97
EUAC/3000 Gallons	$216.00

Ref: 20 Year EUAC Cost Analysis of Leachate Treatment Plant 12-16-2019

TECHNOLOGY, EXPERIENCE, AND RESULTS

Clark LEACHBUSTER® Treatment System

- On-site engineering and duration study
- 70+ systems using this technology in operation treating:
  - Municipal Wastewater
  - Landfill Leachate
  - Septage
  - Industrial Wastewater

CLARK ENGINEERING HDL ENGINEERING CONSULTANTS CLARK TECHNOLOGY

MSB Landfill Leachate Treatment Facility

TECHNOLOGY, EXPERIENCE AND RESULTS

- Clark has innovated and holds intellectual properties for various technologies.
- These technologies provide a comprehensive solution for a wide range of water and wastewater treatment challenges.
- The system offers up to 13+1 levels of treatment.

MSB Landfill Leachate Treatment Facility

CLARK ENGINEERING HDL ENGINEERING CONSULTANTS CLARK TECHNOLOGY

TECHNOLOGY, EXPERIENCE AND RESULTS

- At the heart of these technologies is LEACHBUSTER®
  - Innovative, membrane-based treatment technology.
  - Treats a wide range of waste streams with high solids content.
  - Limited needs for pre-filtration, pre-treatment, staging.
  - No backwashing is needed.

CLARK ENGINEERING HDL ENGINEERING CONSULTANTS CLARK TECHNOLOGY

MSB Landfill Leachate Treatment Facility

TECHNOLOGY, EXPERIENCE, AND RESULTS

- Landfill leachate

- Municipal Wastewater

MSB Landfill Leachate Treatment Facility

NOTABLE CONTAMINANTS REMOVED AND REDUCED TO BELOW REGULATORY LIMITS

Pathogens without using disinfectants

- E-coli <2 CFUs/100 ml
- Fecal Coliforms < 10 CFUs/100 ml
- No THMs or DBPs

Volatile Organic Contaminants

- **VOCs -** TCE, DCE, MEK…
- **SVOCs**
- **PAHs**

Emerging contaminants of concern

- PFCs,
- Boron,
- Chlorides…

CLARK ENGINEERING HDL ENGINEERING CONSULTANTS CLARK TECHNOLOGY

NOTABLE CONTAMINANTS REMOVED AND REDUCED TO BELOW REGULATORY LIMITS

Physical indicators

- Organics BOD, TSS, and COD
- Inorganics TDS and TS
- Metals Cd, Cr, Cu, Pb, Se, Sb
- Conductivity

Common contaminants

- Phosphorus
- Nitrogen compounds, NO_x, NH_3
- Sulfates
- Bromides

Tomorrow's contaminants

- Antibiotics
- Degradation by-products
- Endocrine disruptors
- Super bugs

CLARK ENGINEERING HDL ENGINEERING CONSULTANTS CLARK TECHNOLOGY

MSB Landfill Leachate Treatment Facility

TECHNOLOGY, EXPERIENCE AND RESULTS

Raw Leachate and Treated Leachate Characterization

Parameters	Raw	Treated	% Removal
BOD (mg/l)	>4000	19	100
COD (mg/l)	17000	30	99.99
pH	7-8.5	7	-
Temperature	65 to 75	80-90	-
Ammonia	>400	<2	99.99
TDS (mg/l)	>4000	<200	99.99
TSS (mg/l)	>2000	ND	100
Total Coliforms (CFUs/100ml)	>7 logs	ND	100
E.coli	>5 logs	<2	99.9

CLARK ENGINEERING HDL ENGINEERING CONSULTANTS CLARK TECHNOLOGY

TECHNOLOGY, EXPERIENCE AND RESULTS

PFAS Removal - reported in parts per trillion (ppt or ng/l)

Amount of contaminants in raw leachate, treated effluent, and concentrate together with ILs and HRLs.

Analyte	Raw Leachate	Treated Leachate	HRLs	Removal (%)	Units
Perfluoropentanoic Acid	ND	ND		ND	ng/l
PFBS	680	ND	7000	99.99	ng/l
Perfluorohexanoic Acid	8300	ND		99.99	ng/l
Perfluoroheptanoic Acid	3200	ND		99.99	ng/l
PFHxS	2600	ND	7000	99.99	ng/l
PFOA	4500	ND	300	99.99	ng/l
Perfluorononanoic Acid	ND	ND	300	ND	ng/l
PFOS	1100	ND	300	99.99	ng/l
Perfluorodecanoic Acid	ND	ND		ND	ng/l
Perfluoroundecanoic Acid	ND	ND		ND	ng/l
Perfluorododecanoic Acid	ND	ND		ND	ng/l

CLARK ENGINEERING HDL ENGINEERING CONSULTANTS CLARK TECHNOLOGY

LEACHATE TREATMENT PLANT SUMMARY

- Discharged Water Effluent Meets EPA Primary Drinking Water Standard referenced by ADEC Rule 18 AAC 80 and EPA Groundwater Discharge Standards referenced by ADEC Rule 18 AAC 70.
- Reuse most of the clean water effluent for landfill operations.
- Return leachate contaminants back to the landfill, cradle to grave concept for contaminants. Prevents contaminants from entering Cook Inlet and disrupting aquatic life and food sources.
- Reduce overall transportation and treatment costs over the long term. On-site leachate treatment 20-year EUAC Estimate = **$216 per 3,000 gal.** vs. Hauling and Disposal 20-year EUAC Estimate = **$330 per 3,000 gal.** (based on yearly hauling and disposal cost increase of 3%/year).
- No pressure on municipal wastewater treatment plants to treat leachate and spread PFAS contaminants and other “forever chemicals” from leachate to surface and drinking waters.

CLARK ENGINEERING HDL ENGINEERING CONSULTANTS CLARK TECHNOLOGY

THANK YOU AND QUESTIONS