



Foundry Sand Reuse in Alaska

Best Practices & Regulatory Compliance

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3. Key Concepts and Definitions

What is Foundry Sand?

Foundry sand is high-quality silica sand used in the metal casting process to create molds for industrial, maritime, and precision aviation components. In Alaska, while large-scale primary iron production is limited, specialized fabrication and maintenance hubs in Anchorage and Fairbanks generate spent sand that is a high-value byproduct due to the immense cost of importing virgin silica from the Lower 48.

What is Beneficial Reuse?

In Alaska, beneficial reuse involves the application of a non-hazardous solid waste material in a manner that provides a documented environmental or economic advantage. This is typically achieved by using the material as a substitute for expensive imported aggregate or structural fill.

What is the TCLP Test?

The **Toxicity Characteristic Leaching Procedure (TCLP)** (EPA Method 1311) is the required protocol to determine if a waste is hazardous. Given Alaska's reliance on sensitive groundwater systems and the high cost of hazardous waste export, TCLP verification is the critical first step for any reuse project.

4. Regulatory Guidelines

Alaska Department of Environmental Conservation (DEC)

The **Alaska DEC**, specifically the Division of Environmental Health's Solid Waste Program, regulates the reuse of industrial byproducts.

Specific Legal Citations:

- **18 AAC 60:** "Solid Waste Management." This chapter governs all aspects of waste disposal and reuse in Alaska.
- **18 AAC 60.990:** Provides the definitions for beneficial use and the criteria for departmental approval.
- **Departmental Approval Rule:** Per 18 AAC 60, anyone intending to beneficially use a solid waste **must** submit a formal proposal to the DEC and may not commence until written approval is received.

Federal Framework

Alaska follows the **EPA RCRA Subtitle D** standards for non-hazardous waste. However, the DEC often applies more stringent site-specific evaluations to protect sensitive

permafrost and aquatic environments.

5. Reuse Applications and Alaska Examples

Application	Description	Alaska Context
Structural Fill	Bedding for building pads and utility corridors.	High value in Anchorage/Fairbanks due to the cost of virgin fill material.
Landfill Daily Cover	Alternative Daily Cover (ADC).	Critically needed at Fairbanks North Star Borough and Anchorage landfills.
Road Sub-base	Foundation for arctic infrastructure.	Subject to extreme freeze-thaw evaluation by AK DOT&PF .
Winter Traction	Grit for icy roads (non-salt).	Specialized potential for high-uniformity sand in urban pedestrian zones.

6. Environmental and Technical Considerations

Arctic Performance

- **Freeze-Thaw Cycles:** Sand used in Alaskan construction must be tested for its physical stability during extreme temperature fluctuations.
- **Permafrost Protection:** Leaching analysis must ensure that heavy metals or binder residues do not migrate into sensitive permafrost layers where biological degradation is near zero.

Tipping Fee Landscape (2024-2026)

Alaska has the highest average tipping fees in the U.S., making reuse more profitable here than in any other state:

- **Fairbanks (Commercial MSW): \$145.00 per ton** (FY 2026 Regular Rate; \$290.00 for non-borough waste).
- **Mat-Su Borough (C&D): \$142.00 per ton** (projected 2026).
- **Anchorage (Regional Landfill): \$95.36 per ton** (including the 2026 \$6.00/ton surcharge).

7. Funding, Grants, and Incentives

Alaska DEC Solid Waste Grants

The DEC provides occasional funding for solid waste management improvements, particularly for rural hubs and regional centers looking to reduce their landfill footprint.

Federal Infrastructure Funding (IIJA/BIL)

Alaska receives significant federal funding for maritime and aviation infrastructure. These projects often include "Buy Clean" provisions that favor the use of local, recycled materials over carbon-intensive imports.

8. Active Participants in Alaska

Specialized Fabrication & Precision Casting:

- **Thieman Manufacturing Technologies (TMT Fab)** (Anchorage/Fairbanks) - Precision metal fabrication for mining and oil/gas.
- **Culmination Machine Works** (Anchorage) - Specialized CNC and non-ferrous part creation (Brass/Bronze/Aluminum).

- **Superior Machine & Welding** (Anchorage) - Heavy equipment and marine repair involving metal components.
- **Artistic Foundries**: Small-scale art and memorial casting (e.g., Vinnetti's serves this market).

Potential End-Users:

- **AK DOT&PF** (Alaska Department of Transportation & Public Facilities) - Major infrastructure aggregate user.
- **Anchorage Solid Waste Services (SWS)** - User of alternative daily cover.
- **Fairbanks North Star Borough Solid Waste** - Extremely high-cost disposal zone needing diversion.

9. Success Story Highlights

Maritime Maintenance Reclamation: Marine repair facilities in the Anchorage area, such as **Superior Machine & Welding**, have implemented internal sand reclamation loops to minimize the high cost of importing virgin silica. By repurposing the final "spent" sand as localized structural fill for utility bedding projects, these facilities avoid the Anchorage Regional Landfill disposal fees (which exceed \$95.00 per ton) and the even higher costs associated with long-haul aggregate transport. These programs demonstrate the economic viability of circular sand management in the Alaska maritime sector.

10. Clear Business Case Summary

1. **Massive Cost Avoidance:** Saving at least **\$145/ton** in the Fairbanks region.
2. **Import Replacement:** Every ton of recycled sand replaces a ton of virgin silica that must be shipped into the state at extreme expense.
3. **Logistics Dominance:** Local reuse eliminates the "High-Haul" cost of transporting waste to remote, specialized landfills.

11. Risk Management Overview

- **Regulatory Pre-Approval:** In Alaska, starting a reuse project without a DEC written approval letter is a violation of 18 AAC 60.
- **Groundwater Impact:** Projects must be sited away from primary aquifers to satisfy the DEC's conservative environmental screening levels.

12. Step-by-Step Workflow for Foundries

1. **Chemical Profiling:** Conduct a 32-parameter TCLP and totals suite.
2. **DEC Proposal:** Prepare a "Beneficial Use Determination Request" per 18 AAC 60.
3. **Site Analysis:** If using for fill, conduct a site-specific hydrogeological screening.
4. **DEC Consultation:** Meet with the Solid Waste Program coordinator in Anchorage or Fairbanks.
5. **Execution:** Implement reuse once the DEC approval letter is received.

13. Real Cost Savings Example

Scenario: A Fairbanks industrial hub generating 500 tons of sand per year.

- **Disposal Cost (at \$145/ton):** \$72,500
- **Reuse Program (Testing + DEC Filing + Logistics):** \$22,500
- **Annual Savings:** \$50,000

15. General FAQ & Landfill-Specific FAQ

Q: Why are Fairbanks fees so high?

A: Remote logistics, limited competition, and the extreme cost of operating a Subtitle D landfill in arctic conditions.

Q: Can I use foundry sand for residential landscaping?

A: Likely not without a DEC site-specific determination; industrial or road use is the preferred Alaskan pathway.

16. References

1. **18 AAC 60:** Alaska Solid Waste Management Regulations.
2. **Fairbanks North Star Borough (FNSB):** FY 2026 Solid Waste User Fee Schedule (Ordinance 2025-20).
3. **Anchorage Solid Waste Services (SWS):** 2026 Disposal Rates and Surcharges.
4. **Alaska DOT&PF:** Standard Specifications for Highway Construction.
5. **EPA SMM Technical Guidance:** Foundry Sand in Transportation Applications.