



Foundry Sand Reuse in North Dakota

Best Practices & Regulatory Compliance

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3. Key Concepts and Definitions

What is Foundry Sand?

Foundry sand is high-purity silica sand used by North Dakota's manufacturing sector to form molds for agricultural, industrial, and precision metal components. North Dakota's industrial base, which includes major suppliers to the agriculture and defense industries (e.g., Bobcat and John Deere components), generates spent sand that is physically stable and often categorized as "Inert Waste." Once the sand can no longer be used for casting—due to thermal fatigue—it is removed as **spent foundry sand (SFS)**.

What is Beneficial Reuse?

In North Dakota, beneficial reuse refers to the process of utilizing a non-hazardous solid waste material as an effective substitute for a virgin material in a manner that protects public health and the environment. This process is governed by the North Dakota Department of Environmental Quality (NDDEQ).

What is the TCLP Test?

The **Toxicity Characteristic Leaching Procedure (TCLP)** (EPA Method 1311) is the core analytical protocol required by NDDEQ. For any industrial material to qualify for "Inert Waste" status or simplified reuse pathways, it must be verified as non-hazardous via TCLP for heavy metals.

4. Regulatory Guidelines

North Dakota Dept. of Environmental Quality (NDDEQ)

The **NDDEQ**, specifically the Division of Waste Management, regulates the disposal and reuse of industrial byproducts under the state's solid waste management rules.

Specific Legal Citations:

- **N.D. Admin. Code 33.1-20:** "Solid Waste Management." Provides the foundational regulatory framework for waste disposal and the criteria for material recovery.
- **N.D. Admin. Code 33.1-20-01.1:** Outlines the definitions for "**Inert Waste**," which is a critical classification for high-volume sand reuse.
- **Beneficial Use Determinations:** NDDEQ typically evaluates large-scale reuse projects on a case-by-case basis, ensuring that the SFS is chemically stable and provides a functional benefit for the intended application.

Permitting pathways

Generators seeking to reuse sand in structural fill or road base must provide a chemical characterization to NDDEQ. If the material meets "Inert Waste" standards, it may be managed with significantly reduced regulatory oversight compared to MSW.

5. Reuse Applications and North Dakota Examples

Application	Description	North Dakota Context
Road Sub-base	Foundation layer for road construction.	High potential in NDDOT highway and expansion projects.
Landfill Daily Cover	Alternative Daily Cover (ADC).	Widely used at the Bismarck and Fargo landfills.
Flowable Fill	Low-strength concrete for utility bedding.	Used in municipal trenching across the Fargo and Grand Forks metro areas.
Agricultural Drainage	Bedding for drain tiles or lagoons.	Specialized potential given North Dakota's extensive agricultural sector.
Structural Fill	Bedding for industrial building pads.	Subject to "Inert Waste" status and NDDEQ chemical screening.

6. Environmental and Technical Considerations

Groundwater Protection

Due to North Dakota’s reliance on shallow glacial aquifers for agriculture and municipal use, NDDEQ requires rigorous leaching characterization for any un-bound structural fill

projects. Sand used in un-bound applications must ensure zero risk of metal or binder residuals impacting regional water quality.

Physical Stability

SFS from North Dakota's iron foundries often exhibits high angularity and structural stability. This makes it a superior material for specialized "flowable fill" that provides stable support for utility lines while remaining easy to excavate during maintenance.

7. Funding, Grants, and Incentives

NDDEQ Solid Waste Management Grants

The NDDEQ occasionally offers funding for recycling and waste diversion projects through the state's Environment and Natural Resources Trust Fund. Foundries developing regional "Industrial Aggregate Hubs" may qualify for support.

North Dakota Dept. of Commerce

The state offers various incentives (e.g., the **Agricultural Products Utilization Commission - APUC**) for innovations that support North Dakota's manufacturing and agriculture synergy. Foundries that process byproducts into useful agricultural or construction materials may qualify for APUC or regional development grants.

8. Active Participants in North Dakota

Major Foundries and Hubs:

- **Dakota Iron Castings** (Fargo) - Custom iron casting and precision machining.
- **Vinnetti's Bronze Foundry** (Fargo) - Fine art and monuments casting.

- **Ermak Foundry & Machining** (Regional service) - Significant aluminum casting supplier for ND manufacturers.
- **Dakota Foundry** (Regional/Anderson Industries) - Gray and ductile iron casting (serving ND clients from nearby SD).

Potential End-Users:

- **NDDOT (North Dakota Dept. of Transportation)** - Major consumer of aggregate for highway construction.
- **Knife River Corporation** (Regional) - Major aggregate, asphalt, and concrete producer.
- **Northern Improvement Company** (Bismarck/Fargo) - Large-scale paving and civil contractor.
- **City of Bismarck Solid Waste** - Significant user of Alternative Daily Cover (ADC).

9. Success Story Highlights

Red River Valley Industrial Loop: Manufacturing suppliers in the Fargo-West Fargo industrial corridor, including those supporting North Dakota's major agricultural and defense OEMs, have successfully established diversion programs for their spent silica mold sand. By characterizing the material as "Inert Waste" under N.D. Admin. Code 33.1-20, these facilities provide a localized aggregate source for municipal utility bedding and infrastructure projects. This strategy avoids the high gate fees at regional landfills (which can reach **\$67.00 per ton**) and directly supports the Red River Valley's rapid infrastructure growth by repurposing high-quality industrial byproducts into durable, cost-effective civil engineering solutions.

10. Clear Business Case Summary

1. **Avoidance of Gate Fees:** Saving up to **\$67.00 per ton** (Bismarck 2026 MSW rate).
2. **Transportation Savings:** By utilizing sand in local Red River Valley construction rather than hauling to remote Subtitle D landfills.

3. **Regulatory Efficiency:** Securing an "Inert Waste" designation removes the material from MSW disposal rules and reporting requirements.

11. Risk Management Overview

- **Stockpile Compliance:** Foundries must ensure that SFS is stored in a manner that prevents wind-blown dispersal (dust management) and protects against contact with precipitation to satisfy NDDEQ performance standards.
- **Analytical Consistency:** Regular testing is required to ensure that changes in binder chemistry or alloy casting do not invalidate the "Inert Waste" status.

12. Step-by-Step Workflow for Foundries

1. **Comprehensive Characterization:** Conduct a full 32-parameter chemical profile and TCLP analysis.
2. **NDDEQ Consultation:** Contact the Division of Waste Management to discuss "Inert Waste" classification.
3. **End-User Partnership:** Secure a delivery contract with a local construction project or asphalt plant.
4. **Logistics Documentation:** Maintain records of material weights and destinations for 5 years.
5. **Annual Review:** Re-verify sand chemistry annually to ensure consistency with initial NDDEQ concurrence.

13. Real Cost Savings Example

Scenario: A Fargo-area manufacturer generating 2,000 tons of sand annually.

- **Disposal Cost (at \$57.00/ton Gate Rate):** \$114,000

- Reuse Program (Testing + NDDEQ Filing + Local Logistics): \$30,000
- Annual Savings: \$84,000

15. General FAQ & Landfill-Specific FAQ

Q: Does North Dakota have a "Beneficial Use" permit?

A: NDDEQ evaluates reuse through the "Inert Waste" classification process under N.D. Admin. Code 33.1-20.

Q: Are Bismarck fees higher than Fargo?

A: Yes, Bismarck MSW gate rates are projected to reach **\$67/ton** by 2026, while Fargo rates are around **\$57/ton**, but both provide a massive ROI for sand diversion.

16. References

1. N.D. Admin. Code 33.1-20: North Dakota Solid Waste Management Rules.
2. NDDEQ: Solid Waste Program Guidance and Publications.
3. City of Bismarck: 2026 Landfill Fee Schedule.
4. City of Fargo: Solid Waste and Landfill Pricing Rules.
5. City of Grand Forks: Sanitation and Recycling Rate Information.
6. EPA SMM Technical Guidance: Foundry Sand in Transportation Applications.