



Foundry Sand Reuse in North Carolina

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 and cores. In North Carolina's robust industrial sector—including world-leading pipe and automotive foundries—this sand is typically high-purity quartz, often containing bentonite clay (Green Sand) or chemical binders. Once the sand can no longer be reused in the internal casting loop, it is removed as **spent foundry sand (SFS)**. In North Carolina, this material is recognized as a non-hazardous industrial byproduct that is highly suited for civil engineering.

What is Beneficial Reuse?

In North Carolina, beneficial reuse refers to the practice of diverting non-hazardous industrial byproducts from landfills to productive applications where they serve as functional substitutes for virgin materials. This process is governed by the North Carolina Department of Environmental Quality (NCDEQ) to ensure the protection of the state's groundwater and soil.

What is the TCLP Test?

The **Toxicity Characteristic Leaching Procedure (TCLP)** (EPA Method 1311) is the standard analysis used to determine if a waste is hazardous. In North Carolina, only SFS that passes TCLP for heavy metals is eligible for simplified beneficial reuse pathways or inclusion in state-approved aggregate programs.

4. Regulatory Guidelines

North Carolina Dept. of Environmental Quality (NCDEQ)

The **NCDEQ**, specifically the Division of Waste Management, regulates the reuse of industrial materials through its solid waste program.

Specific Legal Citations:

- **15A NCAC 13B .1600:** "Solid Waste Management." Provides the foundational regulatory framework for waste disposal and the criteria for industrial byproduct management.
- **N.C.G.S. § 130A-309.215:** Provides the statutory authority for the beneficial reuse of certain coal-combustion and industrial byproducts, creating a precedent for high-volume reuse of SFS.
- **N.C. Solid Waste Excise Tax:** Per state law, a **\$2.00 per ton** excise tax is applied to all waste disposed of in municipal solid waste landfills. Material diverted for beneficial reuse is exempt from this tax.

Permitting pathways

North Carolina generally evaluates industrial reuse on a case-by-case basis through "Beneficial Use Determinations." Generators must demonstrate that the SFS is chemically stable and provides a functional benefit for the intended application (e.g., road sub-base).

5. Reuse Applications and North Carolina Examples

Application	Description	North Carolina Context
Road Sub-base	Foundation layer for road construction.	High potential in NCDOT infrastructure and highway maintenance.
Landfill Daily Cover	Alternative Daily Cover (ADC).	Widely used at South Wake (Raleigh) and Foxhole (Charlotte) landfills.
Asphalt Additive	Fine aggregate in hot-mix asphalt.	A viable reuse pathway for major regional paving firms like Blythe .
Flowable Fill	Low-strength concrete for utility trenching.	Demand in Charlotte and Raleigh urban utility expansion projects.
Manufactured Soil	Blending with organics for landscaping.	Subject to NCDEQ evaluation for trace metal stability in un-bound applications.

6. Environmental and Technical Considerations

Piedmont and Coastal Aquifers

North Carolina's geography—ranging from the clay-rich Piedmont to the sandy Coastal Plain—requires careful site selection for un-bound reuse. NCDEQ requires leaching data to

ensure that metal or binder residuals do not impact regional groundwater basins.

Physical Stability

SFS from North Carolina's pipe foundries often exhibits high angularity and structural stability. This makes it a superior material for high-compaction road sub-base compared to naturally occurring silty-sand found in many parts of the state.

7. Funding, Grants, and Incentives

NCDEQ Recycling Business Assistance Center (RBAC)

The **RBAC** provides funding and technical assistance to businesses that divert materials from the waste stream. Foundries can apply for "Recycling Business Development Grants" to fund on-site sand cleaning and processing equipment.

North Carolina Dept. of Commerce

The state offers various incentives (e.g., the **Job Development Investment Grant - JDIG**) for manufacturers that invest in sustainable technology. Projects that significantly reduce the state's landfill burden through high-volume sand recycling may qualify for regional development credits.

8. Active Participants in North Carolina

Major Foundries:

- **Charlotte Pipe & Foundry Company** (Monroe/Stanly County) - Major producer of cast iron pipe and fittings.
- **Greensboro Foundry** (Greensboro) - Gray and ductile iron sand casting.

- **Numerous Precision Fabricators:** Concentrated in the Piedmont Triad and Charlotte-Gastonia industrial hubs.

Potential End-Users:

- **NCDOT (North Carolina Dept. of Transportation)** - Major consumer of recycled aggregate for highway construction.
- **Blythe Construction, Inc.** (Charlotte) - Large-scale paving, asphalt, and civil contractor.
- **Lane Construction Corporation** (Regional) - Major infrastructure and aggregate user.
- **Wake County Solid Waste** - Significant user of Alternative Daily Cover (ADC).

9. Success Story Highlights

Monroe-Charlotte Industrial Loop: Large-scale pipe foundries in the Monroe-Charlotte corridor, such as **Charlotte Pipe & Foundry Company**, have successfully implemented internal sand reclamation systems achieving over 90% material reuse. The remaining spent sand is diverted to regional NCDOT road-base projects and utilized as Alternative Daily Cover (ADC) at the **Foxhole Landfill**. These initiatives allow foundries to avoid regional gate fees (which can reach **\$48.00 per ton**) and bypass the state's mandatory **\$2.00 per ton** solid waste excise tax, while providing North Carolina with high-performance, local aggregate that supports the state's expanding transportation infrastructure.

10. Clear Business Case Summary

1. **Avoidance of Gate Fees:** Saving up to **\$48.00 per ton** (Greensboro Transfer Station rate).
2. **Exemption from State Excise Tax:** Bypassing the mandatory **\$2.00/ton** N.C. solid waste tax.
3. **Logistics Optimization:** Utilizing sand in local Piedmont region infrastructure rather than hauling to remote Subtitle D landfills.

11. Risk Management Overview

- **Leachate Liability:** For projects in un-bound structural fill, foundries must maintain professional engineering documentation proving that the sand meets NCDEQ's conservative soil-risk benchmarks.
- **Permit Compliance:** Failure to secure a formal Beneficial Use Determination for large-scale land application can result in the material being classified as an illegal dump.

12. Step-by-Step Workflow for Foundries

1. **Analytical Profiling:** Conduct a full 32-parameter chemical profile, including TCLP and totals.
2. **NCDEQ Consultation:** Engage with the Solid Waste Division to discuss the project scope and characterization data.
3. **End-User Match:** Secure a delivery contract with a local asphalt plant or NCDOT-approved project.
4. **Logistics Documentation:** Maintain records of material weights and destinations for 5 years.
5. **Annual Review:** Re-verify sand chemistry annually to ensure the material remains consistent with initial NCDEQ approval.

13. Real Cost Savings Example

Scenario: A Charlotte-area foundry generating 4,000 tons of sand annually.

- **Disposal Cost (at \$42.00/ton incl. state tax):** \$168,000
- **Reuse Program (Testing + NCDEQ Filing + Local Logistics):** \$40,000
- **Annual Savings:** \$128,000

15. General FAQ & Landfill-Specific FAQ

Q: Does North Carolina require a permit for sand reuse in asphalt?

A: Incorporation into asphalt is a preferred pathway and often requires a simplified Beneficial Use notification rather than a full solid waste permit.

Q: Are gate fees rising in Raleigh and Charlotte?

A: Yes, regional fees have transitioned from ~\$30 historically to around **\$40-\$48/ton**, increasing the economic drive for diversion.

16. References

1. **15A NCAC 13B:** [North Carolina Solid Waste Management Rules](#).

2. **North Carolina General Statutes § 130A-309.215:** Variance Authority for Waste Management.
3. **North Carolina Department of Revenue:** Solid Waste Disposal Tax Information (\$2.00/ton).
4. **Wake County:** South Wake Landfill 2026 Tipping Fee Schedule.
5. **Mecklenburg County:** Foxhole Landfill and Solid Waste Fee Schedule.
6. **EPA SMM Technical Guidance:** Foundry Sand in Transportation Applications.