

# Beneficial Reuse of a Closed Industrial Solid Waste Landfill Haywood County, North Carolina

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ENGINEERING & HYDROGEOLOGY

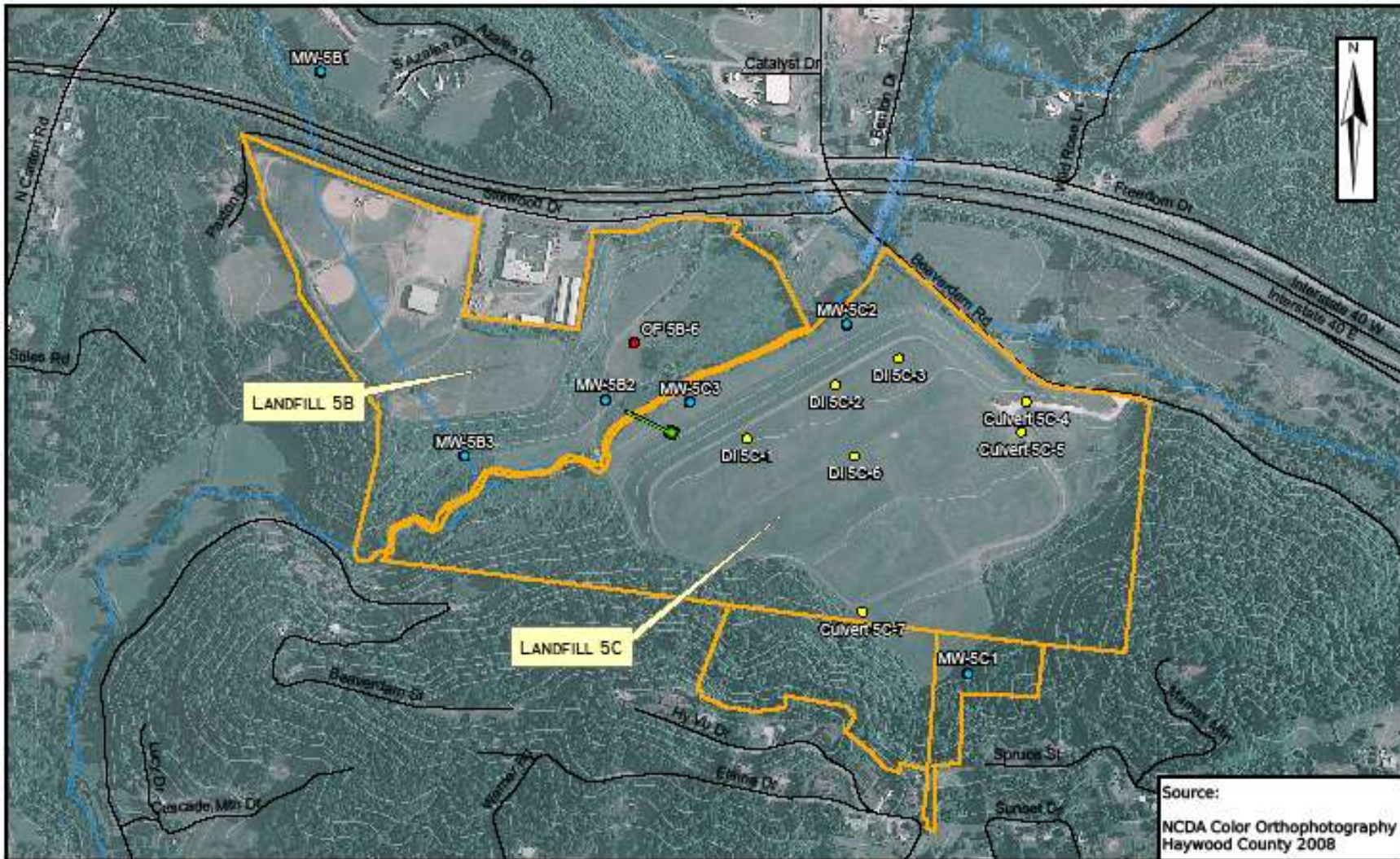
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# Landfill Re-use Project

- Brief history of site
- Overview of two separate uses (LF5B & LF5C)
- Description of livestock facility currently in construction
- Risk assessment (LFG, etc.)
- Geotechnical aspects
- Permitting



Source:  
 NCDAR Color Orthophotography  
 Haywood County 2008

- Legend**
- LF 5 Monitoring Wells
  - LF 5 Outfalls
  - LF 5 Drop Inlets and Culverts
  - LF 5 Leachate Box and Line
  - LF 5 Parcel Boundary
  - Haywood County Hydrology
  - Haywood County Roads
  - 20-foot Interval Contours

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 CLIENT: INTERNATIONAL PAPER CO.  
 DATE: 11/9/2009

SCALE  
 0 150 300 600  
 Feet

**LANDFILL 5**  
 CLOSED INTERNATIONAL PAPER LANDFILL  
 CANTON, HAYWOOD COUNTY  
 NORTH CAROLINA

FIGURE  
5

# Landfill Waste

- Lime Sludge (Calcium Carbonate)
  - Caustic treatment to neutralize chemicals used in pulping process
  - Currently produce 100K tons per year
- Boiler Ash
  - Coal and wood burning for energy production
  - Currently produce 50-60K tons per year
- Wastewater Treatment Plant Sludge
  - Both municipal and industrial WWTP Sludge
- Lesser Amounts of:
  - Cinders (bottom ash): partially burned wood/coal
  - Unburned wood chips

# Landfill Construction



# Landfill Construction



# Landfill 5B



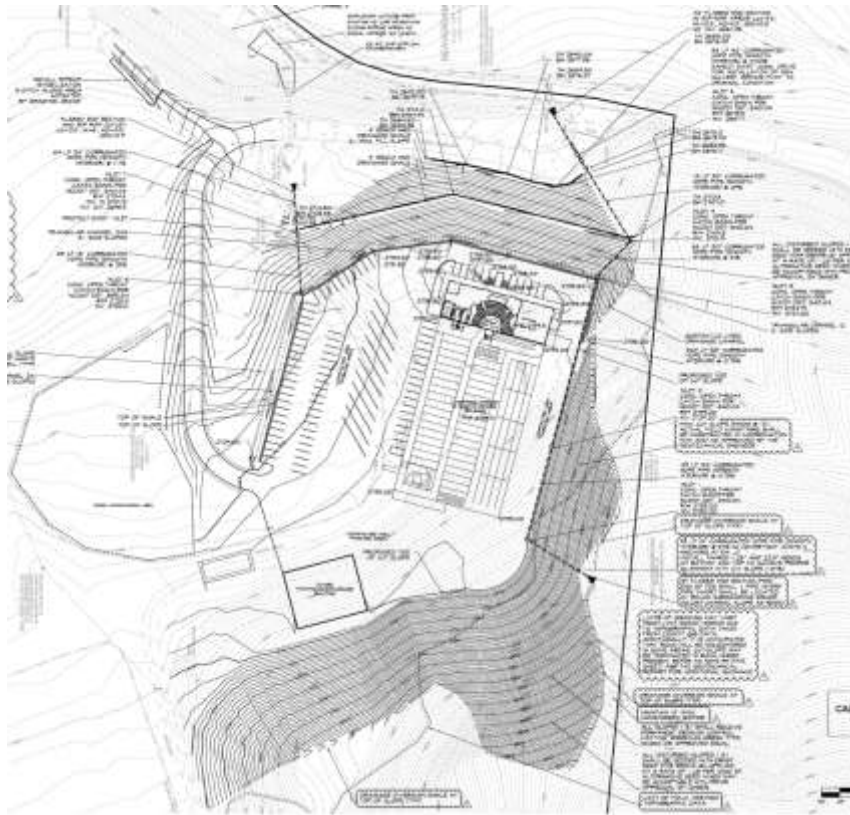
# Landfill 5C



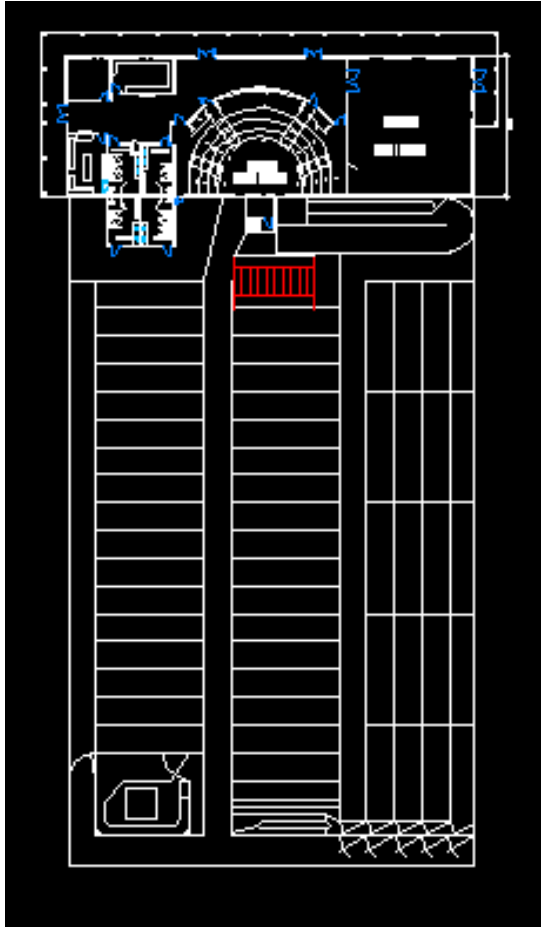
# Reuse Propositions

- Llama Farm
- Motorsports Facility
- AKC Beagle Trials Area
- Sports Complex
- Used for Hay Production Since Closure

# Western North Carolina Regional Livestock Center

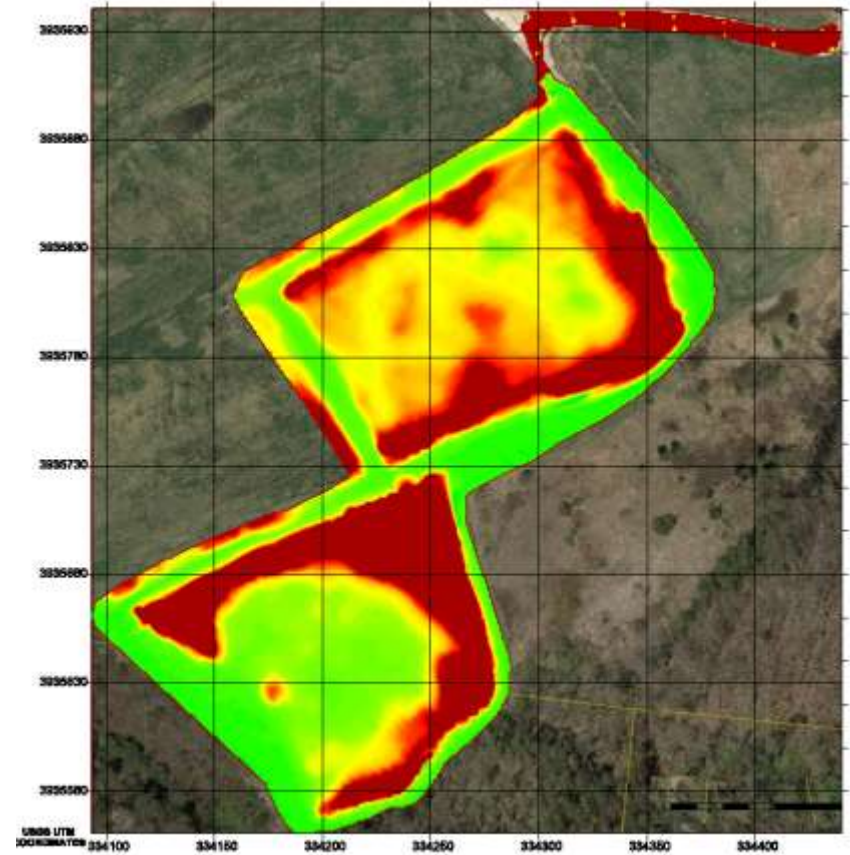


# Site Operation and Layout



- Total square footage: 46,500 square feet
- 38,500 square feet is open-air livestock holding and loading area
- Offices, gathering area, and ticket booths in covered area

# GPR and Electromagnetic Investigation



# Risk Assessment

- Composite Sample of Waste
  - Waste sample from two cells at facility location
  - EPA Method 610 (ICP Metals)
  - EPA Method 7471 (Mercury)
  - EPA Method 8270 (SVOCs)
  - EPA Method 8260 (VOCs)
  - pH
  - EPA Method 600/R-93/116 (Asbestos)
  - Modified EPA 8290 (Dioxin Congeners)
  - Fecal Coliform
  - Organic Halides

# Risk Assessment

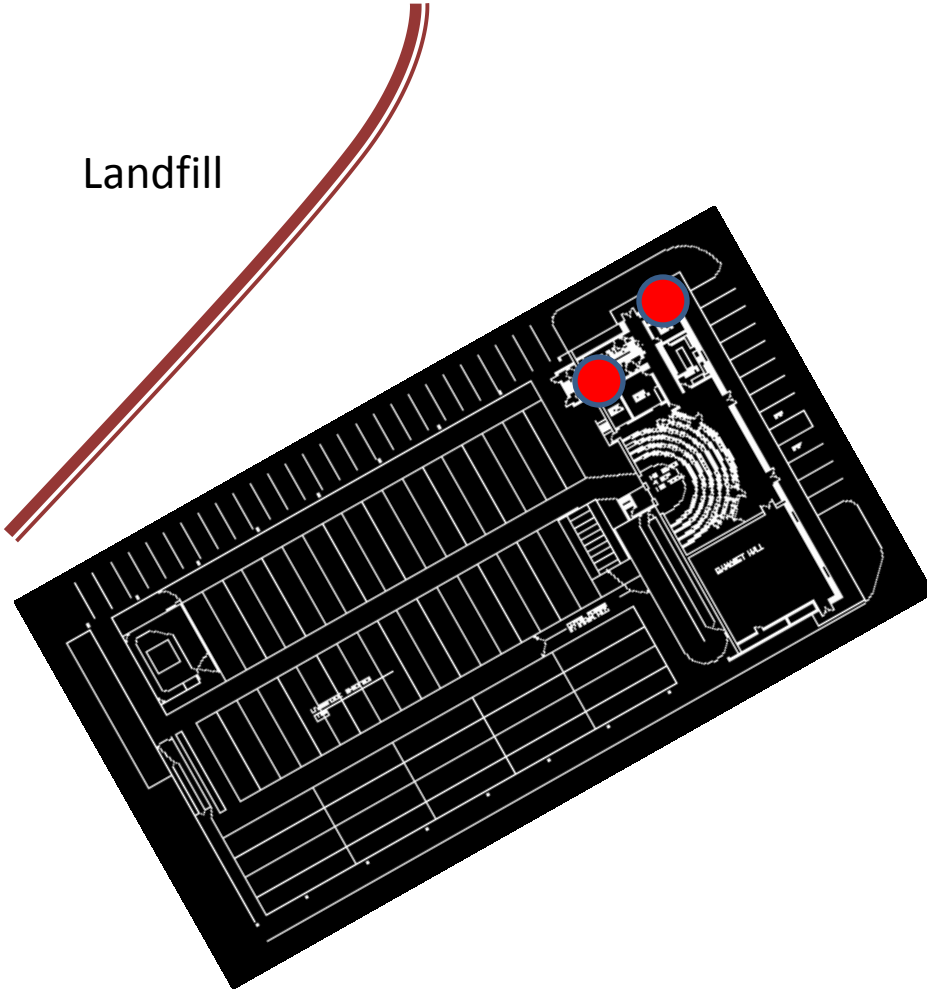
- Landfill Gas
  - Initiated the collection of ambient methane readings at LF5B (existing public use)
    - Identified consistent LFG readings at two culvert locations and installed perimeter fencing
  - Installed “investigative” LFG probes within waste on both cells and at the proposed livestock facility location
  - Developed a LFG Monitoring Plan

# Landfill Gas Monitoring Plan

- Coordinated with DENR to refine 15A NCAC 13B .0503 requirements:
  - Compliance boundary spaced at 500' intervals along perimeter
  - No more than 250' from the waste boundary
  - At least 50' within the property boundary
  - Initially proposed clustered wells when vadose zone is >30'. Recently, DENR proposes one long screen.
    - If LFG is detected, then DENR may recommend discreet zones to be established

# Continuous Landfill Gas Monitoring

Landfill



- Honeywell E3M Sensor linked to fire alarm
- Alarm 1 (Audible): 10% LEL. HVAC to run at full outside air mode until 5% LEL.
- Alarm 2 (Audible and Visual): 25% LEL. Evacuation and emergency response.

# Further Risk Assessment

- H<sub>2</sub>S (hydrogen sulfide) and LEL
  - Common contaminant in paper mill landfills
  - RAI four-gas monitor: (LEL, H<sub>2</sub>S, CO, and O<sub>2</sub>)



# Geotechnical Investigation

- 20 soil test borings with Standard Penetration Testing
- Consolidation Testing for total and differential settling in select locations
- Atterberg limits and natural moisture content to determine soil plasticity
- Standard Proctor testing to determine soil compaction characteristics and suitability of material as structural backfill
- Observation pits in borrow area to estimate volume of cut generated
- Triaxial shear stress tests to determine:
  - Strength parameters of waste
  - Borrow material slope stability analysis

# Geotechnical Design

- Fill ranging in thickness from two to 15 feet will be placed over capped landfill cells
- Slopes at the facility range from 1.5H:1V for cut slopes and 4H:1V for slopes over landfill waste
- Fill over landfill waste will be placed as a geogrid reinforced earth-raft. Construction of earth-raft consists of:
  - Carefully grubbing root mat and topsoil from the landfill cap
  - Smoothing and compaction the level surface
  - Installation of TriAx TX 170 geogrid
  - Eight-inch soil lifts to finish subgrade elevation compacted to 98% proctor to within two-feet of final subgrade and 100% proctor for the final two-feet.
- Eight inches of total and differential settlement could be experienced in the areas of greatest fill over the landfill cells. Parking and driveway areas will be paved with a minimum of eight-inches of crushed aggregate base compacted to 100% of its standard proctor maximum dry density, ASTM D698.

# Solid Waste Section Permitting

- Development of the Request for Permit Modification (RPM) triggered a DENR facility compliance audit.
  - NOV issued for unpermitted activities on LF 5B
  - NOV response was then integrated into the RPM
- DENR was very responsive and cooperative throughout.
- RPM submitted October 28, 2009. Permit to Construct issued on January 27, 2010.







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