



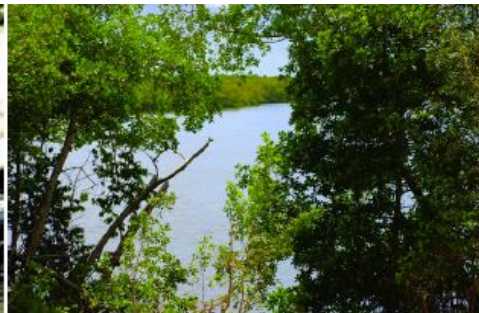
Baker Park Site Risk Assessment Analysis

50 Riverside Circle, Naples, FL

City of Naples

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I. Background





ALTERNATIVE SITE PLAN "G"



II. Geotechnical Considerations

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Pictures of Cesar Chavez Park (Berkeley, CA), Freshkills Park (New York), and Millennium Park (West Roxbury, MA), all developed on landfills

Park Fill Constituents

- Horticultural Materials
- Lime sludge
- Localized rubble and debris
- Dredge Spoils



Primary Geotechnical Considerations

- Ground Movement
- Long-term total and differential settlement
 - Decay and decomposition of organic materials
 - Compression of weak lime sludge
 - Soil migration into rubble/debris zones

Geotechnical Impacts and Maintenance

- Buildings and Structures
 - Lightly loaded masonry or concrete structures
 - Will undergo total and differential settlement
 - Will require a methane venting system
 - Deep foundation support - least long-term maintenance option
 - Driven piles are preferred
 - Avoid cast-in-place piles because of uncontrollable grout/concrete quantities
 - Post-tensioned foundation/slab or reinforced mat
 - Construct on engineered fill section
 - Periodic maintenance can include crack patching and painting (limited movement) to underpinning/slab jacking (more severe movement)

Geotechnical Impacts and Maintenance

- Wood framed structures
 - Supported by individual piers/shallow foundations and include a crawlspace
 - Would require periodic releveling to offset ground movement
 - Utilities can be attached to framing system or placed on the ground
 - Passive methane venting system within crawlspace

Geotechnical Impacts and Maintenance

- Pavements and Walkways
 - Parking lots, slabs-on-grade, sidewalks, walkways
 - Use flexible systems wherever possible (asphalt pavements, concrete pavers, reinforced turf/grass blocks, gravel/shell)
 - Use engineered fill section for support and geotextiles wherever possible
 - Maintenance issues will primarily be associated with releveling of localized ground settlement and backfilling drop-out/potholes

Geotechnical Impacts and Maintenance

- Underground Utilities
 - Flexible connections to buildings
 - Pile support manholes and other utility structures to eliminate movement and future maintenance
 - Support utility structures on engineered fill section in lieu of piling (increased maintenance issues)
 - Use flexible piping (HDPE) between structures
 - Long-term maintenance can include re-establishing hydraulic grade or flow, replacement or reconnection (joint repairs) of pipe sections, relevel structures

Geotechnical Impacts and Maintenance

- Lawn Areas and Sloped Surfaces
 - Hills/elevated lawn areas, terraced slopes and Gordon River shoreline
 - Slope stability evaluations can be used to evaluate slope ratios and the need for reinforced slopes
 - Localized slope or slope face failures from ground movement
 - Long-term maintenance can include filling, regarding and resodding of depressions, drop-outs, and larger areas of localized subsidence
 - Use of geotextile fabric between unsuitable materials and final cover soils to help mitigate ground movement
- Earth Retaining Structures
 - Retaining walls are sensitive to movement, so the walls will have to be pile supported or unsuitable materials removed

Geotechnical Impacts and Maintenance

- Potential Ground Improvement Techniques
 - Successful ground improvement techniques will be limited since a large constituent of the made-land is horticultural materials that will decay and decompose over time
 - Grouting - not recommended because of uncontrolled grout volume within the filled zone
 - Soil Mixing - could be considered because this technique provides a targeted and improved, grouted soil column. Can be used under individual foundations or to improve small areas
 - Dynamic Deep Compaction (DDC)
 - Applicable to larger areas
 - Uses dynamic energy (a dropped weight) to crush and displace underlying materials
 - Would be used to drive and create a sand/gravel plug into the upper section of the filled zone for support of walkways, pavements, and possibly light structures
 - Compresses underlying material that will restrict oxygen and water infiltration to slow the decay process

Geotechnical Impacts and Maintenance

- Geotextiles
 - Geotextiles (fabrics and geogrids) can provide benefit to these types of developments
 - Soil Stabilization and strength increase
 - Reduction in soil migration into the unsuitable materials
 - Slope stability
 - Retaining wall reinforcement
 - Reinforced slopes



III. Environmental Considerations

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Pictures from North Wake Landfill Park in North Raleigh

Primary Environmental Considerations

- Hazards of landfill gas
 - Risk of fire and/or explosion associated with ignition of methane in confined space
 - Health risks associated with non-methanogenic organic constituents (NMOCs)

- Risk of waste byproduct migration through soil, groundwater, or the atmosphere

- Additional moisture added to the landfill for soft-use redevelopment
 - Enhanced gas generation and settlement rates
 - “Reactivate” degradation of organic materials

Screening Level Human Health Risk Assessment — Air and Soil Gas

- Methane (CH₄)
 - Combustible in air with enough oxygen and ignition source in confined space
 - Potential for explosion in confined spaces: 5-15% by volume

- Non-Methane Organic Compounds (NMOCs)
 - May be present in landfill gas due to the existence of data gap

- Recommendation
 - Landfill gas mitigation control BMPs
 - Vapor recovery systems, vapor barriers, methane alarms
 - Site safety plans for use during site construction activities



Screening Level Human Health Risk Assessment — Soil

- **All the detected constituents** were eliminated from further consideration
- Data gaps exist in the available soil dataset
- Recommendation
 - Collection of coherent dataset using Incremental Sampling Methodology
 - Soil and groundwater management plan for use during site construction activities

Screening Level Human Health Risk Assessment — Groundwater

- While COPCs exceeded GCTLs in groundwater, the COPCs (iron, aluminum, and nitrogen-containing compounds) have little toxicity by routes other than ingestion
- Leachate (primarily ammonia, aluminum, and iron) may potentially represent a threat to the aquatic environment
- Data gaps exist in the available groundwater dataset
- Recommendation
 - Eliminating the use of Site groundwater for potable purposes
 - Soil and groundwater management plan for use during site construction activities
 - Short-term groundwater monitoring program
 - Stormwater pond design with minimal percolation



Recommendations for Best Management Practice (BMPs)

- Landfill gas mitigation control
 - Design and implementation of an active or passive gas collection system beneath any confined space at the site (e.g., restrooms, café, etc.)
 - Potentially, a subslab liner could be used in conjunction with the gas collection system
 - A methane alarm system could be included
 - Development of a BMP O&M manual is recommended (including inspection and maintenance schedules)
 - Development of a site safety plan for construction activities
- Groundwater Impact Monitoring and Mitigation Plan
- Credit for Brownfield Redevelopment
- Applicable Guidance
 - Guidance for Disturbance and Use of Old Closed Landfills or Waste Disposal Areas in Florida (FDEP, 2011)



Questions?

