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Stormwater Case Studies in Rhode Island

Igor Runge, Ph.D., P.H.
Senior Consultant
GZA GeoEnvironmental, Inc.



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- **What is Stormwater Runoff?**
 - Precipitation that runs off surfaces such as rooftops, paved surfaces, impervious areas, snow melt . . .





• Why is stormwater an issue?

- Can contaminate and spread contamination
- Sediment and erosion (migration)
- Non-point source pollution
- Temperature altering



• Current Goal - Management

- Keep stormwater on site as much as practicable (detention, swales...)
- Infiltrate
- Manage contaminated sites





Georgia Institute of Technology

• What are contaminated sites?

- Land that contains contaminants in, on, or under the surface
- Potential hazards to health and the environment
- Often from historical uses (industrial sites, dumping grounds...)
- "Brownfield" land



Georgia Institute of Technology

• RI Stormwater Standards (RIPDES Requirements)

- Low Impact Development (LID)
- Groundwater recharge required
- Water quality – treat runoff (WQV)
 - 85% TSS
 - 60% Pathogens
 - 30% TP (Fresh Water)
 - 30% TN (Salt Water)
- Natural channel protection – address erosion
- Overbank flood protection





• RI Stormwater Standards (RIPDES Requirements)

- Redevelopment/infill – 50% rule
- Pollution prevention measures (source controls)
- Land used with higher potential pollutant loads (gas stations, dumps...)
- Illicit discharge
- Construction erosion and sedimentation control
- Stormwater management system – Operation and Management Plan



• Management of contaminated sites

- All are unique
- Types of contaminants present (biodegradable? flammable?...)
- Differentiate between “clean” and “dirty” areas
- Minimize run-off (infiltrate)
- But, infiltration not possible at many contaminated sites





Integrating Environmental and Infrastructure Solutions

Environmental Solutions | Infrastructure Solutions | Environmental Solutions | Environmental Solutions

Case Study 1 – South Street Substation

- Located along the Providence River in Providence, RI
- Rebuild of existing substation (5+ acres); included:
 - Demolition of existing substation and control house
 - Construction of new building
 - Relocation of existing overhead transmission line below ground



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Case Study 1 – South Street Substation

- RIDEM regulated site due to contamination from prior uses - brownfields
 - Excavate/remove certain contaminated soils
 - Install engineered cap (impermeable barrier) – selective?





Engineers • Planners • Scientists • Environmentalists

• Stormwater Management Challenging

- Infiltration questionable – soil contaminated with various constituents
- Groundwater samples revealed only low-level impacts
- Providence River in this area is impaired water (303d list)
- Limited space



Engineers • Planners • Scientists • Environmentalists

• Stormwater Management Challenging

- Underground utilities everywhere
- Limited stormwater allowed in existing municipal system
- Impermeable liner may cause safety issues related to electrical system





Partner for sustainable Baltimore

• Final Plan

- Completed a Green/Yellow/Red assessment of infiltration suitability of soils
- Roof runoff treated separately (small infiltration basin in green area)
- Transformer area, properly located, allowed to infiltrate (yellow area)



Partner for sustainable Baltimore

• Final Plan

- Additional treatment provided by 2 infiltration trenches (to accommodate WQV) – to capture and treat as much runoff as practicable from paved surfaces





• Lessons learned

- Constant communication with regulatory agencies (RIDEM, CRMC, NBC) important
- Pre-application meeting a big benefit
- Clearly articulate existing conditions and offer possible treatment alternatives – and then discuss



Case Study 2 - Energy Facility Infrastructure Modifications

- Work on a portion of a 42-acre parcel
- Located along the Providence River in Providence, RI
- Modifications to an existing facility
 - Construction of a new building
 - Building approximately 11 feet above existing ground level
 - Installation of over 400 piles
 - Considerable existing underground infrastructure
- RIDEM regulated site due to contamination
 - Metals, coal tar, organics
 - Work to comply with Soil Management Plan





• Stormwater Management Challenges

- Considerable new impervious areas – access roadways
- Infiltration not possible – entire site contaminated (and GW)
- Impaired receiving water (metals, fecal coliforms, TN) – no infiltration
- Limited space for management system
- Sea level rise considerations



• Final Plan

- Provide a subsurface conveyance system to capture all runoff
- Route to a lined sediment forebay pre-treatment basin and lined sand filter
- Discharge to impaired water required additional treatment or compensation
 - Metals, Bacteria, Phosphorus
 - Infiltrate 100% or treat and compensate 1:1
 - Nitrogen
 - Treat and compensate 1.5:1
- Space limitations did not allow increasing sand filter size to treat larger WQV
 - WQV - 1 inch of runoff (1.2 inches precipitation)
- Conducted dynamic analysis to demonstrate proposed system would capture and treat required WQV – size of filter did not have to increase



- **Lessons learned**

- Understand intent of requirements and design accordingly
- Pre-application meeting important
- Constant communication with all regulatory authorities