Stormwater Case Studies in Rhode Island

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

• 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
• **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

• **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
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

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?
• **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

• **Stormwater Management Challenging**
  - Underground utilities everywhere
  - Limited stormwater allowed in existing municipal system
  - Impermeable liner may cause safety issues related to electrical system
• 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)

• 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