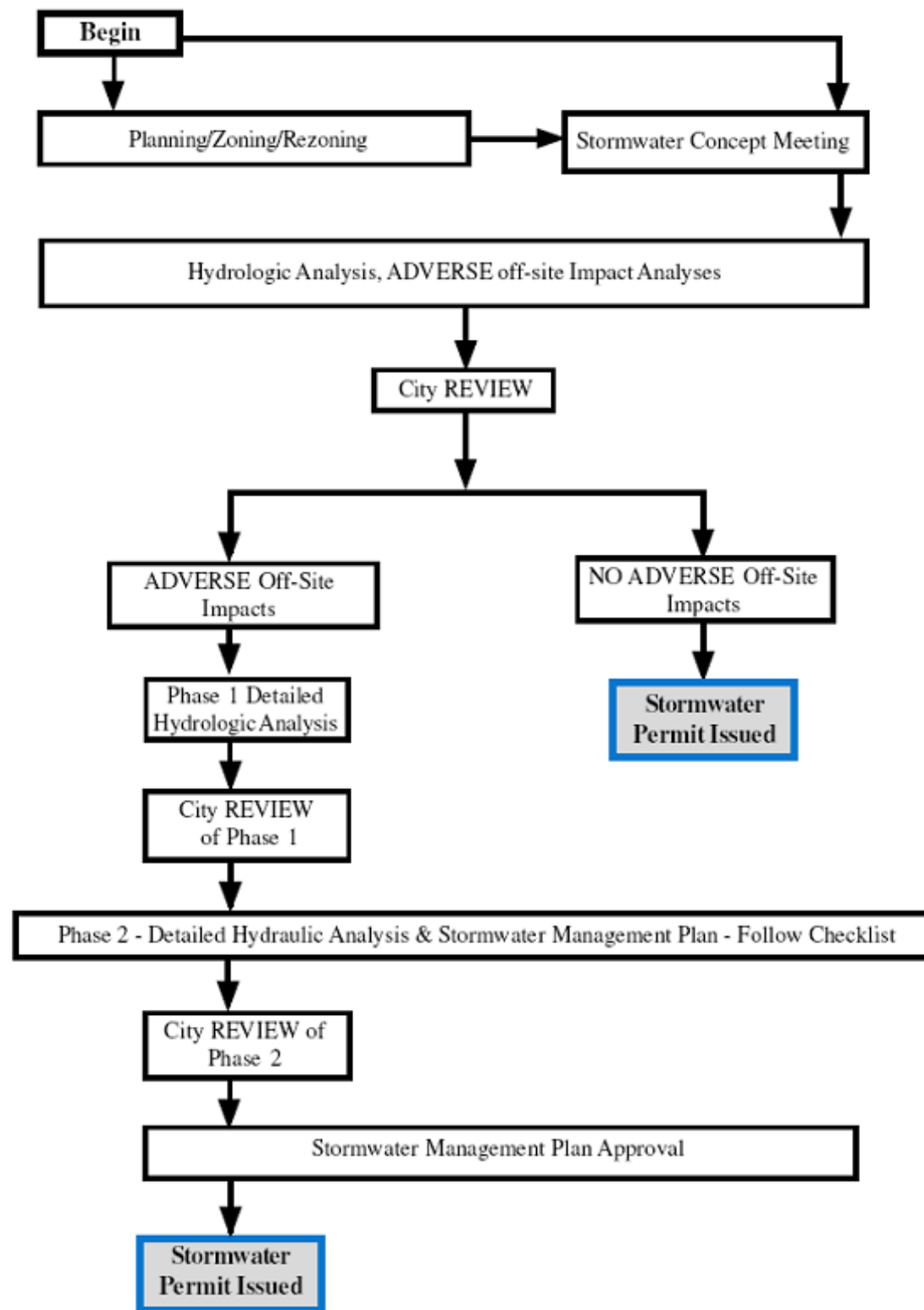




Winston-Salem Stormwater Review Process & Application

September 19, 2008





Stormwater Management Permit Application

- Sections 1 - 4:
 - Project administrative information
- Section 5:
 - Financial Security information
- Section 6:
 - Stormwater Management Concept Meeting
 - Recommended but not mandatory
 - Informal yet informative
 - Basic information



Stormwater Management Permit Application

➤ Section 7:

- **No Adverse Impacts Analysis**
 - Pre and Post hydrologic analysis to determine flows
 - Hydraulic impact analysis
 - 10% Guideline
 - Road crossings – level of service
 - Impounding structures
 - Structure flooding
 - Stream stability



Stormwater Management Permit Application

➤ Section 8:

- **Hydrologic Analysis – design flows**
 - Pre and Post hydrologic analysis
 - Detailed and complete data
 - Detailed methodology
 - Hard copy summaries
 - Digital models
 - Project narrative
 - Organized reports
 - Verify hydrology before designing



Stormwater Management Permit Application

➤ Section 8 (cont'd):

- **Hydraulic Analysis – SWM system design**
 - Hydraulic analysis of individual components
 - Hydraulic analysis of whole system
 - Detailed and complete data
 - Detailed methodology
 - Hard copy summaries
 - Digital models
 - Project narrative
 - Organized reports



Stormwater Management Permit Application

➤ Section 8 (cont'd):

- **Extended Detention Volume using NRCS methods**
 - Drainage area (DA), (convert to square feet)
 - Pre & post CNs
 - P(inches) = 4.06" (25-yr, 6-hr storm event, NWS website)
 - Initial abstraction: $S = (1000/CN) - 10$
 - Runoff depth (inches): $Q^* = (P - .2S)^2 / (P + .8S)$
 - Runoff Volume (CF): $Vol. = (Q^*/12) \times (DA)$
 - Required Storage = Post Volume – Pre Volume



Stormwater Management Permit Application

➤ Section 8 (cont'd):

- **Extended Detention Drawdown**
 - Minimum – 48 hrs, Maximum – 120 hrs
 - HR Malcom methods
 - Stage/storage function
 - Stage/discharge function
 - Chainsaw route drawdown to determine drawdown time
 - Possibly other routing techniques



Stormwater Management Permit Application

➤ Section 9 and following:

- **Detailed Site Plan**
 - Ensure all checklist items are addressed
 - Match construction docs to Section 8 stormwater plan
 - Incorporate SW quality components – follow State BMP manual
 - SWM System Maintenance Plan
 - Coordinate with Erosion & Sediment Control plan
- **Construction & As-built documentation**
 - Project wrap-up paperwork



Stormwater **Quantity** Management

➤ New Regulations Address:

- Mitigate downstream flows – reduced flooding
- Mitigate flood damage costs
- Mitigate stream degradation – less channel stress
- Improve groundwater recharge
- Restore base flow regime – improve aquatic habitat



Stormwater **Quality** Management

➤ New Regulations Address:

- Improve aquatic environment - Cleaner water
- Improve riparian environment - Buffers
- Reduce pollutant discharge
 - Improved water quality
 - Reduced costs to provide clean, potable water
- Reduce trash and debris
- Reduce organic material
- Meet State and Federal requirements



Stormwater Management

➤ Related programs:

- **State requirements**

- CWA-401 – Water Quality Certification
- Dam Safety
- Water Supply Watershed Protection

- **Federal requirements**

- NPDES – Non-Point Source Pollution
- CWA-404 – Wetlands impacts
- FEMA – NFIP – Floodplains, floodways



Stormwater Management

➤ Related issues:

- **Continually improving technology**
 - BMPs, design techniques, design data, standards
- **Low Impact Development**
 - Address issues closer to the source
- **Maintenance**
 - Long-term maintenance
 - Homeowner Associations
- **Stormwater management in perpetuity**



Questions ?