**1. Challenge: Declining Stream Base Flow - Surface Water- Natural page 1 of 3**

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| **Solution** | **Action Step** | **Is solution still relevant based on data or current plan document (Y/N)** | **Ordinance or Plan that addresses solution or action step** | **Additional Comments** |
| A. Decrease Well Withdrawal | Implement water conservation measures |  |  |  |
|  | Encourage more well fields |  |  |  |
| B. Increase Groundwater Recharge | Encourage BMP’s for stormwater recharge |  |  |  |
|  | Beneficial reuse of wastewater |  |  |  |
| C. Protect Sinkhole Recharge Areas | Overlay Zoning |  |  |  |
|  | Modify subdivision and land development processes |  |  |  |
| D. Restore and Protect Riparian Areas | Plant trees to increase stream cover and reduce evaporationSame as 3.1 |  |  |  |
|  | Implement voluntary landowner management programs (also mentioned under sedimentation challenge) |  |  |  |
|  | Discourage removal and encourage restoration buffer in subdivision and land development process |  |  |  |
|  | Establish buffer widths to filter sediments |  |  |  |
|  | Establish riparian buffer conservation zone |  |  |  |
| **1.** **Challenge: Declining Stream Base Flow** **-Surface Water - Natural page 2 of 3**  |
| **Solution** | **Action Step** | **Is solution still relevant based on data or current plan document (Y/N)** | **Ordinance or Plan that addresses solution or action step** | **Additional Comments** |
|  | Create municipal ordinance or overlay zone to protect buffers |  |  |  |
|  | Explore municipal conservation options |  |  |  |
|  | Purchase or acquire riparian buffers |  |  |  |
|  | Works with Clearwater Conservancy or other land trust to discuss easement options |  |  |  |
|  | Acquire trees through CBF and Conservation District |  |  |  |
|  | Organize volunteer groups to help plant (Boy scouts, schools, civic clubs) |  |  |  |
| E. Educate individual landowners | Establish educational series through newspapers |  |  |  |
|  | Identify riparian landowners and create mailing |  |  |  |
|  | Hold public meetings about riparian importance |  |  |  |
|  | Utilize school system to spread the word through students |  |  |  |
|  | Educate landowners about sinkholes (groundwater) |  |  |  |
| **1. Challenge: Declining Stream Base Flow** -**Surface Water - Natural page 3 of 3**  |
| **Solution** | **Action Step** | **Is solution still relevant based on data or current plan document (Y/N)** | **Ordinance or Plan that addresses solution or action step** | **Additional Comments** |
| F. Educate land developers | Offer workshops for developers |  |  |  |
|  | Initiate an Open Space trading program in the watershed |  |  |  |
|  | Establish density trading for riparian protection during development |  |  |  |
| G. Stabilize Stream banks | Moved to 2.C |  |  |  |
| H. Encourage Ground Water Recharge -Marshes and Springs (Moved from Natural discharge challenges) | Beneficial reuse of treated wastewater |  |  |  |
|  | Stormwater management |  |  |  |
| New Solution |  |  |  |  |

**2. Challenge: Increased Sedimentation – Surface Water – Natural page 1 of 1**

|  |  |  |  |  |
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| **Solution** | **Action Step** | **Is solution still relevant based on data or current plan document (Y/N)** | **Ordinance or Plan that addresses solution or action step** | **Additional Comments** |
| A. Manage Stormwater more effectively | Encourage onsite recharge instead of retention and dischargeSame as #1 B |  |  |  |
|  | Encourage BMP’s in new developments  |  |  |  |
| B. Manage Agricultural Lands more effectively | Encourage streambank fencing on agricultural lands |  |  |  |
|  | Promote contour farming |  |  |  |
|  | Work with Conservation District to acquire funding supplies and plants for projects |  |  |  |
|  | Work with PVCA to establish a program like theirs |  |  |  |
| C. Stabilize Streambanks | Plant native woody species with deep roots to stabilize soil. |  |  |  |
| Restore and Protect Riparian BuffersMoved to 1.D |  |  |  |  |

**3. Challenge: Thermal Modifications – Surface Water Natural page 1 of 1**

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| **Solution** | **Action Step** | **Is solution still relevant based on data or current plan document (Y/N)** | **Ordinance or Plan that addresses solution or action step** | **Additional Comments** |
| A. Decrease heated stormwater and impervious surface | Encourage Smart Growth Patterns over sprawl |  |  |  |
|  | Decrease parking requirements & encourage shared parking through ordinances  |  |  |  |
|  | Infiltrate stormwaterSame as 2. A |  |  |  |
| B. Identify and Fix warm point sources | Review NPDES 1 permits and to determine permit discharges |  |  |  |
|  | Identify other non-permitted point source discharges |  |  |  |
|  | Identify funding for retrofits |  |  |  |
| New Solution |  |  |  |  |
| **4. Challenge: Declining Biotic Community – Surface Water Natural** |
| Restore and protect Riparian buffers moved to 1.D  |  |  |  |  |
| Reduce and/ or remove sediment from streamsMoved to 2. |  |  |  |  |
| Create Instream habitat | Add riprap, boulders, woody debris to streams |  |  |  |
| New Solutions |  |  |  |  |
| 5. Challenge: Riparian Buffer Removal moved to 1.D and 2.B and 6.Challenge Riparian Buffer Protection moved to 1.D |

**Surface Water – Engineered Design 1. Challenge: Ineffective Stormwater Management page 1 of 2**

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| **Solution** | **Action Step** | **Is solution still relevant based on data or current plan document (Y/N)** | **Ordinance or Plan that addresses solution or action step** | **Additional Comments** |
| A. Implement Act 167 Stormwater Management Plan by Municipal Ordinance |  |  |  |  |
| B, Offer incentives for BMP Use  | Tax Breaks |  |  |  |
|  | Higher density open space development |  |  |  |
| C. Devise innovative technologies for better stormwater management |  |  |  |  |
| D. Encourage Stormwater BMP’s (moved from Groundwater 4. A) | Utilize Act 167 ordinance guidelines |  |  |  |
|  | Educate developers about varieties of BMP’s and express environmental benefits |  |  |  |
| Offer incentives to reduce Impervious cover in new development (moved from Groundwater 4.A) | Tax incentives, lower costs, higher densities, etc. |  |  |  |
| Create municipal ordinance requiring specific percentage of open space in new developments (moved from Groundwater 4.A) | Work with municipalities that already have one or more: Patton – 50% in RPA; 35% for Gray’s Woods |  |  |  |
| Retrofit existing highly impervious developments (moved from Groundwater 4.A and Natural discharges Marshes and Springs) |  |  |  |  |
| **Surface Water – Engineered Design 1. Challenge: Ineffective Stormwater Management page 2 of 2** |
| **Solution** | **Action Step** | **Is solution still relevant based on data or current plan document (Y/N)**  | **Ordinance or Plan that addresses solution or action step** | **Additional comment** |
| Reduce Impervious surface in new developments ( moved from Natural Recharge Marshes and Springs) |  |  |  |  |
| New Solutions |  |  |  |  |

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| **Surface Water Engineered 2. Challenge: Existing Malfunctioning Stormwater Basins Page 1 of 1** |
| **Solution** | **Action Step** | **Is solution still relevant based on data or current plan document (Y/N)** | **Ordinance or Plan that addresses solution or action step** | **Additional Comments** |
| A. Identify priority basins & stormwater problems through GIS and onsite analysis | Identify sources of problems and affected areas |  |  |  |
|  | Develop a ranking system to prioritize projects |  |  |  |
| Secure funding for retrofit projects | Determine cost of retrofit for specific priority areas |  |  |  |
|  | Identify sources of funding to retrofit problem areas |  |  |  |
| Find available technical assistance | Volunteer experts in the community |  |  |  |
|  | Organizations with expertise |  |  |  |
|  | Other communities with similar problems/experiences |  |  |  |
| Work through the municipalities | Use municipal engineers to identify and prioritize problem areas |  |  |  |
|  | Municipalities may be elidable for funding to retrofit problem areas through DCED. |  |  |  |
| New Solutions |  |  |  |  |

**Groundwater – Natural Recharge**

**Sinkhole- Point Recharge**

**1. Challenge: Sinkhole Protection Page 1 of 3**

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| **Solution** | **Action Step** | **Is solution still relevant based on data or current plan document (Y/N)** | **Ordinance or Plan that addresses solution or action step** | **Additional Comments** |
| A. Create municipal zoning or subdivision through non-disturbance and buffers |  |  |  |  |
| B. Educate Landowners | ID landowners with sinkholes on their property and inform on best care and keeping clean |  |  |  |
| C. Discourage use of sinkholes for stormwater management | Identify the connection of specific sinkholes from source to mouth to determine groundwater flow and impact on drinking water. |  |  |  |
|  | Encourage BMP’s for streams and swales discharging to sinkholes |  |  |  |
| **2. Challenge: Sinkhole Cleanup** |
| A. Organize Cleanup Days | Build upon Clearwater Conservancy’s annual watershed clean up day |  |  |  |
|  | Partner with PA Cleanways to develop Centre County Chapter |  |  |  |
|  | Focus municipal attention on sinkholes, potentially through MS 4public involvement and outreach |  |  |  |
|  |  |  |  | **Page 2 of 3** |
| **Solution** | **Action Step** | **Is solution still relevant based on data or current plan document (Y/N)** | **Ordinance or Plan that addresses solution or action step** | **Additional Comments** |
| Educate landowners about Sinkholes ( moved to 1.E surface flow) and reference groundwater in education |  |  |  |  |
| B. Fine illegal dumpers | Monitor known problem areas |  |  |  |
|  | Work with Centre County Solid Waste Authority |  |  |  |
| **Groundwater 3. Challenge: Sponge Recharge** |
| A. Identify sponge areas using GIS and onsite analysis | Works with local engineers and hydrologists to identify specific criteria for identifying critical recharge areas |  |  |  |
|  | US GIS to map these areas |  |  |  |
| B. Educate Landowners | Meet with landowners when necessary to discuss GIS findings and ground truth the information for potential protection |  |  |  |
| C. Develop methods to protect sponge areas | Municpal overlay ordinance on subdivision and land development ordinance |  |  |  |
|  | Place conservation easement on identified sponge areas |  |  |  |
|  | Purchase or acquire critical recharge areas through land trusts or similar groups |  |  |  |
| New Solution |  |  |  |  |

**Groundwater Diffuse Recharge**

**4. Challenge: Increased Impervious surface page 3 of 3**

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| **Solution** | **Action Step** | **Is solution still relevant based on data or current plan document (Y/N)** | **Ordinance or Plan that addresses solution or action step** | **Additional Comments** |
| Encourage use of stormwater recharge BMP’s ( moved to Surface Water – Engineered Design 1. Challenge: Ineffective Stormwater Management |  |  |  |  |
| New solution |  |  |  |  |
| **5. Challenge: Groundwater Contamination** |
| A. USE GIS to Map known contamination sites | DEP is examining contamination and may have this available |  |  |  |
| B. Identify sources of contamination |  |  |  |  |
| C. Cleanup known contamination |  |  |  |  |
| D. Continue to monitor contamination sites |  |  |  |  |
|  New Solution |  |  |  |  |

**Natural Discharge**

**1. Challenge- Springs Page 1 of 1**

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| **Solution** | **Action Step** | **Is solution still relevant based on data or current plan document (Y/N)** | **Ordinance or Plan that addresses solution, action step** | **Additional Comments** |
| A. Identify all contaminated spring sources |  |  |  |  |
| B. Cleanup contaminated springs | Identification will require historical knowledge of previous industries and the geologic system |  |  |  |
| C. Continue monitoring contaminated springs after cleanup | Ground water monitoring will be necessary to trace the potential flow of contaminants |  |  |  |
| D. Establish an alert system for unacceptable changes |  |  |  |  |
| **2. Challenge: groundwater recharge -Wetland and Marshes** |
| A. Encroachment from Development | Identify and prioritize wetland and March areas using GIS and onsite analysis |  |  |  |
|  | Place conservation easements on priority wetlands, marshes and buffering properties where appropriate.  |  |  |  |
| Encourage groundwater recharge (moved to 1.H Declining stream base flow) |  |  |  |  |
| Reduce Impervious surfaces in new developments (moved to Surface Water – Engineered Design1. D Ineffective stormwater management |  |  |  |  |
| Retrofit existing highly impervious development (moved to Surface Water – Engineered Design1. D Ineffective stormwater management |  |  |  |  |
| New Solution |  |  |  |  |