# Tracking Runoff and Pollutant Reductions

MIDS Work Group Meeting

January 21, 2011

p-gen3-12l

# Presentation Outline

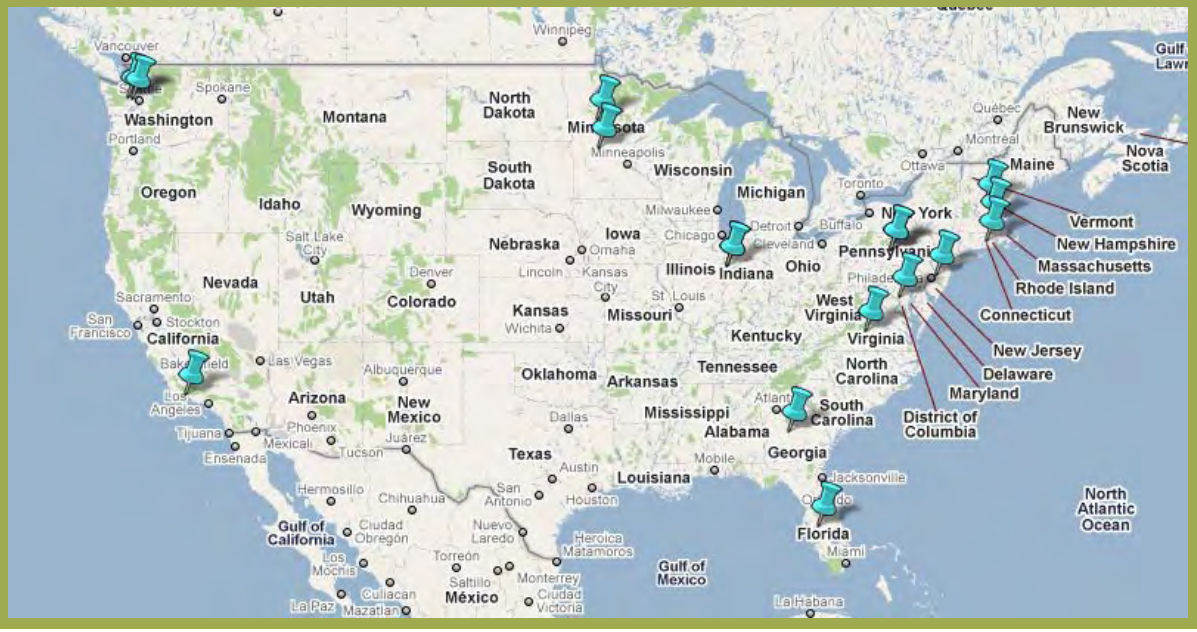
- Review Draft Memo
- Demonstrate Virginia Spreadsheet
- Receive Feedback

# Draft Memo
## System Selection for Screening

- Over 20 systems found
- Selection for screening based on:
  - Level of documentation
  - Applicability to site development
  - If two systems similar, only one chosen

# Draft Memo
## Selected 15 Systems for Screening

- City of Seattle
- Georgia
- Florida
- Kitsap Co., WA
- Maryland
- Massachusetts
- Minnesota
- New Hampshire
- New Jersey
- Pennsylvania
- Purdue University
- Rhode Island
- Stearns Co., MN
- Ventura Co., CA
- Virginia



# Draft Memo
## Initial Screening

Reviewed 15 systems for Goal(s):

- Pollutant Loading
- Groundwater Recharge Volume
- Water Quality Volume/Stormwater Runoff Volume
- Channel Protection Volume
- Stormwater Runoff Rate

# Draft Memo
## Initial Screening

Rated 15 systems by:

- Native Hydrology Mimicry
- LID Promotion
- Pollutant Loading Estimation
- Scientific Evaluation
- User Friendliness
- Input Standardization
- BMPs in Series (Treatment Train) Inclusion

# Draft Memo
## Selected 6 Systems for Further Evaluation

- Florida
- Kitsap County, WA
- Pennsylvania
- Purdue
- Stearns County, MN
- Virginia

# Draft Memo
## System Documentation

| Entity | Methodology Procedure Guidance | Methodology Calculator Instructions | Spreadsheet Calculator | Web-Based Calculator |
|---|---|---|---|---|
| Florida | Fair | None | None | None |
| Kitsap Co. | Excellent | Excellent | Excellent | None |
| Pennsylvania | Good | None | None | None |
| Purdue | Excellent | Excellent | Excellent | Good |
| Stearns Co. | Good | None | Good | None |
| Virginia | Good | Good | Excellent | None |

# Draft Memo
## System Foundations & Performance Standards

| Entity | Goal | | |
|---|---|---|---|
| | Water Quality Volume/ Stormwater Runoff Volume | Stormwater Runoff Rate | Pollutant Loading |
| Florida | | | X |
| Kitsap Co. | X | X | |
| Pennsylvania | X | X | X |
| Purdue | X | | X |
| Stearns Co. | | | X |
| Virginia | X | X | X |

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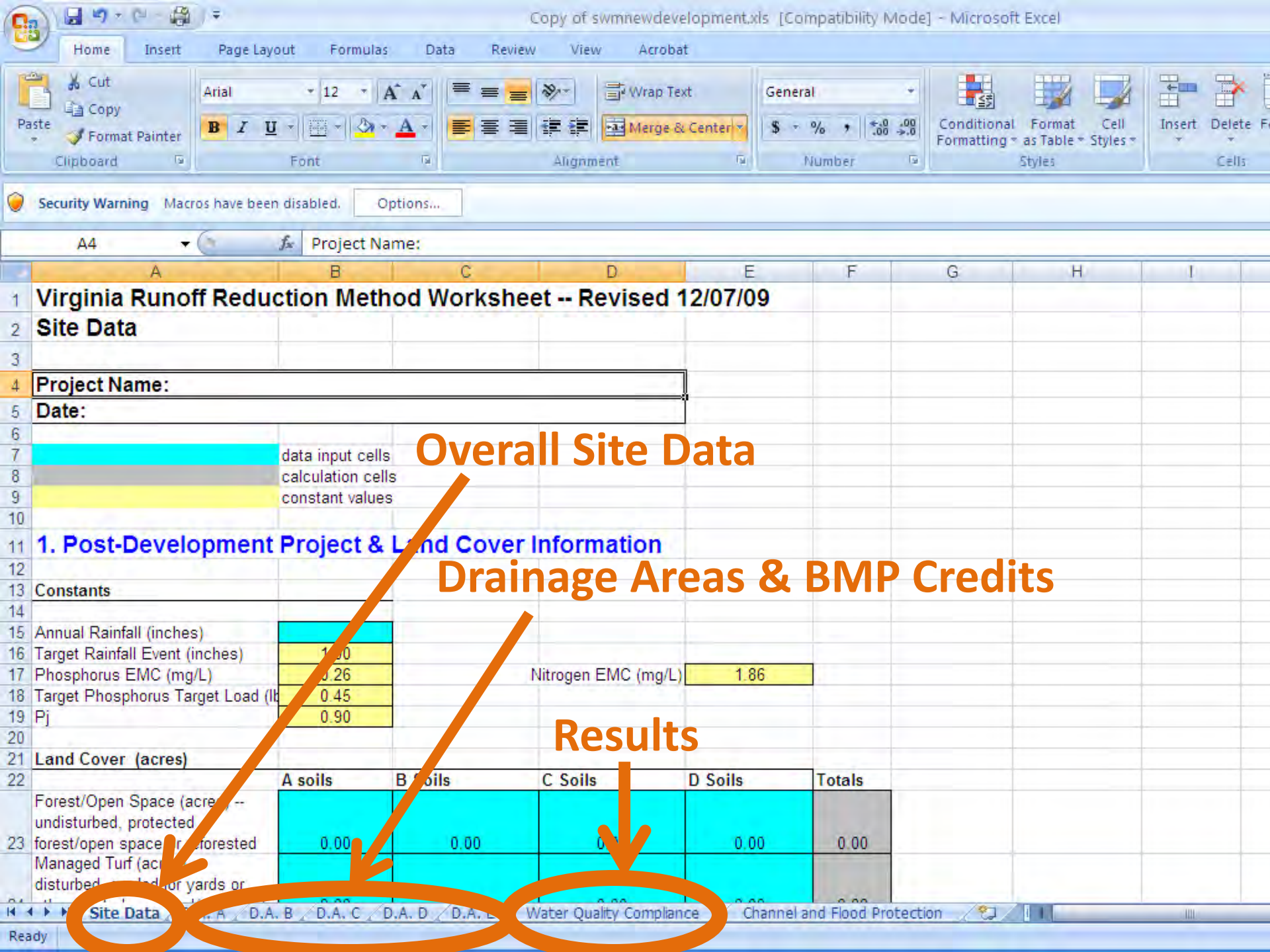
# Draft Memo
## System/Calculator Suggestions

Should:

- Provide an incentive for LID
- Determine the stormwater volume control required on the site
- Determine TP and TSS removal
- Capable of evaluating BMPs in parallel and in series

# Demonstrate Virginia Spreadsheet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Site Data
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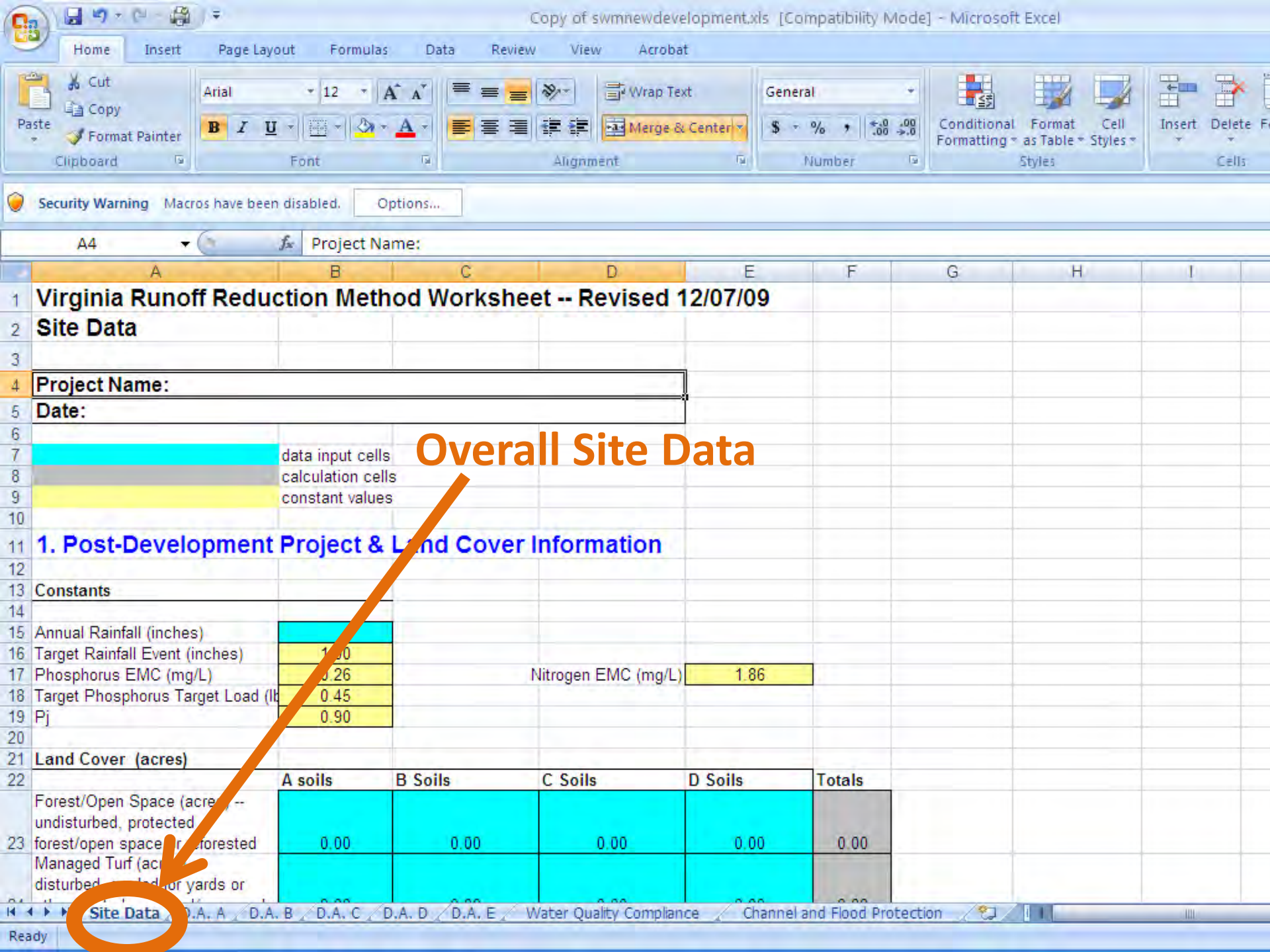
Date:
data input cells
calculation cells
constant values
1. Post-Development Project & Land Cover Information
Constants
Annual Rainfall (inches)
Target Rainfall Event (inches)
Phosphorus EMC (mg/L)
Target Phosphorus Target Load (lb
Pj
0.26
0.45
0.90
Nitrogen EMC (mg/L)
1.86
Land Cover (acres)
A soils
B Soils
C Soils
D Soils
Totals
Forest/Open Space (acre
undisturbed, protected
forest/open space
Managed Turf (ac
disturbed
0.00
0.00
0.00
0.00
Overall Site Data
Drainage Areas & BMP Credits
Results
Site Data
D.A. B
D.A. C
D.A. D
Water Quality Compliance
Channel and Flood Protection
Ready

# Site Data Worksheet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0.00
0.00
0.00
0.00
0.00
Managed Turf (acres) -- disturbed pervious cover or yards or
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Site Data
D.A. A
D.A. B
D.A. C
D.A. D
D.A. E
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Channel and Flood Protection
Ready

Input Legend

Precipitation & Loading

Site Land Cover

Coefficients & Summary

# Virginia Runoff Reduction Method Worksheet -- Revised 12/07/09

## Site Data

| | |
|---|---|
| Project Name: | |
| Date: | |

| | |
|---|---|
| | data input cells |
| | calculation cells |
| | constant values |

## 1. Post-Development Project & Land Cover Information

**Constants**

| | | | |
|---|---|---|---|
| Annual Rainfall (inches) | | | |
| Target Rainfall Event (inches) | 1.00 | | |
| Phosphorus EMC (mg/L) | 0.26 | Nitrogen EMC (mg/L) | 1.86 |
| Target Phosphorus Target Load (lb/acre/yr) | 0.45 | | |
| Pj | 0.90 | | |

**Land Cover (acres)**

| | A soils | B Soils | C Soils | D Soils | Totals |
|---|---|---|---|---|---|
| Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Impervious Cover (acres) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | Total | 0.00 |

**Rv Coefficients**

| | A soils | B Soils | C Soils | D Soils |
|---|---|---|---|---|
| Forest/Open Space | 0.02 | 0.03 | 0.04 | 0.05 |
| Managed Turf | 0.15 | 0.20 | 0.22 | 0.25 |
| Impervious Cover | 0.95 | 0.95 | 0.95 | 0.95 |

**Land Cover Summary**

| | | | |
|---|---|---|---|
| Forest/Open Space Cover (acres) | 0.00 | | |
| Weighted Rv(forest) | 0.00 | | |
| % Forest | #DIV/0! | | |
| Managed Turf Cover (acres) | 0.00 | | |
| Weighted Rv(turf) | 0.00 | | |
| % Managed Turf | #DIV/0! | | |
| Impervious Cover (acres) | 0.00 | | |
| Rv(impervious) | 0.95 | | |
| % Impervious | #DIV/0! | | |
| **Total Site Area (acres)** | 0.00 | | |
| **Site Rv** | #DIV/0! | | |
| Post-Development Treatment Volume (acre-ft) | #DIV/0! | | |
| Post-Development Treatment Volume (cubic feet) | #DIV/0! | | |
| Post_Development Load (TP) (lb/yr) | #VALUE! | Post_Development Load (TN) (lb/yr) | #VALUE! |
| Total Load (TP) Reduction Required (lb/yr) | #VALUE! | | |

# Input Legend

| Virginia Runoff Reduction Method Worksheet -- Revised 12/07/09 | | | |
|---|---|---|---|
| **Site Data** | | | |
| | | | |
| **Project Name:** | | | |
| **Date:** | | | |
| | | | |
| | data input cells | | |
| | calculation cells | | |
| | constant values | | |
| | | | |

# Precipitation & Loading

| 1. Post-Development Project & Land Cover Information | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| **Constants** | | | | | |
| | | | | | |
| Annual Rainfall (inches) | | | | | |
| Target Rainfall Event (inches) | 1.00 | | | | |
| Phosphorus EMC (mg/L) | 0.26 | | Nitrogen EMC (mg/L) | 1.86 | |
| Target Phosphorus Target Load (lb | 0.45 | | | | |
| Pj | 0.90 | | | | |
| | | | | | |

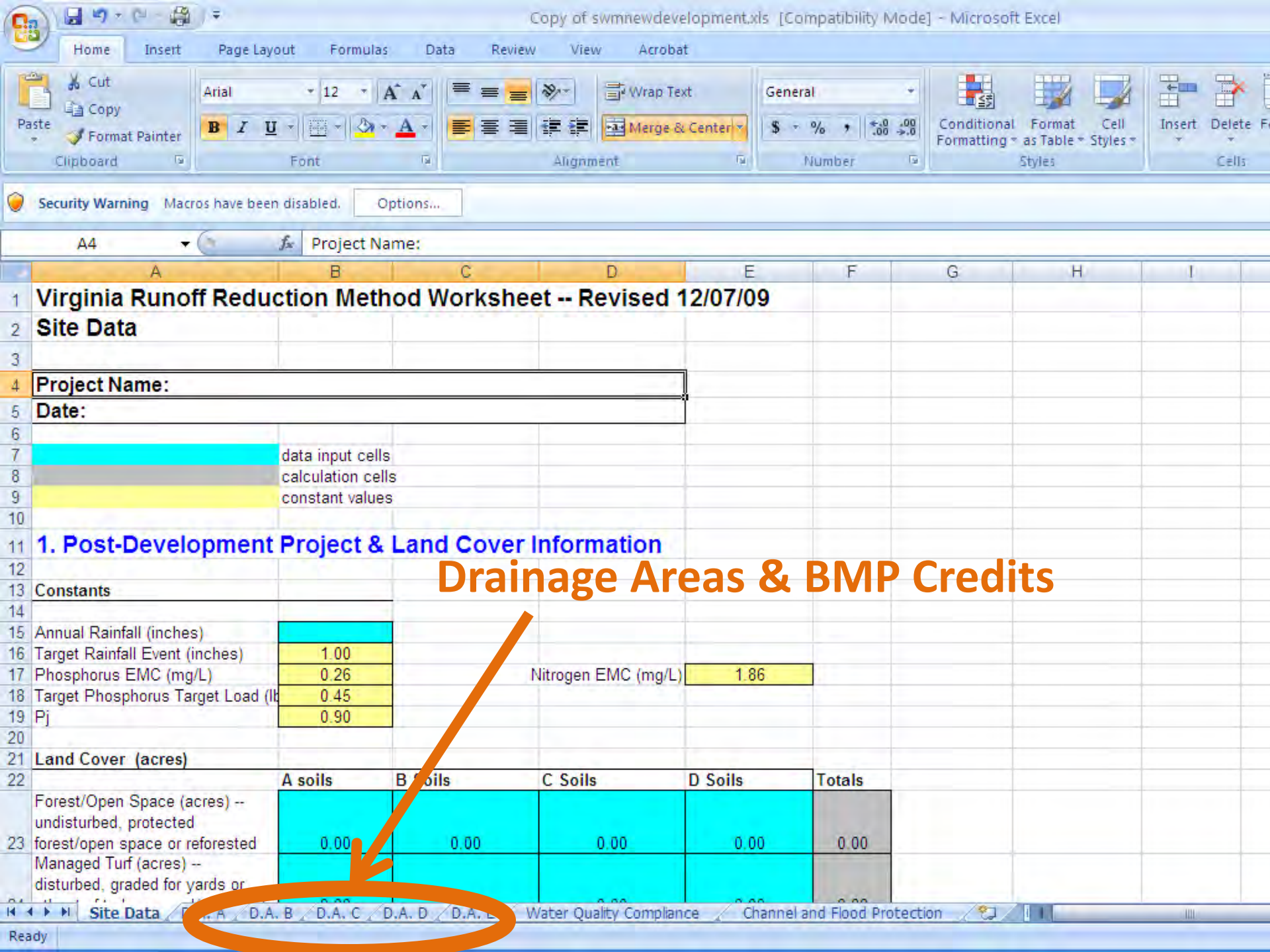
# Site Land Cover

| Land Cover (acres) | | | | | |
|---|---|---|---|---|---|
| | A soils | B Soils | C Soils | D Soils | Totals |
| Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Impervious Cover (acres) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | Total | 0.00 |

# Coefficients & Summary

| Rv Coefficients | | | | |
|---|---|---|---|---|
| | A soils | B Soils | C Soils | D Soils |
| Forest/Open Space | 0.02 | 0.03 | 0.04 | 0.05 |
| Managed Turf | 0.15 | 0.20 | 0.22 | 0.25 |
| Impervious Cover | 0.95 | 0.95 | 0.95 | 0.95 |
| | | | | |
| | | | | |
| | | | | |
| **Land Cover Summary** | | | | |
| Forest/Open Space Cover (acres) | 0.00 | | | |
| Weighted Rv(forest) | 0.00 | | | |
| % Forest | ###### | | | |
| Managed Turf Cover (acres) | 0.00 | | | |
| Weighted Rv(turf) | 0.00 | | | |
| % Managed Turf | ###### | | | |
| Impervious Cover (acres) | 0.00 | | | |
| Rv(impervious) | 0.95 | | | |
| % Impervious | ###### | | | |
| **Total Site Area (acres)** | 0.00 | | | |

# Drainage Areas & BMP Credits Worksheet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Target Rainfall Event (inches) 1.00
Phosphorus EMC (mg/L) 0.26
Nitrogen EMC (mg/L) 1.86
Target Phosphorus Target Load (lb 0.45
Pj 0.90
Land Cover (acres)
A soils
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Totals
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0.00
0.00
0.00
0.00
0.00
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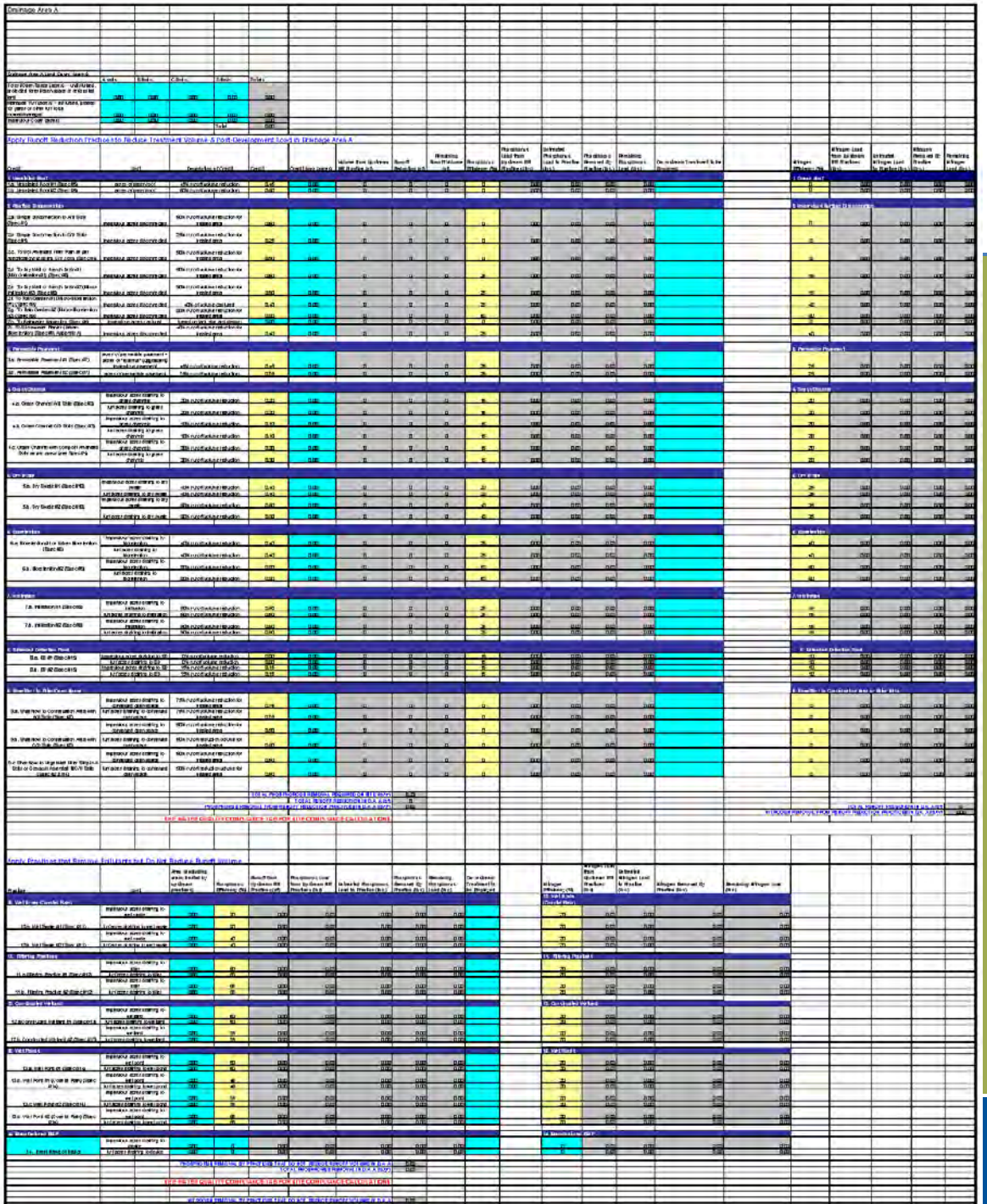
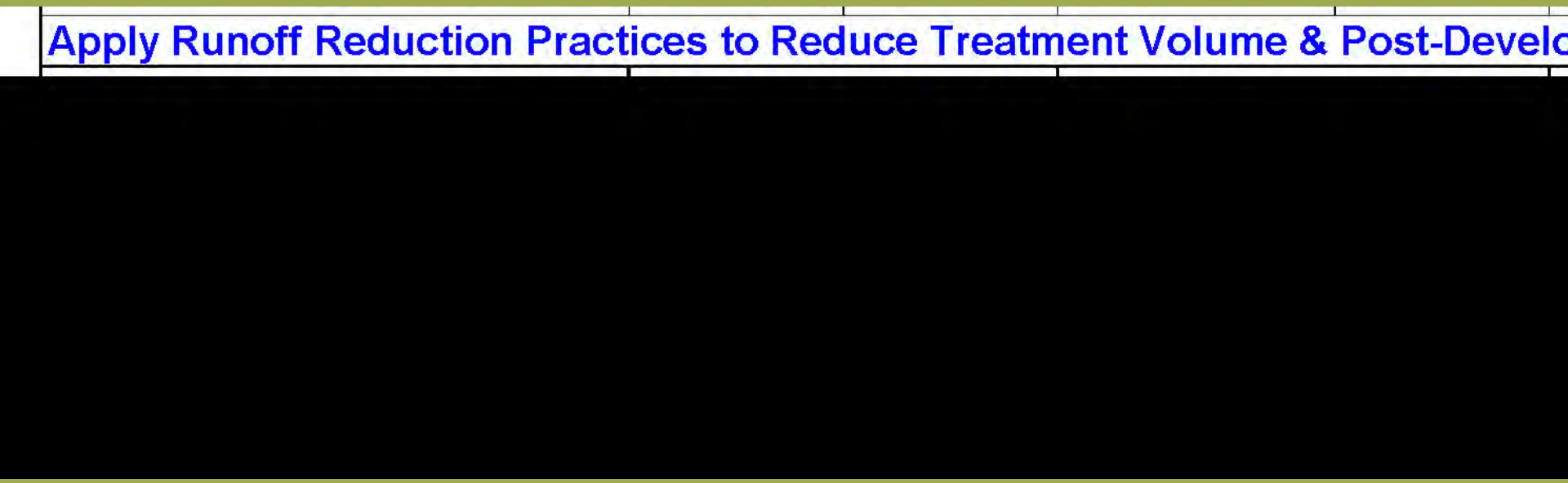


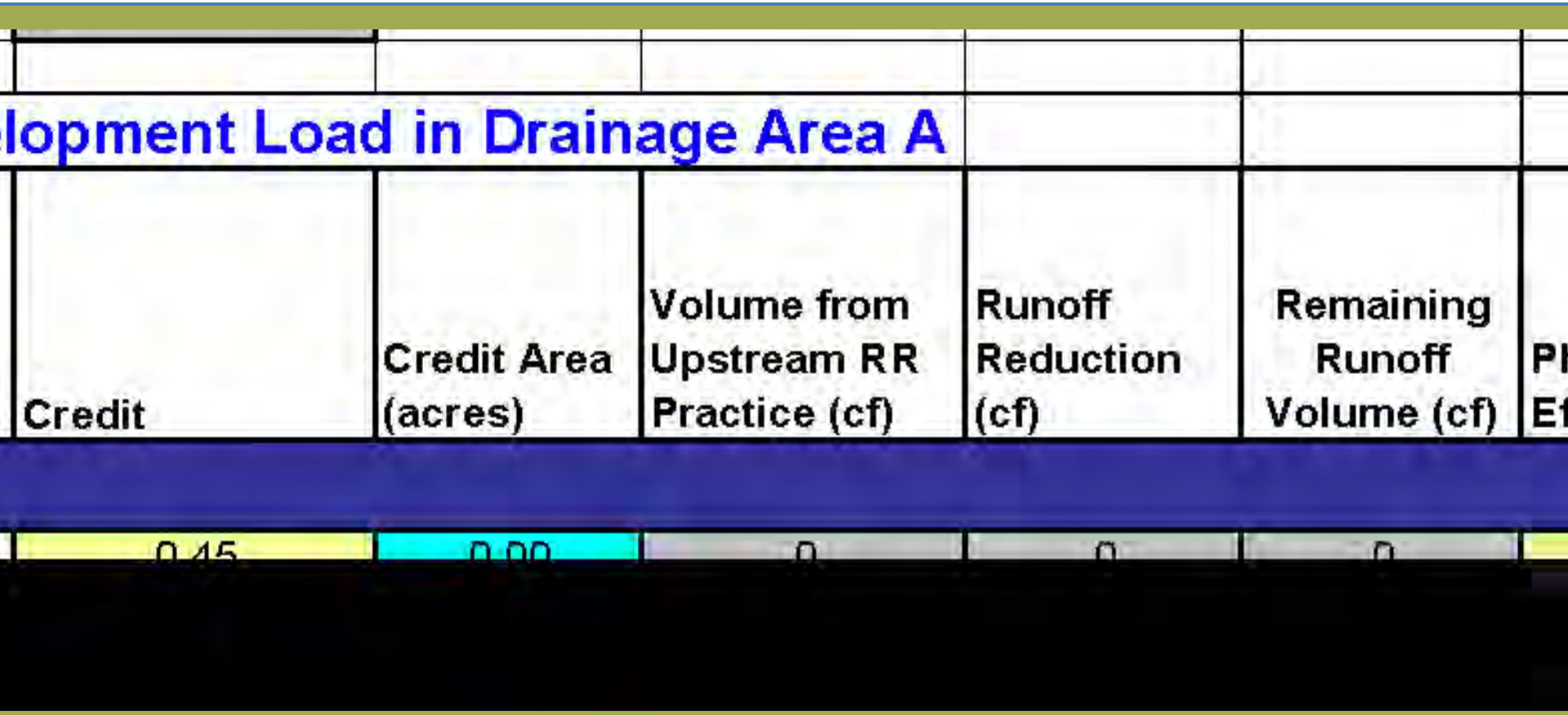
# Drainage Area Land Cover

| Drainage Area A | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| **Drainage Area A Land Cover (acres)** | | | | | |
| | **A soils** | **B Soils** | **C Soils** | **D Soils** | **Totals** |
| Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Impervious Cover (acres) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | | | **Total** | 0.00 |

# BMP Type and Credit Description



# BMP Runoff Reduction



lopment Load in Drainage Area A

| Credit | Credit Area (acres) | Volume from Upstream RR Practice (cf) | Runoff Reduction (cf) | Remaining Runoff Volume (cf) | Pl Ef |
|---|---|---|---|---|---|
| 0.45 | 0.00 | 0 | 0 | 0 | |

# BMP Phosphorus Reduction and Downstream Routing

| g<br>f) | Phosphorus Efficiency (%) | Phosphorus Load from Upstream RR Practices (lbs) | Untreated Phosphorus Load to Practice (lbs.) | Phosphorus Removed By Practice (lbs.) | Remaining Phosphorus Load (lbs.) | Downstream Treatment to be Employed |
|---|---|---|---|---|---|---|
| | 0 | 0.00 | 0.00 | 0.00 | 0.00 | |

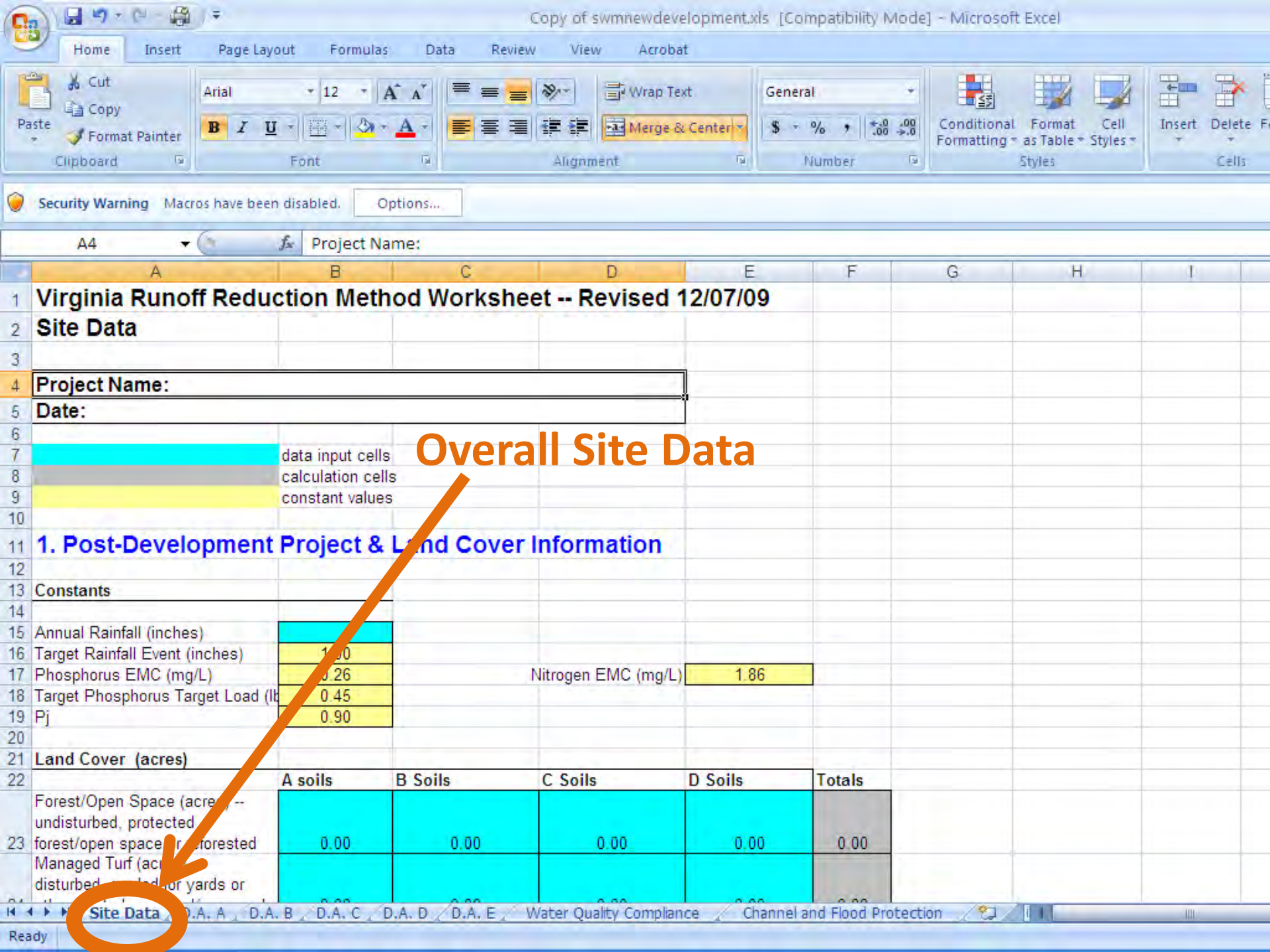
# Reduction Summary

| | |
|---|---|
| TOTAL PHOSPHOROUS REMOVAL REQUIRED ON SITE (lb/yr) | #DIV/0! |
| TOTAL RUNOFF REDUCTION IN D.A. A (cf) | 0 |
| PHOSPHORUS REMOVAL FROM RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr) | 0.00 |

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

# Example: 10 Acre Site on B soils with 80% Imperviousness

# Example: Site Data Worksheet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Target Rainfall Event (inches)
Phosphorus EMC (mg/L)
0.26
Nitrogen EMC (mg/L)
1.86
Target Phosphorus Target Load (lb
0.45
Pj
0.90
Land Cover (acres)
A soils
B Soils
C Soils
D Soils
Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested
0.00
0.00
0.00
0.00
0.00
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Site Data
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D.A. B
D.A. C
D.A. D
D.A. E
Water Quality Compliance
Channel and Flood Protection
Ready

# Virginia Runoff Reduction Method Worksheet -- Re

## Site Data

**Project Name: 10-Acre 80% Imp. B Soils**

**Date: 1/21/2011**

| | |
|---|---|
| | data input cells |
| | calculation cells |
| | constant values |

## 1. Post-Development Project & Land Cover Information

**Constants**

| | | | |
|---|---|---|---|
| Annual Rainfall (inches) | 30 | | |
| Target Rainfall Event (inches) | | | |
| Phosphorus EMC (mg/L) | 0.26 | Nitrogen EMC (mg/L) | 1.86 |
| Target Phosphorus Target Load (lb | 0.45 | | |
| Pj | 0.90 | | |

**Land Cover (acres)**

| | A soils | B Soils | C Soils | D Soils | Totals |
|---|---|---|---|---|---|
| Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed | 0.00 | 2.00 | 0.00 | 0.00 | 2.00 |
| Impervious Cover (acres) | 0.00 | 8.00 | 0.00 | 0.00 | 8.00 |
| | | | | Total | 10.00 |

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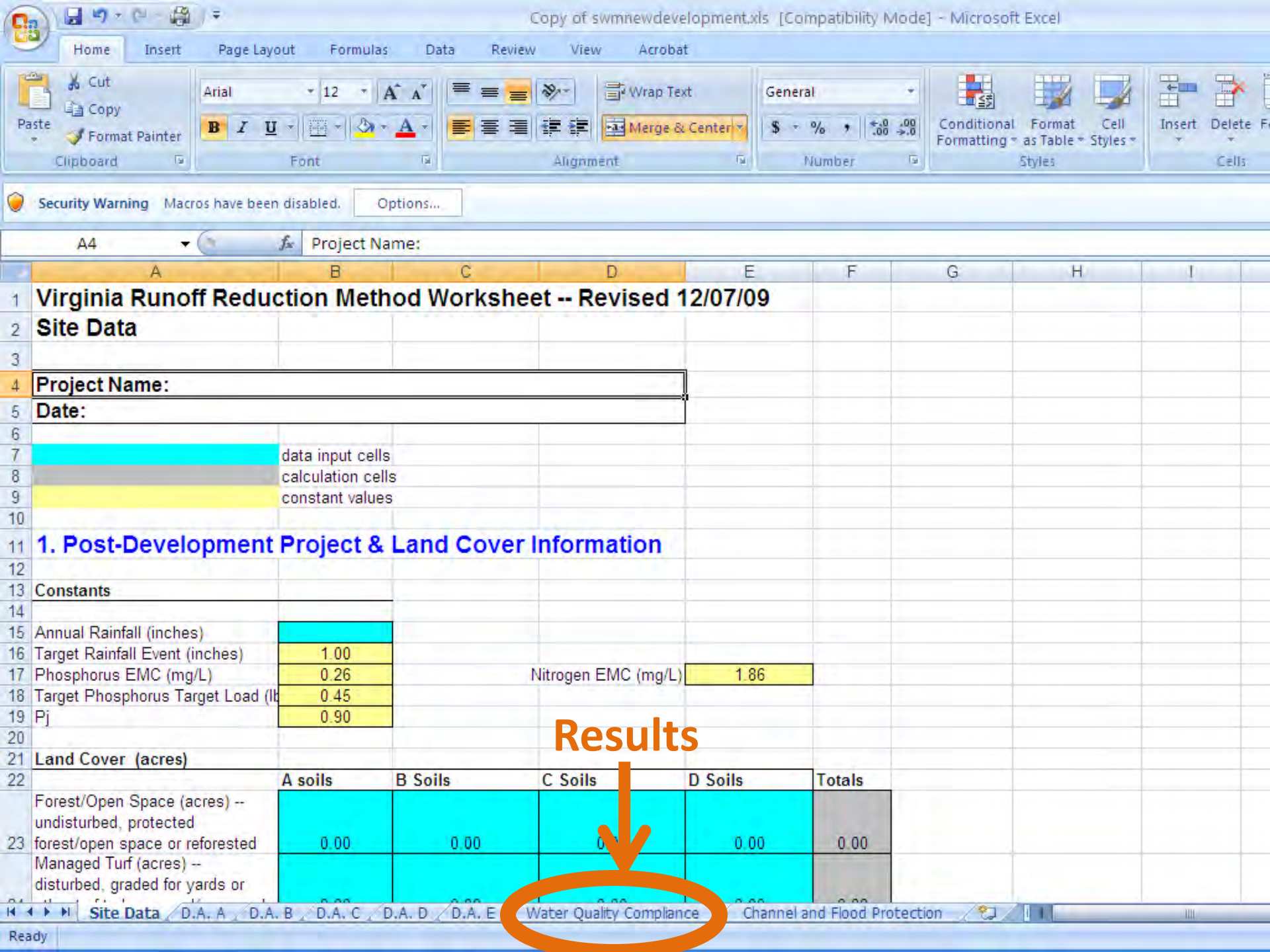
| Rv Coefficients | | | | |
|---|---|---|---|---|
| | A soils | B Soils | C Soils | D Soils |
| Forest/Open Space | 0.02 | 0.03 | 0.04 | 0.05 |
| Managed Turf | 0.15 | 0.20 | 0.22 | 0.25 |
| Impervious Cover | 0.95 | 0.95 | 0.95 | 0.95 |

| Land Cover Summary | |
|---|---|
| Forest/Open Space Cover (acres) | 0.00 |
| Weighted Rv(forest) | 0.00 |
| % Forest | [illegible] |
| Managed Turf Cover (acres) | 2.00 |
| Weighted Rv(turf) | 0.20 |
| % Managed Turf | 20% |
| Impervious Cover (acres) | 8.00 |
| Rv(impervious) | 0.95 |
| % Impervious | 80% |
| **Total Site Area (acres)** | 10.00 |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D.A. E
Water Quality Compliance
Channel and Flood Protection
Ready

# Initial Results

| Site Results | |
|---|---|
| **Phosphorous** | |
| TOTAL TREATMENT VOLUME (cf) | 29,040 |
| TOTAL PHOSPHOROUS LOAD REDUCTION REQUIRED (LB/YEAR) | 8.23 |
| | |
| RUNOFF REDUCTION (cf) | 0 |
| PHOSPHOROUS LOAD REDUCTION ACHIEVED (LB/YR) | 0.00 |
| | |
| ADJUSTED POST-DEVELOPMENT PHOSPHOROUS LOAD (TP) (lb/yr) | 12.73 |
| | |
| REMAINING PHOSPHOROUS LOAD REDUCTION (LB/YR) NEEDED | 8.23 |
| | |
| | |
| | |
| **Nitrogen (for information purposes)** | |
| TOTAL TREATMENT VOLUME (cf) | 29,040 |
| | |
| | |
| RUNOFF REDUCTION (cf) | 0 |
| NITROGEN LOAD REDUCTION ACHIEVED (LB/YR) | 0.00 |
| | |
| ADJUSTED POST-DEVELOPMENT NITROGEN LOAD (TP) (lb/yr) | 91.07 |

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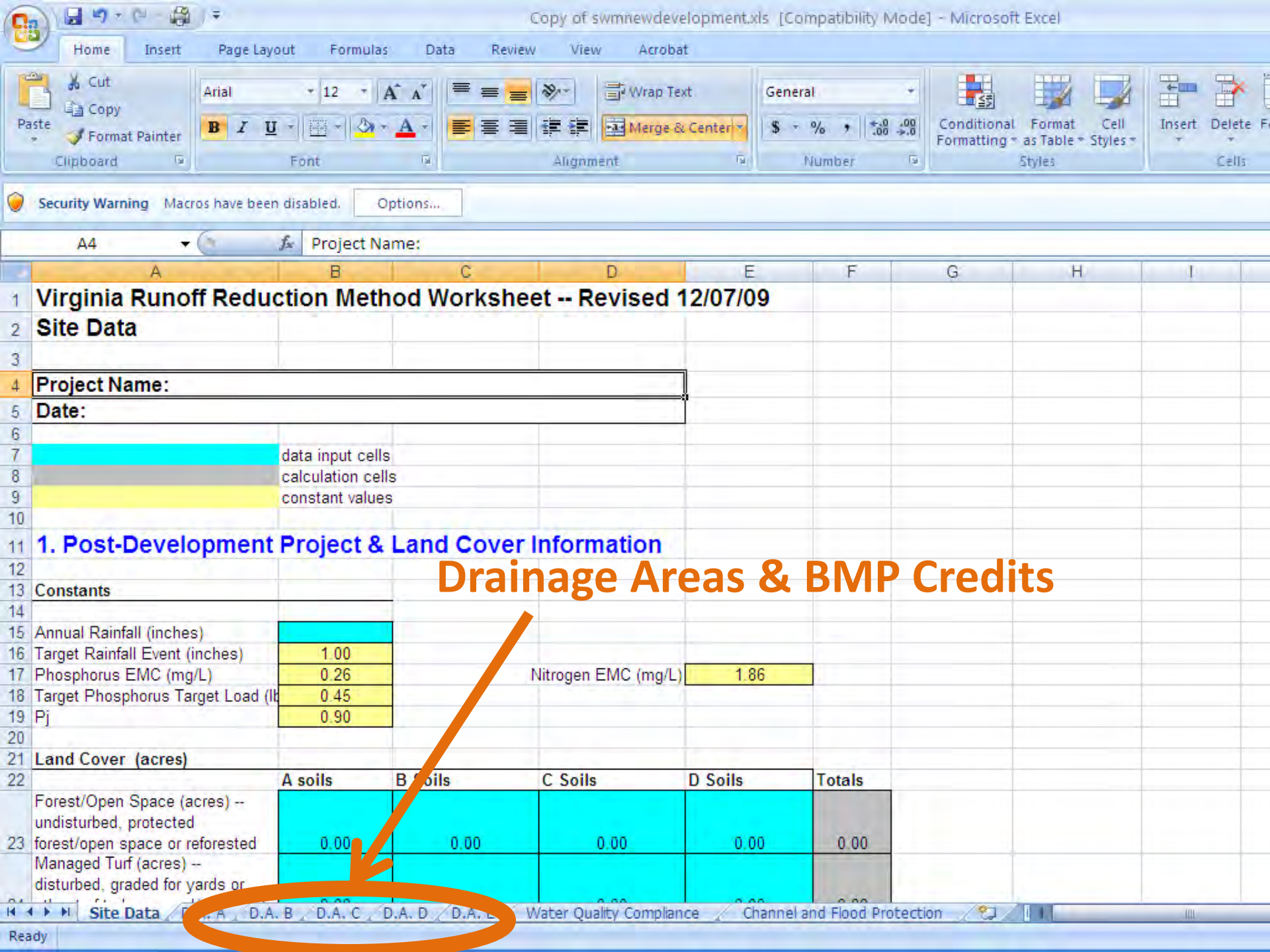
# Example: Drainage Areas & BMP Credits Worksheet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D.A. B
D.A. C
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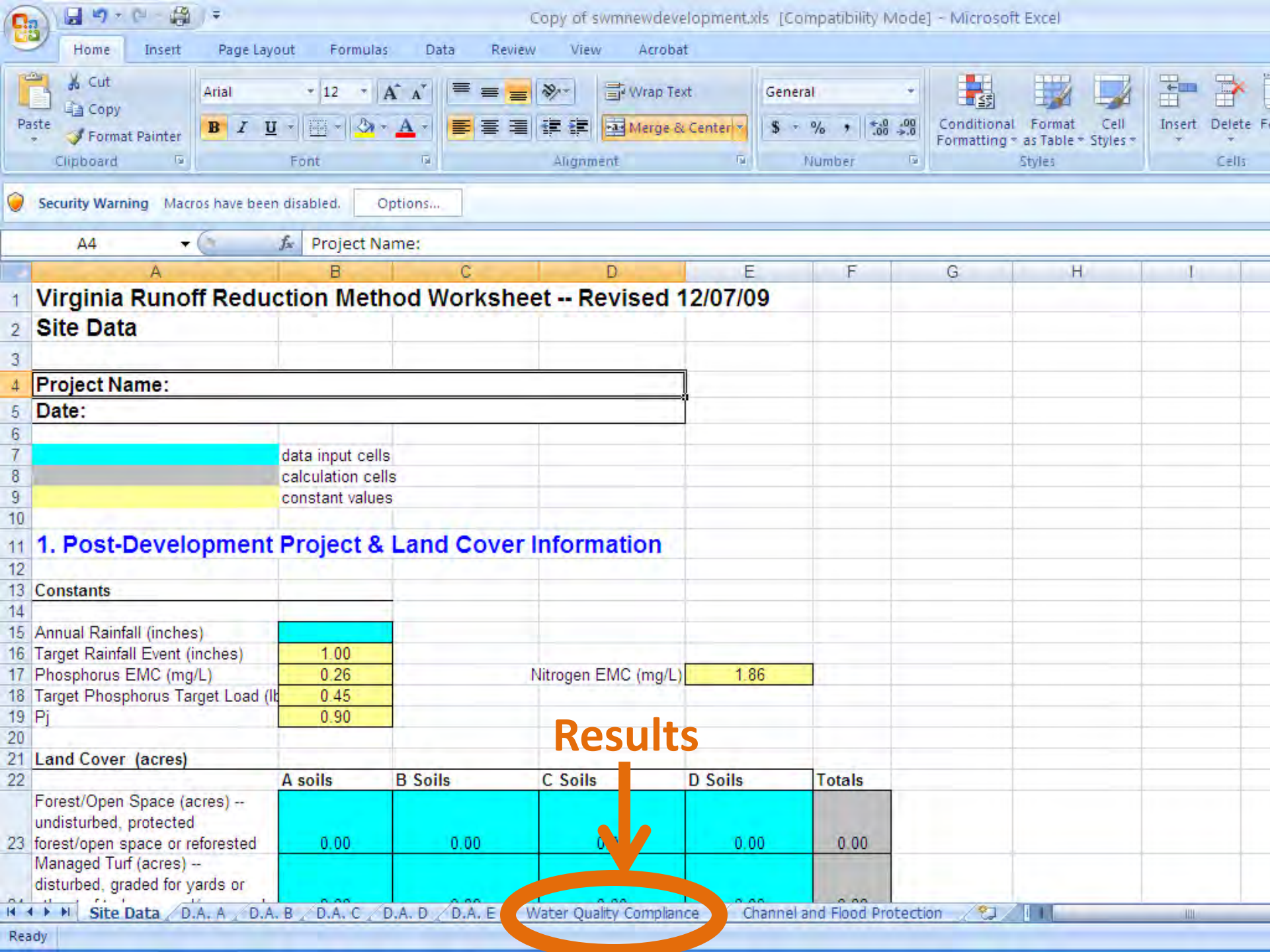
D.A. E
Water Quality Compliance
Channel and Flood Protection
Ready

# Input Drainage Area Land Cover

| Drainage Area A | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| **Drainage Area A Land Cover (acres)** | | | | | |
| | **A soils** | **B Soils** | **C Soils** | **D Soils** | **Totals** |
| Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed | 0.00 | 2.00 | 0.00 | 0.00 | 2.00 |
| Impervious Cover (acres) | 0.00 | 8.00 | 0.00 | 0.00 | 8.00 |
| | | | | **Total** | 10.00 |

# Add Bioretention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General
Number
Conditional Formatting
Format as Table
Cell Styles
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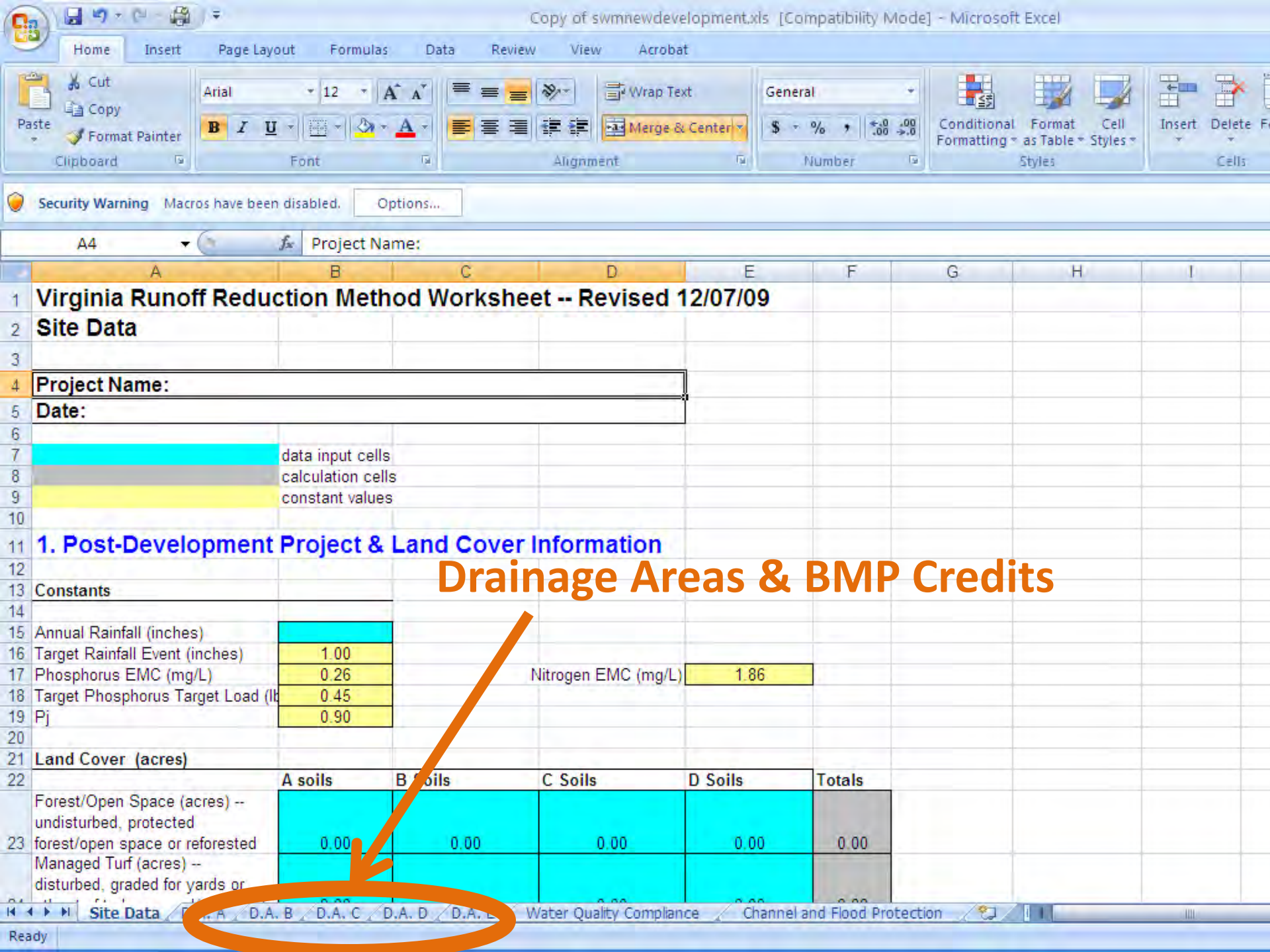
Security Warning
Macros have been disabled.
Options...
A4
Project Name:
Virginia Runoff Reduction Method Worksheet -- Revised 12/07/09
Site Data
Project Name:
Date:
data input cells
calculation cells
constant values
1. Post-Development Project & Land Cover Information
Constants
Annual Rainfall (inches)
Target Rainfall Event (inches)
1.00
Phosphorus EMC (mg/L)
0.26
Nitrogen EMC (mg/L)
1.86
Target Phosphorus Target Load (lb
0.45
Pj
0.90
Land Cover (acres)
A soils
B Soils
C Soils
D Soils
Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested
0.00
0.00
0.00
0.00
Managed Turf (acres) -- disturbed, graded for yards or
Results
Site Data
D.A. A
D.A. B
D.A. C
D.A. D
D.A. E
Water Quality Compliance
Channel and Flood Protection
Ready

# Check Results

| Site Results | |
|---|---|
| Phosphorous | |
| TOTAL TREATMENT VOLUME (cf) | 29,040 |
| TOTAL PHOSPHOROUS LOAD REDUCTION REQUIRED (LB/YEAR) | 8.23 |
| | |
| RUNOFF REDUCTION (cf) | 11035 |
| PHOSPHOROUS LOAD REDUCTION ACHIEVED (LB/YR) | 6.64 |
| | |
| ADJUSTED POST-DEVELOPMENT PHOSPHOROUS LOAD (TP) (lb/yr) | 6.09 |
| | |
| REMAINING PHOSPHOROUS LOAD REDUCTION (LB/YR) NEEDED | 1.59 |
| | |
| | |
| | |
| Nitrogen (for information purposes) | |
| TOTAL TREATMENT VOLUME (cf) | 29,040 |
| | |
| | |
| RUNOFF REDUCTION (cf) | 11035 |
| NITROGEN LOAD REDUCTION ACHIEVED (LB/YR) | 55.31 |
| | |
| ADJUSTED POST-DEVELOPMENT NITROGEN LOAD (TP) (lb/yr) | 35.76 |

BARR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Options...
A4
Project Name:
Virginia Runoff Reduction Method Worksheet -- Revised 12/07/09
Site Data
Project Name:
Date:
data input cells
calculation cells
constant values
1. Post-Development Project & Land Cover Information
Drainage Areas & BMP Credits
Constants
Annual Rainfall (inches)
Target Rainfall Event (inches) 1.00
Phosphorus EMC (mg/L) 0.26
Nitrogen EMC (mg/L) 1.86
Target Phosphorus Target Load (lb 0.45
Pj 0.90
Land Cover (acres)
A soils
B Soils
C Soils
D Soils
Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested
0.00
0.00
0.00
0.00
0.00
Managed Turf (acres) -- disturbed, graded for yards or
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D.A. A
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D.A. D
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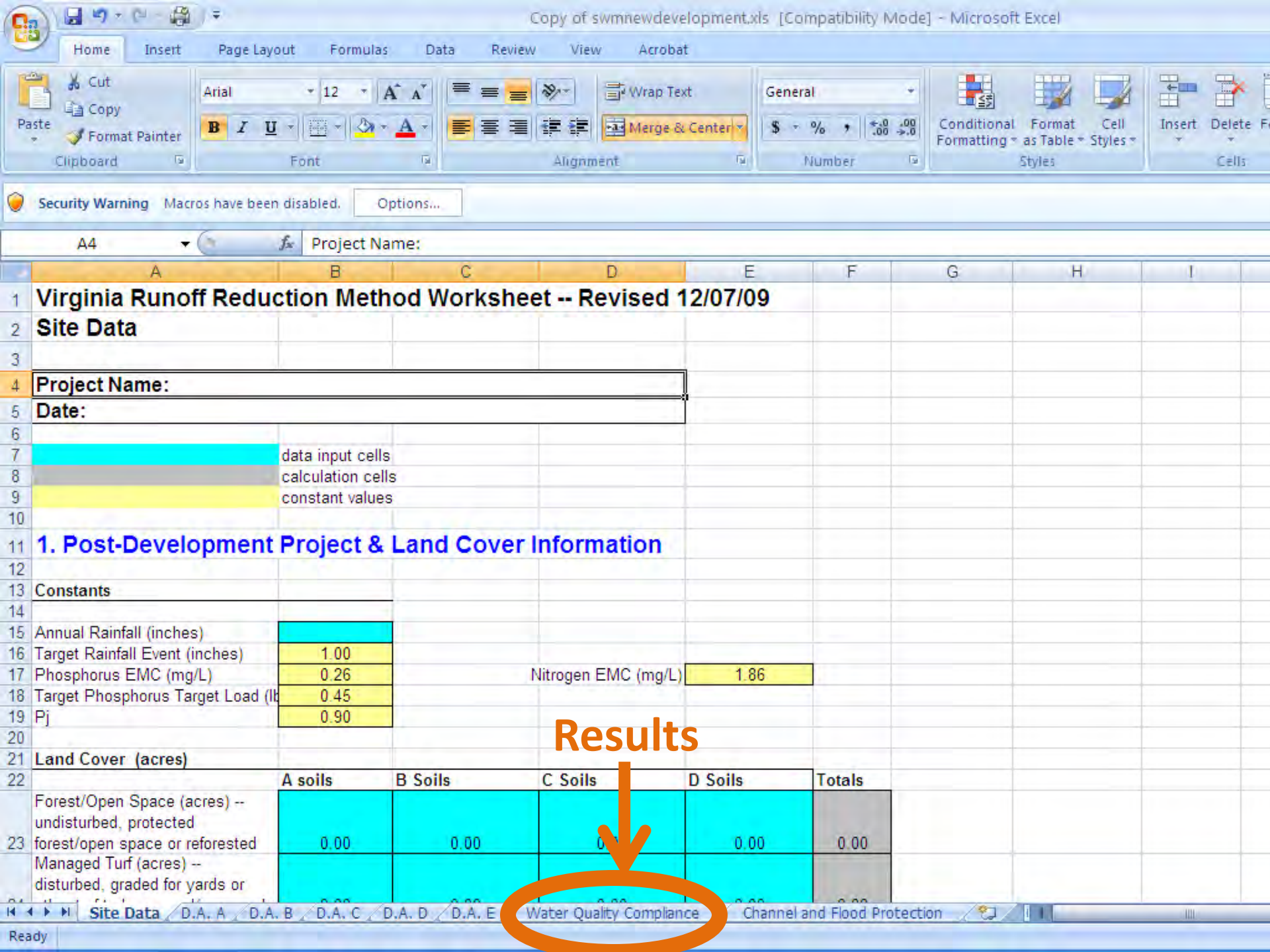
# Route Bioretention to Grass Channel

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 8.00 | 0 | 11035 | 16553 | 25 | 0.00 | 12.08 | 6.64 | 44 | 4.a. Grass Channel A/B |
| | 0.00 | 0 | 0 | 0 | 25 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | 0.00 | 0 | 0 | 0 | 50 | 0.00 | 0.00 | 0.00 | 0.00 | |
| | 0.00 | 0 | 0 | 0 | 50 | 0.00 | 0.00 | 0.00 | 0.00 | |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Constants
Annual Rainfall (inches)
Target Rainfall Event (inches)
1.00
Phosphorus EMC (mg/L)
0.26
Nitrogen EMC (mg/L)
1.86
Target Phosphorus Target Load (lb
0.45
Pj
0.90
Land Cover (acres)
A soils
B Soils
C Soils
D Soils
Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested
0.00
0.00
0.00
0.00
Managed Turf (acres) -- disturbed, graded for yards or
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D.A. B
D.A. C
D.A. D
D.A. E
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Ready

# Success in Meeting Standard

| | | |
|---|---|---|
| 1 | **Site Results** | |
| 2 | **Phosphorous** | |
| 3 | TOTAL TREATMENT VOLUME (cf) | 29,040 |
| 4 | TOTAL PHOSPHOROUS LOAD REDUCTION REQUIRED (LB/YEAR) | 8.23 |
| 5 | | |
| 6 | RUNOFF REDUCTION (cf) | 14346 |
| 7 | PHOSPHOROUS LOAD REDUCTION ACHIEVED (LB/YR) | 8.38 |
| 8 | | |
| 9 | ADJUSTED POST-DEVELOPMENT PHOSPHOROUS LOAD (TP) (lb/yr) | 4.35 |
| 10 | | |
| 11 | REMAINING PHOSPHOROUS LOAD REDUCTION (LB/YR) NEED | CONGRATULATIONS!! YOU EXCEEDED THE TARGET REDUCTION BY 0.2 LB/YEAR!! |
| 12 | | |
| 13 | | |
| 14 | | |
| 15 | **Nitrogen (for information purposes)** | |
| 16 | TOTAL TREATMENT VOLUME (cf) | 29,040 |
| 17 | | |
| 18 | | |
| 19 | RUNOFF REDUCTION (cf) | 14346 |
| 20 | NITROGEN LOAD REDUCTION ACHIEVED (LB/YR) | 66.50 |
| 21 | | |
| 22 | ADJUSTED POST-DEVELOPMENT NITROGEN LOAD (TP) (lb/yr) | 24.56 |
| 23 | | |
| 24 | | |
| 25 | | |
| 26 | | |
| 27 | | |
| 28 | | |
| 29 | | |
| 30 | | |
| 31 | | |

Site Data | D.A. A | D.A. B | D.A. C | D.A. D | D.A. E | **Water Quality Compliance** | Channel and Flood Protection

# Feedback & Questions for Group

- Who will be the primary/secondary users of the MIDS calculator?
- What are the “must have” features?  Nice to be included, but are not required?
- What are the expectations for the MIDS calculator with other programs (TMDLs, MS4, anti-degradation, etc.)?
- How should stormwater runoff rate control be handled? Should the MIDS calculator attempt to simplify hydrology, create a new rate control model, and basically replace widely used models, such as HydroCAD? Or, should the MIDS calculator be focused on runoff volume?

# Draft Memo
## Credit Suggestions

- Base credits on:
  - Continuous modeling (XP-SWMM for volume reduction and P8 for loading reduction) for popular BMPs (as many as budget allows)
  - Literature, when budget doesn't allow
- MIDS Work Group should prioritize BMPs

# Feedback & Questions for Group on Credits
# On which structural BMPs should Barr focus?

- Infiltration practices
  - Bioretention/raingarden
  - Porous pavement
  - Infiltration basin/trench
  - Infiltration shelf at wet pond
- Filtration practices
  - Vegetative swale/grass channel
  - Filter strip
  - Filtration basin (bioretention with drain tile)
- Green Roof
- Extended detention practices
  - Wet pond
  - Underground storage/detention
- Enhancements/ modifications
  - Pretreatment
  - Iron/Alum
  - Harvesting & re-use

# Feedback & Questions for Group on Credits
# On which non-structural BMPs should Barr focus?

- Cluster development/ conservation design
- Impervious Surface Design
  - Street & trail widths, cul-de-sac radii/design, etc.
  - Parking lot design
  - Disconnecting impervious surfaces
  - Management for buildup, street sweeping, etc.
- Landscape management
  - Urban forestry
  - Soil protection, etc.
- Operation & Maintenance
  - Street sweeping
  - Turf and landscaping management