# CONCEPTUAL RESIDENTIAL RAIN GARDEN DESIGN FOR RESIDENTIAL HOMES WITH LARGER YARDS

## MODEL NEIGHBORHOOD PROJECT
## TYPICAL HOME APPLICATION
## (600 SQ. FT. DRAINAGE AREA)

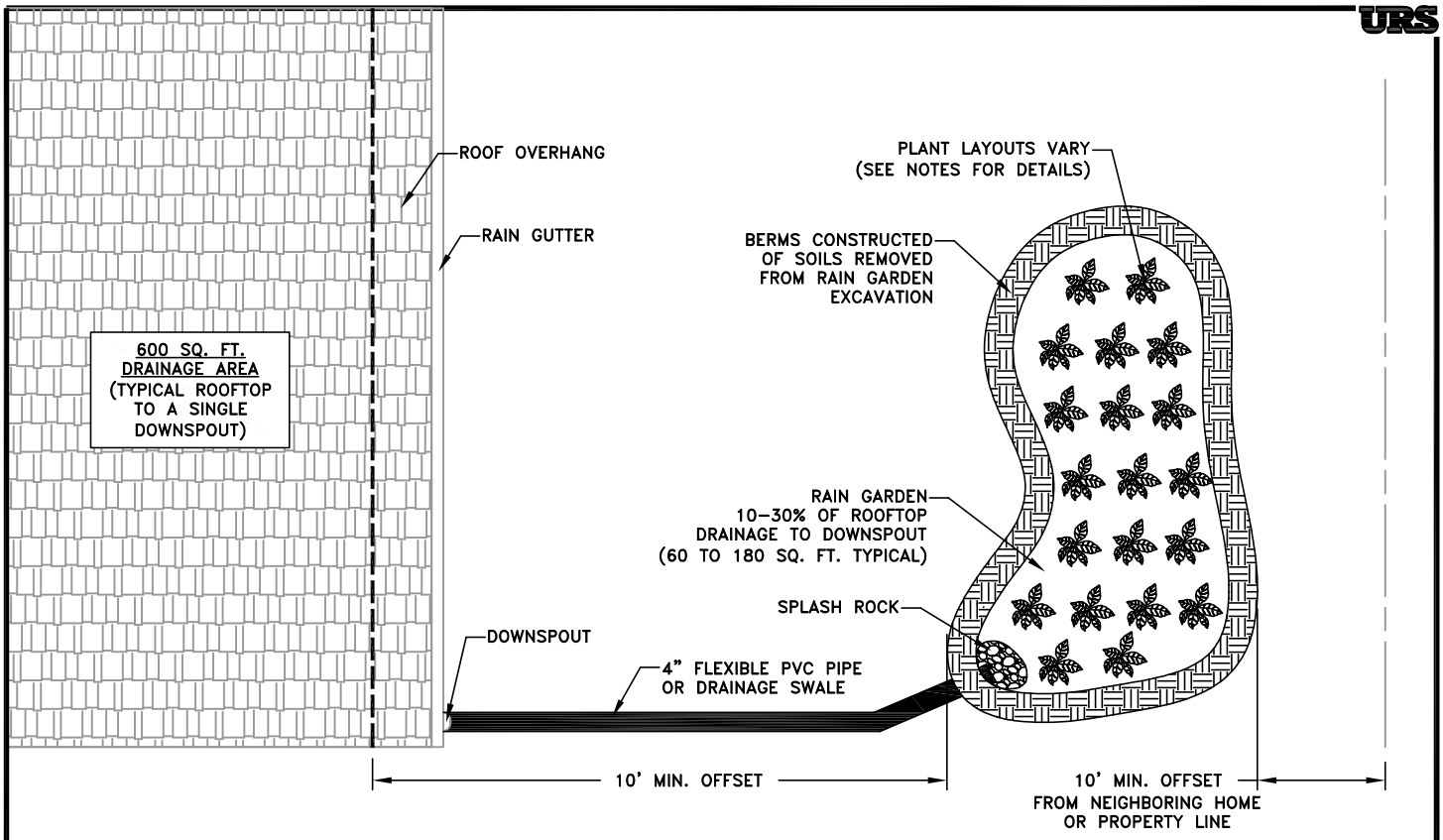
DRAWING LIST

FIGURE 1A – CONCEPTUAL RAIN GARDEN PLAN AND ELEVATION VIEWS
FIGURE 1B – DETAILS AND NOTES
FIGURE 1C – PLANTING SCHEDULE / OPTIONS, MATERIALS LIST, AND BUDGETARY COST ESTIMATE

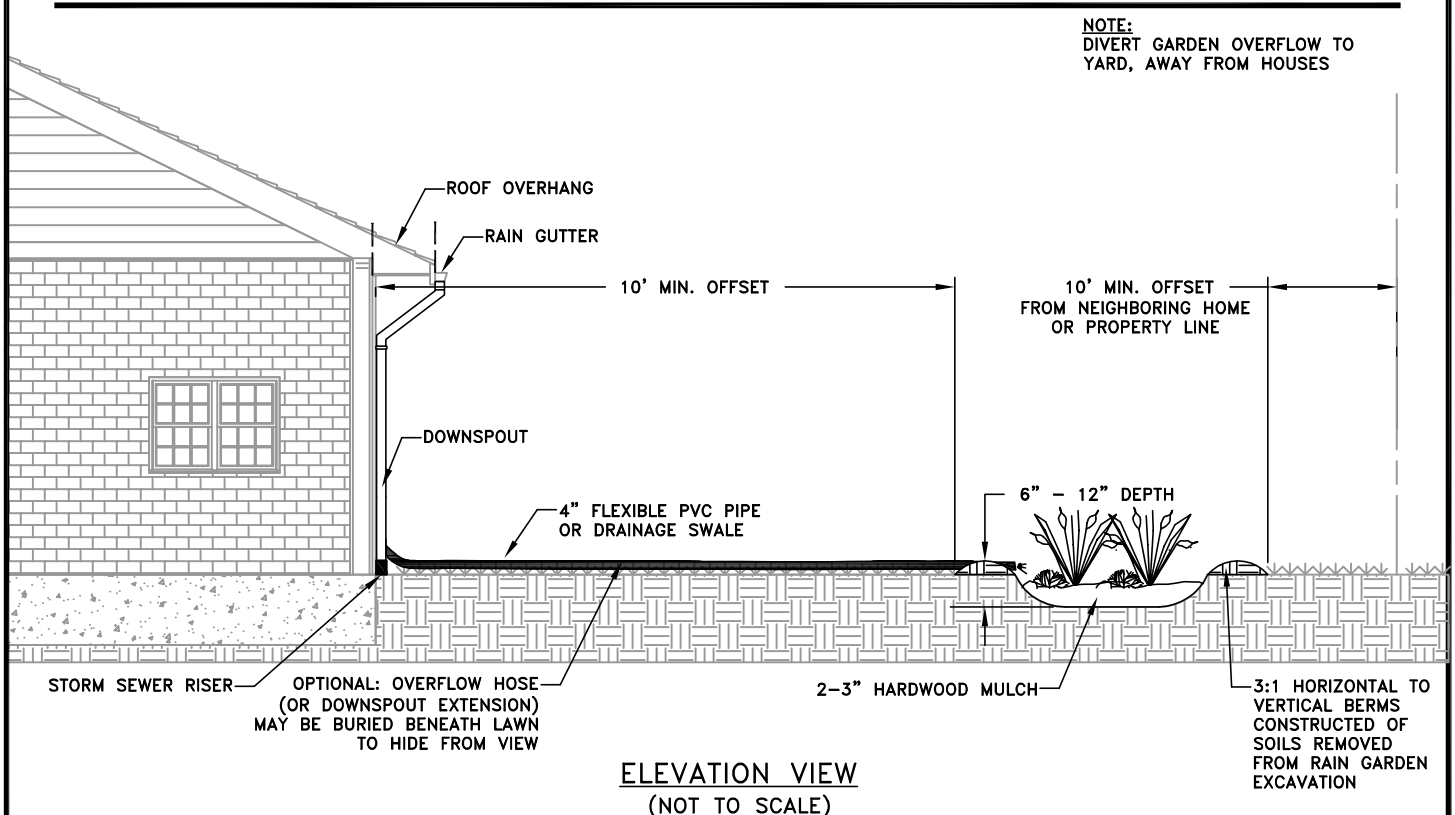
Philadelphia PWD Water Department

SOURCE: NC STATE UNIVERSITY, http://mcdowell.ces.ncsu.edu

URS




PLAN VIEW
(NOT TO SCALE)




ELEVATION VIEW
(NOT TO SCALE)

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|---|---|
| Job: PWD | CONCEPTUAL RESIDENTIAL RAIN GARDEN DESIGN |
| Prepared by: JJ | MODEL NEIGHBORHOOD PROJECT |
| Checked by: TF | TYPICAL HOME APPLICATION (10–30% OF TOTAL DRAINAGE AREA) |
| Date: 08/27/2009 | CONCEPTUAL RAIN GARDEN PLAN AND ELEVATION VIEWS |
| | PHILADELPHIA, PA |
| | FIGURE 1A |

## RESIDENTIAL RAIN GARDEN

**DIMENSIONS:** 60 TO 180 SQUARE FEET (10 TO 30% OF DRAINAGE AREA) AND 6–12 INCH DEPTH.

**NOTE: THIS CONCEPTUAL PLAN IS BASED ON A SMALL RESIDENTIAL HOME (600 SQUARE FEET OF ROOFTOP AREA) WITH ONE DOWNSPOUT CONVEYING ALL OF THE ROOFTOP RAIN WATER TO THE RAIN GARDEN. THIS CONCEPTUAL PLAN IS DEPENDENT UPON THE FOLLOWING REQUIREMENTS AND IS PROTOTYPICAL IN NATURE. RAIN GARDENS ARE TYPICALLY DESIGNED ON A CASE–BY–CASE BASIS TO ADDRESS VARIATIONS IN TOPOGRAPHY, PROPERTY CONSTRAINTS, LAYOUTS, SOIL TYPES, AND INFILTRATION RATES. FURTHER EVALUATION AND TESTING IS REQUIRED FOR URBAN GARDEN APPLICATIONS.**

**THIS IS A SIMPLIFIED DESIGN WHICH DOES NOT INCLUDE AN UNDERDRAIN AND ASSUMES OVERFLOW FROM THE RAIN GARDEN CAN BE DISSIPATED BY OVERLAND FLOW WITHIN THE OWNER'S PROPERTY.**

**DESIGN ELEMENTS & REQUIREMENTS:**

- 10' MINIMUM OF AVAILABLE SPACING FROM HOME TO PROPOSED RAIN GARDEN LOCATION.
- GROUNDWATER TABLE GREATER THAN 5' BELOW GROUND SURFACE.
- DOWNSPOUT IS LOCATED IN THE NEAR VICINITY OF THE PROPOSED RAIN GARDEN LOCATION.
- INFILTRATION TEST RESULTS ARE GREATER THAN 0.5 INCH/HOUR.
- DRAWDOWN OF PONDED WATER WITHIN THE RAIN GARDEN SHOULD BE ACHIEVED WITHIN 24–48 HOURS.
- RAIN GARDEN SHOULD BE LOCATED DOWN SLOPE (DOWN GRADIENT) OF HOME.

**RESIDENTIAL INFILTRATION TESTING AND SIZING:**
PLEASE REFER TO ONE OF THE FOLLOWING GUIDANCE DOCUMENTS TO TEST SOILS FOR INFILTRATION AND SIZING THE RAIN GARDEN:

- **A HOMEOWNER'S GUIDE TO STORMWATER MANAGEMENT** (PAGE 26, OFFICE OF WATERSHEDS, PHILADELPHIA WATER DEPARTMENT VOLUME 1, 2006 – AVAILABLE ONLINE AT: http://www.delawareestuary.org/pdf/HomeownersGuideSWMgmnt.pdf)
- **PENNSYLVANIA RAIN GARDEN GUIDE** (WISSAHICKON WATERSHED PARTNERSHIP, CONTACT PAUL RACETTE, PENNSYLVANIA ENVIRONMENTAL COUNCIL)

**RAIN GARDEN DETAILS:**

- **DOWNSPOUT DISCONNECT**
  DISCONNECT THE DOWNSPOUT AND CONNECT A PIPE SIZED AND COMPATIBLE WITH THE EXISTING DOWNSPOUT DIAMETER (E.G., FLEXIBLE DOWNSPOUT). PIPING CAN BE BURIED OR POSITIONED ABOVE GROUND. ALTERNATIVELY, CONVEY WATER FROM THE DOWNSPOUT VIA A GRASS SWALE OR STONE–LINED CHANNEL.
- **TOPOGRAPHY**
  WATER FLOWS BY GRAVITY; THUS, THE RAIN GARDEN SHOULD BE LOCATED SLIGHTLY DOWNHILL FROM THE HOME. CAUTION ALSO SHOULD BE TAKEN TO PREVENT OVERFLOW FROM THE RAIN GARDEN TO NEIGHBORING PROPERTIES.
- **BERMS**
  BERM SLOPES SHOULD BE 3:1 HORIZONTAL TO VERTICAL. INSTALL 100% BIODEGRADABLE NATURAL WOOD FIBER FABRIC (E.G., PENNINGTON SEED STARTER MAT) OR AN EROSION CONTROL FABRIC OVER THE BERM PRIOR TO PLANTING. CUT HOLES ("X"–SLITS) IN MAT/FABRIC TO CREATE A HOLE FOR PLANT INSTALLATION.
- **PLANTING GUIDANCE**
  SEE SECTION 8 OF THE PHILADELPHIA STORMWATER MANUAL (VERSION 2.0) FOR LANDSCAPE GUIDANCE. SEE TABLE ON FIGURE 1C FOR SUGGESTED RAIN GARDEN PLANT RECOMMENDATIONS.

## ADDITIONAL REFERENCES

- A HOMEOWNER'S GUIDE TO STORMWATER MANAGEMENT (PAGE 26, OFFICE OF WATERSHEDS, PHILADELPHIA WATER DEPARTMENT VOLUME 1, 2006 – AVAILABLE ONLINE AT: http://www.delawareestuary.org/pdf/HomeownersGuideSWMgmnt.pdf)
- STORMWATER MANUAL v2.0 (www.phillyriverinfo.org).
- PENNSYLVANIA NATIVE PLANT SOCIETY, "NATIVE PLANT SOURCES" http://www.pawildflower.org/04_links/links2.htm

## SEQUENCE OF CONSTRUCTION

1. MARK OUTLINE OF RAIN GARDEN AREA (E.G., TEMPORARILY LAY DOWN A GARDEN HOSE AND/OR USE WHITE SPRAY PAINT).
2. REMOVE SOD, IF PRESENT.
3. EXCAVATE TO DESIRED BASIN DEPTH (APPROXIMATELY 4–6" BELOW GROUND SURFACE) CREATING A 4–6" BERM AROUND THE GARDEN PERIMETER. USE STAKES AND STRING/LINE LEVEL TO MEASURE GRADE.
4. SOIL TEST & AMENDMENT (OPTIONAL): SUBMIT SOIL SAMPLE TO PENN STATE AGRICULTURAL SERVICES LABORATORY FOR STANDARD FERTILITY ANALYSIS ($9) AND USE THIS INFORMATION TO DISCUSS PLANT SELECTION AND SOIL AMENDMENTS WITH NURSERY/PLANT SUPPLIER. ADD 2 INCHES OF WELL–DECOMPOSED COMPOST TO BASIN FLOOR AND TILL INTO EXISTING SOIL.
5. INSTALL WOOD FIBER OR EROSION CONTROL FABRIC OVER ENTIRE BERM.
6. INSTALL DOWNSPOUT CONNECTION TO RAIN GARDEN (E.G., FLEXIBLE DOWNSPOUT EXTENSION, SOLID CORRUGATED PIPE, GRASS SWALE, OR STONE LINED CHANNEL).
7. INSTALL SPLASH ROCK AT DISCHARGE OF HOSE OR SWALE WHERE IT DEPOSITS INTO THE RAIN GARDEN.
8. SOAK RAIN GARDEN WITH WATER ALLOWING SOIL TO SETTLE. RAKE TO FINAL GRADE.
9. INSTALL PLANTS.
10. APPLY 2–3 INCHES OF HARDWOOD MULCH (DO NOT USE CYPRESS MULCH).
11. WATER PLANTS 3 TIMES PER WEEK FOR THE FIRST MONTH FOLLOWING INSTALLATION.

## RAIN GARDEN MAINTENANCE

| ACTIVITY | TIMING |
|---|---|
| WATER VEGETATION AFTER INITIAL PLANTING. | 3 TIMES PER WEEK FOR THE FIRST MONTH |
| MULCH | SPRING–AFTER PLANTS HAVE EMERGED AND ARE LARGE ENOUGH THAT THE MULCH WILL NOT SMOTHER THEM |
| REMOVE WEEDS | EARLY SPRING AND MID–SUMMER |
| GENERAL INSPECTION OF BERM AND INLET, HOSES, ETC. REPAIR AS NEEDED. | MONTHLY |
| PRUNE AND REPLACE DEAD PLANTS. | SPRING AND ACCORDING TO PLANT SPECIFIC RECOMMENDATIONS FROM NURSERY/SUPPLIER. |
| TRANSPLANT PLANTS – MOVE PLANTS AROUND IF WETTER/DRYER ZONES DEVELOP ACCORDING TO VARIATIONS OF PLANT PREFERENCES. | SPRING |

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| Prepared by: JJ | |
| Checked by: TF | |
| Date: 08/27/2009 | FIGURE 1B |

## RAIN GARDEN PLANT RECOMMENDATIONS

| COMMON NAME | SCIENTIFIC NAME | MOISTURE PREFERENCE | SUN/SHADE PREFERENCE | HEIGHT (FT) | PLANT FORM | PLANTING AREA IN RAIN GARDEN |
|---|---|---|---|---|---|---|
| St. John's wort | Hypericum calycinum | DRY TO MOIST | SUN TO PARTIAL SHADE | 1–1.5 | GROUNDCOVER FLOWER | BERM |
| Poppy mallow | Callirhoe involucrata | DRY TO AVERAGE | SUN | 0.5 | GROUNDCOVER FLOWER | BERM |
| Stonecrop | Sedum ternatum | DRY TO AVERAGE | SUN TO PARTIAL SHADE | 0.5 | GROUNDCOVER | BERM |
| Pussy Toes | Antennaria plantaginafolia | DRY TO AVERAGE | SUN TO PARTIAL SHADE | 0.5 | GROUNDCOVER | BERM |
| Bee balm | Monarda didyma | AVERAGE TO MOIST | SUN TO PARTIAL SHADE | 3–5 | FLOWER | BASIN FLOOR & PERIMETER |
| Brown–eyed susan | Rudbeckia fulgida 'Goldstrum' | AVERAGE TO MOIST | SUN | 1–3 | FLOWER | BASIN FLOOR & PERIMETER |
| Joe pye weed | Eupatorium dubium 'Little Joe' | DRY TO AVERAGE | SUN TO PARTIAL SHADE | 3–4 | FLOWER | BASIN PERIMETER (TRANSITION AREA) |
| Blue flag iris | Iris versicolor | MOIST TO WET | SUN TO PARTIAL SHADE | 2–3 | FLOWER | BASIN FLOOR (WETTEST AREA) |
| New England aster | Aster novae–angliae 'Purple Dome' | AVERAGE TO MOIST | SUN | 1–2 | FLOWER | BASIN FLOOR & PERIMETER |
| Red switch grass | Panicum virgatum 'Shenandoah' | AVERAGE TO MOIST | SUN | 2–3 | GRASS | BASIN FLOOR & PERIMETER |
| Feather reed grass | Calamagrostis x acutiflora 'Karl Foerster' | AVERAGE TO MOIST | SUN | 5–6 | GRASS | BASIN FLOOR & PERIMETER |
| Red chokeberry | Aronia arbutifolia | MOIST TO WET | SUN TO PARTIAL SHADE | 6–10 | SHRUB | BASIN FLOOR (WETTEST AREA) |
| Black chokeberry | Aronia melanocarpa | DRY TO WET | SUN TO PARTIAL SHADE | 5–10 | SHRUB | BASIN FLOOR & PERIMETER |
| Sweet pepperbush | Clethra alnifolia | DRY TO WET | SUN TO SHADE | 3–8 | SHRUB | BASIN FLOOR & PERIMETER |
| Steeplebush | Spiraea tomentosa | MOIST TO WET | SUN | 3–6 | SHRUB | BASIN FLOOR (WETTEST AREA) |

**SOURCES:**

1. PHILADELPHIA STORMWATER MANUAL (VERSION 2.0).
2. FAIRMOUNT PARK COMMISSION "SELECTED NATIVE PLANTS OF PHILADELPHIA"
3. THE PENNSYLVANIA HORTICULTURAL SOCIETY "RECLAIMING VACANT LOTS, A PHILADELPHIA GREEN GUIDE"
4. PHILADELPHIA PLANNING COMMISSION "RECOMMENDED PLANTING LIST FOR OFF–STREET PARKING UPDATE 2007"
5. U.S. FISH & WILDLIFE SERVICE "NATIVE PLANTS FOR WILDLIFE HABITAT & CONSERVATION LANDSCAPING"

## MATERIALS LIST AND BUDGETARY COST ESTIMATE

| ITEM | MAKE/MODEL/DECRIPTION | UNIT COST | QUANTITY | TOTAL ESTIMATED COST |
|---|---|---|---|---|
| NATURAL WOOD FIBER OR EROSION CONTROL FABRIC | PENNINGTON (39" x 20') SEED STARTER MAT | $17 | 2 TO 3 | $34 – $51 |
| FLEXIBLE DOWNSPOUT OR SOLID CORRUGATED PIPE AND ADAPTER | FLEX–A–SPOUT (EXTENDS UP TO 55") OR 4" SOLID CORRUGATED PIPE (10' SECTION) AND ADAPTER | $9 | 1 | $9 |
| SPLASH ROCK | KOLORSCAPE RIVER PEBBLES | $3.50/0.5 CUBIC FT. BAG | 1 | $3.50 |
| PLANT MATERIALS | ASSUME ALL PERENNIALS PLANTED 18" ON–CENTER (60 SQ. FT. = 27 PLANTS OR 180 SQ. FT. = 80 PLANTS) | $12 | 27 TO 80 | $324 – $960 |
| HARDWOOD MULCH | EVERGREEN 3 CUBIC FEET HARDWOOD MULCH. APPLY 3" THICK LAYER OVER ENTIRE GARDEN AND BERM | $4/CUBIC FT. (3 CUBIC FT./BAG) | 5 TO 15 (15 CF – 45 CF) | $20 – $60 |
| | | | TOTAL BUDGETARY COST ESTIMATE (ROUNDED UP TO NEAREST FIVE DOLLARS) ==> | $390 – $1,085 |

**NOTES:**

1. BUDGETARY COST ESTIMATE DOES NOT INCLUDE TAXES AND SHIPPING/HANDLING COSTS.
2. SPECIFIC MAKES/MODELS HAVE BEEN PRESENTED FOR ESTIMATING PURPOSES ONLY. ALTERNATE OR EQUIVALENT MATERIALS MAY BE USED, WHICH MAY IMPACT QUANTITIES AND OVERALL COST FOR RAIN GARDEN IMPLEMENTATION.

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| | PHILADELPHIA, PA |
| | FIGURE 1C |