CONCEPTUAL RESIDENTIAL RAIN GARDEN DESIGN FOR ROW HOMES

MODEL NEIGHBORHOOD PROJECT
TYPICAL ROW HOME APPLICATION
(FILL SOILS & 600 SQ. FT. DRAINAGE AREA)

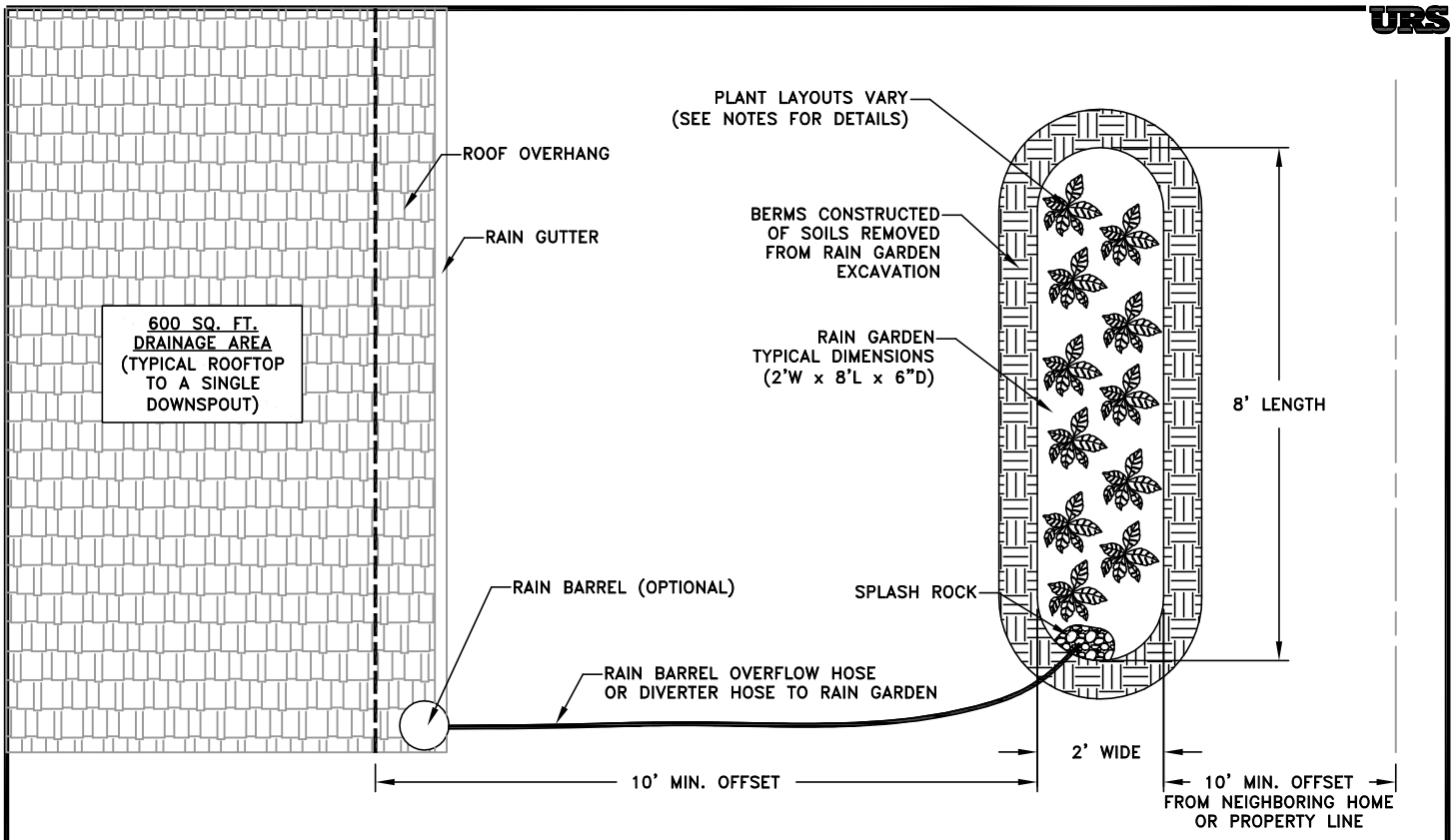
DRAWING LIST

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

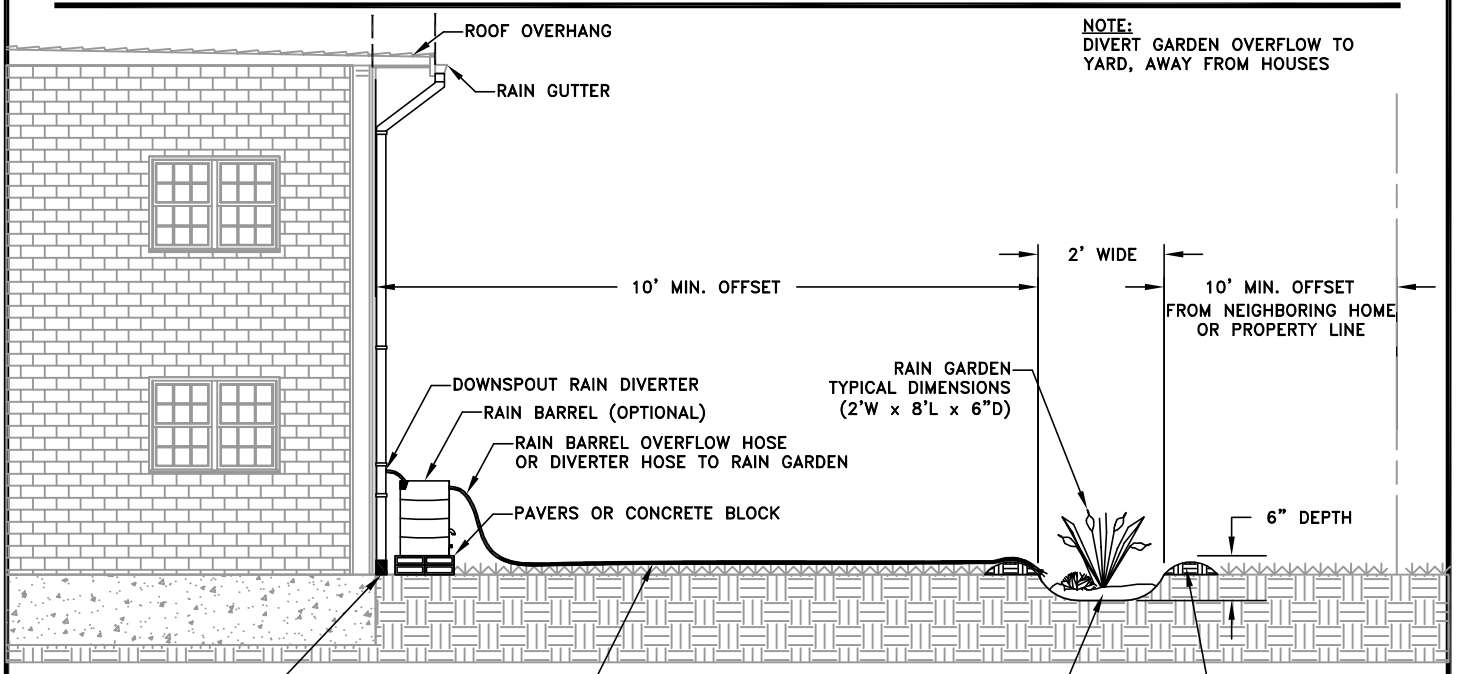
Philadelphia PWD Water Department

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

URS



PLAN VIEW
(NOT TO SCALE)



ELEVATION VIEW
(NOT TO SCALE)

Job: PWD	CONCEPTUAL RESIDENTIAL RAIN GARDEN DESIGN
Prepared by: JJ	MODEL NEIGHBORHOOD PROJECT
Checked by: TF	TYPICAL ROW HOME APPLICATION
Date: 08/27/2009	CONCEPTUAL RAIN GARDEN PLAN AND ELEVATION VIEWS
	PHILADELPHIA, PA
	FIGURE 1A

RESIDENTIAL RAIN GARDEN WITH HIGHLY PERMEABLE FILL SOILS

DIMENSIONS: 2' WIDTH x 8' LENGTH x 6" DEPTH

NOTE: 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.

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 TESTS RESULTS ARE GREATER THAN 1 INCH/HOUR.
- RAIN GARDEN SHOULD BE LOCATED DOWN SLOPE (DOWN GRADIENT) OF HOME.

IF ANY OF THE DESIGN ELEMENTS ARE NOT MET, CONSIDER THE FOLLOWING:

- CONSTRUCT A FLOW-THROUGH PLANTER BOX, OR
- CONSTRUCT A RAIN GARDEN WITH AN UNDERDRAIN SYSTEM IN ACCORDANCE WITH BIOFILTRATION/BIORETENTION GUIDELINES PRESENTED IN THE PHILADELPHIA STORMWATER MANUAL (VERSION 2.0).

RAIN GARDEN DETAILS:

- **DOWNSPOUT DIVERTER**
  THE GARDEN WATER SAVER (AVAILABLE AT: www.gardenwatersaver.com) IS INSTALLED INLINE WITH THE DOWNSPOUT TO CONVEY RAIN WATER DIRECTLY (VIA 5/8" HOSE) TO EITHER THE RAIN GARDEN OR THE RAIN BARREL. THE RAIN BARREL OPTION OFFERS STORAGE OF NON-POTABLE WATER FOR OTHER HOMEOWNER USES (E.G., WASHING THE CAR, WATERING OTHER PLANTING BEDS OR THE LAWN, ETC.).

  IF THE RAIN BARREL IS NOT DESIRED, RUN THE 5/8" HOSE (SIZE OF A STANDARD GARDEN HOSE) FROM THE DOWNSPOUT DIVERTER DIRECTLY TO THE RAIN GARDEN.

- **RAIN BARREL (OPTIONAL STORAGE WITH OVERFLOW TO THE RAIN GARDEN)**
  THE SPRUCE CREEK RAINSAVER IS OFFERED TO PHILADELPHIA RESIDENTS BY THE PHILADELPHIA WATER DEPARTMENT (PWD) AT RAIN BARREL CLASSES. TYPICAL DIMENSIONS FOR THIS BARREL INCLUDE: 23" DIAMETER. 36" HEIGHT, AND A 54-GALLON CAPACITY. AN OVERFLOW (1-1/4" HOSE) DIVERTS FLOW TO THE RAIN GARDEN OR MAY BE DIRECTED BACK INTO THE EXISTING CITY STORMWATER SEWER PIPE. PWD RAIN BARREL WEBSITE: www.phillywatersheds.org/rainbarrel.

RAIN GARDEN DETAILS (CONTINUED):

ALTERNATIVE MODELS ARE AVAILABLE AT HOME STORES AND ONLINE. PLANS FOR MODIFYING A STANDARD PLASTIC BARREL ARE ALSO AVAILABLE. ADDITIONAL REFERENCES ARE PROVIDED.

- **RAIN BARREL**
  THE SPRUCE CREEK RAINSAVER INCLUDES A 1-1/4 INCH OVERFLOW SUMP HOSE (6 FEET IN LENGTH). TO REACH THE RAIN GARDEN, REPLACE OR EXTEND THIS HOSE ACCORDINGLY.

  FOR CUSTOM-MADE RAIN BARRELS, INSTALL A HOSE CONNECTOR KIT TO PROVIDE AN OVERFLOW FEED FROM THE BARREL TO THE RAIN GARDEN.

  RAIN BARREL SPIGOT & GARDEN HOSE CONFIGURATION OPTIONS:
  - SINGLE SPIGOT LOCATED APPROXIMATELY 12" FROM THE BOTTOM OF THE BARREL.
  - DOUBLE SPIGOT (SAME LOCATION) AS AN OPTION TO DEDICATE ONE GARDEN HOSE TO A PLANTING AREA WITH A SOAKER HOSE. THE SECOND SPIGOT CAN BE USED AS NEEDED TO FILL WATERING CANS OR HAVE AN ADDITIONAL HOSE FOR NON-POTABLE USES.

- **CONCRETE BLOCKS OR PAVERS**
  PLACE CONCRETE BLOCKS OR PAVERS UNDERNEATH THE RAIN BARREL TO RAISE BARREL OFF THE GROUND. MAKE SURE PAVER/BLOCK SUPPORTS ARE LEVEL TO PREVENT BARREL TIPPING.

- **TOPOGRAPHY (GROUND SURFACE)**
  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.

  THE RAIN BARREL, IF USED, SHOULD BE ELEVATED ON CONCRETE BLOCKS/PAVERS TO ASSIST IN CONVEYING WATER FROM THE OVERFLOW HOSE TO THE RAIN GARDEN. GARDEN HOSE SHOULD GRADUALLY SLOPE DOWNHILL TO THE RAIN GARDEN.

- **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 RAIN GARDEN PLANT RECOMMENDATIONS.

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

RAIN BARREL MAINTENANCE

RAIN BARREL MAINTENANCE GUIDELINES ARE IDENTIFIED AT THE VARIOUS SUPPLIER WEBSITES (ADDITIONAL REFERENCES). KEY ITEMS TO REMEMBER: (1) EMPTY THE BARREL BETWEEN STORM EVENTS TO ALLOW THE BARREL TO CAPTURE RAIN FROM THE NEXT STORM TO RELIEVE THE CITY'S STORMWATER SYSTEM, AND (2) EMPTY THE BARREL AND RECONNECT THE DOWNSPOUT DURING THE WINTER.

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)
- PENNSYLVANIA RAIN GARDEN GUIDE (WISSAHICKON WATERSHED PARTNERSHIP, CONTACT PAUL RACETTE, PENNSYLVANIA ENVIRONMENTAL COUNCIL)
- PHILADELPHIA STORMWATER MANUAL v2.0 (www.phillyriverinfo.org).
- THIS OLD HOUSE VIDEO OF RAIN BARREL AND DIVERTER INSTALLATION; http://www.thisoldhouse.com/toh/video/0,,20045365,00.html
- http://www.rain-barrel.net/rainwater-tank.html
- http://www.ne-design.net/
- http://www.aquabarrel.com/
- http://www.rainharvest.com/
- http://www.home.comcast.net/~leavesdance/rainbarrels/construction.html
- http://www.rainbarrelsource.com
- PENNSYLVANIA NATIVE PLANT SOCIETY, "NATIVE PLANT SOURCES" http://www.pawildflower.org/04_links/links2.htm

NOTE: THIS IS NOT A COMPREHENSIVE LIST OF AVAILABLE INFORMATION, RAIN GARDEN SUPPLIES, OR SUPPLIERS. URS DOES NOT ENDORSE THESE MANUFACTURERS AND CANNOT VERIFY ANY INFORMATION PROVIDED BY THESE SOURCES.

Job: PWD	CONCEPTUAL RESIDENTIAL RAIN GARDEN DESIGN MODEL NEIGHBORHOOD PROJECT TYPICAL ROW HOME APPLICATION DETAILS AND NOTES PHILADELPHIA, PA
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"

*** PLEASE NOTE THAT DUE TO EXTREME VARIATION IN URBAN SOIL CONDITIONS, THIS LIST IS PROVIDED AS A GOOD STARTING POINT FOR SELECTION AND DOES NOT GUARANTEE THAT THESE PLANTS WILL SURVIVE OR THRIVE IN URBAN FILL SOILS. PLEASE CONSULT FURTHER WITH YOUR LOCAL NURSERY REGARDING PROPERTY–SPECIFIC CONDITIONS AND UNDERSTAND THAT GARDENING IS EXPERIMENTAL.

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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" BELOW GROUND SURFACE) CREATING A 4–6" BERM AROUND THE GARDEN PERIMETER. USE STAKES AND STRING/LINE LEVEL TO MEASURE GRADE. BASIN FLOOR SHOULD BE LEVEL.
4. 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 DIVERTER.

   OPTIONAL: INSTALL RAIN BARREL WITH HOSE TO RAIN GARDEN.
7. INSTALL SPLASH ROCK AT DISCHARGE OF HOSE WHERE IT FLOWS 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.

MATERIALS LIST AND BUDGETARY COST ESTIMATE

ITEM	MAKE/MODEL/DECRIPTION	UNIT COST	QUANTITY	TOTAL ESTIMATED COST
REQUIRED ITEMS				
DOWNSPOUT DIVERTER	THE GARDEN WATER SAVER	$24	1	$24
PLANT MATERIALS	ASSUME ALL PERENNIALS PLANTED 18" ON–CENTER (16 SQUARE FEET/ 2.25 = 8)	$12	8	$96
NATURAL WOOD FIBER OR EROSION CONTROL FABRIC	PENNINGTON (39" x 20') SEED STARTER MAT	$17	1	$17
HARDWOOD MULCH	EVERGREEN 3 CUBIC FEET HARDWOOD MULCH. APPLY 3" THICK LAYER OVER ENTIRE GARDEN AND BERM	$4/CUBIC FT. (3 CUBIC FT./BAG)	4 CUBIC FEET (2 BAGS)	$8
SPLASH BLOCK STONE	KOLORSCAPE RIVER PEBBLES	$3.50/0.5 CUBIC FT. BAG	1	$3.50
SUBTOTAL (ROUNDED UP TO NEAREST FIVE DOLLARS) ==>				$150.00
OPTIONAL ITEMS				
RAIN BARREL	SPRUCE CREEK RAINSAVER	$165	1	$165
RAIN BARREL OVERFLOW PIPE	WAYNE SUMP PUMP DISCHARGE HOSE KIT (1 1/4" x 24')	$10	1	$10
3/4" "Y" SPLITTER BALL VALVE	NA	$5	1	$5
CONCRETE BLOCKS OR PAVERS	DIMENSIONS: 7.5" x 7.5" x 15.5"	$1.30	4	$5.20
SUBTOTAL (ROUNDED UP TO NEAREST FIVE DOLLARS) ==>				$190.00
TOTAL BUDGETARY COST ESTIMATE (REQUIRED + OPTIONAL ITEMS) ==>				$340.00

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 1D