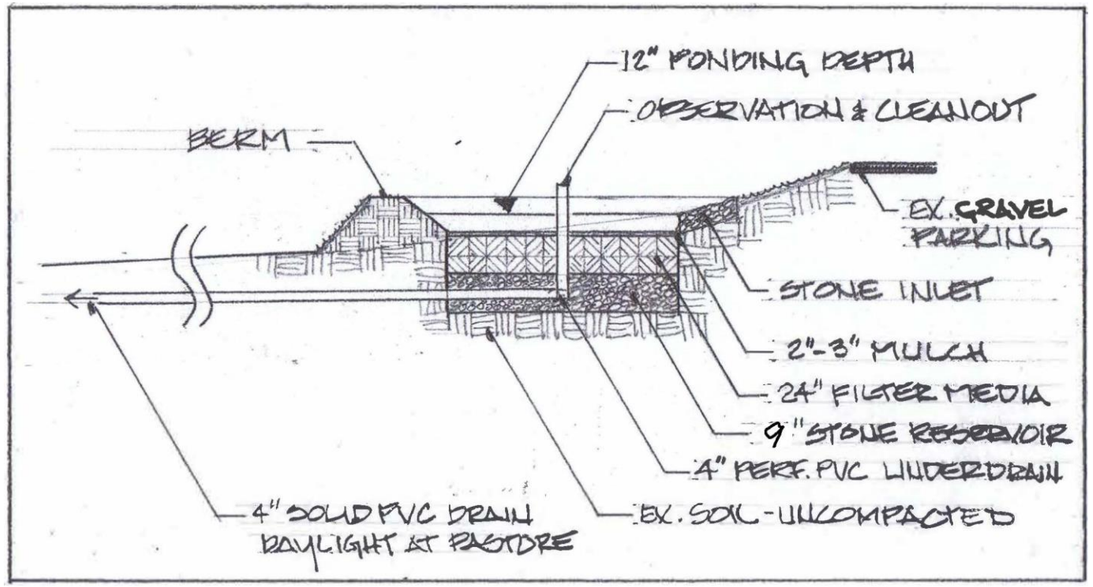
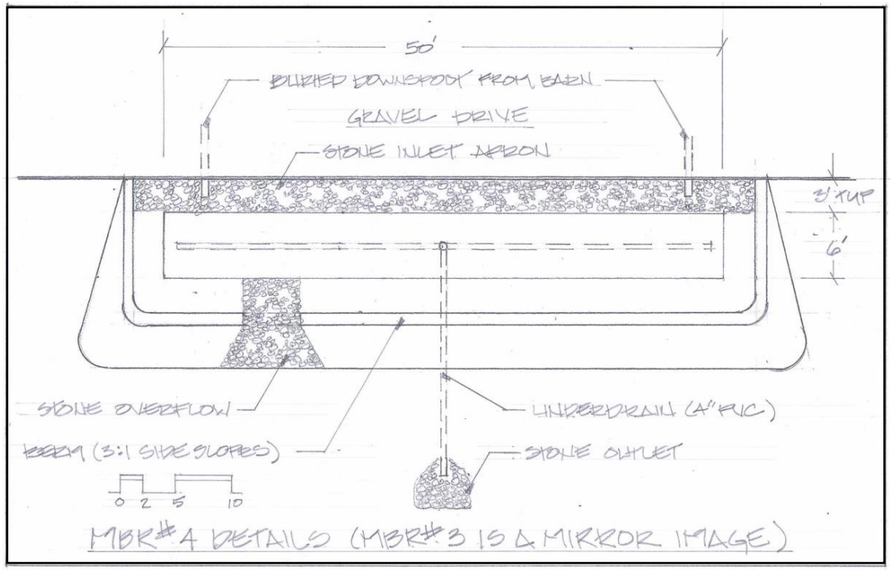
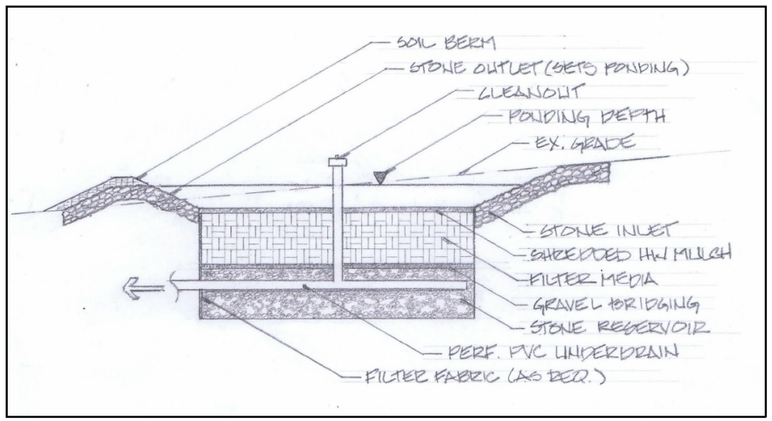


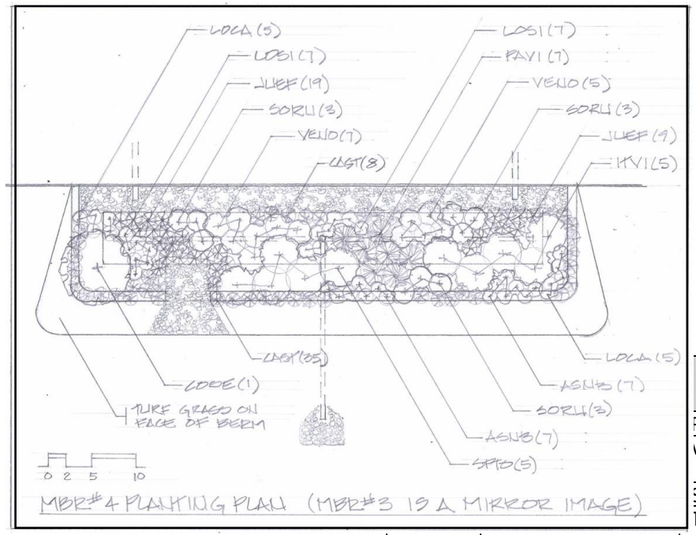


Typical BMP Profile



Notes:

- Typical profile for micro-bioretention (MBR) – see details for dimensions and actual design specifications.
- Elements of the MBR profile will be included and specified as required by the detail design and site considerations.
- See specifications for material selections and requirements.
- A suitable outfall will be located for the BMP overflow and underdrain.
- Rain Garden profiles may include elements of the MBR profile as required by the detail design and site considerations.



Common Name	Qty (ttl)	Type	Size	Notes
Red Twig Dogwood	2	Shrub	#3	7x8, S/PS, May-Jun: White pollinators
Virginia Sweetspire	10	Shrub	#3	4x4, S/PS, Jun-Jul: White pollinators pH 5.5-7.0
Steeplebush	10	Shrub	#3	3x4, S/PS, Jul-Sep: Pink, pollinators
Tussock Sedge	86	Grass	Qt	2.5x1.5, S/PS, birds & amphibians, shelter/food
JUEF Juncus effusus	Common Rush	56	Grass	Qt	3x1.5, S/PS, birds & amphibians, shelter/food
PAVI Panicum virgatum	Switchgrass	14	Grass	Qt	3x5, S, Jul-Feb: Pink, birds shelter/food
ASNB Aster novi-belgii	New York Aster	28	Peren	Qt	3x1.5, S, Aug-Oct: Purple, pollinators
LOCA Lobelia cardinalis	Cardinal Flower	20	Peren	Qt	3x1.5, S/PS, Jul-Sep: Red, pollinators
LOSI Lobelia siphilitica	Blue Cardinal Flower	28	Peren	Qt	3x1.5, S/PS, Aug-Sep: Blue, pollinators
SORU Solidago rugosa	Wrinkleleaf Goldenrod	18	Peren	Qt	3x2, S, Aug-Oct: Yellow, pollinators
VENO Vernonia noveboracensis	New York Ironweed	24	Peren	Qt	5x3, S, Aug-Sep: Purple, pollinators

MICROBIORETENTION (MBR)

GUNPOWDER VALLEY CONSERVANCY

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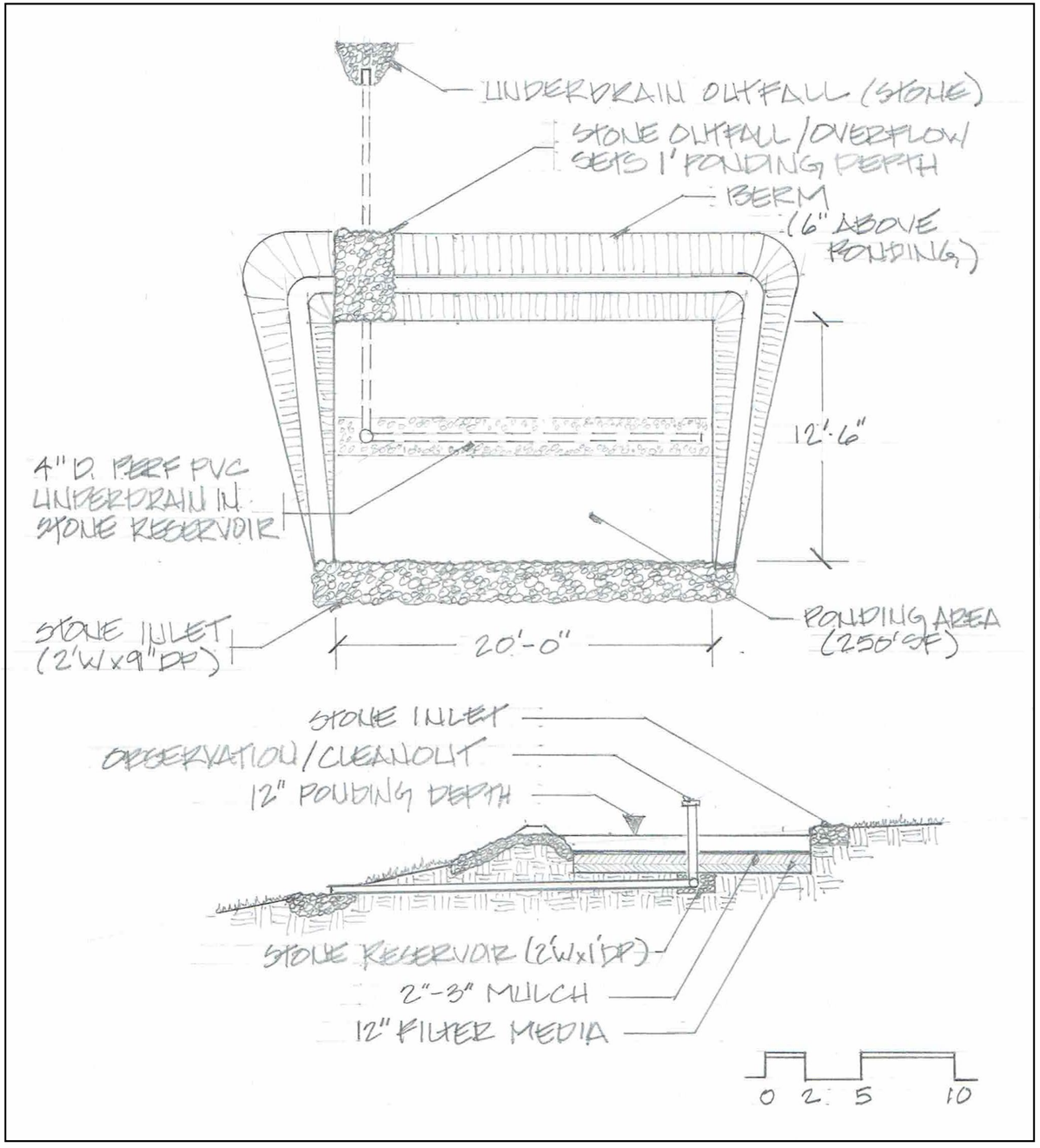

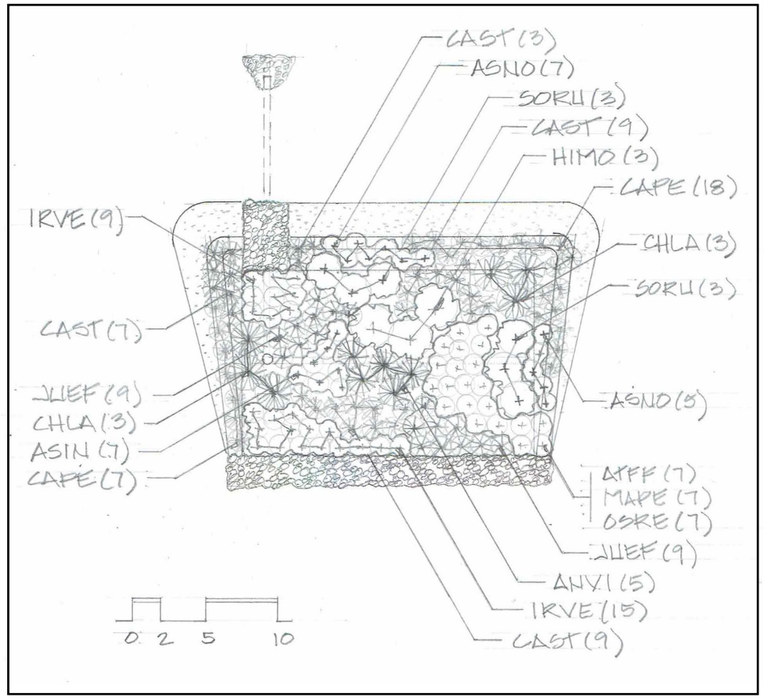

	Botanical Name	Common Name	Qty	Type	Size	Notes
ANVI	Andropogon virginicus	Broomsedge	5	Grass	#1	4x2, PS, Fall-Winter interest, birds shelter/food
CAPE	Carex pensylvanica	Pennsylvania Sedge	25	Grass	#1	1.25x1.5, PS/SH, birds & amphibians, shelter/food
CAST	Carex stricta	Tussock Sedge	28	Grass	#1	2.5x1.5, S/PS, birds & amphibians, shelter/food
CHLA	Chasmanthium latifolium	Northern Sea Oats	6	Grass	#1	3x2.5, S/PS, birds & amphibians, shelter/food
JUEF	Juncus effusus	Common Rush	18	Grass	#1	3x1.5, S/PS, birds & amphibians, shelter
ASIN	Asclepias incarnata	Swamp Milkweed	7	Peren	#1	3x1.5, S, Jul-Sep: Pink, pollinators
ASNO	Aster novae-angliae 'Purple Dome'	New England Aster 'Purple Dome'	12	Peren	#1	2.5x2.5, S, Jul-Sep: Purple, pollinators
HIMO	Hibiscus moscheutos	Swamp Rose Mallow	3	Peren	#1	5x3, S, Jul-Sep: White-Pink, pollinators
IRVE	Iris versicolor	Blue Flag Iris	24	Peren	#1	3x1.5, S/PS, Jul-Sep: Red, pollinators
SORU	Solidago rugosa 'Fireworks'	Goldenrod 'Fireworks'	6	Peren	#1	3.5x1.5, S, Sep-Oct: Yellow, pollinators
ATFF	Athyrium filix-femina	Lady Fern	7	Fern	#1	2x1.5, PS/SH
MAPE	Matteuccia pensylvanica	Ostrich Fern	7	Fern	#1	3.5x1.5, PS/SH
OSRE	Osmunda regalis	Royal Fern	7	Fern	#1	3.5x1.5, PS/SH

INSTITUTIONAL RAIN GARDEN

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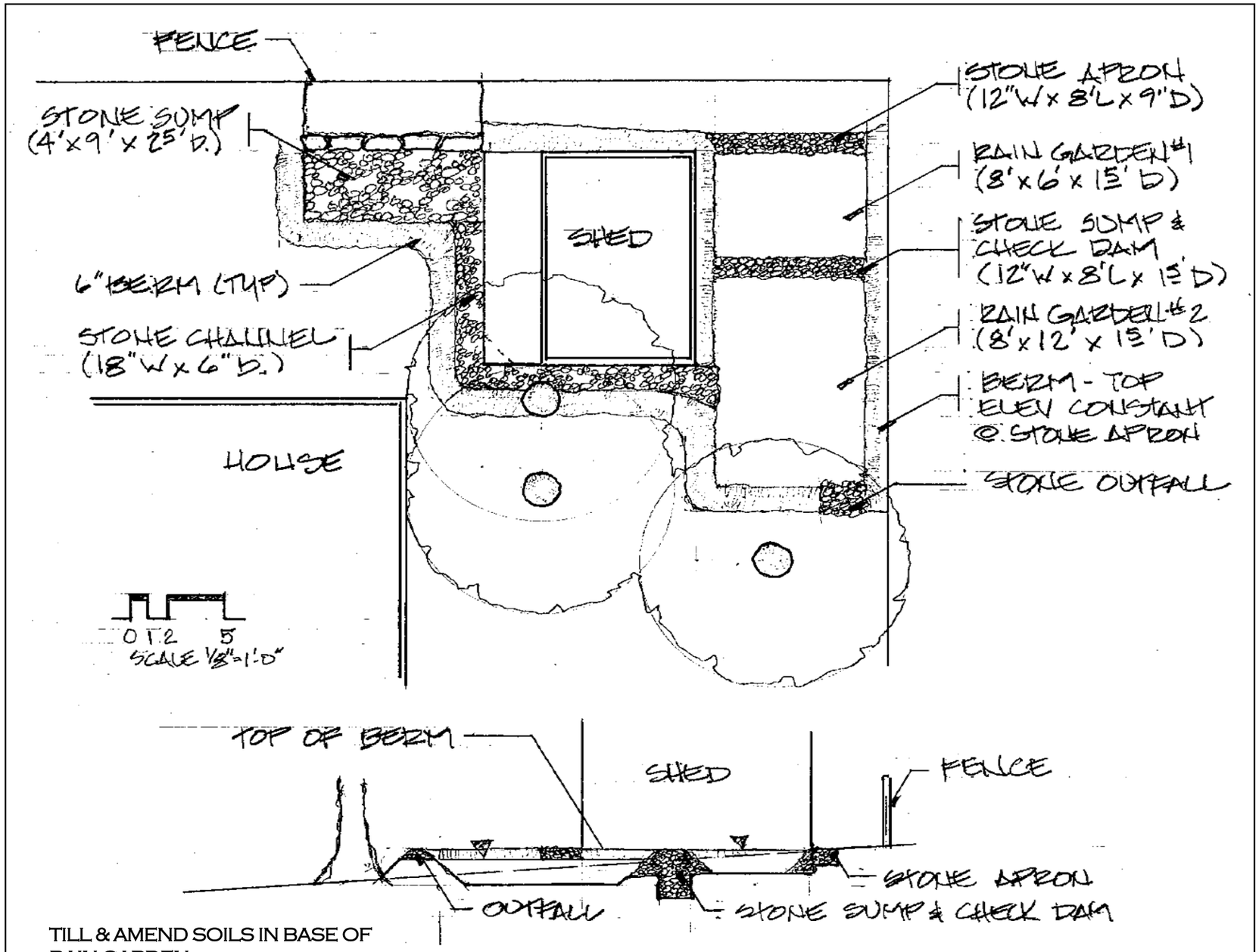

TILL & AMEND SOILS IN BASE OF RAIN GARDEN

RESIDENTIAL RAIN GARDEN

GUNPOWDER VALLEY CONSERVANCY

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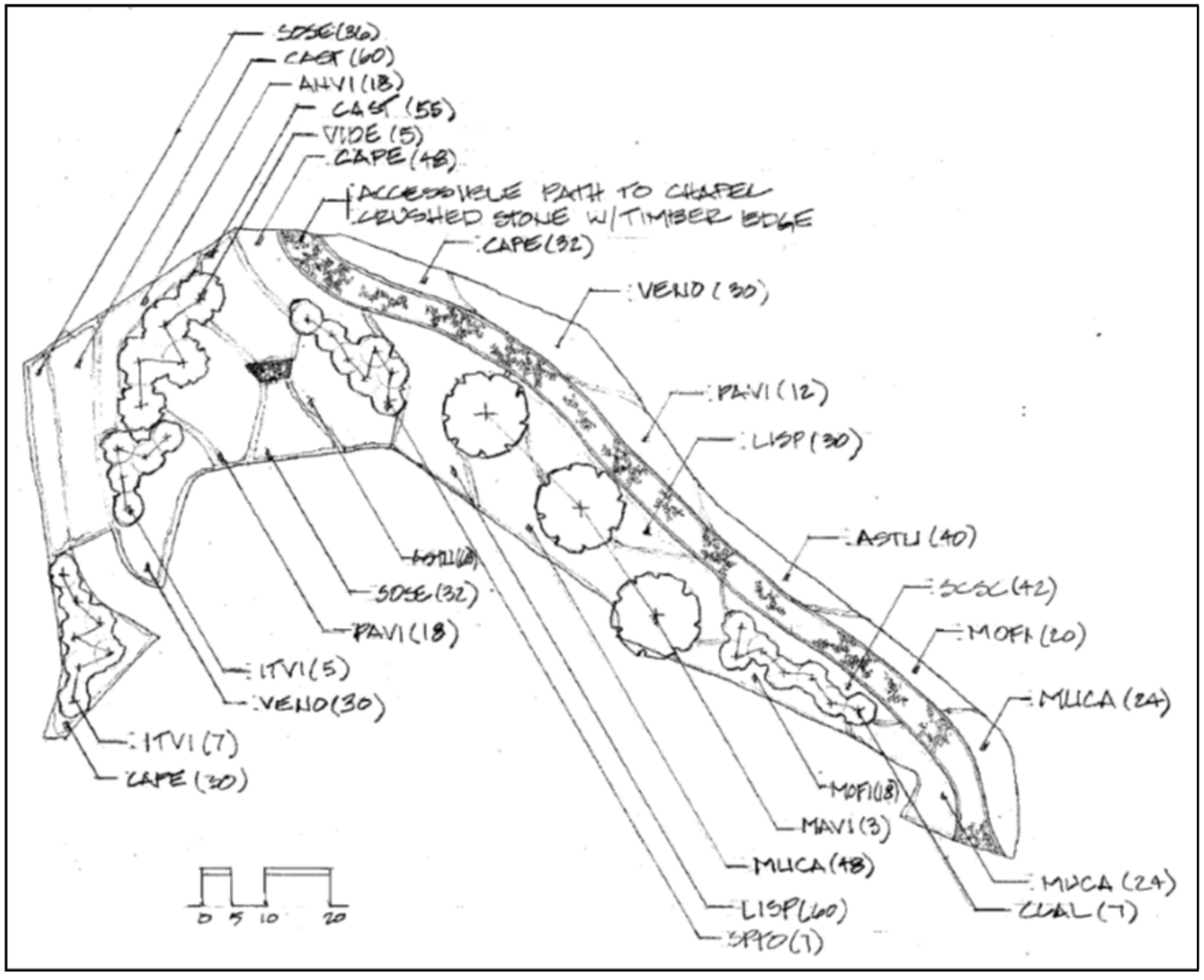

Key	Botanical Name	Common Name	Qty	Type	Size	Notes
MAVI	Magnolia virginiana	Sweetbay Magnolia		Tree	#7	20x12,S/PS, May-Jul: White, Birds
CLAL	Clethra alnifolia	Summersweet		Shrub	#3	4x4, S/PS, Jul-Aug: White pollinators
ITVI	Itea virginica	Virginia Sweetspire		Shrub	#3	4x4, S/PS, Jun-Jul: White pollinators
SPTO	Spirea tomentosa	Steeplebush		Shrub	#3	3x4, S/PS, Jul-Sep: Pink, pollinators
VIDE	Viburnum dentatum	Arrowwood Viburnum		Shrub	#3	3x4, S/PS, Jul-Sep: Pink, pollinators
ANVI	Andropogon virginicus	Broomsedge		Grass	#1	4x2, PS, Fall-Winter interest, birds shelter/food
CAPE	Carex pensylvanica	Pennsylvania Sedge		Grass	#1	1x1.5, S/PS, birds & amphibians, shelter/food
CAST	Carex stricta	Tussock Sedge		Grass	#1	2.5x1.5, S/PS, birds & amphibians, shelter/food
MUCA	Muhlenbergia capillaris	Pink Muhly Grass		Grass	#1	3x2, S, birds & amphibians, shelter/food
PAVI	Panicum virgatum	Switchgrass		Grass	#1	5x3, S, birds & amphibians, shelter/food
SCSC	Schizachyrium scoparium	Little Bluestem		Grass	#1	2.5x1.5, S, birds & amphibians, shelter/food
ASTU	Asclepias tuberosa	Butterfly Weed		Peren	#1	3x1.5, S, Jun-Aug: Orange, pollinators
LISP	Liatris spicata	Gay Feather		Peren	#1	3x2, S, Jul-Aug: Lavender, pollinators
MOFI	Monarda fistulosa	Wild Bergamot		Peren	#1	3x2, S, Jul-Aug: Lavender, pollinators
SOSE	Solidago sempervirens	Seaside Goldenrod		Peren	#1	4x1.5, S/PS, Aug-Oct: Yellow, pollinators
VENO	Vernonia noveboracensis	New York Iron Weed		Peren	#1	5x2.5, S/PS, Aug-Oct: Purple, pollinators

BAYSCAPE
GARDEN
GUNPOWDER VALLEY CONSERVANCY

JGL DESIGN ASSOCIATES
LANDSCAPE ARCHITECTS & PLANNERS

Specifications for Micro-Bioretention, Rain Garden & Bayscape

1. Material Specifications
The allowable materials to be used in the micro-bioretention area are detailed in the following Table:

Materials Specifications for Bioretention & Rain Garden

Material	Specification	Size	Notes
Plantings	see Planting Plan & Plant List	n/a	See Plant Installation note
planting soil (2.5' to 4' deep)	sand 35 - 60% silt 30 - 55% clay 10 - 25%	n/a	USDA soil types loamy sand, sandy loam or loam
mulch	shredded hardwood		aged 6 months, minimum - no pine or wood chips
pea gravel diaphragm and curtain drain	pea gravel: ASTM-D-448 ornamental stone: washed cobbles	pea gravel: No. 6 stone: 2" to 5"	
Filter fabric	Class 2 Type C non-woven geotextile fabric	n/a	
underdrain gravel	AASHTO M-43	NO. 57 OR NO. 6 AGGREGATE (3/8" to 3/4")	

2. Planting Soil
The soil shall be a uniform mix, free of stones, stumps, roots or other similar objects larger than two inches. No other materials or substances shall be mixed or dumped within the bioretention area that may be harmful to plant growth, or prove a hindrance to the planting or maintenance operations. The planting soil shall be free of Bermuda grass, Quackgrass, Johnson grass, or other noxious weeds as specified under COMAR 15.08.01.05.

The planting soil shall be tested and shall meet the following criteria:
- pH range 5.2 - 7.0
- organic matter 1.5 - 4% (by weight)
- magnesium 35 lb./ac
- phosphorus (phosphate - P2O5) 75 lb./ac
- potassium (potash - K2O) 85 lb./ac
- soluble salts not to exceed 500 ppm

Filter Media (Planting Soil) Installation: Bioretention/rain garden soils may be mixed on-site before placement. However, soils should not be placed under saturated conditions. The filter media should be placed and graded using excavators or backhoes operating adjacent to the practice and be placed in horizontal layers (12 inches per lift maximum). Proper compaction of the media will occur naturally. Spraying or sprinkling water on each lift until saturated may quicken settling times.

3. Compaction
Excavation should be conducted in dry conditions with equipment located outside of the practice to minimize bottom and sidewall compaction. Only lightweight, low ground-contact equipment should be used within micro-bioretention practices and the bottom scarified before installing underdrains and filtering media.

It is very important to minimize compaction of both the base of the bioretention/rain garden area and the required backfill. When possible, use excavation hoes to remove original soil. If bioretention areas are excavated using a loader, the contractor should use wide track or marsh track equipment, or light equipment with turf type tires. Use of equipment with narrow tracks or narrow tires, rubber tires with large lugs, or high pressure tires will cause excessive compaction resulting in reduced infiltration rates and is not acceptable. Compaction will significantly contribute to design failure.

Compaction can be alleviated at the base of the bioretention facility by using a primary tilling operation such as a chisel plow, ripper, or subsoiler. These tilling operations are to refracture the soil profile through the 12 inch compaction zone. Substitute methods must be approved by the engineer. Rototillers typically do not till deep enough to reduce the effects of compaction from heavy equipment.

BMP SPECIFICATIONS
NOTES
GUNPOWDER VALLEY CONSERVANCY

Rototill 2 to 3 inches of sand into the base of the bioretention facility before backfilling the optional sand layer. Pump any ponded water before preparing (rototilling) base.

When backfilling the topsoil over the sand layer, first place 3 to 4 inches of topsoil over the sand, then rototill the sand/topsoil to create a gradation zone. Backfill the remainder of the topsoil to final grade. When backfilling the bioretention facility, place soil in lifts 12" to 18". Do not use heavy equipment within the bioretention basin. Heavy equipment can be used around the perimeter of the basin to supply soils and sand. Grade bioretention materials with light equipment such as a compact loader or a dozer/loader with marsh tracks.

4. Plant Material
See Planting Plan and Plant List.

5. Plant Installation
Confirm the location of all utilities prior to planting operations. Planting shall be located where shown on the drawing. Contractors shall confirm all design modifications and/or substitutions with JGL Design Assoc. before proceeding. Field layout of planting beds and plant material by JGL Design Assoc. is recommended. All materials & workmanship are subject to the final approval of JGL Design Assoc.

Mulch should be placed to a uniform thickness of 2" to 3". Shredded hardwood mulch is the only accepted mulch. Pine mulch and wood chips will float and move to the perimeter of the bioretention area during a storm event and are not acceptable. Shredded mulch must be well aged (6 to 12 months) for acceptance. Mulch should not be placed in direct contact with the base of woody plants.

Root stock of the plant material shall be kept moist during transport and on-site storage. The plant root ball should be planted so 1/8th of the ball is above final grade surface. The diameter of the planting pit shall be at least six inches larger than the diameter of the planting ball. Set and maintain the plant straight during the entire planting process. Thoroughly water ground bed cover after installation.

Trees shall be braced using 2" by 2" stakes only as necessary and for the first growing season only. Stakes are to be equally spaced on the outside of the tree ball.

Maintain all plants in accordance with nursery recommendations. The owner will be responsible for maintenance including watering, remulching, cultivating, fertilizing, spraying, and other necessary operations as may be required to keep the plants alive and in a healthy growing condition. Prune only dead, dying or weak branches at time of planting.

The topsoil specifications provide enough organic material to adequately supply nutrients from natural cycling. The primary function of the bioretention structure is to improve water quality. Adding fertilizers defeats, or at a minimum, impedes this goal. Only add fertilizer if wood chips or mulch are used to amend the soil. Rototill urea fertilizer at a rate of 2 pounds per 1000 square feet.

All disturbed areas shall be seeded with the exception of planting beds.

6. Maintenance Criteria
The following items should be addressed to ensure proper maintenance and long-term performance of micro-bioretention practices:
- Privately owned practices shall have a maintenance plan and shall be protected by easement, deed restriction, ordinance, or other legal measures preventing its neglect, adverse alteration, and removal.
- The top few inches of filter media should be removed and replaced when water ponds for more than 48 hours. Silts and sediment should be removed from the surface of the filter bed when accumulation exceeds one inch.
- Where practices are used to treat areas with higher concentrations of heavy metals (e.g., parking lots, roads), mulch should be replaced annually. Otherwise, the top two to three inches should be replaced as necessary.
- Occasional pruning and replacement of dead vegetation is necessary. If specific plants are not surviving, more appropriate species should be used. Watering may be required during prolonged dry periods.

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