

**BIORETENTION FACILITY (F-5) PLANTING SCHEDULE**

Low Zone	Botanical Name	Common Name	Root	Spacing	Ratio	Sq. Ft.	Quantity	Height
Low Zone	Peltandra virginica	Arrow arum	2" Plug	3' O.C.	35%	1,148	82	-
	Potamogeton nodosus	Potamogeton	2" Plug	3' O.C.	35%	1,148	82	-
	Sagittaria latifolia	Duck potato	Quart Pot	3' O.C.	30%	984	75	-
Middle Zone	Pyrus arbutifolia	Red Osier Dogwood	1 Gal.	8' O.C.	-	1,267	19	-
	Rosa palustris	Spotted Alder	1 Gal.	10' O.C.	-	1,267	13	-
	Acer rubrum	Red Maple	B+B	see plan	-	-	4	4'-5'
Outer Zone	Taxus canadensis	Eastern Hemlock	B+B	see plan	-	-	6	4'-5'
	Acer rubrum	Red Maple	B+B	see plan	-	-	2	4'-5'

**EXTENDED DETENTION SHALLOW WETLAND (W-2) PLANTING SCHEDULE**

High Marsh	Botanical Name	Common Name	Root	Spacing	Ratio	Sq. Ft.	Quantity
High Marsh	Sagittaria arifolia	Sagittaria	2" Plug	3' O.C.	35%	1,830	203
	Galium aparine	Marsh Marigold	2" Plug	3' O.C.	35%	1,830	203
	Iris versicolor	Blue flag Iris	Quart Pot	3' O.C.	30%	1,570	175
Low Marsh	Peltandra virginica	Arrow arum	2" Plug	3' O.C.	35%	735	82
	Potamogeton nodosus	Potamogeton	2" Plug	3' O.C.	35%	735	82
	Sagittaria latifolia	Duck potato	Quart Pot	3' O.C.	30%	630	70
Deep Pool	Najas lutea	Yellow Water Lily	2" Plug	3' O.C.	50%	1,184	132
	Najas lutea	White Water Lily	2" Plug	3' O.C.	50%	1,184	132

#### NEW IMPERVIOUS AREA MINIMUM RUNOFF REDUCTION (RRV) CALCULATIONS:

RRV (N ACRE-FOOT OF STORAGE) =  $\frac{(P)(R)(A)}{12}$   
 $A = (S)(A_c)$   
 $A_c = \text{IMPERVIOUS COVER TARGETED FOR RUNOFF REDUCTION}$   
 $R = 0.05 + 0.009(S)$  WHERE  $S$  IS 100% IMPERVIOUS  
 $S = \text{HYDROLOGIC SOIL GROUP (HSG) SPECIFIC REDUCTION FACTOR (S)}$   
 $A_c = (0.20)(2,670) = 0.5340$   
 $A = 0.5340 \text{ AC}$   
 $R = 0.05$   
 $S = (HSG) = 0.20$   
 $RRV = \frac{[(1)(0.05)(0.5340)]}{12} = 0.0023 \text{ AC-FT}$   
 $0.0023 \text{ AC-FT} = 1,842 \text{ CF}$

RRV Roof and Paved Area (Watershed Area P3-B)  
 WATER QUALITY VOLUME (WQV) CALCULATIONS:

ROOF RULE:  
 $P = 1.0$   
 $R = 0.05 + 0.009(66) = 0.644$   
 $A = 0.979$   
 $WQV = \frac{(P)(R)(A)}{12} = \frac{[(1)(0.644)(0.979)]}{12} = 0.0525 \text{ AF}$   
 $0.0525 \text{ AF} = 2,598 \text{ CF}$

#### BIORETENTION DESIGN REQUIREMENTS:

- REQUIRED: PRE-TREATMENT AT INLET: 60% OF FOREBAY AT INLET
- REQUIRED: 4 FOOT PRE-TREATMENT FOREBAY APPROX. 75% OF WQV ENTERING BIORETENTION = 2,298 CF x 0.75 = 1,724 CF PROVIDED: FOREBAY AT PIPE OUTLET WITH 4' DEPTH AND 660 CF CAPACITY
- REQUIRED: VOLUME TO EQUAL 75% OF CONTRIBUTING WQV FOR RRV REQUIREMENT CONTRIBUTING VOLUME = 2,298 CF x 0.75 = 1,724 CF PROVIDED: TOTAL VOLUME = 2,550 CF FOR RRV REQUIREMENT
- WQV PROVIDED BY BIORETENTION = 40% OF VOLUME TOTAL BIORETENTION VOLUME =  $[(660 \text{ CF} + 2,550 \text{ CF}) \times 0.40]$  PROVIDED: 1,380 CF FOR WQV

#### BIORETENTION NOTES:

##### CONSTRUCTION NOTES:

- PERFORATED PIPE AND GRAVEL JACKET IS ADDED TO THE BIORETENTION FACILITY. GRAVEL JACKET SHALL BE LOOSELY COMPACTED, TAMPED LIGHTLY WITH A DOZER OR BACKHOE BUCKET.
- PLACE SOIL IN LOTS OF 12" TO 18" AND COMPACT LOOSELY, TAMPED LIGHTLY WITH A DOZER OR BACKHOE BUCKET.
- INSTALL PLANTINGS AS PER PLANTING SCHEDULE AND LOOSELY APPLY MULCH.
- DURING THE INITIAL PLANTING PERIODS SHOULD BE UNDERSTOOD TO PREVENT AND PROHIBIT ANIMALS FROM GRAZING UNTIL PLANT COMMUNITIES ARE WELL ESTABLISHED. SUCH PRECAUTIONS COULD BE DEEP FENCING, MOUNTAIN TRAPPING, PLANTING AFTER SEASONAL BIRD MIGRATIONS OR ATTRACTING BIRDS OF PREY AND BATS TO CONTROL NUTRIA POPULATIONS.

##### OPERATIONS AND MAINTENANCE NOTES:

- CAREFUL OBSERVATION OF THE SYSTEM OVER TIME IS REQUIRED IN THE FIRST THREE YEARS AFTER CONSTRUCTION. WITHIN THE FIRST GROWING SEASON OR UNTIL IT IS DETERMINED THAT THE SYSTEM IS ESTABLISHED, FREQUENT INSPECTIONS WILL BE REQUIRED, POSSIBLY WEEKLY OR MONTHLY BASED. FOLLOWING THIS, TWO YEAR INSPECTIONS ARE NEEDED DURING BOTH THE GROWING AND NON-GROWING SEASONS. DATA GATHERED DURING THESE INSPECTIONS SHOULD BE RECORDED, MAPPED AND ASSESSED. THE FOLLOWING OBSERVATIONS SHOULD BE MADE DURING THE INSPECTIONS:
  - TYPES AND DISTRIBUTION OF PLANTS IN THE FACILITY.
  - IF THE DESIGN ELEVATION OF THE BIORETENTION FACILITY IS BEING MAINTAINED.
  - SURVIVAL RATE OF PLANTS IN THE FACILITY.
  - SEEDING OF THE FACILITY WHEN THE DESIGN ELEVATION IS BEING MAINTAINED. THE MAJORITY OF SEEDING SHOULD BE TRAPPED AND REMOVED BEFORE THEY REACH THE BASIN IN THE DRAINAGE STRUCTURE SWUMPS. SEEDING ACCUMULATION IN THE BASIN RESULT IN REDUCED WATER DEPTH AND CHANGES IN THE GROWING CONDITIONS. SEEDING SHALL BE REMOVED OUT OF FOREBAY WHEN IT REACHES A DEPTH OF 4".
  - STRUCTURES AND DISCHARGE LOCATIONS SHOULD BE INSPECTED MORE FREQUENTLY. INSPECTIONS FOR THEM COULD CORRELATE WITH MOISTURE OR EXTENDED PERIOD PARTIAL, RATHER THAN JUST INCREASING THE INSPECTION INTERVALS. THAT, IF THERE ARE PERIODS OF DROUGHT OR SMALL INFILTRANT EVENTS IT WOULD NOT BE NECESSARY FOR AN INSPECTION.
  - LOW ZONE VEGETATION SHALL BE LIMITED TO A HEIGHT OF 18".
  - ALL SEEDING SHALL BE REMOVED FROM FOREBAY WHEN IT REACHES A DEPTH OF 1".
  - PLANT BED MATERIAL SHALL BE REMOVED AND REPLACED WHEN FLOODING OF WATER FOR GREATER THAN 48 HOURS IS OBSERVED.
- THE OWNER OF THE PROPERTY SHALL BE THE RESPONSIBLE AGENT FOR THE STORMWATER MANAGEMENT FACILITIES ON SAID PROPERTY.

#### RE-DEVELOPMENT WATER QUALITY VOLUME (WQV) CALCULATIONS:

REQUIRED TREATMENT OF 100% OF THE INCREASE IN IMPERVIOUS AREA WQV AND 25% OF THE ORIGINAL IMPERVIOUS AREA WQV  
 ORIGINAL IMPERVIOUS COVERAGE = 308,116 SF  
 PROPOSED IMPERVIOUS COVERAGE = 424,406 SF

##### EXISTING IMPERVIOUS AREA WQV

ROOF RULE:  
 $P = 1.0$   
 $R = 0.05 + 0.009(61.3) = 0.602$   
 $A = 11,530$   
 THEREFORE WQV CALCULATION:  
 $WQV = \frac{(P)(R)(A)}{12} = \frac{[(1)(0.602)(11,530)]}{12} = 5,795 \text{ AF}$   
 $5,795 \text{ AF} = 25,201 \text{ CF}$

##### PROPOSED IMPERVIOUS AREA WQV

ROOF RULE:  
 $P = 1.0$   
 $R = 0.05 + 0.009(63.8) = 0.624$   
 $A = 19,779$   
 THEREFORE WQV CALCULATION:  
 $WQV = \frac{(P)(R)(A)}{12} = \frac{[(1)(0.624)(19,779)]}{12} = 10,194 \text{ AF}$   
 $10,194 \text{ AF} = 42,804 \text{ CF}$

##### REQUIRED WQV

WQV = PROPOSED WQV - EXISTING WQV + 25% EXISTING WQV  
 THEREFORE WQV CALCULATION:  
 $WQV = 42,804 \text{ CF} - 25,201 \text{ CF} + 0.25(25,201 \text{ CF})$   
 $WQV = 15,704 \text{ CF}$

#### SHALLOW WETLAND (W-2) DESIGN REQUIREMENTS:

- REQUIRED: FOREBAY AT INLET: 25% OF FOREBAY AT INLET
- REQUIRED: 4 FOOT PRE-TREATMENT FOREBAY APPROX. 75% OF WQV ENTERING WETLAND = 11,642 CF x 0.75 = 8,732 CF PROVIDED: MICROPOOL AT OUTLET WITH 4' DEPTH AND 2,550 CF CAPACITY PROVIDED: TOTAL SURFACE AREA = 13,441 SQ. FT.
- REQUIRED: SURFACE AREA TO EQUAL 15% OF CONTRIBUTING DRAINAGE AREA CONTRIBUTING AREA = 197,263 SQ. FT. x 0.015 = 2,959 SQ. FT. PROVIDED: TOTAL SURFACE AREA = 13,441 SQ. FT.
- REQUIRED: 25% OF WQV SHALL BE IN DEEP WATER ZONES OF GREATER THAN 4' WQV = 12,460 CF x 0.25 = 3,115 CF PROVIDED: 3,142 CF OF STORAGE AT GREATER THAN 4' DEPTH
- REQUIRED: A MINIMUM OF 30% OF THE TOTAL SURFACE AREA CAN HAVE A DEPTH OF 4" OR LESS. IF A MINIMUM OF 60% OF THE TOTAL SURFACE AREA SHALL BE SHALLOWER THAN 18" TOTAL AREA = 13,441 SQ. FT. x 60% = 8,065 SQ. FT. PROVIDED: 10,080 SQ. FT. AT <18" DEPTH

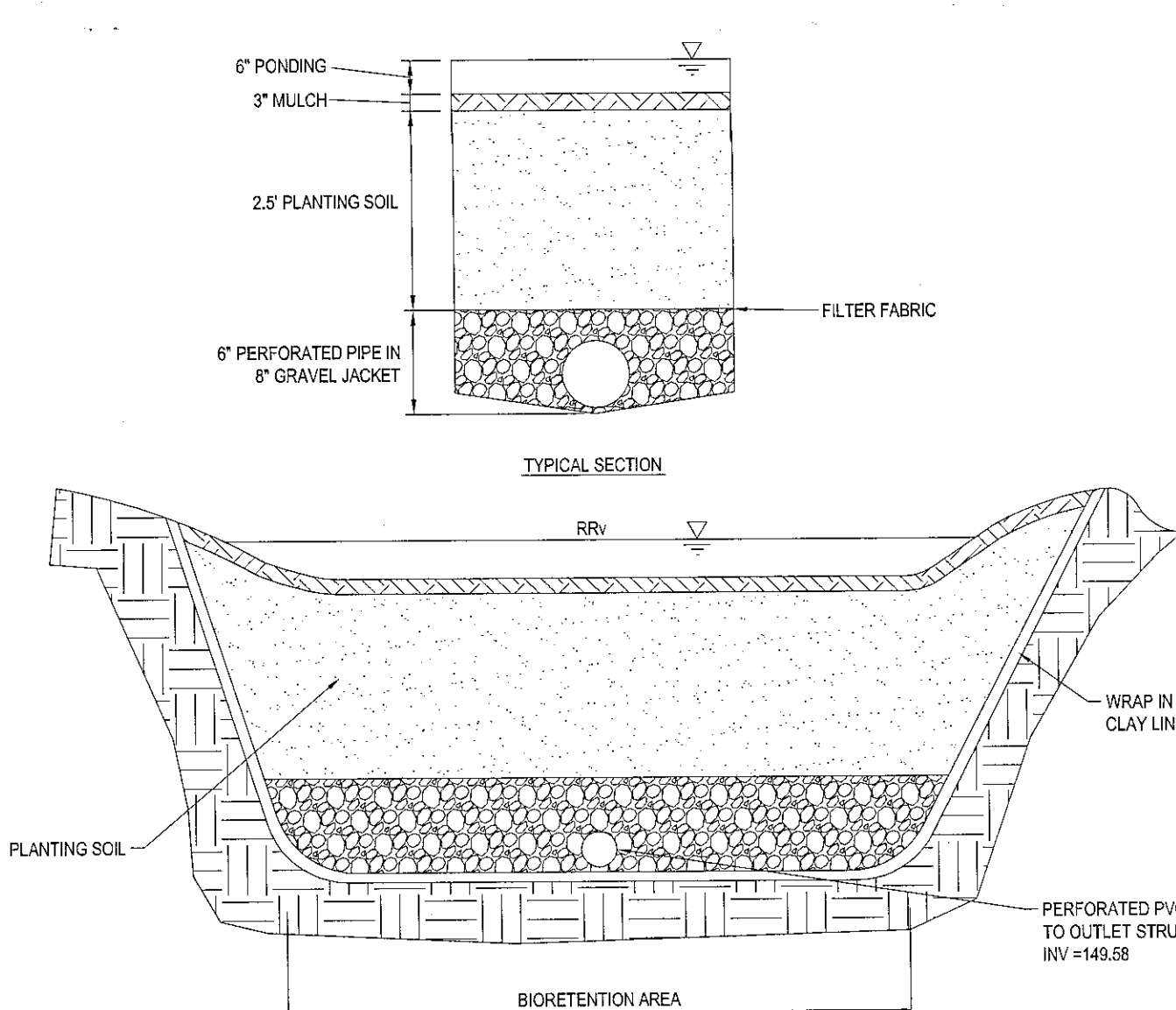
#### WETLAND NOTES:

##### CONSTRUCTION PROCESS:

- TOP SOIL AND/OR WETLAND WOOD IS ADDED TO THE WETLAND EXCAVATION. SINCE DEEP SUBSOILS OFTEN LACK THE NUTRIENTS AND ORGANIC MATTER TO SUPPORT VIGOROUS PLANT GROWTH, THE ADDITION OF MULCH OR TOPSOIL IS IMPORTANT. IF IT IS AVAILABLE, WETLAND MULCH IS PREFERRED TO TOPSOIL. AFTER THE MULCH OR TOPSOIL HAS BEEN ADDED, THE WETLAND NEEDS TO BE GRADED TO ITS FINAL ELEVATIONS.
- EROSION CONTROLS SHOULD BE STRICTLY APPLIED DURING THE STAGING AND PLANTING PERIODS. ALL AREAS ABOVE THE WETLAND BOTTOM ELEVATION SHOULD BE PROPERLY STABILIZED DURING THE STAGING PERIOD, USUALLY WITH HYDROSEEDING.
- DURING THE INITIAL PLANTING PERIODS SHOULD BE UNDERSTOOD TO PREVENT AND PROHIBIT ANIMALS FROM GRAZING UNTIL PLANT COMMUNITIES ARE WELL ESTABLISHED. SUCH PRECAUTIONS COULD BE DEEP FENCING, MOUNTAIN TRAPPING, PLANTING AFTER SEASONAL BIRD MIGRATIONS OR ATTRACTING BIRDS OF PREY AND BATS TO CONTROL NUTRIA POPULATIONS.

##### OPERATIONS AND MAINTENANCE NOTES:

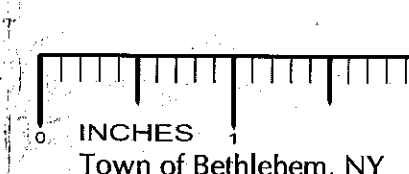
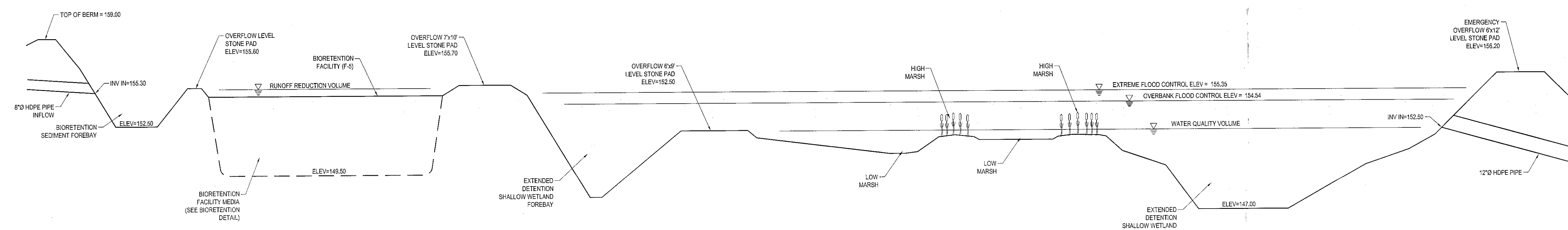
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  - TYPES AND DISTRIBUTION OF PLANTS IN THE WETLAND.
  - IF THE DESIGN ELEVATION OF THE WETLAND FACILITY IS BEING MAINTAINED.
  - SURVIVAL RATE OF PLANTS IN THE WETLAND.
  - SEEDING OF THE FACILITY WHEN THE DESIGN ELEVATION IS BEING MAINTAINED. THE MAJORITY OF SEEDING SHOULD BE TRAPPED AND REMOVED BEFORE THEY REACH THE BASIN IN THE DRAINAGE STRUCTURE SWUMPS. SEEDING ACCUMULATION IN THE BASIN RESULT IN REDUCED WATER DEPTH AND CHANGES IN THE GROWING CONDITIONS FOR THE EMERGENT PLANTS. FURTHERMORE, SEEDING REMOVAL WITHIN THE BASIN CAN DESTROY THE WETLAND PLANT COMMUNITY.
  - STRUCTURES AND DISCHARGE LOCATIONS SHOULD BE INSPECTED MORE FREQUENTLY. INSPECTIONS FOR THEM COULD CORRELATE WITH MOISTURE OR EXTENDED PERIOD PARTIAL, RATHER THAN JUST INCREASING THE INSPECTION INTERVALS. THAT, IF THERE ARE PERIODS OF DROUGHT OR SMALL INFILTRANT EVENTS IT WOULD NOT BE NECESSARY FOR AN INSPECTION.
- THE OWNER OF THE PROPERTY SHALL BE THE RESPONSIBLE AGENT FOR THE STORMWATER MANAGEMENT FACILITIES ON SAID PROPERTY.



#### BIORETENTION DETAIL

N.T.S.

#### BIORETENTION (F-5) AND EXTENDED DETENTION SHALLOW WETLAND (W-2) DETAIL



Town of Bethlehem Planning Board  
 By direction of the Chairman  
 these plans are hereby Approved.  
 See first sheet for date & signature.

#### STORMWATER MANAGEMENT AREA PROFILE

N.T.S.

THE EDUCATION LAW OF THE STATE OF NEW YORK PROHIBITS ANY PERSON ALTERING ANYTHING ON THESE DRAWINGS AND/OR THE ACCOMPANYING SPECIFICATIONS UNLESS IT IS UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, WHERE SUCH ALTERATIONS ARE MADE, THE PROFESSIONAL ENGINEER MUST SIGN, SEAL, DATE AND DESCRIBE THE FULL EXTENT OF THE ALTERATION ON THE DRAWINGS AND/OR THE SPECIFICATIONS. (NYS EDUCATION LAW SECTION 2209.2)

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**REVISIONS**

REV	DATE	COMMENT	BY
1	9/18/12	PER TOWN COMMENTS	SH
2	10/1/13	PER TOWN COMMENTS	SH
3	1/17/13	PER TOWN COMMENTS	SH
4	1/22/13	ADDED NYSDOT PAVEMENT DETAIL	SH
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**PERMIT SET**

PROJECT NO.: B12013255  
 DRAWN BY: SH  
 CHECKED BY: RO  
 DATE: 8/29/2012  
 SCALE: AS NOTED  
 CAD I.D.: B12013255C

**SITE PLAN DOCUMENTS**  
 FOR  
**ROBERT H. FINKE & SONS, INC.**

LOCATION OF SITE  
 1569 U.S. ROUTE 9W  
 SELKIRK, NY 12158  
 TOWN OF BETHLEHEM  
 ALBANY COUNTY, NEW YORK

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**CONSTRUCTION DETAIL SHEET**

SHEET TITLE:  
**C-14**  
 OF 14

REV 4