● Ecology
● Soil & Wetland Studies
● Water Quality Monitoring ● GPS
● Environmental Planning & Management
● Ecological Restoration & Habitat Mitigation
● Aquatic, Wildlife and Listed Species Surveys
● Application Reviews ● Permitting & Compliance

April 4, 2016

Town of Mansfield
Inland Wetlands Agency
14 Park Place
Mansfield, CT 06226-2217

Re: **WETLANDS ASSESSMENT-SUPPLEMENTAL: *WETLAND MITIGATION***
Lodges at Storrs, Hunting Lodge Road, Mansfield, CT

REMA Job No.: 15-1860-MNS18

Dear Agency Members:

REMA ECOLOGICAL SERVICES, LLC (REMA), is providing herein detailed implementation notes and planting materials tables for the proposed wetland mitigation at the above-referenced site. This includes the +/- 6,400 square foot wetland creation/restoration, adjacent to Wetland C1, as well as the eradication of invasive shrub species, particulary Japanese barberry, within Wetland C (see submitted plans).

Respectfully submitted,

REMA ECOLOGICAL SERVICES, LLC

Sigrun N. Gadwa, MS, PWS
Professional Wetland Scientist
Registered Soil Scientist

George T. Logan, MS, PWS, CE
Professional Wetland Scientist
Registered Soil Scientist, Certified Senior Ecologist

VIA E-MAIL & HAND-DELIVERY

Attachments: Wetland Mitigation Implementation Notes, Tables 1, 2, and 3

WETLAND MITIGATION IMPLEMENTATION NOTES

THE LODGES AT STORRS, HUNTING LODGE ROAD, MANSFIELD, CT

HABITAT RESTORATION, CREATION & ENHANCEMENT

JAPANESE BARBERRY REMOVAL: *COMBINATION METHOD*

1. PHASE 1: WINTER 2016/2017. CONDUCT THE MECHANICAL REMOVAL PORTION OF THE JAPANESE BARBERRY REMOVAL. CUT ALL THE BARBERRY PLANTS (AND A FEW WIDELY SCATTERED OTHER INVASIVES) DURING THE DORMANT-LEAF-OFF SEASON WHEN MOST NATIVE VEGETATION IS DORMANT. USE A HAND-HELD WEED-WHACKER (WITH BLADE) OR BRUSH SAW, NOT A BRUSH HOG, AS TERRAIN IS IRREGULAR WITH MUCH MOSS.

2. HAUL THE INVASIVE BRUSH OUT OF THE FOREST TO AN OPEN CENTRAL LOCATION USING TARPS (I.E. NO MACHINERY TO BE USED IN INTERIOR OF FORESTED WETLAND).

3. PHASE 2: SPRING 2017. APPLY DIRECTED FLAME TO NEW SPROUTS AS SOON AS POSSIBLE AFTER NEW SPROUTS FULLY EMERGE, IN EARLY SPRING ON A DAMP DAY WITH HIGH HUMIDITY. USE A 300 TO 400 BTU MODEL FOR THIS LARGE JOB. NOTE: APPLICATOR MUST BE TRAINED AND CERTIFIED BY CT DEEP OR OTHER APPROPRIATE AGENCY SPECIFICALLY IN THIS METHOD.

4. AIM PROPANE TORCH WAND OUTLET AT BASE OF PLANT, HOLDING TIP OF WAND 8 TO 12 INCHES AWAY FROM TARGET AREA. APPLY FROM TWO SIDES IF POSSIBLE. TWO 10 SECOND BLASTS (ONE FROM EACH SIDE) SHOULD BE SUFFICIENT, DEPENDING ON SIZE OF CLUMP. HEAT STEMS UNTIL THEY BEGIN TO GLOW.

5. TAKE CARE NOT TO TRAMPLE OR APPLY HEAT TO THE MANY INTERSPERSED NEARBY NATIVE WILDFLOWERS AND WOODY SEEDLINGS.

6. APPLICATOR SHALL WEAR NATURAL FIBER CLOTHING (WOOL OR COTTON), HEAVY GLOVES, AND EAR AND EYE PROTECTION. FIRE-FIGHTING EQUIPMENT SHALL BE READILY AVAILABLE NEARBY.

7. TAMP DOWN ALL DISTURBED SOIL AND SPREAD ABOUT ONE INCH OF SHREDDED LEAF LITTER (FROM MUNICIPAL STOCKPILE) TO REDUCE REGERMINATION OF INVASIVE SEEDS IN SEEDBANK. TAKE CARE NOT TO BURY NATIVE WOODY SEEDLINGS OR WILDFLOWERS, MOSS, OR FERNS.

8. PHASE 3: IN LATE SUMMER OF 2017 SYSTEMATICALLY, INSPECT THE TREATED AREAS FOR (ONLY LOW NUMBERS EXPECTED) FOR SURVIVING SPROUTS AND SEEDLINGS. DEPENDING ON THE NUMBER OF SURVIVING SPROUTS LABORERS SHALL BE HIRED TO DIG THEM OUT WITH SHARP-SHOOTER OR WEED WENCH, OR A CERTIFIED PESTICIDE APPLICATOR TO APPLY

FOLIAR HERBICIDE TO THE SMALL RESPROUTS. USE TRICLOPYR HERBICIDE (8%) (BRUSH-B-GON OR ANOTHER BRAND WITH THE SAME ACTIVE INGREDIENT).

9. FOR FIVE (5) YEARS, IN LATE SPRING OR EARLY SUMMER, FOLOWING THE INITIAL REMOVAL, SYSTEMATICALLY, INSPECT THE TREATED AREA FOR SEEDLINGS OF BARBERRY AND OTHER INVASIVE SPECIES (ONLY LOW NUMBERS EXPECTED). NUMBERS OF BARBERRY SEEDLINGS WILL DECLINE QUICKLY AS THE SEED BANK IS EXHAUSED. SEEDLINGS SHOULD BE MECHANICALLY REMOVED BY HAND.

INVASIVES REMOVAL FROM EDGE HABITAT

10. IN JUNE OR LATE SUMMER OF THE YEAR FOLLOWING CONSTRUCTION (OF A PARTICULAR PHASE) USE THE "SNIP AND PAINT" METHOD TO TREAT WOODY INVASIVES ON THE NEW WOODS EDGES.

11. USE A NARROW WINDOW SASH BRUSH OR A WICK-TYPE APPLICATOR, PAINT CUT SURFACE AND ONE-TWO INCHES OF BARK BELOW CUT WITHIN TEN MINUTES OF CUTTING. WORK IN PAIRS, ONE PERSON CUTTING, THE OTHER PAINTING. DO NOT USE THE FOLIAR SPRAY METHOD. USE TRICLOPYR HERBICIDE (8%) (BRUSH-B-GON OR ANOTHER BRAND WITH THE SAME ACTIVE INGREDIENT).

12. BAG OR PILE UP WHAT IS PULLED AND CUT INTO A HEAP FOR REMOVAL. SPREAD PULLED AND CUT MATERAIL IN THE SUN, ON A TARP OR PAVEMENT. DO THIS PRIOR TO BURNING (WITH A PERMIT) OR TRUCKING TO LANDFILL.

WETLAND CREATION & RESTORATION

1.0 INTRODUCTION

WETLAND CREATION AND RESTORATION, BY EXCAVATION AND PLANTINGS, WILL TAKE PLACE IN THE SELECTED AREA, JUST EAST OF THE PROPOSED ROADWAY CONNECTING PHASES I AND II OF THE RESIDENTIAL COMMUNITY, ADJACENT TO "WETLAND C1." THIS IS AN AREA OF PREVIOUSLY FILLED WETLANDS, CURRENTLY IN LIGHT WOODS, WITH A SEVERE INFESTATION OF INVASIVE SHRUBS (E.G. JAPANESE BARBERRY, MULTIFLORA ROSE). WETLANDS WILL BE RESTORED IN THIS LOCATION THROUGH THE REMOVAL OF ROUGHLY 2 - 3 FEET OF ROCKY FILL.

FOR THE CREATION & RESTORATION AREA, A MOSAIC OF ***WET MEADOW, SHALLOW MARSH***, AND ***SCRUB-SHRUB*** (ABOUT 25% TOTAL WOODY COVER OF SHRUBS AND SAPLINGS) IS THE SHORT TERM TARGET COVER TYPE. THE GOAL IS TO CREATE WETLAND HABITAT, WITH HIGHER FUNCTIONS AND VALUES TO THAT OF THE EXISTING WETLANDS TO BE DISTURBED AT THE MAIN ACCESS ROAD CROSSING, MOST OF WHICH ARE ALREADY DISTURBED TO SOME EXTENT (OLD WOODS ROAD CROSSING), TO MITIGATE FOR THE ROUGHLY 4,402 SQUARE FEET OF PERMANENT WETLAND DISTURBANCE, FOR ACCESS TO SITE.

THESE WETLAND FUNCTIONS AND VALUES INCLUDE WILDLIFE AND INSECT SUPPORT, AESTHETICS, PRODUCTION EXPORT VIA THE FOOD CHAIN, ESPECIALLY NECTAR, INVERTEBRATES, AND SMALL MAMMALS. WETLAND CREATION WILL ALSO HELP ENHANCE POPULATION SIZES OF INVERTEBRATES AND WILDLIFE THAT USE THE ADJACENT WETLANDS. WETLAND CREATION WILL ALSO MITIGATE FOR DIMINISHED WETLAND FUNCTION WHERE PROPOSED ACTIVITES WILL BE RELATIVELY CLOSE TO WETLANDS, SOMEWHAT DIMINISHING FUNCTIONALITY.

MITIGATION WILL ALSO INCLUDE THE PLANTING OF A DENSE WOODY ***BUFFER*** TO THE NEWLY RESTORED WETLAND (EASTERLY) OF THE INTERNAL CIRCULATION ROADWAY, PROVIDING APPROPRIATE SCREENING. THIS ALSO INCLUDES REMOVAL OF INVASIVE SPECIES AND PLANTING/SEEDING OF SHRUBS AND HERBS.

IMPORTANT: ***ALL WORK, INCLUDING MARKING CLEARING LIMITS, GRADING, AND PLANTING SHALL BE SUPERVISED BY AN ECOLOGIST (OR WETLAND SCIENTIST). A PRE-IMPLEMENTATION MEETING SHALL TAKE PLACE AT LEAST ONE MONTH PRIOR TO PLAN IMPLEMENTATION BETWEEN, AT A MINIMUM, THE LANDSCAPER AND THE ECOLOGIST. TOWN STAFF WILL BE INVITED TO PARTICIPATE AS WELL.***

2.0 SITE PREPARATION

1. IN THE SELECTED MITIGATION AREA (I.E., CREATION AND RESTORATION) ALL OF THE WOODY VEGETATION WILL BE REMOVED, INCLUDING INVASIVE SPECIES, USING APPROPRIATE CT DEEP RECOMMENDED METHODS, SUCH AS MULTIFLORA ROSE AND JAPANESE BARBERRRY. IN ADDITION THE ECOLOGICST WILL FLAG ANY ADDITIONAL INVASIVES TO BE REMOVED IN UPLANDS AND WETLANDS IN CLOSE PROXIMITY TO THE WETLAND MITIGATION AREA.

2. THE CREATION AREA WILL BE +/- **6,400** SQUARE FEET (SF). THE BUFFER ENHANCEMENT AREA WILL BE +/- **1,180** SF. LIMITS OF THESE AREAS WILL BE ADJUCTED IN THE FIELD, AS NECESSARY, BY THE WETLANDS PROFESSIONAL.

3. MULTIFLORA ROSE, JAPANESE BARBERRY, AND OTHER INVASIVES WILL BE BRUSH-HOGGED AND CUTTINGS WILL BE TRUCKED OUT AND APPROPRIATELY DISPOSED OF OFF-SITE.

4. INSTALL *PERIMETER EROSION CONTROLS* AROUND THE MITIGATION AREA AS SHOWN ON PLANS: CORRECTLY TRENCHED AND STAKED SILT FENCE PER THE *2002 CONNECTICUT EROSION & SEDIMENTATION CONTROL GUIDELINES* (2002 GUIDELINES).

5. GRADING, INCLUDING EXCAVATION, WILL TAKE PLACE UNDER THE DIRECTION OF THE ECOLOGIST OR WETLANDS PROFESSIONAL. THE TARGETED WETLAND HYDROLOGIC

REGIMES ARE *"SEASONALLY SATURATED"* TO *"SEASONALLY FLOODED"* AND MAY BE, ADJUSTED AT THE DISCRETION OF THE WETLANDS PROFESSIONAL. OVER-EXCAVATE TO A DEPTH OF 10 TO 20 INCHES, TO ALLOW FOR BACK-FILLING OF 6 INCHES MINIMUM OF SALVAGED FOREST TOPSOIL, FREE OF WETLAND INVASIVES. THE EXCAVATED, INVASIVES-INFESTED TOPSOIL FROM THE WETLAND CREATION AREA WILL BE MOVED TO THE DEVELOPMENT PORTION OF THE SITE FOR SCREENING AND REUSE IN LAWN AREAS, OR BE TRUCKED OFF-SITE.

6. THE MITIGATION AREA WILL BE GRADED AS A BROAD TERRACE WITH UNIFORM DEPTH TO WATER TABLE. ONE "SUMP" WILL BE ABOUT TEN INCHES DEEPER (A TOTAL AREA OF ABOUT 1,600 SQUARE FEET TO BE IN PART PLANTED AS A SHALLOW MARSH). ADDITIONAL, IRREGULAR SHALLOWER DEPRESSIONS WILL BE TWO TO FOUR INCHES DEEP. SURFICIAL MICROTOPOGRAPHY (THE SUMP AND SMALLER DEPRESSIONS) WILL ALLOW LIMITED TEMPORARY TO SEMI-PERMANENT PONDING, WITH LATERAL CAPILLARY ACTION INTO HIGHER ELEVATION AREAS. THE SEASONALLY FLOODED AREA MAY, OVER TIME, ATTRACT ADDITIONAL AMPHIBIANS (E.G. WOOD FROG, SPRING PEEPER, EASTERN TOAD, PICKEREL FROG, GREEN FROG, ETC.).

7. COLLECT THREE TO FOUR CUBIC YARDS OF WOODY DEBRIS (FALLEN STICKS AND LOGS WITH MOSS AND FUNGUS) FROM NATURAL FOREST AREAS (WITH LOW INVASIVE COVER) AFTER THE LIMITS OF THIS AREA HAVE BEEN FLAGGED BY AN ECOLOGIST. WHEELBARROW TO THE MITIGATION SITE AND STOCKPILE.

8. SALVAGED TOPSOIL FROM UPLAND AREAS, MOSTLY FREE FROM INVASIVES (SOUTHERN FORESTED AREA), WILL BE SPREAD PROMPTLY IN CREATION AREA (ALREADY EXCAVATED AND GRADED) TO MINIMIZE MORTALITY OF PROPAGULES DURING STORAGE. PLANTING BED PREPARATION COULD TAKE PLACE IN LATE SUMMER TO EARLY FALL, SO THAT PLANTING OF SHRUBS AND TREES CAN TAKE PLACE IN EARLY FALL, IF POSSIBLE (HERBACEOUS PLANTS WOULD BE PLANTED THE FOLLOWING SPRING; THIS ALLOWS FOR SEVERAL MONTHS OF OBSERVATION AND OVERWINTERING). THIS WILL REINTRODUCE PROPAGULES OF INVERTEBRATES MICROBES, MOSSES, FUNGI, AND VASCUALAR AND PLANTS. *A MINIMUM OF 6 INCHES* OF TOPSOIL SHALL BE USED TO REALIZE FINAL GRADES *MINIMUM 6 PERCENT ORGANIC MATTER (DRY WEIGHT)* IS REQUIRED IN PLANTING MEDIUM. DARK UPPER TOPSOIL ON-SITE MEETS THESE SPECIFICATIONS.

9. IF SUFFICIENT QUANTITY AND QAULITY OF TOPSOIL IS NOT AVAILABLE ON-SITE, IT WILL BE SUPPLEMENTED WITH OFF-SITE TOPSOIL, FREE OF INVASIVES, AND/OR WITH 2-YEAR OLD MULCH MIXED WITH ON-SITE SUBSOIL.

3.0 PLANTINGS - WETLAND MITIGATION AREAS

10. WORK SHALL BE INITIATED *IN SPRING* BETWEEN APRIL 15TH AND MAY 30TH *OR IN EARLY FALL* BETWEEN SEPTEMBER 1ST AND OCTOBER 15TH. ONLY SEEDING MAY BE DONE IN LATE FALL OR EARLY WINTER. BARE ROOT PLANTS SHOULD BE PLANTED IN LATE SPRING AND NO LATER THAN AUGUST 1ST (WATERING COULD BE REQUIRED OF PLANTED IN JULY).

11. *ORDER PLANTS AHEAD OF TIME* (AT LEAST ONE MONTH) TO IMPROVE LIKELIHOOD OF AVAILABILITY. PLANT LIST INCLUDES SOME NURSERY CONTACTS, BUT OTHERS MAY BE USED. NURSERIES SHOULD BE IN SOUTHERN NEW ENGLAND OR THE MID-ATLANTIC STATES. OBTAIN APPROVAL FROM WETLANDS PROFESSIONAL FOR ANY PLANT SUBSTITUTIONS DUE TO LACK OF AVAILABILITY.

3.1 PLANTINGS INSTALLATION

1. STORAGE: KEEP PLANTS IN THE SHADE AND INSTALL WITHIN THREE DAYS OF DELIVERY. KEEP WATERED.

2. A QUALIFIED WETLAND PROFESSIONAL OR ECOLOGIST SHALL SPECIFY PLANTING LOCATIONS AND DIRECT THE INSTALLATION, EITHER BY STAKING PLANTING LOCATIONS WITH A WIRE FLAG OR BAMBOO STAKE LABELED WITH THE SPECIES NAME OR CODE. POTTED STOCK MAY ALSO BE DIRECTLY PLACED AT PLANTING LOCATION.

3. PLANT IN SAME-SPECIES CLUSTERS, FOUR TO SIX FEET APART, FOR SHRUBS, TEN FEET APART FOR SMALL TREES.

4. WOODY PLANTINGS: DIG HOLES *BY HAND* TO *MINIMIZE COMPACTION* OF SOIL (MECHANICAL AUGERS ARE DISCOURAGED). WATER HOLES BEFORE PLANTING, UNLESS SOIL IS ALREADY VERY MOIST. ADD *SLOW RELEASE FERTILIZER* (MILORGANITE OR EQUIVALENT) TO PLANTING HOLE AND AROUND PLANTING. PLACE PLANTS INTO HOLES AND REPLACE SOIL, SO THAT THERE IS FULL COVERAGE OF ROOTS, WITH NO AIR SPACES AND LEVEL SOIL AROUND THE PLANT. HOLES SHALL BE OVERSIZED (2X THE POT DIAMETER) AND BACKFILLED WITH HIGH QUALITY TOPSOIL (NOT SUBSOIL REMOVED FROM BOTTOM PART OF HOLE).

5. SPREAD A THREE-INCH THICK LAYER OF WELL-ROTTED HARDWOOD MULCH THROUGHOUT THE CLUSTER. LEAVE A GAP OF THREE INCHES AROUND EACH TRUNK. FORM SHALLOW *SAUCERS* AROUND ALL MULCHED TREE AND SHRUB PLANTINGS, TWO INCHES HIGH, 36" ACROSS FOR NURSERY STOCK. WATER RIGHT AFTER PLANTING. FOR PLUGS IN THE WET MEADOW, WATERING SEVERAL TIMES A WEEK IS ESSENTIAL, IN DRY WEATHER. FOR IRRIGATION, SET UP A PUMP DRAWING ON LOCAL WATER, IF AVAILABLE.

6. PERENNIAL PLUGS: PLANT *AFTER* SHRUB INSTALLATION (IF IN THE SPRING SEASON), IN MID TO LATE AFTERNOON, OR UNDER SHADY CONDITIONS. *WATER* IMMEDIATELY AFTER PLANTING. SPACE PLUGS 12 TO 18 INCHES APART, PER PLAN.

7. FOR PLANTINGS IN SHALLOW WATER (E.G. WETLAND SUMP), MAKE SURE PLANTS ARE WELL SECURED IN THE BOTTOM. USE BIODEGRADABLE MESH AND STONE WEIGHTS TO SECURE, IF NECESSARY.

8. SPECIES TO BE PLANTED ARE SHOWN IN ***TABLES 1 AND 2***.

3.2 SEEDING

9. IN WET AND MOIST MEADOW AND BETWEEN SHRUB CLUSTERS IN MITIGATION AREA, SEED PER ***TABLE 3***. SEED IN LOCATIONS SPECIFIED IN SEEDING TABLE, AT SPECIFIED RATE. USE SPRAY PAINT TO DELINEATE LOCATIONS OF SEED PATCHES, AND/OR SOW SEED AS DIRECTED BY WETLAND ECOLOGIST.

10. USE THE DARK, HIGH QUALITY TOPSOIL ALREADY ON THE SITE, SALVAGED AND STOCKPILED PRIOR TO INSTALLATION. USE SIX INCHES OF TOPSOIL.

11. FOR SPRING SEEDING, LIGHTLY RAKE IN SEED (LESS THAN ½ INCH DEEP), ROLL, AND LIGHTLY MULCH TO HOLD MOISTURE FOR GERMINATION. FOR MID TO LATE FALL SEEDING, SEED MAY SIMPLY BE SOWN. SNOW AND FROST WILL INCORPORATE INTO THE SOIL.

12. IF SOIL IS SATURATED, BROADCAST SOIL ON SURFACE WITHOUT RAKING.

13. SPREAD A THIN LAYER OF *HAY MULCH* OVER ALL SEEDED AREAS WITHOUT STANDING WATER, ALLOWING SOME LIGHT PENETRATION. (LEAF MULCH IS TO GO UNDER AND AROUND WOODY PLANTINGS.)

3.3 FOLLOW-UP & MAINTENANCE

1. COARSE WOODY DEBRIS. AFTER INSTALLATION OF PLANTINGS, SPREAD THE STOCKPILED LARGE LOGS AND MEDIUM-SIZED BRANCHES IN VARIOUS STAGES OF DECAY IN MITIGATION AREA, INCLUDING INUNDATED AREAS. WOODY DEBRIS WILL HAVE BEEN STOCKPILED, TAKEN FROM SITE'S UPLAND FORESTED AREAS OR OTHER ON-SITE SOURCES, AND SHALL COVER AT LEAST 1% OF SURFACE AREA. WOODY DEBRIS PROVIDES SHELTER FOR WILDLIFE, SUBSTRATES FOR MOSSES AND FOREST FUNGI, AND ASSOCIATED INVERTEBRATES ARE A FOOD SOURCE FOR WILDLIFE.

2. PERIMETER SEDIMENT CONTROLS. MAINTAIN PER THE 2002 CT E&S GUIDELINES, CHECK AFTER EACH RAIN GREATER THAN ONE INCH DURING INITIAL ESTABLISHMENT. REMOVE

SILT FENCE AS SOON AS GROUND IS VEGETATED (>70% COVER) TO PREVENT IMPEDING ANIMAL MOVEMENT TO AND FROM ADJACENT AND NEARBY SEASONALLY FLOODED WETLANDS. SEDIMENT COLLECTED BY THESE DEVICES WILL BE REMOVED AND PLACED UPLAND IN A MANNER THAT PREVENTS ITS EROSION AND TRANSPORT TO A WATERWAY OR WETLAND.

3. IRRIGATION: WATER ALL SEEDED AREAS, PLANTINGS AND/OR TRANSPLANTS AT LEAST WEEKLY DURING DROUGHTY PERIODS. MORE FREQUENT WATERING WILL INCREASE PLANTINGS SUCCESS. FOR PLUGS AND BARE ROOT STOCK, MORE FREQUENT WATERING WILL BE NEEDED.

4. PROTECTION FROM DEER BROWSING: THE WETLANDS PROFESSIONAL MAY EMPLOY TECHNIQUES TO REDUCE DEER BROWSE THAT CAN BE HARMFULL TO NEWLY PLANTED SHRUBS AND TREES, INCLUDING NATURAL DETERENTS (E.G. GARLIC EXTRACT, MILORGANITE FERTILIZER, DOG URINE, ETC.). APPLICATION OF SUCH TECHNIQUES MAY TAKE PLACE SEVERAL TIMES UNTIL PLANTINGS ARE WELL ESTABLISHED.

4.0 PLANTINGS - BUFFER AT WETLAND CREATION-RESTORATION AREA

1. IN THE BUFFER TO THE WETLAND CREATION/RESTORATION AREA (+/- 1,180 SF):
   a. REMOVE ANY MAN-MADE DEBRIS
   b. REMOVE INVASIVE SHRUBS USING APPROPRIATE CT DEEP RECOMMENDED METHOD (E.G. "CUT & PAINT" METHOD USING HERBICIDE).
   c. PLANT SHRUBS AND TREES PER TABLE 1.

5.0 MONITORING

1. INSPECTIONS BY A QUALIFIED WETLAND PROFESSIONAL OR ECOLOGIST SHALL TAKE PLACE IN THE EARLY FALL (AND/OR SPRING) AFTER INSTALLATION, AND IN THE THREE (3) NEXT GROWING SEASONS.

2. DURING INSPECTIONS, CHECK MITIGATION AREA FOR SEEDLINGS OF *INVASIVE SPECIES* AND MECHANICALLY REMOVE. INSPECTIONS SHALL BE DONE BY THE WETLANDS PROFESSIONAL, BUT PERSONNEL TRAINED BY THE PROFESSIONAL IN IDENTIFICATION OF INVASIVE SEEDLINGS MAY ASSIST WITH REMOVAL.

3. *COMPETING PLANTS:* IF THE WETLANDS PROFESSIONAL DETERMINES THAT EXCESSIVE NUMBERS OF SEEDLINGS OF A PARTICULAR NATIVE SPECIES HAVE GERMINATED ON SITE (E.G. CATTAIL), REMOVE THEM BY HOEING OR HAND PULLING. COLONIZATION BY A VARIETY OF NON-PLANTED NATIVE SPECIES IS EXPECTED AND IS DESIRABLE.

4. ANNUAL MONITORING REPORTS SHALL BE SUBMITTED TO THE INLAND WETLANDS COMMISSION OF THE TOWN OF MANSFIELD WITHIN TWO MONTHS OF MONITORING (BUT NO LATER THAN DECEMBER 15TH OF THE YEAR BEING MONITORED), AND SHALL PROVIDE A SHORT *NARRATIVE* INCLUDING INFORMATION ON SURVIVAL AND PERFORMANCE OF PLANTINGS, EXTENT TO WHICH TARGET HYDROLOGY IS ACHIEVED, DEVELOPING WETLAND SOIL CHARACTERISTICS, COLONIZATION BY INVASIVE PLANTS & CONTROL MEASURES, COLONIZATION BY DESIRABLE NATIVE SPECIES, AND OBSERVED USAGE BY FAUNA (E.G., AVIANS, HERPTILES, MAMMALS, INVERTEBRATES).

5. AN 80% SURVIVAL RATE OF PLANTED MATERIALS IS TARGETED, AS WELL AS 90% VEGETATIVE COVERAGE BY THE SECOND GROWING SEASON (EXCLUDING SEASONALLY INUNDATED DEPRESSION).

6. *REMEDIAL MEASURES* SUCH AS REPLACEMENT PLANTINGS, HYDROLOGIC ADJUSTMENTS, AND DEER PROTECTION, MAY BE RECOMMENDED DURING THE FOUR YEARS OF MONITORING, AND IMPLEMENTED PER THE DIRECTION OF THE WETLANDS PROFESSIONAL, AFTER CONSULTATION WITH TOWN ENVIRONMENTAL STAFF.

PLANTING MATERIALS FOR WETLAND CREATION

Table 1: SHRUBS AND TREES

Zone A: Inundated, seasonally to semi-permanently flooded (Shallow Marsh)
Zone B: Saturated within 6", may be flooded at times (Wet Meadow)
Zone C: Transitional wetland / moist upland, occasionally saturated

LOW - MEDIUM SHRUBS										
Scientific Name	**Common Name**	**Shade/salt. tolerant**	**Code**	**Zone**	**Ht.**	**Wet Meadow**	**Wet Meadow / Moist Meadow**	**Shallow Marsh**	**Wetland Buffer**	**Total Numbers per Species**
Cornus amomum	Silky dogwood	No/No	**CA**	**A, B**	**36"**		4			*4*
Aronia arbutifolia	Red chokeberry	No/No	**AA**	**B**	**36"**		4			*4*
Cephalanthus occidentalis	Buttonbush	No/No	**CO**	**A**	**36"**			10		*10*
Clethra alnifolia	Sweet pepperbush	Yes/Yes	**CL**	**B, C**	**36"**	6	4		7	*17*
Cornus racemosa	Gray dogwood	Yes/no	**CR**	**B, C**	**36"**		5		20	*25*
Sambucus americana	Common elderberry	No/No	**SA**	**A, B**	**36"**	5		3		*8*
Spirea latifolia	Meadowsweet	No/Yes	**SL**	**A, B**	**36"**	22				*22*
						33	**17**	**13**	**27**	**90**
TALL SHRUBS										
Scientific Name	**Common Name**	**Shade Tolerant**	**Code**	**Zone**	**Ht.**					
Ilex verticillata	Winterberry	Yes	**IV**	**B**	**48"**	5			4	*9*
Vaccinium corymbosum	Highbush blueberry	Yes	**VC**	**B, C**	**48"**	5	4		4	*13*
Viburnum lentago	Nannyberry	No/No	**VL**	**B, C**	**48"**		5		3	*8*
Total:						**5**	**9**		**7**	**30**

Table 1: SHRUBS AND TREES *(CONTINUED)*

TREES **Scientific Name**	**Common Name**	**Shade Tolerant**	**Code**	**Zone**	**Size**	**Wet Meadow**	**Wet Meadow / Moist Meadow**	**Shallow Marsh**	**Wetland Buffer**	**Total Numbers per Species**
Amelanchier canadensis	Shadblow	Yes	**AC**	**C**	**48"**		3		4	*7*
Nyssa sylvatica	Black gum	Yes	**NS**	**B, C**	**1" cl**	4	1			*5*
Acer rubrum	Red maple	Yes	**PS**	**B, C**	**1" cl**	3	3			*6*
Betula alleghaniensis	Yellow birch	Yes	**BA**	**B**	**1" cl**	5				*5*
Betula papyrifera	Paper birch	No	**BP**	**C**	**1" cl**				4	*4*
Carpinus caroliniana	Ironwood	Yes	**CC**	**B, C**	**48"**		5			*5*
Pinus strobus	White pine	Yes/No	**WP**	**B, C**	**1" cl**		2		2	*4*
Quercus palustris	Pin Oak	Yes	**QP**	**B, C**	**1" cl**		4			*4*
Total:						**12**	**18**	**0**	**10**	**40**

Small Tree species: 4 foot minimum height
Large Tree species: 1.0" diameter minimum caliper or 6 foot minimum height

Planting Form: Potted or balled not bare-root.

Table 2: Shallow Marsh and Wet Meadow Plants for Wetland Mitigation Area

Zone A: Seasonally to semi-permanently flooded (Marsh/Wet Meadow)
Zone B: Saturated within 6", may be flooded at times (Wet Meadow)

Scientific Name	ID	Common name	Planting Form	Spacing	Zone	Total Numbers Per Species: Marsh / Wet Meadow	Wet Meadow	Total Number per Species
Asclepias incarnata	AI	Swamp milkweed	*plug*	2' OC	**A, B**	10	40	*50*
Caltha palustris	CP	Marsh marigold	*plug*	3' OC	**A**	50		*50*
Carex vulpinoidea	CV	Fox sedge	*plug*	2' OC	**B**		50	*50*
Carex stricta	CS	Tussock sedge	*plug*	4' OC	**A, B**	25	25	*50*
Eutrochium maculatum	EM	Spotted Joe-pye-weed	*plug*	3' OC	**B**		50	*50*
Juncus canadensis	JC	Canada rush	*plug*	3' OC	**A, B**	25	25	*50*
Iris versicolor	IV	Blue flag iris	*plug*	2' OC	**A, B**	25	25	*50*
Osmunda cinnamomea	OC	Cinnamon fern	*6" pot*	3' OC	**B**		25	*25*
Pontederia cordata	PC	Pickerelweed	*6" pot*	3' OC	**A**	15		*15*
Mimulus ringens	MR	Monkey flower	*plug*	3' OC	**B, C**	10	40	*50*
Scirpus atrovirens	SA	Green bulrush	*plug*	3' OC	**A**	50		*50*
*Schoenoplectus validus**	SV	Softstem bulrush	*plug*	3' OC	**A**	50		*50*
Symplotrichum novae-angliae	SN	New England aster	*plug*	2' OC	**B**		50	*50*
Vernonia noveboracensis	VN	New York Ironweed	*plug*	3' OC	**B**		50	*50*
Sagittaria latifolia	SL	Northern arrowhead	*6" pot*	2' OC	**A**	15		*15*
					Totals:	**275**	**380**	**655**

Notes:

* If larger size emergent plants are purchased numbers can be reduced by 50%; survival will be greater. Planting form could include potted plants; Plugs are available only in flats of fifty (NEWP).

Sources: ***Most species available from multiple sources***

New England Wetland Plants, Inc. (NEWP), 820 West Street, Amherst, Mass. 01002; phone: 413-548-8000

Aqua Scapes of CT LLC, 505 William St, Portland, CT 06480; phone: 860-342-7331

Table 3: Seed Mixes for Wetland Mitigation Area and Wetland Buffer Area

Zone B: Saturated within 6", may be flooded at times (Wet Meadow)
Zone C: Transitional wetland/ moist upland, occasionally saturated

NEWP Seed Mixes (New England Wetland Plants)	Comments	Zone	Total Pounds Per Seed Mix: Wet Meadow	Wet Meadow / Moist Meadow	Wetland Buffer	Totals
NE Wetmix ***1 lb/2500 sf***	*Excludes shallow marsh sump center (seed around edges)*	**A, B**	2	1		3.00
NE Roadside Matrix Upland Seed Mix ***1 lb/1250 sf***	*For graded slope wetland buffer*	**C**			1	1.00
NE Conservation Wildlife Mix ***1 lb/1750 sf***	*Upper portion of wetland mitigation area and wetland buffer*	**B, C**		1	1	2.00
		Totals:	**2**	**2**	**2**	**6**

Notes:

1. Mix 1:1 with filler (coarse sand or kitty litter) to help correctly divide seed packages and for even spreading.
2. Mixes contain seeds with a range of hydrologic tolerances, so different species will thrive in different areas.
3. Plants will set seed and spread further, increasing in density, becoming concnetrated in most suitable areas.
4. Mulch (do not seed) areas under and around plug & shrub clusters, to exclude weeds and hold moisture. (Coverage specified assumes area occupied by mulched woody plantings has been subtracted.)
5. A late fall seeding will require 20% more seed, because some seed wil be lost to wash off and herbivory, but germination rates will actually be higher, due to the cold winter stratification of the seed.

Sources:

New England Wetland Plants, 820 West Street, Amherst, Massachusetts 01002; phone: 413-548-8000