APPENDIX A

ROAD AND BRIDGE CROSSING BMP CHECKLIST FOR USE IN ATLANTIC SALMON WATERSHEDS

ROAD AND BRIDGE CROSSING BMP CHECKLIST
FOR USE IN ATLANTIC SALMON WATERSHEDS

Note: This checklist may be used for new and/or existing projects. All data recorded is assumed to be existing conditions unless specifically noted as proposed; both existing and proposed conditions can be recorded for the same checklist item where applicable. For example, if the road is a culvert crossing in the existing condition and a bridge is proposed, the evaluator would check both and write-in "proposed" after bridge and "existing" after culvert.

DATE: _____ EVALUATION TEAM:_____

STREAM NAME: _____

LOCATION:_____

_____

SITE DESCRIPTION: [attach photograph(s) and sketch showing plan view and cross-section]

_____

_____

_____

_____

ROAD INFORMATION: *(check all that apply)*

___ *STATE* ___ *TOWN* ___ *PRIVATE*

___PAVED
___HEAVY DUTY GRAVEL (suitable for use by loaded trucks)
___LIGHT DUTY GRAVEL/UNPAVED (not suitable for use by loaded trucks)
___DRIVEWAY/CAMP ROAD
___ATV/SNOWMOBILE/FOOT TRAIL (please specify)

___**ROAD PARALLELS STREAM:** *(check all that apply)*

___ROAD BASE/SHOULDER EXTENDS INTO STREAM OR TO STREAM EDGE

___ROAD MATERIAL HAS ERODED INTO STREAM [as indicated by sediment delta(s) in stream, space between gravel/cobble filled with fines (apparent embeddedness), and erosion along road]

___ROAD SURFACE WITHIN THE ANNUAL FLOODPLAIN OF THE STREAM (as indicated by debris racks, floodplain vegetation both sides of road, floodplain soils/alluvium both sides of road, water marks on trees, etc.)

___ROAD WELL ABOVE STREAM (above annual floodplain)

___**ROAD CROSSES STREAM:** *(check all that apply)*

___CULVERT(S) ___BRIDGE ___FORD ___other:_____

___ROAD MATERIAL HAS ERODED INTO STREAM [as indicated by sediment delta(s) in stream and erosion along road]

ROAD GRADIENT: (note if estimated or measured for all numerical parameters)

___ 0% to 2% ___ 2% to 5% ___ 5% to10%
___ 10% to 15% ___ 15% to 20% ___ 20% to 25%

DESCRIBE RUNOFF FROM ROAD: (If crossing, specify each side of stream as well as crossing itself. If parallel, describe road stretches that drain to stream. Identify all current measures such as water bars, turnouts, and roadside ditches and assess if measures are functioning to protect stream. Specify length of road sloping to stream and features such as broad-based dips and crowning that affect drainage)

_____

_____

_____

_____

ROAD CROWN _____ IN (negative number indicates "u" shaped road)
ROAD WIDTH _____ FT
DITCH DEPTH _____ IN
DITCH WIDTH _____ FT

DITCH TURNOUT OR WATER DIVERSION SPACING (*circle applicable measure(s):*

Turnout, broad-based dip, waterbar, other:____ : ____ NONE

____EVERY 25 FT OR LESS ___ EVERY 26-50 FT ____ EVERY 51-75 FT
____EVERY 76-100 FT ___ EVERY 101-125 FT ____ $\geq$ 126 FT

IF WATER DIVERSION S, HOW DO THEY DIRECT RUNOFF: *(check all that apply)*

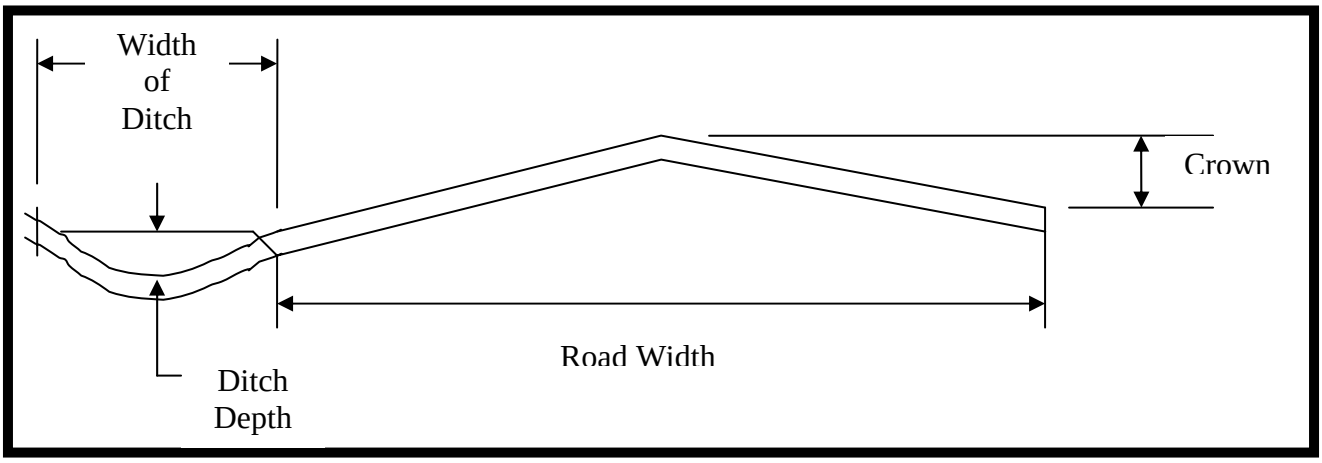
____ DIRECTLY TO WETLAND OR STREAM (INAPPROPRIATE)
____ WITHIN ____ FT OF WETLAND OR STREAM
____ INTO NATURALLY VEGETATED UPLAND BUFFER IN CONCENTRATED MANNER RESULTING IN EROSION
____ INTO NATURALLY VEGETATED UPLAND BUFFER IN CONTROLLED MANNER SUCH AS CONSTRUCTED LEVEL SPREADER (NO EROSION EVIDENT IN BUFFER)

STEEPEST SLOPE FROM ROAD TO STREAM: ____ $\leq$ 2% ____ 3-5% ____ 5-10%
____ 10-20% ____ 20-25% ___ >35%

LENGTH OF ROAD THAT SLOPES TOWARD STREAM

_____FT *RIGHT* SIDE OF STREAM (*facing downstream*)

_____FT *LEFT* SIDE OF STREAM (*facing downstream*)



SLOPE MATERIAL/SHOULDER MATERIAL (between road and stream):

____ ARMORED (*e.g.*, riprap, gabion, etc) ____ GRASS/MEADOW
____ SHRUBS ____ TREES ____ OTHER:_____

_____ROAD BANK and/or _____ SREAM BANK SOILS: (check all that apply)
(This is the area between road and stream; if the road is parallel to the stream the road shoulder/bank and stream bank will be the same; for crossing projects, this information is road bank and more detailed streambank information is included in the next section.)

____ LOAM ____ SILT ____ CLAY ____ SAND ____ GRAVEL
____ BEDROCK ___ OTHER:_____

____ COHESIVE (holds together in small clumps when handled; in Maine this includes glacial tills)
____ NON-COHESIVE (loose; readily falls apart into individual grains when handled; in Maine usually coarse-textured soils like sandy, alluvial sediments or glacial outwash)

____ROAD EROSION EVIDENT:
____ ON ROAD SURFACE ____ ALONG ROADSIDE DITCH
____ ON SHOULDER (between road and stream) ____ OTHER: _____

EROSION DIMENSIONS:

AVERAGE LENGTH_____ AVERAGE WIDTH _____ AVERAGE DEPTH _____
DESCRIBE (*e.g.*, sheet and rill, gully formation, tire ruts, slumping banks, etc.)_____
_____
_____
_____

PRESENCE OF "FALSE DITCHES" (small berms along road margins, inadvertently created by poor grading techniques, that tend to concentrate runoff along their inside margins resulting in erosion as runoff is concentrated and has no place to spread out):

_____ YES _____ NO

WATERWAY CROSSING INFORMATION:

TYPE OF CROSSING:

____ CULVERT(S) _____ BRIDGE _____ FORD

LOCATION OF KNOWN ATLANTIC SALMON HABITAT: (*Refer to Atlantic salmon habitat area maps and enter approximate distance from site. Contact the USFWS or NOAA Fisheries personnel to confirm known habitat features.)*

___UNKNOWN (*Contact the USFWS or NOAA Fisheries personnel)*

___FT UPSTREAM type of habitat: ___ spawning ___ rearing ___
Other: _____ (*e.g.*, adult holding areas, migratory pathways)
___FT DOWNSTREAM type of habitat: ___ spawning ___ rearing ___
Other: _____ (*e.g.*, adult holding areas, migratory pathways)

CHANNEL PATTERN AT CROSSING: (*check all that apply)*

___SHARP TO MODERATE MEANDER (>45˚ change in channel direction within 200 ft upstream or downstream)
___SLIGHT MEANDER (10-45˚ change in channel direction)
___STRAIGHT (<10˚ change in channel direction)
___BRAIDED
___SINGLE CHANNEL

TYPE OF WATER BODY:

UPSTREAM:
___QUICKWATER
DESCRIBE (*e.g.*, riffle, pool, riffle-pool sequence, step, run, glide): _____
_____
___ DEADWATER ___ IMPOUNDED ___ WETLAND/BOG
___OTHER:_____

DOWNSTREAM:
___QUICKWATER
DESCRIBE (*e.g.*, riffle, pool, riffle-pool sequence, step, run, glide): _____
_____
___DEADWATER ___ IMPOUNDED ___ WETLAND/BOG
___OTHER:_____

STREAM INFORMATION:
___INTERMITTENT
___ 1st ORDER (perennial stream where the only upstream tributaries are intermittent)
___ 2nd ORDER (downstream from confluence of two 1st order streams)
___ 3rd ORDER (downstream from confluence of two 2nd order streams)
___ 4th ORDER ___ Unknown

SIZE OF CONTRIBUTING WATERSHED: (*circle method used to determine below*)

____ACRES (as determined by USGS or other topographic maps; delineate the area that drains to the subject stream reach and then determine the area using a computer program, planimeter, or rough estimate by hand/ruler)
___UNKNOWN (unable to calculate)

CHANNEL BED GRADIENT UPSTREAM:

____ 0% to 1% _____ 1% to 2% _____ 2% to 4% _____ Greater than 4%

CHANNEL BED GRADIENT UPSTREAM:

____ 0% to 1% _____ 1% to 2% _____ 2% to 4% _____ Greater than 4%

STREAM BANK COVER TYPE, SOIL, AND SLOPE CHARACTERISTICS:

UPSTREAM LEFT: *(check all that apply)*
____FORESTED FLOODPLAIN ____ OPEN-CANOPY FLOODPLAIN/WETLAND
____UPLAND FOREST ____ UPLAND SHRUB ____ UPLAND MEADOW
____RIPRAP/BOULDER (sparse to no vegetation) ___ BEDROCK (sparse to no vegetation)
____LOAM ___ SILT ___ CLAY ___ SAND ___ GRAVEL
____COHESIVE SOILS (holds together in small clumps when handled; in Maine, this includes glacial tills)
____NON-COHESIVE SOILS (loose; readily falls apart into individual grains when handled; in Maine usually coarse-textured soils like sandy, alluvial sediments or glacial outwash)
___ 0-3% ___ 3-5% ___ 5-10% ___ 10-20% ___ 20-25% ___ >35%

UPSTREAM RIGHT: *(check all that apply)*
____ FORESTED FLOODPLAIN ____ OPEN-CANOPY FLOODPLAIN/WETLAND
____ UPLAND FOREST ____ UPLAND SHRUB ____ UPLAND MEADOW
____ RIPRAP/BOULDER (sparse to no vegetation) ___ BEDROCK (sparse to no vegetation)
____ LOAM ___ SILT ___ CLAY ___ SAND ___ GRAVEL
____ COHESIVE SOILS (holds together in small clumps when handled; in Maine this includes glacial tills)
____NON-COHESIVE SOILS (loose; readily falls apart into individual grains when handled; in Maine usually coarse-textured soils like sandy, alluvial sediments or glacial outwash)
___ 0-3% ___ 3-5% ___ 5-10% ___ 10-20% ___ 20-25% ___ >35%

DOWNSTREAM LEFT: *(check all that apply)*
____ FORESTED FLOODPLAIN ____ OPEN-CANOPY FLOODPLAIN/WETLAND
____ UPLAND FOREST ____ UPLAND SHRUB ____ UPLAND MEADOW
____ RIPRAP/BOULDER (sparse to no vegetation) ___ BEDROCK (sparse to no vegetation)
____ LOAM ___ SILT ___ CLAY ___ SAND ___ GRAVEL
____ COHESIVE SOILS (holds together in small clumps when handled; in Maine this includes glacial tills)
____NON-COHESIVE SOILS (loose; readily falls apart into individual grains when handled; in Maine usually coarse-textured soils like sandy, alluvial sediments or glacial outwash)
____ 0-3% ___ 3-5% ___ 5-10% ___ 10-20% ___ 20-25% ___ >35%

DOWNTREAM RIGHT: *(check all that apply)*
____ FORESTED FLOODPLAIN ____ OPEN-CANOPY FLOODPLAIN/WETLAND

____ UPLAND FOREST ____ UPLAND SHRUB ____ UPLAND MEADOW
____ RIPRAP/BOULDER (sparse to no vegetation) ___ BEDROCK (sparse to no vegetation)
___ LOAM ___ SILT ___ CLAY ___ SAND ___ GRAVEL
____ COHESIVE SOILS (holds together in small clumps when handled; in Maine, this includes glacial tills)
____NON-COHESIVE SOILS (loose; readily falls apart into individual grains when handled; in Maine usually coarse-textured soils like sandy, alluvial sediments or glacial outwash)
___ 0-3% ___ 3-5% ___ 5-10% ___ 10-20% ___ 20-25% ___ >35%

RIPARIAN BUFFER WIDTH (Buffers are naturally vegetated and lack roads, lawns, or impervious surfaces. Describe dominant condition on both banks.):

RIGHT BANK:
FORESTED: ___ >250 FT ___ 100-250 FT ___ 50-100 FT ___ 25-50 FT ___ <25 FT
NON-FORESTED: __ >250 FT __ 100-250 FT __ 50-100 FT __ 25-50 FT __ <25 FT

LEFT BANK:
FORESTED: ___ >250 FT ___ 100-250 FT ___ 50-100 FT ___ 25-50 FT ___ <25 FT
NON-FORESTED: __ >250 FT __ 100-250 FT __ 50-100 FT __ 25-50 FT __ <25 FT

DESCRIBE NON-FORESTED COVER TYPES (*e.g.*, meadows, scrub-shrub) AND ANY IMPERVIOUS SURFACES OBSERVED WITHIN 50 FT OF THE STREAM BANK:

_____
_____
_____

DENSITY OF RIPARIAN VEGETATION:
___ DENSE (90-100% cover) ___ MODERATE (70-90% cover)
___ SPARSE (30-70% cover) ___ ABSENT TO VERY SPARSE (0-30% cover)
IF VARIABLE DESCRIBE:_____

LOCALIZED EVIDENCE OF EROSION: (*attach site sketch*)
___ ERODED BANK ___ SEDIMENTATION (*e.g.*, deltas or imbedded coarse substrate in stream)
___ HIGH TURBITY/DEGRADED WATER QUALITY
___ OTHER (describe) _____

IF YES TO ANY OF THE ABOVE, DESCRIBE: [Include discussion of active (*e.g.*, recent slumping, gully formation/deepening, lack of duff layer/vegetation) versus historic (*e.g.*, tree that fell several years ago and bank appears to be revegetating and stable) erosion, and cause(s) if known.]

_____
_____
_____
_____

DOES CROSSING IMPEDE FISH PASSAGE?:
____ NO (fish passage not impeded relative to natural sections of the stream upstream and downstream) ____ YES ____ UNSURE

EXPLAIN:

_____
_____
_____

IF YES, OR UNSURE: *(check all that apply)*

___ BEAVER DAM AT OR NEAR CROSSING
___ DEBRIS JAM AT CULVERT CONSTRICTION
___ WATER VELOCITY TOO RAPID (velocity barrier) DUE TO CONSTRICTION
___ PERCHED CULVERT (*e.g.,* free-falling water from culvert at normal high and low flows; at flood flows this may be a cascade or glide)
___ SCOUR HOLE PRESENT DOWNSTREAM (may be indication of high velocities at constricted crossing)
___ FLOW TOO SHALLOW THROUGH CULVERT (*e.g.*, culvert elevation too high and not accommodating base flows well)
___ UNNATURAL BACKWATERING UPSTREAM (potential indication of culvert elevation problem or constriction problem)
___ OTHER: _____

AVERAGE STREAM WIDTH 0-100 FT UPSTREAM: (*i.e., distance between the normal high water mark on each side of the stream; see definition of Normal High Water mark* _____ FT

AVERAGE STREAM WIDTH 0-100 FT DOWNSTREAM: _____ FT

PASSAGE WIDTH AT CROSSING: *(check all that apply)*

_____CONSTRICTED (NARROWER THAN STREAM AS MEASURED ABOVE)
field indicators of constricted culvert or bridge crossings:
___UNNATURAL BACKWATERING UPSTREAM
___SCOUR HOLE PRESENT DOWNSTREAM

___DOWNSTREAM BED DEGRADATION OR INCISING (constrictions in the channel can increase flow velocity and cause bed degradation or incising; indications of this include scour holes, and channel deepening as indicated by stream banks that are higher downstream as compared with banks upstream)
___APRON CONSTRUCTED DOWNSTREAM TO PREVENT SCOURING (properly designed structures that do not constrict flows should not result in downstream scour and would, therefore, not require the use of an apron; aprons can be an indication of constricted crossings)
___SOME PORTION OF STREAMFLOW IS OVERTOPPING THE ROAD OR FLOWING AROUND THE CULVERT/BRIDGE CROSSING AT RELATIVELY FREQUENT (*e.g.,* annually or more frequent) INTERVALS

_____THE SAME AS STREAM AS MEASURED ABOVE

_____WIDER THAN STREAM AS MEASURED ABOVE

<u>BRIDGES</u>

DECKING: *(check all that apply)*

____ OPEN DECK SURFACE
____ SOLID DECK SURFACE
____ METAL
____ WOOD
____ PAVED
____ OTHER:_____

NUMBER OF PIERS: ____
TOTAL SPAN ____ FT
DISTANCE BETWEEN PIERS ___ FT ___ FT ____FT
RIGHT SIDE: (circle all applicable materials)
___ABUTMENT (concrete blocks, riprap, timber crib, concrete, field stone, parent material, other:_____)
___WINGWALL DOWNSTREAM (concrete, other:_____)
___WINGWALL UPSTREAM (concrete, other:_____)

LEFT SIDE: (circle all applicable materials)
___ABUTMENT (concrete blocks, riprap, timber crib, concrete, field stone, parent material, other:_____)

___WINGWALL DOWNSTREAM (concrete, other:_____)
___WINGWALL UPSTREAM (concrete, other:_____)

CLEARANCE FROM STREAM TO BOTTOM OF BEAM OR DECK:
___ FT FROM STREAM BED TO BEAM OR DECK
___ FT FROM NORMAL HIGH WATER LEVELTO BEAM OR DECK

CULVERTS

CULVERT WIDTH: ____ IN
CULVERT LENGTH: ____ FT
CULVERT HEIGHT: ____ IN

HEIGHT OF RUST OR STAIN LINE: (indicates normal high water level)

___INCHES FROM BOTTOM OF CULVERT OR TOP OF SUBSTRATE (UPSTREAM END)
___INCHES FROM BOTTOM OF CULVERT OR TOP OF SUBSTRATE (DOWNSTREAM END)
___CANNOT DETERMINE

CULVERT MATERIAL: ___ CORRUGATED STEEL ___ SMOOTH STEEL
___CONCRETE ___ CORRUGATED PLASTIC ___ SMOOTH PLASTIC
___OTHER: _____
SLIP LINING: ___ YES ___ NO

CULVERT SHAPE: (*check all that apply)*

___ CIRCULAR (closed) ___ ELLIPTICAL ___ BOX (square or rectangular)
___ ARCH (open bottom) ___ OTHER:_____

IS CULVERT BOTTOM COVERED WITH NATURAL SUBSTRATE?
___ YES ___ NO
IF YES: DEPTH OF NATURAL SUBSTRATE ____ INCHES
SUBSTRATE TYPE: ____ COARSE (gravel and coarser)
____ SANDS (fine and coarse sand)
____ FINE (organics, clay, and silt)
____ MIX (all of the above)

IF SUBSTRATE TYPE VARIES FROM INLET TO OUTLET PLEASE NOTE DIFFERENCE:
_____

DEPTH OF WATER IN CULVERT:

___ INCHES

AT:___ FLOOD OR HIGH FLOW STAGE

___ NORMAL HIGH WATER

___ LOW FLOW STAGE

Flood or high flows = Flow is high up on the banks and into the floodplain (overbank flows) where topography allows. Terrestrial/upland and floodplain vegetation are inundated.

Normal High Water = Entire channel bottom covered with flow; water at level of visible markings (*e.g.,* water marks on rocks or other objects, debris racks, topographic shelves) indicating dominant water level. The point where changes in vegetation from predominantly aquatic to predominantly terrestrial occurs. Flow extends into aquatic emergent wetland vegetation (*e.g.,* wild rice, soft-stemmed bulrush, pickerelweed, arrowhead) along the streambank but not into predominantly terrestrial vegetation (*e.g.,* maples, oaks, ashes, alder, pines, bunchberry, blueberries). Areas dominated by woody vegetation are typically not inundated, except for buttonbush (the only woody plant in Maine that tolerates persistent inundation), and to some extent certain willows that can tolerate persistent periods of shallow inundation.

Low flow = Typically occurs during late summer and may be referred to as baseflow; portions of channel are exposed, water does not typically reach the edge of the terrestrial, riparian vegetation, and some stream bed substrate is exposed

IF DEPTH VARIES FROM INLET TO OUTLET PLEASE NOTE DIFFERENCE: _____
_____

CULVERT ALIGNMENT WITH STREAM CHANNEL:

HORIZONTAL (ANGLE OF STREAM FLOW TO CROSSING STRUCTURE):

____ALIGNED/PARALLEL WITH NATURAL CHANNEL (no evidence of historic channel straightening – natural riparian vegetation and bank complexity like natural boulder formations, topographic variability, and large dead wood)

____ALIGNED/PARALLEL WITH ARTIFICIALLY STRAIGHTENED CHANNEL (indications stream was channelized/straightened include armored banks, channel just upstream is naturally sinuous, documentation from municipality/agency)

____CULVERT SCEWED AT SLIGHT ANGLE (<10˚) TO STREAM DIRECTION

____CULVERT SCEWED AT MODERATE ANGLE (10˚-30˚) TO STREAM DIRECTION

____CULVERT SCEWED AT SEVERE ANGLE (>30˚) TO STREAM DIRECTION

____OTHER: _____

VERTICAL: (*check all that apply)*

_____BOTTOM OF CULVERT AT GRADE WITH STREAM BED

_____NATURAL SUBSTRATE IN CULVERT AT GRADE

_____CULVERT PERCHED (*e.g.,* free-falling at outlet)

____ AT FLOOD FLOW

____ AT ORDINARY OR NORMAL HIGH FLOW

____ AT LOW FLOW (*e.g.,* summer base flow)

_____CASCADING FLOW AT CULVERT OUTLET (*i.e.,* between perched and at grade)

____AT HIGH OR FLOOD FLOW

____AT ORDINARY OR NORMAL HIGH FLOW
____AT LOW FLOW (*e.g.*, summer base flow)
____CULVERT HORIZONTAL
____CULVERT HAS POSITIVE SLOPE
___SIMILAR SLOPE AS STREAM BED
___OTHER:_____

CULVERT INTEGRITY: (*check all that apply)*

___CULVERT(S) APPEAR STRUCTURALLY SOUND
___CULVERT(S) RUSTING, OR ROTTING TO THE POINT WHERE THERE IS RISK OF COLLAPSING OR ARE COLLAPSING
___HOLES IN ROAD SURFACE THAT EITHER PENETRATE THROUGH A ROTTEN CULVERT OR TO A CAVITY ADJACENT TO THE CULVERT(S)
___CULVERT(S) BEING BYPASSED
___SOME PORTION OF STREAMFLOW IS BYPASSING THE CULVERT(S) BY TUNNELING THROUGH THE ROAD BED ADJACENT TO THE CULVERT(S) (piping or tunneling evident)

ANALYSIS

OBSERVED OR POTENTIAL EFFECT ON ATLANTIC SALMON HABITAT: (Discuss aspects of existing or new road projects in watersheds that may impact Atlantic salmon habitat. Include observed or potential impacts such as: flow constrictions and flow velocity problems, bank instability, erosion and sedimentation, blockage from debris jams or beaver dams, inadequate depth related culvert elevation problem, perched culvert impeding passage, stream bed degradation or incising, etc.)

_____

_____

_____

_____

Note: Any degradation of Atlantic salmon habitat in designated DPS watersheds is a potential "taking" issue under the Endangered Species Act. Discuss your project with the appropriate federal and state agencies prior to project initiation (see Volume II)

TYPE OF BMP(s) PROPOSED TO ADDRESS POTENTIAL OR OBSERVED IMPACTS: (*check all that apply)*

___BRIDGE CONSTRUCTION (new crossing or to replace culvert crossing)
___BRIDGE IMPROVEMENTS (to address existing inadequacy)
___SLOPE STABILIZATION
___CULVERT MAINTENANCE/REPLACEMENT
___STREAM BANK PROTECTION
___ROAD MAINTENANCE (*e.g.*, stormwater management improvements such as turnouts, resurfacing, grading to create features such as broad-based dips and crowns, roadside ditch creation or lining, etc.)
___NEW ROAD ENGINEERING
___EROSION CONTROL (construction related)
___EROSION CONTROL (non-construction related)

DISCUSS (provide rationale for items checked above plus add other items not listed above, if any)

_____

_____

_____

_____

RESTORATION OF RELATED NEARBY DISTURBANCE *(if any)*:

___ NOT REQUIRED

___ REQUIRED *(check all that apply)*:

___ stream vegetation ___ bank stabilization ___ excavate sediment

___ channel reconfiguration ___ debris removal ___ fish passage

___ erosion control