

Civil Engineers • Land Use Planners

June 29, 2015

RECEIVED

Attn: Chris Brunelle  
State of Vermont ANR/DEC  
Watershed Management Program  
111 West Street  
Essex Junction, VT 05452

JUL 01 2015

TOWN OF HINESBURG  
DRB & ZONING

**Subject: Hinesburg Center Phase II, Proposed Stream Crossing  
Route 116 and Farmall Drive, Hinesburg, Vermont**

File: 2007039.1

Dear Chris:

Enclosed are preliminary plans for a 3-sided box culvert crossing of Patrick Brook, to facilitate a connection of two proposed developments in Hinesburg, Vermont: the Hinesburg Center project (Phase II) and the Haystack Crossing development.

Please review and comment on the enclosed draft plans and advise us as to the permit action required for your department. You may contact me by phone at (802) 524-9300 or by email at [cliff@shrugg.com](mailto:cliff@shrugg.com).

Sincerely,  
Ruggiano Engineering, Inc.

Clifford R. Collins, Jr., P.E.

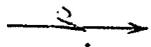
Encl: Sheet C-2, Overall Site Plan  
Sheet C-5, Culvert Details

**AOP Design Recommendations**  
**VT116 Culvert AOP Assessment Study**  
**Hinesburg, Vermont**  
**May 4, 2012**

LocalID	VTrans Milepost (miles)	Drainage Area (square miles)	Existing Structure Type	Channel Bankfull Width (ft)	VTrans Plan of Action Due to Condition*	Upgrade for Flow Capacity	Upgrade for AOP Improvement	Upgrade for Full AOP and Geomorphic Compatibility	Design Recommendation	AOP Priority #
1	6.9	0.0	24" RCP	3	Clean	36" CPP	<i>AOP not applicable. Limited habitat potential.</i>	10.7' x 6.9' Pipe Arch	Clean sediment out of ends.	19
1b	6.7	0.2	4.3' x 3.2' Box	7	No Change	No	48" CMP	7.3' x 5.3' Pipe Arch	Replace with 48" CMP. Embed 0.5'. Lower elevation 4 feet to eliminate drop.	7
1c	6.5	0.1	24" CMP	5	Field Visit	36" CPP	<i>AOP not applicable. Limited habitat potential.</i>	7.3' x 5.3' Pipe Arch	N/A	14
2	6.4	0.0	30" CMP	3	Clean	No	<i>AOP not applicable. Limited habitat potential.</i>	10.7' x 6.9' Pipe Arch	Remove sediment from pipe to restore capacity.	17
3	6.2	0.9	42" CMP	10	Field Visit	66" CMP	72" CMP	10.7' x 6.9' Pipe Arch	Lower inlet 1.25' to reduce slope and lower outlet 1.5' to eliminate drop. Increase slope by 0.5% to 1.5%. Modify farm ford downstream to increase elevation by 0.5' to increase backwater. Embed 20%.	2
4	5.5	0.3	4' x 2.5' Box	10	Field Visit	54" CMP	54" CMP	10.7' x 6.9' Pipe Arch	Install as existing.	10
5	5.4	0.0	18" RCP	3	Field Visit	30" CPP	<i>AOP not applicable. Limited habitat potential.</i>	14' x 8' Box	Lower inlet by 1.5' to reduce slope. Lower outlet by 1.0' to increase backwater depth. Decrease slope by 0.9% to 2%. Embed 20%.	18
6	5.1	7.4	7' x 4' Box	10	No Change	14' x 7' Box	14' x 7' Box	14' x 8' Box	Lower inlet by 1.5' to reduce slope. Lower outlet by 1.0' to increase backwater depth. Decrease slope by 0.9% to 2%. Embed 20%.	4
7	4.8	7.2	Bridge	21	N/A	N/A	N/A	N/A	N/A	22
8	4.7	0.1	36" CMP	5	No Change	60" CMP	<i>AOP not applicable. Limited habitat potential.</i>	<i>AOP not applicable. Limited habitat potential.</i>	Increase pipe size from 60" to 66". Embed 1'. Lower inlet 2.3', lower outlet 2.6', and increase slope by 0.3% to 1.5% to decrease velocity and increase depth. Increased tailwater elevation 1.5'.	12
9	3.9	0.1	36" RCP	5	Field Visit	6.4' x 4.3' Pipe Arch	<i>AOP not applicable. Limited habitat potential.</i>	7.3' x 5.3' Pipe Arch	Limited fill depth, required pipe arch. 72" pipe satisfied conveyance criteria	13
10	3.7	0.3	36" RCP	7	Field Visit	54" CMP	54" CMP	7.3' x 5.3' Pipe Arch	Embed pipe 1 foot. Lower elevation by 1.0'. Decrease slope by 0.8% to 1.5%.	8
10b	3.7	0.0	18" RCP	1	No Change	No	<i>AOP not applicable. Limited habitat potential.</i>	<i>AOP not applicable. Limited habitat potential.</i>	N/A	20
11	3.5	0.1	18" RCP	4	No Change	30" CPP	<i>AOP not applicable. Limited habitat potential.</i>	10.7' x 6.9' Pipe Arch	Embed 1 foot. Lower elevation by 0.5'.	16
12	3.3	0.3	60" CMP	10	No Change	No	No	10.7' x 6.9' Pipe Arch	Replace with single span structure at least 100% bankfull width. Likely a bridge structure.	9
13	3.2	3.2	Two 10' x 6.5' Pipe Arches	22	No Change	No	<i>Beyond Scope of Project.</i>	N/A	Increase pipe size from 66" to 72". Embed 1'. Lower inlet elevation by 0.6', lower outlet by 1', increase slope by 0.6% to 3.6% to eliminate drop and decrease length of depth barrier. Downstream culvert needs to be addressed also.	6
14	2.7	0.7	48" RCP	11	Field Visit	66" CMP	72" CMP	11.4' x 7.3' Pipe Arch	Increase pipe size from 66" to 72". Embed 1'. Lower inlet elevation by 0.6', lower outlet by 1', increase slope by 0.6% to 3.6% to eliminate drop and decrease length of depth barrier. Downstream culvert needs to be addressed also.	3
15	1.5	0.2	36" RCP	6	No Change	42" CMP	<i>AOP not applicable. Limited habitat potential.</i>	<i>AOP not applicable. Limited habitat potential.</i>	Increase pipe size by 1' to 54". Lowered inlet by 2.6' and outlet by 2.4'. Decrease slope from 7% to 5.8%. Increase slope of channel upstream by 2%. Increase tailwater downstream by 1'.	11
16	1.3	0.5	35" CMP	10	No Change	60" CMP	60" CMP	10.3' x 6.8' Pipe Arch	Lower inlet by 3.71' and outlet by 2' to eliminate drop. Modify downstream riffle to increase backwater by 1.0'. Decrease slope by 1.8% to 1.5%. Embed 20%. Fix Headwall	1
17	1.1	0.1	18" RCP	4	Repair	36" CMP	<i>AOP not applicable. Limited habitat potential.</i>	N/A	Install as existing.	15
18	0.7	7.5	Bridge	34	N/A	72" CMP	72" CMP	13' x 7' Box	Install as existing.	21
19	0.2	0.8	42" RCP	13	Field Visit	72" CMP	72" CMP	13' x 7' Box	Install as existing.	5

NOTES:  
RCP = radial concrete pipe. CMP = corrugated metal pipe. CPP = corrugated plastic pipe  
Bold box indicates recommended structure type and size. See design recommendations for embeddedness, slope, inlet/outlet, and alignment  
\* Plan of Action based on VTrans initial assessment of MMJ field data and recommendation.

Starksboro



Geomorphic Compatibility

- Fully Compatible
- Mostly Compatible
- ▨ Partially Compatible
- ▧ Mostly Incompatible
- Fully Incompatible

AOP & coarse Screen

- Full AOP
- Reduced AOP
- No AOP: Except Adult Salmonids
- No AOP
- Bridge

Lakes and Ponds  
River (By Stream Order)



Town Boundary

Railroad

Route 116

Roads

AOP Retrofit Potential Screen  
(Strong-moderate-weak swimmers leapers)

- II High
- M Medium
- I Low



MILTON & MACHROFF

Hinesburg

