

# Bolton Trail Safety and Connectivity Initiative

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2021

# Problem statement

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- Bolton has 14 conserved areas including 47 miles of trails throughout town. These trails would enable users to safely travel throughout many areas of town, except for the fact that the crossings are unsafe – narrow, slippery, broken, and lacking curbs or railings
- Crossings in Bolton Conservation areas need replacement to enable safe mobility for all users including hikers, joggers, cross country skiers, strollers, bikes, and horses
- Summer slipperiness is caused by slick green slime
- Winter slipperiness is caused by ice
- Focus on replacing crossings that are key for trail mobility in Bolton so users can travel safely around and between conservation areas

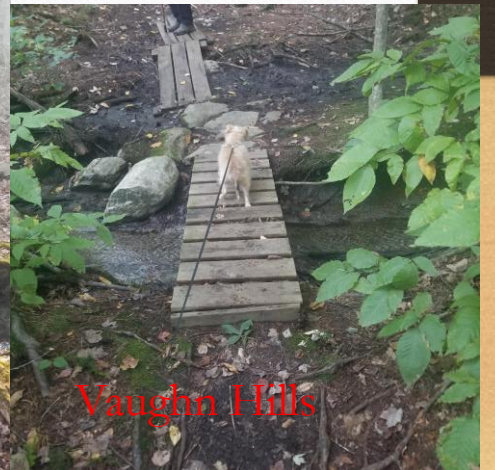
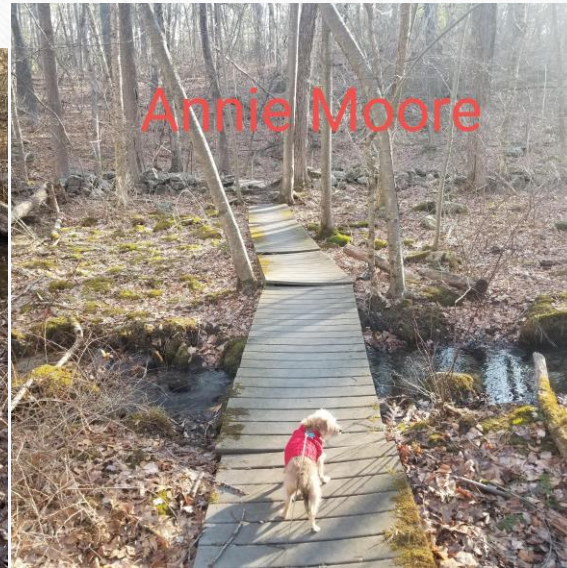
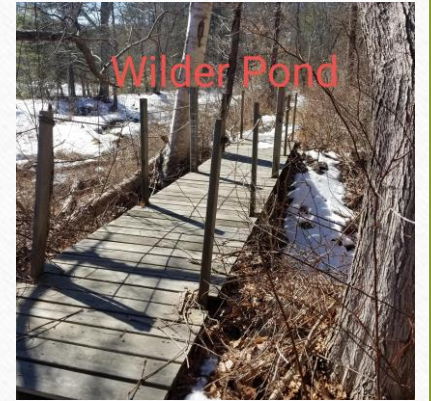


# Photos of Bolton Trail Crossings

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2021







from Bowers  
on Bartsch  
connector



Houghton  
Farm second  
bridge



from Bowers  
to Bare Hill  
#1



Rattlesnake/Lime  
Kiln



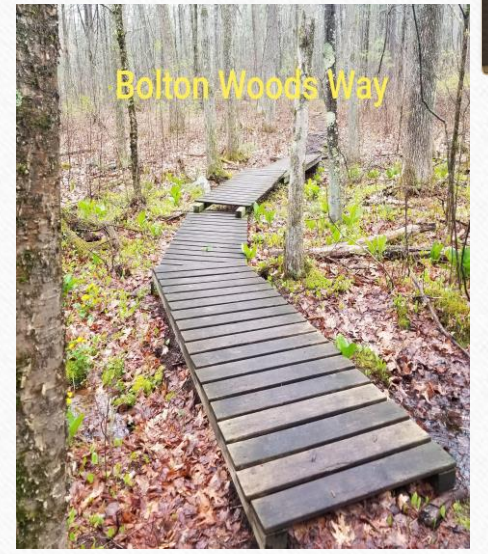
Rattlesnake/Lime  
Kiln



Lime Kiln



Bolton Woods Way











Lime Kiln



Gould-White



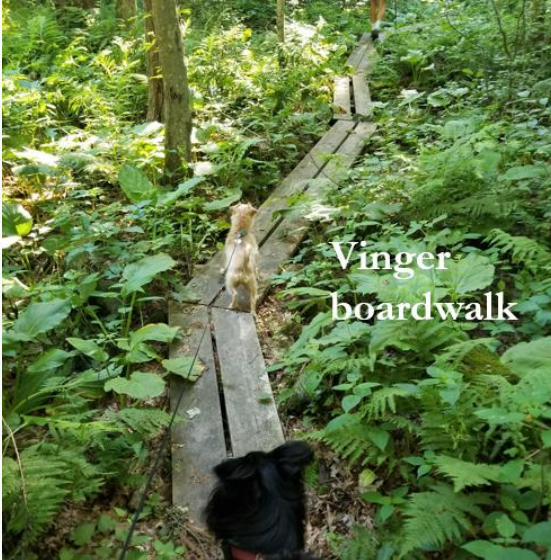
Rattlesnake/Lime Kiln



Lime Kiln



Vaughn heading toward Moen



Vinger boardwalk



Vinger bridge



Fyfeshire



# Plan to address Bolton's trail crossings

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- ✓ Completed extensive research on trail crossings and solutions
- ✓ Inventoried and prioritized Bolton's trail crossings to identify those in most need of repair in areas which are critical for connectivity, interviewed trail users
- ✓ Spoke with state, federal and local authorities, reviewed guidelines and suggestions including Mass Trails Conference info: [https://www.masstrailsconference.com/uploads/9/4/8/2/94821076/solutions\\_for\\_common\\_trail\\_prob\\_11-2-19.pdf](https://www.masstrailsconference.com/uploads/9/4/8/2/94821076/solutions_for_common_trail_prob_11-2-19.pdf)
- ✓ Identified Burnshirt Hills (Bob Hatch) and Bedford Fiberglass Reinforced Plastics, Inc. (Ted Harris) as the source for the safest, longest-lasting and most practicable design solution for replacement crossings for our trails
- ✓ Identified 9 most critical crossings
- ✓ Obtain approval from Conservation Commission to proceed with the project
- ✓ Apply for MassTrails grant
- Implement solutions which will be safe for trail users



# 9 Priority Crossings

to be addressed first based upon safety and connectivity

Vaughn Hills (7)



Annie Moore (1)



Vinger (1)





7

18' 3-Span



6

10' Span



1

10' Span, 10' Triax



Culvert - 8' Span, 10' Triax



2

10' Span, 20' Triax, 10' Triax (with culvert)



3

Beaver Pond Left - 10' Triax, 12' Span, 10' Triax



Beaver Pond right- 8' Span, 10' Triax



4

8' Span, 8' Triax



5



# Town of Bolton, MA Trails Map

Map # 2

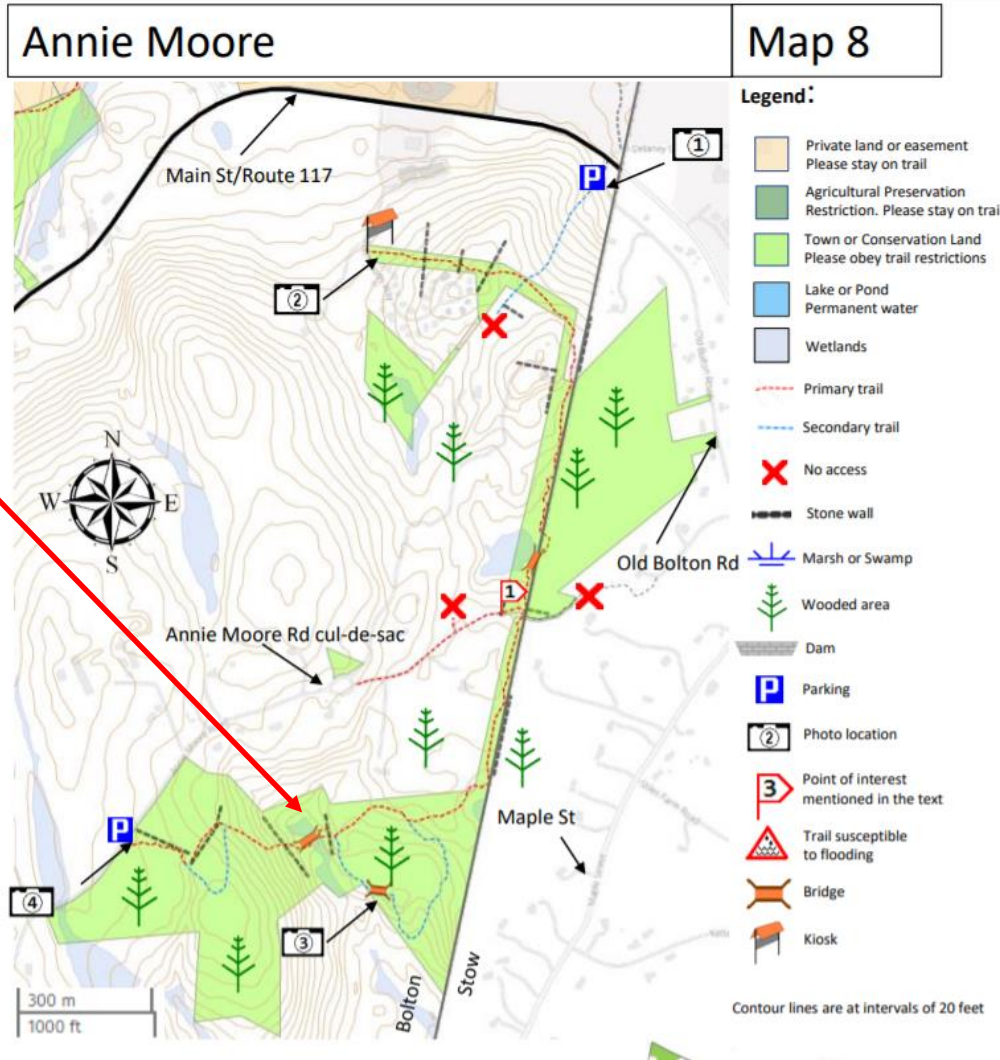
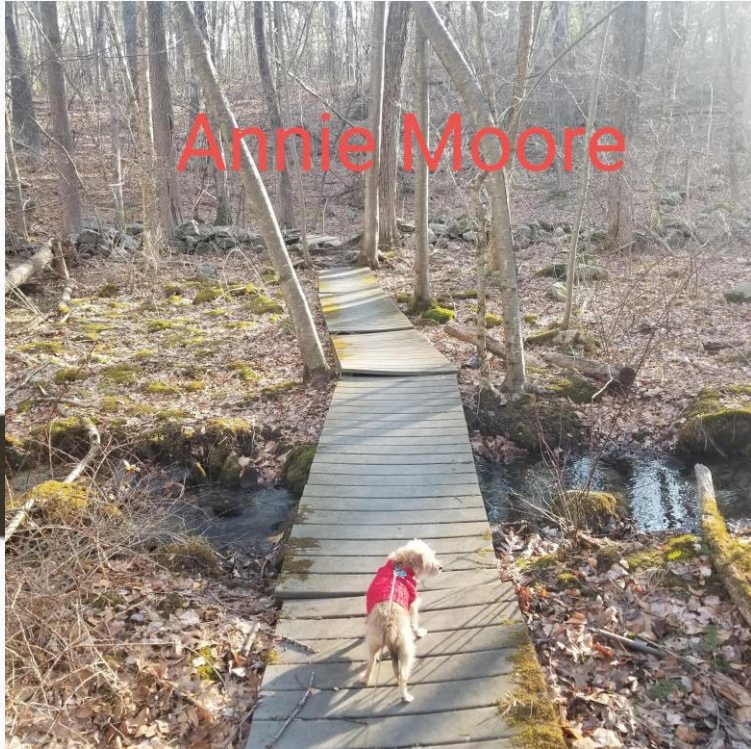
## VAUGHN HILLS MOEN, HARRIS, HANSEN & HELD AREAS



# Vaughn Hills

- 8 crossings need replacement due to being unsafe
- 7 of these (highlighted) are absolutely critical for connectivity
- Beaver Pond Left needs replacement but will defer to a future phase
- The 7 crossings shown with yellow numbers are to be replaced





The Annie Moore boardwalk is in poor condition and is not safely passable. This trail is a key connector for residents and is not currently safe. Abutters, especially those with horses, are cut off from this conservation area by this crossing.



# Vinger



The existing bridge consists of planks (perched on stones), which are exceeding slippery at all seasons.



# Plan Overview

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- Stream crossings – solve with FRP structures (Fiberglass-Reinforced Polymer), with FRP Molded Grating, GT116 geotextile, and Pea Gravel Decking Panels – 75 year lifespan.
- Wet, mucky, unstable trail areas – solve with Triax, an environmentally friendly advanced geo-synthetic solution for trail stabilization for wet, mucky areas, eliminating the need for slippery wooden boardwalks

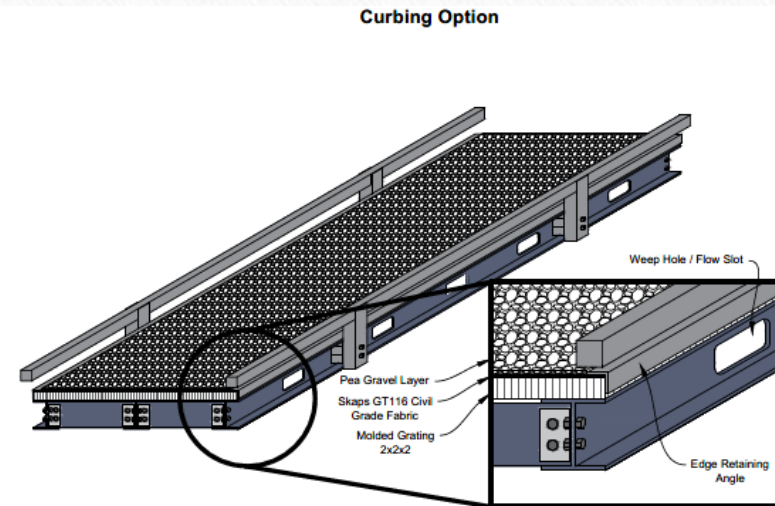




# Vaughn Hill stream crossing

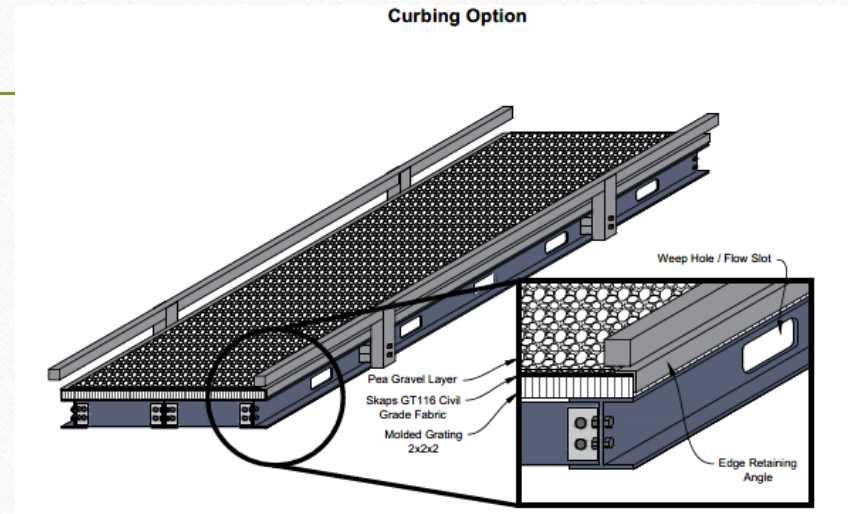
FRP Boardwalk non segmented 5' w/Curb ~ \$46/sq ft - X 10 foot span = \$2300

10' Triax is an option to stabilize the northern trail approach and can be used in conjunction with stone or stump grindings at a cost of \$4/sq foot = \$200





# Vaughn Hills Moen culvert

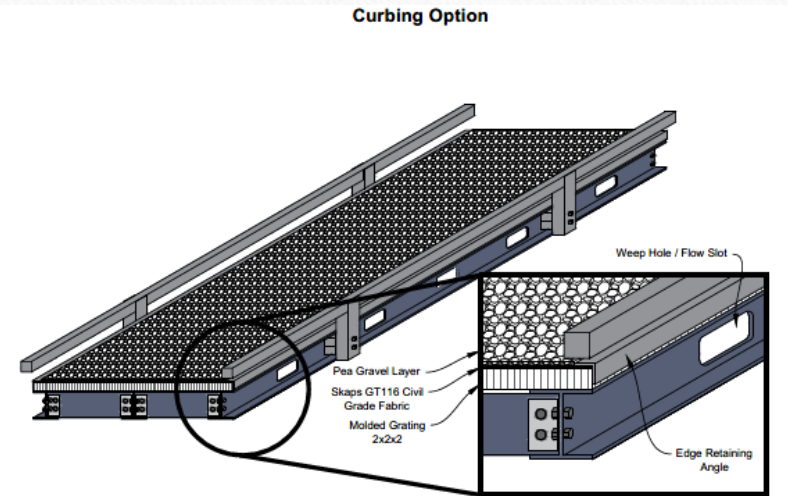


FRP Boardwalk non segmented 5' w/Curb ~ \$46/sq ft - X 8 foot span = \$1840

10' Triax could be used to replace the existing bog crossing and can be used in conjunction with stone or stump grindings at a cost of \$4/sq ft = \$200



# Vaughn Hill heading towards Moen

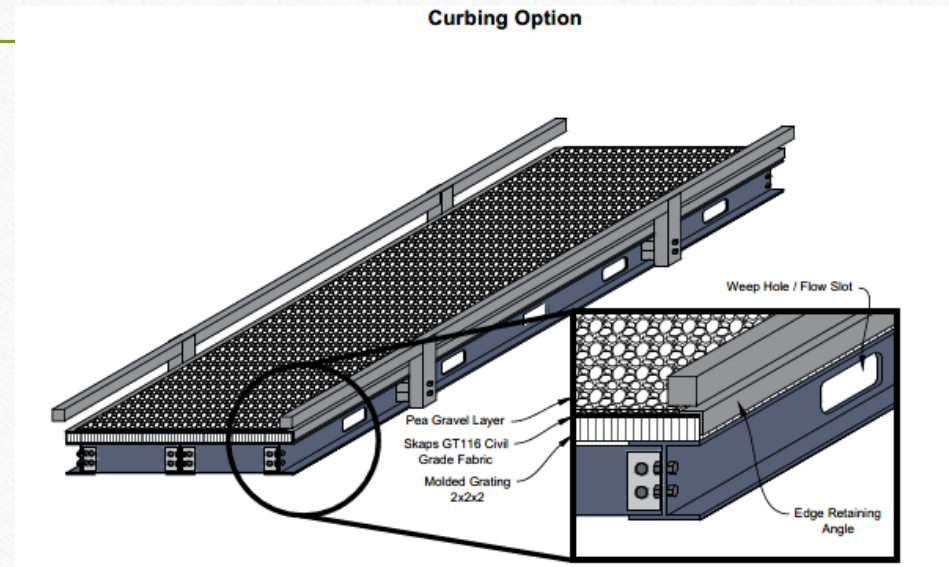


FRP Boardwalk non segmented 5' w/Curb ~ \$46/sq ft - X 8 foot span = \$1840

30' Triax is an option to replace the existing broken bog bridge and can be used in conjunction with stone or stump grindings at a cost of \$4/sq ft = \$600



# Vaughn Hills Beaver Pond right

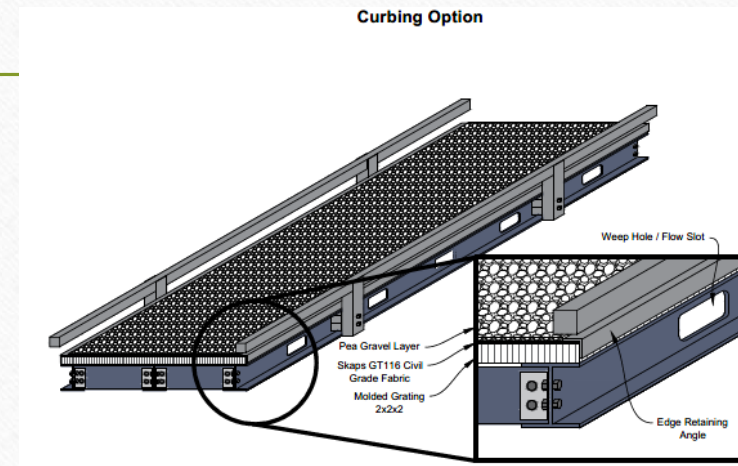


FRP Boardwalk non segmented 5' w/Curb ~ \$46/sq ft - X 8 foot span = \$1840

10' Triax is an option to replace the existing broken bog bridge which is being bypassed anyway and can be used in conjunction with stone or stump grindings at a cost of \$4/sq ft = \$200



# Vaughn Hills Moen stream crossing

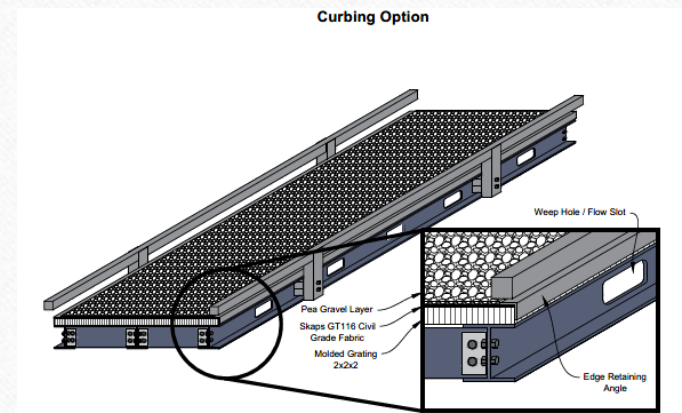


FRP Boardwalk non segmented 5' w/Curb ~ \$46/sq ft - X 8 foot span = \$1840

8' Triax will replace the existing bog bridge and can be used in conjunction with stone or stump grindings at a cost of \$4/sq ft = \$160



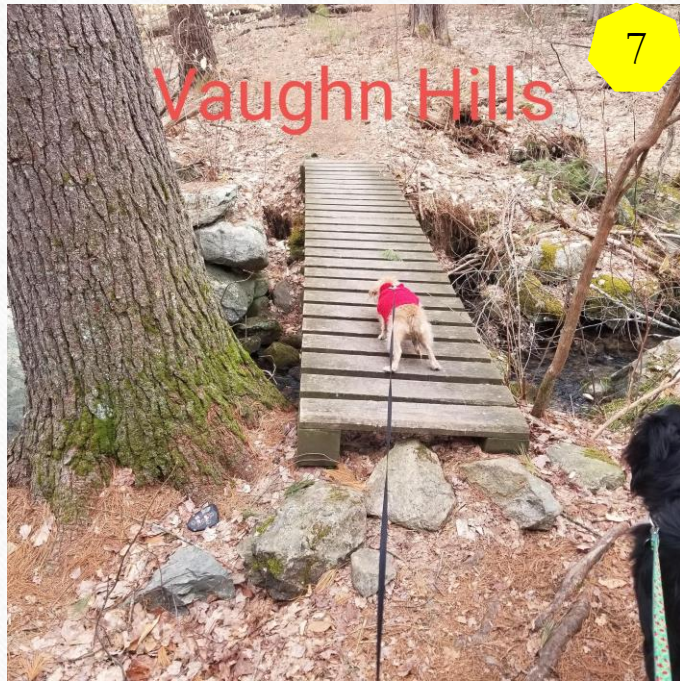
# Vaughn Hills Moen stream crossing



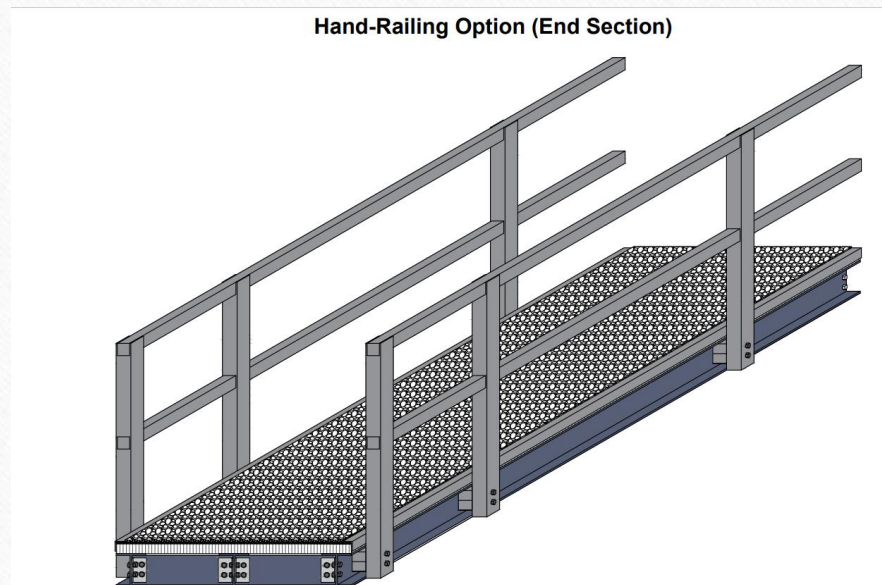
FRP Boardwalk non segmented 5' w/Curb ~ \$46/sq ft - X  
10 foot span = \$2300



# Vaughn Hills Moen stream crossing – 6' drop



FRP Boardwalk non segmented 5' w/curb and railing ~  
\$55/sq ft - X 18 foot 3- span = \$4950





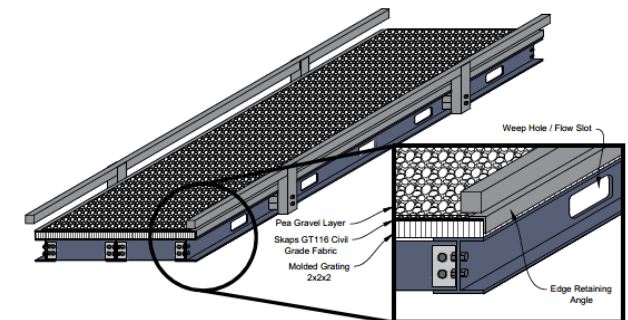


# Vinger marsh crossing

If required to be kept in its current location it would require a "segmented marsh crossing" 5' wide x 80' = about 400 sq ft x \$50/ sq ft = \$20K.



If the trail is moved upstream about 100' there is an ideal spot to do a 16' crossing. The north and south sides are open to connect to the existing trail with no clearing required except for one downed tree on the south. FRP Boardwalk non segmented 5' w/Curb ~ \$46/sq ft – X 16 foot span = \$3680





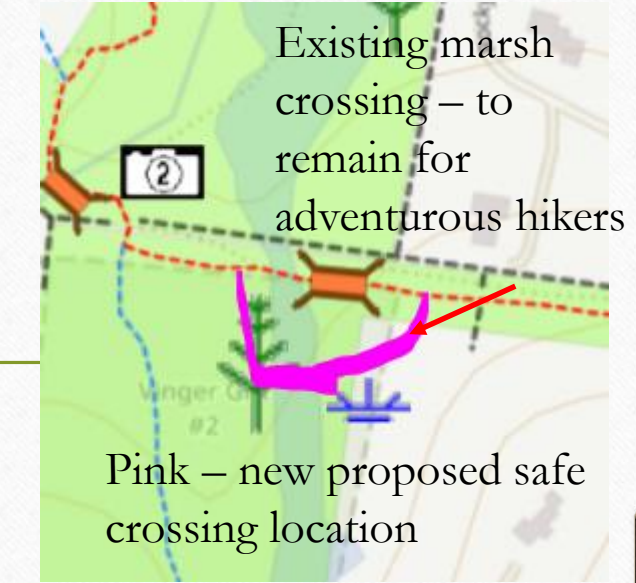
# Vinger new crossing



North new trail location



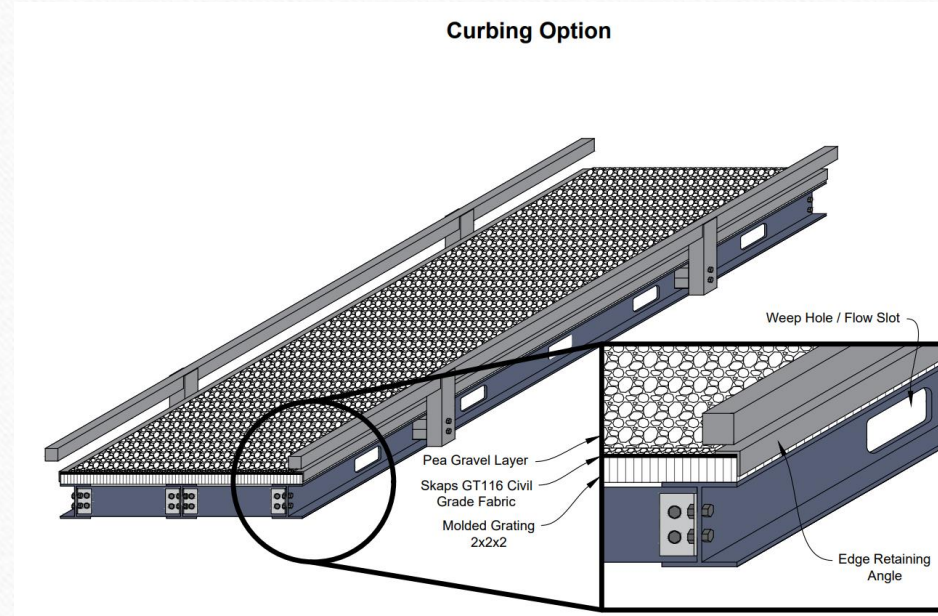
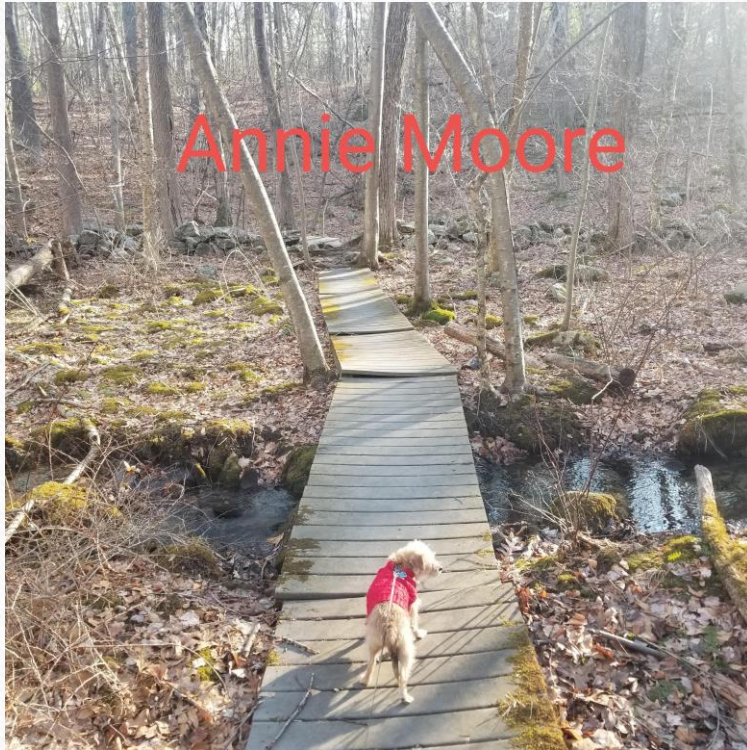
New crossing location



New south trail location->



# Annie Moore boardwalk



84' total -68'  
Clear span  
boardwalk  
\$42/sq ft = \$  
14280 and 16'  
X 46 = 84' x  
5' = \$3680



# Triax

- Trail stabilization for wet areas: <https://www.tensarcorp.com/Systems-and-Products/Tensar-Triax-geogrid>
  - Advanced geosynthetic product for ground stabilization
  - Most environmentally friendly solution
  - Zero ground disturbance
  - Easily work around obstacles like stumps and rocks
  - ABA (Architectural Barriers Act) compliant.
- 1 1/2" faceted stone with 1/2" pea stone, or stump grindings
- Snowshoe effect
- <https://photos.app.goo.gl/ZciUC3Vbf3f7zfHH8>
- <https://photos.app.goo.gl/9BNjQDZakN33J2Tq8>
- Usage approved and implemented by other MA towns including, Groton, Hubbardston, and Millers Falls





# Triax before and after





# Example of FRP Solution

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**2" X 2" X 2" Square Grid**



# Questions

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