A Stormwater Focused Green Infrastructure Alternative To The Currently Proposed State Road Reconstruction Project Between Ellsworth and Morgan in Pittsfield, MI
Introduction

This document outlines a stormwater-focused green infrastructure alternative for the currently proposed reconstruction project of State Road in Pittsfield Township between Ellsworth and Morgan Road.

Information about the current preferred alternative for State Road’s reconstruction was gathered from the 2013-2017 WCRC CIP (http://www.wcroads.org/News/Township/Capital) and the WCRC EA for the reconstruction (http://www.wcroads.org/node/1624).
Currently Proposed State Road Reconstruction Project by Washtenaw County Roads Commission
Currently planned preferred alternative from State Road reconstruction project EA

2.2.2 Illustrative Alternative 2 – Narrow Median with Roundabout Intersections
This alternative consisted of a four-lane roadway (two travel lanes in each direction) with a 20-foot median for the entire length of the project area. As part of this alternative, two-lane roundabouts would be constructed at the State Road intersections with Morgan Road, Textile Road and Old State Road. Median turnarounds would also be provided at locations throughout the corridor. On-street bikes lanes, and a ten-foot wide multi-use path would also be provided on both sides of the roadway. Additionally, this alternative would accommodate future transit facilities (i.e., bus stops/shelters) should the township and/or AATA decide to build facilities along the corridor. This alternative would also require the lengthening of the culvert for the Pittsfield-Junction drain and the railroad crossing near Payeur Road.

This alternative was selected as the Preferred Alternative. For more details regarding this Alternative, see Section 2.4.

2.2.3 Illustrative Alternative 3 – Wide Median with Traffic Signal Intersections
This alternative consisted of a four-lane roadway (two travel lanes in each direction) with a 60-foot median for the entire length of the project area. As part of this alternative, the State Road intersections with Morgan Road, Textile Road, Old State Road, and Campus Drive would be signalized with indirect left turns (i.e., “Michigan Lefts”). Median turnarounds would also be provided throughout the corridor. On-street bikes lanes, and a ten-foot wide multi-use path would also be provided on both sides of the roadway. Additionally, this alternative would accommodate future transit facilities should the township and/or AATA decide to build facilities along the corridor. This alternative would also require the lengthening of the culvert for the Pittsfield-Junction drain and the railroad crossing near Payeur Road.
### State Road reconstruction: WCRC proposed cross section

<table>
<thead>
<tr>
<th>ROW SETBACK</th>
<th>MULTI-USE PATH</th>
<th>BUFFER ZONE</th>
<th>ON-STREET BIKE LANE</th>
<th>TRAVEL LANE</th>
<th>TRAVEL LANE</th>
<th>PROP MEDIAN</th>
<th>TRAVEL LANE</th>
<th>TRAVEL LANE</th>
<th>ON-STREET BIKE LANE</th>
<th>BUFFER ZONE</th>
<th>MULTI-USE PATH</th>
<th>ROW SETBACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>VARIES</td>
<td>10.0'</td>
<td>5.0'</td>
<td>2.0'</td>
<td>11.0'</td>
<td>11.0'</td>
<td>2.0'</td>
<td>12.0' MINIMUM - 20.0' MAXIMUM</td>
<td>2.0'</td>
<td>11.0'</td>
<td>11.0'</td>
<td>5.0'</td>
<td>2.0'</td>
</tr>
</tbody>
</table>

**Notes:**
- **Ex Ground**
- **Curb and Gutter (Typ.)**
- **Prop Row**
- **Multi-Use Path**
- **Travel Lane**
- **On-Street Bike Lane**
- **Buffer Zone**
- **Prop Median**
- **Varies**
Currently proposed design: State Road reconstruction
Currently proposed design projected onto site
2.4.2.4 Culverts/Drainage/Stormwater System

The Preferred Alternative would include curb and gutter and an enclosed stormwater system for the entire length of the project. The system would be designed to meet the guidelines set forth in the Washtenaw County Water Resources Commission’s (WCWRC) Procedures and Design Criteria for Storm Water Management Systems (WCWRC 2000) per the Memorandum of Understanding (MOU) dated January 16, 2007 between the WCRC and WCWRC.

The use of stormwater detention ponds is not anticipated in conjunction with the Preferred Alternative. All stormwater will be accommodated in the median or via prefabricated stormwater systems (e.g., Stormceptor®, StormVault®, or similar products). The Preferred Alternative would include the use of water quality Best Management Practices (BMPs) to pre-treat stormwater before it enters receiving water bodies. During the design phase of the project detailed hydraulic studies will be conducted to determine which BMPs will be used to accommodate stormwater. All BMPs will be designed in accordance with the Procedures and Design Criteria for Storm Water Management Systems. The Preferred Alternative would also require the Pittsfield-Junction Drain culvert to be extended by approximately 65 by feet. The culvert will be designed in accordance with the Procedures and Design Criteria for Storm Water Management Systems. Required hydraulic and hydrology studies will be conducted during the design phase of the project to determine proper culvert size.

2.4.2.5 Access Changes

The proposed median would no longer allow direct left turn access to and from the majority of driveways or side streets within the corridor. As shown in Figure 2, median crossovers would be constructed to
State Road Reconstruction:
Green Infrastructure Alternative
State Road reconstruction - Green Infrastructure Alternative:
Median Rain Garden

VARIES 10.0' 5.0' 2.0' 11.0' 11.0' 2.0' 20.0' MEDIAN 2.0' 11.0' 11.0' 11.0' 5.0' 5.0' 5.0' 10.0' VARIES

ROW SETBACK MULTI-USE PATH BUFFER ZONE ON-STREET BIKE LANE TRAVEL LANE TRAVEL LANE MEDIAN RAIN GARDEN TRAVEL LANE TRAVEL LANE ON-STREET BIKE LANE BUFFER ZONE MULTI-USE PATH ROW SETBACK

SLOPE AWAY SLOPE (2%) CURB WITH CURB CUTS
Median Rain Garden Design Concept

Note: This slide illustrates the original concept design
*Final design plans introduced later
Design Considerations for Median Rain Gardens
State Road reconstruction - Green Infrastructure Alternative: Impervious vs. Pervious areas to be drained by Median Rain Garden

IMPERVIOUS SURFACES OF ROAD CROSS SECTION TO BE DRAINED BY RAIN GARDEN
82' of width of cross section

PERVIOUS SURFACES OF ROAD CROSS SECTION TO BE DRAINED BY RAIN GARDEN
30' of width of cross section
Rain gardens and associated components must be sized based on above data to accept all runoff originating from State Road reconstruction – Green Infrastructure alternative.
In addition to road drainage, we also saw opportunity to accept stormwater from an adjacent site where a high amount of runoff will be generated.

(explained ahead...)
Legend:
- Drainage area of interest (to be drained by green street median rain garden)
- Existing sewer lines & drainage ditches
LEGEND
- Impervious Surfaces: Buildings/Structure (1.76 ac.)
- Impervious Surfaces: Paved: Drain to Sewer (5.26 ac.)
- Open Space - Grass/Scattered Trees: Grass cover > 75% (7.59 ac.)
- Trees: Grass/Turf Understory: Ground cover 50% - 75% (0.47 ac.)
- Trees: Grass/Turf Understory: Ground cover > 75% (0.31 ac.)
- Trees: Impervious Understory (0.05 ac.)
- Urban Bare (0.28 ac.)

15.72 TOTAL ACRES
LEGEND
- drainage area of interest (to be drained by green street median rain garden)
- existing sewer lines & drainage ditches
- general drainage direction
Overall Low Points Along State Road

 LEGEND

- overall low points
Based on drainage patterns and the currently proposed State Road reconstruction design by the WCRC, we believe potential median rain gardens can be incorporated into this future project as follows...
Rain garden section 'A' = 1200'

Rain garden section 'B' = 1600'

Rain garden section 'C' = 1700'
rain garden section 'A' = 1200'
median taper length = 200'
median vehicle turn divider = 50'
median taper length = 200'

rain garden section 'B' = 1600'
median taper length = 175'

rain garden section 'C' = 1700'
median gap for vehicle turns = 125'
median gaps for vehicle turns = 50' each

TOTAL LENGTH = 5300'
See next page for rough plan of rain garden section 'A' projected onto site.
Perspective of Median Rain Garden
*Compacted subgrade under median rain garden will encourage water to flow through less dense rain garden soil and away from under road bed

*Gravel bed at base of rain garden set on slope of compacted sugrade which will encourage water to flow to middle of rain garden trench

*Perforated pipe undedrain will carry water that hasn’t been taken up by plants downhill
Riser with overflow grate in final rain garden pool (i.e. low elevation pool) prevents water from spilling out of median rain garden system.

Riser outlet pipe drains excess water during large storm events to storm sewer or a large open pervious area near site (see slide 27).

Perforated pipe outlet fitted with bulkhead. Bulkhead to be closed during summer and open during winter. Open bulkhead in winter ensures thawing snow/ice is carried out of rain garden and will not refreeze. This mitigates freeze/thaw heaving under roadbed. Perforated pipe is below frost line.
RAIN GARDEN CROSS SECTION C

*NOTE: NOT TO SCALE

CHECK DAM
-HEIGHT - 1'

RISER 36" WITH OVERFLOW
GRATE
-IN FINAL CHECK DAM POOL
ONLY

TERMINAL CHECK DAM
-HEIGHT = 2'

PERFORATED PIPE
UNDERDRAIN

GRAVEL BED
Perspective of Median Rain Garden

Stormwater runoff moves through curb cuts.
Stormwater flow down median rain garden system and infiltrates behind check dams.
Stormwater runs over 1' tall check dams to downstream pools during heavy precipitation events.
High water flows into 1' tall grated overflow riser

Terminal check dam height = 2'
- Water kept in check dam pool
Perspective of Median Rain Garden

Signage about green infrastructure project for pedestrians and motorists

Cross walks at ends of median rain gardens allow pedestrians a closer look at the project.
Sizing Process of Median Rain Gardens and Associated Components
General Plan for State Road

*Lengths of median rain gardens, taper lengths, median gaps, and turn dividers used to calculate runoff totals and ability for rain gardens to accept runoff*

Rain garden section 'A' = 1200'

Median taper length = 200'

Median vehicle turn divider = 50'

Median taper length = 200'

Rain garden section 'B' = 1600'

Median taper length = 175'

Median gap for vehicle turns = 50' each

Median gap for vehicle turns = 125'

Additional drainage area of interest - drains to section 'A' only

Rain garden section 'C' = 1700'

Median taper length = 200'

Median taper length = 200'

Median gap for vehicle turns = 125'

Corporate

TOTAL LENGTH = 5300'
State Road reconstruction - Green Infrastructure Alternative:
Impervious vs. Pervious areas to be drained by Median Rain Garden

**IMPERVIOUS SURFACES OF ROAD CROSS SECTION TO BE DRAINED BY RAIN GARDEN**
82’ of width of cross section

**PERVIOUS SURFACES OF ROAD CROSS SECTION TO BE DRAINED BY RAIN GARDEN**
30’ of width of cross section
Runoff Generated Along State Road and Bioretention Volume Capacities of Rain Gardens

The following pages contain calculations demonstrating:
1. Total bioretention capacity for rain garden section A → 26,256 cubic feet
2. Total runoff generated by areas that may be drained by rain garden section A → 38,308 cubic feet (includes runoff from State Road footprint and highlighted additional drainage area of interest)

Our conclusions are that the State Road median rain garden Section A could accommodate roughly 2/3 the runoff volume generated by a 1” storm for the above mentioned drainage areas. The remainder can be handled by piping the excess water to a storm sewer system or piped into the highlighted adjacent, municipally owned tract of pervious land (see slide 27). If runoff is not accepted from the additional drainage area of interest, Section A would be able to handle all runoff originating from the adjacent roadway footprint.

Based on the following calculations, we can assume that rain garden sections B and C can handle all runoff originating along the adjacent stretches of State Road.