

CITY OF ANN ARBOR, MICHIGAN

**LOCAL BRIDGE PROGRAM FUNDING APPLICATION
FOR
PREVENTATIVE MAINTENANCE
FOR THE
E. MEDICAL CENTER DRIVE BRIDGE OVER THE
WOLVERINE LINE**



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FEDERAL STRUCTURE ID. NO. 814021200000R01 MDOT STRUCTURE NO. 11065

Introduction and Background

The E. Medical Center Drive Bridge over the Wolverine Line (formally known as the Norfolk Southern Railroad tracks) is a two-way, four-lane bridge that was built in 1982.

The three-span bridge was constructed with twelve, rolled-steel, wide flange, beams and a reinforced concrete deck with a latex-modified concrete overlay. The bridge length is approximately 160'-0" from reference line to reference line with an out-to-out width of 70'-11¼" and approximate skew of 36° left. The alignment of E. Medical Center Drive is in a horizontal curve over the bridge. The cross-section includes two sidewalks, four lanes of traffic (three northbound and one southbound lane), and 3-tube, concrete parapet mounted, railings. The clear roadway width is 47'-0". Expansion joints are located over both piers.

The existing substructure consists of two stub abutments and two round column bent piers. In accordance with the existing bridge plans, the abutment substructure units are supported on piles and the two piers are supported on spread footings.

Structure Condition

This structure is in poor condition. There are approximately 1,397 ft² (\approx 12.3% of the deck area) of delaminated and spalled areas. The north span has the largest concentration of spalled areas with approximately 39.5% of the north span being spalled and delaminated. The bottom side of the bridge deck has approximately 5 to 10% of the total area consisting of spalls (some with exposed reinforcement), delaminations, cracks with moisture and efflorescence, and rust stains. In order to better determine the amount of delaminated areas, we utilized infra-red thermal scanning technology in 2013 and hand sounded the deck in 2015 and 2017 to locate and define the extent of delaminated areas.

The paint system has failed. The expansion joints located over the piers are in poor condition. The glands in the expansion joints are torn and debris-filled. The joints leak causing corrosion at the beam ends and ponding water on the pier caps. The beam ends at the expansion joints are corroding, but there is no measurable section loss at this time. The end diaphragms under the expansion joints also have corrosion without measurable section loss.

The bridge abutments are in good condition. The abutments have hairline cracks, but no delaminations were found. The abutments are covered in graffiti.

The piers are in fair condition. The south pier has a total of 18 areas of delaminations totaling 272 ft²; the north pier has 15 areas of delaminations totaling 303 ft². The lower half of the piers are covered in graffiti. The northerly pier's cap is cracked to the extent that it cannot cost-effectively be repaired and must be replaced.

The bridge railings are in fair condition with vertical cracking at approximately 5' increments. The northeast, northwest, and southeast rail end walls have spalled concrete and exposed anchor bolts. The exposed bolts have rusted. The anchorage points of the horizontal steel railings to the concrete end blocks must be chipped out and replaced with new concrete.

Economic Importance of Structure

The E. Medical Center Drive Bridge over the Wolverine Line carries vehicular and pedestrian traffic in a north-south direction. E. Medical Center Drive serves as the main entrance into the University of Michigan's Medical Center. E. Medical Center Drive also connects to Fuller Road and is aligned directly opposite Maiden Lane.

The University of Michigan's Medical Center is located immediately south of the E. Medical Center Drive bridge. The Fuller Road/Maiden Lane/E. Medical Center Drive intersection and the bridges that link to it essentially serves as the main entrance in the medical center. The medical center receives about **35,000 visitors, patients, and employees each day** and has revenues of **\$3 billion dollars** each year. Access to the hospital must be preserved. E. Medical Center Drive directly links to one of two access points to the University Hospital System's Wall Street District which is home to the W. K. Kellogg Eye Center, the University's Department of Ophthalmology, one 500-600 car parking lot and a second proposed 500-600 car parking lot, and a proposed Transit Center that will shuttle patients and visitors between the Wall Street District facilities and the Medical Center. Attached, please find a graphic representation of the University's Medical Campus and its relation to the E. Medical Center Drive Bridge (please see Figure 18.)

Average Daily Traffic

The average daily traffic for E. Medical Center Drive at this bridge is 17,220 vehicles per day (2014 counts). Over 325 pedestrians cross Fuller Road at the E. Medical Center/Maiden Lane intersection during each peak hour.

Maintenance Work Performed and Design Deficiencies

To date, no significant long-term maintenance work has been performed on this structure.

Anticipated Repair Methodology

The bridge is planned to have all steel beams, diaphragms, and cross braces cleaned and re-coated. The northerly pier cap is proposed to be removed and replaced. The southerly pier will be chipped and patched. The expansion joints will be removed and replaced. The latex modified concrete wearing surface is planned to be removed and replaced (shallow overlay.) The existing longitudinal cracks within the sidewalks will be injected and sealed. The guardrails will be upgraded to meet current standards and overgrown brush will be removed from around the perimeter of the bridge. The current barrier and railing configuration on the outside edges of the bridge does not meet current NCHRP 350 crash requirements, however we do not have any crash history on this bridge that suggests their removal and replacement is warranted. Consequently, we will remove the railing elements and have them re-galvanized and painted as were the recently rehabilitated railings on the nearby Fuller Road and Maiden Lane bridges.

Bridge Posting

The bridge is not posted and can carry all legal live loads.

Effects of Bridge Closure

Since the bridge is not posted and can carry all legal live loads and the scope of work that is currently being planned is preventative maintenance, closure of this structure for the foreseeable future is not likely. However, if this bridge were to close, significant disruption to the operation of the medical center would occur. This would include the majority of the 35,000 daily visitors, patients, and employees and significant disruption to the transit operations of the Ann Arbor Transportation Authority that service the Medical Center. The shortest detour route length would be approximately 0.90 miles. Additionally, travel time to, and ingress and egress from, the Medical Center would be greatly increased as the other access points into the medical center are not designed to accommodate the large number of vehicles, busses, and pedestrians that would be forced upon them. Further, emergency access and emergency and scheduled ambulance trips into and out of the medical center would be significantly impacted as well. Without doubt, the operation of the Medical Center and the Wall Street District would be impacted to a large degree.

Local Agency Contact

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City of Ann Arbor, Public Services Area

(734) 794-6410 ext. 43635

Estimated Preventative Maintenance Costs

The estimated construction cost for the planned preventative maintenance for the E. Medical Center Drive Bridge over the Wolverine Line tracks is **\$1,489,000**. A breakdown of the estimated cost is listed below (which includes inflation at 3% per year and railroad flagging costs):

A. Approach Construction	\$ 117,000
B. Structure Construction	<u>\$ 1,372,000</u>
Total	\$ 1,489,000

A detailed derivation of the estimated rehabilitation costs of this structure following the MDOT Local Agency Program – Bridge Cost Estimate Worksheet guidelines is attached to this application package.

Exhibit 4 - Cost Estimating Worksheets

2017

**LAP - BRIDGE COST ESTIMATE WORKSHEET
- CPM, REHAB, REPLACE -**

REV. 1/26/2018

REGION: University	FISCAL YEAR: FY 21	STRUCTURE ID: 11065
ENGINEER: Michael G. Nearing, P.E.	DATE: 2/28/2018	BRIDGE ID: 81402120000R01
LOCATION: E. Medical Center Drive over the Wolverine Line	DECK AREA: 11,350 SFT	STR. TYPE: Rolled Steel Beams
PRIMARY WORK ACTIVITY: Capital Preventative Maintenance	DECK DIM: 70.94' Wide x 160' Long	

<u>WORK ACTIVITY</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>UNIT COST</u>	<u>TOTAL</u>
NEW BRIDGE				
Concrete (add demo & road approach & MOT)		SFT	\$305.00 /SFT	
Steel (as above)		SFT	\$320.00 /SFT	
Precast 3-sided or 4-sided Culvert (add removal, roadway over, MOT)		SFT	\$400.00 /SFT	
Other				
NEW SUPERSTRUCTURE				
Concrete (incl. remove exist super, new railing; add MOT & approach)		SFT	\$140.00 /SFT	
Steel (as above)		SFT	\$190.00 /SFT	
Over Water (add to new superstructure cost)		SFT	\$40.00 /SFT	
Other				
WIDENING				
Added portion only. _____ ft of width (add road approach transition)		SFT	\$270.00 /SFT	
Other				
NEW DECK				
Includes remove exist deck & new railing (add traffic control & approach)		SFT	\$70.00 /SFT	
Other				
DEMOLITION				
Entire bridge, grade separation		SFT	\$32.00 /SFT	
Entire bridge, over water		SFT	\$42.00 /SFT	
Other				
SUPERSTRUCTURE REPAIR				
Concrete Deck Patch (includes hand chipping)		SFT	\$35.00 /SFT	
Full Depth Patch		SFT	\$100.00 /SFT	
HMA Cap (no membrane, add bridge rail if req'd)		SFT	\$1.50 /SFT	
HMA Overlay with WP membrane (add bridge rail if req'd)		SFT	\$5.50 /SFT	
Removal of Concrete Wearing Course (latex), Epoxy Ovly, or HMA Ovly		SFT	\$2.00 /SFT	
Healer Sealer		SYD	\$22.00 /SYD	
Epoxy Overlay		SYD	\$32.00 /SYD	
Shallow Overlay (incl. joint repl & hydro; add bridge rail)	7,632.0	SFT	\$35.00 /SFT	\$267,120
Deep Overlay (incl. joint repl & hydro; add bridge rail)		SFT	\$37.00 /SFT	
High Load Hit Repair (PCI Beam)		SFT	\$250.00 /SFT	
PCI Beam End Repair		EA	\$4,600.00 EA	
Repair Structural Steel (\$4900 bolted, \$7000 welded)		EA	\$6,000.00 EA	
Paint Structural Steel (incl. clean & coat)	16,300.0	SFT	\$20.00 /SFT	\$326,000
Partial Painting (incl. clean & coat)		SFT	\$40.00 /SFT	
Pin & Hanger replacement (incl. temporary supports)		EA	\$7,000.00 EA	
Other Misc. Sidewalk Crack Sealing; Railing Repairs - Paint & Galv	1.0	LSUM	\$30,000.00	\$30,000
SUBSTRUCTURE REPAIR				
Pier repair (measured x 2) Replace if repair area > 30%	270.0	CFT	\$265.00 /CFT	\$71,550
Pier repair over water (measured x 2)		CFT	\$300.00 /CFT	
Pier replacement	2,643.0	CFT	\$80.00 /CFT	\$211,440
Abutment repair (measured x 2)		CFT	\$265.00 /CFT	
Temporary Supports for Substructure Repair	24.0	EA	\$1,800.00 EA	\$43,200
Slope Protection repairs		SYD	\$140.00 /SYD	
Other				
MISCELLANEOUS				
Expansion or Construction Joints (includes removal)		FT	\$550.00 /FT	
Bridge Railing, remove and replace (\$250 Type 4, \$305 Aesthetic Parapet)		FT	\$280.00 /FT	
Thrie Beam Railing retrofit		FT	\$40.00 /FT	
Articulating Concrete Block System (ACB)		SYD	\$120.00 /SYD	
Scour Countermeasures		LSUM	LSUM	
Other Remove Existing Vegetation	1.0	LSUM	\$5,000.00	\$5,000

STRUCTURE CONSTRUCTION BUDGET \$954,310

<u>ROAD WORK</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>UNIT COST</u>	<u>TOTAL</u>
Approach Pavement, 12" RC (add C & G, GR, Slope, Shldr.) 40' ea. end		SFT	\$16.00 /SFT	
Approach Curb & Gutter (18' ea. quad.)	100.0	FT	\$50.00 /FT	\$5,000
Guardrail Anchorage to Bridge (<40')	4.0	quads	\$1,600.00 /quad	\$6,400
Guardrail, Type B or T (beyond GR anchorage to bridge, <200')		FT	\$22.00 /FT	
Guardrail Ending (end section)	4.0	EA	\$1,750.00 /EA	\$7,000
Roadway Approach work (beyond approach pavement)		LSUM	LSUM	
Utilities		LSUM	LSUM	
Other Sidewalk Removal and Replacement	1.0	LSUM	\$2,500.00	\$2,500

<u>TRAFFIC CONTROL</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>UNIT COST</u>	<u>TOTAL</u>
<i>Unit Cost to be determined by Region or TSC Traffic & Safety</i>				
Part Width Construction	1.0	LSUM	\$25,000.00	\$25,000
Crossovers		EA	\$300,000.00 EA	
Temporary Traffic Signals		set	\$25,000.00 /set	
RR Flagging	1.0	LSUM	\$34,400.00	\$34,400
Detour		LSUM	LSUM	
Other				

RELATED ROAD/TRAFFIC CONSTRUCTION BUDGET \$80,300

CONTINGENCY (10% - 20%) (use higher contingency for small projects)	20	%	\$1,035,000.00	\$207,000
MOBILIZATION (estimate at 10%)	10	%	\$1,242,000.00	\$124,000
INFLATION (assume 3% per year, beginning in 2018)	9	%	\$1,366,000.00	\$123,000

(DOES NOT INCLUDE PE & CE)

TOTAL CONSTRUCTION BUDGET \$1,489,000

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Figure 1 East Elevation Looking West



Figure 2 Deck Delaminations in North Span (looking north)



Figure 3 Deck Delaminations in Center Span (looking north)



Figure 4 Sidewalk Delaminations on east sidewalk



Figure 5 Moisture and Cracking in Bottom of Deck, Span 3



Figure 6 Full Depth Cracks with Moisture, Leaching, and Rust Stains



Figure 7 Spalling along South Expansion Joint (looking west)



Figure 8 North Approach (looking north)



Figure 9 End Diaphragm and Beam End Surface Rusting and Paint Failure, Pier 2



Figure 10 Typical Paint Failure



Figure 11 Paint Failures at bottom flange of beams



Figure 12 Cracked Pier Cap (North Pier (Pier 2))



Figure 13 Delamination on South Side of South Pier (Pier 1)



Figure 14 Delaminations on South Side of North Pier (Pier 2)



Figure 15 Typical heavy vegetation surrounding bridge



Figure 16 Typical railing end block failures

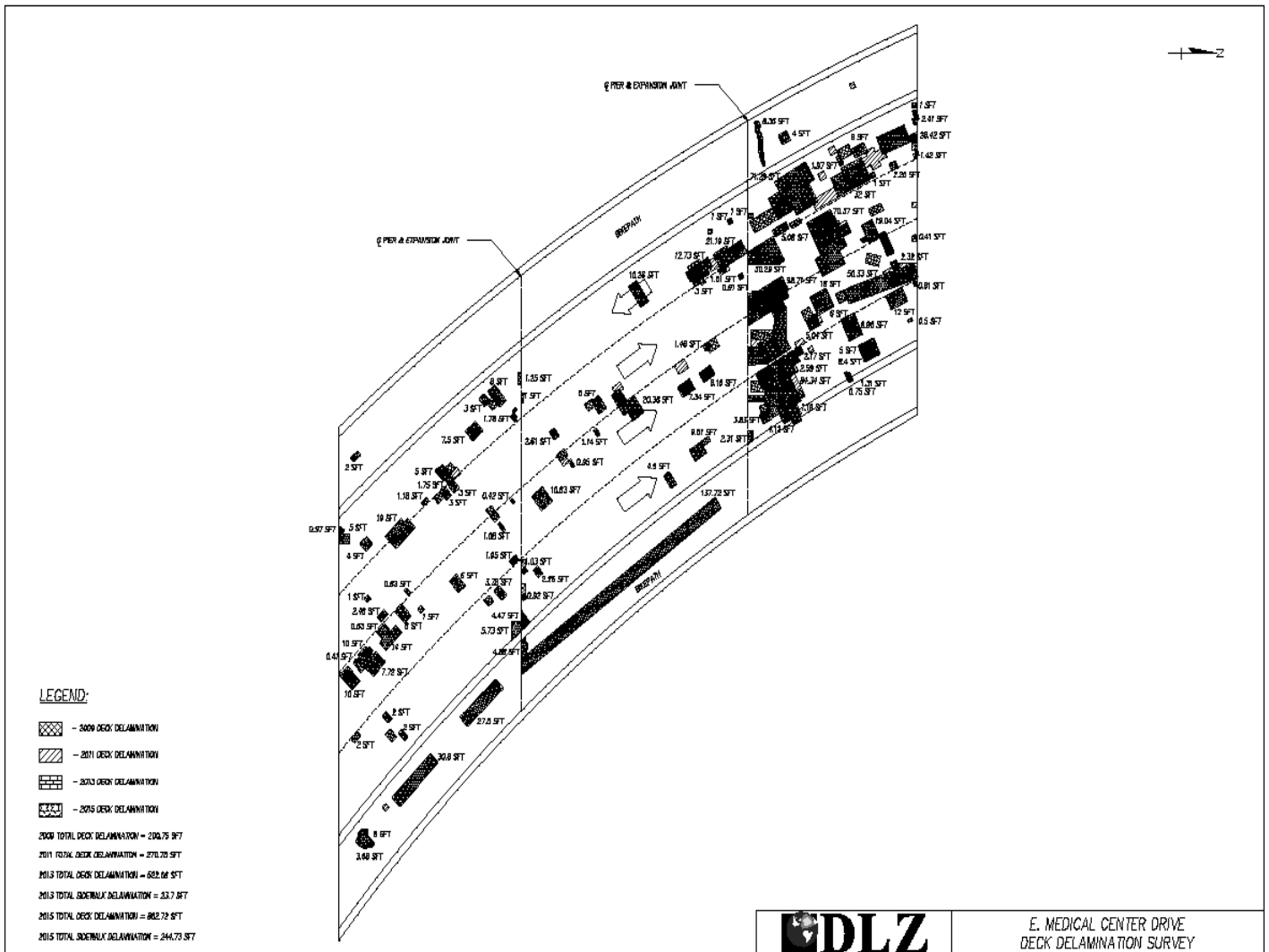


Figure 17 2017 Bridge Deck and Sidewalk Delamination Survey

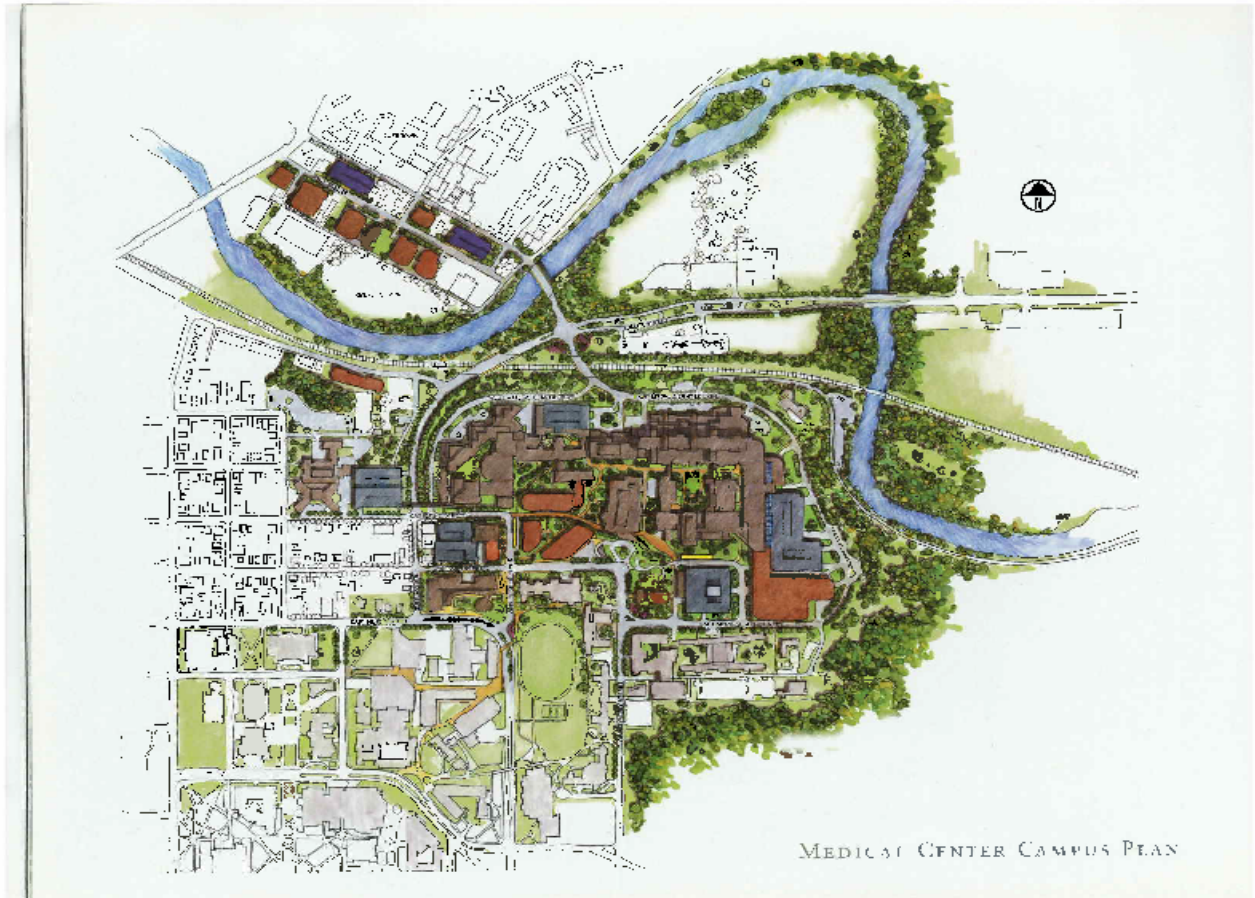
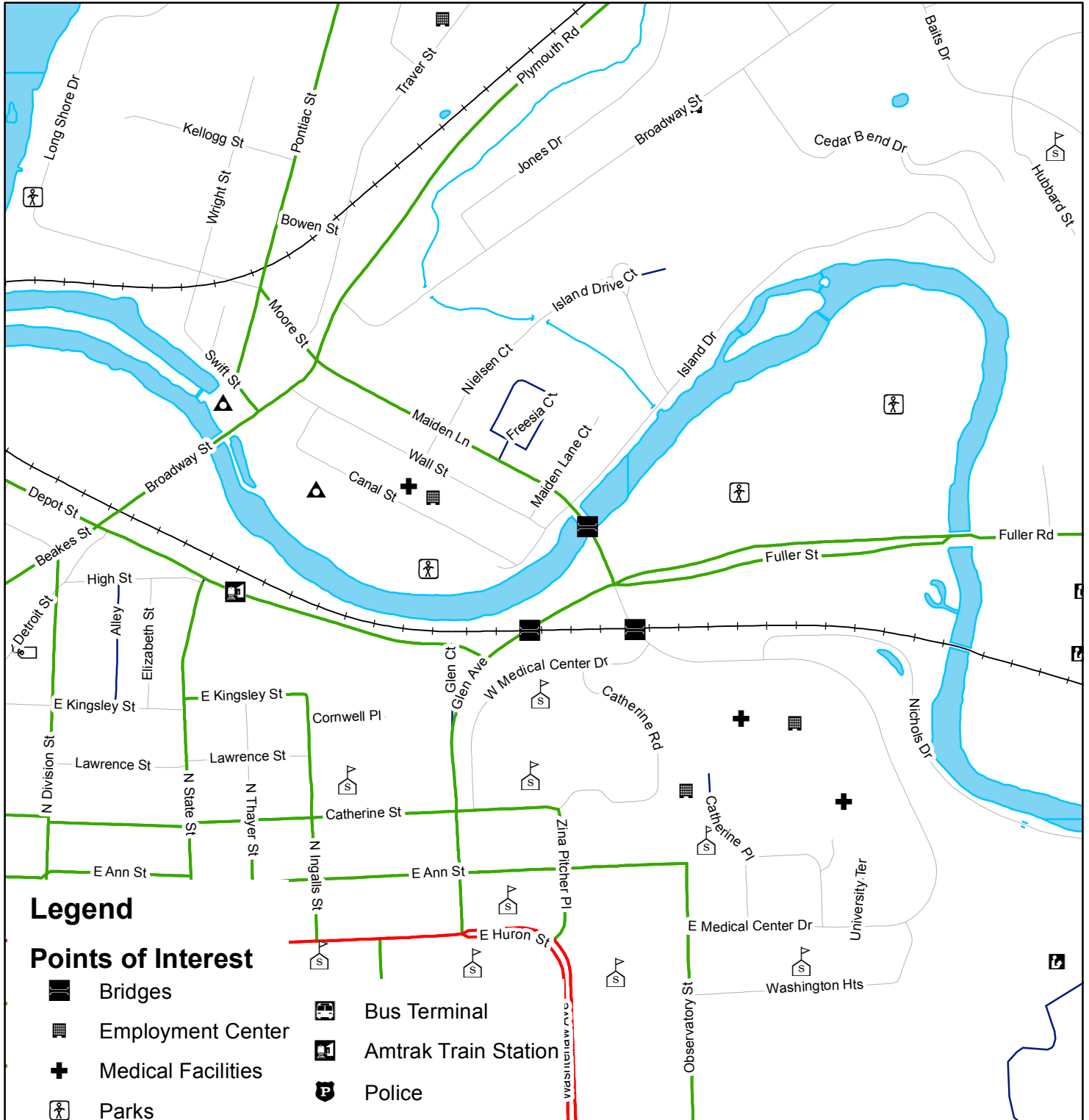


Figure 18 Medical Center Campus Plan
















City of Ann Arbor

Points of Interest and Cultural Features



Legend

Points of Interest

- | | | | | | |
|---|--------------------|---|----------------------|---|-------------------------|
|  | Bridges |  | Bus Terminal |  | U of M Crisler Arena |
|  | Employment Center |  | Amtrak Train Station |  | U of M Football Stadium |
|  | Medical Facilities |  | Police | | |
|  | Parks |  | Post Office | | |
|  | Schools |  | Utilities | | |
|  | Shopping Areas |  | Fire Station | | |
|  | University | | | | |