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United States Department of the Interior
National Park Service

National Register of Historic Places Multiple Property Documentation Form

This form is used for documenting multiple property groups relating to one or several historic contexts. See instructions in How to Complete the Multiple Property Documentation Form (National Register Bulletin 16B). Complete each item by entering the requested information. For additional space, use continuation sheets (Form 10-900-a). Use a typewriter, word processor, or computer to complete all items.

_X_ New Submission ___ Amended Submission

A. Name of Multiple Property Listing

Historic Highway Bridges of Michigan, 1875-1948

B. Associated Historic Contexts

(Name each associated historic context, identifying theme, geographical area, and chronological period for each.)

The Evolution of Michigan's Highway Bridges, 1875-1948
Wayne County: An Exemplary Road Commission, 1906-1948

C. Form Prepared by

name/title Charlene K. Roise and Clayton B. Fraser (Fraserdesign), Historians
organization Hess, Roise and Company date August 1998
street & number 100 North First Street telephone 612-338-1987
city or town Minneapolis state Minnesota zip code 55401

D. Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this documentation form meets the National Register documentation standards and sets forth requirements for the listing of related properties consistent with the National Register criteria. This submission meets the procedural and professional requirements set forth in 36 CFR Part 60 and the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation. (___ See continuation sheet for additional comments.)

Brian D. Conway — Signature and title of certifying official

9/29/99 — Date

State or Federal agency and bureau

I hereby certify that this multiple property documentation form has been approved by the National Register as a basis for evaluating related properties for listing in the National Register.

Edson H. Beall — Signature of the Keeper

11/30/99 — Date

E. Statement of Historic Contexts

The Evolution of Michigan's Roads And Bridges

Introduction

The area that became the state of Michigan was crisscrossed by trails long before the nineteenth century. Some of these paths were adopted by the settlers who swarmed into the region after 1805, when Michigan Territory was established. By the 1820s, the federal government was surveying and improving military roads, designed for long-distance travel, while the territory's new inhabitants were establishing dozens of local roads to serve their nascent communities. A number of nineteenth-century routes are echoed in the alignment of today's highways, such as U.S. 12 (the "Detroit-Chicago Road"), Interstate 94 (the "Territorial Road"), and Interstate 96 (the "Grand River Road").[1]

While little is known of the bridges built during this era, they presumably were as primitive as the rutted trails that carried scores of pioneers to the area and points further west. Travelers were forced to ford small streams or trust simple timber spans. Ferries provided passage over broader waterways.

In the late 1830s, just as Michigan achieved statehood, railroads arrived on the scene. The Erie and Kalamazoo Railroad connected Adrian and Toledo in 1836; by 1849, tracks spanned the state from Detroit to Lake Michigan. The trains' speed and efficiency were far superior to other overland options. In response, ever short of funds to meet the growing demands of its population, the young state abdicated responsibility for its road system. Under Chapters 22 and 27 of the state code, bridges were put under the care of township road commissions. Townships were required to repair or replace a bridge when petitioned by twelve or more property owners. Road commissions could press local property owners into service to build and maintain structures, but were constrained by a mandate limiting their budget to $250. Communities could seek

[1] Frank F. Rogers, "Notes on Some Early Michigan Roads," *Michigan Roads and Pavements* 22 (December 1925): 7, 8; Roger L. Morrison, "The History and Development of Michigan Highways," *University of Michigan Official Publication* 39 (6 April 1938): 1-16.

assistance from the county board if "unreasonably burdened" by the construction. In 1867, townships were granted the authority to issue bonds to fund bridge construction and repair. The sum raised in a given year could not exceed one percent of the township's assessed property value for the proceeding year; total indebtedness could not be greater than three percent of that amount.[2]

To stretch limited funds as far as possible, road commissioners turned to readily available materials. Stone was found in many areas in the state but required skill and energy to utilize. Timber from Michigan's abundant forests produced simple stringer spans which served adequately, albeit temporarily, for many minor crossings. Timber was also used alone, or in combination with iron members, for truss bridges. These combination structures, as well as completely iron structures, were prefabricated by companies that specialized in designing and erecting bridges. The companies boomed in the late nineteenth century when innovative milling technology facilitated the economical production of iron and steel on a large scale, and new ore mines in northern Michigan and Minnesota provided an abundance of raw materials. Steel proved extremely versatile and durable for structural use, and quickly supplanted wrought or cast iron for bridge construction after 1890. Many bridge companies also offered concrete designs when Portland cement became a common commodity in the early twentieth century.

The bridge companies filled an important need as America's frontier galloped westward. They did not, however, always do it in the most efficient or ethical manner. Problems were fostered by the process local governments typically used to procure bridges. Road commissions advertised the letting of a contract for one or more bridges, often providing only the bare minimum of specifications, such as span length and structural type. Since township supervisors were rarely competent to judge the structural merits of proposals, bridge companies sometimes supplied inappropriate or inadequate designs to win the contract as the cheapest bidder. Even when good plans were submitted, unscrupulous contractors insisted on provisions allowing substitution of "like-kind" structural members. According to a 1910 article by John J. Cox, an engineer from

[2] Morrison, "The History and Development," 6-7; *Laws of the State of Michigan, relative to Highways and Bridges, and the Duties of Highway Commissioners and Overseers of Highways* (Lansing: Hosmer and Fitch, 1855), 3-4, 23-24; *Laws of the State of Michigan, relative to Highways and Bridges, and the Duties of Highway Commissioners and Overseers of Highways* (Lansing: W.S. George and Co., 1871), 48-49.

Sturgis who was soon to organize the University of Michigan's engineering department, "what is familiarly known as 'skinning the bridge' is the result. That is, the plans appear attractive to the board and may call for a strong, heavy structure; but the contractor, taking advantage of the substitution clause in the contract and the lack of training of the board, actually builds a much lighter, weaker and consequently cheaper bridge." Remarking on typical bridge-letting practices, Cox concluded that "this loose method of contracting for bridges makes it practically impossible for even honest officials to procure a satisfactory structure, and opens up a way for dishonest officials and contractors to arrange a deal whereby the public comes out second best." Bridge companies also formed pools to fix bids, splitting high profits by eliminating real competition.[3]

Early Years of the State Highway Department

Frustration with corruption, and with the growing inadequacy of the state's roads, led to reform efforts by the turn of the century. The movement was spearheaded by Horatio Earle who, like many other promoters of road improvements, was an ardent bicyclist. Seeking better routes for their sport, cyclists organized "Good Roads" groups that lobbied for the creation of a state agency to oversee Michigan's roads. In 1900, Earle was elected to represent Detroit in the state Senate on a good-roads platform. His reform efforts were slowed by opposition from farmers, who feared both higher taxes and the incipient invasion of the automobile into rural areas. It was not until 1903 that Michigan lawmakers established the state highway department and authorized incentives for road improvements. The attorney general almost immediately declared the legislation unconstitutional, however, because the state's charter prohibited the funding of internal improvements. In the brief time that the law was in force, Governor Bliss appointed Earle state highway commissioner, a position he maintained without pay even after the law was annulled. His tireless crusade to revise the state's constitution paid off in 1905, when a referendum allowed the state to fund road work. The law required the highway commissioner to "furnish outline plans

[3] John J. Cox, "Highway Bridges and Culverts," *Michigan Roads and Forests* 5 (March 1910): 7-8.

and specifications for the improvement of public wagon roads, and, when requested . . . give expert advice of how to best build or improve public roads or bridges."[4]

The new department had an operating budget of $10,000, plus $20,000 for "reward" roads in the first year and $50,000 in the second. "Rewards" were actually subsidies to counties and townships for road construction that met state specifications. The size of the reward ranged from $250 per mile for a basic gravel road to $1,000 for a mile of macadam. Frank Rogers, the first deputy highway commissioner and later the commissioner, noted that initially "it was impossible to induce the people to build enough roads to take the money available." Only a few progressive counties -- Bay, Kalkaska, Manistee and Mason -- created road commissions and adopted state construction standards early on. Also, Alpena and Chippewa counties each committed $100,000 to improve roads.[5]

The department's inaugural biennial report, covering 1905 and 1906, discussed culverts and bridges in great detail. It included a chart outlining the minimum I-beam specifications to carry a ten-ton load for spans of 3.5 to 29.5 feet, and strongly encouraged the use of concrete floors and abutments. Concrete was also enthusiastically recommended by township road commissioners, whose comments were included in a "gabfest" at the end of the report. The commissioners' main complaints focused on property owners who paid road taxes with labor, a problem solved with passage of the Cash Road Tax Law in 1907.[6]

The 1907-1908 biennial report included basic plans for I-beam, riveted Warren pony truss, through plate-girder, and concrete slab spans. All featured concrete floors. The report also included general specifications. These restricted pin-connected trusses to spans 100 feet or more.

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[4] The establishment and early years of the state highway department are discussed in detail in Frank F. Rogers, *History of the Michigan State Highway Department, 1905-1933* (Lansing: n.p., 1933). The "State Reward Road Law" is reprinted in the Michigan State Highway Department's *First Biennial Report*, 1905-1906, 13-19. Subsequent references to these biennial reports will be abbreviated SHDBR, with the appropriate number and years.

[5] Frank F. Rogers, "Twenty Years Work by the State Highway Department," *Michigan Roads and Pavements* (January 1925): 5.

[6] 1 SHDBR (1905-1906).

Riveted Warren pony trusses were preferred for 60 to 100 foot spans; plate girders for 30 to 60 feet; and steel stringers for spans of less than 30 feet.[7]

While the department worked to improve bridge quality, quantity remained a pressing issue as well. In 1908, Deputy Highway Commissioner Frank Rogers reported: "A bridge company that claims to sell more than one-half of the bridges in Michigan sold only $300,000 worth last season." Even if that sum represented only twenty to thirty percent of the bridges built in Michigan in 1907, bridge production clearly fell far short of demand. Faster and heavier loads made older bridges obsolete, while ever-increasing traffic levels required new routes to be opened. In an effort to ensure the longevity of the new bridges that were being built, a 1909 law required bridges to carry at least a ten-ton load and set minimum roadway width at 16 feet.[8]

Improvement of the state's highway system took a major leap forward in 1913, when the legislature authorized designation of a trunk-line network totaling nearly 3,000 miles. Projects to upgrade these roads to state standards were eligible for twice the usual reward reimbursement. The legislation also required the state to design all trunk-line bridges, and to erect and maintain trunk-line bridges spanning 30 feet or more, if the county or local government improved 3 miles of adjacent road. The highway department let contracts and supervised construction for the trunk-line bridge projects. All were in rural areas, since the law prohibited the state from bridge work in towns with over 6,000 inhabitants. In the first year that the system was established, the department invested $75,000 in eighteen bridges. Within four years, the state spent almost $900,000 on trunk-line reward payments, and nearly $400,000 on bridges. By 1918, the state could take credit for 113 new trunk-line bridges.[9]

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[7] 2 SHDBR (1907-1908), 201-207.

[8] Speech by Frank F. Rogers at State Round-Up Farmers' Institute, 25 February 1908, published as "Defects in Michigan Roads and How to Improve Them," *Michigan Roads and Forests* 5 (March 1908): 5.

[9] Rogers, "Twenty Years Work," 5-6; 5 SHDBR (1913-1914), 8-9, 42-46, 113; 7 SHDBR (1917-1918), 1, 72; Frank F. Rogers, "Roads Built with the Fifty Million Dollar Bond Issue," *Michigan Roads and Pavements* 22 (19 February 1925): 3.

Creation of the trunk-line system significantly enlarged the highway department's purview, requiring a substantial increase in staff. Within a few years, it became one of the largest state agencies. During the 1913 reorganization, a bridge department was established with Clement V. Dewart as its director. Dewart was trained as a civil engineer, and had earlier designed bridges for the Pere Marquette Railroad. Under his direction, copies of standard bridge and culvert plans were drafted and made available to township and county road commissions at no charge. Revisions were required after the 1915 legislature raised moving load requirements for new bridges from ten to fifteen tons. Some plans were widened from 16 to 18 feet at the same time. Within a few years, steel shortages precipitated by World War I increased the popularity of concrete through-girder bridges for 30- to 50-foot spans. Also to conserve steel, older truss bridges on trunk-line routes were renovated with new stringers and floors when the structure maintained sufficient strength to justify the effort.[10]

To lower construction costs and control quality, the state began to purchase standard materials in quantity. In 1914, for example, the department let a contract for all the plain rolled I-beams needed for state bridge construction in that season, saving an estimated fifty percent over the typical cost of buying on a bridge-by-bridge basis. The popularity of concrete construction led the department to purchase cement in volume and supply it to contractors for state road and bridge projects beginning in 1922. To further control prices, the state leased the Michigan Portland Cement Company in Chelsea late in 1923 and operated it with prison labor.[11]

Also during this period, the state began pushing to eliminate busy railroad-highway crossings, which had become a significant source of traffic accidents. Often, roads could be rerouted to avoid tracks. When it was necessary to erect a bridge to separate grades, the state could pay up to twenty-five percent of the cost. Typically, the department designed grade separations where the highway passed over the railroad tracks; when the roadway went below, the railroad produced the bridge plans. The first crossings to be considered under this law were in Washtenaw County,

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[10] 5 SHDBR (1913-1914), 9; 6 SHDBR (1915-1916), 14, 126; 7 SHDBR (1917-1918), 32-33; 10 SHDBR (1923-1924), 31; "Michigan State Highway Department in New Quarters," *Good Roads* 13 (3 March 1917): 148; Rogers, "Roads Built," 3.

[11] 5 SHDBR (1913-1914), 9; 10 SHDBR (1923-1924), 31.

where the Michigan Central Railroad intersected the Ann Arbor-Whitmore Lake Road, and in Houghton County, where the Mineral Range Railroad traversed a county road. During the next eight years, 146 grade crossings were eliminated on trunk highways, nearly all by route realignment. Only five bridges over rail lines and four underpasses were built. The problem was particularly acute in densely populated areas, where heavy development made realignment impossible. In Wayne County, for example, the county road commission took on its first grade separation project in 1922, and had completed forty-nine by 1931.[12]

The Covert Act, passed by the 1915 legislature, required that the state, upon request of the appropriate locality, build all trunk-line roads as well as inter-county non-system roads. Adjacent land owners were assessed for half the cost; road commissions could issue bonds for the remainder. While this act ultimately played a significant part in improving road quality in the state, legalities tangled bond sales to fund the program until 1917. By that time, the federal government had enacted the Federal Aid Road Act of 1916 to subsidize state road construction on designated federal routes. Five years later, Congress began to shape federal-aid routes into a national highway system. Michigan Senator Charles E. Townsend was encouraged by Roy Chapin and other leaders of the state's burgeoning automobile industry to author the Federal Highway Act of 1921. He was also supported by State Highway Commissioner Rogers, Wayne County Road Commissioner Edward N. Hines, and other good roads activists from around the country.[13]

Soon after the initial federal-aid bill passed, Michigan authorized $225,000 a year to match the federal contribution. The stakes increased significantly in 1919, when a public referendum approved a $50 million bond issue for highway construction. About 4,000 miles of trunk-line roads were improved before the proceeds were depleted in 1924. This funding also helped the department meet its obligations under the Aldrich Bill, passed during the 1919 legislative session,

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[12] 6 SHDBR (1915-1916), 14, 17; 13 SHDBR (1929-1930), 55-56; "Many Dangerous R.R. Crossings Eliminated by Highway Dept.," *Michigan Roads and Pavements* 21 (10 April 1924): 3; H.A. Shuptrine, "Grade Separations," *The Michigan Engineer* 40 (March 1931): 16.

[13] "Mr. Rogers Suggests Changes in Townsend Bill," *Michigan Roads and Forests* 16 (December 1919): 8; Willis F. Dunbar and George S. May, *Michigan: A History of the Wolverine State* (Grand Rapids, MI: William B. Eerdmans Publishing Company, 1965, rev. ed. 1980), 496, 572.

which gave the state the responsibility of building and maintaining all trunk-line bridges. The state was also authorized to pay half the cost of bridges spanning 30 feet or more on state reward roads, if the cooperating county, good road district, or township built at least 3 miles of adjacent road. The department immediately began hiring workers to carry out this substantial mandate, more than doubling staff size within a year. Investment in bridges rose at an even faster rate, with expenditures in 1919 totaling over $800,000 -- almost as much as had been spent in the years from 1913 through 1918 combined. The work included erection of forty-nine trunk-line bridges, repair of twenty-seven older bridges, and planning for thirty-four bridges for the following construction season.[14]

With an eye to its ever increasing workload, the department took steps to ensure that a steady supply of engineers would be available. In the mid-1910s, the University of Michigan had begun to develop an engineering curriculum, directed by John J. Cox. The university and the highway department hosted a "Short Course in Highway Engineering" in Ann Arbor in February 1915; this subsequently became an annual conference. Published proceedings from the first meeting included two papers on highway bridges, one by highway department bridge engineer C.V. Dewart and the other by O.L. Grover, chief bridge engineer of the U.S. Office of Public Roads. Most of the following conferences also included one or more speakers on bridge-related subjects. Professor Cox left for the private sector in 1919, and the university recruited Arthur H. Blanchard from Columbia University to create a graduate program. He was joined on the faculty by John Bateman, a University of Michigan graduate who had gained four years of engineering experience with the Michigan State Highway Department. Rather than setting up an independent facility, the highway department leased the university's testing laboratory, which was operated under Bateman's direction. The department also began using student interns for summer field work from both the University of Michigan and Michigan State College, which also had an active engineering program.[15]

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[14] Frank F. Rogers, "Work of State Highway Department in 1919," *Michigan Roads and Forests* 16 (December 1919): 8; Rogers, "Twenty Years Work," 6; Willis F. Dunbar, *Michigan Through the Centuries*, vol. 2 (New York: Lewis Historical Publishing Company, 1955), 567-568.

[15] *Proceedings of the Short Course in Highway Engineering* (Ann Arbor, MI: University of Michigan, 1915); "Road Building Course at the University of Michigan," *Good Roads* 56/18 (3 September 1919): 125; "Graduate Courses in Highway Engineering at the University of Michigan," *Good Roads* 56/18 (8 October 1919): 176; 8 SHDBR (1919-1920),

The highway department struggled to keep pace as the demand for new bridges mushroomed. In 1922, C. A. Melick, who had taken over as the department's chief bridge engineer, complained that "the arteries of design become clogged quite easily because of the fact that with a small working force of some eight or nine men, just one special structure such as a movable bridge or a particularly complicated grade separation will tie up about half of the force for a whole season."[16]

Oversight of bridge construction was also time-consuming. By 1924, in an effort to make the process more efficient, the department formed a special in-house construction group that built five or six bridges a year. The state was following the lead of a number of counties, such as Wayne, which had long maintained construction crews. To support this new venture, the department acquired an array of equipment, including mixers, concrete buggies, hoists, and a pile driver. In the winter, with a portable war-surplus sawmill, workers cut lumber for bridge floors and concrete forms.[17]

Legislation passed during the 1925 session required all new bridges in the state meet the highway department's specifications. Perhaps in response, the department updated its bridge specifications in 1926. By this time, the department acknowledged that traffic levels would continue to increase -- the state's registered motor vehicles doubled between 1922 and 1927 -- and engineers began to design bridges accordingly. The new standard roadway width for bridges on trunk-line and federal-aid routes was increased from 24 to 30 feet. To accommodate later expansion to 40 feet, substructures were routinely built wider than initially required. The concrete through-girder bridge fell from favor, since this design became cumbersome in widths greater than 24 feet. In addition, it was almost impossible to widen existing structures. Steel trusses could be widened, but not easily, so the department adopted deck stringer and plate girder spans as standard, issuing plans for 30- to 75-foot spans with concrete floors and railings. Advances in manufacturing during this period also influenced the transition. Steel mills developed techniques to produce

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12, 28.

[16] Paper by C.A. Melick given at 1922 Highway Engineering Conference, published as "Standard Bridge Practice of the Michigan State Highway Department," *Michigan Roads and Pavements* 20 (29 March 1923): 9.

[17] 10 SHDBR (1923-1924), 29.

girders with deeper webs, which permitted rolled beams to span up to 60 feet. Previously, designers had to settle for built-up sections for spans greater than 45 feet. The highway department did not completely abandon concrete, however, as it began experimenting with cantilevered deck arch designs. The department's efforts earned it a favorable review in 1928 from the U.S. Bureau of Public Roads, which noted that Michigan's federal-aid bridges "are suitable for and properly fitted to their locations. The designs are adequate as to strength and liberal as to width of roadway. . . . Due attention has been paid to esthetic features."[18]

Tourism's Influence on Roads And Bridges

Aesthetics was a particularly important issue in promoting tourism. Michigan's varied and dramatic landscape has long attracted visitors. The economic impact of tourists was evident to the state's energetic entrepreneurs from the outset. In the nineteenth century, boats and trains gave relatively easy access to some remote areas. It was not until the advent of the automobile age, though, that the true scale of tourism began to be realized. J. Carl McMonagle, a planning and traffic engineer for Michigan's highway department, wrote in 1948 that "the motor car and the highway have transformed the character of recreation and have given a tremendous impetus to the tourist business. Reciprocally, the tourist business has had a strong influence in shaping important aspects of highway development in this state."[19]

In the late 1910s and early 1920s, as car ownership burgeoned, organizations formed to promote the state's attractions. The Michigan Tourist and Resort Association, with headquarters in Grand Rapids, focused on western and northern Michigan. It was joined by the Flint-based East Michigan Travel and Resort Association, which promoted eastern and northeastern sites accessible from the Dixie Highway and the East Michigan Pike. Other good-roads groups, like

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[18] Dunbar, *Michigan Through the Centuries*, vol. 2, 369; 13 SHDBR (1929-1930), 52-53; 15 SHDBR 1933-1934, 13; 16 SHDBR (1935-1936), 58; "Bridge Construction in Michigan during 1925," *Michigan Roads and Pavements* (December 1925): 22; "Bridge over Cheboyganing Creek on River Road," *Michigan Roads and Pavements* 24 (20 October 1927): 5; "Michigan Bridges Commended by U.S. Bureau of Public Roads," *Michigan Roads and Pavements* 25 (28 June 1928): 6.

[19] J. Carl McMonagle, "Effects of the Tourist Business on the Michigan Highway System," *Michigan Roads and Construction* 45 (1 April 1948): 24.

the Detroit Automobile Club, also encouraged tourist travel. By 1925, a representative of the East Michigan group claimed that tourism was the third-largest industry in the state, surpassed only by manufacturing and agriculture. In the Upper Peninsula, tourism increased from a handful of visitors in the mid-1910s to nearly 150,000 in the summer of 1924. In that same year, the Michigan Tourist and Resort Association reported a fifty-percent jump in activity, despite bad weather. In 1925, to further advance the area, the group dedicated $100,000 to advertising. The industry's inherent boosterism must be viewed with some skepticism. A report on the annual meeting of the American Automobile Association in 1927, for example, asserted that "delegates brought news of the greatest flow and counter-flow of humanity the world has ever known." Regardless of the reliability of some of the industry's claims, however, tourism was clearly a significant factor in the state's economy, and had a major influence on highway department planning.[20]

The West Michigan Pike (originally M-11, later US-21), which followed Lake Michigan north, enticed "the millions who swelter in Chicago's heat in the summer time and are [also] looking for winter sports." The East Michigan Pike, another scenic route leading to the Straits of Mackinaw, drew travelers from Detroit and points beyond. M-14 (US-27), on a north-south alignment through Lansing, traversed the middle of the state to reach Mackinaw City. By the mid-1930s, one of the highway department's highest priorities was improving these three routes to encourage greater tourism. For the shoreline roads, designers aimed to have the Great Lakes within view at least half of the time. [21]

Intrastate routes which were developed, at least in part, with the tourist in mind include the Cloverland Trail (now US-2 and US-41) across the Upper Peninsula, most of which had been at

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[20] "Promoting Tourist Travel," *Michigan Roads and Forests* 16 (May 1920): 2-3; "'No Mean Business' Flint Men Told of Tourist Trade," *Michigan Roads and Pavements* 22 (5 February 1925): 3; "Forty Million Tourists to Spend Three and One-third Billions [in] 1927," *Michigan Roads and Pavements* 24 (31 March 1927): 4; E. D. Tucker, "Good Roads have Opened the Way to Upper Peninsula's Splendid Attractions," *Michigan Roads and Pavements* 22 (January 1925): 70; "Sees Michigan on Verge of Boom because of its Roads," *Michigan Roads and Pavements* 21 (9 October 1924): 3.

[21] Article from *Traverse City Record Eagle*, 15 December 1939, reprinted with the title "Asks Public Support for State Highways" in *Michigan Roads and Construction* 36 (21 December 1939): 2; Van Wagoner, "The Michigan Highway Program," 10; 16 SHDBR (1935-1936), 15.

least somewhat improved by the late 1910s. The same was true for the "Wolverine Paved Way," which essentially followed the nineteenth-century Grand River Road from Detroit to Grand Rapids. Not wanting to be left out of the boom, commercial interests from Muskegon to Saginaw created the Rainbow Trail Association in the late 1920s to promote a direct east-west route between the two cities. While these and other routes played an important role for ordinary commercial traffic, one of their primary legacies was to stimulate tourism throughout the state.[22]

Many of these roads connected with cross-country routes. One of the earliest was the Dixie Highway, which appropriated the East and West Michigan pikes as a scenic loop. The Theodore Roosevelt Highway linked St. Ignace to Duluth, Minnesota, and, ultimately, Portland, Oregon. The Taft Memorial Highway, created in the 1930s, stretched from Fort Meyers, Florida, to Sault Ste. Marie. Michigan's highway department continually upgraded the roads and bridges along these important visitor routes. It issued state maps annually, and sometimes even more often during the summer to provide up-to-date information on road conditions. One of the department's major innovations in the early 1930s was the accordion-fold map, which was easier to use within the confines of an automobile. In addition, the department opened the country's first tourist information station on US-12 near New Buffalo, the state's southwestern entry point, in the 1930s. The experiment proved so successful that plans were immediately drafted to open new stations at Menominee, Monroe, and Sault Ste. Marie by the following summer. The department also focused on roadside beautification, planting trees and creating picnic areas.[23]

As the twentieth century progressed, intrusions from lumbering, mining, and other developments began to threaten the natural beauty that lured visitors to the state. Ironically, the increase in tourism significantly depleted fish and wildlife and damaged sensitive natural areas. By the 1920s,

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[22] D.A. Thomas, "Michigan's Trunk Line System," *Good Roads* 51/13 (16 June 1917): 350-351; D.A. Thomas, "Large Mileage to be Added this Year to Michigan's Improved Roads," *Good Roads* 51/13 (31 March 1917): 199-200; "Wolverine Paved Way Across State," *Michigan Roads and Forests* 16 (July 1920): 9-10; "'Rainbow Trail Association' to Boost Muskegon-Saginaw Highway," *Michigan Roads and Pavements* 25 (28 June 1928).

[23] "Handicap to Touring in Upper Peninsula," *Michigan Roads and Forests* 17 (June 1921): 8; "Pave M-14 to the Straits," *Michigan Roads and Pavements* (January 1925): 11; "New Highway Booms Resort Area in Berrien County," *Michigan Roads and Pavements* 25 (26 April 1928): 10; Van Wagoner, "The Michigan Highway Program," 10; 16 SHDBR (1935-1936), 15.

conservation efforts were advancing. Governor Fred Green joined the cause in 1927 by declaring that "a live deer, as far as advertising is concerned, is worth a truck load of dead bucks."[24]

State parks were established to protect attractive areas and make them accessible to state residents and tourists. By the early 1930s, the state system included seventy-one parks, of which fifty-four were improved for public use. Access became a priority with the aid of state legislation passed in 1929, which authorized the state highway department to create trunk highways to and through state parks. Connections to Bay City, Hartwick Pines, Walter J. Hayes, Interlochen and Orchard Beach parks were among the first to be improved. In the Upper Peninsula, routes were upgraded from Silver City to the Porcupine Mountains and from Manistique to Big Spring. The parks proved extremely popular. In 1931, for example, the state system boasted ten million visitors, "a figure almost three times greater than the number that visited or utilized all the National Parks in the entire country during that period."[25]

Prior to World War II, tourism was estimated to gross about $400 million. That sum jumped to over $500 million after the war, when the state's income from tourism was reportedly second only to the automotive industry. Tourists logged 1.5 billion miles in Michigan in 1946, accounting for one-tenth of the state's highway traffic in that year. Despite the highway department's industrious efforts to meet the demand, a survey of vacationers conducted by the Michigan Tourist Council found road deficiencies the third-highest source of complaints: "They even received more brickbats than the disappointing fishing conditions."[26]

Bridges of The Depression

While tourism was somewhat constrained by the economic downturn of the 1930s, many local governments were hit extremely hard by the Depression. Faced with rapidly declining revenues,

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[24] "Governor says Tourist Industry is One of State's Greatest," *Michigan Roads and Pavements* 24 (24 November 1927): 10.

[25] 14 SHDBR (1931-1932); McMonagle, "Effects of the Tourist Business," 24.

[26] McMonagle, "Effects of the Tourist Business," 25; Walter O. Dow, "Effect of the Tourist Business on the County Road System," *Michigan Roads and Construction* 45 (1 April 1948): 28.

townships and counties defaulted on bonds issued for road improvements. The inefficiencies of road construction by 1,269 townships and the overlap of township and county road authorities could no longer be justified. Consolidation was forced by the McNitt-Smith-Holbeck Act of 1931, which merged all township roads into county systems over a five-year period. Counties received state funding from gasoline and vehicle weight tax revenue. Allocations were based on each county's existing mileage. In the same year, the Dykstra Act permitted the state to pay the full cost of urban trunk-line construction in cities under 20,000, and up to fifty percent for cities with over 50,000 inhabitants. The Horton Act, passed the next year, again modified the allocations, giving counties all income from the weight tax plus over $6.5 million a year from gas taxes. With some modification, this law ruled the state's highway funding for about two decades.[27]

Michigan became involved with road-related relief programs in the early 1930s. The state implemented a special program in the fall of 1931 that poured $12 million into highway construction projects, including about $2.25 million for bridges. Although scattered throughout the state, the largest projects and the greatest number of projects were in urban areas, where the concentration of unemployment was the highest. Up to 24,000 men were on the payroll at one time.[28]

In the following year, the federal government began providing direct grants for relief-related highway work. The Federal Emergency Relief and Construction Act gave the state $3.8 million; another $12.7 million came from the National Industrial Recovery Act in June 1933. The success of these programs paved the way for passage of the Hayden-Cartwright Act in June 1934, which Michigan's highway department heralded as "the most outstanding piece of highway legislation since the Federal Aid Act of 1916." The act allowed, for the first time, the use of federal dollars for highway improvements in municipalities, and also permitted funding of highway planning surveys. Federal funds provided $26 million of the $30 million expended on highway projects

[27] Dunbar, *Michigan Through the Centuries*, vol. 2, 569-570.

[28] 14 SHDBR (1931-1932), 49-50.

between 1934 and 1936. The Hayden-Cartwright Act of 1936 initiated federal funding for secondary roads. Michigan's first allocation was $1.56 million for 1938-1939.[29]

The highest priority of federal relief efforts was employment. As a result, most funding was dedicated to labor, rather than materials. Road work, which became particularly labor intensive when the use of heavy equipment was discouraged, claimed the highest number of projects during the eight-year existence of the W.P.A., a major federal work-relief program. Between 1935 and 1943, the W.P.A. built or maintained over 570,000 miles of rural roads, erected 78,000 new bridges and viaducts, and improved an additional 46,000 bridges throughout the United States. A contemporary report explained that "many of the bridges were small, replacing structures that were dilapidated or inadequate, or taking the place of fords; and many were two-lane bridges built to replace one-lane bridges."[30]

While W.P.A. bridges were sometimes carefully crafted and picturesque, the economic constraints of the Depression often forced Michigan's highway department to adopt utilitarian designs with minimal ornamentation. Bridge construction was concentrated, as much as possible, in winter months, when other road work was curtailed. Bridge design, construction, and maintenance responsibilities, which had been scattered among district offices, were centralized in Lansing in 1934. At the same time, the department adopted new bridge specifications, the first major modification since 1926. Revisions were issued in 1936, 1942, and 1950.[31]

By the late 1930s, Michigan's economy was showing significant signs of recovery. Changes in federal relief program guidelines and, ironically, labor shortages, decreased the number of projects that were undertaken. Also, counties became disenchanted with the abilities of W.P.A. work crews. Concurrently, the amount of federal relief funding dropped dramatically: in 1938,

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[29] 15 SHDBR (1933-1934), 9-12; 16 SHDBR (1935-1936), 17; Dunbar, *Michigan Through the Centuries*, vol. 2 , 570; 17 SHDBR (1937-1938).

[30] U.S. Federal Works Agency, *Final Report on the W.P.A. Program, 1935-43* (Washington, D.C.: Government Printing Office, 1943), 53.

[31] 15 SHDBR (1933-1934), 13, 59-60; 16 SHDBR (1935-1936), 57-58; "New Standard Specifications for State Road Work Out April 15," *Michigan Roads and Construction* 47 (13 April 1950): 2.

emergency grants were reduced by ninety-seven percent. The state was once again forced to bear more of the burden of highway maintenance and improvement.[32]

One of Michigan's last efforts to secure W.P.A. funding occurred in 1941, when the department sought $3 million to improve sections of the state's highway network "to minimum War Department standards." With war lurking on the horizon, attention quickly shifted from soup kitchens to armaments, ushering in a new era of highway construction in Michigan. [33]

Bombers Away: The Influence of World War II on Highway Development

The First World War prompted some improvements to Michigan's roads and bridges, but this paled in comparison to the activity stimulated by the onset of World War II. Speaking at a convention of the American Road Builders Association in New York City in January 1941, Michigan Governor Murray Van Wagoner remarked that "in an era of national defense, the country must be considered as a factory of which the streets and highways are the moving belts of the assembly lines." He observed, however, that "the roadways are both badly overcrowded and highly inefficient. . . . The channels over which defense dollars must flow must be dredged immediately by elevated structures, limited ways, and the blocking off of all important streets to speed production." As the department's 1941-1942 biennial report noted, "From Pearl Harbor on, the full energies of the Department were thrown into the war effort." This effort was challenged, however, by shortages of materials, decreases in gas tax and other revenues, and loss of personnel to military service.[34]

As head of Michigan's highway department in 1940, Van Wagoner had overseen the designation of a 2,400-mile strategic road network, to which about forty percent of the state's highway construction funds were immediately dedicated. Michigan's importance to the war effort was

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[32] 17 SHDBR (1937-1938), 23, 27.

[33] "$3,000,000 State Highway-WPA Program Sought," *Michigan Roads and Construction* 38 (17 April 1941): 3.

[34] "Michigan Represented in ARBA Convention Program," *Michigan Roads and Construction* 39 (30 January 1941): 2; 19 SHDBR (1941-1942), 3.

highlighted in September 1940, when the state was awarded the county's first military road project under the new national defense program. This project, which improved access to Fort Custer, was quickly dwarfed by other war-related road construction, particularly the Willow Run Expressway and the Detroit Industrial Expressway. [35]

These expressways were developed to serve a new aircraft manufacturing plant near Ypsilanti. Designed to produce the massive B-24 bombers, the $47 million Willow Run complex included "its own airport, hangars, assembly building nearly a mile long, machine shop, power plant and offices." When the Ford Motor Company unveiled plans for the facility in February 1941, Michigan's highway department was confronted with a significant problem: "Here was the world's largest plant under one roof located more than 20 miles from its main source of labor." The Willow Run work force was projected to reach 100,000, mostly to be drawn from Detroit. Employee transportation was not the only logistical quandary confronting planners. A highway department survey in 1941 found that thirteen percent of Michigan's factories received all production materials by truck; over half relied on trucks to ship their finished product.[36]

Almost three-quarters of the highway department's engineering staff focused on the problems of circulation around the plant and associated access roads, a road system christened the Willow Run Expressway. As many staff left for military service, the department increasingly relied upon consulting engineers and the Wayne County Road Commission. Wayne County had gained experience with this new type of road in 1941-1942, when it developed the state's first limited-access, high-speed freeway, the Davison Expressway in Highland Park. In addition, the railroads assisted with developing track-highway grade separations. Together, these engineers responded quickly and creatively, designing a highway that reflected the unusual needs of the factory, such as the massive traffic movement at shift changes. Among the most innovative features of the expressway were two three-level, steel-girder grade separations. The only other structure of this

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[35] "Progress in All Fields Reported by Highway Department," *Michigan Roads and Construction* 38 (2 January 1941): 2; "Fort Custer Highway to be First U.S. Military Road," *Michigan Roads and Construction* 37 (19 September 1940): 3; 19 SHDBR (1941-1942), 80.

[36] George A. Harding, "World's Largest Bomber Plant under Construction by Ford Motor Company," *Michigan Engineer* 60 (Summer 1941): 8; 19 SHDBR (1941-1942), 59, 82.

type in the country was under construction at the same time on a highway serving the Pentagon in Washington, D.C.[37]

In addition, the highway included seven three-span, continuous-concrete T-beam structures, and an underpass for the Michigan Central Railroad consisting of two timber stringer and two steel girder spans. The bridges were designed with an eye to both speed of construction and economy of critical materials. Engineers were also concerned about the appearance of the bridges and especially the railings, the feature most visible to the motoring public. Concrete was used whenever possible to conserve precious steel. Lester Millard, Michigan highway department bridge engineer, observed that "this group of bridges represents one of the most complex problems in design and detailing ever completed by the Bridge Division."[38]

Working closely with the road commissions in Wayne and Washtenaw counties, and with the federal Public Roads Administration, the highway department began awarding contracts for the roadway improvements in October 1941. Construction started immediately, even though the regular season for concrete work had ended two weeks earlier. Contractors improvised and innovated to keep the ground and materials from freezing. Later that winter, contracts were awarded for the remainder of the project, including construction of the final six grade separations. The speed with which one of the Willow Run tri-level grade separations was erected illustrates the urgency of the defense build-up: construction began the day after the contract was let on 11 February 1942, and the structure was completed by 1 August of that year.[39]

The Detroit Industrial Expressway linked the urban labor market with the bomber plant. The unique traffic problems of the Detroit metropolitan area had long challenged transportation

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[37] 19 SHDBR (1941-1942), 52, 82; Lester W. Millard, "Design Features of Willow Run Structures," *Michigan Roads and Construction* 39 (15 October 1942): 8, 10.

[38] 19 SHDBR (1941-1942), 52, 82; Millard, "Design Features," 8, 10.

[39] 19 SHDBR (1941-1942), 82; G. Donald Kennedy, "The Access Highway System at Willow Run," *Michigan Roads and Construction* 39 (15 October 1942): 3-4; Speech by G. Donald Kennedy at dedication Willow Run access roads, 12 September 1942, carbon of typed copy in Box 1, G. Donald Kennedy Collection, Bentley Historical Library, University of Michigan, Ann Arbor.

planners. By the late 1930s, it was clear that increasing traffic levels could not be adequately handled by widening surface streets, so Michigan's highway department began planning the Detroit Industrial Expressway. Construction was accelerated by the war. By mid-1942, most of the route had been surveyed, and contracts for 5.7 miles of road work and four grade separations had been awarded. Ultimately, this section required twelve highway grade separations, six highway-railroad separations, and two river crossings. Together, the Willow Run and Detroit Industrial Expressways included two river crossings, 43 road grade separations, and eleven highway-railroad grade separations.[40]

Although construction was rushed, the designers had long-term plans for the expressway, which was to connect with the proposed cross-town expressway in Detroit and, ultimately, with the Detroit-to-Chicago expressway. The highway was also tied to a beltway that provided a bypass south of Ypsilanti for travelers to Ann Arbor on US-12. In 1942, even as the fast-track design and construction for the Willow Run route was underway, State Highway Commissioner G. Donald Kennedy sought advice regarding the design from New York planner Robert Moses, who was particularly famous for work on parkways and other limited-access highways. Moses suggested that bridges be built 4 feet wider than specified in existing plans to accommodate future development of a third traffic lane. Although the Detroit Industrial Expressway was primarily on grade level, Moses recommended that the road be depressed when it was extended east through Detroit. He argued that this design would have a less detrimental effect on surrounding properties than other alternatives. The commission had considered single- and two-tier roadways, but ultimately elected a depressed design.[41]

The road was opened from Hannan to Southfield Roads in July 1943, and to Greenfield Road in November 1944. Ribbon-cutting ceremonies for the completed expressway, which stretched about 21 miles from the Willow Run Expressway to the intersection of Michigan and Wyoming Avenues at the boundary between Dearborn and Detroit, were held 9 March 1945. Charles

[40] 19 SHDBR (1941-1942), 84; 21 SHDBR (1945-1946), 57.

[41] Robert Moses to G. Donald Kennedy, typed report, 4 April 1942, Box 3, Sidney D. Waldon Papers, Burton Historical Collection, Detroit Public Library; Leroy C. Smith, "Wayne County Road Commission Activities, Plans," *Michigan Roads and Construction* (15 March 1945): 8.

Ziegler, who had become head of the state highway department in 1943, pronounced it "one of the finest highways in the nation -- certainly Michigan's greatest contribution to highway construction." G. Donald Kennedy, who had become vice president of the Automotive Safety Foundation, observed that "today . . . Detroit's highway past meets Detroit's highway future." He accurately predicted that "once the people of Detroit drive over this new expressway, and industrial freight rolls over it on trucks, the demand for more of these roads will be irresistible."[42]

While not on as large a scale, highways were also improved around a number of other important industrial facilities, including the Eaton Manufacturing Company in Battle Creek; the Dashel Carter Factory in Benton Harbor; the Hudson Naval Arsenal and Chrysler Tank Plant in Macomb County, immediately north of Detroit; the Dodge truck factory in Detroit; the Grand Blanc Tank factory and the Palace Coach Company near Flint; the Extruded Metals Corporation in Grand Rapids; Continental Motors in Muskegon; the Yellow Truck and Coach Company in Pontiac; and, in Saginaw, the General Motors plant.[43]

Throughout the war, most construction materials were used to manufacture armaments and other products for the battlefront. This provided a challenge for the design skills of Michigan's bridge engineers. Steel was particularly scarce, a problem that affected not only beam and girder bridges but reinforced concrete as well. Continuous concrete T-beam superstructures substituted for the more standard steel on larger bridges. H-piles used in semi-rigid frame structures were sometimes replaced by concrete-filled tubes. Timber, usually reserved for small-span bridges on lightly traveled routes, was called into service for more substantial structures. The substitutions were not always the best long-term solution: many bridges dating from the World War II era, including

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[42] "Highways to War Plants Feature 1942 Program," *Michigan Roads and Construction* 39 (31 December 1942): 6; "Colorful Ceremonies Mark Expressway Opening," *Michigan Roads and Construction* 42 (15 March 1945): 3; "Michigan's Greatest Road System Cost $26,000,000," *Michigan Roads and Construction* (15 March 1945): 4; Kennedy speech at opening of Detroit Industrial Expressway, 9 March 1945.

[43] "Highways to War Plants," 6; Michigan State Highway Department, "Military Access Roads in Michigan: Notes and Data Concerning Immediate and Tentative Future Needs," June 1941, in Box 3, G. Donald Kennedy Collection, Bentley Historical Library, University of Michigan, Ann Arbor; G. Donald Kennedy, "Military Highways of Michigan," *Proceedings of the 27th Annual Highway Conference, February 19 - 21, 1941* (Ann Arbor: University of Michigan, [1941]): 49.

a large number on the Willow Run and Detroit Industrial Expressways, have been rebuilt or replaced.[44]

Peace, Prosperity, and Speed: Michigan's Innovative Expressways

Long before victory was in sight, planning began for post-World War II highway development. The need to employ decommissioned military personnel raised some of the same problems that the nation had faced during the Depression. At the annual Michigan Highway Conference in 1942, Charles Upham, head of the American Road Builders' Association, noted that "in the last depression the collapse occurred in the group of durable goods producers . . . which is in reality the construction industry. If this group can be kept in full production, unemployment would be held to a minimum and there will be an economic balance." Instead of looking to the "make work" emergency programs of the 1930s, planners sought to improve the country's infrastructure to catalyze the growth of private industry.[45]

Michigan engineers received ideas regarding the new generation of highways from a number of sources. Murray Van Wagoner, Michigan's highway commissioner from 1933 to 1940 and governor from 1941 to 1942, toured the German Autobahn while attending the International Road Congress in The Hague in 1938. Upon his return, Van Wagoner observed that "Germany has the roads while we have the traffic. It seems to me that if Germany can build roads of this type, the United States, home of the world's automobile industry, can do the same." In the same year, he led a delegation from the state to New York City "to study the metropolitan method of grade separation to speed through traffic across congested areas." Michigan engineers were undoubtedly familiar with Long Island's Meadowbrook Causeway, the world's first limited-access, high-speed parkway, which had opened just a few months ahead of the Autobahn in 1934.[46] Meadowbrook was among the many innovative developments undertaken during the reign of Robert Moses. In addition to New York, Van Wagoner visited the construction underway on the

[44] 19 SHDBR (1941-1942), 53-54; "Highways to War Plants," 6.

[45] "Post-War Plans Discussed at Highway Conference," *Michigan Roads and Construction* 39 (19 February 1942): 2.

[46] Parkways, unlike other limited-access roads, do not allow commercial traffic.

Pennsylvania Turnpike, the nation's first long distance, limited-access highway which opened in 1940.[47]

Michigan's leadership role in freeway development was acknowledged in April 1941, when President Roosevelt appointed G. Donald Kennedy, then a candidate for head of Michigan's highway department, to the seven-member federal Interregional Highway Committee. Over the next several years, the committee developed a plan for the nation's post-war road construction, focusing on creation of a 32,000-mile interstate highway system. In addition to improving transportation, the planners also sought to provide jobs for decommissioned servicemen, to revitalize deteriorating inner cities, and to control suburban growth.[48]

Highway planning proceeded concurrently in Michigan. In a paper presented to the annual meeting of the American Society of Civil Engineers in January 1942, Commissioner Kennedy outlined the twenty-year master plan for highway development in the state. The plan was based on information from a highway planning survey conducted as a 1930s relief project, which considered the social and economic implications of highway development in addition to standard statistics and technical analyses. The plan established three roadway designs for rural trunk highways, and designated which routes should be improved or maintained to meet these standards. Within two decades, according to projections, the state would have 2,624 miles of major multilane freeways, 3,764 miles of major two-lane roads, and 3,059 miles of minor two-lane highways. Work to upgrade the system was already pressing:

> Of the mileage of existing trunk line listed for multilane construction, 32 per cent has pavement more than 15 years old with accompanying narrow width and faulty

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[47] "State Officials Eye N.Y. Road System," *Detroit Free Press*, 23 August 1938; J. D. Cruise to J. Carl McMonagle, Michigan State Highway Department, memo, 21 July 1942, in Record Group 58-5-A, Box 4, Michigan DOT Collection, Michigan State Archives, Lansing; photographs, Box 2, Murray Delos Van Wagoner Papers, Bentley Historical Library, University of Michigan, Ann Arbor; Seely, *Building the American Highway System*, 148, 152.

[48] Mark H. Rose, *Interstate: Express Highway Politics, 1939-1989* (Lawrence, KS: University Press of Kansas, 1979; revised edition, University of Tennessee Press, 1990; page numbers refer to revised edition), 19-21.

roadway alignment. It also includes 42 bridge structures which are too narrow, too low, or not strong enough for modern loads.[49]

The state plan was complemented by a separate plan that addressed the unique challenges of the Detroit metropolitan area. The city had begun to address traffic congestion as early as the 1920s, when the Rapid Transit Commission developed a master plan for the metropolitan area's road system. The main arteries, known as "superhighways," featured rights-of-way 204 feet wide; 120 feet was considered adequate for other section line roads, and 86 feet for quarter-section roads. The Wayne County Road Commission adopted the plan in 1925, and began developing the road network of superhighways in conjunction with Detroit and other local communities, as well as neighboring Oakland and Macomb Counties. The 165-mile system adopted the existing diagonal roads radiating from Detroit, as well as circumferential routes which Wayne County had started to establish. Originally, superhighway improvements stopped about 6 miles from the center of downtown Detroit. By 1930, planners recognized the wisdom of continuing into the city, and the county board had given the road commission authorization to proceed. Detroit, however, was unable to fund its share of planned state road improvements within the city, and the county was forced to take on that responsibility. As a result, the logical extension of the superhighway system in Detroit was delayed.[50]

Soon the inadequacy of even the superhighways became evident. As early as 1934, the U.S. Congress passed legislation to initiate state highway surveys to aid long-term planning. By the late 1930s, the Wayne County Road Commissioners were voicing alarm about the repercussions of traffic congestion: "A city which pioneered motor transportation and which depends upon the automobile industry for its existence, is lagging behind other metropolitan centers, and the lack of highway facilities is rapidly becoming an economic barrier to Detroit's progress."[51] A more poetic -- and even more dire -- warning was sounded in a study issued by Michigan's highway department:

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[49] 19 SHDBR (1941-1942), 40-43.

[50] Shuptrine, "The Progress": 3; 34 WCAR (1939-1940), 10-11.

[51] 33 WCAR (1938-1939), 5-6; Michigan State Highway Department, *Highway Needs in Michigan*, 45.

> Detroit has a definite rhythmic movement, like the beating of a giant heart. Its streets are arteries, and its traffic is its life blood. In the morning the blood rushes into the heart, in the evening it is pumped out again into the body and limbs of the city. When the arteries harden the heartbeat weakens. Without its strong, replenishing pulse, Detroit will die.[52]

The Wayne County Road Commission called for a network of limited-access "express" superhighways to accommodate the ever-increasing commercial and passenger traffic. Better roads could help revive Detroit's Depression-plagued economy by convincing companies to expand existing manufacturing facilities rather than move to other locations, and by attracting new industry. Furthermore, in considering route layout, "there are numerous slum areas which could be cleared, thereby right-of-way costs would be reduced to a fraction of what they would ordinarily be."[53]

Three east-west routes through Detroit were under study. The state highway department was most interested in having the road follow Harper and McGraw Avenues, since this alignment provided a logical link to the statewide highway system. Improvements to this route, in fact, had been advocated by the 1925 master plan. The Wayne County Road Commission preferred the "Mack-Myrtle Route," which was closer to downtown. Midway between these alternatives, another option appropriated the path of Warren Avenue. A pair of north-south routes would be intersected by another east-west highway near the river, thus completely encircling the city's center. The Detroit Common Council organized a committee with representatives from the city, county and state to recommend a plan of action.[54]

Ironically, none of these alternatives were the first to come to fruition. Instead, by 1941, plans were laid to make a 1.3-mile stretch of Davison Avenue the state's first modern freeway. The

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[52] Michigan State Highway Department, *A Comprehensive Plan of Motorways for Detroit* (N.p., 1941).

[53] 32 WCAR (1937-1938), 7.

[54] 33 WCAR (1938-1939), 7-8; *"Carrying Out the Master Plan,"* report by Advisory Committee to Detroit Common Council, submitted 2 October 1925.

route traversed Highland Park, a city completely surrounded by Detroit. It was probably no coincidence that the Ford Motor Company, long a promoter of road improvement, had significant property holdings in Highland Park. Upgrading Davison Avenue promised significant relief of the congestion around Ford's massive plant on Woodward Avenue. Heavily traveled Davison Avenue, the only east-west artery across Highland Park, also caused a bottleneck for a number of important north-south roads leading into downtown Detroit. By separating the grades of crossing traffic, planners hoped to eliminate daily traffic snarls.[55]

The city and county signed a development agreement for the expressway in April 1941. The construction schedule was accelerated following the nation's entry into World War II, and the road was opened to traffic in November of the following year. The Davison Expressway consisted of six 11-foot lanes, three for each direction, divided in the center by a 6-foot median strip. Seven rigid-frame concrete bridges, erected at a total cost of $607,000, carried local streets over the below-grade highway. The rigid-frame style was chosen, in part, because it used a relatively small amount of steel, a critical war material. Four of the bridges featured single spans of up to 77 feet in length. Two-span bridges, with spans of up to 42.5 feet, were used for the three roads with street-car lines. Single lanes between the sidewalk and the railing permitted U-turns for traffic on the grade-level surface roads that flanked the expressway. The $3.6 million project was financed entirely with funds generated by county gas and other taxes. The *Detroit News* heralded the Davison as the "first depressed highway in the United States outside the New York area." In addition to ranking as one of the first modern freeways in the nation, the Davison was noteworthy for its development in a densely developed urban neighborhood.[56]

The state eventually won backing for the Harper-McGraw cross-town route. Later named in honor of Edsel B. Ford, this freeway was to stretch 14 miles across Detroit from Dearborn

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[55] 34 WCAR (1939-1940), 6-7; 35 WCAR (1940-1941), 25-28; 36 WCAR (1941-1942), 4, 11-14; 38 WCAR (1943-1944), 7; Hyde, *Detroit.*

[56] The single-span bridges were erected at Third, Second, John R and Brush; two-span structures are at Hamilton, Woodward and Oakland. Good overviews of the expressway are provided by Shuptrine, "The Progress": 3-4; Board of Wayne County Road Commissioners, *Davison Limited Highway* (N.p., 1951 reprint); other details are in 34 WCAR (1939-1940), 6-7; 35 WCAR (1940-1941), 25-28; 36 WCAR (1941-1942), 4, 11-14; 38 WCAR (1943-1944), 7; *Detroit News*, 25 November 1942.

northeast to the Macomb County line at Harper Woods. In combination with the Detroit Industrial Expressway and the Willow Run Expressway, this route ultimately became part of Interstate 94, connecting Chicago with the Canadian border at Port Huron, Michigan.

The state's other priority during this period was one of the proposed north-south expressways edging downtown Detroit. Initially known as the Sixth-Hamilton route after the roads it followed, it was subsequently rechristened in honor of former Detroit mayor John C. Lodge. In January 1944, the Wayne County Road Commission, led by engineer Leroy C. Smith, made public a $50 million plan for this route. With interchanges tying this route to the Ford and Davison expressways, and with the route flowing into the existing James Couzens superhighway, the beginnings of a modern freeway system emerged.[57]

This activity was paralleled by national trends. The 1944 Federal Aid Highway Act called for creation of a National System of Interstate Highways connecting principal metropolitan areas. The law also included provisions for funding highway development and, for the first time, dedicated federal funds for urban highway construction. To match the federal allocation for the Detroit expressways, the state agreed to pay fifty percent of the $6 million annual budget, with Wayne County and the city of Detroit each shouldering twenty-five percent. When construction costs came in at about $8 million a mile, much higher than anticipated, the inadequacy of the original funding level was soon recognized. By 1951, with the promise of more federal aid and pledges of revenue from gasoline and vehicle taxes, the state, county, and city backed a bond sale grossing $80 million to accelerate construction.[58]

The state designed and supervised construction of the Ford Expressway, hiring the Wayne County Road Commission to oversee development of the Lodge Expressway. Both used the design of the Davison as a prototype, although some dimensions were slightly more generous. Like the Davison, the later roads consisted of a depressed roadway with three traffic lanes in each direction. The Lodge and the Ford featured three 12-foot lanes in each direction separated by a

[57] Shuptrine, "The Progress": 4; 38 WCAR (1943-1944), 9, 18-19.

[58] 46 WCAR (1951-1952), 37; 47 WCAR (1952-1953), 37; Michigan State Highway Department, *Detroit Expressways* (N.p., 1953); Michigan State Highway Department, *Detroit Expressways* (N.p., 1954).

central median of 12 to 14 feet, plus 8- to 10-foot "refuge" shoulders along the outer edges of the pavement. Grade-level planning again following the Davison's pattern: one-way service streets paralleled the expressways, and bridges traversed the 18-foot-deep depression at regular intervals for crossing traffic. These continuous steel-beam bridges accommodated two sidewalks and roadways as wide as the approaching streets and many, in addition, carried U-turn lanes. The Lodge ultimately required thirty-six structures and the Ford seventy structures, plus a total of forty-five pedestrian overpasses. The Ford-Lodge interchange alone called for fourteen structures.[59]

The state began acquiring rights-of-way for the Ford Expressway after receiving the first federal allocation for the project in October 1945. In January 1947, construction began on the west end of the initial 5.3-mile phase, which extended east from the Dearborn-Detroit border to John R, one block beyond Woodward. The road was opened in segments beginning in 1948, and it immediately attracted widespread attention. An article in *Motor News* in 1948 reported that "highway engineers from all over the country make pilgrimages to Detroit to inspect and admire this great improvement which is a demonstrated success and is building up a very impressive safety record. More and more motorists are learning its advantages from day to day and are acquiring the habit of using it whenever possible." In 1950, completion of the Michigan Avenue overpass at the Detroit-Dearborn border linked the road with the Detroit Industrial Expressway. The route reached John R by 1955, and within a year the expressway's average daily traffic count had grown to 90,000 vehicles. [60]

The first phase of the 9-mile-long Lodge Expressway extended north from First Street, near the Detroit River, to Pallister Avenue, just north of the Grand Boulevard beltline, a distance of about 3.4 miles. A bridge carrying Milwaukee Avenue, apparently the earliest highway structure surviving from the Lodge Expressway, opened to traffic in November 1948. Each of the two

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[59] Shuptrine, "The Progress," 4; 40 WCAR (1945-1946), 31; Michigan State Highway Department, *Detroit Expressways* (1954).

[60] 23 SHDBR (1949-1950), 27; 42 WCAR (1947-1948), 34-35; 49 WCAR (1954-1955), 48; Michigan State Highway Department, *Detroit Expressways* (1953) and *Detroit Expressways* (1954); "Progress Report, Chicago-Detroit Expressway," *Motor News*, March 1948, 15.

spans of this steel-beam structure measure approximately 55 feet. The concrete deck provides a 44-foot-wide roadway for Milwaukee Avenue flanked by 10-foot sidewalks. The construction contract, which was let in February 1948, included about a block of excavation for the nascent expressway. In the following September, a contract was awarded for building a similar two-span structure for Forest Avenue. The roadway was wider, however, to include a 15-foot lane beyond each sidewalk to permit U-turns from the grade-level service roads paralleling the expressway. The West Grand Boulevard Bridge and a pedestrian overpass near Holden Avenue were also completed by 1950 for the first phase of the expressway. Only after work was well advanced on these structures, as well as on necessary utility and railroad relocations, were contracts awarded for grading and paving the expressway itself. The first section completed, running from Holden to Pallister and passing beneath the Grand Boulevard and Milwaukee bridges, opened in 1950. Immediately to the south, work on bridges required at the interchange with the Ford Expressway was stopped for eight months by delays in obtaining structural steel. Traffic began passing on the Lodge axis of the interchange in January 1953. Some of the ramps connecting the Lodge and Ford expressways opened in January 1955; the entire interchange officially opened in October of that year.[61]

While the Detroit area's freeways attracted the most attention, congestion problems also appeared in other communities. Beginning in the mid-1930s, the state highway department had targeted a number of cities for circumferential roadways including Battle Creek, Benton Harbor, Detroit, Flint, Grand Rapids, Monroe, Muskegon, Pontiac and Port Huron. At the same time, roads leading into these beltways were being upgraded. The purpose of these bypasses was undermined, however, by commercial and residential development attracted to the new corridors. Traffic jams quickly followed. A crucial state law adopted in 1941 permitted government agencies to restrict roadside development, since uncontrolled growth reduced the public's investment in road improvements.[62]

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[61] 42 WCAR (1947-1948), 30-31, 33-34; 44 WCAR (1949-1950), 42-44; 45 WCAR (1950-1951), 43-44; 47 WCAR (1952-1953), 38-44; 48 WCAR (1953-1954), 35-39; 49 WCAR (1954-1955), 41.

[62] Murray D. Van Wagoner, "The Michigan Highway Program and the Tourist Industry," *Michigan Roads and Construction* 32 (17 October 1935): 10; Michigan State Highway Department, *Highway Needs in Michigan: An Engineering Analysis*, a report prepared for the Michigan Good Roads Federation and the Highway Study Committee (N.p., 1948), 44-45.

These local by-passes and existing intercity routes were often adopted by interstate planners, who laid out a network consisting of 978 miles in Michigan in 1947. In August of that year, the U.S. Public Works Administration announced a 37,681-mile interstate system, including the following routes in Michigan (current interstate routes are given in parenthesis):

1. Detroit-Lansing-Grand Rapids-Benton Harbor (I-96/I-196)
2. Grand Rapids-Muskegon (I-96)
3. Detroit-Dearborn-Kalamazoo-Benton Harbor (I-94)
4. Kalamazoo-South Bend
5. Detroit-Toledo (I-75)
6. Detroit-Port Huron (I-94)
7. Detroit-Highland Park-Pontiac-Flint-Saginaw-Mackinaw City-Sault Ste. Marie (I-75)

For the most part, these routes followed the general course of trails first developed by Native Americans and subsequently appropriated by explorers, the military, pioneers, and government highway departments. The initial interstate proposal was essentially carried out in the following decades, with only two significant changes. The Kalamazoo-South Bend route was abandoned, and was apparently replaced by I-69 connecting Port Huron, Flint, and Lansing with a major east-west artery, I-80/I-90, in Indiana.[63]

The department's ambitious plans to complete the expressways, as well as road and bridge projects throughout the state, were slowed by materials shortages well into the 1950s. All types of civilian construction projects clamored for raw materials, which became even scarcer when military production resumed for the Korean War. Steel deliveries took months, or were stopped altogether at whim of the National Production Authority. Cement supplies were low, particularly when a strike crippled one of the state's largest plants in 1948. Even aggregates were not always readily available. Limited supplies resulted in high prices: "The purchasing value of the Department's construction funds shrank about 40 per cent below prewar levels," according to the 1947-1948 biennial report. The department's initial response was to delay awarding contracts for

[63] "Federal Highway Plans are Drawn," *Battle Creek Enquirer News*, 3 August 1947; Michigan State Highway Department, "Preliminary Reports," 1934.

less urgent projects. When this strategy appeared futile, in light of sustained higher prices, bridge engineers modified designs to reduce the use of more expensive materials, particularly steel.[64]

Despite these roadblocks, however, the number of projects that had been initiated during World War II gave Michigan a running start. From mid-1942, when Charles Ziegler took over as commissioner, through the end of 1948, the department built 146 new bridges and grade separations. Over one-third were completed during the 1948 construction season. During the following biennium, contracts were awarded for forty-six trunk-line highway bridges and twenty-four grade separations.[65]

Try as they might, though, state, county and local efforts could not keep up with growing traffic demands. A 1948 study found that 471 rural trunk-line bridges were deficient, and estimated that repairing and replacing these structures would cost over $46 million. Urban trunk-line bridges required an additional $23.6 million, plus over $35 million for primary and local county bridges. In an effort to address this pressing problem, the legislature made the first substantial changes in highway funding since the McNitt and Horton acts of the early 1930s. Gasoline and weight taxes were increased, raising revenues by one-third. Forty-four percent of the net income was earmarked for the state highway department, while thirty-seven percent was allocated to counties and the remaining nineteen percent went to cities and incorporated villages.[66]

An unfortunate set-back to highway planning occurred in 1951, when fire ravaged the drafting and file rooms of the highway department's offices in Lansing. Some plans in storage cabinets survived, but most survey notes and blueprints for projects under development were destroyed. The periodical *Michigan Roads and Construction* reported that "road plans are in somewhat

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[64] "Highway Steel Shortages Delay to Current Michigan Road Program," *Michigan Roads and Construction* 48 (23 August 1951): 2; 22 SHDBR (1947-1948), 14, 53-54.

[65] "State Near End of First Post-war Highway Program," *Michigan Roads and Construction* 45 (30 December 1948): 2; 23 SHDBR (1949-1950), 23.

[66] *Highway Needs in Michigan*, 124-126; Dunbar, *Michigan Through the Centuries*, vol. 2, 571.

better position than bridge plans, which suffered heavy damage as the fire slowly ate its way through the south wing of the building."[67]

This context for Michigan's highway bridges ends with the passage of the federal Interstate Highway Act of 1956. This legislation differed from previous highway acts by offering federal subsidies to cover ninety percent of interstate construction costs. Aided by this financial incentive, highway developers rushed to make decade-old plans a reality. Soon, a grid of high-speed, limited-access freeways connected the country. True to tradition, Michigan was once again a national leader. The Detroit Industrial and Ford Expressways provided a head start for its interstate program. By the time the Interstate Highway Act passed, Michigan had made significant progress on I-94 and I-75. Interstate freeway development represents a watershed in the evolution of the transportation system in both Michigan and the United States.

Wayne County: An Exemplary Road Commission

The work of the Wayne County Road Commission merits consideration in its own right. The county's history reflects the evolution of laws, economics and technology related to road and bridge construction in the twentieth century, and offers a well-documented example of how these changes affected counties in Michigan. At the same time, the Wayne County Road Commission was internationally renowned for innovative ideas, sometimes breaking ground well in advance of the Michigan State Highway Department. The county's leadership is not surprising in light of its unique relationship to the automobile industry, and its status as by far the largest population center in the state and, historically, one of the largest metropolitan areas in the nation.

Wayne County encompasses approximately 623 square miles in southeastern Michigan. The city of Detroit claims the county seat. In the early twentieth century, the region became firmly established as the hub of the country's automobile manufacturing industry. Area residents were also significant consumers of this production: in 1935, thirty-eight percent of the state's automobile registrations were concentrated in Wayne County. This totaled "more registrations

[67] "Highway Department Plans Letting Despite Heavy Fire Losses," *Michigan Roads and Construction* 48 (15 February 1951): 2.

than in the entire States of Delaware, Nevada, New Mexico, Utah, Vermont, and Wyoming, combined, and more than in any one of 26 additional states and the District of Columbia."[68]

Early roads set the pattern for later development. The area's first long-distance road, which extended from Detroit to Fort Meigs (now Toledo), is still traced by West Jefferson Avenue. Michigan, Gratiot, Woodward and Grand River Avenues, some of the major arteries radiating from downtown Detroit, were laid out as early nineteenth-century military roads.[69]

Wayne County has a tradition of innovation. It claims credit for building the world's first mile of concrete pavement, the first divided highway, the first cloverleaf grade separation, and one of the first modern, limited-access freeways. The center line painted between lanes of opposing traffic was another Wayne County invention. The county's leadership role can be credited to the Wayne County Road Commission, which was created by a referendum in September 1906. When about 50,000 Wayne County voters cast their ballots, four-fifths favored adoption of a county road system. The first annual report of the Board of County Road Commissioners recalled that "every precinct in the City of Detroit gave the proposition a handsome majority, and every township, with the exception of four, did likewise." By the first of October, a three-man road commission had been appointed, consisting of Edward N. Hines, Cassius R. Benton, and world-famous automobile manufacturer Henry Ford. The commissioners promptly proceeded with plans to survey and improve roads, and to levy a half-mill tax to support this work. Opponents of the county road system, however, unwilling to rest even after passage of the referendum, waged a persistent and litigious war against the commission, particularly against its right to assess taxes. In the following April, Michigan's supreme court found the commission unconstitutional, and Benton and Ford retired from the battle. Hines persisted, and within a year the board was reorganized, reauthorized, and hard at work. Hines remained as a guiding light on the board for decades thereafter.[70]

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[68] Michigan State Highway Department, *Street Traffic, City of Detroit, 1936-1937* (N.p.: Michigan State Highway Department, 1937), 251.

[69] Wayne County Board of Road Commissioners, *Forty-first Annual Report to the Board of Supervisors of Wayne County*, 1946-1947, 4. Annual reports of the Board of Road Commissioners will be referenced hereafter as WCAR.

[70] 1 WCAR (1906-1907), 1; 34 WCAR (1939-1940), 6.

The commission quickly established priorities to direct its efforts, concentrating first on building or upgrading ten primary routes radiating from Detroit. Next, they improved roads extending from smaller communities. Finally, to link this network, the commission planned to ring Detroit with an inner, middle and outer beltway. This systematic approach became a model for other communities. As early as 1911, the commission felt confident in asserting that "Wayne County is coming to be known as a leader in the good roads movement, and the Mecca of those upon whose shoulders devolves the duty of solving traffic problems." Within a few years, the county hosted delegations of engineers from around the United States, as well as from a number of other countries, including Britain, Japan, Australia, and Borneo.[71] The commission's international prominence was enhanced by its advocacy of concrete as a road material. It claimed credit for constructing the country's first mile of concrete-paved rural highway, a section of Woodward Avenue just beyond the Detroit city limits.[72]

From the beginning, the commission took on bridge projects as well as road work. Bridges were required for new routes that the county developed. In addition, nearly every structure on the existing roads that the county adopted for its system was deficient. The road commission's third annual report, issued in 1909, included a photograph of "a flat-top I-beam, concrete floor bridge on Fort road" which it had built. The same report also described the improvement of River Road at Wyandotte, including construction of a 30-foot span for $1,237.07.[73] In its first dozen years of existence, the commission averaged erection of one bridge a year. Then, the pace of construction significantly increased. Between 1918 and 1925, the county built 47 bridges at a cost of nearly $5

[71] 5 WCAR (1910-1911), 10; 9 WCAR (1914-1915), 6; 16 WCAR (1921-1922), 23.

[72] The concrete road was on Woodward Avenue immediately north of Highland Park, between Six Mile Road and Seven Mile Road, an area annexed by the city of Detroit after the pavement had been laid. The Wayne County Road Commissioners' 1921-1922 annual report notes "the passing of Woodward Avenue Road. . . . Barring the objection to its narrow width, this old concrete road has satisfactorily carried the heaviest traffic of any county road in America during its more than 13 years of existence and has justified in every particular what its developers and proponents . . . had hoped for it." The concrete was "broken up and torn out by the Department of Public Works to permit the extension of Detroit's standard city streets, the right of way being increased from 66 to 100 feet in width." (16 WCAR (1921-1922), 21; 50 WCAR (1955-1956), 5.)

[73] 3 WCAR (1908-1909), 18-19.

million. Thirty-two of the bridges were of concrete; fifteen were steel, including three bascules over the Rouge River.[74]

The county quickly recognized the merits of standardization. In a 1910 article on "Michigan Bridges and Culverts," Commissioner Hines took the state highway department to task for not producing adequate standard plans and specifications, and not overseeing local bridge construction. He noted, with some condescension, that the department "is small, and the force is pretty well overworked" and lacked an experienced bridge engineer.[75] The fourth annual report of the Wayne County Road Commission, in contrast, included plans and specifications for 4- to 16-foot concrete culverts apparently prepared by staff bridge engineers George A. Dingman and George A. Burley. The county adopted 24 feet as the standard width for culverts and bridges, generously exceeding the state mandate of 18 feet. By the mid-1920s, they increased the minimum width for bridges on major roads to 40 feet.[76] Concrete slab construction was used for culverts spanning up to 18 feet. Concrete was also the preferred material for bridges. The specific design was determined by site considerations: "Where the banks to streams are low and maximum water way is desirable, we build the girder type of bridge with heavy steel reinforcement imbedded in concrete. Where the banks to a stream are high and the waterway will not be cut down by a reinforced arch type of concrete bridge, we believe it is the best."[77] When the county began to anticipate future roadway widening, however, through girders fell from favor. Deck girders became the design of choice by the early to mid-1920s, at a time when the state highway department still embraced arched through-girder spans. Steel stringer bridges became more common in Wayne County by the end of that decade.[78]

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[74] 19 WCAR (1924-1925), 39.

[75] 4 WCAR (1909-1910), 57-60.

[76] 4 WCAR (1909-1910), 20-24; 5 WCAR (1910-1911), 12; Edward N. Hines, *20 Years of Road Construction in Wayne County, Mich.* (Detroit: Detroit Automobile Club, [1926]), 10.

[77] 7 WCAR (1912-1913), 10; 12 WCAR (1917-1918), 13.

[78] 21 WCAR (1926-1927), 21.

Solid concrete railings modestly ornamented with recessed panels were typical in the 1910s. Concrete spindle rails were sometimes employed, becoming more popular in the 1920s. By 1922-1923, all new bridges included sidewalks. The county typically constructed simple concrete and steel structures in-house, using day labor crews.[79]

In an urbanized region riddled by rivers, standard plans for simple concrete structures could not meet every need. For longer bridges, when site conditions precluded the use of multiple short spans, the commission hired outside contractors to erect steel pony trusses and, occasionally, deck plate girders. Bascule bridges sometimes served as a compromise between Wayne County's vehicular traffic and its manufacturing and shipping interests, which depended on unimpeded river transport. The commission's first bascule, initiated in 1912, was the Dix Road Bridge over the Rouge River. The need to deepen and widen the river in the late 1910s, however, required a reconstruction of the Dix Road Bridge and erection of two new bascules, including the Jefferson Avenue Bridge.[80]

The Rouge improvement project accommodated factories upstream, particularly Ford's new Dearborn plant. The discussion of this project in the road commission's 1924-1925 annual report gives a picture of the rapid metamorphosis of the Detroit area during this era, largely stimulated by the automobile industry:

> The inconspicuous Rouge River of the years prior to 1919, winding its way drowsily through useless, mosquito-infested marshes, has disappeared forever, and in its place . . . has appeared a straight, deep waterway, which during the past year has borne commerce to the extent of 1,400,000 tons. . . .
>
> In these few short years, the clatter of a few hundreds of horse-drawn vehicles, the crash of street cars operating at regular and short intervals, and the buzz of a few hundred automobiles crossing the old drawbridges, have all been replaced by the steady hum of many thousands of automobiles with an undertone occasioned by

[79] 14 WCAR (1919-1920), 69; 16 WCAR (1921-1922), 54; 25 WCAR (1930-1931) 50; 27WCAR (1932-1933), 39.

[80] 6 WCAR (1911-1912), 15; 15 WCAR (1920-1921), 62-67.

> hundreds of busses, quietly rolling over commodious bascule bridges. Quiet as is this new and dense traffic, the very volume and insistence of its hum completely engulfs any sound from the occasional street car and the handful of horse-drawn vehicles.[81]

Because of the constant pressure of growth, the county frequently faced problems and experimented with solutions well in advance of the rest of the state. Often, Michigan's highway department hired the road commission as a contractor for trunk-line projects in Wayne County, thereby tapping into the county's previous experience. Such was the case for a major highway project on the Wayne-Oakland county line initiated in 1930 which included a roadway grade separation, three river bridges, and reconstruction of the Rouge River channel. This was the state's first attempt at a highway grade separation; it was Wayne County's fourth. Two five-span, reinforced-concrete tee-beam bridges, each with a 40-foot-wide roadway and an 8-foot sidewalk, carried Base Line Superhighway (M-102) over Telegraph Superhighway (US-24). The bridges were separated by 84 feet "for future development."[82]

The county's work with grade separations began in the 1910s with railroad-street intersections. Collisions between cars and trains multiplied as the county's cohort of automobiles rose from under 12,000 in 1909 to 35,000 six years later. Of the grade crossings within the commission's jurisdiction, only one (Northville Road over the Pere Marquette Railway) had a bridge to separate traffic. At other busy intersections, the county posted flagman or installed warning bells. It was not until 1921, however, that the county began a concentrated effort to separate grades.[83] The additional work of negotiating with railroads and property owners, realigning streets, rerouting utilities, and moving rail tracks meant that a grade separation typically took longer to build and was more costly than a river bridge of comparable span. Soon, the commission reported that "we are continuously expending a large part of the energy of our organization and of the funds made available to us for this part of the work." Despite the high cost, the commission remained

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[81] 19 WCAR (1924-1925), 71.

[82] 24 WCAR (1929-1930), 119-121.

[83] 9 WCAR (1914-1915), 9-10, 70; 15 WCAR (1920-1921), 45; 22 WCAR (1927-1928), 121, 123.

committed to this effort. In 1930, Commissioner Hines asserted that "hand in hand with the widening and building of new concrete roads and with the reconstruction of the entire bridge system of Wayne County goest the program of railroad grade separations."[84]

The county's first railroad-street separation project was a subway for Telegraph Road under the Michigan Central tracks just south of Michigan Avenue. Bridges typically carried rail tracks, with the street passing below. Because rail overpasses are not highway structures, they are not included in the Michigan Historic Bridge Inventory. Occasionally the terrain, magnitude of traffic and other factors argued for a street overpass. Where the Fort Superhighway intersected with the Michigan Central, Pennsylvania and Wabash railroads, for example, it was found to be easier to elevate the street than to tunnel under the broad swath of railroad tracks.[85]

The county's diligent efforts with the many railroads crossing its jurisdiction resulted in construction of 47 railroad-street grade separations by the mid-1930s. Then, however, the economic toll of the Depression curtailed the railroads' ability to initiate new projects. The companies were also less willing to commit their own funds once the federal government began subsidizing grade separations through state highway department allocations and direct grants. After the federal program was established, Wayne County's grade separation initiative experienced a brief hiatus, since federal grants could not be used to acquire rights-of-way and the state and railroad companies could not, or would not, ante up the necessary dollars. The county soon took on responsibility for these costs to keep the program going.[86]

While it concentrated on eliminating railroad-street grade crossings, the county also explored road grade separations. The commission's first example, built in 1926-1927, carried Outer Driver over Bonaparte Road. Outer Drive, one of the circumferential beltways around Detroit, featured ornamental light posts, attractive landscaping, and handsome reinforced concrete arch bridges. Eliminating an intersection with Bonaparte Road enhanced the experience of driving on this scenic

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[84] 22 WCAR (1927-1928), 117; "All Grade Crossings must Go," *Detroit Free Press*, 6 July 1930.

[85] 22 WCAR (1927-1928), 124-125.

[86] 28 WCAR (1933-1934), 39; 29 WCAR (1934-1935), 36-37.

parkway. The commission's next project, a major interchange between Michigan and Southfield superhighways, was far more ambitious and served a strictly pragmatic purpose. In addition to the two bridges for the Michigan overpass, new structures were required for the Michigan Central Railroad, which crossed over Southfield, and for the Southfield crossing of the Rouge River. Henry Ford donated all of the land needed for the primitive cloverleaf design of the Michigan-Southfield intersection. Despite its strictly functional role, the diamond-shaped interchange was landscaped like a park. Since all directional changes were accomplished by right-hand turns, dangerous cross traffic was eliminated. The commission proudly pronounced the project "one of the most complete grade separation projects, particularly between Superhighways, to be found anywhere in this Country."[87]

The commission subsequently completed a number of road grade separations. Many of these were related to parkway construction following the precedent of the Outer Drive bridge. The commission's work on parkways complemented its dual role as Board of County Park Trustees, which it had taken on in the late 1910s.[88] It was a logical combination. The road commission planted trees along many of the streets it developed both for aesthetic purposes and to control erosion. Likewise, the commission was concerned about attractive landscaping around bridges. "A structure is not considered as complete," the 1923-1924 annual report noted, "until it is cleaned up and the banks sodded and all raw construction marks erased."[89] Also, by the 1920s, the county began completing the most urgently needed traffic arteries and could devote time to creating a master plan for park and parkway development.

The Wayne County Board of Supervisors appropriated funds for acquisition of additional park land in 1929. Within four years, the road commission had purchased about 775 acres along 8 miles of the Middle Rouge River between Newburgh and Northville Roads. The county

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[87] 22 WCAR (1927-1928), 59; schematic sketch of "traffic routing" on page 92; artist's conception 94; 23 WCAR (1928-1929), 129.

[88] The board gained control of airport operations in the late 1920s. A decade later, it took on responsibility for the county's water supply and sewage disposal. (43 WCAR (1948-1949), 67)

[89] 18 WCAR (1923-1924), 73.

constructed a concrete-paved parkway, as well as tennis courts, bridle paths, foot bridges and baseball fields, with the assistance of federal work-relief labor.[90]

The onset of the Depression changed the dynamics of highway stewardship. Townships found it difficult, if not impossible, to maintain their roads, so in 1931, the Michigan legislature passed legislation requiring counties to take over all township roads within five years. This law, known as the McNitt-Smith-Holbeck Act, more than doubled the Wayne County Road Commission's purview from 479 to 1,143 square miles. In the sixth year, the county gained responsibility for subdivision streets beyond incorporated cities and villages, adding another 772 miles of streets and 372 miles of alleys to the system. Many of the bridges on these roads were substandard. As a result, a substantial part of the board's work in the 1930s involved upgrading these crossings. It was aided somewhat by another piece of legislation dating from 1931, the Dykstra Act, which authorized the state highway department to subsidize maintenance and construction of state trunk-line roads in urban areas.[91]

The Horton Act of 1932 distributed a greater percentage of gas and weight tax proceeds to the counties, which were required, in turn, to allocate some of the funds to local governments. User taxes thus effectively replaced property taxes as the primary funding source of revenue for road work. The new paradigm was welcomed by the Wayne County Road Commissioners, who rarely authorized work which could not be funded out of annual tax proceeds. The considerable income from the county's sizable tax base allowed the board to accomplish a good deal even with this conservative fiscal policy. When the economy turned sour in the 1930s, Wayne County avoided the insolvency that plagued towns and counties which had leveraged bonds for capital improvements. As a result, during at least the first years of the Depression, the county found itself able "to carry on and to aid Cities and other communities of our County in these dark days." Detroit was the recipient of the most substantial assistance. In 1930, the city and state had agreed to split the cost of widening major streets in Detroit. When the city could not live up to its end of

[90] 26 WCAR (1931-1932), 81; 27 WCAR (1932-1933), 64.

[91] Michigan State Highway Department, "Preliminary Report on Michigan's Plan for Highways," typed report, 1934.

the deal, the county stepped in and took over the obligation, eventually contributing about $11 million to the effort.[92]

Federal Depression-era grants were primarily restricted to labor costs. Since communities were often unable to purchase construction materials, they assigned federally funded workers to the Wayne County Road Commission. The county, in return, provided materials and supervision. The county also received direct support from the early federal Civil Works Administration and subsequent relief programs. As a result, the road commission's labor force jumped from about 1,600 in the late 1920s to around 5,000 by 1933. The scope of federal assistance broadened during this period as well. The National Industrial Recovery Act of 1933 permitted, for the first time, the use of federal funds for road work within municipalities, a significant reversal of previous federal-aid policy. In the following year, the Hayden-Cartwright Act formally authorized the use of federal aid on designated urban roads.[93]

In the following decade, with the onset of World War II, Detroit-area industries became crucial to the nation's defense, as did the roads that served these factories. "In the Wayne County region," the road commission observed, "highways and streets are actually part of the assembly lines." Improving access to the Willow Run bomber plant was a particularly critical project, and one in which the county played an important role, according to Harry Shuptrine, the road commission's chief bridge engineer:

> The Wayne County Road Commission aided materially in expediting the early program by building some 7 miles of the Willow Run Expressway to the plant area. In addition its organization prepared the detail plans for several of the intricate grade separations of the Detroit Industrial Expressway.[94]

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[92] 27 WCAR (1932-1933), 9; 38 WCAR (1943-1944), 7.

[93] 27 WCAR (1932-1933), 12; Bruce E. Seely, *Building the American Highway System: Engineers as Policy Makers* (Philadelphia: Temple University Press, 1987), 154-155.

[94] 35 WCAR (1940-1941), 5; Harry A. Shuptrine, "The Progress of Development of Limited Expressways in Detroit Metropolitan District," *The Foundation* 9 (January 1945): 3-4.

To create the Willow Run Expressway, Wayne County transformed rural, gravel-covered Chase Road into a concrete-paved, multi-lane divided highway. Within two years, the commission had upgraded 6 miles of the route from the county line east to Hannan Road, and had supervised paving of the road in Washtenaw County. Southfield Superhighway, Eckles Road, Jefferson (near Grosse Ile), and Gallagher Avenue in Hamtramck were among the other roads improved to transport labor, materials and products for the war effort.[95]

Although faced with a labor drain as engineers joined the military forces, the county looked ahead to the end of the war almost from the beginning of the hostilities. By 1942, the commission was surveying routes and planning right-of-way purchases to both improve the region's transportation network and put discharged soldiers to work. The commission focused on the "Sixth-Hamilton" route (later christened the John C. Lodge Expressway) and on a riverfront drive. The state, in the meantime, pursued development of the Harper-McGraw cross-town route, soon renamed in honor of Edsel Ford.[96]

By the time the war ended, the state, Wayne County and Detroit had reached an agreement authorizing the county to draft plans and specifications for the Lodge Expressway. Beginning in 1946, the county supervised construction of the road as an agent for the state highway department, which was responsible for letting contracts on the new state routes. These roads would add to the 245 miles of trunk-line system that the state already maintained within Wayne County, 81 miles of which was in Detroit.[97]

The board also continued to develop parkways, the non-commercial counterpart to the expressways. It initiated a major park expansion in 1945 with acquisition of 125 acres between Warren Avenue and the Outer Drive, thereby connecting the Middle Rouge Parkway with Detroit's Rouge Park. At the same time, Edward N. Hines Drive was extended east from Newburgh to Warren Avenue, and plans were advanced for the Lower Rouge Parkway. Since

[95] 36 WCAR (1941-1942), 7-10.

[96] 36 WCAR (1941-1942), 6.

[97] 40 WCAR (1945-1946), 29-31.

parkway grades were typically separated from other traffic, parkway development meant a good deal of work for the county bridge engineers. The E.N. Hines Drive extension alone called for construction of eleven structures.[98]

Both the expressways and the parkways expanded the distance commuters could travel in a given time, opening up rural areas to suburban development. This coincided with a period of intense demand for new housing from the returning military forces. Housing construction had ground to a halt in the 1930s because of the Depression, and remained minimal in the early 1940s when building supplies were dedicated to the war effort. Personal automobile use had been restricted during the same period by lack of money and, later, by rationing of gas, rubber, and other materials. With the end of World War II, Americans demanded payback for their sacrifices. FHA and VA loans helped spur a construction boom of unprecedented dimension as both urban and rural families were drawn to the suburbs. During the 1940s, the population of Wayne County jumped from two million to over 2.4 million, while the greater metropolitan region including Wayne, Oakland and Macomb Counties grew from 2.4 to over three million. The fastest rate of growth was outside the city limits of Detroit. Suburban sprawl transformed cars from a luxury into a necessity: the three metropolitan counties accounted for almost fifty percent of the state's automobile registrations.[99]

Eventually, during the latter half of the twentieth century, the responsibilities of the Wayne County Road Commission were absorbed by the Wayne County Department of Public Services. As Wayne County evolved, a number of roads and bridges were widened. Aging structures have undergone renovation, often losing original railings and light standards. Hence, representative examples of bridges retaining good integrity are rapidly disappearing.

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[98] 39 WCAR (1944-1945), 33, 80.

[99] Oakland County Planning Commission, *Wagon Roads to Expressways* (N.p.: Oakland County Planning Commission, 1955), 13.

F. Associated Property Types

I. Name of Property Type Concrete Girder Bridges

II. Description

The first reinforced concrete girder bridge was built in France in 1893. Spans of up to 85 feet appeared by 1904 in Europe, the leader in this design. The earliest documented concrete girder bridge in Michigan was the Ottawa Street Bridge over the Muskegon River in Muskegon County, a single-span structure built in 1900. Concrete bridges -- and particularly concrete girder spans -- were just beginning to find favor among Michigan county engineers in the early 1910s when the Michigan State Highway Department (MSHD) developed its first standard designs for concrete girders. MSHD designed standards for concrete through girders in the 1913-1914 biennium, delineating simple, straight-sided structures in 5-foot increments between 30 and 50 feet.[100] The first MSHD concrete girder was a 50-foot span over the Paint River in Iron County. The oldest remaining girders -- both built in 1916 -- are located on county roads in Delta and Mecosta counties.[101]

Citing the advantages of their maximum under-bridge clearance, MSHD favored through girders for bridges up to 50 feet in span through the late 1910s and early 1920s. The department had in 1913-1914 engineered a short-span concrete deck girder, which it distinguished from its through girder configuration by calling it a T-beam, but it was used sparingly in the late 1910s. "The opportunities for using this economical type of structure are few," MSHD stated in its 1917-1918 Biennial Report, "due to the lack of headroom prevalent on Michigan stream crossings."[102] The first MSHD deck girder bridge was built during the 1921-1922 biennium, the same year that MSHD developed its standard for the curved-chord through girder. "These designs have curved

[100] 5 SHDBR (1913-1914), 100-101.

[101] C.A. Melick, "Summary of the Work of the Bridge Department," *Michigan Roads and Pavements* 22 (1 January 1925): 30-31.

[102] 17 SHDBR (1917-1918), 30-31.

top chords and bottom chord brackets," MSHD stated, "making them suitable for relatively long-span applications."[103] The first curved chord girder was a 90-foot span built in 1922 over the Raisin River at Tecumseh.[104] This was followed in the 1920s by a series of curved girders used in single-span or multiple-span configurations.

The drawback of through girders was their inflexibility. With the structural beams above the roadway, they could not be practically widened to accommodate increased traffic. As a result, through girders were superseded by deck girders and stringers when MSHD issued its new standards in 1929-1930. They fell rapidly from favor among the counties after that. Concrete deck girders were built routinely through the 1930s, but these too were overshadowed by steel superstructures in the 1940s. It was not until the development of the interstate highway system in the 1950s and 1960s that concrete girders -- this time in curved, prestressed deck configurations -- found renewed favor with MSHD.

III. Significance

Concrete girder highway bridges in Michigan may be eligible for listing in the National Register under Criterion A for their association with events that have made a significant contribution to the broad historical patterns of the country, the state, or the region. Specifically, this includes bridges that have played an important role in the development of the state's highway transportation system and, hence, in the exploration and settlement of the area. For example, a structure might be significant by its association with a particular route, such as the West Michigan Pike, or because it was built with assistance from the State Aid Bridge Fund or federal Depression-era relief programs. Bridges may, in addition, be eligible under Criterion B for their association with a significant person, as long as the "significant person" was not the designer or builder of the bridge. A bridge can be eligible by virtue of its designer or builder, but this falls under Criterion C. Indeed, most eligible bridges qualify under Criterion C as structures of engineering significance. This can encompass a broad range of considerations. For instance, a bridge can qualify under

[103] 9 SHDBR (1921-1922), 13-14.

[104] Ibid., 14; Melick, "Summary of the Work," 30.

Criterion C as a well-preserved example of a once-common type, or as a unique example of an unusual type.

IV. Registration Requirements

The period of significance for concrete girder highway bridges begins in 1900, the construction date of the earliest documented example of this type, the Ottawa Street Bridge over the Muskegon River in Muskegon County. The period of significance ends in 1948, the fifty-year cutoff date maintained by the National Register. Alterations made during the period of significance may be considered part of the bridge's historic fabric. Integrity of the structure's historic materials and design is essential for any bridge to qualify for the National Register under any criterion. Since it is virtually impossible to move concrete girder bridges, integrity of location is a given. Concrete girder bridges may be eligible for the National Register under Criterion B for their association with a significant person, but this is rare. Most often, these bridges will have significance under Criteria A or C.

Specific registration requirements under Criterion A:

1. Early and/or prominent product of the Michigan State Highway Department: In 1913, the state legislature required the state to design all trunk-line bridges, and to erect and maintain trunk-line bridges spanning 30 feet or more if the county or local government improved 3 miles of adjacent roads. MSHD developed its first standard through girder designs in the 1913-1914 biennium, and in the 1910s built a small number of prototypical girder spans.

2. Outstanding example of federal work relief programs of the Depression era: Federal work programs in the 1930s, particularly those funded by the Works Progress Administration, led to construction of a number of rigid-frame bridges in the state. The most significant display careful craftsmanship and creative design.

Specific registration requirements under Criterion C:

1. Early and/or representative multiple-span arched through-girder bridges: Arched through girders are an uncommon structural type indigenous to Michigan. The first MSHD arched through-girder bridge was erected in 1922; within a decade the design had fallen from favor.

2. Representative examples of variable-depth concrete T-beam bridges: Engineers, particularly in Wayne County, chose the arched form of variable-depth concrete T-beam bridges in some scenic settings in the late 1920s and early 1930s. The form was revived again during World War II and the post-war interstate period when steel shortages forced reconsideration of concrete designs.

3. Bridge with exceptional aesthetic merit: Most bridges built in the state are strictly utilitarian. Occasionally, however, a structure stands out by virtue of its design or because of the quality displayed in its construction. The interrelationship of a bridge and its site can also have aesthetic value.

I. Name of Property Type Concrete Slab Bridges

II. Description

With its deck and superstructure poured integrally in a single flat sheet over steel reinforcing, the simple slab was the most rudimentary of the concrete bridge types. A few concrete slabs were built in Michigan by the counties or by railroads and larger cities after the turn of the century, but their use was not widespread. The Michigan State Highway Department similarly eschewed slab construction when it developed its early bridge standards, preferring concrete box and arch culverts for the shortest spans and concrete through girders for spans in excess of 30 feet. Beginning in the early 1920s, the highway department had begun to build slab bridges on a limited basis. Outside of urban areas, however, they were used sparingly in Michigan until the development of new standards in the 1930s.

III. Significance

Concrete slab highway bridges in Michigan may be eligible for listing in the National Register under Criterion A for their association with events that have made a significant contribution to the

broad historical patterns of the country, the state, or the region. Specifically, this includes bridges that have played an important role in the development of the state's highway transportation system and, hence, in the exploration and settlement of the area. For example, a structure might be significant by its association with a particular route, such as the West Michigan Pike, or because it was built with assistance from the State Aid Bridge Fund or federal Depression-era relief programs. Bridges may, in addition, be eligible under Criterion B for their association with a significant person, as long as the "significant person" was not the designer or builder of the bridge. A bridge can be eligible by virtue of its designer or builder, but this falls under Criterion C. Indeed, most eligible bridges qualify under Criterion C as structures of engineering significance. This can encompass a broad range of considerations. For instance, a bridge can qualify under Criterion C as a well-preserved example of a once common type, or as a unique example of an unusual type.

IV. Registration Requirements

The period of significance for concrete slab highway bridges begins in 1900, the earliest date in which slab bridges appear in Michigan literature. The period of significance ends in 1948, the fifty-year cutoff date maintained by the National Register. Alterations made during the period of significance may be considered part of the bridge's historic fabric. Integrity of the structure's historic materials and design is essential for any bridge to qualify for the National Register under any criterion. Since it is virtually impossible to move concrete slab bridges, integrity of location is a given. Concrete slab bridges may be eligible for the National Register under Criterion B for their association with a significant person, but this is rare. Most often, these bridges will have significance under Criteria A or C.

Specific registration requirements under Criterion A:

1. Early and/or prominent product of the Michigan State Highway Department: MSHD developed its first standard slab design around 1920.

2. Representative examples of the Wayne County Road Commission's innovative continuous concrete-slab design: During World War II and in the decade that followed, steel shortages hampered bridge construction. At the same time, post-war demands for new cars and housing

placed increasing pressure on the Wayne County Road Commission to develop and improve the county's roads. In response, the commission's bridge engineer designed a continuous reinforced-concrete slab bridge. This unique design was used in suburban and semi-rural areas throughout the county. Well-preserved examples may be significant.

Specific registration requirements under Criterion C:

*1. **Earliest well-preserved examples of the style:*** Because simple slab structures were easy to construct, they became common throughout Michigan in the twentieth century. Although a number survive, many have experienced some alteration.

*2. **Bridge with exceptional aesthetic merit:*** Most bridges built in the state are strictly utilitarian. Occasionally, however, a structure stands out by virtue of its design or because of the quality of the craftsmanship displayed in its construction. The interrelationship of a bridge and its site can also have aesthetic value.

I. Name of Property Type Concrete and Steel Rigid-frame Bridges

II. Description

Steel rigid-frame bridges were developed in the late nineteenth century and marketed extensively by the bridge fabricators as the bedstead truss. Due primarily to their structural shortcomings, bedsteads largely fell from favor soon after the turn of the century. Rigid-frame girder bridges were erected in the early twentieth century, but their use was limited essentially to urban viaducts and grade separations. Through its various permutations, the steel rigid frame bridge was never commonly built; the Michigan State Highway Department employed it only occasionally and did not adopt it as a standard design.

The structural type experienced a brief resurgence in the 1930s for federal relief highway projects and, more recently, on the interstate highway system. The steel design was joined in the early 1920s by the concrete rigid frame, which was developed by Westchester County, New York. Both picturesque and practical, the flat or elliptically arched designs appealed to proponents of urban beautification. The Michigan State Highway Department adopted the concrete rigid frame

in the mid-1930s, labeling it a "new type of concrete structure" in its 1935-1936 Biennial Report. "While one of the most modern developments in bridge design, this type has passed the experimental stage and in some locations offers marked advantages over the simple span type."[105] Built in 1935, the first MSHD-designed rigid frame bridge was a two-span structure over Otter Creek south of Monroe. The highway department used concrete rigid-frame bridges on an occasional basis through the 1930s and early 1940s, particularly at urban grade separations. After World War II, the concrete rigid frame was superseded by prestressed concrete beams for use on most bridges and overpasses.

III. Significance

Rigid-frame highway bridges in Michigan may be eligible for listing in the National Register under Criterion A for their association with events that have made a significant contribution to the broad historical patterns of the country, the state, or the region. Specifically, this includes bridges that have played an important role in the development of the state's highway transportation system and, hence, in the exploration and settlement of the area. For example, a structure might be significant by its association with a particular route, such as the West Michigan Pike, or because it was built with assistance from the State Aid Bridge Fund or federal Depression-era relief programs. Bridges may, in addition, be eligible under Criterion B for their association with a significant person, as long as the "significant person" was not the designer or builder of the bridge. A bridge can be eligible by virtue of its designer or builder, but this falls under Criterion C. Indeed, most eligible bridges qualify under Criterion C as structures of engineering significance. This can encompass a broad range of considerations. For instance, a bridge can qualify under Criterion C as a well-preserved example of a common type, or as a unique example of an unusual type.

IV. Registration Requirements

The period of significance for concrete and steel rigid-frame highway bridges begins in 1890, the decade when steel bedstead truss bridges first found widespread use in Michigan. The period of significance ends in 1948, the fifty-year cutoff date maintained by the National Register.

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[105] 15 SHDBR (1935-1936), 57.

Alterations made during the period of significance may be considered part of the bridge's historic fabric. Integrity of the structure's historic materials and design is essential for any bridge to qualify for the National Register under any criterion. Since it is virtually impossible to move concrete rigid-frame bridges, integrity of location is a given. Steel bedstead structures have been moved by cutting them from their rigid-frame legs, but this seriously affects the structural integrity of the bridges. Concrete and steel rigid-frame bridges may be eligible for the National Register under Criterion B for their association with a significant person, but this is rare. Most often, these bridges will have significance under Criteria A or C.

Specific consideration for eligibility under Criterion A:

1. Early and/or prominent product of the Wayne County Road Commission: The Wayne County Road Commission began using the concrete rigid-frame design in the early 1930s, before the MSHD adopted this type. The commission used rigid-frame bridges extensively for grade separations for its parkway system. In most cases, railings and other components of these heavily used structures have since been altered. These alterations damage the structure's integrity under Criterion A, since the graceful design was a major reason why the commission developed rigid-frame bridges. The earliest well-preserved examples are significant.

2. Outstanding example of federal work relief programs of the Depression era: Federal work programs in the 1930s, particularly those funded by the Works Progress Administration, led to construction of a number of rigid-frame bridges in the state. The most significant display careful craftsmanship and creative design.

Specific considerations for eligibility under Criterion C:

1. Representative example of a rare structural type: Concrete and metal rigid-frame designs never dominated bridge construction. Many of the surviving examples have been altered by changes to railings, fascia, or structural systems, and display poor integrity as a result. Well-preserved and well-documented examples are significant.

2. Bridge with exceptional aesthetic merit: Most bridges built in the state are strictly utilitarian. Occasionally, however, a structure stands out by virtue of its design or because of the quality

displayed in its construction. The interrelationship of a bridge and its site can also have aesthetic value.

I. Name of Property Type

Concrete-arch and Stone-arch Highway Bridges

II. Description

Despite an abundance of stone in various forms through the state and an indigenous tradition of masonry construction, stone bridges were never built in abundance in Michigan. As a result, only a handful of stone masonry spans remain in place today, all of which employ short-span arches that spring from stone sidewalls. Most were a product of the federal relief programs in the 1930s.

Concrete arch bridges, on the other hand, were quite popular in Michigan in the first decades of the twentieth century. America's earliest reinforced concrete bridge, the Alvord Lake Bridge in San Francisco (1889), employed a filled spandrel arch configuration. Designed by early engineers as a durable and aesthetic alternative to steel truss construction, concrete arches were used primarily in major urban street crossings in Michigan before 1905. Two of the earliest and most notable examples of this were the West Michigan Avenue Bridge (1903) and the McCamly Street Bridge (1904), both in Battle Creek. Designed by city engineers and bridge contractors such as the Illinois Bridge Company, these medium-span structures typically featured elliptical, relatively low, arch profiles with solid sidewalls, earthen fill and architectural embellishment of the guardrails and spandrels.

MSHD published a standard plan for a reinforced concrete-arch bridge in its *Fifth Biennial Report* (1913-1914). MSHD first designed medium-length filled spandrel arches for county and township road crossings around 1910. The department built its first state arch -- a 50-foot span over Paint Creek in Kent County -- in 1914.[106] With steel scarce and expensive during World War I, the highway department used filled spandrel arches extensively in the late 1910s, sometimes combining them to form multiple-span bridges.

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[106] Melick, "Summary of the Work," 30-31; 5 SHDBR (193-1914).

In the 1921-1922 biennium, MSHD began using open spandrel arches for relatively short-span (100-foot) crossings. These aesthetically appealing structures were soon being employed for monumental urban spans. Whether reinforced or unreinforced, concrete arches consume a prodigious amount of materials and labor in their construction. Eventually, they were displaced as a structural type in Michigan by more efficient concrete and steel beam bridge configurations, and their use dwindled rapidly in the late 1920s.

III. Significance

Concrete- and stone-arch highway bridges in Michigan may be eligible for listing in the National Register under Criterion A for their association with events that have made a significant contribution to the broad historical patterns of the country, the state, or the region. Specifically, this includes bridges that have played an important role in the development of the state's highway transportation system and, hence, in the exploration and settlement of the area. For example, a structure might be significant by its association with a particular route, such as the West Michigan Pike, or because it was built with assistance from the State Aid Bridge Fund or federal Depression-era relief programs. Bridges may, in addition, be eligible under Criterion B for their association with a significant person, as long as the "significant person" was not the designer or builder of the bridge. A bridge can be eligible by virtue of its designer or builder, but this falls under Criterion C. Indeed, most eligible bridges qualify under Criterion C as structures of engineering significance. This can encompass a broad range of considerations. For instance, a bridge can qualify under Criterion C as a well-preserved example of a common type, or as a unique example of an unusual type.

IV. Registration Requirements

The period of significance for concrete- and stone-arch highway bridges begins in 1899, the construction date of the earliest documented example of a masonry-arch structure, the stone-arch Marshall Avenue Bridge over Rice Creek in Calhoun County. The period of significance ends in 1948, the fifty-year cutoff date maintained by the National Register. Alterations made during the period of significance may be considered part of the bridge's historic fabric. Integrity of the structure's historic materials and design is essential for any bridge to qualify for the National Register under any criterion. Since it is virtually impossible to move concrete and stone arch

bridges, integrity of location is a given. Concrete and stone arch bridges may be eligible for the National Register under Criterion B for their association with a significant person, but this is rare. Most often, these bridges will have significance under Criteria A or C.

Specific registration requirements under Criterion A:

1. Early and/or prominent product of the Michigan State Highway Department or the Wayne County Road Commission: The state highway department began designing concrete-arch bridges as early as 1908 and utilized this structural type often in the following decades. The Wayne County Road Commission also built a number of concrete-arch bridges during this period. The earliest well-preserved examples are significant.

2. Important crossing of a major early automobile route related to tourism: As more and more Americans acquired automobiles in the late 1910s and early 1920s, groups formed to promote Michigan's attractions. Road and bridge improvements were essential to lure automobile travelers to many of the state's scenic -- and less developed -- areas. Bridges specifically designed to foster the state's early twentieth-century tourism industry may be significant for this association.

Specific considerations for eligibility under Criterion C:

1. Example of a rare structural type: Despite the abundance of stone in Michigan, this material was rarely used to build bridges. Well-preserved and well-documented examples are significant.

2. Exceptional example of work by an important engineer, architect, or firm: Few companies specialized in concrete-arch construction in Michigan, with one noteworthy exception: Daniel B. Luten, a prominent Indianapolis bridge engineer whose patented design was used in several locations in Michigan.

3. Bridge with exceptional aesthetic merit: Most bridges built in the state are strictly utilitarian. Occasionally, however, a structure stands out by virtue of its design or because of the quality displayed in its construction. The interrelationship of a bridge and its site can also have aesthetic value.

I. Name of Property Type — Steel Stringer and Girder Highway Bridges

II. Description

Steel stringer bridges are the most rudimentary type of all-metal spans. Comprised of parallel rows of relatively shallow I-beams, steel stringer bridges began to replace short-span trusses for county roadway use in the late 1890s. Although built in abundance, few of these earliest I-beam spans remain in place in Michigan. After the turn of the century, small-scale steel stringer bridges were built in profusion throughout the state. A steel stringer span with an integrally poured concrete floor (called a "jack arch" deck) was among the earliest standard bridge types delineated by the Michigan State Highway Department in 1905-1906.[107] During the next biennium, the department developed a standard steel stringer design for bridges under 30 feet in length.[108] Since that time, the highway department has maintained the steel stringer as a standard design, updating the drawings and extending the span lengths periodically to reflect changes in the industry.

Steel beam bridges have enjoyed inconstant popularity with highway department engineers, depending largely on the price of steel at the time. "The use of steel beams should be discontinued altogether during war time," the department complained after World War I.[109] As prices fell, MSHD resumed its reliance on rolled steel beams for bridge construction in the 1920s. Perhaps more than other bridge types, steel stringer technology has depended closely on the capacity of rolling mills that provided the steel. Limited by the mills' output, early MSHD standards for I-beam bridges ranged from 8 feet to 45 feet. "When this type of structure was first put in use," MSHD stated in 1930, "rolled sections of sufficient strength were not available for spans greater than about 45 feet. It was necessary, therefore, to use relatively shallow fabricated deck girders for spans greater than forty-five feet. Rather recently, however, steel mills have improved their methods and are able to furnish rolled sections which, on proper spacing, are

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[107] 1 SHDBR (1905-1906), 105.

[108] 2 SHDBR (1907-1908), 208.

[109] 7 SHDBR (1917-1918), Appendix C.

suitable for spans up to sixty feet."[110] MSHD was able to increase these span lengths to 75 feet when the mills began to roll 33- to 36-inch deep beams in 1928. This longer span made steel bridges more economical than concrete, hence greatly increasing the number of long-span steel beam bridges built in Michigan in the 1930s. The trend has continued to the present. Today steel stringers represent by far the most populous structural type among Michigan's highway bridges.

Steel girders employ a technology similar to that of stringers, substituting two or more deep-profile beams for the row of relatively shallow stringers. With their more complicated bearing condition, beam arrangement and floor system connections, steel girder bridges mark a step up the technological scale from stringers. It was this increased complexity -- along with relatively heavy superstructural weight and the physical limitation of transporting heavy, factory-fabricated girders -- that limited the application of steel girders for highway use in America in the early twentieth century. The Michigan State Highway Department first delineated plans for a steel plate through girder bridge among its first standards in 1907-1908.[111] Intended for spans between 30 and 60 feet, girders were used with moderate frequency in the state between 1908 and about 1915.

The high cost of steel during and after World War I dampened the use of steel through and deck girders, however. By 1922 MSHD had dropped its through girder altogether and reduced the span range of its deck girder standard to only 10 feet between 55 and 65 feet. After the highway department redesigned its girder standard and began encasing the steel beams in concrete in 1927-1928, this structural type experienced a resurgence in the state for long-span crossings. Girders -- both encased and open, deck and through -- were used frequently for long-span bridges and grade separations in the 1930s. They continued to be used in the 1940s and 1950s but have gradually been overshadowed by prestressed concrete beam bridges.

III. Significance

[110] 13 SHDBR (1929-1930), 53.

[111] 2 SHDBR (1907-1908), 204.

Steel stringer and girder highway bridges in Michigan may be eligible for listing in the National Register under Criterion A for their association with events that have made a significant contribution to the broad historical patterns of the country, the state, or the region. Specifically, this includes bridges that have played an important role in the development of the state's highway transportation system and, hence, in the exploration and settlement of the area. For example, a structure might be significant by its association with a particular route, such as the West Michigan Pike, or because it was built with assistance from the State Aid Bridge Fund or federal Depression-era relief programs. Bridges may, in addition, be eligible under Criterion B for their association with a significant person, as long as the "significant person" was not the designer or builder of the bridge. A bridge can be eligible by virtue of its designer or builder, but this falls under Criterion C. Indeed, most eligible bridges qualify under Criterion C as structures of engineering significance. This can encompass a broad range of considerations. For instance, a bridge can qualify under Criterion C as a well-preserved example of a common type, or as a unique example of an unusual type.

IV. Registration Requirements

The period of significance for steel stringer and girder highway bridges begins in 1890, the decade when steel became widely available for bridge construction. The period of significance ends in 1948, the fifty-year cutoff date maintained by the National Register. Alterations made during the period of significance may be considered part of the bridge's historic fabric. Integrity of the structure's historic materials and design is essential for any bridge to qualify for the National Register under any criterion. The definition of "integrity" may vary, however, depending on the criterion. Because location is of primary importance under Criterion A, a structure will rarely qualify under this criterion if it does not remain on its original site. Location can also have significance under Criterion B, but the correlation is not as universal. When focusing on engineering significance under Criterion C, location is not necessarily a factor. However, steel stringer and girder bridges are rarely moved *in toto*. Material from a beam bridge may be salvaged and used for another structure, but this is often a different design. Because most of the beam structure is visible only from beneath the bridge, the survival of original railings, piers, and other details is of particular importance.

Specific considerations for eligibility under Criterion A:

1. Early and/or prominent product of the Michigan State Highway Department: In 1905-1906, the state highway department chose the steel-stringer bridge with a jack-arch deck as one of its first standard designs, and this utilitarian type gained quick popularity. The first MSHD deck girder designs date to about 1910. The earliest well-preserved examples are of these types are significant.

2. Important crossing of a major early automobile route related to tourism: As more and more Americans acquired automobiles in the late 1910s and early 1920s, groups formed to promote Michigan's attractions. Road and bridge improvements were essential to lure automobile travelers to many of the state's scenic -- and less developed -- areas. Bridges specifically designed to foster the state's early twentieth-century tourism industry may be significant for this association.

3. Outstanding example of federal work relief programs of the Depression era: Federal work programs in the 1930s, particularly those funded by the Works Progress Administration, led to construction of a number of metal stringer and girder bridges in the state. The most significant display careful craftsmanship and creative design.

4. Outstanding example of bridge construction related to the World War II defense industry: Most bridge building stopped during World War II, as steel and concrete were dedicated to the war effort. Only a few high-priority projects associated with the defense industry were rushed to completion during this period. Two related projects were particularly prominent: the Willow Run Expressway around the Willow Run Bomber Plant near Ypsilanti; and the Detroit Industrial Expressway, which transported Detroit's workers to Willow Run.

5. Outstanding example of early expressway/interstate highway development: Michigan was one of the nation's pioneers in developing high-speed, limited-access expressways, particularly in the Detroit area. These roads became the basis of the interstate highway system that was planned during World War II and developed in subsequent decades. High-volume intersections of these early expressways were a complex challenge for engineers. Of particular significance are the bridges associated with the first major interchange in Michigan which linked the Edsel Ford and John Lodge Expressways in Detroit. Some bridges associated with other key early expressway

intersections, as well as representative and monumental examples of early interstate bridge design, may also be significant.

Specific considerations for eligibility under Criterion C:

*1. **Earliest well-preserved example of the style:*** Because simple beam bridges were easy to construct, they became extremely common throughout Michigan by the early twentieth century. Although many survive, most have experienced varying degrees of alteration. Stringer and girder spans have often been widened and reinforced, harming their integrity. Also, older stringer bridges are sometimes scavenged for members that are recycled for use in new bridges.

*2. **Example of a rare structural type:*** This is especially applicable to metal through-girder bridges, which were only promoted by MSHD between about 1910 and 1921.

*3. **Bridge with exceptional aesthetic merit:*** Most bridges built in the state are strictly utilitarian. Occasionally, however, a structure stands out by virtue of its design or because of the quality displayed in its construction. The interrelationship of a bridge and its site can also have aesthetic value.

I. Name of Property Type Metal Truss Highway Bridges

II. Description

Beginning in the late 1870s, the pin-connected wrought iron truss was the roadway bridge of choice for medium- and long-span crossings in America. The bridge companies that proliferated through the Midwest and Ohio River Valley competed enthusiastically for county and township bridge business, marketing an ever-changing array of truss types through networks of regional sales representatives. Both patented in the 1840s, the Pratt and Warren web configurations -- with their variations and subtypes -- formed the basis for the overwhelming majority of all-metal trusses built in Michigan in the late nineteenth and early twentieth centuries. They were fabricated by such regional firms as the King Iron Bridge Company, the Wrought Iron Bridge Company, the Massillon Bridge Company and the Smith Bridge Company, all of Ohio, and in-state firms such as the Michigan Bridge Company and the Detroit Bridge and Iron Company.

The earliest bridges featured pinned and bolted connections in some combinations; these were largely superseded by all-pinned Pratt-type trusses in the 1880s. Because of their relatively quick erection and easy fabrication, pin-connected trusses dominated the market until portable riveting machines became widely available after the turn of the century. Riveted trusses began to overshadow pinned around 1910. Their use was encouraged by the Michigan State Highway Department, which published its first truss standard -- a rigid-connected Warren pony that ranged in span from 60 to 100 feet -- in the 1907-1908 biennium.[112]

MSHD updated its pony truss standards periodically to accommodate heavier traffic loads and wider roadways, but the agency maintained its reliance on the Warren configuration for short- and medium-span ponies through the 1930s and 1940s. For long-span pony trusses, MSHD developed the design for a rigid-connected Parker truss in the 1921-1922 biennium.[113] This atypically configured truss was used in the 1920s and 1930s as the standard for spans between

[112] 2 SHDBR (1907-1908), 204.

[113] 9 SHDBR (1921-1922), 13.

100 and 130 feet. For longer spans or trusses that required overhead bracing, MSHD engineers typically employed rigid-connected Pratt through trusses. The agency never developed a through truss standard, however, stating the same individualized-circumstances rationale that it used for concrete arches.

III. Significance

Metal truss highway bridges in Michigan may be eligible for listing in the National Register under Criterion A for their association with events that have made a significant contribution to the broad historical patterns of the country, the state, or the region. Specifically, this includes bridges that have played an important role in the development of the state's highway transportation system and, hence, in the exploration and settlement of the area. For example, a structure might be significant by its association with a particular route, such as the West Michigan Pike, or because it was built with assistance from the State Aid Bridge Fund or federal Depression-era relief programs. Bridges may, in addition, be eligible under Criterion B for their association with a significant person, as long as the "significant person" was not the designer or builder of the bridge. A bridge can be eligible by virtue of its designer or builder, but this falls under Criterion C. Indeed, most eligible bridges qualify under Criterion C as structures of engineering significance. This can encompass a broad range of considerations. For instance, a bridge can qualify under Criterion C as a well-preserved example of a common type, or as a unique example of an unusual type.

IV. Registration Requirements

The period of significance for metal truss highway bridges begins in 1875, the oldest known example known to survive in Michigan. The period of significance ends in 1948, the fifty-year cutoff date maintained by the National Register. Alterations made during the period of significance may be considered part of the bridge's historic fabric. Integrity of the structure's historic materials and design is essential for any bridge to qualify for the National Register under any criterion. The definition of "integrity" may vary, however, depending on the criterion. Because location is of primary importance under Criterion A, a structure will rarely qualify under this criterion if it does not remain on its original site. Location can also have significance under Criterion B, but the correlation is not as universal. When focusing on engineering significance

under Criterion C, the mobility of metal trusses is actually an important trait, since the structures were designed to be moved. Movement of a structure under this criterion might not necessarily detract from its historic integrity. On the other hand, structural integrity is of vital importance for those bridges considered under Criterion C. In engineering terms, a truss bridge is considered to be comprised of a group of distinct structural systems, rather than a single entity. These systems, in general order of importance under Criterion C, are the superstructure, the substructure, the floor and approach spans, if any. The super- and substructure of a bridge, for instance, may have retained a high degree of physical integrity, while the floor system and approach spans may have been altered, replaced, or even removed, and the bridge may still be considered eligible for registration. Loss of physical integrity may be mitigated by technological significance for unique or rare structural types.

Specific considerations for eligibility under Criterion A:

1. Early product of the Michigan State Highway Department: In 1907-1908, the MSHD issued its first standard truss design, a rigid-connected Warren pony with spans of 60 to 100 feet. In 1913, the state legislature required the state to design all trunk-line bridges, and to erect and maintain trunk-line bridges spanning 30 feet or more if the county or local government improved 3 miles of adjacent roads. Examples from this formative period are becoming rare, and may be significant.

2. Outstanding example of federal work relief programs of the Depression era: Federal work programs in the 1930s, particularly those funded by the Works Progress Administration, led to construction of a number of metal-truss bridges in the state. The most significant of these display careful craftsmanship and creative design.

Specific considerations for eligibility under Criterion C:

1. Earliest well-preserved example of a style: In the late nineteenth and early twentieth centuries, metal truss bridges displayed the wide diversity of designs available throughout the country. This variety began to disappear by the 1910s, in part due to the influence of standard designs distributed by the MSHD, although some unusual types continued to appear on the township level. In the 1921-1922 biennium, the MSHD developed an unusual rigid-connected

Parker pony truss. Truss bridges, often the target of today's bridge replacement projects, are becoming increasingly uncommon. Since cast- and wrought-iron bridge members were virtually eliminated by the availability of steel by the 1890s, these bridges are extremely rare and worthy of preservation.

2. Exceptional example of work by an important engineer, architect, or firm: This includes local, regional, and national companies and designers. Among the nationally and regionally prominent bridge building companies working in late nineteenth- and early twentieth-century Michigan were:

King Iron Bridge Company	Cleveland, Ohio
Wrought Iron Bridge Company	Canton, Ohio
Joliet Bridge & Iron Company	Joliet, Illinois
Massillon Bridge Company	Massillon, Ohio
Smith Bridge Company	Toledo, Ohio
Elkhart Bridge & Iron Company	Elkhart, Indiana
Illinois Bridge Company	Chicago, Illinois

Major firms based in Michigan include:

Michigan Bridge Company	Portland, Michigan
Price Brothers Construction Company	Lansing, Michigan
Peninsular Construction Company	Grand Rapids, Michigan
Willits Brothers Construction Company	Bay City, Michigan
Yeager Bridge & Culvert Works	Port Huron, Michigan

3. Monumental span: Long spans, particularly those in excess of 100 feet, were less amenable to standardization and sometimes stretched the limits of available technology. In addition, they were built much less frequently than shorter spans.

4. Bridge with exceptional aesthetic merit: Most bridges built in the state are strictly utilitarian. Occasionally, however, a structure stands out by virtue of its design or because of the quality

displayed in its construction. The interrelationship of a bridge and its site can also have aesthetic value.

NATIONAL REGISTER OF HISTORIC PLACES CONTINUATION SHEET

G. Geographical Data

The State of Michigan

H. Summary of Identification and Evaluation Methods

The Michigan Historic Bridge Inventory, which formed the basis for this Multiple Property Documentation, was undertaken in 1994 for the Michigan Department of Transportation (MDOT) with the cooperation of the Michigan State Historic Preservation Office, a division of Michigan Department of State's Bureau of History. The inventory was a sequel to a study completed in the early 1980s that focused primarily on identifying National Register-eligible bridges constructed before 1940 within four major categories: trusses, arches, concrete girders, and plate girders. The study initiated in 1994 broadened the scope to include all highway bridge types, and lengthened the time frame to examine all highway bridges built before 1955. The study inventoried and evaluated highway bridges currently in use on the state, county, and city road systems. By inventorying roadway bridges on a statewide basis, the study provided a database and the contextual background by which individual structures could be evaluated for historical and technological significance. This information will aid long-range policy and funding decisions at the outset of the planning process and allow enlightened, streamlined review of proposed maintenance, rehabilitation, and replacement projects. Additionally, it will help to guide mitigation measures for construction projects in the future which affect eligible structures.

The Michigan Historic Bridge Inventory project began with an orientation workshop in Lansing attended by the Historic Bridge Advisory Committee, which included representatives of MDOT, the Federal Highway Administration (FHWA), and the Bureau of History. The session established a consensus about project goals and procedures.

Preparation of the historical contexts required extensive research at a number of repositories, including MDOT's files and library; university, college, and public libraries around the state; and city and county engineer's offices. Contextual information relating to Criteria A and C provided parameters for sorting the bridge database to identify a cross-section of potentially eligible bridges which merited field survey. The survey list was refined by a review of photographs of every bridge built prior to 1956. This review eliminated bridges with clear integrity problems, and added bridges to the list with aesthetic features which could not be identified by the computer database. In order to ensure that no bridge was arbitrarily removed from the survey sample, bridges were included in the survey if no photograph was available for analysis. A total of 1,005 bridges was included in the survey sample. Contextual information and justification for bridge selection, as

well as lists of bridges included in and excluded from the survey, were contained in a June 1995 report entitled "Michigan Bridge Inventory: The Survey Sample."

Surveyors visited every bridge in the survey sample, recording each bridge with field notes, 35mm black-and-white photographs, and 35mm color slides. They also completed additional research at county road commissions, county courthouses, county and local historical societies, city engineer's offices, and public libraries. Some township records were reviewed by the surveyors; in other cases, townships were contacted to request information about specific bridges by mail.

Inventory forms were prepared for each bridge. The forms included technical specifications (structure type, maximum span length, deck and roadway width, year built, etc.), as well as a narrative description and statement of significance. A photograph of the structure was attached to each form. The bridges were then assessed to determine National Register eligibility. A preliminary list of structures recommended for National Register nomination was presented to the Historic Bridge Advisory Committee in January 1997. Based on comments at that meeting, the list was adjusted. It was subsequently approved by the SHPO. MDOT and SHPO then proceeded to develop an historic bridge management plan and programmatic agreement for the state's National Register-eligible bridges.

Charlene K. Roise served as principal investigator for the project for Hess, Roise and Company; Chad Perkins and Shawn Rounds assisted with field research and survey, with additional research and assistance provided by Cynthia de Miranda, Ann Gaasch, Denis Gardner, and Jeff Hess. Clayton B. Fraser was the principal investigator for Fraserdesign, with research and survey assistance from Jennifer Strand and Karla Ogilvie.

I. Major Bibliographical References

Books and Published Reports

Dunbar, Willis F., and George S. May. *Michigan: A History of the Wolverine State.* Grand Rapids, MI: William B. Eerdmans Publishing Company, 1965, rev. ed. 1980.

Dunbar, Willis F. *Michigan Through the Centuries.* New York: Lewis Historical Publishing Company, 1955.

Hines, Edward N. *20 Years of Road Construction in Wayne County, Mich.* Detroit: Detroit Automobile Club, [1926].

Hyde, Charles K. *Detroit: An Industrial History Guide.* Detroit: Detroit Historical Society, 1980.

_____. *Historic Highway Bridges of Michigan.* Detroit: Wayne State University Press, 1993.

Proceedings of the Short Course in Highway Engineering. Ann Arbor, MI: University of Michigan, 1915.

Report of Engineers Committee on Grade Separations, Milwaukee Junction Manufactures Association; Presented to Cities of Detroit, Highland Park and Hamtramck. Detroit: Rapid Transit Commission, 1930.

Rogers, Frank F. *History of the Michigan State Highway Department, 1905-1933.* Lansing: n.p., 1933.

Rose, Mark H. *Interstate: Express Highway Politics, 1939-1989.* Lawrence, KS: University Press of Kansas, 1979; revised edition, University of Tennessee Press, 1990.

Seely, Bruce E. *Building the American Highway System: Engineers as Policy Makers.* Philadelphia: Temple University Press, 1987.

Articles

"All Grade Crossings must Go." *Detroit Free Press*, 6 July 1930.

"Asks Public Support for State Highways." *Michigan Roads and Construction* 36 (21 December 1939): 2.

"Bridge Construction in Michigan during 1925." *Michigan Roads and Pavements* (December 1925): 22.

"Bridge over Cheboyganing Creek on River Road." *Michigan Roads and Pavements* 24 (20 October 1927): 5.

"Colorful Ceremonies Mark Expressway Opening." *Michigan Roads and Construction* 42 (15 March 1945): 3.

"The Construction of 10 mi. of Improved Roadway in Monroe County, Michigan." *Good Roads* 53/15 (13 April 1918): 205.

Cox, John J. "Highway Bridges and Culverts." *Michigan Roads and Forests* 5 (March 1910): 7-8.

Dow, Walter O. "Effect of the Tourist Business on the County Road System." *Michigan Roads and Construction* 45 (1 April 1948): 28.

"Federal Highway Plans are Drawn." *Battle Creek Enquirer News*, 3 August 1947.

"Fort Custer Highway to be First U.S. Military Road." *Michigan Roads and Construction* 37 (19 September 1940): 3.

"Forty Million Tourists to Spend Three and One-third Billions [in] 1927." *Michigan Roads and Pavements* 24 (31 March 1927): 4.

"Governor says Tourist Industry is One of State's Greatest." *Michigan Roads and Pavements* 24 (24 November 1927): 10.

"Graduate Courses in Highway Engineering at the University of Michigan." *Good Roads* 56/18 . 8 October 1919): 176.

"Handicap to Touring in Upper Peninsula." *Michigan Roads and Forests* 17 (June 1921): 8.

Harding, George A. "World's Largest Bomber Plant under Construction by Ford Motor Company." *Michigan Engineer* 60 (Summer 1941): 8.

"Highway Department Plans Letting Despite Heavy Fire Losses." *Michigan Roads and Construction* 48 (15 February 1951): 2.

"Highway Steel Shortages Delay to Current Michigan Road Program." *Michigan Roads and Construction* 48 (23 August 1951): 2.

"Highways to War Plants Feature 1942 Program." *Michigan Roads and Construction* 39 (31 December 1942): 6.

"Houghton Co. Benefits from WPA Road Program." *Michigan Roads and Construction* 33 (12 November 1936): 46.

Kennedy, G. Donald. "The Access Highway System at Willow Run." *Michigan Roads and Construction* 39 (15 October 1942): 3-4.

_____. "Military Highways of Michigan." *Proceedings of the 27th Annual Highway Conference, February 19 - 21, 1941* (Ann Arbor: University of Michigan, [1941]).

"Many Dangerous R.R. Crossings Eliminated by Highway Dept." *Michigan Roads and Pavements* 21 (10 April 1924): 3.

McMonagle, J. Carl. "Effects of the Tourist Business on the Michigan Highway System." *Michigan Roads and Construction* 45 (1 April 1948): 24.

Melick, C.A. "Standard Bridge Practice of the Michigan State Highway Department." *Michigan Roads and Pavements* 20 (29 March 1923): 9.

"Michigan Bridges Commended by U.S. Bureau of Public Roads." *Michigan Roads and Pavements* 25 (28 June 1928): 6.

"Michigan's Greatest Road System Cost $26,000,000." *Michigan Roads and Construction* (15 March 1945): 4.

"Michigan Represented in ARBA Convention Program." *Michigan Roads and Construction* 39 (30 January 1941): 2.

"Michigan State Highway Department in New Quarters." *Good Roads* 13 (3 March 1917): 148.

Millard, Lester W. "Design Features of Willow Run Structures." *Michigan Roads and Construction* 39 (15 October 1942): 8, 10.

Morrison, Roger L. "The History and Development of Michigan Highways." *University of Michigan Official Publication* 39 (6 April 1938): 1-16.

"Mr. Rogers suggests Changes in Townsend Bill." *Michigan Roads and Forests* 16 (December 1919): 8.

"New Highway Booms Resort Area in Berrien County." *Michigan Roads and Pavements* 25 (26 April 1928): 10.

"New Standard Specifications for State Road Work Out April 15." *Michigan Roads and Construction* 47 (13 April 1950): 2.

"'No Mean Business' Flint Men Told of Tourist Trade." *Michigan Roads and Pavements* 22 (5 February 1925): 3.

"Pave M-14 to the Straits." *Michigan Roads and Pavements* (January 1925): 11.

"Post-War Plans Discussed at Highway Conference." *Michigan Roads and Construction* 39 (19 February 1942): 2.

"Progress in All Fields Reported by Highway Department." *Michigan Roads and Construction* 38 (2 January 1941): 2.

"Progress Report, Chicago-Detroit Expressway." *Motor News*, March 1948, 15.

"Promoting Tourist Travel." *Michigan Roads and Forests* 16 (May 1920): 2-3.

"'Rainbow Trail Association' to Boost Muskegon-Saginaw Highway." *Michigan Roads and Pavements* 25 (28 June 1928).

"Road Building Course at the University of Michigan." *Good Roads* 56/18 (3 September 1919): 125.

Rogers, Frank F. "Defects in Michigan Roads and How to Improve Them." *Michigan Roads and Forests* 5 (March 1908): 5.

_____. "Notes on Some Early Michigan Roads." *Michigan Roads and Pavements* 22 (December 1925): 7-8.

_____. "Roads Built with the Fifty Million Dollar Bond Issue." *Michigan Roads and Pavements* 22 (19 February 1925): 3.

_____. "Twenty Years Work by the State Highway Department." *Michigan Roads and Pavements* (January 1925): 5.

_____. "Work of State Highway Department in 1919." *Michigan Roads and Forests* 16 (December 1919): 8.

"St. Clair County Road and Bridge Program Summarized." *Michigan Roads and Construction* (28 December 1939): 22.

"St. Clair County to Build Three PWA Bridges." *Michigan Roads and Construction* 33 (12 November 1936): 42.

"Sees Michigan on Verge of Boom because of its Roads." *Michigan Roads and Pavements* 21 (9 October 1924): 3.

Shuptrine, H.A. "Grade Separations." *The Michigan Engineer* 40 (March 1931): 16.

_____. "The Progress of Development of Limited Expressways in Detroit Metropolitan District. *The Foundation* 9 (January 1945): 3-5.

"Six Million Being Spent on Shoreline Roads." *Michigan Roads Construction* 32 (17 October 1935): 44.

Smith, Leroy C. "Wayne County Road Commission Activities, Plans." *Michigan Roads and Construction* (15 March 1945): 8.

"State Near End of First Post-war Highway Program." *Michigan Roads and Construction* 45 (30 December 1948): 2.

"State Officials Eye N.Y. Road System." *Detroit Free Press*, 23 August 1938.

"$3,000,000 State Highway-WPA Program Sought." *Michigan Roads and Construction* 38 (17 April 1941): 3.

Thomas, D.A. "Large Mileage to be Added this Year to Michigan's Improved Roads." *Good Roads* 51/13 (31 March 1917): 199-200.

_____. "Michigan's Trunk Line System." *Good Roads* 51/13 (16 June 1917): 350-351.

Tucker, E.D. "Good Roads have Opened the Way to Upper Peninsula's Splendid Attractions." *Michigan Roads and Pavements* 22 (January 1925): 70.

Van Wagoner, Murray D. "The Michigan Highway Program and the Tourist Industry." *Michigan Roads and Construction* 32 (17 October 1935): 10.

"WPA Surfacing Program is sought by Iosco County." *Michigan Roads and Construction* 32 (17 October 1935): 44.

"Wolverine Paved Way Across State." *Michigan Roads and Forests* 16 (July 1920): 9-10.

Unpublished Sources

Cruise, J.D. to J. Carl McMonagle, Michigan State Highway Department, memo, 21 July 1942, in Record Group 58-5-A, Box 4, Michigan DOT Collection, Michigan State Archives, Lansing.

Kennedy, G. Donald. Speech at dedication Willow Run access roads, 12 September 1942, carbon of typed copy in Box 1, G. Donald Kennedy Collection, Bentley Historical Library, University of Michigan, Ann Arbor.

Moses, Robert, to G. Donald Kennedy. Typed report, 4 April 1942, Box 3, Sidney D. Waldon Papers, Burton Historical Collection, Detroit Public Library.

Van Wagoner, Murray D. Papers. Bentley Historical Library, University of Michigan, Ann Arbor.

Government Documents

"Carrying Out the Master Plan." Report by Advisory Committee to Detroit Common Council, submitted 2 October 1925.

Michigan State Highway Department. *Biennial Reports.* 1(1905-1906); 2(1907-1908); 3(1909-1910); 4(1911-1912); 5(1913-1914); 6(1915-1916); 7(1917-1918); 8(1919-1920); 9(1921-1922); 10(1923-1924); 11(1925-1926); 12(1927-1928); 13(1929-1930); 14(1931-1932); 15(1933-1934); 16(1935-1936); 17(1937-1938); 18(1939-1940); 19(1941-1942); 20(1943-1944); 21(1945-1946); 22(1947-1948); 23(1949-1950); 24(1951-1952); 25(1953-1954).

_____. *A Comprehensive Plan of Motorways for Detroit.* N.p., 1941.

_____. *Detroit Expressways.* N.p., 1953.

_____. *Detroit Expressways.* N.p., 1954.

_____. *Highway Needs in Michigan: An Engineering Analysis.* A report prepared for the Michigan Good Roads Federation and the Highway Study Committee. N.p., 1948.

_____. "Military Access Roads in Michigan: Notes and Data Concerning Immediate and Tentative Future Needs." Report, June 1941. Box 3, G. Donald Kennedy Collection, Bentley Historical Library, University of Michigan, Ann Arbor.

_____. "Preliminary Report on Michigan's Plan for Highways." Typed report, 1934.

_____. *Street Traffic, City of Detroit, 1936-1937.* N.p.: Michigan State Highway Department, 1937.

_____. "Detroit-Willow Expressway." N.p., [ca. 1943]. Box 3, Record Group 58-5-A, MDOT Collection, Michigan State Archives, Lansing.

Oakland County, Michigan. Planning Commission. *Wagon Roads to Expressways.* N.p.: Oakland County Planning Commission, 1955.

U.S. Federal Works Agency. *Final Report on the W.P.A. Program, 1935-43.* Washington, D.C.: Government Printing Office, 1943.

_____. *Report on the Progress of the WPA Program.* Washington, D.C.: Government Printing Office, 1941.

Wayne County, Michigan. Board of Wayne County Commissioners. *Annual Reports to the Board of Supervisors of Wayne County.* 1(1906-1907); 3(1908-1909); 4(1909-1910); 5(1910-1911); 6(1911-1912); 7(1912-1913); 9(1914-1915); 10(1915-1916); 11(1916-1917); 12(1917-1918); 14(1919-1920); 15(1920-1921); 16(1921-1922); 17(1922-1923); 18(1923-1924); 19(1924-1925); 20(1925-1926); 21(1926-1927); 22(1927-1928); 23(1928-1929); 24(1929-1930); 25(1930-1931); 26(1931-1932); 27(1932-1933); 28(1933-1934); 29(1934-1935); 30(1935-1936); 31(1936-1937); 32(1937-1938); 33(1938-1939); 34(1939-1940); 35(1940-1941); 36(1941-1942); 37(1942-1943); 38(1943-1944); 39(1944-1945); 40(1945-1946); 41(1946-1947); 42(1947-1948); 43(1948-1949); 44(1949-1950); 45(1950-1951); 46(1951-1952); 47(1952-1953); 48(1953-1954); 49(1954-1955); 50(1955-1956).

_____. *Davison Limited Highway.* N.p., 1951 reprint.