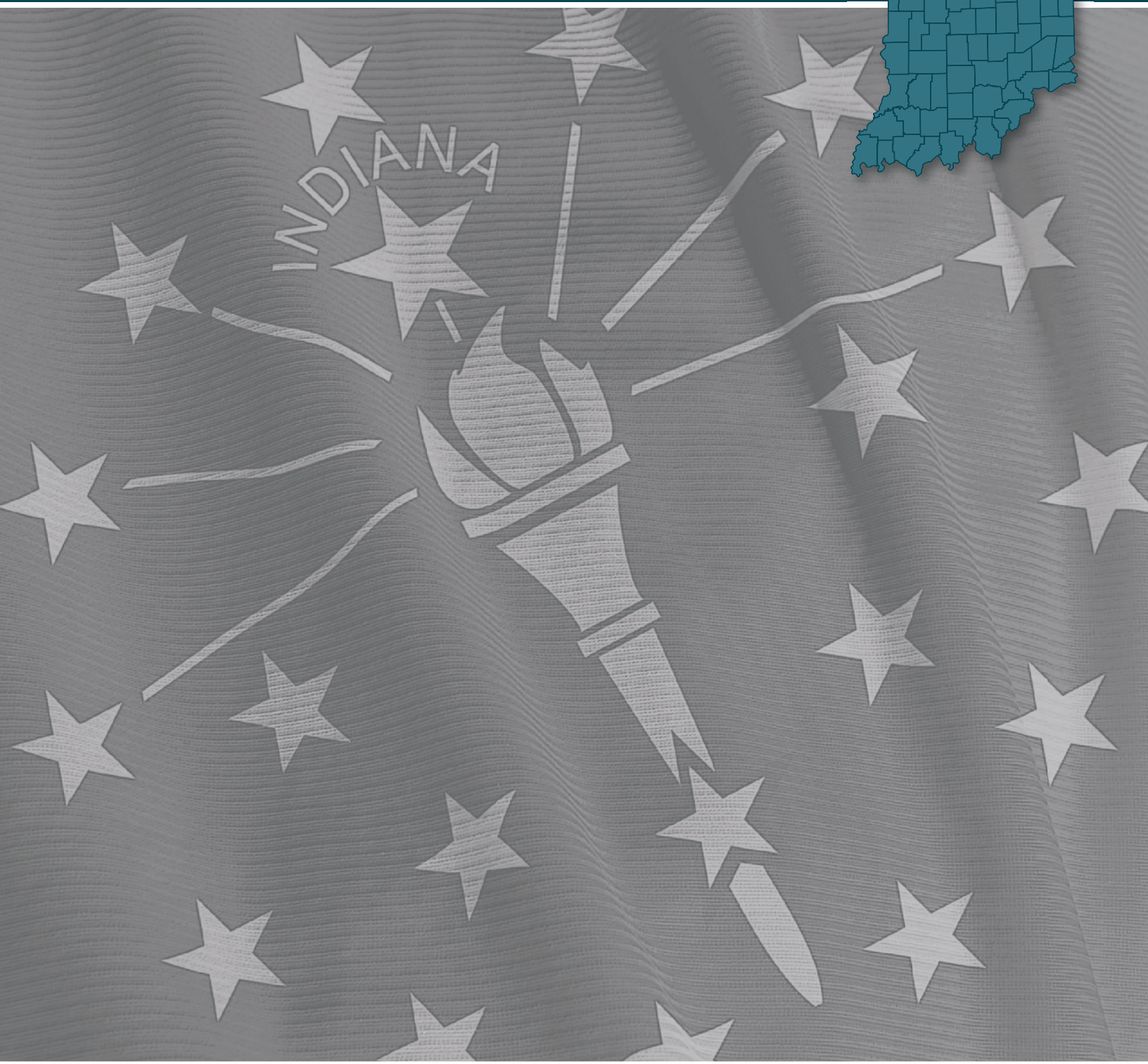
ASCE
INDIANA SECTION

2010 REPORT CARD
FOR INDIANA'S INFRASTRUCTURE



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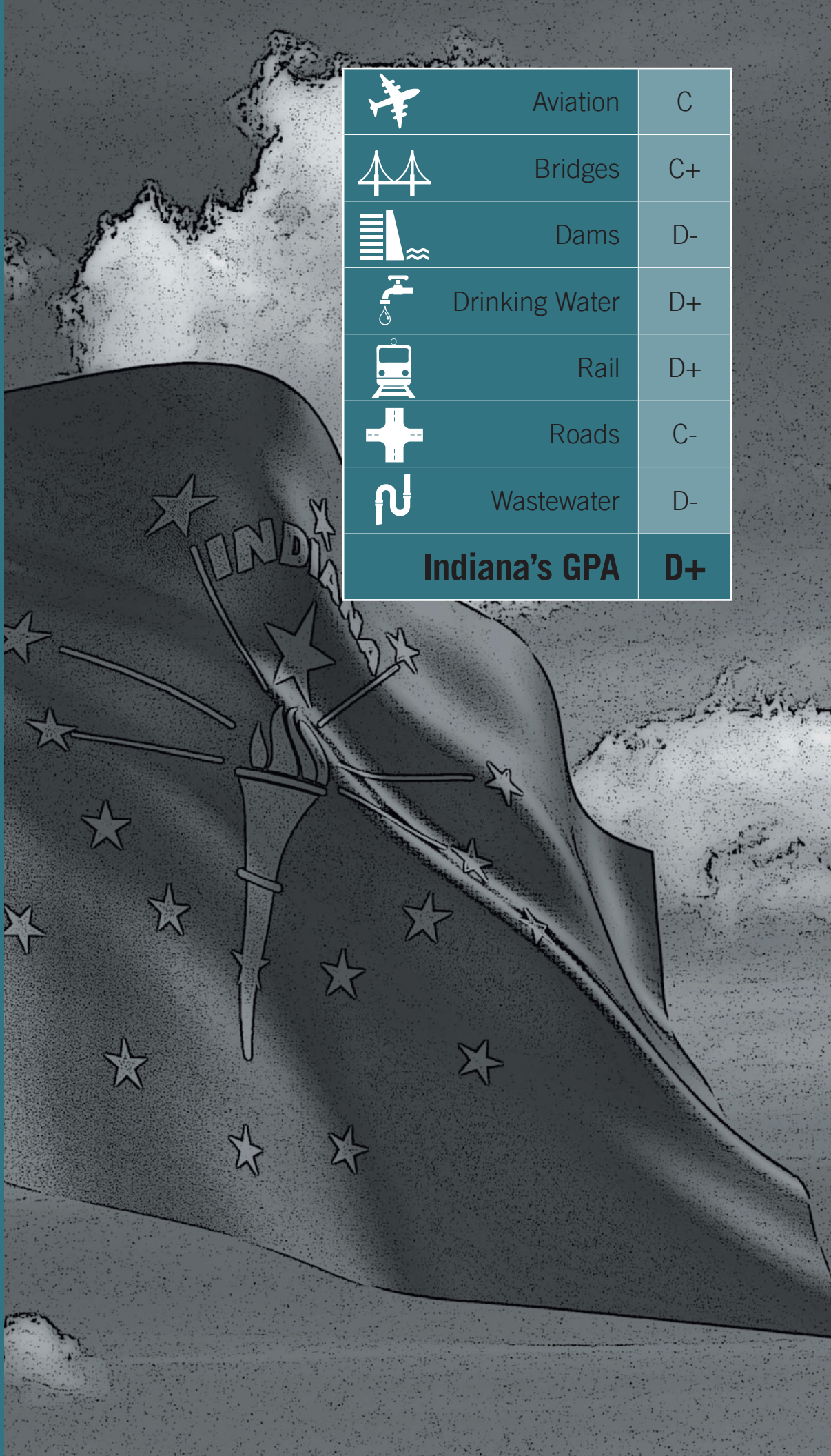
Executive Summary and Acknowledgements

The *2010 Report Card for Indiana's Infrastructure* grades seven categories of infrastructure. The 2010 report is the first time such a report has been compiled for the state of Indiana.

Indiana's cumulative grade for infrastructure is a D+. This grade is half a letter grade higher than the cumulative grade of a D for the *2009 Report Card for America's Infrastructure*. Not all categories face the same problems or severity of issues, but every category does share severe funding restraints and recurring maintenance issues.

EXECUTIVE SUMMARY



Aviation	C
Bridges	C+
Dams	D-
Drinking Water	D+
Rail	D+
Roads	C-
Wastewater	D-
Indiana's GPA	**D+**

Aviation

Airports in Indiana are facing enormous infrastructure decay. With reduced funding sources and more competition for discretionary funding sources, Indiana's airport leaders will need to turn to new funding techniques if they are to continue to provide an efficient and effective means of air travel that will meet the needs in the future.

Bridges

Indiana has 18,483 bridges on its transportation system, with 5,612 maintained by the state. Of these, 4,091 are considered deficient. Although the number has dropped over the last 20 years, more than one in five Indiana bridges are still deficient. All three funding sources (federal gas tax, state gas tax, and state property tax) produce decreased revenues from previous years. A significant increase in funding will be required to maintain and improve the condition and safety of Indiana's bridges. The estimated cost to perform the necessary work on Indiana's bridges is over $3.5 billion.

Dams

Indiana has 1,088 registered dams, of which 240 are classified as high hazard, 249 as significant hazard, and the remaining 599 dams as low hazard. Over 50 percent of these dams are in need of remediation, with approximately 70 percent of the 1,088 dams being owned by private entities. At an estimated $750,000 per deficient high hazard and significant hazard dam, the current cost for upgrades is approximately $180 million. In addition, only 15 percent of Indiana's high-hazard dams have Emergency Action Plans (EAPs), which is far below the national average of 50 percent. Currently, no funding opportunities are available for private dam owners to perform needed dam safety projects.

Drinking Water

Indiana has adequate supplies of source water for its drinking water systems. However, most of the drinking water distribution systems in Indiana were installed in the years following World War II and are at or very near the end of their useful life. In addition, in 2008 approximately 10 percent of the 4,263 public water systems in Indiana had violations of maximum contaminant levels set by regulatory agencies, with most being violations of number of water-borne pathogens. To fund these projects, many communities apply for SRF funds. In 2010, $282 million in drinking water projects were submitted to SRF competing for $22 million in available funding. Some communities try to fund projects in other ways, including unpopular methods such as raising rates, or deciding not do the project at all due to lack of available funding and allow the system to decay further.

Rail

Ranking fourth in the nation in terms of the number of railroads and ninth among states in total rail mileage, Indiana is the cross-railroads of America. In 2007, more than 306 million tons of freight rolled over Indiana's rails—the ninth highest in the country. In 2008 nearly 125,000 intercity passengers were served by Amtrak, and commuters made 4.3 million passenger trips on Northern Indiana Commuter Transportation District (NICTD) in 2007. Looking 20 years into the future, the state's primary rail corridors will be at capacity without significant investment in infrastructure. Investments of $4.3 billion and $416 million in Indiana's Class I and all other classes of railroads, respectively, will be required to keep pace with economic growth and meet the forecast demand by 2035.

Roads

Indiana has roughly 95,500 road miles, of which approximately 11,200 miles are state owned and maintained. While state-owned roads only account for 10 percent of the total road miles, 54 percent of the vehicle miles traveled in the state occur on these roads. According to the FHWA, 75 percent of the $580 billion of freight that traverses Indiana does so through Indiana's roadways. The funding needed to update Indiana's local roads to current standards is approximately $3.5 billion, with a shortfall of around $715 million per year for annual maintenance needs. State-owned roads will require an additional $21.8 billion from 2016 to 2030 for maintenance and expansion, with Major Moves funds covering the needs from the present through 2015. Even with Indiana's influx of money from the Major Moves initiative, funding levels at both the state and local levels continue to be a challenge in addressing the substantial need to improve road conditions and maintain Indiana's economic viability.

Wastewater

Indiana has 108 combined sewer communities, which is 12.5 percent of the communities nationally. The 14 largest of these communities in Indiana discharged a combined 26 billion gallons of combined sewage into state waterways in a 12-month period spanning 2007-2008. At least ten of these combined sewer communities have long-term control plans that exceed $120 million in combined sewer system investments. In addition to these investments, many of the remaining sanitary sewer systems in Indiana are reaching the end of their useful life or being required to upgrade facilities due to more stringent regulatory requirements on treated wastewater. In order to fund these projects, many communities apply for SRF funds. However, in 2009 $1 billion worth of wastewater and combined sewer projects were submitted to SRF competing for only $447 million in funding.

Methodology

The *Report Card* advisory council comprises five engineers who lead the seven different categories. The advisory council is led by two engineers who oversee the general organization and schedule of the report. Each of the seven categories has a champion leading the efforts of research and authorship. In total, 30 engineers have worked as researchers, authors, technical advisors, and champions on the report. For over a year, each category worked to analyze the most current and available data and conditions within each of the seven categories. The individual category groups assessed the data with technical advisors and industry leaders to determine a grade. The grades were then brought before ASCE National and the *Report Card* advisory council for discussion and concurrence.

In assigning the grades, the advisory council considered several criteria, including capacity, condition, operations and maintenance, funding, public safety, and resilience. However, not every criterion was applicable to each category. The grade determination was based on publically available data and the subjective judgments of the engineers working as authors, technical advisors, and advisory council members.

Report Card Structure

The American Society of Civil Engineers and its members are committed to protecting the health, safety, and welfare of the public and, as such, are equally committed to improving the infrastructure of Indiana and the nation. To achieve that goal, the *Report Card* depicts the condition and performance of Indiana's infrastructure in the form of a school report card. Letter grades have been assigned on physical condition and needed fiscal investments for improving each of the seven categories.

Discussion of funding needs and mechanisms are included in each of the categories. Due to the wide variety of funding mechanisms and varying life cycles of the respective infrastructure categories, a five-year investment need for the entire state was not feasible to calculate. It will become evident, as one reads each category, that funding continues to be a major hurdle for improving Indiana's deteriorating infrastructure.

At the end of each category, recommendations will be provided that ASCE believes can serve as mechanisms to foster discussion, educate the public and legislators, and ultimately lead to solutions for Indiana's infrastructure concerns.

We appreciate all the time and effort the team has put in to bring this report card to fruition. Thanks to everyone for your contributions.

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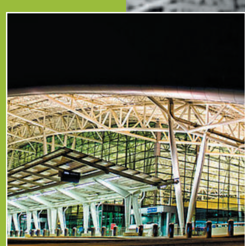
ASCE
INDIANA SECTION

Infrastructure Report Card

Aviation	C
Bridges	C+
Dams	D-
Drinking Water	D+
Rail	D+
Roads	C-
Wastewater	D-
Indiana's GPA	**D+**



AVIATION

GRADE: C

Introduction

Aviation in Indiana, particularly the general aviation community, is faced with declining funding support in 2010, with not much relief on the horizon for 2011 or 2012. Failure by the United States government to successfully pass a new reauthorization bill has severely hindered the ability of the Federal Aviation Administration (FAA) to develop grants due to short-term extensions and continuing resolutions of the 2007 bill.

Indiana has 107 public-use airports[1], of which 69 are identified by the Indiana Department of Transportation (INDOT) as being of 'statewide importance' to the Indiana air transportation system and are therefore included in the Indiana State Aviation System Plan (ISASP). Of these 69 airports, 67 are identified by the FAA as being of significant importance to the National Air Transportation System and are included in the FAA's National Plan of Integrated Airport Systems (NPIAS).

Indiana funds airport development through the INDOT Airport Development Fund program. The program focuses on the 69 ISASP public-use airports and pursues a program that fosters airport development, with special emphasis on improvement of airports as an economic development tool.

The five types of funding sources for projects, when funding is available, are as follows[2]:

Type I – Federal: This funding resource is available for all NPIAS airports, and the level of funding varies by the type of airport (primary, reliever, commercial service, or general aviation airports). Federal grants historically provide for up to 95 percent of a project's cost. Federal programs include federal discretionary funds and federal primary entitlement and non-primary entitlement funds[3].

Type 2 – State/Local: While federal funding sources provide for 95 percent of a project's cost, the remaining five percent must be borne by the state and/or local sponsor. Historically, the state and local sponsors equally split the five percent; however, recent activity at the state level indicates a decreased level of state support, temporarily reducing the state match to 1.25 percent, which will require a higher local allotment.

Type 3 – State Apportionment: State apportionment is a source of funding provided by the FAA for each state for use on airport development projects at non-primary commercial service, general aviation, and reliever airports. The INDOT Office of Aviation identifies projects for the use of these funds with the approval of the FAA. The amount of annual funding is based on each state's land area and population.

Type 4 – State/Local Match: In addition to matching federal funds, state/local match is another authorized funding program, but it has not received state general fund appropriations since 2000. Although the INDOT Office of Aviation is not currently soliciting applications for this funding source, Indiana airports were asked to identify potential projects that could be eligible in the future under this program in their five-year Capital Improvement Plan (CIP) update. In the past, the state provided 50 percent of the funding for this program, with the other 50 percent provided by the local sponsor.

Type 5 – Aviation Loan Fund Projects: This is another state funding source for Indiana airports; however, the INDOT Office of Aviation is not currently soliciting requests for projects under this program.

Conditions

- Pilots and business users surveyed during development of the latest ISASP on the condition and adequacy of Indiana's airports responded with an overall good rating.[4] Those surveyed were asked to base their responses on perception of Indiana's airports having sufficient runway length; sufficient taxiway and/or apron availability; and sufficient pavement conditions, including runway, taxiway, and apron pavements.
- There are only a few geographic regions in Indiana with significant amounts of land area that are not within a 20-mile radius of an existing ISASP facility or 30-minute drive time.[4]
- Indiana airports currently generate almost $5.3 billion in economic activity and support more than 17,000 jobs, which produce more than $640 million in wages.[7]
- The Aviation Association of Indiana (AAI) estimates the state collects a minimum of $10 million in sales tax revenues from aviation, including sales tax of aircraft, fuel, and rentals.[7]
- Aviation is the only mode of transportation under INDOT that does not have a dedicated funding source.[7] Today, INDOT only funds projects that receive federal funding; therefore, the state's aviation needs that are not seen as a priority by the FAA are not addressed.[7]
- Currently, Indiana invests slightly more than $1 million per year to match the FAA program, or $15,000 per airport per year. The national average is $90,000 per airport per year.[7]
- The current property tax bill revisions and caps will cause local municipalities, who continue to struggle with a 2.5 percent match, to continue to struggle with an increased match of a federal grant at 3.75 percent for 2010 and 2011. It is anticipated that a number of general aviation projects will likely be postponed or not undertaken until local or state funding can be secured. Further conditions reveal revenue may be lost and job sustainability and growth may be limited.[6]
- Indiana airports, specifically general aviation airfields, supported by local municipalities are facing significant cuts in funding due to the proposed property tax bill revisions and the current economic climate. As a result, lower priority efforts, such as routine maintenance projects, are being cut from annual budgets to afford higher priority improvements.

- As the FAA continues to decrease its inventory of FAA-maintained navigational aid facilities, such as instrument landing systems and precision approach path indicators, airports are faced with either self-maintenance or relying on new technologies to provide similar precision and visibility minimums without the expense of towers and electronics. This is mostly provided in aircraft electronic upgrades over the years, which rely primarily on the global positioning system (GPS) platform.
- Obstructions, such as trees, cell towers, power poles, buildings, and detention/retention ponds, constructed near airports on land not owned by airports, continue to cause safety issues for airports.
- Airports will face many unfunded mandates, such as Safety Management System adoption, development of Wildlife Control Plans, and new requirements to capture 20 percent of deicing fluids. Since no funding source exists outside of each individual airport for these mandates, each airport will need to find a way to pay for them.

Future Needs

According to the 2009-2013 NPIAS, Indiana currently has four primary, seven reliever, and 56 general aviation airports. Each airport maintains a CIP that identifies and prioritizes airfield improvement/development projects over a five-year span and is updated annually. The CIP provides the basis for determining the annual Airport Improvement Program (AIP) grants to fund these improvements. Indiana has identified the following funding needs for the next five years:

AIRPORT TYPE	DEVELOPMENT NEEDS
Primary	$115,175,020
Reliever	$57,767,964
General Aviation	$454,654,307
Total	**$627,597,291**

With the needs established, the FAA (partnered with the INDOT Office of Aviation) programs funding for improvements identified in the CIP based on priority and ranking. Federal (FAA), state (INDOT), and local stakeholders provide the funding components for a typical AIP project. The FAA funds 95 percent of all AIP grants, leaving the remaining five percent to be split among the state and local constituents. In the past, the split was equal between state and local, with each party responsible for 2.5 percent. For 2010 and 2011, shortfalls in the state budget have reduced the state's ability to participate by 1.25 percent, increasing the local participation to 3.75 percent. For Indianapolis International Airport, the Indianapolis Airport Authority does not participate with the State for Local share, and its share is modified from 5 percent to 25 percent and 20 percent for noise abatement grants due to the level of PFC funding received by the Authority on an annual basis.

Over the next five years, the following funding levels are forecasted as follows:

FUNDING TYPE	FORECASTED FUNDING
Primary Entitlement	$71,740,742*
Passenger Facility Charge (PFC) - Primary Airports Only	$105,382,625*
Non-Primary Entitlement (Includes Reliever and General Aviation)	$45,750,000
State Appointment	$20,862,020
Total	**$243,735,387**

* Primary Entitlement Funds and PFC funds are based on emplanements and cargo activities at each primary airport. These values are fluid and adjust each fiscal year.

In an effort to overcome the shortfall, INDOT and local stakeholders continually work to position themselves for annual discretionary funds and establish annual goals for discretionary funds. In fact, for fiscal years 2008 and 2009, INDOT was not only able to meet its discretionary goal but it also provided additional funding to eligible projects that would have otherwise gone unfunded. Below is a summary of discretionary funding goals established by INDOT for 2009-2013:

DISCRETIONARY TYPE	GOAL
Primary	$128,929,000
Non Primary (Includes Reliever and General Aviation	$94,000,000
Total	**$222,929,000**

Discretionary funds are not guaranteed and therefore cannot be considered when evaluating funding need versus funding provided. From the data listed above, Indiana will be facing a nearly **$384,000,000** shortfall over the next five years.

Conclusion

Indiana's network of airports provides economic opportunity for both large and small communities. The total economic benefit to Indiana from airports is estimated to be $3.2 billion, with expenditure turnover in the communities of an additional $1.4 billion, totaling $4.6 billion per year.[5] In addition, transportation cost savings generated $600 million in savings, for a total induced impact of nearly $5.3 billion. Induced impacts are the impacts from the subsequent rounds of spending and respending in the community, which begin with spending by the airport and airport tenants, otherwise known as the "multiplier effect." This impact could also include the spending and respending made by passengers; however, to maintain a more conservative formula, only those expenditures

actually made on the airport (direct impacts) have been included to calculate the total induced impact of $5.3 billion. These airports are serving as a key infrastructure resource and critical means for future economic development.

Airports in Indiana are facing enormous new burdens with increasing needs for capital improvements and higher levels of maintenance requirements due to infrastructure decay. With reduced funding sources and more competition for discretionary funding sources, Indiana's airport leaders will need to turn to new funding techniques if they are to continue to provide an efficient and effective means of air travel.

Recommendations

- Develop an annual fund dedicated to aviation in Indiana by capturing state sales tax of aviation goods and services. AAI is currently lobbying for a $5 million per year fund that would be funded by sales tax on aviation goods and services, such as fuel and aircraft sales. Currently, sales tax from the aviation industry is collected into the state's general fund. The proposed fund would provide the following:
  - The state's 2.5 percent matching contribution of the FAA's AIP. For every one dollar, there is a $39 matching contribution generated.[7]
  - Fund projects that will increase or accelerate FAA funding. By providing seed dollars, Indiana airports will be better positioned to receive discretionary federal funding. If the project is eligible for federal funding, these seed dollars will be fully reimbursable by the FAA.[7]
  - Make Indiana airports less dependent on property taxes. The FAA priority system ranks revenue-producing projects, such as fuel systems and hangars, as a low priority. By funding these projects, airports will be able to increase aviation-related revenue and decrease their reliance on property taxes.[7]
  - Provide the Indiana Economic Development Corporation (IEDC) with a fund to help make Indiana more competitive. The IEDC will be able to apply for grant funds for aviation-related projects that will attract additional economic activity.[7]
- Increase the Passenger Facility Charge (PFC) cap for primary airports.
- Use balances in the Airport and Airway Trust Fund to fund airport infrastructure and improvement projects.[8]
- Develop alternative funding sources to help local municipalities meet their required local grant match.
- Decrease the shortfall in AIP funding by fostering increases in funding guarantees through reauthorization of the FAA's appropriations.[8]
- Develop general aviation and reliever airfields as viable alternatives to primary airfields for business and recreational aircraft through the FAA's Next Generation Air Transportation System (NextGen) program to improve air traffic control operations, maximize airport usage, and reduce flight delays.[8]
- Develop an airfield maintenance funding program for general aviation airfields to assist local municipalities to prolong the service life of their community airport. Lobby FAA officials to revise AIP Grant eligibility to include maintenance projects in CIP.
- If future funding levels and sources continue to diminish, general aviation airports will be faced with closure of their airfield. Certain assurances would have to be met in order for the FAA to approve the closure of any NPIAS airfield, consequently requiring reimbursement for any federal grant not meeting the specified grant assurances (i.e., maintenance of new pavement for 20-year minimum).
- Educate local municipalities and building departments on the importance of enforcing the Tall Structures Act, which includes the safety, welfare, and protection of persons and property in the air and on the ground by regulating the height, location, and visual and aural identification characteristics of certain structures.
- Continue annual maintenance of airfield pavements, lighting and signage, and drainage infrastructure to prolong their service lives.
- Lobby local building officials to increase awareness and enforcement of the Indiana Tall Structures Act.
- Find new funding resources for unfunded mandates beyond only local airport funds.

Sources

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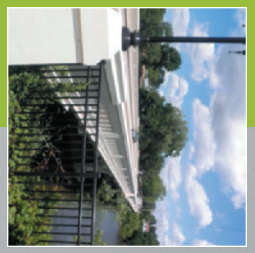
BRIDGES

GRADE: C+






Conditions

In recent years, a string of bridge closings, collapses, and near-misses have made headlines in our nation—Indiana included—leaving deaths, lawsuits, and financial hardships in their wake. These failures result from a growing backlog of bridge deterioration, much like what we have here in Indiana.

As recently as November of 2009, the Indiana Department of Transportation (INDOT) closed the Cline Avenue Bridge over the Indiana Harbor Canal in northwestern Indiana when severe corrosion around the piers crippled the structure beyond repair. INDOT's 2009 Bridge Inventory, delivered to the Federal Highway Administration (FHWA), rated 4,091 Indiana bridges as **structurally deficient** or **functionally obsolete**.

While imminent collapse of any of these bridges is unlikely, the data points to serious problems with our state's bridge network, requiring preventive and corrective actions to be taken now.

Rating Definitions/Implications

Structural deficiency refers to identified bridge weaknesses that must be monitored or repaired. Specifically, the structure's functionality and adequacy are compared to current demands, exposing any defects that demand closer attention. Factors considered include the bridge's load-carrying capacity, clearances, waterway adequacy, and approach roadway alignment.

A deficient rating doesn't necessarily imply an impending collapse. Rather, a deficient bridge requires significant maintenance and repair, as well as eventual rehabilitation or replacement. Vehicles navigating those bridges must submit to gross weight restrictions below standard weight levels allowed by statute, or there may be lane closures if the bridge is allowed to remain in service.

Condition ratings are the primary criteria for the classification of structural deficiencies: 80 percent of structurally deficient bridges have deficiencies in their decks, superstructures, substructures, or culvert ratings. The remaining 20 percent of deficient bridges suffer from other structural and/or waterway inadequacies.

Functional obsolescence refers to bridges built to outdated design standards. Functional adequacy is assessed by measuring existing functional and geometric configurations—including deck geometry, clearance, and/or approach roadway alignment—against current standards and demands.

Bridges have been designed according to standards in place at the time they were constructed. Over time, design and safety requirements evolve and upgrade. A bridge designed in the 1930s no longer reflects the standards of today's environment. The magnitude of those disparities determines the classification of the bridge's functionality today.

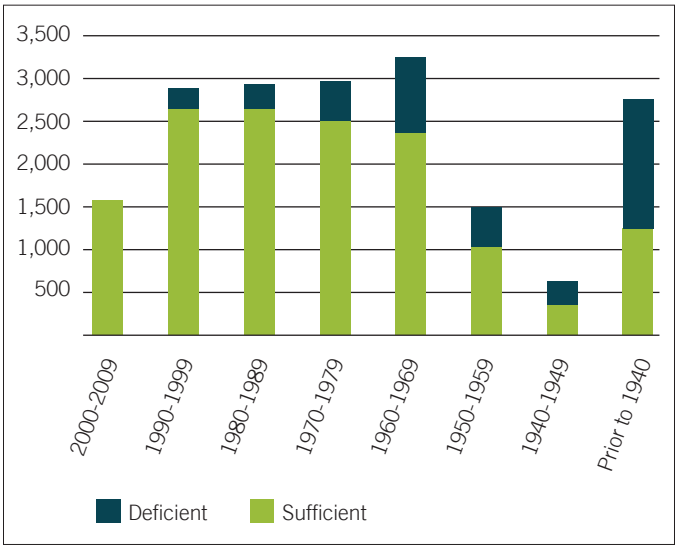
In short, structural deficiencies stem from decaying bridge components, while functional obsolescence results from changed safety standards or traffic demands on that structure.

The two ratings are not mutually exclusive. A bridge may suffer from both types of deficiencies. Its deficiency percentages ultimately place that bridge in one of three categories: structurally deficient, functionally obsolete, or non-deficient. Structural deficiencies are considered more critical, owing to their safety implications. Hence, a bridge that is both structurally deficient and functionally obsolete is identified only as structurally deficient.

The **Sufficiency Rating** is a numerical score of a bridge's structural adequacy, safety, essentiality for public use, serviceability, and functionality. The rating is based on a zero-to-100 scale, with 100 percent representing a fully sufficient bridge.

The National Bridge Inventory (NBI) is a compilation of bridge data supplied by the states to the Federal Highway Administration for bridges located on public roads. The NBI will be used for preparing the selected list of bridges both on and off federal-aid highways for federal funding. That list will include highway bridges with a sufficiency rating of 80 or less. Bridges with a sufficiency rating of 80 or less will be eligible for federal funds for rehabilitation, while those with a sufficiency rating of 50 or less will be eligible for replacement funds as well. To be considered for a deficient classification, a structure must be of bridge length and cannot have undergone construction or major reconstruction for the previous ten years.

As can be seen from the chart below, the older a bridge is, the more likely it is deficient. Most bridges in Indiana were designed for a 50-year lifespan. The chart shows a large number of bridges were built in the 1950s and 1960s. Many of these were connected with the massive investment made to construct the interstate highway system and supporting roadway system. As these bridges age, the maintenance needs can be expected to grow significantly.



Future Needs

Based on the projections included with the biannual bridge inspection reports, the total funding needed for repair and replacement of Indiana bridges is $3,550,400,000. Approximately half of those improvements are needed under the State system, with the other half under the county system.

Primary federal bridge funding programs include the National Bridge Inspection Program (NBIP) and the associated Highway Bridge Replacement and Rehabilitation Program (HBRRP).

On August 10, 2005, President Bush signed into law the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA_LU). With guaranteed funding for highways, highway safety, and public transportation totaling $244.1 billion nationwide over a six-year period from 2004-2009, SAFETEA-LU represents the largest surface transportation investment in our nation's history. Of this money, approximately $63 million per year is distributed to Indiana for work on bridges. This legislation has expired, but Congress continues to pass short-term extensions while working on the next version of a transportation funding bill.

Similarly, the Intermodal Surface Transportation Equity Act for the 21st Century redefined the highway program by including transit, intermodal projects, and technologies such as intelligent transportation systems. Meanwhile, the federal gasoline tax used for transportation funding gradually rose from 3¢ per gallon in 1956 to 18.4¢ in 1993. Improvements made possible by previous regulations are threatened, however, if the US Congress does not act quickly to replace the recently expired SAFETEA-LU.

Previously, the SAFETEA_LU bridge program was broadened to include systematic preventive maintenance, eliminating the requirement that bridges must be considered "significantly important." A total of $21.6 billion was authorized for this program through 2009 to enable states to improve eligible bridges over waterways, other topographical barriers, other highways, and railroads. The requirement that each state spend at least 15 percent of its bridge allocation for bridges on public roads that are not federal-aid highways (i.e., off-system bridges) still exist. Indiana has a long-standing agreement with the cities and counties to pass 25 percent of federal funds to them for road and bridge construction.

The State's ability to maintain current funding levels is far from certain. Currently, Indiana is near the end of an aggressive campaign to invest the funds from the Indiana Toll Road lease. Most of these funds went to projects such as the Hoosier Heartland and US 31 upgrades, increasing traffic capacity and connectivity throughout the state. Meanwhile, recent and projected shortfalls in gas tax receipts could trigger further reductions in federal highway funding. Gasoline taxes in Indiana are 18¢ per gallon and were last raised in 2003 when the national average price of gasoline was $1.72 per gallon.

The 2009 federal economic stimulus package did provide additional funds that state DOTs could use for bridge replacement projects. However, future bridge corrections hinge on lawmakers' ability to identify funding in the next transportation legislation.[8]

Most Indiana counties fund bridge maintenance, repair, and construction with money from their Cumulative Bridge Fund. Five counties in Indiana are allowed to form a Major Cumulative Bridge Fund, based on factors such as county population, bridge length, and need (Indiana State Code 8-16-3.1). According to the Indiana Local Technical Assistance Program, counties are also eligible to use additional funds such as the cumulative capital development, CEDIT (Community Economic Development Income Tax), or the county's general fund.[4] In 2008, 86 of Indiana's 92 counties utilized the Cumulative Bridge Fund as their primary funding source for bridge repair and replacement. Statewide Cumulative Bridge Funds generated approximately $53.4 million in 2007 but only $50.6 million in 2009.

Each year, local county councils set the tax rate for the Cumulative (and Major Cumulative) Bridge Funds, which are financed solely through property tax levies based on assessments. Levy rates are capped at a statewide maximum of $0.10 per $100 of assessed value (Indiana State Code 8-16-3-3). State-wide Cumulative Bridge Funds generated approximately $53.4 million in 2007 but only $50.6 million in 2009.

State legislation enacted in 2008 began to cap property tax rates. Known as the "Circuit Breaker," this legislation (House Enrolled Act 1001) would take effect beginning with 2010 tax bills, capping property tax rates at one percent for homestead properties, two percent for agricultural properties, and three percent for commercial properties. In November 2010, Indiana voters will decide whether this legislation will become part of the State Constitution. The *Indiana Business Review* estimates that, based on the initial reading of House Bill 1001, property tax rates will decrease by approximately 31 percent. Any decrease in property tax collections will directly affect those counties that depend on the Cumulative Bridge Fund for bridge maintenance and replacement.

Conclusions and Recommendations

This report card assigns a grade of C+ to the bridge infrastructure in the state of Indiana, based on its 22.2 percentage of deficient bridges.

In all, Indiana maintains 18,483 bridges per the 2009 Federal Highway Administration report—an increase of 900 bridges since 1992[1]. Among these, 5,612 are maintained by the State, and 12,871 are maintained by the counties. An additional 63 bridges are on federal land such as Crane Naval Base.

During the period from 1992 to 2009, the percentage of deficient bridges dropped from 32.5 to 22.2 percent. While this is a significant improvement, that percentage reflects a staggering 4,091 deficient bridges. Of those, 16.5 percent are maintained by the State, and 24.6 percent are maintained by the counties.

Similarly, a grade of C was assigned to the nation's bridge infrastructure by ASCE in its *2009 Report Card on America's Infrastructure*. One in four US bridges is either structurally deficient or functionally obsolete, with that number rising in urban areas.

Based on the data and its implications outlined above, the Indiana Infrastructure Report Card Committee advises the following precaution and correction measures to enhance the safety of Indiana's bridges:

- Set a state goal to reduce the number of deficient bridges on State and county systems from 22.2 to 15 percent by 2020.
- Advocate additional federal, state and local funding for bridge rehabilitation and replacement programs.
- Establish a fully-funded, comprehensive program that operates consistently to upgrade or replace deficient bridges and maintain all others.[5,7]
- Encourage the use of Life-Cycle Cost Analysis (LCCA) principles in the design process to evaluate the total cost of projects (PS 451).
- Secure federal legislation supporting bridge repair and replacement needs.

The safety standards Hoosiers expect cannot be maintained without public support and the recognition of the need for significant investment. Progress has been made over the years, but still more than one in five bridges we use every day are deficient. With an aging bridge population, these needs will continue to grow. Possible losses of tax revenues to finance bridge improvements represent a serious challenge. With an estimated present cost of over $3.5 billion to solve this situation, the time to start working on it is now.

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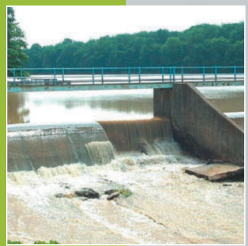
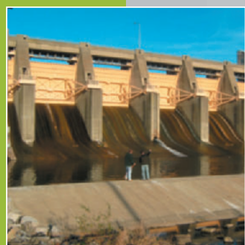
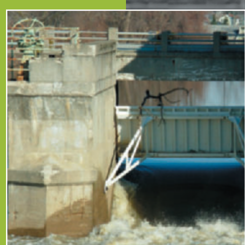
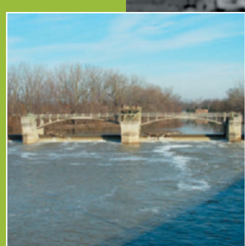
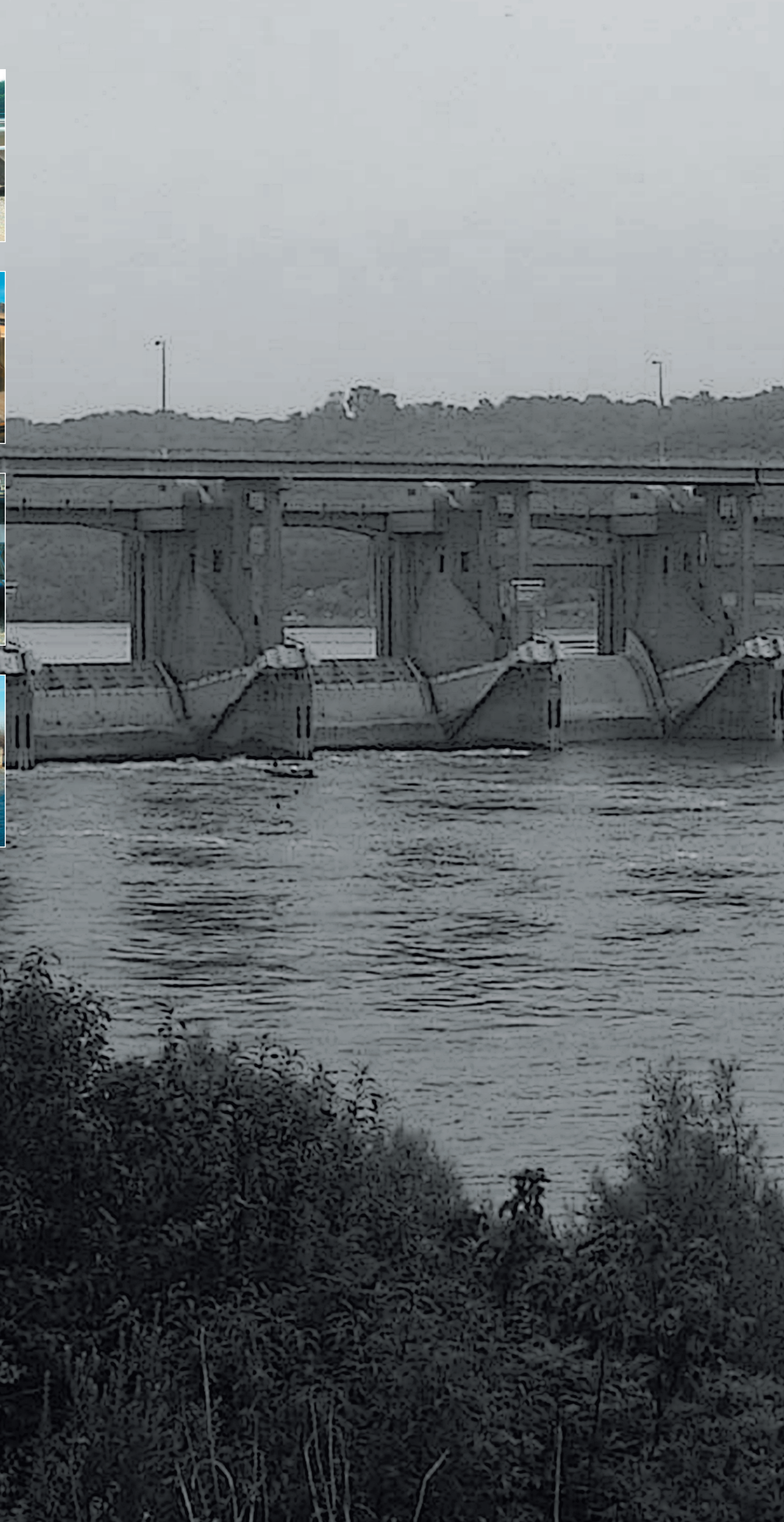










DAMS

GRADE: D-

Introduction

Dams provide essential benefits, including drinking water, power generation, flood protection, irrigation, and recreation. They may be publicly owned and operated by federal agencies, states, cities, and municipalities, or privately owned and operated by individuals, businesses, and corporations. Dams are typically constructed of earthen soils and/or other man-made materials such as concrete. A dam's hazard potential is determined by the anticipated consequences of failure, not the condition of the dam. These classifications include high hazard potential, which indicates anticipated loss of life in the case of a failure; significant hazard potential, which indicates anticipated damage to buildings and important infrastructure; and low hazard potential, which indicates anticipated loss of the dam or damage to the floodplain, but no expected loss of life. A lack of routine frequent inspections, maintenance, and repair can eventually cause a dam to become unsafe.

The failure of several major dams in the 1970s caused the federal government to take notice of the importance of dam safety in the United States. In 1972, the National Dam Safety Act was authorized. This Act called for the U.S. Army Corp of Engineers (USACE) to carry out a national program for the inspection of all non-federal dams listed in the national inventory. Upon completion of the inspection phase of the program, the state dam safety agencies assumed responsibility for the next phase.

The federal government provided assistance with program improvements through the National Dam Safety Act of 1996. The National Dam Safety Program (NDSP) is administered by the Federal Emergency Management Agency (FEMA) and is designed to provide incentive grants to states and training to encourage research.

According to data obtained from the State of Indiana, as of 2008, of the 1,088 dams that are regulated by the State, over 50 percent are identified as needing remediation. While some of these dams are owned and operated by state and municipal entities, approximately 70 percent are owned by private entities.[7] While these dams are regulated by the State of Indiana, the State does not have sufficient resources, funding, or staff to conduct dam safety inspections, take appropriate enforcement actions, or ensure proper construction by reviewing plans and performing construction inspections.

As of 2008, Indiana's Dam Safety Program had an annual budget of $430,000 and five engineers, which equates to 217.6 dams per engineer.[5] In 2005, Indiana ranked 25th in full-time engineers devoted to dam safety.[6] Currently in Indiana, high-hazard dams must be inspected every two years, significant-hazard dams must be inspected every three years, and low-hazard dams must be inspected every five years. The Indiana Department of Natural Resources is currently responsible for inspections of significant- and low-hazard dams. Dam inspection is an enormous challenge, considering the investment needs and dam conditions.

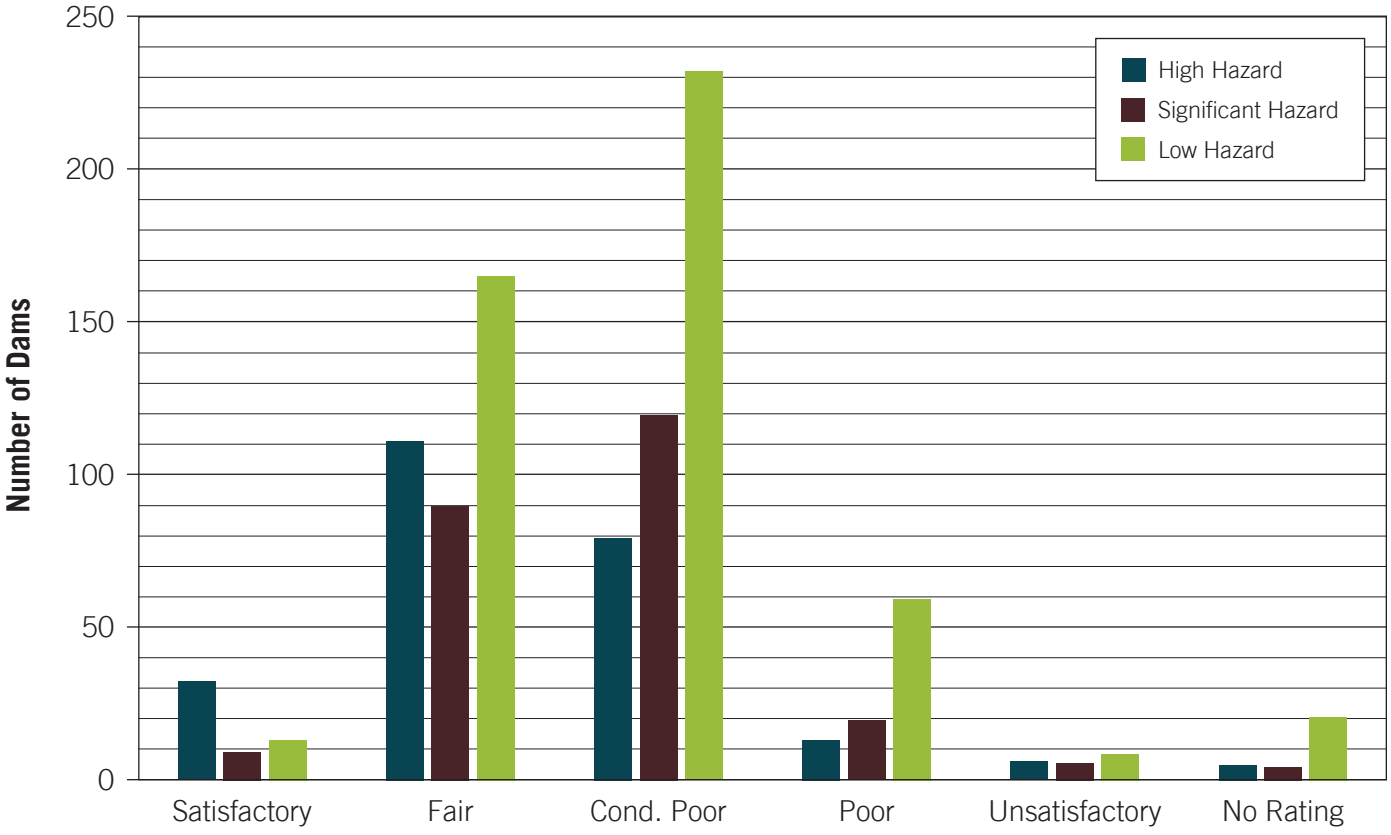
Condition

Today, many dams in Indiana are deficient as a result of age, deterioration, and a lack of maintenance. Several of these dams are deemed unsafe or deficient as a result of increased scientific and engineering knowledge about large flood events and earthquakes and the ability to predict a dam's structural response to such events. Many dams were constructed 30 or 40 years ago, but as a result of an additional 40 years of historical records and greater abilities to predict increases in loads on dams and the dams' responses to those events, more dams are being identified as unsafe or deficient.

Indiana has 1,088 registered dams, of which 240 are classified as high hazard, 249 as significant hazard, and the remaining 599 as low hazard.[1] These are owned and operated by the state and local governments, public utilities, and private individuals or entities.

The Inventory of State Dams compiles inspection data to provide an overall view of the current condition of the dams in the state of Indiana. Table 1 on the following page illustrates the condition, by hazard classification, of the dams in Indiana. The inventory indicates only 43 percent of Indiana's dams are considered fair or better, with 57 percent of Indiana's dams considered conditionally poor or worse.[7] At an estimated average repair cost

TABLE 1: INSPECTION RATINGS FOR INDIANA DAMS



of $750,000 per dam, the total current cost for upgrading the deficient dams with significant and high hazard potentials is approximately $180 million.

EAP Discussion

An Emergency Action Plan (EAP) is a formal document that identifies potential emergency conditions at a dam and outlines the procedures to follow to minimize property damage and loss of life. A well-prepared and maintained EAP can greatly reduce the potential risk of loss of life in the event of a dam breach.

While there have been successes and improvements in the state-level dam safety programs as a result of the NDSP, the safety and condition of the nation's dams have not improved overall. The number of emergency action plans (EAPs) has increased nationally; however, the number of high-hazard potential dams nationwide that have EAPs remains at 50 percent.[3] Indiana is below the national average, with approximately 15 percent of the state's high hazard dams having EAPs.[7] All state-owned high hazard dams have EAPs.[7]

Regulations requiring EAPs varies from state to state. In a survey of state regulatory agencies conducted in 2005 by the National Dam Safety Review Board, it was identified that about 63 percent of the states that responded have regulations that require a dam owner of a high or significant hazard dam to develop and maintain an EAP.[2] The State of Indiana currently has no regulations in place that require a dam owner to have an EAP.

Having an EAP for a dam is not just a benefit to the dam owner, but is very helpful for the state and local emergency managers. EAPs allow for the emergency personnel to understand the hazard, respond to evacuations, and properly apply their resources in dealing with a dam safety emergency.

Funding

In 2000, the State of Indiana appropriated funding to repair some of the state-owned dams. While this funding allowed for the analysis and repair of some of the structures, it was not enough to accomplish all of the required remediation. There are still many state-owned structures in need of repairs to address dam safety issues.

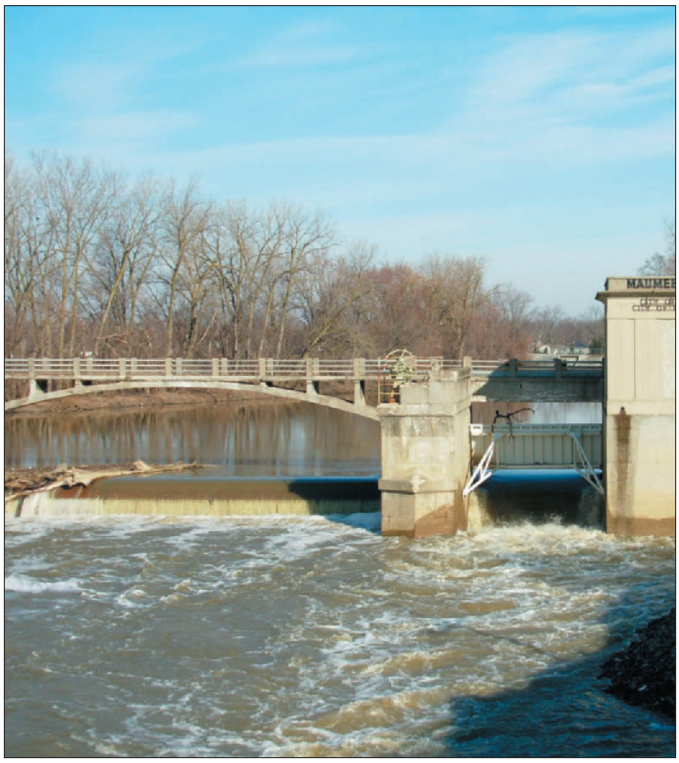
The state legislature appropriates funds to IDNR dam upgrade funding on a biennium basis. The appropriations have diminished over the past three cycles of funding. The 2005 appropriation was $13.5 million, the 2007 appropriation was $10.5 million, and the 2009 appropriation was $8 million. These funds are utilized to repair or upgrade state-owned dams. This leaves the remaining 70

percent of dams under other ownership with no state-appropriated funds for addressing safety condition needs.

Funding for municipally and privately owned dams in the state of Indiana is not directly available to these owners. There are some mechanisms that can be used by certain types of dam owners (establishment of a conservancy district), but these mechanisms are very difficult and time consuming to put in place. Direct funding opportunities for dam safety projects in Indiana for private dam owners is currently not available.

Conclusions and Recommendations

The main issue preventing Indiana from providing adequate dam safety and allowing dam owners the mechanism to repair and upgrade their dams is a lack of dam rehabilitation funding on a federal and state level. This is evidenced by the number of dams that have been identified, through inspections, as deficient and in need of repair, and by the investment needs to improve dams that are classified as significant or high hazard. In addition to lack of funding for dam repair and upgrade, lack of regulations requiring high-hazard dam owners to prepare and maintain an Emergency Action Plan continues to be an area of concern. During recent floods in Indiana, most notably in June of 2008, damage occurred to numerous dams, including several dam failures.[4] Many of the dams that failed or were damaged had been identified during recent inspections as deficient and had been requested to be remediated.



In order to make significant improvements to Indiana's dams—a matter of critical importance to public health, safety and welfare—Indiana needs to:

- Develop a long-term strategic program and plan (including identification of possible funding sources for all types of dam owners) that address the needs to investigate, repair, upgrade, and operate the aging publicly and privately owned dams and increase accountability of dam owners.
- Work with Indiana's congressional delegation to persuade the federal government to fund the National Dam Safety Program and address non-federal public dams through the *Dam Rehabilitation and Repair Act*.

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DRINKING WATER

GRADE: D+

Introduction

Drinking water infrastructure throughout Indiana typically includes supply systems, treatment systems, distribution and storage systems, and operation and maintenance components. Drinking water systems require continual attention for operation and maintenance, rehabilitation and/or replacement of aging components, capacity upgrades, and compliance with regulatory requirements.

In developing this report, research was based on existing available data relating to municipal drinking systems. Topics not evaluated include private on-site drinking water wells and infrastructure owned and operated by private providers.

Capacity and Condition

The supply aspect of drinking water infrastructure includes the availability of raw water, ability to extract the water, and treatability of available water for consumptive use. There are 4,263 public water systems in Indiana, of which 97 percent rely on groundwater; however, only 55 percent of the state's population is served by systems utilizing groundwater. Public water systems supply drinking water to an estimated 83 percent of Indiana residents (5 million out of 6.4 million), while the remaining 1.4 million residents receive drinking water from private water providers.

Groundwater is stored natural water beneath the earth's surface. The natural water source of groundwater is called an aquifer. Aquifers are generally plentiful in northern and central Indiana. Southern Indiana, however, sits primarily on a foundation of limestone, making groundwater highly susceptible to contamination despite an abundant quantity. Surface waters, on the other hand, are waters available from above-ground sources such as lakes, rivers, streams, and creeks. Surface water is also plentiful in Indiana, and large communities with solid revenue sources have developed and maintained large reservoir systems to store and use surface water as their primary supply sources.

The adequacy of drinking water distribution systems is more difficult to quantify than the adequacy of supply and treatment systems. Distribution systems are buried and more difficult to inspect. Most of the distribution system installed in the 30 years following World War II is reaching the end of its anticipated design life. Oftentimes, water main breaks and customer complaints of low pressure are the only indicators of failure of the distribution system. Newer pipe materials will help extend the life of the distribution system. However, resources are not always available to replace as much of the distribution system as required.

Funding

Most community water systems in Indiana face a significant shortfall in capital funds to maintain and improve drinking water systems. The Environmental Protection Agency (EPA) regularly publishes information on drinking water needs. The EPA's most recent report in 2007 identifies the 20-year capital improvement need for drinking water infrastructure projects.[10] Results of this report help determine funding for the drinking water capitalization grants as a part of the State Revolving Fund (SRF). The progression of Indiana's drinking water needs is shown in Table 1.

	1995	1999	2003	2007
US Needs (in Millions of Dollars)	200,400	198,200	331,400	334,800
Indiana Needs (In Millions of Dollars)	2,424	2,224	4,827	5,944
Indiana's Percentage of US Total Needs	1.22	1.21	1.52	1.83

* Needs are presented in millions of January 2007 US dollars.

As shown in the Table 1, Indiana's needs in 2007 comprised 1.83 percent of the total needs in the US. However, Indiana's percentage of the total US population was 2.1 percent, which indicates Indiana is faring well compared to other states.

Funding for drinking water infrastructure improvements typically comes from state and local governments. A 2007 report from the US Conference of Mayors states local government share of water supply systems funding is more than 99 percent.[9] Census Bureau data indicates local government spending increased 81 percent from 1991 to 2005. With less federal funding, municipalities are turning to the state to provide funds for projects that will achieve and maintain compliance with the current and future requirements of the Safe Drinking Water Act (SDWA).

For fiscal year 2010, Indiana received a $22 million capitalization grant to fund the SRF program.[6] In 2010, there were $282 million in applications for projects submitted for SRF funding. The American Recovery and Reinvestment Act of 2009 (ARRA) is estimated to have funded $16 million in projects, which leaves $266 million left to be funded through SRF. To secure SRF funding for a project, a utility has to meet certain criteria and follow the review guidelines established by the Indiana Finance Authority (IFA). SRF estimates mentioned here do not include projects that fail to qualify for SRF funding.

With a lack of grant funds available, many communities are turning to increased water rates and/or privatization of systems to meet funding needs. Rate increases are never popular, especially in uncertain economic times, and privatization has had mixed results in ability to maintain and operate drinking water systems.

Future Need

While available water resources are adequate, the supply and treatment infrastructure needs a thorough review to ensure its ability to supply adequate water to meet projected future demand and to overcome regulatory pressures

in meeting water quality requirements. As will be discussed in the Resilience section of this analysis, Indiana's water supplies are in danger of becoming contaminated by various sources, including untreated stormwater runoff, air pollution, and combined sewer overflows. Should the water supply become contaminated, costly upgrades to treatment systems will be required to ensure the water distributed to the public stays safe for consumption.

Predicted climate change impacts in the Midwest will result in a combination of prolonged drought periods and radical rainfall events, which will tax water supplies, increase the need for storage, and put drinking water facilities (i.e., intakes and reservoirs) located near waterways at risk due to increased flooding.[1] While only a small part of Indiana lies within the Great Lakes natural watershed, the Great Lakes initiative, finalized in 2009, capped the future water withdrawal rate from Lake Michigan at current levels in large population centers. As a result, existing drinking water sources in Indiana will likely be utilized by these growth areas, thereby increasing demand on the water supply.

The EPA and the federal government are considering a number of currently non-regulated chemicals to bring under the safe drinking water compliance statute. Currently, non-regulated contaminants (i.e., pharmaceuticals, personal care products, herbicides, etc.) detected in Indiana's surface waters and drinking water supplies may be regulated in the future. Groundwater quality in Indiana is generally good; however, it is susceptible to contamination from fertilizers and natural mineral deposits. The recently enacted Ground Water Rule (GWR) requires public water systems to conduct sanitary surveys and source monitoring for viral and bacterial contamination in groundwater sources of drinking water.[5] The GWR requires corrective actions, treatment, and public notification in contaminated areas. Many smaller systems may require additional sources of funding to comply with the GWR. Significant funding to upgrade treatment and monitoring facilities will be necessary to comply with any future standards.

Operation and Maintenance

Operation and maintenance activities for a drinking water system occur on a continual basis. General operation and maintenance items include labor, equipment, supplies, electrical power, and replacement parts. Drinking water distribution systems include flow monitoring, valve exercising, booster station pumps, tank painting/coating, emergency power generators, and supervisory control and data acquisition systems. Water treatment facilities include process equipment, pumps, blowers, emergency power generators, chemicals, supervisory control and data acquisition system, possible sludge disposal, laboratory analysis, and flow monitoring.

Municipalities incur continual costs to operate and maintain their drinking water systems. To pay for these costs, municipalities typically account for operation and maintenance in their user rates.

Public Safety

Within the state of Indiana, there were 1,748 systems in violation of standards in 2008, and of those, 1,182 systems had only monitoring and reporting violations. These monitoring/reporting violations are procedural and do not include exceeding maximum contaminant levels (MCL) set by regulatory agencies. Violations of the MCL were found in 406 systems, of which the majority were in violation of the Total Coliform Rule (TCR) followed by inorganic chemicals. Total coliform is a measure of water-borne pathogens in drinking water. Septic systems, livestock feeding operations, and use of fresh manure as fertilizer are all potential sources of groundwater pathogen contamination. Surface water can become contaminated from many sources, including incomplete or ineffective wastewater treatment, stormwater runoff, agricultural feedlot, or the normal activity of wildlife in the watersheds. Inorganic chemicals, on the other hand, enter drinking water sources from non-biological sources. While complete elimination of total coliform and inorganic chemicals from drinking water is not economically feasible, and their presence below the MCL is not known to be harmful to human health, federal and local government regulations require the water providers to maintain their concentration levels below the MCL.

Water suppliers in Indiana were required by federal statute to conduct security vulnerability assessments in 2003. These plans need to be updated and funded with sufficient government grants to ensure the highest level of security for Indiana's water sources and treatment facilities.

Resilience

Safe, resilient pubic drinking water systems in Indiana are essential to quality of life, economic development, and growth for current and future generations. Resiliency

of public water systems can depend upon several factors, including redundancy in water supply, treatment, storage and distribution; exposure to potential natural or man-made contaminants; energy backup availability; vulnerability to security; and adaptation to radical weather impacts, including those created by climate change and natural disasters. Drinking water service disruptions for any of these reasons can negatively affect health, safety, and the economy.

In general, Indiana's public drinking water systems are not highly resilient. Many existing systems lack true redundancy in all or part of the water supply system. Surface water systems are vulnerable to many contaminants from untreated stormwater run-off (urban and agricultural); combined sewer overflows; and settled airborne contaminants, such as mercury from Indiana's numerous coal-burning power plants. Nutrients from farming practices, existing mineral deposits in aquifers, and over-pumping of limited aquifer capacity for increasing energy, agricultural, and human demands continues to affect groundwater source quality. Such vulnerability can potentially reduce water resources options for utilities, and may require expensive treatment processes to maintain adequate supply from current sources or to look for alternate sources.

Conclusion

Indiana generally has an adequate supply of drinking water. The state's source and treatment systems are generally well maintained and able to meet existing needs. Future needs for treatment systems will likely be met due to their high visibility and regulation (to avoid public uproar and fines for violations). Improvements to the distribution system will likely be unable to find funding, as many communities divert funds away from distribution projects to more visible areas of the drinking water system, such as fixing pipe breaks and installing new treatment systems to meet more stringent regulatory requirements.

While Indiana has an adequate water supply, due to the lack of available funding, lack of resiliency and threatened quality, Indiana's drinking water infrastructure rates a grade of D+. This is higher than the overall national grade of D- due to Indiana having an adequate water supply, unlike part of the rest of the country. Significant funding improvements, especially from the federal level, can greatly improve the quality of the distribution systems, the resilience of the systems, and the overall water quality.

Suggestions to increase the grade of Indiana's wastewater infrastructure system include:

- Increasing public awareness of the current system condition
- Increasing funding availability
- Continuing research and development of products to increase the longevity of system components
- Working closely with the EPA to continually update the drinking water needs assessment to get a better understanding of the condition and funding requirements of the state's drinking water infrastructure.

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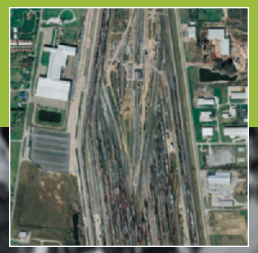
RAIL

GRADE: D+


Introduction

Indiana's rail system provides freight service via 5 Class I (line-haul freight railroads with operating revenues exceeding $345 million, nationally), 3 regional, 20 local linehaul, and 13 switching and terminal railroads. Passengers are served by Amtrak's intercity trains and connecting bus service and by Northern Indiana Transportation District (NICTD) commuter rail.

Ranking fourth in the nation in terms of the number of railroads and ninth among states in total rail mileage, Indiana is the "cross-rails" of America. In 2007, more than 306 million tons of freight rolled over Indiana's rails—the ninth highest in the country. In 2008, nearly 125,000 intercity rail passengers were served by Amtrak, with stations in 11 cities, including Indianapolis, Lafayette, South Bend, and Waterloo. NICTD provided commuter service from South Bend to Chicago and points inbetween, and had 4.3 million passenger trips in 2007.

Capacity

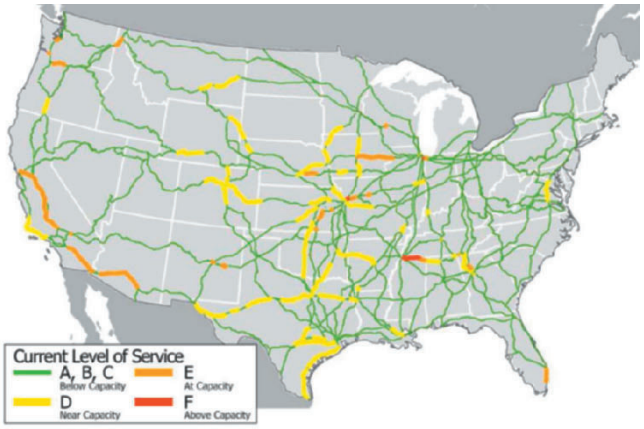
The *2007 National Rail Freight Infrastructure Capacity and Investment Study* estimated current (2007) and future (2035) levels of service (LOS) for the nation's freight rail system, utilizing a methodology similar to highway LOS.[5] LOS is a way to define the various levels of congestion transportation, ranging from LOS A to LOS F, indicating free-flowing to capacity or grid-lock conditions, respectively. As shown in Figure 1, most of the state's major rail corridors are operating with excess capacity, with only small segments in northwest Indiana operating at capacity (LOS E). The Indiana Rail Plan report determined that, without investment in capacity expansion, large portions of the primary rail corridors would deteriorate to LOS F by 2035 (Figure 2).[1]

The passenger rail system is primarily composed of Amtrak (Figure 3) and NICTD running between South Bend and Chicago near the northern boundary of the state (Figure 4). While Amtrak routes have significant residual capacity on most routes, NICTD trains are running consistently at or near capacity, which has been partially addressed with the scheduling of additional trains and the purchase of 14 double-decker passenger cars. NICTD is currently exploring the possibility of extending service in Lake and Porter counties through the West Lake Corridor New Start Studies—a planning, engineering, and environmental project designed to identify public transportation needs and transit solutions for Northwest Indiana.

Condition

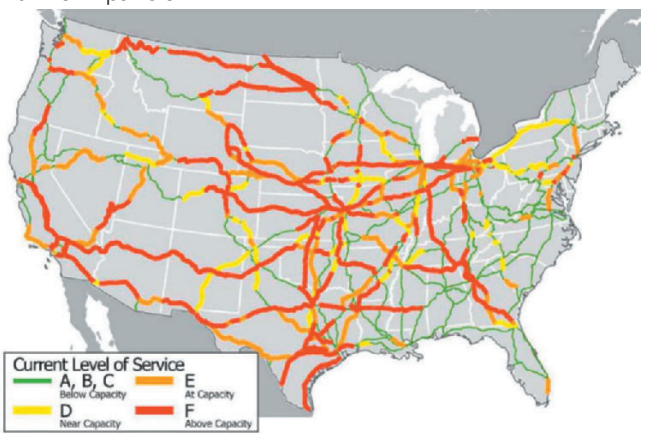
Freight railroads in Indiana are privately owned by the Class I railroads, which have recently been increasing investments in their infrastructure and spending as rail becomes more recognized as a viable solution to transportation energy and environmental issues. Rail is cost effective and is the safest method of transporting a broad spectrum

FIGURE 1: 2007 Freight Level of Service



SOURCE: National Rail Freight Infrastructure Capacity and Investment Study. Association of American Railroads, 2007.

FIGURE 2: 2035 Freight Rail Level of Service with no Expansion

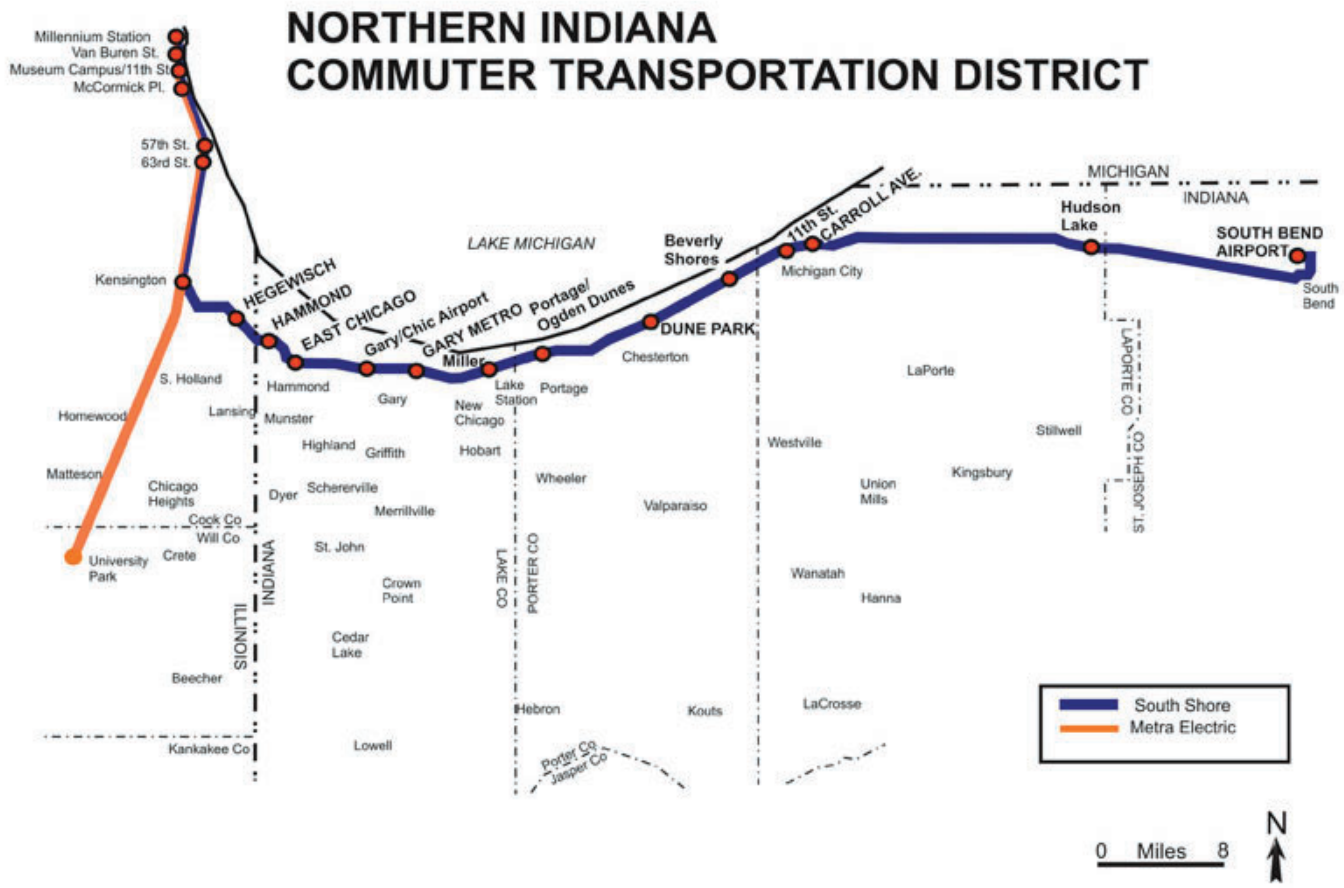


SOURCE: National Rail Freight Infrastructure Capacity and Investment Study. Association of American Railroads, 2007.

FIGURE 3: Amtrak Routes in Indiana

SOURCE: Amtrak Route Atlas, 2008.

FIGURE 4: NICTD Routes



SOURCE: NICTD. Available at http://www.nictd.com/systemmap.html

of goods and commodities, including hazardous, raw industrial, and agricultural products and materials.

The table below shows classes of freight railroad with associated mileage, including trackage rights, and the numbers of companies operating in Indiana in 2008:

TYPE OF RAILROAD	MILES OPERATED	NUMBER OF COMPANIES
Class I (Line-Haul Freight) Railroads	3,532	5
Regional Railroads (Class II)	430	3
Local Line-Haul Railroads (Class III)	1,187	20
Local Switching and Terminal Railroads (Class III)	221	13

Passenger railroads generally operate on the freight railroad-owned lines via trackage agreements; this is the case for Amtrak, in Indiana. On the other hand, NICTD's electric-powered trains operate on their own tracks. The Indiana Department of Transportation (INDOT) is working to improve passenger rail by designating a high-speed rail corridor in the northern part of the state. INDOT is also working to increase mode choices by studying light rail and commuter rail transit options in the center of the state.

Funding

The privately owned Class I railroads are generally able to finance capital improvements on their own systems. Meanwhile, the non-Class I railroads encounter difficulties in making the necessary capital investments to improve, expand, or at times to even maintain their infrastructure since they service shorter hauls and smaller, often rural communities that do not generate enough business to adequately support them.

INDOT's Railroad Section, one of the department's modal divisions, develops initiatives aimed at preserving and developing freight and passenger corridors throughout the state[2]. These initiatives include:

- Industrial Rail Service Fund – assists with rail infrastructure improvements and track rehabilitation for Indiana shortline railroads by investing more than $12 million since 1999.
- Railroad Grade Crossing Fund – provides resources for railroad crossing safety improvements to local jurisdictions, counties, and Class II and III railroads. The fund is divided into two programs. The Crossing Closure Program and Other Safety Improvements

Program were funded in the amounts of $300,000 and $700,000, respectively, in FY2008.

- High-Speed Rail Corridor Designation – allows the application for specific high-speed rail grants through the Federal Railroad Administration to develop these routes

The *National Rail Freight Infrastructure Capacity and Investment Study* "estimates that an investment of $148 billion (2007 dollars) for infrastructure expansion over the next 28 years is required to keep pace with economic growth and meet the U.S. DOT's forecast demand." An investment of $135 billion by Class I railroads and $13 billion by all other classes combined, is needed nationally[5]. Using a ratio of Indiana rail (4,446 miles) to total U.S. rail (140,695 miles) these figures translate to investments of $5.0 billion and $506 million for Indiana's Class I and all other classes of railroads ($4.3 billion and $416 million 2007 dollars increased by five percent annually), respectively, by 2035.

Passenger railroads are funded by federal loans and grants, the state general funds, and revenue generated from system-related activities. Federal funding is the primary source of capital funds.[13] Improvements to the Amtrak system in Indiana, such as a better connection between Indianapolis and Chicago and a high-speed northern corridor, have been in discussion since at least 2000. Any improvements to the passenger corridor would also benefit the freight railroads and, therefore, be of economic benefit to the state.

Future Needs

Future needs for the freight and passenger railroads involve a variety of in-state and out-of-state issues and constraints.

In-state issues and constraints involve rail corridor preservation and development; grade crossing safety; rail infrastructure improvements; and participation in a variety of planning initiatives, including intermodal and high-speed corridor designation, the Midwest Regional Passenger Rail Initiative (MRPRI) and Indy Connect—Central Indiana's Transportation Initiative. "The Indiana Department of Transportation has contributed staff time and financial resources toward the MWRRI Study. The study is an ongoing effort to develop an expanded and improved passenger rail system in the Midwest, including three corridors proposed for Indiana: Chicago to Cleveland, Chicago to Detroit, and Chicago through Indianapolis to Cincinnati. This expanded operation would entail high-speed rail service (80-110 mph) with shorter travel times, increased frequency of service, accessibility, and reliability. Other participating states are Illinois, Iowa, Michigan, Minnesota, Missouri, Ohio, Nebraska, and Wisconsin."[2] The IndyConnect initiative is a comprehensive, multi-modal, public transportation plan for central Indiana. Ultimately, the plan is to connect bus, light rail, commuter rail, highway, and bike/pedestrian facilities to provide efficient transportation options for greater Indianapolis and surrounds.

Out-of-state issues involve restrictions and impacts on Indiana's system by those in surrounding states. According to the *Indiana Rail Plan*, "The capacity and efficiency of the Chicago rail network has significant implications for freight transportation in Indiana. Its continued vitality would signal major growth in shipments radiating to and from that region. Conversely, continued degradation of railroad LOS around Chicago would likely result in a diversion of shipments between Indiana and points west to other modes or other routes." The Chicago Region Environmental and Transportation Efficiency (CREATE) Program is a partnership among the City of Chicago, the State of Illinois, six Class 1 railroads, Amtrak, and Metra (Chicago's commuter railroad) to improve the current efficiency and

future capacity of the rail network in and around the City of Chicago. The CREATE program is of national significance, "since nearly one-third of all rail shipments in the United States pass through the project area." Remedies for the Chicago capacity and efficiency issues include a total of 78 projects, including road-rail grade separations; rail-rail grade separations; and numerous viaduct, grade-crossing, switching, track, and signal improvements worth $1.5 billion. Additionally, bottlenecks and clearance issues in surrounding states are of importance to freight transportations in Indiana. Ohio released the *Ohio Freight Rail Choke Point Study,* which analyzed out-of-state impacts on their rail system and found three significant choke points on a major north-south rail line that passes through Indiana, providing a crucial link in the Cincinnati-Chicago corridor and requiring approximately $32 million to remedy.[1]

Operation and Maintenance

As in much of the nation, freight railroads in Indiana own and maintain the tracks and signal systems not only for their own use but also for use by other freight and passenger railroads through trackage agreements. The

freight railroads have several maintenance facilities and yards throughout the state. Amtrak has a large maintenance facility in Beech Grove, near Indianapolis, which repairs, maintains, and overhauls cars and locomotives used throughout the entire Amtrak system.

As previously mentioned under the Capacity section, most of the major rail corridors, not including the northwest and Muncie locations, are currently operating below capacity. However, as the demand for freight rail service continues to increase and passenger rail attracts more riders, the state-wide system is expected to exceed capacity by 2035 without significant investment in facility improvements and expansion.

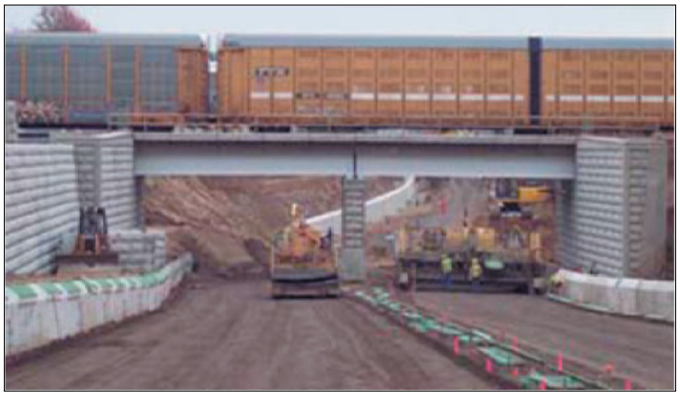
For the passenger system, the most significant operations improvement would be the reduction of travel time in order to be more competitive with other modes of transportation throughout the state. An increase in passenger rail will place significant demands on the freight railroads since most passenger railroads travel over existing freight lines. Although both ridership and the use of freight rail is expected to increase, the previous level of service discussions regarding freight railroads did not take into consideration an increase in passenger rail traffic. As such increases occur, passenger railroads will be competing with freight rail for track time, especially in the state's northwest corridors. Station access would also become an issue, potentially causing a need for additional lines and the rerouting and/or separation of the two modes, at least in Indianapolis.

Public Safety

The Federal Railroad Administration (FRA) maintains records of all railroad-related accidents and incidents and a separate highway-railroad grade crossing database. The

Indiana data shows a steady decline in all railroad-related incidents, from 439 in 2005 to 368 in 2006—the lowest since 1975 (the first year for which FRA data is available).[1]

Most of the general public's interaction with railroads occurs at grade crossings, and the safety of highway-railroad grade crossings are therefore of substantial concern to the railroads. There were 141 highway-railroad grade crossing accidents in 2008 in Indiana. According to the *State Transportation Statistics 2009*,[14] published by the Bureau of Transportation Statistics of the FHWA, there are 7,955 grade crossings in the state of Indiana, and according to INDOT, more than half of them have active



warning devices, which is higher than the national average. However, on a national level, Indiana is fifth in the number of grade crossings and third in terms of accident rates (total number of accidents divided by the total number of crossings). The Federal Grade-Crossing Program funding enables safety improvements at 30 to 35 Indiana crossings per year.[1] While these improvements in crossing protection and crossing closures, along with an active public relations campaign, are continuously contributing to the reduction of highway-rail crossing accidents, considerably more work and funding are needed.

Resilience

Rail, similar to air and water transportation, relies on other modes of transportation for its freight and passengers to access it. Interdependencies outside the state's boundaries also affect the rail system within the state as potential bottlenecks, and differing levels of service in adjacent states particularly impact Class I railroads. Therefore, while railroads offer efficiency and reduced energy consumption and are an important component of the state's transportation infrastructure, their dependence on other modes of transportation and energy supplies and their limited redundancy makes them not resilient.

Resilience also includes a security component. Since the events of 9/11, the security of the nation's infrastructure has come under closer scrutiny. Threats that may not have been previously considered are now routinely taken into account. The lack of redundancy in rail lines, due to their inherent nature and cost, impacts the security and thereby limits the railroads' resiliency.

Conclusions and Recommendations

The rail industry is currently in the limelight as the transportation of goods and people is increasing in popularity due to the direct alleviation of congestion and increased fuel economy it offers. Following are select "Rail Fast Facts" from the American Association of Railroads:[4]

- Each freight rail job supports 4.5 jobs elsewhere in the economy. Each $1 billion in new rail investment creates 20,000 jobs.

- In 2008, America's railroads moved one ton of freight 457 miles on one gallon of fuel, making railroads, on average, four times more fuel efficient than trucks.
- One train can carry the load of 280 or more trucks. In 2008, 284.9 million tons of freight originated, terminated, or passed through Indiana by rail, a load which would have required 15.8 million trucks to handle. Moving freight by rail, instead of truck, reduces greenhouse gas emissions by 75 percent.

Given Indiana's status as ninth in the nation for moving rail freight, combined with the projected increases and already heavily-traveled northern corridors, it is recommended the State increase its involvement in all aspects of planning and expanding the rail system, from becoming a "Freight Technical Lead"—which coordinates freight planning among various DOTs—to conducting effective outreach to stakeholders, linking freight and transportation planning and programming, and advocating for freight planning.[1]

As recommended by AASHTO's Strategic Highway Safety Plan Operation Lifesaver, a highway-rail crossing safety awareness and education program should be continued, and 80 highway-rail crossings per year should be improved via the Highway-Rail Hazard Elimination program, as opposed to the 30-35 crossings per year currently being addressed by INDOT.[15]

The overall grade assigned to Indiana's rail infrastructure is a "D+", reflecting a grade slightly lower than the C- assigned to the nation's rail system in *ASCE's 2009 Report Card for America's Infrastructure*. The condition of Indiana's rail system closely parallels the national picture, but with lower grade crossing safety and significant residual capacity.

Our highways continue to become more congested with cars and trucks, while at the same time the demand for sustainable infrastructure continues to grow. The appeal of rail transport increases, and so should the political, financial, and public support for it.

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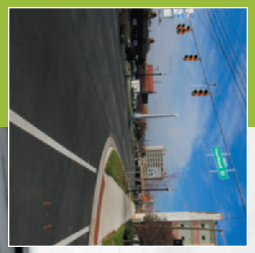
ROADS

GRADE: C-

Conditions

Due to its geographic location, the amount of commerce, and the people traveling through the state's highway system, Indiana has been dubbed the "Crossroads of America." Indiana has approximately 95,500 road miles running throughout the state, of which approximately 10 percent, or 11,200 road miles, are state-owned roads and highways. This ranks Indiana 23rd in the nation for state-controlled highway road miles.[1 5 3] The remaining 90 percent, approximately 85,000 road miles, is maintained by the counties, cities, and towns. Of the roughly 85,000 local roads, county roads account for approximately 66,000 road miles and city roads for roughly 19,000 road miles.[2]

According to the Federal Highway Administration (FHWA), Indiana averages a total of 72.5 billion vehicle miles traveled (VMT) on its roads annually.[3] Of the 72.5 billion, approximately 34 billion of those annual miles are traveled on roads maintained by counties, cities, and towns.[2] While state highways and roads account for only 10 percent of the total road miles throughout the entire state, 54 percent of annual VMT occur on these highways and roads.

Indiana roads play a major role in the transportation of freight internationally and state to state. Per the FHWA, approximately $580.9 billion worth of freight passes through, originates from, or is designated to be delivered within the state of Indiana.[7] Of that total freight, nearly 75 percent is carried by trucks through our state system.[7] It is estimated that by 2035 the amount of freight carried by truck through our state system will have increased by three times its current level.[7]

Crash Rates

Crash rates are one of several factors that help assess the condition of a highway system. Despite carrying more than 50 percent of traffic, state highways only account for 31 percent of all crashes. A much larger 59 percent occur on county and city roads.[2] Of the crashes that resulted in injury, 34 percent occurred on state highways and 63 percent on county and city roads. The overall injury rate of 116.6 injuries per million vehicle miles traveled (MVMT) for county and city roads is more than double the state highway rate of 50.7 injuries per MVMT.[2] Of crashes resulting in fatalities, state highways account for 54 percent and county and city roads account for 46 percent.[2] Although the higher percentage of all crashes resulting in fatalities occurred on state highways, the fatality rate for state highways of 1.21 injuries per MVMT was slightly lower than the county and city rate of 1.23 injuries per MVMT.[2] This ranks Indiana 20th for lowest fatality rate in the nation.[5] This is a concerning trend for county and city roads considering a larger percentage of travelers use state highways, travel at higher speeds, and experience significantly more truck traffic.

Safety

Signage, pavement markings, and lane width are major factors that play a role in the safety of the traveling public. The FHWA considers two 9-foot-wide lanes to be the minimum width for a county or city road and 12-foot-wide lanes for state arterial roads.[4] Fifty-three percent of Indiana's approximately 66,000 road miles of county roads are less than the 18-foot total width required by FHWA.[2] Approximately 6 percent of lane widths on state rural roads are less than 12 feet wide, ranking Indiana 23rd. To compound this issue, nearly 88 percent of county roads have no edge-of-the-road markings (normally the white lines). In addition, another 72 percent have no centerline markings to delineate lanes.[2] Finally, there are roughly 685,000 signs throughout Indiana's cities and counties. Approximately 245,000 of these signs are in need of replacement due to deterioration.[2] This is especially hazardous since these include stop signs, speed limit signs, and warning signs ranging from schools zones to railroad crossings and speed zone signs for dangerous curves.

Pavement Conditions

In 2001 and 2008, studies determined the overall condition of the pavement on both state highways and local roads. The study indicated the percentage of county roads deemed unsatisfactory rose from 28 percent in 2001 to 51 percent in 2008;[2] while the percentage of state highways deemed unsatisfactory dropped from 20 percent to less than 1 percent in that same time period.

A portion of the overall condition rating is determined by the International Roughness Index (IRI) survey. This survey measures the "roughness" a vehicle experiences while traveling on the road. The 2008 survey indicated nearly 77 percent of county roads were considered unsatisfactory, down from 88 percent in 2001. Nineteen percent of state highways surveyed in 2008 were considered unsatisfactory, down slightly from 20 percent in 2001. Comparatively with the rest of the nation, Indiana ranks first in rural interstate conditions, 21st in urban interstate conditions, and ninth in rural arterial conditions for state-owned roads.[5] When considering local roads often have lower speeds, roughness can be tolerated to a higher degree. Based on a rating of "poor"(indicated by an IRI of greater than 200), 46 percent of county roads need resurfacing.

The effect of roughness on the driver is more than an annoyance. The condition of a road directly correlates to the vehicle operation costs (VOC), including vehicle maintenance and increased fuel costs. The aggregate cost per mile for a road in excellent condition is $0.212 per mile traveled, meaning if all the roads in Indiana were in excellent condition, the VOC for the entire state of Indiana would be approximately $15.75 billion dollars. Now, consider that 77 percent of county roads and 19 percent of state highways are considered unsatisfactory, and the cost per mile traveled can increase to $0.250.

Congestion

Indiana ranks 10th for lowest percentage of congested miles on urban interstates, with 25 percent of roads congested, while the national average is approximately 51

percent.[5] Indiana spends one and a half times more than the national average on disbursement of funds per mile, ranking seventh in system performance.[5]

Funding

Indiana's transportation network is funded through four different accounts: the State Highway Fund, Motor Vehicle Highway Account, Highway Road and Street Fund, and Special Distribution Account. Federal dollars for both local and state roads and highways all enter into the State Highway Fund. The State of Indiana transportation budget for 2009-2011 totals $5.906 billion.[6] Federal funds account for $2.639 billion of this total.

The gas and special fuels taxes account for a major portion of funds distributed to the four major accounts—nearly $800 million in 2007-08.[6] As cars become more fuel efficient and other sources of energy become available, the gas tax will become less viable as a means of funding. Other forms of funding will become necessary to improve and maintain our roads and highways.

Funds from the Motor Vehicle Highway Account are disbursed to the Indiana State Police, Bureau of Motor Vehicles (BMV), traffic safety, and Department of Revenue (DOR) first, with the remaining funds being split between the Indiana Department of Transportation (INDOT) at 53 percent and local distribution at 47 percent.[6] The amount allocated to the state police, BMV, traffic safety, and DOR has steadily increased from 15.7 percent of the total collected in 1998-99 to 22.6 percent of the total collected in 2007-08. Of the remaining 47 percent allocated for local distribution, approximately 97 percent is used for operational and administrative expenses, leaving just 3 percent of the funding, or $87 million in 2008, for materials and road maintenance. The Highway Road and Street Fund is split between the State Highway Fund and local distribution at 55 percent and 45 percent, respectively.[6] In 2007-08, a total of $79 million was distributed to counties and cities, with $44 million split among the 92 counties and $35 million split among the cities.[6]

Due to the greater funding needs, many cities and counties in Indiana have looked elsewhere to provide funds for roads and highways. These funds are obtained through mechanisms such as local option vehicle tax, local option income taxes, gaming funds, permitting fees, and capital development funds. In 2008, 89 percent of cities had some additional funding mechanism in place.[2] Of the 92 counties in Indiana, 97 percent of them used supplemental funds.[2]

Indiana has become one of a handful of states that has introduced an alternate form of funding. In 2005, Indiana began a 10-year, $12 billion transportation initiative called "Major Moves," which includes a public-private partnership to lease the Indiana Toll Road for $2.6 billion over 75 years. Between 2001 and 2005, Indiana averaged spending of $750 million dollars per year in statewide construction.[6] Since the development of Major Moves, Indiana has steadily increased total construction spending, with approximately $1.179 billion invested in construction during 2009 construction.[6] The additional capital has allowed Indiana to complete 34 new roadways, start construction on 16 more, and obligate 40 percent of the plan's funds.

The Major Moves plan spans a total of ten years and addresses the need for increased spending on new construction and pavement replacement projects for the short term. After this 10-year investment, funding will return to its normal mechanisms. It is imperative Indiana continues to evaluate and implement sustainable revenue sources for funding our roads and highways for decades to come.

Future Needs

There are short-term and long-term needs to address the current condition of the county and city roads. The short-term needs address immediate action to fix pavement conditions and backlogged maintenance needs. As stated earlier, 51 percent of county roads are unsatisfactory. At $76,000 per mile for paved county roads and $4,600 per mile for unpaved county roads, the short-term need to improve the 51 percent deficiency is $1.962 billion.[2] At less than $85,000 per mile, the short-term need for city roads is $1.542 billion. In total, $3.504 billion dollars is needed to address the short-term needs.[2] Long-term needs are based on a 12-year program and the understanding that all local roads be brought to an adequate function, a short-term need, so that annual maintenance can be performed. This program provides a chip and seal at year six and an overlay at year 12, along with minor maintenance items. At $8,333 per mile of paved county roads, the current annual need is $413 million.[2] The current funding available for annual county road maintenance is $44 million, leaving an annual shortfall of approximately $369 million.[2] Add in the cost of just materials, not including labor, to maintain the remaining 16,537

miles of unpaved county roads, and the funding shortfall for county roads increases to $400 million. Applying the same methods to city roads, the long-term need for city roads is $350 million. The current available funding for city roads is $35 million. The combined annual long-term funding need for all local roads is approximately $794 million, with an overall annual shortfall of $715 million.[2]

Additional funding is also required for short- and long-term traffic safety needs. Short-term needs address pavement width, pavement markings, and signage neglected due to lack of funds. The short-term need for traffic safety is $706 million.[2] Long-term needs address maintenance of pavement markings and outdated signage. The long-term annual costs are estimated to be $26 million.

INDOT prepares a long-range transportation plan that addresses needs for maintenance and expansion of the current state-owned highway system. The current plan covers financial forecasting from 2006 through 2030 in five-year increments. The needs for the first two increments, spanning from 2006 to 2015, are addressed through Major Moves funds, which were procured from the lease of the Indiana Toll Road. Due to the planned expiration of those funds by 2015, a long-term financial forecast was developed for the last three increments, 2016 through 2030. The long-term need for the last three increments is approximately $21.3 billion.[8]

Conclusions and Recommendations

Indiana's state-owned highway and local road systems play a major role in the transportation of commerce and people. As the amount of pedestrian vehicles and freight shipments that traverse the state continues to increase, it will be imperative Indiana's local and state-owned roads and highways be maintained and expanded to ensure safe travel and economic viability. With Major Moves funding, Indiana has been able to address pressing issues related to maintenance and expansion of state-owned highways and portions of local road budgets through 2015. County and city road conditions continue to be an escalating problem due to restrained local budgets and decreasing funding, making them difficult to maintain. Although Indiana has taken an aggressive approach to deal with the current transportation needs, local governments will continue to face increasing budget constraints, and state-level funding will become more uncertain after Major Moves funding expires in 2015. For its efforts in funding and construction, Indiana was awarded a C- for roads. This is a full letter grade higher than the D- issued by ASCE for the national highway system.

Given the uncertainty in funding and the need to provide a safe and economically viable road system in Indiana, the following solutions are recommended:

- Increase federal and state motor fuels fees and develop new methods for funding based on a "user-fee" approach.
- Reduce the effects of being a "donor" state by continued legislative efforts to capture more fuel tax funds leaving the state for federal allocation.
- Continue and expand the Major Moves program while implementing revised approaches learned from previous successes and mistakes within the program.
- Reduce crash-related fatalities and promote safety funding through the *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users* (SAFETY-LU).
- Set and maintain goals for pavement conditions at both the state and local level.

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WASTEWATER

GRADE: D-

Introduction

Wastewater infrastructure throughout Indiana typically includes sanitary and combined sewer collection and conveyance systems, treatment systems, and operation and maintenance components. Wastewater systems require continual attention for operation and maintenance, rehabilitation/replacement of aging components, and capacity upgrades, as well as to comply with regulatory requirements. The availability of increased funding resources would greatly enhance the ability of wastewater systems to meet the continual demands imposed on them.

In developing this report, research was based on existing available data relating to municipal wastewater collection and treatment systems. Topics not evaluated include private on-site systems, pre-treatment facilities, and pre-treatment systems.

Capacity and Condition

Sewers throughout the country, including Indiana, were constructed beginning in the late 1800s. These sewers conveyed waste and stormwater to nearby bodies of water for disposal. In the mid 1900s, communities started constructing wastewater treatment plants and separate sanitary and storm sewer systems. Secondary and tertiary treatment processes were added to many Indiana wastewater treatment facilities in the 1970s and 80s when sufficient federal grant funding was available to most communities. Communities with older sewer systems maintained sewers that conveyed both sanitary sewage and stormwater, referred to as combined sewer systems. Indiana has approximately 411 wastewater treatment facilities and approximately 488 sanitary sewer collection systems.[1]

During wet weather events, combined sewer systems may reach and exceed design capacity. Once this occurs, the system releases untreated combined wastewater and stormwater into surface water bodies, which is referred to as a combined sewer overflow (CSO) event. There are 108 combined sewer communities in Indiana, which is 12.5 percent of the total number of CSO communities nationally, with 842 total CSO locations. The largest 14 CSO communities in Indiana discharged a combined 26 billion gallons of combined sewage into State waterways during a 12-month period in 2007 and 2008. Approximately 2.69 million people are served by combined systems. These communities are in the process of implementing Long-Term Control Plans, which identify how the community will eliminate, reduce, and provide treatment for CSO events. There are at least 10 combined sewer communities in Indiana whose individual long-term control plan needs exceed $120 million.[1, 2] Communities are typically given up to 20 years to implement their CSO long-term control plans.

The components of Indiana's wastewater infrastructure have a limited design/useful life. This design life is dependent upon the material type, environment, and maintenance. Typical design life for various wastewater infrastructure components is listed in the table below.[3]

COMPONENT	YEARS OF DESIGN/ USEFUL LIFE
Collection Systems	80-100
Interceptor Sewers	90-100
Force Mains	25
Treatment Plants - Concrete Structures	50
Treatment Plants - Mechanical/Electrical	15-20
Pumping Stations - Concrete Structures	50
Pumping Stations - Mechanical/Electrical	15

Given the age of many of the state's wastewater infrastructure systems in comparison to their design life, many communities may have wastewater infrastructure components that are nearing the end of their useful life.

Funding

Municipalities in Indiana can typically receive funding for wastewater infrastructure projects from the following sources: Indiana Clean Water State Revolving Loan Fund Program (low-interest loans), Indiana U.S. Department of Agriculture (USDA) Rural Development (loans and grants for communities with a population of less than 10,000), Indiana Office of Community and Rural Affairs – Community Focus Fund (grants), revenue bonds, tax increment financing, and private sources. Municipalities typically repay the capital funds required to make improvements to their wastewater infrastructure through user rates.

Funding available to the state through the Indiana Clean Water State Revolving Loan Fund, Indiana USDA Rural Development, and Community Focus Fund is subject to change based on appropriations from the federal government. Table 2 summarizes funding appropriations for these agencies in 2009.

AGENCY	AMOUNT
Indiana Clean Water State Revolving Loan Fund	$394 million
Indiana USDA Rural Development	$50 million
Community Focus Fund	$3.7 million
2009 Total Appropriations	$447 million

The funding appropriations for 2009 include allocations from the American Recovery and Reinvestment Act of 2009 (ARRA), whose funds are distributed through the Indiana Clean Water State Revolving Loan Fund ($94 million) and Indiana USDA Rural Development ($20 million). An appropriation of $11 million is also available for infrastructure projects (i.e., water, sewer, and storm drainage) through the Community Focus Fund.

Future Need

Future needs include resources for operation and maintenance, improvements to the current infrastructure to rehabilitate/replace worn-out and aging components, and development to accommodate population growth and increasing demands and compliance with regulatory requirements. By April 2009, the Indiana Clean Water State Revolving Loan Fund Program alone had identified more than $1 billion in projects ready to proceed with construction.[4] There is a strong likelihood that new nutrient (Total Nitrogen and Phosphorous) removal requirements will be required for the portion of Indiana that currently discharg-

es into the Ohio/Mississippi River basin. Those communities that discharge to the Great Lakes basin already have this nutrient removal requirement in place. Almost every existing wastewater treatment facility that discharges into the Ohio/Mississippi River basin will require upgrades at considerable cost as these requirements are implemented. These costs have not been estimated to date and are not included in any estimated costs previously presented.

Operation and Maintenance

Operation and maintenance activities for a wastewater system occur on a continual basis. General operation and maintenance items include labor, equipment, supplies, electrical power, and replacement parts. Sanitary sewer collection systems include cleaning, televising, flow monitoring, valve exercising, lift station pumps, emergency power generators, and supervisory control and data acquisition systems. Combined sewer systems include overflow monitoring, rainfall data collection, floatable controls at each CSO outfall, CSO storage, screening and disinfection facilities, and supervisory control and data acquisition systems. Wastewater treatment facilities include process equipment, pumps, blowers, emergency power generators, chemicals, supervisory control and data acquisition system, grit disposal, sludge disposal, laboratory analysis, flow monitoring, and pretreatment monitoring.

Municipalities incur continual costs to operate and maintain their wastewater systems. To pay for these costs, municipalities typically account for operation and maintenance in their user rates.

Public Safety

Wastewater systems can jeopardize public safety if untreated wastewater is released. Untreated wastewater can be released from sanitary sewer overflows, combined sewer overflows, and wastewater treatment plants. Releases can occur due to system overload as a result of wet weather, pipe breaks, pipeline blockages, or equipment failure. *E. coli* and other contaminants in untreated wastewater can also affect public health.

The Indiana Department of Environmental Management (IDEM) received reports of 80 bypass/overflow incidents in 2009. More than 285 million gallons of untreated wastewater are reported to have been released to bodies of water or on to the ground. Forty-seven of these bypass/overflow incident reports did not indicate the volume of untreated wastewater released. Therefore, the total volume released could possibly be substantially higher.

Resilience

Construction, operation and maintenance, and reconstitution of service of wastewater infrastructure are expen-

sive, and the monetary and societal costs incurred when this infrastructure fails are high. Aging, under-designed, or inadequately maintained systems discharge untreated wastewater into Indiana surface waters each year.[5]

The state's wastewater systems are not resilient in terms of current ability to properly fund and maintain, prevent failure, or reconstitute services. Additionally, the interdependence on the energy sector contributes to the lack of system resilience that is increasingly being addressed by the construction of dedicated emergency power generation at key wastewater facilities.[5]

Future investments must focus on updating or replacing existing systems as well as building new ones to meet increasing demand. In addition, operations processes need to be improved by addressing ongoing oversight, evaluation, and asset management on a system-wide basis. Watershed approaches are necessary to look more broadly at water resources in a coordinated, systematic way.[5]

Conclusion

Indiana's wastewater infrastructure grade was developed considering the evaluation category topics and computing an average for the overall grade. The grade for Indiana's wastewater infrastructure for 2010 is D-.

On a national level the wastewater infrastructure grade was D- in 2009. According to ASCE's *2009 Report Card for America's Infrastructure*, Indiana's projected wastewater infrastructure needs are $5.86 billion, and on a national level, the needs are projected to be $255 billion over the next five years for wastewater and drinking water.

Suggestions to increase the grade of Indiana's wastewater infrastructure system include:

- Increasing public awareness of the current system condition
- Increasing funding availability
- Continuation of combined sewer separation
- Continued research and development of products to increase the longevity of system components
- Working closely with IDEM to conduct a wastewater needs survey to get a better understanding of the condition and funding requirements of the state's wastewater infrastructure.

The low grade of the wastewater infrastructure is not truly reflective of the dedication and talent of the professionals working in Indiana, but is more reflective of continual and increasing demands combined with reduced budgets.

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CROSS THIS BRIDGE AT A WALK

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INDIANA SECTION

Methodology and Contributor Biographies

METHODOLOGY

Introduction

In the development of the Report Card grades, seven fundamental components of the infrastructure were considered. These components were not weighted. The grade for each category was allocated at the discretion of each infrastructure subcommittee on the basis of their review and analysis of the data. These subcommittees may have determined grades on the basis of a particular plus or minus in any of the components. The fundamental components assessed were:

- **Capacity** – Evaluation of the infrastructure's capacity to meet current and future demands.
- **Condition** – Evaluation of the infrastructure's existing or near future physical condition.
- **Funding** – Identification of the current level of funding (from all levels of government) for the infrastructure category and comparison to the estimated funding need.
- **Future Need** – Evaluation of the cost to improve the infrastructure and determination of whether future funding prospects will be able to meet the need.
- **Operation & Maintenance** – Evaluation of the owners' ability to operate and maintain the infrastructure properly and determination that the infrastructure is in compliance with government regulations.
- **Public Safety** – Evaluation of to what extent the public's safety is jeopardized by the condition of the infrastructure and what the consequences of failure may be.
- **Resilience** – Evaluation of the infrastructure system's capability to prevent or protect against significant multi-hazard threats and incidents and the ability to expeditiously recover and reconstitute critical services with minimum damage to public safety and health, the economy, and national security. (For more information on resilience, see below.)

Grading Criteria

The *2010 Report Card for Indiana's Infrastructure* followed a traditional letter grade scale.

A = 90-100%
B = 80-89%
C = 70-79%
D = 51-69%
F = 50% or lower

Research and Grading Process

1. Review available data or surveys for each category. Data collected will be used as follows:
    - Assess infrastructure using existing reported grades
    - Identify current amount being spent and dollars needed to replace existing infrastructure, in most recent available year
    - Identify dollars needed to upgrade infrastructure to meet future needs
    - Identify percent capacity of problem
    - Identify quantity of infrastructure, number of bridges, miles of road, pipe, etc.
    - Assess consequences of doing nothing
2. Compile and analyze the data, resulting in the development of a summary report. The following criteria will be used in presenting the data:
    - Total need defined by dollars needed
    - Existing and future needs and current funding levels
    - Percent of capacity represented by the problem
    - Quantity that the problem represents
    - Consequences of doing nothing
3. Determine an initial grade.
4. Analyze, validate, and determine final grade.

Resilience

Infrastructure resilience is the capability of systems to prevent or protect against significant multi-hazard threats and the ability to rapidly recover and ensure continuity of critical services, with minimal negative impact to public health and safety. In evaluating resiliency for each of the seven categories, the following criteria were considered:

- Risk and consequence management (both within each sector and across sectors)
- Life-cycle maintenance
- Sector and system interdependencies
- Time, ease, and cost of recovery

As the metrics for evaluating resilience are in their infancy, the *2010 Report Card for Indiana's Infrastructure* includes brief qualitative comments for each category. There is an overarching need to develop multi-hazard risk assessments for each sector and use them to inform public perceptions and priorities.

As applied to infrastructure, the concept of evaluating resilience embodies a shift from a strategy based on pure protection to one that ensures the continuity of operations in the face of aging as well as man-made and natural hazards. The scope of resilience includes security, disaster preparedness and mitigation, and response and recovery activities. A strong, prosperous, and competitive nation must develop and maintain a resilient infrastructure.

CONTRIBUTOR BIOGRAPHIES

AZIZ AHMED, PE, is a project manager at RW Armstrong in Indianapolis. He has over 14 years of diversified experience in developing water resources plans, infrastructure master plans, system models, and capital improvement programs. He is an experienced manager in design and construction management. Mr. Ahmed is a member of AWWA's Water Resources Management Committee, Climate Change Committee, and Water Supply & Distribution Facilities Design & Construction Committee. He is very active in local chapters of AWWA.

RICHARD O. ALBRIGHT, PE, F.ASCE, F.ACI, is a professional engineer in the state of Indiana. He has worked for civil and structural engineering consulting firms and for organizations in the cement and concrete industries, and has been a county engineer. He has served ASCE at the local, state, and national levels as elected officer and as committee member and chairman.

JENNIFER M. ALFORD, PE, PTOE, M.ASCE, studied Civil Engineering at The Ohio State University where she earned her bachelor's degree in 1997. She is currently a senior project engineer in the Columbus, Ohio, office of American Structurepoint, Inc., a multi-discipline consulting firm, where she has worked since 2000. Her resume includes railroad grade separations, traffic studies, traffic signal design, highway design, roundabout design, and site development. She is a licensed professional engineer in Ohio and a professional traffic operations engineer through the Institute of Transportation Engineers. She has been an active member of ASCE for 10 years and assisted with the Ohio Infrastructure Report Card last year. She received the 2006 Young Engineer of the Year award from the Ohio Society of Professional Engineers for her contributions to the engineering profession in the state.

MICHAEL R. CLINE, PE, M.ASCE, is a vice president and director of Engineering Operations at Hanum, Wagle, and Cline Engineering. Mr. Cline has over 33 years of experience specializing in the study, master planning, design, and construction of water systems, stormwater drainage systems, and wastewater treatment and collection systems. Mr. Cline is an active member of the American Water Works Association, Indiana Water Environmental Association, and American Consulting Engineers Council, and is a diplomat with the American Academy of Environmental Engineers. He is recognized by the Indiana Department of Environmental Management as an authority in the planning and design of water and wastewater systems and sits on several national environmental engineering committees. Mr. Cline received his BS in Civil Engineering from Ohio State University.

REBECCA A. CRANE, EI, AM.ASCE, studied Civil Engineering at Brigham Young University, where she received her bachelor's degree in 2006. She is currently a project engineer for URS Corporation's Indianapolis office. She has experience in roadway design, assisting in geometric design, drainage design, and the preparation of contract plans and engineers estimates for rural and urban transportation projects. During her pre-undergraduate experience, Ms. Crane researched cement-treated base pavements, chloride concentration on bridge decks, and pavement durability, resulting in five peer-reviewed publications. She is an active member of ASCE.

DAVID P. DEVINE, PE, LS, has been a member of ASCE for 23 years and is active at the branch, section, and national level. He is the current chair of the Committee on Licensure and Ethics for ASCE and is on the editorial board of the ASCE journal Leadership and Management in Engineering. He also currently serves on the ASCE Board-level Paraprofessional Task Committee. He has been teaching at the university level for the past nine years and has worked in engineering consulting, government, and international development for 11 years.

RICHARD E. DURHAM, PE, LS, F.ASCE, studied Civil Engineering at Tri-State University, where he earned his bachelor's degree in 1979. He is currently the president of DURHAM Engineering, Inc., in Anderson, Indiana, a consulting firm serving all of Indiana. Mr. Durham has been with DURHAM Engineering since 1988 when he formed the company. His resume includes transportation design for roadway and aviation reconstruction and rehabilitation projects, including interstate highways, urban roads, and rural routes, as well as airport runways, taxiway and apron design. He is a licensed professional engineer in three states. Mr. Durham has been an active member of ASCE for over 30 years. He is currently a member of the ASCE Report Card Committee working to improve infrastructure throughout the state of Indiana and the United States. Under his leadership, DURHAM Engineering has received a number of awards for innovative and high-quality transportation projects.

JOHN E. FISHER, PE, HG, F.ASCE, is the chairman of the Board for Lawson-Fisher Associates, PC, in South Bend,

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R. JERRY FROST, PE, M.ASCE has over 25 years of design and consulting experience in the bridge, roadway, and transportation industries from both the public and private business organizations throughout his career. Mr. Frost has a BS in Civil Engineering from Ohio Northern University, MS in Civil Engineering from Penn State University, and MBA from University of Maryland, University Center. He worked for the Pennsylvania Department of Transportation and multiple consulting firms before opening his own firm in 2005. He has been actively involved with ASCE for nearly his entire professional career. He is licensed in over ten states.

BART GIESLER has been actively representing Indiana airports for nearly 20 years. Mr. Giesler started lobbying for Aviation Association of Indiana (AAI) in 1992 and later became the association's executive director. AAI represents all aspects of aviation in Indiana, and membership includes general aviation airports, commercial service airports, fixed based operators, state universities, and airport consultants and suppliers. AAI hosts three quarterly meetings and an annual meeting in the fall. At these meetings, airport representatives hear presentations from the FAA, the Indiana Department of Transportation Office of Aviation, Transportation Safety Administration and other informative speakers. AAI is recognized as the voice of aviation in the state.

KATHERINE E. GRAHAM, PE, M.ASCE, is a civil engineer employed at American Structurepoint, Inc., in Indianapolis, Indiana. Ms. Graham has been at American Structurepoint for six years and has been involved in planning, design, and construction of drinking water, wastewater, and stormwater projects ranging from general consulting for sewer districts to complex and phased approaches to larger drinking water, wastewater, and stormwater design projects. Ms. Graham is currently a member of the ASCE Metropolitan Indianapolis Branch of the Indiana Section and is also involved with the branch Environmental and Water Resources Institute and chairs the Continuing Education Committee. Ms. Graham graduated from Purdue University in 2004 with a BS in Civil Engineering.

THERESA HARRISON, PE, M.ASCE, is a senior engineer and corporate safety office for Lawson-Fisher Associates, PC, in South Bend, Indiana. Ms. Harrison has over 18 years of transportation experience. She is a member of ASCE, ITE, and APWA, and has received her BS and MS in Civil Engineering from the University of Michigan.

ZACH HURST, PE, is the chief design engineer for the St. Joseph County Department of Public Works. Mr. Hurst oversees the bridge program for St. Joseph County, which includes inspecting, monitoring, plan review, budgeting, and design of approximately 260 structures ranging in length from 4 feet to 400 feet. Prior to joining St. Joseph County, Mr. Hurst spent four years in the private sector doing structural design on projects ranging from railroad underpasses to senior living facilities. Mr. Hurst is a 2004 graduate of the University of Illinois with a BS in Civil Engineering. He is a licensed professional engineer in the state of Indiana, and a member of the American Society of Civil Engineers.

JARED HUSS, PE, M.ASCE, is a civil engineer employed at Lawson-Fisher Associates, PC, in South Bend, Indiana. He has been there for seven years and has been involved in designing transportation projects ranging from complex geometric interchanges to local public intersections and roads. Mr. Huss has also been involved in the monitoring and assessment of various hydroelectric dams. He is a past president of the ASCE North Central Branch of the Indiana Section and is currently a member. Mr. Huss graduated from Tri-State University in 2003 and has a BS in Civil Engineering.

KELLY LAVALLEY, PE, is a civil engineer employed at United Consulting in Indianapolis, Indiana. Ms. LaValley has six years of experience in the wastewater and drinking water industries. She is currently a member of the ASCE Metropolitan Indianapolis Branch of the Indiana Section

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NATHAN LIENHART, PE, has been involved in the aviation development industry as a consultant to airports for over eight years. As an employee of RW Armstrong since graduation from college, his experience ranges from municipal general aviation airports to large commercial/cargo airports, including both domestic and international. Mr. Lienhart attained a BS in Civil Engineering from Tri-State University (now Trine University) in 2002 and currently holds active professional engineering licenses in 11 states and two commonwealth territories of the United States. Prior to graduation, Mr. Lienhart participated in several internship and cooperative education endeavors ranging from construction materials testing to consulting engineering and surveying.

RANDY LINDLEY, PE, CPSWQ is a graduate of Purdue University, holding a BS in Interdisciplinary Engineering. He is a professional engineer in the states of Indiana, Michigan, and Wisconsin. He holds a Class IV and D Wastewater Operator Certification in Indiana. He is also a certified professional stormwater quality (CPSWQ) through EnviroCert International, Inc. Mr. Lindley is experienced in all components of wastewater, water, and stormwater projects, including planning, design, and construction. As a senior civil engineer with Lawson-Fisher Associates, PC, his responsibilities include the preparation of engineering reports, design plans and specifications, and performing construction administration for a variety of municipal infrastructure projects. Mr. Lindley is also knowledgeable about the regulatory and permitting aspects of environmental infrastructure projects.

DR. SCOTT LUDLOW, PE, is a principal engineer with Earth Exploration, Inc., in Indianapolis and has 25 years of consulting experience in geotechnical engineering. During his career, he has been involved in several projects throughout the United States, ranging from small-scale site investigations to complex studies involving such special considerations as excavation support and earth retention systems, dams and embankments, seismic stability and deformations, machine vibrations, soil nailing and earth reinforcement, in-situ testing, and deep foundations. He has contributed to the development of Indiana Department of Natural Resources' document titled "General Guidelines for New Dams and Improvements to Existing Dams in Indiana" and is a member of ASCE's Earth Retaining Structures committee. Dr. Ludlow has also authored or coauthored numerous research reports and technical articles and is a professional engineer in 20 states.

MICHAEL L. MCCOOL JR., PE, is a graduate of Purdue University, holding an MS in Civil Engineering and a BS in Aeronautical and Astronautical Engineering. He is a professional engineer in the states of Indiana and West Virginia, and an INDOT-certified team leader with certification to inspect complex bridges. Additionally, he serves as a member of the INDOT/ASCE Structural Committee and the County Bridge Conference Planning Committee, and as vice-chair of the National PCI Committee on Bridges. Mr. McCool also volunteers as a guest lecturer for a masters-level course on LRFD bridge design at Purdue University. Mr. McCool is experienced in all phases of bridge design and inspection projects. As manager of the Beam, Longest and Neff, LLC, Bridge Department, his responsibilities include the supervision of design and plan development for bridge replacement and rehabilitation projects. Mr. McCool has been utilizing the AASHTO LRFD Bridge Design Specifications on his West Virginia projects since 1998. His focus has been in the design of various structures for transportation projects and completing county-wide bridge inspection projects.

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SKY K. MEDORS, PE, CFM, earned his bachelor's degree from Purdue University in 1996. He is currently a senior civil engineer at the firm of Lawson-Fisher Associates, PC, in South Bend, Indiana. Sky has significant experience in inspections, site investigations, analyses, design, construction, and emergency action plan development for dam safety projects. He is a registered professional engineer in Indiana, Michigan, and Ohio, and a certified floodplain manager in Indiana. His professional affiliations include the Association of State Dam Safety Officials, United States Society on Dams, Association of State Floodplain Managers, Association of Conservation Engineers, Indiana Association of Floodplain Managers, and American Society of Civil Engineers. Mr. Medors has also served as chairman on ASDSO's New Member Committee.

TERRY RAINIER, PE joined RW Armstrong in 1976 after graduating from Purdue University with a bachelor's degree in Civil Engineering. Mr. Rainier started as a project engineer for airport development projects and worked his way up to director of airports and managing partner for RW Armstrong. Through Mr. Rainier's 34 years in the aviation industry, he has worked extensively with air carrier airports, commercial service (Part 139 certificated) airports, joint military/civil airports, privately owned airports, and general aviation airports covering more than 75 airports. Mr. Rainier is also a board member and current president of the Aviation Association of Indiana.

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MICHAEL WENNING, PE, F.ASCE, studied civil engineering at the US Coast Guard Academy before transferring to Purdue University where he earned his BS in Civil Engineering in 1981. He is currently a department manager for both the Indianapolis, Indiana, and Columbus, Ohio, offices of American Structurepoint, Inc., a multi-discipline consulting firm, where he has worked since graduation. His resume includes over 500 bridge replacement and rehabilitation projects, including highway, railroad, and pedestrian structures. He is a licensed professional engineer in four states. He has been an active member of ASCE for over 25 years. Mr. Wenning received the 2004 Indiana Engineer of the Year award for his contributions to the engineering profession in the state. He is currently a member of the INDOT/ASCE Structures Committee working to improve bridge design throughout the state. Under Mr. Wenning's leadership, the Bridge Department at American Structurepoint has received a number of awards for innovative and high-quality bridge and transportation projects.

MICHAEL S. WIGGER, PE, AM.ASCE, studied civil engineering at Purdue University where he earned his bachelor's degree in 1999 and his master's degree in Geotechnical emphasis in 2000. He is currently the geotechnical engineering manager at Earth Exploration, Inc., in Indianapolis, Indiana—a firm specializing in geotechnical engineering, geophysical testing, construction monitoring and materials testing, and laboratory and exploratory field services. His resume includes project coordination, report preparation and review, client development, proposals, and invoice preparation. Mr. Wigger's work is focused toward public-funded projects with geotechnical involvement ranging from consultation to design of bridge foundations, earth retention systems, dams, tunnel-related elements, roadways, and other infrastructure improve-

ments. He is currently on the Board of Directors of the Metropolitan Indianapolis Branch of ASCE and is a director of the Geotechnical Group. He has also served on planning committees for the Purdue Geotechnical Society and the Indiana County Bridge Conference. Mr. Wigger is a registered professional engineer in Indiana.

JAMES A. WURSTER, PE, LS, AIA, M.ASCE, is the founder of American Structurepoint, Inc., in Indianapolis, Indiana. Mr. Wurster started the company as primarily a transportation firm that, under his leadership, expanded to several areas of expertise, including roads, bridges, water, wastewater, surveying, civil-site design, structural engineering, forensic engineering, and architecture. Mr. Wurster is a graduate of Purdue University.

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