Annual Bridge Report 2019

IOWA DOT
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2019 Bridge Data

This report is based on data provided to the FHWA in March 2019. The National Bridge Inventory (NBI) data is submitted to the FHWA annually. The data submitted includes 116 data fields collected during biennial inspections. Once the data is submitted to the FHWA, they perform data analyses and calculate the Sufficiency Rating, determine Structural Deficiency, and Good-Fair-Poor category.

The State is responsible for oversight of the statewide bridge inspection program according to federal regulations. All bridges are inspected by the local jurisdiction responsible for the roadway crossing a bridge. The State has delegated this responsibility to the local agencies through Iowa Code section 314.18.

The State's oversight of local bridge inspections is managed through the Structure Inspection and Inventory Management System (SIIMS). SIIMS is a web based software system used to document all bridge inspections statewide. Oversight is also performed through annual field inspections of a group of counties and cities for quality assurance.

Special points of interest:

- Poor bridges on the Primary Highway System have been reduced from 237 in 2009 to 39 in 2019.
- The average age of Primary Highway Bridges is 40 years. Half of these bridges are over 42 years old.
- The deck area of the bridges on the Primary Highway System is over 1045 acres or 1.63 square miles.

Inside this issue:

Bridge Ownership

Bridge ownership is based on the jurisdiction of the roadway where the bridge is located. There are three main categories of ownership in Iowa. Most bridges on public roadways are owned by the State, a county, or a city.

Owners	Total	Deck Area (ft^2)
State Bridges	4,161	45,533,247
County Bridges	18,666	41,247,163
City Bridges	1,181	8,325,588
Total	24,008	95,105,998

Common Bridge Types

5 in 1 Bridge on I-380

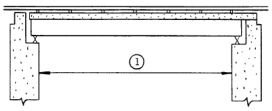
There are several common types of bridges on Iowa's roadways.

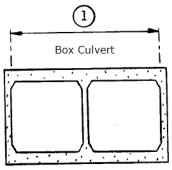
Bridge Types	State	County	City
Pre-stressed Girder	1818	1949	205
Steel Girder	919	4975	173
Concrete Slab	559	4111	278
Truss	10	821	20
Timber Girder	4	1645	28
Culverts	808	3387	352
Other	43	1778	125
Total	**4161**	**18,666**	**1181**

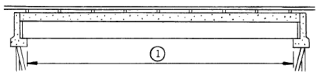
Bridge Definition

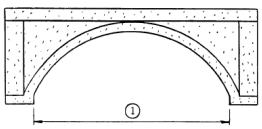
"A bridge is a structure with an opening of more than 20 feet"

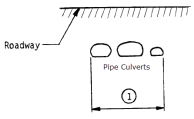
The FHWA definition of a bridge is any structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring-lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.











Interchange of IA-5 and I-35

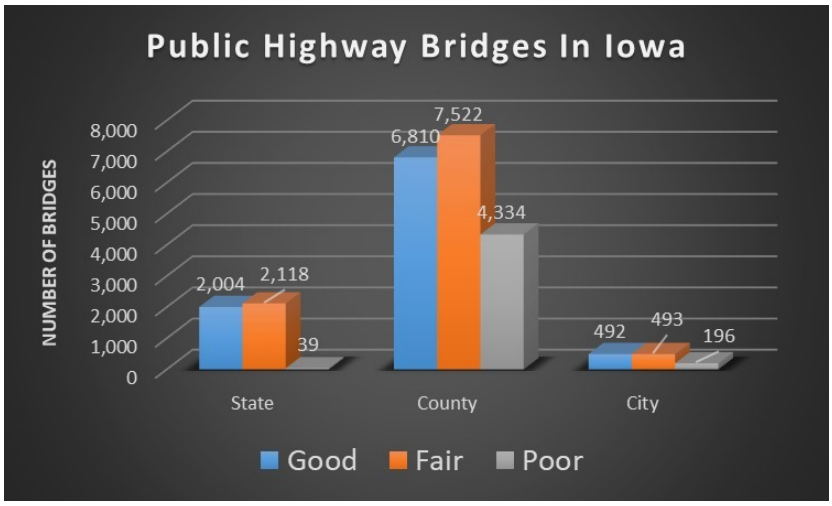
Bridge Categorization: Good-Fair-Poor

The assignment of a classification of Good, Fair, or Poor is as defined by the FHWA for MAP-21 reporting and is based on the bridge's condition ratings for NBI Items 58-Deck, 59-Superstructure, 60-Substructure, and 62-Culverts. The method of assessment to determine the classification of a bridge will be the minimum condition rating. The condition rating of lowest rating of a bridge's 3 NBI Items, 58-Deck, 59-Superstructure, and 60-Substructure will determine the classification of the bridge. For culverts, the rating of its NBI Item, 62-Culverts, will determine its classification. Bridges and culverts will be classified as Good, Fair, or Poor based on the following criteria:

(1) Good: When the lowest rating of any of the 3 NBI items for a bridge (Items 58-Deck, 59-Superstructure, 60-Substructure) is 7, 8 or 9, the bridge will be classified as Good. When the rating of NBI item for a culvert (Item 62-Culverts) is 7, 8, or 9, the culvert will be classified as Good.

(2) Fair: When the lowest rating of any of the 3 NBI items for a bridge is 5 or 6, the bridge will be classified as Fair. When the rating of NBI item for a culvert is 5 or 6, the culvert will be classified as Fair.

(3) Poor: When the lowest rating of any of the 3 NBI items for a bridge is 4, 3, 2, 1, or 0, the bridge will be classified as Poor. When the rating of NBI item for a culvert is 4, 3, 2, 1, or 0, the culvert will be classified as Poor.



"The Poor category does not indicate there is a safety issue. Poor bridges are showing signs of age or deterioration due to other effects that will need repair or replacement in the near future"

Bridge Inspection Requirements

The Federal Highway Administration (FHWA) requires all bridges on public roads that carry traffic be inspected according to the National Bridge Inspection Standards (NBIS).

The NBIS defines a bridge, bridge inspection types, inspector qualifications, and load rating requirements.

The NBIS requires each bridge owner to provide a specific set of data items to FHWA annually.

These data items are defined in the "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nations' Bridges". There are 116 items required to be submitted annually for every bridge.

A bridge must be inspected on a 24 month cycle at a minimum. More frequent inspections are required when a bridge meets specific criteria established by the State.

The FHWA allows a state to establish criteria to extend the inspection frequency for a given bridge to a maximum of 48 months. Iowa has approved criteria to extend the frequency to 48 months on some bridges.

Under Bridge Access Unit

National Bridge Inventory

US-34 in Burlington
The Great River Bridge

Bridges in the National Bridge Inventory (NBI) require biennial inspection according to the National Bridge Inspection Standards (NBIS).

Structures included in the NBI are highway bridges on public roads.

Bridges not part of the NBI are structures such as: Railroad, Toll, Privately owned, and Pedestrian bridges.

There were 616,063 bridges in the 2018 NBI nationally. 47,033 were considered to be in Poor condition.

Iowa Ranking in the following categories:	
Number of Bridges	7th
Number of Poor Bridges	1st
Total Deck Area (sq ft)	16th
Poor Deck Area (sq ft)	8th
Number of NHS Bridges	22nd
Number of Poor NHS Bridges	40th
Poor NHS Deck Area (sq ft)	28th
Poor NHS Deck Area (% of total area)	32nd

Who has the most in the following categories?	
Number of Bridges	Texas
Number of Poor Bridges	Iowa
Total Deck Area (sq ft)	Texas
Poor Deck Area (sq ft)	California
Number of NHS Bridges	Texas
Number of Poor NHS Bridges	California
Poor NHS Deck Area (sq ft)	California
Poor NHS Deck Area (% of total area)	Rhode Island

"Most bridges are required to be inspected every 24 months or less, unless they meet FHWA approved criteria extending the frequency to 48 months."

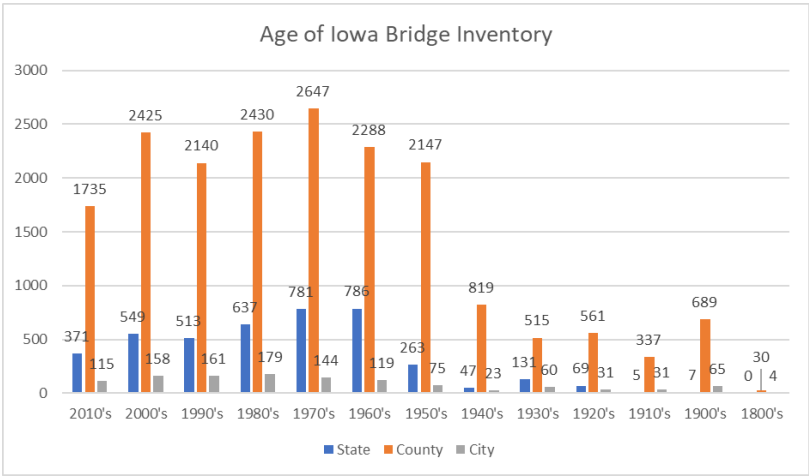
Age of Bridge Inventory

The average bridge age for Iowa's Primary Highway System is 40 years. Nationally the average age is 45 years. The common age used to describe how long a bridge should last has been 50 years. The average age of bridge replaced on the Primary Highway System is 62 years. Bridges built after the late 1970's will likely last longer than 62 years. The design of these bridges included epoxy coated reinforcing and the use of more integral abutments. Limiting the number of deck joints is common in new designs, which improves the longevity of a bridge.

On our Local Highway System, the average age is 45 years. The national average for Locally owned bridges is 42 years. Our Local bridge inventory makes up the majority of the Poor bridge category in Iowa.

In 10 years, the average age of bridges on the Primary Highway system will be 50 years.

I-280 over Mississippi River.



Structurally Deficient / Poor

The definitions for Structural Deficiency and Poor are the same. In January 2018 the definition of Structural Deficiency was modified by excluding two of the previous indicators—Structural Evaluation and Waterway Adequacy.

Structural Evaluation was based on the bridges load carrying capacity and/or condition ratings. The Waterway Adequacy was based on the bridge's size in relation to the waterway underneath.

50% of the Structurally Deficient bridges on the Local highway system carry less than 35 vehicles per day. Almost 80% carry less than 100 vehicles per day.

Of the 4530 locally owned SD/Poor bridges, 384 are closed to traffic.

Restricted bridges are posted for restrictions other than load capacity. They can be restricted to one lane, one vehicle at a time, or a speed restriction.

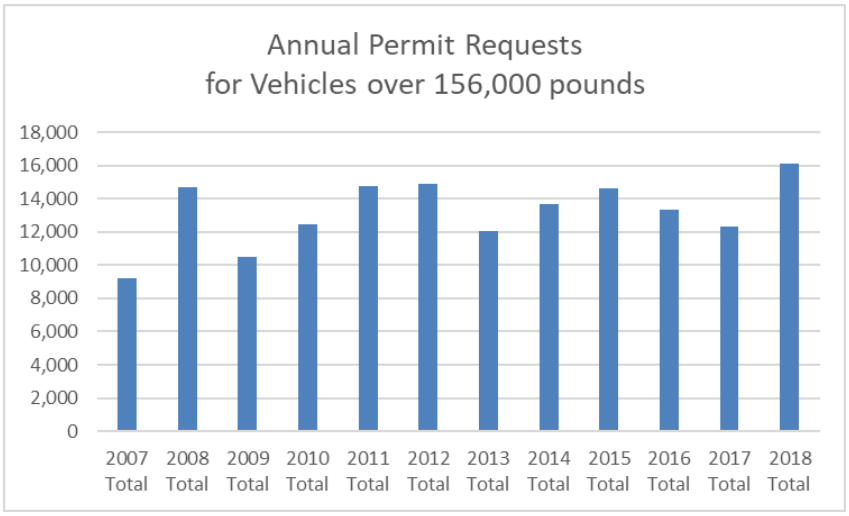
IA-92 in Muscatine, IA.

"Although Iowa has the highest number of Structurally Deficient (SD)/Poor bridges in the country, Iowa is 8th in total SD/Poor deck area."

Poor Bridges	Open	Posted	Restricted	Closed	Other	Total
State Bridges	32	4	0	3	0	39
County Bridges	1,266	2,360	302	364	42	4,334
City Bridges	91	81	4	20	0	196
Total	1,389	2,445	306	387	42	4,569

Heavy Load Permits

The Bridge Office is responsible for the review of all heavy load permit requests , on the Primary Highway System, for gross weights over 156,000 pounds or axle weights above 24,000 pounds. These permit requests are reviewed using the IAPS/Superload program. Each permit must specify the exact route they will be traveling. Every bridge along the proposed route is checked for adequate capacity to carry that specific vehicle. The analysis takes into account the load per axle and the axle spacing of the vehicle. This detailed check ensures the adequacy of the bridges along the proposed route .

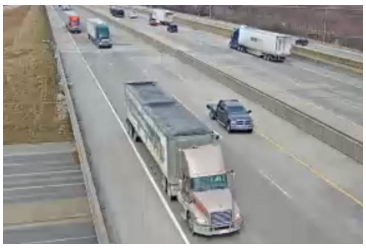


The IAPS system also checks vertical and horizontal clearances along the route based on the height provided on the permit and accurate measurements of clearances stored in the DOT database.

There are over 1200 heavy load permit requests each month. The number of permits has been increasing since 1997. The total number has doubled over the past 15 years.

Superload vehicle over 156,000 pounds.

Average Daily Traffic



Traffic flow on I-80/I-35 corridor.

The Average Daily Traffic (ADT) crossing a bridge is a major factor for making decisions to repair or replace a bridge.

Many bridges on the Secondary Highway System (county and city routes) do not have a very high ADT. Half of the Poor bridges on the County highway system carry less than 35 vehicles per day. The County highway system accounts for the majority of Poor bridges in the State.

Counties do a good job maintaining the bridges that carry the majority of the traffic. Over half of the Poor bridges on the County highway system are posted for weight restrictions. The weight limits allow safe use of these bridges.

It is not cost effective for a local agency to spend a significant amount of money on their low volume bridges. With limited funding, it is best to keep a Poor bridge in service when it is able to accommodate the traffic crossing it.

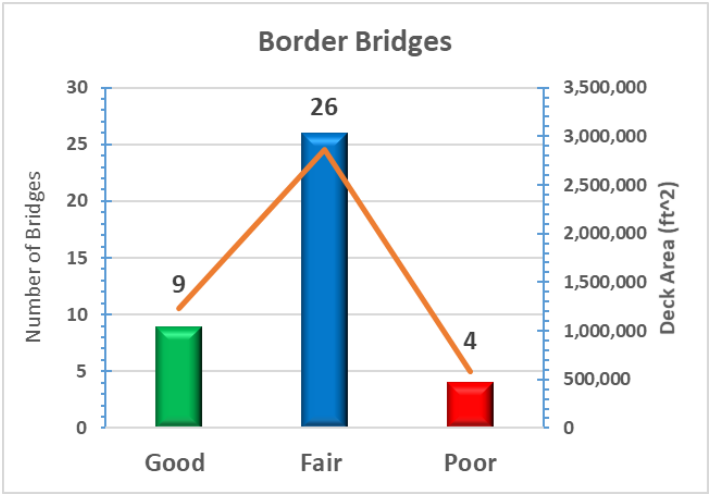
	Owner Classification		
	State	County	City
Average ADT - All Bridges	6615	198	3360
Median ADT - All Bridges	3460	45	1560
Number of Bridges	4161	18,666	1181
Average ADT - Poor Bridges	6420	130	2168
Median ADT - Poor Bridges	2780	35	775
Number of Poor Bridges	39	4334	196
Percent Poor Bridges	0.9%	23.2%	16.6%

"Half of all the Poor bridges on the County highway system carry less than 35 vehicles per day."

Border Bridges

There are 39 bridges that are jointly owned by Iowa and neighboring states. Many of these bridges are complex structure types such as tied arch, continuous thru truss, cable stayed, suspension, or segmental concrete.

Due to the large size and complexity of most of these bridges, they are cleaned annually and maintained at a higher level of repair. Several require painting two, three, or even four times during their life.



IA-9 border bridge at Lansing, IA.
Black Hawk Bridge

Bridge Posting

Bridge posting is needed when the capacity of a bridge no longer meets the needs of the legal loads traveling on public highways.

There are many configurations of legal trucks that must be evaluated on every bridge. If the bridge doesn't have the capacity to carry any one of the many legal truck options, a posting sign must be installed at the bridge.

In Iowa, the legal limits are 80,000 pounds on the Interstate and 96,000 pounds on all other routes. These trucks must comply with the federal bridge formula that limits the gross weight on each axle group.

Bridge postings apply to any vehicle traveling on the bridge, other than fire apparatus, implements of husbandry being transported for repair, or road maintenance equipment owned by the state or local agency.

	Posted	Restricted	Closed	Other	Total
State Bridges	16	0	10	0	26
County Bridges	3,606	718	371	50	4,745
City Bridges	110	9	20	0	139
Total	3,732	727	401	50	4,910

"Posting signs are an economical way to protect the public and keep a bridge in service for the majority of the vehicles using it."

National Highway System

The National Highway System (NHS) is a system of roadways the federal government has designated as essential for national connectivity.

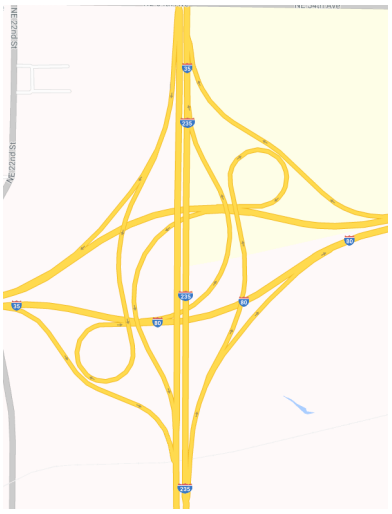
There are 2604 bridges on the NHS in Iowa. 2562 of these bridges are on the Primary Highway System. The interstate system is included in the NHS.

There are over 3000 lane miles of NHS pavement.

Federal requirements established in the FAST Act put limits on the percentage of deck area on the NHS that can be categorized as "Poor". Less than 10 % of the bridge deck area on the NHS can be rated "Poor".

In 2019, the percentage of NHS bridge deck area rated "Poor" was 2.3%. This is well below the required minimum of 10%.

NHS	Number of Bridges	Number of Poor Bridges	% Poor NHS Deck Area (ft^2)
All Bridges	2,604	23	2.3%
State Bridges	2,562	18	2.1%
County Bridges	2	0	0.0%
City Bridges	40	5	11.0%



NEMM in Polk County.

Bridge Funding 2018 Program

The Bridge Office is currently using an optimization and prioritization system developed by Infrastructure Data Solutions, Inc. (IDS). This system uses NBI data from 1992 to present to develop deterioration models for the inventory of typical bridges. Culverts and border bridges are excluded from this analysis. Culverts don't have enough NBI data to make clear decisions on maintenance or replacement. Border bridges are unique and due to their larger size are not easily modeled using NBI data.

The IDS software creates a 20 year program for replacement, rehabilitation, and repair based on set funding limits, or condition targets. Scenarios have been created for an unlimited budget as well as a "Do Nothing" scenario. The unlimited budget shows what may be needed to maintain the inventory at a specified condition level. The "Do Nothing" budget shows what the deterioration rate of the inventory would be if no money was spent for 20 years.

The target levels are based on the Bridge Condition Index (BCI) developed by the Bridge Office. The BCI is based on similar calculations for the Sufficiency Rating created by FHWA. The BCI is more sensitive to changes in condition ratings for the different bridge components. This way, bridges can be compared to each other in a more realistic manner. This helps determine which bridges to choose for the program, when the funding is limited.

"Bridge projects are reviewed by the Bridge Office and the Districts to determine priorities for the Five Year Program."

FY 2018	BRF	BRFN	IM	IMN	IM-NHS	MB	MBIN	NHS	NHSN	NHSX	STPN
Bridge Approach Repair						$626,661					
Bridge Cleaning		$548,394		$314,405		$76,620					
Bridge Deck Overlay		$9,487,236		$3,097,622							
Bridge New-PPCB		$1,458,977			$4,331,824					$21,565,926	
Bridge New-Steel Girder					$53,701,516					$9,608,481	
Bridge Painting						$172,213	$196,478				
Bridge Rehabilitation				$254,603							
Bridge Repair		$373,787		$2,430,591		$777,261	$116,847				
Bridge Replacement - Other		$1,498,130									
Bridge Replacement-CCS	$1,475,607	$6,679,084									
Bridge Replacement-PPCB	$7,647,908	$10,379,757	$2,854,958		$11,454,975					$1,964,455	
Deck Joint Repair		$1,794,060				$2,136,645	$686,097				
RCB Culvert - Repair				$2,328,512							
RCB Culvert Extension - Single Box											$122,232
RCB Culvert Replacement - Triple Box					$570,189						
RCB Culvert New - Single Box					$1,058,665					$985,074	
RCB Culvert New - Twin Box		$657,294									
RCB Culvert Replacement - Single Box	$2,812,557	$548,098								$318,882	$422,729
RCB Culvert Replacement - Twin Box		$1,973,692								$327,221	
RCB Culvert-Unspecified					$559,180						
Reconstruction - Bridge Deck Replacement		$875,995									
Reconstruction - Bridge Widening								$976,879			
Steel Girder Repair				$156,450							
Revetment				$426,244		$99,076			$127,876		$672,633
Slope Protection							$280,146				
Structures - Miscellaneous									$1,394,772		
Total	$11,936,071	$36,274,503	$2,854,958	$9,008,427	$71,676,349	$3,888,477	$1,279,568	$976,879	$1,522,648	$34,770,039	$1,217,593

Number of Bridges	FY2014	FY2015	FY2016	FY2017	FY2018
Bridge Deck Overlay	23	26	20	30	33
Bridge Replacement	30	22	34	22	25
Bridge New	13	11	12	24	18
RCB Culvert Replacement	7	8	11	8	13
RCB Culvert New	1	3	3	3	5
Bridge Deck Replacement	1	1	2	3	1

US-65 over Iowa River

Iowa Department of Transportation
Bridges and Structures Bureau

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We're on the web!

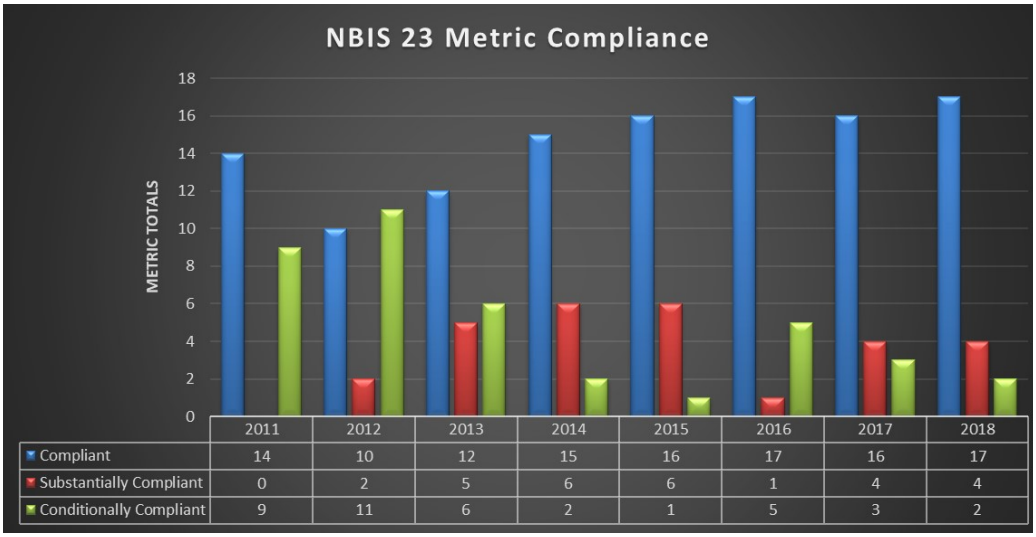
https://iowadot.gov/bridge

FHWA Metric Compliance

Annually the FHWA reviews each state's bridge inspection program against 23 metrics.

There are three levels of compliance for each metric.

1. Compliance– all bridges meet the requirement.
2. Substantial Compliance— a small percentage of bridges need corrections to comply with the metric.
3. Conditional Compliance– a plan of corrective action is needed to become compliant with a metric.



	2011	2012	2013	2014	2015	2016	2017	2018
Compliant	14	10	12	15	16	17	16	17
Substantially Compliant	0	2	5	6	6	1	4	4
Conditionally Compliant	9	11	6	2	1	5	3	2

Metric Review totals since 2011