

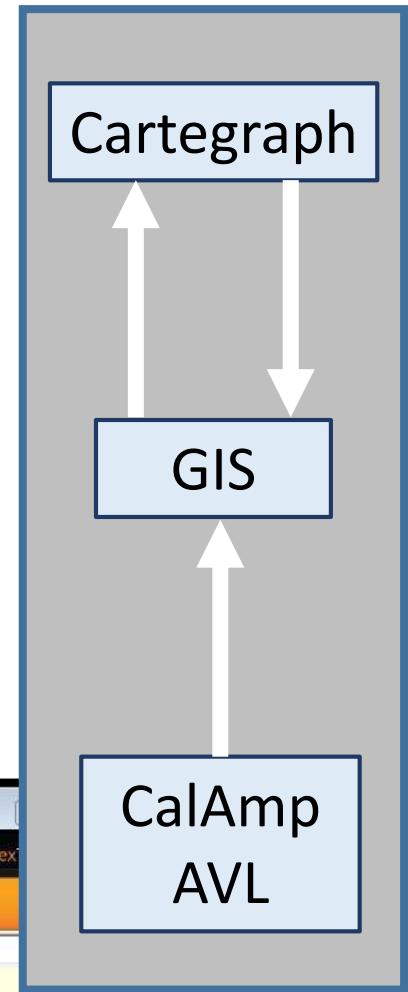
Boone County Public Works 2016 Annual Report



**Presented to the Boone County
Commission**

Utilizing Technology

Boone County Public Works utilizes three software suites to record, analyze, and visualize data that informs our planning and decision making. All asset-related work data is captured in Cartegraph, which can then be analyzed via a reporting feature. Certain asset-related work data (called "Location Activities") are also captured in GIS. This allows us to more easily visualize on a map where this work took place, and on which asset. Through these two technologies, Public Works learns where work was done and what it cost, how that compares to previous years, and how we should then allocate resources in the coming year to reflect department maintenance goals.



Storm Culvert Information ID: 6242

Features

Structure Type:	Culvert	Length:	45 ft
Type:	CMP Pipe	Width:	
Description:	Culvert		
Barrel Count:	1		
Barrel Type:	18" CMP-G		
MoDOT ID:			

Location

Jurisdiction:	Boone County	Route:	CHRISTIAN SCHOOL F
Custodian:	Boone County		
Channel ID:		Location Description:	
Road Surface:	Asphalt		

Attachments

Events

Completed	When Started	When Ended	Work Order Number	Activity	Who	Notes
<input checked="" type="checkbox"/>	10/18/2016	10/18/2016	43926	Culvert - Cros	zhaverly	18"x45'

Details

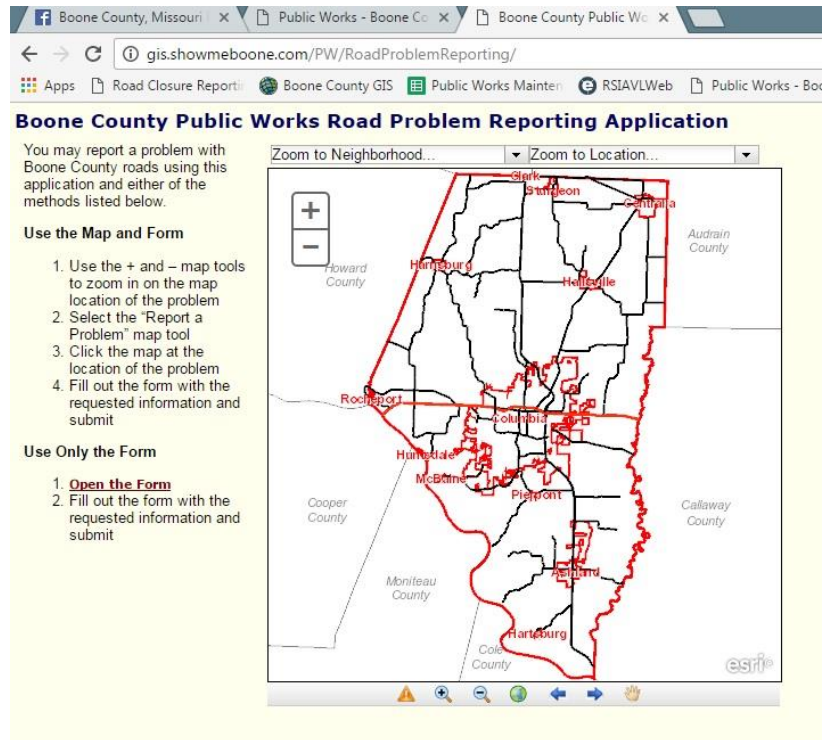
Installed: Replaced:

Buttons: Detailed Inspection, Performance, View Culverts Report

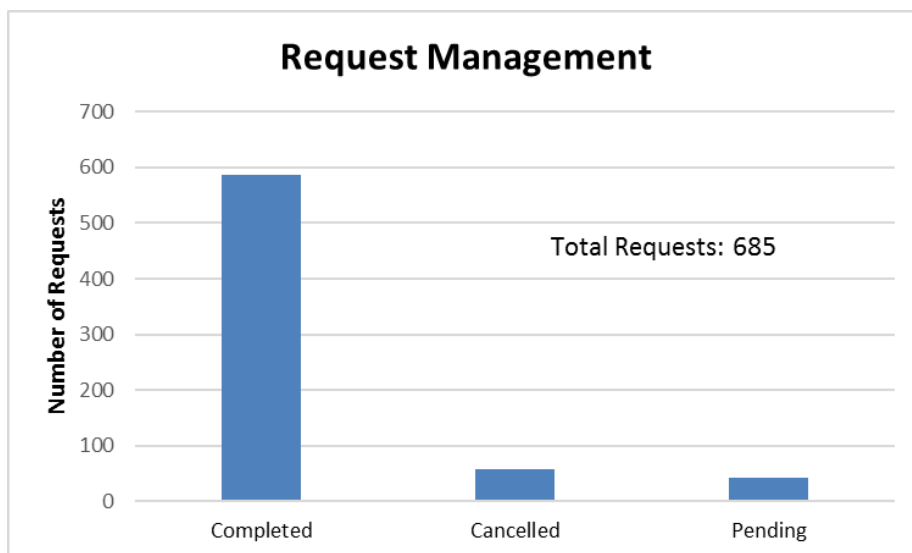
We also use an Automatic Vehicle Location (AVL) service through CalAmp to track and locate our fleet. These data allow us to map route progress during snow removal, and are useful for certain risk management scenarios.

Citizen Request Management

Boone County citizens are able to contact the Public Works office to report a problem or request work on county-maintained right of way. When we receive a request, that request is recorded in our asset management system, Cartegraph, and then sent to a Road Superintendent for evaluation. The superintendent determines the appropriate action and schedules work as needed.



Citizens are also able to report right of way issues via our online reporting application. The portal allows the user to pinpoint the location of the issue and fill out a form to provide additional details and contact information.



Boone County Public Works recorded 685 citizen requests in 2016. Of those, 587 were scheduled for work and completed, 57 were cancelled, and 42 are scheduled and pending work. Labor toward citizen requests totaled 5,132.25 hours for 2016.

Rural Route Maintenance

Maintenance Activities occurring on
or related to gravel road surfaces.

Gravel Road Maintenance



Hauling Rock to Gravel Roads

In 2016, Public Works dump trucks delivered 114,895.25 tons of gravel to Boone County's rural roads. Gravel is lost from the road surface due to traffic and erosion. This is especially true where the road makes any vertical or horizontal curve. In order to prevent as much gravel loss as possible on those curves, specific types of gravel with greater amounts of fine particles, like surface rock, are placed there so that moisture can help bind the particles and rock together.

Motor Grading

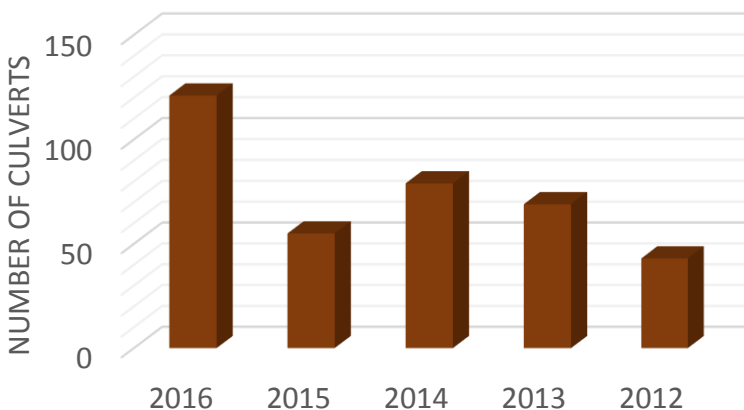
Boone County runs 8 motor graders year-round to maintain the condition of our rural roads. Grading a road helps keep its crown (the slight fall evident from the center to the edges of the road) which facilitates drainage from the surface of the road. Water penetrating through the road surface into the base may cause potholes or washboarding. Grading also allows gravel that is pushed to the edges of the road to be pulled back to the center rather than be completely lost. During dry portions of the year, however, motor grading occurs less frequently as grading a road with no moisture on it can result in gravel loss and excessive dust.



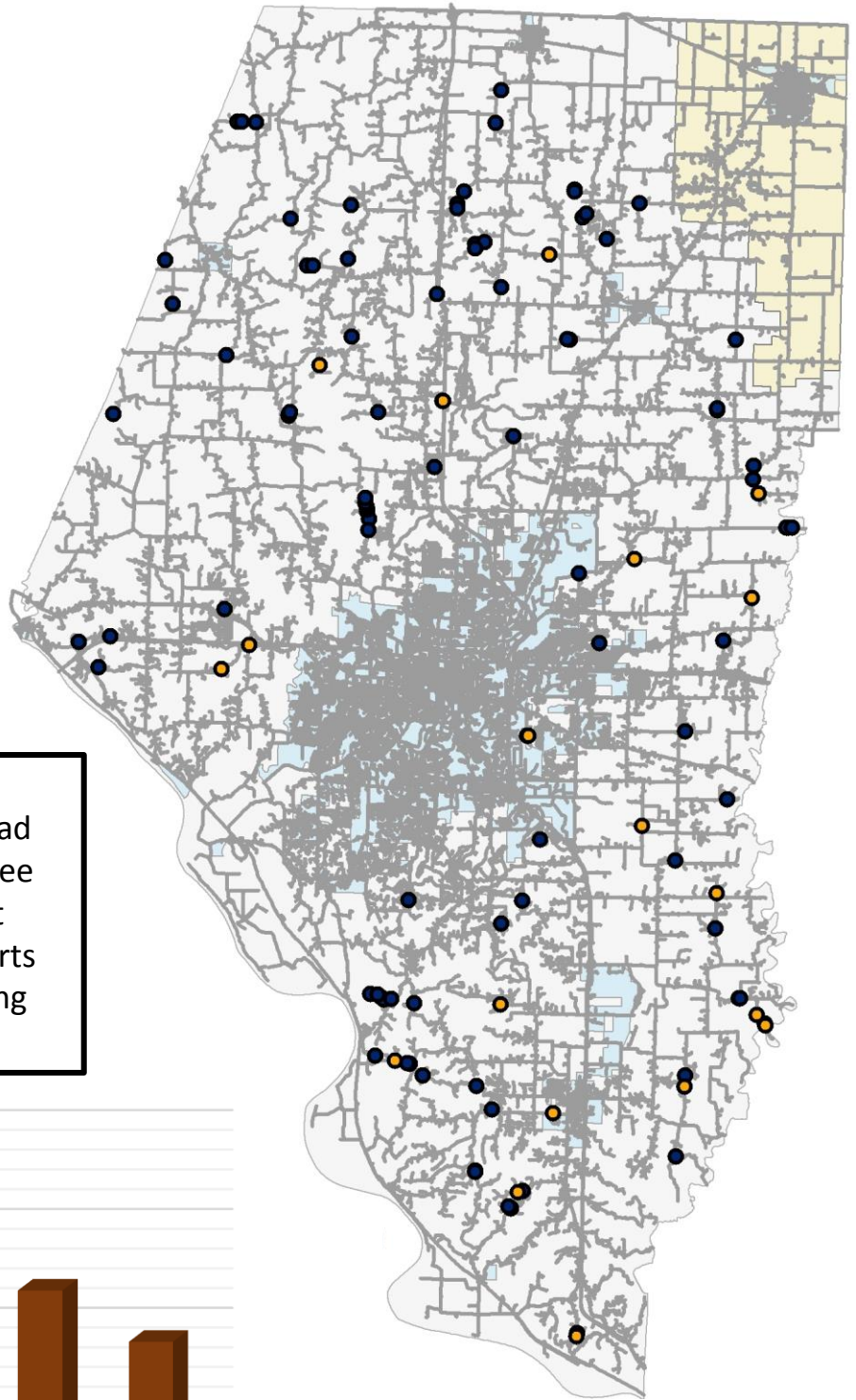
Crossroad Culvert Installation

Culverts improve drainage on and around a road, thereby protecting the road's structural integrity. Public Works collaborates with the Resource Management Department's Engineering Division to regularly inspect and replace failing culverts as well as identify strategic locations where a new culvert would be advantageous. Boone County currently has a crossroad culvert inventory that exceeds 4,000 pipes.

In 2016, Public Works drastically increased the number of crossroad culverts installed (121 culverts; see graph below). We recognize that improving our inventory of culverts is vital to improving and upgrading our gravel road network.



Fun Fact: Public Works used 6,158 feet of culvert pipe in 2016. That's more than a mile of culverts!



- Large Crossroad Culverts (>48")
- Crossroad Culverts

Crossroad Culvert Installation

Fox Hollow Rd

One of our larger culvert projects this year took place on Fox Hollow Rd. Public Works crews replaced three 6-foot Arch pipes with two 8-foot Arch pipes. The project spanned eight working days, totaling 148 labor hours and \$11,223.51 in materials expenses. The two culvert pipes accounted for 94% of the materials expenses and 52% of the total cost of the project.



Left: Crews review project plans and coordinate assignments.

Bottom: The finished project. Road banks are armored with 9"x12" flagstone for erosion control.



Bridge Maintenance



Inspections and Maintenance

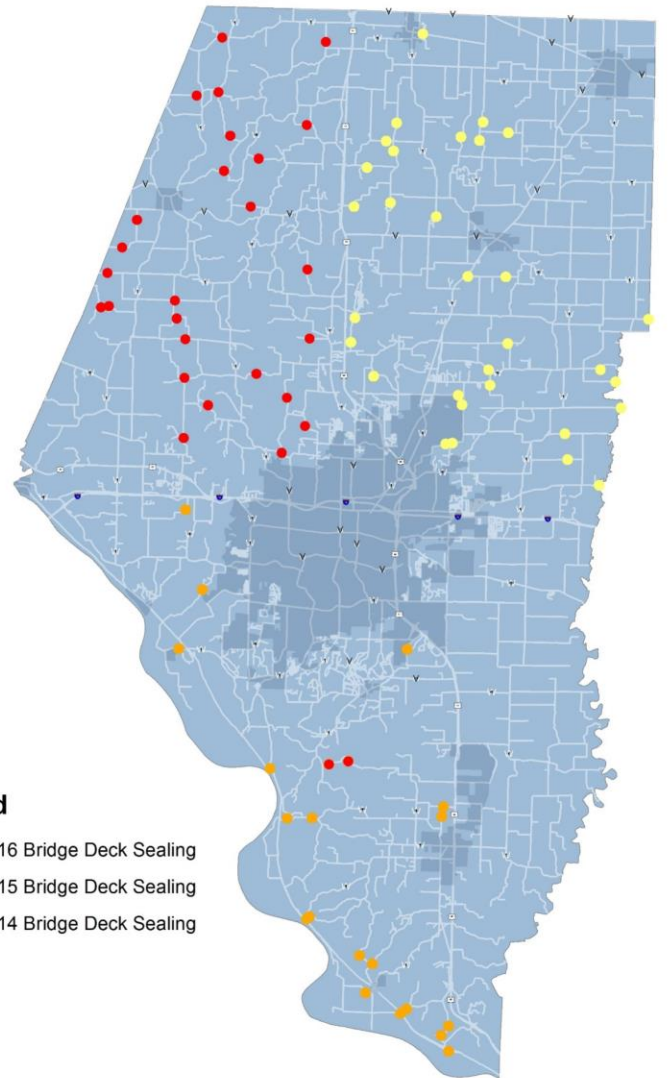
All Boone County Bridges exceeding 20 feet in length are inspected by the Missouri Department of Transportation (MODOT) every other year. The most recent inspection of these 117 bridges took place in 2015. These routine inspections allow Public Works to prevent safety hazards and more costly repairs later in the life of the bridge. To many, bridges that require maintenance work look to be in excellent condition. The pictures above, for example, are of a wing wall replacement on Creed Rd. The soil that anchors the bridge substructure is held in place by the wing walls and prevented from eroding away and undermining the integrity and safety of the bridge.

Bridge Deck Sealing

Boone County concrete bridges are washed and sealed every three years to keep the decks in good, safe condition. Our bridge deck sealing program has been in place since 2010. Bridges in the NE quadrant of Boone County underwent bridge deck sealing in 2016.

Legend

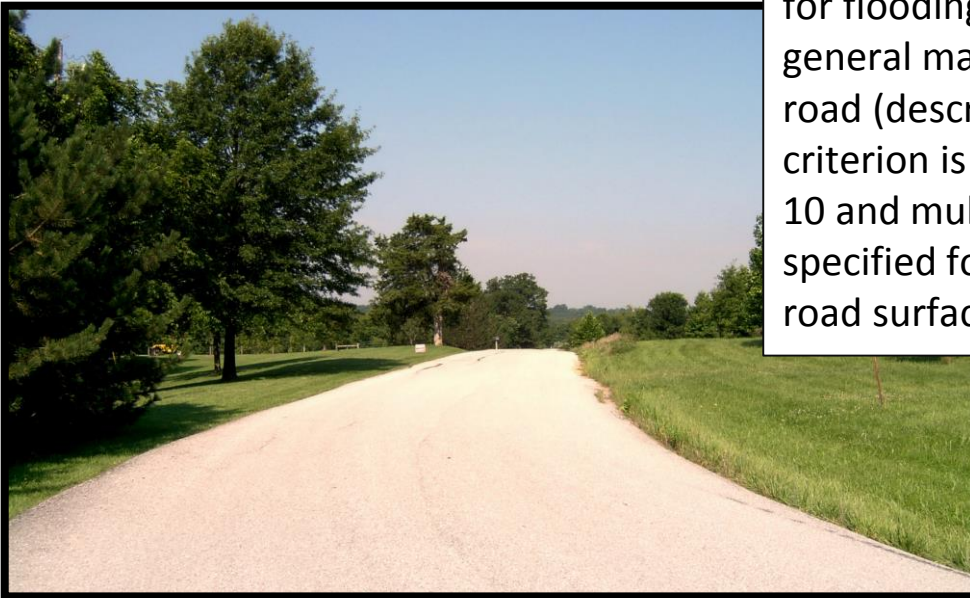
- 2016 Bridge Deck Sealing
- 2015 Bridge Deck Sealing
- 2014 Bridge Deck Sealing



Boone County Road Upgrades

RUST VARIABLES	GRAVEL	PAVED
ADT	10	10
GEOMETRY	6	8
CONNECTIVITY	8	5
FLOODING	4	5
ADT GROWTH RATE	10	10
MAINTENANCE BURDEN	6	6

Boone County roads are systematically reviewed to consider recommendations for surface upgrades. Roads are evaluated across multiple criteria with a calculation of weighted scores. When the county reviews its roads for a potential upgrade, it will assess the most recent traffic count (ADT), geometry, connectivity, propensity for flooding, ADT growth rate, and general maintenance burden of the road (descriptions below). Each criterion is scored on a scale of 1 to 10 and multiplied by the weight specified for that criterion per the road surface type.



Top Left: Table with variable's weights according to road surface type
Bottom: Table with descriptions of road upgrade variables

RUST VARIABLE	DESCRIPTION
ADT	Most recent traffic count
GEOMETRY	Road's deviation from a straight line along vertical and horizontal planes.
CONNECTIVITY	Types of roads that the road in question intersects at each end.
FLOODING	The road is liable to be flooded, and therefore requires appropriate signage.
ADT GROWTH RATE	The overall change in traffic over the last 10 years
MAINTENANCE BURDEN	Labor and expenses associated with maintaining this road relative to other roads.

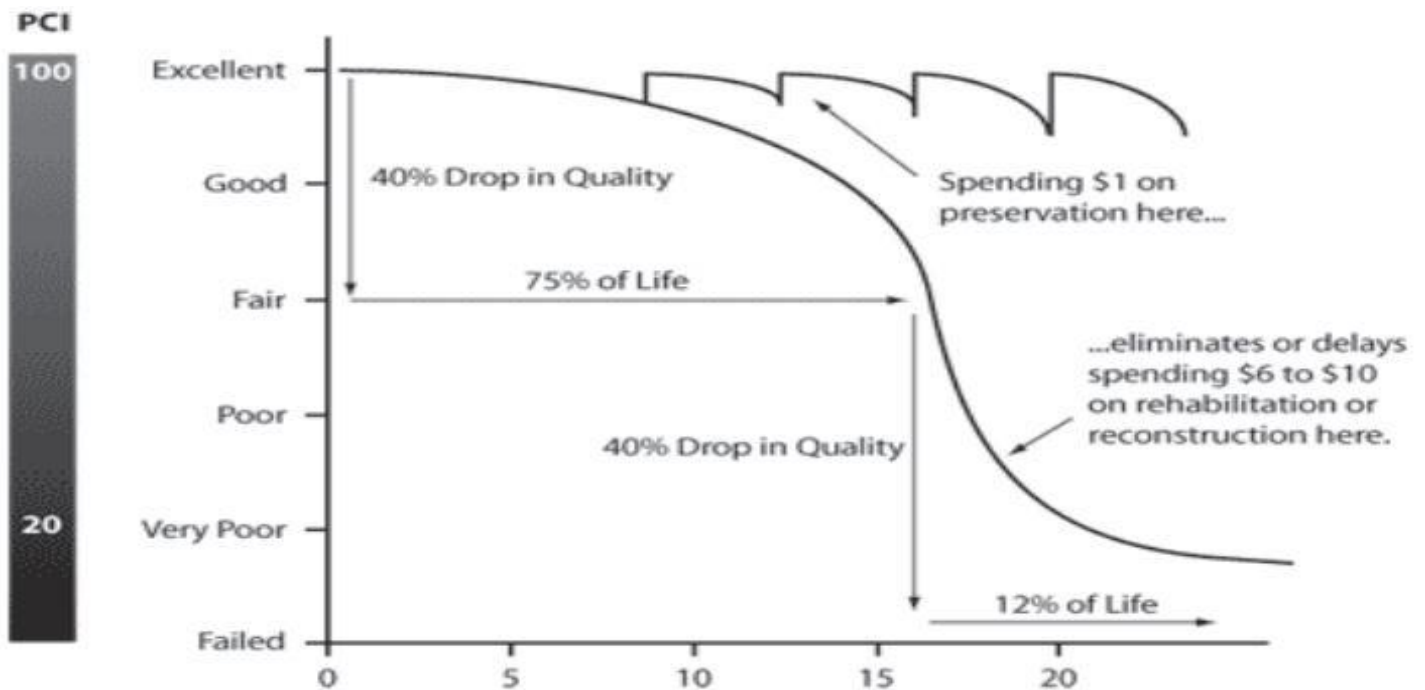
Urban Route Maintenance

Maintenance Activities occurring on
or related to paved road surfaces.

Paved Road Maintenance

Program Overview

Boone County Public Works collaborates with the Resource Management Engineering Division to proactively maintain our 302 miles of paved road surface (retired roads and roads owned but not maintained by the county were not included). Pavement Condition Index (PCI) data and road history are evaluated each year so as to prescribe “the right treatment for the right road at the right time”. Preserving currently paved surfaces extends the life of those surfaces thereby reducing long-term road repair expenses.



Treatment	Description	Costs (per mile)
Asphalt Overlay	Application of 2" of new asphalt to road in good condition.	\$97,482
Preservation Chip Seal (PCS)	Application of oil and surface trap rock to asphalt roads in good to excellent condition—typically 3-5 years after an overlay. Acts as a barrier between asphalt and environment.	\$22,444
Fog Seal	Application of a surface sealant in the year following a PCS treatment.	\$13,215
Full-Depth Asphalt Reclamation	For roads in poor condition. Road surface, base, and subgrade are pulverized and combined with water and cement to form a stabilized road base. Asphalt overlay is then applied.	\$380,987

Paved Road Maintenance

2016 Prep Work

Public Works prepares roads for preservation treatments to reduce the cost of said treatment. In 2016, we prepared Clearview Rd and Rangeline Rd for asphalt overlays. Prep work for asphalt overlays must address every potential issue that might undermine the stability and condition of the road.



Dig-out repairs remove and replace failed portions of the road surface and gravel base; culvert replacements and ditching corrects potential drainage issues; and brush and tree removal improves site distance and vehicle clearance.

Road	Length	Project Duration	Asphalt Used
Clearview Rd	0.75 mi	11 days	344.7 tons
Rangeline Rd	3.0 mi	40 days	964 tons

Paved Road Maintenance

Ongoing Maintenance

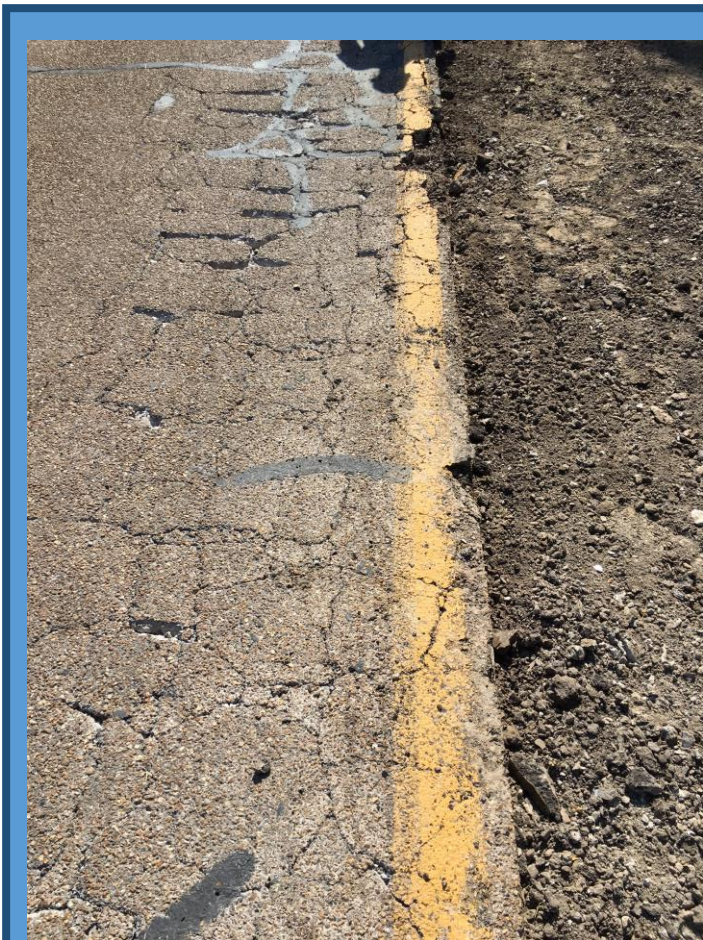


Crack Sealing (above)

Crack sealing is an extremely cost-effective means of maintaining a road surface. Cracks in the road surface allow moisture to infiltrate and subsequently undermine the road bed. In 2016, Public Works crack sealed approximately 14.2 miles of road.

Dig-out Repairs (left)

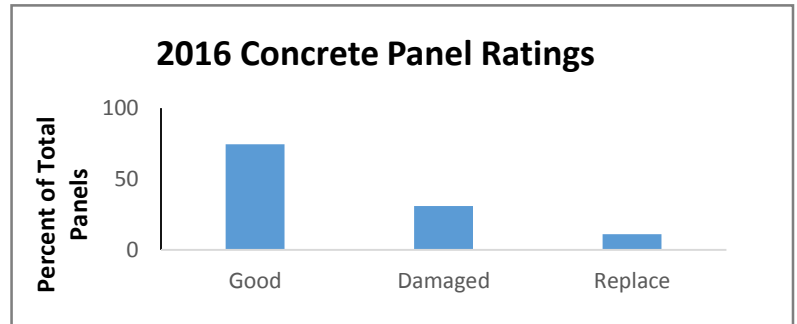
Dig-out repairs are done throughout the county once the local asphalt plants begin producing asphalt—not just as preparation for pavement preservation. In 2016, we applied 2,787.44 tons of asphalt for repairs not associated with asphalt overlay preparation on Clearview Rd and Rangeline Rd.



Concrete Panel Replacement

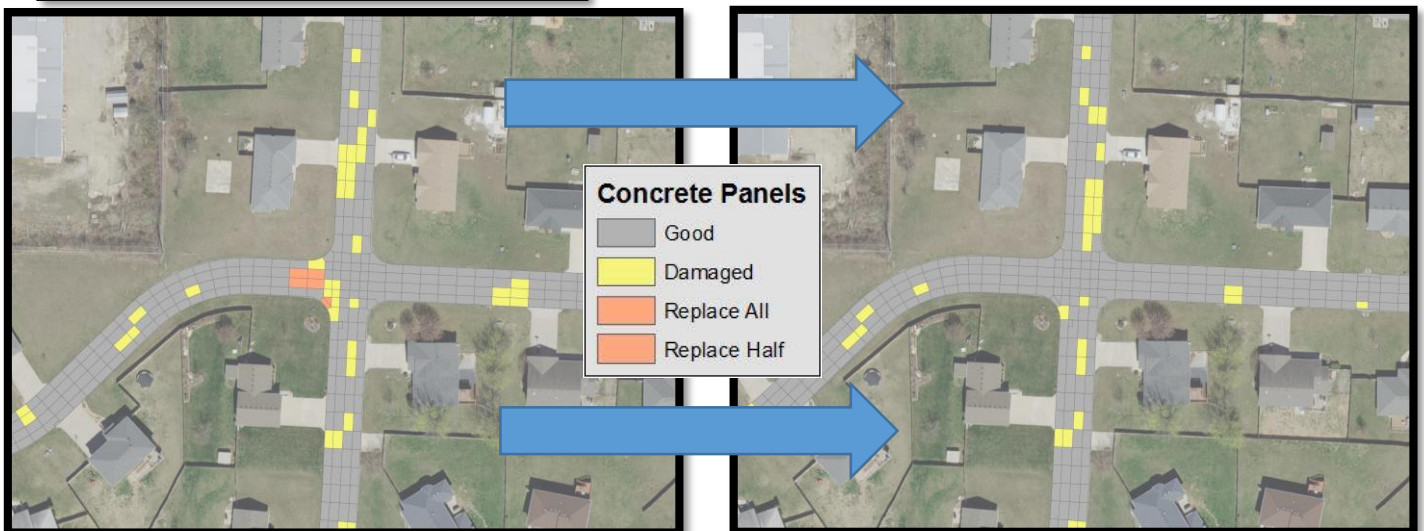
Each year the county inspects and rates individual concrete panels as Good, Damaged, or Replace. These data are then visualized in ArcGIS (see below) and used to determine where, when, and to what extent concrete repairs need to happen. A subdivision area is scheduled for a concrete panel replacement project when at least 30% of the panels within the project area are rated as Replace. In many cases, crews will also replace any adjacent panels that are rated as Damaged.

In 2016, Public Works crews replaced 285 concrete panels, using 861.25 cubic yards of concrete.



Subdivisions:

Arrowhead Lake	Midway Crossings
Concord East	New Town
Country Squire	Obermiller
Country Woods	Paradise Hills
Crestwood Hills	Settler's Ridge
Meadowbrook West	



General Maintenance Activities

Maintenance Activities occurring on
both rural and urban roads or as part
of departmental operations.

Sign and Fleet Management

Fleet Maintenance

In 2016, Public Works deployed one-third of our fleet to the North Facility on Highway 124. This facility was purchased in 2015 as a long-term investment to reduce daily truck mileage, travel times, and response times during inclement weather events. These benefits were realized during the ice event in December 2016. Trucks on northern snow routes saved nearly 35 miles per load of salt.

Public Works utilizes in-house mechanics for the majority of our vehicle and equipment maintenance. In 2016, our technicians processed 1740 work orders and installed \$263,000 in parts.



2016 Purchases

Grader
Excavator
Tandem Dump
Truck

Sign Maintenance

The Public Works sign crew oversees the maintenance of Boone County's 9,378 road signs. Maintenance of these signs becomes necessary largely due to vehicle accidents and theft. However, in 2016 the sign crew was also able to make progress in its project to evaluate horizontal curve signs to meet the new Manual on Uniform Traffic Control Devices (MUTCD) standard on such signs. Public Works anticipates that this project will be complete well before the December 2019 deadline.

Vegetation Control



Above: A Mower and boom shear trims tree limbs

Right: Brush crew cleans up small trees in the right-of-way

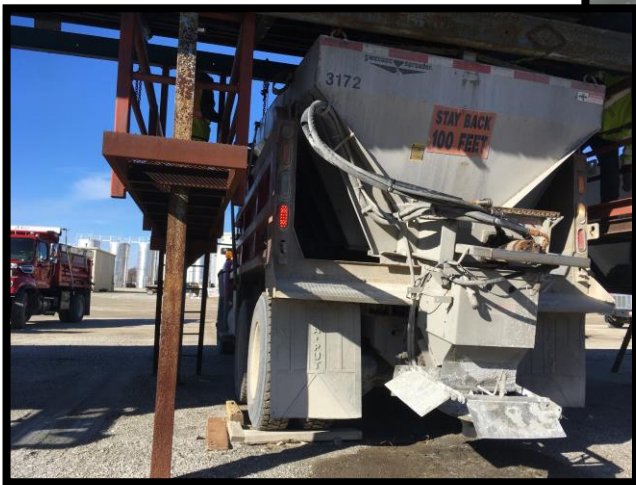
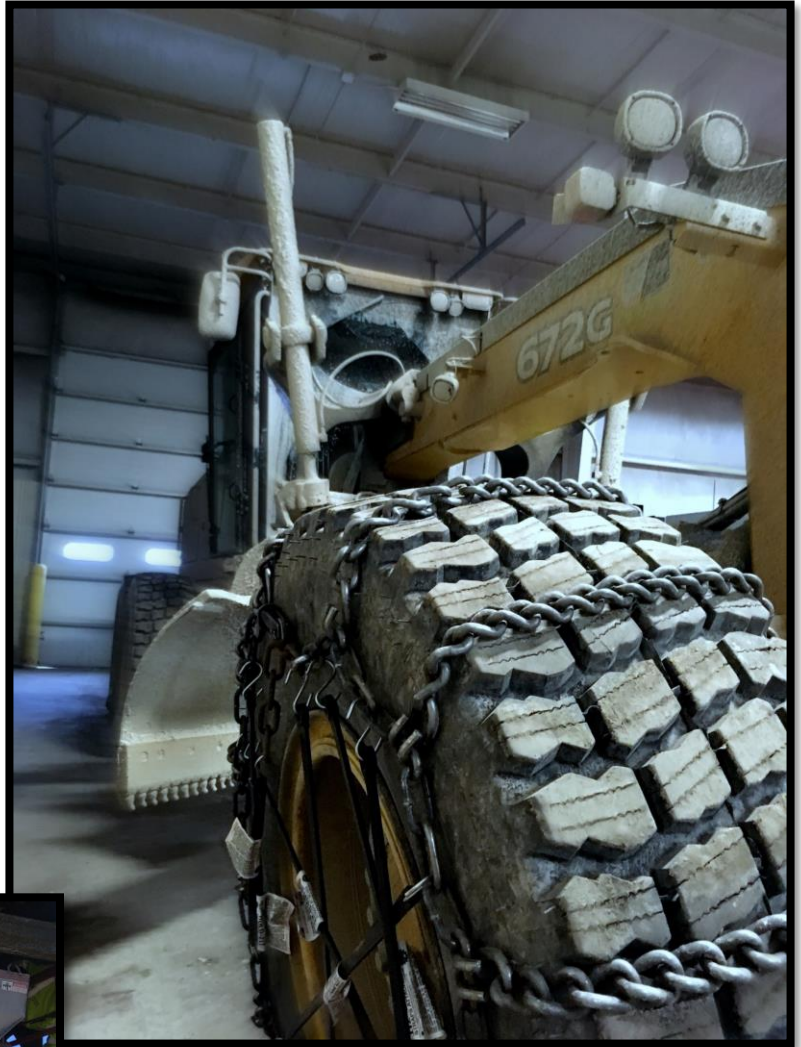
The Public Works brush crew oversees the year-round management of trees and shrubs along county roads. Our crew has been professionally trained to trim limbs and trees such that the health and beauty of the tree is preserved, especially in urban portions of the county. In rural areas, however, overhanging limbs can be trimmed quickly by a mowing tractor and a boom shear.



A wet growing season made it difficult for our mowing tractor operators to keep up with the rapid growth of grasses along county roads. Just four mowing tractors cover Boone County's 800 miles of roads, equating to approximately 200 road miles per operator!

Snow and Ice Control

Snow and ice removal is likely one of the more conspicuous responsibilities of Boone County Public Works. When inclement weather is in the forecast, we determine which crew (day or night shift) will deploy first to pre-treat priority routes with pure salt. Priority and other paved routes are then monitored and treated continuously until snow or ice is no longer a threat; rural snow routes are run during daylight only so as to preserve the gravel on the roads.



Salt begins to lose its effectiveness once the temperature drops below 20 degrees or when sunlight is unable to reach the snowy roads. During these conditions, Public Works will apply a sand/salt mixture to assist with traction.

Start Date	Stop Date	Precip Type	Accumulation (in)	Salt Used (tons)
1/9/2016	1/11/2016	Snow	0.31	171.5
1/17/16	1/22/16	Snow	0.21	275.5
2/8/16	2/14/16	Snow	0.25	280
12/16/16	12/19/16	Ice	0.07	531

Storm Response & Dust Control

Storm Response

In 2016, Boone County Public Works responded to 12 separate severe weather events for a total of 30 working days. During those responses, crews clear brush and debris from culverts and bridges, remove downed trees from roadways, and report road segments that need to be closed due to flooding. Road closures are reported and viewable to the public online through our Road Closure application at showmeboone.com.



Dust Control

When rain is no longer falling, dust is an inherent aggravation on gravel roads. Public Works coordinates with Scotwood Industries to provide a private-pay dust control option for citizens. Citizens may purchase a Magnesium Chloride treatment for their section of road. Magnesium Chloride helps dust particles stay bound to moisture in the road, which also results in a harder road surface during dry weather.

