2022 ANNUAL BRIDGE REPORT

REPORT OF ROAD BRIDGE CONDITIONS
MASON COUNTY, WASHINGTON

County Road Administration Board
2404 Chandler Ct SW
Olympia, WA 98502

RE: 2022 Annual Bridge Report

Dear Ladies and Gentlemen:

We are pleased to provide the 2022 Annual Bridge Report. This report is required under (WAC) 136-20-060, and the reporting period is from mid-2021 to mid-2022, as required by WAC. The report highlights the components of the County bridge inspection program, and includes the following information:

- County Bridge Map
- Bridge Inventory
- Bridge Inspections Discussion
- Bridge Findings
- Deficient Bridges
- Posted Bridges
- Scour Evaluation Discussion

The report summarizes the Mason County Bridge Programs efforts to maintain and preserve the county's bridges. The Board of County Commissioners has this report available to them during the preparation of the Six Year Transportation Improvement Program. Please contact us if you have questions about this report.

Approved By: _____
Mike Collins, PE., PLS.
County Engineer

Reviewed By: _____
Dave Smith, PE.

MASON COUNTY

2022 ANNUAL BRIDGE REPORT

This annual bridge report is prepared by Mason County Public Works Engineering Bridge Team each year to fulfill the requirements of the Washington Administrative Code (WAC) 136-20-060. This WAC requires the County Engineer's report of bridge inspections as follows:

"Each county engineer shall furnish the county legislative authority with a written report of the findings of the bridge inspection effort. This report shall be made available to said authority and shall be consulted during the preparation of the proposed six-year transportation program revision. The report shall include the county engineer's recommendations as to replacement, repair or load restriction for each deficient bridge. The resolution of adoption of the six-year transportation program shall include assurances to the effect that the county engineer's report with respect to deficient bridges was available to said authority during the preparation of the program. It is highly recommended that deficient short span bridges, drainage structures, and large culverts be included in said report."

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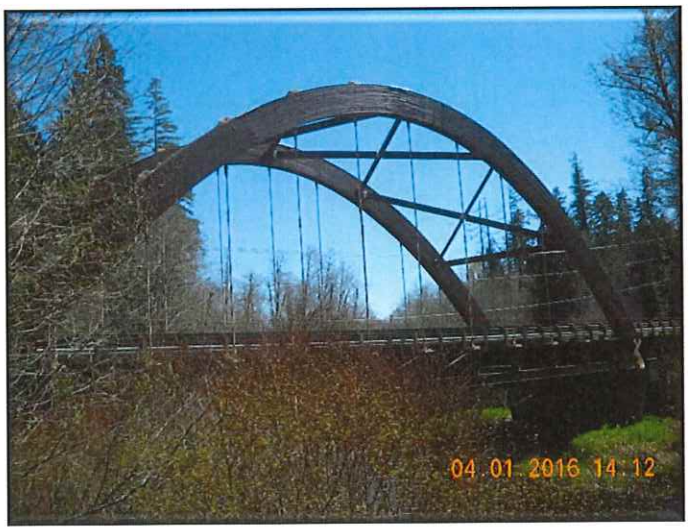
Cloquallum Creek, built 1994

Acronyms

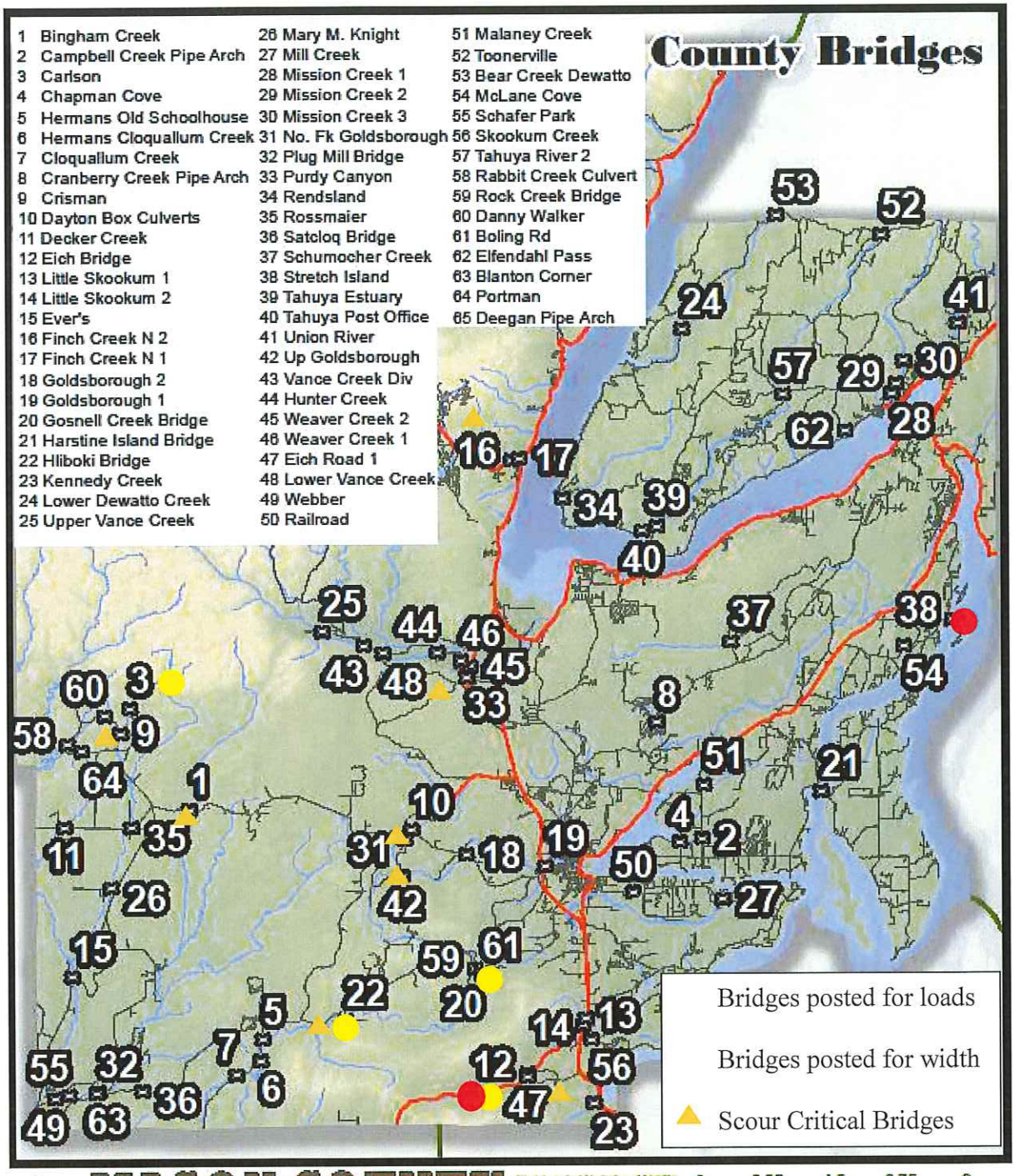
The Following is a list of common acronyms widely used in the bridge inspection field:

ADT	Average Daily Traffic
FC	Fracture Critical
FHWA	Federal Highway Administration
FO	Functionally Obsolete
NBIS	National Bridge Inspection Standards
SD	Structurally Deficient
SID	Structure Identification Number
SR	Sufficiency Rating
UBIT	Under Bridge Inspection Truck
WAC	Washington Administrative Code
WSBIS	Washington State Bridge Inventory System
WSDOT	Washington State Department of Transportation



Eddy Evers, built 1996

COUNTY BRIDGE MAP



Introduction

This report summarizes Mason County's 2022 Bridge Program. This program forms an integrated and comprehensive strategy to maintain and preserve the county's bridges and road network continuity. The three main goals of the Bridge Program are:

- Keep the bridges open and safe for public use.
- Preserve the bridge infrastructure by having a formal bridge report for each bridge which contains: inspection history documentation, condition evaluation, and bridge summary data used to maximize bridge life span via maintenance and rehabilitation.
- Replace bridges with reliable new structures when repair and/or rehabilitation are not economical or physically feasible.

This Bridge Report contains additional information concerning the county's bridge system. For each bridge listed in Appendix A, a report has been submitted to WSDOT for the Washington State Bridge Inventory Systems (WSBIS).

As required by WAC 136-20-060, each county engineer in Washington State must submit a written report of findings to the legislative body concerning the county's bridge inspection effort by June 1 of each year. We have compiled a variety of information in the annual update of the Bridge Report to serve the 2022 report requirements.

Before adoption of the annual budget, the Board of County Commissioners is required to adopt a Six-Year Plan for Transportation Improvements. WAC136-20-060 also requires that the resolution adopting the Six-Year Program state that this engineer's summary with respect to deficient bridges was available to the Board during preparation of the plan.

Rendsland Creek, built 1950

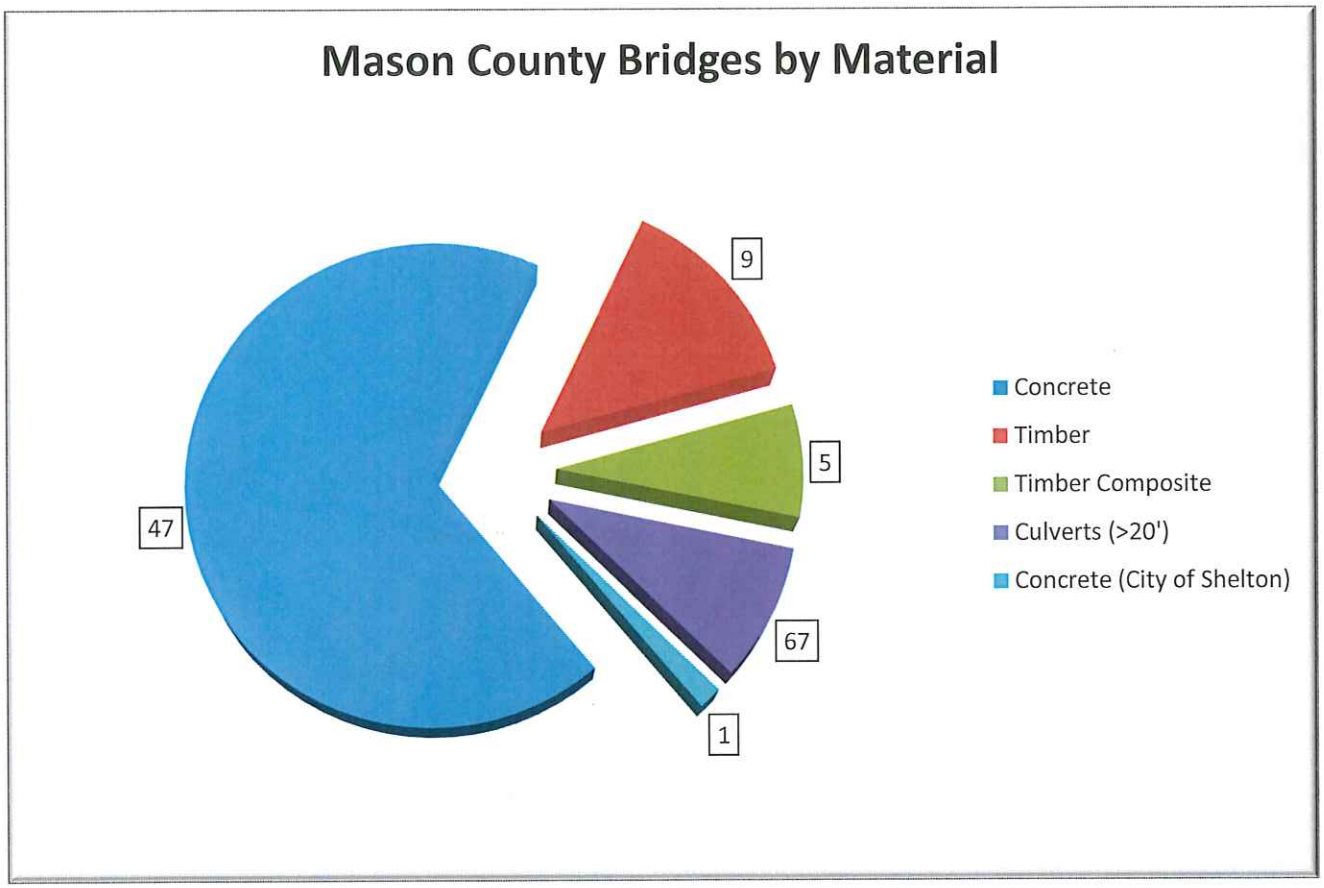
Bridge Inventory

Mason County Public Works inspects and inventories **69 roadway bridges** located within Mason County. (Note: 54 require reporting and 13 are short span). These bridges consist of:

- 68 bridges owned by Mason County
- 1 bridge owned by the City of Shelton

Classified by substructures, the bridges inspected by Mason County are categorized as follows:

- 47 Concrete Bridges
- 9 Timber Bridges
- 5 Timber Composite Bridges
- 7 Culverts (Steel – classified as bridges)
- 1 Concrete Bridge (City of Shelton)



Bridge Inspections

Bridge Inspection is performed in accordance with the National Bridge Inspection Standards (NBIS) to conform to 23 CFR 650.3. The NBIS mandates that public agencies inspect and report on all bridges, except short span bridges, at least once every two years. Under these standards, the county is required to document and report the current condition of each bridge, determine the degree of wear and deterioration, and recommend repairs or required service.

Mason County Public Works department has been able to inspect and rate each bridge at a minimum inspection frequency of two years, with certain bridges being inspected more frequently. The more frequent inspection and evaluation schedule is established for bridges that are aging, have a long maintenance history, or with high environmental exposure. This program has served the citizens of Mason County with early identification of maintenance needs, resulting in economical repair costs.

The inspectors use the NBIS standards to document the current condition of each bridge element listed. The deficiencies are coded to NBIS standards and show the degree of deterioration in various elements— the three primary elements being:

- deck,
- superstructure, and
- substructure

As deterioration occurs, the coding values drop and repair order forms are issued to the Mason County Operations & Maintenance (MCOM) group to conduct the proposed repair. In cases where the coding factors drop significantly, recommendations are made for repair, replacement, or rehabilitation by a qualified structural engineer. Bridges with identified deficiencies may be inspected more often.

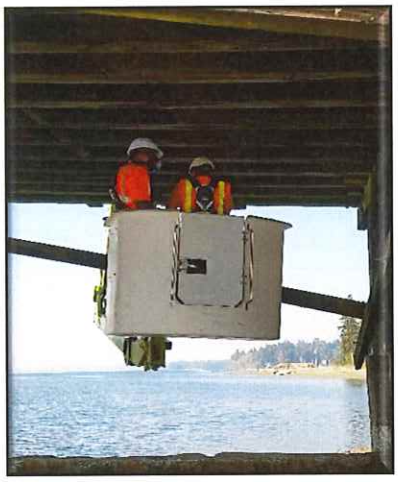
Updated inspection results are forwarded to the WSDOT's Highway and Local Programs Bridge Division, which in turn verifies compliance with the NBIS and reports to the Federal Highway Administration (FHWA). A copy of the Inspection Report is kept in the bridge file at Mason County Public Works.

Bridge Findings

New bridge deficiencies are found during routine inspections each year. Work items are identified and sent to MCOM group. Some work items are urgent and are repaired quickly, while others are prioritized lower as longer-term maintenance items that will help extend the bridge's service life. MCOM crews concentrate on repairs that will help preserve the service life of the inventory, with an emphasis on safety.

Approximately half the bridges are inspected bi-annually. If the underside of the bridge deck cannot be given close or adequate inspection from the ground, then a special inspection using a UBIT is required. During these bridge inspections, inspectors make an in-depth condition evaluation of the bridge structure and document any observable defects. In addition, bridge maintenance crews observe, report, and suggest repairs to bridges.

See our list of special inspections (Exhibit A), for details on inspection frequencies and schedules for all UBIT, underwater bridge (UW), and fracture critical inspections (FC).



Stretch Island – 2020

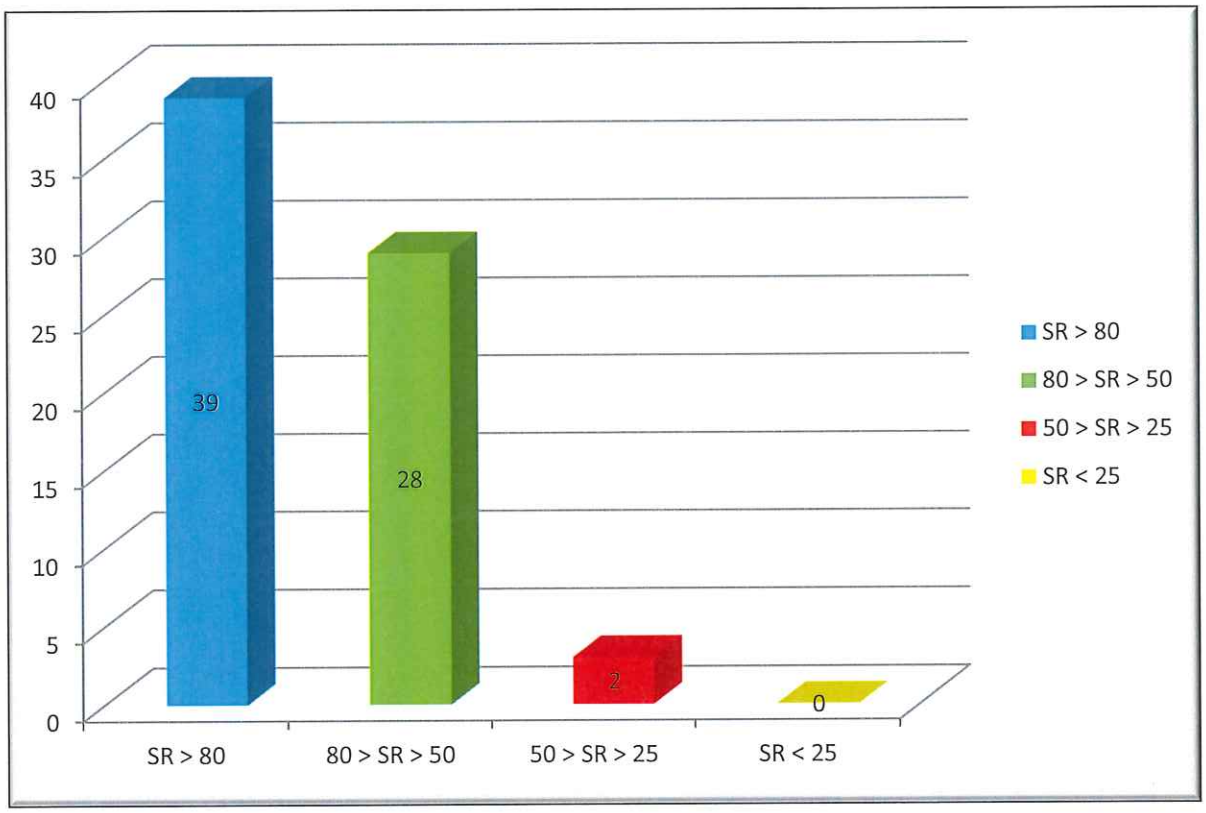
Exhibit A

Structure ID	Bridge Name	2020 UBIT	2021 UBIT	2022 UBIT	2023 UBIT	2024 UBIT	Special Insp
08169800	Chapman Cove		Mar 28		Mar 28		
08619500	Eddy Evers		Apr 25		Apr 25		2021 FC
07996900	Harstine Island		Apr24		Apr 24		2022 UW
08072500	Stretch Island	Sept 6		Sept 6		Sept 6	

See Bridge Map page 4 for locations

Deficient Bridges

A measure that helps provide a condition overview of each bridge is a rating factor known as the Sufficiency Rating (SR). The SR for the entire inventory provides a comparative look at the health of the bridge inventory from one year to the next. The SR is a score calculated from a multitude of ratings the inspector assigns to the bridge, which are based on the condition of the various components of the bridge. The geometric layout, safety, and importance of the bridge to the traveling public are also factored into the SR. The SR ranges from zero (a bridge that is closed and cannot carry traffic loads) to 100 (a new bridge with no deficiencies). The following chart shows an overview of Mason County's bridge Sufficiency Ratings.



Posted Bridges

There is one load restricted bridge in Mason County (Exhibit B). This bridge is posted for load limits, because the standards it was designed to do not meet standards currently in use. The remaining five bridges that require restrictions, per resolution, are due to their narrow width (also known as functionally obsolete).

Stretch Island Bridge

Exhibit B- Load Restricted Bridges

Structure ID	Bridge Name	Comments	Posted For
08072500	Stretch Island	Girder Flexure-Span8 Interior	SU4 thru SU7

Exhibit C- Functionally Obsolete Bridges

Structure ID	Bridge Name	Comments	ADT / No. of Residences Served
08369200	Carlson	One lane Bridge	16 / 2
08169800	Gosnell Creek	One lane Bridge	36 / 3
08619500	Eich Road	One lane Bridge	22 / 1
07996900	Eich Road 1	One lane Bridge	22 / 1
08072500	Hliboki	One lane Bridge	62 / 5

Scour Evaluation

In 1988, federal requirements for bridge inspections were updated to include mandatory scour evaluations for all bridges that cross water. Scour Evaluations examine bridge abutments and piers that may be damaged as a result of debris build up or water surging around the structure and eroding foundation soils. The purpose of a scour evaluation is to determine the susceptability of a bridge's foundation to the erosive action of flowing water, excavating and carrying away material from the bridge foundation. A bridge is considered scour critical if it's foundation is unknown or determined to be unstable for observed or calculated scour.

The implementation of the mandated scour evaluation program in Washington requires all agencies responsible for bridges to complete scour evaluations. All bridges designated as scour critical require a scour Plan of Action. Mason County has 12 bridges that are determined to be scour critical (Exhibit D). These bridges are monitored during or immediately after high water events.

Exhibit D Scour Critical Bridges

Structure ID	Bridge Name	Year Built	Scour Codes
08149500	Bingham Creek	1960	U – Unknown Foundation Elevations
08169800	Chapman Cove	1950	U – Unknown Foundation Elevations
08369800	Crisman	1954	U – Unknown Foundation Elevations
08080600	Decker Creek	1949	U – Unknown Foundation Elevations
08332000	Eich Road	1968	U – Unknown Foundation Elevations
08120600	Finch Creek 1	1956	5 - Countermeasure are installed
08169100	Hliboki	1961	U – Unknown Foundation Elevations
08232300	No Fk. Goldsborough	1958	U – Unknown Foundation Elevations
08803700	Toonerville Bridge	1995	U – Unknown Foundation Elevations
08252600	Upper Golsborough	1966	U – Unknown Foundation Elevations
08312400	Lower Dewatto Ck	1967	U – Unknown Foundation Elevations
08185100	Weaver Creek 2	1966	U – Unknown Foundation Elevations

None of the scour critical bridges have any known issues with scour at this time.

Emergency Repairs & Inspections

No emergency repairs were conducted from mid-2021 to mid-2022.

Bridge Maintenance Activities

Maintenance and repairs are sometimes necessary to prevent further deterioration of structures to extend their useful life, and to reduce major repair costs in the future. During bridge inspections, maintenance needs are identified and documented. Minor bridge repair work is completed by county road operations and maintenance crews, with major repairs being completed by contract. Typical annual maintenance includes brush cutting, deck and drain cleaning, sign repairs, and guardrail repairs. This year, general maintenance was performed by the leveling of roadway approaches, cleaning decks and drains, brush removal, and crack sealing.

Completed Bridge Projects

Homer Adams Pipe Arch, 30 feet span half pipe with concrete foundations was constructed with county forces in 2021. Highland Dayton Box Culvert 19 feet span was also constructed with county forces in 2021.

Homer Adams Pipe Arch

Highland Dayton Box Culvert

Current Bridge Projects

Both North Shore Road Cady Creek and Great Bend box culverts are planed for 2022.

Programmed Bridge Projects

Programmed projects are projects that are included in the Six-Year Transportation Improvement Program. Mason County has one programmed bridge projects at this time.

Harstine Island - 07996900

This is a 1466 ft long 12 span concrete structure supported by concrete columns, built in 1969. This bridge provides the only roadway access to Harstine Island. The island is home to numerous shellfish operations, residential neighborhoods, 2 state parks, and many acres of timberland; therefore, it is necessary to move overweight equipment across this structure. The structure has deck delamination and spalling in the deck and on the columns with rebar showing.

The county obtained a nearly $3 million dollar grant to rehabilitate the bridge deck with a polyester overlay. Work is expected to be completed by 2023.

Appendix A

2021– 2022 Mason County Bridge Inventory

Bridge #	Structure ID	Bridge Name	Structure Length	Curb to Curb Width	Sufficiency Rating	Deficiency	Year Built	Date of Last Inspection	Inspection Frequency	ADT
1	08149500	BINGHAM CREEK	78	24	68		1960	8/2021	24	1437
2	08600900	CAMPBELL CK PIPE ARCH	26	35	98		1993	5/2020	24	3036
3	08369200	CARLSON	31	16	77	FO	1984	4/2020	24	16
4	08169800	CHAPMAN COVE	93	25	69		1950	3/2021	12	257
5	08619600	HERMANS OLD SCHOOLHOUSE	69	33	98		1996	4/2020	24	627

6	08619700	HERMANS CLOQUALLUM CR BR	73	33	98		1996	4/2020	24	627
7	08614700	CLOQUALLUM CREEK	64	34	98		1994	5/2021	24	627
8	08601100	CRANBERRY CK PIPE ARCH	25	40	94		1993	4/2020	24	1783
9	08369800	CRISMAN	24	25	87		1954	7/2021	24	86
10	08564000	DAYTON BOX CULVERTS	40	36	98		1988	10/2020	24	1777
11	08080600	DECKER CREEK	26	24	68		1949	4/2020	24	149
12	08332000	EICH BRIDGE	29	16	59	FO	1968	7/2021	12	22
13	08230300	L'TE SKOOKUM 1	23 *	22	69		1925	5/2021	24	296
14	08233000	L'TE SKOOKUM 2	20 *	22	69		1925	5/2021	24	296
15	08619500	EVER'S	354	32	88		1996	4/2021	24	588
16	08803800	FINCH CREEK 2 - 2009	31	28	99		2009	11/2020	24	184
17	08120600	FINCH CREEK N 1	20 *	19	71		1956	4/2021	24	245
18	08192400	GOLDSBOROUGH 2	122	24	73		1956	5/2021	24	1777
19	08321900	GOLDSBOROUGH 1	100	30	79	FO	1977	3/2021	24	6167
20	08709800	GOSNELL CREEK BRIDGE	40	18	94		2003	5/2020	24	36
21	07996900	HARSTINE ISLAND BRIDGE	1466	24	27		1969	4/2021	24	2155
22	08169100	HLIBOKI BRIDGE	52	14	71	FO	1961	7/2021	12	62
23	08438600	KENNEDY CREEK	136	20	81		1917	4/2020	24	72
24	08312400	LOWER DEWATO CK	55	24	73	FO	1967	11/2020	24	50
25	08132500	UPPER VANCE CR.	140	26	88		1986	4/2020	24	110
26	08279900	MARY M. KNIGHT	30	18	77	FO	1970	4/2020	24	148
27	08340800	MILL CREEK	180	28	90		1971	3/2021	24	879
28	08588400	MISSION CREEK 1	59	28	78		1991	11/2020	24	827
29	08486200	MISSION CREEK 2	30	29	76		1968	9/2021	24	671
30	08588500	MISSION CREEK 3	59	28	72	FO	1990	3/2020	24	950
31	08232300	NO FK GOLDSBOROUGH	40	19	62	FO	1958	7/2021	12	191
32	08614800	PLUG MILL BRIDGE	53	29	92		1994	4/2020	24	37

Bridge #	Structure ID	Bridge Name	Structure Length	Curb /Curb Width	Sufficiency Rating	Deficiency	Year Built	Date of Last Inspection	Inspection Frequency	ADT
33	08292200	PURDY CANYON	20 *	27	69		1959	5/2020	24	494
34	08259500	RENDSLAND	53	24	62		1950	8/2021	12	526
35	08108000	ROSSMAIER	60	24	80		1963	4/2020	24	149
36	08717700	SATCLOQ BRIDGE	22	28	99		2000	4/2020	24	132
37	08709700	SCHUMOCHER CR BRIDGE	63	40	99		2002	3/2021	24	490
38	08072500	STRETCH ISLAND	361	24	43	FO	1920	9/2020	24	385
39	08303700	TAHUYA ESTUARY	125	24	65		1961	11/2020	24	513
40	08304300	TAHUYA POST OF.	20 *	24	74		1963	8/2021	24	513
41	08268300	UNION RIVER	65	38	96		1987	11/2020	24	3440
42	08252600	UP GOLDSBOROUGH	49	19	60	FO	1966	11/2020	24	191

43	08161500	VANCE CREEK DIV	70	23	64		1959	6/2021	12	494
44	08882900	HUNTER CREEK	137	31	90		2016	5/2020	24	494
45	08185100	WEAVER CREEK 2	49	24	80		1966	4/2020	24	73
46	08839500	WEAVER CREEK 1 2012	70	34	99		2012	3/2020	24	494
47	08717800	EICH ROAD 1	29	15	81		2004	7/2021	24	22
48	08239700	LOWER VANCE CR.	103	24	73		1963	11/2020	24	494
49	08404300	WEBBER	145	24	79		1967	4/2020	24	376
50	08379000	RAILROAD	125	38	97		1978	3/2021	24	4134
51	08740400	MALANEY CREEK	20 *	35	95		2005	11/2020	24	3844
52	08803700	TOONERVILLE BRIDGE	30	20	66	SD	1995	8/2021	12	1050
53	08770900	BEAR CREEK / DEWATTO	33	30	100		2008	8/2021	24	79
54	08760400	MCLANE COVE 2008	110	36	99		2008	4/2020	24	835
55	08608000	SCHAFER PARK BRIDGE	160	28	98		1993	11/2020	24	376
56	08799100	SKOOKUM CREEK	83	45	99		2006	9/2020	24	2034
57	08803900	TAHUYA 2 2009	116	40	95		2009	8/2021	24	2558
58	08823700	RABBIT CREEK CULVERT	25	28	95		2010	10/2020	24	32
59	08863500	ROCK CREEK	18 *	26	76		1952	6/2021	24	897
60	08857700	DANNY WALKER	18 *	22	91		1954	8/2021	24	84
61	08863600	BOLING RD	18 *	28	94		1971	6/2021	24	36
62	08857800	ELFENDAHL PASS	38	32	99		2013	8/2021	24	65
63	08863400	BLANTON CORNER	18 *	30	94		1971	6/2021	24	132
64	08857600	PORTMAN	16	22	96		1954	8/2021	24	86
65	08918500	DEEGAN PIPE ARCH	60	22	100		2020	1/2021	24	187
66		SHELTON VALLEY BOX CULV	17*	22			2020		24	
67		HOMER ADAMS PIPE ARCH	31	20			2021		24	
68		HYLAND DAYTON BOX CULV	19*	24			2021		24	
69	08493300	7TH & GOLDSBOROUGH CR	61	28	78	FO	1978	5/2020	24	6000

Note: * - Short Span Bridges
FO – Functionally Obsolete

Glossary of Bridge Terminology

Abutment—a substructure supporting the end of a single span, or the extreme end of a multi-span super-structure and, in general, retaining or supporting the approach fill.

Backwall—the top-most portion of an abutment functioning *primarily* as a retaining wall to contain approach roadway fill.

Bent—a supporting unit of the beams of a span made up of one or more column or column -like members connected at their top-most ends by a cap, strut, or other horizontal member.

Bracing—a system of tension or compression members, or a combination of these, connected

to the parts to be supported or strengthened by a *truss* or frame. It transfers wind, dynamic, impact, and vibratory stresses to the substructure and gives rigidity throughout the complete assemblage.

Cap—the horizontally-oriented, top-most piece or member of a bent sewing to distribute the beam loads upon the columns and to hold the beams in their proper relative positions.

Chord—in a truss, the upper-most and the lower-most longitudinal members, extending the full length of the truss.

Compression—a type of stress involving pressing together; tends to shorten a member; opposite of tension.

Culvert—a pipe or small structure used for drainage under a road, railroad or other embankment. A culvert with a span length greater than 20-feet is included in the National Bridge Inventory and receives a rating using the NBI scale.

Deck—portion of a bridge that provides direct support for vehicular and pedestrian traffic.

Elastomeric pads—rectangular pads made of neoprene, found between the substructures and superstructure, that bears the entire weight of the superstructure. Elastomeric pads can deform to allow for thermal movements of the superstructure.

Endwall—the wall located directly under each end of a bridge that holds back approach roadway fill. The endwall is part of the abutment.

Fracture critical member—a member in tension or with a tension element whose failure would probably cause a portion of or the entire bridge to collapse.

Pier—a structure comprised of stone, concrete, brick, steel, or wood that supports the ends of the spans of a multi-span superstructure at an intermediate location between abutments. A pier is usually a solid structure as opposed to a bent, which is usually made up of columns.

Pile—a rod or shaft-like linear member of timber, steel, concrete, or composite materials driven into the earth to carry structure loads into the soil.

Pinpile—a series of two-inch-diameter pipes driven in a line into the ground to support the timber planks of a small retaining wall, typically used to prevent erosion under a bridge abutment.

Plan of Action—a detailed plan outlining actions needed to be taken by monitoring crews after a high-water event.

Post or column—a member resisting compressive stresses, in a vertical or near vertical position.

Scour—erosive action of removing streambed material around bridge substructure due to water

flow. Scour is of particular concern during high-water events.

Short span bridge—these bridges span less than 20 feet.

Soffit—the underside of the bridge deck or sidewalk.

Spall—a concrete deficiency wherein a portion of the concrete surface is popped off from the main structure due to the expansive forces of corroding steel rebar underneath. This is especially common on older concrete bridges.

Stringer—a longitudinal beam (less than 30' long) supporting the bridge deck, and in large bridges, framed into or upon the floor beams.

Sufficiency rating—the sufficiency rating is a numeric value from 100 to 0. The sufficiency rating is the summation of four calculated values: Structural Adequacy and Safety, Serviceability and Functional Obsolescence, Essentiality for Public Use, and Special Reductions.

Substructure—the abutment, piers, grillage, or other structure built to support the span or spans of a bridge superstructure, and distributes all bridge loads to the ground surface. Includes abutments, piers, bents, and bearings

Superstructure—the entire portion of a bridge structure which primarily receives and supports traffic loads and in turn transfers the reactions to the bridge substructure; usually consists of the deck and beams or, in the case of a truss bridge, the entire truss.

Tension—type of stress involving an action which pulls apart.

Trestle—a bridge structure consisting of beam spans supported upon bents. Trestles are usually made of timber and have numerous diagonal braces, both within each bent and from bent to bent.

Wingwall—walls that slant outward from the corners of the overall bridge that support roadway fill of the approach.