BEFORE THE BOARD OF COUNTY COMMISSIONERS

FOR MULTNOMAH COUNTY, OREGON

Recommending Approval of the Multnomah County Twenty Year 1993-2012 Capital Improvement Plan and Program for Willamette River Bridges	)))))	*R E S O L U T I O N* 93-240

WHEREAS, the Multnomah County Board of Commissioners recognizes the need to maintain and preserve County bridges and related structures so as to promote the efficient movement of people and commerce throughout the County; and

WHEREAS, the preservation and improvement of County bridges and related structures is vital to an orderly and balanced transportation system; and

WHEREAS, a unified approach to long range facilities planning and capital investment programming is a County goal; and

WHEREAS, extensive and timely analysis and evaluation of County bridges and related structures has been undertaken; and

WHEREAS, the Multnomah County Transportation Division Capital Improvement Plan for Willamette River Bridges specified a process to prioritize capital improvement needs which will maximize the use of resources which is the Capital Improvement Program for Willamette River Bridges; and

WHEREAS, the Multnomah County Capital Improvement Plan and Program for the Willamette River Bridges will be updated every two years as a necessary element of the safe and reliable public use of Willamette River Bridges; now therefore

IT IS HEREBY RESOLVED that the Multnomah County Board of Commissioners approve the Multnomah County Twenty Year Capital Improvement Plan and Program for Willamette River Bridges for 1993-2012.

DATED this 1st day of July, 1993.

BOARD OF COUNTY COMMISSIONERS
FOR MULTNOMAH COUNTY, OREGON

Hank Miggins, Acting Chair

REVIEWED:

LAURENCE KRESSEL
MULTNOMAH COUNTY COUNSEL

By _____
John L. DuBay, Chief Deputy

DEPARTMENT of ENVIRONMENTAL SERVICES

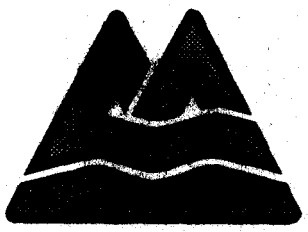
MULTNOMAH COUNTY

20 - YEAR 1993 - 2012

CAPITAL IMPROVEMENT PLAN AND PROGRAM

for the

WILLAMETTE RIVER BRIDGES



PREPARED BY

MULTNOMAH COUNTY
TRANSPORTATION DIVISION

PREFACE

Many changes have taken place in the 20-year capital improvement needs since the previous Capital Improvement Plan and Program for the Willamette River Bridges was created in 1989. These changes involved project completions, project additions and procedural changes. The most notable change of all is the seemingly exorbitant increased cost of the 1993-2012 program over the 1989-2008 program. An explanation of the factors that contributed to that cost increase is provided here.

Two categories of projects make up the Capital Improvement Program. The first category, "Construction Projects," includes structural, mechanical and electrical systems of the bridges. The second category, "Corrosion Protection Projects," is for bridge painting. It includes all of the painting and the required containment and disposal of toxic or hazardous waste. It is essential that parts of these categories be described separately because the reasons for their cost increases were significantly different.

In general, factors known to have contributed to the increased costs for each category are listed below:

Construction Projects

- Inflation
- Additional Construction Contingency
  - Specialized Work Requirements
  - Liability for High Risk or Hazardous Work
  - Logistic Constraints
  - Constraints Due to Special Events
- Increased Engineering
- Change in Concept for Sellwood Bridge Replacement
- Seismic Retrofitting
- Semi-In-Depth and In-Depth Inspections

Corrosion Protection Projects

- Inflation
- Additional Construction Contingency (similar to above)
- New and Tighter Restrictions on Containment
- New and Tighter Restrictions on Disposal of Hazardous Waste

The cost estimates identified in the 1989 CIP for the Willamette River Bridges projects were derived almost exclusively from consultants' recommendations. As stated in the report, cost estimates were determined by the Bridge Engineering Section using the following consultant reports:

> Willamette River Bridges Investigation, Summary Report, prepared by Sverdrup & Parcel and Associates, Inc., in association with Moffatt, Nichol and Bonney, Inc., and Milton C. Stafford, October 1986.

Willamette River Bridge Ramp Investigation, Executive Summary Report by OBEC Consulting Engineers, Eugene, Oregon, January 1988.

Inspection and Cost Estimates for Contract Maintenance Painting, Multnomah County Structural Steel Bridges, prepared by W.L. Bangert, November 1987.

During the three years following implementation of the 1989 CIP, many of the recommended improvements were completed by contract. Through these contracted projects, it became apparent that the 1989 cost estimates were too low; a combination of low initial cost estimate by the consultant and failure to recognize construction constraints specific to the Willamette River Bridges that are of additional cost.

Listed below is a more detailed explanation of the factors contributing to the increased cost for the Construction and Corrosion Protection project categories.

- **Inflation**

  Inflation was estimated at an average 3 percent per year for a total of 13 percent from 1989 to 1993.

- **Specialized Work**

  Bridge contract work is typically structural, however much of the rehabilitation on the Willamette River Bridges involves mechanical and electrical renovations. As a result, specialized mechanical and electrical contractors are required. These specialists are typically unfamiliar with bridge working environment and bid the work at a higher cost to cover unanticipated contingencies and problems. In addition, contractor unfamiliarity with the County's competitive bid process tended to be a stumbling block.

  Another item causing higher than anticipated bids the previous three years was the abundance of more desirable and less risky work at the time of contract bid. These specialists would not normally seek bridge work unless a large profit was anticipated.

- **Liability for High Risk or Hazardous Work**

  The hazards of working over water and with traffic were more of a concern to contractors than previously thought. Concerns for liability regarding the safety of personnel over water and traffic, and the unpredictability of traffic control when traffic had to be maintained throughout the project, drove the bids up to cover contingencies not previously considered.

Liability for damage caused by contractor operations or uncovered deterioration not included in the contract was also an extra cost concern because of the possible extra work and a delay that would prolong the project beyond the contractual time constraints.

▶ **Logistic Constraints**

Renovations and rehabilitations on the movable bridges generally involved two to three different types of specialists on the same project working within the same area. Cooperation becomes a critical issue and very often drives up project cost because of limited work area and access.

▶ **Constraints Due to Special Events**

Most special events along the river front such as the annual Rose Festival, marathons and activities at the Oregon Convention Center or Memorial Coliseum very often require uninterrupted traffic restrictions which minimize bridge closures or lane restrictions for construction on the affected bridges. The City of Portland also requires minimal disruption of traffic during the time period between Thanksgiving and Christmas because of the effect on business. During the weekday, lane restrictions are not permitted during peak hour traffic. Delay or disruption of construction due to these constraints have caused a cost increase to the projects.

▶ **Increased Engineering Costs**

- Design Engineering: Design engineering costs have been raised from the previous 10 percent to 15 percent. From past experience and discussion with other similar transportation agencies, design engineering cost for rehabilitation projects on moveable bridge projects normally vary from 15 percent to 20 percent and can even be as high as 40 percent on small complex projects. The 15 percent we are using represents an average for all projects.

  Their are several reasons for higher than normal design engineering cost. First, the design needs are for renovations of antiquated mechanical and electrical bridge systems. Second, is determining the limits or scope of the design. In the preliminary design stage, scope of rehabilitation, in almost all projects, is extended beyond the original intent because of additional uncovered improvements are needed. Then termination or limit of the renovation must be set which is difficult. Third, is the need for specialized design consultants who are generally unfamiliar with the structure and require

substantial orientation. Then, if problems are uncovered, additional design needs are increased. This adds to the design cost unproportionately since the consultant on the job will usually be the designer for any extras or project extensions.

- Construction Engineering: Costs for construction projects have also increased from 7 to 12 percent. This is considered to be a direct reflection of the contingencies under "Construction Projects". Construction engineering plus construction contingencies now equal 40 percent of project cost. This is in line with ODOT program planning estimates for their rehabilitation projects.

▶ **Change in Concept for the Sellwood Bridge Replacement**

The Sellwood Bridge $20 million increase is significant, and is due mostly to a change from a parallel structure to a completely new bridge. Reference is made to the November 1990 Conceptual Engineering Analysis for Light Rail Services across the Sellwood Bridge prepared by CH2M Hill. Some of the same factors which contributed to the overall cost increase are included in this replacement cost. In addition, approach structures, ramp structures, extra grading and paving have been included in the latest Sellwood estimate.

▶ **Added Cost for Seismic Retrofitting**

The projected scenario on seismic retrofitting, included in the $20,000,000 cost estimate, is as follows:

Of the five Willamette River Bridges under the jurisdiction of Multnomah County, one will be selected as the primary access across the river in the event of an earthquake and first priority for retrofitting will be given this bridge and its approach structures. The approach structures for the remaining four bridges will then be considered for retrofitting as funds become available. All are included in the cost estimate.

▶ **Added Costs for In-Depth Inspections**

The cost estimate of $800,000 for in-depth and semi-in-depth inspections is related to the inspections required under the Multnomah County Bridge Section Policy and the Willamette River Bridges Operations and Maintenance Manual which are as follows:

> "In-Depth Inspection - Every 10 years - The in-depth inspection is a complete inspection and

evaluation of all mechanical, electrical and structural elements involved for each individual bridge. From this inspection, a complete list of short- and long-term needs can be established, along with identifying appropriate projects.

Semi-In-Depth Inspection - Every 5 years - The semi-in-depth inspection is a general inspection of all mechanical, electrical and structural components with special emphasis on confirmation and updating of needs and projects identified through the in-depth inspection. New projects may result from this inspection."

- **New and Tighter Restrictions on Containment and Disposal of Hazardous Waste**

  In an effort to protect the surrounding area and the traveling public (both vehicular and pedestrian) from any toxic contamination, much tighter restrictions are now being required for containment and disposal on painting projects. These restrictions represent the need for a costly apparatus or enclosure that will provide 100 percent containment of all toxic dust and hazardous waste generated by the preparation procedure and subsequent painting for all coats. From this containment, the hazardous waste must be collected and transported under a strict procedure to an approved toxic site. Because of these restrictions, costs for "Corrosion Protection Projects" on major steel truss bridges have skyrocketed.

All of the items mentioned have contributed significantly to the increased cost for the projects that have been projected on the current 20-year CIP. The nature of work in renovating and rehabilitating the Willamette River Bridges does not lend itself to consistent cost estimating or to predictable competitive bids. We have been forced to increase our cost estimate for construction contingencies from 5 percent of the project cost on all projects to 28 percent on construction projects and 15 percent on painting projects.

When we combine the "Construction Projects" with the "Corrosion Protection Projects," including all costs for engineering and contingencies and then add $20 million for the anticipated seismic retro-fitting along with $800 thousand for in-depth and semi-in-depth inspections, we have a final cost estimate of $193,277,888. This is the estimate in 1993 dollars for the 1993-2012 CIP and compares to a cost estimate of $64,458,000 in 1989 dollars for the 1989-2008 CIP.

Multnomah County
20-Year 1993-2012
Capital Improvement Plan - Willamette River Bridges

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Multnomah County
20-Year 1993-2012
Capital Improvement Plan and Program
Willamette River Bridges

The Multnomah County Transportation Division has instituted a process for establishing capital improvement needs projected over the next 20 years. This process follows the policies established in the County Comprehensive Framework Plan. These policies are to plan and develop a timely and efficient arrangement of public facilities and services, and to maintain a safe, efficient and convenient public transportation system.

This plan and program is concerned specifically with capital needs of the six Willamette River Bridges: Sellwood, Hawthorne, Morrison, Burnside, Broadway and Sauvie Island.

The intent of the Capital Improvement Plan for the Willamette River Bridges is to recommend and prioritize improvements and alternate solutions for each improvement for each bridge and indicate specific repairs and replacement to insure safe and reliable operation. Cost estimates are allocated to a specific period; immediate to short range (0-4 years), intermediate (5-9 years), and long range (10-20 years) projects.

The intent of the Capital Improvement Program for the Willamette River Bridges is to assign revenue and to establish a schedule for the construction year of identified high priority projects.

Capital Project Identification

By agreement with the County, consultant services were employed to perform an in-depth inspection and prepare engineering reports on (1) the present condition and recommendation for repair and rehabilitation of each of the six Willamette River Bridge main structures, and (2) the results of a detailed field inspection and structural analysis of each of the approach ramps to four of the Willamette River Bridges: Hawthorne, Morrison, Burnside and Broadway.

Working with the County, Sverdrup & Parcel and Associates, (Consultants) performed complete field inspections of (1) bascule and vertical lift bridge mechanical systems, (2) bascule and vertical lift bridge electrical systems, and (3) bridge superstructure and substructure to the water level to detect any structural deficiencies of the main structures of the four Willamette River Movable Bridges: Hawthorne, Morrison, Burnside and Broadway.

The OBEC Consulting Engineers performed detailed field inspections and structural analysis on the Sellwood and Sauvie Island Bridges and on each of the approach ramps to the Sellwood, Hawthorne, Morrison, Burnside and Broadway Bridges.

Underwater foundation inspections and investigations were performed by the Oregon Department of Transportation (ODOT). Results were then provided to consultants and the County.

By agreement with the County, consultant services of W.L. Bangert, Structural Painting Coordinator (retired), ODOT, were employed to prepare engineering reports on the condition and recommendation for rehabilitation of corrosion protection systems (paint) on the Willamette River Bridge main structures and approach ramps.

In addition to identifying bridge, ramp, and paint improvement requirements, the aforementioned reports prioritized improvement needs. Prioritization is determined by means of an objective rating system (see Rating Criteria Section). Cost estimates, as recommended by the consultant, were also included in the reports but, they have proved to be unreasonably low and when combined with the many changes in procedures and product costs since the consultant reports were written, are no longer relevant. Final cost estimates in 1993 dollars shown in the "Plan and Program" section have been prepared by the Bridge Engineering Section.

The following source documents and consultant reports were used:

Willamette River Bridges Investigation, Summary Report, prepared by Sverdrup & Parcel and Associates, Inc., in association with Moffatt, Nichol and Bonney, Inc., and Milton C. Stafford, October 1986.

Willamette River Bridge Ramp Investigation, Executive Summary Report by OBEC Consulting Engineers, Eugene, Oregon, January 1988.

Inspection and Cost Estimates for Contract Maintenance Painting, Multnomah County Structural Steel Bridges, prepared by W.L. Bangert, November 1987.

Willamette River Bridges 20-Year Capital Works Needs, Multnomah County Transportation Division, May 1988.

Oregon Coding Guide for the Inventory and Appraisal of Oregon Bridges, OR State Highway Division, 1985.

Manual for Maintenance Inspection of Bridges, American Association of State Highway and Transportation Officials (AASHTO), 1983.

Bridge Inspector's Training Manual 70, U.S.D.O.T., FHWA.

Bridge Inspector's Manual for Movable Bridges, U.S.D.O.T., FHWA.

Oregon State Highway Division, 1991 (Paint) Specifications.

Conceptual Engineering Analysis of Light Rail Service for the Sellwood Bridge, November 1990, CH2M Hill.

After reviewing these documents, Multnomah County Transportation Division, Bridge Capital Section, identified 43 construction projects and 15 separate corrosion protection (painting) projects in the 20-year plan ending in the year 2008. In updating this list for the present report, we have deleted the construction projects that have been completed along with those that are no longer applicable and have added seven (7) to the list for a current total of 35 construction projects. All fifteen Corrosion Protection (Painting) projects remain on the list for a total of fifty projects that will continue to enable us to provide for safe and reliable use of the bridges.

In addition to the fifty specific projects, two general projects have been added for seismic retro-fitting and in-depth inspections which are not ranked on the prioritized list but do represent a cost requirement for the Capital Improvement Program.

Project Evaluation

The framework used to evaluate, classify, and prioritize identified projects is a sophisticated rating system which relies heavily on component evaluation criteria. Five different criteria and some 45 or more pieces of information are required for each identified project. It should be noted here that pedestrian/bike accommodation is a possible 20 point consideration under the aforementioned "Component Evaluation Criteria". Multnomah County is committed to the Bicycle Master Plan developed by the Transportation Division and approved by the board as a component of the Master Transportation Plan and the Comprehensive Framework Plan. One objective of this plan is that the Willamette River Bridges under the jurisdiction of Multnomah County be made safe and accessible to bicyclists. In meeting this objective, advantage of every opportunity will be taken to provide for safe bicycling on any new or rehabilitated Willamette River Bridge or bridge ramp where accommodation is a realistic possibility. Assistance will also be made available in initiating the Willamette River Bridges accessibility project.

In general, project rating criteria for the bridges and ramps include a national-standard bridge sufficiency rating, bridge historical significance, outside funding availability for each project, type of project, and time-line considerations. Project rating criteria for corrosion protection (painting) include, in general, existing corrosion damage, area rust breakthrough, quality of paint, weather exposure and visual considerations. (Refer to Criteria Rating Section for detailed project rating criteria and examples of painting review.)

Projects are classified by use of a point system. The point system used for bridge and ramp construction projects is necessarily distinct from that used for corrosion protection classification. A point score for each project is assigned to each significant criteria. Total criteria points are added to determine a total point rating for each project.

Projects designated with the highest total points are the most critical repair or rehabilitation projects. (See Plan Section Format for description of projects and point determination.) Bridge structural improvements are grouped as construction projects within the same project rating criteria framework. Corrosion control (paint) projects are grouped as painting needs within their distinct rating criteria framework.

For construction projects, in general, a rating of 95 or more points (out of a possible 135 point total) indicates attention within 0-4 years of the 20-year program period. Ratings of 75 and above indicate attention is needed within the first 10 years. Projects rated 60 to 74 are necessary during the 10-20 year period. Some project schedules are shifted slightly because of the need to effectively allocate and manage annual resources and to coordinate with maintenance scheduling.

Note: Seismic restrictions have been tightened considerably but retro-fitting has not been added to the project rating criteria since the policy for inclusion is not yet finalized. Besides adding considerable cost to the construction of new bridges, seismic retro-fitting will be required on existing bridges under a possible scenario as follows:

> Of the 5 Willamette River bridges maintained by Multnomah County in the urban area of Portland, one bridge will be selected as the primary access across the river in the event of an earthquake and first priority for retro-fitting will be given this bridge and its approach structures. Priorities in order beyond this initial bridge and as funds become available would be the approach structures on the remaining four bridges in order of priority. Retro-fitting all the approach structures plus one crossing structure is estimated, at a minimum, to cost $20 million. Retro-fitting the remaining

crossing structures is estimated to cost an additional $20 million, but is projected beyond the 20 year plan.

For paint projects, those with the highest rating are generally expected to be completed first. As there is less of a cost spread for the paint projects, the estimated total painting cost can be more evenly distributed as an annual requirement.

Plan Report

The Report, "Willamette River Bridges 20-Year Capital Improvement Needs," has been prepared by the Multnomah County Transportation Division, Bridge Capital Section. This report is the 20-Year Capital Plan, listing bridge construction projects, including seismic retro-fitting along with costs for in-depth and semi-in-depth inspections and corrosion protection projects in order of rank (high to low).

At the end of the report, the combined estimated costs for construction and corrosion protection projects are presented for each of four designated periods in the 20-year program. Figures are presented for the average annual need for the entire 20-year period. Estimated figures are presented for the grand total cost, and total County cost for the 20-year period.

The plan report represents the Transportation Division's recommendation for the 20-year Capital Improvements Program for Willamette River Bridges.

A description of the bridge and summary of the investigative engineering reports process for each of the six Willamette River Bridges (Hawthorne, Morrison, Burnside, Broadway, Sellwood, and Sauvie Island) can be found in Appendices I-VI.

The Capital Improvements Plan and Program Update Process for the Willamette River Bridges

As a necessary element of the safe and reliable public use of Willamette River Bridge structures, inspections and sufficiency ratings are routinely conducted by the County. Any changes in component need involving repair, scheduling and cost will be incorporated into the CIP 20-Year Plan Update Process. The Multnomah County Inspection policy is as follows:

> In-Depth and Semi-In-Depth Inspections - These inspections will be conducted on a routinely regular basis, usually a 10-year frequency for the in-depth inspection and a 5-year maximum interval for the semi-in-depth inspection as dictated by Multnomah County Bridge inspection policy and the Willamette River Bridges Operation and Maintenance Manual. The in-depth inspection is a complete inspection and

evaluation of all mechanical, electrical and structural elements involved for each individual bridge. From this inspection, a complete list of short term and long term needs can be established, along with identifying appropriate projects. The semi-in-depth inspection is a general inspection of all mechanical, electrical and structural components with special emphasis on confirmation and updating of needs and projects identified through the in-depth inspection. New projects may result from this inspection.

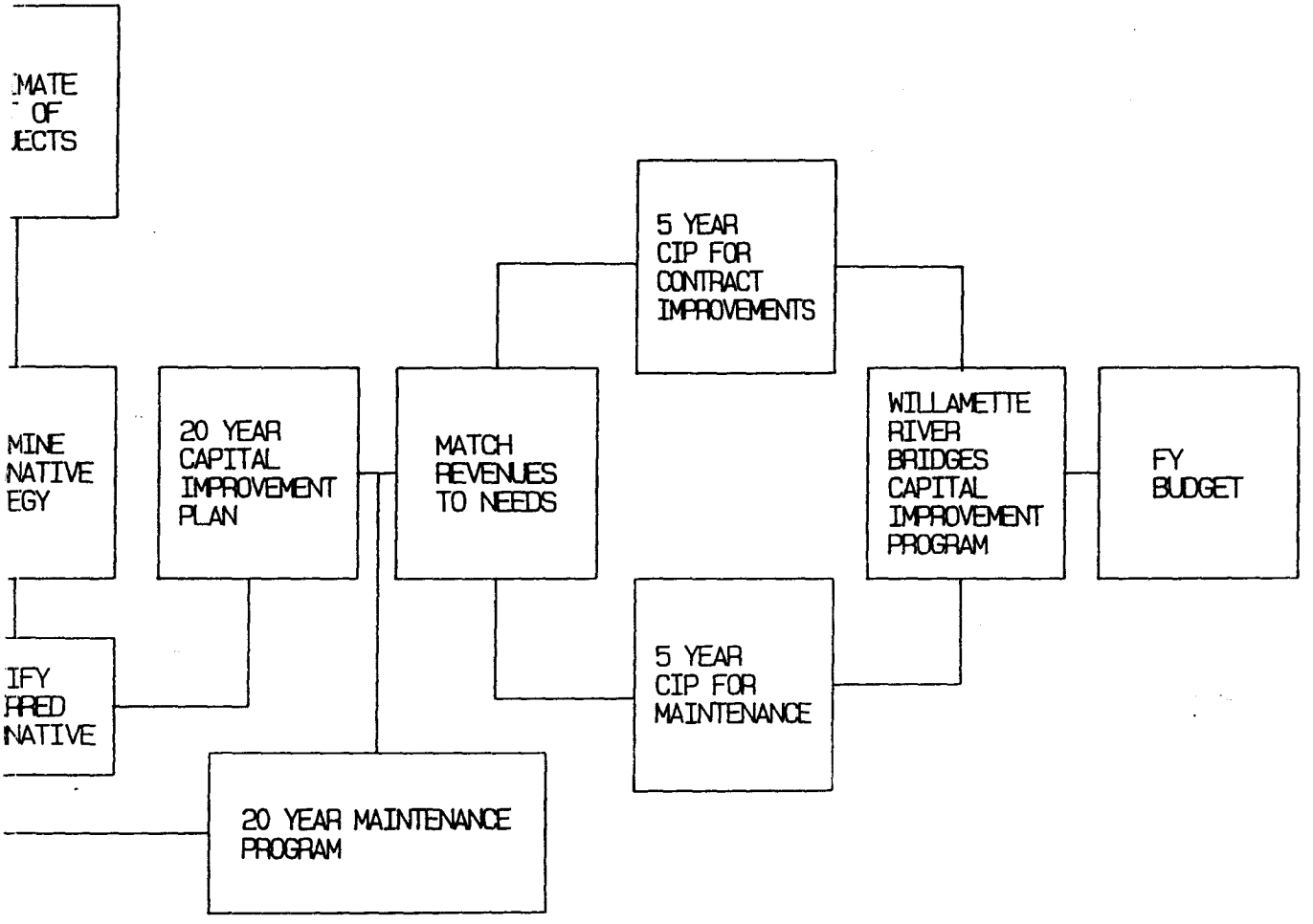
Inspection for Structure Inventory and Appraisal - Every 2 years - This inspection is a visual inspection of all elements of each bridge structural component. The result of this inspection is an overall condition rating for the bridge with related comments and possible recommendations for action required.

General Monitoring of all Bridge Components by Multnomah County Bridge Maintenance Crew - This monitoring includes specifically designed measurements taken to track the progress of any suspicious defect, crack or deviation in structural, mechanical or electrical operation along with visual observations by the maintenance crew in the course of their daily maintenance activities. Input from this monitoring can provide beneficial information in preparing reports on other inspections or may add short term maintenance projects to the agenda.

The Program itself will be reviewed on an annual basis by staff with a scheduled full update process involving all interested parties every two years. These reviews will ensure every consideration is made to appropriate funds for the wisest use of limited resources needed to carry out the 20-Year CIP.

As part of the update process, estimated costs will be re-evaluated every two years to take into consideration any changes in federal, state or local regulations regarding for example, pollution damage control restrictions which are expected to dramatically increase over the next few years.

CESS FOR WILLAMETTE RIVER BRIDGES
NTAINED BY MULTNOMAH COUNTY



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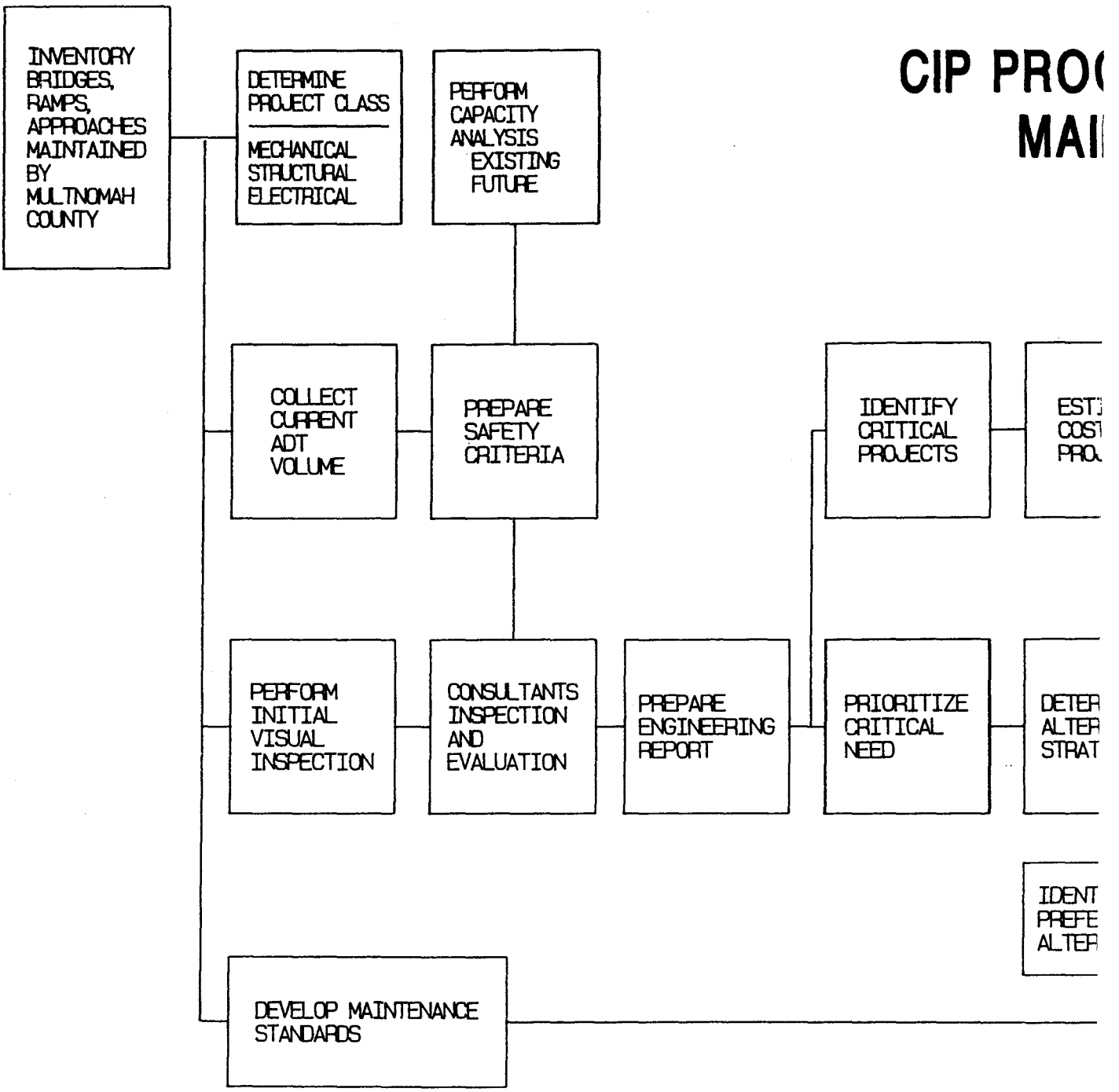
INVENTORY BRIDGES, RAMPS, APPROACHES MAINTAINED BY MULTNOMAH COUNTY
DETERMINE PROJECT CLASS
MECHANICAL
STRUCTURAL
ELECTRICAL
PERFORM CAPACITY ANALYSIS
EXISTING
FUTURE
COLLECT CURRENT ADT VOLUME
PREPARE SAFETY CRITERIA
IDENTIFY CRITICAL PROJECTS
PERFORM INITIAL VISUAL INSPECTION
CONSULTANTS INSPECTION AND EVALUATION
PREPARE ENGINEERING REPORT
PRIORITIZE CRITICAL NEED
DEVELOP MAINTENANCE STANDARDS

Willamette River Bridges
20-Year Capital Improvements Needs
Report

File Name: 93BRCIP4

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20-YEAR CAPITAL IMPROVEMENT NEEDS FOR THE WILLAMETTE RIVER BRIDGES

CONSTRUCTION PROJECTS

All Cost Based on 1993 Dollars
Line Item Costs Include 28% Construction Contingencies
Bridge Section Overhead not Included

ALL ESTIMATED COSTS IN THOUSANDS OF DOLLARS

RANK	BR STR	BRIDGE #	Cat	DESCRIPTION	EST COST	Suf Rat 20	His Sig 5	Out Fun 10	Comp Cri 60	TL 40	TOT PTS	0-4 years FY 92-93 through FY 95-96	5-9 years FY 96-97 through FY 00-01	10-14 years FY 01-02 through FY 05-06	15-20 years FY 06-07 through FY 11-12
1 Burnside	MS	O511	S	Paint Lower Trunnion Tower	235	10	5	0	60	40	115	235			
2 Willamette R.			E	Spare Submarine Cable	55	10	5	0	60	40	115	55			
3 Broadway	MS	6757	M	Mechanical Renovation (Phase II)	1093	10	5	0	60	40	115	1093			
4 Broadway	MS	6757	S	Deck Overlay & Guardrail	449	10	5	0	60	40	115	449			
5 Morrison	MS	2758/B	S	Span 4M Deck Replacement	1318	10	0	0	60	40	110	1318			
6 Burnside	R	0511A	S	First St. Stairway Installation	90	10	0	0	60	40	110	90			
7 Sauvie Island	S	2641	S	Southeast On-ramp Widening	263	10	0	5	50	40	105	263			
8 Burn/Morrison	MS	O511,275	M	Replace two traffic gates on each bridge	200	10	5	0	50	40	105	200			
9 Broadway	R	6757A	S	Sidewalk Rehabilitation	178	5	0	0	60	40	105	178			
10 Morrison	R	2758B	S	West Side Deck Rehabilitation	557	0	0	0	60	40	100	557			
11 Morrison	MS	2758	M	Gear Reducer Replacement	30	10	0	0	50	40	100	30			
12 Morrison	MS	2758	S	Repair Sidewalk Expansion Joints	16	10	0	0	50	40	100	16			
13 Broadway	MS	6757	E	Variable Message Fiber Optic Warning Signs	0	10	5	0	40	40	95	375			
14 Burnside	MS	O511	L	Replace Roadway Lighting With 480V HPS	154	10	5	0	40	40	95	154			
15 Broadway	MS	6757	L	Replace 2300 V Lighting W/ 480 Vac System	61	10	5	0	40	40	95	61			
16 Broadway	R	6757A	S	Repair And Repaint Conc. Retaining Wall	60	5	0	0	50	40	95	60			
17 Morrison	MS	2758	S,R	East Side Deck Rehabilitation	1686	10	0	0	50	30	90		1686		
18 Morrison	MS	2758	L	Replace Wiring in Roadway Lighting System	16	10	0	0	40	40	90	16			
19 Morrison	MS	2758	M	Emergency Drive System For Bascule Spans	235	10	0	0	40	40	90			235	
20 Broadway	MS	6757	S	Sidewalk Replacement	777	10	5	0	40	30	85		777		
21 Burnside	MS	O511	M,E	Buffer Cylinder & Control Equipment	313	10	5	0	40	30	85		313		
22 Broadway	R	6757A/B	S	Broadway/Lovejoy Ramps - Deck/Joint Rehab.	445	5	0	0	50	30	85		445		
23 Hawthorne	MS	2757	S	Replace Deck Grating	3703	5	5	0	40	30	80		3703		
24 Morrison	MS	2758	E	New Sub Cable For Control Conductors	49	10	0	0	40	30	80		49		
25 Broadway	R	6757C	S	Resurface Bridge Deck & Approaches	60	5	0	0	40	30	75		60		
26 Burnside	MS	O511	S	Replace Concrete Roadway Deck	3980	10	5	0	40	20	75			3980	
27 Hawthorne	R	2757A&B	R,S	Madison Viaduct-Rdwy Approach/Deck Overlay	780	5	0	0	40	30	75		780		
28 Hawthorne	R	2757D	S	Concrete Deck Overlay	201	5	0	0	40	30	75		201		
29 Sellwood	MS	6879	S	Replace Structure - Construction	39468	10	0	0	50	10	70				39468
30 Sellwood	MS	6879	S	Replace Structure - Right-of-way	2754	10	0	0	50	10	70				2754
31 Broadway	MS	6757	M	Emergency Drives-Center Locks & Span Drive	155	10	5	0	35	20	70			155	
32 Burnside	R	0511A/B	R	East/West Approach - Rdwy App./Deck Rehab.	727	10	0	0	40	20	70			727	
33 Sauvie Island	MS	2641	S	Concrete Deck Overlay	252	10	0	0	40	20	70			252	
34 Broadway	MS	6757	S	Concrete & Grating Deck Replacement	2762	10	5	0	40	10	65				2762
35 Sauvie Island	MS	2641	S	2nd Crossing or Replacement	6798	10	0	0	40	10	60				6798
Willamette River				Seizmic Retrofit - One Crossing Plus All Ramps	20000									20000	
Willamette River				In Depth and Semi-In-Depth Inspections	800							300	100	300	100
				ESTIMATED CONSTRUCTION COST	91095							5450	8114	25649	51882
				Design Engineering (15%)	13664							818	1217	3847	7782
				Construction Engineering (12%)	10931							654	974	3078	6226
				ESTIMATED CONSTRUCTION COST	115691							6922	10305	32574	65890
				AVERAGE YEARLY COST	5785							1635	2061	6515	10982

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20-YEAR CAPITAL IMPROVEMENTS NEEDS FOR THE WILLAMETTE RIVER BRIDGES
\027\087\048

CORROSION PROTECTION (PAINTING)
100% SP-6 Commercial Blast Preparation
100% Containment, Hazardous Waste Disposal,
Moisture Cured Urethane Coating System

All Cost Based on 1993 Dollars
Line Item Costs Include 15% Construction Contingencies
Bridge Section Overhead not Included

ALL ESTIMATED COSTS IN THOUSANDS OF DOLLARS

Ra	BR	STR	BRIDGE #	Cat	DESCRIPTION	EST COST	Corr Damg 4	Area Rust Thru 4	Quty of Paint 3	Weath Expos 3	Vi-sual 2	TOT PTS	0-4 years FY 92-93 through FY 95-96	5-9 years FY 96-97 through FY 00-01	10-14 years FY 01-02 through FY 05-06	15-20 years FY 06-07 through FY 11-12
1	Hawthorne	MS	2757	P	HAWTHORNE BR. - Thru Truss/ Lift		4.0	4.0	3.0	2.0	2.0	15				
					Entire Bridge	13523							13523			
2	Broadway	MS	6757	P	BROADWAY BR. - Thru Truss/ Bascule		4.0	4.0	3.0	2.0	2.0	15				
					(Floor System)	6045							6045			
					(Minus Floor System)	12145								12145		
3	Burnside	MS	0511	P	BURNSIDE BR. - Steel Deck Truss/ Bascule		4.0	4.0	3.0	2.0	1.0	14				
					Entire Bridge	5100								5100		
4	Sellwood	MS	6879	P	SELLWOOD BRIDGE - Trusses	3883	4.0	3.0	2.0	2.0	2.0	13		3883		
5	Broadway	R	6757A	P	BROADWAY ST. RAMP - Steel Deck on Steel Col.	2170	3.0	3.0	2.0	1.0	2.0	11				2170
6	Morrison	R	2758B	P	W. MORRISON Trans. Struc. - Steel 'I'-Beam	2638	2.0	4.0	2.0	1.0	2.0	11		2638		
7	Broadway	R	6757B	P	LOVEJOY RAMP - Steel Deck on Steel Col.	1333	3.0	3.0	2.0	1.0	2.0	11			1333	
8	Morrison	MS	2758	P	MORRISON BR. - Steel Deck Truss/ Bascule	9841	3.0	3.0	1.0	2.0	1.0	10		9841		
9	Hawthorne	R	2757A	P	HAWTHORNE ST. VIADUCT E.B. - Steel 'I'-Beam	1666	2.0	2.0	1.0	1.0	2.0	8			1666	
10	Hawthorne	R	2757B	P	MADSION ST. VIADUCT W.B. - Steel 'I'-Beam	1709	2.0	2.0	1.0	1.0	2.0	8			1709	
11	Sauvie Island	MS	2641	P	SAUVIE IS. BR. - Steel Deck Truss/ Thru Truss	1167	2.0	2.0	1.0	2.0	1.0	8			1167	
12	Morrison	R	8589	P	MORRISON ST. VIADUCT W.B. - Steel 'I'-Beam	2192	1.0	1.5	0.5	2.0	1.5	7				2192
13	Morrison	R	2758A	P	BELMONT ST. VIADUCT E.B. - Steel 'I'-Beam	2114	1.0	1.5	0.5	2.0	1.5	7				2114
14	Morrison	R	8589Y	P	Water Ave ON Ramp W.B. - Steel 'I'-Beam	0	1.0	1.5	0.5	2.0	1.5	7				0
15	Morrison	R	8589Z	P	Water Ave OFF Ramp E.B. - Steel 'I'-Beam	225	1.0	1.5	0.5	2.0	1.5	7				225
					ESTIMATED PAINTING COST	65751							19568	33607	5875	6701
					Design Engineering (3%)	1973							587	1008	176	201
					Construction Engineering (15%)	9863							2935	5041	881	1005
					ESTIMATED TOTAL PAINTING COST	77586							23090	39656	6933	7907
					AVERAGE YEARLY COST TO PAINT	3879							5773	7931	1387	1318

SUMMARY: COMBINED CONSTRUCTION & PAINTING COST

COMBINED ESTIMATED CONSTRUCTION & PAINTING COST	156846	25018	41721	31524	58583
DESIGN ENGINEERING	15637	1405	2225	4024	7983
CONSTRUCTION ENGINEERING	20794	3589	6015	3959	7231
COMBINED ESTIMATED GRAND TOTAL COST	193277	30012	49961	39507	73797
COMBINED ESTIMATED AVERAGE YEARLY COST	9664	7503	9992	7901	12300

Estimated Construction Cost Table
A. Format - Construction

File Name: 93BRCIP4

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20-YEAR CAPITAL IMPROVEMENT NEEDS FOR THE WILLAMETTE RIVER BRIDGES

CONSTRUCTION PROJECTS

All Cost Based on 1993 Dollars
Line Item Costs Include 28% Construction Contingencies
Bridge Section Overhead not Included

RANK	BR STR	BRIDGE #	Cat	DESCRIPTION	EST COST	Suf Rat 20	His Sig 5	Out Fun 10	Comp Cri 60	TL 40	TOT PTS	0-4 years FY 92-93 through FY 95-96	5-9 years FY 96-97 through FY 00-01	10-14 years FY 01-02 through FY 05-06	15-20 years FY 06-07 through FY 11-12
1 Burnside	MS	0511	S	Paint Lower Trunnion Tower	235	10	5	0	60	40	115	235			
2 Willamette R.			E	Spare Submarine Cable	55	10	5	0	60	40	115	55			
3 Broadway	MS	6757	M	Mechanical Renovation (Phase II)	1093	10	5	0	60	40	115	1093			
4 Broadway	MS	6757	S	Deck Overlay & Guardrail	449	10	5	0	60	40	115	449			
5 Morrison	MS	2758/B	S	Span 4M Deck Replacement	1318	10	0	0	60	40	110	1318			
6 Burnside	R	0511A	S	First St. Stairway Installation	90	10	0	0	60	40	110	90			
7 Broadway	MS	6757	E	Variable Message Fiber Optic Warning Signs	375	10	5	5	50	40	110	375			
8 Sauvie Island	S	2841	S	Southeast On-ramp Widening	263	10	0	5	50	40	105	263			
9 Burn/Morrison	MS	0511,275	M	Replace two traffic gates on each bridge	200	10	5	0	50	40	105	200			
10 Broadway	R	6757A	S	Sidewalk Rehabilitation	178	5	0	0	60	40	105	178			
11 Morrison	R	2758B	S	West Side Deck Rehabilitation	557	0	0	0	60	40	100	557			
12 Morrison	MS	2758	M	Gear Reducer Replacement	30	10	0	0	50	40	100	30			
13 Morrison	MS	2758	S	Repair Sidewalk Expansion Joints	16	10	0	0	50	40	100	16			

Data items described below are taken from the top margin of each page of the Willamette River Bridges 20-Year Capital Improvements Needs Report, Construction Projects.

Rank. The report print-out ranks projects according to total criteria rating points received.

Bridge. Locational description: bridge involved for each project is identified. (Hawthorne, Burnside, Morrison, Broadway, Sellwood, Sauvie Island).

Structure. Identifies project as Main Structure = MS or Ramp = R.

Bridge No. The state and county designated identification number for bridge or ramp.

Category. The system identified for capital work, i.e., Structural = S, Mechanical = M, Electrical = E, Lighting = L, R = Resurface, P = Paint.

Description. Brief project description.

Estimated Cost. Estimated cost represented in thousands of dollars. All costs are based on 1993 dollars. Line item costs include 28% construction contingencies.

Bridge Sufficiency Rating. The basis of the bridge sufficiency rating system is the ODOT sufficiency rating system (Oregon Coding Guide for the Inventory and Appraisal of Oregon Bridges - 1985). The rating system comprises three elements: structural adequacy and safety, serviceability and functional obsolescence, and essentiality for public use.

Historical Significance. Rating points (5) were assigned for projects on bridges of historical significance. The three bridges are Broadway, Burnside and Hawthorne. Bridges with no historical significance received (0) points.

Outside Funding Availability. Projects known to have outside funding available received 10 points. Projects for which outside funding availability is anticipated received 5 points. Most projects have no outside funding availability and received (0) points.

Component Evaluation Criteria. A critical item, structural, mechanical or electrical item received highest ratings, depending on primary or secondary importance. A maximum of 60 points can be assigned to this categorical criteria.

Replacement/Repair Time-line. Completion dates as recommended by consultants investigation reports and confirmed or updated by the County Engineer were assigned points (40 points maximum) with immediate need projects receiving highest points.

Total Points. Above 5 criteria were totaled. This column was used to rank projects. Highest total points were ranked most critical.

1993-2012. Twenty years represented in 20-Year Plan. Project costs in thousands of dollars will appear in appropriate year. Projects capable of schedule shifting are indicated by straight horizontal lines.

B. Format - Painting

20-YEAR CAPITAL IMPROVEMENTS NEEDS FOR THE WILLAMETTE RIVER BRIDGES
\027\067\048

CORROSION PROTECTION (PAINTING)
100% SP-6 Commercial Blast Preparation
100% Containment, Hazardous Waste Disposal,
Moisture Cured Urethane Coating System

All Cost Based on 1993 Dollars
Line Item Costs Include 15% Construction Contingencies
Bridge Section Overhead not Included

Ra	BR STR	BRIDGE #	Cat	DESCRIPTION	EST COST	Corr Damg 4	Area Rust Thru 4	Qnty of Paint 3	Weath Expos 3	Vi-sual 2	TOT PTS	0-4 years FY 92-93 through FY 95-96	5-9 years FY 96-97 through FY 00-01	10-14 years FY 01-02 through FY 05-06	15-20 years FY 06-07 through FY 11-12
1	Broadway MS	6757	P	BROADWAY BR. - Thru Truss/ Bascule		4.0	4.0	3.0	2.0	2.0	15				
				(Floor System)	6045							6045			
				(Minus Floor System)	12145								12145		
2	Hawthorne MS	2757	P	HAWTHORNE BR. - Thru Truss/ Lift		4.0	4.0	3.0	2.0	2.0	15				
				Entire Bridge	13523							13523			
3	Burnside MS	0511	P	BURNSIDE BR. - Steel Deck Truss/ Bascule		4.0	4.0	3.0	2.0	1.0	14				
				Entire Bridge	5100								5100		
4	Sellwood MS	6879	P	SELLWOOD BRIDGE - Trusses	3863	4.0	3.0	2.0	2.0	2.0	13		3863		
5	Broadway R	6757A	P	BROADWAY ST. RAMP - Steel Deck on Steel Col.	2170	3.0	3.0	2.0	1.0	2.0	11				2170
6	Morrison R	2758B	P	W. MORRISON Trans. Struc. - Steel T-Beam	2838	2.0	4.0	2.0	1.0	2.0	11		2838		
7	Broadway R	6757B	P	LOVEJOY RAMP - Steel Deck on Steel Col.	1333	3.0	3.0	2.0	1.0	2.0	11			1333	
8	Morrison MS	2758	P	MORRISON BR. - Steel Deck Truss/ Bascule	8641	3.0	3.0	1.0	2.0	1.0	10		8641		
9	Hawthorne R	2757A	P	HAWTHORNE ST. VIADUCT E.B. - Steel T-Beam	1686	2.0	2.0	1.0	1.0	2.0	8			1686	
10	Hawthorne R	2757B	P	MADSION ST. VIADUCT W.B. - Steel T-Beam	1709	2.0	2.0	1.0	1.0	2.0	8			1709	
11	Sauvie Island MS	2641	P	SAUVIE IS. BR. - Steel Deck Truss/ Thru Truss	1167	2.0	2.0	1.0	2.0	1.0	8			1167	

Data items described below are taken from the top margin of each page of the Willamette River Bridges 20-Year Capital Improvements Needs Report, Painting Projects.

Rank. The report print-out ranks projects according to total criteria rating points received.

Bridge. Locational description: Bridge involved for each project is identified. (Hawthorne, Burnside, Morrison, Broadway, Sellwood, Sauvie Island).

Structure. Identifies structure as Main Structure = MS or Ramp = R.

Bridge No. The state and county designated identification number for bridge or ramp.

Category. The system identified for capital work, i.e., P = Paint.

Description. Brief project description.

Estimated Cost. Estimated cost represented in thousands of dollars. All costs are based on 1993 dollars. Line item costs include 15% construction contingencies.

Corrosion Damage. Criteria rating points were assigned for corrosion damage to the steel, either existing or potentially imminent. Higher numbers indicate a more serious defect.

Area of Rust Breakthrough. Criteria rating points were assigned as to the actual area or degree of rust breakthrough. Higher numbers indicate heavier rust.

Quality of Paint. The quality of the existing paint was a third criteria. Conditions which affect the paint's present quality were degrees and thoroughness of cleaning of the steel surface prior to painting, the quality of the paint, the surface exposure to weather and environmental surroundings.

Weather Exposure. Surface exposure to moisture (rain, leakage, drainage) and u-v light were rated to classify exposure conditions. Higher points indicate higher degree of weather exposure.

Visual (Public Exposure). The overall appearance and exposure to public view varies for each structure as to the structure's location, the traffic volume or population surrounding the site, and whether traffic passes through, over or under the structure. Higher points indicate more public exposure.

Project Rating Criteria

A. Construction Projects

B. Corrosion Control (Paint) Projects

Construction Project Rating Criteria

A. Bridge Sufficiency Rating (20 points maximum)

ODOT	County
0 - 25	20 points
26 - 50	10 points
51 - 80	5 points
81 - 100	0 points

B. Bridge Historical Significance (5 points maximum).

Significant	5 points	Broadway #6757 Burnside #0511 Hawthorne #2757
No Importance	0 points	

C. Outside funding availability (10 points maximum).

Available	10 points
Anticipated	5 points
Not Available	0 points

D. Component Evaluation Criteria (60 points maximum).

Critical Item	60 points		
Structural Item	50 points	Primary	40 Secondary
Mechanical Item	50 points	Primary	40 Secondary
Electrical Item	50 points	Primary	40 Secondary
Deck	40 points		
Illumination	40 points		
Component Life Extension	35 points		
Traffic Control	20 points		
Pedestrian/Bike Accommodation	20 points		

E. Recommended Replacement/Repair Time-line (40 points maximum).

0 - 4 years	40 points
5 - 9 years	30 points
10 - 14 years	20 points
15 - 20 years	10 points

SUMMARY OF BRIDGE SUFFICIENCY RATING FACTORS USED BY ODOT

1. STRUCTURAL ADEQUACY AND SAFETY

S_1 = 55% Max.

59 Superstructure
60 Substructure
62 Culvert
66 Inventory Rating

2. SERVICEABILITY AND FUNCTIONAL OBSOLESCENCE

S_2 = 30% Max.

12 Defense Highway
28 Lanes on Structure
29 ADT
32 Appr. Rdwy. Width
43 Structure Type
51 Bridge Rdwy. Width
53 VC over deck
58 Deck Condition
67 Structural Condition
68 Deck Geometry
69 Under-clearances
71 Waterway Adequacy
72 Appr. Rdwy. Align.

3. ESSENTIALITY FOR PUBLIC USE

S_3 = 15% Max.

12 Defense Highway
19 Detour Length
29 ADT

4. SPECIAL REDUCTIONS

S_4 = 13% Max.

19 Detour Length
36 Traffic Safety Features
43 Structure Type, Main

SUFFICIENCY RATING = $S_1 + S_2 + S_3 - S_4$

Sufficiency Rating shall not be <0 nor> 100

6108V

PROJECT RATING CRITERIA EXAMPLE

CORROSION CONTROL (PAINT) PROJECTS

BR. NO. 6879 NAME Sellwood Bridge COUNTY Multnomah

LOCATION FAU 9704 INSP. BY Bangert Davis DATE 9/29/87

STRUCT. DESCRIPTION 2 - 245'6" & 2 - 300' steel deck trusses

STEEL SPANS Wt. est. by Co. 10-87

WT. STRUCT. STEEL 1,060 tons EST. AREA STEEL 318,000 sq. ft.

EXIST. PAINT TYPE: LAST PAINTED 1962 BY J I Hass 1400-G-63
Prime: Red Lead Int.: Red Lead Top: Alkyd

	Severe	Moderate	Light	None	
Corrosion Damage	4	3	2	1	= 4
	Heavy	Moderate	Scattered	None	
Area Rust Breakthrough	4	3	2	1	= 3
	Loose	Dead	Moderate	Live	
Quality of Paint	3	2	1	0	= 2
	Wet	Moderate	Dry		
Weather Exposure	3	2	1		= 2
	High	Low	None		
Visual (Pub. Exposure)	2	1	0		= 2

(Rate) Total = 13

Span 20 and one panel of span 19 were painted in 1984 by County maintenance forces. Although much old paint remains, the overall condition is good and should last several years without serious failure. The remaining steel is sustaining serious corrosion damage and should be repainted within the next two or three years. There are structures under both ends of the bridge which will require protection.

Blast clean to steel and repaint 1988-1989 seasons.

Appendix 1: Hawthorne Bridge

Appendix 2: Morrison Bridge

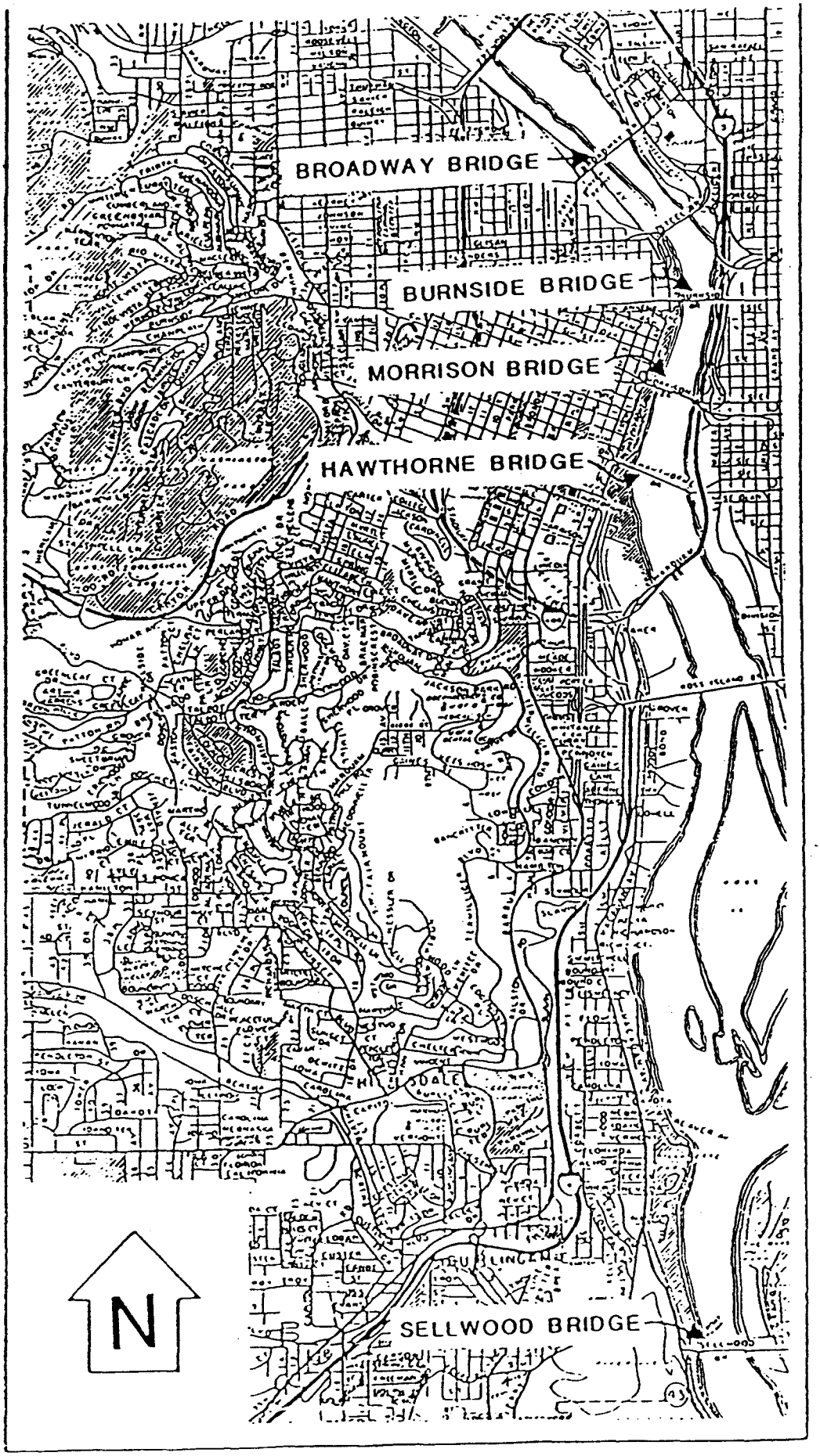
Appendix 3: Broadway Bridge

Appendix 4: Burnside Bridge

Appendix 5: Sellwood

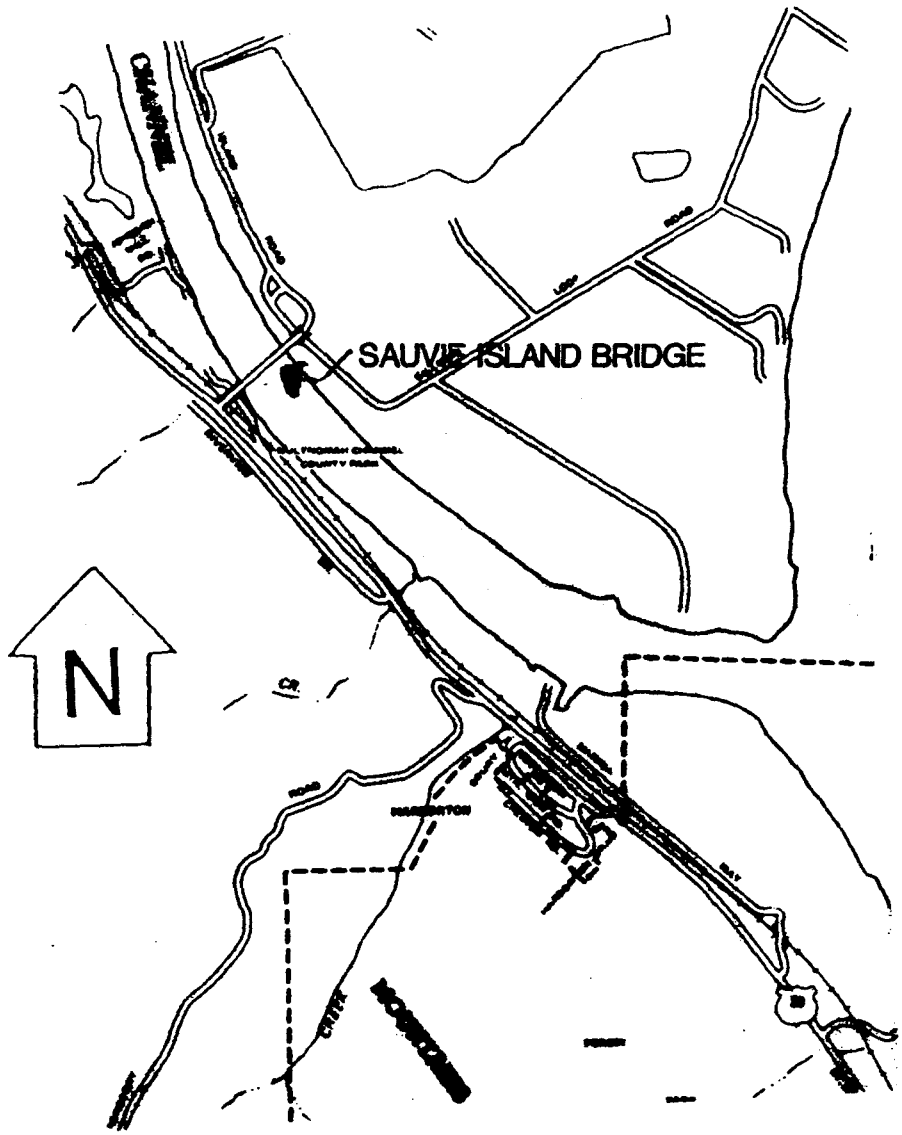
Appendix 6: Sauvie Island

Appendix 7: CIP Process

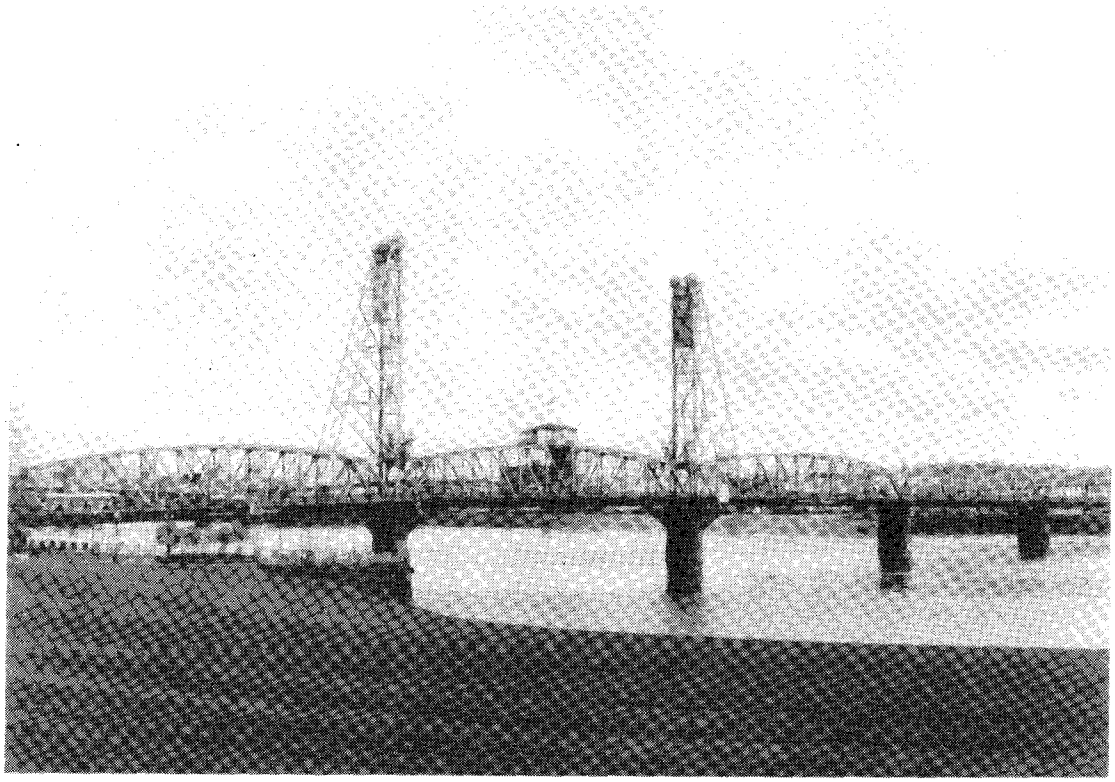


CIP FOR WILLAMETTE RIVER BRIDGES

VICINITY MAP



VICINITY MAP



HAWTHORNE BRIDGE SUMMARY

Structure Number 2757
Madison Street–Hawthorne Boulevard
Portland, Multnomah County

Constructed - 1910
Steel Through Truss (Parker) Vertical Lift
Ownership - Multnomah County

WILLAMETTE RIVER BRIDGES: HAWTHORNE

The Hawthorne Bridge is the oldest remaining highway structure across the Willamette River. The main span is a 244-foot steel through truss (Parker) vertical lift span, capable of a vertical movement of 110 feet and providing a lateral waterway clearance of 230 feet. Two electric motors lift the vertical deck lift span. The two towers are 165 feet tall. The bridge includes five steel through truss (Parker) secondary spans, each 220 feet in length, and thirteen concrete approach spans. The Hawthorne Bridge is the lowest of the Willamette River Bridges in Portland, with 53 feet of clearance at low water, and consequently is raised more than any of the other drawbridges. This structure replaced a timber drawspan structure (Madison Street Bridge) built in 1891 and destroyed by fire in 1902. The Hawthorne Bridge has little architectural or decorative treatment. It was designed by Waddell and Harrington, Kansas City, and constructed by the Pennsylvania Steel Company, Portland, for a total cost of $511,000.

Hawthorne Bridge

Description

The Hawthorne Bridge is one of the eight major bridges that connect east and west Portland. It is maintained by Multnomah County. Originally built in 1910 to carry rail traffic, the Hawthorne Bridge now carries about 27,000 vehicles daily in four traffic lanes. Vertical clearance for river traffic is limited. Approximately 150 openings per month are required for the vertical lift span.

Modifications

Major structural modifications have included removal of the original timber deck and sidewalk and installation of open steel grating deck and concrete sidewalks. The outbound lanes of Span 6 have been widened near the west approach to the bridge.

Analysis

Structural, mechanical and electrical field inspections, investigation of mechanical and operating sequences, and structural analysis for the six main truss spans were made by Sverdrup & Parcel and Associates, consultants, in 1985 and 1986.

Detailed field inspection and structural analysis of the Hawthorne approach ramps on both sides of the main river span were completed by OBEC Consulting Engineers in 1988.

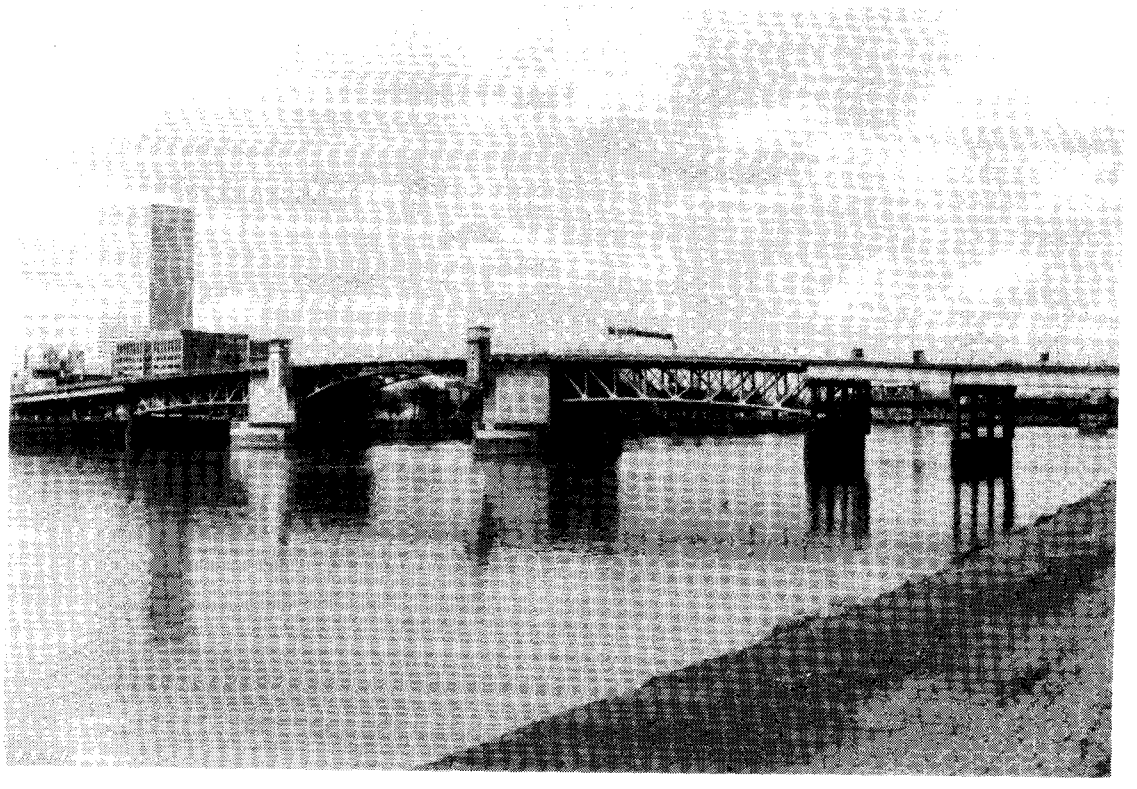
Within the framework of the CIP process, consultant's reports for the Hawthorne Bridge were analyzed by the appropriate County Engineers, projects were identified, and cost estimates were verified to produce the Hawthorne Bridge part of the Willamette River Bridges 20-Year Capital Improvements Needs Plan (see Report Section).

The structural, mechanical, and electrical deficiencies and estimated costs for repairs were summarized for Contract Repair Recommendations in the Sverdrup Investigation Summary Report. A summary of the Contract Repair suggestions, estimated costs, and target years for construction for the Hawthorne ramps were submitted by OBEC Consulting Engineers in 1988.

The paint investigation report and cost estimates from consultant W.L. Bangert for the Hawthorne Bridge and ramps were for cleaning and painting only. Based on risk factor, an additional construction cost was added to cover such items as traffic protection, mobilization, special insurance, and

environmental control measures. These considerations are reflected in the CIP Plan (see Report, Painting Section).

Projects for replacement of the east approach ramp structures and for Phase II Structural and Electrical Rehabilitation, as recommended in the consultants investigation report, have been completed and are not included in the current CIP.



MORRISON BRIDGE SUMMARY

Structure Number 2758
Morrison/Belmont-Front/Alder/Washington
Portland, Multnomah County

Constructed - 1958
Steel Double Leaf Strauss Bascule
Ownership - Multnomah County

WILLAMETTE RIVER BRIDGES: MORRISON

The Morrison Bridge is a six-lane, three-span, steel deck truss structure. The main spans consist of two 206'-8" side span steel deck trusses and a 262'-0" double-leaf Strauss trunnion bascule draw span. The cantilever sections supporting the roadway are divided into six 18'-8" panels with the truss height varying from 6'-0" at the center break to 26'-0" at live load support. The first Morrison Bridge, a wooden bridge built in 1887 with many short spans was the first bridge across the Willamette River into Portland. It was designed by the Pacific Bridge Company and was operated as a toll bridge. In 1905, the second Morrison Bridge, a steel swing span structure was built. It was dismantled in 1958 to make way for the existing Morrison Bridge.

Morrison Bridge

Description

The Morrison Bridge is a major travel corridor linking SE Portland and Interstate 5 to inner-city Portland. It is maintained by Multnomah County.

Built in 1958, the Morrison Bridge accommodates six lanes of traffic with an average daily traffic volume of 41,000 vehicles. Vertical clearance of the closed bascule span is adequate for the majority of river traffic. Approximately 15 openings per month are required for the bascule draw span.

Modification

The only major modifications to the bridge have been a rebuild of the main pier fendering system in 1965, and complete deck replacement of the easterly side span in 1980.

Analysis

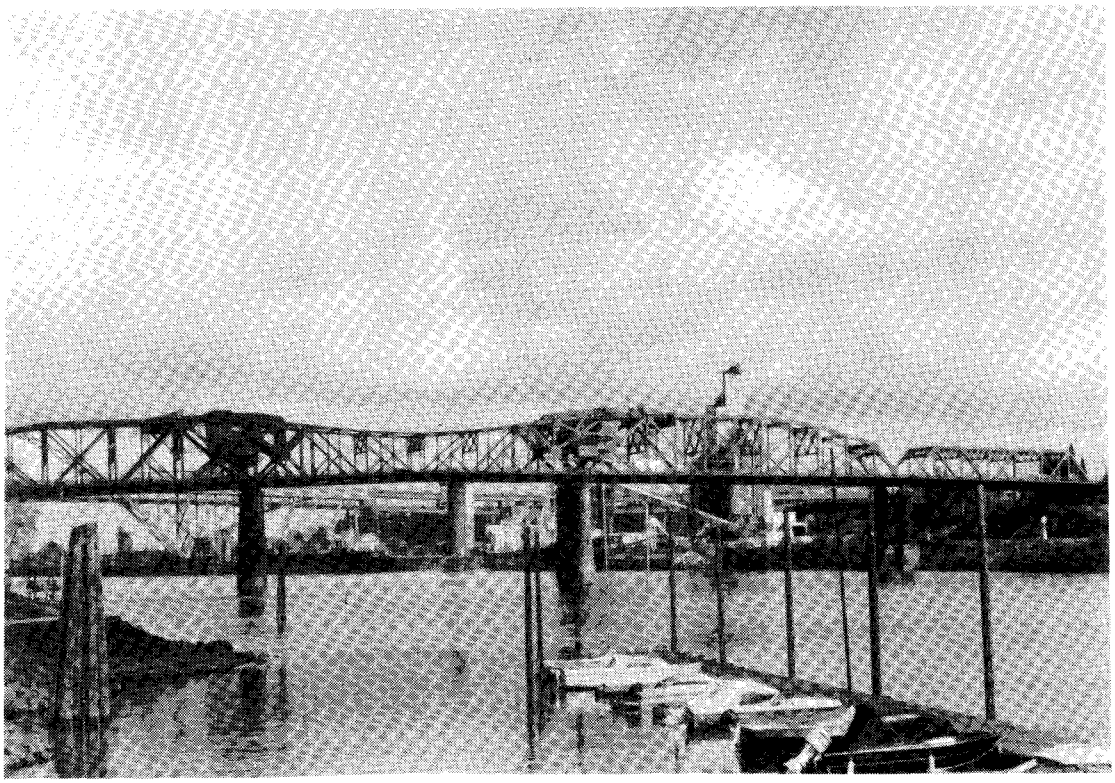
Structural, mechanical and electrical field inspections, investigation of mechanical and operating sequences, and structural analysis for the three main river truss spans were made by Sverdrup & Parcel and Associates between May and August 1985. Detailed field inspection and structural analysis of the Morrison Bridge approach ramps on both sides of the river spans were done by OBEC Consulting Engineers in 1987.

Within the framework of the CIP process, consultant's reports for the Morrison Bridge were analyzed by the appropriate County Engineers, projects were identified, and cost estimates were verified to produce the Morrison Bridge part of the Willamette River Bridges 20-Year Capital Improvements Needs Plan.

The structural, mechanical and electrical deficiencies and estimated costs for repairs were summarized for Contract Repair Recommendations in the Sverdrup Investigation Summary Report. Complete details of the inspection and structural rating are contained in the Morrison Bridge Investigation Engineering Report, dated June 1986. A summary of the repair suggestions, the estimated costs, and the target years for construction of the Morrison Bridge approach ramps were presented by OBEC Engineers in 1988.

The paint investigation report and cost estimates from consultant W.L. Bangert for the Morrison Bridge and approaches were for cleaning and painting only. Based on risk factor, an

additional construction cost was added to cover such items as traffic protection, mobilization, special insurance, and environmental control measures. The considerations are reflected in the CIP Plan (see Report, Painting Section).



BROADWAY BRIDGE SUMMARY

Structure Number 6757
Broadway Street
Portland, Multnomah County

Constructed - 1913
Steel Through Truss (Pennsylvania-Petit)
Double-Leaf Bascule
Ownership - Multnomah County

WILLAMETTE RIVER BRIDGES: BROADWAY

The Broadway Bridge, designed by the internationally famous bridge designer Ralph Modjeski, is cited as "an important example of the Rall-type bascule span" by David Plowden in Bridges: The Spans of North America (1974). The rarity and uniqueness of the Rall bascule structure add considerable technological interest to this structure. Built over a period of two years by the Pennsylvania Steel Company at a cost of $1.6 million, the bridge was the longest double-leaf bascule drawbridge in the world when constructed. The central span is a 297-foot steel through truss double-leaf bascule drawspan, providing 250 feet of lateral waterway clearance. The five secondary spans, four Pennsylvania-Petit steel through trusses and one Pratt steel through truss total 1,736 feet in length. An ornate vintage wrought iron bridge railing adjoins the sidewalks.

Broadway Bridge

Description

The Broadway Bridge is one of the eight major Willamette River bridges. It connects NE Portland to NW Portland. The Broadway Bridge is maintained by Multnomah County.

The Broadway Bridge was one of the first movable span bridges in Portland. Built in 1911 and 1912, the bridge was originally designed for rail traffic and vehicular traffic. The bridge presently accommodates four lanes of vehicular traffic with an average daily traffic volume of 26,000 vehicles. Vertical clearance of the closed bascule span is adequate for the majority of river traffic. Approximately 30 openings per month are required primarily to accommodate grain terminal ships.

Modification

Major structural modifications have included the replacement of the original timber plank deck on the approach spans with a concrete deck slab in 1927. The bascule span deck was replaced with open steel grating in 1948, where the street car rails were removed. Machinery renovations include the addition of automatic traffic gates in 1971, and major repairs to the struts in 1982.

Analysis

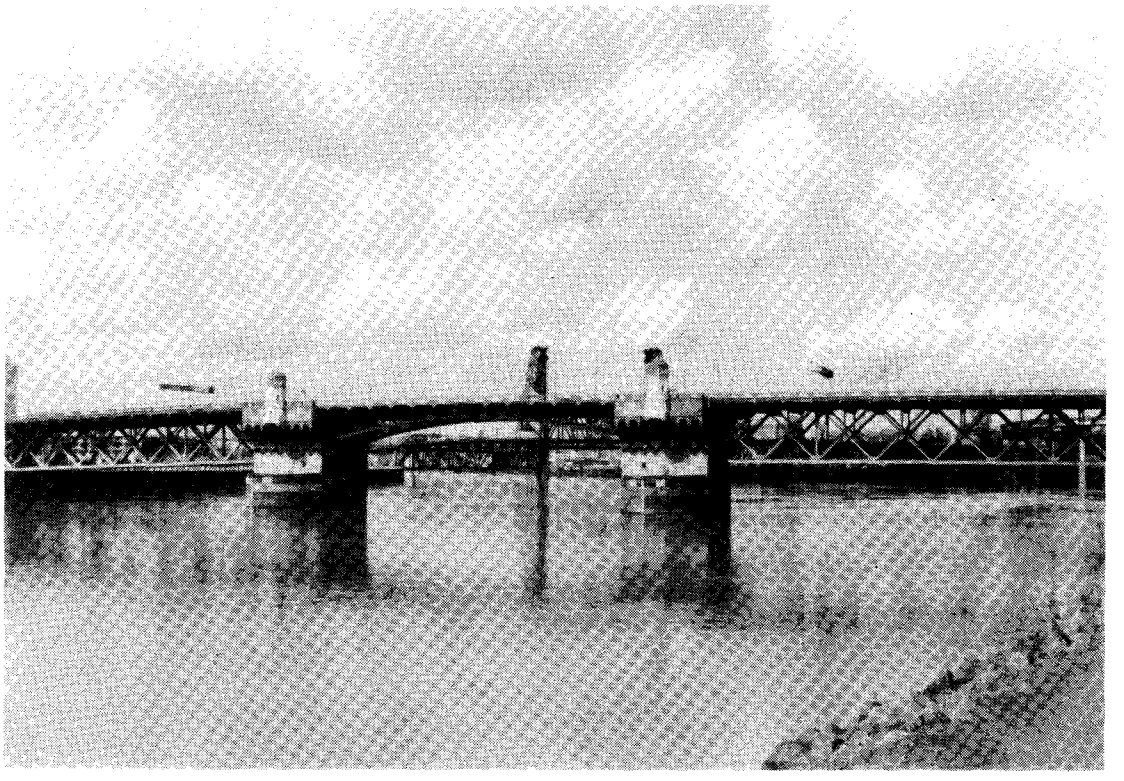
Structural, mechanical, and electrical field inspections, investigation of mechanical and operating sequences, and structural analysis for the six main river truss spans of the Broadway Bridge were made by the Sverdrup Consultant group in 1985 and 1986. Detailed field inspection and structural analysis of the Broadway Bridge east and west approaches were completed by OBEC Consulting Engineers in 1988.

Within the framework of the CIP process, consultant's reports for the Broadway Bridge were analyzed by the appropriate County Engineers, projects were identified, and cost estimates were verified to produce the Broadway Bridge part of the Willamette River Bridges 20-Year Capital Improvements Needs Report.

The structural, mechanical and electrical deficiencies, recommendations for rehabilitation or improvements, and estimated costs associated with these items are included in the Sverdrup Investigation Summary Report. Recommendations for repairs and estimated costs associated with those repairs were determined by OBEC Consulting Engineers and reported in their

Engineering Report to the County in 1988. Projects for electrical renovations, including a new submarine cable along with mechanical renovations on the east side as recommended in the consultant's investigation report, have been completed and are not included in the CIP.

The paint investigation report and cost estimates from consultant W.L. Bangert for the Broadway Bridge and approaches were for cleaning and painting only. Based on variable risk factor, an additional construction cost was added to projects to cover such items as traffic protection, mobilization, special insurance, and environmental control measures. These considerations are reflected in the CIP Plan (see Report, Painting Section).



BURNSIDE BRIDGE SUMMARY

Structure Number 511
Burnside Street
Portland, Multnomah County

Constructed - 1926
Steel Double-Leaf Bascule
Ownership - Multnomah County

WILLAMETTE RIVER BRIDGES: BURNSIDE

The Burnside Bridge is a double-leaf bascule drawspan. It replaced the orignal 1894 wrought iron truss swing span structure. Two spans of the 1894 structure were moved to new locations and are the oldest highway bridges in Oregon (Bull Run River Bridge and the Sandy River Bridge on Lusted Road, both in Clackamas County). The Burnside Bridge has two 266-foot steel deck truss secondary spans and thirty-four steel deck girder approach spans for a total structure length of 2,308 feet. The bascule system for the bridge was designed by Joseph B. Strauss, who later designed San Francisco's Golden Gate Bridge. The principal engineer for the Burnside Bridge was noted engineer Gustav Lindenthal. The original design concept is credited to I.G. Hendrick and Robert Kremers of Multnomah County, who were later replaced by Lindenthal. The Pacific Bridge Company constructed the bridge. Architectural treatment of the bridge includes an ornate spindle-type balustrade railing (wrought iron on the bascule section) and turreted operator shelters cantilevered from the massive main piers. The Burnside Bridge is distinguished as one of the most visually appealing of Portland's Willamette River Bridges.

Burnside Bridge

Description

The Burnside Bridge is one of the four major movable Willamette River Bridges maintained by Multnomah County. It connects east Portland to west Portland and divides south and north Portland. The bridge was originally built in 1926 and carries about 44,000 vehicles daily in six lanes of traffic. Vertical clearance of the closed bascule span is adequate for most river traffic. Approximately 15 openings per month are required of the draw span.

Modifications

Minor modifications have been made to the Burnside Bridge since its original construction. The east and west approaches have undergone deck resurfacing and joint rehabilitation.

Analysis

Structural, mechanical and electrical field inspections, investigation of mechanical and operating sequences, and structural analysis for the three main river spans of the Burnside Bridge were made by Sverdrup & Parcel and Associates, Inc., in 1985. Detailed field inspection and structural analysis of the east and west approach spans of the Burnside Bridge were conducted by OBEC Consulting Engineers in August 1987.

Within the framework of the CIP process, consultant's reports for the Burnside Bridge were analyzed by the appropriate County Engineers, projects were identified, and cost estimates were verified to produce the Burnside Bridge part of the Willamette River Bridges 20-Year Capital Improvements Needs Report.

The structural, mechanical and electrical deficiencies and estimated costs for repairs and rehabilitation associated with these items can be found in the Sverdrup & Parcel and Associates Investigation Summary Report. Complete details of the inspection and structural rating are contained in the Burnside Bridge Investigation Engineering Report, dated June 1986, by Sverdrup.

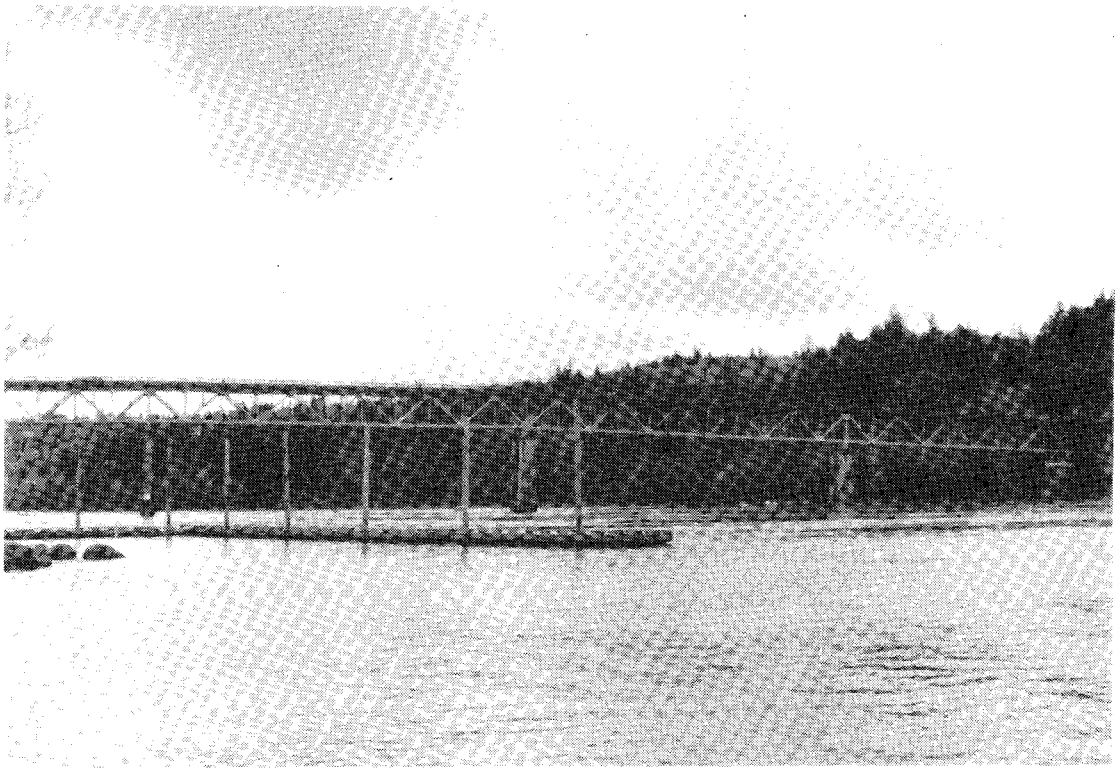
A summary of the Contract Repair suggestions, estimated costs, and target years for construction were submitted for the Burnside Bridge east and west approaches by OBEC Consulting Engineers in 1988.

The paint investigation report and cost estimates from

consultant W.L. Bangert for the Burnside Bridge and approaches were for cleaning and repair only. Based on risk factor, an additional construction cost was added to cover such items as traffic protection, mobilization, special insurance, and environmental control measures. These considerations are reflected in the CIP Plan, Painting Section.

The following projects were recommended in the aforementioned consultant's investigation report and have now been completed. They are not included in the current CIP:

1. Sidewalk and railing rehabilitation.
2. Electrical renovations.
3. Counterweight link modifications.
4. E/W approach rehabilitation and rocker bearing replacement on three piers.



SELLWOOD BRIDGE SUMMARY

Structure Number 6879
SW Macadam-SE Tacoma
Portland, Multnomah County

Constructed - 1925
Steel Deck Truss
Ownership - Multnomah County

WILLAMETTE RIVER BRIDGES: SELLWOOD

The Sellwood Bridge is a Warren steel truss structure. It has an overall length of 1,971 feet and provides a 24' roadway with one 4'-3" sidewalk on the downstream side. The main river spans consist of a 1,092' four span continuous steel Warren truss. The two interior spans of 300' in length, and the two end spans of 246' carry a 6-1/2" thick concrete deck. The truss is supported on five major concrete piers and footings, of which two are founded on piles, and three are founded on hard pan material. The Sellwood Bridge replaced the Sellwood Ferry and is the only major bridge crossing of the Willamette River in a 10-mile stretch.

Sellwood Bridge

Description

The Sellwood Bridge is the only major bridge crossing of the Willamette River in a 10-mile stretch of heavily populated area. The Sellwood Bridge is maintained by Multnomah County. Built in 1925, it has served as a major link for people traveling to west Portland from SE Portland and Milwaukie. It carries about 27,800 vehicles daily. The Sellwood Bridge is a non-movable bridge, i.e., vertical clearance is sufficient for river traffic.

Modifications

In 1960 the structural integrity of the bridge was greatly reduced when the west-side approach spans moved an estimated 18-inches toward the river. Repairs were immediately implemented. In 1961, a 25-foot prestressed concrete girder span was added, new columns and pile foundations were needed.

Analysis

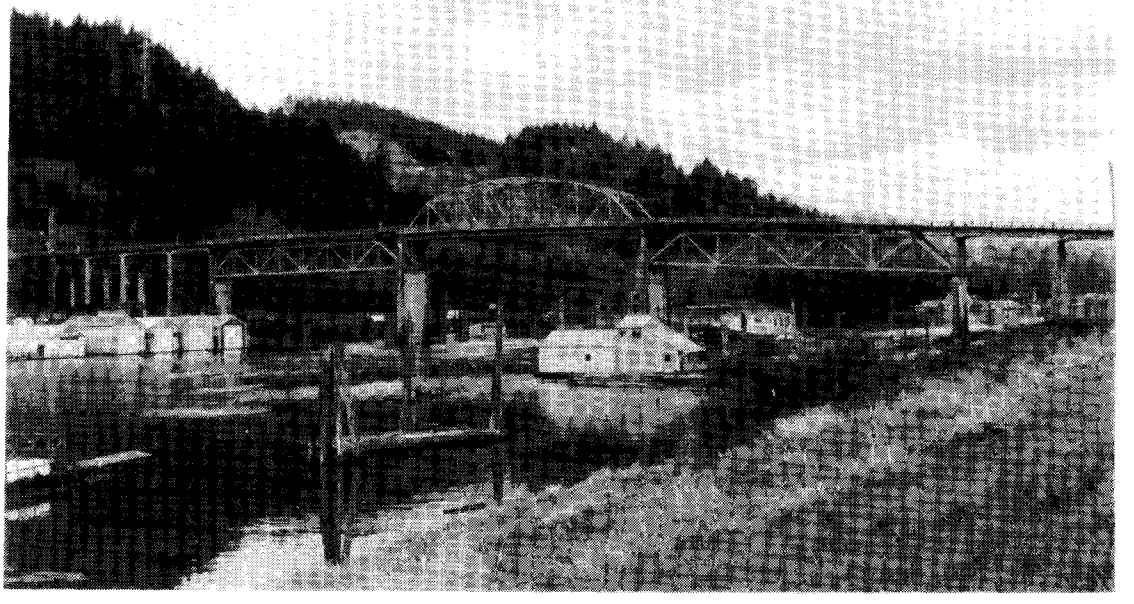
Bridge inspection, geo-technical investigation and structural analysis of the main river spans, and the east and west approaches were presented by Sverdrup & Parcel and Associates in 1986. The detailed engineering report used by the Sverdrup group of consultants was submitted to Multnomah County by OBEC Consulting Engineers in August 1985.

Within the framework of the CIP process, consultant's recommendations for the Sellwood Bridge were analyzed by the appropriate County Engineers and cost estimates were verified for two different scenarios, rehabilitation and replacement. Scenario 1 involves replacement of the existing bridge with a new bridge, having a minimum of four travel lanes. Scenario 2 envisions rehabilitation of the existing bridge (by placing a new superstructure on the existing foundation), plus building a new two-lane bridge. The recommended alternative is replacement and is included in the Willamette River Bridges 20-Year Capital Improvements Needs Report.

Significant structural deficiencies and estimated costs for repair and replacement were summarized in the Sverdrup Investigation Summary Report. Functionally, the Sellwood Bridge is considered "OBSOLETE" because of the substandard 24-foot roadway that carries 27,800 vehicles daily.

The paint investigation report and cost estimates from consultant W.L. Bangert for the Sellwood Bridge were for cleaning and painting only. Based on risk factor identified by consultant, an additional construction cost was added to cover such items as traffic protection, mobilization, special insurance, and environmental control measures. These considerations are reflected in the CIP Plan (see Report, Painting Section).

The project for an asphalt concrete overlay as recommended in the consultant's investigation report has been completed and is not included in the current CIP.



Structure Number 2641
Oregon Highway 30-Sauvie Island
Portland, Multnomah County

Constructed - 1948
Steel Through Truss, Concrete Approach Spans
Ownership - Multnomah County

WILLAMETTE RIVER BRIDGES: SAUVIE ISLAND

The Sauvie Island Bridge is 1,198' long and consists of two separate types of construction. The first six spans (totaling 272') are reinforced concrete deck girders set on concrete piers. The following five spans (totaling 326') are also reinforced concrete deck girders designed as three span continuous followed by two span continuous. The roadway width is 26' with sidewalks on both sides. The bridge was designed by the state and is the only access for the largely agricultural community on the island.

Sauvie Island Bridge

Description

The Sauvie Island Bridge crosses the Multnomah Channel just before it enters the Willamette River. It is maintained by Multnomah County. Built in 1948, the bridge is the only access for the largely agricultural community on Sauvie Island. The Sauvie Island Bridge is a non-movable structure, i.e., river traffic is not restricted.

Modifications

Major structural modifications have not occurred.

Analysis

Structural inspections and load ratings of the bridge and approach spans were conducted by OBEC Consulting Engineers in September 1987. A summary of recommendations for repairs and estimated costs associated with repair projects were determined and presented by OBEC Consulting Engineers in January 1988.

Within the framework of the CIP process, the consultant's reports for the Sauvie Island Bridge were analyzed by appropriate County Engineers, projects were identified, and cost estimates were verified to produce the Willamette River Bridges 20-Year Capital Improvements Needs Report.

The paint investigation report and cost estimates from consultant W.L. Bangert for the Sauvie Island Bridge and approach spans were for cleaning and painting only. Based on risk factor identified by consultant, an additional construction cost was added to cover such items as traffic protection, mobilization, special insurance, and environmental control measures. These considerations are reflected in the CIP Plan (see Report, Painting Section).