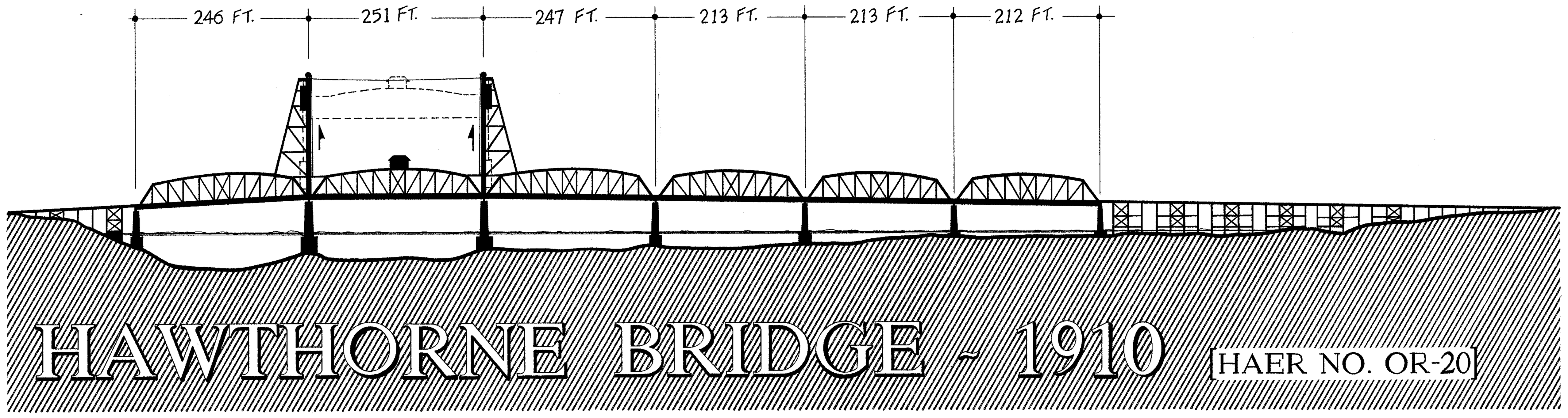
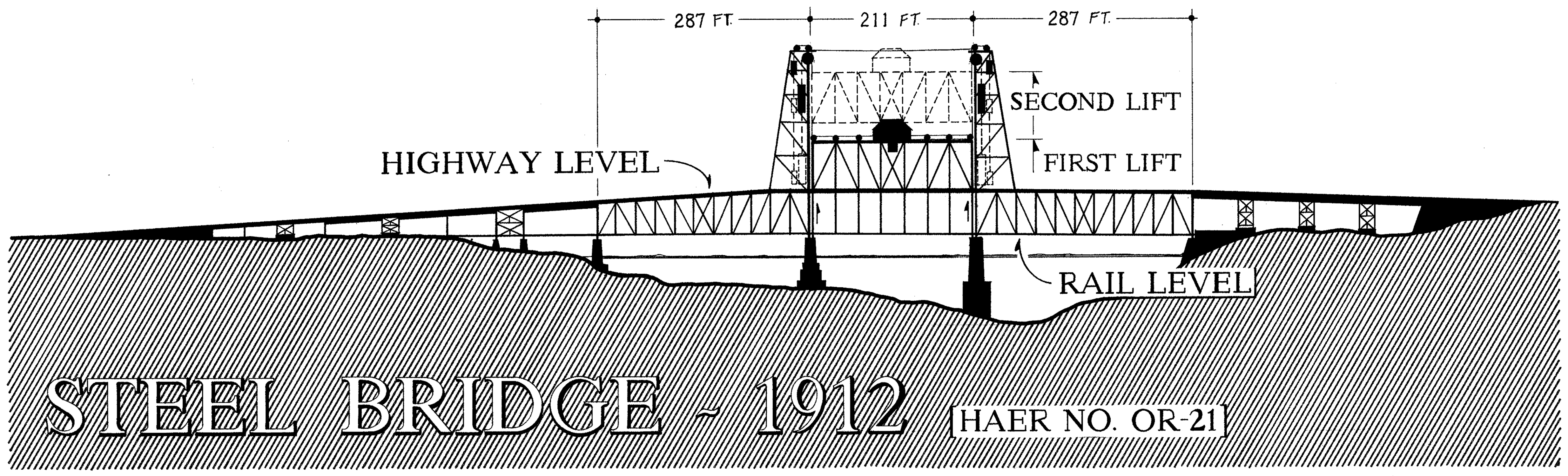
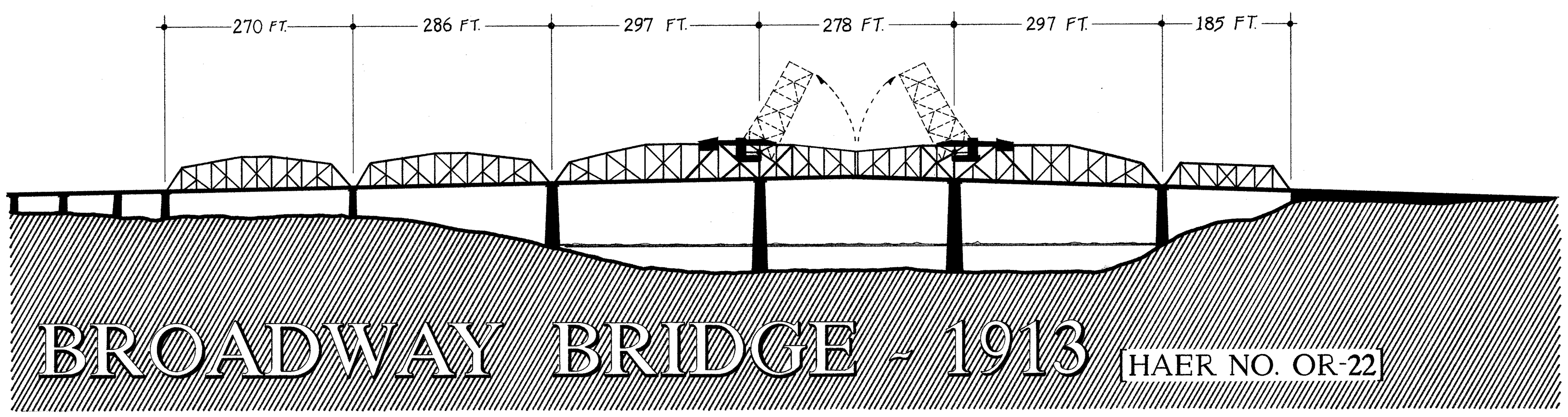
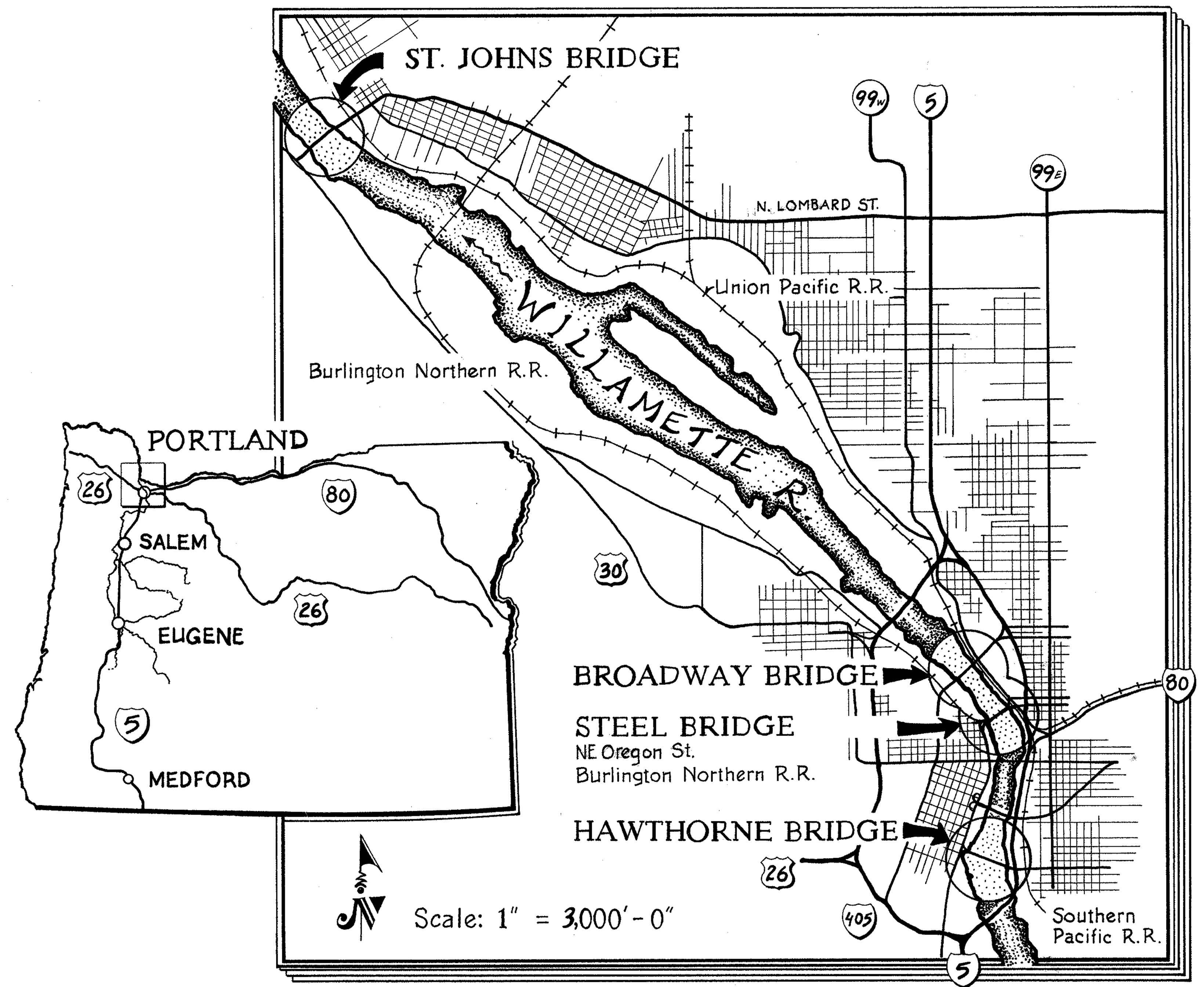
WILLAMETTE RIVER BRIDGES
PORTLAND, OREGON









Based on USGS Quadrangle map

The HAWTHORNE, STEEL AND BROADWAY BRIDGES represent examples of the main stream of American bridge-building of the period.

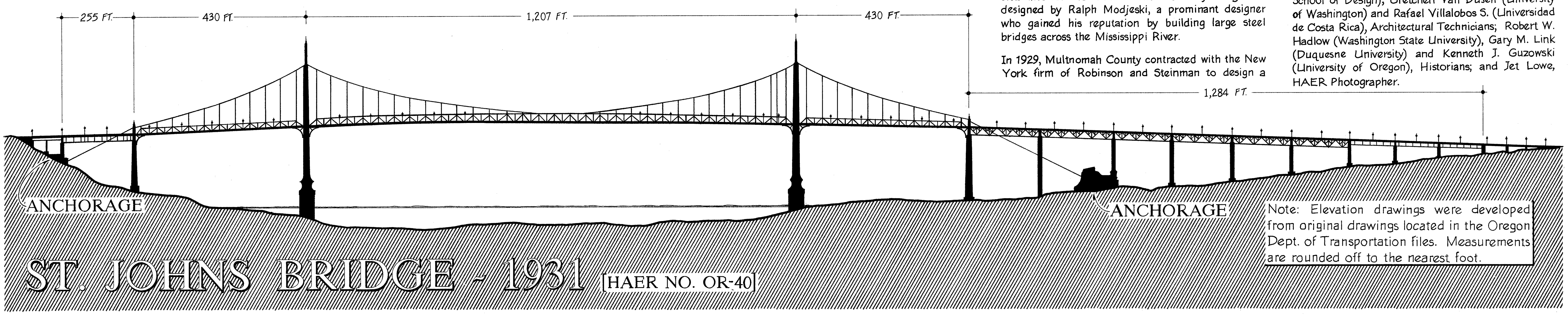
The HAWTHORNE BRIDGE, designed by the firm of Waddell and Harrington, Kansas City, Missouri, was constructed in 1910.

The STEEL BRIDGE is the only bridge in the United States with an independent double-deck design. The upper deck is paved for highway vehicles while the lower deck is used for railroad traffic. The lower deck may be raised independently of the upper deck to enable small river vessels to pass. The steel hangers suspending the lower deck are pulled up through the columns of the upper deck in a process called "telescoping." Both decks may be raised simulataneously to enable tall ships to navigate the river.

The moveable portion of the BROADWAY BRIDGE is balanced on large rollers called "Rall Wheels" which roll backward as it swings upward, providing greater clearance for river traffic. The Broadway Bridge was designed by Ralph Modjeski, a prominant designer who gained his reputation by building large steel bridges across the Mississippi River.

In 1929, Multnomah County contracted with the New York firm of Robinson and Steinman to design a suspension bridge to connect the Linnton and St. Johns districts of the city. When completed in 1931, the ST. JOHNS BRIDGE was the highest and longest span in the world.

This recording project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. The Oregon Historic Bridges Recording Project was co-sponsored in 1990 by the Historic American Engineering Record and the Oregon Department of Transportation (O.D.O.T.). The Oregon State Historic Preservation Office and the Federal Highway Administration encouraged the project. Fieldwork, measured drawings, historical reports and photographs were prepared under the general direction of Dr. Robert J. Kapsch, Chief, HABS/HAER; Eric N. DeLony, Chief, HAER; and Dean Herrin, HAER Staff Historian.
The Recording Team consisted of Richard L. Koochagian (University of Tennessee), Architect and field Supervisor; Todd A. Croteau (Rhode Island School of Design), Gretchen Van Dusen (University of Washington) and Rafael Villalobos S. (Universidad de Costa Rica), Architectural Technicians; Robert W. Hadlow (Washington State University), Gary M. Link (Duquesne University) and Kenneth J. Guzowski (University of Oregon), Historians; and Jet Lowe, HAER Photographer.



Note: Elevation drawings were developed from original drawings located in the Oregon Dept. of Transportation files. Measurements are rounded off to the nearest foot.

Scale: 1" = 100'-0" (0 50 100 200 300)

HISTORIC AMERICAN ENGINEERING RECORD OR-55

SHEET 1 OF 1

OREGON

WILLAMETTE RIVER BRIDGES
MULTNOMAH COUNTY

PORTLAND

DRAWN BY: TODD A. CROTEAU, RICHARD L. KOOCHAGIAN, GRETCHEN VAN DUSEN, RAFAEL VILLALOBOS S., 1990

OREGON BRIDGES RECORDING PROJECT
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

WILLAMETTE RIVER BRIDGES

Portland, Oregon

This image shows the city loop formed by the Interstate 5 and 405 freeways. The Fremont Bridge which will complete the loop is under construction (far right.) Courtesy of Oregon Department of Transportation, 1972.

Portland's ten Willamette River vehicular bridges began as solutions to the problem of linking the city's residential east side with its west side business center. They also reflected the powerful economic influences of real estate developers, street railway companies, and railroads. By the 1920s, common use of the auto motivated the building of new bridges to handle more traffic and serve outlying areas such as Sellwood and St. Johns. After World War II, older bridges received new approaches and ramps to further speed commuter traffic and link it to the new state highways. Starting in the 1960s, new spans in the emerging freeway system helped maintain the flow of through traffic and reduce downtown congestion. Leading American civil engineers such as J.A.L. Waddell, John Lyle Harrington, Ralph Modjeski, Ira Hedrick, Gustav Lindenthal, and David Steinman, found that work designing Portland's big bridges challenged them to develop innovative solutions, some later applied nationally.

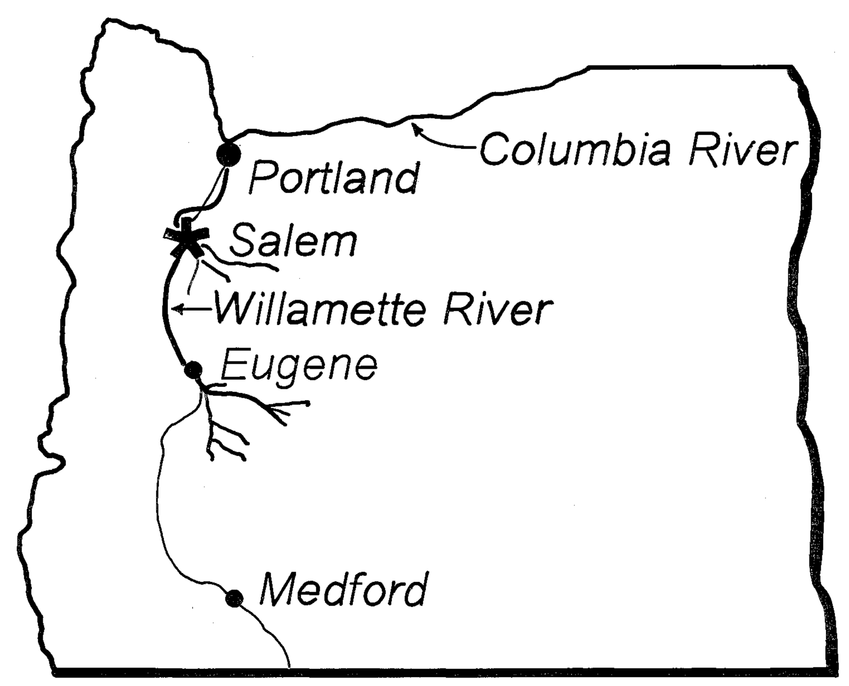
Five Portland bridges accommodate river traffic either by lifting vertically or by having two leaves that swing upward to separate. The 1910 Hawthorne and the 1912 Steel are two of the nation's earliest vertical lift spans. Waddell & Harrington, the firm that created this technology, developed many of its essential features in Portland. The Steel Bridge has a railroad deck that lifts by telescoping into the upper deck, permitting the passage of small vessels, and an upper deck that also lifts to make way for large ships, a combination found nowhere else in the country. The largest of its type ever built, the 1913 Broadway Bridge opens using a rare Rall bascule mechanism that allows its two leaves to both lift and roll back.

Early movable spans had wooden decks, but by the 1920s engineers sought to reduce deck repair costs and make auto crossing safer. The 1926 Burnside Bridge pioneered the use of reinforced concrete on its bascule deck, an innovation that required powerful machinery to move its 10 million pounds of concrete and steel. By contrast, the 1958 Morrison was built with a steel grate bascule deck, a technology first used locally to replace the Hawthorne deck in 1945.

Although engineers had earlier proposed building high bridges, the 1925 Sellwood and the 1926 Ross Island were the first to span the river high enough to allow river traffic to pass. The Sellwood employs a rare four-span continuous truss to do so, while the Ross Island embodies Gustav Lindenthal's wide-ranging creativity as he tailored a cantilever span to fit within serious topographic and financial constraints. The tight budget was one legacy of local 1920s bridge contract scandals that Lindenthal also helped resolve. In 1931, the much better financed St. Johns created a high crossing by using suspension technology. A common solution nationally, but one rare in Oregon.

In contrast to the St. Johns, whose Gothic arches have earned it acclaim for its beauty, the 1966 Marquam evoked formal protest from the Portland Arts Commission. Engineers saw, instead, an economical truss design carrying a double-deck expressway more than 1,000 feet across the river. Engineers for the 1973 Fremont also displayed technological sophistication, including extensive computer use, but the Marquam experience prompted vocal public participation in the Fremont's design. The elegant three-span tied arch that resulted is both the world's longest and an unusual American case of a type more common in Europe.

Portland's bridges also required innovative construction methods. Despite its novel weight-saving orthotropic deck and use of the latest high-strength steel, the Fremont's 6,000 ton center span challenged the relatively new erection techniques that had never previously lifted such weight. More than sixty years earlier, the 9 million pound total weight of the Steel Bridge's liftspan and counterweights, by far the heaviest yet, posed a comparable challenge. The local contractor built an elaborate wooden falsework between the bridge's fixed spans, erecting the lift decks and pouring the concrete main counterweights in place.



State Map of Oregon

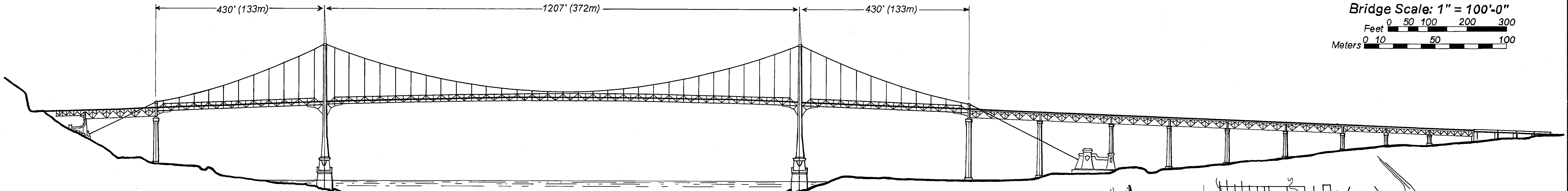
Cut Line

Cut Line

Cut Line

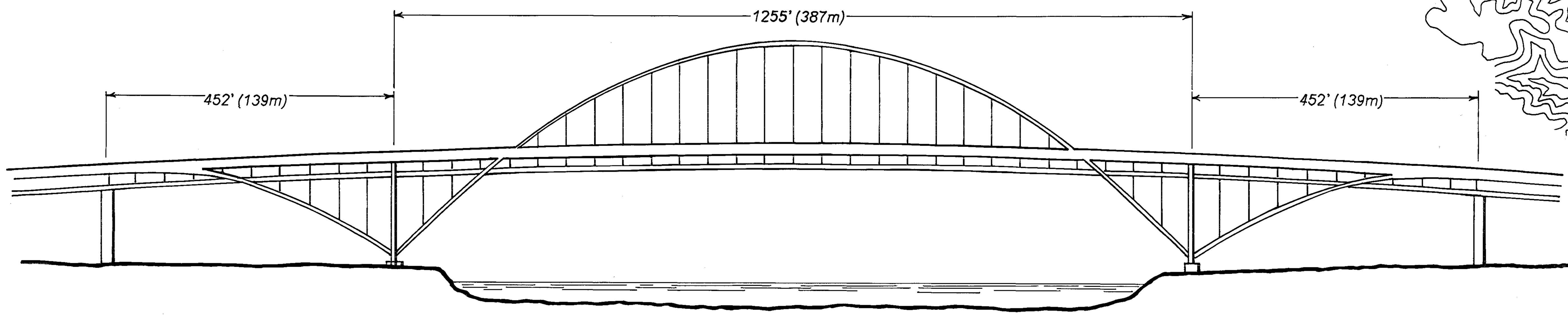
DRAWN BY SHANNON M. SARDELL, JULIA C. STUBBLEFIELD, 1999
WILLAMETTE RIVER BRIDGES RECORDING PROJECT
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR
PORTLAND
WILLAMETTE RIVER BRIDGES - 1910 TO 1973
SPANNING THE WILLAMETTE RIVER
MULTNOMAH COUNTY
OREGON
SHEET 1 OF 3 SHEETS
HISTORIC AMERICAN ENGINEERING RECORD
OR-55
LIBRARY OF CONGRESS INDEX NUMBER

Bridge Scale: 1" = 100'-0"
Feet 0 50 100 200 300
Meters 0 10 50 100



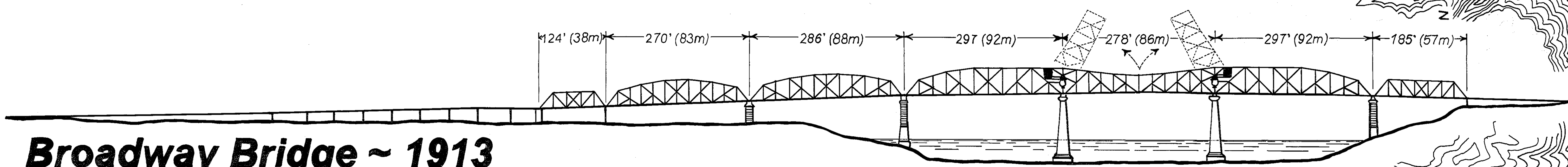
St. Johns Bridge ~ 1931

Designer / Engineer — *Holton D. Robinson and Dr. David B. Steinman (New York, NY)*
HAER Number — *OR-40*
UTM — *10.518490.5047780*



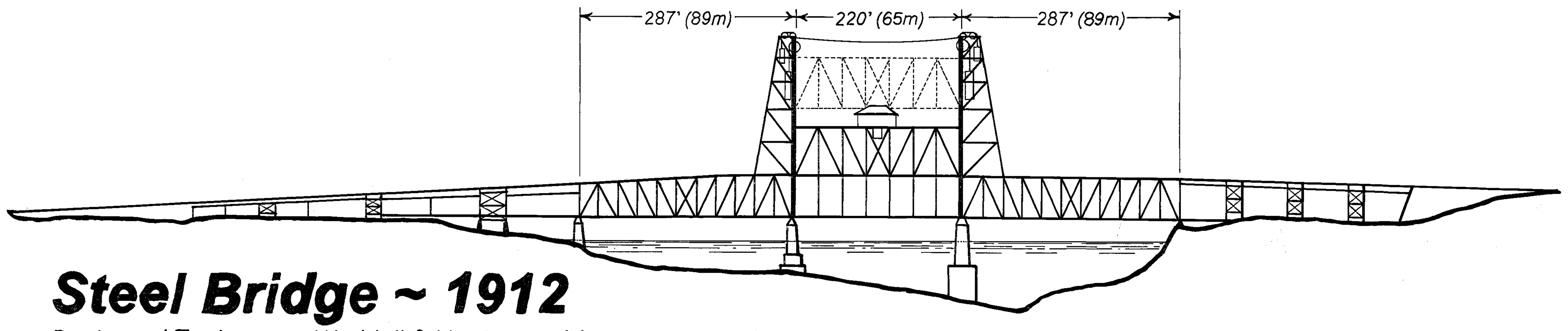
Fremont Bridge ~ 1973

Designer / Engineer — *Parsons, Brinkerhoff, Quade, and Douglas (New York, NY)*
HAER Number — *OR-104*
UTM — *10.524860.50402610*



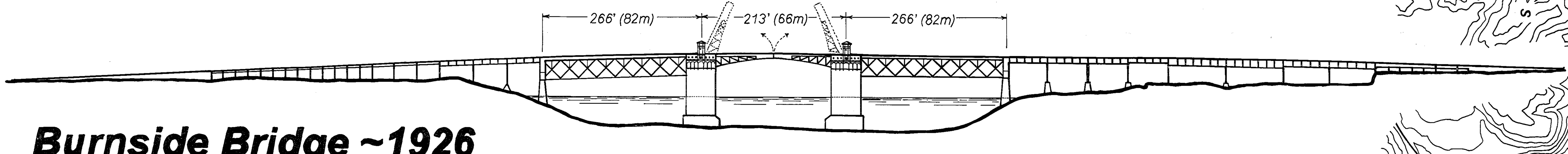
Broadway Bridge ~ 1913

Designer / Engineer — *Ralph Modjeski and Strobel Engineering (Chicago, IL)*
HAER Number — *OR-22*
UTM — *10.525550.5041900*



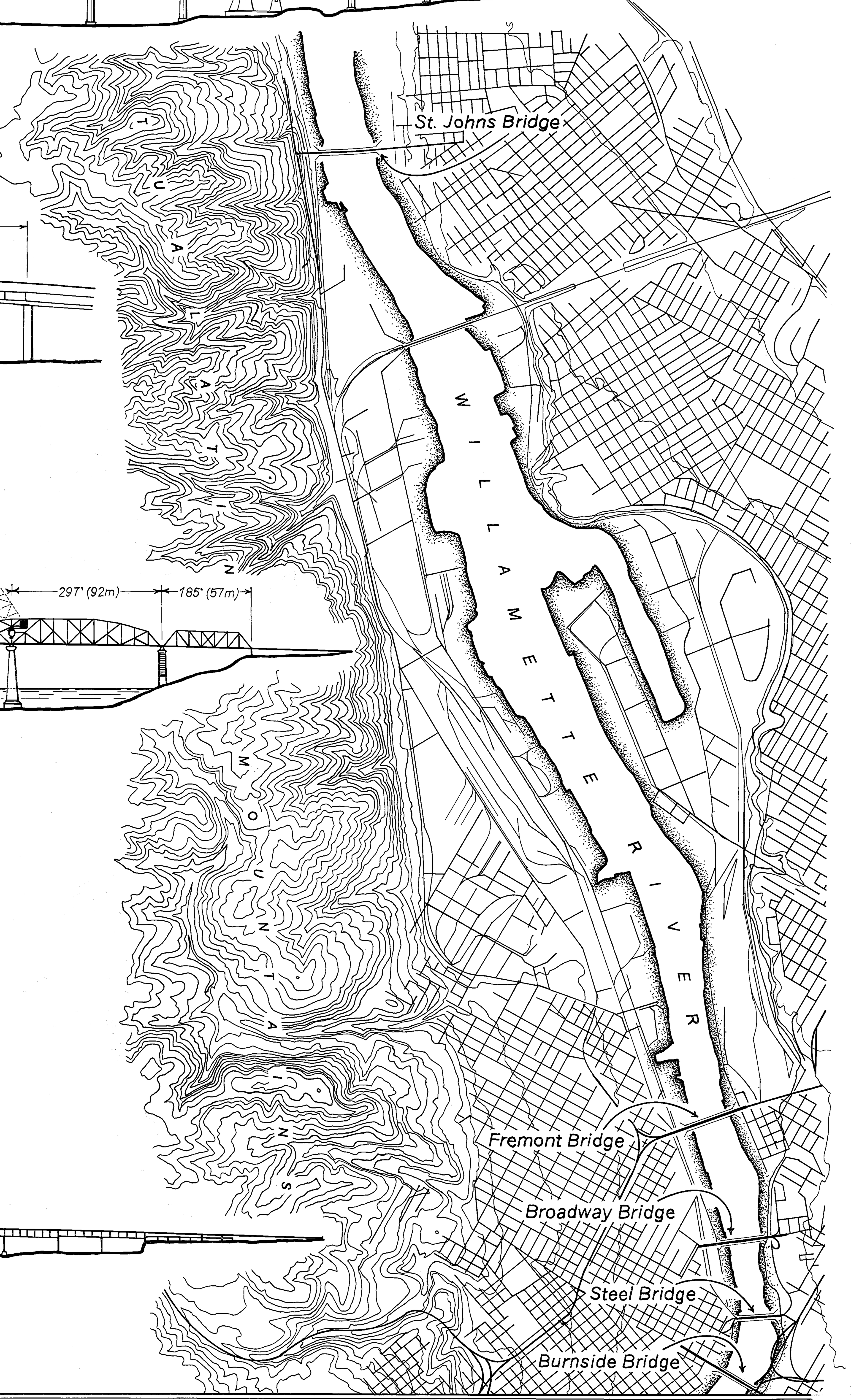
Steel Bridge ~ 1912

Designer / Engineer — *Waddell & Harrington (Kansas City, MO)*
HAER Number — *OR-21*
UTM — *10.525930.5041420*



Burnside Bridge ~1926

Designer / Engineer — *Ira G. Hedrick (Kansas City, MO), Gustav Lindenthal (New York, NY), Joseph B. Strauss Co. (Chicago, IL)*
HAER Number — *OR-101*
UTM — *10.526080.5040915*



HISTORIC AMERICAN ENGINEERING RECORD
OR - 55

SHEET 2 OF 3 SHEETS

OREGON

WILLAMETTE RIVER BRIDGES - 1910 TO 1973
SPANNING THE WILLAMETTE RIVER
MULTNOMAH COUNTY

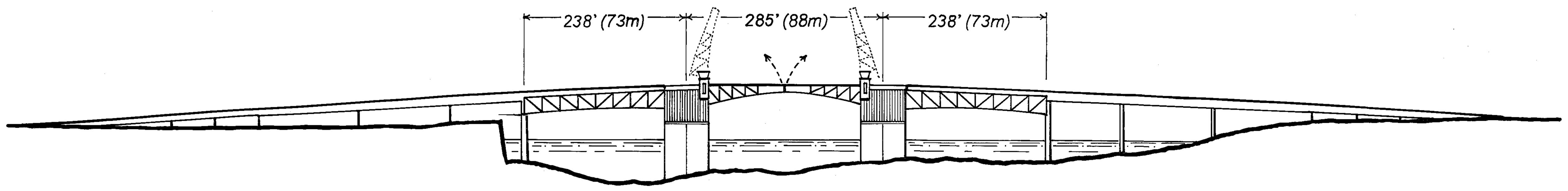
PORTLAND

DRAWN BY: SHANNON M. SARDELL, 1999

WILLAMETTE RIVER BRIDGES RECORDING PROJECT
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

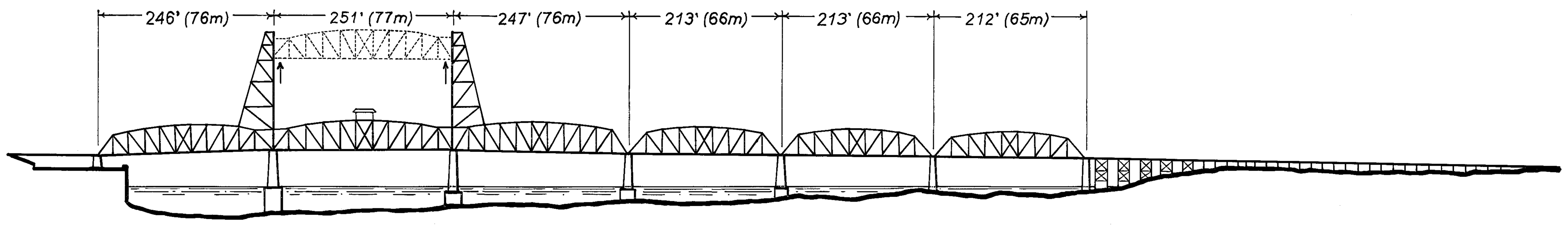
TRIM LINE

Cut Line Cut Line Cut Line



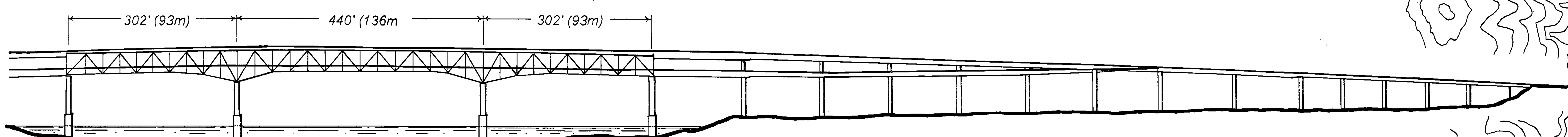
Morrison Bridge ~ 1958

Designer / Engineer Moffatt, Nichol, and Taylor (Portland, OR) and Sverdrup & Parcel, Inc. (St. Louis, MO)
HAER Number OR-100
UTM 10.525940.5040330



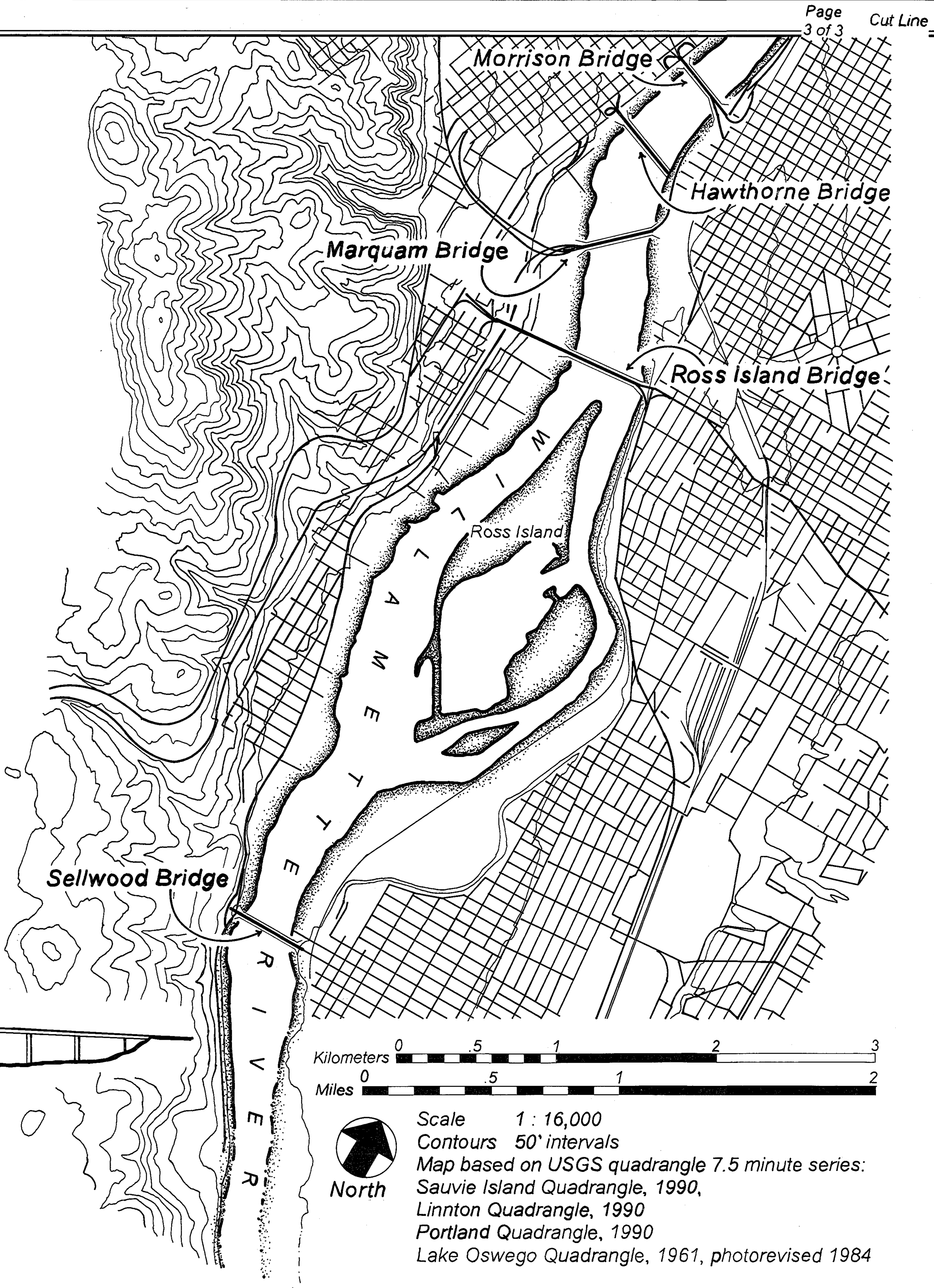
Hawthorne Bridge ~ 1910

Designer / Engineer Waddell & Harrington (Kansas City, MO)
HAER Number OR-20
UTM 10.525835.5039810

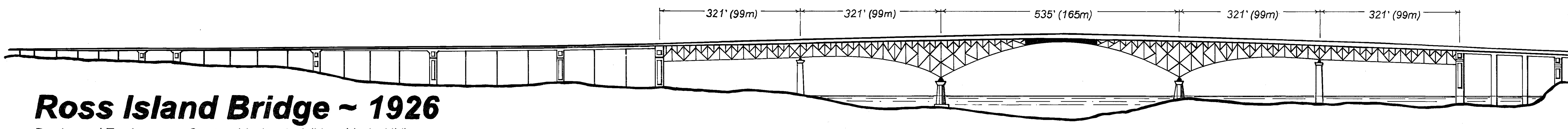


Marquam Bridge ~ 1966

Designer / Engineer Oregon State Highway Department
HAER Number OR-106
UTM 10.525960.5039240

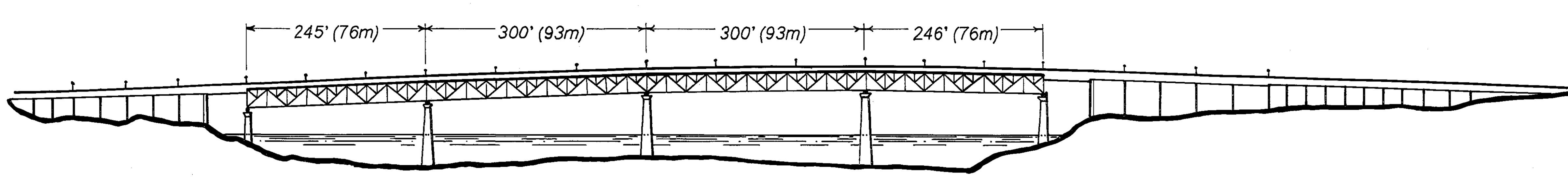


Scale 1 : 16,000
Contours 50' intervals
Map based on USGS quadrangle 7.5 minute series:
Sauvie Island Quadrangle, 1990,
Linnton Quadrangle, 1990
Portland Quadrangle, 1990
Lake Oswego Quadrangle, 1961, photorevised 1984



Ross Island Bridge ~ 1926

Designer / Engineer Gustav Lindenthal (New York, NY)
HAER Number OR-102
UTM 10.526290.5038480



Sellwood Bridge ~ 1925

Designer / Engineer Gustav Lindenthal (New York, NY)
HAER Number OR-103
UTM 10.526220.5034380

Bridge Scale: 1" = 100'-0"
Feet 0 50 100 200 300
Meters 0 10 50 100

Note: Bridge drawings show south or southeast elevations. Dimensions have been rounded to the nearest foot or meter.

This recording project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering, industrial, and maritime works in the United States. The National Park Service, U.S. Department of the Interior, administers the HAER program. The Willamette River Bridges Recording Project was co-sponsored during the summer of 1999 by HAER under the general direction of E. Blaine Cliver, Chief of HABS/HAER, and by the Oregon Department of Transportation (ODOT) Region 1, Kay Van Sickel, manager, and Robert W. Hadlow, Ph.D., historian.

The field work, measured drawings, historical reports, and photographs were prepared under the general direction of project leader Eric DeLony, Chief of HAER, Richard O'Connor, Ph.D., HAER historian, and by Christine Theodoropoulos, AIA, PE (University of Oregon), architectural supervisor, and Joseph Boquiren, RA, of Portland, OR, architectural foreman. The Willamette River Bridges Recording Project team consisted of historians Judith McGaw, Ph.D., Sharon Wood Wortman, M.Ed., and Linda Dodds, M.A., all of Portland, OR, and architects Eric Kenyon (Southern California Institute of Architecture), Manuel Hernández (US/ICOMOS-Unidad Ejecutora Catedral de La Plata, Argentina), Shannon Sardell (University of Oregon) and Nicholas A. Zydycryn (University of Oregon). James B. Norman (ODOT) did large format photography.

DRAWN BY: SHANNON M. SARDELL, 1999
WILLAMETTE RIVER BRIDGES RECORDING PROJECT
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

WILLAMETTE RIVER BRIDGES - 1910 TO 1973
SPANNING THE WILLAMETTE RIVER
MULTNOMAH COUNTY

PORTLAND

OREGON

SHEET 3 OF 3 SHEETS

HISTORIC AMERICAN ENGINEERING RECORD
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TRIM LINE