Port Mann/Highway 1 Improvement Project Kiewit/Flatiron Design Build

July 29, 2010

Presentation Prepared by J. Mahoney

The Project

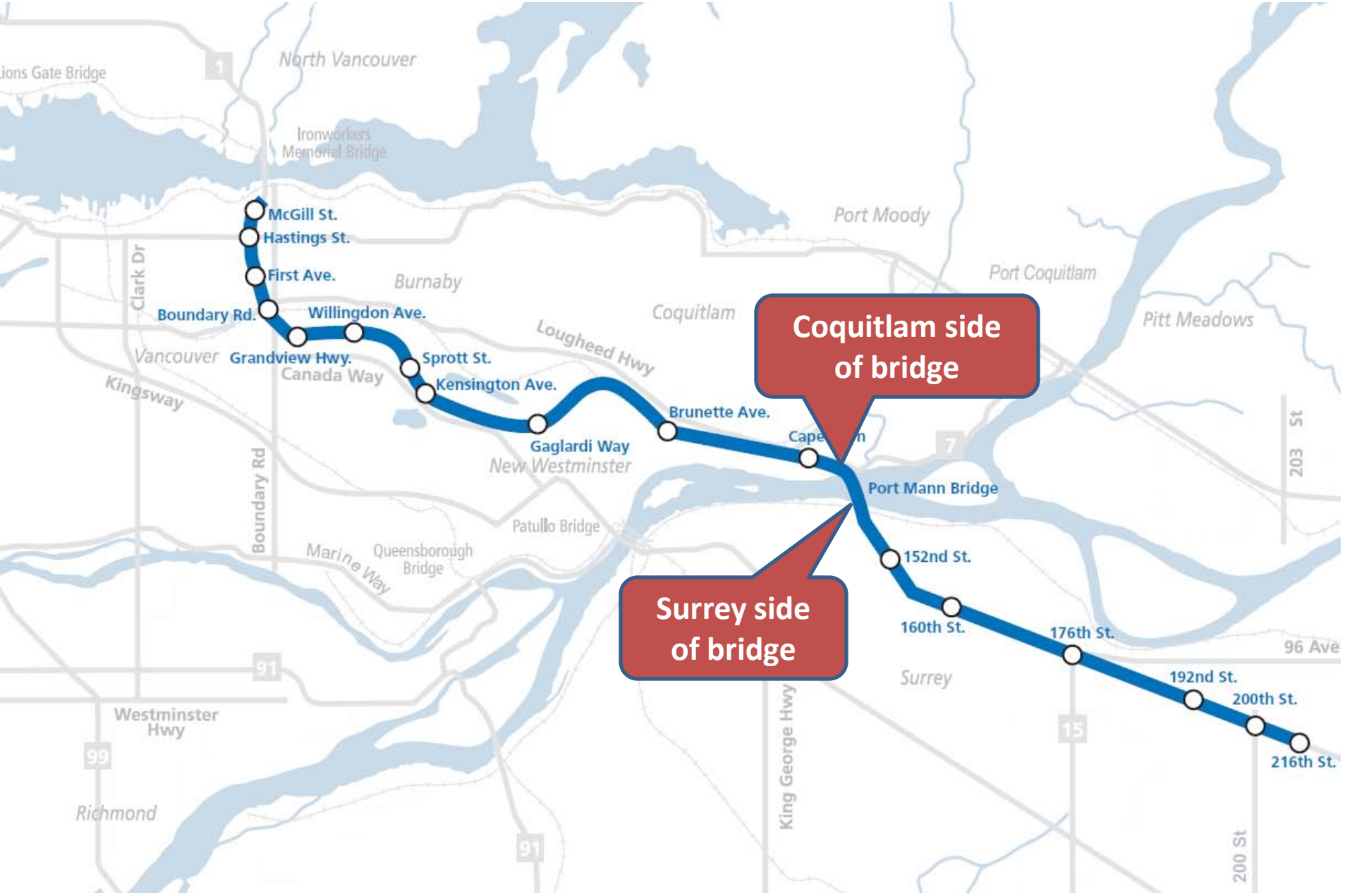
- Total project cost $2.5 billion (Canadian)
- Financed by tolls – about $3 each direction.
- Total project length 37 km (McGill St in Vancouver to 216th in Langley)
- The new Port Mann bridge
  - 10 lanes (existing bridge has 5 lanes).
  - Replaces the existing 45 year old bridge.
  - Includes Rapid Bus service from Langley to Burnaby SkyTrain.
  - Can accommodate installation of light rapid transit underneath the main deck at a future date.

Source: “Port Mann Bridge Plans Unveiled Today,” CBC News, February 4, 2009.

Project Information

- Project website
  - http://www.pmh1project.com/
- **Port Mann/Highway 1 Improvement Project—PP shows status as of Summer 2010**
- Project construction started August 2008.
- Port Mann Bridge to be operational by December 2012.
- All of project complete by December 2013.


North Vancouver
Approximate project limits
Coquitlam
Vancouver
Burnaby
Port Mann
YVR
Richmond
Surrey
Langley
All satellite images in PP from Google Maps


North Vancouver
Ironworkers Memorial Bridge
Port Moody
Port Coquitlam
Pitt Meadows
Burnaby
Coquitlam
Vancouver
Kingsway
Canada Way
Lougheed Hwy
New Westminster
Patullo Bridge
Queensborough Bridge
Marine Way
Boundary Rd
Clark Dr
Westminster Hwy
Richmond
King George Hwy
Surrey
96 Ave
200 St
203 St
McGill St.
Hastings St.
First Ave.
Boundary Rd.
Willingdon Ave.
Grandview Hwy.
Sprott St.
Kensington Ave.
Gaglardi Way
Brunette Ave.
Port Mann Bridge
152nd St.
160th St.
176th St.
192nd St.
200th St.
216th St.
Coquitlam side of bridge
Surrey side of bridge

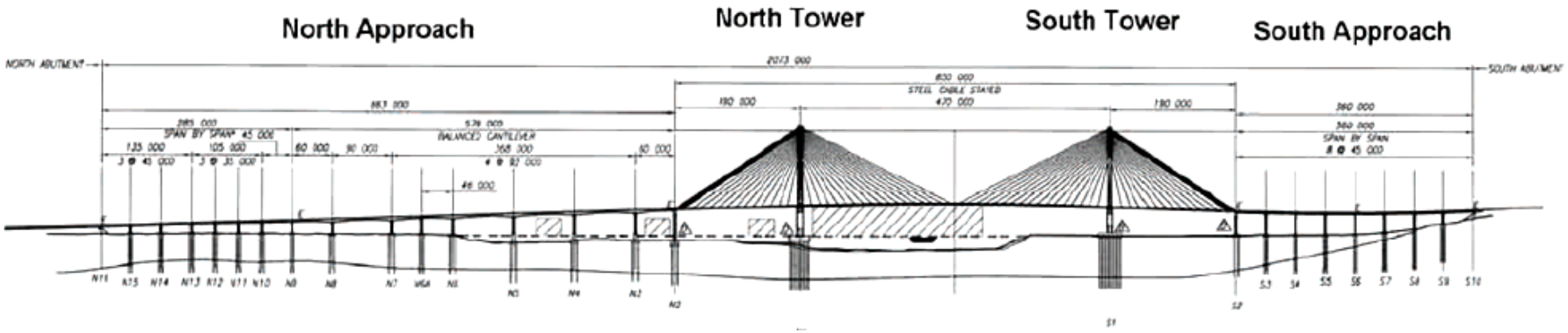
The New Port Mann Bridge

- Three major parts
  - Cable-stayed main bridge across Fraser River.
    - Main span 470 m.
    - South span 190 m.
    - North span 190 m.
  - South approach
    - 350 m constructed using 327 precast sections with HMA road surface.
  - North approach
    - 820 m constructed using 831 precast sections also with an asphalt surface.

Source: PMH1 newsletter—Summer 2010

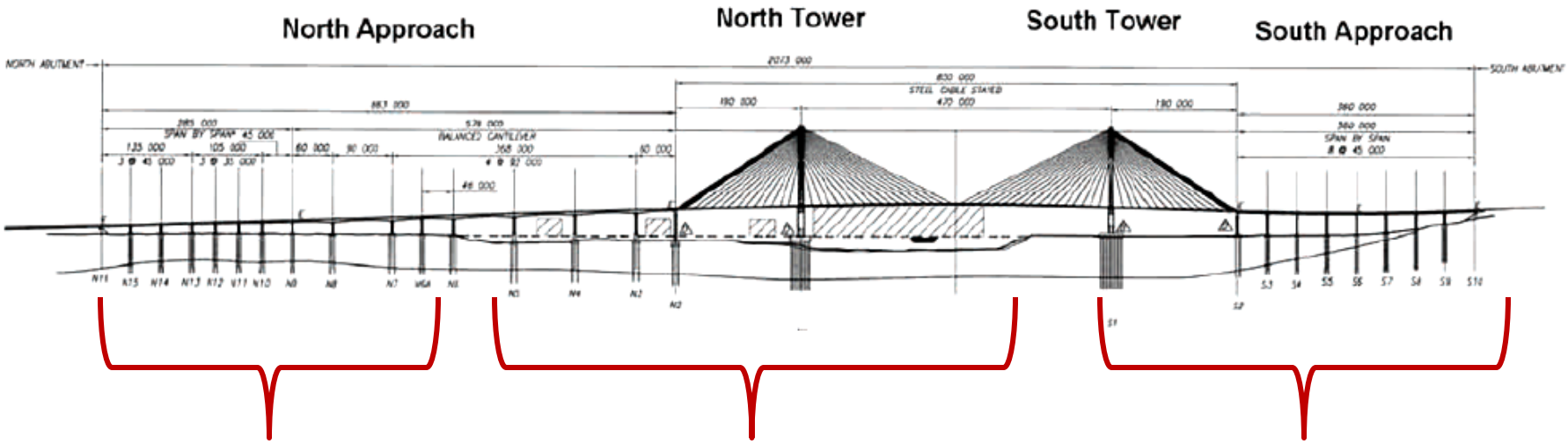
The New Bridge

- Designer: T.Y. Lin International
- Materials
  - New bridge deck requires 25,000 tonnes of HMA
  - 28,000 tonnes of rebar
  - 13,000 tonnes of structural steel



Source: PMH1 newsletter—Summer 2010

The New Bridge



78 drilled shafts 2.5 m in diameter with average depth = 53 m.

129 driven piles 1.8 m in diameter with average depth = 67 m.

30 drilled shafts 2.5 m in diameter with average depth = 31 m and 122 driven piles 1.8 m diameter with average depth = 44 m.

Sources: (1) PMH1 newsletter—Summer 2010, (2) PowerPoint for Professor's Tour, 2010-07-29, Kiewit Flatiron presented by Scott Hanson, Marine Foundation Manager.

S1 Pylon Construction

October 22, 2009

October 26, 2009

Images from: http://www.earthcam.com/clients/britishcolumbia/portmann/?cam=pm_east

S1 Pylon Construction

November 1, 2009

December 1, 2009

Images from: http://www.earthcam.com/clients/britishcolumbia/portmann/?cam=pm_east

S1 Pylon Construction

December 3, 2009

December 18, 2009

Images from: http://www.earthcam.com/clients/britishcolumbia/portmann/?cam=pm_east

S1 Pylon Construction

December 21, 2009

January 20, 2010

Images from: http://www.earthcam.com/clients/britishcolumbia/portmann/?cam=pm_east

South Abutment pile driving and pier construction

November 20, 2010

February 26, 2010

Images from: http://www.earthcam.com/clients/britishcolumbia/portmann/?cam=pm_east

South Abutment pier construction

March 26, 2010

April 26, 2010

Images from: http://www.earthcam.com/clients/britishcolumbia/portmann/?cam=pm_east

South Abutment pier construction

May 26, 2010

June 26, 2010

Images from: http://www.earthcam.com/clients/britishcolumbia/portmann/?cam=pm_east

South Abutment pier construction

July 26, 2010

Image from: http://www.earthcam.com/clients/britishcolumbia/portmann/?cam=pm_east

Existing Port Mann Bridge

- Steel tied arch bridge spanning the Fraser River
- Carries 127,000 vehicles per day (8% trucks) on 5 lanes
- Longest arch bridge in Canada
- Opened June 12, 1964 with construction starting in 1957
- Owner: British Columbia Ministry of Transportation

Photos taken July 30, 2010

Fraser River from existing Port Mann bridge (view to east)


South Approach


Precast segments used for approaches
First full span composed of 22 precast segments


S1
pylon
Most piers have 3
columns

Deal manufactured gantry crane

Places precast segments together as units, then post-tensioned followed by placement onto bridge bearings.


Epoxy is applied between precast segments
load test
June 8th 2010
13
14


13


9
11
12

Joint between two precast segments

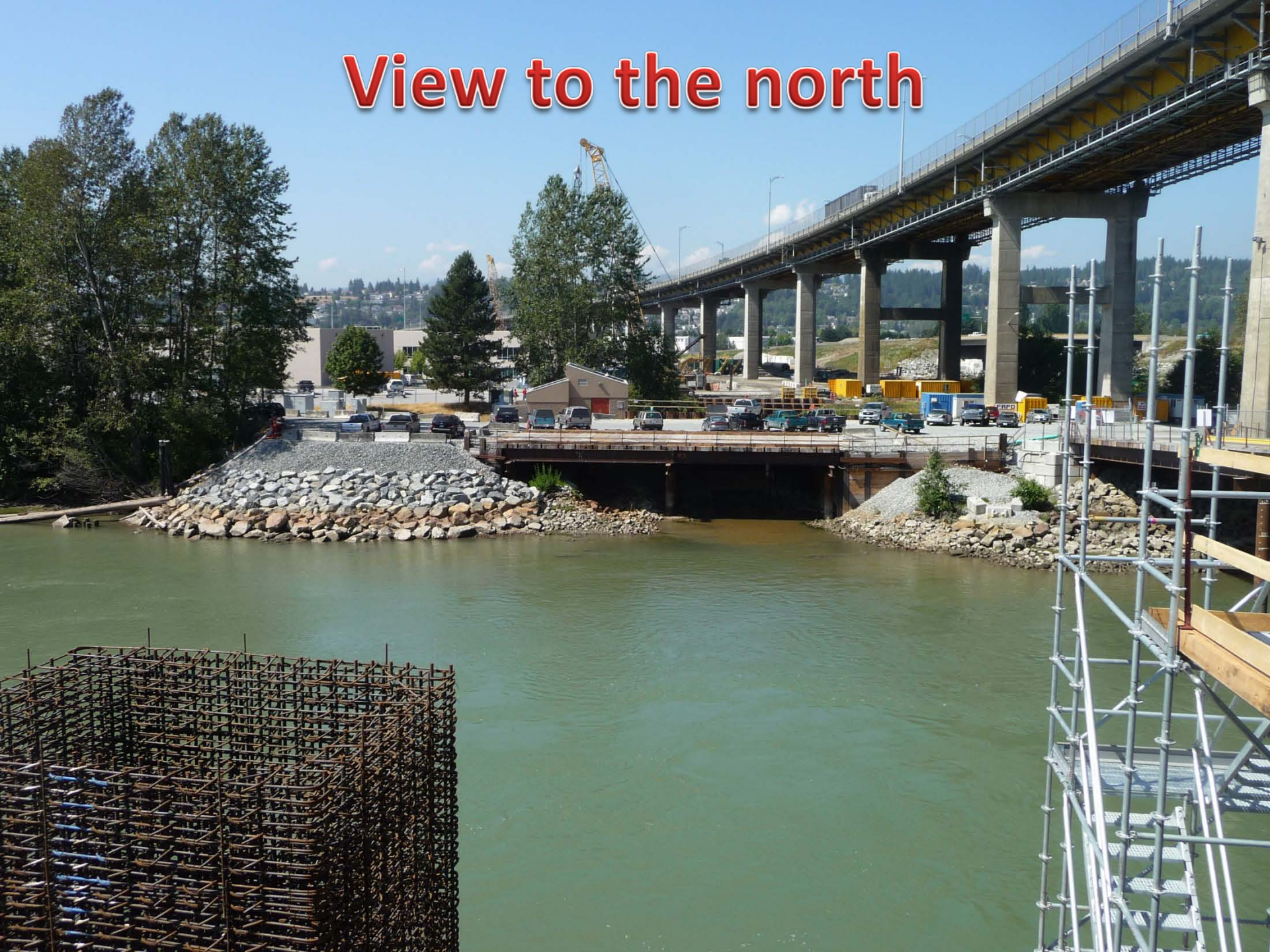
S1 pylon under construction—ultimate height 160 m (525 ft)


Kiewit
248

Formwork for column which is one of three for this pier.


South abutment

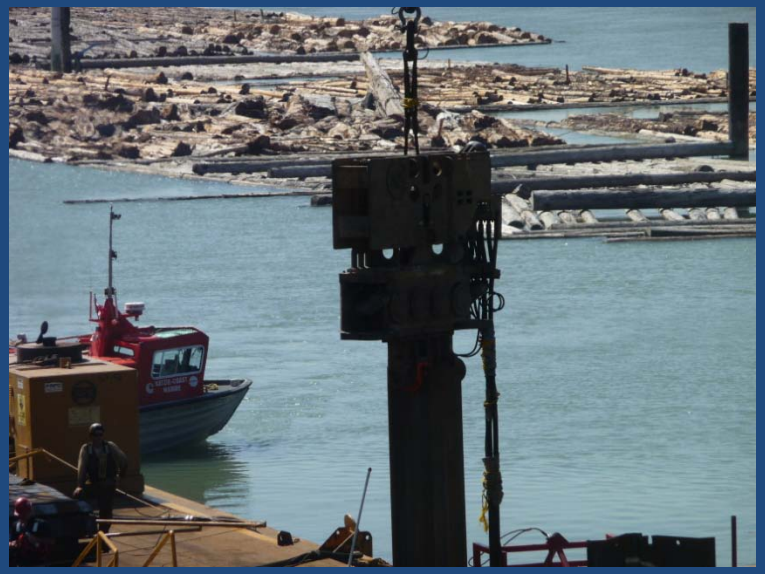

North approach construction


View to the north

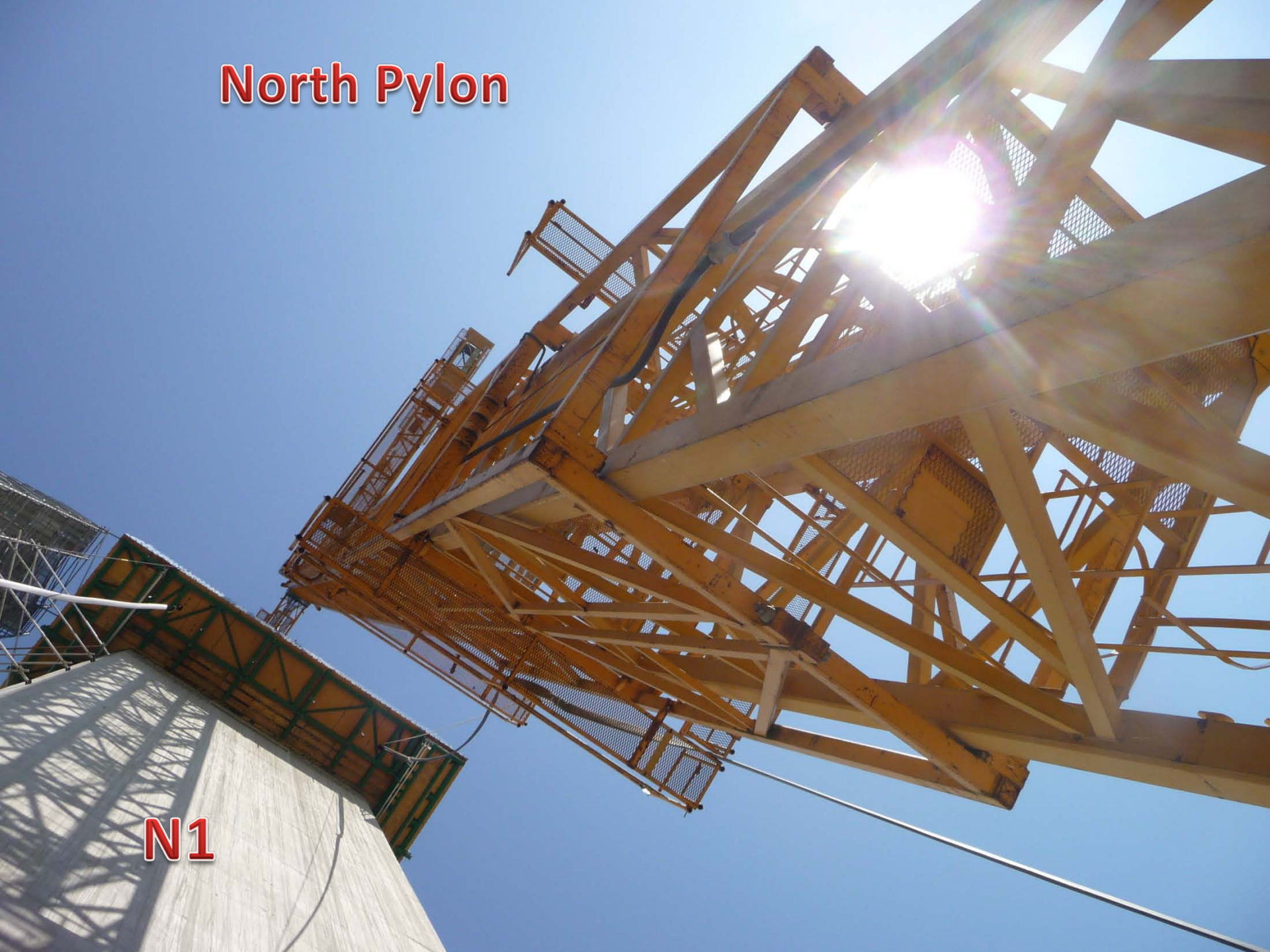

$10 million required to build temporary construction trestle which extends from north shore of Fraser River


Sheet piling removed following construction of pier footings

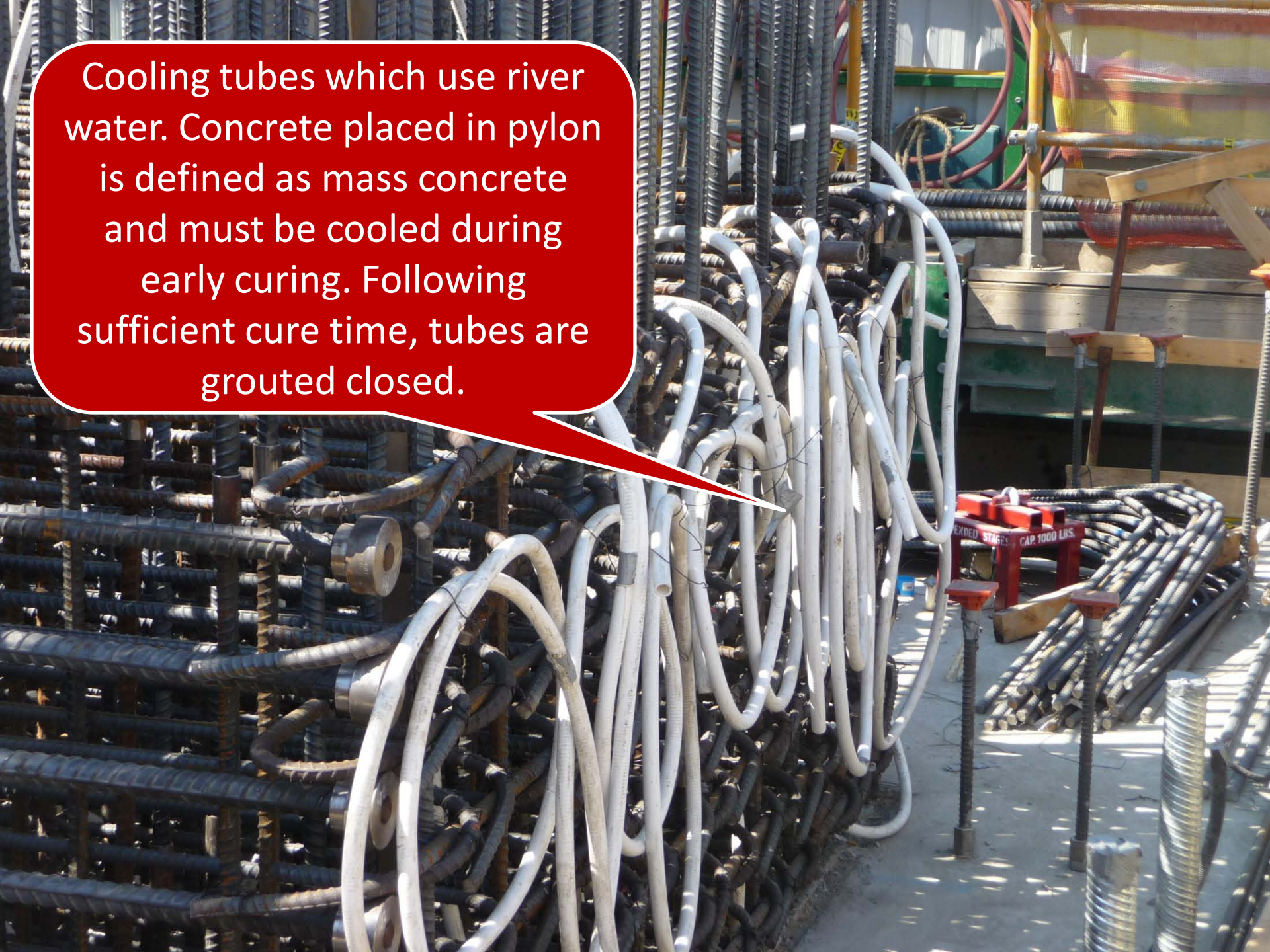
Installation of sheet pile cofferdam prior to dewatering. Temporary structure allows removal of water to construct new pier



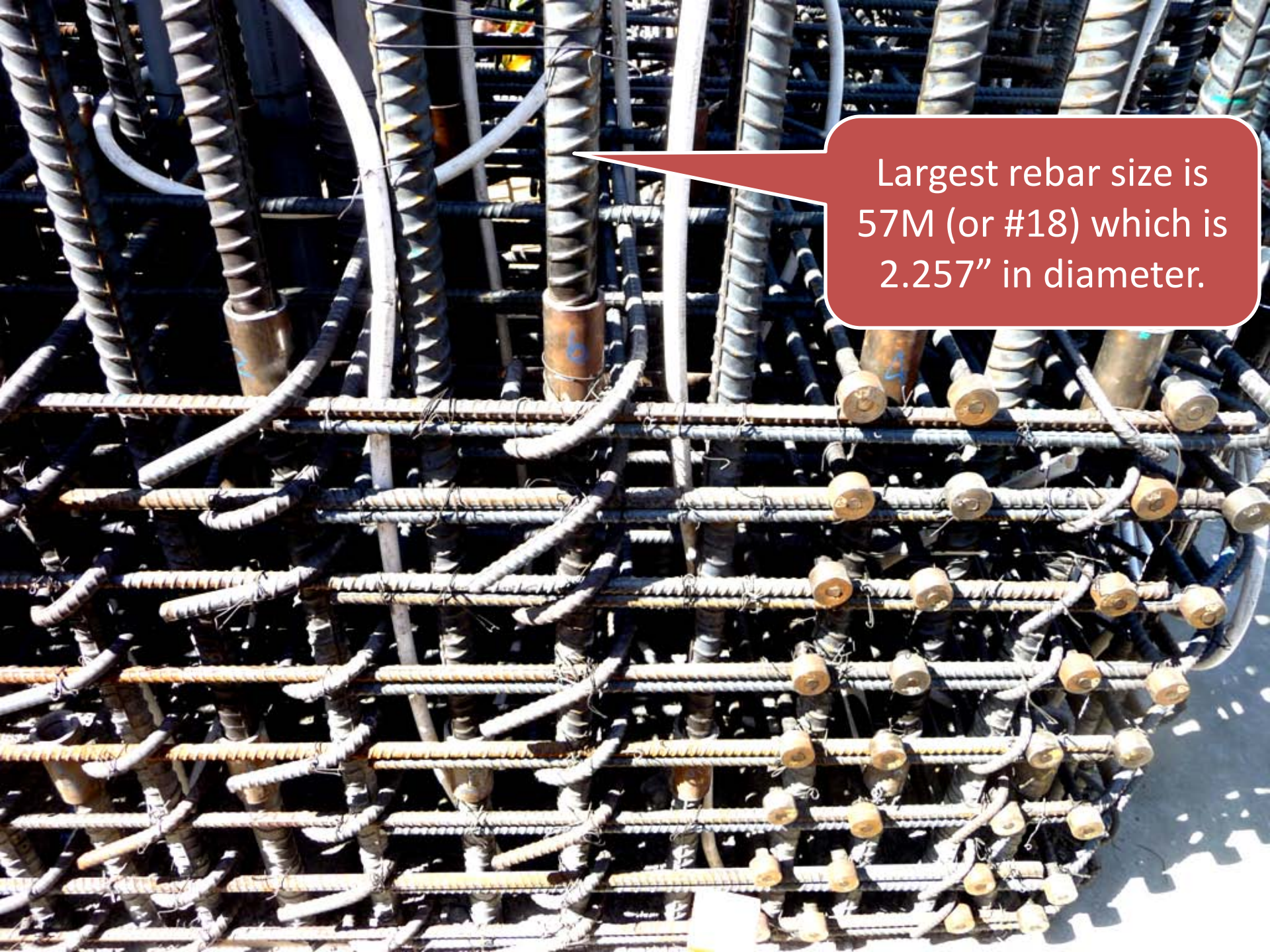

1600

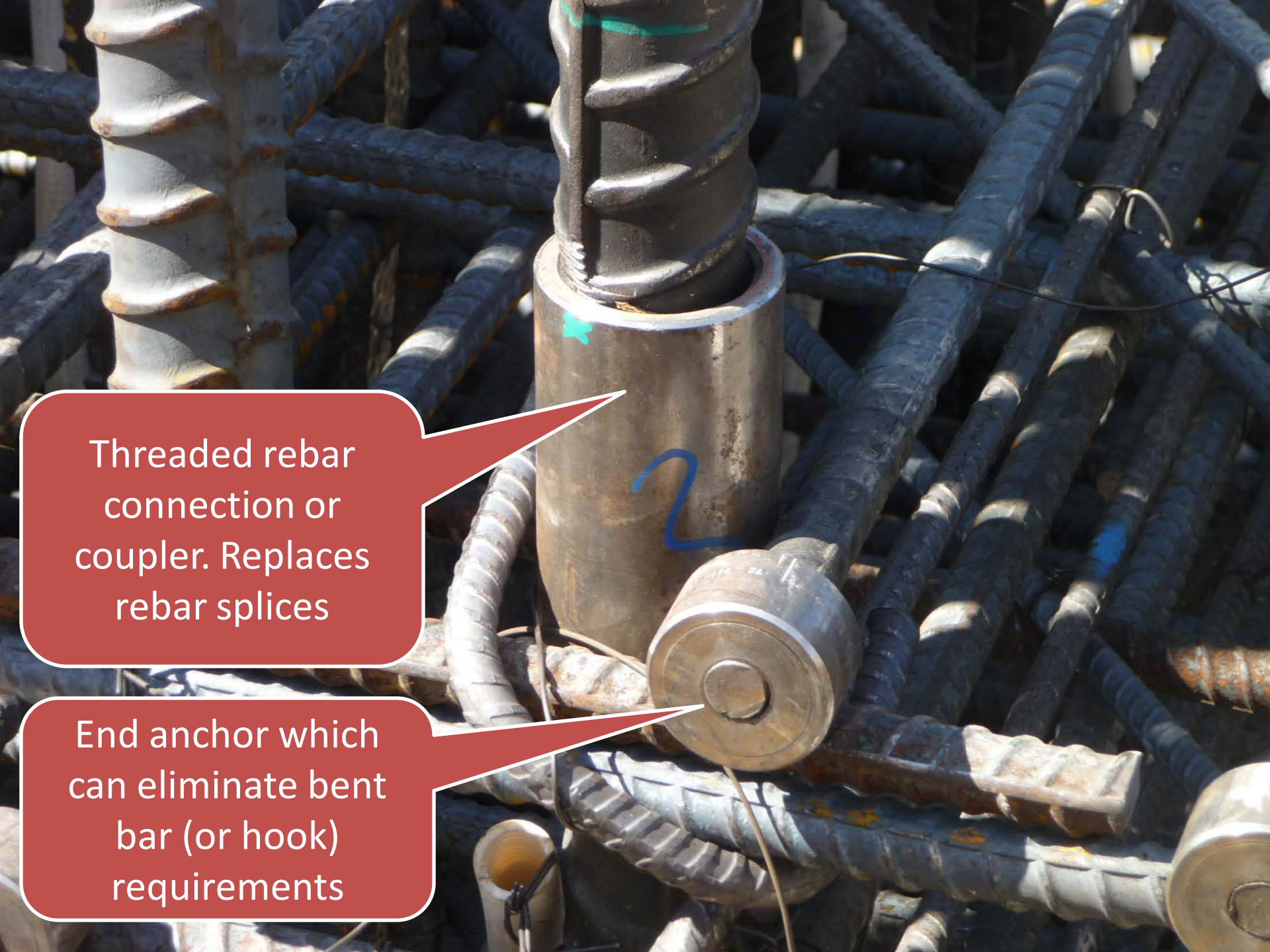

North Pylon
N1

Elevator has capacity for 30 persons


Cooling tubes which use river water. Concrete placed in pylon is defined as mass concrete and must be cooled during early curing. Following sufficient cure time, tubes are grouted closed.


Grounding cable for lightening strikes—one in each corner.


Largest rebar size is 57M (or #18) which is 2.257” in diameter.


Threaded rebar connection or coupler. Replaces rebar splices
End anchor which can eliminate bent bar (or hook) requirements


S 25 N F O

View upriver and the Port Mann bridge to be replaced

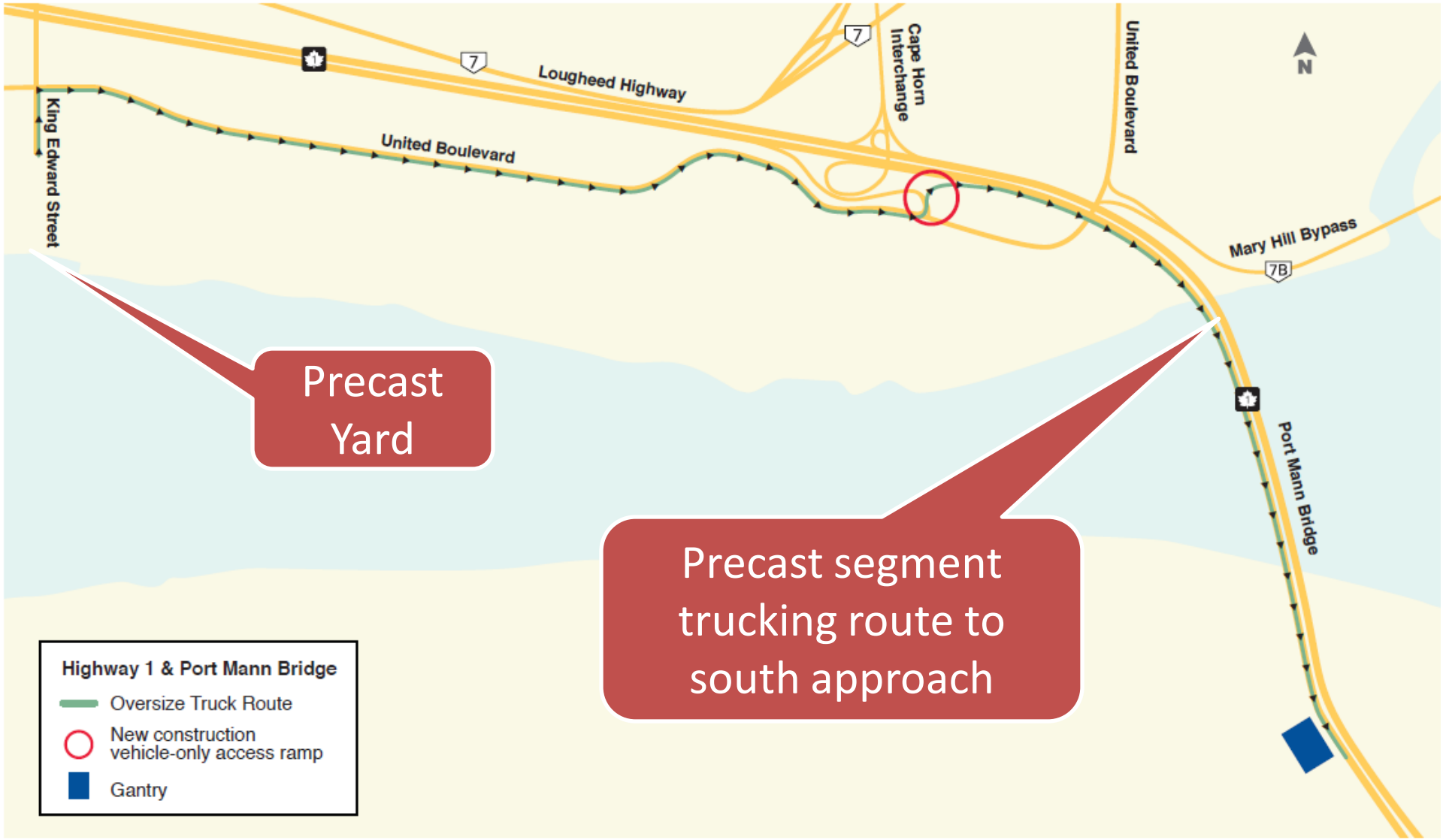
View downriver

Precast Yard


Precast
Yard site
New bridge
Fraser Mills
Trans-Canada Hwy
Lougheed Hwy
United Blvd
Dawes Hill Rd
Schoolhouse St
Mayfair
Mary Hill Bypass
Tree Island
Port Mann Bridge
King Rd
116 Ave
116a Ave
Port Mann
Surrey Rd
Bridgeview

Precast segments for approaches


Segments moved from precast yard to south approach via truck over the existing Port Mann bridge. Require use of two eastbound lanes.


Lougheed Highway
7
7
Cape Horn Interchange
United Boulevard
United Boulevard
King Edward Street
N
Mary Hill Bypass
7B
Port Mann Bridge
Precast Yard
Precast segment trucking route to south approach
Highway 1 & Port Mann Bridge
Oversize Truck Route
New construction vehicle-only access ramp
Gantry


Grouting tubes


DEAL

Precast Plant


YOU ARE RESPONSIBLE
FOR SAFETY


DO NOT ENTER
SILICA DUST
Segment ready for storage

The End