



Steelton Hill Double Track

Superior subdivision capacity upgrade project
2015-11-10



Superior Subdivision
Integral part of the CN core route
between Winnipeg and Chicago
from Hoover (WI) at M. 247.00
to Carson (MN) at M. 479.90



Duluth, Minnesota
About halfway on the CN
core route between
Winnipeg and Chicago



Steelton Hill in Duluth, MN

Located on the Superior sub
between
North Steelton at M. 467.50 and
Nopeming Jct at M. 472.20

Nopeming Jct
M. 472.20

North Steelton
M. 467.50

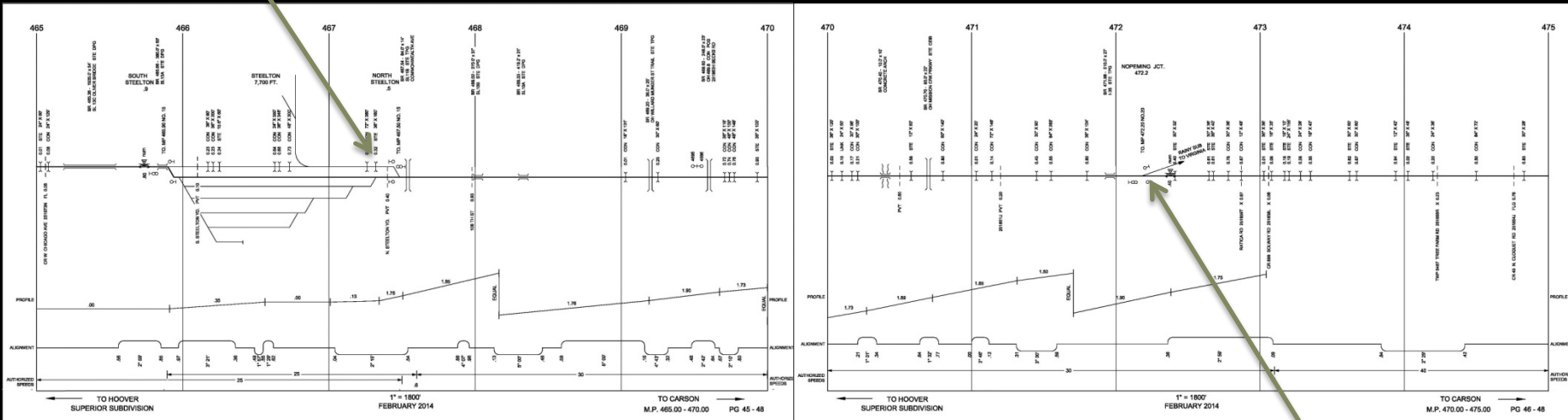


Steelton Hill in Duluth, MN

The track elevation climbs steadily from south to north with grades ranging from 1.50 to 1.90%

The 4.7 mile length of track has 10 curves, two are 5 degrees and one is 4 degrees.

North Steelton
M. 467.50



Traffic volume : 62 MGT
Trains per day : 24
+10 switchers and associated movements

Nopeming Jct
M. 472.20



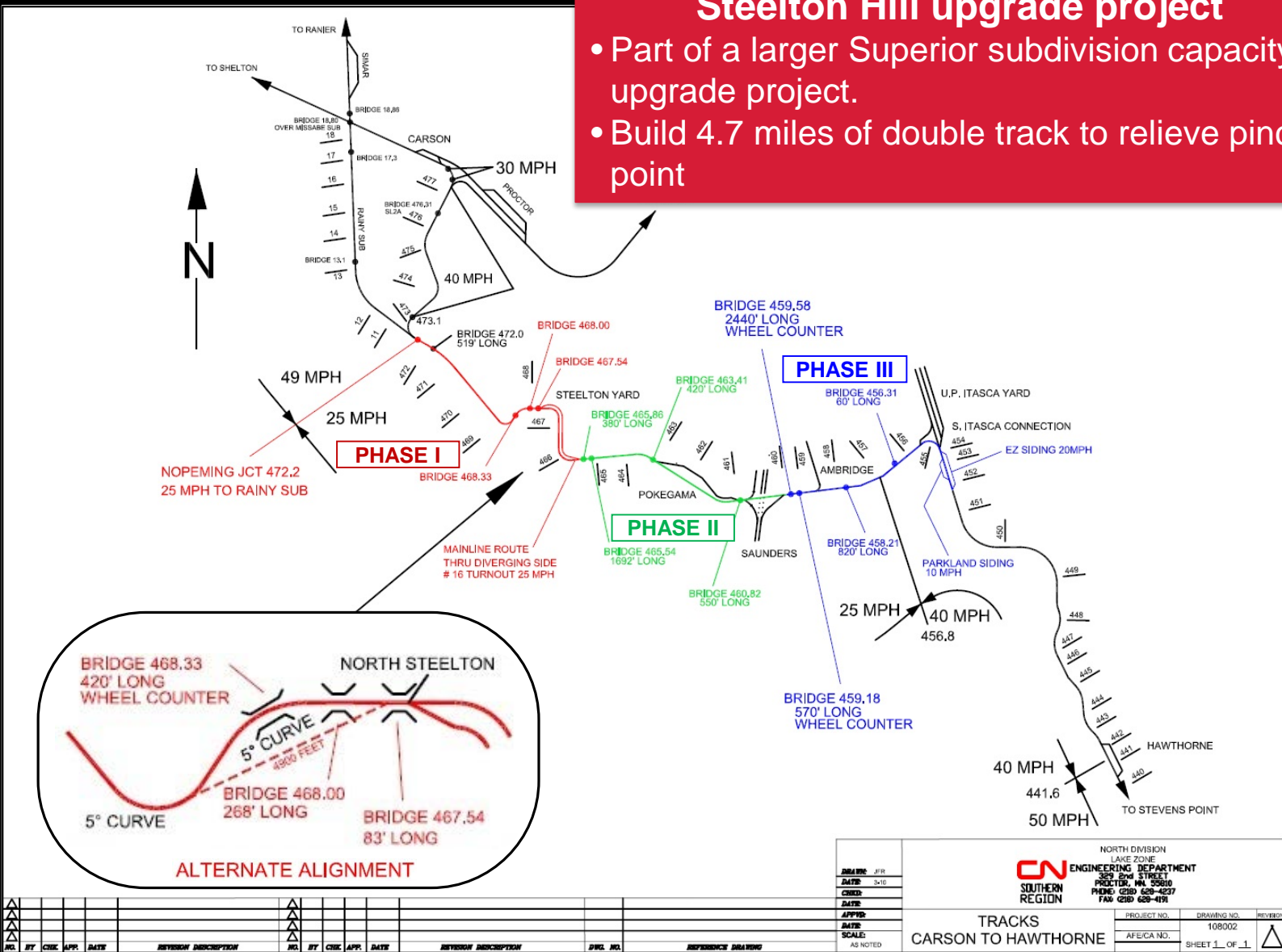


Steelton Hill operations

- Due to topography, long trains must stop in Steelton before ascending grade
- Extra engines are attached to rear of train (shovers)
- Once train reaches Nopeming Jct, the shovers are decoupled and must travel back down the hill
- Even with extra engines, long trains can stall
- In event of a stall, all traffic through Steelton Hill is halted until stalled train can reverse down hill back into Steelton
- Steelton siding capacity only 7700 ft

Steelton Hill upgrade project

- Part of a larger Superior subdivision capacity upgrade project.
- Build 4.7 miles of double track to relieve pinch point



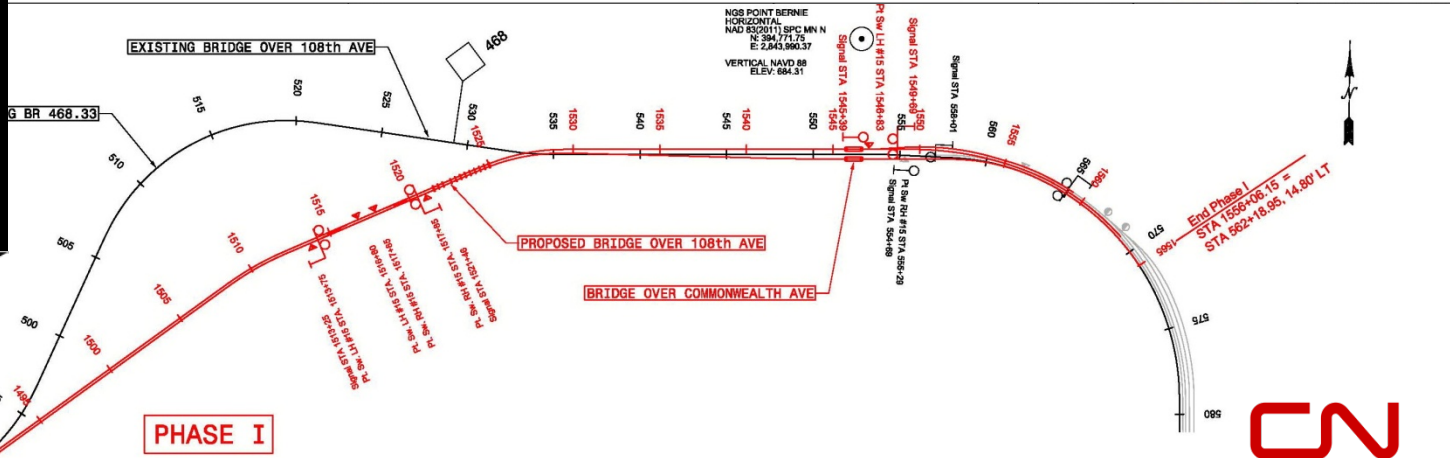
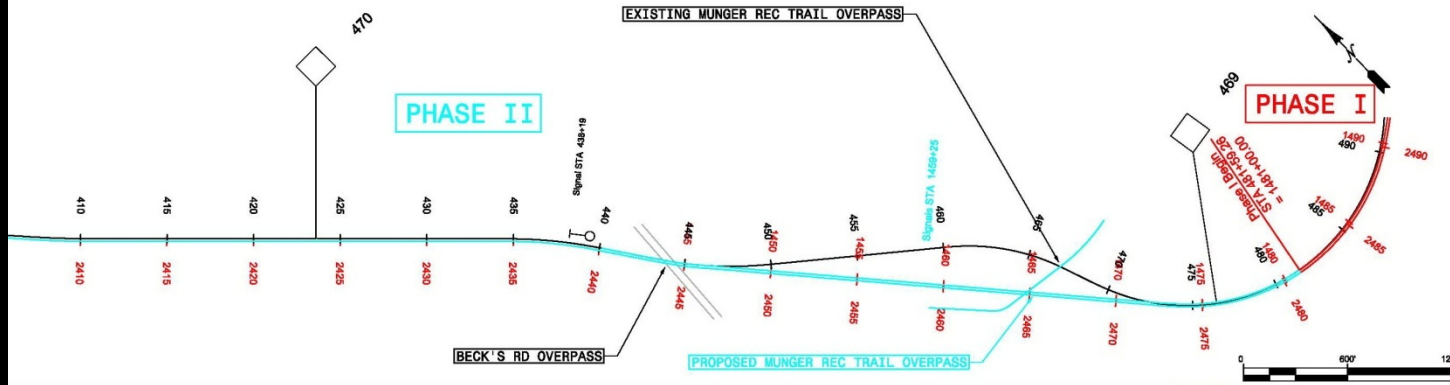
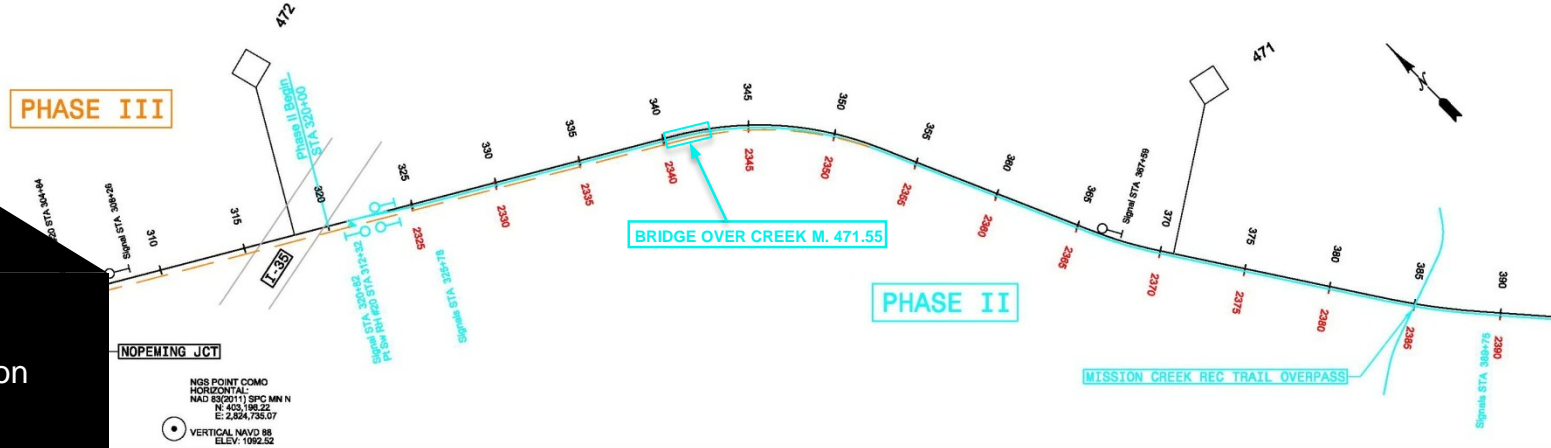
NO.	BY	CHK	APP	DATE	REVISION DESCRIPTION	NO.	BY	CHK	APP	DATE	REVISION DESCRIPTION	DWG. NO.	REFERENCE DRAWING

CN ENGINEERING DEPARTMENT 323 5TH STREET PROCTOR, MN 55960 PHONE (218) 628-4237 FAX (218) 628-4191	NORTH DIVISION LAKE ZONE	PROJECT NO. 108002 DRAWING NO. 108002
	SOUTHERN REGION	REVISION SHEET 1 OF 1
	TRACKS CARSON TO HAWTHORNE	
	AS NOTED	



Steelton Hill construction

- New track construction 32,261 TF
- Embankment fill 680,611 CY
- Bridges (4) – 816 LF
- Overhead bridges (2)
- Culvert installations (16)
- Rail 136 lbs – 64,522 LF (2,924,997 lbs of steel)
- Ties (concrete) – 16,000
- Ballast - 50,000 TN
- Turn-outs (6)
- New control points (3)
- Budget \$56.0M





2015 Steelton Hill Workblocks

Subdivision	Mile	Activity	WB length	Est. date	Notes
Superior	470.7	Demolition Mission Creek O/H bridge	6 hrs	25-Apr	
Superior	471.8	#20 turnout installation	6 hrs	25-Apr	
Superior	467.0 - 467.8	Major realignment of main track	24 hrs	19-Oct	Siding track from Gary to S. Steelton remains in service
Superior	Steelton Siding	Move Gary CP to new alignment, re-align siding	12 hrs	26-Oct	Siding track out of service, main track remains in service

LAYING THE GROUNDWORK



Environmental Controls



Clearing / Grubbing



Chipping



Removing Topsoil

Culverts – Jack & Bore



13 locations for jack & bore



Average of 1 week per location

Grading



Over 30 pieces of equipment (dozers, rollers, excavators, back hoes, etc)

Grading



Over 50 trucks per day – average cycle time of 2.2 min

Grading



Fighting the mud



Keeping the streets clean



Seeding mats



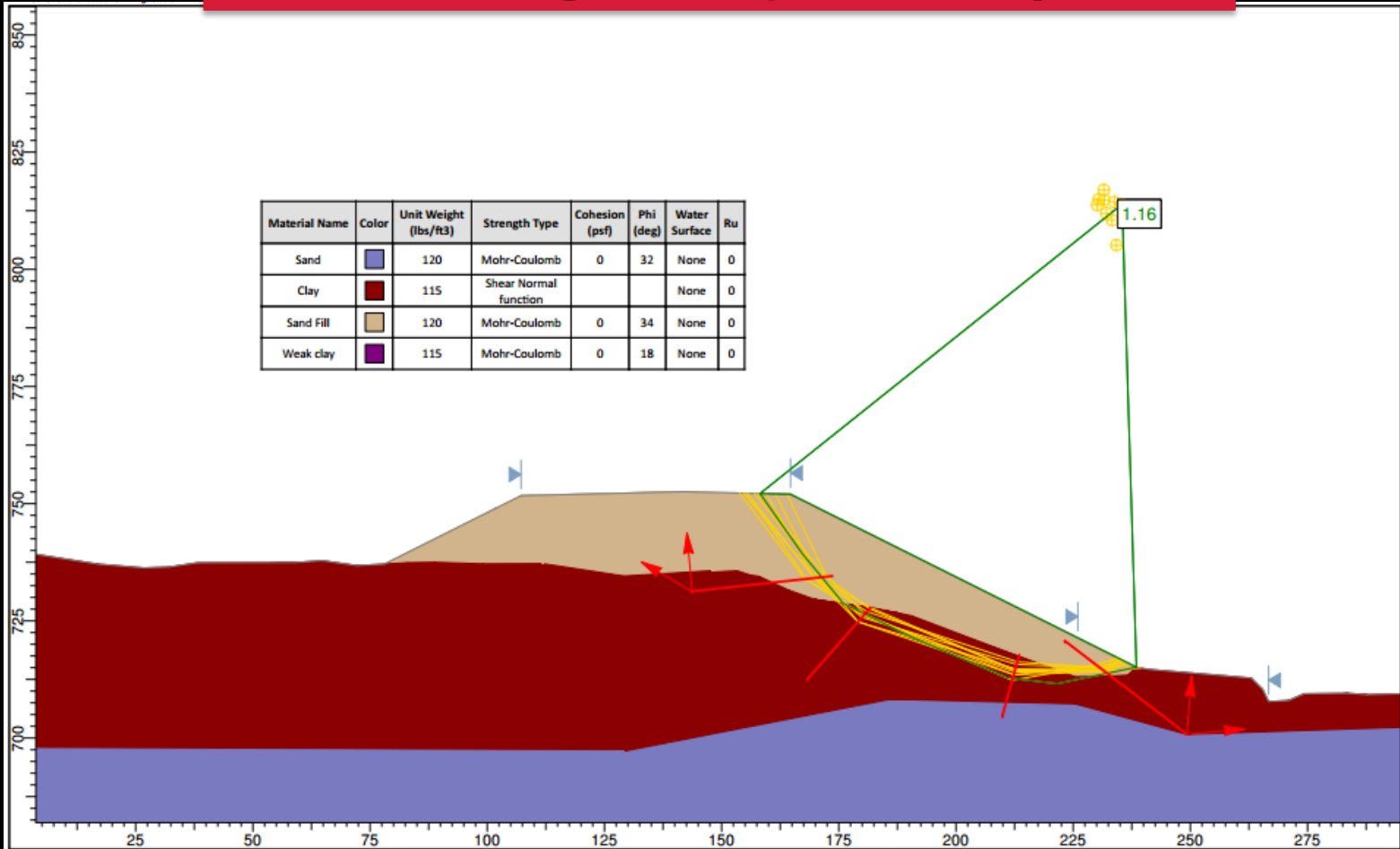
New grade up to 4 ft higher

Challenges – Slope Instability



Slope failure – 300 ft long, 30 ft high

Challenges – Slope Instability



CLIENT
WISCONSIN CENTRAL LIMITED

PROJECT
STEELTON HILL DOUBLE TRACK
EMBANKMENT STABILIZATION
NEW DULUTH, MN

CONSULTANT

YYYY-MM-DD 2015-02-17
PREPARED SRV
DESIGN SRV
REVIEW KSC
APPROVED AJW

TITLE
CONDITIONS AT FAILURE
TOTAL STRESS PARAMETERS
STA 1515+45

PROJECT No.
13-03084

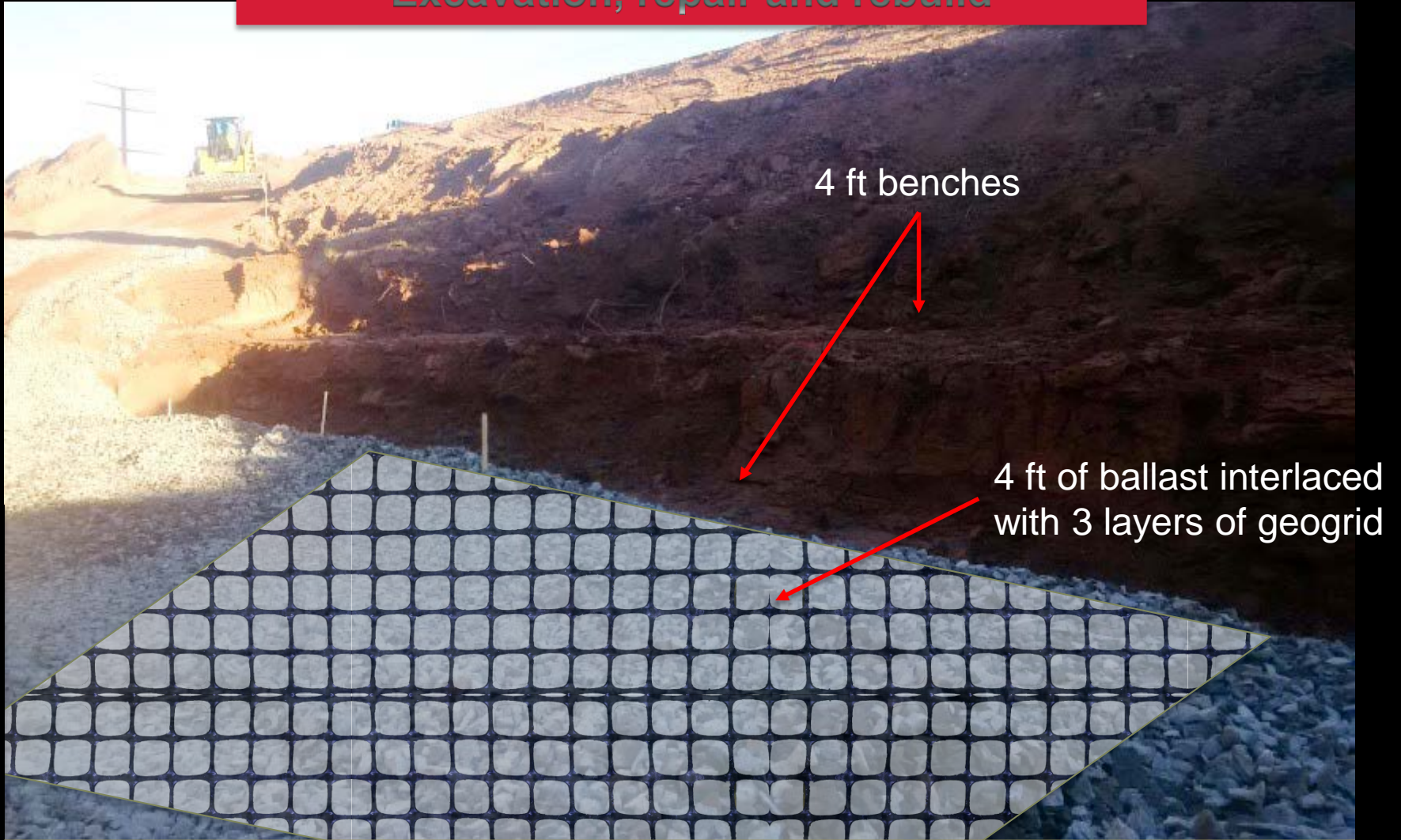
CONTROL

Rev.
0

FIGURE
4

Slope failure analysis

Challenges – Slope Instability Excavation, repair and rebuild



4 ft benches

4 ft of ballast interlaced
with 3 layers of geogrid

Slope failure – Repair procedure

BRIDGE CONSTRUCTION
M. 471.55 – Unnamed Trout Stream



Concrete deck on steel piles, 7 spans, 219 ft long

BRIDGE CONSTRUCTION

M. 468.02 – 108th Ave.



Concrete deck on steel trestles, 11 spans, 359 ft long, double track

BRIDGE CONSTRUCTION

M. 467.54 – Commonwealth Ave.

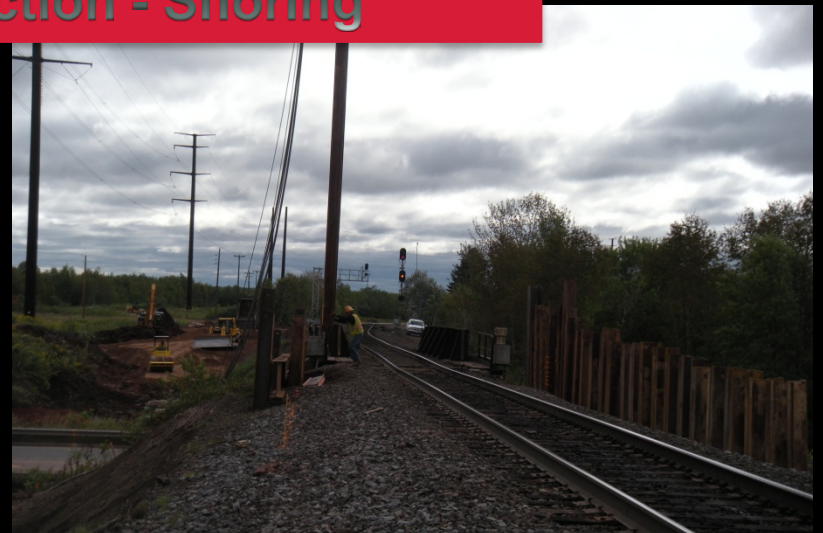


2 through plate girder bridges, 1 span each, 120 ft long

Bridge Construction - Shoring



Clear for trains



Sheets are 12 ft from track centre



Sheets, walers & bars



Shoring height = 24 ft

Bridge Construction – Foundation



110 ft long piles (HP 14x89)



43,160 lbs reinforcement per abut.



339 CY concrete per abut.

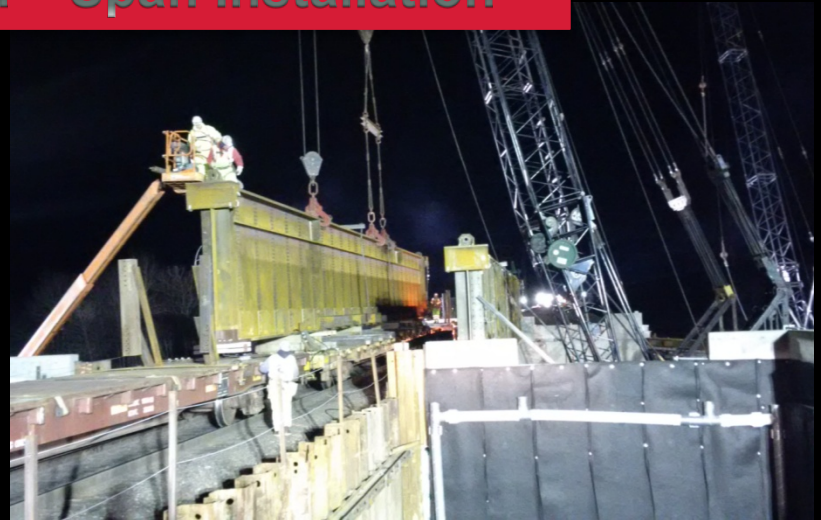


43,160 lbs reinforcement per abut.

Bridge Construction – Span Installation



Clear last train – 6 hr workblock



Girders arrive on railcars



120,000 lbs per girder



Steel deck

TRACK CONSTRUCTION



Concrete ties w/ Safelok clips



New power switches



Grex ballast dumping train



Ballast regulator

TRACK CONSTRUCTION

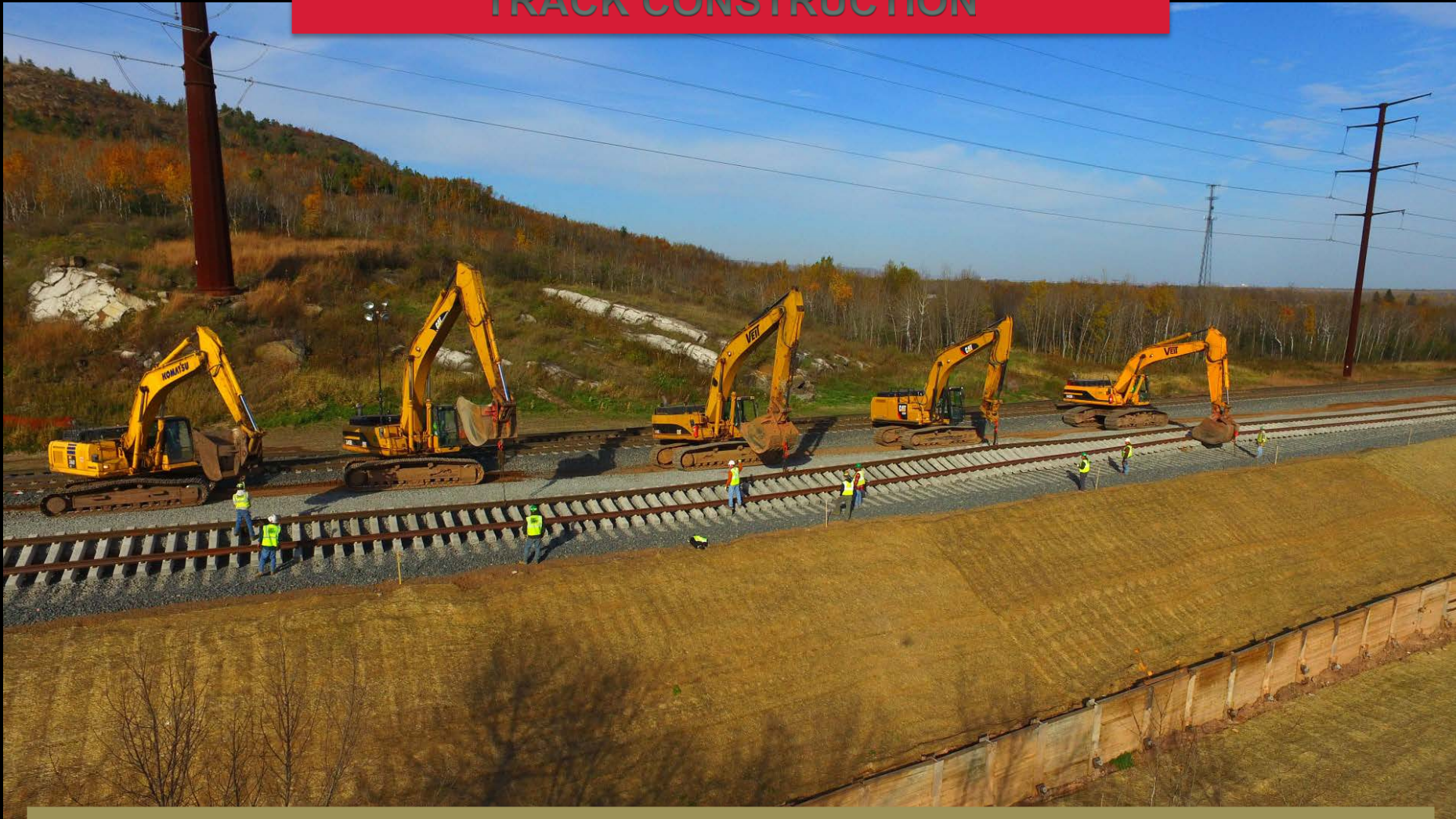


Dec. 8th - 12 hour workblock

Track re-alignment, build 800 ft of new track, put new CP into service

**2 tampers, 2 ballast regulators, 3 hi-rail dump trucks, 4 large excavators,
2 speed swings, 2 TFO trucks, 1 boom truck, 3 front-end loaders, 45 trackmen**

TRACK CONSTRUCTION



Oct. 19th - 24 hour workblock

Build new grade, shift 1400 ft of track, put new CP into service

**2 tampers, 2 ballast regulators, 8 large excavators, 2 rollers
4 welding trucks, 1 boom truck, 3 front-end loaders, 60 trackmen**

TRACK CONSTRUCTION



Oct. 26th - 12 hour workblock
Build new grade, shift 800 ft of track, put new CP into service
2 tampers, 2 ballast regulators, 5 large excavators,
2 welding trucks, 1 boom truck, 2 front-end loaders, 20 trackmen

CHALLENGES OF A LARGE PROJECT

ID	Task Name	Duration	Progress	Start Date	End Date
1	EDWARD KRAEMER & SONS, INC.	131 days		Mon 6/30/14	Fri 12/26/14
2	Bridge 468.02 - Superior Sub	131 days		Mon 6/30/14	Fri 12/26/14
3	Milestones	131 days		Mon 6/30/14	Fri 12/26/14
12	Submittals & Materials	53 days	68%	Fri 7/11/14	Tue 10/7/14
17	Bridge 468.02	56 days	0%	Mon 9/29/14	Fri 12/26/14
44	WLSSD Pipe Encasement	57 days	25%	Fri 8/22/14	Fri 11/7/14
59	LUNDA CONSTRUCTION CO.	140 days	29%	Mon 6/30/14	Thu 1/8/15
60	West Abutment Sheeting	121.35 days	74%	Thu 7/10/14	Thu 12/25/14
73	East Abutment Sheeting	140 days	15%	Mon 6/30/14	Thu 1/8/15
122	VEIT	118 days		Mon 6/16/14	Tue 11/25/14
123	CN-1 Steelton Hill Phase 1	118 days		Mon 6/16/14	Tue 11/25/14
124	Milestones	118 days		Mon 6/16/14	Tue 11/25/14
133	General Conditions	48 days		Mon 6/23/14	Wed 8/27/14
137	Region 1 (North of 108th)	56 days	7%	Wed 8/27/14	Tue 11/25/14
146	Region 2 (PR #2 108th to 23)	19 days	69%	Thu 8/21/14	Tue 9/16/14
154	Region 3 (PR #1 108th to 23)	23 days	0%	Mon 9/15/14	Wed 10/15/14
163	Region 4 (South of 23)	44 days	21%	Thu 8/21/14	Tue 10/21/14

- Coordination of personnel and equipment
 - Up to 7 different contractors working in project area
 - Up to 100 people and 30 pieces of equipment
 - Project manager must ensure conflicts are resolved quickly
 - Each unit and group must be kept productive

CHALLENGES OF A LARGE PROJECT MINNESOTA WEATHER



- Working through the entire winter
 - Equipment freezes up
 - Employees get tired easily, can get sick or have frostbite
 - Few daylight hours means less daily productivity
 - Ice makes surface areas slick and dangerous
 - Material gets buried under snow
- Working through rain
 - Exposed soils turn to mud
 - Equipment can get stuck or slide down slopes
 - Employees get tired easily
 - Heavy rain can mean several days without grading activity, putting schedule in jeopardy

Aerial View of Phase 1 Work





Engineering

Steelton Hill Double Track

Superior subdivision capacity upgrade project

In collaboration with:

- City of Duluth
- Duluth Economic and Development Authority
- WLSSD
- Veit & Company Inc.
- Lunda Construction Co.
- Kraemer North America
- North Shore Track Services
- Stack Brothers Mechanical Contractors Inc.
- Golder Associates
- Benesch Engineering
- ...plus many more

High definition pictures courtesy of Dave Schauer (railpictures.net)