

Orange County Mineral Society

DUKE

Constructing the Second Avenue Subway, NYC, NY



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Google earth

NYC TBM Projects

Second Avenue Subway



1929 – NYC BOT Proposes Subway

1931 – Plans Postponed for
Depression Era

\$86M → \$249M → \$500M

By 1948 – Abandonment

April 2007 – Groundbreaking

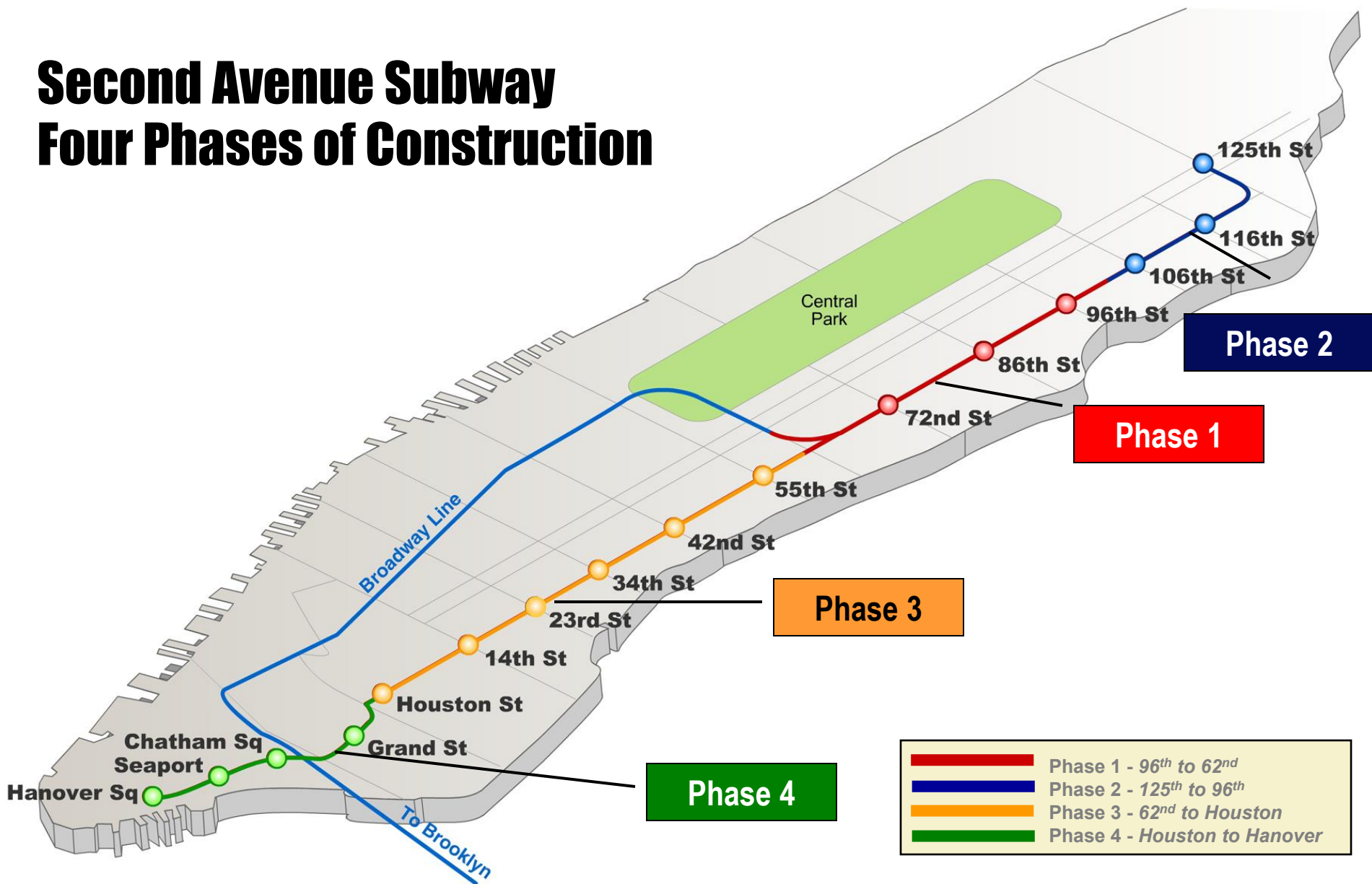
June 2010 – TBM Starts @ 96th

2013 – Station Complexes

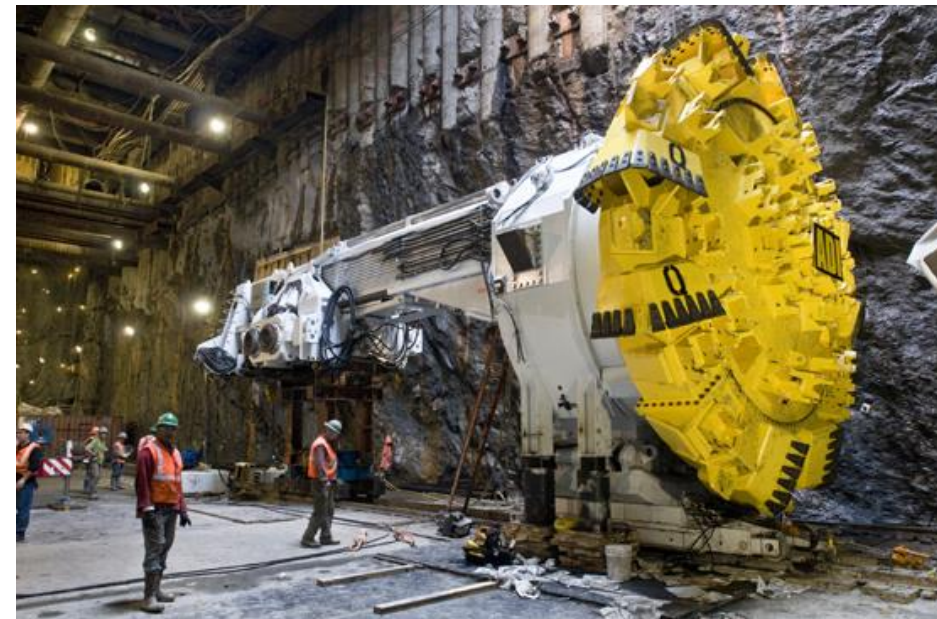
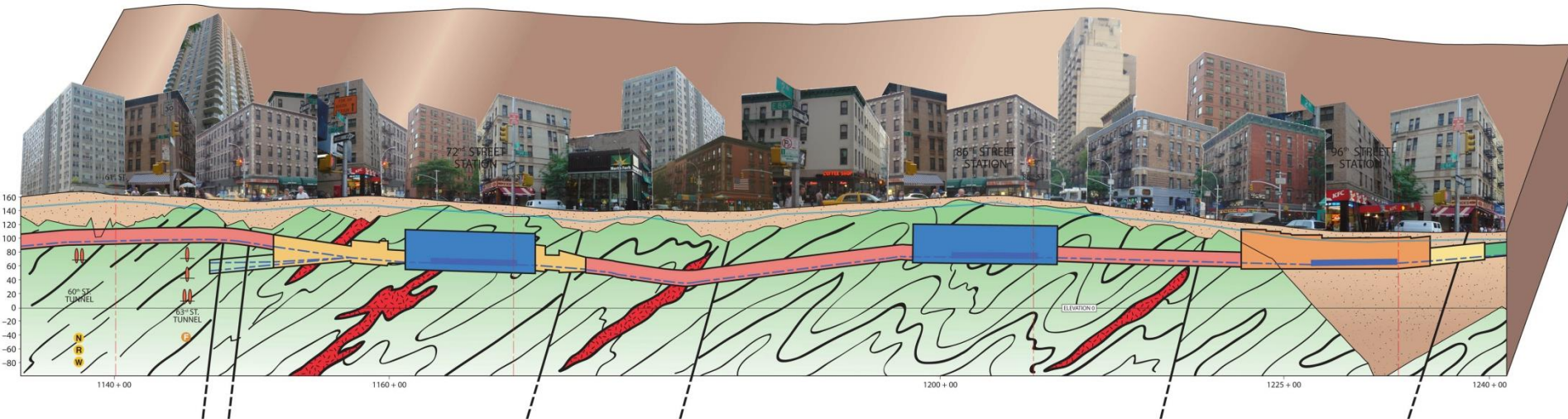
2017 – Phase 1 Stations Open

Second Avenue Subway

Four Phases of Construction

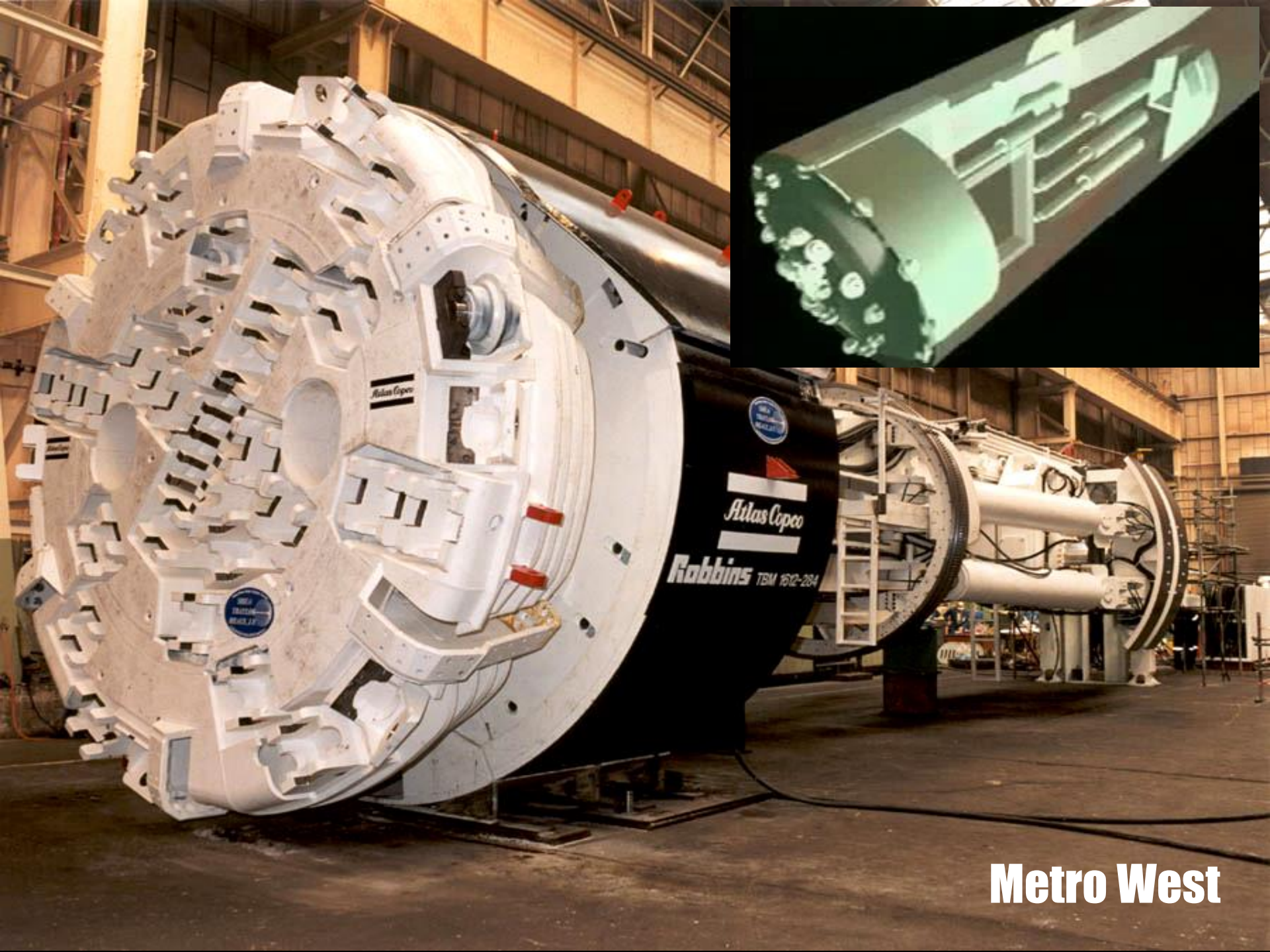


Phase 1 - Threading the Needle south from 96th St.

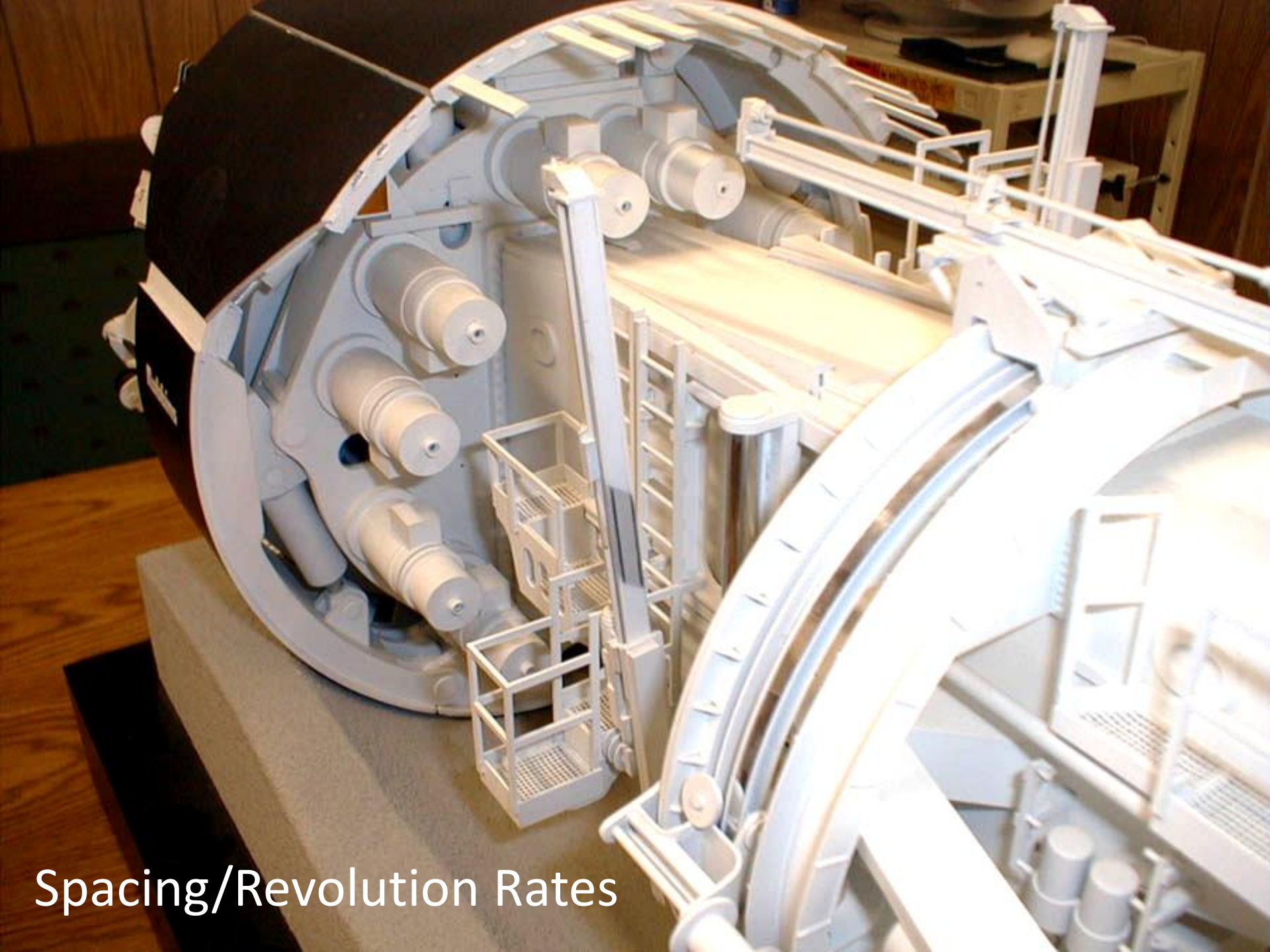


April 2010





Metro West

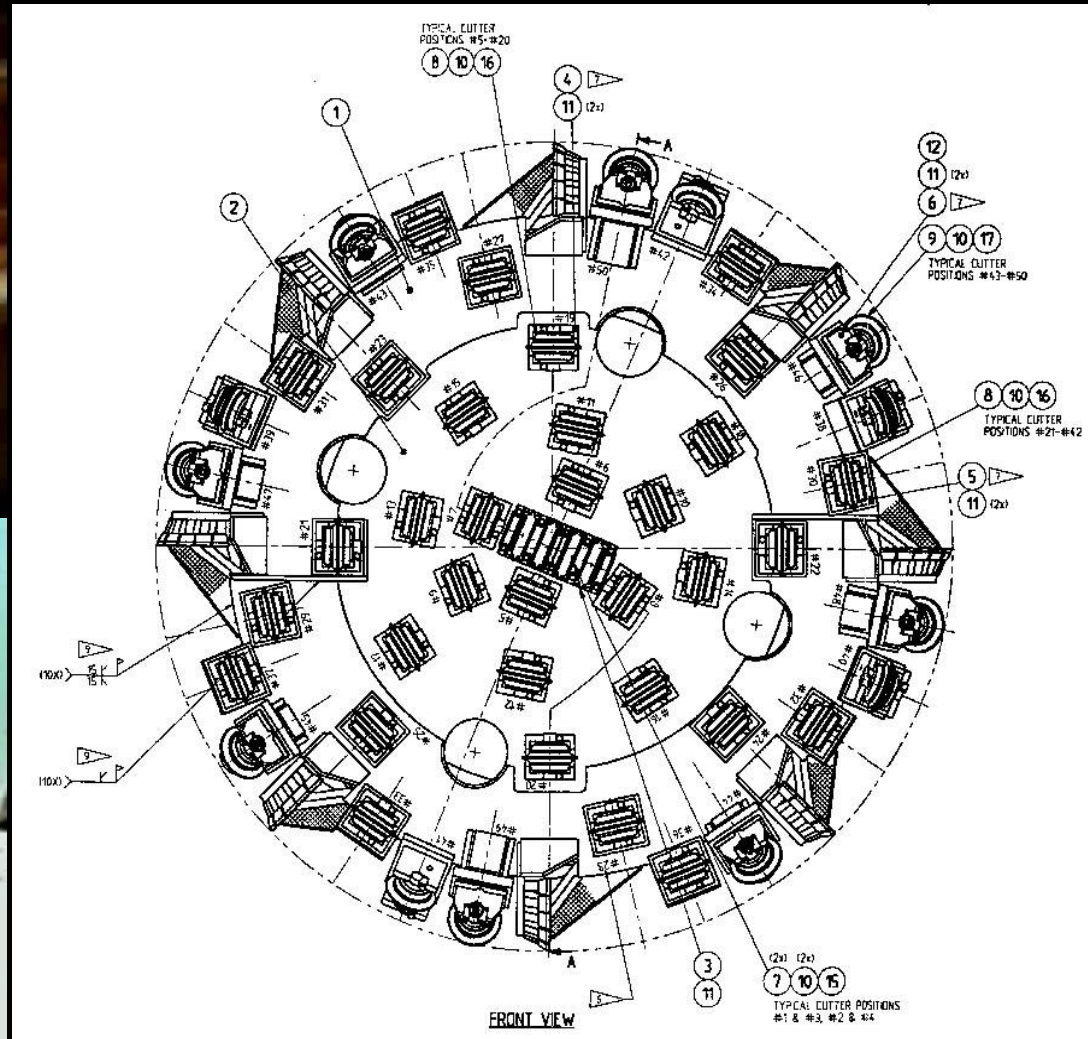
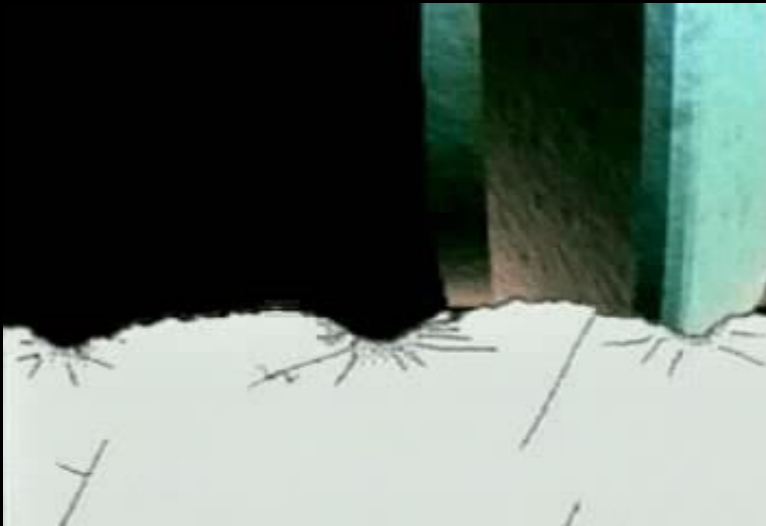


Spacing/Revolution Rates



Queens Tunnel TBM
422 HP Electric
Water Cooled,
Three Phase Motors

10 Motors Total
Usually 8 Online.
At Queens Tunnel
Cutterhead Rotated
at 8.3 Rev/Min

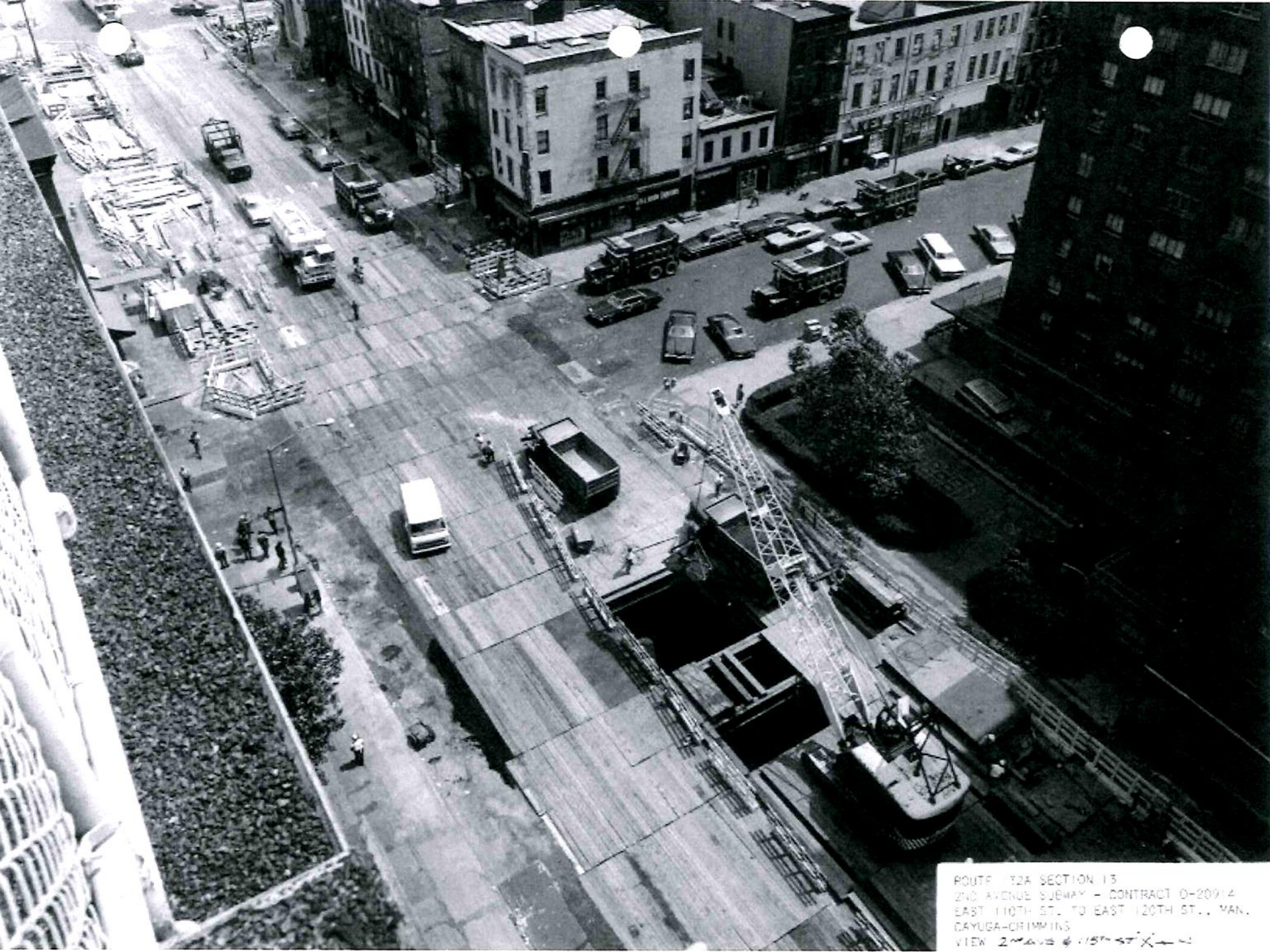




Belly of the Beast

Superb Kerf Pattern in Hard Rock





ROUTE 12A SECTION 13
2ND AVENUE SUBWAY - CONTRACT D-20914
EAST 110TH ST. TO EAST 120TH ST., MAN.
DAYUGA-CRIMMINS
VIEW 2nd Ave & 115th St. X-100

Second Avenue Subway



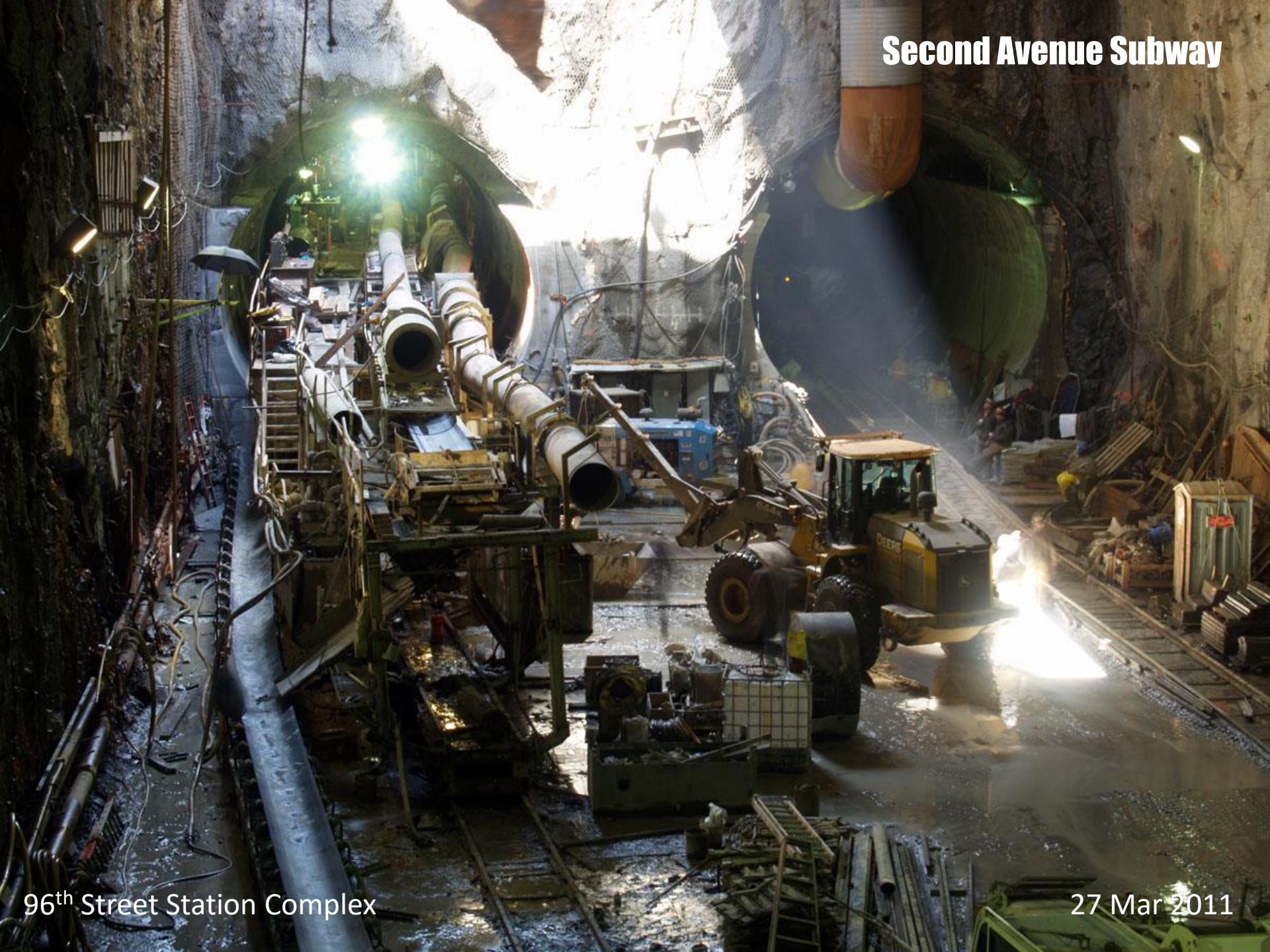
96th Street Station Complex

27 Mar 2011

Second Avenue Subway

96th Street Station Complex

27 Mar 2011



Second Avenue Subway

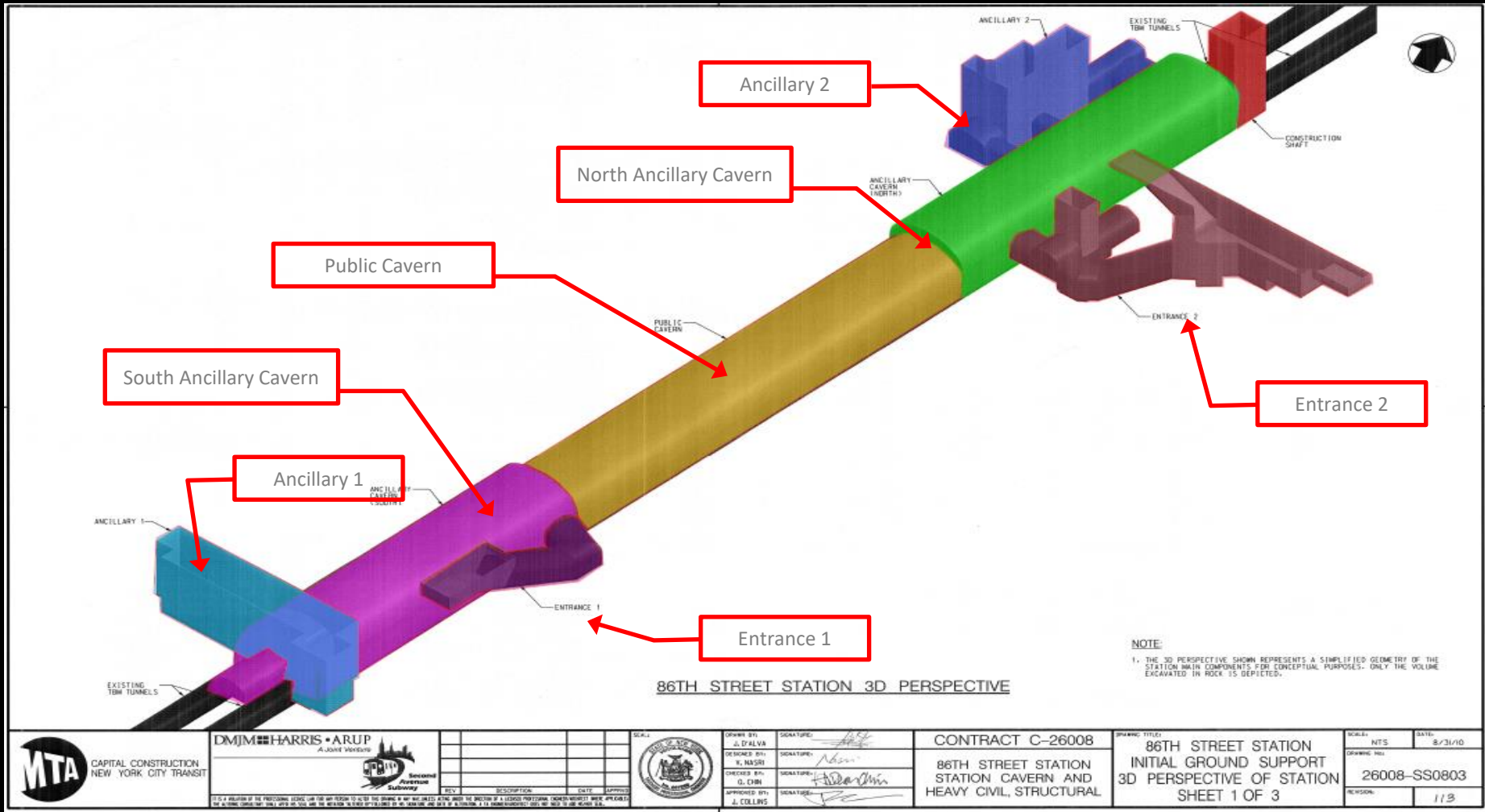


South Tube — Sta. 1172+80

27 Mar 2011

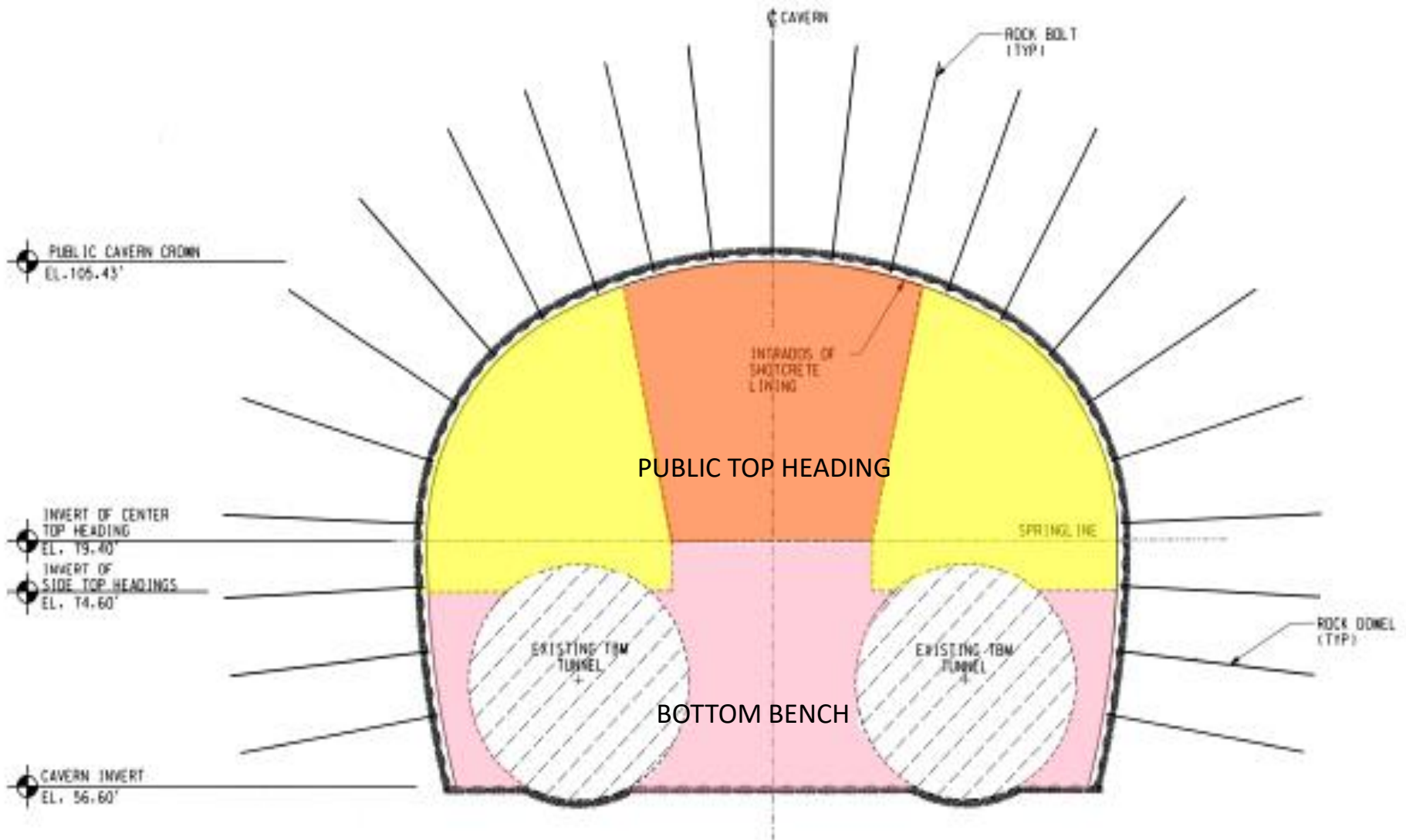
86th Street Station Cavern Excavation Mapping

DUKE



Stations 1198+00 to 1209+00 = ~1,100'

86th Street Station – Public Cavern Excavation (50')



Second Avenue Subway



01/11/2013

Second Avenue Subway



North Cavern

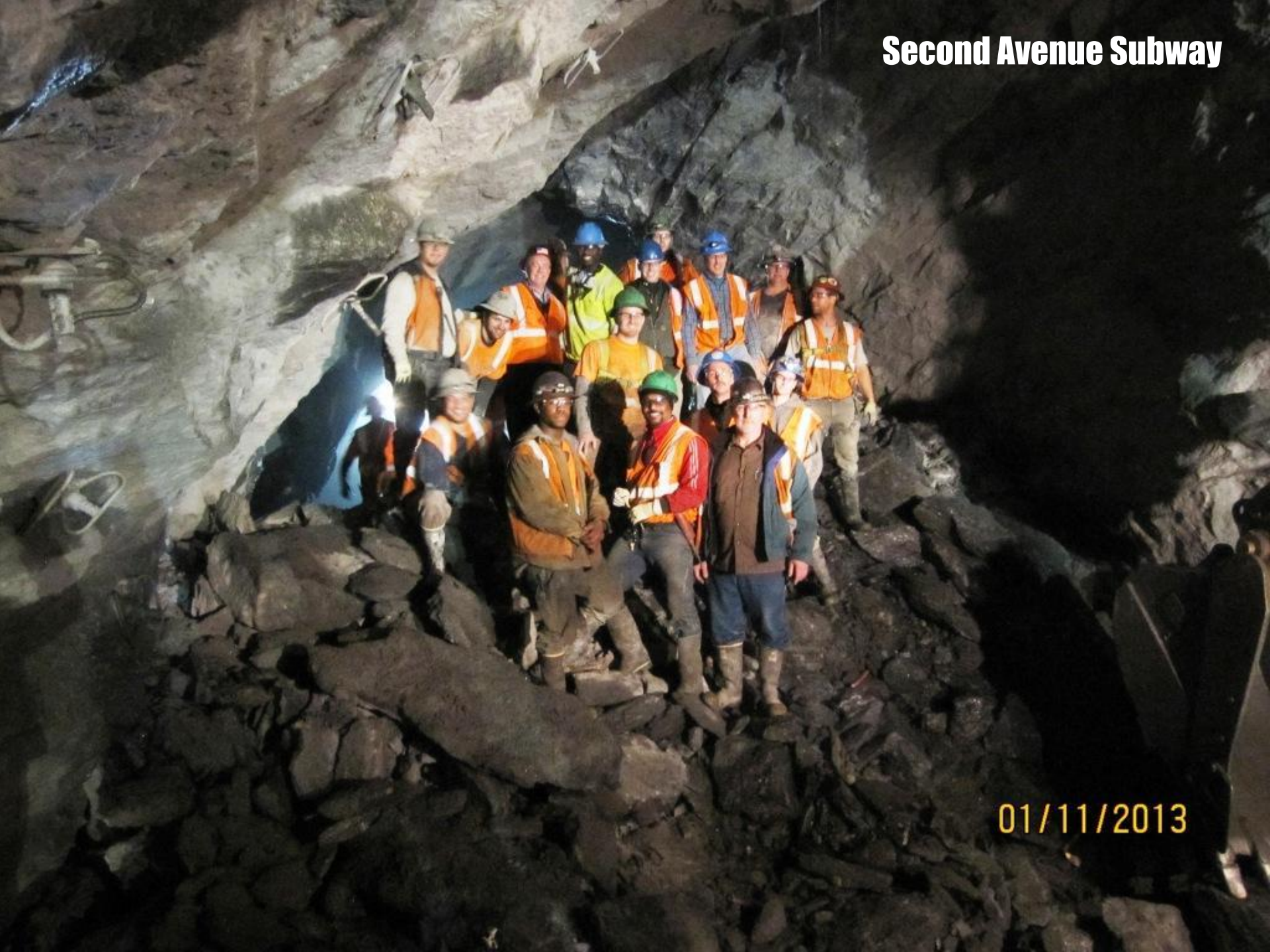
Second Avenue Subway



01/23/2013

Finished North Ancillary and Public Cavern

Second Avenue Subway



01/11/2013

Second Avenue Subway



Main Cavern – Sta 1203+95

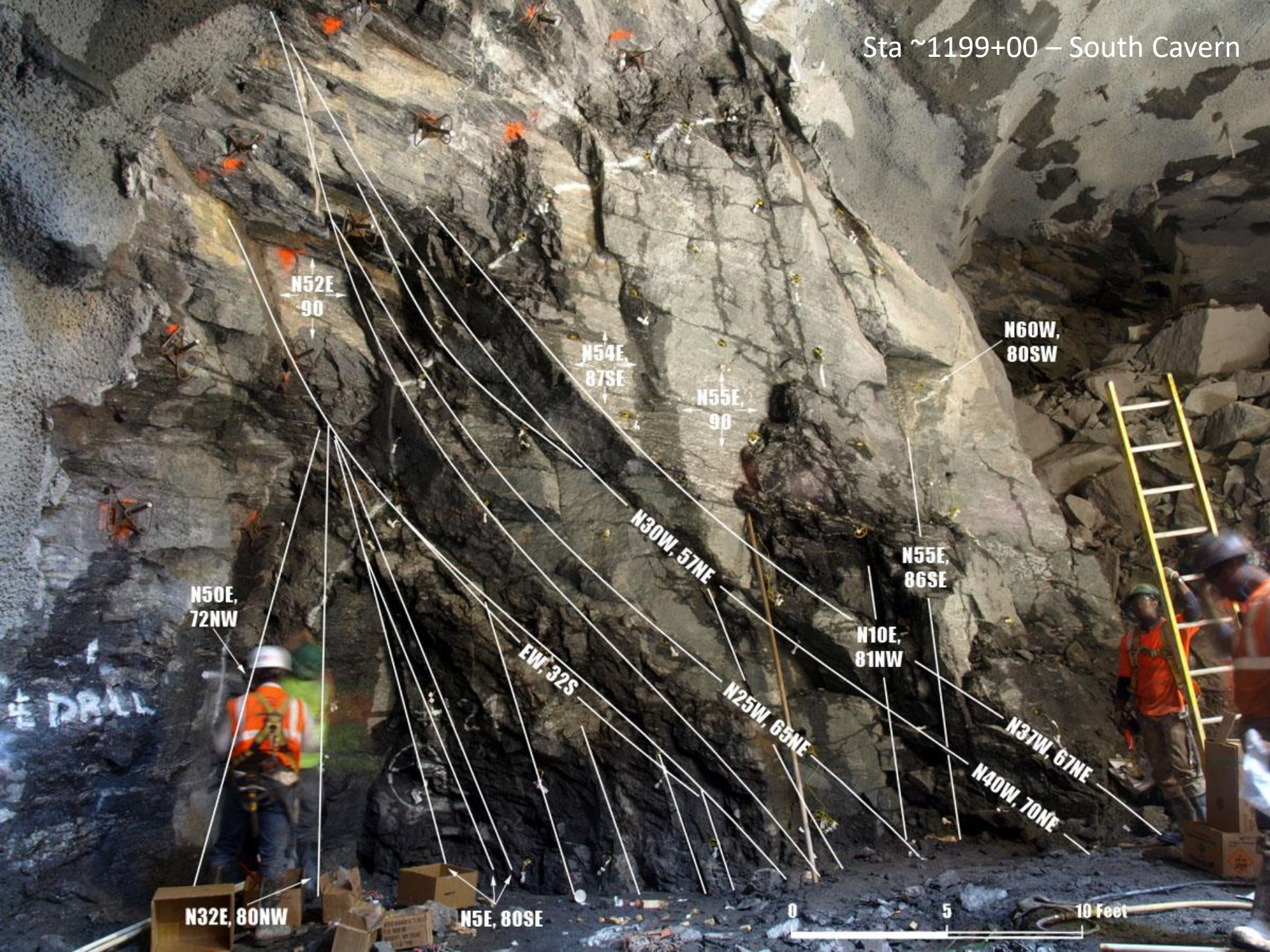
Second Avenue Subway



Sta ~1199+00 – South Cavern

0 5 10 Feet

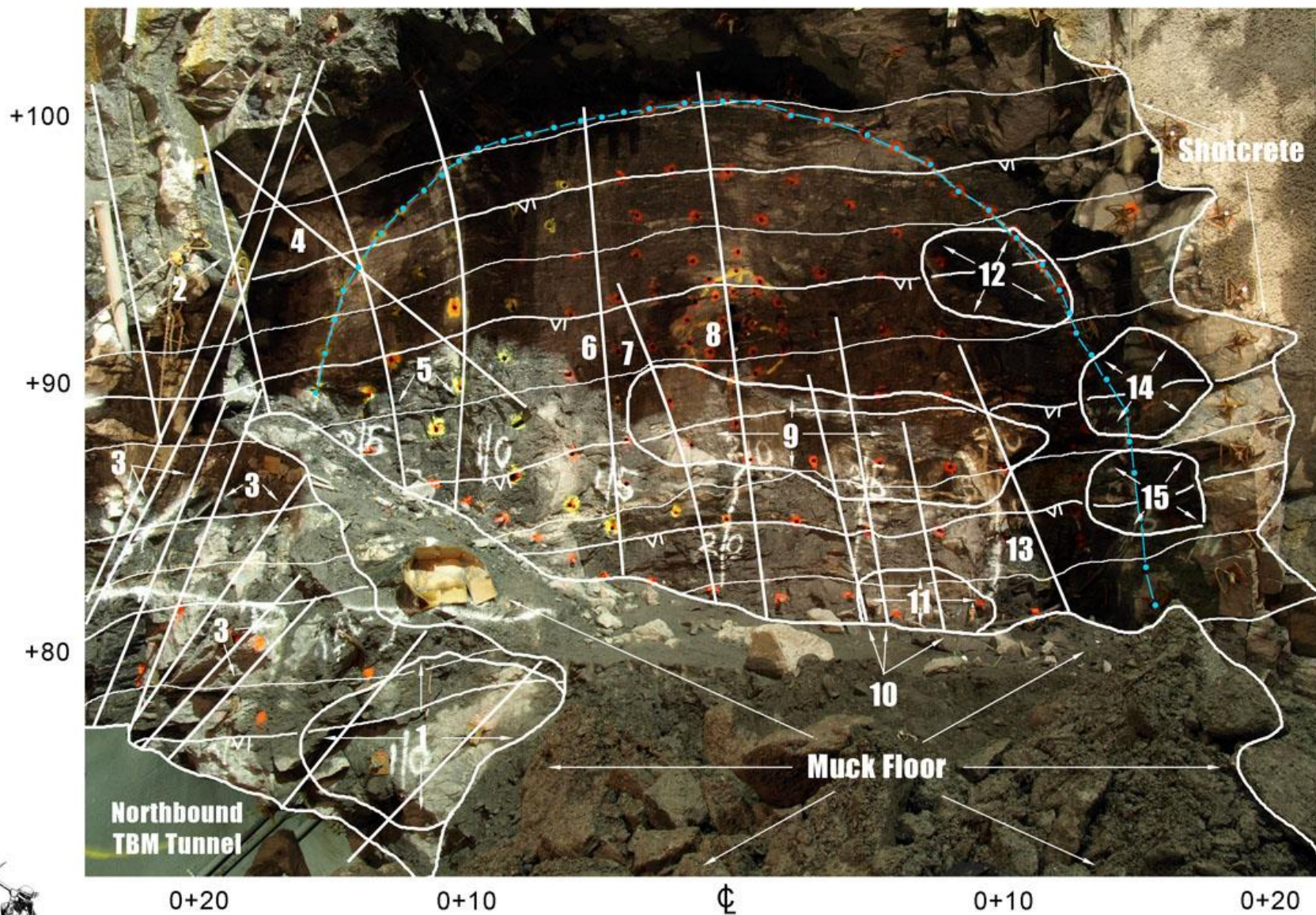
Sta ~1199+00 – South Cavern



Second Avenue Subway



Sta 1198+75 – CIR Room



Duke Geological Lab
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 www.dukelabs.com

← Stationing in Feet East and West of Second Avenue Centerline →

— = Perimeter Drill Holes of CIR room

Mapped 28 February 2013

Second Avenue Subway

CIR Room Floor
Elev. = +81.5'

Sta 1198+75 – CIR Room

Second Avenue Subway

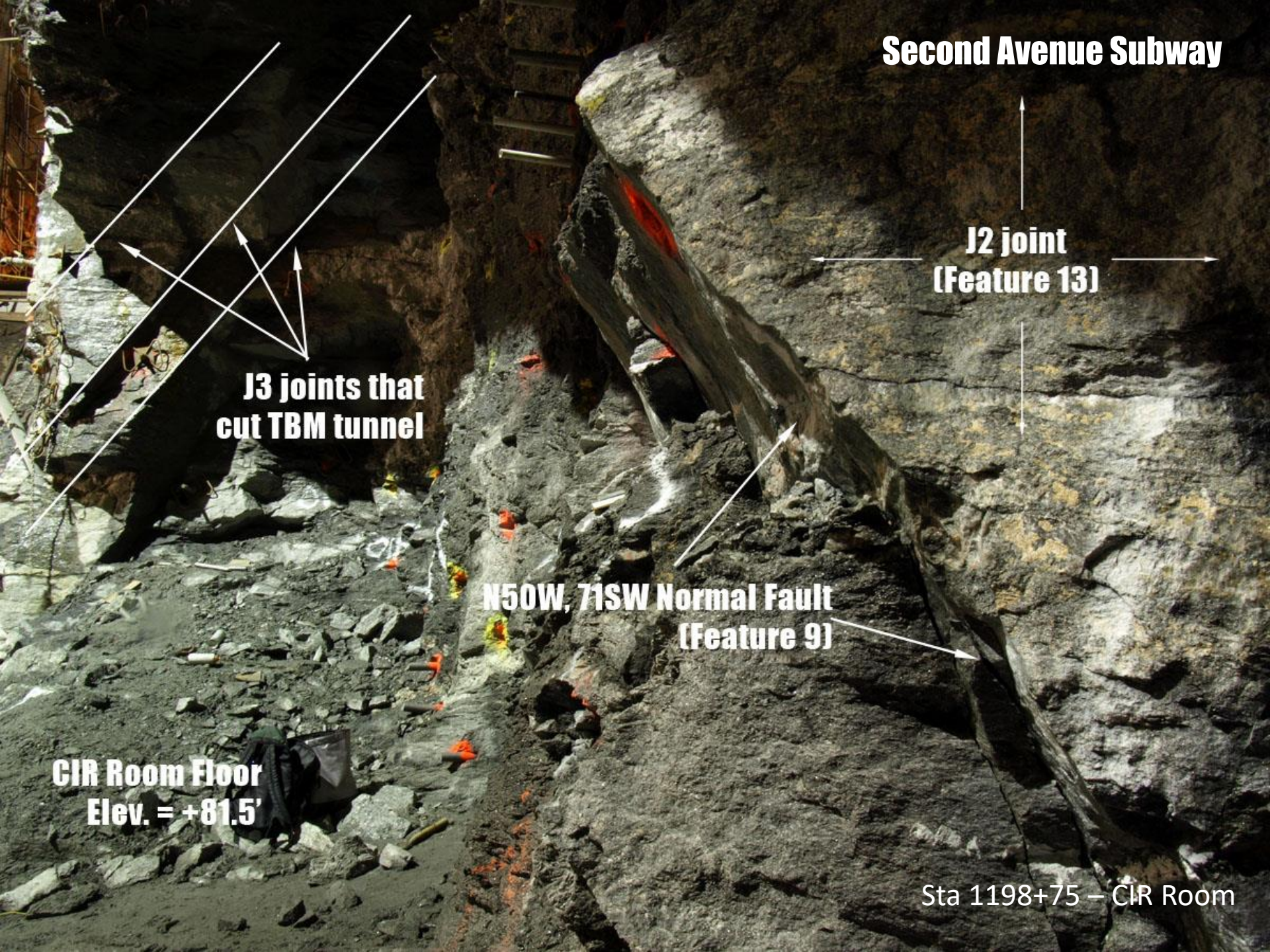
J2 joint
[Feature 13]

J3 joints that
cut TBM tunnel

N50W, 71SW Normal Fault
[Feature 9]

CIR Room Floor
Elev. = +81.5'

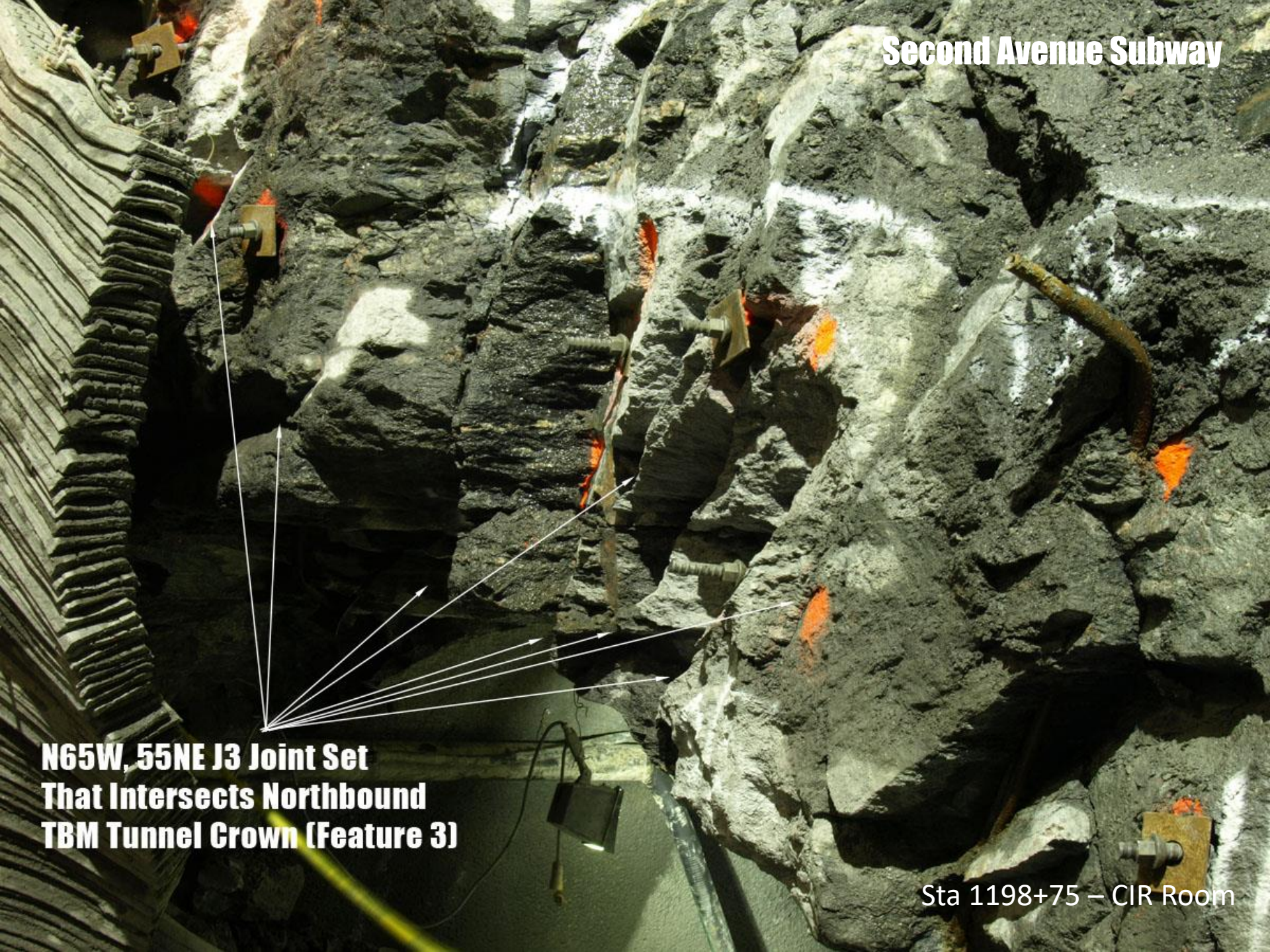
Sta 1198+75 – CIR Room



Second Avenue Subway

**N65W, 55NE J3 Joint Set
That Intersects Northbound
TBM Tunnel Crown (Feature 3)**

Sta 1198+75 – CIR Room



Second Avenue Subway

R
E
L
I
E
F



Tilt and Vibration Monitors



Second Avenue Subway



Blast Mats Set

Second Avenue Subway

Second Avenue Subway
86th Street Station Complex
Ancillary #2

06 Nov 2012

Second Avenue Subway





Sta 1207+50 – Ancillary #2 West Wall

Second Avenue Subway



Second Avenue Subway
86th Street Station Complex
Ancillary #2

**Second Avenue Subway
86th Street Ancillary #2
Southward View of South Wall
Elevation +155' to +133'**

Plate 2



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Sta 1207+07 – Ancillary #2

0+90 0+80 0+70 0+60 0+50 0+40 0+30 0+20 0+10



View of fallout in SE corner of excavation



Fallout near Sta 1207+50

Massive Interlayered migmatitic schist, granofels, and minor amphibolite. Gently inclined and broadly arched with steep NNE dislocations to south that dip 80SE to 90 to 76 NW to produce 1' to 2' of continuous fallout. Foliation and layering vary because of gentle inclination (<4 app. dip)

Dislocations:

- 1 - N32E, 76SE, planar, rough jnt
- 2 - N35E, 90, planar, rough jnt
- 3 - N34E, 88SE, planar, rough jnt
- 4 - N31E, 85SE, planar, rough jnt
- 5 - N35E, 85NW, planar, rough flt
- 6 - N36E, 90, planar, rough flt
- 7 - N35E, 87SE, planar, rough flt

← Stationing in Feet North Along East Wall
(Map Drawn Parallel to Sta 0+50 West of Second Avenue Centerline)

Mapped 21 November 2012



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Second Avenue Subway



Sta 1207+50 – Ancillary #2 West Wall

Second Avenue Subway



Sta ~1205+00 – North Cavern
Center and West Slash

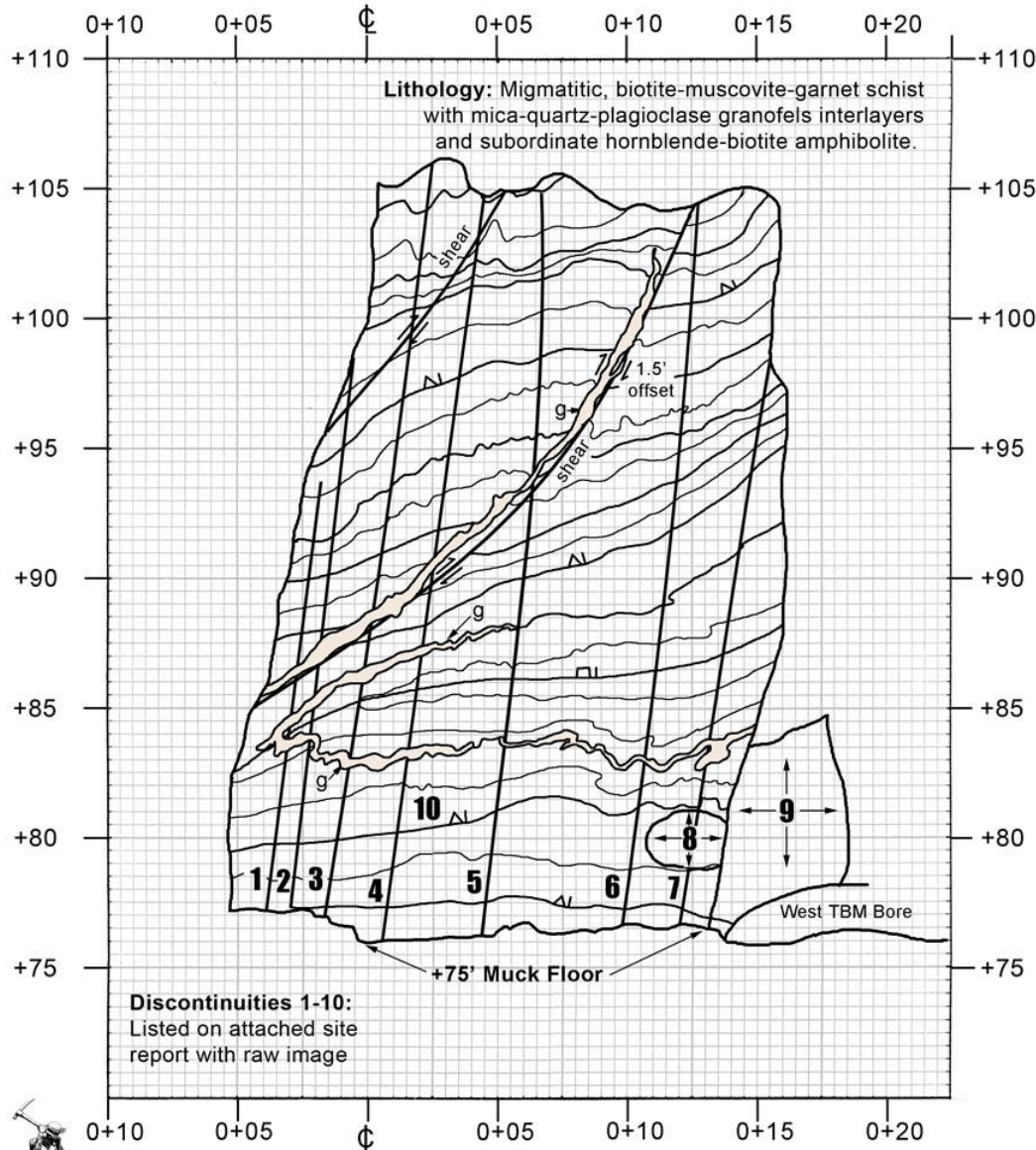
Second Avenue Subway



Sta 1204+90
North Cavern Center Slash

Second Avenue Subway - North Cavern Center Slash
Working Face at Sta. 1204+90; Elev. +75' to +108'

Second Avenue Subway



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Mapped 19 December 2012

Sta 1204+90
North Cavern Center Slash

Second Avenue Subway



Sta 1204+90
North Cavern Center Slash

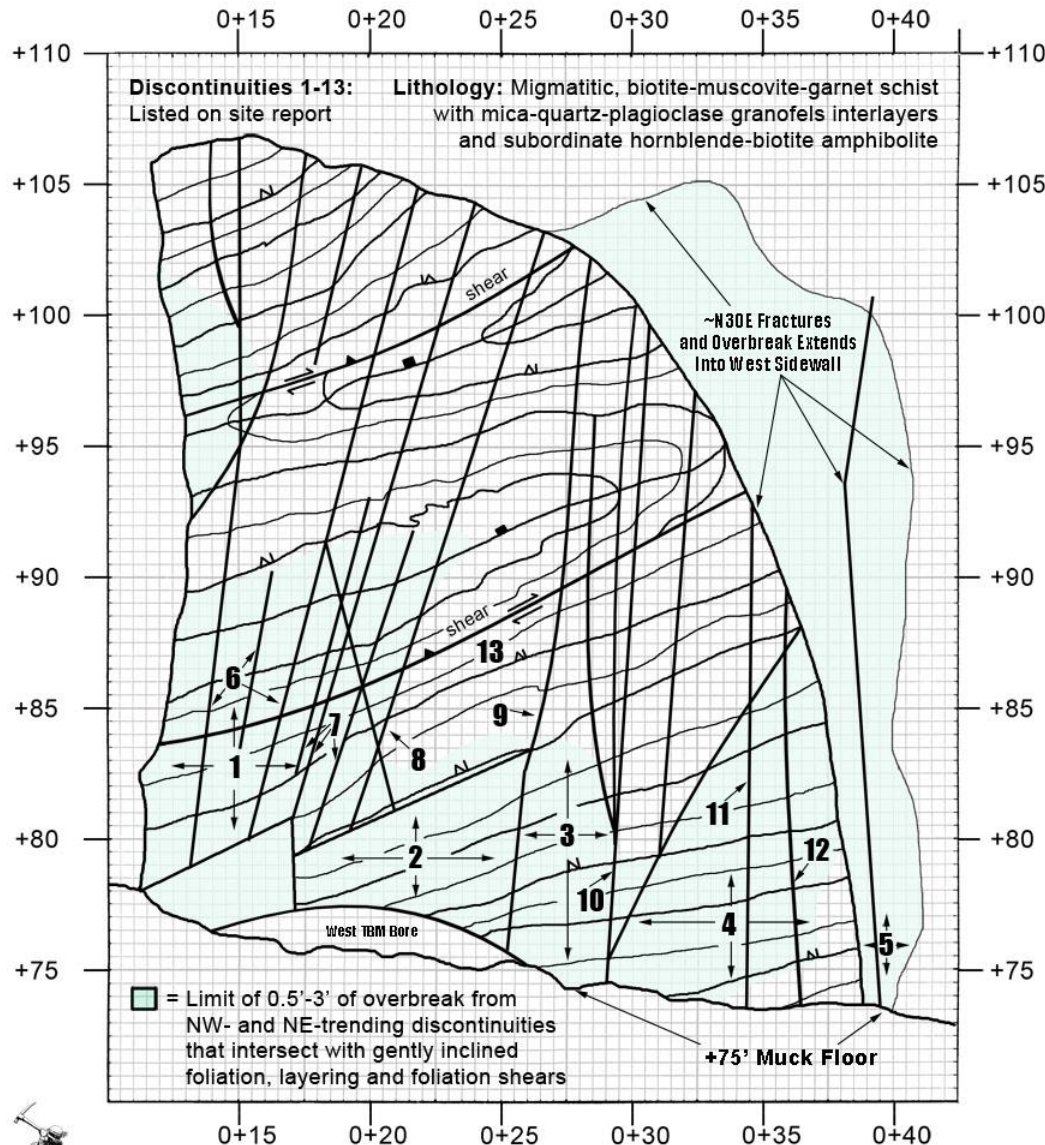
Second Avenue Subway



Sta 1205+10 – North Cavern
West Slash

**Second Avenue Subway - North Cavern West Slash
Working Face at Sta. 1205+10; Elev. +75' to +105'**

Second Avenue Subway



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Stationing in Feet West of Second Avenue Centerline →

Mapped 19 December 2012

**Sta 1205+10 – North Cavern
West Slash**

Second Avenue Subway



Sta 1205+10 – North Cavern

Second Avenue Subway



Sta 1205+10 – North Cavern

Epidote

DL 2840

**Second Avenue Subway
86th Street Station Complex**



Epidote



DL 2840

**Second Avenue Subway
86th Street Station Complex**

Epidote



DL 2845

**Second Avenue Subway
86th Street Station Complex**

Stilbite and Calcite



DL 2689

**Second Avenue Subway
86th Street Station Complex**

Stilbite



DL 2853

**Second Avenue Subway
86th Street Station Complex**

Stilbite



DL 2854

**Second Avenue Subway
86th Street Station Complex**

Stilbite



DL 2857

**Second Avenue Subway
86th Street Station Complex**

Stilbite cut by Calcite



DL 2873

**Second Avenue Subway
86th Street Station Complex**

Calcite

DL 1075

**Second Avenue Subway
86th Street Station Complex**



Calcite

DL 1104

**Second Avenue Subway
86th Street Station Complex**



Pyrite on Stilbite



DL 2851

**Second Avenue Subway
86th Street Station Complex**



DUKE

OK, That's It!
I've Heard Enough!

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H. Manne