Historical Data Compilation and 3D Modelling of the Lovitt Mine Project, Wenatchee, Washington

Jacqueline Blackwell, Ph.D., P.Geo.,

Last Updated: Feb. 3, 2021

Project Status and Deliverables:

1. Data Catalogue: 212 maps scanned and integrated with existing digital files. Database now includes 390 digital maps (1949-1988; see table next slide).

2. Topography digital elevation model (DEM)

3. Spatial Conversion of Historical Data

4. Modelling Tunnels and Stopes

5. Digitizing Muck Assay Samples

6. Modelling Geologic Data

Next steps:

- Digitize drill hole data

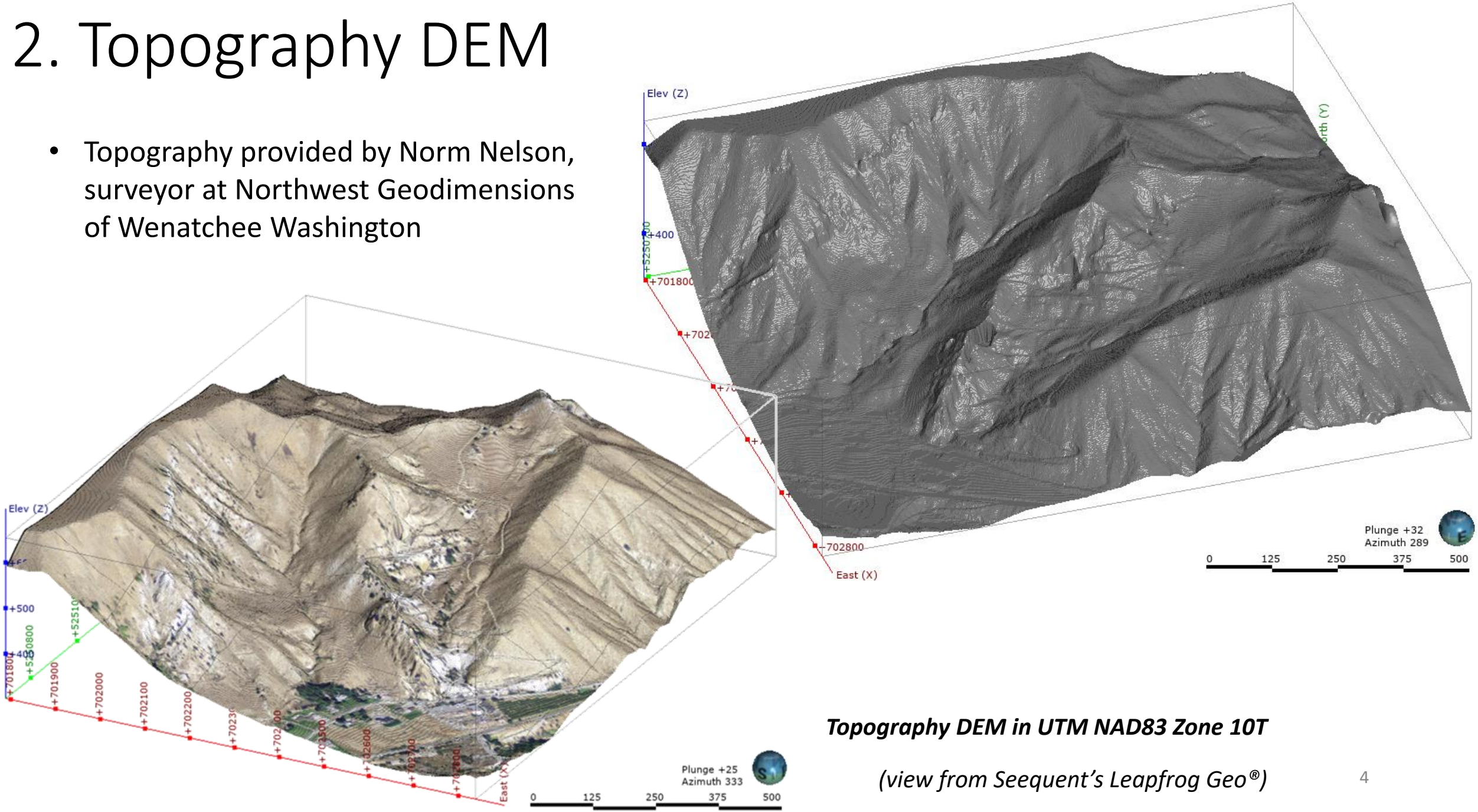
1. Data Catalogue: Level Plans and Sections

GROUP	YEAR	COMPANY	TYPE	HARD COPIES	DIGITAL FILES	UPDATED DIGITAL
OVERVIEW, SURFACE, AND MISCELLANEOUS MAPS				26 (16 scanned)	26	**42**
A	1949	Golden King Mine	Level Plan - Geology	1 (1 scanned)	1	**2**
B	1950	Golden King Mine	Level Plan – Geology & Assay Samples	7 (7 scanned)	3	**10**
C	1953	Lovitt Mining Co.	Cross Section - Overview	1 (1 scanned)	0	**1**
D	1954-1955	Lovitt Mining Co.	Level Plan – Overview, Drill Holes, Long Section & Cross Section – Drill Holes	12 (12 scanned)	3	**15**
E	1957-1964	Lovitt Mining Co.	Level Plan – Composite Plans & Sections, Cross Section – Drill Holes	11 (11 scanned)	3	**14**
F	1957	Lovitt Mining Co.	Level Plan – Assay Samples	2 (2 scanned)	42	**44**
G, H, I	1958-1961	Lovitt Mining Co.	Level Plan – Overview Long Section – Overview Cross Section – Overview	12 (10 scanned)	0	**10**
J	1958	Newmont Expl.	Level Plan – Geology, Cross Section – Geology	5 (5 scanned)	3	**8**
K	1960	Lovitt Mining Co.	Level Plan – Geology	4 (4 scanned)	17	**21**
L & M	1961-1966	Lovitt Mining Co.	Level Plan – Drill Holes	38 (24 scanned)	77	**101**
P, Q, R	1974-1975	Cyprus (Expl. or Mines Corp.)	Level Plan – Overview, Geology, & Assay Samples Cross Section – Geology	46 (33 scanned)	1	**34**
S	1983	United Mining Corp.	Level Plan – Drill Holes & Assay Samples	7 (5 scanned)	2	**7**
U, V, W, X	1986-1988	Asamera	Level Plan – Overview, Cross Section – Drill Holes	96 (81 scanned)	0	**81**
				268	**178**	**390**

** Note: "N and O" series (8 maps) not included as these are rough drafts*

2. Topography DEM

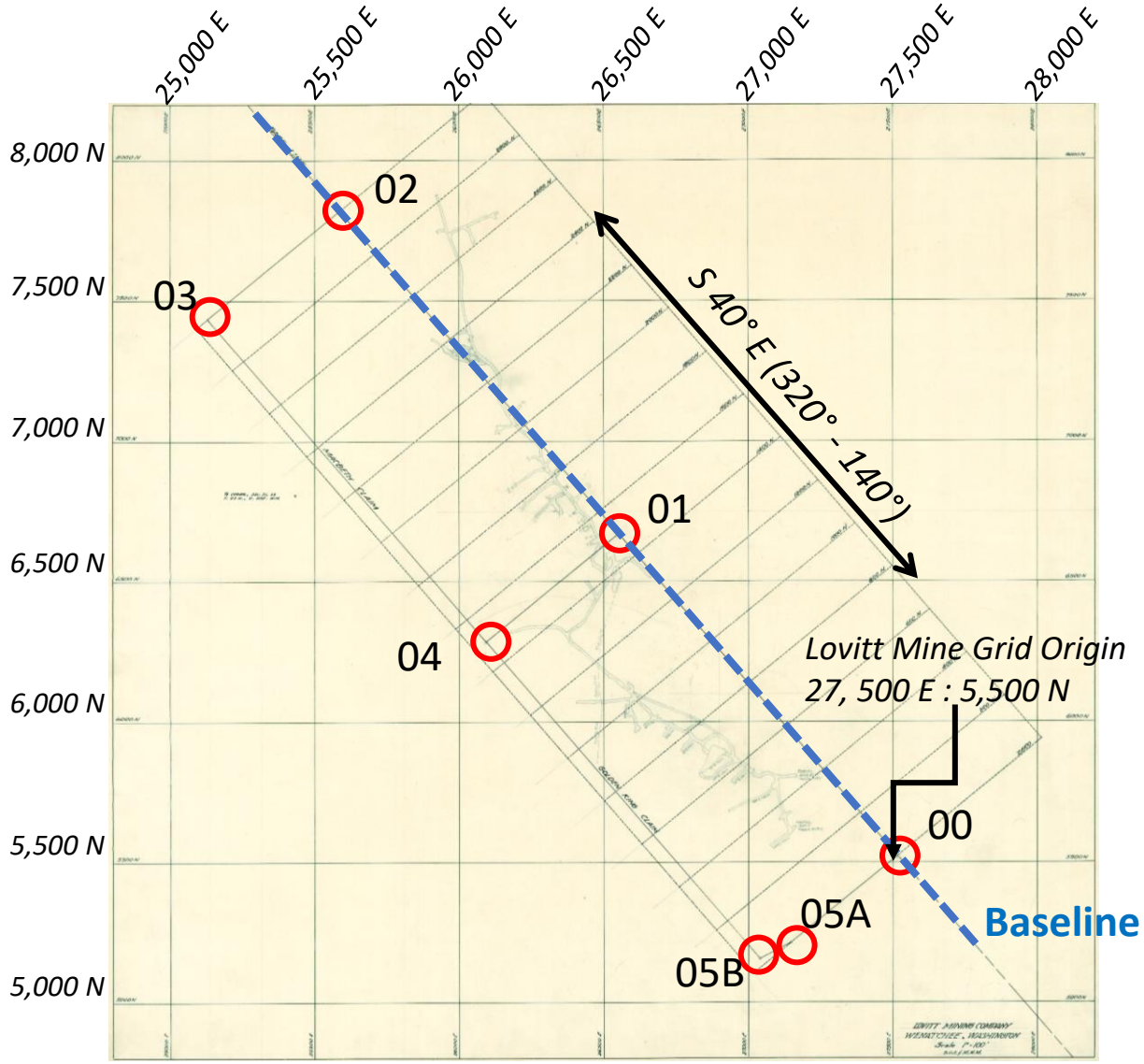
- Topography provided by Norm Nelson, surveyor at Northwest Geodimensions of Wenatchee Washington



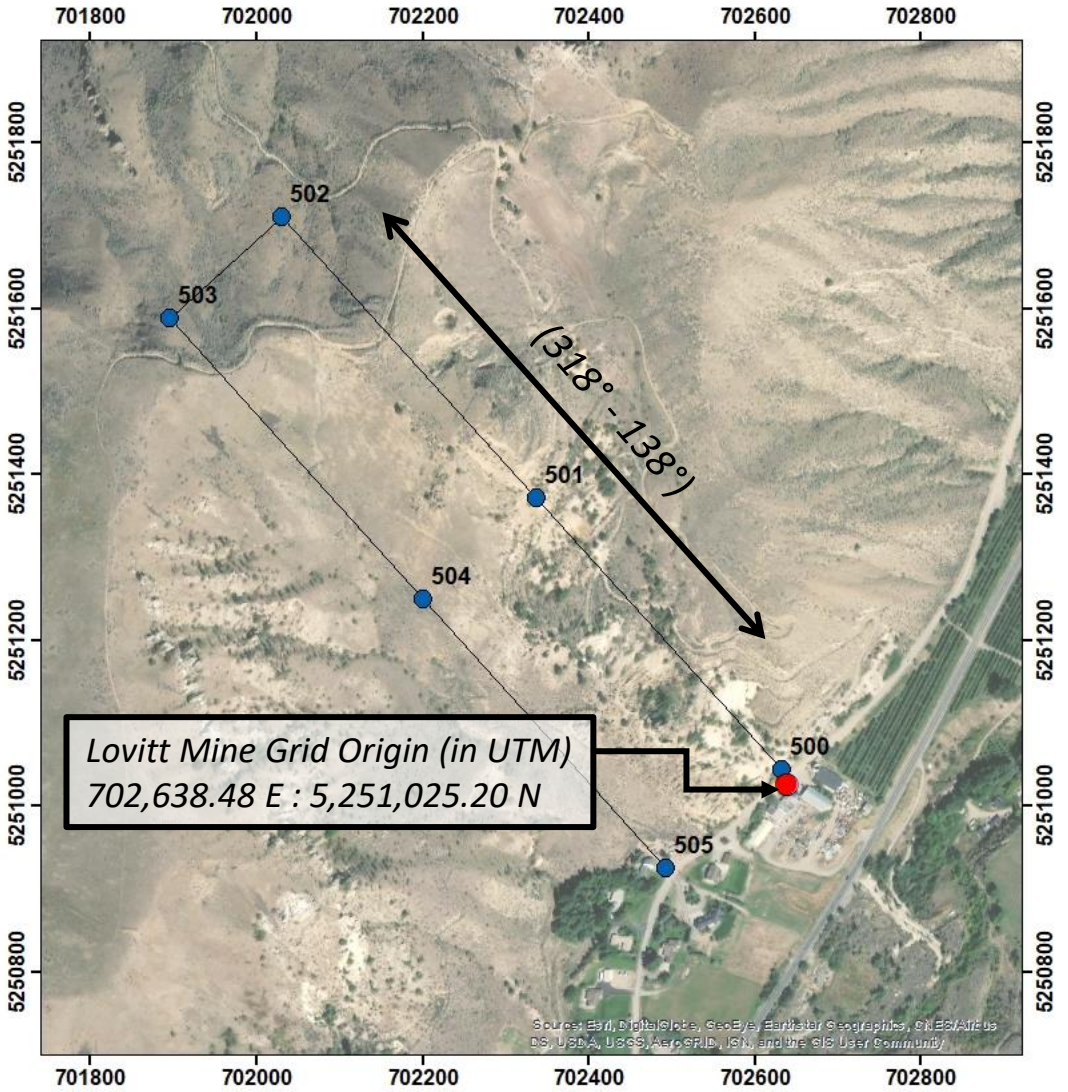
Topography DEM in UTM NAD83 Zone 10T

(view from Seequent's Leapfrog Geo®)

3. Spatial Conversion of Historical Data

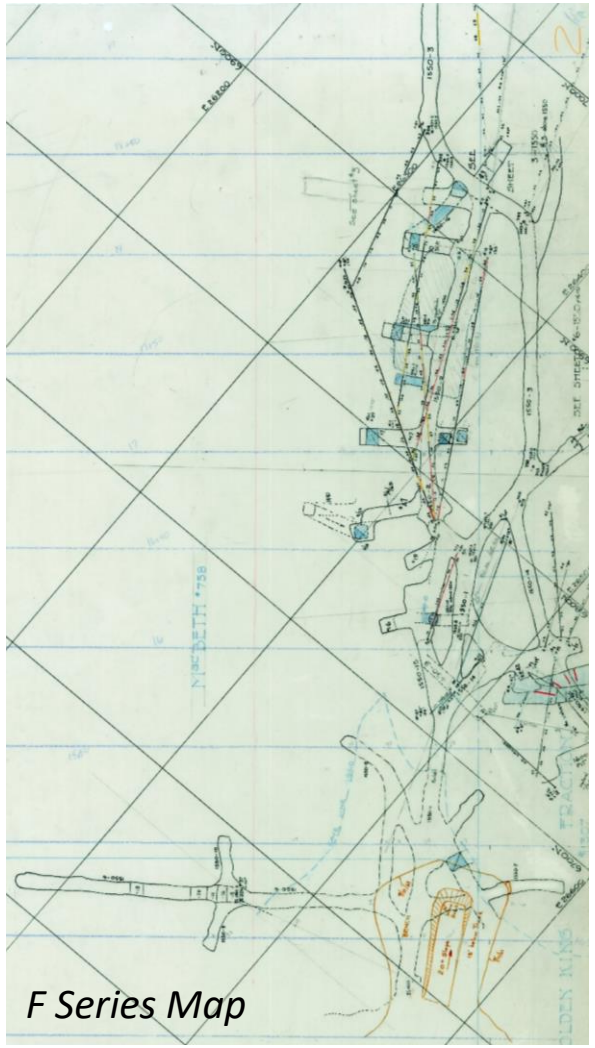


Lovitt Mine Grid

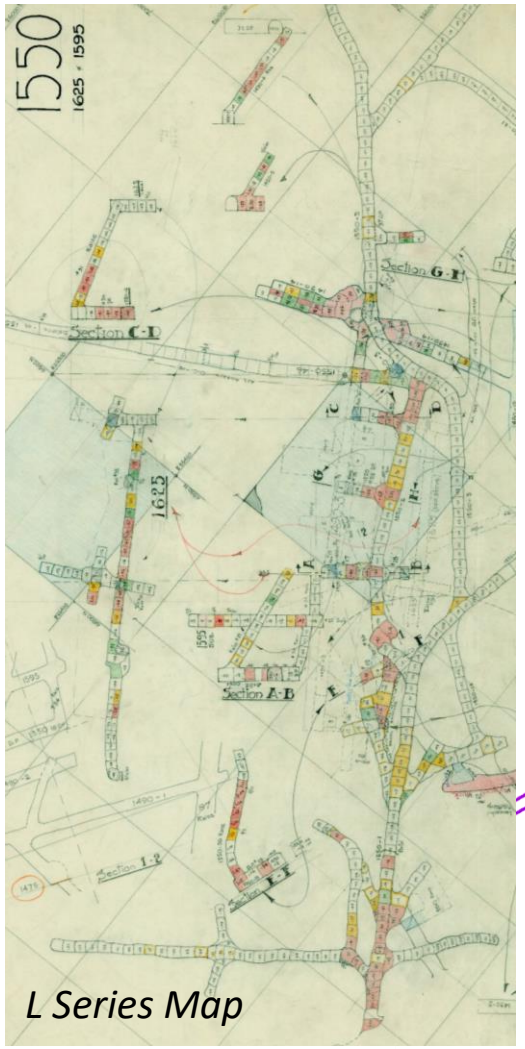


UTM NAD83 Zone10T

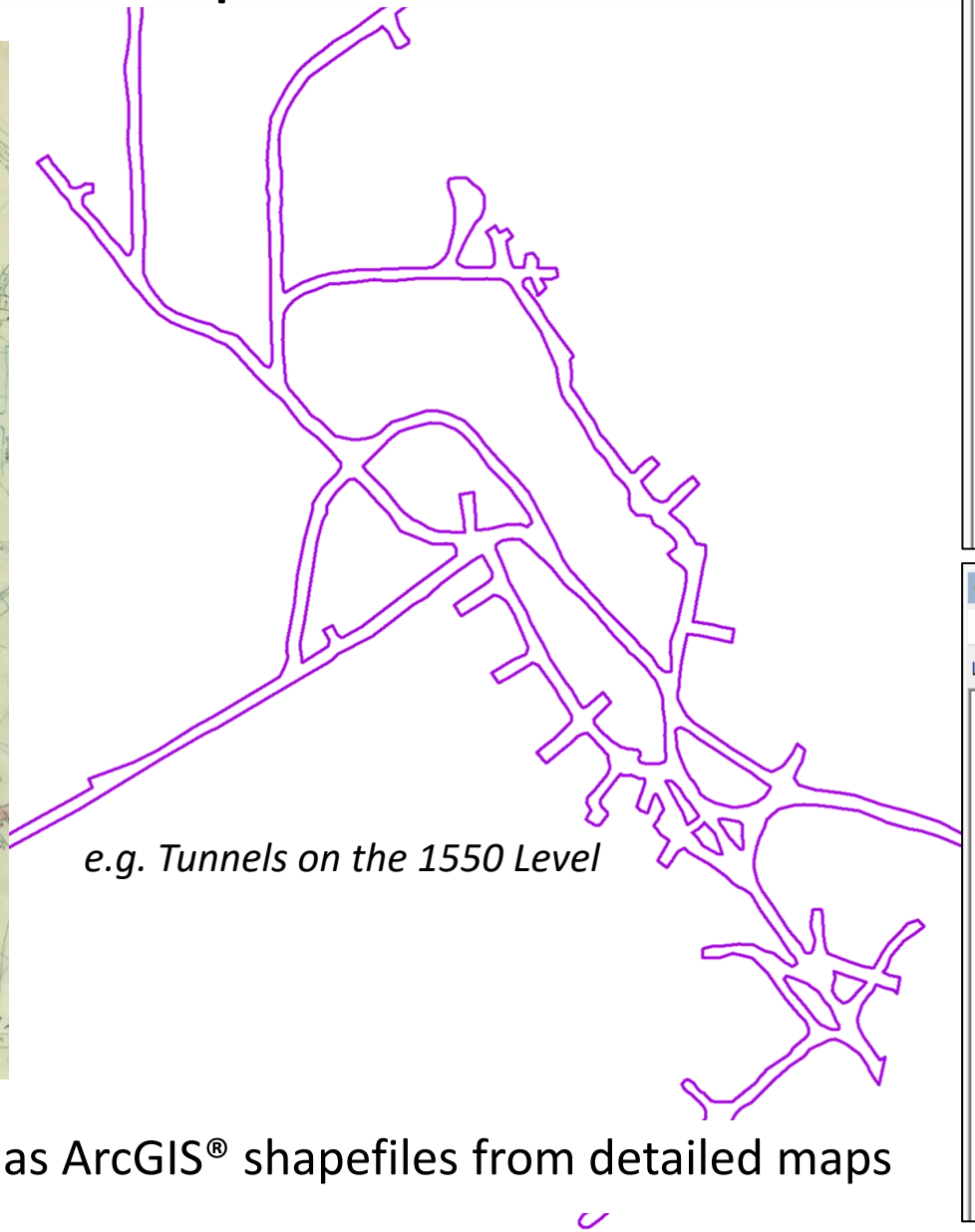
4. Modelling Tunnels and Stopes



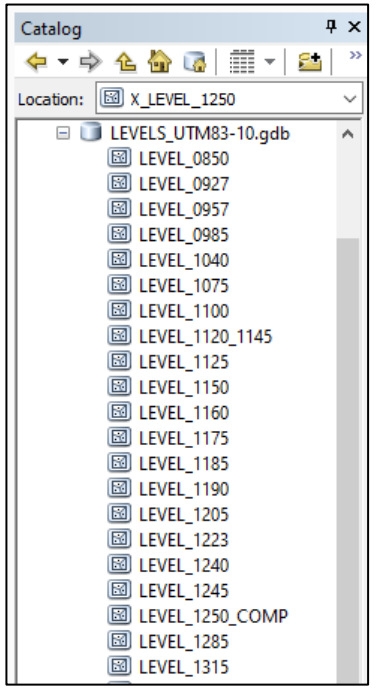
F Series Map

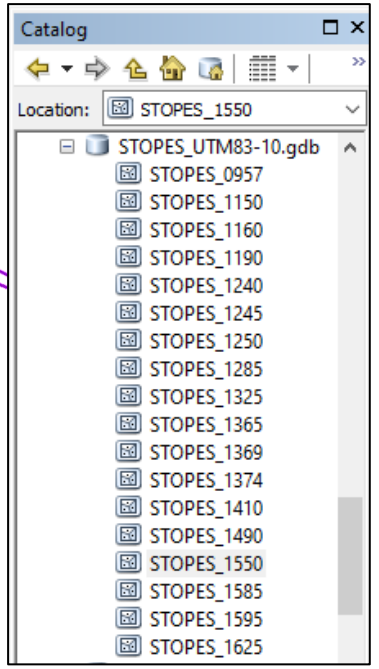


L Series Map



e.g. Tunnels on the 1550 Level

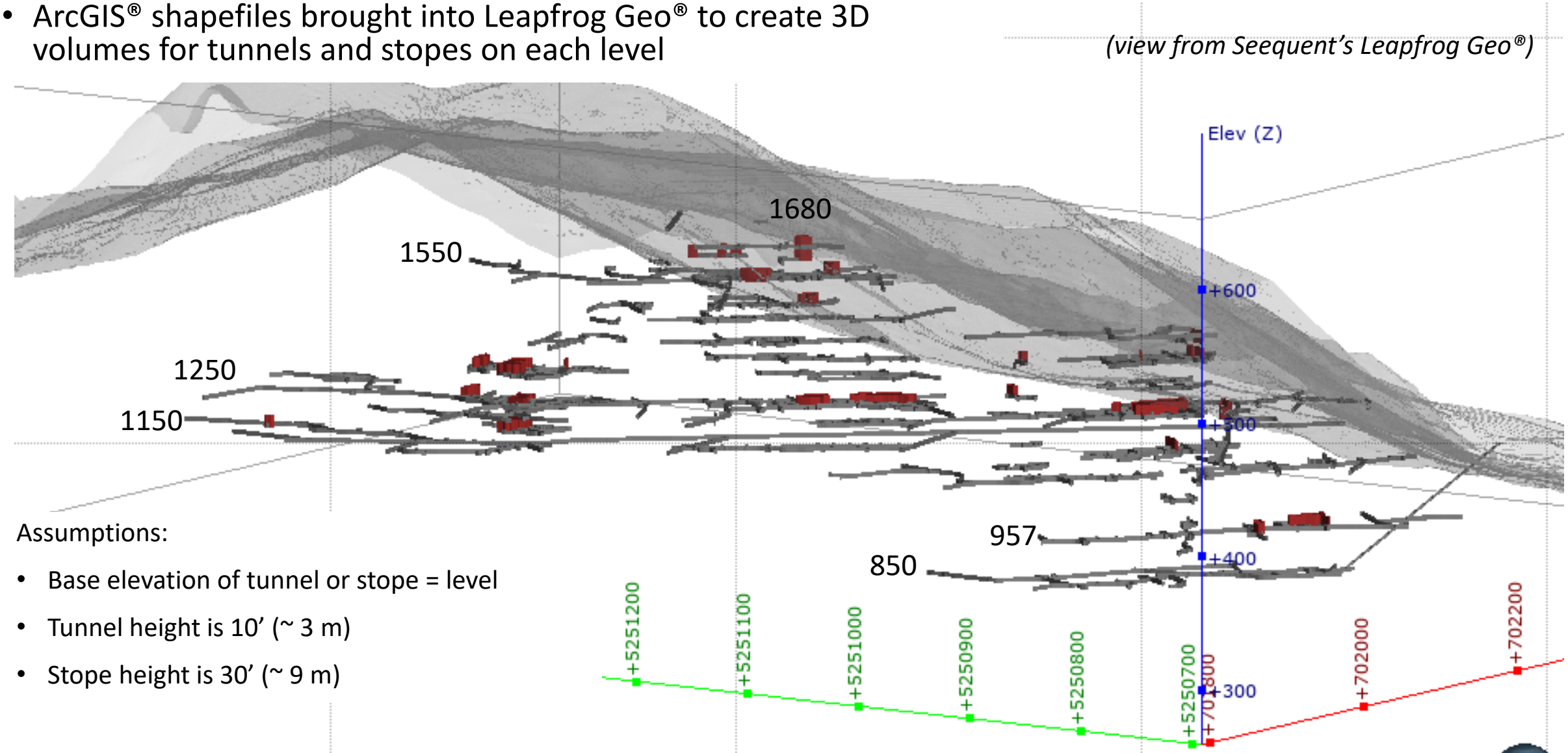




- Digitized underground tunnels (levels) and stopes as ArcGIS® shapefiles from detailed maps

- ArcGIS® shapefiles brought into Leapfrog Geo® to create 3D volumes for tunnels and stopes on each level

(view from Seequent's Leapfrog Geo®)



Assumptions:

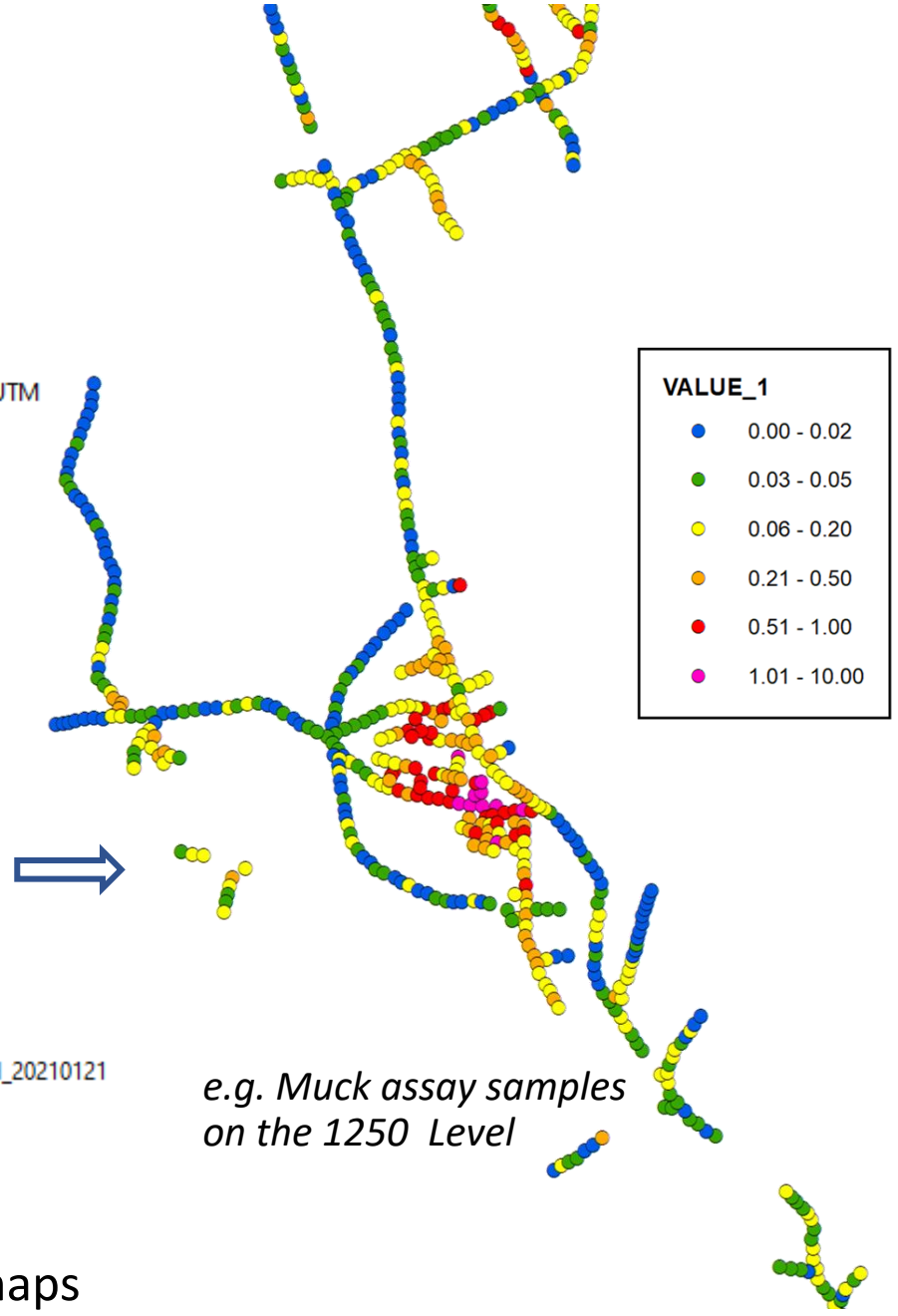
- Base elevation of tunnel or stope = level
- Tunnel height is 10' (~ 3 m)
- Stope height is 30' (~ 9 m)

Tunnels from 45 levels (850 – 1680' levels; or 259.08 – 512.06 m elevation; approximately 15.5 km or 9.67 mi)

Stopes on 18 levels (957 – 1625'; or 291.69 to 495.30 m elevation)

5. Muck Assay Samples

ASSAY_DATA_UTM83-10.gdb
- MuckSamples_Converted_to_UTM
- MuckSamples_UTM_0850LVL
- MuckSamples_UTM_0957LVL
- MuckSamples_UTM_1150LVL
- MuckSamples_UTM_1160LVL
- MuckSamples_UTM_1185LVL
- MuckSamples_UTM_1190LVL
- MuckSamples_UTM_1205LVL
- MuckSamples_UTM_1240LVL
- MuckSamples_UTM_1245LVL
- MuckSamples_UTM_1250LVL
- MuckSamples_UTM_1285LVL
- MuckSamples_UTM_1320LVL
- MuckSamples_UTM_1390LVL
- MuckSamples_UTM_1410LVL
- MuckSamples_UTM_1460LVL
- MuckSamples_UTM_1490LVL
- MuckSamples_UTM_1550LVL
- MuckSamples_UTM_1595LVL
- MuckSamples_UTM_1625LVL
- MuckSamples_UTM_Compiled_20210121

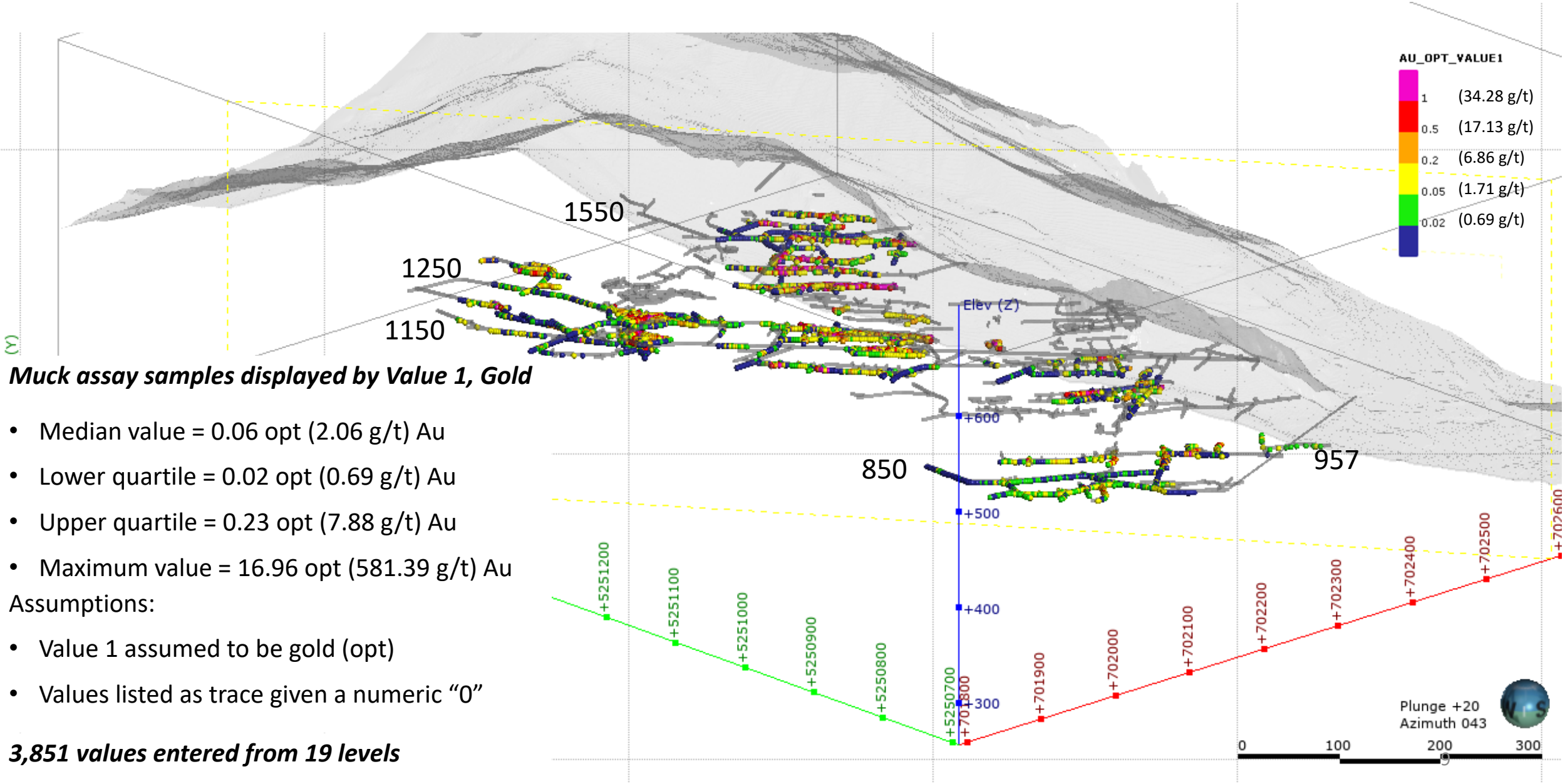


e.g. Muck assay samples on the 1250 Level

- Digitized muck assay samples as ArcGIS® shapefiles from L series maps

- ArcGIS® shapefiles compiled and brought into Leapfrog Geo®

(view from Seequent's Leapfrog Geo®)



Muck assay samples displayed by Value 1, Gold

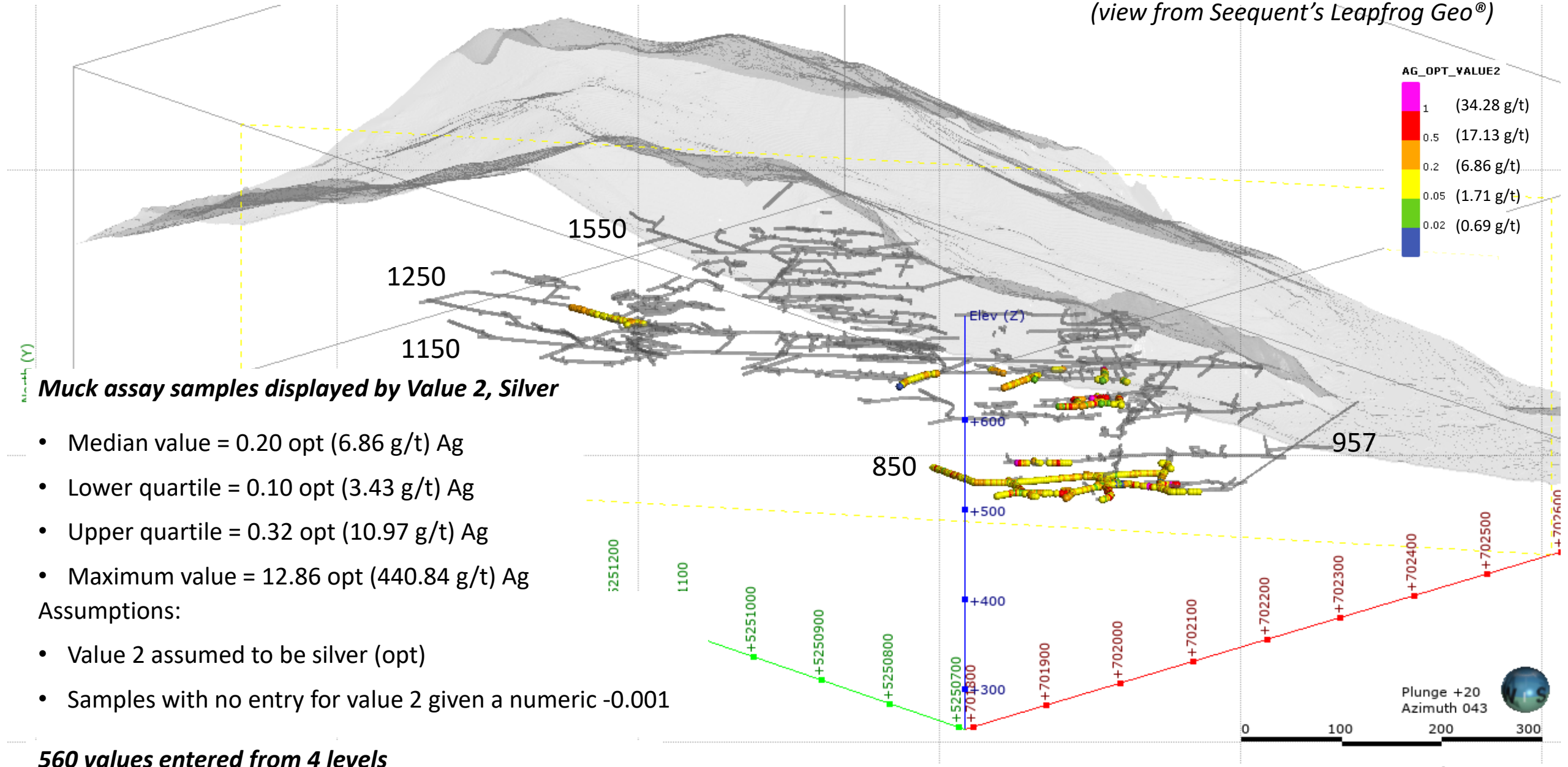
- Median value = 0.06 opt (2.06 g/t) Au
- Lower quartile = 0.02 opt (0.69 g/t) Au
- Upper quartile = 0.23 opt (7.88 g/t) Au
- Maximum value = 16.96 opt (581.39 g/t) Au

Assumptions:

- Value 1 assumed to be gold (opt)
- Values listed as trace given a numeric "0"

3,851 values entered from 19 levels

(view from Seequent's Leapfrog Geo®)



Muck assay samples displayed by Value 2, Silver

- Median value = 0.20 opt (6.86 g/t) Ag
- Lower quartile = 0.10 opt (3.43 g/t) Ag
- Upper quartile = 0.32 opt (10.97 g/t) Ag
- Maximum value = 12.86 opt (440.84 g/t) Ag

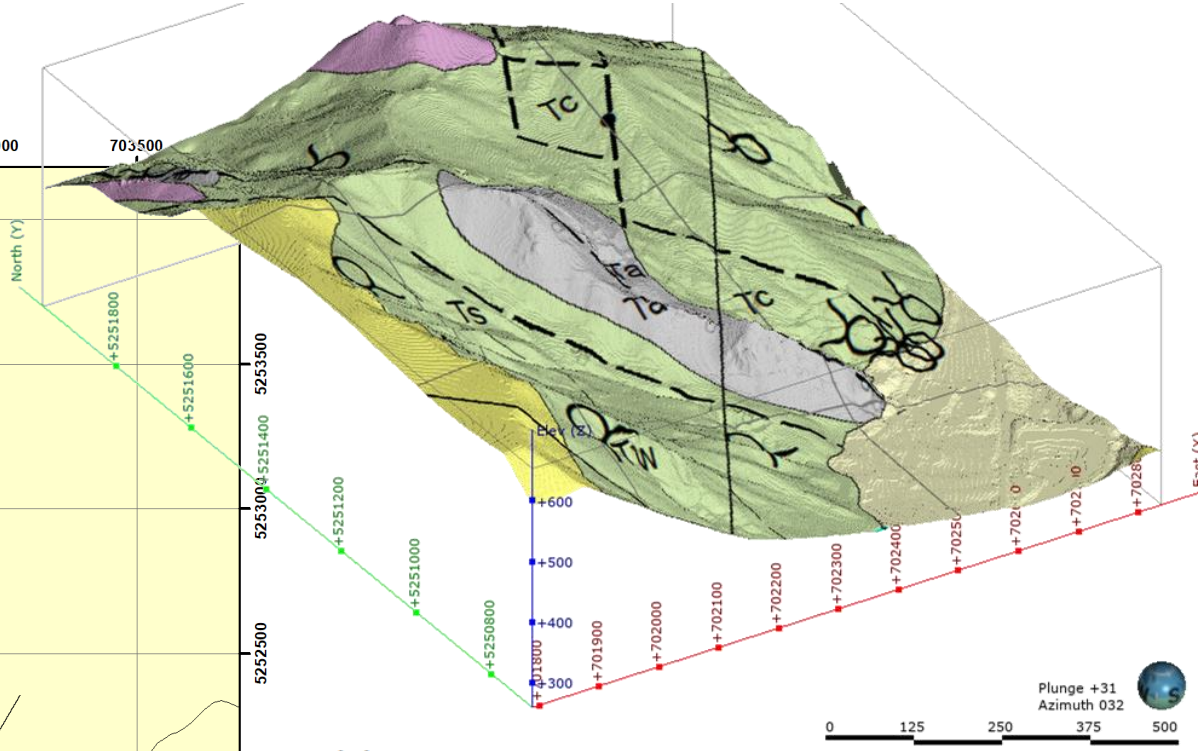
Assumptions:

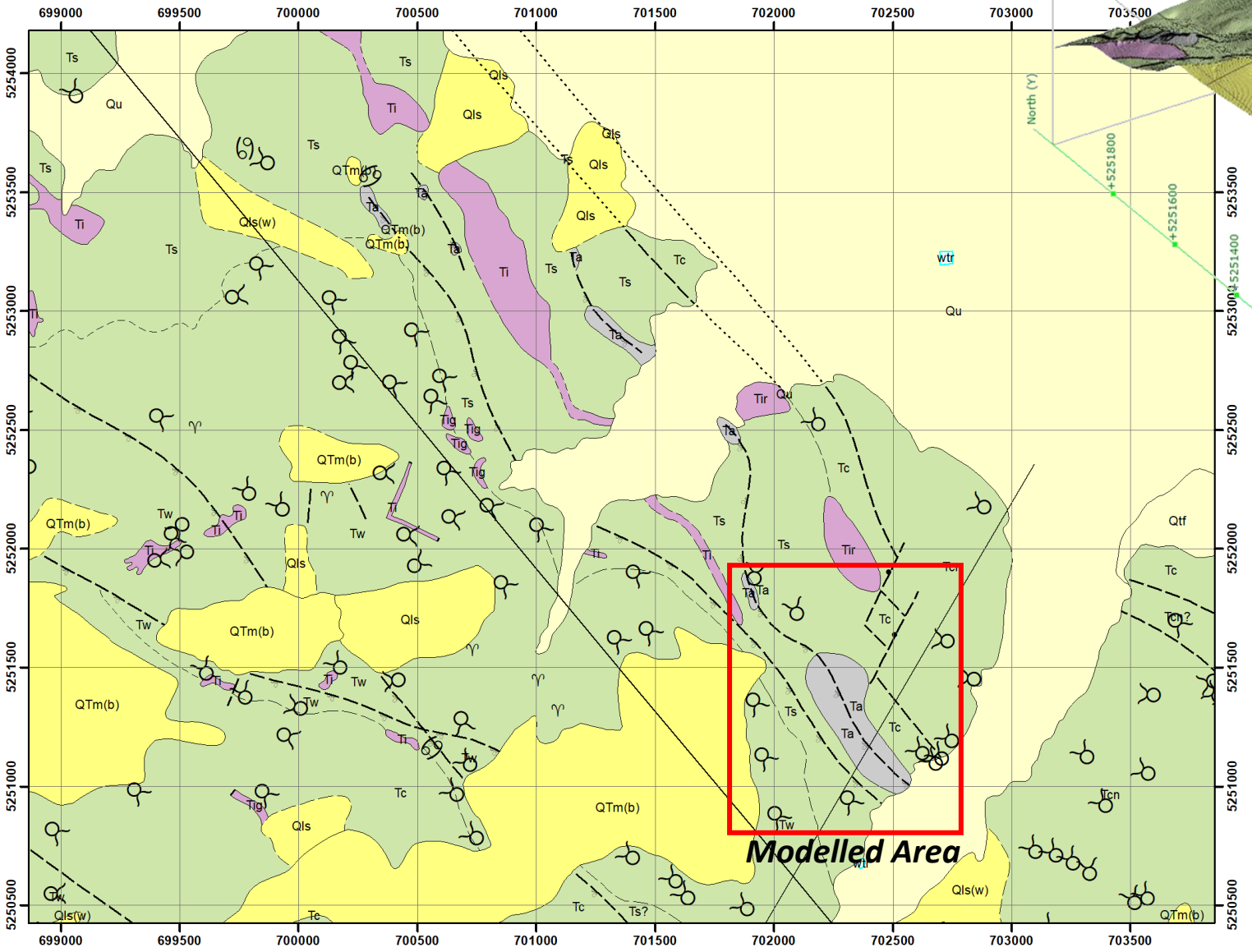
- Value 2 assumed to be silver (opt)
- Samples with no entry for value 2 given a numeric -0.001

560 values entered from 4 levels

6. Modelling Geologic Data

(view from Seequent's Leapfrog Geo®)





(ArcGIS® map)

Bedding, showing strike and dip

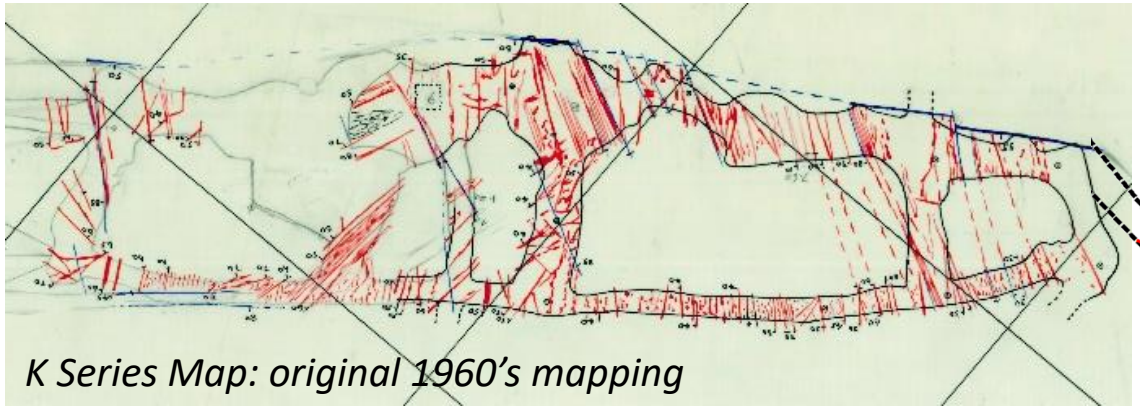
Fault

Qu	Quaternary; alluvium
Ta	Tertiary; alluvium
Ti (ir)	Tertiary; intrusive undifferentiated (rhyolite)
Tc (cn)	Tertiary; continental sedimentary rocks (near shore continental sedimentary rocks)

Washington State Department of Natural Resources, Washington Geological Survey

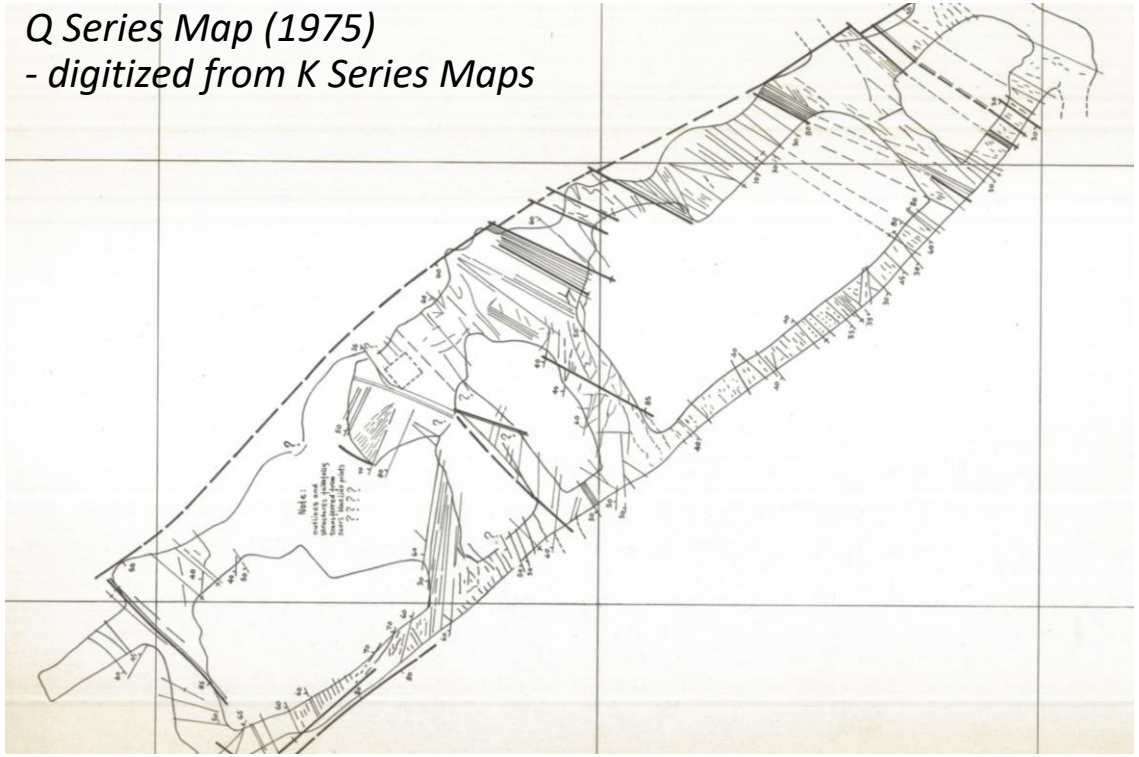
1:24,000-scale geologic mapping database, Nov. 2019

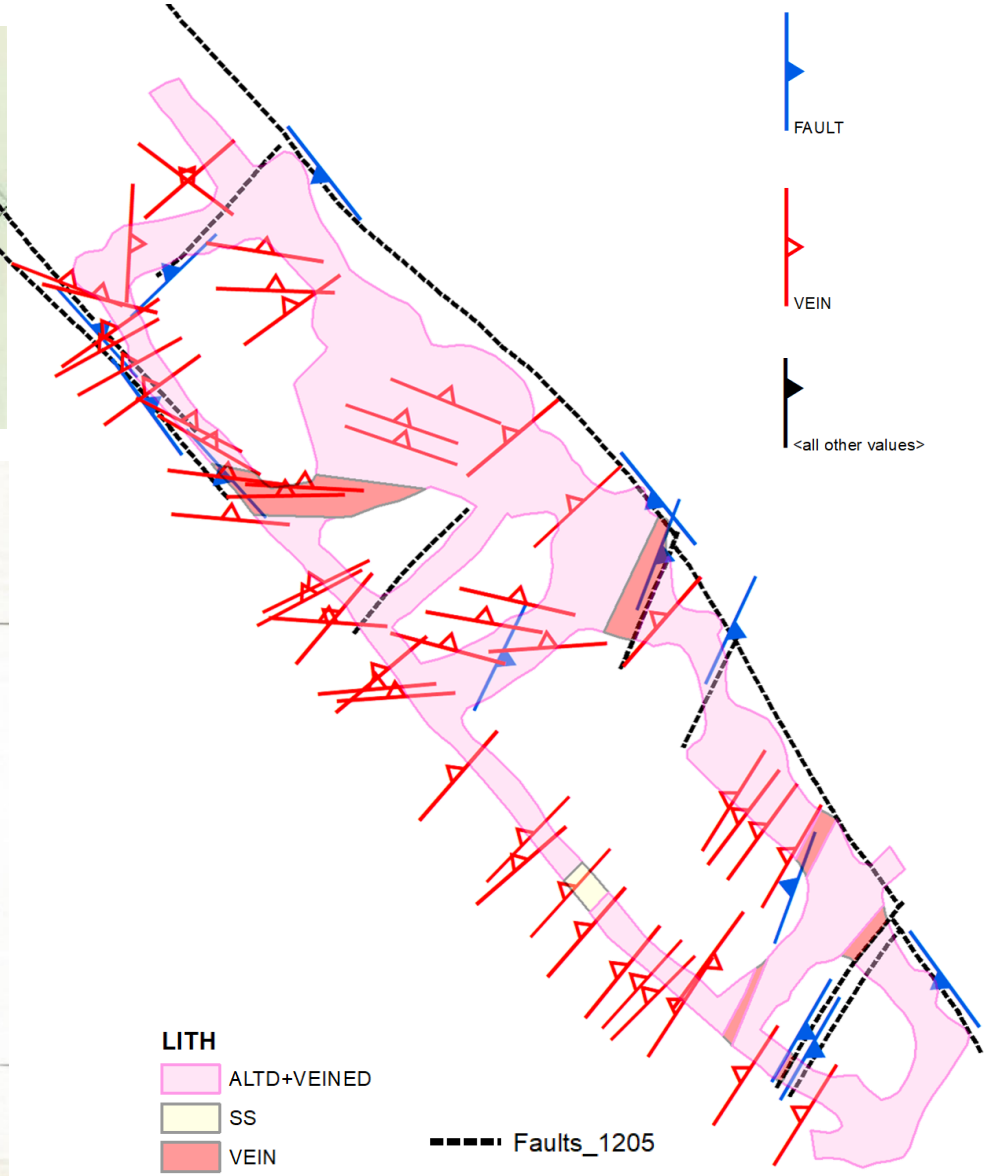
- Digitized lithology, structure and veins as ArcGIS® shapefiles from detailed UTM NAD83 georeferenced maps

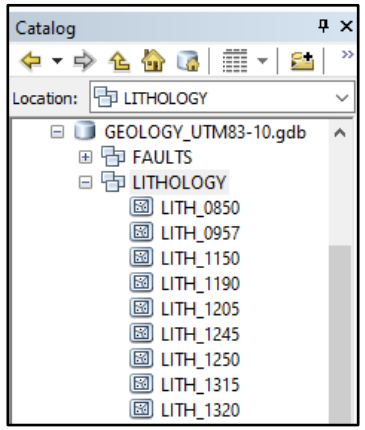


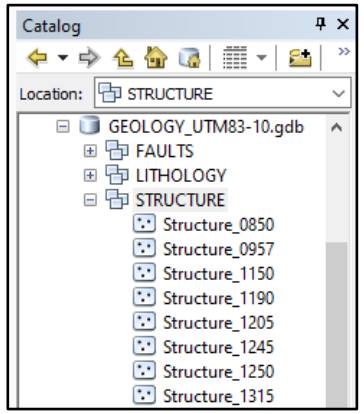
K Series Map: original 1960's mapping

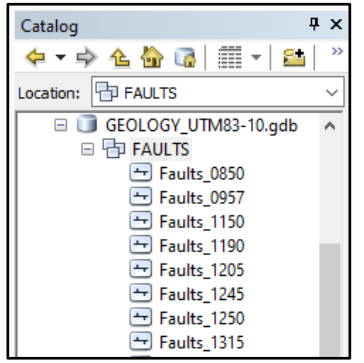
Q Series Map (1975)
- digitized from K Series Maps





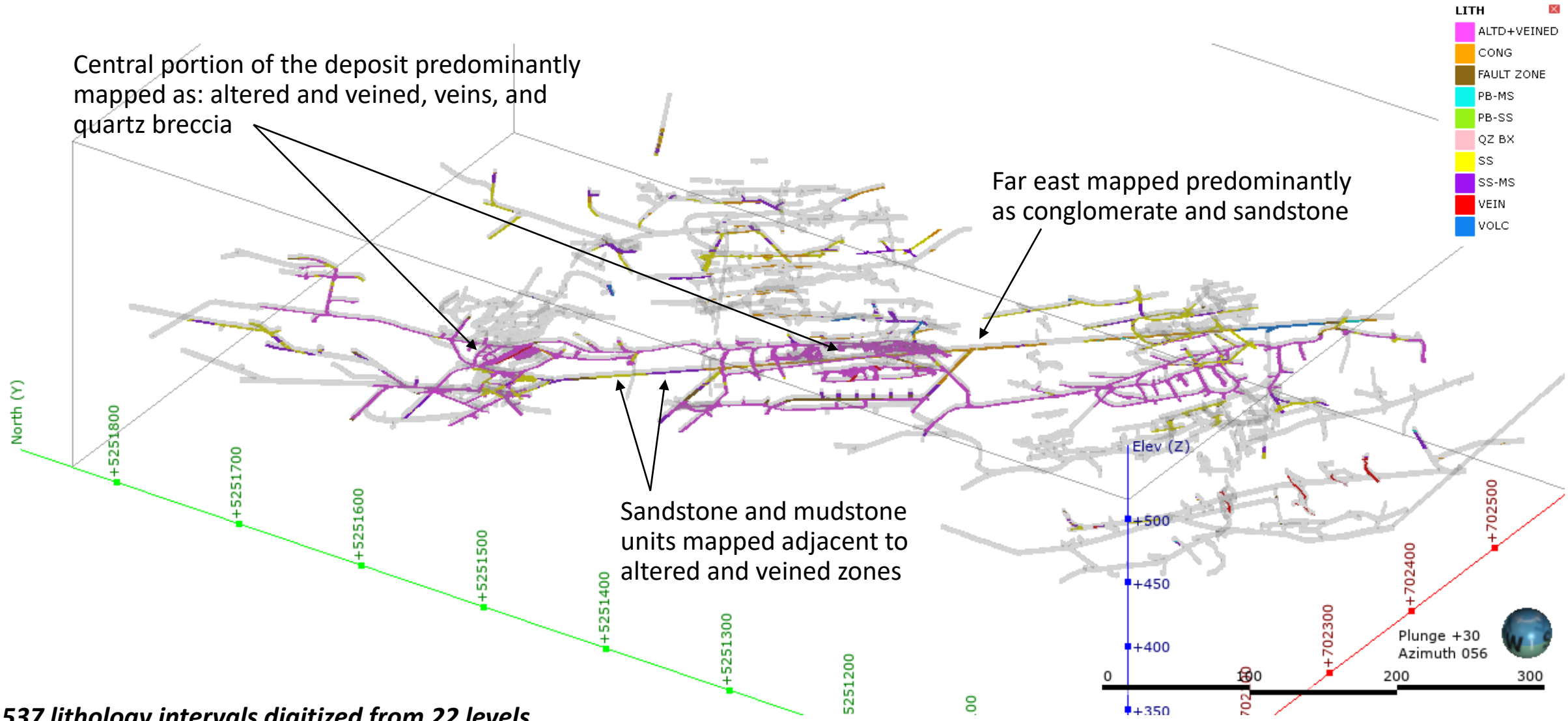






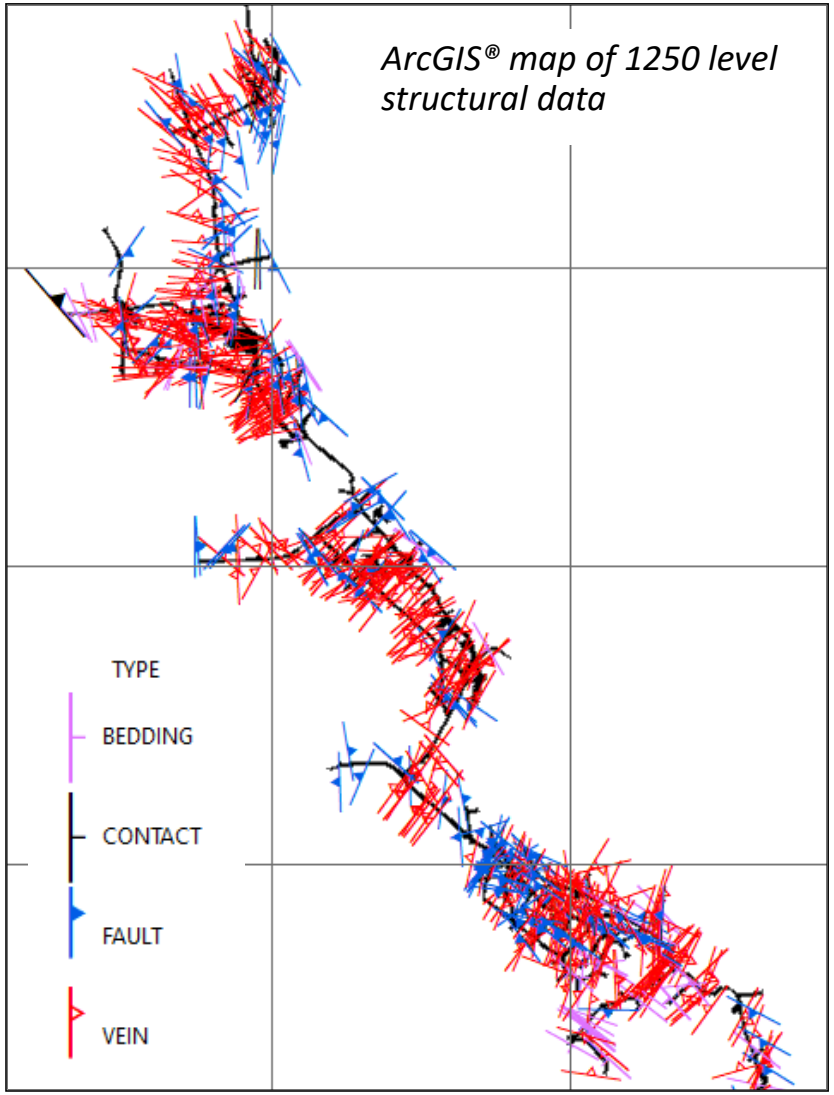
- Lithology ArcGIS® shapefiles brought into Leapfrog Geo®

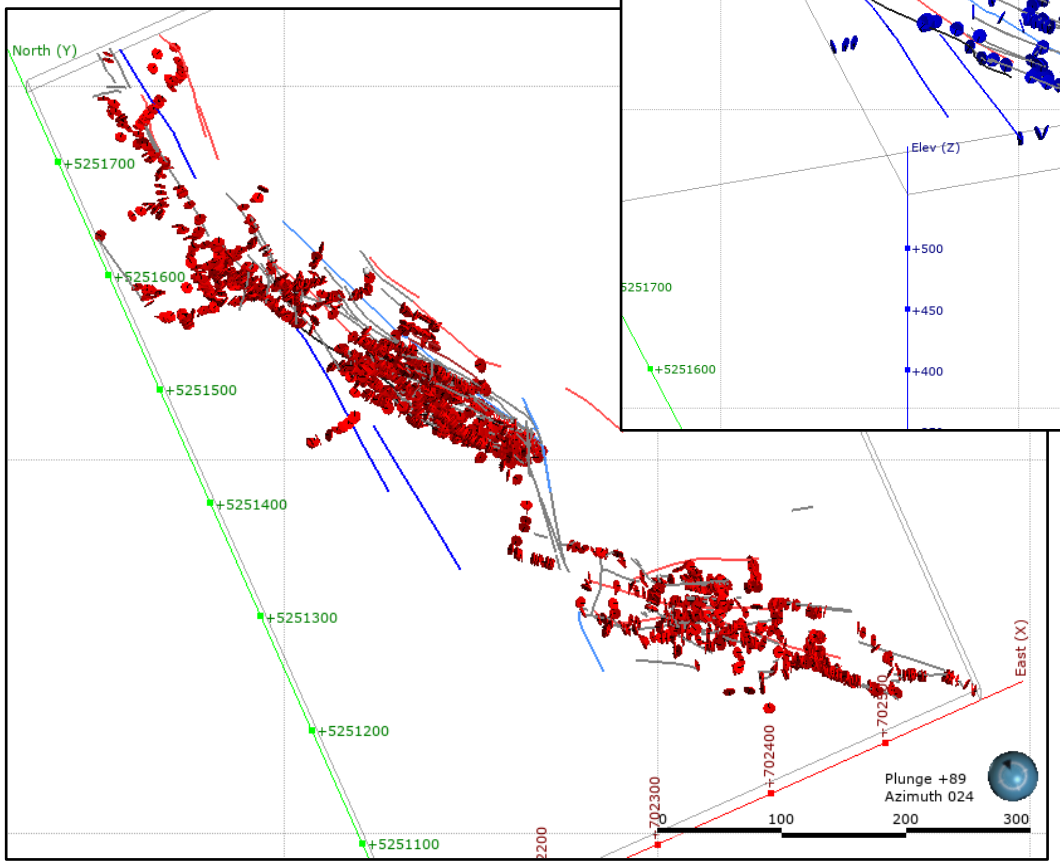
Leapfrog 3D view of lithology data

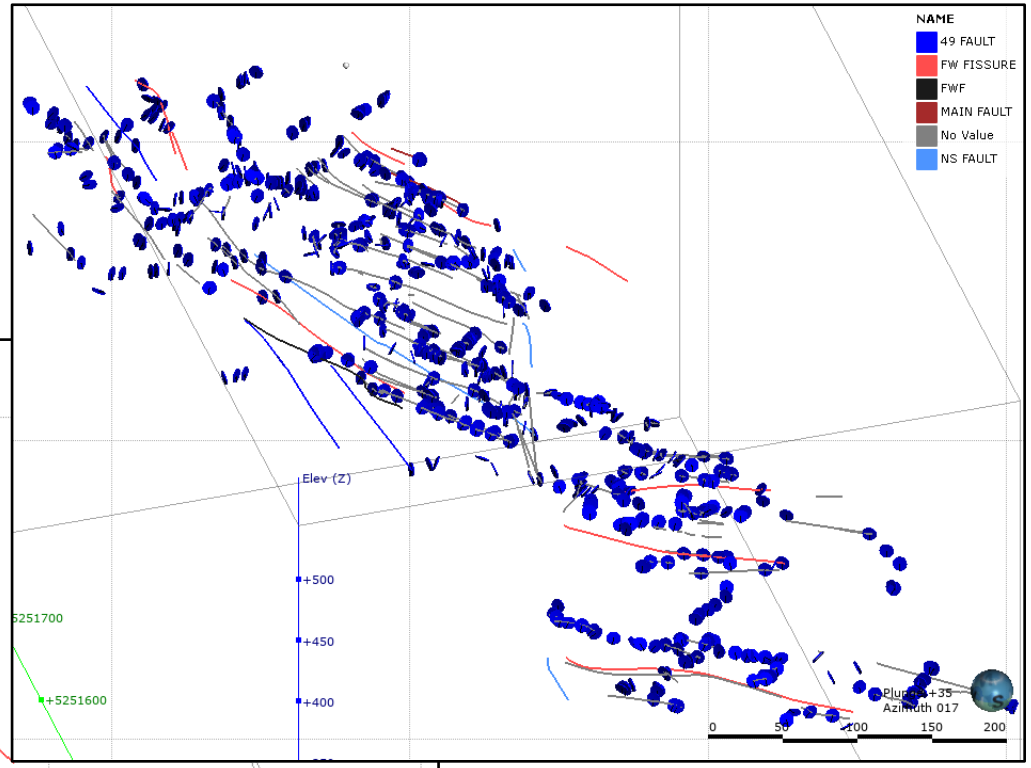


537 lithology intervals digitized from 22 levels

- Structural ArcGIS® shapefiles brought into Leapfrog Geo®



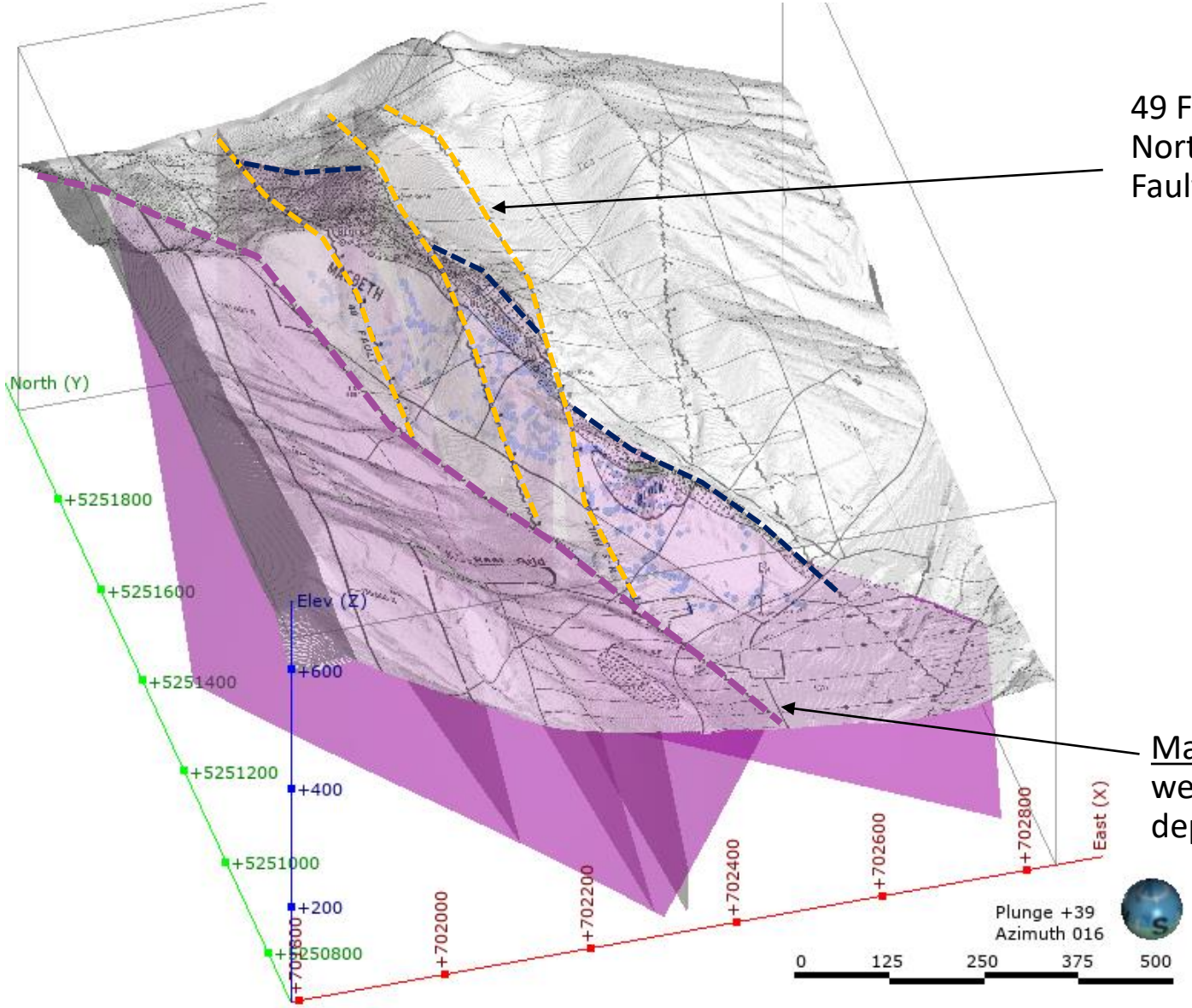




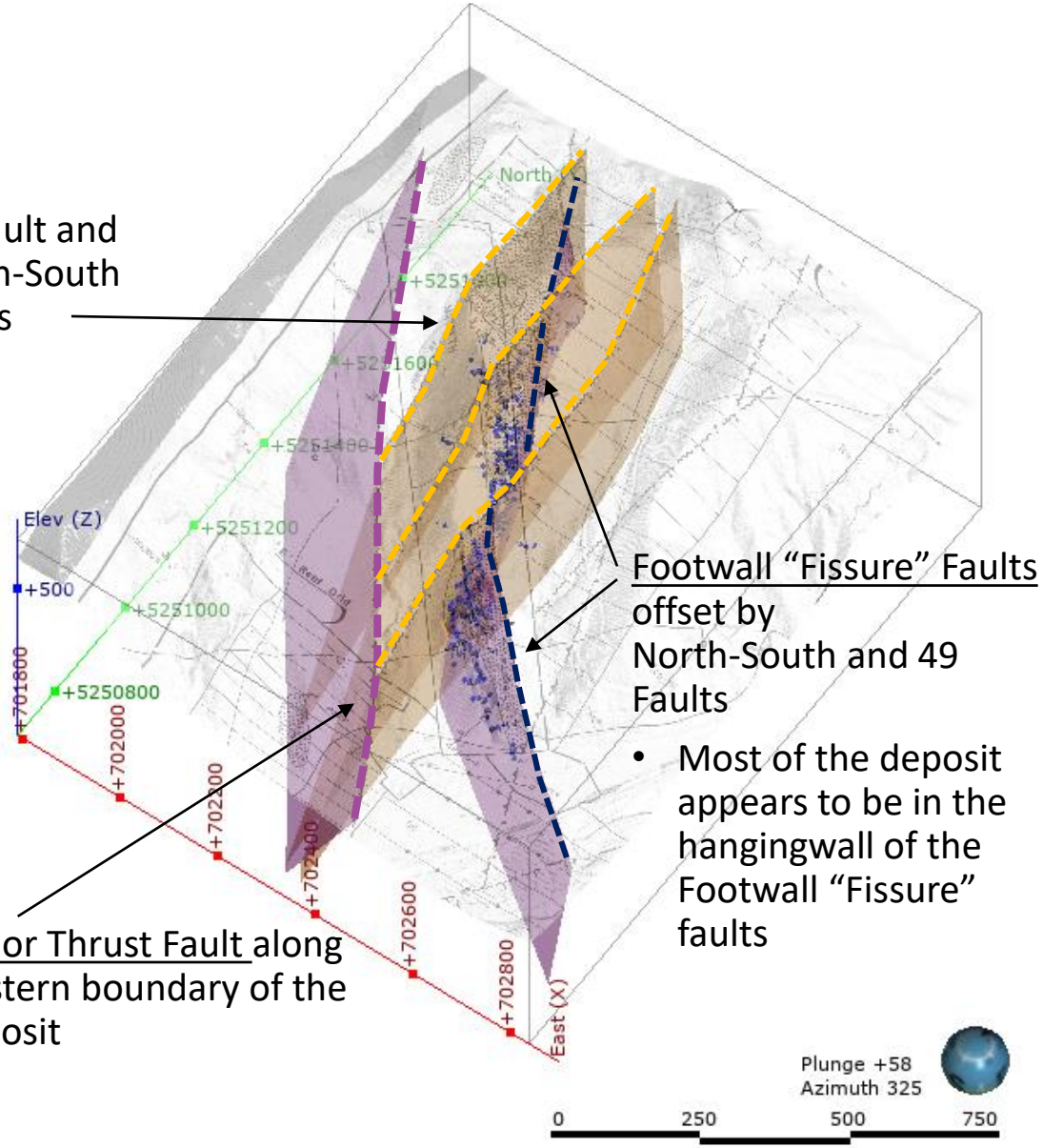
Leapfrog® 3D views of digitized structures showing faults and fault point data (above) and vein data (left)

2,240 structural data points, including veins, faults, bedding, and contacts digitized from 24 levels

- Modelled major faults by selecting fault data points



49 Fault and North-South Faults



Major Thrust Fault along western boundary of the deposit

Footwall "Fissure" Faults offset by North-South and 49 Faults

- Most of the deposit appears to be in the hangingwall of the Footwall "Fissure" faults

Leapfrog® 3D views of modelled faults

Recommendations:

1. Validate the conversion of the Lovitt Mine Grid to UTM NAD83 Zone 10T
    - Engage a professional land surveyor to review the conversion from mine grid
    - Survey control points across the property
2. Digitize drill hole data
    - Digitize drill hole data from ~101 historical maps
    - Estimate ~ 101 hours of work
    - Compilation in a drill hole database
3. Validate the geologic data by completing a surface mapping program
    - Validate historical lithologies and focus on stratigraphic marker units
    - Initial 5 to 10 day field mapping program
4. Engage a mining engineer to refine the stope model
5. Engage a structural geologist to complete a structural review of the property using digitized structural data. This may also require a field mapping program.