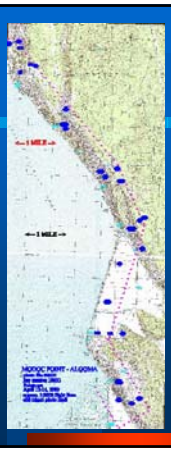
MILLION POINT DTM

ODOT GEOMETRONICS
Modoc Point - Algoma
LIDAR mapping

Modoc



- 300 meter high hillside
- mapping along roadway
- dtm along roadway
- dtm of rockfall areas
- difficult access on top

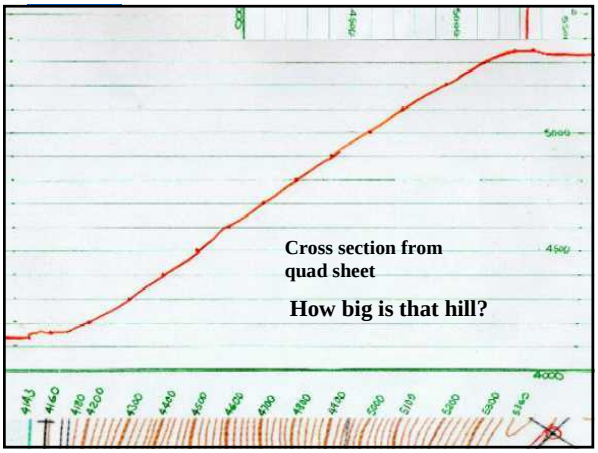
- We chose LIDAR with added photogrammetric breaklines for the dtm.

LIDAR creates DTMs

- Light Detection And Ranging
- Used to map large areas from 8000'
- Point accuracy 15 cm ±
- Random placement of points
- Multiple returns (trees, brush, ground)

FOR MORE INFO...

http://www.sbgmaps.com/lidar.htm

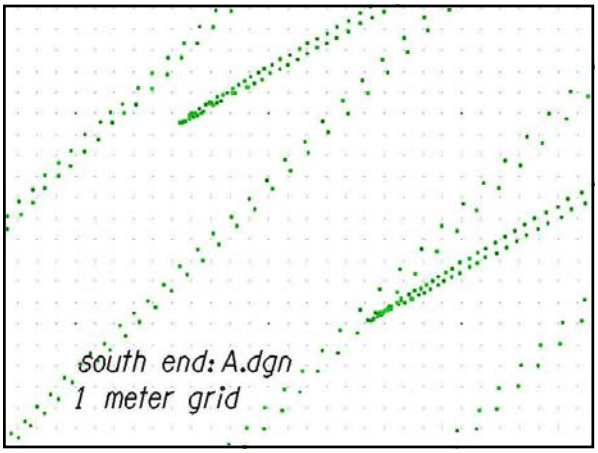


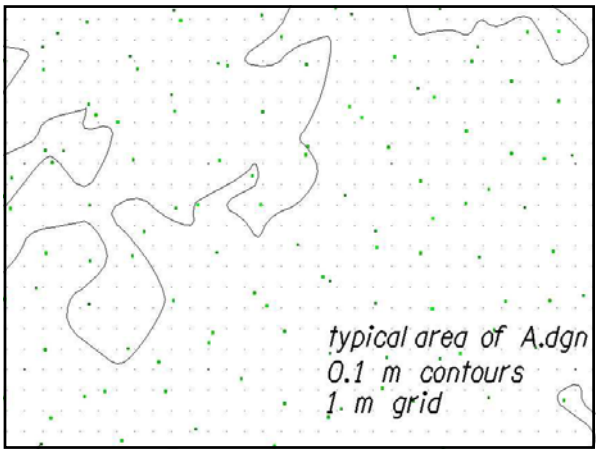
LIDAR DATA delivery

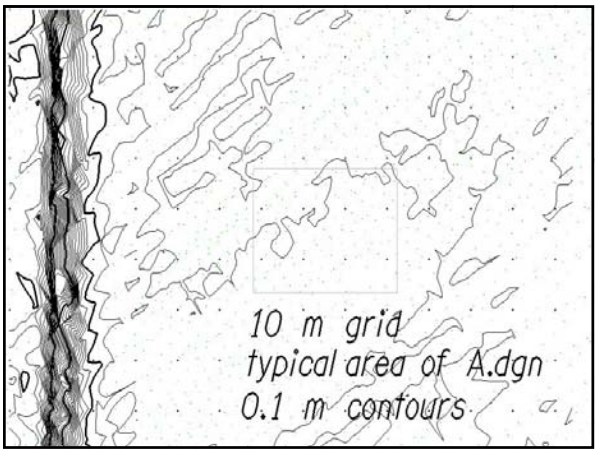
- 19 Microstation Design files
- 101 mb of data
- 1,100,000 xyz coordinates
- If we spend 10 seconds on each point, it would take 78 weeks, or 1.5 years of uninterrupted work.

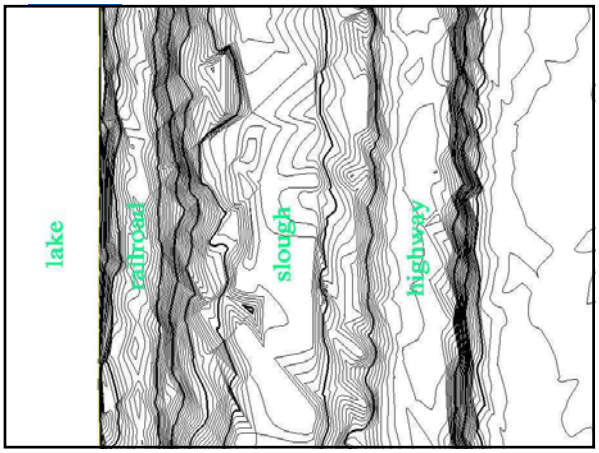
DATA ANALYSIS

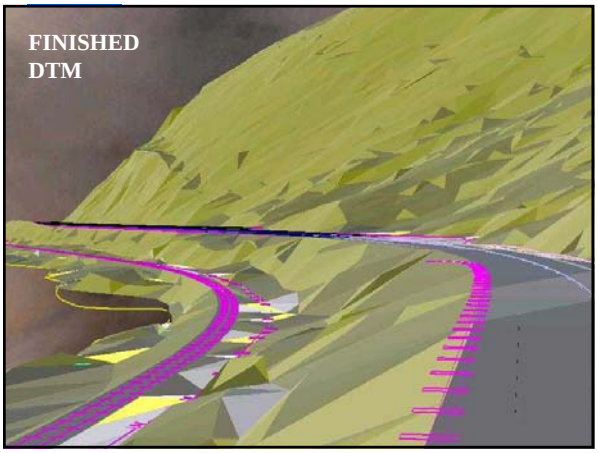
- Look at the points in Microstation
- Load Inroads DTM
- View Contours
- View triangles
- Compare to other mapping

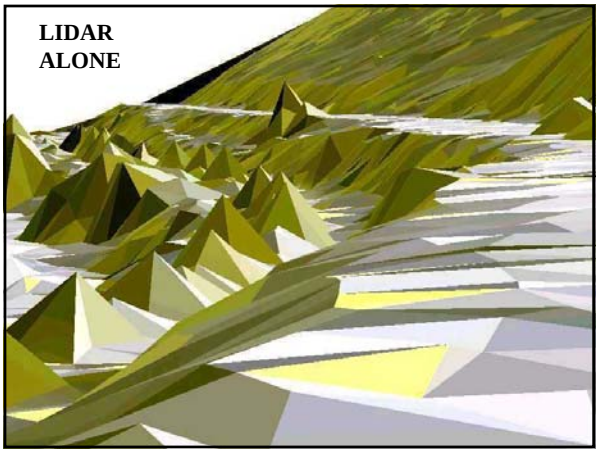


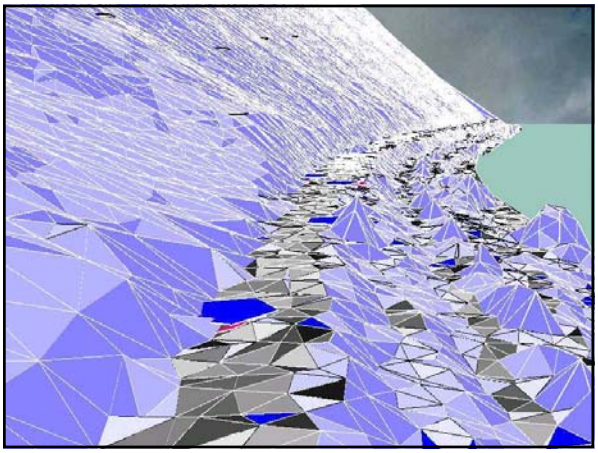

typical area of A.dgn
0.1 m contours
1 m grid

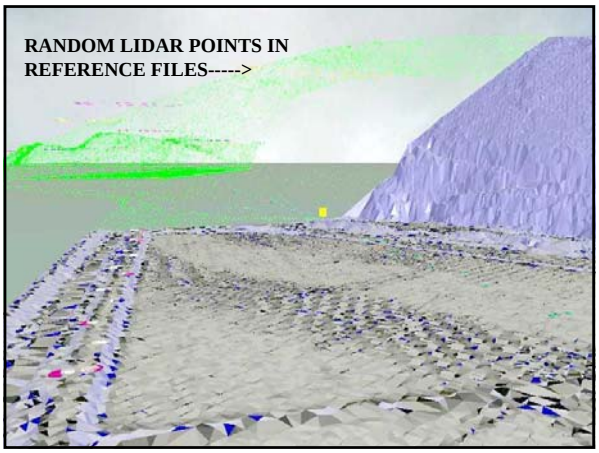

10 m grid
typical area of A.dgn
0.1 m contours

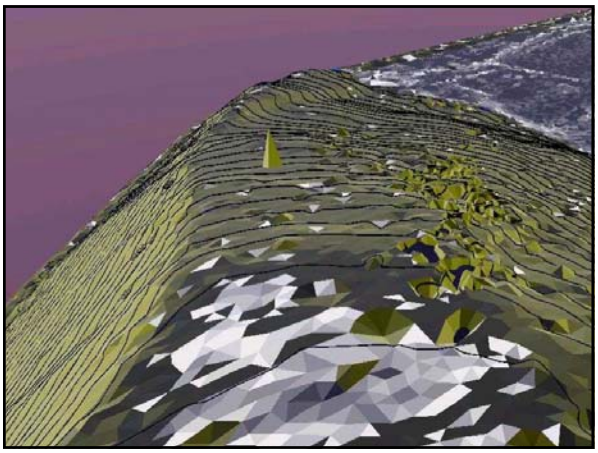

lake
railroad
slough
highway


FINISHED
DTM


LIDAR
ALONE





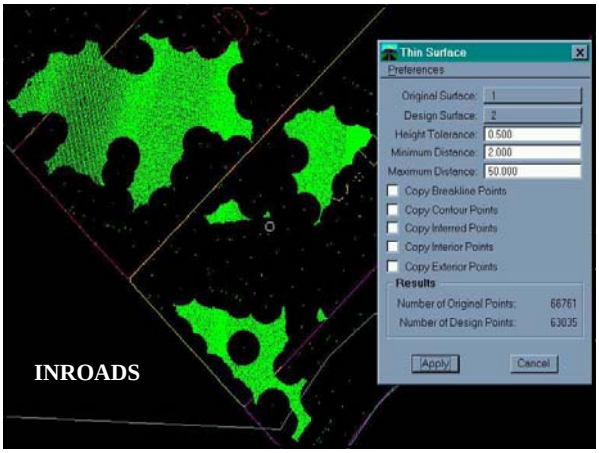


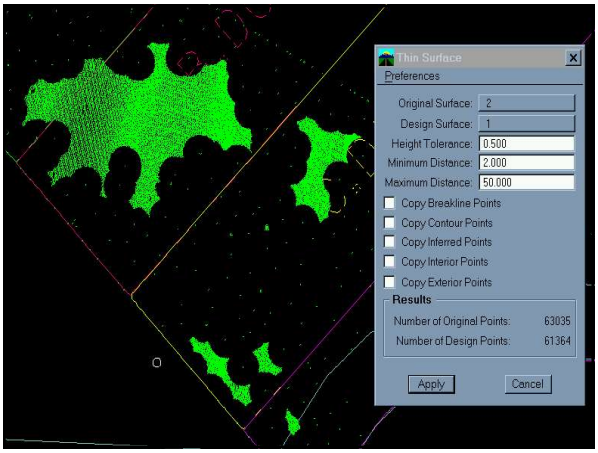
THINNING THE DATA

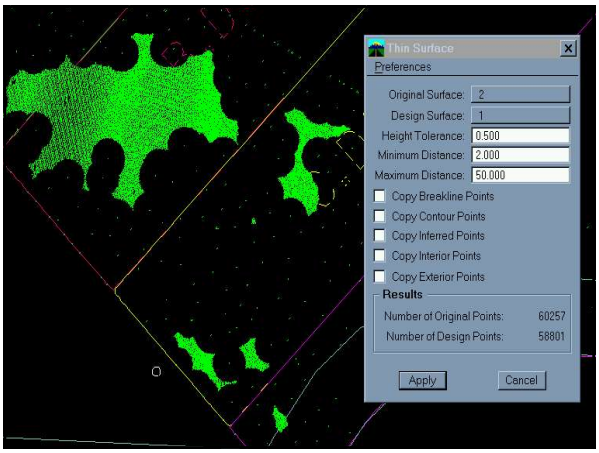
1,100,00 points to 114,000
Inroads Thinning
Liscad Thinning

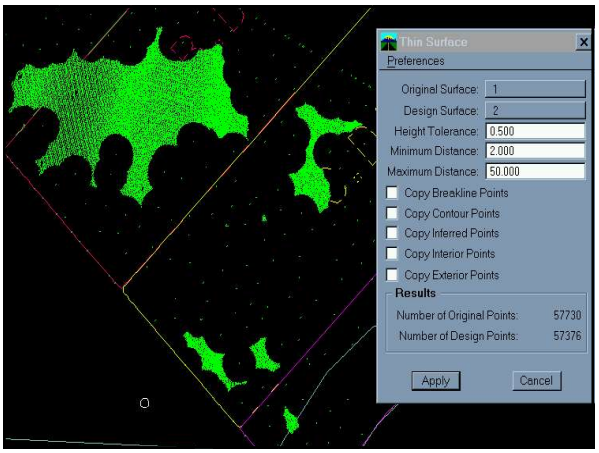
THINNING THE DATA

1,100,00 points
Inroads Thinning
Liscad Thinning
stereoplotter observations



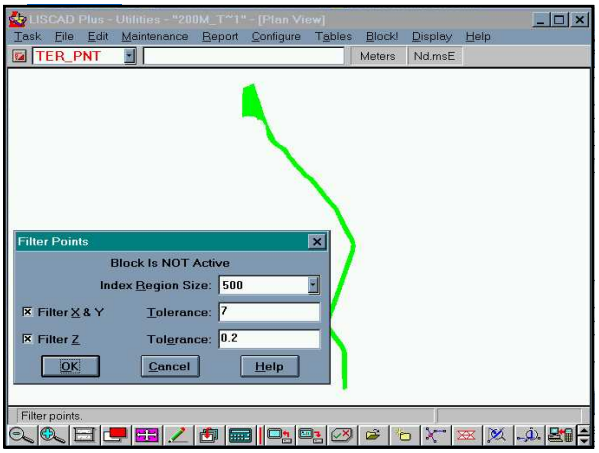






LISCAD THINNING

Near the roadway	xy 7m, z 0.2
Up the slope	xy 9m, no z
Steep areas	xy 5m, z 0.3



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1869	1390818.154	76179.419	0.000	sys1961	1390818.685	76171.601	0.000
1870	1390812.255	76163.263	0.100	sys1962	1390816.168	76170.419	0.482
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1880	1390810.064	76167.402	0.000	sys1972	1390795.579	76143.854	-0.104
1881	1390808.899	76174.488	-0.063	sys1973	1390796.094	76144.232	-0.067
1882	1390810.024	76167.995	0.000	sys1974	1390794.995	76144.473	0.000
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1885	1390804.340	76160.721	0.291	sys1977	1390796.824	76144.997	0.000
1886	1390806.118	76160.477	0.453	sys1978	1390794.602	76151.390	0.412
1887	1390805.722	76161.870	0.263	sys1979	1390798.471	76146.722	0.152
1888	1390794.376	76162.089	0.777	sys1980	1390791.449	76149.699	0.706
1889	1390797.123	76161.712	0.728	sys1981	1390798.844	76147.113	0.141
1890	1390794.443	76162.905	0.595	sys1982	1390798.767	76153.468	0.252
1891	1390801.796	76161.071	0.000	sys1983	1390799.613	76147.918	0.000
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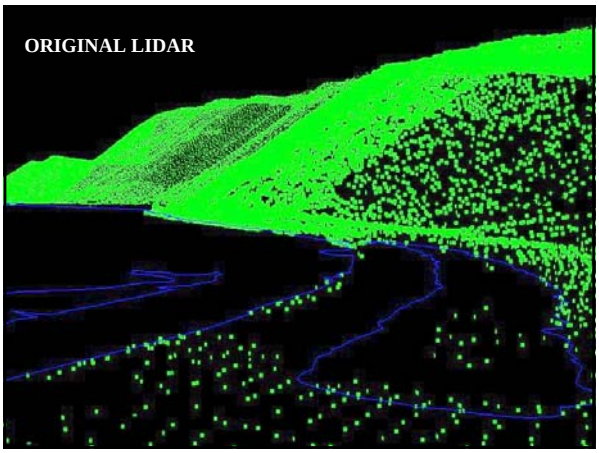
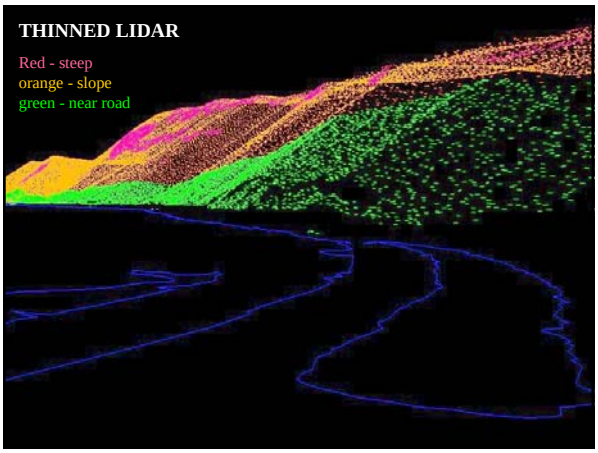
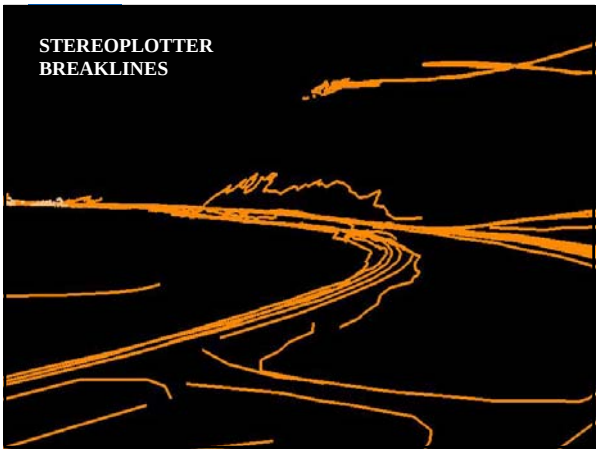
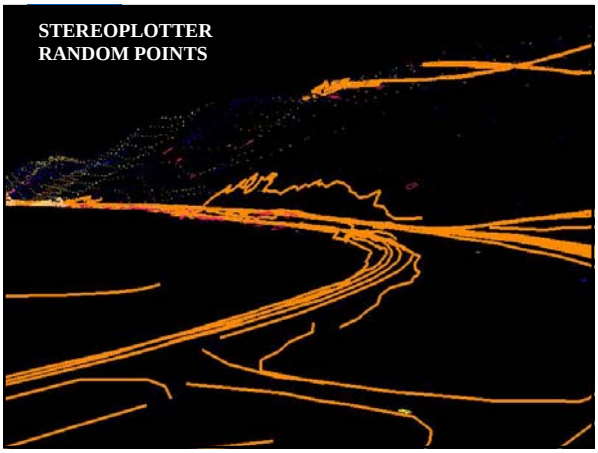
Adding Stereoplotter Data

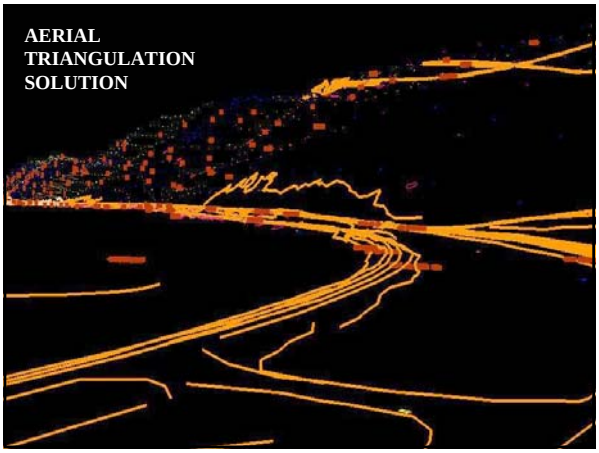
- Breaklines along roadway to control triangulation
- Random points to check consistency of photogrammetry and LIDAR
- Adding boundaries at bodies of water
- Analyzing the results

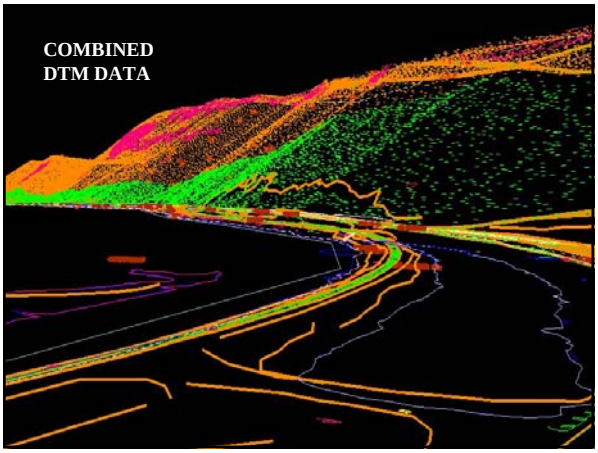

ORIGINAL LIDAR

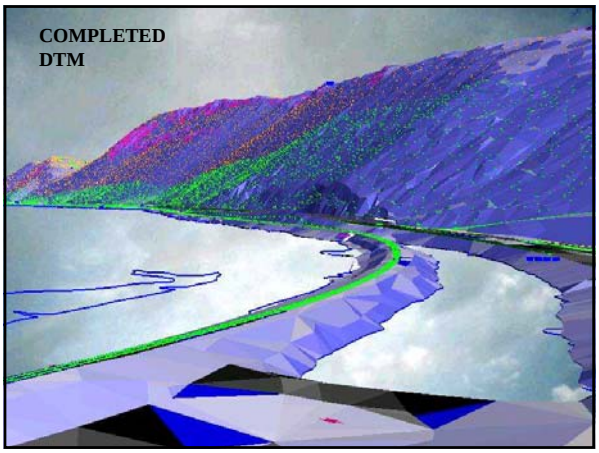

THINNED LIDAR
Red - steep
orange - slope
green - near road

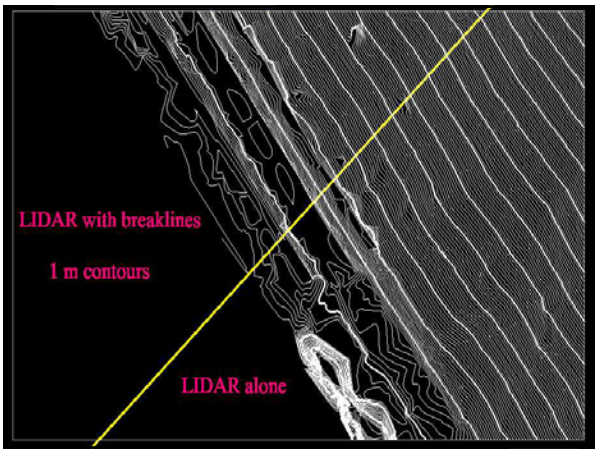

STEREOPLOTTER
BREAKLINES

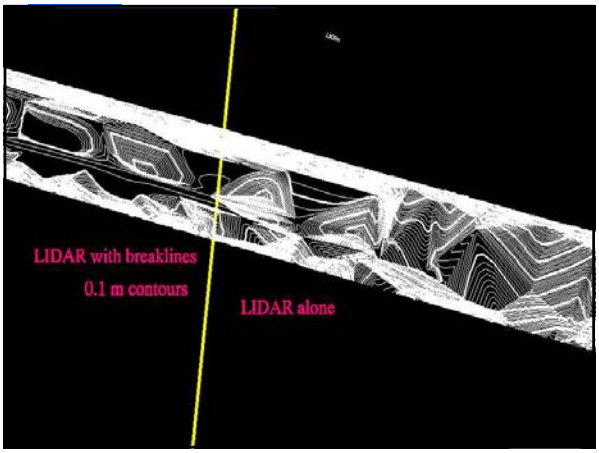

STEREOPLOTTER
RANDOM POINTS

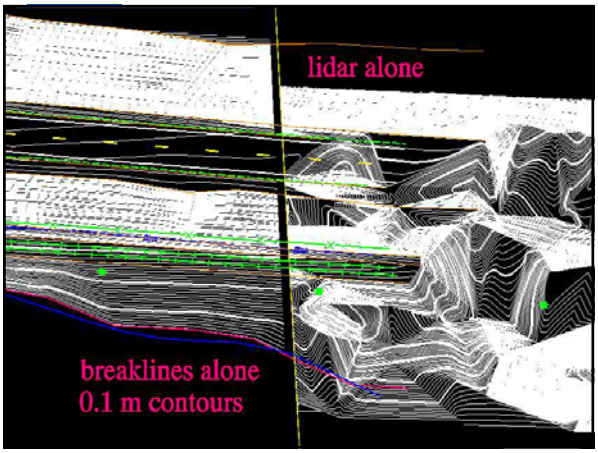

AERIAL
TRIANGULATION
SOLUTION

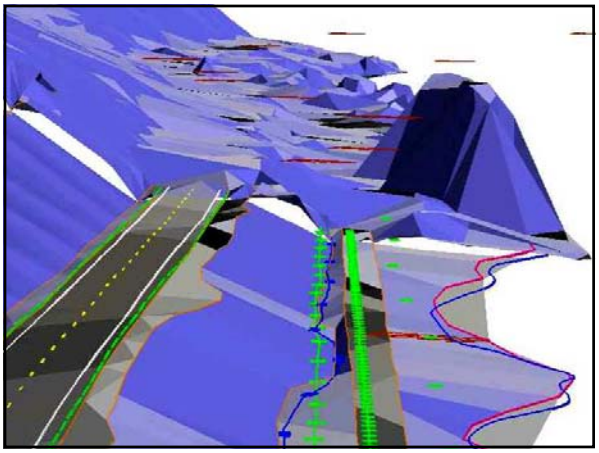

COMBINED
DTM DATA





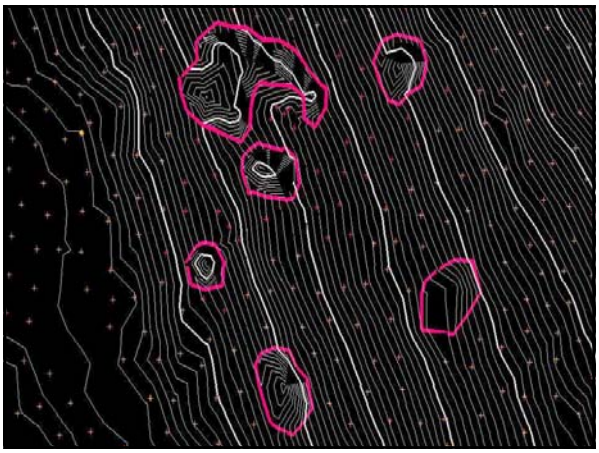


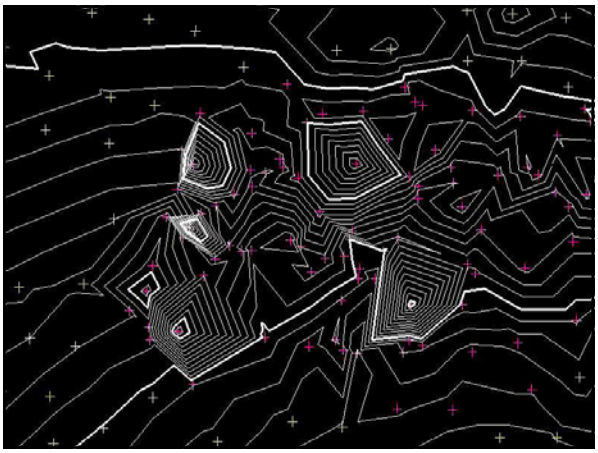


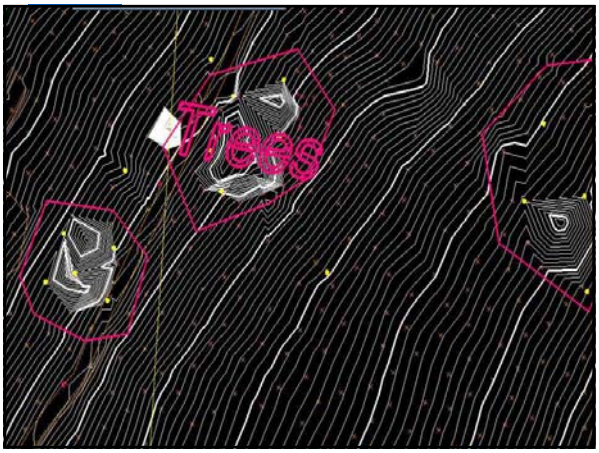


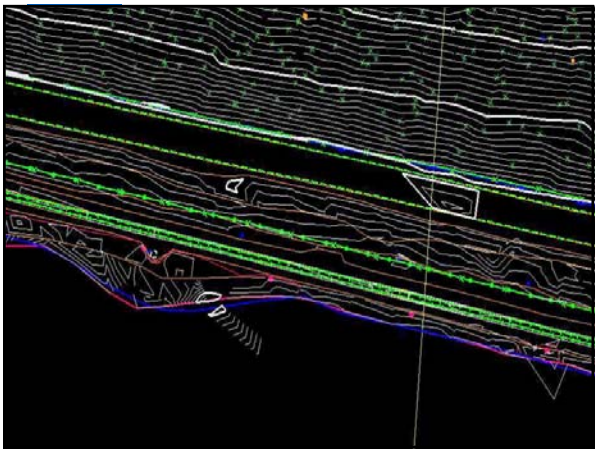
Manual Thinning

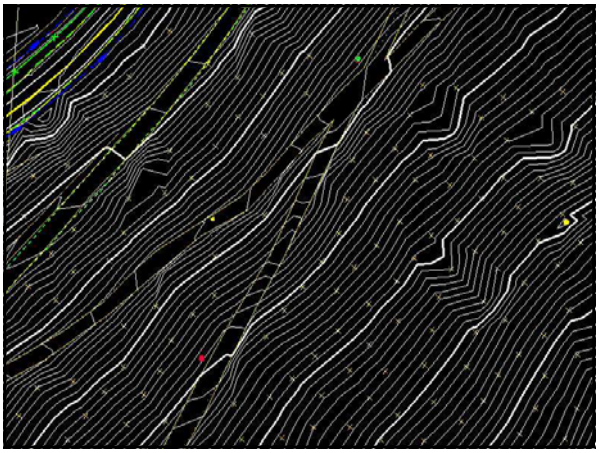
Stereoplotter observations
Common Sense





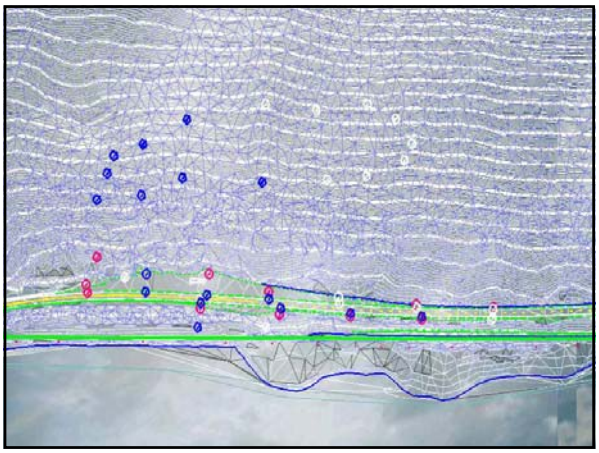


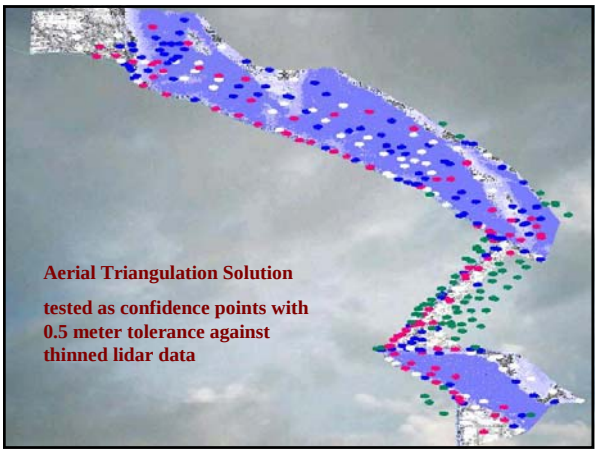


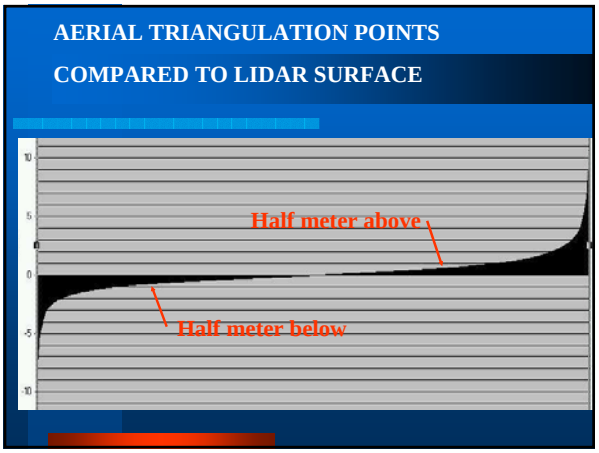


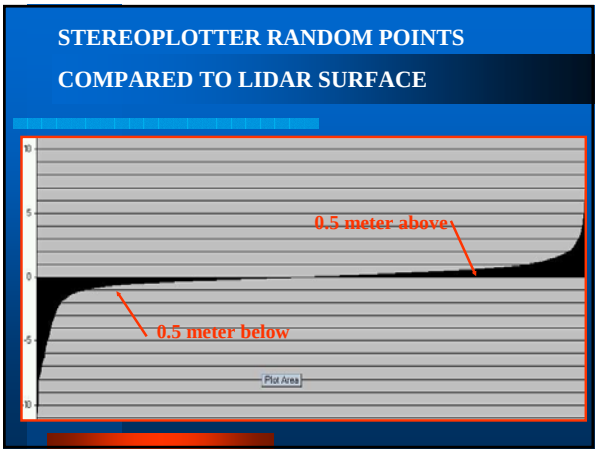
CONFIDENCE POINTS

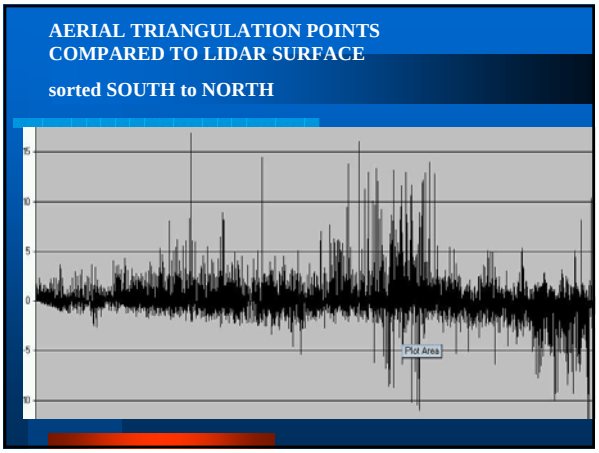
Ground Survey
Aerial Triangulation
Stereoplotter Mapping
Direct Measurement

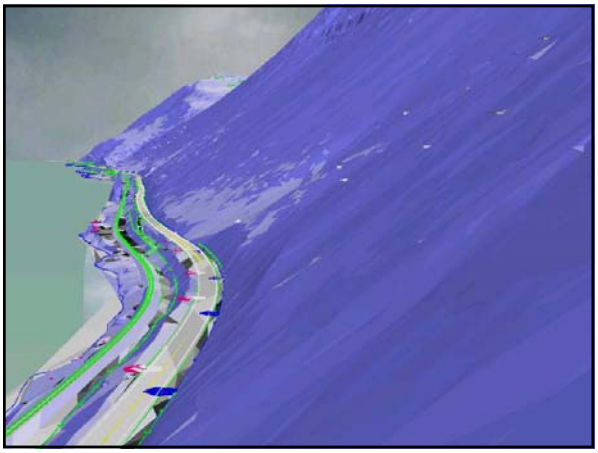


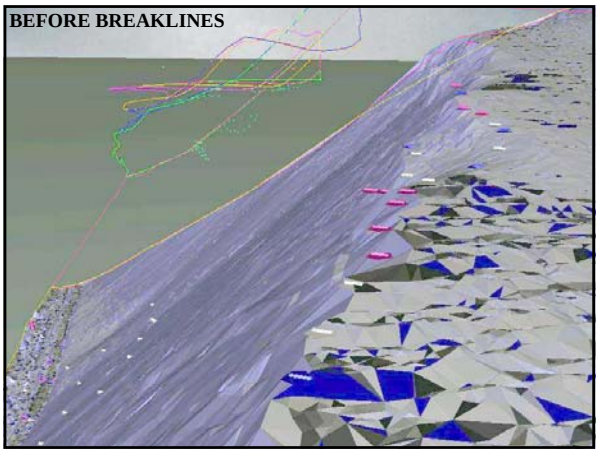

Aerial Triangulation Solution
tested as confidence points with
0.5 meter tolerance against
thinned lidar data

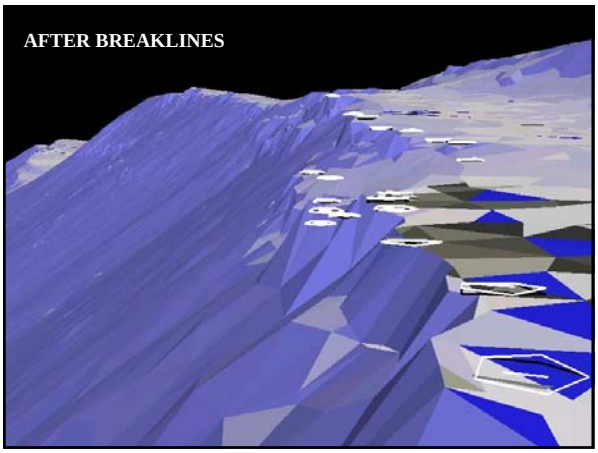

AERIAL TRIANGULATION POINTS
COMPARED TO LIDAR SURFACE
Half meter above
Half meter below


STEREOPLOTTER RANDOM POINTS
COMPARED TO LIDAR SURFACE
0.5 meter above
0.5 meter below
Plot Area

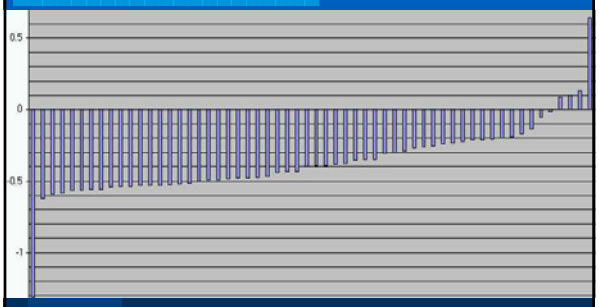

AERIAL TRIANGULATION POINTS
COMPARED TO LIDAR SURFACE
sorted SOUTH to NORTH
Plot Area







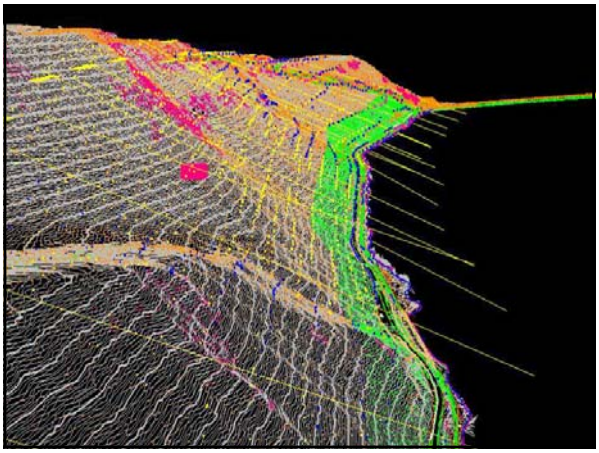
Direct LIDAR point remeasure

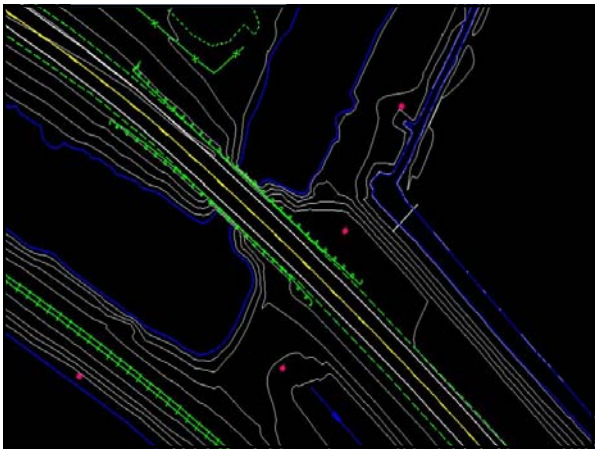


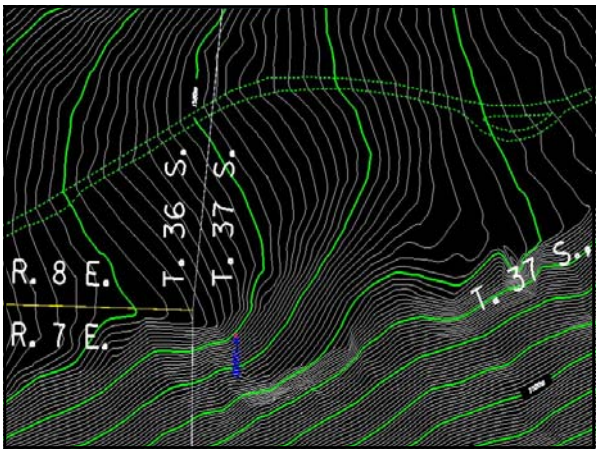
FINAL DTM

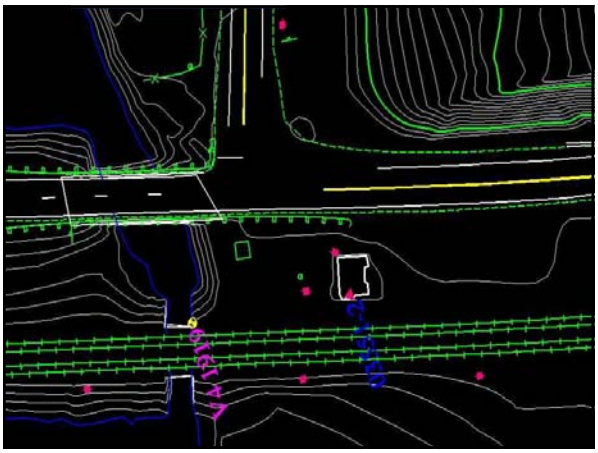
- 114,000 Lidar points
- 20,000 Breakline points added
- 4,000 Random check points
- 2,000 Exterior points

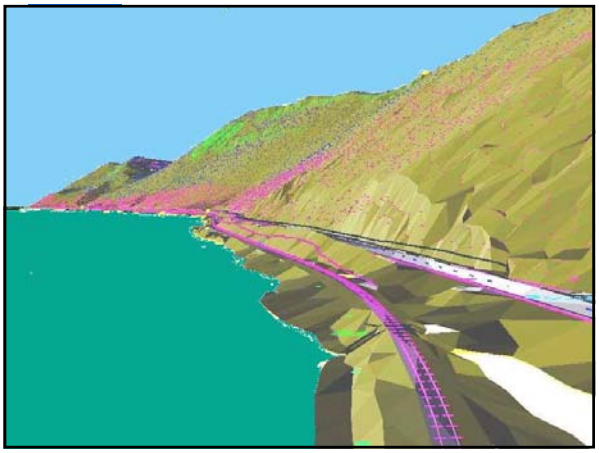
- 0.5 meter dtm accuracy

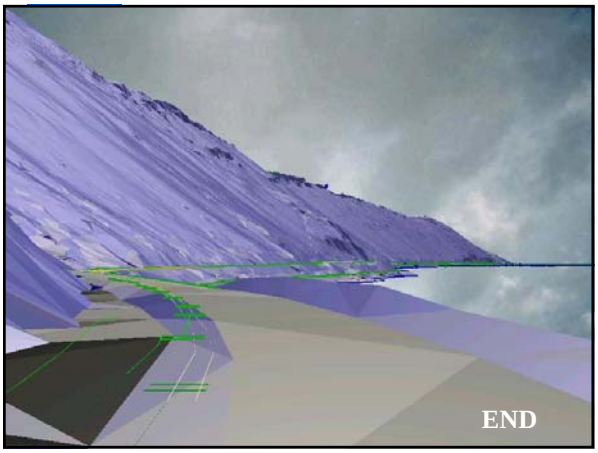





R. 8 E.
R. 7 E.
T. 36 S.
T. 37 S.
T. 37 S.



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