

塑造智慧变革

2018年海克斯康新产品新技术发布暨用户大会

HxGN Local Beijing 2018

2018年9月10日-12日 北京·国家会议中心

塑造智慧变革



HEXAGON

海克斯康



北京
国家会议中心

2018年
9月10-12日

2018.hexagonchina.com.cn

POINT CLOUD ANALYSIS ON TUNNEL LINING

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12-SEP-2018



CONTENT目录

1. PROJECT BACKGROUND项目背景
2. FIELD OPERATION野外作业
3. POST PROCESSING后处理
4. ANALYSIS分析
5. CONCLUSION结论

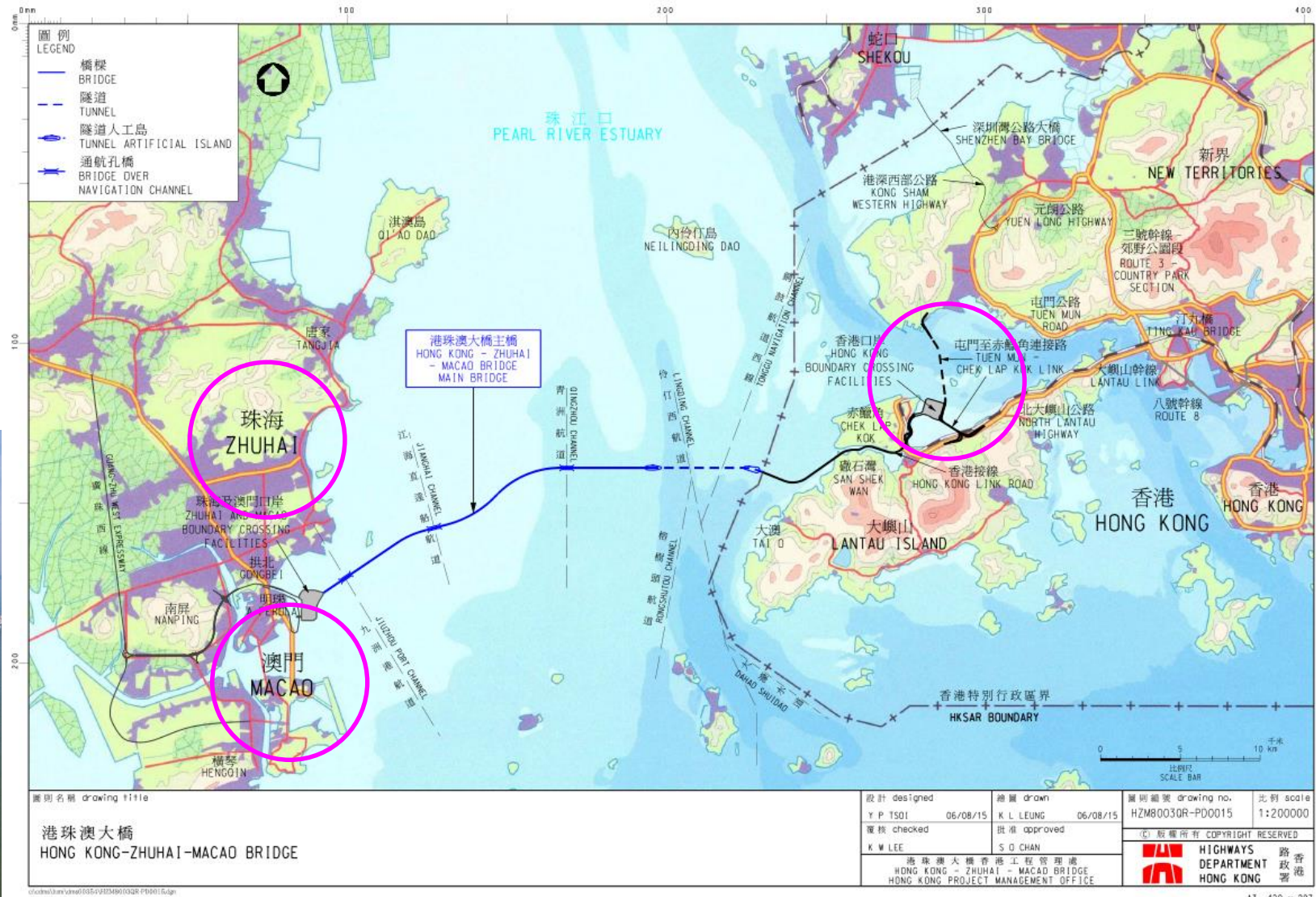
1. PROJECT BACKGROUND项目背景

- Hong Kong – Zhuhai – Macao Bridge
- Tuen Mun – Chek Lap Kok Link
- Underpass at Tuen Mun
- 香港-珠海-澳门大桥
- 屯门-赤腊角线
- 屯门地下通道

1. PROJECT BACKGROUND

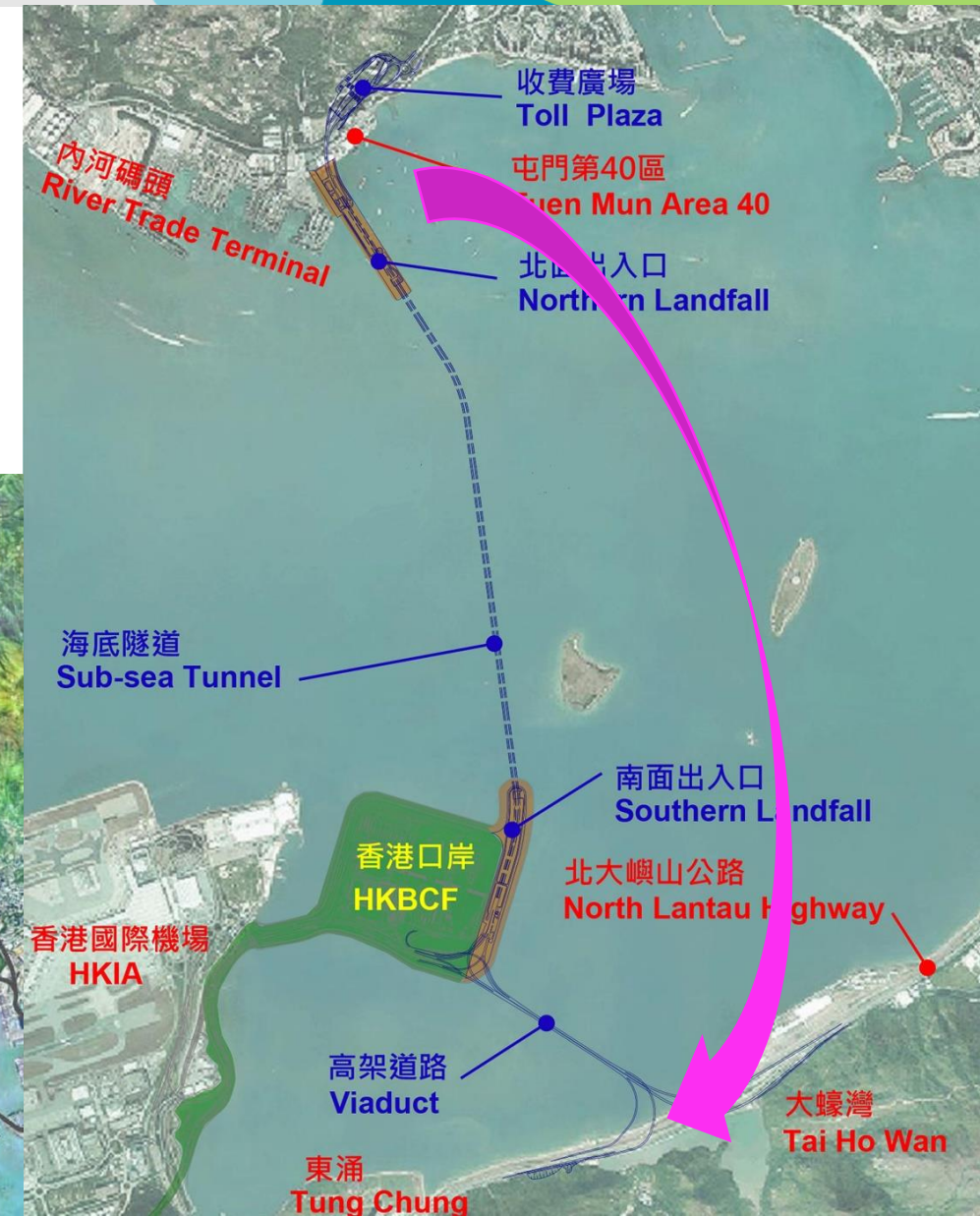
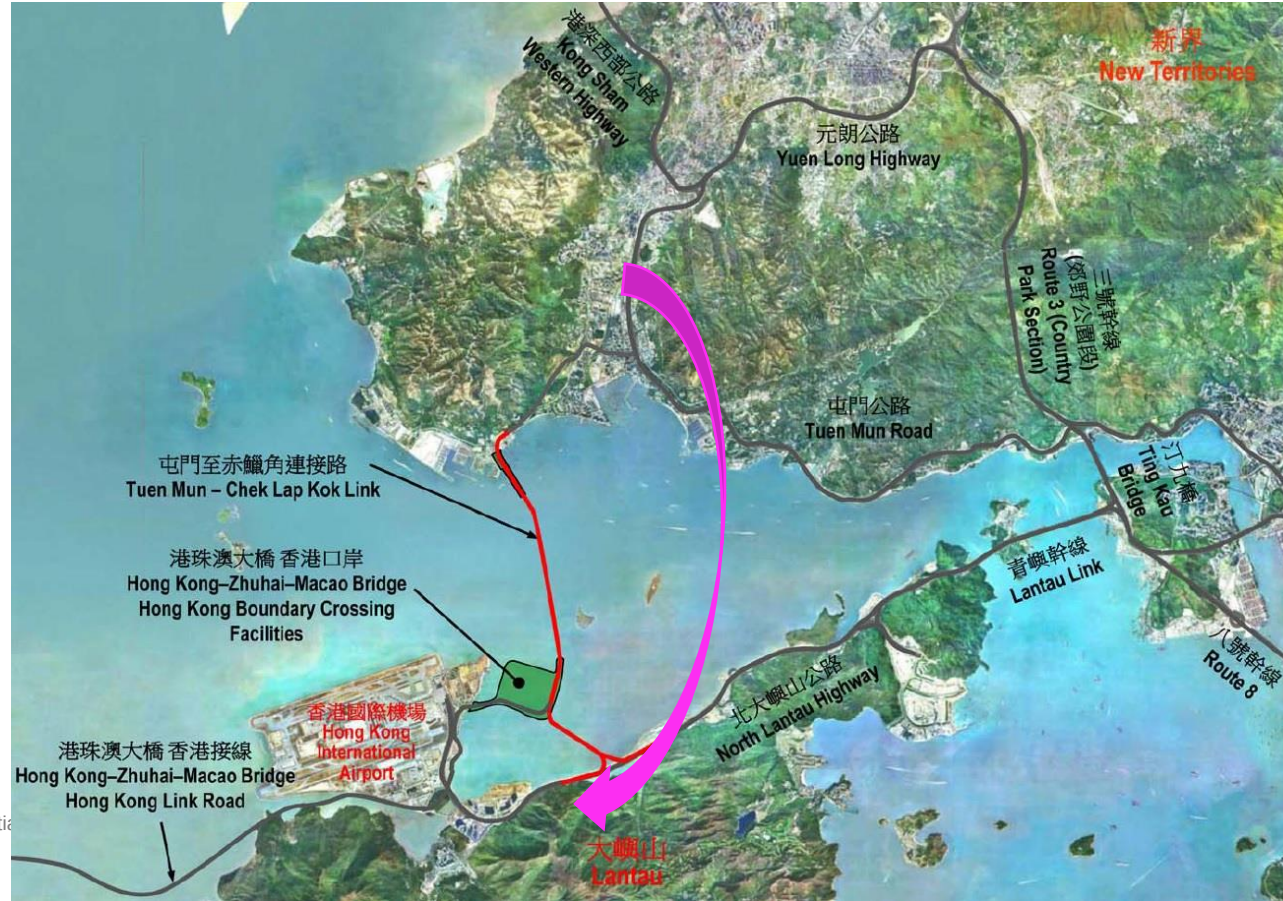
项目背景

- Hong Kong – Zhuhai – Macao Bridge
 - Sea Crossing Linking of Hong Kong, Zhuhai and Macau
- 香港-珠海-澳门大桥
 - 香港、珠海、澳门的跨海连接



1. PROJECT BACKGROUND项目背景

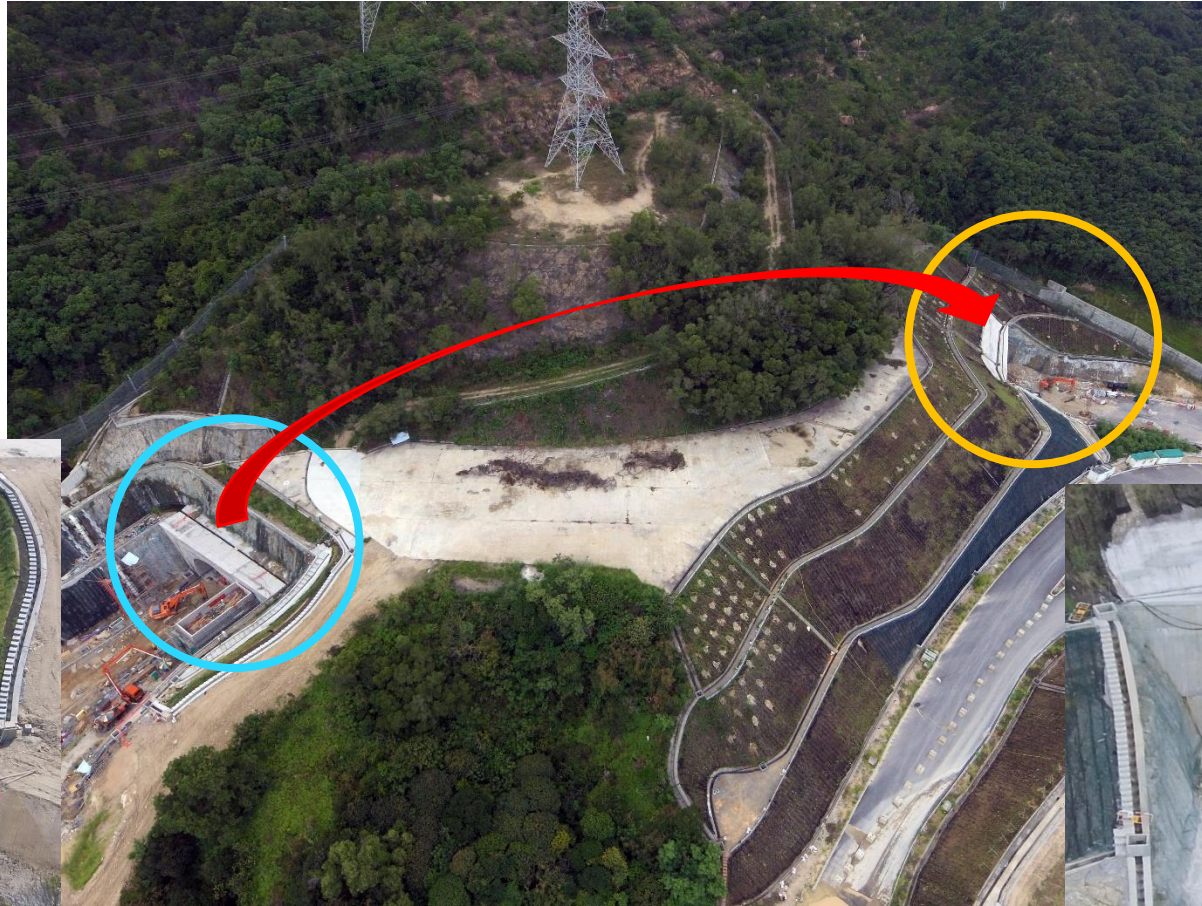
- Tuen Mun – Chek Lap Kok Link 屯门-赤腊角线
 - Connection of Northwest New Territories to North Lantau
 - 新界西北与North Lantau的连接
 - Distance: 37 km → 15 km
 - Time: 30 min → 10 min



1. PROJECT BACKGROUND项目背景

- Underpass at Tuen Mun屯门地下通道
 - 220m
 - Dual Lane双车道
 - Single Direction单向

West Portal西入口



East Portal

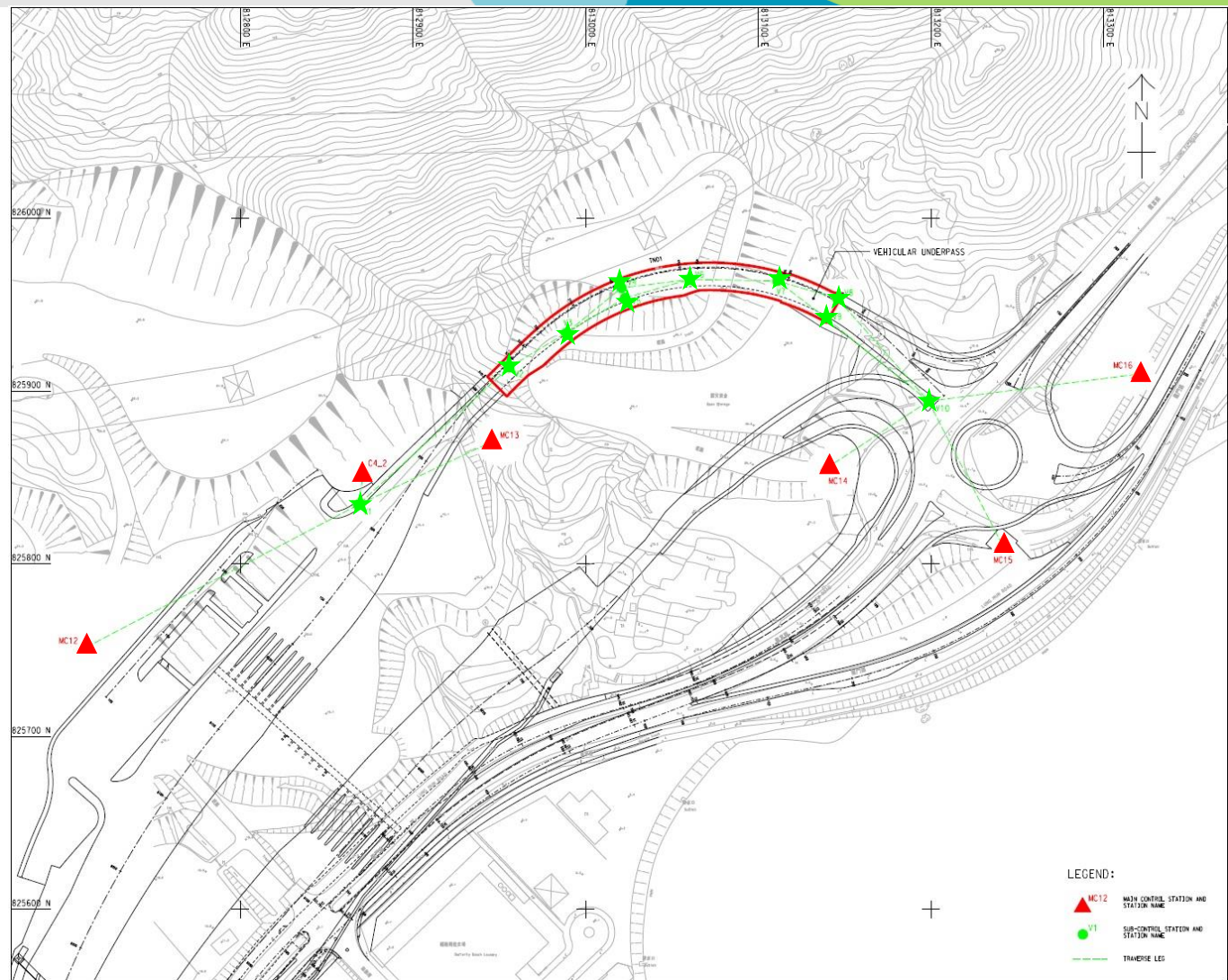


2. FIELD OPERATION野外作业

- Control Network控制网
- Station Setup设站
- Scanning扫描

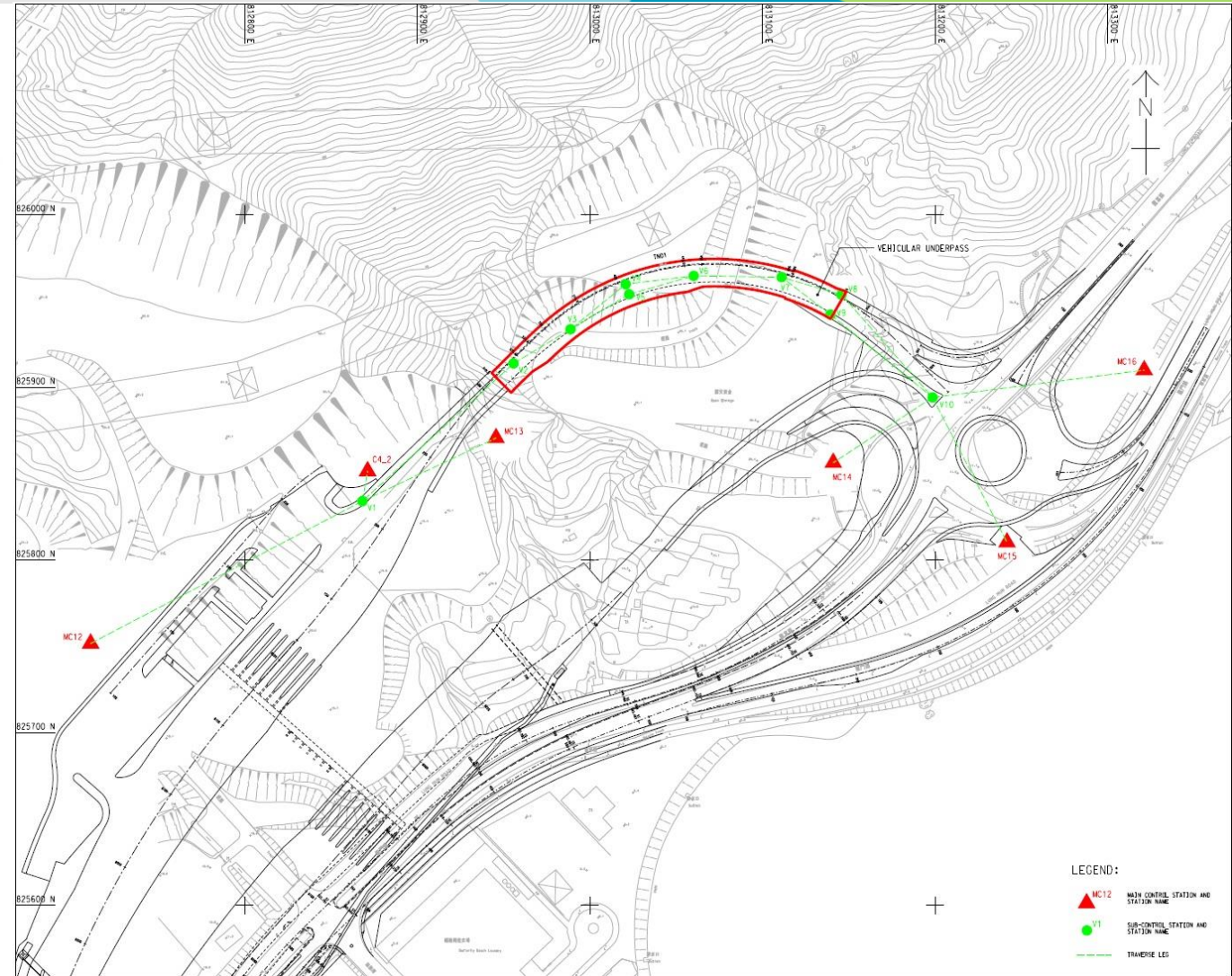
2. FIELD OPERATION野外作业

- Control Network控制网
 - Master Control (In Red)首级控制（红色）
 - Minor Control (In Green)次级控制（绿色）
 - 10 stations站



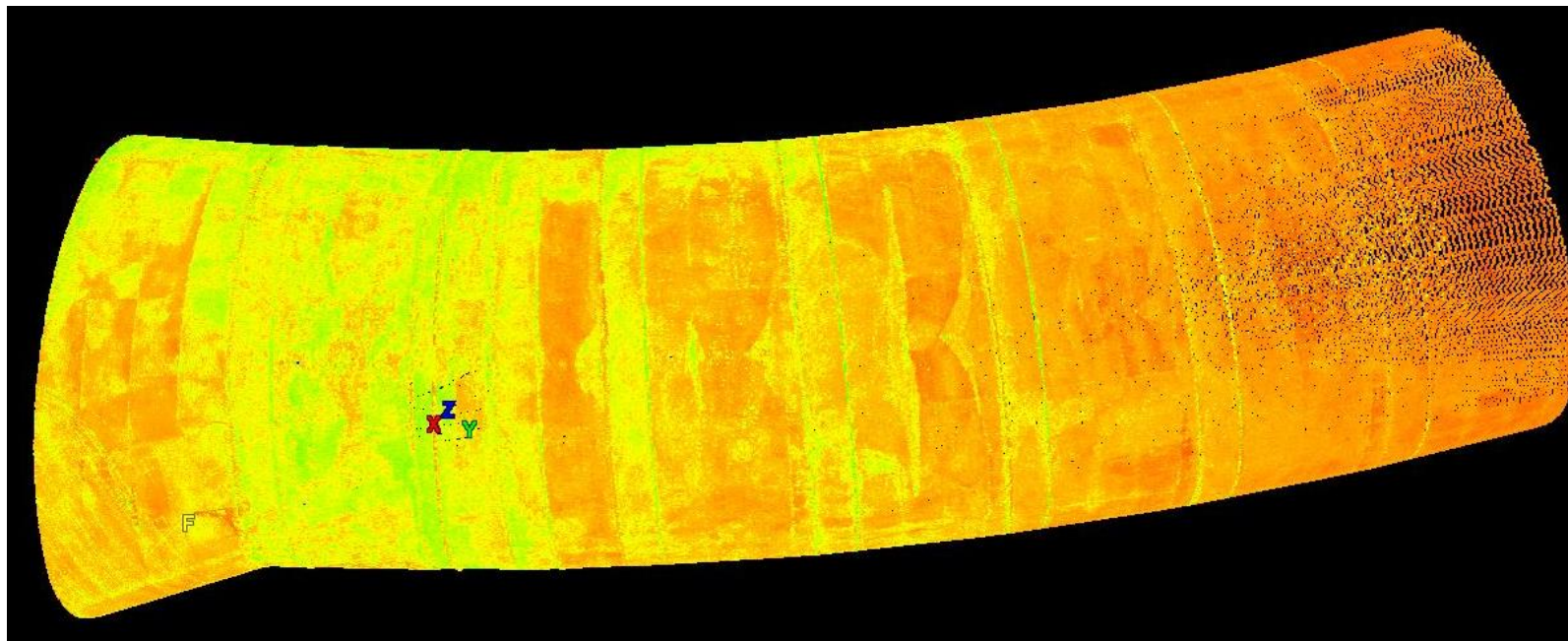
2. FIELD OPERATION 野外作业

- Station Setup 设站
 - Leica ScanStation C10
 - 5 Setup



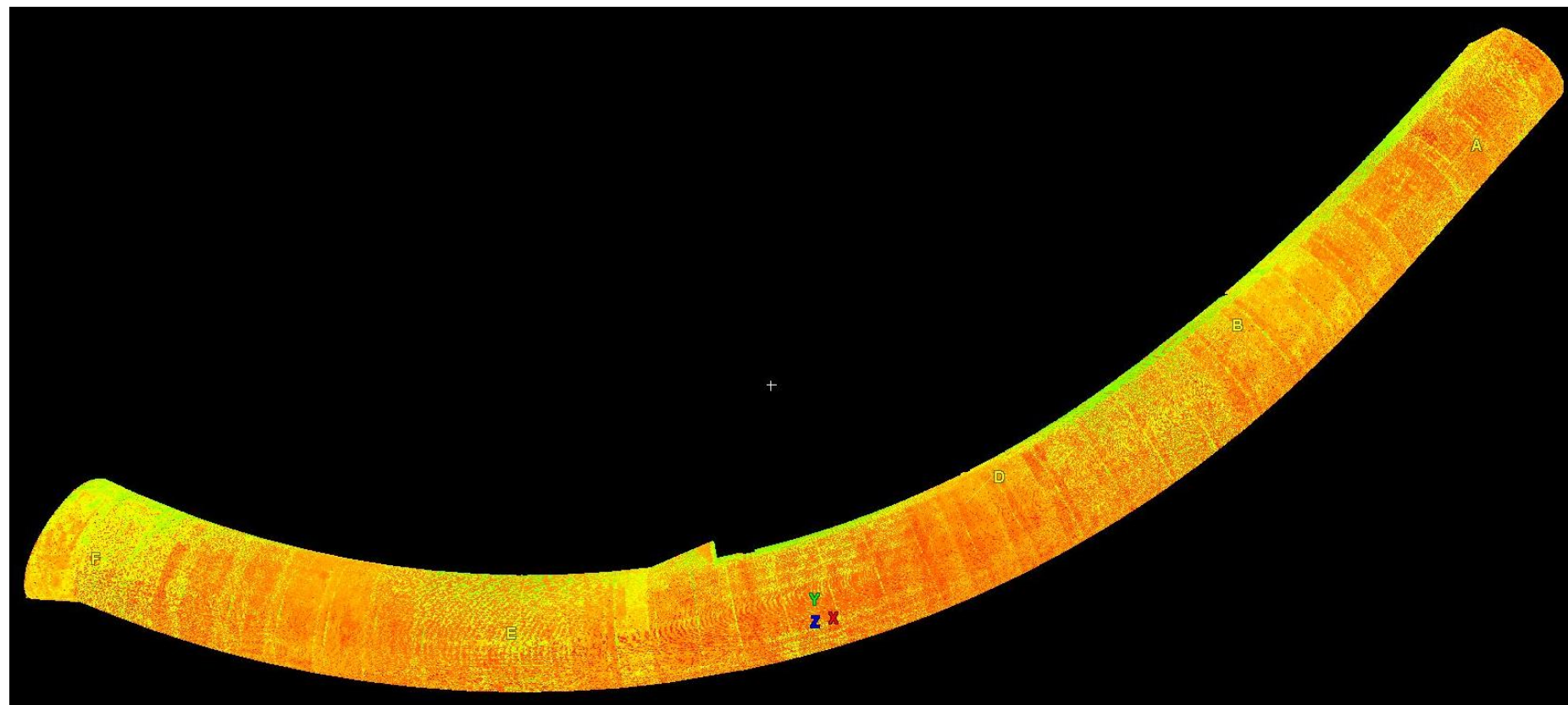
2. FIELD OPERATION野外作业

- Scanning扫描
 - Setting设置
 - Field of View (Horizontal 360°; Vertical 270°)视野（水平360°；垂直270°）
 - Resolutions (5mm x 5mm)分辨率（5mm×5mm）
 - Photo Taking拍照
 - 45 mins/ setup 45分钟/站



3. POST PROCESSING后处理

- Registration拼接
- Geo-Referencing地理参考
- Noise Filtering噪声过滤
- Point Cloud Filtering点云过滤



3. POST PROCESSING后处理

- Registration拼接
 - Scan Data扫描数据
 - Target标靶
 - Cloud Base基于点云

ControlSpace: SW 20180716-3

File Edit View Configure Create Tool

SERVERS

- TM-CLKL-C3 (unshared)
 - 20180716-3
 - Station-001
 - SW 20180716-3
 - 20180716-4
 - Station-001
 - SW 20180716-4

Set Target Height

Target Height1.695 mPlease enter a new value for the target height. A value of 0 removes any existing target height.

Registration: Registration All

Registration Edit ScanWorld Constraint Cloud Constraint Viewers Visual Registration Help

ScanWorlds' Constraints

Constraint List

ModelSpaces

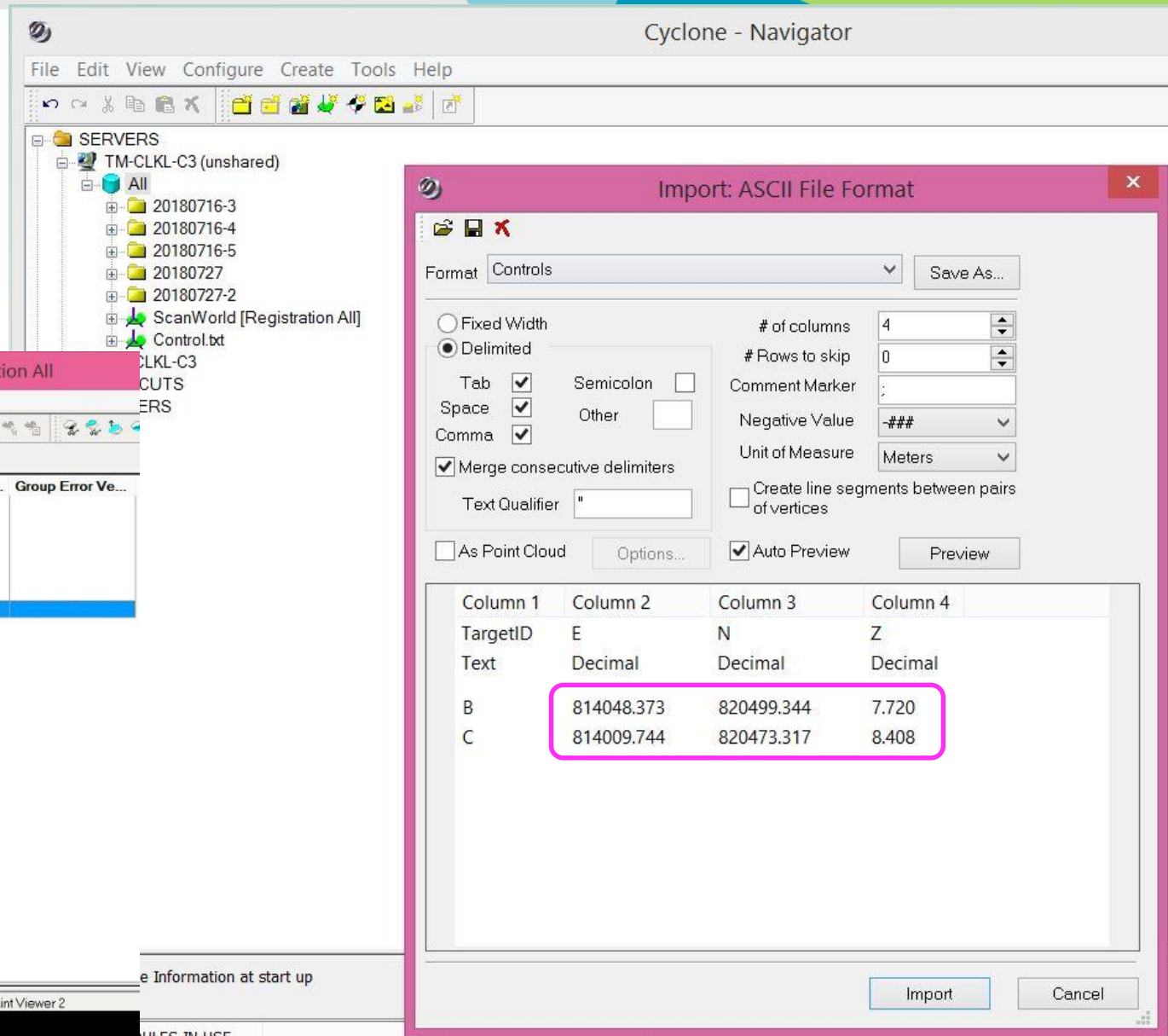
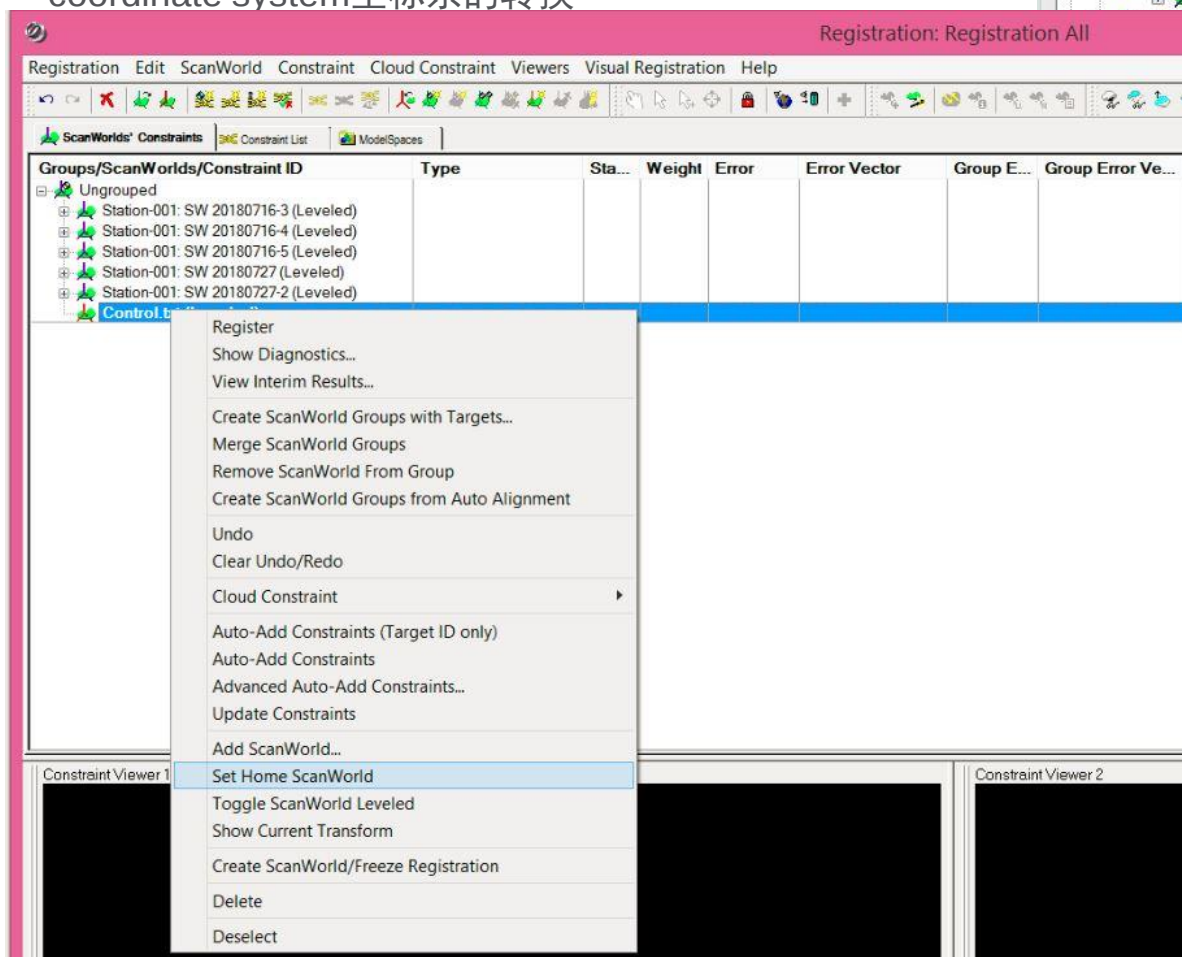
Constraint ID	ScanWorld	ScanWorld	Type	Status	Weight	Error	Error Vector	Group Error	Group Error Vector	Group
D	Station-001: SW 20180716-3 (Leveled)	Station-001: SW 20180727 (Leveled)	Coincident Vertex - Vertex	On	1.0000	0.002 m	(-0.001, -0.001, -0.0...	n/a	n/a	Ungrouped
D	Station-001: SW 20180716-3 (Leveled)	Station-001: SW 20180727-2 (Leveled)	Coincident Vertex - Vertex	On	1.0000	0.003 m	(-0.001, -0.001, -0.0...	n/a	n/a	Ungrouped
B	Station-001: SW 20180716-3 (Leveled)	Station-001: SW 20180727 (Leveled)	Coincident Vertex - Vertex	On	1.0000	0.003 m	(0.002, 0.001, 0.003...	n/a	n/a	Ungrouped
B	Station-001: SW 20180716-3 (Leveled)	Station-001: SW 20180727-2 (Leveled)	Coincident Vertex - Vertex	On	1.0000	0.004 m	(0.001, 0.001, 0.004...	n/a	n/a	Ungrouped
E	Station-001: SW 20180716-3 (Leveled)	Station-001: SW 20180716-4 (Leveled)	Coincident Vertex - Vertex	On	1.0000	0.001 m	(0.000, 0.000, -0.00...	n/a	n/a	Ungrouped
E	Station-001: SW 20180716-3 (Leveled)	Station-001: SW 20180716-5 (Leveled)	Coincident Vertex - Vertex	On	1.0000	0.002 m	(-0.001, 0.000, -0.00...	n/a	n/a	Ungrouped
D	Station-001: SW 20180716-3 (Leveled)	Station-001: SW 20180716-4 (Leveled)	Coincident Vertex - Vertex	On	1.0000	0.001 m	(-0.001, 0.000, -0.00...	n/a	n/a	Ungrouped
D	Station-001: SW 20180716-4 (Leveled)	Station-001: SW 20180727 (Leveled)	Coincident Vertex - Vertex	On	1.0000	0.001 m	(-0.001, 0.000, 0.00...	n/a	n/a	Ungrouped
D	Station-001: SW 20180716-4 (Leveled)	Station-001: SW 20180727-2 (Leveled)	Coincident Vertex - Vertex	On	1.0000	0.003 m	(0.000, 0.000, -0.00...	n/a	n/a	Ungrouped
E	Station-001: SW 20180716-4 (Leveled)	Station-001: SW 20180716-5 (Leveled)	Coincident Vertex - Vertex	On	1.0000	0.001 m	(-0.001, 0.000, -0.00...	n/a	n/a	Ungrouped
F	Station-001: SW 20180716-4 (Leveled)	Station-001: SW 20180716-5 (Leveled)	Coincident Vertex - Vertex	On	1.0000	0.003 m	(0.002, 0.000, 0.002...	n/a	n/a	Ungrouped

There is 1 vertex selected. (Last object is on layer "Default". [Pick @ (22.737, 15.275, 0.798) m])

X.Y.Z

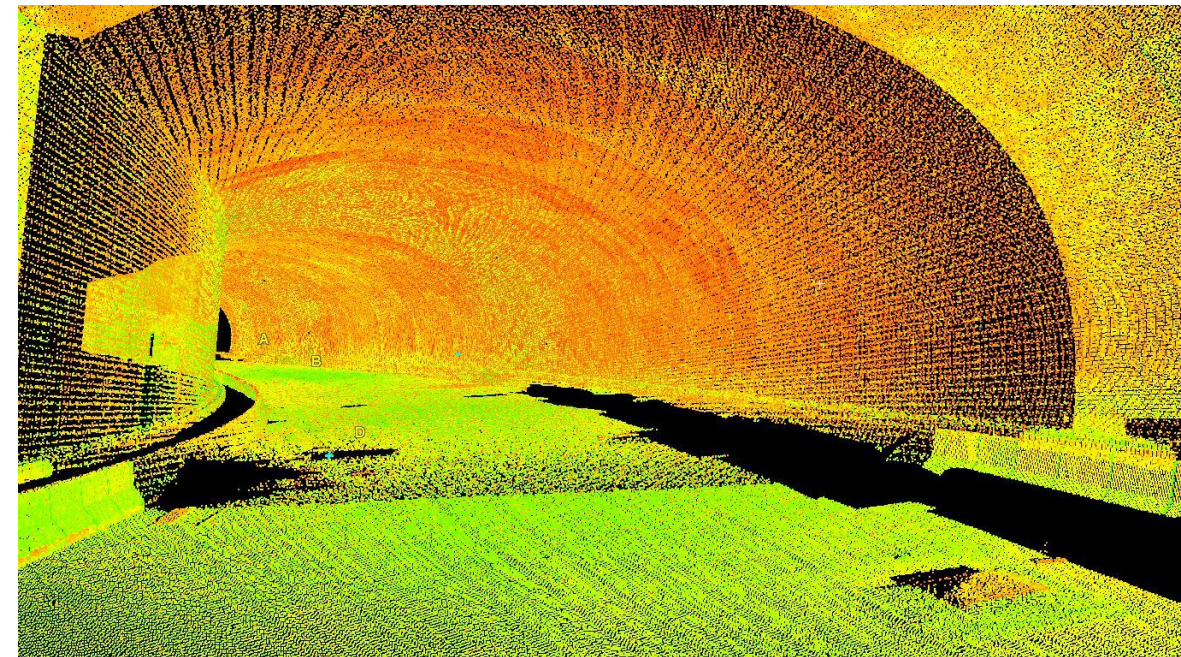
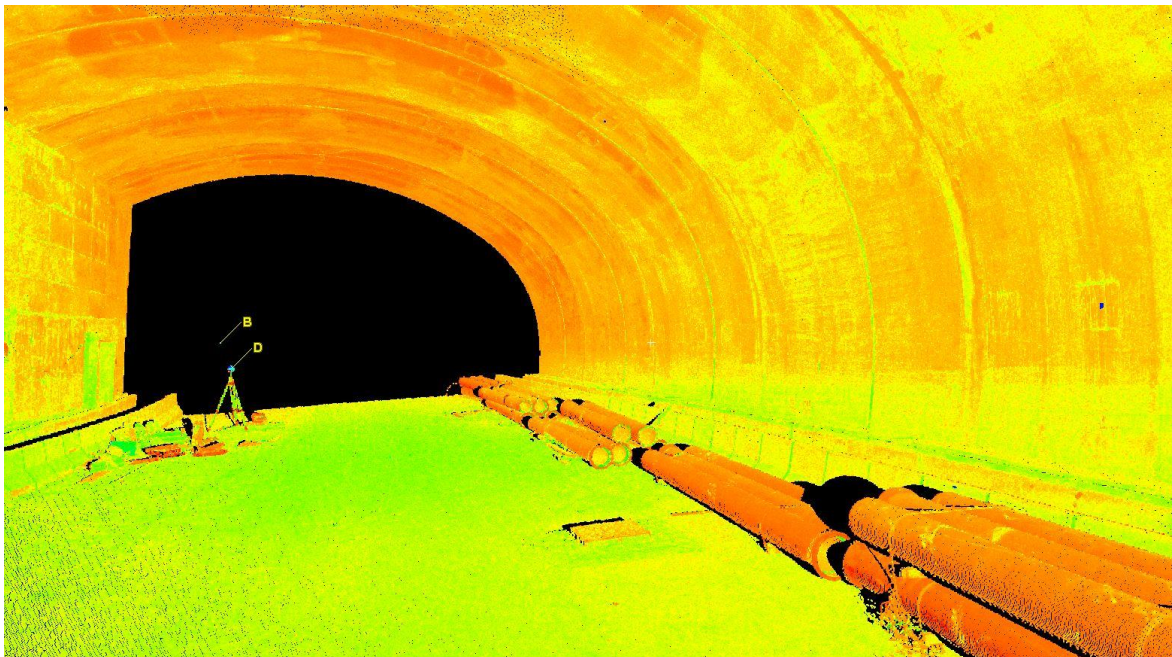
3. POST PROCESSING后处理

- Geo-Referencing地理参考
 - Transformation of ScanWorld data to a Real World coordinate system坐标系的转换



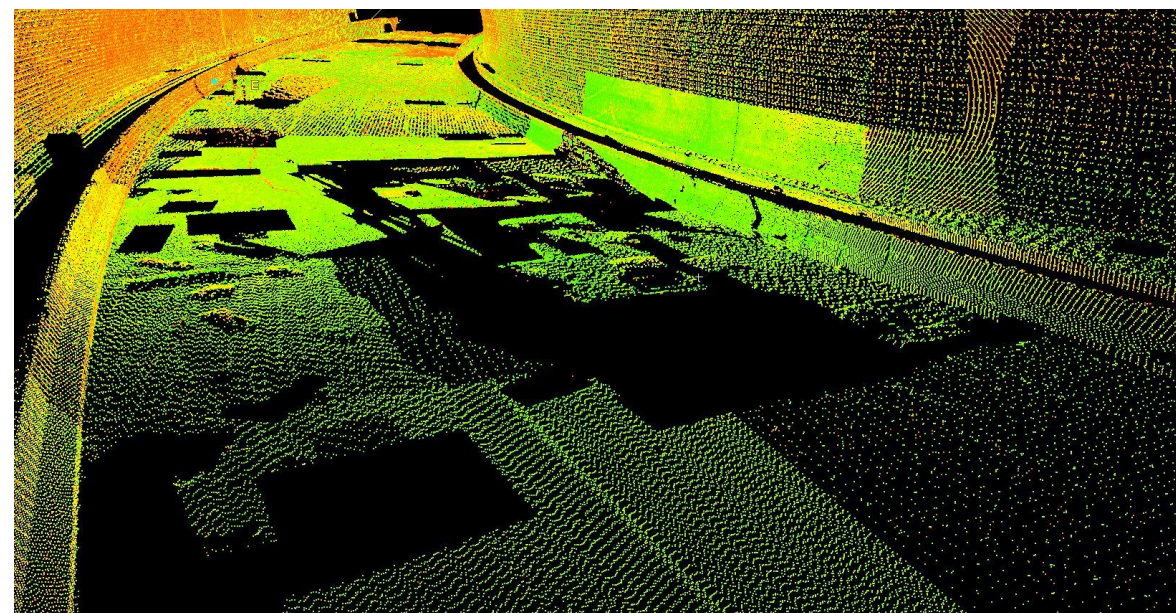
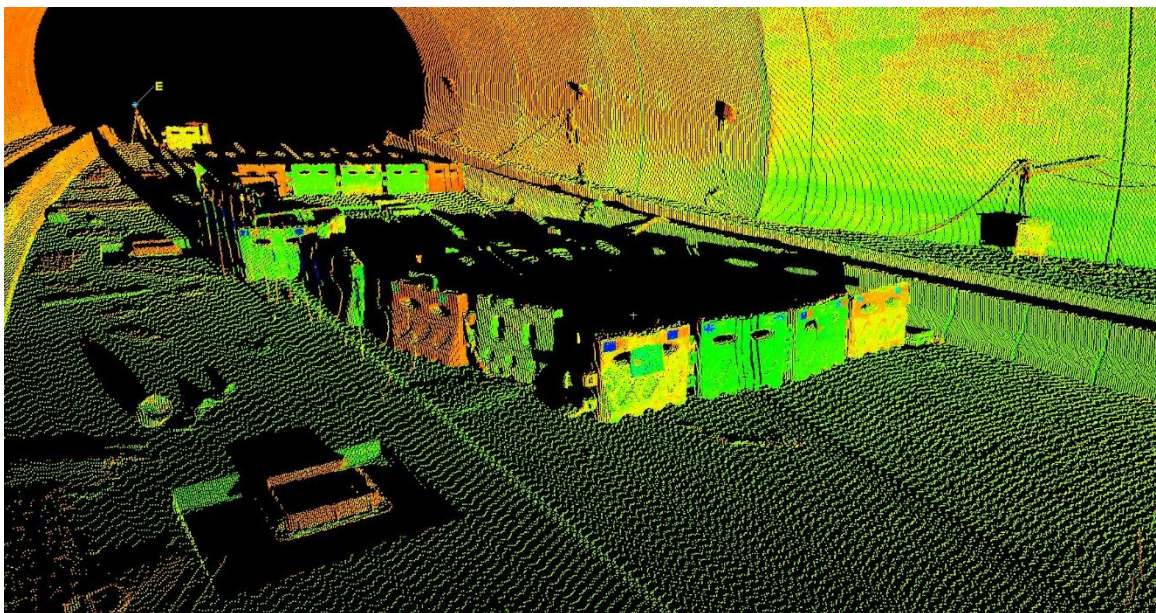
3. POST PROCESSING后处理

- Noise Filtering噪声过滤
 - Obstacles遮挡



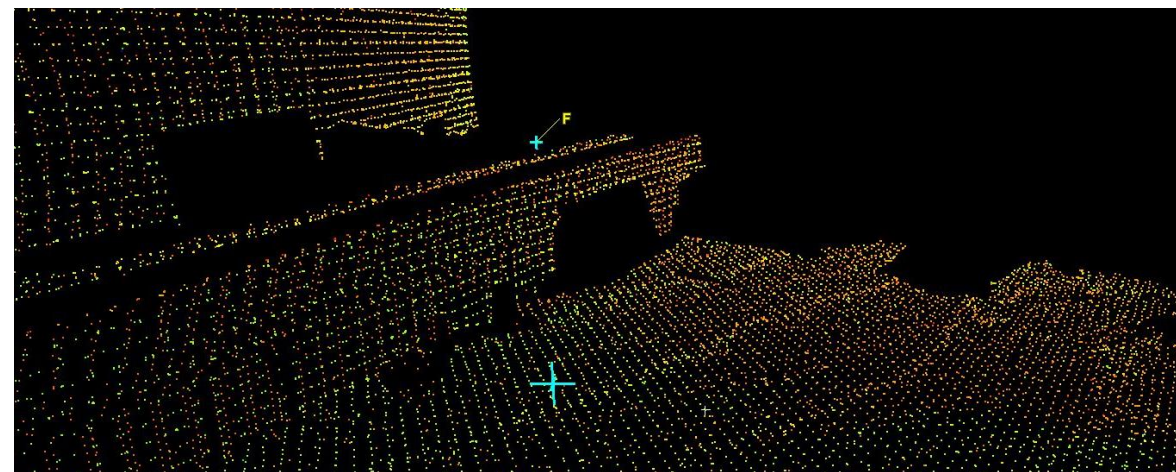
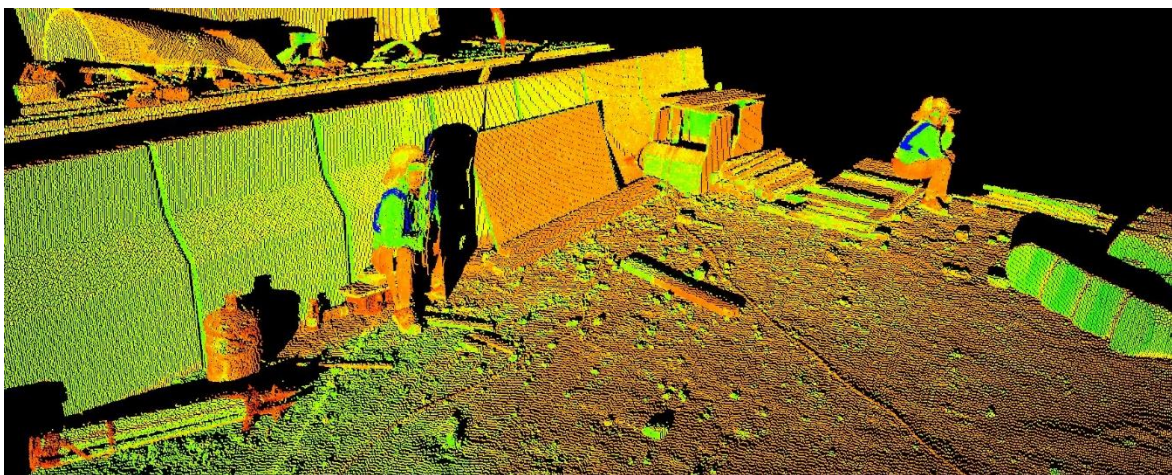
3. POST PROCESSING后处理

- Noise Filtering噪声过滤
 - Site Materials场地材料



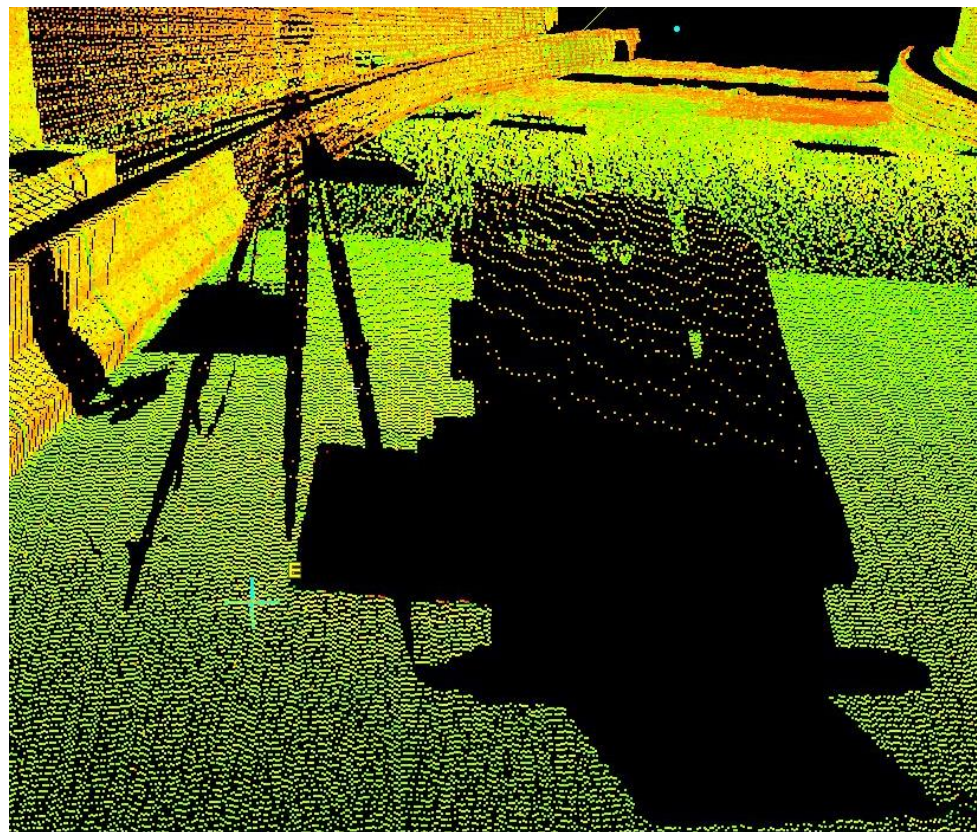
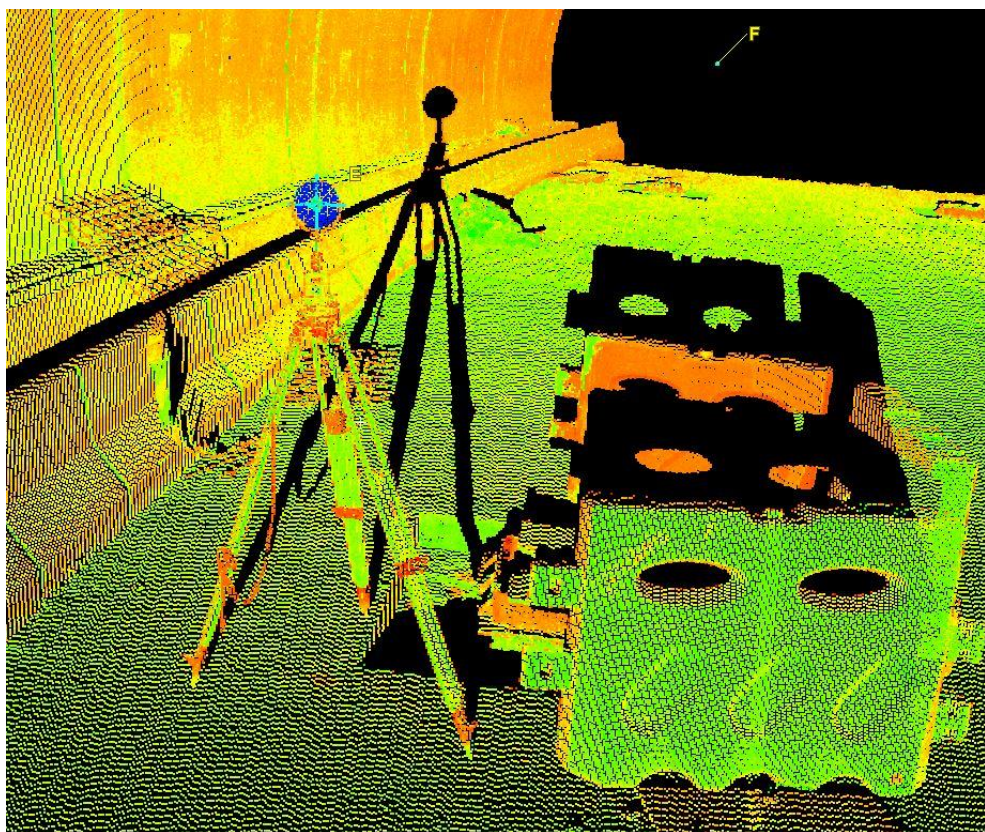
3. POST PROCESSING后处理

- Noise Filtering噪声过滤
 - Workers工人



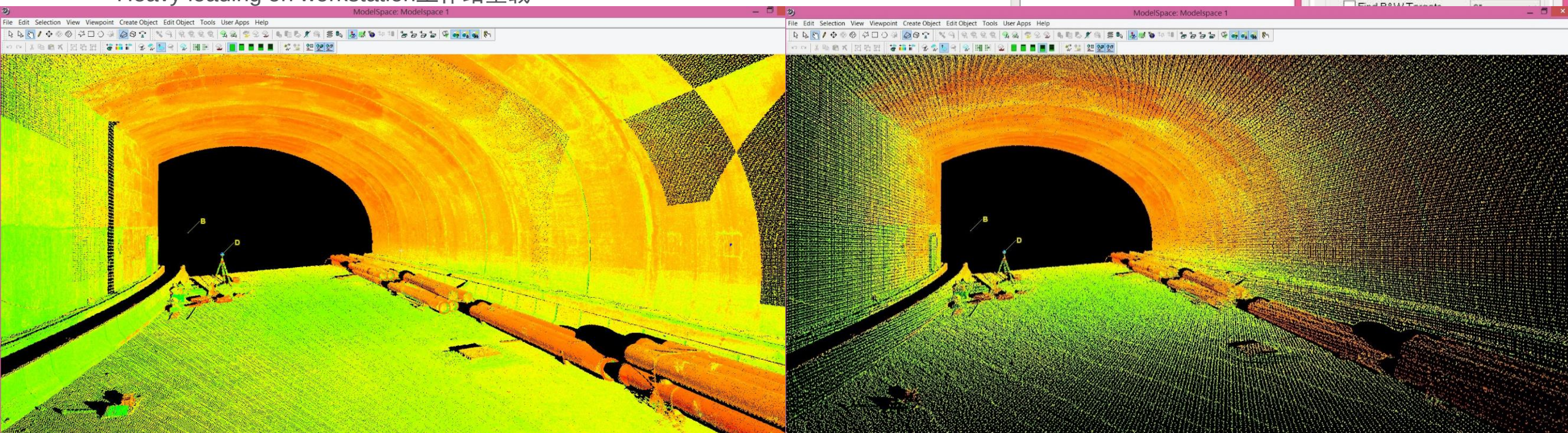
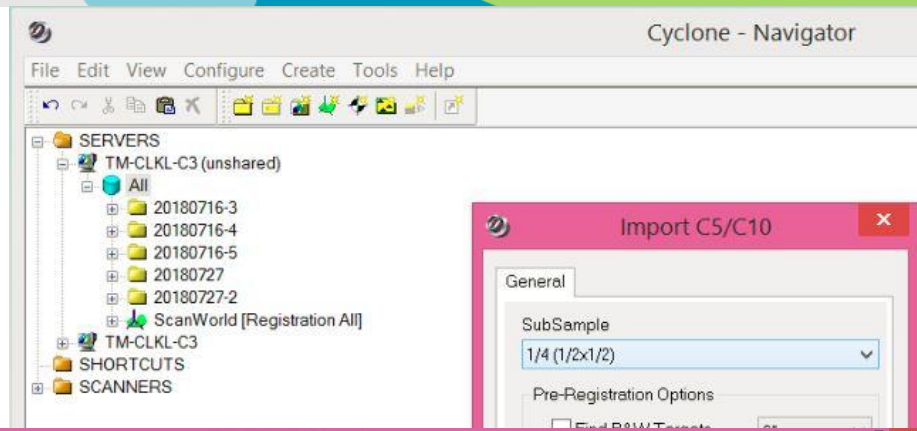
3. POST PROCESSING后处理

- Noise Filtering噪声过滤
 - Target标靶



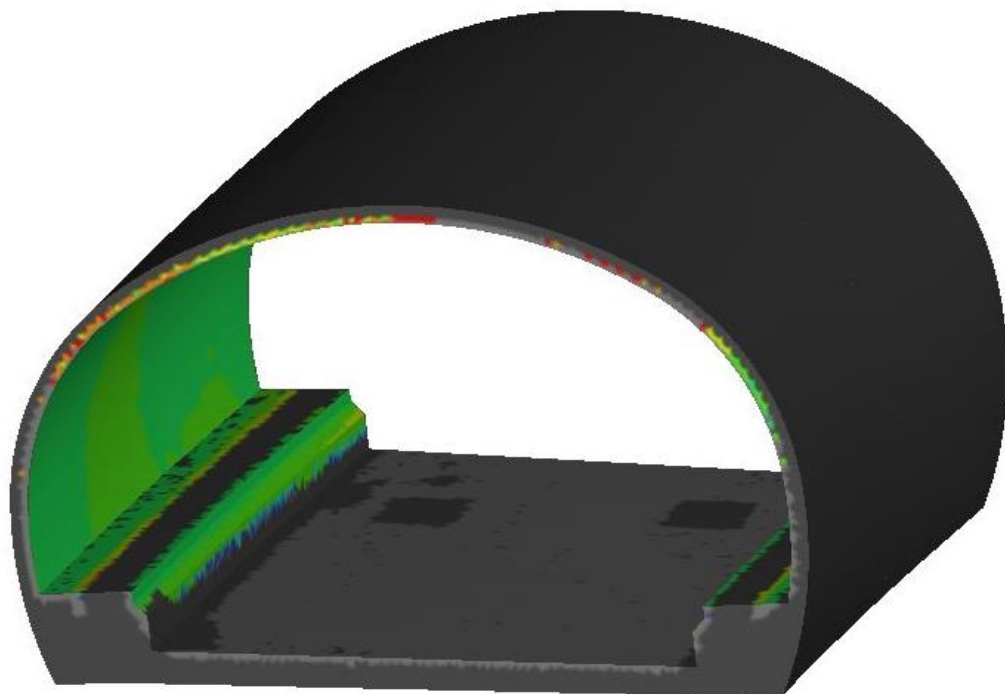
3. POST PROCESSING后处理

- Point Cloud Filtering点云过滤
 - Density密度
 - Heavy loading on workstation工作站重载



4. ANALYSIS分析

- 3D Mesh网格
- 3D 检查



3	Dev	Tol-	Tol+
3D	0.012	-0.225	0.225

4	Dev	Tol-	Tol+
3D	-0.027	-0.225	0.225

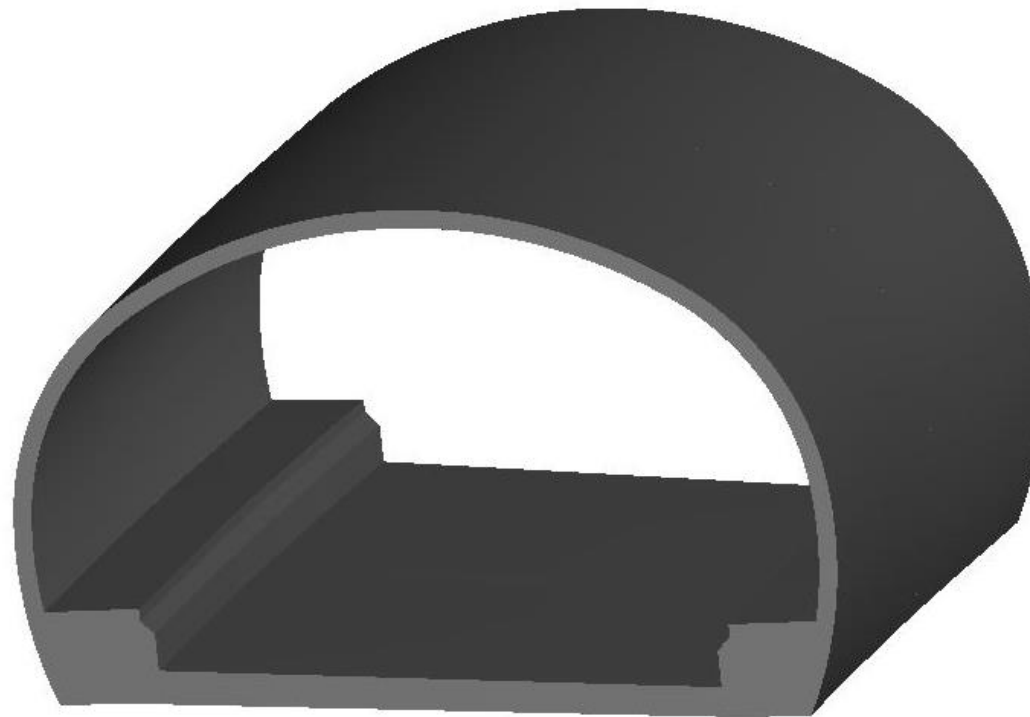
1	Dev	Tol-	Tol+
3D	-0.035	-0.225	0.225

2	Dev	Tol-	Tol+	Note
3D	0.028	-0.225	0.225	+



4. ANALYSIS分析

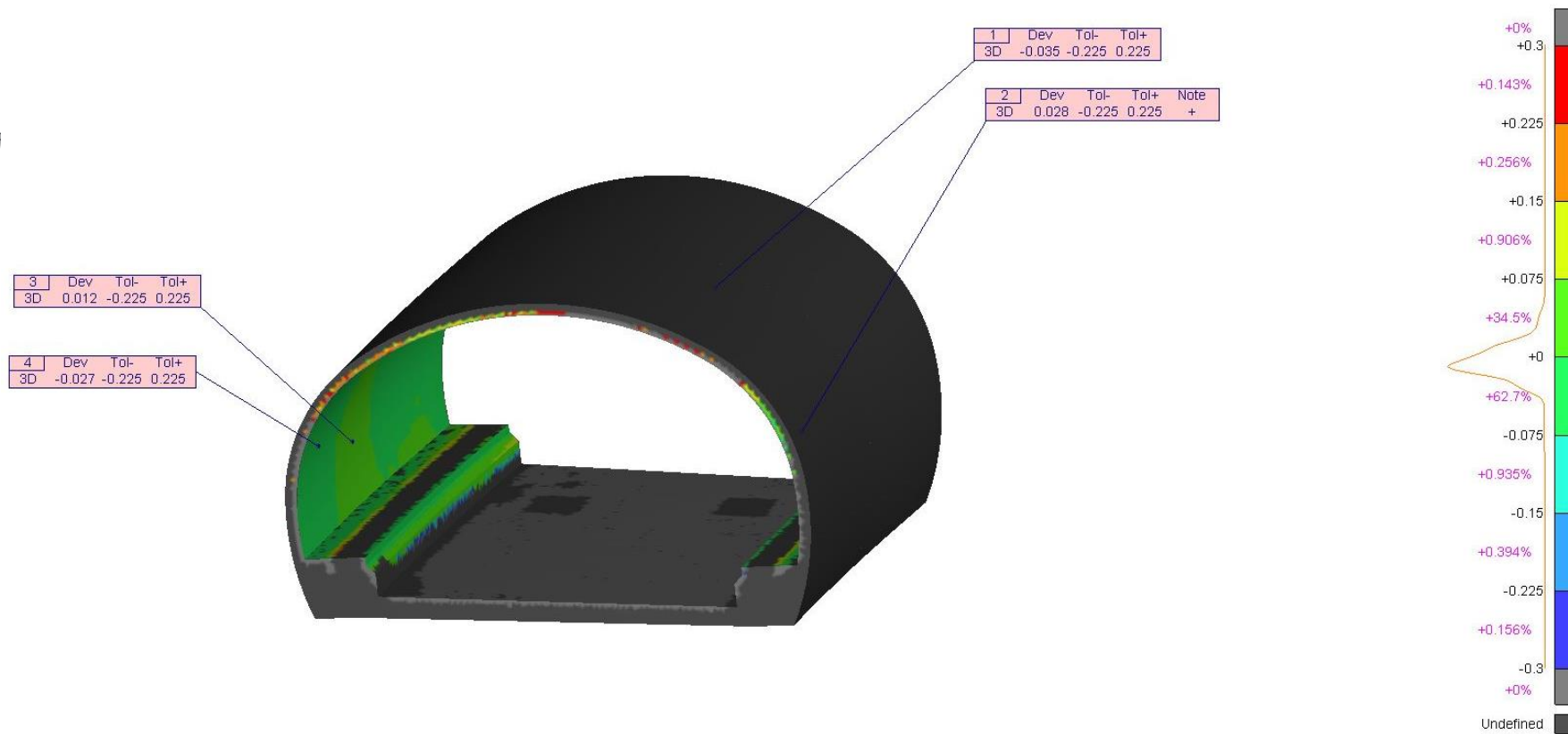
- 3D Mesh网格
 - Manually clean point clouds手动清除点云
 - First mesh第一次创建网格
 - Regular mesh at certain level of detail一定水平的规则网格
 - Filling holes填充孔
 - Deleting some triangles in mesh → Improve accuracy网格中删除三角形→提高精度
 - Re-meshing locally the edges → look sharp局部局部重新网格化
 - Locally smooth noisy parts局部光滑噪声部分
 - Extract some features from the model从模型中提取一些特征
 - Sections along alignment断面图沿直线排列



4. ANALYSIS分析

- 3D Inspection检查

- Compute neutral axis计算中轴线
- Create cross sections along an axis沿轴创建横断
- Compare cross sections横断面对比
- Volume computation体积计算
- Video视频漫游



5. CONCLUSION结论

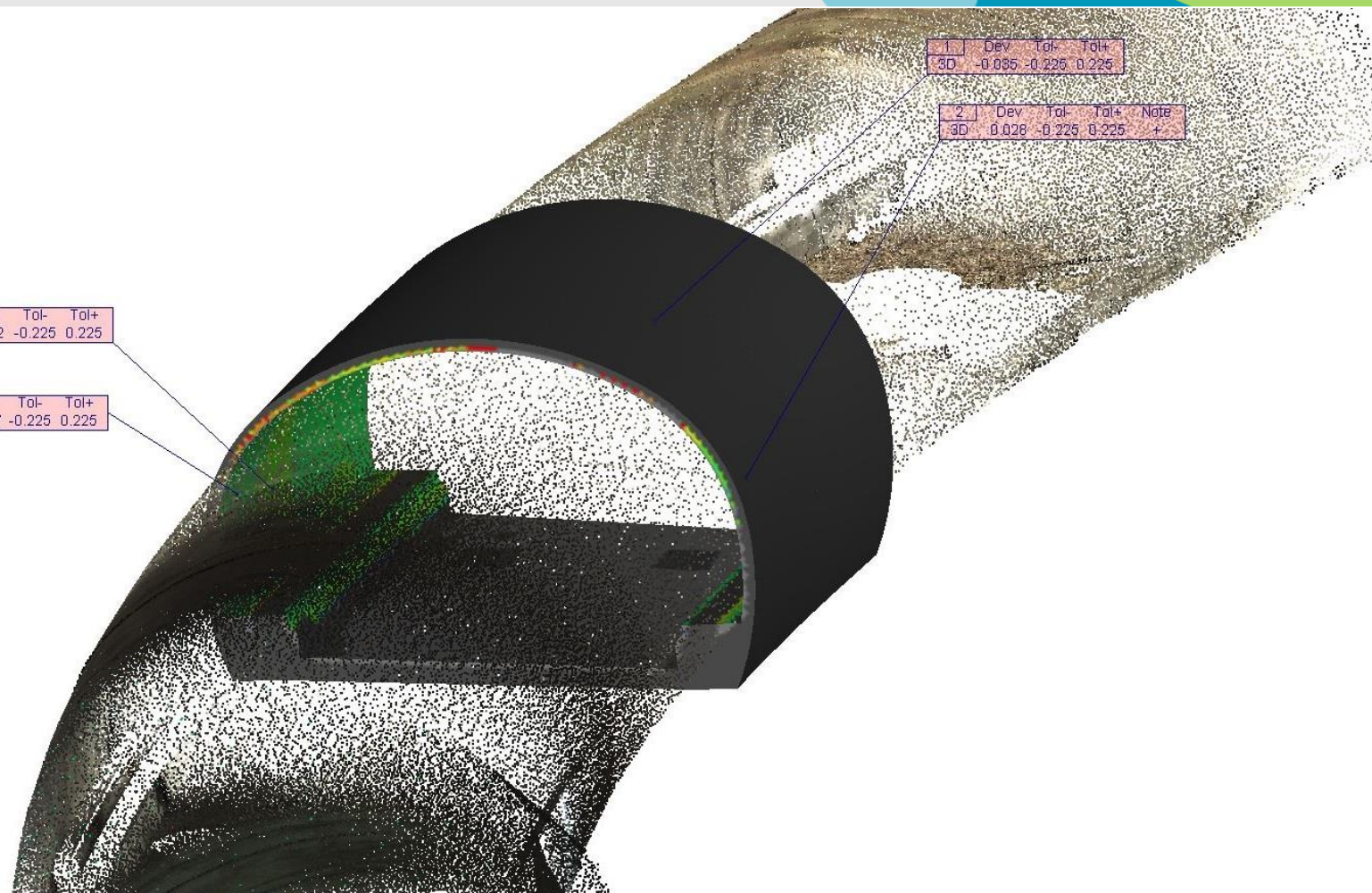
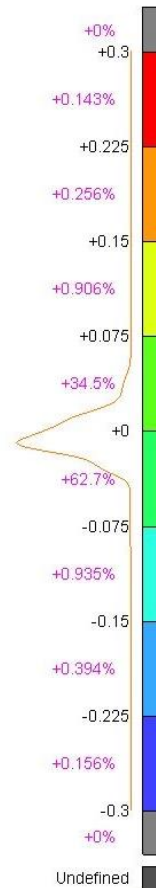
- Efficiency 效率
- 3D Displacement 三维位移
- Rendering 透视图
- As-Built BIM 竣工BIM

3	Dev	Tol-	Tol+
3D	0.012	-0.225	0.225

4	Dev	Tol-	Tol+
3D	-0.027	-0.225	0.225

1	Dev	Tol-	Tol+
3D	-0.035	-0.225	0.225

2	Dev	Tol-	Tol+	Note
3D	0.028	-0.225	0.225	+



5. CONCLUSION



—— 谢 谢 ——

A decorative graphic at the bottom of the slide consisting of multiple nested chevrons (V-shapes) pointing upwards. The chevrons are colored in a gradient from light blue to dark blue, with a green chevron at the very bottom.



如果您对此篇PPT感兴趣，请扫描二维码