The Limitation of Road End Area as Compared to Earthwork End Area Method

Road · https://mes100.com/docs/the-limitation-of-road-end-area-as-compared-to-earthwork-end-area-method/

In MiTS, the Road Module uses the end area method to compute the cut and fill volume. However, you may find that computing the cut and fill volume for your road project using the same method in the Earthwork Module produces different results.

Scenarios in Cut and Fill Computation

Case 1: Platform from Road Module

Project sample here

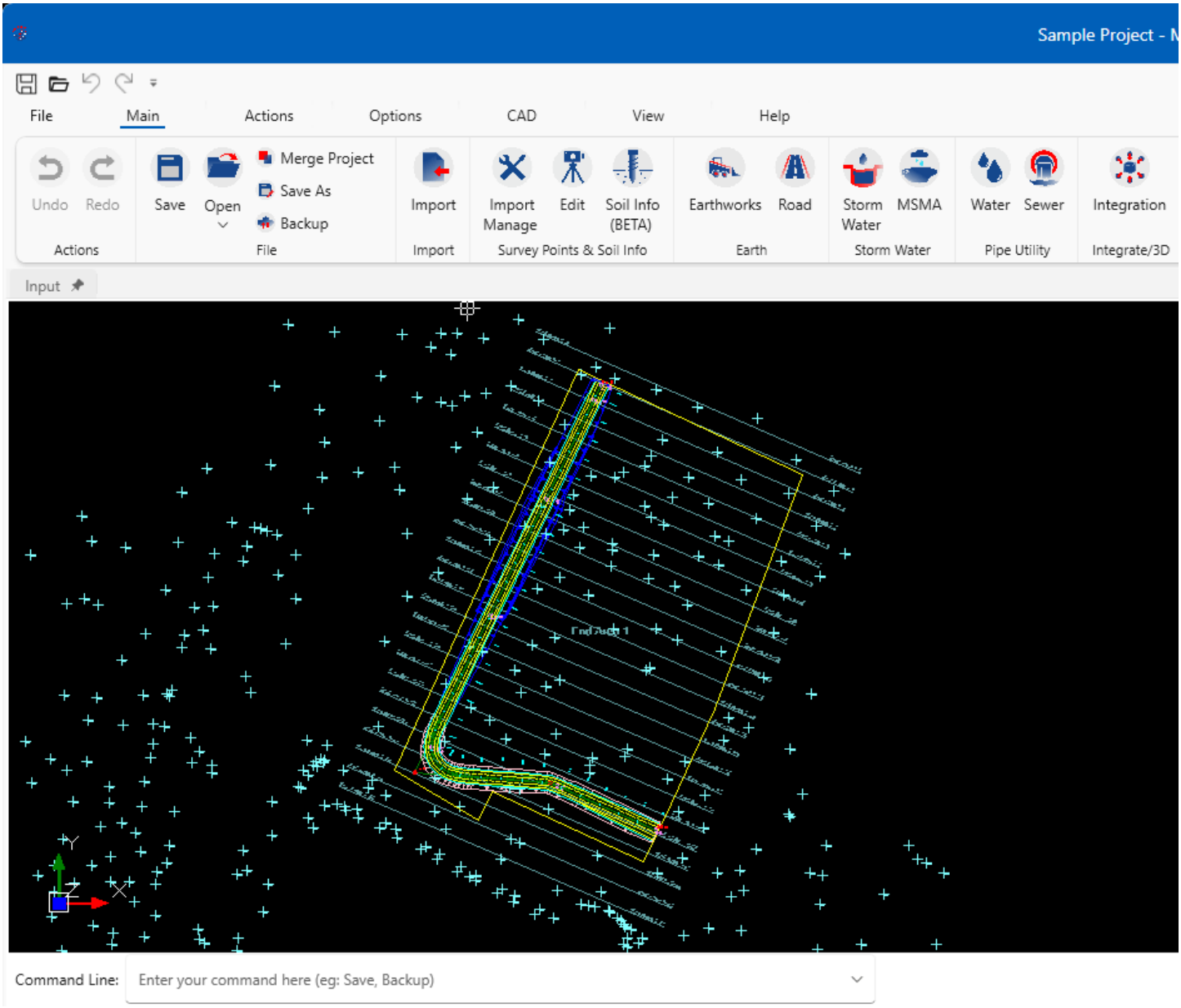


Figure 1.1.1: Project file with one road network

Checking the cut/fill volume

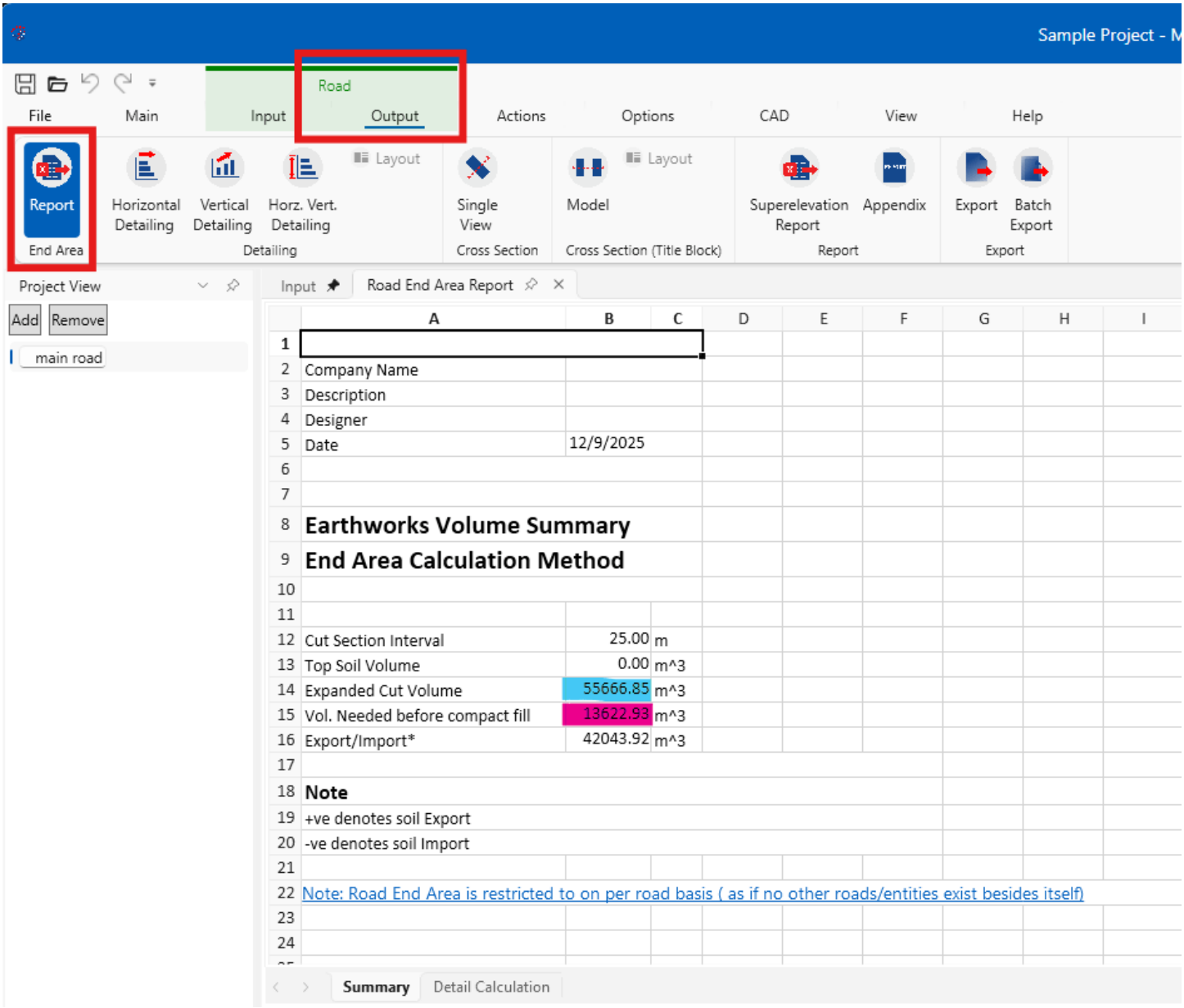


Figure 1.1.2: Summary report of cut/fill volume from road module

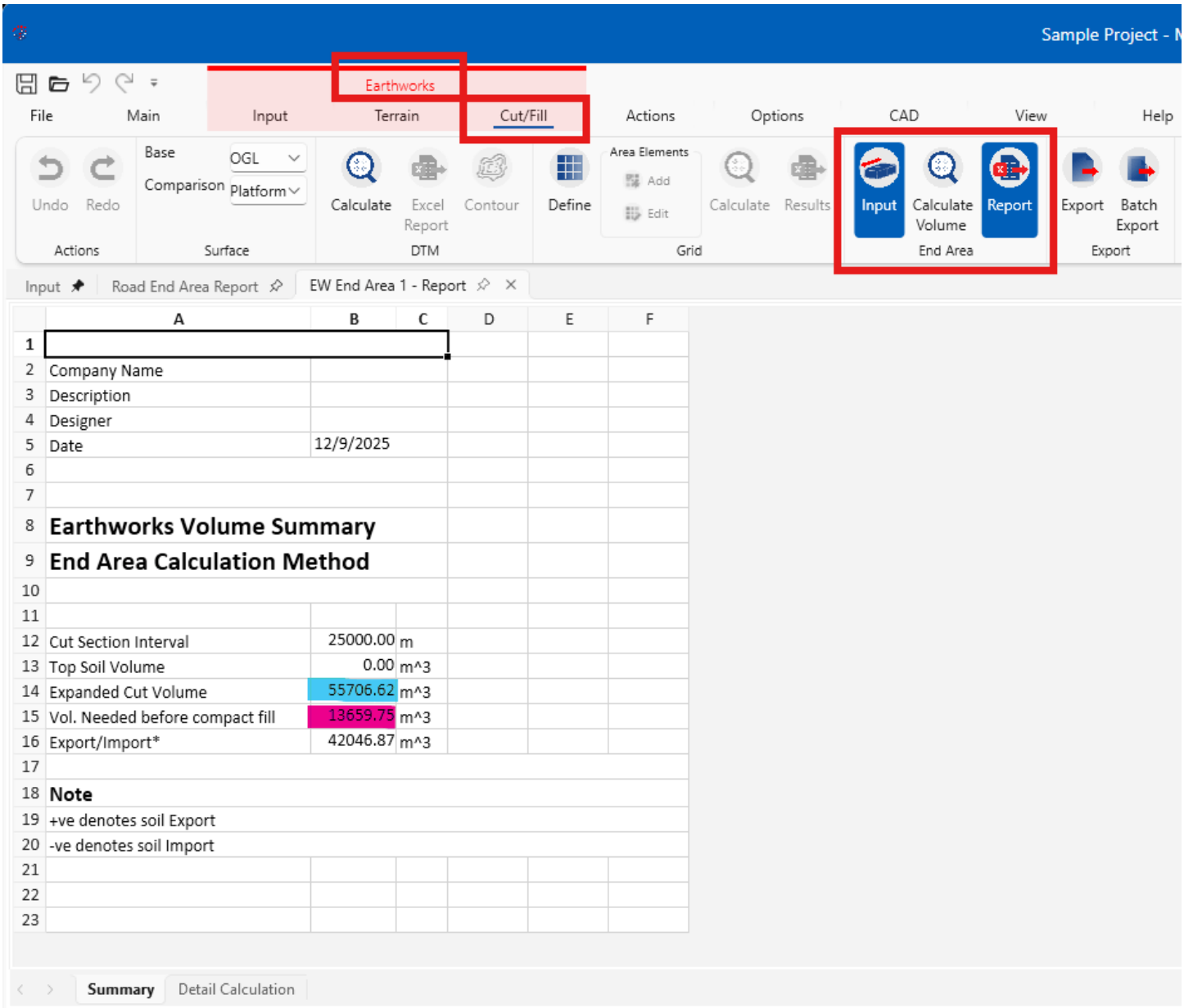


Figure 1.1.3: Summary report of cut/fill volume from earthwork module

We can see that there is just a small difference of 2.95 which equivalent to **0.007%** in Export/Import volume where:

	Road Module	Earthwork Module
Cut (m^3)	55666.85	55706.62
Fill (m^3)	13622.93	13659.75

Export/Import (m^3)	42043.92	42046.87

Case 2: Platform from Road Module and Earthworks Module

Project sample here

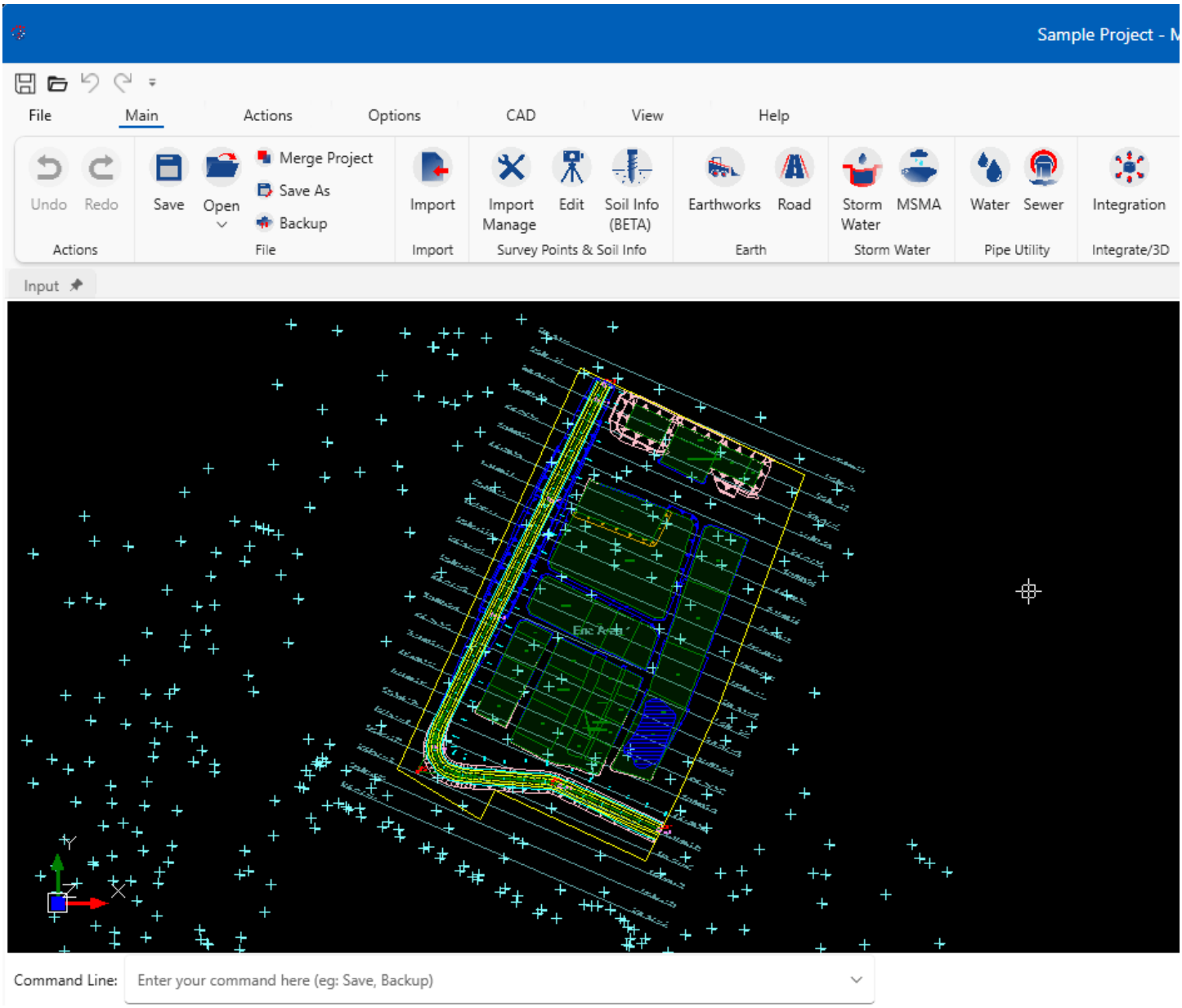


Figure 1.2.1: Project file with one road network and platforms in Earthwork Module

Checking the cut/fill volume

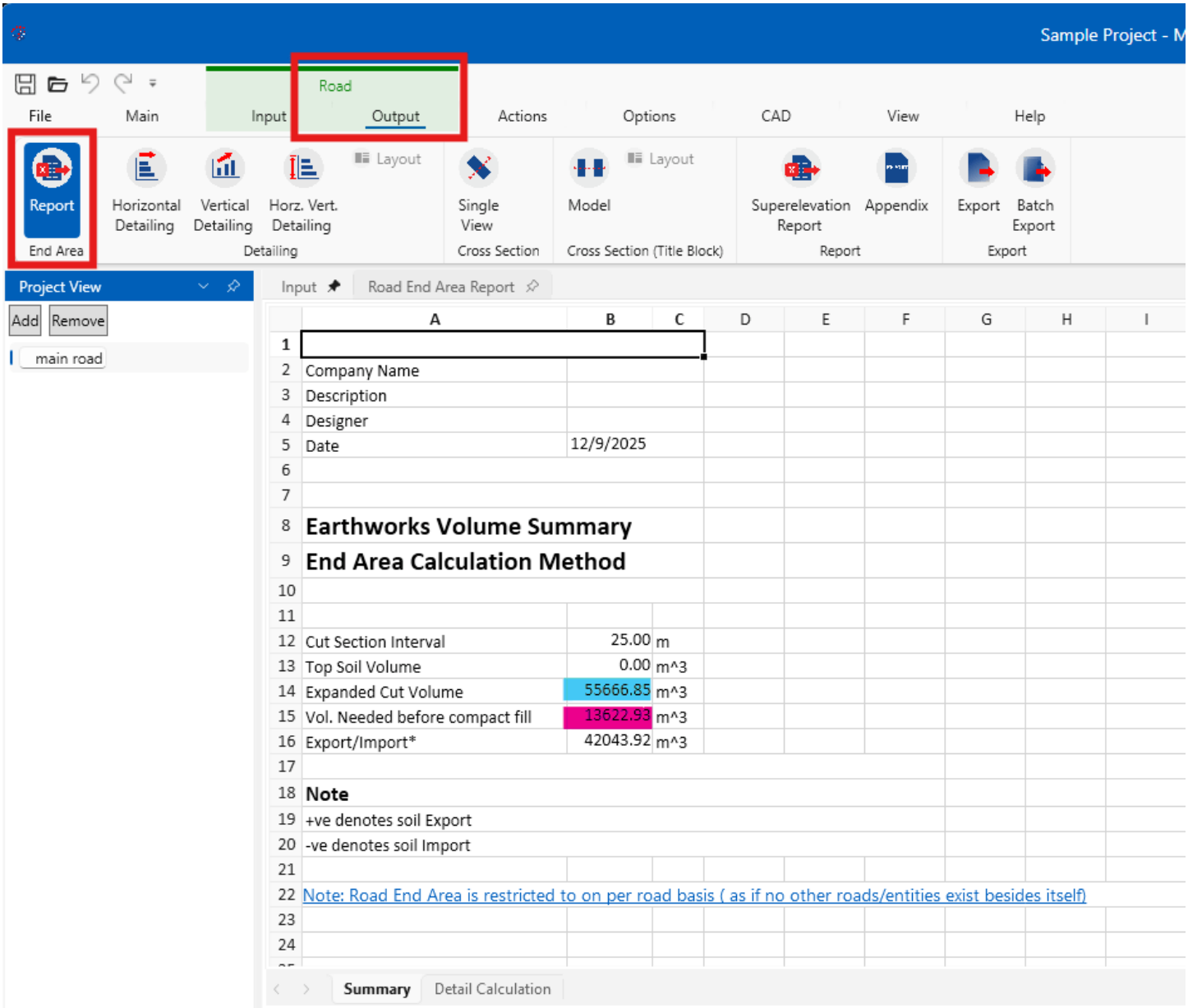


Figure 1.2.2: Summary report of cut/fill volume from road module

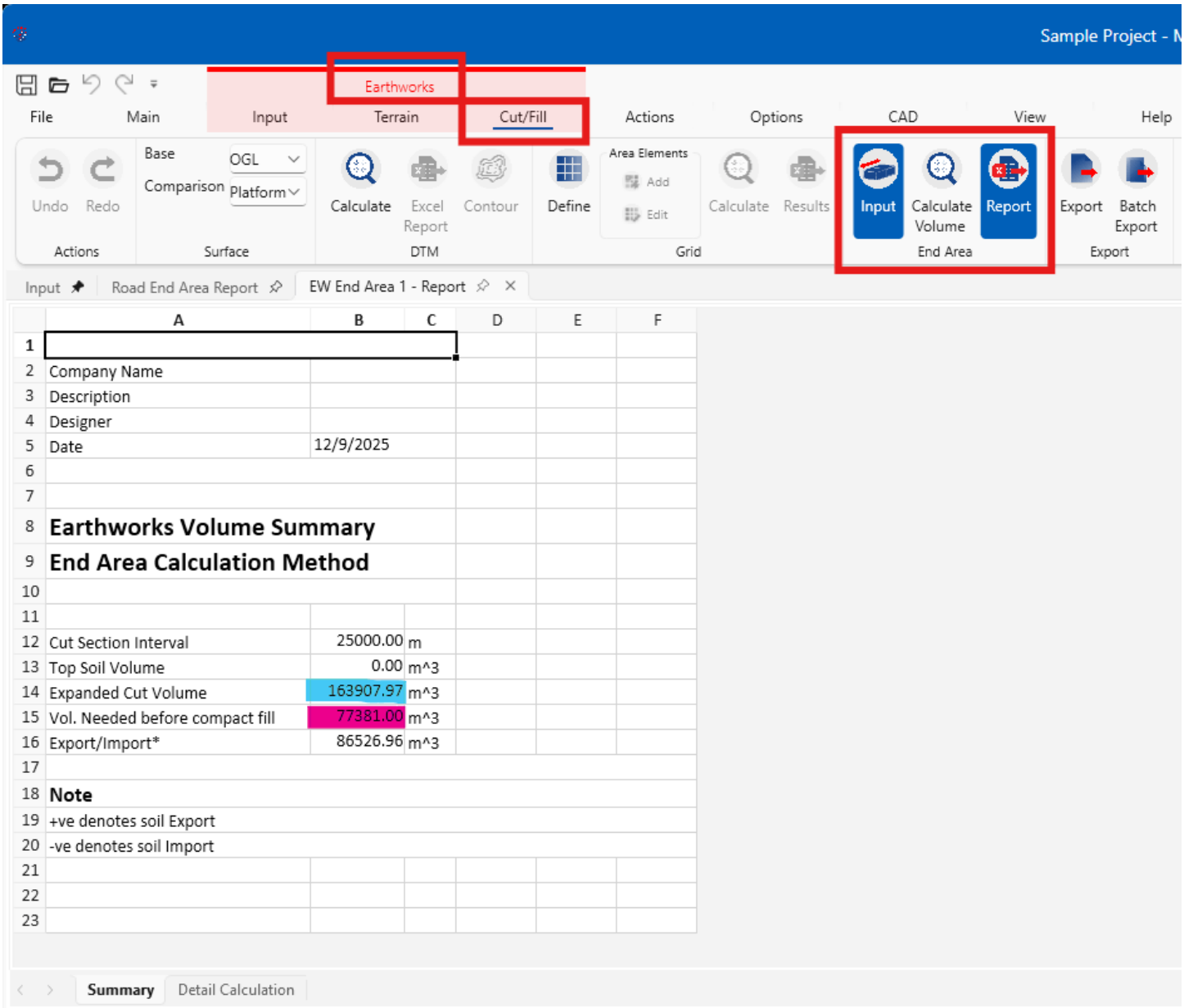


Figure 1.2.3: Summary report of cut/fill volume from earthwork module

We can see that there is a significant difference of 44483.04 which equivalent to **51.409%** in Export/Import volume where:

	Road Module	Earthwork Module
Cut (m^3)	55666.85	163907.97
Fill (m^3)	13622.93	77381.00
Export/Import (m^3)	42043.92	86526.96

Comparison of Outcomes

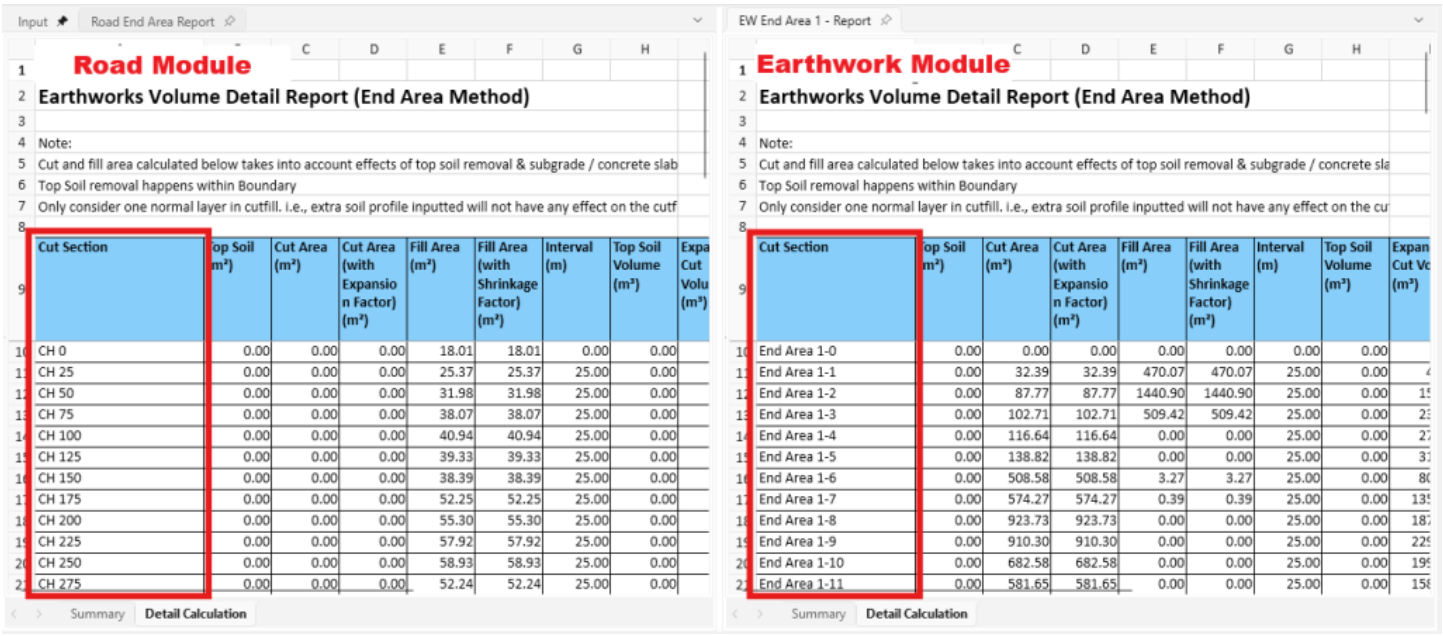
1. From Case 1, the cut and fill volume computed only have slight difference between the outcomes, suggesting that results from both modules can be used with confidence
2. From Figure 1.1.2 and Figure 1.2.2, the cut and fill volume result generated is exactly the same even when there are platforms from the Earthwork Module in Case 2.
3. From Case 2, the cut and fill volume computed in both modules showed a big difference where it even exceed 50%

1.
Before you jump, do consider the below for the explanation of the difference; ***both cases are correct***.

What Causes The Difference?

This is due to the software calculating for the cut and fill volume to be per road basis in the road module. It will not consider any other existing roads, platforms or any boundary when computing the cut and fill volume.

When we open the detail calculation at the end area report, we can see that the end area in the Road Module is calculated based on the chainage interval generated by the software. While in Earthwork Module, the end area is calculated based on the end area input by the user.



Input | Road End Area Report

Road Module

Earthworks Volume Detail Report (End Area Method)

Note:
Cut and fill area calculated below takes into account effects of top soil removal & subgrade / concrete slab
Top Soil removal happens within Boundary
Only consider one normal layer in cutfill. i.e., extra soil profile inputted will not have any effect on the cutf

Cut Section	op Soil (m²)	Cut Area (m²)	Cut Area (with Expansion Factor) (m²)	Fill Area (m²)	Fill Area (with Shrinkage Factor) (m²)	Interval (m)	Top Soil Volume (m³)	Expa Cut Volu (m³)
CH 0	0.00	0.00	0.00	18.01	18.01	0.00	0.00	
CH 25	0.00	0.00	0.00	25.37	25.37	25.00	0.00	
CH 50	0.00	0.00	0.00	31.98	31.98	25.00	0.00	
CH 75	0.00	0.00	0.00	38.07	38.07	25.00	0.00	
CH 100	0.00	0.00	0.00	40.94	40.94	25.00	0.00	
CH 125	0.00	0.00	0.00	39.33	39.33	25.00	0.00	
CH 150	0.00	0.00	0.00	38.39	38.39	25.00	0.00	
CH 175	0.00	0.00	0.00	52.25	52.25	25.00	0.00	
CH 200	0.00	0.00	0.00	55.30	55.30	25.00	0.00	
CH 225	0.00	0.00	0.00	57.92	57.92	25.00	0.00	
CH 250	0.00	0.00	0.00	58.93	58.93	25.00	0.00	
CH 275	0.00	0.00	0.00	52.24	52.24	25.00	0.00	

Summary | Detail Calculation

EW End Area 1 - Report

Earthwork Module

Earthworks Volume Detail Report (End Area Method)

Note:
Cut and fill area calculated below takes into account effects of top soil removal & subgrade / concrete sla
Top Soil removal happens within Boundary
Only consider one normal layer in cutfill. i.e., extra soil profile inputted will not have any effect on the cu

Cut Section	op Soil (m²)	Cut Area (m²)	Cut Area (with Expansion Factor) (m²)	Fill Area (m²)	Fill Area (with Shrinkage Factor) (m²)	Interval (m)	Top Soil Volume (m³)	Expan Cut Vo (m³)
End Area 1-0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
End Area 1-1	0.00	32.39	32.39	470.07	470.07	25.00	0.00	
End Area 1-2	0.00	87.77	87.77	1440.90	1440.90	25.00	0.00	1
End Area 1-3	0.00	102.71	102.71	509.42	509.42	25.00	0.00	2
End Area 1-4	0.00	116.64	116.64	0.00	0.00	25.00	0.00	2
End Area 1-5	0.00	138.82	138.82	0.00	0.00	25.00	0.00	3
End Area 1-6	0.00	508.58	508.58	3.27	3.27	25.00	0.00	8
End Area 1-7	0.00	574.27	574.27	0.39	0.39	25.00	0.00	13
End Area 1-8	0.00	923.73	923.73	0.00	0.00	25.00	0.00	18
End Area 1-9	0.00	910.30	910.30	0.00	0.00	25.00	0.00	22
End Area 1-10	0.00	682.58	682.58	0.00	0.00	25.00	0.00	19
End Area 1-11	0.00	581.65	581.65	0.00	0.00	25.00	0.00	15

Summary | Detail Calculation

Figure 3.1: Detail calculation from Road and Earthwork Module in Case 2

The Comparison between Road Cross Section and Earthwork Cut Section

It’s important to see how the cross section/cut section works in both the Road and Earthwork module.

When we observe the cut section across both modules in both cases, we can clearly see that in the Road Module, the cut section only covers the road part. It does not consider the platform in the Earthwork Module at all. Compared to the cut section of the End Area from Earthwork Module where it includes the platform from both modules.

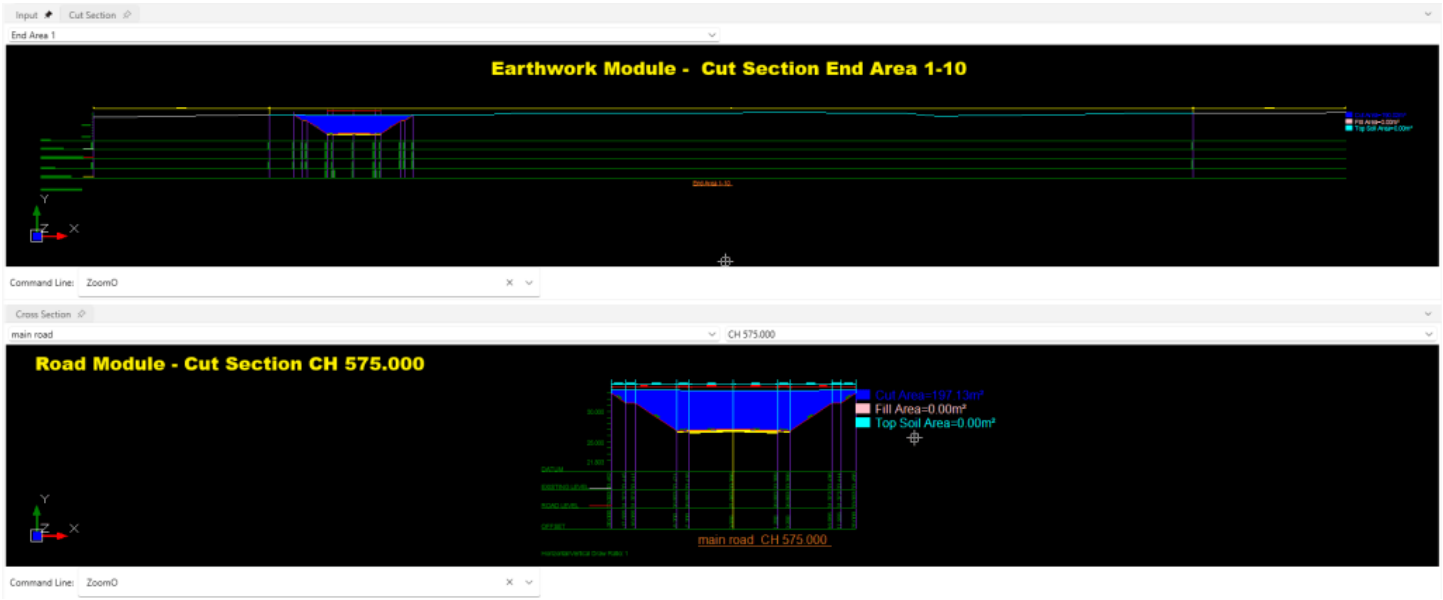


Figure 4.1: Cut Section from Road and Earthwork Module in Case 1

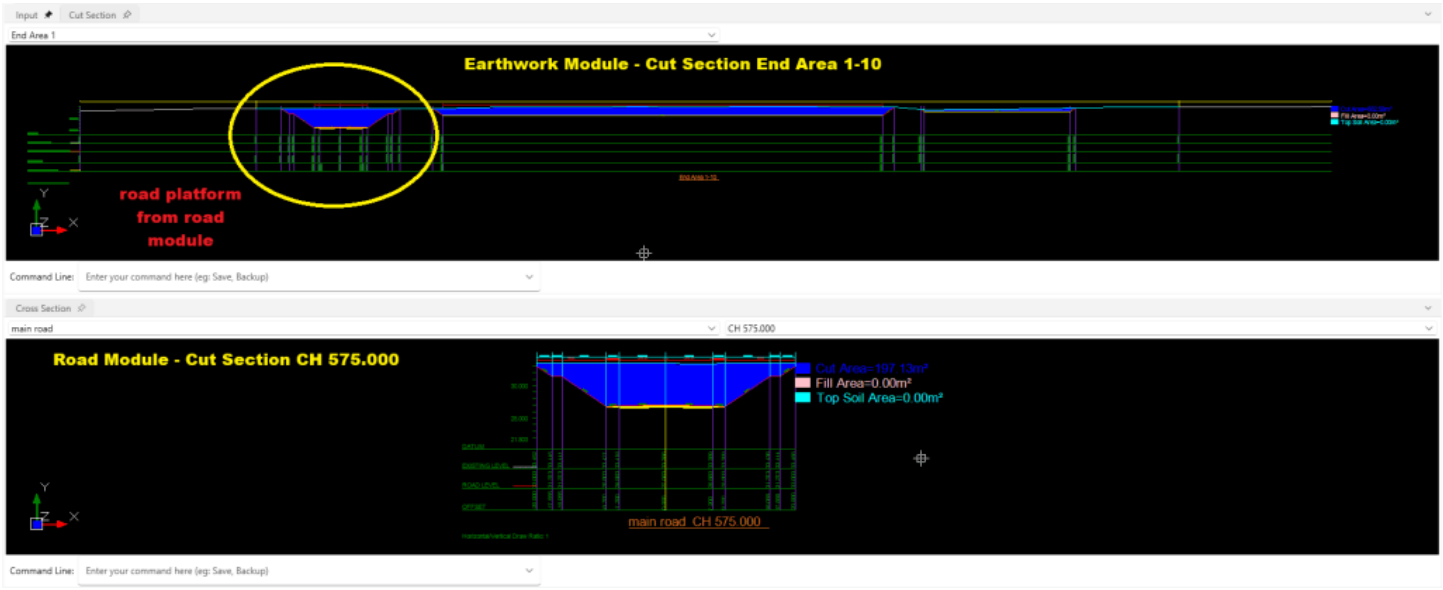


Figure 4.2: Cut Section from Road and Earthwork Module in Case 2

Concluding Remarks

When you are doing Road End Area method calculation, you should be mindful of the above limitation. Make sure that it only applies within its area of validity and not outside of it.

In that case, **what's the advantage of the Road Cross Section method**? The labelling at Road Cross Section method is more suitable for road design engineers and the detailing more

understandable, because each element is labelled according to the Road Width type like median, carriageway. We can afford to do this because we built the Road Cross Section (and hence, the End Area method) specifically by considering the specific features that cross sections of the road have, instead of drawing a generic cut line across platforms, where those platforms don’t have Road specific cross sectional information.

In a nutshell, there are pros and cons as to which cross section/cut section to use. If you want to understand the road design specifically, then the Road cross section is a good go. But if you mix and match road design with other site designs, then the Earthwork Cut Section is a more faithful representation of the whole site.

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