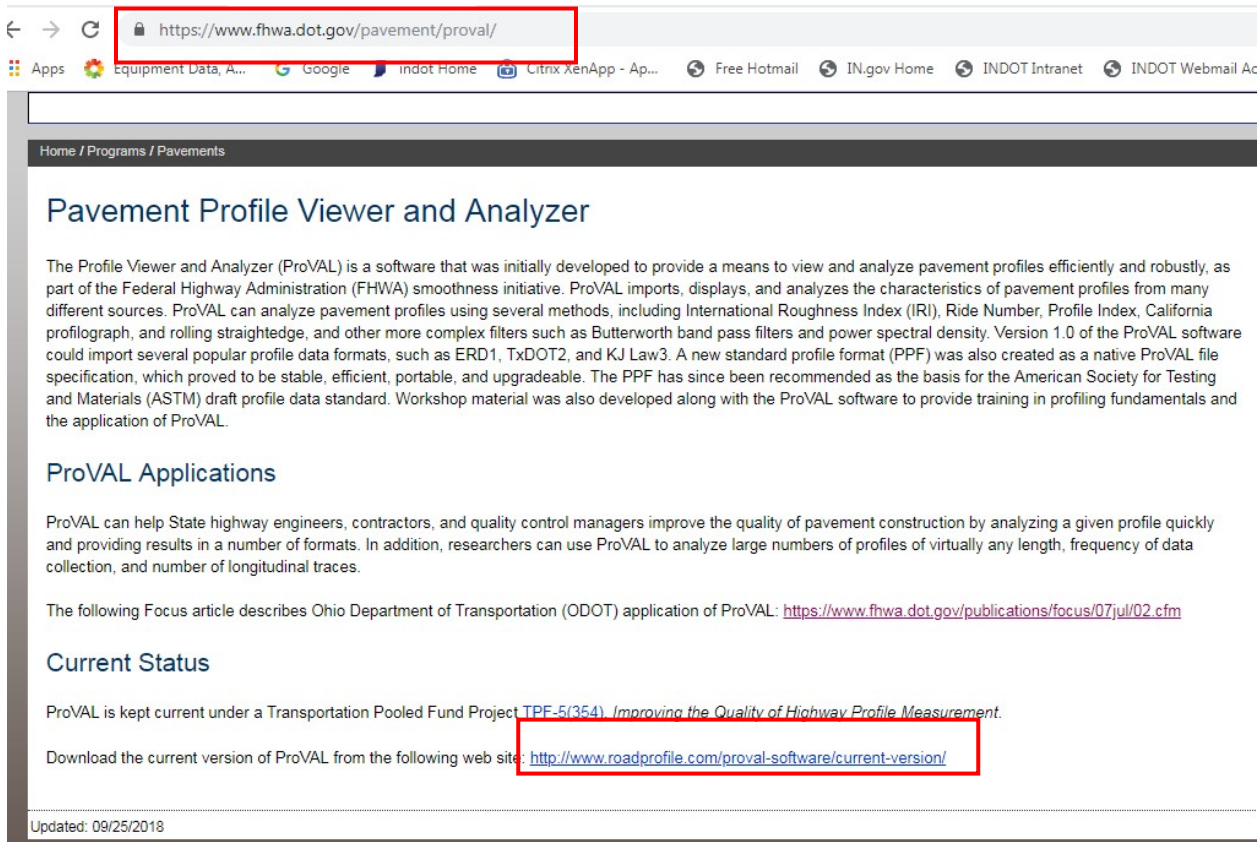


IRI Field Guide

***The steps in this Field Guide are intended to be completed by the contractor performing the high speed profile data collection. After preparing the files, analyzing the data, and generating reports in ProVal, all files are to be submitted to the PE/S for review. The PE/S will review the ProVal files and utilize the smoothness information to generate smoothness payment utilizing the Dept spreadsheets as shown at the end of this guide. Any corrective action required for smoothness sections exceeding the contract thresholds will be performed in accordance with the contract documents.**

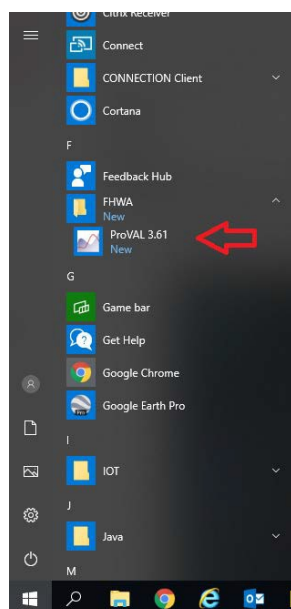
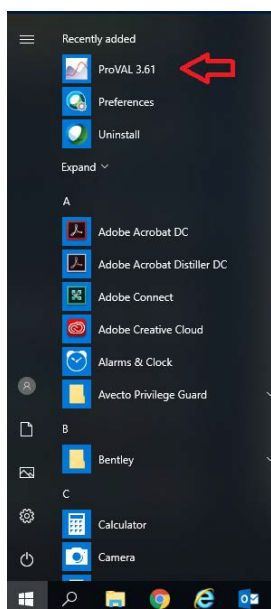
ProVAL Applications can be downloaded from FHWA website:

<https://www.fhwa.dot.gov/pavement/proval/>

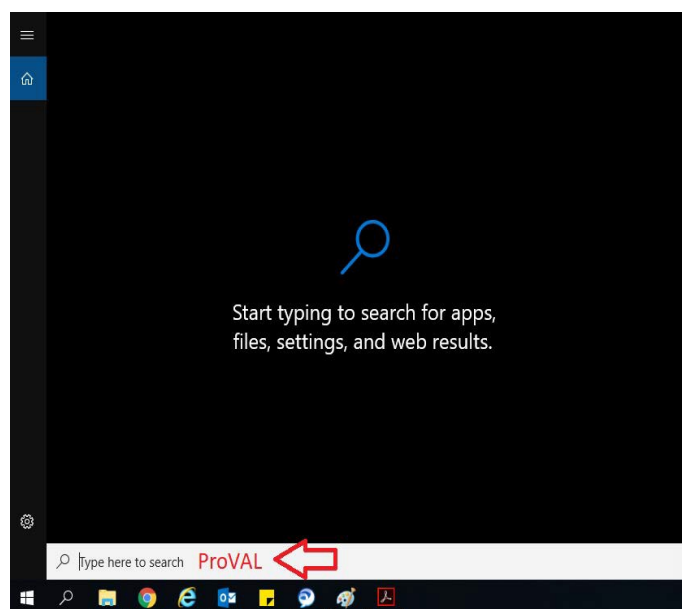


1) Open up ProVAL by either going to the Start button → All Programs → FHWA → ProVAL or typing ProVAL into the search bar located in the Start menu.

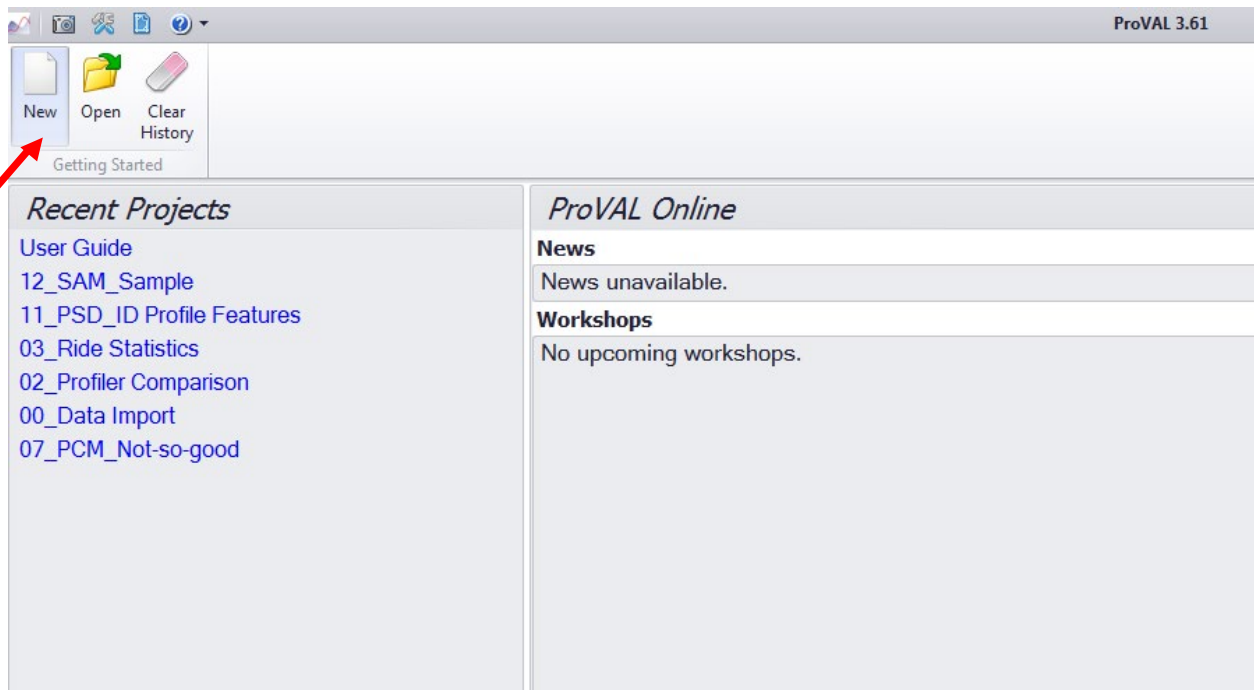
(Windows 10)



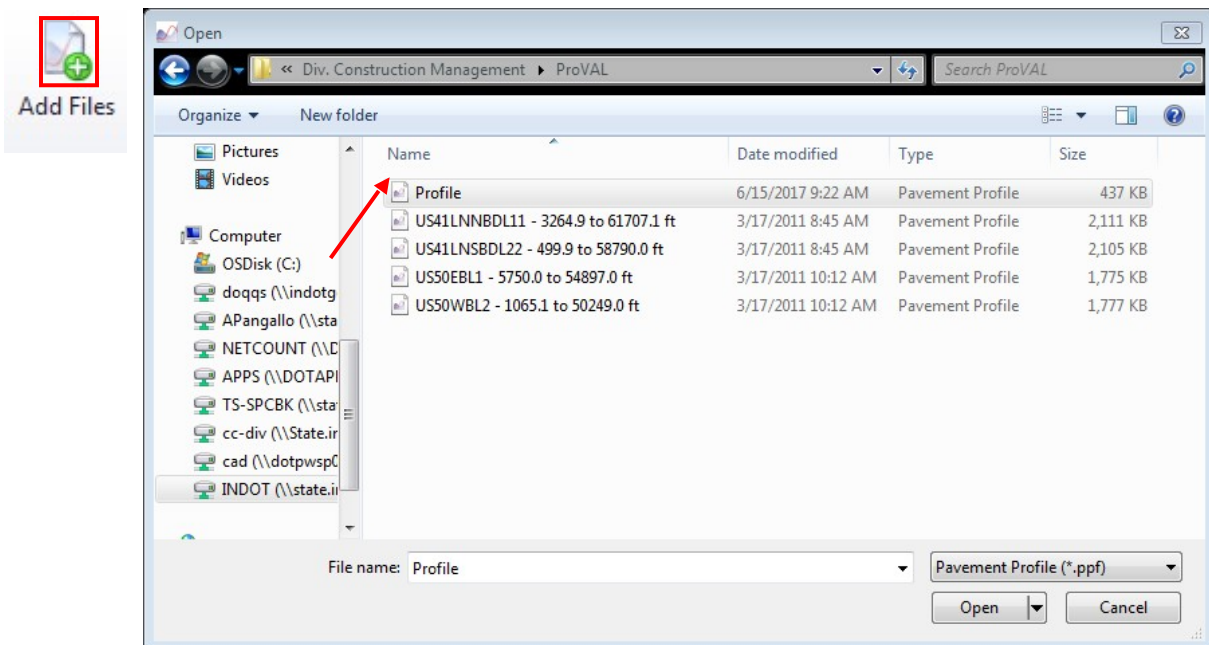
OR



2) Select **New** to begin a new project file



3) The data file the Contractor has sent needs to be downloaded onto this project file. Select **Add Files** and browse the folders where you placed the Contractor's data file (window below is only an example of a folder location) and open it.

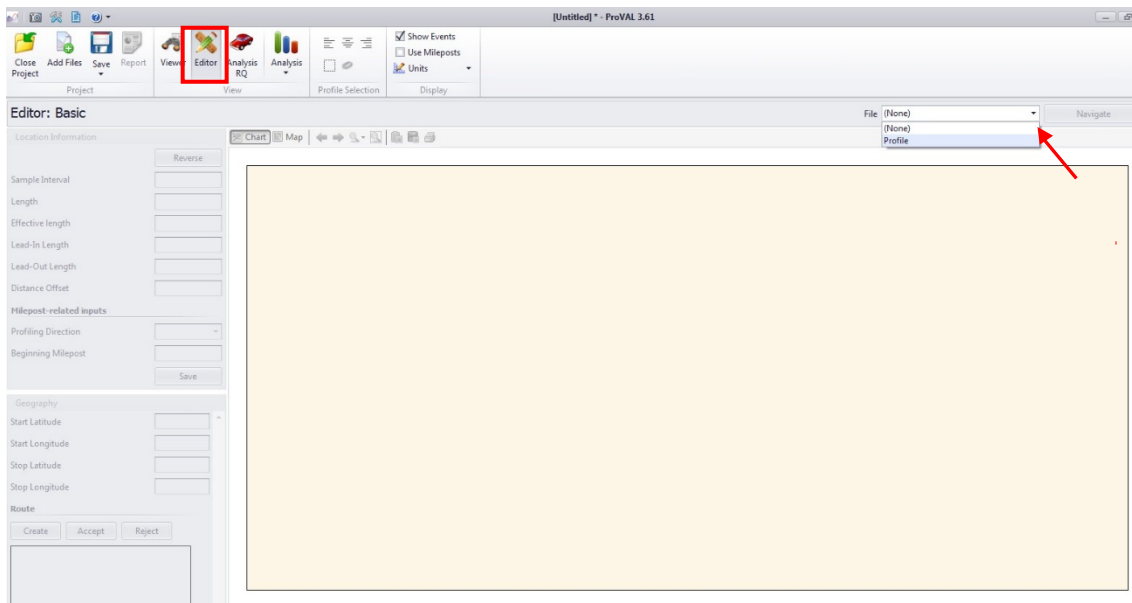


As more data is received, additional files should be added to this one project file to represent all the IRI testing for a contract.

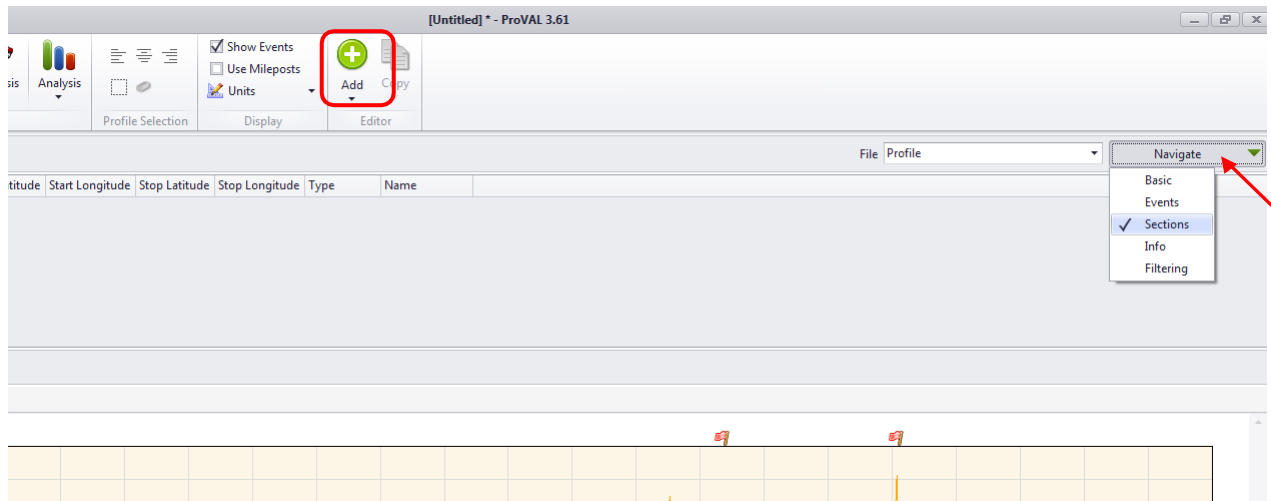
4) A data file will automatically begin in the Viewer pane. Each file will have two checkboxes for left and right wheel path readings. **Clicking** on these checkboxes will display the IRI readouts for the Section tested. The x-axis is listed in feet starting at 0 feet and up to the distance measured by the inertial profiler.



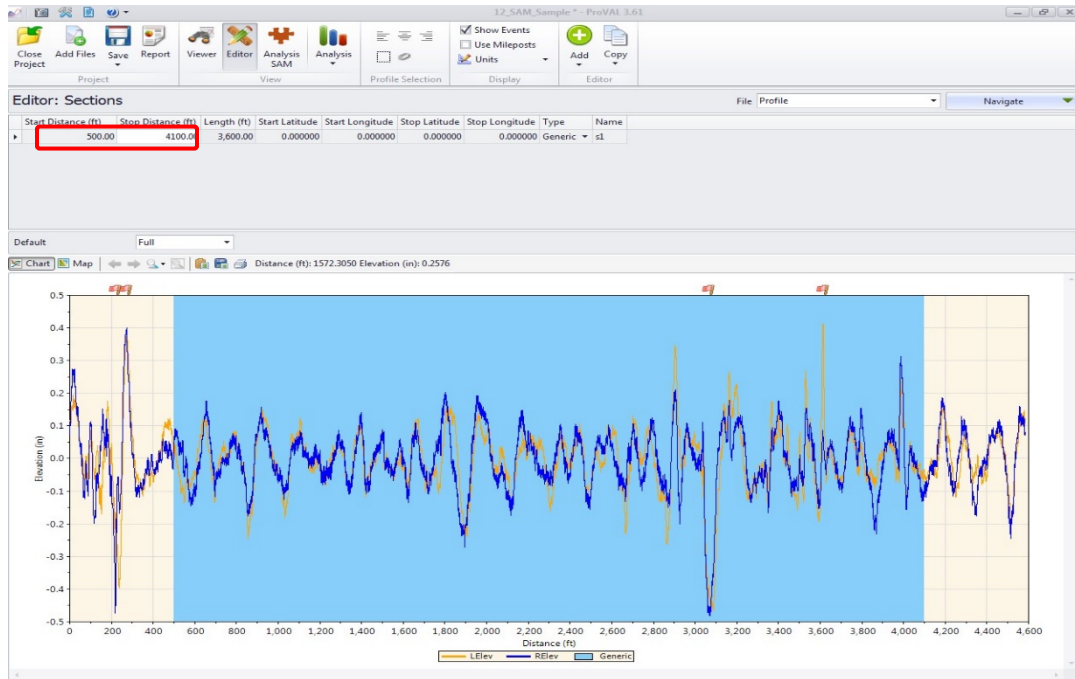
5) Next, the section needs to be identified for analysis. Not all sections start at 0 feet as can be seen above in the example. The starting feet on this graph needs to correspond with a station that represents the start of paving. To identify the section, select the **Editor** icon. Now select which **file** you want to use from the File dropdown.



6) Once the file is selected, you will notice the IRI results appear as they did on the Viewer pane. Click the **Navigate** dropdown to the right of File dropdown and select **Sections**. Next, click the **Add** button and provide a meaningful name that helps identify this exact section (Line/Direction/Lane/etc.).

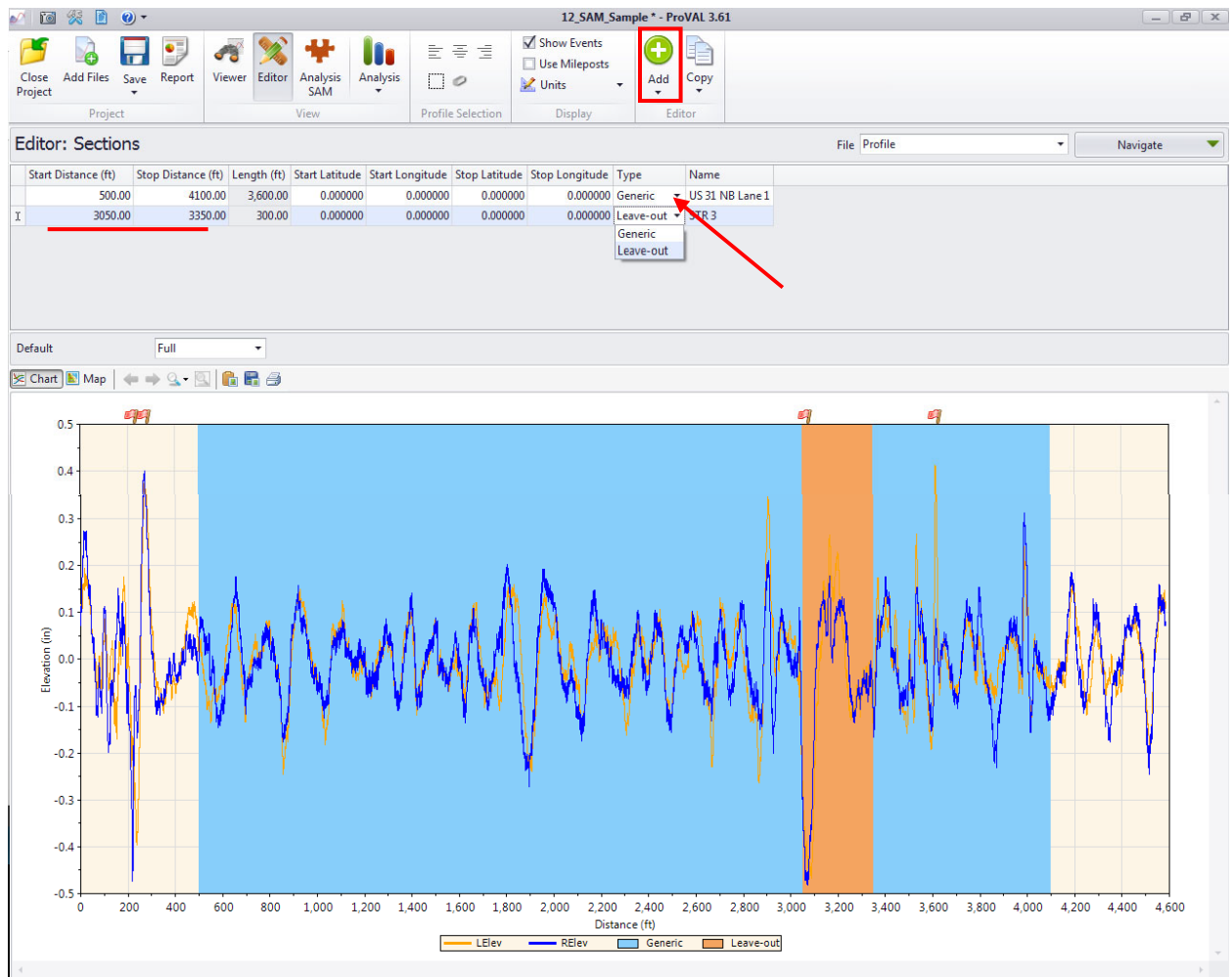


7) Provide the Start Distance and Stop Distance at which the Surface was measured for the contract. The distances will not always match up to your typical section stations. For example, the inertial profiler started taking measurements 500' before the construction limits and ended 500' past the construction limits on the other side of the contract. The total distance measured was 4600'. The starting station for paving is 0+00. That means distance 500' would be station 0+00 since the inertial profiler started measuring 500' before the paving limits. One of the exceptions for the inertial profiler is the first and last 50' of paving. Therefore, the Start Distance would be 550' and the Stop Distance would be 4050'. You will notice the blue shaded area will now shrink to the limits entered.



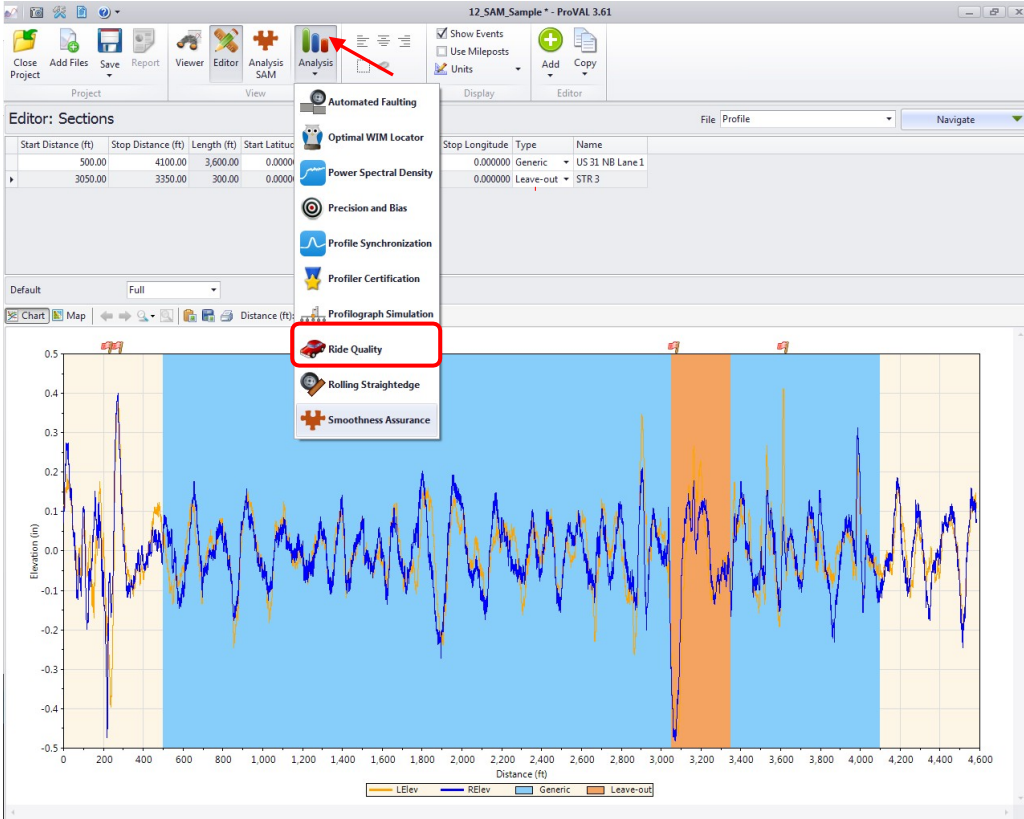
Red Flags can be seen right above the graph. These red flags represent **Events**. Events are usually accompanied by spikes in IRI because of a bridge, casting, railroad crossing or other feature that would cause a bump unrelated to the actual pavement. ITM 917 describes these and exempts 50' before through 50' after these features from measurement. The contractor should help identify these locations which should already be marked in the file before you receive it.

8) Once these exceptions are identified, these areas need to be excluded from measurement. Click **Add** button within Editor and provide a name that describes the exception such as STR 3 for a bridge. The Start Distance should be 50' before and then the Stop Distance should be 50' after the end of the feature. For example, there is a bridge that is 160' long with 20' approaches and the first approach begins at 3100'. The Start Distance should be entered as 3050' and the Stop Distance should be 3350'. The only difference between this section and the previous section is the selection for the dropdown under the Type column. Select **Leave-Out**.



You will notice that the bridge can be seen as the orange shaded area. This area will now be excluded from IRI analysis. Repeat this process for all exceptions located within the section.

9) Now it is time to analyze the Section for IRI and eventually output to obtain pay factors (PF) for smoothness quality adjustments. Click the **Analysis** button and select **Ride Quality** from the dropdown.



10) The Inertial Profiler specification explains that a fixed interval measurement with a 528 ft interval will be used for analysis with 90 in/mi (Type A) and 110 in/mi (Type B) being the threshold for corrective action depending on project type (see USP). To set these parameters, you only need to select “**fixed interval**” for Analysis Type on the Analysis RQ table. Select “**MRI**” for Ride Quality Index. The Segment Length is already set at 528 ft. so no change is required there. Under the threshold column, **enter 90 or 110** for the value for correction Threshold. Next, select the **data files** you would want to analyze and check “**Apply 250 mm Filter**” for all the selected files.

The screenshot shows the ProVAL 3.61 software interface. The toolbar at the top includes buttons for Project, View, Profile Selection, Display, and Analysis. The 'Analysis RQ' button is highlighted with a red box. Below the toolbar is the 'Ride Quality' configuration panel. On the left, there are input fields for Analysis Type (Fixed Interval), Ride Quality Index (MRI), Threshold (in/mi) (90.00), and Segment Length (ft) (528.00). On the right, there is a table with columns for File, Profiles, Section, and Apply 250mm Filter. The table contains four rows, with the last two rows selected (checked) and the 'Apply 250mm Filter' checkbox checked. A red arrow points to the 'Segment Length (ft)' field.

File	Profiles	Section	Apply 250mm Filter
<input type="checkbox"/> US41LNNBDL11 - 3264.9 to 61707.1 ft	Left + Right		<input type="checkbox"/>
<input type="checkbox"/> US41LNSBDL22 - 499.9 to 58790.0 ft	Left + Right		<input type="checkbox"/>
<input checked="" type="checkbox"/> US50EBL1 - 5750.0 to 54897.0 ft	Left + Right	s1	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> US50WBL2 - 1065.1 to 50249.0 ft	Left + Right	Full	<input checked="" type="checkbox"/>

11) Now that the Fixed Interval Analysis has been set to meet the specifications, select the **checkbox** for the file and select the **Section** from the dropdown box. Click the **Analyze** button in the top right.

The screenshot shows the 'Ride Quality' analysis window. The 'Analyze' button is highlighted in red. Below it, a table lists analysis files with checkboxes and section dropdowns. A red arrow points to the 'Section' dropdown for the file 'US50EBL1 - 5750.0 to 54897.0 ft', which is currently set to 'Full'.

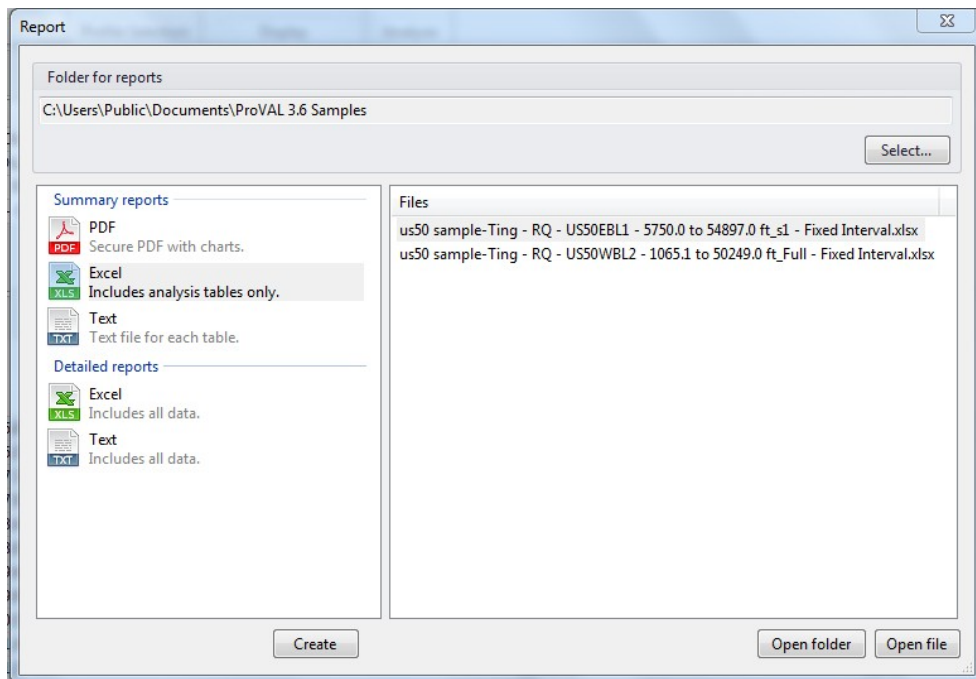
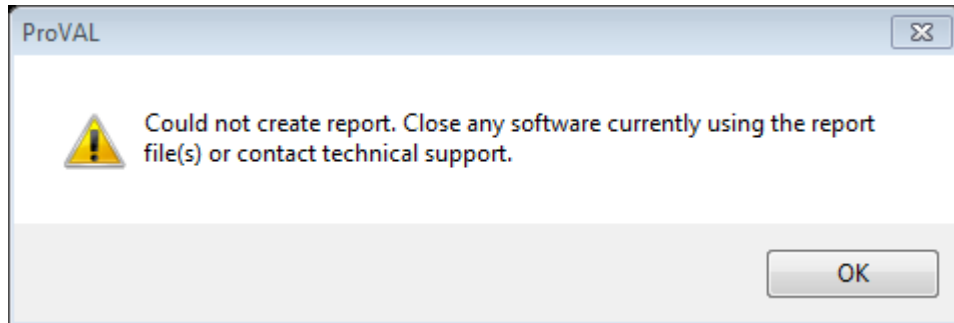
File	Profiles	Section	Apply 250mm Filter
<input type="checkbox"/> US41LNNBDL11 - 3264.9 to 61707.1 ft	Left + Right		<input type="checkbox"/>
<input type="checkbox"/> US41LNSBDL22 - 499.9 to 58790.0 ft	Left + Right		<input type="checkbox"/>
<input checked="" type="checkbox"/> US50EBL1 - 5750.0 to 54897.0 ft	Left + Right	s1	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> US50WBL2 - 1065.1 to 50249.0 ft	Left + Right	Full	<input checked="" type="checkbox"/>

Start Distance (ft)	Stop Distance (ft)	Length (ft)	MRI (in/mi)
6,000.00	6,528.09	528.09	36.43
6,528.09	7,000.07	471.99	34.45
7,350.11	7,878.20	528.09	36.74
7,878.20	8,406.28	528.09	34.70
8,406.28	8,934.37	528.09	38.51
8,934.37	9,462.46	528.09	33.94
9,462.46	9,990.54	528.09	43.97
9,990.54	10,518.63	528.09	39.32
10,518.63	11,046.71	528.09	38.22
11,046.71	11,574.80	528.09	34.55
11,574.80	12,102.89	528.09	35.56
12,102.89	12,630.97	528.09	39.50
12,630.97	13,159.06	528.09	34.11
13,159.06	13,687.15	528.09	36.38
13,687.15	14,215.23	528.09	31.53

12) After that, select the **Report** button. You can click Select to browse folders for the destination of the report. Once a folder is selected, choose the **Excel** includes analysis tables only option on the left and click **Create**.

The screenshot shows the 'Report' dialog box. The folder path is 'C:\Users\Public\Documents\ProVAL 3.6 Samples\Data import'. Under 'Summary reports', the 'Excel' option with the description 'Includes analysis tables only.' is highlighted with a red box. At the bottom, the 'Create' button is also highlighted with a red box.

If you get this screen below, you may have a spreadsheet with the same exact name but by a different user. Either select a different folder or delete the old spreadsheets.



13) You are now ready to compute smoothness adjustments with the Excel Spreadsheet. Open the **IRI Inertial Profiler Quality Adjustments spreadsheet** wherever it is stored on your computer. Open the spreadsheet you created from ProVAL. The spreadsheet should have the project file's name with columns of start distance, stop distance, length and MRI.

	A	B	C	D	E	F
1	Start Distance (ft)	Stop Distance (ft)	Length (ft)	MRI (in/mi)		
2	500.0000305	1027.989746	527.989685	41.1043091		
3	1027.989746	1555.97937	527.989685	42.0843735		
4	1555.97937	2083.968994	527.989685	48.3571472		
5	2083.968994	2611.95874	527.989685	39.6980972		
6	2611.95874	3139.948486	527.989685	106.171463		
7	3139.948486	3667.937988	527.989685	46.4313049		
8	3667.937988	4195.927734	527.989685	42.895607		
9	4195.927734	4723.91748	527.989685	47.2614822		
10	4723.91748	5251.907227	527.989685	43.2703972		
11	5251.907227	5779.896484	527.989685	44.9951668		
12	5779.896484	6307.88623	527.989685	44.8642159		
13	6307.88623	6835.876465	527.989685	45.4732513		
14	6835.876465	7363.865723	527.989685	39.7729492		
15	7363.865723	7891.85498	527.989685	51.4032364		
16	7891.85498	8419.845703	527.989685	49.1647072		
17	8419.845703	8947.834961	527.989685	46.7933578		
18	8947.834961	9475.825195	527.989685	45.8737717		
19	9475.825195	10003.81445	527.989685	49.3246155		
20	10003.81445	10531.80469	527.989685	46.2816925		
21	10531.80469	11059.79395	527.989685	50.0342598		
22	11059.79395	11587.7832	527.989685	45.4399071		
23	11587.7832	12115.77344	527.989685	44.2031784		
24	12115.77344	12643.7637	527.989685	44.270315		

14) Now you can go to INDOT website: <https://www.in.gov/indot/div/construction.htm> and select “IRI Payment Adjustment Spreadsheet – HMA (or PCCP)”. Once you have this spreadsheet open, go to the spreadsheet generated by ProVAL and copy and paste the columns of start distance, stop distance, length and the MRI from the spreadsheet generated by ProVAL into the respective columns on the Adjustments spreadsheet as shown below.

The screenshot shows the 'IRI Payment Adjustment Spreadsheet' interface. At the top, there are buttons for 'New Section', 'Clear IRI', and 'Reset Form'. Below these are input fields for section data: 'Section' (US 50 EB s1), 'LANE WIDTH (ft)' (12.00), 'PROFILE STARTING STATION' (60+50), and 'PROFILE ENDING STATION' (199+50). To the right, there are input fields for 'Unit Price, U (\$/Ton)' and 'Planned Spread Rate, S (lb/SYD)', with a table of values for BASE 2, OG LAYER, BASE 1, INTERMED., and SURFACE. A green box displays the calculated 'ADJUSTMENT FOR SMOOTHNESS TOTAL QUALITY ASSURANCE' as $Q_s = \$32,659.02$ Total for Lane. Below this is a table with columns for ProVAL Starting Distance, ProVAL Ending Distance, ProVAL Output Length, START STATION, END STATION, MRI, Comments, PAY FACTOR FOR SMOOTHNESS, PF_s, CALCULATED CONTRACT VALUE OF HMA MATERIAL PLACED (BASE 2, OG LAYER, BASE 1, INTERMED., SURFACE), and Q_s . The table contains 17 rows of data. At the bottom, there are tabs for 'Qsc', 'US 50 EB s1', 'US50 WB', and 'US 50 EB S2'. A red arrow points to the 'New Section' button and another red arrow points to the 'US 50 EB s1' tab.

15) Fill in all the Section Data in the spreadsheet such as Profile starting station and Profile ending station, lane width, all Planned spread rates (if HMA), and Unit price per pay items. (Note this step should be done prior to step 14 in order for the spreadsheet to calculate smoothly.) Once all this information is entered, you will notice the highlighted cell for variable Q_s will show the dollar amount for the quality adjustment.

When the next Section has been measured for MRI, simply click the New Section button right next to the Q_s cell. This action will save the current section spreadsheet results and will appear at the end of the spreadsheet tab shown at the bottom of the spreadsheet but maintain the profile stations, lane width, planned spread rates, and unit prices per pay item shown at the top of the spreadsheet. It will also clear out the ProVAL spreadsheet data so the next ProVAL section spreadsheet data can be copied to the Adjustment spreadsheet to calculate adjustments for the next section.

16) Once all Sections are completed, return to the first worksheet tab called "Qsc". Simply press the **Calc Qsc** button to get the final quality adjustment for smoothness.

	A	B	C	D	E	F	G	H
1								
2		Calc Qsc	\$ 129,150.22	TOTAL				
3		US 50 EB s1	\$ 32,659.02					
4		US50 WB	\$ 77,350.53					
5		US 50 EB S2	\$ 19,140.67					
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								

Worksheet tabs: Qsc | US 50 EB s1 | US50 WB | US 50 EB S2