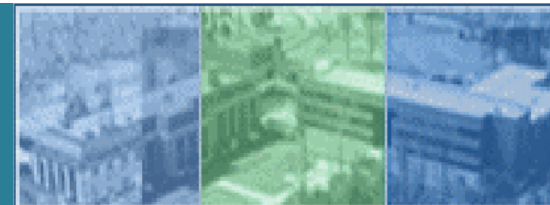


What is in your Asphalt ?

NEAUPG Hartford CT October 18 2017

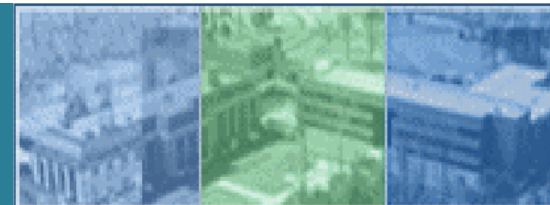




XRF and FTIR Spectroscopy

- **XRF Measures Elements**
 - REOB, Phosphoric Acid, GTR, Glass Beads, Road Marking Paints, Paint Films, Asphalt Binders
- **FTIR Looks at Molecules**
 - Lime, Polymers, Vegetable Oils, Asphalt Oxidation Products





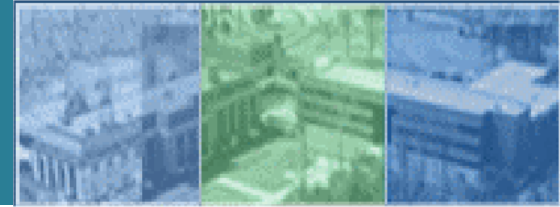
Important Spectroscopy Rules

- **Be Sure you know what you are looking at**
(It will lead you to the wrong conclusions if you don't)
- **Spectrometers are Dumb**
(You have to tell it what you know – Calibration)
- **Spectrometry is Very Powerful**
(Can be extremely useful in Forensic Investigations)
- **It Does Not Do Everything**



ALF High Density Experiment

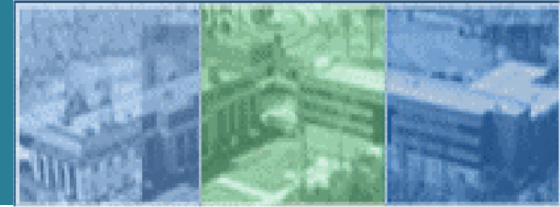




Two Asphalt Binders

Lane	Grade	Cont. PG	D m-s RTFOT	D m-s PAV
1	64-22	68.3	1.8	-1.1
3	64-22	68.3	1.7	-0.8
4	64-22	66.3	1.5	-1.7
5	64-22	66.3	1.5	-1.1
6	64-22	66.4	2.4	-1.9
8	58-28	62.1	1.2	1.7
9	64-22	65.1	2.9	-2.3
11	58-28	65.1	-2.4	0



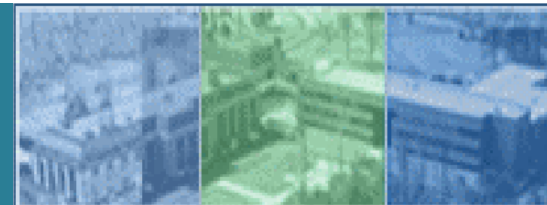


One Asphalt Binder ?

Lane	Grade	Cont. PG	D m-s RTFOT	D m-s PAV	REOB %
1	64-22	68.3	1.8	-1.1	0
3	64-22	68.3	1.7	-0.8	0
4	64-22	66.3	1.5	-1.7	0
5	64-22	66.3	1.5	-1.1	0
6	64-22	66.4	2.4	-1.9	0
8	58-28	62.1	1.2	1.7	9
9	64-22	65.1	2.9	-2.3	0
11	58-28	65.1	-2.4	0	4

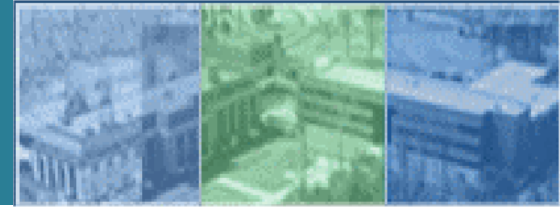


TURNER-FAIRBANK HIGHWAY RESEARCH CENTER



Lane	Grade	Cont. PG	Vanadium ppm	Nickel ppm
1	64-22	68.3	899	100
3	64-22	68.3	903	101
4	64-22	66.3	209	67
5	64-22	66.3	445	70
6	64-22	66.4	181	63
8	58-28	62.1	896	95
9	64-22	65.1	875	93
11	58-28	65.1	695	85

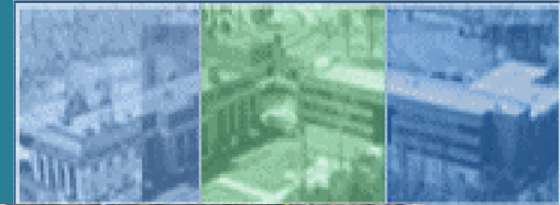




Four Asphalt Binders ?

Lane	Grade	Cont. PG	Vanadium ppm	Nickel ppm	Asphalt
1	64-22	68.3	899	100	A
3	64-22	68.3	903	101	A
4	64-22	66.3	209	67	C
5	64-22	66.3	445	70	B
6	64-22	66.4	181	63	C
8	58-28	62.1	896	95	A
9	64-22	65.1	875	93	A
11	58-28	65.1	695	85	D

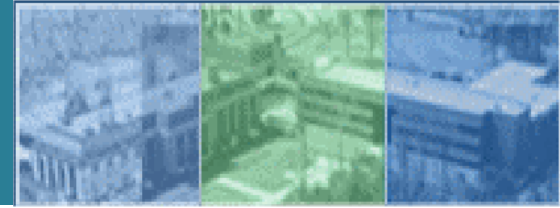




Ultra Thin Bonded Wearing Course

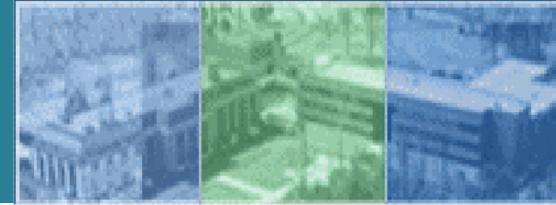
Asphalt Bleeding
to the Surface



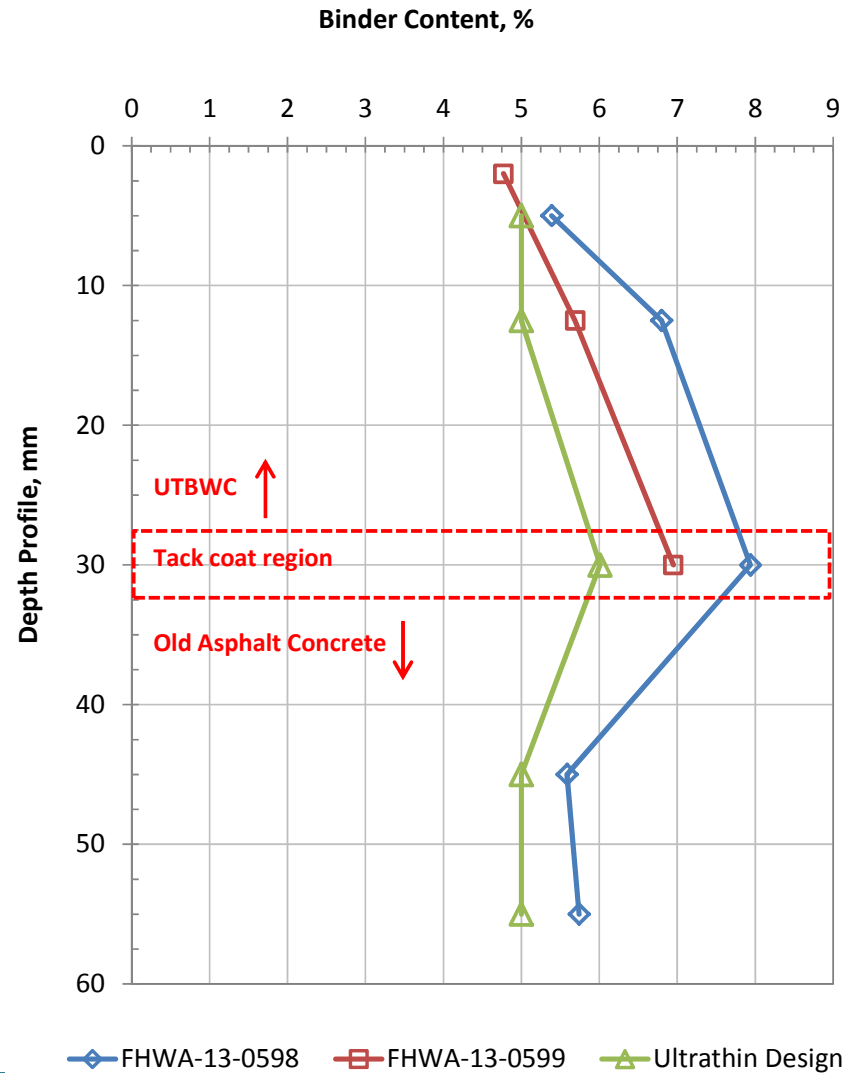


We Cut the UTBWC into Slivers and Recovered the Binder

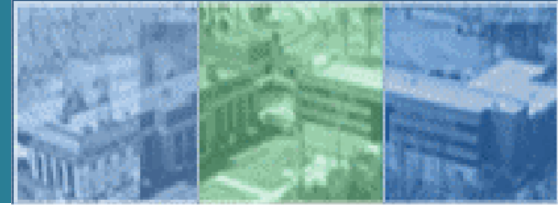




Binder Content Varied with Depth



TURNER-FAIRBANK HIGHWAY RESEARCH CENTER

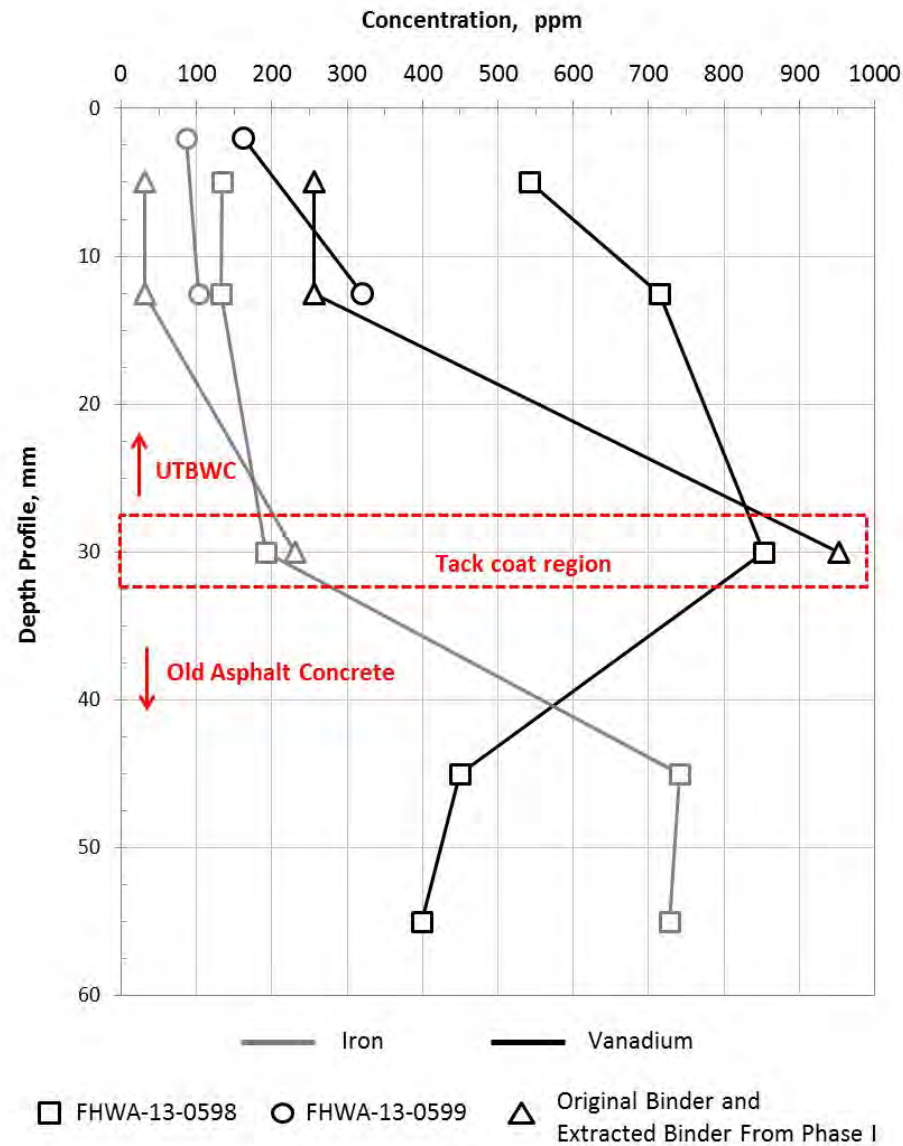
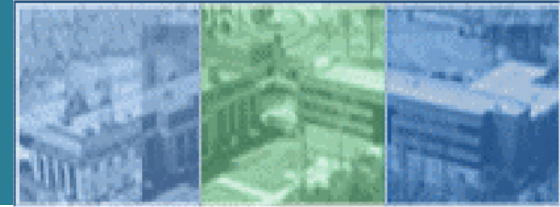


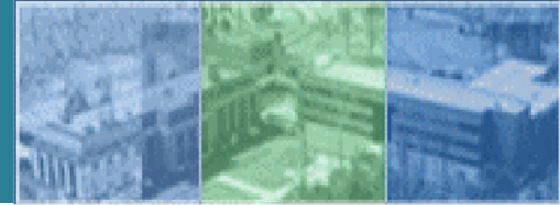
Tack Coat Emulsion Run off



U.S. Department of Transportation
Federal Highway Administration

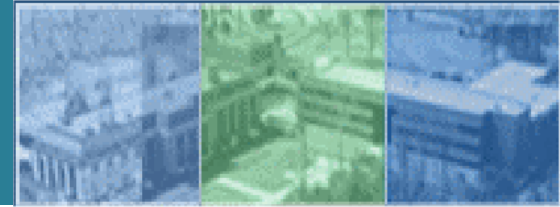
TURNER-FAIRBANK HIGHWAY RESEARCH CENTER





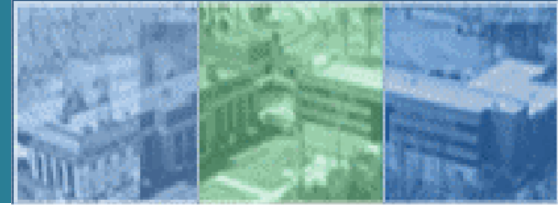
Asphalt Bleeding to the Surface





XRF Spectrometer – Weighs 500lbs.





Thank You

