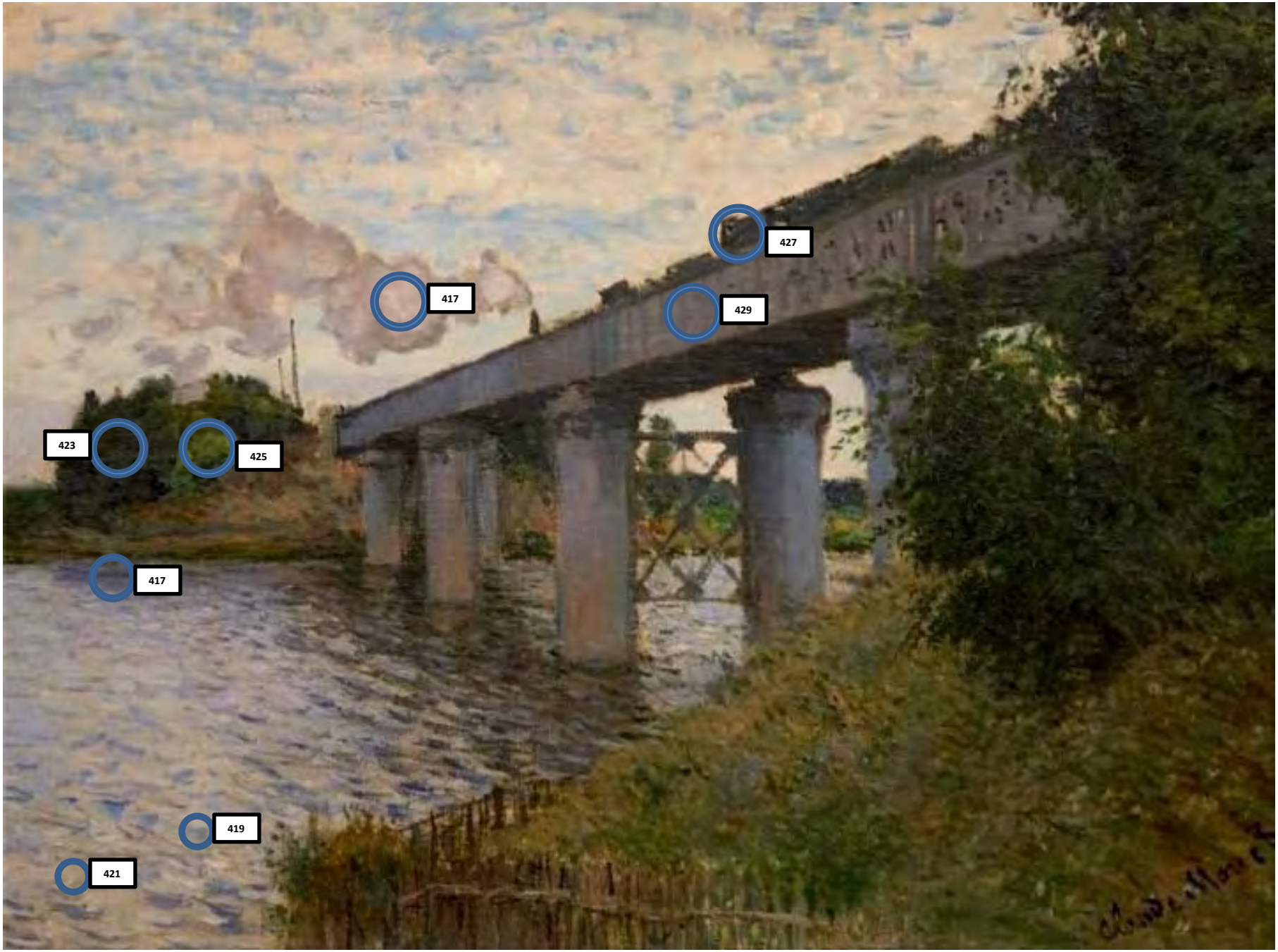
Measurements Monet Pigment at the ORSAY MUSEUM


427
417
429
423
425
417
419
421

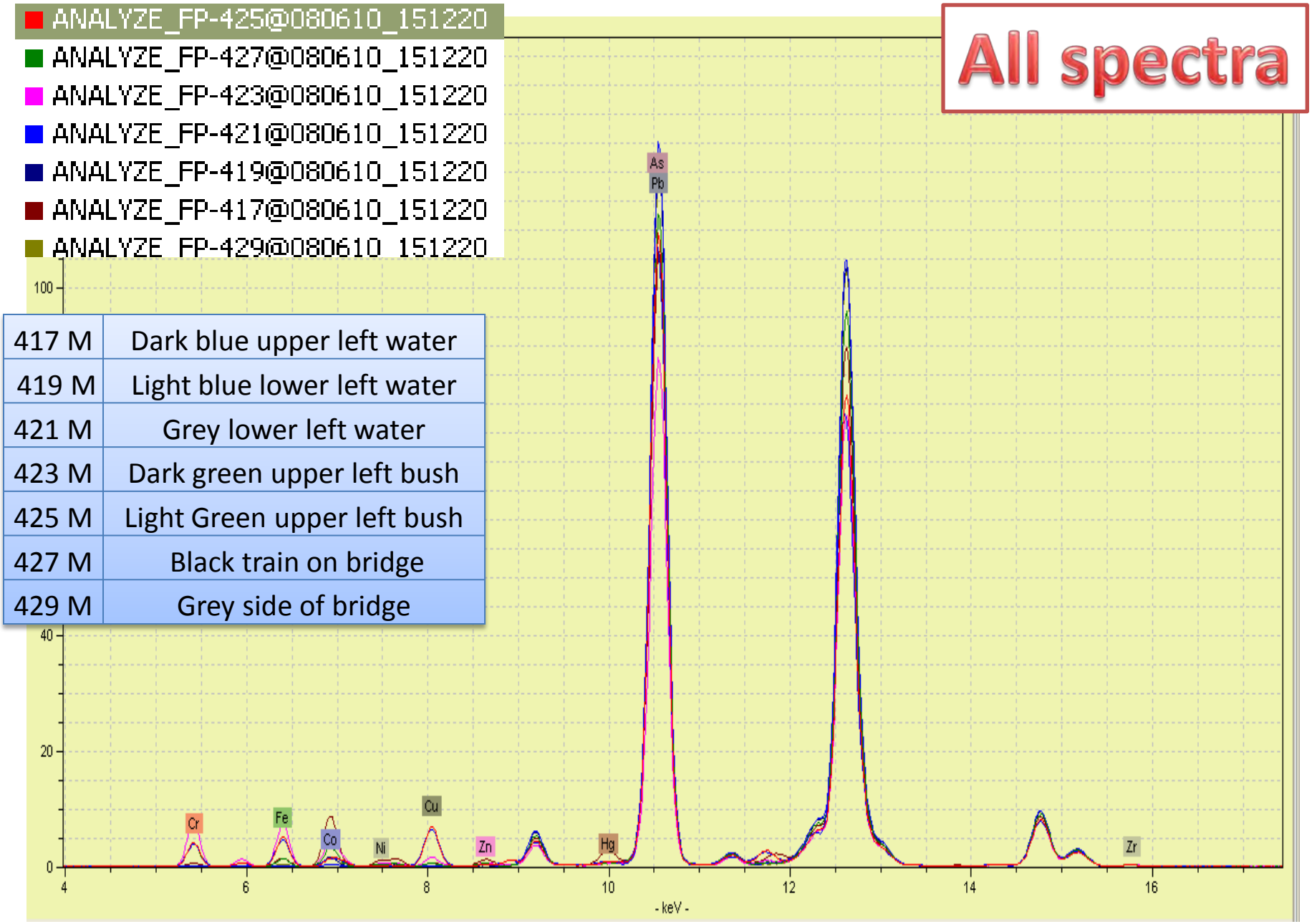
417 M	Dark blue upper left water
419 M	Light blue lower left water
421 M	Grey lower left water
423 M	Dark green upper left bush
425 M	Light Green upper left bush
427 M	Black train on bridge
429 M	Grey side of bridge

Impressionist art is based on the use of color, which has to "draw" the motive without resorting to line.
At the beginning of his career, Monet used dark colors, as he did in the 'Studio Corner' marked by black shades. His painting evokes Courbet and the Realist School.
From 1860 on, Monet abandoned dark colors and worked from a palette limited to pure light colors. In 1905, answering a question about his colors, he wrote :
"**As for the colors I use, what's so interesting about that ? I don't think one could paint better or more brightly with another palette. The most important thing is to know how to use the colors. Their choice is a matter of habit. In short, I use white lead, cadmium yellow, vermilion, madder, cobalt blue, chrome green. That's all."**
The color analysis enabled to identify the colors he used and the binder of the paintings : poppyseed oil and linseed oil. The former dries off slower and yellows less.

According to James Heard in his book *Paint Like Monet*, analysis of Monet's paintings show Monet used these nine colors:

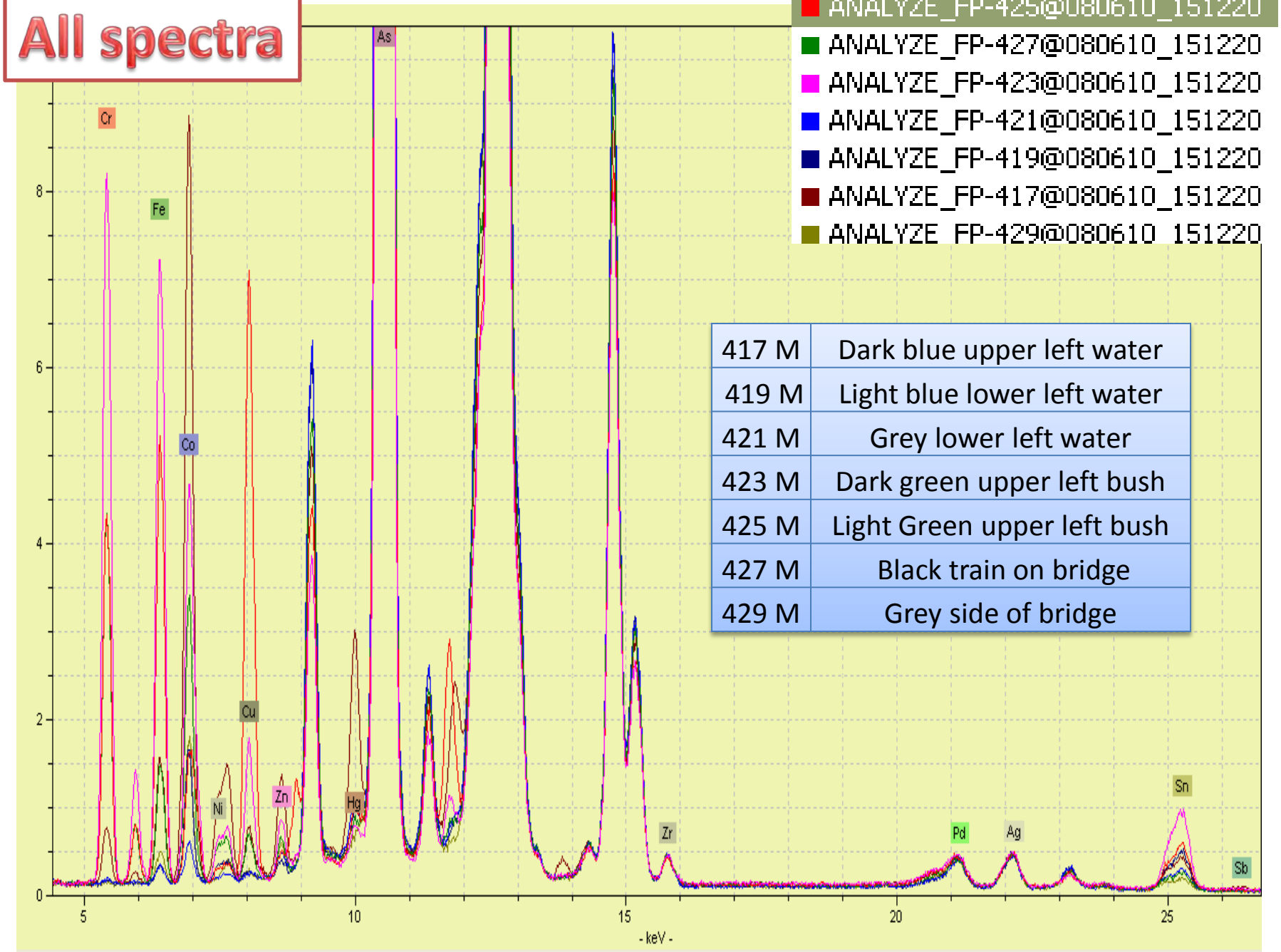
1. Lead white (modern equivalent = titanium white)
2. Chrome yellow (modern equivalent = cadmium yellow light)
3. Cadmium yellow
4. Viridian green
5. Emerald green
6. French ultramarine
7. Cobalt blue
8. Madder red (modern equivalent = alizarin crimson)
9. Vermilion
10. Ivory black (but only if you're copying a Monet from before 1886)

All spectra



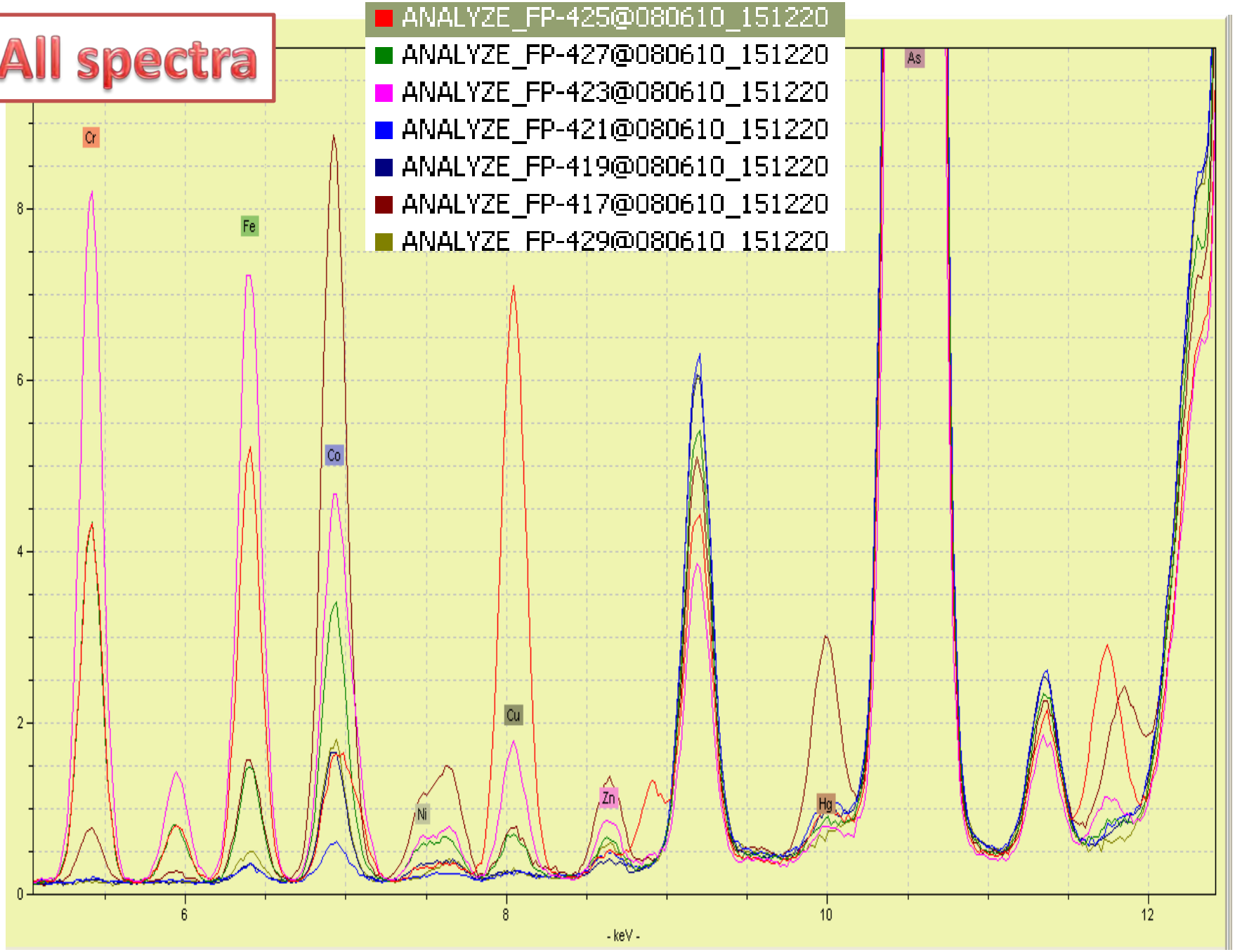
417 M	Dark blue upper left water
419 M	Light blue lower left water
421 M	Grey lower left water
423 M	Dark green upper left bush
425 M	Light Green upper left bush
427 M	Black train on bridge
429 M	Grey side of bridge

All spectra



417 M	Dark blue upper left water
419 M	Light blue lower left water
421 M	Grey lower left water
423 M	Dark green upper left bush
425 M	Light Green upper left bush
427 M	Black train on bridge
429 M	Grey side of bridge

All spectra


ANALYZE_FP-425@080610_151220
ANALYZE_FP-427@080610_151220
ANALYZE_FP-423@080610_151220
ANALYZE_FP-421@080610_151220
ANALYZE_FP-419@080610_151220
ANALYZE_FP-417@080610_151220
ANALYZE_FP-429@080610_151220
Cr
Fe
Co
Ni
Cu
Zn
Hg
As
0
2
4
6
8
6
8
10
12
- keV -

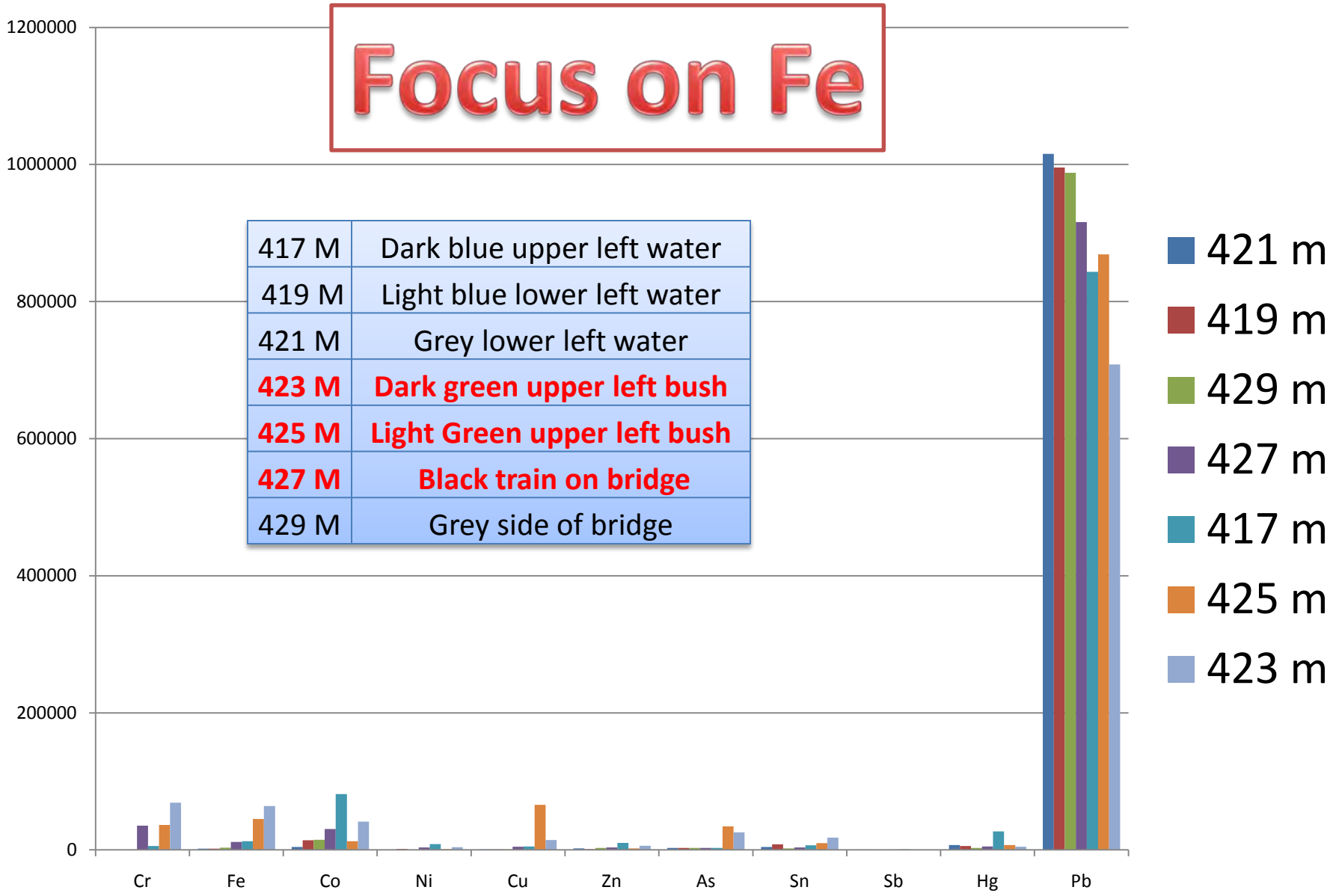
All plots and the numbers of the net area under the elemental lines was done using the ARTAX software.
Each table gives the Number of that elements x rays that were collected in the analysis time for the pigment noted.
Thus it gives a relative abundance of each element in each location and color noted.

"Focus on" in the charts below means the data was sorted on that element's intensity, so you can compare the relative intensities of that particular element, pigment by pigment.

Focus on Fe

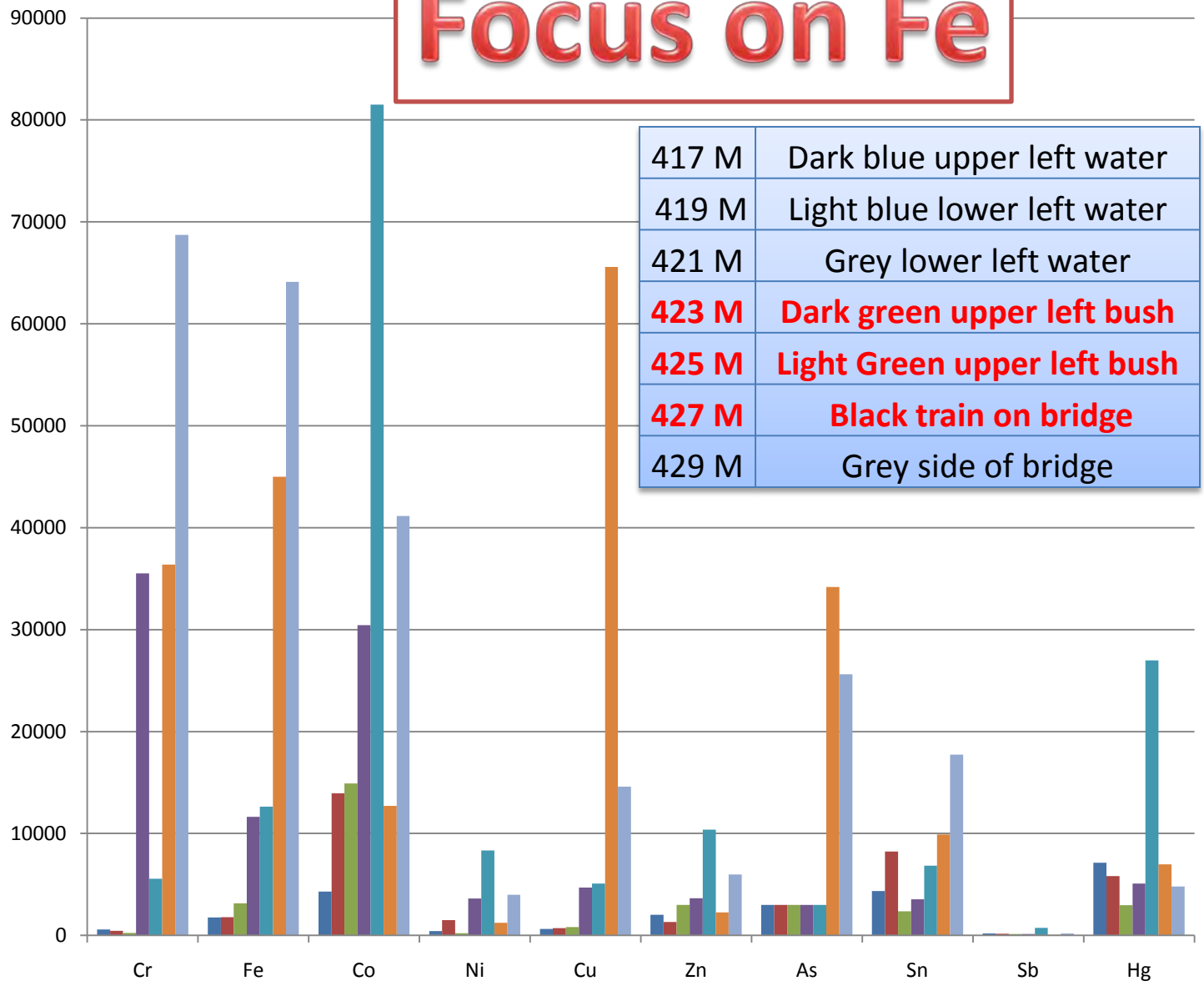
Element	421 m	419 m	429 m	427 m	417 m	425 m	423 m
Cr	575	464	236	35518	5550	36381	68736
Fe	**1771**	**1794**	**3145**	**11635**	**12639**	**44985**	**64112**
Co	4310	13949	14917	30442	81497	12699	41157
Ni	430	1512	230	3623	8332	1231	3982
Cu	648	720	819	4703	5099	65586	14598
Zn	2036	1325	3003	3652	10383	2249	5979
As	3000	3000	3000	3000	3000	34187	25627
Sn	4344	8229	2368	3532	6851	9913	17750
Sb	184	159	129	148	746	48	184
Hg	7125	5814	2966	5091	26978	6970	4803
Pb	1015502	995663	987795	915936	843338	868912	708043

Focus on Fe



417 M	Dark blue upper left water
419 M	Light blue lower left water
421 M	Grey lower left water
423 M	**Dark green upper left bush**
425 M	**Light Green upper left bush**
427 M	**Black train on bridge**
429 M	Grey side of bridge

Focus on Fe



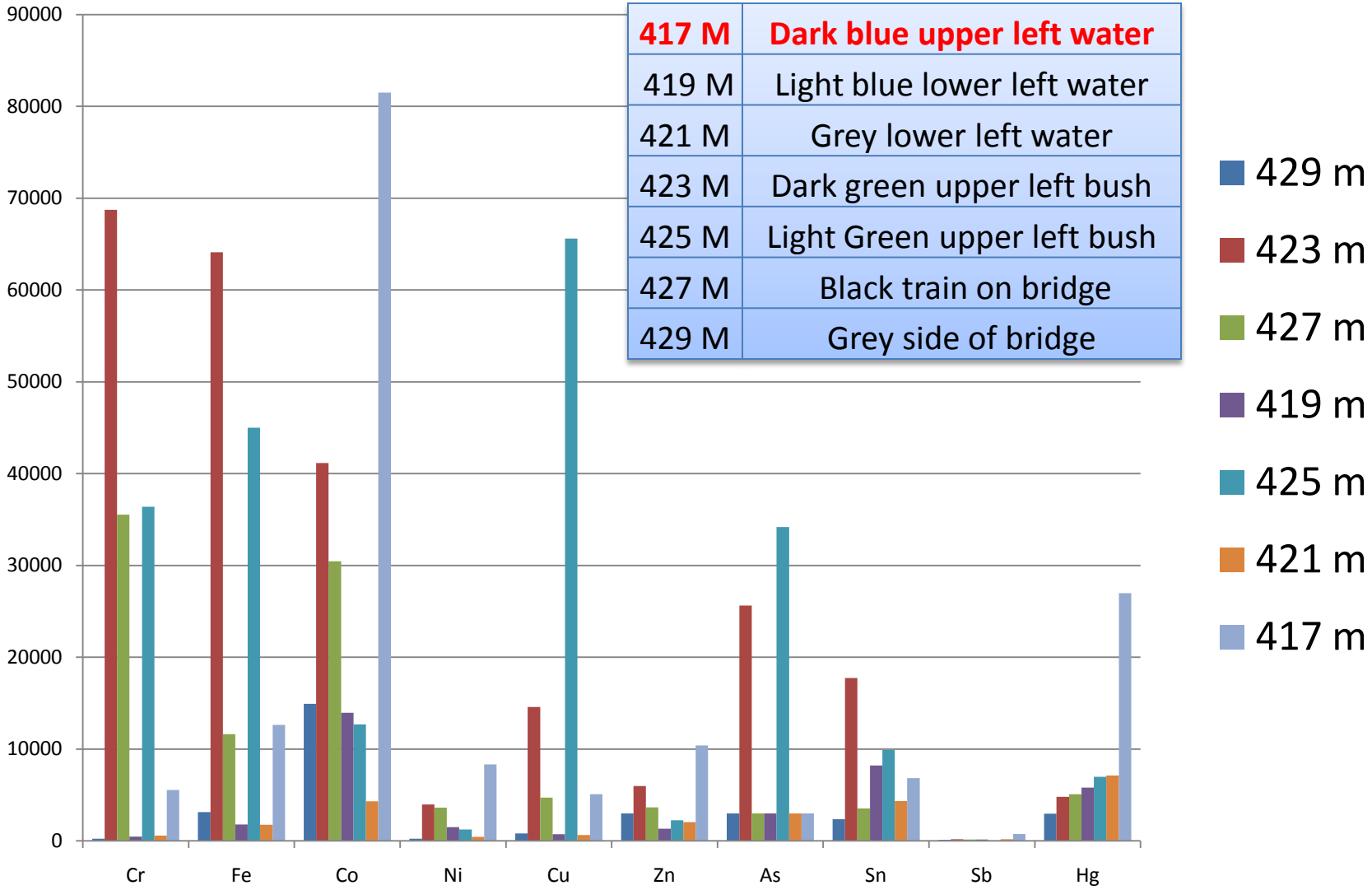
417 M	Dark blue upper left water
419 M	Light blue lower left water
421 M	Grey lower left water
423 M	**Dark green upper left bush**
425 M	**Light Green upper left bush**
427 M	**Black train on bridge**
429 M	Grey side of bridge

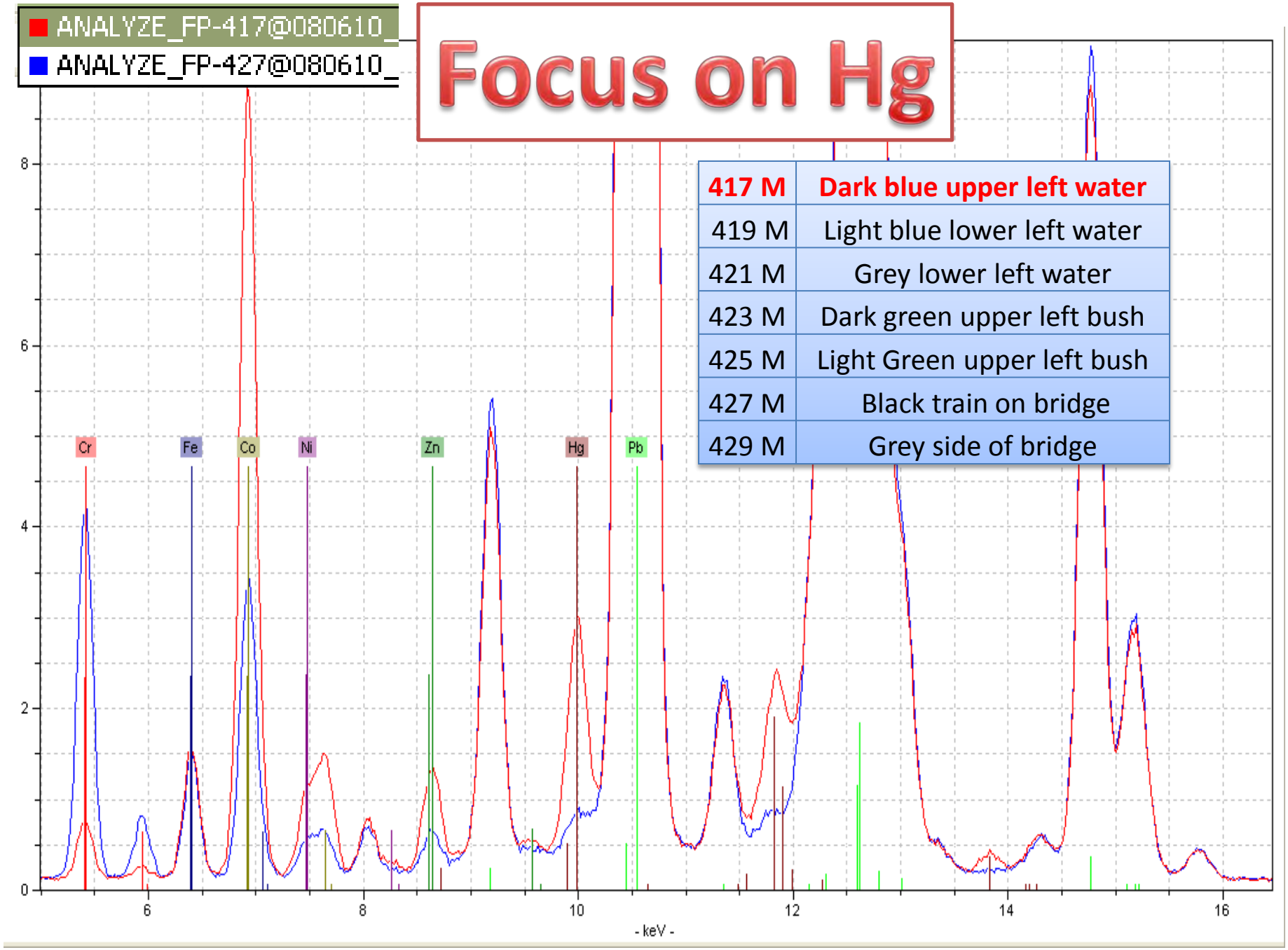
Focus on Hg

Element	429 m	423 m	427 m	419 m	425 m	421 m	417 m
Cr	236	68736	35518	464	36381	575	5550
Fe	3145	64112	11635	1794	44985	1771	12639
Co	14917	41157	30442	13949	12699	4310	81497
Ni	230	3982	3623	1512	1231	430	8332
Cu	819	14598	4703	720	65586	648	5099
Zn	3003	5979	3652	1325	2249	2036	10383
As	3000	25627	3000	3000	34187	3000	3000
Sn	2368	17750	3532	8229	9913	4344	6851
Sb	129	184	148	159	48	184	746
Hg	**2966**	**4803**	**5091**	**5814**	**6970**	**7125**	**26978**
Pb	987795	708043	915936	995663	868912	1015502	843338

Focus on Hg

417 M	**Dark blue upper left water**
419 M	Light blue lower left water
421 M	Grey lower left water
423 M	Dark green upper left bush
425 M	Light Green upper left bush
427 M	Black train on bridge
429 M	Grey side of bridge

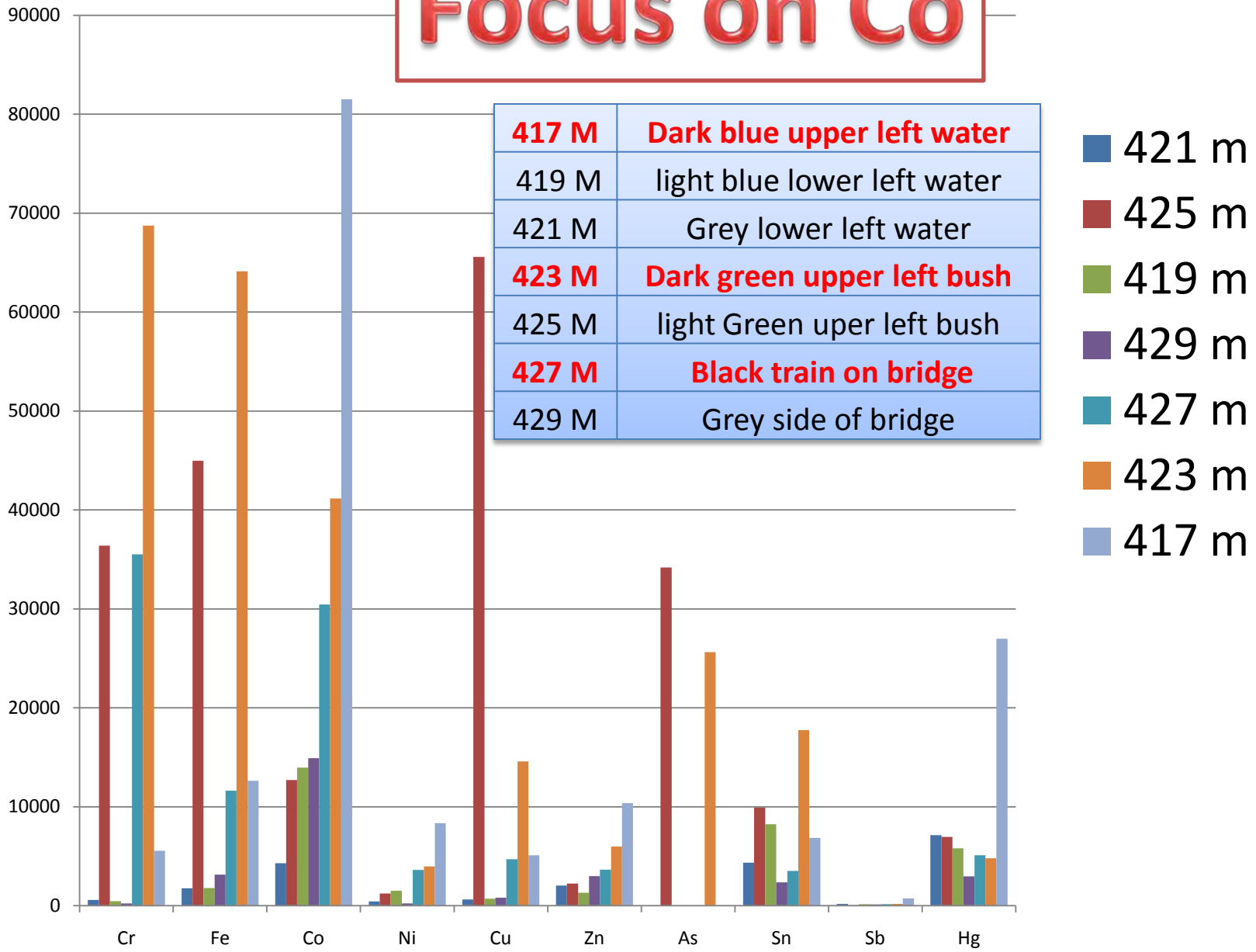



ANALYZE_FP-417@080610_
ANALYZE_FP-427@080610_
Focus on Hg
417 M Dark blue upper left water
419 M Light blue lower left water
421 M Grey lower left water
423 M Dark green upper left bush
425 M Light Green upper left bush
427 M Black train on bridge
429 M Grey side of bridge
Cr
Fe
Co
Ni
Zn
Hg
Pb
0
2
4
6
8
6
8
10
12
14
16
- keV -

Focus on Co

Element	421 m	425				423 m	417 m
Cr	575	36381	464	236	35518	68736	5550
Fe	1771	44985	1794	3145	11635	64112	12639
Co	**4310**	**12699**	**13949**	**14917**	**30442**	**41157**	**81497**
Ni	430	1231	1512	230	3623	3982	8332
Cu	648	65586	720	819	4703	14598	5099
Zn	2036	2249	1325	3003	3652	5979	10383
As	3000	34187	3000	3000	3000	25627	3000
Sn	4344	9913	8229	2368	3532	17750	6851
Sb	184	48	159	129	148	184	746
Hg	7125	6970	5814	2966	5091	4803	26978
Pb	1015502	868912	995663	987795	915936	708043	843338

Focus on Co

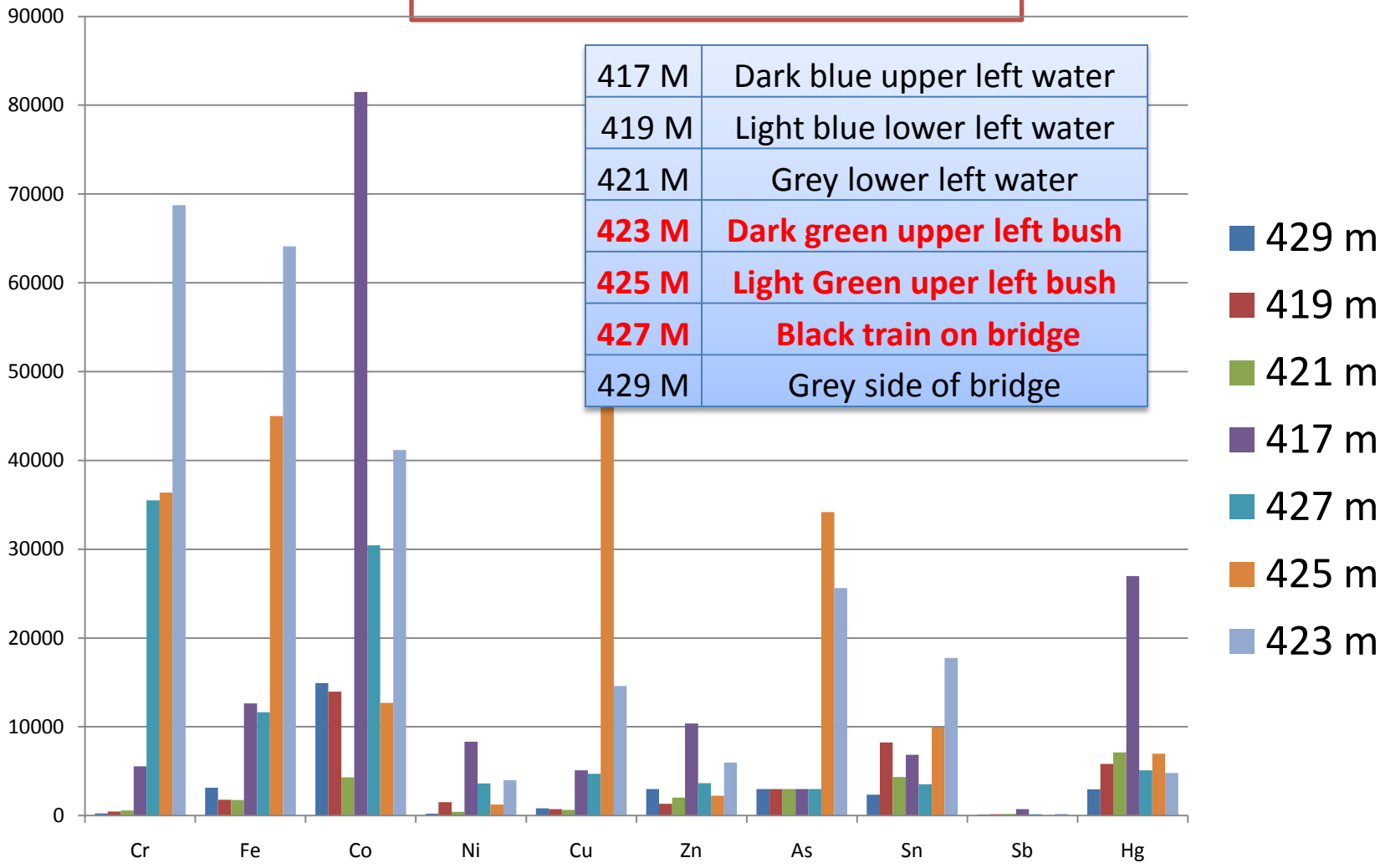


417 M	**Dark blue upper left water**
419 M	light blue lower left water
421 M	Grey lower left water
423 M	**Dark green upper left bush**
425 M	light Green uper left bush
427 M	**Black train on bridge**
429 M	Grey side of bridge

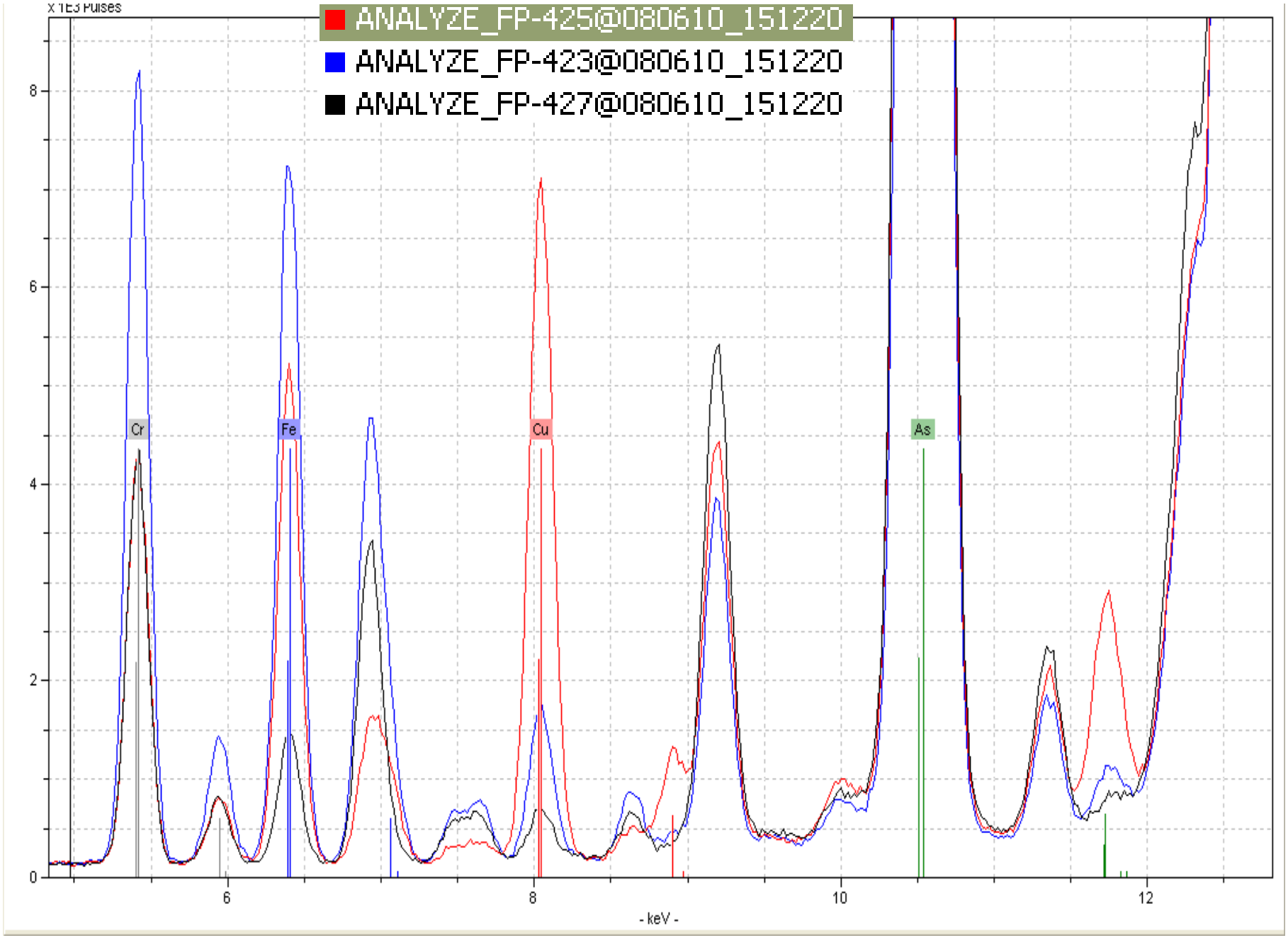
Focus on Cr

Element	429 m	419 m	421 m	417 m	427 m	425 m	423 m
Cr	**236**	**464**	**575**	**5550**	**35518**	**36381**	**68736**
Fe	3145	1794	1771	12639	11635	44985	64112
Co	14917	13949	4310	81497	30442	12699	41157
Ni	230	1512	430	8332	3623	1231	3982
Cu	819	720	648	5099	4703	65586	14598
Zn	3003	1325	2036	10383	3652	2249	5979
As	3000	3000	3000	3000	3000	34187	25627
Sn	2368	8229	4344	6851	3532	9913	17750
Sb	129	159	184	746	148	48	184
Hg	2966	5814	7125	26978	5091	6970	4803
Pb	987795	995663	1015502	843338	915936	868912	708043

Focus on Cr



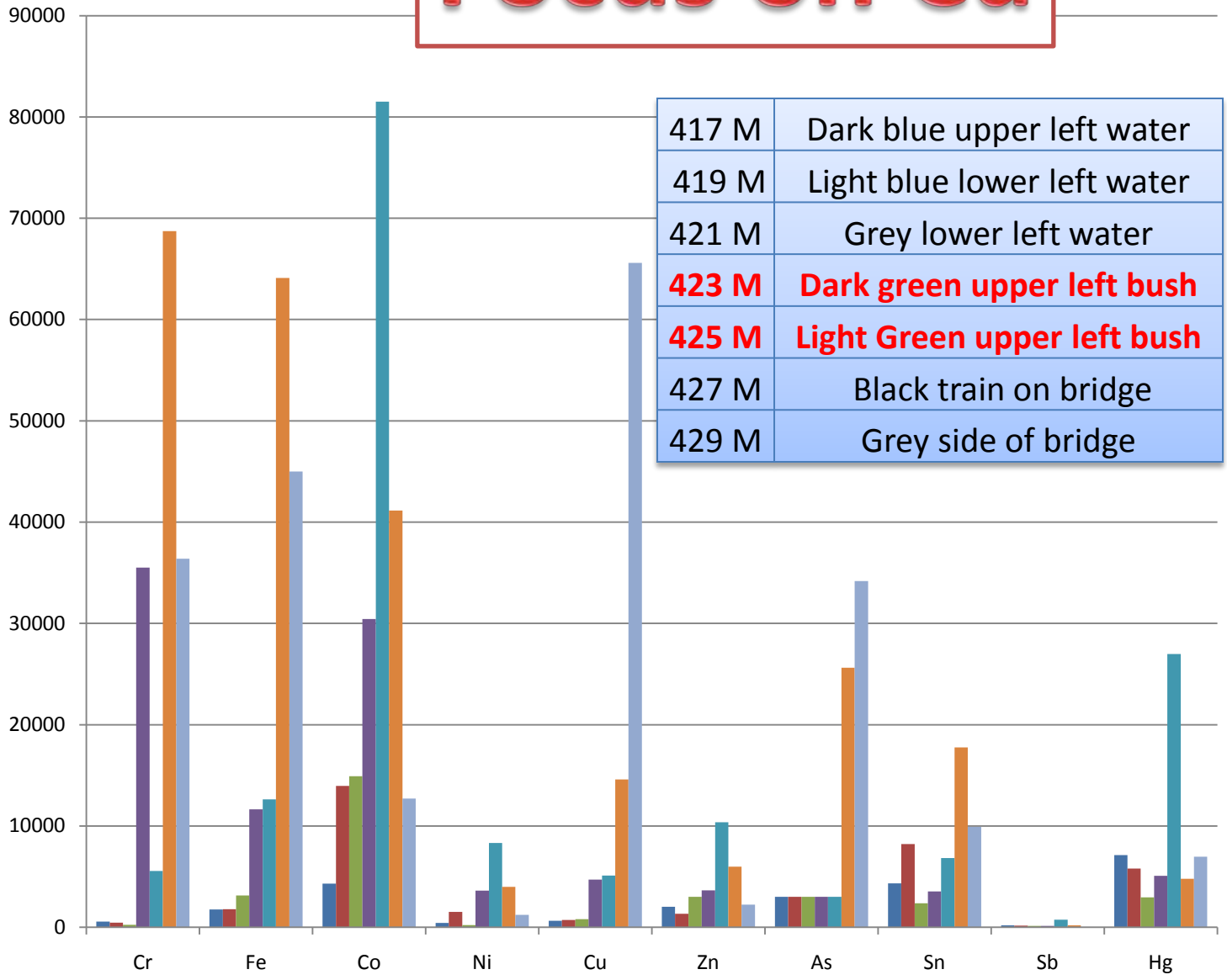
417 M	Dark blue upper left water
419 M	Light blue lower left water
421 M	Grey lower left water
423 M	**Dark green upper left bush**
425 M	**Light Green uper left bush**
427 M	**Black train on bridge**
429 M	Grey side of bridge


X 1E3 Pulses
ANALYZE_FP-425@080610_151220
ANALYZE_FP-423@080610_151220
ANALYZE_FP-427@080610_151220
Cr
Fe
Cu
As
0
2
4
6
8
6
8
10
12
- keV -

Focus on Cu

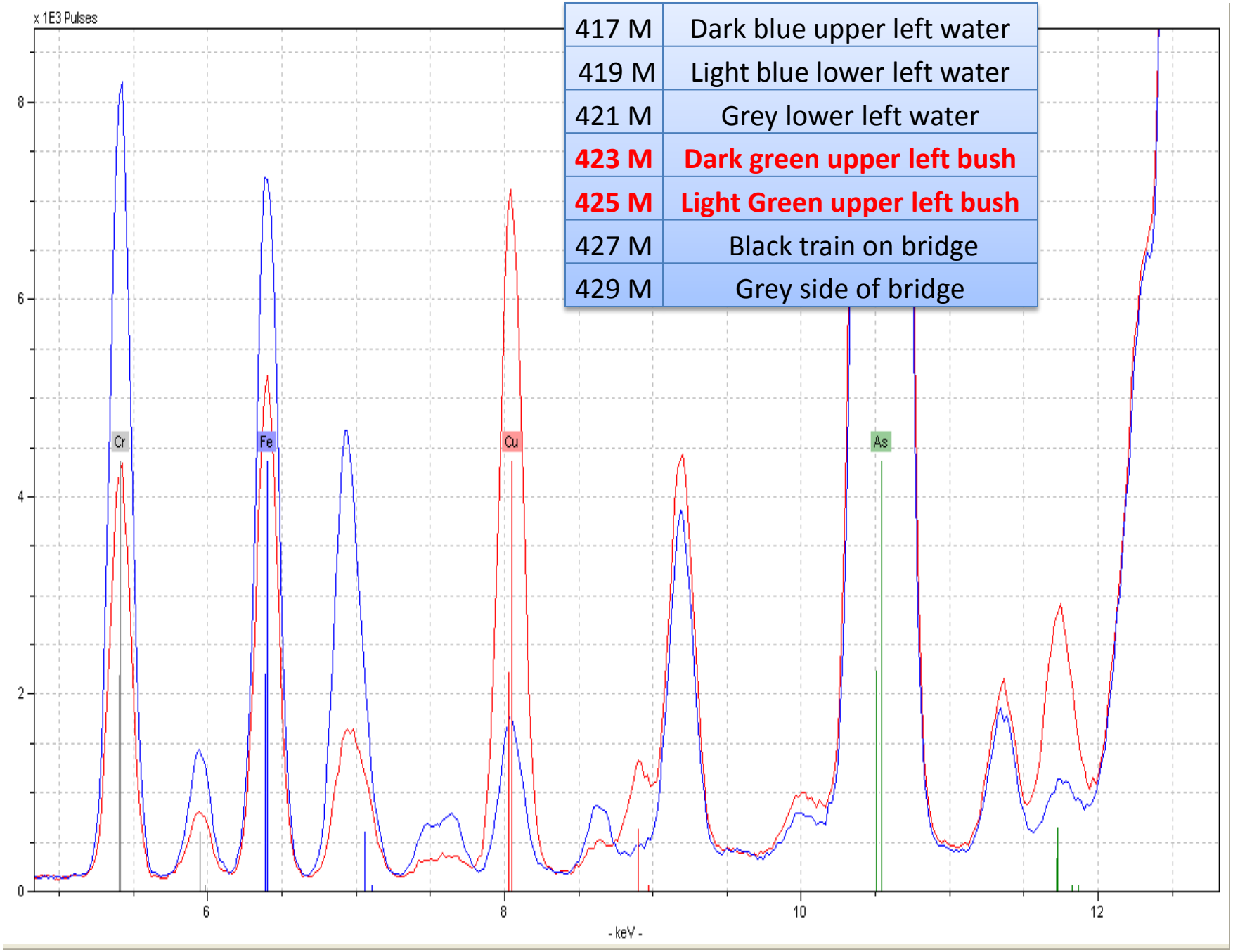
Element	421 m	419 m	429 m	427 m	417 m	423 m	425 m
Cr	575	464	236	35518	5550	68736	36381
Fe	1771	1794	3145	11635	12639	64112	44985
Co	4310	13949	14917	30442	81497	41157	12699
Ni	430	1512	230	3623	8332	3982	1231
Cu	**648**	**720**	**819**	**4703**	**5099**	**14598**	**65586**
Zn	2036	1325	3003	3652	10383	5979	2249
As	3000	3000	3000	3000	3000	25627	34187
Sn	4344	8229	2368	3532	6851	17750	9913
Sb	184	159	129	148	746	184	48
Hg	7125	5814	2966	5091	26978	4803	6970
Pb	1015502	995663	987795	915936	843338	708043	868912

Focus on Cu



417 M	Dark blue upper left water
419 M	Light blue lower left water
421 M	Grey lower left water
423 M	**Dark green upper left bush**
425 M	**Light Green upper left bush**
427 M	Black train on bridge
429 M	Grey side of bridge

421 m
419 m
429 m
427 m
417 m
423 m
425 m

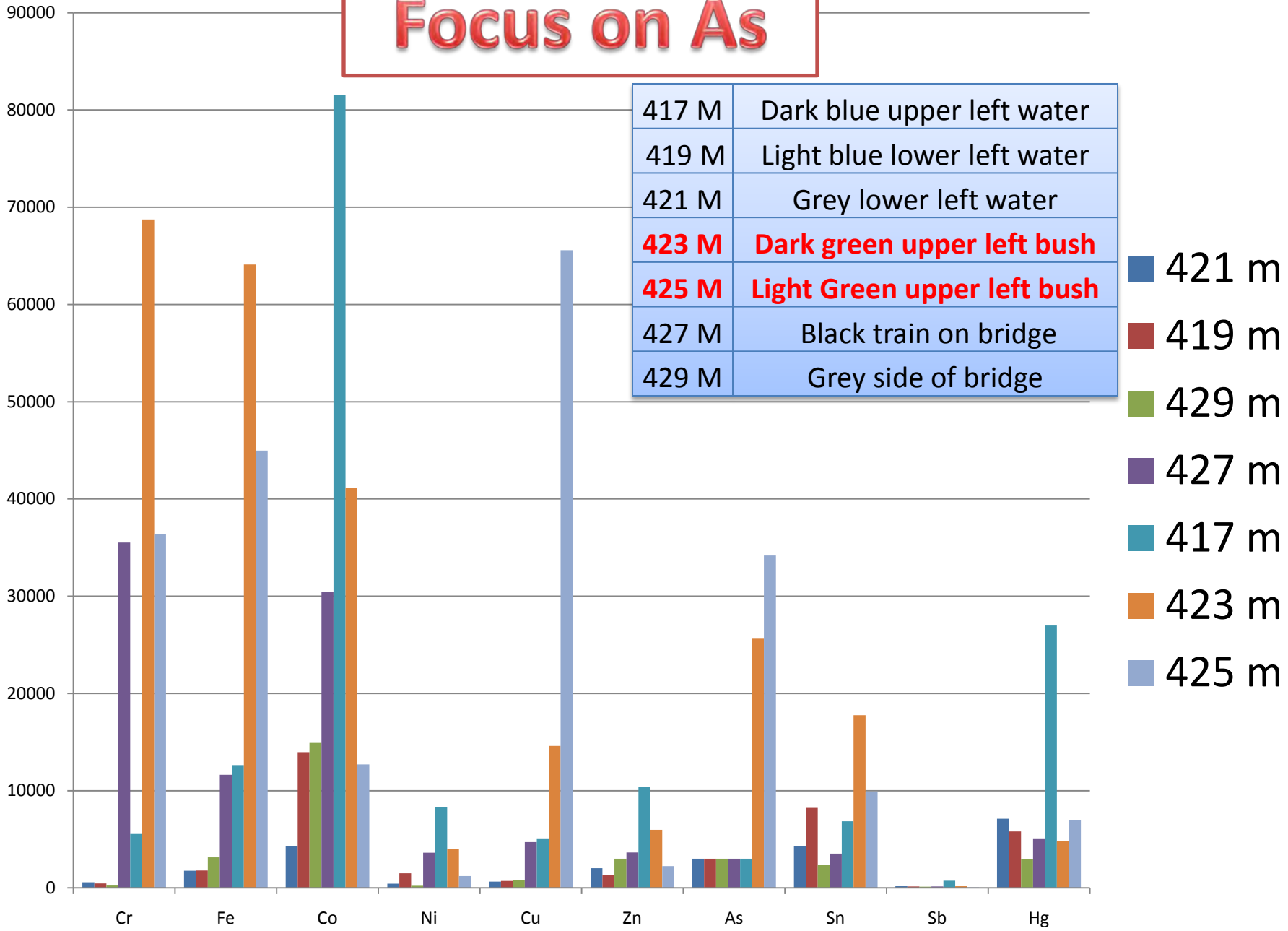


417 M	Dark blue upper left water
419 M	Light blue lower left water
421 M	Grey lower left water
423 M	**Dark green upper left bush**
425 M	**Light Green upper left bush**
427 M	Black train on bridge
429 M	Grey side of bridge

Focus on As

Element	421 m	419 m	429 m	427 m	417 m	423 m	425 m
Cr	575	464	236	35518	5550	68736	36381
Fe	1771	1794	3145	11635	12639	64112	44985
Co	4310	13949	14917	30442	81497	41157	12699
Ni	430	1512	230	3623	8332	3982	1231
Cu	648	720	819	4703	5099	14598	65586
Zn	2036	1325	3003	3652	10383	5979	2249
As	3000	3000	3000	3000	3000	25627	34187
Sn	4344	8229	2368	3532	6851	17750	9913
Sb	184	159	129	148	746	184	48
Hg	7125	5814	2966	5091	26978	4803	6970
Pb	1015502	995663	987795	915936	843338	708043	868912

Focus on As

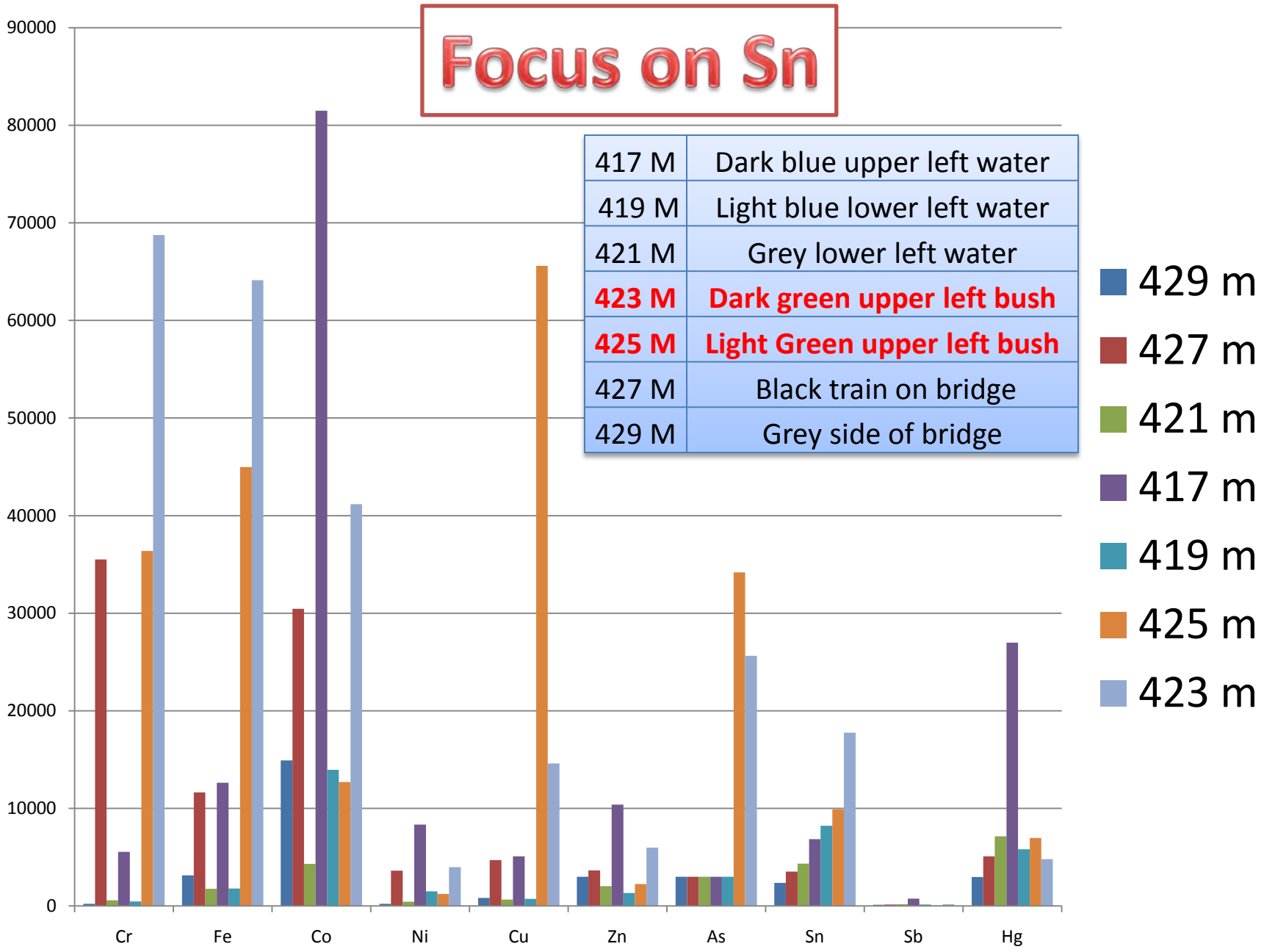


417 M	Dark blue upper left water
419 M	Light blue lower left water
421 M	Grey lower left water
423 M	**Dark green upper left bush**
425 M	**Light Green upper left bush**
427 M	Black train on bridge
429 M	Grey side of bridge

Focus on Sn

Element	429 m	427 m	421 m	417 m	419 m	425 m	423 m
Cr	236	35518	575	5550	464	36381	68736
Fe	3145	11635	1771	12639	1794	44985	64112
Co	14917	30442	4310	81497	13949	12699	41157
Ni	230	3623	430	8332	1512	1231	3982
Cu	819	4703	648	5099	720	65586	14598
Zn	3003	3652	2036	10383	1325	2249	5979
As	3000	3000	3000	3000	3000	34187	25627
Sn	2368	3532	4344	6851	8229	9913	17750
Sb	129	148	184	746	159	48	184
Hg	2966	5091	7125	26978	5814	6970	4803
Pb	987795	915936	1015502	843338	995663	868912	708043

Focus on Sn



417 M	Dark blue upper left water
419 M	Light blue lower left water
421 M	Grey lower left water
423 M	**Dark green upper left bush**
425 M	**Light Green upper left bush**
427 M	Black train on bridge
429 M	Grey side of bridge

Conclusions

The analysis of the pigments is entirely consistent with Monet's words . In short, Monet says he uses;

1. White lead; present Pb
2. Cadmium yellow; not present
3. Vermilion ; present Hg
4. Madder ; present Fe
5. Cobalt blue ; present Co
6. Chrome green ; present Cu and As
7. Black and dark colours are a mixture of these