## Uinta Basin Oil and Gas Speciation Profiles – CORRECTION

Pages 137-139 of the Uinta Basin Composition Study Final Report included Table H-1 (reprinted below). These weight percent speciation profiles were calculated from the Isometric Logratio (ILR) method described in Report D: Supplemental Speciation Profile Analysis. In Report D, we propose novel approach for assess the degree of similarity between groups of composition data. These groups may represent geologic formations, or the type of well from which the samples were collected. The approach is to use a measure of group similarity called the ANOSIM score. In order to use ANOSIM statistic, as well as other common statistics, on composition data, we employ a type of log transformation of the data, called the ILR transformation. This transformation, however, does not work if there are columns of data that have true zeroes (actual zeroes rather than very small values). This is the case for the composition of samples in which a species is entirely absent or represents a very small percentage of the total composition. One approach is to exclude these columns during transformation and ANOSIM analysis, but in this case a mean cannot be calculated in the ILR transform space for those columns. Therefore, we propose that in the case of columns with many small values, these columns be dropped for assessments of group similarity, but that **the average be calculated from the untransformed, raw composition data, including the columns containing zeroes**. This approach is justified because columns that represent very tiny proportions of the composition should not be used to evaluate broader questions such as how to group the data, but their inclusion in the overall average may have a larger impact on chemical modeling, as these smaller components are often very reactive.

The final speciation profiles recommended for photochemical modeling and other air quality applications are therefore the column-average result of all composition data in the following four categories: raw gas from gas wells, raw gas from oil wells, flash gas from gas wells, and flash gas from oil wells. These column-average profiles are printed on page 159 of the UBCS final report in Appendix E, but they should have been printed as Table H-1.

The UPDATED Table H-1 printed here represents the column-average composite profiles submitted to the SPECIATE database. These profiles will be used for photochemical modeling and inventory adjustment applications.

**OUTDATED Table H-1: Uinta Basin Speciation profiles for flash gas and raw gas from oil and gas wells (ILR centroid method of composite profile)**

| | Oil Well – Flash Gas | Oil Well – Raw Gas | Gas Well – Flash Gas | Gas Well – Raw Gas |
|---|---|---|---|---|
| *Profile Name* | ***UNTF_OW*** | ***UNTR_OW*** | ***UNTF_GW*** | ***UNTR_GW*** |
| **METHANE** | 13.01% | 53.38% | 47.76% | 73.76% |
| **ETHANE** | 10.74% | 11.49% | 20.57% | 10.39% |
| **PROPANE** | 16.48% | 9.68% | 15.68% | 5.92% |
| **ISOBUTANE** | 4.85% | 2.22% | 4.37% | 1.67% |
| **N-BUTANE** | 12.38% | 4.99% | 5.25% | 2.12% |
| **ISOPENTANE** | 6.07% | 2.32% | 2.16% | 1.01% |

| | Oil Well – Flash Gas | Oil Well – Raw Gas | Gas Well – Flash Gas | Gas Well – Raw Gas |
|---|---|---|---|---|
| N-PENTANE | 8.12% | 3.13% | 1.52% | 0.83% |
| CYCLOPENTANE | 0.61% | 0.23% | 0.08% | 0.05% |
| N-HEXANE | 6.76% | 2.14% | 0.75% | 0.46% |
| CYCLOHEXANE | 1.73% | 0.57% | 0.37% | 0.26% |
| HEPTANES | 10.47% | 4.99% | 0.33% | 1.45% |
| METHYLCYCLOHEXANE | 2.09% | 0.81% | 0.56% | 0.55% |
| 2,2,4 TRIMETHYLPENTANE | 0.022% | 0.0012% | 0.0022% | 0.000012% |
| BENZENE | 0.38% | 0.16% | 0.10% | 0.07% |
| TOLUENE | 0.53% | 0.26% | 0.17% | 0.20% |
| ETHYLBENZENE | 0.0005% | 0.03% | 0.01% | 0.01% |
| XYLENES | 0.36% | 0.21% | 0.08% | 0.14% |
| OCTANES | 2.04% | 1.81% | 0.11% | 0.54% |
| NONANES | 2.94% | 0.34% | 0.12% | 0.13% |
| DECANES+ | 0.42% | 1.26% | 0.02% | 0.44% |
| TOTAL | 100.00% | 100.00% | 100.00% | 100.00% |

**UPDATED Table H-2: Uinta Basin Speciation profiles for flash gas and raw gas from oil and gas wells (column-average method of composite profile)**

| | Oil Well – Flash Gas | Oil Well – Raw Gas | Gas Well – Flash Gas | Gas Well – Raw Gas |
|---|---|---|---|---|
| *Profile Name* | ***UNTF_OW*** | ***UNTR_OW*** | ***UNTF_GW*** | ***UNTR_GW*** |
| **METHANE** | 13.72% | 52.36% | 46.02% | 73.08% |
| **ETHANE** | 10.39% | 11.41% | 18.62% | 10.29% |
| **PROPANE** | 15.92% | 9.57% | 16.41% | 5.98% |
| **ISOBUTANE** | 4.74% | 2.24% | 4.72% | 1.70% |
| **N-BUTANE** | 12.09% | 5.05% | 6.11% | 2.17% |
| **ISOPENTANE** | 5.94% | 2.44% | 2.35% | 1.02% |
| **N-PENTANE** | 7.93% | 3.29% | 1.71% | 0.85% |
| **CYCLOPENTANE** | 0.63% | 0.26% | 0.09% | 0.05% |
| **N-HEXANE** | 6.60% | 2.30% | 0.77% | 0.48% |
| **CYCLOHEXANE** | 1.67% | 0.61% | 0.36% | 0.27% |
| **HEPTANES** | 11.60% | 5.34% | 1.23% | 1.54% |
| **METHYLCYCLOHEXANE** | 2.03% | 0.84% | 0.60% | 0.67% |
| **2,2,4 TRIMETHYLPENTANE** | 0.05% | 0.00% | 0.01% | 0.00% |
| **BENZENE** | 0.40% | 0.18% | 0.11% | 0.08% |
| **TOLUENE** | 0.56% | 0.29% | 0.25% | 0.25% |

| | Oil Well – Flash Gas | Oil Well – Raw Gas | Gas Well – Flash Gas | Gas Well – Raw Gas |
|---|---|---|---|---|
| **ETHYLBENZENE** | 0.05% | 0.03% | 0.01% | 0.02% |
| **XYLENES** | 0.36% | 0.23% | 0.15% | 0.16% |
| **OCTANES** | 2.00% | 1.88% | 0.20% | 0.71% |
| **NONANES** | 2.87% | 0.38% | 0.26% | 0.15% |
| **DECANES+** | 0.46% | 1.33% | 0.03% | 0.52% |
| **TOTAL** | 100.00% | 100.00% | 100.00% | 100.00% |

There are 2 additional flash gas profiles for oil and gas wells that include carbonyls; these carbonyls profiles remain unchanged from the final report.

**Table H-2: Uinta Basin Flash Gas speciation profiles featuring carbonyls**

| | Oil Well – Flash Gas + carbonyl | Gas Well – Flash Gas + carbonyl |
|---|---|---|
| *Profile Name* | ***UNTF_OW_C=O*** | ***UNTF_GW_C=O*** |
| **methane** | 18.352449% | 29.781276% |
| **ethane** | 11.442717% | 19.158171% |
| **propane** | 13.853831% | 24.774409% |
| **isobutane** | 3.743012% | 7.324207% |
| **n-butane** | 8.717217% | 10.111346% |
| **isopentane** | 4.485868% | 3.755852% |
| **n-pentane** | 5.720342% | 2.841874% |
| **cyclopentane** | 0.566515% | 0.132872% |
| **n-hexane** | 6.150359% | 0.834259% |
| **cyclohexane** | 1.728527% | 0.373549% |
| *Profile Name* | ***UNTF_OW_C=O*** | ***UNTF_GW_C=O*** |
| **heptanes** | 14.715750% | 0.153740% |
| **methylcyclohexane** | 2.321627% | 0.455461% |
| **2,2,4 trimethylpentane** | 0.057637% | 0.005366% |
| **benzene** | 0.442477% | 0.061007% |
| **toluene** | 0.702816% | 0.082497% |
| **ethylbenzene** | 0.071685% | 0.002748% |
| **xylenes** | 0.433246% | 0.027933% |
| **octanes** | 2.372057% | 0.050819% |
| **nonanes** | 3.503362% | 0.062586% |
| **decanes plus** | 0.616783% | 0.008577% |
| **Formaldehyde** | 0.000145% | 0.000006% |
| **Acetaldehyde** | 0.000218% | 0.000755% |
| **Acetone** | 0.000000% | 0.000000% |
| **Acrolein** | 0.001259% | 0.000673% |

| | | |
|---|---|---|
| **Propionaldehyde** | 0.000014% | 0.000004% |
| **Crotonaldehyde** | 0.000004% | 0.000001% |
| **Methacrolein/2-butanone** | 0.000030% | 0.000008% |
| **Benzaldehyde** | 0.000008% | 0.000000% |
| **Valeraldehyde** | 0.000042% | 0.000002% |
| **p-Tolualdehyde** | 0.000000% | 0.000001% |
| **Hexaldehyde** | 0.000005% | 0.000001% |
| **TOTAL** | 100.00% | 100.00% |