Regarding: Senate Bill 17-090
To improve Accuracy of Delta-9 THC Measurements
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The purpose of this document is to advocate on behalf of accurate measurement of delta-9 tetrahydrocannabinol in industrial hemp consistent with the language of the State Constitution in all pursuant statutes, rules, and enforcement. It is important to prevent both under reporting and over reporting of Delta-9 THC concentration in industrial hemp, so the issue of how to sample, measure and report Delta9-THC is quite significant. Vague and undefined terms impact THC concentration accuracy, as does the adoption of a testing protocol which differs significantly from the precedents of the prior art of sampling and measurements in Canada and the EU.

The context of this matter helps clarify the issues. When the EU first allowed hemp farming, the standard was 1% THC, which kept the plant out of the category of marijuana, farmers found it easy to comply, and the crop was undesirable to people who wanted marijuana. Subsequently, (French) researchers developed hemp which had only .3% THC, and lobbied to change the standard (the better to have a monopoly on the seed); later the standard was reduced to .2% in the EU, and remains at .3% in Canada.
The EU provided a crop subsidy per acre planted to support new crops. Hemp varieties over the cutoff threshold were simply not eligible for subsidy.

In all testing in the EU and Canada to determine compliance with their respective target level, the protocol is to take the top 18" of the plant, dry it, record the total sample weight, sift to separate the seeds and stalks from the foliage (since the seeds and stalks have no THC they do not need to be tested), record the weights of the sifted fraction and the removed fraction, test the sifted fraction for THC percentage, and use the total sample weight to calculate the percentage of THC present in the plant on a dry basis using GC.

$$\text{Percent Delta-9 THC in Sample} = \frac{\text{percent Delta-9 THC in sifted sample X Sifted sample weight}}{\text{Total sample weight}}$$

Obviously, if the protocol is changed (as has been done in Colorado) to [take only the top 6" of the plant, dry it, sift to separate the seeds and stalks from the other vegetation, weigh the sifted fraction, test the sifted fraction for Delta-9 THC, and use only the sifted sample weight to calculate the percentage of Delta-9 THC], the results will be as much as three times higher. This leads to falsely condemning plants, to the detriment of innocent farmers and the budding hemp industry in Colorado.

INDUSTRIAL HEMP DEFINED BY COLORADO STATE CONSTITUTION

Article XVIII of the Constitution of the State of Colorado **Section 16. (2) Definitions. (d)** **"INDUSTRIAL HEMP" MEANS THE PLANT OF THE GENUS CANNABIS AND** ANY PART OF SUCH PLANT, WHETHER GROWING OR NOT, WITH A DELTA-9 TETRAHYDROCANNABINOL CONCENTRATION THAT **DOES NOT EXCEED** THREE-TENTHS PERCENT ON A DRY WEIGHT BASIS.

The difference between Delta-9 THC and THC acid may seem confusing, but they are not the same and the issue is quite relevent. GC (gas chromatography) is the instrument the CDA has been using to

measure THC over the past few years. Unfortunately, GC can not distinguish between Delta-9 Tetrahydrocannabinol and THC-acid. HPLC (liquid chromatography) can tell the two apart, but it is not being used. This throws into question any of the hot fields that the CDA has measured.

The Constitution specifies measurement of DELTA-9 TETRAHYDROCANNABINOL. It does not say "THC acid". It does not say "Precursor to DELTA-9 TETRAHYDROCANNABINOL". It does not say "intoxicating potential". (Intoxicating potential is debatable below 3.0%.) So altering the regulations to include measurement of THC acid is unconstitutional. Changing the meaning of a word (as in SB17-090) is a poor remedy to this Constitutional conflict and a bad precedent. What doors would that open?

Regarding the "tainted field" policy espoused by the Colorado Department of Agriculture: they have decided that if any part of any plant in the field is over the threshold (determined by the improper protocol they arbitrarily adopted without allowing public scrutiny), then the entire field is tainted and no portion is permitted to leave the property upon which it grew. As one can clearly see in the Constitution, that policy is the reverse of the intent of the Voters of Colorado, while it also ignores the fact that the seeds and stalks are recognized to contain no THC by all authorities up to and including international treaty.

Is the Colorado Department of Agriculture trying to nip this new industry in the bud by these arbitrary and improper applications of the rule making process to promulgate regulations beyond their jurisdiction? We hope they merely need better guidance, for which we are looking to the legislature since we need its members to be supportive, thereby creating an abundance of new jobs as Colorado citizens find their places in the hemp industry.

We also need our legislators to challenge the Federal Government regarding the unlawful Federal interference with interstate and international trade in certified approved hemp seed. Since the EU and Canada have many producers of such seed, there is no good reason Colorado farmers are not allowed to import live seed. In addition, the fully ratified UN Single Convention Treaty on Narcotic Drugs with regard to marijuana includes in Section 28-2 the language: "nothing in this treaty shall be construed to restrict the cultivation of the cannabis plant for the sole purpose of producing industrial materials (fiber and seed) or for horticultural purposes," so there is very good reason Colorado farmers should be able to arrange such imports at their earliest convenience.

However, it is impractical to expect the Federal Government to allow farmers to import seed independently in a timely fashion. I understand that the CDA has an import license to import hemp seed through the DEA/USDA, so I recommend that the CDA be encouraged to secure and make available seed from Canada and the EU as an alternative to "buyer beware" seed for the 2017 growing season.

In the interest of establishing a level playing field, on which careful scientists will achieve the same results testing the same materials using the same protocols, the following guidelines for the definitions are offered:

Sample--
The top 18 inches of each of 20 plants from a single field, chosen at random. [Is it really necessary to define "random"?]

Sample preparation--
[Proper preparation maintains chain of custody, accuracy, integrity and completeness, while selecting a representative portion of the dried sample for analysis, and avoiding removal or addition of

unmeasured materials other than water.]
Dehydrate the entire sample at a temperature no higher that 70 degrees Centigrade, with air circulating freely.
[Reduce the moisture content of the sample promptly to avoid spoilage, chemical changes from excessive temperature, or changes from stress during storage.]
Weigh and record total sample dry weight.
Separate the seeds and stalks by sifting, using a screen (1mm to 1/16" mesh screen).
Weigh and record the sifted fraction weight, as well as the removed fraction weight.

Analysis of sample--
Revise CDA standard operating procedure specifying that the equipment shall be HPLC instead of GC.
Test the sifted fraction in the lab according to revised Co Dept Ag procedure.
To report results--
Calculate the percentage of Delta-9 THC in the sample by including the entire sample dry basis in the calculation.

$$\text{Percent Delta-9 THC in Sample} = \frac{\text{percent Delta-9 THC in sifted sample X Sifted sample weight}}{\text{Total sample weight}}$$

How does current practice measure up to the Constitution?
Taking less that the top 18 inches constitutes improper concentration.
Removal of seed and stalk weight from the calculation constitutes improper concentration. In the case of a seed crop where seed, stem, and foliage weights are similar, the faulty protocol might report THC concentration up to three times the actual fair whole sample dry basis concentration.
Using GC equipment which causes chemical change to occur to the sample constitutes an improper modification of the sample. HPLC must be used instead of GC.
Deeming the entire field's crop non- salable due to the presence of any samples over 0.3% Delta-9 THC is a reversal of the intent of Constitutional language, which makes it clear that all plant material below the 0.3% level is hemp and should be available for harvest and sale at the farmer's discretion.

How does bill SB-90 measure up to the Constitution?
CDA has been over reporting Delta-9 THC from the start because it has been using GC which raises the sample to a temperature that causes chemical change in the THC-Acid such that the GC can not distinguish Delta-9 THC from THC-Acid.
HPLC (liquid chromatography) operates at lower temperature than GC such that it can distinguish Delta-9 THC from THC-Acid.
This bill seeks to change the meaning of a word as a ploy to quietly change the Constitution (possibly to cover for having used GC for all these years,) rather than use HPLC and comply with our precious Constitution and respect the Voters.

I hope consideration of this bill enables legislators to take advantage of the opportunity to address the above shortcomings of the current THC sampling practice for Industrial Hemp. I hope that suitable amendments can be incorporated into SB90 which will remedy these shortcomings and improve the accuracy of THC measurements and usher in a more promising future for the re-discovery of Hemp Farming. I want Colorado farmers to be able to make money growing and processing hemp.
If this bill can not be remedied by amendments, then I ask that this bill be withdrawn and a new bill drafted consistent with the actual language of our Colorado Constitution.
All Colorado hemp farmers whose crops have failed the THC test should be notified that they are not restricted on use and sale of their fiber and seed harvest.