<u>Importance </u> of
quality assurance and quality control
for
good and comparable analytical results
in <u>ICP Forests programs</u>

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Importance of quality assurance and quality control for good and comparable analytical results in ICP Forest programs

what we need:

1. good „equipment" in the laboratory

2. quality control program within each laboratory

   The laboratories and the NFC´s are responsable for the quality of the analytical data!

3. quality and plausibility checks before importing of analytical data into national and European databases

4. quality control between the different European laboratories and exchange of analytical knowledge

Importance of quality assurance and quality control for good and comparable analytical results in ICP Forest programs

1. good „equipment" of the lab:

a. good technicians with experience in the European reference methods

b. good instruments

c. good method descriptions (for sample preparation, digestion/extraction methods and element determination)

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2. quality control program within each laboratory:

a. regular use of standard material for method control and use of control charts

Institute		X-CONTROL CHART			METHOD:	ROLVAxx		CONTROL SAMPLE:	
Laboratory	PERIOD:	03.08.04	-	30.09.04	INSTRUMENT:	MagicChem		Reagecon 5.00	
Analyte	Target value (Tv)	Warning limits (Tv ± 2STD)			Control limits (Tv ± 3STD)		Mean value	Standard deviation (STD)	
pH	5,000	Upper 5,024	Lower	4,976	Upper 5,035 Lower	4,965	5,003	0,012	
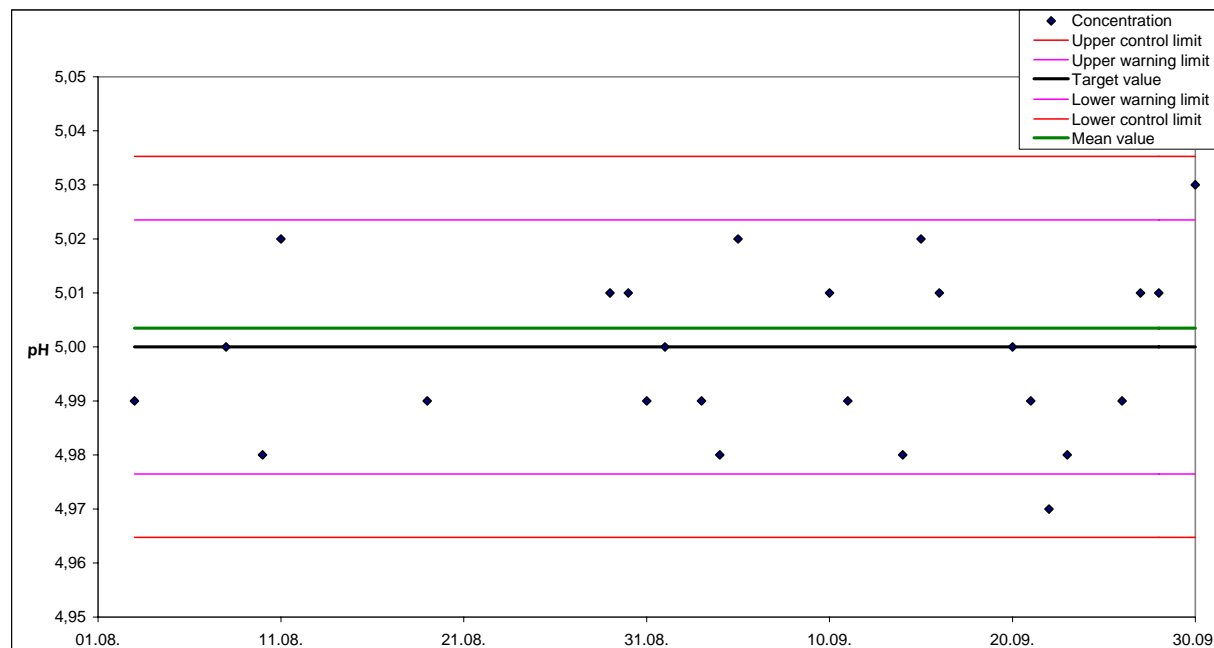
as a help for the labs: excel file with a program for control charts

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Results from the questionaires

**of the 3rd and 4th FSCC soil ringtests:**

Questionnaire	3rd FSCC RT (2002 - 2003)	4th FSCC RT (2005 - 2006)
Use of reference material	77 %	86 %
Use of control charts	50 %	65 %
Use of calibration standards	73 %	63 %

=> reference material, control charts and calibration standards should be used by 100 % of the labs !

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2. quality control program within each laboratory:

b. use of all important plausibility and quality checks directly after analyses
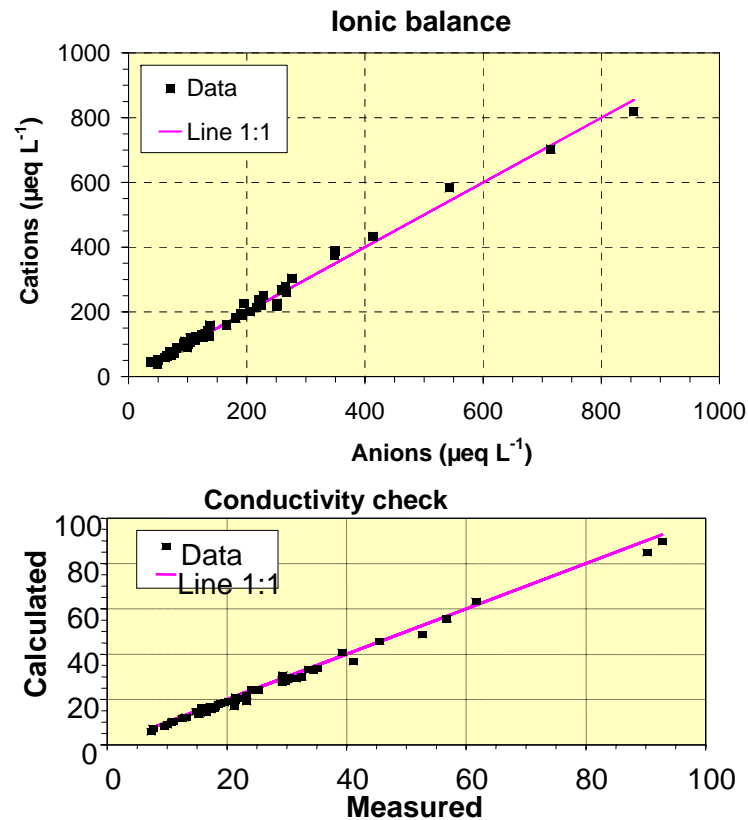
as a help for the labs: excel file with a program for calculation of ion balance, conductivity check, Nitrogen balance, Na/Cl-ratio

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b. use of all important plausibility and quality checks

b.1. for water samples:
- completeness of analyses (all parameters
- ion balance without DOC (only for bulk o
- ion balance with DOC for throughfall, ste
- conductivity check (comparison between
- Na/Cl ratio check (not for soil water)
- Nitrogen balance ($NH_4 + NO_3 <$ Ntot)

b.2. for soil samples:
- pH check ($pH(H_2O) > pH(CaCl_2)$)
- Carbon balance ($C_{CO3} + C_{org} < C_{tot}$)
- Plausible range checks for individual para
- comparison between overlying layers
- Checks based on simple relationships be
- Exchangeable cation 'balances' (CEC, B!

b.3. for plant samples:
- Plausible range checks for individual para

The working group
on QA/QC
will prepare a list
containing
all the suitable quality checks,
including control charts
and plausible ranges
for soil and plant analyses,
and send this list
to all the laboratories
and NFC`s

3. quality and plausibility checks before importing of analytical data into national and European databases

a. data checking program (check of plausible ranges, balance checks and so on) at the European data bases

b. Information about errors associated to measure-ments (CV %) evaluated from control charts

c. Information about data quality evaluated from ringtests results of the labs

c. regulation for results under detection/quantification limit

4. quality control between the different European laboratories and exchange of analytical knowledge

a. regularly ringtests for water, soil and plant material

**rhythm:
each year for water and plant,
all 2 years for soil**

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ringtest results: 2nd water ringtest
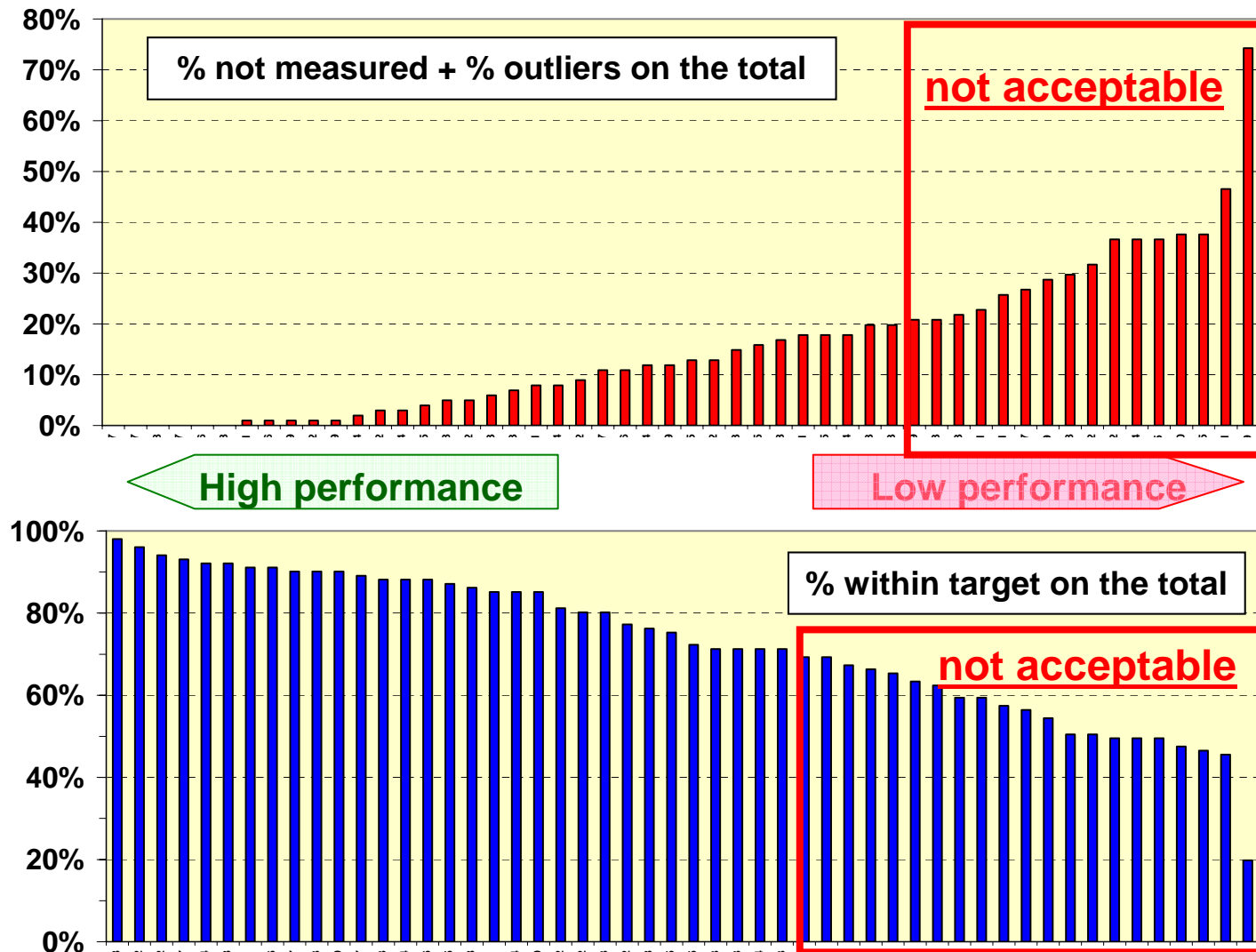
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ringtest results:
comparison between 2., 3. and 4. soil ringtest

Not acceptable

CV (%)	2nd FSCC RT	3rd FSCC RT	4th FSCC RT
Group 1: Particle size distribution		53 ➡	(37)
Group 2: pH	3.25	3.5	3.1
Group 3: Carbonate content		206	*129*
Group 4: Organic carbon	41.5	18 ➡	13
Group 5: Total N	25	17	*27*
Group 6: Exchangeable cations	52	71 ➡	(54)
Group 7: Aqua regia extractable elements	35	47 ➡	(33)

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ringtest results:
comparison between 1st and 2nd water ringtest

% results in the target range on the total

WRT 2002

WRT 2005

More than 85 % of the labs had better results in the 2nd ringtest !

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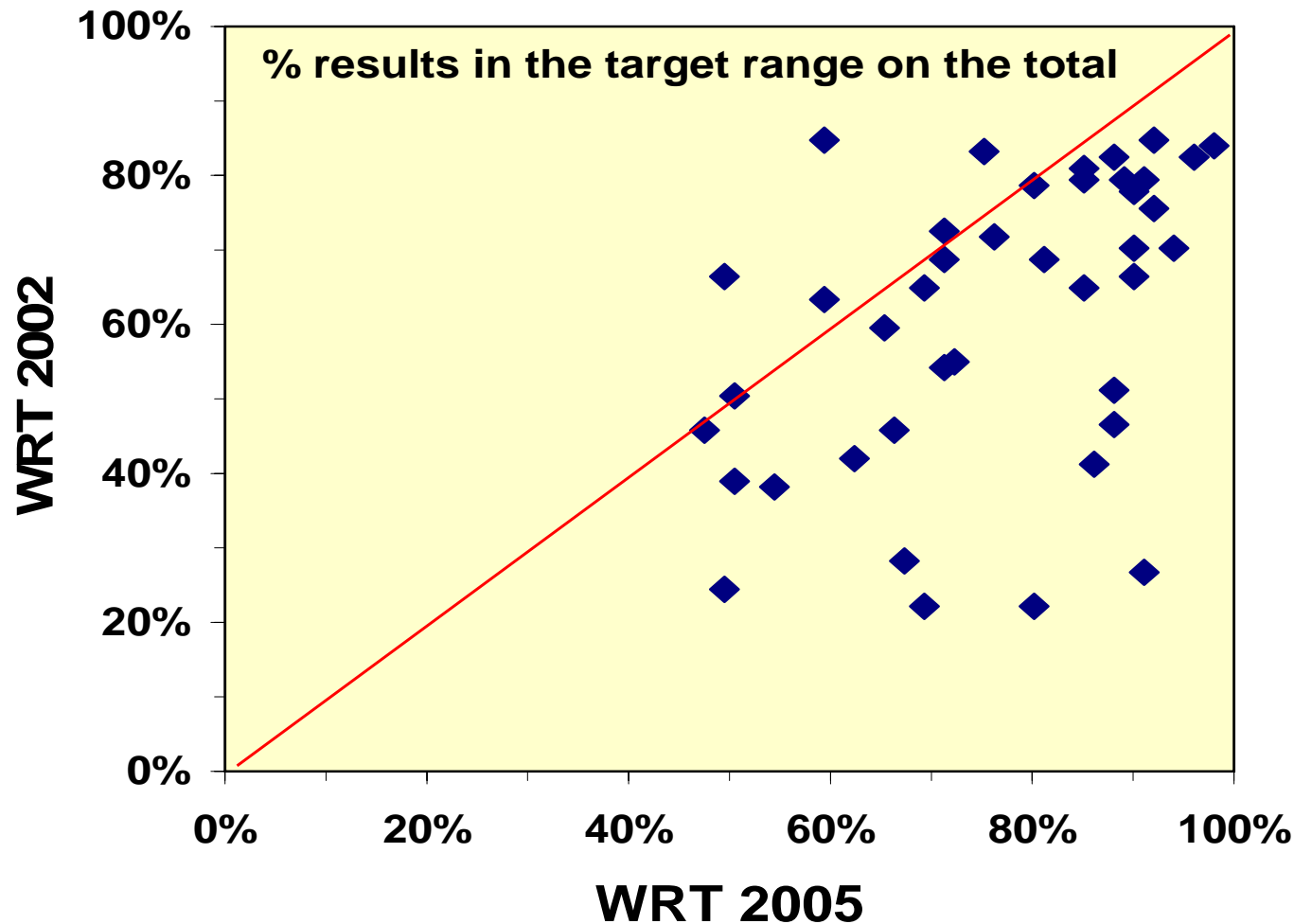
4. quality control between the different European laboratories and exchange of analytical knowledge

b. regularly meetings of the heads of the labs

new !

- discussion of the ringtests results
- discussion about unsuitable methods and analytical problems identified on the basis of the ringtest results
- discussion of analytical questions in the different manuals

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12 years ago the German government decided to install a working group of the leaders of the German labs for forestry analyses (16 labs).
The aim of the group was to harmonize the analytical methods between the labs and to organize regularly ringtests for quality control.

This has led to better and comparable results and shows the importance of the exchange of analytical knowledge between the heads of the labs and of regularly ringtests!
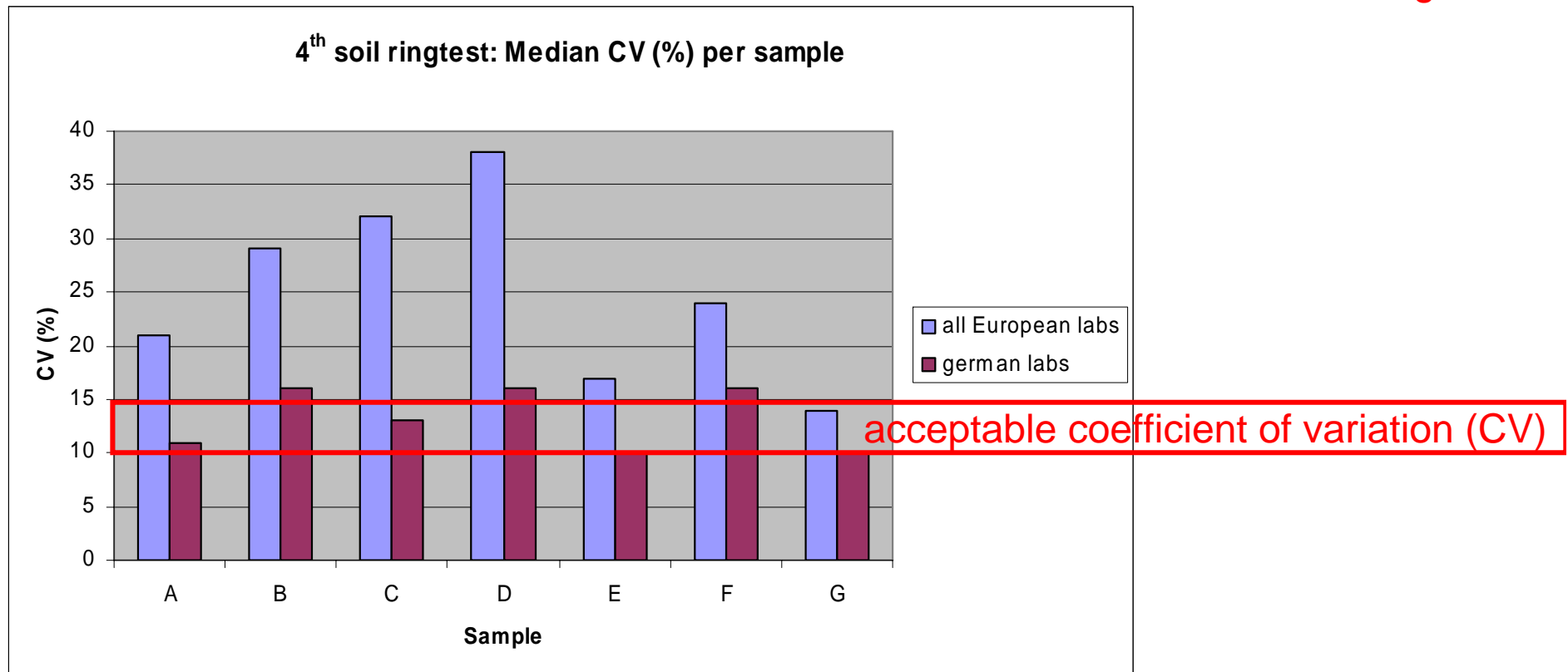
4th soil ringtest: Median CV (%) per sample

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Conclusions:

what to do:

1. More information about the importance of quality control programs within each laboratory !
2. More „pressure" to the labs (by the NFC´s) to use quality checks, control charts, reference standards !
   The laboratories and the NFC´s are responsable for the quality of the analytical data!
3. Ringtests carried out each year (every 2 years for soil) for intercomparable analytcal data
4. Discussion about restrictions for labs/countries with unsuitable ringtest results?

Conclusions:

what to do (continued):

5. Changing of the composition of the w̲o̲r̲k̲i̲n̲g̲ ̲g̲r̲o̲u̲p̲
   in labs:
   representatives of all the ̲c̲h̲e̲m̲i̲c̲a̲l̲ ̲a̲n̲a̲l̲y̲s̲e̲s̲ (̲d̲e̲p̲o̲s̲i̲t̲i̲o̲n̲,̲ ̲s̲o̲i̲l̲ ̲s̲o̲l̲u̲t̲i̲o̲n̲,̲
   F̲o̲l̲i̲a̲r̲ ̲a̲n̲d̲ ̲L̲i̲t̲ter) should be members of the
   g̲r̲o̲u̲p̲

   ▪ ....heads of the laboratories

Therefore I ask this Task Force Meeting for a new mandate for the WG on QA/QC in Labs!