



beyond the technology



laboratory systems integration

Controlling your AQC/IQC charts!

Claire Parker CSols Ltd

20th October 2015

CSols' AqcTools Software



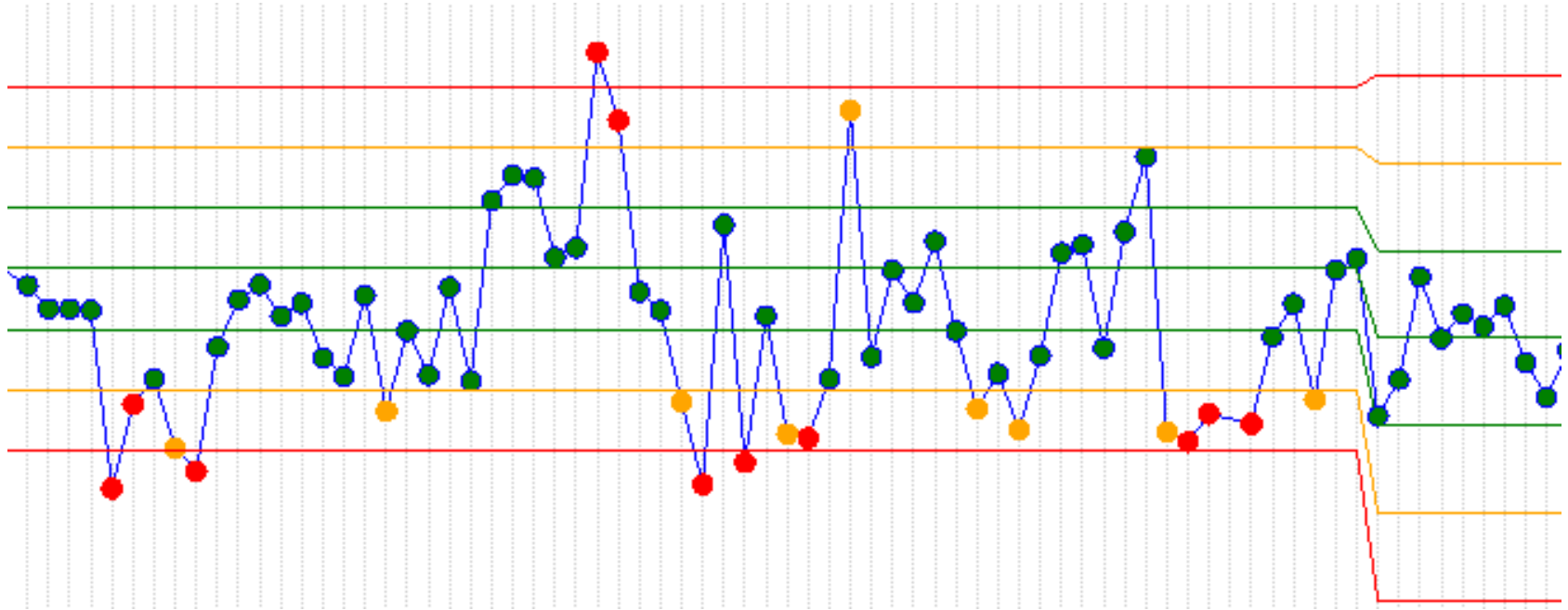
- Designed for UKAS laboratories
- Functionality input from laboratories
- Software being improved – 2 updates per year
- Will keep up with any new UKAS requirements

AqcTools:

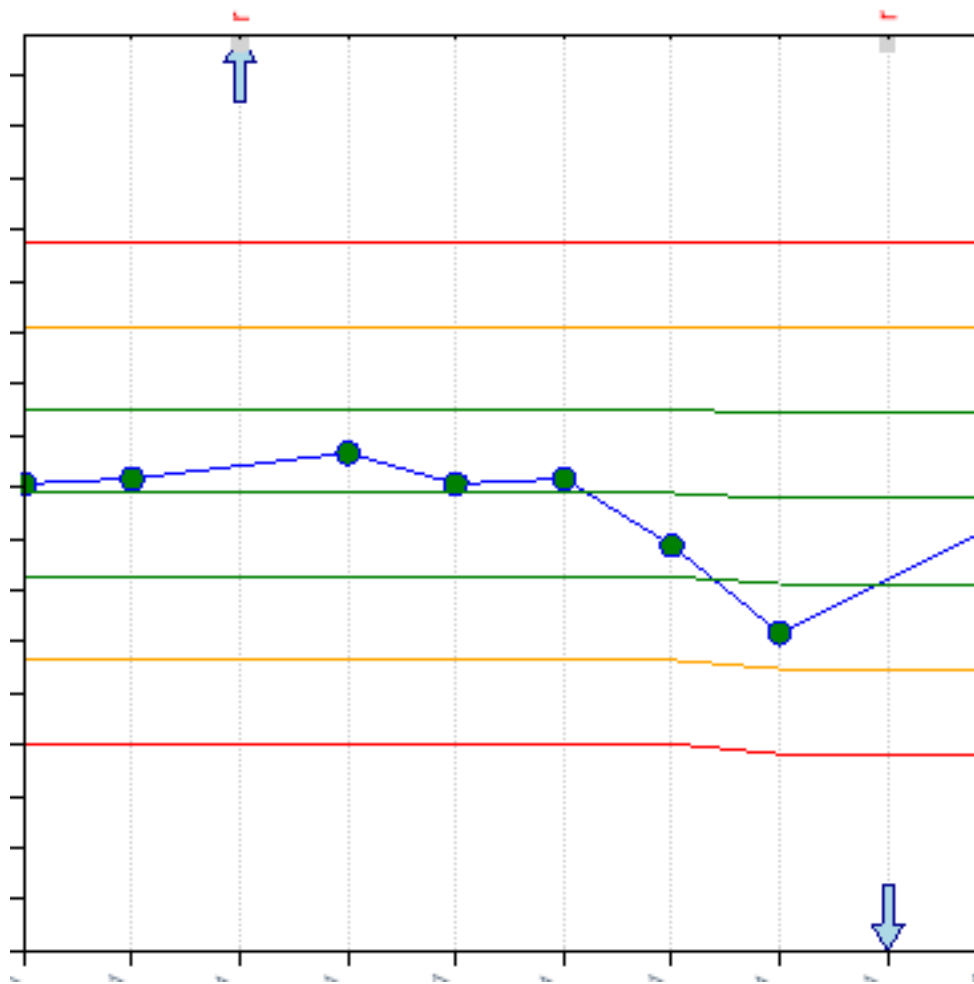
- Makes charts easy to interpret
- Identifies trends
- Deals with QC Exceptions / Failures
- Adds comments to points
- Statistics!!
- Real example



Easy to interpret charts



Data Checking



View with Full Selection

Selection By

Number of Results Number of Days Number of Batches

Date Range Named Dataset

Dates

Start

End

Results Filter

Analyst

Instrument



Tooltip Information

Batch Name ██████████_7150
Analysis Date 07 October 2015
Sample Details ██████████_7150|1|82
Aqc Result 51.0245
Analyst ██████████
Instrument Aquakem 840
Status Failed Double Warning

Batch Name ██████████_890
Analysis Date 07 September 2015
Sample Details ██████████_890|1|25
Aqc Result 47.6383504
Analyst ██████████
Instrument AgilentICPMS 416
Status Failed Action Limit

Analysis Date 23 September 2015
Comment new int cal. 12 monthly s ...
Mean Value 49.1751
Batch #1 ██████████_7106
Individuals:
#1 49.5082
#2 49.235
Batch #2 ██████████_7107
Individuals:
#1 48.7821



Dataset Properties

Statistics

	Results	Batches
Total	90	89
Good	88	87
% Above Mean	26.1	26.4
% Below Mean	73.9	73.6
% Failures	12.5	
% Total Failures	14.8	
% Warnings	11.4	



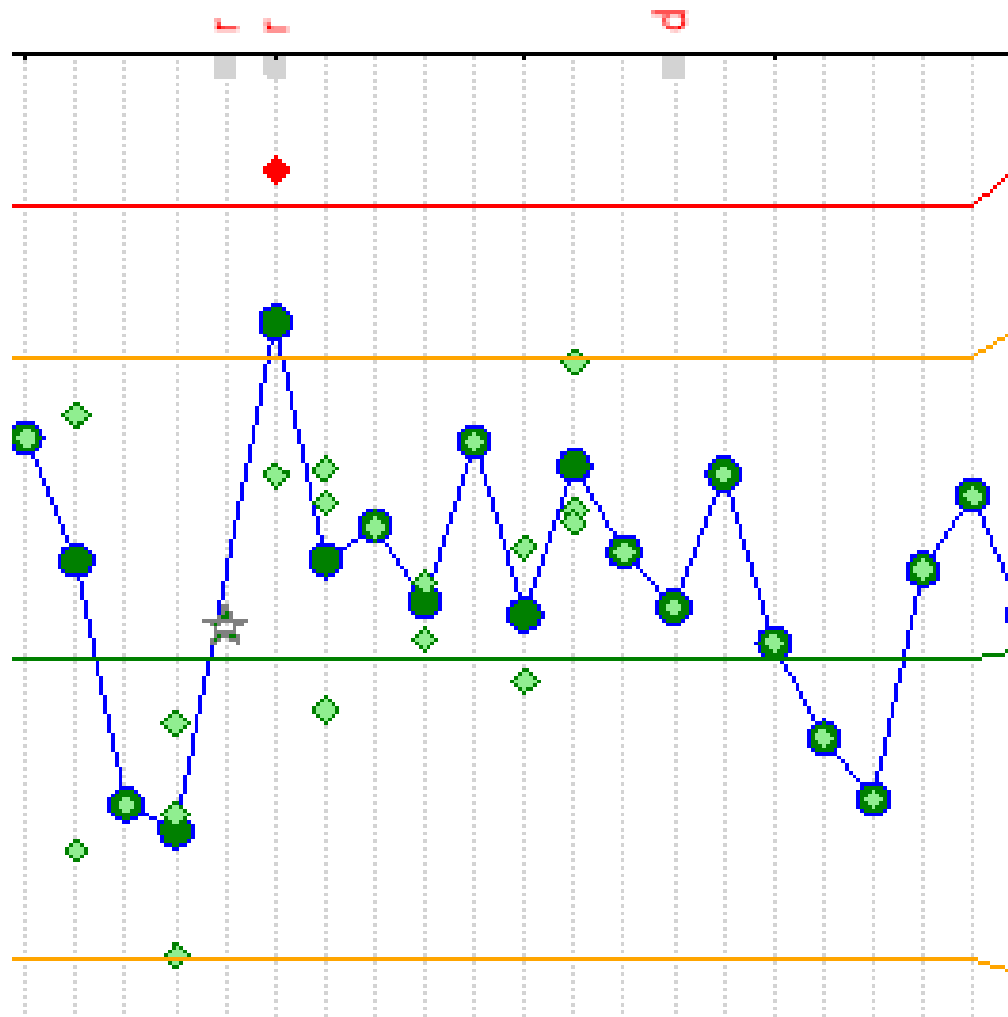
Dataset Calculations

Limits

	This Chart	Currently Released	% Difference
Upper Action Limit	28.08535	28.12223	-0.13
Upper Warning Limit	27.43313	27.4393	-0.02
Mean	26.12870	26.07345	0.21
Lower Warning Limit	24.82427	24.70759	0.47
Lower Action Limit	24.17206	24.02466	0.61
Standard Deviation	0.65221	0.682928085327148	-4.50
Relative Standard Deviation	0.02496	0.02619	-4.71
Relative Standard Deviation %	2.49616	2.61925	-4.70



Identifying Trends



Trend Summary Report

Outstanding Trends: 3

Aqc Id	Trend Type	Trend	No of Points in Trend	Date of Most Recent Point in Trend	Mean of Current Trend Values	First Point Value for Trend	Mean of Applicable Chart
Silver ug/l ICPMS Waste	Day	Below	15		0.870009	0.855000	0.8971568
Lead Total by ICPMS	Day	Above	11	12/10/2010	4.590356	4.733168	4.499889
Lead Total by ICPMS	Day	Above	10		4.572602	4.561455	4.505508

Corrected Trends: 0

Aqc Id	Trend Type	Trend	No of Points in Trend	Point Date that Broke the Trend	Mean of Current Trend Values	Value for Point that Broke the Trend	Mean of Applicable Chart
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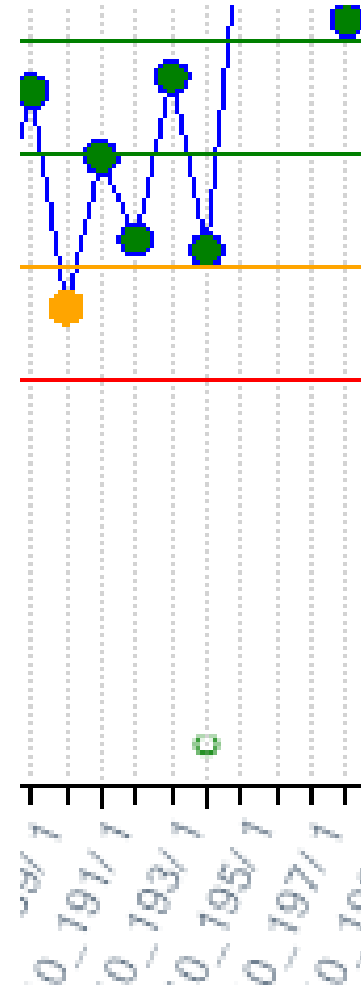


Adding Comments

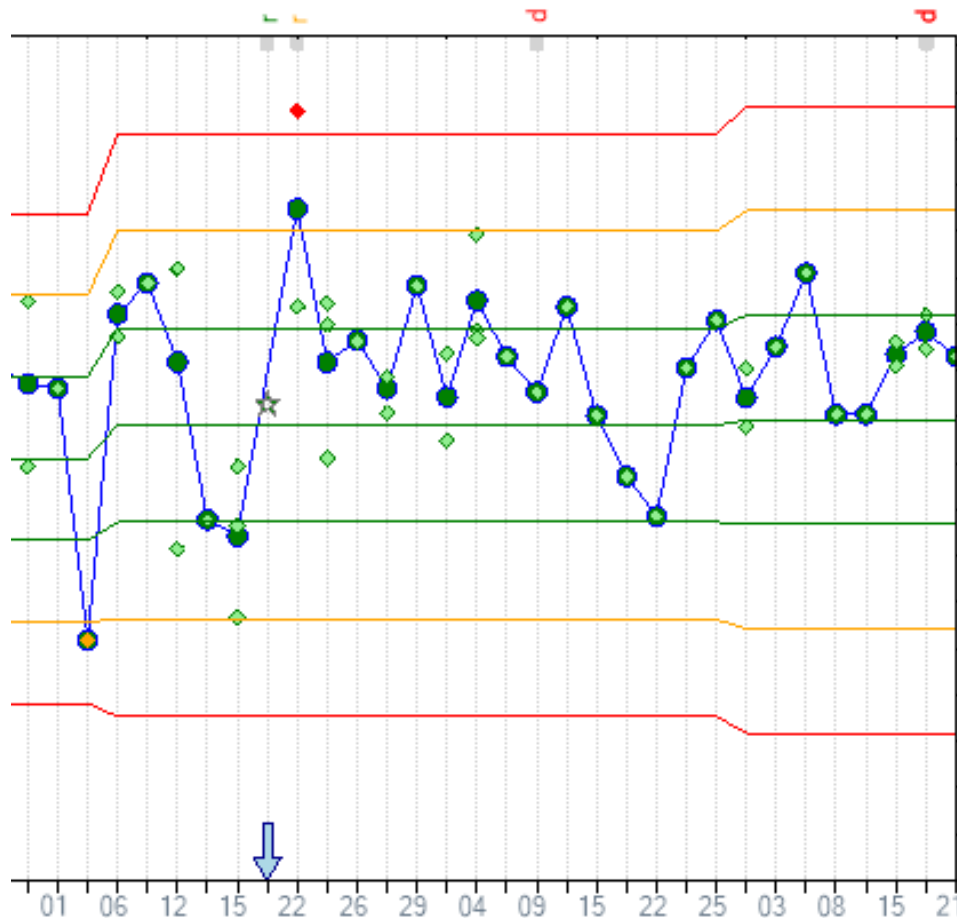
Comments

Add a comment here

Analysis Date	29 September 2010
Instrument	ICPOES
Status	Normal Aqc Result
Aqc Result	25.7427539
Comment	Add a comment here



Highlighting QC Exceptions/Failures



Exception Reporting Form

Description	Results and Limits	Investigation	Actions	Shared Investigations
Details				
Exception Id	34	Method Performed By		
Failure Date	07 April 2010	Method Affected	?Not SetINORGANICS	
Chart Name	ICPOES Ag ug/L			
Reported By		Instrument Run	AG-T-WW10_11	
Failure Type	Excluded	LIMS WorkSheet		



Recording Investigation

Description Investigation Actions Shared Investigations

Checklist

1	Instrument performance / Sensitivity	<input checked="" type="checkbox"/>
2	Calibration	<input checked="" type="checkbox"/>
3	Standard / Reagent expiry	<input checked="" type="checkbox"/>
4	Standards / Reagents preparation logs	<input checked="" type="checkbox"/>
5	Instrument Drift / Blockage	<input checked="" type="checkbox"/>
6	Equipment History logs	<input checked="" type="checkbox"/>

Investigation

9 mean plots below actual mean. Mean values are quite close together and moving around theoretical mean.



Audit of the Actions

Description Investigation **Actions** Shared Investigations

Analyst Action

Comment: Carry on with next analyses.

Analyst: [Redacted] Date: 05 August 2015 [Signoff & Escalate](#)

Supervisor Action

Comment: Returned above mean on 26/8/15. Action acceptable.

Supervisor: [Redacted] Date: 31 August 2015 [Signoff](#)

Review of Action

Comment: Action acceptable.

Supervisor: [Redacted] Date: 31 August 2015 [Signoff & Escalate](#)

Manager Signoff

Manager: [Redacted] Date: 03 September 2015 [Signoff](#)



Incomplete Exceptions Report

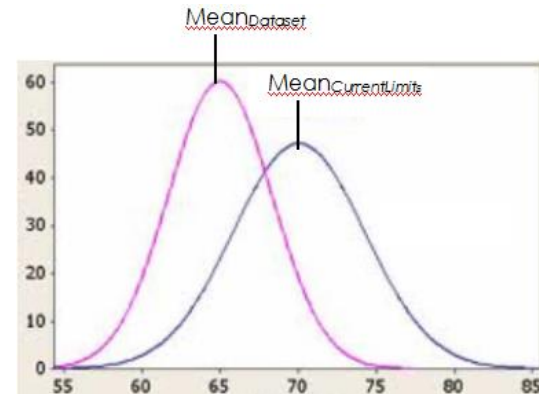
Aqclid	Exception Id	Type	Analysis Date	Result	Failure Type
Lead Total by ICPMS	14/38	Result	21 July 2010	-0.004780	Excluded
Lead Total by ICPMS	14/37	Result	21 July 2010	-0.00065	Excluded
Aq ug/l ICPMS	14/14	Result	12 August 2010	1.06	Excluded
Lead Total by ICPMS	14/40	Result	17 August 2010	3.969	Excluded
ICPOES Pb mg/L Waste_RD2032_UTS_0002_Test Data	14/43	Result	17 August 2010	3.969	Excluded
Silver ug/l ICPMS Waste	14/2	Result	07 October 2010	0.837	Failed Action Limit
Aq ug/l ICPMS	14/15	Result	07 October 2010	0.736	Excluded
Silver ug/l ICPMS Waste	14/3	Result	11 October 2010	0.942	Failed Warning after Fail
Lead Total by ICPMS	14/42	Result	22 October 2010	4.838979	Failed Action Limit
Lead Total by ICPMS	14/35	Day	09 November 2010	4.535	9 successive Days Above Mean
Silver ug/l ICPMS Waste	14/4	Result	15 November 2010	0.941000	Failed Double Warning

Result	Failure Type	Shared Investigation ID	Status	Assignee	Analyst
-0.004780	Excluded	<No Investigation>	No Action Yet Taken		
-0.00065	Excluded	<No Investigation>	No Action Yet Taken		
1.06	Excluded	<No Investigation>	No Action Yet Taken		ANALYST 1
3.969	Excluded	<No Investigation>	Action Agreement Pending	Demo	
3.969	Excluded	<No Investigation>	No Action Yet Taken		
0.837	Failed Action Limit	<No Investigation>	Action Agreement Pending	nikki civil	
0.736	Excluded	15	No Action Yet Taken		ANALYST 1
0.942	Failed Warning after Fail	<No Investigation>	No Action Yet Taken		
4.838979	Failed Action Limit	<No Investigation>	Action Agreement Pending	Demo	
4.535	9 successive Days Above Mean	<No Investigation>	No Action Yet Taken		N/A
0.941000	Failed Double Warning	<No Investigation>	No Action Yet Taken		



Statistics used in Limit Review

$$t = \frac{\text{ABS}(\text{ABS}(\text{Bias}_{\text{Dataset}}) - \text{ABS}(\text{Bias}_{\text{Regulatory}}))}{\left[\frac{\text{SD}_{\text{Dataset}}}{\sqrt{n}} \right]}$$



$$\text{d.f.} = \frac{(s_1^2/n_1 + s_2^2/n_2)^2}{(s_1^2/n_1)^2/(n_1 - 1) + (s_2^2/n_2)^2/(n_2 - 1)}$$

$$df = \frac{110 [M_1 + M_0]^2}{11 M_1^2 + 10 M_0^2}$$

$$t = \frac{(\text{Mean}_{\text{Dataset}} - \text{Mean}_{\text{CurrentLimits}})}{\sqrt{\left[\frac{(\text{SD}_{\text{Dataset}})^2}{n_{\text{Dataset}}} + \frac{(\text{SD}_{\text{CurrentLimits}})^2}{n_{\text{CurrentLimits}}} \right]}}$$



Limit Suitability Report

Comparisons

* Limit Suitability: AdHoc - TEST - 01 Jul 2010 to 31 Oct 2010

Printed on: 14 November 2014 at 13:00

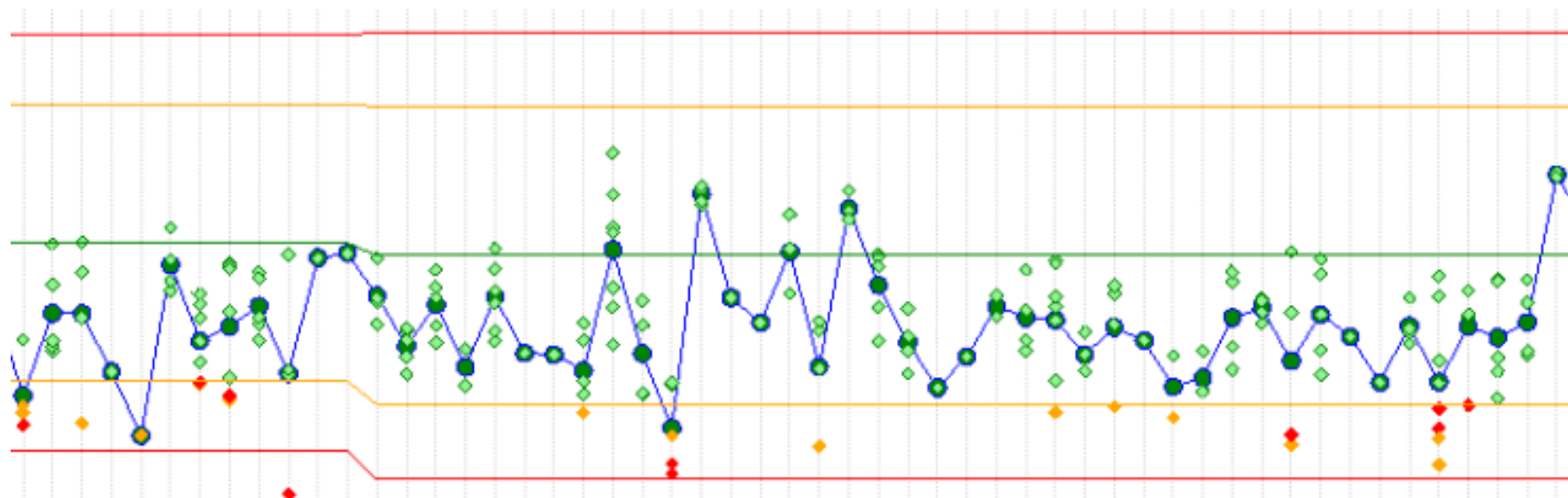
Aqclid	Target RSD%	Target Bias%	Regulatory RSD%	Regulatory Bias%	Aqc Expected Value	Curr Limits
ICPOES Ag mg/L Analysts Exercise 1						0.89
ICPOES Ag mg/L Analysts Exercise 3						0.89
ICPOES Ag mg/L Analysts Exercise 9						0.89
ICPOES Ag mg/L QC Admin Exercise 1						0.89
ICPOES Ag mg/L QC Admin Exercise 3	2	5	10	20	0.92	0.89
ICPOES Ag mg/L Water Analysts Exercise 2.9.2						
ICPOES Ca High mg/Kg Analysts Exercise 5						
ICPOES Ca High mg/Kg Analysts Exercise 5B						
ICPOES Pb Tot mg/L Analysts Exercise 4						

Comparisons

Dataset RSD%	Dataset Bias%	Points in Dataset	Fail%	Warn%	Is dataset RSD% signif. greater than Target RSD%?	Is dataset Bias% signif. greater than Target Bias%?	Is dataset RSD% signif. different from current chart limits RSD%?	Is dataset Mean signif. different from current chart limit Mean?	Is dataset RSD% signif. greater than Regulatory RSD%?	Is dataset Bias% signif. greater than Regulatory Bias%?
1.20122	0.27686	12	0	0	N/A	N/A	Yes	No	N/A	N/A
1.74285	0.00000	14	0	0	No	No	No	No	No	No
2.26839	-0.09617	69	1.4	2.9	N/A	N/A	No	No	N/A	N/A
3.31814	0.55879	14	14.3	14.3	N/A	N/A	Yes	No	N/A	N/A



Real Example



Dataset Properties

	Results	Batches	Days
Total	207	145	
Good	206	144	
% Above Mean	11.2	11.8	
% Below Mean	88.8	88.2	
% Failures	4.9		
% Total Failures	5.3		



Dataset Calculations

Limits

	This Chart	Currently Released
Upper Action Limit	51.18662	51.99448
Upper Warning Limit	50.68349	51.40368
Mean	49.67722	50.22207
Lower Warning Limit	48.67094	49.04046
Lower Action Limit	48.16781	48.44966
Standard Deviation	0.50314	0.5908031



Trend Summary Report

Trends Report for period from 01 Mar 2015 to 22 Sep 2015

Outstanding Trends: 2

Aqc Id	Trend Type	Trend	No of Points in Trend	Date of Most Recent Point in Trend	Mean of Current Trend Values	First Point Value for Trend
[REDACTED]	Day	Above	98	21/09/2015	100.837877	100.929000
[REDACTED]	Day	Above	13	22/09/2015	19.974803	19.816819

Corrected Trends: 24

Aqc Id	Trend Type	Trend	No of Points in Trend	Point Date that Broke the Trend	Mean of Current Trend Values	Value for Point that Broke the Trend
[REDACTED]	Day	Below	14	11/05/2015	228.775357	230.820000
[REDACTED]	Day	Above	13	24/04/2015	657.544872	657.500000



Exception Form

Description Investigation **Actions** Shared Investigations

Analyst Action

Comment
Trend started on 15th July. On 18th July a New stock AQC was put into use.
Trend broken on 28th July, new sodium hydroxide and hydrazine reagents were put into use on this day.

Analyst [Redacted] Date 27 September 2015 [Signoff & Escalate](#)

Supervisor Action

Comment
From 1st July - 27th Sept only 16.7% of results are above the mean. The chart was reviewed on the 10th August and 24th September. On both occasions the mean had dropped.

Supervisor [Redacted] Date 27 September 2015 [Signoff](#)

Review of Action

Comment
There are two other negative trends on this chart, see above date range, these are 41047 and 44907.
Since the chart was reviewed on 24th September there has been a good distribution on points above/below the mean.

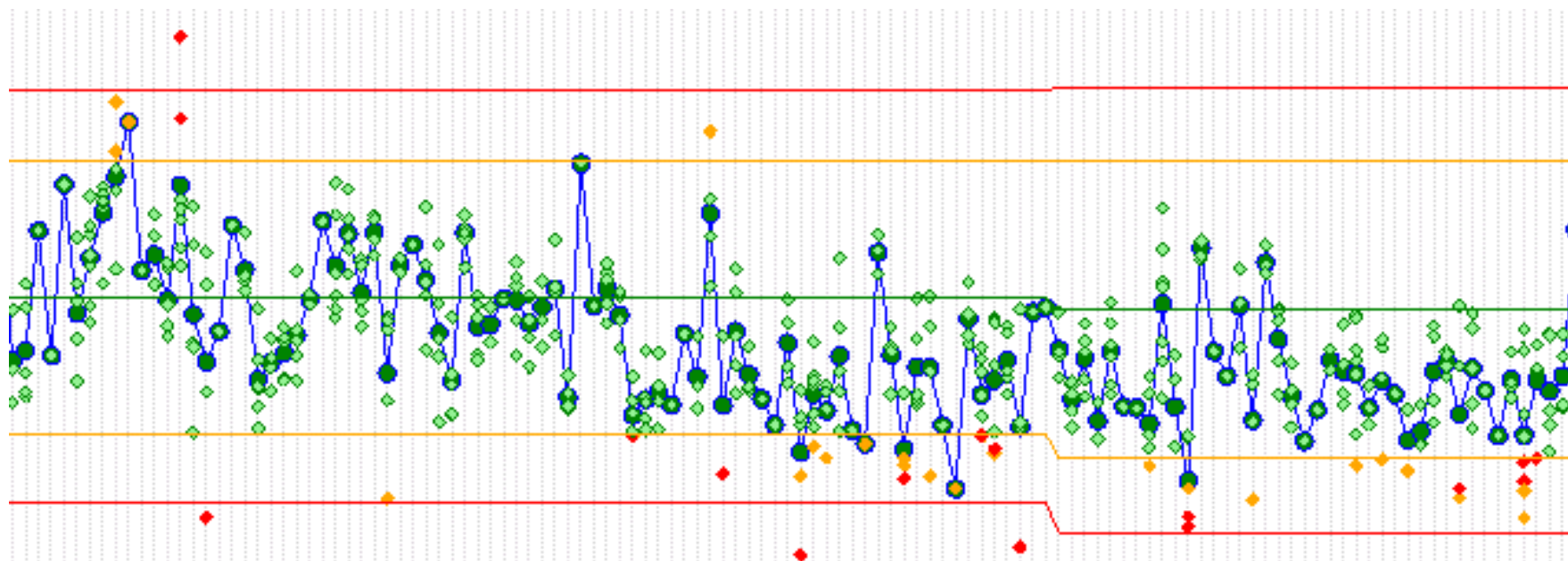
Supervisor [Redacted] Date 27 September 2015 [Signoff & Escalate](#)

Manager Signoff

Manager [Redacted] Date 27 September 2015 [Signoff](#)



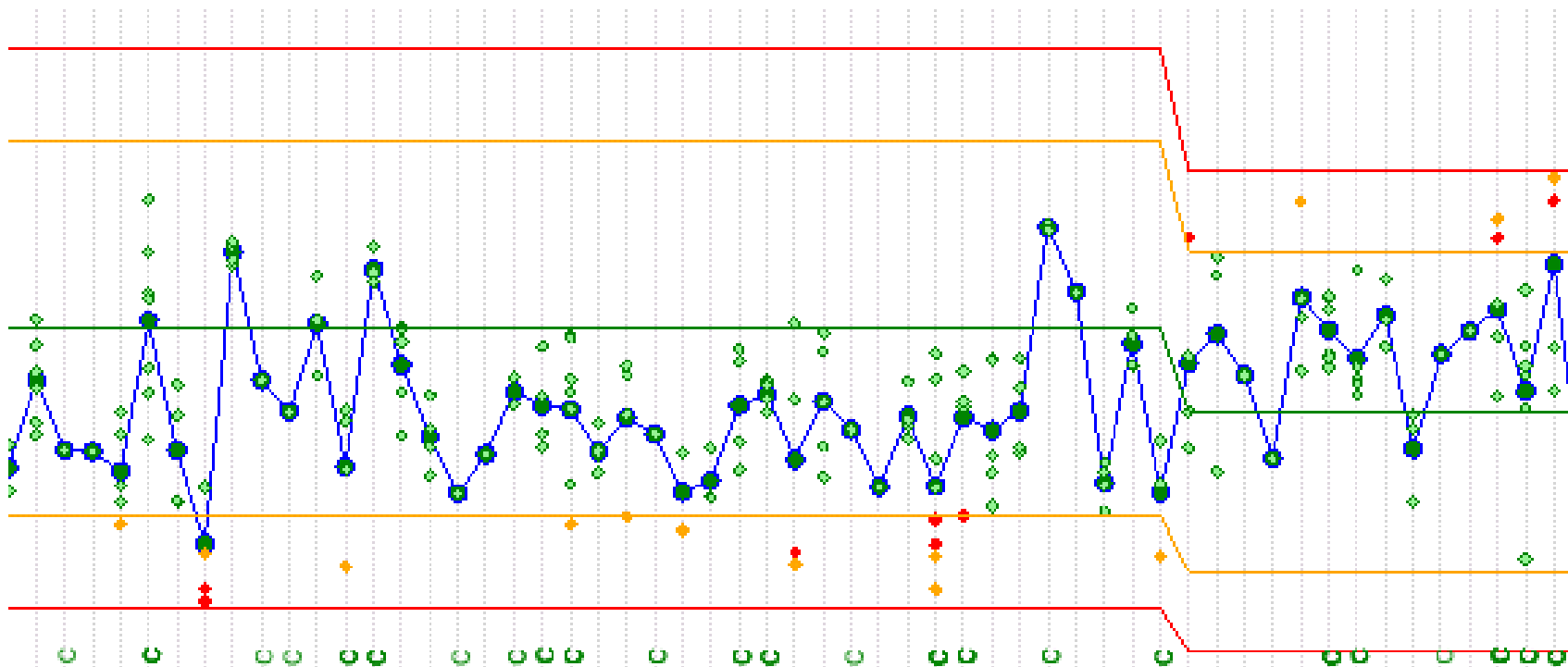
Long term Chart



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laboratory systems integration

New Limit Review Carried out



Benefits of AqcTools

- Ease of use and interpretation of data
- Functionality to record issues and investigations
- Standardised statistics and calculations for Limit Review



In the future....

- Regular improvements using customer feedback
 - New improved statistics
 - User definable reports
 - Faster limit release procedure
 - Audit viewer
 - Multi – language capability

