Handheld Meter Calibration Form – Data Entry

1. OVERVIEW:

Horizon regional Councils (HRC) Discrete Water Quality Program requires the use of handheld meters to collect physio-chemical data on site. Such meters will be validated and calibrated in accordance with NEMS – Water Quality parts 1 through 4.

Further information on the specification, use, calibration, and handheld meter calibration form of HRC's handheld meters are located in Section 14 of the Hydrology Operations Manual.

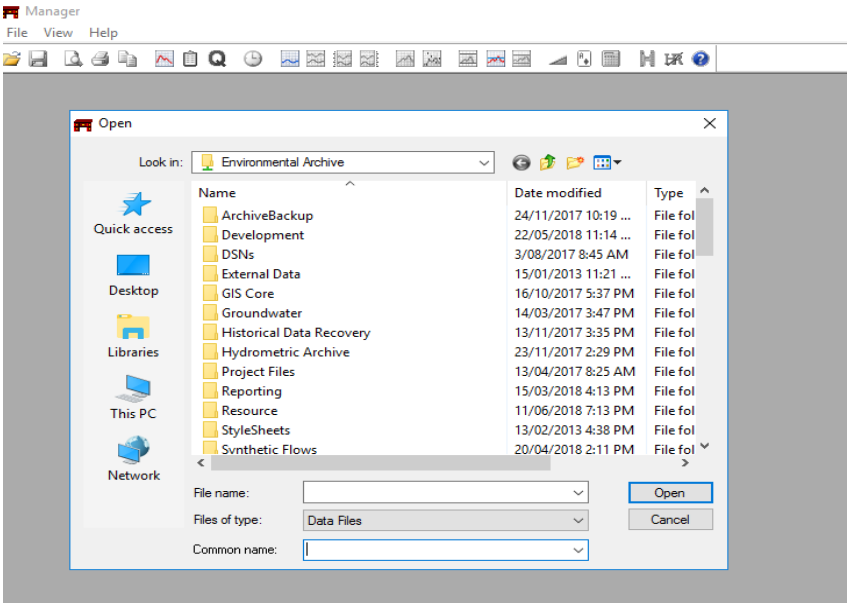
The relevant staff member completes the calibration and end of day checks of the handheld meter used for sample and data collection in duplicate paper form on the day. The Discrete Water Quality Portfolio holder checks the top copies of the forms for omissions or errors and ensures these are rectified as soon as possible. These are then date stamped and digitally entered into Hilltop Manager. The duplicate copy remains in the calibration book until no longer needed at the discretion of the Discrete Water Quality Portfolio holder.

This Standard Operating Procedure (SOP) details the process of digitizing paper SmarTroll/AquaTroll (Troll's) handheld meter calibration forms. This does not cover the data entry for deployed sondes (i.e. YSI Exo's used in the continuous water quality role).

2. LOCATION OF DIGITAL DATA:

The digital versions of the handheld meter calibration forms are stored as a 'site' in the Sampler Provisional Archive: \\ares\Environmental Archive\Provisional WaterQuality.hts. This is the same location where external laboratory derived discrete water quality sample parameters are archived to.

(i) Open (Hilltop) Manager, then go ***file*** and then ***open***



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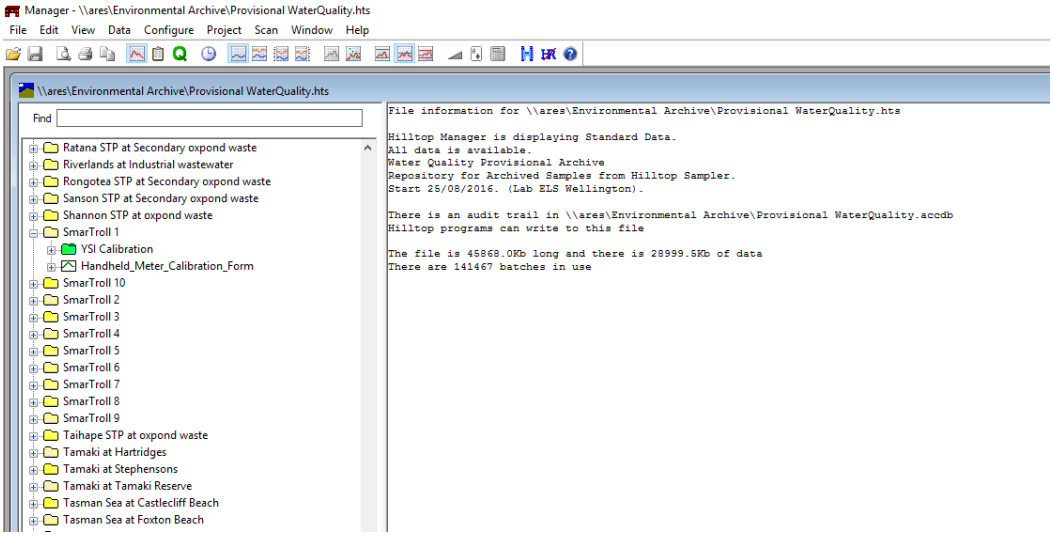
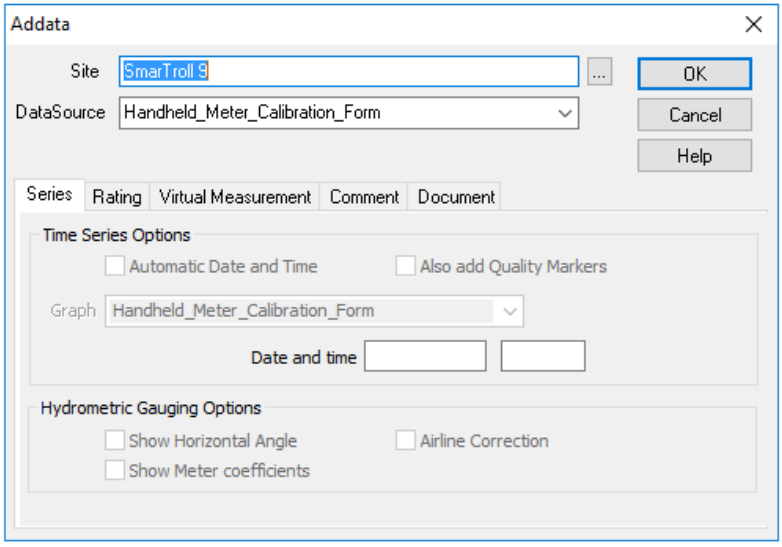
(ii) Open the ***'common name' drop down menu*** and select ***Archive: Sampler Provisional:***



(iii) All 'sites' are in alphabetical order; all Troll's are listed in the site list as either SmarTroll/AquaTroll #.

3. CREATING A DIGITAL FORM:

(i) Select the correct Troll 'site' (in this example SmartTroll 9 is required) and select the plus box to open the file structure. Select the ***Handheld-Meter-Calibration-Form***, then right click and select ***'Add'***.



(ii) Complete the date and time fields (NOTE: the time needs to be HHMMSS) and select ***OK***

(iii) This should open a digital version for the paper handheld calibration form:

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Hand Held Meter Calibration Form

Site Name SmarTroll 10 — Date and Time 19-Oct-2017 05:50:00

Meter ID	SmarTroll 10	Date	19-Oct-2017
Staff Member	Craig Beaven	Time	05:50:00 NZST
Run Name	SOE Upper Whanganui		

BAROMETRIC PRESSURE CHECKS

Handheld Meter Reading	1008.10	mbar
Manawatu at Victoria Avenue	offsite	mbar

DISSOLVED OXYGEN CALIBRATION

DO% (after calibration)	100.1	°C	Temperature		Pass Calibration 99.7%-100.3%
DO mg/L (after calibration)	10.04	%	14.99	°C	Y

3 POINT pH CALIBRATION

	Calibration Value	Temperature		mV pH Value
pH 7 (calibration)	7.02	15.3	°C	
pH 4 (calibration)	4.00	15.3	°C	
pH 10 (calibration)	10.08	15.3	°C	

CONDUCTIVITY CALIBRATION

	Specific Conductivity		Temperature		Pass Calibration
0.001M handheld reading (before)	162.7	us/cm	15.23	°C	0.001M check value is
0.01M calibration reading	1418	us/cm	15.4	°C	between 120-175 us/cm
0.001M handheld reading (after)	162.3	us/cm	15.35	°C	Y

ORP CALIBRATION

	Calibration ORP Value		Temperature	
ORP (calibration)		mV		°C

END OF DAY CHECKS

Staff Member: Craig Beaven — Time: 14:20:00 NZST

pH	Handheld		Temperature		Allowable Range	Passed
pH 7 Buffer	7.08		16.04	°C	6.8 - 7.20	Y

Specific Conductivity	Handheld		Temperature		Allowable Range	Passed
0.001M	160.6	us/cm	16.28	°C	120 - 175	Y

ORP	Handheld		Temperature		Allowable Range	Passed
ORP Check		mV		°C	230 - 295	

COMMENTS

OVERALL CALIBRATION STATUS

Overall Handheld Calibration Status Passed

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4. DIGITAL FORM COMPLETION:

Copy the paper copy of the form into the relevant fields.

4.1 GENERAL NOMENCLATURE:

These general rules will apply to missing data that needs to be digitized:

(i) Missing Data (i.e. temperature, calibration values): Leave ***BLANK***
(ii) Missing Time: enter **00:00:00**

4.2 GENERAL CALIBRATION INFORMATION

For each calibration; Troll #, sample run/meter use, staff member and date/time are recorded.

(i) **Calibration Form page number:** There is currently no field to enter this data. Add to the digital form in the comments section.
(ii) **Meter ID:** select the appropriate Troll # from the drop down box. If the name is not in the list, notify the Discrete Water Quality Portfolio holder and put the entry process on hold.
(iii) **Date:** This is currently an open text field. Manually enter the date in the format: **##-JAN-20##.**
(iv) **Staff member:** select the appropriate staff member from the drop down box. If the name is not in the list, log it as the Discrete Water Quality Portfolio holder and notify them.
(v) **Time:** This is currently an open text field. Manually enter the time in the format: **HH:MM:SS.**
(vi) **Run name:** select the appropriate run name from the drop down box. If it is not in the list use the currently open text field and manually enter the run name as it is shown in Hilltop Sampler.

4.3 BAROMETRIC PRESSURE CHECKS

For each calibration the Troll is checked against the primary barometric pressure sensor located in the WQ Lab (AKA Manawatu at Victoria Avenue).

(i) Handheld Meter Reading: Enter the value as per the paper copy.
(ii) Manawatu at Victoria Avenue: Enter the value as per the paper copy.

- The values should be between three or four digits long with up to two decimal places.
- For any missing data record ***leave the field blank*** and add any comments in the comment field.

Possible issues:

- On occasion, the calibration may be undertaken off site – therefore there is no Manawatu at Victoria Avenue pressure check. In these instances, enter ***OFFSITE*** into this field. Do not enter personal addresses.
- Due to the above point, the pressure check values are on occasion noted upon return to the office (i.e. during the end of day checks). The current form cannot have these

checks noted against a different time than the calibration; leave the field ***BLANK*** for the handheld meter reading and ***OFFSITE*** for the Manawatu at Victoria Avenue reading. Record any data in the comments as:

- Barometric pressure checks undertaken at HH:MM
- Handheld Meter Reading: ####. ##
- Manawatu at Victoria Avenue: ####. ##

4.4 DISSOLVED OXYGEN CALIBRATION

For discrete water quality sampling the Dissolved Oxygen (DO) sensor requires calibration prior to use. The post calibration DO% readings should range from 99.7% to 100.3% to pass. The meter should not be used if this fails.

(i) DO % (after calibration): Enter the value as per the paper copy.
(ii) DO mg/L (after calibration): Enter the value as per the paper copy.
(iii) Temperature: Enter the value as per the paper copy.
(iv) Pass Calibration: Double check the status on the paper form and mark as either Y or N. A pass is any value from 99.7% to 100.3% with no exception.

Definitions:

- DO vs. RDO: For the purposes of this SOP, both wordings are used interchangeably.

Possible issues:

- The calibration could fail by falling outside of the allowable range. At this point, the meter should either be (i) recalibrated with any notes added to the comments section verbatim (ii) the calibration cancelled (record any notes in the comment section verbatim and set the *Overall Handheld Calibration Stat*us as **FAIL**).
- The DO sensor has a set lifetime at which point replacement is needed. When this lifetime is met it is not possible to actually complete the calibration - at this point the staff member has no other option than stopping the calibration and use of the meter.

4.5 THREE POINT pH CALIBRATION

For discrete water quality sampling a 3-point pH calibration is required. The meter shall be calibrated to pH 4, 7 and 10.

(i) Calibration value: Enter the value as per the paper copy.
(ii) Temperature: Enter the value as per the paper copy.
(iii) mV pH Value: Enter the value as per the paper copy.

Definitions:

- Calibration Value: This is the value the meter is being set to. This value is temperature dependent (which is why temperature is recorded) and will therefore vary between calibrations.
- mV pH Value: This is the raw value of the calibration value – pH technically has no units. These values indicate the state of health of the pH probe in the meter. For pH7 the mV should be close +-0mV – once above +-35mV the meter should not be used. The mV values for pH4 and pH10 should be between +-180mV of the pH 7 value.

Possible issues:

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- On occasion, the calibration may fail – typically, the meter will fail to detect one of more of the calibration standards. At this point, the meter should no longer be used and calibration abandoned. Record any notes in the comment section verbatim and set the *Overall Handheld Calibration Stat*us as **FAIL.**
- Use of differing pH Buffers- for some Hydro site checks a pH buffer of 1.68 is used (therefore the calibration will be based on pH1.68, 4 & 7 buffers). The existing paper forms can be modified however the current electronic form cannot. *Entering this data is on hold until a revised form is provided (DBH 7th July 2020).*

4.6 CONDUCTIVITY CALIBRATION

For discrete water quality sampling, a 1-point conductivity calibration is required. Currently the meter shall be calibrated to 0.01M and checked before and after calibration against 0.001M.

(i) 0.001M Handheld Reading (before): Enter the value as per the paper copy.
(ii) 0.01M Calibration value: Enter the value as per the paper copy.
(iii) 0.001M Handheld Reading (after): Enter the value as per the paper copy.
(iv) Temperature: Enter the value as per the paper copy.
(v) Pass Calibration: Double check the status on the paper form and mark as either Y or N. A pass is any value from 120-175µS/cm with no exception.

Definitions:

- Units: The handheld meter calibration form refers to specific conductivity in Molar (M). The meters record to micro Siemens per centimeter (µS/cm). Both units are comparable the difference being in magnitude. The standard solutions used for calibrations and checks vary by +-10 µS/cm so Molar is used on all forms as a form of simplification.
- Conductivity vs. Standard Conductivity: For the purposes of this SOP, both wordings are used interchangeably.

Possible issues:

- On occasion, the calibration may fail – the staff member should be aware and mark the form correctly and either; re-check, re-calibrate or cancel the use of the meter (record any notes in the comment section verbatim and set the *Overall Handheld Calibration Stat*us as **FAIL**).
- The most likely reason for failure is the contamination for the 0.001M standard solution. At this point fresh solution is used and normally resolves the problem –this step may or may not be noted – add any notes to the comment section as verbatim. A change in recorded temperature may also be notable and is not an issue.

4.7 ORP CALIBRATION

For groundwater water sampling, a 1-point Oxidation Reduction Potential (ORP) calibration is required. This is also calibrated for most lakes sampling. All Trolls can be calibrated for and used to measure ORP.

(i) ORP (Calibration): Enter the value as per the paper copy.
(ii) Temperature: Enter the value as per the paper copy.

Possible issues:

- On occasion, the calibration may fail – typically, the meter will fail to detect the buffer. At this point, the meter should no longer be used and calibration abandoned. Record any notes in the comment section verbatim and set the Overall Handheld Calibration Status as **FAIL.**

4.8 END OF DAY CHECKS

At the end each use, the meter will be checked against drift in both the pH, Conductivity and if calibrated ORP.

(i) **Staff member**: Select the appropriate staff member from the drop down box. A different staff member may complete this.
(ii) **Time:** This is currently an open text field. Manually enter the time in the format: **HH:MM:SS.**
(iii) **pH**: the meter is checked against pH7 Buffer:
- Handheld: Enter the value as per the paper copy.
- Temperature: Enter the value as per the paper copy.
- Passed: Double check the status on the paper form and mark as either Y or N (a pass is any value from 6.8-7.2mV with no exception).

(iv) **Specific Conductivity**: the meter is checked against 0.001M standard solution:
- Handheld: Enter the value as per the paper copy.
- Temperature: Enter the value as per the paper copy.
- Passed: Double check the status on the paper form and mark as either Y or N (a pass is any value from 120-175µS/cm with no exception with no exception).

(v) **ORP**: the meter is checked against Zobells Buffer:
- mV ORP Value: Enter the value as per the paper copy.
- Temperature: Enter the value as per the paper copy.
- Passed: Double check the status on the paper form and mark as either Y or N (a pass is any value from 230-295mV with no exception).

Possible issues:

- Any issues that have occurred in the field and that have not been noticed are likely to be detected at the end of day check(s). The most likely end of day check fails are due to contamination of buffers and solutions. Staff are aware of this likelihood, and should at this instance rinse the meters, replace the buffers and re-check. Hopefully this will be commented upon. If fails still occur, the meter is passed over to the Discrete Water Quality Portfolio holder.
- The handheld meter calibration form should be updated to confirm whether the calibrations should be considered as a fail.
- If the issue is not resolved within 24hrs of the calibration date/time, the calibration is automatically considered as a fail.
- Copy any notes or comments verbatim. If clarification etc. is needed contact the Discrete Water Quality Portfolio holder to confirm any details. Alternatively, the Discrete Water Quality Portfolio holder can complete the data entry of said form if required.

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4.9 COMMENTS

Copy any notes or comments verbatim. If clarification etc. is needed contact either the staff member or the Discrete Water Quality Portfolio holder to confirm any details.

4.10 MAINTENANCE

The handheld meter calibration data entry form is also utilized by the Discrete Water Quality Portfolio for maintenance issues. Such maintenance issues include replacing meter probes and components, general repair, cleaning and maintenance.

Generally, these practices result in a half filled handheld calibration data entry form and extensive comments/notes.

Copy any notes or comments verbatim. If clarification etc. is needed contact the Discrete Water Quality Portfolio holder to confirm any details. Alternatively, the Discrete Water Quality Portfolio holder can complete the data entry of said form if required.

4.11 DISCARDED FORMS

Occasionally forms will be missed and left out of sequence. Prior to recycling the 'empty/used' calibration book the Discrete Water Quality Portfolio holder will check to ensure all 'white' top copies have been removed for digitization.

Out of sequence, blank forms will still need to be digitized. They should be marked as DISCARDED (or words to the affect) and be dated and signed. For such instances record:

1. Date: As per the date the form was signed or sampled
2. Staff member: If not stated put against the Discrete Water Quality Portfolio holder
3. Troll#: if not stated confirm with the Discrete Water Quality Portfolio holder
4. Comments: Simply mark as FORM NOT USED – DISCARDED. (Note if there is any other pertinent information include and this in the comments field also).