

Anne Arundel County
Bureau of Watershed Protection and Restoration

Illicit Discharge Detection and Elimination (IDDE)
Standard Operating Procedures (SOP) for Consultants and BWPR
Staff

Prepared for

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ANNE ARUNDEL COUNTY IDDE PROGRAM SOP FOR CONSULTANTS

1.0 INTRODUCTION

Per Part IV.D.3 of Anne Arundel County's (hereafter referred to as "the County") National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit (Permit MD0068306; 20-DP-3316), the County is required to maintain an inspection program designed to detect, isolate, and eliminate all non-permitted discharges to and from the County storm drain system. Non-permitted discharges are defined as discharges that do not originate as stormwater runoff. These discharges can be hazardous to public health, harmful to aquatic life in receiving waters, and detrimental to water quality. Non-permitted discharges may be the result of misconnection of a portion of the sanitary sewer system to the storm sewer system, infrastructure failure allowing infiltration of public drinking water or sanitary sewer effluent into the storm sewer system, inadvertent or deliberate discharges of prohibited effluent to the MS4, or other causes.

Federal regulation defines an illicit discharge as any discharge to an MS4 that is not composed entirely of stormwater, except allowable discharges pursuant to an NPDES permit, including those resulting from firefighting activities. Guidance prepared for EPA by the Center for Watershed Protection (CWP; Brown et al. 2004) provides further explanation, noting that illicit discharges are found at storm drains with measurable flow during dry weather containing pollutants and/or pathogens. Dry weather discharges (as described by Brown et al. 2004) can include illicit types, such as the following:

- sewage and septic flows
- wash water flows, such as residential gray water (laundry) discharges, water from commercial car washes, fleet washing, commercial laundries, and floor washing to shop drains
- liquid wastes such as oil, paint, and process water that enter the storm drain system
- swimming pool drainage and backwash

Dry weather flows can also be associated with cleaner discharges that would typically not be considered illicit:

- tap water, from leaks and losses from a water supply system
- landscape irrigation, when excess clean water from residential or commercial irrigation flows into the storm drain system
- groundwater or spring water entering the MS4

The County's Bureau of Watershed Protection and Restoration (BWPR) is responsible for NPDES monitoring and reporting on illicit discharge detection and elimination (IDDE) efforts. This standard operating procedure (SOP) is intended to summarize the procedures that consultants and BWPR staff follow as part of the County's NPDES IDDE program. This IDDE program is part of an overall approach to comply with NPDES requirements to (1) identify MS4 outfalls in

the county; (2) screen MS4 outfalls for dry weather discharge, the presence of pollutants, or other visible signs of an illicit discharge or connection; and (3) refer the illicit discharge or connection to the appropriate County or State agency for follow-up and potential correction.

2.0 ANNUAL OUTFALL SCREENING AREA

Target screening areas for each year frequently encompass unincorporated towns and are bounded by major roadways or defining geographical features. Preliminary target areas for FY2022 through FY2026 are shown in Figure 1. By assessing a different area of the County each year, a County-wide review of likely sources of dry-weather discharge can be accomplished within the permit period.

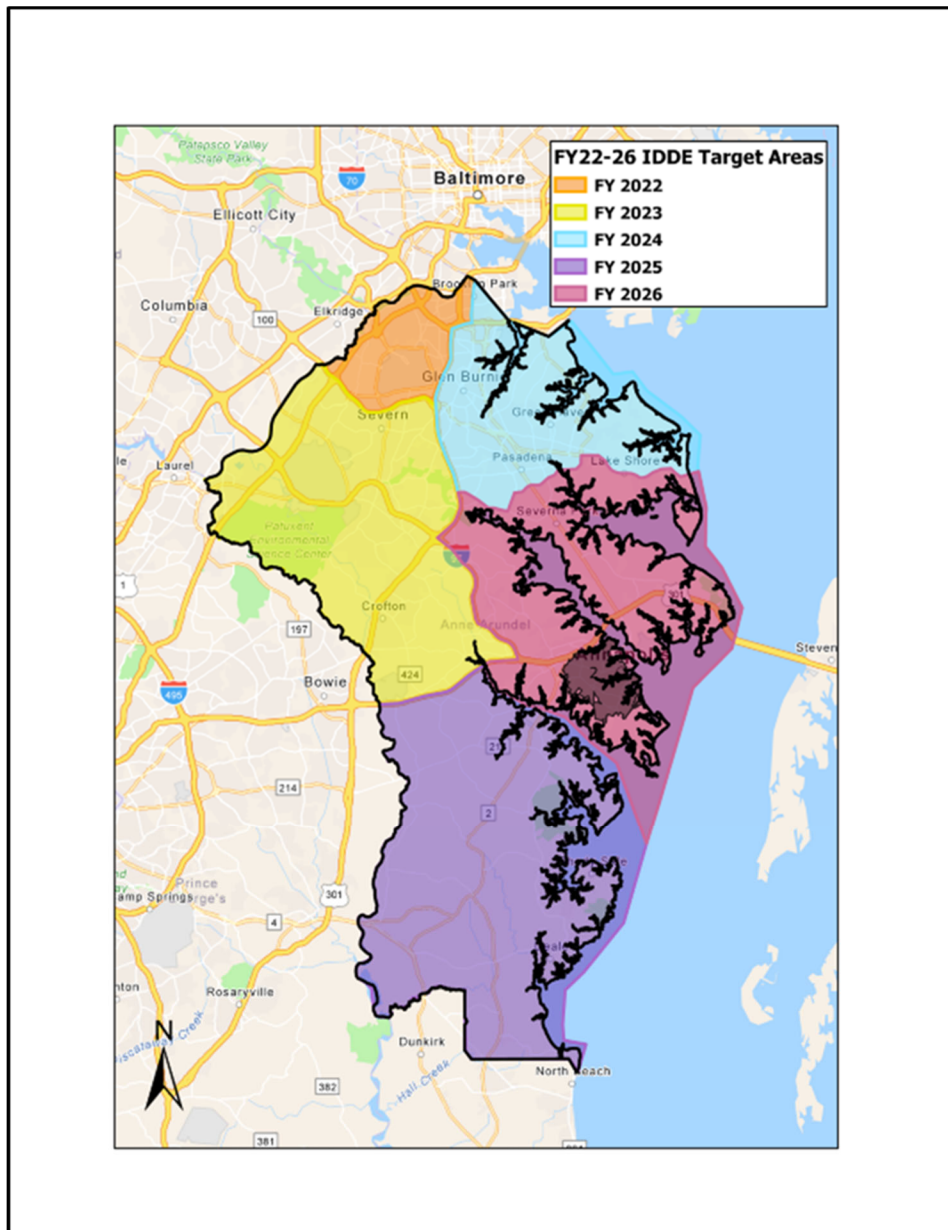


Figure 1. IDDE Target Screening Areas for FY 2022 - FY 2026.

Each year, the Anne Arundel County NPDES MS4 Permit Coordinator, or a delegated staff member, coordinates with the County's IDDE consultant to refine priority assessment areas in the County that should be investigated for possible illicit discharges to the stormwater system. Using

the most recent available digital data (including land use/land cover, stormwater infrastructure, sanitary sewer infrastructure, SSO locations, and TMDL watershed boundaries, as well as the County's commercial and industrial land use geodatabase), Geographic Information System (GIS) tools are employed to examine the areas of concern within a geographical target area boundary. Major storm drain outfalls in areas of concentrated commercial/industrial/institutional land uses, as well as areas of high and medium density residential land uses, are given priority for screening. The County strives for approximately 80 percent of the total number of screened outfalls to drain commercial/industrial land uses. Per 40 CFR § 122.26, a major outfall is defined as:

“An outfall that discharges from a single pipe with an inside diameter of 36 inches or more or its equivalent (discharge from a single conveyance other than circular pipe which is associated with a drainage area of more than 50 acres); or for municipal separate storm sewers that receive storm water from lands zoned for industrial activity (based on comprehensive zoning plans or the equivalent), an outfall that discharges from a single pipe with an inside diameter of 12 inches or more or from its equivalent (discharge from other than a circular pipe associated with a drainage area of 2 acres or more).”

Special consideration should also be given to storm drain systems and outfalls located within Bacteria TMDL watersheds. The County may request that outfall screening efforts include visits to outfalls that had exhibited illicit discharge during previous years' assessments to confirm illicit discharge elimination or to further document unresolved or recurring concerns for enforcement purposes. The location of these outfalls may or may not be in the geographical target screening area for that particular year. The County may also request outfall screenings in response to specific complaints – again, these outfalls may or may not be within the geographical target screening area.

It is recommended that a minimum of 165 outfalls be identified in the event that some outfalls are mis-identified as County-owned (e.g., might be State infrastructure), have been removed/replaced due to land development, or are not accessible.

Once per permit term, the County will revisit outfalls that exhibited illicit discharge during previous inspections to confirm illicit discharge elimination. In addition, the County may request consultants to perform specific outfall assessments throughout the permit term. These assessments will occur at outfalls that were identified in the prior two years of screening, as having an illicit discharge for which the source was not definitively identified or eliminated. These assessments may or may not be located within the priority target area for the current year. The consultant will visit outfalls in question and determine if they are still exhibiting illicit conditions or if the discharge has been eliminated. If illicit conditions exist, the consultant will attempt to identify the source of the discharge. The County may also request outfall screenings in response to specific complaints – again, these outfalls may or may not be within the geographical target screening area.

3.0 FIELD SCREENING OF OUTFALLS

Field teams comprised of two individuals will inspect a minimum of 150 County outfalls within the targeted areas during the field inspection season. Inspections will be performed following a minimum of 72 hours of dry weather (less than 0.10 inches of total rainfall). Outfalls will be visually inspected for signs of dry-weather discharge and physical deterioration.

When entering private, County-owned, commercial or industrial property to track suspicious dry weather flow, consultant staff will request permission from property owner or manager and present a Letter of Entry (see Appendix A) which shall be provided by the County. The Letter of Entry will contain a brief description of the project including purpose and proposed activities, and include the County MS4 Permit Coordinator's contact information. If an active illicit discharge is observed, consultants will not approach potential offenders, but are expected to take photographs (as best can be ascertained) and report the activity to the County's Environmental Hotline.

3.1 OUTFALL ASSESSMENT

When arriving at each outfall, the field team will select the appropriate targeted outfall within ArcCollector and populate a Survey123 inspection record. In the event that ArcCollector or Survey123 are not available, pre-printed outfall inspection forms (See Appendix B) can be used. Outfall inventory information as well as air temperature, date and time of the inspection, last rain date, and any physical deterioration will be recorded. If an outfall is found to be dry or wet, but not flowing; then the outfall will be assessed for all mandatory parameters in the MS4 Geodatabase IDDE Table to determine if an illicit discharge had occurred prior to inspection (e.g., staining, algae, odor, deposits at the outfall, vegetation). If an outfall contains a dry weather flow, the field team will measure the flow directly or estimate the flow depending on site conditions and follow the procedures below in the Dry Weather Discharge section.

Additionally, field teams will verify, update, and/or add the following attributes for each outfall screened:

- Outfall coordinates
 - Use the Projected Coordinate System: NAD 1983 HARN State Plane Maryland FIPS 1900 (US Feet)
- Outfall Height (inches - at tallest point)
- Outfall Width (inches - at widest point)
 - Height and width will be the same for circular or square outfall shapes. These data allow for the County to verify/update the outfall dimensions
- Outfall Type
 - Use the MS4 Geodatabase domain dOutfallType; if Type is 'Other' please include an explanation
- Outfall Material
 - Use the MS4 Geodatabase domain – dOutfallMaterial; if Material is 'Other' please include an explanation

- Outfall Shape
 - Options are: Circular, Semi-circular, Oval, Rectangular, Oblong, Other; if shape is 'Other' please include an explanation. Please include a photo of the outfall that shows the outfall shape.

3.2 DRY WEATHER DISCHARGE

Consultant field teams will collect any observed dry weather discharge into a clean container and test the sample using a Hach Stormwater Test Kit, Hanna Medium Range Ammonia Colorimeter – Checker HC, and Hanna Low Range Fluoride Colorimeter – Checker HC. Please refer to Appendix C to view the instruction manuals for proper sample analysis and also refer to the Health and Site Safety Plan for environmental and chemical hazards associated with discharge screening. The analysis of dry weather discharges will include tests for pH, water temperature, chlorine, phenols, copper, detergents, ammonia, and fluoride. Using the collected sample, field teams will enter values into Survey123 for odor, color, clarity, and floatables. All of the test results will also be entered into a Survey 123 inspection form.

If the dry weather discharge has a concentration above the threshold limit for chlorine, phenols, copper, detergents, ammonia, and/or fluoride, the site will be revisited and retested after 4 hours, but within 24 hours, to verify the result. Threshold limits have been developed from various sources including *Dry Weather Flow and Illicit Discharges in Maryland Storm Drain Systems* (Maryland Department of Environment, 1997), *Methods for Detection of Inappropriate Discharge to Storm Drain Systems* (Pitt & Rittenhouse, 2001), *Illicit Discharge Detection and Elimination, A Guidance Manual for Program Development and Technical Assessments* (CWP and Pitt, 2004) and County DPW drinking water quality data. Any measurements above the thresholds listed below on the initial test and re-test will be considered indicative of a potential illicit discharge.

- 0.17 ppm for phenol;
- 0.4 ppm for chlorine;
- 0.21 ppm for copper;
- 0.5 ppm for detergents;
- 1.0 ppm for ammonia;
- 0.75 ppm for fluoride.

pH thresholds are based on an acceptable range and water temperature does not have threshold concentrations or acceptable ranges. If the reported values are uncharacteristically high or low for pH or water temperature when compared to Anne Arundel County natural waters, then the site will be revisited and retested after 4 hours, but within 24 hours, to verify the result. Since Anne Arundel County is located in the Coastal Plain region, natural conditions (groundwater) tends to be acidic (<6.5). In these situations where pH values between 5.0 and 6.5 are recorded and all other parameters are within acceptable limits, these will not be considered illicit. Another characteristic of the coastal plain, is the prevalence of iron flocculent bacteria that feed off of naturally occurring iron in the water. Iron flocculent can foul the water being tested due to suspended flocculent material and a bacterial sheen. Consultant field teams need to carefully collect samples without disturbing the flocculent material. Significant iron flocculent bacteria

within a tested dry weather discharge can cause the ammonia results to be elevated and can be considered the source if all other parameters are within acceptable limits and no other sources are found in the upstream network.

When an illicit discharge is discovered, the consultant field team will track the discharge up the storm drain system to identify the source of the pollutant. This is done by identifying the extent of the storm drain system on field maps or with ArcGIS Collector. Consultant field crews will then move up the system from structure to structure, opening manholes if possible and testing discharges within the system. The concentrations within each of these structures will identify the direction the source is coming from. Odor, color, clarity and other characteristics of the discharge will be used while tracking discharges up the storm drain network. Consultant inspectors will observe the surroundings at each structure to determine if any sources of the discharge can be located.

When entering private, County-owned, commercial, or industrial property to track suspicious dry weather flow, the consultant field team will request permission from the property owner or manager and present a Letter of Entry. When access is not granted, the field team will not trespass, but will attempt to identify the source of an illicit discharge using available accessible structures outside of the property, if applicable. When tracking illicit flows, consultant field crews will take pictures from outside offender property boundaries when located. The consultant field crew can contact the County if any special requirements arise for access that the County can help facilitate.

If the source of the illicit discharge is identified, or if the source cannot be definitively determined, but the illicit discharge is actively occurring, the consultant will immediately contact the County's Environmental Hotline (410-222-7171) to report the violation and request appropriate action. **Consultant field teams should not approach possible offenders.** The consultant will also notify the IDDE Project Manager or the NPDES MS4 Permit Coordinator that an illicit discharge was identified. For non-illicit discharges, the consultant will investigate the source of the discharge in the same manner above to populate the DISCHARGE_SOURCE field in the MS4 Geodatabase IDDE Table.

For any outfalls containing a possible illicit connection, a concise, site-specific Illicit Discharge report with photographs will be prepared and sent to the County Permit Coordinator and IDDE Project Manager, as soon as possible, but no later than 5 working days after discovering an illicit discharge. Each report will contain the County outfall number (MS4 Geodatabase IDDE table outfall record via the LOCAL_OUTFALL_ID), classification of the outfall, location, type of report, written description of the site and identified issues, location map with labeled streets and identifying features on an aerial photo, and site photographs documenting the conditions at the site.

If consultant field teams observe a broken or leaking potable water or sanitary sewer line, or a sanitary sewer overflow, the Anne Arundel County Bureau of Utilities Emergency Line (410-222-8400) will be called immediately. In these cases, consultant field crews will not call the Environmental Hotline but will still provide an Illicit Discharge site-specific report and notify the IDDE Project Manager or the NPDES MS4 Permit Coordinator. In addition, any discharges that are confirmed by KCI crews to be allowable by the County will not be considered an illicit discharge and as such no site-specific reports or notification of County staff will occur.

If suspicious conditions for the below conditions are found and there is no discharge to sample or the discharge is not exhibiting the characteristics of the evidence, consultant field teams

will investigate the upstream portions of the stormdrain network to determine the source. If a source is located, an appropriate site-specific report will be created and sent to the County Permit Coordinator and IDDE Project Manager.

- Odors like rancid-sour, gas, sewage, or other strong odors.
- Deposits or staining.
- Vegetation condition including excessive or inhibited conditions.
- Significant algal growth.
- Floatables like excessive trash or oil sheen not related to iron flocculent bacteria.
- Abnormal color and clarity.

If consultant field teams come across submerged or partially back watered outfalls, they will follow the stormdrain system upstream and open inlets or manholes as needed or as safely able to confirm the presence of dry weather discharge and to collect a flowing sample using a swing sampler or a bucket on a rope as close to the outfall as possible. If very low discharge conditions (trickle flow) are encountered such that a sample cannot be collected, inspectors will record that there was no flow, use a 0 for cfs flow, and comment on the actual cfs flow measured and this condition per the NPDES MS4 Geodatabase Design and Users Guide.

Consultant field crews will collect all test kit waste and wash water in the field in appropriate labeled containers for proper disposal. A licensed chemical waste removal vendor should be used to dispose of hazardous test kit waste/wash water or expired reagents.

3.3 INFRASTRUCTURE MAINTENACE AND REPAIR

Consultant field crews will assess the structural condition at each outfall by inspecting the pipe and the surrounding area at the outfall. Common issues include concrete spalling and cracking, metal corrosion, pipe and structure separations, excess debris and sediment clogging, scour holes, and severe downstream channel erosion near the outfall. When an outfall is found to have physical maintenance needs, consultant field crews will document the condition in Survey123 or infrastructure concern forms (See Appendix D) can be used.

For outfalls with physical maintenance needs, a concise, site-specific Infrastructure Condition report with photographs will be prepared and sent to the County Permit Coordinator and IDDE Project Manager, within 5 working days after discovery. Maintenance concerns may include severe erosion around outfalls, clogged storm drain infrastructure, damaged storm drain structures, sinkholes, pipe misalignment, and missing or damaged manhole covers. Each report will contain the County outfall number (MS4 Geodatabase IDDE table outfall record via the LOCAL_OUTFALL_ID), classification of the outfall, location, type of report, written description of the site and identified issues, location map with labeled streets and identifying features on an aerial photo, and site photographs documenting the conditions at the site.

3.4 UPLAND POLLUTION

The consultant will look for upland pollutant sources to identify discharges that are either non-detectable at the outfall, or do not drain to a closed storm drain system at all accessible commercial and industrial areas, and improved properties owned by the County and not subject to the Maryland General Permit for Stormwater Discharge from Industrial Facilities (12-SW Permit) within the targeted areas. Typical upland pollutant sources include leaking or excessive staining at dumpsters or waste grease containers, excessive trash, salt or material piles exposed to rain,

abandoned equipment, improper storage of materials, fuel or oil spills, dumping washwater, and poor housekeeping (See Figure 2 below). While accessing the outfalls to be screened, consultant field crews will select the appropriate targeted polygon within ArcCollector and populate a Survey123 inspection record. If an upland pollutant source is identified, then a point feature is captured in ArcCollector and a Survey123 form is filled out for this violation. In the event that ArcCollector or Survey123 are not available, pre-printed upland pollutant forms (See Appendix E) can be used.



Figure 2. Examples of upland pollution sources. Clockwise from top-left: open kitchen waste grease container and staining of pavement, accumulation of trash in dumpster bay, evidence of improper commercial vehicle washing, and an uncovered pile of road salt.

When the consultant field team identifies an upland pollutant source a concise, site-specific Upland Pollutant Source Report with photographs and locational information will be prepared and sent to the County Permit Coordinator and IDDE Project Manager, within 5 working days after discovery. If an active upland pollution event is discovered, the consultant field team will immediately call the Environmental Hotline (410-222-7171) to report the event and request action. **Field teams will not approach possible offenders.** The consultant field team will also notify the IDDE Project Manager that an event was reported. Each Upland Pollutant Source Report will contain the County outfall number if applicable (MS4 Geodatabase IDDE table outfall record via the LOCAL_OUTFALL_ID), classification of the outfall if applicable, location, type of report,

written description of the site and identified issues, location map with labeled streets and identifying features on an aerial photo, and site photographs documenting the conditions at the site.

Where applicable, consultant field crews will ask for permission and present a Letter of Entry to property owners or managers prior to entering private, County-owned, or commercial and industrial properties. If access is restricted due to fenced in-areas with “No Trespassing” signs posted, then consultant field crews will take pictures from outside the fenced-in areas of any viewable conditions. The consultant field crews will coordinate with the IDDE Program Manager for any County-owned improved properties that require coordination or scheduling prior to visual inspections to ensure access to each property.

When all of the visual surveys are complete, the consultant will use the inspected Commercial/Industrial Potential Pollution Source polygons in ArcGIS Collector and Survey123 to tally and report the total number of visual surveys completed as well as the number of potential pollutant sources identified for each reporting year. This information will be incorporated into the Annual IDDE Program Report.

3.5 MAPPING

Consultant field crews will use ArCollector and Survey123 to the maximum extent possible; however, in the event that the equipment becomes inoperable, crews will prepare field maps using ESRI ArcMap software and the County provided data sets. These maps will contain aerial photography, hydrography layers, County storm drain and BMP mapping with targeted commercial and industrial polygons, commercial/industrial areas, outfall drainage areas, road names, and contours. The scale of each map in the target area will vary, but all maps will be created such that the field crew can easily identify upland pollutant source locations.

3.6 NOTIFICATION OF SUSPECTED ILLICIT DISCHARGE

To effectively identify, document, respond to, eliminate, and report on illicit discharge or upland pollution cases, the consultant will follow the reporting guidelines below:

- If the source of an illicit discharge is identified, or if the source cannot be definitively determined, but the illicit discharge is actively occurring, the consultant will immediately contact the County’s Environmental Hotline (410-222-7171) to report the violation and request appropriate action. The consultant will also notify the IDDE Project Manager or the NPDES MS4 Permit Coordinator that an illicit discharge was identified.
- If an active upland pollution event is discovered, the consultant field team will immediately call the Environmental Hotline (410-222-7171) to report the event and request action. The consultant field team will also notify the IDDE Project Manager that an event was reported.
- If a broken or leaking potable water or sanitary sewer line, or a sanitary sewer overflow is observed, the Anne Arundel County Bureau of Utilities Emergency Line (410-222-8400) will be called immediately. In these cases, the Environmental Hotline will not be called and the consultant field team will notify the IDDE Project Manager or the NPDES MS4 Permit Coordinator.

The Environmental Hotline is answered by the Anne Arundel County Inspections and Permits 365 days a year. Upon calling, a complaint case will be created and a County inspector

must follow-up on the case in a timely manner. For all other suspected illicit discharges or upland pollution cases not actively occurring at the time of inspection, a concise, site-specific report with photographs will be prepared and sent to the County Permit Coordinator and IDDE Project Manager, as soon as possible, but no later than 5 working days after discovery.

3.7 HEALTH AND SAFETY

Health and safety of all consultant team members is of paramount important. Every team member is responsible for providing a safe and healthy work environment, which will reduce the potential for accidents. In general, the following safety protocol will be followed by consultant field staff. More detailed safety considerations are found in the Health and Site Safety Plan.

- Perform field work in teams of two or more at all times;
- Mobile phones and first aid kits are required on all inspection visits;
- Use caution when in areas where ticks, snakes, mosquitos, and other wildlife are likely to be encountered;
- If any outfalls are located in remote areas that are unsafe due to homeless or transient individuals, then do not enter these areas;
- Storm drain outfalls may contain a variety of waterborne bacteria and potentially harmful chemicals. Wear gloves when sampling (where applicable) and wash hands, use antibacterial wipes, or use hand sanitizer whenever able;
- Field crews will not perform confined space entry;
- Proper equipment and technique should be utilized when lifting inlet or manhole lids;
- All waste products and rinse water generated from testing dry weather discharges should be properly collected, contained, and disposed of according to applicable MSDS or regulatory guidelines.

3.8 DATA MANAGEMNT AND QUALITY CONTROL

Prior to fieldwork, consultants will publish the targeted outfalls to ArcGIS online, which will allow inspectors to use the outfalls in ArcGIS Collector via a feature service web map. Consultants will also publish all relevant County data including storm drain and BMP mapping, commercial/industrial areas, outfall drainage areas, contours, and hydrography layers and configure symbology and pop-ups in a web map. Consultants will establish a feature service and Apple iPads will be configured to use the web map through ArcCollector and Survey123. The Survey123 inspection form will be configured to match the reporting requirements found in the current and next generation draft NPDES MS4 Permit MS4 Geodatabase IDDE Table. In addition to the required MS4 Geodatabase IDDE table fields, consultants will verify the outfall coordinates, height, width, type, material, and shape fields within Survey123 using any applicable MS4 Geodatabase domains or County supplied domains. The reporting requirements found in the current and next generation draft NPDES MS4 Permit MS4 Geodatabase IDDE Table do not contain fields for ammonia and fluoride. KCI will record these in Survey123 but they won't be included in the final MS4 Geodatabase IDDE Table.

Survey123 allows consultant field crews to:

- Enter field information efficiently by eliminating post-field data entry where data entry errors may occur;

- Enter field information accurately by not allowing fields to be blank, providing valid values, and conditional/mandatory field formatting which will enforce accurate data entry;
- Only inspect targeted outfalls since IDDE sites will be visible and editable within ArcCollector;
- Store data via ArcGIS online and will allow for seamless creation of the MS4 MDE required IDDE annual reporting table;
- Future years of data collection use a standard inspection form and application for data entry;
- Automatically associate photographs to inspections.

Results of the outfall inspections and commercial and industrial surveys will be recorded within ArcGIS Collector and Survey123. All inspections will be housed at the consultant office and available via ArcGIS Online. At the end of each field day, KCI will ensure that all inspection records submitted in Survey123 were accurately recorded within ArcGIS Online. Completed paper inspection field forms, if applicable, will be scanned at the consultant office and placed on a secure network for data entry. The consultant will QC the inspections using an ArcGIS online connection and will make any necessary corrections within Survey123. Since the Survey123 outfall inspection forms will be formatted to match the MS4 Geodatabase IDDE table (including mandatory and conditional fields), the consultant can export the inspections directly into the IDDE table after QC.

If any outfalls are discovered in the field while performing inspections that are not in the County GIS data, the consultant will GPS the location and notify the IDDE Project Manager. The consultant will submit these to the County to determine if they belong in the County dataset after a confirmation and approval process.

ANNE ARUNDEL COUNTY IDDE PROGRAM SOP FOR BWPR STAFF

4.0 MANAGEMENT OF IDDE ISSUES IDENTIFIED DURING CONSULTANT FIELD SCREENING

This procedure details steps taken to ensure that dry weather flow issues identified during the execution of the County’s IDDE Program are investigated and resolved in a timely fashion to ensure compliance with the County’s MS4 NPDES Permit.

At the beginning of the Fiscal Year’s IDDE program activities, BWPR staff assigned to oversee this program (currently the BWPR Planner II) creates the FY20XX IDDE Tracking Table in MS Word. The table is maintained on a desktop computer and saved to a County server and/or Google Drive. This table, when completed, is incorporated into the annual NPDES MS4 IDDE Report that is appended to the Annual NPDES MS4 Report as “Table 5-1”. An example of the IDDE Tracking Table is shown below.

ILLICIT DISCHARGES					
Survey Date	I&P Compliance Database ID	Outfall/Site Address	Issue	Response	Status

Typically, there are three types of issues observed during the IDDE assessment – dry weather discharge from an outfall; upland pollution concerns; infrastructure maintenance concerns. The management for identified IDDE screening issues begins with the receipt of an Illicit Discharge Report, Upland Pollution Report, or Infrastructure Maintenance Concern Report - by the NPDES MS4 Permit Coordinator and assigned staff - from the consultant responsible for the implementation of the County’s IDDE Program.

4.1 BWPR STAFF ACTIONS

1. Read the report carefully and create a record in the IDDE Tracking Table. The record should include all relevant information from the report, including date, time, location, and summary of findings. A timeline of actions associated with each complaint is kept in the IDDE Tracking Table culminating with its ultimate resolution during the Annual Report period of interest, and to be included in the Annual Report.
2. Unless instructed otherwise, the MS4 Permit Coordinator or assigned staff should be copied on all email correspondence associated with the resolution of these complaints. Regular updates should also be prepared for the Environmental Assessment and Evaluation Unit (EAE) biweekly staff meetings so that the MS4 Permit Coordinator is fully informed on the activities of the IDDE Program.
3. Each type of issue has a specific process for follow-up:
 - For dry weather discharge from an assessed outfall, go to **Section 4.2 of this SOP**;

- For upland pollution concerns – poor housekeeping practices taking place at a business that threaten to result in the delivery of trash or other pollutants to a nearby storm drain – go to **Section 4.3 of this SOP**;
- For storm drain system maintenance concerns – structures that are damaged or otherwise need attention – go to **Section 4.4 of this SOP**;
- For any other issue, go to **Section 4.5 of this SOP**.

A flow chart detailing procedures for referring IDDE issues to the appropriate agency for follow-up investigation is provided in Appendix F of this SOP. Referral of IDDE issues for follow-up is to occur within 48 hours of receipt.

4.2 DRY WEATHER DISCHARGES

Overview: This type of complaint is handled by the stormwater management inspectors in the Department of Inspections and Permits (I&P). When a direct discharge from a storm drain outfall is observed during two separate visits after 72 hours of dry weather and the sampled discharge has one or more values that exceed pollutant concentration thresholds used in the program the issue is reported to the BWPR IDDE Program Manager (currently the Planner II) via the Illicit Discharge Report. Observations of vehicle wash water running into the storm drain system will also be reported as described below.

Step 4.2.1. Forward the Illicit Discharge Report to the Stormwater Management Inspection Supervisor or other designated contact person for I&P via email (see Appendix F). If the Illicit Discharge Report states that the complaint was called in to the County’s Environmental Hotline, mention that to the I&P contact person in the transmission email. I&P will add this issue to Case Manager, I&P’s compliance database, so the transmission email should include a request for the case number for future use. The current I&P Stormwater Inspection Supervisor will assign the complaint to a stormwater inspector for subsequent compliance and enforcement action.

Step 4.2.2. Examine MDE’s wastewater permit portal to determine if the subject property has a 12-SW permit (<http://mes-mde.mde.state.md.us/WastewaterPermitPortal/Default.aspx>). If a subject property in the Illicit Discharge Report is on this list, inform the Maryland Department of the Environment’s Wastewater Permits Program (MDE) at (410) 537-3323 and notify the I&P assigned staff. Be sure to request that MDE staff report back with any actions taken at the subject property and share all information received with the I&P staff. Note this request and any MDE staff contact information obtained in the Table.

Step 4.2.3. Add the case number to the Table.

Step 4.2.4. Perform a review of I&P’s investigation in Case Manager every two weeks from the date of submission to I&P by searching the case number. Add any updates and/or status changes to the Tracking Table.

Step 4.2.5. If there is no change in status in Case Manager after 30 days, contact the Stormwater Inspector assigned to the case via email and copy the MS4 Permit Coordinator and the I&P Stormwater Inspection Supervisor to request a status update (be sure and include the case number). If contact is made via telephone, follow up with an email documenting the correspondence. Save all email correspondence for record.

Step 4.2.6. Continue regular status checks until the case is resolved. Update the Table as necessary. If it appears that no action has been taken on the issue after 60 days, consult with the MS4 Permit Coordinator for direction and additional actions.

Step 4.2.7. If the follow up requested in Step 4.2.2 was not received, then contact MDE to determine if the complaint is resolved.

Step 4.2.8. If the complaint cannot be resolved during the MS4 reporting year, mark it as “Unresolved” in the “Status” column of the Tracking Table and continue regular monitoring until it is resolved. Report on the resolution during the next MS4 reporting year in Table 5-2.

4.3 UPLAND POLLUTION CONCERNS

Overview: This type of complaint is most often reported to the Health Department’s (HD) Bureau of Environmental Health. Poor housekeeping problems are classified as hotspots of potential pollution entering into the stormdrain systems. Overflowing trash dumpsters, leaking or incorrectly stored grease barrels, and other refuse and food waste related problems are the usual complaints reported in this category. Upland pollution concerns may also include vehicle washing activities. Vehicle washing activities that contribute non-stormwater runoff to the County’s storm drain system are reported to I&P, not HD, for compliance and enforcement (See section 4.2 above).

Step 4.3.1. Forward the Upland Pollution Report on to the designated contact person for the HD via email. If the Upland Pollution Report states that the complaint was reported to the Environmental Hotline, mention that to the HD contact in the transmission email. The contact person at HD will assign the complaint to a HD inspector for compliance and enforcement.

Step 4.3.2. Examine MDE’s wastewater permit portal to determine if the subject property has a 12-SW permit (<http://mes-mde.mde.state.md.us/WastewaterPermitPortal/Default.aspx>). If a subject property in the Upland Pollution Report is on this list, inform the Maryland Department of the Environment’s Wastewater Permits Program (MDE) at (410) 537-3323 and notify the assigned HD staff. Be sure to request that MDE staff report back with any actions taken at the subject property and share all information received with the HD staff. Note this request and any MDE staff contact information obtained in the Table.

Step 4.3.3. Every two weeks from the date of submission to the HD, send a follow up email to the HD contact person requesting a status update. Record this contact in the timeline on the Table. Continue these regular follow-ups until the complaint is resolved. Save all email correspondence for record.

Step 4.3.4. If there is no response from the HD or change in status within 30 days, consult with the MS4 Permit Coordinator for guidance on appropriate follow up.

Step 4.3.5. The MS4 Permit Coordinator will work with their counterpart at the HD to resolve the complaint in a timely manner.

Step 4.3.6. If the HD determines the complaint is outside their jurisdiction, refer the complaint back to I&P for investigation and further guidance on appropriate action to resolve the issue. Follow Steps 4.2.1 through 4.2.8.

Step 4.3.7. If the follow up requested in Step 4.3.2 was not received, then contact MDE to determine if the complaint is resolved.

Step 4.3.8. If the complaint cannot be resolved during the MS4 reporting year, mark it as “Unresolved” in the “Status” column of the Tracking Table and continue regular monitoring until it is resolved. Report on the resolution during the next MS4 reporting year in Table 5-2.

4.4 INFRASTRUCTURE MAINTENANCE CONCERNS

Overview: This type of complaint is reported to the Stormwater Infrastructure Program (SIP) of the BWPR. Typical issues include broken curb inlets, missing manhole covers, degraded headwalls, and failing or clogged storm drains or pond outlet structures associated with County maintained infrastructure. Note that only County maintained infrastructure will be repaired by the County. Private infrastructure issues, including private stormwater BMPs, are referred to I&P for compliance corrections. Should an infrastructure concern be identified at a State-owned outfall (i.e., State Highway Administration), BWPR staff coordinate with SIP staff to identify the correct SHA representative and refer the complaint directly to the State for appropriate correction.

Step 4.4.1. Forward the Infrastructure Maintenance Concern Report to the appropriate SIP District Manager (See Appendix G) via email, and cc the SIP Program Manager. If the Infrastructure Maintenance Concern Report states that the complaint was reported to the Environmental Hotline, mention that to the SIP contact in the transmission email.

Step 4.4.2. Send an email follow up to the appropriate SIP District Manager after 30 days to request a status update and/or determine if the complaint has been resolved. If contact is made via telephone, follow-up with an email to confirm the conversation. Note all such contacts in the Table.

Step 4.4.3. If SIP reports that the infrastructure is not owned by the County then report the matter to I&P or SHA for their follow up. Note the change of agency in the Tracking Table. Follow procedures 4.2.1 through 4.2.8 for all referrals to I&P.

Step 4.4.4. Continue follow-up with the appropriate County agency every 30 days until the case is resolved. If the issue cannot be resolved during the MS4 reporting year, mark it as “Unresolved” in the “Status” column of the Tracking Table and continue regular monitoring until it is resolved. Report on the resolution during the next MS4 reporting year in Table 5-2.

4.5 OTHER ISSUES

Overview: The majority of issues will be covered by the categories described above. For those that do not fit into these categories, consult with the MS4 Permit Coordinator or assigned staff to determine the best course of action for appropriate resolution.

Step 4.5.1. Consult with MS4 Permit Coordinator for the best course of action to resolve the issue.

4.6 PERTINENT QA/QC PROCEDURES

1. Ensure that all items in the Tracking Table are accounted for before its inclusion in the Annual IDDE Report for the MS4 reporting year.
2. During the production of the summary of IDDE complaints logged into the I&P Compliance database (compiled into an appendix for the Annual IDDE Report), ensure that the items in the Tracking Table are not double counted during development of the Annual IDDE Report produced as part of the MS4 Annual Report.

5.0 PROCEDURES FOR INSPECTION OF I&P COMPLIANCE DATABASE FOR NPDES MS4 IDDE REPORTING

This procedure details the method used to inspect the Compliance Database maintained by the Department of Inspections and Permits. This inspection is necessary as part of required reporting activities for the IDDE initiative associated with the NPDES MS4 Program. Illicit discharge cases from Case Manager will be compiled and added as an appendix to the Annual Report. The following items are not considered IDDE issues and should not be included in selected compliance database reports:

- Discharges from firefighting activities;
 - Discharges from street wash water, and potable water line and fire hydrant flushing;
 - Landscape irrigation drainage;
 - Discharges from air conditioning condensate;
 - Discharges of water from individual residential car washing;
 - Springs;
 - Diverted stream flows;
 - Discharges of uncontaminated water from basement or crawl space sump pumps;
 - Discharges of uncontaminated water from foundation or footing drains;
 - Flows from riparian habitats and wetlands;
 - Discharges from lawn watering;
 - Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill materials have been removed) and where detergents are not used;
 - Discharges from uncontaminated groundwater;
 - Dechlorinated swimming pool discharges, not including filter backwash.
1. Access the Case Manager login webpage and log on using your computer username and password. The login page can be found here: <https://aacoprod-intra.aacounty.org/CaseManager/loginForm>
 2. Once logged in, you are now at the main page of the Case Manager database. Click the “Reporting” button at the top right corner of the screen.
 3. You are now at the “Reports and Metrics” screen. Make sure that you are on the “Search” tab.
 4. The database must be inspected for the entire time period of the IDDE reporting cycle, which runs on the County and State’s fiscal year (July 1 to June 30). To keep things manageable, examine all Illicit Discharges Complaints one month at a time. Under the “Opened Date” heading, either manually enter the range of dates you wish to search using dd/mm/yy format (ex. “07/01/21 – 07/31/21”) or use the pop-up calendar by selecting “Custom Range,” then clicking on the first and last dates you wish to search. Click the “Apply” button after your dates are correctly entered. Click the “Submit” button to imitate the search.

5. All cases opened within the month of interest will appear at the bottom of the screen under “Search Results.” Cases highlighted in red are “closed”, cases highlighted in yellow are in “review”, and cases highlighted in green are “in work.”

IMPORTANT NOTE: All illicit discharge cases submitted to the IDDE Program *from the IDDE field consultant* will also come up during this search. These case reports should be saved as .pdf files in a separate folder and not included in the activities described below. Cases from the IDDE field consultant will be included in Table 5-1 of the Annual IDDE Annual Report and will be discussed by the County’s MS4 Permit support consultant in their report, so there is no need to include them here.

6. Click the Case ID number to review each compliance case individually. This will open a new “Complaint Case” windows tab for the selected case. Click the “Case Timeline” button on the right side of the screen to expand the case timeline and see all actions related to the case. Click through the tabs labeled “Case Information,” “Assignment Information,” “Case Details,” “Events,” “Attachments,” and “Related Information” to see all the pertinent information to the case documented by the inspector(s).
7. If the case is pertinent to the IDDE effort (i.e., If it impacts the storm drain system), the case report must be saved as a .pdf file in a separate folder. To do so, right click on the screen on any of the six tabs and select “Print.” From the print menu, select “Save as PDF” and save the file into the folder under an easily recognizable name, such as the case number (i.e., “E-2021-001”).
8. Once a case has been reviewed and saved, close the “Complaint Case” window tab. Select the next case from the “Reports and Metrics” window tab.
9. Once all cases for the month of interest have been reviewed, click on the “Reporting” button to return to screen described in Step 3. Repeat Steps 4 through 8 for all months in the reporting period.

5.1 SAVED COMPLIANCE CASE PROCESSING

Compliance cases saved as .pdf files require some processing in Adobe Pro before inclusion in the IDDE Annual Report, which is described below.

1. For each .pdf case, the following information should be deleted or obscured:
 - The Inspector name;
 - The Receiver name;
 - All names or addresses under “Complainant Information,” “Case Information,” “Owner Information,” and “Violator Information.”
 - Any names, addresses, or other personal identifiers in the body of the text.
2. Once the .pdf has been properly edited, save as a new .pdf file. Repeat for each saved compliance case.

3. Compile all processed compliance cases into a single .pdf file for inclusion as an appendix to the IDDE Annual Report and deliver to the MS4 Permit Coordinator and/or the MS4 IDDE Consultant, as necessary.

6.0 REFERENCES

Brown, E., D. Caraco, and R. Pitt. 2004. Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments. Center for Watershed Protection, Ellicott City, MD. October.

Maryland Department of the Environment. 1997. Dry Weather Flow and Illicit Discharges in Maryland Storm Drain Systems.

Pitt, R., & Rittenhouse, B. 2001 Methods for Detection of Inappropriate Discharge to Storm Drain Systems. Background literature and summary of findings, #EPA X-82907801-0. Washington DC: Unites States Environmental Protection Agency. Prepared for: USEPA, Office of Water-Water Permits Division, USA.

APPENDIX A

CONSULTANT FIELD TEAM LETTER OF ENTRY



Bureau of Watershed Protection and Restoration

Heritage Office Complex
2662 Riva Road, 4th Floor
Annapolis, MD 21401

August 1, 2023

Dear Anne Arundel County Resident:

Anne Arundel County is mandated by the Federal regulations 40 CFR 122.26(d) to conduct an Illicit Discharge Detection Program to address the problem of illicit connections to storm drains and waterways in the County. An illicit discharge is defined as “any discharge to a municipal separate storm sewer that is not composed entirely of storm water, except for discharges pursuant to a National Pollution Discharge Elimination System (NPDES) permit and discharges resulting from firefighting activities.” Preventing illicit discharges before they occur eliminates a source of water pollution.

The Illicit Discharge Detection and Elimination Program is administered by the Bureau of Watershed Protection and Restoration within the Department of Public Works. KCI Technologies, Inc. (KCI) has been contracted to perform the field assessments in support of the program. A team of individuals from KCI will be taking samples at storm drain outfall pipes and recording information about the immediate drainage system and any flow observed. These data will be used to determine if there are any illicit discharges entering the County’s storm drains and waterways.

Often, accessing these outfalls requires that the field team crosses private property. We request your consent and cooperation to allow Anne Arundel County personnel or our consultant representatives to enter onto your property as needed to access the storm drain infrastructure. Please know that the field team has been directed only to test and record information about the storm drains. The field teams will not be in a position to remedy or address any potential problems identified, but will report those problems as part of their work effort.

If you have any specific concerns about this work effort, please contact KCI’s IDDE Project Leader, Nathan Drescher at 410-316-7694 (Nathan.Drescher@kci.com) or Anne Arundel County’s NPDES MS4 Program Manager, Janis Markusic at 410-222-0551 (pwmark02@aacounty.org) in the Department of Public Works. You may also write the Program Manager at the address listed on the letterhead.

We appreciate your cooperation in allowing us access to your property.

Sincerely,

A handwritten signature in black ink that reads "Janis Markusic".

Janis Markusic
Bureau of Watershed Protection and Restoration
Department of Public Works

APPENDIX B
OUTFALL ASSESSMENT FIELD FORM

Anne Arundel County Outfall Screening Field Form

MDE Outfall ID _____
Local Outfall ID _____
Complaint Driven _____
Illicit Found _____
Illicit Eliminated _____
Test Number _____
Personnel _____
Screen Date _____
Last Rain Date _____
Screen Time _____
Observed Flow _____
CFS Flow _____
Outfall Dimensions _____

Outfall Shape: Round Oval Box Pipe Arch Other _____

Outfall Material: RCP CMP HDPE Other _____

Structural Condition: Normal(N) Concrete Cracking(CC) Concrete Spalling(CS) Other (O)

Chemical Test Performed _____
Water Temperature(Fah.) _____
Air Temperature(Fah.) _____
pH _____
Phenol _____ mg/L
Chlorine _____ mg/L
Detergents _____ mg/L
Copper _____ mg/L
Ammonia _____ mg/L
Flouride _____ mg/L
Algae Growth _____

Odor: None(N) Sewage(SE) Sulfur(S) Oil(IL) Gas(G) Rancid-Sour(RS) Other(O)

Color: Clear(C) Yellow(Y) Brown(B) Green(GR) Red(R) Gray(G) Other(O)

Clarity: Clear(C) Opaque(OP) Cloudy(CD) Other(O)

Floatables: None(N) Oil Sheen(OS) Sewage(SE) Trash(T) Other(O)

Deposits: None(N) Sediment(S) Oil(IL) Other(O)

Vegetative Condition: Normal(N) Excessive Growth (EG) Inhibited Growth(IG) Other(O)

Erosion: None(N) Moderate(M) Severe(S)

Predominate Land use: Residential Commercial Industrial

What is Discharge Source: _____

Comments: _____

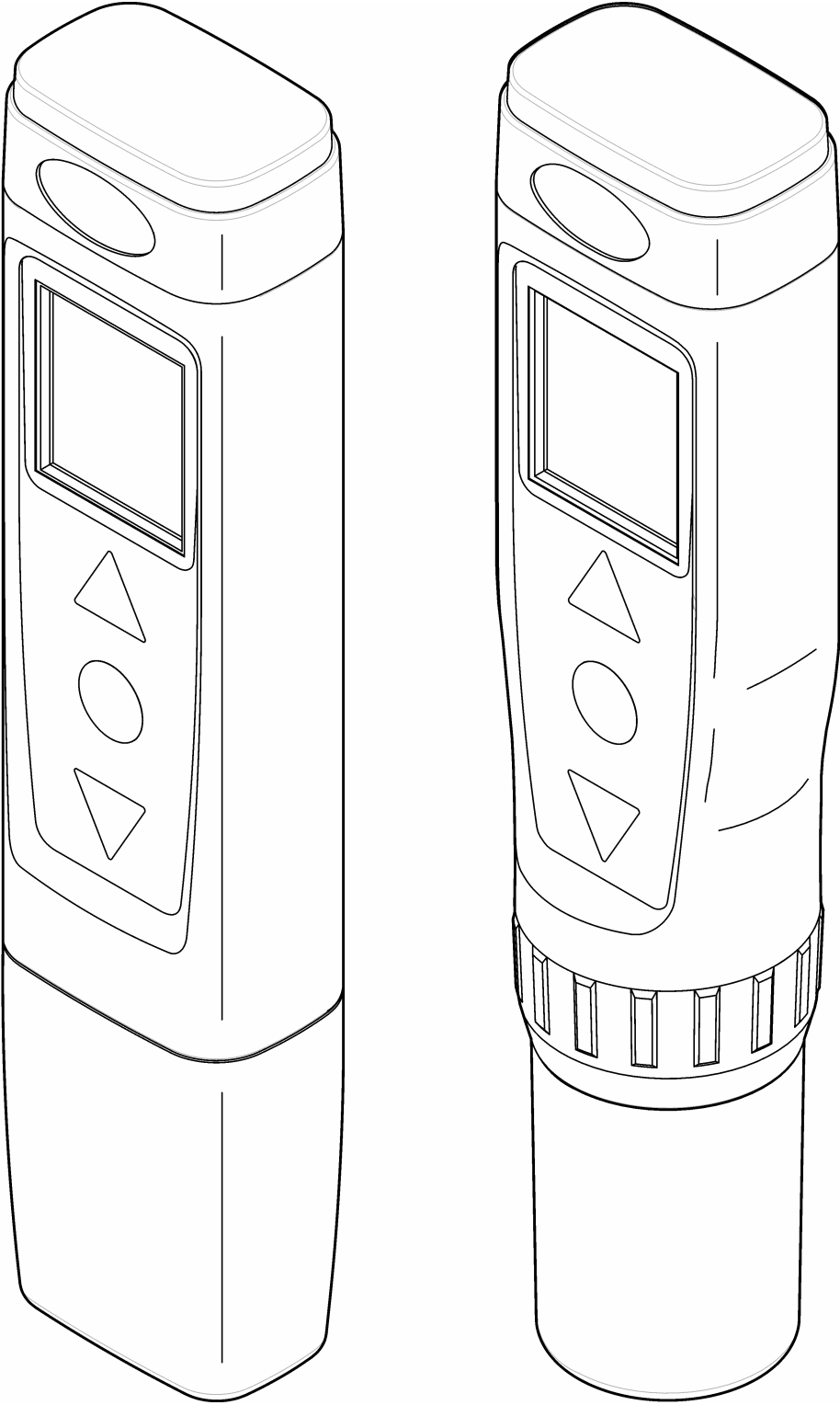
Photographs: _____

APPENDIX C

**PROCEDURE MANUALS FOR
TESTING EQUIPMENT**

User Manual

Pocket Pro™, Pro™ + pH



Specifications

Specifications are subject to change without notice.

Specification	Details
Dimensions (W x D x H)	37 x 30 x 170 mm (1.45 x 1.18 x 6.69 in.)
Enclosure rating	IP67
Weight	135 g (0.297 lb) with batteries
Power requirements (internal)	AAA alkaline batteries (4x)
Battery life	Pocket Pro: 450 hours Pocket Pro+: 450 hours (200 hours with backlight on)
Operating temperature	0 to 50 °C (32 to 122 °F)
Storage temperature	–20 to 60 °C (–4 to 140 °F)
Operating humidity	80% (non-condensing)
Altitude	2000 m (6562 ft)
Instrument range	0.0 to 14.0 pH
Resolution	Pocket Pro: 0.1 pH; Pocket Pro+: 0.01 pH
Accuracy ¹	Pocket Pro: ±0.1 pH; Pocket Pro+: ±0.02 pH
Calibration points	Pocket Pro: 3 points (auto); Pocket Pro+: 3 points (auto) or 2 points (custom) Note: Temperature calibration is not available.
Auto-recognition calibration standards	USA: 4.01, 7.00, 10.01 pH; NIST: 4.01, 6.86, 9.18 pH
Certifications	CE mark, FCC, Industry Canada, KC Mark, RCM, China RoHS
Warranty	6 months for Pocket Pro tester, 1 year for Pocket Pro+ tester and 6 months for replacement sensor for manufacturing faults only. Damage from use is not covered.

General information

In no event will the manufacturer be liable for damages resulting from any improper use of product or failure to comply with the instructions in the manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

Safety information

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

¹ Based on a 3-point calibration and the calibration standards at the same temperature as the samples measured. Also valid for 5.5 to 8.5 pH based on a 1-point calibration, 0.0 to 8.5 pH based on a 2-point calibration with pH 7 and pH 4 standards, or 5.5 to 14 pH based on a 2-point calibration with pH 7 and pH 10 standards.

Use of hazard information

⚠ DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION



Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems. Return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.

Certification

Canadian Radio Interference-Causing Equipment Regulation, ICES-003, Class B:

Supporting test records reside with the manufacturer.

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de classe B répond à toutes les exigences de la réglementation canadienne sur les équipements provoquant des interférences.

FCC Part 15, Class "B" Limits

Supporting test records reside with the manufacturer. The device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1. The equipment may not cause harmful interference.
2. The equipment must accept any interference received, including interference that may cause undesired operation.

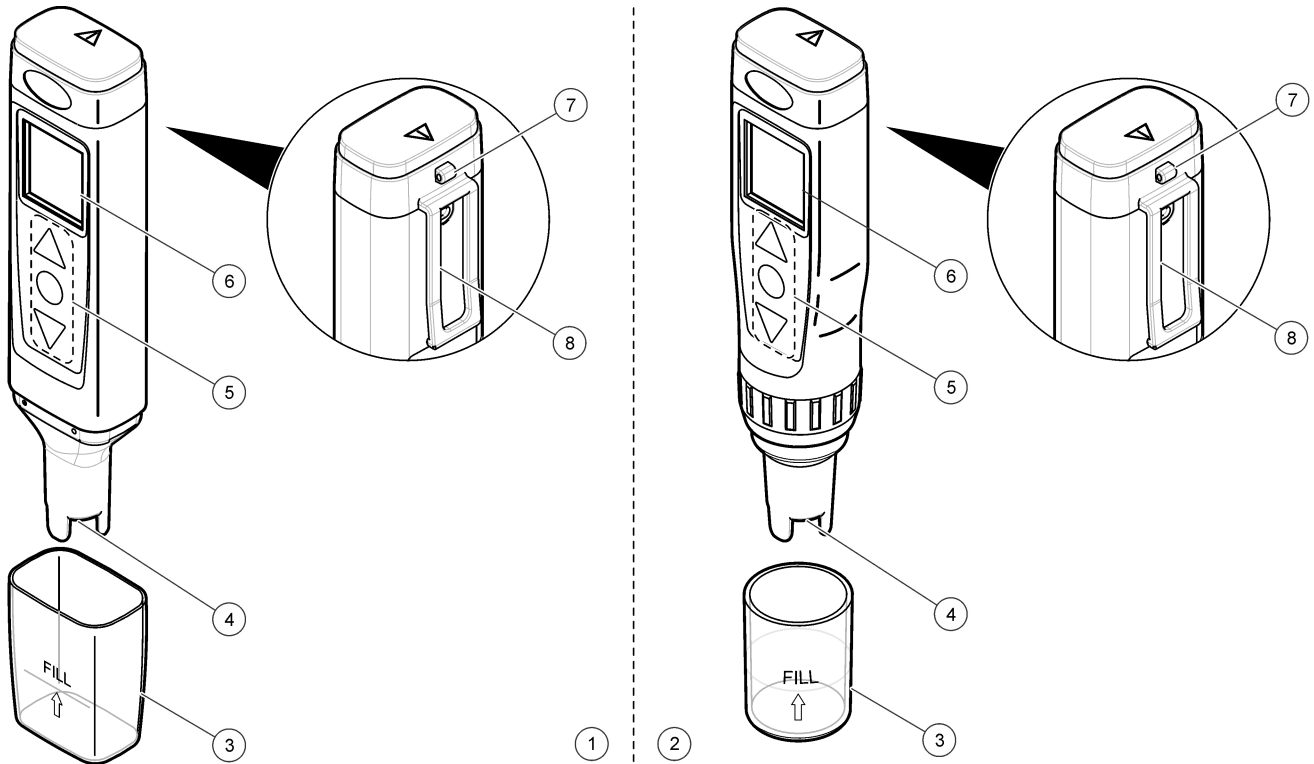
Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their expense. The following techniques can be used to reduce interference problems:

1. Move the equipment away from the device receiving the interference.
2. Reposition the receiving antenna for the device receiving the interference.
3. Try combinations of the above.

Product overview

The Pocket Pro™ pH tester and Pocket Pro™+ pH tester measure the pH of general water samples. Refer to [Figure 1](#). These testers are waterproof and float.

Figure 1 Product features

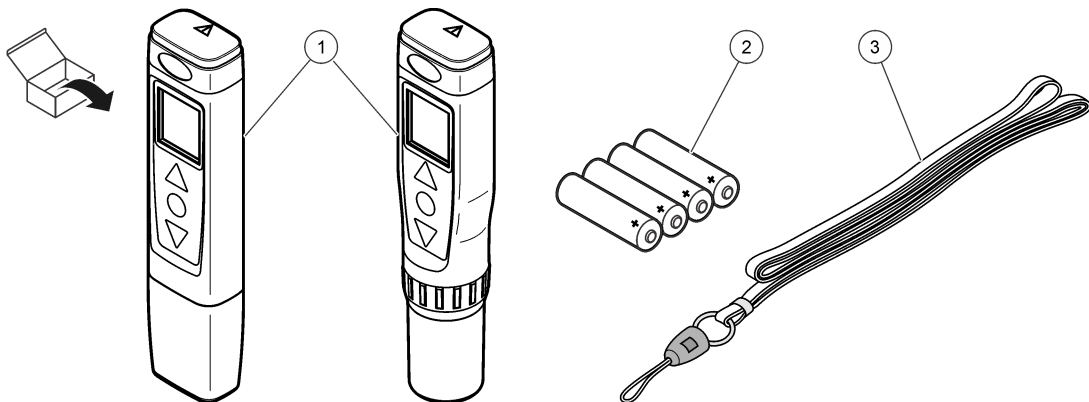


1 Pocket Pro tester	4 Sensor	7 Lanyard attachment
2 Pocket Pro+ tester	5 Keypad	8 Pocket clip
3 Sensor cap	6 Display	

Product components

Make sure that all components have been received. Refer to [Figure 2](#). If any items are missing or damaged, contact the manufacturer or a sales representative immediately.

Figure 2 Product components



1 Pocket Pro tester or Pocket Pro+ tester	3 Lanyard
2 AAA alkaline batteries (4x)	

Install the batteries

⚠ CAUTION



Explosion hazard. Incorrect battery installation can cause the release of explosive gases. Be sure that the batteries are of the same approved chemical type and are inserted in the correct orientation. Do not mix new and used batteries.

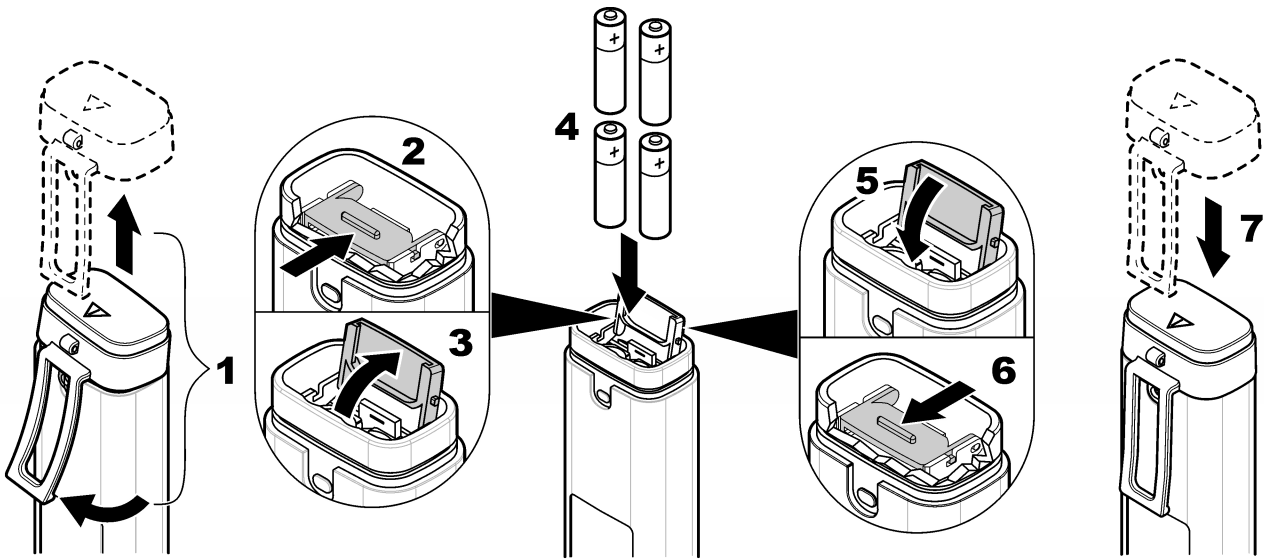
⚠ WARNING



Fire hazard. Battery substitution is not permitted. Use only alkaline batteries.

Install the four AAA alkaline batteries in the tester. Refer to the illustrated steps in [Figure 3](#).

Figure 3 Install the batteries

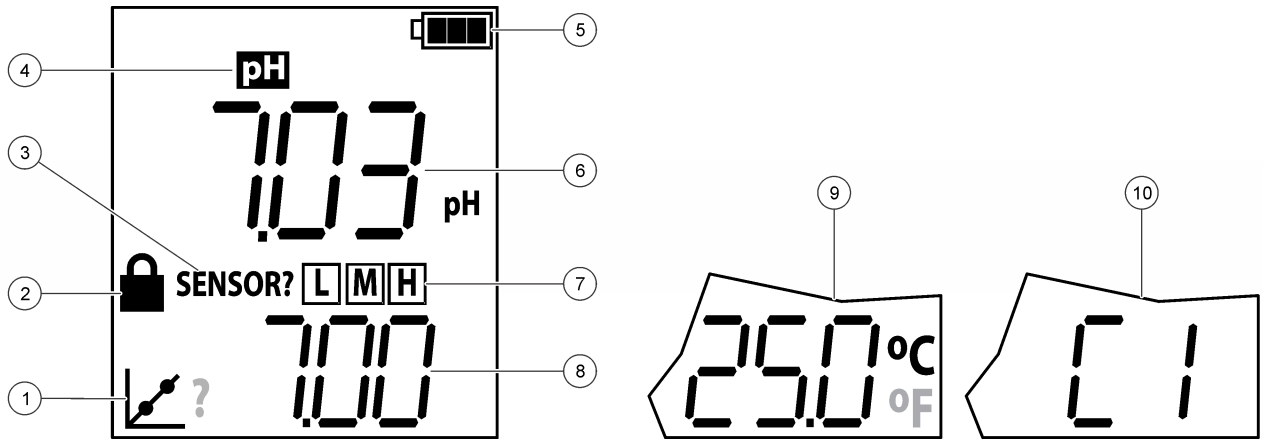


User interface and navigation

Display description

[Figure 4](#) shows the measurements, calibration standard information and indicator icons shown on the display. [Table 1](#) gives descriptions of the icons.

Figure 4 Display overview



1 Calibration icon	5 Battery icon	9 Temperature
2 Lock icon	6 Parameter value	10 Custom standard (C1, C2) ⁴
3 Sensor? icon	7 Calibration standard(s) measured for last calibration (low, medium, high) ²	
4 Parameter	8 Calibration standard(s) expected ³	

Table 1 Display icons

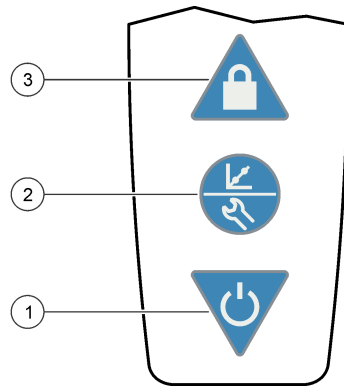
Icon	Description
	Shows the battery power level. Flashes when the battery power is less than 10%.
	Shows when the lock feature is on. When the lock feature is on, the parameter value on the display does not change. Push to set the lock feature to on or off.
Sensor?	Refer to Troubleshooting on page 10.
	Shows when the tester is in calibration mode or when a calibration is due. If "?" shows next to the calibration icon, the last calibration was not successful. When the ACAL setting is set to Yes (default), "?" shows next to the calibration icon when a calibration is due.

Keypad description

Figure 5 and Figure 6 show the Pocket Pro and Pocket Pro+ keypads. Table 2 gives the key descriptions.

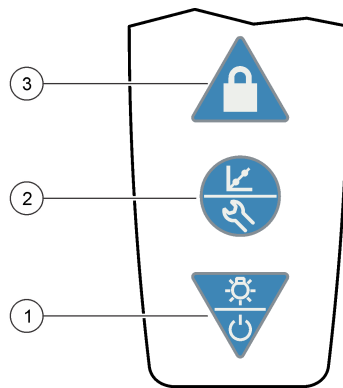
² Shows after auto calibration
³ Shows during auto calibration
⁴ Shows during custom calibration.

Figure 5 Keypad overview - Pocket Pro



1 Power key	2 Calibration/Settings key	3 Lock key
-------------	----------------------------	------------

Figure 6 Keypad overview - Pocket Pro+



1 Power/Backlight key	2 Calibration/Settings key	3 Lock key
-----------------------	----------------------------	------------

Table 2 Key functions

Key	Description
	Push and hold to set the power to on or off.
	Push and hold to set the power to on or off.
	Push to set the backlight to on or off. After 1 minute of no activity, the backlight switches off.
	Push to start a calibration. To exit a calibration, push and hold. Push and hold until "SEt" shows on the display to go to the settings menu. To exit the settings menu, push and hold until "End" shows on the display. When in the settings menu, push to scroll through the settings. Note: Power cannot be set to off while in settings or calibration mode.
	Push to set the lock feature to on or off. When the lock feature is on, the lock icon shows and the parameter value on the display does not change.

Calibration

⚠ CAUTION



Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

Calibrate the tester before initial use and when:

- Results drift

-
- Results are not accurate
 - "?" shows next to the calibration icon




Calibrate the tester with the:

- Auto calibration procedure
- Custom calibration procedure⁵

Before the initial calibration and after a dry storage, soak the sensor for several minutes in the sample or tap water.






Auto calibration

Items to collect: One, two or three auto-recognition calibration standards

1. Set the power to on.
2. Remove the cap from the sensor.
3. Push  to go to calibration mode.
The auto-recognition standard(s) to measure shows on the bottom line.
Note: If "C1" shows on the bottom line, do not continue. Set the tester to auto calibration mode. Refer to [Configure the settings](#) on page 9.
4. Rinse the sensor and cap with deionized water and blot dry.
5. Pour the auto-recognition standard shown into the cap to the fill line.
6. Put the sensor fully into the cap.
7. When the measurement is stable, push  to save the measurement.
The measured value flashes three times.
8. Optional: To measure another calibration standard (maximum of 3), do steps 4–7 again.
9. Push and hold  to go to continuous measurement mode. "END" shows on the display.
Note: "ECAL" shows on the display if the calibration was not successful. Refer to [Troubleshooting](#) on page 10.
10. Rinse the sensor and cap with deionized water and blot dry.

Custom calibration (Pocket Pro+ only)



Items to collect: One or two calibration standards or samples of known pH value

1. Set the power to on.
2. Remove the cap from the sensor.
3. Go to the settings menu. Make sure that the bUFR setting is set to Cus (custom standard). Refer to [Configure the settings](#) on page 9.
4. Push  to go to calibration mode.
"C1" shows on the bottom line.
5. Rinse the sensor and cap with deionized water and blot dry.
6. Pour the calibration standard or sample into the cap to the fill line.
7. Put the sensor fully into the cap.
8. When the measurement is stable, push  and  until the pH value of the calibration solution or sample shows on the display.
9. Optional: To measure a second pH calibration standard or sample of known value, push , then do steps 5–8 again.
10. When the last measurement is stable, push and hold  to save the calibration and go to continuous measurement mode. "END" shows on the display.
Note: "ECAL" shows on the display if the calibration was not successful. Refer to [Troubleshooting](#) on page 10.
11. Rinse the sensor and cap with deionized water and blot dry.

⁵ Custom calibration can only be done on the Pocket Pro+ tester.



Measurement

Note: Air bubbles under the probe tip when submerged can cause slow stabilization or error in measurement. Shake the tester from side to side to remove air bubbles.




1. Set the power to on.
 2. Remove the cap from the sensor.
 3. If the lock icon shows on the display, push  to go to continuous measurement mode.
 4. Rinse the sensor and cap with deionized water and blot dry.
 5. Pour the water sample into the cap to the fill line.
 6. Put the sensor fully into the cap. The measured value shows on the top line.
 7. To keep the measured value on the display when the sensor is removed from the sample, push .
- Note:** The lock icon shows on the display when the measurement is stable.
8. To measure another sample, do steps 3–7.
 9. When done with measurements:
 - a. Rinse the sensor and cap with deionized water.
 - b. Put the cap on the tester.
 - c. Set the power to off.

Advanced operation

Configure the settings

1. Push and hold  until "SET" shows on the display.
2. Push  to scroll through the settings. The current value of the setting shows on the bottom line.

Option	Description
Unit	Select the temperature unit that shows on the display— C (Celsius) or F (Fahrenheit).
bUFR	Select the pH buffers that are used for auto calibration—USA (4.01, 7.01, 10.01, default), NIST (4.01, 6.86, 9.18) or Cus (custom standard). Note: "Cus" can only be selected on the Pocket Pro+ tester.
AOFF	Set the auto-off feature to On (enable, default) or Off (disabled). When set to On, power is automatically set to off after 8 minutes of no activity.
ACAL	Enable or disable pH calibration reminder—Yes (enable, default) or No (disable). When set to Yes, "?" shows next to the calibration icon on the pH screen when a pH calibration is due.
rSET	Change the settings to the factory defaults—Yes or No (default). When set to Yes, changes the settings to the factory settings and default values.

3. To change the value of the setting, push  or .
4. When done with changes, push and hold  until "End" shows to go to continuous measurement mode.

Maintenance

CAUTION



Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

Clean the sensor

Clean the sensor when:

- "SENSOR?" shows on the display
- Stabilization is slow
- Results drift or are not accurate

- Calibration failure occurs
1. Soak the sensor in the applicable cleaning agent. Refer to [Table 3](#).
 2. Rinse or soak the sensor in deionized water for 1 minute.

Table 3 Cleaning agents

Contaminant	Cleaning agent	Time
Grease, oils and fats	Electrode cleaning solution	2 hours maximum
Mineral buildup	10% hydrochloric acid (HCl) solution	5 minutes maximum

Replace the batteries

When the battery icon flashes or the tester will not come on, replace all four batteries. Refer to [Install the batteries](#) on page 5.

Replace the sensor

Note: Only Pocket Pro+ testers have replaceable sensors.

To replace the sensor, refer to the instructions supplied with the sensor.

Troubleshooting

Message	Possible cause	Solution
SENSOR?	The calibration slope is ± 10 –15%.	Gently clean the sensor. Refer to Clean the sensor on page 9.
ECAL	Calibration failure. The pH calibration slope is greater than ± 15 %.	Gently clean the sensor. Refer to Clean the sensor on page 9. Calibrate again. If calibration failure continues, replace the tester or sensor as applicable.
"- - - -" (top line)	The parameter value is not within the measurement range of the tester. Refer to Specifications on page 2.	Make sure that the value of the sample is within the measurement range of the tester. Gently clean the sensor. Refer to Clean the sensor on page 9. Calibrate as necessary.
"- - - -" (bottom line)	The temperature value is not within the operating temperature range of the tester or a temperature sensor failure occurred. Refer to Specifications on page 2 for the operating temperature range.	Make sure that the sample temperature is within the operating temperature range of the tester. Contact technical support as necessary. Note: The tester can still be used if a temperature sensor failure has occurred, but without automatic temperature compensation.
Battery icon flashes	The batteries have less than 10% power remaining.	Replace all four batteries. Refer to Install the batteries on page 5.

Replacement parts and accessories

WARNING



Personal injury hazard. Use of non-approved parts may cause personal injury, damage to the instrument or equipment malfunction. The replacement parts in this section are approved by the manufacturer.

Note: Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.

Table 4 Replacement parts

Description	Quantity	Item no.
AAA alkaline batteries	4/pkg	4674300
Lanyard	1	201305

Table 4 Replacement parts (continued)

Description	Quantity	Item no.
SINGLET, 7.00 pH	20/pkg	2770120
pH sensor, replacement	1	9532001

Table 5 Accessories

Description	Quantity	Item no.
SINGLET, 4.01 pH	20/pkg	2770020
SINGLET, 10.01 pH	20/pkg	2770220
Electrode cleaning solution	500 mL	2965249
Hydrochloric Acid (HCl)	2.5 L	13406
Hydrochloric Acid (HCl)	500 mL	13449

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Storm Water Test Kit

SW-1 (2481300)

02/2017, Edition 2

User Manual

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General information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

Use of hazard information

▲ DANGER
Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.
▲ WARNING
Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.
▲ CAUTION
Indicates a potentially hazardous situation that may result in minor or moderate injury.
NOTICE
Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

Product overview

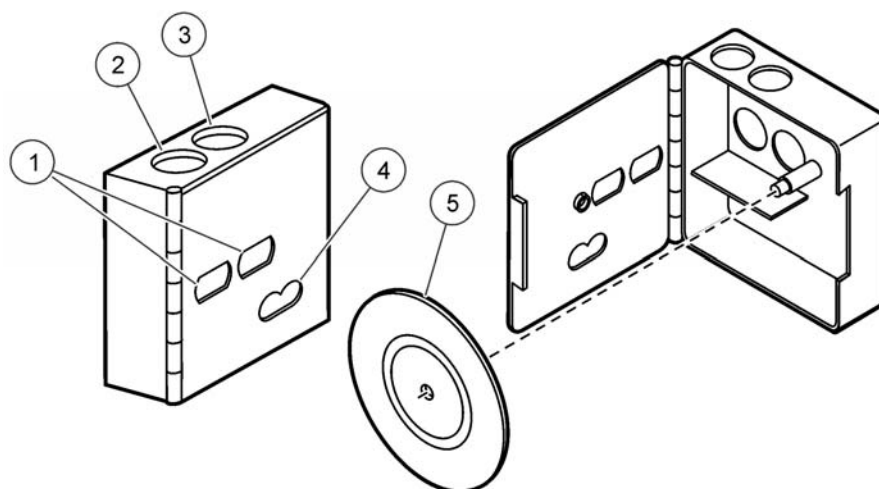
▲ WARNING	
	Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

The storm water test kit includes the necessary items to measure five parameters in storm sewer outflow and industrial discharge samples. Refer to [Table 1](#). The test kit includes a pH tester to measure the pH value of the samples. The test kit includes reagents and color discs to measure the concentration of chlorine, phenols, copper and detergents. Refer to [Figure 1](#).

Table 1 Test kit parameters

Parameter	Range	Number of tests	Method	Sensitivity
pH	0–14	Refer to packaging	Ion selective electrode	Refer to packaging
Chlorine, total	0–3.4 mg/L	100	DPD	0.1 mg/L
Copper, free and total	0–4 mg/L	100	Bicinchoninate	0.1 mg/L
Phenols	0–5 mg/L	100	4-Aminoantipyrine	0.1 mg/L
Detergents	0–1.2 mg/L	32	Toluidine Blue-O	0.05 mg/L

Figure 1 Color comparator box



1 Windows for color matching	4 Scale window
2 Left opening for viewing tube	5 Color disc
3 Right opening for viewing tube	

Product components

Make sure that all components have been received. Refer to the list that follows. If any items are missing or damaged, contact the manufacturer or a sales representative immediately.

- Carrying case
- Color discs (4x)
- Color comparator box
- Color viewing tubes, plastic (2x)
- Color viewing tubes, glass (2x), for detergents test
- Stopper for color viewing tubes (2x)
- Filtering thimble
- Test tube, 10 mL (2x), for detergents test
- Draw-off pipet
- Rubber bulb
- Glass wool for detergents test
- Dropper
- Demineralizer bottle
- Beaker, 100 mL
- Pocket Pro™ pH tester
- Buffer Powder Pillows, pH 7.00
- Clippers for pH powder pillows
- DPD Total Chlorine Reagent Powder Pillows
- Free Copper Reagent Powder Pillows
- Hydrosulfite Reagent Powder Pillows
- Detergents Test Solution
- Chloroform, ACS grade
- Wash Water Buffer Solution (2x)
- Phenol Reagent Powder Pillows
- EDTA Reagent Powder Pillows
- Hardness 1 Buffer Solution
- Potassium Persulfate Powder Pillows

Use of the demineralizer bottle

To use the included demineralizer bottle, fill the bottle with tap water and shake to mix. Use the water from the demineralizer bottle as deionized water in the test procedure. Fill the bottle again when empty. Replace the resin after the bottle is filled approximately 100 times.

pH

Refer to the pH tester documentation to measure the pH value of samples and to calibrate the pH tester. To prepare a pH 7.00 calibration solution, dissolve the contents of one pH 7.00 buffer pillow in 50 mL of deionized water.

Total Chlorine

Test preparation

⚠ CAUTION

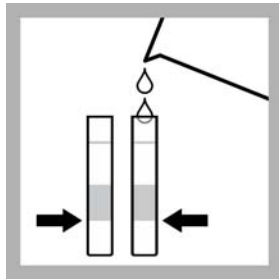
Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.

NOTICE

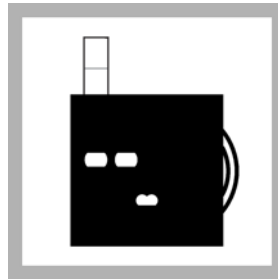
This product has not been evaluated to test for chlorine and chloramines in medical applications in the United States.

- Analyze samples immediately after collection.
- Put the color disc on the center pin in the color comparator box (numbers to the front).
- Use sunlight or a lamp as a light source to find the color match with the color comparator box.
- Rinse the tubes with sample before the test. Rinse the tubes with deionized water after the test.
- If the color match is between two segments, use the value that is in the middle of the two segments.
- If the color disc becomes wet internally, pull apart the flat plastic sides to open the color disc. Remove the thin inner disc. Dry all parts with a soft cloth. Assemble when fully dry.
- Undissolved reagent does not have an effect on test accuracy.

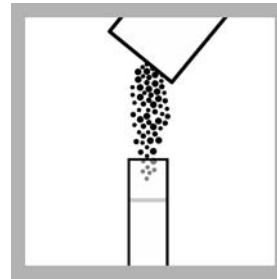
Test procedure—Total chlorine (0–3.4 mg/L Cl₂)



1. Fill two tubes to the first line (5 mL) with sample.



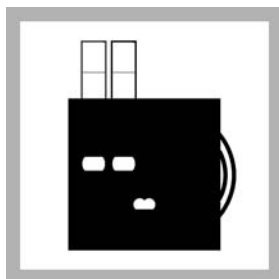
2. Put one tube into the left opening of the color comparator box.



3. Add one DPD Total Chlorine Powder Pillow to the second tube.



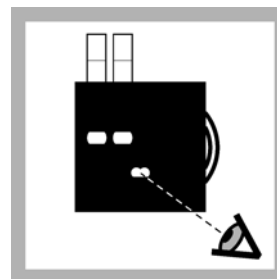
4. Wait 3 minutes. Read the result within 6 minutes.



5. Put the second tube into the color comparator box.



6. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.



7. Read the result in mg/L in the scale window.

Replacement items

Description	Unit	Item no.
DPD Total Chlorine Reagent Powder Pillows, 5 mL	100/pkg	1407699
Color disc, DPD chlorine, 0–3.4 mg/L	each	990200
Color comparator box	each	173200
Plastic viewing tubes, 18 mm, with caps	4/pkg	4660004

Optional items

Description	Unit	Item no.
Caps for plastic viewing tubes (4660004)	4/pkg	4660014
Glass viewing tubes, 18 mm	6/pkg	173006
Stoppers for 18-mm glass tubes and AccuVac Ampuls	6/pkg	173106
Water, deionized	500 mL	27249

Copper

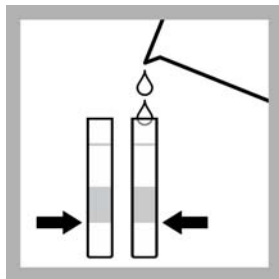
Test preparation

⚠ CAUTION

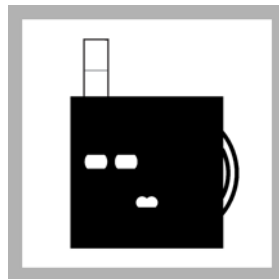
Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.

- Put the color disc on the center pin in the color comparator box (numbers to the front).
- Use sunlight or a lamp as a light source to find the color match with the color comparator box.
- Rinse the tubes with sample before the test. Rinse the tubes with deionized water after the test.
- If the color match is between two segments, use the value that is in the middle of the two segments.
- If the color disc becomes wet internally, pull apart the flat plastic sides to open the color disc. Remove the thin inner disc. Dry all parts with a soft cloth. Assemble when fully dry.
- Undissolved reagent does not have an effect on test accuracy.
- To verify the test accuracy, use a standard solution as the sample.
- High concentrations of cyanide prevent color development. If the cyanide concentration is more than 2 mg/L, add 3 drops of formaldehyde solution to the prepared sample after the free copper reagent is added. Wait 3 minutes, then read the mg/L free copper.
- The test procedure measures free copper and total dissolved copper. Free copper is the free copper ion or weakly chelated copper ion in solution. Total dissolved copper is the sum of free copper and complexed copper. Complexed (chelated) copper is copper that is tightly bound to another compound, as in the copper EDTA complex.
- Free copper is measured to determine if the concentration is toxic to fish and other aquatic species. Free copper is also measured for other types of applications to determine if the quantity of chelant is sufficient.
- Free copper in the sample reacts with bicinchoninic acid in the Free Copper Reagent Powder Pillow and a purple color develops. Complexed (chelated) copper in the sample reacts with the Hydrosulfite Reagent and additional purple color develops. The result after both reagents are added is total dissolved copper. To determine the mg/L of complexed copper, subtract the mg/L free copper from the mg/L total dissolved copper.

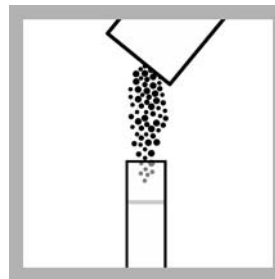
Test procedure—Copper, free and total (0–4 mg/L Cu)



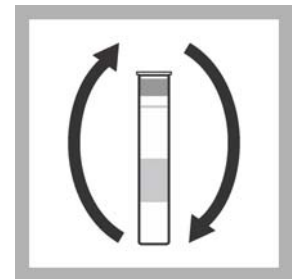
1. Fill two tubes to the first line (5 mL) with sample.



2. Put one tube into the left opening of the color comparator box.



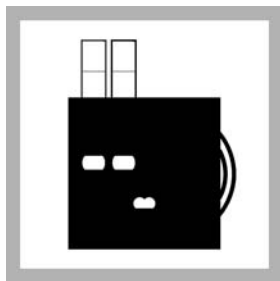
3. Add one Free Copper Reagent Powder Pillow to the second tube.



4. Put a stopper on the tube. Invert to mix.



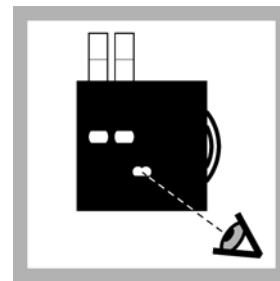
5. Wait 2 minutes. A purple color develops if free copper is in the sample.



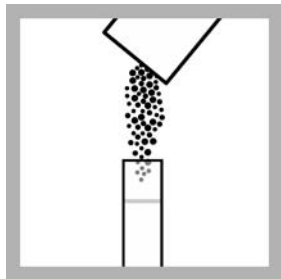
6. Put the second tube into the color comparator box.



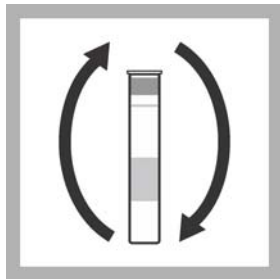
7. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.



8. Read the mg/L free copper in the scale window. Record the value.



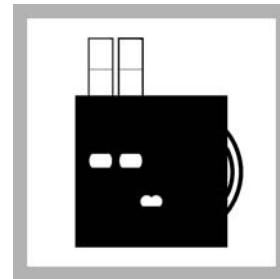
9. To determine total dissolved copper, add one Hydrosulfite Reagent Powder Pillow to the second tube.



10. Put a stopper on the tube. Invert to mix.



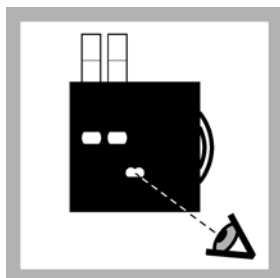
11. Wait 2 minutes.



12. Put the second tube into the color comparator box.



13. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.



14. Read the mg/L total dissolved copper in the scale window.

Replacement items

Description	Unit	Item no.
Free Copper Reagent Powder Pillows	100/pkg	2182369
Hydrosulfite Reagent Powder Pillows	100/pkg	2118869
Color disc, copper, 0–4 mg/L	each	9263300
Color comparator box	each	173200
Glass viewing tubes, 18 mm	6/pkg	173006
Stoppers for 18-mm glass tubes and AccuVac Ampuls	6/pkg	173106

Optional items

Description	Unit	Item no.
Metals standard solution for drinking water (2.5 mg/L Cu, 1.5 mg/L Fe, 5.0 mg/L Mn)	500 mL	2833649
Formaldehyde, ACS	100 mL MDB	205932

Detergents

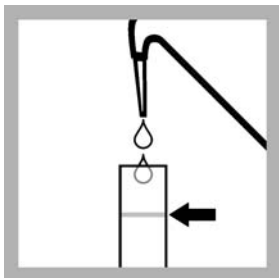
Test preparation

⚠ CAUTION

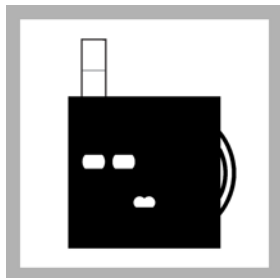
Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.

- Put the color disc on the center pin in the color comparator box (numbers to the front).
- Use sunlight or a lamp as a light source to find the color match with the color comparator box.
- Rinse the tubes with sample before the test. Rinse the tubes with deionized water after the test.
- If the color match is between two segments, use the value that is in the middle of the two segments.
- If the color disc becomes wet internally, pull apart the flat plastic sides to open the color disc. Remove the thin inner disc. Dry all parts with a soft cloth. Assemble when fully dry.
- Use the filtration procedure for samples that contain turbidity.
- If the test result is more than the maximum limit, dilute the sample as follows. Use the dropper to add 1 mL of sample to a tube. Dilute the sample to the 20-mL line with deionized water. Use the diluted sample in the test procedure. Multiply the value in the scale window by 20 to get the test result in mg/L.
- To use the included demineralizer bottle, fill the bottle with tap water and shake to mix. Use the water from the demineralizer bottle as deionized water in the test procedure. Fill the bottle again when empty. Replace the resin after the bottle is filled approximately 100 times.
- Dispose of reacted solutions according to local, state and federal regulations. Refer to the Safety Data Sheets for disposal information for unused reagents. Refer to the environmental, health and safety staff for your facility and/or local regulatory agencies for further disposal information.

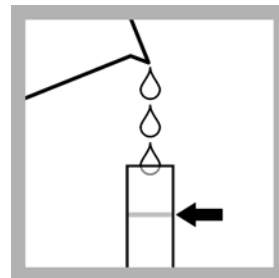
Test procedure—Detergents (0–1.2 mg/L as LAS (linear alkylate sulfonate) and/or ABS (alkyl benzene sulfonate))



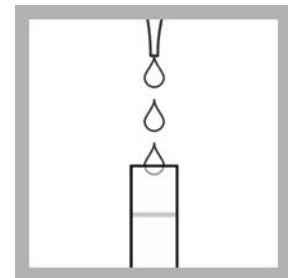
1. Fill a glass tube to the top line (20 mL) with deionized water.



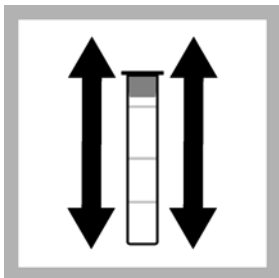
2. Put the tube into the left opening of the color comparator box.



3. Fill a second glass tube to the top line (20 mL) with sample.



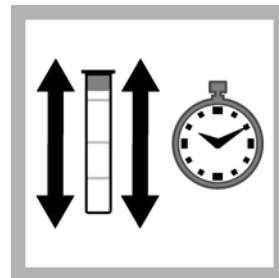
4. Add 12 drops of Detergents Reagent.



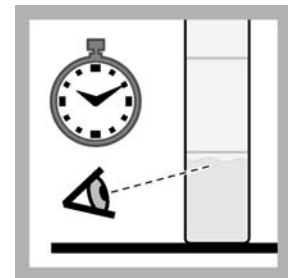
5. Put the stopper on the second tube. Shake to mix.



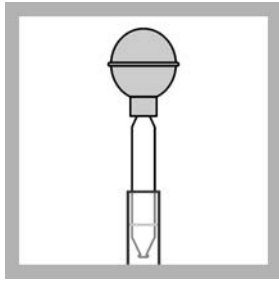
6. Add chloroform to the first line (5 mL). Chloroform is heavier than water and goes to the bottom of the tube.



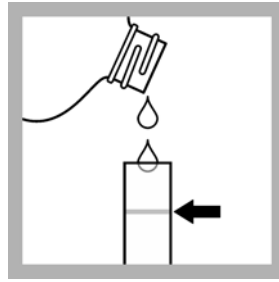
7. Put the stopper on the tube. Shake vigorously for 30 seconds.



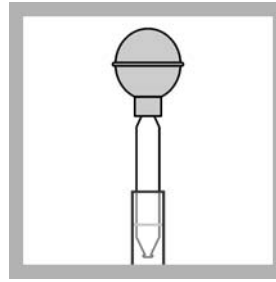
8. Do not touch the tube for 1 minute to let the chloroform separate from the sample.



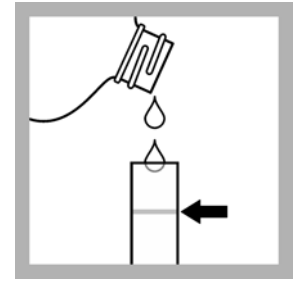
9. Use the transfer pipet to remove the top water layer from the tube. Discard the water.



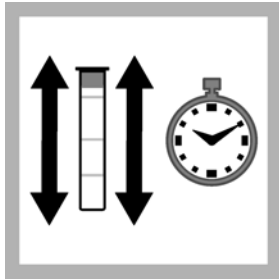
10. Add Wash Water Buffer Solution to the top mark (20 mL).



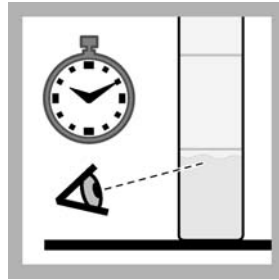
11. Use the transfer pipet to remove the Wash Water Buffer. Discard the buffer. This step removes the remaining water sample.



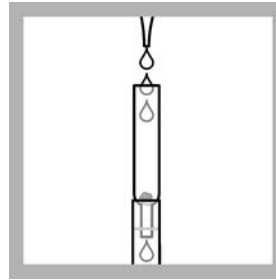
12. Add Wash Water Buffer to the top mark (20 mL).



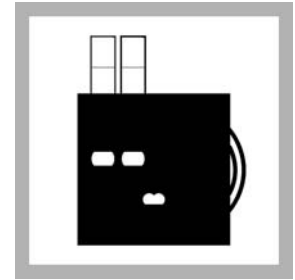
13. Put the stopper on the tube. Shake vigorously for 30 seconds.



14. Do not touch the tube for 1 minute to let the chloroform separate.



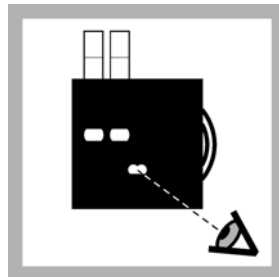
15. If the sample contains turbidity, complete the [Filtration procedure for turbid samples](#) on page 12.



16. Put the second tube into the color comparator box.



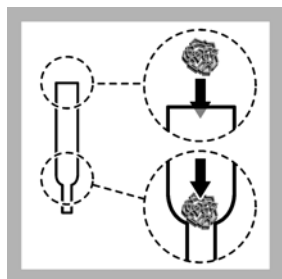
17. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.



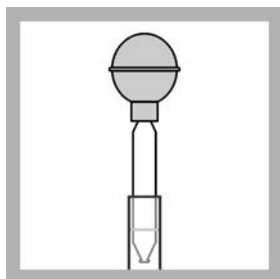
18. Read the result in mg/L in the scale window.

Filtration procedure for turbid samples

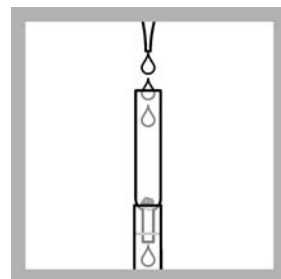
If the sample contains turbidity, pour the chloroform layer through a filter during the test procedure after step 15.



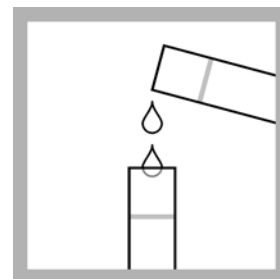
1. Put a small ball (the size of a large pea) of glass wool in the filter thimble.



2. Use the transfer pipet to remove the chloroform layer from the viewing tube.



3. Put the filter thimble on a clean test tube. Add the chloroform to the filter thimble.



4. Use the filtered chloroform to continue the test procedure after step 15.

Replacement items

Description	Quantity	Item no.
Chloroform, ACS grade	500 mL	1445849
Detergents Reagent	100 mL MDB	105932
Wash Water Buffer Solution	500 mL	99949
Color comparator box	each	173200
Color disc, detergents, 0–1.2 mg/L	each	9265700
Demineralizer bottle, 177-mL capacity	each	1429900
Dropper, glass, 0.5- and 1.0-mL marks	5/pkg	1419705
Filter thimble	1	51200
Glass viewing tubes, 5-mL and 20-mL marks	6/pkg	173606
Glass wool	5 g	252074
Pipet bulb	1	178600
Stoppers for viewing tubes, No. 2 plastic	6/pkg	1448001
Test tube, 13 x 100 mm	10/pkg	56510
Transfer pipet	1	221800

Phenols

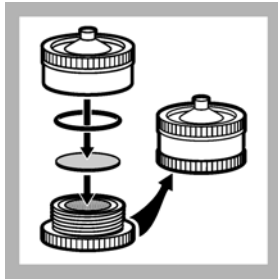
Test preparation

⚠ CAUTION

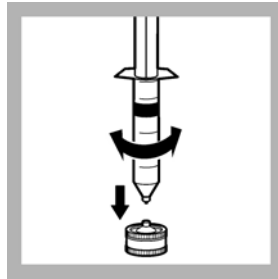
Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.

- Put the color disc on the center pin in the color comparator box (numbers to the front).
- Use sunlight or a lamp as a light source to find the color match with the color comparator box.
- Rinse the tubes with sample before the test. Rinse the tubes with deionized water after the test.
- If the color match is between two segments, use the value that is in the middle of the two segments.
- If the color disc becomes wet internally, pull apart the flat plastic sides to open the color disc. Remove the thin inner disc. Dry all parts with a soft cloth. Assemble when fully dry.
- Use the filtration procedure for samples that contain turbidity.

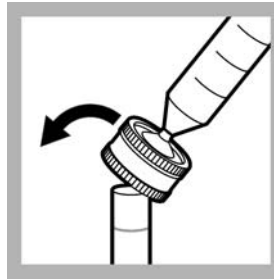
Filtration procedure for turbid samples



1. Put a 0.45- μm filter disc in the 25-mm filter holder. Tighten the filter holder.



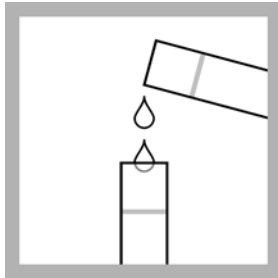
2. Fill a 30-cc syringe with sample. Attach the syringe to the filter holder.



3. Put the filter holder on the tube.

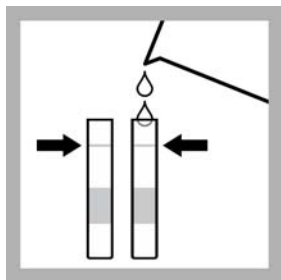


4. Push the sample through the filter.

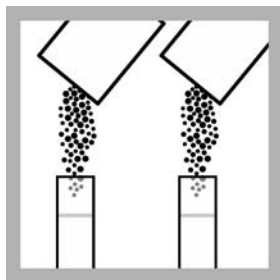


5. Use the filtered sample in the test procedure.

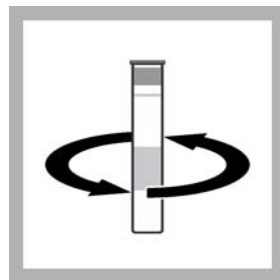
Test procedure—Phenols (0–5 mg/L)



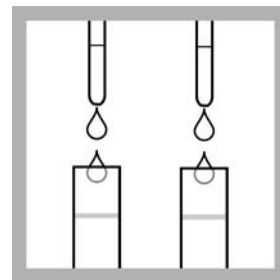
1. Fill two tubes to the top line with sample.



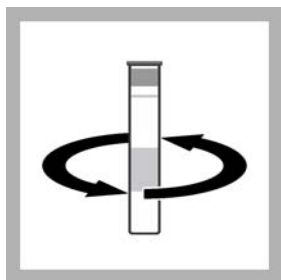
2. Add one EDTA Reagent Powder Pillow to each tube.



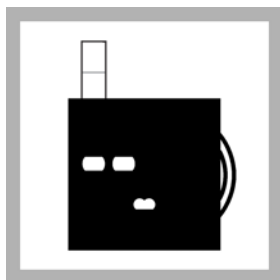
3. Put a cap on each tube. Swirl to mix until the reagent is dissolved.



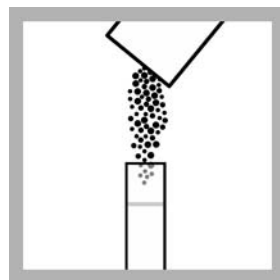
4. Add 15 drops of Hardness 1 Buffer Solution to each tube.



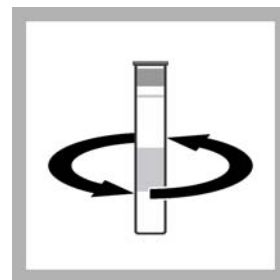
5. Put a cap on each tube. Swirl to mix.



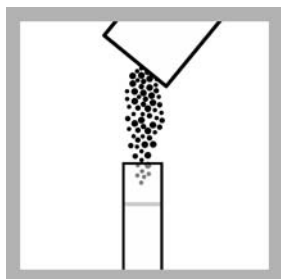
6. Put one tube into the left opening of the color comparator box.



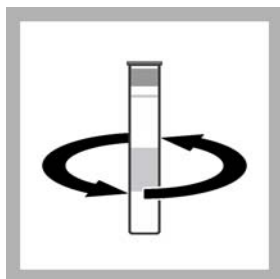
7. Add one Phenol Reagent Powder Pillow for non-extraction method to the second tube.



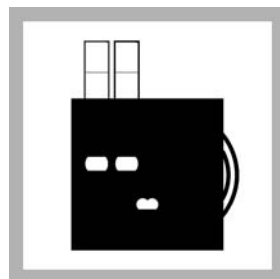
8. Put a cap on the tube. Swirl to mix until the reagent is dissolved.



9. Add one Potassium Persulfate Powder Pillow for phosphonate to the second tube.



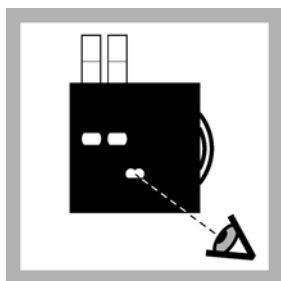
10. Put a cap on the tube. Swirl to mix until the reagent is dissolved.



11. Put the second tube into the color comparator box.



12. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.



13. Read the result in mg/L in the scale window.

Replacement items

Description	Unit	Item no.
EDTA Reagent Powder Pillows	100/pkg	700599
Hardness 1 Buffer Solution	50 mL SCDB	42426
Phenol Reagent Powder Pillows, non-extraction method	100/pkg	2481569
Potassium Persulfate Powder Pillows, phosphonate	100/pkg	2084769
Color disc, phenols, 0–5 mg/L	each	9263100
Color comparator box	each	173200
Plastic viewing tubes, 18 mm, with caps	4/pkg	4660004

Optional items

Description	Unit	Item no.
Filter holder, 25 mm, syringe with Luer-Lok® Tip	each	246800
Filter disc, 0.45 micron, 25 mm	25/pkg	2209525
Syringe, Luer-Lok® Tip, 30 cc	each	2225800
Caps for plastic viewing tubes (4660004)	4/pkg	4660014
Water, deionized	100 mL	27242



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Fax +41 22 594 6499

HI715 Ammonia Medium Range



Recommendations for Users

Before using this product, make sure it is entirely suitable for your specific application and for the environment in which it is used. Any variation introduced by the user to the supplied equipment may degrade the checker's performance. For your and the checker's safety do not use or store it in hazardous environments.

Warranty

HI715 Checker[®]HC is warranted for a period of one year against defects in workmanship and materials when used for its intended purpose and maintained according to instructions. This warranty is limited to repair or replacement free of charge. Damage due to accidents, misuse, tampering or lack of prescribed maintenance is not covered. If service is required, contact your local Hanna Instruments Office. If under warranty, report the model number, date of purchase, serial number and the nature of the problem. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the checker is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization (RGA) number from the Technical Service department and then send it with shipping costs prepaid. When shipping any product, make sure it is properly packaged for complete protection.

Hanna Instruments reserves the right to modify the design, construction, or appearance of its products without advance notice.

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IST715 09/20

Accessories

Reagent Sets

HI715-25 Reagents for 25 Ammonia Medium Range tests

Other Accessories

HI715-11 Ammonia Medium Range certified standard kit

HI731225 Cuvette black cap for Checker[®] HC colorimeters (4 pcs.)

HI731318 Cloth for wiping cuvettes (4 pcs.)

HI731321 Glass cuvette and seal cap for Checker[®] HC colorimeters (4 pcs.)

HI740028P 1.5V AAA battery set (12 pcs.)

HI93703-50 Cuvette cleaning solution, 230 mL

Certification

All Hanna Instruments conform to the **CE European Directives**.

Disposal of Electrical & Electronic Equipment. The product should not be treated as household waste. Instead hand it over to the appropriate collection point for the recycling of electrical and electronic equipment which will conserve natural resources.

Disposal of waste batteries. This product contains batteries, do not dispose of them with other household waste. Hand them over to the appropriate collection point for recycling.

Ensuring proper product and battery disposal prevents potential negative consequences for the environment and human health. For more information, contact your city, your local household waste disposal service, the place of purchase or go to www.hannainst.com.



RoHS
compliant



Tips for an Accurate Measurement

- Ensure the sample does not contain any debris.
- Whenever the cuvette is placed into the checker, it must be dry outside and free of fingerprints, oil and dirt.
- Wipe the cuvette thoroughly with [HI731318](#) microfiber cleaning cloth or a lint-free cloth prior to insertion.
- Shaking the cuvette can generate bubbles, causing higher readings. To obtain accurate measurements, remove such bubbles by swirling or by gently tapping the cuvette.
- Do not let the reacted sample stand too long after reagent has been added, as accuracy will be affected.
- Discard the sample immediately after the reading has been taken or the glass might become permanently stained.

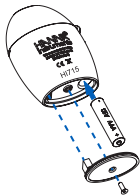


Battery Replacement

To save the battery, the checker shuts down after 10 minutes of non-use. A fresh battery lasts for a minimum of 5000 measurements. When the battery is drained, the instrument displays "bAd" then "bAt", and turns off. To replace the battery, follow the next steps:

To replace the battery, follow the next steps:

1. Press and hold the ON/OFF button to turn the checker off.
2. Turn the instrument upside down and use a screwdriver to unfasten the screw and remove the battery cover.



3. Remove the old battery, replace it with a new 1.5V AAA battery, inserting the negative end first.
4. Replace the battery cover, fasten and tighten the screw.

Dear Customer,

Thank you for choosing a Hanna Instruments product. Please read this instruction manual carefully before using the Checker[®]HC handheld colorimeter. For more information about Hanna Instruments and our products, visit www.hannainst.com or e-mail us at sales@hannainst.com. For technical support, contact your local Hanna Instruments Office or e-mail us at tech@hannainst.com.

Preliminary Examination

Remove the Checker[®]HC handheld colorimeter and accessories from the packing material and examine it carefully. If you require any further information, please contact Hanna Instruments technical support team.

Each HI715 is delivered in a case with custom insert and is supplied with:

- Sample cuvette and cap (2 pcs.)
- Ammonia Medium Range reagent starter kit (reagents for 25 tests)
- 1.5V AAA Alkaline battery (1 pc.)
- Instruction manual

Note: Save all packing material until you are sure that the Checker[®]HC handheld colorimeter works correctly. Any damaged or defective item must be returned in its original packing material with the supplied accessories.

General Description & Intended Use

HI715 Ammonia Medium Range handheld checker is designed to accurately determine ammonia levels in fresh water.

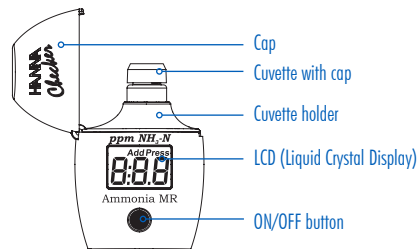
HI715 features a single-button operation system and is easy to use.

The large LCD is easy to read and the auto shut-off feature assures the battery will not be drained.

Specifications

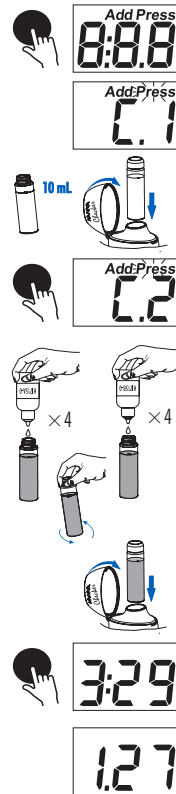
Range	0.00 to 9.99 ppm (as NH ₃ -N)
Resolution	0.01 ppm
Accuracy	±0.05 ppm ±5% of reading @ 25 °C (77 °F)
Light source	Light Emitting Diode @ 470 nm
Light detector	Silicon photocell
Method	Adaptation of the ASTM Manual of Water and Environmental Technology, D1426-92, Nessler Method. The reaction between ammonia and reagents causes a yellow tint in the sample.
Environment	0 to 50 °C (32 to 122 °F); max. 95% RH non-condensing
Battery type	1.5V AAA Alkaline
Auto shut-off	After 10 minutes of non-use
Dimensions	86.0 x 61.0 x 37.5 mm (3.4 x 2.4 x 1.5")
Weight	64 g (2.3 oz)

Functional Description & LCD Display



Measurement Procedure

- Press the ON/OFF button to turn the checker on. All segments will be displayed for a few seconds, followed by "Add", "C.1" with "Press" blinking.
- Fill the cuvette with 10 mL of unreacted sample and replace the cap. Insert the cuvette into the checker and close the cap.
- Press the ON/OFF button. When the display shows "Add", "C.2" with "Press" blinking, the checker is zeroed.
- Remove the cuvette, unscrew the cap and add 4 drops of HI715A-0 Ammonia Medium Range reagent A. Replace the cap and swirl the solution.
- Unscrew the cap and add 4 drops of HI715B-0 Ammonia Medium Range reagent B. Replace the cap and swirl the solution.
- Insert the cuvette into the checker and close the cap. Press and hold the ON/OFF button. The display will show the countdown prior to the measurement. Alternatively, wait 3 minutes and 30 seconds and press the button.
- When the timer ends the checker will perform the reading. The instrument displays the ammonia nitrogen (NH₃-N) concentration in mg/L (ppm). To convert the reading to ppm of ammonia (NH₃), multiply the reading by factor of 1.214. The checker automatically turns off 10 minutes after reading.



Errors & Warnings

The checker shows clear warning messages when erroneous conditions appear and when measured values are outside the expected range. The information below provides an explanation of the errors and warnings, and the recommended action to be taken.

Light High: There is an excess amount of ambient light reaching the detector. Please check the preparation of the zero cuvette.

L.H.

Light Low: There is not enough light to perform a measurement. Please check the preparation of the zero cuvette.

L.Lo

Inverted Cuvettes: The sample and the zero cuvettes are inverted. Swap the cuvettes and repeat the measurement.

Inu

Under Range: A blinking "0.00" indicates that the sample absorbs less light than the zero reference. Check the measurement procedure and make sure to use the same cuvette for reference (zero) and measurement.

0.00

Over Range: Maximum concentration value displayed blinking indicates the measured value is outside the limits of the method. Verify that the sample does not contain any debris. Dilute the sample and repeat the measurement.

9.99

Battery Low: Battery level is too low for the checker to function properly. Replace the battery with a new one.

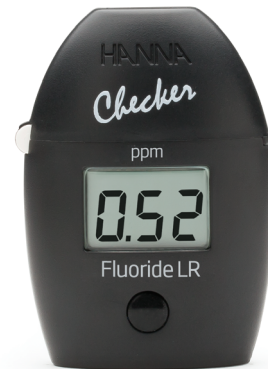
bAt

Drained Battery: The battery is drained and must be replaced. Replace the battery with a new one and restart the checker.

bAd

bAt

HI729 Fluoride Low Range



Recommendations for Users

Before using this product, make sure it is entirely suitable for your specific application and for the environment in which it is used. Any variation introduced by the user to the supplied equipment may degrade the checker's performance. For your and the checker's safety do not use or store it in hazardous environments.

Warranty

HI729 Checker[®]HC is warranted for a period of one year against defects in workmanship and materials when used for its intended purpose and maintained according to instructions. This warranty is limited to repair or replacement free of charge. Damage due to accidents, misuse, tampering or lack of prescribed maintenance is not covered. If service is required, contact your local Hanna Instruments Office. If under warranty, report the model number, date of purchase, serial number and the nature of the problem. If the repair is not covered by the warranty, you will be notified of the charges incurred. If the checker is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization (RGA) number from the Technical Service department and then send it with shipping costs prepaid. When shipping any product, make sure it is properly packaged for complete protection.

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IST729 09/20

Accessories

Reagent Sets

HI729-26 Reagents for 20 Fluoride Low Range tests

Other Accessories

HI729-11 Fluoride Low Range certified standard kit

HI731225 Cuvette black cap for Checker[®] HC colorimeters (4 pcs.)

HI731318 Cloth for wiping cuvettes (4 pcs.)

HI731321 Glass cuvette and seal cap for Checker[®] HC colorimeters (4 pcs.)

HI740028P 1.5V AAA battery set (12 pcs.)

HI740142P 1 mL graduated syringe (10 pcs.)

HI93703-50 Cuvette cleaning solution, 230 mL

Certification

All Hanna Instruments conform to the **CE European Directives**.

Disposal of Electrical & Electronic Equipment. The product should not be treated as household waste. Instead hand it over to the appropriate collection point for the recycling of electrical and electronic equipment which will conserve natural resources.

Disposal of waste batteries. This product contains batteries, do not dispose of them with other household waste. Hand them over to the appropriate collection point for recycling.

Ensuring proper product and battery disposal prevents potential negative consequences for the environment and human health. For more information, contact your city, your local household waste disposal service, the place of purchase or go to www.hannainst.com.



RoHS
compliant



Tips for an Accurate Measurement

- Ensure the sample does not contain any debris.
- Whenever the cuvette is placed into the checker, it must be dry outside and free of fingerprints, oil and dirt.
- Wipe the cuvette thoroughly with HI731318 microfiber cleaning cloth or a lint-free cloth prior to insertion.
- Shaking the cuvette can generate bubbles, causing higher readings. To obtain accurate measurements, remove such bubbles by swirling or by gently tapping the cuvette.
- Do not let the reacted sample stand too long after reagent has been added, as accuracy will be affected.
- Discard the sample immediately after the reading has been taken or the glass might become permanently stained.



Battery Replacement

To save the battery, the checker shuts down after 10 minutes of non-use and 2 minutes after reading.

A fresh battery lasts for a minimum of 5000 measurements. When the battery is drained, the instrument displays "bAd" then "bAt", and turns off.

To replace the battery, follow the next steps:

1. Press and hold the ON/OFF button to turn the checker off.
2. Turn the instrument upside down and use a screwdriver to unfasten the screw and remove the battery cover.



3. Remove the old battery, replace it with a new 1.5V AAA battery, inserting the negative end first.
4. Replace the battery cover, fasten and tighten the screw.

Dear Customer,

Thank you for choosing a Hanna Instruments product. Please read this instruction manual carefully before using the Checker[®]HC handheld colorimeter. For more information about Hanna Instruments and our products, visit www.hannainst.com or e-mail us at sales@hannainst.com. For technical support, contact your local Hanna Instruments Office or e-mail us at tech@hannainst.com.

Preliminary Examination

Remove the Checker[®]HC handheld colorimeter and accessories from the packing material and examine it carefully. If you require any further information, please contact Hanna Instruments technical support team.

Each HI729 is delivered in a case with custom insert and is supplied with:

- Sample cuvette and cap (2 pcs.)
- Fluoride Low Range reagent starter kit (reagents for 6 tests)
- 1 mL syringe with tip
- 1.5V AAA Alkaline battery (1 pc.)
- Instruction manual

Note: Save all packing material until you are sure that the Checker[®]HC handheld colorimeter works correctly. Any damaged or defective item must be returned in its original packing material with the supplied accessories.

General Description & Intended Use

HI729 Fluoride Low Range handheld checker is designed to accurately determine fluoride levels in drinking water.

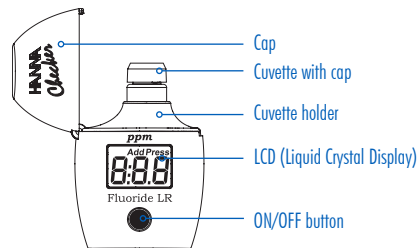
HI729 features a single-button operation system and is easy to use.

The large LCD is easy to read and the auto shut-off feature assures the battery will not be drained.

Specifications

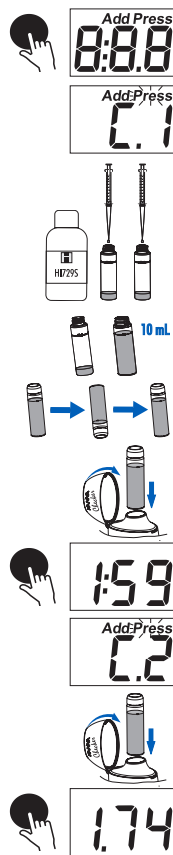
Range	0.00 to 2.00 ppm (as F)
Resolution	0.01 ppm
Accuracy	±0.10 ppm ±5% of reading @ 25 °C (77 °F)
Light source	Light Emitting Diode @ 575 nm
Light detector	Silicon photocell
Method	Adaptation of the Standard Methods for the Examination of Water and Wastewater, 18 th Edition, SPADNS Method
Environment	0 to 50 °C (32 to 122 °F); max. 95% RH non-condensing
Battery type	1.5V AAA Alkaline
Auto shut-off	After 10 minutes of non-use and 2 minutes after reading
Dimensions	86.0 x 61.0 x 37.5 mm (3.4 x 2.4 x 1.5")
Weight	64 g (2.3 oz)

Functional Description & LCD Display



Measurement Procedure

- Press the ON/OFF button to turn the checker on. All segments will be displayed for a few seconds, followed by "Add", "C.1" with "Press" blinking.
- Use the 1 mL syringe and add 2 mL of HI729S SPADNS reagent to both cuvettes.
- Fill the first cuvette up to the 10 mL mark with 8 mL of deionized water and the second cuvette up to the 10 mL mark with 8 mL of sample. Replace the cap and invert several times to mix.
- Insert the first cuvette (deionized water) into the checker and close the cap.
- Press and hold the ON/OFF button. The display will show the countdown prior to the measurement. Alternatively, wait 2 minutes and press the button.
- When the display shows "Add", "C.2" with "Press" blinking, the checker is zeroed.
- Remove the cuvette.
- Insert the second cuvette (sample) into the checker and close the cap. Press the ON/OFF button. The instrument displays the fluoride concentration in ppm. The checker automatically turns off 2 minutes after reading.



Errors & Warnings

The checker shows clear warning messages when erroneous conditions appear and when measured values are outside the expected range. The information below provides an explanation of the errors and warnings, and the recommended action to be taken.

Light High: There is an excess amount of ambient light reaching the detector. Please check the preparation of the zero cuvette.

L.H.

Light Low: There is not enough light to perform a measurement. Please check the preparation of the zero cuvette.

L.Lo

Inverted Cuvettes: The sample and the zero cuvettes are inverted. Swap the cuvettes and repeat the measurement.

Inu

Under Range: A blinking "0.00" indicates that the sample absorbs less light than the zero reference. Check the measurement procedure and make sure to use the same cuvette for reference (zero) and measurement.

0.00

Over Range: Maximum concentration value displayed blinking indicates the measured value is outside the limits of the method. Verify that the sample does not contain any debris. Dilute the sample and repeat the measurement.

2.00

Battery Low: Battery level is too low for the checker to function properly. Replace the battery with a new one.

bAt

Drained Battery: The battery is drained and must be replaced. Replace the battery with a new one and restart the checker.

bAd

bAt

APPENDIX D

INFRASTRUCTURE CONCERN FIELD FORM

Anne Arundel County Infrastructure Concern Field Form

Local Outfall ID _____

Personnel _____

Date _____

Time _____

Structure Type: Inlet Manhole Endwall Endsection Projecting Pipe Other_____

Structural Conditions:

Buried pipes or structures

Undermined/collapsed/broken infrastructure

Damaged infrastructure

Blocked infrastructure – trash/debris/sediment

Metal Corrosion

Severe outfall or downstream channel erosion

Missing/damaged inlet grates or manhole lids

Sinkholes or embankment issues

Other Condition: _____

Comments: _____

Photographs: _____

APPENDIX E
UPLAND POLLUTANT FIELD FORM

Anne Arundel County Upland Pollutant Field Form

Local Outfall ID _____
Com./Ind. Polygon ID _____
Personnel _____
Date _____
Time _____

Categories:

- Shopping Center/Retail
- Restaurant
- Commercial Storage Yard
- Auto Repair
- Materials Recycling Facilities
- Carwashes/Mobile Carwashes
- Office Building
- Auto Salvage Yards/Junkyards
- Construction Site
- Residential
- No Issues Observed
- Other Issues

Subcategories:

- Exposed Materials
- Exposed Stockpile
- Automotive oil/leaks
- Dumpsters
- Housekeeping
- Vehicle Washing
- Vehicle Maintenance
- Commercial Wastewater
- Dumping
- Oil/Grease
- Sewage
- Sediment Runoff
- Household Hazardous Waste
- Other Issues

Business Name: _____

Address/Location: _____

Comments: _____

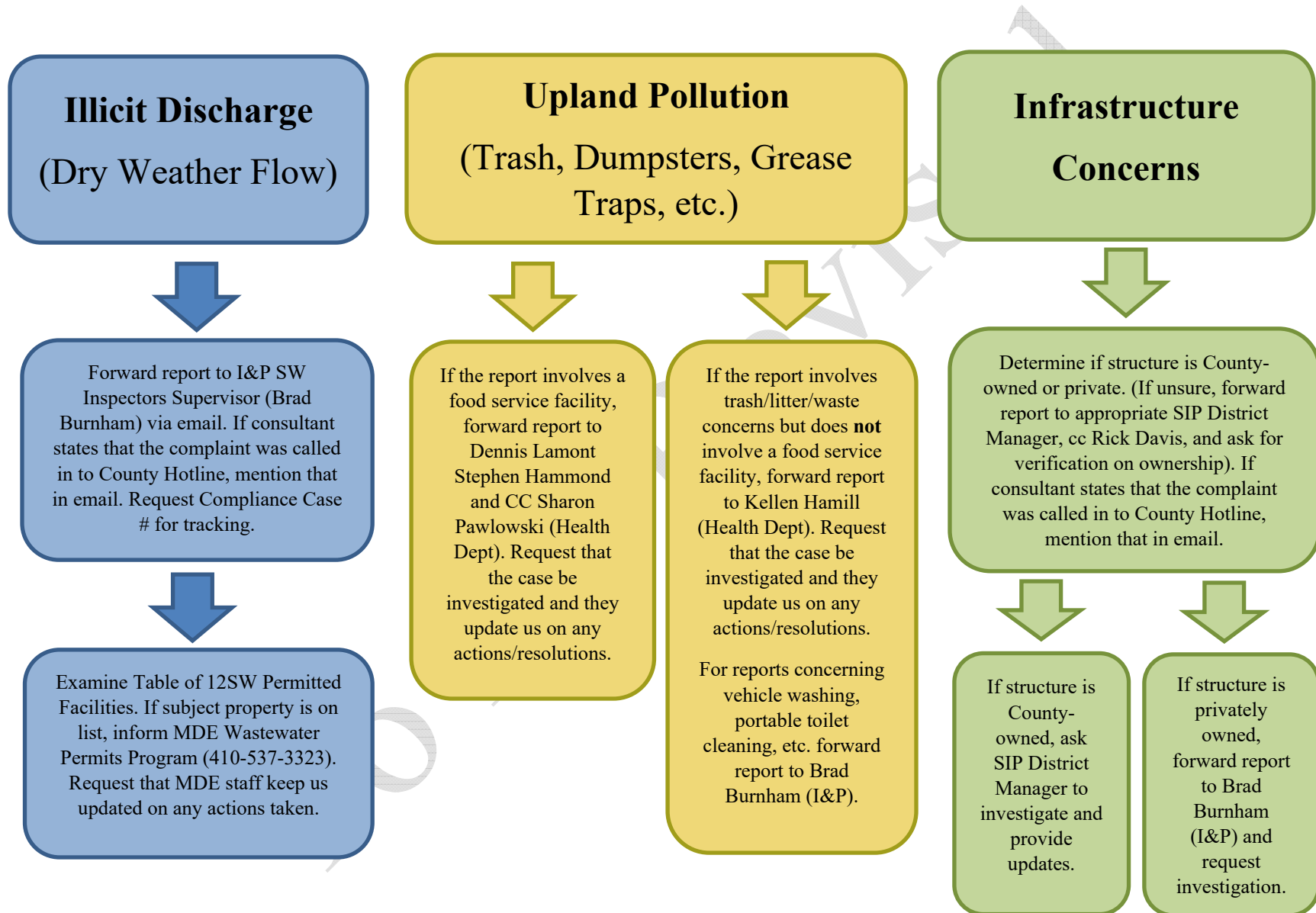
Photographs: _____

APPENDIX F

IDDE REPORTING FLOW CHART FOR BWPR STAFF

Illicit Discharge Detection and Elimination

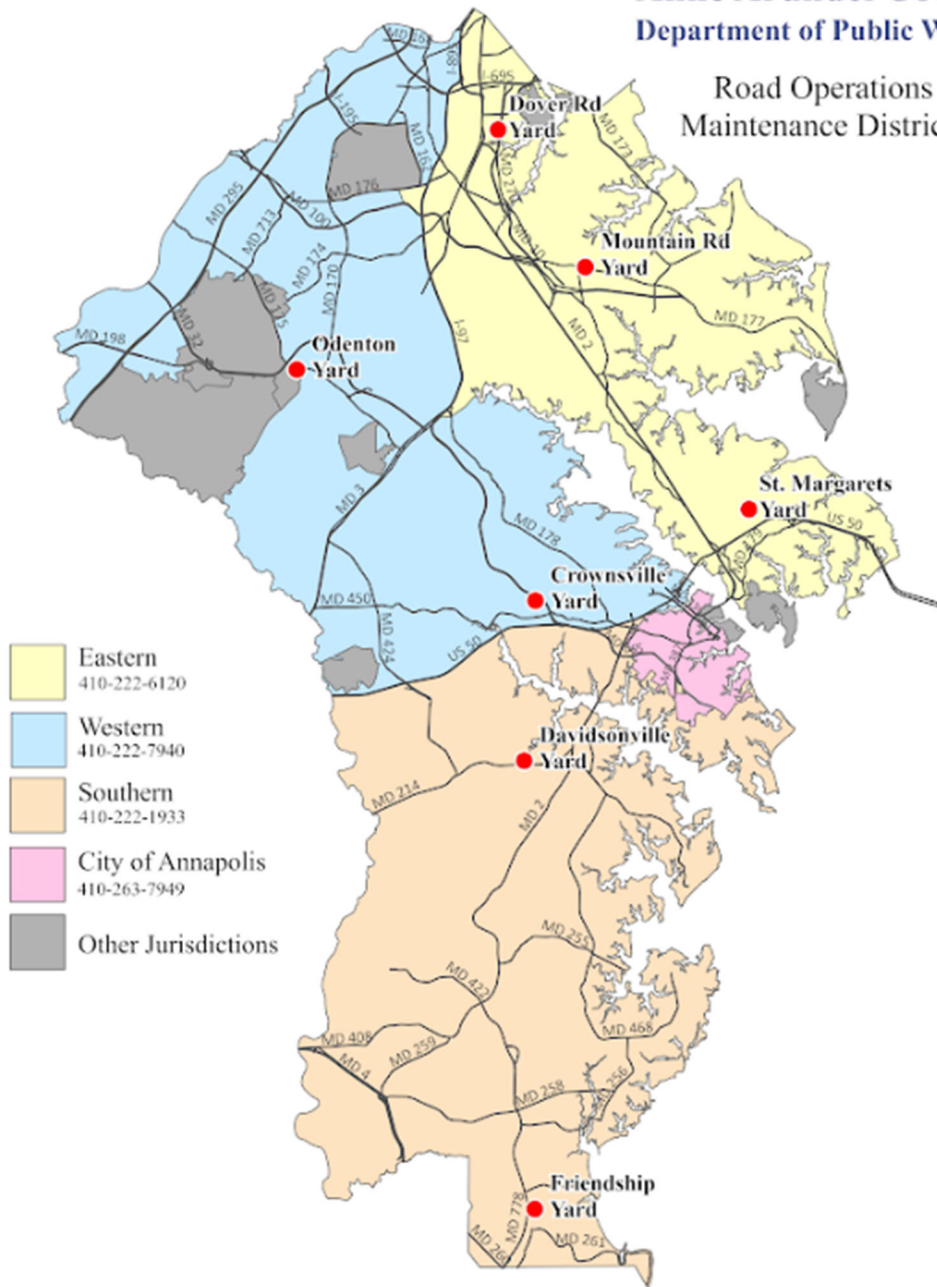
Incident Reporting Flow Chart



APPENDIX G
SIP DISTRICT MAP

**Anne Arundel County
Department of Public Works**

**Road Operations
Maintenance Districts**



- Eastern
410-222-6120
- Western
410-222-7940
- Southern
410-222-1933
- City of Annapolis
410-263-7949
- Other Jurisdictions

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