

ILLICIT DISCHARGE DETECTION AND ELIMINATION MANUAL



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Introduction

Illicit Discharge Detection and Elimination

This manual describes the procedures that should be used to develop an IDDE program for a small MS4. Development of an IDDE program should be based on the specific needs of each municipality and the watersheds it falls within. Each community will develop its own unique IDDE program.

This manual offers Program Managers a six-step process to develop a customized IDDE program:

1. Locate priority areas likely to have illicit discharges
2. Map the storm drain system
3. Develop an illicit discharge detection program
4. Develop procedures to trace the source of an illicit discharge
5. Develop procedures to remove a source
6. Evaluate the IDDE program effectiveness.

This manual provides guidance how to complete each of these six steps, resulting in an effective IDDE program that fulfills the intent of the General Permit.

ILLCIT DISCHARGE DETECTION AND ELIMINATION

Allowable Non-Stormwater Discharges

- Water line flushing
- Landscape irrigation
- Diverted stream flows
- Rising ground waters
- Uncontaminated pumped ground water
- Discharge from portable water sources
- Foundation drains
- Air conditioning condensation
- Irrigation water, springs
- Water from crawl space pumps
- Footing drains
- Lawn watering
- Flows from riparian habitats and wetlands
- De-chlorinated swimming pool discharges
- Street wash water
- Residential building wash waters, without detergents

USEPA defines an illicit discharge as any discharge to an MS4 that is not composed entirely of stormwater or the allowable non-stormwater discharges such as water from fire fighting activities, infiltrating ground water, etc. (See list.)

In most communities, the municipal separate storm drain systems discharge to the receiving water bodies without treatment. Therefore it is particularly important that only stormwater is discharge and to ensure that illicit discharges are eliminated from the system. The General Permit requires that an IDDE program be developed by the regulated municipalities. While most municipalities have programs in place to inspect and address combined sewers or sanitary sewers, few municipalities have procedures in place related to an IDDE program. One guidance manual was reviewed and used in developing this, Standard Operating Procedure: the Center for Watershed Protection's (CWP) Illicit Discharge Detection and Elimination – A Guidance manual for Program Development and Technical Assessments (2004).

This standard operating procedure provides managers with the necessary information to create an effective IDDE program in accordance with the USEPA General Permit. Program Managers should first have a good understanding of the types of illicit discharges that may be encountered. Section 1.1 provides a description of various types of illicit discharges that may be present in a community. The next sections address additional steps to creating an effect IDDE program: locating priority areas within a community (Section 1.2), creating a map of the storm drain system (Section 1.3), detecting illicit discharges (Section 1.4), tracing the illicit discharge back to its source (Section 1.5), removing the illicit discharge (Section 1.6), and tracking illicit discharges (Section 1.7). Lastly, Section 1.8 provides an approach to evaluating the overall IDDE program.

1.1 TYPES AND SOURCES OF ILLICIT DISCHARGES

The USEPA defines an illicit discharge as *any discharge to a regulated small MS4 or to the waters of the State that does not consist entirely of stormwater or allowable non-stormwater discharges*. Illicit discharges are often categorized according to frequency, which provides information about the source and helps determine which tracing techniques may be useful in locating the discharge. The following three categories provide a good basis for defining illicit discharges:

Common examples of
illicit discharges in Provo
Utah:

- Leaves being raked into the storm drain.
- Dirt being transferred from a construction site to the roadway.
- Garbage left in the street or blowing into the storm drain.
- Wash water running into the storm drain.

1. Transitory Illicit Discharges Typically one-time events resulting from spills, breaks, dumping, or accidents. Transitory illicit discharges are often reported to an authority through a citizen complaint line or following observation by a municipal employee during regular duties. Because they are not recurring, they are the most difficult to identify, trace, and remove. The best method to reduce transitory discharges is through general public education, education of municipal response personnel, tracking of discharge locations, and enforcement of an illicit discharge ordinance.
2. Intermittent Illicit Discharge Occur over a period of time (several hours per day, or a few days per year). Intermittent discharges can result from legal connections to the storm drain system, such as a legal sump pump connection that is illegally discharging anything other than groundwater. Intermittent discharges can also result from activities such as drum washing in exterior areas. These types of discharges are more likely to be discovered, and are less difficult to trace and remove, but can still present significant challenges. These discharges can have large or small impacts on water bodies depending on pollutant content and the size of the receiving water body.
3. Continuous Illicit Discharges Typically the result of a direct connection from a sanitary sewer, overflow from a malfunctioning septic system, inflow from a nearby subsurface sanitary sewer that is malfunctioning, or an illegal connection from a commercial or industrial facility. Continuous discharges are usually easiest to trace and can have the greatest pollutant load (CWP 2004).

It is also important to consider land use when looking for illicit discharges. Table 1-1 provides a list of conditions and activities that may produce transitory and intermittent discharges, along with associated sources and land use. Table 1-2 lists possible sources of continuous discharges and their associated land use.

TABLE 1-1

Land Use	Likely Source Locations	Condition or Activity that Produces Discharge
RESIDENTIAL	<ul style="list-style-type: none"> • Apartments • Multi-family • Single family detached 	<ul style="list-style-type: none"> • Driveway cleaning • Dumping/spills (e.g., leaf litter and RV/boat holding tank effluent) • Equipment/vehicle wash-downs • Septic system maintenance • Swimming pool discharges
COMMERCIAL	<ul style="list-style-type: none"> • Campgrounds/RV parks • Car dealers/rental car shop • Car washes • Laundry/Dry cleaning • Gas stations/auto repair shops • Marinas • Nurseries • Oil change shops • Restaurants • Swimming pools 	<ul style="list-style-type: none"> • Building maintenance • Dumping/spills • Landscaping/grounds care • Outdoor fluid storage • Parking lot maintenance • Vehicle fueling • Vehicle maintenance/repair • Wash-down of greasy equipment and grease traps.
INDUSTRIAL	<ul style="list-style-type: none"> • Auto recyclers • Beverages and brewing • Construction vehicle washout • Distribution centers • Food processing • Garbage truck washouts • Marinas, boat building and repair • Metal plating operations • Paper and wood products • Petroleum storage and refining • Printing 	<ul style="list-style-type: none"> • Industrial process water or rinse water • Loading and un-loading area wash-downs • Outdoor material storage
MUNICIPAL	<ul style="list-style-type: none"> • Airports • Landfills • Maintenance depots • Municipal fleet storage areas • Ports • Public works yards • Streets and highways • Golf courses • Schools 	<ul style="list-style-type: none"> • Building maintenance (power washing) • Dumping/spills • Landscaping/grounds care • Outdoor fluid storage • Parking lot maintenance (power washing) • Road maintenance • Emergency response • Vehicle fueling • Vehicle maintenance/repair • Vehicle washing

TABLE 1-2 LAND USES, LIKELY SOURCE LOCATIONS AND ACTIVITIES THAT CAN PRODUCE <u>CONTINUOUS</u> ILLICIT DISCHARGES	
LAND USE	CONDITION OR ACTIVITY THAT PRODUCES DISCHARGE
RESIDENTIAL	<ul style="list-style-type: none"> Failed sanitary sewer infiltrating into storm drain Sanitary sewer connection into storm drain Failed septic systems discharging to storm drain system
COMMERCIAL/ INDUSTRIAL	<ul style="list-style-type: none"> Failed sanitary sewer infiltrating into storm drain Process water connections into storm drain Sanitary sewer connection into storm drain
MUNICIPAL	<ul style="list-style-type: none"> Failed sanitary sewer infiltrating into storm drain Sanitary sewer connection into storm drain

SOURCE (TABLES 1-1 and 1-2): Modified from Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments, Center for Watershed Protection, 2004, p. 12, Table 2.

Once a Program Manager understands the types of illicit discharges that might be present in his/her community, the manager can begin to review existing information that will identify where illicit discharges are likely to be found. An effective detection and elimination program will address all types of illicit discharges.

1.2 LOCATING PRIORITY AREAS

Section 1.2 provides a methodology for locating priority areas that have a high potential for illicit discharges. Municipalities should conduct this process once during their first permit cycle, and then evaluate and revise the process for each subsequent permit cycle as illicit discharges are removed (described in 1.6).

To locate priority areas within a community, the Program Manager should:

1. Become familiar with the community's water bodies, it's watersheds, local water quality classifications, and current water quality in order to divide the community into discrete areas that can be prioritized;
2. Gather and evaluate available information that will provide clues as to where in the community illicit discharges might be found (i.e. older neighborhoods, industrial parks, gentrified neighborhoods); and
3. Use existing information to assess where illicit discharges may be found and what water bodies are particularly sensitive.

1.2.1 REVIEW AVAILABLE INFORMATION

Priority areas for IDDE will vary from one community to another depending on water quality conditions, land use, etc. a relatively simple desktop assessment of available community information can provide many clues as to where illicit discharges may be occurring. The following is a list of resources that should be collected and reviewed and a brief description of factors to consider during the prioritization process:

- Zoning maps – industrial areas with high density development may have a high illicit discharge potential.
- Locations of previous illicit discharges – areas with historical illicit discharge reports or previous citizen complaints should be considered high priority.
- Approximate density of known outfalls per stream lime – areas with a high density of outfalls should be considered high priority.
- Age of infrastructure/development – older areas of the community should be considered high priority.
- Location of public sanitary sewer/age of sewer/date of separation – older areas that were put on public sewer or separated long ago should be considered high priority.
- Location of areas on septic systems – older areas on septic systems should be considered high priority.
- Water quality information.

It should be noted that the above list is not exhaustive. Program managers may be a way of additional data pertinent to locating high priority areas in their community. Similarly, Program Managers may want to exclude some of this information if it is not relevant to identifying priority areas in their community. The evaluation can be qualitative based on the Program Manager's personal knowledge and professional judgment.

1.2.2 EVALUATE ILLICIT DISCHARGE POTENTIAL

Once the Program Manager has an understanding of the water bodies in the community, and has acquired and reviewed the available information, he/she can compile and evaluate the information to define which portions of the municipality are high, which are Medium, and which are Low priority.

Once the IDDE prioritization process is complete the subsequent list can be used to determine:

- Which area should be mapped first;
- Which techniques will be used to develop community-specific detection techniques, and
- How to prioritize storm drain system maintenance work.

1.3 MAPPING THE SYSTEM

This section will focus on developing a complete map of the storm drain system using the geographic information systems (GIS), since most of Storm Water Phase II regulated communities currently use GIS to create their maps.

A sample strategy for mapping a small MS4 community is as follows:

1. Review/Office Preparation:
 - a. Check existing available mapping data in high priority areas first, then in medium priority areas, then low priority areas (planning board submittals or as-built are a good resource for locations).

- b. Decide on and document a numbering or naming system for outfalls and other structures. Establishment of a simple unique numbering system (SWO-0001, SWO-0002, etc.) will facilitate future inspections and documentation of maintenance.
- c. Select a method to mark outfalls in the field (using spray paint, paint pen, signs, or markers), and place an order for necessary materials. (Marking the outfalls ensures they can be consistently identified in the field, but is not required).
- d. Obtain equipment for mapping (see Equipment List).
- e. Develop a schedule for completing (use town or city parcel grid or watershed areas defined in section 1.2).
- f. Conduct preliminary reconnaissance to evaluate if watercraft is necessary to view the banks of the water body.

2. Field Check:

- a. Using existing paper maps as a basis for locations, field personnel should start a mapping program by walking all named water bodies within a given area of the community and collecting outfall location and design information using global positioning system (GPS) equipment capable of sub-meter (approximately 3-foot) accuracy. Use of a data logger and data collection software, such as Pathfinder®, will allow the generation of GIS files that will be useful for many years. Appendix A contains an Outfall Characteristics Form.
- b. Collect dry weather inspection information whenever possible. A Dry Weather Outfall Inspection Form is contained in Appendix A. Dry weather discharge information can either be collected on the paper forms for manual entry into a separate database at a later time, or can be directly entered into a database on a laptop or the data logger on-site.
- c. Mark the outfall with its identifier for future location and easy reference using spray paint, paint markers, or pre-manufactured signs.

3. Develop Initial GIS Maps:

If the storm drain system is being mapped as a part of a larger GIS database for the municipality, the data collection can be displayed with any of the existing data sets. If the storm drain system is not part of the larger data set, the Program Manager must determine what background the maps should be displayed on. Many communities prefer mapping to be displayed on aerial photographs. Aerial photos are one of the most interesting background files to use to display information; however their large file size can make them impractical. An alternative way to display the mapped information consists of downloading either United States Geological Survey (USGS) quadrangles, or a set of roads, political boundaries, water bodies, and watershed information.

4. Review and Field Check other structures (catch basins, culverts, pipes ditches, drain manholes, etc)

- a. Scan and digitize any paper maps of the system into the GIS-compatible files or use aerial photographs to identify point structures. An efficient way to do this is to send field staff along with a catch basin cleaning crew to confirm catch basin locations, to observe the interior of the structures, to determine which pipes enter and leave the structure, and to obtain design information on the pipes and structures. A GPS unit with a data logger can be used to record the location and design information related to the structures
- b. Field check digitized data.
- c. Assign unique identifiers to remaining structures (CB00X for catch basins, DMH-00X for drain manholes, etc), and a set of attributes and allowable fields to describe the structure.

5. Incorporate Field Data into GIS and Revise as Necessary:

Once the GPS data files have been converted into GIS layers, and revised maps have been produced, these maps should be proofed to assess their accuracy and completeness. The reviewer should document any additional data requirements, and correct any errors in the information collected. A relational database can help illustrate connections between pipes, outfalls, and other structures.

It should be noted that there are many possible mapping strategies for a given municipality depending on the amount and format of available storm drain system data and the resources that are available. The strategy described above is presented as one way to complete mapping. For a small to medium size community (6,000 to 10,000 people), this process could take approximately two years to complete depending upon availability of resources and land use.

1.4 DETECTION

Illicit discharge can be detected in many ways. Determining which detection methods are appropriate for a community can be a relatively simple process. An example of this selection process is provided as Table 1-5. As Program Manager review sections 1.4.1 through 1.4.5, they should complete Table 1-6 to document which types of inspections are appropriate for different areas of the community, as well as the frequency of inspections.

1.4.1 Dry Weather Inspections During Mapping (or initial inspection)

The Dry Weather Outfall Inspection Form (see Appendix A) can be used during mapping to detect continuous and intermittent discharges. The form should be completed whenever evidence of an illicit discharge, such as significant flow during dry weather, the presence of raw sewage indicator, staining, or residue, is observed. If the municipality is using paper forms to document inspections, they should complete a Dry Weather Outfall Inspection Form even if there is no evidence of an illicit discharge.

1.4.2 Long-Term Dry Weather Inspections

Long-term, regular inspections of outfalls are a primary part of an effective IDDE program. Regular inspections will not be significantly different from inspections conducted during mapping. The Dry Weather Outfall Inspection Form (see Appendix A) can be used, and the major difference will be that a crew or inspector will have historical data to work with to make assessments. These inspections can be recorded in an electronic database (recommended, especially for medium to large communities) or paper forms can be kept (which may be appropriate for smaller communities).

The Program Manager should develop a schedule of long-term inspections for outfalls. The CWP recommends inspecting all outfalls once, at a minimum, during the first permit cycle. Further inspections should be conducted as personnel and funds allow. Long-term inspections should be conducted during dry weather to maximize the potential to observe evidence of illicit discharge. While winter inspections can be productive, personnel should be aware of the potential for snowmelt during warmer days. Use of interns can be cost effective, but interns must be trained in safety and identification techniques.

1.4.3 Opportunistic Inspections

Most public works crews conduct their regular duties in and around the storm drain system. A Program Manager may elect to have crews conduct outfall inspections on a formal basis (actually bringing an inspection form and equipment) while performing other work, or the Program manager may elect to have crews informally “keep a look out” for illicit discharges. If an employee observes evidence of an illicit discharge during an informal or non-routine inspection, he/she should collect as much information about the potential illicit discharge as possible then contact his/her supervisor or dispatch office so that appropriate action can be taken. The Incident Tracking Sheet (see Appendix A) can be used to collect the information observed. While it may not be reasonable to expect all public works employees to have copies of the form at all times, there are ways to collect the information:

- The person observing the discharge can provide the information verbally to dispatch or the supervisor, who can then complete the Incident Tracking Sheet;
- The person can log as much information as they can recall onto the form upon returning to the office; or
- A third party (such as a code enforcement officer) dedicated to inspecting and tracing illicit discharges can be sent to the location as soon as possible where the potential illicit discharge was observed to collect the necessary information directly on the form.

It is important to collect as much information as possible at the time of initial observation because of the likelihood that a discharge may be transitory or intermittent. Initial identification of the likely or potential sources of the discharge is also very important.

TABLE 1-3: EXAMPLE WORKSHEET TO DEVELOP A DETECTION PROGRAM		
TYPE OF DETECTION PROGRAM	RETAINED/ELIMINATED FROM MUNICIPAL IDDE PROGRAM (PROVIDED DISCUSSION)	FREQUENCY
INSEPCIONS DURING MAPPING OR INITIAL INSPECTIONS		
AREA A – CLOUD LAKE WATERSHED	RETAINED – Mapping scheduled	NOT APPLICABLE
AREA B		
AREA C		
LONGER TERM INSPECTIONS		
AREA A – CLOUD LAKE	RETAINED – Low priority watershed	EVERY 2 YEARS
AREA B		
AREA C		
OPPORTUNISTIC INSPECTIONS		
CITIZEN CALL-IN PROGRAM		
SEPTIC SYSTEM INSPECTIONS		
AREA A – CLOUD LAKE WATERSHED	ELIMINATED – This area was recently sewered to eliminate all septic systems.	
AREA – BEAR BROOK WATERSHED	RETAINED – High priority watershed	OPPORTUNISTIC
AREA C		

INSTRUCTIONS: This form is for Program Managers to determine which detection methods are appropriate for their community. **Review** Sections 1.4.1-1.4.5 as you **complete** this table. Fill in the names of the different areas of your community (boxes labeled Area A – Area C) for each detection program (e.g. inspections during mapping, longer term inspections, etc). **Comment/Discuss** whether the diction program for each area should be retained or eliminated. Note the frequency of inspections, if applicable.

**TABLE 1-4:
EXAMPLE WORKSHEET TO DEVELOP A DETECTION PROGRAM**

TYPE OF DETECTION PROGRAM	RETAIN/ELIMINATED FROM MUNICIPAL IDDE PROGRAM (PROVIDE DISCUSSION)	FREQUENCY
INSPECTIONS DURING MAPPING OR INITIAL INSPECTION		
AREA A -		
AREA B -		
AREA C -		
LONGER TERM INSPECTIONS		
AREA A -		
AREA B -		
AREA C -		
OPPORTUNISITC INSPECTIONS		
CITIZEN CALL-IN PROGRAMS		
SEPTIC SYSTEM INSPECTIONS		
AREA A -		
AREA B -		
AREA C -		

INSTRUCTIONS: This form is for Program Managers to determine which detection methods are appropriate for their community. **Review** Sections 1.4.1-1.4.5 as you **complete** this table. Fill in the names of the different areas of your community (boxes labeled Area A – Area C) for each detection program (e.g. inspections during mapping, longer term inspections, etc). **Comment/Discuss** whether the diction program for each area should be retained or eliminated. Note the frequency of inspections, if applicable.

1.4.4 Citizen Call-In Inspections

A citizen call-in program is an effective way to identify illicit discharges. Most municipalities have citizen comment or complaint lines that are publicized in the community. To maximize the effectiveness of citizen call-ins, dispatch personnel should be instructed on the use of the Illicit Discharge Hotline Incident Tracking Sheet (Appendix A) in order to collect as much information as possible at the time of the report. Dispatch personnel should also be instructed as to where to direct the information gathered from the tracking sheet so that appropriate action is taken. The Program Manager should identify who should be trained, and where the call-in line will be publicized in the discussion column. For communities with active websites and dedicated webmasters, an on-line forum could be incorporated into a storm water page.

1.4.5 Septic System Inspections

Septic system inspections can be conducted in older rural or low density areas that are prone to failed septic systems. Some communities may elect to conduct screening inspections around populated areas, which are particularly susceptible to the adverse effects of a failed septic system. The Program Manager should review his/her community prioritization and determine if any areas that may have high risk of failed septic systems discharging to the storm drain system, they may decide to initiate a screening program for the area.

Indicators of septic system failures include wet areas on the ground or disagreeable odors near the leach field. If municipal personnel observe these indicators near a leach field, they should coordinate with their local health officer to initiate enforcement, to have the owner repair the septic system (or connect to a sanitary sewer). Communities having difficulty with enforcement can refer the failure to Provo City for assistance.

1.5 TRACING ILLICIT DISCHARGES

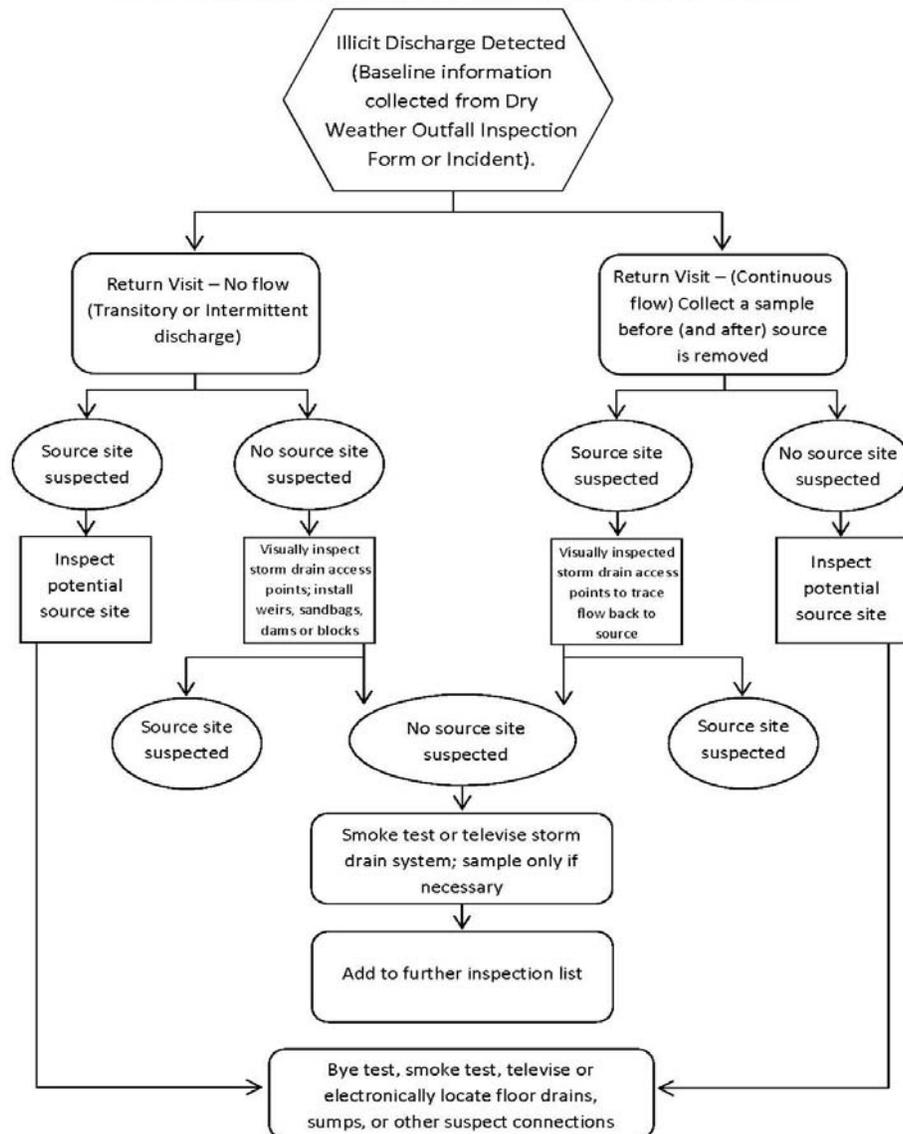
Once an illicit discharge has been reported or detected through an inspection, the next step is to locate the source. Selection of tracing techniques will depend on the type of illicit discharge detected, the information collected during initial discovery and observation (whether through an inspection by a municipal employee or through a citizen call-in) and the resources/technology available to the municipality. A single technique may be used or several techniques may need to be combined to identify the source of the discharge. Figure 1-1 presents a flow chart for selecting tracing techniques that can be applied to the two categories of potential illicit discharges: (1) present at the location (where the illicit discharge was initially reported), and (2) continuous discharges (where upon returning to the site a continuous flow is present and the flow may be more easily traced to its source). Each of these circumstances is described below.

1. **Transitory or Intermittent Discharges:** These conditions may occur as a result of an inspection or a citizen complaint. While initial information may have been collected regarding the potential illicit discharge, a return trip may show that the discharge was either intermittent or transitory (e.g., no flow is present upon return to the site). The investigation techniques that should be used will depend on whether or not a potential source location is identified during the initial observation:
 - o **Potential Source Identified:** If a potential source for the illicit discharge was initially identified, steps should be taken to investigate the potential source site, such as inspecting the site and storm drain system in the vicinity of the site. If floor drains, sumps, or other suspect discharge locations are observed during this inspection, dye testing, smoke testing, electronic location of subsurface pipes, or televising may be used. These techniques

should definitively show whether the suspect site was the source of the illicit discharge.

- **Potential Source not Identified:** If no source site is suspected, and only the general area of the illicit discharge is known, it may be possible to trace the evidence of the illicit discharge by visual inspection of the storm drain access points. If this catch basin/manhole inspection technique is not fruitful, some interim steps could be taken to try to trap water from an intermittent discharge. For example, sand bagging, damming or block testing of selected storm drain access points, combined with installation of an optical brightener trap to assess if detergents are present in a discharge, can help reveal the source of the discharge. If these techniques have no positive result (no water pools behind the weir or sand bag), the discharge was likely transitory (one time only), and it may not be possible to determine its origin. In this case, the location of the originally reported illicit discharge should be added to a regular inspection program to provide for the possibility of future incidents. If the original report of the illicit discharge was severe or gross pollution, then smoke testing or televising of the storm drain system may be warranted.

**FIGURE 1-1
FLOW CHART TO SELECT TRACKING TECHNIQUES**



2. **Continuous Discharge:** Tracing continuous discharges is typically more fruitful than tracing transitory or intermittent discharges. The primary difference between tracing a transitory or intermittent discharge and tracing a continuous discharge is that sandbagging and weirs are not required for a continuous discharge. Visual observation of the system access points should reveal where the flow is coming from. Just as for tracing a transitory or intermittent discharge, if visual inspections are not fruitful in identifying the source and the original report was severe or gross pollution, then televising, smoke testing, or sample collection would be warranted. Provo city recommends collecting a grab sample of bacterial analysis from any pipe with a significant flow, even if the discharge appears to be clear.

While these conditions may not cover the universe of discharges that may be discovered, they should provide general guidance on the selection of tracing techniques. The following subsection describes in more detail each of the techniques that can be applied, including their advantages and disadvantages.

1. **Visual Inspection at Manholes/Catch Basins:** This tracing technique is typically used when there is no suspected source site. It is the most cost effective and efficient method of tracing. Structures should be systematically inspected starting at the initial detection location, gradually working upstream through the system. If the crew is tracking a continuous discharge, the inspections may be relatively easy, and the flow can be tracked back to its source. If the crew is attempting to track a transitory or intermittent discharge, the crew should make the following observations depending on the information provided from the initial identification: color and clarity of any discharge, staining or deposits on bottom of the structure; oil sheen, scum or foam on any standing fluids in sump of structure; odors, staining or deposits on inlet pipes and outlet pipes. Depending on what the crew is looking for, and what they find, they will progressively inspect additional structures until either a potential source is found, or no further evidence is found. If no further evidence is found the crew may elect to further assess some of the structures by installing sandbags or other damming devices to determine if the discharge recurs. Crews should use standard safety procedures when conducting these inspections such as cone placement and safety vests in traffic areas, confined space entry techniques (if entry is necessary), steel-toed boots, etc.
2. **Sampling Flowing Discharge:** As shown in Figure 1-1, samples should be collected only in the event a discharge is flowing through the outfall. Stagnant pools of water or sump water should not be sampled. DEQ can assist with the sampling. If the municipal staff will be collecting the sample, the staff should be trained in safety and proper collection techniques. Table 1-5 lists the parameters that a sample may be analyzed for and provides a general discussion of how the results may be interpreted. This table was taken from the CWP Manual (2004) which provides a more detailed discussion of sampling procedures and analysis of results. Sampling and analysis for many of the compounds should be completed by personnel trained in collection, handling, and preservation techniques to ensure accurate data. DEQ recommends collecting a sample when the discharge is initially found and after any source is removed. The sample collected after removing an illicit discharge can indicate if other illicit discharges are present

**TABLE 1-5
INDICATOR PARAMETERS USED TO DETECT ILLICIT DISCHARGES**

PARAMETER	DISCHARGE TYPES IT CAN DETECT				LABORATORY/ANALYTICAL CHALLENGES
	SEWAGE	WASHWATER	TAP WATER	INDUSTRIAL OR COMMERCIAL LIQUID WASTES	
AMMONIA	•	▪	○	▪	Can change into other nitrogen forms as the flow travels to the outfall
BORON	▪	▪	○	*	
CHLORINE	○	○	○	▪	High chlorine demand in natural waters limits utility to flow with very chlorine concentrations
COLOR	▪	▪	○	▪	
CONDUCTIVITY	▪	▪	○	•	Ineffective in saline waters, generally high variable
DETERGENTS - SUFACTANTS	•	•	○	▪	Reagent is hazardous waste
E. COLI ENTEROCOCCI TOTAL COLIFORM	▪	○	○	○	24-hour wait for results. Need to modify standard monitoring protocols to measure high bacteria concentrations
FLOURIDE **	○	○	•	▪	Reagent is a hazardous waste. Exception for communities that do not fluoride their tap water
HARDNESS	▪	▪	▪	▪	
pH	○	▪	○	▪	
POTASSIUM	▪	○	○		May need to use two separate analytical techniques, depending on the concentration
TURBIDITY	▪	▪	○	▪	

- Can almost always (>80% of samples) distinguish this discharge from clean flow types (e.g., tap water or natural water). For tap water, can distinguish from natural water.
- Can sometimes (>50% of samples) distinguish this discharge from clean flow types depending on regional characteristics, or can be helpful in combination with another parameter.
- Poor indicator. Cannot reliably detect illicit discharges, or cannot detect tap water.
- * Data are not available to assess the utility as a single parameter, but when combined with additional parameters (such as detergents, ammonia and potassium), it can almost always distinguish between sewage and wash water.
- ** Fluoride is a poor indicator when used alone, but can distinguish between wash water and sewage when combined with analysis for detergents, ammonia and potassium.

3. **Sandbagging or Damming:** Sandbagging and damming is typically only conducted when the discharge flow has ceased since initial detection. Application of this technique will show whether the discharge is one time only (no water pools behind the sandbag or dam) or intermittent (water pools behind the sandbag). CWP provides the following explanation:

This technique involves placement of sandbags or similar barriers such as caulk dams within strategic manholes in the storm drain network to form a temporary dam that collects any intermittent flows that may occur. Any flow collected behind the sandbag is then assessed using visual observations or by indicator sampling. Sandbags are lowered on a rope through the manhole to form a dam along the bottom of the storm drain, taking care not to fully block the pipe (in case it rains before the sandbag is retrieved). Sandbags are typically installed at junctions in the network to eliminate contributing branches from further consideration. If no flow collects behind the sandbag, the upstream pipe network can be ruled out as a source of the intermittent discharge. Sandbags are typically left in place for no more than 48 hours, and should only be installed when dry weather is in forecast. Sandbags should not be left in place during a heavy rainstorm. They may cause a blockage in the storm drain, or they may be washed downstream and lost. The biggest downside to sandbagging and damming is that it requires at least two trips to each manhole (CWP 2001, p. 157).

4. **Optical Brightener Monitoring Traps:** Optical brightener monitoring (OBM) traps can be used to trace intermittent or transitory discharges that result from washwater with detergent. Detergents usually contain optical brighteners that can be detected at high concentrations using this method. However, the traps only detect highly concentrated discharges. The detergent concentration required to be detected by the light is approximately the same as pure washwater from a washing machine. Consequently, OBM traps may be best suited as a simple indicator of the presence or absence of intermittent flow or to detect the most concentrated flows. The traps can be made using easily acquired materials.

The traps contain an absorbent, unbleached cotton pad or fabric swatch contained inside a wire mesh trap or section of small diameter (e.g. 2-inch) PVC pipe. The traps should be anchored to the inside of an outfall at the invert using wire or monofilament that is secured to the pipe itself. Rocks or bricks with holes can be used as temporary weights to hold the trap in place.

Field crews can retrieve the OBM traps after 24 to 72 hours of dry weather. OBM traps need to be retrieved before coming into contact with stormwater, which will contaminate that trap or wash it away. When placed under a long wave fluorescent ultraviolet or "black" light, an OBM trap will indicate if it has been exposed to detergents.

5. **Dye Testing:** Dye testing is typically conducted when a potential source site has been identified, and the crew is trying to determine whether the site has floor drains or other locations that connect and discharge to the storm drain system. Permission to access the site must be obtained before dye testing can be conducted. Verbal or written requests are both acceptable. The crew should review available sanitary sewer and storm drain maps before conducting the dye testing. The dye testing procedure consists of two steps: (1) discharging the dye into the suspect location, and (2) opening nearby storm drain and sanitary sewer manhole covers to determine where the dye discharges

too. This procedure is fairly effective for confirming direct connections into the storm drain system for short reaches. If a longer pipe network is being evaluated, charcoal packets can be left in selected structures and later collected and analyzed for the presence of the dye. If dye testing porcelain structures, tablets, or charcoal should be wrapped in tissue before depositing. When dye testing, the crew should keep in mind that each structure (sink, toilet, etc.) should be tested separately. Many times a single utility in a basement may be incorrectly connected to a stormdrain line instead of a sanitary line.

6. **Televising:** Televised video inspections are a useful technique when an illicit connection or infiltration from a nearby sanitary sewer is suspected, but little evidence of the illicit discharge remains behind. Two types of video cameras are available for use: (1) a small camera that can be manually pushed on a stiff cable through storm drains to observe the interior of the piping, or (2) a larger remote operated video camera on treads or wheels that can be guided through storm drains to view the interior of the pipe. Typically the operator of the camera has access to a keyboard or audio voice-over to record significant finding on the videotape that is produced for future review and evaluation.
7. **Smoke Testing:** Smoke testing is a useful technique for tracing intermittent discharges or continuous discharges that have no apparent source site. Smoke is introduced into the storm drain system, and emerges at locations that are connected to the system. Smoke testing works best for short reaches of pipe, or in situations where pipe diameters are too small for video testing. The center for Watershed Protection provides the following discussion on planning and executing smoke testing:

Notifying the public about the date and purpose of smoke testing before starting is critical. The smoke used is non-toxic, but can cause respiratory irritation, which can be a problem for some residents. Residents should be notified at least two weeks prior to testing, and should be provided the following information

- o Date testing will occur
- o Reason for smoke testing
- o Precautions they can take to prevent smoke from entering their homes or businesses
- o What they need to do if smoke enters their home or business, and any health concerns associated with the smoke
- o A number that residents can call to relay any particular health concerns (e.g., chronic respiratory problems)

Program Managers should also notify local media to get the word out if extensive smoke testing is planned (e.g., television, newspaper, and radio). On the actual day of testing, local fire departments and 911 call centers should be notified to handle any calls from the public

The basic equipment needed for smoke testing includes manhole safety equipment, a smoke source, smoke blower, and sewer plugs. Two smoke sources can be used for smoke testing. The first is a smoke “bomb” or “candle” that burns at a controlled rate and releases very white smoke visible at relatively low concentrations. Smoke bombs are suspended beneath a blower in a manhole. Candles are available in 30 second to three minute sizes. Once opened, smoke bombs should be kept in a dry location and should be used within one year.

The second smoke source is liquid smoke, which is a petroleum-based product that is injected into the hot exhaust of a blower where it is heated and vaporized. The length of smoke production can vary depending on the length of the pipe being tested. In general, liquid smoke is not as consistently visible and does not travel as far as smoke from bombs.

Smoke blowers provide a higher volume of air that forces smoke through the storm drain pipe. Two types of blowers are commonly used: "squirrel cage" blowers and direct-drive propeller blowers. Squirrel cage blowers are large and may weigh more than 100 pounds, but allow the operator to generate more controlled smoke output. Direct-drive propeller blowers are considerably lighter and more compact, which allows for easier transport and positioning.

Three basic steps are involved in smoke testing. First, the storm drain is sealed off by plugging storm drain inlets. Next, the smoke is released and forced by the blower through the storm drain system. Lastly, the crew looks for any escape of smoke above-ground to find potential leaks. Septic vents on rooftops are clear indicators of cross connections to the storm drain system.

One of three methods can be used to seal off the storm drain. (1) Sandbags can be lowered into place with a rope from the street surface. (2) Alternatively, beach balls that have a diameter slightly larger than the drain can be inserted into the pipe. The beach ball is then placed in a mesh bag with a rope attached to it so it can be secured and retrieved. If the ball gets stuck in the pipe, it can simply be punctured, deflated and removed. (3) Finally, expandable plugs are available, and may be inserted from the ground surface.

Blowers should be set up next to the open manhole after the smoke is started. Only one manhole is tested at a time. If a smoke candle is used, crews simply light the candle and place it in a bucket, and lower it in the manhole. The two most common situations that indicate an illicit discharge are when smoke is seen rising from internal plumbing fixtures (typically reported by residents) or from sewer vents. Sewer vents extend upward from the sewer lateral to release gas buildup, and are not supposed to be connected to the storm drain system (CWP 2004, p. 165-166).

1.6 REMOVING ILLICIT CONNECTIONS AND DISCHARGES

Regulated MS4 communities are required to adopt an ordinance or other regulatory mechanism to prohibit illicit discharges to their storm drain system. The USEPA has developed sample ordinance for use by the regulated MS4s which describe enforcement procedures that can be taken in the event of discovery of an illicit discharge. This section describes the procedures that should be taken for removal assuming an ordinance has been adopted by the community.

Table 1-6 summarizes the procedures that should be followed to ensure a timely and complete removal depending on the types of illicit discharges that may be discovered and the various responsible parties. For most cases, the enforcement authority for the ordinance will coordinate discharge removal.

TABLE 1-6 NOTIFICATION AND REMOVAL PROCEDURES FOR ILLICIT DISCHARGES INTO THE MUNICIPAL SEPARATE STORM SEWER SYSTEM.			
FINANCIALLY RESPONSIBLE PARTY	SOURCE IDENTIFIED	ENFORCEMENT AUTHORITY	PROCEDURE TO FOLLOW
Private Property Owner	One-time illicit discharge (e.g., spill, dumping, etc)	Ordinance enforcement authority (Code Enforcement Officer)	<ul style="list-style-type: none"> ○ Contact Owner ○ Issue Notice of Violation ○ Issue fine
Private Property Owner	Intermittent or continuous illicit discharge from legal connection	Ordinance enforcement authority (Code Enforcement Officer)	<ul style="list-style-type: none"> ○ Contact Owner ○ Issue Notice of Violation ○ Determine schedule for removal ○ Confirm removal
Private Property Owner	Intermittent or continuous illicit discharge from illegal connection or indirect (infiltration or failed septic)	Plumbing Inspector	<ul style="list-style-type: none"> ○ Notify plumbing inspector
Municipal	Intermittent or continuous illicit discharge from illegal connection or indirect (failed sewer line)	Ordinance enforcement authority (Code Enforcement Officer)	<ul style="list-style-type: none"> ○ Issue work order ○ Schedule removal ○ Remove connection ○ Confirm removal
Exempt 3 rd Party (see Section 1.6.4)	Any	USEPA	<ul style="list-style-type: none"> ○ Notify Exempt third party and USEPA of illicit discharge

The following subsections address the issues of financial responsibility for removal (Section 1.6.1), forms and procedures that can be used in association with issuing a Notice of Violation (NOV) (Section 1.6.2), circumstances in which a municipality can take emergency action for discharges that are a threat to human health or the environment (Section 1.6.3), and procedures to follow when an illicit discharge from an exempt party is identified (Section 1.6.4)

1.6.2 *Financial Responsibility*

Once an illicit discharge's source has been identified, the financial responsibility of removing it must be determined. The following describes three cases that might be encountered:

1. The illicit discharge was a private party dumping into the storm drain system (a transient discharge). In this case, the municipality's ordinance would allow a Notice of Violation to be issued and a fine to be imposed.
2. The illicit discharge originated from a legal connection to the storm drain system (transient, intermittent, or continuous). For example a washing machine discharging through a basement sump that was a municipally approved connection to the storm drain system would be considered an illicit discharge. The connection was legal, and the municipality's ordinance does not require disconnection. The ordinance requires only that the washing machine be disconnected from the sump discharge. The sump connection to the storm drain system, that was legally made, can remain. A Notice of Violation could be issued and a fine could be imposed.
3. The illicit discharge resulted from an illegal connection (i.e., a connection that violates state plumbing codes. For intermittent or continuous discharges that are the result of an illegal direct connection into the storm drain system, the cost for disconnection will fall to either the property owner of the illegal connection or the municipality, depending on the circumstances of the connection. For example, if the connection was incorrectly applied during a separation project conducted by the municipality, the cost to correct the connection should be borne by the municipality if the connection was the result of a private contractor working for the resident, the resident would be financially responsible for correcting the connection. Similarly, if the illicit discharge is the result of a failed sanitary sewer line, the party responsible for the failed sanitary sewer line must pay for the correction.

1.6.2 *Notice of Violation*

For violations of the municipal ordinance, most municipalities will want to issue a Notice of Violation. Although most code enforcement officers will have their own forms, a blank letter is provided for use in Appendix A. It should be noted that the NOV describes a schedule for the removal to be completed, as well as a summary of any agreements between the parties.

1.6.3 *Emergency Suspensions*

A community's ordinance might allow a suspension of access to the storm drain system for discharges that present "imminent and substantial danger to the environment or to the health or welfare of persons, or to the storm drain system". Suspension may include blocking pipes, constructing dams, or taking other measures on public ways or public property to physically block the discharge.

1.6.4 *Discharges from Exempt Parties*

Several categories of facilities are regulated by the USEPA for stormwater discharges under other permits. Because these facilities are already responsible to one enforcement authority for storm water discharges, the municipality can exempt them from their municipal ordinance. If a municipality encounters an illicit discharge that is suspected or determined to be coming from an exempt party that is regulated under some other stormwater regulation, the municipality should notify both the suspected discharger and the enforcement authority for that discharger. The notification can be verbal or in writing. Most municipalities have prior experience working with other enforcement authorities for suspected violations of either state or federal law.

The following is a brief list of parties that are regulated under an alternate storm water program:

TABLE 1-7: EXEMPT FACILITIES		
EXEMPT FACILITY	ALTERNATE REGULATION THEY ARE SUBJECT TO	ENFORCEMENT AUTHORITY

As shown in Table 1-7, if a municipality identifies that an illicit discharge has come from one of these facilities, they should notify both the discharger and the enforcement authority verbally or in writing of the activity. Standard Industrial Classification (SIC) codes for NPDES Stormwater Multi-Sector General Permit (MSGP) Industrial Facilities are listed in Table 1-10

**TABLE 1-8
SIC CODES FOR MSGP INDUSTRIAL ACTIVITIES**

SECTOR NAME	SIC CODE LISTING
SECTOR A:	
SECTOR B:	
SECTOR C:	
SECTOR D:	
SECTOR E:	
SECTOR F:	
SECTOR G:	
SECTOR H:	
SECTOR I:	
SECTOR J:	
SECTOR K:	
SECTOR L:	
SECTOR M:	
SECTOR N:	
SECTOR O:	
SECTOR P:	
SECTOR Q:	
SECTOR R:	
SECTOR S:	
SECTOR T:	
SECTOR U:	
SECTOR V:	
SECTOR W:	
SECTOR X:	
SECTOR Y:	
SECTOR Z:	
SECTOR AA:	
SECTOR AB:	
SECTOR AC:	
SECTOR AD:	

1.7 TRACKING ILLICIT DISCHARGES

Developing a long-term tracking program can help Program Managers better understand the origins of illicit discharges and identify maintenance issues for the storm drain system structures. A tracking program will also facilitate evaluation of the overall IDDE program and will expedite annual reporting. An effective tracking program should address illicit discharges and maintenance issues resulting from the following:

- Citizen complaints
- Opportunistic inspections
- Regular longer term inspections
- Removal actions taken for illicit discharges

1.7.1 *Binder System*

Most communities have an existing work order system that can be used to track illicit discharges and their status. For smaller communities, an effective tracking system can be as simple as maintaining a three-ring binder with paper copies of all the forms that document the citizen complaints, inspections, and follow up information. The binder should be organized by priority area, with a listing in the front of each section or a map showing all the structures that are contained in that section. Because each structure is assigned a unique identifier, the information within the sections can be ordered by structure type and then by unique identifier. This method could become cumbersome for a medium or larger community.

Databases provide an excellent way to organize large quantities of information allowing retrieval at a later time of selected information as needed. Databases work nicely with GIS systems because the GIS database system can be related to a larger database that stores more rapidly changing data that will increase in volume over time.

1.7.2 *Electronic Database*

A distinct electronic database can be created that includes all the fields on the Dry Weather Outfall Inspection Form. The advantage to this tracking program is that the database can be easily linked to the GIS. Linking to a GIS allows mapping of illicit discharge locations, citizen complaint locations, and many other IDDE issues which can assist greatly in their overall program. Tables 1-9 and 1-10 contain simple attributes that can be used in the database. Small to medium communities can use an electronic spreadsheet instead of a database. Larger communities with more data may benefit from a database form of electronic data storage.

1.8 EVALUATING THE PROGRAM

Program Managers should evaluate their IDDE program at the end of each year to assess if it is effective and efficient and to identify where improvements should be made. Table 1-12 is a worksheet that Program Managers can use to evaluate the following components:

1. **Priority Areas:** Are the priority areas initially identified still appropriate? Considerations should include reviewing the priority worksheet to assess if any changes have occurred since the initial evaluation was completed (such as: Have additional illicit discharges been discovered in any of these areas? Has a new priority list come out naming new waterbodies as impaired?)
2. **Detection Program:** Is the detection program effective? Documenting the number of illicit discharges detected by the various detection mechanisms (inspections, citizen call-ins, opportunistic inspections) can help a Program Manager decide where to allocate resources.
3. **Tracing Techniques:** What tracing techniques were generally used? What tracing techniques were generally effective? In how many instances were visual inspections of the area sufficient to identify the source of the illicit discharges? Were there any times the equipment necessary to effectively trace an illicit discharge was not used because it was not available, or was too costly to obtain? Documenting the effectiveness of tracing techniques can help Program Managers be more efficient.

Although completing an evaluation of the overall IDDE program may be time consuming, its benefits may include reduced costs of future inspections and IDDE efforts. Keeping track of where illicit discharges are likely to occur and what techniques are useful can save a municipality time and money.

INSTRUCTIONS: THIS WORKSHEET IS FOR PROGRAM MANAGERS TO EVALUATE THEIR IDDE PROGRAM
<ol style="list-style-type: none">1. Fill in the names of the priority areas in your community2. List any factors that have changed since their initial prioritization (i.e. have additional illicit discharges been discovered in these areas, has a new priority list come out naming new water bodies as impaired, etc)3. Circle the applicable recommended change4. Fill in the number of illicit discharges identified and subsequently resolved for each detection mechanism used5. Fill in the different tracing techniques that were used (visual, sampling, sandbagging, OBM, dye/smoke testing, televising), and check whether they were effective or ineffective for each applicable detection mechanism that they were used for. If the method was ineffective, comment on why it was ineffective and how it could be improved6. Note any additional comments or recommended changes

**TABLE 1-10
IDDE PROGRAM EVALUATION WORKSHEET**

PRIORITY AREAS	LIST ANY FACTORS THAT HAVE CHANGED SINCE INITIAL PRIORITY WAS SET		RECOMMENDED CHANGE (CIRCLE ONE)						
			LEAVE PRIORITY SAME			RE-EVALUATE			
A			LEAVE PRIORITY SAME			RE-EVALUATE			
B			LEAVE PRIORITY SAME			RE-EVALUATE			
C			LEAVE PRIORITY SAME			RE-EVALUATE			
DETECTION PROGRAM	# MAPPING INSPECTIONS		# LONGER TERM INSPECTIONS		# CITIZEN COMPLAINTS		# OPPORTUNISTIC INSPECTIONS		
	PRIORITY AREAS	IDENTIFIED	RESOLVED	IDENTIFIED	RESOLVED	IDENTIFIED	RESOLVED	IDENTIFIED	RESOLVED
A									
B									
C									
TRACING TECHNIQUES USED	EFFECTIVE	INEFFECTIVE (COMMENT BELOW)	EFFECTIVE	INEFFECTIVE (COMMENT BELOW)	EFFECTIVE	INEFFECTIVE (COMMENT BELOW)	EFFECTIVE	INEFFECTIVE (COMMENT BELOW)	

Comments/Recommended Changes

SOURCE: MODIFIED FROM ILLICIT DISCHARGE DETECTION AND ELIMINATION: GUIDANCE MANUAL FOR PROGRAM DEVELOPMENT AND TECHNICAL ASSESSMENTS, CENTER FOR WATERSHED PROTECTION, 2004, P. 53, TABLE 15.

TABLE 1-11: EXAMPLE PRIORITIZATION TABLE USING AVAILABLE INFORMATION						
	LAND USE	UPDES CATEGORY ON PRIORITY LIST	STORM WATER OUTFALL DENSITY (# OF OUTFALLS PER STREAM MILE)	AVERAGE AGE OF DEVELOPMENT (YEARS)	RAW IDP SCORE	NORMALIZED IDP SCORE **
AREA A	COMMERCIAL (2)*	Impaired – Other Sources (1)	14 (2)*	40 (2)	8	2
AREA B	Residential (1)	Not impaired (1)	10 (2)	10 (1)	5	1.25
AREA C	Industrial (1)	Impaired – Illicit Discharge or Storm Water (3)	16 (2)	75 (3)	11	2.75
AREA D	Residential (1)	Not impaired (1)	9 (1)	15 (1)	4	1
AREA E	Residential (1)	No data available	21 (3)	20 (1)	5	1.67
NOTE:						
* The number in parentheses is the Illicit Discharge Potential (IDP) “score” (with 3 defined as a high IDP) earned for that area for the category identified. Basis for assigning scores (based on benchmarks) to assess IDP is defined as follows:						
CATEGORY DEFINITIONS	LAND USE	NHDES CATEGORY	STORM WATER OUTFALL DENSITY	AVERAGE AGE OF DEVELOPMENT		
High (3)	Industrial	Impaired – Illicit discharge or storm water	>20	>50		
Medium (2)	Commercial	Impaired – other source	10-20	25-50		
Low – 1	Residential	Not impaired	<10	<25		
** Normalizing the raw IDP scores (by dividing the raw score by the number of screening factors assessed) will produce scores that fall into the standard scale of 1 to 3 for low to high IDP, respectively.						

**TABLE 1-12
WORK SHEET TO PRIORITIZE AREAS**

AREA OF COMMUNITY	SCREENING FACTORS (1) – CATEGORIES INFORMATION REVIEWED				SCORE	
					RAW SCORE	NORMALIZED IDP SCORE

HIGH (3)				
MEDIUM (2)				
LOW (1)				

INSTRUCTION: This form is for Program Managers to define areas of High, Medium, and Low Priority.

- 1 Select all applicable screening factors from the list provided in Section 1.2.2.
- 2 Determine the category definitions (High, Medium Low) for each screening factor
- 3 Fill in the names of the different areas of your community. Refer to 1.2.1
- 4 To obtain a raw score, first assign a value to each screening factor based on the category definitions. Second, add up the values for each area
- 5 Take the raw score and divide it by the number of screening factors. Normalized scores should fall between 1(low) and 3 (high)

ILLICIT DISCHARGE HOTLINE INCIDENT TRACKING SHEET

Incident ID				
Responder Information				
Call taken by:		Call Date:		
Call time:		Precipitation (inches) in past 24-48 hours:		
Reporter Information				
Incident time:		Incident date:		
Caller contact information (optional)				
Incident Location (complete one or more below)				
Latitude or Longitude (or other coordinate system)				
Stream address or outfall #:				
Closest street address:				
Nearby landmark:				
Primary Location		Secondary location		
Stream Corridor (<i>in or adjacent to stream</i>):		Outfall	In-stream flow	Along banks
Upland Area (<i>land not adjacent to stream</i>):		Near storm drain	Near other water source (storm water, pond, wetland, etc.)	
Narrative description of location:				
Upland Problem Indicator Description				
Dumping	Oil/Solvent/Chemicals	Sewage		
Wash water, suds, etc.	Other:			
Stream Corridor Problem Indicator Description				
Odor	None	Sewage	Rancid/Sour	Petroleum (gas)
	Sulfide (rotten eggs; natural gas)	Other		
Appearance	"Normal"	Oil Sheen	Cloudy	Suds
	Other			
Floatables	None	Sewage (toilet paper)	Algae	Dead Fish
	Other			
Narrative Description of Problem Indicators				
Suspected Violator (name, personal or vehicle description, license plate #, address, etc.)				

APPENDIX A

ILLICIT DISCHARGE DETECTION AND ELIMINATION SOPs AND FORMS

STANDARD OPERATING PROCEDURES FOR:	
A.1 IDDE: INSPECTIONS DURING MAPPING	
PURPOSE OF SOP:	This SOP provides basic checklist for managers and field crews conducting illicit discharge inspections during mapping.

Always:

- Characterize the outfall by recording information on the Storm Drain Outfall Inspection sheet.
- Conduct inspections during dry weather periods using the Dry Weather Outfall Inspection sheet.
- Follow procedure below if an illicit discharge is encountered (such as raw sewage, paint, etc.).
- Conduct inspections with at least two staff per crew.
- Carry a list of emergency phone numbers

Whenever Possible

- Conduct inspections during low groundwater and leaf off conditions.
- Photograph the outfall with a digital camera.
- Identify and label the outfall with a unique identifier. For example "PR-31140R"
- If dry weather flow is present at the outfall and the flow does not appear to be an illicit discharge attempt to identify the source of the flow (intermittent stream, etc), then document the discharge for future comparison
- Carry an authorization letter
- Collect samples of flowing discharges before and after removal.

Never:

- Never put yourself in danger
- Never enter private property without permission

<p>PROCEDURES TO FOLLOW IF ILLICIT DISCHARGE IS DETECTED:</p> <ul style="list-style-type: none"> ○ Use the Dry Weather Outfall Inspection Form to document observations. ○ Visually inspect general area for possible sources. ○ Take photos. ○ Estimate flow/collect samples if instructed to do so.
--

STANDARD OPERATING PROCEDURES FOR:	
A.2 IDDE: LONG-TERM INSPECTIONS	
PURPOSE OF SOP:	Long term dry weather inspections of outfalls are a primary means of detecting illicit discharges and identifying any necessary maintenance or repairs.

Always

- Perform more frequent inspections on outfalls with suspected illicit discharges and/or high priority areas. Refer to high priority outfall map.
- Conduct inspections during dry weather periods.
- Check the outfall's dimensions, shape and component material using the Storm Drain Characteristic Form.
- Characterize and record observations on basic sensory and physical indicators (e.g. odor, color, oil sheen).
- If an illicit discharge is encountered (such as raw sewage, paint, etc.), follow the procedure below.
- Analyze inspection results for effectiveness of the IDDE Program

Whenever possible

- Perform inspections of all the outfalls at least once per permit cycle (long term).
- Photograph the outfall with a digital camera
- Identify and label the outfall with a unique identifier. For example "PR-31140R".
- Carry a letter of authorization with you during inspections that outline is who you are and what you are doing.
- If dry weather flow is present at the outfall, and the flow does not appear to be an obvious illicit discharge (e.g., flow is clear, odorless, etc.), attempt to identify the source of the flow (intermittent stream, etc.) then document the discharge for future comparison.
- Identify the source of the discharge
- Collect samples before and after source removal.

Never

- Never put yourself in danger.
- Never enter private property without permission.

PROCEDURES TO FOLLOW IF ILLICIT DISCHARGE IS DETECTED:

- Use the Dry Weather Outfall Inspection Form to document observations.
- Visually inspect general area for possible sources.
- Take photos.
- Estimate flow/collect samples if instructed to do so.

STANDARD OPERATING PROCEDURES FOR:	
A.3 IDDE: Long-Term Inspections – Wet Weather	
PURPOSE OF SOP:	To provide supervisor and field crew with a punch list of things to remember during regularly scheduled inspections.

Always

- Conduct inspections during flow event, or as close to rain event as possible (no longer than 6 hours)
- Check the outfalls dimensions, shape, and component material using the GPS data dictionary with existing site name in the data dictionary
- Characterize and record observations on basic sensory and physical indicators (e.g. odor, color, oil, sheen).
- If an illicit discharge is encountered (such as raw sewage, paint, etc.) follow the procedure below.
- Perform inspections so as to meet Provo City’s goal of inspecting each outfall within the 5 year permit cycle (long term)
- Take pictures in the data dictionary for later inspections and GIS maps.
- Always have on Provo City credentials when doing inspections.

Whenever Possible

- Identify and label the outfall with a unique identifier. For example “PR-31140R”.
- Collect samples before and after source removal.

Never

- Never enter private property without permission.
- Never put yourself in danger.

<p>PROCEDURES TO FOLLOW IF ILLICIT DISCHARGE IS DETECTED:</p> <ul style="list-style-type: none"> ○ Use the Dry Weather Outfall Inspection Form to document observations. ○ Visually inspect general area for possible sources. ○ Take photos. ○ Estimate flow/collect samples if instructed to do so.
--

STANDARD OPERATING PROCEDURES FOR:		
A.4 IDDE: OPPORTUNISTIC INSPECTIONS		
PURPOSE OF SOP:	This SOP provides field personnel with a quick checklist of proper procedures to follow if they observe illicit discharges while conducting their regular duties.	

Always

- Call dispatcher, supervisor, or code enforcement if you see evidence of an illicit discharge.
- Assess the general area of the illicit discharge to see if you can identify its source.

Whenever Possible

- Use the Incident Tracking Sheet to document observations.
- Take photographs of the illicit discharge.
- Carry a Dry Weather Outfall Inspection Form.
- Use the Catch Basin Cleaning Form to document observations during cleaning.

Never

- Never enter private property without permission
- Never put yourself in danger.

STANDARD OPERATING PROCEDURES FOR:		
A.5 IDDE: CITIZEN CALL-IN INSPECTIONS		
PURPOSE OF SOP:	To collect appropriate information from a citizen reporting potential illicit discharge to increase the chances of identifying and removing it's source.	

Always

- All call ins are forwarded to Richard Snyder and Chris Wright
- Use the Incident Tracking Sheet to collect the appropriate information.
- Promptly investigate reported incidents.
- Document any further action taken.

Whenever Possible

- Document and review incidents reported by citizens on an annual basis to look for patterns of illicit discharges and to evaluate the call-in inspection program.

Never

- Never enter private property without permission.
- Never put yourself in danger.

QUARTERLY INSPCETION FORM (EMAIL)

STANDARD OPERATING PROCEDURES FOR:	
A.6 IDDE: TRACING ILLICIT DISCHARGES	
PURPOSE OF SOP:	To provide a quick reference list of items to keep in mind during tracing activities to efficiently and systematically identify the source of an illicit discharge.

Always

- Review/consider information collected when illicit discharge was initially identified (Incident Tracking Sheet or Dry Weather Outfall Inspection Form).
- Survey the general area/surrounding properties to identify potential sources of the illicit discharge as a first step.
- Trace illicit discharges using visual inspections of upstream points as a second step.
- Document tracing results for future reference.

Whenever Possible

- Use weirs, sandbags, dams, or optical brightener monitoring traps to collect or pool intermittent discharges during dry weather..
- Smoke test or televise the storm drain system to trace high priority, difficult to detect illicit discharges.
- Dye test individual discharge points within suspected buildings.
- If the source cannot be found, add the location to a future inspection program
- Collect bacterial samples of flowing discharges to confirm/refute illicit discharge.

Never

- Never enter private property without permission.
- Never put yourself in danger.

STANDARD OPERATING PROCEDURES FOR:		
A.7 IDDE: REMOVING ILLICIT DISCHARGES		
PURPOSE OF SOP:	Proper removal of an illicit discharge will ensure it does not recur. Using legal methods for the removal will minimize the municipality's liability. This sop provides an overview of illicit discharge removal procedures.	

Always

- Determine who is financially responsible; and follow associated procedures on Table 1-9.
- Suspend access to storm drain if threats of death or serious physical harm to humans or the environment are possible.
- If the discharge is from an exempt facility (see Table A-3) notify the facility operator and the appropriate enforcement authority.
- Repair/correct cause of discharge if municipality is responsible.
- Collect a confirmatory sample after the removal. Seek technical assistance from NHDES, if needed.

Whenever Possible

- Issue a Notice of Violation for violations of the municipal ordinance.

Never

- Never repair/correct cause of discharge on private property until directed to do so by the appropriate municipal authority (storm water Program Manager, etc.).

STANDARD OPERATING PROCEDURES FOR:	
A.8 IDDE: Removing Industrial Illicit Discharges	
PURPOSE OF SOP:	Proper removal of an industrial illicit discharge will ensure it does not recur. Using legal methods for the removal will minimize the municipality's liability. This SOP provides an overview of industrial illicit discharge removal procedures.

Always

- Determine who is financially responsible; and follow associated procedures on Table A-3.
- Suspend access to storm drain if threats of death or serious physical harm to human's or the environment are possible.
- Repair/correct cause of discharge if industrial discharge is from a municipal source
- Collect a confirmatory sample after the removal. Seek technical assistance from the Storm Water Quality Manager if needed.
- Seek finding methods through the *Storm Water Ordinance*. Each day of discharge will constitute a separate offense. These offenses may be subject to escalated fees according to municipal or other ordinances.
- Work with guilty party to solve issues as much as possible.

Whenever Possible

- Issue a Notice of Violation for violations of the *Storm Water Ordinance* adopted by all Storm Water members.
- GIS locate all NPDES discharge sites for all industrial sources within the Storm Water member area

Never

- Never repair/correct cause of discharge on private property until all organizations have met and decided what the best course of action is.

**TABLE A-2
COMMON STORMWATER POLLUTANTS, SOURCES AND IMPACTS**

POLLUTANT	SOURCE	IMPACT
Sediment	Construction sites; eroding stream banks and lakeshores; winter sand and salt application; vehicle/boat washing; agricultural sites.	Destruction of plant and fish habitat; transportation of attached oils, nutrients and other pollutants; increased maintenance costs, flooding
Nutrients (phosphorus, nitrogen)	Fertilizers; malfunctioning septic systems; livestock, bird & pet waste; vehicle/boat washing; grey water; decaying grass and leaves; sewer overflows; leaking trash containers, leaking sewer lines.	Increased potential for nuisance or toxic algal blooms; increased potential for hypoxia/anoxia (low levels of dissolved oxygen which can kill aquatic organisms).
Hydrocarbons (petroleum, compounds)	Vehicle and equipment leaks; vehicle and equipment emissions; pesticides; fuel spills; equipment cleaning; improper fuel storage & disposal.	Toxic to humans and aquatic life at low levels.
Heavy Metals	Vehicle brake and tire wear; vehicle/equipment exhaust; batteries; galvanized metal; paint and wood preservatives; fuels; pesticides; cleaners.	Toxic at low levels; drinking water contamination.
Pathogens	Livestock, bird and pet wastes; malfunctioning septic systems; sewer overflows; damaged sanitary lines.	Risk to human health leading to closure of shellfish areas and swimming areas; drinking water contamination.

TABLE A-3 NOTIFICATION AND REMOVAL PROCEDURES FOR ILLICIT DISCHARGES INTO THE MUNICIPAL SEPARATE STORM SEWER SYSTEM.			
FINANCIALLY RESPONSIBLE PARTY	SOURCE IDENTIFIED	ENFORCEMENT AUTHORITY	PROCEDURE TO FOLLOW
PRIVATE PROPERTY OWNER	One-time illicit discharge (e.g., spill, dumping, etc)	Ordinance enforcement authority (e.g., Code Enforcement Officer)	<ul style="list-style-type: none"> ○ Contact owner ○ Issue Notice of Violation ○ Issue Fine
PRIVATE PROPERTY OWNER	Intermittent or continuous illicit discharge from legal connection	Ordinance enforcement authority (e.g., Code Enforcement Officer)	<ul style="list-style-type: none"> ○ Contact owner ○ Issue Notice of Violation ○ Determine schedule for removal ○ Confirm removal
PRIVATE PROPERTY OWNER	Intermittent or continuous illicit discharge from illegal connection or indirect (e.g., infiltration or failed septic)	Plumbing Inspector	<ul style="list-style-type: none"> ○ Notify plumbing inspector
MUNICIPAL	Intermittent or continuous illicit discharge from illegal connection or indirect (e.g., failed sewer line)	Ordinance enforcement authority (e.g., Code Enforcement Officer)	<ul style="list-style-type: none"> ○ Issue work order ○ Schedule removal ○ Remove connection ○ Confirm removal
EXEMPT 3 RD PARTY	Any	USEPA	<ul style="list-style-type: none"> ○ Notify exempt third party and USEPA of illicit discharge

ILLCIT DISCHARGE HOTLINE INCIDENT TRACKING SHEET

Incident ID				
Responder Information				
Call taken by:		Call Date:		
Call time:		Precipitation (inches) in past 24-48 hours:		
Reporter Information				
Incident time:		Incident date:		
Caller contact information (optional)				
Incident Location (complete one or more below)				
Latitude or Longitude (or other coordinate system)				
Stream address or outfall #:				
Closest street address:				
Nearby landmark:				
Primary Location		Secondary location		
Stream Corridor (<i>in or adjacent to stream</i>):		Outfall	In-stream flow	Along banks
Upland Area (<i>land not adjacent to stream</i>):		Near storm drain	Near other water source (storm water, pond, wetland, etc.)	
Narrative description of location:				
Upland Problem Indicator Description				
Dumping	Oil/Solvent/Chemicals	Sewage		
Wash water, suds, etc.	Other:			
Stream Corridor Problem Indicator Description				
Odor	None	Sewage	Rancid/Sour	Petroleum (gas)
	Sulfide (rotten eggs; natural gas)	Other		
Appearance	"Normal"	Oil Sheen	Cloudy	Suds
	Other			
Floatables	None	Sewage (toilet paper)	Algae	Dead Fish
	Other			
Narrative Description of Problem Indicators				
Suspected Violator (name, personal or vehicle description, license plate #, address, etc.)				

NOV (EMAIL)

APPENDIX B

POLLUTION PREVENTION AND GOOD HOUSEKEEPING

STANDARD OPERATING PROCEDURES FOR:	
B.1 Catch Basin Cleaning (Municipal or Provo City Public Works Employees)	
PURPOSE OF SOP:	To protect Storm Water by maintaining the ability of catch basins to trap sediments, organic matter, and litter. This reduces clogging in the storm drain system as well as the transport of sediments and pollutants into receiving water bodies.

Always:

- Inspect catch basins for structural integrity and evidence of illicit discharges during cleaning. Use the Catch Basin Cleaning Form.
- If gross contamination (sewage or oil), stop cleaning and report to supervisor for follow up.

Whenever Possible

- Inspect catch basin at least annually, during catch basin cleaning. These forms will need to be kept for record keeping.
- Create an internal checklist for catch basins to help classify which catch basins require maintenance and how often.
- Perform street sweeping on an appropriate schedule to reduce the amount of sediment, debris and organic matter entering the catch basins, which in turn reduces the frequency with which they will need to be cleaned.

STANDARD OPERATING PROCEDURES FOR:	
B.2 Storm Drain System Repair and Maintenance	
PURPOSE OF SOP:	To protect storm water by replacing or repairing components of the storm drain system on a regular basis to prevent a failure of the storm drain system.

Always

- Practice preventative maintenance for cracks, leaks, and other conditions that could cause breakdowns in the system by identifying maintenance issues such as:
 - Catch basin cleaning
 - Outfall inspections
- Repair defective structures or equipment identified during an inspection as soon as possible.
- Document inspections, cleanings and repairs and report them to Richard Snyder.
- Use appropriate erosion and sediment control practices when performing repairs.

Whenever Possible

- Practice preventative maintenance for pipes by televising:
 - Prior to reconstruction of roadways, or
 - On a regular schedule beginning with high priority areas.
 - Or track all televising of sewer lines by the sewer department.
- Research and implement new technology that will improve the overall performance of the storm drain system
- Perform street sweeping on a regular basis to reduce the amount of sediment, debris and organic matter entering the storm drain system, which in turn reduces the frequency with which the system will need to be cleaned.
- Use documentation of repairs and maintenance to develop a capital improvement and O&M plan for future system maintenance.

Never

- Never allow defective equipment or structures to go unrepaired.

STANDARD OPERATING PROCEDURES FOR:	
B.3 Erosion and Sediment Control (All Organizations)	
PURPOSE OF SOP:	To protect Storm Water from pollution by reducing or eliminating pollutant loading from land disturbing activities.

Always

- o Use erosion control techniques or devices to stabilize disturbed areas.
- o Use effective site planning to avoid sensitive areas.
- o Keep land disturbance to a minimum
- o Inspect and maintain erosion control devices after each .5 inches of rain
- o Install erosion control devices properly,
- o Remove sediment accumulated during construction from permanent BMPs once construction is completed.
- o Minimize the amount of bare soil by scheduling phases of construction and stabilization
- o Minimize slop lengths.
- o Monitor practices and adjust, maintain, and repair them periodically and after every storm
- o Reduce the velocity of storm water runoff.
- o Protect existing storm water structures from sediment by using temporary sediment traps, silt fence, or perforated risers.
- o Divert clean water around construction site.
- o Make sure all permitting has been done and approved through the storm water department
- o Allow 3-14 business days for initial review time on large commercial developments.

Whenever Possible

- o Limit construction activities during months with higher runoff rates
- o Install erosion control blankets when seeding drainage ways
- o Protect natural vegetation, especially near water bodies, wetlands, and steep slopes.
- o Establish vegetative cover with good root systems prior to freeze/thaw cycles.

Never

- o Divert runoff into a sensitive area.
- o Never remove temporary measures before construction is complete
- o Never allow silt fences to over-run or put in flow paths.

<p>Related References</p> <ul style="list-style-type: none"> - USEPA National Menu of BMPs - Provo City <i>Handbook for Erosion Control, Sediment Control, and Storm Water Management Plan</i>

STANDARD OPERATING PROCEDURES FOR:	
B.4 Landscape Design and Management (All Organizations)	
PURPOSE OF SOP:	To protect Storm Water by designing and managing landscaping in ways that minimizes polluted runoff.

Always

- o Design landscaping by taking into account soil types, light, drainage, desired maintenance level and budget. A soil map is attached on the following page of Utah County but for further soil information to go <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>.
- o Design for ease of maintenance

Whenever Possible

- o Minimize erosion prone steep slopes by using techniques such as terracing.
- o Use native plants that are pest resistant. Plant the right plant in the right area
- o Manage water runoff by rerouting gutters away from storm drains and maintaining ground covers between developed areas and waterways (ditches, swales, shorelines).
- o Reduce or eliminate mown lawn in unused areas
- o Convert excess lawn to meadow or forest
- o Establish set back distances from pavement, storm drains, and water bodies. Allow these areas to serve as buffers with disease-resistant plants and minimal mowing.

Never

- o Never develop a landscape design without assessing its impact on water quality.
- o Never cause unintended consequences such as
 - Planting large variety trees beneath overhead wires.
 - Blocking site distance at intersections
 - Planting trees with a high water demand (weeping willow or cotton wood) near sanitary sewer pipes and storm sewer pipes.

<p>Related References</p> <ul style="list-style-type: none"> - United States Department of Natural Resources Conservation Services Soil Map - Utah Department of Agriculture - USEPA National Menu of BMPs - Utah Urban Forestry Manual
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STANDARD OPERATING PROCEDURES FOR:	
B.5 Storage and Disposal of Fertilizer and Pesticides	
PURPOSE OF SOP:	To protect Storm Water by properly storing and disposing of fertilizers and pesticides (herbicides and fungicides). Because storm drain water is not part of a wastewater treatment system, discharge of these chemicals flow untreated into ponds, lakes, rivers, streams, estuaries, and bays.

Always

- Store fertilizers and pesticides in high, dry locations, according to manufacturer’s specifications and applicable regulations
- Clearly label secondary containers
- Properly dispose of fertilizers and pesticides according to manufacturer’s specifications and applicable regulations
- Regularly inspect fertilizers and pesticide storage areas for leaks and spills
- Clean up spills and leaks of pesticides and fertilizers to prevent the chemicals from reaching the storm drain system.

Whenever Possible

- Store pesticides in enclosed areas or in covered impervious containment, preferably in a locked cabinet.
- Order fertilizers and pesticides for delivery as close to time of use as possible to reduce amount stored at facility
- Order only the amount needed to minimize excess or obsolete materials requiring storage and disposal
- Use all herbicides or pesticides appropriately to minimize the amount of chemicals requiring disposal

EPA defines a pesticide as any substance intended for preventing, destroying, repelling, or mitigating any pest. Pest can include insects, animals, unwanted plants, fungi, bacteria, etc. The term applies to insecticides, herbicides, fungicides, etc.

Never

- Dispose of fertilizers or pesticides in storm drains
- Never leave unlabeled or unstable chemicals in uncontrolled locations.

Related References
- USEPA National Menu of BMPs

STANDARD OPERATING PROCEDURES FOR:	
B.6 Fertilizing and Turf Application	
PURPOSE OF SOP:	To protect Storm Water by properly storing, applying, and disposing of fertilizers and by maintaining turf health to reduce diseases.

Always

- Store, use, and dispose of all fertilizers and contaminated wastes according to manufacturer’s specifications and applicable regulations
- Choose seed based on soil types, intended use of area, latest variety research, and/or assessment of past site performance.
- Check 5-day weather forecast to avoid fertilizing before heavy rain or during a drought.
- Fill out appropriate form below

Whenever Possible

- Apply fertilizers based on a soil testing program, soil type, turf function, and assessment by qualified personnel.
- Avoid fertilizing during a drought or when the soil is dry.
- Apply fertilizers during periods of maximum plant uptake (usually fall or spring)
- Avoid combined products such as weed and feed, which do not necessarily target specific problems at the appropriate time.
- Calibrate application equipment to ensure proper application
- If phosphorus fertilizer is used when re-seeding, mix phosphorus into root-zone.
- Use alternative or environmentally friendly products
- Use natural compost and organic fertilizers instead of synthetic fertilizers.
- Aerate grassed areas to improve drainage and bring more oxygen to the soil.

Never

- Never fertilize before a forecasted heavy rainfall.
- Never apply phosphorus fertilizer on bare soil
- Never deposit fertilizer in the water, into storm drains, or onto impervious surfaces (streets and sidewalks)
- Never apply fertilizer to frozen ground
- Never clean up spilled fertilizer by rinsing it with water.

<p>Related References</p> <ul style="list-style-type: none"> - USEPA National Menu of BMPs
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STANDARD OPERATING PROCEDURES FOR:	
B.7 Weed and Pest Control Application	
PURPOSE OF SOP:	To protect Storm Water by properly applying pesticides (herbicides and insecticides)

Always

- Ensure that pesticides are only applied by personnel certified to do so.
- Apply pesticides according to manufacturer’s specifications, the Utah Department of Agriculture & Industrial Food & Safety Division
- Use pesticides only when necessary
- Rinse equipment only when necessary and use rinse water to dilute next mix as long as application rates are not exceeded.

Whenever Possible

- Use alternative methods to control weeds and pests such as Integrated Pest Management strategies, bio rational insecticides (natural soaps and oils) or biological controls
- Mix/load pesticides in an area where spills can be contained.
- Pull weeds by hand or mechanically
- Spot treat affected areas only instead of entire location
- Apply pest control at the life stage when the pest is most vulnerable
- Tolerate low levels of weeds
- Allow grass to grow 2.5 to 3 inches high, reduce thatch buildup and aerate soils
- Reduce seed release of weeds by timing cutting at seed set.

Never

- Never mix or prepare pesticides near storm drains.
- Never apply controlled pesticides unless certified to do so
- Never apply pesticides before a heavy rainfall
- Never discharge rinse water or excess chemicals to storm drain, sewer, or ground surface.

<p>Related References</p> <ul style="list-style-type: none"> - USEPA National Menu of BMPs
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STANDARD OPERATING PROCEDURES FOR:	
B.8 Mowing and Irrigation	
PURPOSE OF SOP:	To protect Storm Water by using proper mowing and watering techniques. Proper mowing and irrigation techniques will reduce organic matter and other pollutant from entering the storm drain system and water bodies.

Always

- Mow only as low as needed for the area's intended use.
- Vary mowing patterns to minimize ruts and promote even growth
- Base irrigation amounts on monitoring for moisture content
- Water at appropriate times (when no rain is forecasted and in cooler times of the day)
- Manage leaves, clippings, and compost so that runoff does not enter storm drain system or water bodies.

Whenever Possible

- Allow areas to go on meadow or field and mow once or twice per year rather than every week
- Keep mower blades sharpened so avoid damaging grass leaf tissue
- Mow when the grass is dry to prevent spread of turf diseases.
- Sweep lawn clippings and debris instead of using water
- Mulch grass clippings using a mulching mower
- Fill gas tanks in a controlled location.

Never

- Never irrigate based on timers/schedules instead of monitoring for moisture content.
- Never dump gas, waste or contaminated water down storm drains.
- Never refuel or change the mower oil near storm drains
- Never leave mower running in one location (to prevent burning and over-cutting of vegetation.)

<p>Related References</p> <ul style="list-style-type: none"> - USEPA National Menu of BMPs
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STANDARD OPERATING PROCEDURES FOR:	
B.9 Vehicle and Equipment Storage	
PURPOSE OF SOP:	To protect Storm Water from petroleum products that may drip or leak from vehicles and equipment being stored or from dirt and sediment that accumulate in the storage areas.

Always

- o Inspect parking areas for stains/leaks on a regular basis.
- o Use drip pans or adsorbents for leaking vehicles (provide labeled location to empty and store drip pans)
- o Address any known leaks or drips as soon as possible
- o Clean up spills

Whenever Possible

- o Store vehicles inside where floor drains have been properly connected
- o Store vehicles on paved areas, and street sweep on a regular basis to remove drips/leaks/dirt, and dispose of street sweepings properly
- o Maintain vehicles to prevent leaks.

Never

- o Never store leaking vehicles over a storm drain.

<p>Related References</p> <ul style="list-style-type: none"> - USEPA National Menu of BMPs

STANDARD OPERATING PROCEDURES FOR:	
B.10 Vehicle and Equipment Washing	
PURPOSE OF SOP:	To protect Storm Water using proper washing techniques, proper washing locations, and proper disposal of was water for heavy and light-duty vehicles and equipment.

Always

- Discharge to a municipal sanitary sewer.
- Wash fewer than 30 vehicles per week and discharge to the ground surface if:
 - Good Best Management Practice Rules are used,
 - The discharge is registered through NPDES permitting, and
 - The wash water:
 - Is not from power washing, steam cleaning, engine cleaning, or undercarriage cleaning,
 - Does not contain soaps or other products which contain regulated contaminants, and
 - Does not discharge to surface water.

Whenever Possible

- Use a commercial car wash for light duty vehicles
- Obtain and use drain guards (filter inserts) to catch sediments, petroleum products, etc. that might enter the storm drains as a result of vehicle washing.
- Minimize water and soap use when washing or rinsing vehicles.

Never

- Never perform engine or undercarriage washing outside.
- Never wash vehicles over a storm drain or near drinking water wells
- Discharge wash water to surface water.

<p>Related References</p> <ul style="list-style-type: none"> - DEQ Department of Environmental Management

STANDARD OPERATING PROCEDURES FOR:	
B.11 Vehicle and Equipment Fueling	
PURPOSE OF SOP:	To prevent storm water contamination originating from vehicle and equipment fueling.

Always

- Fuel carefully to minimize drips to the ground surface.
- Maintain clean fuel dispensing areas using dry cleanup methods.
- Clearly label and tag all valves to reduce human error.
- Train employees and subcontractors on proper fueling methods and spill cleanup techniques.
- Maintain fuel storage tanks in accordance with local, state and federal laws.
- Have adsorbent spill cleanup kits and materials available at fueling areas.
- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials
- When fueling small equipment from portable containers, fuel in designated area away from storm drains and water bodies.

Whenever Possible

- Install a canopy or roof over aboveground storage tanks and fuel transfer areas.
- Regularly inspect fueling equipment for corrosion and structural failure, cracks in foundations, and with asphalt, add a protective coating to create an impervious surface, inspect regularly, and street sweep quarterly at a minimum.
- Protect storm drains from fueling areas using berms and dikes.
- Use adsorbent materials or adsorbent pads during fueling to collect leaks.

Never

- “Top off” fuel tanks (post signs to remind employees).
- Hose down or bury a fuel spill.

<p>Related References</p> <ul style="list-style-type: none"> - USEPA National Menu of BMPs

STANDARD OPERATING PROCEDURES FOR:	
B.12 Spill Cleanup	
PURPOSE OF SOP:	To protect Storm Water by educating employees on proper spill cleanup procedures, state reporting requirements and preventative actions

Always

- Stop the source of the spill, if possible to safely do so.
- Contain any liquids, if possible to safely do so.
- Contact the storm water department or call 311 and ask for Richard Snyder report spills.
- Cover the spill with absorbent material such as kitty litter, sawdust, or oil absorbent pads.
Do not use straw or water
- Petroleum spills involve, but are not limited to: crude oil, gasoline, heating oil, various fuel oils, lubricating oil, hydraulic oil, and asphaltic residuals.
- Report a petroleum spill if:
 - The spill is greater than 25 gallons, or
 - The spill cannot be immediately contained, or the spill and/or contamination cannot be completely removed within 24 hours, or
 - There is an impact or potential impact to ground/surface water
 - IF IN DOUBT, REPORT THE SPILL
- Hazardous materials spills involve non-oil spills that pose a threat to human health or the environment, such as chemical releases.
- Report any discharge of hazardous waste immediately, (within one hour) to local emergency officials [fire department], then contact the Provo City Emergency Management Agency as listed above.
- Contact local fire department 801-852-6300
- Develop and maintain a Spill Prevent, Control, and Countermeasure (SPCC) Plan if the facility stores more than 1,320 gallons of petroleum.
- Fit petroleum and chemical storage containers with secondary containment structures.
- Keep a spill kit in areas where petroleum or hazardous materials are stored.
- Train employees in spill response procedures and equipment annually.
- Deploy containment booms if spill could potentially reach a storm drain or water body.
- Position mats to contain drips from equipment or vehicles until they can be repaired.

Whenever Possible

- Seal the floor with paint to prevent absorption of fluids into concrete.
- Install low-level or low-pressure alarms and/or cut-off systems on hydraulic equipment

Never

- Never wash a spill into the storm drain or a water body.
- Never leave a spill without cleaning it up.

STANDARD OPERATING PROCEDURES FOR:		
B.13 Parts Cleaning		
PURPOSE OF SOP:	To protect storm water by practicing proper parts cleaning techniques and disposing of waste cleaners properly.	

Always

- Perform all cleaning in a designated area to minimize the potential for spills.
- Store waste cleaners in properly labeled containers in accordance with regulations.
- Dispose of all waste cleaners properly with a licensed contractor, on a regular basis.
- Close parts-cleaner lid when it is not in use.

Whenever Possible

- The variety of cleaners should be minimized to make recycling and disposal simpler.
- Use citrus-based cleaners and dispose of properly.
- Use steam cleaning, pressure washing, or aqueous washers instead of solvents; however, wastewater must be discharged to an oil/water separator and the wastewater treatment plant notified.

Never

- Never dispose of spent cleaners down the floor drains, sinks, storm drain, on the ground or into the air. Disposal by evaporation violates the Utah Hazardous Waste Rules.
- Never mix or add spent or fresh solvents to used oil.
- Never use gasoline as a cleaner or solvent.
- Never burn spent parts cleaning fluids in a used oil burner.
- Never use a hand-held cleaner in/near the parts cleaner; never mix cleaners.

STANDARD OPERATING PROCEDURES FOR:		
B.14 Spare Parts Storage		
PURPOSE OF SOP:	To protect storm water by properly storing spare parts. Improper storage of materials can result in pollutants and toxic materials entering ground and surface water supplies.	

Always

- Store spare parts in a designate area.
- Use drip pans for any parts that are dripping.

Whenever Possible

- Store spare parts inside or under cover.
- Monitor storage areas for staining/leaks on a schedule decided on by the appropriate personnel.
- Clean the majority of petroleum products form the parts that are to be stored.

STANDARD OPERATING PROCEDURES FOR:	
B.15 Petroleum and Chemical Disposal	
PURPOSE OF SOP:	To protect storm water from petroleum and chemical products due to improper disposal practices.

Always

- Maintain tracking and manifest to report to Storm Water, where necessary, of chemicals and petroleum products being disposed or recycled off-site.
- Transport used petroleum and chemical products with a licensed transporter and maintain records for three years.
- The storm water manager will train employees annually on proper disposal practices.
- Drain used oil filters for 24 hours before crushing and disposal (disposal in regular trash allowed).
- Analyze floor drain solids (from sediment trap) for TCLP to determine if hazardous waste or not.
- Contaminated cloth wipe may be laundered onsite or offsite, liquid free, and stored in a closed, labeled container.

Whenever Possible

- Minimize the number of solvents used to reduce the variety of waste generated and to make recycling easier.
- Use safer alternatives (see Alternative Products SOP)
- If burning used oil for on-site heat, analyze for these used oil standards (Arsenic, Lead, Cadmium, Chromium, F-listed Halogens, Flashpoint, and PCBs) approximately once every 1,000 gallons.

Never

- Never place hazardous waste in solid waste dumpsters.
- Never pour liquid waste down floor drains, sinks, or outdoor storm drain inlets.
- Never mix petroleum waste and chemical waste.
- Never dispose of any gasoline-contaminated waste in the regular trash. Dispose of it only as hazardous waste.

STANDARD OPERATING PROCEDURES FOR:	
B.16 Petroleum and Chemical Handling	
PURPOSE OF SOP:	To protect storm water by properly managing petroleum products and chemicals used by municipalities.

Always

- The storm water manager will train employees in hazardous material handling, safety, spill cleanup and reporting on an annual basis.
- Handle petroleum products and chemicals according to manufacturer's specifications.
- Conduct oil changes indoors for equipment that fits indoors.
- Use proper protective equipment
- Maintain Material Safety Data Sheets (MSDS) for all chemicals used.
- Create a sign-off sheet for employees stating that they know the location of the MSDS(s) and provide to Storm Water.
- Train new employees within six months of hire. A record of this should be kept and given annually to Storm Water.

Whenever Possible

- Assess hazardous material needs to minimize the amount and variety of hazardous material in storage.
- Keep an inventory of hazardous materials on hand.
- Transfer materials from one container to another indoors in a well-ventilated area.
- Properly label containers.

Never

- Never treat or dispose of hazardous materials unless licensed to do so.
- Never mix petroleum or chemicals unless directed by manufacturer's instructions.

<p>Related References</p> <ul style="list-style-type: none"> - USEPA National Menu of BMPs

STANDARD OPERATING PROCEDURES FOR:		
B.17 Petroleum and Chemical Storage – Bulk		
PURPOSE OF SOP:	To protect storm water by properly storing bulk petroleum products and chemicals (containers larger than 55 gallons)	

Always

- Store materials away from high traffic areas, posted with appropriate signage.
- Store materials according to manufacturer’s specifications in approved containers and conditions.
- Be prepared for possible spills by having a spill kit nearby.
- Register ASTs if your facility stores more than 660 gallons of petroleum products (10,000 gallons if used for on-site heating).
- Develop and use a Spill Prevention Control and Countermeasure (SPCC) plan if storing more than 1,320 gallons of petroleum (required)
- Store incompatible hazardous materials in separate areas.
- Conduct annual employee training to reinforce proper storage techniques for petroleum and chemical products. Keep record and present to Storm Water

Whenever Possible

- Store bulk chemicals and petroleum products inside or under cover.
- Provide secondary containment for interior storage.
- Cover transfer areas.

Never

- Never store bulk chemicals or petroleum products near a storm drain.

STANDARD OPERATING PROCEDURES FOR:		
B.18 Petroleum and Chemical Storage – Small Quantity		
PURPOSE OF SOP:	To protect storm water from pollution by properly storing petroleum products or chemicals (containers 55 gallons or smaller).	

Always

- Store materials away from high traffic areas.
- Store materials according to manufacturer’s specifications (e.g. in a flammable materials storage cabinet).
- Dispose of unused or waste materials properly.
- Train employees on proper storage procedures for petroleum and chemical products.
- Store materials in their original containers to maintain appropriate labeling.
- Be prepared for spills by having a spill kit nearby.
- Frequently inspect the storage areas for leaks or spills.
- Conduct annual employee training to reinforce proper storage techniques for petroleum and chemical products. A list should be provide to Storm Water at the end of the permit cycle

Never

- Never store petroleum or chemical products near a floor drain or storm water inlet.

STANDARD OPERATING PROCEDURES FOR:	
B.19 Garbage Storage	
PURPOSE OF SOP:	To protect storm water from contamination by properly storing garbage. Garbage and leachate can be transported by storm water and enter the storm drain system and receiving water bodies.

Always

- Cover rubbish bins to keep rubbish and leachate in and wind and rain out.

Whenever Possible

- Store garbage containers beneath a covered structure or inside to prevent contact with storm water. This is done on all food establishments.
- Install berms, curbing or vegetation strips around storage areas to control water entering/leaving storage areas.
- Locate dumpsters on a flat, concrete surface that does not slope or drain directly into the storm drain system.
- Locate dumpsters and trash cans in convenient, easily observable areas.
- Provide properly-labeled recycling bins to reduce the amount of garbage disposed.
- Inspect garbage bins for leaks regularly, and have repairs made immediately by responsible party.
- Keep bins free of improperly discarded trash.
- Provide training to employees to prevent improper disposal of general trash.
- Minimize waste by purchasing recyclable products that have minimal packaging.
- Request/use dumpsters without drain holes.

Never

- Never place hazardous waste in a dumpster or trash bin.
- Never place gasoline-contaminated wastes in a rubbish bin (but small quantities of adsorbents from virgin oil spills are acceptable).
- Never place oil-contaminated materials that release free draining oil into a rubbish bin.

<p>Related References</p> <ul style="list-style-type: none"> - USEPA National Menu of BMPs

STANDARD OPERATING PROCEDURES FOR:		
B.20 General Facility Housekeeping		
PURPOSE OF SOP:	To protect storm water by maintaining a clean, organized facility.	

Always

- Keep open areas clean and orderly.
- Pick up litter.
- Remove unused scrap/junk materials.
- Store Hazardous materials as specified by the manufacturer

Whenever Possible

- Store materials and wastes inside or under cover if outside.
- Substitute less or non-toxic materials for toxic ones.
- Perform a routine cleaning of the facility.
- Inspect facility (exterior, parking areas, etc.) for stains.

Related References

- USEPA National Menu of BMPs

STANDARD OPERATING PROCEDURES FOR:		
B.21 Floor Drains		
PURPOSE OF SOP:	To protect storm water from pollution caused by discharges of hazardous materials to the subsurface, ground surface, waterway, or storm sewer through floor drains.	

Always

- Keep a spill kit in the vicinity of the floor drains.
- Obtain and use drain mats, adsorbent booms, or covers to keep larger spills out of drains.
- Use floor drains that are (1) connected to a holding tank or (2) connected to the sanitary sewer via an oil/water separator.
- Keep internal map of all floor drains.
- Mark floor drains that have regulated contaminants stored or used near them.

Whenever Possible

- Minimize water use or run a dry shop

Never

- Never dump hazardous materials down the floor drains.
- Never use floor drains if you are unsure of their discharge location
- Never store regulated contaminants near a floor drain that discharges directly the environment.

STANDARD OPERATING PROCEDURES FOR:	
B.22 Street Sweeping	
PURPOSE OF SOP:	To remove sediment, debris and other pollutants from streets, parking areas, and paved surfaces through regular, properly timed sweeping schedules.

Always

- Sweep all publicly accepted paved streets and parking lots at least once per year as soon as possible after snowmelt.
- Dispose of street sweepings properly (reuse is unrestricted if visual evidence of litter, animal waste, and petroleum contamination is absent).
- Keep data logs on the mileage of street sweeping conducted in each city to provide to Storm Water.

Whenever Possible

- Start at the “top” of town and work down.
- Sweep downtown areas more frequently (daily)
- Perform additional sweeping on a seasonal schedule and document areas swept.
- Sweep in locations that generate debris, such as construction entrances, sand/salt loading areas, vehicle fueling areas, and vehicle and equipment storage areas on an as needed basis.
- Street sweep before a major rain event.
- Maintain street sweeping equipment for maximum effectiveness.
- Cover storage areas or locate storage areas where runoff discharges to a buffer.
- Clean catch basins after streets are swept.

Never

- Never store street sweepings in areas where storm water could transport fines to the storm drain system or a water body.
- Never purposely sweep into the storm drain system.

STANDARD OPERATING PROCEDURES FOR:	
B.23 Snow Disposal	
PURPOSE OF SOP:	To protect storm water by minimizing the impact of snow piles which contain sand, salt, and trash and which generate concentrated releases of pollutants during spring snowmelt conditions.

Always

- Identify sensitive ecosystems prior to disposal and avoid snow disposal in these areas.
- Store snow at least 25 feet from the high water mark of a surface water.
- Store snow at least 75 feet from any private water supply, at least 200 feet from nay community water supply, and at least 400 feet from any municipal wells.
- Install a double row of silt fence or equivalent barrier securely between the snow storage area and the high water mark, and inspect periodically throughout the winter season.
- Clear debris in storage area each year prior to snow storage use.
- Clear all debris in snow storage area and properly dispose of no later than April 15 or immediately after snowmelt occurs of each year the storage area is in use.

Whenever Possible

- Select storage locations that do not drain into surface waters and where environmental impacts of spring melt are minimal
- Store snow on areas that are well above the groundwater table on a flat, vegetated slope.
- Avoid disposal on pavement, concrete, and other impervious surfaces.
- Do not pile snow in wooded areas, around trees or in vegetative buffers.
- Divert run-on of water from areas outside the snow piles
- Use less harmful deicers such as calcium magnesium acetate, potassium, or organic deicers such as Magic Salt.

Never

- Never dispose of snow in wetlands, lakes, streams, rivers, or near drinking water sources.
- Never store snow in well-head protection areas.

STANDARD OPERATING PROCEDURES FOR:	
B.24 Deicing Material Storage	
PURPOSE OF SOP:	To protect storm water by properly storing deicing materials. Sand, salt and other deicing materials used during winter can be transported by runoff into the storm drain system and eventually into water bodies if not stored properly.

Always

- Locate sand/salt piles and deicing fluid tanks on flat, impervious sites that are easily protected from overland runoff and away from surface waters.
- Store sand salt/sand in storage shed.

Whenever Possible

- Contain wash water from trucks used for salting and sanding in a holding tank for disposal or discharge into sanitary sewers.
- Allow rinse water/melt water to drain into vegetated buffers (away from storm drains)
- Locate deicing material stockpiles and tanks at least 100 feet from streams and flood plains.
- Contain storm water runoff from areas where salt is stored by using buffers to diffuse runoff before entering water bodies.
- Use diversion berms to minimize run-on to storage areas.
- Cleanup “truck tracks” after storm events.

Never

- Never dispose of wash water from sanding and salting trucks into the storm drain system, a water body, or septic system drain fields.

Provo City Public Works, Storm Water Division
1377 South 350 East Provo, UT 84606

STORM WATER STRUCTURAL CONTROL FORM (MUNICIPAL USE)

FORM

Part 1: General Information

Storm Water Municipality: _____
Date: _____
Mayor: _____
Contact Person _____

Part 2: Existing Storm Water
Structural Controls

_____ miles
_____ hrs.
Estimated Miles of Storm Sewer Inspected: _____ estimated # of detention ponds
_____ estimated # of retaining walls
Estimated personnel time spent inspecting: _____ estimated # of ditches repaired
_____ estimated # of head walls repaired
Structural Controls Fixed: _____ estimated # of retention ponds

Part 3: New Storm Water
Structural Controls

_____ miles
_____ hrs.
Estimated Miles of New Storm Sewer Installed: _____ estimated # of detention ponds
_____ estimated # of retaining walls
Estimated Personnel time during Installation: _____ estimated # of ditches repaired
_____ estimated # of head walls repaired
Structural Controls Installed: _____ estimated # of retention ponds

If structural controls are cleaned or maintained by an outside entity then contract with outside entity should be stapled to this form when returned.

Provo City Public Works, Storm Water Division
 1377 South 350 East Provo, UT 84606

Development Form for Storm Water Structural Controls

Submit in Triplicate
APPLICATION

Part 1: General Information

Storm water Municipality: _____
 Applicant's Name: _____
 Applicant's email, address, phone number: _____
 Applicator Company Name: _____
 Mailing Address: _____
 State: _____
 Type of Development: _____

Part 2: Engineering Information

I, _____, a _____ do hereby certify that the data stated in this report and/or attached sheets are true and accurate as presented.

Signature _____ Date: _____ Reg #: _____
 Address _____ City: _____ State: _____
 Zip: _____ Phone #: _____

Part 3: Storm Water Structural Controls _____ ft.

Installed _____ estimated # of detention ponds
 Estimated Distance of New Storm Pipe _____ estimated # of retention ponds
 Installed: _____ estimated # of ditches repaired
 Structural Controls Installed: _____ estimated # of head walls repaired
 _____ estimated # of retention ponds

Estimated Area of Detention Ponds:

1	6
2	7
3	8
4	9
5	10

Estimated Area of Retention Ponds:

1	6
2	7
3	8
4	9
5	10

Are there any other structures used for storm water management? If so, explain _____

APPENDIX C

STORM WATER ENFORCEMENT SOP

STORM WATER ENFORCEMENT SOP

Purpose of SOP

Develop a written enforcement SOP for compliance from violators which shall include escalating enforcement procedures and actions. All city SWPPP Inspections are to be posted in the Storm Water Department Folder.

TARGETED POLLUTANTS:

Nutrients, Heavy Metals, Toxic Materials, Organics, and Oil & Grease

1. RATIONAL:

- a) The Storm water Enforcement SOP is necessary to prevent illicit discharges, from intentional dumping, and also discharges resulting from construction projects with absent or unmaintained BMPs. The problems caused by illicit discharges and poorly maintained construction projects, not only include the polluting of our water resources but also safety concerns, the increase to storm drain maintenance cost, damage to property and construction nuisances.
- b) This SOP is written to encourage persons involved in construction activities to self-manage, select BMPs that are effective, and persuades them to self-police persons (subcontractors, suppliers, utility companies, etc.) who will be involved in their project.
- c) People engaged in construction activities must control pollutants during significant wind, precipitation events and wet conditions. The BMPs used to control these activities must prevent pollutants from leaving the construction site, minimize the construction nuisance and ensure safety of the public.

2. ENFORCEMENT COMMUNICATION

- a) Enforcement communication is intended to provide enough information to ensure understanding.
 1. **SWPPP Corrective Action Notices:**

SWPPP inspection reports are both communication and enforcement. It identifies the status compliance and violations. The Corrective Actions should include correction deadlines. Enforcement Actions Definitions can be found in the Storm Water Ordinance 18.02.050

3. ENFORCEMENT ACTION PROCEDURE FOR PERMIT REGULATED WORK

- a) These persons are subject to UPDES regulations.
- b) Generally warning and communication should occur prior to issuing NOVs, Citations, and SWOs. The Inspector should evaluate understanding or expected understanding prior to this action.

4. Corrective Actions, NOVs and SWOs in this order, are to obtain compliance and the restitution of damages. If non-compliance and damages continue Citations that can result in a criminal record may be exercised. However, the inspector has discretion to apply immediate enforcement of violations that are severe, including but not limited to: intentional dumping of material that will do harm or allowing of this material to contaminate by neglect.

Justification for enforcement action

1. **Discharge of pollutants.** When pollutants leave a property, in runoff, ground water or through the air, this is defined to be an illicit discharge. Also when pollutants are intentionally and inappropriately discharged off site. The presence of BMPs does not excuse an Illicit discharge.

Persons are accountable to how their actions or how their property affect the beneficial use of waters of the state, public land resources, others property or the

cost incurred by others resulting from the irresponsible action. The inspector should consider the severity of storms when applying this enforcement, e.g. allowance for illicit discharge should be greater for storms that exceed 10yr intensities.

2. **Failure to follow UPDES requirements.** The disregard of UPDES requirements is a violation even if no pollution discharges, physical hazards, property damage or construction nuisances have occurred. Functioning BMPs are necessary at all times to minimize damage that can occur with construction operations and when inclement weather or wet conditions are present.

5. FINE AMOUNTS

- a) Fines are determined by the Storm Water Ordinance 18.02.050

6. ENFORCEMENT JUDGMENT

- a) The inspector is allowed discretion in applying this enforcement policy. When the pollution, construction nuisance or safety severity is high, enforcement can be accelerated.
- b) Inspector should evaluate the expected common knowledge or any prior warnings of persons when applying enforcement.

7. ENFORCEMENT ISSUANCE PERMIT WORK

- a) Enforcement actions should be issued to the responsible entity as identified on the NOI, or designated agent representative, if that entity is not the owner, however, if deemed necessary the property owner and the other responsible persons involved in the project, may be issued the enforcement action.
- b) When practical, the enforcement action should be hand delivered. Secondary options can be by email, and postal mail but in either case notification is necessary.

8. ENFORCEMENT ISSUANCE NON PERMIT WORK

- a) Generally, enforcement actions should be issued to the contractor/person(s) involved in the activity violating Storm Water Quality. However, the enforcement action can be issued to the property owner when necessary to stop and contain the activity in violation or to ensure the damaged is repaired.

9. SERVING CITATIONS, SWOS, NOV'S AND WARNINGS

- a) SWOs, NOV's and Warnings should be personally served, however they can also be emailed or posted on site if verbal confirmation of receipt is obtained by phone or in person.
- b) Citations should be personally served.
- c) Make three attempts to personally serve a citation.
- d) When attempts to personally serve the citation are unsuccessful, tape a copy of the citation to the front door of the subject property with a witness. Monitor and document any indications the Citation was recognized by the violator.

Appendix D

THE RESERVE AT EAST BAY POLICIES AND PROCEDURES

COURSE MAINTENANCE OPERATIONS

(Designed specifically for use at The Reserve at East Bay)

The following describes in detail the daily, seasonal and annual maintenance operations that will be found at The Reserve at East Bay.

First, a background of the golf course itself: The Reserve consists of 27 holes of golf on 190 acres and can be divided into three major areas: 1&2) A championship eighteen holes (area one being the Front Nine, area two, the Back Nine); and 3) Nine executive/junior holes, a driving range, and 3 practice greens, along with a nursery green and fairway. The entire property may be broken down as follows: 50 acres of wetlands, consisting of islands and water; 5 acres of greens, 10 acres of tees, 36 acres of fairways, 85 acres of roughs and 5 acres of sand. In addition, the golf course includes many trees and newly developed native areas that are designed to help cut back on maintenance costs. The purpose of these standards is to provide an idea of the detailed labor and equipment used in all course operations. We will first describe the above mentioned divisions, followed by an explanation of what is required to maintain them. We will then follow up with a breakdown of seasonal considerations, and show why some flexibility is always necessary.

We feel it is advantageous that the golf course be broken down into these major areas and further, into sections. In this way, we are able to provide a specific and detailed maintenance program for each section, enabling our staff to offer the most desirable playing conditions possible to the public.

The first area, referred to as the Front Nine, consists of 9 holes, 30 acres of water, 1.75 acres of greens, 15 acres of fairways, 4 acres of tees, 30 acres of rough and lastly, 3 acres of sand. These nine holes will be under the direction of the first assistant superintendent, with approximately 6-8 seasonal employees working under his supervision. This area will be broken down into 3 sections, in which there will be two seasonal workers assigned to each section. Each section will be as follows: holes 1, 7, 9; 2,6,8 and 3,4,5. In each of these sections, seasonal workers will be responsible for trimming, tree maintenance, edging bunkers, fixing ball marks on green, filling divots and will address any other project as directed by the assistant superintendent. Each day's agenda will be detailed by the first assistant according to present conditions and weekly consultations with the superintendent.

The second area, the Back Nine, consists of 9 holes, 20 acres of water, 1.75 acres of greens, 13 acres of fairways, 3.5 acres of tees, 35 acres of rough, and lastly, 2 acres of sand.

This area will be under the supervision of the second assistant superintendent, with approximately 6-8 seasonal employees working under his supervision. The Back Nine will be broken down into 3 sections, in which there will be two seasonal workers assigned to each section. Each section will be as follows: holes 10, 11, 12; 13, 14, 18 and 15, 16, 17. In those sections, seasonal workers will be responsible for trimming, tree maintenance, edging bunkers, fixing ball marks on greens, filling divots, and will address any other project as directed by the assistant superintendent. Again, each day's agenda will be detailed by the first assistant according to present conditions and weekly consultations with the superintendent.

The third area, the Executive/Junior Course and driving range, consists of 9 holes, a driving range and practice greens. This area encompasses 1.25 acres of greens 7 acres of fairways, 4 acres of tees and 18 acres of rough. This nine will be under the supervision of foreman and 2-3 seasonal employees. In this area, the foreman, along with the seasonal workers, will be responsible for trimming, tree maintenance, fixing ball marks on greens, filling divots, and any other project needed and directed by the foreman. Each day will be scheduled out by the foreman, according to present conditions and weekly meetings with the superintendent.

We feel as though we have developed a maintenance program that best suits the needs of the golfers who play at The Reserve at East Bay. It has been developed to accomplish the following key maintenance operational objectives:

1. To establish ergonomically sound and environmentally safe standards and procedures.
2. To provide guidelines to help clarify golf course maintenance priorities
3. To state our management's maintenance philosophy.
4. To list required practices and procedures including:
 - a. Daily course setup
 - b. Mowing schedules
 - c. Cultural practices
 - d. Other pertinent miscellaneous items

It should be noted that maintenance procedures will vary depending upon weather, the environment, conditions of the golf course, and the availability of personnel.

We intend to professionally maintain The Reserve At East Bay in such a way that golfers of all playing levels will come to appreciate what it means to play on an excellently-maintained facility. This signifies continual dedication to providing the best possible playing conditions in any

given circumstances. We intend to create a pleasant experience for all players; challenging, yet fair. As a general rule, the golf course should play at a consistent standard on a regular basis so that extraordinary measures need not to be taken to elevate the course to championship form from any tournament or special event.

DAILY COURSE SETUP

1. GREENS

- Cups will be changed and their location rotated 4 times a week by one that has been trained to do so. The placement of the hole will rotate front to back and right to left. Attention to detail will ensure the old plug is perfectly level.
- The cup cutting device will be kept sharp making certain that a quality cut is made. The employee cutting the cup will make certain that the flag stick is straight, paying special attention to the quality of the flag stick itself and replacing it as necessary. Each time a cup is changed, the worker will thoroughly inspect the green, making certain it is free of contaminants. This constant vigilance protects them from costly damage.
- We will use site specific flags (colored flags) on the championship course. Colored flags will allow players to determine depth of the pin position on the green according to color. A red/white checkered flag will mark the front 1/3 of the green. A yellow/white checkered flag will mark the middle 1/3 of the green. A black/white checkered will mark the back 1/3 of the green. On the executive/junior course we do not use site specific flags. All flags on the executive/junior course will be one color.
- All putting green cups will be changed 1 to 3 times weekly depending on the time of year and other variables such as wear and tear, abuse, etc.
- Ball marks are to be repaired on a daily basis
- Attention will be paid to the general condition of each green

- Unsightly areas are to be repaired immediately, replacing old plugs that have been scalped, repairing the divot marks of careless golfers, neutralizing oil leaks and addressing damage done by wildlife, etc. If damaged area is large enough, replacement sod will be used from the nursery green or other sources.
- Greens will also be on an extensive top dressing, verticutting and spiking schedule which reduces thatch buildup, providing smoother putting surfaces. This will be done in conjunction with daily mowing.

2. TEES

- Tee markers will be moved daily to help even out the wear on the tee boxes. Tee consoles, benches, sand and see containers, and trash receptacles will be moved often enough to avoid yellowing of the grass underneath them.
- On the tees where sand and seed supplies are available, mix will be refilled as needed. Tee box accessories not functioning properly are to be replaced as soon as possible.

3. BUNKERS

- Sand bunkers will be raked 3 times a week with a mechanical rake and the edges of the bunkers along the grass and lake lines will be hand raked by the section workers in that area.
- The section workers will inspect bunkers for excess water, broken rakes and washed-out faces on a daily basis to ensure that quality bunkers are the norm.

MOWING PRACTICES

Mowing duties will be assigned by the head course superintendent, along with the assistant superintendents and/or foremen. As mowing comprises a major portion of the maintenance program, seasonal laborers do not necessarily mow in the areas they are

assigned to for daily set-up. A breakdown of staff requirements according to seasons, followed by a breakdown of the mowing schedules will be as follows:

Off Season (November-February). Normally during this time of the year, the golf course functions with a head course superintendent, one (1) assistant superintendent and head mechanic or foreman.

Peak Season (March-October). During this time of the year, the golf course functions with a head course superintendent, two assistant superintendents, a head mechanic and 14 to 18 seasonal workers.

1. GREENS

- The greens will be mowed as little as 1 to 2 times weekly during the offseason and as often as 5 to 7 times during the peak season. The height of cut will range from as low as 3/64 inch to as high as 3/26 inch depending on variables such as stress, heat, time of season and cultural practices. During the off-season we will be using a triplex mower, which offsets the reduction in staff. During the peak season we will be using walk-behind mowers for the greens on the championship course. Triplex mowers will be used on the executive/junior course. Walking the greens require 6 to 11 machines, depending on the extenuating circumstances.
- Daily mowing will start early enough in the day as to minimize the interference with play. During the peak season, there will be enough mowers out working so that only on rare occasion will golfers encounter an uncut green. The direction of cut will rotate in four directions (N-S, E-W, NE-SW, and NW-SE) and straight lines are required. Clean-up laps, which consist of going around the perimeter of the green, just inside the collar, will change directions daily. This will eliminate grain problems on the edge of the greens. This process will also rotate in three different patterns each day. Note: The buckets, prior to the scheduled cleanup will be emptied to reduce scalping along the edge of the greens from the turning of the mowers.
- Grass clippings will be placed close to the green in a pile. After finishing their assigned holes, the section worker will return to the area and retrieve the clippings with a rake. Clippings are then loaded into a utility vehicle and dispersed in the rough out of play – no clipping will be

dispersed into the ponds. Addressing the clippings this way minimizes the creation of unsightly piles in the rough or near playing areas.

- The greens will be mowed in sequential order unless otherwise stated by the head course superintendent, assistant superintendent or foreman.
- After mowing is completed, the mowers will be washed off by the shop on the grass to eliminate contamination of the water ways.

2. FAIRWAYS

- The fairways are to be mowed as infrequently as 1 to 2 times weekly during the off-season and as much as 3 to 4 times during the peak season. Variables could affect the mowing schedule. The height of the cut will range from as low as $\frac{1}{2}$ inch to as high as $\frac{3}{4}$ inch depending on variable such as stress, heat, time of season and cultural practices. There will be no buckets during the process, thus returning the clipping which reduces waste and labor costs.
- The Championship Course will be mowed in 4 alternating directions. (N-S, E-W, NE-SW, NW-SE) all of which will be coordinated by the head course superintendent or his assistants to ensure consistency between holes. Nine holes will be mowed per day alternating from the back nine to the front nine. This will help in reducing clipping and clumping of grass. Fairway mowing will not start before 10:00 A.M. in order to allow sunlight to dry the fairways from night time irrigation. *Employees mowing fairways will be expected to attend their section work beforehand to maximize labor and cost efficiency.*
- The Executive/Junior Course will be mowed on Mondays and Thursdays, also alternating in 4 directions and being coordinated by the head course superintendent or his assistants. Mowing will be done later in the day to minimize clumping of grass and clean-up problems.

3. TEES

- The tees will be mowed as infrequently as 1 to 2 times weekly during the off-season and as often as 3 to 5 times during the peak season. The height of cut will range from as low as ¼ inch to as high as 5/8 inch depending on variables such as stress, heat, time of year and cultural practices. Using triplex mowers on the Executive/Junior Course is to be standard procedure to reduce labor costs and increase time efficiency.
- The Championship Course will be mowed in 4 alternating directions (N-S, E-W, NE-SW and NW-SE) which will be coordinated by the head course superintendent or his assistants to ensure consistency from hole to hole. Mowing will be done Mondays, Wednesdays, and Fridays starting early in the morning to minimize interference with play. Holes will be cut in sequential order unless otherwise scheduled. Buckets will be used to enhance tee appearance. Clippings will be disbursed in the rough out of sight and away from play, and not into the ponds or streams that surround the golf facility. The machines will be washed by the shop on the grass to eliminate contamination of the water ways.
- The Executive/Junior Course will be mowed in 4 alternating directions as outline above and again will be coordinated by the head course superintendent or his assistants to ensure consistency from hole to hole. Mowing will be done on Tuesdays, and Thursdays following the same philosophy as the Championship Course.

4. ROUGHS (2nd Cut or Primary Rough)

- The roughs are to be mowed as infrequently as 1 to 2 times weekly during the off-season and as often as 2 to 3 times in the peak season. Again, variables may affect the mowing schedule. The height of the cut will range from as low as 2 inches to as high as 2½ inches depending on variables such as stress, heat, time of year, number of machines and cultural practices. There will be no buckets used during this process, thus mulching the clippings, reducing waste and labor cost.

- The Championship Course will be mowed per day alternating from the back nine to the front nine. This will help in reducing the clipping and clumping of grass. Rough mowing will not start before 10:00 A.M. in order to allow sunlight to dry the rough areas following night time irrigation. Those employees mowing roughs will attend to their section work beforehand to maximize labor.
- The Executive/Junior Course will follow the same structure as the Championship Course, mowing the roughs 2 to 3 times weekly.

5. INTERMEDIATE ROUGH (1st Cut of Rough)

- The intermediate cut is to be mowed as infrequently as 1 to 2 times weekly during the off-season and as often as 2 to 3 times during the peak season. Again, variables could affect the mowing schedule. The height of cut will range from as low as $\frac{3}{4}$ inches to as high as 1 inch depending on variables such as stress, heat time of year, number of machines and cultural practices. There will be no buckets used during this process, thus mulching the clippings, reducing waste and labor costs.
- Nine holes will be mowed per day alternating from the back nine to the front nine. This will help in reducing the clipping and clumping of grass. The mowing of the intermediate cut will not start before 10:00 A.M. in order to allow sunlight to dry the intermediate areas following night time irrigation. Those employees mowing the intermediate rough will attend to their section work beforehand to maximize labor.
- The Executive/Junior Course will not have an intermediate cut because the height of the cut on the Executive/Junior Course is lower.

6. DRIVING RANGE

- The fairway portion of the driving range is to be mowed ever Monday and Friday morning, taking into consideration tournaments, special events, and time of year or as needed. The range tee area is to be mowed early in the morning to help the clubhouse in opening the driving range early

- The driving range will be mowed at least 1 to 2 times weekly and as often as 2 to 3 times weekly depending on the time of year, staff, machines, and condition of tees. The direction will be rotated just as practiced and outlined on the regular course. However, fairway mowers are to be used because of the size of the tee area.

SAND BUNKERS

1. Mechanical raking of the bunkers is to be done at least 1 to 2 times weekly and as often as 5 to 7 times weekly, depending on the time of year, staff, condition of bunkers and machines.
2. Raking will start later in the day allowing the sand to dry, creating both a more desirable look and better playing conditions. Variables such as tournaments or special events may alter this philosophy.
3. When exiting the bunkers, care will be given to ensure that sand does not fall off the machine onto the grass. If this does happen, the rake operator will make sure that the sand is spread out and not left in a pile.
4. The perimeters of bunkers will be hand-raked by section employees, leaving a 1 inch lip on the upside of the bunker and a 2 inch lip on the back side of the bunker. Bunker rakes will be evenly distributed around the bunker edge, inside of the bunker. Damaged or broken rakes will be replaced immediately.

CULTURAL PRACTICES

1. AERATION

- The greens are to be aerated at least once per year and as often as 2 to 3 times per year. The optimal time of year to aerate is in the last part of April or August when tournament activity and play is slowing down. Aeration is accomplished in three days, completing 9 holes per day, having 9 holes closed each day. The holes are in the pattern of 1 to 2 inch centers and the task is completed by using machines. Following aeration, plugs are gathered using a core harvester and piled into a common location for later use. Enough top dressing is applied to fill the aeration holes completely. Along with top dressing, we fertilize using a good seed germinating analysis mixture. This allows the greens to heal faster, usually in 2 to 4 weeks depending on the weather and temperature.

- The fairways will be aerated as well, up to 3 times per year. This is done when growing temperatures are desirable, allowing the fairways to heal completely. The plugs resulting from this process are dragged back in the fairways; however, where there are instances of clay-intensive fairways, we remove the plugs totally from the surface and then top dress to help promote drainage and root growth. Broadcasting or slitting seed is usually done at the same time, along with fertilization. This helps the healing process before winter. Top dressing of bad or weak areas can occur any time during the year.
- The tees are aerated at least once per year in the fall. Ideally, this needs to occur twice, once again in the spring. The plugs that are a result from this process are dragged back into the tees; however, there are instances, again as with the fairways, on clay-intensive tees, where we remove the plugs totally from the surface and then top dress to help promote drainage and root growth. We also broadcast and fertilize during this process, thus promoting faster healing time. The teeing area on the driving range is done at the same time as the course tees. We seed and top dress after moving the tees up or back. This allows the tee area to grow back more quickly to accommodate the driving range needs.
- The roughs, along with the main landing area of the driving range are aerated in the spring as well as in the fall; however, time usually only permits fall aerating. Over seeding is only done in weak or damaged areas. As we aerate, we follow with an airway, or slitter, which helps to create a more intense application for root development, as it allows more water and oxygen to get to the roots.

2. FERTILIZATION

Fertilization of the golf course calls for different analysis at different times to the different types of playing surfaces. The following will describe the fertilization practices of each playing surface, along with the analysis used and the time, along with frequency. Note: The analysis mentioned can and will be substituted according to soil samples and tissue analysis, but as a general rule of thumb, the percentages do not change dramatically

enough to be mentioned. Included with this fertilizer section, other applications to the specific turf will be mentioned, including fungicides, growth regulators and wetting agents.

The greens will be fertilized once a month during the year with granular fertilizer that will be supplemented with minors, i.e, manages and iron, by using a liquid type application which is applied by using a spray machine.

Spring application(s) of fertilizer on greens will be as follows:

- Late March, and early April Start fertilizer 19-26-5 (4lbs/1000 square feet)
- Early June 19-0-17 (4lbs/1000 square feet)
- Late July 0-0-45 (6lbs/1000 square feet)
- Late August Starter fertilizer (19-26-5 (4lbs/1000 square feet)
- October 19-0-17 (4lbs/1000 square feet)
- Late Nov. early Dec. FFII 14-3-3 fungicide (double rate) for snow mold

Other types of applications as far as minors and growth regulators to the greens are listed as follows:

- Late April *Primo*, TGR double rate for poa control
- Late May *Primo* (8oz/acre) full rate, with iron agent at full rate, with iron (6oz/1000) at full rate, minors and wetting agent at full rate (8oz/1000)
- Mid July *Primo* (8oz/acre) full rate, with iron (6oz/1000) at full rate, minors and wetting agent at full rate (8oz/1000)
- Early August *Primo* (8oz/acre)full rate, minors and wetting agent at full rate (8oz/1000)
- Early October Iron (6oz/1000 minors, with wetting agent at full rate (8oz/1000)

The fairways will also be fertilized 2 to 3 times during the year with granular fertilizer and will be supplemented with minors by using a liquid type application.

Spring application(s) of fertilizer on fairways will be as follows:

- Early April *Exodus* (as per label for salt problems) will be injected through the fertigation system
- First of May 25-3-10 (250lbs/acre) or comparable

- Mid July *UNKNOWN* (150lbs/acre)
- Late October 38-0-0 (250lbs/acre)
- Peak season long Injection will be done through the fertigation system.

Other types of applications as far as minors and growth regulators to the fairways are listed as follows:

- Late April *Embark* at normal rate of (6oz/acre) and iron at normal rate (8oz/1000)
- Late May *Primo* (11oz/acre) full rate, with iron (6oz/1000 at full rate, minors and wetting agent at full rate (8oz/1000)
- Mid July *Primo* (11oz/acre) full rate, with iron (6oz/1000) at full rate, minors and wetting agent at full rate (8oz/1000)
- Late August *Primo* (11oz/acre) full rate, with iron (6oz/1000) at full rate, minors and wetting agent at full rate (8oz/1000)
- Early October Iron (6oz/1000) minors, with wetting agent at full rate (8oz/1000)

The tees, because of wear and tear, are to be fertilized 3 to 5 times per year with a granular fertilizer and will be supplemented with minors by using a liquid type application.

Spring application(s) of fertilizer on the tees will be as follows:

- Early April *Exodus* (as per label for salt problems) injected through the fertigation system along with 19-25-5 at full rate
- Mid May 25-3-10 (250lbs/acre)
- Mid July *UNKNOWN*
- Mid-September 12-2-30 (200lbs/acre)
- October *UNKNOWN*

- Peak season long Injection will be done through the fertigation system

Other types of applications as far as minors and growth regulators to the tees are listed as follows:

- Late April *Embark* at normal rate of (6oz/acre) and iron at normal rate (8oz/1000)
- Late May *Primo* (11oz/acre) full rate, with iron (6oz/1000) at full rate, minors and wetting agent at full rate (8oz/1000)
- Mid July *Primo* (11oz/acre) full rate, with iron (6oz/1000) at full rate, minors and wetting agent at full rate (8oz/1000)
- Late August *Primo* (11oz/acre) full rate, with iron (6oz/1000) at full rate, minors and wetting agent at full rate (8oz/1000)
- Early October Iron (6oz/100) minors, with wetting agent at full rate (8oz/1000)

The primary in intermediate roughs will also be fertilized two times during the year with a granular fertilizer and will be supplemented with minors by using a liquid type application.

Spring application(s) of fertilizer on roughs will be as follows:

- Early April *UNKNOWN*
- First of May 38-0-0
- Late October 38-0-0
- Peak season long Injection of 8-8-8 will be done through the fertigation system

MISCELLANEOUS

The head course superintendent and/or the assistant superintendent will check the general condition of the golf course each morning, with paying particular attention to the greens. Green color, moisture content, quality of cut and any signs of disease or insects will be noted. Immediate action to problem areas will follow. This is to be done in addition to an inspection of club house, practice areas, the condition of bunkers, course set-up and restrooms.

Trash receptacles are to be emptied daily. Tee towels will be checked and replaced as necessary. Debris around shoe brushes is to be addressed on as-needed basis. Spike brushes are to be cleaned and replaced when necessary.

Restrooms will be cleaned daily. Supplies will be restocked and care will be taken to ensure that cob webs are removed from the corners of walls, windows, under plumbing fixtures, around lights and shelving. In the event that a problem with the plumbing arises that cannot be immediately repaired, the door will be locked and a sign indicating RESTROOM UNDER REPAIR is to be posted.

Careful attention is to be given to ropes and stakes being upright, straight and rotated. Problems or potential problems will be noted and reported according to severity. The head course superintendent, assistant superintendents and foremen are to keep notes recording any item that requires attention.

IRRIGATION

A preventative maintenance program will be adhered to with periodic checks and adjustments as follows:

- Pump station – daily
- Central controller – daily
- Water schedule – daily
- Injection system – daily
- Satellite controller – weekly
- Pressure and air relief valves – biweekly
- Irrigation heads operation and flow – weekly

EQUIPMENT PREVENTATIVE MAINTENANCE

1. The golf course will have an experienced golf course mechanic on duty to provide both the preventative and repair-oriented maintenance that goes into keeping equipment running efficiently. During peak season, the mechanic will be responsible for any and all repairs, preventative maintenance and safety inspections, along with keeping the maintenance facility clean and free of clutter in order to avoid accidents.
2. Equipment is to be constantly inspected. This includes height adjustments, fluid levels and quality of cut.
3. It is the sole responsibility of the head mechanic to document any and all repairs and all routine duties performed on the equipment. This documentation is then kept for budgeting purposes and equipment needs that may arise in the future.

An integral part of any maintenance operation is a sound and efficient winter maintenance program. During this time the staff readies the golf course for its peak season. Every piece of equipment is completely disassembled, inspected, cleaned and refurbished in order to maximize readiness for the regular golfing season. Items to be addressed are the rebuilding of reels, rollers, engines, the sharpening of all bed-knives, reels, and whatever else the manufacturer suggests.

The head course superintendent and his assistants will assist the mechanic in these tasks to ensure that all golf course accessories are repainted and renovated, thereby avoiding costly replacements.

The ordering of supplies is to be completed at this time so as to maximize the time the staff can address the more important matters of peak season play. The head mechanic will also be responsible for training new employees and for keeping records for both training and new equipment.

EMPLOYEE TRAINING

All employees will be properly trained and supervised about each facet of golf course maintenance, from safety and operations to etiquette and appearance.

1. Safety

- Personal
 - i. Eyewear – when necessary or required
 - ii. Eye protection provided
 - iii. Clothing as it pertains to certain tasks
 - iv. Shirts – provided

2. TESTING AND PROGRESS EVALUATION

- Oral demonstration
- Video and/or reading materials
- Performance evaluation and correction
- Clarification (as needed)

3. MISCELLANEOUS TRAINING

- Proper course protocol
- Course rules
- Playing privileges

- Hazards and exposures
- Emergency procedures
- Controls

4. PROFESSIONAL IMAGE

- Personal appearance at a high standard
- Dressing appropriately
- Uniform or shirt neat in appearance
- Maintenance areas and club house are to be kept clean inside and out

5. CONDUCT GUIDELINES

- Possess a friendly, courteous attitude
- Listen attentively to instructions
- Post maintenance information (aerating greens, spraying and construction projects)
- Attend all meetings assigned
- Be available to meet with and/or speak to various associations
- Be innovative and proactive
- Play golf and know the golf course

CHEMICALS FOR WEED/PEST CONTROL

Ideally, weed control on fairways, tees, driving range and roughs is to be addressed in both spring and fall. However, circumstances may warrant only one application per year. The course will be closed during the time of application to eliminate exposure to chemicals by golfers and staff, reducing golf course liability. Greens are to be treated independently and always as per label rate.

We will be using IPM for insect and weed control. In the past years, insects, other than ants, have not been a major concern, but constant vigilance is to be kept in preventing the overgrowth of problem insects. Animals such as geese, beavers, gophers, etc., are part of the wildlife at East Bay golf course. They will be treated on an individual basis and controlled or eliminated only when their damage affects the well-being of either people or the property.

CONCLUSION

In most instances, the superintendent manages the largest operating budget at a golf facility. This holds true at The Reserve at East Bay golf course.

Too often, it may be assumed that costs can be reduced without any significant impact to the golf course conditioning. Rarely do significant spending reductions come without some compromise in conditioning. When budget cuts come, too many times the default answer is that it should come from labor, because labor is such a significant amount of the maintenance budget. The problem with this thinking is that when you reduce labor, it affects virtually every task on the course.

The second reason the superintendents budget often is targeted for cuts is that the golf course maintenance operation might be viewed as a big spender rather than a revenue generator. In reality, the golf course superintendent maintains the facility's greatest asset, the golf course. Without the golf course, very few golf shops, club houses and grills would survive.

P.A.R Golf Management understands that the golf course is the lifeblood of the business. We recognize that the condition of the golf course is tied directly to revenue generation for all departments of the facility. Because of this philosophy, our maintenance duties correlate with specific golf course maintenance standards and conditioning for The Reserve at East Bay golf course.

P.A.R Golf Management is all about team work, sharing a common vision and developing open, honest working relationships with employees. It's a combination that can accomplish uncommon success.