



City of Brisbane Sewer System Management Plan

August 2006

Last Revision – January 2018

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Revision Log

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Section 1 – Goals

1. To maintain a safe, cost-effective, and reliable collection system for the residents and businesses in Brisbane.
2. To properly manage, operate, and maintain all parts of the wastewater collection system.
3. To provide adequate capacity to convey peak flows.
4. To eliminate sanitary sewer overflows.
5. To minimize and mitigate impacts of sanitary sewer overflows.
6. To educate the public regarding proper disposal practices for materials which are detrimental to a collection system.

Section 2 – Organization

Figure 1 details the organizational structure within the City of Brisbane with regard to managing the sanitary sewer collection system and responding to sanitary sewer overflows. The roles for the various agency staff are further defined, as follows:

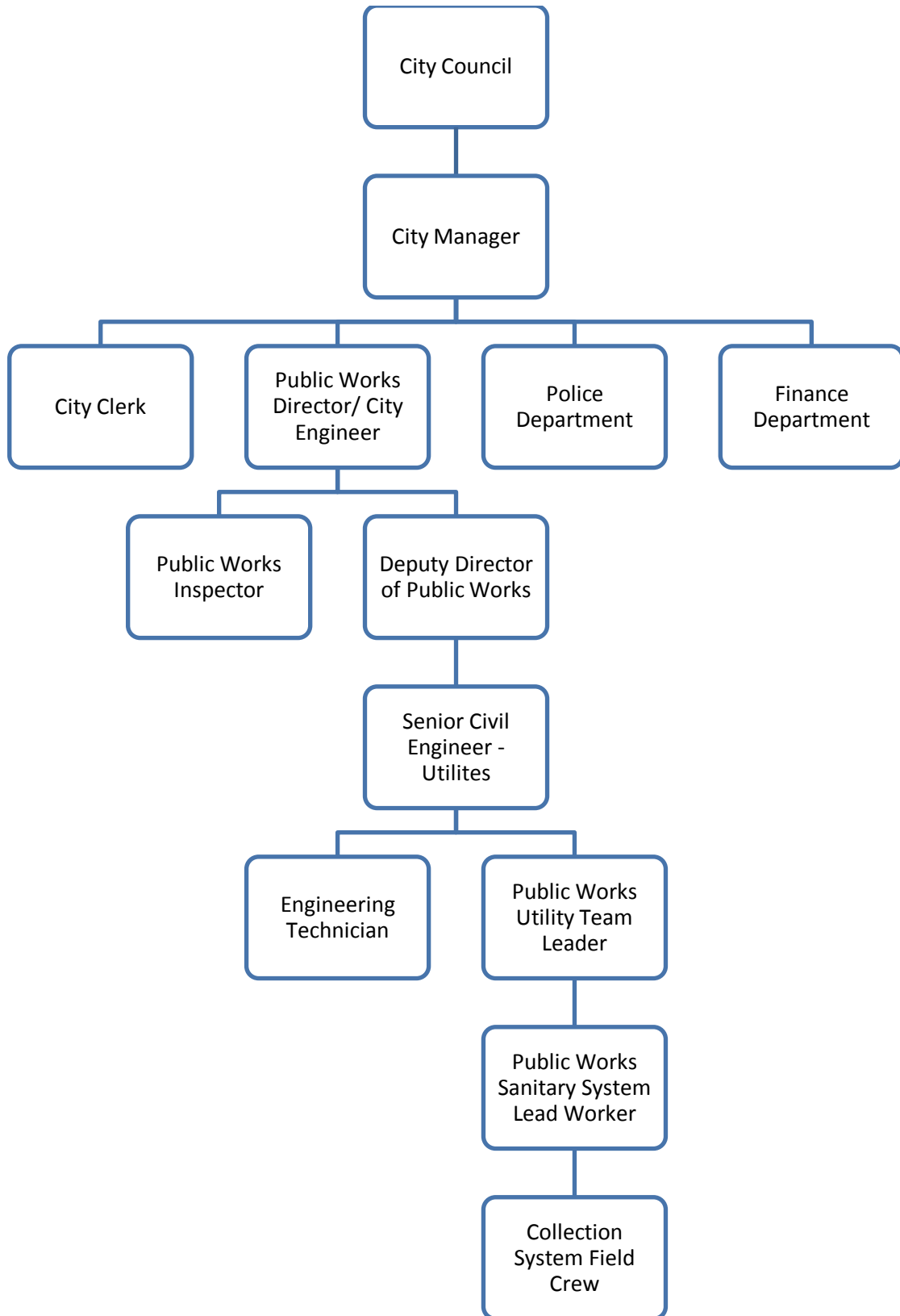
- City Council: Establishes policy, approves sewer rate structure
- City Manager: Establishes policy, leads staff, allocates resources, delegates responsibility, provides reports to City Council
- Assistant to the City Manager: Serves as Public Information Officer
- Finance Department: Sets funding levels needed for maintaining collection system, allocates fiscal resources for collection system staff
- Dispatch, Police and Fire Departments: Receive off-hours or emergency calls reporting sanitary sewer overflows, respond to reports of illegal dumping or sanitary sewer overflows in off-hours, notify Public Works Supervisor/Utility Team Leader or Public Works Director of reports of sanitary sewer overflows
- Public Works Director/City Engineer: Leads staff, allocates resources, delegates responsibility, authorizes outside contractors to perform services, establishes department policy, approves sanitary sewer design criteria, provides verbal reports to City Manager and City Council
- Senior Civil Engineer - Utilities: Supervises Utility Team Leader and provides technical support and training to field crews for managing collection system, investigates and reports sanitary sewer overflows, provides relevant information to agency management, prepares and implements contingency plans, involved in emergency response and serves as Capital Improvement Program manager for the collection system.
- Public Works Inspector: Inspects new sanitary sewer installation/improvements to ensure compliance with City standards, works with field crews to handle emergencies when contractors are involved, provides verbal reports to Public Works Director and Collection System Manager
- Public Works Administrative Assistant: Receives work-hour phone and radio reports from the public and city crews of sanitary sewer overflows, provides verbal and written documentation for overflows to Utility Team Leader and Senior Civil Engineer – Utilities.

- Utility Team Leader: Manages field operations and maintenance activities, supervises the lead worker and sanitary maintenance team, delegates responsibility, responds to reports of sanitary sewer overflows, trains field crews, leads emergency response activities, provides verbal reports to Senior Civil Engineer and Public Works Director.
- Sanitary System Lead Worker: This lead position works as a member of the crew and performs the more difficult and complex maintenance and repair tasks, as well as assisting with supervising, training, and directing less experienced staff.
- Sanitary System Field Crew: Perform preventive maintenance activities, mobilize and respond to notification of blockages and sanitary sewer overflows, including mobilizing sewer cleaning equipment, by-pass pumping equipment, portable generators, and vacuum truck, provide verbal and written reports to Utility Team Leader.
- City Clerk: Provides written information updates to City Council, arranges for emergency meetings, as necessary

City of Brisbane Public Works Emergency Contact List

Employee	Title	Office	Cell
Randy Breault	Director of Public Works	(415) 508-2131	(415) 716-5853
Karen Kinser	Deputy Director of Public Works	(415) 508-2133	(415) 740-0816
Jerry Flanagan	Senior Civil Engineer - Utilities	(415) 508-2137	(415) 321-0047
Diane Cannon	Administrative Assistant	(415) 508-2130	(415) 740-4721
Bob Sage	Engineering Technician Public Works	(415) 508-2121	(650) 892-1290
Dustin Cohn	Public Works Utility Team Leader	N/A	(415) 728-7986
Kessel Crockett	Public Works Sanitary Lead Worker	N/A	(415) 894-7938
Todd Curtis	Maintenance Utility Worker	N/A	(415) 269-4746
Chris Redfield	Maintenance Utility Worker	N/A	(650) 291-8845
Gerald Wilkin	Maintenance Utility Worker	N/A	(415) 407-3398
Frank Lozano	Maintenance Utility Worker	N/A	(415) 612-0218
Albert Mosely	Maintenance Utility Worker	N/A	(415) 730-6926
Randy Thomas	Maintenance Utility Worker	N/A	(510) 909-3148
Varies	Public Works 24 hr On-Call Staff	N/A	(415) 286-0164
Greg Morris	Public Works Inspector	N/A	(415) 760-3053
Joe Friars	Buildings and Grounds Supervisor	N/A	(650) 766-4353
Mike Hahn	Harbor Master	(650) 583-6975	(650) 269-1225
Dolan Shoblo		N/A	(415) 793-7093
Keegan Black	Maintenance Program Manager	N/A	(415) 728-7986
Dispatch	Brisbane Police	(415) 467-1212	911
	Brisbane Fire	(415) 657-4300	911
Engine 81	Brisbane Fire		(415) 716-0414
Dispatch	North County Fire	(650) 368-1421	911
	Company Nurse	1-877-215-7284	

Figure 1 - Chain of Command Flow Chart



Section 3 – Overflow Emergency Response Plan

A. Staff Notification

Sanitary sewer overflows are typically reported in one of two ways in the City of Brisbane:

1. Observed and reported directly to City staff by a member of the public, another agency, or City crews during working hours
2. Observed and reported by a member of the public or another agency to the police department during non-working hours

If a sewer overflow is reported to City Hall during working hours, the Public Works Administrative Assistant will make note of the time reported, the name and contact information of the reporting party, and location and details of the overflow. The Administrative Assistant will immediately notify the Public Works Utility Team Leader and provide the recorded information, and the Public Works Utility Team Leader will then dispatch appropriate field crews to the site. Once City crews have responded to the site and assessed the situation, they will report back to the Public Works Utility Team Leader, who will then notify the Senior Civil Engineer - Utilities with the details of the overflow.

For overflows reported during non-working hours to the police or fire departments, dispatch will record the time reported, the name and contact information of the reporting party, and location and details of the overflow. This information will be relayed to the Public Works Utility Team Leader or directly to on-call personnel if the Public Works Utility Team Leader cannot be reached. The Public Works Utility Team Leader will relay the details of the overflow and dispatch the on-call personnel to the scene. The Senior Civil Engineer - Utilities will be notified on the next working day unless the overflow requires reporting within 2 hours, in which case, notification will occur as soon as feasible after the overflow is corrected.

To minimize SSO impacts, the main priorities shall be protection of public health and the environment. For all SSOs, if there is potential for public contact with sanitary waste, the affected area shall be cordoned off to prevent public access, using traffic barricades, warning tape, cones, signs, etc. All overflow volume that is recoverable shall be contained and pumped back into the sanitary sewer system, either with trash pumps or a vactor truck. If the overflow reaches the storm drain system, a downstream catch basin or storm system manhole shall be plugged with sandbags or inflatable drain plugs, and the contained volume pumped out or vacuumed with the vactor truck. Impacted areas on the surface shall be washed down, with all washwater contained and returned to the sanitary sewer system. Impacted areas shall be cleaned and disinfected, as appropriate, to eliminate any public health threats. Should any overflow volume visibly impact surface waters, City staff will pursue follow-up sampling and mitigation efforts in coordination with appropriate regulatory agencies.

In 2015 City Staff developed and implemented a set of Lift Station Emergency Response Plans, to be stationed at all of the City Maintained Lift Stations. These plans include maps, retention times, emergency contacts, and site specific response plans. The purpose of these Emergency

Response Plans is to mitigate any impact to the local waterways from a failure at any of the City's Lift Stations.

B. Crew Response

The following steps outline the typical overflow response procedures:

1. Perform Initial Assessment
 - a. Conduct quick visual volume assessment (gallons) with photo documentation
 - b. Call for additional backup support, as required
 - c. Identify overflow destination (catch basin, infiltrate into ground, gutter, etc.)
 - d. Determine equipment needs for restricting public access, traffic control, overflow containment and recovery, clearing blockage, and cleanup
 - e. If overflow appears to meet the following criteria, **contact Dustin Cohn - Public Utilities Team Leader (cell: 415-728-7986); or contact Jerry Flanagan – Senior Civil Engineer – Utilities (office: 415-508-2137 or cell: 415-321-0047) immediately:**
 - i. All discharges of sewage of any volume resulting from a failure in the City-owned and operated sanitary sewer system that:
 - Result in a discharge to a surface water body and/or reach a drainage channel tributary.
 - Discharge to a storm drainpipe that was not fully captured and returned to the sanitary sewer system or not otherwise captured and disposed of properly.
2. Preliminary Response
 - a. If there is potential for public contact with overflow material, isolate the area using barricades, cones, warning tape, etc.
 - b. Set up appropriate traffic control for City staff and public protection
3. Containment/Recovery
 - a. Take photo documentation of containment/recovery efforts
 - b. If overflow is ongoing, or if some or all of flow can be captured, contain flow by plugging catch basin outlets, covering catch basins, using sandbags, plugging downstream stormdrain manhole outlets, excavating for containment, etc.
 - c. Set up Vactor equipment or trash pumps to recover overflow volume, as appropriate
3. Correct Overflow
 - a. Set up equipment at dry cleanout or manhole location, follow standard procedures for cleaning
 - b. Capture and remove material flowing from blockage, assess material captured to determine cause of overflow
4. Cleanup
 - a. Take photo documentation of cleanup activities

- b. Collect solid and liquid materials
 - c. Wash and disinfect area only if all washwater and disinfectant can be captured and removed with pumps or Vactor
 - d. Clean impacted storm drain lines and catch basins
5. Document Incident
- a. Make final estimate of overflow volume
 - b. Take pictures (digital or polaroid)
 - c. Fill out overflow field report, tracking chronology of event, including: date, location, time call received, time crew arrived, time overflow ceased, time cleanup completed, estimate of total volume, estimate of volume contained and recovered for discharge to sanitary sewer, estimate of volume reaching water bodies, if known, identify probable cause of overflow, notifications made
6. Provide documentation and incident results to Public Works Utility Team Leader.

C. SSO Categories, Notification and Reporting

The following reporting requirements are based on Amending Monitoring and Reporting Program 2006-0003 in the Statewide General Waste Discharge Requirements for Sanitary Sewer Systems and amended in Order WQ2013-0058-EXEC:

1. Sanitary Sewer Overflow (SSO) Categories

- a. **Category 1** - All discharges of sewage of any volume resulting from a failure in the City-owned and operated sanitary sewer system that:
 - i. Result in a discharge to a surface water and/or reach a drainage channel tributary to a surface water; or
 - ii. Discharge to a storm drainpipe that was not fully captured and returned to the sanitary sewer system or not otherwise captured and disposed of properly.
- b. **Category 2** – All discharges of sewage resulting from a failure in the City’s sanitary sewer system of 1,000 gallons or greater that does not reach surface water, a drainage channel or storm pipeline unless the entire SSO discharged to the storm drain system is fully recovered and disposed of properly.
- c. **Category 3** – All other discharges of sewage resulting from a failure in the City’s sanitary sewer system.
- d. **Private Lateral Sewage Discharges** – Sewage discharges that are caused by blockages or other problems within a privately owned sewer lateral may be voluntarily reported to the California Integrated Water Quality System (CIWQS) Online SSO Database.

2. SSO Notification

Effective immediately, the following is notification requirement for sanitary sewer overflows that discharge to a drainage channel or surface water.

- a. **Category 1 SSO – 1,000 gallons and greater discharged to drainage channel or surface water**
 - i. Notify Cal OES (800-852-7550) within 2 hours after
 - knowledge of the discharge;
 - notification is possible;
 - notification can be provided without substantially impeding cleanup or other emergency measures.
 - ii. Note the list of what Cal OES might ask when you call;
 - iii. Obtain a notification control number;
 - iv. Following the initial notification to Cal OES and until such time that the Discharger certifies the SSO report in the CIWQS Online SSO Database, the Discharger shall provide updates to Cal OES regarding substantial changes to the estimated volume of sewage discharged and any substantial changes to known impacts.

In order to comply with these new notification requirements, it may be necessary for City staff on the maintenance crew to perform the necessary notifications, especially in cases where overflows occur after hours. The contact information for the required notification is as follows:

California State Office of Emergency Services
(800) 852-7550

When calling this number be prepared to report the following:

- i. Identity of caller and direct return phone number.
- ii. Estimated SSO volume discharged (gallons).
- iii. If ongoing, estimated SSO discharge rate (gallons per minute).
- iv. SSO Incident Description:
 - a. Brief narrative.
 - b. On-scene point of contact for additional information (name and cell phone number).
 - c. Date and time Discharger became aware of the SSO.
 - d. Name of sanitary sewer system agency causing the SSO.
 - e. SSO cause (if known).
- v. Indication of whether the SSO has been contained.
- vi. Indication of whether surface water is impacted.
- vii. Name of surface water impacted by the SSO, if applicable.
- viii. Indication of whether a drinking water supply is or may be impacted by the SSO.
- ix. Any other known SSO impacts.
- x. SSO incident location (address, city, state, and zip code).

3.0 SSO Reporting Requirements

- a. **Category 1 SSO** – Submit draft report within three (3) business days of becoming aware of the SSO and certify within 15 calendar days of SSO end date. Enter data into the

CIWQS Online SSO Database (<http://ciwqs.waterboards.ca.gov/>), certified by enrollee's Legally Responsible Official.

- b. **Category 2 SSO** – Submit draft report within three (3)) business days of becoming aware of the SSO and certify within 15 calendar days of SSO end date. Enter data into the CIWQS Online SSO Database (<http://ciwqs.waterboards.ca.gov/>), certified by enrollee's Legally Responsible Official.
- c. **Category 3 SSO** – Submit certified report with thirty (30) calendar days of the end of the month in which SSO occurred. Enter data into the CIWQS Online SSO Database (<http://ciwqs.waterboards.ca.gov/>), certified by enrollee's Legally Responsible Official.
- d. **SSO Technical Report** – Submit within 45 calendar days after the end date of any Category 1 SSO in which 50,000 gallons or greater are spilled to surface waters. Enter report into the CIWQS Online SSO Database (<http://ciwqs.waterboards.ca.gov/>), certified by enrollee's Legally Responsible Official.
- e. **Water Quality Monitoring** – Conduct water quality sampling within 48 hours after initial SSO notification for Category 1 SSOs in which 50,000 gallons or greater are spilled to surface waters. Water quality results are required to be uploaded into the CIWQS Online SSO Database (<http://ciwqs.waterboards.ca.gov/>), certified by enrollee's Legally Responsible Official.
- f. **“No Spill” Certification** – Certify that no SSOs occurred within 30 calendar days of the end of the month.
- g. **Collection System Questionnaire** - All SSOs that meet the criteria for Category 1 or Category 2 SSOs shall be reported to the CIWQS Online SSO Database.
- h. **CIWQS Online SSO Database Unavailability** - In the event that the SSO Online Database is not available, the City must fax or e-mail all required information to the San Francisco Bay Regional Water Quality Control Board office (510-622-2460) in accordance with the time schedules identified herein. In such event, the City must also enter all required information into the CIWQS Online SSO Database when the database becomes available.
- i. **Amended SSO Reports** – The City may update or add additional information to a certified SSO report within 120 calendar days after the SSO end date by amending the report or by adding an attachment to the SSO report in the CIWQS Online SSO Database.

D. SSO Technical Report

The City shall submit an SSO Technical Report in the CIWQS Online SSO Database within 45 calendar days of the SSO end date for any SSO in which 50,000 gallons or greater are

spilled to surface waters. This report, which does not preclude the Water Boards from requiring more detailed analyses if requested, shall include at a minimum, the following:

1. Causes and Circumstances of the SSO:

- a. Complete and detailed explanation of how and when the SSO was discovered.
- b. Diagram showing the SSO failure point, appearance point(s), and final destination(s).
- c. Detailed description of the methodology employed and available data used to calculate the volume of the SSO and, if applicable, the SSO volume recovered.
- d. Detailed description of the cause(s) of the SSO.
- e. Copies of original field crew records used to document the SSO.
- f. Historical maintenance records for the failure location.

2. Enrollee's Response to SSO:

- a. Chronological narrative description of all actions taken by enrollee to terminate the spill.
- b. Explanation of how the SSMP Overflow Emergency Response plan was implemented to respond to and mitigate the SSO.
- c. Final corrective action(s) completed and/or planned to be completed, including a schedule for actions not yet completed.

3. Water Quality Monitoring:

- a. Description of all water quality sampling activities conducted including analytical results and evaluation of the results.
- b. Detailed location map illustrating all water quality sampling points.

E. Water Quality Monitoring Requirements:

Appendix D includes the sampling and analytical methodology for the implementation of the SSO Water Quality Monitoring Program to assess the impacts from SSOs to surface waters in which 50,000 gallons or greater are spilled to surface waters. The SSO Water Quality Monitoring Program includes:

1. Sampling and Analytical Methodology
2. Account for spill travel time in the surface water and scenarios where monitoring may not be possible.
3. Require water quality analyses for ammonia and bacterial indicators to be performed by an accredited or certified laboratory.
4. Require monitoring instruments and devices used to implement the SSO Water Quality Monitoring Program to be properly maintained and calibrated.
5. Within 48 hours of becoming aware of the SSO, required water quality sampling at a minimum shall require:
 - a. Ammonia
 - b. Bacterial Indicator(s)

F. SSO Online Reporting

The City at a minimum, will report the following mandatory information prior to finalizing and certifying an SSO report for each category of SSO:

1. Draft Category 1 SSOs:

- a. SSO Contact Information: Name and telephone number of enrollee contact person who can answer specific questions about the SSO being reported.
- b. SSO Location Name.
- c. Location of the overflow event (SSO) by entering GPS coordinates. If a single overflow event results in multiple appearance points, provide GPS coordinates for the appearance point closest to the failure point and describe each additional appearance point in the SSO appearance point explanation field.
- d. Whether or not the SSO reached surface water, a drainage channel, or entered and was discharged from a drainage structure.
- e. Whether or not the SSO reached a municipal separate storm drain system.
- f. Whether or not the total SSO volume that reached a municipal separate storm drain system was fully recovered.
- g. Estimate of the SSO volume, inclusive of all discharge point(s).
- h. Estimate of the SSO volume that reached surface water, a drainage channel, or was not recovered from a storm drain.
- i. Estimate of the SSO volume recovered (if applicable).
- j. Number of SSO appearance point(s).
- k. Description and location of SSO appearance point(s). If a single sanitary sewer system failure results in multiple SSO appearance points, each appearance point must be described.
- l. SSO start date and time.
- m. Date and time the enrollee was notified of, or self-discovered, the SSO.
- n. Estimated operator arrival time.
- o. For spills greater than or equal to 1,000 gallons, the date and time Cal OES was called.
- p. For spills greater than or equal to 1,000 gallons, the Cal OES control number.

2. Certified Category 1 SSOs:

- a. All information previously provided in Draft Category 1 SSO;
- b. Description of SSO destination(s);
- c. SSO end date and time;
- d. SSO causes (mainline blockage, roots, etc.);
- e. SSO failure point (main, lateral, etc.);
- f. Whether or not the spill was associated with a storm event;
- g. Description of spill corrective action, including steps planned or taken to reduce, eliminate, and prevent reoccurrence of the overflow; and a schedule of major milestones for those steps;
- h. Description of spill response activities;
- i. Spill response completion date;
- j. Whether or not there is an ongoing investigation, the reasons for the investigation and the expected date of completion;
- k. Whether or not a beach closure occurred or may have occurred as a result of the SSO.
- l. Whether or not health warnings were posted as a result of the SSO;

- m. Name of beach(es) closed and/or impacted. If no beach was impacted, NA shall be selected;
 - n. Name of surface water(s) impacted;
 - o. If water quality samples were collected, identify parameters the water quality samples were analyzed for. If no samples were taken, NA shall be selected;
 - p. If water quality samples were taken, identify which regulatory agencies received sample results (if applicable). If no samples were taken, NA shall be selected.
 - q. Description of methodology(ies) and type of data relied upon for estimations of the SSO volume discharge and recovered;
 - r. Upon SSO Certification, the CIWQS Online SSO Database will issue a final SSO identification (ID) number.
3. Draft Category 2 SSOs:
 - a. At a minimum, report on Items a-n of Draft Category 1 SSO reporting.
 4. Certified Category 2 SSOs:
 - a. At a minimum, report on Items a-n of Draft Category 1 SSO reporting and Items a-j and Item r of Certified Category 1 SSO reporting.
 5. Certified Category 3 SSOs:
 - a. At a minimum, report on Items a-n of Draft Category 1 SSO reporting and Items a-f and Item r of Certified Category 1 SSO reporting.

G. Reporting to Other Regulatory Agencies

The City shall also report SSOs to other regulatory agencies pursuant to California state law.

1. The City shall report any discharge of untreated wastewater or other waste in or on any waters of the State, or discharged in or deposited where it is, or probably will be, discharged in or on any surface waters of the State to San Mateo County Health (Milton Jordan 650-208-4392 cell) officials in accordance with California Health and Safety Code Section 5410 et seq.

H. Record Keeping Requirements:

The following records shall be maintained by the enrollee for a minimum of five (5) years and shall be made available for review by the Water Boards during an onsite inspection or through an information request:

1. General Records: The enrollee shall maintain records to document compliance with all provisions of the SSS WDRs and the MRP for each sanitary sewer system owned including any required records generated by an enrollee's sanitary sewer system contractor(s).
2. SSO Records: The enrollee shall maintain records for each SSO event, including but not limited to:

- a. Complaint records documenting how the enrollee responded to all notifications of possible or actual SSOs, both during and after business hours, including complaints that do not result in SSOs. Each complaint record shall, at a minimum, include the following information;
 - i. Date, time, and method of notification.
 - ii. Date and time the complainant or informant first noticed the SSO.
 - iii. Narrative description of the complaint, including any information the caller can provide regarding whether or not the complainant or informant reporting the potential SSO knows if the SSO has reached surface waters, drainage channels or storm drains.
 - iv. Follow-up return contact information for complainant or informant for each complaint received, if not reported anonymously.
 - v. Final resolution of the complaint.
 - b. Records documenting steps and/or remedial actions undertaken by enrollee, using all available information, to comply with section D.7 of the SSS WDRs.
 - c. Records documenting how all estimate(s) of volume(s) discharged and, if applicable, volume(s) recovered were calculated.
3. Records documenting all changes made to the SSMP since its last certification indicating when a subsection(s) of the SSMP was changed and/or updated and who authorized the change or update. These records shall be attached to the SSMP.
 4. Electronic monitoring records relied upon for documenting SSO events and/or estimating the SSO volume discharged, including, but not limited to records from:
 - a. Supervisory Control and Data Acquisition (SCADA) systems
 - b. Alarm system(s)
 - c. Flow monitoring devices(s) or other instruments(s) used to estimate wastewater levels, flow rates and/or volumes.

I. Certification

1. All information required to be reported into the CIWQS Online SSO Database shall be certified by a person designated as a Legally Responsible Official (LRO).
2. Any designated person shall be registered with the State Water Board to certify reports in accordance with the CIWQS protocols for reporting.
3. Any enrollee employee may enter draft data into the CIWQS Online SSO Database on behalf of the enrollee if authorized by the LRO and registered with the State Water Board.
4. A registered designated person (i.e., and LRO) shall certify all required reports.

Section 4 – Fats, Oils, and Grease (FOG) Control Program

Grease has not been found to be a significant contributor to SSOs in the City of Brisbane, however, the City will implement a FOG Control Program as follows:

A. Source Identification:

The likely sources of highest-concentration FOG discharge to the sewer system are from the City's food service facilities. There are typically between 30 and 40 food service facilities in Brisbane at any one time. These facilities are primarily located in "the Village" area of Brisbane along Old County Road and in the commercial district on Visitacion Avenue. Additional facilities are scattered in Crocker Industrial Park and at Sierra Point in association with the hotels and office buildings.

FOG may be discharged to the sanitary sewer from residences in central Brisbane or the Northeast Ridge.

B. Source Control:

Source control measures for food service facilities are primarily accomplished through San Mateo County's Environmental Health Department inspection program. County health inspectors enforce operation and maintenance of grease interceptors and ensure proper management of food service waste. In addition, if an SSO occurs in a residential or commercial area due to FOG buildup, City staff will distribute door hangers alerting residents that grease was found in sewer lines in their area and directing them to properly manage their FOG.

The installation of grease removal units are required in all new restaurants and in tenant improvements of existing restaurants. Installation of a grease removal unit is also required in all new commercial and industrial food-handling facilities and in tenant improvements of existing commercial and industrial food-handling facilities.

C. Facility Inspection:

The City relies on the County Health inspectors for food service facility inspection. The County inspectors are required to inspect all food service facilities on a regular basis (at least annually) and are able to enforce for issues related to FOG management and disposal. County inspectors will notify City staff if there is a problem at a particular facility requiring additional action.

D. Legal Authority:

The City has adequate legal authority to prohibit discharges of FOG to the collection system as detailed in the Brisbane Municipal Code. Relevant sections of the Code are included in Appendix A.

In addition, the City's municipal code adopts San Mateo County's environmental health code as the applicable regulations for food service facilities.

Section 5 – Legal Authority

Although not required for collection systems serving a population of 10,000 or less under the SF Regional Water Quality Control Board requirements, adequate legal authority is required under the Statewide General Waste Discharge Requirements. Relevant sections from the Brisbane Municipal Code are included in Appendix B documenting the City's ability to:

- Control infiltration/inflow from satellite wastewater collection systems and laterals (SF RWQCB)
- Require proper design and construction of new and rehabilitated sewers and connections (SF RWQCB)
- Require proper installation, testing, and inspection of new and rehabilitated sewers (SF RWQCB)
- Prevent illicit discharges into the sanitary sewer system (State WDR)
- Require that sewers and connections be properly designed and constructed (State WDR)
- Ensure access for maintenance, inspection, or repairs for portions of the lateral owned or maintained by the Public Agency (State WDR)
- Limit the discharge of fats, oils, and grease and other debris that may cause blockages (State WDR)
- Enforce any violation of its sewer ordinances (State WDR)

Section 6 – Measure and Activities

A. Collection System Map

The City currently has electronic maps of the entire sewer system in AutoCAD format. The maps were also imported into SewerCAD, an off-the-shelf sewer modeling software package. The City hired a consultant, Brown and Caldwell, in 2002 to generate a Sewer Master Plan. As part of that effort, Brown and Caldwell staff surveyed and inspected all of the City's sewer manholes, documenting size, rim and invert elevations, location coordinates, condition, and size and type of pipes entering and exiting. This information was transferred into SewerCAD to assist with modeling efforts. The hydraulic model was updated in 2015 by EKI, Inc. as part of the 2015 Sewer System Master Plan Update. As such, the City now has electronic maps that show accurate manhole locations with rim and invert elevations and pipe sizes, lengths, and materials. Maps include manhole and pipe IDs and can be cross-referenced with electronic street and parcel maps to give additional location information. Direction of flow can be determined from manhole invert elevations. SewerCAD includes capability to provide construction information to document dates of installation or rehabilitation.

In 2015 the City updated the City's Sanitary Sewer Maps after extensive field verification of the entire sanitary sewer system. This field information was then georeferenced in AutoCAD and mapped with a satellite imagery background into a 35 page map book, and a 6' x 4' wall map of the entire system. The City is in the process of merging these CAD maps with the City's GIS program to create searchable maps based off of the CCTV database.

In addition to the maps, the City has construction drawings for the Valley Drive Lift Station that was upgraded in late 2003, Lift Station # 4, and Lift Station #5 at the Firehouse. The City also has various historical sewer maps and construction plan sets, for both public and private sewers, all maintained in a database-organized filing system.

B. Resources and Budget

The City has a reliable, consistent funding source for collection system operations, maintenance, and repair through a dedicated Utility Fund. Revenues for this fund are generated by sewer service charges and connection fees, as well as some revenues that are part of the Guadalupe Valley Municipal Improvement District (a special district that the City Council also oversees). For fiscal year 2017/18, the City projected \$2.1M in revenue from sewer service charges and connection fees. The adopted operation and maintenance budget for sewer in 2017/18 is approximately \$2.1M.

The sewer operating budget includes funding for maintenance personnel salaries and benefits, insurance, services and supplies, and depreciation. Services and supplies include safety clothing, communications equipment, equipment maintenance, maintenance of structures, improvements, and/or grounds, association memberships, general office expenses, professional services, equipment rental, special department expenses, small tools and supplies, travel and training, and

utility and wastewater treatment costs. The adopted budgets also include department objectives and associated performance measures.

The City has annual capital improvement budgets in addition to operations/maintenance budgets. Capital projects vary from year to year. The 2003 Sewer Master Plan included a prioritized (four priority categories) Capital Improvement Plan totaling \$3,930,000. As of December 2017, the City completed all first and second priority projects and a portion of third priority projects, representing \$2,164,000 of the total. Prior to completing the Master Plan, the City also replaced its main sewer lift station (approximately \$2,000,000) and constructed important force main improvements and lift station upgrades. The Public Works Director requests funding from the City Council for capital improvement projects on a regular basis; however, the amount the Council allocates in any given year for sewer projects depends upon the City's overall capital improvement priorities for water, sewer, storm drain, streets, buildings, and grounds.

In 2015, the City hired EKI, Inc. to update the 2003 Sewer Master Plan and an updated list of priority-based Capital Improvement Projects were developed totaling approximately \$2.7M. .

C. Prioritized Preventive Maintenance

The City's Prioritized Preventive Maintenance program consists of five main components: 1) annual chemical foaming for root control, 2) annual cleaning for known sewer main segments with blockage issues, 3) investigation and resolution of customer complaints, 4) lift station maintenance, and 5) keeping maintenance activity records. Prioritization is primarily based on sewer crew experience/historical knowledge and verbal communications. Each of these components is described in more detail, as follows, along with plans for improvements:

Root Control: City staff chemically treats approximately 40 locations annually for root control, which includes 14 mains and 26 laterals. As new areas of root intrusion are identified, City crews add them to the list for annual chemical root control. The City currently uses "Root-X" in its chemical root control program. As of the start of 2010, maintenance staff initiated videoing lines scheduled for chemical root control in advance to determine if the root control is effective or if adjusting the frequency, additional volume of chemical used or mechanical cleaning is needed to control root growth.

Sewer Main Video Program: Beginning in 2011 City Staff initiated a video program with the intention of shifting our sanitary sewer system maintenance from reactive to proactive. In the first year we were able to video 1/3 of our gravity system. Identifying areas needing grit and root removal, additions to our high frequency videoing and cleaning schedule and sections of main to repair or replace. The sewer department purchased a new video inspection camera in FY 2014-15. **The crew has utilized this new camera to inspect over 28,000 lf of sewer main in 2016.**

Sewer Cleaning: With the creation of a Video Program we were able to add to our list of main cleaning locations that need attention once a year or more. With the 2010 reorganization to utility teams in the maintenance department, the City has been able to initiate a more proactive sewer cleaning program.

As the city crews perform CCTV inspection of the City’s gravity sewer mains and manholes throughout the year, each video inspection is saved as a PDF video report with condition assessment, photos and distances of issues within the pipe, and notes regarding any issues at the manhole. The pipe sections are rated at the time of inspection and their inspection frequency is based upon this rating. These reports are then added to the maintenance program spreadsheets. A table of this CCTV Inspection Rating System is included below.

Sanitary Sewer CCTV Inspection Rating System			
POSM Rating	Inspection Frequency	Determining Factors	Cleaning
1	Biennial	No observed problems Zero to minimal roots, cracks, offsets, or bellies	None
2	Annual	Minimal roots, cracks, offsets, or bellies	As needed
3	Biannual	Moderate to heavy roots, cracks, offsets or bellies	Cleaning required
4	Biannual	Moderate to heavy roots, cracks, offsets or bellies Pipe Section added to CIP list	Cleaning required
5	Continual	Significantly damaged pipe Immediate Supervisor notification Continual observation until repair completed	Cleaning required

Investigation and Resolution of Complaints: When customers contact the City with complaints about sewer issues, appropriate staff personnel are promptly dispatched to the location to investigate. If the blockage is between the building and the mainline, City crews inform the property owners of their responsibility to contact a plumber to assess and fix the problem. (The property owner owns and is responsible for maintaining the sewer lateral from the property structure into the City’s sewer main.)

Lift Station Maintenance: The City currently owns and operates three sewer lift stations. City crews perform regular maintenance at all stations on a prioritized schedule, as well as a fourth lift station servicing the City’s Fire Station. The City's main lift station, the Valley Drive Lift Station, was upgraded in 2003 and has a detailed operations and maintenance manual that City crews use to schedule maintenance activities. That manual is incorporated into this Management Plan by reference. The City also contracts for annual standby generator maintenance at each of the three lift stations.

Keeping Maintenance Records: City crews track locations and details of sewer maintenance activities on handwritten forms. Pertinent information is then transferred digitally to the Public Works Database for future review and retrieval.

Plans for Improvement: City staff plan to make the following improvements to the Prioritized Preventive Maintenance program:

1. All new CIP’s identified in the 2015 Sanitary Sewer Master Plan updates will be added once the Master Plan is finalized.

2. Schedule additional sewer main videoing and cleaning on an annual basis, to increase the overall percentage of the City's system that is regularly cleaned; and
3. Continue to develop improved electronic and paper systems for tracking sewer maintenance activities to provide enhanced analysis and reporting capabilities.

D. Scheduled Inspections and Condition Assessment

As part of the 2003 Sewer Master Plan, the City identified and prioritized structural deficiencies for about half of its collection system, and implemented a Capital Improvement Program of prioritized short-term and long-term actions. The assessment of structural deficiencies was based on video surveys of approximately 42,000 linear feet of sewer line and inspections of all manholes, and flow modeling to evaluate hydraulic deficiencies. Uniform condition assessment criteria were applied during review of the video inspections to determine deficiency ratings. The Master Plan indicated a total of 7,200 feet of sewer was in moderate to severely deteriorated condition and 21 manholes needed rehabilitation. Two sewer segments totaling 700 linear feet were found to be hydraulically deficient. To date, the City has corrected all of these deficiencies through two sewer rehabilitation projects (Project 9407 – Sewer and Manhole Rehabilitation Project, Project 9505 – Glen Parkway Sewer Rehabilitation Project, and Project 9F07 – Bayshore Boulevard South Sewer Force Main Project) incorporated herein by reference).

Based upon the planning and infrastructure improvements implemented since the 2003 Sanitary Sewer Master Plan, the City determined that an update to the 2003 Sanitary Sewer Master Plan would be sufficient to identify any additional capacity and conditional deficiencies in the sanitary system. This update was started in the summer of 2015 and is substantially complete.

City crews perform station checks at each of the City's three sewer lift stations, as well as the Fire Department's lift station, on a daily basis to ensure proper operation and identify any unusual operating characteristics. Sewer flow rates from central Brisbane (primarily residential with some commercial) are tracked via a Parshall flume with an ultrasonic transducer, and pumped flows from the Valley Drive Lift Station are tracked via magnetic flowmeters on the two discharge lines. City crews monitor these flows on a daily basis, noting and investigating any anomalous readings.

E. Contingency Equipment and Replacement Inventories

Although this section is not required for collection systems serving a population of 10,000 or less, the following describes critical contingency equipment for the City's sewer lift stations:

Valley Drive Lift Station: This station utilizes four submersible non-clog sewage pumps, two of which are 50 horsepower and two 150 horsepower. Both sets of pumps discharge through two separate force mains, which allows for ongoing operation if one force main becomes non-operational. The two force mains also have a valved interconnection, which allows discharge by either set of pumps to either force main to allow maximum maintenance

flexibility. The submersible pumps include thermal and moisture intrusion alarms to protect the pumps from mechanical failure, and various pressure and flow rate alarms will automatically shut down pumps in the event of a problem. This station has a 450-kilowatt propane-fired standby generator with an automatic transfer switch that powers the entire station in the event of a power failure. Two 500-gallon propane tanks fuel the standby generator, and City crews keep the tanks at least half-full at all times. The standby generator exercises on a weekly basis. A primary ultrasonic transducer, with a secondary backup, controls pump operation at this station. There are also backup mechanical floats to activate alarms in the event both transducers fail. The channel grinder was replaced in November 2013 with a Franklin Miller Dimminutor channel grinder, which is capable of processing 13.8 million gallons a day of waste water.

Sierra Point Lift Station: This station has a standby diesel-powered generator to keep the station operational in the event of a power failure, which exercises on a weekly basis. A pressure transducer controls pump operation and there are backup mechanical floats if the transducer fails. In June 2014 a new isolation valve and bypass pumping capabilities were purchased and installed, including bypass hoses. Agreements were made with neighboring Public Works Departments, Kevin McCarthy of Daly City (650)991-8097, and Aaron Grote of South San Francisco (650) 877-8550 to borrow trailer mounted bypass pumps in case of an emergency at this station. Hertz Rental of San Francisco has bypass pumps available for rent.

Marina Lift Station: This station has a new (2003) standby diesel-powered generator that will operate the entire station in the event of a power failure. The station exercises on a monthly basis. The pumps, wet well piping, and isolation valves for this station were replaced in 2005. The station has a pressure transducer for pump operation and backup mechanical floats for alarms and pump control.

Fire House Lift Station: The City of Brisbane's Fire Station No. 81, located at 3445 Bayshore Boulevard is managed by North County Fire Authority (NCFA). This fire station contains a wet well with two pumps operated by pressure transducers with backup mechanical floats for alarms and pump control. The City of Brisbane Public Works Department performs routine inspections and cleaning of this station and equipment, but repairs and equipment upgrades are the responsibility of NCFA.

Contingency Equipment: City crews maintain multiple portable sump pumps and generators for use during a sewer emergency. The City also has a 2,500 gallon vactor truck that is utilized for capturing and containing any sewer overflow volume, as well as during cleanup and line clearing activities. A trailer mounted vacuum system with 400 gallons of storage capacity can be used for containment of smaller overflows and spills. City crews maintain an inventory of extra pipe of varying diameters and materials as well as necessary couplings and fittings to allow prompt repair of most gravity sewer failures.

Potential Enhancements: Response to sewer overflows with the City's vactor truck is difficult in some of the hilly parts of central Brisbane with very narrow streets. City staff will evaluate the usefulness of acquiring a smaller vacuum truck or trailer mounted vactor system

that can be maneuvered in tighter situations. These options would also provide City crews more control when responding to sewer overflows, as one unit can be deployed for containment and recovery efforts, while the second can be used to clear blockages.

F. Training

City staff participate in regular ongoing training activities, both in-house and through outside vendors. In-house safety training occurs on a bi-weekly basis, with some of the training seminars specific to collection systems management. The Public Works Utility Team Leader possesses a collection II certificate as issued by CWEA. Various other Public Works employees have collection I and II certificates as well. CWEA certification requires biannual submittal of 12 contact hours of training related to Collection Systems Management. Crewmembers attend seminars by CWEA and other outside entities to accumulate contact hours. City staff also participate in on-the-job training, where crewmembers are cross-trained on different aspects of municipal maintenance. This helps ensure all crew members are able to respond to a variety of emergency situations. Certain crew members are also required to maintain Class B driver's licenses with air and tanker endorsements in order to operate the vac truck.

G. Outreach to Plumbers and Building Contractors

This section is not required for collection systems serving a population of 10,000 or less; however, the City, as a member of the Bay Area Clean Water Agencies (BACWA), has access to model plumber outreach materials and will evaluate sending materials to local plumbers.

Section 7 – Design and Construction Standards

a. Standards for Installation, Rehabilitation, and Repair

The City has identified minimum design and construction standards and specifications for installation of new sewer systems. The City's design standards are included as Appendix C to this document. The City also has construction specifications for installation of new sewers via pipe bursting or reaming from two recently completed sewer rehabilitation capital improvement projects.

b. Standards for Inspection and Testing of New and Rehabilitated Facilities

The City has identified minimum design and construction standards and specifications for rehabilitation and repair of existing systems. The City's standards are included as Appendix C to this document. Inspection of new and rehabilitated facilities is performed by the Public Works Inspector in the field during and at the completion of construction. Depending on the situation, inspections vary from visual inspections to air/water pressure testing, mandrel

testing, or video inspection. For City capital improvement projects, testing requirements are called out in the construction specifications, and typically include air testing, mandrel testing, and video inspection for sewer mains and water leakage testing for manholes.

Section 8 – Capacity Management

a. Capacity Assessment

Section 5 of the City's 2003 Sewer Master Plan and 2015 Sewer Master Plan Upgrades provides a capacity evaluation of the sewer system. This evaluation was based on hydraulic modeling of the sewer system using SewerCAD software. Modeling was done based on escalating peaking factors applied to base flow estimates for future (build-out) flow conditions. Flow estimates were prepared using peaking factors of 3, 5, 7, and 9. City staff decided to use a peaking factor of 5 to simulate design wet weather events, and used the following flow depth criteria for determining which gravity sewers were hydraulically deficient:

- When the peak flow depth exceeds one-half full for pipelines 10-inches in diameter or less
- When the peak flow depth exceeds two-thirds full for pipelines 12-inches in diameter or greater

The modeling results indicated two reaches (totaling almost 700 linear feet) in the City's sewer system were considered hydraulically deficient using the above peaking factor and flow depth criteria. These segments are shown on Figure 5-1 of the City's Master Plan.

b. System Evaluation and Capacity Assurance Plan

The City's 2003 Sewer Master Plan presents a recommended capital improvement program for mitigating both hydraulic and structural deficiencies in the City's sewer collection system (see Table 6-2 in the Master Plan). The two sewer segments identified in Section 8.a, above, were designated as Priority 1 capital improvement projects. The City corrected the hydraulic deficiencies in both of these sewer segments by upsizing the existing six-inch diameter vitrified clay pipes to eight-inch diameter high density polyethylene pipe through trenchless rehabilitation processes (pipe bursting) in the 2004 Sewer and Manhole Rehabilitation Project. In addition to correcting these hydraulic deficiencies, the City addressed all Priority 2 capital improvement projects to correct identified significant structural deficiencies.

Section 9 – Monitoring, Measurement, and Program Modifications

The City will monitor implementation of SSMP elements and measure effectiveness of SSMP elements in reducing SSOs through annual review meetings with collection system staff. During these review meetings, the following performance indicators will be evaluated:

- Number of dry weather SSOs
- Number of wet weather SSOs
- Total number of SSOs
- Number of SSOs per 100 LF of sewer per year
- Number of SSOs < 100 gallons
- Number of SSOs 100 to 999 gallons
- Number of SSOs 1,000 to 9,999 gallons
- Number of SSOs >10,000 gallons
- Total volume of SSOs
- Total volume recovered
- Net volume of SSOs (total minus recovered)
- Total annual volume conveyed to wastewater treatment plant
- Net volume of SSOs compared to total annual volume conveyed (% conveyed)
- Number of SSOs caused by:
 - Roots
 - Grease
 - Debris
 - Pipe failure
 - Pump station failure
 - Capacity-limited pipe segment (no debris)
 - Other
- Number of locations with more than one SSO in the past year
- Average response time during business hours
- Average response time outside of business hours
- Planned cleaning/chemical root control (LF)
- Unplanned cleaning/chemical root control (LF)
- Ratio of planned to unplanned cleaning/chemical root control (LF)
- Number of blockages in the past year
- Number of blockages due to:
 - Roots
 - Grease
 - Debris
 - Other
- Number of customer complaints in the last year
- Number of positive customer responses

At the annual review meetings, collection system staff will also go through the SSMP to ensure the information is current, including any updates to infrastructure, wastewater flow characteristics, new or modified operations and maintenance

protocols, revised emergency response procedures, or changed organizational structure.

The main staff person responsible for monitoring the effectiveness of the SSMP is the Senior Civil Engineer. This person will organize and oversee the annual review meetings with collection systems maintenance staff. After the annual review meeting, the Public Works Utility Team Leader will draft an annual review summary for the Senior Civil Engineer. Any SSMP modifications determined necessary during the annual review meeting will be detailed in the summary document. Minor SSMP modifications will be implemented by the Public Works Utility Team Leader. Significant SSMP modifications will be reviewed and approved by the Public Works Director.

Section 10 – SSMP Audits

Although not required by the Regional Board for collection systems serving less than 10,000 persons, the City's annual review summary described in Section 9, above, will serve as an abbreviated audit under the Statewide Order. City staff believes this level of auditing is appropriate at this time given relatively few SSOs each year and the small size of the collection system. As the City continues to grow and expand its collection system infrastructure, staff will evaluate during the annual reviews whether expanded auditing is appropriate. City staff will use the sample SSMP audit forms prepared by CWEA as a guide should formal audits be deemed appropriate.

Section 11 – Communication Program

City of Brisbane Website

The City has a link to the current SSMP right on the main Sewer page of the City's website. There is also a link to the Public Works Department with a note encouraging people to contact the City with any questions or concerns. Following is the link to that webpage.

<http://brisbaneca.org/departments/public-works/sewer>

Public Outreach Events

- **Day in the Park** – This is an annual Event held in the City of Brisbane's Community Park. The City of Brisbane's Public Works Department has a booth every year where the Sanitary Sewer Field set up a demonstration trailer that includes a mock up sewer lateral and information points. The booth is staffed by the Maintenance Utility Workers from 8:00am – 3:00pm. This provides the public a full day to question, provide feedback, and learn about the City's Sanitary Sewer System.
- **City Hall Office Hours** – In addition to being open Monday, Tuesday, and Thursday until 5, the City of Brisbane's City Hall remains open until 8 pm every Wednesday. This is to provide an option for citizens to voice their questions and concerns outside of their regular working hours.

Crew Interactions with the Public

The City's Utility Maintenance workers regularly interact with the public during their daily activities. The crew is trained to handle all of these interactions with dignity and professionalism. If any of the public has questions or concerns that the crew members can't answer, they are instructed to give out the business card for the City's Public Works Department.

APPENDIX A

Municipal Code Sections Fats, Oils, and Grease

13.04.480 Discharge of substances causing obstructions to public sewers prohibited.

No person shall discharge, deposit, throw, or cause, allow, or permit to be discharged, deposited, or thrown, into any public sewer or into any plumbing fixture, manhole, or private sewer or drain connected to a public sewer, any substance of any kind whatever tending to obstruct or injure the sewage works, or to cause a nuisance or hazard, or which will in any manner interfere with the proper operation or maintenance of the sewage works in the opinion of the city engineer. (Ord. 53 §4.3, 1963).

13.04.490 Prohibited discharges to public sewers.

A. Except as hereinafter provided, no person shall discharge or cause to be discharged any of the following waters or wastes into any public sewer:

1. Any liquid or vapor having a temperature detrimental to the sewer system;
2. Any gasoline, benzene, naphtha, fuel oil, or other flammable or explosive liquid, solid, or gas;
3. Any water or waste which contains excessive amounts of grease, oil, or fats;
4. Any garbage, except properly ground garbage from individual dwelling units, as specified in Section 13.04.530;
5. Any sand, cement, cinders, ashes, metal, glass or other heavy solids; any straw, shavings, animal hair, feathers, paunch manure, or other fibrous matter; and tar, asphalt, resins, plastics, or other viscous substance; or any other matter of such a nature as to obstruct the flow in sewers or as to cause other interference with the proper operation of the sewage works;
6. Any water or waste containing excessive amounts of acid, alkali, or dissolved sulfide, or having any other corrosive property capable of causing damage or hazard to structures, equipment, or personnel of sewage works;
7. Any waters or wastes containing a toxic or poisonous substance in sufficient quantity to injure or interfere with any sewage treatment process, to constitute a hazard to humans or animals, or to create a hazard in the waters receiving effluent from the sewage treatment plant;
8. Any waters or wastes containing suspended solids or dissolved matter of such character and quantity that unusual attention or expense is required to handle such materials at the sewage treatment plant;
9. Any noxious or malodorous gas or substance capable of creating a public nuisance;
10. Any radioactive wastes, as provided in Sections 13.04.540 and 13.04.550.

B. Whenever deemed necessary by the superintendent, the owner shall, at his own expense, provide such treatment or take such other measures as shall be required in order to reduce the objectionable characteristics, contents, or rate of discharge of waters or wastes being deposited in

the sewer, so that the same may be received therein without any damage to the sewage works or any undue interference with its operation and without any hazard of any kind to humans or animals. (Ord. 53 §4.4, 1963).

13.04.500 Restrictions on quantity and character of wastes.

A. The admission into the public sewers of any wastes or waters having an average daily flow greater than two percent (2%) of the average daily flow at the sewage treatment plant, or having any of the following characteristics, shall be subject to the review of the superintendent:

1. Temperature in excess of one hundred fifty degrees (150°) Fahrenheit, approximately sixty-five and six-tenths degrees (65.6°) Centigrade;
2. Suspended solids, or matter which upon dilution with water or sewage results in the formation of suspended solids, in excess of five hundred (500) parts per million;
3. Biochemical oxygen demand in excess of four hundred (400) parts per million;
4. Floatable grease of animal or vegetable origin in excess of fifty (50) parts per million, and of mineral origin in excess of fifteen (15) parts per million, or dispersed grease in excess of six hundred (600) parts per million;
5. A pH of less than five and five-tenths (5.5) or more than ten and five-tenths (10.5);
6. Dissolves sulfides in excess of one (1) part per million.

B. The provisions of subsection A of this section and the values therein set forth shall not be regarded or construed as regulating or limiting the quantity or character of any specific industrial waste which may be received into the sewer system, but shall serve as a guide in the administration of this chapter for the purpose of determining, in general, the acceptability of waste for admission into the sewer system. (Ord. 53 §4.5, 1963).

APPENDIX B

Relevant Municipal Code Sections Overall Legal Authority

13.04.460 Discharge of stormwater, surface water and groundwater into sanitary sewer prohibited.

No person shall discharge, or cause to be discharged, any stormwater, surface water, groundwater, roof runoff, or subsurface drainage into any sanitary sewer. (Ord. 53 §4.1, 1963).

13.04.410 Connections to public sewers.

The connection to the public sewer, including the piping within any public street or right-of-way, shall be installed at the sole expense of the owner of the property served, by a contractor with an appropriate license issued by the state for this work. The contractor shall be prequalified before issuance of any permit. Such connection shall not be made without an approved permit issued by the superintendent. (Ord. 163 §2, 1971; Ord. 53 §3.5, 1963).

13.04.420 Sewer installation specifications and requirements.

Sewers to be installed in the city shall satisfy the following requirements:

A. All sewers constructed in the public right-of-way shall be constructed in accordance with plans and specifications approved by the city council upon recommendation of the city engineer. Sewer laterals shall be constructed in accordance with standard plans prepared by the city engineer and approved by the city council.

B. Minimum size of all individual laterals shall be four (4) inches and shall require cleanout at the property line.

C. The minimum size of sewer mains shall be six (6) inches and standard manholes shall be placed at frequencies no greater than three hundred (300) feet or in places of change of direction or grade, except sewers twelve (12) inches in diameter or greater, under which circumstances the specific design shall be recommended by the city engineer and approved by the city council.

D. When sewers cannot be placed in the public right-of-way or in existing rights-of-way of ten (10) feet in width or greater, special easements shall be acquired a minimum of ten (10) feet in width and wherever possible shall straddle existing property lines.

E. Wherever easements ten (10) feet in width or greater can be acquired, public sewers shall be extended in accordance with approved plans and specifications and in accordance with proper master planning for the area being served.

F. Wherever a public sewer can be extended along public rights-of-way or standard easements, each service shall be extended to the public sewer by a lateral serving only one unit of ownership unless the city council, by resolution, approves the service of more than one unit of ownership by a lateral.

G. A cleanout shall be placed on each sewer lateral tying into a public utility easement at the line of the easement. The city shall maintain a portion of the lateral between the cleanout and

the main so long as the cleanout is readily kept available and open for access by the city. Otherwise, it shall become the responsibility of the individual property owner who shall be liable for any damage to the main or lateral within the right of way.

H. Wherever a substandard extension of the sewer exists, i.e., a four (4) inch line or across private easements, no further extension of the sewer line can be made until such a time as an agreement for maintenance and rights of easement for all individuals using the line is recorded with the office of the county recorder.

I. The city council may, by resolution, upon finding good cause therefor, grant approval for a private sewer line (one which traverses another's private property in order to connect to the public sewer main); provided, that each applicant therefor shall submit plans in advance to the city engineer for approval. Any approval granted by the city council for a private sewer line is contingent upon an acceptable easement being recorded with the county recorder for access and maintenance of the sewer line. (Ord. 163 §3, 1971: Ord. 53 §3.6, 1963).

15.24.010 Adoption.

The code of rules, regulations and standards printed in two (2) volumes and published by the International Conference of Building Officials, under the title "Uniform Building Code, 1988 Edition," including the appendix thereto, and "Uniform Building Code Standards, 1988 Edition," including the appendix thereto, and "Uniform Building Code Standards, 1988 Edition," hereinafter collectively called "Uniform Building Code," regulating the erection, construction, enlargement, alteration, repair, moving, removal, demolition, conversion, occupancy, equipment, use, height, area and maintenance of all buildings and structures in the city, printed in book form and filed herewith in the office of the city clerk, is adopted and by reference incorporated in this chapter as if fully set forth, except as otherwise provided in this chapter, as the building code of the city. The mandatory requirements of the appendix to the building code shall be enforceable to the same extent as if contained in the body of the building code. (Ord. 355 §2, 1990: Ord. 312 §1(part), 1985; Ord. 291 §1(part), 1983: Ord. 243 §1041, 1978).

15.32.010 Adoption.

The code of rules and regulations known and designated as the "Uniform Plumbing Code, 1988 Edition," and the appendices printed therein, prepared and published by the International Association of Plumbing and Mechanical Officials, regulating the erection, installation, alteration, addition, repair, relocation, replacement, maintenance or use of any plumbing system in the city, printed in book form and filed herewith in the office of the city clerk, is adopted and by reference incorporated in this chapter as if fully set forth except as otherwise provided in this chapter, as the plumbing code of the city. The mandatory requirements of the appendix to the plumbing code shall be enforceable to the same extent as if contained in the body of the plumbing code. (Ord. 355 §5, 1990: Ord. 312 §1(part), 1985; Ord. 291 §1(part), 1983: Ord. 243 §1066, 1978).

13.04.480 Discharge of substances causing obstructions to public sewers prohibited.

No person shall discharge, deposit, throw, or cause, allow, or permit to be discharged, deposited, or thrown, into any public sewer or into any plumbing fixture, manhole, or private sewer or drain connected to a public sewer, any substance of any kind whatever tending to obstruct or injure the sewage works, or to cause a nuisance or hazard, or which will in any manner interfere with the proper operation or maintenance of the sewage works in the opinion of the city engineer. (Ord. 53 §4.3, 1963).

13.04.490 Prohibited discharges to public sewers.

A. Except as hereinafter provided, no person shall discharge or cause to be discharged any of the following waters or wastes into any public sewer:

1. Any liquid or vapor having a temperature detrimental to the sewer system;
2. Any gasoline, benzene, naphtha, fuel oil, or other flammable or explosive liquid, solid, or gas;
3. Any water or waste which contains excessive amounts of grease, oil, or fats;
4. Any garbage, except properly ground garbage from individual dwelling units, as specified in Section 13.04.530;
5. Any sand, cement, cinders, ashes, metal, glass or other heavy solids; any straw, shavings, animal hair, feathers, paunch manure, or other fibrous matter; and tar, asphalt, resins, plastics, or other viscous substance; or any other matter of such a nature as to obstruct the flow in sewers or as to cause other interference with the proper operation of the sewage works;
6. Any water or waste containing excessive amounts of acid, alkali, or dissolved sulfide, or having any other corrosive property capable of causing damage or hazard to structures, equipment, or personnel of sewage works;
7. Any waters or wastes containing a toxic or poisonous substance in sufficient quantity to injure or interfere with any sewage treatment process, to constitute a hazard to humans or animals, or to create a hazard in the waters receiving effluent from the sewage treatment plant;
8. Any waters or wastes containing suspended solids or dissolved matter of such character and quantity that unusual attention or expense is required to handle such materials at the sewage treatment plant;
9. Any noxious or malodorous gas or substance capable of creating a public nuisance;
10. Any radioactive wastes, as provided in Sections 13.04.540 and 13.04.550.

B. Whenever deemed necessary by the superintendent, the owner shall, at his own expense, provide such treatment or take such other measures as shall be required in order to reduce the objectionable characteristics, contents, or rate of discharge of waters or wastes being deposited in the sewer, so that the same may be received therein without any damage to the sewage works or any undue interference with its operation and without any hazard of any kind to humans or animals. (Ord. 53 §4.4, 1963).

13.04.500 Restrictions on quantity and character of wastes.

A. The admission into the public sewers of any wastes or waters having an average daily flow greater than two percent (2%) of the average daily flow at the sewage treatment plant, or having any of the following characteristics, shall be subject to the review of the superintendent:

1. Temperature in excess of one hundred fifty degrees (150°) Fahrenheit, approximately sixty-five and six-tenths degrees (65.6°) Centigrade;
2. Suspended solids, or matter which upon dilution with water or sewage results in the formation of suspended solids, in excess of five hundred (500) parts per million;
3. Biochemical oxygen demand in excess of four hundred (400) parts per million;
4. Floatable grease of animal or vegetable origin in excess of fifty (50) parts per million, and of mineral origin in excess of fifteen (15) parts per million, or dispersed grease in excess of six hundred (600) parts per million;
5. A pH of less than five and five-tenths (5.5) or more than ten and five-tenths (10.5);
6. Dissolves sulfides in excess of one (1) part per million.

B. The provisions of subsection A of this section and the values therein set forth shall not be regarded or construed as regulating or limiting the quantity or character of any specific industrial waste which may be received into the sewer system, but shall serve as a guide in the administration of this chapter for the purpose of determining, in general, the acceptability of waste for admission into the sewer system. (Ord. 53 §4.5, 1963).

13.04.560 Suspension of service for unlawful use of sewers.

When deemed necessary by the superintendent for the preservation of public health or safety, or for protection of public or private property, he may suspend sewer service to any person or persons using the sewer system in a manner or way as to endanger the public health or safety or public or private property, and in this regard may sever from the public sewer all pertinent connections thereto. If such endangerment shall be imminent, then the superintendent may act immediately to suspend sewer service without giving any advance notice or warning whatsoever to the person or persons. (Ord. 53 §4.11, 1963).

13.04.600 Power and authority of inspectors.

The superintendent, and other duly authorized employees and agents of the city bearing credentials and identification shall, in all cases affected by this chapter, be permitted to enter upon all properties for the purpose of:

- A. Determining the size, depth, location, and condition of any sewer or storm drain connection;
- B. Determining the location of discharge connections of roof and surface drains and plumbing fixtures; and
- C. Inspecting, observing, measuring, sampling, and testing the quantity, consistency, and characteristics of sewage being discharged into any public sewer or natural outlet. (Ord. 53 §6.1, 1963).

13.04.610 Violation--Notice.

Any person found to be violating any provision of this chapter, except Section 13.04.580, shall be served by the city with written notice which shall state the nature of the violation and shall provide a reasonable time limit for the satisfactory correction thereof, the actual duration of the time limit to depend, in any particular case, upon all the facts and surrounding circumstances. The offender shall, within the period of time specified in such notice, permanently cease the continuance of the violation. (Ord. 53 §8.1, 1963).

13.04.620 Violation--Penalty.

Any person who continues any violation beyond the time limits provided for in Section 13.04.610 shall be guilty of a misdemeanor, and upon conviction thereof shall be subject to a fine of not more than three hundred dollars (\$300.00), or by imprisonment in the county jail for a period of not more than three (3) months, or by both such fine and imprisonment for each violation. Each day in which any such violation shall continue shall be deemed a separate offense. (Ord. 53 §8.2, 1963).

13.04.630 Violation--Liability for expense, loss or damage.

Any person violating any of the provisions of this chapter shall become liable to the city for any and all expense, loss, or damage occasioned the city by reason of such violation. (Ord. 53 §8.3, 1963).

APPENDIX C

City Standards for Sewer Installation, Rehabilitation, and Repair and Inspection and Testing of New and Rehabilitated Sewer Facilities

DEFINITIONS

Sewage or Wastewater: This is the “used” water that contains human wastes from toilets and water from other sources such as sinks, showers, washing machines, dishwashers, etc. Industrial and commercial wastes are also considered sewage or wastewater.

Sanitary Sewer System, or Wastewater Collection System, or Sewers: These are pipes through which sewage is carried from homes and businesses to a treatment plant. The sanitary sewer system includes the main sewer lines in the streets and the branch lines to individual sewer customers called “sewer laterals.”

Sewer systems are generally designed to flow by gravity through sloped pipes until it reaches either the treatment plant or a sewage pumping station (which pumps the sewage up to another higher sewer or a treatment plant).

The term “sanitary sewer” is used because sewer pipes are separate from the pipes used for storm water drainage. This helps protect public health and the environment. In some older cities, such as San Francisco, sewage and rainwater flow through the same pipes. This can cause major environmental and public health problems because untreated or partially treated-sewage may be discharged into streams, rivers, and other water bodies during heavy rain.

Sewer Lateral: This is the sewer pipe that connects a building's plumbing system to the main sewer line in the street. Maintenance and ownership of sewer lateral pipes is the responsibility of the property owner.

Sewer Main: This is the sewer pipe that collects flow from laterals. Mains are typically larger pipes than laterals, and get larger and larger further downstream as more and more flow enters the main. Sewer mains are typically located under public streets and maintained by the City.

Sewer Cleanout: This is a pipe rising from the sewer lateral to the ground surface with a removable cap or plug. It is used to access the sewer lateral to free blockages. A sewer cleanout is usually located just inside the property line. There may be additional sewer cleanouts at various other locations on a property.

Backflow Prevention Device: This is a device that prevents sewage from backing up from a main line into a lateral beyond where it is installed. This forces an overflow outside of a home, through a manhole or cleanout, rather than inside where significant property damage may occur.

Infiltration: This refers to groundwater (water found below the ground surface) that enters sewer pipes through cracks, pipe joints, and other system leaks. Because sewers in coastal areas are typically buried deep, they are often located below the water table. Since most sewer lines do not flow full (under pressure), groundwater “infiltrating” into the sewer line is actually more of a problem than sewage leaking out of the line. Storm events can raise groundwater levels and increase infiltration of groundwater into sewer pipes. The highest infiltration flows are observed during or right after heavy rain. Too much infiltration may overload the sewers and cause spills.

Inflow: This is rainwater that enters the sewer system from sources such as yard and patio drains, roof gutter downspouts, uncapped cleanouts, pond or pool overflow drains, footing drains, cross-connections with storm drains, and even holes in manhole covers. Inflow is greatest during heavy rainfall and like infiltration, can cause excessive flows and sewage spills.

Manholes: Sewer manholes are underground structures used to provide access to underground sewer lines and are usually found in a street, parking area or sidewalk. Access is required to periodically inspect and clean the lines. Sewer manholes typically have heavy round covers with the words “Sanitary Sewer” on the cover.

Sanitary Sewer Overflow: Sewage spills are technically called “sanitary sewer overflows” since it involves the overflow of sewage from the sanitary sewer system. Sewage overflows often occur from sewer manholes in the streets. Sewage can also backup into homes through toilets, showers, and floor drains. Sewage spills are caused by sewage filling the sewer pipes behind the clog to the point where it spills out of an opening in the system (generally the lowest manhole, shower drain or other plumbing fixture).

Average Flows: Average flows are typically dry weather sewer flows over a specific time period and often expressed in gallons per day. Average flows do not account for inflow and infiltration and are therefore not usually the basis for designing a sewer piping system.

Peak Flows: Peak flows are typically average flows multiplied by a peaking factor to account for inflow and infiltration and diurnal fluctuations. Sewer designs are usually based on peak flows, and a typical peaking factor is between three and five.

Design Flows: Design flows are the flows used to design a sewer system. Typically, they are peak flows. For the City of Brisbane’s sewer design criteria, design flows are peak flows at build-out conditions, which are average flows multiplied by a peaking factor of three.

SEWER MAINS

Materials

1. New gravity mains shall be polyvinyl chloride (PVC) or high density polyethylene (HDPE) with a maximum standard dimensional ratio (SDR) of 35 for conditions with at least three feet of cover. In cases where the City authorizes less than three feet of cover, alternate SDRs may be required. The City may require alternate pipe materials in cases with less than minimum cover or when other utilities are in close proximity to the sewer main.

2. For sewer main replacements that are five feet or less in length, pipe materials may match existing materials (e.g., when replacing a five-foot section of vitrified clay pipe (VCP), the replacement section can also be VCP). All sewer main replacements of more than five feet shall be PVC pipe.

Sizing

1. Flow Sizing

- A. Gravity mains shall be a minimum of eight inches (8”) in diameter.
- B. Mains shall be designed to carry peak flows at build-out conditions (“design flows”). Average daily flow values shall be computed based on the following table, and multiplied by a peaking factor of five (5) to determine design flows. Calculations for design flow rates shall be submitted to the City Engineer for review.

Land Use	Unit Flow Rate (gallons/day/ acre)	Unit Flow Rate (gallons/day/ dwelling unit)
Brisbane Village Neighborhood Commercial District	500	-
Downtown Brisbane Neighborhood Commercial District	500	-
Manufacturing District	500	-
Medium Density Apartment District	-	90
Multiple Use Residential District	-	90
Office District	1500	-
Open Space District	0	-
Planned Development District	-	90
Single Family (20,000 sq. ft. building site)	-	105
Single Family (5,000 sq. ft. building site)	-	105
Southwest Bayshore Commercial District	500	-
Trade Commercial – Crocker Park District	250	-

- C. Maximum depth of flow for pipes between eight and ten inches in diameter shall be one-half (1/2) the pipe diameter at design flows. For pipes twelve inches and larger in diameter, the maximum flow depth shall be two-thirds (2/3) the pipe diameter at design flows.
- D. Mains shall be sized using Manning’s equation based on design flows, a roughness coefficient (“n”) of 0.0135 or the pipe manufacturer’s recommendation, whichever is greater, maximum flow depths, and maintaining minimum design slopes.
- E. Miscellaneous head losses at manholes, curves, and junctions shall be estimated and allowed for as follows:
 - i) At manholes on straight runs allow head loss = 0.05 feet.
 - ii) 90° turns made inside of manholes, where the radius of turn is less than two pipe diameters, allow $0.50 V^2/2g$. If the radius of turn is greater than two pipe diameters,

allow $0.25 V^2/2g$. In no case shall the total allowance be less than 0.05 feet.

iii) At transitions and intersections of sewers larger than 24 inches in diameter, allow $0.50 V^2/2g$.

2. Velocity Sizing

- A. Mains shall be designed to transport suspended solids without deposition in the pipe.
- B. Mains shall be designed to maintain minimum cleansing velocities of three (3) feet per second for ten inch and smaller diameter pipes and two (2) feet per second for twelve inch and larger diameter pipes at design flow conditions.
- C. The maximum velocity for all pipe diameters is 10 feet per second.

Alignment

1. Depth

- A. Gravity mains shall be installed at a depth sufficient to provide a minimum of three feet of cover above the crown of the pipe. Installations with lesser amounts of cover are at the City's discretion, and may require alternative pipe material.
- B. Sewers shall be installed at sufficient depth to provide gravity service to properties contiguous to the sewer line. Additional depth may be required to provide service. Generally, house services shall be a minimum of four feet below the top of curb at the property line as measured from the top of curb to the invert of the services.

2. Slope

- A. Ten-inch and smaller diameter mains shall have a minimum slope of 0.0036. Twelve-inch and larger diameter mains shall have a minimum slope of 0.0024.
- B. Slopes shall be adjusted based on ground level gradient and maintaining minimum cleansing velocities. Minimum slopes shall only be used when topography and existing sewer depth make greater slopes impossible or when anticipated flows are such that scouring velocity is achieved on a regular basis. Increasing pipe size to allow lesser slopes will be at the City's discretion.

3. Curvature

- A. Horizontal and vertical curves are not recommended, but in cases where justification can be shown, limited use of such designs will be considered. A design report shall be submitted from the design engineer justifying a curved alignment. In no case shall horizontal or vertical curves exceed 1/32 bend (11.25 degrees). Complete and accurate details shall be furnished, including: exact location of such curved sewers, length of

curve, degree of curve (or radius), and stationing of curve points.

B. Where curved alignments are utilized, the City may require the following:

- i) Slope greater than minimum slope for the size of pipe.
- ii) Manhole spacing of less than 300 feet.
- iii) Provide a licensed professional land surveyor or engineer to continuously monitor installation of the curved pipe during construction.
- iv) Video inspection prior to final acceptance.

4. Placement in street/easement

A. Under normal conditions, sewers shall be constructed in straight lines from manhole to manhole in public rights-of-way or private roads. When practical, sewers shall be installed on the opposite side of the right-of-way from water and storm drain lines.

B. Sewer trenches shall not extend under the edge of gutters.

C. When necessary to locate sewers in public easements, such easement shall have a width equal to twice the depth of the sewer main, or 15 feet, whichever is greater. Sewers 24 inches in diameter or larger, or over 12 feet in depth, may require wider easements. All easements shall allow for year-round vehicular access to all manholes and cleanouts.

Clearances to other utilities/structures

1. Sewer mains shall be installed a minimum of 10 feet horizontally from all structures and existing or proposed water mains. In situations where it is not feasible to maintain a 10-foot separation, the distance may be reduced at the City's discretion.
2. Sewer mains shall have a minimum one foot clearance to all other utilities. Installations with lesser clearances are at the City's discretion and may require alternate pipe materials.
3. Sewer mains shall be installed beneath water lines and storm drain lines by at least 18 inches (crown of sewer line to invert of water or storm drain line). Crossings shall be arranged so sewer line joints will be equidistant and as far as possible from the water main (~10 feet).
4. Sewer mains shall be installed at least five feet horizontally from all trees, where practical.

Cover/trench requirements

1. Minimum cover over gravity sewer mains shall be three feet.

2. Plastic detection tape shall be installed one foot above the crown of all gravity sewer mains.
3. Sewer main trenches shall be backfilled with four inches of compacted fill sand prior to laying pipe. Once pipe is installed, it shall be backfilled to twelve inches above the crown with compacted fill sand, followed by native material (with rocks over two inches removed) compacted to 90% relative compaction. Native material shall extend to finished grade in unimproved areas. In existing or new streets, backfill and street section above the pipe shall be in accordance with the City's Street Standards.

Maximum run between and connections to manholes

1. The maximum run between manholes shall be no more than 300 feet.
2. Connection to existing manholes shall be made with a concrete core saw and neoprene adapter boot. Exceptions to this requirement are at the City's discretion. New connections to existing manholes shall be fitted with a temporary plug until the entire project has been accepted. Connections to structures other than manholes shall be specifically detailed on the plans for approval by the City.

Cleanouts

Terminal cleanout structures are acceptable at the end of sewer lines if located no more than 100 feet to the downstream manhole.

LATERALS

Materials

Sewer laterals shall be SDR 35 PVC or HDPE pipe with a minimum of three feet of cover. In situations where cover is between 18 inches and three feet, SDR 26 is required. The City may require alternative pipe materials if minimum cover cannot be achieved.

Sizing

Laterals shall be a minimum of four inches (4") in diameter for single family residences and six inches (6") for multiple units, apartments, local retail, and commercial, and eight inches (8") or larger as required for manufacturing and industrial, and should be sized to accommodate anticipated flow.

Connections per building/unit

For new construction, service laterals shall be provided to every parcel being served as part of the project. Each individual building or dwelling unit requires a separate service lateral, with separate connection to the sewer main. Connections for multi-unit buildings will be at the City's direction. For existing construction, if the City determines individual buildings or dwelling units are served by a joint lateral, the City may require property owners to install separate laterals for

each building or dwelling unit and establish appropriate private easement agreements as necessary, or may require upgrades to existing joint laterals if installation of separate laterals is infeasible.

Alignment

1. Depth

Laterals shall be placed a minimum of three feet (3') below finished grade. This shall extend all the way to the building connection. Therefore, in general, the minimum depth for sewer to serve a given residential property shall be three feet plus 2% times the length of the house lateral (the distance from the sewer to the center of the house). Less than minimum cover is at the City's discretion and may require alternative pipe material.

2. Slope

Laterals shall have a minimum two percent (2%) slope. Lesser slopes are at the City's discretion.

3. Cover/trench requirements

Sewer lateral trenches shall be backfilled with four inches of compacted fill sand prior to laying pipe. Once pipe is installed, it shall be backfilled to twelve inches above the crown with compacted fill sand, followed by native material (with rocks over two inches removed) compacted to 90% relative compaction. Native material shall extend to finished grade in unimproved areas. In existing or new streets, native material shall be followed by asphalt concrete/aggregate base lifts in accordance with the City's Street Standards.

Clearances to other utilities/structures

Laterals shall be installed with a ten-foot minimum horizontal separation to water service lines.

Cleanouts

Each lateral shall have an approved cleanout. Cleanouts shall be located approximately six inches (6") from the property line on private property (at the right-of-way or easement line).

Backflow prevention devices

Backflow prevention devices shall be incorporated as part of the cleanout on all new lateral installations. Backflow prevention devices shall be installed on existing laterals during remodeling or if new plumbing fixtures are added to a home.

Connection to mains

1. No sewer laterals smaller than eight inches shall be connected to manholes.

2. Lateral connections to existing mains may be made by tapping the existing main only when the lateral diameter is less than or equal to three-fourths (0.75) the main line size. If this ratio is exceeded, the connection shall be made by removing a section of the main line and installing a properly sized wye fitting. Laterals eight inches in diameter and larger shall connect to the mainline at a manhole.
3. Laterals shall be constructed perpendicular to the main line and shall intersect the property line a minimum of five feet from the property corners. Exceptions will be made in the case of cul-de-sacs where perpendicular service lines are not practical.

PRESSURE SYSTEMS

Materials

All pressure systems shall utilize heat-fused high density polyethylene (HDPE) pipe meeting Specification Section 15066, or PVC pipe meeting American Water Works Association (AWWA)'s C900 specifications with appropriate couplings.

Sizing

Pressure mains shall be sized to accommodate anticipated peak flow rates based on hydraulic calculations for downstream pump sizing. Hydraulic calculations showing pump and pipeline sizing shall be submitted to the City Engineer for approval.

Alignment

1. Depth

Pressure mains shall be installed with a minimum of three feet of cover. Installation at shallower depths shall be at the discretion of the City Engineer and may require alternate pipe material.

2. Slope

Pressure mains shall be installed to avoid bellies.

3. Cover/trench requirements

Minimum cover over pressure mains shall be three feet.

Clearances to other utilities/structures

1. Pressure mains shall be installed a minimum of 10 feet horizontally from all structures.
2. Pressure mains shall have a minimum one foot clearance to all other utilities. Installations with lesser clearances are at the City's discretion and may require alternate pipe materials.

3. Pressure mains shall be installed beneath water lines and storm drain lines by a minimum of 18 inches (crown of sewer line to invert of water or storm drain line).

Air release/vacuum valves

Air release/vacuum valves shall be installed at all high points along the pressure main alignment.

MANHOLES

Frequency/Location

1. Manholes shall be located at all sewer main intersections, at all changes in vertical or horizontal alignment, pipe size, or grade, where laterals larger than eight inches are connecting to a main, and at the beginning and end of curved sewer sections.
2. Manhole spacing shall be 300 feet, at a maximum. Manholes shall be installed at all terminating sewer mains longer than 100 feet.
3. All manholes shall be located in such a way that maintenance vehicles will have year-round access.
4. Monitoring manholes may be required at commercial/industrial service connections at the direction of the City. A monitoring manhole shall be required on all new construction or renovations or modifications to existing facilities, where the discharge originating in the new, renovated, or modified facility is, or will have the potential to be, non-domestic in nature. All waste from the facility shall flow through the monitoring manhole.

Type

1. Drop manholes are not recommended, but in cases where justification can be shown, limited use of such designs will be considered. Elevation drop through manholes shall be a minimum of 0.2 ft. Inside drops shall have a maximum drop of 2 ft. Drops greater than 2 ft shall be constructed with outside drop structures. Where unequal pipe diameters enter a manhole, crown of pipes shall be at the same elevation.
2. Flat top manholes shall be used where the distance from the invert to the rim is less than six feet. Manholes greater than six feet deep shall be constructed with standard cone sections.

Materials

1. Manholes shall be constructed using Class A concrete.
2. Manhole joints shall be made watertight using neoprene gaskets, subject to City Engineer approval.
3. New connections to existing manholes shall be made with neoprene adapter boots.

Sizing

1. Manholes 48 inches in diameter may be used for sewer mains up to 18 inches in diameter and up to 15 feet deep. Manholes 60 inches in diameter may be used for sewer mains up to 42 inches in diameter and up to 22 feet deep, or where the alignment of the main lines is such that the distance between openings would be less than 1.5 feet with a smaller manhole.
2. Manhole necks shall be adjusted to finished grade by the use of concrete grade rings with approved sealant between each ring. The maximum height of grade rings shall be 12 inches for new construction and 18 inches for modifications to existing manholes. Adjustments beyond these limits shall be made with full barrel sections.

Lining

Downstream transition manholes originating from a pump station or manholes where turbulence is a factor may be required to be coated with hydrogen sulfide-resistant material.

TESTING AND ACCEPTANCE REQUIREMENTS

General

1. All gravity and pressure sewer pipes and service laterals shall be tested for exfiltration and/or infiltration and deflection.
2. Sanitary sewer systems shall be subjected to an air or water pressure test, as approved by the City Engineer.
3. Sewer lines shall be television-inspected at the City's discretion.
4. Manholes shall be hydrostatically tested for leakage after installation, but prior to being backfilled. Prior to hydrostatic testing, all manholes shall be visually inspected for leaks. All leaks or cracks shall be repaired prior to hydrostatic testing, to the satisfaction of the Public Works Inspector.

MAINTENANCE REQUIREMENTS

The City maintains all public sewer mains, manholes and lift stations.

Property owners own and are required to maintain the lateral from the connection at the structure to the main line. Tree root intrusion, grease buildup, cracks, breaks, etc., are all the responsibility of the property owner.

APPENDIX D

WATER QUALITY MONITORING PLAN

Introduction

This Water Quality Monitoring Plan describes the sampling and analytical methodology along with data management protocol that will be used by Cel Analytical Inc. ELAP # 2647 to gather water quality data for the receiving water body in the event of sanitary sewer overflow of greater than 50,000 gallons, and the time frame for the events. The water quality sampling results will enable authorities to prioritize areas of concern with regard to water quality impacts.

Contact Cel Analytical at 415-882-1690(office) and 415-810-2177(cell)

Surface Water Sampling Procedures

Surface water samples will be collected using the direct grab sampling technique. New, sterile, nitrile powder-free surgical gloves will be worn by sampling personnel at all times during sampling. Sampling gloves will be changed between sampling locations.

Samples will be collected in the following order using the procedures recommended by US EPA for surface water sampling.

Order of sampling:

1. Ammonia
2. Fecal coliform
3. E. coli
4. Field measurements (temperature, pH, conductivity, dissolved oxygen)

Equipment and supplies

1. Cooler with blue ice
2. Sterile bacterial sampling bottles with or without preservative 3 per location (one may serve as duplicate for QC purpose)
3. Gloves
4. Marking pen (water resistant or permanent sharpies)
5. Clean bucket/bailer in case need
6. Paper towels
7. Decontamination solution and a disposal bucket for storing liquid waste
8. Field log forms,

9. Chain of custody and labels
10. Contact information for the Field supervisor

Procedure:

1. Determine the point that the SSO entered waterway.
2. If the SSO is occurring, the “source” location is the point where the SSO is entering the waterway.
3. If sampling is performed after the SSO has stopped, calculate the approximate downstream distance from the original SSO location by dividing the time since the SSO occurred by the estimated velocity. The velocity may be estimated by observing or dropping floatable debris in the surface water and timing how long it takes to travel over a measured distance.
4. Put on safety gloves and safety glasses.
5. Upstream Sample Collection: Collect the upstream samples first. Move approximately one hundred feet (100ft) upstream of the source location. Label the sample bottle “Upstream A” with the date and time.
 - a. Take a photo of the sample location, including a reference point in the photo.
 - b. Fill the three labeled bottles against the direction of the water flow. Collect samples well away from the bank, preferably at a point where water is visibly flowing. Avoid sampling debris or scum layer from the surface.
 - c. Use the thermometer to measure the temperature of the “Upstream A” sample three times and record the results.
6. Source Sample Collection: Collect the “source” samples next. Move approximately ten feet (10ft) downstream of the Source location. Label the sample bottle “Source A” with the date and time.
 - a. Take a photo of the sample location.
 - b. Fill the labeled bottles against the direction of the water flow. Collect samples well away from the bank, preferably at a point where water is visibly flowing. Avoid sampling debris or scum layer from the surface.
 - c. Use the thermometer to measure the temperature of the “Source A” sample three times and record the results.
7. Downstream Sample Collection: Lastly, collect the downstream sample. Move one hundred feet (100ft) downstream of the source location. Label the sample bottle “Downstream A” with the date and time.
 - a. Take a photo of the sample location.

- b. Fill the labeled bottles against the direction of the water flow. Collect samples well away from the bank, preferably at a point where water is visibly flowing. Avoid sampling debris or scum layer from the surface.
 - c. Use the thermometer to measure the temperature of the “Downstream A” sample three times and record the results.
8. Submerge collection container into the water to the depth of 6 to 10 inches carefully to avoid: a) contamination from land and surface debris; and b) losing the preservative tablet (sodium thiosulfate) in the bottle.
9. For safety reasons, it may not be possible to collect a bacteria sample directly into the sterile container. A clean bucket may be used to collect the sample then the sample transferred to the sterile container.
10. Alternatively, a clean sanitized bailer may be lowered into the receiving water to collect and transfer water into sterile containers sterile to minimize any possibility of contamination of the sample.
11. Fill bacterial container to the 125 ml mark, make sure there are enough containers/location to accommodate the testing needs.
12. Screw the caps on each bottle securely to avoid leakage. Avoid touching the inside of the sample bottle(s) or the cap(s).
13. Repeat the sampling process with the remaining containers.
14. Log all samples onto a Chain of Custody Document and place all samples in cooler with Blue ice. If exterior of the bottles get contaminated with highly turbid water, rinse the exterior of the bottles with deionized water before placing into the cooler.
15. When laboratory sample collection is complete, Hanna multi-parameter probes will be used to measure temperature, pH, conductivity, dissolved oxygen
16. Allow meter readings to stabilize, then record field parameter measurements on the Field Sampling Log.

Fecal coliform and E. coli samples must be delivered to the laboratory within approximately five hours of sample collection to meet the six hour holding time for these analyses.

Laboratory Quality Control Policy

- Maintain an updated ELAP certification
- Participate in third party proficiency testing
- Ensure sample is analyzed within its hold time of 6 hrs
- Analyze Ten percent of the samples collected in duplicate to establish levels of precision.
- Determine the acceptance and rejection of data based on established Control limits

Field sampling Quality Control Policy

- Ten percent of the samples collected will be used for quality control purposes.
- Duplicate samples will be used to determine laboratory method precision.
- Replicate samples will be used to determine representativeness of sampling.
- Field samples may be split for inter-laboratory comparisons.
- All field instruments used in the measurement of physical, chemical, or biological parameters shall be properly calibrated and maintained. Records will be kept of these operations for each instrument.
- Decontamination of clean buckets and or bailer if used prior to sampling at a different location
- All liquid waste generated from decontamination must be collected and disposed of by the Laboratory

APPENDIX E
SSO FIELD RESPONSE DOCUMENTATION PACKET



CITY OF BRISBANE SSO RESPONSE PLAN

**CHAIN OF COMMAND • EMERGENCY CONTACT LIST • INITIAL
ASSESSMENT
CONTAINMENT • CLEANUP • CATEGORIES • REPORTING
INSTRUCTIONS**

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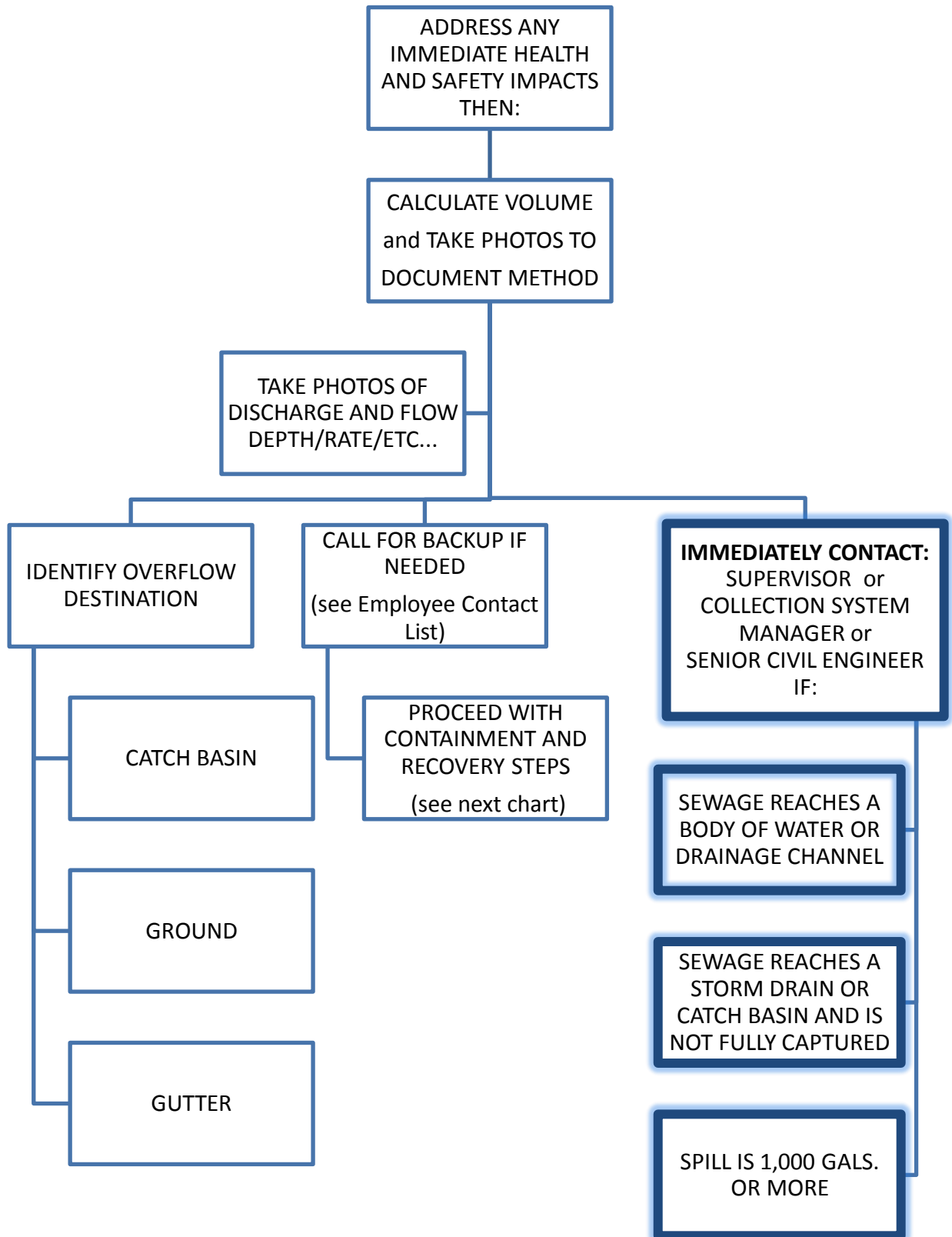
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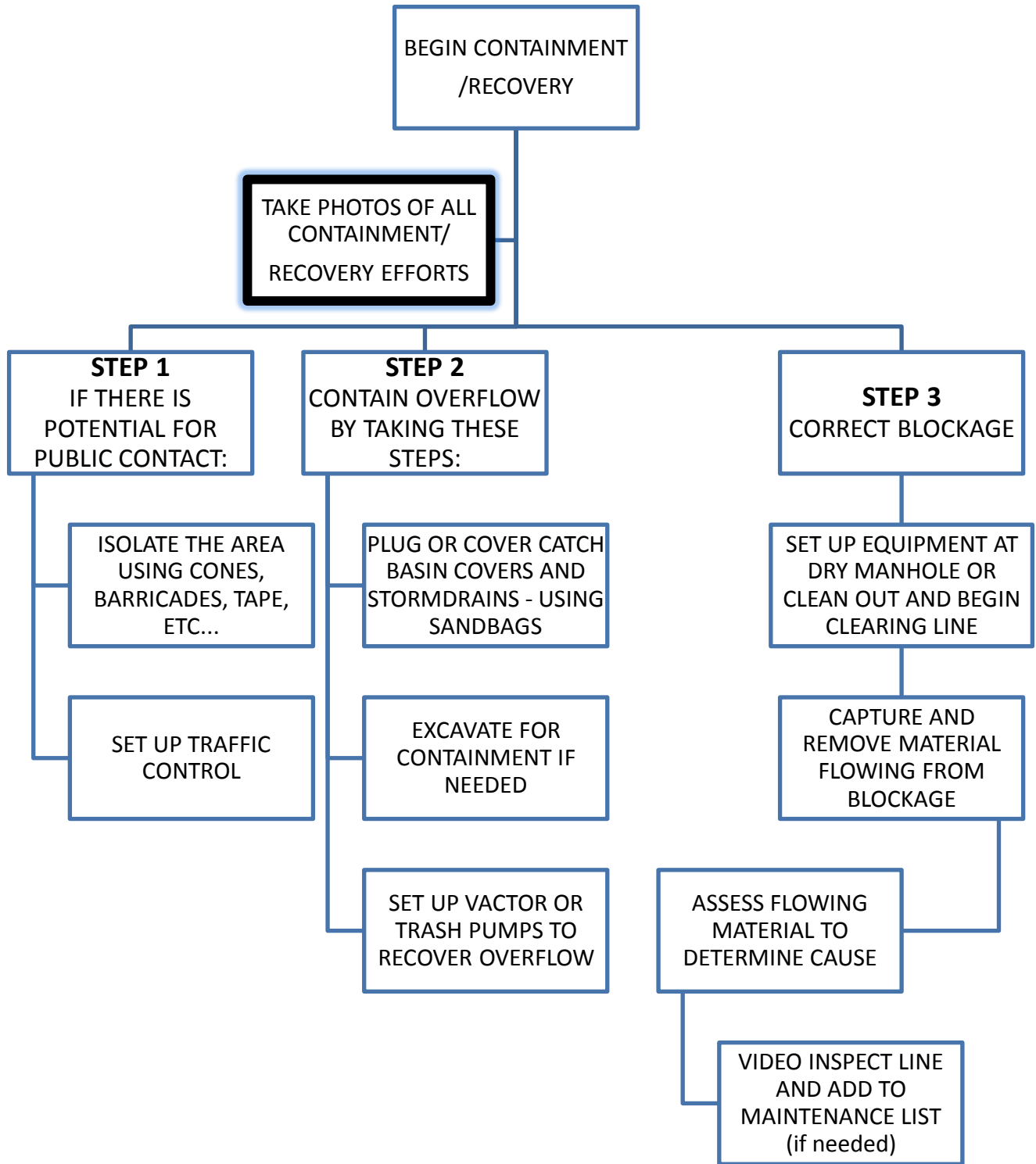
BRISBANE PUBLIC WORKS EMPLOYEE CONTACT LIST -2016

Employee	Title	Office	Cell
Dustin Cohn	Public Works Utility Team Leader	(415) 508 - 2105	(415) 298-8644
Kessel Crockett	Public Works Sanitary Lead Worker	N/A	(415) 894-7938
Todd Curtis	Public Works Maintenance Utility Worker	N/A	(415) 269-4746
Albert Mosely	Public Works Maintenance Utility Worker	N/A	(415) 730-6926
Chris Redfield	Public Works Maintenance Utility Worker	N/A	(650) 291-8845
Gerald Wilkin	Public Works Maintenance Utility Worker	N/A	(415) 407-3398
Frank Lozano	Public Works Maintenance Utility Worker	N/A	(415) 612-0218
Randy Thomas	Public Works Maintenance Utility Worker	N/A	(510) 909-3148
Varies	Public Works 24 hr On-Call Staff	N/A	(415) 286-0164
Randy Breault	Director of Public Works	(415) 508-2130	(415) 716-5853
Karen Kinser	Deputy Director of Public Works	(415) 508-2133	(415) 740-0816
Jerry Flanagan	Senior Civil Engineer Public Works	(415) 508-2137	(415) 321-0047
Diane Cannon	Administrative Assistant Public Works	(415) 508-2130	(415) 740-4721
Bob Sage	Engineering Technician Public Works	(415) 508-2121	(650) 892-1290
Greg Morris	Public Works Inspector	(415) 508-2130	(415) 760-3053
Joe Friars	Buildings and Grounds Supervisor	(415) 508-2104	(650) 766-4353
Mike Hahn	Harbor Master	(415) 508-2243	(650) 269-1225
Dolan Shoblo		(415) 508-2240	(415) 793-7093
Keegan Black	Maintenance Program Manager	(415) 508-2106	(415) 728-7986
Dispatch	Brisbane Police	(415) 467-1212	911
	Brisbane Fire	(415) 657-4300	911
Engine 81	Brisbane Fire		(415) 716-0414
Dispatch	North County Fire	(650) 368-1421	911
	Company Nurse	1-877-215-7284	

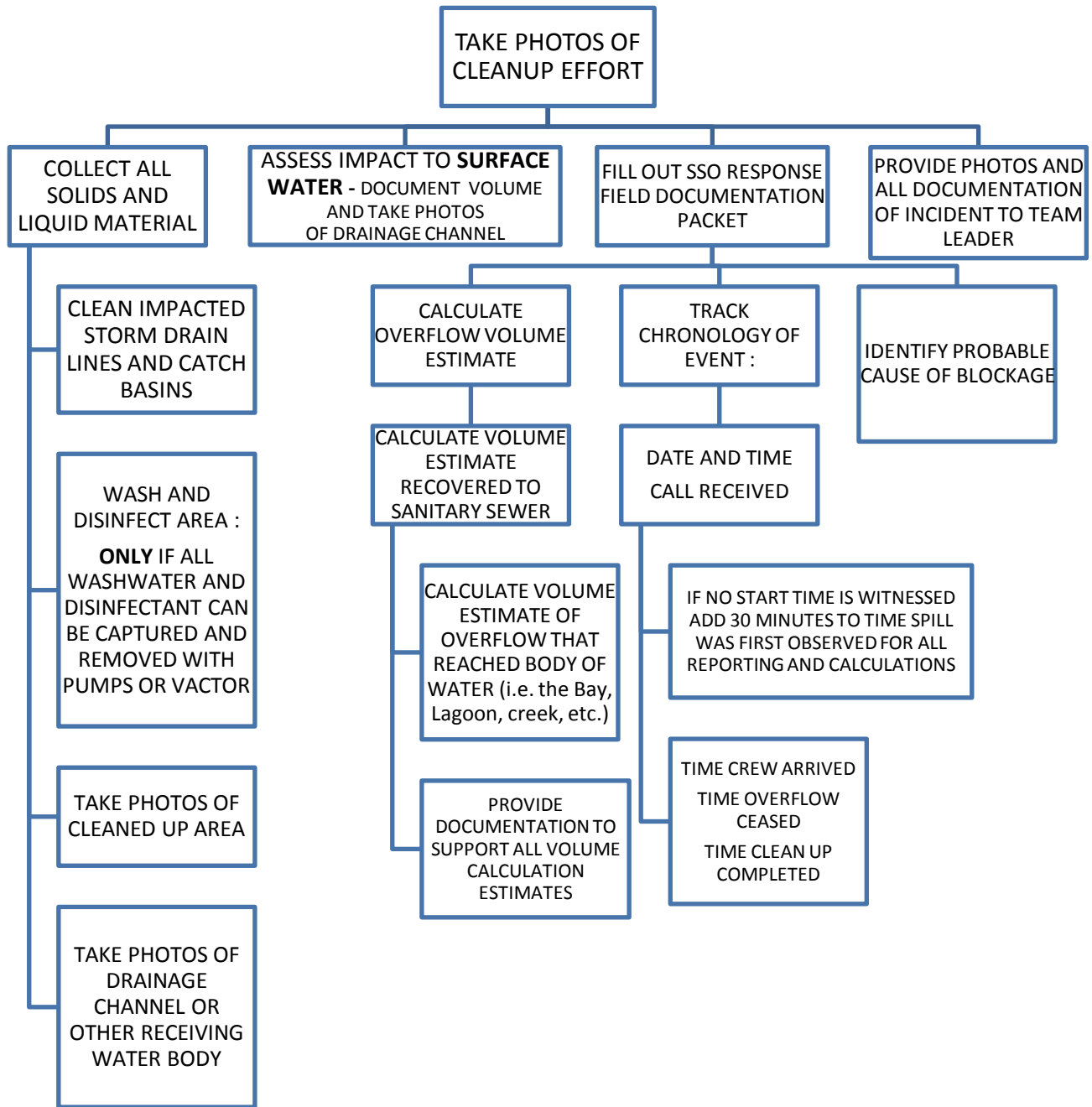
SSO INITIAL ASSESSMENT FLOW CHART



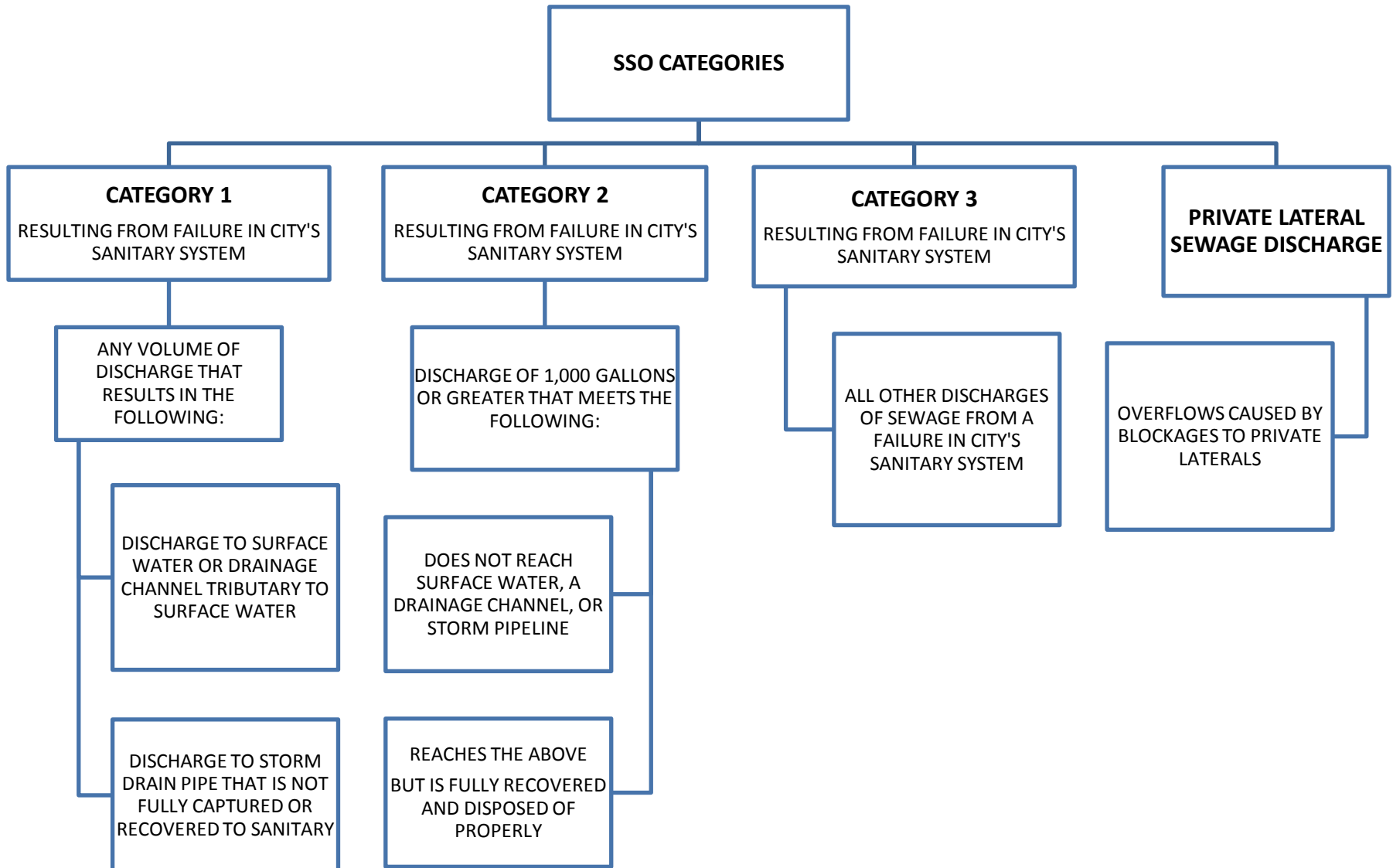
SSO CONTAINMENT/RECOVERY FLOW CHART



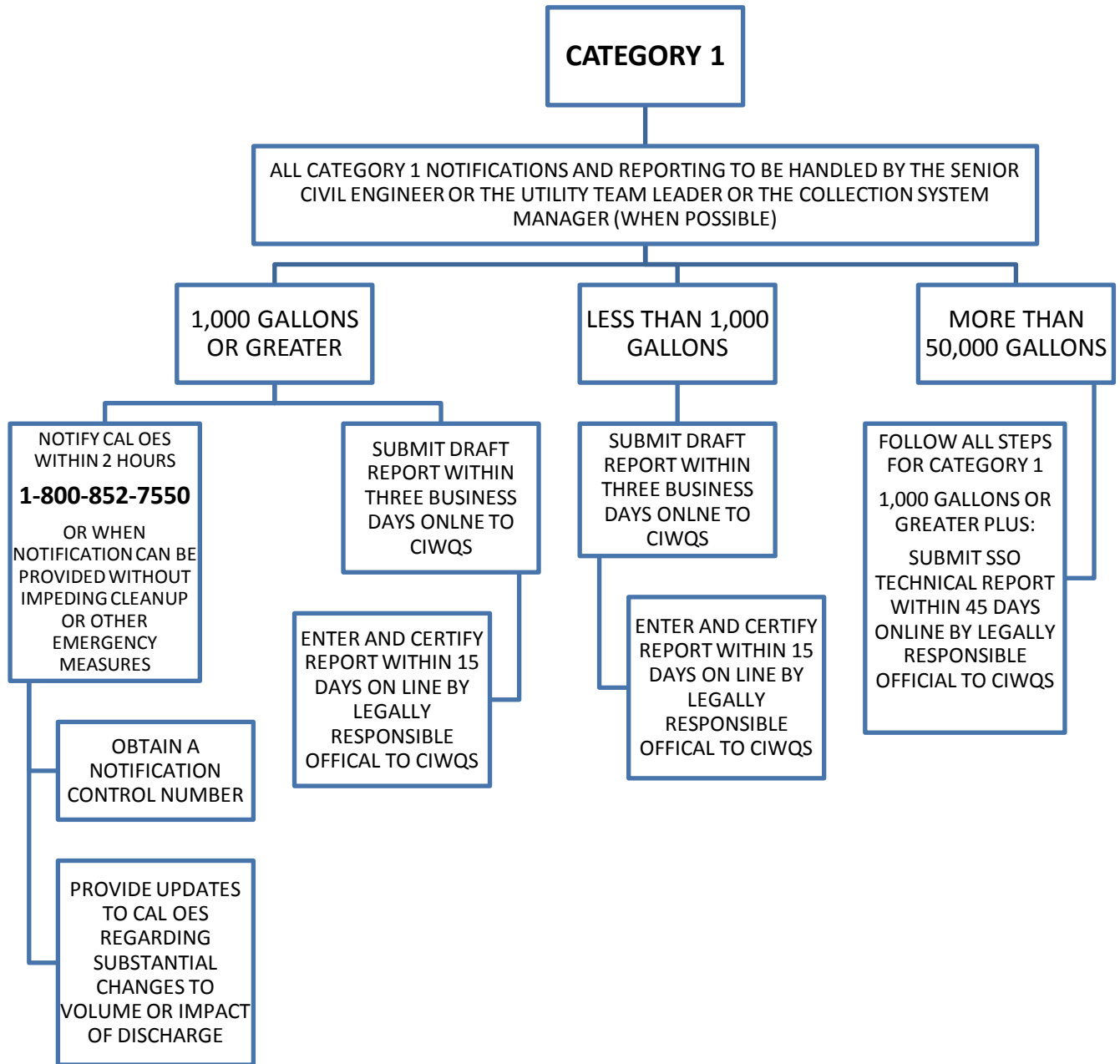
SSO CLEANUP/DOCUMENTATION FLOWCHART



SSO CATEGORIES



SSO CATEGORY 1 NOTIFICATION / REPORTING REQUIREMENTS



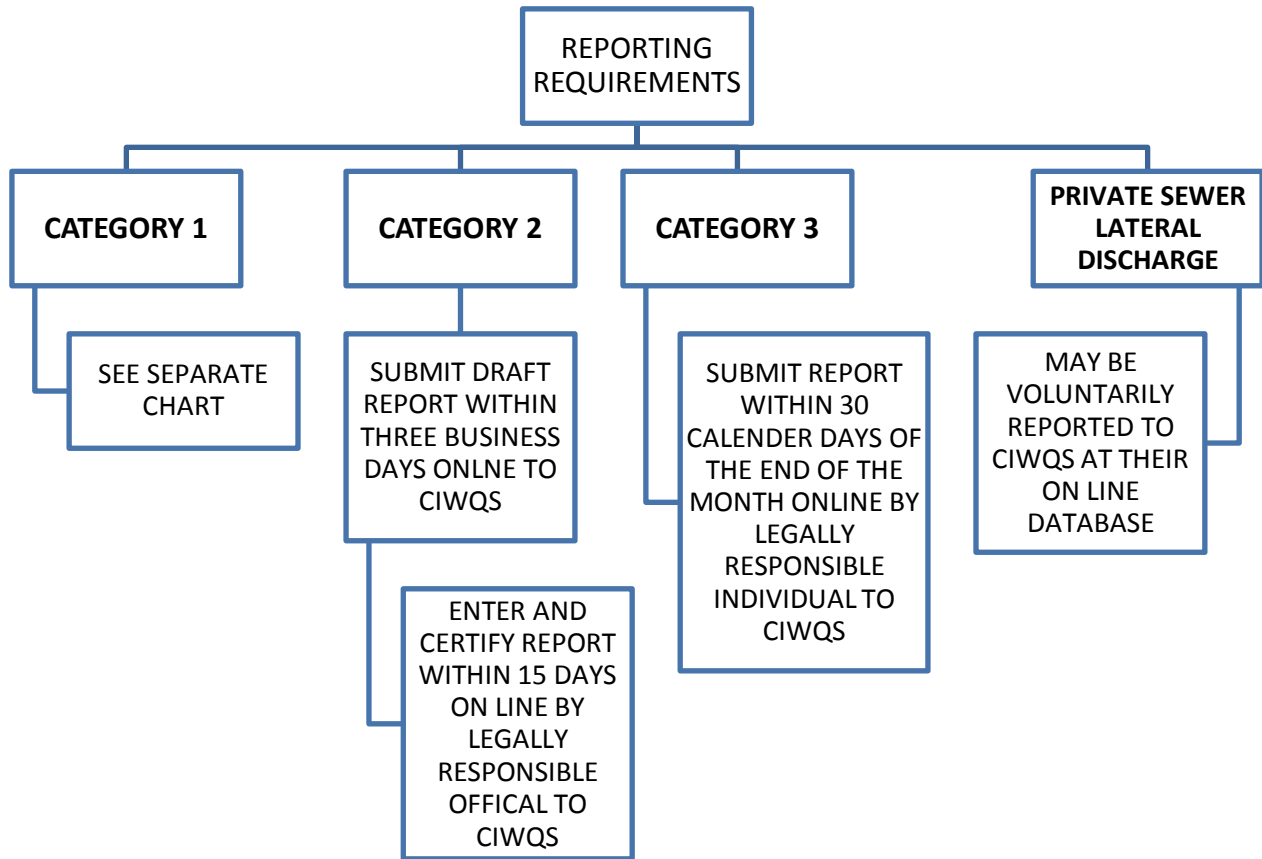
California Integrated Water Quality System: www.waterboards.ca.gov/ciwqs/

San Mateo County Environmental Health: (650) 363-4305

Regional Water Quality Control Board: (510) 622-2300

California State Office of Emergency Services: 1-800-852-7550

SSO CATEGORIES 2,3,PRIVATE LATERAL REPORTING REQUIREMENTS



California Integrated Water Quality System: www.waterboards.ca.gov/ciwqs/

SSO REPORTING INSTRUCTIONS

California State Office of Emergency Services: 1-800-852-7550

When calling this number be prepared to report the following:

- i. Identity of caller and direct return phone number.
- ii. Estimated SSO volume discharged (gallons).
- iii. If ongoing, estimated SSO discharge rate (gallons per minute).
- iv. SSO Incident Description:
 - a. Brief narrative.
 - b. On-scene point of contact for additional information (name and cell phone number).
 - c. Date and time Discharger became aware of the SSO.
 - d. Name of sanitary sewer system agency causing the SSO.
 - e. SSO cause (if known).
- v. Indication of whether the SSO has been contained.
- vi. Indication of whether surface water is impacted.
- vii. Name of surface water impacted by the SSO, if applicable.
- viii. Indication of whether a drinking water supply is or may be impacted by the SSO.
- ix. Any other known SSO impacts.
- x. SSO incident location (address, city, state, and zip code).

California Integrated Water Quality System: www.waterboards.ca.gov/ciwqs/
San Mateo County Environmental Health: (650) 363-4305
Regional Water Quality Control Board: (510) 622-2300



CITY OF BRISBANE

SSO RESPONSE – FIELD DOCUMENTATION PACKET

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REPORTED BY: _____

REPORT DATE: ___ / ___ / ___

CALLER (OBSERVER) INFORMATION

CALLER (OBSERVER) INFORMATION	
Caller (Observer) Name:	Caller phone #:
Time of initial call: <input type="checkbox"/> AM <input type="checkbox"/> PM	Caller email:
Date of initial call:	Call received by:
Service Request #	Call assigned to:
Address on Ser. Request:	
Location where caller saw spill:	
Did caller observe the start of the spill? <input type="checkbox"/> YES <input type="checkbox"/> NO	
If 'YES' – What time did spill start? <input type="checkbox"/> AM <input type="checkbox"/> PM	
CALLER COMMENTS	
Use separate paper if more room needed	

SSO TIMELINE

SSO TIMELINE	
Was start of spill witnessed or documented?*	Documented start time: <input type="checkbox"/> AM <input type="checkbox"/> PM
<input type="checkbox"/> Yes <input type="checkbox"/> No	Official spill start time:* <input type="checkbox"/> AM <input type="checkbox"/> PM
Dispatch received call: <input type="checkbox"/> AM <input type="checkbox"/> PM	Name of dispatcher:
Dispatch calls Public Works Employee: <input type="checkbox"/> AM <input type="checkbox"/> PM	Name of employee who received call:
Employee contacts Supervisor: <input type="checkbox"/> AM <input type="checkbox"/> PM	Name of supervisor contacted:
Staff Arrives at spill: <input type="checkbox"/> AM <input type="checkbox"/> PM	Date:
Staff requests additional employees and equipment <input type="checkbox"/> AM <input type="checkbox"/> PM	List additional employees and equipment requested:
Staff requests additional employees and equipment <input type="checkbox"/> AM <input type="checkbox"/> PM	List additional employees and equipment requested:
Containment started: <input type="checkbox"/> AM <input type="checkbox"/> PM	Date:
Overflow stopped: <input type="checkbox"/> AM <input type="checkbox"/> PM	Date:

Blockage cleared:	<input type="checkbox"/> AM <input type="checkbox"/> PM	Date:
Spill cleaned up:	<input type="checkbox"/> AM <input type="checkbox"/> PM	Date:
Departure Time:	<input type="checkbox"/> AM <input type="checkbox"/> PM	Date:
TIMELINE COMMENTS		
Use separate paper if more room needed		

*** If start of spill is not witnessed or otherwise documented (with photos showing spill hasn't reached storm drain system or natural waterway) then add estimated 30 minutes to time spill was reported for Official spill start time. Adjust volume calculation estimate to reflect this additional 30 minutes (per RWQCB directive from March 4, 2016)**



SSO CAUSE AND FAILURE LOCATION

SSO CAUSE			
CHECK ALL THAT APPLY FROM LIST BELOW			
<input type="checkbox"/> ARV/BOV Failure	<input type="checkbox"/> City maintenance caused spill/blockage	<input type="checkbox"/> Construction debris	
<input type="checkbox"/> Damage by others not related to City Sewer	<input type="checkbox"/> Debris from lateral	<input type="checkbox"/> General debris	
<input type="checkbox"/> Rags	<input type="checkbox"/> Excess Flow	<input type="checkbox"/> Roots	<input type="checkbox"/> Grease (FOG)
<input type="checkbox"/> Inappropriate discharge to City Sewer	<input type="checkbox"/> Natural disaster	<input type="checkbox"/> Non-dispersibles	
<input type="checkbox"/> Operator Error	<input type="checkbox"/> Pipe Structural Problem / Failure	<input type="checkbox"/> Pipe Structural Problem - Install	
<input type="checkbox"/> Pump Station Fail - Controls	<input type="checkbox"/> Pump Station Fail - Mechanical	<input type="checkbox"/> Pump Station Fail - Power	
<input type="checkbox"/> Rainfall Exceeded Design	<input type="checkbox"/> Siphon Failure	<input type="checkbox"/> Root Intrusion	<input type="checkbox"/> Surcharged pipe
<input type="checkbox"/> Other – Describe:			<input type="checkbox"/> Vandalism
Was this spill related to a storm event? <input type="checkbox"/> YES <input type="checkbox"/> NO			
SSO CAUSE COMMENTS			
Use separate paper if more room needed			

SSO FAILURE LOCATION			
CHECK ALL THAT APPLY FROM LIST BELOW			
<input type="checkbox"/> ARV/BOV	<input type="checkbox"/> Force main	<input type="checkbox"/> Gravity main line	<input type="checkbox"/> Lower lateral (public)
<input type="checkbox"/> Manhole	<input type="checkbox"/> Siphon		<input type="checkbox"/> Upper lateral (public)
<input type="checkbox"/> Pump Station Fail - Controls	<input type="checkbox"/> Pump Station Fail - Mechanical	<input type="checkbox"/> Pump Station Fail - Power	
<input type="checkbox"/> Other – Describe:			
SSO FAILURE QUESTIONS			
Diameter of sewer pipe at the point of blockage or failure (inches):			
Material of sewer pipe at the point of blockage or failure:			
Estimated age of sewer asset at the point of blockage or failure (years):			
SSO FAILURE COMMENTS			
Use separate paper if more room needed			



SSO LOCATION AND FINAL DESTINATION *

SSO APPEARANCE LOCATION			
Address or Location of spill:			
Latitude of spill:		Longitude of spill:	
Number of appearance points:		CHECK ALL THAT APPLY FROM LIST BELOW	
<input type="checkbox"/> SS Backflow Device	<input type="checkbox"/> Combined Sewer D.I.	<input type="checkbox"/> Force Main	<input type="checkbox"/> Gravity Mainline
<input type="checkbox"/> Inside Building/Struct	<input type="checkbox"/> Private lateral C.O.	<input type="checkbox"/> Public lateral C.O.	<input type="checkbox"/> Private lower lateral
<input type="checkbox"/> Lift Station	<input type="checkbox"/> Manhole (public)	<input type="checkbox"/> Manhole (private)	<input type="checkbox"/> Public lower lateral
<input type="checkbox"/> Other - Describe Below:		<input type="checkbox"/> Public upper lateral	<input type="checkbox"/> Private upper lateral
LOCATION COMMENTS			



Use separate paper if more room needed

FINAL SPILL DESTINATION*

CHECK ALL THAT APPLY FROM LIST BELOW

<input type="checkbox"/> Beach	<input type="checkbox"/> Building/Structure	<input type="checkbox"/> Storm drain	<input type="checkbox"/> Drainage Channel
<input type="checkbox"/> Paved Surface	<input type="checkbox"/> Unpaved Surface	<input type="checkbox"/> Street/Curb/Gutter	<input type="checkbox"/> Surface Water
<input type="checkbox"/> Other - Describe Below:		<input type="checkbox"/> Public upper lateral	<input type="checkbox"/> Private upper lateral

DESTINATION QUESTIONS*

Did the spill discharge to a drainage channel and/or surface water?*	<input type="checkbox"/> YES <input type="checkbox"/> NO
Did the spill reach a storm drainpipe that is not part of a combined sewer system?	<input type="checkbox"/> YES <input type="checkbox"/> NO
If spill reached a separate drainpipe, was all of the wastewater fully captured from the separate storm drain and returned to the sanitary sewer system?	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A

DESTINATION COMMENTS



Use separate paper if more room needed

*** Photo Documentation of the Drainage Channel (or final receiving body) required in all SSO instances.**

SPILL CATEGORY / NOTIFICATION

SSO CATEGORIES*	
1. Was the spill \geq 1,000 gallons?	<input type="checkbox"/> YES <input type="checkbox"/> NO
1.a. If 'YES', was CAL OES notified within two hours?	<input type="checkbox"/> YES <input type="checkbox"/> NO
2. Was there a discharge to a drainage channel and/or surface water?	<input type="checkbox"/> YES <input type="checkbox"/> NO
3. Was there a discharge to a storm drain pipe that was "NOT" fully captured & returned to the SS system?	<input type="checkbox"/> YES <input type="checkbox"/> NO
If answer is YES to any of the questions above, the SSO is a Category 1*	

*See SSO Response Plan for all categories and reporting requirements Standard Operating Procedures.

CAL OES: 1-800-852-7550 RWQCB: (510) 622-2300 SMCO Environmental Health: (650)363-4305



SPILL VOLUME*

SPILL VOLUME*	
a) Estimated spill volume that reached a separate storm drain that flows to a surface water body?	gallons
b) Estimated spill volume recovered from the separate storm drain that flows to a surface water body? (Do not use water used for clean-up)	gallons
c) Estimated spill volume that directly reached a drainage channel that flows to a surface water body?	gallons
d) Estimated spill volume recovered from a drainage channel that flows to a surface water body?	gallons
e) Estimated spill volume discharged directly to a surface water body?	gallons
f) Estimated spill volume recovered from surface water body?	gallons
g) Estimated spill volume discharged to land? (Includes discharges directly to land, and discharges to a storm drain system or drainage channel that flows to a storm water infiltration/retention structure, field, building, or other non-surface water location.)	gallons
h) Estimated spill volume recovered from the discharge to land? (Do not include water used for cleanup)	gallons

*See attached worksheets for spill volume calculations



CLEANUP OPERATIONS

DESCRIBE CLEANUP OPERATIONS

Use separate paper if more room needed



SPILL VOLUME ESTIMATION METHODS

The purpose of this worksheet is to capture the data and method(s) used in estimating the volume of an SSO. It is useful to use more than one method, if possible, to validate your estimate.

VOLUME ESTIMATE METHODS *		
CHECK ALL ESTIMATION METHODS USED*		
<input type="checkbox"/> Flow around MH cover	<input type="checkbox"/> Measured Volume Method	<input type="checkbox"/> Duration and Flow Method
<input type="checkbox"/> USD SSO Flow Rate Estimating Tool	<input type="checkbox"/> Daily Per Capita Use	<input type="checkbox"/> Pump Station Meter
<input type="checkbox"/> Flow from vent or pick holes	<input type="checkbox"/> Eyeball Estimate Method	
<input type="checkbox"/> Other – Describe:		

***SEE THE SEWER SPILL ESTIMATION GUIDE FOR DETAILED INSTRUCTIONS ON EACH METHOD**

DURATION AND FLOW RATE METHOD

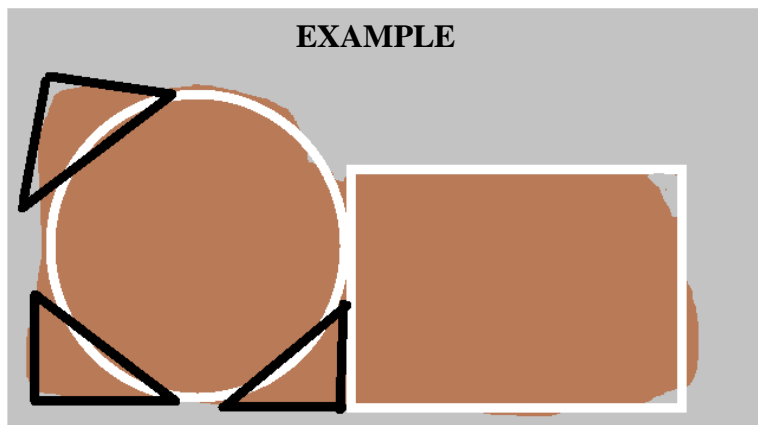
1. Start Date and Time:	
2. End Date and Time:	
3. Total time of overflow (show time in minutes):	
a. Total time + 30 minutes*:	
4. Average flow rate GPM:	
5. Total Volume Estimated (multiply line 3(a) and 4):	

*** Add 30 minutes to the start time if start of spill is not witnessed or documented with photos**

MEASURED VOLUME METHOD (See page 6 of the Sewer Spill Estimation Guide)

If not raining, the shape, dimensions, and depth of the spill may be used to estimate the volume.

Sketch spill with dimensions and depth (in feet) Measure depth in several locations		
1. Multiply (area) x (depth) to get volume:	cu ft.	Rectangle Area (length) x (width)
2. Repeat as needed:	cu ft.	
2. Repeat as needed:	cu ft.	Circle Area (dia) x (dia) x 0.785
2. Repeat as needed:	cu ft.	
3. Add volume from all shapes drawn to get Total Volume:	cu ft.	Triangle Area (base) x (height) x 0.5
4. Multiply (Total volume) x (7.48) to convert to gallons:	gallons	



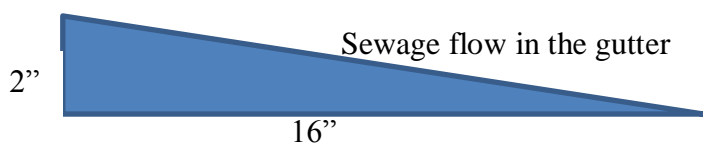
For spill of this shape draw 3 triangles, one circle, and one rectangle.
Measure depth for each shape in multiple locations and figure average.

GUTTER FLOW ESTIMATION METHOD (See page 21 of the Sewer Spill Estimation Guide)

1. Drop a small floating object into the sewage flow and measure how far it floats in one second.	VELOCITY	(ft/sec)
2. Calculate the Area of flow in the gutter line in square inches. <i>Area of a triangle is 1/2 x Base x Height (common flow shape in gutter)</i>	AREA	(in ²)
3. Multiply: (in ²) x .007 to get square feet (ft ²) =	AREA	(ft ²)
4. Multiply: (ft/sec) x (ft ²) x 7.48 (gal/min) x 60 (sec/min) =	FLOW	(gal/min)
5. Determine total spill time in minutes*	TIME	(min)
6. Multiply: (gal/min) x (min) =	TOTAL SPILL VOLUME	(gallons)

* Add 30 minutes to the start time if start of spill is not witnessed or documented with photos

Gutter Flow Estimation Example



For this example, let's assume that a piece of bark floated 2ft in one second, when dropped into the sewage flow. Let's assume that the SSO lasted 16 minutes, but nobody witnessed the start, so we must add 30 minutes to bring our time to 46 minutes.

1 sq inch = .007 sq ft The area of a triangle is (1/2)Base x Height

1. That would mean that **Velocity** = 3ft/sec. **Time** = 46 minutes
2. The area of this flow would be (1/2) x 2" x 16" = 16 sq inches.
3. Convert 16 sq inches to sq ft. 16 x .007 = .112 The **Area** = .112 ft²
4. **Flow** = 2(ft/sec) x .112(ft²) x 7.48(gal/min) x 60 (sec/min)
5. **Flow** = 101(gal/min) x 46 minutes = 4,646 gallon **Total Spill Volume**

EYEBALL ESTIMATION METHOD (See page 5 of the Sewer Spill Estimation Guide)

Imagine amount of water that would spill from a bucket or barrel. This method useful up to 100 gallons. This method should be used as a last resort if the other estimation methods aren't available.

Size of bucket(s) or barrel(s)	How many?	Mutliplier	Estimated Volume
1 gallon water jug		x1	gallons
5 gallon bucket		x5	gallons
32 gallon trash can		x32	gallons
55 gallon drum		x55	gallons
Total Volume Estimated Using Eyeball Method			gallons

