SEP 27 2017

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

SEP 25 2017

CERTIFIED MAIL 7016 1970 0000 8992 3686
RETURN RECEIPT REQUESTED

Mr. Michael Patrick, P.E.
Director, Waste Resources Division
City of Chattanooga
455 Moccasin Bend Road
Chattanooga, Tennessee 37405

Re: Approval of the Revised Pump Station Preventive Maintenance Program
U.S. District Court Civil Action 1:12-cv-00245

Dear Mr. Patrick:

The U.S. Environmental Protection Agency Region 4 and the Tennessee Department of Environment and Conservation have reviewed and hereby approve the revised Pump Station Preventive Maintenance Program (PSPMP) for the City of Chattanooga (the City) dated August 14, 2017, pursuant to Section VI.20.f of the subject Consent Decree above. The City shall implement the revised PSPMP in accordance with the submittal. In addition, the City shall certify the status of the implementation of the revised PSPMP, including its completion, in the Semi-Annual or Annual Work Progress Report pursuant to Section IX of the subject Consent Decree.

Please contact Ms. Sara Janovitz at (404) 562-9870 or via email at janovitz.sara@epa.gov if you have any questions.

Sincerely,

Maurice L. Horsey, IV, Chief
Municipal & Industrial Enforcement Section
NPDES Permitting and Enforcement Branch

cc: See Attached Mailing List

Mailing List:

Mr. Karl Fingerhood
U.S. Department of Justice, Washington, D.C.

Mr. Phillip Hilliard
Office of the Attorney General

Ms. Jessica Murphy
Tennessee Department of Environment and Conservation

Mr. Donald L. Norris
City of Chattanooga, Tennessee

Mr. Wade Hinton
City of Chattanooga, Tennessee

Mr. Adam Sowatzka
King & Spalding LLP

Ms. Shelby Ward
Tennessee Clean Water Network

City of Chattanooga

Mayor Andy Berke

September 13, 2017

VIA CERTIFIED MAIL

Mrs. Sara Schiff Janovitz
Environmental Engineer
Clean Water Enforcement Branch
US EPA - Region 4
61 Forsyth Street, SW
Atlanta, GA 30303

Re: ***United States of America et. al. v. City of Chattanooga, No. 1:12-cv-0024***
Capacity, Management, Operations and Maintenance (CMOM) Program-
Pump Station Preventive Maintenance Program (PSPMP) – Revised

Dear Mrs. Janovitz:

On behalf of the City of Chattanooga, Tennessee ("City"), and in accordance with the consent decree entered by the United States District Court for the Eastern District of Tennessee (Southern Division), on April 24, 2013, in the case styled the *United States of America et. al. v. City of Chattanooga, No. 1:12-cv-0024* ("Consent Decree"), we are submitting to both the Environmental Protection Agency ("EPA") and the Tennessee Department of Environment and Conservation ("TDEC") the Pump Station Preventive Maintenance Program revised on August 14, 2017, to reflect minor comments made by the City. These changes include:

1. Acronyms and Abbreviations: Updated meaning of acronym for "PS"
2. Table 1-1: Removed Collegedale PS and updated the name of Airport 1 PS to New Airport Rd PS
3. Table 1-2: Updated Grinder PS List
4. Section 1.6: Revised the total number of PS and grinder pumps
5. Section 3.1: Updated frequency of preventive maintenance schedule
6. Table 3-1: Updated the name of Airport 1 PS to New Airport Rd PS
7. Section 3.3.1: Removed reference to Appendices I & J
8. Section 3.3.2: Updated description

9. Section 3.3.3: Updated Corrective Maintenance Tracking description and added Table 3-2 Failure Codes.
10. Table 5-1: Removed "Actual Labor availability" and "Track Work Orders by Failure Code"
11. Section 6.1: Corrected typo in description of "Periodic Evaluation"
12. Section 6.2: Update descriptions for "Checklist Enhancements and Use", "Fully Implement and Monitor KPIs", and "Develop a Program to Locate and Maintain Air Relief Valves"
13. Appendix I: Removed
14. Appendix J: Removed

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Please let me know if you have any questions regarding our revision.

Sincerely,

Michael C. Patrick, P.E.
Director, Waste Resources Division

Enclosure

cc: Karl Fingerhood, Esq., US DOJ
Chief, Environmental Enforcement Section, US DOJ
Chief, Clean Water Enforcement Branch, US EPA Region 4
Bill Bush, Esq., US EPA
Sohnia Hong, Esq., Office of the Attorney General
Enforcement Coordinator, Water Pollution Control, TDEC
Shelby Ward, TN Clean Water Network
Adam Sowatzka, Esq., King & Spalding
Mike Marino, P.E., Jacobs

Pump Station Preventive Maintenance Program

Prepared for

United States Environmental Protection Agency and Tennessee Department of Environment and Conservation

City of Chattanooga
Waste Resources Division
Consent Decree Program
Case No. 1:12-cv-00245

Prepared by

Brown and Caldwell

Submitted by

Jacobs Engineering Group Inc.
Consent Decree Program Manager

Chattanooga, Tennessee

November 18, 2014
Revised August 14, 2017

Contents

Appendices

Tables

Acronyms and Abbreviations

CM	Corrective Maintenance (or corrective maintenance work order)
CMMS	Computerized Maintenance Management System
CMOM	Capacity Management Operations and Maintenance
CSO	Combined Sewer Overflow
CSOTF	Combined Sewer Overflow Treatment Facility
DPW	Department of Public Works
EMRIP	Equipment Maintenance and Reliability Improvement Program
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
ISS	Interceptor Sewer System
KPI	Key Performance Indicator
MBWWTP	Moccasin Bend Wastewater Treatment Plant
O&M	Operations and Maintenance
PER	Preliminary Engineering Report
PM	Preventive Maintenance (or preventive maintenance work order)
PS	Pump Station
SCADA	Supervisory Control and Data Acquisition
SOP	Standard Operating Procedure
SSO	Sanitary Sewer Overflow
SORP	Sewer Overflow Response Plan
TDEC	Tennessee Department of Environment and Conservation
VFD	Variable Frequency Drive
WCTS	Wastewater Collection and Transmission System
WIMS	Water Information Management System
WO	Work Order
WRD	Waste Resources Division
WWTP	Wastewater Treatment Plan

1.0 Introduction

1.1 Purpose

On April 24, 2013, the City of Chattanooga (City) entered into a consent decree with the United States and the State of Tennessee, in the case styled United States of American et. Al. v. City of Chattanooga, No. 1:12-cv-00245 (CD). The City's, Waste Resources Division (WRD) has prepared this Pump Station (PS) Preventive Maintenance Program for review and approval by the United States Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC), as a condition of paragraph 20(c) of the CD.

The purpose of this PS Preventive Maintenance Program for the City of Chattanooga is to provide adequate guidelines to improve the reliability of operations at these facilities. PS and CSOTF availability and reliability is essential in the conveyance of wastewater, while reducing the risk of Sanitary Sewer Overflows (SSOs). Goals of this PS Preventative Maintenance Program include the following:

- Provide reliable and continuous service; and
- Minimize impacts to surrounding communities during service interruptions (e.g. power outages, etc.) and maximize the useful life of the equipment.

The goals will be accomplished through the following actions, among others, which are highlighted below and in the remainder of this document:

- Inspect and lubricate pumps and other mechanical equipment according to the manufacturers' recommendations.
- Verify the proper operation of the alarms, telemetry system, and auxiliary equipment.
- Develop specific job qualifications and make appropriate staff aware of the proper maintenance activities necessary at each PS and CSOTF.
- Utilize data and maintenance history to build preventive maintenance tasks that increase PS and CSOTF reliability and minimize down-time of equipment.
- Develop schedules for inspections, lubrication, and other tasks that provide appropriate intervals for the equipment within its working environment.
- Use data and history to predict and avoid equipment failures.

Table 1-1 lists the wastewater PSs and CSOTFs.

Table 1-1
City of Chattanooga Wastewater PSs and CSOTFs

Name	Type	Location	City, State	Year in Service	Wastewater Type	Pump Nameplate Rating (GPM)	Number of Pumps	Operational Visit Schedule
19th St. CSO	CSOTF	1504 Riverfront Pky	Chatt, TN	2001	Combined	N/A	N/A	Monthly
19th St. PS	PS	1000 W. 19th St.	Chatt, TN	1966	Domestic, Industrial, and Combined	7,000	3	Weekly
23rd St. PS	PS	299 Poss Dr.	Chatt, TN	1955	Domestic, Industrial, and Combined	18,000	4	Weekly
26th St. PS	PS	2600 Carr St.	Chatt, TN	1979	Domestic	25	2	Monthly
New Airport Rd PS	PS	5801 Rosedale Rd	Chatt, TN	1971	Domestic	800	2	Monthly
Airport Rd. #2 PS	PS	850 Jubilee Dr.	Chatt, TN	2005	Domestic, Industrial	180	2	Monthly
Altamont PS	PS	2406 High Point Dr.	Chatt, TN	1999-2000	Domestic	50/500	4	Monthly
Alton Park PS	PS	3000 E. 34th St.	Chatt, TN	1972	Domestic	265	2	Monthly
Arbor Creek PS	PS	2701 Arbor Creek Way (2543)	Hixson, TN	1989	Domestic	150	2	Monthly
Battery Place PS	PS	501 Battery Place	Chatt, TN	1985	Domestic	300	2	Monthly
Big Ridge No. 1 PS	PS	5816 Lake Resort Dr.	Hixson, TN	1995	Domestic	950	2	Monthly
Big Ridge No. 2 PS	PS	4600 Gann Store Road	Hixson, TN	1995	Domestic	950	2	Weekly
Big Ridge No. 3 PS	PS	4714 Privateer Rd	Hixson, TN	1995	Domestic	80	2	Monthly
Big Ridge No. 4 PS	PS	4736 Privateer Rd	Hixson, TN	1997	Domestic	25	2	Monthly
Big Ridge No. 5 PS	PS	4802 Woodland Circle	Hixson, TN	1995	Domestic	550	2	Weekly
Big Ridge No. 6 PS	PS	1902 Wisteria Dr.	Hixson, TN	1996	Domestic	550	2	Monthly
Big Ridge No. 7 PS	PS	2224 Rambler Ln. (2223)	Hixson, TN	1997	Domestic	25	2	Monthly
Big Ridge No. 8 PS	PS	2226 Wisteria Dr. (2200)	Hixson, TN	1997	Domestic	25	2	Monthly
Big Ridge No. 9 PS	PS	6402 Lake Shadows Circle	Hixson, TN	1997	Domestic	25	2	Monthly
Big Ridge No. 10 PS	PS	4029 Breakwater Dr.	Hixson, TN	1997	Domestic	25	2	Monthly
Big Ridge No. 11 PS	PS	5733 Lake Resort Terrace	Hixson, TN	1999	Domestic	150	2	Monthly
Big Ridge No. 12 PS	PS	5530 Lake Resort Terrace	Hixson, TN	1999	Domestic	180	2	Monthly

Table 1-1
City of Chattanooga Wastewater PSs and CSOTFs

Name	Type	Location	City, State	Year in Service	Wastewater Type	Pump Nameplate Rating (GPM)	Number of Pumps	Operational Visit Schedule
Big Ridge No. 13 PS	PS	5596 Lake Resort Terrace	Hixson, TN	1999	Domestic	400	2	Monthly
Big Ridge No. 14 PS	PS	1965 Hixson Marina Rd.	Hixson, TN	2003	Domestic	225	2	Monthly
Boy Scout Rd. PS	PS	Boy Scout Rd. 816 (811 W. Boy Scout)	Hixson, TN	1992	Domestic, Industrial	2,570/3,150	3	Weekly
Brainerd Golf Course PS	PS	409 Tacoa Ave.	Chatt, TN	1949	Domestic	500	2	Monthly
Brainerd Manor PS	PS	4600 Ricky Dr.	Chatt, TN	1972	Domestic	100	2	Monthly
Carter St. CSO	CSOTF	West 20th 500 Block	Chatt, TN	1998	Combined	N/A	N/A	Monthly
Central Ave CSO	CSOTF	2700 Market St	Chatt, TN	2000	Combined	N/A	N/A	Monthly
Citico CSO	CSOTF	201 Riverside Pky	Chatt, TN	2000	Combined	N/A	N/A	Monthly
Citico PS	PS	1004 Riverside Dr.	Chatt, TN	1999	Domestic, Industrial, and Combined	27,500	4	Weekly
Davidson Place	PS	1075 Dodie Dr.	Chatt, TN	2009	Domestic	450	2	Monthly
Dupont Industrial Park/North Industrial Park PS	PS	4500 Pinnacle Lane	Chatt, TN	1999	Domestic	25	2	Monthly
Dupont Parkway PS	PS	1610 Elm St.	Hixson, TN	1995	Domestic, Industrial	4,500	3	Monthly
East Brainerd PS	PS	Frawley Rd.	East Ridge, TN	1978	Domestic	2,250	3	Weekly
East Gate #1 PS	PS	5630 Brainerd Rd.	Chatt, TN	1963	Domestic	200	2	Monthly
East Gate #2 PS	PS	220 Cornelison Rd	Chatt, TN	2007	Domestic	500	2	Monthly
ESIP / Enterprise	PS	6705 Bonny Oaks Dr.	Chatt, TN	2004	Industrial	795	2	Monthly
Fagan Street PS	PS	3816 Fagan St.	Chatt, TN	1979	Domestic	50	2	Monthly
Friar Branch PS	PS	3910 Juandale Dr.	Chatt, TN	Built 1978	Domestic, Industrial	16,800	3	Weekly
Heritage Green	PS	653 Calloway Court	Chatt, TN	2005	Domestic	60	2	Monthly
Highland Park PS	PS	2331 S. Holtzclaw Ave.	Chatt, TN	1995	Domestic, Industrial	4,500	3	Monthly
Hixson No. 1 PS	PS	4677 Adams Rd.	Hixson, TN	1980	Domestic	7,000	3	Weekly

Table 1-1
City of Chattanooga Wastewater PSs and CSOTFs

Name	Type	Location	City, State	Year in Service	Wastewater Type	Pump Nameplate Rating (GPM)	Number of Pumps	Operational Visit Schedule
Hixson No. 2 PS	PS	Adams Rd. and Old Hixson Pike (5401)	Hixson, TN	1980	Domestic	7,000	3	Weekly
Hixson No. 3 PS	PS	5234 Cassandra Smith Rd.	Hixson, TN	1985	Domestic	7,000	3	Weekly
Komatsu PS	PS	400 Runyan Dr.	Hixson, TN	1987	Domestic, Industrial	275	2	Monthly
Lake Vista PS	PS	4537 Peckinpaugh Dr.	Chatt, TN	1985	Domestic	132	2	Monthly
Latta Street PS	PS	1424 Latta St.	Chatt, TN	1973	Domestic	1,000	2	Monthly
Manker Patten PS	PS	Manker Patten/Tennis Courts	Chatt, TN	2002	Domestic	46	2	Monthly
Meadow Trace PS	PS	4905 Meadow Trace	Hixson, TN	1992	Domestic	25	2	Monthly
MLK CSO	CSOTF	1015 Riverfront Pky	Chatt, TN	2000	Combined	N/A	N/A	Monthly
Mountain Creek PS	PS	Baylor School Rd.	Chatt, TN	1971	Domestic, Industrial	4,166	2	Weekly
Murray Hills No. 1 PS	PS	4550 Webb Rd.	Chatt, TN	1994	Domestic	255	2	Monthly
Murray Hills No. 2 PS	PS	4951 Bal Harbor Dr.	Chatt, TN	1994	Domestic	80	2	Monthly
Murray Hills No. 3 PS	PS	4924 Bal Harbor Dr.	Chatt, TN	1994	Domestic	150	2	Monthly
Murray Hills No. 4 PS	PS	3707 Kings Rd.	Chatt, TN	1994	Domestic	80	2	Monthly
Murray Hills No. 5 PS	PS	3820 Kings Rd.	Chatt, TN	1994	Domestic	450	2	Monthly
Orchard Knob WW PS	PS	808 N. Holtzclaw	Chatt, TN	1976	Domestic, Industrial	5,200	3	Weekly
Pineville Rd PS	PS	1138 Pineville Rd.	Chatt, TN	1971	Domestic	250	2	Monthly
Ringgold	PS	75 Christian Rd.	Ringgold, GA	2007	Domestic, Industrial	1,215	2	Weekly
River Park 1	PS	4301 Amnicola Hwy	Chatt, TN		Domestic		2	Monthly
River Park 2	PS	4301 Amnicola Hwy	Chatt, TN		Domestic		2	Monthly
Ross Landing CSO	CSOTF	201 Riverfront Pky	Chatt, TN	1992	Combined	N/A	N/A	Monthly
South Chickamauga PS	PS	4000 N. Hawthorne St.	Chatt, TN	1978, Upgraded 1995	Domestic, Industrial	24,000	4	Weekly
Somerville PS	PS	110 Somerville Avenue	Chatt, TN		Domestic		2	*
Spring Creek PS	PS	250 Vero Beach Avenue	Rossville, GA	1999	Domestic, Industrial	5,000	3	Weekly

Table 1-1
City of Chattanooga Wastewater PSs and CSOTFs

Name	Type	Location	City, State	Year in Service	Wastewater Type	Pump Nameplate Rating (GPM)	Number of Pumps	Operational Visit Schedule
Summit #1	PS	4238 Old Woodland Dr.	Chatt, TN	2009	Sanitary	350	2	Monthly
Tiftona No. 1 PS	PS	1006 Browns Ferry Rd.	Chatt, TN	1984	Domestic, Industrial	3,030	2	Weekly
Tiftona No. 2 PS	PS	141 Browns Ferry Rd.	Chatt, TN	1984	Domestic, Industrial	2,260	2	Weekly
Tiftona No. 3 PS	PS	248 Aster Avenue	Chatt, TN	1985	Domestic, Industrial	1,760	2	Weekly
Tiftona No. 4 PS	PS	1305 Browns Ferry Rd.	Chatt, TN	1994	Domestic	475	2	Monthly
Tiftona No. 5 PS	PS	Browns Ferry Rd. and 1339 Burgess Rd.	Chatt, TN	1994	Domestic	200	2	Monthly
Tremont CSO	CSOTF	20 Tremont St	Chatt, TN	2000	Combined	N/A	N/A	Monthly
VAAP PS	PS	Hwy 58	Chatt, TN	1998	Domestic, Industrial	780	2	Monthly
Warner Park Storage Facility	CSO / Storage	1254 E. 3rd St.	Chatt, TN	2008	Combined	2,000	2	Monthly
West Chickamauga	PS	241 Lillian Dr.	Fort Oglethorpe, GA	2009	Domestic	999	2	Monthly
Williams St. CSO	CSOTF	2705 Williams St	Chatt, TN	2000	Combined	N/A	N/A	Monthly
Willow Bend PS	PS	1645 Eucalyptus Dr.	Chatt, TN	1981	Domestic	100	2	Monthly

*Somerville PS is a duplex grinder PS and is not regularly visited by operations.

In addition, the City maintains grinder PSs located throughout the Interceptor Sewer System (ISS). A list of the grinder PSs is provided in Table 1-2.

Table 1-2
Grinder PS List

Address	City	State	ZIP
2206 Rambler Ln.	Hixson	TN	37343
2121 Wisteria Dr.	Hixson	TN	37343
2017 Clematis Dr.	Chattanooga	TN	37421
2217 Rambler Ln.	Hixson	TN	37343
2201 Wisteria Dr.	Hixson	TN	37343
2200 Wisteria Dr.	Hixson	TN	37343
2223 Rambler Ln.	Chattanooga	TN	37407
2222 Rambler Ln.	Hixson	TN	37343
2206 Wisteria Dr.	Chattanooga	TN	37402
2019 Clematis Dr.	Hixson	TN	37343
2025 Clematis Dr.	Hixson	TN	37343
2033 Clematis Dr.	Hixson	TN	37343
2111 Clematis Dr.	Hixson	TN	37343
2117 Clematis Dr.	Hixson	TN	37343
2133 Clematis Dr.	Hixson	TN	37343
4919 Bal Harbor Dr.	Chattanooga	TN	37416
6504 Lake Shadows Cir.	Hixson	TN	37343
6404 Lake Shadows Cir.	Hixson	TN	37343
6508 Lake Shadows Cir.	Hixson	TN	37343
6402 Lake Shadows Cir.	Hixson	TN	37343
6528 Lake Shadows Cir.	Hixson	TN	37343
2120 Clematis Dr.	Hixson	TN	37343
2137 Clematis Dr.	Hixson	TN	37343
6500 Lake Shadows Cir.	Hixson	TN	37343
6400 Lake Shadows Cir.	Hixson	TN	37343
1901 Crystal Lake Ln.	Hixson	TN	37343
5739 Browntown Rd.	Chattanooga	TN	37415
5733 Browntown Rd.	Chattanooga	TN	37415
6054 Browntown Rd.	Chattanooga	TN	37415
2026 Marina cove Dr.	Hixson	TN	37343
2028 Marina cove Dr.	Hixson	TN	37343
503 Battery Pl.	Chattanooga	TN	37403
726 Old Dallas Rd.	Chattanooga	TN	37405
1931 Riverwood Dr.	Hixson	TN	37343
2003 Riverwood Dr.	Hixson	TN	37343
2027 Riverwood Dr.	Hixson	TN	37343

Table 1-2
Grinder PS List

Address	City	State	ZIP
2015 Wisteria Dr.	Hixson	TN	37343
2024 Crescent Club Dr.	Hixson	TN	37343
5831 North Park Rd.	Hixson	TN	37343
4015 Creekwood Terrace Ln.	Chattanooga	TN	37421
2023 Riverwood Dr.	Hixson	TN	37343
2510 Crescent Club Dr.	Hixson	TN	37343
5827 North Park Rd.	Hixson	TN	37343
2051 Hamill Rd.	Chattanooga	TN	37404
2117 Rambler Ln.	Hixson	TN	37343
2100 Wisteria Dr.	Hixson	TN	37343
2110 Rambler Ln.	Hixson	TN	37343
2207 Rambler Ln.	Hixson	TN	37343
2106 Wisteria Dr.	Hixson	TN	37343
2110 Wisteria Dr.	Hixson	TN	37343
6405 Lake Shadows Cir.	Hixson	TN	37343
6401 Lake Shadows Cir.	Hixson	TN	37343
6410 Middle Ridge Ln.	Hixson	TN	37343
6406 Middle Ridge Ln.	Hixson	TN	37343
6400 Middle Ridge Ln.	Hixson	TN	37343
1914 Crystal Lake Ln.	Hixson	TN	37343
6411 Middle Ridge Ln.	Hixson	TN	37343
6405 Middle Ridge Ln.	Hixson	TN	37343
1910 Crystal Lake Ln.	Hixson	TN	37343
6401 Middle Ridge Ln.	Hixson	TN	37343
1904 Crystal Lake Ln.	Hixson	TN	37343
4028 Breakwater Dr.	Hixson	TN	37343
4026 Breakwater Dr.	Hixson	TN	37343
4024 Breakwater Dr.	Hixson	TN	37343
4020 Breakwater Dr.	Hixson	TN	37343
2127 Clematis Dr.	Hixson	TN	37343
2129 Clematis Dr.	Hixson	TN	37343
2120 Wisteria Dr.	Chattanooga	TN	37422
2105 Rambler Ln.	Hixson	TN	37343
3591 Kings Rd.	Chattanooga	TN	37416
3589 Kings Rd.	Chattanooga	TN	37416
3790 Queens Rd.	Chattanooga	TN	37416

Table 1-2
Grinder PS List

Address	City	State	ZIP
3635 Kings Rd.	Chattanooga	TN	37416
3627 Kings Rd.	Chattanooga	TN	37404
3611 Kings Rd.	Chattanooga	TN	37416
3643 Kings Rd.	Chattanooga	TN	37422
3759 Kings Rd.	Cleveland	TN	37311
3515 Rhoda Ln.	Chattanooga	TN	37416
3517 Rhoda Ln.	Chattanooga	TN	37416
4925 Bal Harbor Dr.	Chattanooga	TN	37416
4923 Bal Harbor Dr.	Chattanooga	TN	37416
4921 Bal Harbor Dr.	Chattanooga	TN	37416
4935 Bal Harbor Dr.	Chattanooga	TN	37416
4937 Bal Harbor Dr.	Chattanooga	TN	37416
4904 Shoreline Dr.	Chattanooga	TN	37416
4939 Bal Harbor Dr.	Chattanooga	TN	37416
4923 Bal Harbor Cir.	Chattanooga	TN	37416
4921 Bal Harbor Cir.	Chattanooga	TN	37416
4906 Shoreline Dr.	Chattanooga	TN	37416
4941 Bal Harbor Dr.	Chattanooga	TN	37416
4919 Bal Harbor Cir.	Chattanooga	TN	37416
4917 Bal Harbor Cir.	Chattanooga	TN	37416
4910 Shoreline Dr.	Chattanooga	TN	37416
4943 Bal Harbor Dr.	Chattanooga	TN	37416
4945 Bal Harbor Dr.	Chattanooga	TN	37416
4915 Bal Harbor Cir.	Chattanooga	TN	37416
3798 Kings Rd.	Chattanooga	TN	37416
3785 Kings Rd.	Chattanooga	TN	37416
3773 Kings Rd.	Chattanooga	TN	37416
3775 Kings Rd.	Chattanooga	TN	37416
3735 Kings Rd.	Chattanooga	TN	37401
3707 Kings Rd.	Chattanooga	TN	37416
3715 Kings Rd.	Chattanooga	TN	37416
3733 Kings Rd.	Chattanooga	TN	37422
3721 Kings Rd.	Chattanooga	TN	37416
3731 Kings Rd.	Chattanooga	TN	37406
911 Siskin Dr.	Chattanooga	TN	37403
3780 Queens Rd.	Chattanooga	TN	37416

Table 1-2
Grinder PS List

Address	City	State	ZIP
4931 Bal Harbor Dr.	Chattanooga	TN	37416
4927 Bal Harbor Dr.	Chattanooga	TN	37416
401 Signal Mountain Rd.	Chattanooga	TN	37404
3810 Lake Vista Dr.	Chattanooga	TN	37416
3818 Lake Vista Dr.	Chattanooga	TN	37416
3724 Skylark Trl.	Chattanooga	TN	37416
3630 Faith Rd.	Brentwood	TN	37027
3732 Skylark Trl.	Collegedale	TN	37315
3740 Skylark Trl.	Chattanooga	TN	37416
4601 Tarpon Trl.	Chattanooga	TN	37416
4722 Tarpon Trl.	Chattanooga	TN	37416
4604 Lake Haven Dr.	Chattanooga	TN	37416
4124 Melinda Dr.	Chattanooga	TN	37416
4622 Paw Trl.	Birchwood	TN	37308
901 Siskin Dr.	Chattanooga	TN	37403
4013 Creekwood Terrace Ln.	Chattanooga	TN	37421
4011 Creekwood Terrace Ln.	Chattanooga	TN	37421
4009 Creekwood Terrace Ln.	Chattanooga	TN	37421
4007 Creekwood Terrace Ln.	Chattanooga	TN	37421
4017 Caine Ln.	Chattanooga	TN	37421
4017 Creekwood Terrace Ln.	Chattanooga	TN	37421
4012 Creekwood Terrace Ln.	Chattanooga	TN	37421
4005 Creekwood Terrace Ln.	Chattanooga	TN	37421
4003 Creekwood Terrace Ln.	Chattanooga	TN	37421
4008 Creekwood Terrace Ln.	Chattanooga	TN	37421
4006 Creekwood Terrace Ln.	Chattanooga	TN	37421
4004 Creekwood Terrace Ln.	Chattanooga	TN	37421
4016 Creekwood Terrace Ln.	Chattanooga	TN	37421
3939 Caine Ln.	Chattanooga	TN	37414
6834 Standifer Gap Rd.	Chattanooga	TN	37421
6810 Robin Dr.	Chattanooga	TN	37414
627 O Grady Dr.	Chattanooga	TN	37419
4600 Maria St.	Chattanooga	TN	37411
504 Hemphill Ave.	Chattanooga	TN	37411
402 S Seminole Dr.	Chattanooga	TN	37415
398 East View Dr.	Rock Springs	GA	30739

Table 1-2
Grinder PS List

Address	City	State	ZIP
450 S Crest Rd.	Signal Mtn.	TN	37377
416 East View Dr.	Chattanooga	TN	37404
913 Shady Fork Rd.	Chattanooga	TN	37421
906 Shady Fork Rd.	Chattanooga	TN	37421
916 Shady Fork Rd.	Chattanooga	TN	37421
912 Shady Fork Rd.	Chattanooga	TN	37421
910 Shady Fork Rd.	Chattanooga	TN	37421
898 Shady Fork Rd.	Chattanooga	TN	37421
911 Shady Fork Rd.	Chattanooga	TN	37421
896 Shady Fork Rd.	Chattanooga	TN	37421
909 Shady Fork Rd.	Chattanooga	TN	37421
995 Hurricane Creek Rd.	Chattanooga	TN	37411
892 Shady Fork Rd.	Chattanooga	TN	37421
890 Shady Fork Rd.	Chattanooga	TN	37421
993 Hurricane Creek Rd.	Chattanooga	TN	37421
899 Shady Fork Rd.	Chattanooga	TN	37421
897 Shady Fork Rd.	Chattanooga	TN	37421
893 Shady Fork Rd.	Chattanooga	TN	37421
891 Shady Fork Rd.	Chattanooga	TN	37421
885 Shady Fork Rd.	Chattanooga	TN	37421
915 Shady Fork Rd.	Chattanooga	TN	37421
4002 Creekwood Terrace Ln.	Chattanooga	TN	37421
110 Somerville Ave.	Chattanooga	TN	37405
313 Stringer St.	Chattanooga	TN	37405
6823 Bacon Ln.	Chattanooga	TN	37421
6050 Browntown Rd.	Chattanooga	TN	37415
5052 Browntown Rd.	Chattanooga	TN	37415
6816 Robin Ln	Chattanooga	TN	37421

This document will outline the City's PS and CSOTF maintenance procedures and will be used to train staff in implementing the program. This document will also be used to educate the public on the City's PS Management Program.

1.2 Background

The City developed numerous procedures related to PS maintenance, but these were not collated into a single document nor did the procedures address equipment at PSs, CSOTFs, or grinder PSs. This document updates these existing documents while providing maintenance

procedures for PSs and CSOTFs. It also provides additional guidance based upon the requirements of the CD and the *EPA Region 4 Guide to Collection and Transmission System Management, Operation, and Maintenance Programs*, as set forth in paragraph 20(a) and Appendix B of the CD.

1.3 Re-Evaluation of Existing PS and CSOTF Preventive Maintenance

Based on a re-evaluation of the City's existing PS and CSOTF maintenance procedures, the program was found to be sufficient. However, improvements were identified, and these are discussed in detail in Section 5.

1.4 Goals

The goal of this PS Preventive Maintenance Program include: 1) making sure that appropriate staff are aware of the proper maintenance necessary for critical assets at each PS and CSOTF; and 2) making adjustments, as necessary, to the program to reduce SSOs.

1.5 Authority

The City's legal authority for the development and implementation of this PS Preventive Maintenance Program is derived from the following federal, state and local laws, ordinances, and regulations:

- The Clean Water Act;
- National Pollution Discharge Elimination System (NPDES) Permit Number TN0024210;
- Tennessee Water Quality Control Act;
- City of Chattanooga Sewer Use Ordinance, City Code Chapter 31; and
- Paragraph 20 (c) of the CD (pages 28-29).

1.6 Description of the Wastewater Collection and Transmission System

As a regional wastewater utility, the City of Chattanooga, a Municipal Corporation, owns, operates, maintains, and manages a network of pipes, manholes, pump stations, force mains, CSOTFs, and associated appurtenances that transport wastewater from homes, businesses, and industries to the Moccasin Bend Wastewater Treatment Plant (WWTP). All of this infrastructure is part of the Wastewater Collection and Transmission System (WCTS), as defined in the CD and herein, and managed by the Waste Resources Division (WRD). The City has historically classified the WRD, WWTP and the WCTS as part of the Interceptor Sewer System (ISS). With the advent of the CD and recent reorganizations within the City, the term ISS is not recognized by all stakeholders and therefore the City will refer to WCTS and WWTP as the infrastructure and WRD as the organization to manage this infrastructure going forward.

Property owners own the private service laterals from the served residential, commercial, and industrial structures to the public main line in the street or right-of-way, including the connection.

The City's WCTS currently serves approximately 170,000 people with approximately 61,000 customers within the City including 80 permitted industries. It also provides treatment for eight (8) regional or satellite users comprised of approximately 25,000 customers. The WCTS is composed of:

- 1,263 miles of gravity sewers (approximate), including 70 miles of combined sewers;
- 30,000 manholes (approximate);
- 69 PSs;
- 53 miles of force main;
- Eight (8) CSOTFs;
- One (1) Combined Sewer Storage Facility;
- 172 (approximate) residential/grinder pumps; and
- One (1) Moccasin Bend WWTP

An organizational chart for the Waste Resources Division is provided in Appendix H.

2.0 Program Documentation

PSs and CSOTFs are operated by the City and a site location list can be found in Section 1 of this document. The City maintains documentation of PS and CSTOF preventive maintenance along with their functionality. Information available in digital and hard copy format to PS and CSOTF maintenance personnel includes the following:

- PS capacity;
- Number of pumps;
- Type of pumps;
- Pump control information;
- Lead/lag/standby pump level settings for wet wells;
- Wet well size/volumes;
- Alarm capabilities;
- Overflow locations and receiving water bodies;
- Safety and other ancillary equipment;
- Flow meter information;
- Map and driving directions to PS; and
- Photographs of the PS/CSOTF.

Most of this information is included in the PS Inventory book located in the Maintenance Management Center in the basement of the Operations and Control building at the WWTP. Additional information can be found in the PS operations and maintenance (O&M) manuals located in the Plant Maintenance Building as well. Maintenance of the PS and CSOTF is performed by utilizing Preventive Maintenance (PM) work orders and Corrective Maintenance (CM) work orders generated from the City's Computerized Maintenance Management System (CMMS) CityWorks™. PM work orders include tasks for maintenance and operations staff as well as predictive maintenance tasks such as vibration and infrared monitoring performed by contractors. CM work orders are generated as a result of PM work orders or at the request of operations or maintenance staff to address maintenance and repair issues.

Documentation for the PM Program includes an inspection report for electrical, mechanical, and physical PM inspections (found in the appendices), work orders for repairs as outlined in Section 3.3, "Reactive Component" found in this document, and a weekly list of outstanding repairs.

Once a PM work order has been generated by CityWorks, a checklist is used for operational checks at that PS. A CM is generated for any problems discovered. Operators note in a logbook any corrective action that was performed, and maintenance work is kept as machine history in CityWorks. The following sections of this PS Preventative Maintenance Program describe in further detail preventive maintenance for PSs and CSOTFs, including electrical, mechanical,

and physical components that are outside of and in addition to the actions described in the PS and CSOTF Operations Program.

3.0 Description of Program

This PS and CSOTF Maintenance Program includes the following components:

- Electrical maintenance;
- Mechanical maintenance;
- Physical maintenance; and
- PS and CSOTF reactive component.

The electrical, mechanical, and physical maintenance components provide guidance to managers and field personnel responsible for the appropriate preventive maintenance on PSs and CSOTFs.

The PS and CSOTF reactive component serves as a reactive maintenance system to repair PSs and CSOTFs that are currently in need of repair but are still cost-effective to service. This component establishes a method of identification, prioritization, scheduling, and repair of PSs or CSOTFs on a timely basis once a PS or CSOTF critical PS component has deteriorated beyond the scope of the PM programs. This component includes the following:

- A process for identifying a prioritized inventory of PSs and CSOTFs in need of repair;
- A process for documenting an ongoing inventory of completed repairs; and
- A target timeframe for repairs.

CityWorks is utilized to prioritize and keep track of maintenance activities. O&M personnel request that a CM be created by the Asset Manager or the Maintenance Planner, who creates the work order in CityWorks. PMs have a regular schedule frequency and are issued automatically. CM work orders are given a priority code by the CM creator, which determines the schedule for completion. PM work orders generally have an attached maintenance template(s) which describes the maintenance task(s) and the materials and tools required, necessary labor types (operator, mechanic, electrician, etc.), and estimated labor effort. The maintenance templates are standardized documents where it makes sense to develop consistency in maintenance procedures.

When the PM or CM is completed, the staff completing the work fills out data on the PM including a listing of materials used, the actual amount of time it took to complete the work, any notes or comments concerning future maintenance needs, and any improvements to the maintenance procedures. This information is reviewed by the maintenance manager, who signs off that the work order is complete. This work order is then returned to the work management center, which enters the pertinent notes into the CMMS, thereby improving the process and developing machine (equipment) history.

Workflow charts have been developed depicting the work order process including a high level overview, the process of creating work orders, and the process of responding to and completing work orders. These workflow charts are included in Appendix A.

3.1 Preventive Maintenance Schedule

The following are examples of equipment types, which are scheduled for regular PM through CityWorks-generated work orders:

- Pumps;
- Motors;
- Flow Meters;
- Valves;
- Bar Screens;
- Air Filters;
- Slide/Sluice Gates;
- Actuators;
- High Level Floats;
- Bubbler tubes;
- PLC Cabinets;
- Switchgear;
- MCCs;
- Control Panels;
- Instrumentation (pressure transmitters, level switches, etc.);
- VFDs; and
- HVAC Equipment.

The maintenance performed on this equipment by maintenance staff may be suggested by the specific manufacturer in the vendor's O&M manual or developed through operational experience and includes preventive, as well as predictive maintenance activities. Predictive maintenance tasks include thermography of electrical and some mechanical equipment, vibration monitoring of the larger pumps, and some limited oil sampling and analysis. PS Operations staff also perform some "light" PM. Operator-performed maintenance includes exercising and inspecting valves, float checks, draw-down testing and flow meter history review.

PM work orders are generated by maintenance staff and describe in detail regular maintenance required for critical equipment. Frequencies are weekly, monthly, quarterly, semi-annually, or every 18 months as required. CM work orders are requested by PS Operators when necessary based on the results of routine and emergency operations or by maintenance personnel as a result of performing PMs. Additional information can be found in Section 2 of the PS and CSOTF Operations Program document. A method for prioritizing a CM is included in the PS Preventative Maintenance Program, Section 3.3 - Reactive Component.

Schedules for maintenance have been adapted at times to the specific conditions or specific equipment at the PSs. This information is contained in CityWorks and used to issue the PM work orders.

3.1.1 Electrical Preventive Maintenance

The electrical component of the PS Preventative Maintenance Program provides guidance to managers and field personnel responsible for electrical maintenance so that preventive

maintenance on PS and CSOTF electrical components are performed on a routine basis. This component includes meter calibration schedules (by meter type) for meters used to record data collected at or from a PS or CSOTF as well as maintenance on power and control systems. Electrical maintenance is primarily performed by electricians and instrumentation technicians.

3.1.1.1 Checklist

A checklist of typical baseline electrical PMs for PSs and instruments, such as level indicators, safety devices, and temperature switches is found in Appendix B of this document. Equipment in each PS within the City's WCTS has its own schedule for PM, which has been programmed into CityWorks.

3.1.1.2 Meter Calibration

There are two functional types of flow meters associated with the PSs. Some are used for operational control and monitoring the PS and the equipment and some are also used for billing purposes. Meters used for billing are generally calibrated quarterly. Other flow meters are calibrated annually. City staff calibrate all of the meters. This is described on the PM work orders. A complete list of flow meters with the required calibration frequency is included in Table 3.1:

Table 3-1.
Flow Meter List

PS	Calibration Frequency
19th Street CSOTF	Annually
19th Street PS	Annually
23rd Street PS	Annually
26th Street PS	Annually
New Airport Rd PS	Annually
Airport PS #2	Annually
Altamont PS	Annually
Alton Park PS	Annually
Arbor Creek Lift PS	Annually
Battery Place Pump PS	Annually
Big Ridge Pump PS #1	Annually
Big Ridge Pump PS #2	Annually
Big Ridge Pump PS #3	Annually
Big Ridge Pump PS #4	Annually
Big Ridge Pump PS #5	Annually
Big Ridge Pump PS #6	Annually
Big Ridge Pump PS #7	Annually
Big Ridge Pump PS #8	Annually
Big Ridge Pump PS #9	Annually
Big Ridge Pump PS #10	Annually
Big Ridge Pump PS #11	Annually
Big Ridge Pump PS #12	Annually
Big Ridge PS #13	Annually
Big Ridge PS #14	Annually
Boyscout Road PS	Annually
Brainerd Golf Course PS	Annually
Brainerd Manor PS	Annually

Table 3-1.
Flow Meter List

PS	Calibration Frequency
Carter Street CSOTF	Annually
Central Avenue CSOTF	Annually
Citico CSOTF	Annually
Citico PS #2	Annually
Collegedale PS	Quarterly
Davidson Place	Annually
Dupont Industrial Park	Annually
Dupont Parkway PS	Annually
East Brainerd PS	Annually
Eastgate PS #1	Annually
Eastgate PS #2	Annually
Enterprise South Industrial Park	Annually
Fagan Street PS	Annually
Friar Branch PS	Annually
Heritage Green PS	Annually
Highland Park PS	Annually
Hixson PS #1	Annually
Hixson PS #2	Annually
Hixson PS #3	Annually
Komatsu PS	Annually
Lake Vista PS	Annually
Latta Street PS	Annually
Manker Patten PS	Annually
Meadow Trace PS	Annually
MLK CSOTF	Annually
Mt Creek	Annually
Murray Hills #1	Annually
Murray Hills #2	Annually
Murray Hills #3	Annually
Murray Hills #4	Annually
Murray Hills #5	Annually
Orchard Knob PS	Annually
Pineville PS	Annually
Ringgold PS	Quarterly
River Park #1	Annually
River Park #2	Annually
Ross Landing CSOTF	Annually
South Chickamauga PS	Annually
Spring Creek PS	Quarterly
Summit Landfill PS #1	Annually
Summit Landfill PS #2	Annually
Tiftonia PS #1	Annually
Tiftonia PS #2	Annually
Tiftonia PS #3	Annually
Tiftonia PS #4	Annually
Tiftonia PS #5	Annually
Tremont CSOTF	Annually
Vaap Plant	Quarterly
Warner Park CSOTF	Annually

Table 3-1.
Flow Meter List

PS	Calibration Frequency
West Chickamauga PS	Quarterly
Williams Street CSOTF	Annually

In addition to the above table, the City also reads and calibrates the Dade County PS and Lookout Mountain PS meters quarterly, although these PSs are not owned by the City.

3.1.2 Mechanical Preventive Maintenance

This mechanical component of the PS Preventative Maintenance Program provides guidance to managers and field personnel responsible for mechanical maintenance so that preventive maintenance on PS or CSOTF mechanical components is performed on a routine basis. Mechanical maintenance is primarily performed by mechanics.

3.1.2.1 Checklist

A checklist of typical baseline mechanical PMs for PSs is found in Appendix C. Equipment in each PS within the City's WCTS has its own schedule for PM, which has been programmed into CityWorks.

3.1.3 Physical Preventive Maintenance

This physical maintenance component of the PS Preventative Maintenance Program provides guidance to managers and field personnel responsible for physical maintenance (pipes, walls, inverts, covers, etc.), so that PM on PS or CSOTF physical components is performed on a routine basis. PS inspections are performed on a regular basis by operations staff as described in the PS Operations Program. Through these inspections, issues or deficiencies in the physical assets are noted and CM work orders are created to address these deficiencies. Detailed bi-annual inspections (once every other year) of the physical condition of the PSs and CSOTFS are to be performed by maintenance staff. Based on the results of the regular operational inspections and the bi-annual detailed inspections, the need for significant physical maintenance will be identified and work to address the issues scheduled through regular maintenance budgets or through capital improvements.

3.1.3.1 Checklist

A checklist of typical baseline physical PM for PSs can be found in Appendix D. Each PS within the City's WCTS has its own schedule for PM, which has been programmed into CityWorks.

3.2 Standard Inspection Forms

See Appendices E, F, and G for electrical, mechanical and physical inspection forms, respectively. Inspection forms when completed are returned to the maintenance planner for development of PMs or CMs as required.

3.3 Reactive Component

This reactive component of the PS and CSOTF Maintenance Program provides guidelines to repair PSs and CSOTFs that need maintenance but are still cost-effective to service. This component provides for the identification, prioritization, scheduling, and repair of PSs or CSOTFs on a timely basis once a PS or CSOTF or critical PS or CSOTF component has deteriorated beyond the scope of the maintenance program. This component includes the following:

- Guidance outlining when a PS, critical PS component or CSOTF is to be placed in the repair program;
- A process for identifying a prioritized inventory of PSs and CSOTFs in need of repair;
- A process for documenting an ongoing inventory of completed repairs;
- A target timeframe for repairs; and
- Relevant documentation of program implementation.

3.3.1 Guidance for Prioritization

The City maintains its PSs and CSTOFs to provide for the goals identified in Section 1 of this document. If a critical asset associated with a PS is out of service, then the PS falls within the reactive maintenance component. Out of service assets or assets in need of major repair are assigned CM work orders with a priority code. CM work orders are written by the City's Maintenance Planners.

Priority codes are assigned to CM work orders by Maintenance Planners in consultation with O&M Staff. CM work orders are then approved by a maintenance supervisor, if necessary. After a code has met approval, the work order is entered in CityWorks.

3.3.2 Scheduling Guidelines

Repairs are scheduled using work order priority. Work order priorities range from Priority 1 to Priority 3 and are explained below:

- Priority 1: This repair requires immediate attention and is considered to be of the highest priority. This WO could result in overtime and after-hours labor. Work will be continuous until repaired. Overtime is authorized.
- Priority 2: This second priority results in repair typically within a 24 hour to 48 hour repair time and will seldom require overtime, weekend, or after hours work. Priority 2 is considered less of a critical repair than Priority 1.
- Priority 3: This represents every repair that does not fit into Priority 1 or Priority 2. No after-hours work will be required and usually there is no cause for overtime.

Priority selection is a result of work orders being reviewed by appropriate staff. Priorities 1 and 2 are reviewed and approved by maintenance supervisors. Supervisors have discretion to re-evaluate priorities according to the following criteria:

- Weather conditions;

- Status of other equipment at PS;
- Staff availability;
    - The city matches the actual hours required to perform CM and PM work to the assigned resources in the maintenance department that perform the CM and PMs as part of the CM and PM work orders. On a daily basis, the city reconciles the available resources to the required resources to ensure the prioritized PMs and CMs are being executed. This is reviewed on a weekly basis to ensure the necessary resources are being procured and required resource availability is maintained to keep up with the demand of PMs and CMs.
- Operational history;
- Site specific conditions; and
- Level of degradation to equipment and PS operation.

3.3.3 Corrective Maintenance Tracking

The following process identifies the method of tracking repairs and maintaining an inventory of completed repairs:

1. A need for repair is identified by an operator or maintenance staff.
2. A work order with a priority code is drafted by the Maintenance Planner.
3. PS Operations decides Priority status and the work order is finalized.
4. The work order is entered into CityWorks and added to a list of outstanding repairs.
5. Weekly status of repair is updated and equipment which is out of service is noted on chalk board or dry erase board in the O&C Building Control Room.
6. All work orders are assigned a failure code to track the type and frequency of failures experienced. The City if currently using 14 failure codes, which are listed in Table 3-2:

Table 3-2.
Failure Codes

Failure Code Number	Description
1	Improper operation or start up
2	Improper installation or repair
3	Inadequate PM/PdM task
4	Design problem
5	Lubrication or cooling problem
6	Out of balance or misaligned
7	Plugged up/blockage
8	Normal wear
9	Power failure, power quality, or power surge
10	Material or part defect
11	Not mechanical or electrical equipment related
12	Corrosion problem
13	Unexplained catastrophic failure
14	New install

Grinder PSs are maintained on a reactive basis. Five new grinder pumps are purchased each year and used to replace failing pumps.

4.0 Resource Management

The following section of this PS Preventative Maintenance Program describes in detail parties responsible for the implementation of the PM program for the City. Information found within this section will include organizational charts (see Appendix H) showing maintenance personnel including management and those in a supervisory role as well as general qualifications required by all personnel involved in any aspect of maintenance as set forth by the City.

4.1 Personnel

The organization chart for the Maintenance Department can be found in Appendix H (Chart 4). The department is led by the Maintenance Manager, who reports to the Deputy Director. Reporting to the Maintenance Manager are the Maintenance Planner, the Asset Management Systems Coordinator and the Maintenance Chiefs. There is no separate PS or CSTOF maintenance staff - the electricians, mechanics, lubricators and laborers attend to plant and PS and CSOTF PM and CM needs.

During emergencies, the personnel resources of the entire WRD department staff are available to support maintenance staff. In addition, on-call contracts with local contractors are in place to provide additional personnel if needed.

The job description and skill requirements are provided on the City's website at http://www.chattanooga.gov/2011-12-14-14-38-52/job-descriptions.

4.1.1 Electrical Maintenance Personnel

Duties of personnel responsible for electrical maintenance include, but are not limited to, the following:

- Performing a variety of routine electrical maintenance activities, which may include repairing and installing electrical conduit, relays, switches, fixtures, receptacles, controls, circuits and related items, replacing plugs on electrical equipment, troubleshooting electrical problems, and/or performing other related activities.
- Calibrating gas sensors and flow meters.
- Maintenance of the SCADA system.
- Conducting and completing the PM Electrical Inspection Schedule found in Appendix B of this document.
- Performing other duties as assigned.
- Maintaining records and logs of work performed.
- Minimum qualifications include:
- Vocation/technical training in electrical work and HVAC.
- Ability to operate applicable tools and equipment of the trade.

- Licensure or certification in electrical or other applicable trade.

4.1.2 Mechanical Maintenance Personnel

Duties of personnel responsible for mechanical maintenance include, but are not limited to, the following:

- Monitoring mechanical systems to ensure proper functioning, diagnosing potential problems, troubleshooting, and repairing machinery.
- Diagnosing and repairing PS, motors, sump pumps, valves and gate valves, and performing minor fabrication of parts as required.
- Diagnosing and repairing mechanical machinery at master PSs, including pumps, motors, gear reducers, valves, and bar screen systems.
- Inspecting and repairing cell gates, cell blowers, hydraulic valves, and water lines.
- Maintaining records and logs of work performed.
- Conducting and completing the PM Mechanical Inspection Schedule found in Appendix C of this document.
- Performing other duties as assigned.

Minimum qualifications include:

- High School Diploma or G.E.D.
- Three years mechanical experience in wastewater or water plant setting.
- Valid Tennessee Driver's License.
- Must be able to obtain a Forklift Certification.

4.1.3 Physical Maintenance Personnel

Duties of personnel responsible for physical maintenance are similar to those required for mechanical maintenance and include, but are not limited to, the following:

- Checking and changing oil in machinery and equipment as well as applying grease to minimize noise vibration of machinery and equipment.
- Performing routine preventive maintenance on applicable machinery and equipment to ensure safety and efficiency of operations.
- Checking and replacing belts and parts.
- Cleaning machinery and equipment, including wet wells and bar screens.
- Operating various equipment and machinery to provide basic maintenance to the buildings, grounds and related facilities of the PS and CSOTF.
- Maintaining records and logs of work performed.
- Conducting and completing the PM Physical Inspection Schedule found in Appendix C of this document.

- Performing other duties assigned.

Minimum Qualifications include:

- High School Diploma or G.E.D.
- One year of machinery and equipment experience
- A valid Tennessee Driver's License
- Ability to obtain Forklift Certification

4.2 SCADA Maintenance

Maintenance for the City's SCADA system for PSs and CSOTFs is performed utilizing PM work orders and CM work orders generated by CityWorks. Specific SCADA-related maintenance items can be found in the Electrical Inspection as well as the Electrical Inspection Report (Appendix E).

5.0 Performance Measures

As part of the proactive Equipment Maintenance and Reliability Improvement Program (EMRIP), the City has established performance measures or key performance indicators (KPIs) related to maintenance and work order management for PSs and CSOTFs. Tracking KPIs allows the City to measure the status of their maintenance program and to make adjustments if required. The following KPIs are directly related to the performance of the PS and CSOTF Maintenance Program and will be monitored by the Maintenance Manager when fully implemented:

Table 5-1
KPIs for PSs and CSOTFs

KPI	Purpose	Target	Responsibility	Frequency
Work Backlog	Measure progress	Not more than 6 weeks of work	Craft Chief	Weekly reviews with daily updates
Work Orders Awaiting Parts	Track the number of work orders incomplete due to materials and parts	No work order older than 30 days awaiting parts	Stores Manager	Weekly reviews with daily updates
PM Completion Schedule	Assure all PMs are being completed as scheduled	95% adherence to PM schedule	Craft Chief	Weekly reviews with daily updates
Overtime as a Percent of Total Hours Worked	Evaluate the use and cost of labor	Less than 5%	Maintenance Supervisor	Weekly reviews with monthly updates
Number of Preventable Work Orders	Limit and track work orders that could have been preventable	Less than 5 preventable work orders per month	Maintenance Supervisor	Weekly reviews with monthly updates
Track the Work Orders Found Via PM Activities	Evaluate the success of the PM program	Less than 6 PM cycles per work order generated	Craft Chiefs	Daily with weekly updates
Track the Age of Work Orders	Not let the work orders get lost in the process	No work orders older than 6 months	Maintenance Supervisor	Weekly reviews with monthly updates
Percentage of Emergency Work Orders	Track the reliability of the City assets	Less than 10% of the work orders are emergencies	Craft Chiefs	Daily with weekly updates

6.0 Periodic Evaluation/Continuous Improvement

6.1 Periodic Evaluation

The City checks the PS Preventative Maintenance Program KPIs on a monthly basis with a more comprehensive self-evaluation done on an annual basis. The self-evaluation is performed with consideration to the EPA guideline: Guide for Evaluating CMOM Programs at Sanitary Sewer Collection Systems.

6.2 Continuous Improvement Initiatives

The following initiatives are being implemented by the City in order to improve the PS and CSOTF Maintenance Program:

- The City performs a periodic evaluation of the Maintenance Program by review of PS and CSOTF-related KPIs on a monthly basis with a more comprehensive self-evaluation done on an annual basis.
- Continuous improvement of the Maintenance Program is achieved by the tasks listed in subsections 6.2.1 through 6.2.4.

6.2.1 Checklist Enhancements and Use

This initiative includes review and revision of inspection checklists and reports, and regular use of the checklists. This review will be performed annually.

- Target Timeframe: Determine whether PSs have been visited and checklists and inspection reports completed for PSs and CSOTFs by December 2016 - complete
- Review and update checklists and reports by June 2017 - complete
- Responsible Party: Maintenance Manager and Deputy Director.

6.2.2 Fully Implement and Monitor KPIs

KPIs have been developed to track maintenance effectiveness but the required data to input into the KPIs is not always gathered. This initiative includes determining whether data required to input into the KPIs is collected and KPIs are monitored daily, weekly, or monthly as required.

- Target Timeframe: Determine whether data is collected and KPIs monitored – Update December 2017
    - Although significant progress has been made and the majority of the KPI data gathering has been established and consistently monitored, there are still a few that are being improved.
- Responsible Party: Maintenance Manager and Deputy Director

6.2.3 Develop a Program to Locate and Maintain Air Relief Valves

There are many air relief valves associated with wastewater force mains throughout the WCTS. Some of these are easy to locate and maintain while others are more difficult. This initiative consists of identifying and locating air relief valves in the system, visiting them to evaluate existing conditions and developing access routes, and then developing a maintenance program for these valves.

- Target Timeframe:– June 2018 - complete
- Responsible Party: Maintenance Manager and Deputy Director

6.2.4 Continue the Development and Refinement of PM Work Orders

PMs have been developed for the majority of the critical equipment at the PSs and CSOTFs. There are additional PMs which could be considered, including an enhanced use of predictive maintenance tasks. In addition, as PMs are completed and repeated, modifications or refinements of the work order tasks become apparent to improve efficiency and minimize equipment downtime. These may include refining the hour estimates, creating material lists, or other improvements. The task of developing and refining work orders is truly continuous.

- Target Timeframe: None –a continuous process
- Responsible Party: Maintenance Manager, Maintenance Planner, and Deputy Director

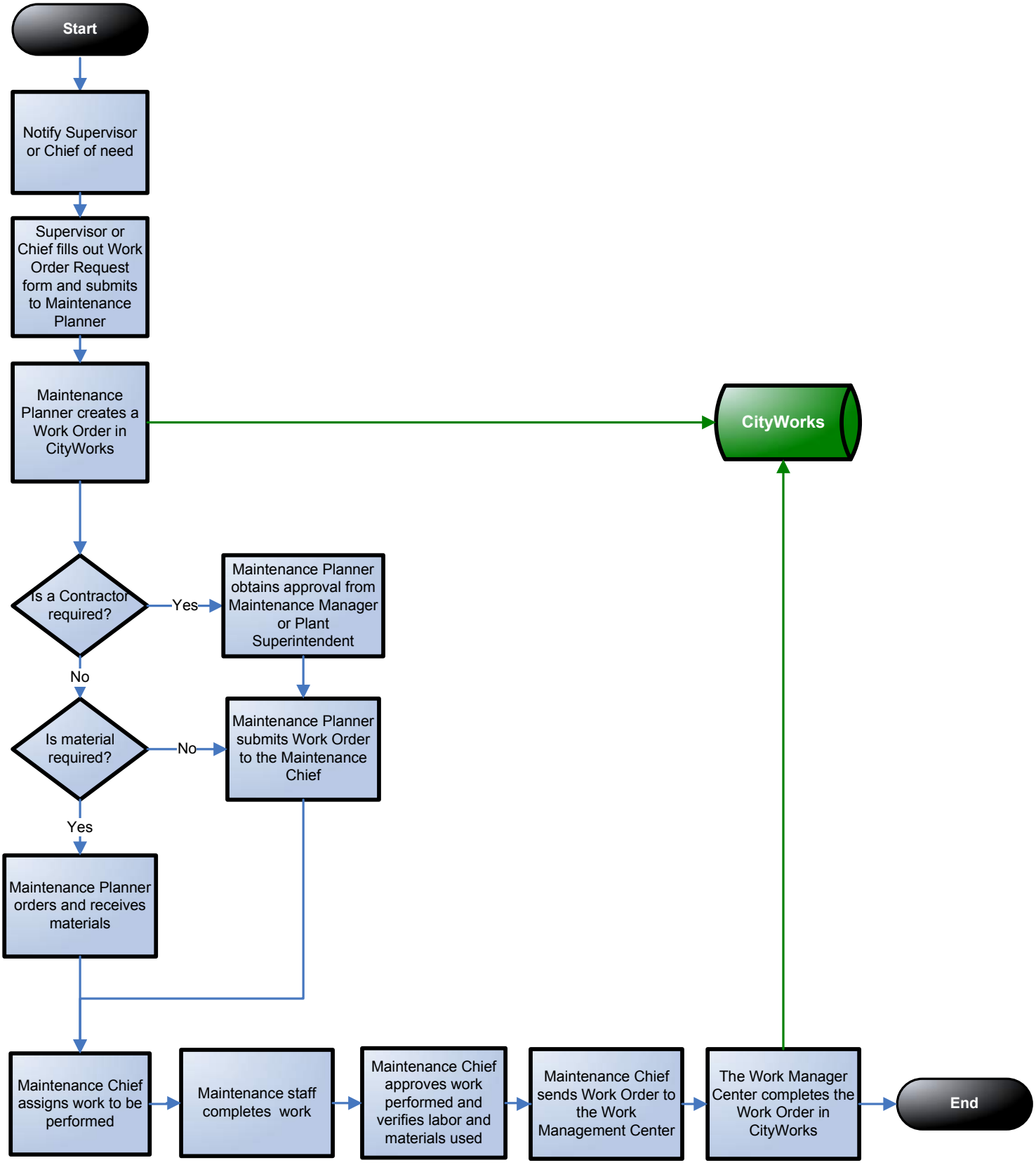
6.2.5 Capacity Management Operations and Maintenance (CMOM) Development

As part of the initial CMOM Development, the City completed the following initiatives:

- **Development of PMs for critical equipment**. As part of the initial CMOM development, the City developed PM work orders for more than a thousand critical assets.
- **Development of a method to track performance**. As part of the initial CMOM development, the City developed PS maintenance KPIs.
- **Development of weekly operational checks for critical PSs**. As part of the initial CMOM development, the City developed Inspection Checklists and Report templates for use in regular electrical, mechanical and physical maintenance as described in Section 2 and Section 3 of this document.

Appendix A
Work Order Flow Charts

High Level Work Order Request Procedure for Liquids, Solids, and Pump Stations Maintenance



Prepared for the City of Chattanooga Waste Resources Division
February 11,2013

Pump Station, CSOTF and Plant Maintenance - Work Identification, Planning and Scheduling Process

City of Chattanooga, WRD

WO = Work Order

Front Desk

Trigger: Customer Request

Phone

Receive Customer Request via 311 to respond to issue related to Pump Station, CSOTF, or Plant (i.e. odor complaint)

Take a screen shot of the issue from 311 system, attach to an email and send to the Maintenance Planner
Place phone call as a follow-up action.
Contact Maintenance Manager if Planner is non-responsive/not available

Control Room

Trigger: Request from Liquids Operator

Radio/Phone

Work Order Request Form contains the following information:
- Requestor's Name
- Priority
- If CM is a result of a PM

Receive requests for work, and write them in the Log Book

Is it an emergency?

Yes

No

Contact the appropriate Maintenance Chief then with Maintenance Planner to create the WO

Determine work priority and communicate work order need to the Maintenance Planner by phone, radio or WO Req Form

Phone/Radio/WO Req Form

Phone/Radio/WO Req Form

Maintenance Planner (Planning Department)

Trigger: Request from Chattanooga WRD staff

Radio/Phone/WO Req Form

Email/Phone/Radio/WO Req Form

Work Order Request Form contains the following information:
- Requestor's Name
- Priority
- If CM is a result of a PM

Receive requests for newly identified work and add to "WO Request List." Confirm receipt of any requests sent via email. Communicate with others (i.e. Maint Chiefs) to determine where work should be assigned.

The Maintenance Planner will contact the Maintenance Manager to coordinate and discuss Contractor work assignments. Will obtain quotes and SOWs from Contractors as appropriate.

Generate WO in CityWorks and assign to appropriate Maintenance Chief

CityWorks

Are parts/ materials needed?

Yes

No

Check the Warehouse and order parts/materials if necessary. Enter Request # on WO. (Change status to "Waiting on Parts" if ordered). Deliver/notify Maintenance Chief when parts/materials are obtained and update WO status to "Open"

CityWorks

Phone/Radio

Print WO to appropriate Maintenance Chief's printer and follow-up by phone/radio

Trigger: Preventive Maintenance Schedule

Maintain Preventative/ Routine Maintenance Work Orders in CMMS

CityWorks

Operations Supervisor

Trigger: Request from Solids or PS Operators

Radio/Phone

Receive request for work

Is it an emergency?

Phone/Radio/WO Req Form

Yes

No

Determine work priority and communicate work order need to the Maintenance Planner by phone, radio or WO Req Form

Phone/Radio/WO Req Form

Contact the appropriate Maintenance Chief then with Maintenance Planner to create the WO

Maintenance Manager

Trigger: Weekly

Review Data from CityWorks to identify system issues/trends/ KPIs

CityWorks

Discuss with appropriate staff and request creation of WO from Maintenance Planner

Yes

Are there any issues?

No

End

Phone/Radio

Maintenance Chiefs

Receive Emergency call and discuss with others as needed

Receive WOs from the printer.

Respond to and Complete Work Order

Power User (Work Management Center)

Trigger: Daily

Review Data from CityWorks for problems with CityWorks, user entry issues, or as requested by the Maintenance Manager

CityWorks

Are there any issues?

Yes

No

Discuss with the Maintenance Manager

End

02/11/2013

Pump Station, CSOTF and Plant Maintenance - Respond to and Complete Work Order Process

City of Chattanooga, WRD

Trigger: Work listed on the WO is completed/ Monthly

Definitions:
Priority 1 = Immediate Response
Priority 2 = Routine/Respond within 24 hours
Priority 3 = Preventive Maintenance/Respond as scheduled

WO = Work Order

Contractors

- Receive WO request and write down WO number if provided
- Travel to site of work and ensure safety precautions are taken as appropriate
- Perform work and document work performed as required
- Submit daily documentation of work performed to the WO Provider
- Submit hard copy WO to WO Provider when WO is completed (include summary of hours expended and resources used)
- Prepare and submit Invoices to Inventory Control

Inventory Control

- Receive Invoice, review and approve and send to the Maintenance Planner

WO/Verbal Instructions/WO#

Documentation from Contractor

Contractor WO

Copy of Invoices

Maintenance Planner (Planning Department)

- **Work Identification, Planning and Scheduling**
- Receive documentation from Contractor and report results to others as appropriate
- Review, approve and sign the hard copy WO. Confirm time/cost and dates are accurate and submit to the Work Management Center
- Review and provide approved Contractor WOs to the Work Management Center
- Match invoices to closed Contractor WOs, review and approve – report discrepancies to Inventory Control
- Send copy of Invoice with attached WO and a transmittal to the Work Management Center

WO/Verbal Instructions/WO #

Note on Contract Work:
- The Maintenance Chiefs oversee Contractor work performed by Triad and H&H.
- The Maintenance Planner oversees all other Contractors.

Documentation from Contractor

Contractor WO

Contractor WO

Maintenance Chief

- **Work Identification, Planning and Scheduling**
- Discuss results of work performed
- Receive documentation from Contractor and report results to others as appropriate
- Review, approve and sign the hard copy WO. Confirm time/cost and dates are accurate
- Provide approved internal WO to the Work Management Center and Contractor WOs to the Maintenance Planner

Contractor WOs

Contractor WO

Copy of approved Invoice

Maintenance Crew

WO/Verbal Instructions/WO#

- Receive hard copy WO or WO number if verbal request and write down WO number if provided.
- Travel to site of work and ensure safety precautions are taken as appropriate and perform work.
- Communicate results to the Maintenance Chief
- Return to office and document work performed (labor and materials) on the hard copy WO and provide it to the Maintenance Chief

Internal WO

Internal WO

Copy of Contractor WO/Timesheets

Work Management Center

- Receive the hard copy WO and update CityWorks with WO details. Close WOs in CityWorks and file in file cabinet
- Receive approved Contractor WO, update details in CityWorks and file in "Waiting on Invoice" file cabinet. Send copies of completed Contractor WOs/ timesheets to Maintenance Planner
- Confirm costs are captured in CityWorks on the closed WO. File completed WOs into "Completed" file cabinet

CityWorks

CityWorks

End

02/11/2013

Appendix B
Example of PS Electrical Inspection and Preventive Maintenance Checklist

PS Electrical Inspection and Preventive Maintenance Checklist				
Item	**Monthly**	**Semi-Annual**	**Annual**	**Every 18 Months**
Conduct CSO overflow simulation	X			
Conduct regulator overflow simulation	X			
Calibrate LEL meter at CSO	X			
Check telemetry and replace battery				X
Inspect and clean the MCC components for loose connections, dirt, and debris				X
Inspect bus and buckets for loose connections and signs of overheating				X
Clean and visually inspect bar screen motor			X	
Clean and visually inspect pump motors			X	
Clean and visually inspect Switchgear			X	
Inspect electrical connections on PLC			X	
Perform electrical check of motorized actuators			X	
Perform electrical check on belt drive fans			X	
Perform insulation resistance test on switchgear			X	
Perform visual inspection on flow meter.		X		
Inspect and clean PLC cabinet		X		
Perform airborne ultra-sound on Switchgear		X		
Perform motor current analysis (offline) on pump motors		X		
Clean, perform visual inspection and thermography of VFD.			X	

Appendix C
Example of PS Mechanical Inspection and Preventive Maintenance Checklist

PS Mechanical Inspection and Preventive Maintenance Checklist				
Item	**Monthly**	**Quarterly**	**Semi-Annual**	**Annual**
Clean and visually inspect belt drive fan				X
Lubricate bar screen motor				X
Lubricate couplings on pumps				X
Lubricate direct drive fan				X
Lubricate pump motors				X
Perform visual inspection of direct drive fan				X
Clean, visually inspect and adjust slide gates				X
Collect carbon sample from tub scrubber for analysis				X
Perform operational check and visual inspection of gate valves >12", but <30"				X
Perform operational test and visual inspection on slide gates				X
Lubricate direct drive fan on tub scrubber				X
Perform visual inspection of direct drive fan on tub scrubber				X
Change gear box oil			X	
Lubricate mechanical bar screen	X			
Inspect mechanical bar screens	X			
Lubricate bearings on pumps		X		
Replace air filters and check condition of belts		X		
Lubricate motorized actuators			X	
Lubricate slide gates			X	
Lubricate sluice gates			X	
Conduct sampler inspection at CSO	X			
Perform visual inspection and operational check of high level floats				X

Appendix D
Example of PS Physical Inspection and Preventive Maintenance Checklist

PS Physical Inspection and Preventive Maintenance Checklist							
Item	**Daily**	**Weekly**	**Monthly**	**Quarterly**	**Semi-Annually**	**Annual**	**Other**
Exterior							
General Appearance							As Needed
Grass/Shrubs							As Needed
Walks/Drives						X	
Doors/Windows/Trim						X	
Fence/Gates/Driveway Barrier						X	
Walls						X	
Gutters/Downspouts						X	
Roofing/Vents/Chimney						X	
Steps/Rails/Hatches			X			X	
Louvers/Screens/Grills						X	
Emergency. Signs/Address No.						X	
Vaults/Chambers					X		
Manhole Covers/Valve Boxes					X		
Paint Code Observed							As Needed
Interior							
General Appearance							As Needed
Walls/Ceilings/Floors						X	
Steps/Rails/Hatches						X	
Ventilation Ductwork						X	
Doors/Windows/Trim						X	
Wet wells						X	
Wet well Piping						X	
Other							

Appendix E
Example of PS Electrical Inspection Report

Date:	Comments:
Time:	
PS:	
Employee:	
Weather:	

PS Electrical Inspection Report

Item	Results/Condition			
	OK	Repaired	Needs Repairing	Additional Comments
Calibrate LEL meter at CSO				
Conduct CSO overflow simulation				
Conduct regulator overflow simulation				
Check telemetry and replace battery				
Inspect and clean the MCC components for loose connections, dirt and debris				
Inspect bus and buckets for loose connections and signs of overheating				
Clean and visually inspect bar screen motor (See attached procedure)				
Clean and visually inspect pump motors				
Clean and visually inspect Switchgear				
Inspect electrical connections to PLC				
Perform electrical check of motorized actuators (See attached procedure)				
Perform electrical check on belt drive fans				
Perform insulation resistance test on Switchgear				
Perform visual inspection and certification				
Inspect and clean PLC cabinet				
Perform airborne ultra-sound on Switchgear				
Perform motor current analysis (offline) on pump motors				
Perform motor current analysis (online) on pump motors				
Perform motor current analysis (online) on pump motors				
Clean, perform visual inspection and thermography of VFD				

Appendix F
Example of PS Mechanical Inspection Report

Date:	Comments:
Time:	
PS:	
Employee:	
Weather:	

PS Mechanical Inspection Report				
Item	Results/Condition			
	OK	Repaired	Needs Repairing	Additional Comments
Clean and visually inspect belt drive fan				
Lubricate bar screen motor				
Lubricate couplings on pumps				
Lubricate direct drive fan				
Lubricate pump motors				
Perform visual inspection of direct drive fan				
Clean, visually inspect and adjust slide gates				
Collect carbon sample from tub scrubber for analysis				
Perform operational check and visual inspection of gate valves >12” but <30”				
Lubricate direct drive fan on tub scrubber				
Perform visual inspection of direct drive fan on tub scrubber				
Change gear box oil				
Lubricate mechanical bar screen				
Inspect mechanical bar screen				
Lubricate bearings on pumps				
Replace air filter and check belts				
Lubricate motorized actuators				
Lubricate slide gates				
Lubricate sluice gates				
Conduct sample inspection at CSC				
Perform visual inspection and operational check of high level floats				

Appendix G
Example of PS Physical Inspection Report

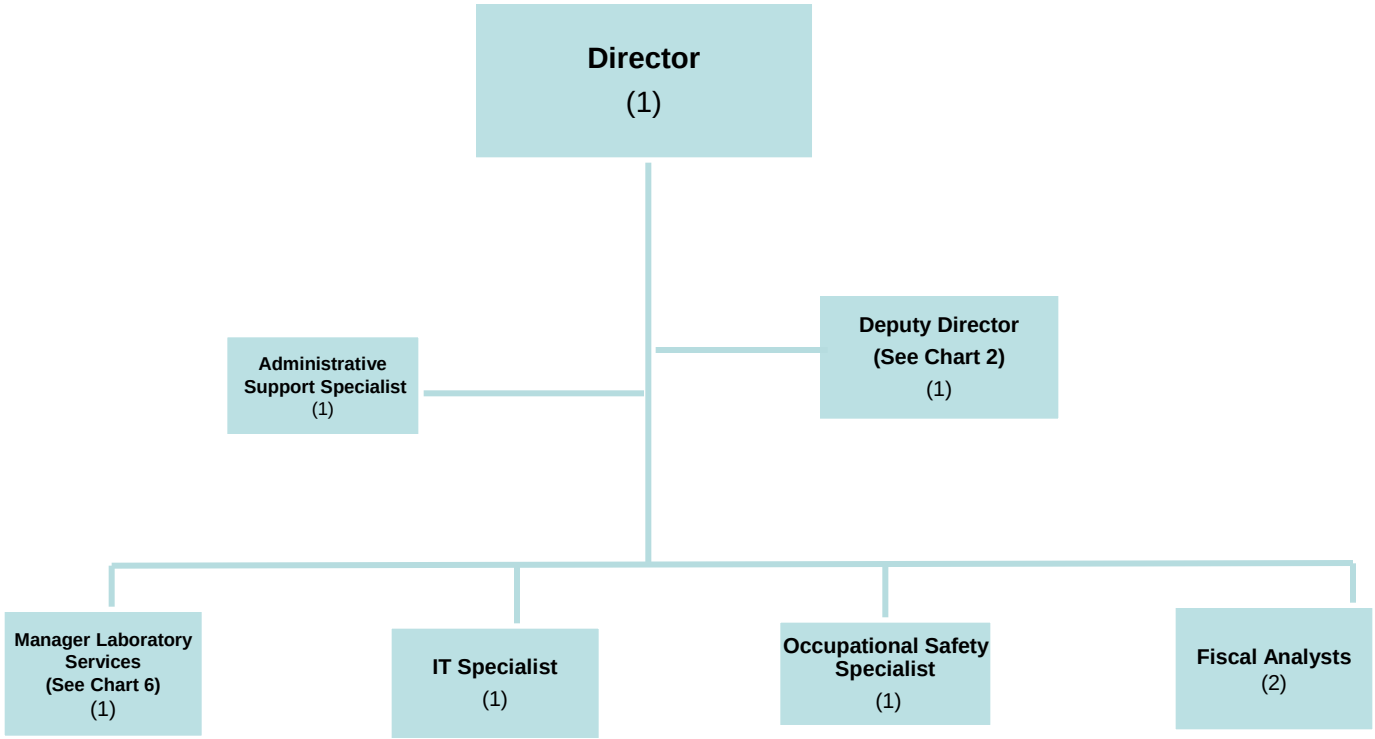
Date:	Comments:
Time:	
PS:	
Employee:	
Weather:	

PS Physical Inspection Report

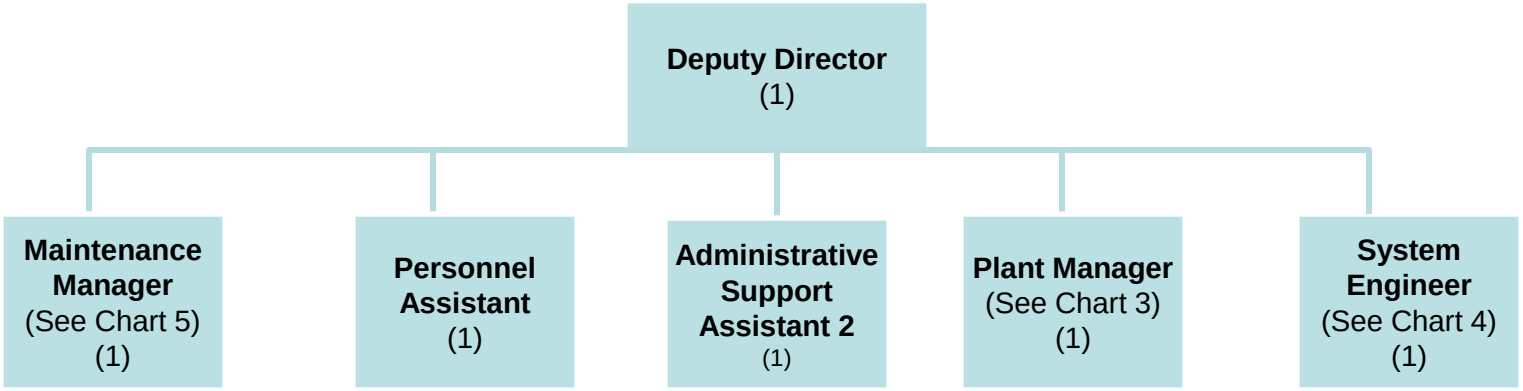
Item	Results/Condition			
	OK	Repaired	Needs Repairing	Additional Comments
Exterior				
General Appearance				
Grass/Shrubs				
Walks/Drives				
Doors/Windows/Trim				
Fence/Gates/Driveway Barrier				
Walls				
Gutters/Downspouts				
Roofing/Vents/Chimney				
Steps/Rails/Hatches				
Louvers/Screens/Grills				
Emergency. Signs/Address No.				
Vaults/Chambers				
Manhole Covers/Valve Boxes				
Paint Code Observed				
Interior				
General Appearance				
Walls/Ceilings/Floors				
Steps/Rails/Hatches				
Ventilation Ductwork				
Doors/Windows/Trim				
Wet wells				
Wet well Piping				
Other				

Appendix H
Waste Resources Division Organizational Chart

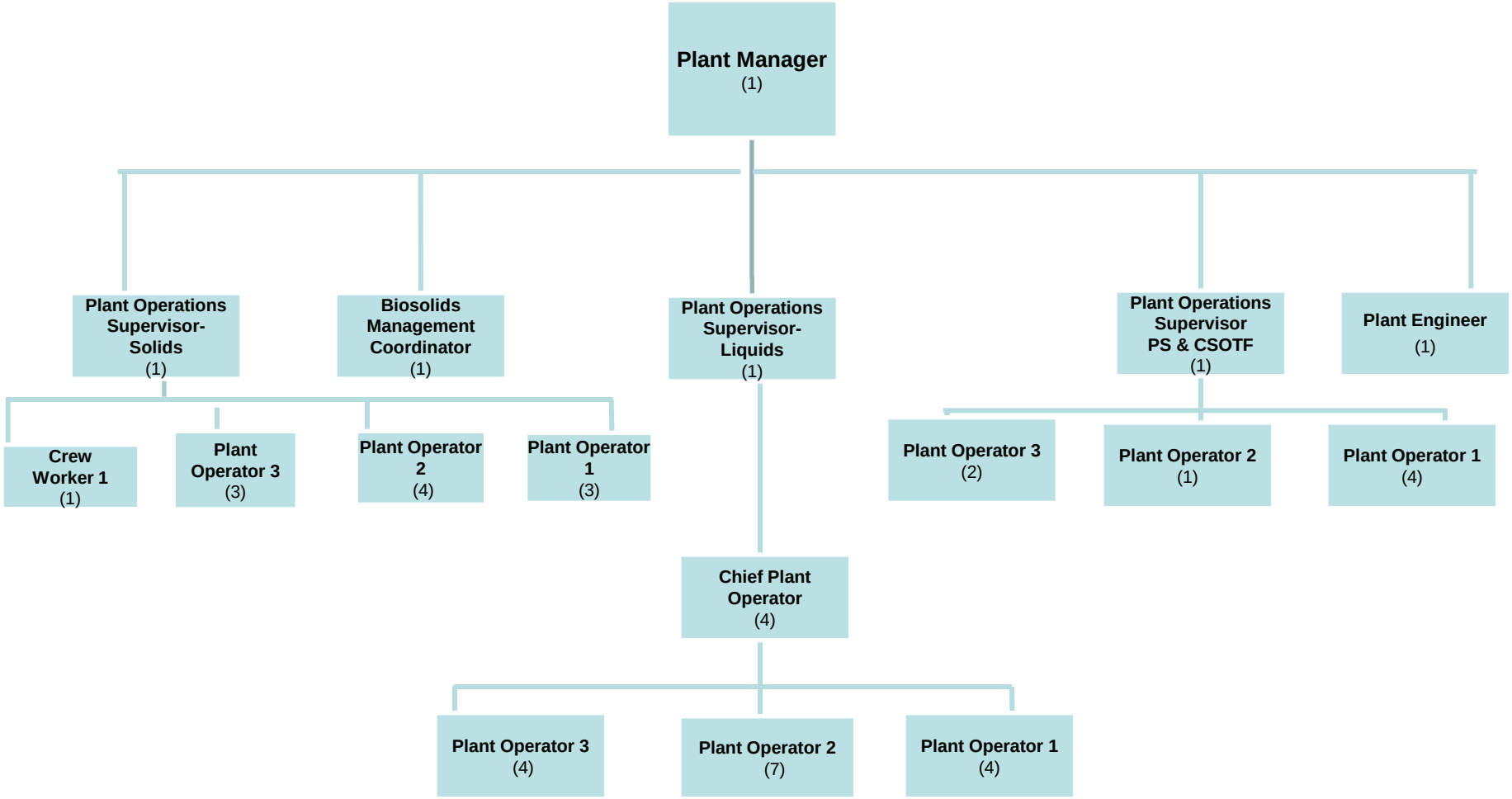
WASTE RESOURCES DIVISION
ORGANIZATIONAL CHART
(September, 2014)



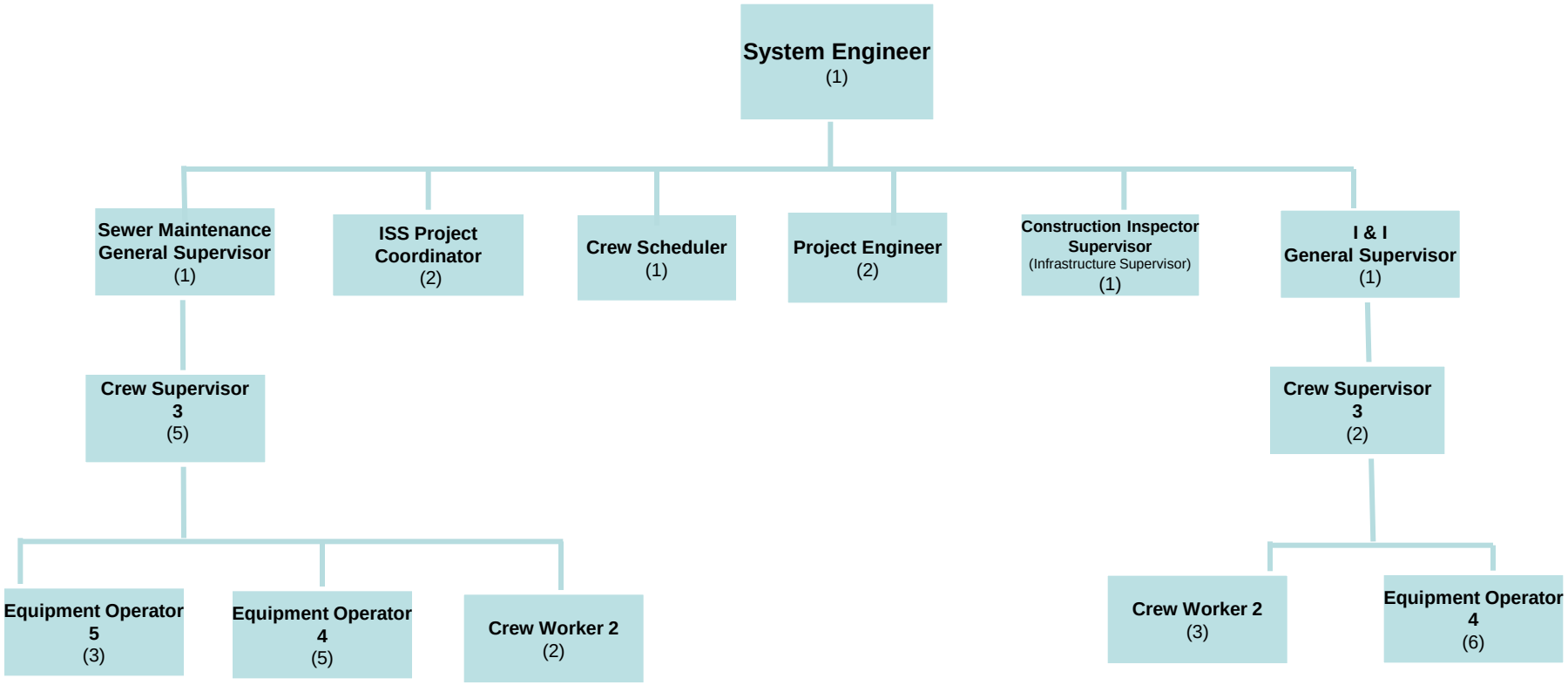
WASTE RESOURCES DIVISION
ORGANIZATIONAL CHART
Chart 2
(September, 2014)



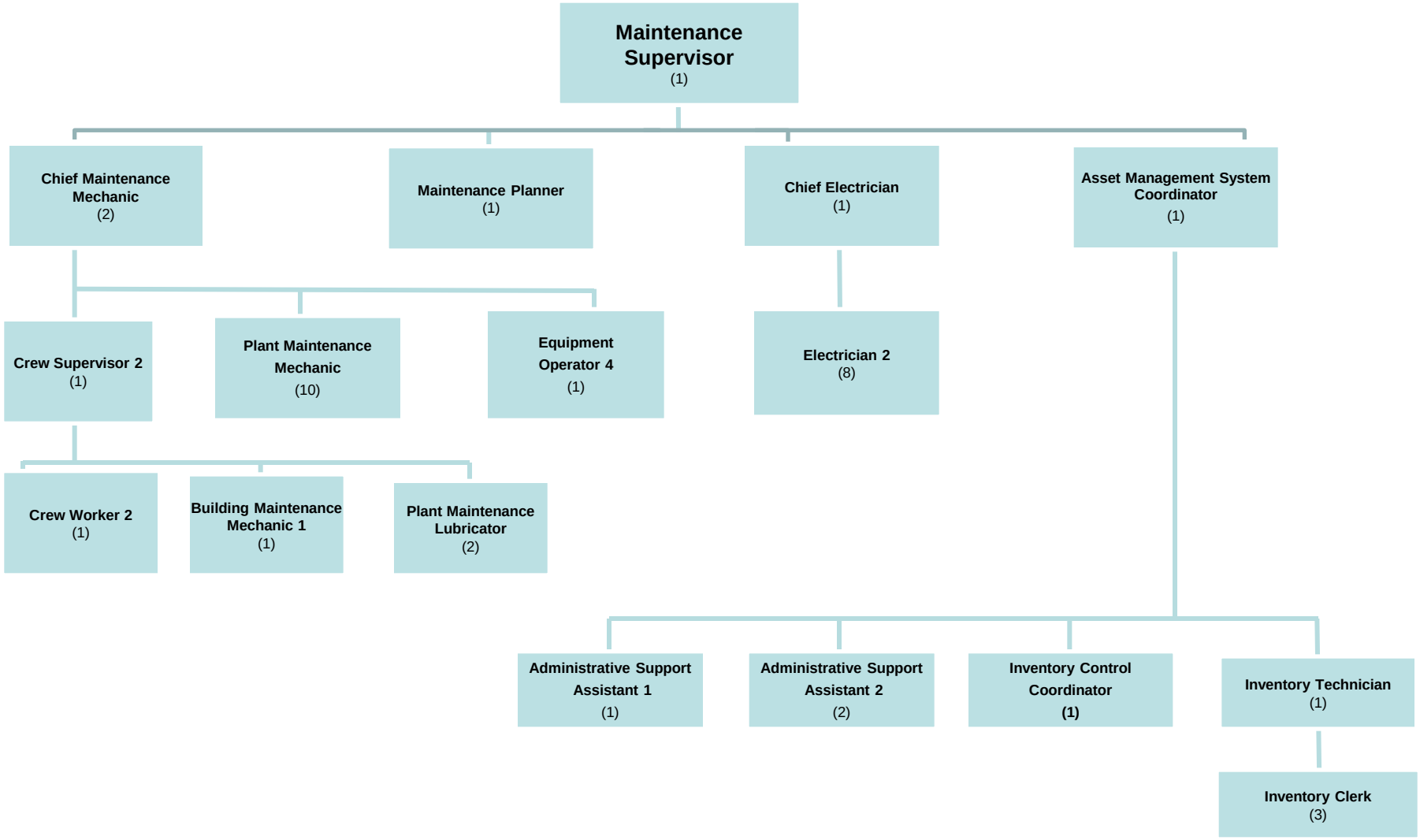
WASTE RESOURCES DIVISION
ORGANIZATIONAL CHART
Chart 3
(September, 2014)



WASTE RESOURCES DIVISION
ORGANIZATIONAL CHART
Chart 4
(September, 2014)



WASTE RESOURCES DIVISION
ORGANIZATIONAL CHART
Chart 5
(September, 2014)



WASTE RESOURCES DIVISION
ORGANIZATIONAL CHART
Chart 6
(September, 2014)