Gulf Coast Authority

**Alarm Management:
An Overview, Execution, and Lessons Learned**

July 22, 2022

Joanne MacDougall, PE – Assistant Director, Process Engineering

Agenda

> Overview of GCA

> What is Alarm Management

> Creating the Plan

> Staying up to date

> Example of the system working

> Final tips and lessons learned

GCA

Meeting Our Mission through Service

REGIONAL FACILITIES

6 PASADENA
BAYPORT 1
HOUSTON 3
FRIENDSWOOD 2
4 ODESSA
TEXAS CITY 5

1. Bayport / Central Lab
2. Blackhawk
3. Central Office
4. Odessa South
5. 40-Acre/Campbell Bayou
6. Washburn Tunnel/Vince Bayou

> Industrial regionalized wastewater treatment
  - 4 facilities, serving 90+ customers
> Municipal wastewater treatment
  - 1 facility, serving multiple communities
> NELAC-accredited laboratory
  - 400+ lab analysis daily
> 2 trucked-in waste receiving stations
> Industrial water reuse – non-potable
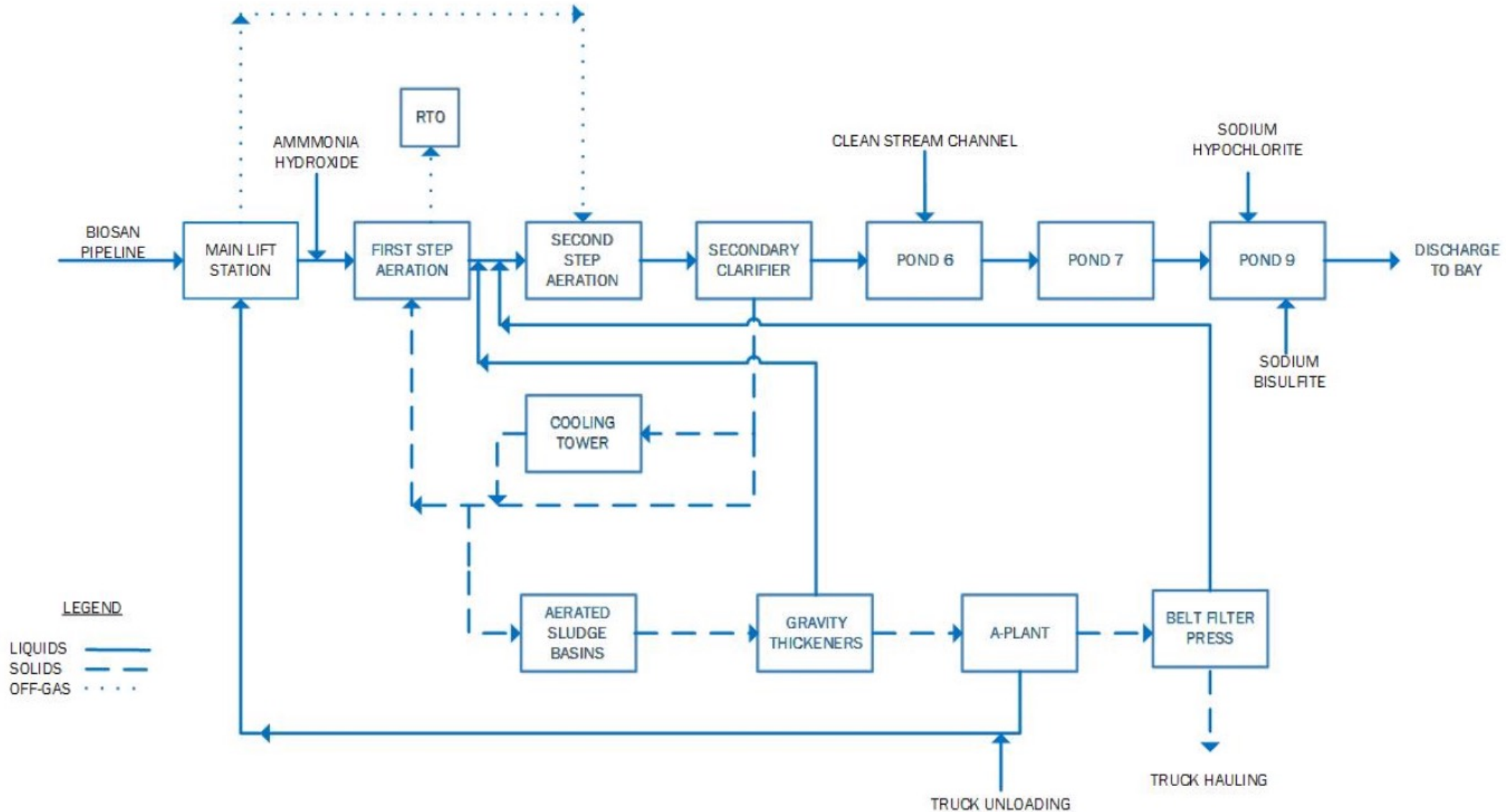> Unique pre-treatment program

GCA

Bayport Facility

Pasadena, Texas

- Treats wastewater from over 70 industries (and counting)
  - Chemical manufacturing
  - Petrochemical industries
- Average Flow: 24 MGD
- Average TOC: 80,000 lb/day
- Two step activated sludge process
- Strict air permit
- Always manned with at least 4 Operators

GCA

Bayport Facility

Blackhawk Facility

Friendswood, Texas

- Treats wastewater from municipalities and MUDs
- Average flow: 5 MGD
- Average BOD: 12,000 lb/day
- Single-step activated sludge process
- Not constantly manned by Operators

GCA

What is Alarm Management?

> A way to ensure Operations is alerted, when needed, to alarms

> Purposefully choosing what an Operator need to be alerted to

> Prioritizing – Deciding how critical of an issue it is

> Documenting the alarms.

The need for Alarm Management

Time	State	Type	Priority	Name	Group	Alarm Comment	Value	Limit	Class	Operator
07/19/2022 08:11 AM	UNACK...	HI	251	PIT-2505B	RTO_2602	RTO Header Pressure alarm	-4.47696	-4	VALUE	None
07/19/2022 07:32 AM	UNACK...	LO	251	FIC-2503A_PV	Tank_2003	T-2003 Offgas Flow Process Variable	4275.41	4200	VALUE	None
07/19/2022 07:31 AM	UNACK...	HI	251	PIT-2505A	RTO_2601	RTO Header Pressure alarm	-4.23925	-4	VALUE	None
07/19/2022 06:09 AM	UNACK...	HIHI	251	TE-2602-002	RTO_2602	PROCESS FAN OUTBOARD BEARING TEMP HI	164.849	165	VALUE	None
07/19/2022 03:42 AM	UNACK...	DSC	251	XA-2308	Tank_2001	Tank 2001 Oxygen Leg 2308 Disabled from PLC	None	None	DSC	None
07/19/2022 03:42 AM	UNACK...	DSC	251	XA-2307	Tank_2001	Tank 2001 Oxygen Leg 2307 Disabled from PLC	None	None	DSC	None
07/18/2022 06:48 PM	UNACK...	LO	251	FIC-2501A_PV	Tank_2001	T-2001 Offgas Flow Process Variable	4628.98	4200	VALUE	None
07/18/2022 04:38 PM	UNACK...	LO	251	FIC-2505A_PV	Tank_2005	T-2004 Offgas Flow Process Variable	4254.65	4200	VALUE	None
07/18/2022 04:08 PM	ACK	DSC	501	B-2009_SP_Des...	Tank_2002	Tank 2002 B-2009 Amps setpoint descrepancy	None	None	DSC	None
07/17/2022 06:26 AM	ACK	DSC	501	B-2006_SP_Des...	Tank_2001	Tank 2001 B-2006 Amps setpoint descrepancy	None	None	DSC	None
07/17/2022 06:26 AM	ACK	DSC	1	XA-9002	Eff_Pmp_Station	P-9002 Low Seal Water Flow	Alarm	Alarm	DSC	None
07/16/2022 09:23 AM	ACK	DSC	501	FIC_2339_FLO...	Tank_2005	Tank 2003 AIT-2503B Vapor Oxygen Analyzer Offline	OFF	OFF	DSC	None
07/16/2022 05:30 AM	ACK	DSC	501	FIC_2311_STA...	Tank_2002	Tank 2003 AIT-2503B Vapor Oxygen Analyzer Offline	CLOSE	CLOSE	DSC	None
07/14/2022 09:08 PM	ACK	DSC	1	CL7_LAHH_87...	Clarifier_Area	High level in meter vault	HI	HI	DSC	None
07/13/2022 03:35 PM	ACK	DSC	1	DTB_FA_9210A	$System	SODIUM BISULFITE AREA EAST SAFETY SHOWER FS	ON	ON	DSC	None
07/13/2022 03:35 PM	ACK	DSC	251	XS_801	Beltpresses	H2S Detector Trouble Alarm	XS 801	XS 801	DSC	None
07/13/2022 03:35 PM	ACK	DSC	600	STATION_3_A...	CHANNEL	BATTERY POWER HEALTH	BAD	BAD	DSC	None
07/13/2022 03:35 PM	ACK	DSC	501	NI-2015T_Alm	Tank_2005	Tank 2005 B-2015 Blower Tripped alarm	None	None	DSC	None
07/13/2022 03:35 PM	ACK	DSC	251	XY_PLC24_YY	$System	LOSS OF LEL SIGNAL FROM PLC 24	ALARM	ALARM	DSC	None
07/13/2022 03:35 PM	ACK	DSC	251	MLS_FSH_252	$System	AMMONIA EMERGENCY EYEWASH	EMERGENCY	EMERGENCY	DSC	None
07/13/2022 03:35 PM	ACK	DSC	501	SG1_ALM	Beltpresses	Sludge Grinder 801 failed to start.	On	On	DSC	None
07/13/2022 03:35 PM	ACK	DSC	501	HHLS-2602-001	RTO_2602	SEALPOT HH LEVEL SWITCH INSTANTANEOUS	OFF	OFF	DSC	None
07/13/2022 03:35 PM	ACK	DSC	501	B-2008_SP_Des...	Tank_2002	Tank 2002 B-2008 Amps setpoint descrepancy	None	None	DSC	None
07/13/2022 03:35 PM	ACK	DSC	1	TEST_STAT24	$System	Sodium Hypochlorite Pump 9303 Disabled	Disabled	Disabled	DSC	None
07/13/2022 03:35 PM	ACK	DSC	251	DPT_RTO_AL...	$System	HIGH DP ACROSS COMBUSTION CHAMBER	ALARM	ALARM	DSC	None
07/13/2022 03:35 PM	ACK	DSC	501	BTA-820	BL801	BP-820 Belt Tension Alarm	Alarm	Alarm	DSC	None
07/13/2022 03:35 PM	ACK	DSC	1	MLS_PUMP_21...	Lift_Station	MLS Pump 212 Disabled	Disabled	Disabled	DSC	None
07/13/2022 03:35 PM	ACK	DSC	501	HHLS-2601-001	RTO_2601	SEALPOT HH LEVEL SWITCH INSTANTANEOUS	OFF	OFF	DSC	None
07/13/2022 03:35 PM	ACK	DSC	251	DPT_RTO_AL...	$System	LOW DP ACROSS COMBUSTION CHAMBER	ALARM	ALARM	DSC	None

Summary

Displaying 1 to 29 of 37 alarms.   Default Query   100 % Complete

The need for Alarm Management

Time	State	Type	Priority	Name	Group	Alarm Comment	Value	Limit	Class	Operator
07/19/2022 08:11 AM	UNACK...	HI	251	PIT-2505B	RTO_2602	RTO Header Pressure alarm	-4.47696	-4	VALUE	None
07/19/2022 07:32 AM	UNACK...	LO	251	FIC-2503A_PV	Tank_2003	T-2003 Offgas Flow Process Variable	4275.41	4200	VALUE	None
07/19/2022 07:31 AM	UNACK...	HI	251	PIT-2505A	RTO_2601	RTO Header Pressure alarm	-4.23925	-4	VALUE	None
07/19/2022 06:09 AM	UNACK...	HIHI	251	TE-2602-002	RTO_2602	PROCESS FAN OUTBOARD BEARING TEMP HI	164.849	165	VALUE	None
07/19/2022 03:42 AM	UNACK...	DSC	251	XA-2308	Tank_2001	Tank 2001 Oxygen Leg 2308 Disabled from PLC	None	None	DSC	None
07/19/2022 03:42 AM	UNACK...	DSC	251	XA-2307	Tank_2001	Tank 2001 Oxygen Leg 2307 Disabled from PLC	None	None	DSC	None
07/18/2022 06:48 PM	UNACK...	LO	251	FIC-2501A_PV	Tank_2001	T-2001 Offgas Flow Process Variable	4628.98	4200	VALUE	None
07/18/2022 04:38 PM	UNACK...	LO	251	FIC-2505A_PV	Tank_2005	T-2004 Offgas Flow Process Variable	4254.65	4200	VALUE	None
07/18/2022 04:08 PM	ACK	DSC	501	B-2009_SP_Des...	Tank_2002	Tank 2002 B-2009 Amps setpoint descrepancy	None	None	DSC	None
07/17/2022 06:26 AM	ACK	DSC	501	B-2006_SP_Des...	Tank_2001	Tank 2001 B-2006 Amps setpoint descrepancy	None	None	DSC	None
07/17/2022 06:26 AM	ACK	DSC	1	XA-9002	Eff_Pmp_Station	P-9002 Low Seal Water Flow	Alarm	Alarm	DSC	None
07/16/2022 09:23 AM	ACK	DSC	501	FIC_2339_FLO...	Tank_2005	Tank 2003 AIT-2503B Vapor Oxygen Analyzer Offline	OFF	OFF	DSC	None
07/16/2022 05:30 AM	ACK	DSC	501	FIC_2311_STA...	Tank_2002	Tank 2003 AIT-2503B Vapor Oxygen Analyzer Offline	CLOSE	CLOSE	DSC	None
07/14/2022 09:08 PM	ACK	DSC	1	CL7_LAHH_87...	Clarifier_Area	High level in meter vault	HI	HI	DSC	None
07/13/2022 03:35 PM	ACK	DSC	1	DTB_FA_9210A	$System	SODIUM BISULFITE AREA EAST SAFETY SHOWER FS	ON	ON	DSC	None
07/13/2022 03:35 PM	ACK	DSC	251	XS_801	Beltpresses	H2S Detector Trouble Alarm	XS 801	XS 801	DSC	None
07/13/2022 03:35 PM	ACK	DSC	600	STATION_3_A...	CHANNEL	BATTERY POWER HEALTH	BAD	BAD	DSC	None
07/13/2022 03:35 PM	ACK	DSC	501	NI-2015T_Alm	Tank_2005	Tank 2005 B-2015 Blower Tripped alarm	None	None	DSC	None
07/13/2022 03:35 PM	ACK	DSC	251	XY_PLC24_YY	$System	LOSS OF LEL SIGNAL FROM PLC 24	ALARM	ALARM	DSC	None
07/13/2022 03:35 PM	ACK	DSC	251	MLS_FSH_252	$System	AMMONIA EMERGENCY EYEWASH	EMERGENCY	EMERGENCY	DSC	None
07/13/2022 03:35 PM	ACK	DSC	501	SG1_ALM	Beltpresses	Sludge Grinder 801 failed to start.	On	On	DSC	None
07/13/2022 03:35 PM	ACK	DSC	501	HHLS-2602-001	RTO_2602	SEALPOT HH LEVEL SWITCH INSTANTANEOUS	OFF	OFF	DSC	None
07/13/2022 03:35 PM	ACK	DSC	501	B-2008_SP_Des...	Tank_2002	Tank 2002 B-2008 Amps setpoint descrepancy	None	None	DSC	None
07/13/2022 03:35 PM	ACK	DSC	1	TEST_STAT24	$System	Sodium Hypochlorite Pump 9303 Disabled	Disabled	Disabled	DSC	None
07/13/2022 03:35 PM	ACK	DSC	251	DPT_RTO_AL...	$System	HIGH DP ACROSS COMBUSTION CHAMBER	ALARM	ALARM	DSC	None
07/13/2022 03:35 PM	ACK	DSC	501	BTA-820	BL801	BP-820 Belt Tension Alarm	Alarm	Alarm	DSC	None
07/13/2022 03:35 PM	ACK	DSC	1	MLS_PUMP_21...	Lift_Station	MLS Pump 212 Disabled	Disabled	Disabled	DSC	None
07/13/2022 03:35 PM	ACK	DSC	501	HHLS-2601-001	RTO_2601	SEALPOT HH LEVEL SWITCH INSTANTANEOUS	OFF	OFF	DSC	None
07/13/2022 03:35 PM	ACK	DSC	251	DPT_RTO_AL...	$System	LOW DP ACROSS COMBUSTION CHAMBER	ALARM	ALARM	DSC	None

Displaying 1 to 29 of 37 alarms.   Default Query   100 % Complete

Definition of an Alarm

> An alarm indicates a problem or abnormal event
  - Safety, process, compliance, equipment protection, etc

> An alarm should require a response
  - Not just for informational purposes

> An alarm is targeted to the Operator
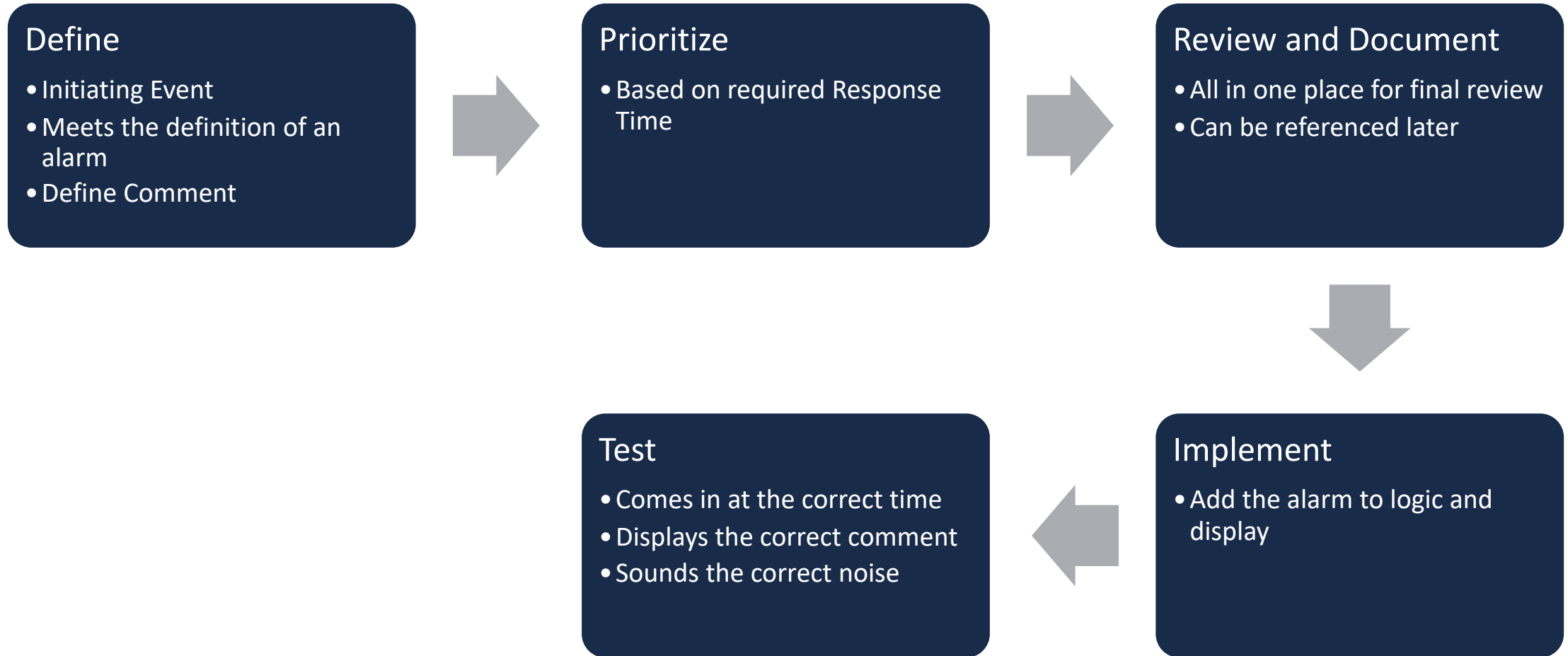 - Not informational for other groups

Criticality of Alarms

- Level 1 – Critical event.
    - Risk of immediate safety or compliance concern.
    - Drop what you are doing and address.
- Level 2 – Non-critical.
    - Something the operator needs to address soon.
    - Finish the test you are running
- Level 3 – No audible alarm
    - as you scroll through the screens.

GCA

The Alarm Rationalization Process

Define
- Initiating Event
- Meets the definition of an alarm
- Define Comment

Prioritize
- Based on required Response Time

Review and Document
- All in one place for final review
- Can be referenced later

Test
- Comes in at the correct time
- Displays the correct comment
- Sounds the correct noise

Implement
- Add the alarm to logic and display

GCA

Documenting Alarms

TAG	GROUP	INITIATING EVENT	COMMENT TO BE DISPLAYED	SETPOINT	PRIORITY
LAHH-110	MAIN LIFT STATION	DISCRETE SIGNAL FROM FLOAT IN FIELD	HIGH level upstream of barscreen – check for pluggage	n/a	1
NI-100	OFFSITE	NI-120 AND NI-130 show running AND LIT-100 is less than 8 ft.	Two pumps running at OFFSITE with low level – Check for proper operation.	8 ft	2
LIT – 700	CHEMICAL STORAGE	LIT-700 reads below 4 feet	Low inventory in T-700. Consider re-ordering	4 feet	3

GCA

Tag	Group	Initiating event	Comment to be displayed	Setpoint	Priority
LAL-100	OFFSITE	Reading from analog transmitter is above adjustable setpoint	Low level at offsite from level transmitter	2 ft	
LAH-100	OFFSITE	Reading from analog transmitter is above adjustable setpoint	High level at offsite from level transmitter	8 ft	
LAHH-100	OFFSITE	Reading from analog transmitter is above adjustable setpoint	High High level at offsite from level transmitter	10 ft	
	OFFSITE	Two pumps running at offsite and LIT-100 is less than 8 ft	Two pumps running at offsite with low level - Check for proper operation		
	OFFSITE	any pump running and no flow for 10 minutes	No flow from offsite - check pump opertions, level, and possible leaks		
HS-100	OFFSITE	Loop in REMOTE/MANUAL	Wet well pump control in REMOTE/MANUAL		2
NI-330	AERATORS	Mechanical aerator not running	Aerator 330 in Aeration basin not running		2
NI-331	AERATORS	Mechanical aerator not running	Aerator 331 in Aeration basin not running		2
NI-320	AERATORS	Mechanical aerator not running	Aerator 332 in Aeration basin not running		2
NI-321	AERATORS	Mechanical aerator not running	Aerator 333 in Aeration basin not running		2
NI-401	CLARIFIERS	Off	Clarifier 401 rake not running		2
NI-402	CLARIFIERS	Off	Clarifier 402 rake not running		2
NI-403	CLARIFIERS	Off	Clarifier 403 rake not running		2
Ni-701	CLARIFIERS	off	Thicken rake not running		2
NI-710	CLARIFIERS	P-710 and P-711 not running for 1 hour	Thickener sump pumps haven't run check level in sump		2
NI-722/23	CLARIFIERS	P-722 and P-723 both running for 20 minutes	Both decant pumps running for 20 minutes check decant sump		2
NI-712/13/14	CLARIFIERS	Any pump running for 30 minutes	Wasting pumps have been running for 30 minutes. Confirm timer is working		2
FIL-001	OUTFALL	Flow less than 0.5 MGD	Low flow at final outfall		1
FAH-001	OUTFALL	flow greater than 20 (adjustable at HMI)	High flow at outfall		2
	BELTPRESS	Keep existing beltpress alarms			
	BELTPRESS	Polymer being added but conveyor not running	conveyor not running but press may be in operation		2
LAH-401	CLARIFIERS	LIT-401 from analog transmitter is above adjustable setpoint	High sludge level in clarifier 401		1
LAH-402	CLARIFIERS	LIT-402 from analog transmitter is above adjustable setpoint	High sludge level in clarifier 402		1
LAH-403	CLARIFIERS	LIT-403 from analog transmitter is above adjustable setpoint	High sludge level in clarifier 403		1
NI-???	Headworks	from discrete	Flex-rake at headworks not running		1
NI-???	Headworks	from discrete	Flex-rake at headworks not running		1
NI-???	Headworks	from discrete	Screw conveyor at headworks not running		1
NI-???	Headworks	from discrete	Washer compactor at headworks not running		1
	UV	UV-22	Low-Low Transmittance at UV system		3
	UV	UV-9	Hydraulic max flow exceeded at UV system		2

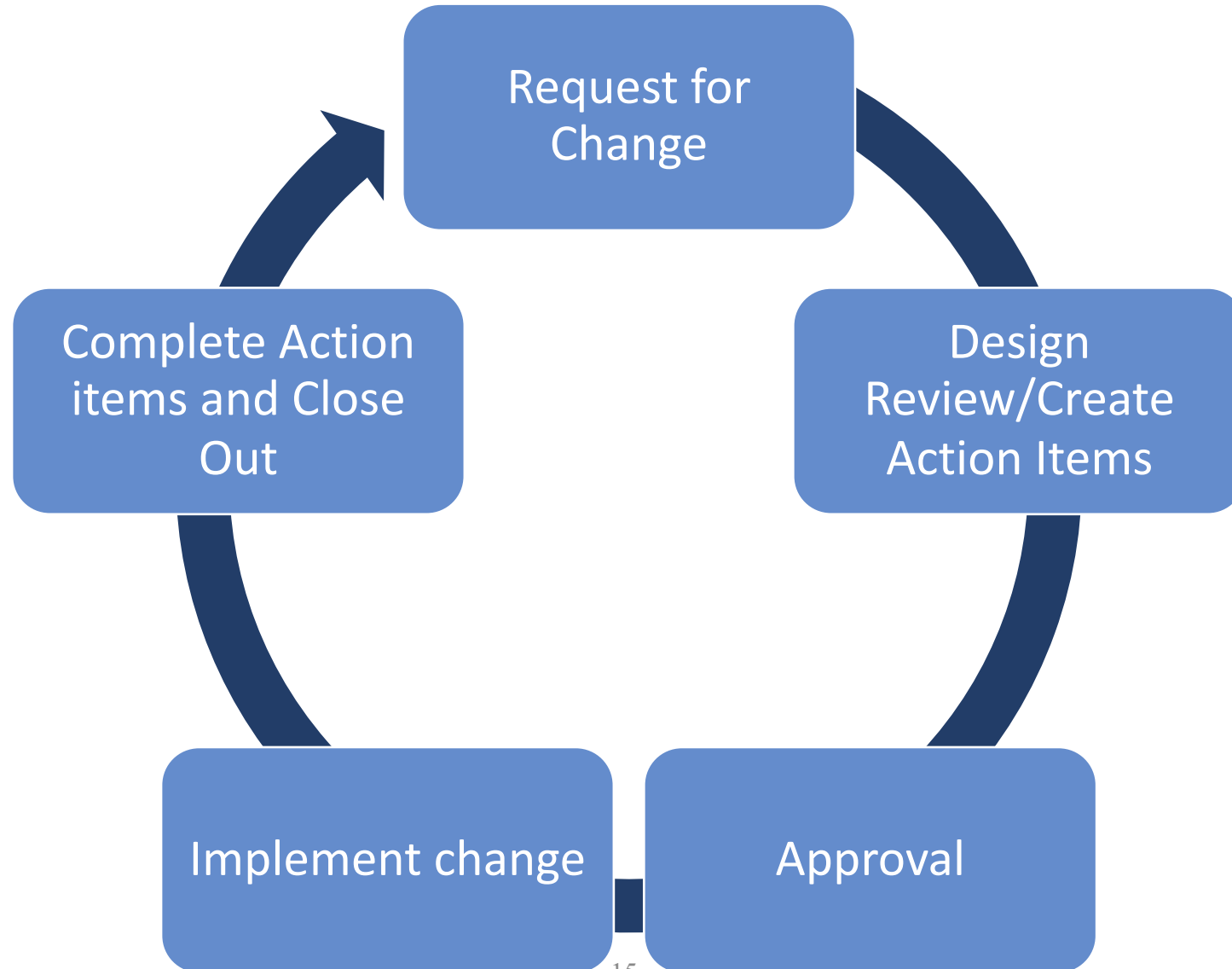# Staying up to date with alarms

Rationalize alarms:

> Anytime a change is made to PLC/HMI

> New projects and equipment changes

> New requests for alarms

> Follow a Management of Change process

General Management of Change (MOC) Process

Benefits of MOC Processes

Change gets reviewed by the correct people	Documentation stays up to date	Documents the change for future reference
• Is it safe? • Is it Compliant? • Will it work? • Could it be done differently?	• Drawings • SDS books • Stormwater Plans	• Form includes reason and justification • If change is denied you document why

GCA

Example of adding a new Alarm

Septage Receiving Station

Treatment Facility

~1/2 mile

Flow
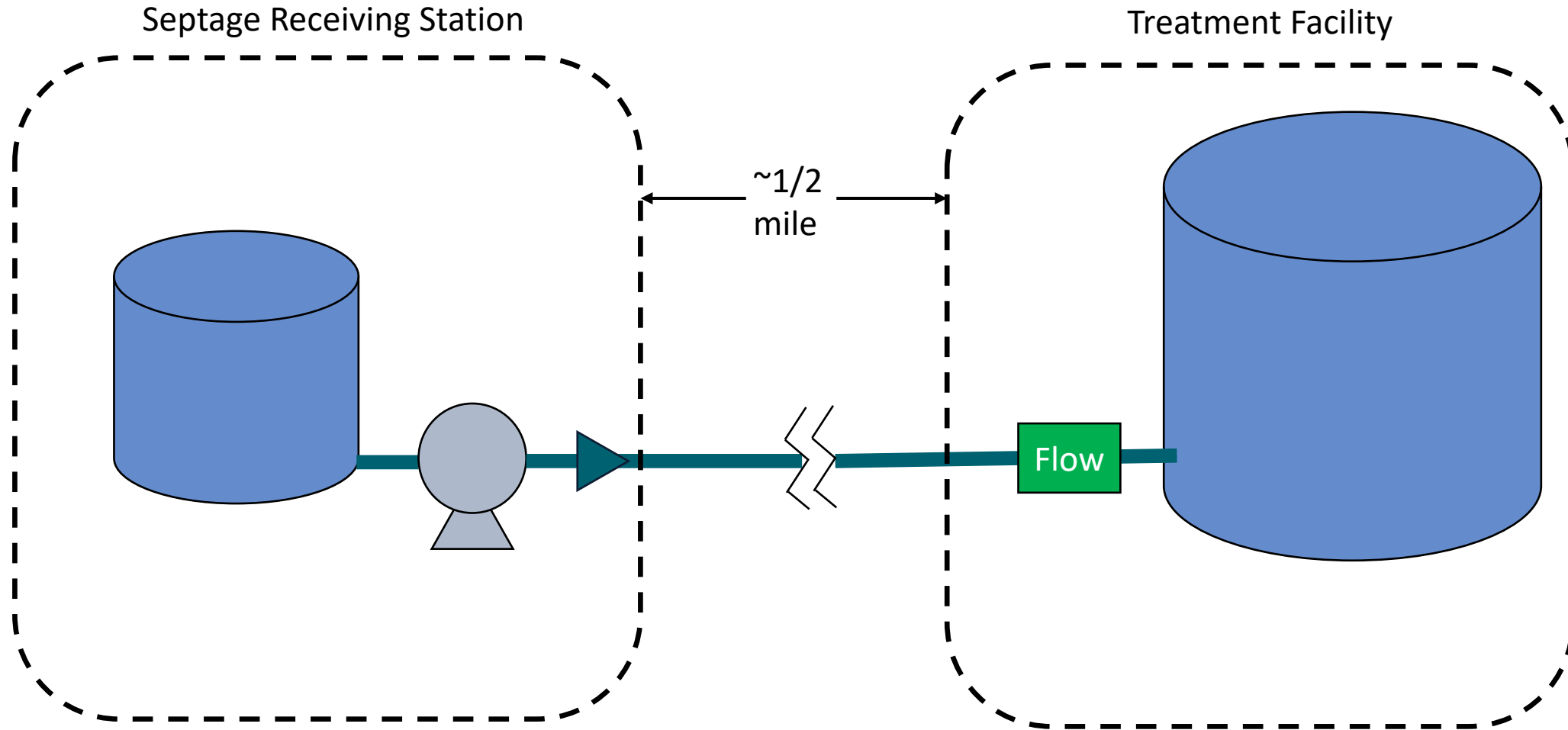
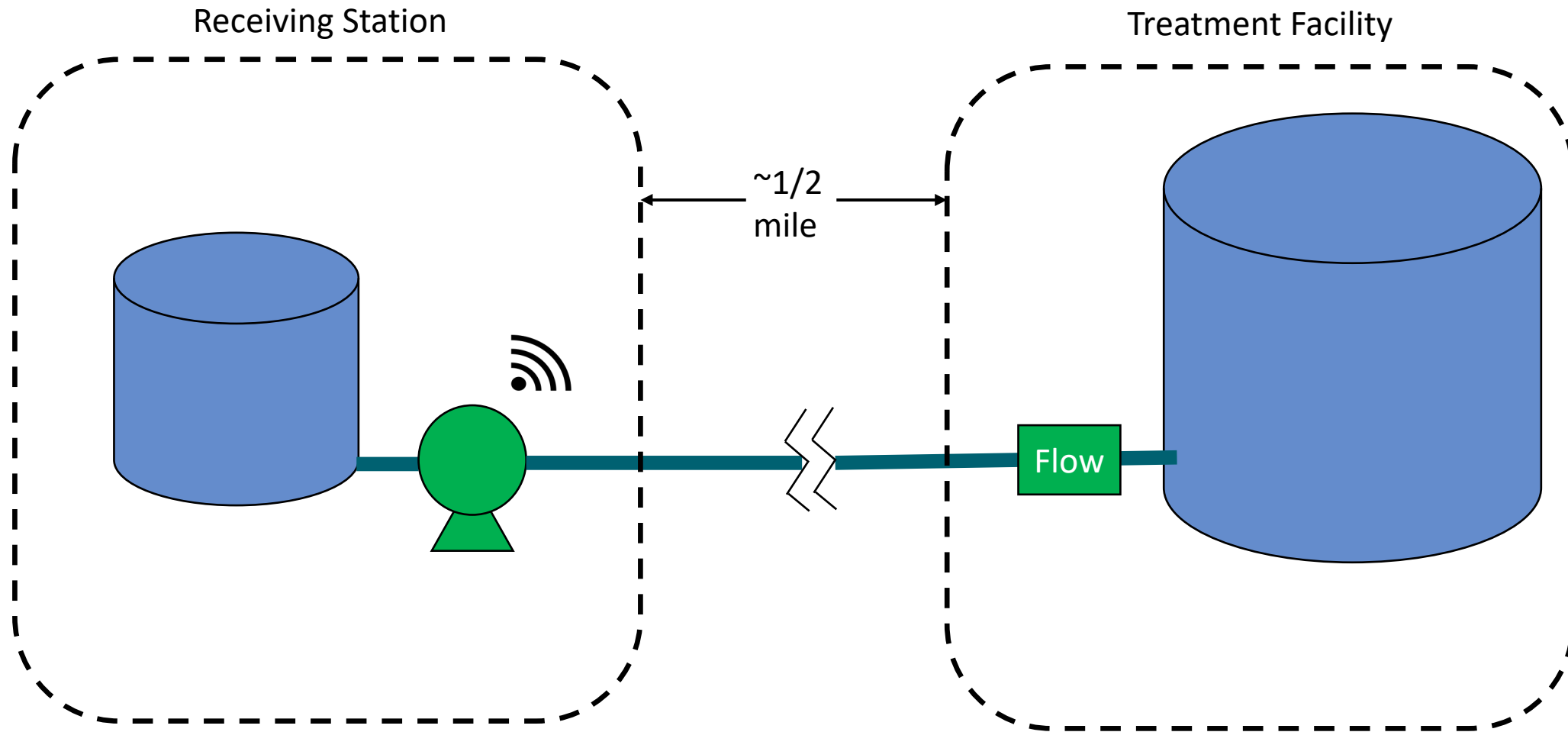# Remember: Definition of an Alarm

X • An alarm indicates a problem or abnormal event.
  • Not normal process condition or event

X • An alarm requires a Response
  • Not just for informational purposes

• An alarm is targeted to the operator
  • Not for Engineering, Maintenance, or Compliance

GCA

Example of the system working

Receiving Station

Treatment Facility

~1/2 mile

Flow

Final Tips/Lessons Learned: Setting up an alarm system

- Consider starting from scratch instead of modifying what you have
- Find an organized way to go through system
  - P&IDs
  - HMI screens
  - PFD
- Keep it up to date.

GCA

Questions?

Joanne MacDougall, P.E.
jmacdoug@gcatx.org

GCA