USAG Humphreys
Slug Prevention Plan

21 Feb 2020

Environmental Division, DPW
USAG Humphreys

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EMERGENCY AND TECHNICAL ASSISTANCE NUMBERS

KEGS CROSS-REFERENCE TABLE

KEGS REQUIREMENT	DESCRIPTION	PLAN SECTION
4-3c(6)(a)	Description of discharge practices, including non-routine batch discharges.	3
4-3c(6)(b)	Description of stored chemicals.	4
4-3c(6)(d)	Necessary practices to prevent accidental spills.	5
4-3c(6)(f)	Necessary procedures to control toxic organic pollutants and solvents.	5.3
4-3c(6)(e)	Procedures for building containment structures and equipment.	5.4
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4-3c(6)(c)	Plan for immediately notifying the DWTS of slug discharges and discharges that would violate prohibitions under KEGS chapter 4, including procedures for subsequent written notification within five days.	7

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BOD	Biochemical Oxygen Demand
CFR	Code of Federal Regulation
COD	Chemical Oxygen Demand
DOD	Department of Defense
DPW	Directorate of Public Works
DWTS	Domestic Wastewater Treatment System
EPA	Environmental Protection Agency
EO	Environmental Officer
FD	Fire Department
FIC	Facility Incident Commander
FOG	Fats, Oils, and Grease
FRT	Facility Response Team
HAZCOM	Hazard Communication
HM	Hazardous Material
HMMP	Hazardous Material Management Plan
HMSA	Hazardous Material Storage Area
HS	Hazardous Substances
HW	Hazardous Waste
HWAP	Hazardous Waste Accumulation Point
HWMP	Hazardous Waste Management Plan
IU	Industrial User
IWTS	Industrial Wastewater Treatment System
KEGS	Korea Environmental Governing Standards
KN	Korean National
MWR	Morale Welfare and Recreation
OHS	Oil and Hazardous Substance
OWS	Oil/Water Separator
PAO	Public Affairs Officer
POL	Petroleum Oil Lubricants
POTW	Publically Operated Treatment Works
ROK	Republic of Korea
SFO	Senior Fire Official
SOP	Standard Operating Procedure
SP	Slug Prevention
SPRP	Spill Prevention and Response Plan
TN	Total Nitrogen
TP	Total Phosphorous
TSS	Total Suspended Solids
UFGS	Unified Facilities Guide Specifications
USAG	U.S. Army Garrison
USFK	United States Forces Korea

1 GENERAL INFORMATION

1.1 INTRODUCTION

The General Pretreatment Regulations (40 CFR 403.5(b)) define slug loading as any pollutant discharge that can create a fire or explosion hazard, can cause corrosive structural damage, can cause obstructions to flow, or that can react to form toxic gases, vapors, or fumes. Slug discharges include, but are not limited to, accidental spills and high strength batch discharges. This Slug Prevention (SP) Plan documents measures to prevent and control slug discharges to the DWTSs treating wastewater generated at U.S. Army Garrison Humphreys (USAG Humphreys). This plan includes sufficient general information to enable USAG Humphreys to categorize and restrict the potential for a slug discharge and respond promptly and effectively in the event of an emergency.

1.2 PLAN ORGANIZATION AND ADMINISTRATION

Section 1 of this plan summarizes the plan objectives and provides general information about the main USAG Humphreys installation included in the plan, Camp Humphreys. Section 2 contains the applicable regulatory background and the required aspects of a SP Plan in accordance with Chapter 4 of the KEGS. Sections 3 through 7 describe existing wastewater discharge practices, stored chemicals, slug discharge prevention and controls, slug response procedures, and reporting procedures, respectively. The appendices provide references, sample signs for prevention of unauthorized discharges, Directorate of Public Works (DPW) slug prevention standard operating procedures (SOP), notification forms and reports, reporting procedure diagrams, information on the local DWTS, and a fact sheet for staff education.

This SP Plan will be kept in a location easily accessible to the DPW Environmental Division. The plan will be reviewed annually and updated as needed.

1.3 ROLES AND RESPONSIBILITIES

The following sections detail the roles and responsibilities associated with the implementation of this SP Plan. Specific roles and responsibilities in the event of a spill are located in the SPRP.

Director, Directorate of Public Works, U.S. Army Garrison Humphreys
The DPW Director is ultimately responsible for all slug discharge response and notification actions. Specific responsibilities include:

- Ensure development and implementation of the SP Plan;

- Ensure responsible parties are aware of and knowledgeable in their areas of responsibility as defined in this plan; and,
- Designate other responsibilities as required.

Facility Incident Commander (FIC)

For the purposes of this SP Plan, the FIC is the current Fire Chief for USAG Humphreys. The FIC is responsible for:

- Directing and controlling spill response efforts;
- Mobilizing personnel and equipment for spill response and clean-up;
- Maintaining an updated list of resources including spill response contractors that are available to respond in the event that a spill cannot be handled by Army resources;
- Determining if a spill is reportable and making the appropriate notifications to other DOD-organizations.

Environmental Division, Directorate of Public Works

The Directorate of Public Works (DPW) Environmental Division serves as a technical resource for spill clean-up actions, disposal of contaminants, and environmental issues. Specific responsibilities associated with this SP Plan include:

- Facilitate implementation of and serve as primary point of contact for the SP Plan;
- Ensure that SP Plan is reviewed annually and updated at least every five years or when there are significant changes to installation operations;
- Provide technical assistance on policies and procedures for implementing the SP Plan;
- Ensure that required inspections are conducted;
- Receive and evaluate requests for non-routine batch discharges and provide requesters with appropriate pre-discharge requirements (i.e. laboratory analytical parameters); and
- Review pre-discharge requirements and accept, reject, or impose pretreatment requirements for non-routine batch discharges (See Appendix C)

In the event of a slug discharge, the Environmental Division's responsibilities include:

- Ensure that the appropriate DWTS is notified of the slug discharge as soon as reasonably possible;
- Ensure that the Garrison Commander receives completed Slug Discharge written report within three (3) days;

- Ensure that the follow up written notification is received by the DWTS via the Garrison Commander within five (5) days; and
- Ensure that Responsible Organization implements any corrective actions as required by the DWTS.

Responsible Organization (User)

For the purposes of this SP Plan, a responsible organization is defined as any organization that stores or handles POL products and/or hazardous substances in their operations, routinely discharges to the wastewater treatment system from batch operations, and/or requests to discharge non-routine batch discharges to any USAG Humphreys wastewater system. This includes associated tenants and contractors. Responsible organizations are required to:

- Comply with the KEGS and other applicable Army and Department of Defense environmental regulations and DPW Standard Operating Procedures;
- Implement slug discharge prevention measures as appropriate;
- Notify spill response agency (i.e. Fire Department and DPW Environmental) of any spills entering the wastewater system;
- Provide required information contained in Slug Discharge Notification Form (Appendix B);
- Submit completed Slug Discharge written report to DPW Environmental Division within three days following the event;
- Develop an after action corrective plan if deemed necessary by the Garrison Commander or DPW Environmental Division;
- Maintain copies of Slug Discharge Notification and Corrective Action Plans and make available for review upon request;
- Request and obtain permission from DPW Environmental Division prior to any non- routine discharges;
- Ensure personnel receive appropriate training on slug discharge prevention responsibilities related to this plan as described in Section 5.9 of this plan; and
- Notify the DPW Environmental Division of any significant changes to the facility operations, inventories, or wastewater discharges.

2 SLUG DISCHARGE PREVENTION REQUIREMENTS

2.1 APPLICABLE REGULATION

Chapter 4 of the KEGS requires that installations with significant potential for spills or batch discharges develop a SP Plan that contains the components required by Section 4-3.c.(6). Other sections of the KEGS that are relevant to this plan include Section 4-3.c, which establishes effluent limitations for industrial indirect dischargers.

This SP Plan also references the most recent Hazardous Management Plan, Hazardous Waste Management Plan, and SPRP for U.S. Army Garrison Humphreys, which were based on the applicable requirements of the KEGS. The SPRP is especially relevant as it identifies facilities storing and using POL and hazardous substances and provides site-specific recommendations for spill prevention. The SPRP also includes procedures for controlling and reporting spills as required by the KEGS.

2.2 SANITARY SEWER AND WASTEWATER TREATMENT SYSTEM

Wastewater from Camp Humphreys is treated by the Paengseong DWTS which is operated by Pyeongtaek City. The existing plant has been in operation since 2014 and has since been expanded to accommodate the growth of Camp Humphreys. The plant has a design capacity of 14,200 cubic meters per day (3.8 MGD), though it is currently operating at 50% capacity, and makes use of conventional pre- and primary treatment processes, an advanced phase isolation ditch (APID) system, and disinfection with chlorine. Phased isolation ditch technology is a type of continuous flow activated sludge process which alternates between oxic (nitrification) and anoxic (denitrification) phases in separate reactors. (Ref 5) Phase alternation is based on either continuous monitoring of nutrient levels or by a predetermined flow sequence. The plant discharges its treated effluent into Dunpo Stream, a tributary of the Anseong River, a Class II river (KEGS, Table 4-4). Contact information for the plant and a general flow diagram are provided in Appendix F.

2.3 SLUG DISCHARGE DEFINITION

The General Pretreatment Regulations (40 CFR 403.5(b)) define slug loading as any

pollutant discharge that can create a fire or explosion hazard, can cause corrosive structural damage, can cause obstructions to flow, or that can react to form toxic gases, vapors, or fumes. Slug discharges include, but are not limited to, accidental spills and high strength batch discharges. For the purposes of this plan, a slug discharge is defined as any non-routine discharge to the wastewater system that has a reasonable potential to inhibit any of the DWTS treatment processes, cause contaminant pass through or violation of regulatory conditions, affect the normal operations of the facility, and/or endanger the health and safety of DWTS employees.

The Paengseong Wastewater Treatment Plant exclusively services Camp Humphreys and the RoK Army compound, with the bulk of wastewater originating from Camp Humphreys. There have been historical incidences of slug discharges that are suspected to have originated from Camp Humphreys and resulted in the plant effluent unexpectedly exceeding regulatory compliance thresholds. One such incident involved the suspected discharge of used conditioning water from a newly constructed boiler that resulted in elevated concentrations of total phosphorous in the DWTS effluent. In response to this incident, the DPW developed SOP #11 (Appendix C). Another incident involved the suspected discharge of glycol-containing antifreeze from the chilled water line of a closed-loop air conditioning system that resulted in elevated COD in the DWTS effluent. In response to this incident, the DPW and facility manager implemented facility-specific corrective actions including replacing and protecting the damaged valve responsible for the leak. For Paengseong DWTS, it is appropriate to consider these previous incidents when defining slug discharges.

Hazardous Substances

The functional definition of a slug varies and depends upon the type and capacity of the treatment plant. Treatment plants for large populations often adopt the pollutant reportable quantity (RQ) as the quantitative definition of a slug. (Ref 1) Table B-4 of the KEGS lists hazardous materials/ substances/ wastes and their corresponding RQs. The following table presents a list of hazardous substances identified during the 'Slug Prevention Assessment':

Typical Hazardous Substances and their RQ

Hazardous Substance	RQ (lbs.)	RQ (gal)
Ammonia (10%)	100	20
2,4-D	100	10
Bromine	1	0.1
Caustic soda (5%)	1,000	90
Cyclohexylamine	1	0.1
Ethylene glycol	5,000	550
Formaldehyde (1%)	100	10
Hydrochloric acid	5,000	500
Methyl ethyl ketone	5,000	750
Sodium bisulfite	5,000	450
Sodium hydroxide (5%)	1,000	100
Sodium hypochlorite	100	10
Sodium phosphate, tribasic	5,000	550
Sulfuric acid	1,000	100

Note: Since spills of liquid substances are of greater concern in slug prevention than solid substances, the volumetric RQ has been estimated for reference.

A slug discharge of a hazardous substance would interfere with key physical, chemical, and biological processes at the DWTS, resulting in incomplete treatment an exceedance of an effluent criteria. For example, toxic chemicals such as heavy metals and sodium hypochlorite may inhibit biological treatment processes, including nitrification and denitrification.

Conventional Pollutants

Slug discharges of conventional pollutants from Camp Humphreys to the Paengseong DWTS may result in an exceedance of an effluent monitoring criteria. Conventional pollutants include total nitrogen, total phosphorous, COD, pH, and suspended solids. A slug discharge of a conventional pollutant, such as a high nitrogen or phosphorous-containing, corrosive, or high COD substance or material to the sewer may exceed the treatment capacity of the DWTS (i.e. pass-through), resulting in an exceedance of a monitoring criteria. The following table provides a list of DWTS effluent monitoring criteria, their respective standards, and common sources:

Summary of Effluent Monitoring Criteria

Criteria	Influent[1] (mg/L)	Effluent[1] (mg/L)	Effluent Standard (mg/L)	Common Industrial Sources
Total phosphorous (TP)	7.1	0.19	2	Boiler water conditioning chemicals, boiler system commissioning chemicals, fertilizers
Total nitrogen (TN)	55	7.3	20	Fertilizers, boiler conditioning chemicals, cleaners (quaternary ammonium compounds, ammonia)
Chemical oxygen demand (COD)	85	21.9	40	Various
Suspended solids (SS)	--	1.4	10	Various
pH	7.1	6.4	5.8-8.6	Water treatment plants

Note: Values collected from Paengseong DWTS on 17 June 2019.

Glycols

Glycols are commonly used as an additive to closed, chilled water systems due to their ideal heat exchange properties and for freeze protection. Glycols are also the active ingredient in automotive antifreeze. Based on data collected from EESOH-MIS (9 September 2019), approximately 11,400 gallons of glycol-containing antifreeze is stored on Camp Humphreys. Glycols are not especially toxic and are readily biodegradable under aerobic conditions, but have a high oxygen demand. The biochemical oxygen demand (BOD) of ethylene glycol is estimated at 800,000 mg/L and 1,000,000 mg/L for propylene glycol, depending upon the concentration of the solution. (Ref 6) The average COD for the wastewater effluent from Camp Humphreys is less than 100 mg/L as measured at Paengseong DWTS. In the event of a slug discharge of glycol, the DWTS may be unable to provide adequate dissolved oxygen to sustain aerobic oxidation of organic matter within the normal plant operating constraints, exceeding the plants treatment capacity and resulting in a release of untreated waste. Glycols are discussed further in Sections 3.2 and 5.8 of this plan.

Note: Although BOD and COD are not equivalent, they are well-correlated parameters. The manufacturer value ranges for average COD:BOD ratio for ethylene glycol and propylene glycol are 2.08 and 2.23, respectively. (Ref 7) Therefore, the COD value for a pure solution of ethylene glycol is approximately 1,600,000 mg/l and 2,200,000 mg/l for pure propylene glycol.

Petroleum, Oil, and Lubricants (POL)

POL are complex mixtures of aliphatic and aromatic hydrocarbons. The Paengseong DWTS has processes for removing solids such as screens and grit chambers, but does not have an oil-water separator (OWS) or other physical separation process that can be used to remove POL. Therefore, any POL that enters the sanitary sewer system may pass through the DWTS untreated or cause obstructions or interference within the plant. OWS pretreatment systems are necessary to prevent POL from entering the

sanitary sewer system. However, pretreatment systems will not remove dissolved POL substances or small oil droplets. POL and OWS are discussed further in Sections 3.1, 5.4, 5.6, and 5.8 of this plan.

Heavy Metals

Elevated levels of heavy metals in wastewater can cause operational problems for biological treatment processes involving secondary treatment. Disruption of a DWTSs biological processes is referred to as inhibition and can interfere with the plants ability to remove BOD/ COD and other pollutants. The following table lists several heavy metals that the USEPA (Ref 4) considers 'Pollutants of Concern' for their potential to inhibit biological processes and impact sludge quality:

Summary of Pollutants that Inhibit Biological Treatment Processes

Pollutant	Activated Sludge Inhibition Threshold Levels, mg/L	Nitrification Inhibition Threshold Levels, mg/L	Anaerobic Digestion Inhibition Threshold Levels, mg/L
Arsenic	0.1	1.5	1.6
Cadmium	[1-10]	5.2	20
Chromium	[1-100]	[0.25-1.9]	110
Copper	1	[0.05-0.48]	40
Cyanide	[0.1-5]	[0.34-0.5]	[1-4]
Lead	[1-5]	0.5	340
Mercury	[0.1-1]	NR	NR
Nickel	[1-2.5]	[0.25-0.5]	10
Silver	[13-65]	NR	[13-65]
Zinc	[0.3-5]	[0.08-0.5]	400
Molybdenum	NR	NR	NR
Selenium	NR	NR	NR

NR – None Reported; [] – Range of values provided

A review of effluent testing results for OWS at Camp Humphreys indicates concentrations of heavy metals that are less than the Class II limitation but significant enough to impact biological treatment processes if discharged to the sanitary sewer in large volumes. For example, zinc was detected in OWS effluent at concentrations as high as 4.11 mg/L, which is less than the Class II limitation, but greater than the thresholds for inhibition of activated sludge and nitrification. Copper has been detected at concentrations greater than 0.50 mg/L, which is less than the indirect effluent limitation of 3 mg/L, but greater than the threshold for inhibition of nitrification. Finally, cadmium was detected in OWS effluent at a concentration of 0.24 mg/L which exceeds the indirect effluent limitation of 0.1 mg/L but not the inhibition threshold for biological treatment processes.

3 DESCRIPTION OF EXISTING DISCHARGE PRACTICES

A comprehensive review of all non-residential wastewater discharge practices was conducted during the preparation of this plan. Section 3 describes the general discharge practices of interest for this plan that are applicable to the installation. A listing of all specific activities at USAG Humphreys is presented in the Slug Prevention Assessment Report (Ref 12) and has been included in Appendix J of this plan.

For each activity, the general class or type of chemical is listed as well as the implication for a slug discharge of the chemical to the DWTS. Based on the definitions of slug discharges and their harmful effects described in Section 2, six (6) implications were identified:

1. *Slug loading*: a discharge of a significant quantity of a pollutant;

2. *Interference*: a discharge that inhibits or disrupts a DWTS, its treatment processes and operations, or its sludge processes, use, or disposal that results in a violation of the DWTSs permit;

3. *Pass-through*: a discharge that enters natural waters from a DWTS in quantities or concentrations that causes a violation of an effluent requirement of the DWTS;

4. *Corrosion*: a discharge of a pollutant that will cause corrosive structural damage to a DWTS;

5. *Health & safety*: a discharge of pollutants that leads to the accumulation of toxic gases, vapors, or fumes in the DWTS in sufficient quantity to cause acute worker health and safety problems;

6. *Flammable/explosive*: a discharge of a pollutant to a DWTS that can threaten the integrity of the collection system and the health and safety of DWTS workers. Specifically, the flashpoint of the pollutant is less than standard temperature (25 ℃ or 77 ℉) or the concentration by percentage is greater than the lower explosive limit.

3.1 EXISTING BATCH DISCHARGE ACTIVITIES

Existing batch discharges can be described as non-continuous discharges other than domestic sanitary waste resulting from normal processes or operations. These discharges are generally thought to contain no hazardous constituents and include pretreatment systems, if necessary. Examples include, but are not limited to, equipment and/or work area wash-down, boiler blow-down, and process tank draining.

In order to minimize harmful impacts on the DWTSs, industrial users that generate batch discharges may be required to implement one or more of the following controls:

- Obtain approval from the Garrison Environmental Division
- Flow equalization
- Pretreatment (OWS, FOG removal, pH neutralization, etc.)
- Sampling/monitoring
- Discharge only at specified times

There are numerous sources of routine discharges on Camp Humphreys and activities relevant to this plan are highlighted below:

BOILER OPERATION AND MAINTENANCE

Camp Humphreys has several low pressure heating boilers that are treated with chemical products that minimize corrosion and scale build-up, extending the service life of the boiler. Specifically, these chemicals incorporate oxygen scavengers such as sulphites, tannins, or carbohydrazide, alkalinity boosters such as sodium and/or potassium hydroxide, and antiscalants such as phosphate blends.

Boiler blowdown is chemically-treated water that is intentionally wasted to maintain the dissolved solids concentration of the boiler water within acceptable limits in order to minimize scale buildup and corrosion. Blowdown water may contain elevated concentrations of phosphorous and nitrogen and is often discharged in batches, at recurring daily intervals. Depending upon the rate of blowdown, chemical treatment program, and total phosphorous and nitrogen concentrations, boiler blowdown may present a slug discharge risk if not properly managed by the responsible organization. In addition to periodic blowdown, boilers require annual maintenance in order to maximize the service life and improve system performance. Maintenance practices may include draining used chemically-treated boiler water and replacing it with fresh chemically-treated water. If drained and discharged to the sanitary sewer system, this boiler water may present a slug discharge risk if not properly managed by the responsible organization. Boilers are also discussed further in Sections 3.2 and 5.8 of this plan.

Chemicals: boiler water treatment chemicals including oxygen scavengers, alkalinity boosters, and anti-scalants.
Implication for DWTS: Slug loading; Interference; Pass-through; Corrosion

FOOD PREPARATION AND DINING FACILITIES

Camp Humphreys has several military and commercial food preparation and dining facilities. These facilities prepare and serve thousands of meals each day and are a significant contributing source of fats, oils, and grease (FOG) to the sanitary sewer

system. FOG can be solid or viscous and can create obstructions in the DWTS and collection system. Cooking oil and waste grease is separated at the point of use and recycled while any remaining FOG is removed by a grease trap or interceptor. The majority of food preparation and dining facilities on Camp Humphreys have grease traps or interceptors that require recurring maintenance to ensure that they remain effective as full grease traps do not prevent FOG from entering the sanitary sewer system. The EPA estimates that the annual production of collected grease trap waste and uncollected grease entering a DWTS can range from 800 to 17,000 pounds per year per restaurant. (Ref 13) A complete list of food preparation and service establishments is provided in Appendix K. Food preparation and dining facilities are discussed further in Section 5.8 of this plan.

Chemicals: Fats, oils, and grease
Implication for DWTS: Obstruction

WASH RACK/ CAR WASH

Tactical vehicle, Government-owned Vehicle (GOV), and commercial wash racks and car wash facilities are located on Camp Humphreys. Tactical vehicles are cleaned with water using hoses with high-pressure nozzles and wash water flows into floor drains and through an OWS and then discharges to the installation sanitary sewer system. Use of detergents is prohibited at tactical vehicle wash racks. GOV and commercial washing facilities also have floor pits that drain to an OWS and discharge to the sanitary sewer. GOV and commercial wash facilities use detergents and soaps, though non-phosphate, biodegradable detergents are preferable. Pollutant chemicals are not routinely discharged from wash racks and car wash facilities in large quantities.

Chemicals: detergents, POL
Implication for DWTS: Interference; Pass-through

DENTAL TREATMENT FACILITIES

Camp Humphreys also has [redacted]) that provide routine dental care, including filling teeth and removing dental amalgam fillings, a potential source of mercury pollution. Dental treatment facilities are discussed further in Section 5.8 of this plan.

Chemicals: Mercury
Implication for DWTS: Interference; Pass-through

3.2 NON-ROUTINE BATCH DISCHARGE ACTIVITIES

Non-routine Batch Discharges are atypical, one-time discharges into the wastewater

system by existing industrial users, parties not included in this plan, or non-Army parties. These discharges include, but are not limited to, septage or porta-potty waste, groundwater cleanup or spill waste, and potable water line chlorination water. Non-routine discharges may also be unanticipated, uncontrolled releases or spills to the sanitary sewer system that are not representative of the normal or expected characteristics of a facility's wastewater discharge.

There are several types of activities on Camp Humphreys that qualify as potential sources of non-routine discharges:

HAZARDOUS SUBSTANCE STORAGE AREAS

Several activities on Camp Humphreys use hazardous materials (HM) and generate hazardous wastes (HW). These activities primarily include vehicle and aircraft maintenance and repair facilities and public works facility operation and maintenance shops [redacted] HWSA on Camp Humphreys. HM and HW is stored in labeled containers, either indoors or in covered, outdoor storage areas. The USAG HUMPHREYS Hazardous Waste Management Plan and Hazardous Material Management Plan describe the procedures for managing hazardous substances in detail. HM and HWAP storage areas do not routinely discharge to the sanitary sewer, though there is a potential for a spill at these sites and a risk to the DWTS if a floor drain or sump is located nearby that discharges to the sanitary sewer. A non-routine discharge to the sanitary sewer system from these sites may consist of petroleum products (e.g. engine oil, lubricating oil, used oil, used fuel), antifreeze, and hydraulic fluid. A well-maintained storage area that is not in close proximity to an open floor drain or other pathway to the sanitary sewer poses little or no risk to the DWTS.

Chemicals: POL, ethylene glycol, paint thinner, misc. HAZMAT
Implication for DWTS: Flammable/explosive; Health & Safety; Slug loading; Interference; Pass-through; Corrosion

NEW BOILER CONSTRUCTION

Per Unified Facilities Guide Specifications (UFGS), heating boilers and piping in newly constructed facilities must undergo passivation treatment and be thoroughly cleaned by filling the system with a solution of trisodium phosphate and/or caustic soda. Total phosphorous is a conventional pollutant that is monitored in the effluent of the DWTS and caustic soda can be corrosive. After filling the system, the water is circulated for 24-48 hours and then discharged, after which the system is flushed with water. Used conditioning water, if drained and discharged to the sanitary sewer system, may present a slug discharge risk if not properly managed by the construction contractor. For example, per Section 3.4 of UFGS 23 52 46.00 20, low pressure boilers with a heating

output of greater than 800,00 BTU/hr should be treated with a phosphate solution consisting of two (2) pounds of trisodium phosphate per one hundred (100) gallons of water, which is approximately 2,000-3,000 mg/L trisodium phosphate or 400-600 mg/L total phosphorous. Passivation treatment for heating boilers and piping may produce several thousand gallons of water with a phosphorous concentration significantly greater than that of the average wastewater flow from Camp Humphreys, posing a moderate risk to the DWTS and probable exceedance of an effluent monitoring criterion. Boilers are discussed further in Section 5.8 of this plan.

Chemicals: Trisodium phosphate, caustic soda
Implications for DWTS: Slug loading; Pass-through; Corrosion

AIR CONDITIONING SYSTEMS

Camp Humphreys has several buildings with four season, closed-loop air conditioning systems with recirculating chilled water lines that contain glycol antifreeze, either ethylene glycol or propylene glycol. The typical concentration of glycol in these AC systems is 30 - 40%, or 300,000 – 400,000 mg/L. As indicated in Section 2.5 of this plan, glycols are not especially toxic and are readily biodegradable under aerobic conditions, but have a high oxygen demand. In the event of a slug discharge of glycol, the DWTS may be unable to provide adequate dissolved oxygen to sustain aerobic oxidation of organic matter within the normal plant operating constraints. Under normal operating conditions, there is little or no risk of a slug discharge of glycol from an AC system. However, there are multiple pathways to the sanitary sewer in the event of a leak or damage to the chilled water system. Also, in the event that faulty valves, gauges, or piping in the chilled water loop require replacement, it may be necessary to drain some or all of the glycol solution in order to conduct repairs. If drained and discharged to the sanitary sewer system, glycol solution may present a moderate slug discharge risk. AC systems are discussed further in Section 5.8 of this plan.

Chemicals: antifreeze solution (30-40% propylene or ethylene glycol)
Implication for DWTS: Slug loading; Pass-through

MEDICAL TREATMENT FACILITIES

[redacted]

and a variety of other outpatient services, including medical laboratory (phlebotomy and clinical and anatomic pathology), pharmacy, nuclear medicine, etc. These facilities utilize chemical solutions, either as reagents or for therapeutic purposes, and store large quantities of these materials on the premises. These facilities would not routinely discharge untreated waste or unused reagents to the sanitary sewer, though there is a

potential for a spill at these sites and risk to the DWTS if a floor drain is located nearby. There is also a risk to the DWTS if chemical reagents and pharmaceuticals are intentionally or unintentionally disposed of in sinks or drains.

Chemicals: formaldehyde, xylene, isopropyl alcohol (flammable), hospital-grade disinfectants (quaternary ammonium compounds), pharmaceuticals
Implication for DWTS: Slug loading; Interference; Pass-through; Flammable/explosive; Health & safety

FACILIITY O&M AND SHOP WORK AREAS

Maintenance and shop work areas are the point of use for a variety of hazardous materials and the point of generation of hazardous wastes at Camp Humphreys. The

floor drain or deep sink nearby. The USAG Humphreys Hazardous Waste Management Plan and Hazardous Material Management Plan describe the procedures for managing hazardous substances in detail. The USAG Humphreys Spill Prevention and Response Plan describes procedures for spill prevention and response. If the Responsible Organization adheres to the requirements in the aforementioned plans, then maintenance and shop work areas pose little or no risk to the DWTS.

Chemicals: POL, glycol antifreeze, paints, paint thinner, paint stripper, Hydrochloric acid, sodium hypochlorite, miscellaneous HAZMAT
Implication for DWTS: Slug loading; Interference; Pass-through; Flammables/explosives; Corrosion

AIRCRAFT HANGARS AND VEHICLE MAINTENANCE FACILITIES

Aircraft and vehicle (GOV and tactical) maintenance and repair facilities are the point of use for a variety of hazardous materials and the point of generation of hazardous wastes

there is a floor drain or deep sink nearby. The USAG Humphreys Hazardous Waste Management Plan and Hazardous Material Management Plan describe the procedures for managing hazardous substances in detail. The USAG Humphreys Spill

Prevention and Response Plan describes procedures for spill prevention and response. If the responsible organization adheres to the requirements in the aforementioned plans, then maintenance and shop work areas pose little or no risk to the DWTS.

Chemicals: POL, glycol antifreeze, paints, paint thinner, paint stripper, hydrochloric acid, sodium hypochlorite, miscellaneous HAZMAT
Implication for DWTS: Slug loading; Interference; Pass-through; Flammables/explosives; Corrosion

RECREATIONAL SWIMMING AND TRAINING POOLS

[redacted] room. Though these chemicals are not routinely discharged at high concentrations to the sanitary sewer, the chemical injection rooms have floor drains which flow to the sanitary sewer system and the potential for a spill exists. The overflow system for the indoor pools is plumbed to the sanitary sewer system and all pool water is drained to the sanitary sewer system during seasonal closure and annual maintenance. The residual chlorine level in the pools is at least 1 ppm, but ranges from 1.5 to 3 ppm and the pH is ~7. Pools are discussed further in Section 5.8 of this plan.

Chemicals: hydrochloric acid, sodium hypochlorite, bromine
Implication for DWTS: Slug loading; Interference; Corrosion

PESTICIDE STORAGE AND MIXING SHOPS

[redacted] However, pesticide formulation is conducted indoors in sinks that drain to pits that are not connected to the sanitary sewer system, therefore there is no pathway to the sanitary sewer system and no risk to the DWTS if mixing occurs in the designated areas and pesticides are stored in accordance with installation policy. Non-routine discharges of pesticides could result from accidental spills.

Chemicals: water-soluble pesticides, including glyphosate, 2,4-D, carbaryl (carbamate), cyfluthrin (pyrethroid), fipronil (phenylpyrazole)
Implication for DWTS: Interference

3.3 SPECIFIC DISCHARGE LOCATIONS

A detailed list of all industrial users (IU) discharge locations, including HWAP/HMSA, OWS, and wash racks, are included in Appendix K and in the SPRP.

4 GENERAL DESCRIPTION OF STORED CHEMICALS

Industrial users that handle and store hazardous substances include vehicle and aircraft maintenance shops, facilities operation and maintenance shops, health care facilities, dining facilities, gas stations, bulk fuel storage areas, wash racks, boilers, air conditioning systems, swimming pools, water treatment plants, and POL laboratories. A complete list of all hazardous materials used on Camp Humphreys is maintained on EESOH-MIS and each hazardous substance storage area (HWAP/ HMSA) maintains an inventory and current safety data sheets (SDS). The following table contains a list of common hazardous substances stored at Camp Humphreys and the most common unit of issue:

Common Hazardous Substances on Camp Humphreys	
Hazardous Substance	*Unit of Issue*
Acetic acid, glacial	5 lb bottle
Acetone	5 gallon can
Aircraft exterior cleaners	55 gallon drum
Antifreeze ethylene glycol	55 gallon drum
Antifreeze propylene glycol	5 gallon can
Automotive lubricant grease	5 gallon can
Brake fluid	1 gallon can
Brominating tablets	50 lb container
Caustic soda (sodium hydroxide)	5 gallon can
Corrosion control chemical	5 gallon can
Corrosion removing compound, acidic descaler	5 gallon can
Disinfectant, Calcium hypochlorite	50 lb drum
Disinfectant, Sodium hypochlorite	5 gallon can
Enamel paint	1 gallon can
Herbicides	1 gallon can
Hydraulic fluid	55 gallon drum
Ice melt /de-icing chemical, runway	265 gallon container
Insecticides	1 gallon can
Isopropyl alcohol	5 gallon can
Latex paint	1 gallon can
Lubricating oil	55 gallon drum
Methyl ethyl (propyl) ketone	5 gallon can
Hydrochloric acid (HCl 35%)	5 gallon can
Paint primer	2 gallon can
Paint stripper/ remover	1 gallon can
Paint thinner	5 gallon can
Scale prevention chemical	5 gallon can
Sodium bisulfite, pool/spa pH reducer	50 lb container
Solvent parts cleaner	5 gallon can
Sulfuric acid (37%)	1 gallon can
Toluene	1 gallon can
Transmission fluid	5 gallon can

Note: Data obtained from EESOH-MIS on 9 September 2019.

5 SLUG DISCHARGE PREVENTION

The following section provides general slug prevention measures that will be followed by all industrial users. Activity- specific recommendations for improving slug prevention and control measures are included in the Slug Prevention Assessment Report (Ref 12).

5.1 GENERAL SLUG PREVENTION CONTROLS

General slug prevention controls include engineering controls to eliminate pathways to the sanitary sewer and administrative controls such as overall housekeeping, basic spill prevention, and operation and maintenance procedures. The following table lists the general slug prevention controls that are recommended for all industrial facilities at Camp Humphreys.

General Slug Prevention Controls
• Protect floor drains from spills and/or ensure there is no use of hazardous substances near sinks or floor drains; • Plug all unnecessary floor drains, especially those in high-risk areas; • Do not store excessive quantities of hazardous substances and POL at the point of use; • Ensure that facility housekeeping practices are adequate. Hazardous substances and POL will be stored in designated, properly labeled storage areas, be neat and orderly, and clearly labeled. Spills will be promptly cleaned up; • Post signs advising employees not to dispose of hazardous substances/POL down the sinks and drains (See Appendix D); • Train employees and Soldiers on the purpose, operation, and maintenance of pretreatment systems including oil-water separators and grease traps; • Implement appropriate security measures including fences with locked gates, locking fuel pump controls, and securing chemical storage areas; • Ensure that storm water does not discharge into the sanitary sewer system except for designated areas; • Provide all base contractors with a copy of DPW SOP #11, Slug Prevention; and • Develop and implement a written Corrective Action Plan for all known slug discharges.

5.2 MANAGEMENT OF HAZARDOUS SUBSTANCES

USAG HUMPHREYS implements plans for management of hazardous substances that include provisions to protect against accidental slug discharges.

The USAG HUMPHREYS Hazardous Material Management Plan (HMMP) describes in detail the requirements of the installation's hazardous material management program. Specifically, Section 3.4 of the plan lists the requirements for hazardous material storage areas including:

- Restrictions on storing incompatible materials and requirements for storage containers to be compatible with the stored material;
- Permissible stacking/height procedures;
- Provisions for adequate aisle space in storage areas;
- Restrictions on locating HMSAs in areas such that accidental spills or discharges could flow into sanitary sewers.

The HMMP also includes requirements for maintaining appropriate stock levels and procuring hazardous substances in the smallest unit of issue (UI) available that will satisfy the needs of the Responsible Organization. Implementing and enforcing the procedures in the HMMP will significantly reduce the risk of accidental spills of hazardous materials.

The USAG HUMPHREYS Hazardous Waste Management Plan (HWMP) provides guidance to personnel that generate, treat, store, or dispose of hazardous waste. Specifically, section 5.2.6 list requirements for container management which, if implemented, will significantly reduce the risk of an accidental slug discharge including:

- Containers holding hazardous waste will be in good condition and free of rust, bulges, or severe structural defects;
- Containers must not be opened, handled, or stored in a manner that may rupture the container or cause it to leak;
- Containers on pallets must be secured to the pallet prior to moving;
- Containers must be inspected weekly for sings of leakage, deterioration, and the integrity of the containment system; and
- Containers holding liquid wastes will be stored away from floor drains that lead to the sanitary sewer.

5.3 MEASURES TO CONTROL TOXIC ORGANIC SUBSTANCES AND SOLVENTS

Materials containing organic compounds, metals, and solvents can pose a threat to the DWTS. Camp Humphreys has several facilities that store and/or use substances containing toxic organic pollutants and/or solvents. These facilities include the consolidated Hazardous Waste Storage Area and HAZMART Center, the pest management shops, the MWR swimming pools, and the DPW water treatment plants. The DPW Environmental Division will ensure that individual facility chemical use records in EESOH-MIS adequately document the quantities and types of chemicals stored, used and disposed, as well as the disposal methods. The following table lists controls for facilities using materials containing toxic organic pollutants and/or solvents:

Toxic Organic Pollutants/Solvents Controls
• Ensure that toxic organic substances and solvents are used only in designated and centralized locations that are contained and/or enclosed; • Ensure that pesticide mixing and formulation occurs only in designated areas; • Ensure that spent solvent is not disposed of in the wastewater system by implementing procedures for collection and disposal of spent solvents as hazardous waste; • Ensure that appropriate spill control and response measures are implemented near solvent use areas; • Substitute less hazardous materials for those currently used, if possible, to reduce the potential for toxic slug discharges

The USAG HUMPHREYS Hazardous Waste Management Plan includes procedures for the management of toxic organic substances and solvents. If the HWMP is properly implemented, there is little or no risk of spent solvents being disposed of in the wastewater system. The installation pollution prevention plan will identify opportunities for substituting toxic organic substances and solvents for less hazardous alternatives. Processes that use HM containing toxic organic pollutants and solvents will be evaluated and substitute compounds will be used, if available.

5.4 CHEMICAL STORAGE AND PROCESS TANKS

In addition to the requirements listed in Sections 5.2 and 5.3, the following requirements also apply to chemical storage and process tanks and chemical-containing equipment:

Storage/Process Container Controls
• Construct containers of material compatible with the material being stored. • Equip containers with appropriate and adequate liquid level sensing, overflow, temperature, and/or pressure alarms and grounding apparatus. • Equip with alarm systems to detect unauthorized discharge flows, pH excursions, etc. • Construct adequate secondary containment in accordance with Section 5.5. • Ensure that container foundations and supports are in good structural condition and are protected from collision damage. • Ensure that routine inspections and preventive maintenance on containers, valves, piping, and equipment is adequate. • Ensure that containers and equipment are not located near a floor drain.

5.5 SECONDARY CONTAINMENT

Per the KEGS, the term "adequate secondary containment" means an impervious containment system such as a dike, berm, containment curb, drainage system or other device that will prevent the escape of spilled material into the surrounding soil or, in the case of slug discharges, the nearest floor drain or pathway to the sanitary sewer.

HAZARDOUS SUBSTANCES
Secondary containment structures for hazardous substances will meet the following requirements:

- Must be sufficiently impervious to contain leaks, spills, and accumulated precipitation until a discharge is detected and removed; and
- Must have sufficient capacity to contain ten percent (10%) of the volume of the stored HM or the volume of the largest container, whichever is greater.

Hazardous material storage tanks for chemical injection systems (e.g. boiler anti-scalant/anti-corrosion chemicals, chiller glycol, drinking water and swimming pool chlorine and pH reducers) are often located indoors and in close proximity to floor drains. Adequate secondary containment will prevent spills or leaks from the tanks to

the sanitary sewer system. Hazardous substance process areas were evaluated on the adequacy of spill prevention devices, condition of tank system components, and preventive maintenance practices during the preparation of this plan. Specific recommendations can be found in the Slug Discharge Assessment Report presented in Appendix J.

PETROLEUM, OIL, AND LUBRICANTS

According to Chapter 9 of the KEGS, all POL storage containers on Camp Humphreys must be provided with a secondary means of containment (e.g., dike) capable of holding the entire contents of the largest single tank plus sufficient freeboard to allow for precipitation and expansion of product. Alternatively, POL storage containers that are equipped with adequate technical spill and leak prevention options (such as overfill alarms and flow shutoff or restrictor devices) may provide secondary containment by use of a double wall container, with interstitial monitoring.

In addition to the volumetric requirements for secondary containment structures, containment structures must also meet the following requirements for POL containment in accordance with Section 9-3.b. of the KEGS:

- Maximum permeability of 10^{-7} cm/sec;
- Equip with drainage valve that can be locked closed when not in active use;
- Design in accordance with good engineering practice to prevent unintentional discharges by use of overflow prevention devices;
- Buried metallic tanks and associated piping must be equipped with corrosion protection in accordance with recognized industry standards.

In general, the bulk storage containers (containers □ 55 gallons) on Camp Humphreys are equipped with an adequate means of secondary containment and/or stored within enclosed buildings. Aboveground Storage Tanks (ASTs) are typically double-walled and/or constructed with a secondary containment with sufficient volume to contain the entire tank contents plus adequate freeboard for anticipated precipitation. The secondary containment drains are connected to oil/water separators, which are typically connected to the sanitary sewer systems. Since the OWSs on Camp Humphreys discharge to the sanitary sewer, it is important that these pretreatment systems be maintained in order to mitigate the risk of slug discharges due to leaking tanks or spills.

Construction drawings for new bulk storage tanks and hazardous material/waste storage areas are reviewed by DPW Environmental Division to ensure that designs are in compliance with the secondary containment requirements defined in the KEGS. If

construction of secondary containment is not feasible, other means of spill prevention measures can be implemented as determined by a licensed or certified authority preparing the installation SPRP.

5.6 POL STORAGE/PROCESS TANKS, PIPING, AND APPURTENANCES

In general, the KEGS criteria for POL requires storage tanks and pipelines to be compatible with stored material and to be periodically tested, to have corrosion protection, overfill prevention devices, and adequate pipe supports, and to have provisions for traffic protection. Structural and mechanical inspections will be performed on Aboveground Storage Tanks (AST), pipelines and Oil/Water Separator (OWS) on a regular basis. As indicated in Section 5.4, POL storage containers must have a secondary containment with the capacity to contain the entire contents of the largest single tank plus sufficient freeboard for precipitation and product expansion or be double-walled and have adequate leak prevention provisions. The following table lists recommended storage/process components items:

Storage/Process Container Controls
• Construct containers of material compatible with the material being stored and equip with appropriate and adequate liquid level sensing, overflow, temperature, and/or pressure devices and grounding apparatus. • Ensure that container foundations and supports are in good structural condition and are protected from collision damage. • Ensure that preventive maintenance on containers, valves, piping, and equipment is adequate. • Ensure that pipes, valves, piping, and fittings have adequate

5.7 HANDLING AND TRANSFER PROCEDURES

Personnel will exercise extreme caution when handling or transferring hazardous substances or POL in order to prevent spills and accidental discharges. Only personnel who are trained in properly handling POL or specific hazardous materials and have had Hazard Communication (HAZCOM) training will handle these materials. When significant quantities of POL or hazardous substances are transferred (POL □ 55 gallons, hazardous substance □ reportable quantity), all down gradient wastewater drainage openings (floor drains, etc.) within a 50 foot radius will be blocked prior to beginning the transfer. In addition, personnel will ensure that an adequate supply of absorbent materials is readily available.

55-gallon drums will not be lifted directly with the forks of a forklift. Pallets or other

lifting aids will be used to avoid potential damage to the drums during handling and lifting. The following table lists handling and transfer related controls:

Handling/Transfer Controls
• Ensure that storage container handling equipment is adequate for the type and quantities of containers used (i.e. no use of fork lift forks to directly lift drums, etc.). • Ensure that handling and transfer is conducted within properly contained areas and/or down gradient wastewater system entry points are blocked prior to handling/transfer.

5.8 LOADING AND UNLOADING OPERATIONS

Loading and unloading operations will be conducted by personnel trained in the handling of POL or specific hazardous materials and have had the appropriate HAZCOM training. The following procedures will be implemented during loading operations:

Loading Procedures
• Inspect vehicle tanks for discharges prior to filling and departure and ensure that required repairs are made to prevent discharge during transit. • Establish a system to ensure that vehicles do not depart prior to disconnection of oil/fuel transfer hoses or lines. • Ensure that any secondary containment valves are in the closed position prior to filling. • Place drip pans under connection points and other points with the potential for leakage to occur.

Loading/unloading pump station controls will be locked in the off position and accessible only to authorized personnel when the pumps are not in use. Loading/unloading connections of oil pipelines or facility piping will be securely capped or blank-flanged when not in service or when in standby service for an extended period of time. The following table lists loading and unloading area controls:

Loading/Unloading Controls
• Ensure that loading/unloading areas have appropriate curbing and drains, warning signs, improper disconnect protection, secondary containment, and/or spill response materials are readily available. • Ensure that connection points and other points with potential for leakage are provided with drip pans. • Ensure that loading/unloading pump station controls are secured. • Ensure that secondary containment valves are in the closed

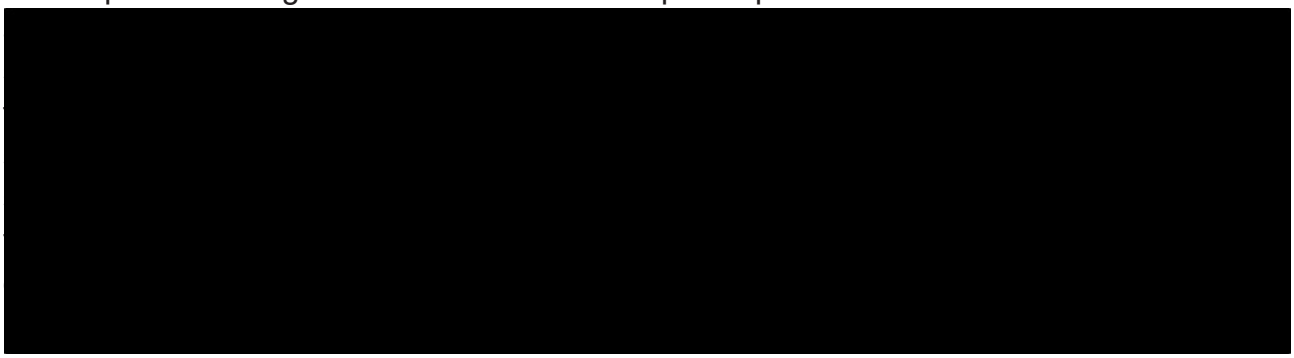
5.9 PRETREATMENT

Specific pretreatment controls may be required at facilities in order to ensure that batch discharges to the wastewater system do not result in slug loadings. Pretreatment requirements are based on the types and quantities of potential discharges from a facility. The following table provides a summary of general pretreatment control measures:

General Pretreatment Control Measures
• Ensure that oil/water separators and grease interceptors are installed correctly, are in good working condition, and are properly maintained; • Ensure that existing pretreatment practices for routine batch

Specific pretreatment control measures are as follows:

OIL-WATER SEPARATORS (OWS)
Oil-water separators are pretreatment systems that remove POL from wastewater streams and prevent it from entering the sanitary sewer system. However, these pretreatment systems will not remove dissolved POL substances or small oil droplets and require recurring maintenance to ensure optimal performance. There are



leading to wastewater surges to the DWTS.

The OWSs are used as pretreatment for the following types of discharges:

- AST secondary containment drain water;
- Industrial facility trench and floor drains; and
- Wash rack drains.

According to DPW Environmental Division personnel, a majority of the OWS identified are connected to the sanitary sewer system. Some of the OWSs are isolated from the discharge location via an isolation valve normally kept in the closed position. Others were allowed to directly discharge into the sanitary sewer system. The majority of the OWSs are maintained by a contractor through a contract administered by DLA Energy. A list of OWSs on Camp Humphreys that discharge to the sanitary sewer system are provided in Appendix K.

GREASE INTERCEPTORS/ TRAPS

[redacted]

ensure proper operation, grease traps and interceptors will be maintained on a monthly or bi-monthly basis, depending upon the rate of accumulation of grease and food solids debris. The complete contents of the trap or interceptor will be pumped to ensure that all fats, oils, and grease as well as food solids are removed during each service call. Any deficiencies with the interceptor/trap will be noted at this time, such as a missing or partially corroded outlet T.

BOILERS

The boilers located on USAG HUMPHREYS are maintained by contract and are used for generating hot water and steam. All boilers discharge blow down water to the storm sewer system. Blow down water will be monitored periodically for total phosphorous, total nitrogen, and pH and pretreatment systems will be installed, if necessary. For example, corrosive blowdown and process water will be evaluated by the Garrison Environmental Division before being discharged to the sanitary sewer system. For larger boilers, it is recommended that automated neutralization systems be installed to monitor the pH of the influent and effluent water in real-time.

HYPER-CHLORINATED WATER

Per ANSI/AWWA Standard C651-92, the conventional practice for disinfecting water mains following the installation and/or repair of potable water system components, including main water lines, storage tanks, and plumbing components, is to fill the affected section with hyper-chlorinated water (as much as 300 mg/l). Prior to discharging hyper-chlorinated water to the storm or sanitary sewer system, it will be

dechlorinated in order to minimize the impact on aquatic life in receiving waters (storm) or reduce the risk of a slug discharge (sanitary). Dechlorination removes the free or total combined chlorine residual remaining after chlorination, typically by adding sulfur dioxide or sulfite salts (i.e., sodium sulfite, sodium hyposulfite/thiosulfate, sodium bisulfite, or sodium metabisulfite). Carbon adsorption is also an effective dechlorination method, but is expensive compared to other methods. Carbon adsorption is usually implemented when total dechlorination is desired. (Ref 14)

NEW CONSTRUCTION/ COMMISSIONING OF BOILER SYSTEMS

As indicated in Section 3.2, used conditioning water, if drained and discharged to the sanitary sewer system, may present a slug discharge risk if not properly managed by the construction contractor. Per DPW SOP #11, contractors shall test used conditioning water for conventional pollutants including pH, BOD, COD, total nitrogen, and total phosphorous and provide the results to DPW Environmental Division. Upon completion of the impact assessment (Appendix C), the contractor will be directed to either discharge the waste to the sanitary sewer or pump and drum the conditioning water and manage as a regulated waste.

AIR CONDITIONING SYSTEMS

As indicated in Section 3.2, in the event that faulty valves, gauges, or piping in the chilled water loop require replacement, it may be necessary to drain some or all of the glycol solution in order to conduct repairs. If drained and discharged to the sanitary sewer system, glycol solution may present a moderate slug discharge risk. Used glycol solution will be drummed and managed as regulated waste.

DENTAL TREATMENT

As discussed in Section 3.1, dental treatment facilities are a potential source of mercury pollution. ISO 11143-certified Hg5 series high volume central suction amalgam separators by Solmetex are installed and maintained by contract. See Figure 23 in Appendix E of the ‘Slug Prevention Assessment Report’ (Ref 12). These separators achieve a greater than 95% removal efficiency of amalgam particles from wastewater.

5.10 TRAINING

Training on the contents of this SP Plan will be held in conjunction with the above training programs and/or during initial and recurring Environmental Officer (EO) training and will comply with the same requirements for training frequency. The SP Plan training will include, but not be limited to:

- Definition and potential impacts of slug discharges;
- Practices for preventing and responding to slug discharges; and
- Slug discharge notification and reporting procedures.

Records of personnel training will be maintained by the DPW Environmental Division as well as the individual units/facilities and will be available for inspection upon request.

5.11 INSPECTIONS

Facilities that were identified as either Moderate, High, or Extremely High slug risk facilities in the Slug Discharge Assessment Report (Appendix J) will be re-inspected annually to ensure that slug prevention control measures are in place and that there are no significant changes to the hazardous material and POL inventories and batch discharge processes.

All other inspections for slug discharge prevention will be on an ‘as needed’ basis. Responsible Organizations are required to notify DPW Environmental Division of process changes with implications for slug discharges. DPW Environmental will identify and assess pollutants discharged, or potentially discharged, by industrial users. The checklist in Appendix H will be used when conducting slug discharge prevention assessments of new and existing industrial users. This information will help the installation:

- Identify new industrial users;
- Identify pollutants likely to be discharged to the wastewater collection system; and
- Evaluate the potential for slug loadings and periods of increased loading from variable discharges.

6 SLUG DISCHARGE RESPONSE

Unanticipated spills or leaks are the most likely cause of slug discharges at Camp Humphreys. These spills or leaks, if discovered, must be remedied and reported to the Paengseong DWTS. There are three (3) relevant 'spill' scenarios that could occur: 1) an equipment malfunction; 2) a defective POL or hazardous substance storage container; and 3) an accidental spill at the point of use.

In general, the response procedures for an accidental spill at the point of use or from a storage tank are identical to those described in the Spill Prevention and Response Plan, which describes procedures for addressing spills of POL and hazardous substances. In addition to the procedures in the SPRP, special precautions must be taken to prevent spills from entering the wastewater system by blocking floor drains and other pathways. If a piece of equipment malfunctions and discharges a pollutant to the sewer system, it is possible that it may go undetected by the Responsible Organization until after the DWTS has been impacted. In this case, it is important to identify equipment with the potential to discharge pollutants to the sanitary sewer and implement the prevention measures identified in Section 5.

For all scenarios, if a known or suspected spill enters the wastewater system, the Fire Department (911) and DPW Environmental Office will be notified immediately by the Responsible Organization. If a large spill enters the wastewater system, the Pyeongtaek DWTS will be notified immediately by the Garrison Commander with prior approval and coordination with HQ USFK, unless infeasible due to an immediate threat to human life or the environment.

6.1 SPILL PREVENTION AND RESPONSE PLAN

The USAG HUMPHREYS SPRP identifies potential spill sources, existing spill controls, and procedures to prevent oil and hazardous substance spills, much of which is also applicable to the prevention of slug discharges. The Spill Contingency Plan describes the responsibilities and procedures for an emergency response to oil or hazardous substance spills and so is referenced within this SP Plan. The SPRP also includes procedures for responding to a POL or hazardous substance spill. Specifically, the SPRP:

- Designates the Facility Incident Commander (FIC), who is responsible for coordinating and directing spill control and clean-up efforts;
- Establishes spill detection and notification procedures;
- Identifies equipment and resources available for spill response and clean-up;

- Describes general and material-specific containment, clean-up and disposal methods; and
- Describes reporting and training requirements.

The following table lists general spill response provisions:

General Spill Response Provisions
• Ensure that emergency communication and notification equipment are adequate and routinely tested. • Ensure that facilities have spill kit(s) with the appropriate amount and type of spill response materials and an adequate supply of equipment to contain spills is readily available. • Ensure that spill response procedures/evacuation plan/emergency numbers are posted and a written spill response plan is accessible. • Ensure that storage containers for spilled material are available. • Ensure that minor spills are immediately cleaned. • Ensure that appropriate personal protective equipment is readily available. • Ensure that a first aid kit, ventilation equipment, decontamination equipment, and fire extinguishing equipment are readily available (if required).

6.2 SPILL ASSESSMENT, RESPONSE, CLEAN-UP, AND DISPOSAL PROCEDURES

The SPRP states that all personnel at activities that handle POL or hazardous substances must be trained in the procedures and safety requirements applicable during a spill incident. According to the SPRP, the first responder is responsible for restricting access to the spill area, evacuating the area, if necessary, and reporting the spill to the Fire Department, if necessary.

For small spills that can be handled by the Responsible Organization, the First Responder will follow the procedures described below and in the SPRP. In addition to the general spill reporting and recordkeeping requirements in the SPRP, the First Responder will take action to protect or block any pathways to the wastewater sewer system. If a small spill enters the wastewater sewer system, the Fire Department (911) and DPW Environmental Office will be notified immediately. For large spills outside of the spill response capabilities of the Responsible Organization, the first responder and/or supervisor is responsible for notifying affected personnel, evacuating the spill area if necessary, and notifying the Fire Department. The FIC (Fire Chief) is responsible for coordinating and directing control and clean-up efforts, notifying the Garrison Commander and the DPW

Environmental Division, and completing the appropriate notifications. If a large spill enters the wastewater system, the Paengseong DWTS will be notified immediately by the Garrison Commander with prior approval and coordination with HQ USFK, unless infeasible due to an immediate threat to human life or the environment.

The supervisor will notify the Fire Department, initiating the notification process detailed in the SPRP. Any notification of ROK agencies will be conducted by the Garrison Commander with prior coordination and approval of HQ USFK, unless infeasible due to an immediate threat to human life or the environment.

The SPRP provides general spill containment, clean-up and disposal methods and also has an inventory of spill response equipment. Material-specific containment, clean-up, and disposal methods are also included in the SPRP. A written corrective action plan will be developed by the RO and presented to DPW Environmental Division for review and approval. The corrective action plan will include recommendations for improving operational, inspection, maintenance, and/or spill response procedures based upon the incident.

The SPRP requires that any POL or hazardous substance spill that meets or exceeds the reportable quantities must be reported to the FIC immediately. The FIC is responsible for maintaining spill records containing the information listed in the SPRP. The Garrison Commander will notify HQ USFK in accordance with procedures described in the Memorandum from HQ, USFK titled ‘USFK’s Spill Response and Reporting Requirements’, dated 31 May 2019.

Specific procedures for notifying Korean DWTSs of suspected or actual slug discharges are provided in Section 7 of this plan.

7 SLUG DISCHARGE NOTIFICATION, REPORTING, AND RECORDKEEPING

Slug discharges from Camp Humphreys can be categorized as unanticipated, unintentional spills or leaks and anticipated, intentional routine and non-routine batch discharges. Unanticipated spills or leaks, if known, that meet the definition of a slug discharge as defined in Section 2.3, must be reported to Paengseong DWTS.

7.1 ACCIDENTAL DISCHARGES

Accidental discharges are spills and/or leaks that enter the wastewater system. Spills are unintentional releases that are not representative of the normal or expected characteristics of a facility's wastewater. In accordance with the KEGS, a plan must be established for notifying the affected DWTS of slug discharges. The flow charts in Appendix E illustrate the steps involved in the slug discharge notification and reporting process. Page iv of this plan contains emergency and reporting agency contact information for USAG Humphreys and USFK.

Notification, reporting, and recordkeeping procedures for accidental discharges will depend upon whether or not the responsible organization is aware that an accidental discharge has occurred. For 'known' occurrences, a proactive approach is necessary. However, for 'unknown' occurrences in which the installation or responsible organization is notified after the impact of a slug discharge has been observed, a reactive approach is more appropriate.

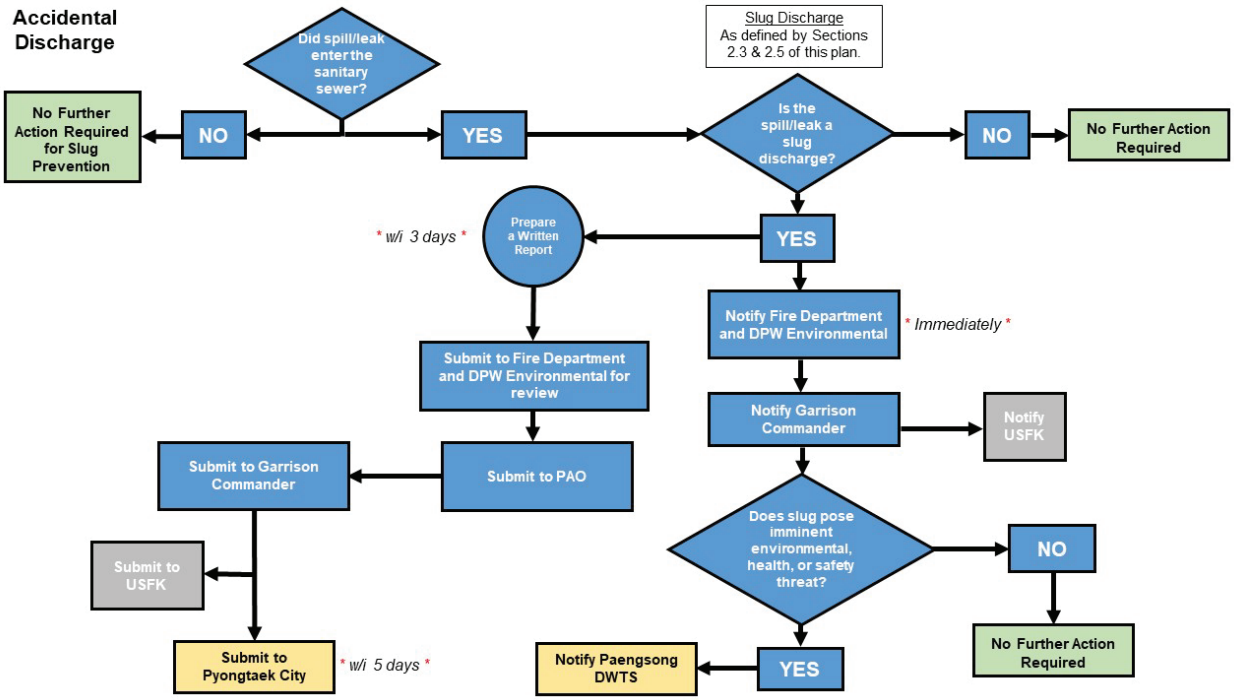
KNOWN OCCURRENCES

In the event of a known, accidental slug discharge to the wastewater system as defined in Section 2.3, the Responsible Organization will follow the response procedures established in the USAG HUMPHREYS SPRP and in Section 6 of this plan. The DPW Environmental Division and FIC will be notified immediately of all spills that enter the wastewater system by the Responsible Organization. The Responsible Organization will complete the Slug Discharge Notification Form (Appendix B) and will submit the form to the FIC and/or DPW Environmental Division as soon as reasonably possible. The DPW Environmental Division and/or the FIC will obtain the information contained in the Slug Discharge Notification Form (Appendix B) from the Responsible Organization and will provide the information to the Garrison Commander in preparation for notification of the Lead Environmental Component (LEC), HQ USFK. Notification will be made to USFK by the Garrison Commander as soon as possible after the discharge. Verbal notification of local officials will be made, as appropriate, with prior coordination with HQ USFK unless infeasible due to

an immediate threat to human life or the environment.

The Responsible Organization shall also complete the Slug Discharge written report and submit it to the DPW Environmental Division and/or FIC within three (3) days following the discharge. DPW Environmental Division and/or the FIC will review the report. Notification of ROK agencies will be conducted by the Garrison Commander with prior coordination and approval of HQ USFK. Written notification will be submitted within five (5) working days to Pyeongtaek City. Appendix F provides contact information for the Pyeongtaek City technical POC. The following figure depicts the notification and reporting process for accidental slug discharges to the sewer system (also presented in Appendix E):

Slug Discharge Notification and Reporting Process



Completed forms and corrective action plans will be maintained by the Responsible Organizations as well as the DPW Environmental Division.

UNKNOWN OCCURRENCES

In the event of an unknown, accidental slug discharge to the wastewater system as defined in Section 2.3, the DWTS will notify the installation once it has determined that it has been impacted by a slug discharge, most likely by either influent or effluent monitoring. Upon notification by the DWTS, the Garrison Commander will notify USFK.

For unknown discharges, the responsible organization is unaware that a slug discharge has occurred and so the DPW Environmental Division, on behalf of the garrison, will investigate the claim and identify potential sources.

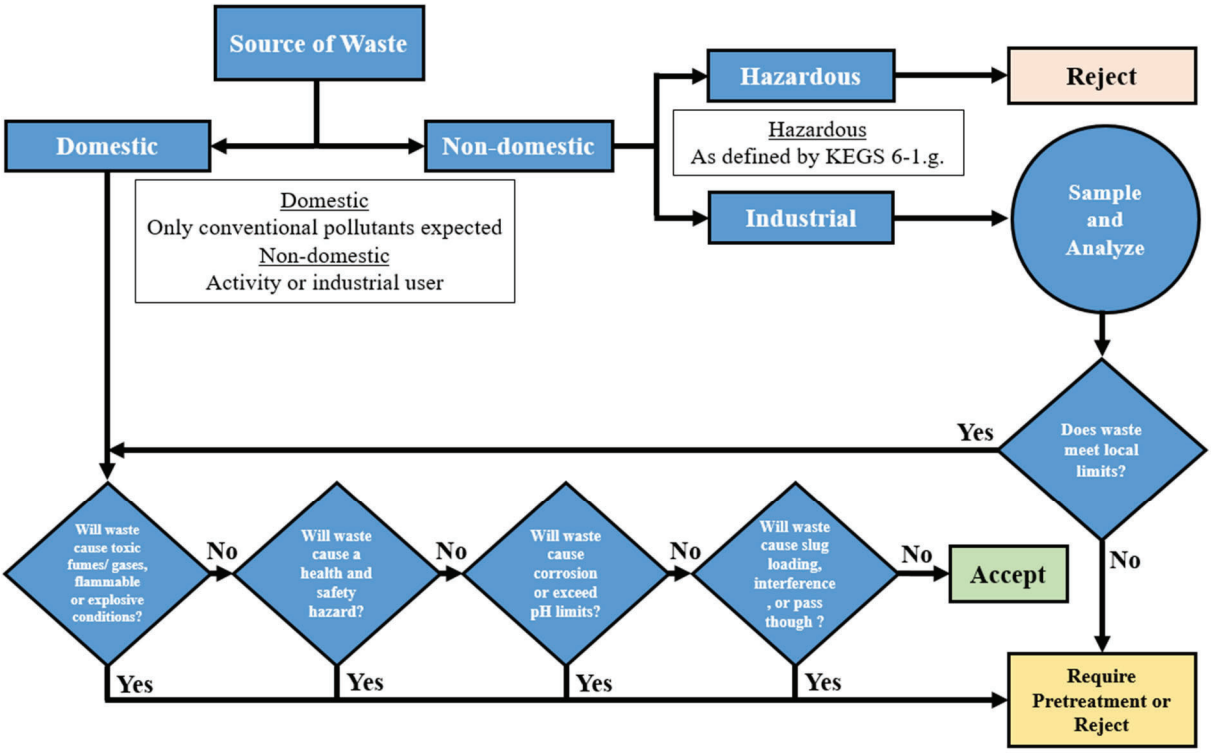
Once the source(s) has been identified, the responsible organization will prepare, submit, and implement a written corrective action plan. If the garrison identifies the source but is unable to identify the responsible organization, the DPW will prepare and implement a written corrective action plan to prevent future slug discharges from the source. If the garrison is unable to determine the source, no further action will be taken.

Records of notification of potential slug discharges by the DWTS or Pyeongtaek City will be maintained by the DPW Environmental Division. Completed investigation reports and corrective action plans will be maintained by the Responsible Organizations as well as the DPW Environmental Division.

7.2 INTENTIONAL DISCHARGES

The DPW Environmental Division must be informed of all batch discharges to the sanitary sewer system, regardless of the frequency of the occurrence. The following figure depicts the impact assessment process for evaluating batch discharges to the sewer system (also presented in Appendix C):

Wastewater Batch Discharge Impact Assessment



ROUTINE BATCH DISCHARGES

Appendix H includes an assessment checklist that DPW Environmental will use to determine if the routine batch discharge conditions present a risk to the DWTS. DPW Environmental will perform an impact assessment according to the impact assessment work flow diagram presented above and in Appendix C and recommend permanent pretreatment systems, if necessary. If a Responsible Organization changes processes or operations such that routine batch discharge conditions are altered or created, the organization is responsible for reporting these changes, including but not limited to type, concentrations, volume, and/or frequency of any new batch discharges, to the DPW Environmental Division. Records of assessments of routine discharge practices will be maintained by the DPW Environmental Division.

NON-ROUTINE BATCH DISCHARGES

Parties seeking to discharge to the installation wastewater system shall request permission from the DPW Environmental Division in accordance with DPW Standard Operating Procedure #11, 'Slug Prevention' (Appendix C). DPW Environmental will review requests and determine whether to accept, accept with conditions, or reject on a case-by-case basis.

The DPW Environmental Division may require laboratory and/or field testing, or other

control measures depending on the contents of the discharge. In general, non-routine batch discharges should meet the KEGS limits for indirect discharges (local limits) and should not meet any of the slug discharge conditions described in Section 2.3. No non-routine batch discharge will take place until approval has been granted by the DPW Environmental Division. The DPW Environmental Division can also prohibit a non-routine batch discharge if it is determined that the potential harmful impact(s) of the discharge cannot be reduced to acceptable levels, or if specifically prohibited by the DWTS. Discharge will be conducted only at locations and times designated by the DPW Environmental Division. Records of non- routine discharges will be maintained by the DPW Environmental Division.

APPENDIX A - REFERENCES

1. Guidance Manual for Control of Slug Loadings to POTWs, U.S. Environmental Protection Agency, September 1988.
2. Control of Slug Loadings to POTWs Guidance Manual, U.S. Environmental Protection Agency, February 1991.
3. Code of Federal Regulations, 40 CFR Part 403.5(b), General Pretreatment Regulations for Existing and New Sources of Pollution
4. Local Limits Development Guide, U.S. Environmental Protection Agency, July 2004.
5. Environmental Engineers Handbook, Liptak, Bela. Lewis Publishers, 1997.
6. EPA 650/11-79-0006 Investigation of Selected Potential Environmental Contaminants: Ethylene Glycol, Propylene Glycol, and Butylene Glycol. Miller, Lynne M. Office of Toxic Substances, USEPA. Washington D.C. May 1979.
7. EPA 821-R-00-016 Preliminary Data Summary Airport Deicing Operations, USEPA. Washington D.C. August 2000.
8. Korea Environmental Governing Standards (EGS), 2012.
9. Spill Prevention and Response Plan for U.S. Army Garrison Humphreys.
10. Hazardous Waste Management Plan for U.S. Army Garrison Humphreys.
11. Hazardous Material Management Plan for U.S. Army Garrison Humphreys.
12. Slug Prevention plan Assessment Report, USACE POJ, July 2019.
13. EPA 833-F-12-003 Controlling Fats, Oils, and Grease Discharges from Food Service Establishments, USEPA. Washington D.C., September 2012.
14. EPA 832-F-00-022 Wastewater Technology Fact Sheet Dechlorination, USEPA. Washington D.C., September 2000.
15. ANSI/AWWA C651-92 Standard for Disinfecting Water Mains, American Waterworks Association (AWWA). 1992.
16. UFGS 23 52 46.00 20 Low Pressure Water Heating Boilers, USACE/NAVFAC/ AFCEC/NASA. May 2015.

APPENDIX B –SLUG DISCHARGE FORMS

USAG Humphreys
Wastewater Slug Discharge Notification Form

CONTACT INFORMATION:	
Reported by (Name)	Unit/ Activity/ Contractor Name
Location/ Facility Address	
Contact Phone Number	
Comments	

SLUG LOADING INFORMATION:	
Discharge Date/ Time	
Type of Slug (chemical name, constituents, etc.)	
Discharge Location (Installation, building number, manhole number, etc.)	
Concentration (s)	Volume
Current response efforts	
Comments	

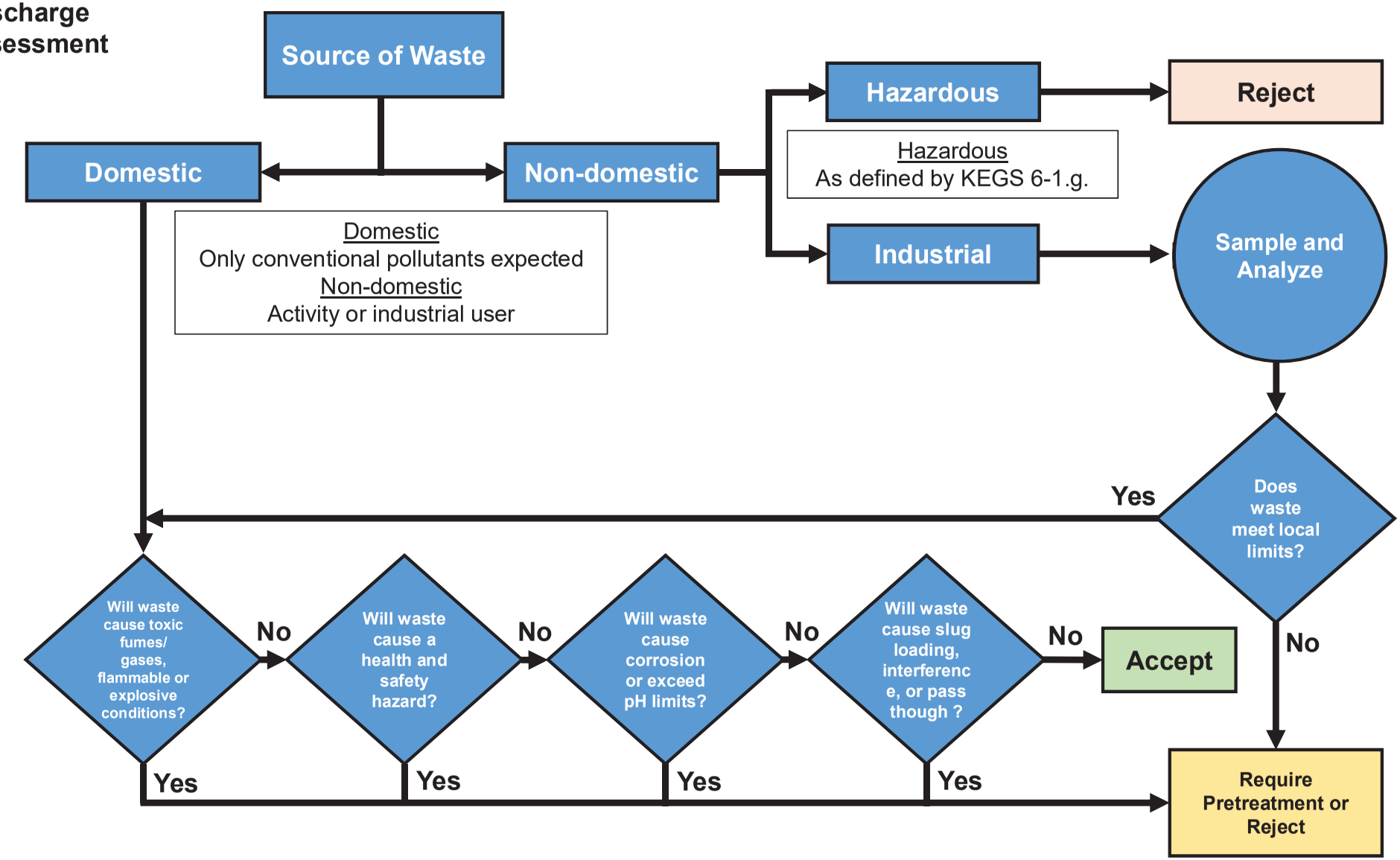
HAZARD/POLLUTION EVALUATION:		
Fire Hazard	Explosive	Corrosive
Fumes	Solid/ Viscous	Heat
Treatment interference/ pass through	Other	
Comments		

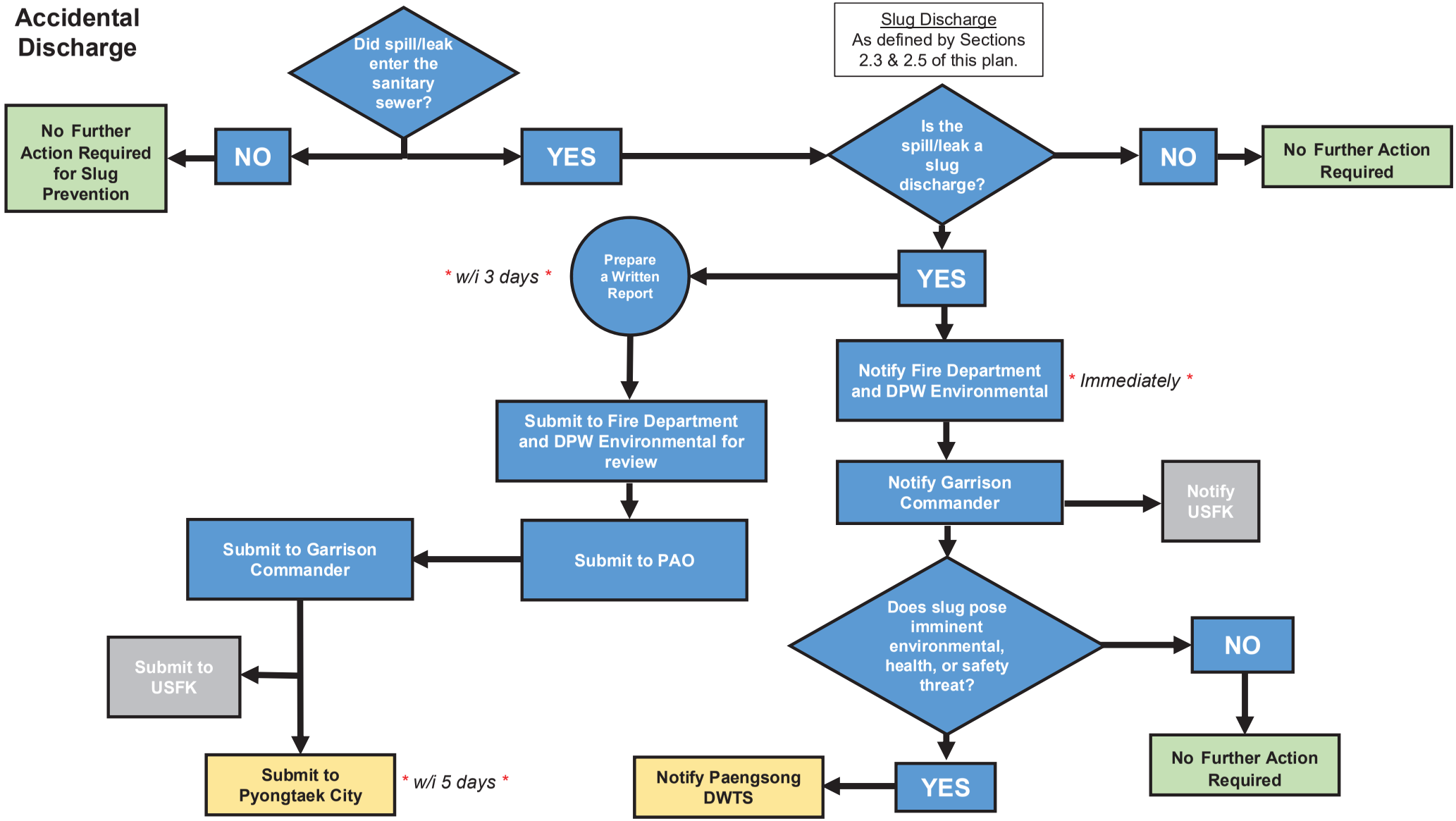
INITIATION OF RESPONSE
Report Received By
Report Date/Time

AGENCIES CONTACTED:

APPENDIX C – SLUG PREVENTION STANDARD OPERATING PROCEDURES

Batch Discharge Impact Assessment




Accidental Discharge
Did spill/leak enter the sanitary sewer?
NO
No Further Action Required for Slug Prevention
YES
Slug Discharge
As defined by Sections 2.3 & 2.5 of this plan.
Is the spill/leak a slug discharge?
NO
No Further Action Required
YES
Prepare a Written Report
* w/i 3 days *
Notify Fire Department and DPW Environmental
* Immediately *
Submit to Fire Department and DPW Environmental for review
Notify Garrison Commander
Notify USFK
Submit to PAO
Submit to Garrison Commander
Submit to USFK
Submit to Pyongtaek City
* w/i 5 days *
Does slug pose imminent environmental, health, or safety threat?
NO
No Further Action Required
YES
Notify Paengsong DWTS

DEPARTMENT OF THE ARMY
INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON HUMPHREYS
UNIT #15228
APO AP 96271-5228

IMHM-PW 5 November 2018

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: DPW Standard Operating Procedure (SOP) #11, Slug Prevention

1. This SOP supersedes all the previously provided slug prevention instructions at USAG Humphreys.

2. Reference: USFK Regulation 201-1, Environmental Governing Standards, dated 18 June 2012.

3. A slug discharge is any discharge of a non-routine, episodic nature, including but not limited to, an accidental spill or non-customary batch discharge, which can adversely affect a sewage treatment plant. Camp Humphreys must immediately notify the Paengseong municipal sewage treatment plant (MSTP) of slug discharges.

4. Any planned batch discharges from construction sites or existing facilities shall be coordinated with Environmental Division to prevent adverse impact to the Paengseong MSTP. An activity who plans a batch discharge must provide the following information to Environmental Division:

a. Batch wastewater discharge log (Enclosure).

b. Batch wastewater test results including but not limited to pH, BOD, COD, Total Nitrogen (T-N), and Total Phosphorus (T-P).

c. Safety Data Sheets (SDS) for used chemicals.

5. Based on the provided information, Environmental Division will conduct impact assessment and provide an environmental guidance. Environmental Division will oversee batch discharge practices to ensure slug prevention.

6. For cleaning operation, instead of phosphate type chemicals, caustic soda must be used to prevent the high level of T-P.

7. Point of contact is Mr. Pak, Chung Mok, Wastewater Program Manager, at DSN (315) 756-1059 or email: chungmok.pak.ln@mail.mil.

Encl

HYUK PAK
Director Public Works

Distribution:
Far East District, USACE
65th Medical Brigade
O&M Division, DPW
Engineering Division, DPW
Housing Division, DPW

Batch Wastewater Discharge Log

Date	Project # or Bldg #	Reason of Batch Discharge	Chemicals Used	Used Chemical Amount (Kg)	Planned Batch Wastewater Amount (gallons)	POC (Name, Phone #)	Comments

Enclosure

APPENDIX D – SAMPLE SIGN FOR PREVENTION OF UNAUTHORIZED DISCHARGES

NO

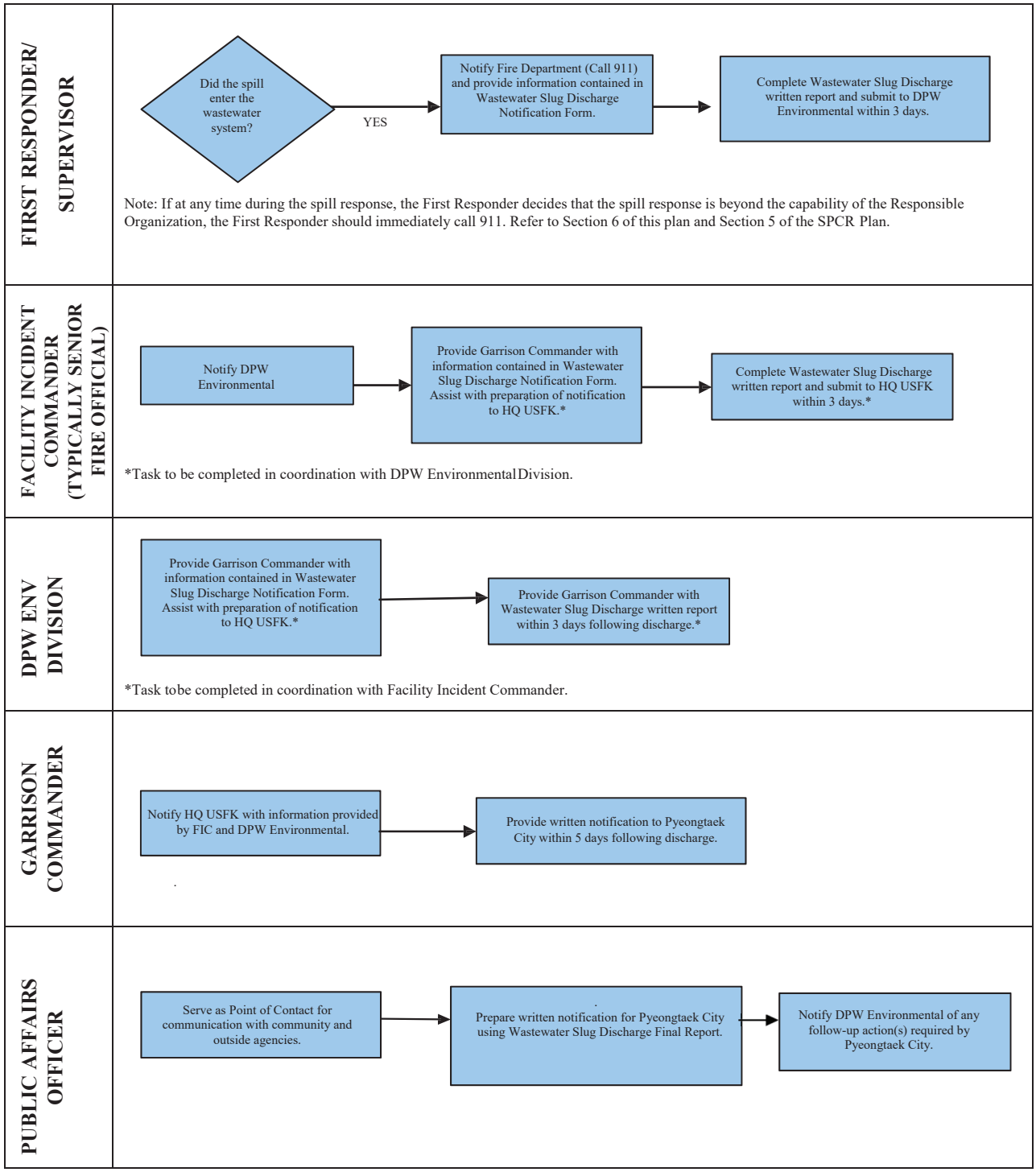
HAZARDOUS CHEMICALS

Do not dispose of hazardous chemicals including chlorinated solvents, toxic heavy metals, or other chemicals that are ignitable, corrosive (pH < 5 or > 9), reactive (cyanides, sulfides, water reactive), or toxic in sewer drains, sumps, or oil water separators.

IN THE EVENT OF A SPILL TO A SINK or FLOOR DRAIN, CALL DPW ENVIRONMENTAL IMMEDIATELY AT DSN 756-1059.

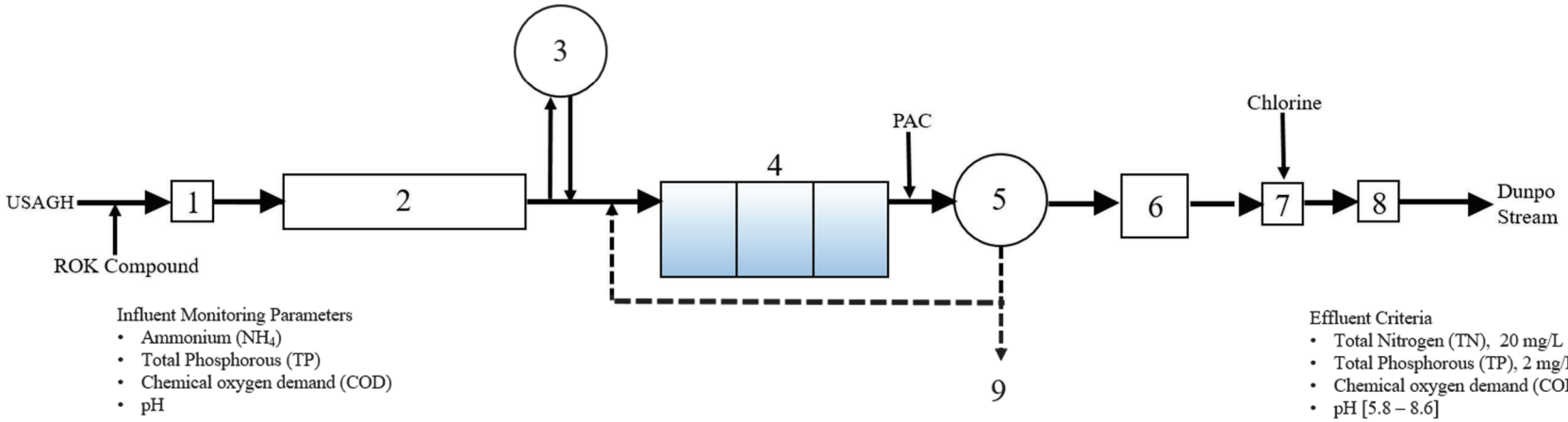
APPENDIX E –NOTIFICATION/REPORTING PROCEDURES

The following flow chart illustrates the steps involved in the wastewater slug discharge notification and reporting process for each responsible party:



APPENDIX F – DWTS PLANT FLOW DIAGRAM

Paengseong Wastewater Treatment Plant – General Plant Flow Diagram



Influent Monitoring Parameters
- Ammonium (NH_4)
- Total Phosphorous (TP)
- Chemical oxygen demand (COD)
- pH

Effluent Criteria
- Total Nitrogen (TN), 20 mg/L
- Total Phosphorous (TP), 2 mg/L
- Chemical oxygen demand (COD), 40 mg/L
- pH [5.8 – 8.6]
- Suspended solids (10 mg/L)

1) Influent monitoring (Continuous and Hourly)
2) Screens, comminution, grit removal
3) Equalization tanks (2 x 1000 m^3)
4) Biological processes (Advanced Phase Isolation Ditch, 2 x 2,500 m^3, 1 in operation/ 1 offline)
5) Secondary settling tanks (4 x 1,200 m^3)
6) Filtration
7) Chlorine injection/ mixing/ contact/de-chlorination
8) Effluent monitoring (Continuous and Hourly)
9) Waste sludge for recycling, land application (1,400 m^3 per year)
   Waste sludge for incineration, landfill disposal (200 tons per year)

Plant Design/ Operating Criteria
- MLSS = 2,100 mg/L
- Design Q = 14,200 m^3/day (7,100 m^3/day per ADIP reactor)
- Average Q = 5,500 m^3 /day
- DO = 2-5 mg/L
- Average HRT = 12 - 22 hours

APPENDIX G – SLUG PREVENTION FACT SHEET

SLUG PREVENTION

What is a Slug Discharge?

A wastewater slug is any substance that could cause an obstruction or imbalance in the sewer system.

Camp Humphreys Wastewater System

Domestic wastewater includes water from sinks, toilets, washing machines, showers, and cooking. Wastewater is also created from industrial processes such as vehicle or aircraft wash racks, oil/water separators, or boiler blow down water.

At Camp Humphreys, the primary domestic wastewater treatment plant is located off-base and operated by the local city government. The plant uses biological processes to remove conventional pollutants from wastewater and is not designed to remove industrial pollutants.

Chemicals of Concern

Certain substances can interfere with the physical, chemical, and biological processes used to treat wastewater including the following:

- Oil, Fats, and Greases
- Oxidizing Agents
- Pesticides
- Solvents
- Petroleum Products
- Corrosion Prevention Chemicals
- Antifreeze
- Surfactants
- Medicines

How to Prevent Slugs

- DO NOT dispose of chemicals, cooking oil, or grease in sinks, drains or toilets.
- Protect sinks and floor drains from spills.
- Ensure hazardous substances are not used near sinks or floor drains.
- Only store chemicals in containers that are approve for storage of that chemical.
- Ensure that oil/water separators and grease traps are properly installed, in good working condition, and properly maintained
- Place drip pans under connection points and other points with the potential for leakage.

APPENDIX H – SLUG PREVENTION ACTIVITY ASSESSMENT

USAG HUMPHREYS SLUG PREVENTION PLAN ACTIVITY ASSESSMENT SHEET			
Facility Name	**Facility Number**	**Inspection Date/Time** /	**Inspector(s)** Vencalek/Ricafrente
Give a Brief Description of All Operations in this Facility		**Photographs Taken?** **___ Yes ___ No** If NO pictures were taken, why? (permission not granted or pictures not needed, etc.)	
Facility Contacts Present During Inspection		**Contact Phone Number**	
FOR ROUTINE DISCHARGES			
Description of Routine Wastewater Discharges (Include drawings showing layout and process flow diagrams)		**Is Process: Continuous____ Batch____**	
		If Batch, list frequency of discharges	
		Est. Volume of Discharge	
List Constituents of Routine Discharges		**Are any pretreatment measures in place?**	
FOR NON-ROUTINE DISCHARGES			
List ALL Hazardous Materials/Wastes/Substances Stored at the Facility (Include an est. quantity for each item)		**Do floor drains exist in the vicinity of the storage area?** **___ Yes ___ No** (If Yes, include a sketch of the spill pathway on the back of this form)	
		Have personnel received spill prevention and response training? **___ Yes ___ No**	
		Have any spill events occurred at this facility in the last 12 months? **___ Yes ___ No**	
		Are containment structures in place? **___ Yes ___ No** **Is so, are they adequate?** **___ Yes ___ No**	

USAG HUMPHREYS SLUG PREVENTION PLAN ACTIVITY ASSESSMENT SHEET
Sketch of the Spill Pathway
Recommendations