GOVERNMENT OF THE VIRGIN ISLANDS OF THE UNITED STATES
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DEPARTMENT OF PLANNING AND NATURAL RESOURCES
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EXECUTIVE SUMMARY
OPERATION BREATHE EASY II

ST. CROIX CENTRAL HIGH SCHOOL ODOR INVESTIGATION (March 23-April 4, 2014)

Alicia V. Barnes, Commissioner

Background

The Department of Planning and Natural Resources (DPNR) received its first complaint about the foul odor at the St. Croix Central High School around mid-February 2014. The Department's Air Quality Management Program responded to the school, but the Staff was unable to detect any odors there or around the perimeter of HOVENSA. Towards the end of February, more complaints were received from Central High School. The odor complaints at the end of February 2014 were attributed to tank cleaning operations at HOVENSA. The Department ordered a cease and desist to HOVENSA and mandated that HOVENSA submit a contingency plan for all tank cleaning operations to mitigate the effect of any odors that may be released during that process. HOVENSA complied with the Department's orders and DPNR subsequently approved the contingency plan for tank cleaning operations.

In early March, the Department received additional complaints of the foul odor at the Central High School. On or around March 10, 2014, the Honorable Governor John de Jongh activated the Virgin Islands National Guard 23rd Civil Support Team (CST) to provide technical assistance to DPNR during the investigatory efforts. On March 11 and 12, 2014, DPNR and the CST conducted real time air monitoring using area raes and multi raes. The teams sampled for hydrogen sulfide, carbon monoxide and volatile organic compounds (VOCs), however, these tested parameters were detected below the threshold levels for impact to human health. During the same time frame, DPNR's Air Pollution Control Program canvassed the industrial complex but did not detect any distinct odors. The Department requested operational logs from HOVENSA in order to determine whether there were any operational malfunctions on the days in question.

The complaints culminated on March 18, 2014, when approximately 35 students and at least one adult reported sick to the Governor Juan F. Luis Hospital. As a result, a multi-agency task force was formed to include DPNR as the lead, the Virgin Islands Emergency Management Agency (VITEMA) as the coordinating entity, the Virgin Islands National Guard 23rd Civil Support Team, the Waste Management Authority, the Department of Education, the Office of the Governor, Department of Public Works and Department of Labor–OSHA. Additionally, the Department also requested the assistance of the United States Environmental Protection Agency.

The task force was devised to employ a multi-prong approach with the objective of identifying the source of the odor. In order to leave no stone unturned, an unannounced inspection was conducted at HOVENSA, and the industrial complex, and wind conditions were also assessed to determine if there were any changes in the prevailing winds.

DPNR also canvassed surrounding neighborhoods in the areas of Estate Profit, Estate Clifton Hill, Harvey (Matthew & Charles) and the Kingshill area to determine whether residents detected the odor on March 18, 2014 and whether they experienced any illnesses and the nature of said illnesses. Based on those findings, the residents who were interviewed in Estate Profit described the odor detected as that which is normally detected from Diageo; those in Harvey described a rotten egg smell, while those in Clifton Hill described a propane and sewage type of odor and those in the Kingshill area, described propane and septic odor. At the Headstart in Kingshill, employees indicated the odor was detected when the toilets were flushed.

Based on the fact that the odor complaints were localized at the Central High School, site investigations at the school intensified. Incident command was established at the school and on-site investigations were ongoing on a daily basis. This included real time air monitoring, with the help of the EPA and the CST, assessment of underground infrastructure, and the sewer and storm drain system on property.

Through a process of elimination, it appeared that the foul odors were being caused by a sewer system on or near the school.

Real time air monitoring at the Central High School have indicated elevated levels of hydrogen sulfide, and propane. The propane odor was traced to a leaking tank on the campus which has since been addressed. Elevated levels of hydrogen sulfide were detected on campus grounds especially when the man holes were uncovered. In light of these findings, emphasis was placed on inspecting the sewer system at and near the Central High School.

Based on the findings to date, there is no indication that the intermittent noxious odor at Central High School is being caused by industrial processes at HOVENSA and/ or Diageo. Rather through a process of elimination, it is likely that the intermittent noxious odor is being caused by a sewer system on or near the school.

Investigation Summary

Based on interviews with hospital staff, CHS students and teachers, and others who experienced the March 18th incident, it was determined that hydrogen sulfide (H_2S) and potentially other reduced sulfur compounds were the chemicals that likely caused the odor and the physical symptoms. The investigation focused on potential local sources of H_2S and reduced sulfur compounds including the sanitary sewer system at the school and along Queen Mary Highway and on the two more distant potential industrial sources: the Diageo Rum Distillery and the HOVENSA Oil Terminal. The investigation included the described activities in the following locations.

Central High School

EPA, DPNR, and the CST conducted real time H_2S air monitoring throughout the CHS campus with a the Jerome J605 Hydrogen Sulfide Analyzer (part per billion {ppb} range) and a MultiRae Pro (part per million {ppm} range); conducted continuous H_2S screening of the ambient air and air within manholes using Honeywell Single Point Monitors (SPMs); collected samples (both grab and 24-hour) for laboratory analysis for volatile organic compounds (VOCs - TO-15) and reduced sulfur compounds (ASTM D5504); and collected samples for aldehyde and ketone (TO-11) analysis.

EPA performed limited dye and smoke testing of the sewer system at CHS to better understand the sewer connections, sewage flow patterns and potential venting points for sewer related gases.

Virgin Islands Waste Management Authority's (VIWMA's) Sewer System - Barren Spot and along Centerline Road

EPA, DPNR, and CST conducted real time H_2S air monitoring at the Barren Spot Lift Station, the Curriculum Center ("Transition") manhole and manholes along the gravity flow line near the VI Superior Court with the Jerome J605 and a MultiRae Pro; conducted continuous SPM H_2S monitoring of ambient air outside the VI Superior Court; collected grab samples for laboratory analysis for VOCs and reduced sulfur compounds in and around selected manholes and at the lift station; and performed an engineering evaluation of the lift station, force main, transition and gravity flow sewer system.

Virgin Islands Superior Court

At the request of the Honorable Judge Willocks, EPA conducted real time H_2S air monitoring inside the Territorial Court building using the Jerome J605. A grab air sample was collected inside the Court building and submitted to the laboratory for analysis for VOCS and reduced sulfur compounds.

HOVENSA

EP, DPNR, and the CST performed multiple inspections of the HOVENSA facility and the ongoing operations; reviewed records and on-site recent monitoring data; conducted interviews with residents living near the facility; performed H_2S and VOC monitoring and reduced sulfur compound and VOC sampling during both "inactive" and operational (tank cleaning) conditions.

Diageo

EPA performed an inspection of ongoing operations at the Diageo facility; reviewed records and recent on-site monitoring data; conducted interviews with residents living near the facility; performed H_2S and VOC monitoring; and collected air samples for VOC, reduced sulfur compound and aldehyde and ketone analysis during both "inactive" and operational conditions.

Results and Conclusions

Inspections, monitoring and sampling results did not indicate any evidence of an upset condition or source at either Diageo or HOVENSA that could have produced enough hydrogen sulfide and/or other reduced sulfur compounds to have caused an acute impact at CHS as occurred on March 18th.

Additionally, any such source emanating from Diageo or HOVENSA could not have impacted CHS without acutely impacting HOVENSA/Diageo personnel and the residents surrounding and downwind of the facilities. Residents of Estates Profit and Clifton Hill (densely populated communities between the industries and CHS) did not complain of odors or medical symptoms on March 18th. Other than people at CHS, only populations associated with the VI Superior Court and the Herbert Grigg Home for the Aged, both in Kingshill, have complained of H_2S-like exposures during the month of March 2014. As a result, a reduced sulfur source more local to Kingshill was considered more plausible.

On March 22 and 23, 2014, EPA identified a potential local source in the VIWMA sewer system near the Curriculum Center and the Territorial Court along Centerline Road. The Curriculum

Center or "Transition" manhole is where the force main from the Barren Spot lift station discharges sewage prior to it flowing down the gravity sewer line that runs past the Court and towards the treatment plant located near the airport. This manhole also receives waste from 3 other gravity feed lines, including one from CHS. Levels of hydrogen sulfide measured in the Transition manhole were observed to exceed 200 ppm. This concentration represents the maximum detectable level for EPA's Multi Rae Pro direct-read instrumentation and is twice the Immediately Dangerous to Life and Health (IDLH) threshold published by the National Institute for Occupational Safety and Health.

At the VI Superior Court manhole just downstream of the Transition manhole, levels greater than 600 ppm were detected by the National Guards' CST using their instrumentation. EPA also observed strong odors and detected elevated H_2S levels (> 50 ppb) inside portions of the court building during the investigation. The presence of such a significant continuously produced source of H_2S less than 1000 feet from the school and in close proximity to the Territorial Court and Herbert Grigg makes the sewer a likely potential source of the March 18th release and of subsequent complaints in the Kingshill area.

The specific conditions which caused the H_2S gas to migrate to the school are not completely understood, however; the gravity feed line from the school provides a potential pathway to the campus. Additionally, smoke testing revealed multiple venting points throughout the courtyard and classroom area where students and teachers were impacted. Results of interviews conducted during the investigation suggest that there has periodically been a sewer odor at the school indicating that sewer gas has made its way onto campus in the past.

Recommendations

Although monitoring at CHS between March 23 and April 4, 2014 did not reveal elevated levels of H_2S on the CHS campus and within its associated sewer system, it should be noted that modifications to the VIWMA sewer system on Centerline Road were being made shortly after EPA initiated its investigation.

EPA's investigation was conducted under different conditions than were present on March 18, 2014. Therefore, the conditions that led to that release could not be replicated nor adequately tested during EPA's investigation. However, based on all available information, the sewer system has been identified as the most likely source of the chemical release that impacted the CHS population on March 18th.

The components of the sewer system involved in generating the H_2S and other sulfur gases are believed to include the Barren Spot Wet Well, the force main and the gravity flow system from the Curriculum Center to the Courthouse along Queen Mary Highway.

EPA tasked Weston Solutions, Inc. to evaluate the engineering of this system and make recommendations to remediate the H_2S problem. In summary, recommendations for the future protection of CHS include:

1) pretreatment of the wastewater at the lift station to reduce H_2S formation;

2) cleaning of the inside of the force main and any other activities necessary to increase flow rate and reduce residence time in the force main;

3) addition of an air relief valve on the lift station discharge pipe to prevent air binding;

4) thorough testing of the CHS sanitary system and repair of all defects that could allow sewer gas to escape; and

5) Construction of a "weir structure" in the northwestern most man-hole on the CHS campus to prevent potential migration of sewer gas into the CHS system.

6) Department of Education and Public Works should conduct joint inspections of the sewage system at CHS and complete "As Built" Survey of the system.

7) the separation of the CHS gravity feed line from the force main transition manhole by moving the transition manhole west of the VI Superior Court

8) Eventual decommissioning of the Barren Spot lift station as a long term plan is also deemed appropriate.

On March 28th DPNR met with VIWMA on the possibility of VIWMA revising its FY' 05 OSA funding (CWA§604(b) based), which was recently revised to "find and fix" various manholes, to now include the manholes in the vicinity of the St. Croix Central High School.

To date, VIWMA via the Department of Public Works (DPW) has submitted the grant application information with requisite Scope of Work and National Environmental Policy Act (NEPA) Documentation. Dave Rosoff, EPA On-scene Coordinator has also successfully notified and gained support of the USEPA Region 2 and Headquarters Staff to ensure that the application/amendment is processed expeditiously. The only outstanding items that are within DPNR's control are the State Historic Preservation Office and Endangered Species Act Approval, which are drafted by DPNR-SHPO and DPNR-Division of Fish and Wildlife respectively.

APPENDIX
PHOTOGRAPHS

PHOTOGRAPH NO. 1

Date: 04/01/14
Direction: N/A

Description:

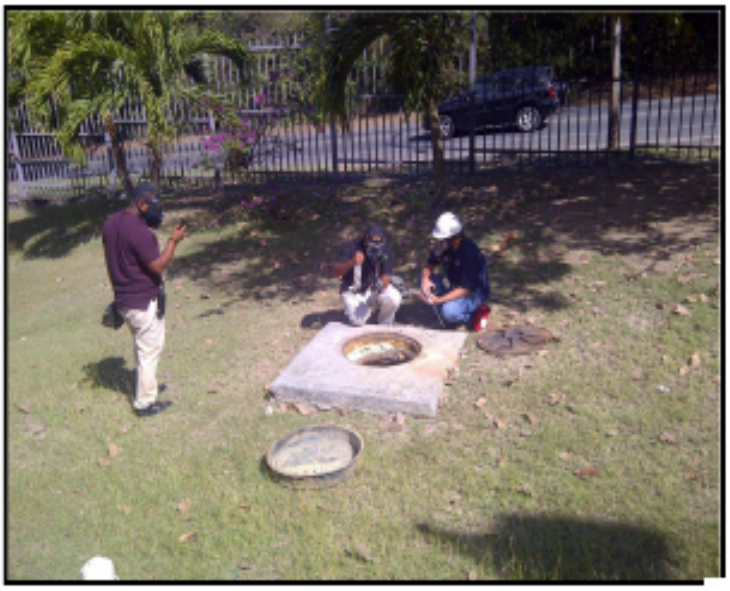
Sulfide Corrosion Damage to Cover Ring and Interior Concrete Surface of Manhole Between Curriculum Center and Territorial Court

PHOTOGRAPH NO. 2

Date: 03/27/14
Direction: N/A

Description:

Sampling Atmosphere in Manhole on Territorial Court Grounds



PHOTOGRAPH NO. 3

Date: 04/02/14
Direction: N/A

Description:

View of Barren Spot Lift Station Wet Well from Above. Pump Discharge Hose is at the Right of the photo; Level Control Floats are at Left

PHOTOGRAPH NO. 4

Date: 04/03/14
Direction: N/A

Description:

Barren Spot Lift Station Discharge Piping (Pump Discharges Through Diagonal 4" Hose at Bottom of Photo Into Horizontal Header Above)

PHOTOGRAPH NO. 5

Date: 03 Apr 14
Direction: N/A

Description:

Barren Spot Lift Station Exterior Piping

PHOTOGRAPH NO. 6

Date: 04/02/14
Direction: N/A

Description:

Section of 8" Force Main Showing Extent of Deposits Inside the Pipe

PHOTOGRAPH NO. 7

Date: 04/02/14
Direction: N/A

Description:

Setting Up Smoke Testing at CHS MH 5

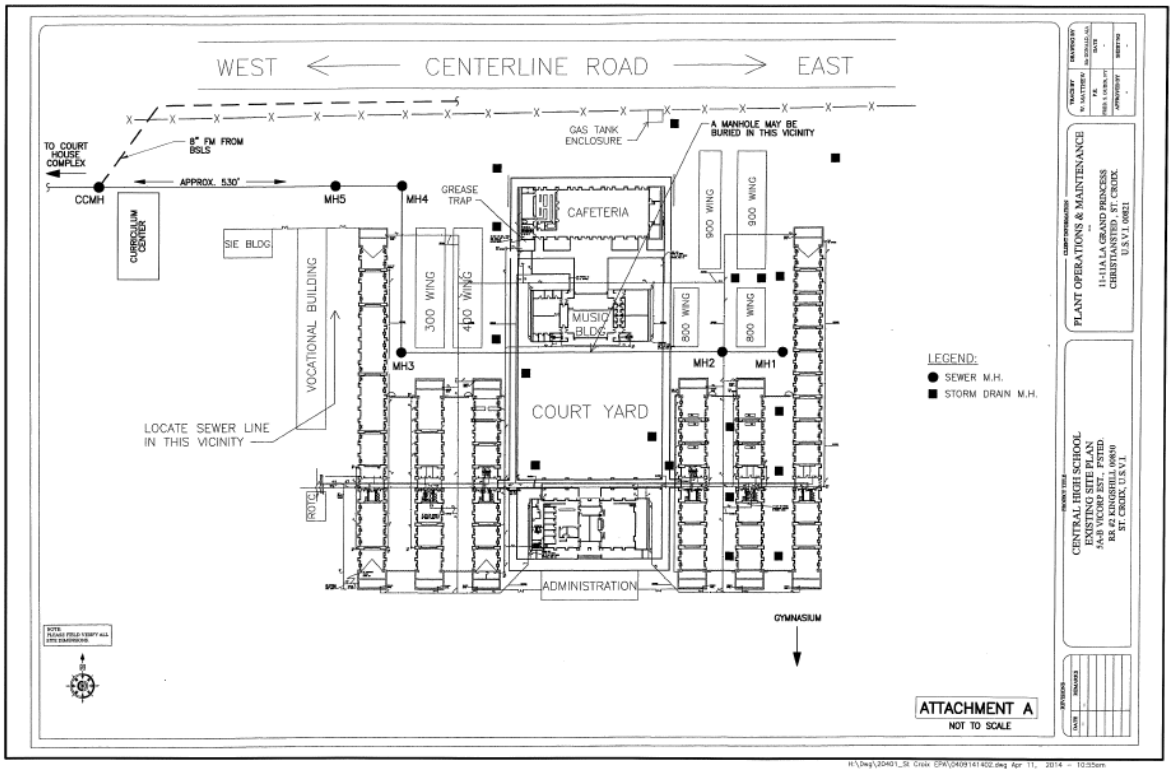
PHOTOGRAPH NO. 8

Date: 04/02/14
Direction: N/A

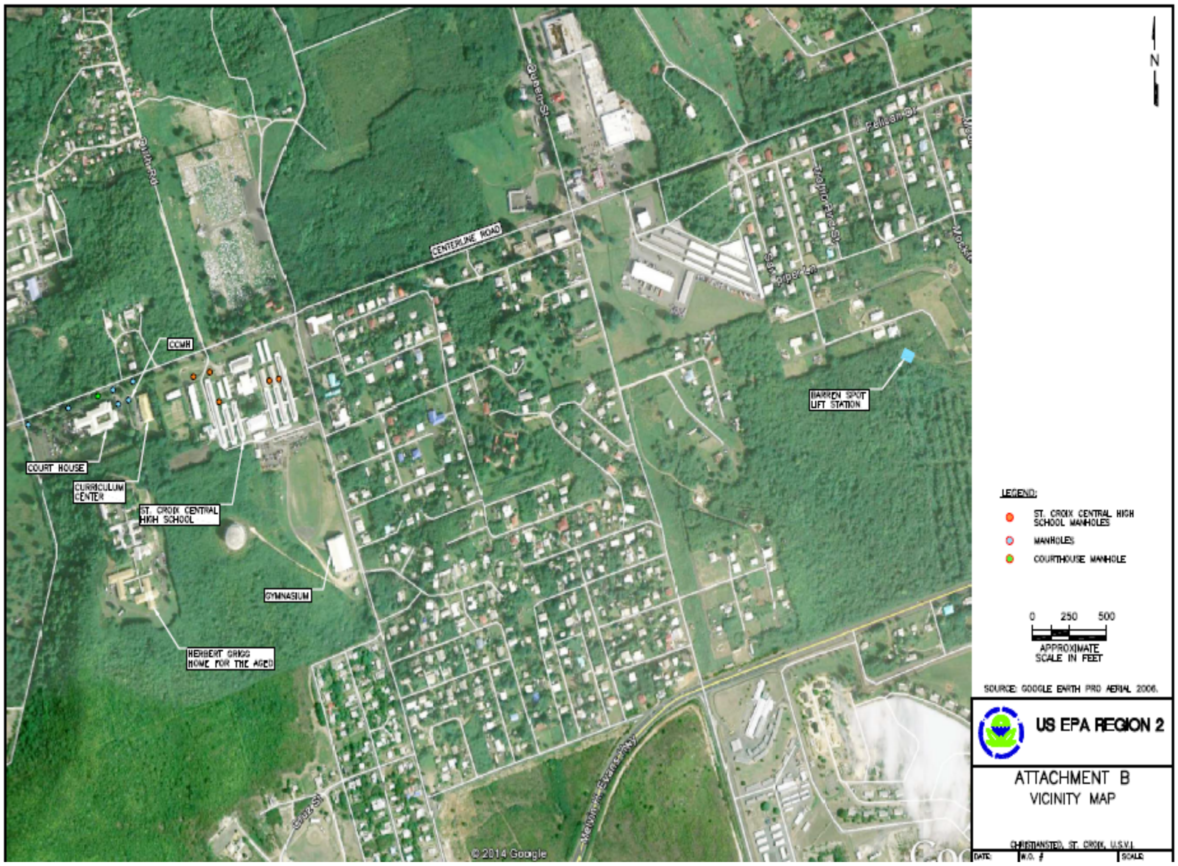
Description:

Attaching Smoke Generator Output Duct to CHS MH 5

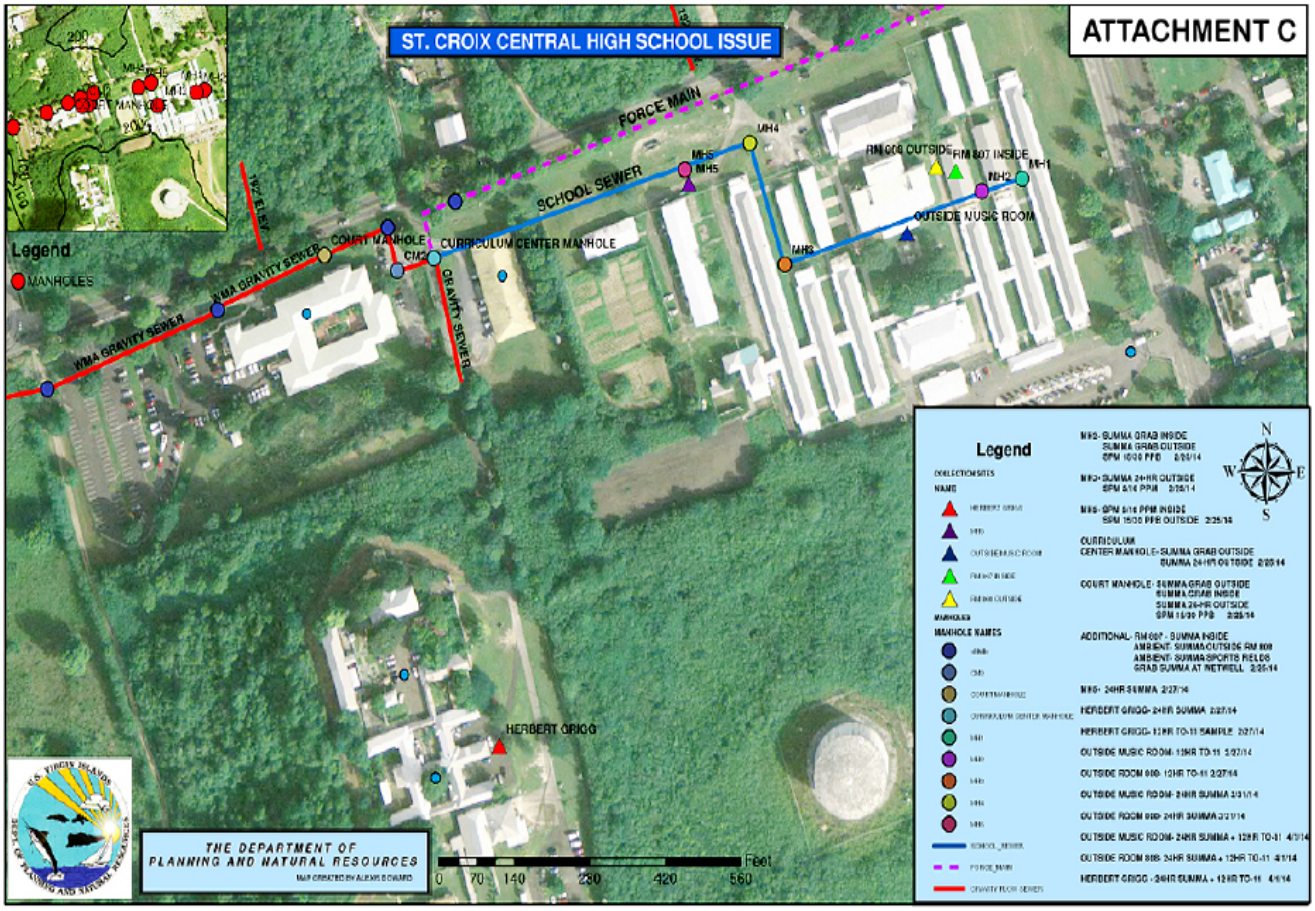
ATTACHMENT A
LAYOUT OF THE ST. CROIX CENTRAL HIGH SCHOOL CAMPUS


WEST
CENTERLINE ROAD
EAST
TO COURT HOUSE COMPLEX
8" FM FROM BSLS
APPROX. 530'
CCMH
MH5
MH4
GREASE TRAP
GAS TANK ENCLOSURE
A MANHOLE MAY BE BURIED IN THIS VICINITY
CURRICULUM CENTER
SIE BLDG
VOCATIONAL BUILDING
300 WING
400 WING
CAFETERIA
MUSIC BLDG
900 WING
800 WING
MH3
MH2
MH1
COURT YARD
LOCATE SEWER LINE IN THIS VICINITY
ROTC
ADMINISTRATION
GYMNASIUM
LEGEND:
SEWER M.H.
STORM DRAIN M.H.
ATTACHMENT A
NOT TO SCALE
PLANT OPERATIONS & MAINTENANCE
11-11A LA GRAND PRINCESS
CHRISTIANSTED, ST. CROIX
U.S.V.I. 00821
CENTRAL HIGH SCHOOL
EXISTING SITE PLAN
A.K.A. ALTHEA E. FREDERICK SR. ED.
ST. CROIX, U.S.V.I.

ATTACHMENT B
VICINITY MAP


N
CENTERLINE ROAD
CCMH
COURT HOUSE
CURRICULUM CENTER
ST. CROIX CENTRAL HIGH SCHOOL
GYMNASIUM
HERBERT GRIGG HOME FOR THE AGED
BARREN SPOT LIFT STATION
© 2014 Google
LEGEND:
ST. CROIX CENTRAL HIGH SCHOOL MANHOLES
MANHOLES
COURTHOUSE MANHOLE
0 250 500
APPROXIMATE SCALE IN FEET
SOURCE: GOOGLE EARTH PRO AERIAL 2006.
US EPA REGION 2
ATTACHMENT B
VICINITY MAP
CHRISTIANSTED, ST. CROIX, U.S.V.I.
DATE:
W.O. #
SCALE:

ATTACHMENT C
SEWERS AND FORCE MAIN AT ST. CROIX CENTRAL HIGH SCHOOL, CURRICULUM CENTER AND COURT HOUSE COMPLEX


ATTACHMENT C
ST. CROIX CENTRAL HIGH SCHOOL ISSUE
FORCE MAIN
SCHOOL SEWER
MH4
MH5
MH1
MH2
MH3
RM 606 OUTSIDE
RM 607 INSIDE
OUTSIDE MUSIC ROOM
CURRICULUM CENTER MANHOLE
COURT MANHOLE
CM2
GRAVITY SEWER
WMA GRAVITY SEWER
HERBERT GRIGG
Legend
MANHOLES
Legend
COLLECTION SITES
NAME
MANHOLES NAMES
SCHOOL_SEWER
FORCE_MAIN
GRAVITY FLOW SEWER
MH5- SUMMA GRAB INSIDE
SUMMA GRAB OUTSIDE
MH2- SUMMA 24-HR OUTSIDE
MH3- SUMMA 24-HR OUTSIDE
MH5- SPM 5/14 PPM INSIDE
CURRICULUM
CENTER MANHOLE- SUMMA GRAB OUTSIDE
COURT MANHOLE- SUMMA GRAB OUTSIDE
SUMMA GRAB INSIDE
SUMMA 24-HR OUTSIDE
ADDITIONAL- RM 607 - SUMMA INSIDE
AMBIENT- SUMMA OUTSIDE RM 606
AMBIENT- SUMMA SPORTS FIELDS
GRAB SUMMA AT INETWELL
MH5- 24HR SUMMA 2/27/14
HERBERT GRIGG- 24HR SUMMA 2/27/14
HERBERT GRIGG- 12HR TO-15 SAMPLE 2/27/14
OUTSIDE MUSIC ROOM- 12HR TO-15 2/27/14
OUTSIDE ROOM 606- 12HR TO-15 2/27/14
OUTSIDE MUSIC ROOM- 24HR SUMMA 2/27/14
OUTSIDE ROOM 606- 24HR SUMMA 2/27/14
OUTSIDE MUSIC ROOM- 24HR SUMMA + 12HR TO-15 4/3/14
OUTSIDE ROOM 606- 24HR SUMMA + 12HR TO-15 4/3/14
HERBERT GRIGG - 24HR SUMMA + 12HR TO-15 4/4/14
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S
E
W
THE DEPARTMENT OF
PLANNING AND NATURAL RESOURCES
0 70 140 280 420 560
Feet