Virtual Working Group Meeting

28 March 2023

Country Report: Republic of the Philippines

Guidelines on Site Charactrerization and Remediation

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Outline

- Short Country Profile
- Legal Basis for Contaminated Site Remediation
- Guidelines for Site Assessment
- Guidelines for Site Remediation
- Ongoing Remediation Projects in Metro Manila


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DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES · 1987 ·

Legal Basis: RA 6969 or the Toxic Substances and Hazardous and Nuclear Wastes and Control Act of 1990

https://emb.gov.ph/wp-content/uploads/2015/12/RA-6969.pdf

- **Chemical Management**
  - **Philippine Inventory of Chemicals and Chemical Substances (PICCS: 54K+)**
  - **Pre-Manufacturing and Pre-Importation Notification (PMPIN)**
  - **Priority Chemical List (PCL: 48)**
  - **Chemical Control Order (CCO: 10)**

- **Hazardous Wastes Management**
  - **Hazardous Wastes Generators**
  - **Hazardous Wastes Transporters**
  - **Hazardous Wastes Treatment, Storage and Disposal Facilities**

➢ **The GENERATOR shall be responsible until the waste has been disposed of properly in an environmentally sound way and is liable in case of spill or illegal disposal.**

https://emb.gov.ph/wp-content/uploads/2015/12/DAO-1992-29.pdf

https://emb.gov.ph/wp-content/uploads/2018/06/MC-2017-003_Site-Characterization-Guidelines.pdf

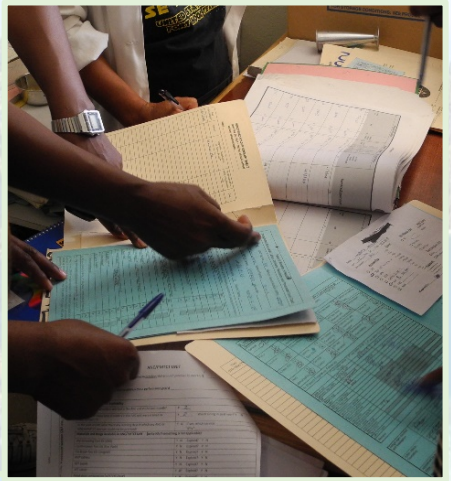
EMB MC 2017-003:Guidelines for Site Characterization

- Intended to assist stakeholders and property owners in systematically identifying Persistent Organic Pollutants (POPs) contaminated sites, either operational or abandoned;
- Site Characterization is divided into two stages:
  - Preliminary Site Assessment (PSA) – initial investigation into the possible POPs contamination (based on previous use/activities)
  - Detailed Site Assessment (DSA) – more intrusive investigation that will involve both soil and water sampling and the development of a Conceptual Site Model (CSM)
- For sustainable redevelopment of CS focusing on reduction of risks to human health and the environment

EMB MC 2017-003:Guidelines for Site Characterization

Preliminary Site Assessment (PSA)

- Records Review
- Development of a Conceptual Site Model (CSM)
- Site Inspection
- Interviews
- Preliminary Site Assessment (PSA) Report



ONLY IF RECOMMENDED BY PSA TO PROCEED TO A DSA

EMB MC 2017-003:Guidelines for Site Characterization

ONLY IF RECOMMENDED BY PSA TO PROCEED TO DSA

Detailed Site Assessment (DSA)

- Review of Conceptual Site Model (CSM) from PSA
- Establish Assessment Objectives
  (start the Data Quality Objectives (DQO) Process
- Identify Data Gaps and Information Requirements
- Preparation of Detailed Work Plan
  (Health and Safety, Sampling & Analysis Plan)
- Prepare for Site Investigation
- Conduct Sampling and Analyses
- Interpret and Evaluate/ Validate Data
- Update CSM
- Detailed Site Assessment (DSA Report)

ONLY IF RECOMMENDED BY DSA TO PROCEED TO SITE REMEDIATION

Site Remediation

EMB MC 2017-003:Guidelines for Site Characterization

SECTION FOUR **Appendices**

4.3 Appendix C: Selected Screening Levels (Tier-I)

Tier 1 POPs Screening Values for Soil

POPs Parameter	DIV* (mg/Kg)	USEPA RSLs** Residential (mg/kg)	USEPA RSLs Industrial (mg/kg)
Aldrin	0.32	0.029	0.1
Chlordane	4	1.6	6.5
Total DDT (DDT+DDE+DDD)	4	N/A	N/A
Dieldrin		0.03	0.11
Endrin		18	180
Heptachlor	4	0.11	0.28
HCB	2	0.3	1.1
Mirex		0.027	0.096
Toxaphene		0.44	1.6
PCBs Total	1	0.22	0.74
Dioxins (I-TEQ)	0.00018		

** DIV = Dutch Intervention Value*
***USEPA RSLs = USEPA Regional Screening Values*

Recommended Philippines Tier 1 Screening Values for Soil

(These are the highlighted values in Table 1 above. The USEPA RSL Industrial Values have been mainly chosen except for Chlordane and Endrin where the Industrial Values are high and the Residential values have been chosen. There are no USEPA RSL values for Total DDT and Dioxins/Furans so the DIV values have been chosen.)

POPs Parameter	Philippines - Recommended Value
	mg/kg
Aldrin	0.1
Chlordane	1.6
Total DDT (DDT+DDE+DDD)	4
Dieldrin	0.11
Endrin	18
Heptachlor	0.28
HCB	1.1
Mirex	0.096
Toxaphene	1.6
PCBs Total	0.74
Dioxins (I-TEQ)	0.00018

SECTION FOUR **Appendices**

Tier 1 POPs Screening Values for Water

POPs Parameter	DIV (µg/L)	USEPA RSLs Tap Water (µg/L)	Philippines Drinking Water Std (µg/L)
Aldrin		0.004	
Chlordane	0.2	0.19	0.2
Total DDT	0.01		1
Dieldrin		0.0015	
Endrin		1.7	0.6
Heptachlor	0.3	0.0018	0.3
HCB	0.5	0.042	
Mirex		0.0037	
Toxaphene		0.013	
PCBs Total	0.01	0.017	
Dioxins (I-TEQ)		0.0001*	

**US National Drinking Water Standards Value*

Recommended Philippines Tier 1 Screening Values for Water

(These are the highlighted values in Table 3 above. The USEPA RSL's for Tap Water have been mainly chosen except where existing Philippines Drinking Water values already exist. The Dioxins value is the US National Drinking Water Standards value.)

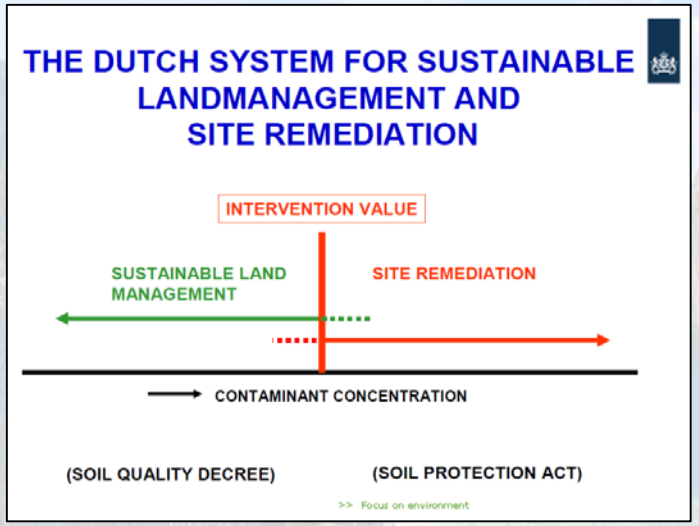
POPs Parameter	Philippines - Recommended Value
	(µg/L)
Aldrin	0.004
Chlordane	0.2
Total DDT (DDT+DDE+DDD)	1
Dieldrin	0.0015
Endrin	0.6
Heptachlor	0.3
HCB	0.042
Mirex	0.0037
Toxaphene	0.013
PCBs Total	0.017
Dioxins (I-TEQ)	0.0001

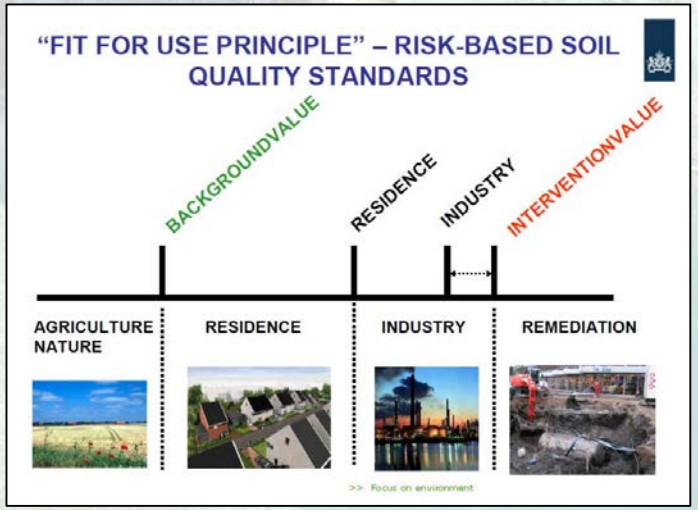
EMB MC 2017-003:Guidelines for Site Characterization

SECTION FOUR — Appendices

Non-POPs Contaminants Tier 1 Screening Values

Parameter	USEPA RS Residential (Soil - mg/kg)	USEPA RS Industrial (Soil - mg/kg)	USEPA RS Tapwater (µg/kg)	New Dutchlist Action Level (Soil - mg/kg)	New Dutchlist Action Level (Water - µg/kg)
Arsenic	0.39	1.6	0.045	55	60
Barium	15000	190000	2900	625	625
Cadmium	70	800	6.9	12	6
Total Chromium	No Value	No Value	No Value	380	30
Copper	3100	41000	6200	190	75
Lead	400	800	No Value	530	75
Mercury	23	310	4.3	10	0.3
Nickel	1500	20000	300	210	75
Selenium	390	5100	78	No Value	No Value
Zinc	23000	310000	4700	720	800
Heptachlor epoxide	0.053	0.19	0.0033	No Value	No Value
2,4,6-Trichlorophenol	44	160	3.5	No Value	10
Benzo(a)anthracene	0.15	2.1	0.029	No Value	0.5
Bis(2-ethylhexyl) phthalate	35	120	4.3	No Value	No Value
Di-n-butylphthalate	6100	62000	670	No Value	No Value
Butylbenzylphthalate	260	910	14	No Value	No Value
Benzo(b)fluoranthene	0.15	2.1	0.029	No Value	No Value
Benzo(k)fluoranthene	1.5	21	0.29	No Value	0.05
Pentachlorophenol					





EMB MC 2017-004:Guidelines for Site Remediationtion

https://emb.gov.ph/wp-content/uploads/2018/06/MC-2017-004_Site-Remediation-Guidelines.pdf

- Developed to address **Persistent Organic Pollutants (POPs)** contaminated sites;
- Present current available remediation technologies;
- Provide advice on environmental management of on-site remediation activities for POPs contaminated sites;
- Present monitoring programs both during and after the remediation activities; and
- Provide administrative or regulatory approaches that maybe employed to facilitate successful remediation program.
- **Also applies to sites contaminated by non-POPs** and presents how the remediations decision-making process should be undertaken

EMB MC 2017-004:Guidelines for Site Remediationtion

Development of Remedial Action Plan (Rem AP)

Determine Remediation Goals	Recommend Remedial Actions	Develop Site Management Plan

Implementation of RemAP

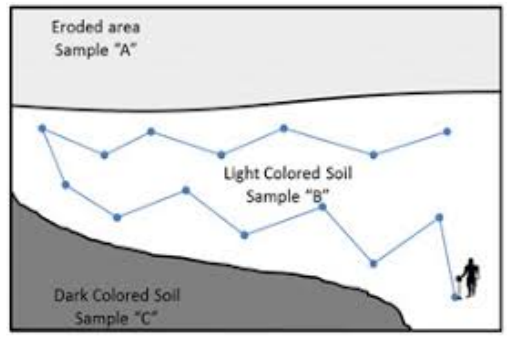
Prepare Work Plan	Secure Regulatory Permits	Procurement Process

Site Validation

Sampling Activities	Recommendation(s) on further Site Management and Long term Monitoring (if required)

ONLY IF RECOMMENDED BASED ON RESULTS OF SITE VALIDATION

LONG TERM MONITORING



EMB MC 2017-004:Guidelines for Site Remediationtion

Section 3.2 .Tiered Approach to Remediation Criteria

3 basic approaches that maybe utilized for the development of Site-Specific Remediation Criteria:

- **Tier 1**. Direct adoption of remediation criteria (criteria-based approach)
- **Tier 2.** Adoption of remediation criteria with limited modification (modified criteria approach)
- **Tier 3**. The use of risk assessment (risk-based approach)

SECTION THREE — **Basis for Decision-Making and Remediation Criteria/Clean-Up Goals**

3.3 Tier 1 Screening Values

Table 1: Tier 1 Screening Values

POPs Parameter	Residential Use Soil (mg/kg)	Industrial Use Soil (mg/kg)	Surface Water (µg/L)	Groundwater (µg/L)
Aldrin	0.029	0.1	1	0.004
Chlordane	1.6	6.5	3	0.2
Total DDT (DDT+DDE+DDD)	4	4	50	1
Dieldrin	0.03	0.11	1	0.0015
Endrin	18	180	0.6	0.6
Heptachlor	0.11	0.28	0.3	0.3
HCB	0.3	1.1	0.042	0.042
Mirex	0.027	0.096	0.0037	0.0037
Toxaphene	0.44	1.6	5	0.013
PCBs Total	0.22	0.74	1	0.017
Dioxins (I-TEQ)	0.00018	0.00018	0.0001	0.0001

Notes:

1. *For Soil, these were all taken from USEPA RSLs but since there are no USEPA RSL values for Total DDT and Dioxins so the DIV values have been chosen.*
2. *For Surface Water, those available from the DENR Standards were selected except for the Endrin and heptachlor values were taken from the Philippine Drinking Water Standards. The rest were selected from USEPA RSL Tap water if available but if not, then from DIV.*
3. *For Groundwater, the USEPA RSL's for Tap Water have been mainly chosen except where existing Philippines Drinking Water values already exist. The Dioxins value is the US National Drinking Water Standards value.*
4. *The USEPA RSLs are regularly updated twice a year, thus, please refer to the latest values at the following link: https://www.epa.gov/risk/regional-screening-levels-rsls*

Completed Remediation Project

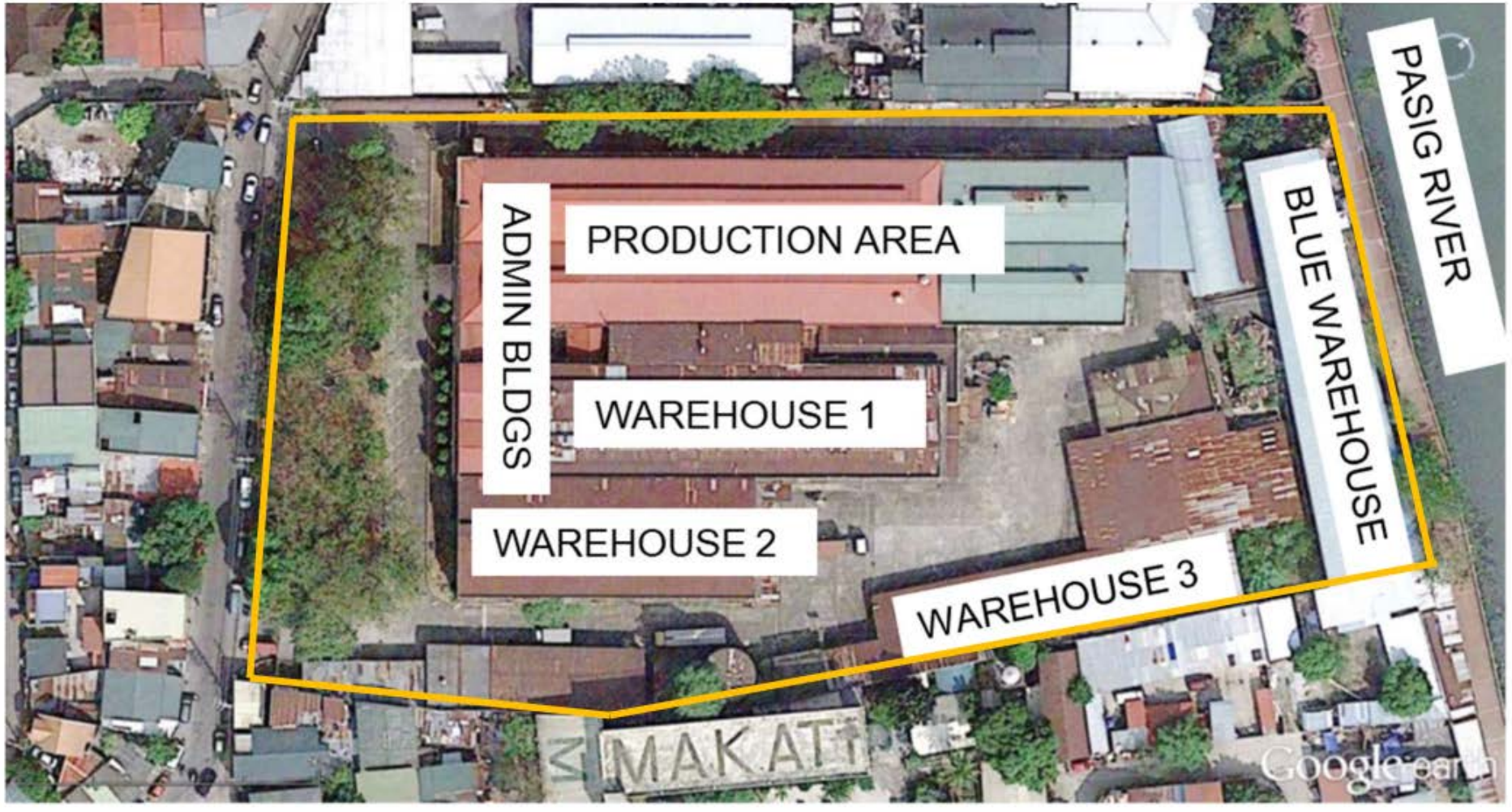
Case 1: Lighting Products Manufacturing Plant

Site History

Completed Remediation Project

Case 1: Lighting Products Manufacturing Plant

Site Features



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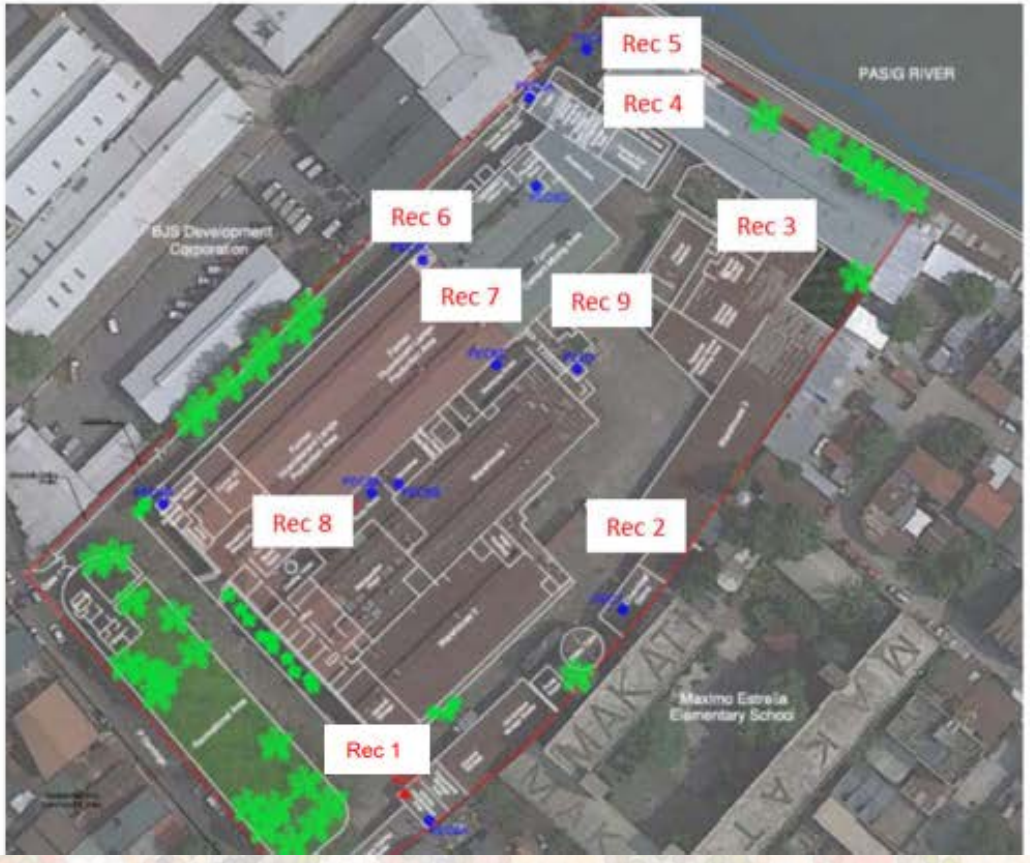
Case 1: Lighting Products Manufacturing Plant

Recognized Environmental Conditions (REC)



1. Vehicle Maintenance Area
2. Warehouse 3
3. Vacuum Pump and Maintenance Room
4. Blue Warehouse
5. Former Wastewater Treatment Area
6. Storage Shelter Pits
7. Fluorescent Area Exhaust Machine
8. Pump Room
9. Sulfur Dioxide Cylinder Storage Area

Completed Remediation Project

Case 1: Lighting Products Manufacturing Plant

Site Investigation

- More than 100 soil borings were performed to evaluate subsurface conditions
- Environmental samples collected
  - Concrete
  - Building materials
  - Soil vapor
  - Fill
  - Soil
  - Groundwater
- Collective results informed demolition and remediation decision making

Completed Remediation Project

Case 1: Lighting Products Manufacturing Plant

Soil Borings Encountered Glass Fill

- Glass with remnant debris of lighting manufacture found in multiple areas
- Glass percentage in fill varied widely; zones with 100% glass were found
- Confirmed contaminants
  - Antimony, Cadmium
  - Copper, Lead
  - Mercury, Nickel and Zinc
- Several samples determined as characteristic hazardous waste

Completed Remediation Project

Case 1: Lighting Products Manufacturing Plant

Human Health Risk Assessment (HHRA) Guides Remedial Action

HHRA has historically been used to make decisions and inform remediation in the Philippines

The HHRA identifies potential unacceptable risks

- Chemicals
- Media
- Exposure scenarios

Identifies scenarios which warrant mitigation to lower risk & control exposures

Completed Remediation Project

Case 1: Lighting Products Manufacturing Plant

Risk Based Remediation Goal Summary

Compound	Exposure Scenario		
	Residential (0 to 2 mbgs)	Construction Worker (0.5 to 2 mbgs)	Commercial/ Industrial (0 to 0.5 mbgs)
	Concentration (mg/kg)		
Antimony	31	84	NE
Cadmium	71	NE	NE
Copper	3,218	2,100	NE
Mercury	11	20	46

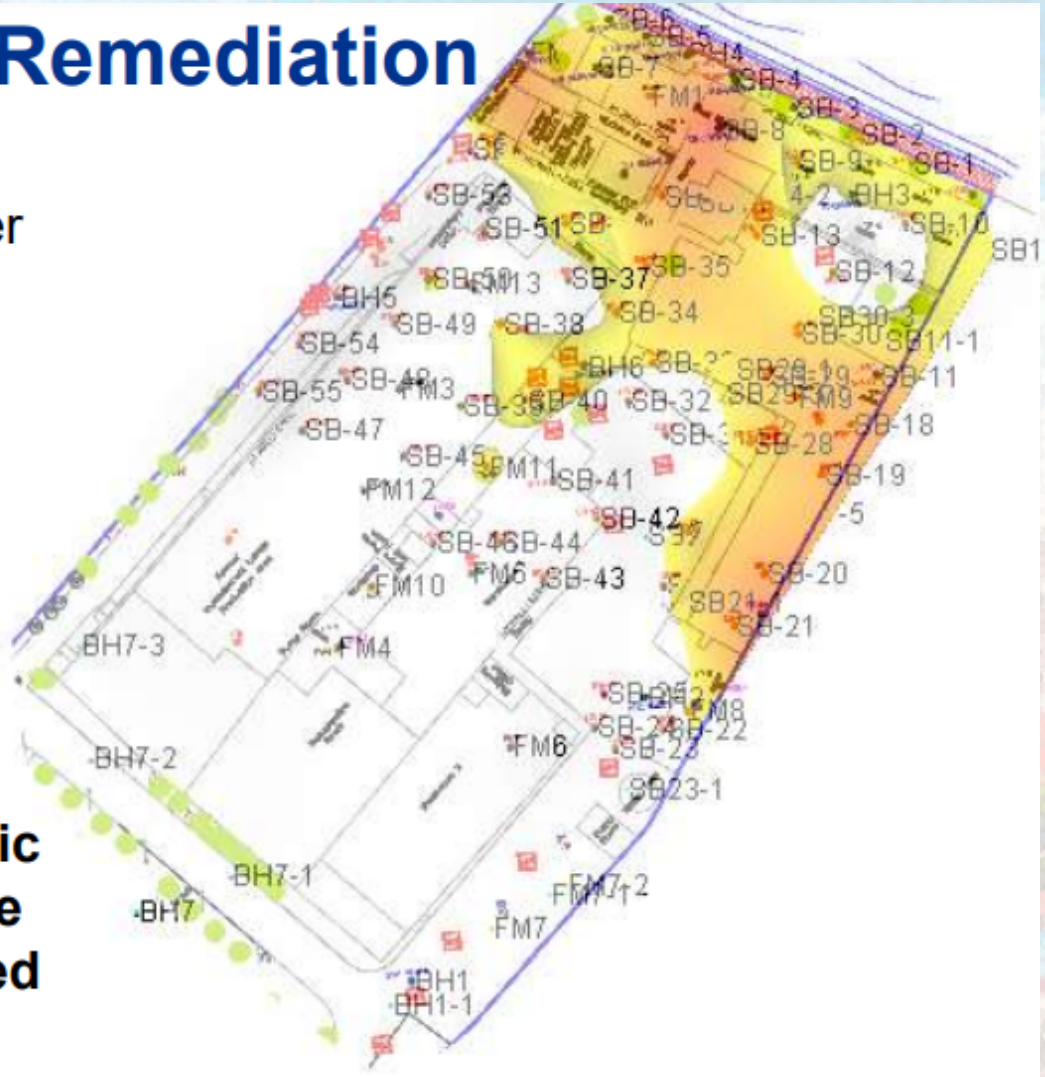
Note:
NE = not established (not a COC)

Completed Remediation Project

Case 1: Lighting Products Manufacturing Plant

Mercury Extent Drives Remediation

- More than 220 soil samples defined mercury contamination extent greater than 11 mg/kg
- Spatial analysis of COC distribution supported by desktop software package (mining visualization software [MVS])
  - Antimony, cadmium and copper exceedances were included with mercury remediation extent
- **Remediation of 6,000 to 8,500 cubic meters (m^3) of fill containing waste glass with mercury was determined necessary.**



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Case 1: Lighting Products Manufacturing Plant

Remedial Action

Excavation with Off-site Disposal

- Excavation
  - Removal of subsurface materials >11 mg/kg mercury
- Backfill
  - Replacement with certified clean import soil and;
  - Reuse of clean crushed concrete from building demolition
- Excavated Soil
  - Staged in tonner bags; stored on site until disposed
  - Characterized every 10 m^3 for waste disposal purposes
- Disposal
  - Hazardous – Dolomatrix Treatment followed by Metro Clark landfill
  - Non-hazardous – Direct transport to Metro Clark landfill

Completed Remediation Project

Case 1: Lighting Products Manufacturing Plant

Excavation and Tonner Bag Transport

EXCAVATION, BAGGING AND TRANSPORTATION OF TONNER BAGS FROM AREA 7

Completed Remediation Project

Case 1: Lighting Products Manufacturing Plant

Environmental Controls

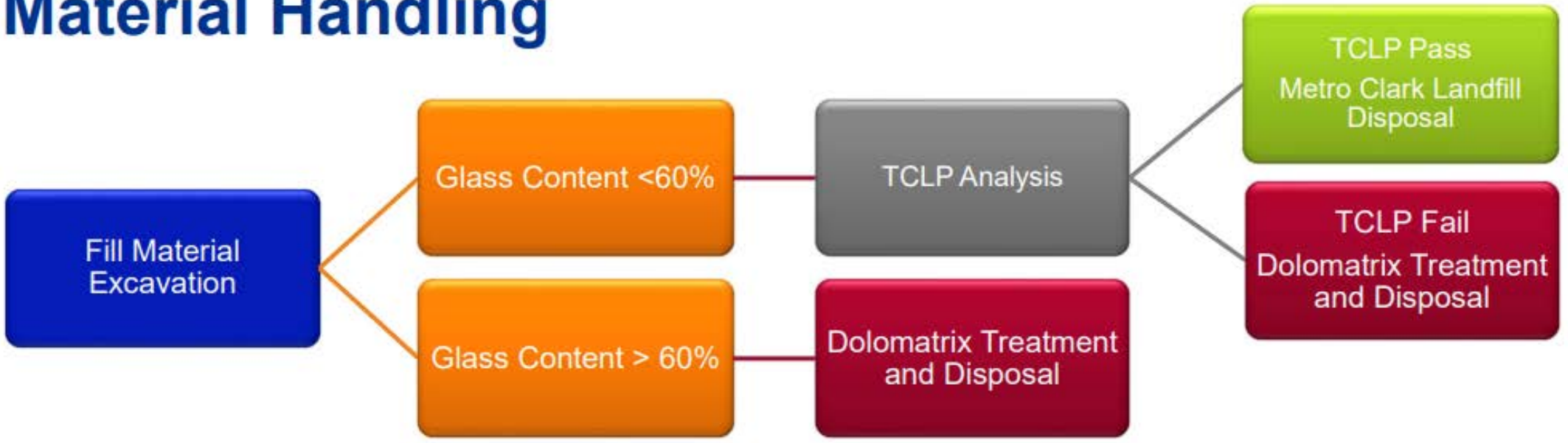
Mercury Vapor Suppression - HgX

Water Cannon Provides Dust Control

Completed Remediation Project

Case 1: Lighting Products Manufacturing Plant

Material Handling



Completed Remediation Project

Case 1: Lighting Products Manufacturing Plant

Confirmation Sampling

- As defined by the Remedial Action Plan

Location	Collection Summary	Collection Frequency
Sidewall	Samples collected from exterior perimeter of RAP defined excavation area only. Samples to be collected at the midpoint between ground surface and excavation depth up to a maximum of 2m.	Where feasible, one confirmation sample will be collected for every 15m of exposed excavation sidewall.
Bottom (<2m bgs)	Grab soil sample collected from RAP defined excavation areas which are less than 2m in total depth.	One confirmation sample will be collected per every 250 square meters excavated

Completed Remediation Project

Case 1: Lighting Products Manufacturing Plant

Project Summary

- Successful removal of all historic property improvements
  - Demolition of six major buildings
  - Management of > 26,000 MT of materials including approximately 350 MT of materials which were recycled off site for resource recovery.
- Remediation of environmental contamination
  - Excavation, offsite treatment and disposal of approximately 7,100 MT of hazardous wastes
  - Removal and offsite disposal of >11,800 MT of nonhazardous waste
  - Reuse of > 6,700 MT of crushed concrete and foundation fill materials as excavation backfill
- Restoration of the project site

Completed Remediation Project

Case II: Petroleum Pipeline Leak

Background

July 2010 – Residents of the West Tower Condominium detected smell of fuel fumes traced to cracks in the basement walls and sump pit at the level 4 basement

November 8, 2010 – the FPIC announced that holes were found in the pipeline that caused the seepage of fuel into the West Tower basement.

November 22, 2010 – The FPIC representatives presented their findings to the Department of Health (DOH) on the situation in Bangkal, Makati City. The Inter-Agency Committee on Environmental Health (IACEH) was directed to convene and assist in the environmental sampling and monitoring of the health of the residents in the area.

Completed Remediation Project

Case II: Petroleum Pipeline Leak

Background

The Inter-Agency Committee on Environmental Health (IACEH) was created by virtue of Executive Order No. 489 on November 22, 1991.

Its functions include:

1. Formulate policies, promulgate guidelines and develop programs for environmental health protection;
2. Coordinate, monitor and evaluate environmental health programs;
3. Undertake information dissemination and education campaigns on environmental health programs;
4. Coordinate in, assist and/or support the conduct of researches to carry out the provisions of the EO.

Completed Remediation Project
Case II: Petroleum Pipeline Leak

The IACEH issued the following resolutions

1. IACEH Resolution No. 2010-0001
   Directs EOHO-NCDPC to coordinate drinking water sampling activities with other government agencies
2. IACEH Resolution No. 2010-0002
   Creation of a National Task Force to address the petroleum leak
3. IACEH Resolution No. 2011-0002
   Approval of the Multi Phase Extraction (MPE) Technology for the remediation and recovery of the environment in Bangkal, Makati City
4. IACEH Resolution No. 2011-0001
   Provisional guidelines for BTEX
5. Department Personnel Order No. 2016-3601
   Creation of an Expert Panel on the Human Health Risk Assessment

Completed Remediation Project

Case II: Petroleum Pipeline Leak

Remediation Updates

As of September 30, 2020, the FPIC reported that the combined petroleum hydrocarbon recovered is 1,198,650 liters or 66.59% of the estimated volume of product that accidentally leaked.

The MPE System has stopped operation last June 2017. Since September 2017, rebound testing stage has been implemented to monitor the plume's movement since the MPE is no longer operating.

The recent Ground Monitoring Events conducted by the FPIC showed that the plume's movement has been almost static and that its size has become significantly smaller, following a downward trend.

Completed Remediation Project

Case II: Petroleum Pipeline Leak

Remediation Updates

As of December 2022, the Independent Panel of Expert (IPE) engaged by IACEH has already recommended for the approval pf the Post Remediation Action Plan (PRAP).

FPIC already informed the IACEH on their intent to decommission the MPE System that has stopped operation since June 2017.

Only MW 37 is above the 5 ug/L levels for Benzene, and the results of environmental sites assessments show a continuous downward trend of the Benzene levels for this well. The rest of the monitoring wells are also already compliant or have reached the target mediation goal since 2020.

Thank you!!!

Department of Environment and Natural Resources
Environmental Management Bureau
https://emb.gov.ph/

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