



Building Sustainable Futures: Insights into Sanitary Landfills in the Philippines

Date 04 April 2024

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Bologna, Italy
Global Headquarters

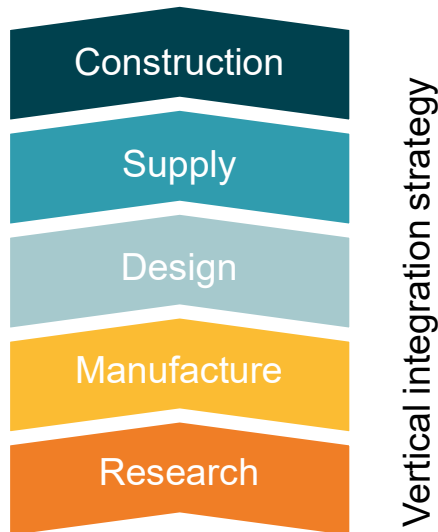


MISSION AND VISION



MISSION

To become a **leading international provider of advanced solutions** to the civil, geotechnical and environmental construction markets.

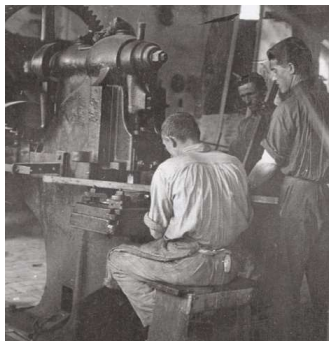


VISION

We strive to be a **technical reference** solving our client's problems through innovation, collaboration and best-value environmental solutions.



ENDURING HISTORY



// For over 140 years, we have researched, designed and developed solutions to solve technical problems within the Civil Engineering, Geotechnical and Environmental Construction Markets.

1879

The origins

On May 3, 1879 Raffaele Maccaferri established "Ditta Maccaferri Raffaele, Officina da Fabbro" in Lavino (Bologna) for the production of wrought iron items.

1907

Beginning of expansion

The original "sack" gabions were followed by the new box-shaped design, which was used in many large public work projects.

1946-1966

New launch and products

Reorganisation and re-launch of production. Creation of new products: Maccaferri was the first company in Europe to introduce 'heavy duty' galvanising. In 1966 Florence was hit by disastrous floods. Gabions proved to be extremely efficient for the reconstruction of roads and water courses.

1893

The gabion invention

"Ditta Maccaferri" invented the famous gabion. The old craft trade grows into an industrial enterprise.

1914-1940

Diversification

Start of the diversification process: 18 new companies set up, through mergers and new acquisitions.

ENDURING HISTORY



1996-2005

Evolution

Start of systematic partnerships to offer to customers a full range of durable and cost-effective environmental solutions. Maccaferri enters the Geosynthetic market with its own portfolio of solutions.

Today

New challenges

Development of new value-added solutions: Geosynthetics specialities, Rockfall protection and smart early-warning systems, applications for tunnelling and solutions in the defence and security sectors.

1967-1995

Five continents

Operations expanded over 5 continents. Sharp acceleration in geographical and product diversification. New market approach in compliance with international standards and specifications. Overseeing presence of our engineers at the most important sites in every part of the world.

2006-2018

Expansion

Geographical expansion through localization and further widening of the portfolio of environmental engineering solutions.



WHO WE ARE

MACCAFERRI



Sales in **100+** countries



Revenues ~ **500 M€**



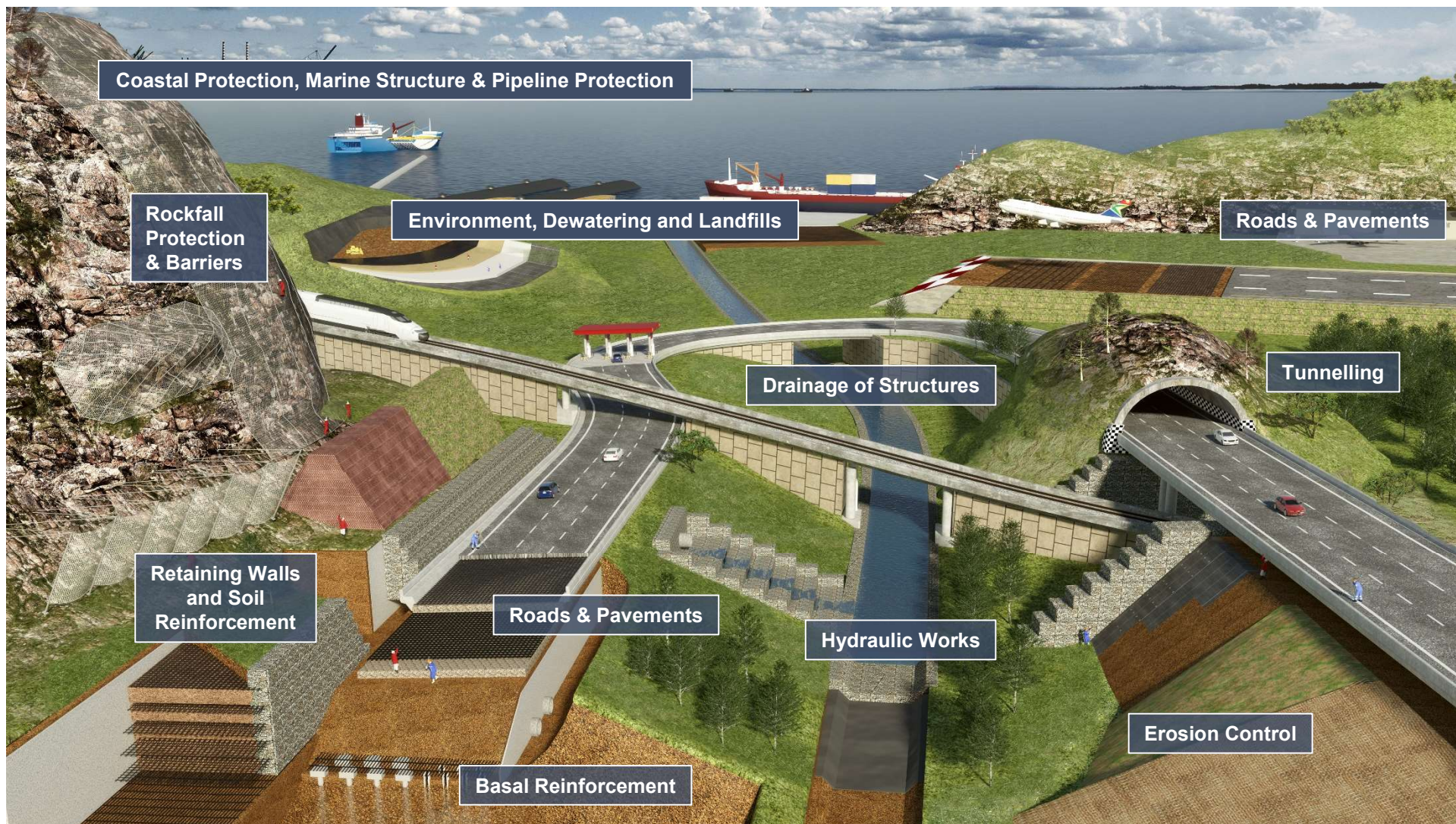
3,000+ employees



25+ factories



60+ subsidiaries



TOPIC OUTLINE

SOLID WASTE IN THE PHILIPPINES

REGULATORY FRAMEWORK

INTRODUCTION TO SANITARY LANDFILL

MODERN AND STANDARD PRACTICES

Q & A

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Q & A

TALE OF TWO BARGES



SOLID WASTES IN THE PHILIPPINES



Different Classifications of Disposal Facilities

TECHNICAL GUIDEBOOK ON SOLID WASTE DISPOSAL BY NSWMC & JICA

- OPEN DUMPSITES
- CONTROLLED DUMPSITES
- CATEGORIZED FINAL DISPOSAL FACILITY



Different Classifications of Disposal Facilities

TECHNICAL GUIDEBOOK ON SOLID WASTE DISPOSAL BY NSWMC & JICA

“A Categorized Final Disposal Facility (Landfill) – a disposal site that is designed, constructed, operated, and maintained to exert engineering control over significant potential environmental impacts that may arise from its development and operation. Basic operational controls include leachate collection and treatment systems, landfill gas management, waste compaction, application of soil cover, all-weather primary and access roads, a trained labor force, and a prohibition on waste pickers, among other measures. The site design is based on hydrogeological considerations, and site preparation includes provisions for controlling surface runoff and containing earth movements.”



SANITARY LANDFILLS IN THE PHILIPPINES



PLANNING FOR SANITARY LANDFILL SYSTEM

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**The Local
Government
Unit Solid
Waste
Management
Plan**

**Review of
Laws and
Regulations
Related to
Solid Waste
Management**

**Solid Waste
Management
Intermediate
Treatment
System**

**The
Preliminary
Process for
the
Development
of
Categorized
Disposal
Facility**

REGULATORY FRAMEWORK

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RA 9003 - The Ecological Solid
Waste Management Act of 2000

DENR Administrative Order (DAO)
No. 10

National Solid Waste Management
Commission (NSWMC)

REGULATORY FRAMEWORK

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PD 1152 – Philippine Environment Code

PD 984 – Pollution Control Law

Commonwealth Act No. 383

PD 825 – Penalty for Improper Garbage Disposal

PD 856 – Code of Sanitation

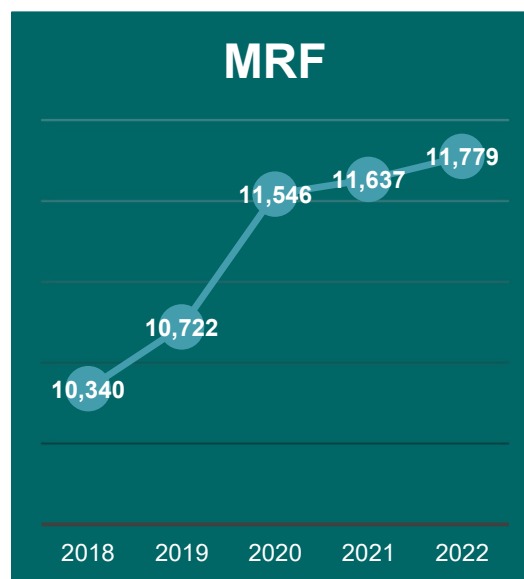
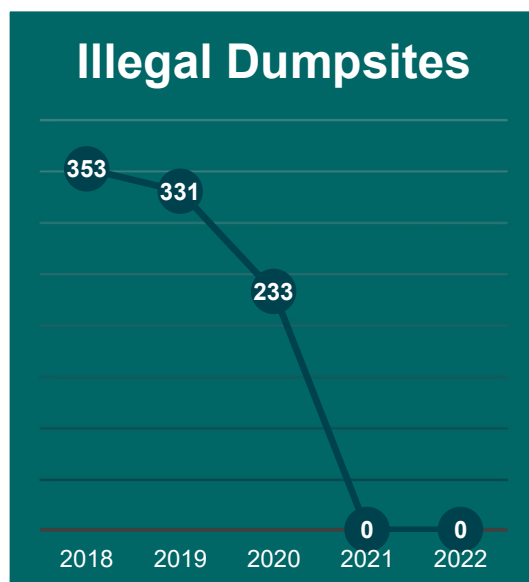
PD 1160, PD 1151

DAO 98 – 49, DAO 98 – 50

RA 6957, RA 7160

SANITARY LANDFILLS IN THE PHILIPPINES

	2018	2019	2020	2021	2022
Illegal Dumpsites	353	331	233	0	0
Materials Recovery Facility (MRF)	10,340	10,722	11,546	11,637	11,779
Sanitary Landfill (SLF)	165	187	241	245	290



WASTE GENERATION BY REGION



PHILIPPINES	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
TONS PER DAY	48,450	49,418	50,409	51,424	52,463	53,527	54,616	55,731	56,874	58,044	59,243
NCR	7,660	7,795	7,933	8,073	8,216	8,363	8,512	8,665	8,821	8,981	9,144
CAR	770	784	798	812	827	842	858	873	889	906	922
Region I - Ilocos Region	2,292	2,321	2,350	2,379	2,408	2,438	2,469	2,499	2,531	2,562	2,594
Region II - Cagayan Valley	1,515	1,536	1,557	1,579	1,601	1,624	1,646	1,669	1,693	1,716	1,740
Region III - Central Luzon	5,618	5,739	5,863	5,990	6,120	6,252	6,388	6,526	6,668	6,813	6,962
Region IV-A - CALABARZON	7,376	7,611	7,854	8,105	8,365	8,634	8,912	9,200	9,498	9,806	10,125
MIMAROPA Region	1,323	1,348	1,375	1,401	1,429	1,457	1,486	1,515	1,545	1,576	1,608
Region V - Bicol Region	2,539	2,576	2,613	2,651	2,690	2,729	2,769	2,809	2,850	2,891	2,933
Region VI - Western Visayas	3,697	3,746	3,797	3,848	3,900	3,953	4,006	4,060	4,115	4,171	4,227
Region VII - Central Visayas	3,681	3,752	3,825	3,899	3,976	4,054	4,134	4,216	4,300	4,386	4,474
Region VIII - Eastern Visayas	1,824	1,848	1,872	1,897	1,922	1,947	1,973	1,999	2,025	2,052	2,079
Region IX - Zamboanga Peninsula	1,742	1,777	1,812	1,849	1,886	1,924	1,963	2,003	2,043	2,085	2,128
Region X - Northern Mindanao	2,319	2,367	2,416	2,466	2,518	2,570	2,623	2,678	2,734	2,791	2,849
Region XI - Davao Region	2,705	2,760	2,817	2,874	2,933	2,994	3,055	3,118	3,182	3,248	3,315
Region XII - SOCCSKSARGEN	2,149	2,199	2,250	2,302	2,356	2,411	2,467	2,525	2,583	2,644	2,705
Region XIII - Caraga	1,241	1,259	1,278	1,297	1,316	1,335	1,355	1,375	1,396	1,417	1,438
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Notes:

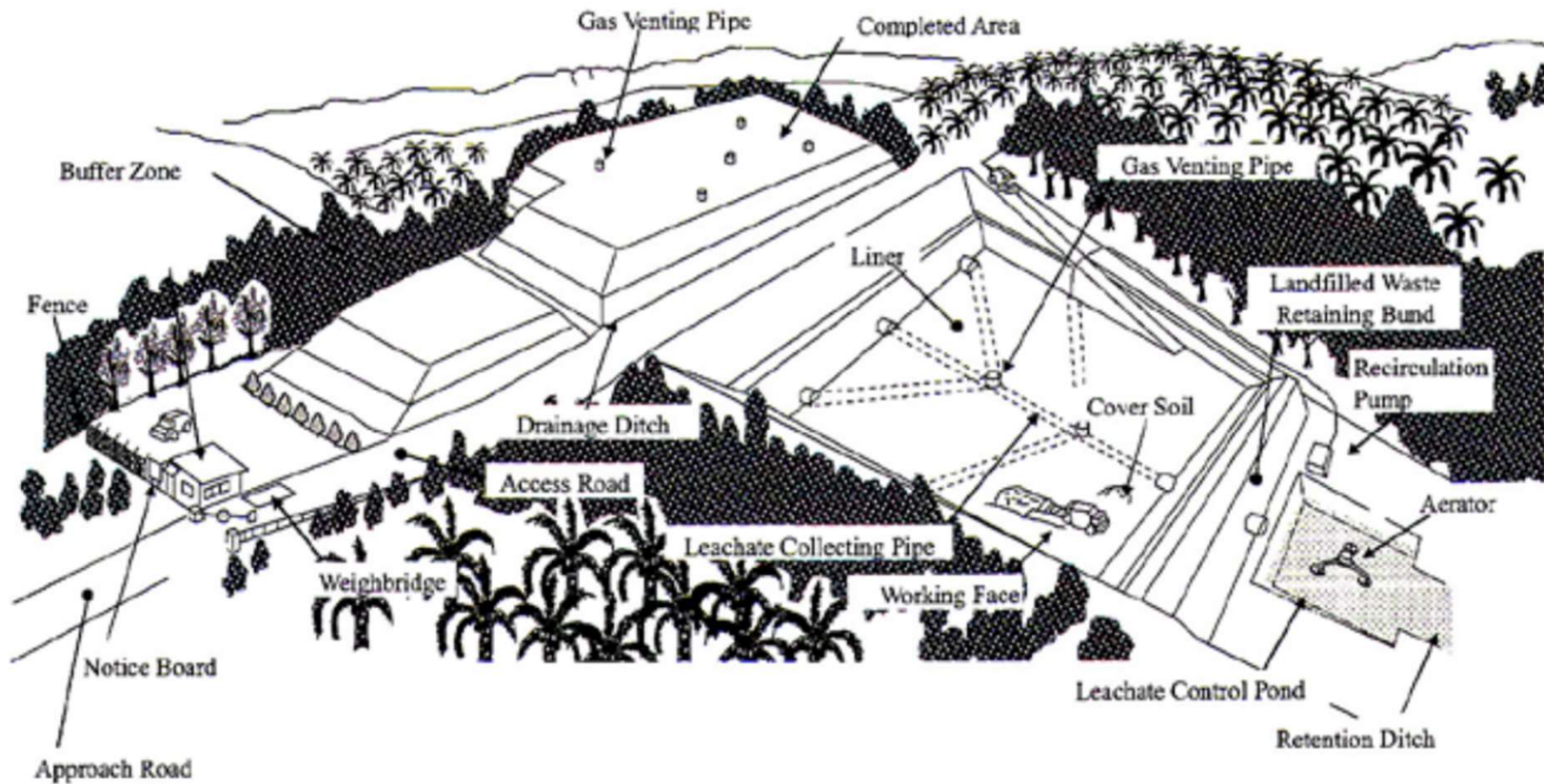
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Based on PSA 2010 Census of Population

Source: Environmental Management Bureau, Department of Environment and Natural Resources

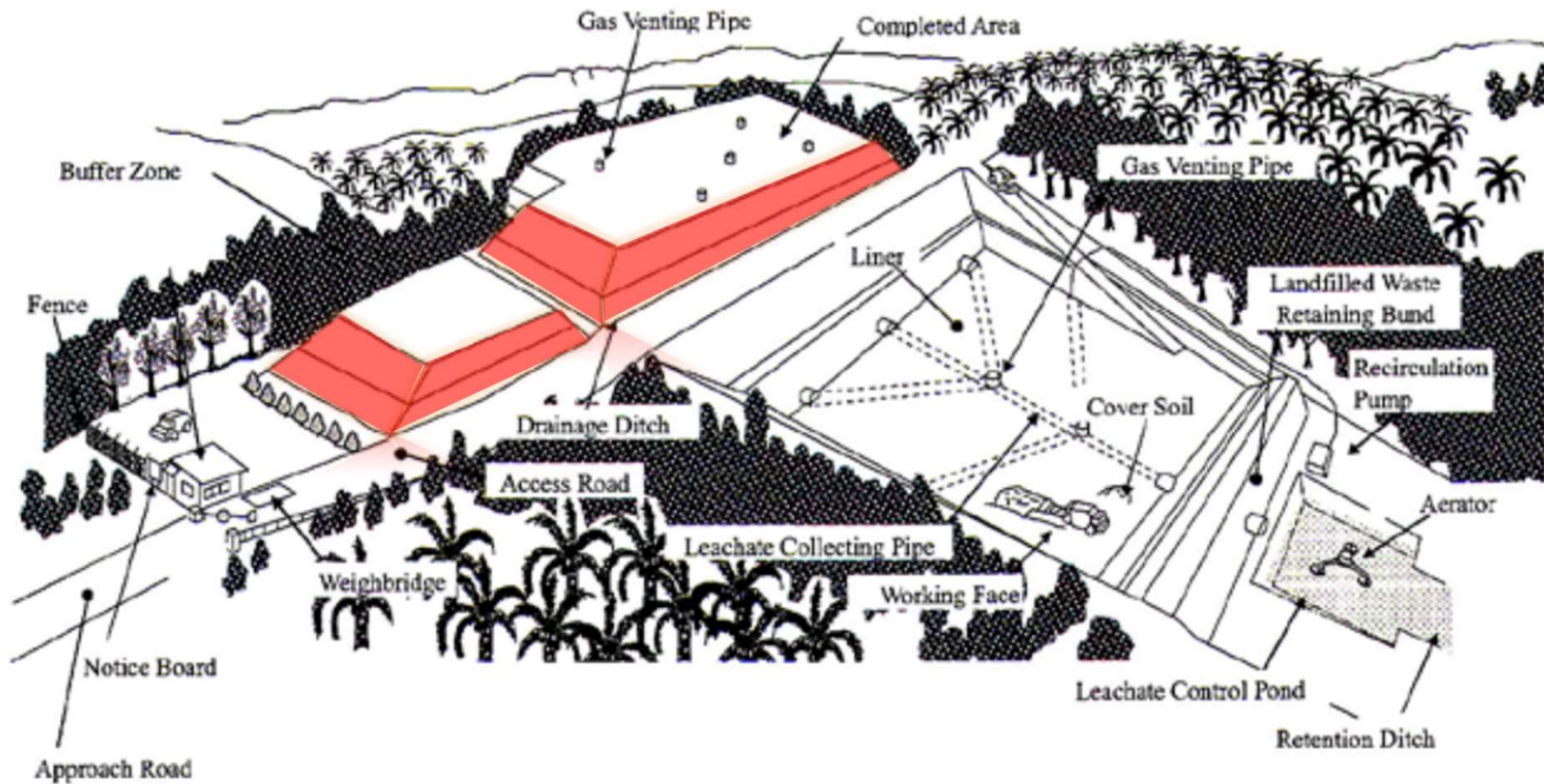
INTRODUCTION TO LANDFILL

TYPICAL SANITARY LANDFILL



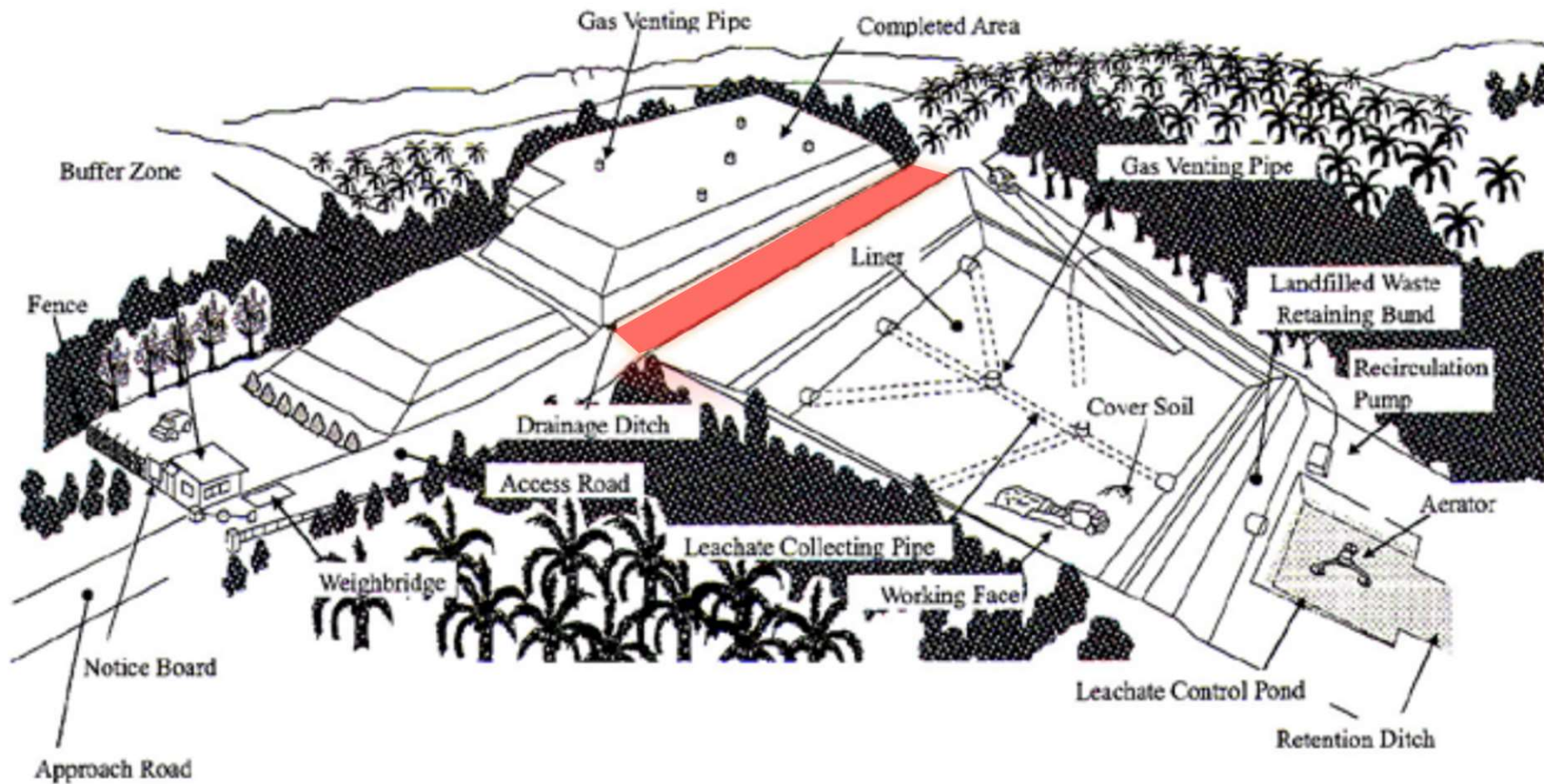
INTRODUCTION TO LANDFILL

WASTE RETAINING FACILITY



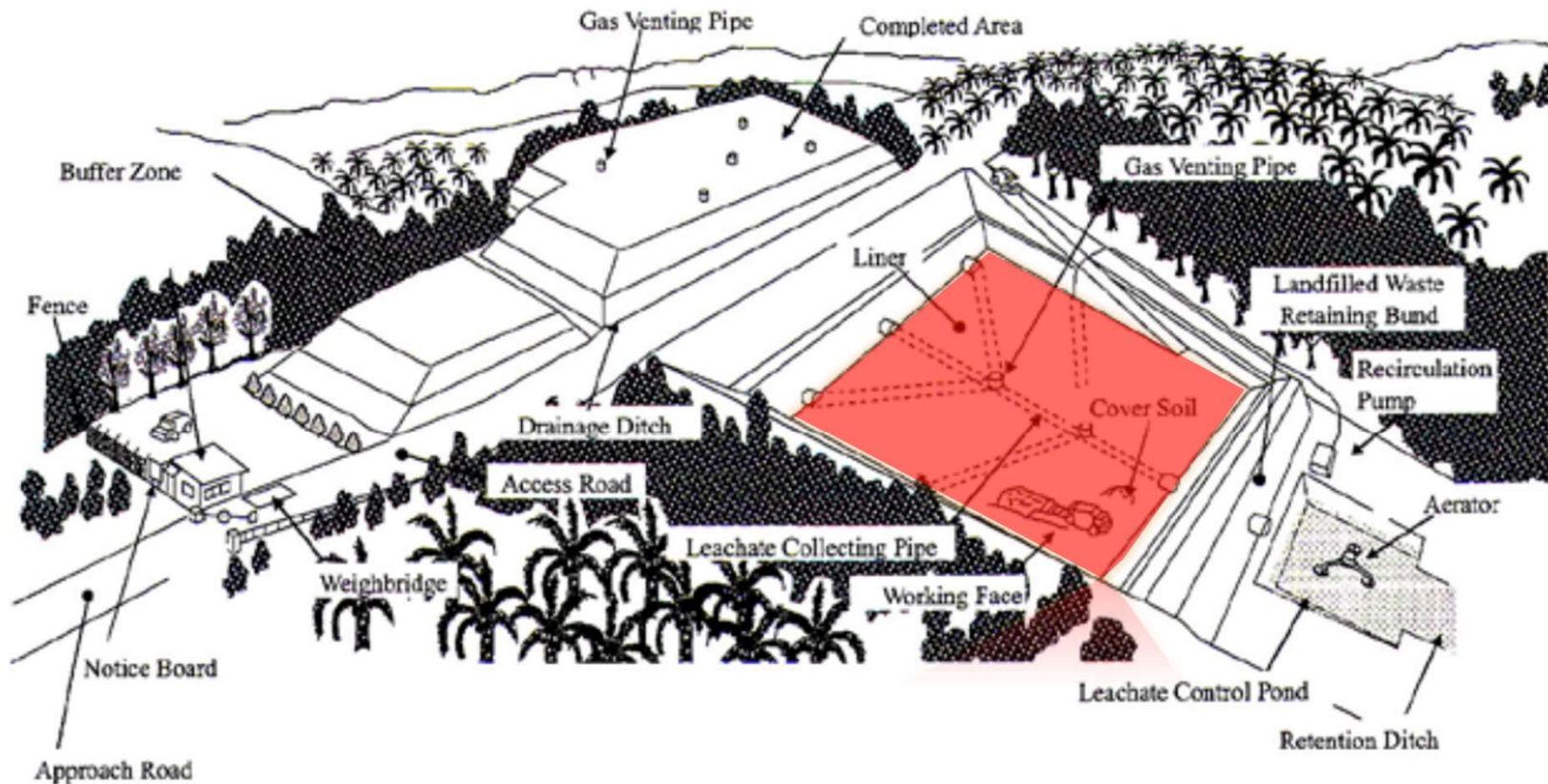
INTRODUCTION TO LANDFILL

STORMWATER DRAINAGE



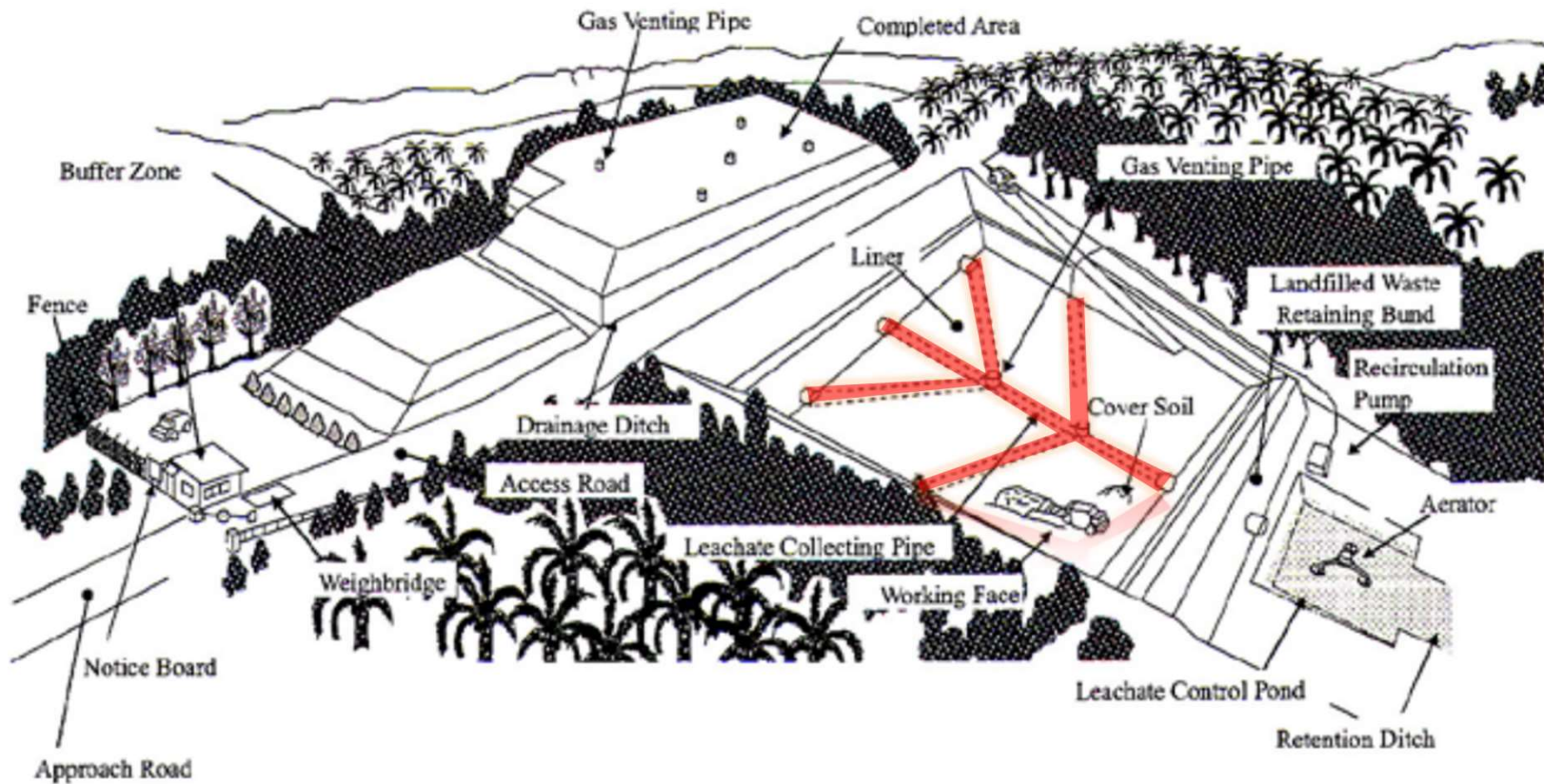
INTRODUCTION TO LANDFILL

LINER FACILITY



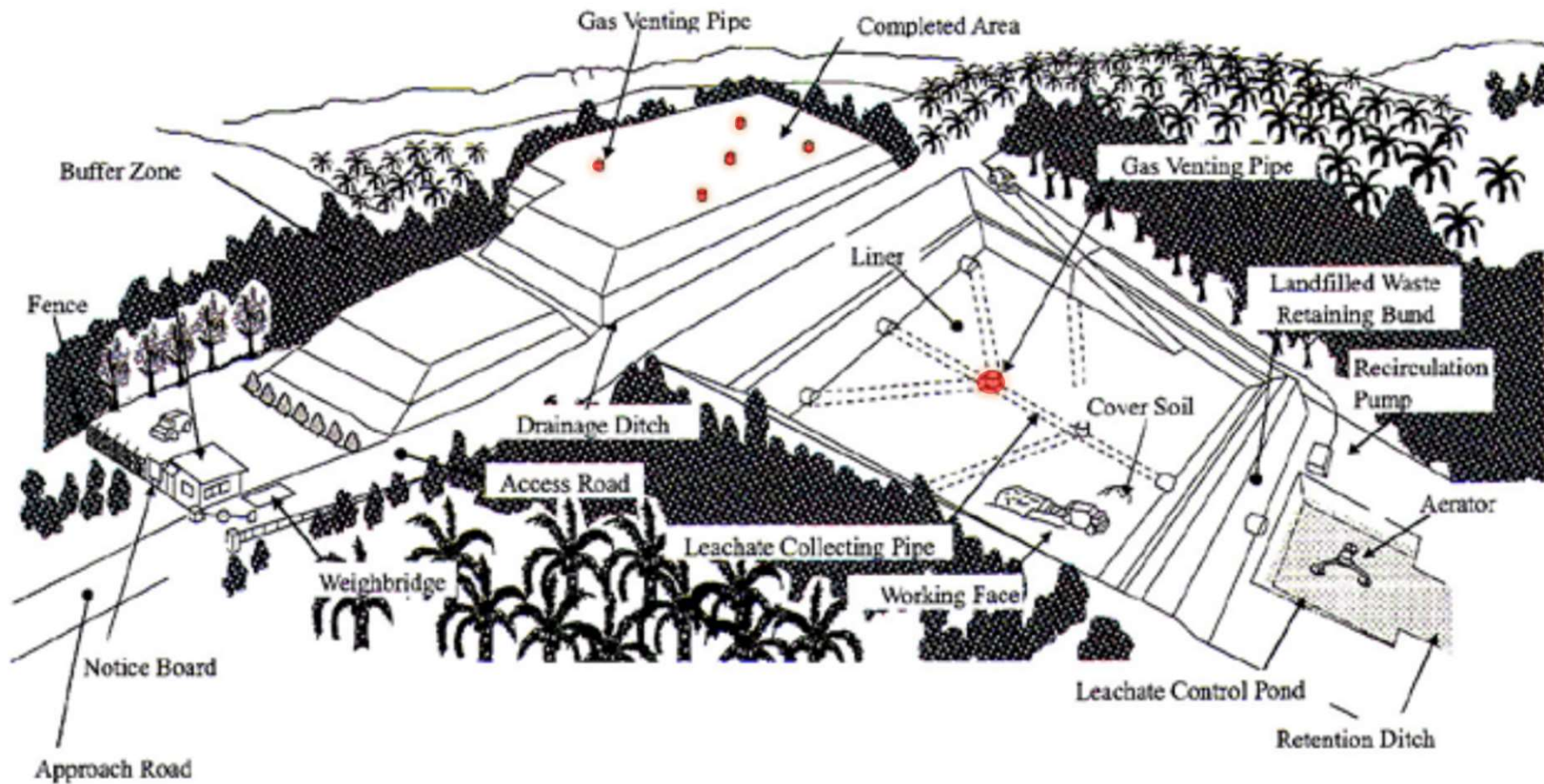
INTRODUCTION TO LANDFILL

LEACHATE FACILITY



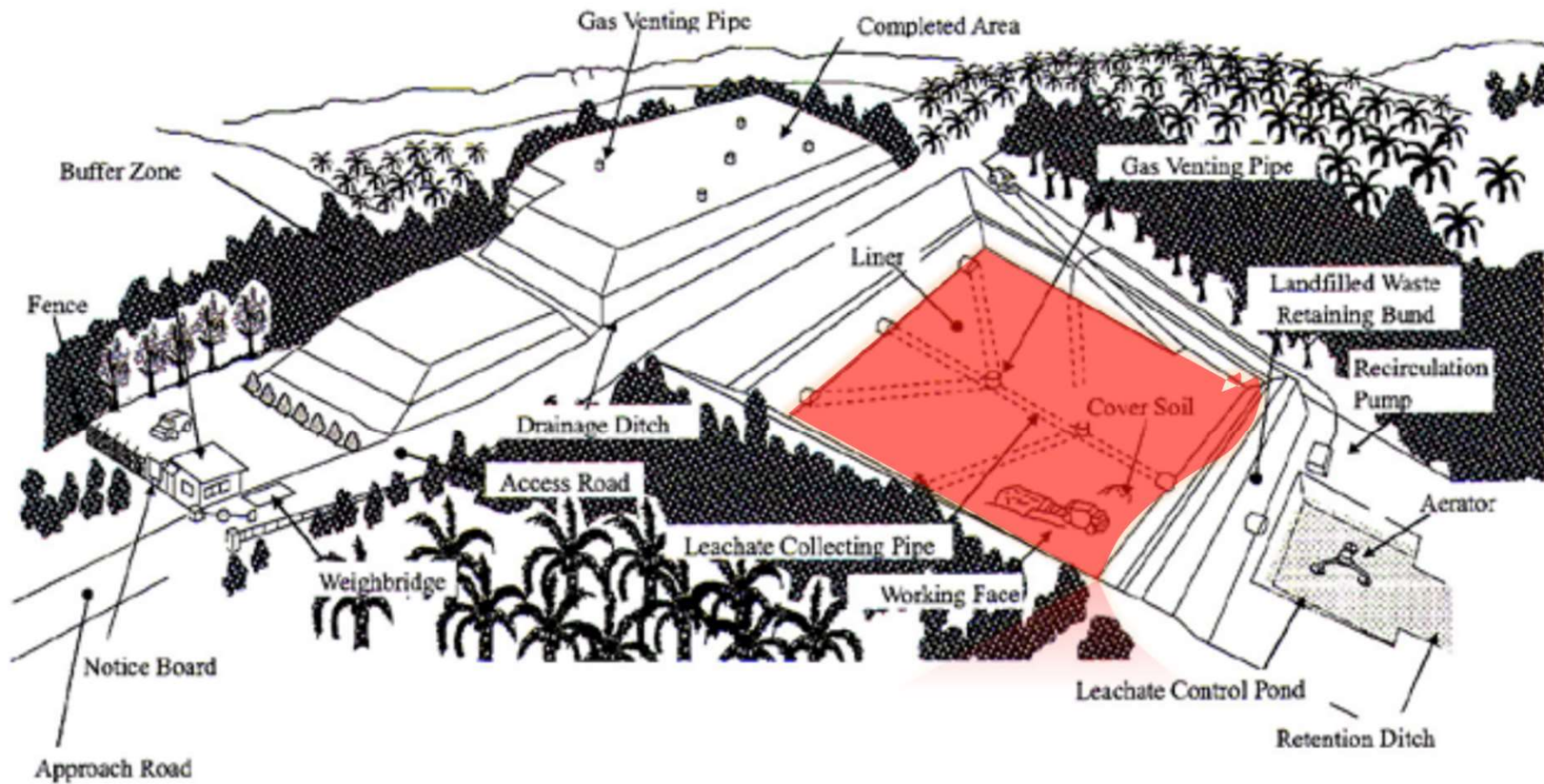
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GAS VENTS



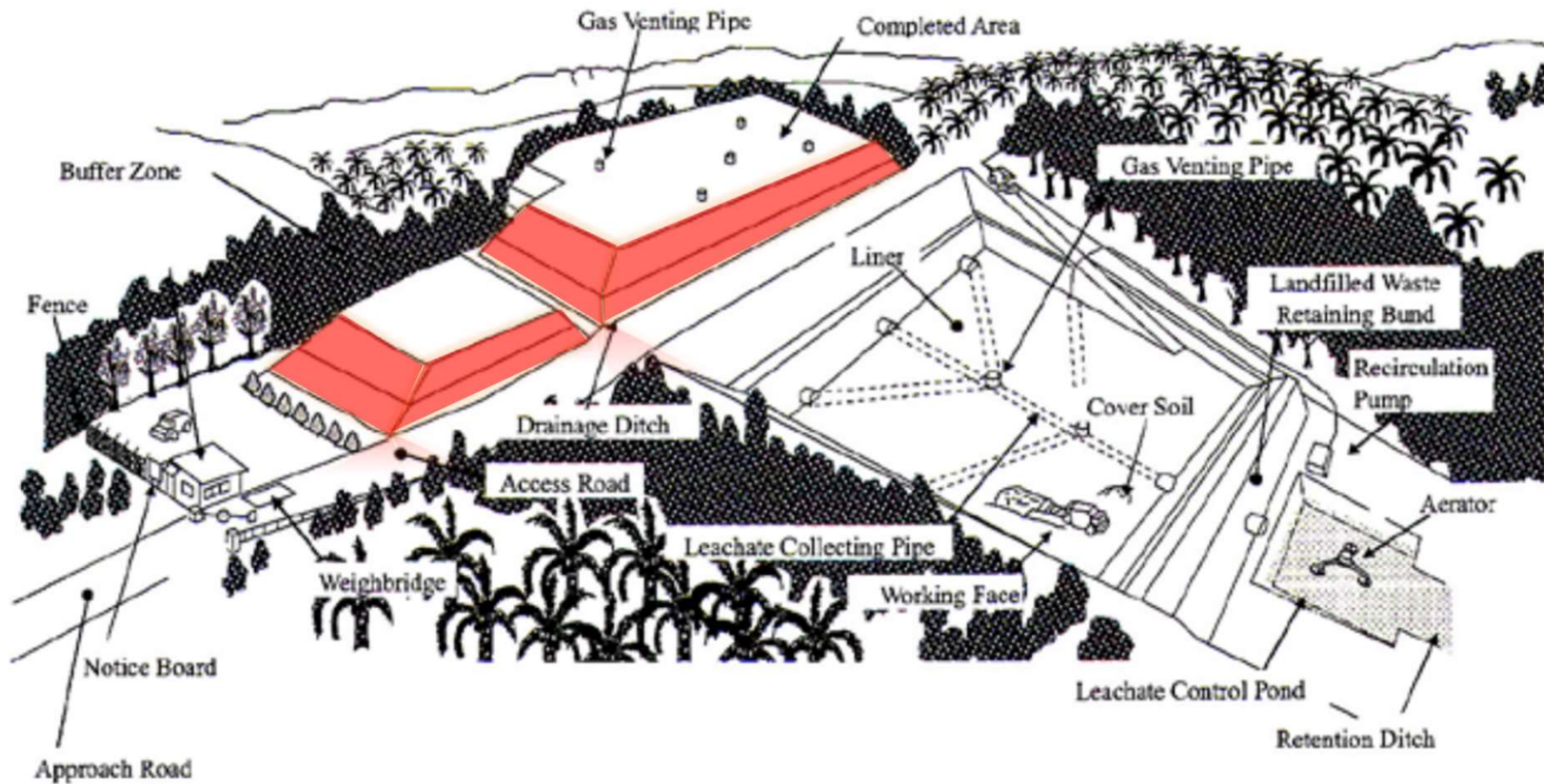
INTRODUCTION TO LANDFILL

LANDFILL COVER



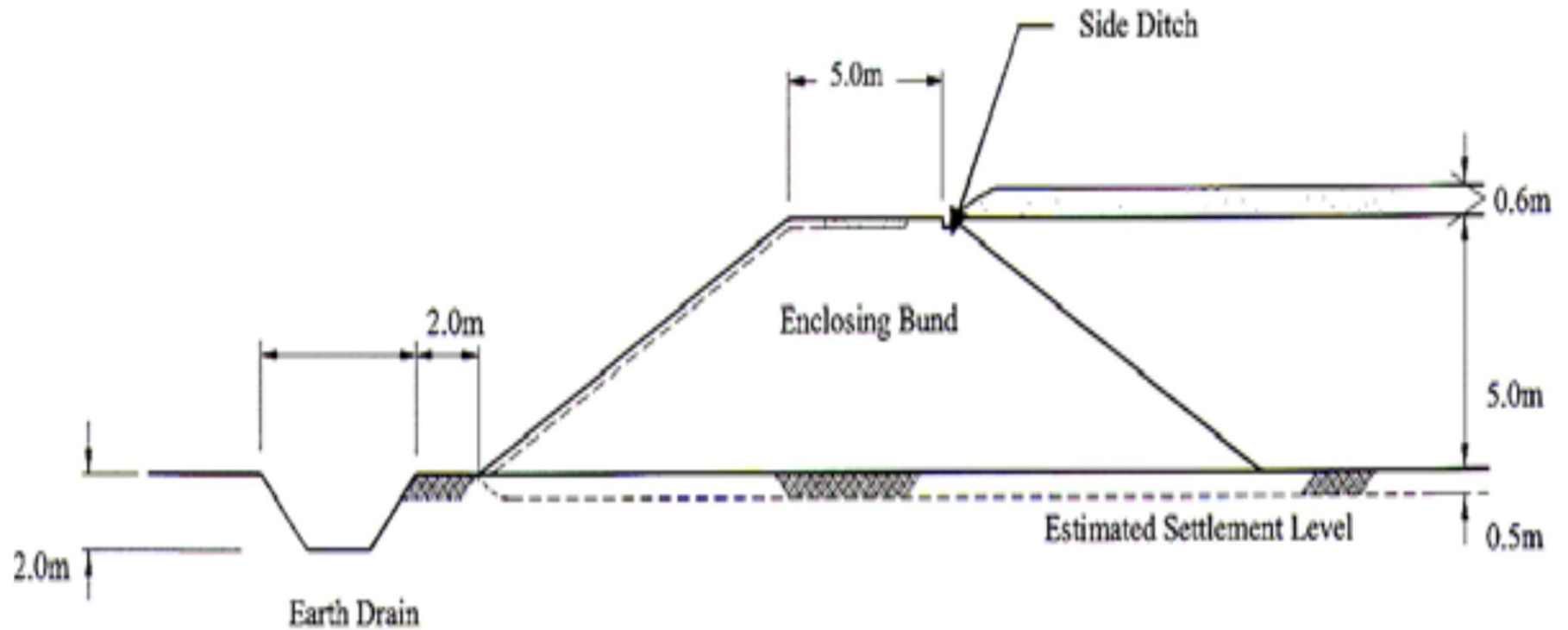
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WASTE RETAINING FACILITY



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WASTE RETAINING FACILITY

MACCAFERRI



INTRODUCTION TO LANDFILL

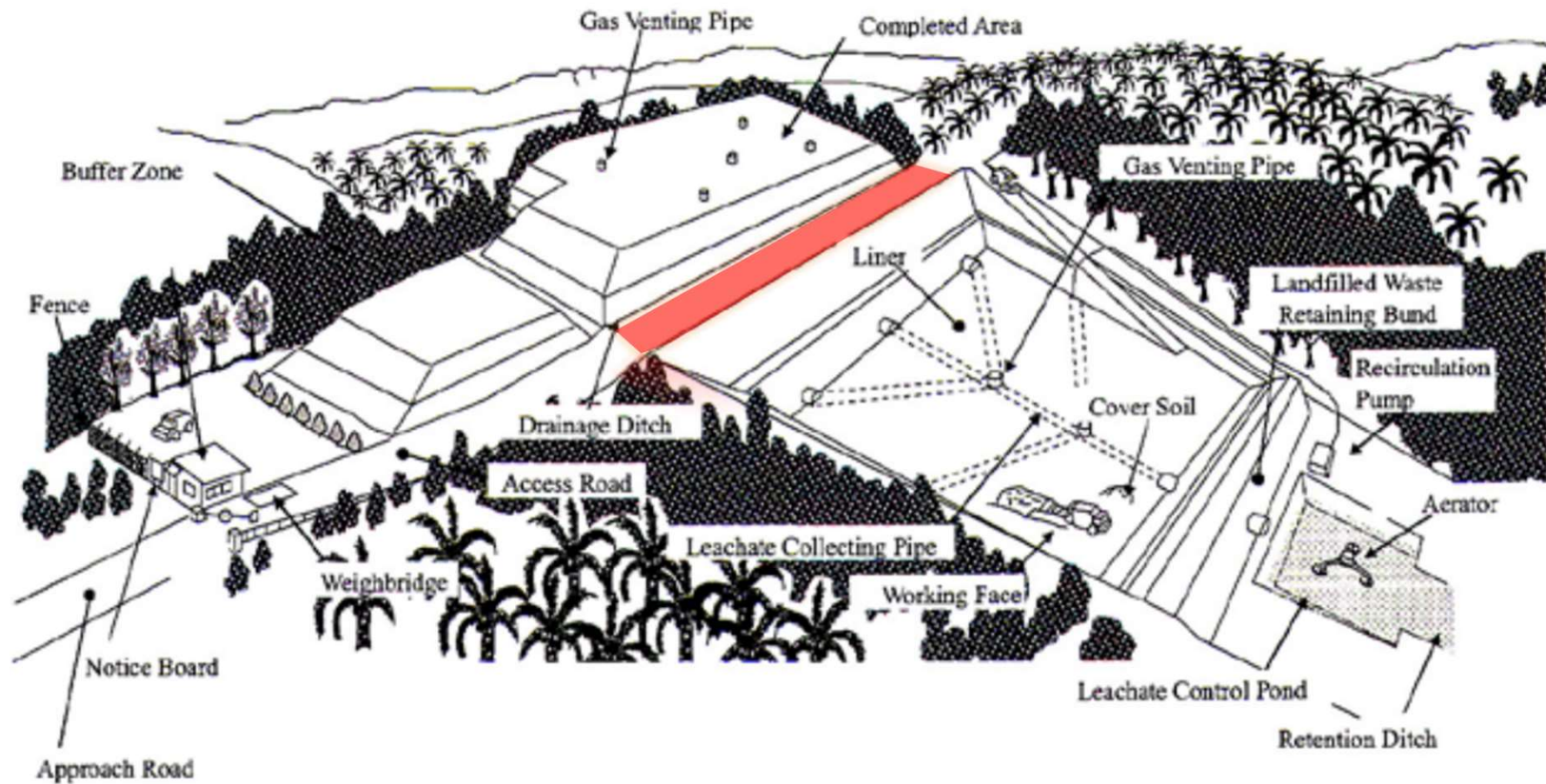
WASTE RETAINING FACILITY

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INTRODUCTION TO LANDFILL

STORMWATER DRAINAGE





MACCAFERRI STORMWATER DRAINAGE SOLUTION

STRICTLY CONFIDENTIAL

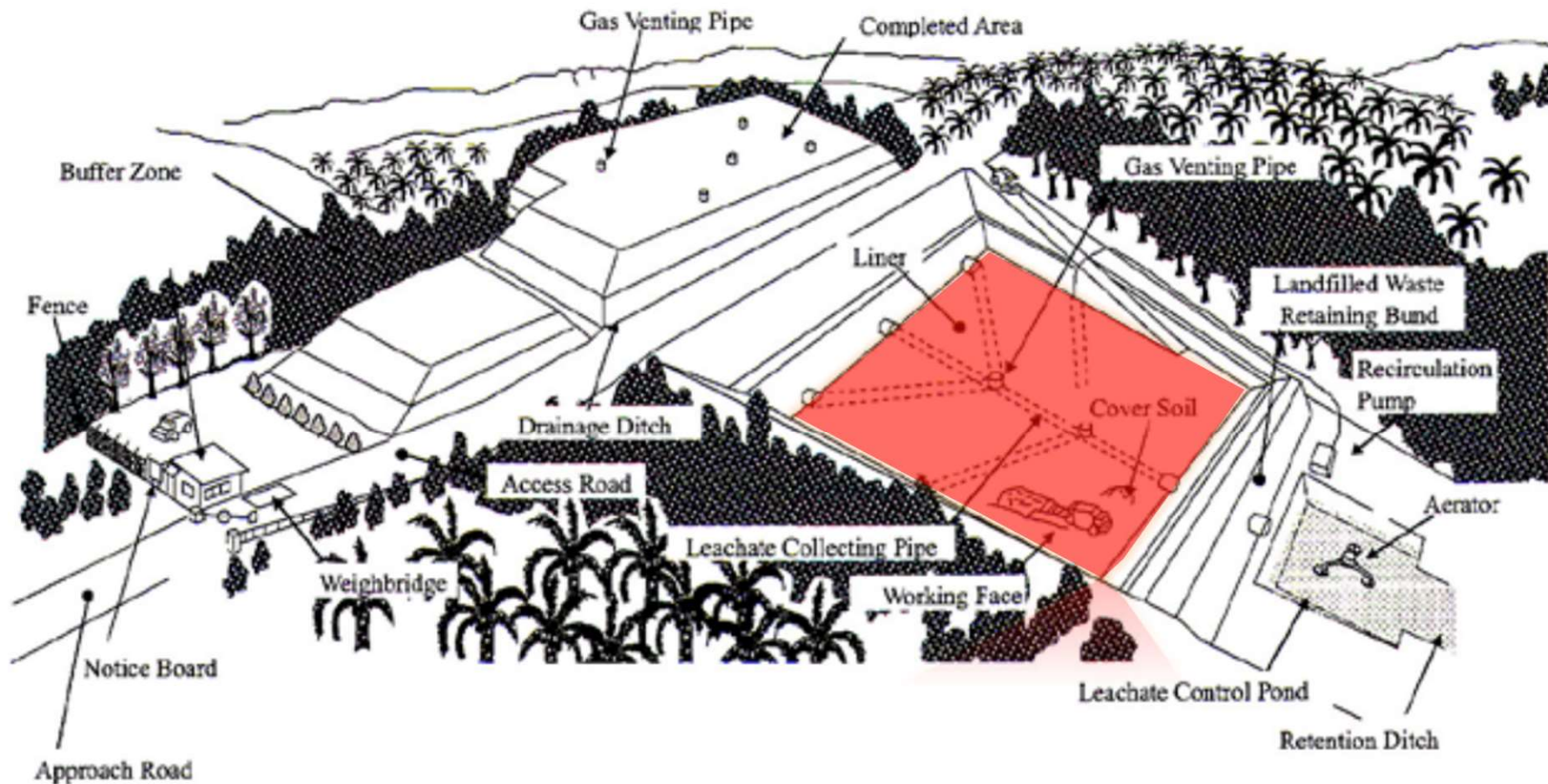
STORMWATER DRAINAGE: RENO MATTRESS

MACCAFERRI STORMWATER DRAINAGE SOLUTION



INTRODUCTION TO LANDFILL

LINER FACILITY



CLASSIFICATIONS OF SANITARY LANDFILLS

TECHNICAL GUIDEBOOK ON SOLID WASTE DISPOSAL BY NSWMC & JICA

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As of 2022

1. Region IV-A – 10,125 tpd
2. NCR – 9,144 tpd
3. Region III – 6,962 tpd
- .
- .
16. CAR – 922 tpd

*tpd = tons per day

<https://psa.gov.ph/statistics/environment/peenra/node/1684061719>

Classification of Categorized Final Disposal Facility

Category 1 < 15 tpd

15 tpd < Category 2 ≤ 75 tpd

75 tpd < Category 3 ≤ 200 tpd

Category 4 > 200 tpd

CLASSIFICATIONS OF SANITARY LANDFILLS

LINER FACILITY MINIMUM REQUIREMENTS

CATEGORY 1

0.60 m clay liner
 $k \leq 1 \times 10^{-5}$ cm/s

CATEGORY 3

1.5 mm HDPE
 $k \leq 1 \times 10^{-14}$ cm/s

0.60 m clay liner
 $k \leq 1 \times 10^{-6}$ cm/s

CATEGORY 2

0.75 m clay liner
 $k \leq 1 \times 10^{-6}$ cm/s

CATEGORY 4

1.5 mm HDPE
 $k \leq 1 \times 10^{-14}$ cm/s

0.60 m clay liner
 $k \leq 1 \times 10^{-7}$ cm/s

MACCAFERRI LINER FACILITY SOLUTION



MACCAFERRI LINER FACILITY SOLUTION



LINER FACILITY: MACLINE GCL

MACCAFERRI LINER FACILITY SOLUTION

MACCAFERRI



MACCAFERRI

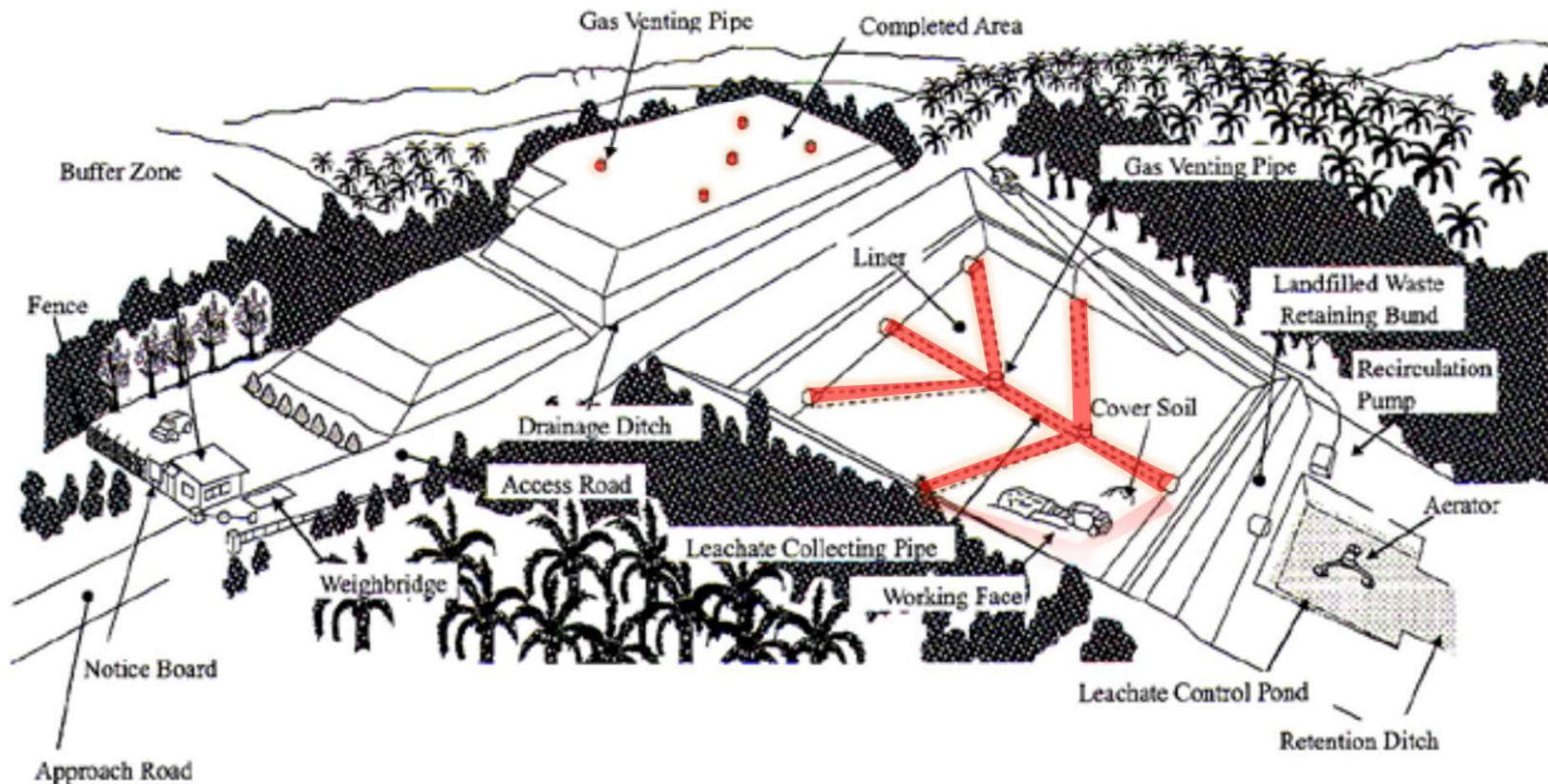


LINER FACILITY: MACLINE GCL

STRICTLY CONFIDENTIAL

INTRODUCTION TO LANDFILL

LEACHATE FACILITY AND GAS VENTS

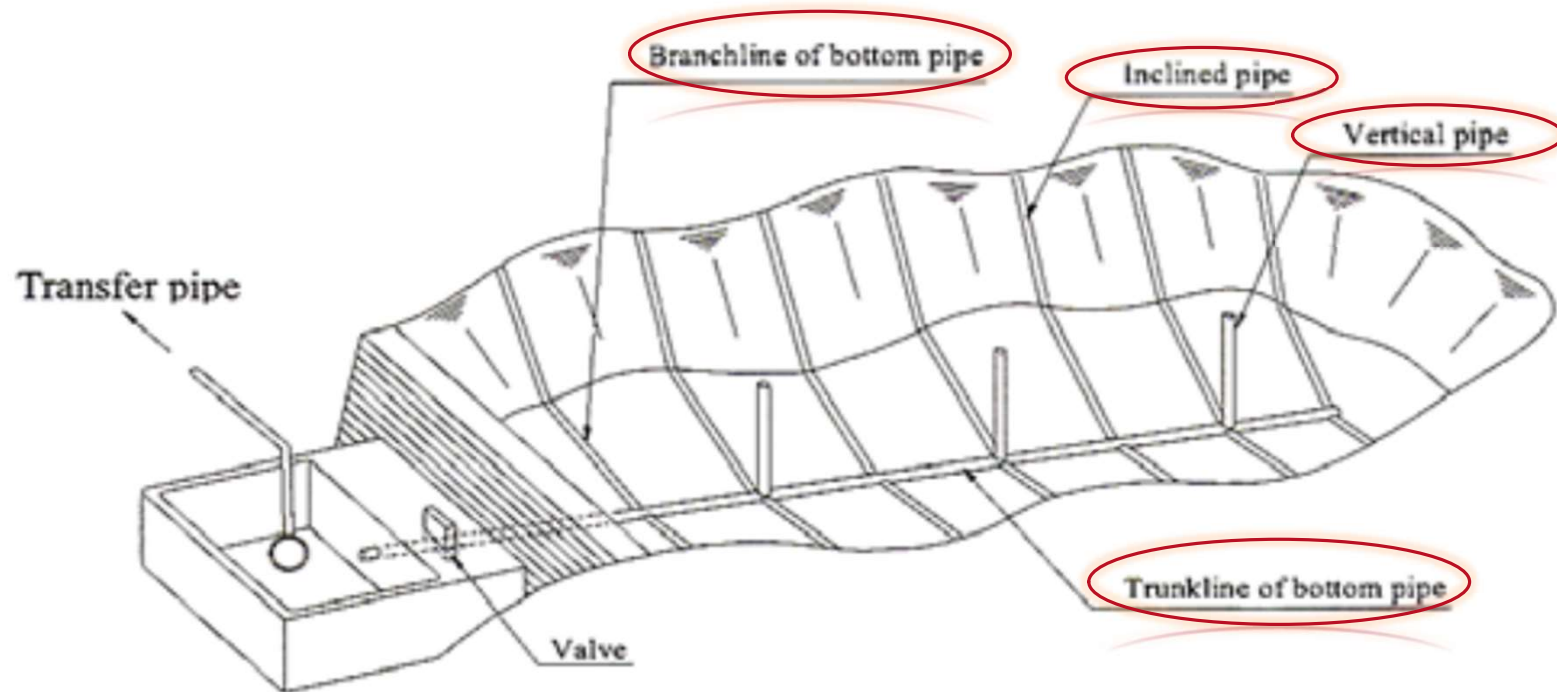


MACCAFERRI LEACHATE FACILITY SOLUTION

LEACHATE FACILITY: HDPE PIPES

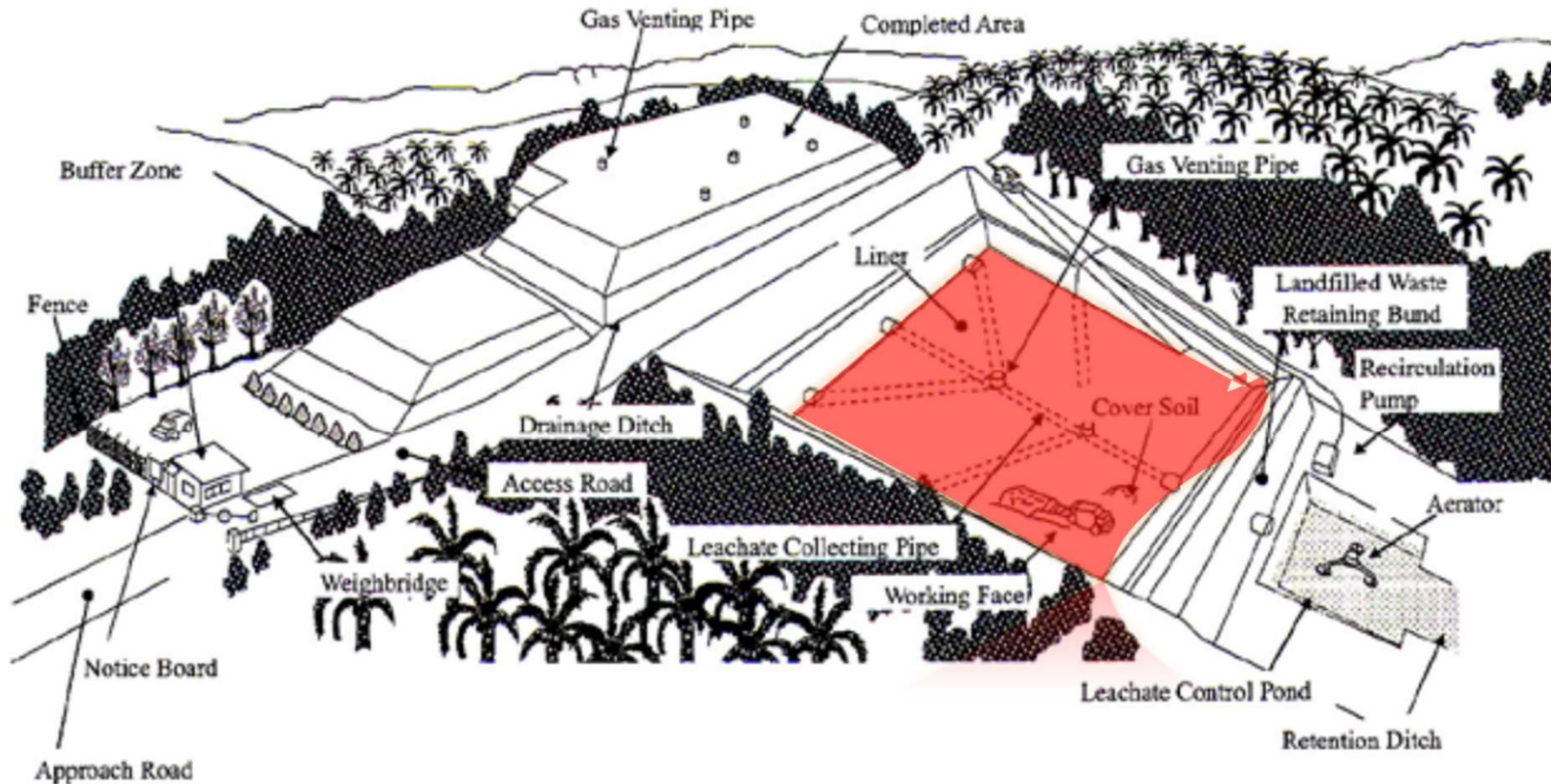
MACCAFERRI SOLUTIONS ON LEACHATE FACILITY

TYPICAL SECTION FOR LEACHATE FACILITY



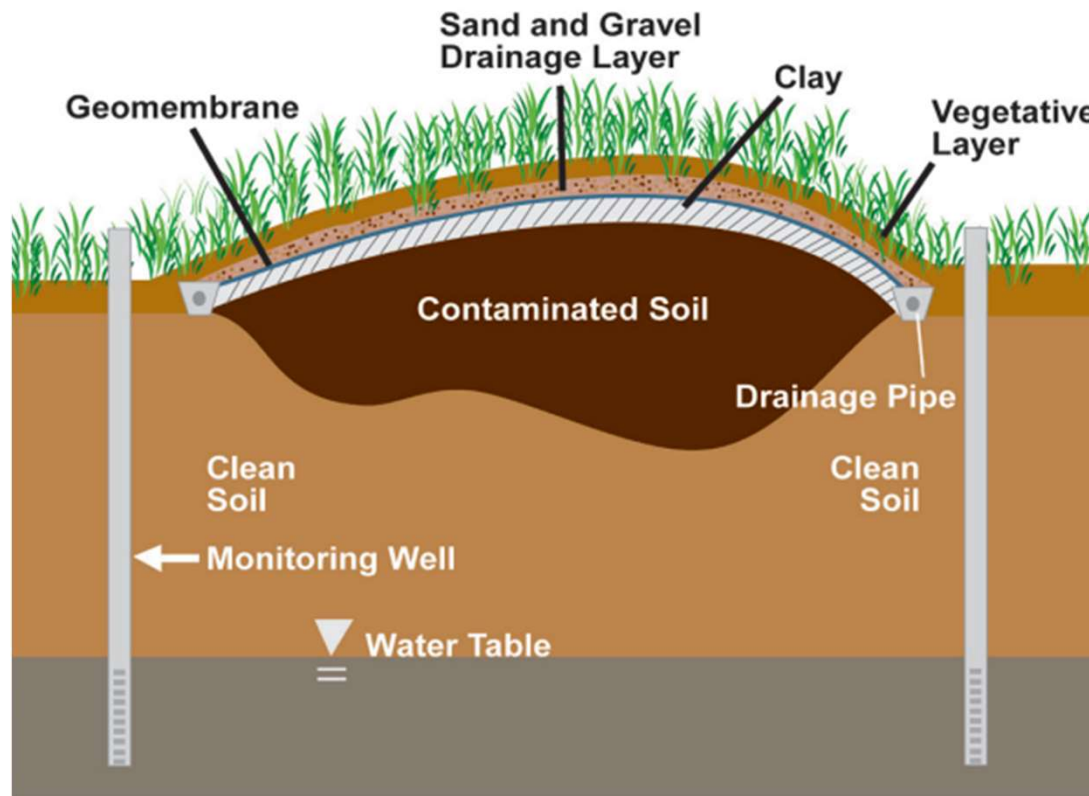
INTRODUCTION TO LANDFILL

TYPICAL SANITARY LANDFILL – LANDFILL COVER



LANDFILL COVER

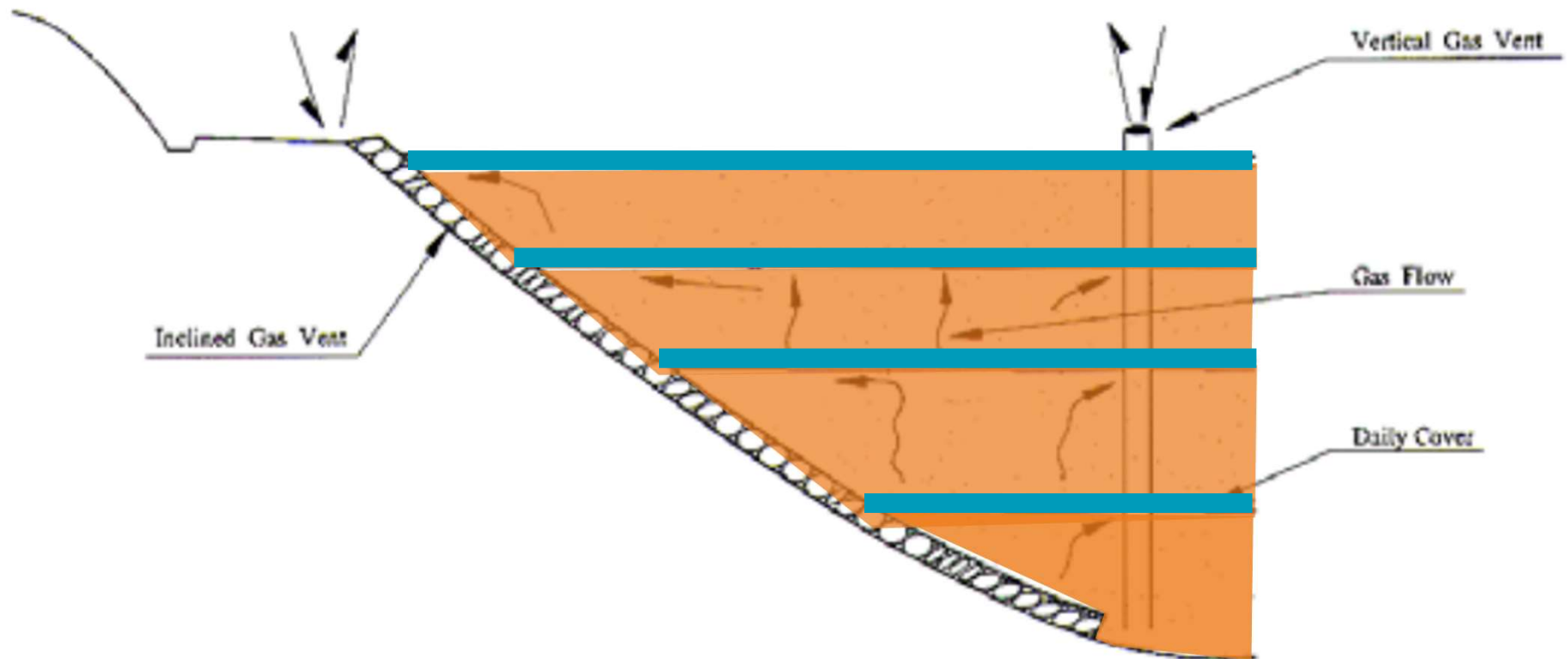
DAO-2001-34 – IRR OF RA 9003



- Tarps
- Geotextiles
- Spray-On Covers
- **Soil Cover**

LANDFILL COVER

DAO-2001-34 – IRR OF RA 9003



RULE XIV OPERATIONS OF SANITARY LANDFILLS

Section 1. Minimum Considerations for Siting and Designing Sanitary Landfills

Cover shall consist of a daily soil cover at least 6 inches in thickness applied at the end of each workday. **Alternative Daily Cover (ADC), may be used** provided that the owner/operator can demonstrate to the Department in writing, the equivalency of the proposed ADC in controlling infiltration, vector, odor and litter based on technical research or studies. In areas within the landfill that will not be used for at least 180 days, an additional interim soil cover of 6 inches thick shall be placed over the existing daily cover. The final cover shall consist of, from bottom to top, the foundation layer (consisting of 0.60m thick soil layer including interim cover), a final cap with an equivalent permeability as that of its liner system. A drainage layer and a vegetative layer. Installation of final cover shall be completed within six (6) months from the last receipt of waste. (IRR RULE XIV Section 1.w)

MACCAFERRI SOLUTION

Alternative Daily Cover



- **TOPCOAT** is spray-on daily cover
- Controls Odor, Disease, Vectors, Scavenging, and Erosion
- **Saves 20% or More Landfill Space**
- Fully effective as soon as it's applied
- **Cheaper and easier than soil cover**
- **Easier and more effective than tarps**



TOPCOAT

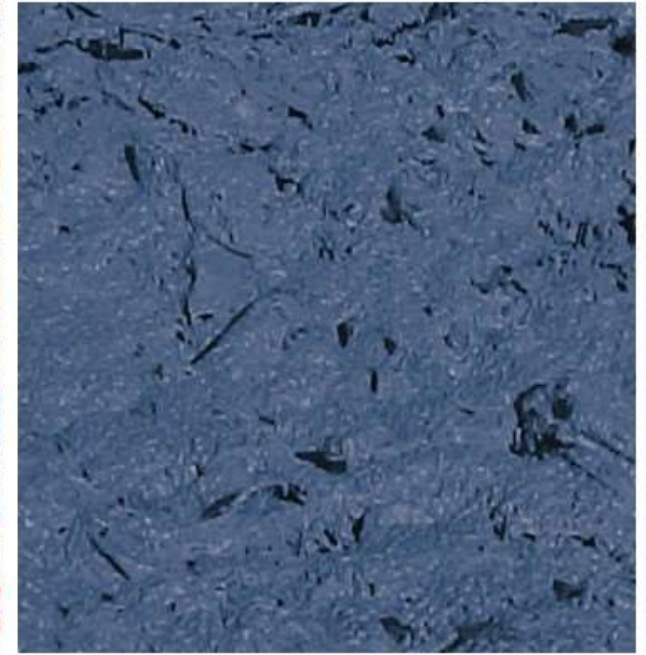
Alternative Daily Cover



Upon application TOPCOAT forms a consistent and effective layer between waste and the surrounding environment



Before TOPCOAT



After TOPCOAT

TOPCOAT vs SOIL

SPACE SAVINGS

Daily Rate	250 Tons	500 Tons	1800 Tons
Dirt Usage (cu. m./day)	190 cu. m	300 cu. m	765 cu. m
Air Space Used for Garbage (cu. m/day)	320 cu. m	640 cu. m	2300 cu. m
Air Space Used for Dirt Cover	190 cu. m	300 cu. m	765 cu. M
% of Space Used by Garbage	62.6 %	67.6 %	75 %
% of Space Used by Dirt	37.4 %	32.4 %	25 %
Days Added to the Life of the Landfill Per Year	180 days	144 days	100 days

TOPCOAT

Alternative Daily Cover



- Simple to Install
- No need to walk and drag over the working face
- No removal needed for the next day
- Dark green color makes spotting easy
- **REQUIRES ONLY MAXIMUM OF 2 PEOPLE TO APPLY**



MACCAFERRI



TOPCOAT® | Alternative Daily Cover | VIETNAM

MACCAFERRI



TOPCOAT® | Alternative Daily Cover | VIETNAM | 2 days after application



CONCLUSION

**Building Sustainable Futures Insights into
Sanitary Landfills in the Philippines**

THANK YOU!

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