Methane to Markets

Relevant Laws and Regulations

Content

- Introduction
- Relevant Laws and Regulations with Regards to MSW, Landfill, and LFG Utilization in USA
- Relevant Laws and Regulations with Regards to MSW, Landfill, and LFG Utilization in China

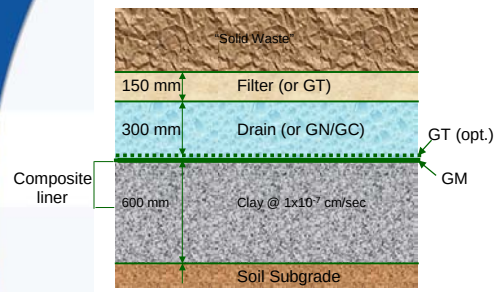
2

Landfill Regulations in USA

- Landfills are regulated under the *Resource Conservation and Recovery Act (RCRA).*
- Non-hazardous waste is regulated under Subtitle D of RCRA (Parts 257 and 258, Title 40, Code of Federal Regulations (CFR)).
- Hazardous waste is regulated under Subtitle C of RCRA (Part 264.221, Title 40, CFR).
- Landfill design requirement is published by EPA. Dependent on classification of the waste, Minimum technology guidance (MTG) is recommended. Each state must follows, or exceed, the MTG.

3

Minimum Technology Guidance (MTG) for a Subtitle D Landfill



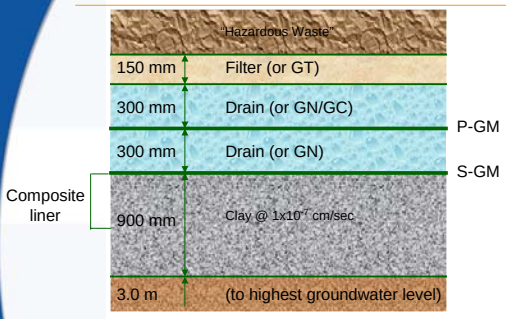
Source: www-gateway.vpr.drexel.edu/files/NewEh/htmls/**Waste**_Slides_Hsuan.ppt

4

Los Angeles County Sanitation Districts Calasbasas Landfill

5

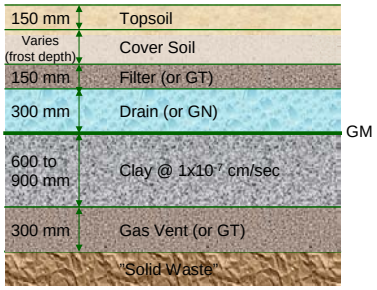
Minimum Technology Guidance (MTG) for a Subtitle C Landfill



Source: www-gateway.vpr.drexel.edu/files/NewEh/htmls/**Waste**_Slides_Hsuan.ppt

6

Landfill Cover System (Subtitle C & D)



Source: www-gateway.vpr.drexel.edu/files/NewEh/htmls/Waste_Slides_Hsuan.ppt

7

California CCR Title 23, Chapter 15 - Landfills

- Class I – Hazardous Waste
- Class II – Designated Waste: Hazardous waste which has been granted a variance, or non-hazardous waste which contains pollutants which could be released at concentrations in excess of water quality objectives
- Class III – Non-hazardous Waste
- California RWQCB - Lead agency for discharges of hazardous wastes to land for Class I Landfills.
- California IWMB – Management of solid wastes in landfills (Class II and Class III)

8

Overview of RCRA Subtitle D – Landfill Siting

- Airport: >10,000 ft of the end of airport runway used by turbojet; > 5,000 ft for piston-type aircraft
- Flood Plain Restrictions: LF shall not be within the 100-yr flood plain
- Wetland: No (no net loss of wetlands in terms of acreage and function)
- Fault Areas: >200 ft of a fault area that has experienced displacement within Holocene Epoch (last 10,000 years)

9

Overview of RCRA Subtitle D – Landfill Siting….

- Seismic Impact Zone: Regions having >10% probability that maximum horizontal acceleration by earthquake will exceed 0.1 g in 250 years.
  - The design of LF must consider the stability of LF, its supporting structures, and the underlying soils. Shall focus on the slope stability (because of low friction angle of FMLs).
  - Also for the sub-grade stability, should identify the zones of saturated, loose sands for potential liquefaction, which is caused by generation of shear-induced excess pore water pressures within the sands.

10

Overview of RCRA Subtitle D – Landfill Siting ….

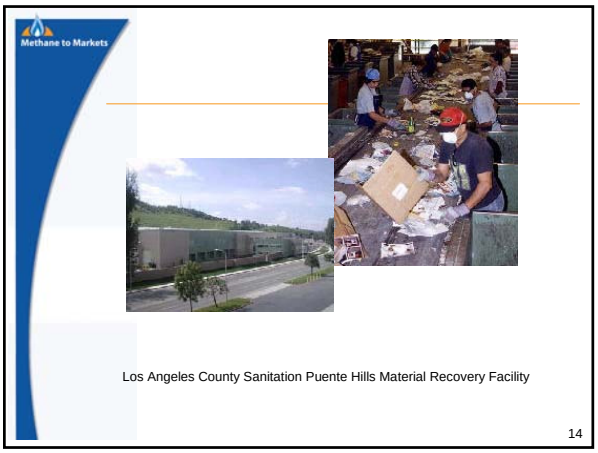
- Unstable Areas: Areas include poor foundation condition (highly compressible soil layers), sites susceptible to mass movement (landslide), and karst terrain (have hidden sink holes, caves and large springs that result from the dissolution of limestone or other soluble rock).
  Ex: site on a 60-ft natural clay layer: good for leachate impacts, but need to study the potential settlement on the integrity of the liner (weight of LF may squeeze out the moisture in clay and creates settlement)

11

Overview of RCRA Subtitle D – Operating Criteria

- Procedure to exclude HW
- Apply daily cover
- Control disease vectors
- Control explosive gases
- Control access to LF
- Control run-on and run-off
- Protect surface water and groundwater
- Restrict liquid
- Maintain operating records

12



Overview of RCRA Subtitle D – Design Criteria

- Performance-based
  Contaminant level shall not be exceeded in the uppermost aquifer at the relevant point of compliance, which shall not be more than 150 m from the unit boundary and still on the property
- Technology-based
  - a composite liner: top FML >30 mil (60 mil for HDPE) and lower compacted soil (K < 1E-7 cm/s) with a leachate collection system.
  - or approved alternative design.

15

Overview of RCRA Subtitle D – Groundwater Monitoring & Correction Plan

- Routine groundwater monitoring (detection monitoring) annually minimum for indicator parameters.
- If > background concentrations of any parameter ➔ assessment monitoring
- If elevated concentration continues ➔ corrective action plan.

16

Overview of RCRA Subtitle D – Closure and Post Closure Care

- After receipt of final delivery of MSW ➔ closure.
- Closure plan.
- Requirements for final LF cover: (1) an infiltration layer > 18" of earthen material that has K ≤ the bottom liner or <1E-5 cm/s , which ever is less, (2) an erosion prevention layer >6" to sustain native plant growth.
- 30 years is common for post-closure.
- Financial assurance is needed for closure, post-closure, and corrective action.

17

Other Regulations - USA

EPA Municipal Solid Waste Landfills, Volume 1:

Summary of the Requirements for the New Source Performance Standards and Emission Guidelines for Municipal Solid Waste Landfills

FINAL

OAQPS

18

Other Regulations - USA

- Air Emissions
  - Non-methane organic compounds (NMOCs), hazardous air pollutants (HAPs), and odors.
  - New Source Performance Standards (NSPS)
  - Emission guidelines (EG)
  - Methane gas monitoring
- Wastewater and Stormwater Management
  - Leachate
  - Condensate
  - Transportation and equipment washwater
  - Stormwater: run-on and run-off

19

China's Relevant Laws and Regulations on MSW Landfills

20

Requirements for MSWLF

1. Requirements for LF Siting
2. Requirements for LF Design
3. Requirements for Waste Acceptance
4. Discharge Limits for Air Pollutants
5. Leachate Control and Discharge limits
6. Wastewater Discharge from Collection Ponds
7. Noise Control at MSWLF
8. Groundwater Evaluation and Protection
9. Operation and Landfill Closure
10. Monitoring

21

Requirements for LF Siting

- The landfill location should comply with the local city planning and meet the requirements on protection of air quality, water resources, and natural environment.
- Landfill should be located downwind of the prevailing summer wind, and not within 500 meter of livestock lots.

22

Requirements for LF Siting……

- MSWLF should not be located in or close to the following areas：
  1. Designated natural protection areas, scenic areas, potable water sources, and other areas that need special protection.
  2. Populated areas
  3. Airplane fly zones
  4. Unstable geological zones

23

Requirements for Engineering Design……

- Design should prevent leachate leakage and include leachate collection, removal, and treatment.
- The hydraulic conductivity of the bottom liner should be equal to or less than 10^{-7} cm/s.
- Design should prevent leachate leakage in horizontal as well as in vertical directions.
- The bottom layer should be stable and will not be distorted due to degradation of the waste contained.

24

Requirements for Engineering Design……

- The bottom layer should have leachate collection sump, and it should be equipped with a collection pipe extended to the ground surface (100 cm above the ground) for leachate retrieval.
- Landfill design should include LFG collection and management system.
- The LFG conveyance system should include both vertical and horizontal pipes and the manifold should be at least 100 cm above the ground surface to facilitate gas collection and treatment.

25

Requirements for Engineering Design……

- If the energy content of LFG reaches a certain level, it should be collected and utilized.
- If it can not be economically recovered for beneficial use, it should be flared to prevent fire and explosion.
- The buildings should be well-ventilated to prevent accumulation of combustible gases.

26

Requirements for Engineering Design……

- The storm water run-off and run-on should be managed and directed to a collection pond or diverted away from the site.

27

Waste Acceptance Criteria

- Only municipal solid waste can be accepted in a MSWLF.
- Mixing of MSW and dangerous wastes are prohibited. The MSWLF should not accept hazardous wastes including those are explosive, ignitable, toxic, corrosive, infectious, and radioactive.

28

Air Pollutants and Discharge Limits

- Air pollutant limits are set for MSWLF: total suspended particles (TSP), ammonia, hydrogen sulfide, methyl mercaptan, and ozone.
- TSP: $\leq$1.0 mg/m^3
- Limits on ammonia, hydrogen sulfide, methyl mercaptan, and ozone are set in GB14554-93.

29

Leachate Control and Discharge Limits

- Discharge limits on leachate from MSWLF include: COD, SS, BOD_5, and coliform.
- Other parameters will be set by local environmental agencies based on the composition of the wastes.

30

Leachate Control and Discharge Limits….

- Leachate can not be discharged into GB3838-88 Category I, II , and potable water protection zones in Category III and GB3097-82 Category I costal area.
- For discharge intoGB3838-88 Category III or GB3097-82 Category II costal area, the discharge limits should follow the level 2 in the table below.
- For discharge into GB3838-88 IV, V categories, or B3097-82 Category III costal, the discharge limits should follow the level 2 in the table below.

31

Leachate Discharge Limits (in mg/L)

	一级	二级	三级
悬浮物	70	200	400
生化需氧量（BOD_5）	30	150	600
化学需氧量（COD_{cr}）	100	300	1000
氨 氮	15	25	------
大肠菌值	10^{-1}–10^{-2}	10^{-1}–10^{-2}	

注：大肠菌值为10^{-1}，即是在0.1(ml或g)渗滤液中能检出一个大肠菌

32

Leachate Control and Discharge Limits….

- For leachate discharge into municipal secondary treatment plants, the limits should follow the level 3 in the table above.
- The exact limits can be negotiated with local municipalities.

33

Leachate Control and Discharge Limits….

- For those cities without wastewater treatment plants, the capacity of the receiving water body should be considered.
- The local environmental protection agency should set the discharge limits based on GB8978－1996.

34

Stormwater Collection

- Water gathered in the collection pond should be diverted to leachate treatment system before discharge.
- If it is to be discharge separately, it should be treated first.
- The discharge limits are the same as those for leachate.

35

Noise Control and Limits

- Depending on the location of the MSWLF, the noise limits should be set and complied with GB12348-90.

36

Groundwater Protection and Evaluation

- Leachate should not create groundwater pollution. The evaluation of underlying groundwater should follow GB/T14848—93.
- For those parameter containing high levels of compounds due to local geology, the water quality of upstream groundwater should be considered as a reference or the background level.

37

Operation and Closure

- Landfill operation should be worked cell by cell. Compaction should be done promptly in layers. Daily covers should be applied. The acceptable depth of waste is site-specific.
- Water should be sprayed to minimize dust, when needed. The treated water in the collection pond can be used to spray the surface of the landfill.

38

Operation and Closure ……

- For landfill closure, good management of cover is needed. It should cover with 30-cm natural soil, and then 15-20 cm of clay with good compaction to minimize the penetration of rainwater.
- The top cover should be sloped to one specific direction to facilitate drainage.
- Until it is stabilized, the closed landfill can not be used as a site for new construction.

39

Monitoring Requirements

- Ambient air
- Noise
- Groundwater
- Leachate discharge

40

China's Relevant Regulations on Energy Generation from Landfill Gases

41

Electricity Generation from LFG

- Siting
- Technologies and Equipment
- Air Pollution Control
- Pollutants Discharge Limits
- Odor Control
- Environment Impact Assessment
- Water Uses

42

Siting

- Use of land should meet the city planning and environmental protection and comply with federal regulations.
- Should avoid being located at upwind of the city and/or villages.
- Location of the energy generation plant should be selected in accordance with that of the landfill.

43

Technologies and Equipment

- Should adopt the advanced and mature technologies from abroad. Should include environmental protection and pollution control. The system should meet the discharge limits set in relevant regulations.

44

Air Pollutant Discharge Limits

- Standards for discharges from stacks
- Standards for discharges from non-point sources

45

Standards for Discharge from Stacks

- For boilers >65t/h: follow those specified in GB13223-2003
- For boilers < 65t/h: follow GB13271-2001

46

Standards for Discharge from Stacks

- If local discharge limits are more stringent, the local limits prevail.
- For foreign equipment, the discharge limits should meet its design standards, provided they meet the Chinese regulations.

47

Standards for Discharge from Non-point Sources

- Discharge limits of ammonia, hydrogen sulfide, methyl mercaptan, and ozone should comply with the requirements set by GB14555-93. For example, in Category II areas, the limits should be those of level 2.
- The discharge limits of non-methane hydrocarbons should follow GB16297-1996.

48

Control of Other Pollutants

- The system should also comply with the national particulate limits.
- Boiler should have a burning system that would reduce NO_x emissions.

49

Odor Control

- Should provide sufficient set-back distance and the distance should be based on the strength of ammonia, hydrogen sulfide, methyl mercaptan, and ozone.

50

Environmental Impact

- Should assess environmental impact of the energy generation system. A risk prevention and pollution prevention plan should be prepared and implemented.

51

Water Uses

- Use of water for electricity generation should comply with the national policy on water uses (use of reclaimed water is encouraged; in northern part of China where the water is scarce, use of surface is restricted and no groundwater should be used. Air-cooling, instead of water-cooling, should be used, when appropriate).

52

References

- 中华人民共和国国家标准，生活垃圾填埋污染控制标准，（GB16889-1997）
- 国家环境保护总局文件，国家环境保护总局 国家发展和改革委员会 环发〔2006〕82号，关于加强生物质发电项目环境影响评价管理工作的通知
- 生物质发电项目环境影响评价文件审查的技术要点

53