



Wayne Disposal, Inc.

## Liner Design Upgrade

July 19, 2018



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### Presenter – Dr. Te-Yang Soong

- Principal Engineer at CTI & Associates.
- Over 28 years of experience in landfill related teaching, research and engineering consulting.
- Areas of expertise: landfill liner and cover design, geosynthetic materials, and durability of barriers.
- Published more than 60 technical papers, frequently referenced as industry standard.
- Worked on landfill projects throughout the U.S. and has advised landfill clients in China, India and Brazil for private, state and World Bank funded projects.



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## Project Background

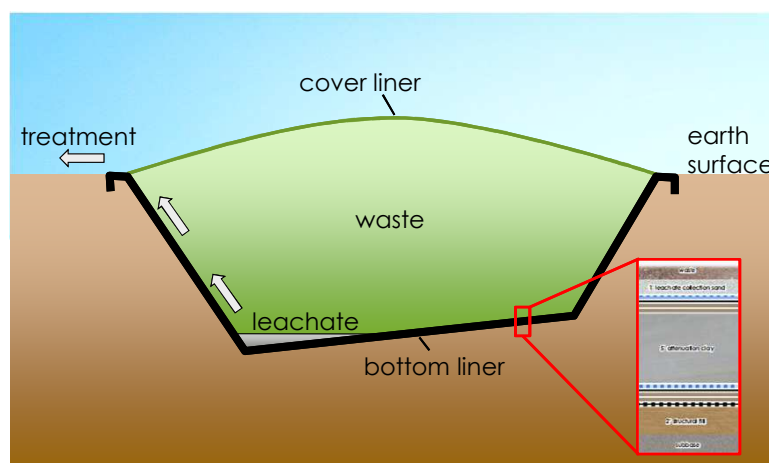
- CTI (Dr. Soong) was retained by US Ecology to evaluate WDI's currently permitted liner design to identify:
  - potential engineering improvements
  - potential ways to improve constructability
  - potential ways to reduce uncertainty in material availability and quality
- CTI recommended geosynthetic clay liner which we will discuss in more detail in subsequent slides

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## Landfill Liners



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## The Building Blocks of Liner

- Geocomposite – collecting and removing liquid
- Geomembrane Liner – liquid barrier
- Compacted Clay Liner (CCL) – liquid barrier
- Geosynthetic Clay Liner (GCL) – liquid barrier
- We will discuss each in detail

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## Geocomposite

- Plastic drainage net sandwiched between two layers of fabric.
- Fabric acts as a filter to keep soils out of the net.
- Purpose is to efficiently remove liquid.



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## Geomembrane

- Main liquid barrier (man-made)
- 80 mil (2mm) high density polyethylene (HDPE) liner.
- Impervious to water flow.
- Adjacent panels are heat welded together.



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## Compacted Clay Liner

- Back-up liquid barrier (naturally occurring)
- Max. permeability  $\leq 0.0000001$  cm/sec.
- Spread, compacted and rolled to a smooth finish.



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## Geosynthetic Clay Liner (GCL)

- Back-up liquid barrier (man-made)
- Layer of bentonite between 2 supporting fabric layers.
- Max. permeability  $\leq 0.000000005$  cm/sec.
- Widely used in the landfill industry for 30 years.



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## Geogrid

- Reinforcing layer to provide additional structural support
- Made from high strength synthetic material
- Ultimate strength exceeding 5,000 lbs. per foot



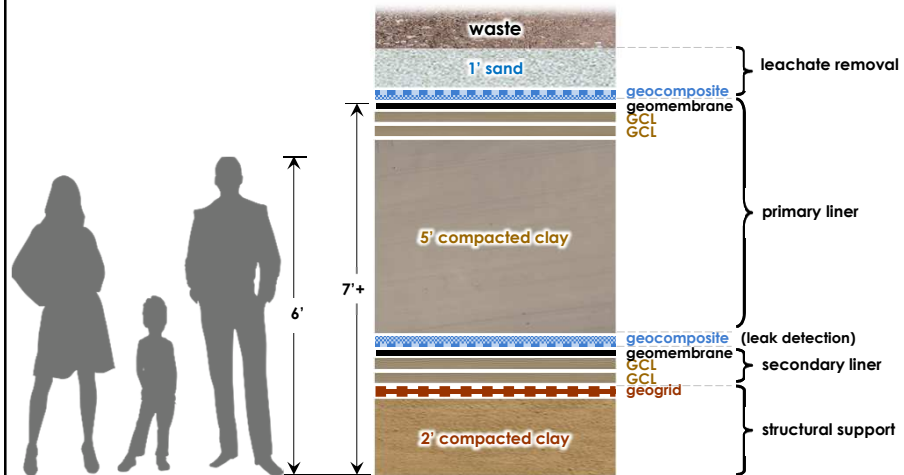
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## Proposed Liner



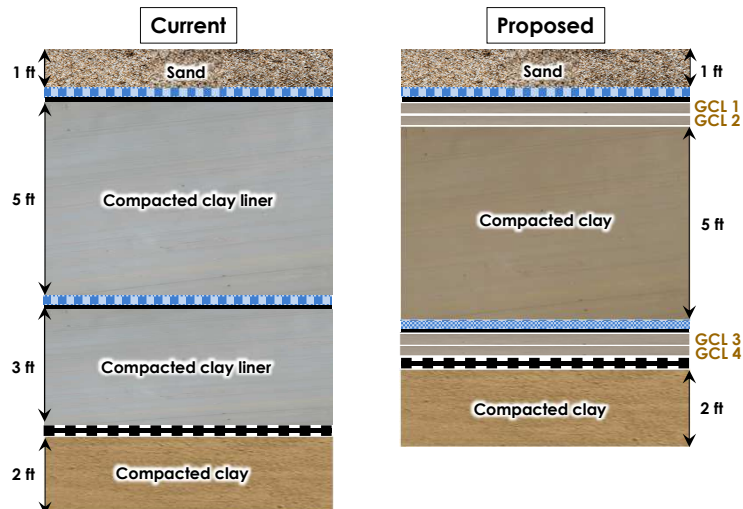
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## Current vs. Proposed Liners



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## GCL vs. Clay Liner

- 20-200 times less permeable depending on the product.
- One layer is equivalent to 2 to 3 ft of compacted clay liner
- Factory manufactured – consistent and reliable quality.
- More resistant to weathering (freeze-thaw & wet-dry)
- Much stronger with higher resistance to strain.
- Readily available, lower carbon footprint

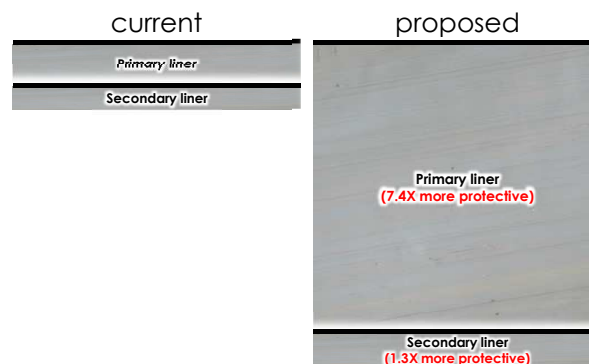


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## Relative Protectiveness



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## Proposed Liner – A Superior Barrier

- Superior at resisting liquid flow.
- Superior at adsorbing chemicals.
- Superior to the previously approved liner and the Part 111 Rule requirements.
- Superior at preventing migration of any hazardous constituent into the groundwater or surface water.

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The logo for CTI, with the letters "cti" in a bold, lowercase, sans-serif font. The "c" is blue, and the "ti" is green.

Thank You

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