New York City Landfills

Past and Present

Landfill, 1904

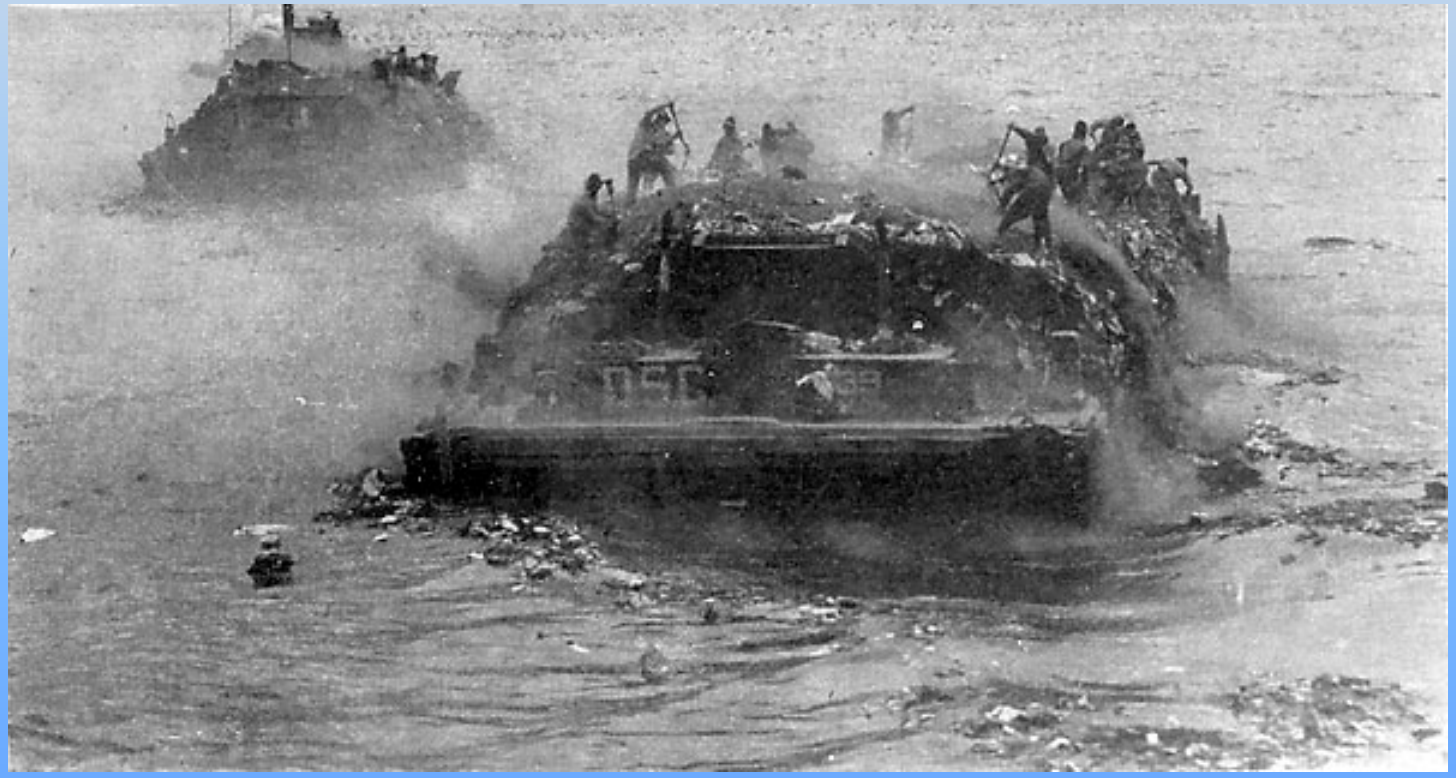
Tipping, 1904

Hand Cart Tipping into Scow

- Earliest recycling pre-1900s
- Rags etc. removed from hand carts prior to tipping

Loaded to Capacity

Unloading Scow, circa 1905



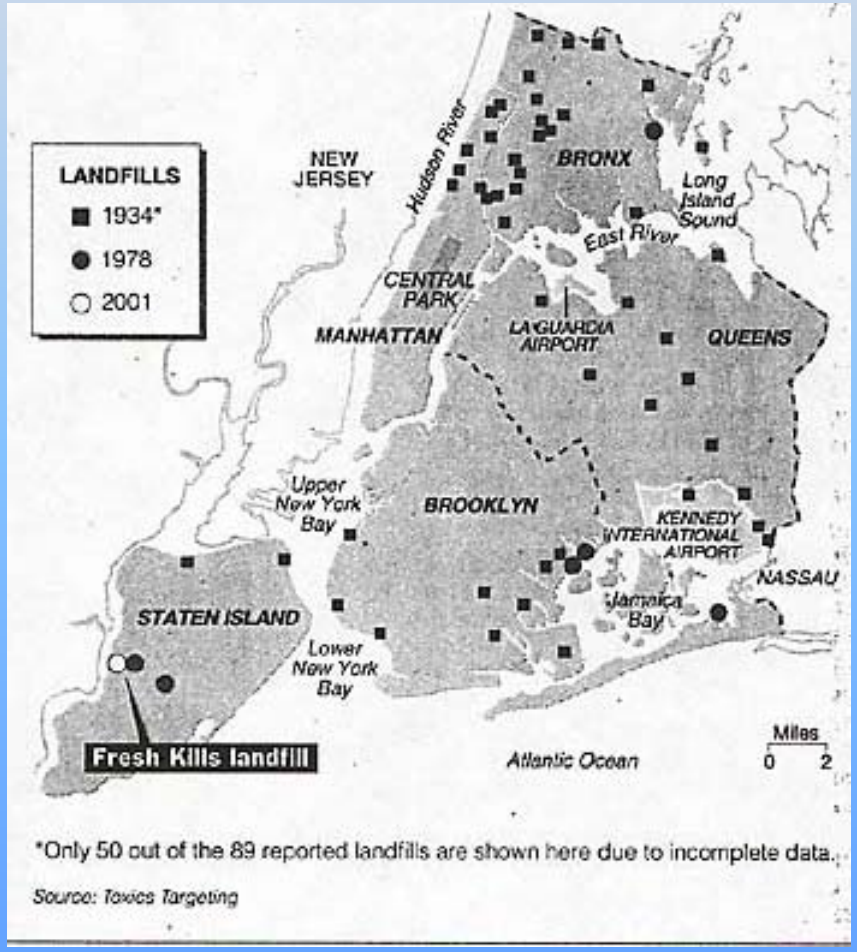
Sunken Scow

Empty Scow

- Next to Brooklyn Bridge

Hand Loading Scow circa 1905

Landfills in NYC



Past Landfills by Borough

Bronx

Baychester
Fairfield
Metcalf & Soundview
Orchard Beach
Rikers Island
East 117th Street
Ferry Point
O'Brien Avenue
Pelham Bay
White Plains Road

Queens

20th Avenue
Brookville
Flushing Meadows
Juniper Valley
Lefferts
Bergen
Edgemere
Whitestone Pkwy.
Kissena Park
Spring Creek

Brooklyn

Flatbush Avenue
Fountain Avenue
Marine Park
Ralph Avenue
Floyd Bennett
Jerome Avenue
Pennsylvania Avenue
Remsen Avenue

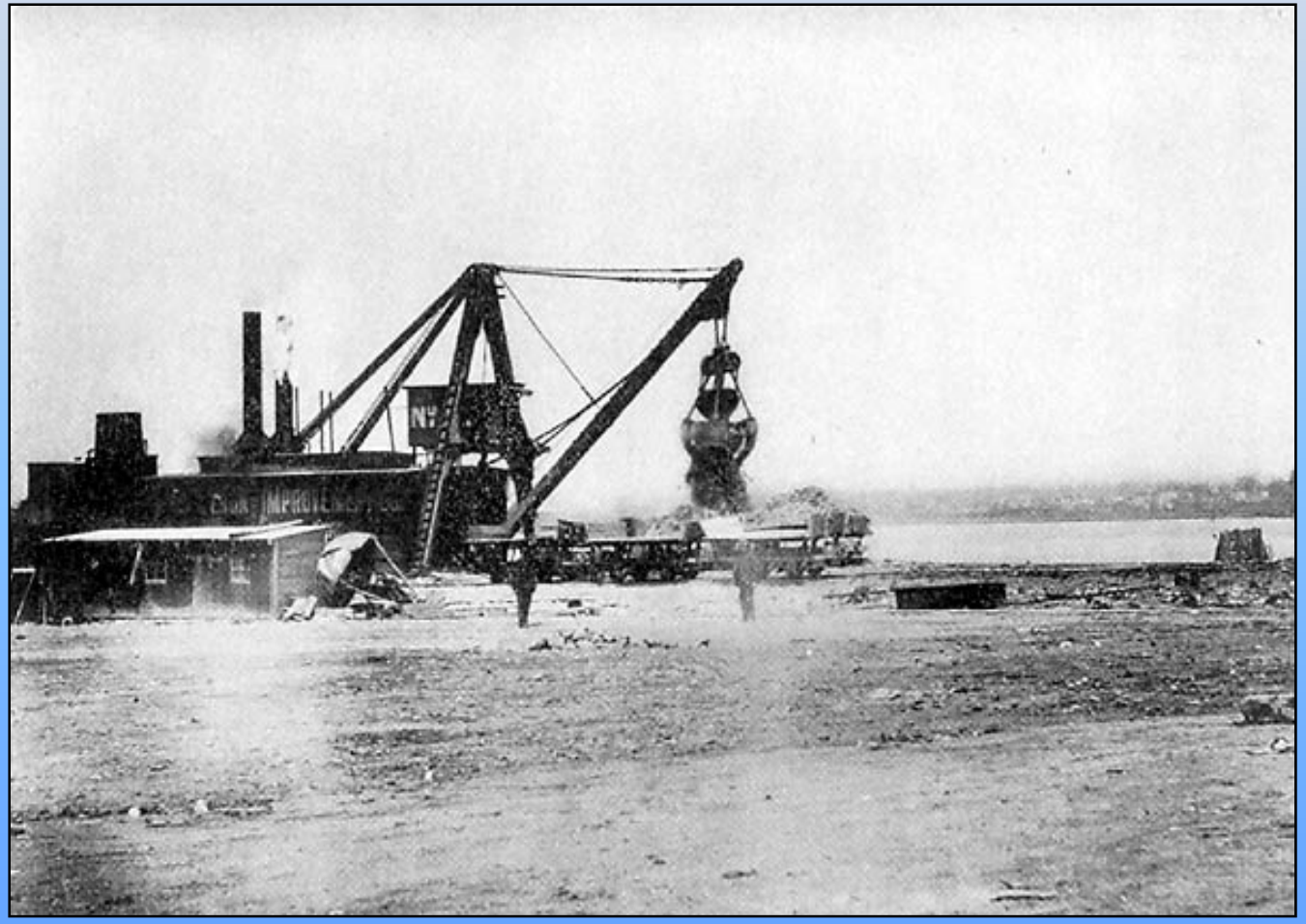
Staten Island

Great Kills
Fresh Kills Plant #2
Richmond Avenue
South Shore
Fresh Kills Plant #1
Brookfield Avenue
Fort Totten

Corona Fill 1931

- 2.9 million cubic yards of ash and mixed refuse were deposited that year, making possible the site of 1963 World's Fair

Ash Unloading at Rikers Island, circa 1905



Reclaiming Land at Rikers Island, circa 1905

Reclaiming Land at Rikers Island, circa 1905

Rikers Island 1938

- Marine Unloading Plant
- Three Marine Diggers
- 1938
  - 4,080 Scows or Barges Unloaded
  - 7,252,170 Cubic Yards
  - 3, 237 Tons Coal Unloaded

North Beach Airport, 1938

- 1938 - 14,000,000 cubic yards of old fill were removed for the expansion of the North Beach Airport (Laguardia Airport)

Rikers Island, 1964

Rikers Island

Spring Creek Landfill, 1956

- Located in Queens
- 17.8 acres of swamp land filled in 1956

Ferry Point Landfill, 1956

Ferry Point Park

Ferry Point Park

- Located near Whitestone Bridge
- In 1998 was used as a compost facility
- Compost facility has been moved due to planned golf course

Pelham Bay Landfill

- Opened 1963
- Located in the Borough of the Bronx
- Material primarily from the Bronx
- Truckfill only

Pelham Bay Landfill, 1973

- Accepted municipal, commercial and C&D wastes
- 81 acres
- 40,000 tons per month

Queueing at Pelham

Dumping at Pelham

Bulldozer Clearing at Pelham

Spreading Cover at Pelham

Pelham Bay Landfill

- 1963-1979
- Final Elevation 160 feet
- Listed as a Superfund site
- Now zoned as park land

Early Aerial Photo of Fountain & Pennsylvania Ave. Landfills

Fountain Avenue

- Opened 1961 in Brooklyn
- Closed 1985
- Served boroughs of Brooklyn and Queens
- 8700 tons per day average
- Peak elevation 160 feet
- Now part of Gateway National Park

Fountain & Pennsylvania Avenues 1952

- Pre-Landfill

Fountain & Pennsylvania Avenues 1973

- Man-Made Peninsulas
- Both served Brooklyn, Queens
- Fountain
  - 300 Acres
  - Municipal, commercial, asbestos & C&D wastes, incinerator ash
- Penn
  - 110 acres
  - Municipal, C&D waste,sewage sludge at different times

Edgemere Landfill

- Opened in 1938 and closed in 1991
- Located in the Borough of Queens
- Approximately 173 acres
- One of the oldest sanitary landfills in New York City

Edgemere 2000

Edgemere Active Bank

Primarily served the borough of Queens

- Truckfill only
- Daily tonnage 900
- Final elevation 65 feet

Edgemere

- Closed early due to airport concerns
- Bird sanctuary
- Now closed and capped

Unloading Final Cover at Edgemere

- Closure 1996
- All final cover material delivered by barge – no trucks

Edgemere Offloading Facility

Offloading Cover Material at Edgemere

Geomembrane Cap at Edgemere

- 1997

Landfill Gas Flare at Edgemere

- First New York City Landfill to use flaring for odor control

Fresh Kills, 1943

- Pre-landfill

Fresh Kills Landfill Opens, 1948

Fresh Kills Landfill, 1954

- By 1955, the world's largest landfill
- FK remained the largest until 1999

Fresh Kills Landfill, 1961

1951

- Early Cable Crane

Cable Crane Unloading Barge

Unloading – Pre-1990

- Cable Cranes
- Tractor – Athey Wagons
- Dirt -- Refuse Roads
- Round Trip 1.6 Miles -- 50 Minutes

Unloading Into Athey Wagon

Cable Crane Bucket

Athey Wagons

Athey Wagons

Athey Wagons

Athey Wagons (Cont'd)

Athey Wagons

Athey Wagons (Cont'd)

- Along a dirt/garbage road to active bank
- 1980s

Athey Wagons on Haul Road

Athey Wagons On Haul Road

Athey Wagon Tipping

Athey Wagons Tipping

Active Bank

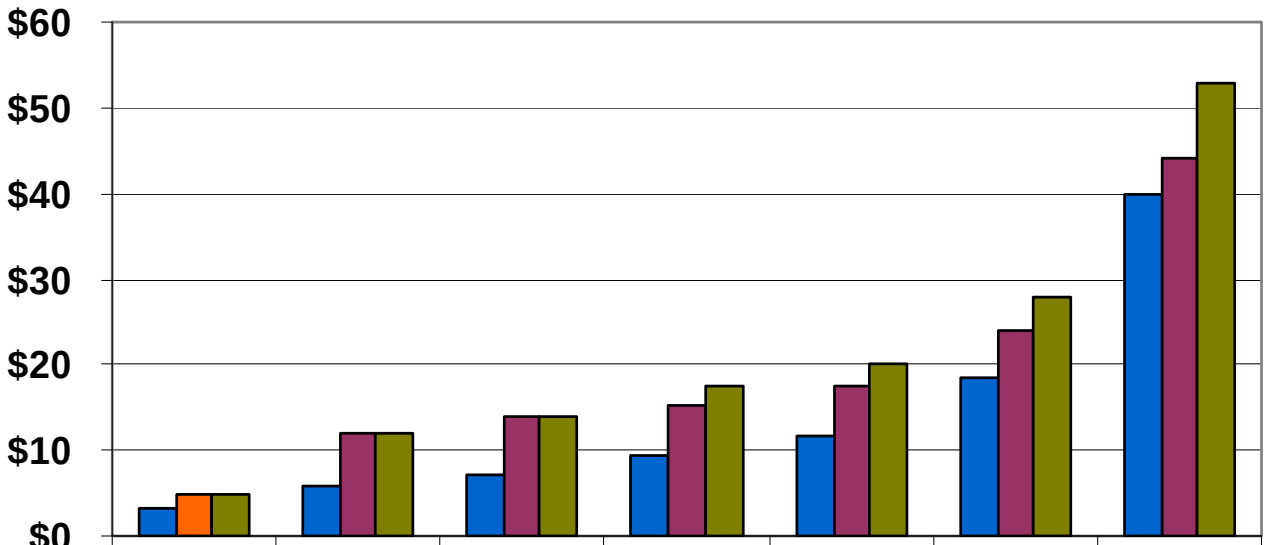
Bank Shanty

- Supervisor station

Compactors

Fresh Kills Landfill, 1972

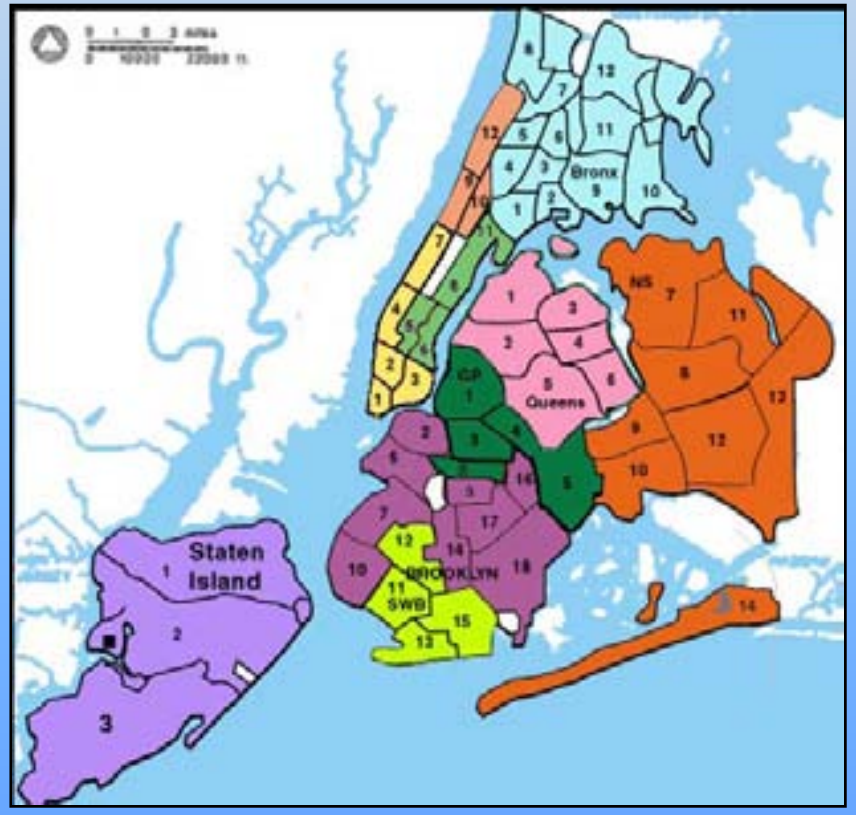
Charge Per Cubic Yard 1976 - Present



	1976	1982	1983	1985	1986	1987	1988 to present
Landfill	$3.25	$6.00	$7.00	$9.25	$11.75	$18.50	$40.00
MTS	$5.00	$12.00	$14.00	$15.25	$17.50	$24.00	$44.00
Incinerators	$5.00	$12.00	$14.00	$17.50	$20.00	$28.00	$53.00

General Overview

- 13,000 tons of Residential Waste per Day
  - 2500 tpd Recycled
  - 8 Marine Transfer Stations
- 59 Sanitation Districts

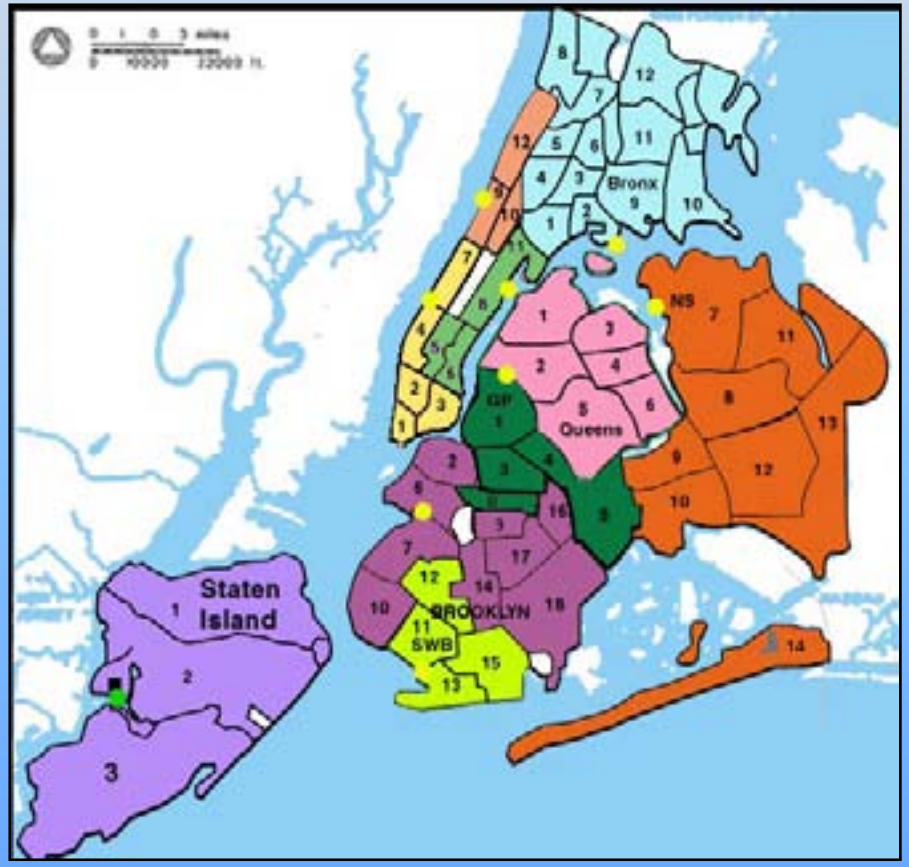


Disposal Facilities

- Marine Transfer Stations
- Private Transfer Stations
- Landfills

Marine Transfer Stations

- Locations
- Capacity
  - Permitted at 4800 tpd
  - Average Use in Full Operation = 1800 TPD
- Rehab/Redesign



Hamilton Avenue MTS

Daily Operations

- Truck weighed at entrance
- Proceeds to tipping floor (inside station)
- Barges staged outside
  - Hand shifting
  - Tug shifting

Refuse Arrival

- Peak in 1987-88 at 28,000 TPD
  - 19,000 by barge
  - 9,000 by truck
- 13,000 TPD at closure
  - 11,000 by barge
  - 2,000 by truck

DOS Barge Fleet

- Dimensions
  - L 150 ft,
  - W 37 ft
  - Depth 17.6
  - Loaded draft approx 8.5 ft
- Capacity 620 tons

Marine Transportation

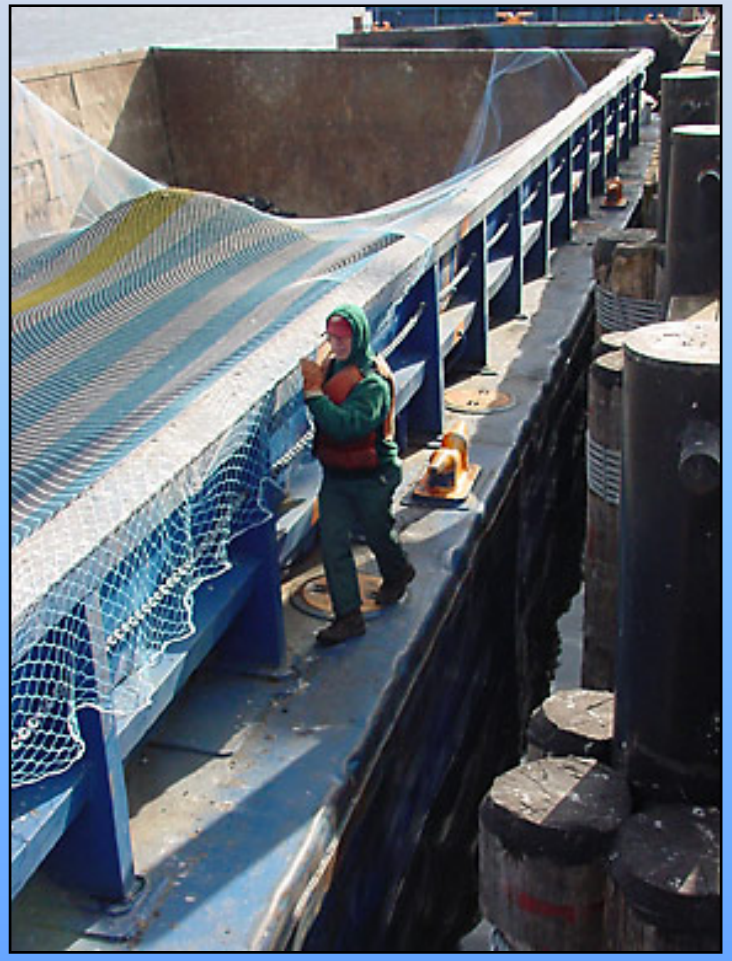
- Tower Dispatcher
  -Coordinates barge and tug movements
- Towing
  - Up to 4 barges
  - Up to 27 nautical miles

Marine Transportation (Cont'd)

- Barge Maintenance Unit
  - Emergency Response
  - Soundings
  - Shipyard Readiness

Clean Water Procedures

- Dip Netting
- Containment Booms
- Barge Netting
- Barge Deck Cleaning



Barge Staging Area

- Stores approximately 50 barges along west catwalk

Boom System

- Outer Boom
- Range Boom
- Super Boom

Super Boom

Super Boom (Cont'd)

- Mechanical refuse barrier
- Fully automated
- Opens only on incoming tide to prevent escape of floatables
- $8 million

Water Quality

- Sweeper Boats
- Dipnets
- Canvas
- Monitors
- Clean Decks
- Shore Line Cleaning

Water Quality (Cont'd)

- Marine containment fence throughout landfill

Super Boom & Range Boom

Fresh Kills Landfill

Unloading Plants

- Plants 1 & 2
- Pads

Unloading – Post 1990

- Hydraulic Cranes
  - 10 Yard Bucket
  - 992 FEL – 20 Yard Bucket
  - Pit Area 150 x 60 Feet
- Payhauler Trucks
  - 80 cubic yard capacity
  - Covers

Unloading -- Post 1990 (Cont'd)

Unloading -- Post 1990 (Cont'd)

Unloading -- Post 1990 (Cont'd)

- Paved Roads
- Round Trip 1.6 Miles – 18 Minutes

Fresh Kills – Post 1990

- Average Tonnage 13,000 TPD
- Active Bank 250 x 60 Feet
- Split Bank – Top, Bottom
- Compaction

Fresh Kills – Post 1990 (Cont'd)

1990 - 2001: Modernizing

Loaded O & K Crane Bucket

Loading Pay Hauler

Odor Control

- Flushers
- Atomizers
- String line misters

Active Bank

Active Bank

Fresh Kills – Post 1990, Cont'd

- Side Slopes 3 to 1
- Slope Stability
- Litter Control

Compacting

Miscellaneous

- High Wind Procedures
- Seagull Deterrents

Litter Control

30-foot Litter Fencing

- Surrounds perimeter of landfill

Compactor

Erosion Control (Cont'd)

- Building series of storm water runoff culverts

Erosion Control

Final Cover

- Sections 3/4, 2/8, 6/7 completed
- Section 1/9

Beautification

- Richmond Avenue 1987
- Landfill perimeter

Beautification

- 1987

Beautification

- Richmond Avenue Today

Beautification

- Richmond Avenue Today

Fresh Kills Landfill, 1997

Fresh Kills Landfill, 1998

Fresh Kills Landfill, 1999

Fresh Kills Landfill, 2000

Last Barge

Fresh Kills Landfill is Closed

Acreage- Section Chart

Section	Acreage	Elevation	Closure Date
3 & 4	131	160	11/92
2 & 8 North	147	107	6/94
2 & 8 South		148	5/93
6 & 7 North	346	130	6/97
6 & 7 South		95	6/99
11 & 12	272	50	8/80
10	70	25	1966
1 & 9	460	182	3/01
Total Acres	**1,416**		

Landfill Gas Recovery at Fresh Kills Landfill

Fresh Kills Landfill

- Approximately 3000 acres
- Gas collection in place

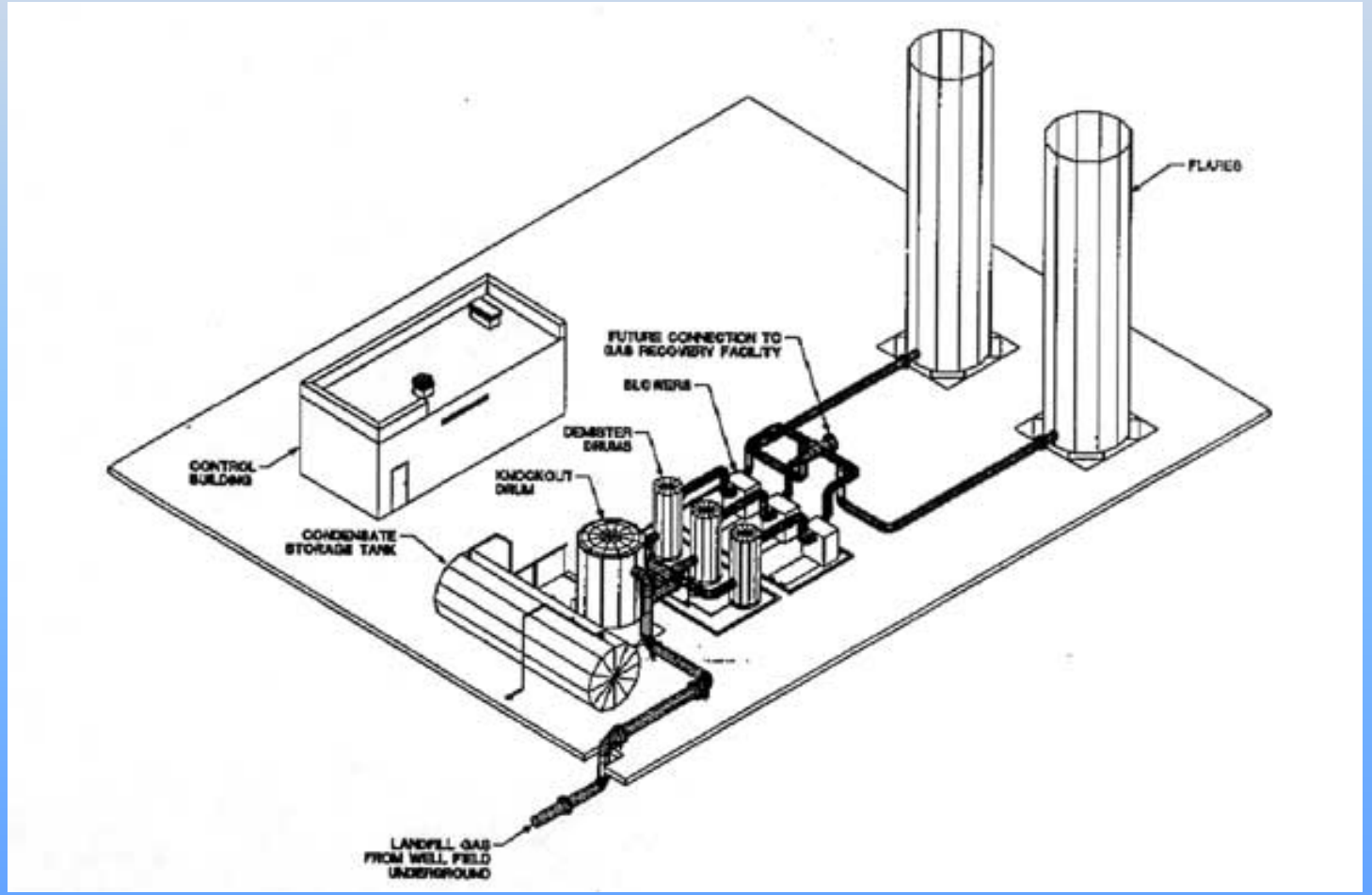
Flares

- Six flares
- 5000 cfm each

Phase I Status

- 6 flares have been installed
- Permits
  - In place for flares

Flare Schematic

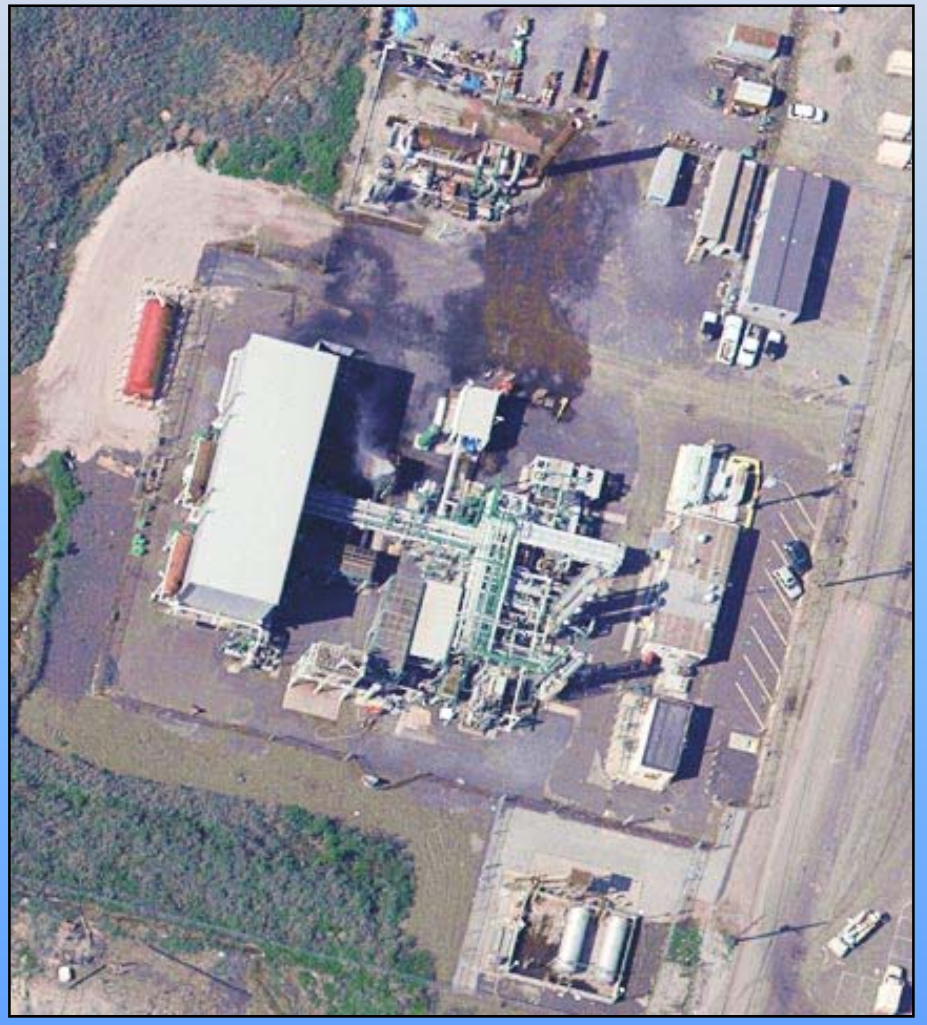


Stack Emissions

- Emissions limited by permits

Landfill Gas Recovery

- Existing plant began commercial operations in 1982
- 10 MMSCFD Processing Capacity (Selexol)
- Upgraded to 14 MMSCFD capacity in 2000



Well Locations
Section 6/7

Leachate Treatment at Fresh Kills Landfill

What is Leachate?

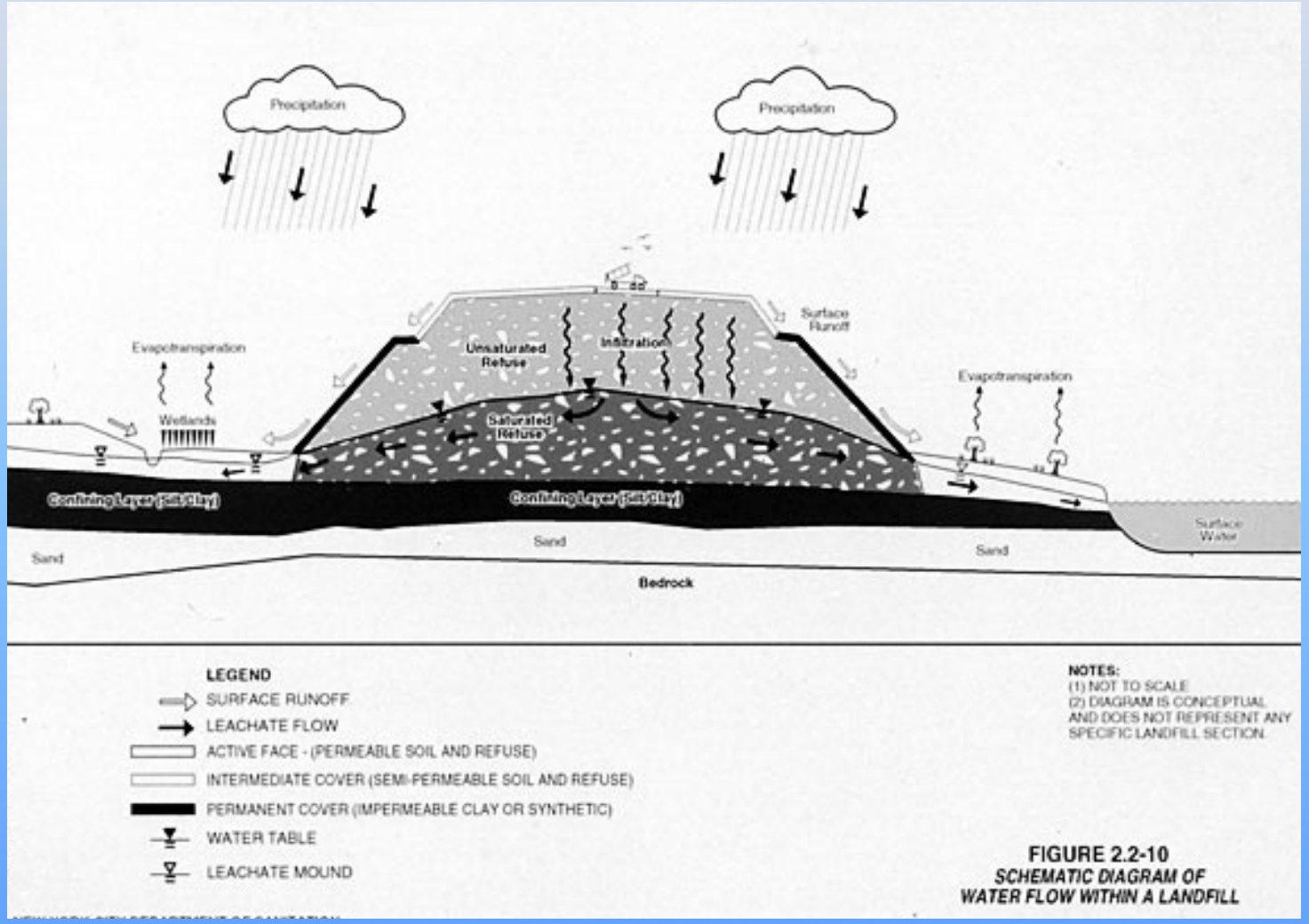
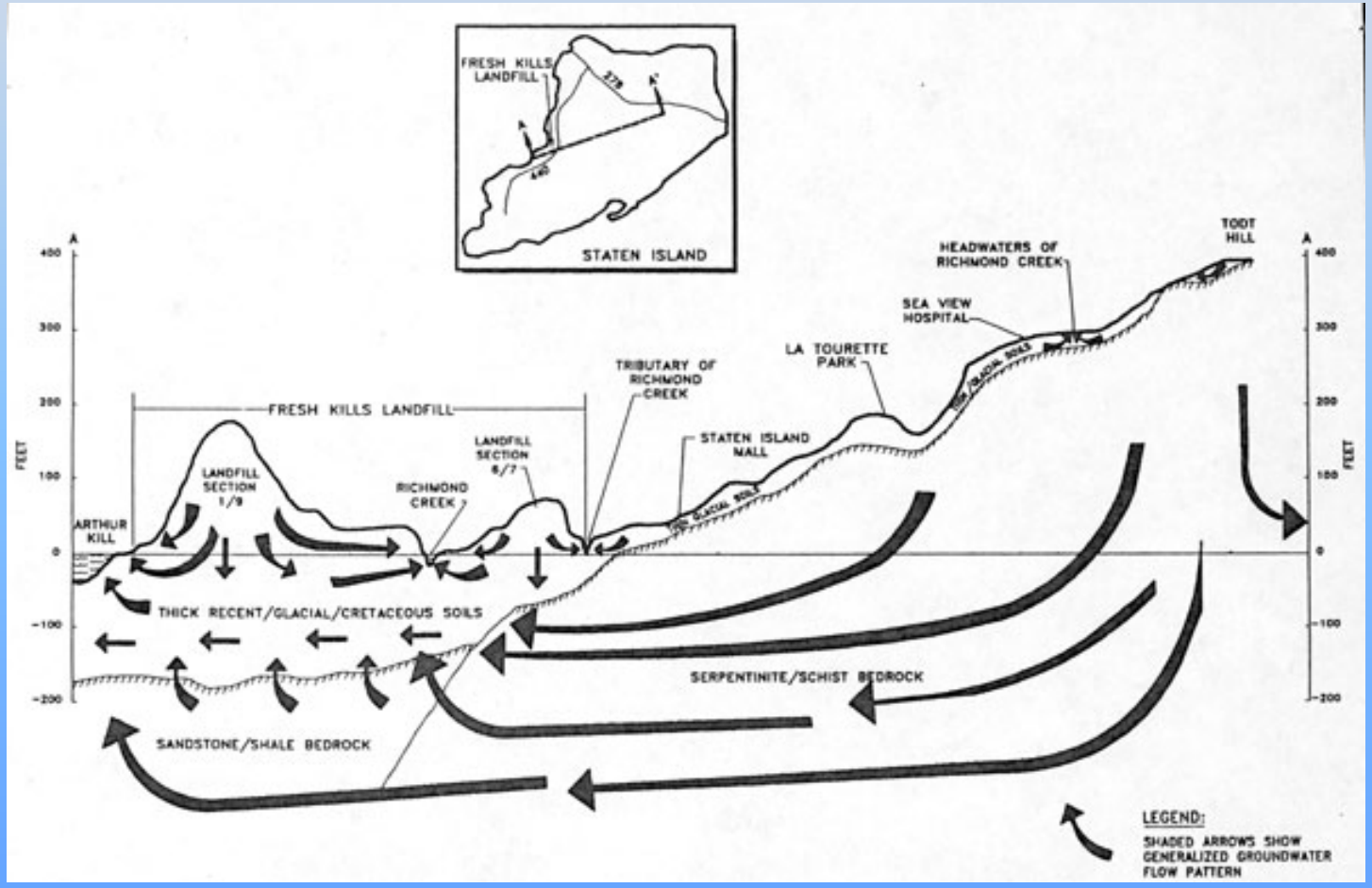


FIGURE 2.2-10
SCHEMATIC DIAGRAM OF WATER FLOW WITHIN A LANDFILL

Flow of Leachate



REDUCTION OF LEACHATE

- Active Face
- Stormwater Drainage
- Intermediate Cover
- Final Cover

DATA

- Characterize Material under the Landfill
- Describe the Chemical Makeup of the Leachate
- Estimate the Quantity
- Discover the pathways of leachate flowing into the underlying groundwater and adjacent surface waters

FINDINGS

- Types of Geologic Material Found; three distinct layers
  - Garbage
  - Natural Soils and Sediments
  - Bedrock

LEACHATE FLOW

- Flows through the garbage and shallow underlying sands into adjacent surface water
- Detection:
  - Ammonia
  - Organic Matter
  - Some Metals

Collection & Containment System

- Collection trench
  - 39,000 linear feet (7.4 miles)
  - Up to 38 feet deep
- Cutoff wall
  - To prevent migration beyond landfill boundary
- 32 collection wells

Collection System (cont'd)

- Perimeter access road
  - 38,500 feet (7.3 miles) of paved road
- Transmission of collected leachate
  - Dual-wall force main
  - 11,500 feet (2.2 miles)
- Supervisory control 7 data acquisition system (SCADA)

Slurry Wall

- Surrounds landfill perimeter
- Typical depth 20 – 50 feet

Cutoff Wall

- Slurry wall construction
- 1.4 million vertical square feet
- 3 feet wide

Perimeter Access Roads

- Cutoff wall runs adjacent to perimeter road around Sections 1/9 & 6/7

Collection Vault

Leachate Collection Overview

Incoming Leachate

- Leachate from all sections enters here
- Anti-foam agent added at this stage

Leachate Treatment

- Capacity 1.2 million gallons per day
- Average processing 600,000 - 800,000 gallons per day

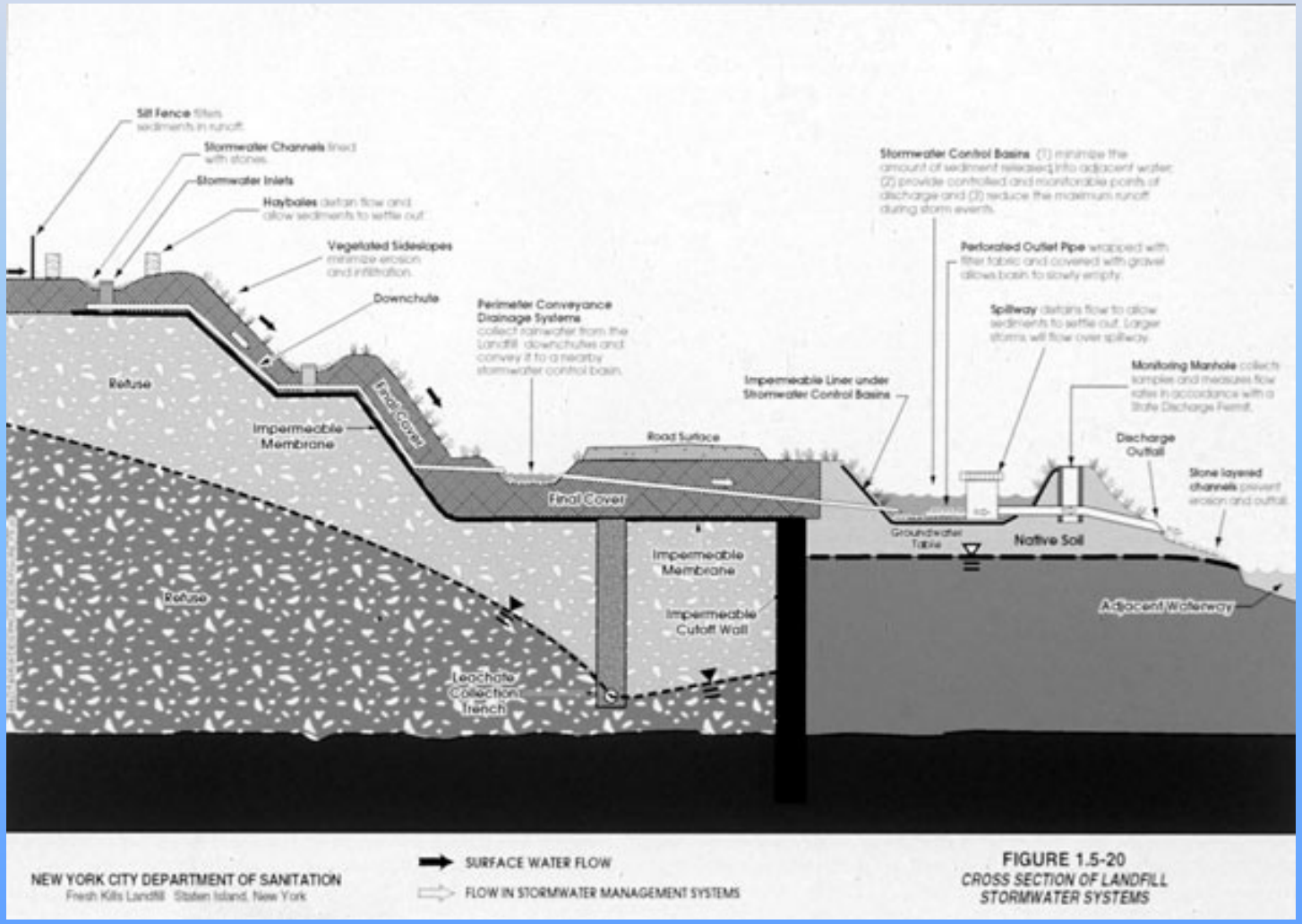
Leachate Treatment

- Capacity of 1 million gallons per day
  - 100,000 on line 1994
  - Remainder on line 1997
- Sequencing batch reactors & chemical precipitation to remove
  - Ammonia
  - BOD
  - Metals (Primarily iron)

Leachate Management Overview

- 4 Systems
  - Cover system to prevent infiltration
  - Containment system to prevent escape of leachate from landfill
  - Collection system to transport leachate for treatment
  - Treatment system

A Landfill Storm Water System



Storm Water Drainage

- Collection and Conveyance
  - Diversion swales constructed to collect and convey storm water
  - Bench storm drains & down chutes
  - Perimeter conveyance system
  - Storm water control basins

Storm Water Drainage (cont'd)

- Reduced benching to 50 vertical feet
- Drainage channels designed to convey 100-year storm
- All drainage channels designed are routed to a storm water control basin

Collection Basin

Fresh Kills Today

Fresh Kills Today

Fresh Kills Today

A New Beginning