



greenstar
setting the standard

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Practical Aspects of Landfill Gas Management at Greenstar Landfills

John Jones – General Manager

EPA Landfill Workshop - 21st October 2009

...a new vision

recycling - composting - collection - commercial & domestic - residual disposal

consultancy - materials recovery -

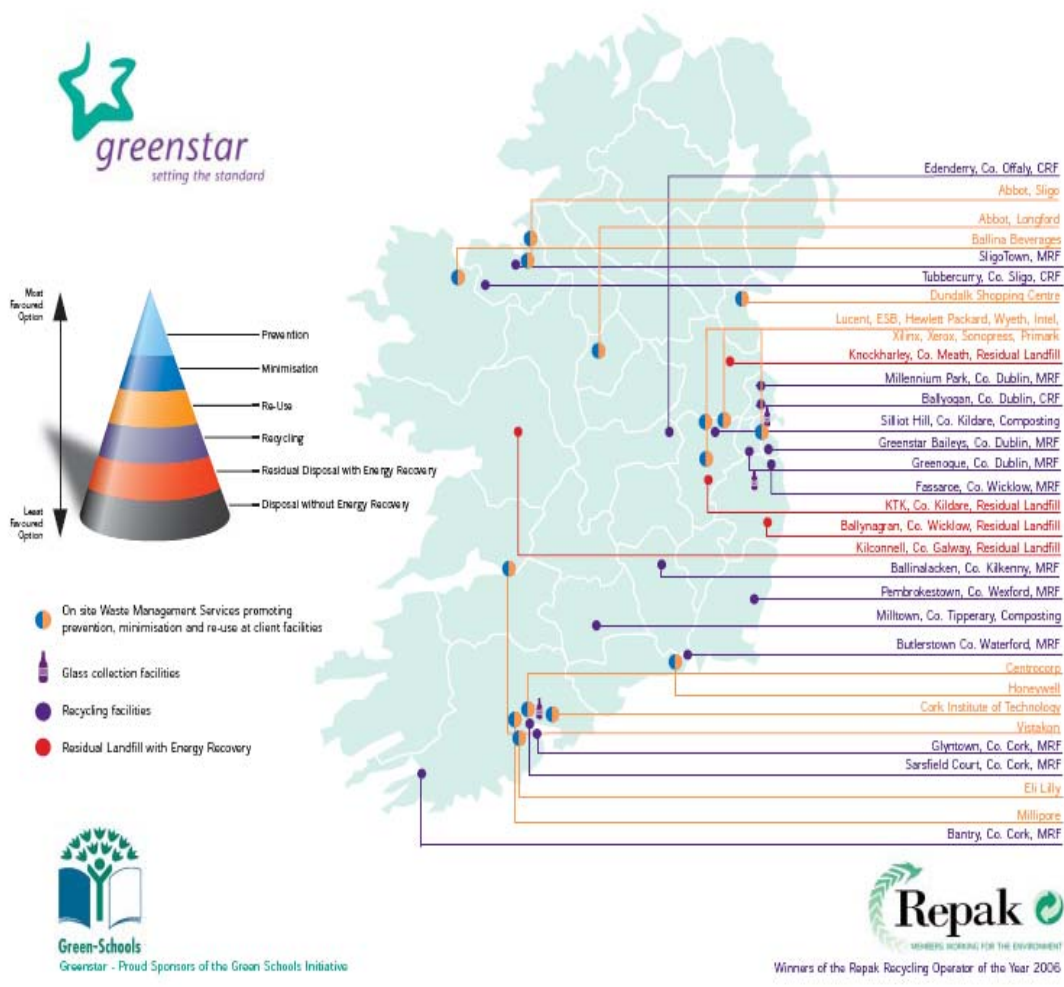


Greenstar – *who are we?*

- Established 1999.
- Irish owned and managed.
- Part of NTR Plc group of companies – Recycling, Solar, Wind, Biofuel.
- Ireland's largest waste management company.
- Waste collection, Recycling, Composting, Residual Landfill with Energy Recovery.
- Manages household, commercial and industrial wastes.
- Award winning recycling and landfill operations.
- Operates Ireland's most environmentally compliant landfills.



Greenstar – Integrated Waste Services



Landfills in Ireland

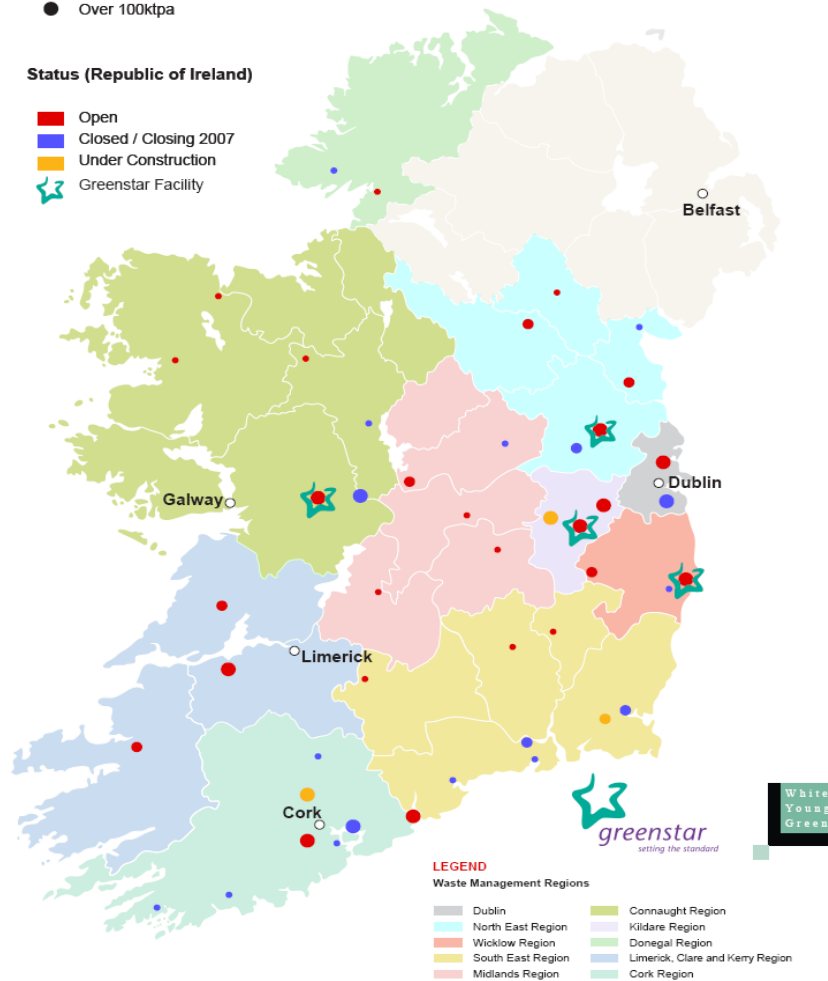
Active & Closed Licensed Landfill Locations - Republic of Ireland - May 2007

LEGEND

- Landfill Under 50ktpa
- Landfill 50ktpa to 100ktpa
- Over 100ktpa

Status (Republic of Ireland)

- Open
- Closed / Closing 2007
- Under Construction
- ★ Greenstar Facility



LEGEND

Waste Management Regions

- Dublin
- North East Region
- Wicklow Region
- South East Region
- Midlands Region
- Connacht Region
- Kildare Region
- Donegal Region
- Limerick, Clare and Kerry Region
- Cork Region

White
Young
Green



Ballynagran Residual Landfill – WM165-01

- Facility opened during October 2006.
- Accepts 150,000 tpa of residual waste per annum.
- Currently have approximately 400,000 tonnes of residual waste in place.
- Burning approximately +2,600m³/hr of landfill gas.
- Planning obtained for gas utilisation plant. Awaiting ESB approval.
- Awarded CIWM PEELs Cup for Operational Excellence during 2008.
- Awarded International Green Apple Award for Environmental Best Practice 2009.
- Awarded ISO 14001 Certification during January 2009.
- Currently working towards ISO 18001.
- All Greenstar Landfill are ISO 14001 certified.



Aerial view of Ballynagran Landfill



Why Collect Landfill Gas?

- Kyoto Protocol – legally binding agreement for reducing emissions of greenhouse gases.
- EU Landfill Directive – “Landfill gas shall be collected from all landfills receiving biodegradable waste and the landfill gas must be treated and used. If the gas collected cannot be used to produce energy, it must be flared.”
- Waste Management Licence Conditions – Gas migration / treatment / odour control
- EPA Landfill Manuals and BAT for Landfill Operations
- EU Renewable Energy Target % national electricity consumption
 - EU Directive 2001/77/EC – national indicative target - 13.2% by 2010
 - Irish Government Target (2007) – 15% RE by 2010
 - Irish Government Target (2007) – 33% RE by 2020

Landfill Gas Management

- Waste Acceptance
- Landfill Gas Collection Infrastructure
 - Drilled Wells
 - Built up Wells
 - Horizontal Trenches
 - Pin Wells
 - Flares
 - Gas Engines / Utilisation
- Day to day management
 - Balancing the field
 - FID surveys
 - Daily checks
 - Remote access

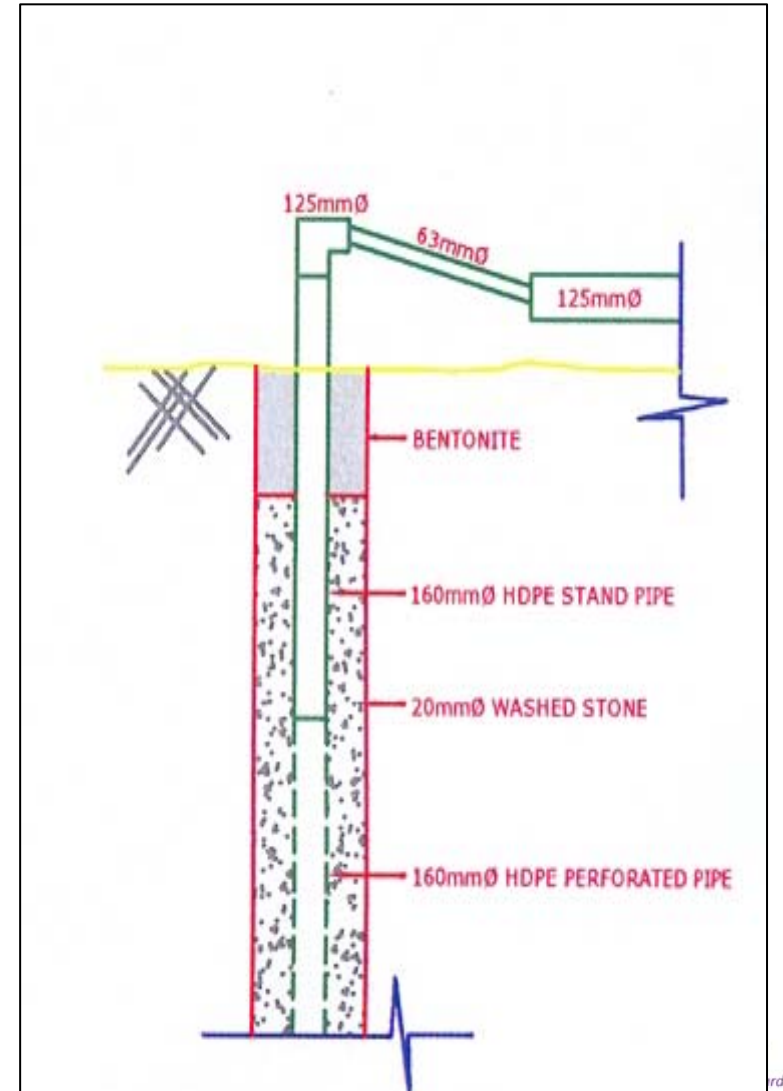
Waste Acceptance

Some potential sources of gas contamination include:

- Commercial lubricants – Siloxanes
- Wastewater treatment sludges – Siloxanes
- Cleaning agents - Siloxanes
- Gypsum – Hydrogen Sulphide
- Crushed demolition waste containing plaster – Hydrogen Sulphide



Drilling Gas Wells



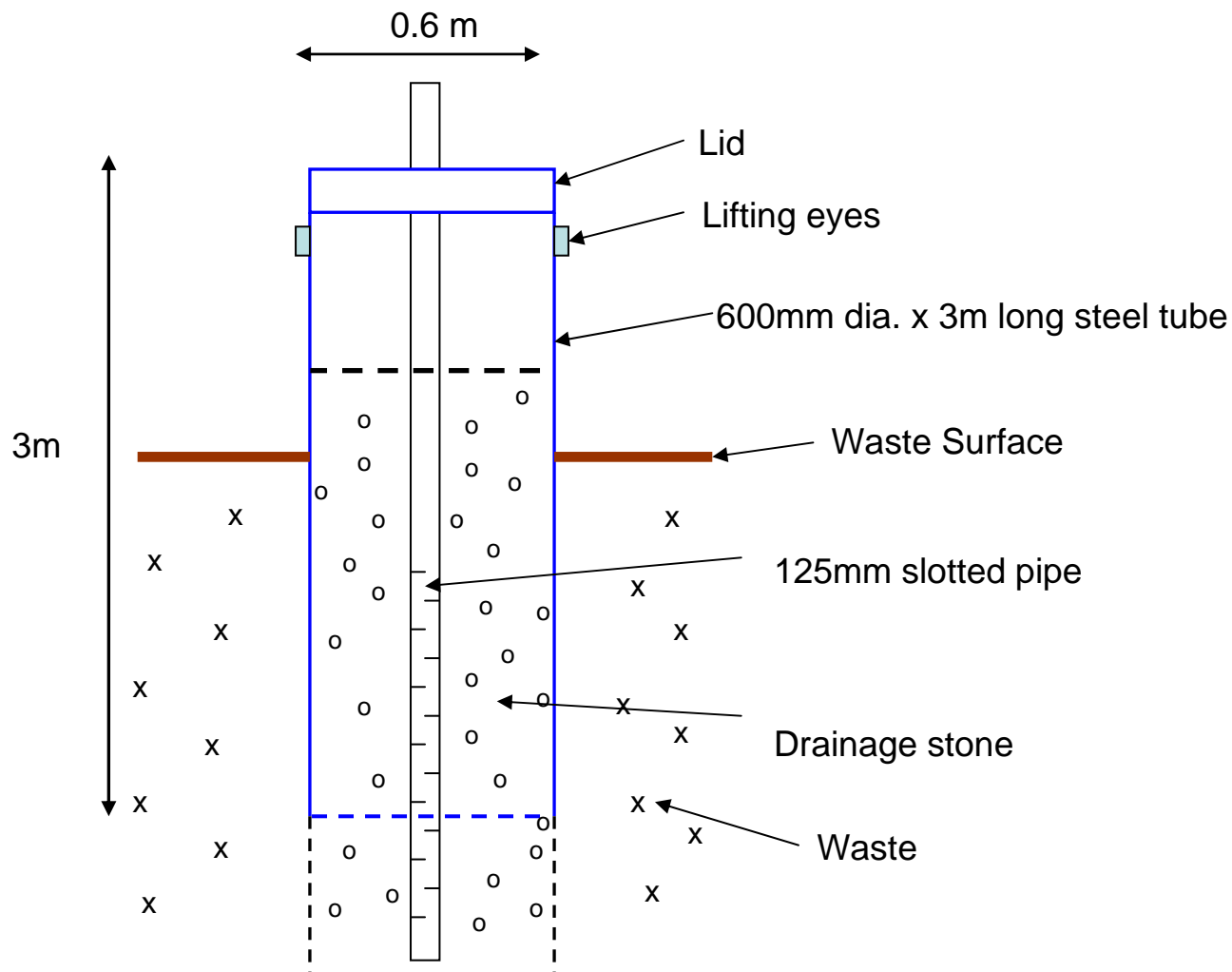
Built up Well



Raising a Built up Well



Built up gas well



Installing temporary horizontal trench



Installing temporary horizontal trench



Permanent Horizontal Trench at KTK Landfill



Pin Well Installation at Connaught Landfill



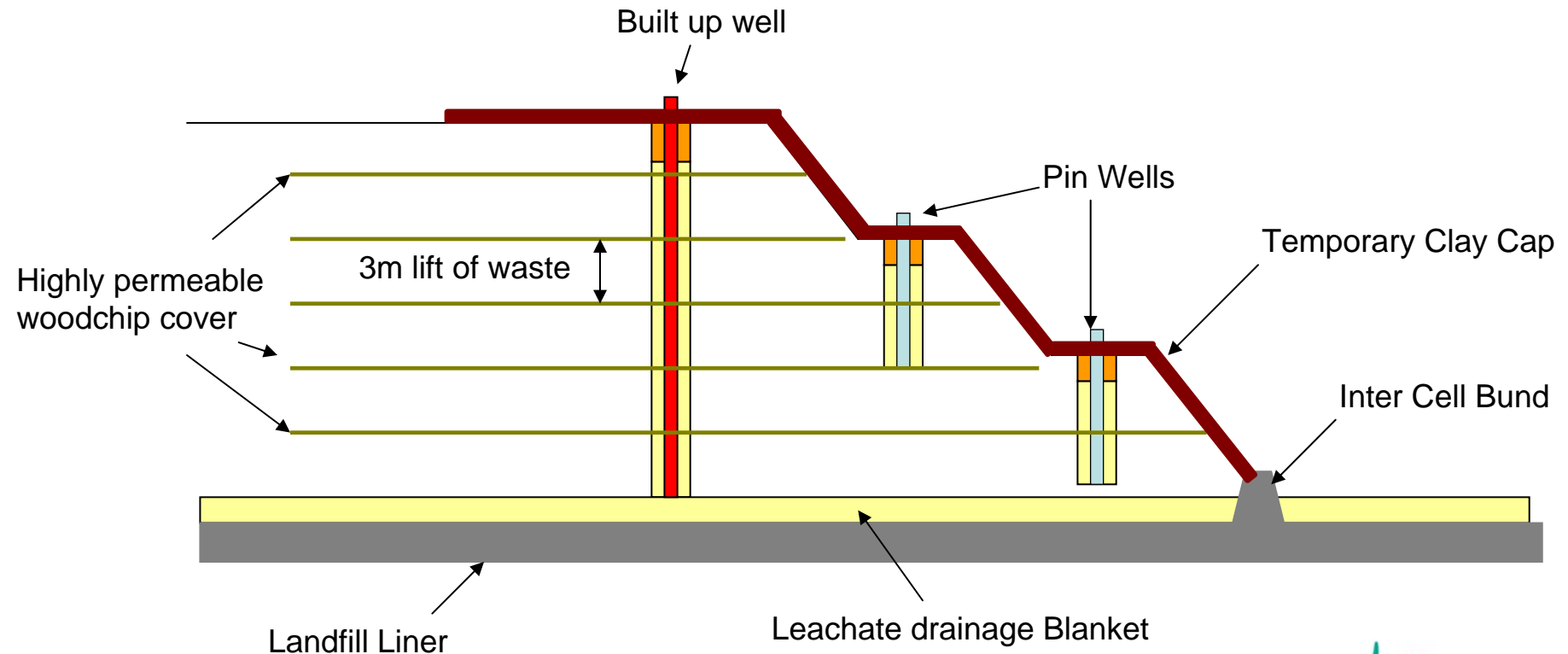
Pin Wells on flank at Connaught Landfill



Approximate Costs

➤ Drilled Wells	+100 euro/m
➤ Temporary Horizontal Trenches	+5 euro/m
➤ Pin Wells	+80 euro each
➤ Built Wells	+20 euro/m

Cross Section Through Landfill



Reinforced Polyethylene Temporary Capping at Connaught Landfill



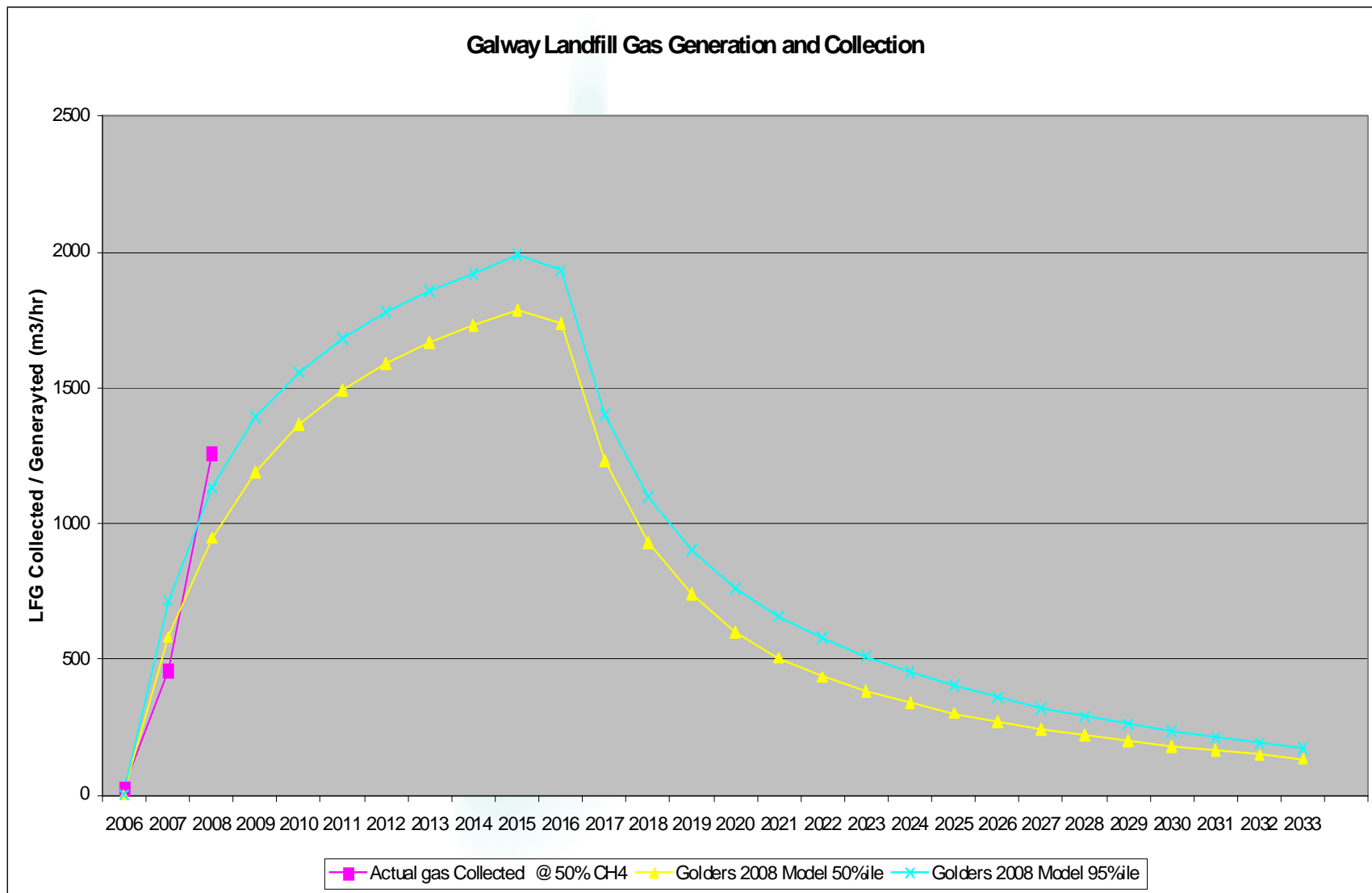
Temporary Capping at Connaught Landfill



Temporary Capping at Knockharley Landfill

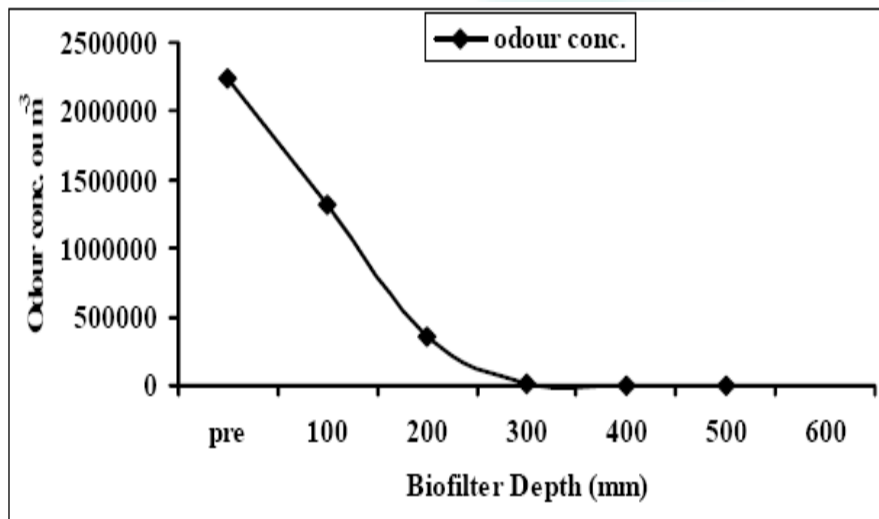


Efficiency in Gas Collection



Woodchip Odour Abatement Layer in Daily Cover

- Dr. P Solan, UCD carried out laboratory testing on bio-filtration properties of woodchip when used as bio filtration layer on landfills.
- Odour reduction due to application of daily cover on the working face is in excess of 50% and virtually 100% when background odours are taken into consideration.

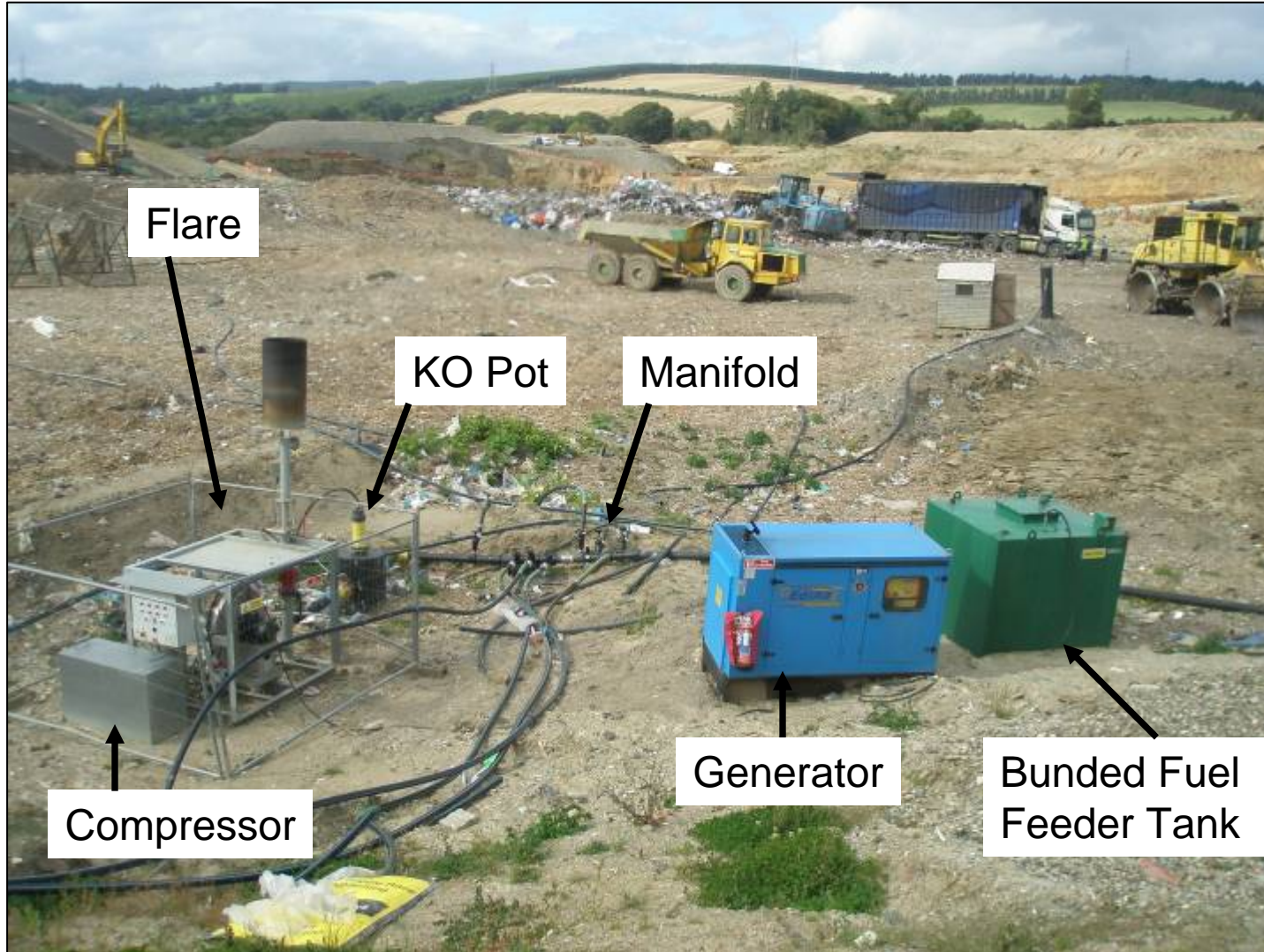


Source: Dr. P Solan PhD, University College Dublin 2008



Woodchip cover at Knockharley Landfill

500m³/hr Mobile Flaring Unit



Connaught Landfill



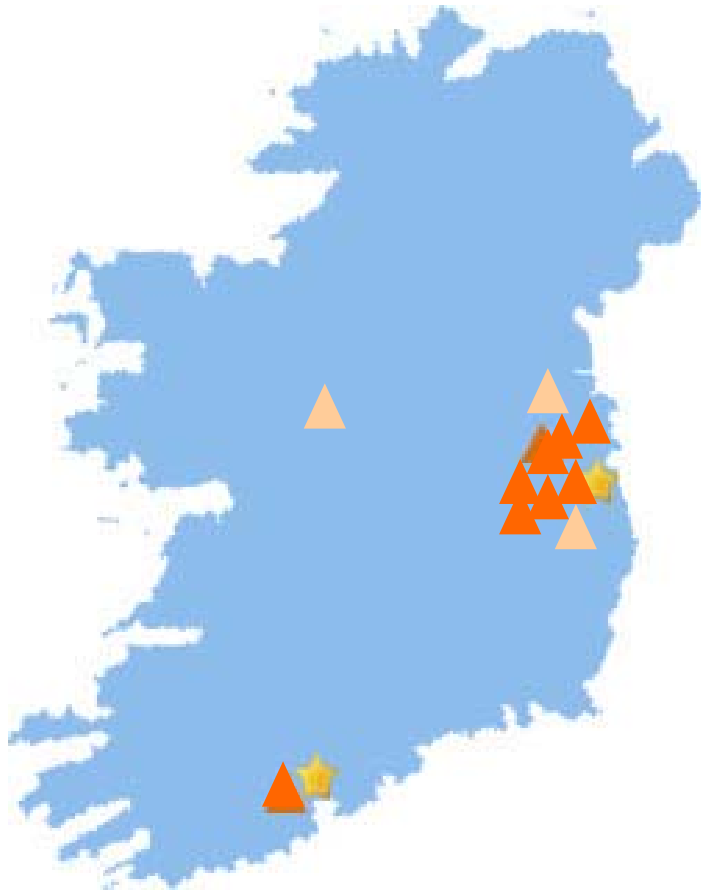
Knockharley Landfill



Power Generation



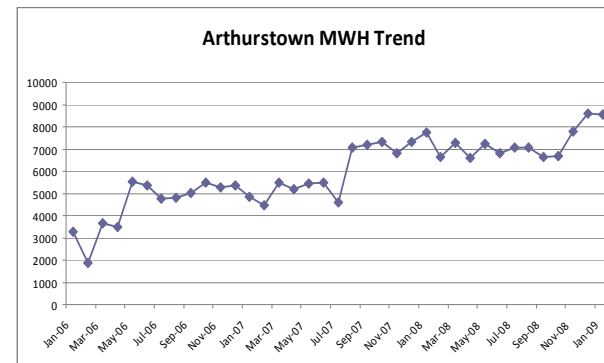
Site	Go Live	
KTK	Currently	3.6 MW
Knockharley	Late 2009	5.6 MW
Ballynagran	Early 2010	4.2 MW
Connaught	Early 2010	4.2 MW
Total		17.6MW



Current Operating Sites ▲		
Site	LF Operator	Installed Generation
Balleally	Fingal CC	5.0MW
Ballyogan	Dun Laoghaire Rathdown CC	2.0MW
Friarstown	South Dublin CC	0.6MW
Dunsink	Fingal CC	1.2MW
Arthurstown	South Dublin CC	14.2MW
KTK	Greenstar	3.8MW
Kinsale RD	Cork City Council	1.0MW
Sites Under Development ▲		
Knockharley	Greenstar	5.6MW
Ballynagran	Greenstar	4.2MW
Kilconnell	Greenstar	4.2MW

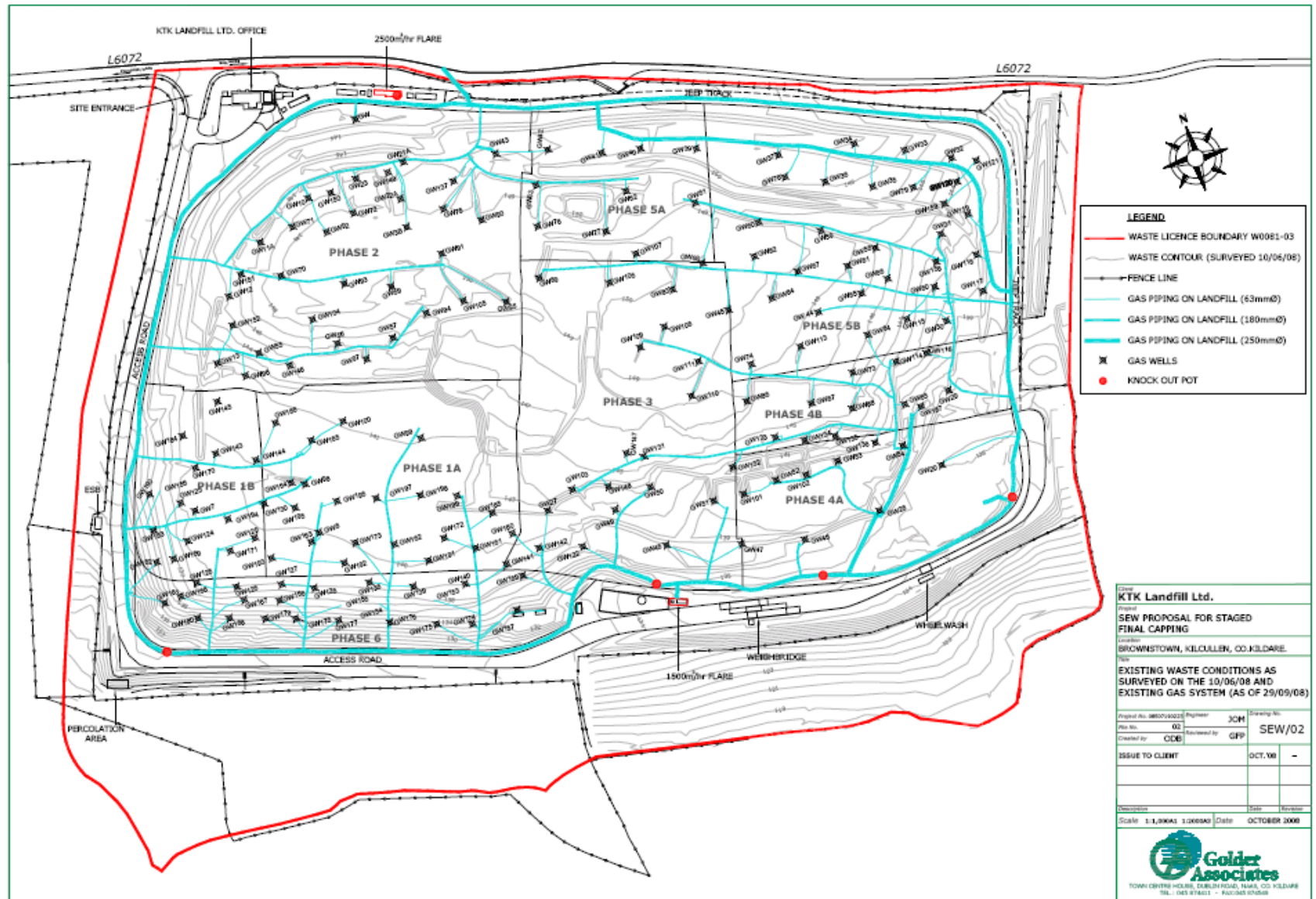
- In 2008 Greenstar/BPS generated 160GWh – enough to power approx. 30,000 households ~ 5.4% of ROI renewable energy usage.*

Arthurstown Landfill, Kill

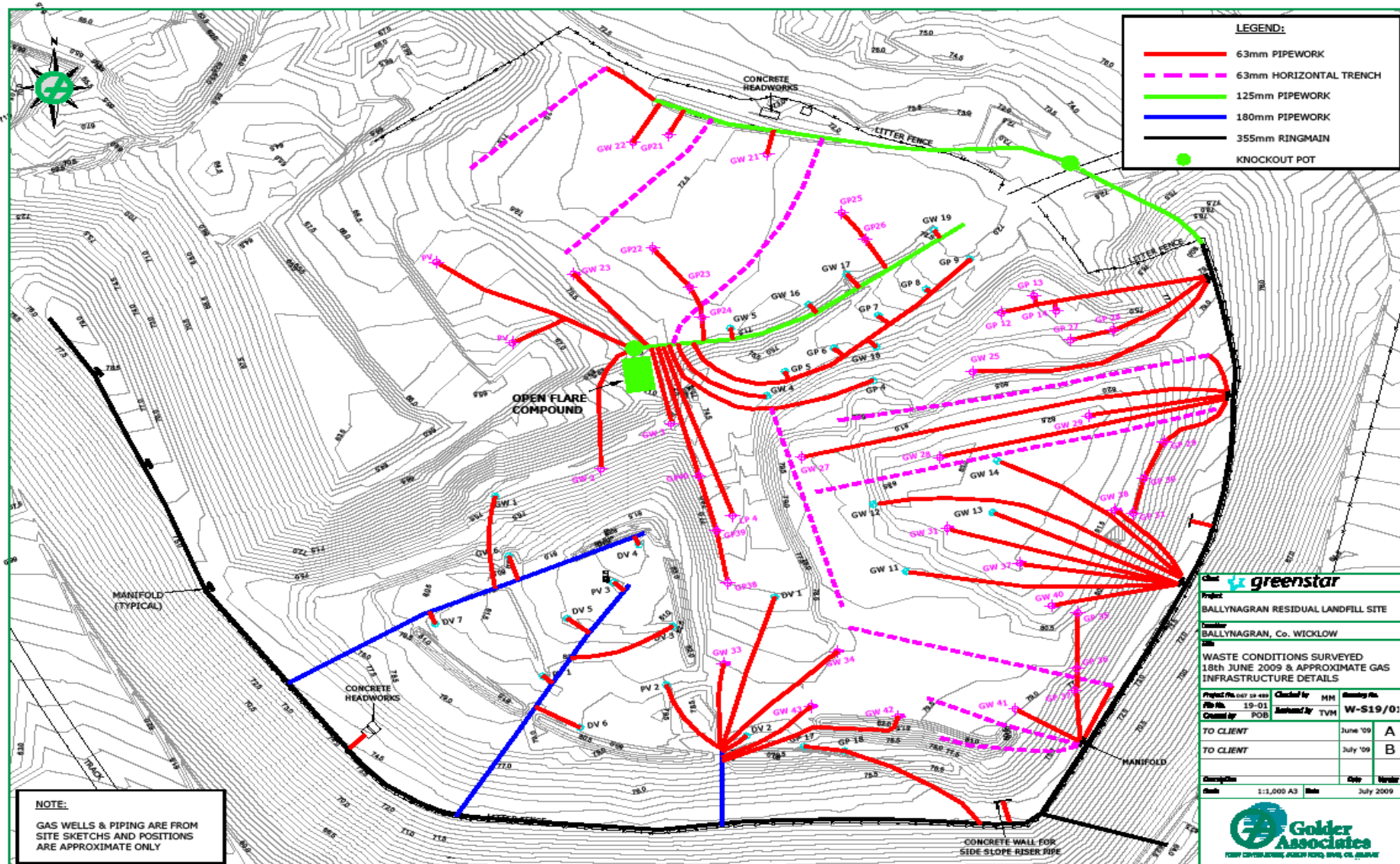


- Power generation from landfill gas started 2005
- Site has a total export capacity of 14MW :
- Site equipment : 11 engines and 3 booster stations
- BPS were responsible for the design, installation and commissioning of the facility.
- BPS are responsible for electricity generation and gas flaring infrastructure
- BPS are responsible for negotiating power off-take agreements with electricity suppliers.
- Annual availability >93% of uptime

High Density of Gas Abstraction Infrastructure at KTK Landfill



High Density of Gas Abstraction Infrastructure at Ballynagran Landfill



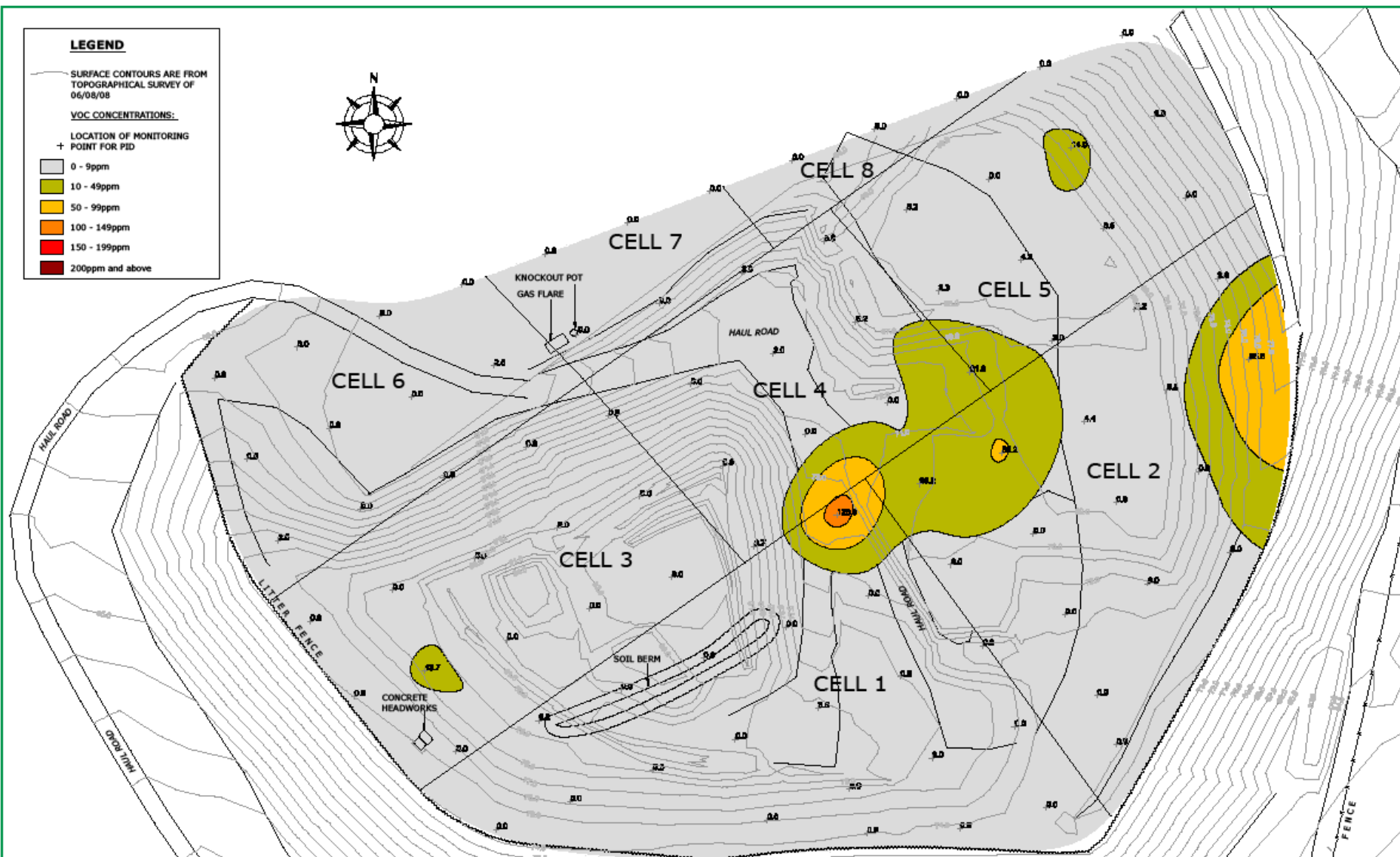
Balancing the Gas Field



FID Survey

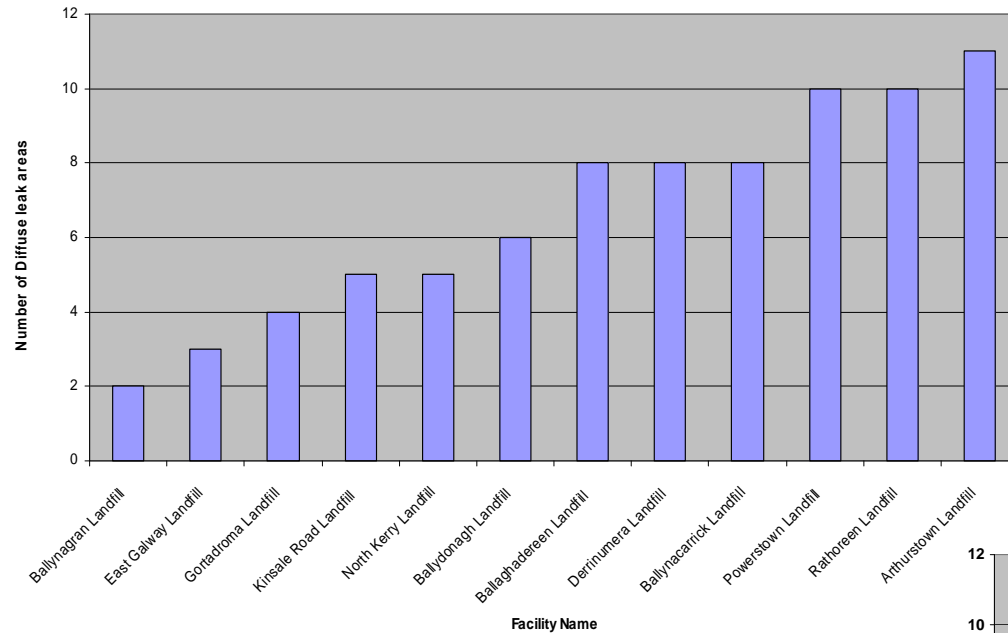


FID Survey

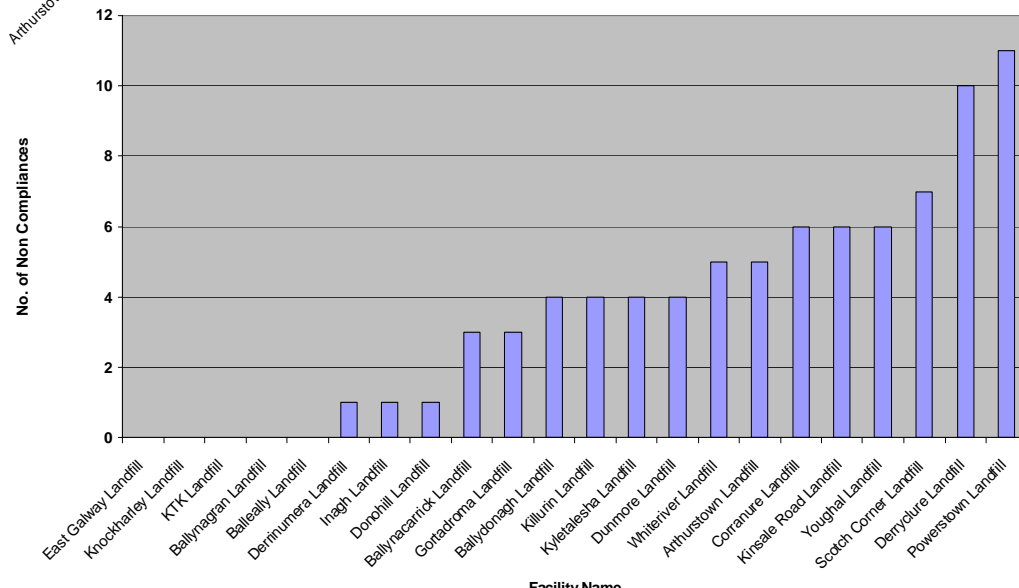


EPA Landfill Gas Compliance

EPA/OMI Diffuse Source LFG Leakage Comparison on 2009 results to date on regional public file



Comparison of MSW Landfills EPA Annual Licence Audits 2008



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Copies of presentation and visits to any Greenstar facilities
available on request.