Dunfermline Eastern Expansion. Dunfermline, Scotland. 1998.

A multi-disciplinary collaboration successfully implemented a stormwater master plan for a major expansion to the ancient city of Dunfermline. DEX is one of the first UK examples of integrated sustainable urban water management of a large scale multi-purpose development site.

Plate 1. DEX Regional SUDS.

Abstract: DEX is a 350 ha development of residential, retail, commercial, industrial, leisure and public open space which commenced construction in 1996 on a Greenfield site on the eastern periphery of Dunfermline. An holistic approach to the surface water drainage design and planning was necessary because of limitations of the receiving watercourses and flooding issues identified downstream. DEX is a European showcase for the application of SUDS on a regional scale. The development relies on retention ponds as the regional treatment component, and source control in the form of detention basins and swales. The lead developer liaised with the statutory authorities to develop an integrated stormwater master plan based on SUDS in order to mitigate downstream flooding and ensure water quality targets were met.

27.7.00 — DULOCH PARK, DUNFERMLINE

	PHASE 1 (1996-2006)				PHASE 2 (2006-2011)				PHASE 3 (2011-2016)				PHASE 4 (2016-)				GRAND
PLOT	AFF	LOW	MED	HIGH	AFF	LOW	MED	HIGH	AFF	LOW	MED	HIGH	AFF	LOW	MED	HIGH	TOTAL
U1			10.00														10.00
L2															5.69		5.69
H2															4.07		4.07
V2											8.78						8.78
W3					1.57		4.42	2.08									8.07
X4									1.94		7.31	4.83					14.08
Y5			13.19	1.43													14.62
Z1			6.32														6.32
AA2	2.17		0.90	1.73													4.80
P4														4.68	5.09		9.77
J3						6.40	2.35										8.75
K5		4.44	4.28														8.72
K5a													0.40		5.78		6.18
R3											5.52						5.52
S4						6.08											6.08
TOTAL	2.17	4.44	34.69	3.16	1.57	12.48	6.77	2.08	1.94	0.00	21.61	4.83	0.40	4.68	20.63	0.00	121.45
	PHASE 1 TOTAL = 44.46				PHASE 2 TOTAL = 22.90				PHASE 3 TOTAL = 28.38				PHASE 4 TOTAL = 25.71				

NOTE:
1. AREAS MEASURED IN HECTARES.
2. THIS TABLE SHOULD BE READ IN CONJUNCTION WITH DRAWINGS 5870/101 AND 5870/102
3. TOTAL AFFORDABLE HOUSING = 6. 08hectares
4. MEASURED AREAS EXCLUDE POND AREAS AND AS BUILT STRUCTURE PLANTING AREAS

Plate 2. DEX Development Phasing Table.

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Main Stakeholders: A collaboration of Wilcon Homes (now Taylor Wimpey), Fife Council, Scottish Enterprise, Meedhurst Project Management (now CEIMA Ltd), SEPA, Scottish Water, Fairhurst and Ironside Farrar Consultants, and the Local Community came together in the early 1990's to agree on a stormwater drainage master plan for the expansion to go ahead.

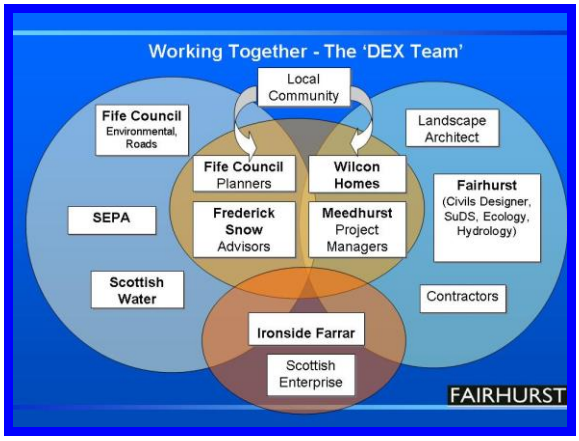

Plate 3. DEX regional SUDS.

Outcome: SUDS (formerly known as Best Management Practices) began to be implemented in Scotland in the mid 1990's due to a drive by SEPA to deal with Scotland's polluted watercourses. Outline planning consents contained a condition that SUDS be used to drain surface water from DEX due to four stressed local watercourses that drained down into Dunfermline where chronic flooding was an existing problem. The sustainable drainage structures implemented by the Lead Developer at DEX have been in the ground for more than a decade. They have been fully accepted by the new communities that have taken up residence in the area due to their integration into the landscape, their intrinsic aesthetic appeal and the obvious benefits gained from the amenity & biodiversity attributes that the regional structures offer. Since inception, action research of the SUDS at DEX have been studied by the academic community with many research outcomes that have informed best practice over the years (i.e. hydraulic, treatment, catchment response, sedimentation rates and quality performances). This has resulted in the evolution of national guidance that is founded in robust research outcomes.

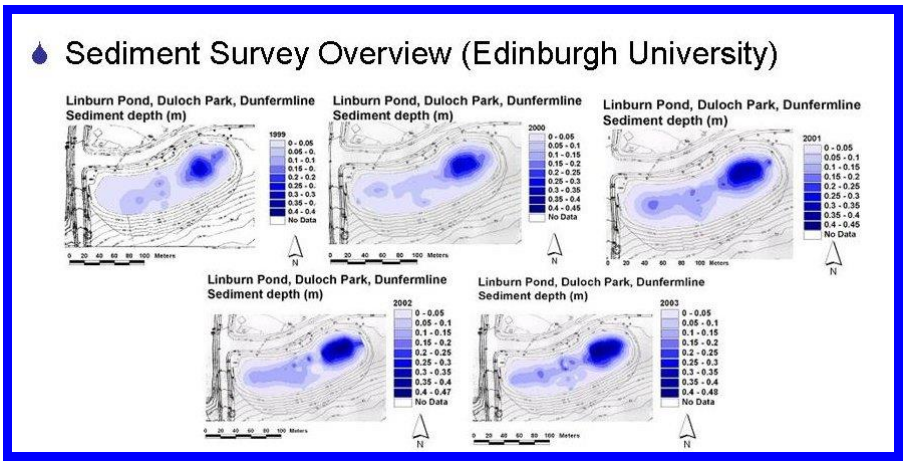

Plate 4. DEX Linburn Pond sediment surveys 1991 - 2003.

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Reason to register: The unique DEX partnership created for DEX to go ahead not only produced one of the first well conceived UK sustainable stormwater master plans but brought in Larry Roesner from the US who is a world expert and leader in best management practices (SUDS in the UK) to guide the process in an area where developer experience was limited and no precedents had been set. DEX also inspired the academic community to undertake multi-stakeholder led research resulting in evolving guidance in several areas which has enabled practitioners to have confidence in implementing SUDS throughout the UK. The DEX SUDS are extremely well managed by the lead developer and Fife Council. This has led to SUDS which consistently perform in the manner that they were designed for. Abertay University is contracted by the lead developer to inspect & track performance based on operation and maintenance of the SUDS and has continuing communication with the developer, their consultants, Fife Council and SEPA to ensure that remedial works are undertaken as and when required.

Reason why communication worked: There are several areas where communication between practitioners has strengthened the success not only of the SUDS at the DEX development but the uptake of SUDS on a national (UK wide) scale.

- The ongoing multi-stakeholder led research at DEX has confirmed that this truly cross disciplinary approach to sustainable drainage is the way forward to progress implementation of new methodologies and techniques.
- The successful performance of the DEX SUDS in several areas has given the industry confidence that development is viable using SUDS to provide water quality and flow management whilst enhancing biodiversity potential. This is illustrated by the statutory policies now in place in Scotland.
- Research results that are founded in the catchment studies undertaken at DEX has proven to Scottish Water that retention ponds and detention basins are viable above ground structures for vesting into the public sewer network.
- Hydraulic studies at DEX were fundamental to Scottish Water providing optimal treatment volume guidance in their Sewers for Scotland 2nd Edition technical guidance document. The DEX studies confirmed that for residential areas, a treatment volume of 1Vt only is needed for regional structures as opposed to the conservative 4Vt applied to previous existing ponds and basins.
- The ongoing commitment of the lead developer to ensure performance of the SUDS has highlighted the need for a practicable inspection programme. The relationships that a SUDS inspector fosters with all responsible organisations are crucial to avoid potential failures that would result in costly remediation works.

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