

COMMERCIAL DEVELOPMENT



Projects in Europe

LOCATION	NITROGEN LOAD, lbs/day	COMMISSIONING DATE	STATUS
Utrecht, NL	1984	1997	O
Rotterdam, NL	1829	1999	O
Zwolle, NL	1190	2003	O
Beverwijk, NL	2645	2003	O
Groningen, NL	6172	2004	O
Haag – Houtrust, NL	2865	2005	O
Geneva CH	3748	2009	C
Manchester, GB	3528	2010	C
Willingham, GB	3307	2010	C
Paris, FR	7717	2010	D
Linkoping, SW	2000	2011	D



Projects in North America

LOCATION	NITROGEN LOAD lbs/day	COMMISSIONING DATE	STATUS
New York, NY	11,000	2009 (June)	C

(P) in demonstration (D) in design; (C) in construction; (O) in operation

UTRECHT, UTRECHT, NL



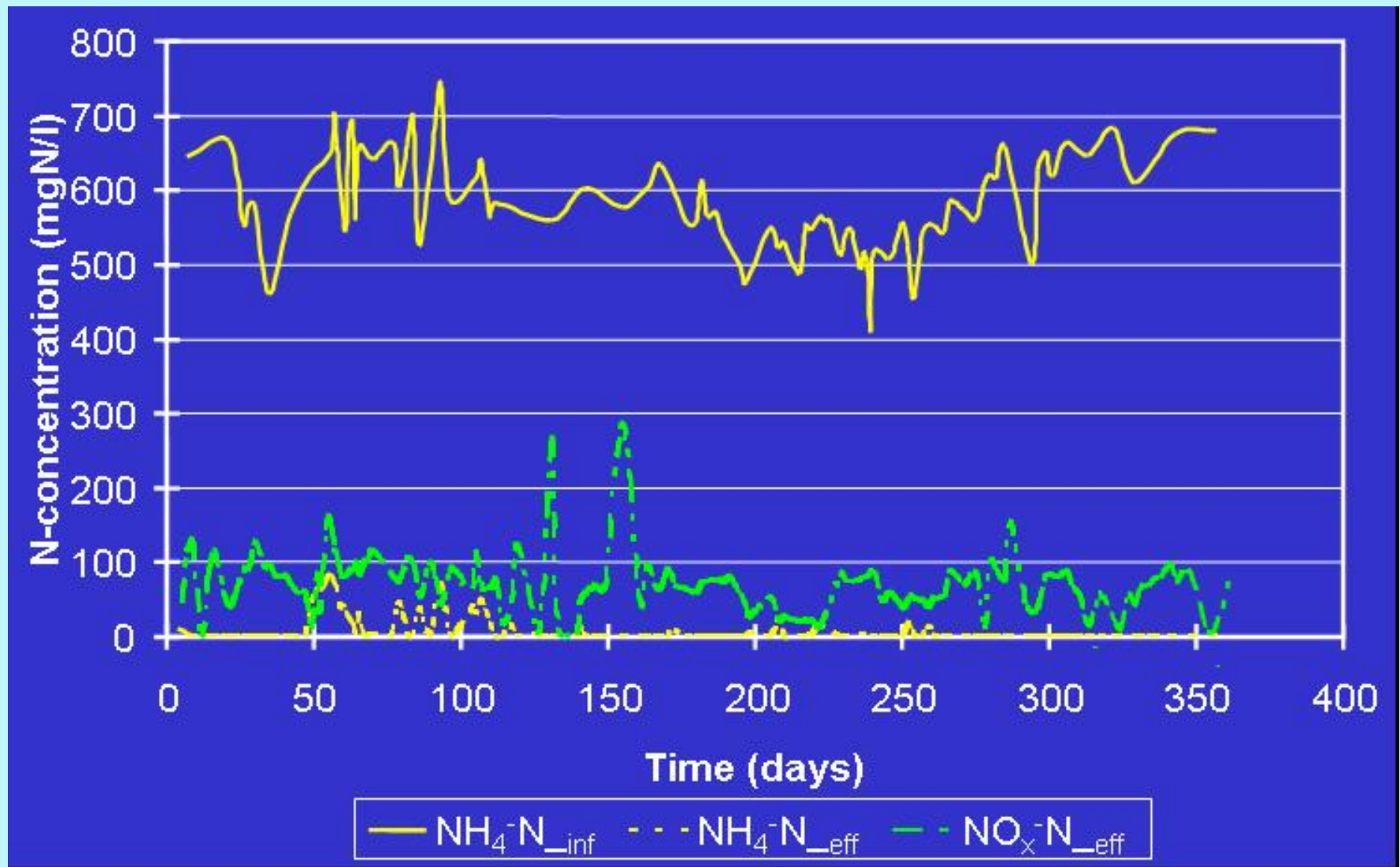
TABLE 1
DESIGN PARAMETERS UTRECHT, THE NETHERLANDS⁽²⁾

<u>Parameter</u>	<u>metric units</u>	<u>American units</u>
Flow _{design}	35.0 m ³ /hr	221,928 gal/day
Flow _{maximum}	62.5 m ³ /hr	396,300 gal/day
NH ₄ influent	0.5-0.7 g/l	500-700 ppm
Nitrogen Load _{design}	420 kg/day	926 lbs/day
Nitrogen Load _{maximum}	900 kg/day	1984 lbs/day
Reactor Size		
oxic	3,000 m ³	792,600 gallons
anoxic	1,500 m ³	396,300 gallons
Oxic Retention Time		2, days
Anoxic Retention Time		1, day

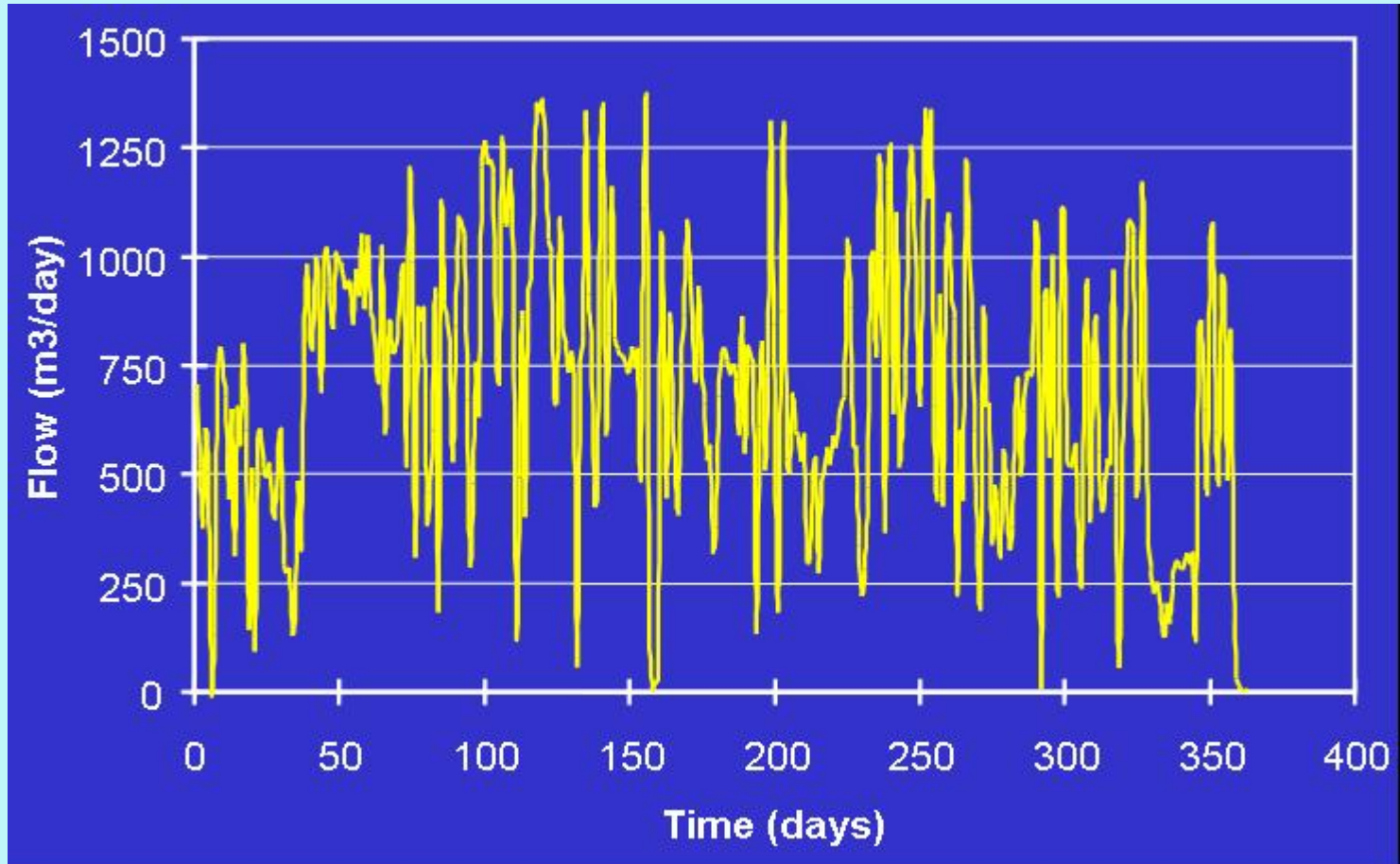


**SHARON TWO STAGE REACTOR
NITRIFICATION REACTOR FOREGROUND
NITRIFICATION REACTOR BACKGROUND**

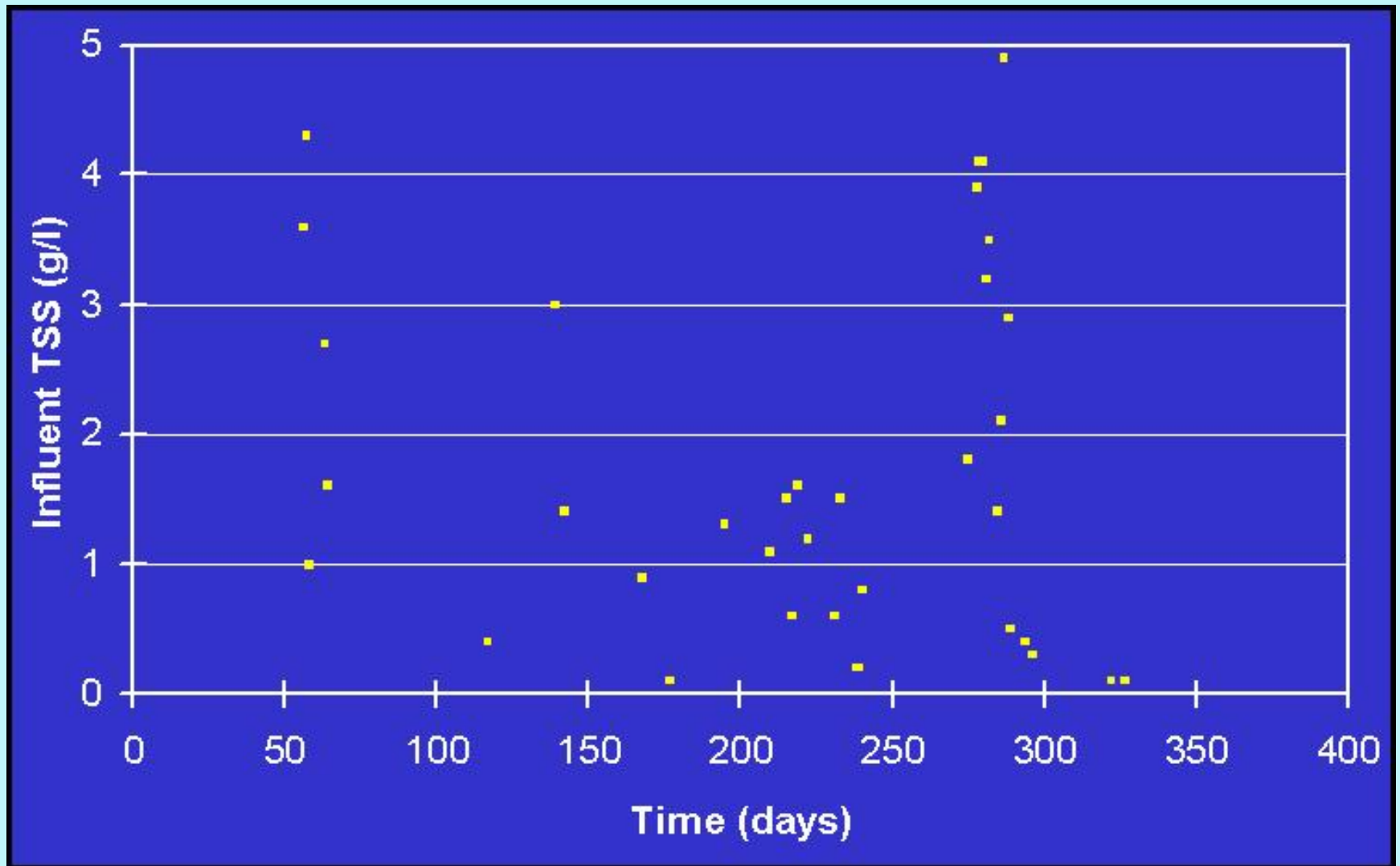
CONTINUING OPERATION



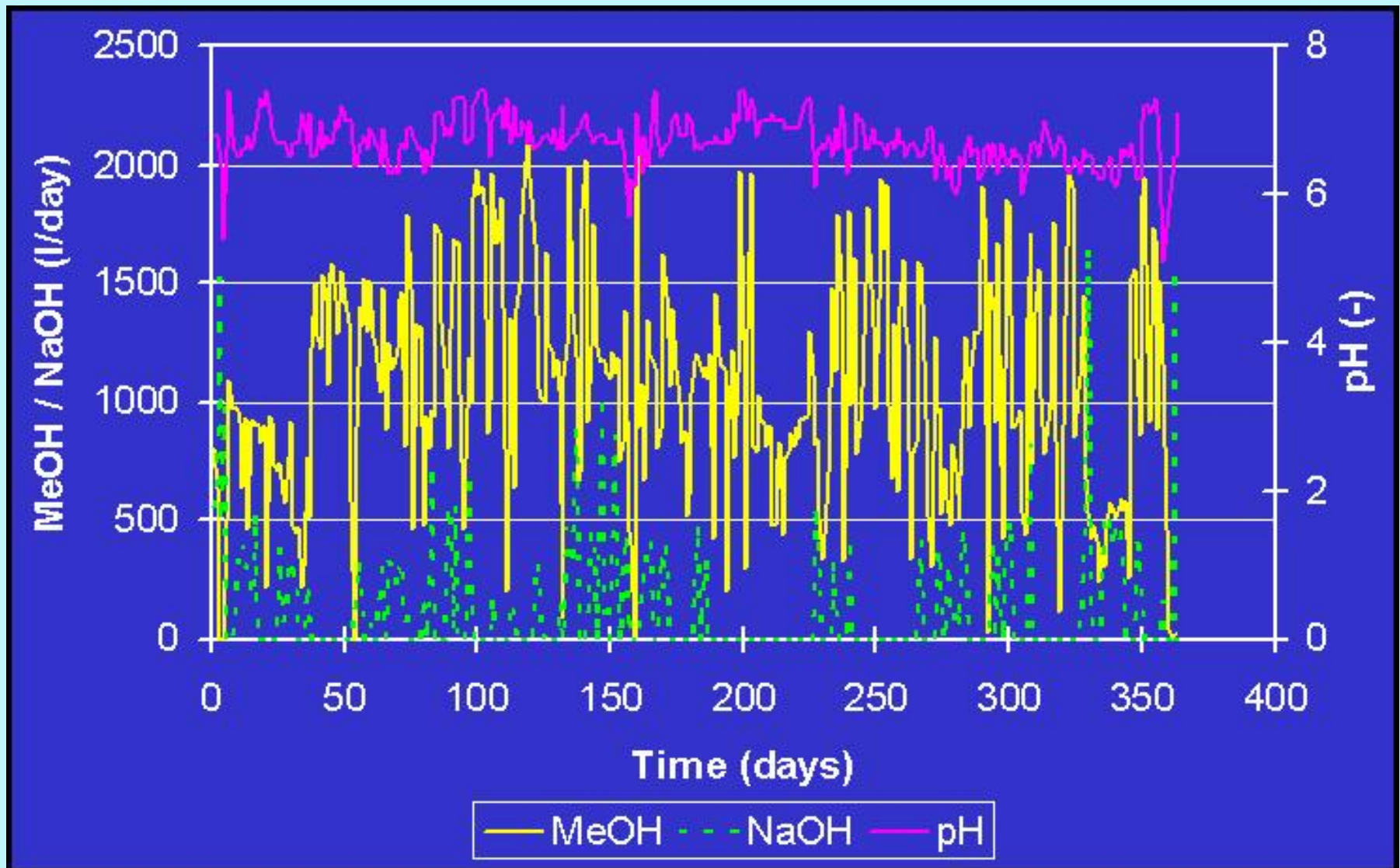
CONTINUING OPERATION



CONTINUING OPERATION



CONTINUING OPERATION



ROTTERDAM, ZUID, NL, DOKHAVEN - SLUISJESDIJK PLANT



TABLE 2
DESIGN PARAMETERS ROTTERDAM, THE NETHERLANDS⁽³⁾

Parameter	Metric units	American units
Flow _{design}	31.5 m ³ /hr	199,735 gal/day
Flow _{maximum}	50.0 m ³ /hr	317,040 gal/day
NH ₄ influent	1-1.5 g/l	1000-1500 ppm
Nitrogen Load _{design}	540 kg/day	1190 lbs/day
Nitrogen Load _{maximum}	830 kg/day	1830 lbs/day
Reactor Size		
oxic/anoxic	1800 m ³	475,560 gallons
Oxic Retention Time		1, day
Anoxic Retention Time		0.5 days



**SIDE STREAM
SHARON SINGLE STAGE
NITRIFYING/ DENITRIFYING REACTOR**



REACTOR IN OXIC MODE, NITRIFYING



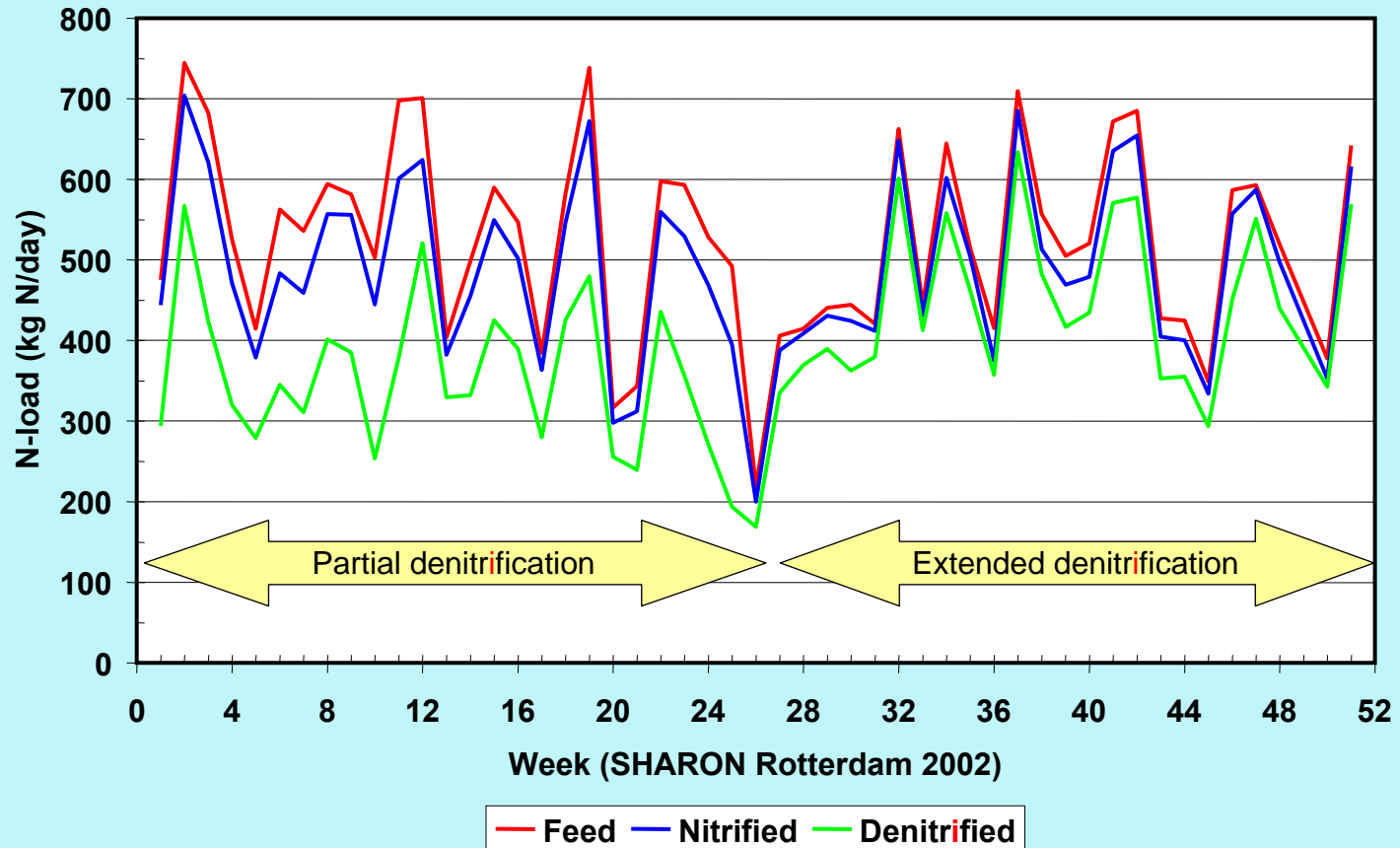
REACTOR ANOXIC MODE, DENITRIFYING



REACTOR MIXED LIQUOR

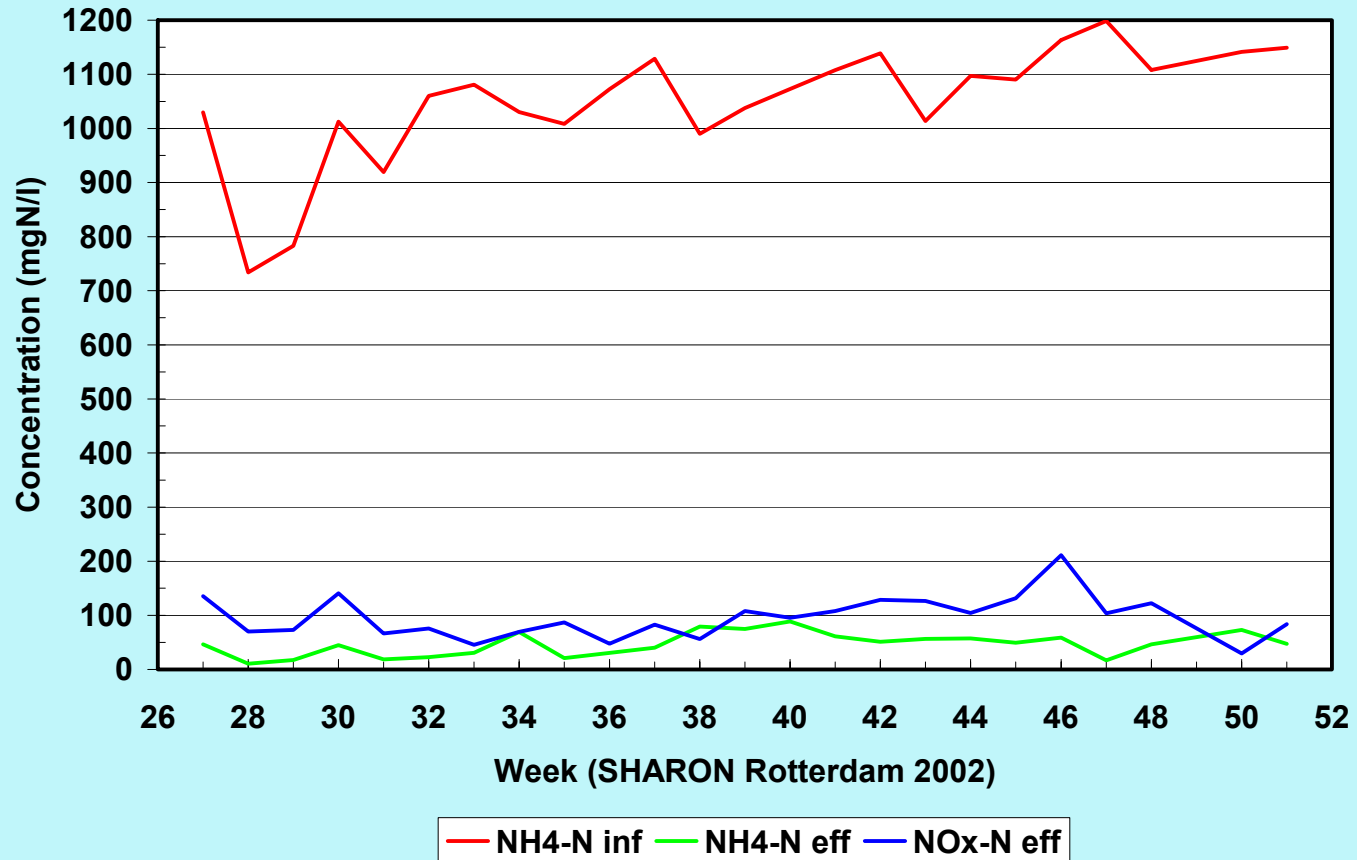
CONTINUING OPERATION

N-load Fluctuations



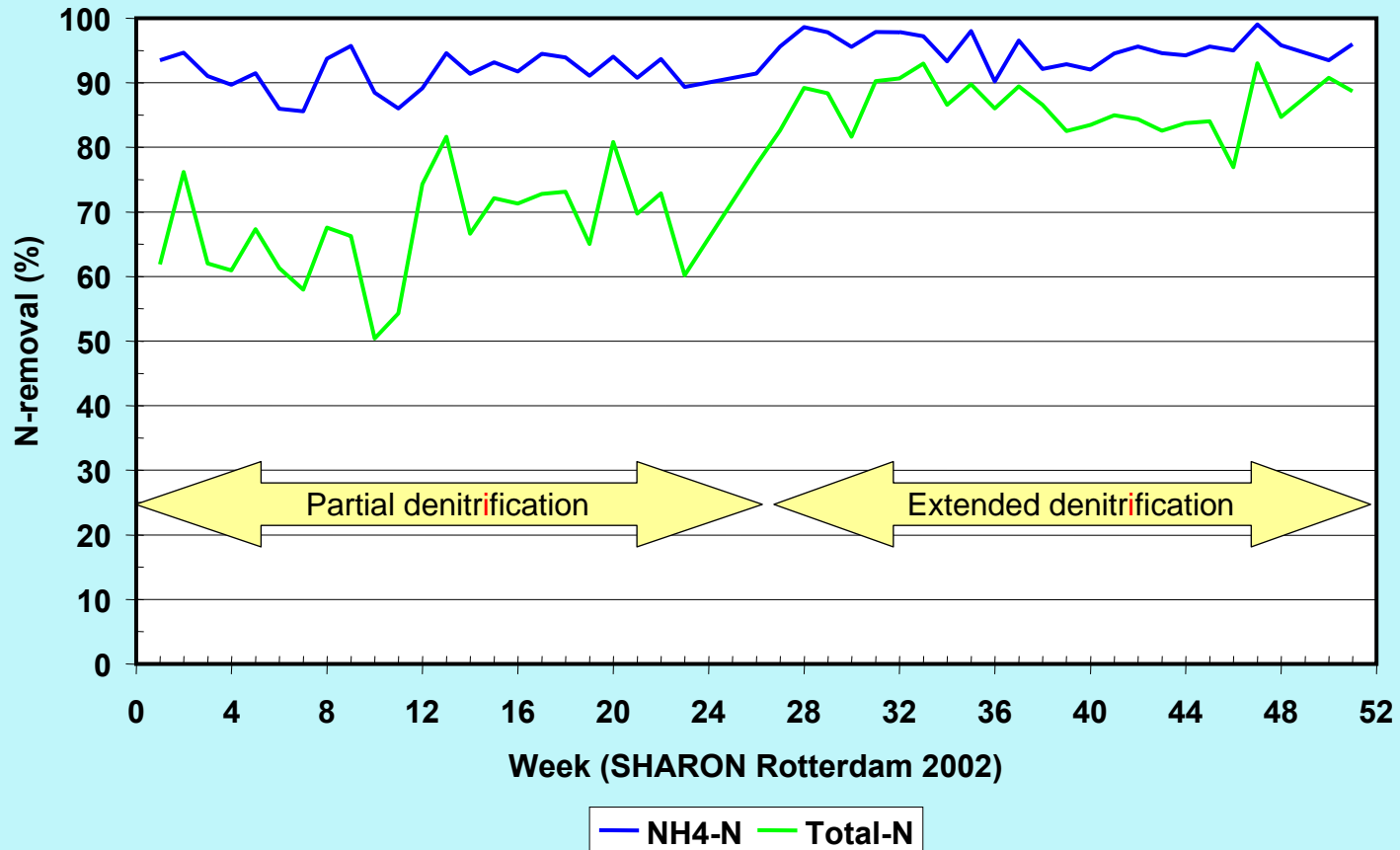
CONTINUING OPERATION

Effluent Quality



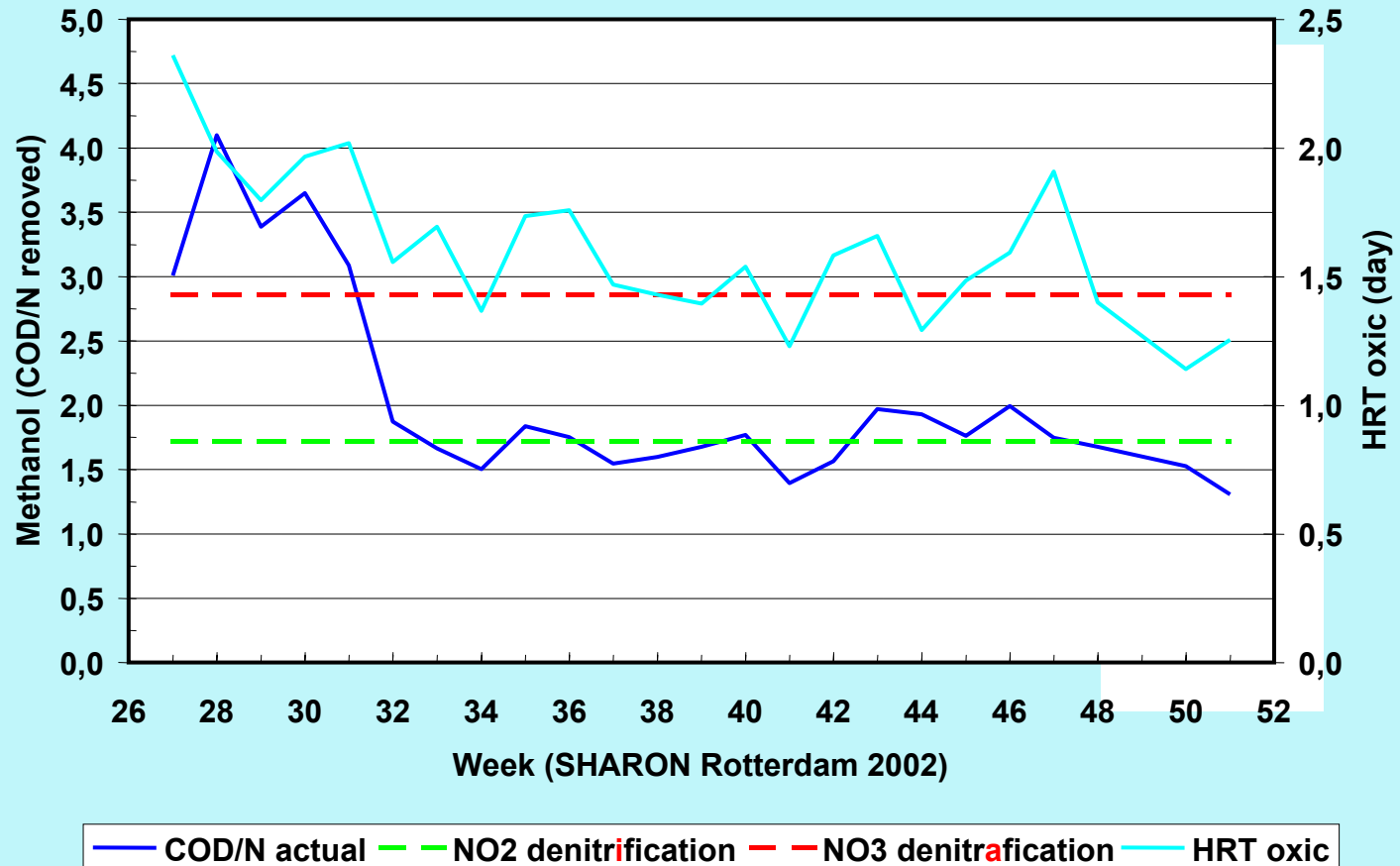
CONTINUING OPERATION

N-removal Efficiency

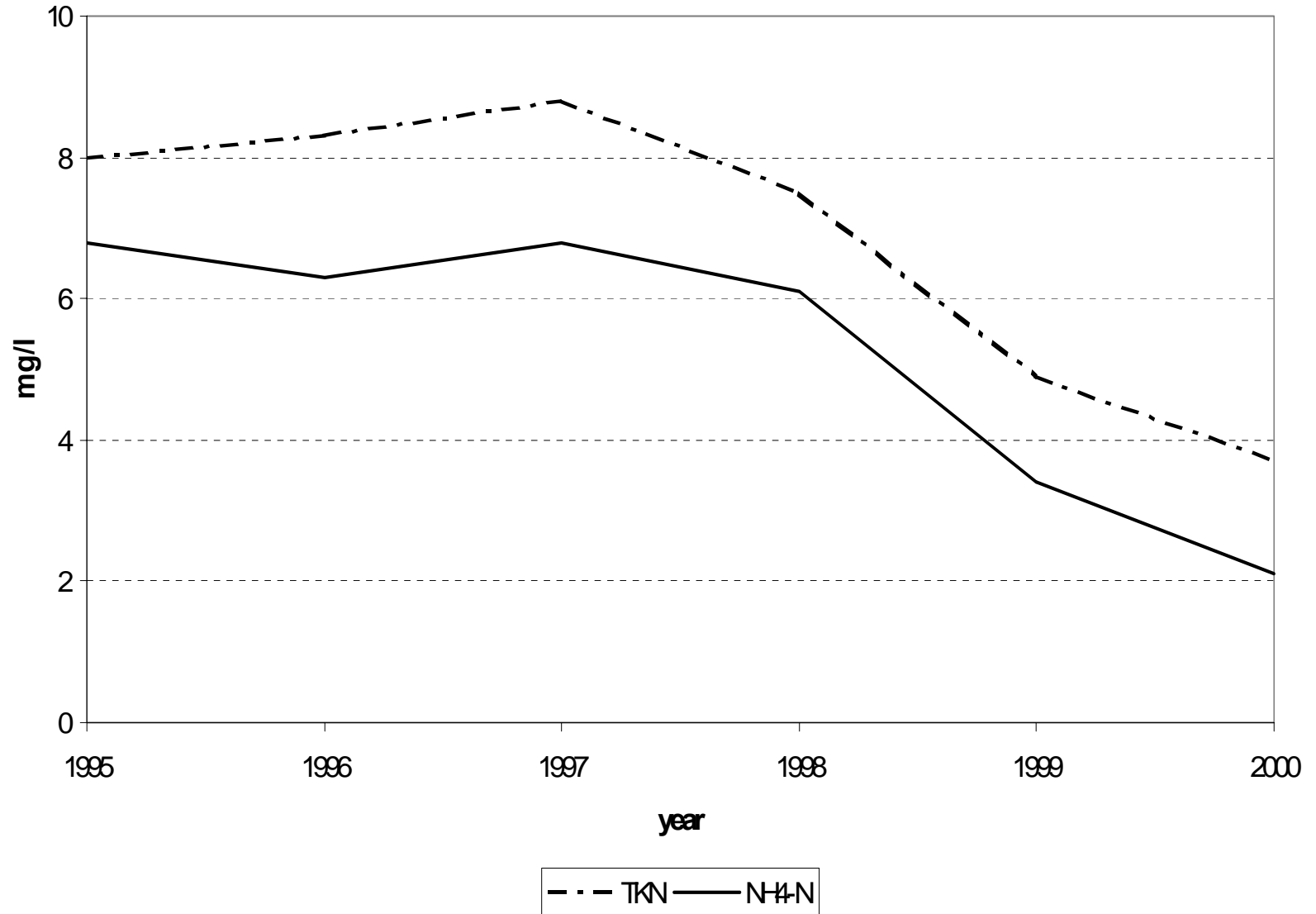


CONTINUING OPERATION

N-removal by NO₂



CONTINUING OPERATION



Zwolle, Over, NL



- Plant Capacity
200,000 pop. equ.
- SHARON
Capacity
900lbs. N/day
- N-removal >95%

- Temp 32-38 °C
- D.O. 1-2 ppm
- pH 6.7-6.9

Beverwijk, Noord, Holland, NL



320,000 pop. equ.

- SHARON Capacity
2640 lbs. N/day
- Plant Capacity
- N removal >95%

Groningen, Groningen, NL



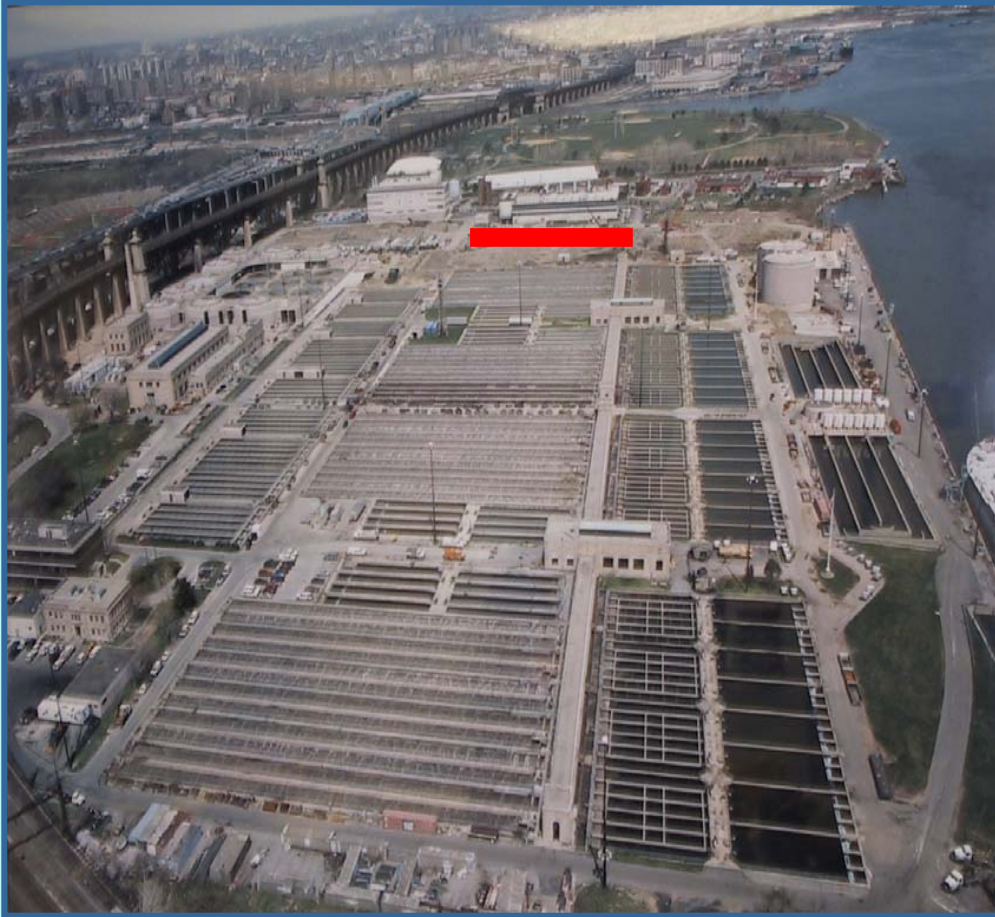
- Plant Capacity
300,000 pop. equ.
- SHARON Capacity
5,280 lbs. N/day
- N-removal >95%

Haag, Zuid, NL



- Plant Capacity
1,000,000 pop. equ.
- SHARON Capacity
2,640 lbs. N/day
- N-removal >95%
- Start-up 4Q 2004

New York, New York, USA



- Plant Capacity
250 MGD
- SHARON Capacity
12,690 lbs. N/day
- N-removal >95%

NEW YORK NEW YORK WARD'S ISLAND PLANT

