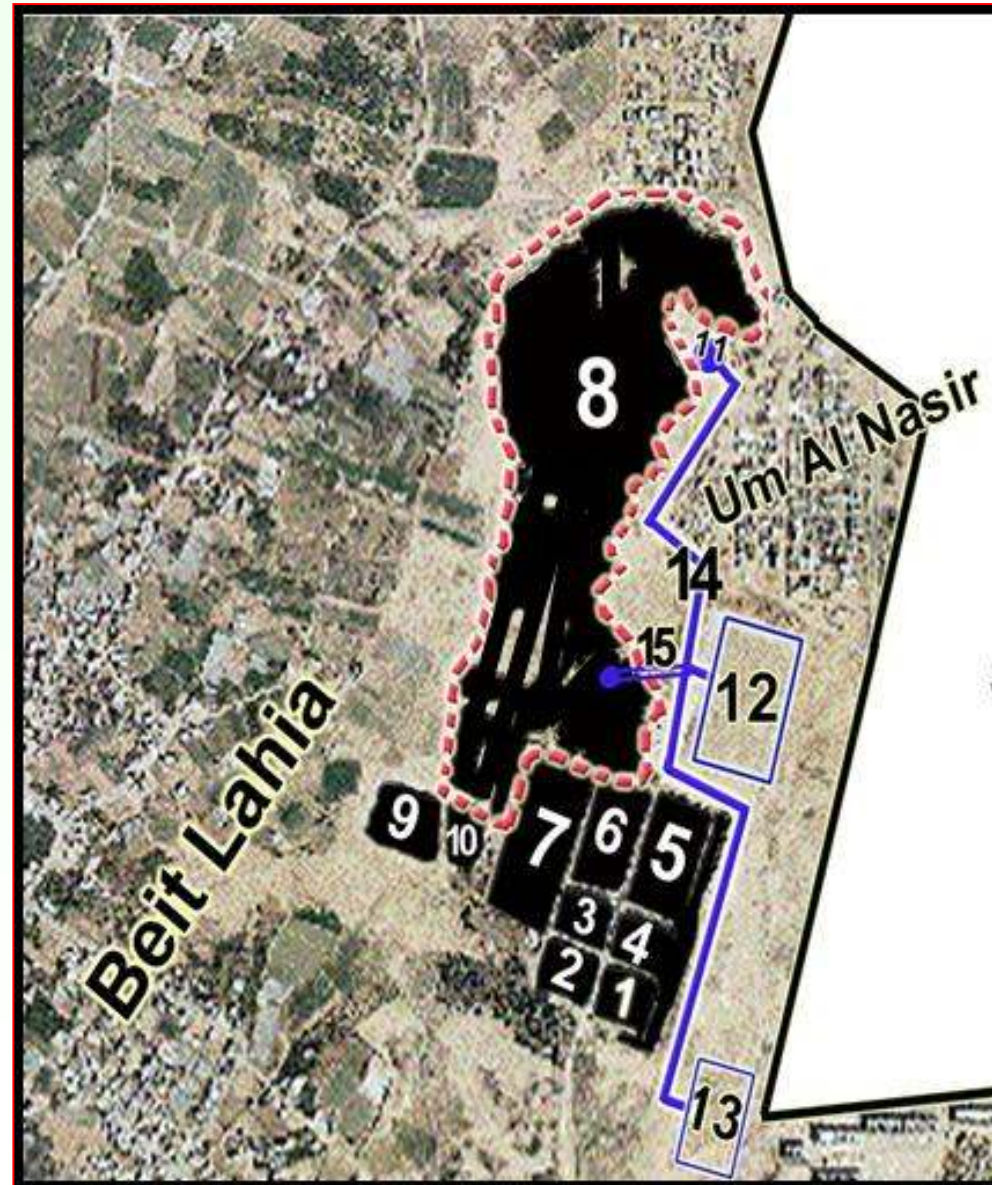


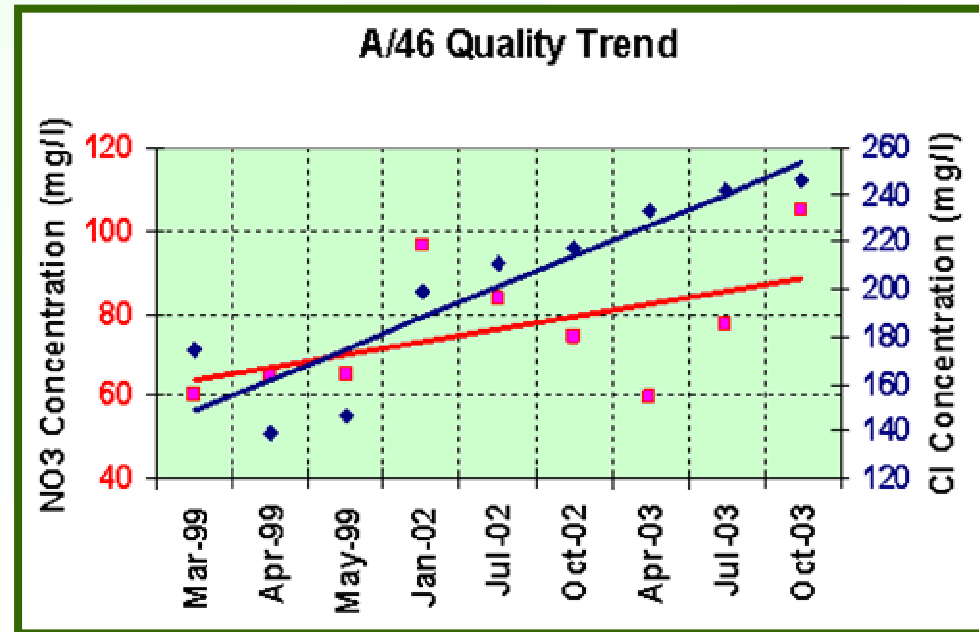
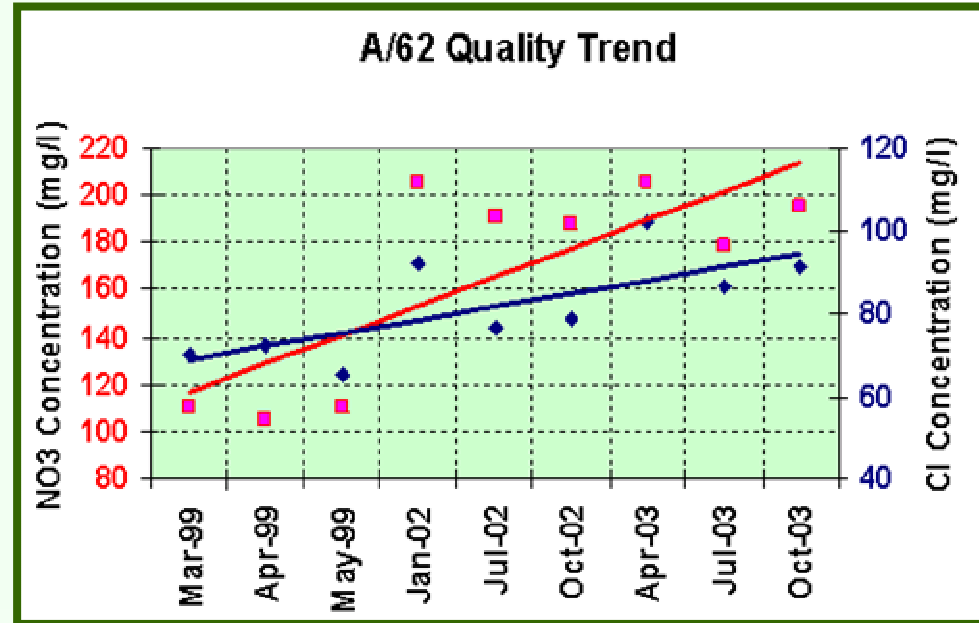
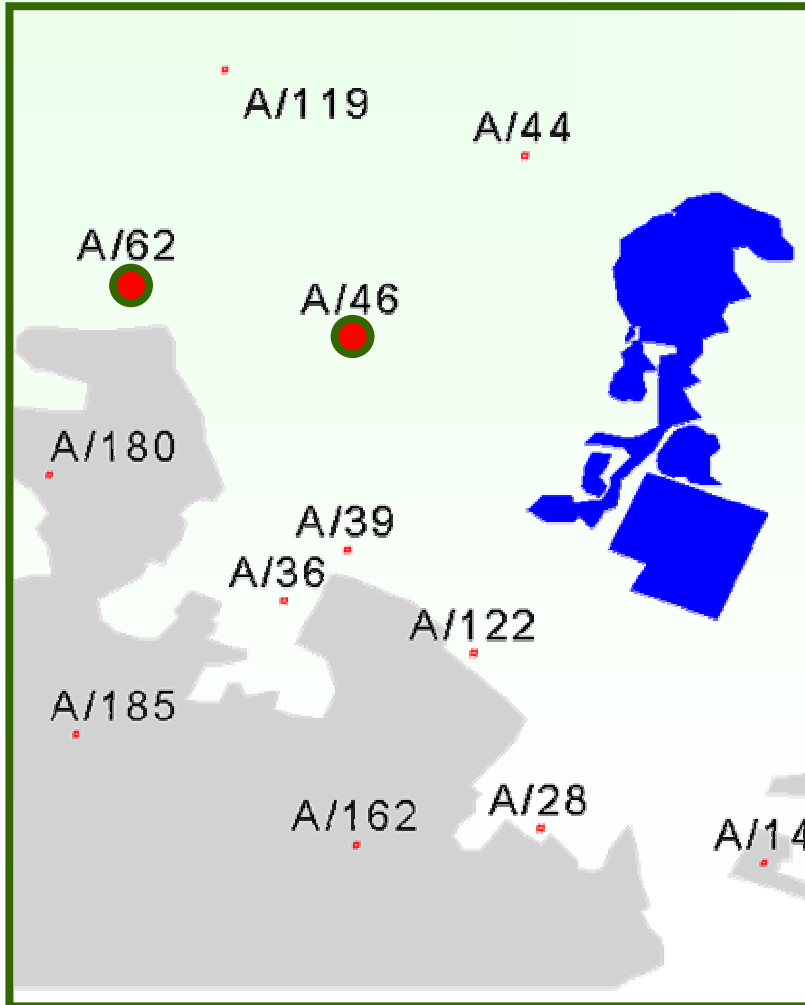
# Wastewater Reuse Aspects in Gaza

# North Gaza WWTP

- 1976
- Served Population
  - 50,000 to 180,000
- Effluent
  - 5,000 to 12,000 m<sup>3</sup>/day
- In-efficient treatment
- No natural outlet
- Flooding sand dunes
- Creating a lake
  - 1.5 MCM, 35 hectares
- Risk of flooding
  - 1989, 1992 Floods
- health problems
- Aquifer pollution



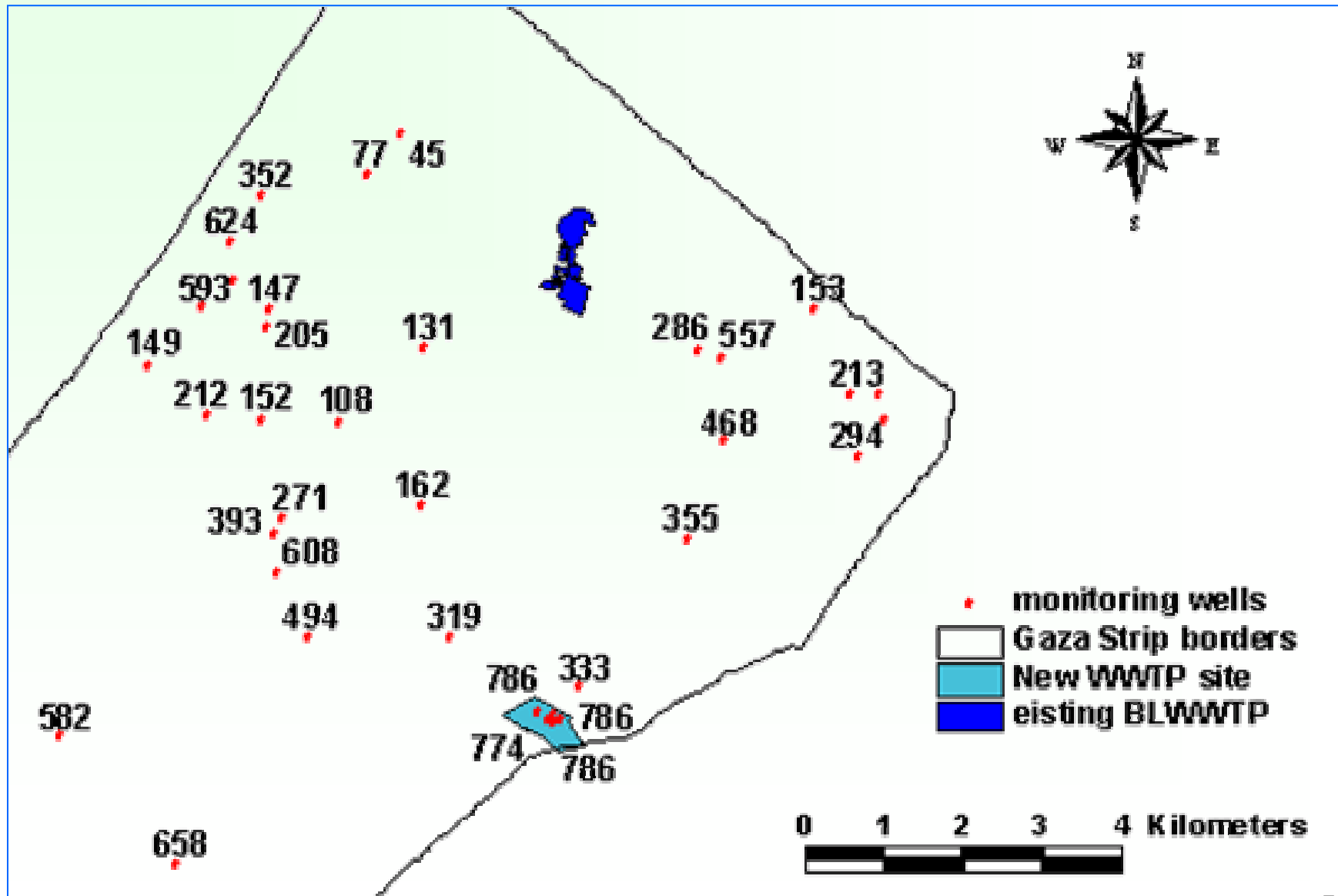
# EXISTING SITUATION (GW QUALITY)



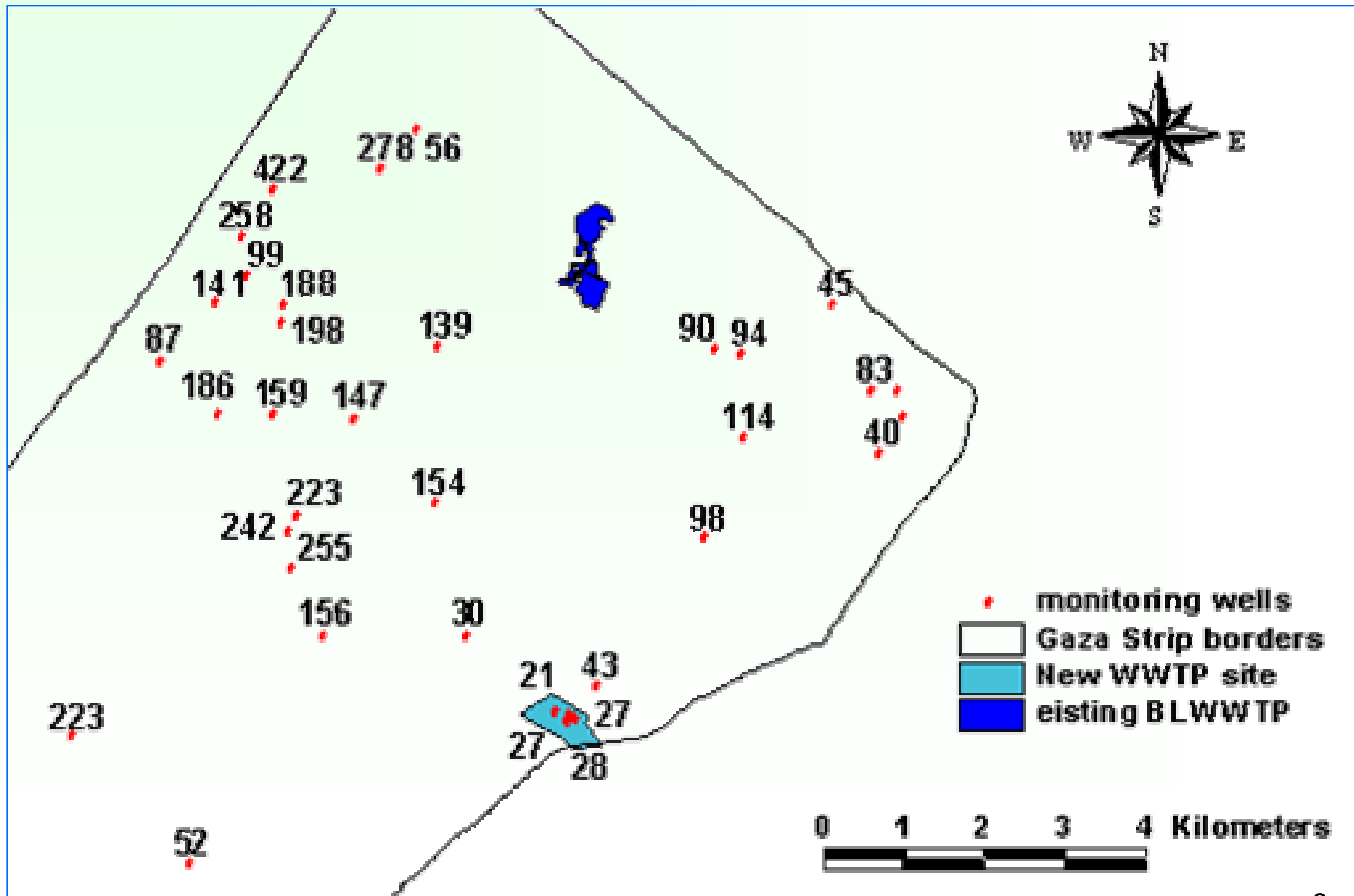
# EXISTING SITUATION (THE NEW SITE)



# 2004 CI CONCENTRATION (mg/l)

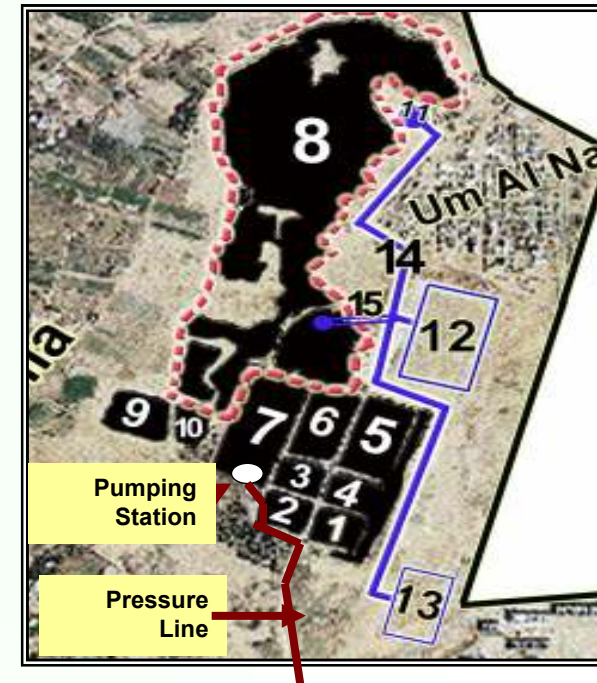
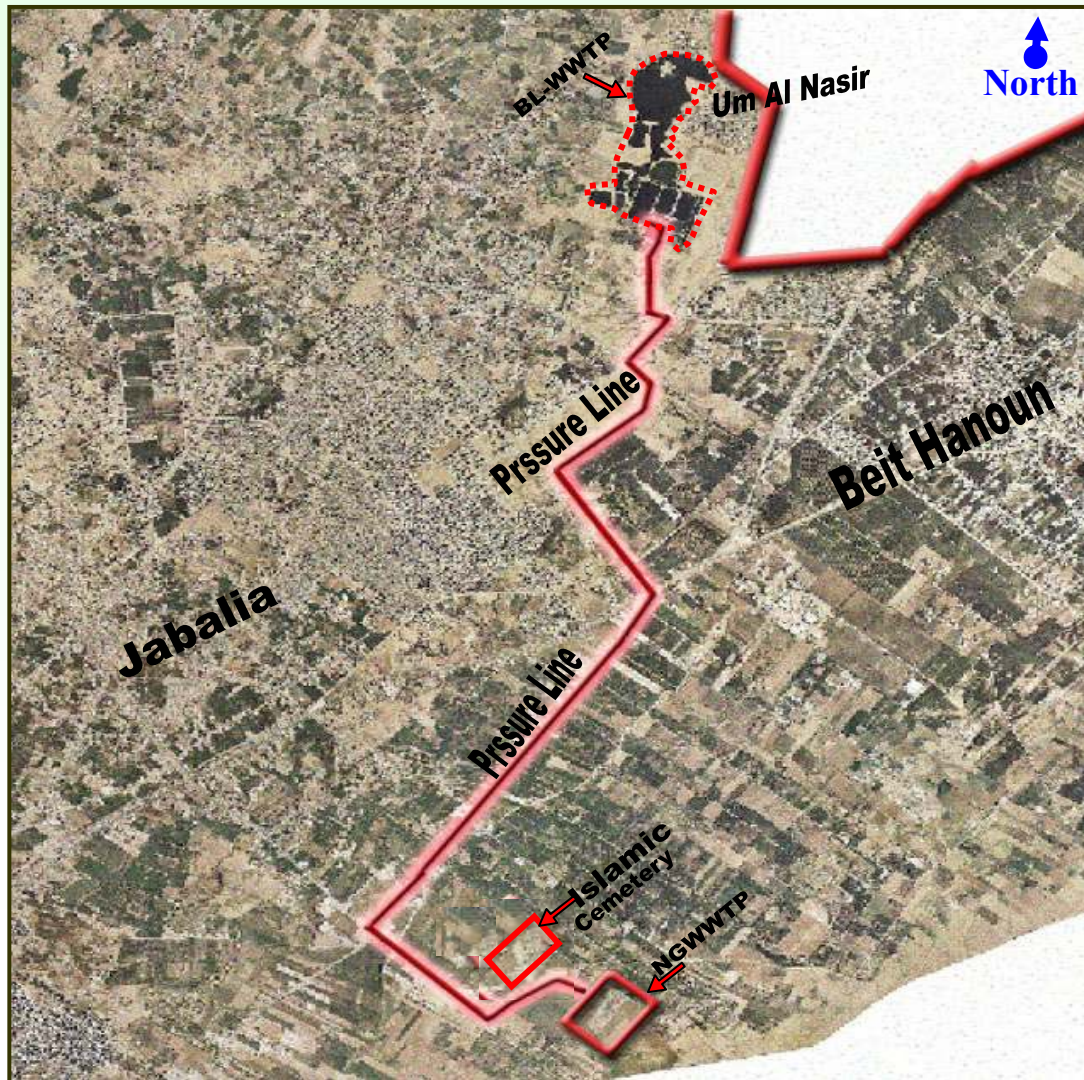


# 2004 NO<sub>3</sub> CONCENTRATION (mg/l)



# PROJECT DESCRIPTION

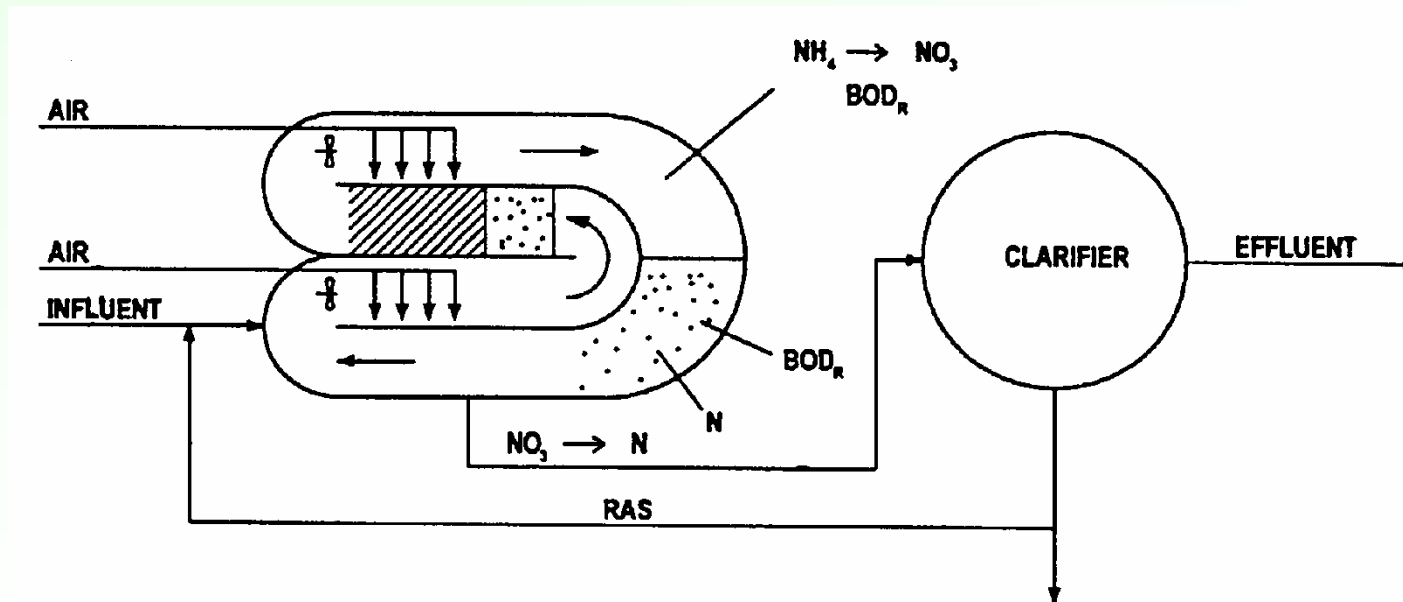
## (EMERGENCY PHASE – Integral Part of NGWWTP)



- Terminal Pumping Station
- Transfer Pipeline
- Effluent Infiltration system

# PROJECT DESCRIPTION (NGWWTP)

- Preliminary treatment (Pre-Aeration, Fine Screening, Grit and Grease Removal)
- Primary Clarification
- Biological Treatment (Circular complete. mixed activated Sludge system)



- Noise and Odour Control (insulation, bio-filters, landscaping)
- Tertiary treatment (Soil Aquifer Treatment)



# PROJECT DESCRIPTION

## (PLANNED INFILTRATION QUANTITIES)

START OF YEAR	INFILTRATION QUANTITY (m <sup>3</sup> /day)	EFFLUENT SOURCE
2006	20,000	Existing BLWWTP + <u>LAKE</u>
2007	20,000	Existing BLWWTP + <u>LAKE</u>
2008	20,000	Existing BLWWTP + <u>LAKE</u>
2009	28,800	New NGWWTP
2010	31,000	New NGWWTP
2011	33,300	New NGWWTP
2012	35,600	New NGWWTP
2025	35,600	New NGWWTP

# BLWWTP EFFLUENT

Element	Unit	Result 29/11/04	Result 20/02/04	Result 06/03/05	<sup>1</sup> Average Historical records
BOD	mg/l	100	95		85
COD	mg/l	250	284		267
pH	--	7.1	7.8		
TSS	mg/l	19	20		60
TDS	mg/l	999	1100		
T.P.	mg/l	1.2	-		
Ammonia	mg/l	64	19	22.5	
Nitrate	mg/l	5.5	3.7	2.5	
TKN	mg/l	75	31	31	78
Chloride	mg/l	210	267		
Sulfate	mg/l	-	15.5		
Nematode eggs		0	0		
Fecal Coliform	CFU/100ml	12.5*10 <sup>3</sup>	40*10 <sup>3</sup>		
Sodium	mg/l	30	101		
Magnesium	mg/l	68	95		

# EFFLUENT QUALITY IN THE LAKE

<b>Element</b>	<b>Unit</b>	<b>Result 29/11/04 sample 1</b>	<b>Result 29/11/04 sample 2</b>	<b>Result 20/02/05</b>	<b>Result 06/03/05</b>	<b><sup>1</sup>Average Historical records</b>
BOD	mg/l	145	140	130		43
COD	mg/l	317	315	343		156
pH	--	7.6	7.6	8.1		
TSS	mg/l	71	67	50		55
TDS	mg/l	1130	1150	982		
T.P.	mg/l	1	0.2	-		
Ammonia	mg/l	68	68	13	18.5	
Nitrate	mg/l	2.5	2.5	1	0.3	
TKN	mg/l	140	150		23	64
Chloride	mg/l	250	250	252		
Sulfate	mg/l			14.8		
Nematode		0	0	0		
F.C.	CFU/100ml	29.5*10 <sup>3</sup>	34.2*10 <sup>3</sup>	0.00		
Sodium	mg/l	60	60	103		
Magnesium	mg/l	68	68	93		

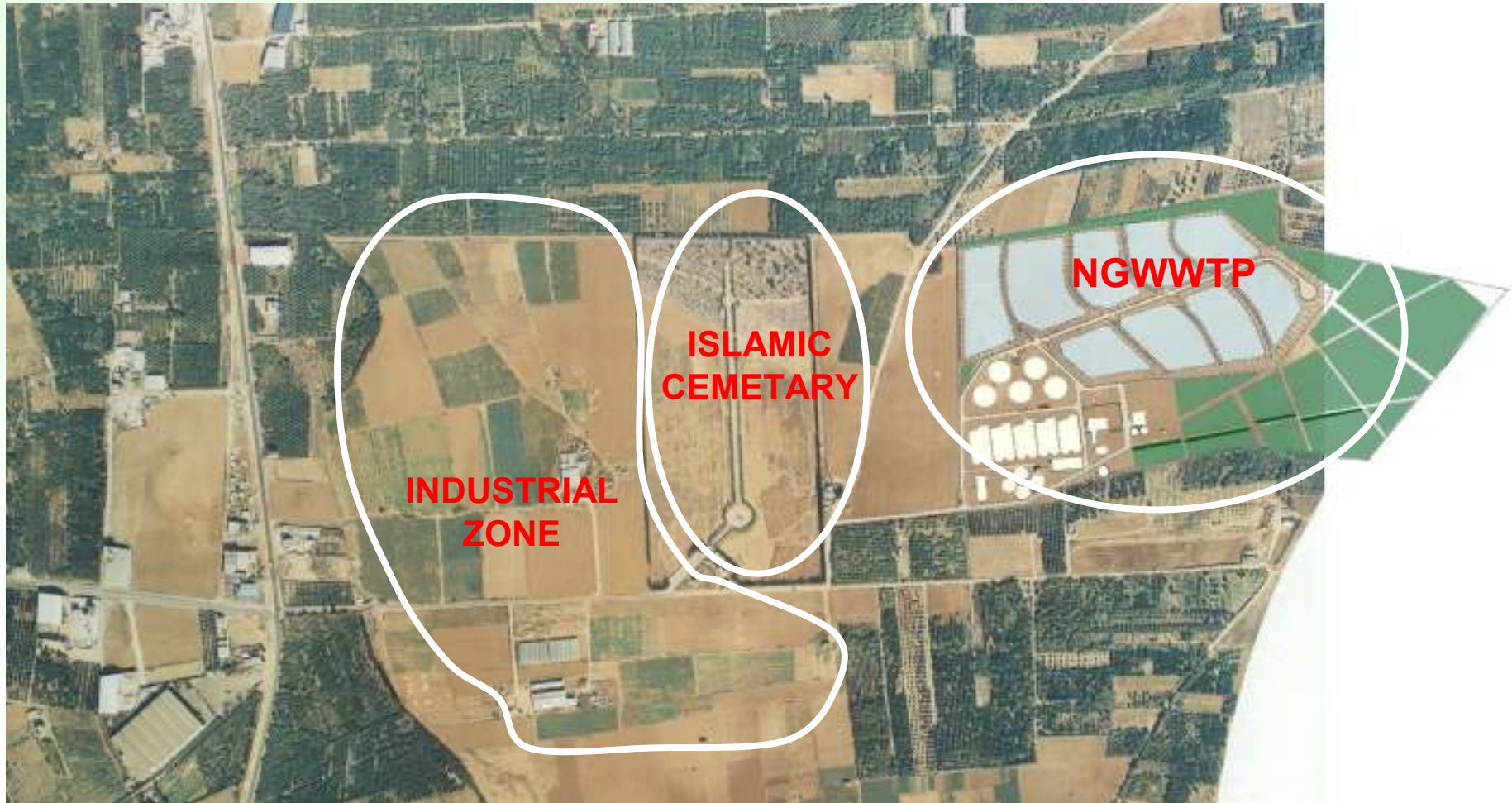
# PROJECT DESCRIPTION

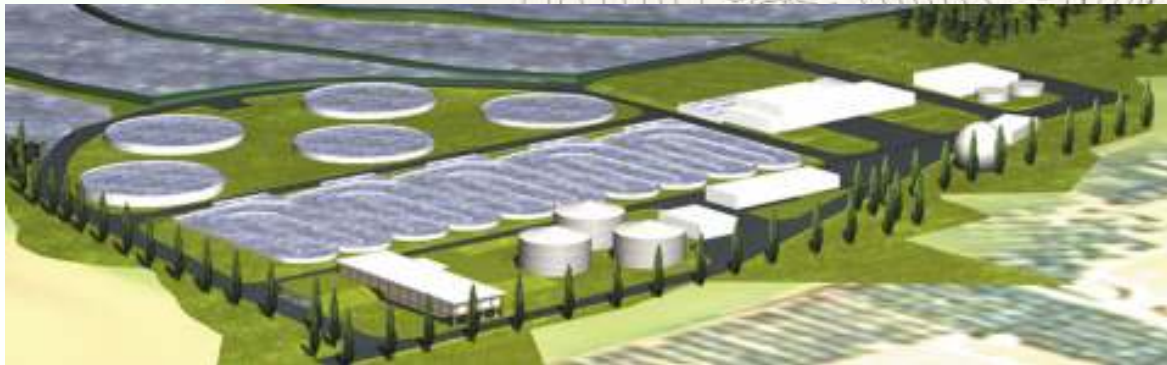
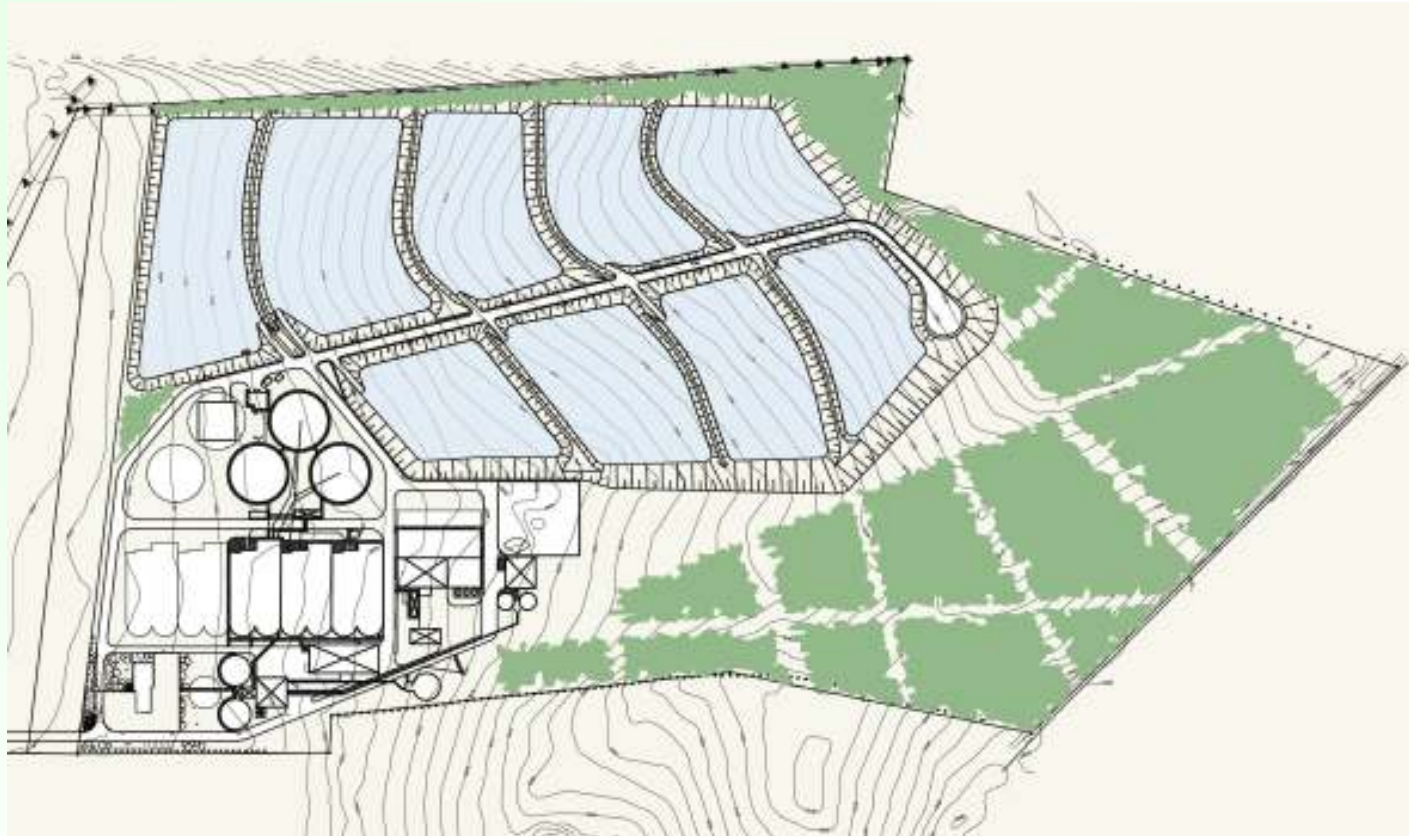
## (NGWWTP PLANNED PERFORMANCE)

- **Aquifer Recharge**
- **Unrestricted Irrigation**

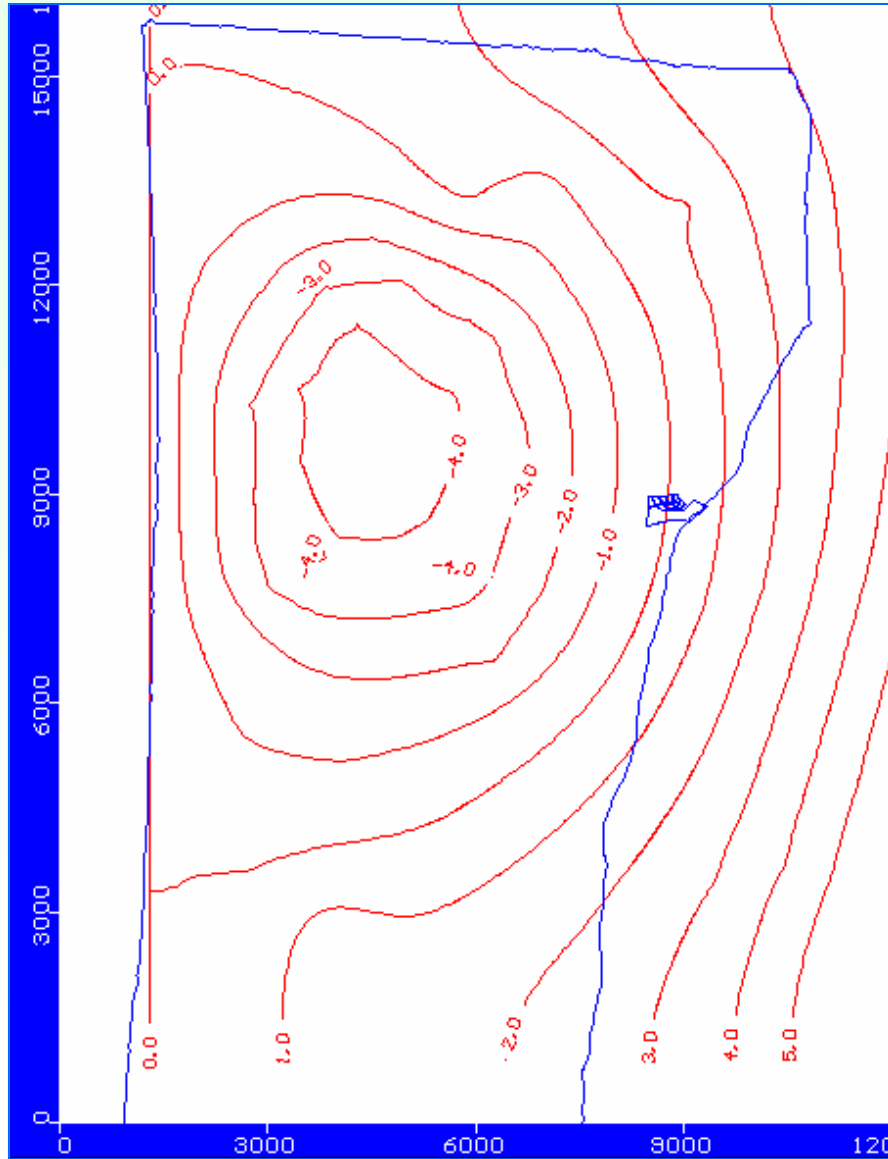
	<b>Unit</b>	<b>Raw Wastewater</b>	<b>Max effluent concentration</b>
<b>BOD<sub>5</sub></b>	<b>mg/l</b>	<b>650</b>	<b>10</b>
<b>SS</b>	<b>mg/l</b>	<b>540</b>	<b>15</b>
<b>N<sub>-tot</sub></b>	<b>mg/l</b>	<b>120</b>	<b>10</b>

# PROJECT DESCRIPTION (NGWWTP SITE)

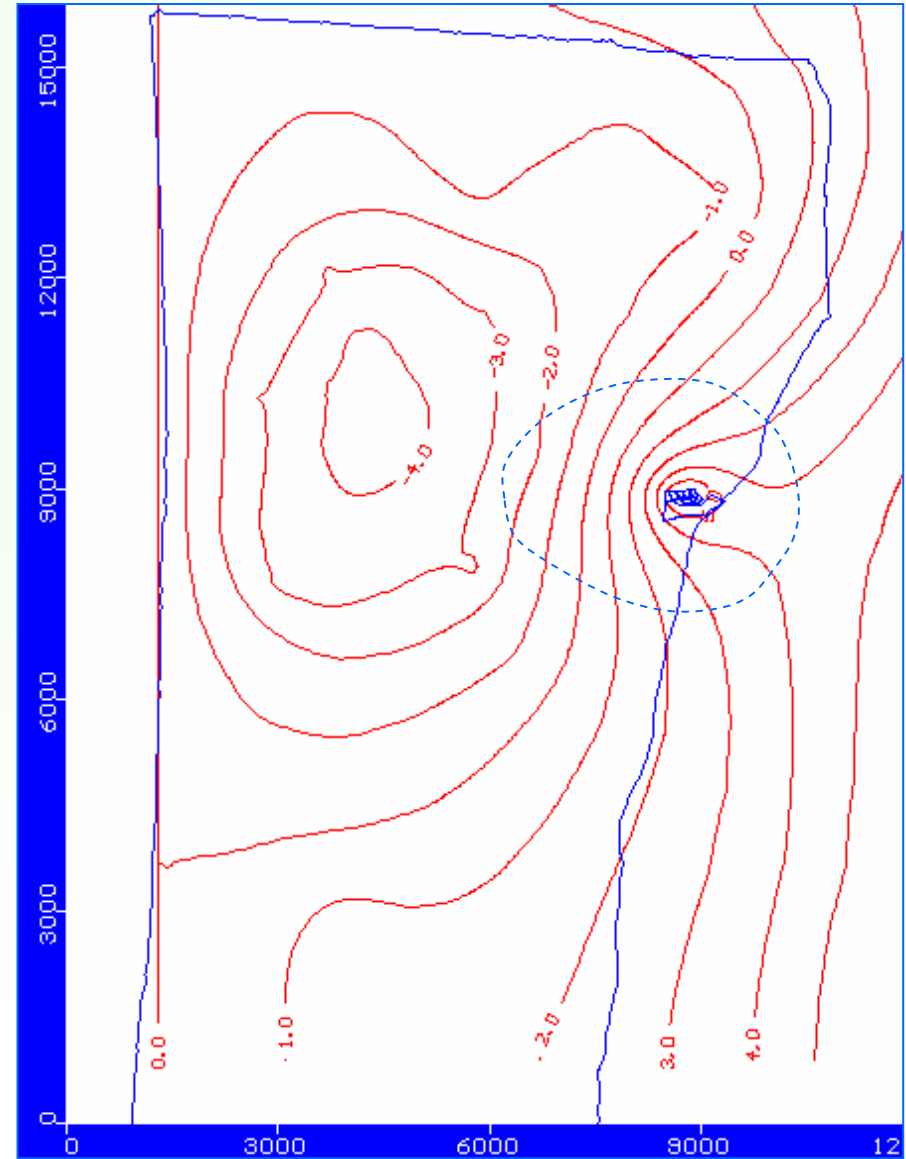




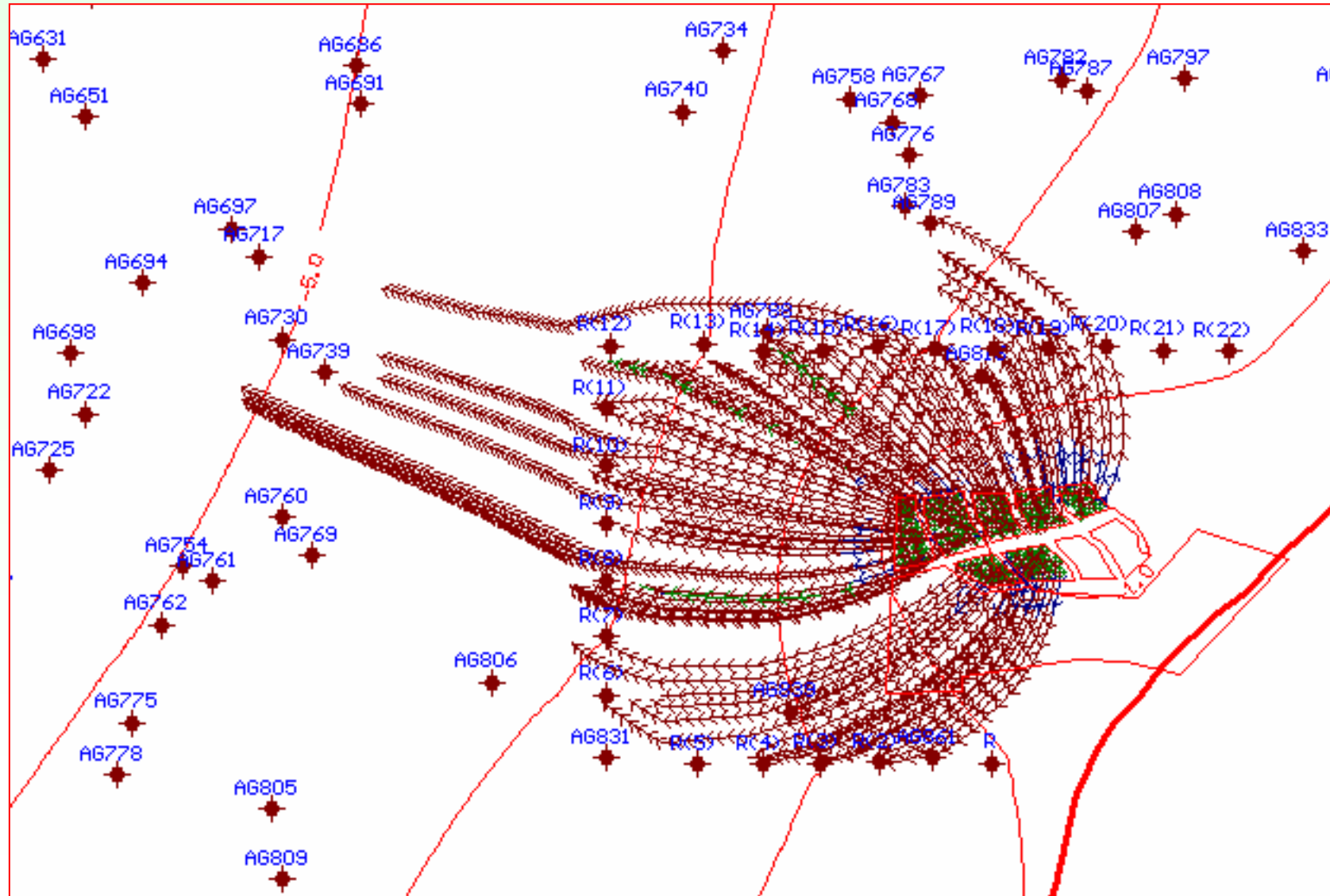
# WL 2005



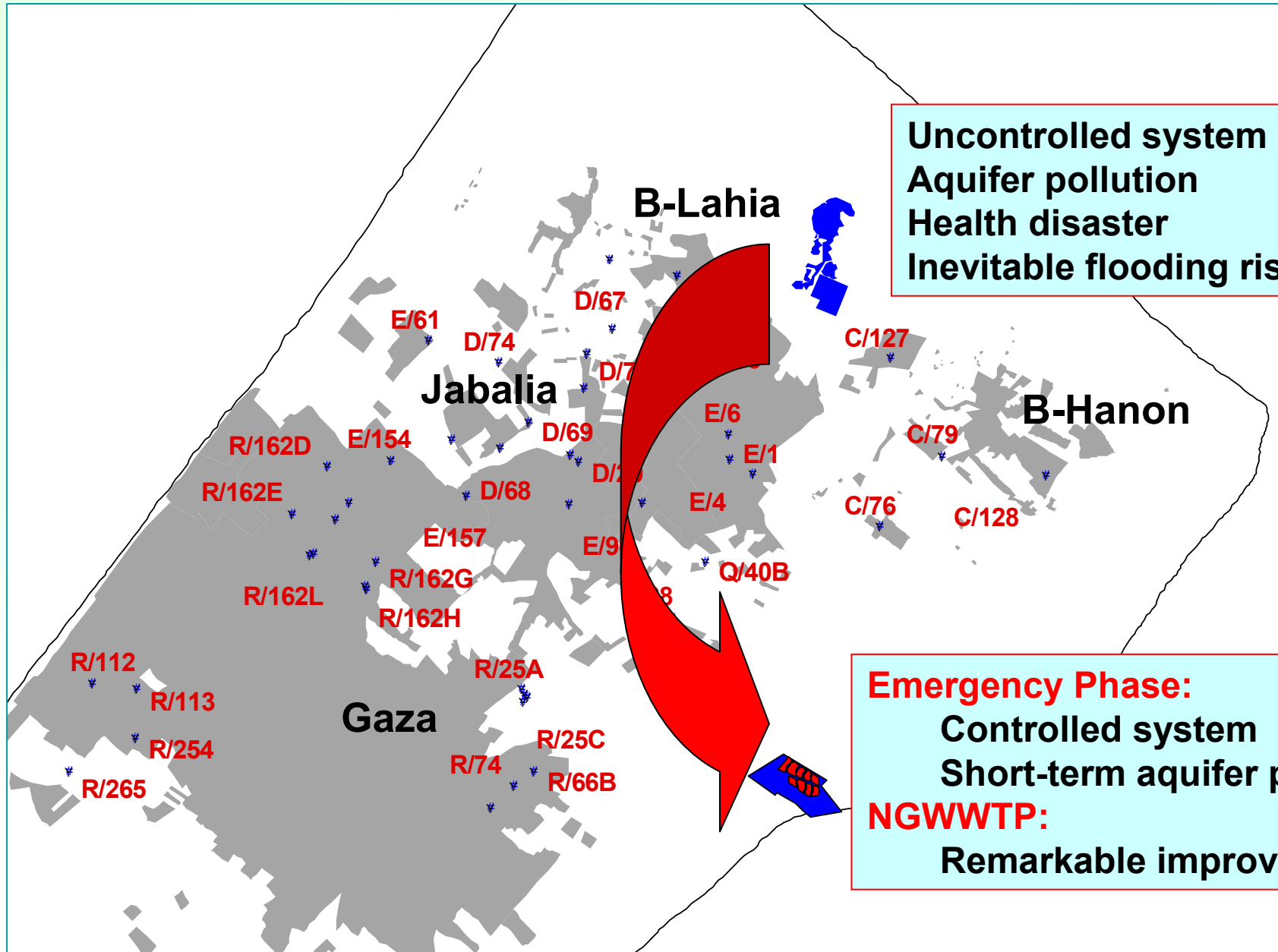
# STEADY STATE WL



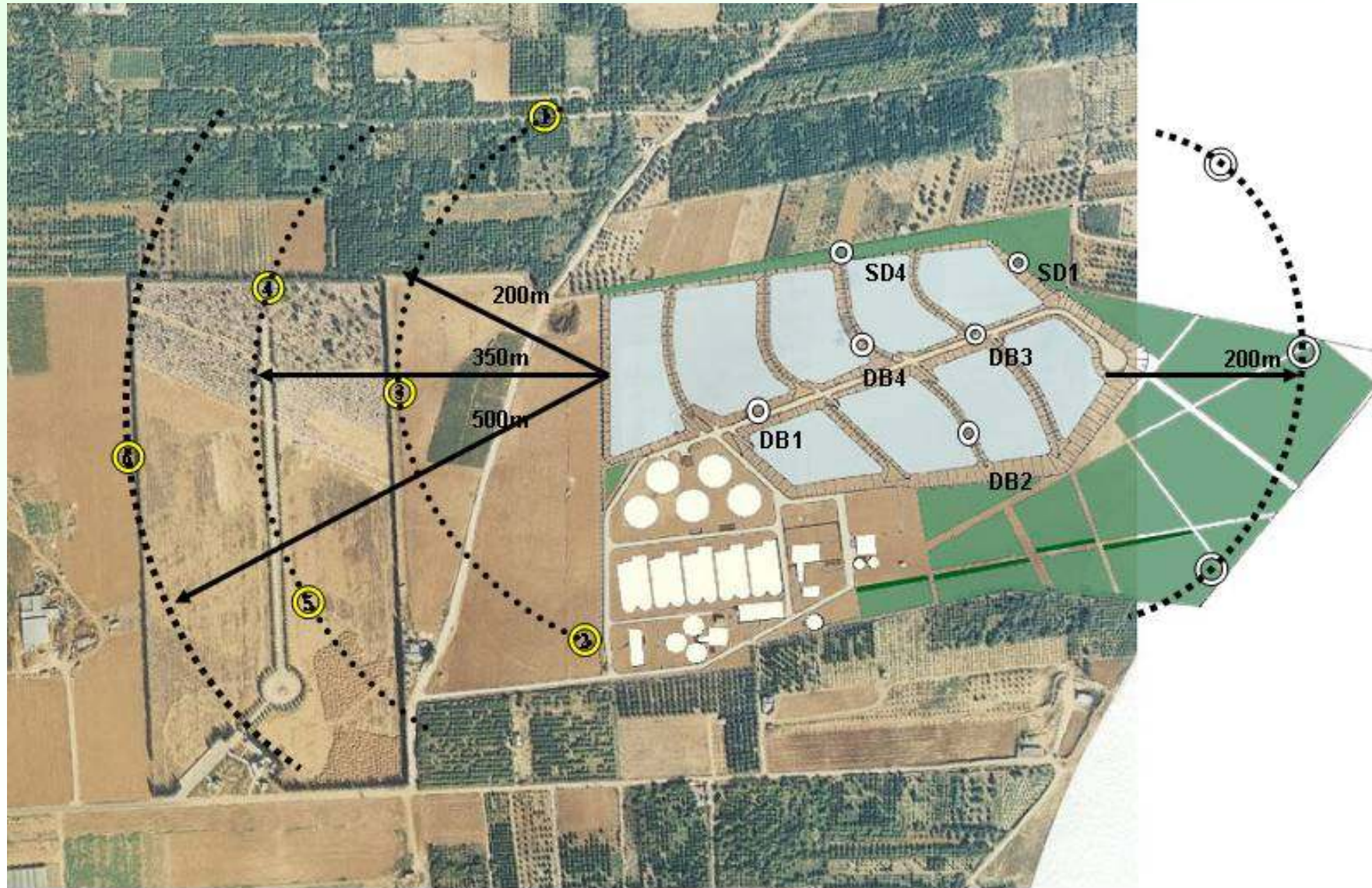
# WORST CASE – RECOVERY WELLS



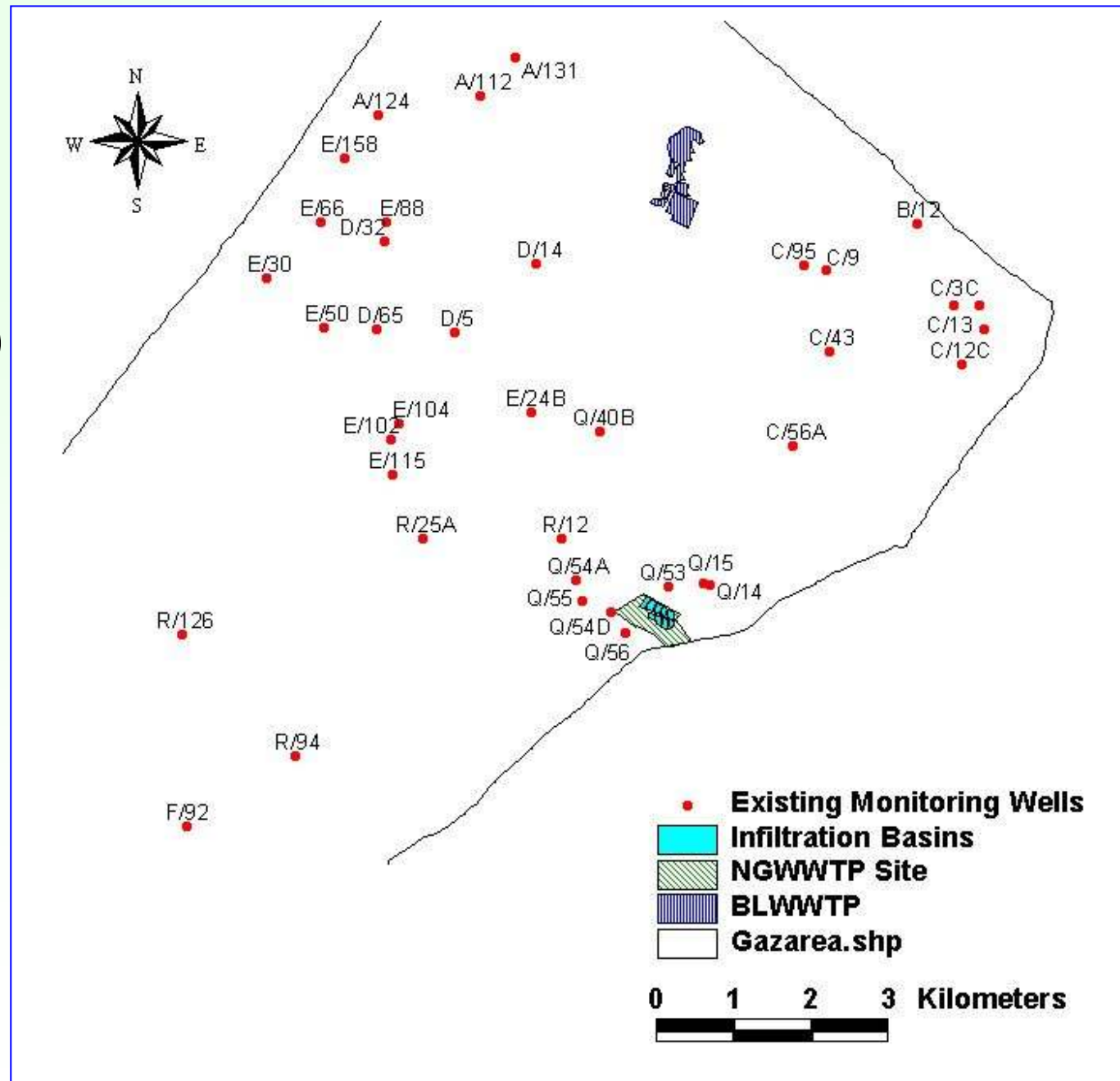




# WATER QUALITY MONITORING



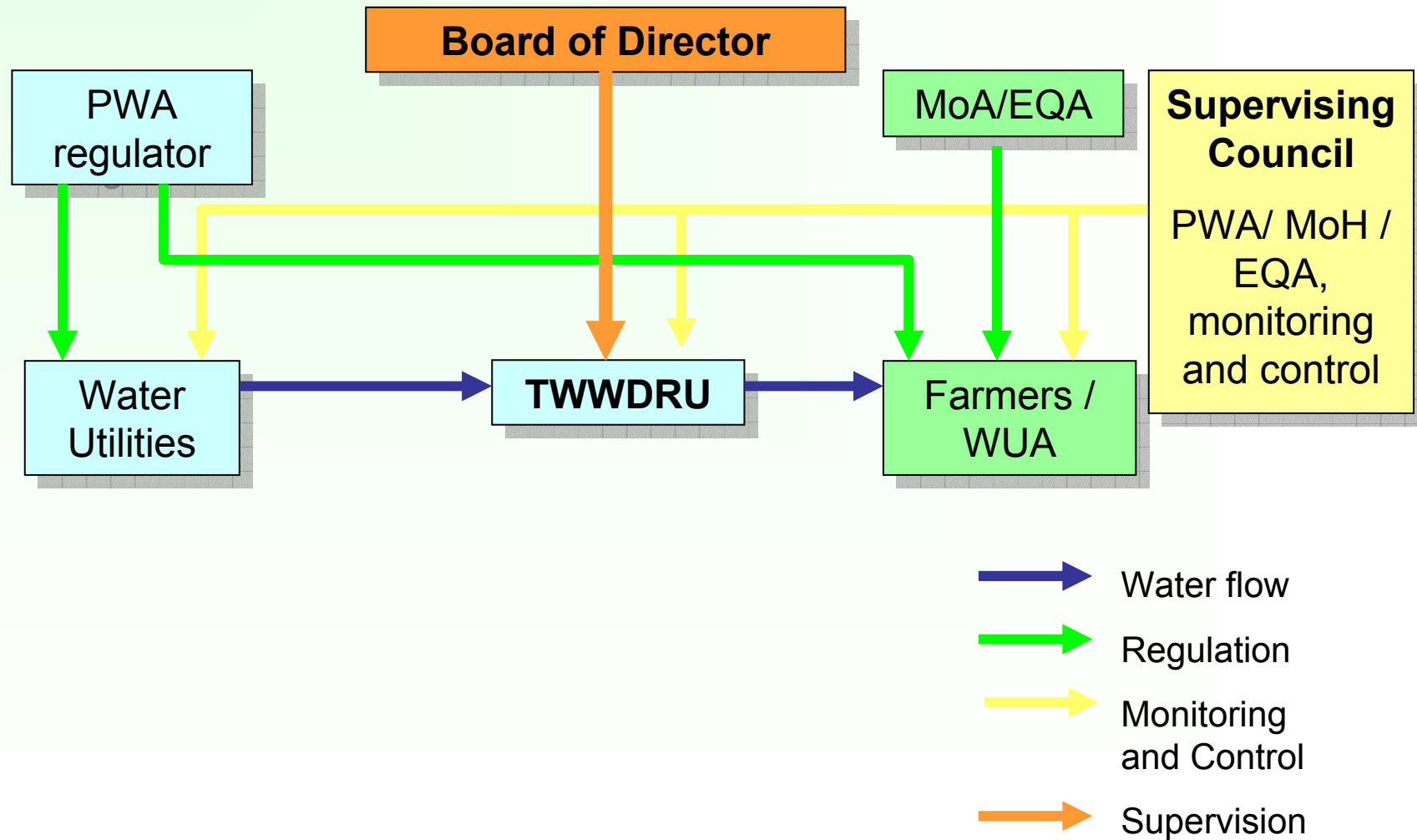
# EXISTING WELLS USED FOR WQ MONITORING



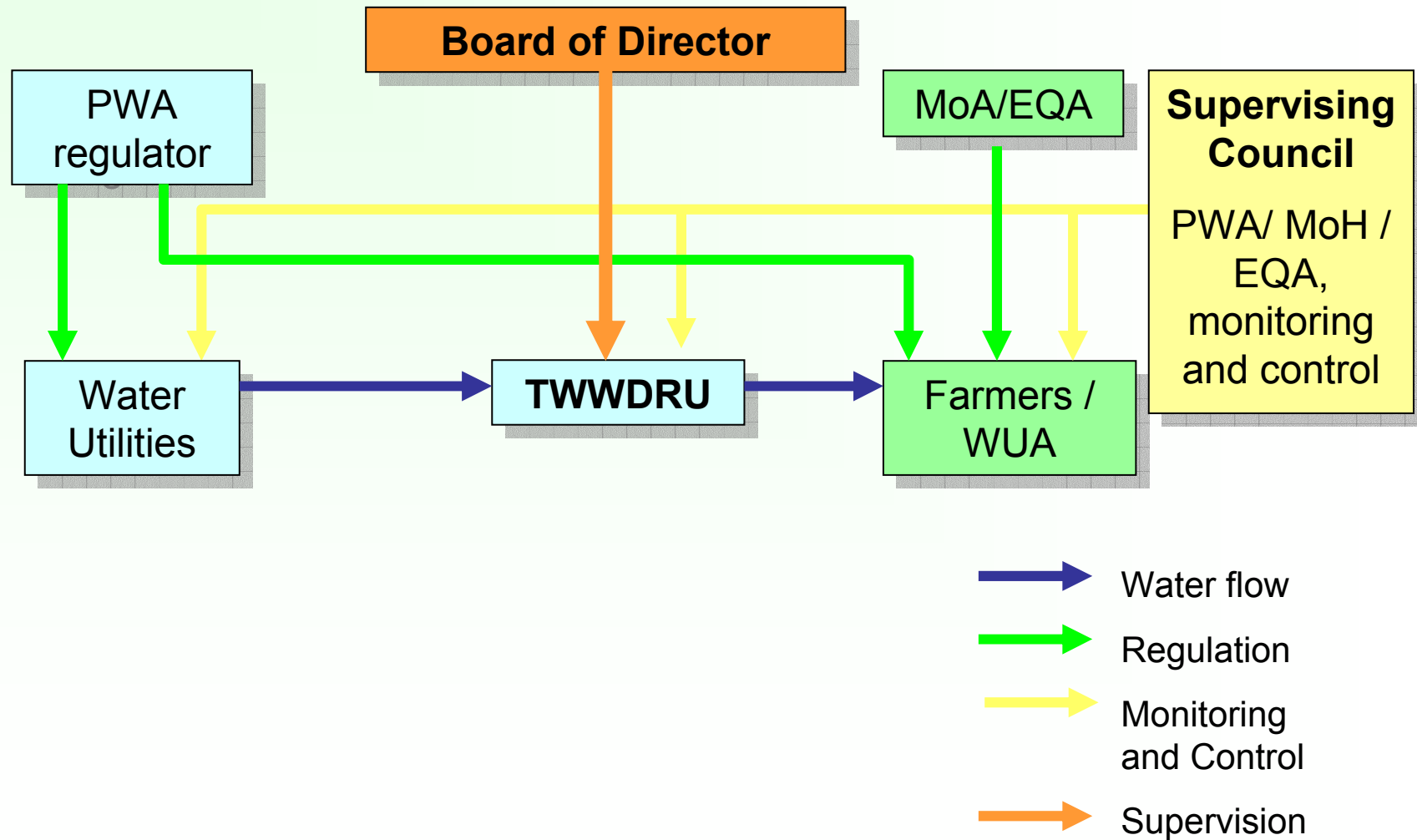
# WATER QUALITY MONITORING

Parameter	Pumped Effluent	Observation Wells (starting after 2 month from the start of infiltration)			
	every month	every two weeks	every three months	every month	every six months
Water level	N/A	X	X	X	X
pH	X	X	X	X	X
EC	X	X	X	X	X
TDS	X	X	X	X	X
SS	X				
BOD	X	X	X	X	X
COD	X	X	X	X	X
NO <sub>3</sub>	X	X	X	X	X
NH <sub>3</sub> /NH <sub>4</sub>	X	X	X	X	X
Cl	X	X	X	X	X
SO <sub>4</sub>	X		X		X
P	X		X		X
Ca	X		X		X
Mg	X		X		X
K	X		X		X
Na	X		X		X
Faecal Coliform	X	X	X	X	X
Total Coliform	X		X		X
B	X	X	X	X	X
Detergents (HPLC)	X	X	X	X	X
Heavy metals	X		X		X

# Suggested Institutional Framework TWWDRU



# Suggested Institutional Framework TWWDRU



Thank You for your Attention