Attachment 2 of 5
Northrop Grumman Comments on Proposed Amended Record of Decision and Feasibility Study

Modeling Memorandum

MEMO

Attachment 2
to Northrop Grumman Comments on Proposed Amended Record of Decision and Feasibility Study for Northrop Grumman Bethpage Facility and Naval Weapons Industrial Reserve Plant
Modeling Memorandum

1. INTRODUCTION

On behalf of Northrop Grumman Systems Corporation (Northrop Grumman), Arcadis was retained to summarize the groundwater flow and solute transport modeling conducted as part of the response to the Proposed Amended Record of Decision (Proposed AROD; New York State Department of Environmental Conservation [NYSDEC], 2019) for the Northrop Grumman Bethpage facility and Bethpage Community Park (Site No. 1-30-003A on the New York State Registry of Inactive Hazardous Waste Sites) and the former Naval Weapons Industrial Reserve Plant (NWIRP), Bethpage, New York (Site No. 1-30-003B), collectively referred to herein as the Site. The development of the conceptual site model (CSM), calibrated groundwater flow model, and solute transport model for the Site is summarized in Attachment 1 to Northrop Grumman's Comments on the Proposed PAROD and accompanying Feasibility Study Report (FS) (the Northrop Grumman Comments).

2. NYSDEC PLUME DEVELOPMENT

The plume extents presented in this memo represent the plume depicted by NYSDEC in the FS and Proposed AROD, which was assumed to be sourced from the Site. Figure 2.1 represents the boundaries of that NYSDEC-depicted plume (the NYSDEC plume). For the purposes of this evaluation, the concentration at the boundaries of the NYSDEC plume was assumed to be five micrograms per liter (µg/L). The plume presented in Figure 2.1 represents the total volatile organic compounds (TVOC) plume. The volume of the NYSDEC plume is approximately 90% larger than the plume presented in Figures 3.5-3 and 3.5-4 of Attachment 1 to the Northrop Grumman Comments. The mass of the NYSDEC plume is approximately 10% larger than the plume presented in Figures 3.5-3 and 3.5-4 of Attachment 1 of the Northrop Grumman Comments. The NYSDEC-depicted plume configuration (as given in the PAROD) were used as initial conditions in the solute transport model (notwithstanding Northrop Grumman's Expert Team's disagreement with the interpretation of the water quality data and representation of the plume and its extent).

3. REMEDIAL SCENARIO DESCRIPTONS

3.1. NYSDEC Scenario 1 – ROD Required Remediation (referred to in the Northrop Grumman comments as the ROD Remedy)

As of 2019, there are three currently operating remedial systems for the Site (see Figure 3.1-1; Table 3.1-1):

- **ONCT-OU3 System:** Based on the OU3 ROD (NYSDEC, 2013) the following are the main features and components of the OU3 Bethpage Park Groundwater Containment System (BPGWCS) system, which is designed to actively remediate the on-site impacted groundwater originating from Bethpage

Park and prevent contaminants from moving off-site: 1) Four remedial wells (RW-1, RW-2, RW-3, and RW-4) operating at a combined rate of 210 gpm; 2) A treatment system to remediate extracted groundwater from the four remedial wells to standards; and 3) A recharge basin (OU3 Basin) located on the adjacent former NWIRP property to discharge the treated water from the treatment system to groundwater.

- **ONCT-OU2 System:** Based on the OU2 ROD (NYSDEC, 2001), the following are the main features and components of the OU2 On-Site Groundwater Remedy, which is designed to actively remediate the onsite portion of the VOC-impacted groundwater and prevent contaminants from moving off-site: 1) Five remedial extraction wells (1, 3R, 17, 18, and 19) operating at a total rate of 3,800 gpm; 2) Two treatment systems (Tower 96 and Tower 102) to remediate extracted groundwater from the five remedial wells to standards; and 3) Two sets of recharge basins (West [Plant 5] and South Basins) discharge the treated water from the treatment systems to groundwater (minus approximately 300 gpm of treated water for non-potable use conveyed to Calpine, a power company).
- **GM-38 System:** As described in the OU2 ROD (NYSDEC, 2001), the following are the major components of the GM-38 Hot Spot remedy: 1) Two remedial wells GM-38_RW-1 and GM-38_RW-3; 2) A groundwater treatment system to remediate the extracted groundwater to standards; and 3) The Arthur Avenue Basin to recharge the treated water to groundwater. GM-38_RW-1 is engineered to operate at 1,000 gpm; GM-38_RW-3 is not expected to operate.

Based on plans as of 2019, there are three currently approved remedial systems for the Site (See Figure 3.1-1; Table 3.1-1) that are not operational:

- **RW-21 System:** Three OU3 remediation wells (RW-20, RW-21, and RW-22) are scheduled to become operational within a year. The RW-21 System is designed to operate at a total of 1,900 gpm, 700 gpm each for wells RW-20 and RW-21 and 500 gpm for RW-22. The treated groundwater pumped from these wells will be discharged to the existing on-site basins (West [Plant 5] and South Basins).
- **RE-108 Interim Well:** An interim remedial well (RE-108 IRM) has been proposed by the Navy to be in operation as part of the OU2 remediation program (based on information provided by Tetra Tech, the consultant to the Navy). The proposed RE-108 IRM is expected to be operational in a year. The RE-108 IRM well is expected to pump at 400 gpm. The treated water is proposed to be recharged to the Arthur Avenue Basin. The recharge capacity of Arthur Avenue Basin is approximately 1,000 gpm. The pumping rate of well GM-38-RW-1 will be decreased to 600 gpm when the RE-108 IRM becomes operational, to maintain the total recharge rate to Arthur Avenue Basin at its present rate of 1,000 gpm.
- **RE-108 System:** Two remediation well pairs (four wells total) are proposed by the Navy to be in operation as part of the OU2 remedial program (based on information provided by Tetra Tech, consultant to the Navy) and are scheduled to become operational in three years. The wells are proposed to be constructed in pairs, one shallow well and one deep well, at the eastern and western locations identified on Figure 3.1-1. Each of the four proposed wells will be designed to operate at an average rate of 250 gpm, for a total pumping rate of 1,000 gpm (based on information provided by Tetra Tech, consultant to the Navy). The proposed remedial design for the RE-108 remedial system provides that the treated groundwater from the four wells would be split evenly and discharged at 500 gpm each to two proposed recharge basins.

The public water supply wells in the vicinity of the Site were assumed to be operational during the 30 year simulation:

- The detailed records of the annual average pumping rates of the regional water supply wells were reviewed to estimate long-term trends. The average annual pumping rates from 2006 through 2018 for individual wells within each water district in the vicinity of the Site are listed in Appendix C of Attachment 1 to the Northrop Grumman Comments. Total pumpage in each water district was relatively stable during this period, although within individual districts, on a well by well basis, some changes were observed.
- Based on the relative stability of pumping rates per water district, 3-year average rates (2016 through 2018) were used for the Model. These rates were held constant for the 30-year simulation. The only exceptions are the Bethpage Water District (BWD) Plant 6 wells, which are expected to be non-operational until 2021. The rates in the BWD Plant 6 wells for the remainder of the 30 year simulation were set to historical 2014 through 2016 rates.

3.2. NYSDEC Scenario 5B – Proposed Amended Remedy

NYSDEC Scenario 5B has the following remedy components (see Figure 3.2-1; Table 3.2-1):

- All the pumping described in NYSDEC Scenario 1 (Section 3.1 of this memorandum).
- Eight mass flux remediation wells operating at 4,290 gpm total, expected to become operational in five years.
- Sixteen hydraulic containment wells operating at 7,850 gpm total, expected to become operational in five years.
- Treated groundwater is planned to be discharged to the following locations:
    - 2,000 gpm to Massapequa Creek;
    - 8,140 gpm to a central recharge basin located in Bethpage State Park. This rate will be reduced to 7,215 gpm while irrigation at the golf course is occurring;
    - 925 gpm will be used for irrigation at the golf course for eight months of the year (for the remaining four months, the treated water would be discharged to the central recharge basin located in Bethpage State Park); and
    - 2,000 gpm will be recharged to three infiltration basins south of Southern State Parkway.

3.3. The Improved Remedy Alternative (IRA): NYSDEC Scenario 1 together with suggested improvements to the ROD Required Remediation

The suggested IRA would represent amendments to NYSDEC Scenario 1 and has the following components (see Figure 3.3-1; Table 3.3-1):

- All the pumping described in NYSDEC Scenario 1 (Section 3.1 of this memorandum).
- Navy-1 (RE-137): The existing RE-137 well located along Hempstead Turnpike would be operated at 500 gpm and become operational in five years.
- NYSDEC Wells: Two existing NYSDEC mass flux remediation wells (DECEX-06 and DECEX-02) are expected to operate at 500 gpm each and become operational in five years.

- Upgradient Well (UG-1): One proposed extraction well located south of the former Occidental Chemical Corporation/Hooker Chemical Corporation/RUCO Polymer Corporation site (referred to as the OXY Site; NYSDEC Site # 1-30-0004) is located adjacent (north) to, and hydraulically upgradient of the Site. This well is expected to operate at 500 gpm and become operational in five years.
- On-Site Containment Well 18-1: A proposed amendment to the ONCT-OU2 system is Well 18-1, located between existing Wells 17 and 18. It is expected to operate at 700 gpm and become operational in five years.
- Southern Mass Flux Wells: Two proposed extraction wells located south of the Hempstead Turnpike, provide both hydraulic containment and mass flux remediation. They are expected to operate at 800 gpm total and become operational in five years.
- Treated groundwater is planned to be discharged to the following locations:
    - New York State Department of Transportation [NYSDOT Basin 71];
    - On-site recharge basins (West [Plant 5] and South Basins); and
    - Six injection wells screened above or below the plume.

4. REMEDIAL SCENARIO EVALUATION

The calibrated groundwater flow and transport model (described in Attachment 1 to the Northrop Grumman Comments) was used to evaluate the three remedial scenarios listed in Section 3. The NYSDEC plume (described in Section 2 of this memorandum) was used in the solute transport model evaluation.

4.1. Groundwater Flow Evaluation

The groundwater flow model (described in Attachment 1 to the Northrop Grumman Comments) was used to evaluate the effects of the three remedial scenarios on groundwater flow (i.e., do any of the remedies cause adverse effects on groundwater), potential changes in the freshwater/saltwater interface (i.e., do any of the remedies change the location of the freshwater/saltwater interface), and the potential changes to groundwater flow to shoreline creeks (i.e., is the flow to any of the shoreline creeks reduced by any of the scenarios). The groundwater flow model was run under steady-state conditions for each scenario. This assumes that NYSDEC Scenario 5B is running after 5 years, the same as the IRA, given the larger number of wells; this is a conservative assumption.

4.1.1. Remedy Effects on Groundwater Flow

The groundwater flow model was used to evaluate the changes in groundwater elevation at the water table between NYSDEC Scenario 1 and the other proposed groundwater remedies (NYSDEC Scenario 5B and the IRA). Changes to the depth to water were also evaluated. Figures 4.1-1 to 4.1-3 show these evaluations. There is significant mounding (increase in water table elevation relative to NYSDEC Scenario 1) for NYDEC Scenario 5B beneath the central recharge basin (Figure 4.1-2). This mounding under NYSDEC Scenario 5B changes the local groundwater flow direction to be less southerly and more south-western, therefore also changing the direction of the movement of the plume (discussed in Section 4.2.1 below). There is significant drawdown (decrease in water table elevation relative to NYSDEC Scenario 1) near the Southern State Parkway (Figure 4.1-2). There are little to no changes in water table elevation for IRA relative to NYSDEC Scenario 1. The extents of the depth to water less than 10 feet (a depth of water

less than 10 feet could be problematic for homeowners with basements) does not change between NYSDEC Scenario 1 and IRA. The extents of depth to water less than 10 feet is smaller for NYSDEC Scenario 5B than for NYSDEC Scenario 1.

4.1.2. Freshwater-Saltwater Interface

The groundwater flow model was used to evaluate changes to the simulated freshwater-saltwater interface for each scenario (Figures 4.1-4 to 4.1-6). This evaluation was completed using the MODular flow ALLocation (MODALL) program (Potter et al., 2008). This program uses the same MODFLOW-calculated cell-by-cell flow output as MODPATH (Pollock, 1989), but rather than tracking individual particle paths, it tracks the movement of groundwater in the model. The freshwater-saltwater interface is the boundary between the fresh water moving north to south and the saline water, represented as equivalent fresh-water heads along the southern limit of the model, moving south to north. The reduction in freshwater moving north to south, results in the freshwater-saltwater interface for NYSDEC Scenario 5B to generally move northward by approximately 2,000 feet from the freshwater-saltwater interface calculated for NYSDEC Scenario 1. The northward movement relative to NYSDEC Scenario 1 is approximately 5,000 ft in the far eastern area of the model, adjacent to New York American Water Well 7M (NYSDEC Well ID N-08603) for NYSDEC Scenario 5B. This additional movement in the eastern portion of the model results in conditions where the pumping from Well 7M could pull in saline water under Scenario 5B, leaving the supplier with the option of closing down the well or reducing pumping sufficient to avoid drawing in saline water, if possible. There are no changes to the freshwater-saltwater interface location for IRA relative to NYSDEC Scenario 1.

4.1.3. Changes in Groundwater Flow to Shoreline Creeks

Changes to groundwater flow to shoreline creeks (including Massapequa Creek, Bellmore Creek, Bellmore Creek Tributary, Seamans Creek, Seaford Creek, Carman Creek, and Cedar Creek, which all discharge to South Oyster Bay) were evaluated (Table 4.1-1). For NYSDEC Scenario 5B there is a predicted decrease in streamflow (not including Massapequa Creek as it will be augmented with treated water from NYSDEC Scenario 5B) of almost 15 percent compared to NYSDEC Scenario 1. There is no predicted change in the groundwater flow to shoreline creeks for the IRA compared to NYSDEC Scenario 1.

4.2. Solute Transport Evaluation

The solute transport model (described in Attachment 1 of the Northrop Grumman Comments) was used to evaluate the plume movement (evolution) over time, off-site mass removal over time (i.e., how much off-site mass remains after 30 years), remediation efficiency, water supply well concentrations over time (i.e., are currently unimpacted water supply wells affected by each remedial scenario), and remediation well concentrations over time (i.e., how effective is each remediation well) for the three remedial scenarios. In each TVOC solute transport simulation, time zero represents 2019 and the proposed remedial component was turned on at each of their anticipated start dates relative to 2019. All solute transport scenarios were run for a simulated period of 30 years under steady-state conditions. The solute transport parameters remained constant for all scenarios.

4.2.1. NYSDEC Plume Evolution Over Time

Figures 4.2-1 to 4.2-3 show the evolution of the NYSDEC plume over time for each of the scenarios. Each figure has four panels representing solute transport results after 0 (i.e., 2019), 10, 20, and 30 years.

All three scenarios significantly reduce the extent of the plume after 30 years. The core of the offsite portion of the NYSDEC plume (south of the Site where TVOCs are greater than 50 µg/L) has been reduced in extent as well as concentration after 30 years for all three scenarios. Onsite portions of the NYSDEC plume remain but are essentially contained by the existing ONCTs. Two small areas of TVOCs greater than 5 µg/L are seen at and just south of Southern State Parkway for all three alternatives; however, time versus concentration graphs (presented in Section 4.2.4) indicate that any wells south of the Southern State Parkway that had been deemed "threatened" by the NYSDEC, are simulated not to be impacted.

A consequence of NYSDEC Scenario 5B is the spreading of the northwestern portion of the plume from sources upgradient of the Site towards the south. This is due to the hydraulic effect of the new basin to be constructed in Bethpage State Park and the lack of an extraction well south of upgradient sources north of the Site. The large-scale discharge of treated water to the basin (and hence to the groundwater system) has a profound effect that results in pushing water away from it in a radial pattern. Under NYSDEC Scenario 5B, TVOCs in the northeastern portion of the plume are either captured by pumping wells or are hydraulically pushed to the west and southwest. A similarly shaped expansion is noted for NYSDEC Scenario 1; however, the expansion is much less severe than that noted for NYSDEC Scenario 5B as the NYSDEC Scenario 1 does not include the new recharge basin in Bethpage State Park. This expansion does not occur in the IRA, primarily due to the placement of a new remedial well just south of upgradient sources.

4.2.2. Off-Site Mass Removal Over Time

The removal of off-site mass over time for each scenario is shown in Figures 4.2-4 to 4.2-6. Each figure has four panels summarizing the solute transport results after 5, 10, 20, and 30 years. Off-Site mass was considered mass south (and downgradient) of the ONCT-OU2 and ONCT-OU3 systems as of 2019. The percentage of off-site mass remaining after 30 years of simulation is 9% for NYSDEC Scenario 1, 2% for NYSDEC Scenario 5B, and 4% for the IRA. The total off-site remediation pumping after 30 years of remediation is 63 billion gallons (BG) for NYSDEC Scenario 1, 223 BG for NYSDEC Scenario 5B, and 93 BG for the IRA.

The effort required to yield these results is significantly disparate with NYSDEC Scenario 5B pumping far greater amounts of raw water. Given the volumes pumped (63, 223, and 93 BG for NYSDEC Scenario 1, NYSDEC Scenario 5B, and IRA, respectively), there are diminishing benefits to simply pumping higher amounts of groundwater. This is reflected by the fact that 96% of the mass is removed by pumping 93 BG (IRA), while the percent removed only increases to 98% with more than a doubling (up to 223 BG) of the water pumped in NYSDEC Scenario 5B. Pumping an additional 130 BG (5B versus IRA) yielded only an additional 2% mass removal, indicating a negligible improvement for a significantly greater effort expended.

4.2.3. Remediation Efficiency – Mass Removed Per Billion Gallons

The remediation efficiency (mass removed per billion gallons of water pumped) for different well groups are shown on Figures 4.2-7 to 4.2-9 after 30 years of simulation. The mass removed per billion gallons of water pumped is the total mass extracted by the well group after 30 years of simulation divided by the total amount of water pumped by the well group after 30 years of simulation. The remediation efficiency for all remediation wells is 609 pounds per BG (lb/BG) for NYSDEC Scenario 1, 283 lb/BG for NYSDEC Scenario 5B, and 522 lb/BG for the IRA. Therefore, the wells operated for NYSDEC Scenario 1 and the IRA are significantly more efficient for remediation than the wells operated for NYSDEC Scenario 5B. The

remediation efficiency for public water supply wells are similar for each scenario (82 lb/BG for NYSDEC Scenario 1, 55 lb/BG for NYSDEC Scenario 5B, and 63 lb/BG for the IRA). Therefore, protectiveness of public supply wells is similar under NYSDEC Scenario 5B and the IRA, and both show benefits over NYSDEC Scenario 1.

4.2.4. Water Supply Well Concentration Over Time

The simulated TVOCs concentration in threatened and already impacted public water supply wells are shown in Figures 4.2-10 to 4.2-36 for each of the three scenarios. The concentration of TVOCs in all Bethpage Water District supply wells decline to below 5 µg/L for each of the scenarios (Figures 4.2-10 through 4.2-14). All South Farmingdale Water District Wells, except for Well 6-1 (N-8664), do not have TOVCs concentrations exceeding 5 µg/L at any point during the 30-year simulation for any of the scenarios (Figures 4.2-15 through 4.2-20). Once remediation is implemented (after 5 years), all Town of Hempstead - Levittown Water District wells decline to below 5 µg /L TVOCs during the 30-year simulation for all Scenarios (Figures 4.2-21 through 4.2-25). TVOCs concentrations in New York American Water Wells 4S and 3S (Figures 4.2-26 and 4.2-27, respectively) are predicted to increase to above 9 µg/L for NYSDEC Scenario 1; TVOCs concentrations for NYSDEC Scenario 5B and IRA remain below 5 µg/L. No Massapequa Water District supply wells are predicted to become impacted for any of the scenarios during the 30-year simulation (Figures 4.2-28 through 4.2-36). Therefore, all the scenarios are equally protective of water supply wells south of the Southern State Parkway. Thus, the overall protectiveness of alleged “impacted” and “threatened” public supply wells is equivalent under NYSDEC Scenario 5B and the IRA, and both show slight benefits over NYSDEC Scenario 1.

4.2.5. Remediation Well Concentration Over Time

The simulated TVOCs concentration in remedial wells are shown in Figures 4.2-37 to 4.2-79 for each of the three scenarios, even if the remediation well is not pumping in that scenario. Nonproductive remedial wells capture little mass and are inefficient in limiting any potential migration as the wells are sited in extremely low TVOC concentration areas. DECHC-11 is one example (Figure 4.2-68). Under all three alternatives, this well is not expected to remove any groundwater exceeding 5 µg/L over the 30-year period. Such a “remedial” well will be pumping water that may not even require treatment. In fact, as shown in Figures 4.2-59 to 4.2-74, the groundwater concentrations in 14 of the 16 proposed NYSDEC Scenario 5B hydraulic containment wells will not be above 5 µg/L TVOC at system startup (5 years) and 13 wells will remain below 5 µg/L TVOC for the 30 year simulated period essentially making these wells unnecessary. Another nonproductive well is DECHC-06 (Figure 4.2-63) located just southwest of the Site and just south of upgradient sources. For approximately 20 years, this well only captures groundwater below 5 µg/L. Of interest however, is that under NYSDEC Scenario 5B, concentrations rise in response to the growing plume emanating from the vicinity of upgradient sources. Certainly, this well could have been located closer to sources upgradient of the Site and served to eliminate the growth of the plume in this area.

5. REFERENCES

NYSDEC. 2019. Proposed Amended Record of Decision. Northrop Grumman Bethpage Facility and Naval Weapons Industrial Reserve Plant. Site Nos. 130003A & 130003B. May 2019.

NYSDEC. 2013. Record of Decision. Northrup Grumman – Bethpage Facility, Operable Unit Number: 03, State Superfund Project, Bethpage, Nassau County, Site #1-30-003A. March 2013.

NYSDEC. 2001. Record of Decision, Operable Unit 2 Groundwater, Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites, Nassau County, Site Numbers 1-30-003A & B, March 29, 2001.

Potter, S.T., E. Moreno-Barbero, and C.E. Divine, 2008. MODALL: A Practical Tool for Designing and Optimizing Plume Capture Systems. Groundwater. 46(2): 335-340.

Table 3.1-1
NYSDEC Scenario 1: Pumping Rates at Existing and Proposed Remediation Wells
Northrop Grumman Systems Corporation
Bethpage, NY
PAROD Comments Modeling Memorandum

Well Group	Well ID	Easting (NY Long Island NAD 83)	Northing (NY Long Island NAD 83)	Top of Screen (ft NAVD 88)	Bottom of Screen (ft NAVD 88)	NYSDEC Scenario 1 (gpm)
OU2 North / ONCT	Well 1	1123449	210803	-409	-460	800
	Well 3R	1122814	211832	-306	-416	700
	Well 17	1124090	209750	-376	-459	1,000
	Well 18	1125785	209771	-362	-466	800
	Well 19	1126878	209909	-360	-512	500
OU3 Bethpage Park Groundwater Containment System	RW-1	1126144	214506	17	-3	30
	RW-2	1126404	214446	40	20	75
	RW-3	1126647	214413	39	19	75
	RW-4	1126904	214381	11	-9	30
GM-38 Hot Spot	GM38_RW-1	1129735	205701	-247	-343	600
	GM38_RW-3	1128889	206395	-302	-413	0
RW-21	RW-20	1128849	207431	-573	-662	700
	RW-21	1128670	208822	-528	-629	700
	RW-22	1129127	206375	-617	-696	500
RE-108 IRM	RE-108 Interim Well	1125234	206449	-456	-556	400
RE-108	RE-108 Navy Western-Shallow	1125140	203258	-471	-571	250
	RE-108 Navy Western-Deep	1125140	203258	-591	-691	250
	RE-108 Navy Eastern-Shallow	1126479	203093	-471	-571	250
	RE-108 Navy Eastern-Deep	1126479	203093	-591	-691	250
OU2 North / ONCT Basins	West (Plant 5) Basins	Receives treated water from ONCT Wells 17, 18, 19, and Well1, 3R, and RW-21 System minus flow to Calpine				1,635
	South Basins	Receives treated water from ONCT Wells 17, 18, 19, and Well 1,3R, and RW-21 System minus flow to Calpine				3,765
OU3 Bethpage Park Groundwater Containment System Basins	OU3 Basins	Receives treated water from OU3 Bethpage Park Groundwater Containment System				210
GM-38 Hot Spot Basin	Arthur Avenue Basin	Receives treated water from GM-38 System and RE-108 Interim Well				1,000
RE-108 Basins	RE-108 Navy Basin - East	Receives treated water from RE-108 East Wells				500
	RE-108 Navy Basin - West	Receives treated water from RE-108 West Wells				500

Notes and Abbreviations

ONCT = On-Site Containment and Treatment System

IRM = Interim Remedial Measure

NAD 83 = North American Datum of 1983

NAVD 88 = North American Vertical Datum of 1988

gpm = gallons per minute

Grey shaded cells are proposed wells.

Table 3.2-1
NYSDEC Scenario 5B: Pumping Rates at Existing and Proposed Remediation Wells
Northrop Grumman Systems Corporation
Bethpage, NY
PAROD Comments Modeling Memorandum

ARCADIS

Well Group	Well ID	Easting (NY Long Island NAD 83)	Northing (NY Long Island NAD 83)	Top of Screen (ft NAVD 88)	Bottom of Screen (ft NAVD 88)	NYSDEC Scenario 5B (gpm)
OU2 North / ONCT	Well 1	1123449	210803	-409	-460	800
	Well 3R	1122814	211832	-306	-416	700
	Well 17	1124090	209750	-376	-459	1,000
	Well 18	1125785	209771	-362	-466	800
	Well 19	1126878	209909	-360	-512	500
OU3 Bethpage Park Groundwater Containment System	RW-1	1126144	214506	17	-3	30
	RW-2	1126404	214446	40	20	75
	RW-3	1126647	214413	39	19	75
	RW-4	1126904	214381	11	-9	30
GM-38 Hot Spot	GM38_RW-1	1129735	205701	-247	-343	600
	GM38_RW-3	1128889	206395	-302	-413	0
RW-21	RW-20	1128849	207431	-573	-662	700
	RW-21	1128670	208822	-528	-629	700
	RW-22	1129127	206375	-617	-696	500
RE-108 IRM	RE-108 Interim Well	1125234	206449	-456	-556	400
RE-108	RE-108 Navy Western-Shallow	1125140	203258	-471	-571	250
	RE-108 Navy Western-Deep	1125140	203258	-591	-691	250
	RE-108 Navy Eastern-Shallow	1126479	203093	-471	-571	250
	RE-108 Navy Eastern-Deep	1126479	203093	-591	-691	250
NYSDEC Scenario 5B Mass Flux Wells	DECEX-01	1123713	204291	-350	-450	400
	DECEX-02	1124875	204232	-250	-500	1,000
	DECEX-03	1126147	204243	-350	-575	800
	DECEX-04	1124254	207237	-350	-500	440
	DECEX-05	1125776	207411	-400	-550	400
	DECEX-06	1127928	210144	-250	-400	400
	DECEX-07	1127991	211383	-200	-350	500
	DECEX-08	1127487	212552	-50	-250	350
NYSDEC Scenario 5B Hydraulic Containment Wells	DECHC-02	1122913	200942	-500	-700	750
	DECHC-03	1125136	199770	-500	-700	750
	DECHC-04	1127374	197981	-700	-850	750
	DECHC-05	1125937	193261	-500	-700	600
	DECHC-06	1122552	209265	-500	-730	400
	DECHC-07	1124468	195127	-100	-200	700
	DECHC-08	1124433	196666	-100	-200	500
	DECHC-09	1127351	195203	-100	-200	700
	DECHC-10	1128314	196077	-100	-200	500
	DECHC-11	1129319	196271	-100	-200	500
	DECHC-12	1130768	198546	-100	-200	500
	DECHC-13	1129716	198583	-100	-200	500
	DECHC-14	1131594	202247	-200	-300	250
	DECHC-15	1130390	202773	-200	-300	150
	DECHC-16	1129229	203070	-200	-300	150
	DECHC-17	1127966	203431	-200	-300	150
OU2 North / ONCT Basins	West (Plant 5) Basins	Receives treated water from ONCT Wells 17, 18, 19, and Well1, 3R, and RW-21 System minus flow to Calpine				1,635
	South Basins	Receives treated water from ONCT Wells 17, 18, 19, and Well 1,3R, and RW-21 System minus flow to Calpine				3,765
OU3 Bethpage Park Groundwater Containment System Basins	OU3 Basins	Receives treated water from OU3 Bethpage Park Groundwater Containment System				210
GM-38 Hot Spot Basin	Arthur Avenue Basin	Receives treated water from GM-38 System and RE-108 Interim Well				1,000
RE-108 Basins	RE-108 Navy Basin - East	Receives treated water from RE-108 East Wells				500
	RE-108 Navy Basin - West	Receives treated water from RE-108 West Wells				500
NYSDEC Scenario 5B Recharge	Central Recharge Basin	Receives treated water from NYSDEC 5B wells				8,140
	Southern Recharge Basins	Receives treated water from NYSDEC 5B wells				2,000
	Massapequa Creek	Receives treated water from NYSDEC 5B wells				2,000

Notes and Abbreviations

ONCT = On-Site Containment and Treatment System

IRM = Interim Remedial Measure

NAD 83 = North American Datum of 1983

NAVD 88 = North American Vertical Datum of 1988

gpm = gallons per minute

Grey shaded cells are proposed wells.

Table 3.3-1
IRA: Pumping Rates at Existing and Proposed Remediation Wells
Northrop Grumman Systems Corporation
Bethpage, NY
PAROD Comments Modeling Memorandum

Well Group	Well ID	Easting (NY Long Island NAD 83)	Northing (NY Long Island NAD 83)	Top of Screen (ft NAVD 88)	Bottom of Screen (ft NAVD 88)	NYSDEC Scenario 1+ (gpm)
OU2 North / ONCT	Well 1	1123449	210803	-409	-460	800
	Well 3R	1122814	211832	-306	-416	700
	Well 17	1124090	209750	-376	-459	1,000
	Well 18	1125785	209771	-362	-466	800
	Well 19	1126878	209909	-360	-512	500
	Well 18-1	1124850	210104	-332	-478	700
	UG-1	1121538	212326	90	30	500
OU3 Bethpage Park Groundwater Containment System	RW-1	1126144	214506	17	-3	30
	RW-2	1126404	214446	40	20	75
	RW-3	1126647	214413	39	19	75
	RW-4	1126904	214381	11	-9	30
GM-38 Hot Spot	GM38_RW-1	1129735	205701	-247	-343	600
	GM38_RW-3	1128889	206395	-302	-413	0
RW-21	RW-20	1128849	207431	-573	-662	700
	RW-21	1128670	208822	-528	-629	700
	RW-22	1129127	206375	-617	-696	500
RE-108 IRM	RE-108 Interim Well	1125234	206449	-456	-556	400
RE-108	RE-108 Navy Western-Shallow	1125140	203258	-471	-571	250
	RE-108 Navy Western-Deep	1125140	203258	-591	-691	250
	RE-108 Navy Eastern-Shallow	1126479	203093	-471	-571	250
	RE-108 Navy Eastern-Deep	1126479	203093	-591	-691	250
NYSDEC Wells	DECEX-02	1124875	204232	-250	-500	500
	DECEX-06	1127928	210144	-250	-400	500
OU2 South	OU2S-EX-5	1125281	199081	-459	-624	700
	OU2S-EX-6	1125292	196440	-574	-661	100
	NAVY-1 (RE-137)	1125722	204305	-550	-670	500
OU2 North / ONCT Basins	West (Plant 5) Basins	Receives treated water from ONCT Wells 17, 18, 19, and Well1, 3R, RW-21 System, DECEX-6, HR-1, and Well 18-1 minus flow to Calpine				2,190
	South Basins	Receives treated water from ONCT Wells 17, 18, 19, and Well1, 3R, RW-21 System, DECEX-6, HR-1, and Well 18-1 minus flow to Calpine				4,410
OU3 Bethpage Park Groundwater Containment System Basins	OU3 Basins	Receives treated water from OU3 Bethpage Park Groundwater Containment System				210
GM-38 Hot Spot Basin	Arthur Avenue Basin	Receives treated water from GM-38 System and RE-108 Interim Well				1,000
RE-108 Basins	RE-108 Navy Basin - East	Receives treated water from RE-108 East Wells				500
	RE-108 Navy Basin - West	Receives treated water from RE-108 West Wells				500
OU2 South Recharge	NYSDOT Basin 71	Receives teated water from OU2 South/DECEX-02 Wells				500
	OU2S-INJ-1	1127830	204379	-31	-191	240
	OU2S-INJ-2	1127773	203543	-20	-182	240
	OU2S-INJ-3	1122659	201159	-34	-201	240
	OU2S-INJ-4	1122706	200913	-19	-173	240
	OU2S-INJ-5	1122784	200358	-29	-185	240
	OU2S-INJ-6	1125292	196440	-274	-361	100

Notes and Abbreviations

ONCT = On-Site Containment and Treatment System

IRM = Interim Remedial Measure

NAD 83 = North American Datum of 1983

NAVD 88 = North American Vertical Datum of 1988

gpm = gallons per minute

Grey shaded cells are proposed wells.

Table 4.1-1
Effects of Future Groundwater Pumping on Stream Flow
Northrop Grumman Systems Corporation
Bethpage, NY
PAROD Comment Modeling Memorandum

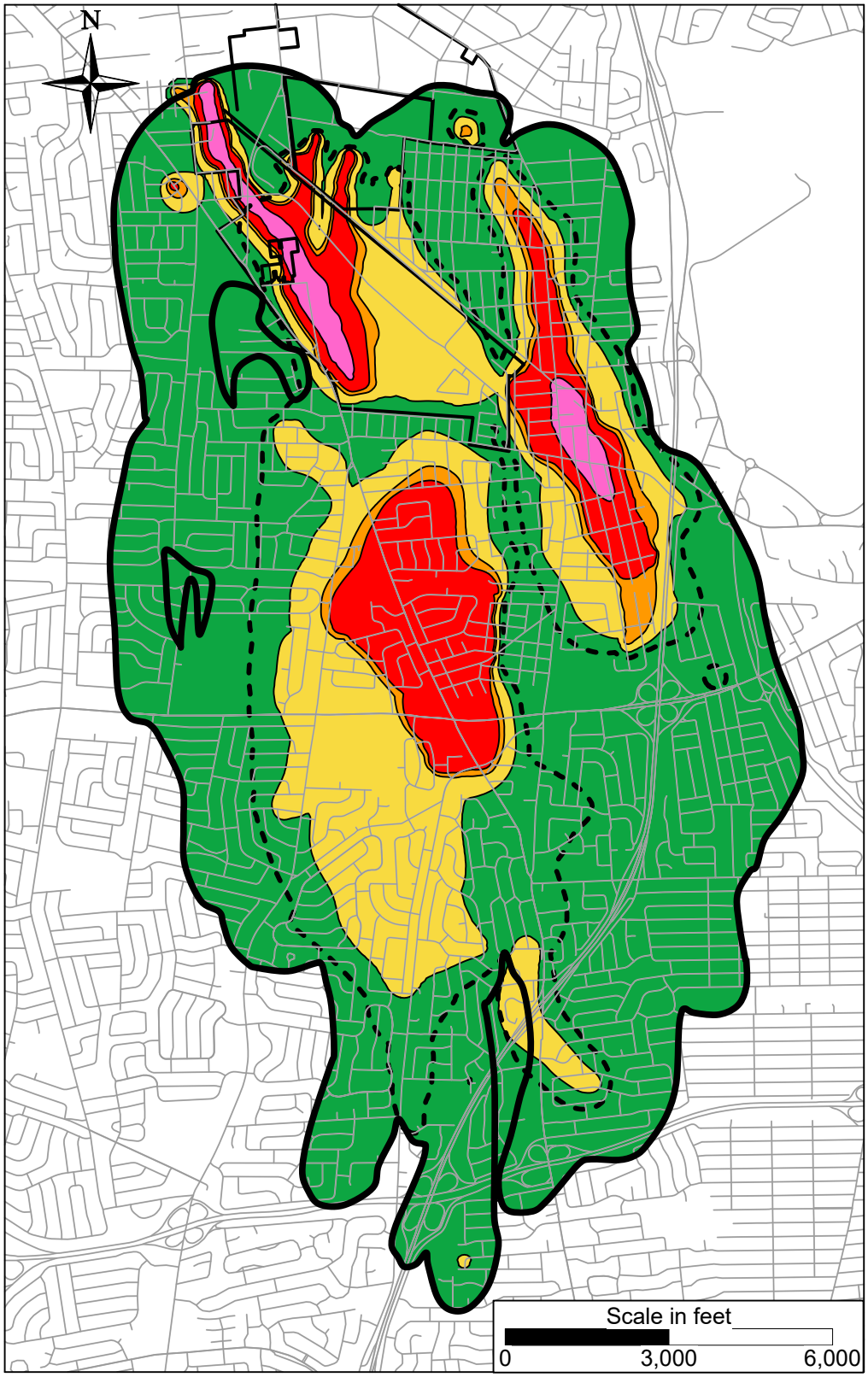
Scenario	Stream Flow (cfs)											
	Massapequa Creek Upgradient of USGS Stream Gage	Bellmore Creek Upgradient of USGS Stream Gage	Bellmore Creek Tributary Upgradient of USGS Stream Gage	Massapequa Creek Downgradient of USGS Stream Gage	Bellmore Creek Downgradient of USGS Stream Gage	Seaford Creek	Seamans Creek	Cedar Creek	Carman Creek	All Creeks Along Shoreline	All Creeks Along Shoreline - Not Including Massapequa Creek	Percent change in Overall Streamflow (not including Massapequa Creek) from Scenario 1
NYSDEC Scenario 1	3.18	0.56	0.08	4.47	5.26	5.10	2.61	0.77	1.80	25.59	17.94	0.0%
NYSDEC Scenario 5B*	1.38	0.00	0.00	4.08	4.41	4.47	2.47	0.73	1.63	20.74	15.28	-14.83%
IRA	3.15	0.57	0.08	4.46	5.26	5.08	2.61	0.77	1.80	25.55	17.94	0.0%

Notes and Abbreviations

cfs = cubic feet per second

NM = Not Measured

*Average streamflow is estimated to be 5.83 cfs, 1.38 cfs from groundwater discharge plus an additional 4.45 cfs (2,000 gpm) from the treatment system.



TVOCs Concentration (μg/L)

5,000
1,000
500
50
5

LEGEND

Site Outline

NYSDEC SCGs Plume Extents

Plumes assumed to be sourced from Navy and Northrop Grumman Sites for the purpose of this analysis (Attachment 1)

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

NYSDEC TVOCS PLUME

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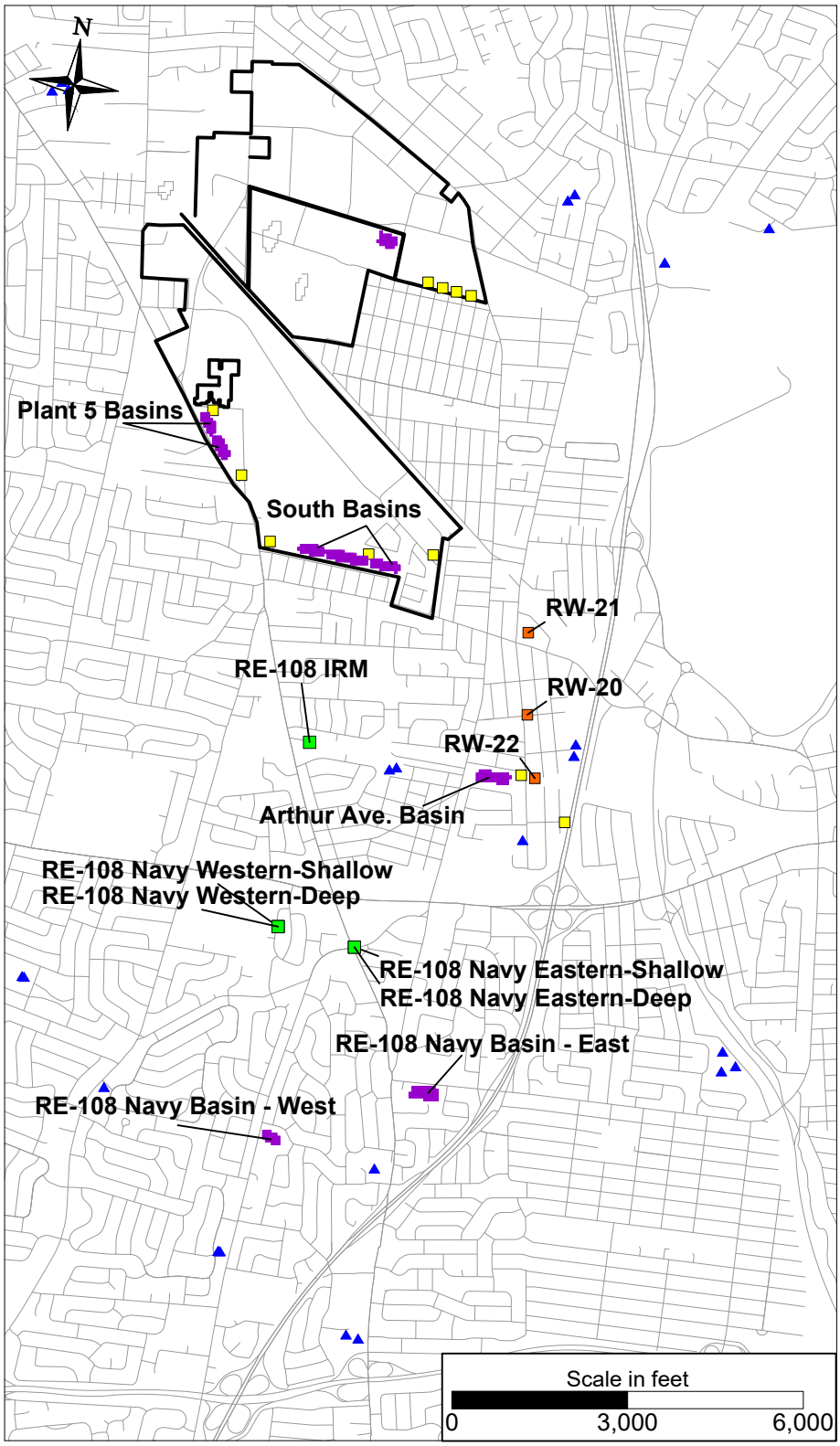
FIGURE
2.1



LEGEND

- Site Outline
- Water Supply Well
- Remediation Well
- RW-21 Remedy Well
- RE-108 Remedy Well
- Recharge Locations

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

NYSDEC SCENARIO 1: ROD REQUIRED REMEDIATION LAYOUT

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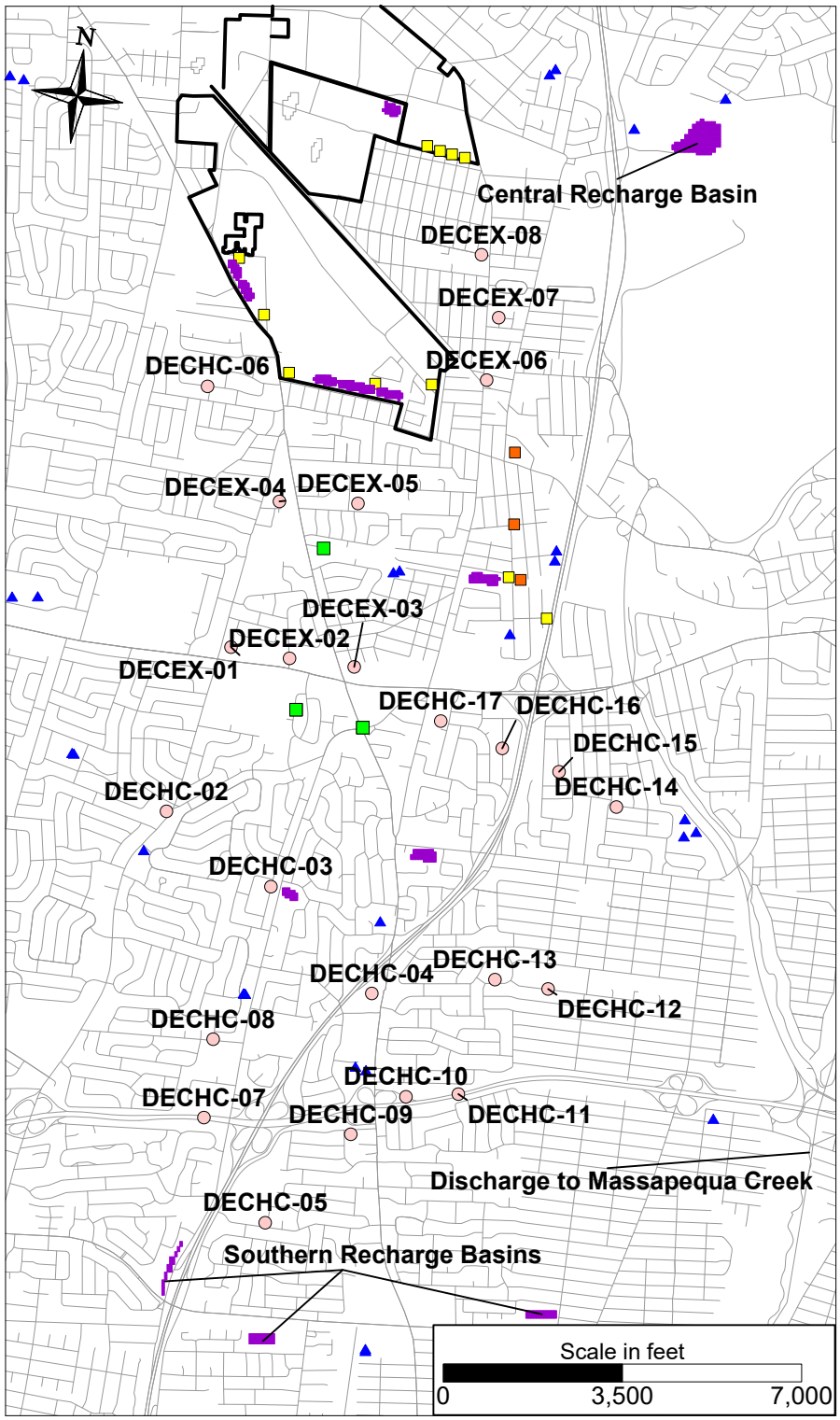
FIGURE
3.1-1



LEGEND

- Site Outline
- Water Supply Well
- Remediation Well
- RW-21 Remedy Well
- RE-108 Remedy Well
- Recharge Locations
- NYSDEC Scenario 5B Remedy Well

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BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

NYSDEC SCENARIO 5B
LAYOUT

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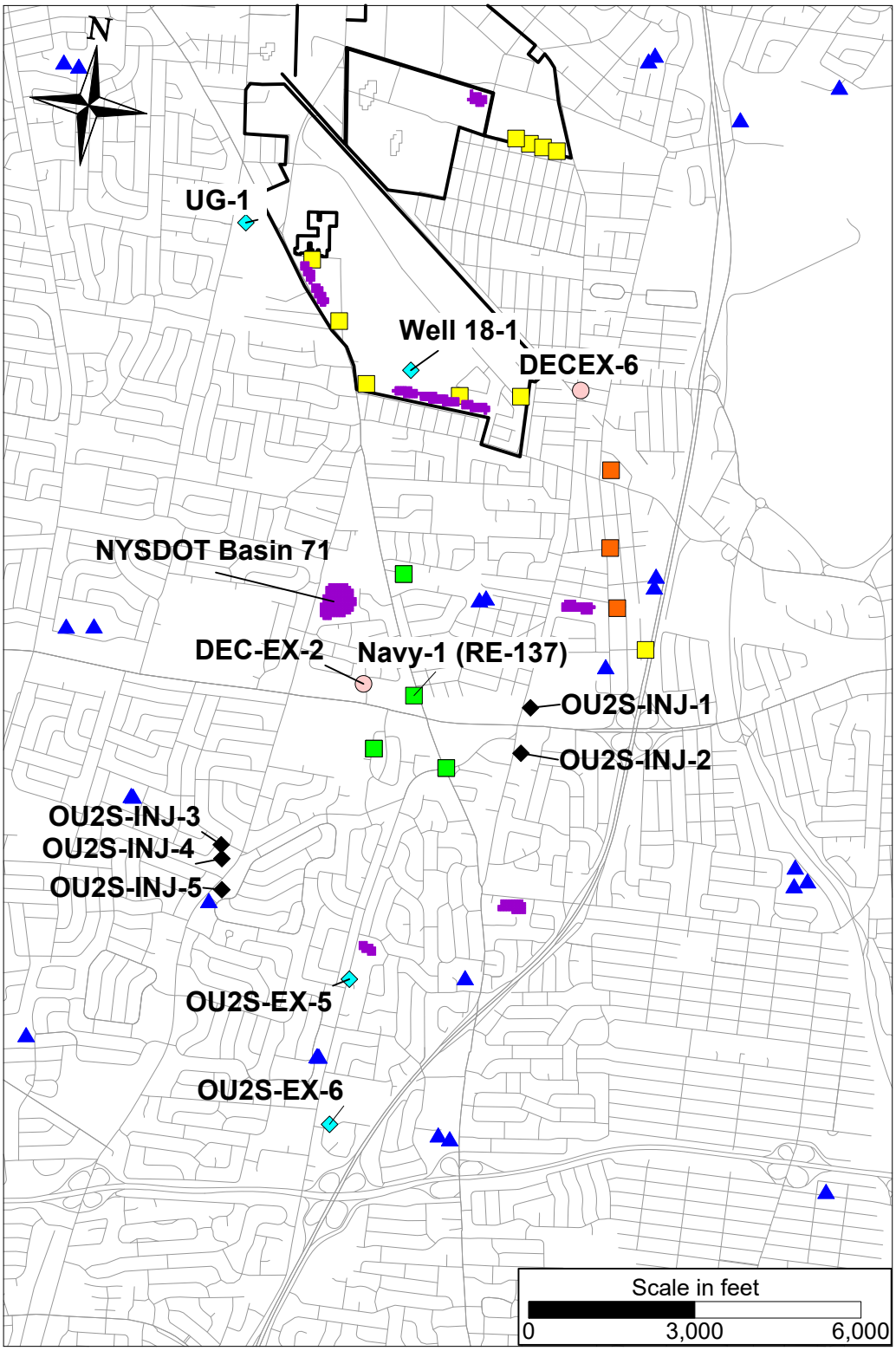
FIGURE
3.2-1



LEGEND

- Site Outline
- Water Supply Well
- Remediation Well
- RW-21 Remedy Well
- RE-108/Navy Remedy Well
- Recharge Locations
- NYSDEC Remedy Well
- IRA Remedy Well

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

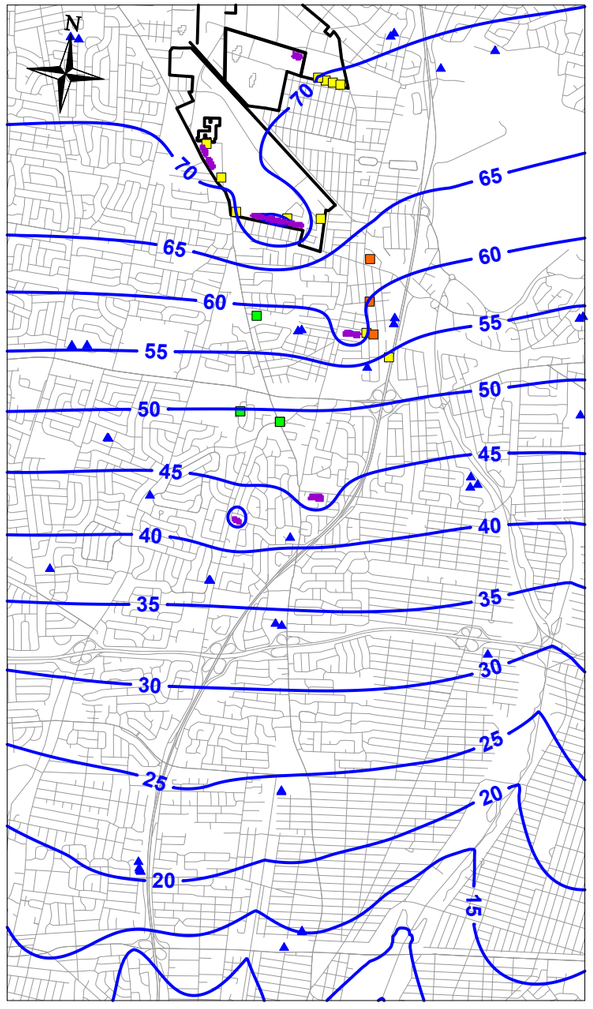
PAROD COMMENTS MODELING MEMORANDUM

IRA LAYOUT

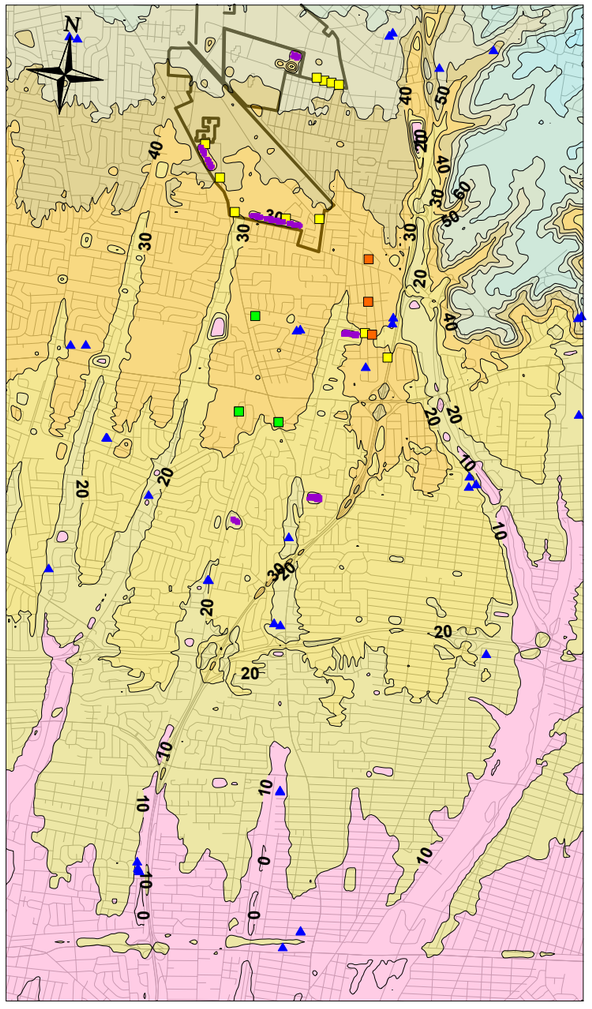
ARCADIS Design & Consultancy for natural and built assets

FIGURE
3.3-1

Water Table Elevation



Depth to Water



LEGEND

- Site Outline
- Water Supply Well
- Remediation Well
- RW-21 Remedy Well
- RE-108 Remedy Well
- 20 — Groundwater Elevation (ft NAVD88)

*Pumping wells are also shown regardless of pumping status (wells that are not pumping are shown).

**ft NAVD88 = feet North American Datum of 1988

Scale in feet

0 5,000 10,000

Depth to Water (feet)

Summary of Groundwater Pumping

Remediation (Total Pumping: 7,910 gpm)
- ONCT-OU2: 3,800 gpm
- OU3 BPGWCS: 210 gpm
- RW-21 System: 1,900 gpm
- GM-38: 600 gpm
- RE-108: 1,400 gpm

Total Water Supply
- 28,915 gpm

NORTHROP GRUMMAN SYSTEMS CORPORATION
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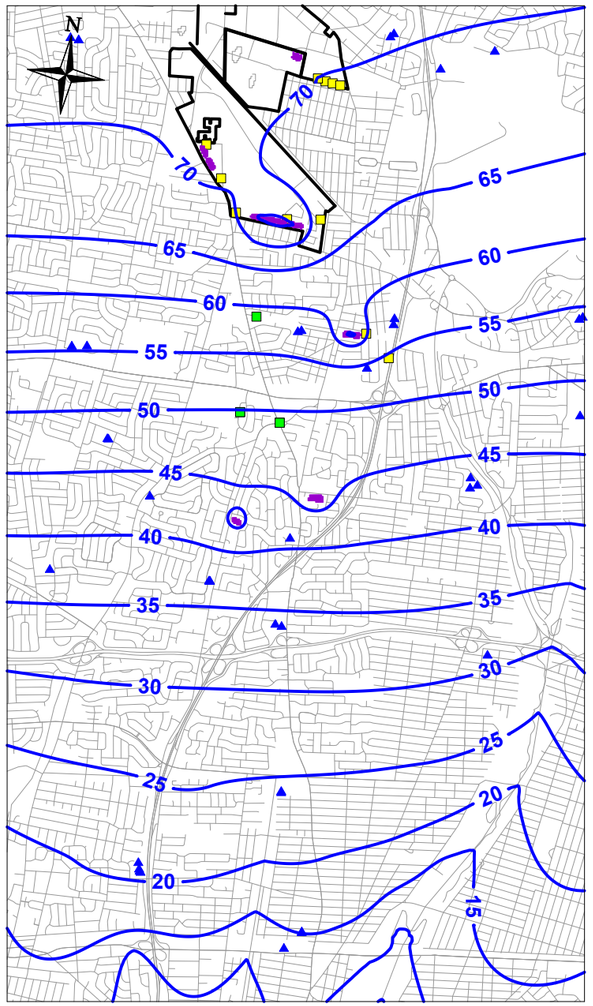
PAROD COMMENTS MODELING MEMORANDUM

REMEDY EFFECTS ON GROUNDWATER FLOW: NYSDEC SCENARIO 1

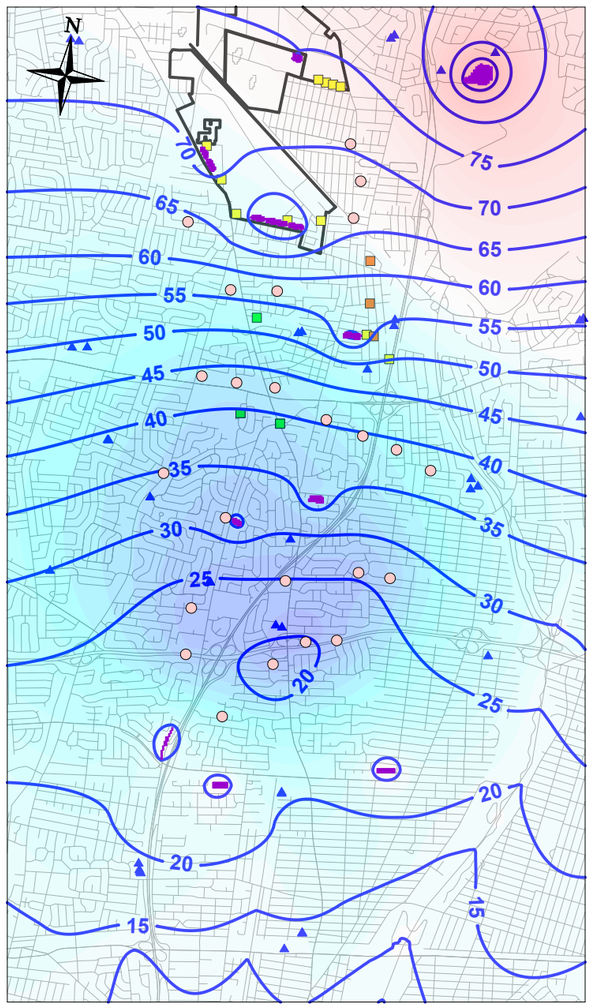
ARCADIS Design & Consultancy for natural and built assets

FIGURE 4.1-1

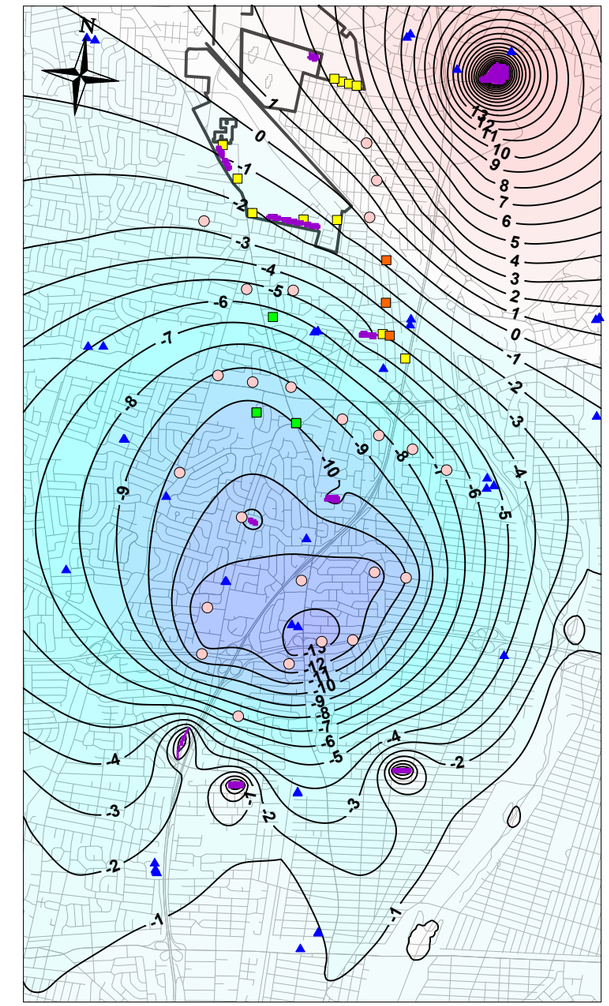
NYSDEC 1 Water Table Elevation



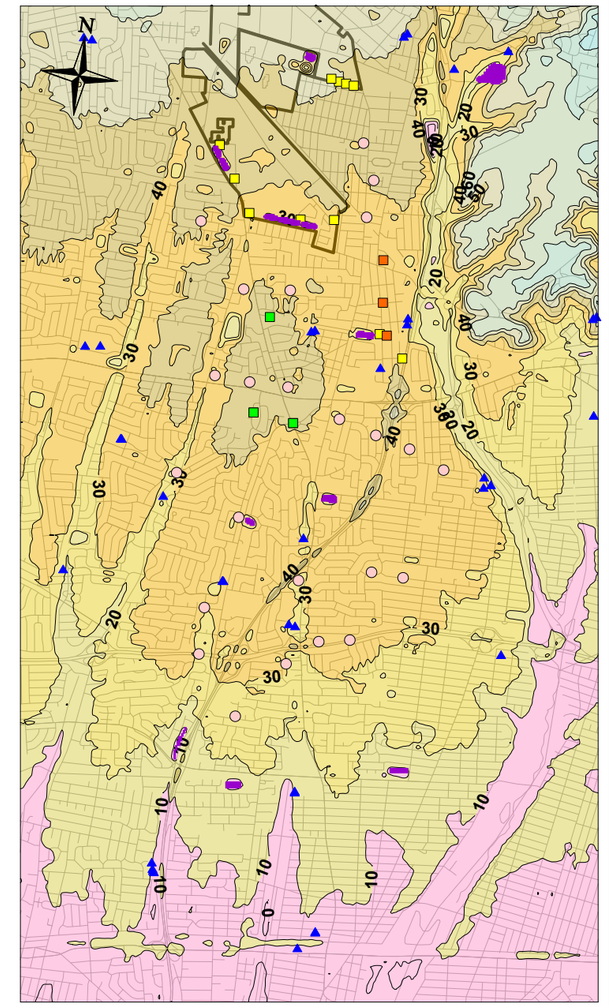
NYSDEC 5B Water Table Elevation



NYSDEC 5B Changes in Water Table Elevation from NYSDEC 1



NYSDEC 5B Depth to Water



LEGEND

- Site Outline
- Water Supply Well
- Remediation Well
- RW-21 Remedy Well
- RE-108 Remedy Well
- NYSDEC Remedy Well
- 20 — Groundwater Elevation (ft NAVD88)

*Pumping wells are also shown regardless of pumping status (wells that are not pumping are shown).

**ft NAVD 88 = feet North American Datum of 1988

Scale in feet

0 5,000 10,000

Change in Water Table Elevation (ft)
(NYSDEC Scenario 5B Water Table - NYSDEC Scenario 1 Water Table)

-15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24

Depth to Water (ft)

-10 0 10 20 30 40 50 60 70 80 90 100

Summary of Groundwater Pumping

Remediation (Total Pumping: 20,050 gpm)
- ONCT-OU2: 3,800 gpm
- OU3 BPGWCS: 210 gpm
- RW-21 System: 1,900 gpm
- GM-38: 600 gpm
- RE-108: 1,400 gpm
- NYSDEC 5B: 12,140 gpm

Total Water Supply
- 28,915 gpm

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

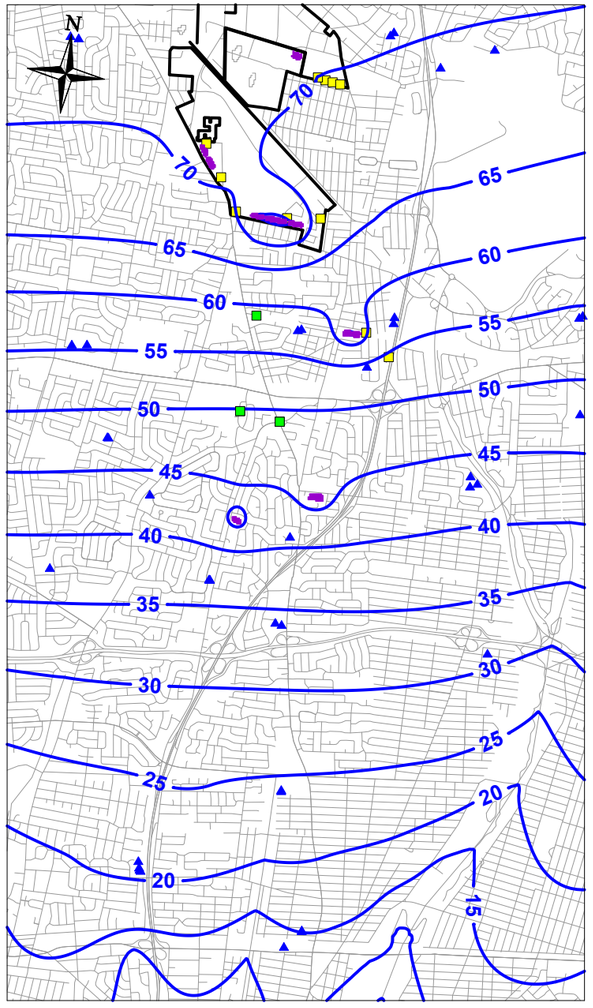
PAROD COMMENTS MODELING MEMORANDUM

REMEDY EFFECTS ON GROUNDWATER FLOW: NYSDEC SCENARIO 5B

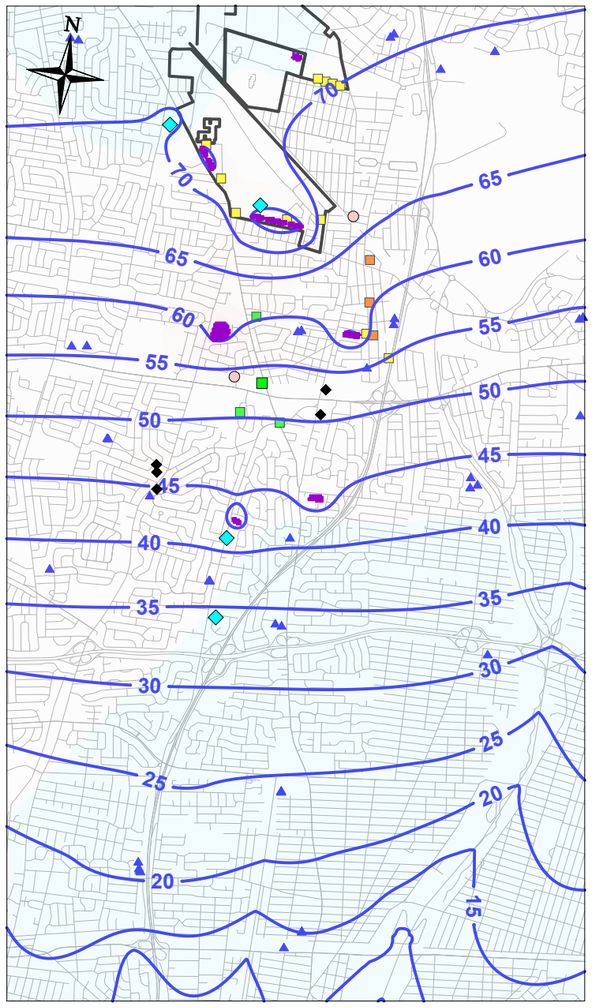
ARCADIS Design & Consultancy for natural and built assets

FIGURE 4.1-2

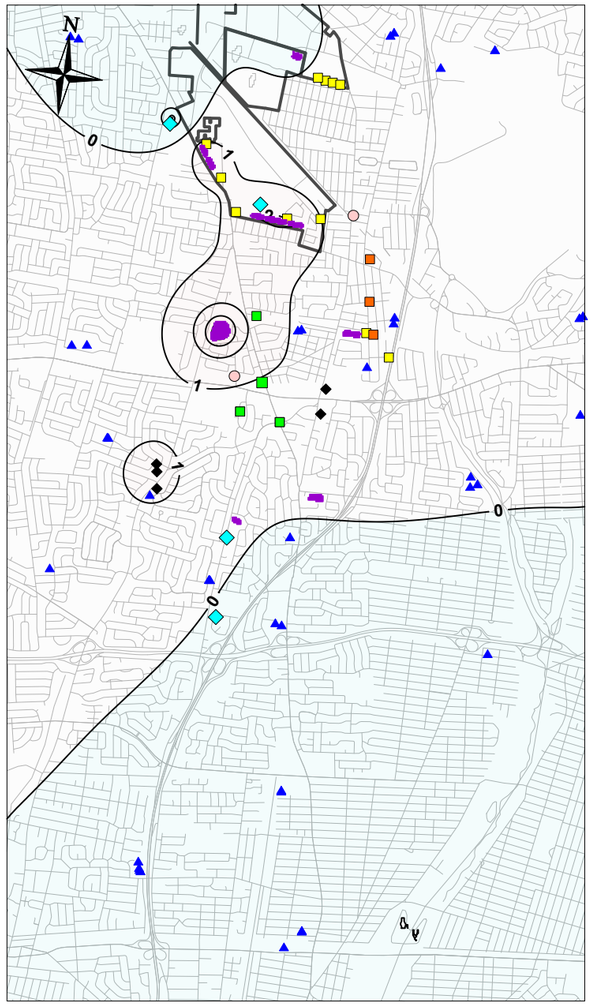
NYSDEC 1 Water Table Elevation



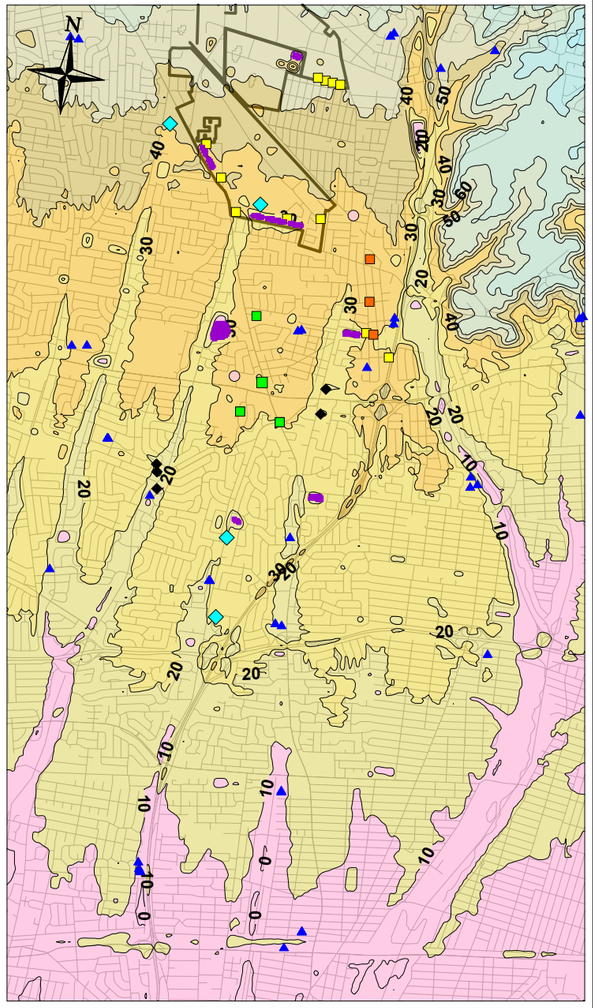
IRA Water Table Elevation



IRA Changes in Water Table Elevation from NYSDEC 1



IRA Depth to Water



LEGEND

- Site Outline
- Water Supply Well
- Remediation Well
- RW-21 Remedy Well
- RE-108 Remedy Well
- NYSDEC Remedy Well
- IRA Remedy Well Groundwater
- 20 Elevation (ft NAVD88)

*Pumping wells are also shown regardless of pumping status (wells that are not pumping are shown).

**ft NAVD 88 = feet North American Datum of 1988

Scale in feet

0 5,000 10,000

Change in Water Table Elevation (ft)
(IRA Water Table - NYSDEC Scenario 1 Water Table)

-15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24

Depth to Water (ft)

-10 0 10 20 30 40 50 60 70 80 90 100

Summary of Groundwater Pumping

Remediation (Total Pumping: 11,410 gpm)
- ONCT-OU2: 3,800 gpm
- OU3 BPGWCS: 210 gpm
- RW-21 System: 1,900 gpm
- GM-38: 600 gpm
- RE-108: 1,400 gpm
- IRA: 3,500 gpm

Total Water Supply
- 28,915 gpm

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

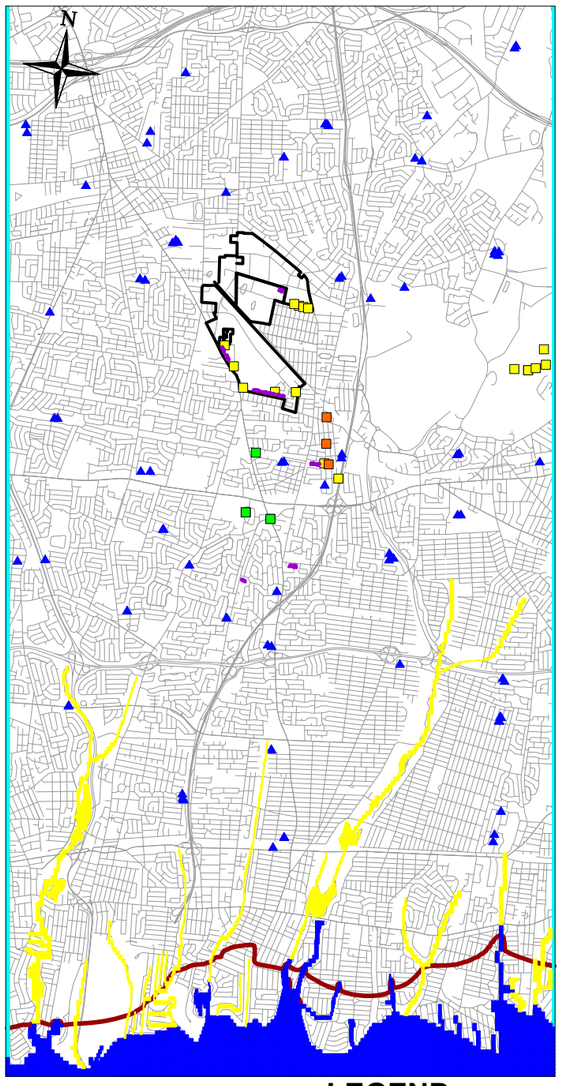
PAROD COMMENTS MODELING MEMORANDUM

REMEDY EFFECTS ON GROUNDWATER FLOW: IRA

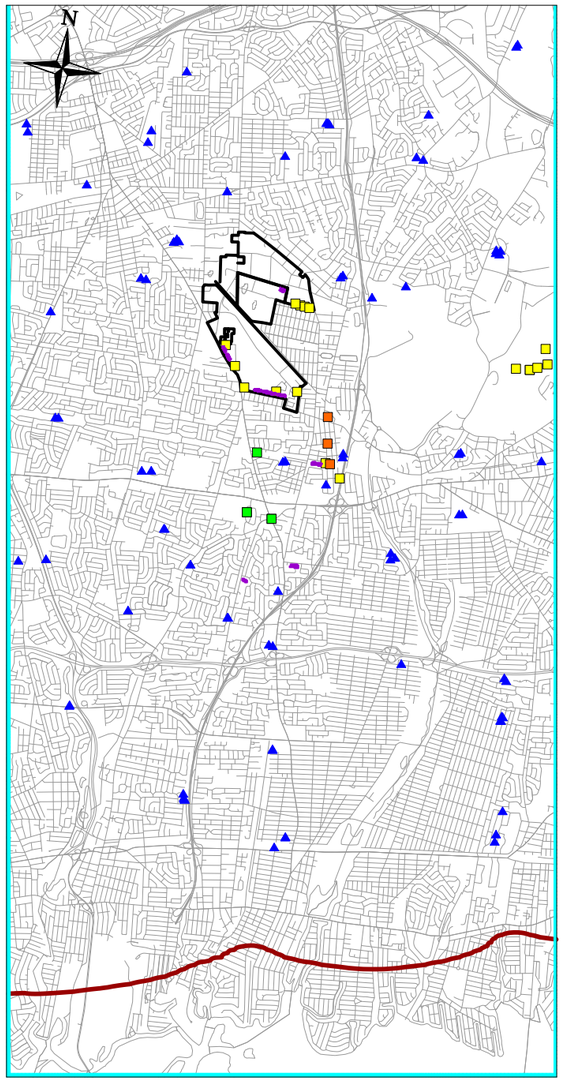
ARCADIS Design & Consultancy for natural and built assets

FIGURE 4.1-3

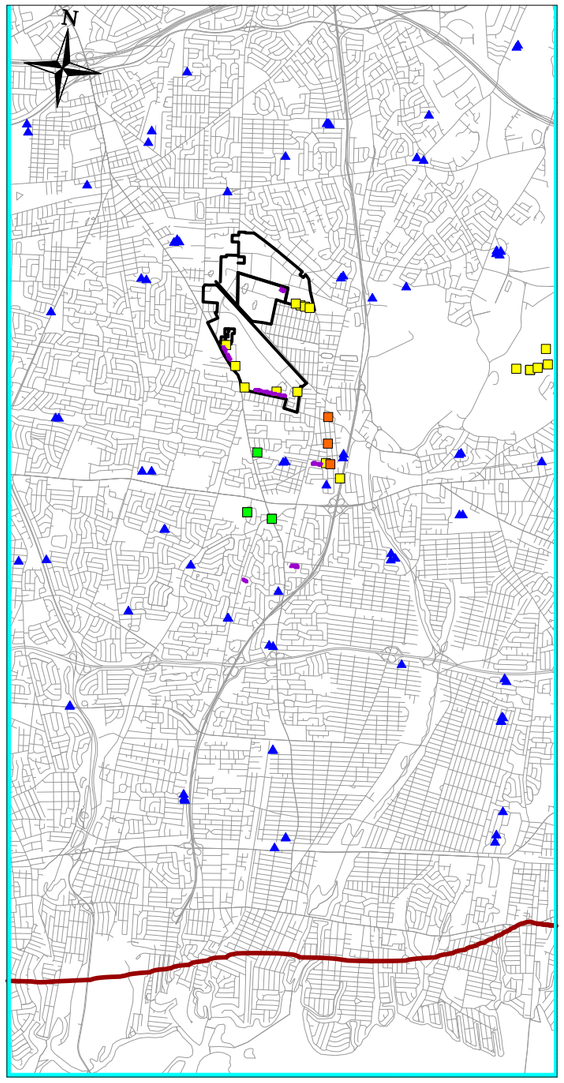
LAYER 1



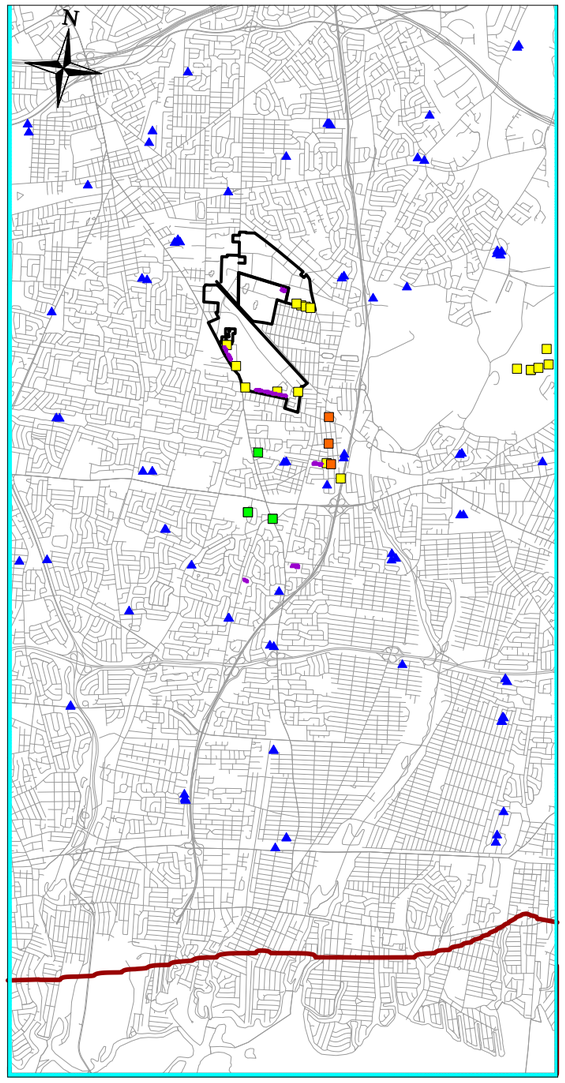
LAYER 4



LAYER 8



LAYER 12



LEGEND

- Site Outline
- Recharge Basin
- Water Supply Well
- Remediation Well
- Constant Head Cell
- Drain Boundary
- General Head Boundary
- RW-21 Remedy Well
- RE-108 Remedy Well
- Steady-State Interface Between Saltwater and Freshwater

Summary of Groundwater Pumping

Remediation (Total Pumping: 7,910 gpm)
- ONCT-OU2: 3,800 gpm
- OU3 BPGWCS: 210 gpm
- RW-21 System: 1,900 gpm
- GM-38: 600 gpm
- RE-108: 1,400 gpm

Total Water Supply
- 28,915 gpm

*Recharge basins, water supply wells, and remediation wells are shown on each panel for reference regardless of layer designation.
**Pumping wells are also shown regardless of pumping status (wells that are not pumping are shown).

Scale in feet
0 8,000 16,000

Figures encompass the entire model domain.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

MODEL SIMULATED LOCATION OF FRESHWATER/SALTWATER INTERFACE: NYSDEC SCENARIO 1

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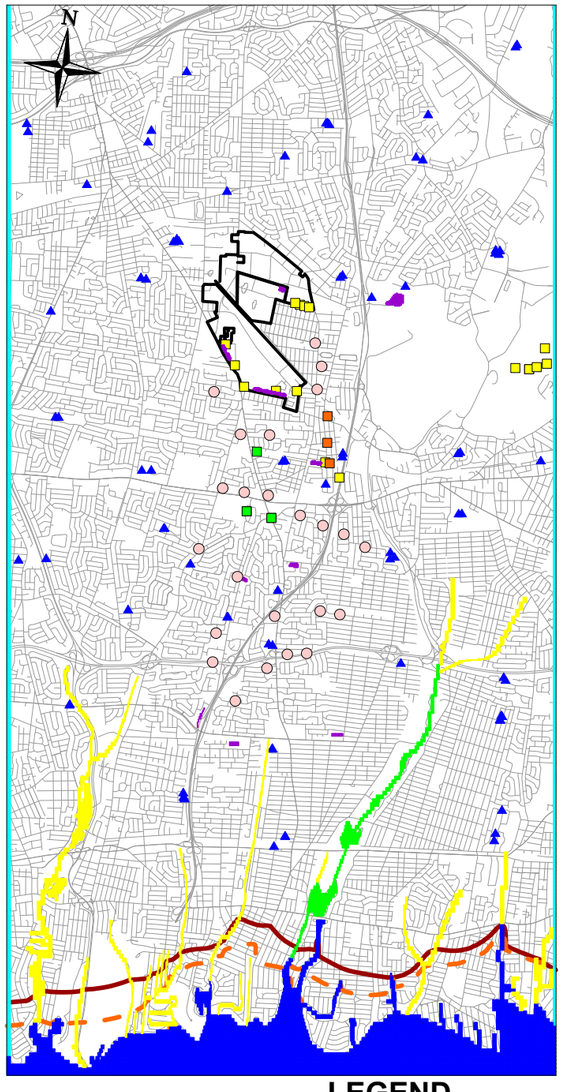
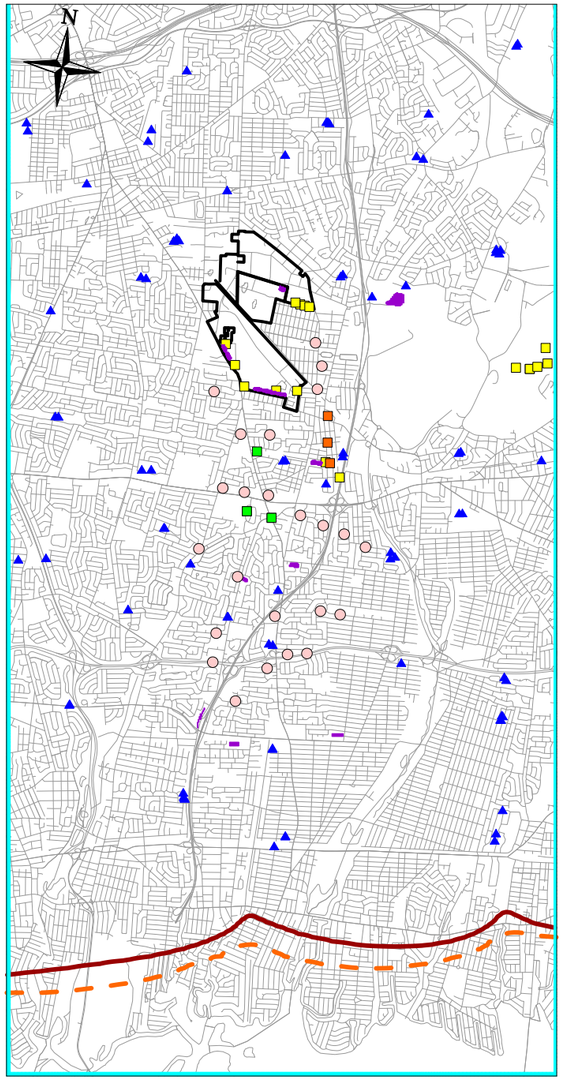
FIGURE 4.1-4

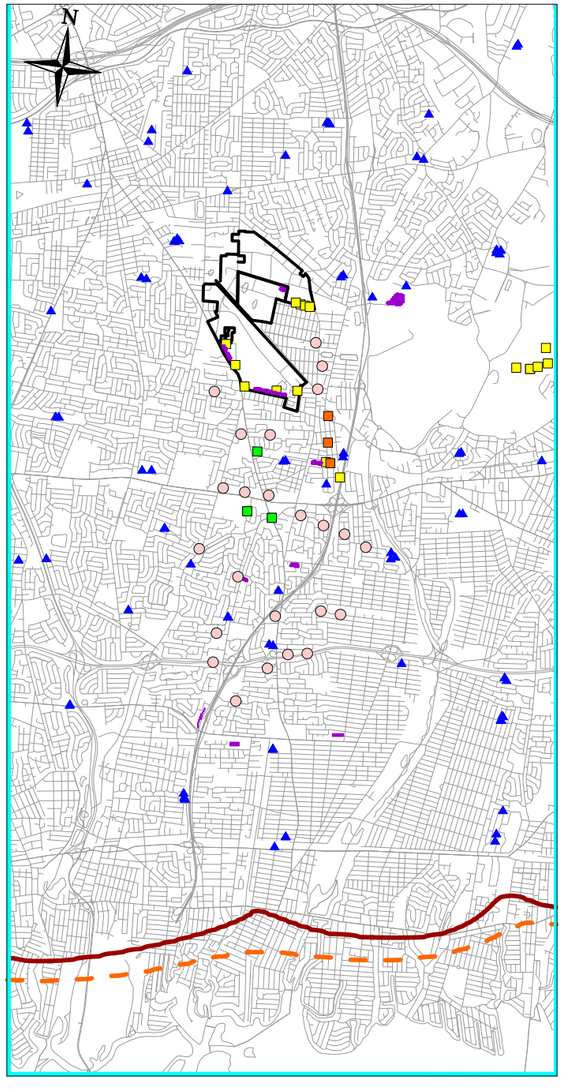
LAYER 1



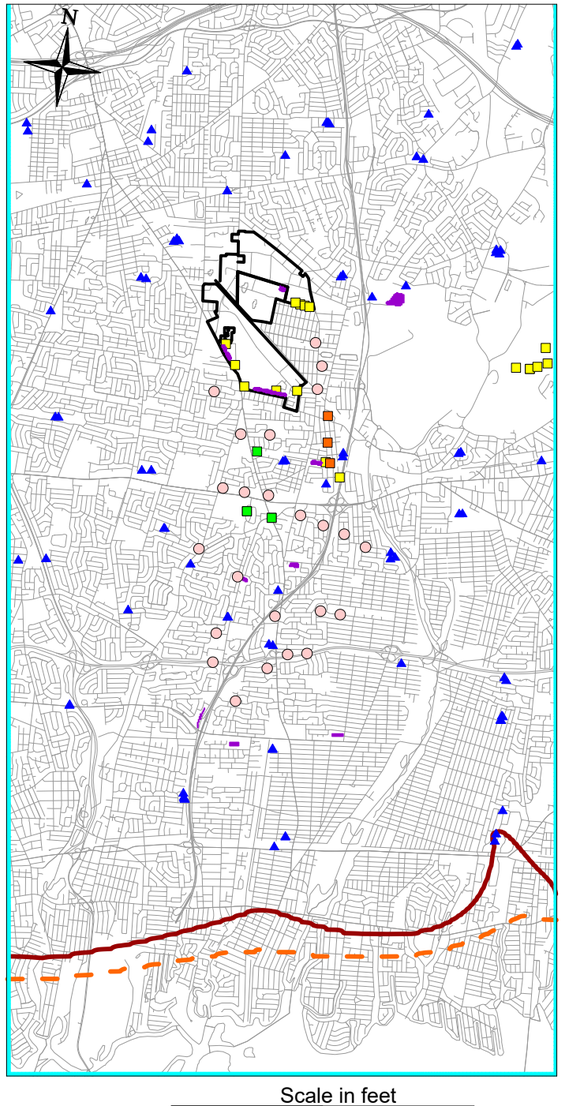
LAYER 4



LAYER 8



LAYER 12



LEGEND

- Site Outline
- Recharge Basin
- Water Supply Well
- Remediation Well
- Constant Head Cell
- Drain Boundary
- River Boundary
- General Head Boundary
- RW-21 Remedy Well
- RE-108 Remedy Well
- NYSDEC Remedy Well
- Steady-State Interface Between Saltwater and Freshwater
- NYSDEC Scenario 1 Steady-State Interface Between Saltwater and Freshwater

Summary of Groundwater Pumping

Remediation (Total Pumping: 20,050 gpm)
- ONCT-OU2: 3,800 gpm
- OU3 BPGWCS: 210 gpm
- RW-21 System: 1,900 gpm
- GM-38: 600 gpm
- RE-108: 1,400 gpm
- NYSDEC 5B: 12,140 gpm

Total Water Supply
- 28,915 gpm

*Recharge basins, water supply wells, and remediation wells are shown on each panel for reference regardless of layer designation.
**Pumping wells are also shown regardless of pumping status (wells that are not pumping are shown).

Scale in feet
0 8,000 16,000

Figures encompass the entire model domain.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

MODEL SIMULATED LOCATION OF FRESHWATER/SALTWATER INTERFACE: NYSDEC SCENARIO 5B

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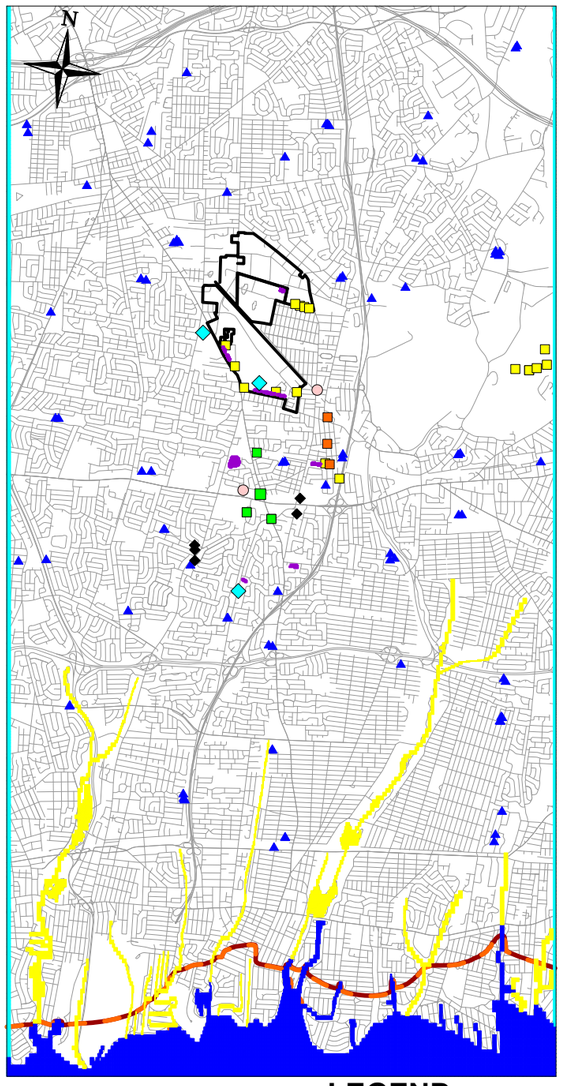
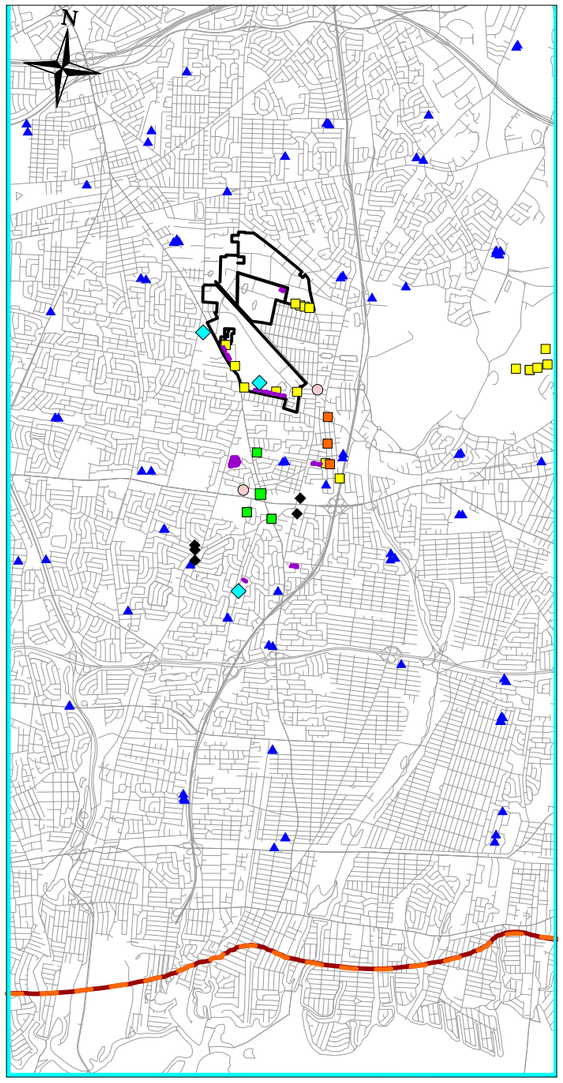
FIGURE 4.1-5

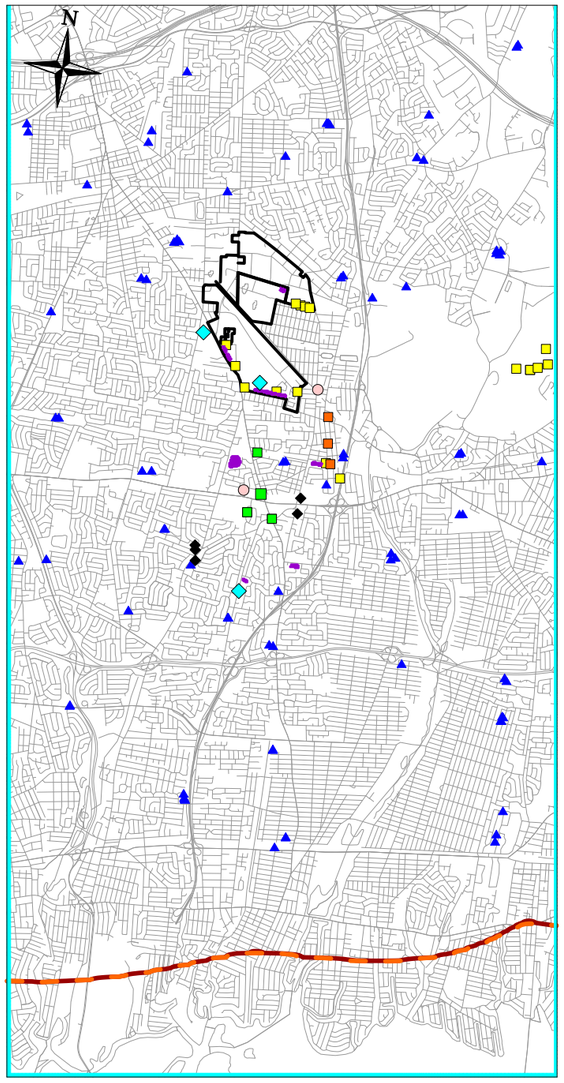
LAYER 1



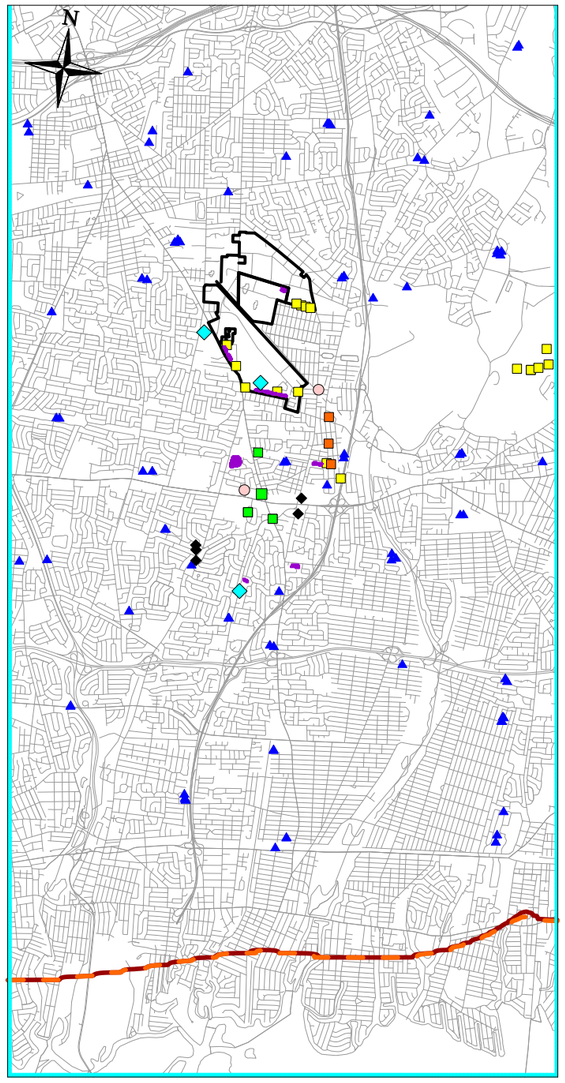
LAYER 4



LAYER 8



LAYER 12



LEGEND

- Site Outline
- Recharge Basin
- Water Supply Well
- Remediation Well
- Constant Head Cell
- Drain Boundary
- General Head Boundary
- RW-21 Remedy Well
- RE-108 Remedy Well
- NYSDEC Remedy Well
- IRA Remedy Well
- Steady-State Interface Between Saltwater and Freshwater
- NYSDEC Scenario 1 Steady-State Interface Between Saltwater and Freshwater

Summary of Groundwater Pumping

Remediation (Total Pumping: 11,410 gpm)
- ONCT-OU2: 3,800 gpm
- OU3 BPGWCS: 210 gpm
- RW-21 System: 1,900 gpm
- GM-38: 600 gpm
- RE-108: 1,400 gpm
- IRA: 3,500 gpm

Total Water Supply
- 28,915 gpm

*Recharge basins, water supply wells, and remediation wells are shown on each panel for reference regardless of layer designation.

**Pumping wells are also shown regardless of pumping status (wells that are not pumping are shown).

Scale in feet

0 8,000 16,000

Figures encompass the entire model domain.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

MODEL SIMULATED LOCATION OF FRESHWATER/SALTWATER INTERFACE: IRA

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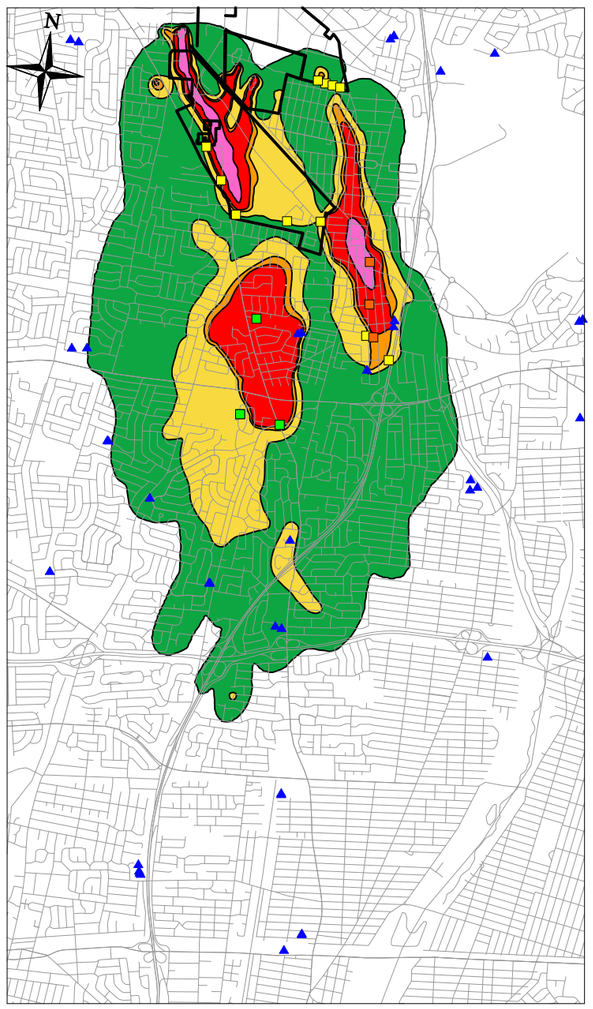
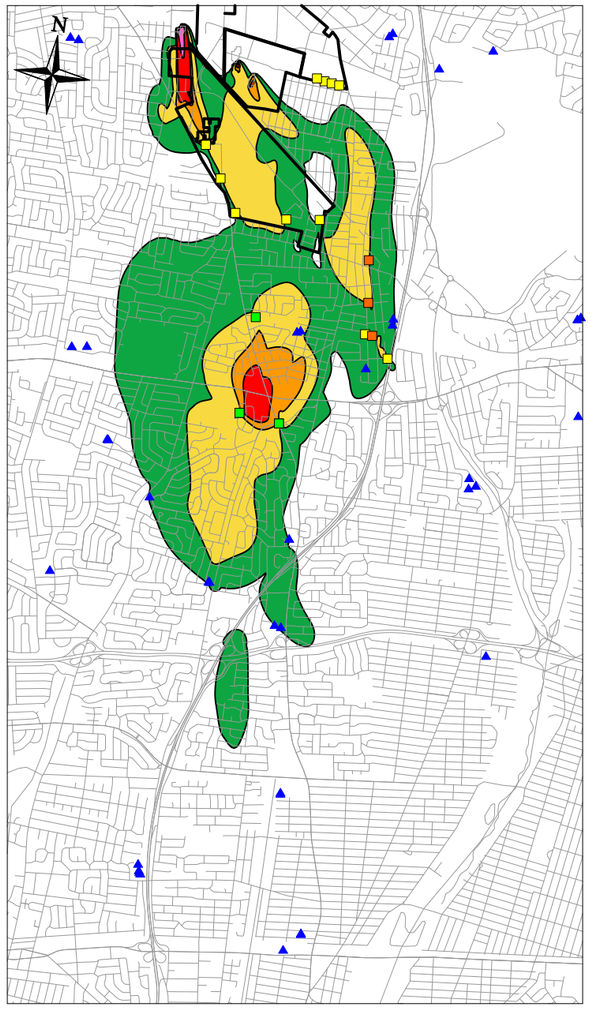
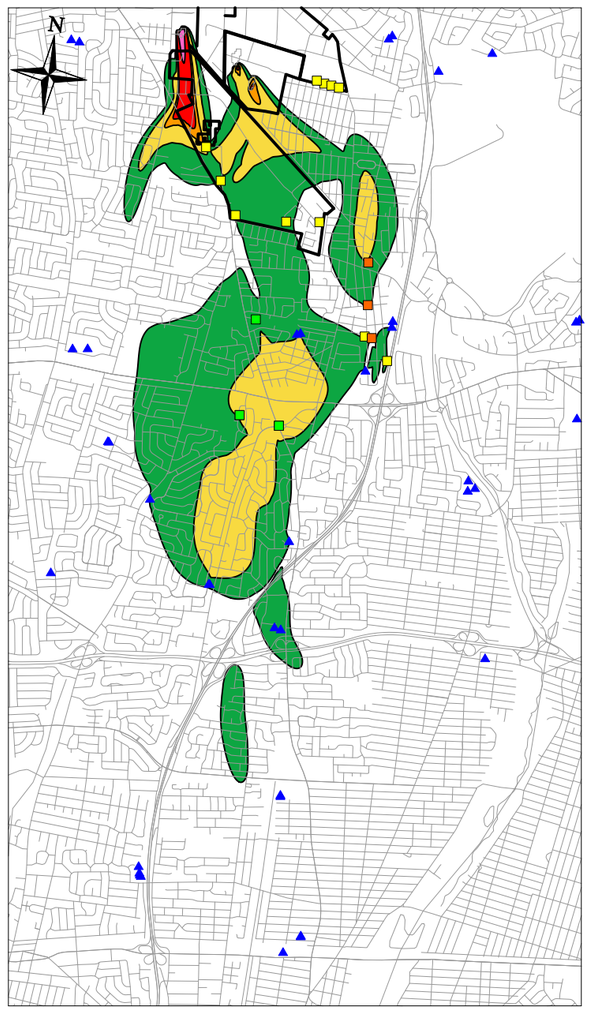
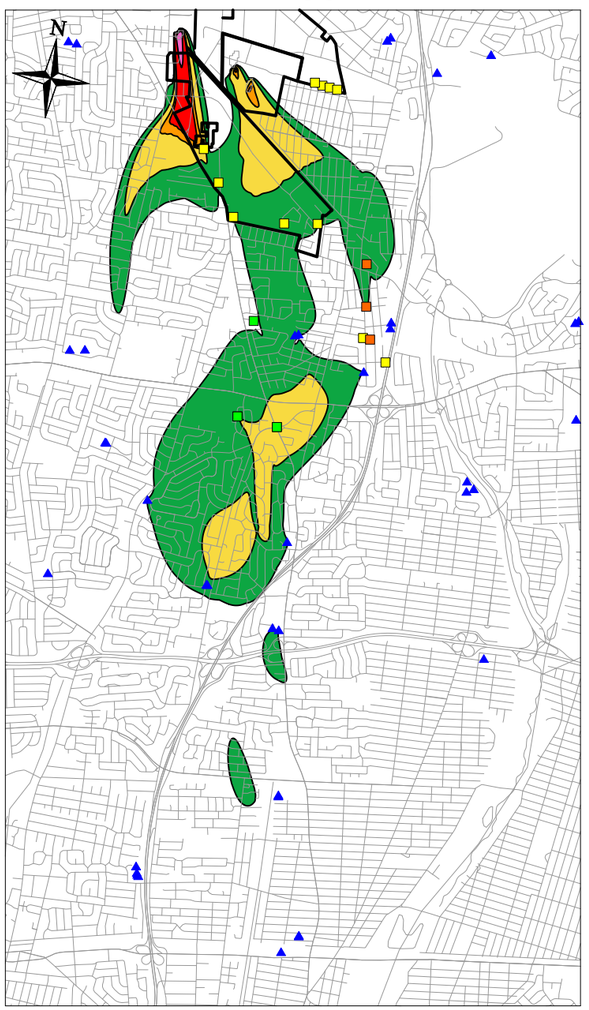
FIGURE 4.1-6









Plumes for each year represent maximum concentrations in layers 1 through 12.

LEGEND

- Site Outline
- Water Supply Well
- Remediation Well
- RW-21 Remedy Well
- RE-108 Remedy Well

*Pumping wells are also shown regardless of pumping status (wells that are not pumping are shown).

Scale in feet

0 5,000 10,000

TVOCs Concentration (μg/L)

5 50 500 1,000 5,000

Summary of Groundwater Pumping

Remediation (Total Pumping: 7,910 gpm)
- ONCT-OU2: 3,800 gpm
- OU3 BPGWCS: 210 gpm
- RW-21 System: 1,900 gpm
- GM-38: 600 gpm
- RE-108: 1,400 gpm

Total Water Supply
- 28,915 gpm

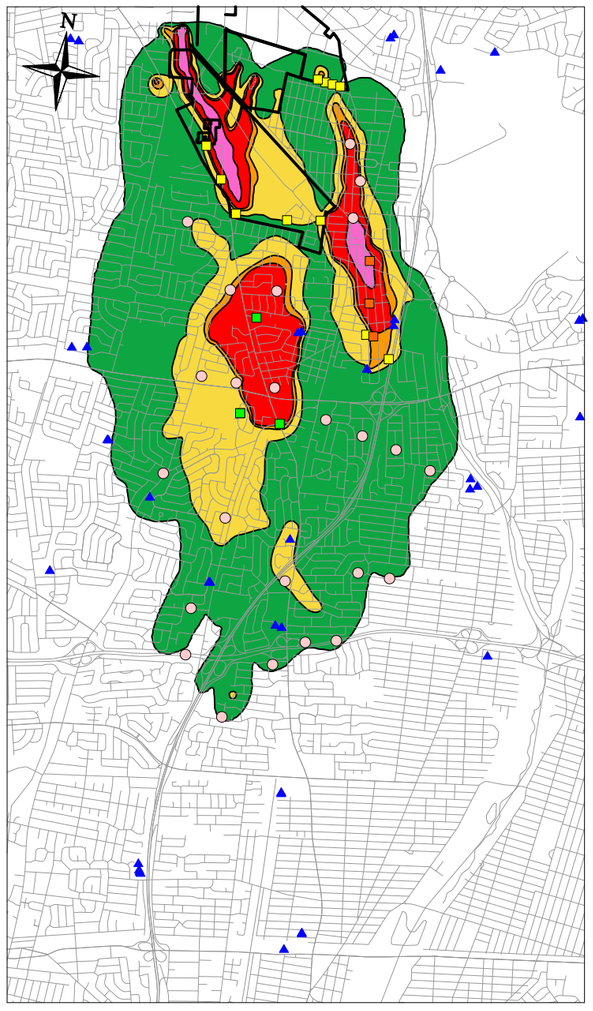
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

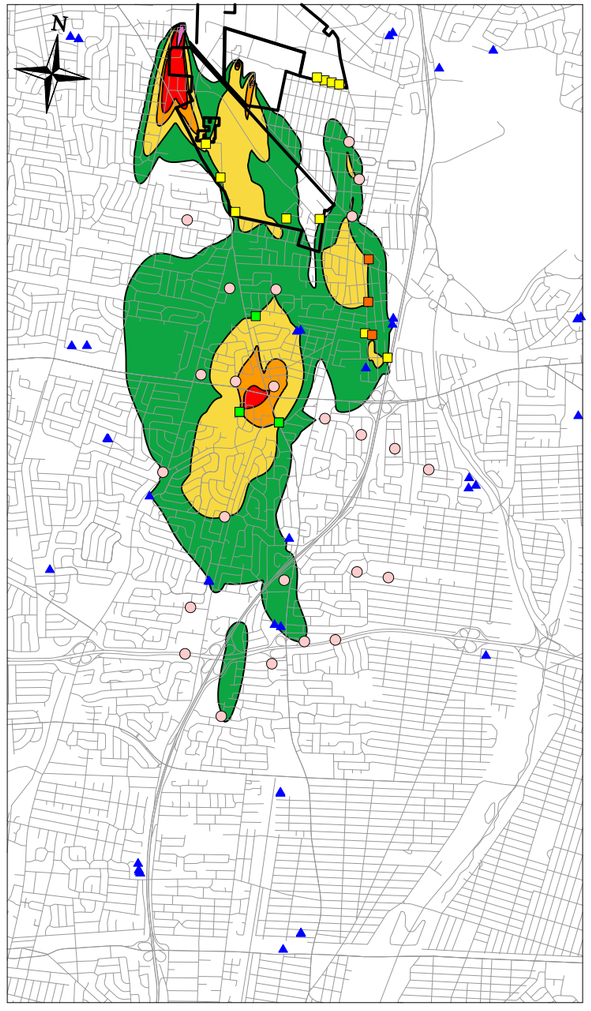
PAROD COMMENTS MODELING MEMORANDUM

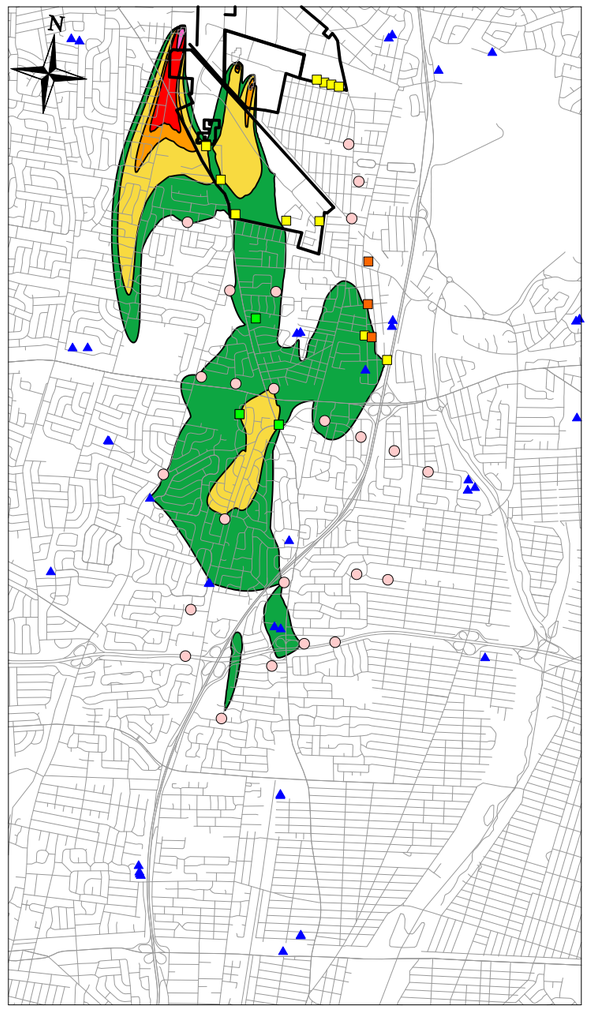
MODEL SIMULATED EXTENT OF TVOCS: NYSDEC SCENARIO 1

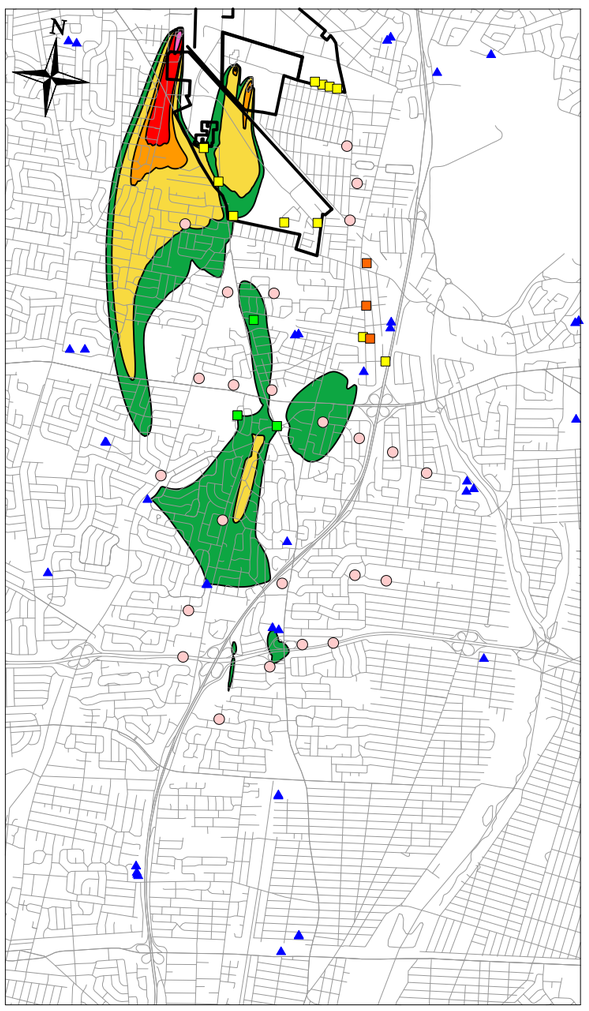
ARCADIS Design & Consultancy for natural and built assets

FIGURE 4.2-1









Plumes for each year represent maximum concentrations in layers 1 through 12.

LEGEND

- Site Outline
- Water Supply Well
- Remediation Well
- RW-21 Remedy Well
- RE-108 Remedy Well
- NYSDEC Remedy Well

*Pumping wells are also shown regardless of pumping status (wells that are not pumping are shown).

Scale in feet

0 5,000 10,000

TVOCs Concentration (μg/L)

5 50 500 1,000 5,000

Summary of Groundwater Pumping

Remediation (Total Pumping: 20,050 gpm)
- ONCT-OU2: 3,800 gpm
- OU3 BPGWCS: 210 gpm
- RW-21 System: 1,900 gpm
- GM-38: 600 gpm
- RE-108: 1,400 gpm
- NYSDEC 5B: 12,140 gpm

Total Water Supply
- 28,915 gpm

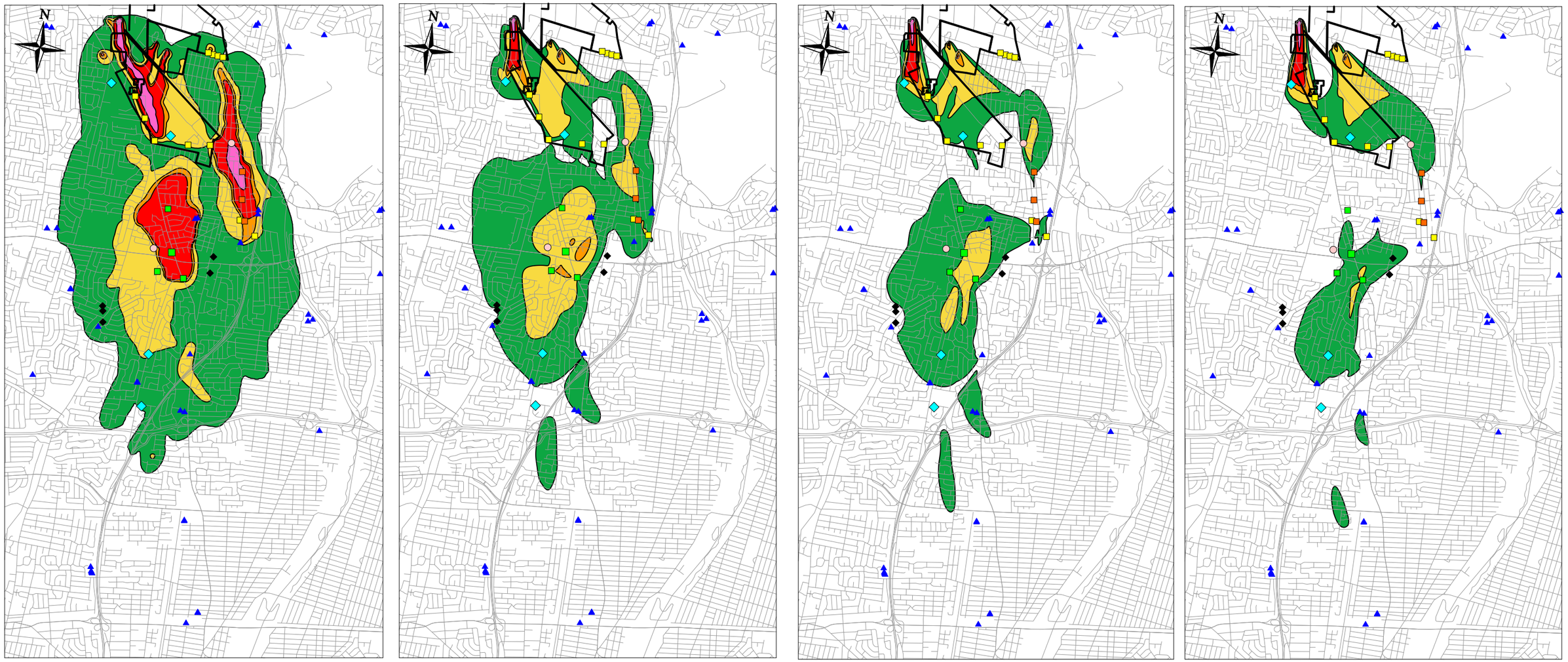
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

MODEL SIMULATED EXTENT OF TVOCS: NYSDEC SCENARIO 5B

ARCADIS Design & Consultancy for natural and built assets

FIGURE 4.2-2



Plumes for each year represent maximum concentrations in layers 1 through 12.

LEGEND

- Site Outline
- Water Supply Well
- Remediation Well
- RW-21 Remedy Well
- RE-108 Remedy Well
- NYSDEC Remedy Well
- IRA Remedy Well

*Pumping wells are also shown regardless of pumping status (wells that are not pumping are shown).

Scale in feet: 0 — 5,000 — 10,000

TVOCs Concentration (μg/L)

5 | 50 | 500 | 1,000 | 5,000

Summary of Groundwater Pumping

Remediation (Total Pumping: 11,410 gpm)
- ONCT-OU2: 3,800 gpm
- OU3 BPGWCS: 210 gpm
- RW-21 System: 1,900 gpm
- GM-38: 600 gpm
- RE-108: 1,400 gpm
- IRA: 3,500 gpm

Total Water Supply
- 28,915 gpm

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

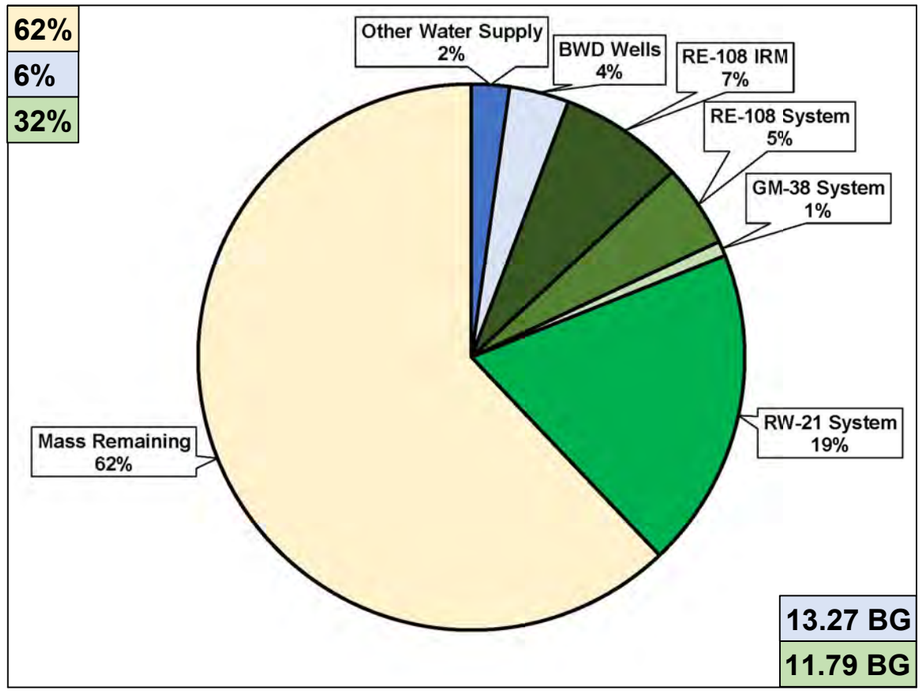
PAROD COMMENTS MODELING MEMORANDUM

MODEL SIMULATED EXTENT OF TVOCS: IRA

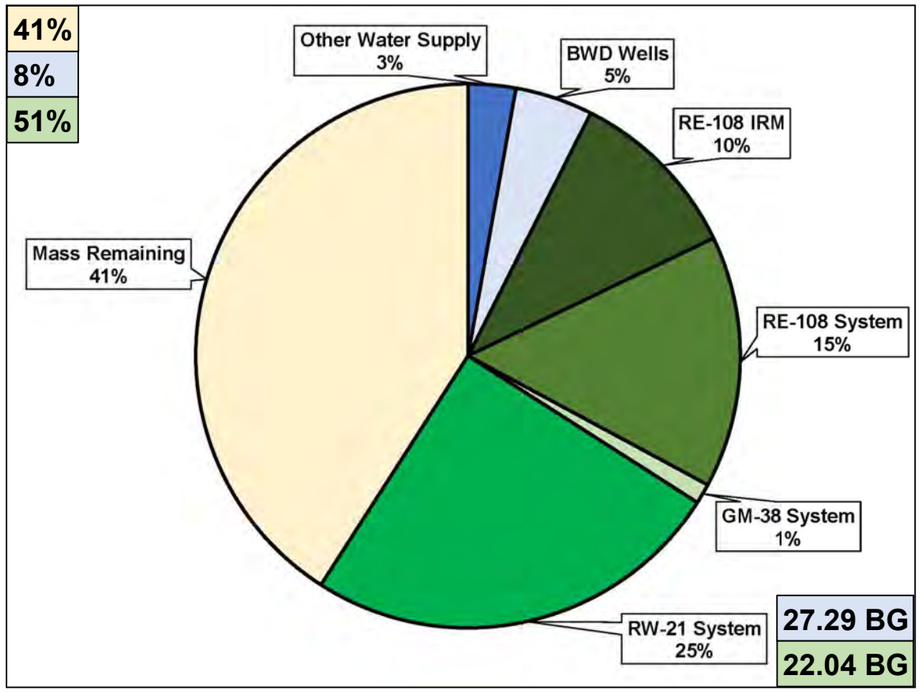
ARCADIS Design & Consultancy for natural and built assets

FIGURE 4.2-3

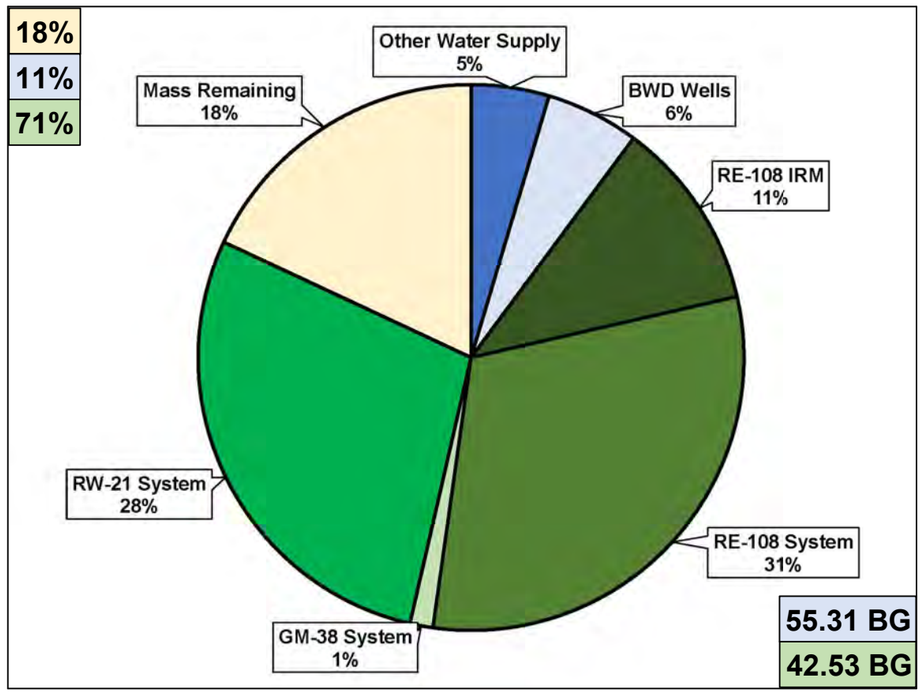
Year 5



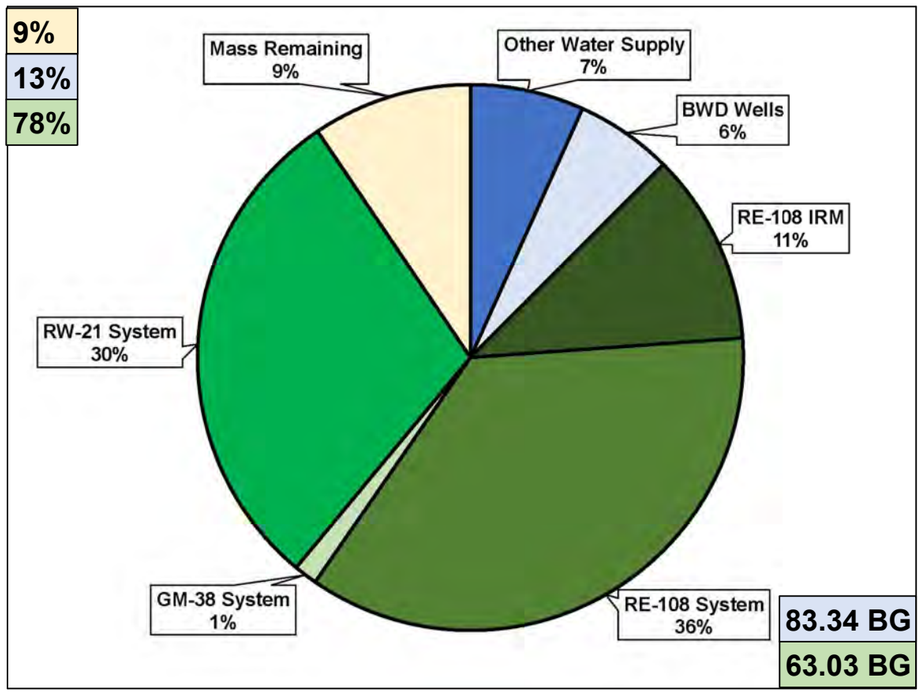
Year 10



Year 20



Year 30



Legend

88%	Percent Mass Remaining
11%	Percent Mass Removed by Water Supply Wells
1%	Percent Mass Removed by Remediation Wells

26.50 BG	Total Pumping by Water Supply Wells
5.26 BG	Total Off-Site Pumping by Remediation Wells

Notes

1. BG = Billion gallons
2. Time zero = January 1, 2019

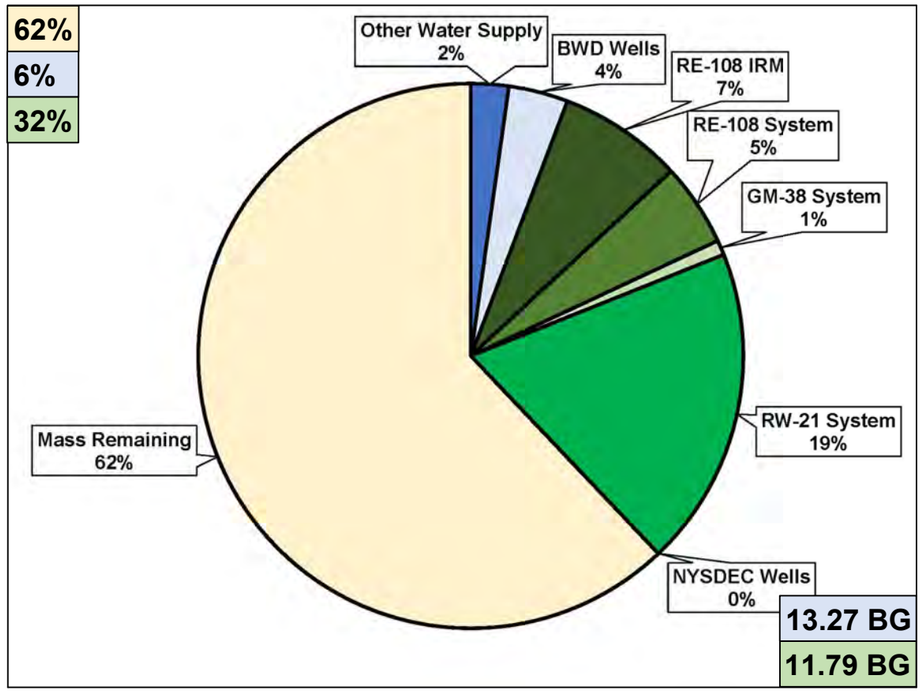
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
PAROD COMMENTS MODELING MEMORANDUM

TVOC OFF-SITE MASS REMOVAL AFTER 5, 10, 20, AND 30 YEARS OF SIMULATION: NYSDEC SCENARIO 1

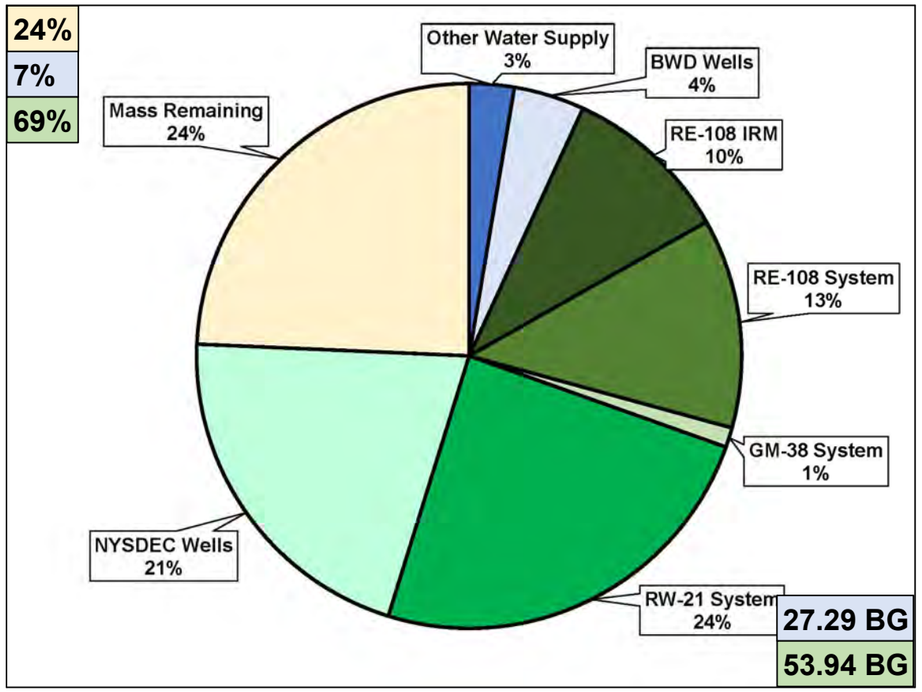
ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-4

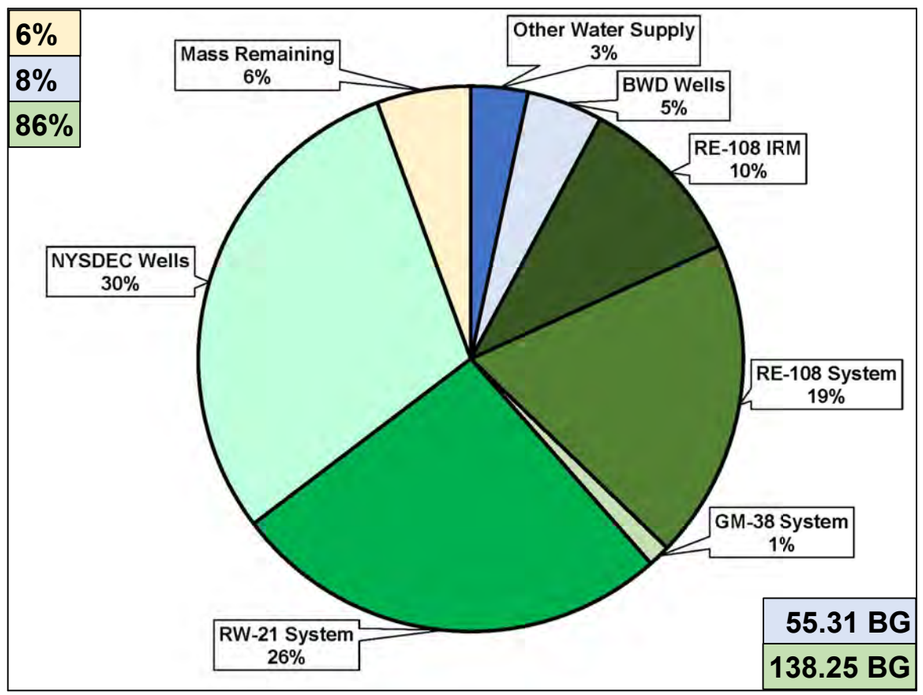
Year 5



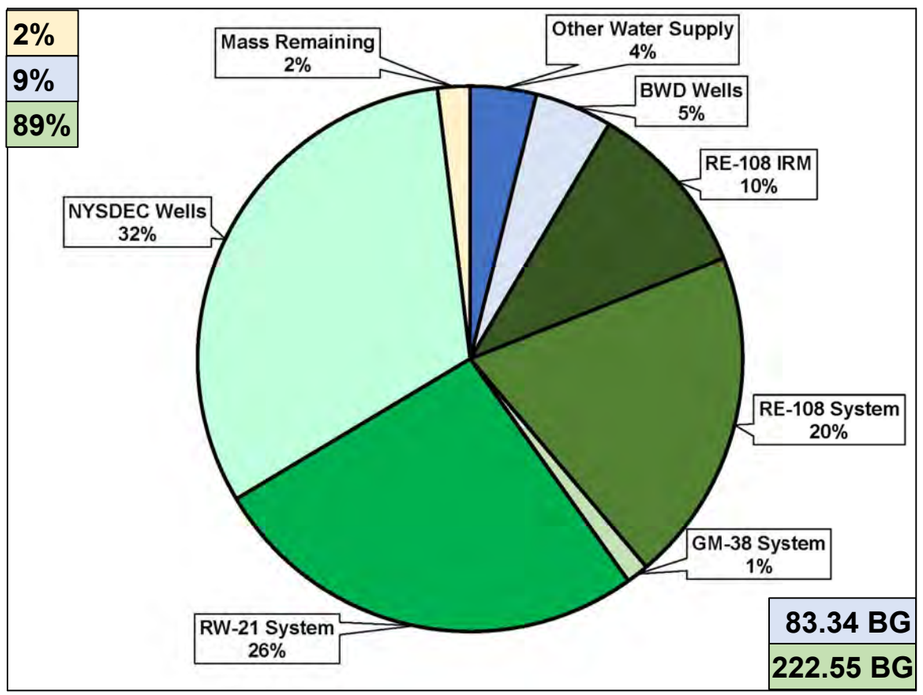
Year 10



Year 20



Year 30



Legend

88%	Percent Mass Remaining
11%	Percent Mass Removed by Water Supply Wells
1%	Percent Mass Removed by Remediation Wells

26.50 BG	Total Pumping by Water Supply Wells
5.26 BG	Total Off-Site Pumping by Remediation Wells

Notes

1. BG = Billion gallons
2. Time zero = January 1, 2019

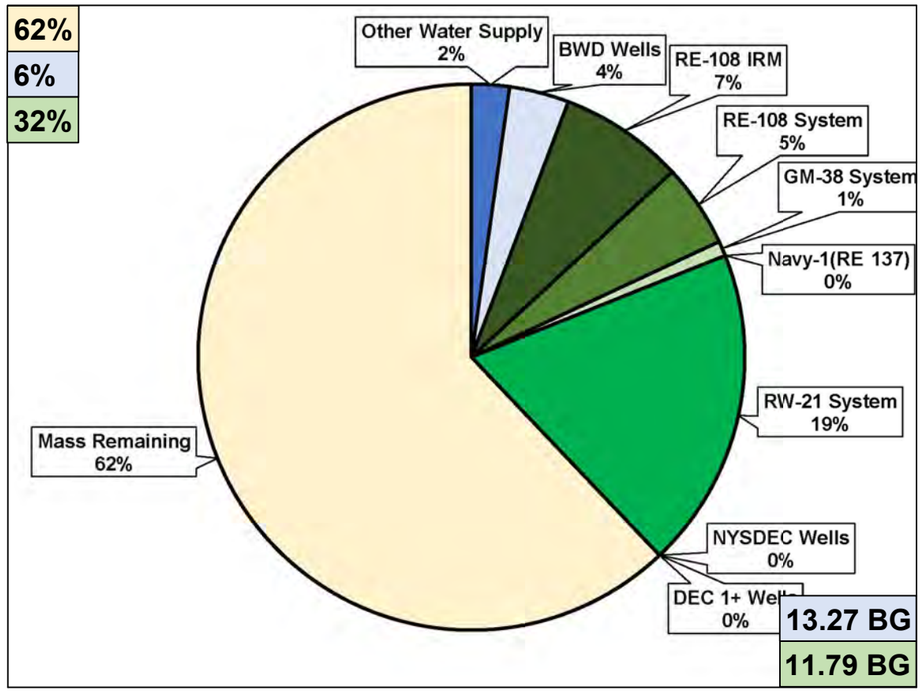
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
PAROD COMMENTS MODELING MEMORANDUM

TVOC OFF-SITE MASS REMOVAL AFTER 5, 10, 20, AND 30 YEARS OF SIMULATION: NYSDEC SCENARIO 5B

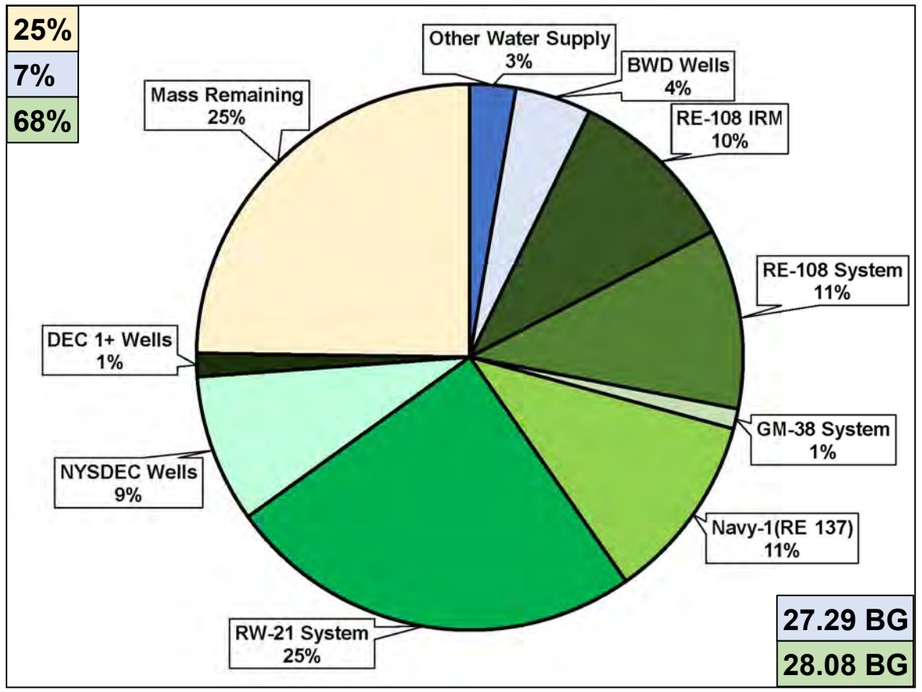
ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-5

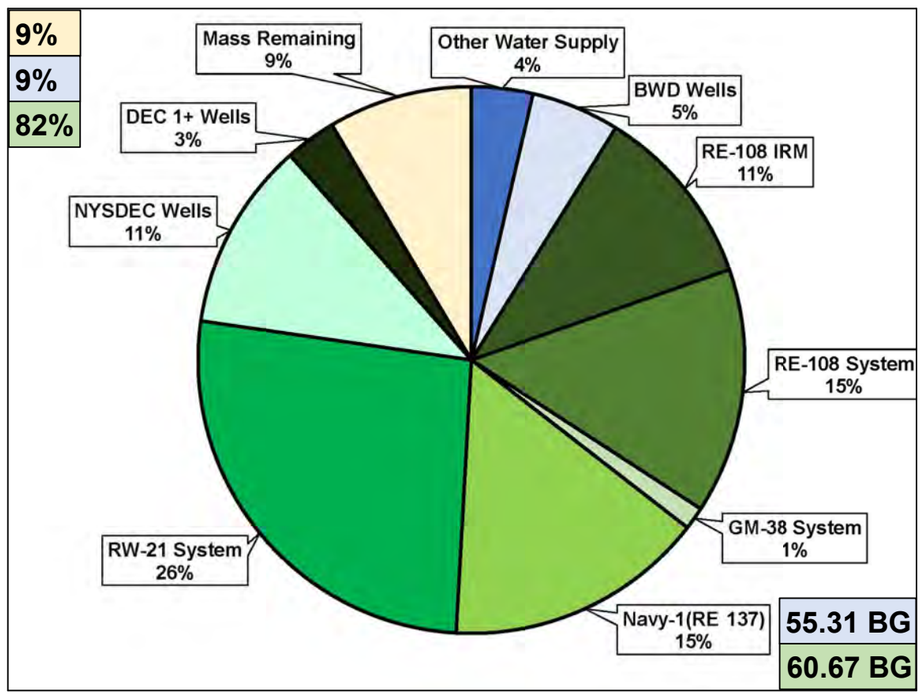
Year 5



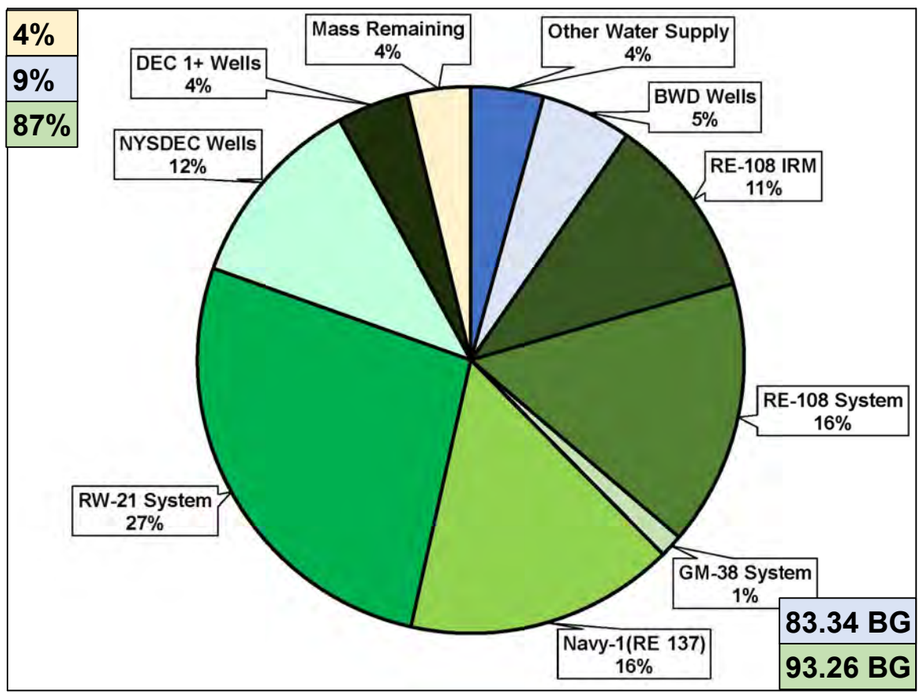
Year 10



Year 20



Year 30



Legend

88%	Percent Mass Remaining
11%	Percent Mass Removed by Water Supply Wells
1%	Percent Mass Removed by Remediation Wells

26.50 BG	Total Pumping by Water Supply Wells
5.26 BG	Total Off-Site Pumping by Remediation Wells

Notes

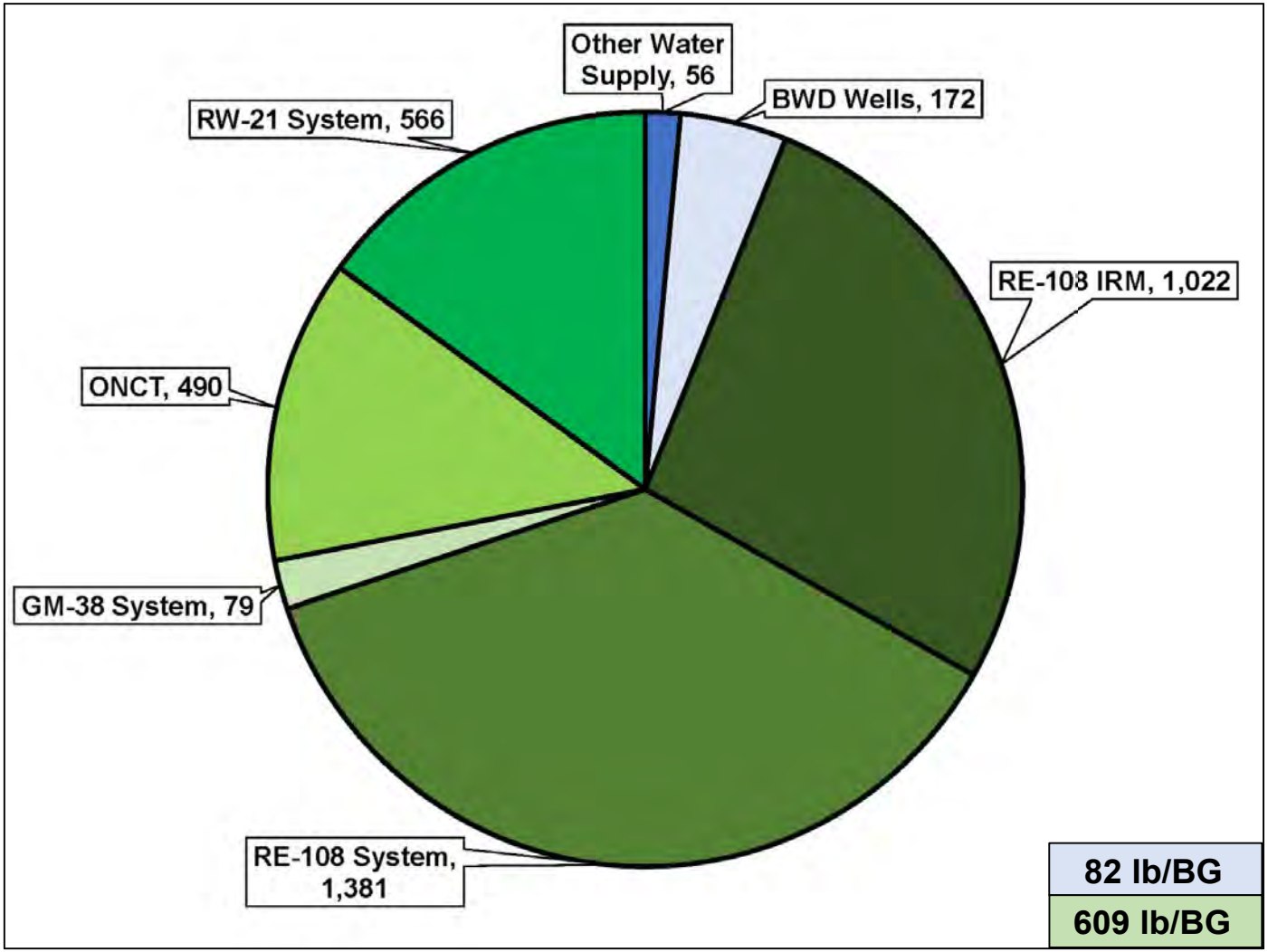
1. BG = Billion gallons
2. Time zero = January 1, 2019

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
PAROD COMMENTS MODELING MEMORANDUM

TVOC OFF-SITE MASS REMOVAL AFTER 5, 10, 20, AND 30 YEARS OF SIMULATION: IRA

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-6



NYSDEC Scenario 1

Legend

82 lb/BG — Pounds of TVOC Removed Per Billion Gallons of Water Pumped by Water Supply Wells

609 lb/BG — Pounds of TVOC Removed Per Billion Gallons of Water Pumped by ROD Required Remediation Wells

Notes

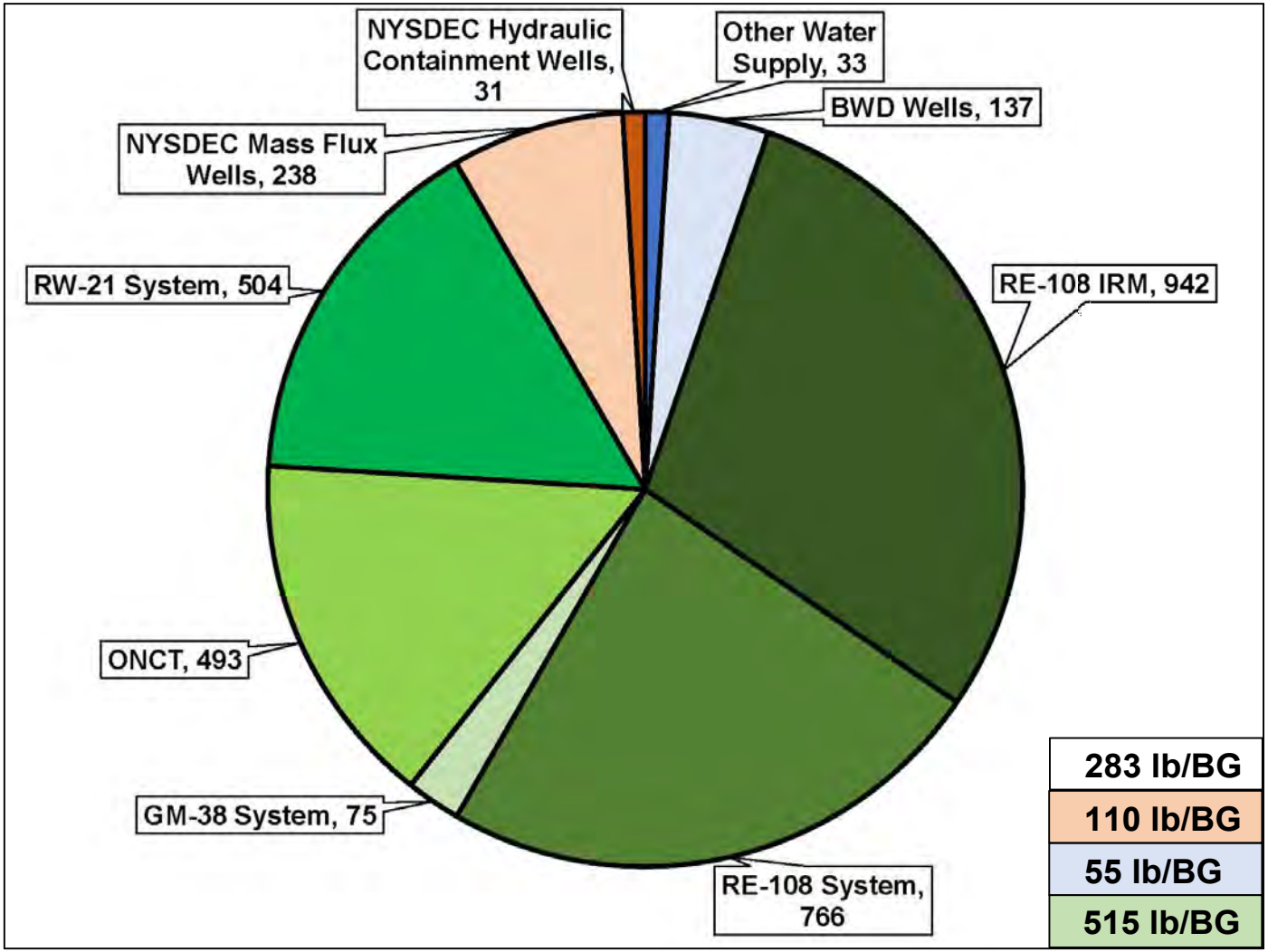
1. lb/BG = Pounds per Billion gallons
2. Time zero = January 1, 2019
3. Pounds of TVOC Removed Per Billion Gallons of Water Pumped was calculated by dividing the total mass removed over 30 years of simulation by the total amount of water pumped over 30 years of simulation.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
PAROD RESPONSE MODELING MEMORANDUM

REMEDIATION EFFICIENCY - POUNDS OF TVOC MASS REMOVED PER BILLION GALLONS OF WATER PUMPED AFTER 30 YEARS OF SIMULATION: NYSDEC SCENARIO 1

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-7



NYSDEC Scenario 5B

Legend

283 lb/BG	Pounds of TVOC Removed Per Billion Gallons of Water Pumped by Remediation Wells
110 lb/BG	Pounds of TVOC Removed Per Billion Gallons of Water Pumped by NYSDEC 5B Remediation Wells
55 lb/BG	Pounds of TVOC Removed Per Billion Gallons of Water Pumped by Water Supply Wells
515 lb/BG	Pounds of TVOC Removed Per Billion Gallons of Water Pumped by ROD Required Remediation Wells

Notes

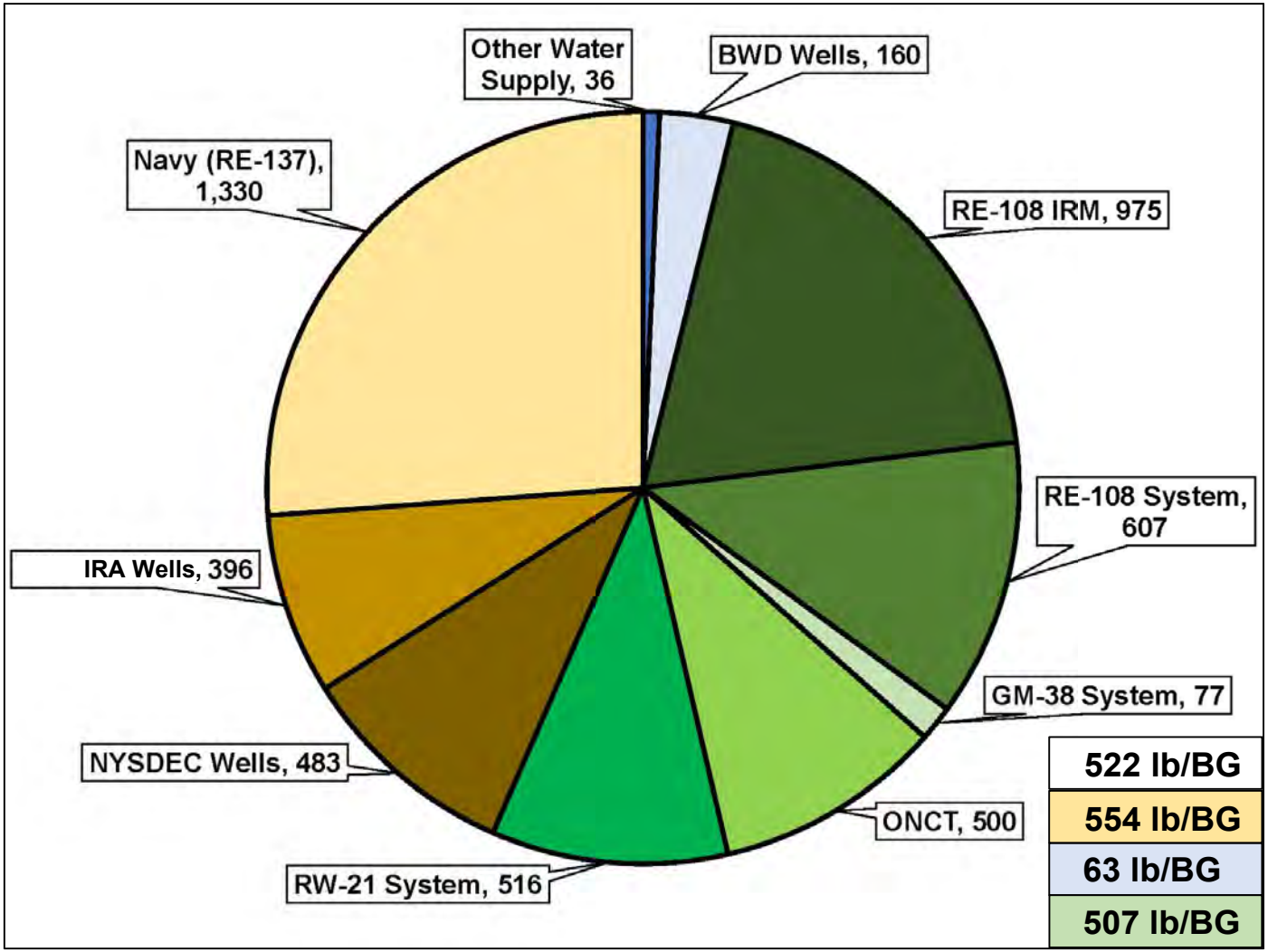
1. lb/BG = Pounds per Billion gallons
2. Time zero = January 1, 2019
3. Pounds of TVOC Removed Per Billion Gallons of Water Pumped was calculated by dividing the total mass removed over 30 years of simulation by the total amount of water pumped over 30 years of simulation.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
PAROD COMMENTS MODELING MEMORANDUM

REMEDIATION EFFICIENCY - POUNDS OF TVOC MASS REMOVED PER BILLION GALLONS OF WATER PUMPED AFTER 30 YEARS OF SIMULATION: NYSDEC SCENARIO 5B

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-8



IRA

Legend

522 lb/BG	Pounds of TVOC Removed Per Billion Gallons of Water Pumped by Remediation Wells
554 lb/BG	Pounds of TVOC Removed Per Billion Gallons of Water Pumped by IRA Remediation Wells
63 lb/BG	Pounds of TVOC Removed Per Billion Gallons of Water Pumped by Water Supply Wells
507 lb/BG	Pounds of TVOC Removed Per Billion Gallons of Water Pumped by ROD Required Remediation Wells

Notes

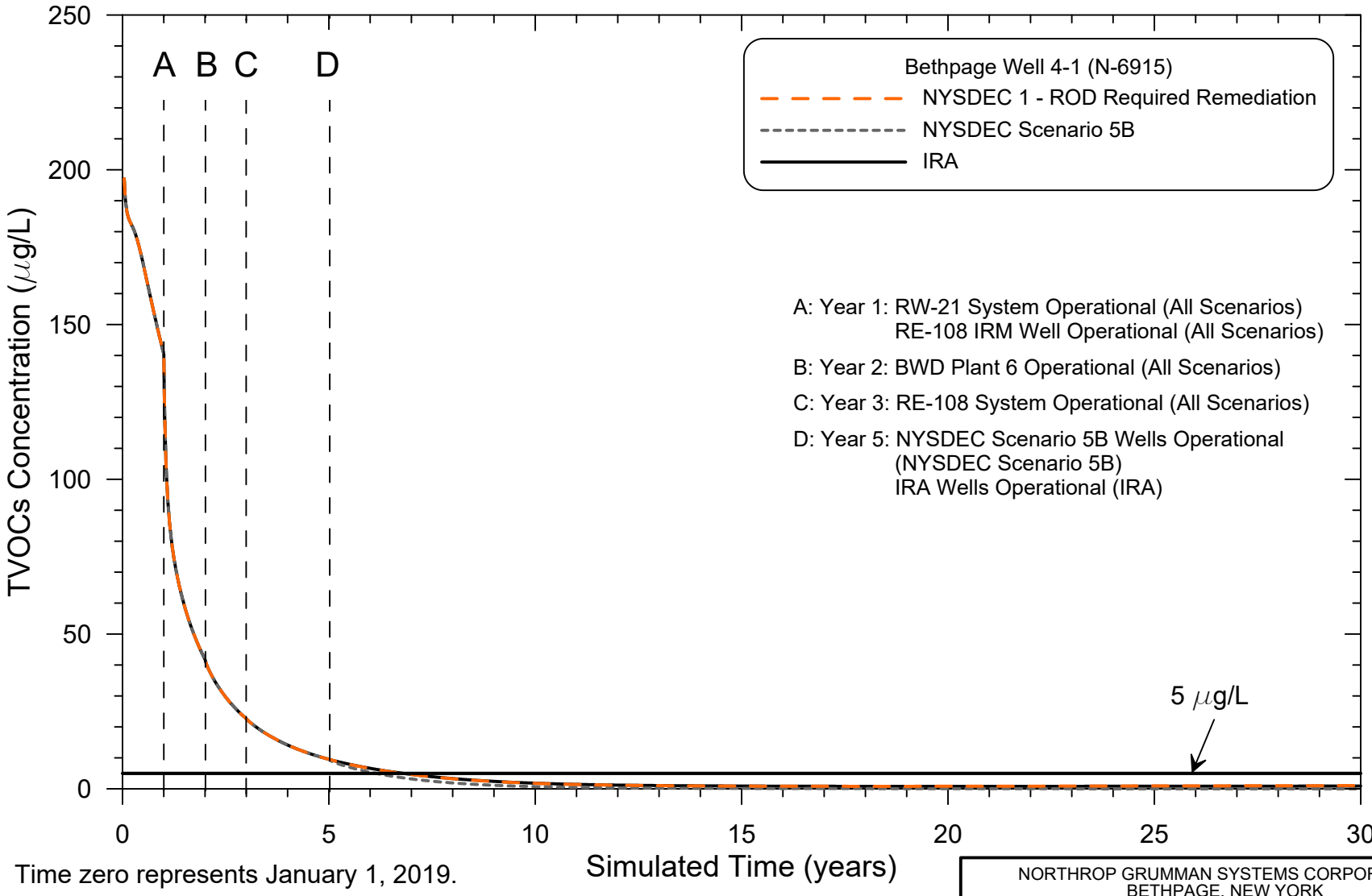
1. lb/BG = Pounds per Billion gallons
2. Time zero = January 1, 2019
3. Pounds of TVOC Removed Per Billion Gallons of Water Pumped was calculated by dividing the total mass removed over 30 years of simulation by the total amount of water pumped over 30 years of simulation.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
PAROD COMMENTS MODELING MEMORANDUM

REMEDIATION EFFICIENCY - POUNDS OF TVOC MASS REMOVED PER BILLION GALLONS OF WATER PUMPED AFTER 30 YEARS OF SIMULATION: IRA

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-9



Time zero represents January 1, 2019.

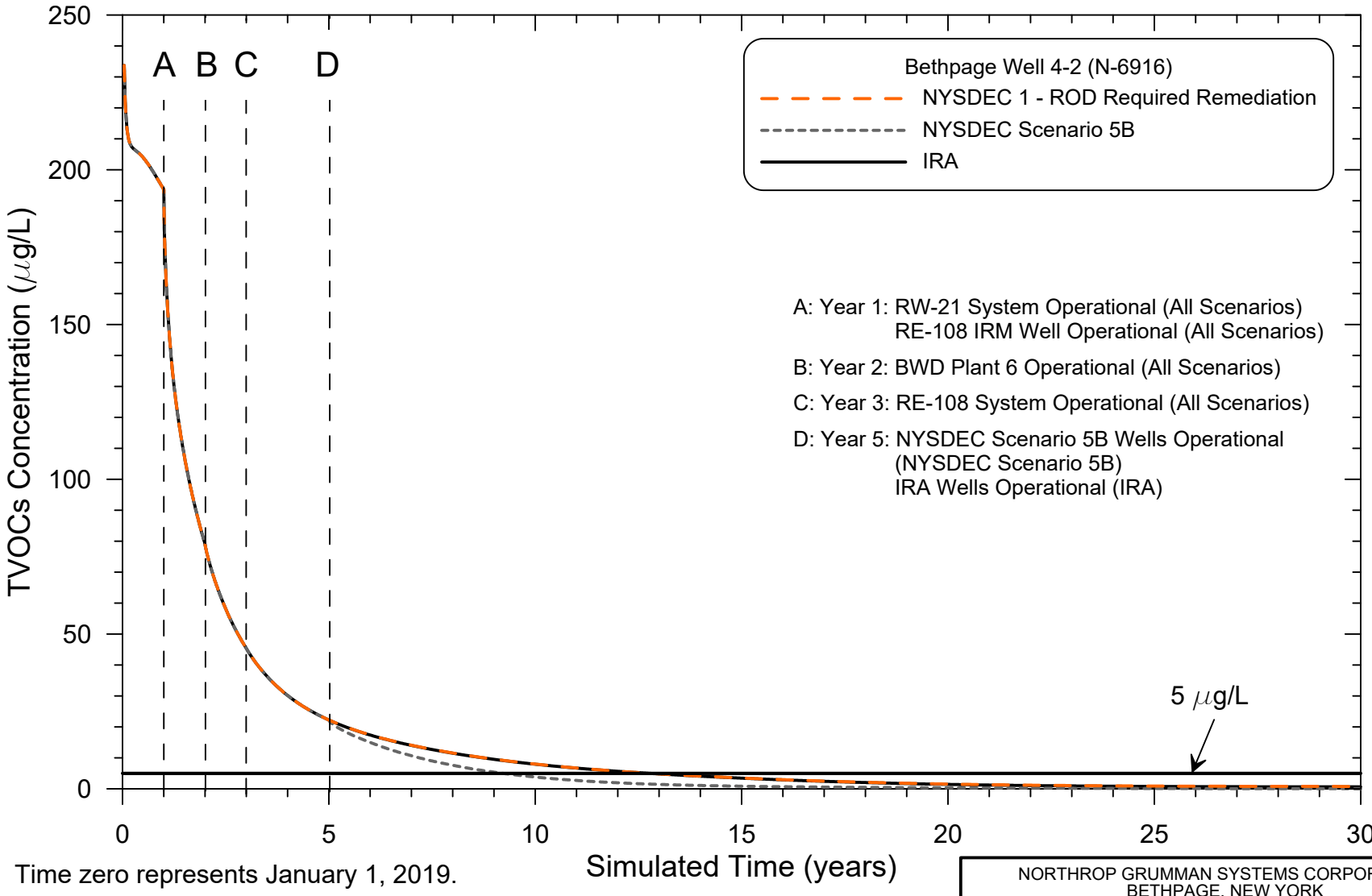
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
BETHPAGE WELL 4-1 (N-6915)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-10



Time zero represents January 1, 2019.

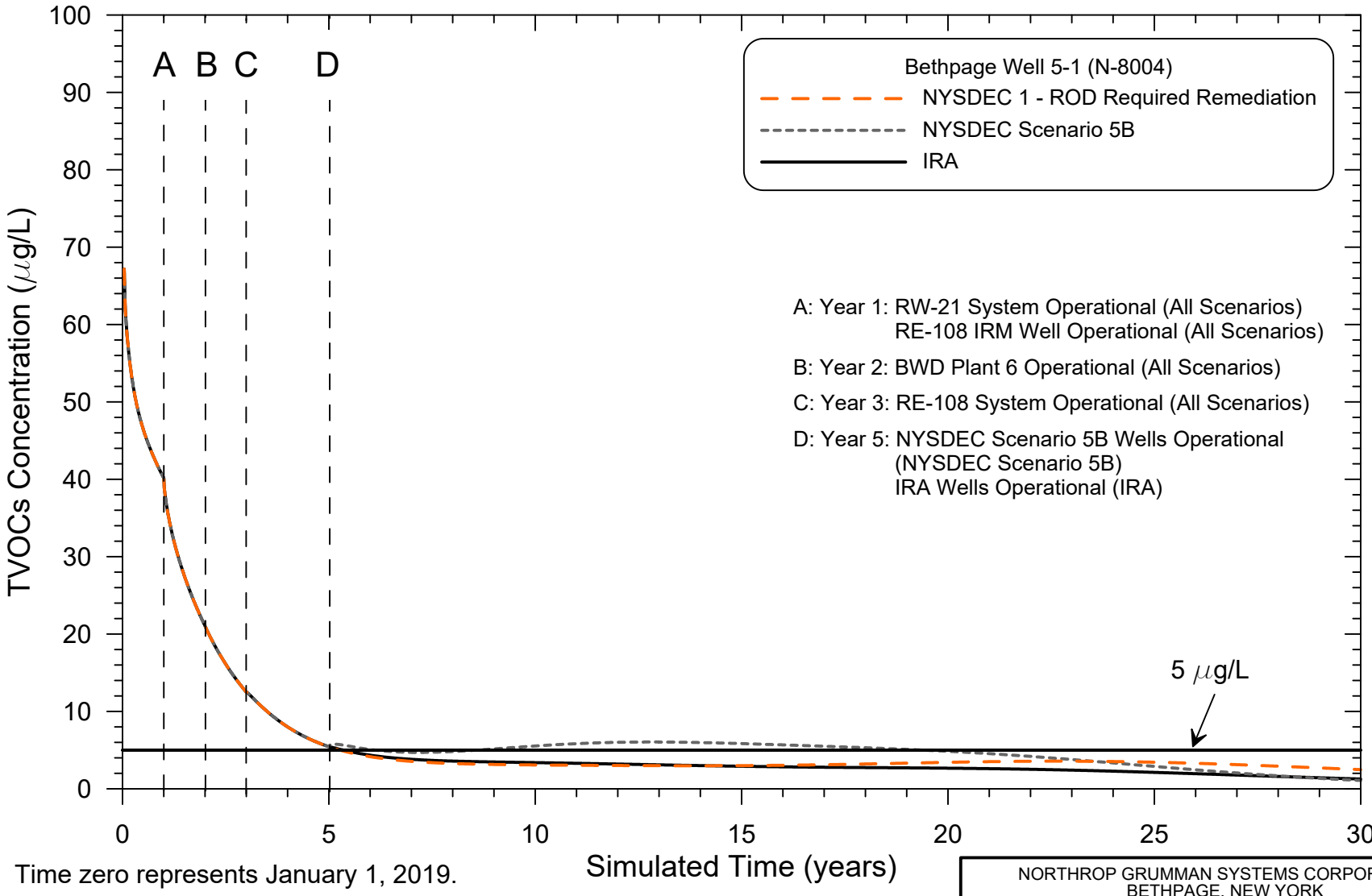
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
BETHPAGE WELL 4-2 (N-6916)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-11



Time zero represents January 1, 2019.

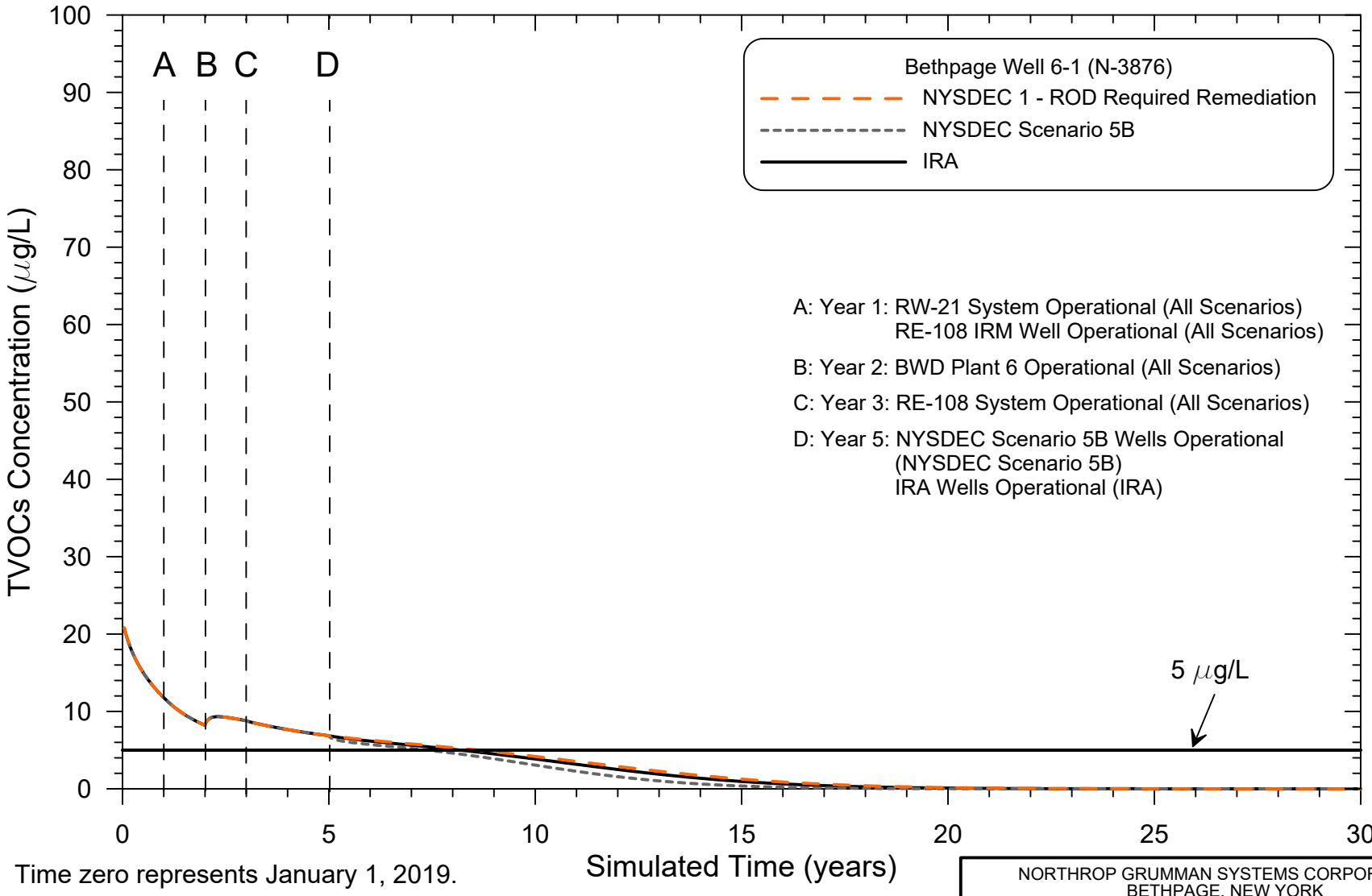
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION BETHPAGE WELL 5-1 (N-8004)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-12



Time zero represents January 1, 2019.

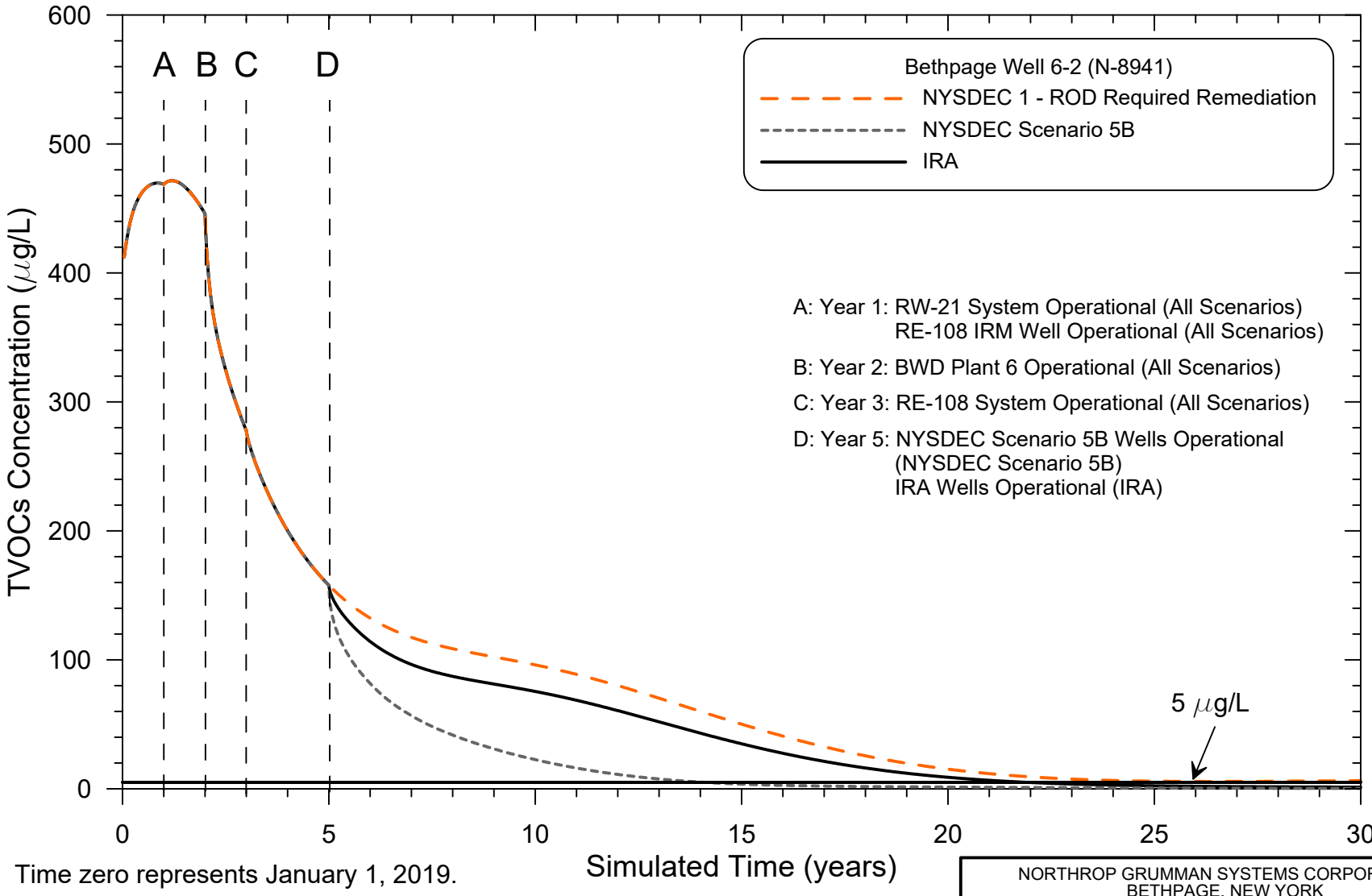
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION BETHPAGE WELL 6-1 (N-3876)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-13



Time zero represents January 1, 2019.

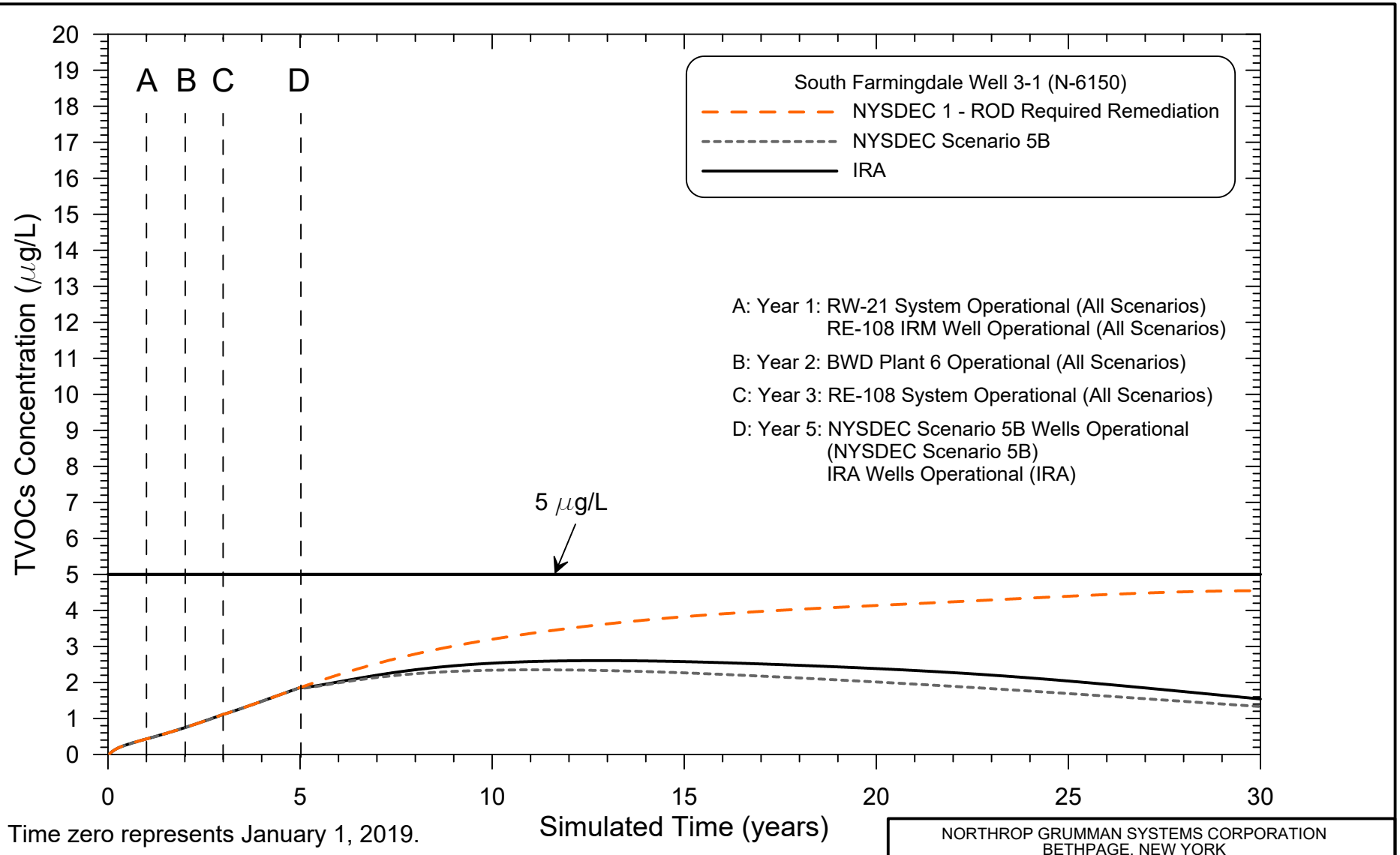
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
BETHPAGE WELL 6-2 (N-8941)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-14



Time zero represents January 1, 2019.

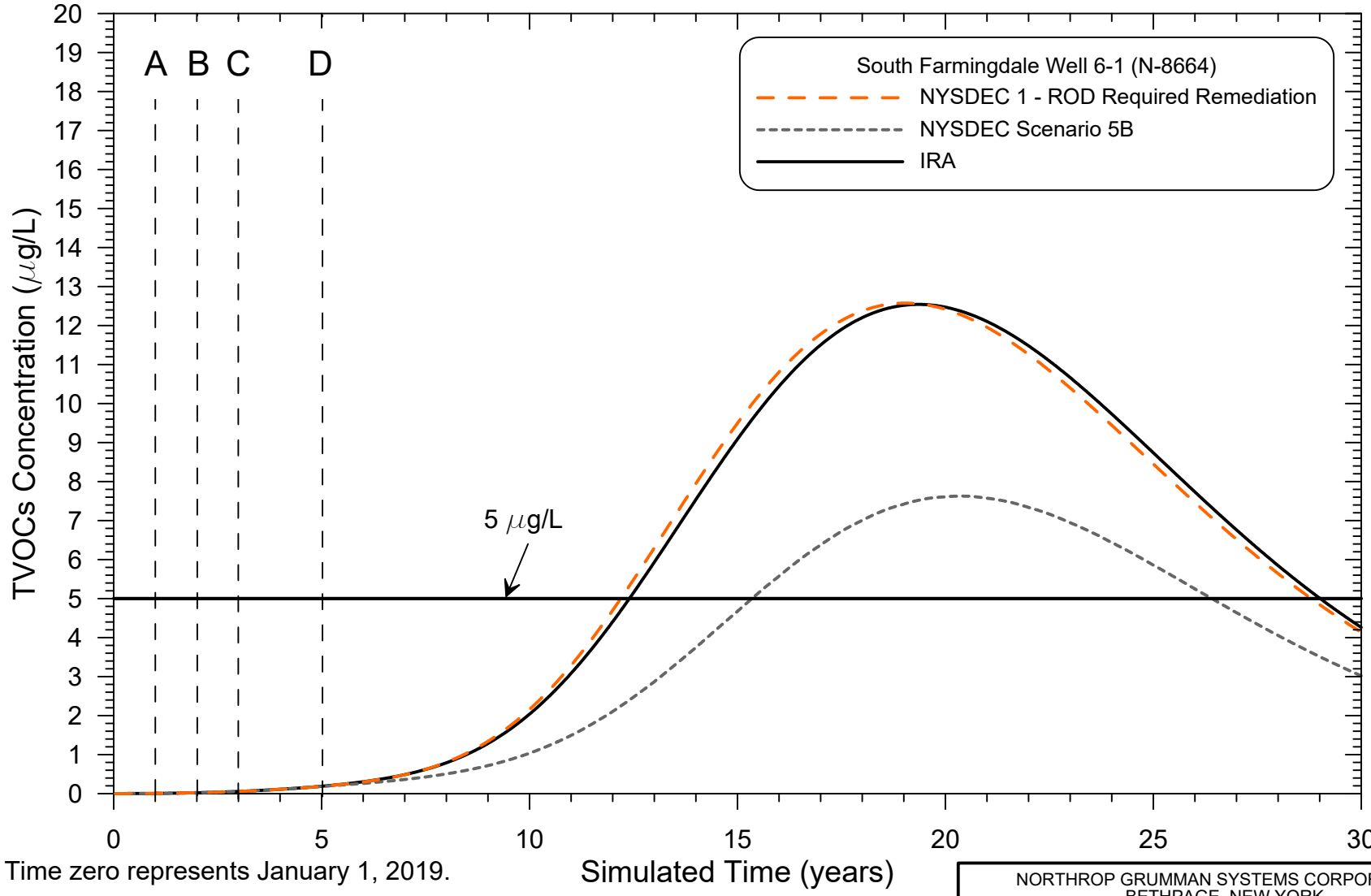
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION SOUTH FARMINGDALE WELL 3-1 (N-6150)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-15



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

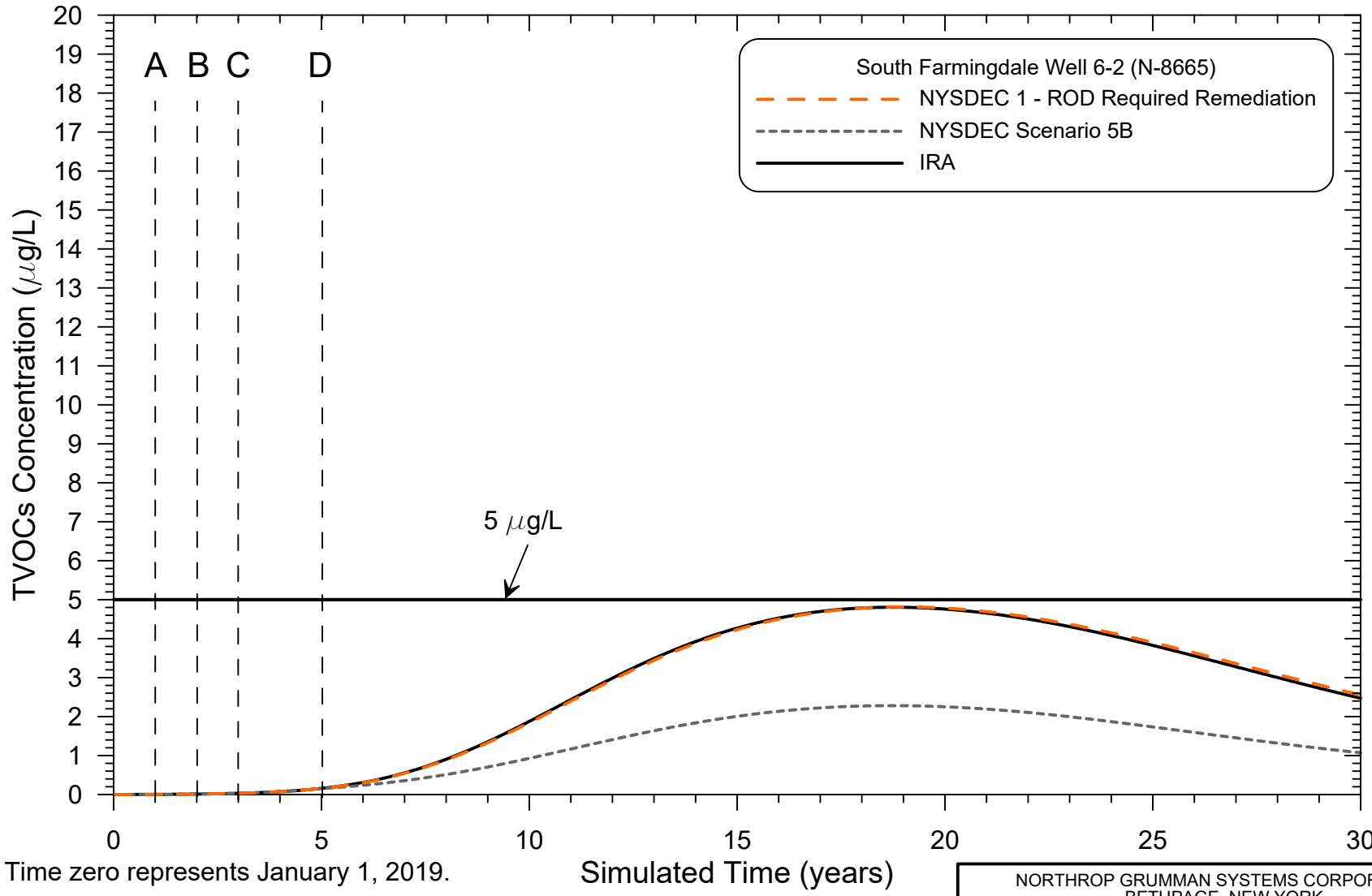
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION SOUTH FARMINGDALE WELL 6-1 (N-8664)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-16



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

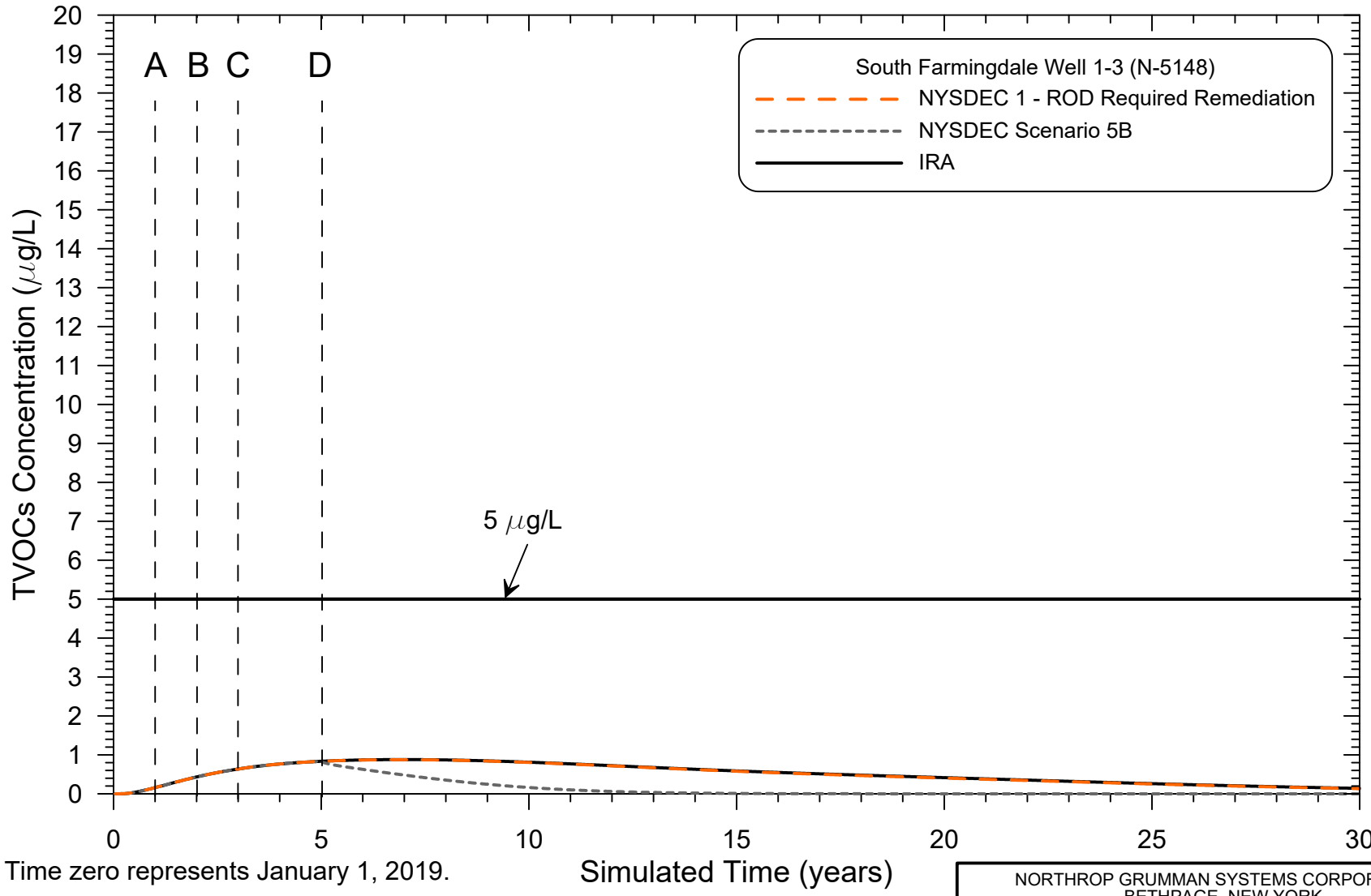
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION SOUTH FARMINGDALE WELL 6-2 (N-8665)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-17



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

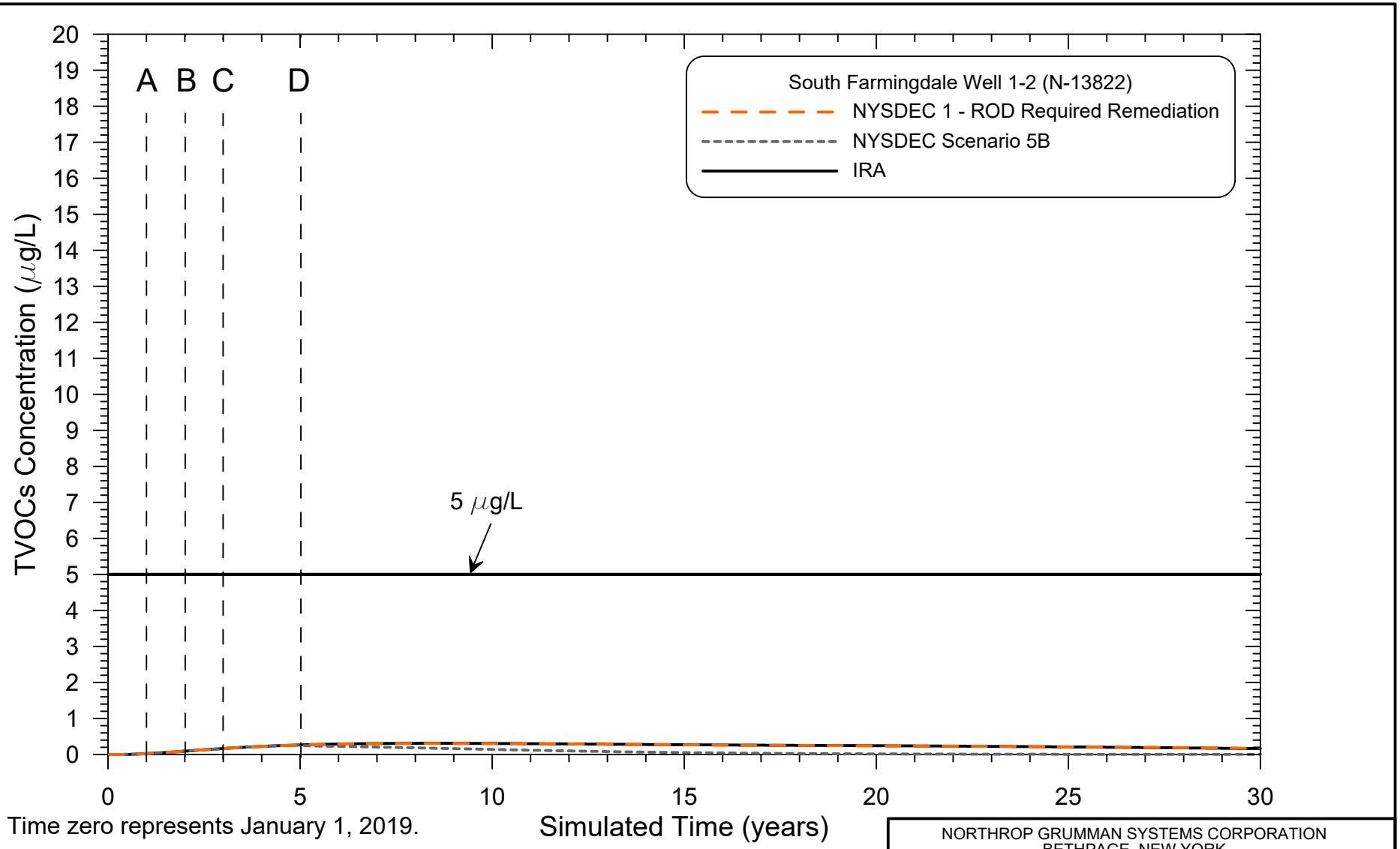
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION SOUTH FARMINGDALE WELL 1-3 (N-5148)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-18



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

NORTHROP GRUMMAN SYSTEMS CORPORATION
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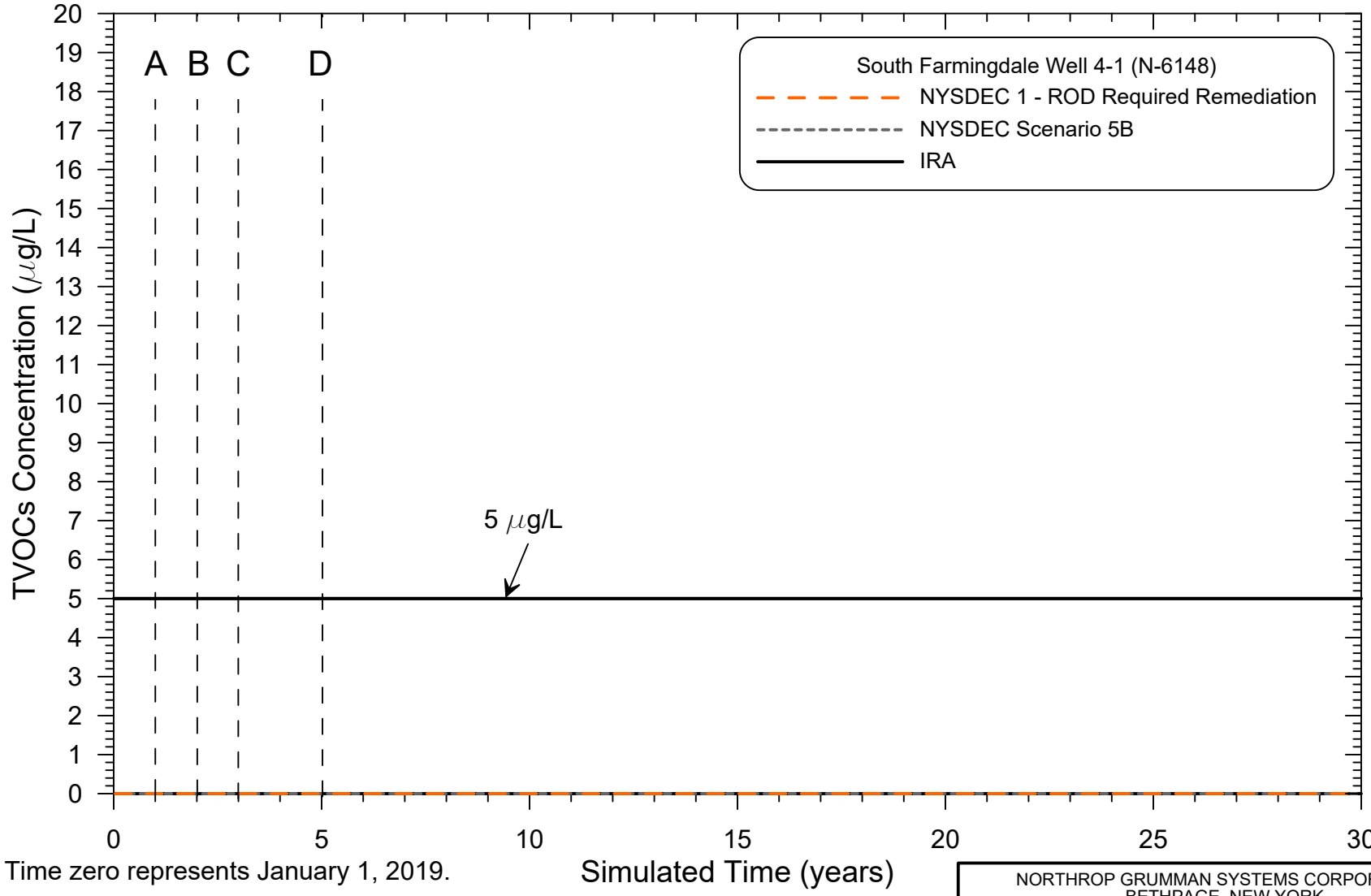
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION SOUTH FARMINGDALE WELL 1-2 (N-13822)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-19



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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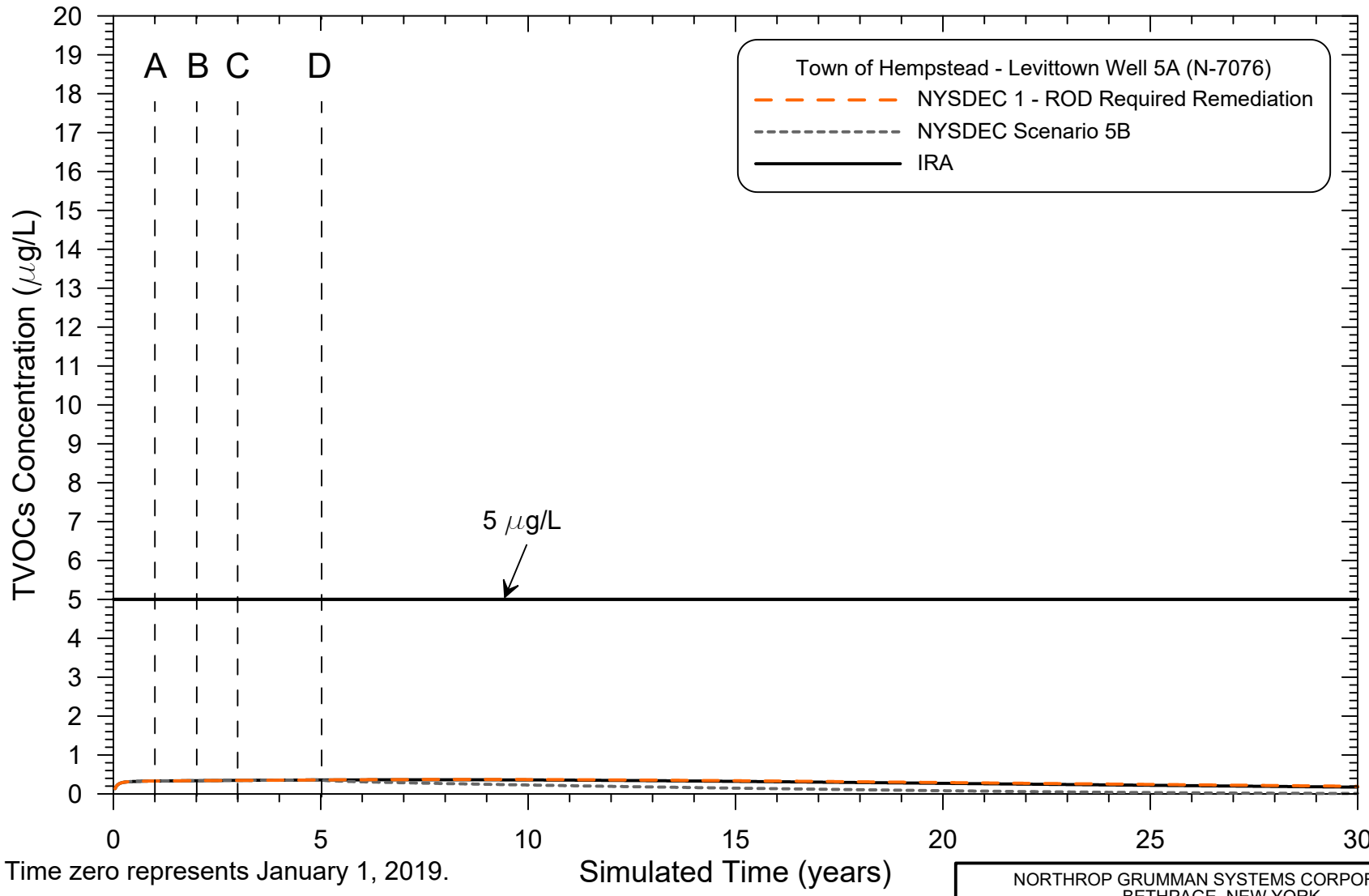
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION SOUTH FARMINGDALE WELL 4-1 (N-6148)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-20



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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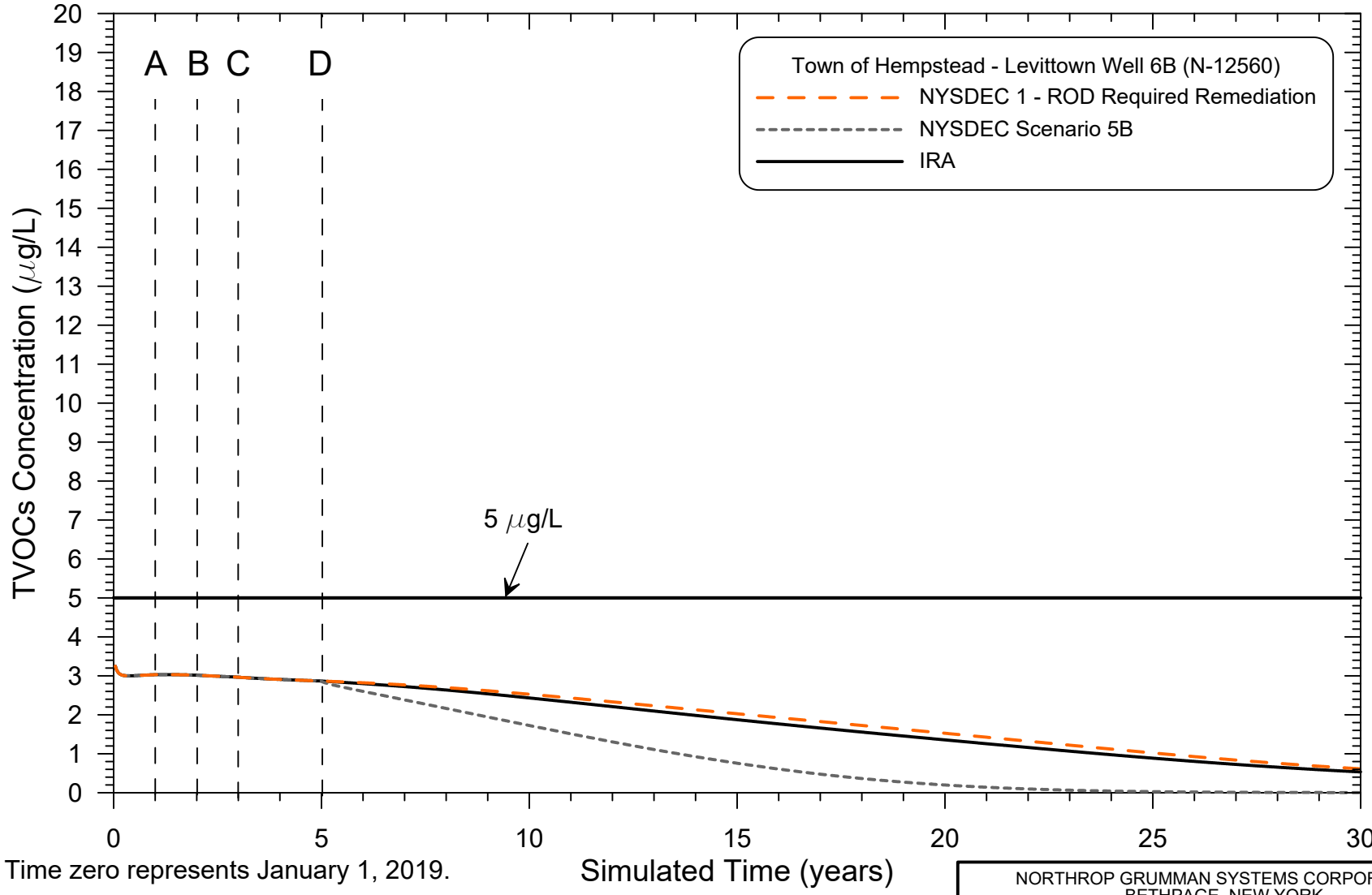
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION TOWN OF HEMPSTEAD - LEVITTOWN WELL 5A (N-7076)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-21



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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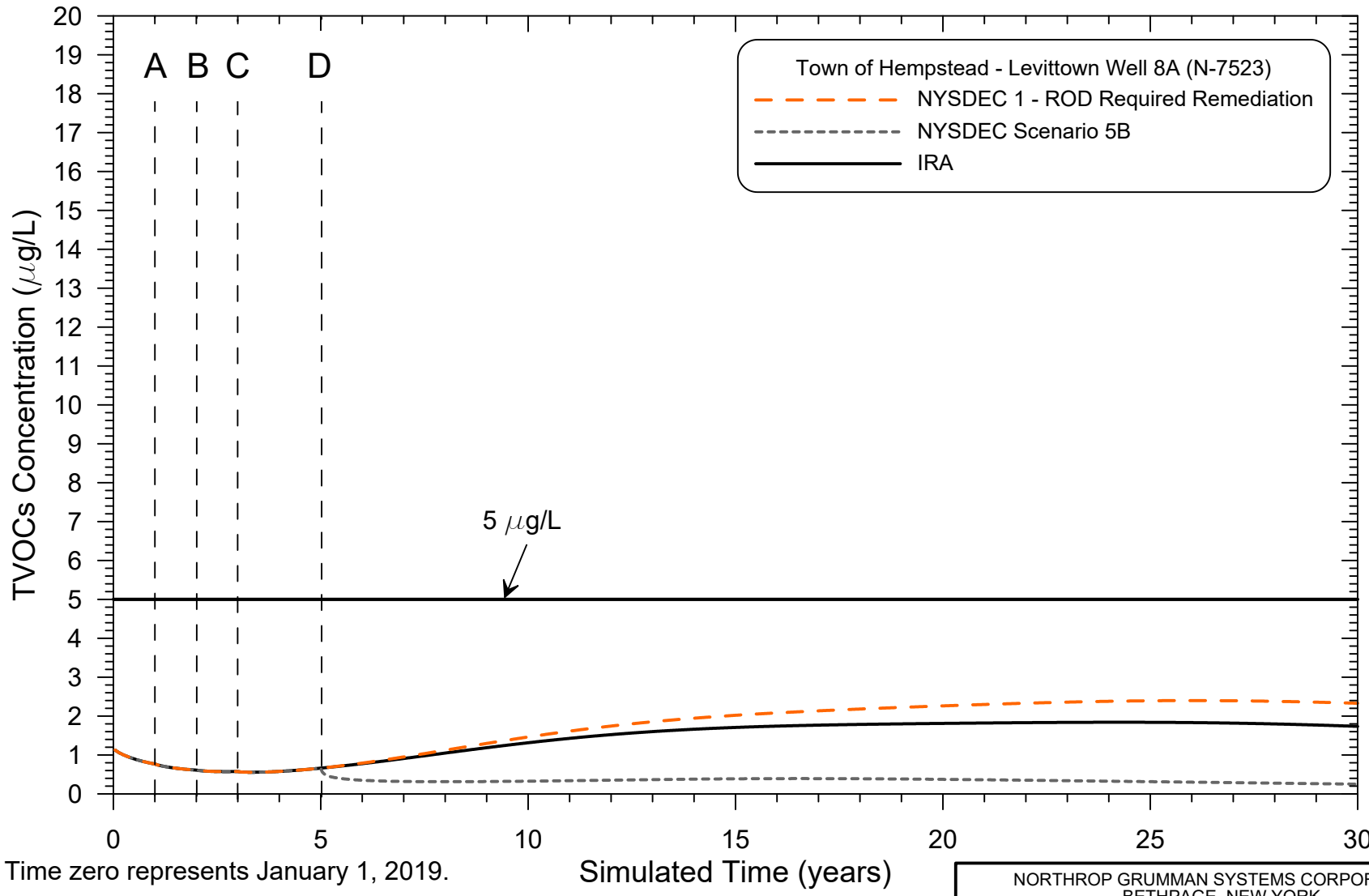
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION TOWN OF HEMPSTEAD - LEVITTOWN WELL 6B (N-12560)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-22



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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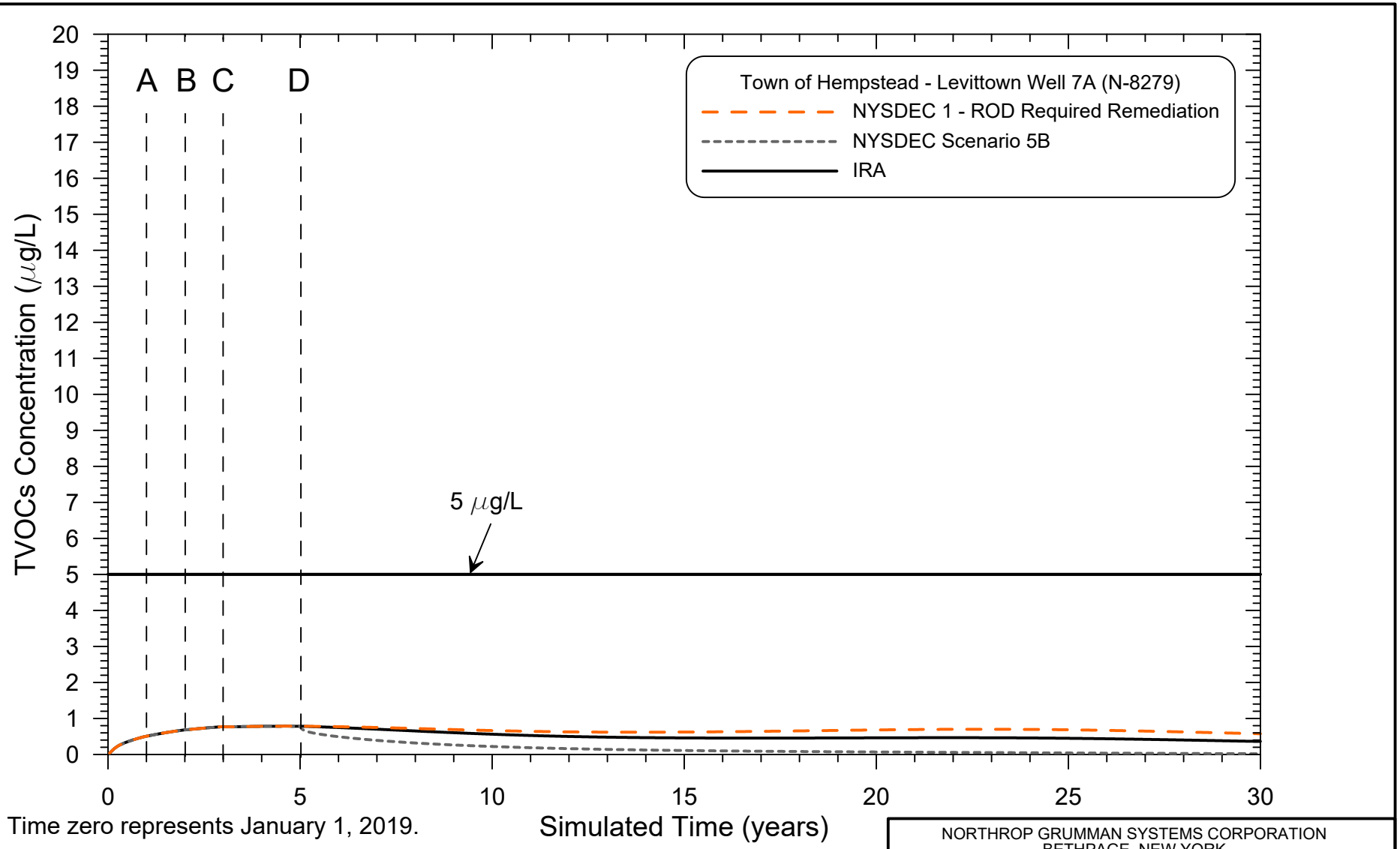
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION TOWN OF HEMPSTEAD - LEVITTOWN WELL 8A (N-7523)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-23



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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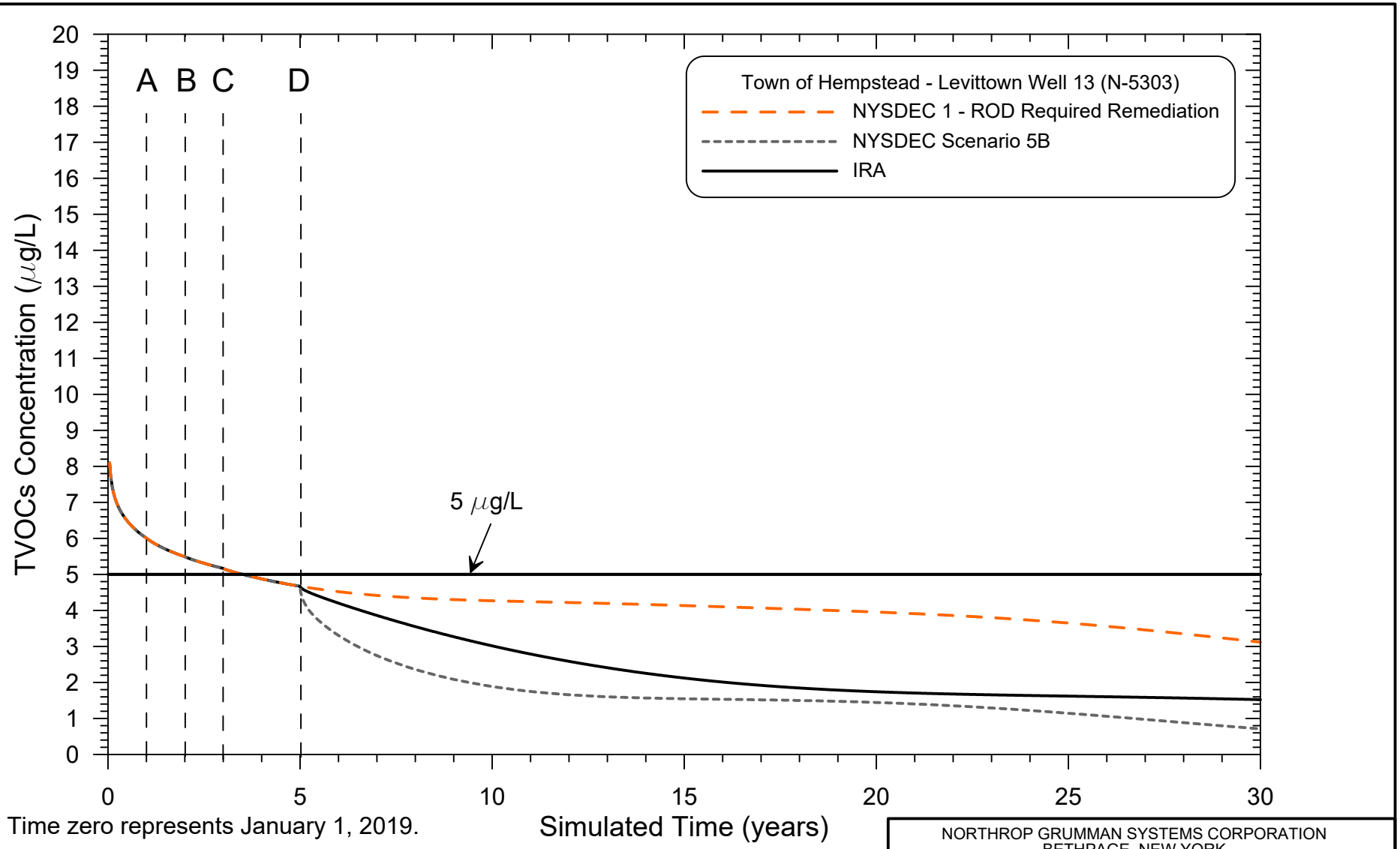
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION TOWN OF HEMPSTEAD - LEVITTOWN WELL 7A (N-8279)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-24



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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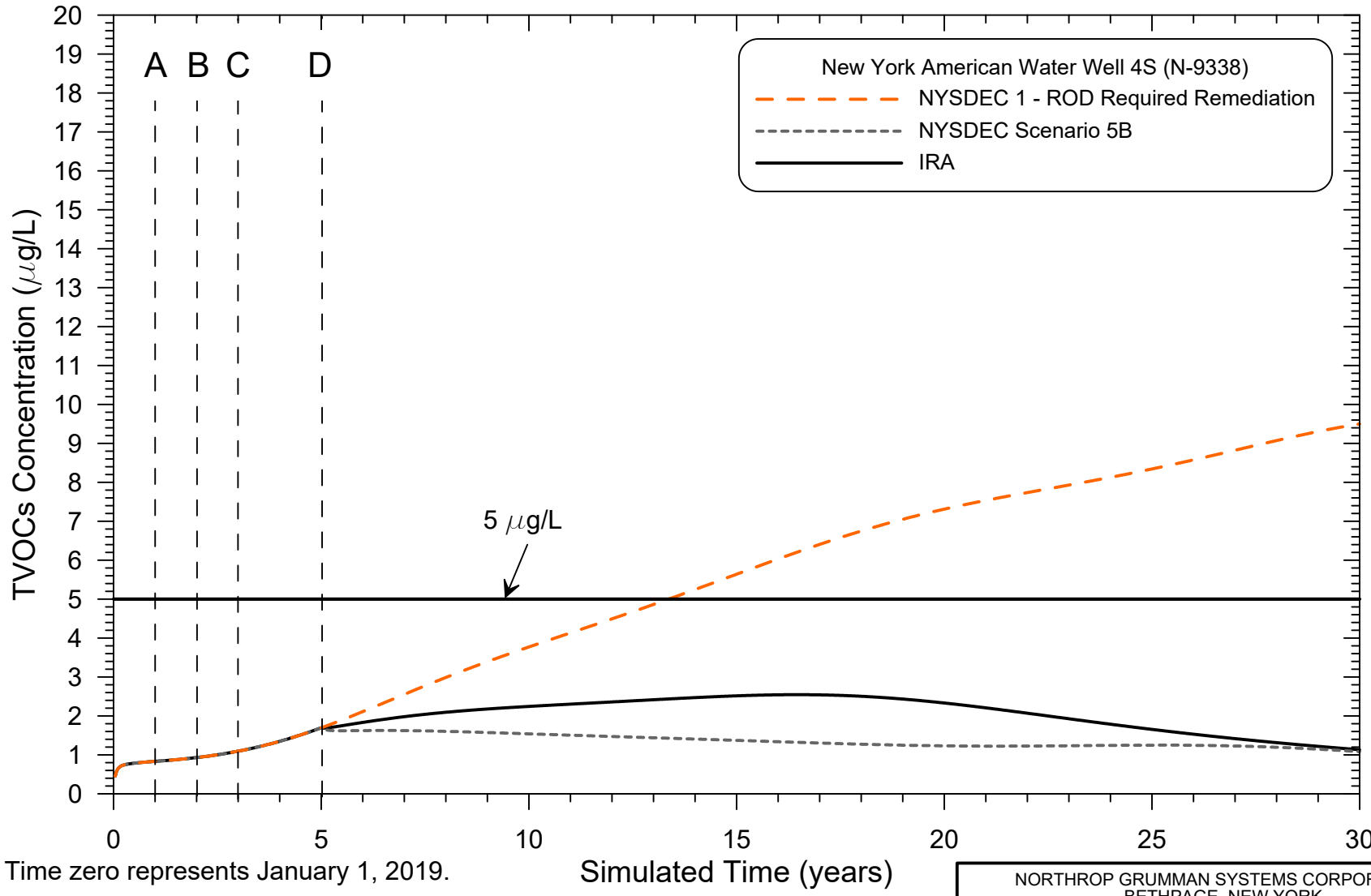
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
TOWN OF HEMPSTEAD - LEVITTOWN
WELL 13 (N-5303)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-25



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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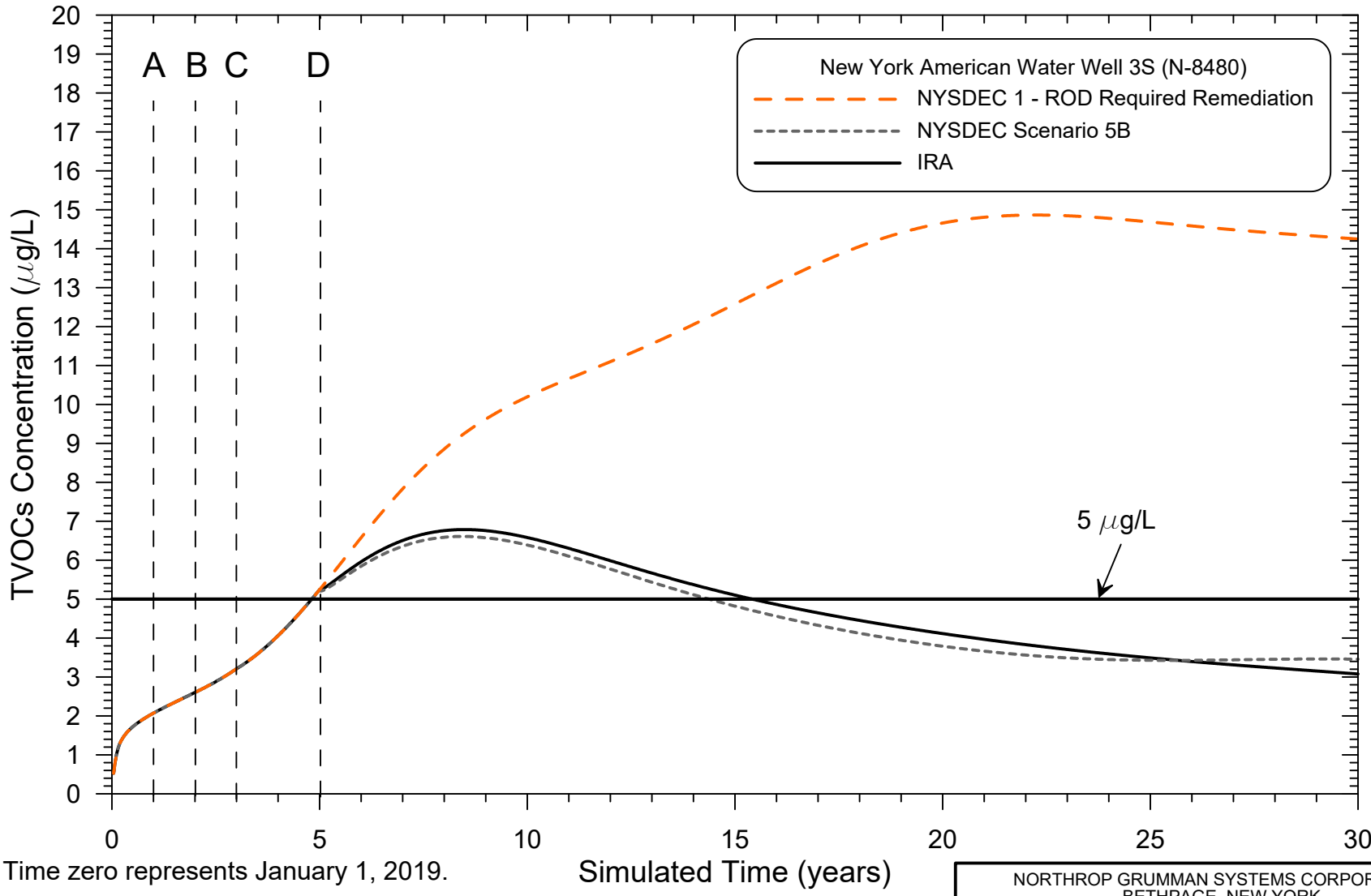
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
NEW YORK AMERICAN WATER
WELL 4S (N-9338)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-26



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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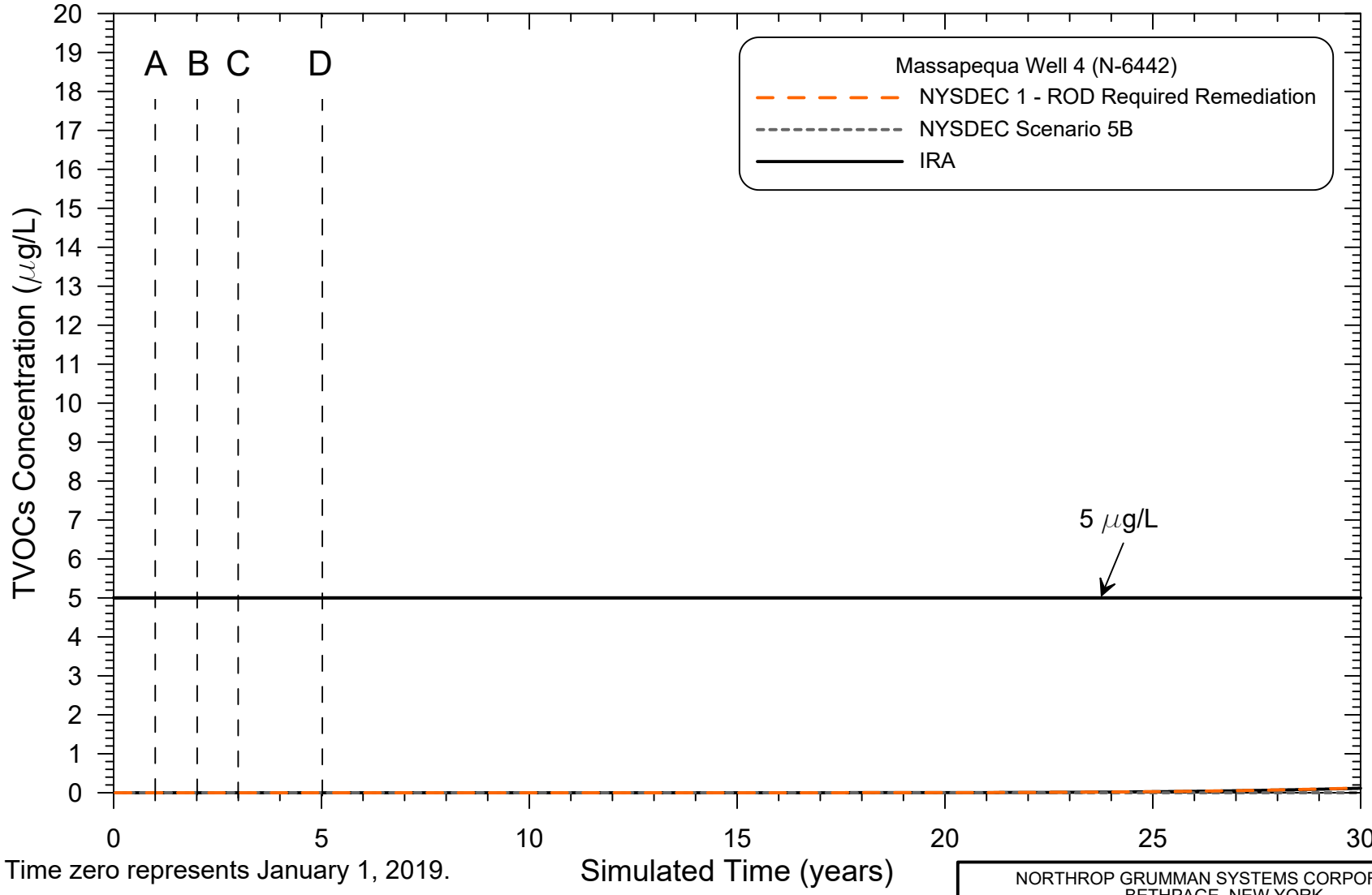
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION NEW YORK AMERICAN WATER WELL 3S (N-8480)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-27



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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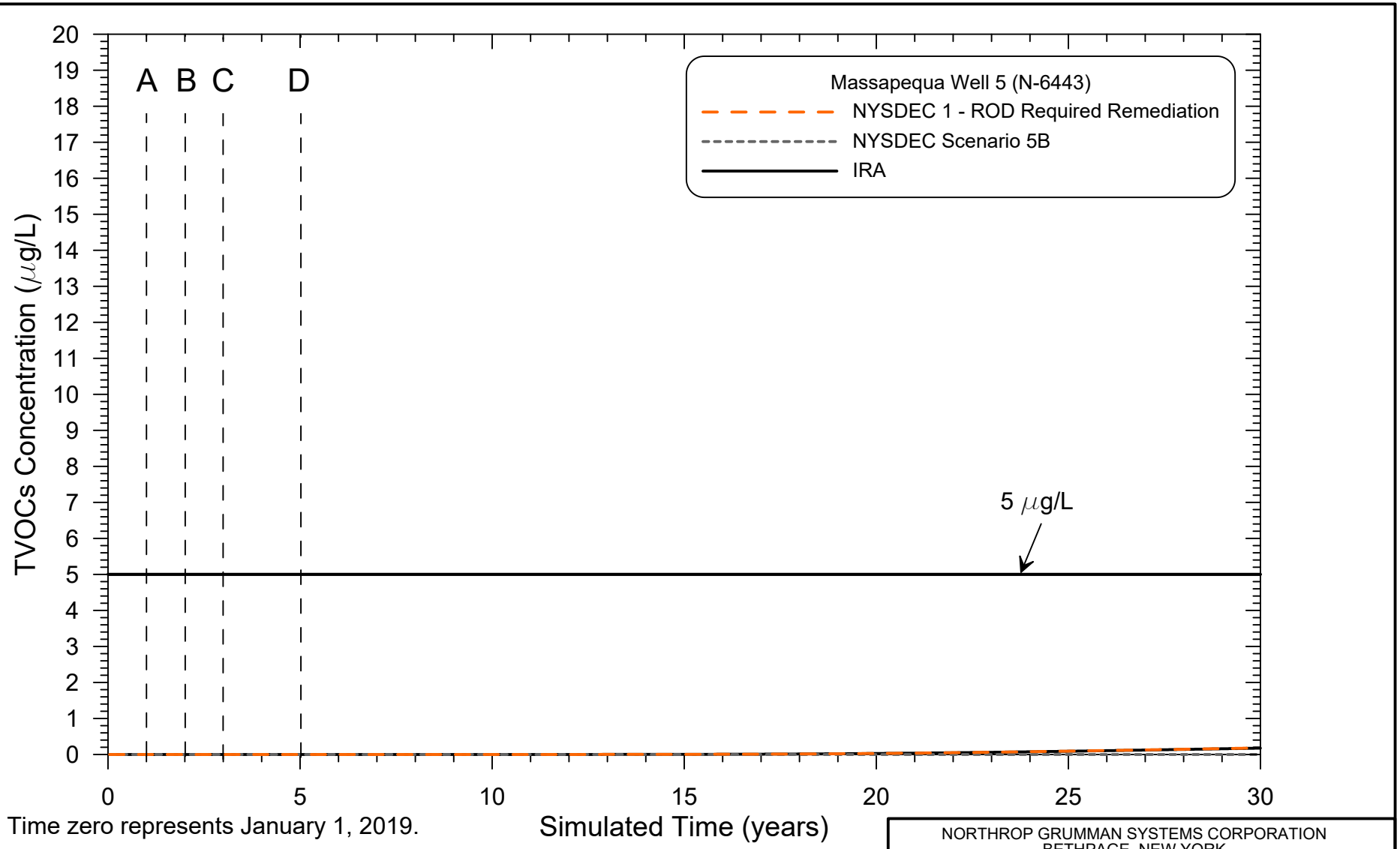
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
MASSAPEQUA
WELL 4 (N-6442)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-28



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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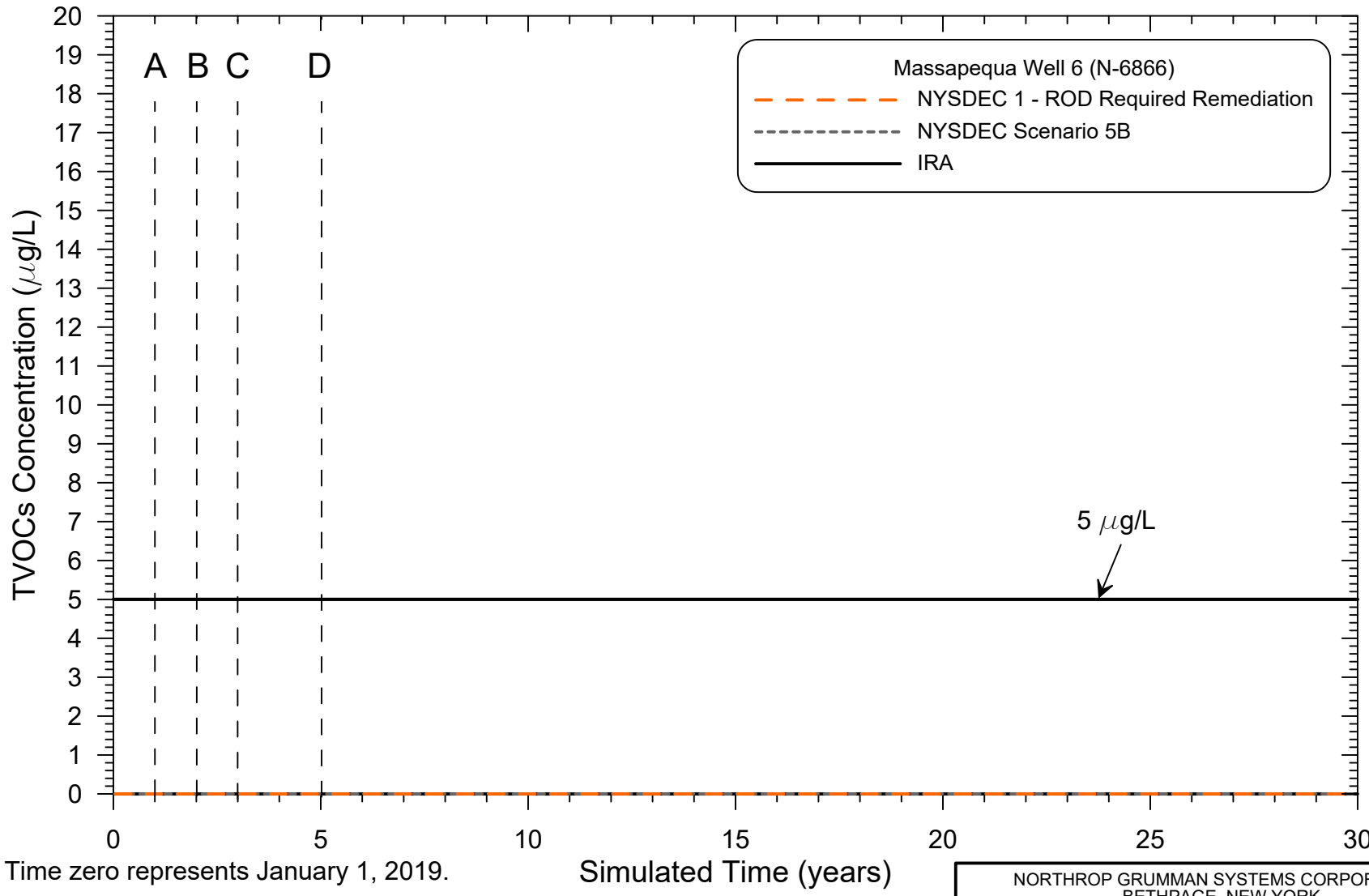
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION MASSAPEQUA WELL 5 (N-6443)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-29



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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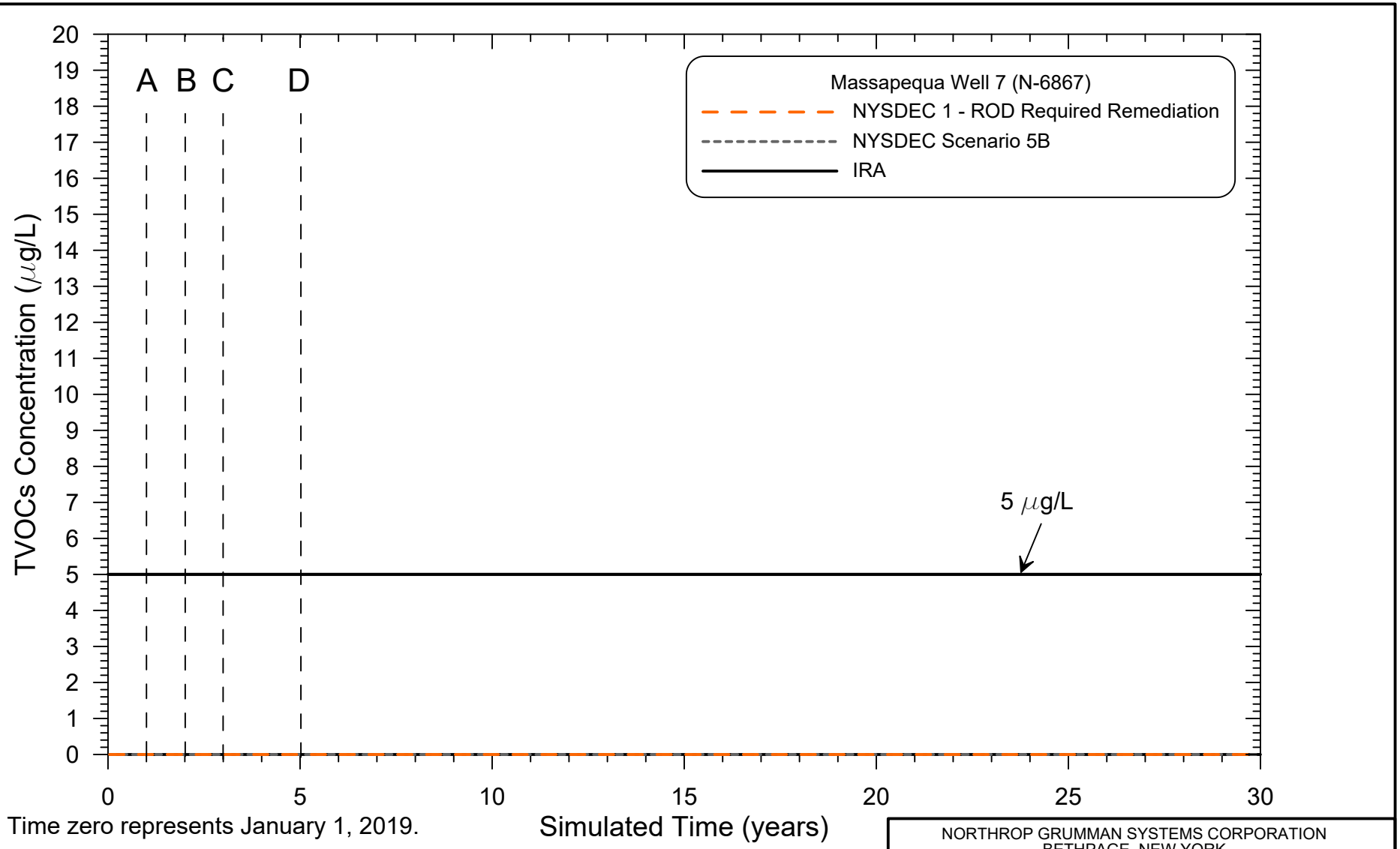
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
MASSAPEQUA
WELL 6 (N-6866)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-30



A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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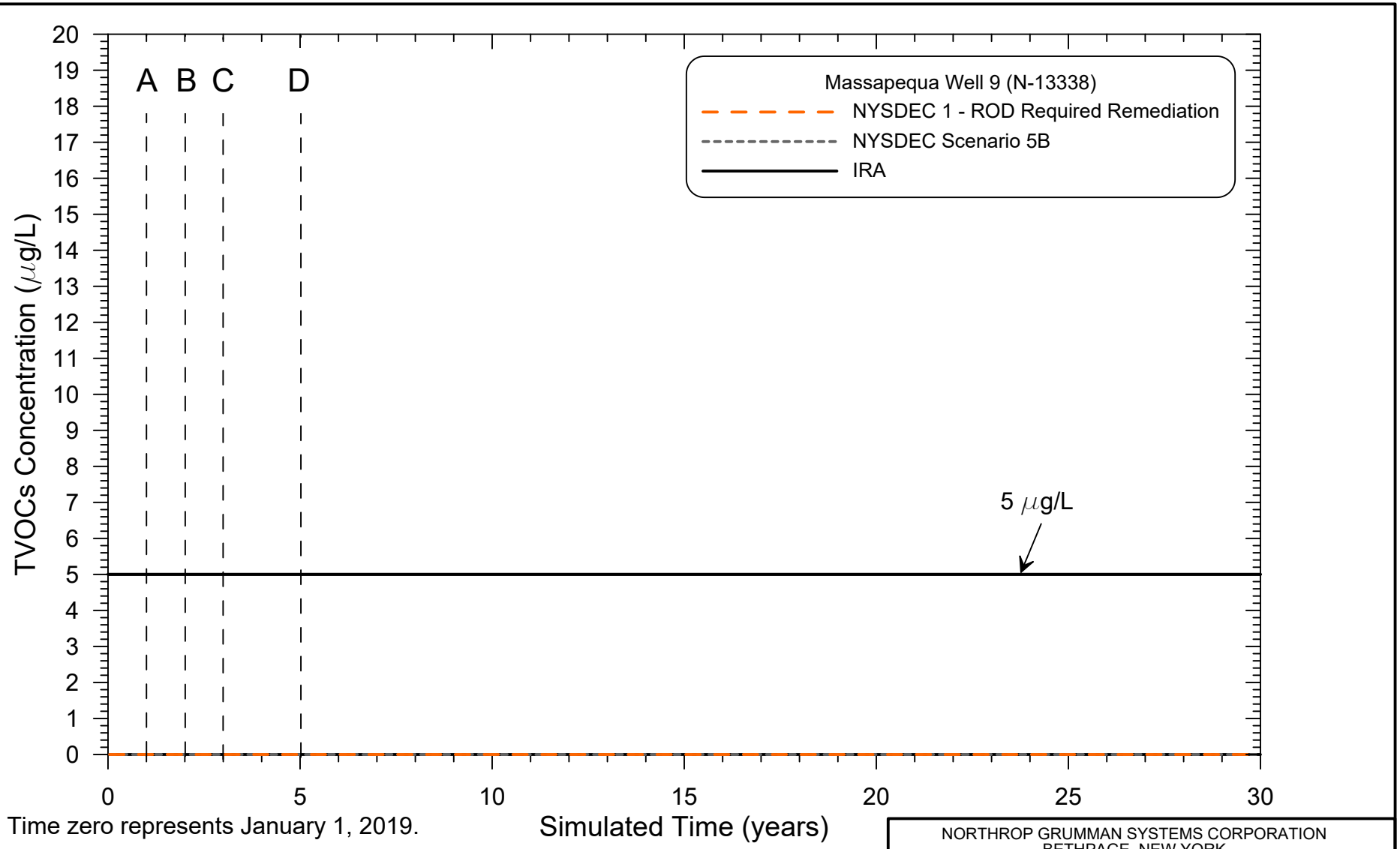
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
MASSAPEQUA
WELL 7 (N-6867)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-31



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

NORTHROP GRUMMAN SYSTEMS CORPORATION
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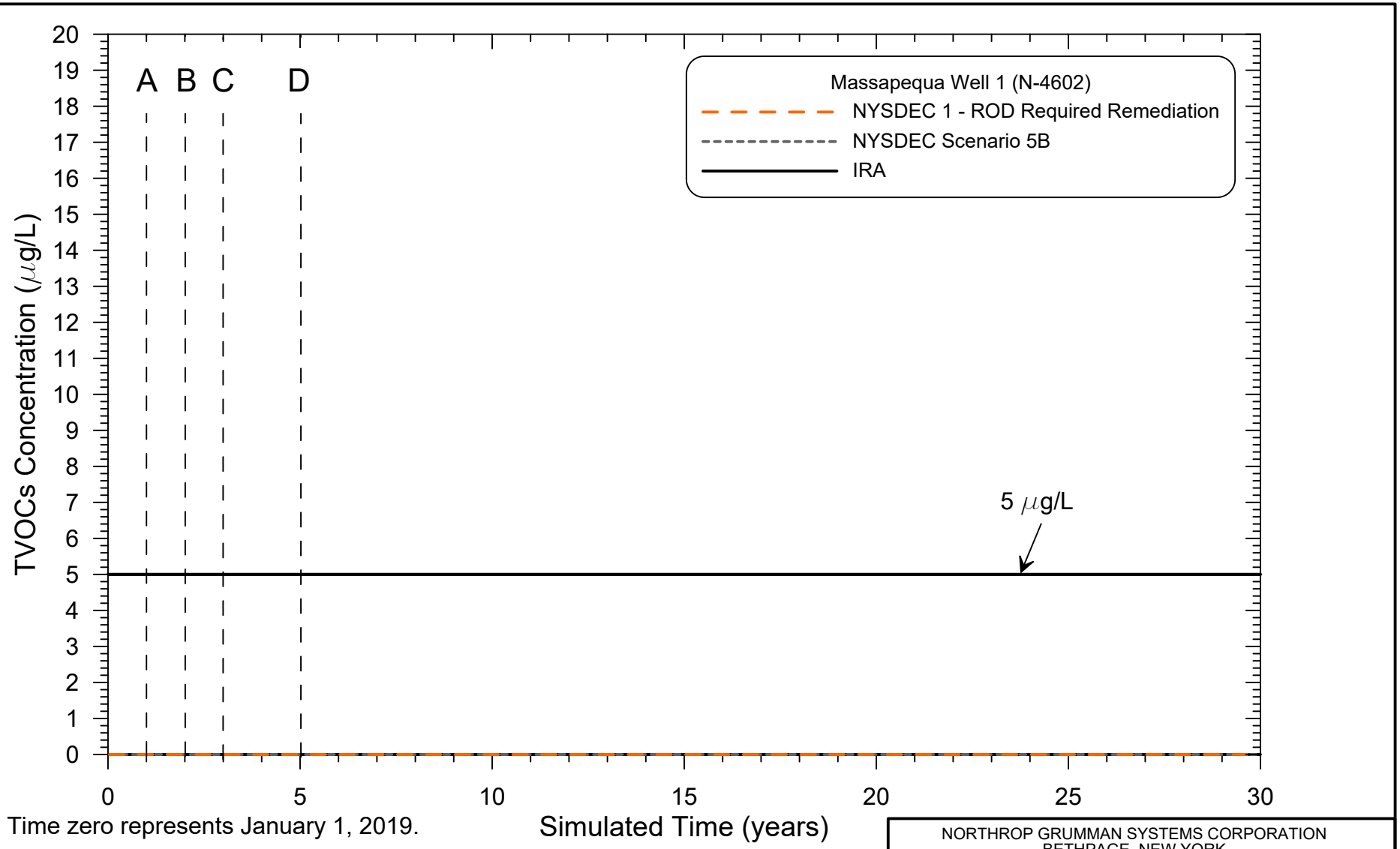
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
MASSAPEQUA
WELL 9 (N-13338)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-32



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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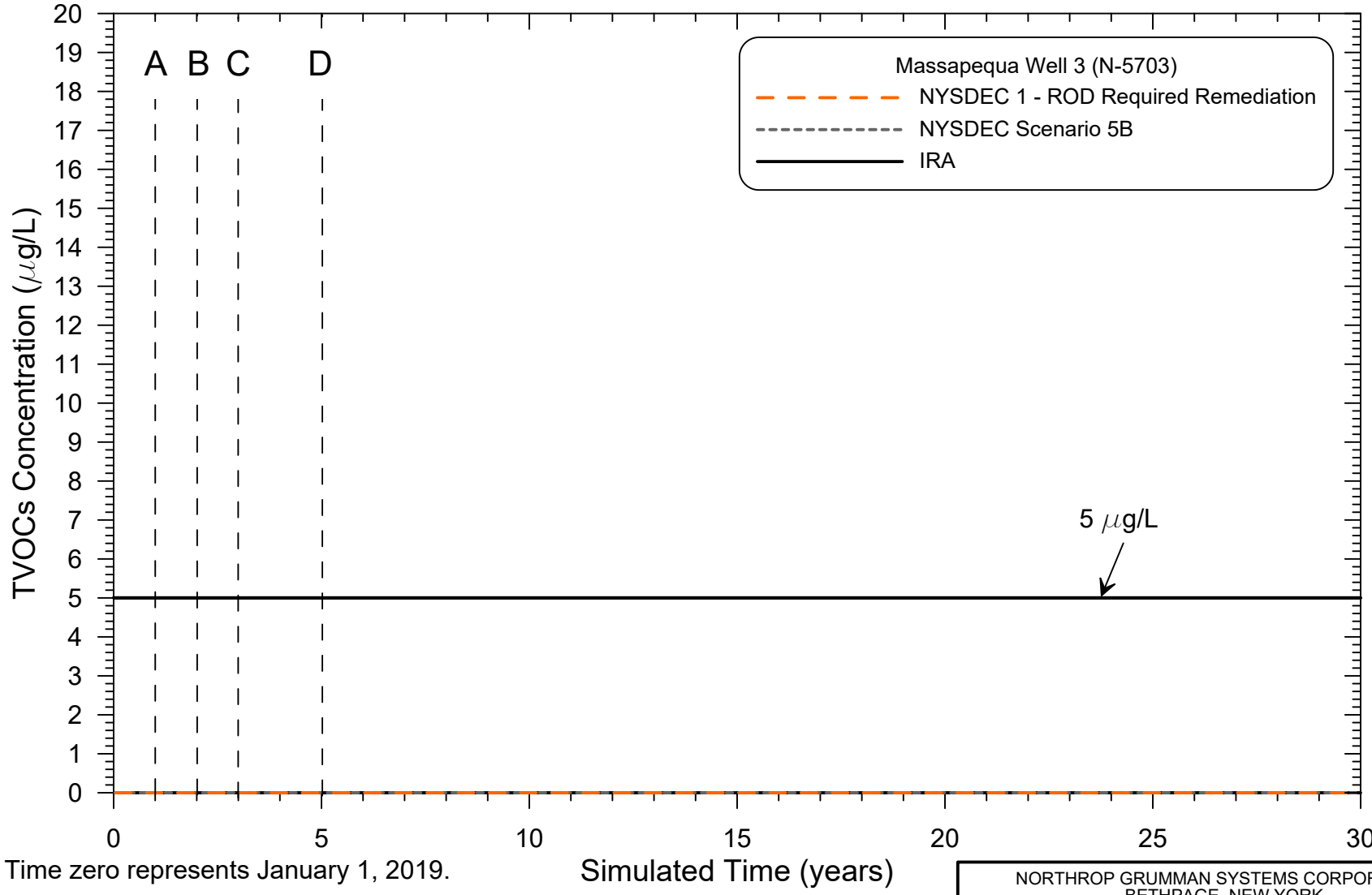
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION MASSAPEQUA WELL 1 (N-4602)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-33



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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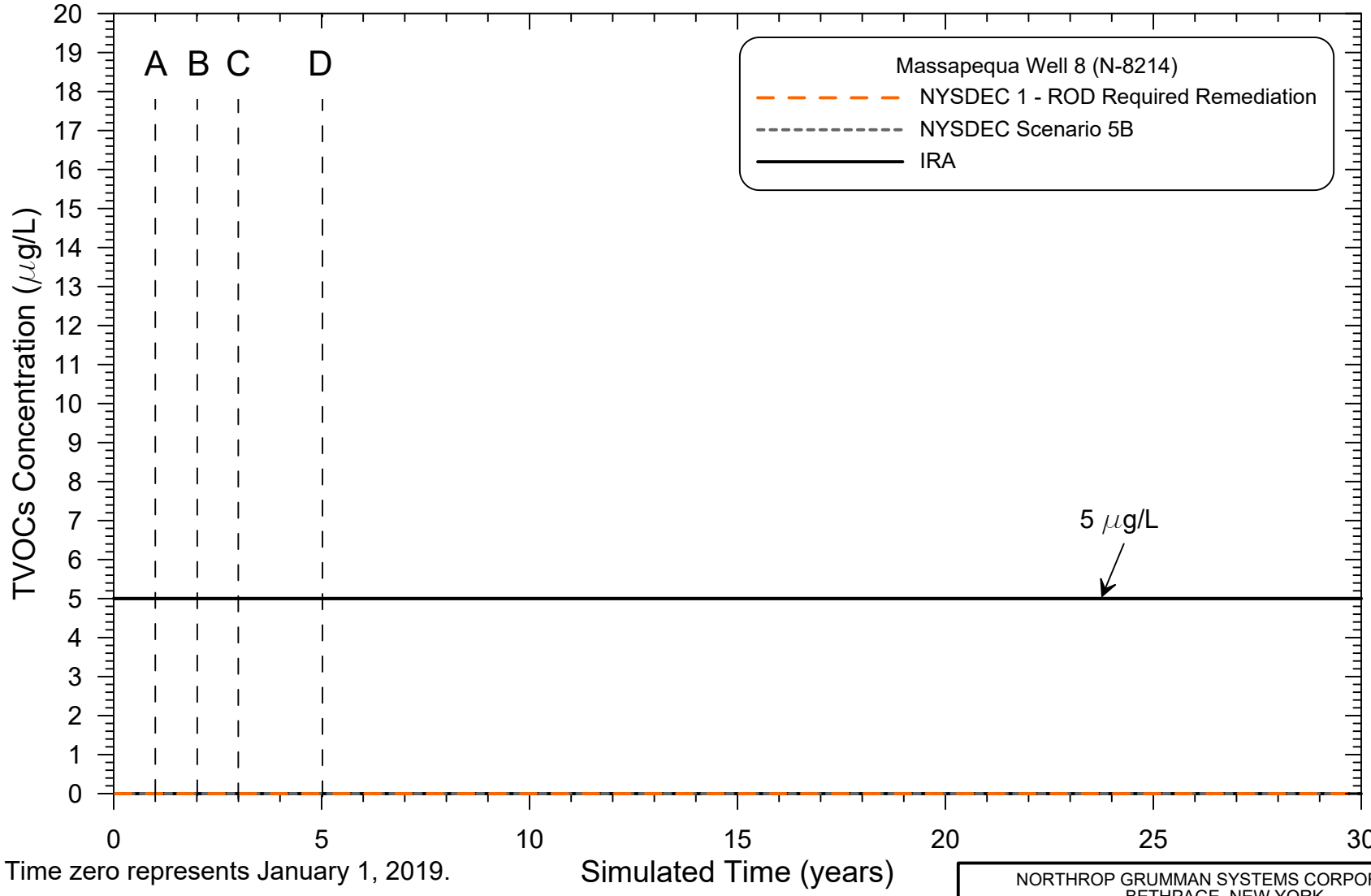
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION MASSAPEQUA WELL 3 (N-5703)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-34



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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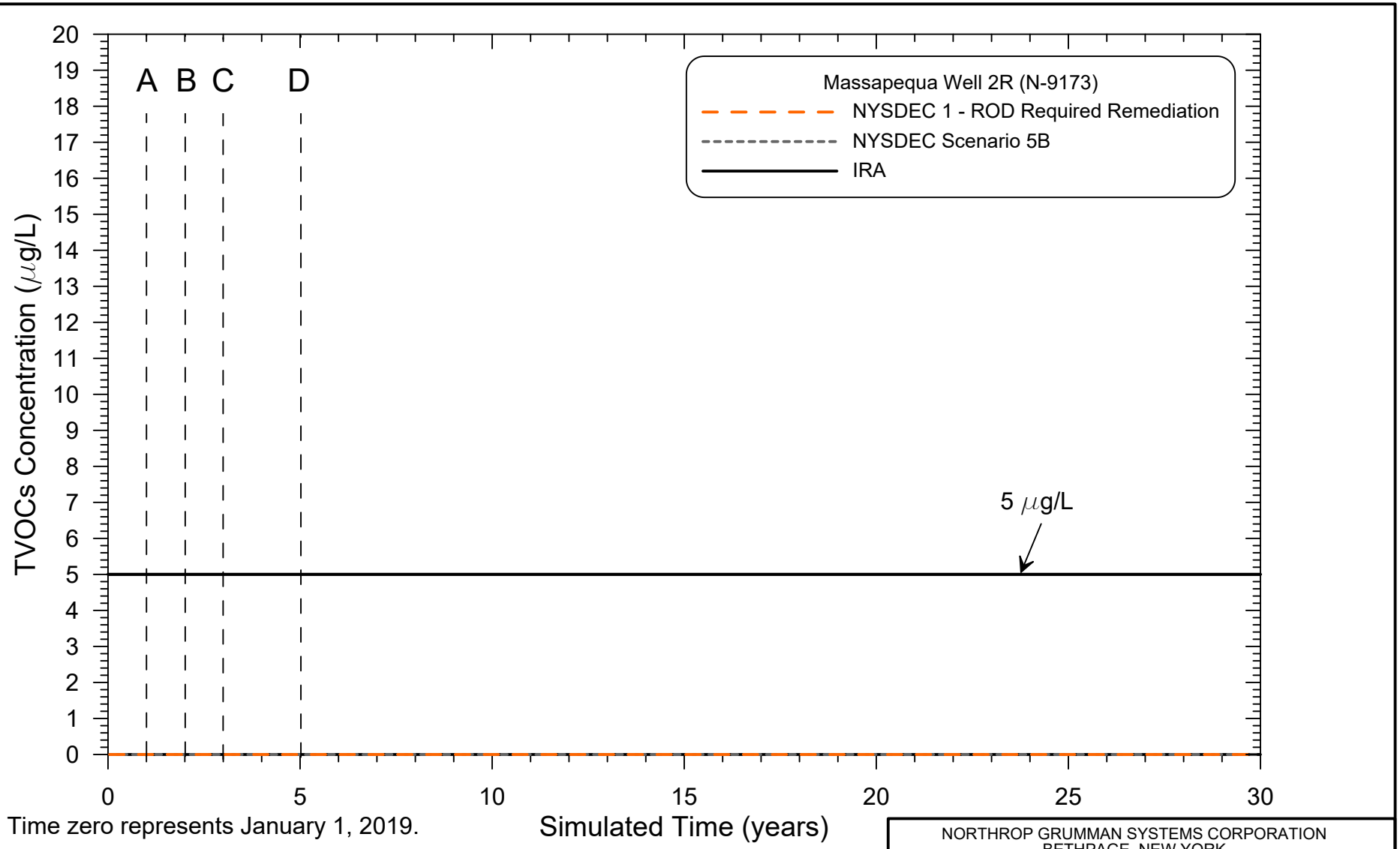
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
MASSAPEQUA
WELL 8 (N-8214)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-35



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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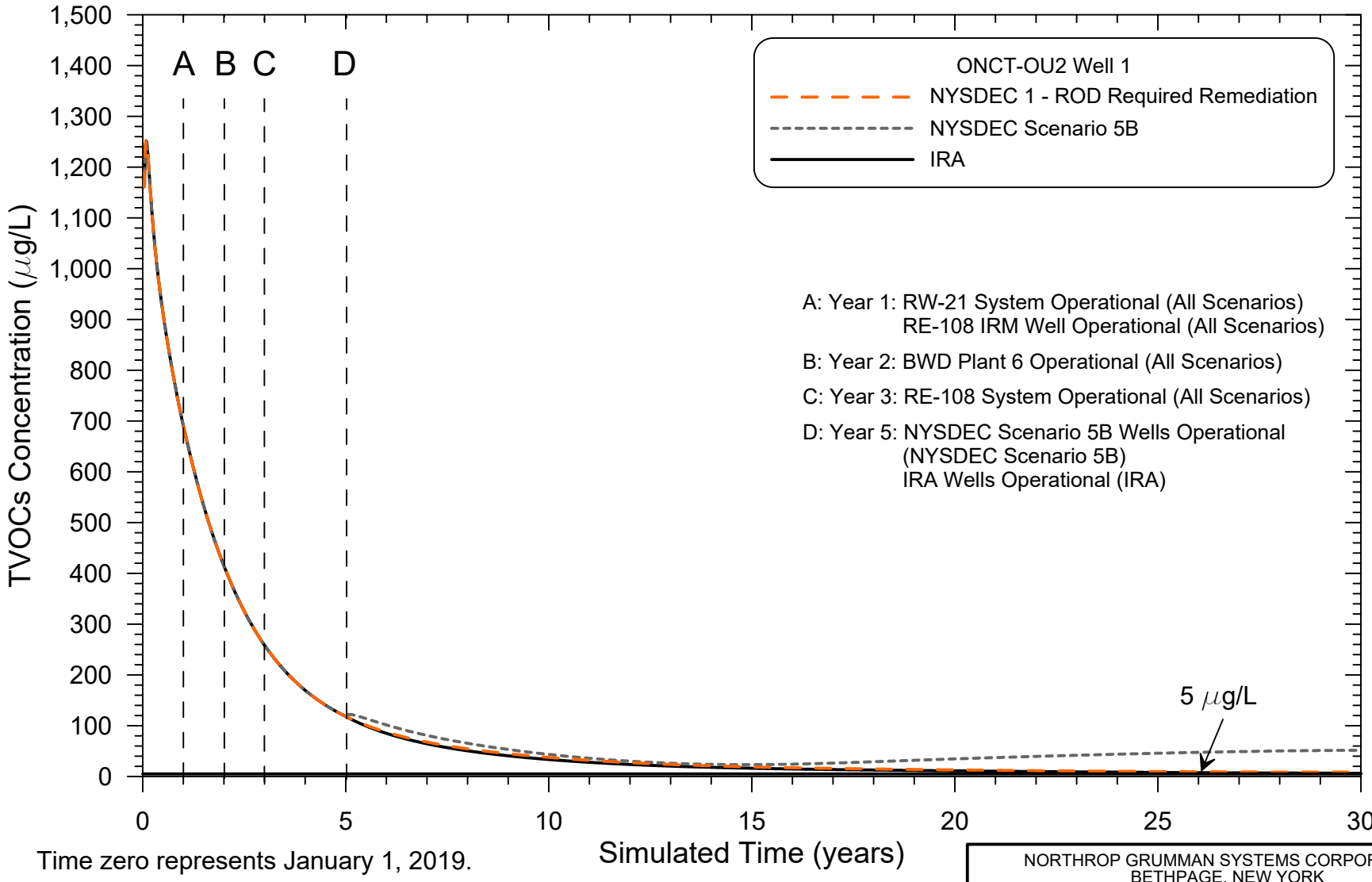
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION MASSAPEQUA WELL 2R (N-9173)

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-36



Time zero represents January 1, 2019.

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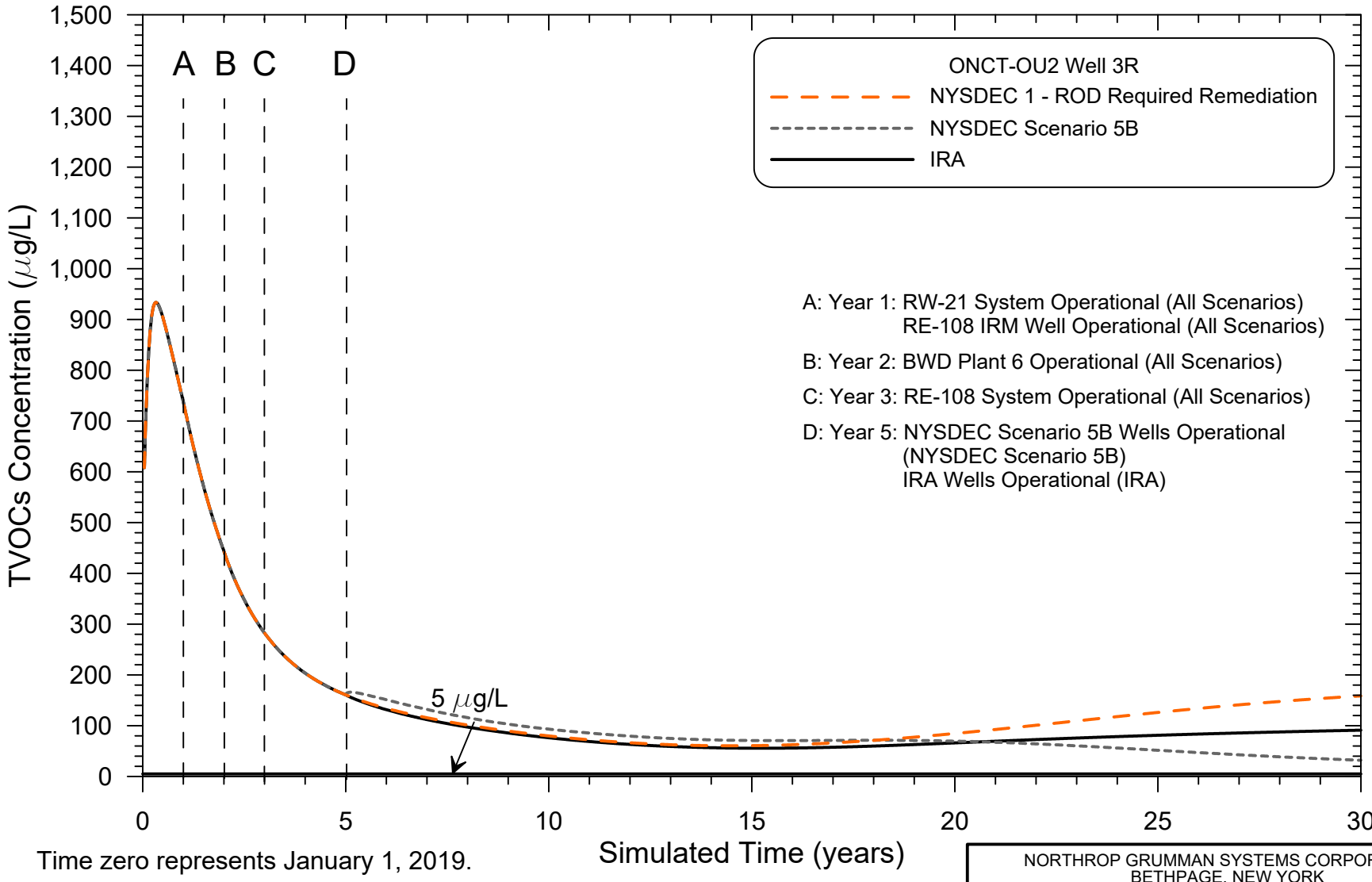
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
ONCT-OU2 WELL 1

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-37



Time zero represents January 1, 2019.

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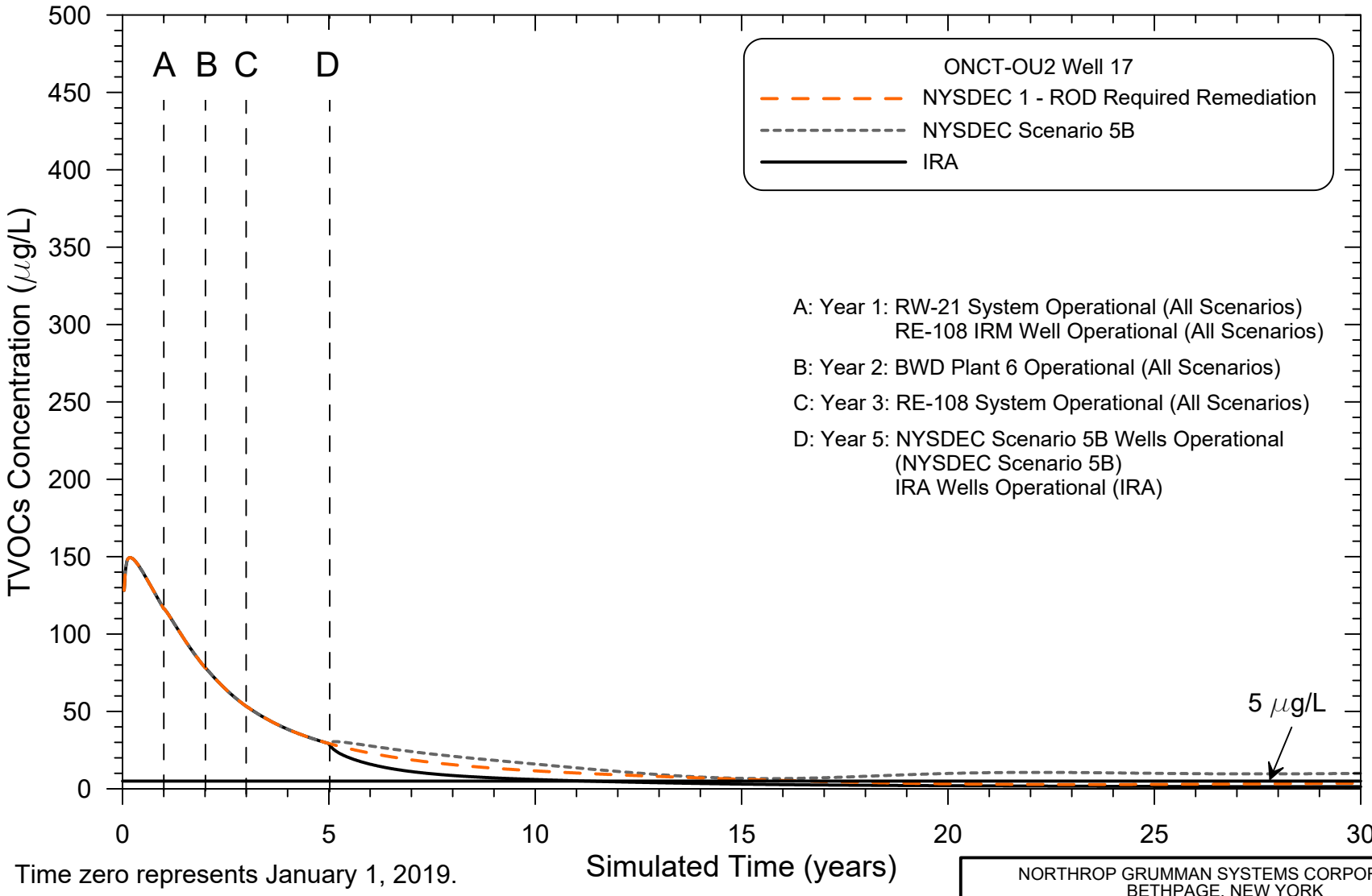
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
ONCT-OU2 WELL 3R

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-38



Time zero represents January 1, 2019.

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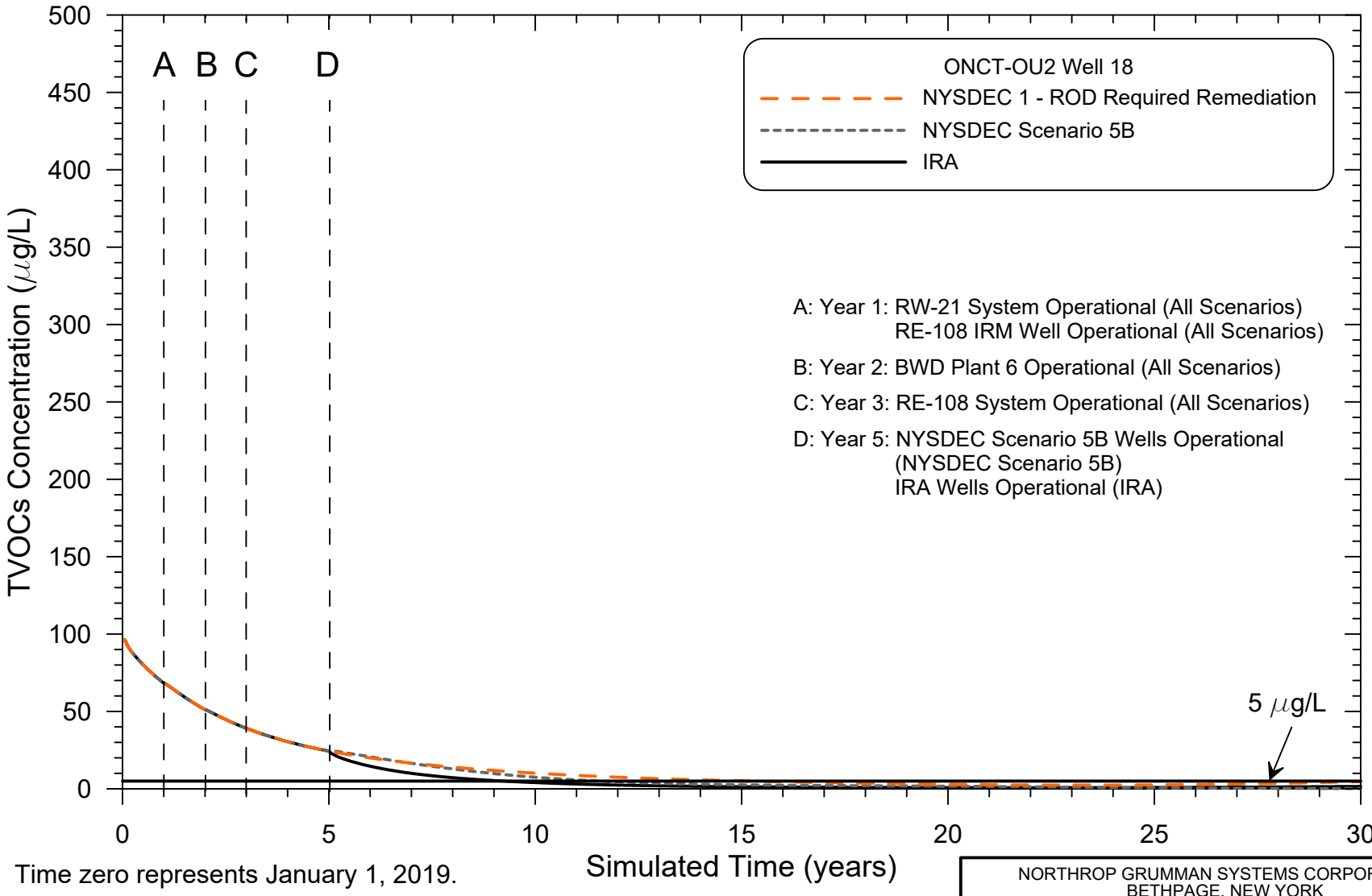
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
ONCT-OU2 WELL 17

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-39



Time zero represents January 1, 2019.

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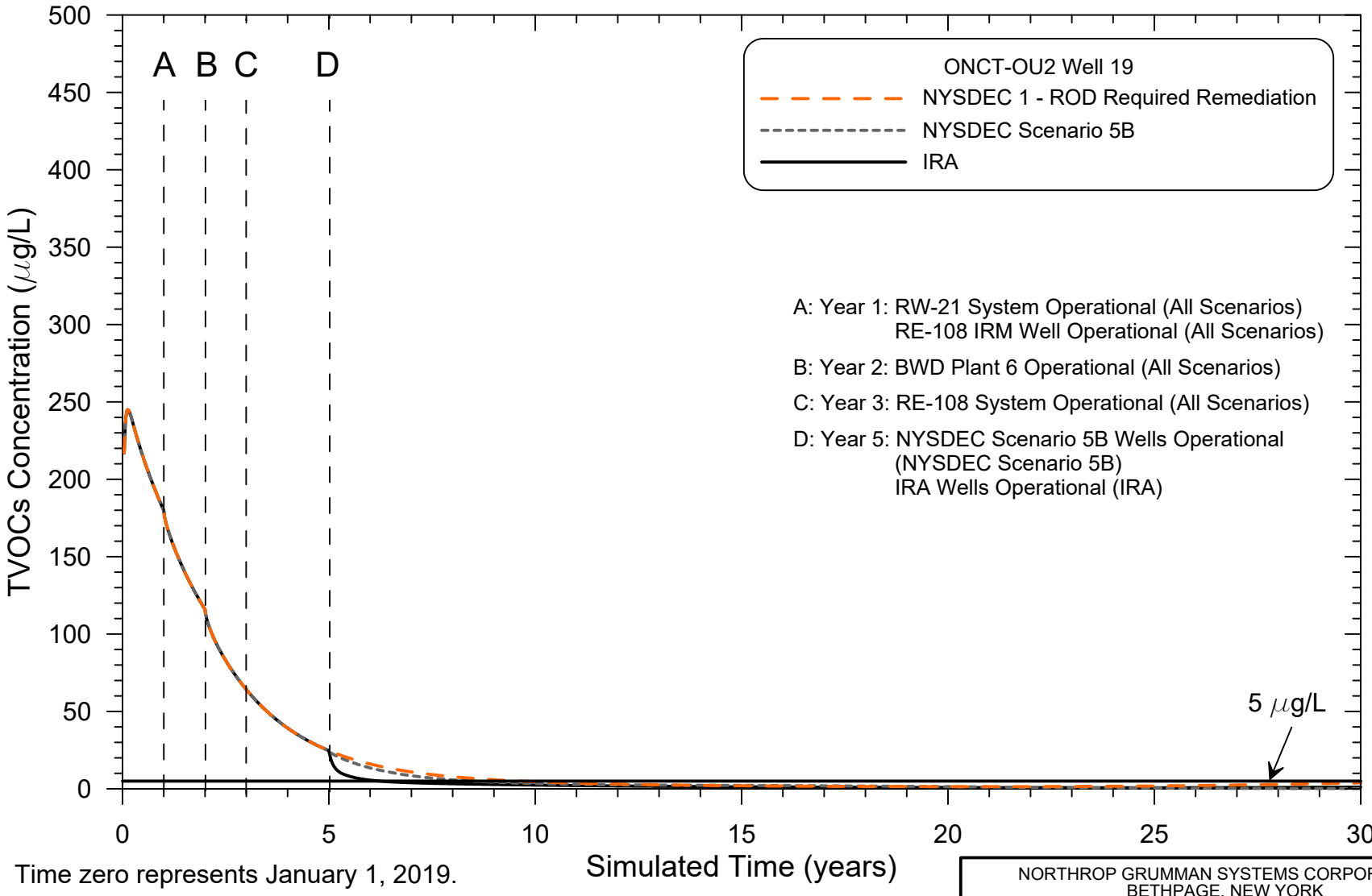
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
ONCT-OU2 WELL 18

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-40



Time zero represents January 1, 2019.

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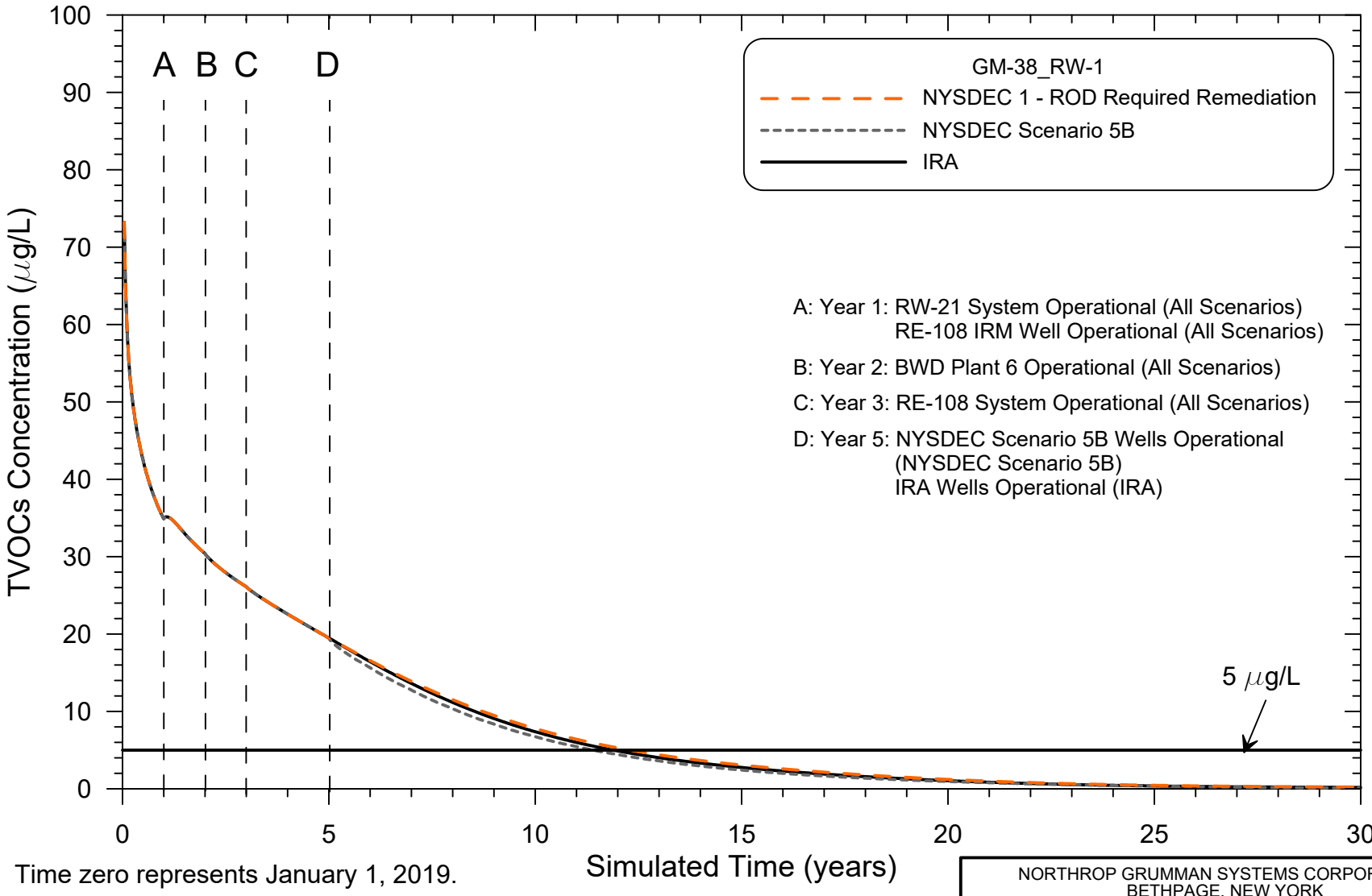
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION ONCT-OU2 WELL 19

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-41



Time zero represents January 1, 2019.

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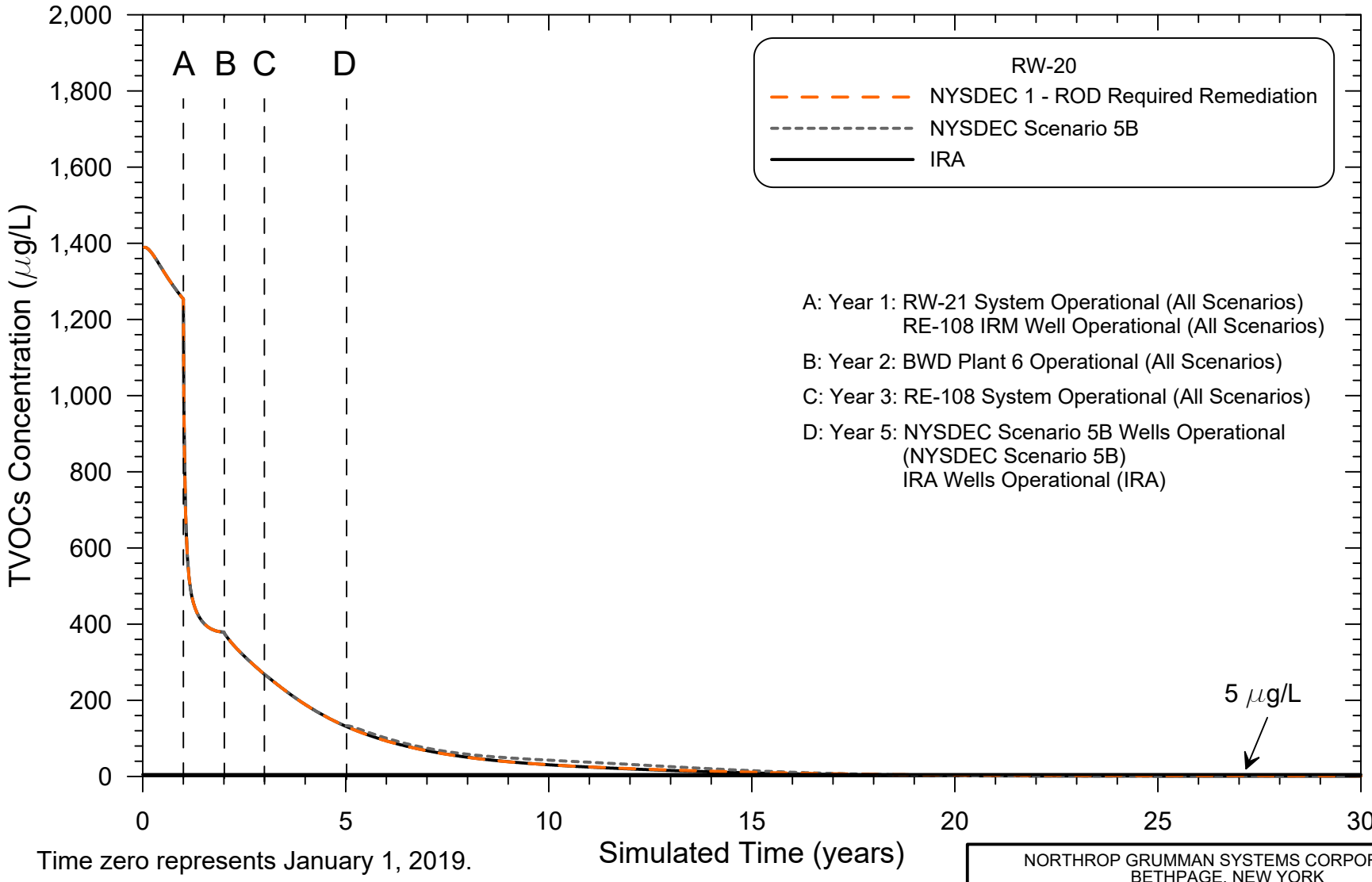
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
GM-38_RW-1

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-42



Time zero represents January 1, 2019.

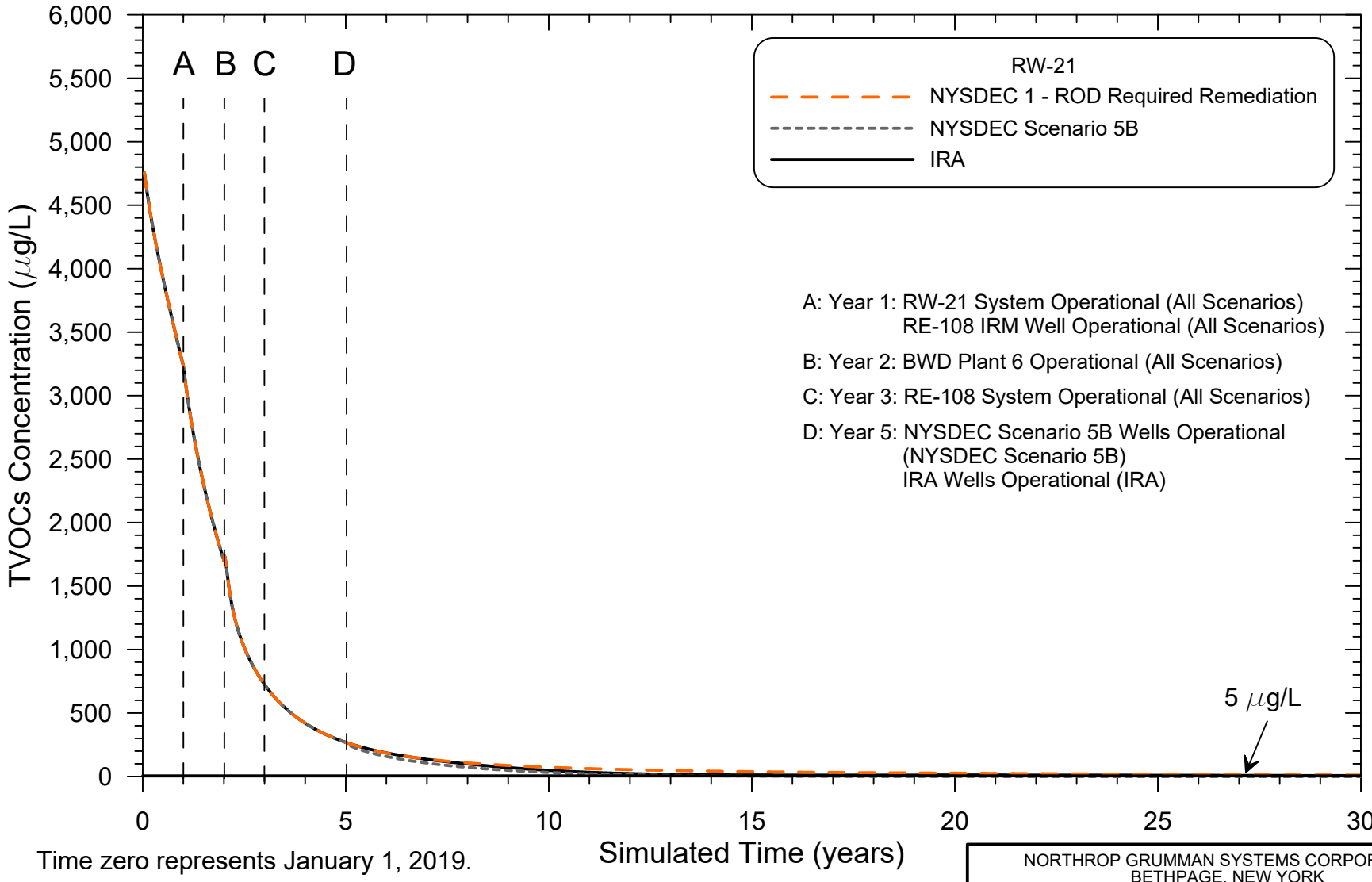
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION RW-20

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-43



Time zero represents January 1, 2019.

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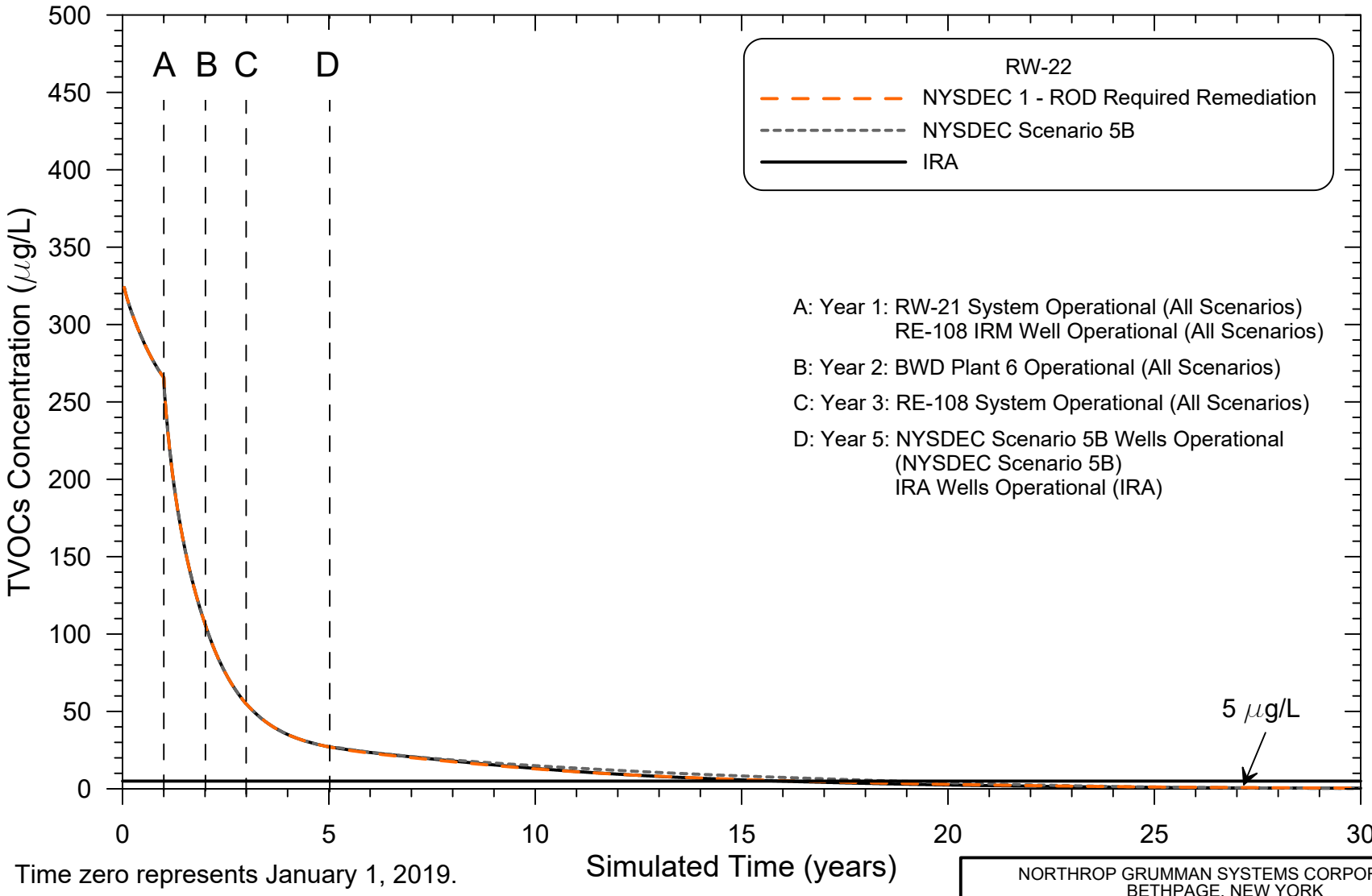
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION RW-21

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-44



Time zero represents January 1, 2019.

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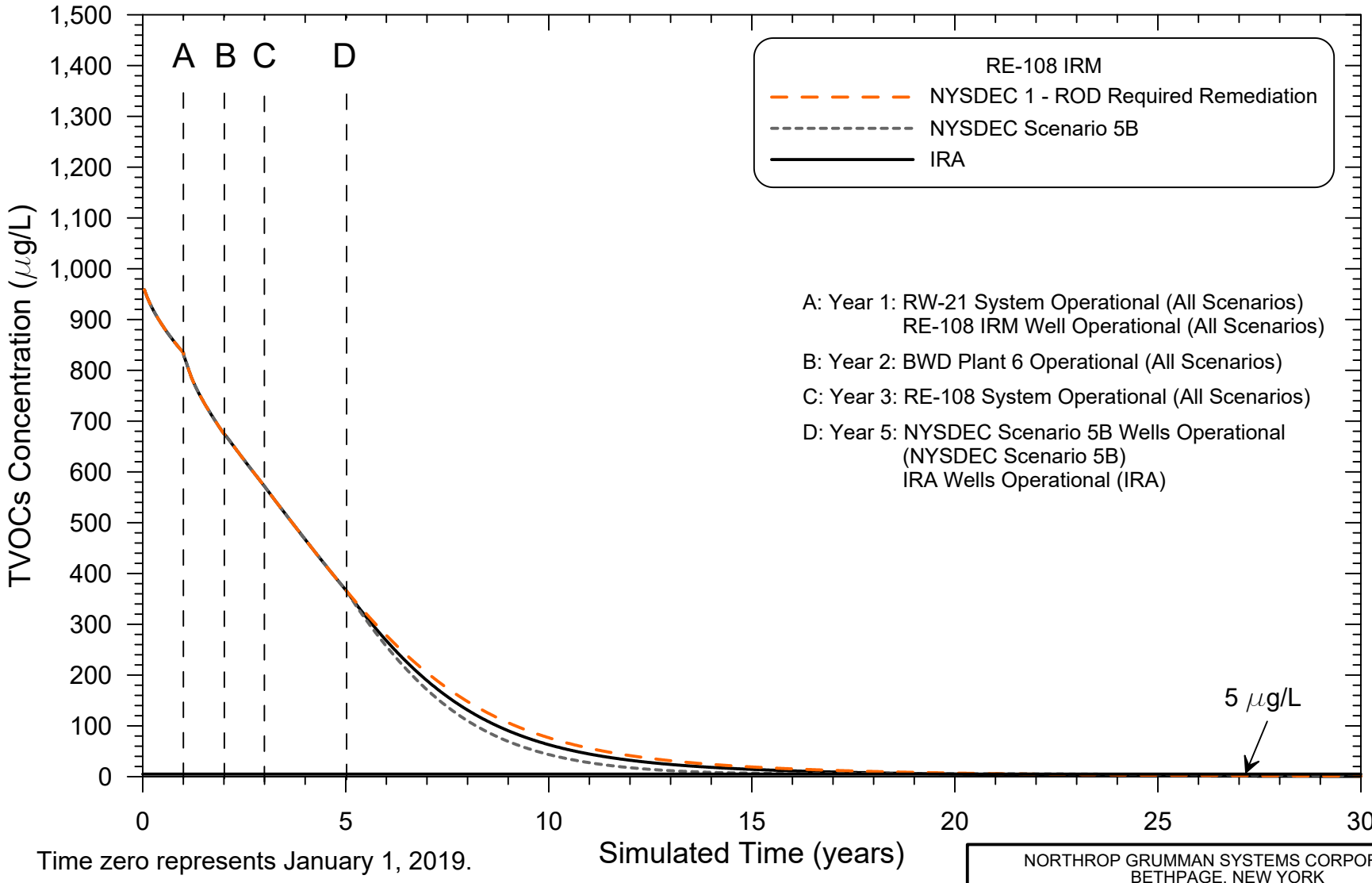
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION RW-22

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-45



Time zero represents January 1, 2019.

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
RE-108 IRM

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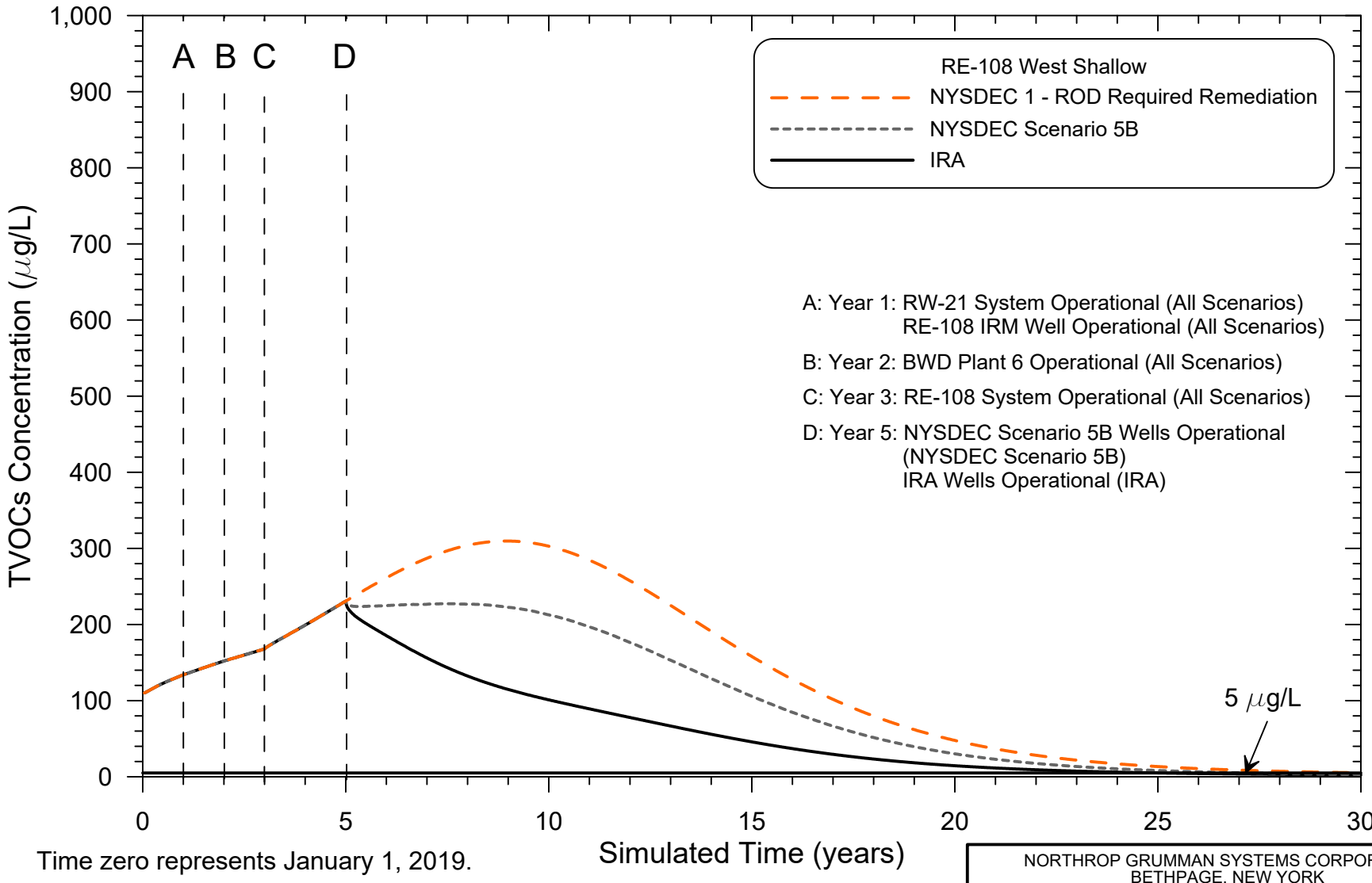
FIGURE
4.2-46



Time zero represents January 1, 2019.

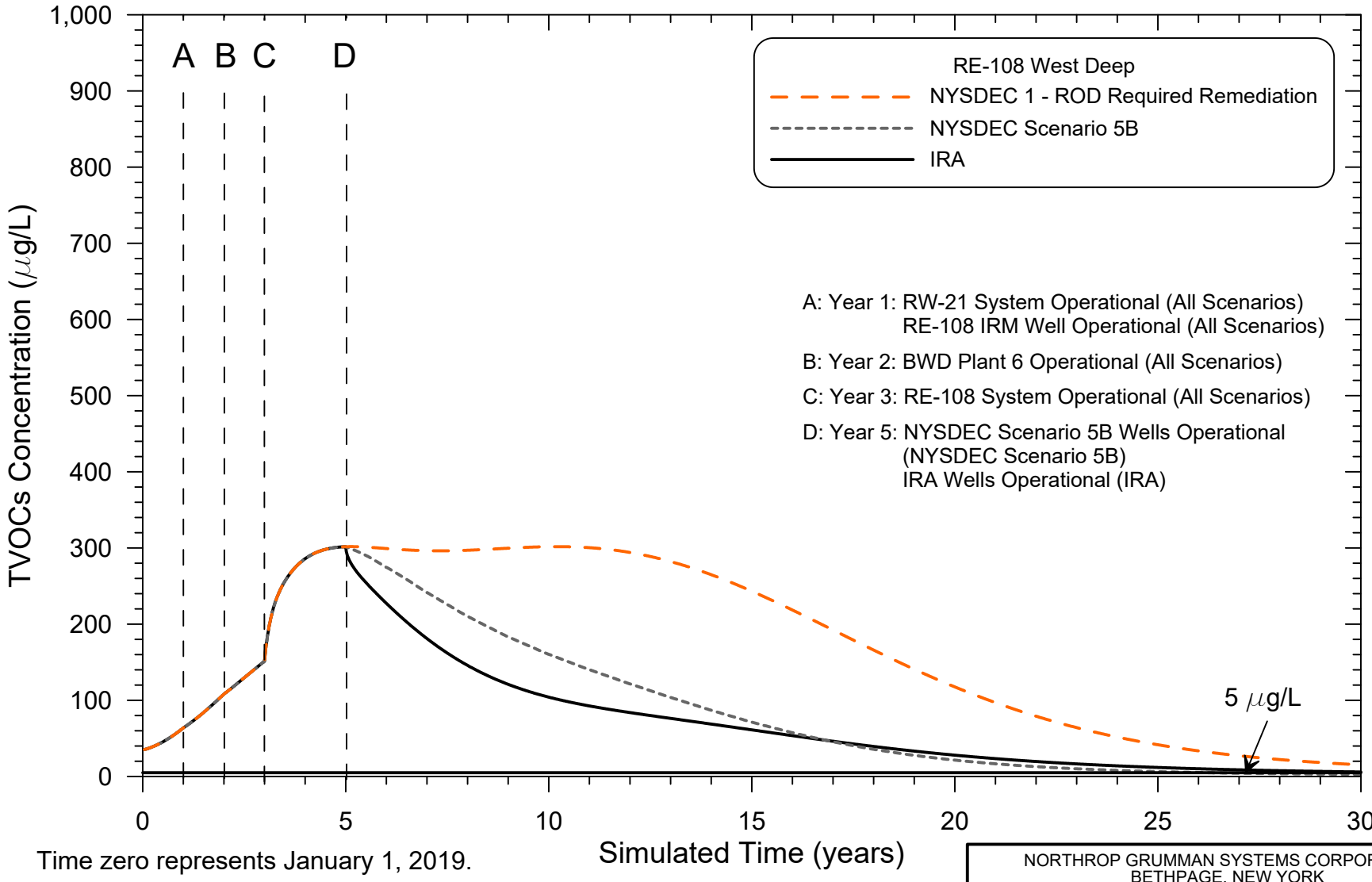
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION RE-108 WEST SHALLOW

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-47



Time zero represents January 1, 2019.

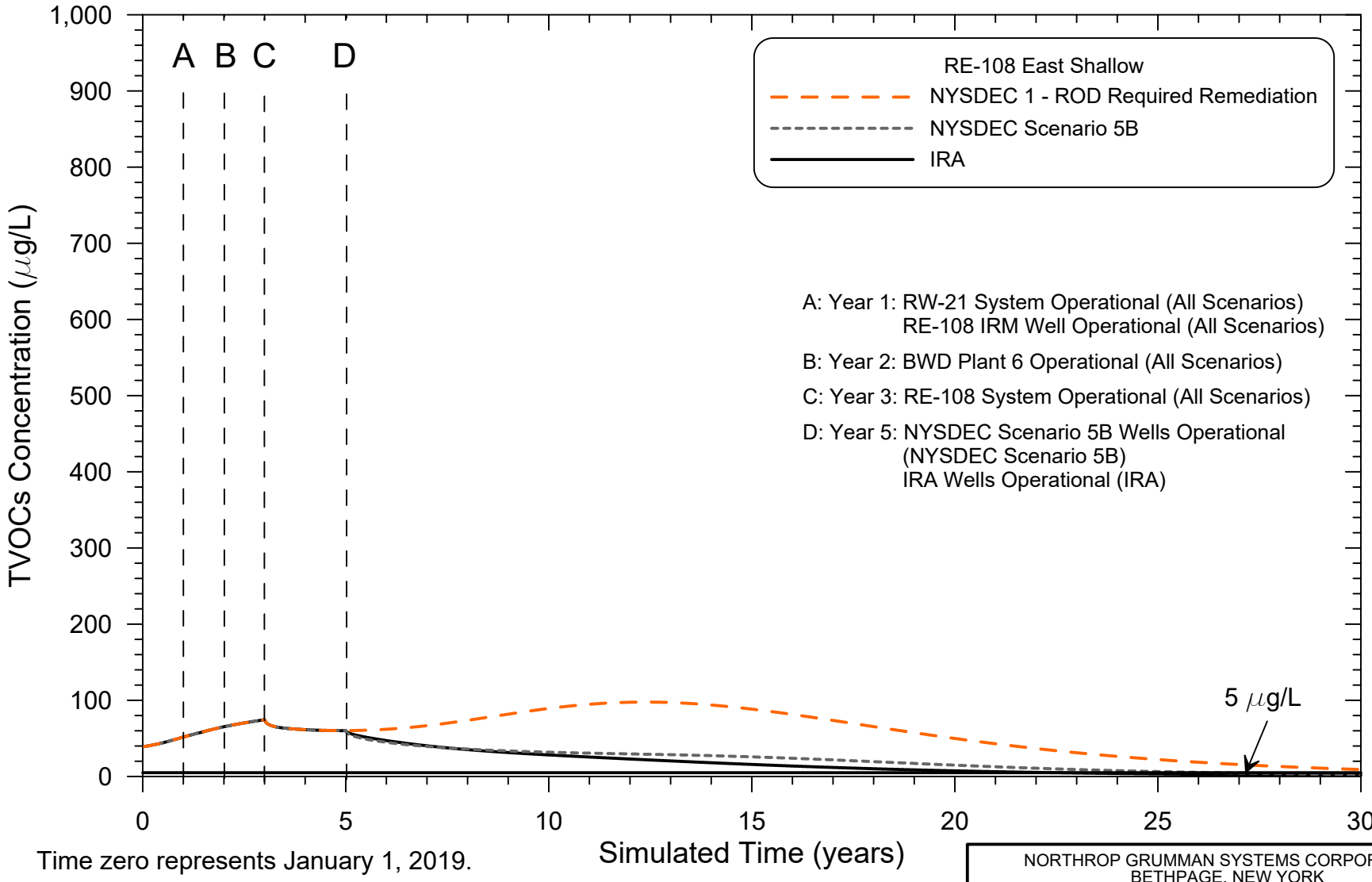
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION RE-108 WEST DEEP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-48



Time zero represents January 1, 2019.

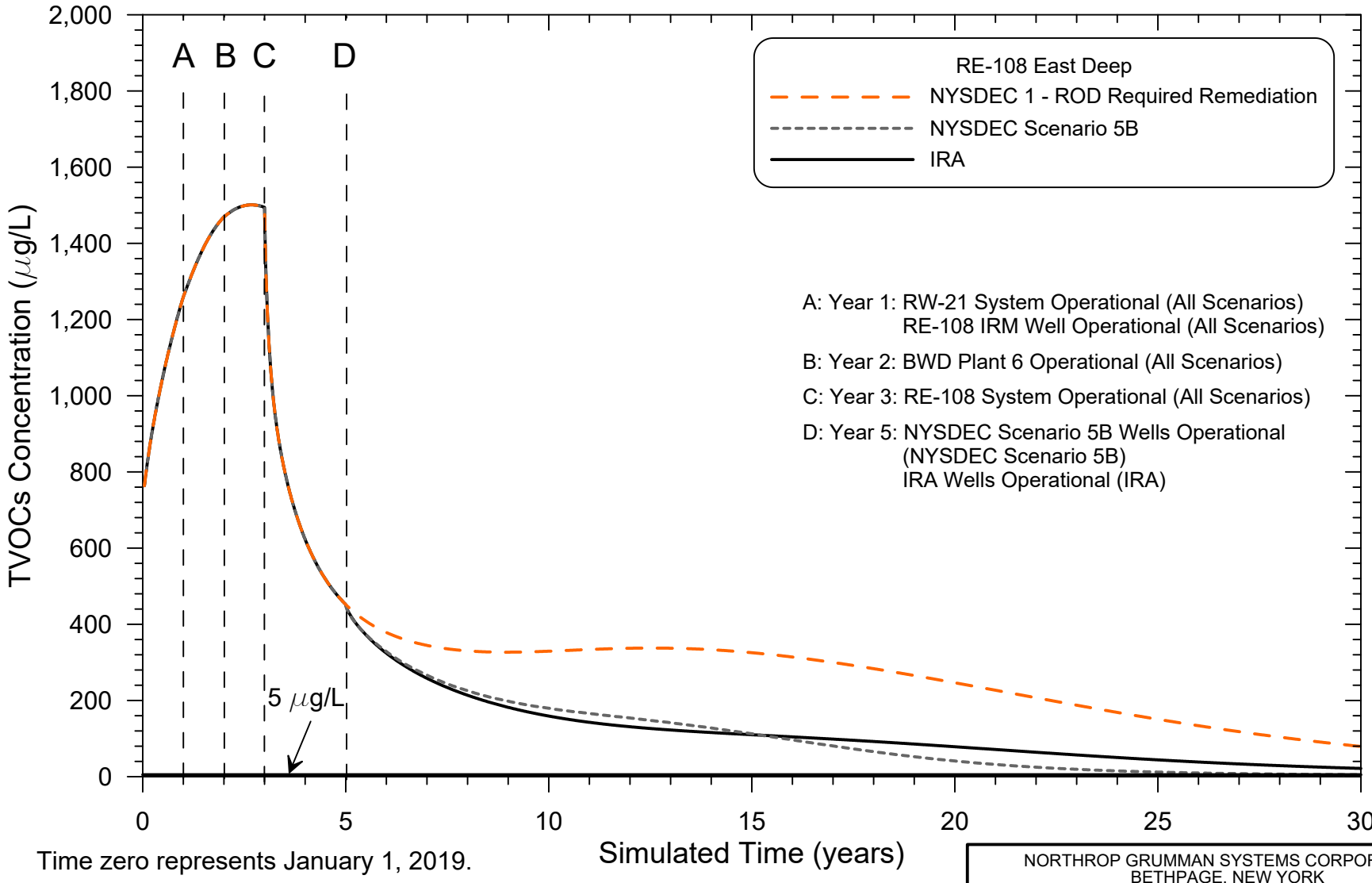
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION RE-108 EAST SHALLOW

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-49



Time zero represents January 1, 2019.

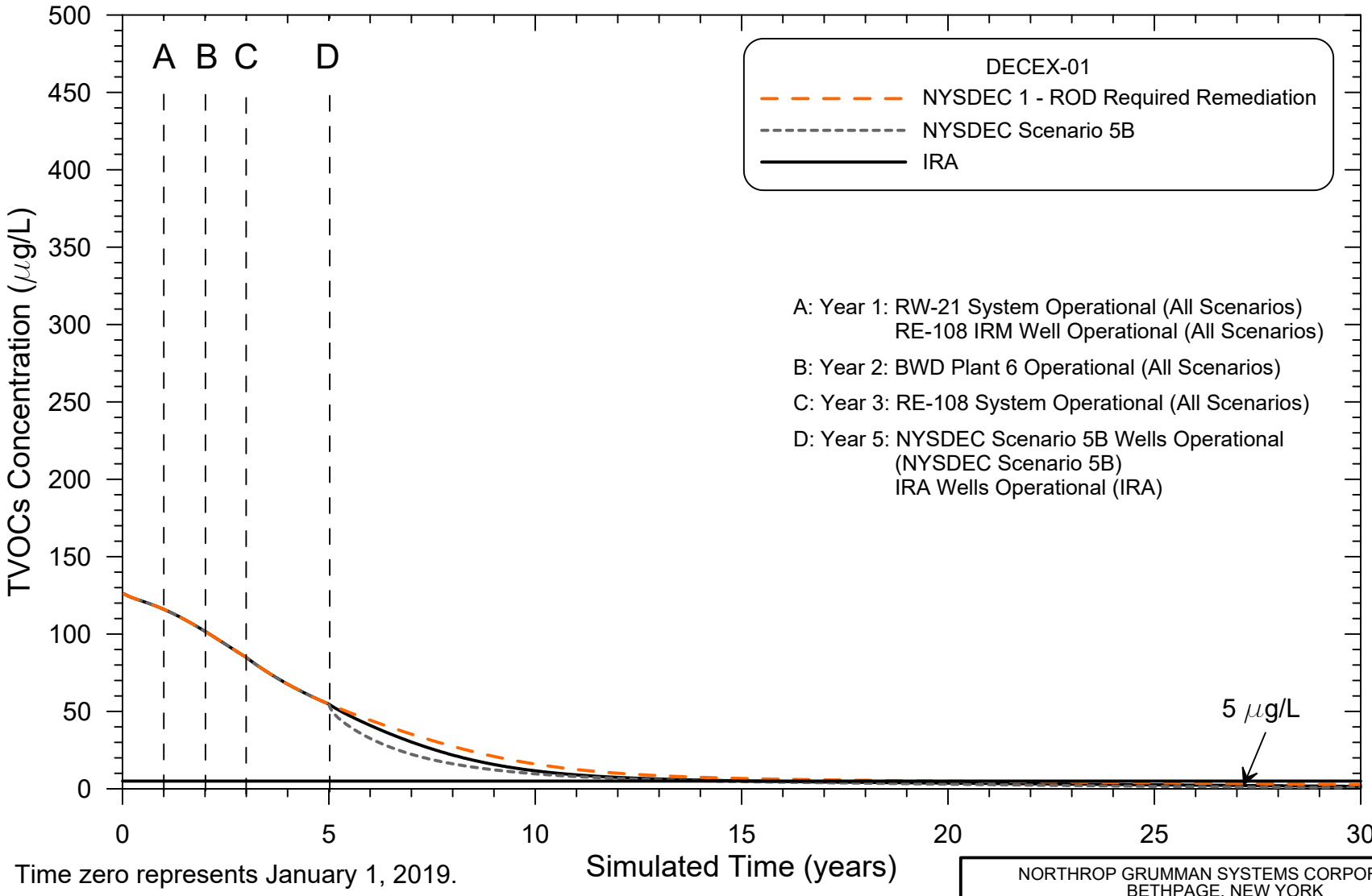
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
RE-108 EAST DEEP

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-50



Time zero represents January 1, 2019.

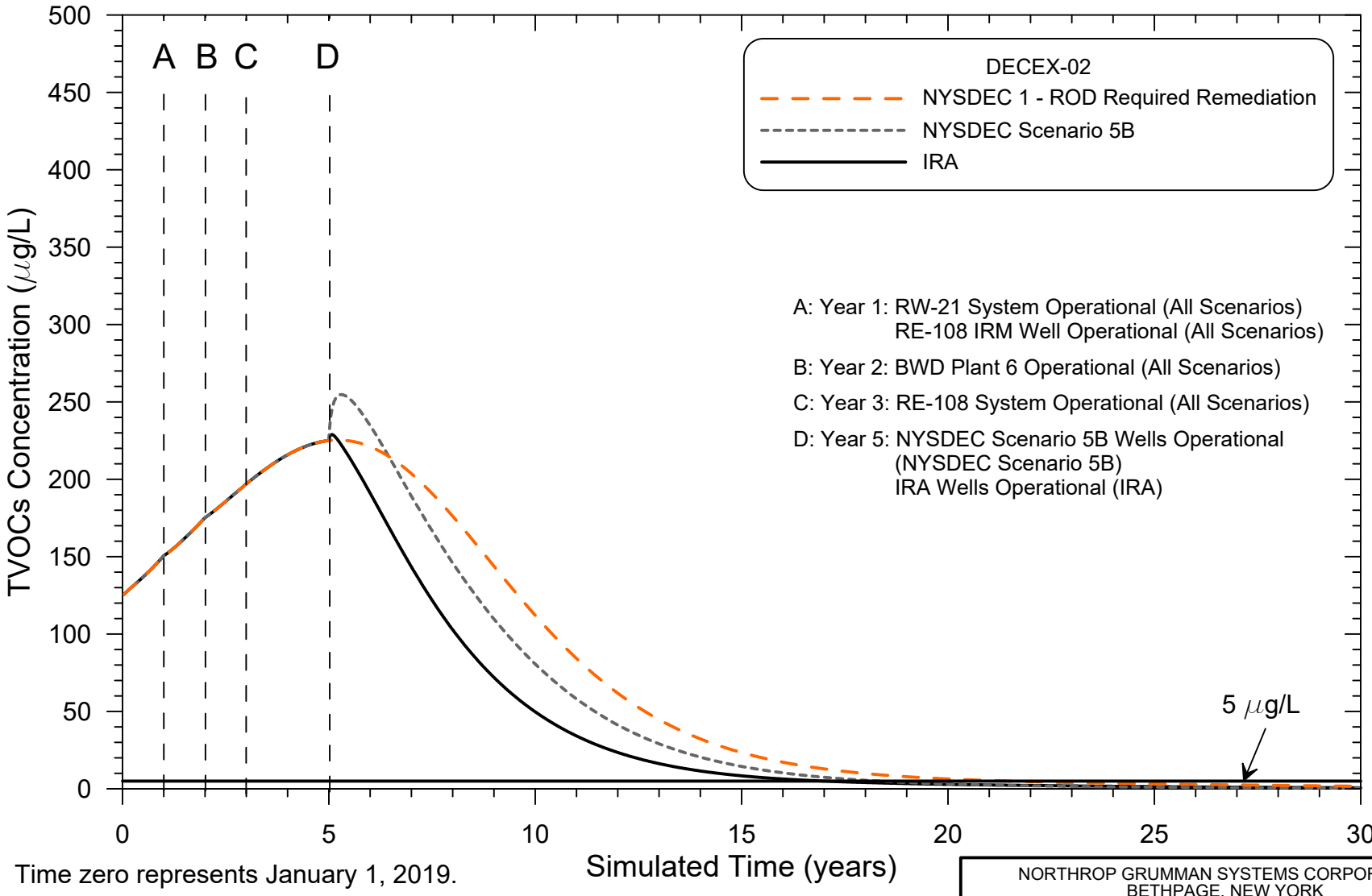
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
DECEX-01

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-51



Time zero represents January 1, 2019.

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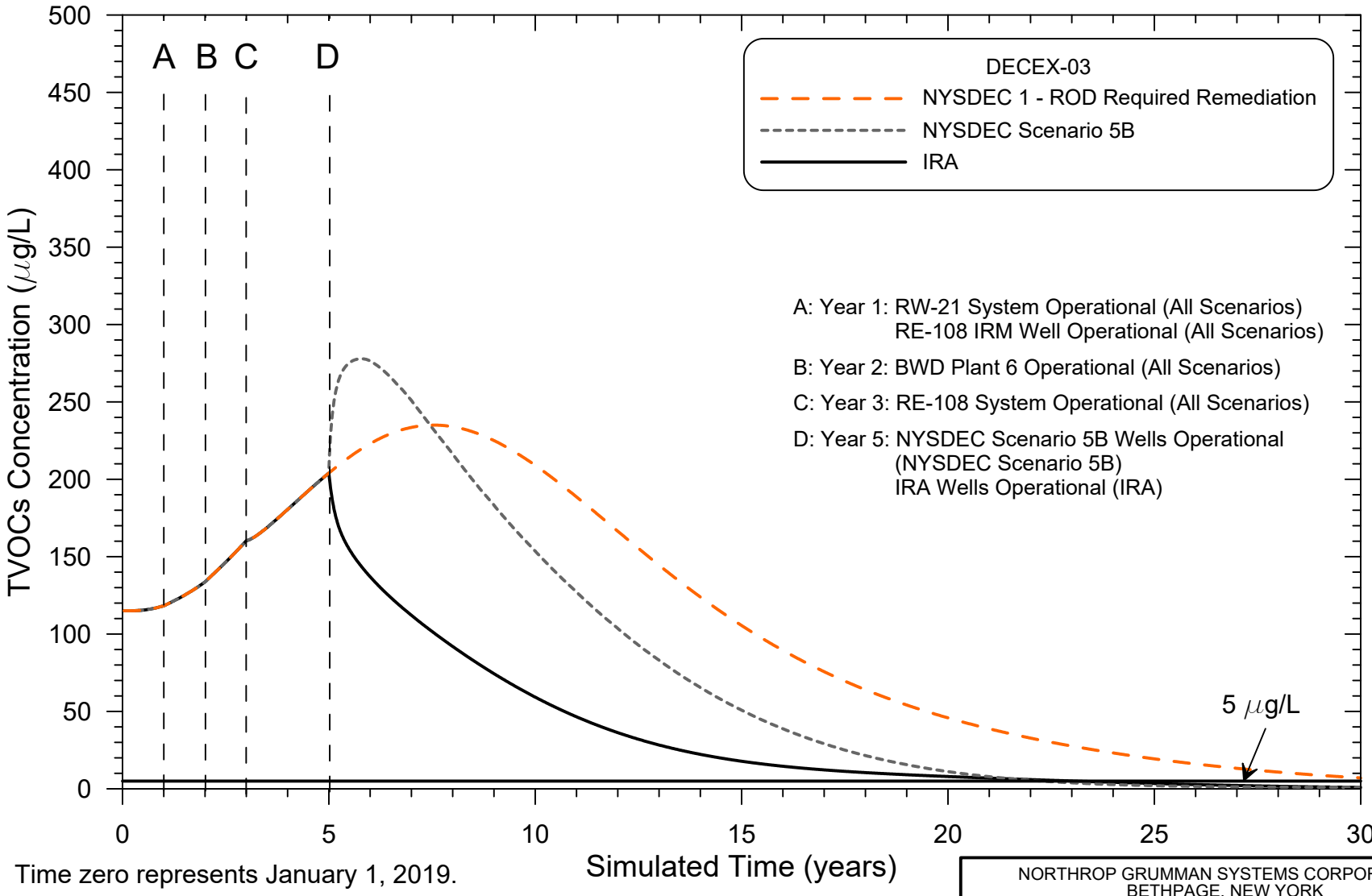
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECEX-02

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-52



Time zero represents January 1, 2019.

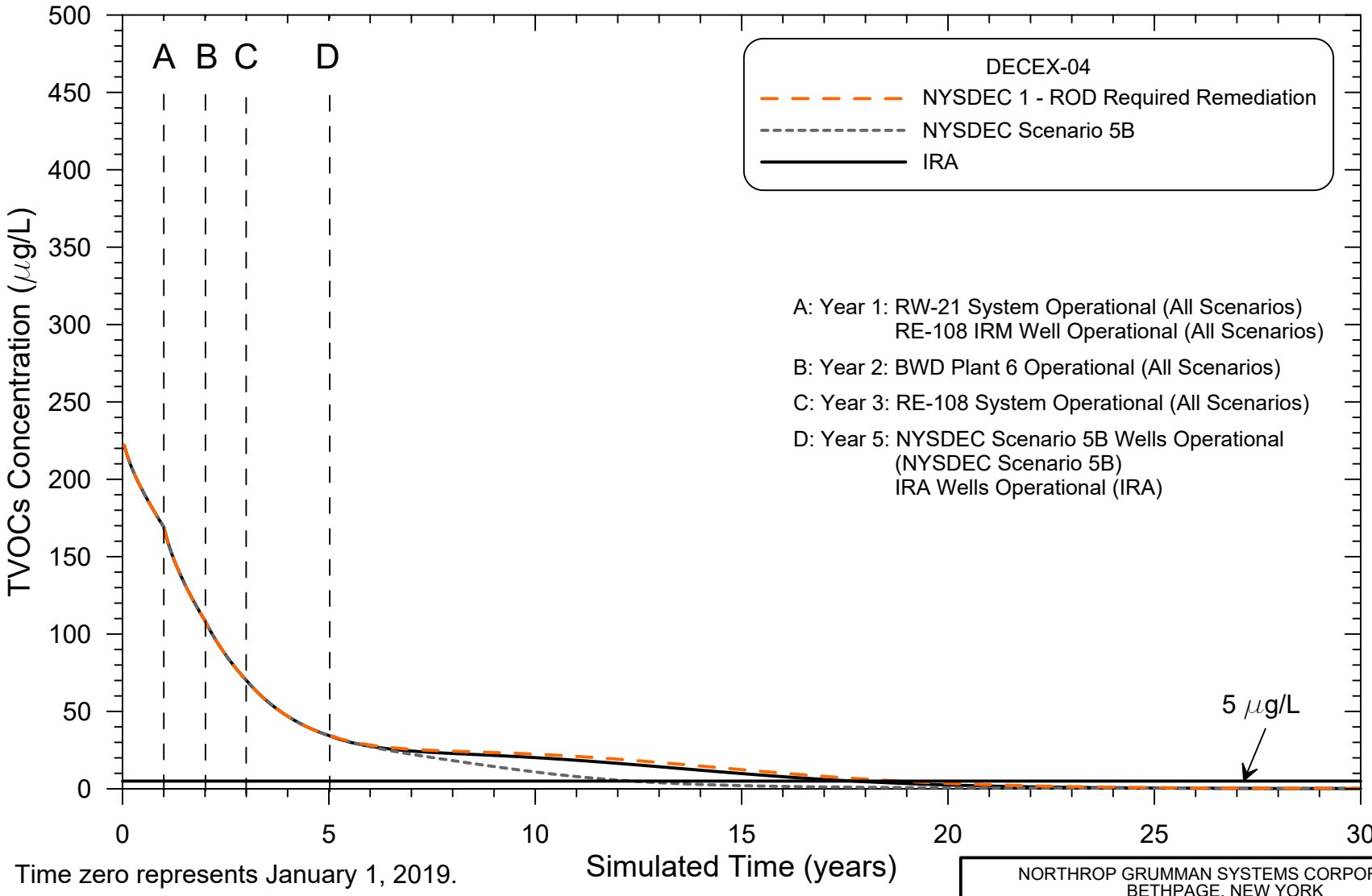
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECEX-03

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-53



Time zero represents January 1, 2019.

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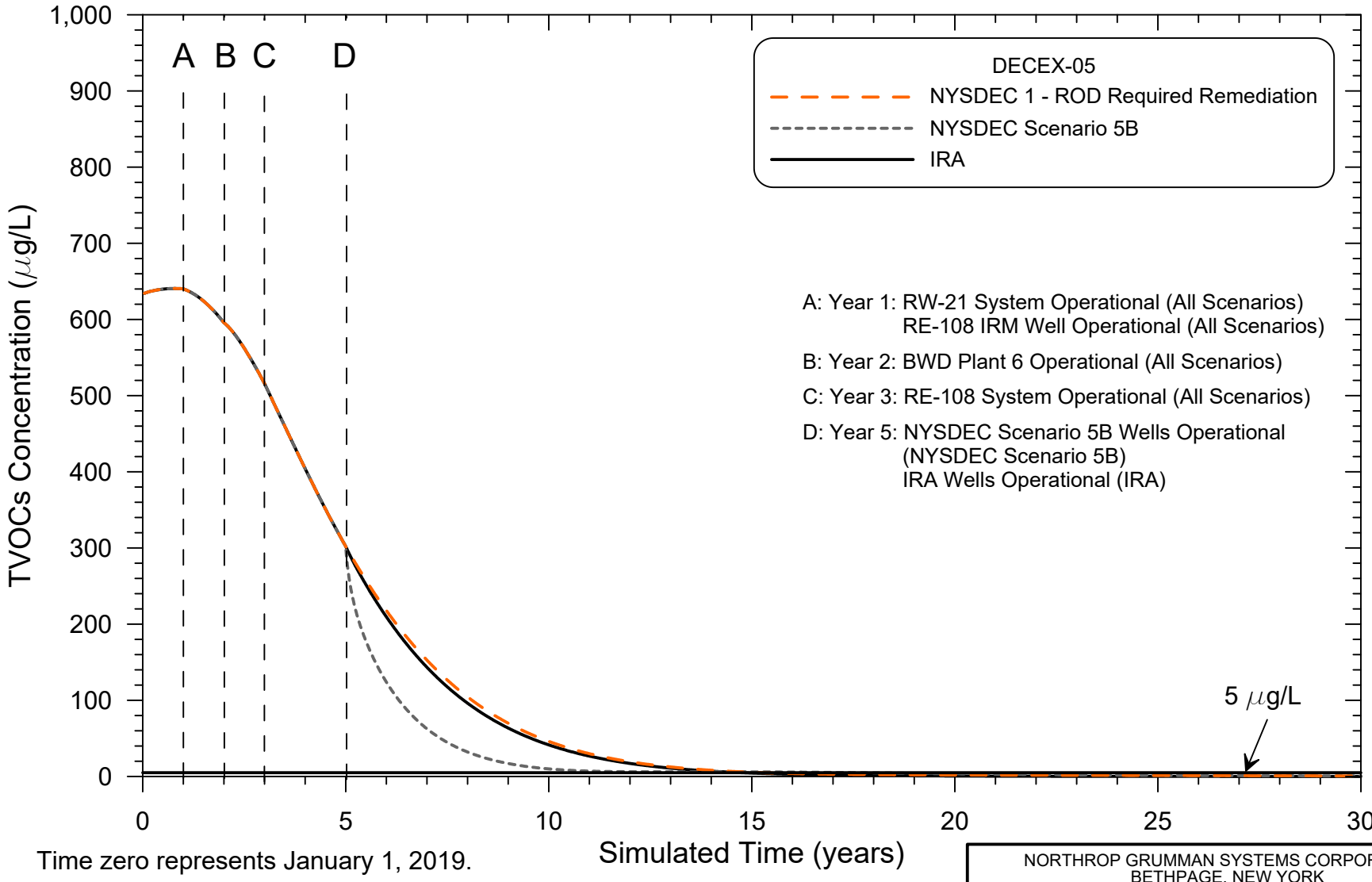
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECEX-04

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-54



Time zero represents January 1, 2019.

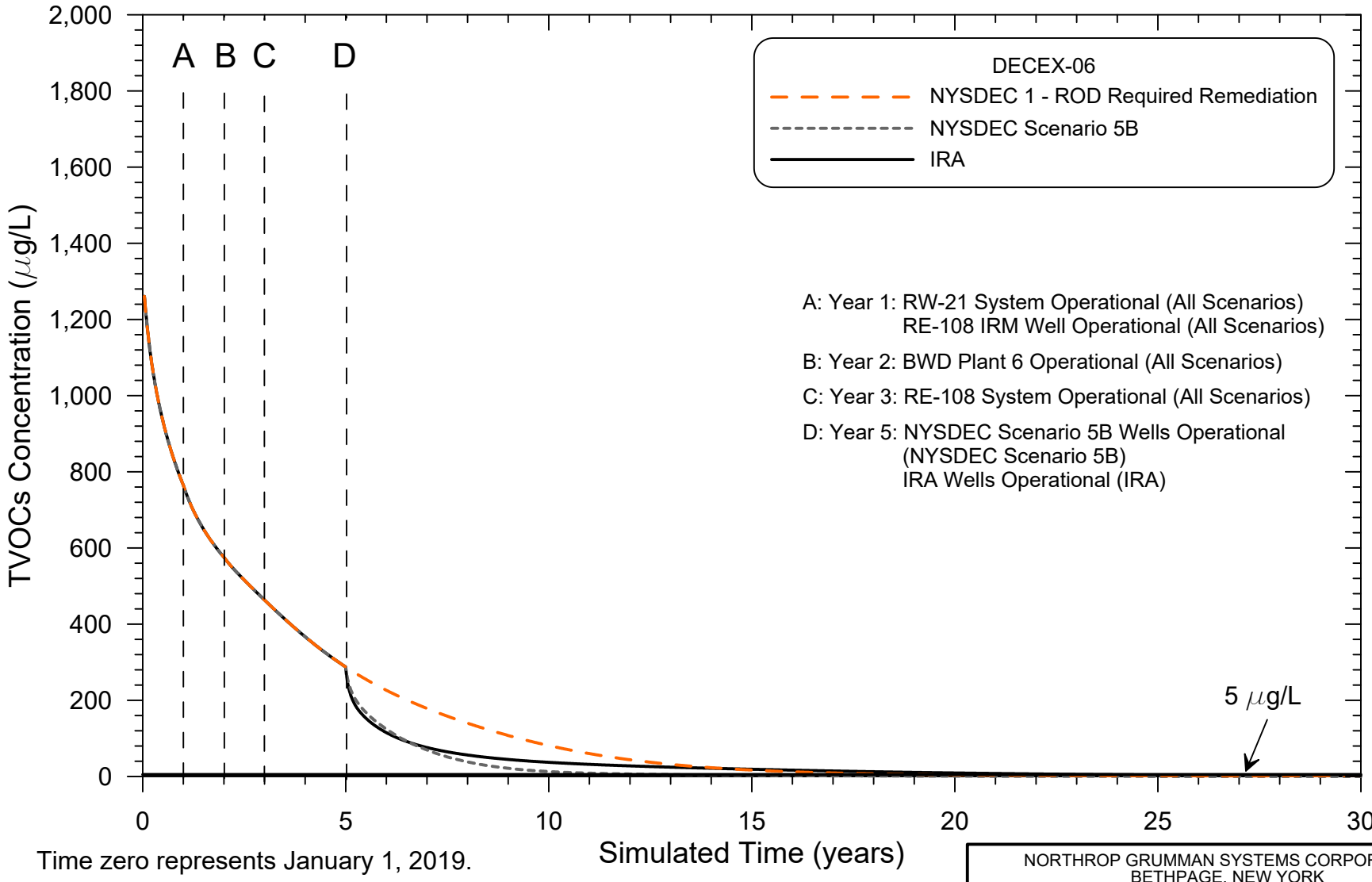
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECEX-05

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-55



Time zero represents January 1, 2019.

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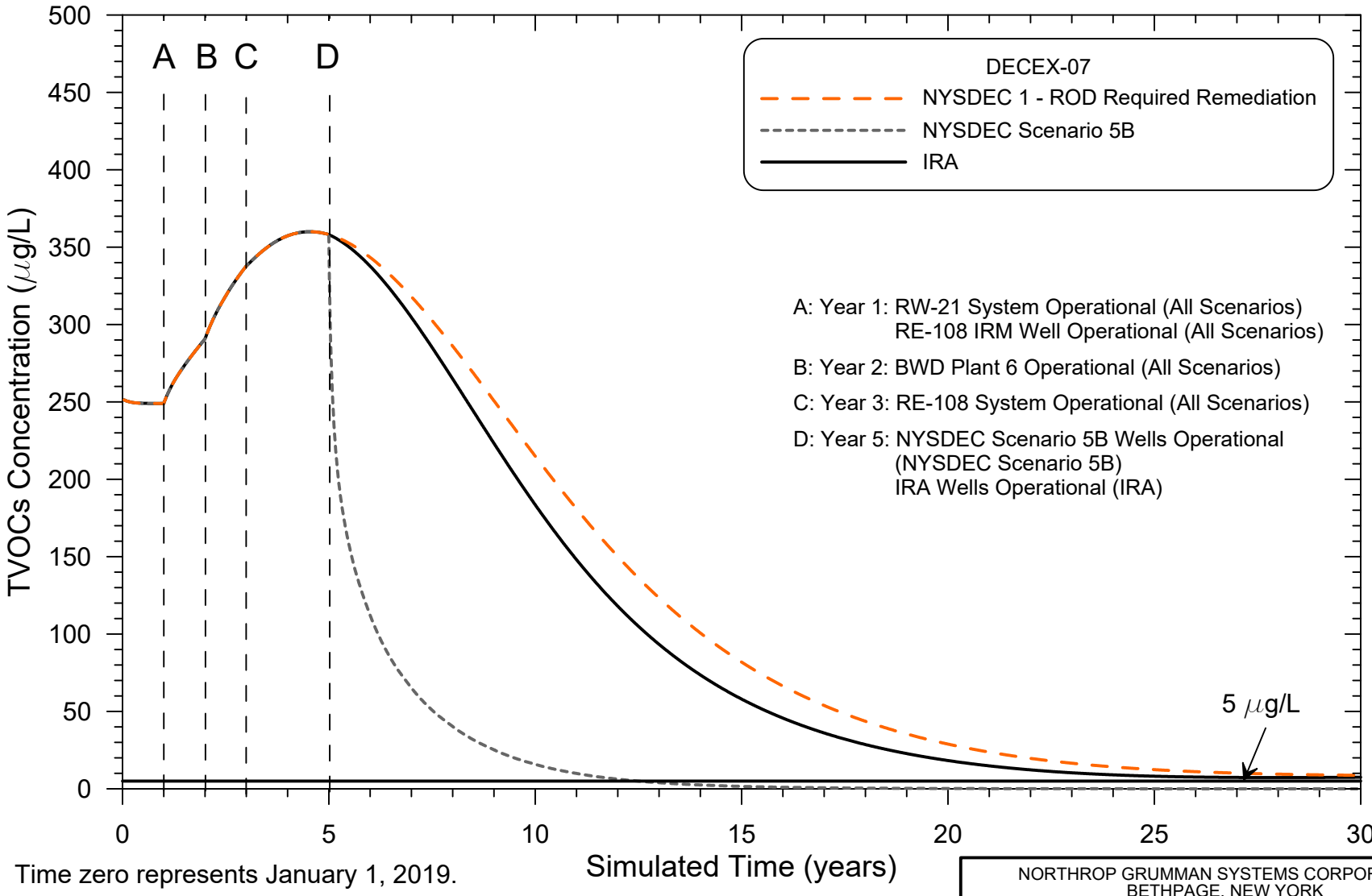
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECEX-06

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-56



Time zero represents January 1, 2019.

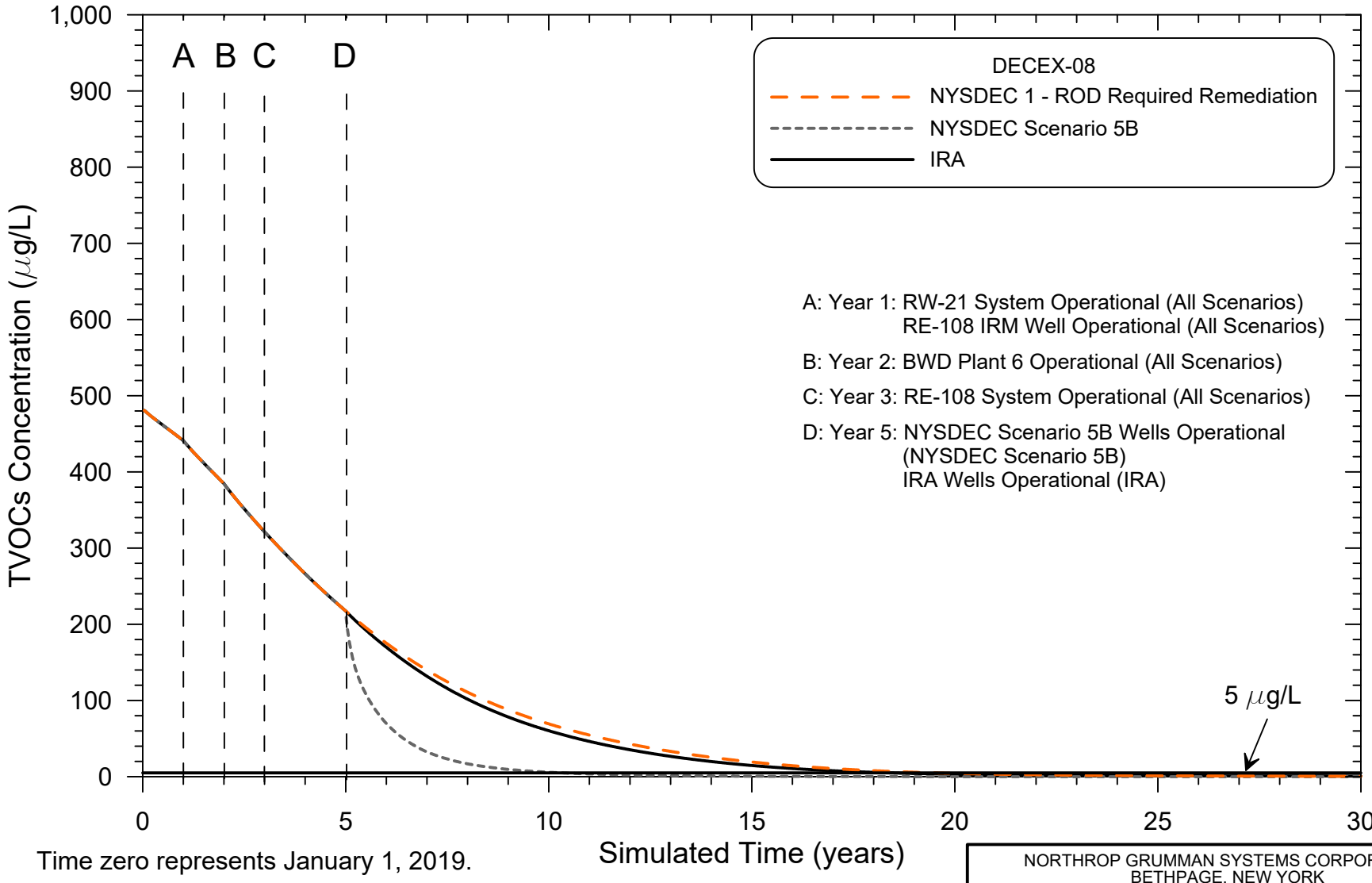
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECEX-07

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-57



Time zero represents January 1, 2019.

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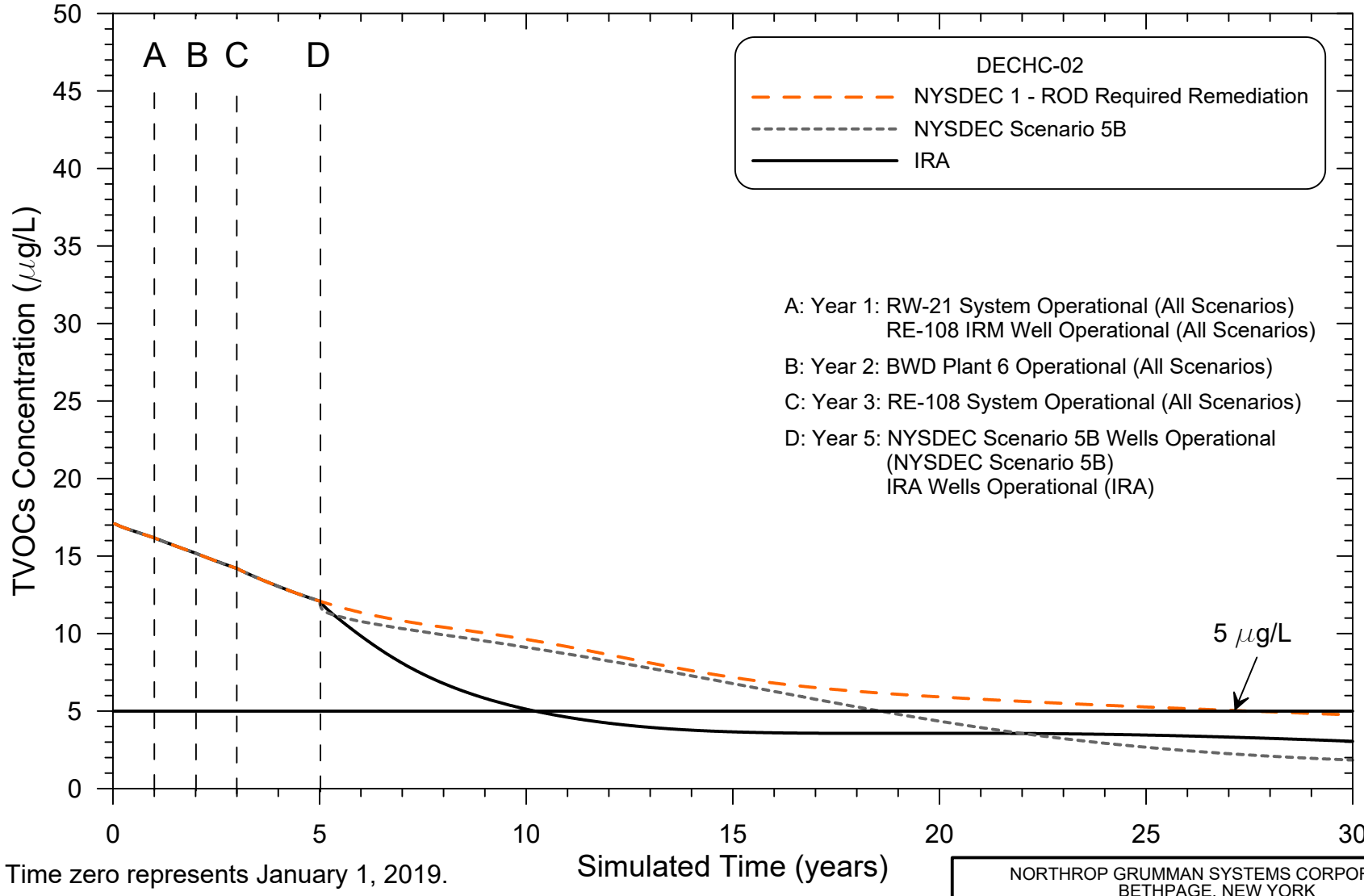
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECEX-08

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-58



Time zero represents January 1, 2019.

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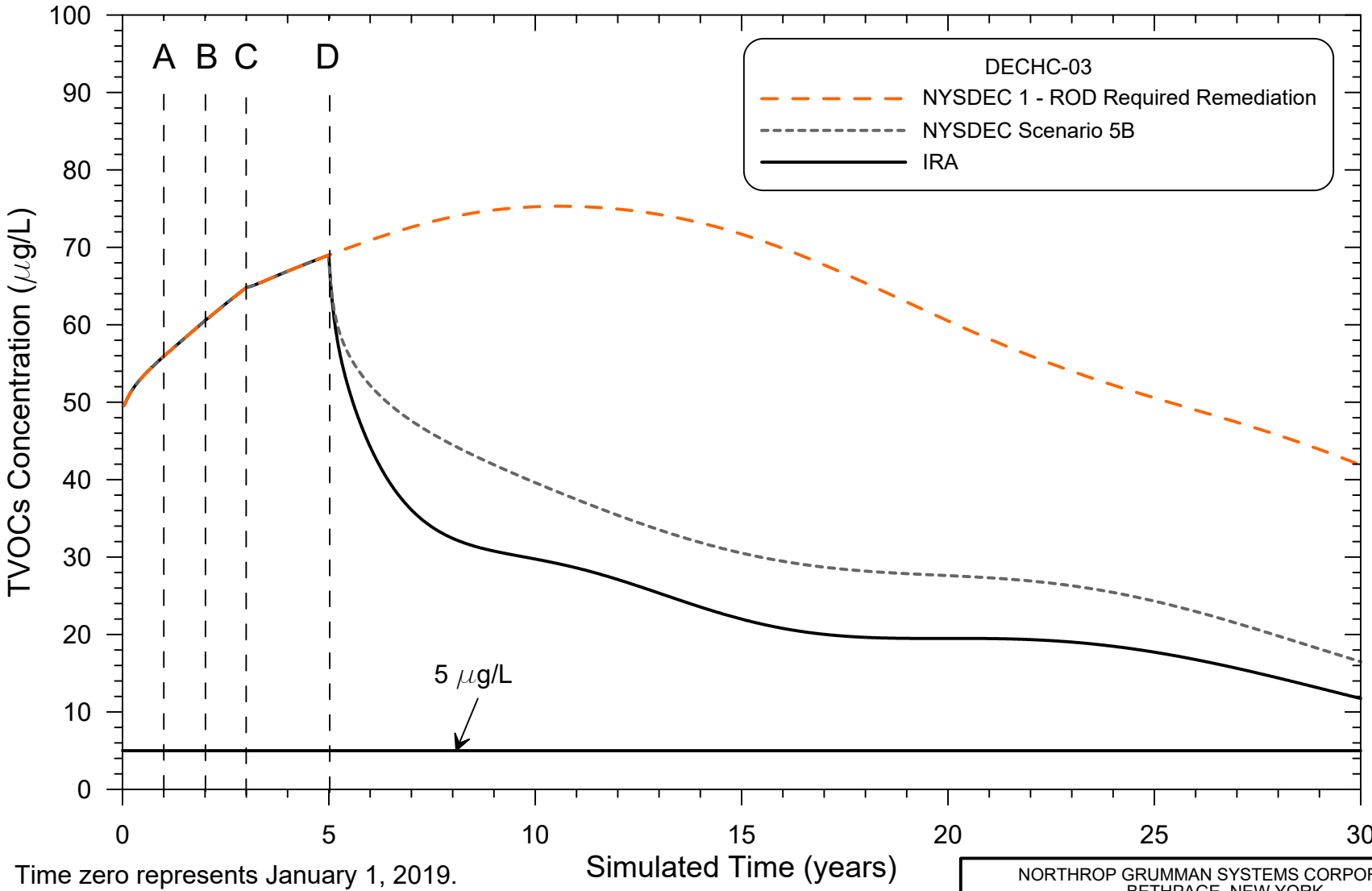
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-02

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-59



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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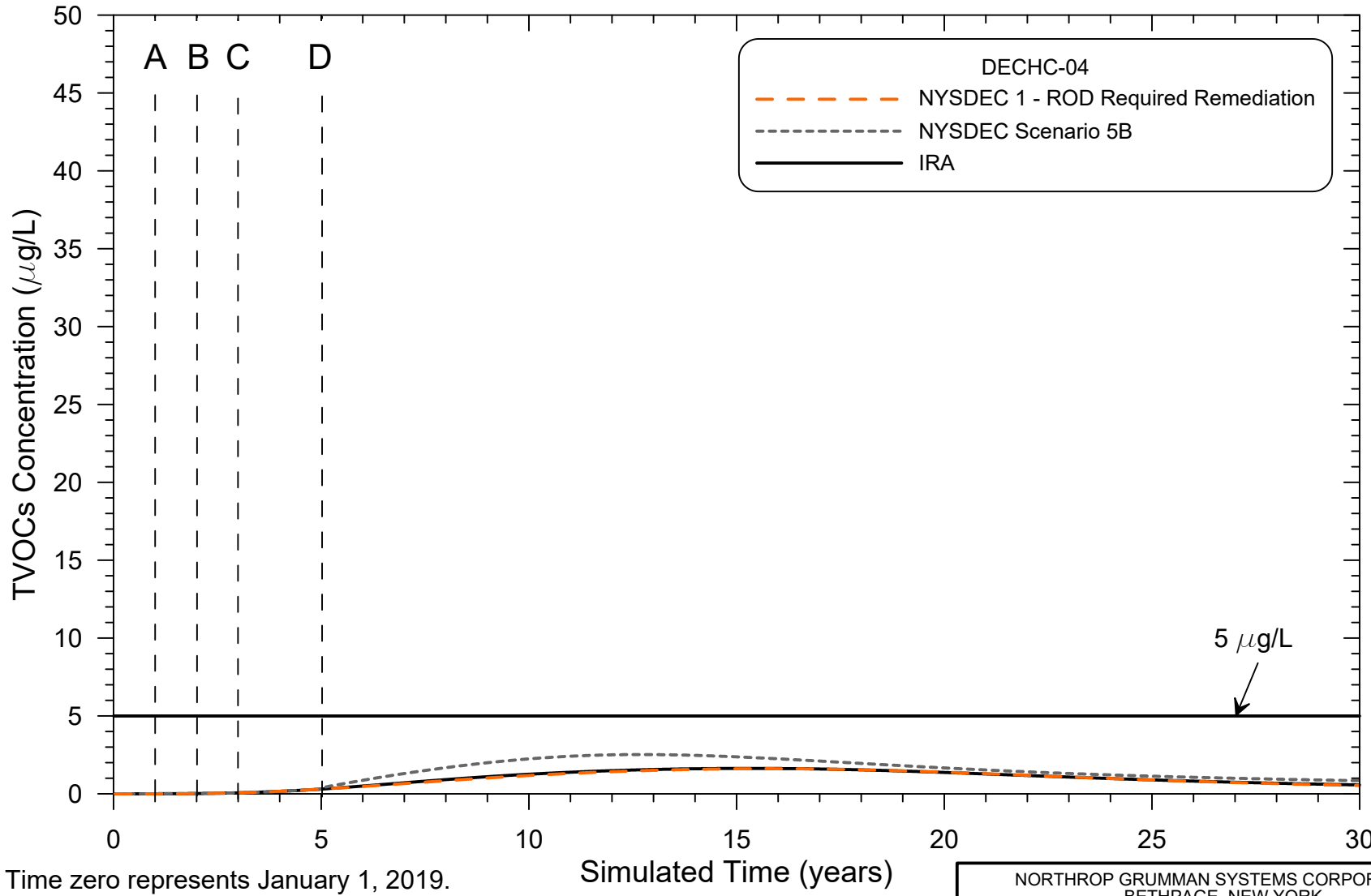
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-03

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-60



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

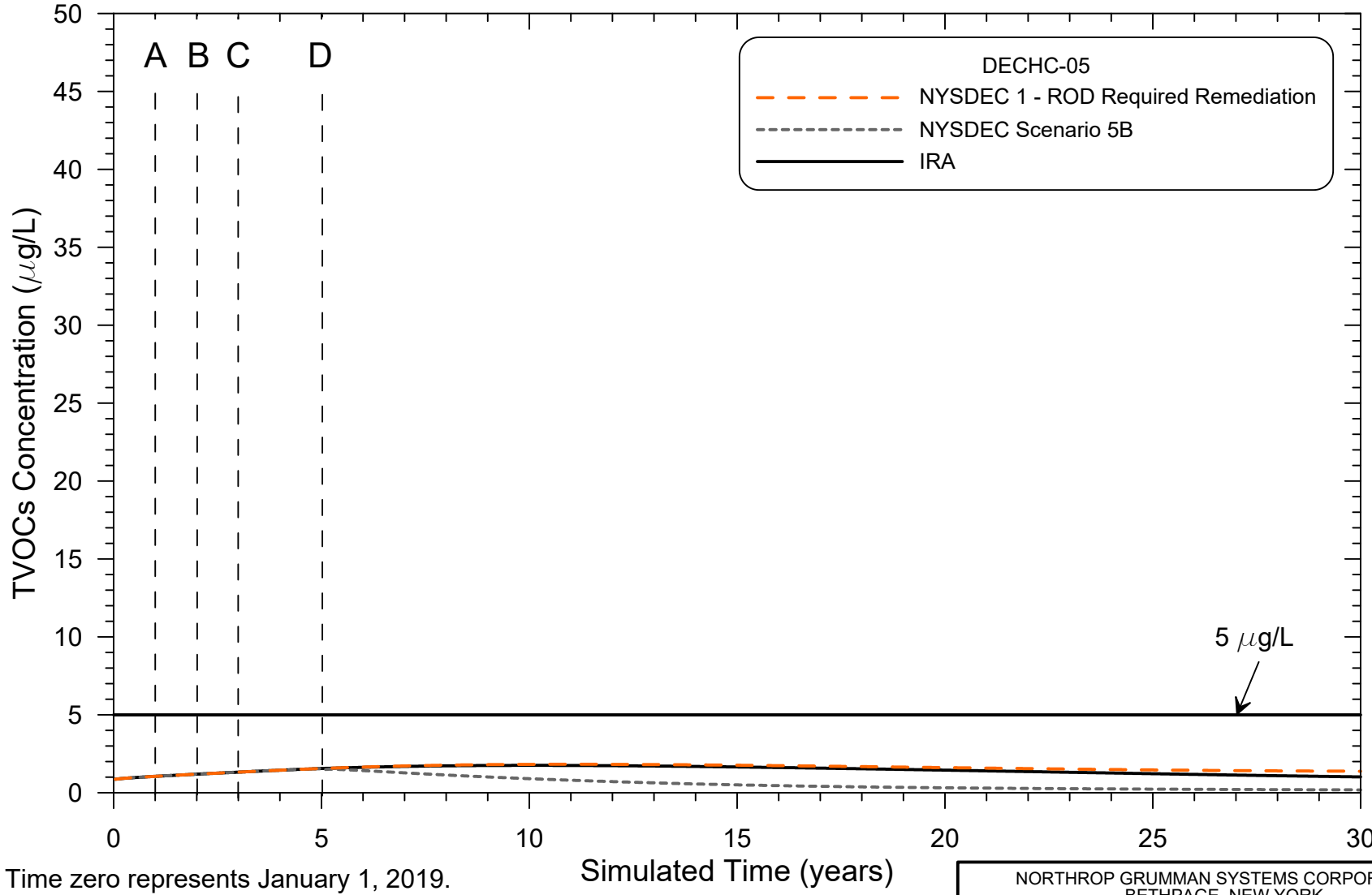
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-04

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-61



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

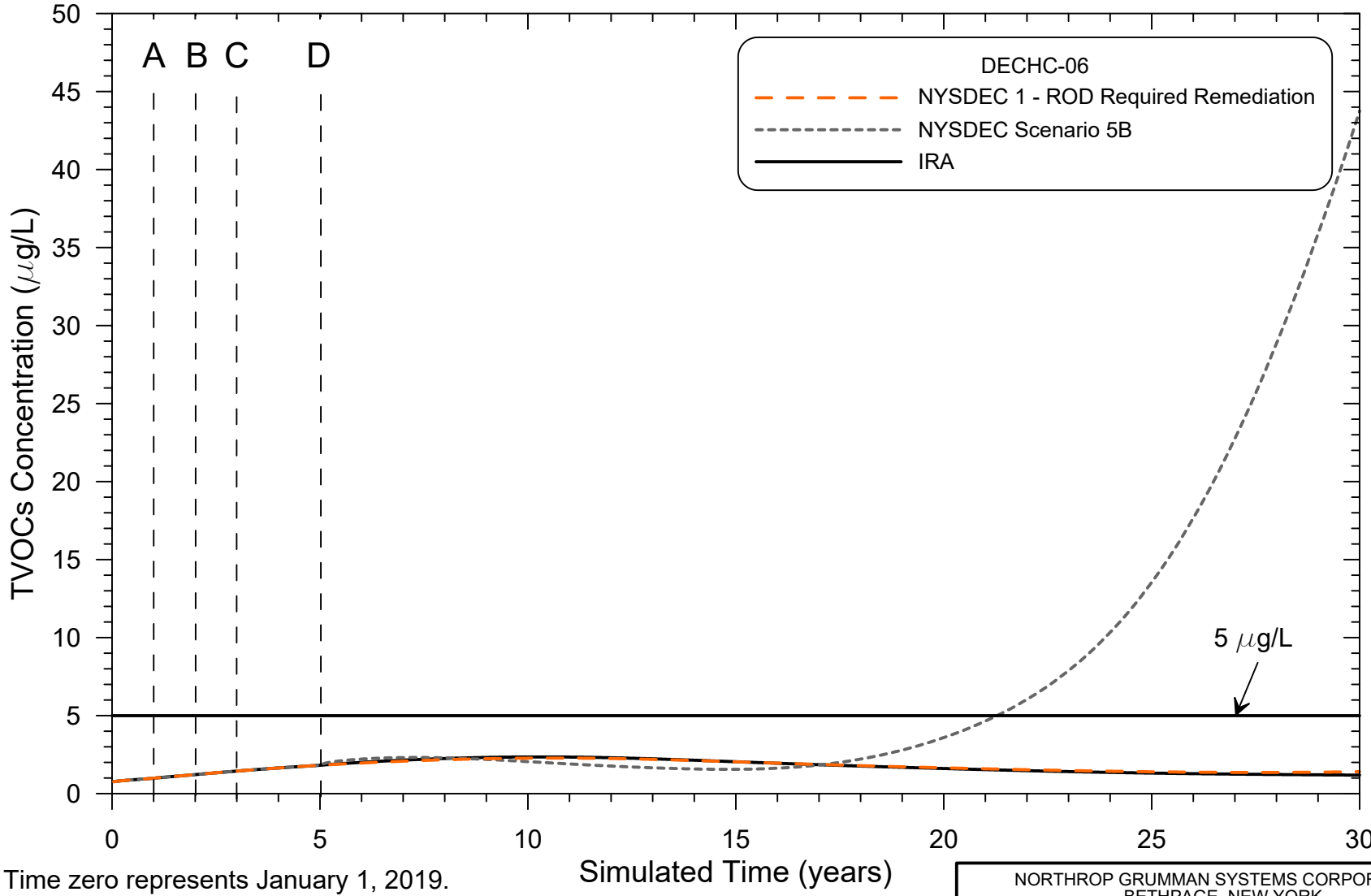
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION
DECHC-05

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-62



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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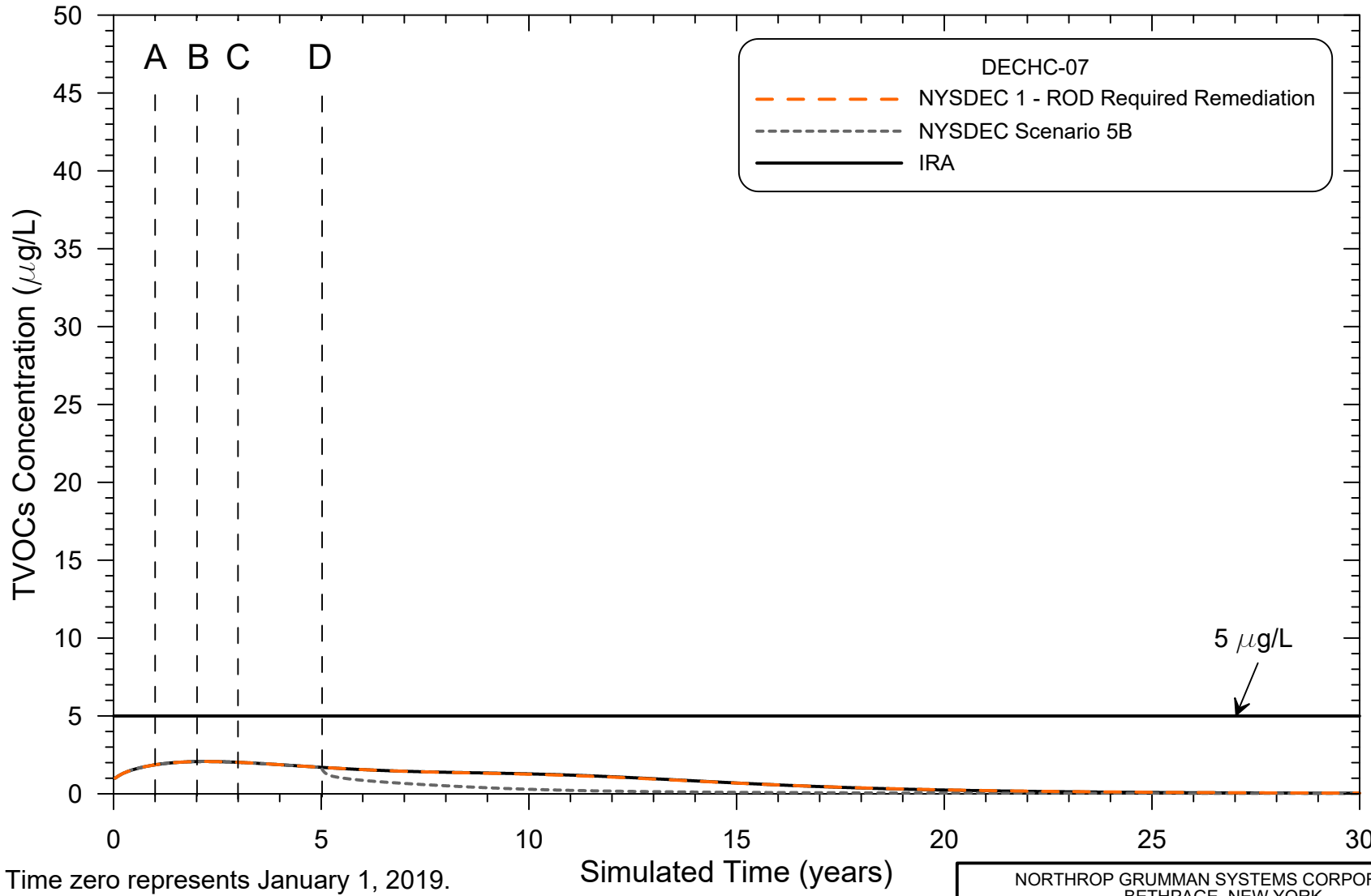
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-06

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-63



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

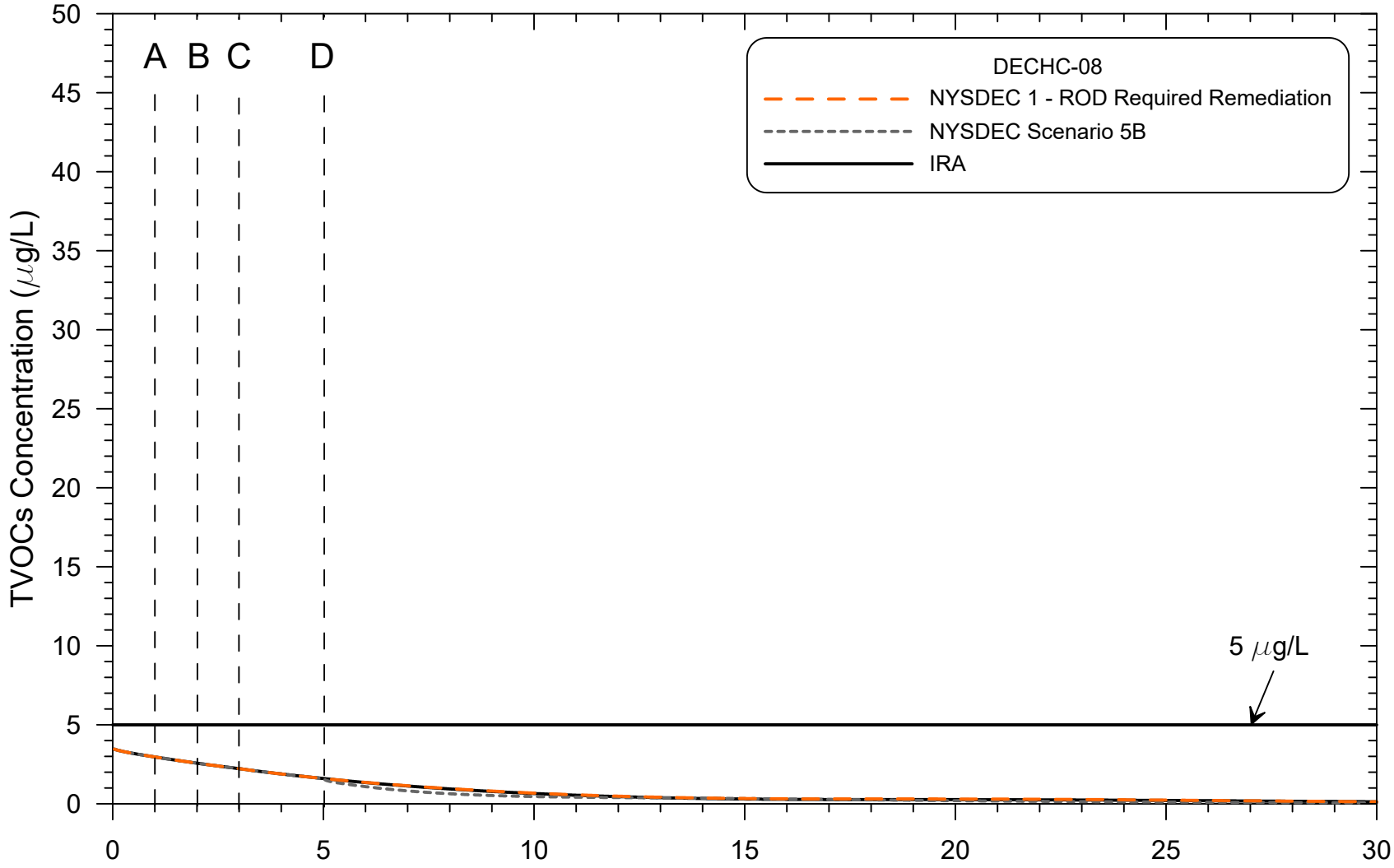
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-07

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-64



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

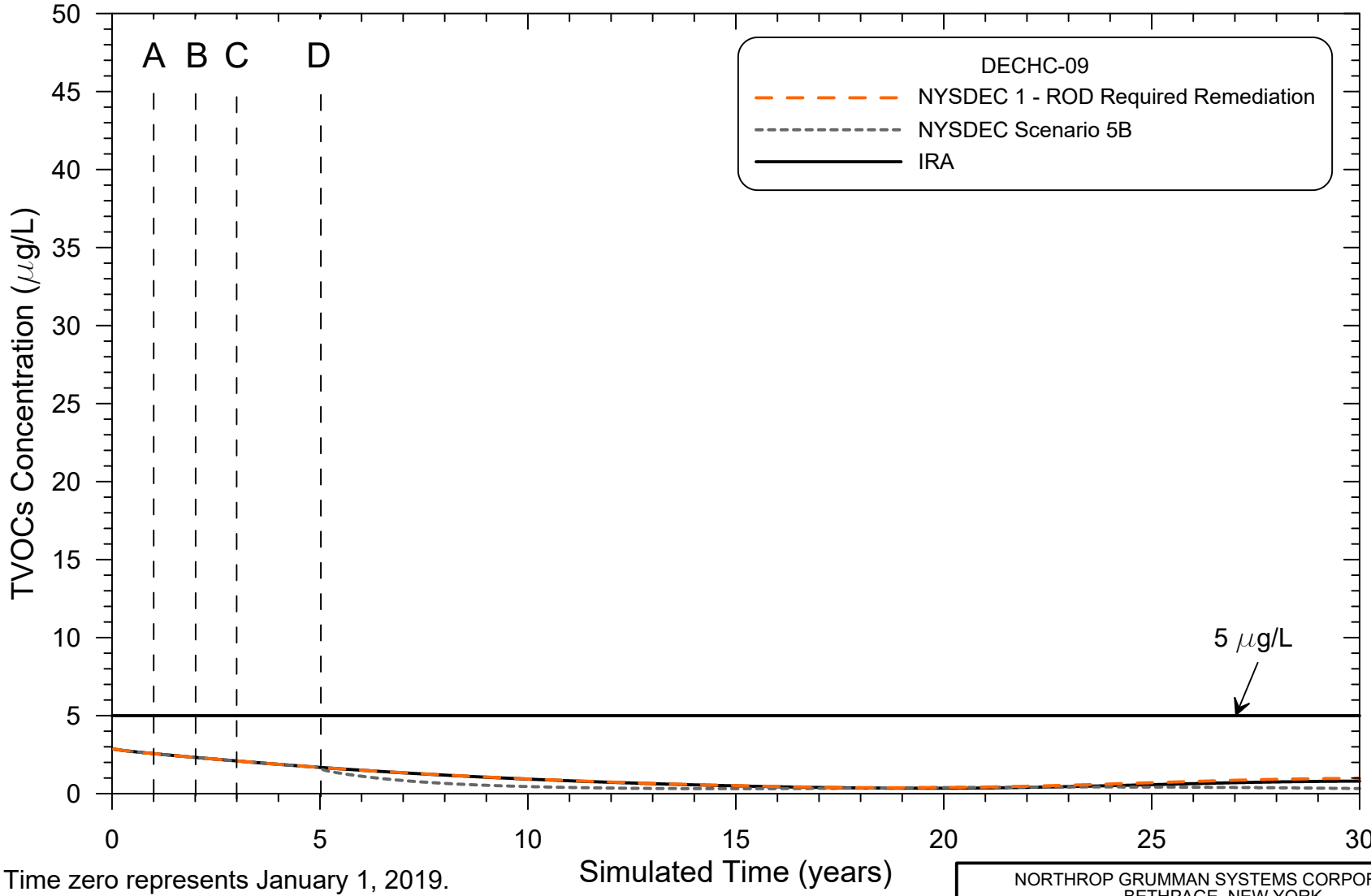
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-08

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-65



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

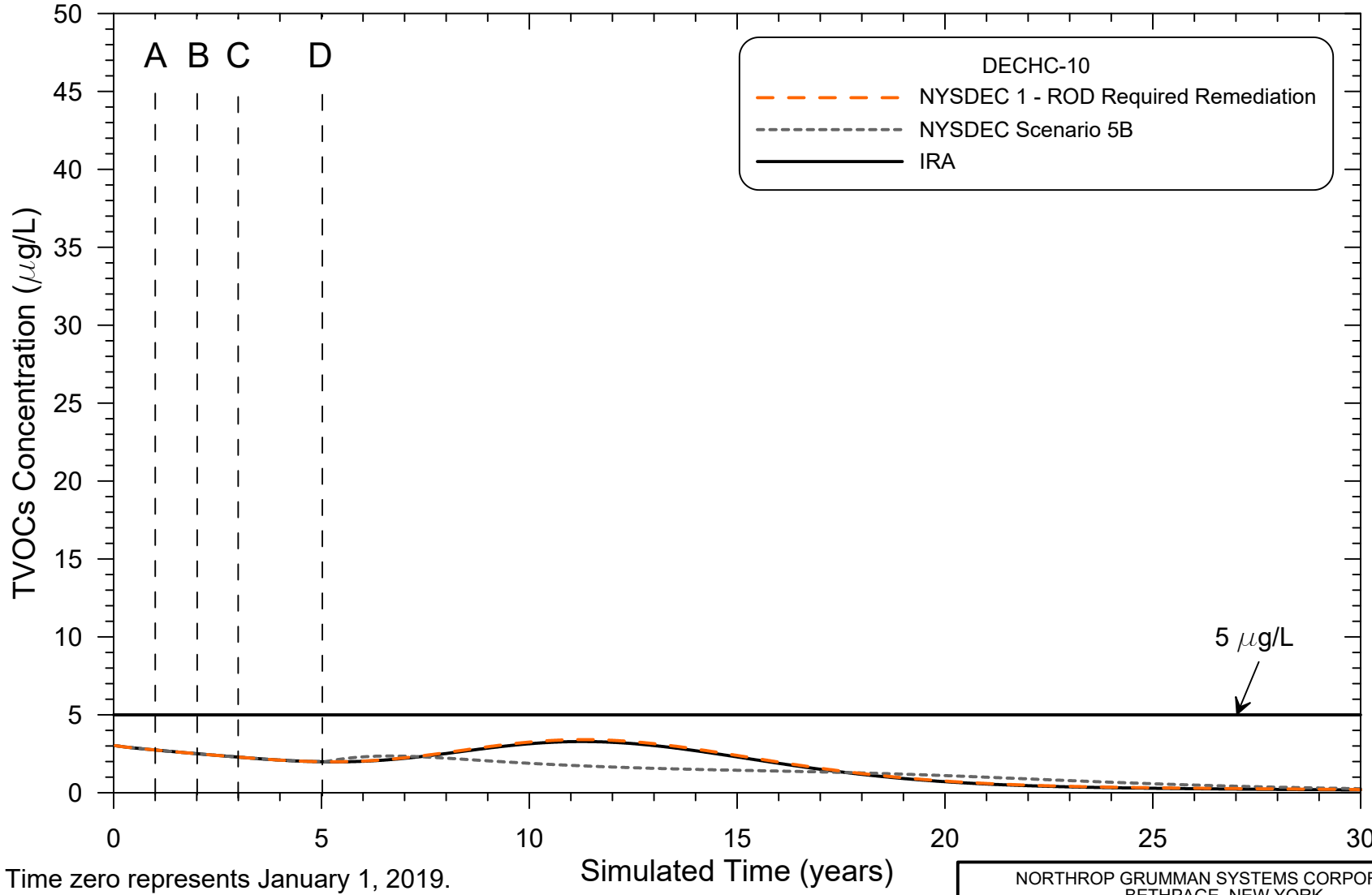
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-09

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-66



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

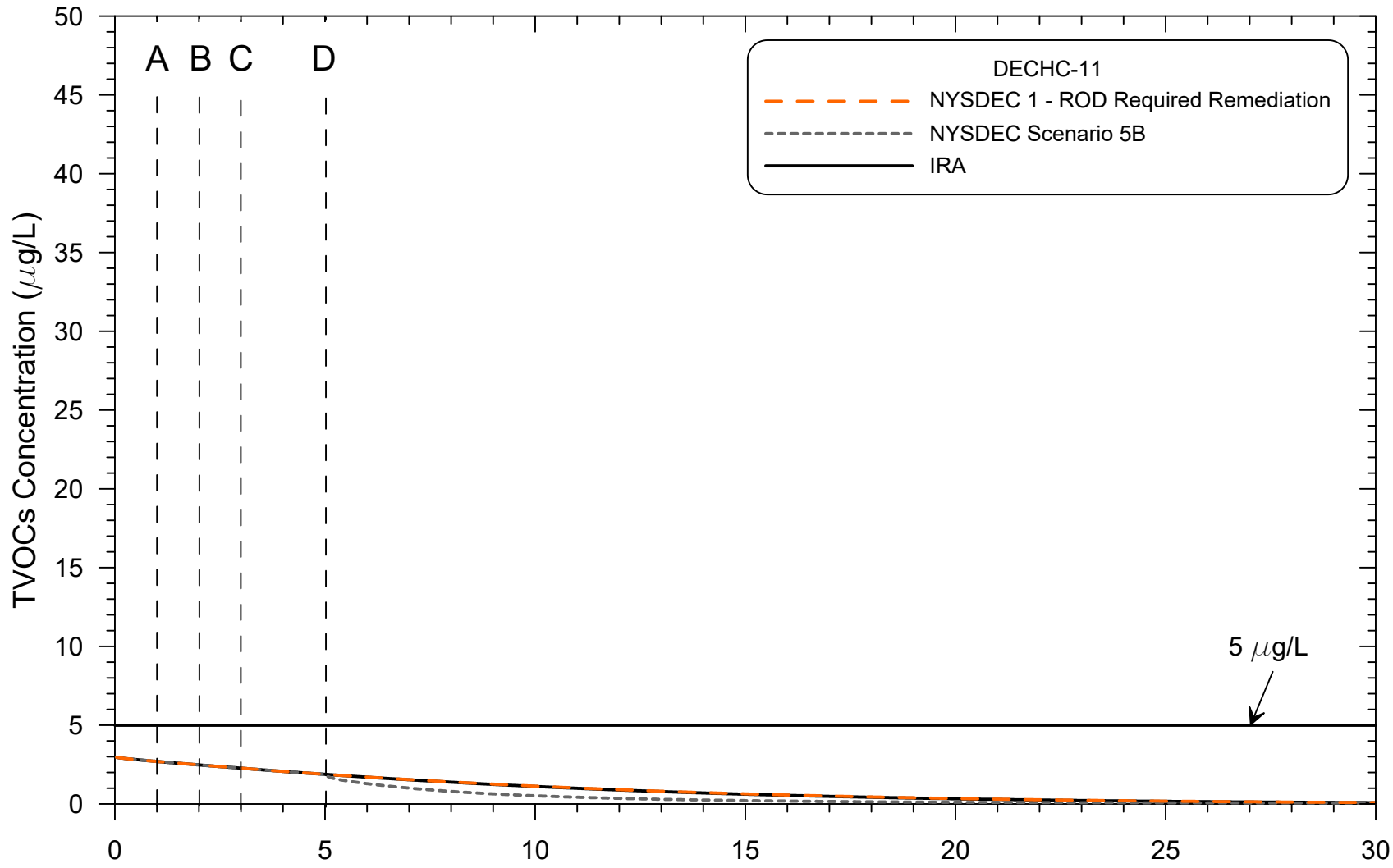
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-10

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-67



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

NORTHROP GRUMMAN SYSTEMS CORPORATION
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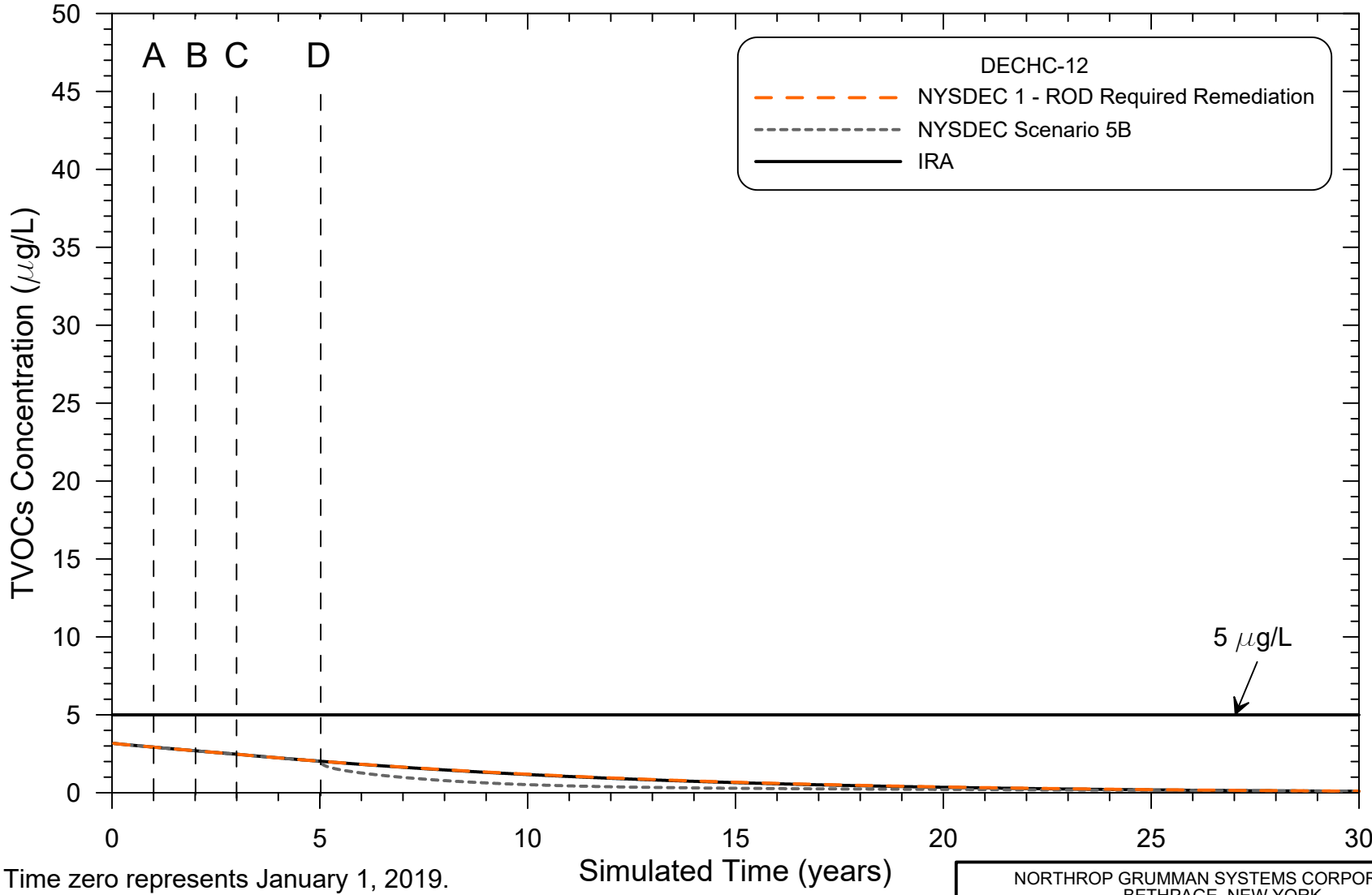
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-11

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-68



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

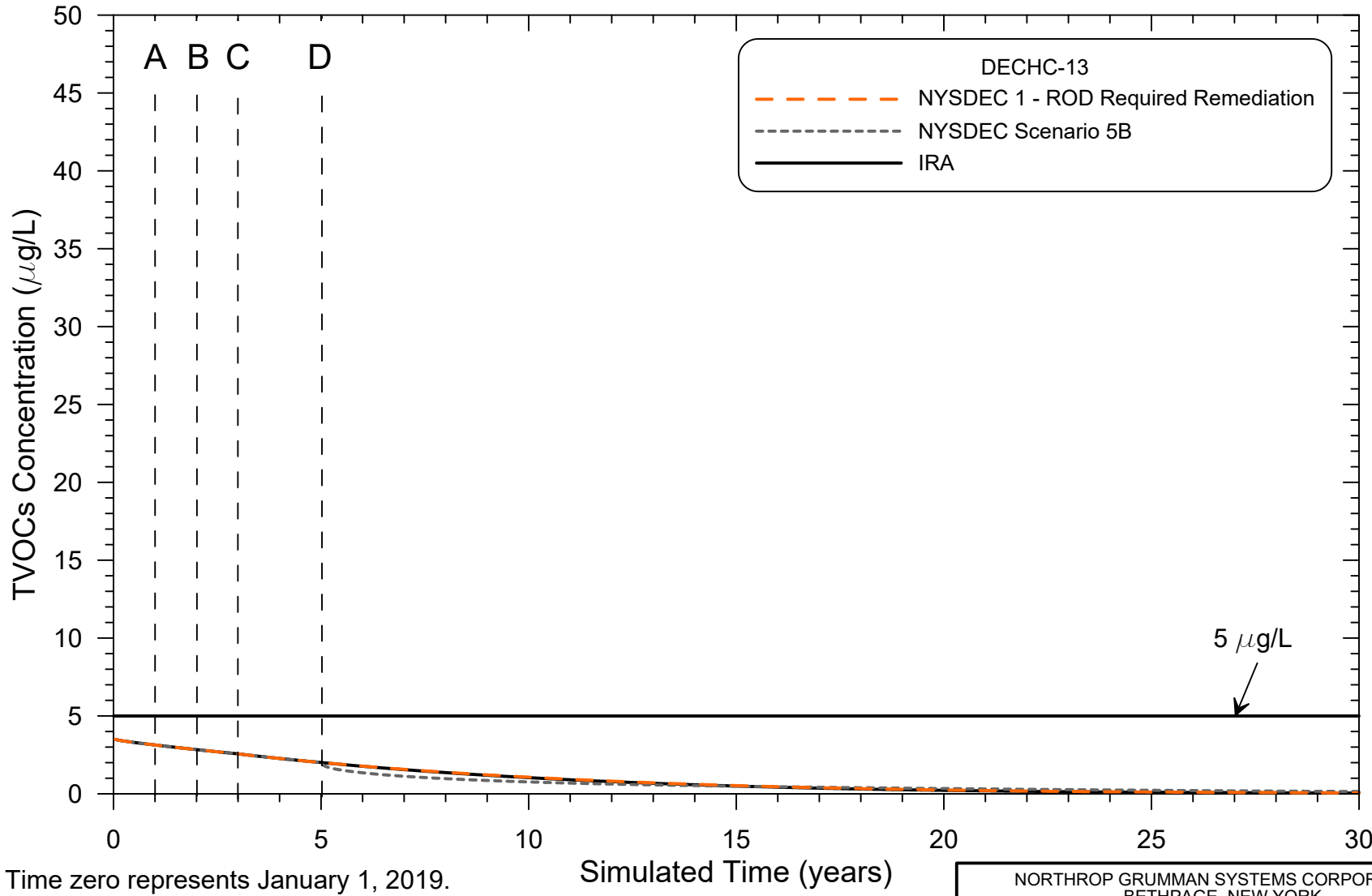
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-12

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-69



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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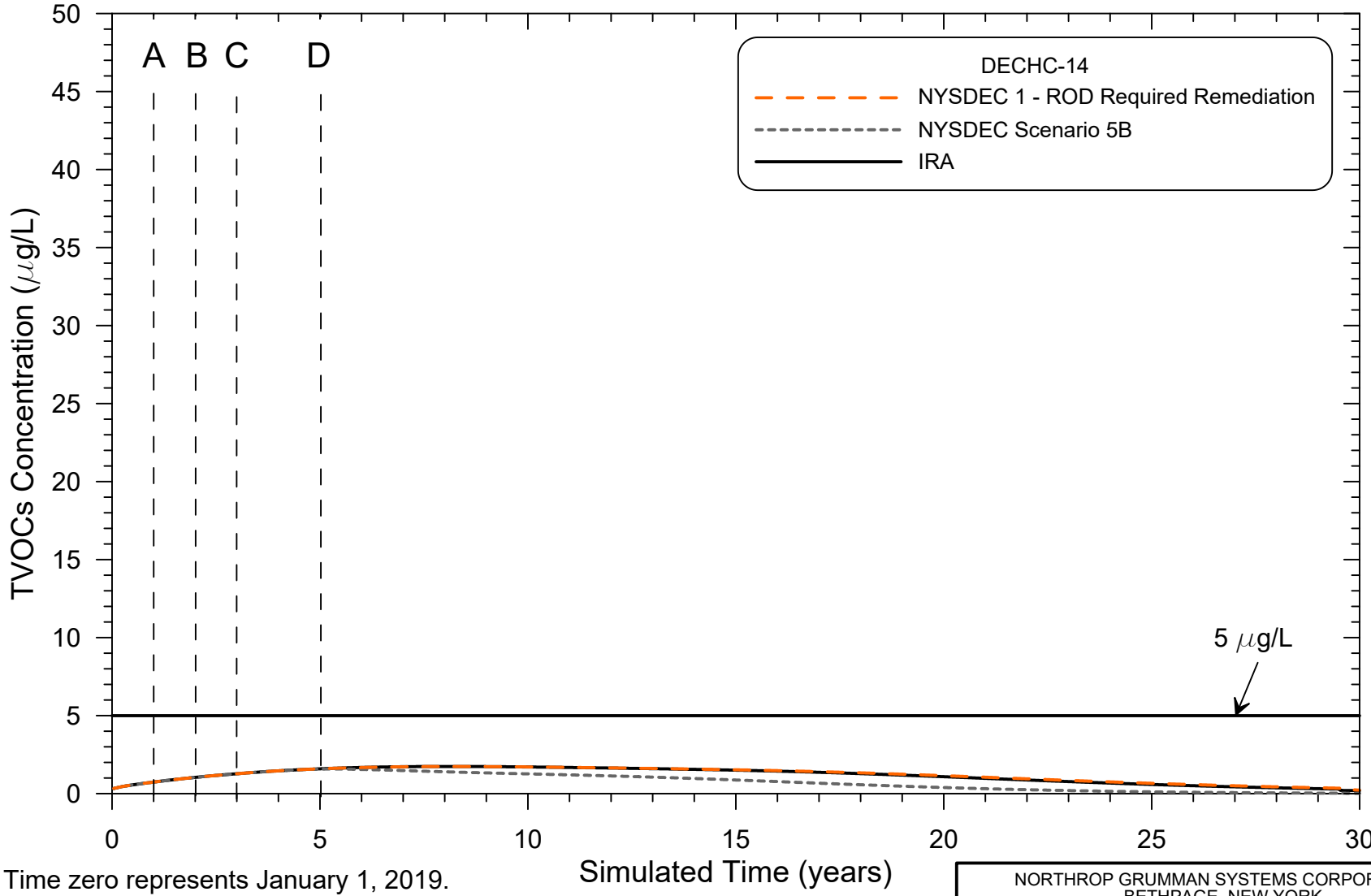
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-13

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-70



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

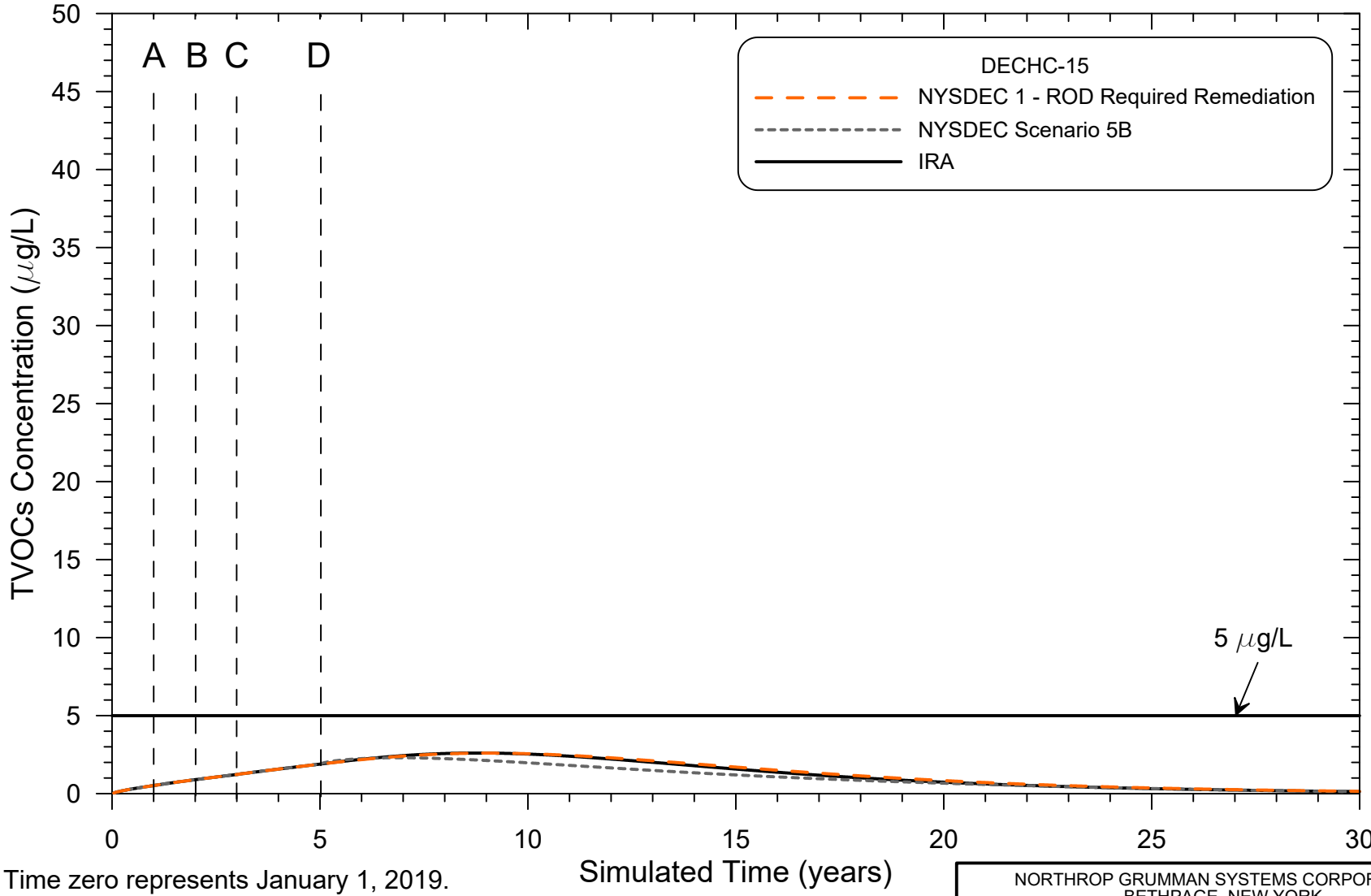
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-14

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-71



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

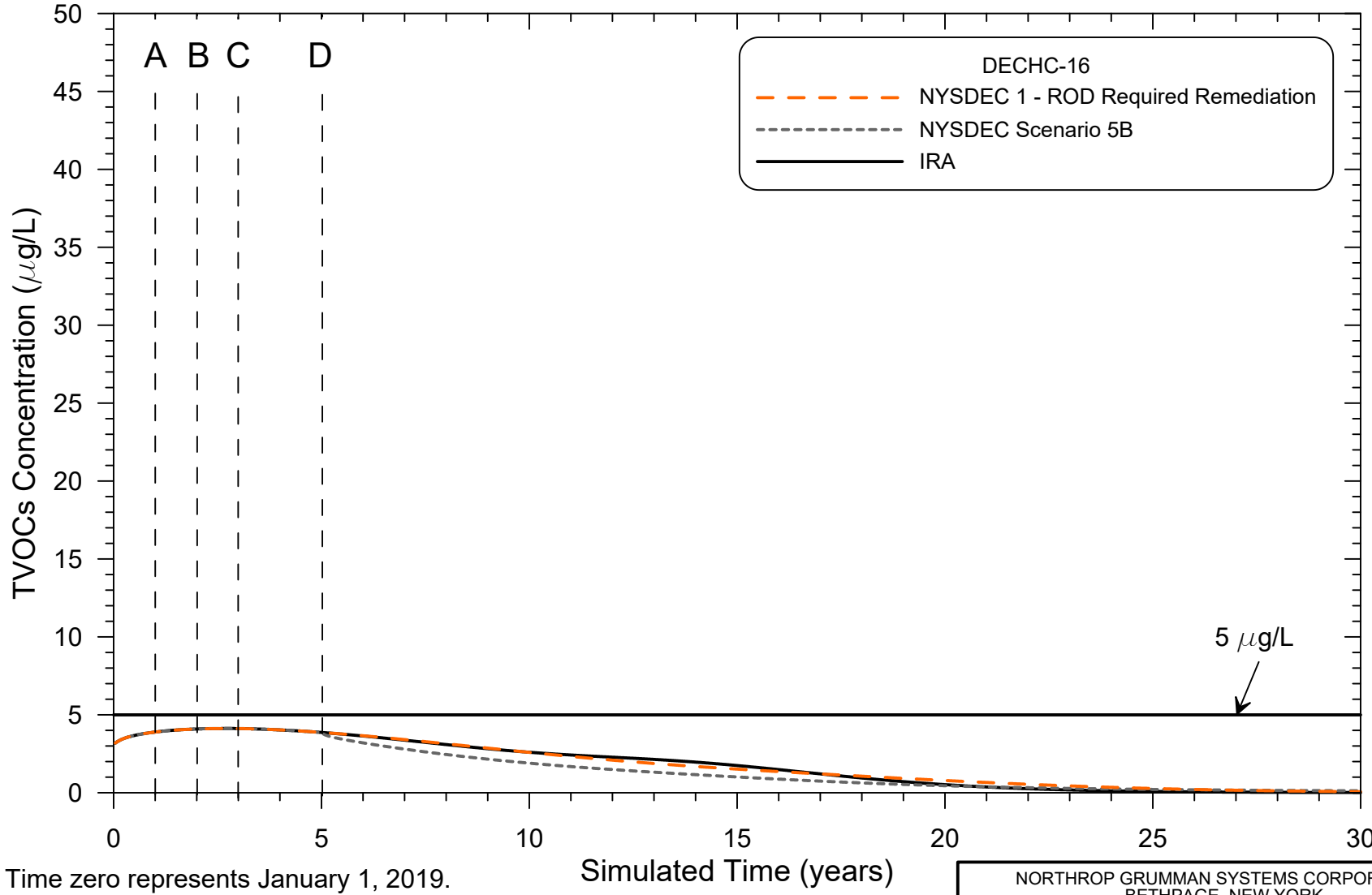
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-15

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-72



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

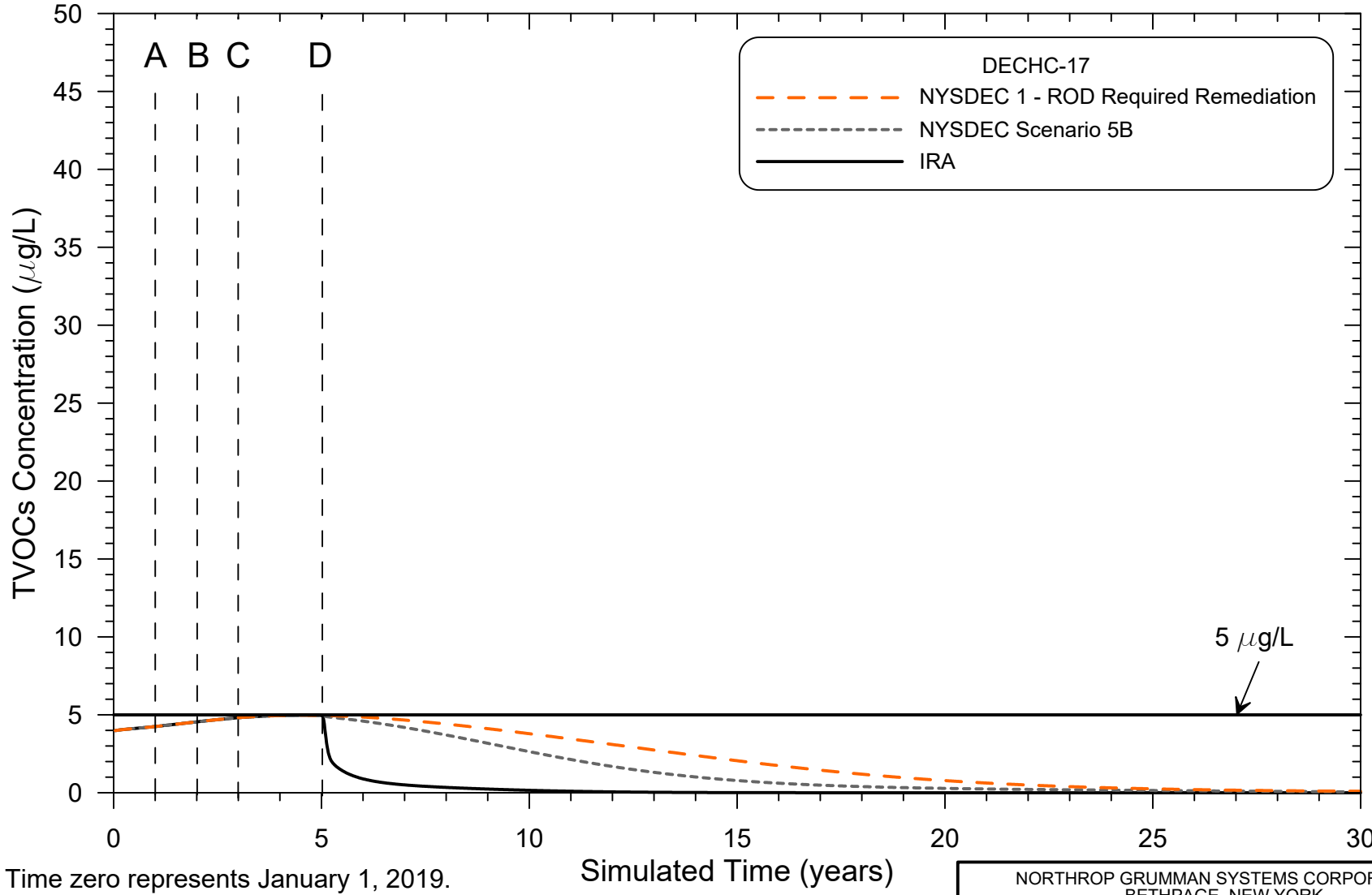
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-16

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-73



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

NORTHROP GRUMMAN SYSTEMS CORPORATION
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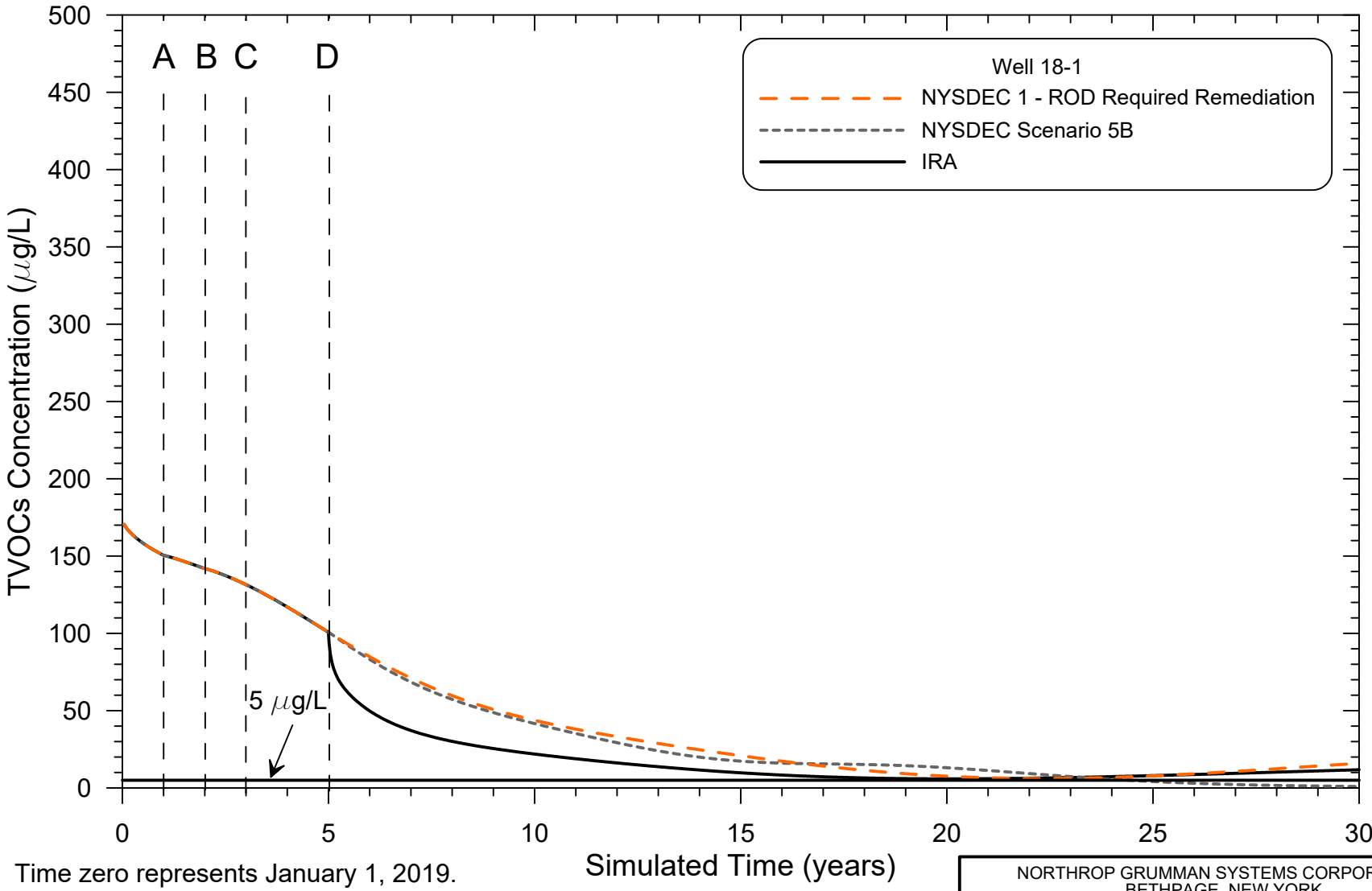
PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION DECHC-17

ARCADIS Design & Consultancy for natural and built assets

FIGURE
4.2-74



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

PAROD COMMENTS MODELING MEMORANDUM

PREDICTED TVOCS CONCENTRATION WELL 18-1

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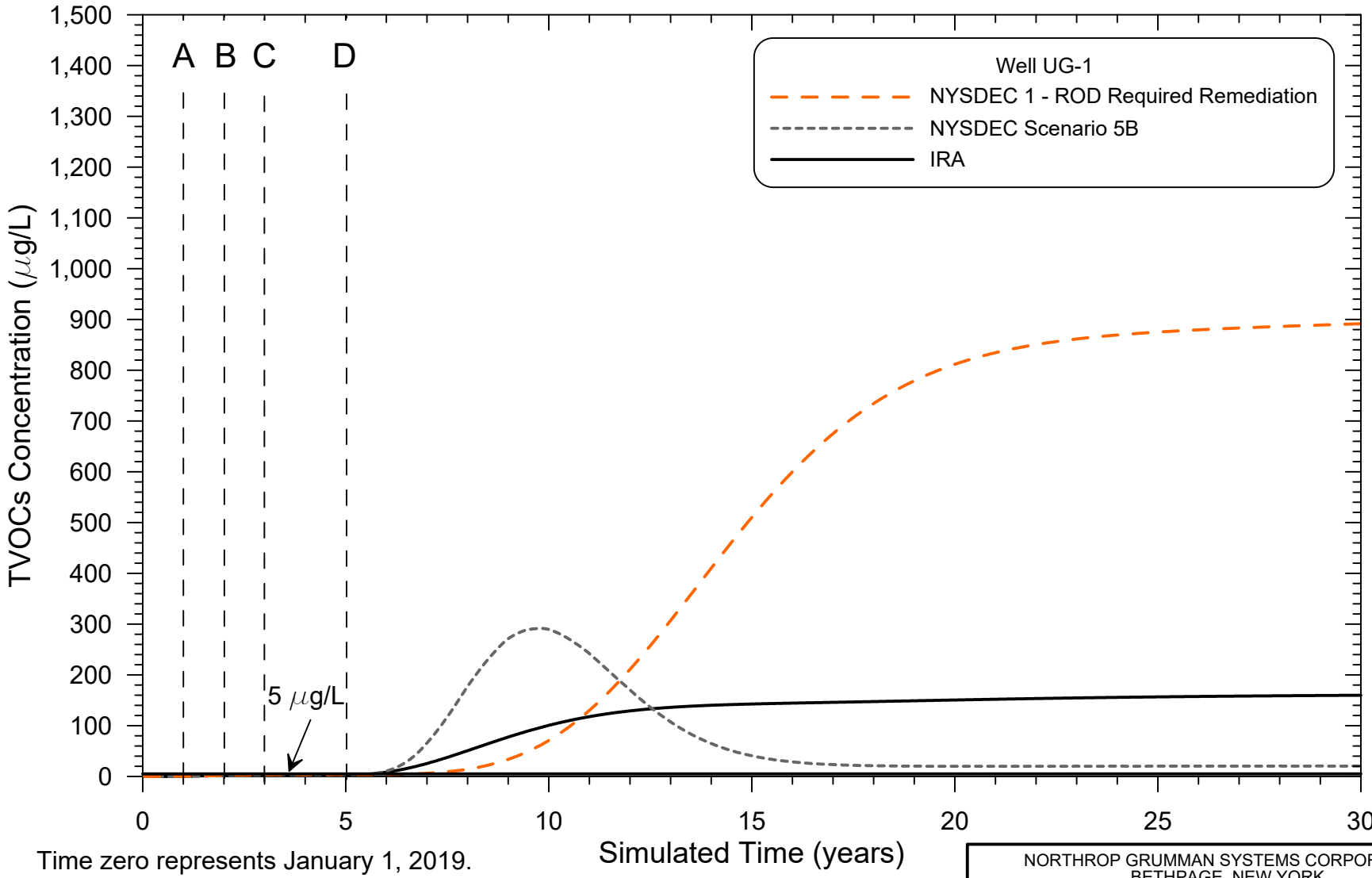
FIGURE
4.2-75



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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PREDICTED TVOCS CONCENTRATION WELL UG-1

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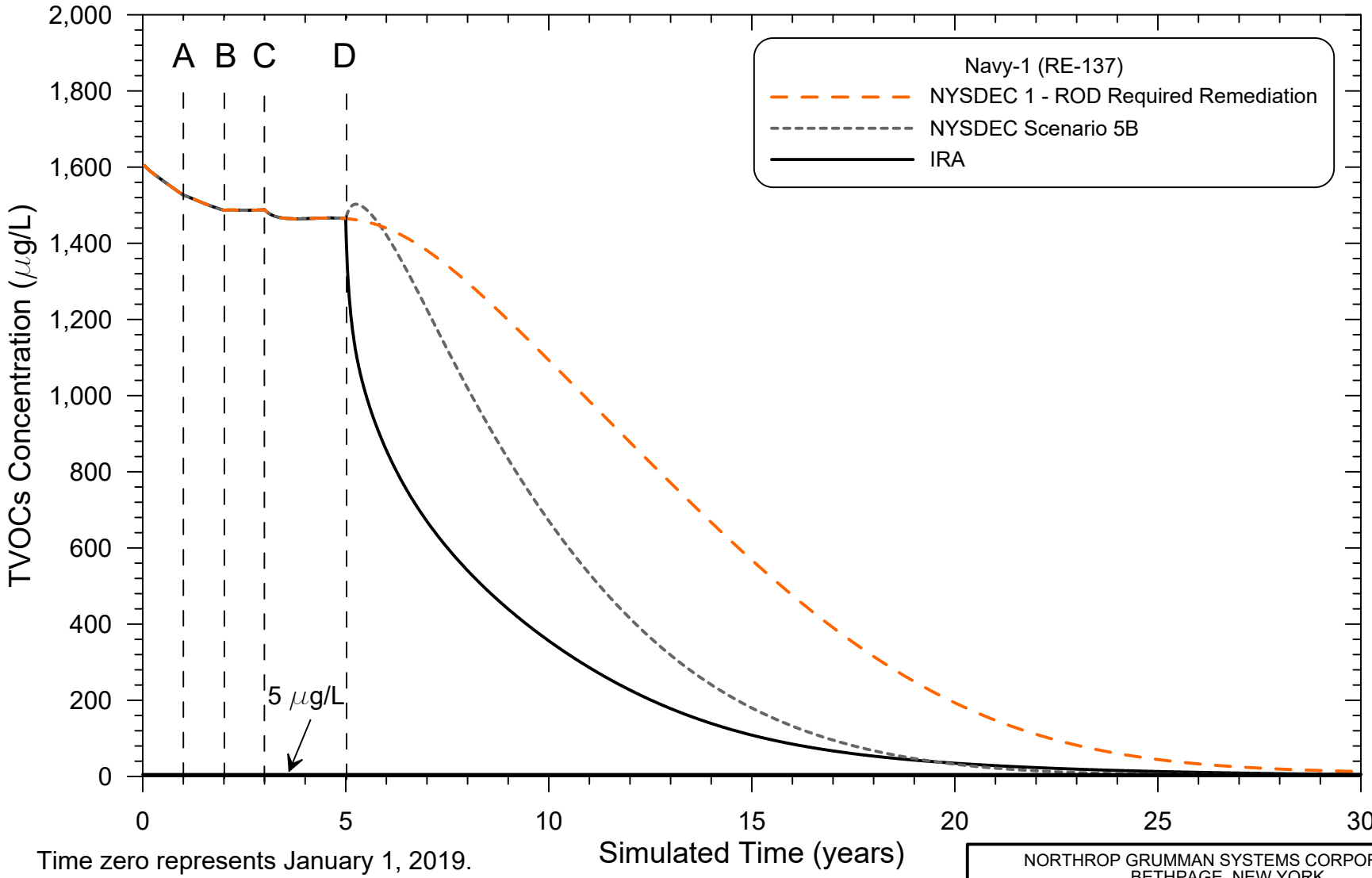
FIGURE
4.2-76



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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PREDICTED TVOCS CONCENTRATION NAVY-1 (RE-137)

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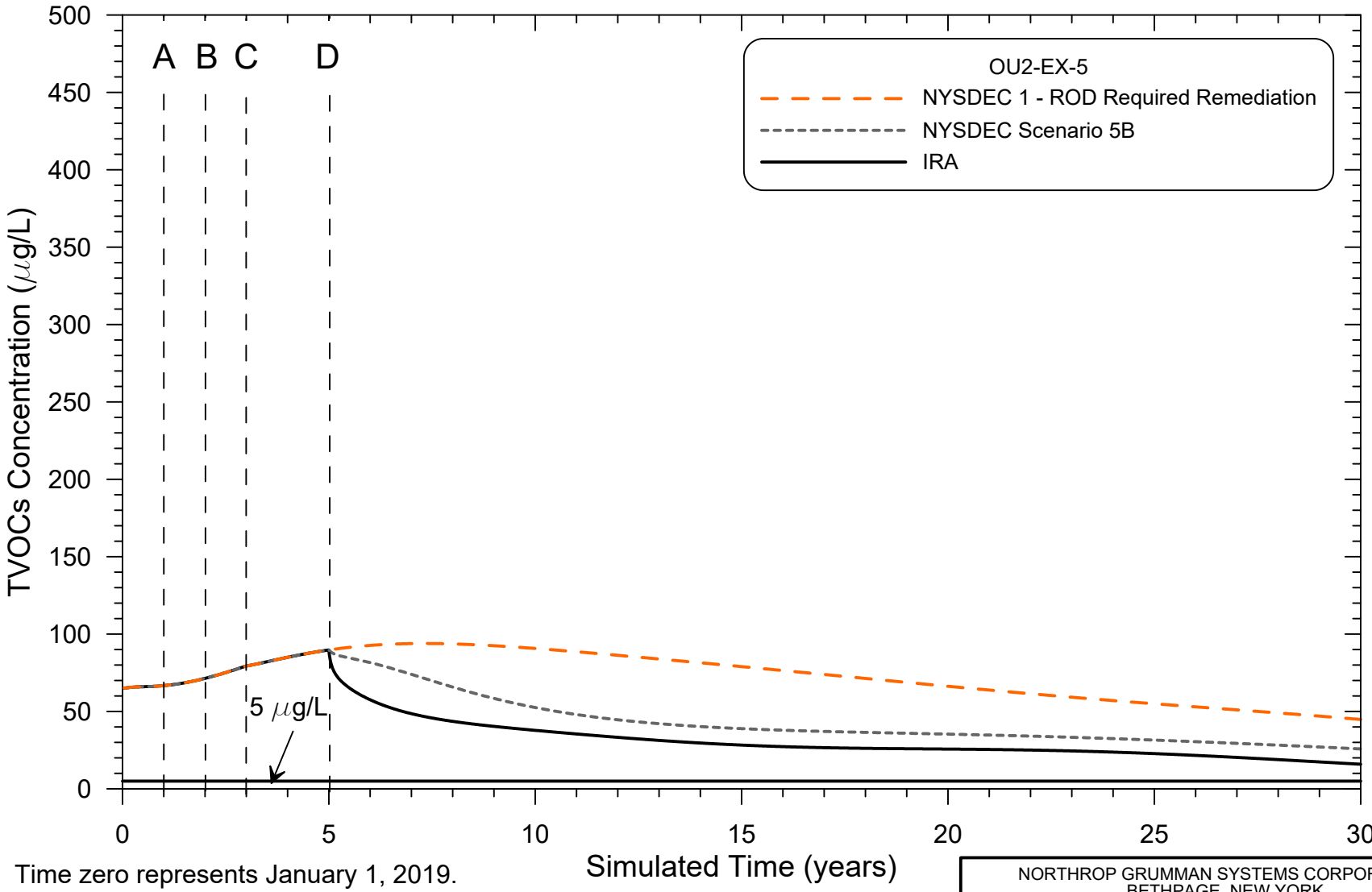
FIGURE
4.2-77



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational
(NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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PREDICTED TVOCS CONCENTRATION OU2-EX-5

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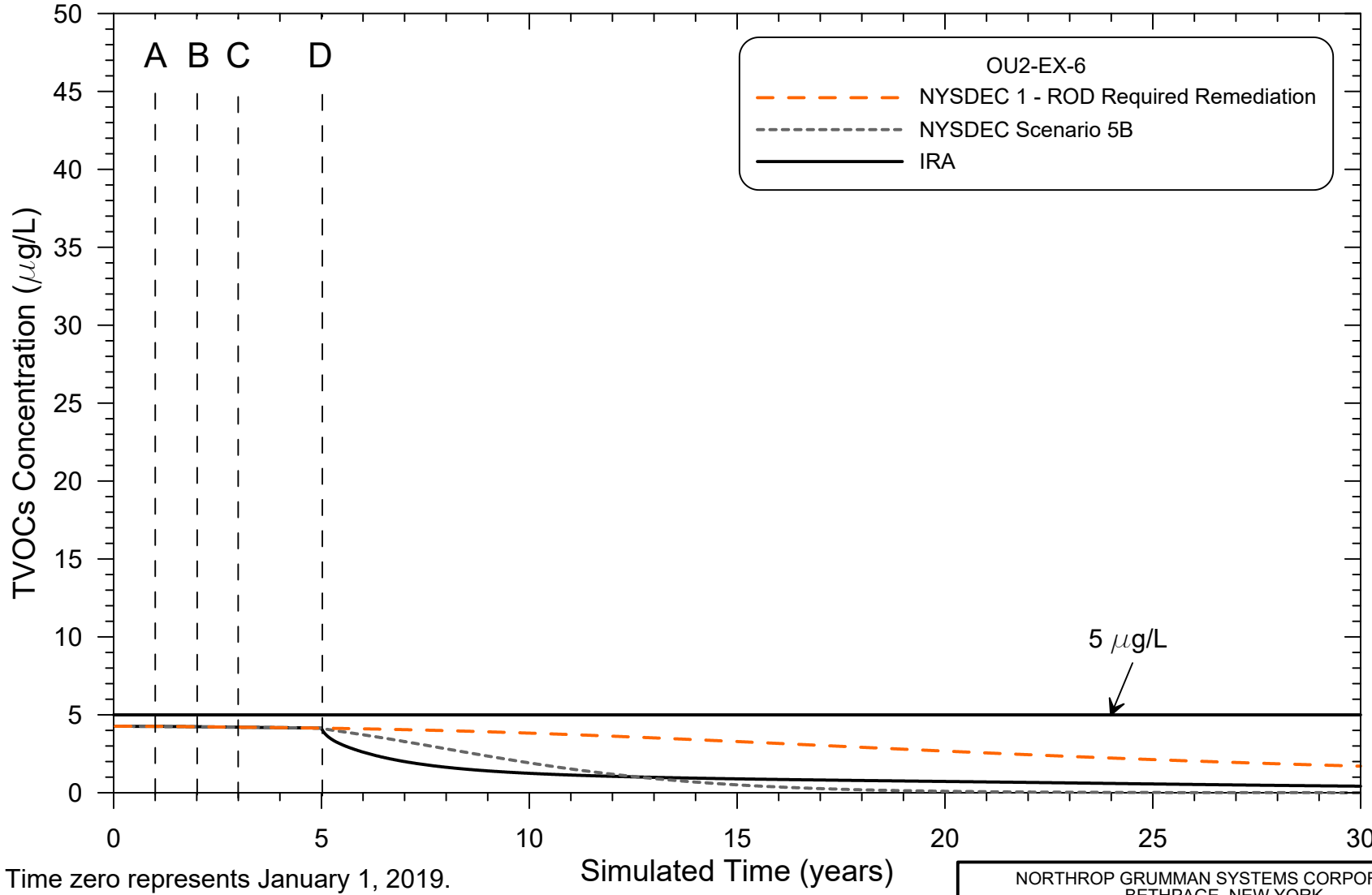
FIGURE
4.2-78



Time zero represents January 1, 2019.

A: Year 1: RW-21 System Operational (All Scenarios)
RE-108 IRM Well Operational (All Scenarios)

B: Year 2: BWD Plant 6 Operational (All Scenarios)

C: Year 3: RE-108 System Operational (All Scenarios)

D: Year 5: NYSDEC Scenario 5B Wells Operational (NYSDEC Scenario 5B)
IRA Wells Operational (IRA)

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PREDICTED TVOCS CONCENTRATION OU2-EX-6

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FIGURE
4.2-79