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Subject:

2018 Third Quarter Operation Maintenance and Monitoring Report,
Operable Unit 2, Northrop Grumman Systems Corporation and Naval Weapons
Industrial Reserve Plant (NWIRP) Sites, Bethpage, New York.
(NYSDEC Site #s 1-30-003A and B)

ENVIRONMENT

Date:
November 29, 2018

Dear Jason:

On behalf of Northrop Grumman Systems Corporation (Northrop Grumman), Arcadis is providing the NYSDEC with the 2018 Third Quarter Operation Maintenance and Monitoring Report (Report). This Report was prepared to document the operation, maintenance, and monitoring (OM&M) activities conducted for the on-site portion of the Operable Unit 2 (OU2) groundwater remedy and the results of ongoing volatile organic compound (VOC) and inorganic monitoring in groundwater to meet the remedial objectives set forth in the March 2001 OU2 Record of Decision (ROD).

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Our ref:
NY001496.22TM.RPTI4
NY001496.23TM.NAVI4


Table 1 summarizes OU2 remedial system performance operational data, total mass removal, and water balance. Tables 2 and 3 provide the analytical results for remedial system water and vapor samples for this period, respectively. Tables 4A and 4B provide the air modeling inputs and outputs and resulting analyses, based on quarterly vapor samples collected from the Tower 96 and Tower 102 systems, respectively, for this period. Tables 5A and 5B provide a summary of percent mass emittance of TCE from third quarter 2017 through third quarter 2018. Table 6 provides the validated analytical results of groundwater monitoring for this period. Figures 1 through 3 show the Locations of Wells and Onsite Groundwater Remedy, ONCT Groundwater Extraction and Treatment System Site Plan, and the ONCT Groundwater Extraction and Treatment System Schematic, respectively.

Mr. Jason Pelton
November 29, 2018

Please contact us if you have any questions or comments.

Sincerely,

Arcadis of New York, Inc.



Christopher Engler, P.E. 069748
Engineer of Record

Copies:

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TABLES



Table 1
Operational Summary for the On-Site Portion of the OU2 Groundwater Remedy, Third Quarter 2018⁽¹⁾ Reporting Period
Operable Unit 2, Northrop Grumman Systems Corporation,
Bethpage, New York

| | Quarterly Flow Rates (gpm) | | Quarterly Flow Volumes (MG) | | | Quarterly VOC Concentrations (µg/L) | | VOC Mass Removed (lbs) ⁽⁷⁾ | | |
|--|----------------------------|--------------------------|-----------------------------|-------------------------|-------------|-------------------------------------|-----------------------|---------------------------------------|--------------|----------------|
| | Design ⁽²⁾ | Average ^(3,4) | Design ⁽²⁾ | Actual ^(3,4) | % of Design | TCE ⁽⁵⁾ | TVOC ^(5,6) | Quarterly | Annual | Cumulative |
| Influent Groundwater | | | | | | | | | | |
| Well 1 ⁽¹¹⁾ | 800 | 704 | 102.5 | 65.4 | 64% | 554 | 590 | 322 | 1,394 | 47,373 |
| Well 3R ⁽¹¹⁾ | 700 | 639 | 89.7 | 58.6 | 65% | 272 | 310 | 152 | 704 | 91,293 |
| Well 17 ^(11,12) | 1,000 | 1,014 | 128.2 | 126.4 | 99% | 96 | 120 | 127 | 420 | 53,447 |
| Well 18 ^(11,12) | 600 | 816 | 76.9 | 101.7 | 132% | 39 | 59 | 50 | 170 | 6,539 |
| Well 19 ^(11,12) | 700 | 516 | 89.7 | 64.3 | 72% | 108 | 130 | 70 | 220 | 8,600 |
| Total⁽¹³⁾ | 3,800 | 3,689 | 487 | 416 | 85% | -- | -- | 721 | 2,908 | 207,252 |
| Effluent Groundwater⁽⁸⁾ | | | | | | | | | | |
| Calpine | 100 - 400 | 222 | -- | 28.5 | -- | -- | -- | -- | -- | -- |
| OXY Biosparge ⁽¹⁰⁾ | 2 - 42 | 0 | -- | 0 | -- | -- | -- | -- | -- | -- |
| West Recharge Basins | 1,112 - 1,455 | 2,022 | -- | 259.1 | -- | -- | 0.7 | -- | -- | -- |
| South Recharge Basins ⁽¹²⁾ | 2,231 | 1,002 | 285.9 | 128.4 | 45% | -- | 1.3 | -- | -- | -- |
| Total⁽¹⁴⁾ | -- | 3,246 | -- | 416 | -- | -- | -- | -- | -- | -- |
| Additional Flow to South Recharge Basins | | | | | | | | | | |
| Storm Water Runoff Contributing to South Recharge Basins Flow Volume ⁽¹⁴⁾ | -- | -- | -- | 37.3 | -- | -- | -- | -- | -- | -- |
| Total Flow Volume to South Recharge Basins^(12,14,15) | -- | -- | 286 | 166 | 58% | -- | -- | -- | -- | -- |
| Treatment Efficiencies⁽⁹⁾ | | | | | | | | | | |
| Tower 96 System: | >99.9% | | | | | | | | | |
| Tower 102 System: | >99.9% | | | | | | | | | |

Notes and abbreviations on last page.

Table 1
Operational Summary for the On-Site Portion of the OU2 Groundwater Remedy, Third Quarter 2018⁽¹⁾ Reporting Period
Operable Unit 2, Northrop Grumman Systems Corporation,
Bethpage, New York

Notes and Abbreviations:

- (1) Quarterly reporting period: July 03, 2018 through September 30, 2018
 - (2) "Design" flow rates were determined for the five remedial wells and for the South Recharge Basins based on computer modeling (ARCADIS G&M, Inc. 2003c, modified in April 2005). Flow rates for Calpine, OXY Biosparge and West Recharge Basins are typical flow rates and are provided for reader information. "Design" flow volumes represent the volume of water that should be pumped/discharged during the reporting period and is calculated by multiplying the design rate by the reporting period duration.
 - (3) "Average" flow rates for the remedial wells represent the average actual pumping rates when the pumps are operational and do not take into account the time that a well is not operational. During this quarterly reporting period, the remedial wells operated for the following percentage of the time: Well 1 (72.4%), Well 3R (71.5%), Well 17 (97.2%), Well 18 (97.3%), and Well 19 (97.2%). "Actual" volumes are determined via totaled values computed by SCADA using the instantaneous flow rates transmitted from local flow meters.
 - (4) "Average" flow rates for the system discharges represent the average flow rate during the entire reporting period and are determined by dividing the total flow during the reporting period by the reporting period duration. The Calpine and South Recharge Basins flow volumes are determined via totaled values computed by SCADA using the instantaneous flow rates transmitted from local flow meters. The West Recharge Basin flow is calculated by subtracting the cumulative flow to the other discharges from the total influent flow. Actual flow to the recharge basins is greater, as shown, because storm water combines with the plant effluent prior to discharge to the recharge basins.
 - (5) The TCE and TVOC concentrations for the remedial wells are from the quarterly sampling event performed during this reporting period on September 5, 2018.
 - (6) The TVOC concentration for the two sets of recharge basins are their respective average monthly SPDES concentration for the current quarter.
 - (7) TVOC mass removed for the reporting period is calculated by multiplying the TVOC concentration from the quarterly sampling event and the quantity of water pumped during the reporting period.
 - (8) There are four discharges for the effluent groundwater: South Recharge Basins, West Recharge Basins, Calpine and OXY Biosparge system. Treated water is continuously discharged to the south and west recharge basins, and is available "on-demand" to both the Calpine Power Plant (Calpine) for use as make-up water, and the biosparge remediation system operated by Occidental Chemical (OXY Biosparge).
 - (9) Treatment System Efficiencies are calculated by dividing the difference between the remedial well flow weighted influent and effluent TVOC concentrations by the remedial well flow weighted influent concentration.
 - (10) Occidental Chemical has not reported any water usage for the OXY Biosparge system since May 2016.
 - (11) The downtime during Third Quarter 2018 was minor and due to typical operation and maintenance with the exception of Tower 96 . Tower 96 shut down from July 12, 2018 through August 1, 2018 due to failure and repair of supplemental blower shaft bearings. See Note 12 for detail on reduced percent design flow values.
 - (12) During the third quarter, the pumping rates for Wells 1 and 3R were reduced from August 1, 2018 to August 30, 2018 due to supplemental bower repairs at Tower 96. The pumping rates for Wells 18 and 19 continued to be adjusted to maximize capture efficiency. Additionally, flow was diverted to the West Basins to accommodate basin rehabilitation work at the center most of the South Basins. Average pumping rates and modified South Basin recharge rates are shown above.
 - (13) Total pumpage/recharge rates are accurate to ±15% due to limitations in metering.
 - (14) Storm Water Runoff Volume is calculated by multiplying the adjusted tributary area and NOAA precipitation data for the reporting periods. The adjusted tributary area is tributary area that is adjusted by the runoff coefficient to exclude the infiltration volume from the total rainfall volume. The tributary area, runoff coefficient, and adjusted tributary area are from Dvirka and Bartilucci Consulting Engineers' Storm Water Permit Evaluation Report (January, 28, 2010). The NOAA precipitation data are calculated as a sum of NOAA daily precipitation data for the reporting period. NOAA precipitation data are retrieved from Station GHCND:USW00054787 - FARMINGDALE REPUBLIC AIRPORT, NY US.
 - (15) Total Flow Volume to South Recharge Basins is estimated as a sum of flow volumes contributed from the Effluent Groundwater to South Recharge Basins and from Storm Water Runoff to South Recharge Basins.
- | | | | |
|--------------------------------|---|--|---|
| -- µg/L gpm lbs MG | Not Applicable micrograms per liter gallons per minute pounds million gallons | NOAA SCADA SPDES TCE TVOC VOC | National Oceanic and Atmospheric Administration Supervisory Controls and Data Acquisition State Pollution Discharge Elimination System trichloroethene total volatile organic compounds volatile organic compounds |
|--------------------------------|---|--|---|

Table 2
Concentrations of Constituents in Remedial Wells and
Treatment System Effluents, Third Quarter 2018, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

| Constituents ⁽¹⁾ (units in µg/L) | Location ID: Sample ID: Sample Date: | WELL 1 WELL 1 9/5/2018 | WELL 3R WELL 3R 9/5/2018 | 96 EFFLUENT 96 EFFLUENT 9/5/2018 | WELL 17 WELL 17 9/5/2018 |
|---|--|------------------------------|--------------------------------|--|--------------------------------|
| <u>Volatile Organic Compounds (VOCs)⁽²⁾</u> | | | | | |
| 1,1,1-Trichloroethane | | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,1,1,2,2-Tetrachloroethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| 1,1,2-Trichloroethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| 1,1-Dichloroethane | | 0.71 J | 1.3 | <1.0 | 0.74 J |
| 1,1-Dichloroethene | | 2.6 | 3.5 | <0.50 | 1.4 |
| 1,2-Dichloroethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| 1,2-Dichloropropane | | 4.3 | <1.0 | <1.0 | <1.0 |
| 2-Butanone (MEK) | | <10 | <10 | <10 | <10 |
| 2-Hexanone (MBK) | | <5.0 | <5.0 | <5.0 | <5.0 |
| 4-methyl-2-pentanone (MIK) | | <5.0 | <5.0 | <5.0 | <5.0 |
| Acetone | | <10 | <10 | <10 | <10 |
| Benzene | | <0.50 | <0.50 | <0.50 | <0.50 |
| Bromodichloromethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| Bromoform | | <1.0 | <1.0 | <1.0 | <1.0 |
| Bromomethane | | <2.0 | <2.0 | <2.0 | <2.0 |
| Carbon Disulfide | | <2.0 | <2.0 | <2.0 | <2.0 |
| Carbon Tetrachloride | | <1.0 | <1.0 | <1.0 | <1.0 |
| Chlorobenzene | | <1.0 | <1.0 | <1.0 | <1.0 |
| Chloroethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| Chloroform | | <0.50 | <0.50 | <0.50 | <0.50 |
| Chloromethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| cis-1,2-Dichloroethene | | 5.6 | 3.7 | <0.50 | 2.4 |
| cis-1,3-Dichloropropene | | <1.0 | <1.0 | <1.0 | <1.0 |
| Dibromochloromethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| Ethylbenzene | | <1.0 | <1.0 | <1.0 | <1.0 |
| Methylene Chloride | | <0.50 | <0.50 | <0.50 | <0.50 |
| Styrene | | <1.0 | <1.0 | <1.0 | <1.0 |
| Tetrachloroethene | | 19.4 | 26.4 | <0.50 | 18.1 |
| Toluene | | <1.0 | <1.0 | <1.0 | <1.0 |
| trans-1,2-Dichloroethene | | <0.50 | <0.50 | <0.50 | <0.50 |
| trans-1,3-Dichloropropene | | <1.0 | <1.0 | <1.0 | <1.0 |
| Trichloroethylene | | 554 | 272 | <0.50 | 96.4 |
| Trichlorotrifluoroethane (Freon 113) | | 3.8 | 2.8 | <0.50 | 2.5 |
| Vinyl Chloride | | <0.50 | 1.9 | <0.50 | <0.50 |
| Xylene-o | | <1.0 | <1.0 | <1.0 | <1.0 |
| Xylene-m,p | | <1.0 | <1.0 | <1.0 | <1.0 |
| Total VOCs⁽³⁾ | | 590 | 310 | 0 | 120 |
| 1,4-Dioxane⁽²⁾ | | 6.4 | 11 | 9.0 | 4.8 |

Notes and abbreviations on last page.

Table 2
Concentrations of Constituents in Remedial Wells and
Treatment System Effluents, Third Quarter 2018, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

| Constituents ⁽¹⁾ (units in µg/L) | Location ID: Sample ID: Sample Date: | WELL 17 REP-090518-JJC-1 9/5/2018 | WELL 18 WELL 18 9/5/2018 | WELL 19 WELL 19 9/5/2018 | 102 EFFLUENT 102 EFFLUENT 9/5/2018 |
|---|--|---|--------------------------------|--------------------------------|--|
| <u>Volatile Organic Compounds (VOCs)⁽²⁾</u> | | | | | |
| 1,1,1-Trichloroethane | | <0.50 | <0.50 | <0.50 | <0.50 |
| 1,1,1,2,2-Tetrachloroethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| 1,1,2-Trichloroethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| 1,1-Dichloroethane | | 0.76 J | 1.2 | 0.59 J | <1.0 |
| 1,1-Dichloroethene | | 1.5 | 2.8 | 1.2 | <0.50 |
| 1,2-Dichloroethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| 1,2-Dichloropropane | | <1.0 | <1.0 | <1.0 | <1.0 |
| 2-Butanone (MEK) | | <10 | <10 | <10 | <10 |
| 2-Hexanone (MBK) | | <5.0 | <5.0 | <5.0 | <5.0 |
| 4-methyl-2-pentanone (MIK) | | <5.0 | <5.0 | <5.0 | <5.0 |
| Acetone | | <10 | <10 | <10 | <10 |
| Benzene | | <0.50 | <0.50 | <0.50 | <0.50 |
| Bromodichloromethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| Bromoform | | <1.0 | <1.0 | <1.0 | <1.0 |
| Bromomethane | | <2.0 | <2.0 | <2.0 | <2.0 |
| Carbon Disulfide | | <2.0 | <2.0 | <2.0 | <2.0 |
| Carbon Tetrachloride | | <1.0 | <1.0 | <1.0 | <1.0 |
| Chlorobenzene | | <1.0 | <1.0 | <1.0 | <1.0 |
| Chloroethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| Chloroform | | <0.50 | <0.50 | <0.50 | <0.50 |
| Chloromethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| cis-1,2-Dichloroethene | | 2.6 | 2.6 | 14.7 | <0.50 |
| cis-1,3-Dichloropropene | | <1.0 | <1.0 | <1.0 | <1.0 |
| Dibromochloromethane | | <1.0 | <1.0 | <1.0 | <1.0 |
| Ethylbenzene | | <1.0 | <1.0 | <1.0 | <1.0 |
| Methylene Chloride | | <0.50 | <0.50 | <0.50 | <0.50 |
| Styrene | | <1.0 | <1.0 | <1.0 | <1.0 |
| Tetrachloroethene | | 18.7 | 13.5 | 6.2 | <0.50 |
| Toluene | | <1.0 | <1.0 | <1.0 | <1.0 |
| trans-1,2-Dichloroethene | | <0.50 | <0.50 | <0.50 | <0.50 |
| trans-1,3-Dichloropropene | | <1.0 | <1.0 | <1.0 | <1.0 |
| Trichloroethylene | | 98.4 | 38.5 | 108 | <0.50 |
| Trichlorotrifluoroethane (Freon 113) | | 2.6 | <0.50 | <0.50 | <0.50 |
| Vinyl Chloride | | <0.50 | <0.50 | <0.50 | <0.50 |
| Xylene-o | | <1.0 | <1.0 | <1.0 | <1.0 |
| Xylene-m,p | | <1.0 | <1.0 | <1.0 | <1.0 |
| Total VOCs⁽³⁾ | | 120 | 59 | 130 | 0 |
| 1,4-Dioxane⁽²⁾ | | 5.1 | 4.9 | 4.4 | 5.5 |

Notes and abbreviations on last page.

Table 2
Concentrations of Constituents in Remedial Wells and
Treatment System Effluents, Third Quarter 2018, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

Notes and Abbreviations:

- (1) Results for the program are validated at 20% frequency, per protocols specified in OU2 Groundwater Monitoring Plan (Arcadis 2016c).
 - (2) VOC samples analyzed using USEPA Method 8260C. 1,4-dioxane samples analyzed using USEPA Method 8270D-SIM.
 - (3) Total VOC results rounded to two significant figures.
- 2.6** Bold value indicates a detection.
< 5.0 Compound is not detected above its laboratory quantification limit.
J Constituent value is estimated.
µg/L micrograms per liter
OU2 Operable Unit 2
REP Blind Replicate Sample
USEPA United States Environmental Protection Agency
VOC Volatile Organic Compound

Table 3
Vapor Sample Analytical Results for Treatment Systems,
Third Quarter 2018,
Northrop Grumman Systems Corporation,
Operable Unit 2, Bethpage, New York

| Location ID: | 96 INFLUENT | 96 MID-EFFLUENT | 96 EFFLUENT |
|--|-------------------|-------------------|-------------------|
| Sample ID: | T96 INFLUENT (AA) | T96 MIDTRAIN (AA) | T96 EFFLUENT (AA) |
| Constituents (Units in $\mu\text{g}/\text{m}^3$) | 9/5/2018 | 9/5/2018 | 9/5/2018 |
| Volatile Organic Compounds (VOCs)⁽¹⁾ | | | |
| 1,1,1-Trichloroethane | 17 | 3.9 | 0.76 |
| 1,1,2,2-Tetrachloroethane | <0.55 | <0.55 | <0.55 |
| 1,1,2-Trichloroethane | 2.7 | <0.44 | <0.44 |
| 1,1-Dichloroethane | 41.7 | 32 | 36 |
| 1,1-Dichloroethene | 118 | 110 | 75.3 |
| 1,2-Dichloroethane | 2.2 | 0.65 | 0.36 J |
| 1,2-Dichloropropane | 98.4 | 13 | 1.6 |
| Benzene | 1.2 | 0.27 J | 0.93 |
| Bromodichloromethane | <0.54 | <0.54 | <0.54 |
| Bromoform | <0.33 | <0.33 | <0.33 |
| Bromomethane | <0.62 | <0.62 | <0.62 |
| Carbon Disulfide | <0.50 | <0.50 | 0.53 |
| Carbon Tetrachloride | 3.4 | 0.18 J | <0.20 |
| Chlorobenzene | 1.5 | <0.74 | <0.74 |
| Chloroethane | 3.4 | 3.7 | 2.6 |
| Chloroform | 15 | 7.8 | 7.3 |
| Chloromethane | 0.70 | 0.87 | 4.1 |
| cis-1,2-Dichloroethene | 201 | 148 | 132 |
| cis-1,3-Dichloropropene | <0.73 | <0.73 | <0.73 |
| Dibromochloromethane | <0.68 | <0.68 | <0.68 |
| Ethylbenzene | <0.69 | <0.69 | <0.69 |
| Methylene Chloride | 0.73 | 0.76 | 0.69 |
| Styrene | <0.68 | <0.68 | <0.68 |
| Tetrachloroethene | 848 | 44 | 1.6 |
| Toluene | 0.53 J | <0.60 | 75.4 |
| trans-1,2-Dichloroethene | 2.3 | 1.8 | 2.2 |
| trans-1,3-Dichloropropene | <0.73 | <0.73 | <0.73 |
| Trichloroethylene | 18,700 | 3,650 | 693 |
| Trichlorotrifluoroethane (Freon 113) | 123 | 54 | 21 |
| Vinyl Chloride | 32.5 | 35.3 | 27.1 |
| Xylene-o | <0.69 | <0.69 | <0.69 |
| Xylene-m,p | <0.69 | <0.69 | <0.69 |
| Total VOCs ⁽²⁾ | 20,213 | 4,106 | 1,082 |

Notes and abbreviations on last page.

Table 3
Vapor Sample Analytical Results for Treatment Systems,
Third Quarter 2018,
Northrop Grumman Systems Corporation,
Operable Unit 2, Bethpage, New York

| Constituents (Units in $\mu\text{g}/\text{m}^3$) | Location ID: | 102 INFLUENT | 102 EFFLUENT |
|--|--------------|--------------------|--------------------|
| | Sample ID: | T102 INFLUENT (AA) | T102 EFFLUENT (AA) |
| | | 9/5/2018 | 9/5/2018 |
| Volatile Organic Compounds (VOCs)⁽¹⁾ | | | |
| 1,1,1-Trichloroethane | | 16 | <0.55 |
| 1,1,2,2-Tetrachloroethane | | <0.55 | <0.69 |
| 1,1,2-Trichloroethane | | 1.4 | <0.55 |
| 1,1-Dichloroethane | | 63.5 | 2.1 |
| 1,1-Dichloroethene | | 124 | 12 |
| 1,2-Dichloroethane | | 3.6 | <0.81 |
| 1,2-Dichloropropane | | 7.9 | <0.92 |
| Benzene | | 0.73 | <0.64 |
| Bromodichloromethane | | <0.54 | <0.67 |
| Bromoform | | <0.33 | <0.41 |
| Bromomethane | | <0.62 | <0.78 |
| Carbon Disulfide | | <0.50 | <0.62 |
| Carbon Tetrachloride | | 4.3 | <0.25 |
| Chlorobenzene | | <0.74 | <0.92 |
| Chloroethane | | <0.42 | <0.53 |
| Chloroform | | 17 | <0.98 |
| Chloromethane | | 0.89 | 0.85 |
| cis-1,2-Dichloroethene | | 500 | 5.6 |
| cis-1,3-Dichloropropene | | <0.73 | <0.91 |
| Dibromochloromethane | | <0.68 | <0.85 |
| Ethylbenzene | | <0.69 | <0.87 |
| Methylene Chloride | | 0.56 | 1.7 |
| Styrene | | <0.68 | <0.85 |
| Tetrachloroethene | | 351 | <0.27 |
| Toluene | | 0.87 | <0.75 |
| trans-1,2-Dichloroethene | | 5.2 | <0.79 |
| trans-1,3-Dichloropropene | | <0.73 | <0.91 |
| Trichloroethylene | | 3,480 | 1.1 |
| Trichlorotrifluoroethane (Freon 113) | | 110 | 2.7 |
| Vinyl Chloride | | 0.25 | 0.28 |
| Xylene-o | | <0.69 | <0.87 |
| Xylene-m,p | | <0.69 | <0.87 |
| Total VOCs ⁽²⁾ | | 4,687 | 26 |

Notes and abbreviations on last page.

Table 3
Vapor Sample Analytical Results for Treatment Systems,
Third Quarter 2018,
Northrop Grumman Systems Corporation,
Operable Unit 2, Bethpage, New York

Notes and Abbreviations:

- (1) Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per Modified USEPA Method TO-15.
- (2) Total VOCs represents the sum of individual concentrations of compounds detected rounded to the nearest whole number.

| | |
|-------------------|--|
| 3.9 | bold value indicates a detection |
| J | Compound detected below its reporting limit; value is estimated. |
| µg/m ³ | micrograms per cubic meter |
| ELAP | Environmental Laboratory Approval Program |
| NYSDOH | New York State Department of Health |
| USEPA | United States Environmental Protection Agency |
| VOC | Volatile Organic Compound |

Table 4A
Summary of AERMOD Air Quality Impact Analysis
Tower 96 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

| Constituent | CAS# | T96 Effluent (ug/m ³) | Emission Rate ⁽¹⁾ | | | Scaled Impact - Hourly ⁽²⁾ | Scaled Impact - Annual ⁽²⁾ | SGC (3) (ug/m ³) | AGC(3) (ug/m ³) | %SGC | % AGC |
|--------------------------------------|------------|--------------------------------------|------------------------------|----------|----------|---|---|---------------------------------|--------------------------------|-------|-------|
| | | 9/5/2018 | lb/yr | lb/hr | g/s | (ug/m ³) | (ug/m ³) | | | | |
| 1,1,1 - Trichloroethane | 00071-55-6 | 0.76 | 0.12 | 1.37E-05 | 1.72E-06 | 2.55E-04 | 7.48E-06 | 9,000 | 5,000 | 0.00% | 0.00% |
| 1,1 - Dichloroethane | 00075-34-3 | 36 | 5.67 | 6.48E-04 | 8.16E-05 | 1.21E-02 | 3.55E-04 | -- | 6.30E-01 | -- | 0.06% |
| 1,2 - Dichloroethane | 00107-06-2 | 0.36 | 0.06 | 6.48E-06 | 8.16E-07 | 1.21E-04 | 3.55E-06 | -- | 3.80E-02 | -- | 0.01% |
| 1,1 - Dichloroethene | 00075-35-4 | 75.3 | 11.87 | 1.35E-03 | 1.71E-04 | 2.53E-02 | 7.42E-04 | -- | 200 | -- | 0.00% |
| Tetrachloroethene | 00127-18-4 | 1.6 | 0.25 | 2.88E-05 | 3.63E-06 | 5.37E-04 | 1.58E-05 | 300 | 4 | 0.00% | 0.00% |
| Trichloroethene ⁽⁴⁾ | 00079-01-6 | 693 | 109.21 | 1.25E-02 | 1.57E-03 | 2.33E-01 | 6.83E-03 | 20 | 2.00E-01 | 1.16% | 3.41% |
| Vinyl Chloride ⁽⁴⁾ | 00075-01-4 | 27.1 | 4.27 | 4.88E-04 | 6.14E-05 | 9.09E-03 | 2.67E-04 | 180,000 | 1.10E-01 | 0.00% | 0.24% |
| cis 1,2-Dichloroethene | 00156-59-2 | 132 | 20.80 | 2.37E-03 | 2.99E-04 | 4.43E-02 | 1.30E-03 | -- | 63 | -- | 0.00% |
| trans 1,2-Dichloroethene | 00156-60-5 | 2.2 | 0.35 | 3.96E-05 | 4.99E-06 | 7.38E-04 | 2.17E-05 | -- | 63 | -- | 0.00% |
| Benzene ⁽⁴⁾ | 00071-43-2 | 0.93 | 0.15 | 1.67E-05 | 2.11E-06 | 3.12E-04 | 9.16E-06 | 1,300 | 1.30E-01 | 0.00% | 0.01% |
| Toluene | 00108-88-3 | 75.4 | 11.88 | 1.36E-03 | 1.71E-04 | 2.53E-02 | 7.43E-04 | 37,000 | 5,000 | 0.00% | 0.00% |
| 1,2-Dichloropropane | 00078-87-5 | 1.6 | 0.25 | 2.88E-05 | 3.63E-06 | 5.37E-04 | 1.58E-05 | -- | 4 | -- | 0.00% |
| Carbon Disulfide | 00075-15-0 | 0.53 | 0.08 | 9.53E-06 | 1.20E-06 | 1.78E-04 | 5.22E-06 | 6200 | 700 | 0.00% | 0.00% |
| Chloroethane | 00075-00-3 | 2.6 | 0.41 | 4.68E-05 | 5.89E-06 | 8.73E-04 | 2.56E-05 | -- | 10,000 | -- | 0.00% |
| Chloroform | 00067-66-3 | 7.3 | 1.15 | 1.31E-04 | 1.65E-05 | 2.45E-03 | 7.19E-05 | 150 | 15 | 0.00% | 0.00% |
| Chloromethane | 00074-87-3 | 4.1 | 0.65 | 7.38E-05 | 9.29E-06 | 1.38E-03 | 4.04E-05 | 22,000 | 90 | 0.00% | 0.00% |
| Dichloromethane | 00075-09-2 | 0.69 | 0.11 | 1.24E-05 | 1.56E-06 | 2.32E-04 | 6.80E-06 | 14,000 | 60 | 0.00% | 0.00% |
| Trichlorotrifluoroethane (Freon 113) | 00076-13-1 | 21 | 3.31 | 3.78E-04 | 4.76E-05 | 7.05E-03 | 2.07E-04 | 960,000 | 180,000 | 0.00% | 0.00% |

Notes and Abbreviations on next page

Table 4A
Summary of AERMOD Air Quality Impact Analysis
Tower 96 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York

Notes and Abbreviations:

(1) Emission rate calculated based on effluent concentration and a stack air flow rate of 4,770 cfm. The stack air flow rate (in acfm) is taken from the actual stack air flow rate on 9/05/2018.

Effluent temperature used in the model was 92 °F from direct read in-line gauge.

Trichloroethene (lb/hr) = $(10 \text{ ug/m}^3) \times (4,770 \text{ ft}^3/\text{min}) \times (1 \text{ m}^3/35 \text{ ft}^3) \times (60 \text{ min/hr}) \times (0.000001 \text{ g/1 ug}) \times (0.0022 \text{ lb/g})$

lb/yr = lb/hr x 8,760 hrs/yr

g/s = lb/hr x 1 hr/3,600 sec x 453.59 g/1 lb

(2) Ambient impact based on AERMOD modeling using normalized rate of 1 g/s is scaled to the actual emission rate of the pollutant. Modeling was performed using the representative meteorological data from the nearest station (Farmingdale, NY) for the years 2011 through 2015, and a stack which is 55 feet high and 20 inches in diameter. The maximum impact from all the years was used for the calculations.

Scaled hourly impact (ug/m^3) = AERMOD predicted hourly ambient impact at 1 g/s ($[\text{ug/m}^3]/[\text{g/s}]$) x Actual emission rate (g/s)

Scaled annual impact (ug/m^3) = AERMOD predicted annual ambient impact at 1 g/s ($[\text{ug/m}^3]/[\text{g/s}]$) x Actual emission rate (g/s)

| AERMOD Normalized Ambient Impact at 1 g/s | |
|--|--|
| Hourly ([\mathit{ug}/\mathit{m}^3]/[\mathit{g}/\mathit{s}]) | Annual ([\mathit{ug}/\mathit{m}^3]/[\mathit{g}/\mathit{s}]) |
| 148.05 | 4.35 |

(3) Short-term and annual guideline concentrations for air toxic pollutants specified in the NYSDEC DAR-1 AGC/SGC tables revised August 10, 2016.

(4) Vinyl Chloride and Benzene potential emission rates are less than 0.1 lb/hr and therefore below the trigger emissions for degree of air cleaning requirement (6 CRR-NY 212-2.3). TCE potential emissions are above the trigger limit and require a 12 month rolling average of annual emission to be maintained (see Table 5A) to demonstrate compliance with the 6 CRR-NY 212-2.2 500 lb/year requirement.

| | | | |
|--------|---|--------------------------|----------------------------------|
| AGC | Annual Guideline Concentration | 36 | bold value indicates a detection |
| CAS # | Chemical Abstracts Service Registry Number | acfm | actual cubic feet per minute |
| CRR-NY | New York Codes, Rules and Regulations | g/s | grams per second |
| DAR-1 | Division of Air Resources-1 | $\mu\text{g}/\text{m}^3$ | micrograms per cubic meter |
| -- | None Specified | lb/yr | pounds per year |
| NYSDEC | New York State Department of Environmental Conservation | lb/hr | pounds per hour |
| SGC | Short-term Guideline Concentration | | |

Table 4B
Summary of AERMOD Air Quality Impact Analysis
Tower 102 Treatment System, Operable Unit 2,
Northrop Grumman Systems Corporation,
Bethpage, New York



| Constituent | CAS# | T102 Effluent (ug/m ³) | Emission Rate ⁽¹⁾ | | | Scaled Impact - Hourly ⁽²⁾ | Scaled Impact - Annual ⁽²⁾ | SGC ⁽³⁾ | AGC ⁽³⁾ | %SGC | % AGC |
|--------------------------------------|------------|---------------------------------------|------------------------------|----------|----------|--|--|----------------------|----------------------|-------|-------|
| | | 9/5/2018 | lb/yr | lb/hr | g/s | (ug/m ³) | (ug/m ³) | (ug/m ³) | (ug/m ³) | | |
| 1,1 - Dichloroethane | 00075-34-3 | 2.1 | 0.57 | 6.55E-05 | 8.25E-06 | 2.88E-03 | 1.88E-05 | -- | 6.30E-01 | -- | 0.00% |
| 1,1 - Dichloroethene | 00075-35-4 | 12 | 3.28 | 3.74E-04 | 4.71E-05 | 1.64E-02 | 1.08E-04 | -- | 200 | -- | 0.00% |
| Trichloroethene ⁽⁴⁾ | 00079-01-6 | 1.1 | 0.30 | 3.43E-05 | 4.32E-06 | 1.51E-03 | 9.87E-06 | 20 | 2.00E-01 | 0.01% | 0.00% |
| Vinyl Chloride ⁽⁴⁾ | 00075-01-4 | 0.28 | 0.07 | 8.16E-06 | 1.03E-06 | 3.59E-04 | 2.35E-06 | 180,000 | 1.10E-01 | 0.00% | 0.00% |
| cis 1,2-Dichloroethene | 00156-59-2 | 5.6 | 1.53 | 1.75E-04 | 2.20E-05 | 7.67E-03 | 5.02E-05 | -- | 63 | -- | 0.00% |
| Chloromethane | 00074-87-3 | 0.85 | 0.23 | 2.65E-05 | 3.34E-06 | 1.16E-03 | 7.63E-06 | 22,000 | 90 | 0.00% | 0.00% |
| Dichloromethane | 00075-09-2 | 1.7 | 0.46 | 5.30E-05 | 6.68E-06 | 2.33E-03 | 1.53E-05 | 14,000 | 60 | 0.00% | 0.00% |
| Trichlorotrifluoroethane (Freon 113) | 00076-13-1 | 2.7 | 0.69 | 7.87E-05 | 9.92E-06 | 3.46E-03 | 2.27E-05 | 960,000 | 180000 | 0.00% | 0.00% |

Notes and Abbreviations:

(1) Emission rate calculated based on effluent concentration and a stack air flow rate of 7,640 cfm. The stack air flow rate (in acfm) is taken from the actual stack air flow rate on 9/05/2018.

Effluent temperature used in the model was 80°F from direct read in-line gauge.

Trichloroethene (lb/hr) = (1.6 ug/m³) x (7,640 ft³/min) x (1 m³/35 ft³) x (60 min/hr) x (0.000001 g/1 ug) x (0.0022 lb/g)

lb/yr = lb/hr x 8,760 hrs/yr

g/s = lb/hr x 1 hr/3,600 sec x 453.59 g/1 lb

(2) Ambient impact based on AERMOD modeling using normalized rate of 1 g/s is scaled to the actual emission rate of the pollutant. Modeling was performed using the representative meteorological data from the nearest station (Farmingdale, NY) for the years 2011 through 2015, and a stack which is 69.52 feet high and 24 inches in diameter. The maximum impact from all the years was used for the calculations.

Scaled hourly impact (ug/m³) = AERMOD predicted hourly ambient impact at 1 g/s ((ug/m³)/[g/s]) x Actual emission rate (g/s)

Scaled annual impact (ug/m³) = AERMOD predicted annual ambient impact at 1 g/s ((ug/m³)/[g/s]) x Actual emission rate (g/s)

| AERMOD Normalized Ambient Impact at 1 g/s | |
|---|--|
| Hourly ((ug/m ³)/[g/s]) | Annual ((ug/m ³)/[g/s]) |
| 348.85 | 2.29 |

(3) Short-term and annual guideline concentrations for air toxic pollutants specified in the NYSDEC DAR-1 AGC/SGC tables revised August 10, 2016.

(4) Vinyl Chloride potential emission rate is less than 0.1 lb/hr and therefore below the trigger emissions for degree of air cleaning requirement (6 CRR-NY 212-2.3). TCE potential emissions are above the trigger limit and require a 12 month rolling average of annual emission to be maintained (see Table 5B) to demonstrate compliance with the 6 CRR-NY 212-2.2 500 lb/year requirement.

| | | | |
|--------|---|-------------------|----------------------------------|
| AGC | Annual Guideline Concentration | 2.1 | bold value indicates a detection |
| CAS # | Chemical Abstracts Service Registry Number | acfm | actual cubic feet per minute |
| CRR-NY | New York Codes, Rules and Regulations | g/s | grams per second |
| DAR-1 | Division of Air Resources-1 | ug/m ³ | micrograms per cubic meter |
| -- | None Specified | lb/yr | pounds per year |
| NYSDEC | New York State Department of Environmental Conservation | lb/hr | pounds per hour |
| SGC | Short-term Guideline Concentration | | |

Table 5A
Summary of TCE Mass Removal, Tower 96 Treatment System,
Third Quarter 2018, Northrop Grumman Systems Corporation,
Operable Unit 2, Bethpage, New York^(1,2,3)

| Date | TCE Concentration ($\mu\text{g}/\text{m}^3$) | | | | TCE Mass Emission ⁽³⁾ | Percent of Allowable TCE Emissions ⁽⁴⁾ |
|--------------------------|--|--------------|------------------|--------------|----------------------------------|---|
| | T96 INFLUENT | T96 MIDTRAIN | T96 SUP MIDTRAIN | T96 EFFLUENT | (lbs) | 12 Month Rolling Average |
| 7/18/2017 | NS | NS | NS | 3,360 | 30 | 63.4% |
| 8/18/2017 ⁽⁵⁾ | NS | NS | NS | 4,745 | 66 | 76.7% |
| 9/19/2017 | 12,100 | 6,610 | 3,670 | 6,130 | 87 | 92.4% |
| 12/13/2017 | 18,600 | 6,610 | 95 | 10 | 0.1 | 91.4% |
| 1/31/2018 | NS | 3,510 | 2,710 | 17 | 0.4 | 91.3% |
| 2/28/2018 | 13,000 | 2,860 | 3,930 | 86.5 | 1.0 | 91.4% |
| 4/13/2018 ⁽⁶⁾ | 13,000 | NS | NS | 232 | 4.4 | 52.9% |
| 5/15/2018 | 17,400 | 5,430 | 14 | 1590 | 22 | 44.5% |
| 9/5/2018 ⁽⁷⁾ | 18,700 | 3,650 | NS | 693 | 34 | 20.0% |

Notes and Abbreviations:

- (1) Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per Modified USEPA Method TO-15.
- (2) A carbon change out was performed in Supplemental Bed 1 and new carbon was placed in the previously empty Supplemental Bed 2 on May 18, 2017.
- (3) TCE Mass Emission calculated based on the exhaust air flow rate on the day of sampling and the period of time since the preceding day of sampling.
 $\text{TCE (lb)} = \text{TCE Concentration } [\mu\text{g}/\text{m}^3] \times \text{Days} \times \text{Flow Rate } [\text{ft}^3/\text{min}] \times (1 \text{ m}^3/35 \text{ ft}^3) \times (60 \text{ min}/\text{hr}) \times (24 \text{ hr}/\text{day}) \times (0.000001 \text{ g}/1 \text{ ug}) \times (0.0022 \text{ lb}/\text{g})$
- (4) Percent of allowable TCE emissions to date is a time-weighted annual rolling average based on the 500 lb/year emission limit specified in the CRR-NY 212-2.2 Table 2. High Toxicity Air Contaminant List, revised April 1, 2017.
- (5) Sampling not conducted in August, the average of July and September effluent data and actual average air flow rate for the time period were used for estimated for August 18, 2017. calculations for August 18, 2017.
- (6) Carbon changeout for Tower 96 lead supplemental bed was completed on April 6, 2018.
- (7) Regenerative Carbon changeout for Tower 96 was completed on July 28, 2018.

| | |
|--------------------------|---|
| $\mu\text{g}/\text{m}^3$ | micrograms per cubic meter |
| lbs | pounds |
| CRR-NY | Codes, Rules and Regulations of the State of New York |
| ELAP | Environmental Laboratory Approval Program |
| NS | Not Sampled |
| NYSDOH | New York State Department of Health |
| SUP | Supplemental |
| TCE | Trichloroethylene |
| USEPA | United States Environmental Protection Agency |
| VOC | Volatile Organic Compound |

Table 5B
Summary of TCE Mass Removal, Tower 102 Treatment System,
Third Quarter 2018,
Northrop Grumman Systems Corporation, Operable Unit 2,
Bethpage, New York^(1,2,3)

| Date | TCE Concentration ($\mu\text{g}/\text{m}^3$) | | TCE Mass Emission ⁽²⁾ | | Percentage of Allowable TCE Emissions ⁽³⁾ | | T102 Treatment Efficiency |
|------------|--|---------------|----------------------------------|---------|--|--------------------------|---------------------------|
| | T102 INFLUENT | T102 EFFLUENT | lbs | lbs/day | Period | 12 Month Rolling Average | |
| 6/30/2017 | 5,480 | 15 | 1.5 | 0.01 | 0.8% | 0.9% | 99.7% |
| 10/17/2017 | 3,990 | 40 | 3.0 | 0.03 | 2.0% | 1.3% | 99.0% |
| 12/21/2017 | 2,340 | 5 | 0.2 | 0.00 | 0.3% | 1.1% | 99.8% |
| 2/28/2018 | 2,970 | 4 | 0.2 | 0.00 | 0.2% | 0.9% | 99.9% |
| 5/10/2018 | 1,710 | 2 | 0.1 | 0.00 | 0.1% | 1.2% | 99.9% |
| 9/5/2018 | 647 | 2 | 0.2 | 0.00 | 0.1% | 0.4% | 99.7% |

Notes and Abbreviations:

- (1) Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per Modified USEPA Method TO-15.
- (2) TCE Mass Emission calculated based on the exhaust air flow rate on the day of sampling and the period of time since the preceding sampling day.
- TCE (lb) = TCE Concentration [$\mu\text{g}/\text{m}^3$] x Days x Flow Rate [ft^3/min] x ($1 \text{ m}^3/35 \text{ ft}^3$) x (60 min/hr) x (24 hr/day) x (0.000001 g/1 ug) x (0.0022 lb/g)
- (3) Percent of allowable TCE emissions to date is a time-weighted annual rolling average based on the 500 lb/year emission limit specified in the CRR-NY 212-2.2 Table 2. High Toxicity Air Contaminant List, revised April 1, 2017.

$\mu\text{g}/\text{m}^3$ micrograms per cubic meter
 lbs pounds
 ELAP Environmental Laboratory Approval Program
 NYSDOH New York State Department of Health
 T102 Tower 102
 TCE trichloroethene
 USEPA United States Environmental Protection Agency
 VOC volatile organic compound

Table 6
Concentrations of Volatile Organic Compounds
and 1,4-Dioxane in Monitoring Wells ⁽¹⁾
BPOW 2-1, BPOW 2-2 and BPOW 2-3, Third Quarter 2018
Operable Unit 2 (Groundwater),
Bethpage, New York

| CONSTITUENT Units (ug/L) | Location ID: Sample ID: Date: | BPOW 2-1 BPOW 2-1 8/29/2018 | BPOW 2-2 BPOW 2-2 9/6/2018 | BPOW 2-3 BPOW 2-3 9/6/2018 |
|--|-------------------------------------|-----------------------------------|----------------------------------|----------------------------------|
| <u>Volatile Organic Compounds (VOCs) ^(2,3)</u> | | | | |
| 1,1,1-Trichloroethane | | < 0.50 | < 0.50 | < 0.50 |
| 1,1,2,2-Tetrachloroethane | | < 0.50 | < 0.50 | < 0.50 |
| 1,1,2-trichloro-1,2,2-trifluoroethane | | < 1.0 | < 1.0 | < 1.0 |
| 1,1,2-Trichloroethane | | < 0.50 | < 0.50 | < 0.50 |
| 1,1-Dichloroethane | | < 0.50 | < 0.50 | < 0.50 |
| 1,1-Dichloroethene | | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichloroethane | | < 0.50 | < 0.50 | < 0.50 |
| 1,2-Dichloropropane | | < 0.50 | < 0.50 | < 0.50 |
| 2-Butanone (MEK) | | < 5.0 | < 5.0 | < 5.0 |
| 2-Hexanone | | < 2.0 | < 2.0 | < 2.0 |
| 4-methyl-2-pentanone (MIK) | | < 2.0 | < 2.0 | < 2.0 |
| Acetone | | < 5.0 | < 5.0 | < 5.0 |
| Benzene | | < 0.50 | < 0.50 | < 0.50 |
| Bromodichloromethane | | < 0.50 | < 0.50 | < 0.50 |
| Bromoform | | < 0.50 | < 0.50 | < 0.50 |
| Bromomethane | | < 0.50 | < 0.50 | < 0.50 |
| Carbon Disulfide | | < 0.50 | < 0.50 | < 0.50 |
| Carbon tetrachloride | | < 0.50 | < 0.50 | < 0.50 |
| Chlorobenzene | | < 0.50 | < 0.50 | < 0.50 |
| Chloroethane | | < 0.50 | < 0.50 | < 0.50 |
| Chloroform | | < 0.50 | < 0.50 | < 0.50 |
| Chloromethane | | < 0.50 | < 0.50 | < 0.50 |
| cis-1,2-dichloroethene | | < 0.50 | < 0.50 | < 0.50 |
| cis-1,3-dichloropropene | | < 0.50 | < 0.50 | < 0.50 |
| Dibromochloromethane | | < 0.50 | < 0.50 | < 0.50 |
| Ethylbenzene | | < 0.50 | < 0.50 | < 0.50 |
| Methylene Chloride | | < 0.50 | < 0.50 | < 0.50 |
| Styrene | | < 0.50 | < 0.50 | < 0.50 |
| Tetrachloroethene | | < 0.50 | < 0.50 | < 0.50 |
| Toluene | | < 0.50 | < 0.50 | < 0.50 |
| trans-1,2-dichloroethene | | < 0.50 | < 0.50 | < 0.50 |
| trans-1,3-dichloropropene | | < 0.50 | < 0.50 | < 0.50 |
| Trichloroethylene | | < 0.50 | < 0.50 | < 0.50 |
| Vinyl Chloride | | < 0.50 | < 0.50 | < 0.50 |
| Xylene-o | | < 0.50 | < 0.50 | < 0.50 |
| Xylenes - m,p | | < 0.50 | < 0.50 | < 0.50 |
| Total VOCs | | 0 | 0 | 0 |
| 1,4-Dioxane ^(2,3) | | 2.14 | 0.430 | 4.27 |

See last page for Notes and Abbreviations.

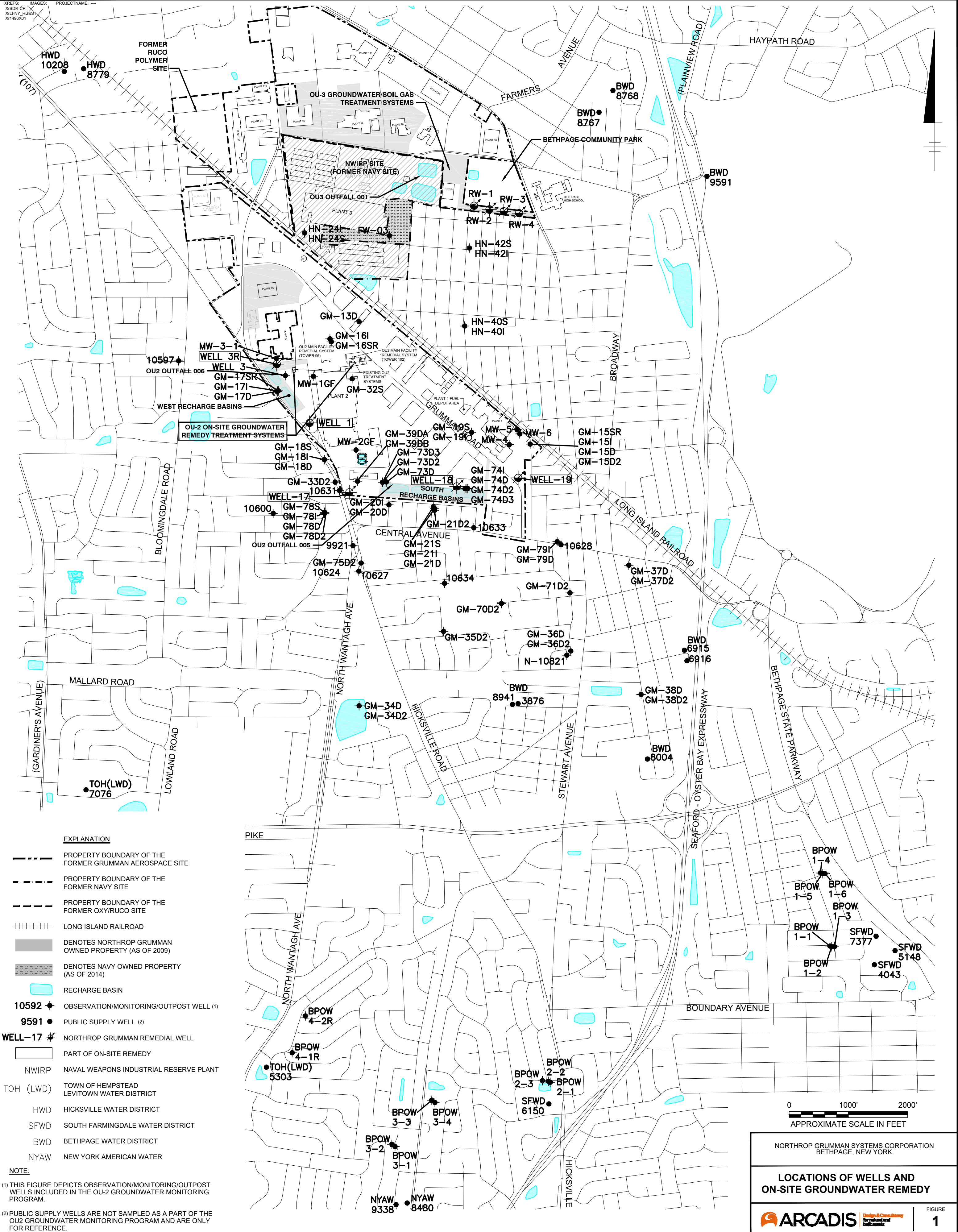
Table 6
Concentrations of Volatile Organic Compounds
and 1,4-Dioxane in Monitoring Wells ⁽¹⁾
BPOW 2-1, BPOW 2-2 and BPOW 2-3, Third Quarter 2018
Operable Unit 2 (Groundwater),
Bethpage, New York

Notes and Abbreviations:

- (1) These outpost wells have been recently repurposed for use as plume monitoring wells per the June 2015 Groundwater Monitoring Plan Addendum (ARCADIS of New York, Inc., 2015) as conditionally approved by the NYSDEC (August 25, 2015). Therefore, TVOC trigger levels that may have been previously established are no longer shown
- (2) Samples were analyzed for VOCs using USEPA Method 524.2; samples were analyzed for 1,4-Dioxane using USEPA Method 522
- (3) Results for the program are validated at 20% frequency, per protocols specified in the OU2 Groundwater Monitoring Plan (Arcadis 2016)
- 4.27** Bold value indicates a detection
- VOC Volatile Organic Compound
- µg/L micrograms per liter
- <0.5 Compound not detected above its laboratory quantification limit

FIGURES

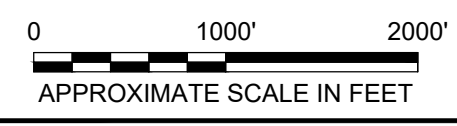




EXPLANATION

- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- - - PROPERTY BOUNDARY OF THE FORMER NAVY SITE
- - - PROPERTY BOUNDARY OF THE FORMER OXY/RUCO SITE
- +++++ LONG ISLAND RAILROAD
- DENOTES NORTHROP GRUMMAN OWNED PROPERTY (AS OF 2009)
- DENOTES NAVY OWNED PROPERTY (AS OF 2014)
- RECHARGE BASIN
- 10592 ● OBSERVATION/MONITORING/OUTPOST WELL (1)
- 9591 ● PUBLIC SUPPLY WELL (2)
- WELL-17 ● NORTHROP GRUMMAN REMEDIAL WELL
- PART OF ON-SITE REMEDY
- NWIRP NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
- TOH (LWD) TOWN OF HEMPSTEAD LEVITOWN WATER DISTRICT
- HWD HICKSVILLE WATER DISTRICT
- SFWD SOUTH FARMINGDALE WATER DISTRICT
- BWD BETHPAGE WATER DISTRICT
- NYAW NEW YORK AMERICAN WATER

NOTE:
 (1) THIS FIGURE DEPICTS OBSERVATION/MONITORING/OUTPOST WELLS INCLUDED IN THE OU-2 GROUNDWATER MONITORING PROGRAM.
 (2) PUBLIC SUPPLY WELLS ARE NOT SAMPLED AS A PART OF THE OU2 GROUNDWATER MONITORING PROGRAM AND ARE ONLY FOR REFERENCE.



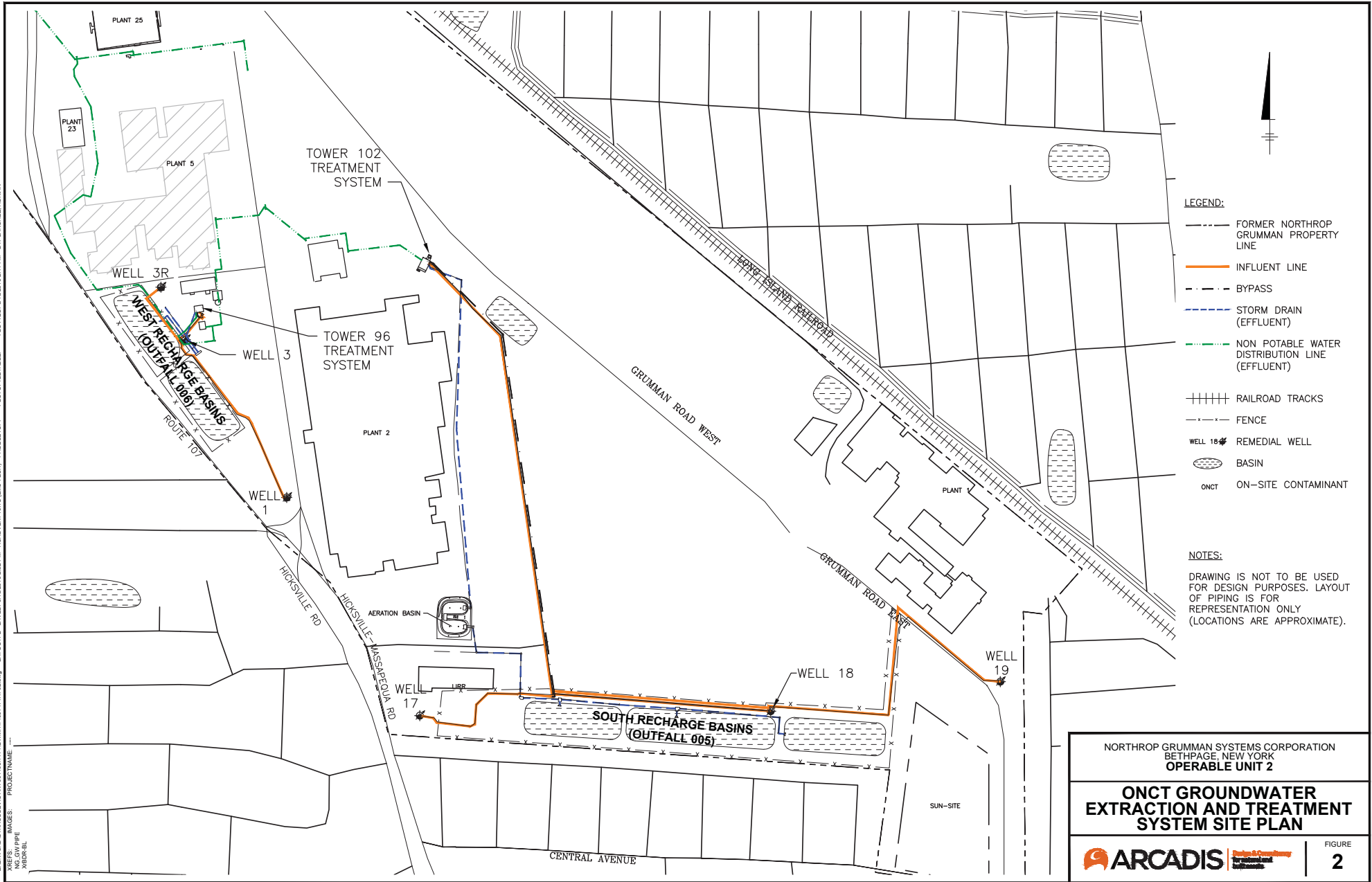
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

**LOCATIONS OF WELLS AND
ON-SITE GROUNDWATER REMEDY**

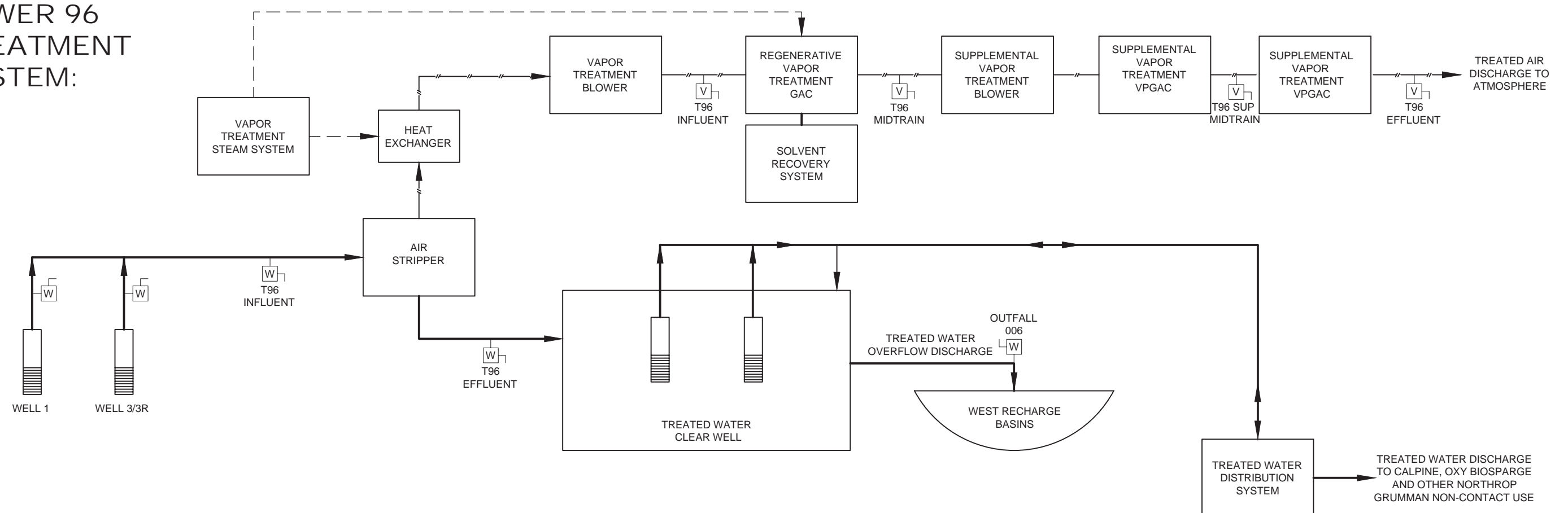
ARCADIS Design & Construction
for natural and
built assets

FIGURE
1

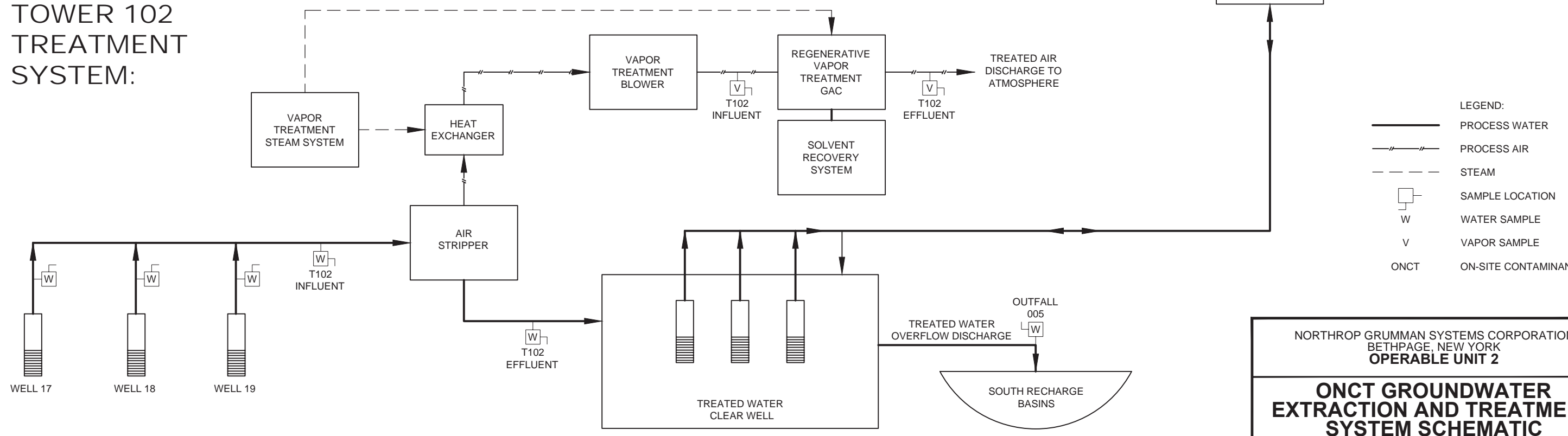
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 XREF:SYRACUSE:PIPE XBDK:BL PROJECTNAME:



TOWER 96 TREATMENT SYSTEM:



TOWER 102 TREATMENT SYSTEM:



- LEGEND:
- PROCESS WATER
 - - - PROCESS AIR
 - - - - STEAM
 - W SAMPLE LOCATION
 - W WATER SAMPLE
 - V VAPOR SAMPLE
 - ONCT ON-SITE CONTAMINANT

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
OPERABLE UNIT 2

**ONCT GROUNDWATER
EXTRACTION AND TREATMENT
SYSTEM SCHEMATIC**

ARCADIS Design & Consultancy
for natural and
built assets

FIGURE
3

CITY: SYRACUSE, NY DIV: GROUPE NV DB: A. SANCHEZ LD: ALS PIC: (Regd) TM: (Opt) LYR: (Opt) ON: -OFF- REF: (PATRICIA RICHE PDF CHANGES SUP BED TEXT and extra VSP-10.26.17)
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