FEASIBILITY STUDY WORK PLAN

Former Oak Materials John Street
Hoosick Falls, New York
NYSDEC Site Number 442049

Prepared for:

Honeywell

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SIGNATURE PAGE

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Feasibility Study Work Plan, Former Oak Materials John Street

I, Daniel Servetas, certify that I am currently a New York State Professional Engineer and that this Feasibility Study Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

August 22, 2022

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ACRONYMS AND ABBREVIATIONS

Name	Description
COC	Compounds of Concern
DER	Division of Environmental Remediation
FS	Feasibility Study
IRM	Interim Remedial Measure
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PFAS	Per- and Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic acid
PTFE	Polytetrafluoroethylene
RI	Remedial Investigation
SC	Site Characterization
SCGs	Standards, Criteria and Guidance
TAL	Target Analyte List
TCL	Target Compound List
TCE	Trichloroethene
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

Honeywell International Inc. (Honeywell) entered into an Order on Consent and Administrative Settlement with the New York State Department of Environmental Conservation (NYSDEC) dated 3 June 2016 (the Order; Index Number CO 4-20160415-79) for the Former Oak Materials John Street Site (the Site, NYSDEC Site No. 442049). The Order required the performance of a Site Characterization (SC) and based on those results, the NYSDEC required a follow-on Remedial Investigation (RI) and Feasibility Study (FS) to be completed for the Site.

NYSDEC approved the SC Report in July 2019 and the RI Report in May 2022 (ERM, 2019; ERM, 2022a). The SC and RI activities were performed with oversight from both NYSDEC and the New York State Department of Health (NYSDOH).

This FS Work Plan (FSWP) presents the process that will be undertaken to identify, evaluate and select remedial technologies and to develop and evaluate remedy alternatives for the Site. This FSWP has been prepared in accordance with applicable portions of the following documents:

- NYSDEC DER-10 "Technical Guidance for Site Investigation and Remediation" (NYSDEC, 2010), and
- 6 New York Codes, Rules and Regulations (6 NYCRR) Part 375 "Environmental Remediation Programs".

1.1 Site Description

The approximately 0.6-acre Site is located in the Village of Hoosick Falls in an area of mixed commercial and residential use, bounded to the west by Lyman Street, to the north by John Street, to the east by Woods Brook, and to the south by a residential property. Rensselaer County tax records indicate that the Site is zoned commercial-vacant. The Site is generally flat, gently sloping northward, covered with crushed stone and fenced to prevent unauthorized access.

The past uses of the Site were commercial and industrial. A three-story mortar and wood building formerly located on the John Street site was constructed in the 1890s and demolished in 2012. It is believed that from at least the mid-1970s to the mid-1990s, operations on this Site included the adhesive coating of various materials and the production of polytetrafluoroethylene- (PTFE-) coated yarn. During that period, the property was owned and operated by a number of entities, including Oak Materials Group and AlliedSignal Laminate Systems, and it was leased for a period of time by Furon.

No plans currently exist for future use of the property.

Notable features on and adjacent to the Site include a subsurface sanitary sewer that runs through the Site on the east side and a subsurface concrete culvert located north of the Site beneath the John Street roadway. Other structures in the area surrounding the Site include several US Army Corps of Engineers (USACE) Flood Control structures: the Woods Brook culvert that runs along the eastern boundary of the parcel, a concrete flood control wall along the southern bank of the Hoosic River from Church Street to just beyond Lyman Street, and the flood control berm along the river at the 80 First Street property. An active railroad line runs parallel to Lyman Street to the west of the Site just beyond the occupied residential properties adjacent to the Site.

1.2 Geologic/Hydrogeologic Setting

Area-wide unconsolidated material above bedrock (collectively referred to as overburden) typically consists of the following deposits starting from the ground surface:

- Coarse-grained alluvium, consisting predominantly of sand and gravel,
- Glaciolacustrine brown and gray silt and clay,
- Glacial outwash (predominantly sand and gravel),
- Diamict (lodgment till), which is typically a dense, compact, poorly sorted mixture of silt, clay, sand, gravel, cobbles, and boulders.

Bedrock in the area consists predominantly of dark gray to black slate mapped by the New York State Geological Survey (NYSGS) as the Walloomsac Formation, which is characterized as a low permeability formation that has been subject to complex structural deformation and deep erosional features. The resulting bedrock stratigraphy includes a paleochannel that influences deep groundwater flow to the west and the structural geology of the area is variable and complex.

Groundwater in the unconsolidated overburden at, and adjacent to, the Site is separated by the silt/clay into shallow and deep water-bearing units, which flow to the northwest and west, respectively, toward the Hoosic River. The silt/clay deposit that separates the shallow overburden groundwater from the deeper groundwater in the sand and gravel thins near the Hoosic River. In this area, deeper groundwater flows upward and discharges to the Hoosic River as a result of the silt and clay not being present near the river.

1.3 Results of Investigations

Multiple phases of investigation were conducted at the Site from 2016 through 2020 as part of the SC and RI resulting in: 167 soil boring locations; 110 overburden monitoring wells, 8 bedrock monitoring wells; 37 soil vapor samples,407 soil samples; 335 groundwater samples; 2 sediment samples, and 13 surface water samples. These samples yielded 596 analyses (all media) for per- and polyfluoroalkyl substances (PFAS); 643 analyses (all media) for Target Compound List (TCL) constituents; and 282 analyses (all media) for Target Analyte List (TAL) constituents.

Volatile organic compounds (VOCs), primarily trichloroethene (TCE), are the primary Contaminants of Concern (COCs) in soil and groundwater. VOCs dissolved in shallow and deeper sand and gravel groundwater extend northward to the Hoosic River.

VOCs are present in soil in three secondary source areas: VOCs entrained in the on-Site silt/clay unit; VOCs in soil residuals in the subsurface culvert, which was the subject of an Interim

Remedial Measure (IRM) (as described below), and the former stream bed to the north; and VOCs in off-Site diamict (dense lodgment till) deposits that overlie bedrock to the east of the Site. These secondary VOC sources will present unique technical challenges to achieve additional VOC mass reduction due to low permeability and depths of these materials.

Per- and polyfluoroalkyl substances (PFAS) are predominantly perfluorooctanoic acid (PFOA) and likely result from:

- Discrete, localized releases from beneath or immediately adjacent to the former on-Site building impacting shallow groundwater and on-Site shallow soil;
- Other local off-Site sources and potentially historical air emissions, which impacted shallow soil and groundwater upgradient and cross-gradient of the Site; and
- Upgradient source areas that impact deep groundwater, which flows beneath the Site to the Hoosic River.

1.4 Interim Remedial Measures (IRMs)

Since 2018, NYSDEC approved and Honeywell implemented three IRMs at the Site.

- Vapor Intrusion Mitigation IRM - Consists of off-Site soil vapor intrusion (SVI) screening and mitigation for VOCs in residences and one commercial property in the vicinity of the Site. A combination of passive (i.e., structural improvements) and active mitigation (i.e., sub-slab depressurization systems [SSDS] or air recirculation systems with activated carbon purification) were completed as preventative steps against potential future vapor intrusion.
- Shallow Groundwater IRM - Consists of a permeable adsorptive barrier using a carbon product (PlumeStop™) to adsorb the VOC impacts from shallow groundwater before leaving the Site. In addition, the IRM barrier is adsorbing PFAS from shallow groundwater before it moves off-Site.
- John Street Culvert IRM - Consisted of the investigation and subsequent removal of VOC-impacted materials within the old concrete culvert beneath the John Street roadway immediately adjacent to the Site.

2.0 FEASIBILITY STUDY PROCESS

The purpose of the FS is to develop and evaluate the remedial action alternatives that can be applied at the Site to address COCs and ultimately recommend a remedial alternative that meets the site-specific remedial goals and objectives. The FS will follow the following steps, pursuant to DER-10 guidance.

2.1 Identify Remedial Goals

General, non-site-specific remedial goals have been established by NYS for remedial actions to be implemented under NYSDEC's Inactive Hazardous Waste Disposal Remedial Program. These remedial goals are:

- At a minimum, to eliminate or mitigate all potential threats to human health and the environment presented by contaminants at the site, to the extent feasible.
- To restore the site to pre-disposal/pre-release conditions, to the extent feasible

2.2 Develop Remedial Action Objectives (RAOs)

Remedial Action Objectives (RAOs) are media-specific and site-specific objectives that address potential exposure pathways identified in the qualitative human health and fish and wildlife assessments, consistent with the FS process set forth in 6 NYCRR Part 375 (NYS, 2006) and DER-10 (NYSDEC, 2010). Identified potential media-specific pathways include:

- Soil – exposure of construction workers, commercial/industrial workers, recreational users, and residents to COCs through direct contact and incidental ingestion
- Groundwater – exposure of construction workers through direct contact
- Soil vapor – exposure of construction workers, commercial/industrial workers, recreational users, and residents to VOCs through inhalation of indoor vapors
- Surface water – exposure of recreational users through direct contact and incidental ingestion

No exposure pathways based on sediment were identified.

The NYSDEC default media-specific RAOs are presented in Table 2.1.

Table 2.1 Remedial Action Objectives

NYSDEC Default Remedial Action Objectives by Media
Groundwater Public Health Protection: • Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards • Prevent contact with, or inhalation of volatiles, from contaminated groundwater Environmental Protection: • Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable. • Prevent or reduce the discharge of contaminants to surface water and sediment • Remove the source of ground or surface water contamination
Soil Public Health Protection • Prevent ingestion/direct contact with contaminated soil • Prevent inhalation exposure to contaminants volatilizing from soil Environmental Protection • Prevent migration of contaminants that would result in groundwater, surface water, or sediment contamination. • Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain
Soil Vapor Public Health Protection • Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site
Surface Water Public Health Protection • Prevent ingestion of water impacted by contaminants. • Prevent contact or inhalation of contaminants from impacted water bodies. • Prevent surface water contamination which may result in fish advisories. Environmental Protection • Restore surface water to ambient water quality criteria for the contaminant of concern. • Prevent impacts to biota from ingestion/direct contact with surface water causing toxicity and impacts from bioaccumulation through the marine or aquatic food chain.

2.3 Identify General Response Actions Based on RAOs

General response actions will be identified based on the RAOs. These response actions will be media-specific and include non-technology specific categories of treatment, containment, excavation, extraction, disposal, institutional controls, or a combination of these categories. The focus will be on response actions that are appropriate to the site-specific conditions and the identified COCs.

Table 2.2 presents a preliminary list of general response actions that may be considered during the FS evaluation.

2.4 Identify and Screen Technologies for Effectiveness and Implementability

The response actions will be screened to identify those actions that are technically implementable and can, either alone or in combination with other technologies, meet the RAOs. Actions that are not technically implementable or not considered effective, will be screened out from further consideration.

2.5 Assemble Retained Technologies into Site-Wide Alternatives

The retained technologies from the proceeding step will then be assembled into site-wide remedial alternatives unless media-specific alternatives are justified. These alternatives will be developed and defined to provide:

- size and configuration of process options;
- estimated time for remediation;
- spatial requirements;
- options for disposal, if required;
- substantive technical permit requirements
- limitations or other factors necessary to evaluate the alternatives; and
- beneficial and/or adverse impacts on fish and wildlife resources.

Cost estimates will be developed for each alternative, including net present worth over thirty (30) years discounted to the current year using a discount rate as specified by NYSDEC. It will be noted if the alternative will exceed 30 years.

At this step, alternatives that are not technically implementable or are not cost effective relative to other alternatives will be screened out from further consideration.

Table 2.22 Preliminary List of General Response Actions

Response Action	Description
Baseline Option	
No Further Action	No additional remedial activities
Institutional Controls (ICS / Engineering Controls (ECs)	
Environmental Easement	Agreement between NYSDEC and property owner to restrict future uses of the Site or other properties, for example, a restriction against development of a property for residential use
Site Management Plan	Plan for handling impacted media during future intrusive activities such as excavation, utility work, construction, or drilling, or vapor mitigation systems,
Fencing	Fencing, signage, and other security measures to restrict access to property with impacted media
VI Evaluations and Mitigation	Installation of vapor mitigation systems (e.g., basement sealing, subslab depressurization systems, air recirculation with carbon treatment) to prevent potential migration of vapors into indoor air.
Long Term Groundwater Monitoring	Monitoring of groundwater quality will allow evaluation of performance of remedial systems, plume stability, and natural attenuation processes.
Removal (excavation, extraction, disposal)	
Excavation	Excavation of impacted soil from designated areas and depths. Excavation may require sloping or sheet piling for stabilization and dewatering or vapor controls.
Groundwater Extraction	Extraction of impacted groundwater by pumping water from the aquifer through wells (vertical or horizontal) or trenches.

Product Removal	Free-phase liquid/product can be removed from wells by various means including pumping (continuously or intermittently), bailing, or the use of adsorbent material placed in the well.
Soil Vapor Extraction	Soil vapor extraction (SVE) involves applying a vacuum to wells screened in the unsaturated zone and removing volatile COCs such as TCE by volatilization.
Air Sparging	Air sparging involves the injection of air below the water table to strip volatile COCs with low Henry's Law constants, such as TCE, from groundwater. The air containing COCs is then captured by SVE and can be treated to remove VOCs.
Thermal Enhanced Removal	The volatilization and stripping of VOCs by SVE and air sparging, respectively, can be enhanced by applying heat to soil and groundwater as vapor pressures increase and Henry's Law constants decrease at higher temperatures. Heat can be applied by steam injection, radio frequency (RF) heating, or electric resistive heating (ERH).
Containment	
Solidification	Remedial amendments (e.g., Portland cement) are combined with soil, either through mixing or injection, to reduce the permeability of the soil and migration of groundwater through the treatment zone. This technology can be combined with stabilization and chemical oxidation/reduction.
Stabilization	Remedial amendments (e.g., clay, activated carbon) are combined with soil, either through mixing or injection, physically bind COCs and limit migration from the treatment zone. This technology can be combined with solidification and chemical oxidation/reduction.
Barrier Wall	Installation of sheet piling or slurry wall to prevent continued migration of COCs in groundwater. This technology often requires groundwater extraction to control groundwater within the containment zone.
Passive Barriers	A passive treatment zone can be installed perpendicular to groundwater flow to destroy COCs through abiotic or biotic processes or adsorb COCs to reduce downgradient flux. Process options include materials such as zero valent iron, PlumeStop, or mulch.

Active Barriers	An active barrier to control COC migration in groundwater can be installed perpendicular to groundwater flow to destroy or remove COCs. Process options can include SVE with air sparging, bioremediation, and chemical oxidation or reduction.
Capping	A cap system can be installed over an impacted area to prevent exposure to COCs and to prevent percolation of rainwater and subsequent leaching of COCs to groundwater. Such systems can consist of a soil cover or asphalt cover, can incorporate a geomembrane layer, or can be a fully engineered cap system.
Treatment	
In Situ Chemical Oxidation	Chemical oxidants can degrade some COCs such as TCE through complete mineralization to end products of carbon dioxide and inorganic ions (e.g., chloride). Commercially available oxidants include permanganate, persulfate, hydrogen peroxide, and ozone.
In Situ Chemical Reduction	Chemical reductants can degrade some COCs such as TCE through mineralization to end products of methane, carbon dioxide, and inorganic ions (e.g., chloride). Commercially available reductants include zero valent iron and calcium polysulfide.
In Situ Biological Degradation	Naturally occurring microorganisms can destroy various COCs (e.g., TCE) in appropriate redox environments. These biological processes can be stimulated by injection of either electron acceptors (e.g., sulfate), carbon substrates (e.g., lactate), co-substrates (e.g., methane), or other nutrients. Commercially available microbial cultures are also available for in situ bioaugmentation.

2.6 Analyze Alternatives Against Eight Evaluation Criteria

Each alternative retained in the previous step will be analyzed pursuant to the following eight evaluation criteria in subdivisions 4.2(b) to (i) of DER-10:

- Overall protection of public health and the environment
- Reduction in toxicity, mobility, and volume of hazardous waste (e.g., by thermal destruction, biological or chemical treatments or containment wall construction)
- Long-term effectiveness and permanence
- Short-term effectiveness and potential impacts during remediation
- Implementation and technical reliability
- Compliance with statutory requirements
- Community acceptance (to be addressed during the public comment period before the ROD is issued)
- Cost effectiveness

A cost comparative analysis will be conducted for the alternatives to the other alternatives using the eight criteria.

2.7 Evaluate Institutional and/or Engineering Controls

Any proposed use restrictions and/or institutional controls (ICs) and the mechanisms that will be used to implement, maintain, monitor, and enforce the restrictions and controls will be described, along with any proposed engineering controls (ECs) and site management requirements. Sufficient analysis will be provided to support a conclusion that these ICs and or ECs can be maintained and will be sufficiently protective of human health and the environment.

2.8 Recommend Remedy for Site

A remedy for the Site will be recommended based on the criteria evaluation with a summary of the reasons for the recommendation.

3.0 SCHEDULE AND DELIVERABLES

3.1 Deliverables

A FS report will be prepared with the following sections:

- Introduction;
- Site description and history;
- Summary of RI and exposure assessment;
- Remedial goals and remedial action objectives;
- General response actions;
- Identification and screening of technologies;
- Development and analysis of alternatives, which
    - assembles technologies into site-wide alternatives;
    - evaluates alternatives with respect to the eight criteria; and
- Recommend remedy, with discussion supporting why it is recommended and evaluation of the institutional/engineering controls for the selected remedy.

An interim deliverable will include:

- Site–specific RAOs (NYSDEC default RAOs with modifications, if appropriate)
- Table of general response actions
- Table of screening of general response actions
- Table of site-specific remedial alternatives

The interim deliverables will be presented to NYSDEC on one of the regularly scheduled biweekly calls, or other scheduled calls if appropriate, followed by discussion on the following regularly scheduled biweekly calls.

Scopes of work for additional data collection will be submitted to NYSDEC by email or letter for approval prior to implementation. The results will be reported either in the FS report or as an interim deliverable based on discussions with NYSDEC.

3.2 Schedule

The overall schedule for development of the FS and FS Report is shown below. The schedule assumes NYSDEC approval of the FSWP in September 2022 with submission of the draft FS Report 15 months after approval. This time frame will allow for collection of groundwater data to evaluate plume stability. The schedule may be adjusted if approval is delayed.

Table 3.1 Feasibility Study Schedule

Date	Action
July 2022	Submit draft FSWP
August 2022	Receive approval of FSWP from NYSDEC and initiate FS
September 2022 through September 2023	Submit interim deliverables (as discussed in Section 3.2)
December 2023	Submit Draft FS Report
April 2024	Revise the FS in response to comments and submit Final FS Report

4.0 REFERENCES

ERM. 2019. Final Site Characterization Report, Former Oak Materials Fluorglas Division–John Street. July 2019.

ERM. 2022a. Final Remedial Investigation Report, Former Oak Materials Fluorglas Division–John Street. June 2022.

ERM. 2022b. Qualitative Human Health Exposure Assessment, Former Oak Materials Fluorglas Division John Street. April 2022.

ERM. 2022c. Fish and Wildlife Resource Impact Assessment, Former Oak Materials Fluorglas Division John Street. April 2022.

NYSDEC. 2010. DER-10: Technical Guidance for Site Investigation and Remediation. NYSDEC Division of Environmental Remediation, Albany, May 2010.