IMPACT AREA GROUNDWATER STUDY PROGRAM
JOINT BASE CAPE COD
REMEDY SELECTION PLAN FOR THE J-3 RANGE

October 2014

The United States Environmental Protection Agency (EPA) seeks your feedback on this Remedy Selection Plan for the J-3 Range site located on the Camp Edwards portion of Joint Base Cape Cod (JBCC). The Remedy Selection Plan explains the cleanup alternatives considered for the site, which alternative is proposed, and why.

The Army National Guard's Impact Area Groundwater Study Program (IAGWSP), under the oversight of EPA and the Massachusetts Department of Environmental Protection (MassDEP), has investigated soil and groundwater contamination at the site and has issued reports on those investigations, along with a Feasibility Study report presenting alternatives for addressing the contamination associated with the J-3 Range.

The Army National Guard's work at the site was conducted under the authority of two of EPA's Safe Drinking Water Act Administrative Orders (SDWA 1-97-1019 and SDWA 1-2000-0014), and in consideration of the substantive cleanup standards of the Massachusetts Contingency Plan (MCP).

EPA wants your feedback and is seeking public comment from (October 13 through November 13, 2014). Please review this Remedy Selection Plan, and send your comments to us. After the comment period ends, EPA will consider the public comments, consult with MassDEP, and issue a Decision Document providing the details of the remedial actions selected for the site. With the Decision Document, EPA will include a Responsiveness Summary that provides responses to comments received. MassDEP will issue its official position in a comment letter after the comment period has ended.

HOW TO PARTICIPATE

You can provide written comments on this Remedy Selection Plan from October 13 through November 13, 2014. At the next JBCC Cleanup Team meeting to be held on October 15, 2014 at 6:00 p.m. at Building 1805 on the JBCC, a public information session has been scheduled and a presentation will provide information on the contamination associated with the J-3 Range, and the proposed remedy. You may also provide oral comments at the public meeting. EPA, MassDEP and Army representatives will attend this meeting and be available to respond to questions regarding the J-3 Range and the proposed remedy. A summary of comments and the responses to those comments will be provided as part of the Decision Document.

Public Comment Period for the J-3 Range Remedy Selection Plan

October 13 through November 13, 2014

Oral comments may be offered at the Public Meeting or written comments may be submitted by U.S. mail or email no later than November 13, 2014.

Public Information Meeting/Public Hearing
October 15, 2014
Joint Base Cape Cod
Building 1805 West Outer Road
Camp Edwards, MA 02542

Written comments should be mailed to:
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J-3 RANGE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

The Remedial Investigation and Feasibility Study (RI/FS) report for the J-3 Range is the document used to summarize activities conducted to characterize possible sources of contamination (i.e. soil and munitions), determine the impacts of these sources on groundwater, and evaluate a range of cleanup alternatives to address any contamination identified. During the RI, several different sources of contamination were identified including disposal pits containing unexploded ordinance (UXO) as well as soil contamination from training and testing activities on the range. The various sources of contamination were removed as they were discovered during the investigation. Based on the work conducted during the investigation, it is likely that most of the significant sources of groundwater contamination have been removed. However, additional soil sampling and UXO clearance will be performed and any additional sources found will be removed as part of the long term remedy.

The feasibility study focused on the development and evaluation of a range of potential response actions necessary to address contaminants detected in groundwater associated with the site. The groundwater at the J-3 Range has been contaminated by RDX and perchlorate. These chemicals are associated with the use and disposal of military munitions.

The groundwater cleanup objectives for the J-3 Range are as follows:

- to restore the useable groundwater to its beneficial use wherever practicable, within a timeframe that is reasonable given the particular circumstances of this site;
- to provide a level of protection in the aquifer that takes into account that the Cape Cod Aquifer (including the Sagamore Lens) is a sole source aquifer that is susceptible to contamination; and
- to prevent ingestion and inhalation of groundwater containing the contaminants of concern (COCs) (RDX and perchlorate), in excess of federal maximum contaminant levels (MCLs), Health Advisories, drinking water equivalent levels (DWELs), applicable State standards or an unacceptable excess lifetime cancer risk or non-cancer Hazard Index.

The groundwater cleanup levels used in the feasibility study are 2 parts per billion (ppb) for perchlorate, which is the Massachusetts drinking water standard (Maximum Contaminant Level, or MMCL), and 0.6 ppb for RDX, which is the concentration in drinking water that would be expected to cause an increased lifetime cancer risk of one in a million (sometimes called the 10^{-6} cancer risk level).

The feasibility study evaluated the following alternatives for achieving the groundwater cleanup objectives: No Further Action, Monitored Natural Attenuation and Land Use Controls, and alternatives with Focused Extraction. For more details on the alternatives see the Remedial Investigation/Feasibility Study report for the site available on EPA's web site.

The IAGWSP developed conceptual designs for these alternatives, including:

- Number, location, and sampling frequency of existing locations needed to monitor the plumes;
- Number and location of any new monitoring wells, if needed;
- Number and location of extraction wells and injection trenches, and estimated groundwater extraction flow rates;
- Type, size, and location of treatment facilities;
- Preliminary schedule for construction and operation; and
- Preliminary cost estimate.

The conceptual designs for the alternatives are based on the following information:

- Plume extent and concentrations as delineated based on the most up-to-date groundwater analytical data;
- Predictions of groundwater flow and contaminant fate and transport as estimated using groundwater modeling;
- Use of treatment systems with ion exchange resin and/or granular activated carbon vessels (similar to those currently in use by the IAGWSP).
- Continuation of groundwater monitoring (where applicable) for two years after cleanup objectives are achieved.

Preliminary cost estimates were prepared for each groundwater alternative. Each estimate includes the following components:

- Capital costs, which are expenditures required to initiate and install a remedial action. The cost estimates do not include costs associated with the previously constructed treatment systems;
- Operation and maintenance (O&M) and Land Use Controls costs, which are post-implementation costs, such as monitoring, labor, reporting, electricity costs, equipment replacement and disposal of treatment residuals, necessary to ensure the continued effectiveness of the remedial action;
- Present worth analyses; and
- Indirect costs, including engineering services.

All alternatives outlined in this Remedy Selection Plan, except Alternative 1 (No Further Action), include Land Use Controls and long-term monitoring. Land Use Controls consist of measures that would prevent human exposure to plume contaminants and prevent actions that would interfere with the remedy. In this case, the Land Use Controls would restrict well drilling or other activities that could expose individuals to contaminated groundwater. Land Use Controls would be monitored to ensure effectiveness and a Land Use Controls document will be prepared annually. The long-term monitoring would consist of groundwater monitoring to determine if the remedy is performing as planned and when contaminant concentrations reach cleanup levels. Reporting on monitoring results and periodic updating of the sampling plan also are included.

CRITERIA FOR EVALUATING THE CLEANUP REMEDY

As documented in the feasibility study, a detailed analysis was performed on all of the groundwater alternatives presented for the J-3 Range. The evaluation used the EPA evaluation criteria listed below to select the proposed response action for the site. These nine criteria are summarized as follows:

1. Overall protection of human health and the environment; which includes prevention of the movement of contaminants into the aquifer and its preservation as a public drinking water supply: Will the remedy protect human health? Will it restore the aquifer?

2. Compliance with regulations: Does the remedy meet all applicable federal and state standards?

3. Long-term effectiveness and permanence: What are the remaining risks after completion of the remedial action? What is the adequacy and suitability of controls, if any, that are used to manage untreated contaminants remaining at the site?

4. Reduction of toxicity, mobility, and volume through treatment: What is the expected reduction in toxicity, mobility or volume? What are the type and quantity of treatment residuals that will remain following treatment?

5. Short-term effectiveness: Is the community protected during the remedial action? Are workers protected during the remedial action? What are the environmental impacts to natural resources? How long will it be before remedial response objectives are achieved?

6. Implementability: Is it technically and administratively feasible to design and construct the technology? How reliable is it? Can effectiveness be monitored? Are the services and materials available?

7. Cost: What are the capital costs of the remedy? What are the operations and maintenance costs? What is the net present value of the costs?

8. State Acceptance: What issues and concerns might the State Department of Environmental Protection have regarding each alternative? This criterion will be evaluated throughout the development, screening and evaluation of alternatives based on comments and input received from MassDEP.

9. Community Acceptance: What issues and concerns might the public have regarding each alternative? This criterion will be evaluated based on public feedback, such as comments made at the public hearing, or written comments submitted during the public comment period or at the public hearing.

A summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria is included on pages 8-9.

BACKGROUND

The J-3 Range is located adjacent to the Impact Area and is the southernmost of four former military training and defense contractor test ranges that operated from the 1930s until the 1990s. The J-3 Range is approximately 1,280 meters long and between 240- and 490-meters wide. The range is oriented southeast to northwest, with the southeastern "uprange" end near Greenway Road, bordered to the northeast by the L Range and the northwestern "downrange" end extending to Chadwick Road. Physical features of the J-3 Range fell into four general categories: contractor facilities, contractor test firing ranges, contractor disposal areas, and former military training areas lying adjacent to the J-3 Range proper.

The J-3 Range was originally established between 1935 and 1941 along the west side of Greenway Road under the designation of the "H Range". The H Range was used into the 1950s as a mortar and rocket range. In 1968, the area was developed as the J-3 Range by AVCO/Textron Systems Corporation (TSC) as a Department of Defense contractor test range, and used into the late 1990s. The primary mission of TSC was to develop and test tactical weapons systems under contract to the U.S. Army and U.S. Air Force. Textron used the following facilities at the range: headquarters trailer; workshop building; explosive loading building (melt/pour facility); ordnance assembly/X-ray building; instrumentation trailer; environmental test/assembly building; two test towers; four explosives storage bunkers; and several test range areas.

Activities associated with historical range uses, primarily munitions testing and disposal, have resulted in releases of energetic compounds to the soil which are the likely source of groundwater contamination at the site. The conceptual site model, based on known range use and activities and the presence of soil contaminants, suggests disposal and testing activities in the Demolition/Artillery/Warhead Testing Area, and activities conducted at the Melt Pour Facility Area as the major sources of the J-3 Range groundwater contamination.

INVESTIGATIONS AND FINDINGS

GROUNDWATER

Intensive investigations of the J-3 Range groundwater began in 2000. Investigative activities included aquifer profiling, monitoring well installation, groundwater sample collection from monitoring wells, drive points and diffusion samplers, sample analysis, water level surveys and groundwater model development. A total of 112 new and existing well screens were sampled in 56 locations and over 1,500 samples were analyzed during the investigation.

A large-scale plume of RDX and perchlorate has been found to be migrating from sources on the J-3 Range. The approximate current extent of the J-3 perchlorate plume is 3,500 feet long by 450-feet wide. Detected concentrations of perchlorate have decreased from a maximum of 770 ppb (MW-198M3, 2005) to a current maximum of 4.5 ppb (MW-163S) although higher concentrations likely exist between monitoring wells. The RDX plume is approximately 2,500-feet long by 200-feet wide. The current detected maximum RDX concentration is 7.5 ppb (MW-198M4); the maximum historical detection was 37.6 ppb (MW-343M2, 2005).

SOIL

From 1997 through March 2013, 1,700 soil samples were collected from 505 locations within the J-3 Range investigation area. Results of historical releases and soil investigations in the Demolition and Artillery Areas as well as the Melt Pour Area show soil contamination that is consistent with explosives found in downgradient groundwater. These areas are located in Areas 1 and 3 and the extent of the groundwater plume is consistent with sources in these locations. Explosive and perchlorate soil contamination associated with these source areas has been removed as discussed on page 5, Response Actions.

MUNITIONS

UXO discoveries have primarily been made in conjunction with ordnance clearance conducted in support of intrusive drilling, surface and subsurface soil sampling, and ground-based geophysical surveys. Ground-based geophysical surveys were conducted in portions of the J-3 Range to produce a digital geophysical record of the ground surface that might help locate potential munitions disposal pits and UXO items representing potential sources of contamination to the aquifer. The geophysical investigations proceeded in a sequential manner. Each investigation used information collected during previous investigations to guide the next step of the process. The investigations typically focused on the anomalies with the highest potential to contain burial or disposal pits based on geophysical signals, field observations, witness interviews and accumulated site knowledge. Generally, the largest and/or most densely distributed anomalies were investigated during each phase, which resulted in smaller anomalies being investigated as the phases of investigation progressed. Individual anomalies likely indicating the presence of barrage rockets were also investigated in the Barrage Rocket Study Area.

J-3 Groundwater Treatment System is Housed in AFCEC's FS-12 Facility

J-3 Range Prior to the Demolition of Structures

RESPONSE ACTIONS

GROUNDWATER

In 2006, a groundwater rapid response action (RRA) was initiated to mitigate further migration of the J-3 plume until a final remedy could be determined. The J-3 extraction, treatment and reinjection (ETR) system consists of three extraction wells situated along the plume axis operating at a combined flow rate of 195 gallons per minute (gpm). Water is treated using granular activated carbon and ion exchange resins. The treatment system is housed within the nearby Fuel Spill-12 (FS-12) treatment building where the treated groundwater is fed into the FS-12 effluent system of reinjection wells. To date, the system has treated over 730 million gallons of groundwater. Contaminant concentrations have diminished throughout most of the plume due to mass removal from operation of the ETR system and natural attenuation. As of December 2013, the system has removed more than 25 pounds of perchlorate and 4 pounds of RDX from the aquifer.

SOIL

Soil sampling results identified soils with elevated concentrations of explosives in the following general areas: former burn box, detonation pit, warhead and artillery test firing range, drum disposal area, and the area surrounding the melt/pour facility. With the exception of the Drum Disposal Area which was remediated by TSC, soils from these locations were removed during the soils RRA between February and December 2004. The objective of the soils RRA was to reduce or eliminate probable sources of groundwater contamination. Soils with explosives detections were excavated to depths ranging from 1.25 to 6 feet below ground surface and mechanically screened to remove any remaining munitions. These soils were thermally treated on-site. Approximately 2,386 cubic yards of contaminated soil was excavated. Post-excavation soil samples were collected from each of the excavation areas. Results indicated no detections of explosives or perchlorate exceeding action levels.

Soils associated with the Drum Disposal Area were disposed of off-site by TSC in 2008. TSC also demolished and removed the range infrastructure, including buildings, concrete target walls, and blocks, and performed additional housekeeping measures in accordance with the Consent Decree. These targeted soil removal actions have likely removed most of the soil contamination that was an active source of groundwater contamination. However, additional soil sampling is necessary to confirm that all potential sources have been addressed.

MUNITIONS

Over the course of the investigations and removal actions, approximately 1,900 munitions containing high explosives were removed. In addition, approximately 560 munitions containing small quantities of explosives were removed along with 29,600 pounds of range debris. The three burial pits found during the investigations were concentrated in one area and were associated with TSC's disposal practices. It is unlikely that any burials remain because the surrounding area has been investigated. These targeted removals of munitions have likely removed most of the active sources of groundwater contamination. However, additional targeted geophysical work is necessary to confirm that all sources have been addressed. This work will include the excavation and removal of rockets identified within the Barrage Rocket Study Area.

DEVELOPMENT OF GROUNDWATER ALTERNATIVES

The remedies evaluated for groundwater in the J-3 Range Feasibility Study are no action, monitored natural attenuation and focused extraction. These remedies include technologies already proven to be effective at Joint Base Cape Cod. The technology proposed for the alternatives is groundwater extraction, treatment with granular activated carbon (GAC) for RDX and ion exchange resin for perchlorate contaminated groundwater, and return of treated water back into the aquifer via reinjection wells.

All the alternatives assume that there is no continuing source to groundwater contamination. This assumption must be verified as part of the final remedy.

J-3 RANGE GROUNDWATER PLUME ALTERNATIVES

Alternative 1 – No Further Action

Capital Cost	$ 146,000
Operations &Maintenance (O&M) Costs	$ 0
Site closeout and documentation	$ 82,000
Total Present Value	$ 228,000

Alternative 1 provides for no further action to address the J-3 Range groundwater contamination. Under this alternative:

- Model predictions could not be confirmed due to abandonment of existing treatment units and monitoring wells.
- Land Use Controls would not be implemented and so would not ensure against exposure until cleanup is achieved.
- Site close-out documentation would be completed.

Contamination within the plume is predicted to drop below the 2 ppb MMCL for perchlorate by 2079 and is expected to reach background levels after 2114. RDX concentrations are expected to decrease below the 10^{-6} risk-based level of 0.6 ppb by 2043 and background after 2114.

Alternative 2 – Monitored Natural Attenuation (MNA) and Land Use Controls (LUCs)

Capital Cost	$ 225,000
O&M Costs	$ 1,544,000
Site closeout and documentation	$ 23,000
Total Present Value	$ 1,792,000

Alternative 2 would provide optimized monitoring of groundwater until concentrations of contaminants within the plume reach risk-based levels. Under this alternative:

Alternative 2 (cont.)

- No further extraction and treatment would occur however, long-term groundwater monitoring would continue.
- Land Use Controls would be implemented to prevent use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site close-out documentation would be completed.

Contamination within the plume is predicted to drop below the 2 ppb MMCL for perchlorate by 2079 and is expected to reach background levels after 2114. RDX concentrations are expected to decrease below the 10^{-6} risk-based level of 0.6 ppb by 2043 and background after 2114.

Alternative 3 - Focused Extraction with Three Wells, MNA and LUCs (Continued Operation of Current System)

Capital Cost	$ 410,000
O&M Costs	$ 7,427,000
Site closeout and documentation	$ 39,000
Total Present Value	$ 7,867,000

Alternative 3 would provide for extraction and treatment of the groundwater (Figure 1). Under this alternative:

- Contamination would be remediated through the long term operation of the current extraction system consisting of:
  - A flow rate of 100 gpm at J3EW1P1, 65 gpm at J3EW0032, and 30 gpm at 90EW0001 for a total combined pumping rate of 195 gpm.
  - Treatment with granular activated carbon and ion-exchange resin at the treatment facility.

Alternative 3 (cont.)

  - Infiltration of the treated water via FS-12 reinjection wells.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- LUCs would be implemented to prevent use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site-closeout documentation would be completed.

Contamination within the plume is predicted to drop below the 2 ppb MMCL for perchlorate by 2052 and is expected to reach background levels after 2114. RDX concentrations are expected to decrease below the 10^{-6} risk-based level of 0.6 ppb by 2032 and background by 2086.

Alternative 4 – Focused Extraction with Three Wells, MNA and LUCs (Optimization of Current System)

Capital Cost	$ 433,000
O&M Costs	$ 7,300,000
Site closeout and documentation	$ 52,000
Total Present Value	$ 7,785,000

Alternative 4 would provide for extraction and treatment of the groundwater by enhancing the existing groundwater extraction system (Figure 2). Under this alternative:

- The pump and treat system would include:
  - A flow rate of 150 gpm at J3EW1P1, 50 gpm at 90EW0001, and 65 gpm at J3EW0032 for a total combined pumping rate of 265 gpm. Treatment with granular activated carbon and ion-exchange resin.
  - Infiltration of the treated water via FS-12 reinjection wells.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- LUCs would be implemented to prevent the use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site-closeout documentation would be completed.

Contamination within the plume is predicted to drop below the 2 ppb MMCL for perchlorate by 2039 and is expected to reach background levels after 2114. RDX concentrations are expected to decrease below the 10^{-6} risk-based level of 0.6 ppb by 2031 and background by 2076.

Alternative 4a – Focused Extraction with Four Wells, MNA and LUCs (Optimization of Current System with Additional In-Plume Extraction Well)

Capital Costs	$ 1,400,000
O&M Costs	$ 3,400,000
Site closeout and documentation	$ 70,000
Total Present Value	$ 4,900,000

Alternative 4a (cont.)

Alternative 4a would provide for extraction and treatment of the groundwater by optimizing the existing groundwater extraction system and adding an extraction well (Figure 3). Under this alternative:

- The pump and treat system would include:
  - A flow rate of 90 gpm at J3EW1P1, 65 gpm at J3EW0032, and 50 gpm at 90EW0001, and the addition of one new extraction well, upgradient of J3EW1P1 at 60 gpm for a total combined pumping rate of 265 gpm.
  - Infiltration of the treated water via FS-12 reinjection wells.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- LUCs would be implemented to prevent the use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site-closeout documentation would be completed.

Contamination within the plume is predicted to drop below the 2 ppb MMCL for perchlorate by 2022 and is expected to reach background levels after 2114. RDX concentrations are expected to decrease below the 10^{-6} risk-based level of 0.6 ppb by 2021 and background by 2114.

Alternative 5 – Focused Extraction with Six Wells, MNA and LUCs

Capital Costs	$ 3,723,000
O&M Costs	$ 4,535,000
Site closeout and documentation	$ 73,000
Total Present Value	$ 8,331,000

Alternative 5 would provide for extraction and treatment of the groundwater by enhancing the current groundwater extraction system (Figure 4). Under this alternative:

- The pump and treat system would include:
  - A flow rate of 120 gpm at J3EW1P1, 50 gpm at J3EW0032, and 50 gpm at 90EW0001, and the addition of three new extraction wells, one upgradient of J3EW1P1 and two upgradient of 90EW0001 near J2EW0001 for a total combined pumping rate of 625 gpm.
  - Treatment with granular activated carbon and ion-exchange resin by expanding the treatment units.
  - Infiltration of the treated water by expanding the use of the FS-12 reinjection wells.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- LUCs would be implemented to prevent the use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site-closeout documentation would be completed.

Contamination within the plume is predicted to drop below the 2 ppb MMCL for perchlorate by 2024 and is expected to reach background levels by 2110. RDX concentrations are expected to decrease below the 10^{-6} risk-based level of 0.6 ppb by 2024 and background by 2065.

EVALUATION OF GROUNDWATER ALTERNATIVES FOR THE J-3 RANGE PLUME

Below is a summary of how the alternatives were evaluated in the Feasibility Study.

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternatives 2 through 5 would be protective of human health and the environment. Alternative 1, however, would not be protective because it offers no monitoring or confirmation of existing Land Use Controls to ensure that future exposures do not occur. Alternative 2 through 5 add provisions for plume monitoring and Land Use Controls to help prevent future exposure to contaminated groundwater. Alternatives 3, 4, 4a and 5 add extraction and treatment components and achieve risk-based concentrations earlier.

COMPLIANCE WITH REGULATIONS

All alternatives are expected to eventually result in compliance with applicable regulations. Alternatives 1 and 2 would meet chemical-specific regulations when contaminant concentrations decrease below the cleanup standards by natural attenuation. Alternative 2 includes monitoring to confirm this occurs; Alternative 1 does not. Alternatives 3, 4, 4a and 5 include active treatment to ensure that applicable standards are met, and monitoring to confirm this occurs.

LONG-TERM EFFECTIVENESS AND PERMANENCE

All alternatives are expected to provide long-term effectiveness and permanence; however, the timeframes differ. Additional soil sampling and UXO clearance will be performed to confirm that the source area has been removed so residual soil contamination is unlikely to compromise the permanence of the remedial alternatives once completed. Alternatives 2 through 5 also include long term groundwater monitoring to verify the effectiveness of the soil and UXO removal.

Alternative	Predicted RDX Cleanup Times 0.6 ppb *10^{-6} Cancer Risk Level*	Predicted Perchlorate Cleanup Times 2 ppb *MMCL*
1	2043	2079
2	2043	2079
3	2032	2052
4	2031	2039
4a	2021	2022
5	2024	2024

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Alternatives 1 and 2 are not treatment alternatives and, therefore, do not reduce toxicity, mobility, or volume through treatment. However, the toxicity and volume of the contaminated groundwater would be reduced through natural processes. Modeling estimates that Alternatives 3, 4, 4a and 5 would extract 10.9, 12.4, 13.1, and 14.8 pounds of perchlorate and 1.5, 1.7, 1.8 and 2.4 pounds of RDX, respectively through the use of extraction wells and treatment with GAC/ion exchange resin.

SHORT-TERM EFFECTIVENESS

Alternative 1 would have the least impact on workers and the environment because construction is minimal. Alternatives 4a and 5 would have the greatest impact to the environment, community and workers because they include the installation of additional extraction wells. Of the active cleanup alternatives, alternatives 2, 3, and 4 have the least impact on workers, the community and the environment since they do not require any new construction activities. In addition, all alternatives would eventually involve construction to decommission the wells and treatment facilities.

IMPLEMENTABILITY

None of the alternatives are limited by administrative feasibility. Alternative 1 is the most easily implemented alternative since it requires no further action other than abandoning system infrastructure, groundwater monitoring wells and preparing close out documentation. Alternatives 2, 3, and 4 are the next most easily implemented alternatives with groundwater monitoring, O&M of the existing ETR system and Land Use Controls. Alternative 4a would require the installation of a new on-base extraction well while Alternative 5 would require installation of three new extraction wells, two of which would be located off-base.

COST

The costs of alternatives increase as the amount and length of treatment increases. Alternative 1 has a total estimated cost of $228,000, Alternative 2 - $1,792,000, Alternative 3 - $7,876,000, Alternative 4 - $7,785,000, Alternative 4a - $4,900,000 and Alternative 5 - $8,331,000.

EVALUATION OF GROUNDWATER ALTERNATIVES FOR THE J-3 RANGE PLUME (CONT.)

STATE ACCEPTANCE

This criterion is continually evaluated as MassDEP participates in all aspects of the evaluation and selection of a remedy. MassDEP will issue its' official position in a comment letter after the public comment period has ended.

COMMUNITY ACCEPTANCE

This criterion will be evaluated in detail based on all public comments received on the Remedy Selection Plan.

PROPOSED REMEDY FOR THE J-3 RANGE GROUNDWATER PLUME

ALTERNATIVE 4A FOCUSED EXTRACTION WITH FOUR WELLS, MONITORED NATURAL ATTENUATION AND LAND USE CONTROLS (OPTIMIZATION OF CURRENT SYSTEM WITH ADDITIONAL IN-PLUME EXTRACTION WELL)

Alternative 4a, Focused Extraction with Four Wells, Monitored Natural Attenuation and Land Use Controls, as presented in the Feasibility Study, provides the best balance of the criteria used to evaluate the cleanup alternatives based on current information. The exact location of the additional on-base extraction well will be optimized to achieve the best balance between efficiency, cleanup time, cost, implementability and environmental and worker impacts (Figure 5). The location of the pipeline will be based on the well location. However, to strengthen this alternative, EPA has recommended an Enhanced Alternative 4a. This Enhanced Alternative 4a includes:

- Extraction and treatment of groundwater by shifting pumping stress between the existing and new extraction wells within the current system design, and/or expanding the system to ensure complete containment of the plume at concentrations above cleanup levels up gradient of the base boundary; treatment with granular activated carbon and ion exchange resin at the existing and/or expanded treatment system; and infiltration of the treated water at the existing reinjection wells. A work plan will be developed and implemented as part of the remedy, after approval by EPA and MassDEP, and will include the installation of additional monitoring wells to determine if the on base extraction wells are achieving containment. If containment is not achieved, an additional work plan will be developed to explain how the extraction and treatment system will be altered and augmented to insure that containment at the on-base extraction well is achieved.
- Confirmatory soil sampling and UXO clearance in select areas of the range to verify source removal is complete. A work plan will be developed and implemented as part of the remedy, after approval by EPA, in consultation with Mass DEP, which includes soil sampling and geophysical investigations in areas of the range known to have contributed to groundwater contamination. Soil contamination and munitions posing a threat to groundwater shall be removed.
- Long-term groundwater monitoring at existing and new monitoring wells to verify the effectiveness of the soil and UXO removal; to ensure that groundwater modeling predictions regarding the reduction and migration of contamination are correct; and to ensure that any remaining contamination remains below risk-based levels.
- Implementation and verification of Land Use Controls to prevent use of contaminated portions of the aquifer for drinking water until contamination is reduced to below risk-based levels and to prevent actions that would interfere with the remedy.
- Five year reviews will be conducted to ensure that the remedy remains protective and is achieving the goals established in the RSP.

The remedy is predicted to achieve a perchlorate level of 2 ppb by 2022 as site contaminants in groundwater are reduced through treatment and natural processes. RDX is estimated to reach a level of 0.6 ppb by 2021.

This alternative is proposed because it achieves permanent cleanup of RDX and perchlorate in groundwater in the J-3 Range economically and in a reasonable timeframe without excessive environmental and worker impacts. Through groundwater treatment, continued monitoring and enforcement of Land Use Controls that would prevent exposure to contaminated groundwater, the proposed remedy ensures protection of human health and the environment.

The estimated cost of the proposed remedy is approximately $4,900,000. This cost would increase if the current system needs to be expanded to meet the containment objectives.

GLOSSARY OF TERMS AND ACRONYMS

Background	A background level is the concentration of a hazardous substance that represents the level of the substance in an undisturbed environmental setting at or near the site.
Decision Document (DD)	Document that summarizes the response action selected to address contamination.
Feasibility Study (FS)	Document presenting and evaluating a range of alternatives for addressing contamination.
Granular Activated Carbon (GAC)	A treatment medium used to remove contaminants, such as explosives from groundwater.
Lifetime Health Advisory (HA)	Guideline established by EPA that represents the concentration of a chemical in drinking water that, given a lifetime of exposure, is not expected to cause adverse, non-cancerous effects.
Federal Maximum Contaminant Level (MCL)	Federal maximum contaminant level for drinking water.
Ion Exchange Resin (IX)	A treatment medium used to remove perchlorate from groundwater.
Land Use Controls (LUC)	Administrative and/or legal controls that minimize the potential for human exposure to contamination by limiting land or resource use
Massachusetts Maximum Contaminant Level (MMCL)	Maximum contaminant level for drinking water in the Commonwealth of Massachusetts.
mg/Kg	Milligram per kilogram; used interchangeably with parts per million (ppm)
Perchlorate	An oxidizer used in some munitions, fireworks, flares, pyrotechnics and other items.
ppb	Parts per billion; used interchangeably with micrograms per liter (µg/L) in liquids (gw) and ug/kg in solids (soil).
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine / Royal Demolition Explosive, a compound commonly used in explosives.
Rapid Response Action (RRA)	An interim cleanup action taken to reduce contamination while the investigation and selection of a response action is completed.
Remedial Investigation (RI)	Document that provides a summary of activities conducted and a synthesis of data gathered for the characterization of soil and groundwater associated with the site.
Remedy Selection Plan (RSP)	The document outlining the cleanup alternatives and the proposed remedy.

NEXT STEPS/UPCOMING ACTIVITIES

EPA is holding a public comment period to provide an opportunity for public input. After consideration of public comments and consultation with MassDEP, EPA will issue a Decision Document that will detail the selected remedy. MassDEP will issue its' official position in a comment letter after the public comment period has ended. A public informational session is scheduled during the JBCC Cleanup Team meeting on October 15, 2014 at Building 1805 on JBCC.

FOR MORE INFORMATION

Contact the following individuals for more information:

Pamela Richardson – Impact Area Groundwater Study Program
(508) 968-5630

Ellie Donovan – Massachusetts Department of Environmental Protection
(508) 946-2866

Kate Melanson – U.S. Environmental Protection Agency
(617) 918-1491

Or visit the EPA or IAGWSP Web site at:

http://www.epa.gov/region1/mmr/

http://www.jbcc-iagwsp.org

Information repositories have been established at the local public libraries in Bourne, Sandwich, and Falmouth to make information on the program available to the public. A complete repository of documents, including copies of work plans, sampling results, site reports, fact sheets, meeting minutes, and other materials, are available at the Jonathan Bourne Library in Bourne. All documents are available on the CLAMS automated system. Documents can also be viewed at the IAGWSP office by appointment.

Key documents related to the J-3 Range site include:

- *Final J-3 Range Remedial Investigation and Feasibility Study, October 2014*

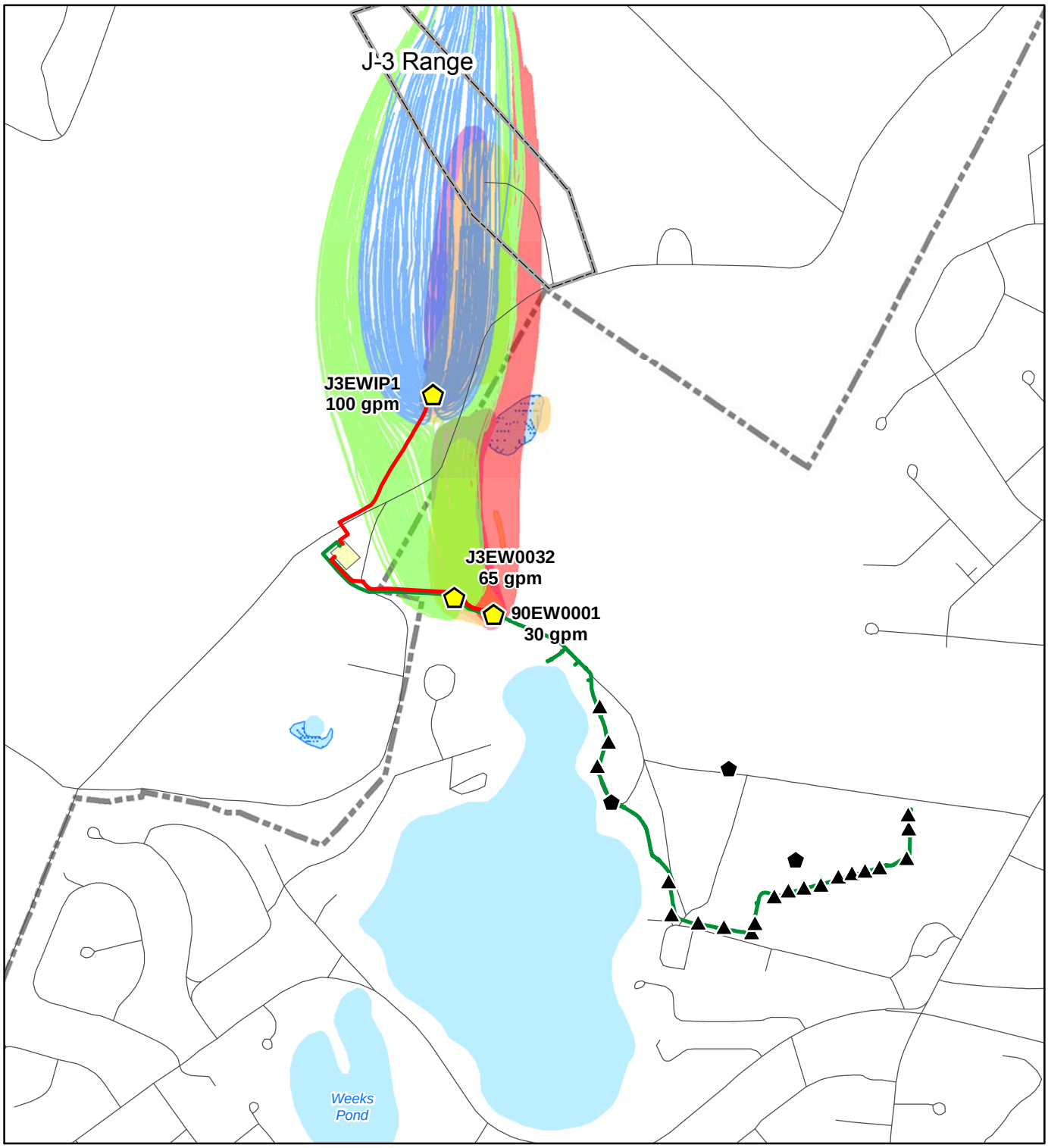
OPPORTUNITIES FOR PUBLIC COMMENT

The 30-day public comment period for the Remedy Selection Plan will be October 13, through November 13, 2014. During the public comment period, comments can be submitted as follows:

By fax to:
(617) 918-0020

By mail to:
Kate Melanson
US EPA Region 1
5 Post Office Square - Suite 100
Boston, MA 02109-3912

By email to:
melanson.kate@epa.gov

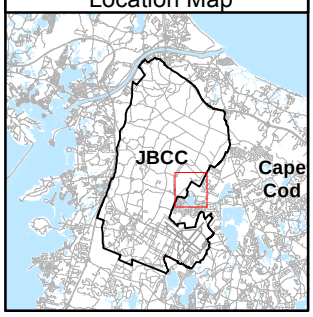


Legend

- J-3 Extraction Well
  Current Extraction Rate
- FS-12 Extraction Well (operational)
- Reinjection Well (operational)
- Influent Piping
- Effluent Piping
- J3EWIP1 Capture Zone
- J3EW0032 Capture Zone
- 90EW0001 Capture Zone
- Perchlorate > 2 µg/L
- RDX > 0.6 µg/L
- Treatment System
- J-3 Range Boundary
- JBCC Boundary

Plume: January 2014

Location Map



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TITLE

Alternative 3
Groundwater Extraction Scenario

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

FIGURE 1

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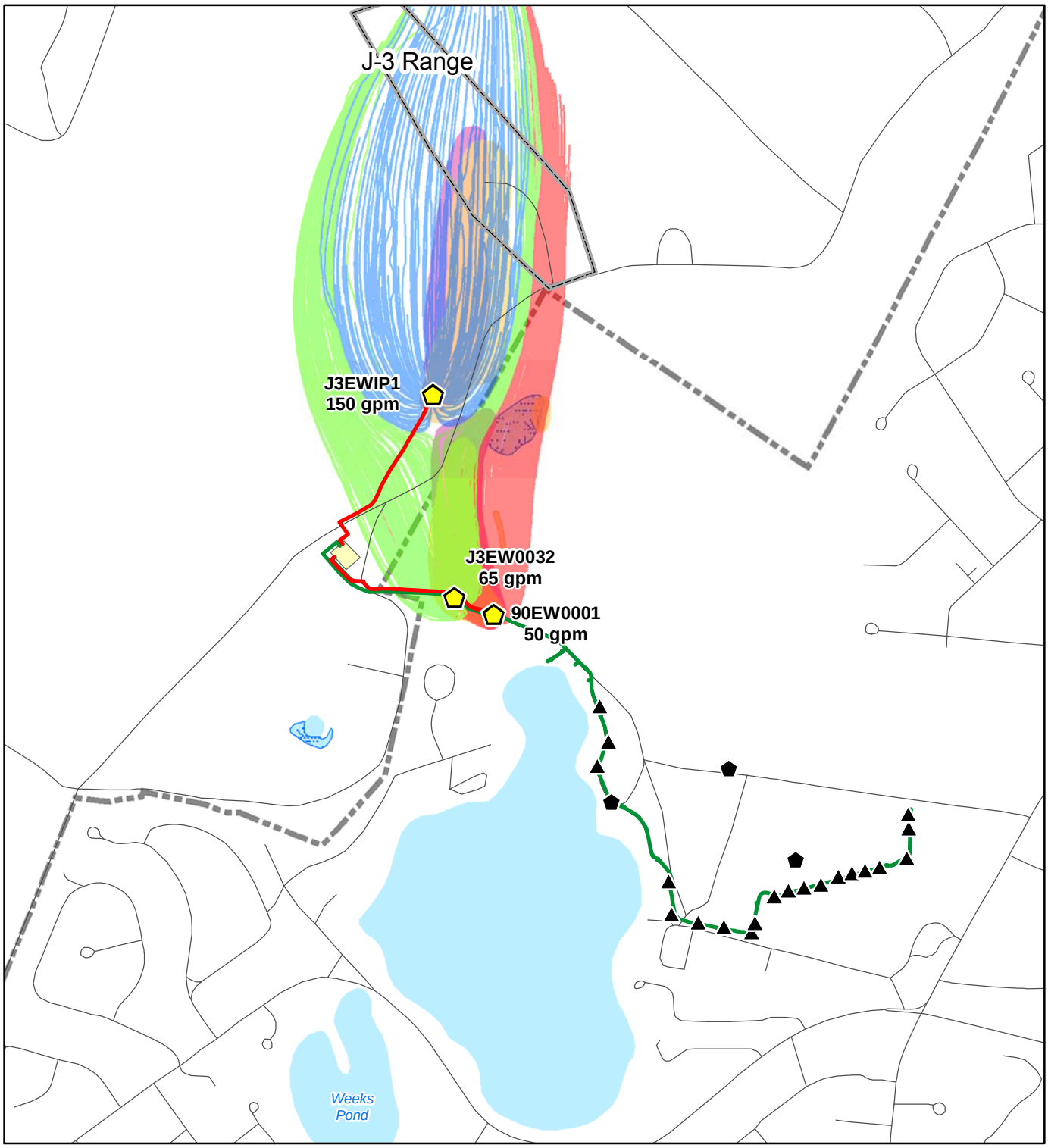
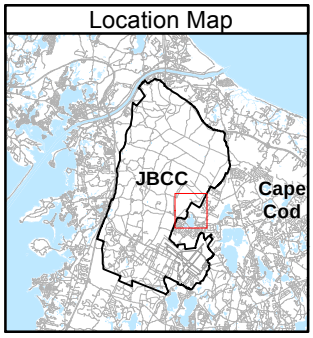
August 27, 2014 DWN: MTW CHKD: KJH



Legend

- J-3 Extraction Well Optimized Extraction Rate
- FS-12 Extraction Well (operational)
- Reinjection Well (operational)
- Influent Piping
- Effluent Piping
- J3EWIP1 Capture Zone
- J3EW0032 Capture Zone
- 90EW0001 Capture Zone
- Perchlorate > 2 µg/L
- RDX > 0.6 µg/L
- Treatment System
- J-3 Range Boundary
- JBCC Boundary
- Plume: January 2014

Location Map



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TITLE

Alternative 4
Groundwater Extraction Scenario

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

FIGURE 2

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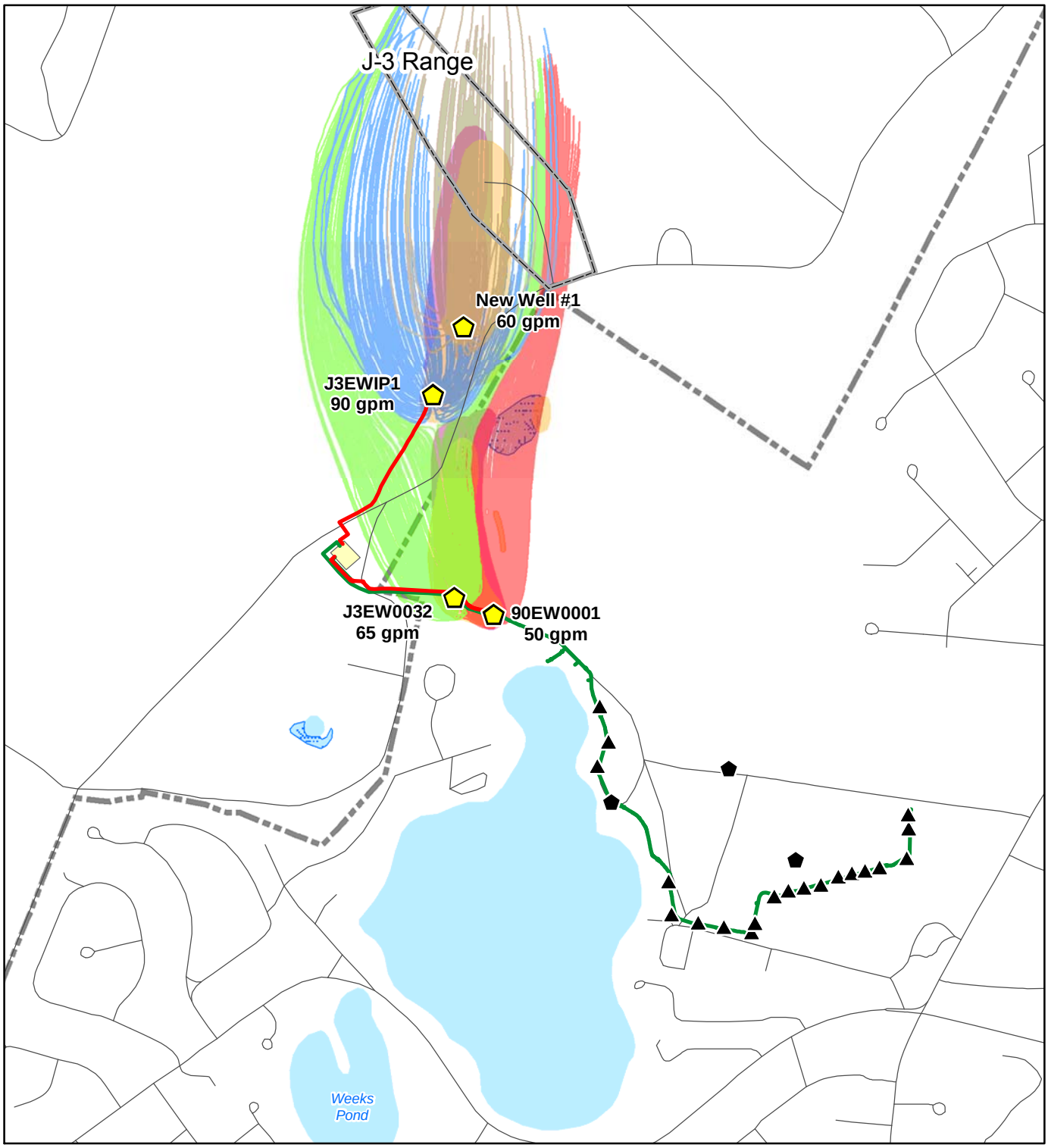
August 27, 2014 DWN: MTW CHKD: KJH

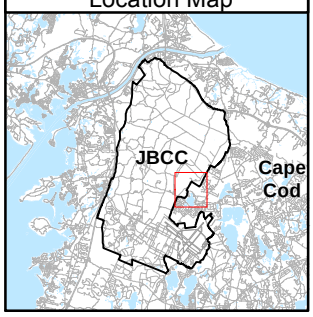


Plume: January 2014

Legend

- J-3 Extraction Well Optimized Extraction Rate
- FS-12 Extraction Well (operational)
- Reinjection Well (operational)
- Influent Piping
- Effluent Piping
- J3EWIP1 Capture Zone
- J3EW0032 Capture Zone
- 90EW0001 Capture Zone
- Perchlorate > 2 µg/L
- RDX > 0.6 µg/L
- Treatment System
- J-3 Range Boundary
- JBCC Boundary
- New Well #1 Capture Zone

Location Map



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Alternative 4a
Groundwater Extraction Scenario

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

FIGURE 3

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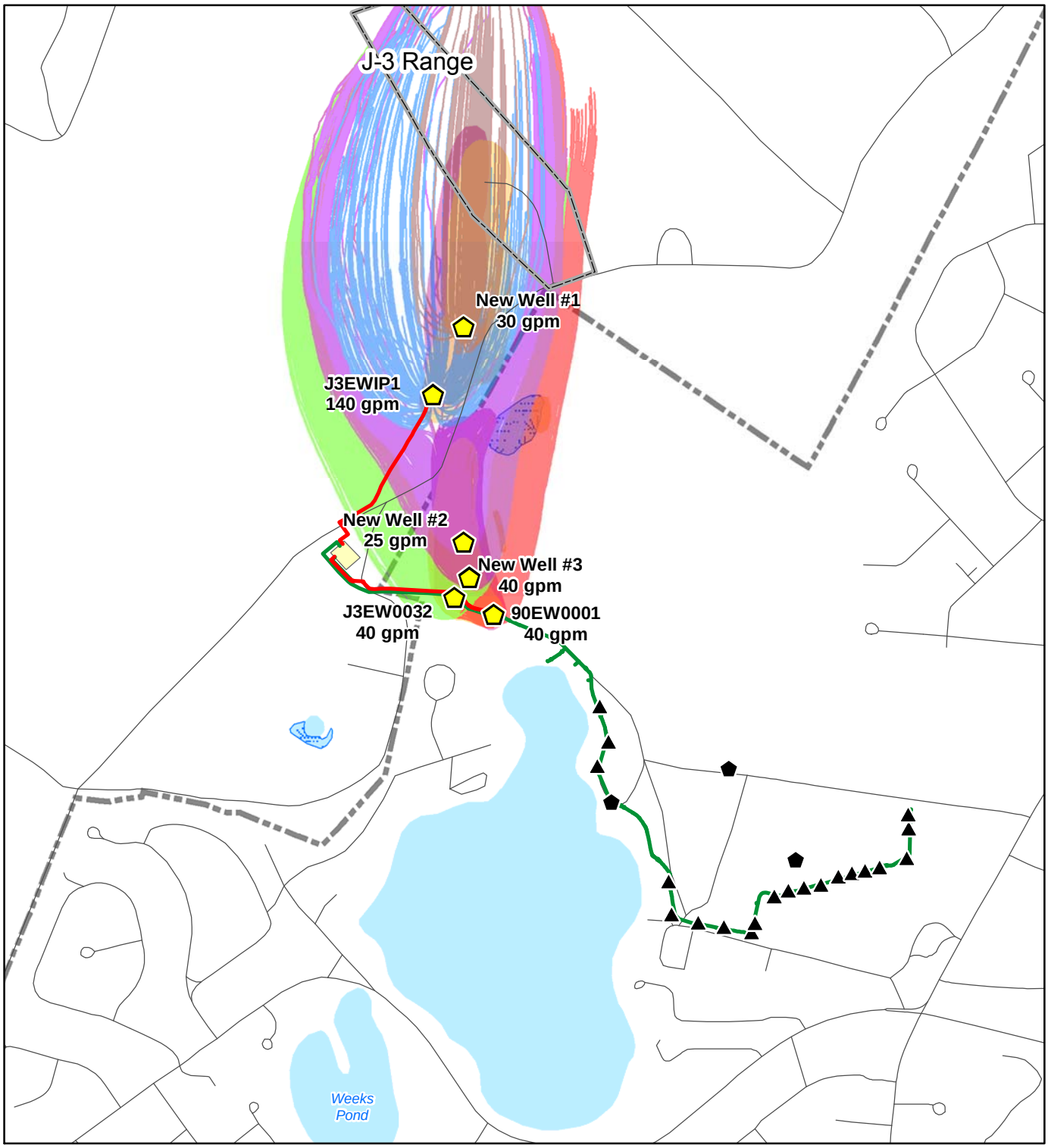
August 27, 2014 DWN: MTW CHKD: KJH

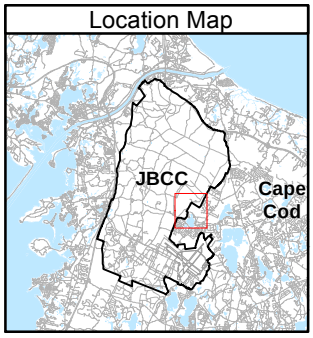


Plume: January 2014

Legend

- J-3 Extraction Well
  10 Year Extraction Rate
- FS-12 Extraction Well (operational)
- Reinjection Well (operational)
- Influent Piping
- Effluent Piping
- J3EWIP1 Capture Zone
- J3EW0032 Capture Zone
- 90EW0001 Capture Zone
- Perchlorate > 2 µg/L
- RDX > 0.6 µg/L
- Treatment System
- J-3 Range Boundary
- JBCC Boundary
- New Well #1 Capture Zone
- New Well #2 Capture Zone
- New Well #3 Capture Zone

Location Map



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TITLE

Alternative 5
Groundwater Extraction Scenario

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

FIGURE 4

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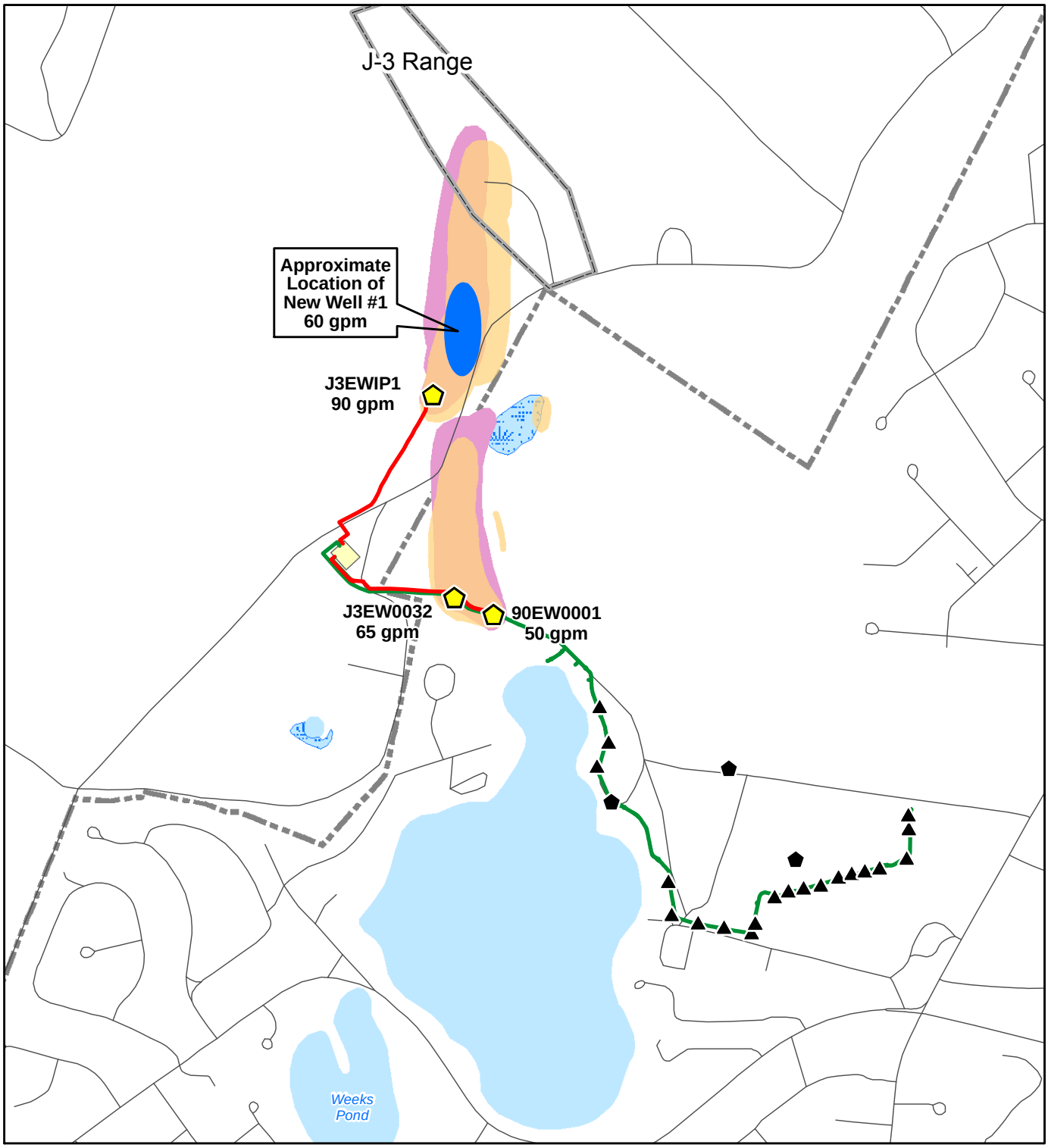
August 27, 2014 DWN: MTW CHKD: KJH

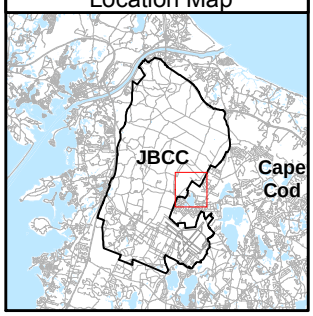


Plume: January 2014

Legend

- J-3 Extraction Well Optimized Extraction Rate
- FS-12 Extraction Well (operational)
- Reinjection Well (operational)
- Influent Piping
- Effluent Piping
- General Extraction Well Location
- Perchlorate > 2 µg/L
- RDX > 0.6 µg/L
- Treatment System
- J-3 Range Boundary
- JBCC Boundary

Location Map



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TITLE

Alternative 4a
Groundwater Extraction Scenario

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

FIGURE 5

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September 30, 2014 DWN: MTW CHKD: KJH