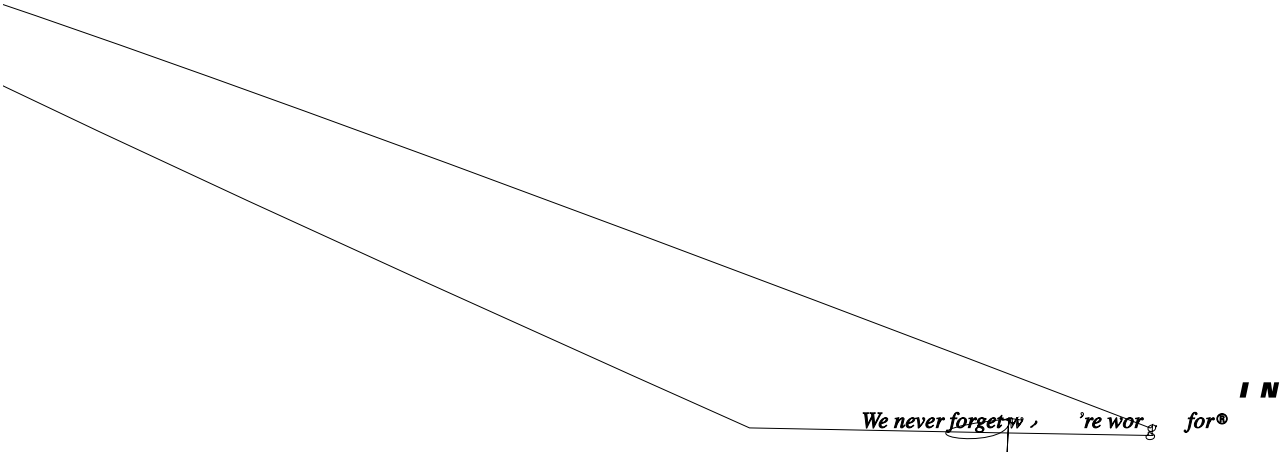
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What is a Response Action Plan? Why is Lockheed Martin required to ýle one for its groundwater cleanup at the Lockheed Martin Middle River Complex? What does the Response Action Plan mean to the community?

This Citizensô Guide is designed to help Middle River, Md., residents and other interested parties better understand the proposed groundwater cleanup plan for Lockheed Martinôs Middle River Complex.

For the past several years, Lockheed Martin has been actively investigating groundwater, soil and sediment conditions at the Middle River Complex and nearby Martin State Airport.

This guide speciýcally addresses the groundwater cleanup at the Middle River Complex. Additional guides will be provided as Response Action Plans are completed for other cleanup efforts.

Over the past several years, the Lockheed Martin team has collected more than 800 samples at the Middle River Complex with over 3,300 analytical tests at more than 200 groundwater locations. Chemicals known to have been used during former industrial operations were detected in groundwater at the site.

The chemicals do not pose signiýcant health risks to people because the location of the chemicals makes it unlikely that people would be exposed or because in other locations the amounts and concentrations are insigniýcant.

As youôll read in this guide, Lockheed Martin, its technical contractors and a specially formed strategic evaluation team have assessed the groundwater contamination, extensively evaluated the cleanup alternatives and developed a proposed plan for safely and effectively cleaning up the contamination.

Lockheed Martin shared a draft of the Groundwater Response Action Plan with the state this spring and will begin the cleanup after it receives ð and incorporates ð input from the public and the Maryland Department of the Environment, the state agency responsible for oversight of environmental matters.

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The Middle River Complex is located at 2323 Eastern Boulevard in Middle River, Md. The 160-acre complex is part of the Chesapeake Industrial Park and includes 12 main buildings, an active industrial area and yard, perimeter parking lots, an athletic ýeld, a concrete-covered vacant lot, a trailer and parts storage lot, and various grassy green spaces along its perimeter.

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Lockheed Martin is participating in the Maryland Department of the Environmentôs Voluntary Cleanup Program and is required by the state to sub Db ation Ū] d ᵀ e acŦ e

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Lockheed Martin has been actively investigating groundwater, soil and sediment conditions at the Middle River Complex and nearby Martin State Airport. Between the two sites, the Lockheed Martin team has collected thousands of samples. The samples were taken from 200 groundwater locations, 400 soil borings and 80 surface water and sediment locations. They were tested for chemicals, including those known to have been used during aircraft manufacturing and related industrial operations.

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The contamination may have resulted from heritage company operations and disposal practices that were commonplace in the aerospace industry more than half a century ago. Although the actions were legal and considered safe at the time, modern-day research has shown that some of the practices may have led to the contamination.

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A response action plan provides details about contamination at a cleanup site. It describes the methods used to evaluate the contamination, the alternatives for cleanup and the recommended ways to clean up the contamination.

Monitoring of air within the buildings has indicated that where TCE is found, it is below the MDE screening level.

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Lockheed Martin monitors vapors going from beneath the building into the treatment system, and it has found volatile organic compounds in those vapors. The concentrations of volatile organic compounds has dropped signiýcantly since the systems ýrst were started.

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Lockheed Martin is conducting the groundwater cleanup to address the impacts of past practices and to remove contamination from higher concentration areas in an accelerated time frame. This will reduce potential future human and environmental exposure directly to contaminated groundwater and contaminated vapors that may accumulate in structures that may be built in the future. The site is safe under current site use, but this cleanup will ensure that it will be safe if, in the future, property owners decide to use the land differently. Lockheed Martin performs this work because it is the right thing to do.

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Yes. Lockheed Martin used a peer review evaluation method that called on a team of specialists from other corporations as well as from inside Lockheed Martin. To help with the evaluation, the project team ð working closely with the strategic evaluation team ð developed a comprehensive Conceptual Site Model that outlined the sources of contamination, the paths the contamination might follow, and the potential for people or the environment to be impacted. The evaluation also considered site history, regulatory requirements and exposure risks related to possible land uses in the future.

Over the course of one year, the team evaluated each of the 14 alternative cleanup programs against the project objectives and criteria for success.

This evaluation reduced the list to three ýnal alternatives, which were then evaluated in detail.

The team chose the method that provided the most-effective cleanup while also causing the least environmental impact.

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The process was extremely effective. The strategic evaluation team introduced innovative processes to evaluate each alternative and prioritize decision making criterion. This peer review provided a ñfresh eyesò approach that helped the technical team identify challenges and ýnd solutions that might not have been considered otherwise.

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The ýnal three response action alternatives for consideration were:

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The Lockheed Martin team selected Alternative 3. The alternative will consist of in situ (meaning performed in place) bioremediation of contaminated groundwater in high concentration areas and institutional controls. In situ bioremediation injects a mixture of water, food grade vegetable oil and lactate (a non-toxic food additive that is produced from sugars of corn or beets) into the ground to stimulate naturally occurring bacteria that consume ð and break down ð the contamination.

This alternative will reduce the plume of trichloroethene at the site by using in situ bioremediation in the three areas with the highest concentrations and greatest accumulations of TCE. The highest concentrations are found south of the active industrial facilities ð one area to the west, and two areas to the east.

Institutional controls such as deed restrictions and limits on groundwater use will reduce potential risks in the future. The groundwater will be cleaned to standards that support ñrestricted residential use,ò meaning the site will be safe but the groundwater should not be used for drinking water. The groundwater currently is not used for drinking water, since municipal water is available. In addition, until groundwater contamination is reduced, new structures in the area above the plume я e p ri tim tl " l d e bove " h
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The cleanup will remove at least 70 percent of the contaminant plume. The rest will go away eventually as natural processes continue to clean the remaining contamination. The Maryland State Department of the Environment has noted that a ñrestricted residentialò level ð which the state calls Tier 1B ð is an appropriate goal because the groundwater probably would not meet drinking water standards for a long time. This is because the groundwater lies within tight clay soils that slow down groundwater movement and make distribution of the injected solution more difýcult. The tight soils are also the principal reason that, regardless of quality, the groundwater at the Middle River Complex is not readily available as a source of drinking water.

ñTightò soils can be easily demonstrated by pouring water over sand in a colander and over clay in a second colander. Water readily pours through the sand, which is more ñporousò or having many open spaces, and moves very slowly through the ñtightò clay soils which has limited open space between soil particles.

The pilot tracer injection program injects a harmless tracer solution to conýrm pathways below ground where injected materials might þow. Results will be used to modify injection plans during in situ bioremediation.

Groundwater modeling uses all the data collected from the site to represent the site and predict the results of the various alternatives. It has been checked against historic groundwater behavior under ýeld-measured average and pump test conditions. Model assumptions used in the injection simulations will be checked by a pilot tracer injection program to be performed in the summer of 2011. If necessary, model assumptions will be adjusted and the changes will be incorporated in the preliminary design to be initiated after Maryland Department of the Environment and public concurrence.

Groundwater does not move quickly at the Middle River site because the soils are mostly clay. As a result, the model predicted that it would be better to treat the material in place than to attempt to pump it out, which would take a very long time.

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The team conducted additional groundwater modeling to assess the effectiveness of in situ bioremediation used alone at the site and to determine whether groundwater extraction, or removal, would complement the cleanup efforts. The model included injections with and without groundwater removal in a small portion of the southeast area of the site.

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In situ (or performed in place) bioremediation is a process that injects a mixture of water and nutrients into the ground to stimulate naturally occurring bacteria that break down the contamination. Nutrients proposed for this project are food grade vegetable oil and lactate. It is an effective, well-proven, safe technique that enhances natural processes that are already occurring in the ground.

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There are numerous beneýts to using in situ bioremediation. A typical pump and treat cleanup program requires the construction of buildings to house the treatment facility and other related infrastructure such as large networks of underground piping. In situ bioremediation signiýcantly reduces infrastructure requirements. Additionally, since the treatment will take place below the ground surface, there is less potential for human exposure to the contaminants since they are not being extracted, treated and discharged.

This technique is environmentally friendly. It uses fewer materials and natural resources than a pump-and-treat system. With the proposed system, it is expected that the active remediation will continue for about ýve years, as compared to 15 years with a pump and treat system, to accomplish the same goals. This program will be most-effective while also being environmentally friendly.

Depiction of In Situ Bioremediation

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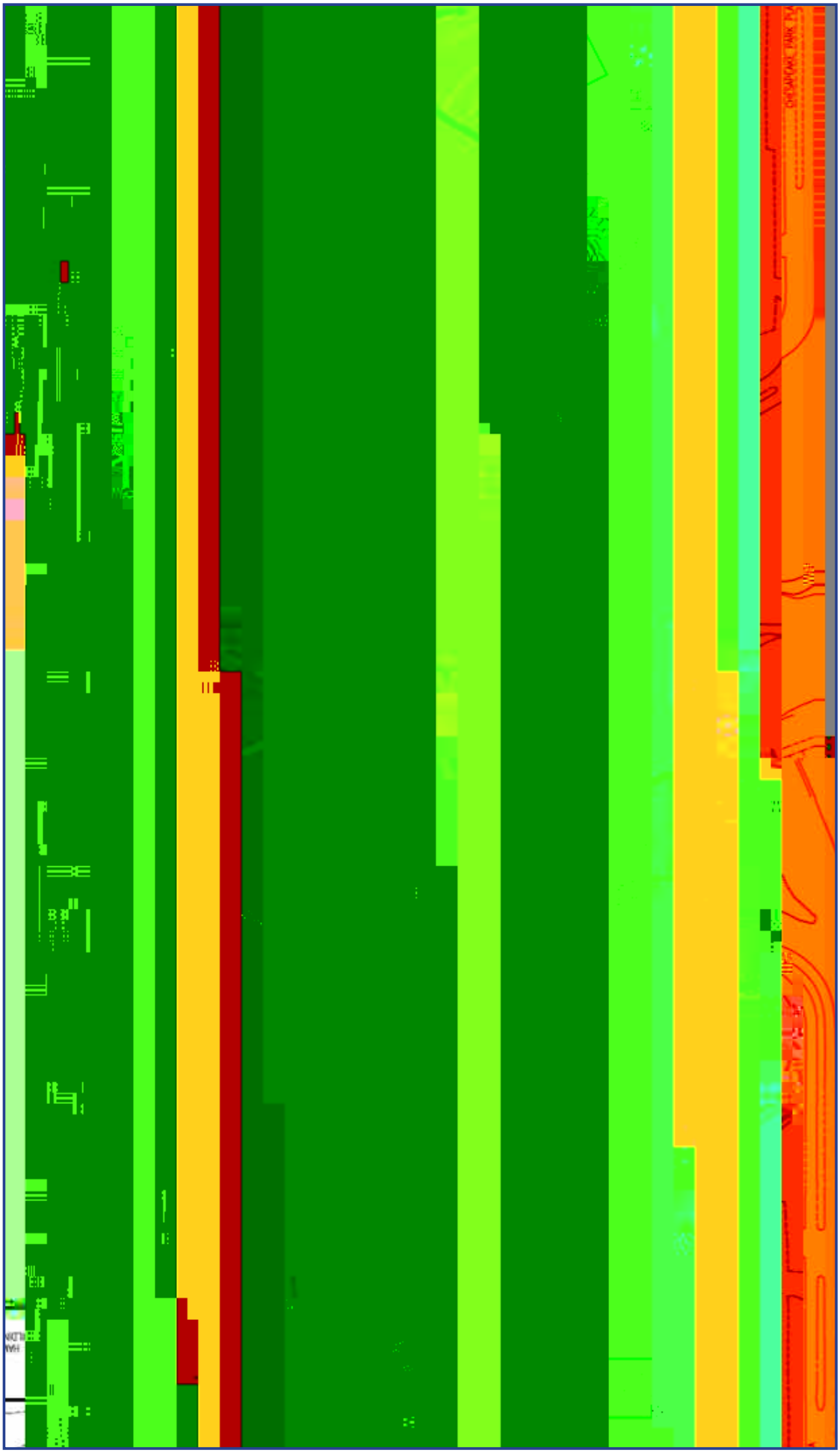
Yes. Lockheed Martin has used in situ bioremediation



, Q V W L W X W L R Q D O F R Q W U R O V ð administrative tools to limit exposure to contaminants, such as deed restrictions to prevent use of groundwater as drinking water.

0 ' (ð Maryland Department of the Environment

0 L G G O H 5 L Y H U & R P S O H [ð the site of Lockheed Martinôs Mission Systems and Sensors (MS2) facility and General Electricôs Middle River Aircraft System (MRAS); also known locally as Plant 1.

0 5 $ 6 ð Middle River Aircraft Systems, a subsidiary

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Questions may be addressed to the following individuals at Lockheed Martin:

- Gary Cambre ð 1.800.449.4486
  gary.cambre@lmco.com
- Kay Armstrong ð 1.888.340.2006
  darrylkay@aol.com
- Jennifer Allen ð 330.734.9911
  jennifer.l.allen@lmco.com

All documents are available at the Essex Library, 410-887-0295, or on Lockheed Martinôs Web site at: http://www.lockheedmartin.com/aboutus/energy-environment/places/remediation/

A public comment period will be held from September 1-30, 2011.

To make comments, please send by Sept. 30 to:

Lockheed Martin
c/o Kay Armstrong
Mail: 455 Hillside Trail
Eddyville, KY 42038

Email: darrylkay@aol.com
Phone: 888-340-2006
Fax: 270-388-0348

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To be added to the mailing list for future updates, please notify Kay Armstrong at 1-888-340-2006 or darrylkay@aol.com.

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