



## **REVIEW AND REFERENCES FOR PHOS-CHEK® LC95W FIRE RETARDANT**

### **August 11, 2021**

#### **EXECUTIVE SUMMARY**

Pacific Gas and Electric Company (PG&E) is in the process of piloting a program involving land-based application of Perimeter Solutions' Phos-Chek® LC95W long-term fire retardant under targeted electric lines and poles in Tier 2 and Tier 3 High Fire Threat Districts as a preventive measure against potential wildfire threats. This memorandum summarizes PG&E's and its third-party consulting partners' review of Phos-Chek® LC95W and provides additional context about the regulatory framework that currently governs the use of long-term fire retardants by Federal agencies on Federal lands.

#### **REGULATORY BACKGROUND FOR PHOS-CHEK® LC95W**

Phos-Chek® LC95W is a non-colored long-term fire retardant that is currently used for direct wildland fire management and pretreatment by the U.S. Forest Service (USFS 2021a). The U.S. Forest Service has qualified Phos-Chek® LC95W for application using fixed-wing aircraft, helicopters, and ground-based application methods (USFS 2021a). As a U.S. Forest Service qualified product, Phos-Chek® LC95W was required to undergo testing (e.g., efficacy, toxicology, and physical properties) and a review process through which it was evaluated, qualified, and approved for use on Federal lands at a specified mix ratio by specified application equipment according to U.S. Forest Service Specification 5100-304d (USFS 2020a). Standard testing procedures required under U.S. Forest Service Specification 5100-304d (USFS 2020a) are provided on the U.S. Forest Service's *Wildland Fire Chemicals Test Procedures* webpage (USFS 2021b) and include several tests, such as those pertaining to:

- Health, safety, and the environment (e.g., mammalian toxicity, fish toxicity, biodegradability, risk assessment);
- Fire retardant effectiveness;
- Optimum mixing conditions;
- Physical properties (e.g., salt content, density, pH, viscosity, flash and fire point, etc.);
- Material effects (e.g., corrosion); and
- Product stability.

Testing results for Phos-Chek® LC95W have been made publicly available by the U.S. Forest Service on their *Product Performance and Test Results* webpage, in the section for long-term retardants (USFS 2021c).

#### **TOXICOLOGY AND RISK ASSESSMENT**

Phos-Chek® LC95W has undergone toxicity testing, a review of potentially relevant environmental regulations, and a human health and ecological risk assessment in accordance with requirements described in U.S. Forest Service Specification 5100-304d (USFS 2020a). Phos-Chek® LC95W has met all of the U.S. Forest Service's (2020a) toxicity testing (mammalian and fish), environmental regulation, and risk assessment requirements and is free of several hazardous substances and classes of compounds, including:

- Sodium ferrocyanide (yellow prussiate of soda);
- Dichromates;
- Thiourea;

- Borate or other boron-containing compounds;
- Polychlorinated biphenyls;
- Polybrominated diphenyl ethers;
- Nonylphenol ethoxylates;
- Ammonium sulfate;
- Per- and polyfluoroalkyl substances, including but not limited to perfluorooctanoic acid and perfluorooctanesulfonate compounds.

Key references detailing hazard and risk assessment information for Phos-Chek® LC95W include:

- Mammalian Toxicity Testing Results for Long-Term Retardants:  
[https://www.fs.fed.us/rm/fire/wfcs/performance/documents/MamTox-Retardant\\_Rev-2020-1005.pdf](https://www.fs.fed.us/rm/fire/wfcs/performance/documents/MamTox-Retardant_Rev-2020-1005.pdf);
- Fish Toxicity Testing Results for Long-Term Retardants:  
[https://www.fs.fed.us/rm/fire/wfcs/performance/documents/FishTox-Retardant\\_Rev-2020-1005.pdf](https://www.fs.fed.us/rm/fire/wfcs/performance/documents/FishTox-Retardant_Rev-2020-1005.pdf);
- Safety Data Sheet for Phos-Chek® LC95W:  
[https://www.fs.fed.us/rm/fire/wfcs/products/msds/retard/phoschek/Phos-Chek\\_LC95W.pdf](https://www.fs.fed.us/rm/fire/wfcs/products/msds/retard/phoschek/Phos-Chek_LC95W.pdf);
- U.S. Forest Service Human Health Risk Assessment of Wildland Fire-Fighting Chemicals, Long-Term Retardants: <https://www.fs.fed.us/rm/fire/wfcs/documents/2020%20NONCONFIDENTIAL-HHRA-Retardants-July2020.pdf>;
- U.S. Forest Service Ecological Risk Assessment of Wildland Fire-Fighting Chemicals, Long-Term Retardants: <https://www.fs.fed.us/rm/fire/wfcs/documents/NONCONFIDENTIAL%20EcoRA-Retardants-Aug2020.pdf>.

Key references detailing the Federal Government's health and safety due diligence efforts for wildland fire chemicals include:

- U.S. Forest Service Record of Decision for Nationwide Aerial Application of Fire Retardant on National Forest System Land:  
[https://www.fs.usda.gov/sites/default/files/media\\_wysiwyg/wfcs\\_rod\\_12\\_15\\_11\\_0.pdf](https://www.fs.usda.gov/sites/default/files/media_wysiwyg/wfcs_rod_12_15_11_0.pdf);
- U.S. Forest Service Final Environmental Impact Statement for Nationwide Aerial Application of Fire Retardant on National Forest System Land:  
[https://www.fs.usda.gov/sites/default/files/media\\_wysiwyg/wfcs\\_final\\_feis\\_0.pdf](https://www.fs.usda.gov/sites/default/files/media_wysiwyg/wfcs_final_feis_0.pdf);
- National Oceanic and Atmospheric Administration Biological Opinion on the U.S. Forest Service Draft Environmental Impact Statement for Nationwide Aerial Application of Fire Retardant on National Forest System Land: [https://www.fs.usda.gov/sites/default/files/media\\_wysiwyg/wfcs\\_noaa\\_bioopinion\\_0.pdf](https://www.fs.usda.gov/sites/default/files/media_wysiwyg/wfcs_noaa_bioopinion_0.pdf);
- U.S. Fish and Wildlife Service Biological Opinion on the U.S. Forest Service Draft Environmental Impact Statement for Nationwide Aerial Application of Fire Retardant on National Forest System Lands: Part 1: [https://www.fs.usda.gov/sites/default/files/media\\_wysiwyg/fws\\_afr\\_bo\\_firsthalf.pdf](https://www.fs.usda.gov/sites/default/files/media_wysiwyg/fws_afr_bo_firsthalf.pdf), and Part 2: [https://www.fs.usda.gov/sites/default/files/media\\_wysiwyg/fws\\_afr\\_bo\\_final\\_secondpart.pdf](https://www.fs.usda.gov/sites/default/files/media_wysiwyg/fws_afr_bo_final_secondpart.pdf);
- Environmental studies conducted by the Columbia Environmental Research Center and Northwest Fisheries Science Center (and references contained therein):  
<https://www.fs.fed.us/rm/fire/wfcs/environmental-studies.php>;
- U.S. Forest Service General Information for Toxicity and Environmental Concerns for Wildland Fire Chemical Products: <https://www.fs.fed.us/rm/fire/wfcs/documents/envinfo.pdf>;
- U.S. Forest Services Environmental Brief on Clean-up of Wildland Fire Chemicals:  
<https://www.fs.fed.us/rm/fire/wfcs/documents/cleanup.pdf>.

Key references detailing the Federal Government's current policies for use of wildland fire retardants on Federal lands include:

- National Interagency Fire Center's Interagency Standards for Fire and Fire Aviation Operations: <https://www.nifc.gov/standards/guides/red-book>.
- Interagency Wildland Fire Chemicals Policy and Guidance (and references contained therein): <https://www.fs.usda.gov/managing-land/fire/chemicals>.

## COMBUSTION-RETARDING EFFECTIVENESS EVALUATION

Phos-Chek® LC95W has undergone an effectiveness evaluation in accordance with requirements described in U.S. Forest Service Specification 5100-304d (USFS 2020a). Requirements include either, 1) a concentration of active fire retardant ingredient in the mixed product that is greater than or equal to specified levels and analytical verification using the U.S. Forest Service's required testing protocol (USFS 2017), or 2) acceptable performance in a combustion-retarding effectiveness test performed according to the U.S. Forest Service's required testing protocol (USFS 2020b). Inclusion on the U.S. Forest Service's qualified product list (QPL) (USFS 2021a) indicates that Phos-Chek® LC95W has met the U.S. Forest Service's (2020a) requirements for combustion-retarding effectiveness.

## REFERENCES

USFS. 2017. Standard Test Procedure 4.1: Salt Content Determination. Evaluation of Wildland Fire chemicals. January 11. Available online at: <https://www.fs.fed.us/rm/fire/wfcs/tests/documents/STP-4.1%20Salt%20Content.pdf>.

USFS. 2020a. Specification 5100-304d – Long-Term Retardant, Wildland Firefighting. January 7. Available online at: [https://www.fs.fed.us/rm/fire/wfcs/documents/5100-304d\\_LTR\\_Final\\_010720\\_with%20Amendment%201.pdf](https://www.fs.fed.us/rm/fire/wfcs/documents/5100-304d_LTR_Final_010720_with%20Amendment%201.pdf).

USFS. 2020b. Standard Test Procedure 2.1L Combustion Retarding Effectiveness. Rev. 05/08/2020. Available online at: <https://www.fs.fed.us/rm/fire/wfcs/tests/documents/STP-2.1%20Combustion%20Retarding%20Effectiveness,%20Burn%20Test.pdf>.

USFS. 2021a. Qualified Product List (QPL): Long-Term Retardant for Wildfire Management. Fire & Aviation Management. August 5. Available online at: [https://www.fs.fed.us/rm/fire/wfcs/documents/2021-0805\\_qpl\\_ret.pdf](https://www.fs.fed.us/rm/fire/wfcs/documents/2021-0805_qpl_ret.pdf).

USFS. 2021b. Wildland Fire Chemicals Test Procedures. Available online at: <https://www.fs.fed.us/rm/fire/wfcs/wildland-fire-chemicals-test-procedures.php>.

USFS. 2021c. Product Performance and Test Results, Long-Term Retardant. Available online at: <https://www.fs.fed.us/rm/fire/wfcs/product-performance-and-test-results.php>.