

Analytical method for benzobicyclon and its metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-962, and 1315P-966, and 1315P-076 in water

Reports: ECM: EPA MRID No.: 51086513 (Appendix 3, pp. 326-1189). Mitchell, J., and M.T. Boatwright. 2017. GWN-10235: Aquatic Field Dissipation of the Herbicide Benzobicyclon at Two Rice Production Locations (Louisiana and California). WEI Study No.: 469.13. GPL Study No.: 140544. Report prepared by Waterborne Environmental, Inc. (WEI), Leesburg, Virginia, and Golden Pacific Laboratories, LLC (GPL), Fresno, California (analytical phase), and sponsored and submitted by Gowan Company, Yuma, Arizona; 864 pages (Analytical Method study). Final report issued January 12, 2017.

ILV: EPA MRID No.: 51086514. Bentley, K. 2018. Independent Laboratory Validation (ILV) of the Analytical Method for the Determination of Benzobicyclon and its Metabolites 1315P-070, 1315P-076, 1315P-570, 1315P-683, 1315P-960, 1315P-962, and 1315P-966 in Water by LC-MS/MS. Smithers Viscient Study No.: 12791.6296. Report prepared by Smithers Viscient, Wareham, Massachusetts, and sponsored and submitted by Gowan Company, Yuma, Arizona; 253 pages. Final report issued February 9, 2018.



Document No.: MRIDs 51086513 & 51086514

Guideline: 850.6100

Statements: ECM: The AFD and Analytical Method study were conducted in accordance with USEPA FIFRA Good Laboratory Practice (GLP) standards (40 CFR Part 160; p. 3; Appendix 3, p. 327 of MRID 51086513). The following GLP exception was noted for the analytical phase: the metabolites 1315P-076, 1315P-570, 1315P-683, 1315P-960, 1315P-962, and 1315P-966 were certified by SDS Biotech K.K. and certificates of analysis were received with the standards, however, the analysis was not conducted according to GLPs. For the AFD, signed and dated Data Confidentiality, GLP, and Quality Assurance statements were provided (pp. 2-5); an authenticity statement was included with the QA statement. For the Analytical Method, signed and dated GLP and Quality Assurance statements were provided (Appendix 3, pp. 327-328); a Data Confidentiality statement was not provided. An authenticity statement was included with the QA statement.

ILV: The study was conducted in accordance with USEPA FIFRA GLP standards (p. 3 of MRID 51086514). Signed and dated No Data Confidentiality, GLP, and Quality Assurance statements were provided (pp. 2-4). An authenticity statement was included with the QA statement.

Classification: This analytical method is classified as **supplemental**. The reported method LOQ was not based on the procedures defined in 40 CFR Part 136, the reported LOQ is the lowest level of method validation (LLMV) rather than LOQ. **The LLMV is greater than the most sensitive toxicological endpoint.** ILV performance data for 1315P-962 at 0.100 mg/L was 53.1-59.0% of the applied, outside the guideline 70-120% recovery range. The study authors did not provide characterization data for several of the test matrices. No ECM representative chromatograms were submitted for the method validation samples. The chemical purity of 1315P-962 test material was <90% in the

	ECM.		
PC Code:	215101		
EFED Final Reviewer:	Joshua Antoline, Ph.D., Chemist	Signature:	
	Katrina White, Ph.D., Senior Scientist	Signature:	
CDM/CSS-Dynamac JV Reviewers:	Lisa Muto, M.S., Environmental Scientist	Signature:	
		Date:	10/15/2020
	Mary Samuel, M.S., Environmental Scientist	Signature:	
		Date:	10/15/2020

This Data Evaluation Record may have been altered by the Environmental Fate and Effects Division subsequent to signing by CDM/CSS-Dynamac JV personnel. The CDM/CSS-Dynamac Joint Venture role does not include establishing Agency policies.

Executive Summary

The analytical method, entitled “Analytical Method for the Determination of Benzobicyclon and its Metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-076, 1315P-962, and 1315P-966 in Water by LC-MS/MS”, is designed for the quantitative determination of benzobicyclon and its seven metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-962, 1315P-966, and 1315P-076 in water at the stated LOQ of 0.001 mg/L using LC/MS/MS. The reported method LOQ was not based on procedures defined in 40 CFR Part 136, therefore the reported LOQ is the lowest level of method validation (LLMV) rather than a LOQ. The LLMV is greater than the lowest toxicological level of concern in water for benzobicyclon and its seven metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-962, 1315P-966, and 1315P-076, based on No Observable Adverse Effects Concentration for acute aquatic plant toxicity of 0.0007 mg/L (MRID 49541206). Based on the performance data submitted by the ILV and ECM, the LLMV was equal to 0.001 mg/L, the stated method LOQ for benzobicyclon and its six metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-966, and 1315P-076 in the tested water matrices. Based on the performance data submitted by the ILV and ECM, the LLMV was equivalent to 0.01 mg/L for metabolite 1315P-962. The ECM and ILV were based on the analytical method reported in Golden Pacific Laboratories Method GPL-MTH-087 Revision 2; however, Golden Pacific Laboratories Method GPL-MTH-087 Revision 2 was not included in the submitted ECM or ILV.

The ECM validated the method using two paddy water matrices which were sourced from the two sites in the benzobicyclon aquatic field dissipation studies which was also the submitted ECM. ECM water characterization was submitted, but the specific samples used for method validation were unclear. The ILV validated the method using uncharacterized ground water and characterized surface (river) water. Direct communication between the ECM and ILV study authors regarding ILV issues were documented in Appendix 3.

The ILV validated the method for benzobicyclon and its six metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-966, and 1315P-076 in the second trial at the LOQ and 10×LOQ. For 1315P-962, the method was validated in the second trial at 10×LOQ, but the method was not successfully validated at 0.001 mg/L (LOQ). The study author reported that the low LOQ recoveries of 1315P-962 were due to the fact that the fortification stock and analytical stock solutions were prepared in two different solvents. The study author also noted that the LOD for 1315P-962 met acceptance criteria of 3:1 signal to noise ratio. The ILV performed the ECM method as written, except for the use of calibration standards which were interspersed with the test samples and insignificant modifications to the analytical parameters. No additional ILV modifications were made to optimize the method for the 1315P-962 validation. Following ILV recommendations, the ECM should be updated to include interspersed calibration standards.

All ILV data regarding repeatability, accuracy, precision, linearity, and specificity were satisfactory for benzobicyclon and its six metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-966, and 1315P-076 in tested water matrices. All ILV data regarding repeatability, accuracy, precision, linearity, and specificity were satisfactory for 1315P-962, except for performance data at the LOQ in both waters (means 53.1-59.0%). ECM data from the method validation samples and aquatic field dissipation laboratory fortification samples were assessed. All ECM data regarding repeatability, accuracy, precision, and linearity were satisfactory for benzobicyclon and its seven metabolites in tested water matrices. The specificity of the method was not well-supported by submitted ECM representative chromatograms. No ECM representative chromatograms were submitted for the method validation samples. Insufficient ECM representative chromatograms were submitted for the aquatic field dissipation laboratory fortification samples.

Table 1. Analytical Method Summary

Analytes	MRID		EPA Review	Matrix	Method Date	Registrant	Analysis	Lowest Level of Method Validation (LOQ)
	Environmental Chemistry Method	Independent Laboratory Validation						
Benzobicyclon	51086513 ^{1,2}	51086514 ³	Supplemental	Water	09/06/2017 (AFD) 12/01/2017 (Analytical Report of AFD)	Gowan Company	LC/MS/MS	0.001 mg/L
1315P-070								
1315P-570								
1315P-683								
1315P-960								
1315P-076								
1315P-966								
1315P-962 ⁴								

AFD = aquatic field dissipation

- The DER included ECM data from the method validation samples and aquatic field dissipation laboratory fortification samples (p. 34; Appendix 3, Tables 2-15, pp. 369-382; Tables 29-44, pp. 396-415; Appendix 3, Appendix B, pp. 528-541 of MRID 51086513).
- California paddy water (Sample ID: 469.13-CA. BK. Water; Irrigation Water Pre-Flood: pH 7.9, 0.81 mmohs/cm conductivity, 316 ppm dissolved solids; Paddy Water 60 DAA: pH 7.8, 0.61 mmohs/cm conductivity, 332 ppm dissolved solids) was used in the method validation study (pp. 19-20; Appendix B, pp. 528-541 of MRID 51086513). The California paddy water used for the aquatic field dissipation laboratory fortification samples was the same California paddy water as that of the method validation (Appendix 3, Appendix B, pp. 725-797). Louisiana paddy water (Sample ID: 469.13-LA. BK. Water; Irrigation Water Pre-Flood: pH 7.1, 0.49 mmohs/cm conductivity, 334 ppm dissolved solids; Paddy Water 58 DAA: pH 7.8, 0.45 mmohs/cm conductivity, 346 ppm dissolved solids) was also used in the laboratory fortification portion of the aquatic field dissipation (pp. 19-20; Appendix B, pp. 725-797). The waters were obtained from this aquatic field dissipation study with sites in California and Louisiana and characterized by Agvise Laboratories, Northwood, North Dakota. Water characterization was not provided in the method validation report, but reviewer-correlated based on the Sample ID of the method validation samples and the water classification. It could not be determined if the Irrigation Water Pre-Flood or Paddy Water 58/60 DAA characterization data corresponded to the California and Louisiana water used for the method validation and laboratory fortification samples.
- In the ILV, ground water (pH not reported, typical hardness <160 mg as CaCO₃) obtained as unadulterated water from a 100-meter bedrock, in-house well and surface water (Lot No. 17Oct16Wat-A-3; pH 6.9, dissolved oxygen concentration 9.3 mg/L) obtained from Weweantic River in West Wareham, Massachusetts were used in the study (pp. 27-28 of MRID 51086514). The water characterization laboratory for the surface water was Agvise Laboratories, Northwood, North Dakota; the water characterization for the ground water was not performed.
- The ILV reference standard/test material for the benzobicyclon metabolite 1315P-962 was stereospecific for the cis isomer (pp. 25-26 of MRID 51086514). This reference standard was provided by the Sponsor, Gowan Company. The ECM reference standard/test material for the benzobicyclon metabolite 1315P-962 was not reported with a specified stereochemistry (p. 17; Appendix 3, p. 345 of MRID 51086513).

I. Principle of the Method

Water samples were analyzed using Golden Pacific Laboratories Method GPL-MTH-087 Revision 2 entitled “*Analytical Method for the Determination of Benzobicyclon and its Metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-076, 1315P-962, and 1315P-966 in Water by LC-MS/MS*” (M. Boatwright, July 2015; Appendix 3, p. 349 of MRID 51086513; p. 16; Appendix 1, p. 187 of MRID 51086514).

For benzobicyclon, 1315P-070, 1315P-570, 1315P-683, 1315P-960, and 1315P-076: Water samples (7 mL) in appropriate vessels were fortified at 0.001 mg/L or 0.01 mg/L and mixed with 3 mL of acetonitrile (Appendix 3, pp. 348-349, 356; Appendix 3, Appendix A, p. 524 of MRID 51086513). An aliquot of sample extract was analyzed by LC-MS/MS. Samples requiring further dilutions were diluted with acetonitrile:water (30:70, v:v). The procedure was repeated with a smaller volume using 0.7 mL of water and 0.3 mL of acetonitrile to show that the method was successful at smaller volumes as long as the dilution ratio was maintained.

For 1315P-962 and 1315P-966: Water samples (0.9 mL) in appropriate vessels were fortified at 0.001 mg/L or 0.01 mg/L and mixed with 0.1 mL of acetonitrile (Appendix 3, pp. 348-349, 356; Appendix 3, Appendix A, p. 524 of MRID 51086513). An aliquot of sample extract was analyzed by LC-MS/MS. Samples requiring further dilutions were diluted with acetonitrile:water (10:90, v:v).

Samples were analyzed for benzobicyclon and its metabolites using a Shimadzu LC-20AD XR HPLC coupled with a Sciex API5000 MS with TurboIonSpray (ESI) ion source with multiple reaction monitoring (MRM; Appendix 3, pp. 350-352 of MRID 51086513). For benzobicyclon, 1315P-070, 1315P-570, 1315P-683, 1315P-960, and 1315P-076, the following LC conditions were used: Phenomenex Luna 3 μ C18 100 \AA column, 150 mm x 2.0 mm, 3 μ particle size; column temperature not reported), mobile phase of (A) 0.2% formic acid in acetonitrile and (B) 0.2% formic acid in water [mobile gradient phase of percent A:B (v:v) at 0.0 min. 10:90, 7.00-8.00 min. 95:5, 8.10-9.50 min. 10:90] and injection volume of 10.0 μ L. MS polarity was positive; MS source temperature was not reported. For 1315P-962 and 1315P-966, the following LC conditions were used: Phenomenex Luna 3 μ C18 100 \AA column, 150 mm x 2.0 mm, 3 μ particle size; column temperature not reported), mobile phase of (A) 0.2% formic acid in acetonitrile and (B) 0.2% formic acid in water [mobile gradient phase of percent A:B (v:v) at 0.0 min. 0:100, 7.00-8.00 min. 95:5, 8.10-9.50 min. 0:100] and injection volume of 20 or 50 μ L. MS polarity was negative; MS source temperature was not reported. One ion pair transition was monitored for each analyte: m/z 447.1 \rightarrow 257.1 for benzobicyclon, m/z 355.0 \rightarrow 165.0 for 1315P-070, m/z 354.0 \rightarrow 164.0 for 1315P-570, m/z 319.1 \rightarrow 240.1 for 1315P-683, m/z 412.1 \rightarrow 176.0 for 1315P-960, m/z 398.1 \rightarrow 208.1 for 1315P-076, m/z 157.0 \rightarrow 113.0 for 1315P-962, and m/z 235.0 \rightarrow 191.0 for 1315P-966. Reported retention times were *ca.* 4.78, 3.75, 2.56, 2.38, 2.61, 2.40, 2.32, 2.65 minutes for benzobicyclon, 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-076, 1315P-962, and 1315P-966, respectively.

The ILV was conducted to independently validate “*Analytical Method for the Determination of Benzobicyclon and its Metabolites 1315P-070, 1315P-076, 1315P-570, 1315P-683, 1315P-960, 1315P-962, and 1315P-966 in Water by LC-MS/MS*” (Boatwright, 2015; p. 16; Appendix 1, p. 187 of MRID 51086514). The ILV performed the ECM method as written, except for the use of calibration standards which were interspersed with the test samples and insignificant modifications

to the analytical parameters (pp. 27-35, 38-39). The ILV sample size was 5 mL for all analyses, then the samples diluted into the appropriate acetonitrile:water ratio. A confirmatory ion transition was added to the LC/MS/MS method for all analytes, but 1315P-966 (pp. 27, 36-39). For 1315P-966, a slightly different quantitation ion transition was used. Samples were analyzed for benzobicyclon using Shimadzu LC-20AD HPLC coupled with an AB Sciex API 5000 MS with ESI Turbo V ion source operated in the positive or negative ion mode with multiple reaction monitoring (MRM). The LC/MS/MS parameters were the same as those of the ECM; however, the column temperature was reported as 40°C and the MS source temperature was reported as 550°C (positive mode) and 500°C (negative mode). Two ion pair transitions were monitored for each analyte, except 1315P-966 (quantitation and confirmation, respectively): m/z 447.44→257.07 and m/z 447.44→229.10 for benzobicyclon, m/z 355.35→165.09 and m/z 355.35→183.09 for 1315P-070, m/z 354.34→164.10 and m/z 354.34→318.10 for 1315P-570, m/z 319.33→240.12 and m/z 319.33→212.10 for 1315P-683, m/z 412.33→176.15 and m/z 412.33→222.12 for 1315P-960, m/z 398.30→208.14 and m/z 398.30→319.10 for 1315P-076, and m/z 157.1→113.1 and m/z 157.1→71.0 for 1315P-962. For 1315P-966, only one ion transition was monitored: m/z 233.1→189.0. The monitored quantitation ion transitions were generally similar to those of the ECM. Reported retention times were *ca.* 4.57, 3.49, 2.29, 2.12, 2.28, 2.20, 2.02, and 2.16 minutes for benzobicyclon, 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-076, 1315P-962, and 1315P-966, respectively. The ILV identified a critical step and had a recommendation for the ECM based on the ILV modification (p. 40).

The Limit of Quantification (LOQ) for benzobicyclon and its seven metabolites 1315P-070, 1315P-076, 1315P-570, 1315P-683, 1315P-960, 1315P-962, and 1315P-966 in water were reported as 0.001 mg/L in the ECM and ILV (pp. 27, 33-34; Appendix 3, pp. 347-348; Appendix 3, Appendix B, pp. 528-541 of MRID 51086513; pp. 16-20, 41-46 of MRID 51086514). Since the LOQ was not based on procedures defined in 40 CFR Part 136, the reported LOQ is the lowest level of method validation (LLMV) rather than an LOQ. In the ECM, the Limits of Detection (LODs) were reported as 0.0005 mg/L for all analytes. In the ILV, the LODs were calculated as 0.01-0.06 µg/L for benzobicyclon, 0.02-0.04 µg/L for 1315P-070, 0.005-0.02 µg/L for 1315P-570, 0.004-0.01 µg/L for 1315P-683, 0.02-0.03 µg/L for 1315P-960, 0.004-0.02 µg/L for 1315P-076, 0.03-0.2 µg/L for 1315P-962, and 0.1-0.2 µg/L for 1315P-966.

II. Recovery Findings

ECM (MRID 51086513): Data from the method validation samples and aquatic field dissipation laboratory fortification samples were evaluated. For the method validation, mean recoveries and relative standard deviations (RSDs) were within guidelines (mean 70-120%; RSD ≤20%) for analysis of benzobicyclon and its seven metabolites 1315P-070, 1315P-076, 1315P-570, 1315P-683, 1315P-960, 1315P-962, and 1315P-966 at fortification levels of 0.001 mg/L (LOQ) and 0.01 mg/L (10×LOQ) in one water matrix (p. 34; Appendix 3, Tables 2-15, pp. 369-382; Appendix 3, Appendix B, pp. 528-541). Actual fortification levels ranged 0.00100-0.00101 mg/L and 0.0100-0.0101 mg/L. For the aquatic field dissipation laboratory fortification samples, mean recoveries and RSDs were within guidelines for analysis of benzobicyclon and its seven metabolites 1315P-070, 1315P-076, 1315P-570, 1315P-683, 1315P-960, 1315P-962, and 1315P-966 at fortification levels of 0.001 mg/L (LOQ) and 0.01 mg/L (10×LOQ) in two water matrices (Appendix 3, Tables 29-44, pp. 396-415). Benzobicyclon and 1315P-070 were also prepared at 0.80 mg/L (800×LOQ, actual 0.808 mg/L) in the California water and at 0.40 mg/L (400×LOQ, actual 0.404 mg/L) in the Louisiana water; mean recoveries and RSDs were within guidelines for these analyses. One ion pair transition was monitored and quantified. A confirmatory method is not usually required when

LC/MS or GC/MS is used as the primary method to generate study data. The method validation results with the 10 mL total volume sample size and 1 mL total volume sample size were comparable for the six tested analytes: benzobicyclon, 1315P-070, 1315P-076, 1315P-570, 1315P-683, and 1315P-960. Results from the method validation samples were comparable to results from the aquatic field dissipation laboratory fortification samples.

California paddy water (Sample ID: 469.13-CA. BK. Water; Irrigation Water Pre-Flood: pH 7.9, 0.81 mmohs/cm conductivity, 316 ppm dissolved solids; Paddy Water 60 DAA: pH 7.8, 0.61 mmohs/cm conductivity, 332 ppm dissolved solids) was used in the method validation study (pp. 19-20; Appendix B, pp. 528-541). The California paddy water used for the aquatic field dissipation laboratory fortification samples was the same California paddy water as that of the method validation (Appendix 3, Appendix B, pp. 725-797). Louisiana paddy water (Sample ID: 469.13-LA. BK. Water; Irrigation Water Pre-Flood: pH 7.1, 0.49 mmohs/cm conductivity, 334 ppm dissolved solids; Paddy Water 58 DAA: pH 7.8, 0.45 mmohs/cm conductivity, 346 ppm dissolved solids) was also used in the laboratory fortification portion of the aquatic field dissipation (pp. 19-20; Appendix B, pp. 725-797). The waters were obtained from this aquatic field dissipation study with sites in California and Louisiana and characterized by Agvise Laboratories, Northwood, North Dakota. Water characterization was not provided in the method validation report, but reviewer-correlated based on the Sample ID of the method validation samples and the water classification. It could not be determined if the Irrigation Water Pre-Flood or Paddy Water 58/60 DAA characterization data corresponded to the California and Louisiana water used for the method validation and laboratory fortification samples.

ILV (MRID 51086514): Mean recoveries and RSDs were within guidelines for analysis of benzobicyclon and its seven metabolites 1315P-070, 1315P-076, 1315P-570, 1315P-683, 1315P-960, and 1315P-966 at fortification levels of 0.001 mg/L (LOQ) and 0.01 mg/L (10×LOQ) in two water matrices (Tables 1-30, pp. 53-82). For 1315P-962, mean recoveries and RSDs were within guidelines for analysis at 0.01 mg/L (10×LOQ) in two water matrices, but unacceptable at 0.001 mg/L (LOQ) where means were 53.1-59.0% in the ground and surface water. Two ion pair transitions were monitored for all analytes, but 1315P-966; performance data was comparable between the quantitation and confirmation analyses. One ion pair transition was monitored and quantified for 1315P-966; a confirmatory method is not usually required when LC/MS or GC/MS is used as the primary method to generate study data. A 5 mL total volume sample size was used. Ground water (pH not reported, typical hardness <160 mg as CaCO₃) obtained as unadulterated water from a 100-meter bedrock, in-house well and surface water (Lot No. 17Oct16Wat-A-3; pH 6.9, dissolved oxygen concentration 9.3 mg/L) obtained from Weweantic River in West Wareham, Massachusetts were used in the study (pp. 27-28). The water characterization laboratory for the surface water was Agvise Laboratories, Northwood, North Dakota; the water characterization for the ground water was not performed.

The method for benzobicyclon and its six metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-966, and 1315P-076 in water was validated in the second trial at 0.001 mg/L (LOQ) and 0.01 mg/L (10×LOQ; pp. 16-20, 51). For 1315P-962, the method was validated in the second trial at 0.01 mg/L (10×LOQ), but the method was not successfully validated at 0.001 mg/L (LOQ) due to low recoveries. The study author reported that the low LOQ recoveries of 1315P-962 were due to the fact that the fortification stock and analytical stock solutions were prepared in two different solvents. The study author also noted that the LOD for 1315P-962 met acceptance criteria of 3:1 signal to noise ratio. The ILV performed the ECM method as written, except for the use of

calibration standards which were interspersed with the test samples and insignificant modifications to the analytical parameters (pp. 27-35, 38-40). Following ILV recommendations/issues, the ECM should be updated to include interspersed calibration standards (p. 40).

Table 2. Initial Validation Method Recoveries for Benzobicyclon and its seven metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-962, 1315P-966, and 1315P-076 in Water¹

Analyte	Fortification Level (mg/L) ²	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
Method Validation Data³						
California Paddy Water – 10 mL total volume (7 ml water:3 mL acetonitrile)						
Quantitation ion transition						
Benzobicyclon	0.001 (LLMV)	5	98.0-106	103	3.27	3.17
	0.01	5	97.7-103	101	2.05	2.03
1315P-070	0.001 (LLMV)	5	94.2-105	98.8	3.99	4.04
	0.01	5	97.8-101	99.8	1.32	1.32
1315P-570	0.001 (LLMV)	5	99.0-109	103	4.02	3.90
	0.01	5	100-107	105	2.88	2.74
1315P-683	0.001 (LLMV)	5	105-112	108	3.21	2.97
	0.01	5	99.0-105	103	2.88	2.80
1315P-960	0.001 (LLMV)	5	95.5-107	103	4.42	4.29
	0.01	5	100-104	102	1.52	1.49
1315P-076	0.001 (LLMV)	5	104-109	106	1.82	1.72
	0.01	5	100-103	102	1.34	1.31
1315P-962	0.001 (LLMV)	5	Not performed at this volume size.			
	0.01	5				
1315P-966	0.001 (LLMV)	5	Not performed at this volume size.			
	0.01	5				
California Paddy Water – 1 mL total volume (0.7 ml water:0.3 mL acetonitrile or 0.9 mL water:0.1 mL acetonitrile)						
Quantitation ion transition						
Benzobicyclon	0.001 (LLMV)	5	100-105	102	1.92	1.88
	0.01	5	100-102	101	0.894	0.885
1315P-070	0.001 (LLMV)	5	92.8-106	99.7	5.05	5.07
	0.01	5	97.4-102	99.8	1.87	1.87
1315P-570	0.001 (LLMV)	5	98.2-106	103	3.35	3.25
	0.01	5	99.0-107	104	3.32	3.19
1315P-683	0.001 (LLMV)	5	96.7-103	98.5	2.56	2.60
	0.01	5	98.5-102	99.9	1.34	1.34
1315P-960	0.001 (LLMV)	5	103-109	105	2.30	2.19
	0.01	5	97.5-103	101	2.11	2.09
1315P-076	0.001 (LLMV)	5	99.1-112	105	5.47	5.21
	0.01	5	101-108	104	2.59	2.49
1315P-962	0.001 (LLMV)	5	92.9-106	100	4.91	4.91
	0.01	5	93.9-98.8	96.9	2.17	2.24
1315P-966	0.001 (LLMV)	5	90.0-105	98.3	5.41	5.50
	0.01	5	93.1-104	97.8	4.39	4.49
AFD Laboratory Fortification Data^{4,5}						
California Paddy Water						
Quantitation ion transition						
Benzobicyclon	0.001 (LLMV)	4	70.1-106	95.8	17.2	18.0
	0.01	4 ⁶	69.1-102	92.1	15.5	16.8
	0.80	5	97.5-102	99.5	1.64	1.65

Analyte	Fortification Level (mg/L) ²	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
1315P-070	0.001 (LLMV)	4	93.2-102	97.7	3.61	3.69
	0.01	4 ⁶	94.2-96.2	94.8	0.971	1.02 ⁷
	0.80	5	95.4-100	98.2	1.84	1.87
1315P-570	0.001 (LLMV)	4	98.5-109	104	4.33	4.16
	0.01	4	97.1-105	100	3.56	3.56
1315P-683	0.001 (LLMV)	4	104-112	107	3.59	3.36
	0.01	4	94.2-102	98.6	3.23	3.28
1315P-960	0.001 (LLMV)	4	88.2-105	96.3	6.91	7.18
	0.01	4	94.5-101	98.4	2.86	2.91
1315P-076	0.001 (LLMV)	4	100-110	105	4.57	4.35
	0.01	4	95.7-98.0	96.6	1.09	1.13
1315P-962	0.001 (LLMV)	4	94.0-98.2	96.6	1.85	1.92
	0.01	4	90.0-98.3	95.1	3.66	3.85
1315P-966	0.001 (LLMV)	4	99.0-109	103	4.19	4.07
	0.01	4	93.3-109	100	6.49	6.49
Louisiana Paddy Water						
Quantitation ion transition						
Benzobicyclon	0.001 (LLMV)	4	101-108	103	3.20	3.11
	0.01	4 ⁶	97.2-103	101	2.61	2.58
	0.40	5	98.3-115	105	6.45	6.14
1315P-070	0.001 (LLMV)	4	87.4-97.4	91.6	4.85	5.29
	0.01	4 ⁶	83.7-99.1	91.2	6.32	6.93
	0.40	5	94.8-101	98.7	2.61	2.64
1315P-570	0.001 (LLMV)	4	99.0-111	104	5.38	5.17
	0.01	4	97.5-104	100	2.69	2.69
1315P-683	0.001 (LLMV)	4	101-107	103	3.00	2.91
	0.01	4	95.7-107	100	4.97	4.97
1315P-960	0.001 (LLMV)	4	96.4-104	99.7	3.22	3.23
	0.01	4	96.2-102	99.6	2.91	2.92
1315P-076	0.001 (LLMV)	4	97.0-110	103	5.56	5.40
	0.01	4	92.8-107	102	6.49	6.36
1315P-962	0.001 (LLMV)	4	92.7-106	99.9	5.61	5.62
	0.01	4	91.3-102	98.3	4.85	4.93
1315P-966	0.001 (LLMV)	4	103-109	106	2.58	2.43
	0.01	4	102-108	105	3.20	3.05

Data (uncorrected recovery results; Appendix 3, Appendix B, pp. 528-541) were obtained from p. 34; Appendix 3, Tables 2-15, pp. 369-382; Tables 29-44, pp. 396-415; Appendix 3, Appendix B, pp. 528-541 of MRID 51086513. AFD = Aquatic Field Dissipation.

1 One ion pair transition was monitored for each analyte: m/z 447.1→257.1 for benzobicyclon, m/z 355.0→165.0 for 1315P-070, m/z 354.0→164.0 for 1315P-570, m/z 319.1→240.1 for 1315P-683, m/z 412.1→176.0 for 1315P-960, m/z 398.1→208.1 for 1315P-076, m/z 157.0→113.0 for 1315P-962, and m/z 235.0→191.0 for 1315P-966 (Appendix 3, pp. 350-351). A confirmatory method is not usually required when LC/MS or GC/MS is used as the primary method to generate study data.

2 Nominal fortification level reported. Actual fortification levels ranged 0.00100-0.00101 mg/L and 0.0100-0.0101 mg/L, as well as 0.808 mg/L and 0.404 mg/L for the 800×LOQ and 400×LOQ laboratory fortification samples, respectively (Appendix 3, Tables 2-15, pp. 369-382; Tables 29-44, pp. 396-415).

3 California paddy water (Sample ID: 469.13-CA. BK. Water; Irrigation Water Pre-Flood: pH 7.9, 0.81 mmohs.cm conductivity, 316 ppm dissolved solids; Paddy Water 60 DAA: pH 7.8, 0.61 mmohs.cm conductivity, 332 ppm dissolved solids) was used in the method validation study (pp. 19-20; Appendix B, pp. 528-541). The waters were

obtained from this aquatic field dissipation study with sites in California and Louisiana and characterized by Agvise Laboratories, Northwood, North Dakota. Water characterization was not provided in the method validation report, but reviewer-correlated based on the Sample ID of the method validation samples and the water classification. It could not be determined if the Irrigation Water Pre-Flood or Paddy Water 60 DAA characterization data corresponded to the water used for the method validation.

- 4 The California paddy water used for the aquatic field dissipation laboratory fortification samples was the same California paddy water as that of the method validation (Appendix 3, Appendix B, pp. 725-797). Louisiana paddy water (Sample ID: 469.13-LA. BK. Water; Irrigation Water Pre-Flood: pH 7.1, 0.49 mmohs/cm conductivity, 334 ppm dissolved solids; Paddy Water 58 DAA: pH 7.8, 0.45 mmohs/cm conductivity, 346 ppm dissolved solids) was also used in the laboratory fortification portion of the aquatic field dissipation (pp. 19-20; Appendix B, pp. 725-797). The waters were obtained from this aquatic field dissipation study with sites in California and Louisiana and characterized by Agvise Laboratories, Northwood, North Dakota. Water characterization was not provided in the method validation report, but reviewer-correlated based on the Sample ID of the method validation samples and the water classification. It could not be determined if the Irrigation Water Pre-Flood or Paddy Water 58/60 DAA characterization data corresponded to the California and Louisiana water used for the laboratory fortification samples.
- 5 Total sample volume (10 mL versus 1 mL) was not reported for the laboratory fortification samples.
- 6 One or two samples were re-analyzed to demonstrate extract stability, but the result of the re-analysis was not included in the statistical calculations (Appendix 3, Tables 29-30, pp. 396, 398; Tables 37-38, pp. 406, 408).
- 7 Typographical error in study report listed this value as 102% (Appendix 3, Table 30, p. 398).

Table 3. Independent Validation Method Recoveries for Benzobicyclon and its seven metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-962, 1315P-966, and 1315P-076 in Water^{1,2,3}

Analyte	Fortification Level (mg/L)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
5 mL total volume (3.5 ml water:1.5 mL acetonitrile)						
Ground Water						
Quantitation ion transition						
Benzobicyclon	0.001 (LLMV)	5	99.0-107	102	3.49	3.41
	0.01	5	89.5-105	100	6.21	6.20
1315P-070	0.001 (LLMV)	5	94.7-105	98.4	4.38	4.45
	0.01	5	101-112	106	5.11	4.84
1315P-570	0.001 (LLMV)	5	102-110	106	4.22	3.98
	0.01	5	97.8-108	102	3.59	3.52
1315P-683	0.001 (LLMV)	5	105-115	110	3.91	3.55
	0.01	5	103-110	105	2.85	2.71
1315P-960	0.001 (LLMV)	5	82.4-88.6	85.8	2.74	3.19
	0.01	5	94.0-104	97.5	4.14	4.25
1315P-076	0.001 (LLMV)	5	107-114	110	2.55	2.31
	0.01	5	97.6-102	99.8	1.84	1.85
1315P-962	0.001 (LLMV)	5	50.2-55.6	53.1	2.52	4.74
	0.01	5	87.0-91.0	89.6	1.60	1.79
1315P-966	0.001 (LLMV)	5	77.1-91.2	84.9	5.47	6.44
	0.01	5	91.2-105	96.5	5.57	5.78
Confirmation ion transition						
Benzobicyclon	0.001 (LLMV)	5	77.4-108	91.5	11.2	12.2
	0.01	5	82.1-104	93.9	10.0	10.6
1315P-070	0.001 (LLMV)	5	93.9-104	100	4.22	4.22
	0.01	5	104-111	107	2.68	2.50
1315P-570	0.001 (LLMV)	5	105-118	112	5.36	4.79
	0.01	5	98.8-102	101	1.47	1.46
1315P-683	0.001 (LLMV)	5	108-113	112	2.29	2.05
	0.01	5	101-108	104	3.17	3.04
1315P-960	0.001 (LLMV)	5	79.8-89.2	83.7	3.69	4.41
	0.01	5	94.8-105	99.7	4.82	4.84
1315P-076	0.001 (LLMV)	5	103-116	110	5.33	4.84
	0.01	5	92.4-104	96.9	4.83	4.99
1315P-962	0.001 (LLMV)	5	50.8-65.3	56.7	5.93	10.5
	0.01	5	77.2-102	89.3	11.4	12.8
Surface (River) Water						
Quantitation ion transition						
Benzobicyclon	0.001 (LLMV)	5	94.2-104	99.4	4.06	4.09
	0.01	5	90.9-107	98.9	6.08	6.15
1315P-070	0.001 (LLMV)	5	95.9-104	98.6	3.16	3.20
	0.01	5	102-119	111	6.32	5.69
1315P-570	0.001 (LLMV)	5	109-115	113	2.39	2.11
	0.01	5	95.3-105	101	4.20	4.14

Analyte	Fortification Level (mg/L)	Number of Tests	Recovery Range (%)	Mean Recovery (%)	Standard Deviation (%)	Relative Standard Deviation (%)
1315P-683	0.001 (LLMV)	5	114-119	116	2.15	1.86
	0.01	5	102-109	106	2.68	2.54
1315P-960	0.001 (LLMV)	5	78.5-86.0	82.7	3.16	3.83
	0.01	5	97.6-102	100	1.70	1.70
1315P-076	0.001 (LLMV)	5	109-120	115	3.80	3.30
	0.01	5	100-103	102	1.08	1.06
1315P-962	0.001 (LLMV)	5	51.0-54.7	53.4	1.45	2.71
	0.01	5	86.1-91.5	88.4	2.01	2.27
1315P-966	0.001 (LLMV)	5	84.5-97.5	91.0	5.38	5.91
	0.01	5	93.6-104	97.7	5.27	5.39
Confirmation ion transition						
Benzobicyclon	0.001 (LLMV)	5	79.2-97.8	90.4	8.43	9.33
	0.01	5	80.1-106	94.4	9.65	10.2
1315P-070	0.001 (LLMV)	5	99.5-108	104	3.46	3.33
	0.01	5	104-109	107	1.99	1.85
1315P-570	0.001 (LLMV)	5	106-115	112	3.68	3.28
	0.01	5	95.0-106	99.1	4.41	4.45
1315P-683	0.001 (LLMV)	5	114-120	118	2.51	2.14
	0.01	5	95.8-106	103	4.21	4.08
1315P-960	0.001 (LLMV)	5	76.3-88.9	84.5	4.85	5.74
	0.01	5	88.2-97.8	93.5	3.71	3.97
1315P-076	0.001 (LLMV)	5	113-118	116	2.13	1.84
	0.01	5	93.3-106	98.0	4.87	4.97
1315P-962	0.001 (LLMV)	5	50.5-68.0	59.0	7.11	12.0
	0.01	5	90.5-103	95.2	4.93	5.17

Data (uncorrected recovery results; pp. 40-41) were obtained from Tables 1-30, pp. 53-82 of MRID 51086514.

1 Ground water (pH not reported, typical hardness <160 mg as CaCO₃) obtained as unadulterated water from a 100-meter bedrock, in-house well and surface water (Lot No. 17Oct16Wat-A-3; pH 6.9, dissolved oxygen concentration 9.3 mg/L) obtained from Weweantic River in West Wareham, Massachusetts were used in the study (pp. 27-28). The water characterization laboratory for the surface water was Agvise Laboratories, Northwood, North Dakota; the water characterization for the ground water was not performed.

2 Two ion pair transitions were monitored for each analyte, except 1315P-966 (quantitation and confirmation, respectively): m/z 447.44→257.07 and m/z 447.44→229.10 for benzobicyclon, m/z 355.35→165.09 and m/z 355.35→183.09 for 1315P-070, m/z 354.34→164.10 and m/z 354.34→318.10 for 1315P-570, m/z 319.33→240.12 and m/z 319.33→212.10 for 1315P-683, m/z 412.33→176.15 and m/z 412.33→222.12 for 1315P-960, m/z 398.30→208.14 and m/z 398.30→319.10 for 1315P-076, and m/z 157.1→113.1 and m/z 157.1→71.0 for 1315P-962 (pp. 37-38). The monitored quantitation ion transitions were similar to those of the ECM. For 1315P-966, only one ion transition was monitored: m/z 233.1→189.0. For 1315P-966, a slightly different quantitation ion transition was used from that in the ECM (p. 39). A confirmatory method is not usually required when LC/MS or GC/MS is used as the primary method to generate study data.

3 5 mL sample size for analysis (pp. 33-34).

III. Method Characteristics

The reported LOQ for benzobicyclon and its seven metabolites 1315P-070, 1315P-076, 1315P-570, 1315P-683, 1315P-960, 1315P-962, and 1315P-966 in water was 0.001 mg/L in the ECM and ILV (pp. 27, 33-34; Appendix 3, pp. 347-348; Appendix 3, Appendix B, pp. 528-541 of MRID 51086513; pp. 16-20, 41-46 of MRID 51086514). No justification or calculations were provided to support the LOQ in the ECM or ILV. In the ECM, the LODs were reported as 0.0005 mg/L for all analytes, without justification.

In the ILV, the LODs were calculated from the signal-to-noise response of each analyte in matrix at the LOQ level using the following equation:

$$\text{LOD} = (3 \times (\text{SN}_{\text{ctl}}) / (\text{Resp}_{\text{LS}}) \times \text{Conc}_{\text{LS}} \times \text{DF}_{\text{Ctl}})$$

Where, LOD is the method limit of detection ($\mu\text{g/L}$), SN_{ctl} is the mean signal to noise in height of the control samples (or blanks), Resp_{LS} is the mean response in height of the two low calibration standards ($0.250 \mu\text{g/L}$), Conc_{LS} is the concentration of the low calibration standard ($\mu\text{g/L}$), and DF_{Ctl} is the dilution factor of the control samples.

The ILV LODs were calculated as 0.01-0.06 $\mu\text{g/L}$ for benzobicyclon, 0.02-0.04 $\mu\text{g/L}$ for 1315P-070, 0.005-0.02 $\mu\text{g/L}$ for 1315P-570, 0.004-0.01 $\mu\text{g/L}$ for 1315P-683, 0.02-0.03 $\mu\text{g/L}$ for 1315P-960, 0.004-0.02 $\mu\text{g/L}$ for 1315P-076, 0.03-0.2 $\mu\text{g/L}$ for 1315P-962, and 0.1-0.2 $\mu\text{g/L}$ for 1315P-966.

Since the LOQ was not based on procedures defined in 40 CFR Part 136, the reported LOQ is the lowest level of method validation (LLMV) rather than a LOQ.

Table 4a. Method Characteristics in Water

		Benzobicyclon	1315P-070	1315P-570	1315P-683
Limit of Quantitation (LOQ)*	ECM	0.001 mg/L			
	ILV				
Limit of Detection (LOD)	ECM	0.0005 mg/L			
	ILV (calc)	0.02 µg/L (Q, GW)	0.04 µg/L (Q, GW)	0.005 µg/L (Q, GW)	0.004 µg/L (Q, GW)
		0.04 µg/L (C, GW)	0.02 µg/L (C, GW)	0.01 µg/L (C, GW)	0.005 µg/L (C, GW)
		0.01 µg/L (Q, SW)	0.05 µg/L (Q, SW)	0.01 µg/L (Q, SW)	0.005 µg/L (Q, SW)
	0.06 µg/L (C, SW)	0.02 µg/L (C, SW)	0.02 µg/L (C, SW)	0.01 µg/L (C, SW)	
Linearity (calibration curve r and concentration range)	ECM ²	r = 0.9996-0.9999 (Q, CW) r = 0.9997 (AFD)	r = 0.9996-0.9999 (Q, CW) r = 0.9997 (AFD)	r = 0.9998 (Q, CW) r = 0.9998 (AFD)	r = 0.9994-0.9999 (Q, CW) r = 0.9991 (AFD)
		0.350-20.0 ng/mL or 0.354-20.2 ng/mL (CW) 0.250-10.0 ng/mL or 0.253-10.1 ng/mL (AFD)			
	ILV	r = 0.9981 (Q) r = 0.9978 (C)	r = 0.9950 (Q) r = 0.9994 (C)	r = 0.9990 (Q) r = 0.9981 (C)	r = 0.9994 (Q) r = 0.9982 (C)
		0.250-10.0 ng/mL			
Repeatable	ECM ^{2,3,4}	Yes at LOQ (0.001 mg/L) and 10×LOQ (0.010 mg/L) (one characterized paddy water matrix – method validation) (two characterized paddy water matrices – laboratory fortification)			
	ILV ^{5,6}	Yes at LOQ (0.001 mg/L) and 10×LOQ (0.010 mg/L) (uncharacterized ground water and characterized surface water)			
Reproducible		Yes for 0.001 mg/L (LLMV)* and 0.010 mg/L in tested water matrices			
Specific	ECM	No representative chromatograms were submitted for the method validation samples. Representative chromatograms were submitted for the laboratory fortification samples of the AFD, but only one matrix per analyte was submitted.			
		Yes, based on chromatograms submitted for the laboratory fortification samples of the AFD. No matrix interferences were observed.	Yes, based on chromatograms submitted for the laboratory fortification samples of the AFD. Minor baseline noise interfered with analyte integration and attenuation. Minor contaminant was observed (RT ca. 2.5 min.). ⁷	Yes, based on chromatograms submitted for the laboratory fortification samples of the AFD. No matrix interferences were observed.	
	ILV	Yes, matrix interferences were <5% of the LOQ (based on peak area).	Yes, matrix interferences were <5% of the LOQ (based on peak area).	Yes, matrix interferences were <5% of the LOQ (based on peak area).	Yes, matrix interferences were <5% of the LOQ (based on peak area).

		Minor baseline noise interfered with analyte integration and attenuation.	LOQ analyte peak small compared to baseline noise. Minor contaminant was observed (RT <i>ca.</i> 2.25 min.). ⁸		Minor baseline noise interfered with analyte integration and attenuation.
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Data were obtained from pp. 27, 33-34; Appendix 3, pp. 347-348; Appendix 3, Appendix B, pp. 528-541 (LOQ/LOD); p. 34; Appendix 3, Tables 2-15, pp. 369-382; Tables 29-44, pp. 396-415; Appendix 3, Appendix B, pp. 528-541; Appendix 3, Appendix B, pp. 725-797 (recovery results & calibration coefficients); Appendix 3, Appendix C, Figures 1-10, pp. 910-919; Figures 21-30, pp. 930-939; Figures 41-50, pp. 950-959; Figures 61-70, pp. 970-979; Figures 81-90, pp. 990-999; Figures 101-110, pp. 1010-1019; Figures 121-130, pp. 1030-1039; Figures 141-150, pp. 1050-1059 (chromatograms and calibration curves) of MRID 51086513; pp. 16-20, 41-46 (LOQ/LOD); Tables 1-30, pp. 53-82 (recovery results); p. 46; Figures 81-95, pp. 163-177 (calibration coefficients and calibration curves); Figures 1-80, pp. 83-162 (chromatograms) of MRID 51086514. Q = quantitation ion transition; C = confirmation ion transition; CW = California Paddy Water; GW = Ground Water; SW = Surface Water; AFD = Aquatic Field Dissipation.

* Since the LOQ was not based on procedures defined in 40 CFR Part 136, the reported LOQ is the lowest level of method validation (LLMV) rather than an LOQ. The lowest concentration tested with sufficiently accurate and precise recoveries is the LLMV.

- In the ECM, one ion pair transition was monitored for each analyte (Appendix 3, pp. 350-352 of MRID 51086513). In the ILV, only one ion transition was monitored for 1315P-966 (p. 38 of MRID 51086513). A confirmatory method is not usually required when LC/MS or GC/MS is used as the primary method to generate study data.
- Data from the method validation samples and aquatic field dissipation laboratory fortification samples were included. Aquatic field dissipation laboratory fortification sample data denoted with AFD, if necessary. Solvent-based calibration standards were used in the ECM.
- California paddy water (Sample ID: 469.13-CA. BK. Water; Irrigation Water Pre-Flood: pH 7.9, 0.81 mmohs/cm conductivity, 316 ppm dissolved solids; Paddy Water 60 DAA: pH 7.8, 0.61 mmohs/cm conductivity, 332 ppm dissolved solids) was used in the method validation study (pp. 19-20; Appendix B, pp. 528-541 of MRID 51086513). The California paddy water used for the aquatic field dissipation laboratory fortification samples was the same California paddy water as that of the method validation (Appendix 3, Appendix B, pp. 725-797). Louisiana paddy water (Sample ID: 469.13-LA. BK. Water; Irrigation Water Pre-Flood: pH 7.1, 0.49 mmohs/cm conductivity, 334 ppm dissolved solids; Paddy Water 58 DAA: pH 7.8, 0.45 mmohs/cm conductivity, 346 ppm dissolved solids) was also used in the laboratory fortification portion of the aquatic field dissipation (pp. 19-20; Appendix B, pp. 725-797). The waters were obtained from this aquatic field dissipation study with sites in California and Louisiana and characterized by Agvise Laboratories, Northwood, North Dakota. Water characterization was not provided in the method validation report, but reviewer-correlated based on the Sample ID of the method validation samples and the water classification. It could not be determined if the Irrigation Water Pre-Flood or Paddy Water 58/60 DAA characterization data corresponded to the California and Louisiana water used for the method validation and laboratory fortification samples.
- The method validation was performed at two sample sizes, 10 mL total volume and 1 mL total volume, for six analytes: benzobicyclon, 1315P-070, 1315P-076, 1315P-570, 1315P-683, and 1315P-960. Performance data was comparable. The method validation for 1315P-962 and 1315P-966 was only performed with a 1 mL total volume sample size. Samples sizes for the laboratory fortification samples was not reported.
- In the ILV, ground water (pH not reported, typical hardness <160 mg as CaCO₃) obtained as unadulterated water from a 100-meter bedrock, in-house well and surface water (Lot No. 17Oct16Wat-A-3; pH 6.9, dissolved oxygen concentration 9.3 mg/L) obtained from Weweantic River in West Wareham, Massachusetts were used in the study (pp. 27-28 of MRID 51086514). The water characterization laboratory for the surface water was Agvise Laboratories, Northwood, North Dakota; the water characterization for the ground water was not performed.
- The ILV validated the method for benzobicyclon and its six metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-966, and 1315P-076 in water was validated in the second trial at 0.001 mg/L (LOQ) and 0.01 mg/L (10×LOQ; pp. 16-20, 51 of MRID 51086514). For 1315P-962, the method was validated in the second trial at 0.01 mg/L (10×LOQ), but the method was not successfully validated at 0.001 mg/L (LOQ). The study author reported that the low LOQ recoveries of 1315P-962 were due to the fact that the fortification stock and analytical stock solutions were prepared in two different solvents. The study author also noted that the LOD for 1315P-962 met acceptance criteria of 3:1 signal to noise ratio. The ILV performed the ECM method as written, except for the use of calibration standards

which were interspersed with the test samples and insignificant modifications to the analytical parameters (pp. 27-35, 38-40). Following ILV recommendations/issues, the ECM should be updated to include interspersed calibration standards (p. 40). A 5-mL total volume sample size was used (pp. 33-34).

7 Based on Appendix 3, Appendix C, Figures 29-30, pp. 938-939 of MRID 51086513. 1315P-570 occurred at RT *ca.* 2.56 min.

8 Based on Figures 8-10, pp. 90-92 and Figures 48-50, pp. 130-132 of MRID 51086514. 1315P-570 and 1315P-960 occurred at RT *ca.* 2.29 and 2.28 min., respectively.

Table 4b. Method Characteristics in Water (con't)

		1315P-960	1315P-076	1315P-966	1315P-962	
Limit of Quantitation (LOQ)*	ECM	0.001 mg/L				
	ILV					
Limit of Detection (LOD)	ECM	0.002 mg/L				
	ILV (calc)	0.02 µg/L (Q, GW) 0.03 µg/L (C, GW) 0.03 µg/L (Q & C, SW)	0.004 µg/L (Q, GW) 0.02 µg/L (C, GW) 0.007 µg/L (Q, SW) 0.02 µg/L (C, SW)	0.2 µg/L (Q, GW) 0.1 µg/L (Q, SW)	0.03 µg/L (Q, GW) 0.2 µg/L (C, GW) 0.04 µg/L (Q, SW) 0.2 µg/L (C, SW)	
Linearity (calibration curve r and concentration range)	ECM ²	r = 0.9997-0.9998 (Q, CW) r = 0.9999 (AFD)	r = 0.9994-0.9998 (Q, CW) r = 1.0000 (AFD)	r = 0.9994 (Q, CW) r = 0.9994 (AFD)	r = 0.9994 (Q, CW) r = 0.9998 (AFD)	
		0.350-20.0 ng/mL or 0.354-20.2 ng/mL (CW) 0.250-10.0 ng/mL or 0.253-10.1 ng/mL (AFD)		0.250-10.0 ng/mL or 0.253-10.1 ng/mL (CW & AFD)		
	ILV	r = 0.9969 (Q) r = 0.9986 (C)	r = 0.9992 (Q) r = 0.9988 (C)	r = 0.9975 (Q) r = 0.9973 (C)	r = 0.9978 (Q)	
		0.250-10.0 ng/mL				
Repeatable	ECM ^{2,3,4}	Yes at LOQ (0.001 mg/L) and 10×LOQ (0.010 mg/L) (one characterized paddy water matrix – method validation) (two characterized paddy water matrices – laboratory fortification)				
	ILV ^{5,6}	Yes at LOQ (0.001 mg/L) and 10×LOQ (0.010 mg/L) (uncharacterized ground water and characterized surface water)			Yes at 10×LOQ (0.010 mg/L). No at LOQ (0.001 mg/L): means 53.1-59.0% (uncharacterized ground water and characterized surface water)	
Reproducible	Yes for 0.001 mg/L (LLMV)* and 0.010 mg/L in tested water matrices				Yes for 0.010 mg/L in tested water matrices. No for 0.001 mg/L (LLMV)* - only one set of acceptable data.	
Specific	ECM	No representative chromatograms were submitted for the method validation samples. Representative chromatograms were submitted for the laboratory fortification samples of the AFD, but only one matrix per analyte was submitted.				
		Yes, based on chromatograms submitted for the laboratory fortification samples of the AFD. No matrix interferences were observed. Minor baseline noise was present around 1315P-966 analyte peak at LOQ.				
	ILV	Yes, matrix interferences were <5% of the LOQ (based on peak area).	Yes, matrix interferences were <5% of the LOQ (based on peak area).	Yes, matrix interferences were <5% of the LOQ (based on peak area).	Yes, no matrix interferences were observed. Analyte peak small compared to baseline noise.	

		Minor baseline noise interfered with analyte integration and attenuation.		Analyte peak small compared to baseline noise. Minor baseline noise interfered with analyte integration and attenuation.	
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Data were obtained from pp. 27, 33-34; Appendix 3, pp. 347-348; Appendix 3, Appendix B, pp. 528-541 (LOQ/LOD); p. 34; Appendix 3, Tables 2-15, pp. 369-382; Tables 29-44, pp. 396-415; Appendix 3, Appendix B, pp. 528-541; Appendix 3, Appendix B, pp. 725-797 (recovery results & calibration coefficients); Appendix 3, Appendix C, Figures 1-10, pp. 910-919; Figures 21-30, pp. 930-939; Figures 41-50, pp. 950-959; Figures 61-70, pp. 970-979; Figures 81-90, pp. 990-999; Figures 101-110, pp. 1010-1019; Figures 121-130, pp. 1030-1039; Figures 141-150, pp. 1050-1059 (chromatograms and calibration curves) of MRID 51086513; pp. 16-20, 41-46 (LOQ/LOD); Tables 1-30, pp. 53-82 (recovery results); p. 46; Figures 81-95, pp. 163-177 (calibration coefficients and calibration curves); Figures 1-80, pp. 83-162 (chromatograms) of MRID 51086514. Q = quantitation ion transition; C = confirmation ion transition; CW = California Paddy Water; GW = Ground Water; SW = Surface Water; AFD = Aquatic Field Dissipation.

* Since the LOQ was not based on scientifically acceptable procedures defined in 40 CFR Part 136, the reported LOQ is the lowest level of method validation (LLMV) rather than an LOQ. The lowest concentration tested with sufficiently accurate and precise recoveries is the LLMV.

- In the ECM, one ion pair transition was monitored for each analyte (Appendix 3, pp. 350-352 of MRID 51086513). In the ILV, only one ion transition was monitored for 1315P-966 (p. 38 of MRID 51086513). A confirmatory method is not usually required when LC/MS or GC/MS is used as the primary method to generate study data.
- Data from the method validation samples and aquatic field dissipation laboratory fortification samples were included. Aquatic field dissipation laboratory fortification sample data denoted with AFD, if necessary. Solvent-based calibration standards were used in the ECM.
- California paddy water (Sample ID: 469.13-CA. BK. Water; Irrigation Water Pre-Flood: pH 7.9, 0.81 mmohs/cm conductivity, 316 ppm dissolved solids; Paddy Water 60 DAA: pH 7.8, 0.61 mmohs/cm conductivity, 332 ppm dissolved solids) was used in the method validation study (pp. 19-20; Appendix B, pp. 528-541 of MRID 51086513). The California paddy water used for the aquatic field dissipation laboratory fortification samples was the same California paddy water as that of the method validation (Appendix 3, Appendix B, pp. 725-797). Louisiana paddy water (Sample ID: 469.13-LA. BK. Water; Irrigation Water Pre-Flood: pH 7.1, 0.49 mmohs/cm conductivity, 334 ppm dissolved solids; Paddy Water 58 DAA: pH 7.8, 0.45 mmohs/cm conductivity, 346 ppm dissolved solids) was also used in the laboratory fortification portion of the aquatic field dissipation (pp. 19-20; Appendix B, pp. 725-797). The waters were obtained from this aquatic field dissipation study with sites in California and Louisiana and characterized by Agvise Laboratories, Northwood, North Dakota. Water characterization was not provided in the method validation report, but reviewer-correlated based on the Sample ID of the method validation samples and the water classification. It could not be determined if the Irrigation Water Pre-Flood or Paddy Water 58/60 DAA characterization data corresponded to the California and Louisiana water used for the method validation and laboratory fortification samples.
- The method validation was performed at two sample sizes, 10 mL total volume and 1 mL total volume, for six analytes: benzobicyclon, 1315P-070, 1315P-076, 1315P-570, 1315P-683, and 1315P-960. Performance data was comparable. The method validation for 1315P-962 and 1315P-966 was only performed with a 1 mL total volume sample size. Samples sizes for the laboratory fortification samples was not reported.
- In the ILV, ground water (pH not reported, typical hardness <160 mg as CaCO₃) obtained as unadulterated water from a 100-meter bedrock, in-house well and surface water (Lot No. 17Oct16Wat-A-3; pH 6.9, dissolved oxygen concentration 9.3 mg/L) obtained from Weweantic River in West Wareham, Massachusetts were used in the study (pp. 27-28 of MRID 51086514). The water characterization laboratory for the surface water was Agvise Laboratories, Northwood, North Dakota; the water characterization for the ground water was not performed.
- The ILV validated the method for benzobicyclon and its six metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-966, and 1315P-076 in water was validated in the second trial at 0.001 mg/L (LOQ) and 0.01 mg/L (10×LOQ; pp. 16-20, 51 of MRID 51086514). For 1315P-962, the method was validated in the second trial at 0.01 mg/L (10×LOQ), but the method was not successfully validated at 0.001 mg/L (LOQ). The study author reported that the low LOQ recoveries of 1315P-962 were due to the fact that the fortification stock and analytical stock solutions were prepared in two different solvents. The study author also noted that the

LOD for 1315P-962 met acceptance criteria of 3:1 signal to noise ratio. The ILV performed the ECM method as written, except for the use of calibration standards which were interspersed with the test samples and insignificant modifications to the analytical parameters (pp. 27-35, 38-40). Following ILV recommendations/issues, the ECM should be updated to include interspersed calibration standards (p. 40). A 5-mL total volume sample size was used (pp. 33-34).

IV. Method Deficiencies and Reviewer's Comments

1. Since the reported method LOQ was not based on procedures defined in 40 CFR Part 136, the reported LOQ is the Lowest Level Of Method Validation (LLMV) rather than an LOQ (27, 33-34; Appendix 3, pp. 347-348; Appendix 3, Appendix B, pp. 528-541 of MRID 51086513; pp. 16-20, 41-46 of MRID 51086514). The lowest concentration tested with sufficiently accurate and precise recoveries is the LLMV. Based on the performance data submitted by the ILV and ECM, the LLMV was equivalent to the method LOQ for benzobicyclon and its six metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-966, and 1315P-076 in the tested water matrices (0.001 mg/L). Based on the performance data submitted by the ILV and ECM, the LLMV was equivalent to 0.01 mmg/L for metabolite 1315P-962.
2. The submitted ECM was a benzobicyclon aquatic field dissipation study which contained method validation data of the analytical method used to analyze the field samples. The original method was Golden Pacific Laboratories Method GPL-MTH-087 Revision 2 entitled "*Analytical Method for the Determination of Benzobicyclon and its Metabolites 1315P-070, 1315P-570, 1315P-683, 1315P-960, 1315P-076, 1315P-962, and 1315P-966 in Water by LC-MS/MS*" (M. Boatwright, July 2015; Appendix 3, p. 349 of MRID 51086513). The submitted ILV was performed using the protocol which was based on that same method, Golden Pacific Laboratories Method GPL-MTH-087 Revision 2 (M. Boatwright, 2015; pp. 16, 52; Appendix 1, p. 187 of MRID 51086514). However, the original method Golden Pacific Laboratories Method GPL-MTH-087 Revision 2 was not included in the submitted ECM or ILV. It was also noted that the author of Golden Pacific Laboratories Method GPL-MTH-087 Revision 2 was also the author of the analytical phase of the submitted ECM (benzobicyclon aquatic field dissipation study).

The analytical method for Golden Pacific Laboratories Method GPL-MTH-087 Revision 2 was only provided in summary and diagram form in the ECM (Appendix 3, pp. 348-349, 356; Appendix 3, Appendix A, p. 524 of MRID 51086513). Details of the fortification and calibration solution preparation were not included. Some sample processing details and LC/MS/MS parameters were not included.

The ILV study author (Kristen Bentley, Smithers Viscient) communicated directly via phone conference with the ECM study author (Megan Boatwright, Golden Pacific Laboratories, LLC) regarding ILV technical issues (p. 1; Appendix 3, p. 326 of MRID 51086513; p. 1; Appendix 3, pp. 214-215, 218-219 of MRID 51086514). The communications between the ILV study author (Kristen Bentley, Smithers Viscient), Paul Reibach (Technical Director, Smithers Viscient), Peter Stchur (undefined role, Smithers Viscient), ILV Study Monitors (Premjit Halarnkar and Chris Waid, Gowan Company), ECM study author (Megan Boatwright, Golden Pacific Laboratories, LLC), and Robert Testman (President, Golden Pacific Laboratories, LLC) were summarized in the ILV study report and communication details were provided in Appendix 3 of the ILV (pp. 1, 5, 39-40; Appendix 1, p. 164; Appendix 3, pp. 205-253 of MRID 51086514). Communications were in the form of email and phone conferences. Phone conference agendas and minutes were generally provided. Reported communications summary included: protocol and method issue, matrix differences, ILV failed first attempt, exchange of the results of the second attempt of the ILV. The correspondence details also involved ILV water matrix choice, ILV request for supporting chromatograms from the ECM, deadline changes, ILV issues with validating the

method for 1315P-962, ILV sample size concerns (5 mL versus 10 or 1 mL), the use of specific glassware, reagent manufacturers, or glass-cleaning procedures, and decision to proceed with a third trial or not. The reviewer noted that Paul Reibach explained that an ILV lab is allowed to ask for clarification of method steps if the first attempt is unsuccessful (Appendix 3, p. 228 of MRID 51086514). Interspersed calibration standards were necessary to successfully validate the analytical method (p. 40 of MRID 51086514).

3. No ECM updates were made or requested to include the use of specific glassware, reagent manufacturers, or glass-cleaning procedures since those modifications were not included for the ILV validation of the second trial.

4. ILV performance data was not acceptable for the validation of 1315P-962 at 0.100 mg/L in the ground and surface water (means 53.1-59.0%; Tables 1-30, pp. 53-82 of MRID 51086514; see Reviewer's Comment #13). OCSPP guidelines state that means should be 70-120% and RSD should be $\leq 20\%$. The study author reported that the low LOQ recoveries of 1315P-962 were due to the fact that the fortification stock and analytical stock solutions were prepared in two different solvents (p. 51). The study author also noted that the LOD for 1315P-962 met acceptance criteria of 3:1 signal to noise ratio. The reviewer noted that extensive communications occurred between the ILV and the ILV Study Monitor regarding the difficulties in validating the method for 1315P-962 (Appendix 3, pp. 218-219, 227-230, 245). The ILV tried remaking the fortification solutions with Fisher-brand acetonitrile (the same manufacturer as the ECM), as opposed to EMD-brand acetonitrile (the usual manufacturer of the ILV). This did not solve the issues of low recovery (increase to 80% from 50%, but not 100% in stock recovery checks). In ILV communications, the ECM study author (Megan Boatwright) made these two additional comments regarding the ILV issues validating the method for 1315P-962: acetonitrile concentration of fortification stock solution is important and final volumes of samples have had an effect on recoveries in other projects (Appendix 3, pp. 218, 227).

In the ILV communications, it was noted that 1315P-962 was of little toxicological concern and was observed in only a few samples of the dissipation study (Appendix 3, pp. 229, 245 of MRID 51086514).

5. The ILV ground water matrix was not characterized (pp. 27-28 of MRID 51086514). The ECM water matrices were two paddy waters (pp. 19-20; Appendix B, pp. 528-541; Appendix 3, Appendix B, pp. 725-797 of MRID 51086513). The ECM water characterization for the matrices used was not provided in the method validation report, but reviewer-correlated based on the Sample ID of the method validation samples and the water classification. It could not be determined if the Irrigation Water Pre-Flood or Paddy Water 58/60 DAA characterization data corresponded to the California and Louisiana water used for the method validation and laboratory fortification samples.

6. No ECM representative chromatograms were submitted for the method validation samples. Representative chromatograms were submitted for the laboratory fortification samples of the AFD, but only one matrix per analyte was submitted (Appendix 3, Appendix C, Figures 1-10, pp. 910-919; Figures 21-30, pp. 930-939; Figures 41-50, pp. 950-959; Figures 61-70, pp. 970-979; Figures 81-90, pp. 990-999; Figures 101-110, pp. 1010-1019; Figures 121-130, pp.

- 1030-1039; Figures 141-150, pp. 1050-1059 of MRID 51086513). The reviewer's evaluation of the specificity of the method for the ECM was based on chromatograms submitted for the laboratory fortification samples of the AFD.
7. The chemical purity of the ECM reference standard/test material for the benzobicyclon metabolite 1315P-962 was <90% (88.3%; p. 17; Appendix 3, p. 345 of MRID 51086513). OCSPP guidelines state that the chemical purity of non-radiolabeled test materials should be >90%.
 8. The DER included ECM data from the method validation samples and aquatic field dissipation laboratory fortification samples (p. 34; Appendix 3, Tables 2-15, pp. 369-382; Tables 29-44, pp. 396-415; Appendix 3, Appendix B, pp. 528-541; Appendix B, pp. 725-797 of MRID 51086513). California paddy water was used in the method validation study. For the laboratory fortification samples, the same California paddy water as that of the method validation was used, as well as Louisiana paddy water. Data from the aquatic field dissipation laboratory fortification samples was included in the DER since the only submitted representative chromatograms were from the aquatic field dissipation laboratory fortification samples.
 9. No reagent blank was included in the ECM.
 10. In the ECM, actual fortification levels ranged 0.00100-0.00101 mg/L and 0.0100-0.0101 mg/L, as well as 0.808 mg/L and 0.404 mg/L for the 800×LOQ and 400×LOQ laboratory fortification samples, respectively (Appendix 3, Tables 2-15, pp. 369-382; Tables 29-44, pp. 396-415 of MRID 51086513). The method validation was based on the nominal fortifications of 0.001 mg/L and 0.01 mg/L.
 11. The reviewer noted that a minor contaminant at RT *ca.* 2.25 min. was observed in ILV representative chromatograms of 1315P-070 (Figures 8-10, pp. 90-92 and Figures 48-50, pp. 130-132 of MRID 51086514). The reviewer proposed that this contaminant could have been the metabolite 1315P-570 or 1315P-960 since 1315P-570 and 1315P-960 occurred at RT *ca.* 2.29 and 2.28 min., respectively. The reviewer also noted that a minor contaminant at RT *ca.* 2.5 min. was observed in ECM representative chromatograms of 1315P-070. The reviewer proposed that this contaminant could have been the metabolite 1315P-570 since 1315P-570 occurred at RT *ca.* 2.56 min.
 12. The reviewer noted that the ILV reference standard/test material for the benzobicyclon metabolite 1315P-962 was stereospecific for the cis isomer (pp. 25-26 of MRID 51086514). This reference standard was provided by the Sponsor, Gowan Company. The ECM reference standard/test material for the benzobicyclon metabolite 1315P-962 was reportedly stereospecific for the cis isomer as well, but the structure shown was not stereospecific (p. 17; Appendix 3, p. 345; Appendix 3, Appendix C, Figure 138, p. 1047; Appendix 4, p. 1230 of MRID 51086513). The CAS # for 1315P-962 was reported in the ILV, but not in the ECM.
 13. The determinations of the LOD and LOQ in the ECM and ILV were not based on procedures as defined in 40 CFR Part 136 (pp. 27, 33-34; Appendix 3, pp. 347-348; Appendix 3, Appendix B, pp. 528-541 of MRID 51086513; pp. 16-20, 41-46 of MRID

51086514). No justification or calculations were provided to support the LOQ in the ECM or ILV. In the ECM, the LOD was reported without justification. In the ILV, the LOD was calculated using the following equation: $LOD = (3 \times (SN_{ctl}) / (Res_{PLS}) \times Conc_{CLS} \times DF_{ctl})$, where, LOD is the limit of detection of the analysis, SN_{ctl} is the mean noise in height of the control samples (or blanks), Res_{PLS} is the mean response in height of the two low calibration standards (0.250 µg/L), $Conc_{CLS}$ is the concentration of the low calibration standard, and DF_{ctl} is the dilution factor of the control samples. Detection limits should not be based on the arbitrarily selected lowest concentration in the spiked samples.

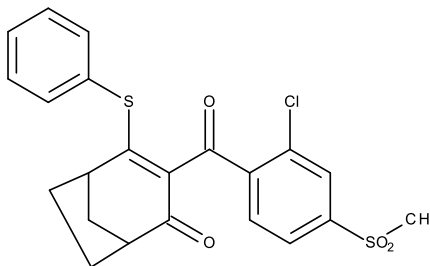
14. The storage stability was assessed in the ECM as part of the aquatic field dissipation study.
15. Solvent-based calibration standards were used in the ILV (p. 40 of MRID 51086514). Matrix effect assessment was not included in the ECM or ILV. It was assumed that solvent-based calibration standards were also used in the ECM.
16. The total time required to complete one set (one matrix) of 25 samples was reported as two calendar days total, with one working day (8 hours) for sample processing and LC/MS/MS analysis performed overnight (9 hours) in the ILV (p. 40 of MRID 51086514).

V. References

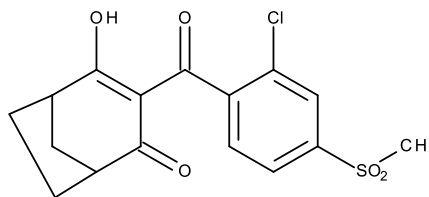
- U.S. Environmental Protection Agency. 2012. Ecological Effects Test Guidelines, OCSPP 850.6100, Environmental Chemistry Methods and Associated Independent Laboratory Validation. Office of Chemical Safety and Pollution Prevention, Washington, DC. EPA 712-C-001.
- USEPA. 2012. *Environmental Chemistry Method Guidance*. Memorandum From D. Brady to Environmental Fate and Effects Division. December 20, 2012. Environmental Fate and Effects Division. Office of Pesticide Programs. Office of Chemical Safety and Pollution Prevention. U.S. Environmental Protection Agency. Available at: <https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/environmental-chemistry-methods-guidance-pesticides>.
- 40 CFR Part 136. Appendix B. Definition and Procedure for the Determination of the Method Detection Limit-Revision 1.11, pp. 317-319, and Revision 2; 1994 and 2016.

Attachment 1: Chemical Names and Structures**Benzobicyclon (GWN-10037, SAN1315H, SB-500)**

IUPAC Name: 3-(2-Chloro-4-mesylbenzoyl)-2-phenylthiobicyclo[3.2.1]oct-2-en-4-one
CAS Name: 3-[2-Chloro-4-(methylsulfonyl)benzoyl]-4-(phenylthio)bicyclo[3.2.1]oct-3-en-2-one
CAS Number: 156963-66-5
SMILES String: CS(=O)(=O)c1ccc(c(c1)Cl)C(=O)C2=C(C3CCC(C3)C2=O)Sc4ccccc4

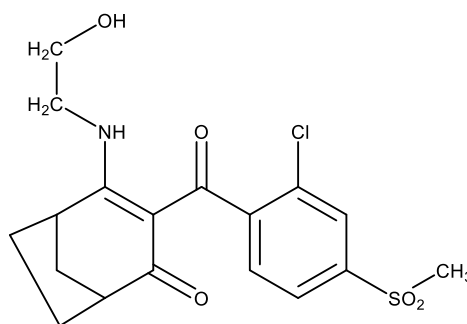
**1315P-070 (Metabolite B)**

IUPAC Name: 3-(2-Chloro-4-methylsulfonyl-benzoyl)-2-hydroxy-bicyclo[3.2.1]oct-2-en-4-one
CAS Name: Not reported
CAS Number: 126656-88-0
SMILES String: CS(=O)(=O)c1ccc(c(c1)Cl)C(=O)C2=C(C3CCC(C3)C2=O)O

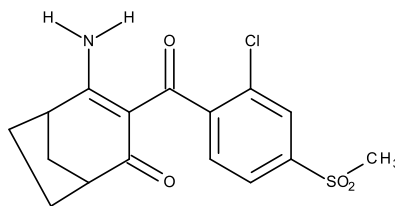


1315P-076

IUPAC Name: 3-(2-Chloro-4-(methylsulfonyl)benzoyl)-4-((2-hydroxyethyl)amino)bicyclo[3.2.1]oct-3-en-2-one
CAS Name: Not reported
CAS Number: Not reported
SMILES String: CS(C1=CC=C(C(C2=C(NCCO)C(C3)CCC3C2=O)=O)C(Cl)=C1)(=O)=O

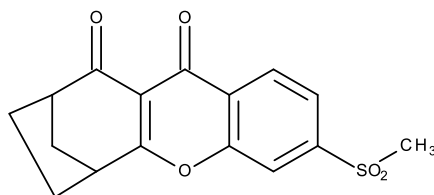
**1315P-570**

IUPAC Name: (3-(2-Chloro-4-methylsulfonylbenzoyl)-4-amino)bicyclo[3.2.1]oct-3-en-2-one
CAS Name: Not reported
CAS Number: Not reported
SMILES String: [H]N([H])C1=C(C(=O)C2CCC1C2)C(=O)c3ccc(cc3Cl)S(=O)(=O)C

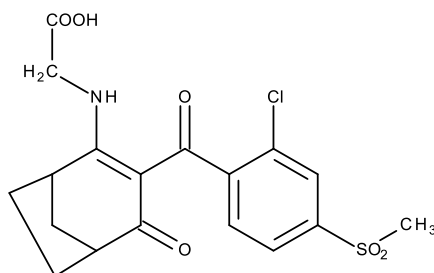


1315P-683

IUPAC Name: 3,4-Dihydro-2,4-ethylene-6-methylsulfonyl-1H-xanthane-1,9(2H)-dione
CAS Name: Not reported
CAS Number: Not reported
SMILES String: CS(=O)(=O)c1ccc2c(c1)oc3c(c2=O)C(=O)C4CCC3C4

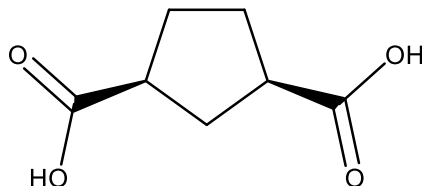
**1315P-960**

IUPAC Name: 2-[[3-(2-Chloro-4-methylsulfonyl-benzoyl)-4-oxo-2-bicyclo[3.2.1]oct-2-enyl]amino]acetic acid
CAS Name: Not reported
CAS Number: Not reported
SMILES String: CS(=O)(=O)c1ccc(c(c1)Cl)C(=O)C2=C(C3CCC(C3)C2=O)NCC(=O)O



1315P-962

IUPAC Name: cis-1,3-Cyclopentanedicarboxylic acid
(1R,3S)-cyclopentane-1,3-dicarboxylic acid
CAS Name: Not reported
CAS Number: 876-05-1
SMILES String: OC([C@H]1C[C@@H](C(O)=O)CC1)=O

**1315P-966**

IUPAC Name: 2-Chloro-4-methylsulfonyl-benzoic acid
CAS Name: Not reported
CAS Number: 53250-83-2
SMILES String: CS(=O)(=O)c1ccc(c(c1)Cl)C(=O)O

