## Appendix A. Summary of Submitted EcoToxicity Studies

### A. Aquatic Animal Toxicity studies

Several fish toxicity studies were submitted. Acute toxicity of Pendimethalin technical to fish is highly toxic and of the formulations, ranges from highly toxic to slightly toxic.

**Table 1. Freshwater Fish Toxicity**

| Common Name<br>Taxonomic | AI | Study Time | Toxicity (ppm) | Category | MRID |
|---|---|---|---|---|---|
| Acute Freshwater Fish Toxicity | | | | | |
| Bluegill sunfish<br>*Lepomis macrochirus* | 93.2 | 96 hr LC50 | 0.199 | Acceptable | 00046291<br>Sleight, 1972 |
| Rainbow trout<br>*Oncorhynchus mykiss* | 93.2 | 96 hr LC50 | 0.138 | Acceptable | 00046291<br>Sleight, 1972 |
| Channel catfish<br>*Ictalurus punctatus* | 93.2 | 96 hr LC50 | 0.418 | Acceptable | 00046291<br>Sleight, 1972 |
| Bluegill sunfish<br>*Lepomis macrochirus* | 3-E | 96 hr LC50 | 1.04 ppm formulation | Supplemental [2] | 00037927<br>Bentley, 1974 |
| Rainbow trout<br>*Oncorhynchus mykiss* | 3-E | 96 hr LC50 | 1.0 ppm formulation | Supplemental [2] | 00037927<br>Bentley, 1974 |
| Bluegill sunfish<br>*Lepomis macrochirus* | 45 | 96 hr LC50 | 0.92 ppm formulation | Supplemental [2] | 00037927<br>Bentley, 1974 |
| Rainbow trout<br>*Oncorhynchus mykiss* | 45 | 96 hr LC50 | 0.52 ppm formulation | Supplemental [2] | 00037927<br>Bentley, 1974 |
| Bluegill sunfish<br>*Lepomis macrochirus* | 2-S | 96 hr LC50 | 90.4 ppm formulation | Supplemental [2] | 00037927<br>Bentley, 1974 |
| Rainbow trout<br>*Oncorhynchus mykiss* | 2-S | 96 hr LC50 | 86.6 ppm formulation | Supplemental [2] | 00037927<br>Bentley, 1974 |
| Channel catfish<br>*Ictalurus punctatus* | 45 | 96 hr LC50 | 1.9 ppm formulation | Supplemental [2] | 00131773<br>LeBlanc, 1983 |
| Chronic Fish Full Life Cycle (ppm) | | | | | |
| Fathead minnow<br>*Pimephales promelas* | 98.3 | 288 D NOAEC | 0.0063 [1] | Acceptable | 00037940<br>EG&G Bionomics, 1975 |

1 LOAEC = 9.8 ppb for reduction of egg production. Reduced hatchability observed at 22 and 43 ppb.
2 Supplemental due to formulation product being tested and not technical

Acute toxicity of Pendimethalin technical to estuarine fish is categorized as highly toxic and the formulation is categorized as moderately toxic.

**Table 2. Estuarine Fish Toxicity**

| Common Name<br>Taxonomic | AI | Study Time | Toxicity (ppm) | Category | MRID |
|---|---|---|---|---|---|
| Sheepshead minnow<br>*Cyprinodon variegatus* | 92.2 | 96 hr | LC50= 0.71 ppm | Acceptable | 00131774<br>Ward, 1983 |
| Sheepshead minnow<br>*Cyprinodon variegatus* | 45 | 96 hr | LC50 = 1.7 ppm formulation | Acceptable | 00131774<br>Ward, 1983 |

Acute toxicity of Pendimethalin technical to freshwater invertebrates is categorized as highly toxic and moderately toxic. Pendimethalin formulation is categorized as slightly toxic and moderately toxic.

**Table 3. Toxicity of Freshwater Invertebrates**

| Common Name<br>Taxonomic | ai | Study Time | Toxicity (ppm) | Category | MRID |
|---|---|---|---|---|---|
| Water flea<br>*Daphnia magna* | 93.2 | 48 hr | EC50 = 0.28 | Acceptable | 00059738<br>LeBlanc, 1976 |
| Crayfish<br>*Procambarus simulans* | 94.2 | 96 hr | EC50 >1.0 | Supplemental [1] | 00071123<br>Thompson, 1980 |
| Water flea<br>*Daphnia magna* | 45.6 | 48 hr | EC50 = 5.1 ppm formulation | Acceptable | 00153772<br>Forbis, 1985 |
| Invertebrate life cycle study | | | | | |
| Water flea<br>*Daphnia magna* | 92.2 | 21-D | NOAEC = 0.0145 [2] | Acceptable | 00100504<br>Graney, 1981 |

1 Precipitate was seen of nominal concentrations over 1 ppm, the dissolved O2 concentration is less than 40% of saturation, and DMSO was used as a solvent which tends to increase mortalities rather than decrease them.

2 The NOAEC is based on reduced production of Daphnia. LOAEC = 0.0172 ppm (17.2 ppb). Mortality was observed in the study with 100% mortality at the 2 highest dose levels of 35.8 and 74.2 ppb. No appreciable mortality observed at 3 lowest concentration levels of 4.3, 8.2, and 14.5 ppb. Reduction of productivity of 50% occurred at 22.1 and 17.5 ppb concentration levels.

Acute toxicity of Pendimethalin technical to estuarine invertebrates is categorized as highly toxic.

**Table 4. Mollusca**

| Common Name<br>Taxonomic | ai | Study Time | Toxicity (ppm) | Category | MRID |
|---|---|---|---|---|---|
| Eastern oyster<br>*Crassostrea virginica* | 92.2 | 48 hr | EC50 = 0.21 | Acceptable | 00131775<br>Ward, 1983 |
| Pink shrimp<br>*Penaeus duorarum* | 92.2 | 96 hr | EC50 = 1.6 | Acceptable | 00131775<br>Ward, 1983 |
| Pink shrimp<br>*Penaeus duorarum* | 45 | 96 hr | EC50 = 11 ppm formulation | Supplemental [1] | 00131775<br>Ward, 1983 |
| Eastern oyster<br>*Crassostrea virginica* | 45 | 48 hr | EC50 =0.45 ppm formulation | Supplemental [1] | 00131775<br>Ward, 1983 |

1 Supplemental due to formulation being tested.

## B. Terrestrial Animal Toxicity Studies

Acute toxicity of Pendimethalin technical to birds is categorized as slightly toxic.

**Table 2. Acute Toxicity to Birds**

| Common Name<br>Taxonomic | ai | Study Time | Toxicity | Category | MRID<br>Author, Year |
|---|---|---|---|---|---|
| Mallard duck<br>*Anas platyrhynchos* | Tech | 8 D LD50 | 1421(mg/kg-bw) | acceptable | 00059739<br>Fink, 1976 |

| | | | | | |
|---|---|---|---|---|---|
| Mallard duck<br>*Anas platyrhynchos* | Tech | 8 D<br>LC50 | >4640 ppm [1] | acceptable | 00026674<br>Fink, 1973 |
| Bobwhite quail<br>*Colinus virginianus* | Tech | 8 D<br>LC50 | 4187 ppm | acceptable | 00026675<br>Fink, 1973 |

1 20% mortality at 4640 ppm and no mortality below 2150 ppm

**Table 6. Avian Reproduction Studies**

| Species | a.i. | NOAEL (ppm) | LOAEL (ppm) | Endpoint affected | Category | MRID<br>Author, year |
|---|---|---|---|---|---|---|
| Mallard duck<br>*Anas platyrhynchos* | 92.6 | 141 | 1410 | 14-day survivor bodyweight | Acceptable | 44907601<br>Beavers, 1996 |
| Bobwhite quail<br>*Colinus virginianus* | 92.4 | >1410 | >1410 | none | Acceptable | 44907602<br>Beavers, 1996 |

**Acute Honey Bee Toxicity Studies**

Pendimethalin is categorized as practically non-toxic to honey bees.

**Table 7. Toxicity to Insects**

| Common Name<br>Taxonomic | ai | Study Time | Toxicity (ug/Bee) | NOAEL | Category | MRID<br>Author, year |
|---|---|---|---|---|---|---|
| Honey bee<br>*Apis mellifera* | Tech | 48 hr LD50 | 49.8 | Not reported | Acceptable | 00099890<br>Atkins, 1974 |

No mortality was reported at the highest concentration level (49.8 ug/bee).

**C. Plant Toxicity Studies**

**Table 8. Toxicity of pendimethalin to Aquatic Plant**

| Common Name<br>Taxonomic | AI | Study Time | $EC_{50}$ (**ppb**) | NOAEL | Category | MRID |
|---|---|---|---|---|---|---|
| Green algae<br>*Selenastrum capricornutum* | 92.9 | 120 h<br>EC50 | 5.4 ppb | 3.0 | Acceptable | 42372204<br>Hughes, 1992 |
| Marine diatom<br>*Skeletonema costatum* | 92.9 | 120 h<br>EC50 | 5.2 ppb | 0.7 | Acceptable | 42372205<br>Hughes, 1992 |
| Freshwater diatom<br>*Navicula pelliculosa* | 92.9 | 120 h<br>EC50 | 6.7 ppb | 3.2 | Acceptable | 42372206<br>Hughes, 1992 |
| Bluegreen algae<br>Anabaena flos-aquae | 92.9 | 120 h<br>EC50 | >174 ppb | 98 | Acceptable | 42372207<br>Hughes, 1992 |
| Duckweed<br>Lemna gibba | 93 | 14 D<br>EC50 | 12.5 ppb | 5.6 | Acceptable | 42137101<br>Hughes, 1991 |

**Table 9. Toxicity of Pendimethalin to Terrestrial Plant**

| Common Name<br>Taxonomic | EC25<br>(lb a.i./A) | NOAEC | Endpoint | Category | MRID<br>Author, Year |
|---|---|---|---|---|---|
| Seedling Emergence (93 % a.i.) | | | | | |
| Soybean<br>*Glycine max* | 4.7 | 2.0 | Dry weight | Acceptable | 42372201<br>Chetram, 1992 |
| Lettuce<br>*Lactuca sativa* | 0.09 | 0.063 | Dry weight | Acceptable | |
| Radish<br>*Rhaphanus sativus* | 0.86 | 0.13 | Plant height | Acceptable | |
| Tomato<br>*Lycopersicon esculentum* | 0.2 | 0.13 | Dry weight | Acceptable | |
| Cucumber<br>*Cucumis sativus* | 2.4 | 0.25 | Plant height | Acceptable | |
| Cabbage<br>*Brassica oleracea* | 0.44 | 0.25 | Plant height | Acceptable | |
| Oat<br>*Avena sativa* | 1.0 | 0.25 | Plant height | Acceptable | |
| Ryegrass<br>*Lolium perenne* | 0.01 | 0.065 [1] | Dry weight | Acceptable | |
| Corn<br>*Zea mays* | 0.68 | 0.5 | Plant height | Acceptable | |
| Onion<br>*Allium cepa* | 0.08 | 0.06 | Dry weight | Acceptable | |
| Vegetative Vigor | | | | | |
| Soybean<br>*Glycine max* | 0.27 | 0.13 | Dry weight | Acceptable | 42372203<br>Chetram, 1992 |
| Lettuce<br>*Lactuca sativa* | 0.10 | 0.003 | Dry weight | Acceptable | |
| Radish<br>*Rhaphanus sativus* | >4.0 | >4.0 | n/a | Acceptable | |
| Tomato<br>*Lycopersicon esculentum* | 0.5 | 0.13 | Dry weight | Acceptable | |
| Cucumber<br>*Cucumis sativus* | >4.0 | >4.0 | n/a | Acceptable | |
| Cabbage<br>*Brassica oleracea* | 4.8 | 2.0 | Dry weight | Acceptable | |
| Oat<br>*Avena sativa* | 0.78 | 0.5 | Dry weight | Acceptable | |
| Ryegrass<br>*Lolium perenne* | 0.034 | 0.0008 | Dry weight | Acceptable | |
| Corn<br>*Zea mays* | 2.8 | 2.0 | Plant height | Acceptable | |
| Onion<br>*Allium cepa* | 0.56 | 0.50 | Plant height | Acceptable | |

1 EC05 was used in lieu of NOEAC since study was unable to determine NOAEC value