TECHNICAL MEMORANDUM

DATE 15 August 2014

PROJECT No. 127635006-018-M-Rev0-05300-HSCA Groundwater Tracers

TO Simon Kearney
QGC

CC Chris Lingard (QGC)

FROM Madeleine Thomas

EMAIL Madeleine_Thomas@golder.com.au

HAZARD ASSESSMENT OF FLUOROBENZOIC ACID GROUNDWATER TRACERS

1.0 INTRODUCTION

QGC has requested that Golder Associates Pty Ltd (Golder) undertake a hazard assessment of fluorobenzoic acid (FBA) groundwater tracers proposed for use in QGC's stimulation activities. The assessment is in regards to their potential toxicity to human health and toxicity to both aquatic and terrestrial environments.

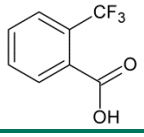
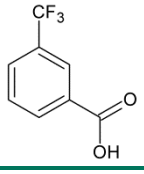
1.1 Background

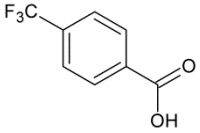
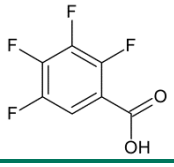
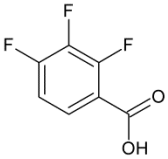
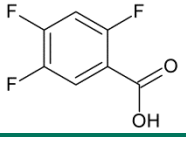
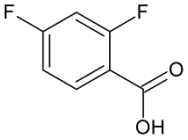
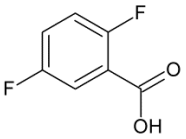
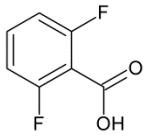
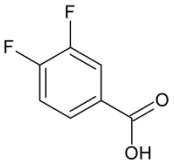
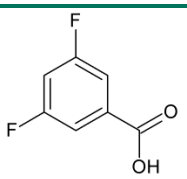
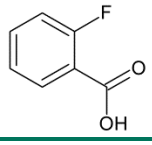
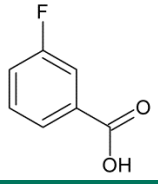
Golder has previously assessed a number of hydraulic stimulation chemicals for human health and ecological hazards for QGC. The chemical assessments are documented in the report*: Human Health and Ecological Chemical Assessment – Hydraulic Stimulation Chemical Assessment – QGC Surat and Bowen Basin Operation* (Golder Ref: 127635006-004-R-Rev1, dated 21 February, 2014). This assessment of FBA groundwater tracers is provided as an addendum to the 21 February 2014 Report.

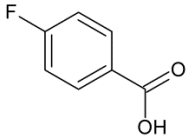
1.2 Groundwater Tracers

QGC provided Golder with Material Safety Data Sheets (MSDS) for fourteen (14) chemical groundwater tracers, listed in Table 1 below. The MSDSs are included in Attachment 1. Golder understands that QGC propose to add the groundwater tracers to stimulation fluid, each for a different stimulation stage, at a concentration of approximately 0.76 mg/L per tracer (see Section 3.0). QGC plan to undertake a well flow back monitoring program which will measure the tracer quantities recovered and indicate the relative performance of each stage of stimulation.

Table 1: Chemical Groundwater Tracers

Compound	Acronym	CASRN	Molecular Structure
2-(Trifluoromethyl)benzoic Acid	2-TFMBA (*o*-TFMBA)	433-97-6	
3-(Trifluoromethyl)benzoic Acid	3-TFMBA (*m*-TFMBA)	454-92-2	

Compound	Acronym	CASRN	Molecular Structure
4-(Trifluoromethyl)benzoic Acid	4-TFMBA (*p*-TFMBA)	455-24-3	
2,3,4,5-Tetrafluorobenzoic Acid	2,3,4,5-TeFBA	1201-31-6	
2,3,4-Trifluorobenzoic acid	2,3,4-TFBA	61079-72-9	
2,4,5-Trifluorobenzoic acid	2,4,5-TFBA	446-17-3	
2,4-Difluorobenzoic Acid	2,4-DFBA	1583-58-0	
2,5-Difluorobenzoic Acid	2,5-DFBA	2991-28-8	
2,6-Difluorobenzoic Acid	2,6-DFBA	385-00-2	
3,4-Difluorobenzoic Acid	3,4-DFBA	455-86-7	
3,5-Difluorobenzoic Acid	3,5-DFBA	455-40-3	
2-Fluorobenzoic Acid	2-FBA	445-29-4	
3-Fluorobenzoic Acid	3-FBA	455-38-9	

Compound	Acronym	CASRN	Molecular Structure
4-Fluorobenzoic Acid	4-FBA	456-22-4	

Notes: CASRN - Chemical Abstracts Service Registry Number

1.3 Approach

A review of the groundwater tracers listed in Table 1 revealed that there was limited information available from standard reference databases/sources on the individual chemicals. Based on the limited information available, Golder was unable to complete full human health or ecological assessments on each of the groundwater tracers (in line with the methodologies used in the report listed above, *Human Health and Ecological Chemical Assessment – Hydraulic Stimulation Chemical Assessment – QGC Surat and Bowen Basin Operation* (Golder, 2014)).

Therefore, Golder undertook the hazard assessment as a staged approach:

1) An initial literature review on the groundwater tracers as a group (i.e. fluorobenzoic acid compounds).
    a. Where information could be sourced, a hazard assessment was undertaken on the group as a whole.
    b. Where information was lacking, a surrogate compound was assigned and assessed.
2) Hazard assessment of a chosen surrogate compound.

1.4 Scope of Works

As a part of this assessment, the following scope of work was completed:

- Literature review and summary of potential human health and ecotoxicological hazards posed by FBAs
- Preparation of a human health toxicological profile for the surrogate chemical benzoic acid (discussed in Section 2.2.3).
- A mass balance calculation for the groundwater tracers.
- Preparation of this technical memorandum.

A summary of the information collated is provided in the following sections:

- FBAs Hazard Assessment – Section 2.0
    - Human Health (including benzoic acid assessment) – Section 2.2
    - Ecotoxicology – Section 2.3
- Mass balance calculations for the groundwater tracers are presented in Section 3.0.

2.0 FLUOROBENZOIC ACID COMPOUNDS HAZARD ASSESSMENT

2.1 General

FBAs are a group compounds characterised by the substitution of one or more hydrogen atoms with a fluorine atom on the benzene ring of a benzoic acid compound. Also included are compounds with fluorinated methyl groups attached to the benzene ring. FBAs vary in the number and position of the fluorine atom (or fluorinated-methyl group) (Hu and Moran, 2005). There are up to 16 FBA isomers or derivatives that exhibit similar physical properties and environmental behaviour (Hu and Moran, 2005).

The use of FBAs as groundwater tracers has been studied since the 1980s. FBAs are used as groundwater tracers because they do not occur naturally, are relatively nonreactive, are generally resistant to degradation

in groundwater and are detectable at low concentrations (McCarthy *et al*., 2000; Hu and Moran, 2005). Analytical methods allow different isomers within the FBA group to be distinguished from each other, hence multiple FBAs can be applied either simultaneously or sequentially (Hu and Moran, 2005). In addition, FBAs appear to have low aquatic toxicity (McCarthy *et al.*, 2000), which is discussed further in Section 2.3.2.

2.2 Human Health Toxicity

Golder undertook an extensive review of the literature to ascertain any specific information on the human health toxicity of fluorochemicals and in particular, fluorobenzoic acids (FBAs). Human toxicity data were limited and the following information provides a summary perspective of the data found. FBAs have not been evaluated by the International Agency for Research on Cancer Carcinogen (IARC) for carcinogenicity (IARC, 2014). FBAs have also not been identified in the European Commission (EC)'s report "*Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption*" as a substance of interest (EC, 2000).

Of particular note, however, was an associated study of the efficacy of quinolone derivatives in arresting the growth of adenocarcinoma cells in an "in vitro" evaluation (Olszewska *et al.*, 2014). This recent study of the anti-lung cancer properties of 2,3-dihydro-1H-cylopenta[b]-quinoline derivatives substituted with 4-fluorobenzoic acid (4-FBA) or hydrazinonicotinic acid, reported that compounds with a 4-FBA moiety were effective in inhibiting up to 50% cancer cell growth at concentration below 20 µg/L. Adenocarcinoma cell growth was inhibited by mechanisms that involve cell cycle arrest in G0/1 phase and induction of apoptosis. This suggested a protective effect of the influence of 4-FBA as an attached structural moiety to the main compound of interest, however, without a clear understanding of the biochemical mechanisms these data should be treated with caution.

Available animal toxicity studies on FBAs are summarised is Section 2.2.1.

2.2.1 Animal Toxicity Studies

Tai *et al.* (1986) studied the toxicity of 24 fluorinated aromatic compounds in rats. The compounds were administered to 7 week old Wistar rats by gavage, and mortality 72 hours after exposure was reported. Generally, the FBA compounds appeared less toxic than other aromatic fluorinated compounds (such as fluorinated phenols, benzaldehyde, benzoyl chlorides and benzyl alcohol compounds). The oral acute LD_{50} reported for FBAs are summarised in Table 2.

Table 2: Reported LD_{50} (g/kg) for fluorobenzoic acid compounds

Compound	LD_{50} (mg/kg)
2--Fluorobenzoic Acid (2-FBA)	4 000
3--Fluorobenzoic Acid (3-FBA)	3 000
4--Fluorobenzoic Acid (4-FBA)	> 5 000
2-(Trifluoromethyl)benzoic Acid (2-TFMBA)	> 5 000
4-(Trifluoromethyl)benzoic Acid (4-TFMBA)	> 5 000

LD_{50}: Lethal Dose for 50% of the test population. Data from Tai et al. (1986)

The Tai *et al.* study also reported a decrease in movement and weakness around the LD_{50} dosage level. A decrease in body weight was observed for one to two days after administration of 2-FBA and 3-FBA. The authors suggested that this body weight decrease was primarily a consequence of gastrointestinal impairment as the decline of body weight was recovered within one or two days (Tai *et al.*1986). Furthermore, the authors reported additional symptoms such as central-nervous system depression, diarrhoea and decrease of body temperature, however, no dose data were reported at which these symptoms occurred. The study concluded that the toxicity of fluorinated compounds was estimated to be similar to those of the parent non-fluorinated compounds, which in this case is benzoic acid.

This conclusion was supported by an earlier study conducted by Hager and Starkey (1943) which reported that benzoic acids substituted with fluorine were less toxic than other types of halogen-substituted benzoates and only slightly more toxic than un-substituted benzoic acid (Hager and Starkey 1943, as cited in Benson and Bowman, 1994).

2.2.2 Uncertainty analysis

The information presented on FBAs as presented in Section 2.2.1is weighted to acute toxicity outcomes and does not reflect information across a range of other toxicological outcomes. These include carcinogenicity, mutagenicity, reproductive toxicity, chronic toxicity, irritation or sensitivity.

Based on available information, animal toxicity studies suggest that FBAs may be considered to be of the same toxicity or only slightly more toxic than benzoic acid. On this basis and taking account limitations in some of the toxicological parameter profiles expressed above, benzoic acid has been considered as a surrogate compound to review potential hazards associated with FBAs.

2.2.3 Surrogate Review - benzoic acid

The Human Health Toxicity Profile for benzoic acid is included in Attachment 2, with the results of the review summarised below.

Benzoic acid is a white solid which is soluble in water and occurs naturally in foods, such as fruit and berries. It is used in food production as an antimicrobial agent and a flavouring agent (ECHA 2014, US FDA 2013). Benzoic acid is listed as "*Generally Recognised as Safe*" (GRAS) by the U.S. Food and Drug Administration's (FDA) Select Committee on GRAS Substances (SCOGS) (US FDA 1973; 2013). Current uses of benzoic acid result in a maximum level of 0.1 % in food. The US EPA's Integrated Risk Information System (IRIS) database provides an oral RfD for benzoic acid of 4 mg/kg/day (US EPA 1993). Benzoic acid appears to have relatively low oral toxicity, with the toxicity limited to dermal exposure, where irritancy is evident, and ocular exposure, where it has been demonstrated to be corrosive resulting in the potential to cause serious (irreversible) eye damage (ECHA 2014). Based on the potential corrosive properties of the compound, it has been assigned a Hazard Band Rating of 3 (0 being lowest and 4 being highest). These concerns relate to occupational settings where the acid powder may be used (e.g. in the preparation of solutions) and where occupational management measures would be required.

2.2.4 Summary

On the basis of equivalence in toxicity between the fluorinated benzoic acids and benzoic acid, FBA compounds appear to pose low oral toxicity to human health. In regards to benzoic acid toxicity and additional toxicological information relevant to benzoic acid, there is a potential that FBA compounds may also result in irritancy following dermal exposure and corrosive effects following ocular exposure where it has been demonstrated to cause serious (irreversible) eye damage. The hazards are thus limited to those readily managed through occupational health management measures.

2.3 Ecotoxicity

2.3.1 Environmental Fate and Transport

In the environment, the sorption and transportation of FBAs is dependent on soil pH, as their transport is primarily influenced by the presence of the carboxylic acid group (Flury and Wai, 2002). pK_a (logarithmic acid dissociation constant) values for the compounds are generally relatively low, which means that under most environmental conditions (near neutral environments), FBAs are predominately negatively charged. However, under increasingly acidic conditions FBAs become predominately non-ionized, which studies have shown to increase sorption and retardation of the compounds (McCarthy *et al.*, 2000 and Flury and Wai, 2002). McCarthy *et al.* (2000) reported that the extent of sorption and retardation under acidic conditions is progressively greater for FBA isomers with higher pK_a values. Studies have shown that the transport properties of FBAs are similar to, and sometimes indistinguishable from, bromine anions (Br^-) (Bowman and Gibbens, 1992, Benson and Bowman, 1994).

FBAs with direct aromatic ring substitution by two or more fluorine exhibit the greatest resistance to degradation in the environment (Bowman and Gibbens, 1992). Bowman and Gibbens (1992) ranked the FBAs in the following order of reliability as stable, nonreactive anionic tracers: pentafluorobenzoate (PFBA) > 2,6-difluorobenzoate (2,6-DFBA) > 2,3-DFBA = 2,5-DFBA = 3,4-DFBA = 3,5-DFBA > *o*-trifluoromethylbenzoate (*o*-TFMBA) > *m*-TFMBA. Bowman and Gibbens (1992) indicated that the difluorobenzoate tracers were stable and did not undergo sorption reaction in arid-zone soils and aquifers for periods of at least three months. These results vary from the results of a study using neutral pH and high organic soils, where 3,5-DFBA and *m*-TFMBA apparently underwent irreversible interaction in the soil causing a loss of mass in the solution phase (this was not observed for PFBA, 2,6-DFBA and *o*-TFMBA)

(Jaynes, 1994). The mechanisms which lead to the loss of mass of 3,5-DFBA and *m*-TFMBA were hypothesised to potentially include slow adsorption of FBAs onto the mineral or organic phases of the soil (i.e. not degradation), as well as potential microbial degradation of the FBAs (Jaynes, 1994). Another study showed that mono-fluoro benzoates (o-, m-, and p-isomers) degrade readily under aerobic conditions (Bentley, 1983 cited by Bowman and Gibbens, 1992). The amount of degradation observed or potential mechanisms for degradation were not discussed.

2.3.2 Aquatic Toxicity

The lowest freshwater toxicity value reported by the ECOTOX Databased (USEPA, 2014) for fish (fathead minnow, *Pimephales promelas*) was an acute (4-days) Lethal Concentration $(LC)_{50}$ of 69 mg/L for 2,6-DFBA. Based on the hazard rank scores previously developed by Golder (2014), this concentration indicates moderate toxicity. Toxicity data for other FBAs was not listed.

McCarthy *et al.* (2000) studied the aquatic invertebrate toxicity of four FBAs (2,6-DFBA, 3,5-DFBA, 2,3,6-TFBA and PFBA) over a range of pK_a values (2.7 to 3.6). The test involved a 96-h acute toxicity test on *Ceriodaphnia sp.* and involved five concentrations (1, 10, 100, 300 and 1000 mg/L) of each of the four FBA compounds. The study showed that none of the FBA compounds were highly toxic, with a minimum LC_{50} of greater than 100 mg/L (3-5 DFBA). The study found that, in general, toxicity appeared to increase with an increasing degree of fluorination (di and tri-FBAs compared with pent-FBA) and increasing pK_a (2,6-DFBA (pK_a 2.85) compared with 3-5 DFBA (pK_a 3.59)). It is noted that the highest toxicity was observed for 3,5-DFBA, which was on the lower end of the degree in fluorination but did have the highest pK_a value. The study reports that these findings are consistent with a pattern of increased toxicity for larger or more hydrophobic isomers, which would be expected to be more readily accumulated in aquatic biota (McCarthy *et al.*, 2000).

Zhao *et al.* (1998) reported that the toxicity of 4-FBA to the aquatic invertebrate *Daphnia magna* decreased with increasing pH. The study suggests that although both the ionized and non-ionized forms of benzoic acid compounds contribute to their aquatic toxicity, the non-ionized form plays a more significant role, based on the observed decrease in toxicity with increasing pH. The authors hypothesise that this is due to faster uptake of the non-ionised form through biological membranes (Zhao *et al.* 1998). The study also investigated the toxicity of bromo-, chloro- and amino- benzoic acid compounds and found that the toxicity to *Vibrio fischeri* (a marine bacterium) and *Daphnia* decreased in the order of bromo > chloro > fluoro ≈ amino benzoic acids.

The same pattern of halogenated benzoic acid toxicity was observed by Lee and Chen (2009), who reported brominated benzoates were consistently more toxic than the chloro- and fluoro- containing compounds to *Pseudokirchneriella subcapitata* (algae). This conclusion was based on the following toxicity ranking 4-bromobenzoic acid > 4-chlorobenzoic acid > 4-FBA. The study also reported that for the different isomers of chlorinated benzoic acids, halogens at the meta- and para- position were more toxic than compounds with the halogen at the ortho-position (Lee and Chen, 2009). The reason provided for this was that ortho-halogenated benzoic acids were more ionized (having lower pK_a values) and were, therefore, less toxic than the meta- and/or para-substituted acids. This study provided an EC_{50} (effect concentration for 50% of the test population) of 16.91 mg/L and a NOEC (No Observed Effect Concentration) of 2.82 mg/L for 4-FBA exposure of algae (Lee and Chen, 2009). Based on Golder (2014), these concentrations correlate to “low to moderate” hazard ranks for aquatic toxicity. Algae biomass was measured after 48 hours and the test was conducted at an initial pH of 6.5. The EC_{50} and NOEC reported for benzoic acid were 36.39 mg/L and 4.81 mg/L, respectively. These concentrations are also correlated to “low to moderate” hazard ranks for aquatic toxicity.

2.3.3 Terrestrial Toxicology

A terrestrial plant growth study indicated that soybean *(Glycine max [L] Merr.*) plant growth was significantly (P=0.05) decreased compared to the control after treatments using 3,5-DFBA (Jaynes, 1994). No significant changes in plant growth were observed compared with the control for soybean after treatment using other FBAs (PFBA, 2,6-DFBA, 3,4-DFBA, 2,5-DFBA, *o*-TFMBA, *m*-TFMBA) or for corn *(Zea mays L.)* after treatment of all FBAs included in the study. The study involved the application of each tracer at 3 g/m^2 to 21-day old plants. The plants were harvested 14 days after tracer application and dry plant weight was measured following 24 hours of drying.

A study by Bowman *et al.* (1997) reported that at soil solution concentration at or above 125 mg/L (equivalent to 17 mg/kg soil or 0.57 g/m^2), PFBA, 2,6-DFBA and 3,4-DFBA inhibited the growth of alfalfa, barley and canola. The growth of the three crops was not inhibited by FBA concentrations of 50 mg/L (6.7 mg/kg soil or 0.23 g/m^2). The study also found that measurable amounts of each tracer (0.1 – 55% of applied tracer) were recovered in the plant tissue of alfalfa, barley and canola and that significant amounts of PFBA, 2,6-DFBA and 3,4-DFBA were not recovered due to soil degradation and/or plant metabolism. The study concluded that plant toxicity, uptake and metabolism of PFBA, 2,6-DFBA and 3,4-DFBA will be a concern if these compounds are used in the presence of growing plants (Bowman *et al*., 1997).

2.3.4 Uncertainty analysis

The information found on ecological toxicity was considered adequate to assess the persistence, bioaccumulation and toxicity of FBA in an environmental setting. Therefore, an environmental review of benzoic acid as a surrogate compound has not been undertaken.

2.3.5 Summary

FBAs are primarily used as groundwater tracers in hydrogeological studies. To be effective groundwater tracers, FBAs are required to be non-reactive and resistant to degradation in groundwater. Based on this, it's considered these compounds will be persistent in the environment, although some studies have shown mono-fluoro benzoates degrade readily under aerobic conditions. FBAs with direct aromatic ring substitution by two or more fluorine exhibit the greatest resistance to degradation in the environment.

Transport and sorption of FBAs is dependent on soil pH, due to the influence of the carboxylic acid group. Under most environmental conditions (near neutral environments), FBAs are predominately negatively charged. However, under increasingly acidic conditions FBAs become predominately non-ionized, which studies have shown increased sorption and retardation of the compounds.

Generally, FBAs appear to be of low to moderate aquatic toxicity. The lowest LC_{50} value reported (for 2,6-DFBA to fathead minnows) was 69 mg/L, which is two orders of magnitude higher than the calculated concentrations proposed in the stimulation fluid (0.76 mg/L; mass balance calculations are presented in Section 3.0). Toxicity was reported to increase with the increasing degree of fluorination and also with decreasing pH (resulting in the presence of the non-ionized form of FBAs). This increase in toxicity is considered likely due to the larger or more hydrophobic isomers more readily bioaccumulating in aquatic biota.

Low concentrations of FBAs also appear to be of low to moderate terrestrial plant toxicity. Studies have shown FBAs can inhibit the growth of plants when soil solution concentration were at or above 125 mg/L. FBAs were also observed in the plant tissue at levels of 0.1 – 55% of the applied tracer.

3.0 MASS BALANCE CALCULATIONS

QGC provided the following information on the application of the FBA groundwater tracers during the hydraulic stimulation process:

- The proposed mass of each tracer per fracturing stage is approximately 144 g (equal to 0.144 kg).
- The proposed volume of stimulation fluid (not including proppant) per stage is approximately 50 000 gal (189 270 L).
- It is assumed there will be 10 hydraulic fracturing stages per well. A different tracer is proposed to be added to each stage and the flow back water quality monitoring program will provide a qualitative assessment of the relative performance of each stage following well stimulation.

Based on this information and assuming that the density of the total fluid volume is 1 kg/L, the concentration of each tracer per stimulation is estimated to be 7.6 x10^{-7} kg/L (0.76 mg/L). The tracers will comprise approximately < 10^{-4} % of the hydraulic stimulation solution.

Golder understands that the stimulation will be undertaken as a staged approach. This method will include the initial drilling of the well and preparation for hydraulic stimulation. The well will then be fractured in 10 sequential stages, completing the stimulation. Once completed the flow back fluid will be retrieved. This process will result in 10 x 144 g of tracer added per well over the whole stimulation process, resulting in a

total of 1 440 g of tracers. This, however, will not theoretically change the concentration of tracer in the well as 50 000 gal of fluid will also be added for each stage (i.e. a total of 500 000 gal).

Following completion of the stimulation process, a percentage fraction of the injected hydraulic stimulation chemical mass will remain in the well. If it is conservatively assumed that 20% of the hydraulic stimulation fluid remains in the formation (reasonable 'worst case') this would correspond to approximately 0.3 kg of chemical additives per well.

4.0 UNCERTAINTY ANALYSIS

This evaluation of the human health and ecological hazards of the FBA tracers is limited to the quantity and quality of information available in the information sources reviewed and the literature received by Golder from the provider. A measure of the data completeness across the toxicological and hazard parameters used has been estimated expressed as a percentage of the parameters for which data were available. These are presented for the benzoic acid assessment in Attachment 2. Overall, sufficient human health toxicity data on the surrogate compound benzoic acid was found (92% completeness). For aquatic toxicity, there was considered to be sufficient data to categorise the FBAs as having low to moderate toxicity.

An assessment of the quality of the available data is beyond the scope of this report. In the absence of such a review Golder has relied on primary literature sources from established, robust and reputable sources such as the FDA and US EPA, where available. As new toxicological data are generated and become available in the published literature, the information presented in this hazard evaluation and the associated conclusions may be subject to change. On this basis the hazard profiles are dated to enable future review as may be appropriate. This is particularly pertinent across human health parameters within the highest Hazard Band category (4) which includes such areas as endocrine disruption potential and carcinogenicity.

5.0 EXCLUSIONS

This document provides a hazard assessment which reflects the potential concerns associated with the intrinsic toxicity of the substances reviewed. This does not include exposure assessment considerations that may realise the expression of this toxicity, however, comment is made to place exposures into perspective associated with fate and transport properties. Assessment of mixtures and potential break-down products is considered beyond the scope of a screening level human health and environmental hazard assessment.

6.0 CONCLUSIONS

Generally, FBAs appear to be of low to moderate human and ecological toxicity when used at low concentrations as groundwater tracers. However, in regards to benzoic acid toxicity and additional toxicological information relevant to benzoic acid, there is a potential that FBA compounds may also result in irritancy following dermal exposures and corrosive effects following ocular exposures where it has been demonstrated to cause serious (irreversible) eye damage. These concerns subsequently relate to occupational settings where the acid powder may be used (e.g. in the preparation of solutions) and where occupational management measures would be required.

The outcomes of the FBA groundwater tracers assessment does not change the overall conclusions of the *Human Health and Ecological Chemical Assessment – Hydraulic Stimulation Chemical Assessment – QGC Surat and Bowen Basin Operation* report (Golder, 21 February 2014).

7.0 LIMITATIONS

Your attention is drawn to the document - "Limitations", which is included in Attachment 3 of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by Golder, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

8.0 REFERENCES

Benson, C. F. and Bowman, R. S.,1994. *Tri- and Tetrafluorobenzoates as Nonreactive Tracers in Soil and Groundwater.* Soil Science Society of America Journal, Vol. 58, July – August,1994, pp. 1123 - 1129

Bowman, R. S. and Gibbens, J. F. 1992. *Difluorobenzoate as nonreactive tracers in soil and ground water*. Ground water. V. 30, pp. 8 – 14.

Bowman, R. S., Schroeder, J., Bulusu, R., Remmenga, M. and Heightman, R. 1997. Plant Toxicity and Plant Uptake of Fluorobenzoate and Bromide Water Tracers. Journal of Environmental Quality, Vol. 26, 1997, pp. 1292 – 1299.

ECHA (European Chemicals Agency Registered Chemical Substances Search) 2014. *Dossier for Benzoic Acid*. Available at http://apps.echa.europa.eu/registered/data/dossiers/DISS-9d8b8ff8-7308-2921-e044-00144f67d249/AGGR-56f3e120-e134-4900-9f67-a051b2614122_DISS-9d8b8ff8-7308-2921-e044-00144f67d249.html#AGGR-56f3e120-e134-4900-9f67-a051b2614122, Accessed August 2014.

EC (2000). European Commission. *Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption, preparation of a candidate list of substances as a basis for priority setting*, Final Report (Incorporating corrigenda to final report dated 21 June 2000). BKH Consulting Engineers, Delft, The Netherlands in association with TNO Nutrition and Food Research, Zeist, The Netherlands Available at http://ec.europa.eu/environment/chemicals/endocrine/strategy/substances_en.htm#priority_list, Accessed August 2014

Flury, M. and Wai, N. N., 2002. *Dyes as Tracers for Vadose Zone Hydrology*. Reviews of Geophysics, Vol 41, No. 1, 2003, 1002

Golder (Golder Associates Pty Ltd), 2014. *Human Health and Ecological Chemical Assessment – Hydraulic Stimulation Chemical Assessment – QGC Surat and Bowen Basin Operation*. Golder Ref. 127635006-004-R-Rev1. Submitted to QGC, 21 February 2014.

Hu, Q. and Moran, J. E., 2005. *Simultaneous analyses and applications of multiple fluorobenzoate and halide tracers in hydrologic studies*. Hydrological Processes, Vol: 19, 2005, pp. 2671 - 2687

IARC (2014). *International Agency for Research on Cancer Agents classified by IARC Monographs*, Volumes 1- 109. Last updated: 31 March 2014, Available at http://monographs.iarc.fr/ENG/Classification/index.php., Accessed August 2014.

Jaynes, D., 1994. *Evaluation of Fluorobenzoate Tracers in Surface Soils*. Ground Water, Vol. 32, No. 4, July-August 1994, pp. 532 – 538.

Lee, P. Y. and Chen, C. Y., 2009. *Toxicity and quantitative structure-activity relationship of benzoic acids to* Pseudokirchneriella subcapitata. Journal of Hazardous Materials, 2009, Vol. 165, pp. 156 - 161

McCarthy, J. F., Howard, K. M., and McKay, L. D., 2000. *Effect of pH on Sorption and Transport of Fluorobenzoic Acid Ground Water Tracers*. Journal of Environmental Quality, Vol. 29, Nov/Dec 2009, pp. 1806 -1813

Olszewska, P., Szymanski, J., Mikiciuk-Olasik, E., and Szymanski, P., 2014. *New cyclopentaquinoline derivatives with fluorobenzoic acid induce G1 arrest and apoptosis in human lung adenocarcinoma cells*. European Journal of Pharmacology, Vol. 729, 2014, pp. 30 - 36

Tai, T., Yamashita, M., Takeda, M. and Naito, H. 1986. *The toxicity and structure of various aromatic fluorides*. Fluoride: Quarterly Reports. International Society for Fluoride Research. Vol. 19, July 1986, No. 3, pp. 117 – 121

US FDA (U.S. Food and Drug Administration).1973. *Select Committee on GRAS Substances (SCOGS) Opinion: Sorbitol, Report Number 7*. Generally Recognised as Safe (GRAS) Substance Database. Available at http://www.accessdata.fda.gov/scripts/fcn/fcnDetailNavigation.cfm?rpt=scogsListing&id=36. Accessed August 2014.

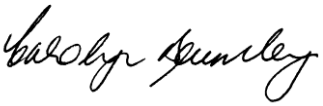
US FDA (U.S. Food and Drug Administration) 2013. *Code of Federal Regulations: Title 21, Volume 3 listing for Benzoic acid* (Section 184.1021). Revised 1 April 2013. Available at

http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=184.1021. Accessed August 2014.

US EPA (United States Environmental Protection Agency),1993. *Integrated Risk Information System (IRIS),Dossier for Benzoic acid (CASRN 65-85-0)*. Available at http://www.epa.gov/iris/subst/0355.htm#refinhal. Accessed August 2014.

US EPA (United States Environmental Protection Agency), 2014. ECOTOX (ECOTOXicology) Database, Release 4.0. Available at http://cfpub.epa.gov/ecotox/, Accessed August 2014.

Zhao Y. H., Ji, G. D., Cronin, M.T. D., and Dearden, J. C. 1998. *QSAR study of the toxicity of benzoic acids to* Vibrio fischeri, Daphnia magna *and carp*. The Science of the Total Environment, Vol. 216, 1998, pp. 205-215.



Madeleine Thomas
Environmental Scientist

Carolyn Brumley
Principal Scientist

MGT/CB:LT:GS/

Attachments: 1 – Material Safety Data Sheets
2 – Benzoic Acid Human Health Profile
3 – Limitations

\\golder.gds\gap\melbourne\jobs\env\2012\other offices\brisbane\127635006 qgc\05300 - 2014 ad-hoc chem assessments\chemical tracers\memo 18\127635006-018-m-rev0-05300-hsca groundwater tracers.docx

ATTACHMENT 1

Material Safety Data Sheets

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 2-(Trifluoromethyl)benzoic Acid
GENERAL USE: Diagnostic
GENERIC NAME: 2-TFMBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
2-(Trifluoromethyl)benzoic Acid	433-97-6	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2-(Trifluoromethyl)benzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2-(Trifluoromethyl)benzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2-(Trifluoromethyl)benzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 2,3,4,5-Tetrafluorobenzoic Acid
GENERAL USE: Diagnostic
GENERIC NAME: 2,3,4,5-TTFBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
2,3,4,5-Tetrafluorobenzoic Acid	1201-31-6	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,3,4,5-Tetrafluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,3,4,5-Tetrafluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,3,4,5-Tetrafluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 2,3,4-Trifluorobenzoic acid
GENERAL USE: Diagnostic
GENERIC NAME: 2,3,4-TFBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
2,3,4-Trifluorobenzoic acid	61079-72-9	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,3,4-Trifluorobenzoic acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,3,4-Trifluorobenzoic acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,3,4-Trifluorobenzoic acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 2,4,5-Trifluorobenzoic acid
GENERAL USE: Diagnostic
GENERIC NAME: 2,4,5-TFBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
2,4,5-Trifluorobenzoic acid	446-17-3	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,4,5-Trifluorobenzoic acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,4,5-Trifluorobenzoic acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,4,5-Trifluorobenzoic acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 2,4-Difluorobenzoic Acid
GENERAL USE: Diagnostic
GENERIC NAME: 2,4-DFBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
2,4-Difluorobenzoic Acid	1583-58-0	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,4-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,4-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,4-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 2,5-Difluorobenzoic Acid
GENERAL USE: Diagnostic
GENERIC NAME: 2,5-DFBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
2,5-Difluorobenzoic Acid	2991-28-8	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,5-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,5-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,5-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 2,6-Difluorobenzoic Acid
GENERAL USE: Diagnostic
GENERIC NAME: 2,6-DFBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
2,6-Difluorobenzoic Acid	385-00-2	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,6-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,6-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2,6-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 2-Fluorobenzoic Acid
GENERAL USE: Diagnostic
GENERIC NAME: 2-FBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
2-Fluorobenzoic Acid	445-29-4	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2-Fluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2-Fluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 2-Fluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 3-(Trifluoromethyl)benzoic Acid
GENERAL USE: Diagnostic
GENERIC NAME: 3-TFMBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
3-(Trifluoromethyl)benzoic Acid	454-92-2	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 3-(Trifluoromethyl)benzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 3-(Trifluoromethyl)benzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 3-(Trifluoromethyl)benzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 3,4-Difluorobenzoic Acid
GENERAL USE: Diagnostic
GENERIC NAME: 3,4-DFBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
3,4-Difluorobenzoic Acid	455-86-7	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 3,4-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 3,4-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 3,4-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 3,5-Difluorobenzoic Acid
GENERAL USE: Diagnostic
GENERIC NAME: 3,5-DFBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
3,5-Difluorobenzoic Acid	455-40-3	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 3,5-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 3,5-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 3,5-Difluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 3-Fluorobenzoic Acid
GENERAL USE: Diagnostic
GENERIC NAME: 3-FBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
3-Fluorobenzoic Acid	455-38-9	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 3-Fluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 3-Fluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 3-Fluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 4-(Trifluoromethyl)benzoic Acid
GENERAL USE: Diagnostic
GENERIC NAME: 4-TFMBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
4-(Trifluoromethyl)benzoic Acid	455-24-3	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 4-(Trifluoromethyl)benzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 4-(Trifluoromethyl)benzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 4-(Trifluoromethyl)benzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

Date of revision: 04/22/2014

Contact information: 713-328-2320

MATERIAL SAFETY DATA SHEET

Date-Issued: 04-2014
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: 4-Fluorobenzoic Acid
GENERAL USE: Diagnostic
GENERIC NAME: 4-FBA

MANUFACTURER

ProTechnics
Division of Core Laboratories
6510 W. Sam Houston Parkway N
Houston, Texas 77041

24 HR. EMERGENCY TELEPHONE NUMBERS

Emergency: 713-328-2320
Transportation Emergency:
1-800-535-5053 (inside US)
1-352-323-3500 collect (outside US)

COMMENTS: To the best of our knowledge, this Material Safety Data Sheet conforms to the requirements of US OSHA 29 CFR 1910.1200, 91/155/EEC and Canadian Hazardous Products Act.

2. HAZARDS IDENTIFICATION

CLASSIFICATION OF THE SUBSTANCE OR MIXTURE
Classification under CHIP: Xi: R/36/37/38
Classification under CLP: STOT SE 3: H335; Eye Irrit. 2: H319; Skin Irrt. 2: H315
Most important adverse effects: Irritating to eyes, respiratory system and skin.

LABELS ELEMENTS
Label elements under CLP:
Hazard statements: H315: Causes skin irritation
H315: Causes serious eye irritation
H335: May cause respiratory irritation

Signal words: Warning: Warning

Hazard pictograms: GHS07: Exclamation mark

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Solid with no odor.
IMMEDIATE CONCERNS: May cause eye and skin irritation.

POTENTIAL HEALTH EFFECTS
EYES: May cause irritation to the eyes.
SKIN: May cause irritation to the skin.
INGESTION: May cause irritation to the digestive tract.
INHALATION: May cause irritation to the lungs, upper respiratory tract and nose.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
EYES: Redness and possible itching and/or tearing of the eyes.

SKIN: Redness and/or itching of the skin
INGESTION: Possible nausea and/or vomiting.
INHALATION: Possible coughing, burning, tightness of chest and/or shortness of breath.

ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute oral toxicity.
No test data is available for acute inhalation toxicity.

CARCINOGENICITY: Not Listed by NTP
Not listed by IARC
Not listed by OSHA

MUTAGENICITY: Not Available

REPRODUCTIVE TOXICITY
REPRODUCTIVE EFFECTS: Not Available
TERATOGENIC EFFECTS: Not Available

MEDICAL CONDITIONS AGGRAVATED: None known

TARGET ORGAN STATEMENT: Contains material which may cause gastrointestinal tract and respiratory tract irritation.

SENSITIZATION: Not Available

3. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS/Exempt No	Percent	Hazardous
4-Fluorobenzoic Acid	456-22-4	100	No

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 37, R 38: Irritating to eyes and skin.

EEC Irritant - "Xi"

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, seek medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, seek medical attention. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water and keep at rest. Seek immediate medical attention.

INHALATION: Although unlikely, remove from further exposure. If cough or other symptoms develop, seek medical attention.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: Not Available

FLAMMABLE LIMITS: None – nonflammable

AUTOIGNITION TEMPERATURE: Not Available

FLAMMABLE CLASS: Nonflammable

FLAME PROPAGATION OR BURNING RATE OF SOLIDS: Not Available

GENERAL HAZARD: None

EXTINGUISHING MEDIA: Non-needed.

HAZARDOUS COMBUSTION PRODUCTS: None.

FIRE FIGHTING PROCEDURES: This product is a nonflammable substance.

SENSITIVE TO STATIC DISCHARGE: Not Available

SENSITIVITY TO IMPACT: Not Available

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: Construct temporary dikes of dirt, sand, or any appropriate readily available material to prevent spreading of the material.
Wearing the appropriate personal protective equipment designated in Section 8, move the container to a containment area.

GENERAL PROCEDURES: Remove containers of strong acids from release area.

7. HANDLING AND STORAGE

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle in a well ventilated area.
Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

STORAGE: Store in unopened containers under cool and dry conditions.
Do not store with, or close to strong acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.
SKIN: To prevent any contact, wear protective clothing such as neoprene or butyl rubber gloves and apron where appropriate.
RESPIRATORY: If airborne dust is present, use a NIOSH approved particulate respirator.

WORK HYGIENIC PRACTICES: Facilities storing or using this material should be equipped with an eyewash facility.
Good personal hygiene practices should always be followed.

COMMENTS: No PEL's, TLV's or OEL's for this product or it's ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

9. PHYSICAL AND CHEMICAL PROPERTIES

State: Solid
Color: White
Odor: Odorless
Oxidizing: Non-oxidizing

10. STABILITY AND REACTIVITY

STABLE: YES

HAZARDOUS POLYMERIZATION: NO

CONDITIONS TO AVOID: Extreme Cold.

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: Will not occur.

HAZARDOUS DECOMPOSITION PRODUCTS: None.

INCOMPATIBLE MATERIALS: Strong acids

11. TOXICOLOGICAL INFORMATION

ACUTE
DERMAL LD_{50}: Not Available
ORAL LD_{50}: Not Available
INHALATION LC_{50}: Not Available

EYE EFFECTS: This material may cause irritation to the eyes.

SKIN EFFECTS: This material may cause irritation to the skin.

TARGET ORGANS: Eyes
Skin
Gastrointestinal tract
Respiratory system

CARCINOGENICITY:
IARC: Listed by IARC - No
NTP: Listed by NTP - No
OSHA: Listed by OSHA - No

MUTAGENICITY: Not Available

REPRODUCTIVE EFFECTS: Not Available

TERATOGENIC EFFECTS: Not Available

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: Not Available

ECOTOXICOLOGICAL INFORMATION: Not Available

DISTRIBUTION: Not Available

CHEMICAL FATE INFORMATION: Not Available

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

PRODUCT DISPOSAL: Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

EMPTY CONTAINER: Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

GENERAL COMMENTS: Refer to Section 6, Accidental Release Measures for additional information.

14. TRANSPORT INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 4-Fluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

AIR (ICAO/IATA)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 4-Fluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

VESSEL (IMO/IMDG)
PROPER SHIPPING NAME: Not Regulated
TECHNICAL NAME: 4-Fluorobenzoic Acid
LABEL: Use Product Identifier, "Trade Name", with technical name below.

15. REGULATORY INFORMATION

UNITED STATES
SARA TITLE III (SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)
311/312 HAZARD CATEGORIES:
FIRE: NO **PRESSURE**
GENERATING: NO **REACTIVITY:** NO **ACUTE:** NO **CHRONIC:** NO
313 REPORTABLE INGREDIENTS: Not Applicable
TITLE III NOTES: Not Applicable

CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)
CERCLA RQ: Not Applicable

TSCA (TOXIC SUBSTANCE CONTROL ACT)
TSCA REGULATORY: All intentional ingredients are listed on the TSCA Inventory.

NATIONAL RESPONSE CENTER: U.S. Coast Guard National Center telephone # 1-800-424-8802

CANADA

WHMIS HAZARD SYMBOL AND CLASSIFICATION

Class D, Division 2, Subdivision B: Toxic Material
May cause eye and skin irritation.

WHMIS Toxic

WHMIS (WORKER HAZARDOUS MATERIALS INFORMATION SYSTEM): This product is WHMIS controlled.

CANADA INGREDIENT DISCLOSURE LIST: This product does not contain any known ingredient(s) on the "Ingredient Disclosure List".

CANADIAN ENVIRONMENTAL PROTECTION ACT: All intentional ingredients are listed on the DSL (Domestic Substance List).

EUROPEAN COMMUNITY

EEC LABEL SYMBOL AND CLASSIFICATION

R 36, R 38: Irritating to eyes and skin.
S 24, S 25: Avoid contact with skin or eyes.
S 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 28: After contact with skin, wash immediately with plenty of soap and water.

EEC Irritant - "Xi"

EUROPEAN COMMUNITY REGULATORY: All intentional ingredients are listed on the European's EINECS Inventory.

MEXICO This product is considered to be an irritant according to Mexican Standard, Instruction No. 9, ANNEX 1

STATE REGULATIONS Not Available

REGULATIONS

LOCAL REGULATIONS: Not Available

16. OTHER INFORMATION

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

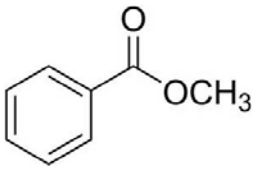
Date of revision: 04/22/2014

Contact information: 713-328-2320

ATTACHMENT 2

Benzoic Acid Human Health Profile

Project number: 127635006
Project name: Hydraulic Fracturing Chemicals Assessment, Southwest Queensland
Client name: QGC

Name	Benzoic Acid
Synonyms	Carboxybenzene, Benzenecarboxylic acid
CAS number	65-85-0
Molecular formula	$C_7H_6O_2$
Molecular Structure	

Overview	References
Benzoic acid is a white solid, which is either odourless or with a slight benzaldehyde odour. It comprises a benzene compound substituted with a carboxylic acid group. Benzoic acid is considered soluble in water (solubility of 2.45 g/L at 15ºC, 2.93 g/L at 20ºC and 3.47 g/L at 25ºC) and has a melting point of 122.4ºC (sublimation begins at about 100ºC). Benzoic acid occurs naturally in may foods (including cranberries, prunes, plums, cinnamon, ripe cloves and most berries). Commercial uses of benzoic acid include as an antimicrobial agent and a flavouring agent in food production.	ECHA 2014, US FDA 2013
Benzoic acid is listed as "*Generally Recognised as Safe*" (GRAS) by the U.S. Food and Drug Administration's (FDA) Select Committee on GRAS Substances (SCOGS). The committee reviewed available information and concluded that there is "*no evidence in the available information to show that benzoic acid and sodium benzoate as food ingredients constitute a hazard to the general public when used at levels that are now current or that might reasonably be expected in future*". The review included metabolic data on benzoic acid and sodium benzoate in experimental animals and man. The FDA's Code of Federal Register (CFR) states that current uses results in a maximum level of 0.1 % (w/w) in food.	US FDA 1973, US FDA 2013
The United States Environmental Protection Agency (US EPA)'s Integrated Risk Information System (IRIS) provides an oral reference dose (RfD) of 4 mg/kg/day benzoic acid.	US EPA 1993

Human Health Toxicity Summary	Reference
Carcinogenicity Benzoic acid has not been evaluated by the International Agency for Research on Cancer (IARC) as to its carcinogenicity.	IARC 2014
IRIS states that benzoic acid is not classifiable as to human carcinogenicity due to either a lack of human data or inadequate data from animal bioassays.	US EPA 1993
IRIS presents a lifetime study (conducted in 1984) of mice exposed to 3502 mg/kg/day and 3367 mg/kg/day of benzoic acid for males and females, respectively. The treatment had no apparent effect on survival or tumor incidence. A 5-generation reproduction study (conducted in 1970) is also presented where mice were fed a daily dose of 40 mg/kg benzoic acid combined with 80 mg/kg sodium bisulfite in a paste before feeding. One group was only fed benzoic acid (further	

details are not provided). Malignant tumors (not otherwise specified) occurred in 8/100 treated mice and 1/8 mice in the third generation of the treated group. Tumor incidences were not reported for untreated mice. A study from 1966 indicated that 3-month exposure to 0.2% benzoic acid in the diet increased the susceptibility of mice to the development of carcinomas following intraperitoneal inoculation with Erlich ascites carcinoma cells. The study reported that tumours developed in 62/90 (68.8%) of benzoic acid-treated mice and in 16/49 (32.6%) of the control mice. IRIS also stated that no positive results have been reported in mutagenicity or genotoxicity test in prokaryotes, eukaryotes and several mammalian test systems for benzoic acid and sodium benzoate.	
Mutagenicity/Genotoxicity Benzoic acid is not classified as a germ cell mutagen by ECHA (ECHA stated conclusive data have been reviewed, indicating low toxicity which doesn't support classification under the GHS (Rev3)).	ECHA 2014
Reproductive Toxicity Benzoic acid is not classified as reproductively toxic by ECHA (ECHA stated conclusive data has been reviewed, indicating low toxicity which doesn't support classification under the GHS (Rev3)). ECHA provides a 4-generational feeding study in rats who received benzoic acid at 0.5% or 1%. After chronic dietary exposure of rats to 1% benzoic acid, no effects were noted. In the four generations, no effects were observed on fertility and no effects on reproduction were seen. IRIS states that sodium benzoate appeared to have no maternal toxicity or foetal toxicity in mice, rats, hamsters or rabbits when given orally.	ECHA 2014 US EPA 1993
Developmental Toxicity/Teratogenicity Benzoic acid is not classified as a developmental toxicant by ECHA (ECHA stated conclusive data had been reviewed, indicating low toxicity which doesn't support classification under the GHS (Rev3)). ECHA cites a developmental toxicity study of aspirin, sodium salicylate and benzoic acid. Pregnant animals were treated orally at day 9 of gestation with 510 mg/kg of benzoic acid, followed 2 hours later by 250 or 500 mg/kg aspirin orally, and at day 11 of gestation, with a further 510 mg/kg of benzoic acid orally, followed 2 hours later with 500 mg/kg sodium salicylate. The study reports that treatment with benzoic acid alone did not lead to developmental effects. IRIS states that sodium benzoate appeared to have no observed teratogenicity in mice, rats, hamsters or rabbits when given orally.	ECHA 2014 US EPA 1993
Endocrine Disruption Benzoic acid is not identified in the European Commission (EC)'s report, "*Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption*" as a substance of interest.	EC 2000
Acute Toxicity (oral, dermal, inhalation) Benzoic acid is not classified as acutely toxic by ECHA (ECHA states conclusive data has been reviewed, indicating low toxicity which doesn't support classification under the GHS (Rev3)). **Oral** ECHA lists a study which reports acute oral LD_{50} for benzoic acid in male, female and combined male and female rats of 2742 mg/kg, 2360 mg/kg and 2565 mg/kg, respectively. Benzoic acid was suspended in corn oil and administered orally to rats in a range of dosages, from 500 to 5000 mg/kg. Mortality and body weights were observed for a 14 day period. Another study listed by ECHA, reports an oral LD_{50} of 2250 mg/ kg bw for mice. Benzoic acid was administered at doses ranging from 1500 to 4000 mg/kg. The animals were observed for intoxication and mortality for a period of 14 days.	ECHA 2014

Dermal ECHA lists a study reporting a dermal LD_{50} for rabbits exposed to benzoic acid of > 2000 mg/ kg bw (single exposure dose). Four rabbits were dermally exposed (semi-occlusive) for 24 hours to the test substance. ECHA considers that benzoic acid would not be a toxic substance if administered by the dermal route. **Inhalation** ECHA reports findings from an inhalation study conducted on rats. The rats were exposed in a glass chamber for 4 hours to a dynamic atmosphere containing a dust of benzoic acid at 12 200 mg/m^3. The study reported that the LC_{50} was > 12 200 mg/m^3 and therefore, benzoic acid was considered not to be a highly toxic material by the inhalation route of administration.	ECHA 2014
Chronic/repeat dose toxicity (oral, dermal, inhalation) The United States Environmental Protection Agency (US EPA)'s Integrated Risk Information System (IRIS) provides an oral reference dose (RfD) of 4 mg/kg/day benzoic acid. This RfD was based on the FDA's (1973) estimate of daily per capita intake of 0.9-34 mg of benzoic acid and 34 – 328 mg for sodium benzoate. At these levels, there were no reports of toxic effects in humans. The upper range was therefore used as a No Observed Adverse Effect Level to calculate the RfD with no uncertainty factor being used, the RfD was calculated as 312 mg/day for a 70 kg human or 4 mg/kg/day (based on sodium benzoate being converted to the equivalent benzoic acid amount). Not considered chronically toxic by ECHA. **Oral** ECHA provides a 3-month study of mice exposed to 80 mg/kg day of benzoic acid orally. Benzoic acid was reported to produce a higher mortality rate than seen in the control group. Weight loss of 31.7% was observed for the animals exposed to benzoic acid, whereas for the control group, weight loss was 41.2%. **Inhalation** ECHA lists an inhalation study where rats were exposed to benzoic acid dust at varying concentrations (25 mg/m^3, 250 mg/m^3 and 1200 mg/m^3) for 6 hours per day, 5 days a week, for 4 consecutive weeks. The study reported a NOAEL for local effects of < 25 mg/m^3 and a NOAEL for systemic effects of 250 mg/m^3. Local effects observed included nasal redness and discharge, pulmonary fibrosis and inflammatory cell infiltrates in the lungs, which can be related to the irritant properties of benzoic acid. Systematic effects included mortality, decreased body weights and decreased liver, kidney and lung weights. It was noted that at 250 mg/m^3 a slight decrease in absolute kidney weight was seen in females only (body weight was also slightly lower (although not significantly) than in control females). **Dermal** ECHA lists a dermal study in New Zealand white rabbits which reported a NOAEL of >2 500 mg/kg. Benzoic acid was applied 5 days a week for 3 weeks at dosage levels of 100, 500 and 2 500 mg/kg. No changes were seen in general behaviour and appearance, body weight, clinical laboratory tests, organ weights or survival at >2 500 mg/kg. Although, at these doses very slight dermal irritation was noted for one rabbit.	US EPA 1993 ECHA 2014
Sensitisation of the skin or respiratory system Benzoic acid is not classified as skin sensitising by ECHA (ECHA states conclusive data has been reviewed, indicating low toxicity which doesn't support classification under the GHS (Rev3)).	ECHA 2014
Corrosion (irreversible)/irritation (reversible) effects on the skin or eye **Skin irritation** Benzoic acid is considered a skin irritant by ECHA (GHS Classification of Category 2).	ECHA 2014

ECHA provides a study which reports benzoic acid had produced erythema and swelling of the earlobes of guinea pigs. Benzoic acid was applied in solution, at a concentration of 20% and the effects were observed for 3 hours following application. It was noted that these effects were not produced in the mouse or rat ear. **Eye damage** Benzoic acid is considered to cause serious eye damage by ECHA (GHS Classification of Category 1). ECHA provides a study which reported that benzoic acid was found to be severely irritating to rabbit eyes under the conditions of the test. Instillation of approximately 77 mg of the test substance in one of the eyes of each of three albino rabbits resulted in adverse effects on the cornea, iris and conjunctivae. Effects were observed for 21 days and were not reversible within this time.	ECHA 2014

Physical Hazards	Reference
Flammable Potential Benzoic acid is considered non-flammable by ECHA.	ECHA 2014
Explosive Potential Benzoic acid is considered non-explosive by ECHA.	ECHA 2014

Toxicity Values	Value	Reference
Human Toxicity Data		
High Chronic/Repeat Dose Toxicity		
NOAEL, oral (dietary intake)	312 mg/day benzoic acid	US EPA 1993
Animal Toxicity Data		
Acute Toxicity		
LD_{50}		
Rat, oral	2742 mg/kg	ECHA 2014
Mouse, oral	2250 mg/ kg	ECHA 2014
Rabbit, dermal, 24 hr	> 2 000 mg/ kg	ECHA 2014
LC_{50}		
Rat, 4 hr	> 12 200 mg/m^3	ECHA 2014
High Chronic/Repeat Dose Toxicity		
NOAEL, inhalation, rats, local effects	< 25 mg/m^3	ECHA 2014
NOAEL, inhalation, rats, systemic effects	250 mg/m^3	ECHA 2014
NOAEL, dermal, rabbits, 3 week	>2 500 mg/kg	ECHA 2014

Footnotes:
LD_{50} – lethal dose for 50% of experimental population
LC_{50} – lethal air concentration for 50% of experimental population
LOAEL – Lowest Observed Adverse Effect Level
LOAEC – Lowest Observed Adverse Effect Concentration
NDF – No data found within the limits of the search strategy

Project number: 127635006
Project name: Hydraulic Fracturing Chemicals Assessment, Southwest Queensland
Client name: QGC

Human Health Toxicity Ranking*		
	Hazard data	**Comment**
Hazard Band 4		
Carcinogenicity (IARC Group 1 or 2A)	NDF	
Mutagenicity/Genotoxicity (GHS Category 1A and 1B)	No	ECHA 2014
Reproductive Toxicity/Developmental toxicity (GHS Category 1, 1A and 1B)	No	ECHA 2014
Endocrine Disruption[1]	No	EC 2000
Hazard Band 3		
Carcinogenicity (IARC Group 2B)	NDF	
Mutagenicity/Genotoxicity (GHS Category 2)	No	ECHA 2014
Reproductive Toxicity/Developmental toxicity (GHS Category 2)	No	ECHA 2014
Acute Toxicity (oral, dermal or inhalation) Very Toxic/Toxic • oral LD_{50} ≤ 300 mg/kg [2] • dermal LD_{50} ≤ 1000 mg/kg • inhalation LC_{50} ≤ 10 mg/L [3] (or mg/m^3) (vapour)	No	See below
High Chronic/repeat dose toxicity • oral LOAEL ≤ 10 mg/kg/d [2]; • dermal LOAEL ≤ 20 mg/kg/d; • inhalation LOAEC (6 h/d) ≤ 50 ppm/d for gases, ≤ 0.2 mg/L/d for vapours or ≤ 0.02 mg/L/d for dust/mists/fumes [3]	No	See below
Corrosive (irreversible effect)	Yes	Considered to cause serious eye damage (effects not reversible after 21 days), ECHA 2014
Respiratory sensitiser	No	ECHA 2014
Hazard Band 2		
Harmful chronic/repeat dose toxicity • oral LOAEL > 10 mg/kg and ≤ 100 mg/kg/d • dermal LOAEL > 20 mg/kg/d and ≤ 200 mg/kg/d • inhalation (6-h/d) LOAEC > 50 mg/L ≤ 250 mg/L/d for gases, > 0.2 mg/L ≤ 1 .0 mg/L/d for vapours or > 0.02 mg/L ≤ 0.2 mg/L/d for dust/mists/fumes [3]	No	NOAEL, rabbit, dermal - > 2 500 mg/kg NOAEL, rats, inhalation, systemic effects - 250 mg/m^3 ECHA 2014
Skin Sensitiser	No	ECHA 2014
Hazard Band 1		
Acute Toxicity-Harmful • oral LD_{50} > 300 mg/kg ≤ 2000 mg/kg • dermal LD_{50} >1 000 mg/kg ≤ 2000 mg/kg; • inhalation LC_{50} (6 h/d) > 10 mg/L ≤ 20 mg/L for vapours) [3]	No	LD_{50}, rat, oral - 2742 mg/kg LD_{50}, mouse, oral - 2250 mg/ kg LD_{50}, rabbit, dermal - > 2 000 mg/ kg LC_{50}, Rat - > 12 200 mg/m^3 ECHA 2014
Irritant (reversible effect)	Yes	Considered a skin irritant, ECHA 2014
Hazard Band 0 **All indicators outside criteria listed in Hazards 1-4**	-	
Physical Hazards		
Flammable potential	No	

Explosive potential	No	
Hazard Evaluation (highest band) not including physical hazards	**3**	**Based on being corrosive to the eyes**
Uncertainty analysis /data confidence (out of 12 parameters)	11/12 = 92%	**Classification data lacking for carcinogenicity**

* Based on IMAP Framework [NICNAS (2013) Inventory Multi-tiered Assessment and Prioritisation (IMAP) Framework. National Industrial Chemicals Notification and Assessment Scheme. Department of Health and Aging, Canberra].

"[1]*Based on list of endocrine disrupting chemicals from the European Commission's Endocrine Disrupters website.*

[2] *milligrams per kilogram body mass (mg/kg) or milligrams per kilogram body mass per day (mg/kg/d)*

[3] *Based on GHS cut-offs for hazard classification. For chronic/repeat dose toxicity, GHS cut-offs are provided as guidance values (i.e. the dose/concentration at or below which significant health effects are observed)". (p 18, NICNAS 2013).*

Human Health Guidelines		
Media	**Concentration (mg/m^3; mg/L; mg/kg)**	**Reference**
Occupational Exposure Limits		
Air (OEL)		
8-h TWA	NDF	
STEL	NDF	
Peak Limitation	NDF	
Environmental Exposure		
Air, ambient	NDF	
Air, indoor	NDF	
Water, potable	7.5 mg/L	US EPA 2014
Water, recreational	NDF	
Soil, residential	25 000 mg/kg	US EPA 2014
Soil, commercial/industrial	330 000 mg/kg	US EPA 2014

Footnotes:

OEL = Occupational Exposure Limit

TWA = 8 h Time-Weighted Average

STEL = (15 min) Short-term Exposure Limit

Qualifying Summary Comments

Benzoic acid is a white solid which is soluble in water and occurs naturally in foods, such as fruit and berries. It is used in food production as an antimicrobial agent and a flavouring agent. Benzoic acid is listed as "*Generally Recognised as Safe*" (GRAS) by the U.S. Food and Drug Administration's (FDA) Select Committee on GRAS Substances (SCOGS). Current uses of benzoic acid result in a maximum level of 0.1 % in food. The US EPA's IRIS provides an oral RfD of 4 mg/kg/day benzoic acid. Benzoic acid appears to have relatively low oral toxicity, with the toxicity limited to dermal exposures where irritancy is evident and ocular exposures where it has been demonstrated to be corrosive resulting in the potential to cause serious eye damage. Based on the potential corrosive properties of the compound, it has been assigned a Hazard Band Rating of 3. These concerns

subsequently relate to occupational settings where the acid powder may be used (e.g. in the preparation of solutions) and where occupational management measures would be required. Its solubility and ready biodegradation limits its potential to persist under general environmental conditions.

References

EC 2000. *European Commission Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption, preparation of a candidate list of substances as a basis for priority setting, Final Report* (Incorporating corrigenda to final report dated 21 June 2000). BKH Consulting Engineers, Delft, The Netherlands in association with TNO Nutrition and Food Research, Zeist, The Netherlands. Available at http://ec.europa.eu/environment/chemicals/endocrine/strategy/substances_en.htm#priority_list,. [Accessed August 2014].

ECHA (European Chemicals Agency Registered Chemical Substances Search) 2014. *Dossier for Benzoic Acid*. Available at http://apps.echa.europa.eu/registered/data/dossiers/DISS-9d8b8ff8-7308-2921-e044-00144f67d249/AGGR-56f3e120-e134-4900-9f67-a051b2614122_DISS-9d8b8ff8-7308-2921-e044-00144f67d249.html#AGGR-56f3e120-e134-4900-9f67-a051b2614122. [Accessed August 2014].

IARC 2014. *International Agency for Research on Cancer Agents classified by IARC Monographs*, Volumes 1-109. Last updated: 31 March 2014, Available at http://monographs.iarc.fr/ENG/Classification/index.php. Accessed August 2014.

US FDA 1973. *Select Committee on GRAS Substances (SCOGS) Opinion: Sorbitol, Report Number 7*. Generally Recognised as Safe (GRAS) Substance Database. U.S. Food and Drug Administration. Available at http://www.accessdata.fda.gov/scripts/fcn/fcnDetailNavigation.cfm?rpt=scogsListing&id=36. [Accessed August 2014].

US FDA 2013. *Code of Federal Regulations: Title 21, Volume 3 listing for Benzoic acid* (Section 184.1021). Revised 1 April 2013. U.S. Food and Drug Administration. Available at http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?fr=184.1021. [Accessed August 2014].

US EPA 1993. *Integrated Risk Information System (IRIS),Dossier for Benzoic acid (CASRN 65-85-0)*. Available at http://www.epa.gov/iris/subst/0355.htm#refinhal. [Accessed August 2014].

US EPA 2014. *Regional Screening Level – Screening Levels for Chemical Contaminants*, United States Environmental Protection Authority, Updated May 2014. Available at http://www.epa.gov/region9/superfund/prg/. [Accessed August 2014].

Created by:	MGT	06/08/2014
Reviewed by:	LT	07/08/2014 Rev0

ATTACHMENT 3

Limitations

LIMITATIONS

This Document has been provided by Golder Associates Pty Ltd ("Golder") subject to the following limitations:

This Document has been prepared for the particular purpose outlined in Golder's proposal and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.

The scope and the period of Golder's Services are as described in Golder's proposal, and are subject to restrictions and limitations. Golder did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Golder in regards to it.

Conditions may exist which were undetectable given the limited nature of the enquiry Golder was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.

In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Golder's opinions are based upon information that existed at the time of the production of the Document. It is understood that the Services provided allowed Golder to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document.

Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Golder for incomplete or inaccurate data supplied by others.

Golder may have retained subconsultants affiliated with Golder to provide Services for the benefit of Golder. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any direct legal recourse to, and waives any claim, demand, or cause of action against, Golder's affiliated companies, and their employees, officers and directors.

This Document is provided for sole use by the Client and is confidential to it and its professional advisers. No responsibility whatsoever for the contents of this Document will be accepted to any person other than the Client. Any use which a third party makes of this Document, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this Document.