METHYL BROMIDE CRITICAL USE RENOMINATION FOR POST-HARVEST USE TREATMENT OF STRUCTURES – FOOD PROCESSING PLANTS

EXECUTIVE SUMMARY

This nomination is for facilities, or portions of facilities, that are unsuitable for the alternatives of methyl bromide, and where the alternatives are not economically feasible. Sulfuryl fluoride is highly dependent upon temperature, so should a facility need fumigation during cold temperatures, it may not be the product of choice because of the increase in costs. Also sulfuryl fluoride requires higher dosages for egg kill, but in some facilities killing eggs is paramount, again contributing to higher costs. Phosphine is corrosive to many metals that are present in facilities, especially in the computers and other electronic process control instrumentation; and it is flammable. Heat is dependent on several parameters: the structural composition, as different components expand and contract at different rates; the building design/layout factors, which affect the ability to evenly distribute heated air; and the availability of convenient and economical sources of heat. In addition, heat may not be a viable option for treatment of food products or commodities.

METHYL BROMIDE CRITICAL USE RENOMINATION NOMINATION FOR STRUCTURES, COMMODITIES OR OBJECTS

NOMINATING PARTY:
The United States of America

NAME
USA CUN10 **POST HARVEST** **STRUCTURES - FOOD PROCESSING PLANTS**

BRIEF DESCRIPTIVE TITLE OF NOMINATION:
Methyl Bromide Critical Use Nomination for Post Harvest Use on Structures -- Food Processing Plants (Submitted in 2008 for 2010 Use Season)

STRUCTURE, COMMODITY OR OBJECT TREATED:
This sector includes rice mills, flour mills, and pet food manufacturing facilities. Primarily this sector is treating only the portions of the facilities that contain electronic components and have machinery with copper and copper alloy parts. These facilities are under intense pressure from many insect pests. The flour millers do not directly target their commodities with fumigation, although some may be present in the equipment or in storage areas. However, rice millers and pet food manufacturers may target some of their products during fumigations with methyl bromide.

Food processing facilities in the United States have reduced the number of methyl bromide fumigations by incorporating a variety of different techniques to control pests. The most critical strategy implemented is IPM, especially sanitation, and equipment design modifications to enable cleaning and inspection in all areas of a facility. Facilities are now being monitored for pest populations, using visual inspections, pheromone traps, light traps and electrocution traps. When insect pests are found, facilities will attempt to contain the infestation with treatments of low volatility pesticides applied to both surfaces and cracks and crevices; spot treatments with heat or phosphine will be used in areas that are suitable. Incoming ingredients are inspected for insect pests and may be treated with phosphine if temperature and time are sufficient, or contaminated ingredients may be rejected. These techniques do not disinfest a facility but are critical in monitoring and managing pests, and hopefully preventing outbreaks. However, when all these methods fail to control a pest problem, facilities must rely on fumigation, to kill insects within the processing equipment, bins, storage spaces and even within the walls of the structure. There are two primary fumigants available to this industry that may accomplish these tasks: methyl bromide and sulfuryl fluoride.

This nomination is for facilities, or portions of facilities, that are unsuitable for the alternatives, and where the alternatives are not economically feasible. Sulfuryl fluoride is highly dependent upon temperature, so should a facility need fumigation during cold temperatures, it may not be the product of choice. Also sulfuryl fluoride requires higher dosages for egg kill, but in some facilities killing eggs is paramount. Phosphine is corrosive to many metals that are present in

facilities, especially in the computers and other electronic process control instrumentation; and it is explosive. Heat is dependent on several parameters: the structural composition, as different components expand and contract at different rates; the building design/layout factors, which affect the ability to evenly distribute heated air; and the availability of convenient and economical sources of heat. In addition, heat may not be a viable option for treatment of food products or commodities.

QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION:

TABLE COVER SHEET: QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION

YEAR	NOMINATION AMOUNT (KILOGRAMS)
2010	**191,993**

SUMMARY OF ANY SIGNIFICANT CHANGES SINCE SUBMISSION OF PREVIOUS NOMINATIONS:

The bakeries that have previously been included in this sector have not requested methyl bromide for use in 2010. These specific bakeries were portions of large food processing corporations. They have significantly reduced their fumigations by investing in additional personnel and building and equipment modifications to improve their IPM strategies, such as monitoring pest populations, improved crack and crevice treatments, and sanitation. They have improved sealing their facilities to improve fumigations. In addition to the improvements in their IPM strategies, they are using spot treatments, heat and sulfuryl fluoride to manage their pest pressures. The bakeries that have been included in this sector think they can be transitioned away from methyl bromide by 2010, but it has taken much capital investment by the corporations.

The critical uses remain where the alternatives are not technically and economically feasible.

(Details on this page are requested under Decision Ex. I/4(7), for posting on the Ozone Secretariat website under Decision Ex. I/4(8))

This form is to be used by holders of single-year exemptions to reapply for a subsequent year's exemption (for example, a Party holding a single-year exemption for 2005 and/or 2006 seeking further exemptions for 2007). It does not replace the format for requesting a critical-use exemption for the first time.

In assessing nominations submitted in this format, TEAP and MBTOC will also refer to the original nomination on which the Party's first-year exemption was approved, as well as any supplementary information provided by the Party in relation to that original nomination. As this earlier information is retained by MBTOC, a Party need not re-submit that earlier information.

NOMINATING PARTY CONTACT DETAILS:

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Following the requirements of Decision IX/6 paragraph (a)(1) [*insert name of Party*] has determined that the specific use detailed in this Critical Use Nomination is critical because the lack of availability of methyl bromide for this use would result in a significant market disruption. X Yes ☐ No

_____ _____ _____

Signature Name Date

Title: _____

CONTACT OR EXPERT(S) FOR FURTHER TECHNICAL DETAILS:

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LIST OF DOCUMENTS SENT TO THE OZONE SECRETARIAT IN OFFICIAL NOMINATION PACKAGE:

1. PAPER DOCUMENTS: **Title of paper documents and appendices**	**No. of pages**	**Date sent to Ozone Secretariat**
USA CUN10 POST HARVEST STRUCTURES - FOOD PROCESSING PLANTS		
2. ELECTRONIC COPIES OF ALL PAPER DOCUMENTS: ***Title of each electronic file (for naming convention see notes above)**	**No. of kilobytes**	**Date sent to Ozone Secretariat**
USA CUN10 POST HARVEST STRUCTURES - FOOD PROCESSING PLANTS		

* Identical to paper documents

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Part A: SUMMARY INFORMATION

1. NOMINATING PARTY AND NAME:

The United States of America
USA CUN10 POST HARVEST STRUCTURES -- FOOD PROCESSING PLANTS

2. DESCRIPTIVE TITLE OF NOMINATION:

Methyl Bromide Critical Use Nomination for Post Harvest Use on Structures -- Food Processing Plants (Submitted in 2008 for 2010 Use Season)

3. YEAR FOR WHICH EXEMPTION SOUGHT: 2010

TABLE A 1: QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION

YEAR	NOMINATION AMOUNT (KILOGRAMS)
2010	**191,993**

4. SUMMARY OF ANY SIGNIFICANT CHANGES SINCE SUBMISSION OF PREVIOUS NOMINATIONS (e.g. changes to requested exemption quantities, successful trialling or commercialisation of alternatives, etc.)

The bakeries that have previously been included in this sector have not requested methyl bromide for use in 2010. These specific bakeries were portions of large food processing corporations. They have significantly reduced their fumigations by infesting in additional personnel and building and equipment modifications to improve their IPM strategies, such as monitoring pest populations, improved crack and crevice treatments, and sanitation. They have improved sealing their facilities to improve fumigations. In addition to the improvements in their IPM strategies, they are using spot treatments, heat and sulfuryl fluoride to manage their pest pressures. The bakeries that have been included in this sector think they can be transitioned away from methyl bromide by 2010, but it has taken much capital investment by the corporations.

Food processing facilities in the United States have reduced the number of methyl bromide fumigations by incorporating a variety of different techniques to control pests. The most critical strategy implemented is IPM, especially sanitation, and equipment design modifications to enable cleaning and inspection in all areas of a facility. Facilities are now being monitored for pest populations, using visual inspections, pheromone traps, light traps and electrocution traps. When insect pests are found, facilities will attempt to contain the infestation with treatments of low volatility pesticides applied to both surfaces and cracks and crevices; spot treatments with heat or phosphine will be used in areas that are suitable. Incoming ingredients are inspected for insect pests and may be treated with phosphine if temperature and time are sufficient, or contaminated ingredients may be rejected. These techniques do not disinfest a facility but are critical in monitoring and managing pests, and hopefully preventing outbreaks. However, when all these methods fail to control a pest problem, facilities must rely on fumigation, to kill insects within the processing equipment, bins, storage spaces and even the walls of the structure. There

are two primary fumigants available to this industry that may accomplish these tasks: methyl bromide and sulfuryl fluoride.

This nomination is for facilities, or portions of facilities, that are unsuitable for the alternatives, and where the alternatives are not economically feasible. Sulfuryl fluoride is highly dependent upon temperature, so should a facility need fumigation during cold temperatures, it may not be the product of choice. Also sulfuryl fluoride requires higher dosages for egg kill, but in some facilities killing eggs is paramount. Phosphine is corrosive to many metals that are present in facilities, especially in the computers and other electronic process control instrumentation; and it is explosive. Heat is dependent on several parameters: the structural composition, as different components expand and contract at different rates; the building design/layout factors, which affect the ability to evenly distribute heated air; and the availability of convenient and economical sources of heat. In addition, heat may not be a viable option for treatment of food products or commodities.

In addition, there is some confusion as to the materials that may be directly fumigated with sulfuryl fluoride. According to the Profume™ label pet food is not listed as a material approved for direct treatment. Therefore, the interpretation is that all pet food products would need to be removed from treatment areas or sufficiently protected to prevent the formation of sulfuryl fluoride residues within the pet food products. This may sufficiently increase the costs and timing considerations for sulfuryl fluoride use on a host of processed foods and ingredients.

Part B: TRANSITION PLANS

Provision of a National Management Strategy for Phase-out of Methyl Bromide is a requirement under Decision Ex. I/4(3) for nominations after 2005. The time schedule for this Plan is different than for CUNs. Parties may wish to submit Section 21 separately to the nomination.

5. DESCRIBE MANAGEMENT STRATEGIES THAT ARE IN PLACE OR PROPOSED TO ELIMINATE THE USE OF METHYL BROMIDE FOR THE NOMINATED CRITICAL USE, INCLUDING:

1. Measures to avoid any increase in methyl bromide consumption except for unforeseen circumstances;
2. Measures to encourage the use of alternatives through the use of expedited procedures, where possible, to develop, register and deploy technically and economically feasible alternatives;
3. Provision of information on the potential market penetration of newly deployed alternatives and alternatives which may be used in the near future, to bring forward the time when it is estimated that methyl bromide consumption for the nominated use can be reduced and/or ultimately eliminated;
4. Promotion of the implementation of measures which ensure that any emissions of methyl bromide are minimised;
5. Actions to show how the management strategy will be implemented to promote the phase-out of uses of methyl bromide as soon as technically and economically feasible alternatives are available, in particular describing the steps which the Party is taking in regard to subparagraph (b) (iii) of paragraph 1 of Decision IX/6 in respect of research programmes in non-Article 5 Parties and the adoption of alternatives by Article 5 Parties.

The U.S. submitted the National Management Strategy in accordance with the Decision Ex. IX/6.

Part C: TRANSITION ACTIONS

Responses should be consistent with information set out in the applicant's previously-approved nominations regarding their transition plans, and provide an update of progress in the implementation of those plans.

In developing recommendations on exemption nominations submitted in 2003 and 2004, the Technology and Economic Assessment Panel in some cases recommended that a Party should explore the use of particular alternatives not identified in a nomination' transition plans. Where the Party has subsequently taken steps to explore use of those alternatives, information should also be provided in this section on those steps taken.

Questions 5 - 9 should be completed where applicable to the nomination. Where a question is not applicable to the nomination, write "N/A".

6. TRIALS OF ALTERNATIVES

Where available, attach copies of trial reports. Where possible, trials should be comparative, showing performance of alternative(s) against a methyl bromide-based standard

There are several new investigations that compare an alternative with methyl bromide.

(i) DESCRIPTION AND IMPLEMENTATION STATUS:

Small (2007) compared fumigations of sulfuryl fluoride and methyl bromide in four UK flour mills. He used pheromone traps to monitor several stored product insect pests: rust red flour beetle, confused flour beetle, and Mediterranean flour moth. Traps were placed within each mill for 2 weeks prior to fumigation (except one mill the traps were placed in there just one week prior to fumigation). The post-fumigation populations were monitored with trap catch data at 2 weeks and 5 weeks. Each mill was fumigated twice, about a month apart. Small (2007) found that the efficacy of sulfuryl fluoride compared favourably to that of methyl bromide. Small (2007) did report that some populations were low pre-fumigation (i.e. confused flour beetle at Mill A); and that some influx of moths from outside the fumigated area was probably the source of elevated moths shortly after a fumigation. The dosage for sulfuryl fluoride ranged from 571 g h/m^3 to 1326 gh/m^3. The dosage for methyl bromide in the study ranged from231.5 gh/m^3 to 476.5 gh/m^3. The dosage rate of sulfuryl fluoride was 2 to 3 times the dosage rate of methyl bromide. Economics were not considered in this study.

Another study compared methyl bromide and sulfuryl fluoride fumigations in flour mills (Tsai, et al. 2006). Indianmeal moth and red flour beetle, all life stages were used in bioassays exposed during fumigations. In addition, before and after fumigation, insect monitoring by traps were conducted to determine pest populations and rebound rates. The preliminary results were 100% mortality of adults and larvae of both species for both fumigants. Sulfuryl fluoride had 100% mortality of pupae, whereas methyl bromide had 100% of Indianmeal moth pupae but only 99.6% of red flour beetle pupae at one facility. In reporting egg mortality, Tsai, et al. (2006) distinguished between two types: those eggs that do not hatch and those eggs that hatch but do

not survive to adulthood. The methyl bromide fumigations had 100% egg mortality of red flour beetle eggs whereas sulfuryl fluoride in one facility had extremely high egg mortality, but in another facility the egg mortality was low. However, none of the hatched individuals matured to adults. Egg mortality of Indianmeal moth had different results. One facility fumigated with sulfuryl fluoride had 100% egg mortality, but the other facility had 99.67% egg mortality, but the hatched larvae all died before adulthood. One of the methyl bromide fumigated facilities also had 100% mortality of Indianmeal moth eggs, but the other facility 88.67% egg mortality and 95.4 % of the hatched larvae died before becoming adults. (Tsai, et al. 2006) This study does not report the fumigation parameters (although the information is available through Maier), nor does it have any economics included.

Dr. Maier's laboratory at Purdue University has been researching and modelling how fumigants move through structures. This agricultural engineering laboratory investigated how important such parameters as sealing, wind speed and direction, building temperature, fan circulation efficacy impact the effectiveness of fumigation (Maier, et al. 2007). For instance half life is a direct function of sealing. Improving half life could lead to a reduction in fumigant use. If HLT is increased from 10 to 20 hr, then fumigant use could decrease by 10 to 40% (Maier, et al., 2007). This research team has also demonstrated that temperatures in the mills are not constant, but are affected by weather conditions (Maier, et al. 2007).

The final new study that compares methyl bromide structural fumigation to an alternative compares economics. This paper uses an economic-engineering approach to estimate costs that "typical" firms would incur under alternative scenarios, as opposed to specific firms and situations (Adam 2007). Adam (2007) compared methyl bromide to sulfuryl fluoride in a food processing facility. A number of parameters were considered including: labor costs, equipment costs, and fumigant costs. The results showed that although there are a number of costs that are essentially the same between methyl bromide and sulfuryl fluoride fumigations (labor rates, hours/worker, number of workers, worker training, etc.), there are several costs that are different. The interscan/electronic monitor and heavy-duty hoses, fittings are more expensive for sulfuryl fluoride than for methyl bromide (ca. $6,000 vs. $2,500, respectively), but spreading the costs over a year of 50 fumigations the difference is about $23/job. The main difference in costs is the fumigant cost. This relates to the temperature and the level of control selected in the Fumiguide for sulfuryl fluoride. In a hypothetical fumigation of a 1,000,000 ft^3 facility, where a pound of either fumigant is $7, the cost of sulfuryl fluoride (2.5 lb/1000 ft^3) was 90% higher than the cost of a 1 lb/1000 ft^3 dose of methyl bromide and 46% higher than the cost of a 1.5 lb/1000 ft^3 dose of methyl bromide. (Adam 2007)

USDA Agriculture Research Service has developed their 5 year plan. The objectives that they established are: (1) Obtain information on the field efficacy of alternative structural treatments, such as sulfuryl fluoride or heat, compared with methyl bromide. (2) Evaluate the impact of some alternative tactics such as reduced-risk aerosol insecticides or targeted treatment with residual contact insecticides as part of an IPM or systems approach to eliminate the need for, or reduce the frequency of, fumigations or other structural treatments. (3) Develop improved monitoring tools and strategies to evaluate the need for and effectiveness of different management tactics to improve the implementation of an IPM program. (4) Develop models

using the above information with which to determine optimal management strategies using methyl bromide alternatives.

IPM

Research is continuing in the area of contour mapping to support pest management /IPM (Arbogast, et al. 2005; Nansen, et al., 2006). Spatial studies are important in monitoring pest populations. Contour mapping in Indian meal moth illustrate that higher trap catches are nearer the source of infestations (Arbogast, et al., 2005).

Efficient insect detection of cereal grains is being studied (Neethirajan, et al., 2007). Researchers are trying to develop efficient and fast insect detection techniques for grain. The potential of acoustic detection, carbon dioxide measurement, near-infrared spectroscopy, and soft X-ray methods have been discussed. Most were found to be cost prohibitive, and also the complexities of caibrating & operating the instruments presented problems to implementation (Neethirajan, et al., 2006).

The literature regarding essential oils consists of studies in small areas and laboratory experiments. In addition, none have included economic analyses. Thus these data do not shed light on commercial feasibility as yet. But numerous articles on essential oils have been published recently (Lee 2002; Nansen and Phillips, 2003) and on other spot-treatments (Lee, et al., 2003; Leelaja, et al. In Press; Wang, et al., 2006). Essential oils are not alternatives to fumigation of structures.

Hydroprene is receiving attention as well (Mohandass, et al. 2006a, 2006b). A review of hydroprene, an insect growth regulator, demonstrates that it works well on the immature stages of many of the stored product insects, but the efficacy depends upon the surface texture, temperature, and sanitation (Mohandass, et al. 2006a). In addition, mortality of Indian meal moth larvae is increased at higher temperatures Mohandass, et al., 2006b).

Alternative Fumigants

Phosphine investigations continue. Collins, et al. (2005) conducted laboratory studies examining resistant and susceptible strains of the *Rhyzopertha dominica* to a range of phosphine concentrations and exposure periods. Collins, et al. (2005) in studies on *R. dominica*, indicate that complete control can be expected in 5, 10, and 14 days depending on phosphine concentration. However, phosphine is corrosive to metal fixtures (as has been previously discussed).

Germinara, et al. (In Press) have begun preliminary investigations into the biological activity of proprionic acid on adults of *Sitophilus granarius* and *S. oryzae*. These laboratory studies demonstrated that proprionic acid was effective in killing adult weevils, and dose-dependent repellent effects.

Ozone as a fumigant in grain bins is being investigated (Kells, et al., 2001). Kells, et al. (2001) determined that ozone can be used as a fumigant in grain bins. In 8.9 tonnes of maize, with 50 ppm ozone for 3 days resulted in 92-100% mortality of adult red flour beetle, adult maize weevil and Indian meal moth larvae.

The registrant of sulfuryl fluoride is conducting more experiments through-out the U.S., but the results of the experiments are not available at the time of this nomination.

Heat Treatments

Boina and Subramanyam (2004) studied confused flour beetle life stages in the laboratory to a range of elevated temperatures. Boina and Subramanyam (2004) found that old larvae of confused flour beetles most resistant to elevated temperatures. In pupae & adults of red flour beetles, sublethal heat exposure resulted in impaired reproductive performance (Mahroof, et al. 2005).

New Grants

Kansas State University has received $369,181 in a USDA/CSREES grant to investigate aerosols as an alternative to methyl bromide in commercial flour mills, processing plants and food storage facilities (to be completed in 2009). Kansas State University had received a grant for optimizing heat treatments in these same facilities. Researchers at Purdue University have gotten funding from USDA/CSREES to develop a structural fumigation and analysis tool for sulfuryl fluoride and the combination of phosphine+heat+carbon dioxide. These and other CSREES Funded Projects can be found at: http://www.csrees.usda.gov/fo/fundview.cfm?fonum=1107.

(ii) OUTCOMES OF TRIALS: (*Include any available data on outcomes from trials that are still underway. Where applicable, complete the table included at Appendix I identifying comparative disease ratings and yields with the use of methyl bromide formulations and alternatives.*)

See 6(i) above.

(iii) IMPACT ON CRITICAL USE NOMINATION/REQUIRED QUANTITIES: *(For example, provide advice on any reductions to the required quantity resulting from successful results of trials.)*

Most of the available literature does not compare potential replacements for methyl bromide with methyl bromide. In addition, few studies have information regarding costs. However, the industry is learning how to implement sulfuryl fluoride as well as heat. There have been a few instances in the past of building damage from heat fumigations, as many heat companies are trying to match the down times of methyl bromide fumigations. One paper did report that fumigation of food processing facilities with sulfuryl fluoride was more expensive than with methyl bromide.

The industry is making progress by increasing sanitation, better monitoring of pests, and using spot treatments. In some cases companies have been able to afford to hire more people to improve their IPM strategies. Other facilities have been able to improve their buildings and equipment.

The USG has applied an aggressive transition rate which is reflected in the nomination amount and detailed in Appendix A.

During the preparation of this nomination the USG has accounted for all identifiable means to reduce the request. Specifically, approximately 13 million kilograms of methyl bromide were requested by methyl bromide users across all sectors. USG carefully scrutinized requests and made subtractions to ensure that no growth, double counting, inappropriate use rates on a treated hectare basis was incorporated into the final request. Use when the requestor qualified under some other provision (QPS, for example) was also removed and appropriate transition given yields obtained by alternatives and the associated cost differentials, was factored in. As a result of all these changes, the USG is requesting roughly 1/3 of that amount.

Therefore, USG feels that no additional reduction in methyl bromide quantities is necessary, given the significant adjustments described above.

(iv) ACTIONS TO ADDRESS ANY DELAYS/OBSTACLES IN CONDUCTING OR FINALISING TRIALS:

Research takes both time and financial resources. The above experiments are continuing and require more time in order to complete. After the data are analyzed, the results will dictate what further actions will be needed. Any further investigations will need appropriate funding, most likely through competitive grants.

The USG has the ability to authorize Experimental Use Permits (EUPs) for large scale field trials for methyl bromide alternatives. As with other activities connected with registration of a pesticide, the USG has no legal authority either to compel a registrant to seek an EUP or to require growers to participate.

As noted in our previous nomination, the USG provides a great deal of funding and other support for agricultural research, and in particular, for research into alternatives for methyl bromide. This support takes the form of direct research conducted by the Agricultural Research Service (ARS) of USDA, through grants by ARS and CSREES, by IR-4, the national USDA-funded project that facilitates research needed to support registration of pesticides for specialty crop vegetables, fruits and ornamentals, through funding of conferences such as MBAO, and through the land grant university system. The 5-year accomplishments of this program are available at: http://www.ars.usda.gov/SP2UserFiles/Program/308/NP308AccomplishmentReport.pdf

7. TECHNOLOGY TRANSFER, SCALE-UP, REGULATORY APPROVAL FOR ALTERNATIVES

The USDA maintains an extensive technology transfer system, the Agricultural Extension Service. This Service is comprised of researchers at land grant universities, county extension agents, and private pest management consultants. In addition to these sources of assistance for technology transfer, there are trade organizations and grower groups, some of which are purely voluntary but most with some element of institutional compulsion, that exist to conduct research, provide marketing assistance, and to disseminate “best practices.”

(i) DESCRIPTION AND IMPLEMENTATION STATUS:

Many of the USDA grants include technology transfer. Most of the recipients of grants typically accomplish this by extension education (publications, websites) and industry engagement via trade-shows and conferences. Several awardees will hold hands-on training and demonstrations.

(ii) OUTCOMES ACHIEVED TO DATE FROM TECHNOLOGY TRANSFER, SCALE-UP, REGULATORY APPROVAL:

See above.

(iii) IMPACT ON CRITICAL USE NOMINATION/REQUIRED QUANTITIES: (*For example, provide advice on any reductions to the required quantity resulting from successful progress in technology transfer, scale-up, and/or regulatory approval*.)

Most of the available literature does not compare potential replacements for methyl bromide with methyl bromide. In addition, few studies have information regarding costs. However, the industry is learning how to implement sulfuryl fluoride as well as heat. There have been a few instances in the past of building damage from heat fumigations, as many heat companies are trying to match the down times of methyl bromide fumigations. One paper did report that fumigation of food processing facilities with sulfuryl fluoride was more expensive than with methyl bromide.

The industry is making progress by increasing sanitation, better monitoring of pests, and using spot treatments. In some cases companies have been able to afford to hire more people to improve their IPM strategies. Other facilities have been able to improve their buildings and equipment.

The USG has applied an aggressive transition rate which is reflected in the nomination amount and detailed in Appendix A.

During the preparation of this nomination the USG has accounted for all identifiable means to reduce the request. Specifically, approximately 13 million kilograms of methyl bromide were requested by methyl bromide users across all sectors. USG carefully scrutinized requests and made subtractions to ensure that no growth, double counting, inappropriate use rates on a treated hectare basis was incorporated into the final request. Use when the requestor qualified under some other provision (QPS, for example) was also removed and appropriate transition given yields obtained by alternatives and the associated cost differentials, was factored in. As a result of all these changes, the USG is requesting roughly 1/3 of that amount.

Therefore, USG feels that no additional reduction in methyl bromide quantities is necessary, given the significant adjustments described above.

.

(iv) ACTIONS TO ADDRESS ANY DELAYS/OBSTACLES:

Research takes both time and financial resources. The above experiments are continuing and require more time in order to complete. After the data are analyzed, the results will dictate what further actions will be needed. Any further investigations will need appropriate funding, most likely through competitive grants. In addition, extension education (publications, websites) and industry engagement via trade-shows and conferences, and other venues (like the Methyl Bromide Alternatives Outreach Annual Meetings) will be pursued. Some groups will hold hands-on training and demonstrations.

Furthermore, the USG has no legal authority to compel registrations; it can only act on registrations requested by private entities. The timely submission of data to support a registration decision is at the sole discretion of the registrant.

8. COMMERCIAL SCALE-UP/DEPLOYMENT, MARKET PENETRATION OF ALTERNATIVES

(i) DESCRIPTION AND IMPLEMENTATION STATUS:

The issues are described in the National Management Strategy previously submitted.

(ii) IMPACT ON CRITICAL USE NOMINATION/REQUIRED QUANTITIES: (*For example, provide advice on any reductions to the required quantity resulting from successful commercial scale-up/deployment and/or market penetration*.)

The USG has applied an aggressive transition rate which is reflected in the nomination amount and detailed in Appendix A.

During the preparation of this nomination the USG has accounted for all identifiable means to reduce the request. Specifically, approximately 13 million kilograms of methyl bromide were requested by methyl bromide users across all sectors. USG carefully scrutinized requests and made subtractions to ensure that no growth, double counting, inappropriate use rates on a treated hectare basis was incorporated into the final request. Use when the requestor qualified under some other provision (QPS, for example) was also removed and appropriate transition given yields obtained by alternatives and the associated cost differentials, was factored in. As a result of all these changes, the USG is requesting roughly 1/3 of that amount.

Therefore, USG feels that no additional reduction in methyl bromide quantities is necessary, given the significant adjustments described above.

(iii) ACTIONS TO ADDRESS ANY DELAYS/OBSTACLES:

USG endeavors to identify methyl bromide alternatives to move them forward in the registration queue. However USG has no legal authority to compel registrations; it can only act on registrations requested by private entities. The timely submission of data to support a registration decision is at the sole discretion of the registrant.

No new applications for methyl bromide alternatives in post-harvest settings are pending review with EPA.

The USDA maintains an extensive technology transfer system, the Agricultural Extension Service. This Service is comprised of researchers at land grant universities and county extension agents in addition to private pest management consultants. In addition to these sources of assistance for technology transfer, there are trade organizations and grower groups, some of which are purely voluntary but most with some element of institutional compulsion, that exist to conduct research, provide marketing assistance, and to disseminate "best practices". The California Strawberry Commission is one example of such a grower group.

9. CHANGES TO TRANSITION PROGRAM

If the transition program outlined in the Party's original nomination has been changed, provide information on the nature of those changes and the reasons for them. Where the changes are significant, attach a full description of the revised transition program.

See Appendix A.

10. OTHER BROADER TRANSITION ACTIVITIES

Provide information in this section on any other transitional activities that are not addressed elsewhere. This section provides a nominating Party with the opportunity to report, where applicable, on any additional activities which it may have undertaken to encourage a transition, but need not be restricted to the circumstances and activities of the individual nomination. Without prescribing specific activities that a nominating Party should address, and noting that individual Parties are best placed to identify the most appropriate approach to achieve a swift transition in their own circumstances, such activities could include market incentives, financial support to exemption holders, labelling, product prohibitions, public awareness and information campaigns, etc.

These issues are discussed in the National Management plan for methyl bromide submitted previously.

Part D: REGISTRATION OF ALTERNATIVES

Progress in registration of a product will often be beyond the control of an individual exemption holder as the registration process may be undertaken by the manufacturer or supplier of the product. The speed with which registration applications are processed also can falls outside the exemption holder's control, resting with the nominating Party. Consequently, this section requests the nominating Party to report on any efforts it has taken to assist the registration process, but noting that the scope for expediting registration will vary from Party to Party.

11. PROGRESS IN REGISTRATION

Where the original nomination identified that an alternative's registration was pending, but it was anticipated that one would be subsequently registered, provide information on progress with its registration. Where applicable, include any efforts by the Party to "fast track" or otherwise assist the registration of the alternative.

The registration status of the alternatives to methyl bromide has not changed since the previous nomination.

Methyl bromide alternatives do have a fast track for registration in the U.S. EPA. However, before registering a new pesticide or *new use* for a registered pesticide, EPA must first ensure that the pesticide, when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment. To make such determinations, EPA requires more than 100 different scientific studies and tests from applicants. Where pesticides may be used on food or feed crops, EPA also sets tolerances (maximum pesticide residue levels) for the amount of the pesticide that can legally remain in or on foods.

There is a registration decision expected soon on applying an insect growth regulator, methoprene, onto a plastic film used for coating food boxes to control pests after food has been processed. It is undergoing review within the EPA Office of Pesticide Programs.

USG has no legal authority to compel registrations; it can only act on registrations requested by private entities. The timely submission of data to support a registration decision is at the sole discretion of the registrant.

12. DELAYS IN REGISTRATION

Where significant delays or obstacles have been encountered to the anticipated registration of an alternative, the exemption holder should identify the scope for any new/alternative efforts that could be undertaken to maintain the momentum of transition efforts, and identify a time frame for undertaking such efforts.

Methyl bromide alternatives have a fast track for registration in the U.S. EPA. However, before registering a new pesticide or *new use* for a registered pesticide, EPA must first ensure that the pesticide, when used according to label directions, can be used with a reasonable certainty of no harm to human health and without posing unreasonable risks to the environment. To make such

determinations, EPA requires more than 100 different scientific studies and tests from applicants. Where pesticides may be used on food or feed crops, EPA also sets tolerances (maximum pesticide residue levels) for the amount of the pesticide that can legally remain in or on foods.

13. DEREGISTRATION OF ALTERNATIVES

Describe new regulatory constraints that limit the availability of alternatives. For example, changes in buffer zones, new township caps, new safety requirements (affecting costs and feasibility), and new environmental restrictions such as to protect ground water or other natural resources. Where a potential alternative identified in the original nomination's transition plan has subsequently been deregistered, the nominating Party would report the deregistration, including reasons for it. The nominating Party would also report on the deregistration's impact (if any) on the exemption holder's transition plan and on the proposed new or alternative efforts that will be undertaken by the exemption holder to maintain the momentum of transition efforts.

No chemicals have been de-registered. However, methyl bromide use on structures, commodities, and post harvest treatments was reregistered in the US last year. The proposed mitigations for that reregistration include a fumigation management plan, treatment buffers to enhance worker safety and ventilation buffers to enhance bystander safety. The proposed buffers are based primarily on use rate, total amount of methyl bromide used, and the type and duration of aeration. The Reregistration Eligibility Decision for methyl bromide post harvest uses is available at: http://www.epa.gov/oppsrrd1/REDs/methyl_bromide_tred.pdf .

An additional complication in forecasting changes in the registration of alternatives is that under the US federal system individual states may impose restrictions above those imposed at the Federal level. Examples of these additional restrictions may include increasing buffer zones around facilities and chambers and requiring capture and destruction technology.

Part E: IMPLEMENTATION OF MBTOC/TEAP RECOMMENDATIONS

The Methyl Bromide Technical Options Committee and the Technology and Economic Assessment Panel may recommended that a Party explore and, where appropriate, implement alternative systems for deployment of alternatives or reduction of methyl bromide emissions.

Where the exemptions granted by a previous Meeting of the Parties included conditions (for example, where the Parties approved a reduced quantity for a nomination), the exemption holder should report on progress in exploring or implementing recommendations.

Information on any trialling or other exploration of particular alternatives identified in TEAP recommendations should be addressed in Part C.

14. USE/EMISSION MINIMISATION MEASURES

Where a condition requested the testing of an alternative or adoption of an emission or use minimisation measure, information is needed on the status of efforts to implement the recommendation. Information should also be provided on any resultant decrease in the exemption quantity arising if the recommendations have been successfully implemented. Information is required on what actions are being, or will be, undertaken to address any delays or obstacles that have prevented implementation.

By using sanitation and IPM the industry has been able to reduce methyl bromide use by extending the time between fumigations. According to the applicants, 10-12 years ago, plants in the United States used to fumigate with methyl bromide as much as 4-6 times a year. Currently, most southern facilities have reduced the number of methyl bromide fumigations to twice a year and some only fumigated once last year. These fumigations are typically at the beginning of the summer when pest pressure is significantly increasing and at the end of the summer.

In the northern regions of the United States, IPM strategies and sanitation methods have enabled some of these facilities to fumigate with methyl bromide once every 3 years, and a few facilities have gone without a methyl bromide fumigation for almost 5 years. The facilities in the northern United States have been able to exploit heat treatments more extensively than their southern counterparts, as well as opening up facilities during extremely cold weather for extensive cleaning coupled with low volatility pesticides (organophosphates, pyrethroids, insect growth regulators, botanicals) at the perimeters.

The industry is committed to studying how to improve insect control with IPM strategies and sanitation and to further reduce the number of methyl bromide fumigations. They are also continuing to pursue research of heat treatments, sulfuryl fluoride, and other potential alternatives to maximize efficiency.

In addition, USDA has several grant programs that support research into overcoming obstacles that have prevented the implementation of methyl bromide alternatives. USEPA and USDA jointly fund an annual meeting on methyl bromide alternatives. At the 2006 MBAO meeting

(November, Orlando, Florida) sessions were held to assess and prioritize research needs and to develop a use/emission minimization agenda for methyl bromide alternatives research. The 2007 MBAO meeting (October, San Diego, CA) further deliberations were held to discuss more specific measures. It may take several years for researchers to get funding to support these research goals.

The USG feels that no additional reduction in methyl bromide quantities is necessary, given the significant adjustments described above.

PART F: ECONOMIC ASSESSMENT

15. ECONOMIC INFEASIBILITY OF ALTERNATIVES – Methodology *(MBTOC will assess economic infeasibility based on the methodology submitted by the nominating Party. Partial budget analysis showing the operations' gross and net returns for methyl bromide and next best alternatives is a widely accepted approach. Analyses should be supported by discussions identifying which costs and revenues change and why. The following measures may be useful descriptors of the economic outcome using methyl bromide or alternatives. Parties may identify additional measures. Regardless of the methodology used, this section should explain why the calculated measures with the alternative are levels that indicate the alternative is not economically feasible. In the case of culturally significant artifacts economic assessment may not be practical.):*

The following measures or indicators may be used as a guide for providing such a description:

(a) The purchase cost per kilogram of methyl bromide and of the alternative;
(b) Gross and net revenue with and without methyl bromide, and with the next best alternative;
(c) Percentage change in gross revenues if alternatives are used;
(d) Losses per cubic meter relative to methyl bromide if alternatives are used;
(e) Losses per kilogram of methyl bromide requested if alternatives are used;
(f) Losses as a percentage of net cash revenue if alternatives are used;
(g) Percentage change in profit margin if alternatives are used.

TABLE F 1. SUMMARY OF ECONOMIC REASONS FOR EACH ALTERNATIVE NOT BEING FEASIBLE OR AVAILABLE

METHYL BROMIDE ALTERNATIVE	ECONOMIC REASON (IF ANY) FOR THE ALTERNATIVE NOT BEING AVAILABLE	ESTIMATED MONTH/YEAR WHEN THE ECONOMIC CONSTRAINT COULD BE SOLVED
Heat Treatment	For food processing facilities which are able to convert to heat treatment, economic losses are from additional production downtimes due to longer fumigation time and from capital expenditures required to adopt an alternative. There are other food processing facilities in areas of United States where heat treatment is not feasible.	Economic losses due to downtime with heat treatment are persistent.
Sulfuryl Fluoride	A small portion of the food processing facilities can economically convert to sulfuryl fluoride. Other facilities cannot due to economic losses that would result from inefficacious control of pests and higher treatment costs which arise at higher temperatures. See "Summary Of Technical Reason For Each Alternative Not Being Feasible Or Available."	Limitations of sulfuryl fluoride are persistent

MEASURES OF ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES

The four economic measures in Table E 2 through E 5 were used to quantify the economic impacts to post-harvest uses for food-processing. The measures are not independent of each other since they can be calculated from the same financial data. The economic measures do, however, complement each other in evaluating the CUE applicant's economic viability. These measures represent different ways to assess the economic feasibility of methyl bromide alternatives for methyl bromide users.

Net revenue is calculated as gross revenue minus operating costs. This is a good measure as to the direct losses of income that may be suffered by the users. It should be noted that net revenue does not represent net income to the users. Net income, which indicates profitability of an operation of an enterprise, is gross revenue minus the sum of operating and fixed costs. Net income should be smaller than the net revenue measured in this analysis. We did not include fixed costs because it is often difficult to measure and verify.

Sulfuryl Fluoride

Results of the assessment of using sulfuryl fluoride as an alternative to methyl bromide are provided in Tables 14.1, and E.1 through E.4. For purposes of this analysis, current prices of sulfuryl fluoride, the number of applications, and efficacy with methyl bromide were assumed equal and plant temperatures are assumed to be 24 degrees centigrade (75 degrees Fahrenheit). This analysis only covers cases where sulfuryl fluoride is a technically feasible alternative to methyl bromide and can be used and its use is not restricted. Fumigation with sulfuryl fluoride at lower temperatures controlling all pest life stages is infeasible due to prohibitively high application rates and minimal efficacy.

Heat Treatment

Potential economic losses were estimated for the food-processing facilities that have not been converted to heat treatment. This analysis only covers cases where heat treatment may potentially be technically feasible, and does not cover situations where heat would degrade the commodity being processed (those with fats and edible oils). Economic costs in the post-harvest uses of the food-processing sector can be characterized as arising from three contributing factors. First, the direct pest control costs are increased in most cases because heat treatment is more expensive, and labor is increased because of longer treatment time and increased number of treatments. For food-processing facilities that are not already using heat, capital expenditure is required to retrofit them to be suitable for heat treatment. Moreover, additional production downtimes for the use of alternatives are unavoidable. Many facilities operate at or near full production capacity and alternatives that take longer than methyl bromide or require more frequent application can result in manufacturing slowdowns, shutdowns, and shipping delays. Slowing down production would result in additional costs to the methyl bromide users. Economic cost per 1000 m^3 was calculated as the additional costs of methyl bromide if methyl bromide users had to replace methyl bromide with heat treatment. Implementation of heat treatment is likely to have substantial cost implications to the facilities that have not been converted to heat in the food-processing sector.

Production downtime is estimated at almost two additional days per heat treatment. Potential economic losses associated with the use of heat treatment also include the cost of capital investment. The estimated economic losses are shown in Tables E 2 through E 5. The estimated economic loss as a percentage of net revenue is over 50% for all the CUE applicants in the food-processing sector and over 100% for the rice millers resulting in negative net revenues.

TABLE F 2. ANNUAL ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR RICE MILLER'S ASSOCIATION

LOSS MEASURE	METHYL BROMIDE	SULFURYL FLUORIDE	HEAT TREATMENT
GROSS REVENUE (US$/1000 M^3)	$29,385	$29,385	$27,720
- OPERATING COSTS (A+B) PER 1000 M^3	$27,916	$28,758	$29,429
A) COST OF METHYL BROMIDEOR ALTERNATIVE	$2,596	$3,438	$3,894
B) OTHER OPERATING COSTS	$25,320	$25,320	$25,535
NET REVENUE (US$/1000 M^3) (NET OF OPERATING COSTS)	$1,469	$627	($1,709)
LOSS MEASURES			
TIME LOST (DAYS)	0 DAYS	0 days	17 days
LOSS PER 1000 M^3 (US$/1000 M^3)	$0	$843	$3,178
LOSS PER KILOGRAM METHYL BROMIDE(US$/KG)	$0	$8.43	$32
LOSS AS A % OF GROSS REVENUE (%)	0%	3%	11%
LOSS AS A % OF NET REVENUE (%)	0%	57%	216%
PROFIT MARGIN (NET REVENUE/GROSS REVENUE)	5%	2%	-6%

TABLE F 3: ANNUAL ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR PET FOOD INSTITUTE

LOSS MEASURE	METHYL BROMIDE	SULFURYL FLUORIDE	HEAT TREATMENT
GROSS REVENUE (US$/1000 M³)	$175,452	$175,452	$170,773
- OPERATING COSTS (A+B) PER 1000 M³	$166,679	$166,848	$167,154
A) COST OF METHYL BROMIDEOR ALTERNATIVE	$519	$688	$779
B) OTHER OPERATING COSTS	$166,160	$166,160	$166,375
NET REVENUE (US$/1000 M³) (NET OF OPERATING COSTS)	$8,773	$8,604	$3,619
LOSS MEASURES			
TIME LOST (DAYS)	0 DAYS	O days	8 days
LOSS PER 1000 M³ (US$/1000 M³)	$0	$169	$5,153
LOSS PER KILOGRAM METHYL BROMIDE(US$/KG)	$0	$3.45	$258
LOSS AS A % OF GROSS REVENUE (%)	0%	<1%	3%
LOSS AS A % OF NET REVENUE (%)	0%	2%	59%
PROFIT MARGIN (NET REVENUE/GROSS REVENUE)	5%	5%	2%

TABLE F 4. ANNUAL ECONOMIC IMPACTS OF METHYL BROMIDE ALTERNATIVES FOR NORTH AMERICAN MILLER'S ASSOCIATION

LOSS MEASURE	METHYL BROMIDE	SULFURYL FLUORIDE	HEAT TREATMENT
GROSS REVENUE (US$/1000 M³)	$437,472	$437,472	$424,348
- OPERATING COSTS (A+B) PER 1000 M³	$415,598	$416,040	$416,452
A) COST OF METHYL BROMIDEOR ALTERNATIVE	$1,277	$1,719	$1,916
B) OTHER OPERATING COSTS	$414,321	$414,321	$414,536
NET REVENUE (US$/1000 M³) (NET OF OPERATING COSTS)	$21,874	$21,432	$7,896
LOSS MEASURES			
TIME LOST (DAYS)	0 DAYS	0 days	9 days
LOSS PER 1000 M³ (US$/1000 M³)	$0	$442	$13,978
LOSS PER KILOGRAM METHYL BROMIDE(US$/KG)	$0	$9.30	$294
LOSS AS A % OF GROSS REVENUE (%)	0%	0.1%	3%
LOSS AS A % OF NET REVENUE (%)	0%	2%	64%
PROFIT MARGIN (NET REVENUE/GROSS REVENUE)	5%	5%	2%

Part G: CHANGES TO QUANTITY OF METHYL BROMIDE REQUESTED

This section seeks information on any changes to the Party's requested exemption quantity.

16. CHANGES IN USAGE REQUIREMENTS

Provide information on the nature of changes in usage requirements, including whether it is a change in dosage rates, the number of hectares or cubic metres to which the methyl bromide is to be applied, and/or any other relevant factors causing the changes.

The USG has applied an aggressive transition rate which is reflected in the nomination amount and detailed in Appendix A.

During the preparation of this nomination the USG has accounted for all identifiable means to reduce the request. Specifically, approximately 13 million kilograms of methyl bromide were requested by methyl bromide users across all sectors. USG carefully scrutinized requests and made subtractions to ensure that no growth, double counting, inappropriate use rates on a treated hectare basis was incorporated into the final request. Use when the requestor qualified under some other provision (QPS, for example) was also removed and appropriate transition given yields obtained by alternatives and the associated cost differentials, was factored in. As a result of all these changes, the USG is requesting roughly 1/3 of that amount.

The USG feels that no additional reduction in methyl is necessary.

17. RESULTANT CHANGES TO REQUESTED EXEMPTION QUANTITIES

TABLE G.1: RESULTANT CHANGES TO REQUESTED EXEMPTION QUANTITIES

QUANTITY REQUESTED FOR PREVIOUS NOMINATION YEAR:	291,418 kgs
QUANTITY APPROVED BY PARTIES FOR PREVIOUS NOMINATION YEAR:	291,418 kgs
QUANTITY REQUIRED FOR YEAR TO WHICH THIS REAPPLICATION REFERS:	191,993 kgs

Part H: CITATIONS

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APPENDIX A: 2010 METHYL BROMIDE USAGE NEWER NUMERICAL INDEX EXTRACTED (BUNNI)

2010 Methyl Bromide Usage Newer Numerical Index - BUNNIE

Structures - Food Facilities

January 16, 2008	Region		Rice Millers	Bakeries	Pet Food Institute	North American Millers	Sector Total	Notes
Dichotomous Variables	Currently Use Alternatives?		Yes	Yes	Yes	Yes		
	Pest-free Requirements?		Yes	Yes	Yes	Yes		
Other Issues	Frequency of Treatment of Product		2x per year	3x per year	1x per 3 years	2.5x per year		
	Quarantine & Pre-Shipment Removed?		Yes	Yes	Yes	Yes		
Most Likely Combined Impacts (%)	Regulatory Issues (%)		0%	0%	0%	0%		
	Key Pest Distribution (%)		100%	100%	100%	100%		
	Total Combined Impacts (%)		**100%**	**100%**	**100%**	**100%**		
Most Likely Baseline Transition	(%) Able to Transition		90%	72%	75%	58%		
	Minimum # of Years Required		4	4	4	4		
	(%) Able to Transition per Year		**23%**	**18%**	**19%**	**15%**		
EPA Adjusted Use Rate (kg/1000m3)			**20**	**14**	**18**	**19**		
2010 Applicant Requested Usage	*Amount - Pounds*	*Pounds*	*224,000*	*-*	*87,009*	*562,000*	*873,009*	
	Volume - 1000ft^3	*Pounds*	*138,500*	*-*	*75,660*	*465,000*	*679,160*	
	Rate (lb/1000ft^3)	*Pounds*	*1.62*	*-*	*1.15*	*1.21*	*1*	
	Amount - Kilograms	Metric	**101,605**	**-**	**39,467**	**254,919**	**395,990**	
	Volume - 1000m^3	Metric	3,922	-	2,142	13,167	19,232	
	Rate (kg/1000m^3)	Metric	26	-	18	19	21	
EPA Preliminary Value		**kgs**	**101,605**	**-**	**39,467**	**254,919**	**395,990**	
EPA Baseline Adjusted Value has been adjusted for:		MBTOC Adjustments, QPS, Double Counting, Growth, Use Rate, Miscellaneous Adjustments, and Combined Impacts						
EPA Baseline Adjusted Value		kgs	78,438	-	31,364	254,919	364,721	
EPA Transition Amount		kgs	(63,927)	-	(17,642)	(91,158)	(172,727)	
EPA Amount of All Adjustments		**kgs**	**(87,094)**	**-**	**(25,745)**	**(91,158)**	**(203,997)**	
Most Likely Impact Value (kgs)		kgs	**14,511**	**-**	**13,722**	**163,760**	**191,993**	
		1000m^3	**726**	**-**	**745**	**8,459**	**9,929**	
		Rate	**20**	**-**	**18**	**19**	**19**	
Sector Research Amount (kgs)			**-**	**2010 Total US Sector Nomination**		**191,993**		

1 Pound = 0.453592 kgs

1 lb/1000 ft^3 = 0.0624 kg/1000 m^3

1000 cubic feet= 0.028316847 1000 cubic meters

(ounces/1000 ft^3 ~ kg/1000 m^3)